



Junior Bat Biologist



How to Become a Junior Bat Biologist

Bat biologists do research in Carlsbad Caverns National Park and around the world to learn more about bats. You can learn more about bats by completing this activity book and becoming a Junior Bat Biologist!



4–6 years old complete all pages with the **purple bat icon**



7–12 years old complete all pages with the **blue headlamp icon**



13+ years old complete all pages with the **brown clipboard icon**

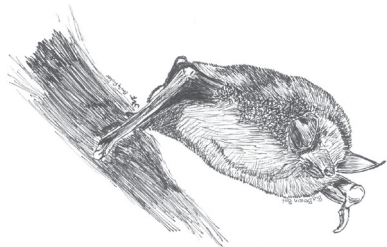
Check the boxes next to the activities as you work to keep track of how many activities you have completed. When you have completed the required pages, take your booklet to the information desk to receive your Junior Bat Biologist Badge and have your official certificate signed.

Activity

- | | | |
|--|--------------------------|--|
| | <input type="checkbox"/> | 1. Color a Bat Flight (<i>page 3</i>) |
| | <input type="checkbox"/> | 2. Seeing with Sound (<i>page 4</i>) |
| | <input type="checkbox"/> | 3. Thank You, Bats! (<i>page 5</i>) |
| | <input type="checkbox"/> | 4. Bats in the Kitchen (<i>page 6</i>) |
| | <input type="checkbox"/> | 5. Can You Find Our Pups? (<i>page 7</i>) |
| | <input type="checkbox"/> | 6. Interview a Ranger (<i>page 8</i>) |
| | <input type="checkbox"/> | 7. Take Me Home! (<i>page 9</i>) |
| | <input type="checkbox"/> | 8. Biologist Scramble (<i>page 10</i>) |
| | <input type="checkbox"/> | 9. Handwing (<i>page 11</i>) |
| | <input type="checkbox"/> | 10. Batty Poetry (<i>page 12</i>) |
| | <input type="checkbox"/> | 11. White-Nose Syndrome Crossword (<i>pages 13-14</i>) |
| | <input type="checkbox"/> | 12. A World of Bats (<i>pages 15-16</i>) |
| | <input type="checkbox"/> | 13. Is it a Bird or a Bat? (<i>page 17</i>) |
| | <input type="checkbox"/> | 14. Do Your Field Research (<i>page 18</i>) |

Bat Facts

Carlsbad Caverns National Park is home to 17 species of bats, each one unique and interesting. Read about a few of the species below. Ask a park ranger for more information on these (and other) bats found within the park!

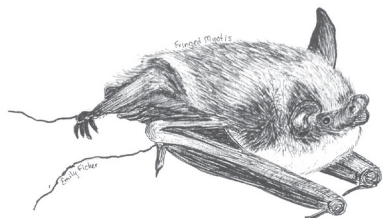


Big Brown Bats

An insect-eating bat, they have powerful jaws built to chew through the tough exoskeleton of beetles—their favorite food. Their heart rate can also increase from 490 beats per minute before flight to 1097 beats per minute in flight!

Eastern Red Bats

They will have between one to five pups when giving birth, with an average of three pups. When hibernating, these tree bats can be found in many places—including on the ground in leaf litter!

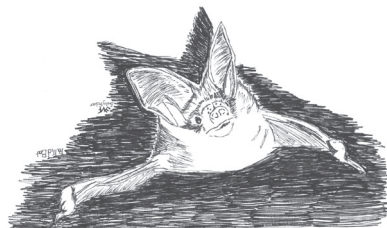


Fringed Myotis Bats

Named after the fringe on their tail membrane, they are one of three species of bats living in Carlsbad Cavern. They fly over 2 miles (4 km) just to exit the cavern every night!

Hoary Bats

They use camouflage to look like dead leaves as they roost in trees, and are one of the most widespread bat species in the Americas. In fact, due to their amazing and long flight abilities, they are the only bat native to Hawaii!



Pallid Bats

Their huge ears help them hunt. They fly close to the ground and listen for footsteps of their favorite food—scorpions!

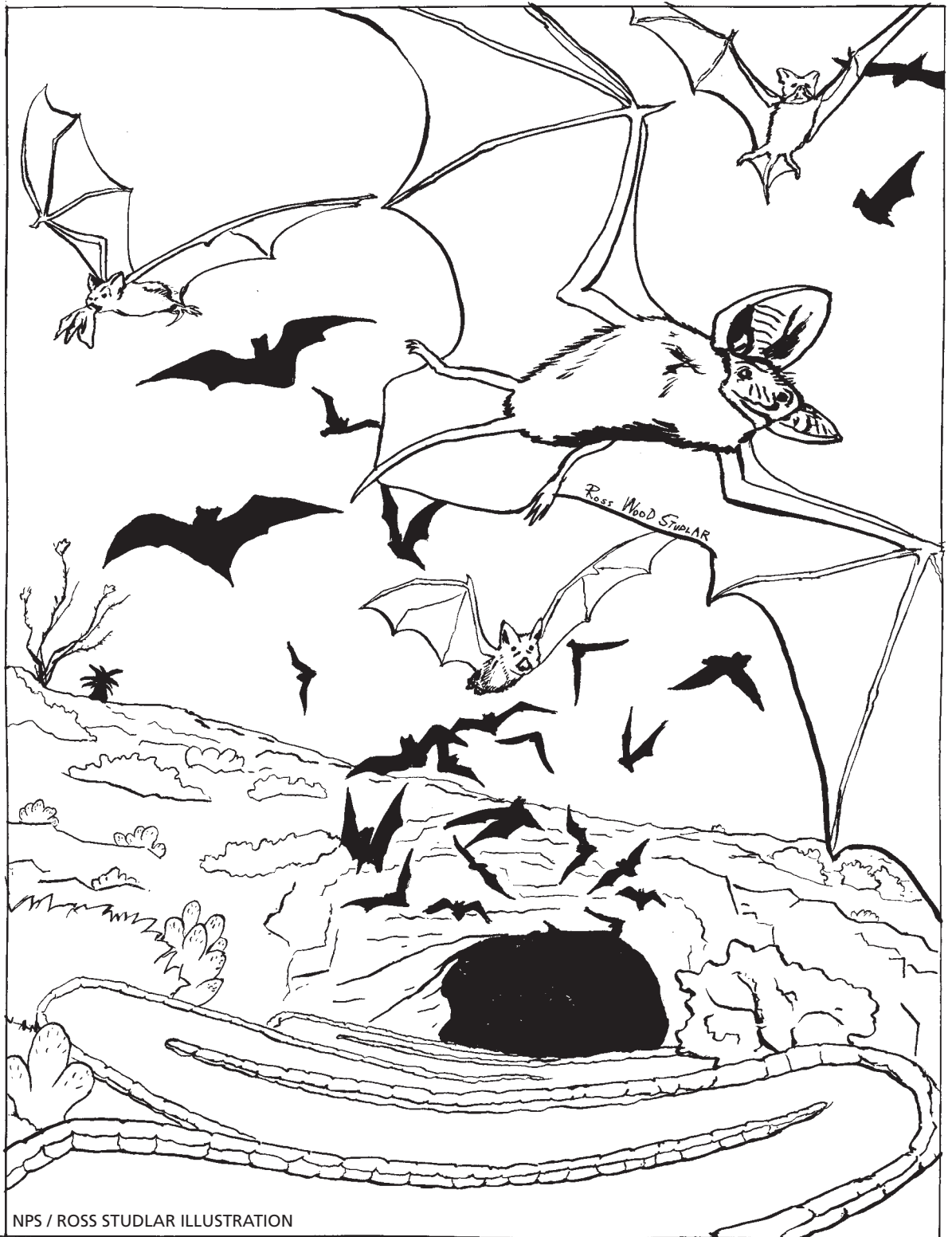
Pocketed Free-Tailed Bats

They live in very small colonies. They are named from a small fold of skin on the bottom of their tail membrane, which forms a tiny pocket!



Color a Bat Flight

Many species of bats call Carlsbad Caverns National Park their home. The most famous are the Brazilian Free-Tailed Bats that return to the cavern each summer to roost in a large colony of several hundred thousand bats. If you are visiting in the summer, ask a ranger when you can see the bats leave the cavern. Color the bat flight below.



NPS / ROSS STUPLAR ILLUSTRATION



Seeing with Sound

In the exhibit hall, between the doors leading to the Natural Entrance, is a short movie about bats' amazing ability to echolocate. Watch the movie and complete the questions below.

1. Bats' large ears and face wrinkles are believed to aid echolocation.

True or False

2. Bats are blind.

True or False

3. Why can't we hear bats echolocate? _____

4. How fast can a bat analyze echolocation data? _____

5. A large colony of bats can eat approximately how many pounds of insects a night?

A. 500 pounds

B. 2,000 pounds

C. 200,000 pounds

D. 1,000,000 pounds

6. What do we call technology that does the same thing as echolocation?

7. Fossils suggest bats have had the ability to echolocate for more than _____ million years.

8. Draw a picture of how echolocation works.



Thank You, Bats!

Bats provide numerous benefits to people. Brazilian Free-Tailed Bats, who find a home in Carlsbad Caverns National Park, eat insects that are crop pests. Other bats pollinate plants and some disperse seeds from the fruits they eat. Many of the foods we like to eat need bats to pollinate them or to disperse their seeds. Without bats, we would not have any of the foods shown below.

Look at the pictures. Circle the foods you like to eat!



Almonds



Peaches



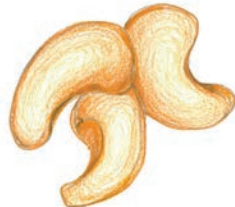
Chocolate



Cloves



Coconut



Cashews



Mangos



Figs



Black Pepper



Avocados



Bananas

Bats in the Kitchen

Bats play a crucial role in the life-cycle of the food we eat. Bats not only pollinate and disperse seeds, they also reduce the use of pesticides by eating common crop pests. Using the foods that benefit from bats (listed on this page and the *Thank You, Bats!* page), create your own smoothie recipe like the one below.

Recipe Title: MANGO BANANA SMOOTHIE

INGREDIENTS:

- 1 mango, peeled and chopped
- 1 banana, peeled
- 1 cup almond or cashew milk
- 1/4 cup chocolate chips (optional)
- 1/2 cup ice (optional)

DIRECTIONS:

Mix all ingredients in a blender until smooth.
Serve immediately and thank a bat!

Foods that Benefit from Insect-Eating Bats:

- | | |
|---------|------------|
| Pumpkin | Wheat |
| Garlic | Spinach |
| Basil | Corn |
| Ginger | Tomatoes |
| Oats | Pistachios |
| Rice | |

Foods that Benefit from Nectar and Fruit-Eating Bats:

- Dates
- Vanilla
- Allspice

Recipe Title: _____

INGREDIENTS:

DIRECTIONS:



Can You Find Our Pups?

Using scents, sounds, and location, a mother bat can find her baby out of hundreds of thousands of bats. Use sounds (and hairstyle) to help these two mothers find their babies! Circle the correct pups below.



Interview a Ranger

Ask a ranger the following questions about bats at Carlsbad Caverns National Park and current bat research in the park.

1. What species of bats live in Carlsbad Cavern? Where do they live in the cavern?

2. What is the difference between migrating and hibernating bats?

3. What is something new you have learned about bats while working here?

4. What bat research is ongoing at Carlsbad Caverns National Park?



Take Me Home!

When insect-eating bats leave their roost each night, they sometimes have to fly long distances to find food. Brazilian Free-Tailed Bats can travel up to 30 miles (48 km) away and eat half their body weight before returning home. That would be like an average adult eating 360 quarter-pound hamburgers every day!

Help the Brazilian Free-Tailed Bat get home to Carlsbad Cavern. Along the way, make sure the numbered moths she flies past equal 20 or more to keep her stomach full.



Biologist Scramble

Bat biologists study the lives of bats. Learning more about bats can be challenging since bats are nocturnal. It is hard to observe the behavior of animals that are only active at night, so bat biologists require special tools.

Unscramble the words below to learn what kinds of tools bat biologists use to study the mysterious lives of bats!

DLAEHPAM

This item helps bat biologists see in a dark cave and keep their hands free to work.

AETLREH LESOGV

This piece of equipment is made of strong fabric that protects the bat biologists' hands while they handle bats.

ITSM ENT

The incredibly fine mesh of this equipment is nearly invisible to us at night. It helps biologists catch bats as they fly by.

FRNIEDRA MACREA

This technology films the bats as they fly or roost in the cave by showing their body heat.

ABT ETODCRTE

This device helps bat biologists hear the high frequency calls bats make as they hunt.

If you were a bat biologist, which tool do you think would be the most valuable and why?

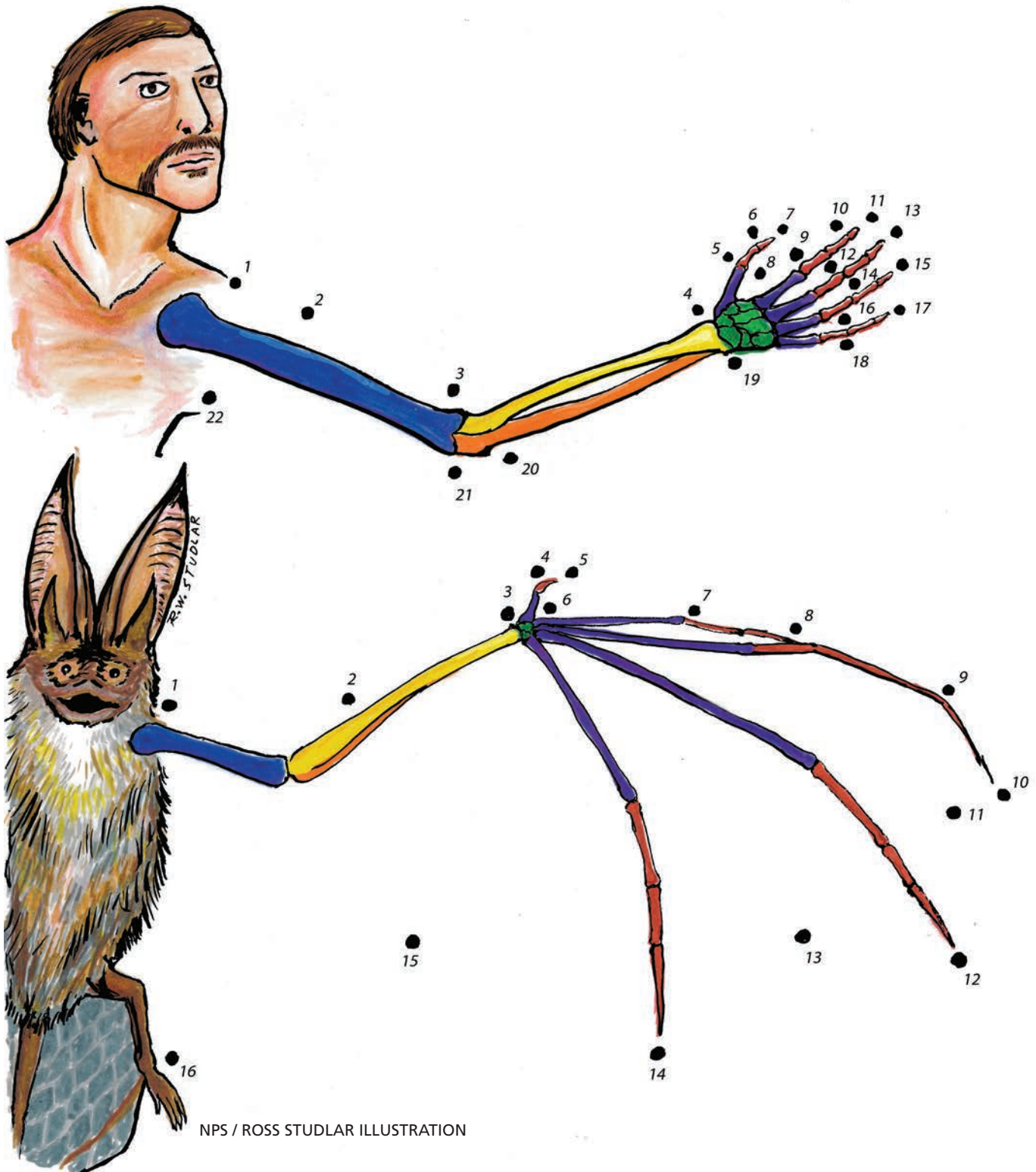
Name at least one more tool that you think would be helpful when studying bats.



Handwing

There are over 1,300 kinds of bats in the world. All of them are members of the order Chiroptera, which means “handwing.” Bats have the same bones in their wings that we have in our arms and hands. They are just arranged and shaped a little differently to allow bats to fly.

Connect the dots to compare the shape of a human arm and a bat wing.



Batty Poetry

Use the secret code to finish the bat poem.

If I could $\overline{14} \overline{25} \overline{3} \overline{11}$ inside this $\overline{26} \overline{23} \overline{8} \overline{11}$,
What a wonderful sight I'd see;
Brown $\overline{15} \overline{23} \overline{24} \overline{17}$ all hanging $\overline{19} \overline{7} \overline{17} \overline{25} \overline{3} \overline{11}$ down
Like dark leaves on a tree.

Their $\overline{21} \overline{22} \overline{19} \overline{24} \overline{14} \overline{17}$ wide open as they $\overline{6} \overline{5} \overline{18}$,
Shouting $\overline{17} \overline{22} \overline{19} \overline{16} \overline{3} \overline{17}$ as they go by;
The $\overline{11} \overline{26} \overline{14} \overline{22} \overline{11} \overline{17}$ bounce off rocks and things.
To help them $\overline{17} \overline{24} \overline{11} \overline{11} \overline{12}$ their hunter's $\overline{4} \overline{25} \overline{16} \overline{20} \overline{17}$.

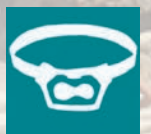
-Author Unknown

Secret Code

1-J	14-H
2-Q	15-B
3-D	16-N
4-W	17-S
5-L	18-Y
6-F	19-U
7-P	20-G
8-V	21-M
9-Z	22-O
10-X	23-A
11-E	24-T
12-R	25-I
13-K	26-C

Ages 13+

Write your own poem or sentence about bats using the secret code.



White-Nose Syndrome Crossword



Use the clues below to fill in the crossword about White-Nose Syndrome, a deadly fungus that has been affecting bats in North America since the winter of 2006–2007. *Ask a ranger if you need help with an answer.*

Across

1. White-Nose Syndrome (WNS) is a _____ that often grows on the noses and hairless parts of the bat, such as its wings.
2. The _____ name for WNS is *Pseudogymnoascus destructans*, although it is often referred to as Pd. by biologists.
3. The fungus grows in _____ environments, where the temperature is less than 60°F (15.5°C) and greater than 40°F (4°C).
4. Bats are affected by the fungus growth while they _____, during which a bat's heart rate, breathing rate, and immune system are lowered.
5. White-Nose Syndrome was first detected by biologists in Howe Caverns in _____ State when they noticed unusual bat activity in winter.
6. One of the _____ effects of the fungus is that bats wake up from hibernation and burn needed fat reserves.
7. White-Nose Syndrome has _____ quickly across the United States and into Canada since its initial discovery in New York, resulting in many cave closures.
8. Researchers have found conditions in _____ Cavern that could support the fungus.

Down

9. The fungus is not always visible on _____ bats. You should assume all caves in fungus-affected states are contaminated with the fungus.
10. Humans may spread the fungal spores by taking contaminated _____ from one cave into another cave.
11. You can help protect bats and their homes by not taking items into multiple _____ or mines without first decontaminating them.
12. When WNS arrives in a new cave system the _____ is often 97% of the total bat population; thus, millions of bats have died as a result of this disease.
13. You can find _____ procedures, as well as the latest information on research and the spread of WNS, at www.whitenosesyndrome.org.
14. You can help to protect bats by honoring cave _____ and other cave recreation regulations.
15. You can also help to protect bats by reporting _____ behavior you observe in bats, such as bats flying during the day, to your local natural resources agency.

A World of Bats

Bats are found in every continent, except Antarctica. Just like people, bats come in all sizes. The smallest bat in the world—a bumblebee bat—has a wingspan roughly the length of an adult index finger, from palm to fingertip. The largest bat in the world is the endangered golden crowned flying fox, which has a wingspan up to five feet and weighs as much as a chihuahua.

All ages

Draw a ● on the map where you are from.

Draw an ★ on the map for Carlsbad Caverns National Park.



Ages 13+



1. Bumblebee bats are only found in two locations: one in Myanmar and one in Thailand. Find and color both countries on the world map.



2. The golden crowned flying fox is part of a group of fruit-eating bats commonly called flying foxes. Draw a circle around the Philippines on the world map, the only country where the world's largest bat can be found.



Myanmar and Thailand



Philippines



3. Brazilian Free-Tailed Bats have a wide range. The dotted line represents the northern-most point where they can be found in the United States. Find and color the only four countries below the red line where Brazilian Free-Tailed Bats **cannot** be found.



Nicaragua

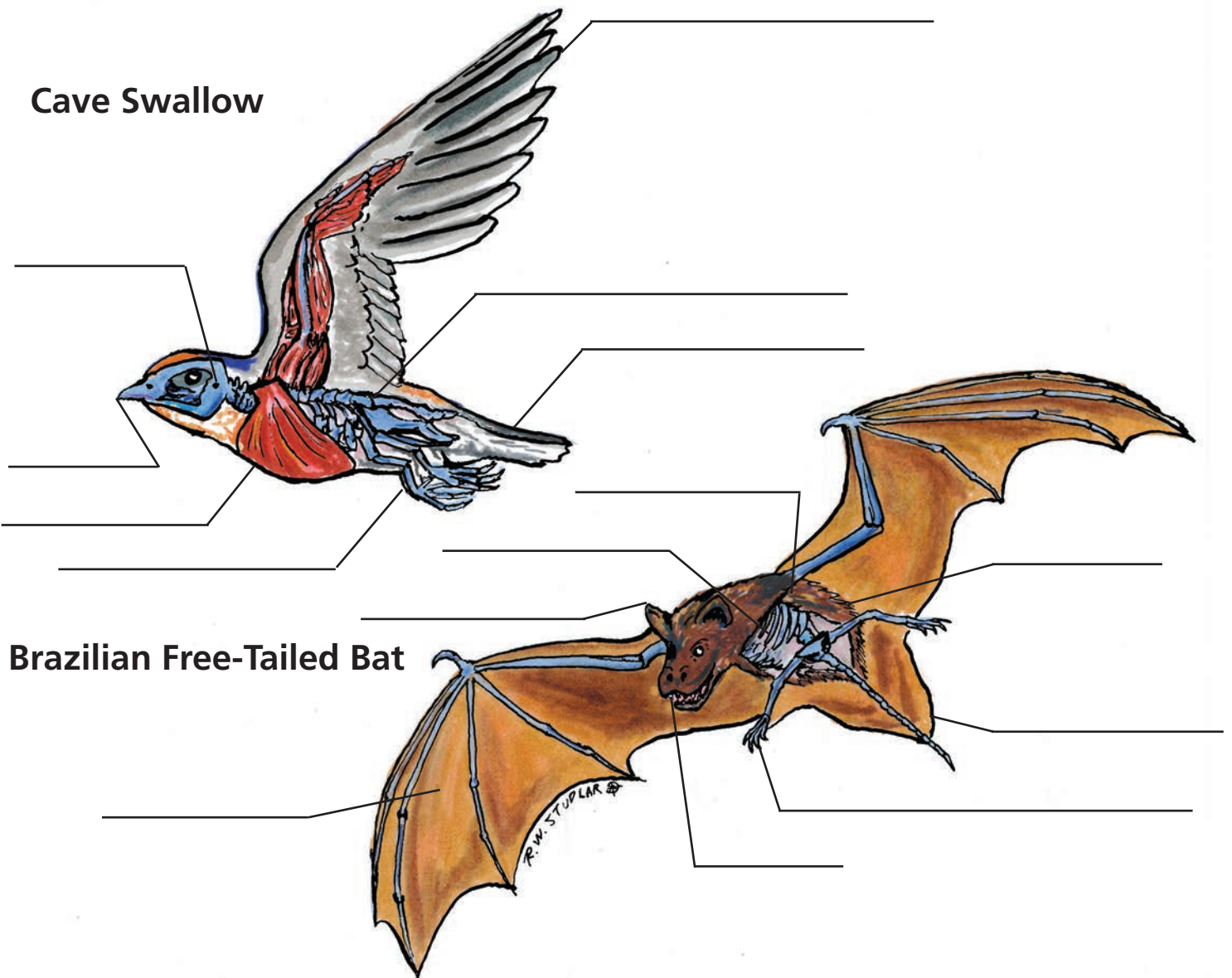


Guyana, Suriname, and French Guiana

Is it a Bird or a Bat?

Both birds and bats have the ability to sustain true flight, but they have evolved vastly different ways of accomplishing this feat.

Use the word bank at the bottom of the page to label the different traits of the cave swallow and the Brazilian Free-Tailed Bat.



Cave Swallow

Brazilian Free-Tailed Bat

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Word Bank



- Feathers
- Mammaries
- Legs designed for hanging
- Large flight muscles
- Legs designed for standing
- Tail membrane
- Teeth
- Hollow bones
- Internal ears
- Wing membrane
- Solid bones
- Beak
- Fur
- Tail feathers
- External ears

Do Your Field Research

If you are visiting Carlsbad Cavern in the summer, attend a Bat Flight Program. Ask at the information desk for the program time. As you wait for the bats' nightly exodus, answer the questions below.

If you are visiting in the off-season, you can ask a ranger the questions below.

1. Why are electronics not allowed during bat flight?

2. What time of year do Brazilian Free-Tailed Bats live in Carlsbad Cavern?

3. How much does a Brazilian Free-Tailed Bat weigh?

4. How do mother bats find their pups in the roost?

5. What do Brazilian Free-Tailed Bats prefer to eat and why?

After learning about the bats of Carlsbad Caverns National Park, what is one question you still have about bats?

Design a way to study the bats and learn the answer to your question.



Certificate of Achievement

_____ has officially completed the requirements of the
Junior Bat Biologist Program and is hereby proclaimed an official

Carlsbad Caverns National Park Junior Bat Biologist



_____ Park Ranger

_____ Date