

The Woodland Steward

Promoting the Wise Use of Indiana's Forest Resources

Giving Credit Where Credit is Due: Bats are Crucial to a Healthy Forest

Joy O'Keefe

Let me introduce you to the coolest mammalian order – Chiroptera, also known as bats. Why do I think bats are so cool? They're remarkably diverse, with almost 1500 species worldwide that eat everything from beetles to blood, moths to mangoes, and spiders to songbirds. Especially in the tropical parts of the world, bats show incredible variation in form and function, with cryptic coloration, wrinkly faces, projections from their noses to aid in echolocation, sucker pads for hanging onto leaves, and more. Indiana is a regular home to ten of these animals, all nighttime predators of insects and spiders. The largest species is the hoary bat (*Lasiurus cinereus*), clocking in at around 30 grams for an adult female, and the smallest is the tricolored bat (*Perimyotis subflavus*), averaging just five grams – that's just five paperclips! Local bat diversity is highest in the southern portion of the state, where karst features and forests abound.

Do you have bats on your property? Likely so, but they may not be obvious to you. Go outside about ten minutes past official sunset on a warm summer night and you might be

lucky enough to see bats swooping around as they chase bugs under the trees in your yard or coming down for a drink from a pond. Many folks tell me they see fewer bats in the night sky than they did when they were kids and there is indeed evidence of population declines in many of Indiana's bat species due to disease, habitat loss and degradation, roost disturbances, and collisions with wind turbines. Three of Indiana's bats are federally endangered, and another is a candidate for listing.

Forests are essential habitat for bats worldwide and in Indiana. From late March to late October, most bats in Indiana spend their days roosting in trees. Tree-roosting bats can be divided into foliage dwellers, like the eastern red bat



Micronycteris bat from Peru. Photo by Vanessa Rojas.



Eastern red bat in a red cedar by Mark Vukovich

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Calendar of Events

January 16

Breakfast with a Forester • LaPorte County

January 24

Sawmill Efficiency and Quality Control Workshop
Purdue University, Tippecanoe County, \$79
RSVP to info@ihla.org

February 5- March 25

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February 13

Conservation Tree Planting webinar • 1-4 pm ET
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Forest Management for the Private Woodland Owner
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February 15 and 17

Winter Tree ID Workshop
Feb 15, 6-8 pm indoors, Feb 17, 9-noon outdoors
Spring Mill State Park, Lawrence County
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February 20

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March 23

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See all forestry and wildlife events for woodland owners at www.ifwoa.org/events

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Bats are Crucial to a Healthy Forest *Continued from page 1*

(*Lasiurus borealis*) and the tricolored bat, and the cavity or crevice dwellers, like the endangered northern long-eared bat (*Myotis septentrionalis*) and Indiana bat (*Myotis sodalis*). Favored roosts are large, solar-exposed trees that provide warm temperatures for pup development and rearing, which happens from about May to August each year. Some trees may host tens to hundreds of females in a “maternity colony.” Bats sometimes shift to shaded trees below the canopy, roosting in small groups or singly. Even bats that roost among leaves are faithful to their summer roosting areas, returning year after year to the same trees or patches of woods.



Photo of girdled maple in the sun on the HEE, which was an Indiana bat roost. Photo by Reed Crawford.

Look around your woodland for the trees that are valuable to bats. How will you know? Large-diameter trees (>1 foot across the trunk) are favored as roosts, particularly dead or damaged trees that offer big patches of sloughing bark on the main trunk or a cavity in the trunk or a branch, or all of the above. Foliage dwellers will tuck inside clumps of leaves (live or dead) of live trees. When choosing a roost, bats aren’t particular about tree species so much as tree structure. While oaks and hickories are always desirable, bats will take advantage of flushes of dead trees that arise due to

disturbances, like the recent influx of ash snags because of the intrusion of the emerald ash borer into Hoosier forests. Even fast-growing poplar, maple, and cottonwood trees can be desirable roosts for bats.

Because large trees and dead trees are essential for many bats, it’s important to protect some large trees with the unique nooks and crannies bats favor. Because most of Indiana’s forests were cut over in the past 150 years, there aren’t many really big trees left for bats to use. Dead trees are important habitat for several imperiled bat species, so if you plan to remove dead trees from your property the optimal time to do so is when bats are hibernating, which is from about November to late March. If you conduct a harvest during the warmer months, I recommend safeguarding dead trees, even leaving a patch of live trees around them to buffer them from treefall and the wind that will whip through newly open woods.

Understanding the effects of forest management on bats has been a focal area of my team’s research for over 20 years. One project I’ve been lucky to be involved in is the Hardwood Ecosystem Experiment (“HEE”; www.heeforeststudy.org) on Morgan-Monroe and Yellowwood state forests in southern Indiana. Capturing bats and tracking them to their roosting and foraging sites, we’ve learned how bats respond to even-aged and uneven-aged management techniques implemented by the Indiana Department of Natural Resources Division of Forestry. In general, we’ve shown that even endangered bats are coexisting with timber management, selectively roosting near patch cuts and logging roads, and foraging near patch cuts, clear cuts, thinned stands, roads, and ponds. In the mature but still relatively young state forest land where we work, small openings are desirable for bats because they allow



Photo of forest pond by Joy O’Keefe

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Restoring Sustainability for White Oak and Upland Oak Communities: An Assessment and Conservation Plan

White Oak Facts

- American white oak is a foundational tree species, currently occupying more than 104 million acres of public and private forestland across much of the eastern and central United States—including a strong presence in Alabama, Arkansas, Georgia, Illinois, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Missouri, Pennsylvania, North Carolina, Ohio, Tennessee, Virginia, West Virginia and Wisconsin.
- White oak forests support extensive plant and animal biodiversity, providing a critical food source for a variety of wildlife species and serving an important role in maintaining our diverse forest ecosystem.
- Forest sector economic reports from central hardwood region states (where white oak predominates) clearly indicate the importance of oak resources, which generate billions of dollars annually.
- White oaks are the most commercially important timber oak—necessary for industries such as furniture, flooring, cabinetry, and wine and spirits.

Overall Report Findings

- Due to shifts in land management and ecological changes, an increasing amount of competing tree species have been establishing themselves in the understories of America's white oak forests.
- Competing species, most notably maples and beech, are shading out white oak trees and preventing them from regenerating.
- As a result, older white oak trees are not being replaced by younger white oak trees at a pace that will support long-term sustainability.
- About 75% of all white oak trees across the eastern United States can be classified as "mature," while populations of young white oak trees are limited.



- Challenges such as climate change, invasive insects and diseases, and behavior change are also impacting white oak sustainability.
- Without intervention today, the American white oak population will begin to decline significantly within the next 10 to 15 years, with more extreme declines over the next several decades.

Recommended Forest Management Practices

Reversing the decline of America's white oak population is possible, but intervention must begin today. To restore the long-term sustainability of America's white oak forests,



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and maintain the economic, social and environmental benefits they provide, we need active, cross-boundary collaboration, participation and support from industry, resource professionals, policymakers, landowners and others who can align knowledge and resources behind the following recommended forest management practices, before it's too late.

The following 10 recommended forest management practices will provide sustainability benefits across all oak forests as well as the upland forests they inhabit.

- **Crop tree release.** This practice is the primary technique used to ensure oaks continue to maintain vigorous growth.
- **Midstory/understory removal.** This practice is aimed at improving the vigor of advance regeneration.
- **Shelterwood establishment cuts.** A shelterwood harvest allows forest owners to capitalize on their timber value and provides a semi-shaded light regime favorable to oaks.
- **Group openings and gaps cuts.** A group opening allows for harvesting of older stands that dominate the region and provides a semi-shaded area around the opening edge that is conducive to oak regeneration.
- **Two-aged deferment cuts.** This practice is a technique of last resort, sacrificing immediate oak regeneration but maintaining future oak regeneration potential.
- **Site preparation for regeneration.** This practice removes trees that are or will compete with oak regeneration.
- **Afforestation.** This practice involves the establishment of new forests with seedlings or seeds, competition control, and at times control of deer and other wildlife.



- **Underplanting/enhancement.** This approach uses artificial regeneration to establish oak that is limited or nonexistent in upland hardwood stands.
- **Scarification.** Scarification is used to help ensure adequate acorn germination and seedling establishment.
- **Prescribed fire.** This approach can be used as a phase in a shelterwood establishment cut, or after a harvest as a liberation or cleaning tool.

Founded in 2017 by the University of Kentucky, the DendriFund and the American Forest Foundation, the White Oak Initiative brings together industries, universities, state and federal agencies, private landowners, conservation organizations and trade associations that are committed to ensuring the long-term sustainability of America's white oak forests as well as the economic, social and environmental benefits they provide. Learn more about the White Oak Initiative and our recommendations for action at whiteoakinitiative.org.



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The Birders' Dozen Profile 8: Yellow-billed Cuckoo

Dr. Jessica Outcalt, consulting bird biologist

Welcome to the Birders' Dozen! Over the next five issues we are going to continue introducing the last half of the bird species from Forestry for the Birds. The Birders' Dozen are forest birds that can benefit from targeted management practices, as most are declining due to habitat loss. We've curated this list to cover a wide range of habitat types, from young to mature forest, open to closed canopy, or dense to non-existent shrub layers. Our goal is to engage landowners and foresters in the process of managing forests for wildlife, or "forests for the birds."

Skulking in riparian shrubs and singing on dreary days, the "Raincrow" or Yellow-billed Cuckoo is a unique bird in need of proactive management. Though this species has been declining most significantly in the western portion of its range due to loss of habitats near rivers, cuckoos in the east have lost approximately 60% of their population in the past 50 years. The Black-billed Cuckoo, a closely related species, has also been declining significantly; both species occupy similar niches, though the Yellow-billed Cuckoo is slightly more widespread and will be the primary focus of this profile.

Natural History

Cuckoos are often called "Raincrows" because of a penchant for singing in the rain or on cloudy days, as well as their skulking, secretive behavior when foraging or when observers are near. They are primarily insectivorous, though they also consume berries and occasionally amphibians and small reptiles. Their foraging habitat, then, is often riparian shrub and open woodlands near water. Cuckoos nest in dense deciduous areas, often near the ground. Though they are often found near rivers, eastern populations of cuckoos are not restricted solely to these areas and may nest in hardwood groves with consistent humidity.

A migratory species that spends the winter in South America, the cuckoo has one of the more unusual breeding systems in the bird world. Cuckoos are brood parasites, which means they lay eggs in other birds' nests and trick the host parent into raising their young. However, they only do this occasionally and most often to other cuckoo nests. For this reason, they are known as "facultative" brood parasites, unlike "obligate" brood parasites such as the Brown-headed Cowbird which only lay eggs in the nests of other bird species. It is possible this behavior is a response to times of increased food abundance, such as periodical

cicada outbreaks. In fact, many of the cuckoo's favorite food sources are insects that outbreak periodically, like eastern tent caterpillars and fall webworms, gypsy moth larvae, and cicadas.

When cuckoos exhibit typical breeding behavior, they are generally monogamous pairs, both parents helping to build the nest. Nests are built from twigs and leaves in trees or large shrubs, typically in areas with dense foliage and shrub cover and often near humid or wet areas. The female lays a clutch of 1-5 blue-green eggs, the number likely dependent on food availability as mentioned above, and incubates them around 10 days. Hatchlings, which are fed mostly caterpillars, are feathered within hours of hatching and fledge very rapidly, within 7-8 days.



Yellow-billed Cuckoo, photo courtesy Matt Williams Nature Photography.

Habitat Management

Though considered a shrubland species by many, Yellow-billed Cuckoos are dependent on areas of woodland and young forest. Management for both species of cuckoo should include both forest management to create nesting and foraging habitats as well as creation of openings and shrubby areas for foraging, particularly if nearby riparian zones are available and can be restored.

Cuckoos can use a wide range of habitat types, from abandoned farmland and orchards to thickets along creeks to regenerating clearcuts. They often use areas with dense stands of young saplings, both for foraging and for nesting. While most research on Yellow-billed Cuckoos is focused on western populations as these populations are declining fastest, some recommendations can be applied to Midwestern forests as well.

Provision of open areas with dense shrub layers is the most important aspect of management to create cuckoo habitat. When forests are near waterways, management to create openings can greatly benefit cuckoos, both in encouraging insect populations to grow and providing nesting site shelter from predators. Removal of invasive shrubs and providing native berry-producing plants like blackberries, elderberries, and wild grape can also benefit cuckoos, especially during migratory seasons.

Finally, cuckoos are dependent on insects for food. Broad spectrum pesticides such as neonicotinoids (e.g., imidacloprid) can be fatal to insects that might not be considered true pests, including important pollinators like bees. Pesticides can also harm cuckoos themselves, when cuckoos eat insects contaminated with chemicals. Limiting use of pesticides, especially in areas near waterways where many insects breed, can thus be beneficial for cuckoos as well as benefitting local pollinators.

Conclusion

These two striking birds, the Black-billed Cuckoo with its bright red eye ring and the Yellow-billed Cuckoo with its domino tail spots, are important insect predators in young Midwestern forests. Management that focuses on providing open shrubby areas, especially near waterways, can provide

important habitat for these secretive Raincrows. Like some of the other birds we've discussed in these profiles so far, management for young forest is often overlooked but is still an important aspect of maintaining a diverse and healthy forest ecosystem in Indiana.

Special thanks to the Alcoa Foundation, the Indiana Forestry Educational Foundation, and The Nature Conservancy for their support and leadership of Forestry for the Birds.



Black-billed Cuckoo, photo courtesy Matt Williams Nature Photography.

Jessica Outcalt is an independent consulting biologist who worked with The Nature Conservancy to develop the "Birders' Dozen Profiles." She is now an Agriculture and Natural Resources educator with Purdue Extension in Grant County. She completed her BS in biology at Taylor University, her PhD in wildlife ecology at Purdue University, and is passionate about birds and getting people involved in conservation and scientific processes.

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Bats, Caves, and Forests

by Carroll Ritter

Many conservation efforts are included in management of our forest resources. Not only are we designing plans for silvicultural outcomes, but also for habitat and species of concern. Bats are one of these species.

One's perception of bats depends primarily on early teaching by parents or other persons. Historically, bats have been regarded as frightening or harmful creatures to be eliminated.

Fortunately, many educators today are much more attuned to the important ecological benefits of bats and call for conservation efforts to protect them. The beneficial roles of bats are quite impressive, especially in maintaining balance of insects. The Nature Conservancy estimates that insect control provided by bats is valued at \$23 billion to our state's agricultural industry. Fluctuations in bat populations may also be a "canary in the coal mine" indicator of parallel environmental concerns that need addressed. Considering that the average Indiana bat's mass is about 7 grams (.25 ounce), the amount of work done for such a small creature is phenomenal.

Our state species include the Indiana Bat (*Myotis sodalis*), the little brown bat (*Myotis lucifugus*), big brown bat (*Eptesicus fuscus*), gray bat (*Myotis grisescens*), northern long-eared bat (*Myotis septentrionalis*), and tri-colored bat (also called

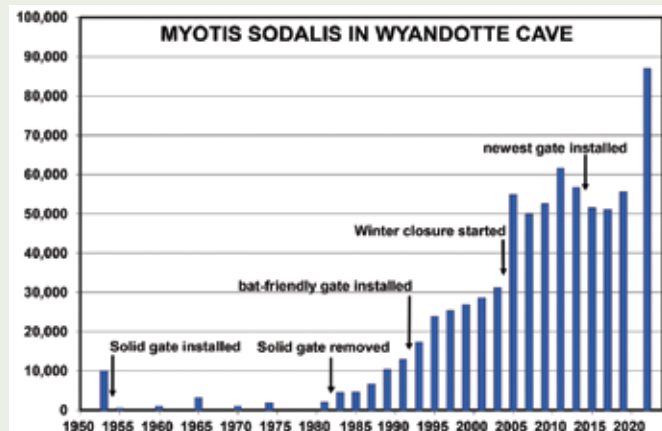


Figure 2 Indiana Bat Population-Wyandotte. Courtesy Indiana Karst Conservancy

eastern pipistrelle, *Pipistrellus subflavus*). All are recognized as endangered except for the big brown bat. These six species were most often observed in caves that I have visited over the years. Other bats found occasionally and seasonally in the state are primarily migratory and are designated as special concern species.

Although most of Indiana's 3,000 caves provide potentially suitable winter habitat for smaller clusters, only about a dozen caves have sizeable winter populations. The long-running census on Indiana bats began in 1980 and the latest survey occurred in 2022. Conducted for the IDNR by Dr. Virgil Brack and Dr. Darwin Brack of Environmental Services and Solutions, their teams visit the selected caves and do most of the censusing by photography, quickly and efficiently, while minimizing any disturbance. I followed the same policy when exploring caves years ago.

Trends show some encouragement from the devastating impact of white-nose syndrome, which arrived here in 2011 and drastically plunged the population of bats in general. Note from Figure 1 that the overall *Myotis sodalis* population has had its ups and downs over the years but the latest census shows some improvement. It also appears that preferred locations for their hibernacula have shifted toward the very southern tier of counties, especially Harrison and Crawford. Monroe and Greene had some of the largest wintering populations years ago, with one cave alone hosting some 77,000 bats. Wyandotte Cave is now the leading site,

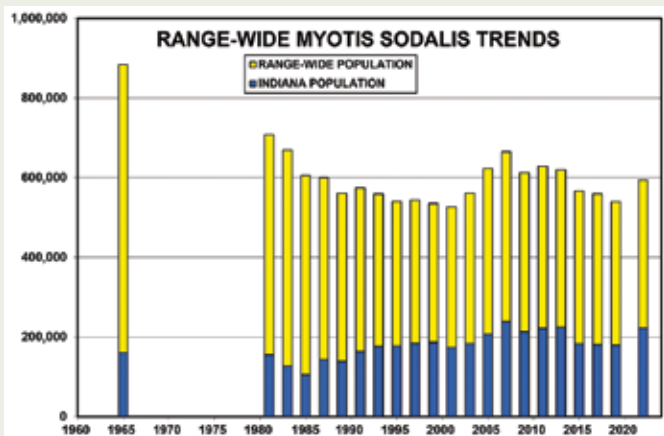


Figure 1 Indiana Bat Populations. Courtesy Indiana Karst Conservancy



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Pipistrelle bat suspended from soda straw stalactite, Fredericksburg Cave, Washington County. Photo by Carroll Ritter

with a 2022 census of 87,000 Indiana bats. (See Figure 2). Other species are recorded if observed. The little brown bat continues to struggle with any rebound from the white-nose syndrome impact.

What has affected bat populations? As with many species, delays in proactive recognition, study, and policy wait until the problems have become substantial. The Endangered Species Act has helped immensely and even today recognizes more needed listings. Our primary concern has been and is, loss of habitat. That same bat area is also home for other plants and animals which benefit from wise stewardship decisions. Years ago, bats hanging from the ceiling may have slept over bears hibernating for the winter. Bear wallows have been documented by cavers as they mapped passageways. I once encountered a baby fox on a ledge resting while the mother was outside looking for the next meal. I quickly retreated. It is not uncommon to see raccoon tracks in caves and most likely coyotes now den up in some of the sandstone caves and overhangs in my area.

The forest environment provides many opportunities for bat conservation strategies, especially since several factors are most likely present. Retention of snags, maintaining the presence of hickory and other summer maternity trees, open flyway corridors, and water holes all contribute essential components of favorable habitat. We must realize that bats



Tri-colored bat (or Pipistrelle) during winter hibernation. Photo by Carroll Ritter



Cave Salamander, Lawrence County photo by Carroll Ritter

need that summer hibernaculum as well as that cave in the winter. Those old shagbarks, shellbarks, oaks, and maples are where the mother hides her young while foraging. If the woods contain the components listed above, you are on the path to maintaining suitable habitat. Lastly, those caves and sinkholes provide a wintering home. Whether large cave openings or small cracks and crevices, consider protecting them as well. Our tendency to fill these openings has effects on creatures who may live there.

While a cave certainly feels warmer than the outside in the winter, be aware that your exploring needs done with care or postponed if any sleeping bats are encountered. Disturbance may mean arousal, consumption of body fat, and inability to fly out and feed.

Precautions have been very strict during the white-nose syndrome times, with cave closures common on state and federal properties. Some permitting is now available. Finally, always get permission from private landowners. As always, take only pictures and leave no trace or impact on this fragile environment and our great bat friends.

Special recognition to the Indiana Department of Natural Resources Nongame Wildlife Fund, the Nature Conservancy, and the Indiana Karst Conservancy.

Carroll Ritter is a retired science teacher and naturalist educator.



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Southern Indiana Sentinel Landscape to lead new Regional Conservation Partnership Program

By the Conservation Law Center

The Southern Indiana Sentinel Landscape (SISL) partnership is excited to announce approval of a Regional Conservation Partnership Program (RCPP) for the 3.5-million-acre SISL area. RCPP is a partner-driven approach to conservation that funds innovative solutions to natural resource challenges. The Natural Resources Conservation Service within the US Department of Agriculture oversees the federal program.

This RCPP will increase private lands conservation on farms and forests in southern Indiana. NRCS will provide funding to the partnership over the next five years to permanently protect and restore over 2,500 acres of forestland through conservation easements, restore an additional 5,000 to 10,000 acres of oak-hickory forest ecosystems, and increase sustainable farming practices on tens of thousands of acres.

“Since nearly 90% of the land in SISL is owned and managed by private landowners, it is critical to our rural way of life, including our rich agricultural and natural heritage, that these landowners have the support and resources needed to sustainably manage their lands. Furthermore, having a landscape dominated by rural uses supports the critical missions of our four military installations and ranges.”

Michael Spalding SISL Program Coordinator

Since designation in February 2022, the SISL partnership has been working on ways to advance the pace and scale of conservation in southern Indiana. This RCPP will help achieve many of the program’s goals. The diverse partnership advancing this project includes NSA Crane, Atterbury-Muscatatuck Training Center, The Conservation Fund, The Nature Conservancy, Conservation Cropping Systems Initiative, American Bird Conservancy, Let the Sunshine IN, Indiana Forestry and Woodland Owners Association, Indiana DNR Division of Fish and Wildlife, Central Indiana Land Trust, and Indiana State Department of Agriculture Division of Soil Conservation.

Landowners interested in learning more about conservation on their farms and forests should reach out to SISL Program Coordinator Michael Spalding at mbspalding@sentinellandscapes.org or 812-855-1898.

“Indiana Forestry and Woodland Owners Association educates our members and informs the general public about the benefits of good forest management, including the recognition that we are and will continue to lose our oak woodlands and forests without more action. By partnering on this RCPP, we can combine the power of our outreach and education with significant funding to private landowners to restore southern Indiana’s forests.” IFWOA Executive Director Liz Jackson

“Healthy oak-hickory forests are critical to supporting wildlife, regulating our climate and supplying valuable economic products,” said Indiana NRCS Acting State Conservationist Curtis Knueven. “While oak-hickory forests are still abundant across the eastern half of the United States, the conditions are lacking in most forests to support the next generation of trees. Projects like this one help ensure our forests are conserved, restored and made more resilient to climate change through proper management practices.”

Conservation Law Center (the Center) is an independent, non-profit organization that provides legal counsel to conservation organizations and works to improve state and federal conservation law and policy. The organization works with clients on a wide range of transactional, policy, and litigation matters pertaining to both regional and national conservation issues. The Center has particular interest and expertise endangered species protection and litigation, natural habitat protection, conservation easements, and the protection of freshwater ecosystems especially in the Great Lakes region.




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Bats are Crucial to a Healthy Forest *Continued from page 3*

sunlight to reach roost trees and give bats space to maneuver when zippering around searching for prey. With a better understanding of how bats respond to management, we can craft policies for forest management that are also conducive to protection of bats and their essential habitat.

While my graduate students and I have been deliberately tackling questions about forest management and bats over the past 20 years, always in the back of my head was this question: if forests are important to bats, are bats important to forests? Surely the answer was yes, but we had essentially no data to assert this as a fact.

One “simple” way to address this question is to figure out what bats are eating. Historically this was done through microscopic analysis of dried bat guano pellets, which bats conveniently leave in our holding bags when we capture them. However, I entered this field at a time when metagenomics technology was emerging. Submitting samples of DNA we extracted from those guano pellets to be processed by powerful sequencing instruments, we can identify and tabulate the DNA fragments from residual bits of prey left in the guano. While we’re limited to identifying organisms with known DNA sequences stored in a common database, there are thousands of those sequences available and the database is always growing. This metagenomic approach has become the norm for most animal diet studies and yields some amazing information.

For example, my student Tim Divoll identified more than 500 prey items in the diets of endangered Indiana and northern long-eared bats foraging over Indiana’s forests. The prey consumed by the most individuals for both bat species were two oak-feeding moths (*Chionodes pereyra* and *Perimede erransella*) and a leafhopper (*Gyponana brevita*). Other frequently consumed prey included large forest moths (*Catocala micronympha* and *Malacosoma americanum*), and a large wood cockroach (*Parcoblatta uhleriana*), mosquitoes (*Aedes vexans*), and

beetles (*Dendroides canadensis* and *Ptilodactyla serricollis*). The sequencer detected many agricultural and forest pest species detected, such as leafhoppers (*Cicadellidae*), leaf-rolling and vegetation-boring moths (*Tortricidae* and *Pyrilidae*), fruit flies (*Drosophilidae*), and weevils (*Curculionidae*). Tim identified at least 314 pests that either damage vegetation or transmit disease.

Noting that bats were consuming such a variety of forest pests, we conceived a study that would become a cornerstone of student Lizz Beille’s PhD work. Working on the HEE, for three summers Lizz and her crew set up 6-7 pairs of plots each year, each with a control with no net and a bat-excluded plot for which the net was closed at night and opened during the day. This allowed birds but not bats access to the treatment plots. Lizz monitored oak and hickory seedlings in each plot, measuring insect density and leaf area at the beginning and end of the summer. This study showed that plots from which bats were excluded suffered five times more defoliation compared to control plots. And oaks were three times more affected by bat exclusion than hickories. As I’d hoped, Lizz’s work showed that bats are benefiting forests by suppressing pests that feed on ecologically important trees when they’re in the sapling stage.

I’m eager to apply more developing technology to the study of bats in Indiana’s forests. I’m guessing we will discover more ways that bats are benefiting forests and unique behaviors of bats in managed forests. By showing that a healthy bat population is an important component of a healthy forest, I hope I’ve convinced you to keep an eye out for bats and to safeguard the places and conditions they need to thrive in our forests.

Joy O’Keefe is an Assistant Professor and Wildlife Extension Specialist with the Natural Resources and Environmental Sciences Department at the University of Illinois Urbana Champaign.



A red oak leaf damaged by insect herbivory. Photo by Joy O’Keefe



Ask the Steward

By Dan Ernst

Question: How many species of Ash are native to Indiana?

Answer: Ash has long been a common tree of Indiana's forests and woodlands and an important commercial timber species with a rich cultural history. The species was also commonly planted in urban and community landscapes due to its beauty, hardiness and relative absence of insect and disease issues. That all changed with the invasion of the Emerald Ash borer (EAB) in 2004. While most ash trees in the State fell to EAB, it is still an important species which I believe will survive this pest in the long run. **Back to your question:** there are five Ash species native to Indiana. By far the most common and widespread is White ash (*Fraxinus americana*); Then Green ash (*F. pennsylvanica*) which is similar to White ash but generally prefers moist slopes and lower ground. The Blue ash (*F. quadrangulata*) is sporadically found around the state preferring drier rocky sites. The bark of mature Blue ash is flaky or scaly in appearance, and owing up to its scientific name its young branches are uniquely 4-angled. Black ash (*F. nigra*) also has flaky grayish bark and is more common in Indiana's natural lakes region on moist to wet sites. It is a long-favored tree by Indigenous peoples for basket making. And lastly Pumpkin ash (*F. profunda*— formerly *F. tomentosa*) Its fissured bark is similar White and Green ash, but mature Black ash will often have a swollen base when growing in its preferred wet river bottoms and sloughs of Southern Indiana. All Ash species above have pinnately compound leaves and characteristic opposite branching habit. What about Prickly ash? Certainly, native to the Hoosier state Prickly ash is a unique shrub- but is a member of the genus *Zanthoxylum* and hence not a true Ash. More on that species another time.

Question: What wood is used for major basketball floors like Purdue University, Indiana University and the Indiana Pacers? Do they all use the same wood?

Answer: Sugar Maple is undoubtedly the top choice for natural basketball flooring across the United States and elsewhere with good reason. Its ready availability, durability, finishing qualities and the wood's light-dark color contrast against a basketball make it a natural choice. In fact, the first basketball game ever played (1891), complete with peach baskets for hoops, was on a sugar maple gymnasium floor in Springfield, Massachusetts. That was over 130 years ago and while the design and flooring layout may differ, the official playing court of all NBA teams are made of Sugar Maple— except for one. Any guesses?

As for collegiate basketball arenas, Sugar maple is clearly the top choice, including Indiana and Purdue universities- and most likely the college court near you. It's a great floor with great ball bounce, footing, color contrast and natural beauty. Yet the Boston Celtics chose another species common to Indiana- Red Oak. Making their BAA debut in 1946 during a time of materials shortage, lumber options were limited. Persevering and with some creativity they pulled together surplus scraps of Tennessee Red Oak to create the Celtics classic parquet oak floor. That tradition continues today.

Dan Ernst is a professional forester and past Assistant State Forester with the Indiana Division of Forestry. He has authored 'Ask the Steward' since 1992 and can be reached at foresterdan@yahoo.com.

SIDE NOTE- Bowling pins are also made of Sugar Maple, but not just any Sugar maple. The ABC and WIBC, which regulate bowling pin construction, requires sugar maple be sourced north of the 45th parallel to achieve the required bowling pin density. Which unfortunately excludes Indiana grown sugar maple.



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The Sentinel Landscapes Partnership

By Michael Spaulding

The USDA, DoD, and DOI established the Sentinel Landscapes Partnership in 2013 to streamline federal assistance to landowners in areas where they have shared interests. Voluntary landowner assistance programs across the three federal agencies typically provide funding to permanently protect a property through a conservation easement or help to offset costs associated with preserving natural resources. However, despite using similar funding mechanisms, USDA, DoD, and DOI programs vary significantly with respect to scope and mission. By aligning federal assistance programs around military installations and ranges, sentinel landscapes allow USDA, DoD, and DOI to mitigate internal resource constraints and advance their collective objectives.

In 2018, the National Defense Authorization Act (NDAA) introduced language that formally recognized the Partnership in statute. Under Section 317 of the NDAA, the Secretary of Agriculture and the Secretary of the Interior are encouraged to give any eligible landowner or agricultural producer within a designated sentinel landscape, “priority consideration for participation in any easement, grant, or assistance programs administered by that Secretary’s department.”

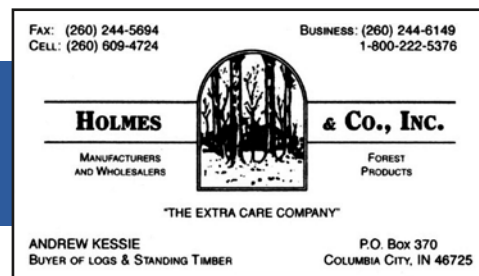
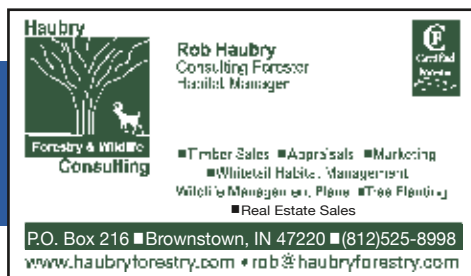
Representatives from the USDA, DoD, and DOI coordinate the Sentinel Landscapes Partnership at the national level through the Federal Coordinating Committee (FCC). The FCC defines sentinel landscapes as areas in which natural and working lands are well suited to protect defense facilities from land use that is incompatible with the military’s mission. The FCC designates locations as sentinel landscapes and then works to deliver voluntary federal assistance to landowners who sustainably manage their properties as farms, ranches, timberlands, or open space.

While the three founding agencies maintain oversight of the Partnership, sentinel landscapes are predominantly local enterprises. Each sentinel landscape relies on a network of local partners to carry out conservation projects on the ground. In addition to federal assistance, participating states,

local governments, and NGOs provide funding and program-specific support to interested landowners within sentinel landscapes. Working throughout all tiers of government and within the private sector enables sentinel landscapes to address the needs of local communities while also fulfilling the mission of the USDA, DoD, and DOI. Our Southern Indiana Sentinel Landscape is led and managed by the Conservation Law Center in Bloomington. I am the program coordinator, and my colleague Rob McCrea is the landscape conservation attorney. The Conservation Law Center provides pro bono legal support to nonprofit conservation organizations and is an affiliate of Indiana University through teaching the Conservation Law Clinic with the Mauer School of Law.

Southern Indiana Sentinel Landscape (SISL) was officially designated in February 2022. SISL is one of only ten designated in the entire country and is 3.5 million acres in size. Camp Ripley Sentinel Landscape in Minnesota is the only other landscape anywhere near ours and is 805,000 acres. Many partners, including but not limited to The Nature Conservancy, NSA Crane, Atterbury-Muscatatuck Training Center, IDNR, US Fish and Wildlife Service, NRCS, and the Conservation Law Center, came together to submit a compelling application and earn this designation.

Sentinel landscapes promote land use around defense facilities that is compatible with the military’s mission. The DoD’s ability to conduct realistic live-fire training and weapon system testing is vital in preparing the warfighter and their equipment for real-world combat. However, heightened development, loss of habitat, and other encroachment concerns outside an installation’s fence line can constrain the military’s ability to carry out its training and testing activities. USDA, DoD, and DOI mitigate this challenge through the Sentinel Landscapes Partnership by directing federal resources to projects that advance sustainable land management practices around military installations and ranges. Sustainable land management practices such as farming, ranching, and forestry act as buffers around defense





facilities for light pollution, spectrum interference, and other common side effects of incompatible development.

Sentinel landscapes build on existing efforts made by the DoD's Readiness and Environmental Protection Integration (REPI) Program. The DoD REPI Program provides authority and funding for cost-sharing partnerships between the Military Services, state and local governments, and private organizations to acquire conservation easements from willing landowners. These acquisitions promote compatible land use and preserve important natural resources and habitat surrounding military installations and ranges.

Despite exceptional gains thus far, traditional REPI partnerships alone are insufficient to guarantee long-term mission sustainability. Encroachment pressures are projected to grow as the country continues to grapple with the effects of population growth and urban sprawl. Sentinel landscapes address this gap by aligning REPI projects with other federal landowner assistance programs within the USDA and DOI. Furthermore, sentinel landscapes encourage collaborative conservation projects around defense facilities that leverage resources from state and local governments and NGOs.

Sentinel landscape projects leverage resources from a diverse network of defense, agricultural, and conservation stakeholders, which enables them to address ecological challenges that extend beyond the scope of any one organization. Most sentinel landscape projects are designed to help private landowners keep their properties sustainably managed as forests, farms, ranches, or open space. Over time, these projects form corridors of permanently protected and sustainably managed land that limit habitat fragmentation; improve water, air, and soil quality for agricultural producers; and protect imperiled species. Landscape-scale conservation projects within sentinel landscapes have contributed to the delisting of several threatened and endangered species and helped restore critical ecological assets.

Through sentinel landscapes, federal, state, and local partners work together to explicitly acknowledge and reward private landowners for their stewardship practices. By keeping their lands as farms, ranches, timberlands, or open space, landowners have for years—and without due recognition—

significantly contributed to the military's mission and other public benefits. These properties buffer military installations from urban sprawl, help to preserve high quality ecosystems, and reduce light pollution, which is invaluable to night-vision training. The goal of a sentinel landscape is to provide willing and interested landowners with the resources they need to continue to manage their properties sustainably.

In southern Indiana, with most of the land being privately owned, our intent is to support sustainable rural uses such as farming and forestry on those private lands through working directly with landowners to help them navigate the overwhelming options for conservation including conservation easements, working with partners to bring additional funding to their already amazing work, and where appropriate work to assist land trust and government agency partners to bring in funding for land acquisition. The Conservation Discovery Web Application is now up and running at <https://conservationlawcenter.org>. This website can be used to search by owner name or navigate to the land parcel and help discern what conservation options you have on your land. The site will then generate a custom report for your property.

We have been working to build partnerships, build the program, pursue grants, and work directly with landowners to find options to conserve their land. These projects are largely in the early stages, but look forward to future updates to share exciting results we are helping to bring to southern Indiana's forests and farms. We have a quarterly newsletter list that you can be added to as well. I can be reached at mspalding@sentinellandscapes.org or (812) 855-1898 (please leave voicemail as it will email me). Many folks reading this may already be well-versed in conservation options, but regardless of your experience level please never hesitate to reach out directly to me to visit your land in the Southern Indiana Sentinel Landscape with you.

Michael Spalding is the Program Coordinator for the Southern Indiana Sentinel Landscape. Michael grew up in central Indiana on land that has been in his family since 1889. His passion for conservation began while exploring the fields, forests, and streams of his family's farm.

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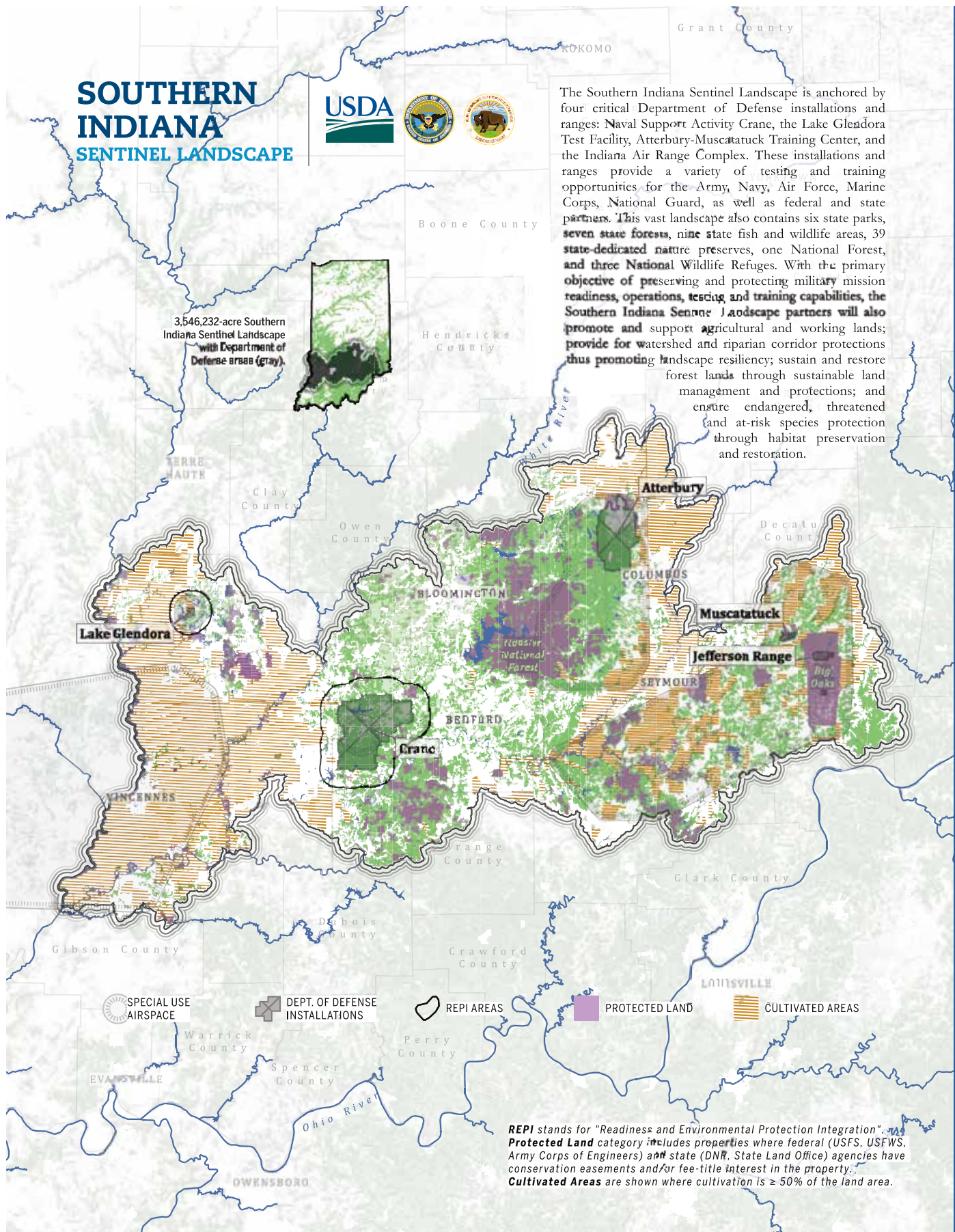
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SOUTHERN INDIANA SENTINEL LANDSCAPE



3,546,232-acre Southern Indiana Sentinel Landscape with Department of Defense areas (gray).

The Southern Indiana Sentinel Landscape is anchored by four critical Department of Defense installations and ranges: Naval Support Activity Crane, the Lake Glendora Test Facility, Atterbury-Muscatawuck Training Center, and the Indiana Air Range Complex. These installations and ranges provide a variety of testing and training opportunities for the Army, Navy, Air Force, Marine Corps, National Guard, as well as federal and state partners. This vast landscape also contains six state parks, seven state forests, nine state fish and wildlife areas, 39 state-dedicated nature preserves, one National Forest, and three National Wildlife Refuges. With the primary objective of preserving and protecting military mission readiness, operations, testing and training capabilities, the Southern Indiana Sentinel Landscape partners will also promote and support agricultural and working lands; provide for watershed and riparian corridor protections thus promoting landscape resiliency; sustain and restore forest lands through sustainable land management and protections; and ensure endangered, threatened and at-risk species protection through habitat preservation and restoration.



REPI stands for "Readiness and Environmental Protection Integration". **Protected Land** category includes properties where federal (USFS, USFWS, Army Corps of Engineers) and state (DNR, State Land Office) agencies have conservation easements and/or fee-title interest in the property. **Cultivated Areas** are shown where cultivation is $\geq 50\%$ of the land area.

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Days Gone By



Like many Hoosiers of our past, Mr. John David Grove used native hardwoods for many uses. One hundred year-old yellow poplar was used as siding on the large tool and work shop (left). Mr. Grove stands in the doorway of a corn crib build with native lumber (undated; Roy C. Brundage, photo credit).

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