



U.S. Fish & Wildlife Service

# Indiana bat

## *Myotis sodalis*

Indiana bats have long lived in the forests and caves of the Northeast and Southeast but primarily in the Midwest. Very gregarious animals, these little bats congregate in winter and summer colonies, migrating between the two in spring and fall. Although they once numbered in the millions, the Indiana bat population has declined 56 percent in the past 40 years, from 883,300 in the 1960s to 387,300 today. In 1967, Indiana bats were listed for protection under the Endangered Species Act.

### Small, social sleepers

Indiana bats hibernate in limestone caves, called hibernacula, from mid-autumn to early spring. Hibernating bats form large, compact clusters with as many as 5,000 individuals but averaging 500 to 1,000 bats per cluster. Bats form clusters in the same area in a cave each year, with more than one cluster in some caves. Clustering may protect individual bats from temperature changes, reduce sensitivity to external disturbance, or enable rapid arousal and escape from predators.

Roosts usually are in the coldest part of the cave. This ensures a sufficiently low metabolic rate so the bats' fat reserves last through the six-month hibernation. Bats may move from a location deeper in the cave to a site nearer the entrance as the cold season progresses to move away from areas that go below freezing. Indiana bats tend to return to the same hibernacula each year.

### Single mom, single pup

Having mated in autumn, a female becomes pregnant after the winter hibernation when she ovulates and an egg is fertilized by sperm stored from the autumn mating. Pregnant females migrate to trees that serve as maternity colonies throughout the summer. The female births a single pup, which she tends for about a month before taking it on its first flight in tandem with her. The weather affects the length of time for the



*Indiana bats still live in Alabama, Arkansas, Georgia, Iowa, Illinois, Indiana, Kansas, Kentucky, Maryland, Michigan, Missouri, Mississippi, North Carolina, New Jersey, New York, Ohio, Oklahoma, Pennsylvania, South Carolina, Tennessee, Virginia, Vermont, and West Virginia.*

pup to mature. Females sometimes relocate their pups to warmer spots on the tree. Dozens and up to hundreds of mothers and their young can inhabit maternity roost trees.

In the summer, bats live in wooded or semi-wooded areas. Groups of female Indiana bats form maternity colonies to bear their offspring in crevices of trees or under loose tree bark. Dead trees are preferred roost sites, and trees standing in sunny openings are attractive because the air spaces and crevices under the bark are warm. Typical roosts are beneath the bark and in crevices of dead trees and beneath loose bark of living trees. Roost trees are likely to be exposed to direct sunlight throughout the day, and are as likely to be in upland habitats as in floodplain forests. Indiana bats are also known to roost in human-made structures such as bridges, sheds, houses and abandoned churches.

### Meals on the fly and migration, too

Indiana bats eat flying insects, and their diet reflects the available prey. Bats forage along river and lake shorelines, in the crowns of trees in floodplains and in upland forests. Reproductively active females generally forage within a mile of roost trees. Bats may attempt to capture flying insects as many as 17 times a minute.

Indiana bats show strong homing instincts to their hibernacula. When released to the west of a winter cave, over 68 percent of the bats returned to the cave from 12 miles away. Biologists released approximately 500 female bats up to 200 miles from their winter cave and found that more than two-thirds returned. These researchers noted much stronger homing tendencies along a north-south axis, the direction for migrating to and from summer roosts, than along the east-west direction. Winter and summer

habitats may be as much as 300 miles apart, but are probably much closer for the majority of bats.



### **Bats in trouble**

While hibernating in large numbers is beneficial to bats, it also leaves them vulnerable to catastrophe. Human disturbance at winter caves arouses bats, depleting energy reserves. Vandalism and indiscriminate killing have destroyed much of the population. Some early attempts to keep people out of hibernacula by installing gates inadvertently made the caves unsuitable for bats. Improperly constructed gates can alter the air flow, trap debris and block the entrance by not allowing enough

flight space. Altering air exchange by opening additional entrances can also change cave temperature and humidity, rendering the cave unsuitable for bats. Since disruption during hibernation is detrimental, biologists schedule research to avoid harming the bats. To reduce disturbance during a census, the cave is mapped in the autumn before the bats arrive. Then a few, well-trained people carefully collect the minimum data needed for the census.

### **The rest of the problem**

When first looking at the decline of Indiana bat populations, the problems of vandalism and human disturbance in the winter hibernacula were addressed first. When bat populations continued to decline, biologists looked at where bats spend their summers. Loss and degradation of summer habitat and roost sites due to water impoundment, stream channeling, forest clearing, housing development, and clear cutting for agricultural or other uses may be important factors in continuing Indiana bat population decline. Additional research is needed to verify the causes of decline.

Within the delineated summer range, activities planned in habitats occupied by Indiana bats may need to be changed to

accommodate the needs of the bats. Summer roosts and surrounding forest and foraging areas may need to be maintained in as natural a state as possible. In addition, while winter hibernacula themselves must be protected, the forests above and around hibernacula should not be dramatically altered. After all, Indiana bats are animals of the forest. Once as plentiful as the passenger pigeon, these little flying mammals are rapidly falling toward extinction. The Service, along with many partners, is working to conserve and protect Indiana bats for now and for the future.

**Northeast Region  
U.S. Fish & Wildlife Service  
300 Westgate Center Drive  
Hadley, MA 01035**

**Federal Relay Service  
for the deaf and hard-of-hearing  
1 800/877 8339**

**U.S. Fish and Wildlife Service  
<http://www.fws.gov>  
1 800/344 WILD**

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