

Photos of Trifold:

BAT WING ANATOMY

A: Humerus, Radius, Ulna, Carpals, Metacarpals, Phalanges, Wing Membrane, Hand, Tail, Pelvis, Femur, Tibia, Fibula, Tarsals, Hoof, Claw, Toe, Digit, Wing Membrane, Hand, Tail, Pelvis, Femur, Tibia, Fibula, Tarsals, Hoof, Claw, Toe, Digit

B: Wing Membrane, Hand, Tail, Pelvis, Femur, Tibia, Fibula, Tarsals, Hoof, Claw, Toe, Digit

C: Wing Membrane, Hand, Tail, Pelvis, Femur, Tibia, Fibula, Tarsals, Hoof, Claw, Toe, Digit

Bats have a humerus, radius, and ulna just like us. Their metacarpals and phalanges are elongated, and a thin skin membrane stretched between them forms the wing. The body forms a series of ribs that assist in flight by generating lift unlike birds which rely on their arms and feathers for flight.

mysteries
of the
night

BATS

ECHOLOCATION:

WHAT ARE BATS?

- Bats are the only mammals that can fly
- They are nocturnal so they all their activities from dusk until dawn
- They use echolocation to navigate their surroundings and to locate and catch insects
- They hibernate in large groups extremely close to each other in spaces called roosts
- Indiana has 13 native bat species

BATS ARE BENEFICIAL

- Insect pest control
- Plant pollination
- Seed dispersal
- Cave nutrients
- Indicator species

WHERE YOU CAN FIND THEM

- Trees, caves, rock crevices, buildings, houses or other structures
- Worldwide distribution
- Lakes and ponds at dusk

Chimney, Roof, Eaves, Gutter, Siding, Windows, Porch, Deck, Foundation, Under eaves, Attic, Crawl space, Basement, Garage, Porch, Deck, Foundation, Under eaves, Attic, Crawl space, Basement, Garage

WHITE NOSE SYNDROME

- Has claimed the lives of over 6 million bats in the US since 2006.
- Caused by a fungus named *Pseudogymnoascus destructans*
- Attacks nose, ear, and wing tissues and looks like white fuzz
- Causes frequent arousals during hibernation

CONSERVATION

- Providing healthy habitats
- Forest management geared towards not disturbing bats
- Funding bat related research
- Reduce pesticide use
- Bringing awareness through educational programs

Materials for “Bat” Presentation:

- “Mysteries of the Night- Bats” poster
- Bat cave replica box
- Black light

Key terms:

Pollinate, Disperse, Beneficial, Insectivore, Pollen, Nectar, Ecosystem, Dependent, and Torpor

Bats are mammals:

Bats are mammals just like us! They do not lay eggs like birds or some reptiles but they give live birth to their offspring and provide parental care.

Like other mammals they are covered in fur. They are also warm blooded like all mammals. This means that they regulate their body temperature internally. They keep their body temperature at a constant temperature.

Bats can fly:

True flight vs gliding:

- True flight is being able to generate lift from a standstill and to control height and speed while maneuvering through an air medium.
- There are a few mammals that can glide. They have a thin skin membrane that they use like a parachute when jumping.

Bat wings compared to bird wings:

- Human arm bone structure
 - 1 bone, 2 bones, many bones (hand), fingers
- Bird arm bone structure
 - 1 bone, 2 fused bones, fused hand bones and fingers
- Bat arm bones
 - Reduced 1 bone, reduced 2 bones, elongated hand bones and fingers, with exception of thumb which helps in holding things and flight control
 - This means that unlike birds, bats do not use their arms to flap their wings. They use their super elongate fingers!

Thin skin membrane provides lift:

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- A thin skin membrane provides lift for flight like feathers do for birds

Benefits:

Pollinators:

- Spreading pollen that gets on their face/wings/body while catching insects/bugs or eating nectar and fruits

Seed dispersal:

- Ingesting seeds while eating nectar/fruits
- Fecal excretion spreads seeds (guano)
- Getting small seeds stuck on their wings and body and falling off later

Pest control:

- A lot of bat species are insectivores. They eat a lot of insects that are harmful to our agricultural food sources such as corn, beans, wheat, along with many others.
- With the decline in bat populations we have seen in recent years the agricultural industry has taken a financial blow. Ruined crops by pest insects.

Indicator species:

- An indicator species is one that can be used to gauge the health of an entire ecosystem/environment. Generally, these species are sensitive to pollution and feed on certain plants, animals, or insects exclusively. Ecologists can use indicator species information such as population increase or decline to determine the available resources in an area.

Nocturnal & echolocation:

Bats aren't blind:

- A lot of people think that bats are blind but they are not and can see fairly easily!

Bats are nocturnal:

- Bats are active from sunset to sunrise.
- This means that even though they do not lack vision they do need some other kind of help to be successful in their nighttime activities.

They use echolocation:

- Echolocation is a way of navigation where the animal makes high pitched noises, most we cannot hear, and they can hear these sound waves bouncing off objects. They can visualize their surroundings by sound alone. Using echolocation bats are able to maneuver and hunt in total darkness.

Hibernation & migration:

Hibernation/torpor:

- Slows down heart rate, lowers its body temperature to near freezing, takes very few breaths per minute
- These all help to conserve (save) a lot of energy while they enter a “sleeping” state
- Hibernation=long periods of time (up to months on end)
- Torpor=short periods of time (could only be for a couple hours on a cold evening)

Roosting habitats:

- Trees (under loose bark), Caves, Rock crevices, undisturbed structures

Group roosting behavior:

- Group together extremely close to help maintain a constant body temperature while sleeping

Threats:

WNS- white nose syndrome:

- *Pseudogymnoascus destructans* is the fungus that causes it
- How does WNS impact infected bats?
 - Fungus attacks nose, ear, and wing tissues
 - Frequent arousal during hibernation
 - If a bat does not arouse to groom the fungus off of their wings when the hibernation period is over they have tissue damage and holes in their wings and can not take flight.
 - Fat storage depletes
 - Most do not make it through the hibernation period and die of starvation.
 - Indiana Bat species is endangered because of WNS and other environmental impacts.

Conservation efforts & what we can do to help:

1. Forest management employing methods that distribute minimal stress and disturbance to native bat species.
2. Help fund research on bats to learn more about pop sizes, habitats, and behaviors

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3. Bat awareness; programs like these help us learn more about these fascinating animals and hopefully encourage everybody to do their own reading and research and try to make even small efforts to help stabilize the bat population.
4. Place bat houses in undisturbed locations that are high and out of the way help to provide more roosting structures as bats lose their natural habitat. Bats will readily use bat houses.
5. Enjoy their presence and do not disturb them.

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Supplemental Info:

(Do not need to know or memorize, just for those who want to know more)

Indiana bats have been on the Federal Endangered Species list since 1967. Unfortunately the current population (about 457,000 in 2005) is about half as many bats as when the species was initially listed. The following summary is from the US Fish and Wildlife Services fact sheet for the Indiana bat (<http://www.fws.gov/midwest/endangered/mammals/inbafactsht.html>)

Why is the Indiana Bat Endangered?

Human Disturbance

Indiana bats, because they hibernate in large numbers in only a few caves, are extremely vulnerable to disturbance. During hibernation, they cluster in groups of up to 500 per square foot. Since the largest hibernation caves support from 20,000 to 50,000 bats, it is easy to see how a large part of the total population can be affected by a single event. Episodes of large numbers of Indiana bat deaths have occurred due to human disturbance during hibernation.

Cave Commercialization and Improper Gating

The commercialization of caves – allowing visitors to tour caves during hibernation – drives bats away. Changes in the structure of caves, such as blocking an entrance, can change the temperature in a cave. A change of even a few degrees can make a cave unsuitable for hibernating bats. Some caves are fitted with gates to keep people out, but improper gating that prevents access by bats or alters air flow, temperature, or humidity can also be harmful. Properly constructed gates are beneficial because they keep people from disturbing hibernating bats while maintaining temperature and other requirements and allowing access for bats.

Summer Habitat Loss or Degradation

Indiana bats use trees as roosting and foraging sites during summer months. Loss and fragmentation of forested habitats can affect bat populations.

Pesticides and Environmental Contaminants

Insect-eating bats may seem to have an unlimited food supply, but in local areas, insects may not be plentiful because of pesticide use. This can also affect the quality of the bats' food supply. Many scientists believe that population declines occurring today might be due, in part, to pesticides and environmental contaminants. Bats may be affected by eating contaminated insects, drinking contaminated water, or absorbing the chemicals while feeding in areas that have been recently treated.

What is Being Done to Prevent Extinction of the Indiana Bat?

Listing

Prompted by declining populations caused by disturbance of bats during hibernation and modification of hibernacula, the Indiana bat was listed in 1967 as "in danger of extinction" under the Endangered Species Preservation Act of 1966. It is listed as "endangered" under the current Endangered Species Act of 1973. Listing under the Endangered Species Act protects the Indiana bat from take (harming, harassing, killing) and requires Federal agencies to work to conserve it.

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Recovery Plan

The Endangered Species Act requires that recovery plans be prepared for all listed species. The U.S. Fish and Wildlife Service developed a recovery plan for the Indiana bat in 1983 and is now revising that Plan. The recovery plan describes actions needed to help the bat recover.

Habitat Protection

Public lands like National Wildlife Refuges, military areas, and U.S. Forest Service lands are managed for Indiana bats by protecting forests. This means ensuring that there are the size and species of trees needed by Indiana bats for roosting; and providing a supply of dead and dying trees that can be used as roost sites. In addition, caves used for hibernation are managed to maintain suitable conditions for hibernation and eliminate disturbance.

Education and Outreach

Understanding the important role played by Indiana bats is a key to conserving the species. Helping people learn more about the Indiana bat and other endangered species can lead to more effective recovery efforts.

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