

The WOODland Steward

Promoting the Wise Use of Indiana's Forest Resources

Woodland Steward – President's Letter 2015

Threatened and Endangered Species and Me

Quick, think of an endangered species. Did you instantly think of the Bald Eagle, the Spotted Owl, or the Rabbitsfoot mussel? Okay, maybe not the Rabbitsfoot mussel, but maybe something more exotic like the Black Rhino, Giant Panda or Loggerhead Turtle. When we think of endangered species, we tend to think about large charismatic animals.

There are more endangered species than many of us know about or want to admit and then there are some species that are extinct, lost forever. Animals that once graced our Hoosier state: the Carolina parakeet, Passenger pigeon, Eastern elk and Wabash riffleshell mussel are lost forever. Once a species is gone a part of our world is lost. This happens naturally, but also happens increasingly at the hands of people.

Endangered species are a big part of my professional life. I do forest conservation and management work for The Nature Conservancy aimed at protecting habitat for a group of neo-tropical songbirds that are not endangered, but are experiencing severe population declines due mainly to the actions of people. The Indiana Bat, a federally endangered species, is also found in the woodlands I manage. Trouble begins when habitat guidelines for the Indiana bat do not align with the ecological management of the forest or the habitat needs of some of the declining bird species. Many private landowners face the same problem. You may have goals for your woodland, but if an endangered species is found on or around your property, you may need to make changes to your management to consider the endangered species.

In my private life I get a break from endangered species. I can go hang out at a lake and enjoy some sun and fun... until last summer. Water levels in Lake Freeman started dropping rapidly around the 4th of July weekend. Full-time residents were concerned, part-time residents had no idea what was going on. I had my suspicions, because The Nature Conservancy has been working for well over a decade to protect endangered mussel species, improve water quality and promote conservation farming practices along the Tippecanoe River. But these activities, like tree planting, filter strips, 2-stage ditches and conservation easements had never impacted Lake Freeman.

As it turns out, there are 6 federally endangered freshwater mussels found in the Tippecanoe River, including the Rabbitsfoot mussel, mentioned above. Many of the endangered mussel species have declined by more than 50%. Of the 300 freshwater mussel species in North America, 38 have gone extinct in recent history (lost forever)

cont'd on page 7



Purdue FNR students participate in an invasive species training program.

In This Issue

President's Letter 2015	1
Calendar of Events	2
2014 Indiana Logger of the Year	2
Northern Long-Eared Bat	3
Value of Endangered Species	4
Invasive Species	6
Reintroduction of the River Otter	8
Trapping Season for River Otter	9
Bats Exploit Dynamic Forests	11
Woodland Steward Prescribed Grazing Article (Part 2)	14
Days Gone By	16

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www.inwoodlands.org

Calendar of Events

September 12

Nature Daze

Brown County

See www.bcnwp.org for more info.

September 16

White River RC&D Stump to Product Tour

Salem area, Washington County

Call 765-583-3501 or email ifwoal@gmail.com for more details.

November 6-7

Annual Landowner Conference

Jasper, Dubois County

Call 765-583-3501 or email ifwoal@gmail.com for more details

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The opinions expressed by the authors do not necessarily reflect those of the Woodland Steward Institute. The objectives of the newsletter are to provide general and technical natural resource information to woodland owners of Indiana, improve information distribution and build support for responsible forest resource management.

Congratulations to Oden Sawmill 2014 Indiana Logger of the Year



Read the full story online at www.inwoodlands.org

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Northern Long-Eared Bat Listed under Endangered Species Act: *What Woodland Owners in Indiana Need to Know*

by Andy King

On May 4, 2015, the northern long-eared bat (*Myotis septentrionalis*; NLEB) was officially listed by the U.S. Fish and Wildlife Service (FWS) as “threatened” under the federal Endangered Species Act of 1973 (ESA). This species has experienced severe population declines in areas impacted by the fungal disease white-nose syndrome (WNS). Below are some key points regarding this newly protected species and how it may (or may not) affect your forest management practices.

SUMMARY: If you are a private woodland owner in Indiana, the recent federal listing of the NLEB is not likely to affect your forest management activities unless you or others have documented this species roosting or hibernating on or within 0.25 miles of your property.

- The NLEB is closely related to the federally endangered Indiana bat (*Myotis sodalis*), and both species occur throughout the State of Indiana. Similar to the Indiana bat, the NLEB hibernates in caves and mines during the winter and roosts in trees (within cavities, under loose bark and in crevices) during the spring, summer and fall. In addition, NLEBs may occasionally roost in man-made structures such as barns, houses, bridges and bat houses.
- In recent years, the U.S. Fish and Wildlife Service (FWS) has been funding researchers, who are exploring effective and practical means to target and control the specific fungus (*Pseudogymnoascus destructans*; Pd) that causes WNS, but no broad-scale treatments have been developed to date. WNS was first observed on hibernating bats in Indiana in 2011 and now occurs throughout the state and continues to spread westward.
- Prior to WNS, the NLEB was one of the most common bat species within forest and woodland habitats in Indiana. Although NLEBs were still being captured in fairly high numbers in some areas of Indiana in 2014, no NLEBs (or other *Myotis* species) were captured in other areas where they had been routinely captured in pre-WNS surveys. Also effective May 4, 2015, the FWS promulgated an interim special rule, known as a “4(d) rule,” that specifically applies to the NLEB. This rule is an option for federally “threatened” species under the ESA and provides flexibility to landowners, land managers, government agencies and others as they conduct activities in NLEB habitat. The interim NLEB 4(d) rule exempts non-intentional “take” (i.e., killing, injury and harassment) of NLEBs for some forest management-related activities that would otherwise be prohibited under the ESA.
- The interim NLEB 4(d) rule established a “WNS Buffer Zone” including and extending 150 miles beyond the border

of counties that have documented the presence of WNS/Pd. The entire State of Indiana and surrounding states (IL, KY, OH and MI) fall within the WNS Buffer Zone, and thus purposeful or incidental/unintended take of NLEBs is prohibited in Indiana unless it is from an activity specifically excepted within the 4(d) rule.

- Under the interim 4(d) rule, take of NLEBs incidental to certain activities conducted in accordance with the following habitat conservation measures, as applicable, will not be prohibited (i.e., will be excepted from the prohibitions). For such take to be excepted, the activity must:
 - Occur more than 0.25 mile (0.4 kilometer) from a known, occupied hibernaculum;
 - Avoid cutting or destroying known, occupied roost trees during the pup season (June 1–July 31); and
 - Avoid clearcuts (and similar harvest methods, e.g., seed tree, shelterwood, and coppice) within 0.25 mile (0.4 kilometer) of known, occupied roost trees during the pup season (June 1–July 31).

Note that activities that may cause take of northern long-eared bat that do not use these conservation measures may still be done, but only after consultation with the Service. This means that, while the resulting take from such activities is not excepted by this interim rule, the take may be authorized through other means provided in the Act (section 7 consultation or an incidental take permit).

- At this time in Indiana, nearly all of the known occupied roost trees for NLEBs are on federal and state-owned forest lands. Known occupied hibernacula for NLEBs occur on public and private lands in the following counties: Crawford, Greene, Harrison, Jefferson, Lawrence, Martin, Monroe, Owen, Washington and Vermillion. Private landowners are not required to survey for NLEB.
- The FWS is accepting comments on the interim 4(d) rule through July 1, 2015 (instructions for submitting comments are available at the website at end of this article). The FWS plans to finalize the 4(d) rule by the end of the calendar year 2015.
- **CAUTION:** The NLEB and Indiana bat may both occur in forest and woodland habitat throughout the State of Indiana and all federal protections and take prohibitions pertaining to Indiana bats and their habitat still apply. Therefore, the FWS’ Bloomington Field Office (BFO) advises private woodland owners in Indiana to continue to follow the BFO’s

cont’d on page 5

The Value of Endangered Species: the Importance of Conserving Biological Diversity¹

By Frank J. Mazzotti

Background

A species is endangered when it is threatened with extinction. Since time began, countless species have gone extinct from natural processes. The extinction of dinosaurs is the best known example.

Why Save Endangered Species?

If extinction is a natural process, why should we make an effort to save endangered species? Because we can no longer attribute the accelerating extinction of plants and animals to natural causes. Today most species of plants and animals become extinct because of habitat destruction (loss of living space to development or pollution), introduction of non-native organisms, and direct killing (over-harvesting, poisoning). Indiana's endangered wildlife includes the Karner Blue Butterfly, Figure 1, Indiana Bat, Figure 2, and the Least Tern, Figure 3.

Changing Perceptions

Our understanding of the value of endangered species to humans has increased together with the recognition that human activities cause extinction. In general, benefits of species can be classified as ecological, economic, and social. Different combinations of benefits occur for any particular species, and some species are obviously more "valuable" than others.

More important than knowing why a particular species is valuable is understanding why so many kinds of plants and animals are valuable.

Biological Diversity

The assemblage of populations of plants and animals in an area is termed its "biological diversity." The term biological diversity is often used interchangeably (sometimes confusingly) with two other terms, "genetic diversity" and "ecological diversity." Genetic diversity (amount of genetic variability among individuals of the same species) and ecological diversity (number and relative abundance of species) are both components of biological diversity.

Genetic diversity is directly related to a species' ability to survive environmental change. For example, plants and animals can be characterized by their ability to exist under different climatic (moisture and temperature) conditions.

However, within different species there is a certain amount of variability in the tolerance of individuals to climatic conditions. The ability of different species to cope with environmental change depends on this variability – when genetic variability is reduced the risk of extinction increases.

The loss of a single species can set off a chain reaction affecting many other species. The total impact of extinction is not always apparent, and is difficult to predict, but it is clear that conserving biological diversity is essential for maintaining intact ecosystems.



Figure 1. The Karner Blue Butterfly



Figure 2. Indiana Bat



Figure 3. The Least Tern

Benefits of Biological Diversity

How does maintaining biological diversity benefit humanity? It only takes a moment to realize that throughout history plants and animals have provided humans with food, clothing, energy, medicines, and structural materials.

Today, solutions to problems in agricultural production in tropical countries, reliance on petrochemicals, and the cures for cancers may lie in organisms not yet discovered. It would be a shame to lose these benefits without even knowing we had them.

Ecotourism

One way that conservation of biological diversity is being linked directly to economic and social development is through a relatively new process called ecological tourism, or simply ecotourism. This is particularly important in developing countries that otherwise could not afford conservation programs. Example: The exploitation of renewable natural resources (woods, nuts, oils) in tropical rain forests may bring greater economic benefits than conversion to more intensive land uses.

Agricultural Benefits

Only a small proportion of the world's plants have been cultivated for food on a large-scale basis. Wild plants can benefit modern agriculture as sources for new crops, genetic material to improve existing crops, and as sources of new biodegradable pesticides. Many of our common foods have tropical origins and it is natural to turn to tropical forests as a source for new crops. The tropics are also a source for relatives of commercial species. Continual crossbreeding is necessary to improve crop yield, nutritional quality, adaptiveness to different growing conditions, and resistance to pests and diseases. Undiscovered plants have a great potential for providing new medicines. Many plants have developed chemical defenses to deter animals that eat them. These plants may be cultivated to provide sources of bio-degradable pesticides in the future. Wild plants are also important as a source for new medicines. At least 25 per cent of all prescription drugs dispensed in the United States contain active principals that are still extracted from higher plants. We should never forget that a lowly mold gave us penicillin.

Unrecognized Benefits

Unrecognized benefits of maintaining biological diversity are those services we receive when ecosystems function normally. These ecosystem functions include energy fixation, chemical cycling (oxygen production by rainforests), soil generation and maintenance, ground water recharge, water purification, and flood protection. These services are provided to us at no cost.

When we destroy the ability of ecosystems to function naturally we not only lose these free services but all too often have to pay to replace them. There is no more dramatic example of the problems caused by ecosystem degradation and species endangerment than the loss of wetlands and natural flood control along the Mississippi River to the Gulf of Mexico. Floods, problems in water quality, sediments, nutrients and a dead zone in the Gulf of Mexico all contribute to declines in fish and wildlife populations, loss of species and negative impacts to human health. The price tag for fixing these problems is hundreds of millions of dollars.

Species as Indicators

Certain species are especially important as indicators of environmental quality. Endangered species act as our miner's canary, they tell us when something is wrong in our life-support system. The rapid decline in bald eagles and peregrine falcons was a dramatic warning of the dangers of DDT.

What You Can Do

The conservation and management of threatened and endangered species is a tremendous challenge. Because of efforts of federal, state, regional, and local agencies--sometimes in cooperation with private interests—some endangered species now have a better chance of survival. The involvement of every individual, and especially private citizens, is essential. The following list includes some of the things you can do to help save endangered species:

- Support the Nongame Program of the Indiana Division of Fish and Wildlife
- Visit a national, state or local park where resident naturalists describe local ecosystems. Look into volunteer activities at these locations.
- Volunteer with local land trusts, environmental groups and cooperative weed control organizations.
- Attend public hearings concerning land and water use decisions. Regional planning Councils, water management districts, and county and city commissions are all charged with the responsibility of making decisions affecting biological diversity. Become informed, then involved.
- Report violations of conservation laws to federal and state authorities
- Plant a refuge for wildlife (and energy and water conservation).
- Contact your local County Extension Office for more information on landscaping for wildlife.

Frank J. Mazzotti, Ph.D. is an associate professor with the Wildlife Ecology and Conservation Department at the University of Florida.

¹ This story was reprinted (with minor revisions) with permission from the author. Original publication date December 1990. Revised September 2002. Reviewed June 2014. Visit the EDIS website at <http://edis.ifas.ufl.edu>.

Northern Long-Eared Bat (cont'd from page 3)

forest management guidelines outlined in a previous article of *The Woodland Steward* [Spring Issue, 21(1):11-13] [Available online.

To receive a copy of the BFO Forest Management Guidelines or to discuss questions you may have regarding northern long-eared bats (or Indiana bats), forest management practices or ESA compliance issues in Indiana, please email Andy King (andrew_king@fws.gov) or call the Bloomington Field Office at 812-334-4261.

Andy King is an endangered species biologist with the U.S. Fish and Wildlife Service's Bloomington Field Office.

Additional information regarding the NLEB, the interim 4(d) rule and WNS (respectively)

- www.fws.gov/midwest/Endangered/mammals/nlba/index.html
- www.fws.gov/midwest/Endangered/mammals/nleb/pdf/FRnlebFinalListing02April2015.pdf
- www.whitenosesyndrome.org/

Invasive Species – How Do They Impact Threatened and Endangered Species?

By Ellen Jacquart

There is wide acceptance that invasive species impact threatened and endangered species, but there is surprisingly little research on this topic in Indiana. Despite this lack of research, there are several examples of rare species that are being impacted by invasive species in Indiana.

White-nose syndrome on Indiana bat – Indiana bat (*Myotis sodalis*) is a federally endangered bat that hibernates in large clusters in caves every winter. Its population has been declining for the last several decades; though the reasons are not clear, it may be a combination of human disturbance, cave commercialization and improper cave gating, summer habitat loss and pesticides. Despite the overall decrease in the species' number, Indiana's populations have remained steady or increased over time. However, the recent introduction of white-nose syndrome (WNS) puts Indiana's bats at further risk. WNS is an infectious disease associated with a fungus (*Geomyces destructans*) believed to have been introduced from Europe. WNS is responsible for unprecedented levels of mortality among hibernating bats in North America and is named for the white fungal growth that invades the skin tissue on the muzzle, wings and ears of cave-dwelling bats during winter hibernation. The 2013 population surveys of Indiana bat in Indiana found a 16% decline in the three years since WNS was found in Indiana, and further reductions in population are expected over time. Overall, the disease has caused the death of an estimated 5.7 – 6.7 million bats across eastern North America with estimates of mortality often exceeding 90% in caves that have experienced multiple years of infection.

Crown vetch on Short's goldenrod – Short's goldenrod (*Solidago shortii*) is known from just two places in the world, one of which is in Indiana along the Blue River. This bright yellow-flowered goldenrod grows from the cracks of limestone that line the river banks. Being a fairly severe habitat, there are few native plants that compete with it in such a location. Unfortunately, crown vetch (*Securigera varia*), an aggressive legume used for erosion control, has found its way to these riverine habitats. Crown vetch grows quickly and spreads through rhizomes, and is able to invade these limestone cracks, directly competing with the Short's goldenrod.

Phragmites on pipewort - Pipewort (*Eriocaulon aquaticum*) is a tiny state-endangered plant that grows along lake shores in northern Indiana. A cap of white flowers tops a flower stalk less than six inches tall. Habitat loss through lake development and shoreline destruction is the primary reason for its rarity,



There are about 25 species of goldenrod native to Indiana, but Short's Goldenrod is one of the rarest plants in Indiana. It is one of only two plant species in Indiana federally listed as endangered. (photo by Tom Barnes, University of Kentucky)



Common Reed (*Phragmites australis*) is a non-native plant and forms dense monocultures. These thick stands can choke out our native species including rare or endangered plants. (LaVonda Walton, U.S. Fish and Wildlife Service)

but invasive species are also taking a toll. Pipewort has no chance when phragmites (*Phragmites australis* ssp. *australis*) invades a lakeshore, as this invasive grass can reach 20' tall and forms a dense monoculture that eliminates pipewort and all other plants.

Phragmites on spotted turtle – Spotted turtle (*Clemmys guttata*) is a small turtle with a dark shell peppered with yellow dots. This state-endangered turtle is found in fens

Woodland Steward – President’s Letter 2015 (cont’d from page 1)

and 77 others are critically imperiled. The Tippecanoe River supports one of the most significant and diverse freshwater mussel populations in the United States with 46 of the original 58 mussel species still found there

Lake Freeman and Lake Shaffer generate hydroelectric power. The dams alter the hydrology of the river, but generate the electricity we all need and use. The lakes create recreation opportunities and economic opportunity for many people. I grew up swimming, wakeboarding and playing in the lake. My kids love the lake. To protect the federally endangered mussels, the dams must release a certain amount of water per hour to maintain the downstream flow of the river. In drought years, this may lower the lake level and limit recreation and economic opportunities associated with the lake.

People are part of this world and have an impact on this world, but no other species on the planet can accept the responsibility or has the power to be a good steward of the Earth like we do. Freshwater mussels serve a purpose. Filtering over a gallon of water an hour, they purify rivers

Invasive Species (cont’d from page 6)

and wet prairies in northern Indiana and eats slugs, worms, snails, and spiders. At the end of breeding season, the female turtles find an open area to dig a nest and lay 3-4 eggs. The nest site is carefully chosen to provide adequate solar heat for developing eggs, as nest temperature is the most important factor for embryo development and actually determines the sex of the embryos. *Phragmites australis* ssp. *australis* also prefers to grow in open areas, and often invades the kind of habitats in which turtles are most likely to nest. The tall, dense monoculture of phragmites near turtle nests alters the microenvironment of turtle nests during incubation, particularly the nest temperature, threatening successful reproduction of the turtles.

Ellen Jacquart is the Director of Northern Indiana Stewardship for the Nature Conservancy in Indiana. She has worked in Indiana’s natural areas since 1987.

and streams. They are also an important part of the aquatic food chain. I do not want to cause the extinction of a mussel, or any other plant or animal. However, ensuring their survival will directly impact me and my family. Protecting mussels may limit my ability to wakeboard or get the full use out of our cottage, but extinction is forever. I am willing to give up some of my personal recreation to help keep a species from extinction. I am willing to alter the forest management I am doing for The Nature Conservancy to help the Indiana Bat. There are real costs to protecting endangered species and many of the costs are borne by private landowners. In some cases, protecting endangered species has put people out of business or disrupted entire industries. As landowners and private citizens, we can encourage the use of sound science and work to promote species recovery plans that balance the needs of people and endangered species. One way for private landowners to do this is to provide public comment on U.S. Fish and Wildlife Service proposed listings and endangered species recovery plans.

Throughout this issue of the Woodland Steward, you will find information on some of Indiana’s endangered species, gain an understanding of how humans can help endangered species, and learn how non-native invasive plants and animals are impacting endangered species.

One way to stay informed about endangered species and their impacts to woodland owners is to read the Woodland Steward. In this issue we are asking you to show your support by making a donation to ensure that we can continue to produce and print this newsletter for 33,000 woodland owners in Indiana. Private landowner donations help pay for the cost of printing and mailing the newsletter. So please consider a donation. On behalf of the Woodland Steward Institute and our executive board, thank you for your support. We hope you enjoy and benefit from the Woodland Steward.

Dan Shaver, Woodland Steward President

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A Recipe for Success: Reintroduction of River Otter in Indiana

By Shawn Rossler

The sight of a wild river otter swimming, sliding, or vocalizing is an experience everyone should have the opportunity to enjoy at least once in their lifetime. Thanks in part to the Indiana DNR Division of Fish & Wildlife (DFW), this opportunity is now a reality for Hoosiers willing to visit or navigate one of the state's waterways. However, this wasn't always the case.

River otters were extirpated from many Midwestern states due to habitat degradation and unregulated harvest. In Indiana, river otters received protection in 1921, but the efforts were too little, too late. Except for a few sparse reports, otters were essentially unheard of and remained a missing piece of aquatic systems throughout much of the 1900s. Talks of reintroducing otters to Indiana started in the late 1970s, but concerns over habitat quality stalled efforts. The pros and cons of reintroductions were discussed on and off over the course of two decades.

During the late 1980s and early '90s, other Midwestern states were having the same conversation and began experimenting with river otter reintroductions. One of the most involved otter reintroductions was completed by the Missouri Department of Conservation. The Missouri framework was extremely successful and eventually served as a template for many states, including Ohio, Kentucky, and Illinois.

The proven track record of successful reintroductions in other states reignited the otter conversations in Indiana. At the request of the public, the DNR Fish & Wildlife nongame program conducted a feasibility study to determine if river otter reintroductions were viable in Indiana. Staff from the DNR Fish & Wildlife and U.S. Fish & Wildlife Service completed an extensive review of Indiana's river basins. Biologists reviewed all watersheds with consideration to habitat quality, socio-economic concerns, reintroduction logistics, regulatory provisions, and funding for such a large project. All Indiana watersheds were ranked as to which was most likely to give otters the best opportunity to survive. The areas showing the most promise were the Muscatatuck River, Tippecanoe River, and Patoka River basins.

In early 1995, 25 otter were released at Muscatatuck National Wildlife Refuge. They were fitted with internal radio transmitters that allowed biologists to track their movement and determine their survival and dispersal. The results of the preliminary release were promising, and the decision was made to move forward with additional releases. Over a five-year period, 303 otters were transported from Louisiana and released at 12 sites in northern and southern Indiana.



River otters were extirpated from Indiana and many other Midwestern states due to habitat degradation and unregulated harvest.



River otters being released at Muscatatuck NWR in 1995.

Partnerships were a critical part of the reintroduction. After being transported from Louisiana, otters were housed temporarily at Purdue University, where they went through a complete physical and received veterinary care to ensure they were in the best health prior to release.

The Indiana State Trappers Association provided fish needed to feed the otters prior to their release, and many Hoosiers made financial contributions to the nongame fund that directly supported the reintroductions.

After the otters were released, DNR Fish & Wildlife staff continued to monitor trend information gathered from annual bridge and stream surveys, citizen reports, and incidental

A Regulated Trapping Season for River Otter: When, Where and Why?

By Shawn Rossler

A conversation about river otters and their management in Indiana isn't usually a short one.

Depending on the day, most discussions eventually migrate to a number of subtopics focused on variations of the following questions: All of our neighboring states have a trapping season for otter, why doesn't Indiana? Is it too soon to have a regulated otter trapping season; didn't we just reintroduce them? If we do have a season, what is the best management approach?

All areas of conversation are guaranteed to have passion and debate. The fact these questions come up in conversation is important.

River otters have an interesting history in the Midwest and Indiana. A portion of their story is captured in "A Recipe for Success: Reintroduction of River Otter in Indiana," also printed in this special issue of the *Woodland Steward*.

The bottom line from that article is a lot of time and energy were spent to reintroduce river otter back to Indiana, and the efforts have paid off. River otters are doing well and can be found throughout most of their historic range. The story of the river otter continues in Indiana with the next chapter...active management through a regulated trapping season.

Why a trapping season? One reason is the population is doing well (Figure 1). The DNR Division of Fish & Wildlife (DFW) has established harvest seasons for many wildlife species, and these regulated seasons help maintain a balance between habitat, people, and wildlife. Seasons are managed through

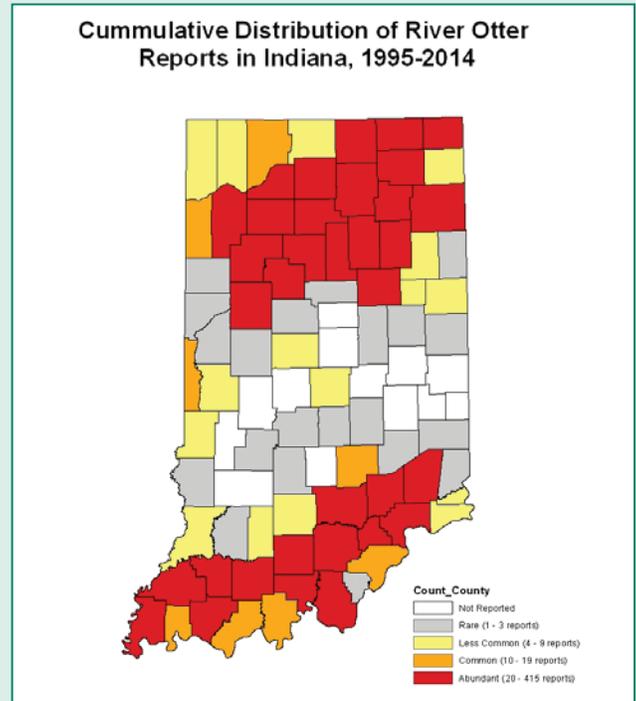


Figure 1.

scientifically based regulations that are enforced by Indiana Conservation Officers to ensure species remain abundant.

In addition, even though techniques to avoid trapping river otter are actively being used by trappers, more than 100 river otters are incidentally killed each year during legal trapping seasons for other furbearer species. These otter are turned

cont'd on page 10

River Otters (cont'd from page 8)

mortality reporting. The five-year reintroduction program was completed in 1999, and it didn't take long to see that the released otters took an immediate liking to Indiana.

The reintroduction recipe was so successful that by 2005 otters were removed from the state's endangered species list. It has been 20 years since the first release and almost 10 years since delisting. River otters have now been documented in 80 percent of Indiana counties, and all information indicates the otter population continues to expand.

Although original release sites were in northern and southern Indiana, otters are now moving into central Indiana. Data from the feasibility study indicated the habitat in central Indiana wasn't considered ideal for river otters, but some otters have found suitable habitat to survive. Work to improve water quality in the state has likely benefited river otter expansion.

Thanks to the hard work and dedication of DNR Fish & Wildlife and partners, river otters are expanding in Indiana and now occupy much of their historic range, representing a success story for wildlife conservation. As with similar wildlife success stories in Indiana (white-tailed deer, wild turkey, and beaver) there is usually a next chapter. DNR Fish & Wildlife is currently preparing to ensure the next chapter is also a success. The goal is to use modern wildlife management techniques to guarantee river otters continue to do well and remain part of the Hoosier landscape for the benefit, enjoyment, and memories of future generations.

Shawn Rossler is the Furbearer Biologist with the Indiana Department of Natural Resources, Division of Fish & Wildlife.

Otter Trapping (cont'd from page 9)

over to the DFW, used for research, and pelts are provided for educational purposes, but the sheer number being turned in is much higher than requests coming in from educators. Allowing these pelts to be retained by trappers reduces chances the resource will be wasted. Plus, the carcasses will still be collected by the DFW to gather valuable biological data.

All of our neighboring states have established otter populations as well as regulated otter trapping seasons. Ohio, Kentucky, Illinois, Missouri, Iowa, and West Virginia all reintroduced river otter in the 1980s and 1990s. Their reintroductions were followed by regulated trapping seasons – the best tool to manage otter populations. Currently, regulated trapping is used to manage river otters in at least 33 states, many of which reintroduced river otter.

Transitioning from monitoring to active management of a population isn't a short process, especially with a charismatic species like the river otter. The Indiana Natural Resources Commission (NRC) is the rulemaking body with the authority to establish a regulated trapping season. Meetings were planned, regulations and protocols were proposed, and engaged members of the public had several opportunities to review and comment. The entire NRC process takes about two years from start to finish before a season can be implemented.

So what does the otter trapping season look like after going through the rulemaking process?

The river otter season will run concurrent with the beaver trapping season (Nov. 15 to March 15 of the following year). River otter and beaver share similar habitat types. The potential to trap one while targeting the other is always a possibility.

The DFW has designated 66 counties open for otter trapping with 26 central Indiana counties closed. The counties open to harvest are in watersheds where river otters originally were relocated, have had time to establish, and where populations are doing well. The 26 closed counties are within watersheds where river otters were not reintroduced and have not become established.

There are a few additional requirements, including a two otter seasonal bag limit per trapper. The intent is to provide more equity and opportunity for all trappers interested in trapping an otter.

There also will be a state season quota of 600 otters. If this figure is reached before March 15, the season will close early and all river otters trapped after this point will need to be turned over to the state, without penalty. These conservative sideboards are in place to control harvest levels, especially during the first couple years.

There will be mandatory reporting of harvest (similar to deer and turkey). All trapped river otters will need to be registered through the online Check-IN Game program within 24 hours of harvest. Also, all otters will need to be physically registered with a designated DNR property or Conservation Officer within 15 days after the month of harvest.

Prior to physical registration, the otter will need to be skinned. A successful trapper will then bring the separated pelt and skinned carcass to a DNR property or Conservation Officer. The pelt will be sealed with a CITES tag and the carcass will be collected so DFW biologists can collect reproductive and age data from the animal. Information from the carcass helps biologists make future recommendations for the season.

What is a CITES tag? CITES stands for the Convention on International Trade of Endangered Species of Fauna and Flora,

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Bats Exploit Dynamic Forests

Timothy Divoll

There's no better time than now to consider how we may help surviving bats keep calm and carry on. Several bat species in danger occur regularly in the forested matrix of the Hardwood Ecosystem Experiment, or HEE (heeforeststudy.org), in Morgan, Monroe, and Brown counties, Indiana. The northern long-eared bat, *Myotis septentrionalis*, is a small forest-dependent bat at the focus of several current HEE projects, alongside the Indiana bat, *Myotis sodalis*, a federally Endangered Species. Not only is the northern long-eared (northern *Myotis*) bat a focal point of the HEE, it is in the federal spotlight as well. This species has declined so much from white-nose syndrome that it is was very recently listed as a threatened species under the Endangered Species Act.

White-nose syndrome survivors

Several million bats have died from the deadly fungus that finds its way into bats' tissues while they're fast asleep for winter. The bulk of mortalities have been little brown (*Myotis lucifugus*) northern long-eared, Indiana, and tri-colored (*Perimyotis subflavus*) bats. Bats typically disappear from summer landscapes 2-3 years after detection of the disease in nearby caves. (See Figure 1.) Hibernating bats with white-nose syndrome wake up more often than usual and this excessive activity burns precious fat stored for hibernation. Some bats may exit caves in winter to search for food, burning even more stored fat. In northern locations, bats likely don't find much to eat but recent studies suggest bats hibernating in southeastern caves may find limited food in winter. In either case, many bats will not be able to restore fat reserves. However, some do make it through the winter and emerge in spring to head on to their summer habitats. It's likely that survivors emerge with very low energy reserves, and thus, quality habitat and forage are necessary for bats

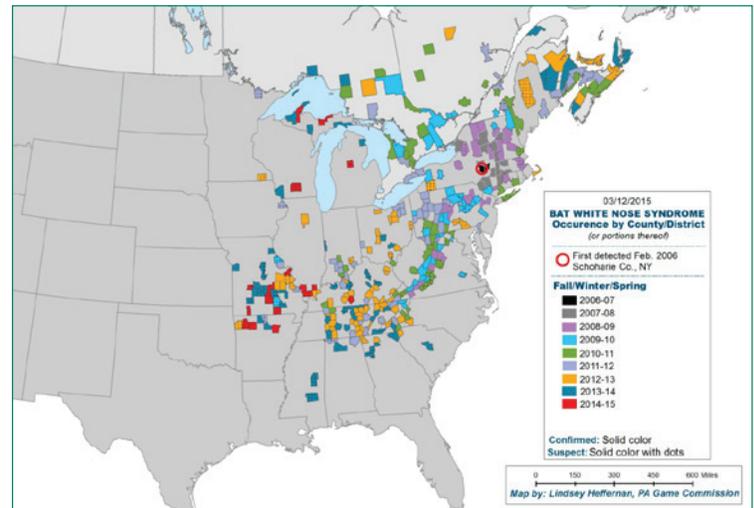


Figure 1. Map depicting the spread of white-nose syndrome (WNS) since its discovery near Albany, NY in 2006. County confirmations are based on winter hibernacula surveys and declines in summer populations are typically observed 2-3 years after initial detection of WNS in nearby caves. Millions of bats have died from this epidemic, most of which were little brown, northern long-eared, and Indiana bats. Forest bats at the HEE most likely overwinter in southern Indiana and/or Kentucky. Compare this 2015 WNS map with the map in Dr. Tim Carter's 2010 Woodland Steward article: www.inwoodlands.org/bats-are-dying-by-the-thousand/

to gain strength for migration, birthing, and nursing pups to independence.

HEE Captures and Roost Selection

Both northern long-eared and Indiana bats have migrated back to the HEE landscape and settled in by the time research

cont'd on page 12

Otter Trapping (cont'd from page 10)

an international agreement that governs trade of endangered species. As a CITES participant, the United States must follow certain requirements. River otters are on Appendix II of CITES, which means they are a "look alike" species to other endangered river otter species found throughout the world. To ensure river otters entering international markets were harvested legally in the United States, an unaltered tag must be affixed to the pelt. Each state with a river otter season has uniquely marked tags and general regulations for issuance... but long story short, an otter pelt must have a CITES tag before it can be sold.

So, the idea of having a river otter season seems straightforward, but there is a lot of coordination and record keeping.

The DNR cares deeply about river otters, as do Indiana trappers. We intend to see otters thrive in Indiana while allowing sustainable harvest in areas where they are doing well and providing them the opportunity to expand their range in central Indiana.

The DNR will closely monitor the new season and work closely with trappers to ensure responsible management and recordkeeping in order to sustain healthy river otter populations.

Shawn Rossler is the Furbearer Biologist with the Indiana Department of Natural Resources, Division of Fish & Wildlife.

Bats (cont'd from page 11)

crews from Ball State University and Indiana State University show up in mid-May each year. Both bats have been captured consistently since 2006, though we capture tenfold more northern long-eared bats in our mist-nets each year. (See Figure 2.)

Declines in captures rates over the last few years have led us to focus our mist-netting activities at small forested ponds where capture rates are higher than on forest roads and our efforts are maximized. The fact that northern long-eared and Indiana bats favor small ponds as foraging sites suggests that permanent water sources may be an important resource for bats stressed by white-nose syndrome. Water is limited in the HEE landscape, where most creeks are dry for most of the summer. It is also important to point out that bats seem to visit small ponds under the forest canopy rather than ponds and lakes without tree cover.

Another limiting resource for forest-dependent northern long-eared and Indiana bats is suitable roosting habitat, but these bats have many roost options in the mixed deciduous forest of the HEE. In 3 seasons of tracking, we have learned that both northern long-eared and Indiana bats roost primarily in oak or maple snags with sloughing bark or cavities, but sometimes use live trees with crevices and/or cavities, such as sassafras and hickory. Northern long-eared bats were more versatile, selecting trees smaller in diameter than Indiana bats, which typically selectively roost under exfoliating bark with high solar exposure in larger dead trees. On the HEE, Indiana bats used 13 different tree species, including oaks, maples, hickories, elm, and tulip poplar. Northern long-eared bats roosted in trees of 11 different genera, but used mostly oaks, maples and

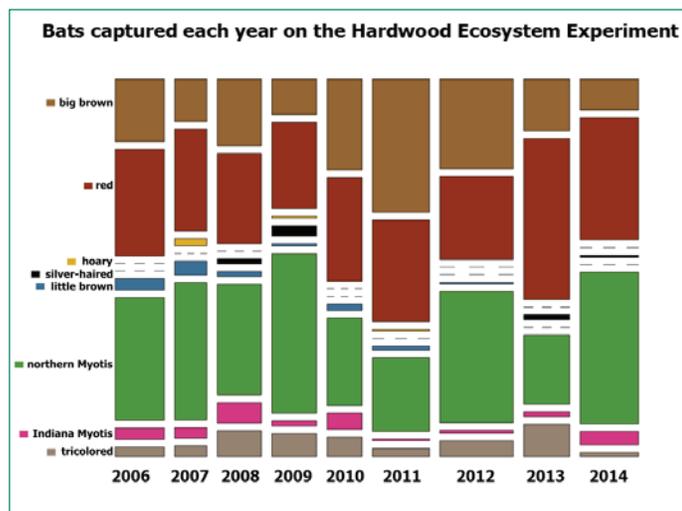


Figure 2. Eight forest-dwelling bat species have been captured during ongoing surveys at the Hardwood Ecosystem Experiment in south-central Indiana. Bar widths are relative to the number of total bats captured per year, comparing among years. Bar heights relate to the number of each species captured within the same year, comparing among species. The Indiana Myotis (Indiana bat) is a Federally Endangered species and all others are State Special Concern with the exception of the big brown bat. Northern Myotis = northern long-eared bat.

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Bats (cont'd from page 12)

sassafras—which provide many bat-sized roosting cavities. Both bats roost in interior forest or near the edge of small openings, such as patch cuts. High solar exposure is important for bats in maternity roosts, which rely on the heat of the sun for passive thermoregulation. Both bat species will take advantage of available resources in different forest types. For example, in southern forests, both bat species will roost in pines and northern long-eared bats will roost in sugar maple and yellow birch in northern forests. If forest bats have access to critical resources such as water and a variety of snags, they will exploit various forest types while foraging. Small *Myotis* bats are highly mobile (they can fly, after all) and have the opportunity to utilize different structural components with differing heights. Timber management strategies such as single-tree selection, patch cutting, and shelterwood harvesting all create horizontal as well as vertical edges and gaps for bats to forage in.

HEE foraging –acoustics and telemetry

Based on acoustic surveys used to record bat activity as an index of species-specific echolocation recordings, we know that Indiana bat activity is highest in the HEE matrix near patch cuts (1, 3, and 5 acre openings) and first stage shelterwood treatments compared to larger clearcuts and control units. Northern long-eared bat activity is relatively equal among forest treatments types, suggesting that this species is also able to use forests with a variety of age-classes and openings. In 2014, we used radio telemetry to track both bat species at night; both selectively foraged in harvested areas, mainly around the edges of patch cuts and within single-tree selection harvests. Tracked bats did not use first stage shelterwood cuts in 2014, but we will investigate this further in 2015, as well as targeting areas harvested and/or burned in spring 2015 to study use of newly disturbed areas.

Bats and management in harmony

Our case study with bats at the HEE demonstrates that heterogeneity is critical to maintaining roosting and foraging habitats needed by bats during the summer maternity season. There is an optimal distance dynamic between roosting areas and foraging areas. We found northern long-eared bats foraging no more than 2 km from roost trees and Indiana bats no more than 3.3 km, suggesting that bats will travel to forage, but should thrive in foraging areas that already contain many roost tree options. Although many bat species will forage or commute along larger edges, northern long-eared and Indiana bats prefer patch and shelterwood edges that are more representative of natural disturbances such as fire, tree fall gaps, and storm destruction. Situating small openings near large tracts of mature forests with suitable



Figure 3. This small forest pond, approximately ½ acre in size, has been a productive capture site for mist-netting at the HEE. There are several of these small ponds scattered about the HEE and water is otherwise limited, with the exception of a few small streams. Bats simply love to visit these waterholes in the forest matrix, which require minimal management. As long the pond edge remains cleared and aquatic vegetation does not cover the water's surface, bats maintain the ability to drink and forage under the safety of canopy cover.

roost trees (e.g., dead oaks or cavity-bearing sassafras trees) should provide quality of habitat for these *Myotis* bats. However, too much forest fragmentation may force *Myotis* bats to find new summer areas.

Although bats use harvested areas, it is important to consider timing of forest management activities in relation to the maternity season of bats to minimize disturbance while bats are present. Indiana bats (*Myotis sodalis*) are a federally protected species that drive seasonal harvest restrictions. Rules related to Northern long-eared bats (*Myotis septentrionalis*) are currently under consideration. For more information on endangered bat species and management recommendations, visit the U.S. Fish & Wildlife, Bloomington, IN Field Office website or review their timber management guidance document at: http://efotg.sc.egov.usda.gov/references/public/IN/BFO_Forest_Management_Guidelines2-14-08.pdf

Whether endangered or common, all bats benefit from healthy forests and studies such as the HEE show that low-impact forest management can provide quality habitat for a diverse assemblage of bats.

Timothy Divoll is a current PhD student at the Center for Bat Research, Outreach and Conservation located at Indiana State University.

Woodland Steward Prescribed Grazing Article (Part 2)

By Ron Rathfon

... And so we return to my original story of trying to control multiflora rose in a woods at SIPAC and the day the goats arrived.

My colleagues Songlin Fei (Purdue Forestry & Natural Resources), Mike Neary (Purdue Animal Science), Ken Andries (Kentucky State University animal scientist), and Jason Tower (SIPAC manager) and I began addressing some of the questions just raised about prescribed grazing by conducting an experiment in the multiflora rose woods. The objectives of this study were to test grazing intensity (low and high goat stocking rates) and two grazing frequencies within a growing season using goats to reduce multiflora rose and to quantify impacts of those treatments on non-target native vegetation, including hardwood tree regeneration. By the time grazing started in May 2012, multiflora rose had fully recovered from our earlier attempts to burn it out, averaging 6 ft. tall and covering 56% of the forest floor. Our experimental treatments were:

- Control, or no treatment
- Manual cutting + herbicide
- Low stocking with two grazings
- Low stocking with one grazing
- High stocking with two grazings
- High stocking with one grazing

Goats assigned to the project were mature does that were open (not pregnant) and not lactating (no kids). The goats were meat goats provided by the existing herd at SIPAC and from a Kentucky State University herd. They were a relatively hardy, self-sustaining cross-breed of Boer, Kiko, Savanna, and Spanish influence. Paddocks were fenced using portable electric netting.

Goats are considered generalists (Figure 1), meaning they eat just about anything green. In fact, “prescribed grazing” may be a bit of a misnomer since goats not only graze on leaves, but also browse woody stems. In the case of multiflora rose, the newest, most tender and succulent leaves



Figure 1. Goats are well-adapted to both grazing and browsing on woody vegetation. Portable grazing system fences such as this electric netting make prescribed grazing feasible in forest environments and on rough terrain.

and shoot tips located at the goats head level were first grazed and browsed. When that was gone, the goats stretched their necks a little higher. Finally, expending more energy, goats stood on hind legs to reach more woody stems or work harder to penetrate to the interior of dense rose thickets using their long, slender muzzles and prehensile, yet amazingly tough, tongues and lips to delicately extricate older interior leaves.

High intensity grazing using high stocking rates for short durations are frequently recommended for controlling invasive brush infestations in western U.S. rangelands (Campbell and Taylor 2006). The high stocking treatments employed three times the number of goats as the low stocking treatment (Table 1), yet low stocking treatments took a little less than three times longer in the summer grazing, and just a little more than two times longer in the fall grazing compared to high stocking treatments, to deplete plot forage. Large numbers of grazers in close confinement seems to produce greater psychological pressure to feed intensely and a sort of feeding frenzy ensues resulting in less selective feeding and a more complete consumption of target vegetation. Even so, our low stocking treatments uniformly stripped the vegetation on their paddocks, albeit over a longer period of time. Unlike the destructive continuous grazing described by Professor Den Uyl in part 1, goats were removed from their research paddocks once most forage was eaten, allowing the understory vegetation to regrow.

Visual impacts immediately following prescribed grazing treatments showed heavy to near complete defoliation of woody plants up to 6 – 7 ft. in height and severe reductions in herbaceous plant cover for most species. Additional reductions in woody cover and height occurred through debarking or breaking small stems by horn rubbing, particularly on spicebush stems.

Table 1. Goat stocking and grazing duration in a study testing prescribed grazing for control of invasive brush in a hardwood forest understory. (LS = low goat stocking, HS = high goat stocking)

Treatment	1 st Grazing		2 nd Grazing	
	Stocking (goats/acre)	Duration (no. days)	Stocking (goats/acre)	Duration (no. days)
LS2	16	33	8	16
LS1	16	21	n/a	n/a
HS2	48	9-12	24	7
HS1	48	11-14	n/a	n/a

One year following the initial grazing, multiflora rose leafed out vigorously and grew new canes. However, modest reductions in rose were seen, ranging from an 8 to 10 percent reduction in cover and a 0.8 to 1.4 ft. average reduction in height. However, no rose plants were killed following one year of grazing. It's too early to know how grazing will impact native species diversity. After the first season of grazing there were no decreases in number of native plant species, woody or herbaceous.

As I mentioned earlier, goats are considered generalists in their feeding behavior. However, some selectivity occurs depending on palatability and the individual animal's previous experience with different plants. In this study, almost all species within reach were ultimately fed upon. Notable exceptions included pawpaw and wild ginger, which aside from some stem breakage and trampling, were not fed upon at all.

Prescribed grazing alone may eventually eradicate non-native invasive infestations, like our multiflora rose, but only after three or more years of intense grazing pressure. More research needs to be done to look at multiple years of grazing and its impact on both target invasive vegetation and non-target native vegetation. In fact, this study is now going into its fourth year of grazing and will produce those results. In some circumstances, forest managers may find multiple years of prescribed grazing too damaging to desirable non-target vegetation. The good news here is that even where one short-term grazing is applied to dense brush, prescribed grazing with goats cleared between and pruned back large shrubs sufficiently to allow workers much easier access to much of the area that was largely inaccessible. Prescribed grazing could be used in combination with conventional mechanical cutting and herbicide treatments to reduce costs and chemical inputs into the environment. Where complete eradication of invasive vegetation is desired, prescribed grazing will most certainly need to be followed-up with herbicide treatment.

Much more work needs to be done before foresters and other natural resource managers can feel comfortable making management prescriptions using prescribed grazing. An overriding factor determining the viability of prescribed grazing as a forest management tool, and one not addressed in this article, is cost. Determining the economic feasibility is a complicated matter. A wide range of prescribed grazing

services models could be applied. Landowners and managers could maintain their own "forestry" goat herds, contract with a "herd for hire" enterprise dedicated solely to providing vegetation management services, or offer free forage to a neighboring goat farmer, with many other variations possible.

Having fought bush honeysuckle, multiflora rose, Japanese honeysuckle, autumn olive, and other invasive species across many forest acres over the past two decades using chainsaws and brush saws, tractor mounted sprayers and backpack sprayers, hydraulic rotary brush cutters and tree shears, and having sprayed thousands of gallons of glyphosate and triclopyr, 2,4-D and Arsenal, not to mention Tordon and Escort, I'm getting tired and ready to try a fresh approach. Watching those adorable, furry ungulate friends of mine munching so eagerly on the arch enemies of my forest just does my heart good, refreshes my hope, and reinvigorates my desire to continue the fight.

Bringing this discussion full circle, I never imagined as a young forestry student steeped in the tradition that proclaimed the evils of fire and livestock in the forest, that I would be writing an article on the tremendous possibilities of both as forest management tools. Prescribed fire is now being used as a tool to help promote the establishment of oak regeneration. It sounds good, but for many private landowners it's just not an option. What about prescribed grazing as a sort of surrogate for fire in managing forest vegetation to favor oak regeneration? Sounds a little crazy. I think I'll try it! Come to think of it, I have already started. That's a story that will have to wait until next time.

Ron Rathfon is an Extension Forester with Purdue University's Department of Forestry and Natural Resources since 1992. His primary focus is applied forestry research and forestry extension activities directed to private landowners, professional foresters and other natural resource professionals.

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Days Gone By

Ready to "square up" a black locust log for an end post at Rutherford Mill, Madison, IN. According to a note written on the back of the original photo, these retailed from \$2.50 to \$3.50.

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