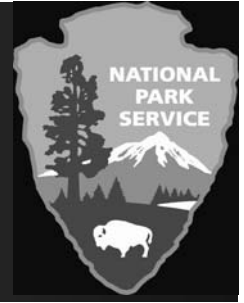


# Up, Up and Away

Rangers in the Classroom—Presentation Lesson Plan



**Grade Level(s):** K—2nd

**Setting:** Classroom

**Duration:** 1 hour

**Standards Addressed:**

Kindergarten

° Science—Life Science:

2.a., 2.b., 2.c.

° Reading:

1.3

° Reading Comprehension:

2.5

First Grade

° Science—Life Science:

2.a., 2.c., 2.d.

° Reading Comprehension:

2.2

° Literary Response & Analysis:

3.1

° Listening and Speaking:

1.1

Second Grade:

° Science—Earth Science:

1.g.

° Science—Life Science:

2.a.

° Reading Comprehension:

2.5

° Literary Response & Analysis:

3.2

° Listening and Speaking:

1.3

**Vocabulary:**

bat, bird, echo, echolocation, hibernate insectivore, mammal, migrate, nocturnal, predator, prey, senses, species

**Introduction:**

Welcome to the Rangers in the Classroom—Up, Up and Away presentation. This program introduces students to the unique, yet often misunderstood life of bats through a comparison with birds. It provides a framework for understanding the beneficial role bats play in our lives and helps dispel some of the myths surrounding these aerodynamic creatures of the night.

**Objective:**

After completing this program, kindergarten, first and second grade students will be able to:

1. List 3 differences between bats and birds.
2. List 3 similarities between bats and birds.
3. Explain echolocation and how bats use it to find food.

**Materials:**

- Book *Stellaluna* by Janell Cannon
- Projector
- Echolocation video
- Extension cord
- Brown bat puppet
- Bat finger puppets
- Acorn Woodpecker and family puppets
- Bat skulls (2)
- Bat skeleton
- Laminated handout of bat wings
- Beach ball
- Park Maps and Student fee waivers



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## Presentation:

### Introduction

Bats...what do you think of when you hear that word? There are many stories or myths about bats. They are unique, gentle creatures. Bats are mammals just like us except they are the only mammals that can fly. There are more than 1,000 different kinds of bats. They live all around the world except in the coldest and hottest places on the planet. Only one bat actually lives on blood, the Vampire Bat. All other bats eat either insects (about 70% of bat species) or fruit (30%).

In Sequoia and Kings Canyon and in the Central Valley, bats are the primary hunters of night flying insects. When night falls and the insects come out, it is dinner time for bats. One bat can eat about 600 insects in an hour or about 3,000 in a night of hunting. Today, we will learn more about these night-time fliers and we will compare them to birds. We will discuss how bats and birds are the same and how they are different. Let's start our adventure into the fascinating world of bats with a story.

Read *Stellaluna* by Janell Cannon aloud to the class (10 minutes).

### I. Questions about the story, *Stellaluna*.

- A. Describe what happened in the beginning of the story.
- B. Describe what happened in the middle of the story.
- C. Describe what happened at the end of the story.
- D. How was Stellaluna the same as her bird friends?
- E. How was Stellaluna different from her bird friends?
- F. How was Stellaluna's bat family the same as her bird family?
- G. How was Stellaluna's bat family different from her bird family?
- H. How did Stellaluna adapt to live with her new family of birds?
- I. In the end, Stellaluna and her bird friends figured out they were different. How did this make them feel about one another?
- J. If you could make the story longer, describe what might happen to Stellaluna and her friends. (e.g. When would they see each other? How would they spend their time together?)
- K. Can you predict what might happen to Stellaluna after the end of the story?

### II. Bird v. bat movement activity.

#### Directions:

1. Have the students stand up with a little space between for moving their arms.
2. Demonstrate the difference between how a birds flaps its wings and how a bat flaps its wings.
3. Ask the students the following questions about *Stellaluna* and have them flap their arms in response as if they were a bird or a bat.
  - a. I hatch out of an egg.
  - b. My mom fed me bugs to eat.
  - c. I sleep hanging upside down.
  - d. I can fly in dark.
  - e. My wings are covered with feathers.
  - f. I live in a nest.
  - g. I could not land gracefully on the branch.
  - h. I eat fruit.

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## III. Compare bats and birds.

### A. Baby birds v. baby bats

1. How many baby birds were in our story, *Stellaluna*? Three—use acorn woodpecker puppets to demonstrate.
  - a. Baby birds hatch from eggs.
  - b. Birds usually have a clutch with two or more eggs.
2. How many baby bats were in our story, *Stellaluna*? One—use large bat puppet and bat finger puppet for demonstration.
  - a. Baby bats are born alive, just like humans and other mammals.
  - b. Bats, like humans, usually have just one baby, but may occasionally produce twins.
  - c. Bats are one of the slowest reproducing mammals on earth for their size, most producing only one young annually.

### B. Food for baby bird v. food for baby bat

1. What does the mama bird feed her babies and how does she feed them in our story, *Stellaluna*? Bugs from her mouth.
  - a. Before baby birds can fly, mama bird brings food back to the nest.
  - b. Birds will eat the same thing their entire lives.
2. This was not in the story, but what does the mama bat feed her baby? Milk.
  - a. Baby bats, like human babies, drink their mother's milk.
  - b. Bats will change to their adult diet of insects or fruit once they can fly.
3. Are humans more like bats or birds when it comes to how and what we eat as babies?

### C. Care of babies

1. In our story, *Stellaluna*, the mama bat carried Stellaluna with her when she went out to feed.
  - a. Why do you think she did this? Protect her. Teach her to find food. etc.
2. Once bats deliver their babies, they often place them together with other baby bats in a nurse colony while they are out hunting (like daycare for working parents).
  - a. The colony is a safe place where the babies are close together, which helps them stay warm.
  - b. A mother can return to the colony and find her baby by knowing the baby's smell and voice, just like how Stellaluna's mom found her in the story.

### D. Bird nest v. bat cave

1. Where did the mama and baby birds live and sleep in our story, *Stellaluna*? Nest.
  - a. Many kinds of birds make a home in a nest.
  - b. Other types of birds live in caves, cracks in the rocks, buildings etc.
2. This was not in our story, but where do you think bats live?
  - a. Bats can be found living in almost any type of shelter: trees, bridges, barns, abandoned buildings, mines, churches, attics, basements, though they are best known for living in caves.
    1. Resting in high places keeps bats safe from predators.
  - b. Their home is called a roost.
  - c. Bats sleep by hanging upside down from their strong feet.
    1. Show picture of sleeping bat and ask students if they could hang up side down from their feet.

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2. Hanging upside down allows them to fly away quickly as most bats cannot take off in flight from the ground.
  3. Wrap their wings around themselves to stay warm.
- E. Bird bodies v. bat bodies.
1. What are bird bodies covered with? Feathers.
  2. Bats bodies covered in fur to help keep the bat warm.
    - a. Fur is of different colors and designs to act as camouflage.
    - b. Fur is kept clean, by licking like a cat.
    - c. Bats, like humans have arms, hands and feet.
- F. Bird wings v. bat wings.
1. What are bird wings covered with? Feathers.
    - a. Bird wings are connected to the bird body at the shoulder.
      1. Demonstrate with acorn woodpecker puppet.
      - b. Bird wings are fairly rigid.
  2. Bat wings
    - a. Consist of bones similar to the bones in the human arm and hand.
    - b. Show similarity by comparing fingers in puppet or bat skeleton to human arm and fingers.
      1. Have the students extent their arms with thumbs up to demonstrate how bat wings are just like human hands, but with longer fingers.
      2. The scientific order of bats, chiroptera, is Greek for "handwing."
    - c. The long fingers are covered with a double layer of this skin called a membrane.
      1. It is so thin you can see light through it.
      2. It is strong and really soft—like your eyelids.
    - d. Bat wings are connected down the entire body to the feet.
      1. Pass out bat finger puppets to illustrate difference between how bat wings are attached v. how bird wings are attached.
    - e. The flexible bat wing provides for amazing maneuverability to catch insects mid-flight.
    - f. Bats also use their wings to scoop insects into their mouths as they fly.
- G. Bird diet v. bat diet
1. What kind of mouth does a bird have? Beak (refer to pictures in *Stellaluna*).
    - a. The shape of bird beaks varies depending on the birds diet.
      1. Insect-eating birds have pointed beaks.
      2. Seed and nut eating birds have shorter, blunt beaks.
  2. Bats have mouths filled with teeth just like people.
    - a. The shape of the teeth depends on what the bats eat.
      1. Insect-eating bats called insectivores have sharp, pointy teeth for piercing and eating insects.
      2. Fruit-eating bats have flat teeth for mashing and grinding food.
    - b. Ask students to feel their teeth with their tongues. What do they feel? Are their teeth more like insect or fruit eating bats?
- H. Bats are divided into two distinct types based on what they eat and how they find food.
1. Megabats
    - a. Stellaluna was this kind of bat.

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- b. Large herbivores that eat fruit, flowers, nectar or pollen.
  - c. Most live in warm, tropical places.
  - d. Have tiny ears, since they rely more on their eye and nose to find food.
2. Microbats
- a. Small carnivorous bats that eat mosquitoes, moths, beetles, scorpions, lizards and even frogs, fish or other birds.
  - b. Live all over the world, but hibernate or migrate during the winter months.
  - c. Smaller eyes than megabats.
  - d. Some eat about half their weight in insects each night.
    - 1. If you weighed 60 pounds, that would be like eating 125 pb&j sandwiches every night.
  - e. Sing the Bats Eat Bugs Song (3—5 minutes)

Directions:

1. Have the students stand up.
2. Sing the song once through showing the students the hand gestures for each line.
3. Have the students sing along twice through the song.

Song: Bats Eat Bugs

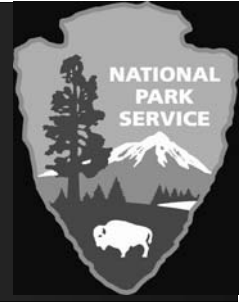
*Bats eat bugs, they don't eat people  
Bats eat bugs, they don't fly in your hair  
Bats eat bugs, they eat insects for dinner  
That's why they're flying up there*

Repeat

- I. Bats in Sequoia and Kings Canyon
1. Of the 47 bat species found within the United States, 18 live in the parks.
    - a. Due in large part to the diversity of habitat and 200+ caves found within the parks.
  2. Some bats hibernate during the winter in one of the many caves.
  3. Some species migrate out of state and some just migrate to lower (warmer) elevations.
  4. Only have insect-eating bats here.
    - a. All insect-eating bats have a special adaptations for hunting insects in the dark.
- J. Special senses for flying and hunting at night
1. Bats are **nocturnal**, which means they hunt at night.
    - a. Avoids daytime predators.
    - b. Take advantage of all the bugs that come out at night.
  2. Eyesight
    - a. Contrary to popular belief, bats are not blind
    - b. Have very acute eyesight
    - c. Insect-eating bats also use their special sense of echolocation to help them hunt and navigate in the dark
  3. Sense of Smell
    - a. Sense of smell is well developed in most bats.

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1. Refer to *Stellaluna* and how mother bat followed the scent of ripe fruit.
  - b. Used to find and identify certain foods and to recognize roost mates and young.
4. Hearing and Echolocation.
- a. Play Echolocation Video Clip (3 minutes)
  - b. Bats use echolocation to find food and to navigate in the dark
    1. Send out high pitched sound waves like “peeps” similar to a waves across the surface of a lake
    2. Sound is emitted from mouth or nose in some species
      - a. Emitting sound from nose allows fruit bats to navigate and carry food in their mouth at the same time (e.g. Leaf-nosed bats of South and Central America).
  - c. When the sound wave hits an object, it bounces an echo back to the bat
  - d. Echolocation Demonstration

## Directions:

1. Ask for two or three student volunteers to act as mosquitoes.
  2. Have the students stand up about 4 or 5 feet away from you.
  3. Explain to the student that you will be sending out a “peep” represented by the ball.
  4. The student is to return the “peep”/ball to you immediately after they get it.
  5. Gently toss the ball to the student and remind them to send it right back.
  6. Discuss how quickly this process happens with the bat “peeps.”
- e. The time it takes the echo to return gives the bat distance to prey
    1. Echo gives the bat lots of information about its prey: its location, size, speed and direction of travel—almost like a mental picture of where the prey is and what it’s doing.
  - f. The echo is very sensitive, it sounds different when it bounces off a tree or versus off of a mosquito.
  - g. These pulses of sound last for only a few thousandths of a second.
    1. Bats emit around 10—15 pulses per second.
    2. The silences between the pulses allow them to listen in to the echo information coming back.
  - h. Bats have very acute hearing to pick up these pulses.
    1. Some bats have hearing so keen then can hear the footsteps of an insect walking in sand from six feet away.

## Bat and Moth Echolocation Activity [10 minutes]

1. Line the students up to go outside (weather permitting).
2. Arrange the students in a large circle.
3. Have them sit cross-legged on the ground.
4. Quickly review how bats uses sound waves/“peeps” and echoes to fly and hunt in the dark.
5. Ask one student to be the bat and another student to be the moth.
6. The remaining students will be the trees in the forest.

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7. Have the students trees stand still with their arms pressed to their sides.
8. Cover the bat's eyes with a bandana to simulate how a bat uses echolocation to pinpoint its prey. \*\*Remind the students that bats really aren't blind. The eyes are covered just to focus on echolocation and not sight.
9. Ask the student "trees" to remain quiet or they will disrupt the echolocation of the bat.
10. Lead the blindfolded bat and the moth to the center of the circle.
11. The moth and the bat will both move around the circle.
12. The goal is for the bat to find the moth using echolocation.
13. Have the bat call out, "MOTH?"
14. The moth is to reply, "HERE!" or to clap their hands in response.
15. The bat must listen closely for the moth's response in order to find it. The bat can call out as many times as necessary to find the moth.
16. If the bat gets close to a tree, the student should whisper, "TREE."
17. Once the moth has been captured, it becomes a tree and a new student should rotate in to play the moth.
18. Continue for one minute and total the number of moths that bat found.
19. In the next and following rounds, increase the number of moths and/or the number of bats.
20. At the end, ask the students if it was harder to find dinner when there was only one moth or many moths.
21. Was it harder to find dinner when there were more bats?
22. Wrap up the game and lead the students back to the classroom.

## Conclusion:

Bats...everyone has a reaction to bats. Now that you have had a glimpse into the world of bats with our friend, Stellaluna, how do you feel about bats? Are you interested in learning more about these unique and complex creatures? Bats play a very important role in controlling the insect populations. Next time you see a bat flying around at night, remember that it is eating lots of mosquitoes! We hope that you will share what learned today with your family about these strange looking, but amazing creatures.

Pass out park passes and encourage students to come to the park.

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## Vocabulary:

**Bat**—noun—any of numerous flying mammals having modified forelimbs that serve as wings. The wings are covered with skin and extend to the hind limbs.

**Bird**—noun—warm blooded, egg laying characterized by feathers and modified forelimbs used as wings.

**Echo**—noun—a repetition of a sound produced by the reflection of the sound waves off another surface.

**Echolocation**—noun—the sonar-like system used by bats to detect and locate objects by emitting usually high-pitched sounds that reflect off the object and return to the animal's ears. Location is determined by measuring the time it takes for an echo to return and the direction from which it returns.

**Hibernate**—verb—to pass the winter in an inactive or dormant state.

**Insectivore**—noun—any of the various small insect-eating mainly nocturnal mammals.

**Mammal**—noun—any warm-blooded vertebrate having the skin more or less covered with hair, young are born alive (except for the small subclass) and nourished with milk.

**Migrate**—verb—to pass periodically from one region or climate to another, as certain birds, fishes and animals.

**Nocturnal**—adjective—most active during darkness.

**Predator**—noun—an animal that kills other animals for food.

**Prey**—noun—an animal that is eaten by other animals.

**Senses**—noun—any of the faculties, as sight, hearing, smell, taste, or touch, by which humans and animals perceive stimuli originating from outside or inside the body.

**Species**—noun—basic category of biological classification, composed of related individuals that resemble one another, are able to breed among themselves, but are not able to breed with members of another species.

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