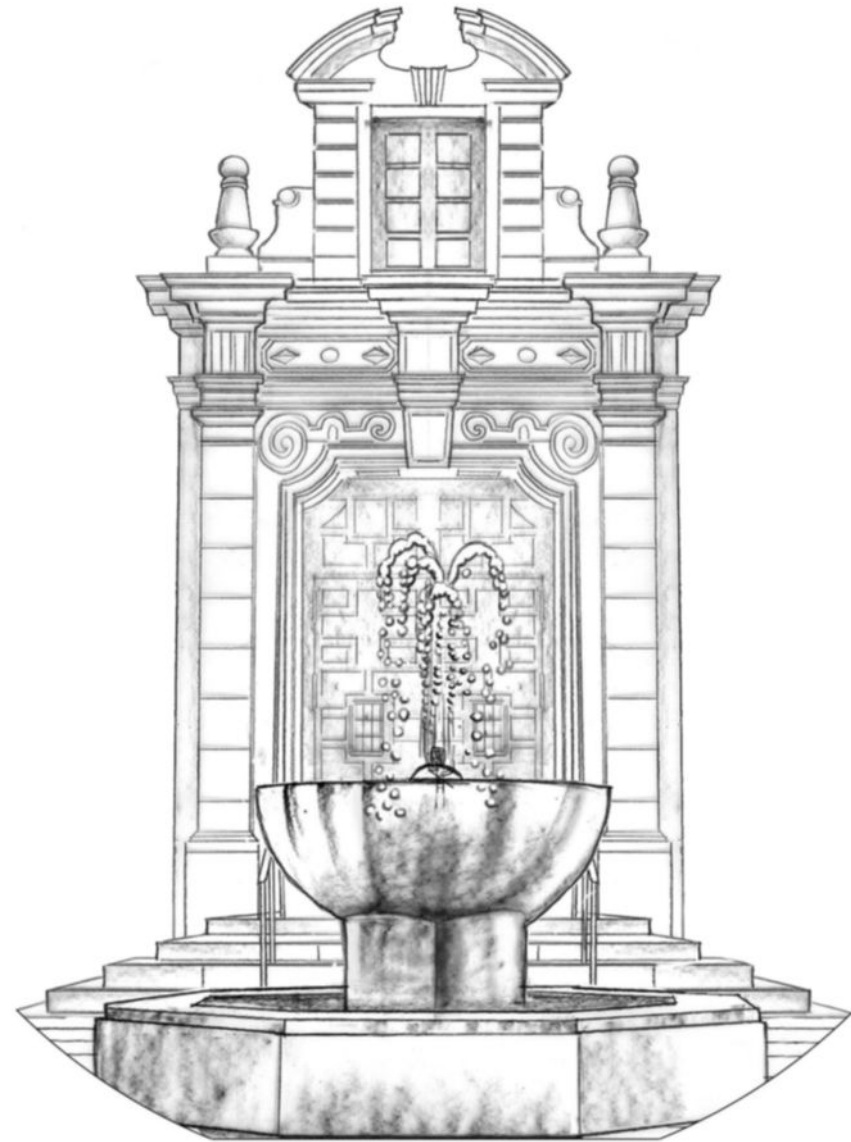




Thanks for visiting!



The National Park Service cares for the special places saved by the American people so that all may experience our heritage.

EXPERIENCE YOUR AMERICA

National Park Service
U.S. Department of the Interior



Junior Ranger Activity Book— All About Bats



Photo credits (front cover):

Top left—A little brown bat showing symptoms of White Nose Syndrome. Photo by Marvin Moriarty, courtesy NPS Biologic Resources Division.

Top right—A roosting big brown bat. NPS photo, courtesy Chesapeake and Ohio Canal National Historic Park.

Bottom left—A new Junior Ranger takes his pledge. NPS photo, Hot Springs National Park.

This Junior Ranger Booklet was produced at Hot Springs National Park by NPS Academy intern Zachary Lee and Mosaics-in-Science intern Linque Martin, whose financial support was provided by the Youth Programs Division and the Geological Resources Division of the National Park Service. These internships were made possible through partnerships with the Student Conservation Association and the Greening Youth Foundation. White Nose Syndrome funding provided by the NPS Biological Resources Division also supported this project.

Weldon Baird, a Hot Springs National Park volunteer through the Volunteers-in-Parks program, provided graphic design expertise and created the graphics on pages 11 and 13.



National Park Service

JUNIOR PARK RANGER



has successfully completed the requirements to
become a Junior Park Ranger of the
National Park Service

Presented by: _____

Date: _____



Next steps as a Junior Ranger

How you can help bats in our national park

Build a bat box

With the help of an adult, you can build a bat box in your yard for your new bat friends to enjoy. They are easy to build and help provide a home for bats who are in danger of going extinct. Search the internet for a guide to building one.

Find bats in your neighborhood

Bats live in national parks, but they might also live in your neighborhood. Go for a walk with an adult in the evening and look for bats flying in the sky.

Don't disturb any bats you see

Getting near bats might frighten them. You can take pictures, but keep your distance from bats. They may carry diseases that can hurt other bats which human touch could help spread.

Get educated and share what you know

Learn more about the coolest creatures in the world and share that knowledge with others. Parks need Junior Rangers to help with everything from telling visitors about bats to looking for them.

Complete this booklet and head to a National Park Service Visitor Center to receive your badge and award certificate to become an official National Park Junior Ranger!

National Park Service



What does a Park Ranger Do?

Park Rangers do many jobs. They give guided tours, take you on hikes and give campfire programs. Some even dress like people who lived a long time ago to show what life was like back then. Many study plants and animals in the park. Others study ruins, tools, documents and other things that show how our nation developed. Rangers also take care of old houses, furniture, photos, papers, and landscapes that tell the story of the park. Still others ride in patrol cars to make sure all visitors are safe.

What is a Junior Ranger?

A Junior Ranger is someone who, after touring a National Park and **completing activities** in this booklet, promises to take care of National Parks.

A Junior Ranger has fun learning about the National Parks and enjoys telling others about the parks and activities there. A Junior Ranger, like all rangers, takes care of the parks by respecting the rules, helping wildlife, learning park history, and keeping the parks clean.



The Junior Ranger Pledge

As a Junior Ranger,
I promise to help the National Park Service.
I will keep learning about its past and natural resources.
I will share this with my friends and family.
I will help preserve and protect my home community, too.



Name

Date



“Hi! I’m Bart the bat and I’ll be your guide as you discover some very interesting things about the National Park Service and earn your Junior Ranger badge.

Did you know that bats are very important to different ecosystems? That’s right! Bats help control insect populations in certain areas as well as pollinate flowers in their environment.

Bats live in some really neat places all over the world and even in national parks. Stick with me and I’ll let you know all about the wonderful world of bats!”



Photo courtesy of US Fish and Wildlife (Ann Froschauer)

There are about 1,300 known species of bats in the world, but more research is being done on bats around the world every day.

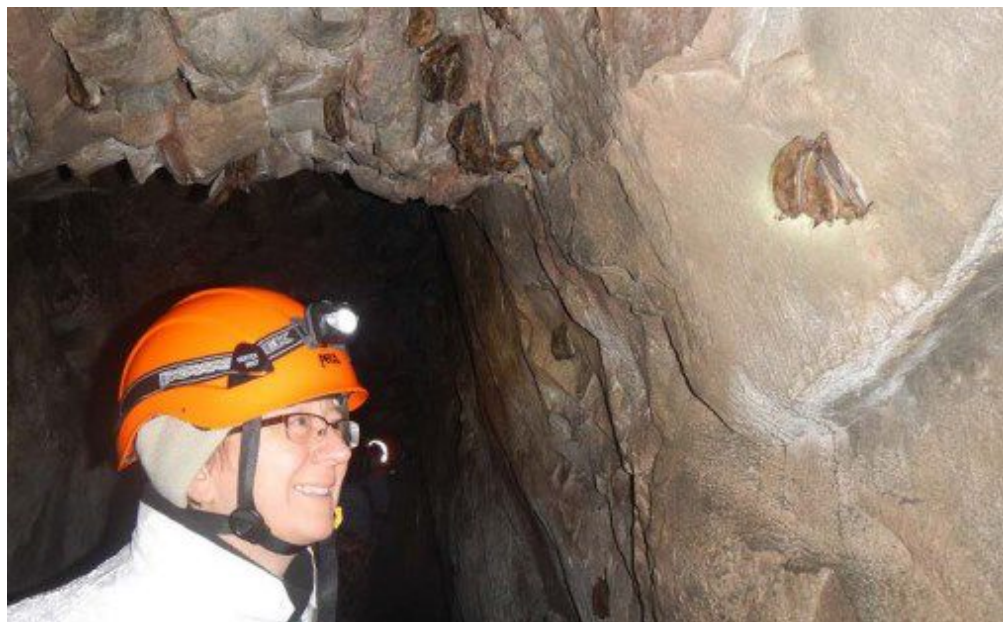


Photo courtesy of U.S. Forest Service

“We’re almost done! Lets review!”



A good Junior Ranger knows a lot about his job. Define the terms we talked about today to prove you have what it takes to be a Junior Ranger.

Pollination - _____

Snag - _____

Roost - _____

Ranger - _____

Echolocation - _____

Chiroptera - _____

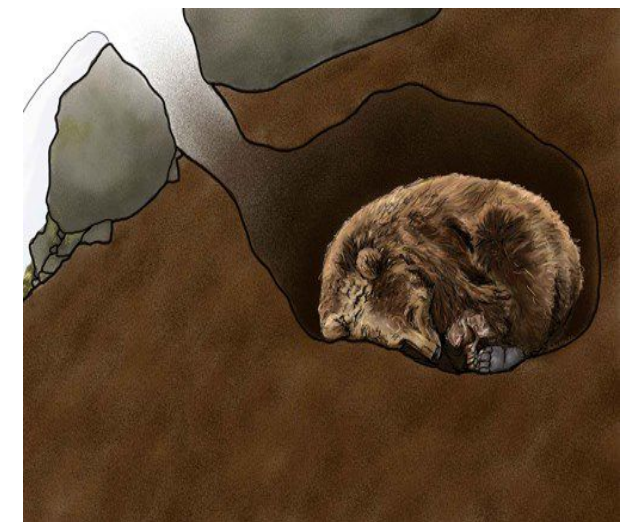
Hibernate - _____

Nocturnal - _____

Insectivorous Bat- _____



NPS photo, courtesy of Hot Springs National Park (Emily Roberts)



Brown bear hibernating | NPS image, courtesy of Katmai National Park & Preserve

“Try to find some of the things we talked about!”



d y r d u s y d d m a q j p a v l
 z v w b b p m p j p b m p z p a r
 e w m p y e p q l p t x p o q m d
 q m s u w c p i n s e c t k q p n
 j p n r c i p l o u d w c v f i m
 p z a k v e b b d j d b i y r r p
 a p g q c s p r u d u p p b u e w
 l u j w w h i t e n o s e b i b h
 l r d n m p w t u t t t o d t a a
 g u a n o e u p g p x p u j d t n
 t g i b r r a c l s p s d d u q d
 c n b l a n q y e b a m p p p b w
 h p i p n c p p a y r o o s t b i
 i l c i g g j p n p k j l t o d n
 r h p b e u d a i n g d b p u r g
 o b d p r a k s n u b u b y w c v
 p b p u d n q w g k w u a q p j p
 t b e c h o l o c a t i o n p p r
 e d r b i y t b u k u i p q b t u
 r m p p p b p k d b t p s b y p d
 a n o c t u r n a l p e r n c u w
 g g s f m d r l r y j g q e i u a
 l r d n m p w h a n d w i n g v p
 j d v k w f x a w q n g j i f e t
 w s h i b e r n a t e y b b d j d

- Snag
- Park
- Echolocation
- Hand-wing
- Insect
- Guano
- Gleaning
- Fruit
- Roost
- Species
- Nocturnal
- Ranger
- Vampire Bat
- White Nose
- Chiroptera
- Hibernate



Bats can get sick

“White Nose Syndrome is a disease that causes bats to act strangely. An example of this would be flying during the day time or when they should be hibernating. The disease is characterized by a white fungus appearing on the nose, wingtips, and body of an affected bat. It is thought to come from Europe. Did you know that some types of bats are in danger of becoming extinct because so many have died of white nose syndrome? When an animal becomes extinct, it means that no more of that kind of animal are alive in the world.”



NPS photo, courtesy Mammoth Cave National Park

White nose syndrome is caused by a fungus. Can fungus grow... (mark yes or no)

- _____ On a dead tree?
- _____ On old bread?
- _____ In a dark humid cave?
- _____ On your toes?



NPS photo, courtesy Hot Springs National Park

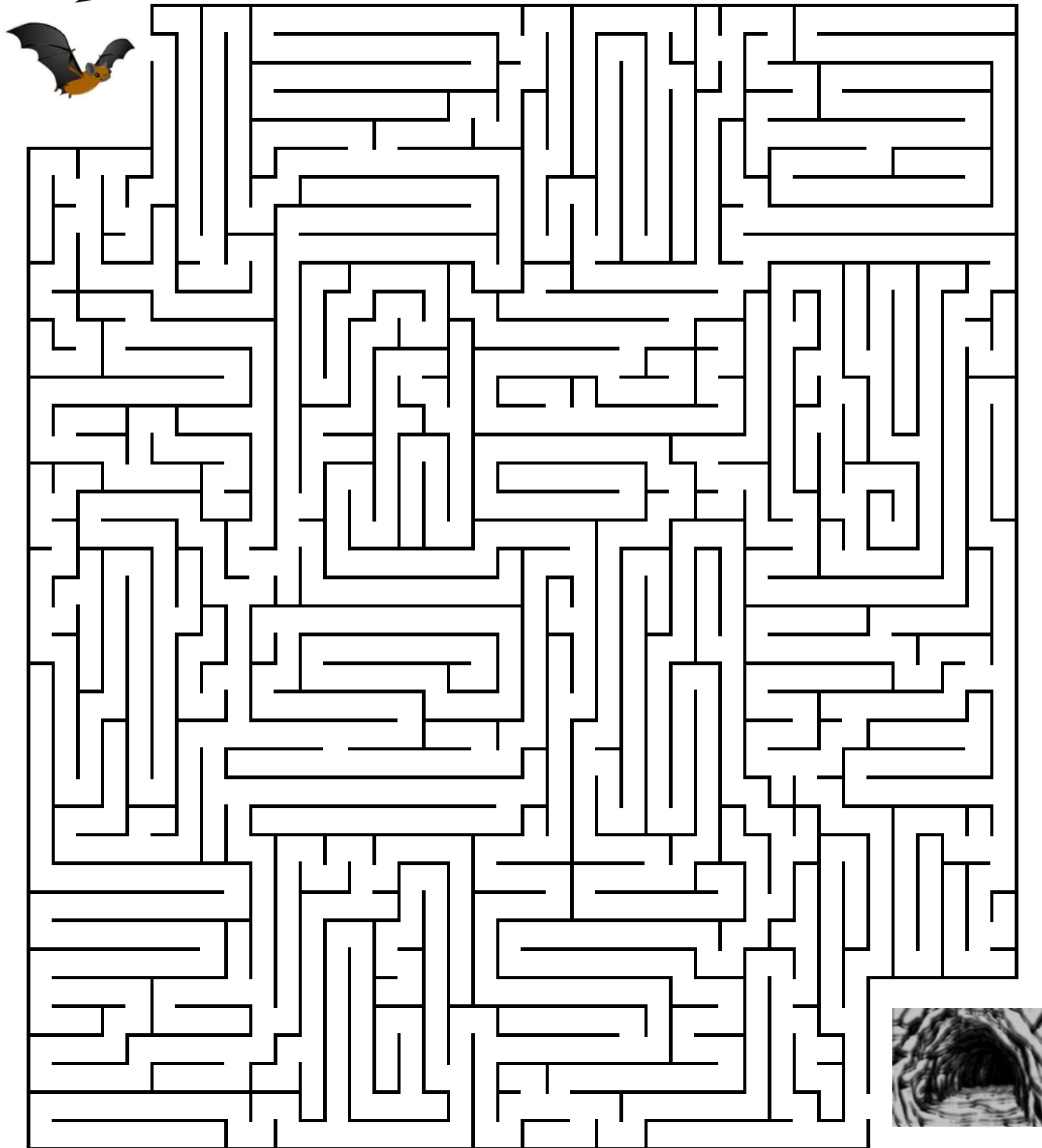


NPS photo, courtesy Carlsbad Caverns National Park (Peter Jones)

Have you ever eaten a mushroom? Did you know that mushrooms are a type of fungus? The umbrella shaped portion of a mushroom you might have seen outside is called the fruiting body!

Help me get home!

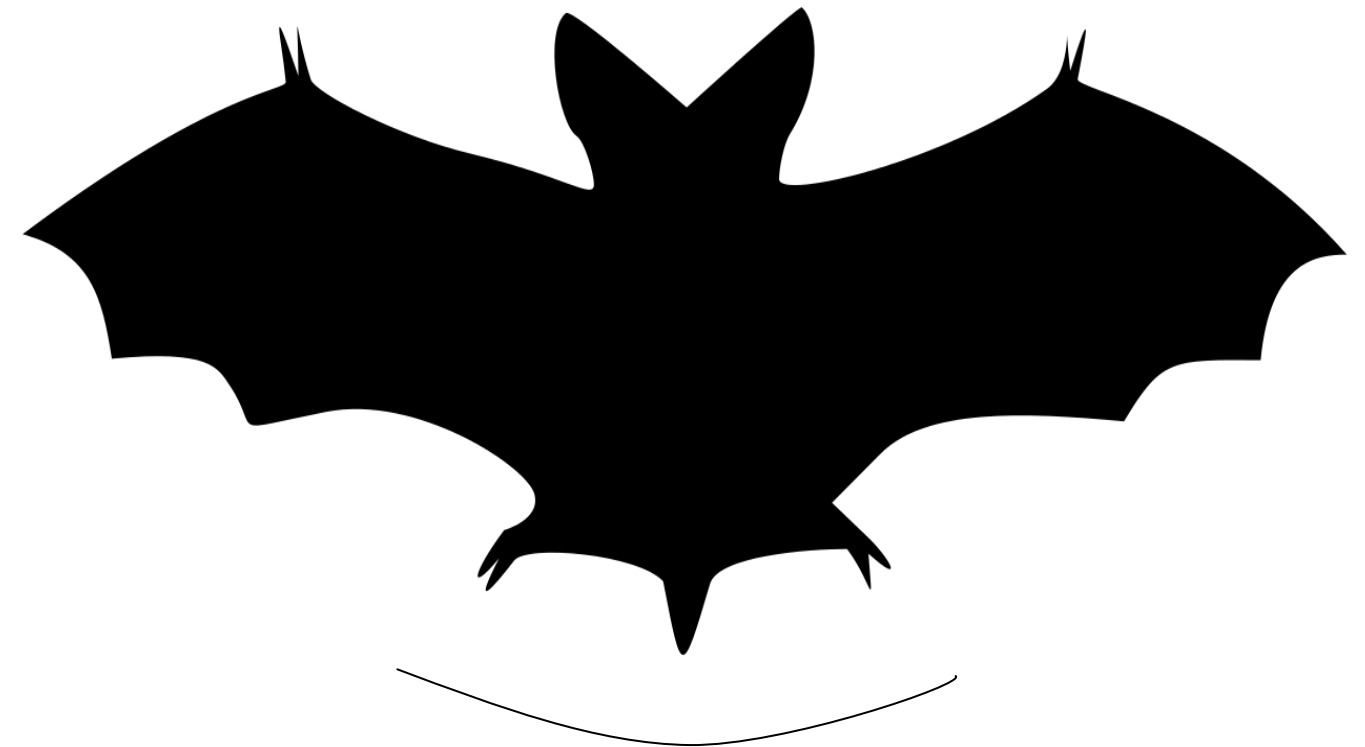
“Oh dear, I seem to have gotten a little turned around on my way back to my roost. **Could you help me find my way back?** I’d really appreciate the help!”



Q: How big are vampire bats?

A: People always seem to think we’re these giant creatures. We’re actually quite small, with our body size being about 3.5 inches long and having a wingspan of 7 inches. Adult vampire bats weigh about 2 ounces. That’s roughly the same weight as 12 crayons!

Vlad is a fully grown adult vampire bat. He is about as big as the picture below. **Line your palm up with the line and point your fingers toward the top of the page and trace!** Is your hand larger than Vlad the vampire bat? Could you hold Vlad in your hands?



Place your palm on the line and point your fingers to the top of the page to trace



Interview with a real vampire bat

“Hi there, I’m Vlad the vampire bat! I can’t wait to tell you all sorts of cool information about my species of bat!”

Q: Do vampire bats really turn into vampires that look like humans?

A: Ha-ha, no! That’s actually a myth that started a long time ago when Bram Stoker wrote the book *Dracula*. We are born as smaller versions of our parents, and we live our whole lives as just bats!

Q: Are there any vampire bats in National Parks in the United States?

A: No, we live in Central and South America where it’s always nice and warm!

Q: Do they drink from humans?

A: We aren’t usually interested in humans. We bite mostly sleeping farm animals, but we don’t suck blood like you see vampires do in the movies. We lap it up from the very small cut our bite makes. The animal we bite doesn’t even notice!

Q: How do vampire bats find food?

A: We are specially equipped to detect heat given off by warm blooded animals from a distance.

Q: Are vampire bats really mean and scary?

A: We’re very social within our colonies. If one of our colony members doesn’t eat, we make the effort to share some of our meal with them in exchange for grooming. New mothers get extra special treatment and a lot of help since they’re so busy raising their young.

Q: Are vampire bats important or just cool to look at?

A: Scientists have been using our saliva to help create a medicine that prevents blood clotting, which could be very helpful to stroke and heart attack patients in the future.



“I’m so excited that you have a chance to learn about me and all of my flying friends! We come in all shapes and sizes and we are a lot different than other flying animals.”



Tricolored Bat

Image courtesy of Bat Conservation International

A changing understanding of bats

Many people refer to bats as “flying mice” or “rats with wings,” but that’s not true! They belong to the order **Chiroptera** which means “hand wing” in ancient Greek. They got this name because the bones of their wings are arranged in a pattern like the bones that make up human hands. **Color the next page to see if you can match up the similar bones.**

People only started studying bats 200-300 years ago but folklore and myths have existed about them for much longer. Many of these stories have made people afraid of bats over the years, but bats aren’t so bad! Today we’re going to clear up some of these myths so you can become an expert on bats.



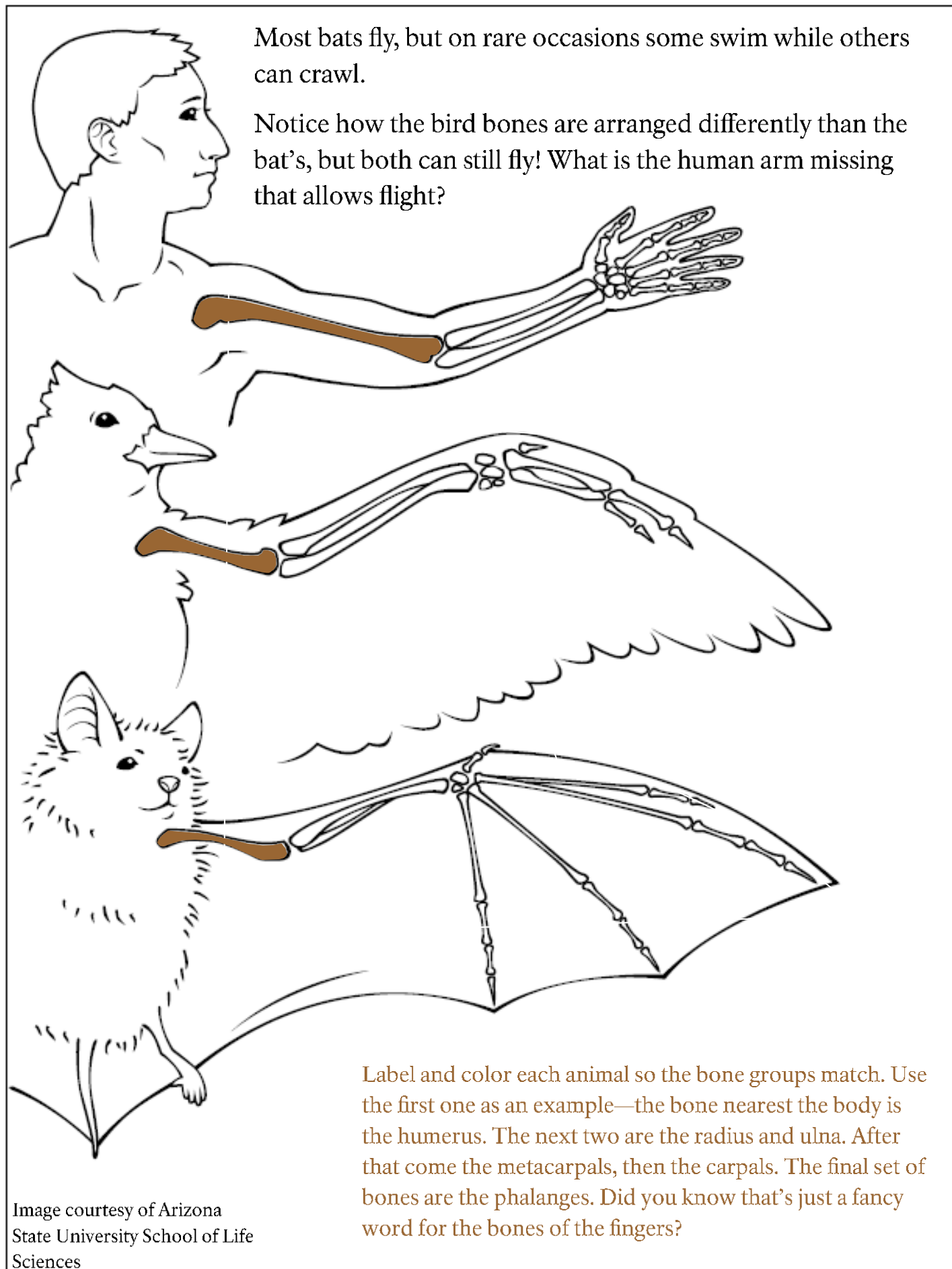
Jamaican Fruit-Eating Bat

Image courtesy of US Forest Service

What do bats eat?

Some bats eat insects like moths and beetles. Scientists call them insectivorous bats. A Little Brown Bat can eat up to 1,000 insects in an hour!

Fruit bats like to eat fruit. They tend to be larger than insectivorous bats and usually cannot use echolocation to navigate the forest at night. Fruit bats have a keen sense of smell for locating fruits like avocados, peaches, and mangoes. To learn more about echolocation, turn to page 10!



Most bats fly, but on rare occasions some swim while others can crawl.

Notice how the bird bones are arranged differently than the bat's, but both can still fly! What is the human arm missing that allows flight?

Label and color each animal so the bone groups match. Use the first one as an example—the bone nearest the body is the humerus. The next two are the radius and ulna. After that come the metacarpals, then the carpals. The final set of bones are the phalanges. Did you know that's just a fancy word for the bones of the fingers?

Image courtesy of Arizona State University School of Life Sciences

Bats are nocturnal

“Bats are nocturnal creatures, meaning that they sleep during the day and normally emerge during the evening to find food.”



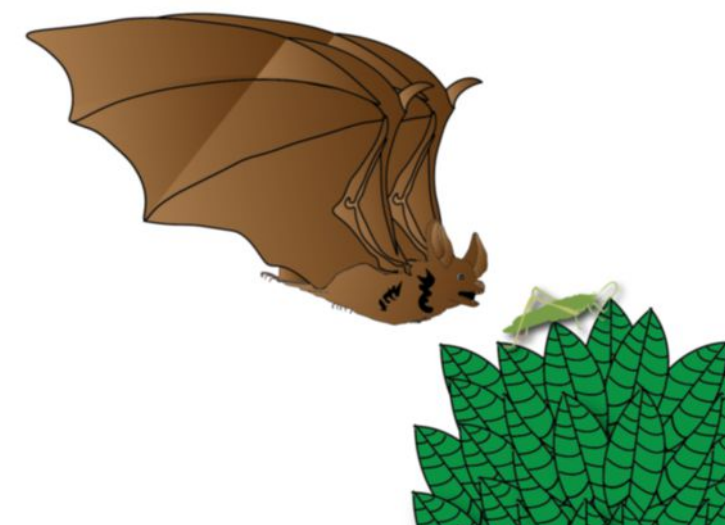
During the winter, many bats sleep for a long time in caves. This is called hibernation.



Why do you think bats might want to hibernate in a cave?

Gleaning

Bats spend most of the night searching for insects to eat. When a bat catches insects lying on surfaces such as a leaf or a branch, that is called gleaning. Can you draw something a bat might eat in the box below?





This bat is roosting under bark in a pine tree snag. Photo courtesy of The Wildlife Society



These fruit bats are roosting on tree limbs. NPS photo, courtesy of the National Park of American Samoa



“Roosting is what it’s called when a bat sleeps. Some bats like to roost in caves and mines while others enjoy roosting under the bark of a nice tall dead tree called a **snag**. Certain bats like to roost under bridges near busy highways! Do you think you can identify all the common places bats can sleep? The pictures below are of kinds of roosting locations. **Draw a line matching the pictures to the roost names you think are correct.**”



NPS photo, courtesy of Carlsbad Caverns National Park



Photo courtesy of the Bureau of Land Management



Photo courtesy of US Forest Service (Kathleen Knight)

Attic Tree Bat Box Bridge Cave Mine



NPS photo, courtesy of Hot Springs National Park



NPS photo, courtesy of Brown v. Board of Education National Historic Site



NPS photo, courtesy New River Gorge National River

Frequency

Sound can be thought of as vibration or movement of the air. Frequency is a measure of how often a vibration happens. A measure of how many times this vibration happens each second is a Hertz or Hz.

Most humans can hear between 20 Hertz and 20,000 Hertz. Bats have very sensitive hearing and can hear sounds that other animals can’t hear. Some bats can hear sounds as high as 200,000 Hertz!

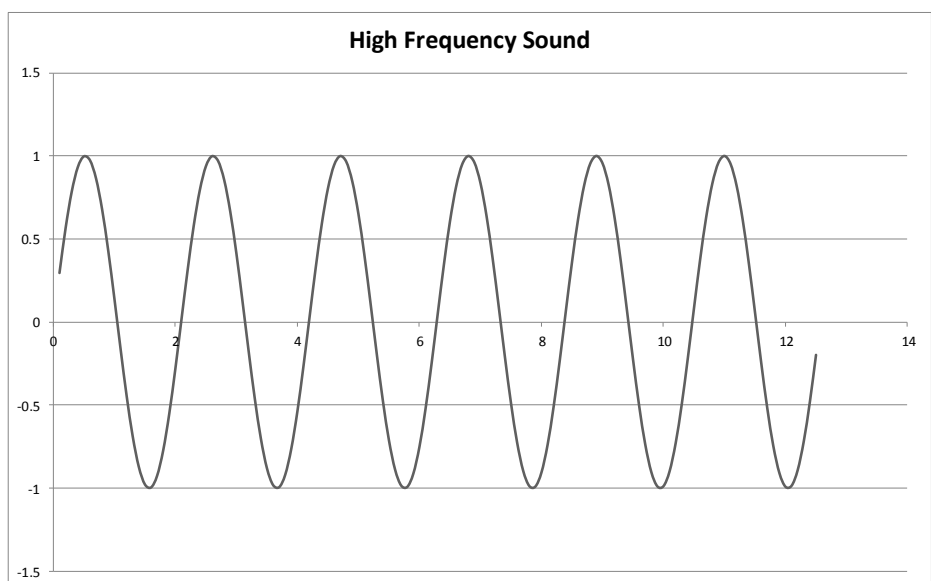
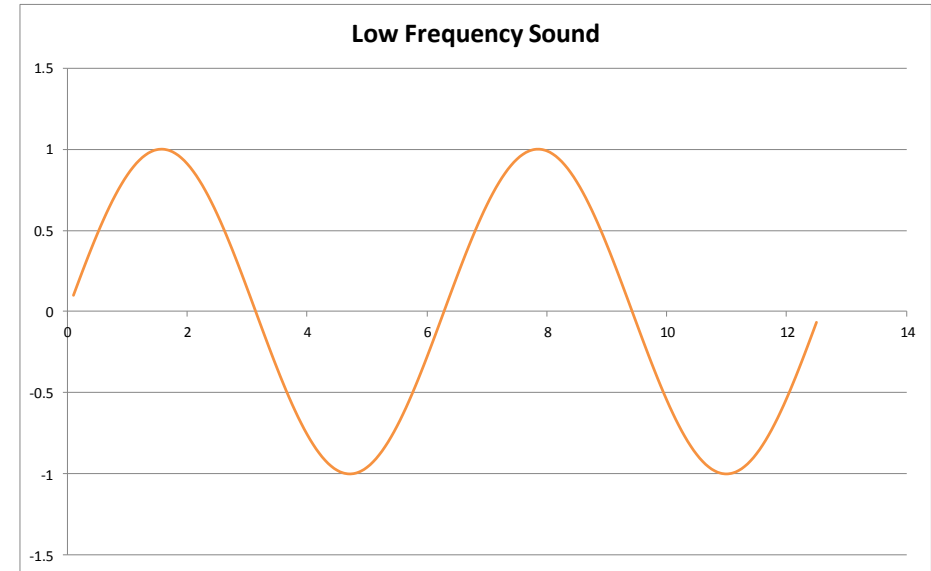
Music of higher frequency tends to have a higher pitch. Sing the words below. Lower pitch words like “doe” have lower frequencies than “tea” and “da.”

Lower Frequency



Do (doe)
Re (ray)
Mi (me)
Fa
So
La
Ti (tea)
Do (doe)

Higher Frequency



Echolocation



“To help get around the forest at night we use a technique called echolocation. When bats make our high-pitched call, it travels away from us, reflects off of a surface such as a tree or an insect, and returns to our ears. The time it takes for the sound to reach our ears helps us determine where things are and what sort of shape they have. Some large mammals use sound waves similarly to figure out their surroundings in the ocean. Did you know that humans borrowed the use of echoing sound waves to help drive submarines? When used under water, this is called sonar.”

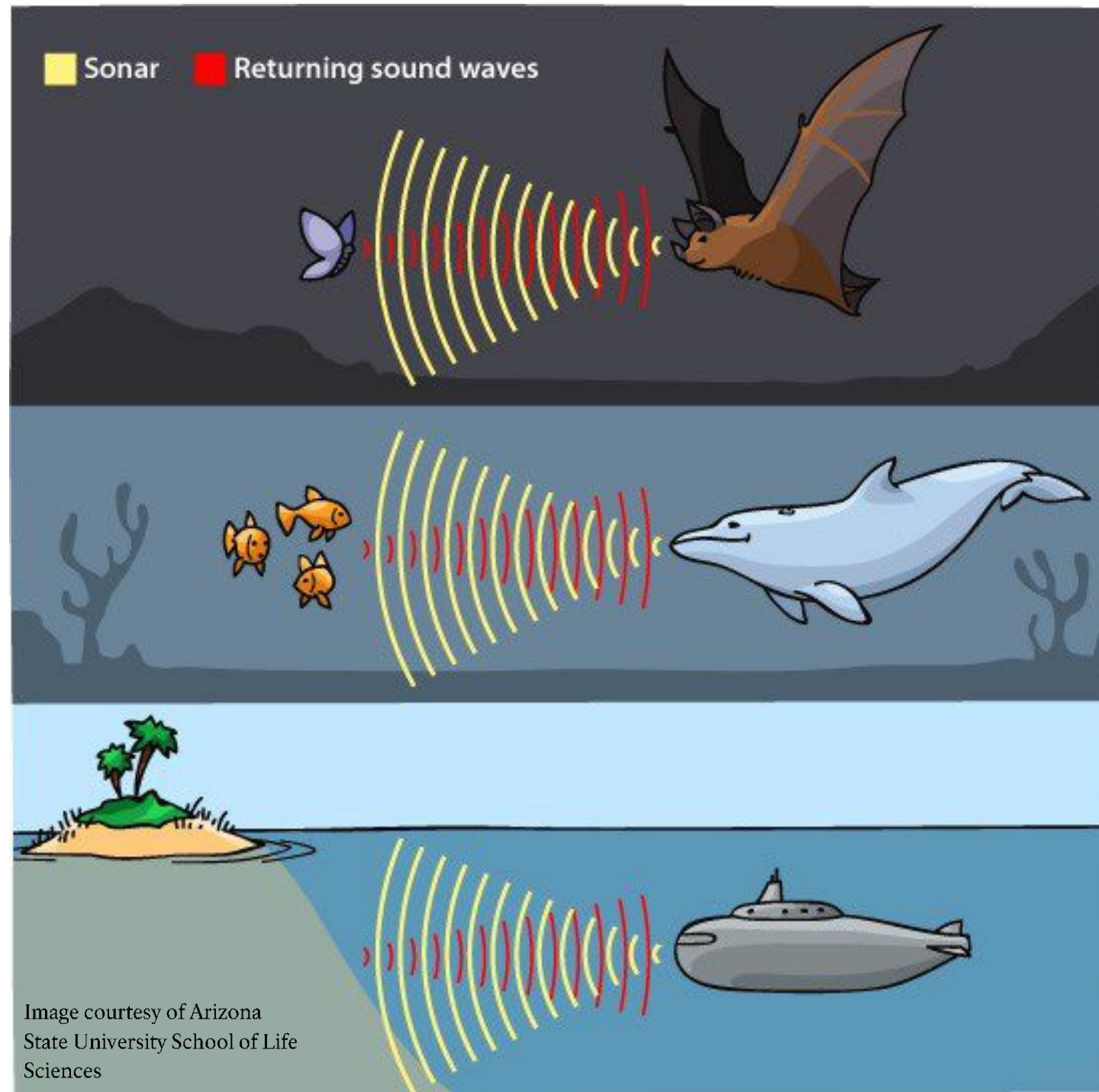


Image courtesy of Arizona State University School of Life Sciences

Bats help plants



“**Pollination** is a process that helps plants produce seeds that can grow into new plants. When a bug flies to a flower, it picks up pollen and moves it to another flower. Bats can do this, too. Over 500 plant species rely on bats to pollinate their flowers!”



Can you name other animals that also pollinate flowers?

Where are bats located?

It would be easiest to say where bats are not found! Bats do not live in the north or south pole regions. Bats can pretty much be found everywhere else, but some places have more bats than others. The map below indicates how many different types of bats are found in an area. Red areas have more types of bats than blue areas. Can you find South America on the map? Are there more bats living in South America or in North America? Why do you think some places have more types of bats than others?

