

Bats for Students and Home Educators

Educational Resource Packet



Woodlands Nature Station
Land Between the Lakes National Recreation Area

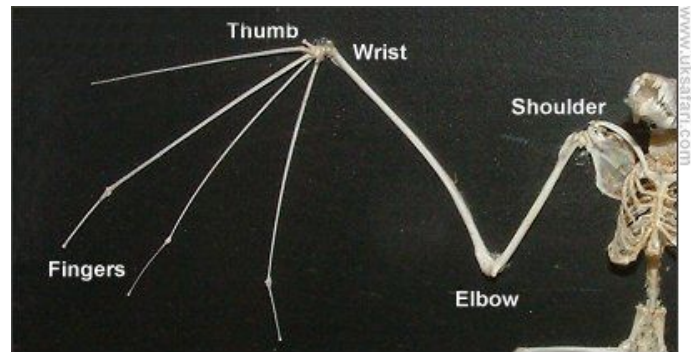


Introduction: What is a Bat?

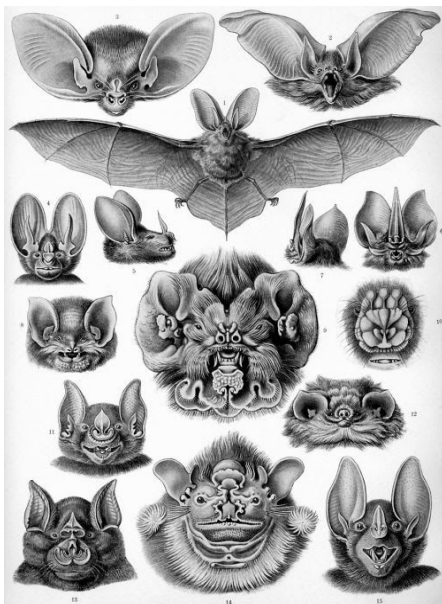
Bats are very special mammals.

They are vertebrates (have a backbone), warm-blooded, have hair, give birth to live young, and feed them milk. They are also the **only flying mammal** in the whole world. They are nocturnal, which means they are active at night.

Even though many people call them “flying mice” or “flying rats”, they are not related to rodents at all. Bats are in their own Order called Chiroptera, which literally means “hand wing”. The bones in their wings are the same as the bones in our hands, just a different shape and with strong, thin webbing between each finger. They even have a tiny thumb on top of each wing that has a claw. These tiny thumbs are vital to help bats when they climb or eat.



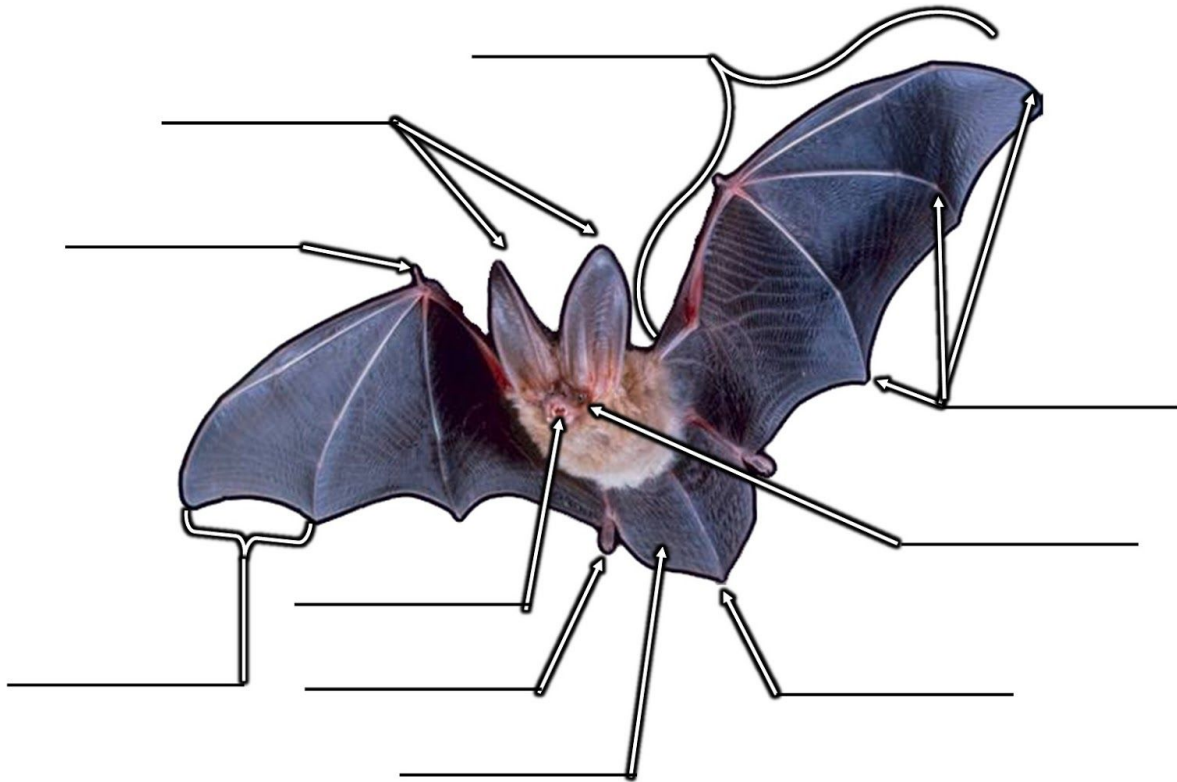
Bats live all over the world. They can be fruit eaters, bug eaters, fish eaters, and some even drink blood. All the ones in our part of the world are insectivores, or insect eaters.



Bats use echolocation to catch their food. They are not blind and can see almost as well as humans. But they use their ability to pick up supersonic sounds to help pinpoint prey. They use their mouth to make a sound (one humans can't hear) and then listen for the echoes when the sound bounces off their prey. Depending on what and how they hunt, bats can have some very strange looking faces. They have specialized ears and noses to find specific prey.

Bat Anatomy

Label the different parts of the bat using the words in the Word Box.



Word Box	Wing	Eye	Ears
Wing Membrane	Tail	Mouth	Back Foot
Uropatagium (membrane between back feet)	Finger Bones	Thumb	

The bat in this diagram is a Townsend's Big-Eared bat, which lives mostly in the Western US, from Canada down to Mexico. But it also lives in parts of the Ozark and Appalachian Mountains. Keep reading to learn more about some of the common bats in Land Between the Lakes.

Bats of Land Between the Lakes

Kentucky and Tennessee have many species of bat. Meet 5 of our favorites.

Little Brown Bats



This is Land Between the Lakes' most common bat! It weighs about 8g, is about 3½ inches in length, and has a wingspan of about 10 inches. The Little Brown Bat likes to make its home in attics, barns, or boxes. It also hibernates and migrates to warm caves in the winter. The Little Brown Bat's diet is mostly insects. It can eat its own body weight in insects every night. Along with Big Brown Bats, these bats are often found in bat houses in the summer.

Big Brown Bat



This is one of Land Between the Lakes' largest bats, reaching up to 5 inches long and can have a wingspan of more than 13 inches. They have adapted well to living near or in human structures. They often create nursery roosts in buildings and under bridges. They have large teeth, and are especially good at catching beetles. They have been called a "friend to farmers", because they eat many beetles that are crop pests.

Red Bat



These bats are almost the same size as Big Brown Bats, but they are a rusty red color. They are experts at camouflage, hanging by one foot to look like a dead leaf. They are solitary hibernators, choosing to roost alone under tree bark and in leaf litter. They will wake up from hibernation on warm winter evenings to hunt. Head outside at dusk on the next warm winter night and see if you can find some!

Eastern Pipistrelle



This is one of Land Between the Lakes' smallest bats. It is barely 3½ inches in length and has a wingspan of just over 9 inches. It is also known as the Tricolored Bat, because of its unique fur. The hairs have three colors on them: gray at the base, tan in the middle, and dark at the end. They are migratory, with some spending the summer north and returning to Kentucky and Tennessee to hibernate. They eat very small flying insects that they find in forest understory, along stream corridors, and along woodland edges.

Hoary Bat

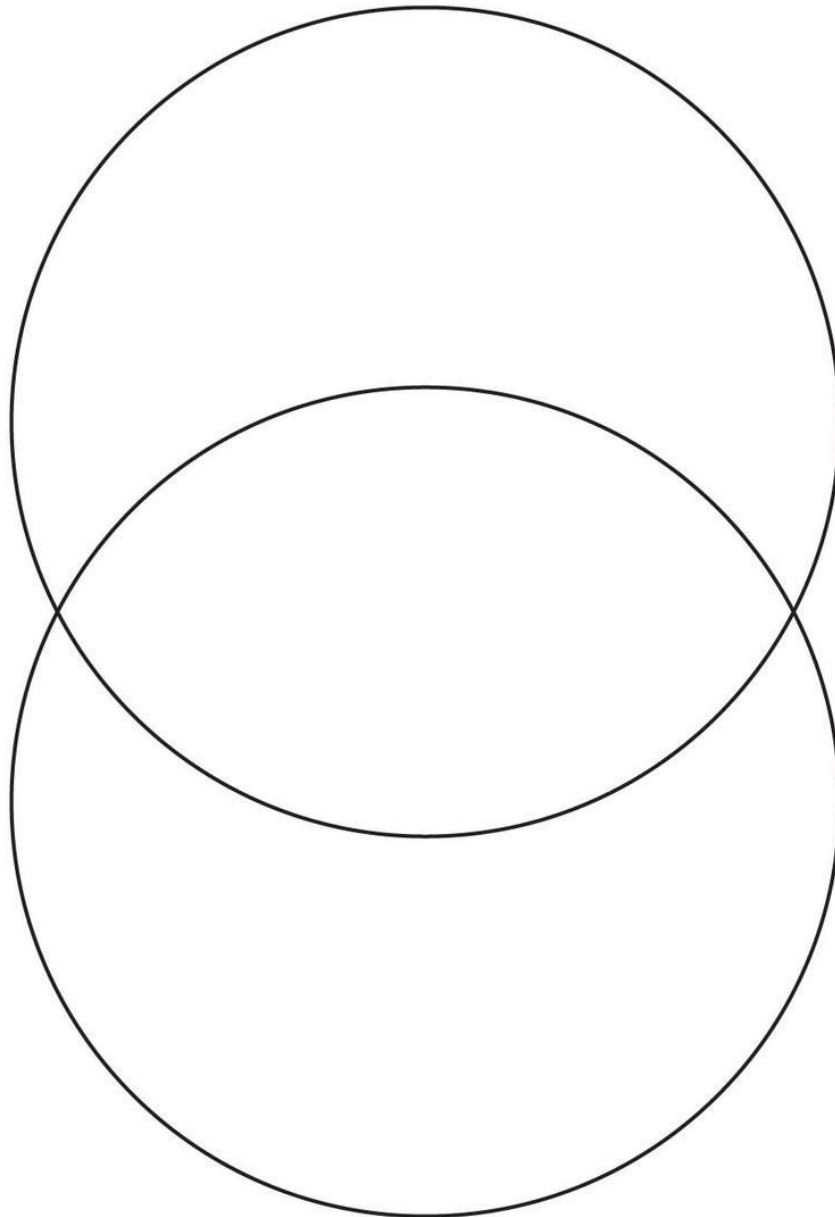


This is the largest bat in Land Between the Lakes. It is called the “Hoary” bat because it is very fluffy, including having fur on its tail and ears. Like the Red Bat, the Hoary bat is a “tree bat”, spending most of its time roosting in trees alone rather than gathering in large groups. There is not much known about where they hibernate.

Visit <https://fw.ky.gov/Wildlife/Pages/Kentucky-Bat-Working-Group.aspx> to learn about all the bats we have in Kentucky.

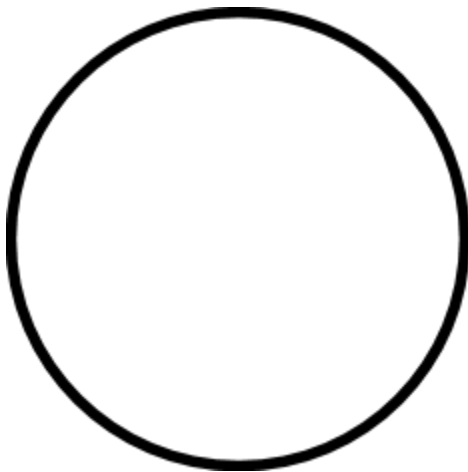
Research: Compare and Contrast

Bats and birds both have wings, but they aren't the same! Do some research to learn about bat and bird wings. Use this venn diagram to compare and contrast some of their traits.



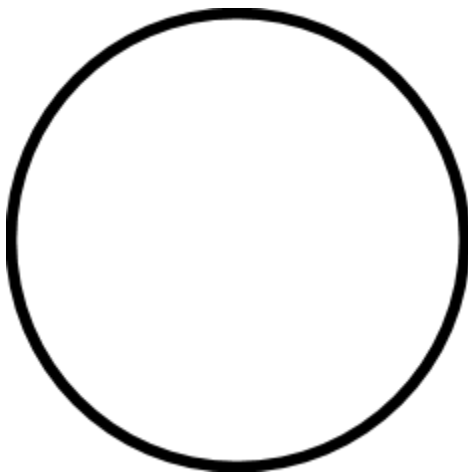
Dinner Time!

Animals can be grouped based on many things. Do they have a backbone? Do they have fur, feathers, or scales? What do they eat? Carnivores eat only other animals. Herbivores eat only plants. Omnivores eat both plants and animals. But sometimes you can be even more specific. We've gathered all the bats of the world into different groups depending on their diet. Draw a picture next to each category of what that bat might like to eat. The pronunciation is next to the word in *italics*.



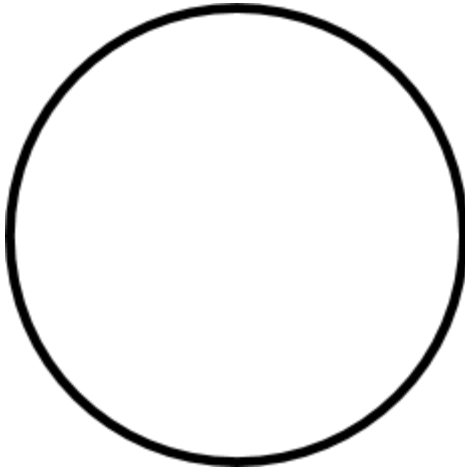
Insectivore (*In-sek-ti-vor*)

These bats eat insects. Almost all of the bats in the US are insectivores. These bats have perfected hunting with echolocation. They listen to the echoes created by their supersonic calls to find something to eat, like a moth. Once they find one, they figure out exactly where the moth is by calling faster and faster, learning more about exactly where their prey is with every call and echo. Right before they catch their food, they call so fast that it sounds like one long note, called a "kill buzz".



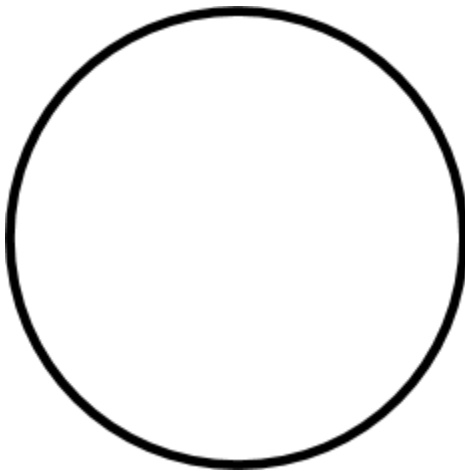
Frugivore (*Froo-gi-vor*)

These bats eat fruit. They use their eyes more than their ears to find food, and many don't use echolocation. However, scientists recently discovered that some species of fruit bat do echolocate, but they use their wings to make sounds rather than their mouth. The Golden-Crowned Flying Fox, the largest bat in the world, is a frugivore. It weighs up to 2.6 lbs and has a wingspan of 5.5 feet! They live in the Philippines, away from humans.



Nectivore (Nek-ti-vor)

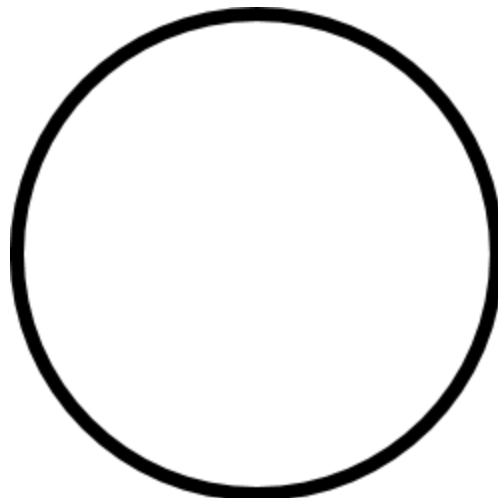
These bats eat pollen and nectar. They have very long tongues to lick nectar out of flowers, and many get their protein from pollen rather than insects. Some are also frugivores. These bats are very important pollinators. There are two species of nectar bats that migrate into the US, but they spend most of the year in Mexico. Nectar bats pollinate agave, mangos, saguaro cacti, and bananas.



Hematophage (He-mat-oh-fage)

These bats drink blood, and are called vampire bats. There are only three species of vampire bats in the whole world. Unlike other bats, vampire bats can walk, run, and jump as well as fly. Despite their name, they don't suck blood. They will bite a sleeping mammal, usually livestock, and lick up the blood. They are so good at it that their bites don't hurt, and their feeding often goes unnoticed. They only feed for about 20 minutes, and never kill their prey.

What do you like to eat? Draw it in the circle below.



Bat Hibernation

Bats hibernate to survive the winter. Hibernation is like taking a really deep nap all winter long. In fact, when an animal hibernates, they slow down different processes in their body, like their breathing and heart rate. It helps them conserve energy so that they can survive all winter long.

Bats drop their heartbeat from 200-300 beats per minute (BPM) down to 10 BPM during hibernation. To see what that feels like, use a stopwatch and clap every 6 seconds for a minute. If each clap was a heartbeat, that would be 10 BPM. That's really slow!

Do this activity to discover how your heart rate changes while doing different things!

How to find your pulse:

There are two ways to feel your pulse, or your heartbeat.

- 1) In your neck: (This can be hard for some people to feel)

Gently put two or three fingers on your chin. Move your fingers down your neck until you feel a bump. This is your Adam's apple. (We all have one, but it's called an "Adam's apple" because boys tend to have larger ones than girls.) Move your fingers just to the side of your Adam's apple until you feel a large tendon (feels like a really strong rubber band). Place your fingers in between the tendon and your Adam's apple. Don't push too hard. Keep your fingers there until you can feel a gentle beat. That's your heart!

- 2) In your wrist:

Flip one of your wrists up so that you're looking at your palm. Run two fingers down the outside of your thumb until you get to your wrist. In the middle of your wrist you'll feel some strong tendons (feels like a strong rubber band) Find the tendons and then move your fingers just to the side closest to your thumb. Very gently press at that spot with the fingers on your other hand until you feel your pulse. (Make sure not to use the thumb to take a pulse, only your fingers. Our thumbs have a very strong pulse, and it can give you mixed results. This is especially important if you are taking someone else's pulse.)

Heart Rate Activity:

Do the following activities, recording your heart rate (Beats Per Minute, or BPM) before and after each one. To calculate your heart rate, take your pulse for 30 seconds and then multiply by 2. It can be very helpful to have someone keep track of time for you so you can focus on counting your heartbeats.

Activity	Pulse for 30 seconds		Heart Rate: Pulse for 30 seconds X 2 = Heart rate (BPM)	
	Before	After	Before	After
Sitting still for 5 minutes				
Doing 40 jumping jacks				
Running in place for 3 minutes				
Laying down in a dark room for 10 minutes				
Make up your own!				

When was your heart rate the highest? Why?

When was your heart rate the lowest? Why?



Bat and Moth Game

Bats can find their food using sound waves called echolocation. They make a noise with their mouth and listen for the echoes! Play this game to see if you can be a bat and catch a moth using sounds and hearing alone!

You will need:

- 4 or more friends
- Blindfold
- Large area to play in

How to play:

Decide who will be the bat and who will be the moth. Everyone else will be trees. All the trees make a circle around the bat and the moth. The object of the game is for the bat to catch the moth. Both the bat and the moth can move inside the circle of trees but can't go outside it. Blindfold the bat, and spin the bat around three times.

The bat shouts "BAT," and the moth has to immediately shout "MOTH," back. As the bat moves in the direction of the sounds from the moth, the moth tries to escape. (It's best if the bat and moth walk.) The bat can call "BAT" as many times as they want, and the moth must immediately answer, "MOTH." If the bat or moth bumps into a tree, the tree shouts, "TREE."

The game ends when the bat touches the moth. Then the moth can be the bat and one of the trees can be the moth. If there are a lot of players, try playing with more than one bat and moth.

Post-Game Questions:

1. How did it feel to be the moth?

2. How did it feel to be the bat?

3. How was the bat able to find the moth?

4. What is it called when a bat uses sound to find its food?

Build a Bat House



Why Build a Bat House?

You might be surprised: bats don't always live in caves. Some bats spend winter months in caves, but most bats spend summers in trees, under bridges, or in old buildings where they give birth and rear young. Other bats may only spend a night or two in a bat house. Kind of like a bat version of AirBnB.

Your goal is to **make a bat house that mimics the space between bark and a tree trunk**. That would be the bats' ideal nursery. That's why the space inside a bat house is very narrow, unlike a bird house which would house a nest. Bats like tight spaces. They also need it to be nice and warm for the babies. That's why we paint the box a dark color in most climates and why we caulk the sides to keep the heat in. Also, you'll be using a saw to rough up inside the box. That makes it more like tree bark and easier for the bats to climb up.

You might wonder why you need to build a bat house. Why can't the bats just find a nice tree? That is the challenge for many bat species as forests are cleared. Ideally they would live in a natural home but we build bat houses to help those who can't find space in a forest.

A bat house is also a great way to **provide cover for wildlife**, as well as a **place for wildlife to raise young**--two components of becoming a **National Wildlife Federation Certified Wildlife Habitat site**.

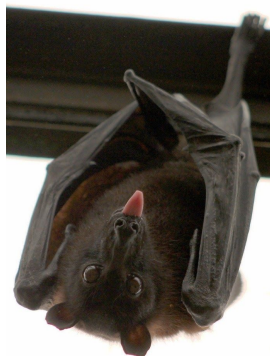
To learn more about how to build a bat house, visit <https://www.landbetweenthelakes.us/visit/brochures/> and click on "Fact Sheets", and select the "Bat Conservation Fact Sheet."

Bat Vocabulary Match-Up

We've got our bat words and their definitions all mixed up! See if you can untangle them. Draw a line matching each word to the correct definition.

Word	Definition
Carnivore	<ul style="list-style-type: none">● A way some animals survive winter. They slow many bodily processes. Like taking a long, deep nap
Chiroptera	<ul style="list-style-type: none">● Active at night
Echolocation	<ul style="list-style-type: none">● An animal that eats blood
Frugivore	<ul style="list-style-type: none">● An animal that eats fruit
Hematophage	<ul style="list-style-type: none">● An animal that eats insects
Herbivore	<ul style="list-style-type: none">● An animal that eats nectar
Hibernate	<ul style="list-style-type: none">● An animal that eats other animals
Insectivore	<ul style="list-style-type: none">● An animal that eats plants
Nectivore	<ul style="list-style-type: none">● An animal that eats plants and animals
Nocturnal	<ul style="list-style-type: none">● Bats are in this Order. It literally means "hand wing."
Omnivore	<ul style="list-style-type: none">● The membrane between a bat's back feet
Uropatagium	<ul style="list-style-type: none">● Using echoes to locate something

Fable: Why Bat Has No Friends



Many years ago, there was a great battle between the animals. The mammals on the ground and the birds in the sky began a terrible war that lasted for many weeks. Bat was very nervous about the war and did not want to be stuck on the losing side.

At first it seemed as though the birds would win. There were far more birds than mammals. They could swoop down and peck away at the mammals and then fly up out of harm's way before the mammals could attack.

Bat flew up to the birds. They swooped towards him, ready to attack! But bat flapped his wings and said, "Look! I have wings just like you. Do not attack me for I wish to fight on your side." The birds huddled around, twittering, cawing and squawking to each other. Finally, they agreed that Bat could fight with them.

"What a wonderful choice I've made. With so many more birds than mammals I will be on the winning side for sure." But the mammals were not that easy to defeat. Although there were fewer of them, they had sharp teeth and claws and were much larger than the birds.

To make matters worse, Bat awoke to a very windy day. The wind made it difficult for the birds to control their attacks. Before long it was clear that the mammals had won that day's battle.

That night after the miserable defeat, Bat decided enough was enough. He flew down and joined the mammals. "What are you doing here?" roared the cougar, his paw raised to strike bat down. Bat opened his mouth wide to show his pointy teeth. "Wait," he said, "I am one of you! See, I have teeth in my mouth like a mammal -- not a beak like a bird."

The mammals pondered for a few moments and then agreed that Bat did indeed belong on their side.

The next day, the battle was again fierce. But this time the wind was gentle and the birds were able to organize. They pecked at the eyes of the mammals and flew away before they could be touched.

That evening, Bat snuck away from the mammal's camp and quietly flew back up into the sky to join the triumphant birds. When they complained that they had seen him on the mammal's side during the battle, Bat again flapped his wings and claimed to belong with the birds.

And so it went for many days. Whenever the birds won a battle, Bat would flap his wings and go with them. Whenever the mammals won a battle, Bat would bare his teeth and side with them.

Finally the animals grew tired of battling each day. The Chiefs held a meeting to make peace. They were all so exhausted, that it did not take long to reach a truce -- but during the process the mammals and the birds began to talk about Bat.

"It doesn't seem fair that he just switched sides whenever he wanted," squawked Crow.

"No, not fair at all," growled Bear, "Bat has wings but he did not stay with the birds."

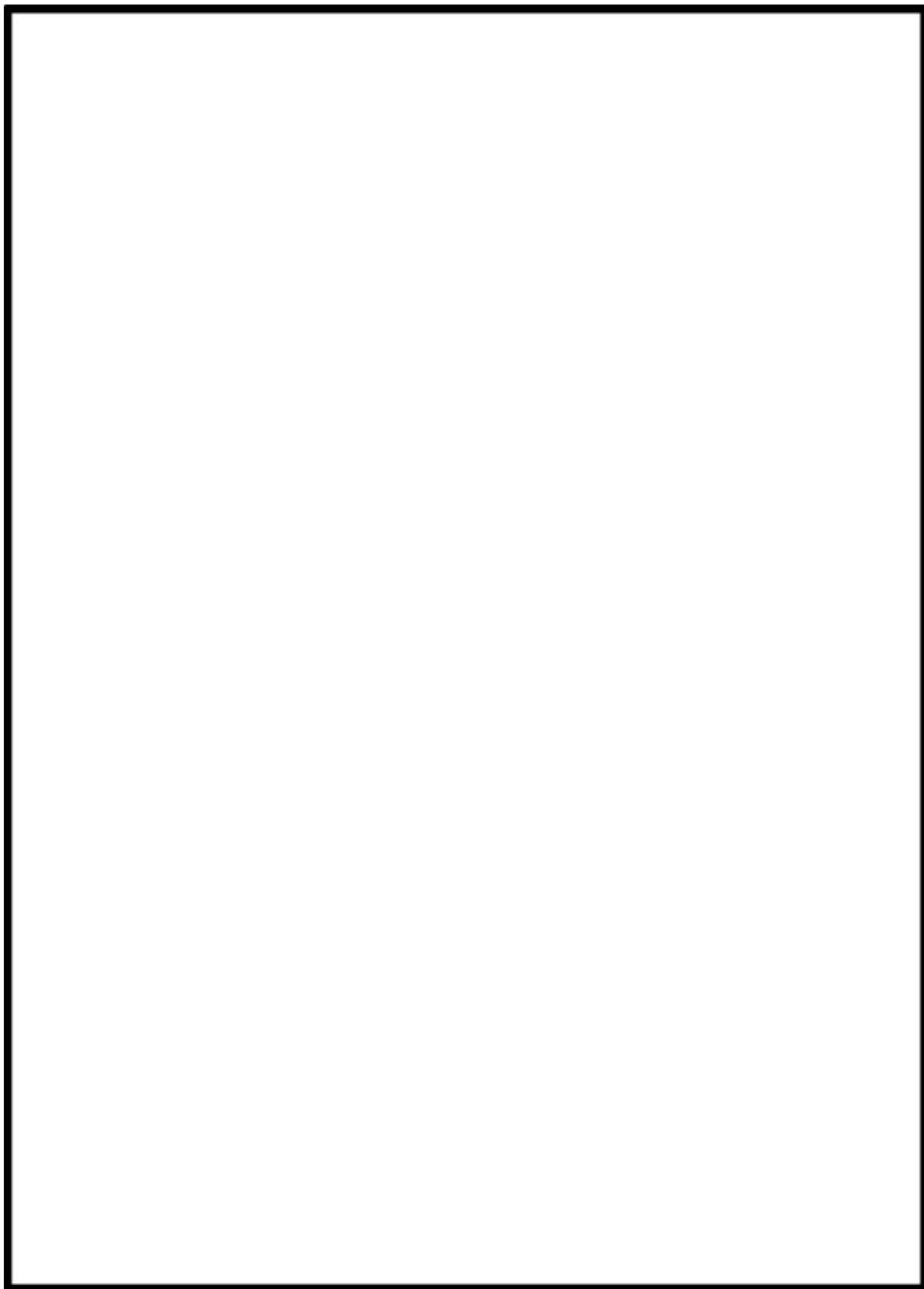
"And he has teeth but did not always help the mammals," added Crow.

All of the animals nodded and looked at Bat, "Because you could not choose your friends during war, you will not have them during peace. From this point forward, you will only fly at night when everyone else is sleeping. You will have no friends among the mammals or the birds."

And that is why Bat doesn't have any friends.

(The morale of the fable: Choose your friends carefully and remain faithful to them.)

Use the space on the next page to draw a picture of the fable, or to write a story about bats of your own!



Additional Resources

Bats at the Ballgame by Brian Lies

Bat Loves the Night by Nicola Davies

Little Red Bat by Carole Gerber

Nightsong by Ari Berk

Stellaluna by Janell Cannon

Bats by Kate Riggs

Amazing Bats by Eyewitness Junior

What is a Bat? by Bobbie Kalman

The Life Cycle of a Bat by Bobbie Kalman

Bats by Gail Gibbons

Websites:

Project EduBat: batlive.pwnet.org/edubat/curriculum.php

Bat Cam: www.zoo.org/batcam

White-nose Syndrome: www.whitenosesyndrome.org

EducationWorld: Bats in the Classroom, Activities Across the Curriculum:

http://www.educationworld.com/a_lesson/lesson/lesson031.shtml

Bat Conservation International: www.batcon.org

National Park Service: <https://www.nps.gov/articles/detojr-bat-drawing.htm>

USFWS Indiana: How Many Bats Can Fit in a Shoebox Activity:

<https://www.fws.gov/Midwest/endangered/mammals/inba/curriculum/Chapter18.pdf>