



# 2013 WILDLIFE DIVERSITY REPORT



## ON THE COVER: A TALE OF TWO BATS

Indiana is home to 13 bat species. The two on this year's cover, the hoary bat (top picture, Tim Torrance, Middlebury, IN) and the Northern long-eared bat (NLEB; bottom picture) lead different lives. Yet, for different reasons, both could be facing the greatest challenge of their species' existence. The same could be said for nearly all of Indiana's bat species.

The hoary bat, Indiana's largest and perhaps most colorful bat, gets its name from the grizzled white-tipped fur, which gives it the appearance of being covered in hoarfrost. Hoary bats are the most widespread of North American bats, occurring throughout much of Canada, the 48 contiguous United States, and south into Mexico and portions of Central and South America. They make long-distance seasonal migrations but much of their winter range and habits remain unknown. Hoary bats are found in Indiana during the summer months. This bat is mainly solitary, except for a mother and up to two pups. The species roosts among tree foliage and, less frequently, in buildings. Hoary bats are uncommon but widely distributed across the entire state. Wind-energy-generating turbines can be a fatal obstacle to hoary and other migrating bats in eastern North America but the actual impacts on the species remain to be determined.

Instead of migrating to warmer climates, NLEB spend winter hibernating in caves and mines. Until recently, these bats were thought to be common, but not abundant, and well distributed in Indiana. Unlike other cave-hibernating bats, NLEB are rarely seen during hibernacula surveys due to their habit of crawling far back in the cracks and crevices of cave walls and ceilings. The NLEB, like all of Indiana's cave-dwelling bats, is susceptible to white-nose syndrome. Since 2006, this fungus-caused disease has devastated wintering bat populations throughout eastern North America. Many states have already documented dramatic declines in NLEB populations. As a result, the species was recently proposed for inclusion as endangered on the Federal Endangered Species list.

Until recently, the benefits of bats to humans went largely unnoticed by many people. The nighttime insect eaters consume vast quantities of agricultural and forest pests. Scientists are concerned about the loss of this ecological service. Biologists from many agencies are working together to reduce, minimize or mitigate the new threats facing North America's bats.

We must find a way to conserve the bats of Indiana. Doing so will take time, patience and a willingness to try new techniques to recover and maintain healthy populations.

## INDIANA RARE SPECIES CONSERVATION

State law charges the Indiana Department of Natural Resources (DNR) Division of Fish & Wildlife (DFW) with management and conservation of nongame and endangered species, terms that can be confusing unless explicitly defined. "Nongame" species are mammals, birds, reptiles,

## WILDLIFE DIVERSITY STAFF

John Castrale, avian biologist  
Amy Kearns, assistant avian biologist  
Mitchell  
(812) 849-4586  
jcastrale@dnr.IN.gov  
akearns@dnr.IN.gov

Sarabeth Klueh-Mundy,  
reptile and amphibian biologist  
Jason Mirtl, assistant  
reptile and amphibian biologist  
Bloomington  
(812) 334-1137  
sklueh-mundy@dnr.IN.gov  
jmirtl@dnr.IN.gov

Scott Johnson, mammal biologist  
Cassie Hudson, assistant mammal biologist  
Tim Shier, assistant mammal biologist  
Bloomington  
(812) 334-1137  
sjohnson@dnr.IN.gov  
chudson@dnr.IN.gov  
tshier@dnr.IN.gov

Brant Fisher, aquatic biologist  
JoAnne Davis, assistant aquatic biologist  
Edinburgh  
(812) 526-5816  
bfisher@dnr.IN.gov  
jodavis1@dnr.IN.gov

Catherine (Katie) Gremillion-Smith, retired

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 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 a modern scientific resource program including survey and monitoring, research and habitat management, and protection. This 2013 report includes information on the status of specific nongame and endangered species, new emerging threats, and updates of ongoing contracted research and studies.

## KATIE GREMILLION-SMITH RETIRES

After serving for more than 24 years as supervisor of the Wildlife Diversity Program, Katie Gremillion-Smith retired from the DFW in November 2013.

Katie was the guiding vision of the program. She was responsible for assembling the first State Wildlife Action Plan for Indiana, which enabled the DFW to obtain more than \$12 million in federal State Wildlife Grant funds, which have been used for the conservation of nongame and endangered species. Her careful stewardship of the Nongame Wildlife Fund resulted in money well spent on needed projects for a wide variety of species. Grants funded with these monies also brought in a substantial amount of matching non-federal funds from numerous partners. Several wildlife species, including bald eagles, river otters and peregrine falcons, were restored to Indiana during her tenure and key land was acquired.

Katie strongly advocated that management activities should be grounded in science. She worked tirelessly to develop regulations to protect reptiles and amphibians from indiscriminate collecting and supported innovative strategies needed to conserve some of Indiana's at-risk species such as Eastern hellbender and Allegheny woodrat.

## HOW TO DONATE

The Indiana Department of Natural Resources Division of Fish & Wildlife 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 donated goes directly to the protection and management of more than 750 wildlife species in Indiana—from songbirds and salamanders to state-endangered barn owls and bantam sunfish. 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-infl/index.html](http://www.IN.gov/ai/appfiles/dnr-infl/index.html)

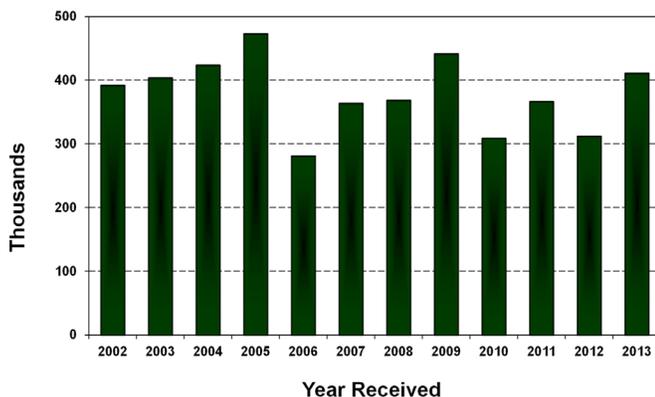


***Katie Smith with Wildlife Diversity Staff. Pictured left to right are Cassie Hudson, Amy Kearns, Sarabeth Klueh-Mundy, Scott Johnson, John Castrale, Katie Smith, Jason Mirtl, Tim Shier, JoAnne Davis, and Brant Fisher.***

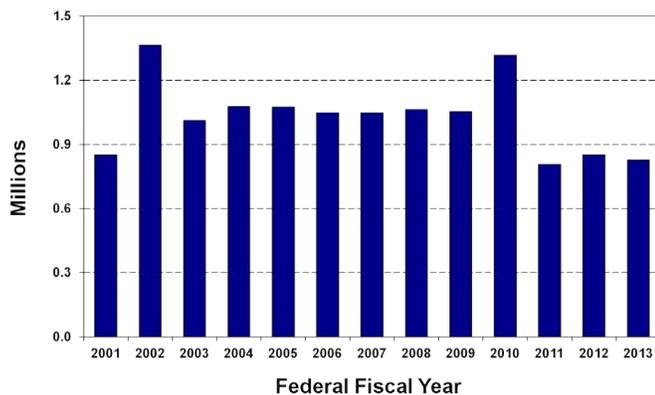
## FUNDING

In 2013, in spite of a slow economy and increasing competition for federal discretionary funds, donations to the Nongame Fund rebounded 32 percent over last year, as Indiana citizens donated \$411,478 when filing their State income taxes. Such generosity during an economic recovery is inspiring, a tribute to the importance so many Hoosiers place on our diverse wildlife. The DFW appreciates the continued support of Indiana citizens who make its work possible.

The State Wildlife Grant (SWG) funds remain below the long-term average but have not declined further. We are grateful to our many university partners who continue to supply the non-federal match needed to secure these funds. Additional federal funds were received in 2013 from a competitive White-Nose Syndrome (WNS) grant (\$9,230) and a Section 6 Endangered Species grant (\$56,347). The WNS grant supports staff travel to national and regional WNS meetings, additional winter hibernacula surveys, production and distribution of public outreach materials to encourage the reporting of sick and dead bats, and the purchase of software for the automated analysis of bats from acoustic files. The endangered species grant will be paired with a SWG



*Donations to the Nongame Fund during the last 12 tax years in thousand-dollar increments.*



*Federal matching funds for Indiana's Nongame Fund for the last 13 years.*

grant to foster stewardship of freshwater mussels in the Tippecanoe River, which is home to five federally listed mussel species. The Tippecanoe is one of the most important freshwater mussel streams in North America, and this new project is both timely and relevant as we seek to work with local communities to conserve this important and historic resource.

All federal discretionary funding is uncertain at this time, including SWG funds slated for 2014. Uncertain funding, however, is just one of the many challenges facing Indiana's nongame and endangered wildlife. Through the years, DFW has been blessed with many great partners and supporters. This is a team effort. There is good reason to be encouraged that Indiana has the right team to efficiently and economically preserve the state's rich wildlife diversity and heritage.

## SURVEY AND MONITORING

Inventory is the critical first step in 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.

## BIRDS

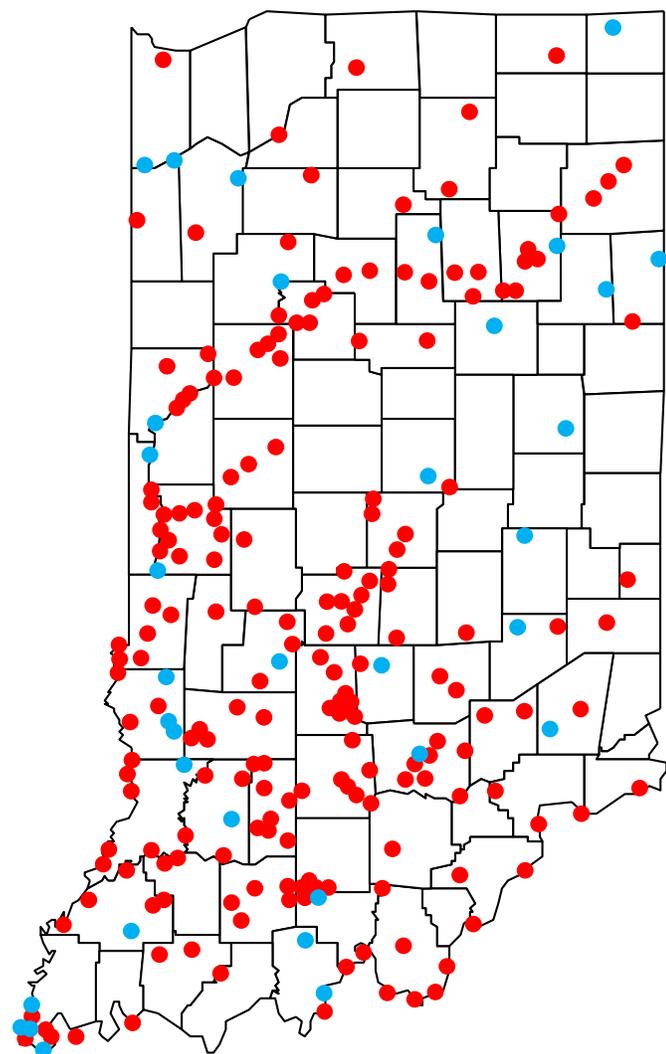
### Bald Eagle

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 alert us of newly discovered eagle nests. During the last comprehensive survey in 2010, 120 eagle pairs were known in Indiana. Approximately 20 new nests were reported in 2011, and another 35 in 2012. In 2013, 35 new bald eagle nests were discovered, although a few were new nests in territories already recorded as having nests. Five nests represented new county records for Steuben, Wells, Grant, Delaware, and Rush counties. In recent times, bald eagle nesting has been documented in 68 of Indiana's 92 counties. The current population is likely around 200 breeding pairs.

Another way to monitor long-term bald 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, they were done by helicopter, but aerial surveys were discontinued in 2009; however, in January 2013, an

opportunity arose to accompany the waterfowl biologist during helicopter surveys of portions of the Ohio, Wabash, and White rivers. Nine other locations, mainly fish & wildlife properties or public lakes, were surveyed for bald eagles from the ground. One section of the Wabash River was flown twice, and a bald eagle night roost along the Mississinewa River also was surveyed twice. Overall, the total number of bald eagles tallied at these sites ranged from 358–404 individuals. At the seven sites surveyed from the ground in past years, 126 bald eagles were counted compared to the previous five-year average of 98 birds. Among these counts, most eagles were seen at Sugar Creek (58) and Lake Monroe (41).

For the first time, counts were made at a major night roost along the Mississinewa, with 31 and 63 birds noted on the two occasions. Aerial counts along the Wabash from Posey to Tippecanoe counties ranged from 107–121 bald eagles, with the section from Posey to Sullivan counties surveyed twice. These numbers compare to an average of 68 birds annually from 1999–2008. The East Fork of the White from Daviess to Jackson counties had 41 ea-



*Blue dots show locations of bald eagle nests discovered in 2013. Red dots show nests known from previous years.*

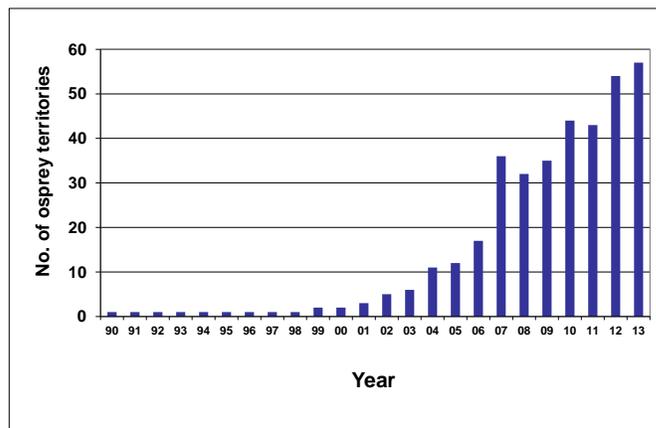
gles compared to the previous 10-year mean of 14 birds. The West Fork of the White from Morgan County to the main stem of the White hosted 31 eagles, a number much greater than the 12-bird average from previous years. Nine eagles were observed along the main stem of the White, where, on average, less than one eagle is counted. Finally, only 10 bald eagles were found along the Ohio River from Floyd to Posey counties, but this exceeded the average of four birds for this stretch from 1985–1998.

Winter bald 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. During the 2013 surveys, conditions were mild. Ice was rarely encountered, and water levels ranged from normal to below normal.

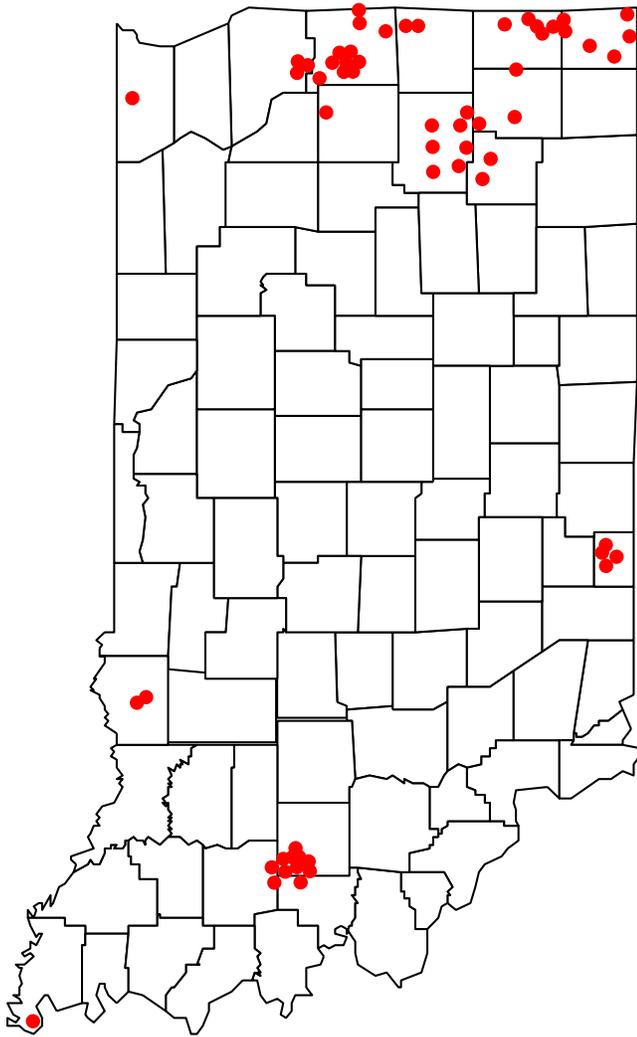
After showing dramatic population declines after World War II primarily from the devastating effects of DDT and other pesticides, our national symbol was declared recovered in 2007 and removed from the federal endangered species list. Indiana followed suit in 2008 after reaching a goal of 50 nesting pairs, a remarkable achievement considering that no bald 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 Lake Monroe, contributed greatly to the statewide recovery.

## Osprey

A restoration effort was undertaken for this state-endangered bird from 2003–2006 with 96 young ospreys taken from nests in coastal areas of Virginia, then 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 Indiana DNR and private groups and individuals, Indiana's osprey population has grown steadily. The goal is to sustain a population of 50 pairs. If success continues at a similar rate, osprey will be considered for removal from the Indiana list of endangered species in two or three years.



*Annual number of osprey territories.*



**Locations of osprey territories during 2013.**

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 in such areas 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 such as utility poles, cell towers and especially on nesting platforms built specifically for them.

Monitoring efforts continued for osprey in Indiana during 2013. Nearly 80 sites were checked, including previous nests, nesting platforms and locations with reports of new nests. Nesting appeared to have been delayed by a couple of weeks this spring, but nest success was above normal. Six new nests were found in 2013, resulting in a total of 57 pairs, with 51 pairs believed to have laid eggs. Of those, 47 were thought to be successful. At least 82 chicks were produced, but this is likely to be a significant underestimate 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,

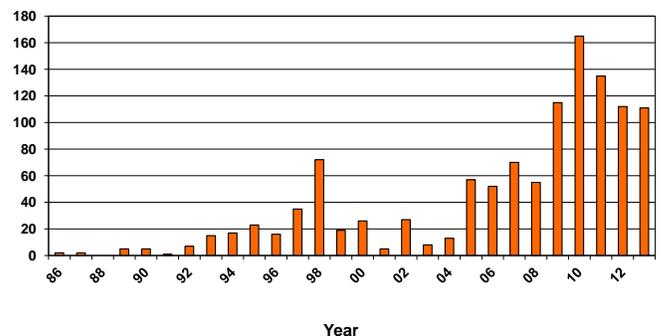
12 pairs and active nests in 2005, and 54 pairs and 49 active nests in 2012.

The distribution of ospreys is clustered in Indiana and includes 17 counties. Counties with the largest number of nests are St. Joseph (12 nests or pairs), Orange (8), Kosciusko (7), Steuben (6), and Lagrange (5). Public areas with the largest concentrations of osprey nests are Patoka Lake, Pigeon River Fish & Wildlife Area (FWA), Potato Creek State Park, and Brookville Lake. Nests in 2013 were built on nesting platforms (23), utility towers or poles (15), communication towers (14), dead trees (6), and, for the first time in Indiana, a grain silo (1) and a live tree (1). As communication towers have become increasingly used by ospreys, companies that service the equipment are encountering and recognizing osprey nests. Many contact the DFW for guidance. Most companies are willing and able to delay maintenance on the towers to after nesting season. Although vacant nests can be removed from towers without a permit, companies are encouraged to maintain at least part of the nest structure at a location on the tower where it is less likely to interfere with the tower’s operation.

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

### Least Tern

As a ground-nesting bird found along major rivers, 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, high river levels reduce the amount of suitable area available for nesting, and heavy rains can flood nests and result in losses of eggs and chicks or cause abandonment. With a return to more normal water levels in southwestern Indiana during 2013, the Wabash and Ohio rivers offered few sandbars or islands suitable for nesting. High water levels in key nesting areas along the Mississippi River during the early part of the nesting season generally result in least terns venturing north to Indiana searching for nesting



**Annual number of least terns produced at Gibson Lake.**



***Least tern chick on the nesting island at Goose Pond FWA in 2013.***

sites. In 2013, we saw the third highest number of adult terns at the complex of sites in Gibson County with about 220 birds present. At the American Electric Power (AEP) Rockport Plant in Spencer County, 30 adults were noted. For the first time, least terns nested on an island designed for them at Goose Pond FWA in Greene County, about 50 miles northeast of the Gibson County colony. As many as five adults were observed, three-to-four nests were initiated, and one chick was confirmed to have survived to flight stage. This record represents the northernmost breeding by interior least terns east of the Mississippi River.

Working closely with Duke Energy, AEP, and the U.S. Fish and Wildlife Service, we closely monitor least tern colonies at these two locations and take steps to ensure successful nesting. The Gibson County colonies nest on property owned and managed by Duke Energy, the U.S. Fish and Wildlife Service (Cane Ridge Wildlife Management Area), and the Indiana DNR (Tern Bar Slough Wildlife Diversity Area). The first least terns reported in Indiana during 2013 occurred on May 11 and were first noted at the Gibson County nesting areas on May 17. Birds remained until Aug. 4. Production was good with an estimated 146 nests producing a conservative estimate of 111 chicks fledged, virtually identical to last year's estimate. Eighty-five nests were found during the early part of the breeding season, while another 61 were tallied later, the result of pairs re-nesting after failed attempts and birds showing up from other parts of their range. More than half of all nests and young produced were on the center dike of Gibson Lake. The remainder were at Cane Ridge and a coal ash disposal area. No nesting occurred at Tern Bar Slough, although least terns were seen foraging and loafing there. Pump problems limited water levels at Cane Ridge and left Tern Bar Slough nesting islands without a protective moat for most of the season.

At the AEP Rockport plant in Spencer County, an electric



***Tern Bar Slough Wildlife Diversity Area borders Duke Energy's Gibson Station power plant.***

fence was installed around the main nesting site to reduce predation by mammals and prevent Canada geese from loafing on the dike. Partly as a result of this effort, a record 25–30 young were produced from 19 nests found. This location is along the Ohio River about 50 miles southeast of the Gibson Lake colony. Least terns have been present since 2003. The nesting site is a short, narrow dike separating some retention ponds. A nearby dredge island in the Ohio River sometimes has nesting terns, but few birds were seen this year due to high water levels.

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 more than adequate production in eight out of the last nine years and a steadily increasing number of least terns in Indiana since their discovery in 1986.

## **Build It and They Will Come**

Wildlife species respond to changes in habitat and landscape. Some of these changes occur slowly, over decades. Other changes happen in a matter of days, weeks or months, or over a few years. Animals and plants vary in their ability to take advantage of new situations. Birds, with their power of long-distance flight, are among the first to respond or colonize new areas. A key implement in wildlife conservation is the creation or restoration of land and water features to attract native wildlife. Establishing forests takes a relatively long time, but grasslands and wetlands can be developed in one or several seasons with plantings or the manipulation of water levels. Over its history, the DFW has targeted some of its resources to acquiring land and restoring or managing that land to create more productive habitat for rare species.

Goose Pond FWA and Tern Bar Slough Wildlife Diversity Area are examples of the principle that if you build it, they will come. Size matters in conservation and can be achieved by either making the project big or by strategically locating it in a matrix of similar habitat. Both approaches can achieve similar results—creating large areas that can support more species because of the variety of habitat types, and creating enough space to provide for species with large home ranges and a population size that can better sustain itself.

The “large size” route was taken with Goose Pond. Even though the area had recently been part of a vast sea of corn and soybeans, the unprecedented size of this restoration in the state has made Goose Pond a nearly irresistible magnet to wetland and grassland birds. At more than 8,000 acres located in Greene County, Goose Pond provides habitat that migrating and dispersing birds can detect from the air from miles away because of the expansive waves of grass and shallow waters. Once they discover Goose Pond, some birds such as the Northern bobwhite remain year-round. Others spend just the summer or winter, and many more use it as a stopover during spring or fall migration. Restorations the size of Goose Pond are rare due to the expense involved. Making this one happen took the combined effort of a diverse coalition of public and private partners.

From its purchase in 2005 and the wetland development done by the Natural Resources Conservation Service (NRCS), mostly completed by 2009, Goose Pond has become a premiere birding spot in the Midwest. It boasts more than 270 bird species, which is especially notable given that little of the property is forested. Goose Pond also has attracted some extremely unusual bird species, including spotted redshank, hooded crane and curlew sandpiper, Eurasian birds that seldom occur in North America.

Many wetland birds normally found in the southern United States show up at Goose Pond. These include the roseate spoonbill, wood stork, white ibis, glossy ibis,



*Nesting island designed for least terns at Goose Pond FWA.*

white-faced ibis, Neotropic cormorant, and fulvous and black-bellied whistling-ducks. The property has set state records for the largest one-day counts of more than a dozen species. Many others are seldom found elsewhere in Indiana in the sizable numbers that show up at Goose Pond. Notable among these is the greatest wintering concentration of endangered whooping cranes in the eastern United States. Of high conservation interest are the relatively large numbers of breeding king rails and several other rail and bittern species, and the 2013 nesting by the federally endangered least tern, which is an extension of its breeding range in the Midwest. As part of its development, a nesting island was specifically designed at Goose Pond to attract least terns.

Tern Bar Slough in Gibson County, near the Wabash River, was purchased in 2003. The 840 acres of row-crop fields present at that time were restored, by the NRCS, to wetlands and warm-season grasses. Additional areas were planted to trees by 2008. Two 3-acre islands were constructed and surrounded by a moat to provide nesting areas suitable for the federally endangered least tern. Although much smaller in size than Goose Pond, Tern Bar Slough is part of a complex of managed sites that includes the adjacent federally owned Cane Ridge Wildlife Management Area and nearby protected areas owned by the DNR Division of Nature Preserves and The Nature Conservancy. Duke Energy’s 3,000-acre Gibson Lake attracts impressive numbers of water birds. Duke and private individuals manage additional wildlife areas.

Due to its smaller size and less-frequent use by birders, Tern Bar Slough has recorded fewer bird species and lesser overall numbers than Goose Pond. However, it still hosts a wide diversity of grassland and wetland birds, many of which are of conservation concern, some of which are on state and federal endangered species lists. The federally endangered least tern has nested and regularly forages at Tern Bar Slough although much less frequently than at the adjacent Gibson Lake power plant and Cane Ridge. The piping plover, another federally endangered shore bird, has been documented during migration, and as many as eight whooping cranes regularly winter in the area and use Tern Bar Slough. Impressive numbers of grassland birds, including dickcissels, grasshopper sparrows, Henslow’s sparrows, field sparrows, Eastern meadowlarks, and American goldfinches breed at Tern Bar Slough. Raptors, including bald and golden eagles, Northern harriers, and wintering short-eared owls, also are present. When water conditions are suitable, a wide variety of waterfowl, wading birds, rails and shore birds can be observed.

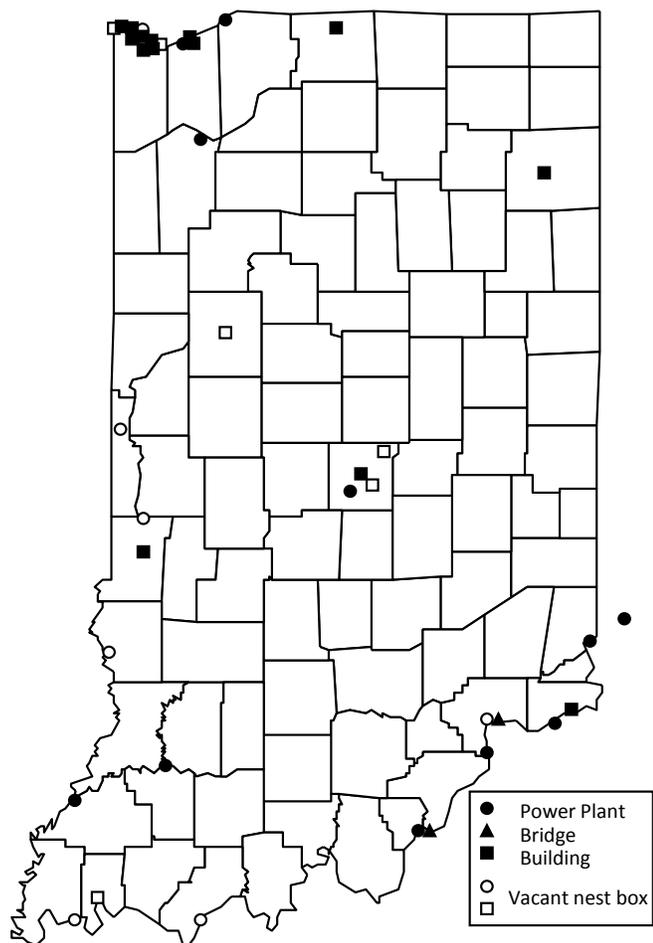
Big or small, restored wetland and grassland sites contribute greatly to the wildlife diversity found in Indiana.

## **Peregrine Falcon**

The year 2013 was the 25th consecutive year of peregrine falcon nesting in Indiana. The population has

come a long way from the discovery of a pair raising three chicks under a bridge in Lake County in 1989. The change has been so drastic that the Natural Resources Commission approved the delisting of this species from endangered to special concern. By the time this report is published, the last administrative hurdles should have been cleared for formal delisting. The goal of maintaining a population of 16 falcon territories for at least three consecutive years with an average productivity of more than 2.0 young raised per nest attempt has been achieved.

Highlights for the 2013 breeding season were numerous. Records were established for number of young raised (46), chicks banded (44), successful nests (15), and locations with territorial pairs or individuals (24). These marks were especially notable because several long-time breeding birds died. Although no new nest sites were discovered this year, the new Fort Wayne pair raised four chicks after the lack of a nesting attempt there since 2007. The previous unproductive female named Freedom, who was replaced by another falcon last year, was found dead near the nest site in May. Freedom is the oldest female falcon recorded in Indiana with a lifespan of 19 years and one week. She also was the last surviving bird of the 60 falcons released in Indiana from 1991–1994.



**Locations of peregrine falcon nesting territories and additional falcon nest boxes in 2013.**



**Peregrine falcon 78/D wintered in Costa Rica during 2012-2013 after having been raised at a nest in Lake County during 2012. Photo by Pablo Camacho.**

Although most falcons produced in Indiana and the Midwest travel only a few hundred miles from where they were raised, a chick banded in 2012 at its nest site along Lake Michigan in Whiting migrated and wintered this year in Costa Rica, a trip of more than 2,400 miles.

The only population number that declined from last year's record figures was the number of nesting attempts, which fell by one pair. Only two nesting attempts failed and all but two chicks at one site were banded—because their nest could not be safely accessed. Seven unhatched eggs were collected.

Because many young falcons are banded in the nest each year, much is known about them. Of the adults noted in the 24 territories during 2013, five were unbanded, 21 were identified by their leg bands, at least four others had leg bands but their origins could not be determined, and the remaining birds were not observed well enough to identify. Identified adults originated in eight different states: Kentucky (5), Indiana (3), Illinois (3), Missouri (3), Wisconsin (2), Michigan (2), and Ohio (1). Two other banded adults had been initially captured and banded at their breeding sites in Indiana, so their origin is unknown. Two birds had been bred in captivity and released; the rest were produced in the wild.

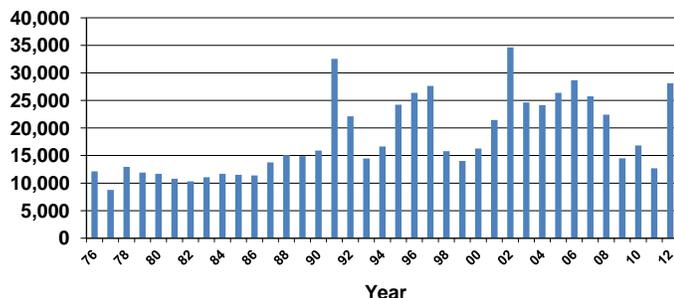
The 24 territories in Indiana are unevenly distributed around the state. Most peregrine territories are close to a large body of water. Indiana's nesting pairs were found near Lake Michigan (12 pairs), the Ohio River (4), White River (3), Wabash River (2), St. Joseph River (1), Kankakee River (1), and the three rivers of Fort Wayne (St. Mary's, Maumee, St. Joseph). Six nests are in downtown urban areas (five on office buildings, one on a bridge), and the remainder are in industrial areas: power plants (8), steel mills (7), an oil refinery, a lime plant, and a grain elevator. All but two nests were in nest boxes. Twelve nests were on buildings, four on smokestacks, and one under a bridge.

Indiana's healthy population continues to slowly grow and reflects the trend in the Midwest where more than 300 pairs are present, a total several times greater than the 60–80 pairs estimated to have been present historically.

## Sandhill Crane

The sandhill crane is a long-legged, long-necked water bird that can be confused with the similar-appearing but unrelated great blue heron, which is sometimes inappropriately called the blue crane. Sandhills fly with their necks outstretched and are seldom seen alone. An individual is almost always in company with its mate, family group or flocks numbering from a couple of dozen to the hundreds. During fall and spring migratory periods, groups of 50–100 are most commonly encountered flying in a loose V-formation or 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 Lakes states and in southern Canada, and that population 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 the 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 stops at Jasper-Pulaski 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. 29, 2012. Jasper-Pulaski FWA had 9,602 sandhill cranes present, with lesser numbers at Pigeon River FWA (978), Kingsbury FWA (525), Willow Slough FWA (12), and Goose Pond FWA (9). No cranes were observed at Tri-County FWA, Atterbury FWA, Brookville Lake, the Ewing Bottoms in Jackson County, or Lake



**Annual peak numbers of sandhill cranes counted during fall surveys at Jasper-Pulaski FWA.**

Monroe, although 150 were noted flying-over the day before the survey. Many sandhill cranes had not yet moved south into Indiana from Wisconsin, Michigan, and other Northern locales. Numbers on weekly counts at Jasper-Pulaski FWA exceeded 6,000 birds from mid-October to early January, with more than 10,000 cranes from November to early January. A large influx occurred around Thanksgiving when the peak count of 28,126 birds was tallied on Nov. 27. More than 20,000 remained until late December. These were the highest counts noted since 2006. Additional birds were present in the area, as sandhill cranes are now regularly using open water areas at a NIPSCO power plant just west of Jasper-Pulaski FWA.

## Whooping Crane

Whooping cranes continue to stop in Indiana during spring and fall migration from Wisconsin to Florida. Movements south to Indiana were first noted at the end of October. In early March, half of the 108 cranes in the population were reported in Indiana. This year, a large number (40–45 birds) wintered in Indiana, more than in any other state. Whooping cranes are primarily found at Goose Pond FWA, with a smaller number at Cane Ridge Wildlife Management Area and Tern Bar Slough Wildlife Diversity Area as well as at other scattered locations, mostly in southwestern and west-central Indiana. Staff at Goose Pond FWA documented 3,168 use-days by 29 different whooping cranes from fall 2011 to spring 2012. A comparable period one year earlier had 988 use-days by 27 different cranes.

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. Although survival of individuals in this introduced population appears adequate in Wisconsin, reproduction is seldom successful. Hatching occurred in only 2 of 23 nesting attempts (including two re-nestings) documented in 2013. Three chicks were produced, but only one survived by the end of August. Black fly infestations during the egg-laying period is believed to be a major cause for nest failures by causing nest abandonment.

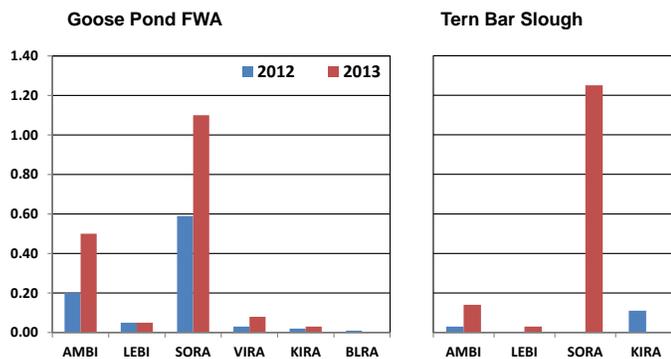
## Marsh Bird Surveys

Marsh birds consist of a diverse array of birds from different groups. Such birds include bitterns, rails, gallinules, grebes, and Wilson's snipe. These birds are difficult to survey. They reside in dense emergent vegetation and are inconsistently vocal during breeding season. Thus, little is known about their numbers, population trends, and responses to habitat changes and land management.

Standardized protocol using playbacks of vocalizations has been developed and is used throughout North America to gain more information. In Indiana,



**Wetlands, grasslands and shallow water areas result in an abundant and diverse wildlife community at Goose Pond FWA.**



**Number of birds per survey point detected on marsh bird surveys at Goose Pond FWA and Tern Bar Slough Wildlife Diversity Area during 2012 and 2013. Species include American bittern (AMBI), least bittern (LEBI), sora (SORA), Virginia rail (VIRA), king rail (KIRA) and black rail (BLRA).**

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 8,000-plus 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, DFW biologists overtook administration of the Goose Pond survey and set up additional routes at 840-acre Tern Bar Slough Wildlife Diversity 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 2013, state agency staff and volunteers again surveyed 26 points along eight routes at Goose Pond FWA. Tern Bar Slough had two routes with nine points. Surveys were conducted during four two-week time

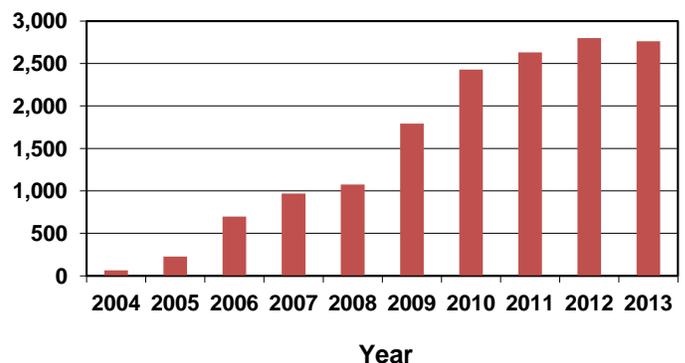
periods from mid-April through mid-June. Three rail species (king rail, Virginia rail, sora) and two bittern species (American bittern, least bittern) were detected at Goose Pond. Soras and both bittern species were found at Tern Bar Slough. In 2012, one black rail was found at Goose Pond and two king rails called at Tern Bar Slough. These rare birds were not detected in 2013, although one least bittern and many soras were heard at Tern Bar Slough in 2013, but not in 2012.

Sora and American bittern were the most common species detected at both locations. Soras and Virginia rails are mostly migrants in southern Indiana, while bittern species and king rails regularly breed. All species except least bittern were detected most commonly on earlier surveys due to timing of migration and higher calling frequencies before egg-laying. Water levels were much more favorable to most marsh birds in 2013 than in 2012, and the birds' densities on 2013 survey routes reflected this.

All rail and bittern species except 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 rare. Restorations such as Goose Pond FWA and Tern Bar Slough show that wetland birds will readily discover and use these habitats.

## Colonial Waterbirds

Colonial waterbirds refers to a number of different bird groups that nest near each other. In Indiana, these include cormorants, herons, egrets, terns and gulls. Two large gull colonies along Lake Michigan have been assessed periodically as part of the Great Lakes Colonial Waterbird Survey. Nests were last counted in 2011 with tallies of 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. Colonies of great egrets and black-crowned night-herons are counted annually at these sites along with double-crested cormorants, which are present at the eastern location. The herons and egrets are state-listed. Double-crested cormorants are viewed with some concern in the Midwest



**Annual number of double-crested cormorant nests at the ArcelorMittal Steel plant in Lake County.**

because increasing populations pose a potential threat to local fisheries, and they can compete for nest sites with less-common heron and egret species.

This year's surveys of these birds were conducted on May 21. At ArcelorMittal Steel West, nesting cormorants have yet to be found. Black-crowned night-herons used to have a thriving colony here in the 1990s until virtually all of the trees used for nesting were destroyed by beavers. Regrowth has occurred, and night-herons and great egrets now nest at this site along the Indiana Harbor at Lake Michigan. Numbers of black-crowned night-heron nests fell slightly from 2012, with 72 nests (81 nests in 2012). The number of great egret nests (41) was similar to the 43 found in 2012. Great egret nesting was first observed at this site in 2009. All nests of black-crowned night-herons and great egrets are in trees at this location and adjoin a large breeding gull colony.

At ArcelorMittal Steel East, numbers of double-crested cormorants and great egrets were similar to those of the previous year, while numbers of black-crowned night-herons declined. Since first nesting here in 2004, double-crested cormorants are now the dominant species with 2,764 nests found in 2013 compared to 2,800 nests in 2012. Great egrets have also increased over the years, and 119 egret nests were counted in 2013 compared to 112 nests in 2012. In 2013, only 28 black-crowned night-heron nests were tallied compared to 66 in 2012. These three species of waterbirds somewhat segregate themselves in the nesting colony. Double-crested cormorants nest closest to the Lake Michigan shoreline, while great egrets mainly use the few remaining trees that are farther from the shore. Black-crowned night-herons will nest in shrubs or the lower portions of trees used by great egrets, but many of their nests are on rock along the perimeter of two small impoundments at this site and adjacent to gull nests. At most nesting locations, all three species prefer to nest in trees and shrubs, but at this site beaver activity and the accumulation of cormorant guano have eliminated most woody vegetation. Great egrets claim most of the remaining trees for nesting with 98% of their nests found in trees, while only 7% of black-crowned night-herons and 3% of cormorant nests are off the ground. Ground-nesting birds are relatively safe at this site because it is isolated from most mammalian predators due to the protection of the waters of Lake Michigan and heavy industry on the remaining sides.

Continued monitoring at these sites will be used to guide management decisions regarding the need to control double-crested cormorants. A graduate student from Northern Illinois University is beginning a study of cormorant diets at this site to gain insight on the impacts of double-crested cormorants to Lake Michigan fisheries.

## Loggerhead Shrike

The loggerhead shrike is a songbird but eats and

behaves like a small raptor or bird of prey. It tears at small prey with a large, hooked bill, using thorns or barbed wire, instead of talons, as an anchor. These “butcher birds” eat beetles, grasshoppers, and other insects; mice, voles, and other small mammals; and small birds, snakes, frogs and other vertebrates. It is a perch hunter, scanning the ground from a utility wire, post, fence or plant stalk before pouncing on prey it spies below.

Habitats for loggerhead shrikes consist of grasslands, deserts, shrub lands, and, especially in the Midwest, agricultural areas. Farmland favored by loggerhead shrikes consists of smaller fields planted with a variety of crops bordered by shrubby hedgerows and fence lines, and livestock pasture with low vegetation and bare ground. Nests are substantial structures made of small twigs and grass, lined with horse hair and placed in a shrub or small tree. Eastern red cedars and multiflora rose bushes are favorite nest sites.

Loggerhead shrikes have been undergoing substantial population declines in the eastern United States and are a state endangered bird in Indiana and many Eastern states. Reasons for this decline are puzzling but theories include the loss of quality breeding habitat, the use of pesticides, and increasing human development on wintering grounds in the southern United States. A major investigation of this species occurred in the late 1980s. A follow-up was done 10 years later. In 1988, loggerhead shrikes were found at 110 locations in 17 counties, and at 143 sites in 16 counties the next year. Most shrikes were found in the southern part of the state, the majority in Daviess, Dubois, and Spencer counties. In 1999–2000, a study of shrikes in Daviess and Dubois counties found similar numbers in these areas except for the disappearance of birds in northeastern Dubois County. Fewer loggerhead shrikes have been reported in this area in later years, and observations of breeding shrikes in that area are now rare.



*Two adult loggerhead shrike tend to a young shrike at a fencerow in Daviess County.*

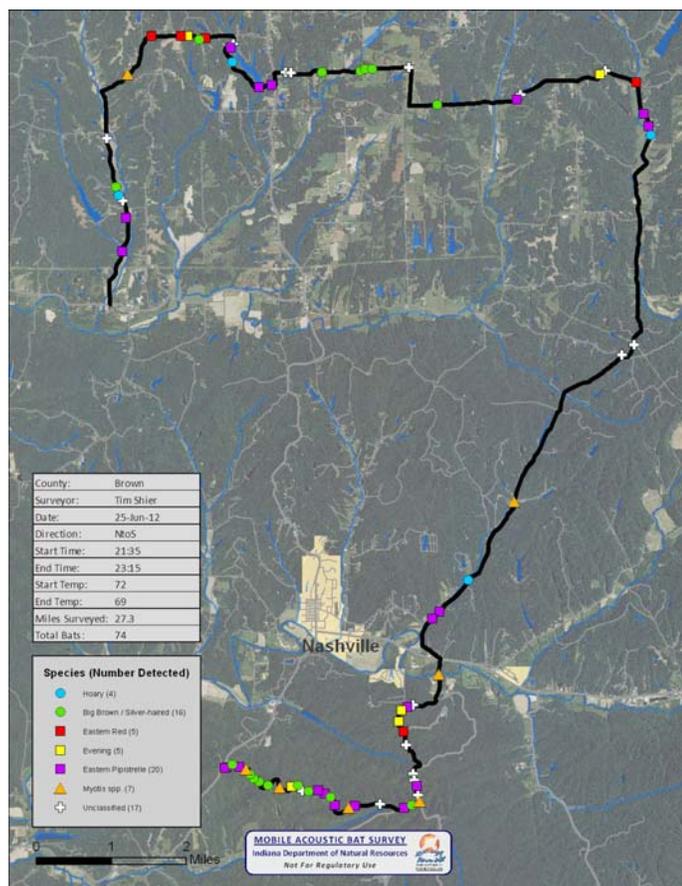
Since 2010, roadsides in areas with historical shrike nesting territories in Daviess, Dubois, and Orange counties have been surveyed and locations of shrike pairs recorded. All nests found in recent years have been on or adjacent to traditional Amish farms. In 2013, six nesting territories were located in Daviess and Orange counties and monitored during breeding season. Eight nests were found and 10 nestling shrikes at two nests were banded. Five nesting attempts failed. Predation was suspected in four cases. One nest was lost after a strong storm with high winds. Numbers of shrike territories have remained steady since 2010, suggesting that the Indiana shrike population is stable but vulnerable.

## MAMMALS

### Tracking Indiana's Summer Bat Populations

#### Mobile acoustic bat survey program enters third year

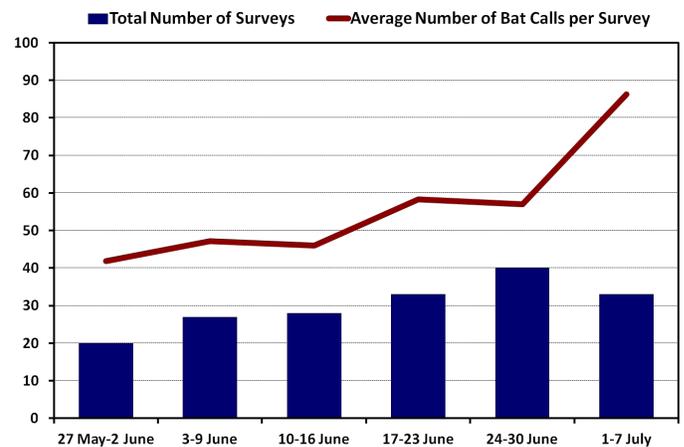
Summer 2013 marked the third year for Indiana's mobile acoustic bat survey (MABS), a project that monitors the distribution and relative abundance of bat populations on their summer range. The project uses acoustic equipment in which an ultrasonic detector and vehicle-



**Results of a mobile acoustic survey in Brown County. Seventy-four bats of six different species or species groups were detected. Nearly a third of the bats detected were in Brown County State Park, located south of Nashville.**



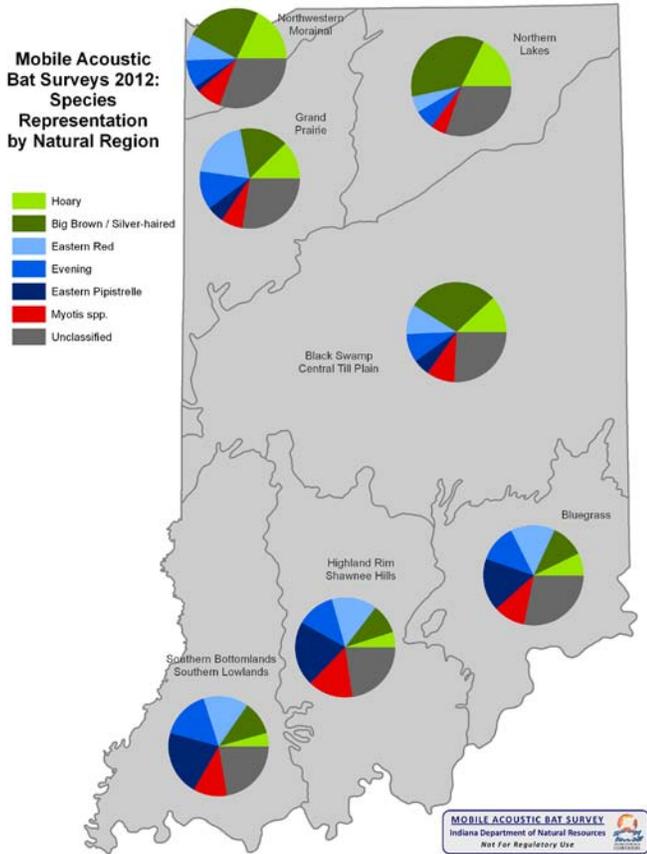
**Cassie Hudson instructs surveyors during a 2013 regional training session at Salamonie Lake.**



**Surveys conducted later in the summer detected an increasingly higher number of bats.**

mounted microphone record echolocation calls emitted by bats in the environment. Surveyors slowly drive a predetermined route (25–30 miles in length) shortly after sunset when bats become active. The same routes will be surveyed annually, thus allowing biologists to monitor multiple bat species at different locations in the state and across years.

Analysis of data collected during the 198 surveys from 2012 was one of the first MABS-related tasks accomplished early in 2013. More than 35,000 acoustic files were generated. About 11,000 contained echolocation calls of free-ranging bats (other files may contain noise from insects, machinery, birds or static). The number of bats detected during each survey in 2012 averaged about 58 and ranged from a high of 177 in Crawford County to four in Adams County. Interestingly, the average number of bats in each survey gradually increased through summer and peaked in early July, perhaps due to the addition of juvenile bats entering the population. Analyses classified tri-colored bats, big brown bats/silver-haired bats, and Eastern red bats as the most frequently detected species statewide.



**Results from the 2012 mobile acoustic bat survey showing species representation by natural region.**

In 2013, MABS was expanded to 74 counties (compared to 57 in 2012) and 268 total surveys were conducted. Data analysis is ongoing as nongame personnel refine 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 not practical for long-term studies that generate tens of thousands of files. Automated systems of call identification are 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.

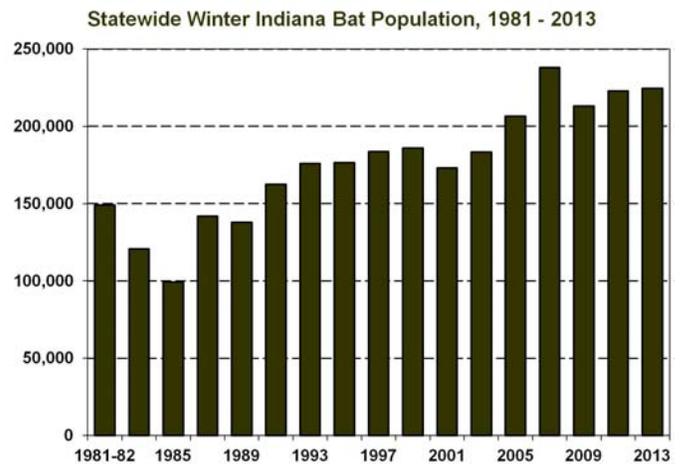
### 2013 Winter Bat Counts

**Surveys document impact of WNS to Indiana's winter bat populations**

The 2012–13 winter was the first opportunity for nongame biologists to evaluate the impact of WNS on bat populations in some of Indiana's most important hibernacula. WNS is an infectious disease associated with a cold-loving fungus responsible for unprecedented levels of mortality among hibernating bats in North America. It is named for the white fungal growth that invades the skin tissue on the muzzle, wings and ears of infected



**Survey teams surveying bats in Wyandotte Cave.**



**The statewide winter population of the endangered Indiana bat has consistently exceeded 200,000 individuals in each of the last five surveys.**

bats. The disease, which is responsible for the death of ca. 5.7–6.7 million bats across the eastern United States, was first detected in Indiana in 2011.

Eleven caves were visited in January and February 2013. Many harbor the largest known winter concentrations of the endangered Indiana bat in the state. This species, which often forms large dense clusters during hibernation, fared relatively well during the initial stages of WNS. Although there was considerable variation among caves, nearly 224,500 Indiana bats were tallied in 2013, a figure essentially unchanged from that of the last count in 2011. However, little brown bats, a species hit particularly hard by WNS in other states, experienced a total loss of 4,130 bats. This figure represents an alarming drop of 61% in just two years. Declines were most consistent and severe at caves with a longer history of WNS. To illustrate, this winter marked the third year of infection in Batwing, Coon, Endless, Grotto and Wyandotte caves. In these sites, little browns declined 77%

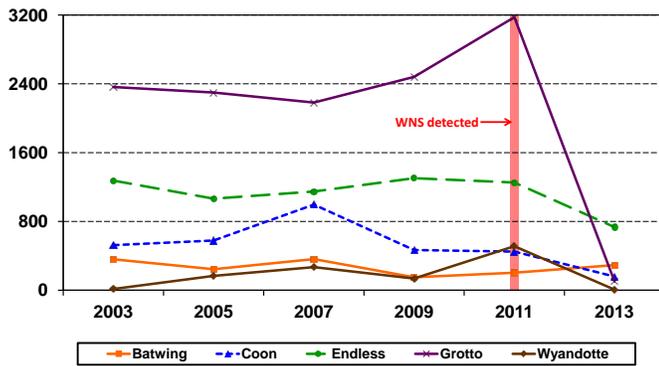


*Indiana bats hibernate in dense, compact clusters ranging from 300 to 500 individuals per square foot.*



*Tri-colored bats with visible signs of WNS infection roost in an Indiana cave.*

**Little Brown Bat Populations in WNS-infected Caves in Indiana**

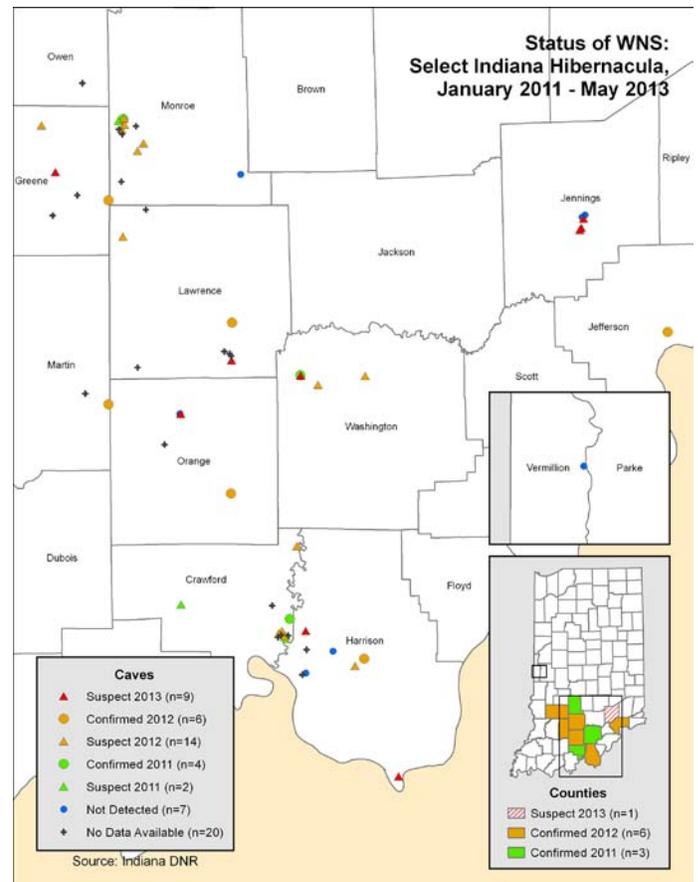


*Winter populations of little brown bats have experienced an overall decline of 77% in WNS-infected caves since 2011.*

from 2011 and several suffered catastrophic losses, including Grotto (3,175 bats to 103), Wyandotte (512 bats to 7), and Endless (1,253 to 734).

Tri-colored bats, the smallest bats that winter in Indiana, are usually found in small numbers in many caves. In 2013, more than 700 tri-colored bats were counted, a modest decline of 10% from the most recent comparable surveys. However, in the five caves that had been infected for three winters, populations decreased 30%. This figure included substantial losses in Grotto (134 bats to 5) and Coon (149 bats to 62) caves. Biologists typically see few big brown bats during winter counts with most caves averaging fewer than 20 individuals. In 2013, 46 total bats were found in eight caves, a 46% decline from 2011. Endless Cave usually has one of the larger populations, averaging about 50 bats since 2001, but only eight were seen in 2013.

An equally disturbing observation emerging from the 2013 surveys was that biologists found evidence of WNS



*Since 2011, evidence of WNS has been found in 35 caves in 10 Indiana counties.*

in all but one of the six presumably WNS-free caves. Visibly infected bats were noted in Clyfity, Rays, River and Twin Domes caves, whereas swab samples detected fungal spores on bats hibernating in Wallier Cave. Of the 11 major Indiana bat hibernacula in the state, only Jug Hole Cave appeared to be free of WNS.

## Helping to Understand White-Nose Syndrome

### Indiana's contributions to the greater WNS community

The discovery of WNS in New York in 2007 and its rapid spread into the central United States and eastern Canada presents virtually unparalleled challenges as natural resource agencies struggle to understand and manage such a widespread and devastating disease outbreak. A broad network of federal and state partners, as well as many non-government organizations and university scientists are teaming up to better address WNS and conserve bat populations. Efforts are largely guided by an overarching National Plan published in 2011 that outlines a framework of actions needed for an effective and coordinated response.

Since 2011, Indiana has partnered with the U.S. Fish and Wildlife Service, U.S. Geological Survey Fort Collins Science Center, University of Tennessee, and Southern Illinois University to examine hibernation behavior of bats that roost in Wyandotte Cave. The project, which is entering its third winter, uses near-infrared and thermal cameras to record video imagery to monitor hibernating bats for uncharacteristic behaviors indicative of WNS infection. Ongoing surveillance 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.

The DFW also assisted staff from the National Wildlife Health Center (NWHC) to evaluate the risk of transmission of the fungus responsible for WNS by bats that occupy infected hibernation caves in summer. In July 2012, nongame biologists used a harp trap at Grotto Cave to capture bats exiting the cave so wing swabs could be collected and later examined for the presence of fungal spores. Additional samples were taken from winter roost sites within the cave as well as from equipment (backpacks, netting, etc.) used to obtain the samples.

Indiana began participation in a continental-scale study of the geographic distribution, spread and transmission of the fungus responsible for WNS on hibernating bats across North America. The five-year project, which now covers 25 states, is a joint effort between Boston University, University of Tennessee, Northern Arizona University, and the University of California at Santa Cruz. During 2013 winter bat counts, DFW personnel took swab samples of the forearms and muzzles of hibernating bats in five caves. Additional swabs were taken of the wall or ceiling beneath sampled bats. Although visible sign of WNS infection was rarely seen, fungal spores were found in all five caves and on nearly 90% of the bats and 86% of the ceiling/wall samples. Nongame biologists plan to expand the collection efforts to other hibernacula in 2014.

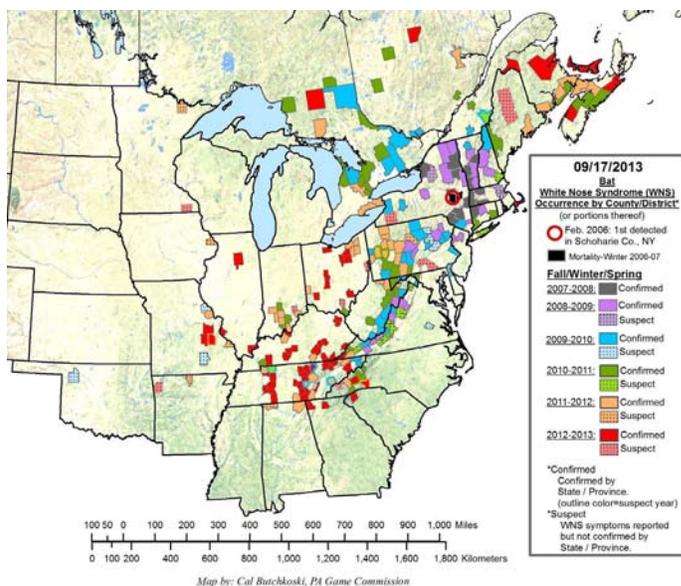
In 2013, the DFW contracted with the Center for Bat Research, Outreach, and Conservation at Indiana State University (ISU) to examine impacts that WNS may have on the bat community surrounding the Indianapolis



*DFW and NWHC personnel drop into Grotto Cave.*



*Wing swabs taken from an Indiana bat.*



***By the end of the 2012-13 hibernation season, bats with WNS were confirmed from 22 states and five Canadian provinces. The fungus that causes WNS had been found in four additional states (Cal Butchkoski, Pennsylvania Game Commission).***



*DFW and U.S. Fish and Wildlife Service personnel use a harp trap to capture bats emerging from Grotto Cave.*



*A DFW biologist swabs the muzzle and forearm of an Indiana bat hibernating in Wyandotte Cave.*

International Airport (IIA). ISU researchers have been monitoring bat populations associated with the IIA expansion project area since 2002, nearly a decade before WNS was first found in Indiana. Although WNS causes mortality of cave-dwelling bats during winter hibernation, detailed studies of complementary summer populations may provide further insight into the ultimate impact of this disease on a large spatial scale. Researchers will examine factors such as capture success, species presence and abundance, body condition, and reproductive output through 2014 to see if these standard measures of bat community structure and health have changed since the arrival of WNS in Indiana.

## Re-Gating Wyandotte Cave

**Shift in winter roost sites necessitates new gate to protect bats**

Wyandotte Cave in O'Bannon Woods State Park harbors one of the country's largest known winter populations of the endangered Indiana bat with the most recent census totaling nearly 57,000 individuals. In recent years, an

increasing number of bats have begun to hibernate in the large entrance room (Faneuil Hall) and were, unfortunately, located outside the protective steel gate built in 1991. Fewer than 30 bats were typically found here until 1999, when nearly 2,000 were noted during the winter survey. A second jump occurred eight years later when about 8,800 bats roosted in Faneuil Hall, increasing to nearly 11,000 bats by 2011. Reasons for such large shifts are unclear. Management of the cave has varied over the years, which may have prompted changes in roost site selection. The overall population in Wyandotte also has grown over time, which may have triggered a proportional increase in the number of bats using Faneuil Hall. Lastly, WNS was first confirmed in Wyandotte in 2011, and WNS-infected bats have a tendency to move to colder roost sites near the cave entrance.

Regardless of the reasons, an opportunity to rectify the situation presented itself in 2013 when construction of a new bat-friendly gate closer to the entrance at Wyandotte was identified as a winter habitat mitigation measure in the Habitat Conservation Plan for the Fowler Ridge Wind Farm (FRWF) in northwest Indiana. This "re-gating" project involved many partners including FRWF, the DNR, U.S. Fish and Wildlife Service, Bat Conservation International (BCI), and Indiana Karst Conservancy (IKC). The project was funded by FRWF and administered by BCI while DFW staff served as project manager responsible for overall coordination and oversight. The site-specific design and construction of the new gate was contracted to the IKC, which has a long history of bat and cave-related conservation in the state.

Work began in May 2013 with on-site measurements at the new gate site about 70 feet from the entrance, well in front of the roost sites used by wintering bats in Faneuil Hall. IKC members spent several days in early July removing up to 3 feet of rock and compacted soil needed for a 2-foot-wide trench in which to anchor the gate. The actual construction, including painting, took place over a five-day period in mid-July and required



*IKC members set one of the 38 horizontal bar sections used in the new gate.*



***A moisture-curing urethane primer coat is applied to the finished gate.***



***Finished Wyandotte Cave gate, looking toward entrance from Faneuil Hall.***

about 500 total man-hours of direct labor. Off-site design and project management by the IKC took an additional 50 man-hours. The new gate required four tons of steel and has maximum dimensions of 43 feet in width and 14 feet in height. This covers a much larger cross-sectional area than the 1991 gate, which should maximize the gate's air flow and provide more openings for bats to pass through.

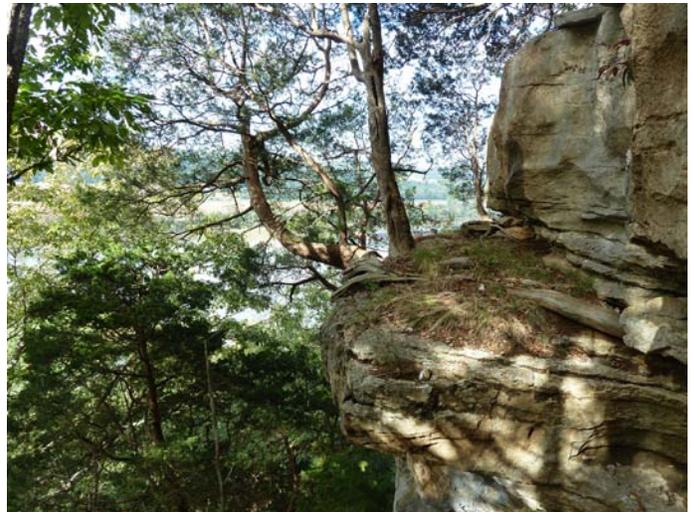
In autumn, DFW biologists placed cameras in the entrance area of Wyandotte to document flight behavior of bats as they approach the new gate. Several weeks of imagery and a night of on-site surveillance found no negative impact. This suggests that bats have adapted to the new structure. Assuming this pattern persists, the old gate will be removed shortly after the 2013–14 hibernation season.

## **Allegheny Woodrat Surveys**

The Allegheny woodrat is a state-endangered rodent and one of the rarest and least-observed mammals in Indiana. They live among the limestone cliffs, outcrops

and caves in the forested hills along the Ohio River. Also known as trade rats or pack rats, woodrats are nocturnal. They stay close to the deep crevices and ledges that provide protection from predators so they can raise their young and store food.

The current 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. Since 1991, nongame personnel have periodically conducted live-trapping surveys at these sites to monitor the species' distribution and relative abundance in the state. Surveys conducted into fall 2013 found a continued decline in the number of woodrats at these cliff sites. Abundance ranged from 27 woodrats at Tobacco Landing near Laconia to only two individuals captured at Shelterhouse No. 2 on O'Bannon Woods State Park.



***Allegheny woodrats live among the limestone cliffs that border the Ohio River in Crawford and Harrison counties.***



***Woodrats eat plant material and start storing stems, leaves, acorns and other nuts in protective crevices in late summer. These dried plant parts provide food for the upcoming winter.***



*An adult woodrat after its release. A small numbered aluminum tag is affixed to each ear.*

Across all sites, there was a 27% decline in abundance compared to surveys completed in 2012. Most woodrats were located along four cliffs in the Laconia/Rabbit Hash Ridge complex that collectively yielded 72 individuals, more than 62% of the total captured.

## REPTILES AND AMPHIBIANS

### Eastern Hellbender

The Eastern hellbender is Indiana's largest salamander, reaching 2 feet or more in length. Once occurring in a handful of rivers and streams in southern Indiana, it is now known to occur in only one. 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 (passive integrated transponder) tag, similar to the micro-chips used for pets, that enables biologists to identify that particular hellbender if it is found again. Since 2008, the DFW has partnered with Purdue University to study the distribution, habitat use, and genetic composition of hellbenders in Indiana.

As with many states fortunate enough to have hellbenders, Indiana has opted to discontinue annual summer surveys. Instead, summer surveys will take place every two to three years to reduce disturbance to the hellbender's habitat. In place of the annual summer surveys, nongame biologists will conduct winter trapping, which is less invasive and does not disturb precious habitat. In winter 2012, two adult hellbenders were caught in two separate traps. Neither had a PIT tag from previous surveys and are believed to have never been captured before.

It is important to note that even though the hellbender



*An Eastern hellbender caught during winter trapping being measured.*

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.

### The Complex Case of the Eastern Box Turtle

The Eastern box turtle is one of the most-well-known reptiles and perhaps the most beloved. It also is one of the most complex species to manage. Many of us have childhood memories of finding box turtles while playing outside or hiking in the woods. Box turtles come in many different colors and are long-lived individuals.



*An Eastern box turtle with the transmitter and antennae fixed to shell for the radio-telemetry study.*

Eastern box turtles like to move around, especially after a warm spring rain. Unfortunately, many of them end up on the road and get hit by cars. Because so many of these turtles are seen on roads and highways, there is a misconception that their populations are doing well. Often, the opposite is true. Eastern box turtles must live up to 10 years before they can reproduce; many mammals, by comparison, are capable of breeding at 1–2 years of age. One old female box turtle will lay many eggs and have many nests over the course of her lifetime, but few baby turtles make it to adulthood.



*Nongame herpetologist Sarabeth Klueh-Mundy takes a blood sample from an Eastern box turtle.*



*A copper-bellied watersnake encountered during Eastern box turtle radio-telemetry.*



*An American bullfrog tadpole collected from Cikana Fish Hatchery for Ranavirus testing.*



*A close-up of an Eastern box turtle from the captive population.*

A female must have at least one baby turtle survive to adulthood in order to replace herself in the population. Of course, she must have more for the population to grow. If just one female gets hit on the road, or taken home by a well-intentioned but misguided person, she cannot contribute to the population in that area. If this happens enough times, population numbers dwindle and over time die out. Unfortunately, by the time people realize that something is wrong with turtle populations, it is often too late.

In 2004, Indiana declared the Eastern box turtle a special protected species. This makes it illegal to possess an Eastern box turtle or any of its parts without a 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, nongame biologists rescued more than

200 Eastern box turtles from the proposed Interstate 69 alignment during 2010, 2011, and 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 to not return the turtles to their original habitat near the newly constructed interstate, 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 is more complicated than 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 such an adjustment period is required to help them adopt a new home area.

During fall 2012, some of the captive Eastern box turtles were dying due to an unknown illness. In winter 2013, three specimens were sent to the NWHC lab in Madison, Wis. Tests confirmed all three turtles were positive for Ranavirus, a virus known to cause large die-offs in turtles and amphibians. Ranavirus had previously been detected in Indiana in 2009. That year, it was documented in free-ranging Eastern box turtles at a separate location in the south-central part of the state. In a combined effort with researchers from Purdue University, nongame biologists began taking blood samples and oral swabs from both the captive Eastern box turtles and the resident Eastern box turtles on the reclaimed mine area. Tests confirmed that Ranavirus was present in both the captive and free-ranging populations as well as in species of other turtles and tadpoles on the reclaimed mine land. A series of other tests were run on individuals from the captive colony to ensure they were not infected with secondary diseases that might put the residents at risk. Approximately one-third of the captive colony has died thus far.

After testing was completed, it was determined safe to move the surviving captive Eastern box turtles to the new enclosure. There they will re-learn a new home area and be kept until spring 2015. We are using this opportunity to learn more about this disease. Blood sampling and oral swabs were taken every other week until the turtles went into brumination, which is a state similar to hibernation. In addition, tadpoles are being collected from different areas around the state to determine the presence or absence of Ranavirus. We are continuing with the original reintroduction program and conducting radio-telemetry on resident Eastern box turtles to learn their movements within the reclaimed mine land, as well as learning everything we can about the transmission and survivorship of Ranavirus.

## Kirtland's Snake

The Kirtland's snake is best known for its red belly, which is bordered on either side by a row of black dots. Kirtland's snakes prefer grassy areas near creeks or ponds and often hibernate in crayfish burrows. They are a small- to medium-sized snake, measuring 13–18 inches long. This snake has a small total range, occurring only in Indiana, Illinois, Ohio, Michigan, Kentucky, Pennsylvania and Missouri. It is currently known to occur in 38 counties in Indiana, but a majority of the records are pre-2002. This secretive, state-endangered species is unique—it can be found in highly developed urban areas. Unfortunately, local populations are often destroyed during development or are poached by collectors.

Surveys for this secretive species began in spring 2013. Historic locations within these counties were visited: Washington, Scott, Morgan, Brown, Bartholomew, Johnson, Clay, Vigo, Marion, and Clark. Kirtland's snakes were found in only two of these counties.



*Kirtland's snake found during surveys.*

## North American Amphibian Monitoring Program

Did you know that there are 17 different frog and toad species in Indiana? You are probably familiar with the deep “bruummm” sound of the bullfrog, but do you know what is making that loud “peep, peep, peep” sound in spring? The answer is spring peeper. If you ever heard a large chorus of the state endangered crawfish frog, you would likely never forget it.

If this sounds interesting, or if you are interested in conserving frogs and toads, consider becoming a volunteer in 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 frog and

**The Division of Fish & Wildlife would like to recognize all of the dedicated volunteers that participated in NAAMP for 2013.**

**Volunteers that ran all 3 windows:**

Vicky Meretsky  
Charles Boswell  
Bill Dean  
Tim Shier  
Noah Gordon \*  
Robin Stark \*\*  
Wesley Wilson  
Barbara Harcourt \*\*  
Darrel Joy  
Jane Fuller  
Jim Brown  
John Bednar \*\*  
Erin Malcomb  
James Neal \*  
Nicole Harmon  
Julia Mast  
Julie Henricks \*\*  
Rick Dold  
Steve Trippel

**Volunteers that ran 2 windows**

Jim Horton  
Jack Still  
Merilee Britt  
Noah Shields  
Jason Mirtl \*\*

**Volunteers that ran 1 window**

Dwayne Caldwell  
Keith Michalski \*

\* Denotes new volunteers

\*\* Denotes volunteers that ran two routes

toad species. NAAMP was initiated because of increasing concerns about global amphibian declines.

Each year, the state herpetologist recruits volunteers to recognize the mating calls of Indiana's frogs and toads while conducting survey routes at night 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 2013, 25 volunteers submitted data for 30 routes statewide. Thanks to all of our dedicated volunteers for their invaluable

assistance in monitoring this important group of animals statewide. We could not do it without them.

If you are interested in becoming a NAAMP volunteer, see [www.pwrc.usgs.gov/naamp](http://www.pwrc.usgs.gov/naamp), or e-mail [naamp@dnr.IN.gov](mailto:naamp@dnr.IN.gov). If you would like to learn more about the frogs and toads of Indiana, but are not interested in volunteering, see [dnr.IN.gov/fishwild/3325.htm](http://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](http://www.pwrc.usgs.gov/naamp).

## Emerging Infectious Diseases in Reptiles and Amphibians

Reptiles and amphibians are no strangers to emerging infectious diseases. Large die-offs occur world-wide, sometimes in places with rare and endangered species, at alarming rates. Here we highlight the three main diseases affecting reptiles and amphibians today: Ranavirus, Chytrid, and Snake Fungal Disease.

These diseases pose no immediate threat to humans or other mammals, but they can act as carriers. Therefore, it is important that scientists and nature lovers alike help prevent the spread of these diseases.

- Don't pick up any sick or dying reptile or amphibian.
- If you are visiting different wetland areas, disinfect your boots and any equipment with bleach between sites.
- Don't move animals from one area to another.
- Don't release unwanted reptiles or amphibians into the wild.
- If you see any major die-offs or see sick turtles, report them to [dfw@dnr.IN.gov](mailto:dfw@dnr.IN.gov) or (317) 234-5191.

### Ranavirus

Ranavirus, a type of iridovirus, affects cold-blooded animals (reptiles, amphibians and fish) and was discovered in the 1960s. Recorded outbreaks in amphibian populations have accounted for up to 90% mortality in a single population. Outbreaks in reptiles, especially Eastern box turtles, have risen in the past few years. Signs of ranavirus in turtles include nasal discharge, puffy eyes, oral lesions and skin lesions. Researchers can find hundreds or even thousands of dead or dying amphibians in an area in a short period of one to five days. Clinical signs include hemorrhaging on the belly or near the hind limbs, lethargy, and weak or erratic swimming. Although Indiana has not had massive die-offs of amphibians, Ranavirus has been detected. In winter 2013, three deceased captive box turtles were submitted to the NWHC in Madison, Wis., and all three tested positive for Ranavirus.

### Chytrid

In 1999 a new species of fungus that only infects

the skin of amphibians was discovered. This fungus was named *Batrachochytrium dendrobatidis* or 'Bd'. Once an amphibian is infected with Bd it can develop chytridiomycosis (chytrid), an often deadly infectious disease that has been linked to devastating population declines and extinctions worldwide. Chytrid affects the skin of amphibians, which they use to absorb moisture and oxygen. When an amphibian has chytrid, its skin becomes thick, which complicates regulating the exchange of water, electrolytes and oxygen. This condition often results in death. Signs of chytrid include red or discolored skin, excessive shedding of skin, and abnormal behavior. Chytrid has been detected in amphibian populations in Indiana but so far no massive die-offs have been discovered.

### Snake Fungal Disease

Snake Fungal Disease (SFD) is an emerging infectious disease afflicting snakes in the eastern and midwestern United States. To date, this disease has not been found in Indiana, but has been detected in Illinois and Ohio. SFD has been detected in the Northern water snake, Eastern racer, rat snake, timber rattlesnake, massasauga, and milk snake, all of which are species native to Indiana. Common signs include scabs or crusty scales, nodules under the skin, white cloudy eyes not associated with shedding, or skin ulcers.

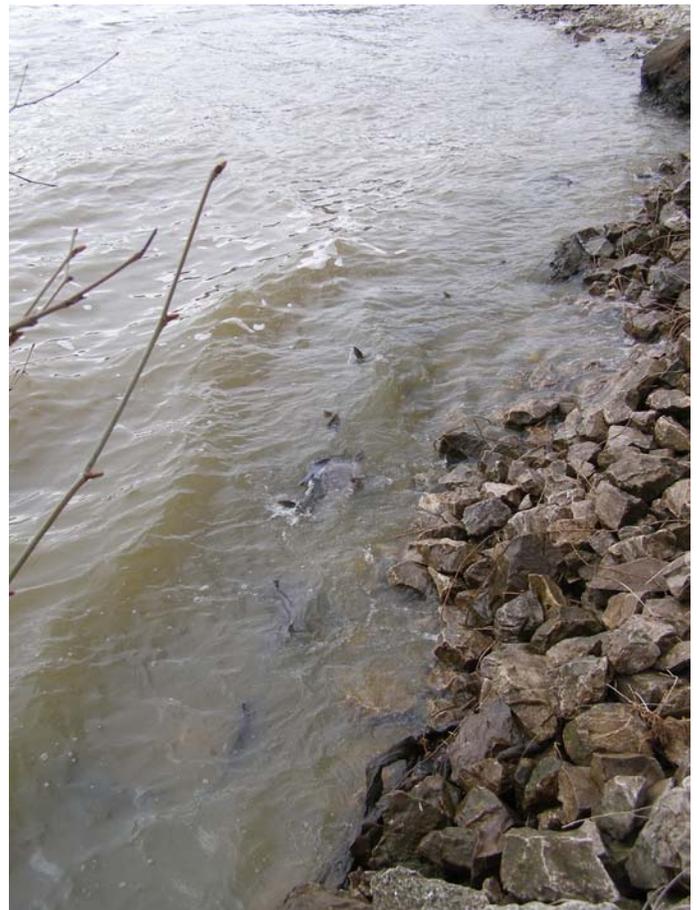
## FISH AND FRESHWATER MUSSELS

### Lake Sturgeon

Annual sampling and study of the lake sturgeon population of the East Fork White River has been conducted 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, primarily in Lawrence and Martin counties.

Gill and trammel nets have been used to annually sample lake sturgeon at several locations in the East Fork White River. Basic information such as length and weight are taken from collected lake sturgeon, which are tagged with PITs so individual fish can be tracked over time. Of the 12 lake sturgeon collected during this year's sampling, nine were recaptures and three were tagged for the first time. The collected sturgeon ranged in size from 1.7 pounds (1kg) and 1.9 feet (572mm) to 77 pounds (34.9kg) and 5.4 feet (1641mm).

The high number of recaptures is typical. Many lake sturgeon have been recaptured multiple years over the course of this work. For example, the one that weighed 77 pounds this year was first captured in 1999 at a weight of 43 pounds (19.5kg) and length of 4.5 feet (1371mm), and again in 2004 at a weight of 52 pounds (23.6kg) and length of 4.9 feet (1496mm). Another lake sturgeon caught this year at 40 pounds



*Blue suckers spawning in the East Fork White River downstream of Williams Dam in Lawrence County. They normally spawn just before lake sturgeon spawn.*



*Male blue sucker with breeding tubercles, which are small bumps on the head, fins and body that develop during breeding season.*

(18.1kg), 4.8 feet (1472mm) was first captured in 1996 at 27 pounds (12.2kg), 4.2 feet (1268mm). The larger fish are likely to be females, which grow much larger than males.

Successful reproduction was first documented in 2005



**A 77-pound lake sturgeon collected during this year's sampling.**



**Young lake sturgeon have sharp protrusions extending from their scutes, which are armored bony plates that run along their body. These sharp points wear off or break off over time.**



**A 1.7-pound lake sturgeon collected during this past field season's sampling. This was a "new" lake sturgeon, meaning it had not been tagged previously.**

when spawning lake sturgeon were tracked to below Williams Dam using radio telemetry. The spawning run has been monitored annually ever since. With unseasonably warm temperatures in 2012, lake sturgeon spawned the last week of March. With a more normal spring warm-up in 2013, spawning occurred in mid-April.

Tracked lake sturgeon have shown similar annual movement patterns. Little movement occurs during winter months until water temperatures reach about 50 F. At that point lake sturgeon participating in the year's spawning activities make an impulsive movement upstream until they are blocked by Williams Dam. Lake sturgeon remain in the Williams Dam area until water temperatures approach 60 F, at which point they spawn. Once spawning activity ends, lake sturgeon re-distribute downstream to where they spend the summer until the next year's spawning migration. There are currently six lake sturgeon with radio tags (five new radio tags were placed on lake sturgeon in fall 2013) being tracked in the East Fork White River.

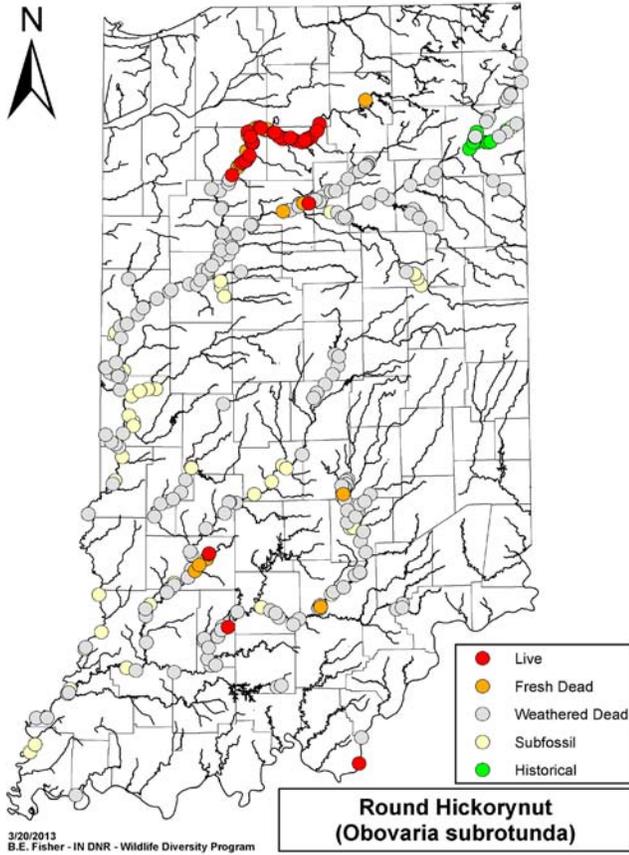
## **Freshwater Mussels**

### **New federal and state designations for freshwater mussels in Indiana**

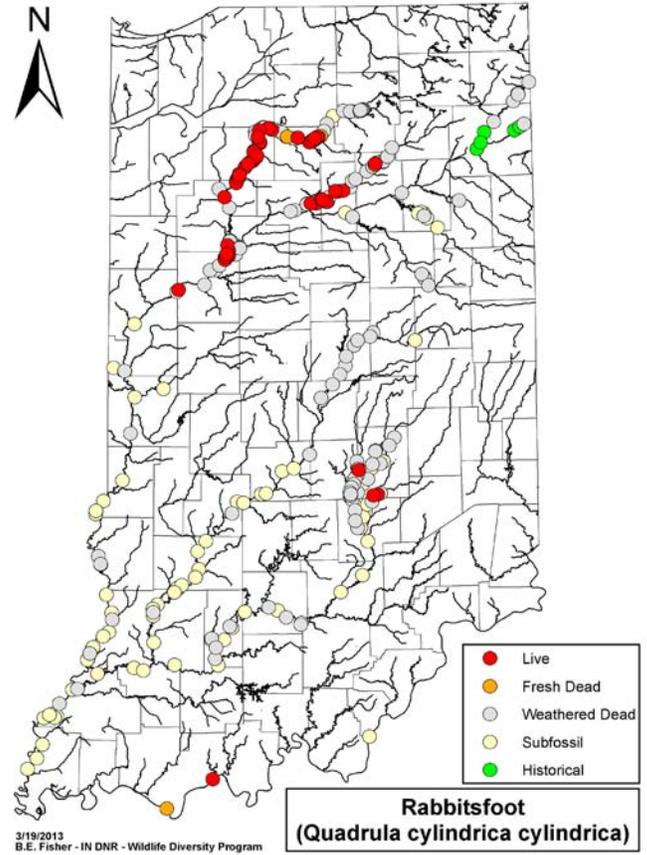
Final rule to designate the rabbitsfoot (*Quadrula cylindrica cylindrica*) a federal threatened species was published in the Federal Register on Sept. 17, 2013 (Vol. 78, No. 180). Once found throughout the Ohio River and Lake Erie drainages in Indiana, it currently only maintains reproducing populations in sections of the Tippecanoe and Eel rivers. Indiana now has 20 federal-listed freshwater mussel species (19 endangered, one threatened) among the 77 species historically known from the state. Many of these mussels are no longer found live in Indiana. Clubshell (*Pleurobema clava*), fan-shell (*Cyprogenia stegaria*), fat pocketbook (*Potamilus*



**Round hickorynut in the Tippecanoe River, Pulaski County.**



**Map of current known distribution of round hickorynut in Indiana.**



**Map of current known distribution of rabbitsfoot in Indiana.**



**A rabbitsfoot in the substrate of the Tippecanoe River, Tippecanoe County.**



**Wavyrayed lampmussel females used to collect glochidia.**

*capax*), rabbitsfoot, rayed bean (*Villosa fabalis*), sheepnose (*Plethobasus cyphus*), and snuffbox (*Epioblasma triquetra*) still maintain limited populations. The others are considered extirpated.

A previous state species of special concern, round hickorynut (*Obovaria subrotunda*), was elevated to state-endangered status on Oct. 13, 2013. 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).

**Snuffbox augmentation in the Tippecanoe River**

Federal funding was procured in 2012 to initiate an augmentation for snuffbox in the Tippecanoe. Snuffbox



***Extracting glochidia from gills of female wavyrayed lampmussel.***



***Smallmouth bass swimming in a soup of wavyrayed lampmussel glochidia.***



***Smallmouth bass gills with attached wavyrayed lampmussel glochidia.***



***JoAnne Davis prepares a cage for placement in Lake Shafer.***

populations in the river 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 (a known snuffbox host) collected from the Tippecanoe. These logperch will be held in cages in the Tippecanoe until the glochidia they are holding transform and fall off. The newly produced larval snuffbox will then be grown in the cages until they are an appropriate size to be translocated to another section of the Tippecanoe. The hope is to re-establish a self-sustaining snuffbox population in the Tippecanoe.

Twenty cages, in which the juvenile snuffbox will be raised, were procured from Genoa National Fish Hatchery in March 2013. High waters in the Salamonie River delayed collection of female snuffbox until near

the end of May. These were checked for viable glochidia, but none could be extracted. Due to the lateness of collection, glochidia release for the year had likely already occurred.

Even though snuffbox work would have to be delayed until spring 2014, it was decided that it would still be important to run through the procedures of harvesting glochidia, infecting host fish, and placing cages. Another species of mussel, the wavyrayed lampmussel (*Lampsilis fasciola*), was chosen as a substitute for this year's work. With the help of The Nature Conservancy (TNC) personnel, locations for placement of the cages in Lake Shafer were identified. Near the end of September, smallmouth bass (host for wavyrayed lampmussel) were collected from the section of the Tippecanoe upstream from Lake Shafer. Five gravid (with glochidia) female wavyrayed lampmussel were collected from the lower Tippecanoe (below Lake Freeman). Glochidia were extracted and 12



**Variation in displays of female wavyrayed lampmussel from the Blue River, Harrison County. This is one technique mussels use to attract a host fish on which the glochidia (parasitic freshwater mussel larvae) will attach.**

smallmouth bass were infected and then placed among two cages. The cages were then secured in the bottom of Lake Shafer. The smallmouth bass will be monitored to see when juvenile wavyrayed lampmussel transform. Wavyrayed lampmussel is not currently found live in the section of the Tippecanoe upstream of Lake Shafer. If some are produced, they will be released in this area in hope of restoring a population.

**Freshwater mussel surveys completed this past field season**

General mussel surveys were completed in portions of the following watersheds: Big Pine Creek (Warren County), Richland Creek (Greene), Little Cicero Creek (Hamilton), North Fork Wildcat Creek (Carroll), Blue River (Crawford and Harrison), West Fork White River (Marion, Morgan and Randolph), Indian Creek (Harrison), Salamonie River (Wells), Tippecanoe River (Carroll, Fulton,

Pulaski, and Tippecanoe), Eel River (Cass), Wabash River (Tippecanoe), Sugar Creek (Johnson), Driftwood River (Bartholomew and Johnson), and Elkhart River (Elkhart).

Interesting finds included several live rabbitsfoot representing several ages from the Eel River (Cass). The wavyrayed lampmussel, a state species of special concern, was seen live at locations in the West Fork White River (Randolph), Blue River (Crawford and Harrison), Tippecanoe River (Carroll, Tippecanoe and Fulton), and Big Pine Creek (Warren). A single live round hickorynut was found in Richland Creek in Greene County. A reproducing population of this species is still thought to remain in this stream system but this was the only live individual collected from the several sites sampled. A single live Ohio pigtoe (*Pleurobema cordatum*) was collected from the Blue River in Harrison County. It is questionable whether a reproducing population of this species is still found in the Blue River.