Photo by Larry Thompson.

That's a Humdinger!

Black-Chinned Hummingbird Nesting in Response to Forest Treatments

Meet the Scientists!

Mr. Max Smith, wildlife biologist: My favorite science experience is going outside to discover where birds nest, what they eat, and what eats them. In the photo, I am bird-watching with my dog near Seattle, Washington.

Dr. Deborah Finch, biologist: My favorite science experience is monitoring bird nests. I especially enjoy watching the adult birds build nests in trees and shrubs. I also like observing the nestlings grow and finally pop out from the nests and flutter to the ground.

What Kind of Scientist Did This Research?

biologist: This scientist studies living organisms and living systems.

wildlife biologist: This scientist studies animals living in the wild, including what they eat, their habitat, and how they interact with their environment.

Thinking about Science

Observation is an important skill for a scientist. Observation is the ability to watch something closely to gain information and details. In this study, the scientists frequently used their observation skills. The scientists observed hummingbirds and their nests over a 7-year period.

Sometimes it was difficult for the scientists to see the whole nest. When the scientists could not see the nest, they made other observations to tell if the nest was doing well. For example, the scientists watched to see if birds were coming and going. The scientists also had several different people observe the nests to gather more data.

The data the scientists gathered from these observations helped them to better understand hummingbirds and their nesting behavior. The next time you are outside, take 5 minutes to observe your surroundings. Write down three things that you noticed while you were observing that you never noticed before. Share your observations with your classmates.

Thinking About the Environment

Riparian (rə **per** ē ən) forests are found along streams, rivers, and other waterways **(figure 1)**. These forests are a **transition** area between water and upland areas **(figure 2)**. Riparian forests are important because they help with flood control, water quality, and wildlife **habitat**.

Forests help with flood control because a forest is like a sponge. Forests store water during floods just like a sponge stores water when you are washing dishes. Forests also help stop **erosion** along the banks of a river. The roots of trees and other plants help hold soil in place. These roots also help improve water quality by keeping extra soil, **sediment**, and pollution from getting into the water.

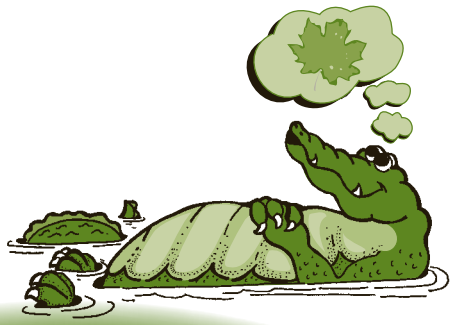


Figure 1. A riparian forest is **productive** because it is close to water. High soil quality in a riparian forest also makes the forest productive. Photo courtesy of Gila National Forest.

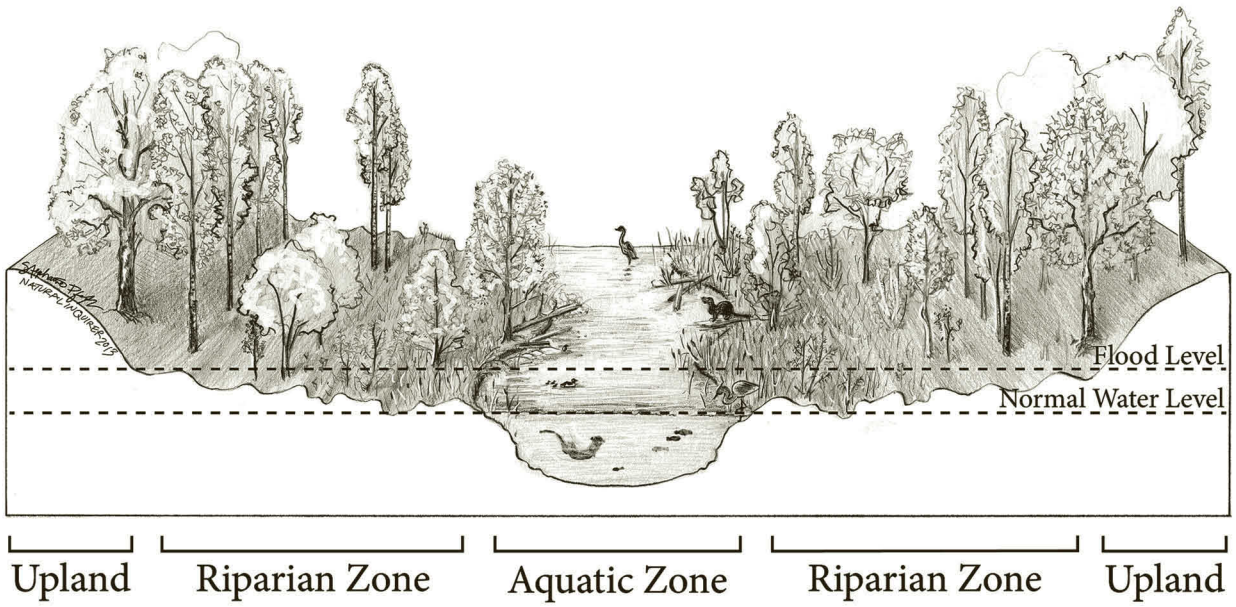


Figure 2. The plants found in riparian areas often have characteristics of both the aquatic ecosystem and the upland areas because they are in this transition zone. Aquatic means that something is growing or living in or upon water. Illustration by Stephanie Pfeiffer.

Riparian forests are also excellent habitats for wildlife. Forests provide food and shelter for many animals. These forests, for example, help shade waterways. The shade keeps the water cool and improves the aquatic habitat for certain animals. Trees and shrubs in the forests are also used as habitats by a variety of land animals. The scientists in this study were interested in the black-chinned hummingbird that makes its home in riparian forests **(figure 3)**.

Figure 3. A black-chinned hummingbird and its nest. Photo courtesy of Thinkstock.com.

Introduction

Many different types of birds live in riparian forests. In this study, the scientists were interested in black-chinned hummingbirds that live in riparian forests **(figure 4)**. The scientists wanted to know if black-chinned hummingbirds were being affected by human changes to the forest.

Figure 4. The black-chinned hummingbird has a purple band on its neck. This is a male hummingbird. To see this photo in color, visit http://www.scienceinvestigator.org.
Photo courtesy of Deborah Finch.

Did You Know?

All hummingbirds, including black-chinned hummingbirds, lay only two eggs at a time. Look at figure 3. How many baby hummingbirds do you see? Black-chinned hummingbird eggs are about the size of a coffee bean. The adults create nests that expand as the nestlings grow because the birds make their nests using spider silk and cocoon fiber. To find out more about black-chinned hummingbirds, visit http://www.allaboutbirds.org/guide/black-chinned_hummingbird/lifehistory.

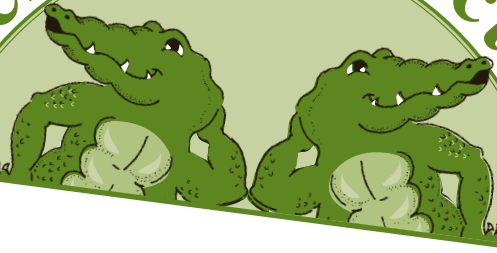
Number Crunch

Get 10 whole coffee beans. Measure and record the length of each bean. Calculate the average length of the 10 coffee beans. What would you say, on average, is the length of a black-chinned hummingbird egg?

Humans make changes to forests for a variety of different reasons. These changes are called forest management. Sometimes forests are managed to reduce the risk of **wildfire**. When forests are managed to reduce the risk of wildfire, several treatments may be done. One of the treatments to reduce the risk of wildfire is to remove small trees and shrubs. Extra **litter** and **debris** may also be removed. The scientists in this study examined this management method to see if it had an effect on hummingbirds.

Forests are also managed to reduce the amount of **invasive** species. Invasive species include plants, animals, or organisms that are not **native** to where they live. Invasive species may cause harm to the environment, the **economy**, or human health. In this study, the scientists used **herbicides** to get rid of the invasive plants in the forest. The scientists also studied this method of management to see if it had an effect on hummingbirds.

Reflection Section



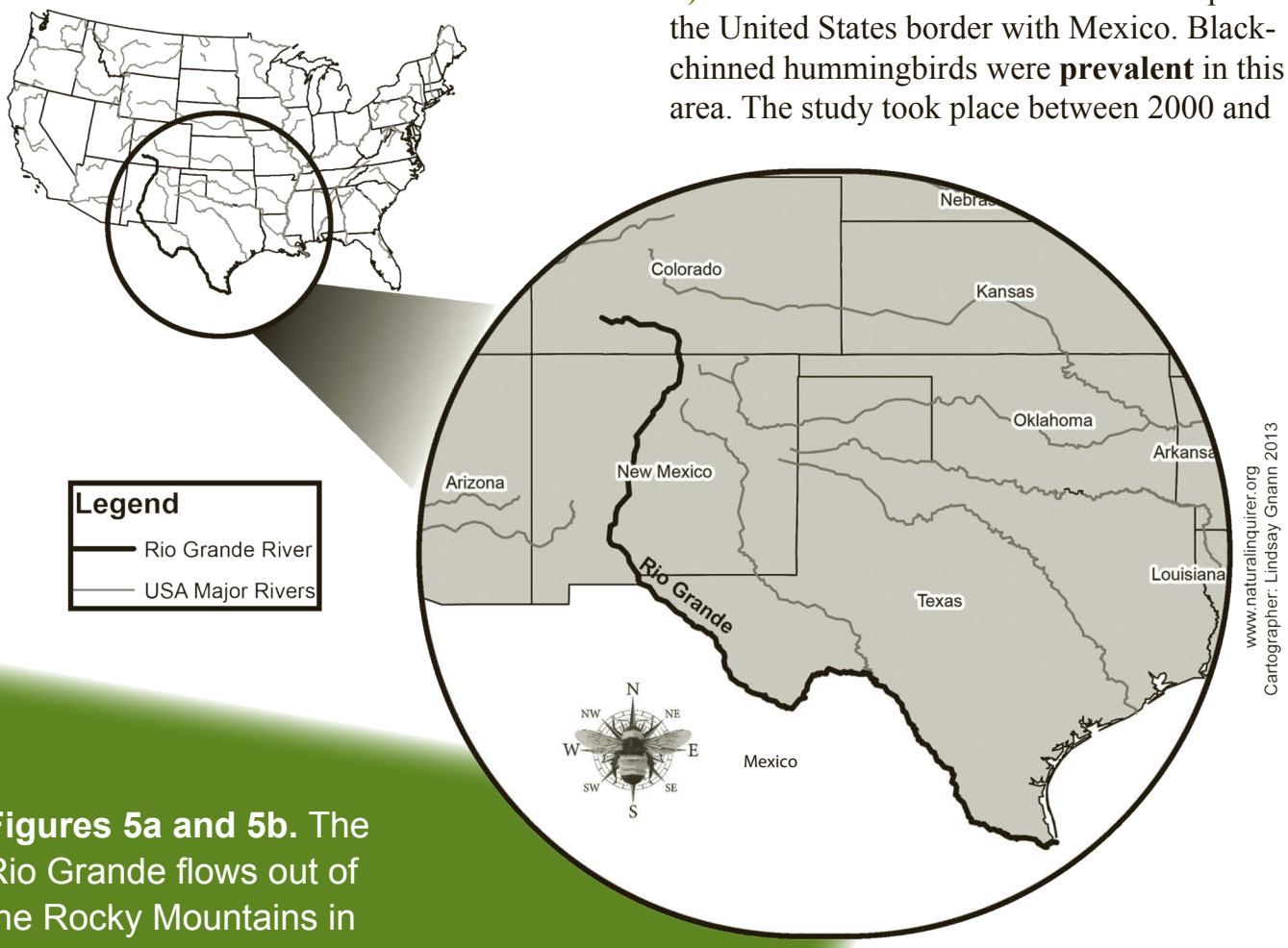
- What did the scientists want to find out in this study?
- Why do you think removing small trees, shrubs, and extra litter may help reduce the risk of wildfire?

Photo courtesy of Gila National Forest.

Methods

The scientists wanted to figure out if forest management methods affected black-chinned hummingbird nesting. To figure this out, the scientists examined three things. First, they looked at where in the forests the hummingbirds nested. This included identifying what species of trees and how high off of the ground the birds nested. The scientists studied how these areas changed following treatment. Then, the scientists looked at whether the nests survived.

The scientists did their study in central New Mexico along the Rio Grande **(figures 5a and b)**. The Rio Grande is a river that forms part of the United States border with Mexico. Black-chinned hummingbirds were **prevalent** in this area. The study took place between 2000 and



Figures 5a and 5b. The Rio Grande flows out of the Rocky Mountains in Colorado to the Gulf of Mexico.
Photo by Chuck Murphy and http://www.boywithcamera.com.

2007. The scientists identified three land areas that they called blocks along the northern, middle, and southern **reaches** of the Rio Grande.

Each block was divided into four plots **(figure 6)**. In each set of four plots, one plot was **randomly** selected as a **control** plot. The control plots were areas that the scientists did not treat. The scientists compared the control plot to the other plots. This comparison enabled the scientists to learn whether the treatments or something else were affecting hummingbird nests. The other three plots were treated in three different ways.

In one plot, invasive shrubs and woody debris were cut down and chipped. Herbicide was then applied twice to the remaining roots of the invasive shrubs. In the second plot, the scientists repeated the first treatment. Then they planted native shrubs in the areas where they cut down the invasive shrubs. In the third plot, the invasive shrubs were cut, piled, and burned. Afterwards, herbicide was twice applied to the remaining roots of the plants that had been cut **(figure 7)**.

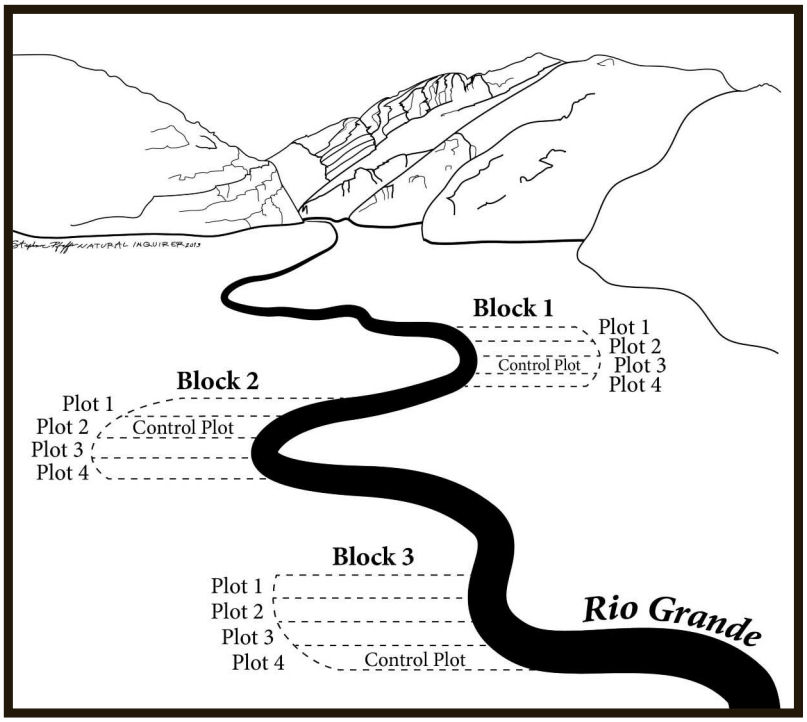


Figure 6. Each block was divided into four plots. Illustration by Stephanie Pfeiffer.

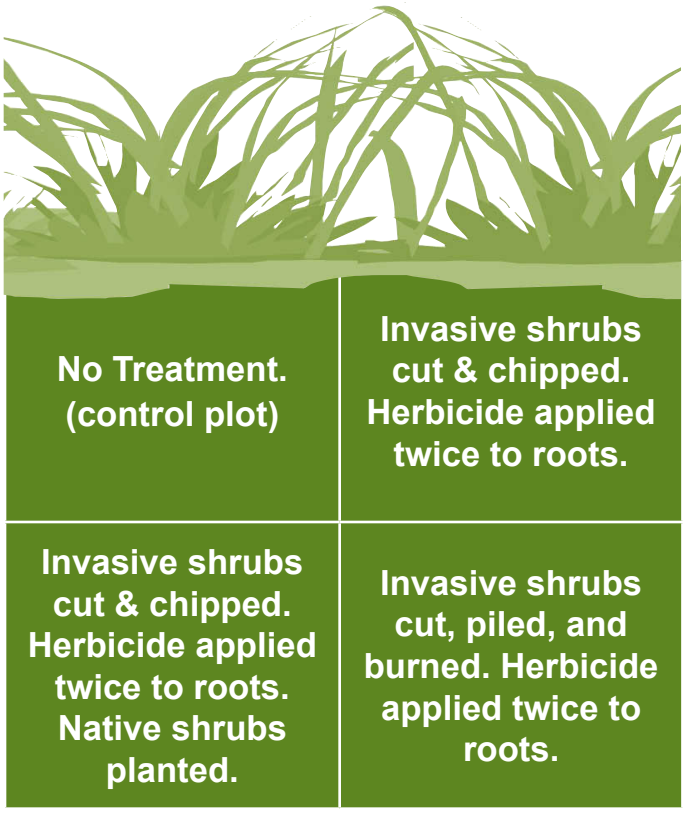
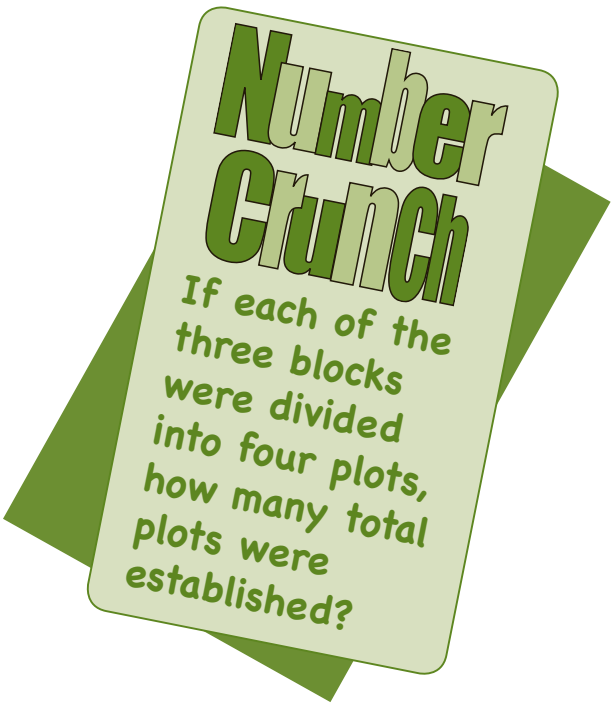


Figure 7. The four treatments applied in the plots.



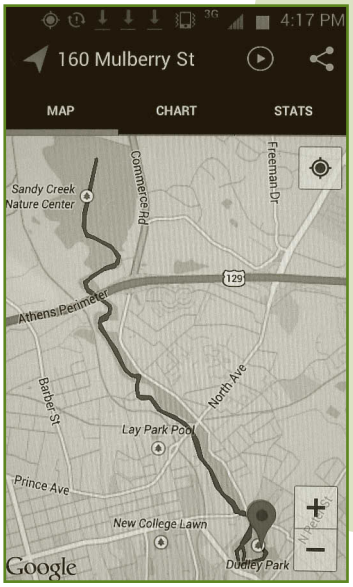
What is chipping?

Big machines are used to turn trees and shrubs into small chips **(figure 8)**. These chips are often used as a ground cover or are placed around trees to help hold moisture in the ground.

Figure 8. Large chipping machines turn large trees into small chips of wood. Photo courtesy of the U.S. Forest Service.

The scientists **monitored** all plots for the presence of black-chinned hummingbird nests and birds. The scientists monitored the areas between the beginning of May and the end of August each year. The location of each nest was recorded with a Global Positioning System (GPS) unit. The scientists also measured the height of the nest from ground level. They visited each nest every 3 to 5 days to make observations until nesting was complete. When possible, the scientists looked into the nests to see if the two eggs, and later the two tiny nestlings, were still in the nest. Nestlings are young birds that have not yet left the nest.

Once the nesting was complete, the scientists did two things. The scientists first measured and recorded the height of the tree or shrub. Then the scientists identified and recorded the condition (alive or dead) of the tree or shrub in which the nest was located.



What is GPS?

A GPS is a navigation system. GPS stands for Global Positioning System. A GPS can tell the exact **coordinates** of where you are located on Earth. A GPS works by using satellites orbiting Earth to send information to GPS receivers. At any time, at least three satellites are able to send signals to any receiver on Earth. GPS was designed in 1973 by the United States military. The military designed GPS to help soldiers and military vehicles find their exact location anywhere in the world. Today, GPS units are used in a wide variety of ways. Often, cell phones have GPS receivers and you may even have a GPS device in your car that tells you directions!

Why do you think the scientists monitored hummingbird nesting sometime between the beginning of May and the end of August every year?

Why do you think the scientists visited the nests every 3 to 5 days until nesting was complete?

Findings

The scientists found that black-chinned hummingbirds chose their nest areas differently in different plots. The hummingbirds made more nests in the cottonwood **canopy** after the area had been treated **(figure 9)**. The nest location was also higher after an area had been treated.

From 2000 to 2007, the scientists observed 635 hummingbird nests. A majority of the nests (61 percent) survived. Of the 237 nests that did not survive, the cause of failure was not always clear. Some nests may have failed because of predators, weather, starvation, or fire. The scientists found, however, that nest survival rates were lower after treatments.

Photo by Chuck Murphy and http://www.boywithcamera.com.

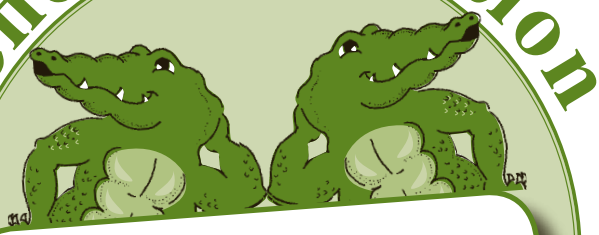
Female ruby-throated hummingbird.

Figure 9. The cottonwood canopy provided a nesting area for hummingbirds after treatments. This cottonwood canopy is located in New Mexico. Photo by Rod Replogle, Forest Service.

Number Crunch

What percentage of the hummingbird nests represents a majority? Write the percentage in decimal form.

Reflection Section



- Why do you think it may have been hard to figure out why a nest failed?
- In your own words, summarize the major findings from the study.

Discussion

Before treatment, the riparian forest had a thick **understory** below a cottonwood canopy **(figure 10)**. After treatment, the area looked like open woodlands with very few shrubs **(figure 11)**. In response to these treatments, the hummingbirds moved their nesting areas to the cottonwood canopy.

The scientists think that hummingbird nests located high in cottonwood trees are at greater risk from predators. The scientists think that the nests are easier for predators to see in the canopy as compared to nests that are located lower in thick shrubs and plants. Compare figures 9 and 10 to see if you agree with the scientists.

The scientists also found evidence that nest survival was greater in the understory. Scientists suggest that after treatments, it is important to plant native shrubs and saplings so the hummingbirds have safer places to nest. Recall that one of the treatments included planting native shrubs. The scientists think that these shrubs did not have a chance to get large and **dense** enough to provide protection.

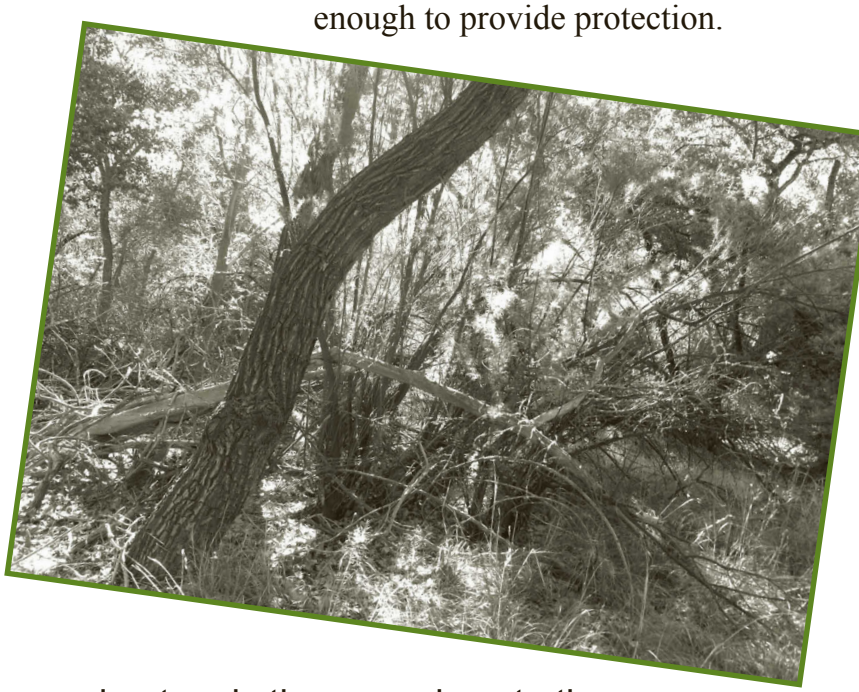
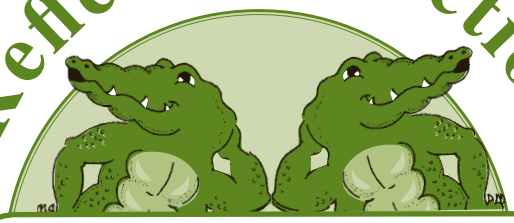


Figure 10. The understory is the area close to the ground underneath the tall trees. The understory is made up of small trees, shrubs, and other plants. Photo by Max Smith.

Figure 11. An example of how the area looked after treatment.
Photo by Max Smith.

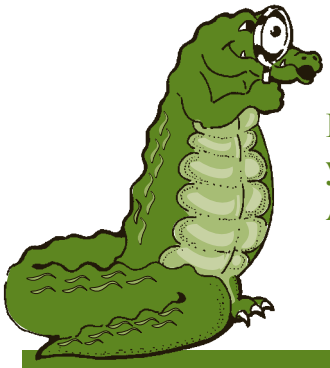
Reflection Section



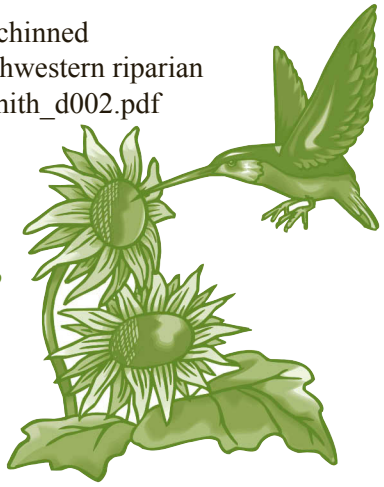
- Why do you think hummingbird nests may be safer in thick shrubs and plants?

- Forest managers are often faced with decisions about how to best manage an area for multiple concerns. In this study, the area needed to be managed for fire, invasive species, and habitat for hummingbirds. Think of a time when you had to make a decision and there were competing interests. For example, you received $10 from your grandmother and you really wanted to buy a video game with it, but you also wanted to buy a present for your mom's birthday. Think about how you made your decision. Write down two sentences about how you made your decision and compare it to the decisions these forest managers must make. Discuss with your class.

Adapted from Smith, D. Max; Finch, Deborah M.; Hawksworth, David L. 2009. Black-chinned hummingbird nest-site selection and nest survival in response to fuel reduction in a southwestern riparian forest. The Condor. 111(4): 641-652. http://www.fs.fed.us/rm/pubs_other/rmrs_2009_smith_d002.pdf



If you are a trained Project Learning Tree educator, you may use Activity 12: Invasive Species or Activity 22: Trees as Habitat.



Glossary

aquatic (ə **kwä** tik): Growing or living in or often found in water.

canopy (**ka** nə pē): The uppermost spreading branchy layer of a forest.

control (kən **trōl**): Part of an experiment that is not treated with something being tested. It serves as a comparison in the experiment.

coordinate (kō **ȯrd** nət): Any of a set of numbers used to locate a point on a line or surface or in space.

debris (də **brē**): The remains of something broken down or destroyed.

economy (ē **kä** nə mē): A system relating to the production, distribution, and consumption of goods and services.

ecosystem (**ē** kō **sis** təm): Community of plants and animal species interacting with one another and with the nonliving environment.

erosion (i **rō** zhən): The process or state of wearing or washing away.

habitat (**ha** bə tat): The environment where a plant or animal naturally grows and lives.

herbicide (**(h)ər** bə sīd): Chemical substance used to destroy or stop plant growth.

invasive (in **vā** siv): Tending to spread or infringe upon.

litter (**li** tər): The uppermost slightly decayed layer of organic matter on the forest floor.

native (**nā** tiv): Living or growing naturally in a particular region.

prevalent (**pre** və lənt): Widespread.

productive (prə **dək** tiv): Having the quality or power of producing especially in abundance.

randomly (**ran** dəm lē): Selecting in such a way that each has an equal chance of being selected.

riparian (rə **per** ē ən): Areas along streams and rivers.

sediment (**se** də mənt): Material deposited by wind, water, or glacier.

transition (tran **zi** shən): A changing from one state, stage, place, or subject to another.

understory (**ən** dər stȯr ē): The layer of plants and especially the trees and shrubs between the forest canopy and the ground cover.

Accented syllables are in **bold**. Marks and definitions are from http://www.merriam-webster.com.

The title "That's a Humdinger!" is a phrase that refers to a striking or extraordinary person or thing. In this case, the extraordinary thing is the hummingbird. Learn more about hummingbirds at http://www.dgif.virginia.gov/habitat/hummingbirds.asp.

FACTivity

Time needed: Two class periods. The first day will be a classroom activity. The second day will be a classroom or field exercise.

The question you will answer in this FACTivity is:

What species of birds are found living in my schoolyard?

Materials

- "That's a Humdinger" article
- Copies of "Bird Identification Chart" on page 26
- Bird field guides (online editions or printed copies)
- Pencils

Optional: binoculars, digital camera

As you learned in the "That's a Humdinger!" article, a riparian forest is an area of forest between water and upland areas. Riparian forests provide habitat for wildlife, including many species of birds. Schoolyards can also provide habitat for wildlife. If your schoolyard has trees, it is an urban forest, a special type of forest. Urban forests are found throughout cities and other developed areas. Urban forests may have just a few trees, or they may have many trees.

For more information about urban forests, see the *Natural Inquirer* Urban Forest Edition at http://www.naturalinquirer.org.

The scientists in the "That's a Humdinger!" article studied black-chinned hummingbirds in New Mexico. They wanted to see if the birds' nests were affected by forest management activities. The scientists observed the birds and their nests, and watched their behavior. Like the scientists, you will conduct a study to observe birds found in your schoolyard.

Birds are important to ecosystems. They help control insect populations. Birds help scatter plant, tree, and flower seeds. Birds are prey for predators, and they serve an important role in the food web. Many people also enjoy birding, or bird-watching. Scientists who study birds are called ornithologists (**or** nə **thä** lə jists). In this FACTivity, you will act as an ornithologist while learning to identify birds seen in your schoolyard.

Photo by Chuck Murphy and http://www.boywithcamera.com .

Day One: Learn to Identify Birds

1. If you haven't previously done so, read the "That's a Humdinger!" article.

2. Make a list of birds that you think you might see in your schoolyard. If you live close to the school, it's likely that you will see the same bird species at school that you see around your home. For each bird that you list, explain how you know what bird it is. For example, tell if it has red feathers or a thick beak. You might want to use a bird identification guide to give you some ideas.

3. Next, your teacher will divide you into small groups. Each group will be given a field guide. You may also use online resources such as Cornell University's "All About Birds" Web site (http://allaboutbirds.org). The "Bird ID" section of the "All About Birds" Web site provides images and text that cover bird identification clues in detail.

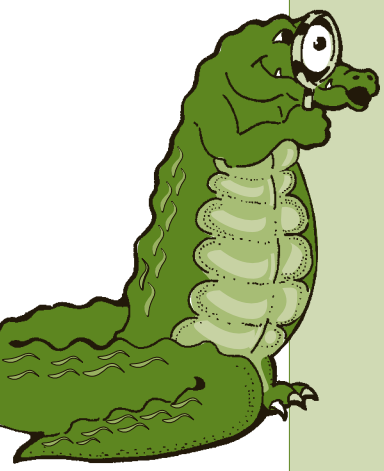
In your group, study the field guide and become familiar with ways to identify birds in the field. View images of birds that are common to your local area. This can be done by:

- Using BirdSleuth focus cards (order at http://www.birds.cornell.edu/birdsleuth).
- Viewing an online bird guide (http://www.allaboutbirds.org or http://www.enature.com).
- Looking at pictures of local birds (taken from magazines, posters, or the Internet) or looking at pictures in a field guide or textbook.

Photo courtesy U.S. Fish and Wildlife Service.

Photo by Chuck Murphy and http://www.boywithcamera.com.

Day Two: Observe and Identify Birds in Your Schoolyard



1. You will observe birds seen at your school. Birds can be observed by looking out the classroom window or by going outside with your teacher. Your teacher will pass out the Bird Identification Chart to each student. If you have binoculars, they can be used to help you see birds close-up.

2. In your small group, discuss the Bird Identification Chart with your classmates. Work together to discuss identification features and ways to identify birds. Use the completed chart to help you fill out the Bird Identification Chart for one species of bird that you observe. Write down key identification features of a bird you see, such as “This bird has blue feathers and sits upright on a branch.”

3. Work with your small group using field guides to determine if your identification is correct.

4. As a class, discuss the birds you observed and the features used to identify them.

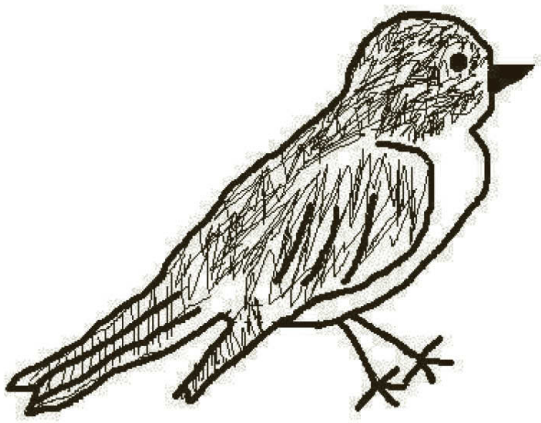
5. Once you have practiced observing birds from your classroom, go outside with the class (if you haven’t already) and observe birds in the schoolyard. Practice using a field guide to identify birds that you see.

Photo courtesy of Gila National Forest.

FACTivity Extension:

Now that you've practiced observing birds, your class can conduct a Stationary Bird Count and submit the data online to the BirdSleuth database. For more information and instructions on how to complete this extension, view the "Birding FACTivity" on the *Natural Inquirer* Web site at http://www.naturalinquirer.org/Outdoor-v-102.html.

Sample Bird Identification Chart

Name: **Eastern Phoebe**	Size: **About the same size as a sparrow, about 7" from head to tail.**
Sketch 	Shape: **Plump bird with medium-long tail. Short, thin, black beak.**
	Field Marks: **Dark head that fades to lighter color on back. White throat.**
	Behavior(s): **Flew from perch to catch an insect in the air. Bobbed up and down and from side to side when sitting on a branch.**
	Song(s) or call(s): **Raspy "fee-bee" call and some soft chirps.**
Color(s): **Dark brownish-gray above, off-white below. Light patch of yellow on belly.**	Habitats/Other comments: **Perched on low branches; did not seem scared of humans.**

This activity was adapted with permission from the Cornell Lab of Ornithology's BirdSleuth curriculum. To order the complete curriculum set, visit http://www.birds.cornell.edu/birdsleuth/.

Bird Identification Chart

Name:	Size:
Sketch	Shape:
	Field Marks:
	Behavior(s):
	Song(s) or call(s):
Color(s):	Habitats/Other comments:

Additional Web Resources

Cornell Lab of Ornithology- Black-chinned hummingbird
http://www.allaboutbirds.org/guide/Black-chinned_Hummingbird/id

Audubon Kids Page
http://www.audubon.org/educate/kids/

Tucson Bird and Wildlife Festival
http://www.tucsonaudubon.org/festival.html

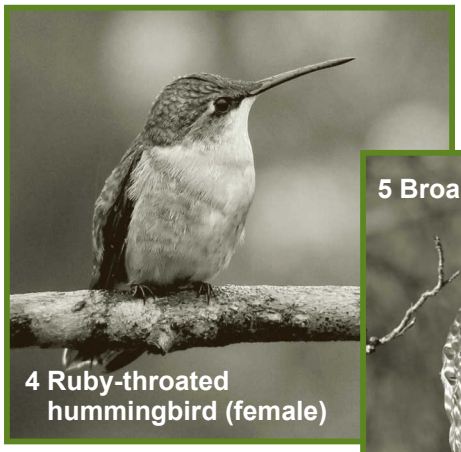
Attracting Hummingbirds
http://www.hummingbirds.net/attract.html

Look at each of the bird photos. Write down 2 similarities and 2 differences you see among the birds. Why do you think these birds have some different characteristics?


1 Cardinal


2 Mountain chickadee


3 Ruby-throated hummingbird (male)


4 Ruby-throated hummingbird (female)


5 Broad-winged hawk


6 Osprey


7 Black-crowned night heron

Photo Credits:
1, 3 and 4: Chuck Murphy and http://www.boywithcamera.com.
2: Photo by Dave Menke and courtesy of U.S. Fish and Wildlife Service.
5-7: James Holland.