



## **Barataria-Terrebonne Estuary Bird Curriculum**

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## Acknowledgements

We would like to thank Susan Testerot-Bergeron and Richard DeMay for their guidance in the initiation and creation of this curriculum, and Alma Robichaux for seeing it to completion.

We also want to thank the teachers of Louisiana who will use this curriculum to inform their students about migratory birds and the environmental issues that affect these animals. We appreciate your efforts to build an environmentally literate citizenry in Louisiana.

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Teachers,

Welcome to a new teaching experience! We hope you will enjoy teaching a variety of science topics using this newly developed birding curriculum.

Dr. Pam Blanchard and Mr. Paul Conover have designed some wonderful lessons for you to share with your students. They have covered a multitude of science topics using the dynamic 5E Learning Cycle lesson format. Dr. Blanchard has been developing curriculum for the Barataria-Terrebonne National Estuary Program for years. She is a former middle school science and math teacher and currently is an associate professor at Louisiana State University. While she admits that she is not a birder, she has brought great insight to the pedagogy of this curriculum. Mr. Conover is an elementary school classroom teacher currently at Ridge Elementary in Lafayette, Louisiana. He is also an avid birder who has gained great respect with birders in the Louisiana birding community. His name can be found in recent postings on the Louisiana Birding List and in the Louisiana Ornithological Society news. Their team work was instrumental in bringing you this fresh new approach to teaching science and birding in your classroom.

We encourage you to look at the various topics and Louisiana Grade Level Expectations (GLEs) that are addressed in these lessons as you plan for your students. Science topics include a range of ideas and techniques such as human interactions with nature, collecting and analyzing scientific data in diverse ways, inquiry skills lessons, exploring nonfiction literature as well as simple topics such as food webs, comparing organisms and their relationships, and population dynamics. The lessons are assorted, in that some topics require the use of technology, such as Google Earth, while others encourage art and language arts.

There should be something for everyone here. The lessons are grouped by grade level and GLEs so you can easily find something exciting for your students.

We here at the Barataria-Terrebonne National Estuary Program hope you enjoy teaching the lessons and share them with your fellow teachers.

Enjoy,

Susan Testroet-Bergeron

Alma Robichaux  
Barataria-Terrebonne National Estuary Program  
Education Coordinator





# Introduction

## Educational Goal

The goal of the *Barataria-Terrebonne Estuary Migratory Bird Curriculum* is to educate teachers and students of grades K-12 about the birds and related habitats of the Barataria-Terrebonne Estuary and the priority issues facing the basins. This curriculum facilitates instruction for teachers by providing hands-on, inquiry-based lessons focused primarily on science and math content and skills. The lessons also provide easy access to birding materials necessary to teach students, as well as to environmental issues that have a direct effect on the bird populations within the B-T Estuary.

## Educational Objectives

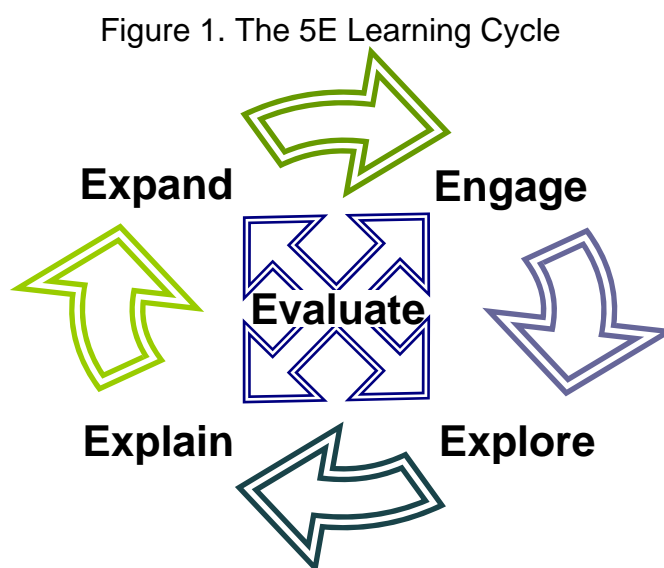
The objectives of the *Barataria-Terrebonne Estuary Migratory Bird Curriculum* are:

- To develop and heighten a personal understanding of birds and environmental issues connected to the Barataria-Terrebonne Estuary
- To provide teaching activities and strategies that help students develop their inquiry skills as they learn about birding and significant environmental concepts

## Lesson Format

*Barataria-Terrebonne Estuary Migratory Bird Curriculum* consists of 20 lessons written in a Learning Cycle format. Each lesson is correlated to the Louisiana Grade Level Expectations (2004) in Mathematics and Science and contains learning objectives, materials list, background information, advance preparation instructions, reproducible blackline masters, and related BTNEP publications, websites and printed resources. Appendices for this curriculum include a Louisiana birding checklist, field guide for beginning birders, American Bird Association information, BTNEP Migratory Bird Celebration Information, and Louisiana Birding Trail information.

The Learning Cycle lesson format is a constructivist teaching and learning model that has been developed over the last 50 years and has its roots in the ideas of Dewey and Piaget. It is based on the idea that learning begins with concrete experience. In this model, instruction is sequenced into a series of teaching (or learning) stages, or phases. While the number of learning cycle phases varies from three to five across the various models, all of the frameworks involve the phases of exploration, explanation, and elaboration (for a review of the history of the Learning Cycle see



Lawson, 1995). In the *Barataria-Terrebonne Estuary Migratory Bird Curriculum* we utilize the 5E Learning Cycle model developed by Bybee (1997). In the 5E model, the lesson progresses through four phases: Engage, Explore, Explain, and Expand (Apply). The fifth phase is Evaluate, which occurs throughout the lesson.

Summarizing recent neuroscience research into the way our brains learn, Zull (2001) states that the “learning is physical,” in that the “learning cycle is the natural result of the structure of the brain.” Zull argues that the learning cycle is complete only when we have tested, or acted on, our ideas.

### Building Environmental Literacy

Environmental literacy is a continuum of competencies with regard to prerequisite understandings, skills, and actions. As people become environmentally literate they progress through four stages that include awareness, concern, understanding, and action (Roth, 1992; Figure 2).

Figure 2. Four Stages of Environmental Literacy (Roth, 1992)	
Awareness	Perception of human interactions with nature and their consequences
Concern	Perception of real or potential negative consequences of interactions between humans and nature, with a feeling that change is needed
Understanding	Detailed knowledge of consequences of interaction between humans and nature and of alternative interactions, with associated thinking and decision-making skills
Action	Behavior that reflects new understanding and that can change or alter interactions between humans and nature in a responsible way designed to reduce or eliminate negative consequences

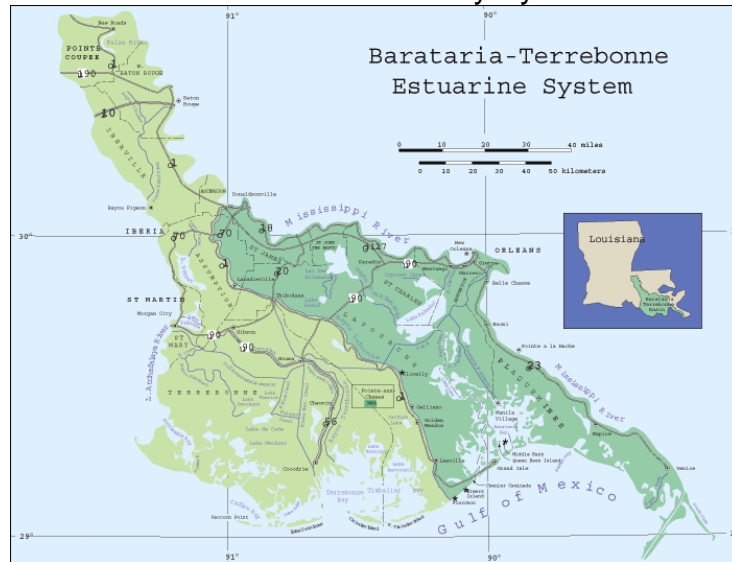
### References

- Bybee, R.W. (1997). *Achieving scientific literacy: From purposes to practices*. Portsmouth, NH: Heinemann.
- Kolb, D. (1984). *Experiential Learning: Experience as the Source of Learning and Development*. Englewood Cliffs, NJ: Prentice-Hall Inc.
- Roth, C. E. (1992). *Environmental Literacy: Its roots, evolution, and directions in the 1990s*. Columbus, OH: Education Resources Information Center/Center for Science, Mathematics and Environmental Education.
- Zull, J.E. (2002). *The Art of Changing the Brain*. Sterling, VA: Stylus Publishing, 263 p.

## The Barataria-Terrebonne Estuary

The Barataria-Terrebonne Estuarine System (BTES) is a biologically rich and productive ecosystem encompassing 4.1 million acres of forested uplands, swamps, marshes, bayous, bays, and barrier islands. There are 16 parishes that fall either partially or entirely within the BTES. It is bound on the west side by the Atchafalaya River and on the east by the Mississippi River. The BTES provides habitat for previously endangered species such as the Brown Pelican and the Bald Eagle, commercially important fisheries such as shrimp, oysters, and menhaden, as well as recreational opportunities for residents and visitors.

The Barataria Terrebonne Estuary System boundary



The Barataria-Terrebonne National Estuary Program identified 7 Priority Problems within the estuary in 1990. The BTES community identified 51 Action Plans to address the seven Priority Problems.

### Priority Problems in the BTES

- Hydrologic modification (human changes to water flows in the estuary)
- Reduced sediment flows (reductions in the amount of sediment inputs to the estuary)
- Habitat loss (land loss and marsh deterioration)
- Changes in living resources (population reductions in important species and introductions of non-native species)
- Eutrophication (too many nutrients in the estuary's water)
- Pathogen contamination (untreated sewage and storm water discharged to the estuary)
- Toxic substances (heavy metals and pesticides in runoff and oil spills to the estuary)

# Barataria-Terrebonne Estuary Bird Curriculum

## Matrix of BTNEP Bird Curriculum Lessons



Lesson Focus	Eagle	Other Louisiana Birds		
<b>K-2</b>	<b>Eagle nest and egg size</b> <i>Lesson 1</i>	<b>What's for Lunch?</b> The swallow-tailed Kite's diet <i>Lesson 2</i>	<b>Wood duck houses</b> <i>Lesson 3</i>	<b>Bird Families:</b> Baby birds and their parents <i>Lesson 4</i>
<b>3-5</b>	<b>Wingspans:</b> How big is an Eagle? <i>Lesson 5</i>	<b>Hummer Heartbeats</b> <i>Lesson 6</i>	<b>Homeward Bound</b> <i>Lesson 7</i>	<b>Form and Function in Birds</b> <i>Lesson 8</i>
<b>6-8</b>	<b>At the Top:</b> A look at the Bald Eagle's diet <i>Lesson 9</i>	<b>American Robin Migration</b> <i>Lesson 10</i>	<b>Waders Jeop-birdy</b> (PPT-based) <i>Lesson 11</i>	<b>Songbird migration:</b> Researching Purple Martins & Wood Thrushes <i>Lesson 12</i>
<b>9-12 biol</b>	<b>Operation Eagle</b> <i>Lesson 13</i>	<b>Google Mapping Ruby-throated Hummingbird Migration</b> <i>Lesson 14</i>	<b>Climate Change and Birds</b> <i>Lesson 15</i>	<b>Birdwatching with Radar</b> <i>Lesson 16</i>
<b>9-12 env sci</b>	<b>The Eagle Soars Again</b> <i>Lesson 17</i>	<b>Humming Along</b> <i>Lesson 18</i>	<b>What's in the Food Chain?</b> A pelican's diet <i>Lesson 19</i>	<b>The Cowbird</b> <i>Lesson 20</i>



## Grade Level for Bird Curriculum Lesson

		PK	K	1	2	3	4	5	6	7	8	HS Biol	HS Env Sci
1	Eagle nests and eggs												
2	What's for lunch? The Swallow-tailed Kite's diet												
3	Wood ducks												
4	Bird families: Baby birds and their parents												
5	Wingspans: How big is an Eagle?												
6	Hummer heartbeats												
7	Homeward bound												
8	Who lives here?												
9	At the Top: A look at the Bald Eagle's diet												
10	American Robin migration												
11	LA Wader Jeop-birdy												
12	Songbird migration												
13	Operation Eagle												
14	Google Mapping Ruby-throated Hummingbird migration												
15	Global warming and birds												
16	Birdwatching with radar												
17	The Eagle soars again												
18	Humming along												
19	What's in the food chain?												
20	The Cowbird												



# Eagle Nests and Eggs

Activity 1

Lower Elementary

## Focus/Overview

In this lesson, students will learn about Bald Eagle's nests and eggs. They will compare the size of Bald Eagle nests and eggs to Hummingbird and other migratory species, as well as to several common native species.

## Learning Objectives

The learner will...

- learn about the Bald Eagle by reading nonfiction literature.
- compare size, color and markings of eggs of eight Louisiana bird species.
- compare diameter of nests of six Louisiana bird species.

## Louisiana Science Grade Level Expectations

PK:GLE 22	Learn about plants and animals through nonfiction literature (PK-CS-L1) (LS-E-B1)
K: GLE 12	Construct patterns by using color, size and shape of objects (PS-E-A1)
K: GLE 13	Sort objects based on their properties (e.g., size, weight, texture) (PS-E-A1)

## Louisiana Math Grade Level Expectations

PK:GLE 6	Use comparative vocabulary in measurement settings (e.g., <i>long/longer, short/shorter, more/less, hotter/colder, heavier/lighter, bigger/smaller</i> ) (PK-CM-M3) (M-1-E) (M-2-E) (M-3-E)
PK:GLE 9	Sort concrete objects by an attribute (e.g., shape, size, color) (PK-CM-D1) (G-2-E) (D-1-E)
K:GLE 15	Use comparative and superlative vocabulary in measurement settings (e.g., <i>longest, shortest, most, hottest, heaviest, biggest</i> ) (M-3-E) (M-1-E) (M-2-E)

## Materials List

- shower curtain or table cloth (inexpensive) or roll paper (see Advance Preparation, Note #1)
- scissor (for teacher)
- copies of Blackline Masters 1 and 2 (1 per student)
- copy of BTNEP resources
  - ♦ *Habitats of the Barataria-Terrebonne: Their importance to migratory and resident birds (HB-T)*
  - ♦ 2007 Louisiana Waders Calendar (available online at [http://www.btnep.org/Libraries/Calendars/2007\\_Birding\\_Calendar.sflb.ashx](http://www.btnep.org/Libraries/Calendars/2007_Birding_Calendar.sflb.ashx))
  - ♦ 2008 Louisiana Raptors Calendar (available online at [http://www.btnep.org/Libraries/Calendars/2008\\_Birding\\_Calendar.sflb.ashx](http://www.btnep.org/Libraries/Calendars/2008_Birding_Calendar.sflb.ashx))
  - ♦ 2010 Louisiana Raptors Birds of Prey (available online at the BTNEP office)

## BTNEP Connection

Birds

## Grade Level

PK, 1

## Duration

Three activities, each about 20-30 minutes

## Subject Area

science, math

## Setting

classroom

## Extension Area

art, social studies

## Vocabulary

nest, height, width





## Background Information

Birds build nests to provide shelter and to hold their eggs. Nests are built to suit the habitat in which the birds live and/or their reproductive requirements. Nests can be located in trees or bushes, grasses or reeds, on the ground, in a tree hole or cavity, in a ground hole or cavity, on a wall, on a ledge, or on the water. There are four general shapes of nests: platform (Bald Eagle, Great Blue Heron), cup (Northern Cardinal, Ruby-Throated Hummingbird), cavity (Wood Duck, Carolina Chickadee), and ground (Brown Pelican, Least Tern). Nests are generally built of materials that are available to the bird in the nearby ecosystem and can include large branches, twigs, grass, weeds, lichens, mud, spider webs, and leaves. Nests sizes are generally proportional to the size of the bird.

Eggs are classified as five basic shapes: spherical, elliptical, cylindrical, oval, or pyriform (round on one end and pointy on the other end). Egg markings can also be described as wreathed, capped, overlaid, scrawled, streaked, marbled, dotted, spotted, blotched, splashed. In addition, the texture of the egg shell can be described in a number of ways, including smooth, rough, chalky, glossy, and non glossy.

The following eight birds will be used in the three activities involved in this lesson. References to Barataria-Terrebonne resources are included (HB-T=Habitats of Barataria-Terrebonne; 2007 Waders = 2007 LA's Waders calendar; 2008 Raptors = 2008 LA Raptors calendar; Louisiana Raptors: Birds of Prey). *NOTE: Pictures of these birds can be found in the BTNEP documents listed in each description.*

**Bald Eagle (*Haliaeetus leucocephalus*).** The Bald Eagle is a raptor, or bird of prey. A Bald Eagle's nest is very large (5 feet wide by 2 feet high; 1.52 meters wide by 0.61 meters high). In the center, the inner nest is 20 inches (50cm) wide by 4-5 inches (10.2-12.7cm) deep. The nest is constructed of large sticks, twigs, driftwood, and stalks of weeds, and is often lined with grass or seaweed and a few feathers. It occasionally contains such materials as old shoes and bones. Bald eagles build their nests in the top of a tall tree near water, but they are also known to build nests on buildings, telephone poles, or chimneys. Bald eagles use the same nest year after year, adding materials to the old nest. Some old nests are so large, one measured 12 feet (3.66 meters) high by 8½ feet (2.59 meters) across, that the tree has collapsed because of the weight of the nest. Eagles usually lay two eggs, which are oval and bluntly rounded on the ends. The eggs are dull white and are unmarked. The average egg size is 2.78 x 2.13 inches (70.5 x 54.2 mm), oval, bluntly rounded on ends. [HB-T: p. 39-41, 42, 43, 49; 2008 Raptor: intro, Feb 2008]



Photo credit: Paul Conover

**Brown Pelican (*Pelecanus occidentalis*).** The Brown Pelican is a colonial nesting bird. It lives in large colonies often located on islands with nests of herons, egrets, and cormorants. They will nest on the ground if there are no trees available. On the ground, Brown Pelican nests are built of sticks, reeds, leaves, grass. The male pelican gathers the nesting material and the female builds the nest. Brown Pelican nests are 18-24 inches (45.7-61.0 cm) across and measure 4-10 inches (10.2 -25.4 cm) in height (for ground nests). Brown Pelicans lay an average of three white oval eggs, which average 2.87 x 1.83 inches (73 x 46.5 mm) in size. The egg shell has a lusterless rough granular surface, with a thick chalky layer that often becomes scratched and stained. [HB-T: p. 3, 26, 49]



Photo credit: Paul Conover

**Great Blue Heron (*Ardea herodias*).** The Great Blue Heron is a wading bird. Great Blue Herons generally nest in congested colonies in trees located in woody swamps with nests of other herons, ibises, cormorants, and pelicans. Great Blue Herons build a compact platform of large sticks on the branches of trees and line this platform of sticks with fine twigs and green leaves. The male heron brings material to the female, who places it in nest. Their nests have an outside diameter of 25-40 inches (63.5-101.6 cm). Great Blue Herons usually lay four pale



bluish green oval eggs. The average size of the eggs is 2.54 x 1.78 inches (64.5 x 45.2 mm). The eggs can be smooth or slightly rough and there are no markings on the egg. [HB-T: p. 17, 26, 49; 2007 Waders: November 2007]

**Wood duck (*Aix sponsa*).** Wood Ducks are water fowl. They lay their eggs in a natural cavity in a tree usually located near water. The nest is lined with accumulated wood chips and pale mouse-gray down from female's breast. The Wood Duck will also use man-made wood or metal nest boxes partially filled with wood shavings. Wood Ducks lay between 10-15 oval eggs, which are creamy white, smooth, shiny and unmarked. The average size of the eggs is 2.01 x 1.53 inches (51.1 x 38.8 mm) oval. [HB-T: p. 26, 27, 48]



**Carolina Chickadee (*Parus carolinensis*).** The Carolina Chickadee is a song bird. Carolina Chickadees build their nests in the soft, rotting wood of dead trees. The nest is about 2-3 inches (50.8-76.2 mm) wide and 5 inches (12.7cm) deep. Chickadees line the base of the cavity with moss and the cup sides with soft materials such as plant down, hair, feathers, and plant fibers. They may also nest in a natural cavity, abandoned woodpecker hole, or birdhouse. They lay ~6 oval eggs that are smooth and white. The eggs are marked with reddish brown spots at the larger end. The average size of the eggs is 0.60 x 0.43 inches (15 x 11 mm). [HB-T: p. 54]



**Northern Cardinal (*Cardinalis cardinalis*).** Northern cardinals are song birds. They build their nests in dense shrubbery 3-10 feet (0.91-3.05 meters) above ground. Their cup-shaped nests are loosely built of twigs, vines, leaves, bark, and grasses. The nests are lined with fine grasses and sometimes hair or Spanish moss. They lay an average of 3-4 white, slightly glossy, oval eggs, which are smooth and grayish, bluish, or greenish white in color. They are spotted all over with brown, gray and purple splotches. The average size is 1.00 x 0.72 inches (25.3 x 18.2 mm). [HB-T: p. 26, 56]



**Ruby-Throated Hummingbird (*Archilochus colubris*).** Ruby-throated Hummingbirds are song birds. They build solitary nests in trees about 10-20 feet (3.05-6.10 meters) above the ground. The nests are attached to a branch with spider silk. The nest is built of plant fibers, lined with soft plant down, and covered outside with greenish-gray lichens. The outside diameter is 1-1.53 inches (25.4-38.9 mm) and its height is 1-2 inches (25.4-50.8 mm). Ruby-throated Hummingbirds lay two eggs that are elongated ovals. The shell is smooth, non-glossy, and pure white. The average egg measures 0.51 x 0.33 inches (12.9 x 8.5 mm). [HB-T: p. 52]



**Least Tern (*Sterna albifrons*).** The Least Tern is a shore bird. Their nests may be in colonies or solitary. They form their nest by scratching a very shallow hollow in sand, shell or gravel. Least Terns lay two oval eggs, which average 1.22 x 0.93 inches (31 x 23.5 mm) in size. The shells are smooth, pale olive-buff to whitish in color, and unevenly sprinkled with profuse brown spots. [HB-T: p. 52]





### Background references

- Hansell, M. (2000). *Bird nests and construction behavior*. Cambridge, UK: Cambridge University Press.
- Harrison, C. (1978). *A field guide to the nests, eggs and nestlings of North American birds*. Glasgow, United Kingdom: William Collins Sons and Company.
- Harrison, H. (1975). *A field guide to birds' nests of 285 species found breeding in the United States east of the Mississippi River*. Boston, MA: Houghton Mifflin Co.
- Headstrom, R. (1951). *Birds' nests of the west: A field guide*. New York, NY: Ives Washburn, Inc.
- Reed, C.A. (1965). *North American birds eggs*. New York, NY: Dover Publ.
- Fernbank Science Center's Ornithology Web. (no date). Birds in the Classroom, Nesting Ecology, found December 31, 2008, at <http://fsc.fernbank.edu/Birding/nestecology.htm>

### Advance Preparation

1. **Engage:** Preview the BioDiversity Research Institute's live **Bald Eagle's nest webcam** at <http://www.briloon.org/watching-wildlife/eagle-cam.php>. If you wish to use the Eagle cam, be sure to check to see if you have the proper software on your computer with which to view the video. It's a live camera, so preview the eagle cam just before you plan to show it to the students to make sure the eagles are actually in the nest. Remember, that if you are teaching this lesson in the winter, the sun sets early in Maine, so if you get a black screen with noise, you are viewing the nest at night... and there is nothing to see. There is also a **photo archive** on the site [<http://www.briloon.org/watching-wildlife/eagle-cam-archive.php>] that has some fantastic photos. Scroll through the photos and make a note of some of the photos that have clear images of the nest and the nestlings, for example: feeding 5-3-06 shows one of the parents feeding two baby eagles; feeding the chicks 4-25-06 shows a parent feeding a newly hatched eagle chick; there are numerous photos of the nest itself.
2. **Engage:** Select sentences or paragraphs from BTNEP resources that you will read to students [**HB-T**: p. 39-41, 42, 43, 49; **2008 Raptor**: intro, Feb 2008; Louisiana Raptors: Birds of Prey: p.20-21]. Some words will need to be simplified for primary grade students. Reading from this non-fiction text is important. Be ready to point out how this type of information differs from fairy tales or other fictional stories.
3. **Explore Activity A and B:** Make copies (preferably in color) of Blackline Master #1. Cut the 8 egg cards apart. Remove the Bald Eagle card from each set and place the remaining cards in an envelope or plastic bag.
4. **Explore Activity C:** Using an inexpensive shower curtain, plastic table cloth or roll paper, cut out three circles to represent the diameters of Bald Eagle (5 ft), Brown Pelican (21 in), and Great Blue Heron (32 in). Make signs on three sentence stripe with the names of each of these larger birds.

### Procedure

#### Engage

1. View the webcam and still images of a pair of Bald Eagles that have nested in the same white pine tree in Maine for the last 13 years (see Advance Preparation, Note #1). Together, this pair of Bald Eagles has raised 20 offspring in this nest. As you view the webcam and archived images, ask students to make observations of the Bald Eagles.
2. Ask students what they know about Bald Eagles. Do they know that Louisiana has Bald Eagles? Read the selected sentences and/or paragraphs about the Bald Eagle from the BTNEP resources (see Advance Preparation, Note #2) Reading from this non-fiction text is important. Be ready to point out how this type of information differs from fairy tales or other fictional stories.

#### Explore/Explain

##### Activity A – Comparing Eggs: Ordering by Size

1. Distribute the remaining sets of egg cards that were prepared for each student prior to class.
2. Ask students to put the eggs in order from largest to smallest. (*Correct order: Bald Eagle, Brown Pelican, Great Blue Heron, Wood Duck, Least Tern, Cardinal, Carolina Chickadee, and Ruby-throated Hummingbird*). Check to see if students have gotten them in the correct order.
3. Ask students to describe the size relationships between eggs. (*For instance: the Bald Eagle egg is the largest egg; the Least Tern egg is larger than the Northern Cardinal eggs; the Ruby-throated Hummingbird and the Carolina Chickadee are the smallest of all the eggs, etc.*)

##### Activity B – Comparing Eggs: Grouping by Markings



1. Ask students to describe some of the ways that eggs can be put into groups based on their color and markings. Write these grouping methods on the chalkboard or whiteboard. Some grouping methods include: *with or without markings, color, size of spots/plotches*. Have students choose one of the methods and group their egg cards using this method. Check student cards.
2. Have students select a second method of grouping their eggs. Check student cards. Ask students, "Why is there more than one way to group their egg cards?" Answer: Because each egg has several different characteristics. Stress that groups are created based on the characteristic(s) that we choose to focus on.

### **Activity C – Comparing Nest Size: Ordering by Size**

1. Lay the cutouts of the Bald Eagle, Great Blue Heron and Brown Pelican's nests (see Advance Preparation Note #4) on the floor in the center of the classroom. Distribute copies of Blackline Master #2 to each student. Students should have their egg cards at their desks.
2. Have a student volunteer put the three larger circles in order of size. Have another student volunteer put the name signs (on sentence strips) on the correct nest. [Bald Eagle (Diameter: 5'), Great Blue Heron (Diameter: 32"), and Brown Pelican (Diameter: 21")].
3. Have students try to figure out which of the other birds we've been discussing in the lesson are the owners of the three nests on the handout [Northern Cardinal (W: 4.5"), Carolina Chickadee (W: 2.5"), and Ruby-throated Hummingbird (W: 1.25")]. Explain to students that the Wood Duck lives in a natural cavity (hole) in a tree, and the Least Tern scratches a clear spot in the sand and shells on the beach).

### **Expand**

1. Have students take the three egg cards of the following birds: Northern Cardinal, Ruby-throated Hummingbird and the Carolina Chickadee from the deck of egg cards. They can cut out (or place) the eggs of these three cards on the appropriate nests.
2. Have students write or say a sentence that describes one of the nests and eggs.

### **Assessment**

- Assess whether students are able to put the eggs and nests in the correct order by size.
- Assess whether students can correctly group their eggs by different characteristics.
- Assess whether students can correctly use the terms larger/smaller, wider/narrower (etc.), with regard to the size relationships between the eggs.

### **Blackline Masters**

1. **Comparing Eggs**
2. **Comparing Nests**

### **Extensions**

- ART. Students can draw a picture of one of the birds that are featured in this lesson. Images of most of the birds can be found in the BTNEP resources listed after each of the birds in the Background Information or in one of the recommended field guides listed in the Resource Section.
- SOCIAL STUDIES. Students can learn about how the Bald Eagle became the symbol that represents the United States [see *The Bald Eagle* by Pearl (2007)].

### **Resources**

#### **BTNEP publications**

- 2007 Louisiana Waders Calendar (available online at [http://www.btnep.org/Libraries/Calendars/2007\\_Birding\\_Calendar.sflb.ashx](http://www.btnep.org/Libraries/Calendars/2007_Birding_Calendar.sflb.ashx))
- 2008 Louisiana Raptors Calendar (available online at [http://www.btnep.org/Libraries/Calendars/2009\\_Birding\\_Calendar.sflb.ashx](http://www.btnep.org/Libraries/Calendars/2009_Birding_Calendar.sflb.ashx))
- *The Habitats of Barataria-Terrebonne: Their Importance to Migratory and Resident Birds* (see specific page numbers in Background Information)
- Wings Over the Wetlands (video)



### **Recommended Field Guides**

- Sibley, D.A. (2000). *The Sibley Guide to Birds*. Audubon Society Nature Guides. Random House, Inc.
- Peterson, R., and Peterson, V. (2002). *A Field Guide to the Birds of Eastern and Central North America*. Peterson Field Guide Series. Houghton Mifflin Harcourt.
- Alderfer, J. (ed.) (2005). *National Geographic Complete Birds of North America*. Random House, Inc.

### **Internet Sites**

BioDiversity Research Institute's Bald Eagle's Nest Webcam

<http://www.briloon.org/watching-wildlife/eagle-cam.php>

A 24/7 live camera of a Bald Eagle's nest in Maine. Also has links to archived photos and an eagle expert's blog.

### **Other resources**

Boring, M. (1998). *Bird, Nests, and Eggs*. National Book Network.

A fun, informative take-along guide that will help children identify 15 birds. Kid will also learn how and where birds build their homes and all about their young. Plus the guide features activities that are fun and easy to do. Age Range: 7 to 10 years.

Cole, J. (2005) *The Magic Schoolbus Flies From the Nest*. Scholastic, Inc. 32 pp.

Kids on the bus pay a visit to a robin's nest. Age Range: 4 to 8 years.

Evert, L. (2001). *Eagles*. T&N Children's Publishing. 48 pp.

This book explores the lives of both Bald Eagles and Golden Eagles: where the animal lives, what it eats, when it sleeps, and how it raises its young. Features over 30 photos. Age Range: 7 to 10 years.

Jenkins, P.B. (1995). *A Nest Full of Eggs*. HarperCollins Publishers. 32 pp.

Children observe a Robin's nest from nest building, hatching, through fledging. Age Range: 5 to 6 years.

Morrison, G. (1998). *Bald Eagle*. Houghton Mifflin Company. 32 pp.

This book of watercolor images introduces children to the Bald Eagle's life cycle, from egg to full grown bird, with additional information on eagles' anatomy, behavior, and habitat. Age Range: 5 to 8 years.

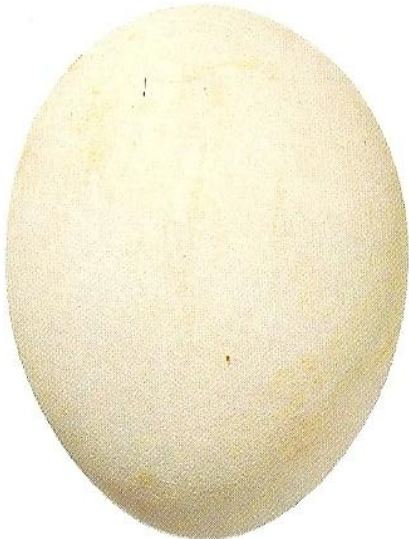

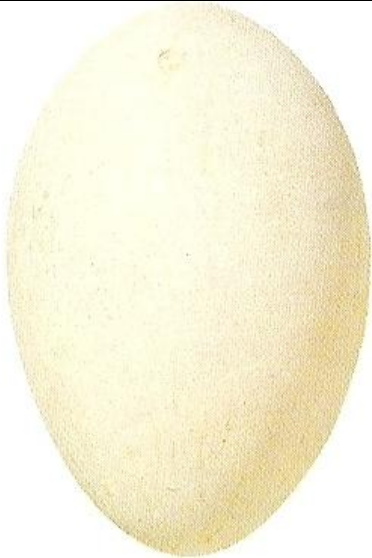

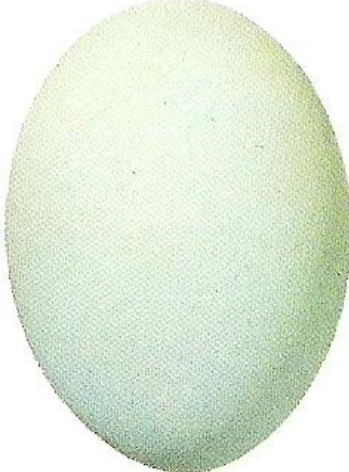


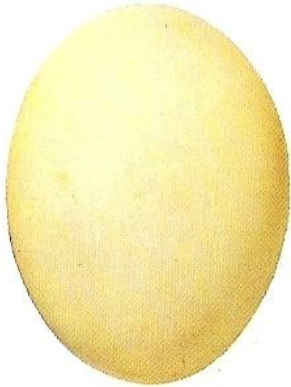
Pearl, N. (2007). *The Bald Eagle*. Coughlan Publishing. 24 pp.

This book of watercolor images reviews the debate over the national bird (Eagle versus Turkey), looks at how the Eagle is used on our currency and the Great Seal, and facts about the biology of the bird. Age Range: 4 to 8 years.

Sill, C. (1997). *About Birds: A guide for children*. Peachtree Publishers. 40 pp.

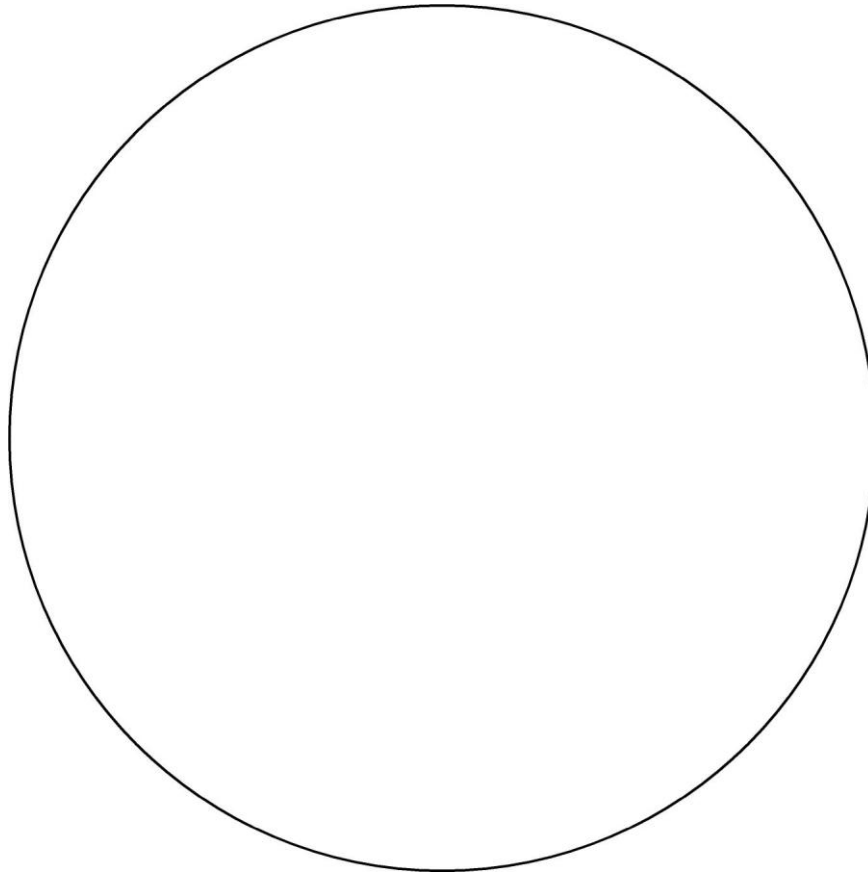
Text and illustrations introduce the world of birds from eggs to flight, from songs to nests. Age Range: 4 to 8 years.

## Comparing Eggs

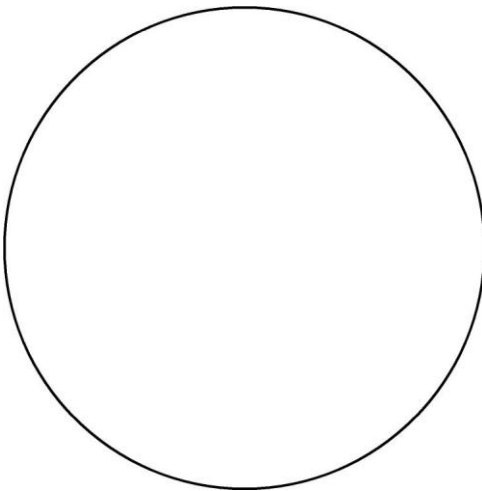
		
Bald Eagle	Carolina Chickadee	Brown Pelican
		
Northern Cardinal	Great Blue Heron	Least Tern
		
Ruby-throated Hummingbird	Wood Duck	

*Eggs are actual size and approximate color as reported in Harrison (1978). Images are from Harrison (1978).*

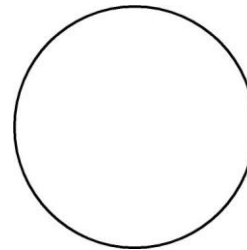
## Comparing Nest Sizes



Northern Cardinal nest



Carolina Chickadee nest



Ruby-throated Hummingbird nest





# What's for Lunch?

## The Swallow-tailed Kite's diet

Lower Elementary

### Focus/Overview

In this lesson, students will learn about the Swallow-tailed Kite's diet. In the activity, students will collect data by drawing paper chips that represent animals that swallowed-tail kites typically eat. They will display their data in the form of a bar graph. Students will describe a simple food chain represented by the Swallow-tailed Kite's diet.

### Learning Objectives

The learner will...

- collect data and sort it into categories.
- express data graphically.
- identify what the swallowed-tailed kite eats.
- describe a simple food web.

### Louisiana Science Grade Level Expectations

1: SI GLE-8 2: SI GLE-9	Express data in a variety of ways by constructing illustrations, graphs, charts, tables, concept maps, and oral and written explanations as appropriate (SI-E-A5) (SI-E-B4)
2: GLE 27	Match the appropriate food source and habitat for a variety of animals (e.g., cows/grass/field, fish/tadpoles/water) (LS-E-A1)
2: GLE 46	Illustrate and describe a simple food chain located within an ecosystem (SE-E-A2)

### Louisiana Math Grade Level Expectations

1:GLE 32	Given a set of data, construct and read information from bar graphs and charts (D-1-E) (D-2-E)
2: GLE 25	Collect and organize data using observations, surveys, and experiments (D-1-E)
2: GLE 26	Construct and read line plots and tables (D-2-E)

### Materials List

- paper or plastic bags (1 per pair of students)
- Blackline Master #1 (1 per pair of students)
- Blackline Master #2 (1 per student)
- Blackline Master #3 (1 per student)
- Blackline Master #4 (OPTIONAL – 1 per student)
- glue or glue dots

### Background Information

The Swallow-tailed Kite (*Elanoides forficatus*) belongs to the family of hawks and eagles. The Swallow-tailed Kite is a beautiful black and white bird that flies with much grace and agility. It mostly glides through the air, rotating its tail to steer it where it wants to go.

### BTNEP Connection

Birds

### Grade Level

1, 2

### Duration

1 hour

### Subject Area

science, math

### Setting

classroom

### Extension Area

art, language arts

### Vocabulary

food chain, diet



[www.btnep.org](http://www.btnep.org)



The bird has a white head, but the entire upperside is black. The bird's belly is white, which also extends to the leading edge of the underside of the wings, with the remaining portion of the underside of the bird being black. It is about 50-64 cm (20-25 in) in size and has a wingspan of 122 cm (48 in). It weighs 370 - 600 g (13.06-21.18 ounces).

Photo credit: Greg Lavaty



It lives in the southeast portion of the United States and in tropical America. During the winter, the bird migrates to tropical America. It lives in wooded river swamp habitats. It dines mostly on insects, but will also eat small reptiles, flying insects, amphibians, and small birds and nestlings. They can catch and eat insects in mid-air, and they also can capture their prey in the tops of trees while gliding slowly over the tree canopy.

A research study in Central America that counted the numbers and types of prey (not the biomass) brought to a nest, researchers found that 62% of 1496 prey deliveries were insects, 18% nestling birds, and 10% lizards; frogs and fruit were brought infrequently (Gerhardt, Gerhardt, and Vasquez, 2004). In another research study in southern Florida, the biomass of prey that was brought the nest included frogs (56%), birds (30%), and reptiles (11%) (Meyer, McGehee, and Collopy, 2004). Meyer et al. noted that five years previous to their study, considerably more insects and frogs were brought to the nest.

#### Background References:

Meyer, K., McGehee, S., and Collopy, M. (2004). Food deliveries at swallow-tailed kite nests in southern Florida. *The Condor*, 106(1): 171–176.  
 Gerhardt, R.P., Gerhardt, D.M., and Vasquez, M.A. (2004). Food delivered to nests of swallow-tailed kites in Tikal National Park, Guatemala. *The Condor*, 106(1):177-181.

### Advance Preparation

1. Run off enough copies of **Blackline Master #1** for each student or student group. Cut the 20 squares apart and place in a plastic or paper bag.
2. Make copies of **Blackline Master #2 and #3** for students. (**Blackline Master #4** is optional.)

### Procedure

#### Engage

1. View the video of two Swallow-tailed Kites gliding in the sky. This video was recorded on August 11, 2010 in Sanibel, Florida [<http://www.youtube.com/watch?v=88uJtXVAc0>]. Ask the students to describe the bird (see the Background Information included in this lesson to guide student observations during the video).
2. Introduce the students to the fact that this bird is a Swallow-tailed Kite. One of the interesting facts about this bird is its diet. In today's lesson, we are going to discover the types of prey that Kites eat.

#### Explore

1. Distribute a bag of swallow-tail kite food chips and **Blackline Masters #2** (one for each student) to each student pair.
2. Have the pairs of students take turns drawing food chips from the paper bag until each student has drawn 10 food chips. There should be no extra chips in the bag.
3. Have students sort out their 10 food chips into groups.
4. Have students move their groups of chips to **Blackline Master #2** (Swallow-tailed Kite Food Graph) and arrange the chips in the appropriate columns. Students should glue their chips down.
5. Have students count the number of blocks in each of their categories and write this number at the top of each group of food types. NOTE: Students can pull up to 10 insects – if this occurs, then have students group these chips in multiple columns and write the total number of insects at the top of the group of columns.
6. Have students orally describe the types and numbers of foods that their kite ate.

## Expand

1. Discuss with students the types of prey that the Swallow-tailed Kite eats. Have them complete the Swallow-tailed Kite food web on **Blackline Master #3** by drawing arrows to indicate what animals rely on for their food. Review with students the meaning of the words “predator” and “prey”.

## Assessment

- Graphs (Blackline Master #2) can be graded based on whether the student correctly grouped and counted the different types of prey that the Swallow-tailed Kites eat.
- The food web worksheet (Blackline Master #3) can be graded based on whether the student correctly identified the predator-prey relationships.

## Blackline Master

1. **Swallow-tail Kite Food Chips**
2. **Swallow-tail Kite Food Graph**
3. **Swallow-tail Kite Food Web [Answer Key provided]**
4. **Swallow-tail Kite Diagram**

## Extensions

- ART. Have students review the opening video (see Step 1, Engage). Use their observations of the birds to color in the diagram of the swallow-tail kite (**Blackline Master #4**).
- LANGUAGE ARTS. Have students write a story about a kite and what it might have for lunch.

## Resources

### BTNEP publications

- Raptors calendar (see April 2008 for specific information)  
[http://www.btnep.org/Libraries/Calendars/2008\\_Birding\\_Calendar.sflb.ashx](http://www.btnep.org/Libraries/Calendars/2008_Birding_Calendar.sflb.ashx)
- Louisiana Raptors: Birds of Prey
- The Habitats of Barataria-Terrebonne: Their importance to Migratory and Resident Birds (see page 16 for specific information)
- Wings Over the Wetlands video
- BTNEP Migratory Flyway Poster

### Recommended Field Guides

- Sibley, D.A. (2000). *The Sibley Guide to Birds*. Audubon Society Nature Guides. Random House, Inc.
- Peterson, R., and Peterson, V. (2002). *A Field Guide to the Birds of Eastern and Central North America*. Peterson Field Guide Series. Houghton Mifflin Harcourt.
- Alderfer, J. (ed.) (2005). *National Geographic Complete Birds of North America*. Random House, Inc.

### Internet Sites

#### **All About Birds: Swallow-tailed Kite**

[http://www.birds.cornell.edu/AllAboutBirds/BirdGuide/Swallow-tailed\\_Kite.html](http://www.birds.cornell.edu/AllAboutBirds/BirdGuide/Swallow-tailed_Kite.html)

*This webpage has good information about the Swallow-tailed Kite, including a map of the bird's habitat within the U.S., Central and South America. The site also has a recording of the bird's call. You need Quicktime to play the sound.*

### Other resources

Cerulean, S. (2005). *Tracking Desire: A Journey after Swallow-Tailed Kites*. University of Georgia Press, 192 pp.

*This book details the natural history and biology of Swallow-tailed Kites. Age range: adults.*





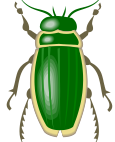



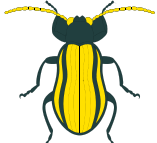










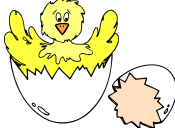
Kennedy, P. (2007). *Fun with Birds of Prey Stencils*. Dover Publications, 6 pp.

*Create realistic drawings of a Condor, Bald Eagle, Screech Owl, Peregrine Falcon, Osprey, and Swallow-tailed Kite with six brightly colored open stencils. Age Range: 4 to 6 years.*





## Swallow-tailed Kite Food Chips

 Insect	 Insect	 Insect	 Insect
 Insect	 Insect	 Insect	 Insect
 Insect	 Insect	 Insect	 Insect
 lizard	 lizard	 baby bird	 baby bird
 frog	 fruit	 baby bird	 baby bird

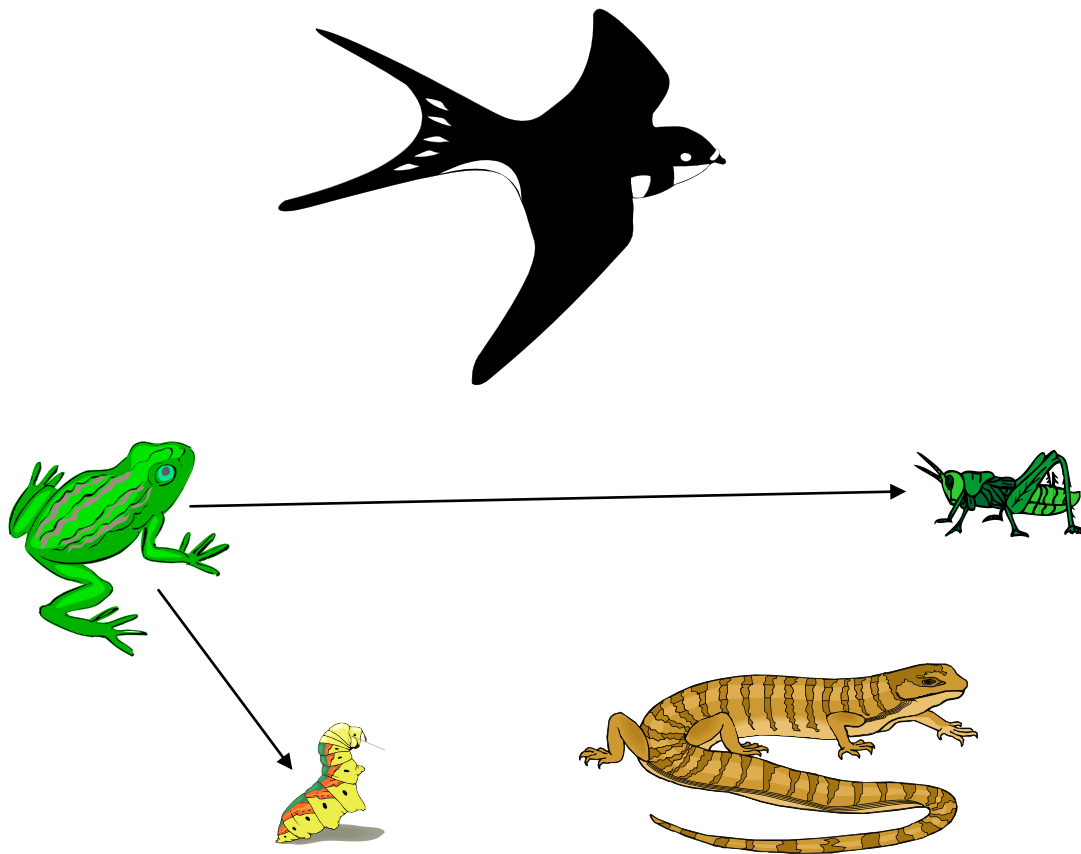
Blackline Master #2

Swallow-tailed Kite Food Graph


Animals that Swallow-tailed Kites Eat

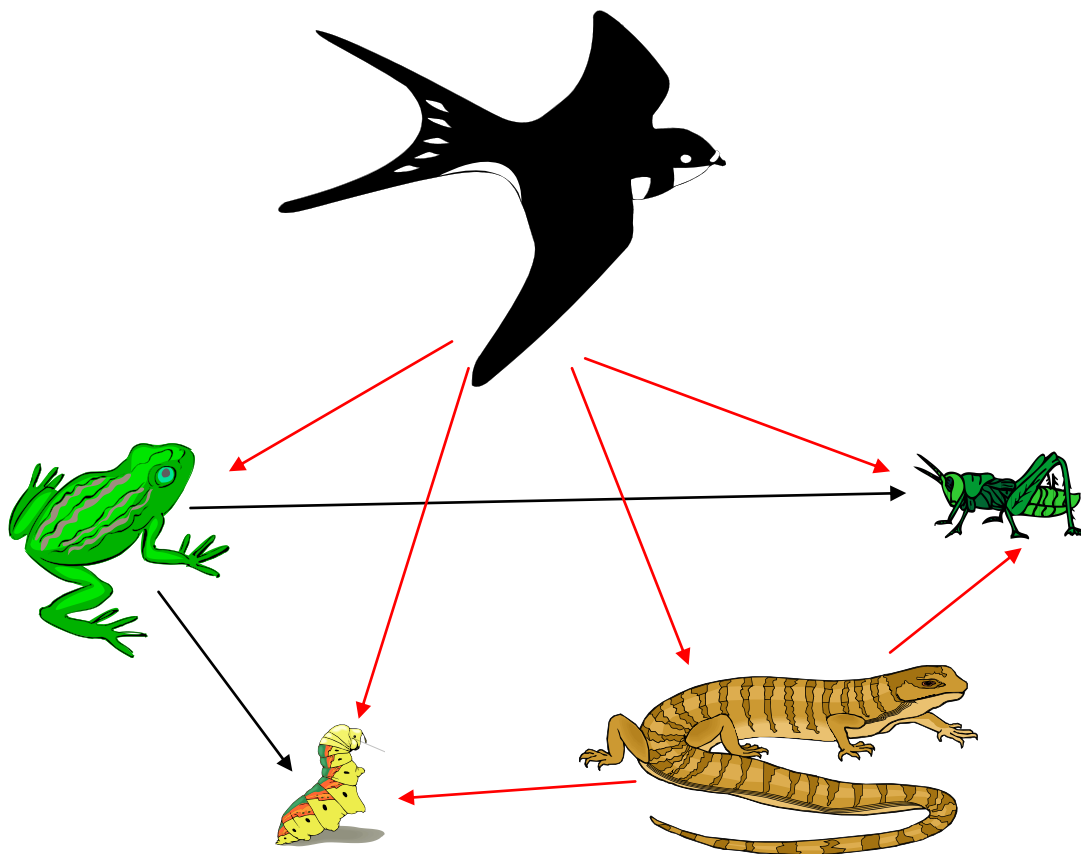
### Food Web for a Swallow-Tailed Kite

**Instructions:** Draw arrows starting at prey and ending at predator for this food web for the Swallow-tailed Kite. For instance, frogs eat insects, so draw an arrow beginning at a frog and ending at an insect.

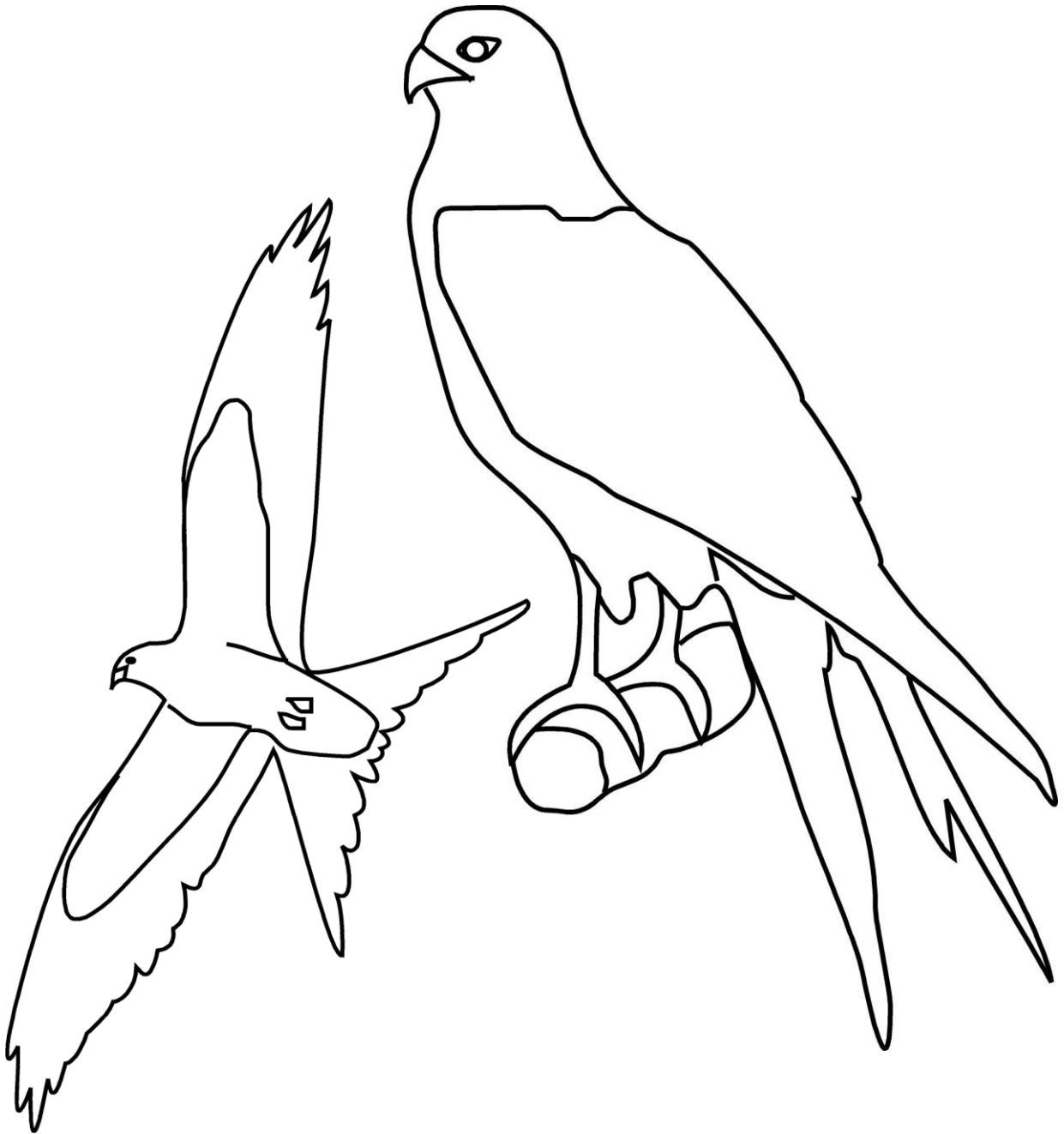


### Food Web for a Swallow-Tailed Kite

Instructions: Draw arrows starting at prey and ending at predator for this food web for the Swallow-tailed Kite. For instance, frogs eat insects, so draw an arrow beginning at a frog and ending at an insect.



# Swallow-tailed Kite



ROOF

Figure 1. Sides & Roof

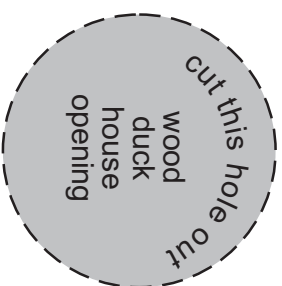


Figure 1, flap A

Figure 1, flap B

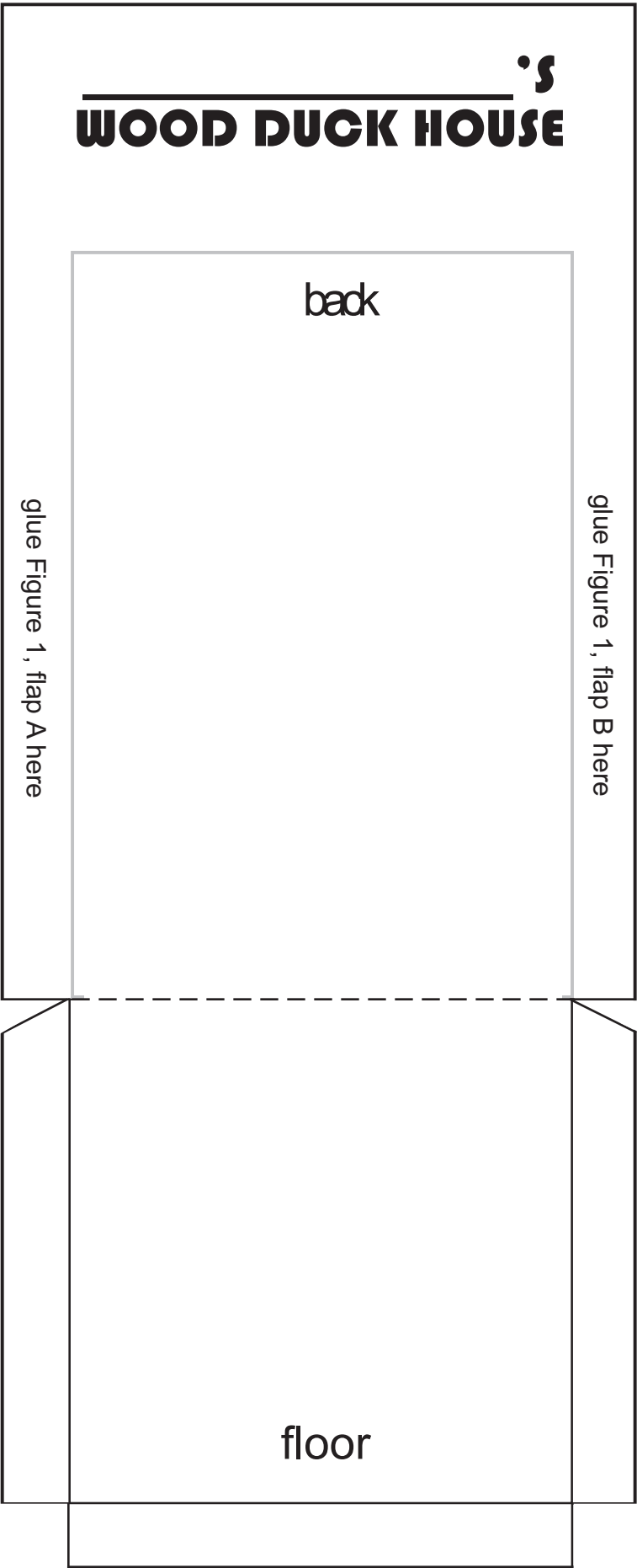
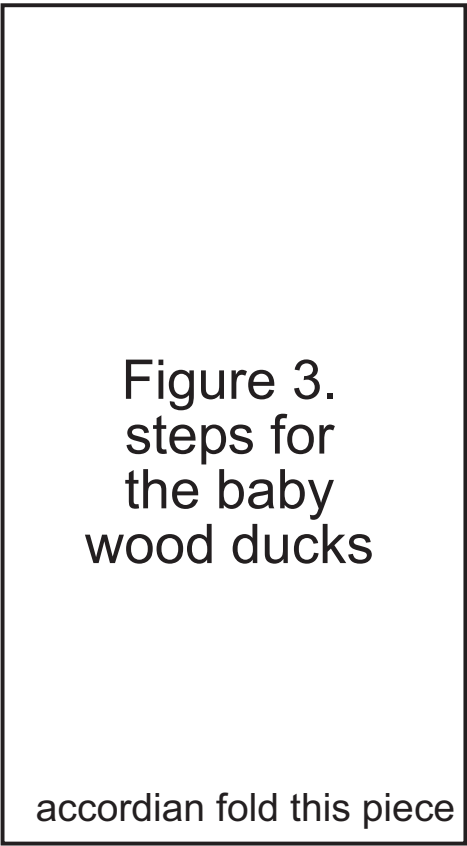


Figure 2. Back & floor





# Wood Duck Houses

Activity 3

Lower Elementary

## Focus/Overview

In this lesson, students will learn about the life cycle of Wood Ducks, with a special focus on the nesting habits of Wood Ducks and how humans are trying to help increase the population of this species by building and maintaining Wood Duck boxes.

## Learning Objectives

The learner will...

- distinguish between a male and female Wood Duck.
- describe how to build a Wood Duck box.
- describe the type of place that a Wood Duck would normally build their nest.
- explain why there is a need for humans to help the environment by building Wood Duck boxes.

## Louisiana Science Grade Level Expectations

1: GLE 27	Identify what animals and plants need to grow and develop (LS-E-A1)
1: GLE 32	Describe features of some animals that benefit them in their environments (LS-E-C1)
2: GLE 48	Describe a variety of activities related to preserving the environment (SE-E-A3)
2: GLE 50	Describe ways in which habitat loss or change can occur as a result of natural events or human impact (SE-E-A5)

## Materials List

- *A House for Wanda Wood Duck* by Patricia Barnes-Svarney
- Copies of **Figures 1, 2 and 3** (one copy per student)
- Scissors (one per student)
- Glue stick or paste (one per student or pair of student)
- Water colors or poster paints (one per pair of student)
- Computer with Internet access
- Infocus projector

## Background Information

Over the last 100 years, natural predators, human-harvested trees, and increasing farmland acreage have significantly reduced the number of Wood Ducks (*Aix sponsa*) in southern Louisiana. Wood Ducks, which migrate more than 500 miles through Louisiana, would normally lay their eggs in natural crevasses in trees. They are one of the few North American ducks that nest in tree cavities. Unfortunately, predators, including raccoons, snakes and humans, find those easy to reach eggs an easy meal. This pressure on successful hatching of eggs has helped to reduce the number of Wood Ducks in the ecosystems of south Louisiana.

In response to this problem, The Louisiana Department of Wildlife and Fisheries (LDWF) as well as many ecologically minded hunters, have built and deployed Wood Duck boxes throughout south Louisiana to

## BTNEP Connection

Birds

## Grade Level

1, 2

## Duration

2-3 hours

## Subject Area

science

## Setting

classroom

## Extension Area

art, language arts (writing)

## Vocabulary

nest, habitat



[www.btnep.org](http://www.btnep.org)





help sustain the Wood Duck population. LDWF maintains a very active nest-box and banding program for Wood Ducks. Currently, about 2,700 nesting boxes have been placed and are being monitored and maintained by LDWF personnel. Research has shown that four out of five of these boxes have nests in them in an average year. LDWF also bands more than 1,700 Wood Ducks each year. Banding is an important tool for estimating movements, harvest rates, and annual survival for Wood Ducks breeding here in Louisiana.

The Wood Duck box is built of cypress or red cedar, attached to a pipe and usually has a predator collar attached to prevent raccoons and snakes from being able to access the nest in the box. Wood Ducks feed mostly on seeds, fruits and other plant parts. They will occasionally eat spiders, insects, snails, and crawfish. They are one of the “dabbling” ducks, which means that when they are looking for food in shallow water, they bend forward until their tail sticks straight upward. They particularly like to eat duck weed, bald cypress cone scales, grass seeds and fruits and seeds of water elm, ash, wild grape, swamp privet, buttonbush, beech, tupelo, blackgum, and hickories. They will also forage for food on the swamp forest floor and are especially fond of acorns from water oak, laurel oak, and shumard oak.



Top: Wood Duck box in the Atchafalaya Basin.  
Bottom: Wood Duck nest and eggs in a box.  
Photos courtesy of Thomas Blanchard, Sr.

#### Background References:

Schaefer, J.M., Cohen, J., and Hostetler, M.E. *The Wood Duck*, The Institute of Food and Agricultural Sciences website. Retrieved February 23, 2009 at <http://edis.ifas.ufl.edu/UW180>.

### Advance Preparation

1. Make sure you have the software necessary to show the two videos used in the lesson to your students:  
[http://nationalzoo.si.edu/ConservationAndScience/MigratoryBirds/Video/video.cfm?id=hp\\_bfoMVWJ0](http://nationalzoo.si.edu/ConservationAndScience/MigratoryBirds/Video/video.cfm?id=hp_bfoMVWJ0)  
<http://news.nationalgeographic.com/news/2006/05/duck-video-1.html>
2. Run off the pattern pieces for the Wood Duck Boxes (**Figures 1, 2 and 3**). It would be best to run them off on thicker paper so that the students will find them easier to work with. It is recommended that you assemble a Wood Duck box as a model for your students so they can see what it looks like when complete.
3. Contact Louisiana Wildlife and Fisheries or Ducks Unlimited if you are interested in having a speaker come and talk with your students. Ask them to bring in a real Wood Duck box to show students. Ask them to talk about how conservationists help build the Wood Duck populations by protecting the Wood Duck eggs from predators such as snakes and raccoons.
  - Please contact LDWF at 225-765-2800 between 8 am and 4:30 pm, Monday - Friday to request a speaker.
  - Ducks Unlimited – Louisiana contacts:  
<http://www.ducks.org/Louisiana/LAContent/287/LouisianaStateDUContacts.html>

### Procedure

#### Engage

1. Show students a picture of a male and female Wood Duck (**Blackline Master #1**). Ask them to make observations about the two birds. What characteristics do they notice? How are they similar? How are they different? The teacher can summarize the characteristics on the black board or on chart paper.

2. Show students a video of a male and female Wood Duck. View [http://nationalzoo.si.edu/ConservationAndScience/MigratoryBirds/Video/video.cfm?id=hp\\_bfoMVWJ0](http://nationalzoo.si.edu/ConservationAndScience/MigratoryBirds/Video/video.cfm?id=hp_bfoMVWJ0). Can they identify which is the male duck? Which is the female duck?

### Explore/Explain

1. Read A House for Wanda Wood Duck by Patricia Barnes-Svarney. This may be too long to read to students at one sitting, so teachers might plan to break up the reading. As students hear the book, have them identify important information about the ducks, including identifying the male and female ducks in the illustrations, noting where Wood Ducks live, how long it takes Wood Duck eggs to hatch, etc. This information can be noted on chart paper or the blackboard.
  - Where do Wood Ducks normally make their nests? [*Wood Ducks nest in cavities of old large trees.*]
  - Why do Wood Ducks sometimes have a difficult time finding suitable trees to make nests in? [*When these old trees are cut down by humans for wood or blown down in storms, Wood Ducks have fewer natural nesting sites.*]
  - Why is there a need for humans to help the environmental by building Wood Duck boxes? [*Humans can help increase the Wood Duck population by building nest boxes so we can increase the number of Wood Duck eggs that are laid and the number of babies born each year.*]
  - What does a human-built Wood Duck box look like? [*A human-built Wood Duck box is about two feet tall and 1 foot wide and 1 foot deep. It has an oval hole in the upper front panel of the box that measures 3" by 4". It has a hinged top or a hinged door in the back so that humans can check on the eggs and clean the box.*]
  - What type of problem does a raccoon pose for a Wood Duck mom and her eggs? [*Raccoons like to raid Wood Duck boxes and eat the eggs. It's an easy meal.*]
  - How long does the momma Wood Duck sit on her eggs? [*About one month.*]
2. Have students make their own paper Wood Duck boxes (Blackline Master #2 – 3 pages). NOTE: The pages are best copied onto thicker paper.

### Expand

1. Have students view a video of baby Wood Ducks hatching and leaving the nest at <http://news.nationalgeographic.com/news/2006/05/duck-video-1.html>
2. Ask students to write two important things they learned about Wood Ducks and their nests (**Blackline Master #3**).
3. Display students' Wood Duck boxes and their "I Know About Wood Duck" (**Blackline Master #3**) pages in the classroom or hallway.
4. Optional: Invite someone from LA Wildlife and Fisheries or Ducks Unlimited to speak to your students about Wood Duck conservation efforts.

### Assessment

- Students' writing (**Blackline Master #3** can be graded).

### Blackline Master

1. Wood Duck pictures, male, female, and chick
2. Instructions for making Wood Duck box models (3 pages)
3. I Know about Wood Ducks

### Extensions

- ART. Feather painting
- LANGUAGE ARTS. Have students write a story about a baby Wood Duck leaving its duck box for the first time.

## Resources

### **BTNEP publications**

- The Habitats of Barataria-Terrebonne: Their importance to Migratory and Resident Birds
- Wings Over the Wetlands video
- BTNEP Migratory Flyway Poster

### **Recommended Field Guides**

- Sibley, D.A. (2000). *The Sibley Guide to Birds*. Audubon Society Nature Guides. Random House, Inc.
- Peterson, R., and Peterson, V. (2002). *A Field Guide to the Birds of Eastern and Central North America*. Peterson Field Guide Series. Houghton Mifflin Harcourt.
- Alderfer, J. (ed.) (2005). *National Geographic Complete Birds of North America*. Random House, Inc.

### **Internet Sites**

#### **Smithsonian National Zoological Park: Migratory Bird Center: The Wood Duck**

[http://nationalzoo.si.edu/ConservationAndScience/MigratoryBirds/Video/video.cfm?id=hp\\_bfoMVWJ0](http://nationalzoo.si.edu/ConservationAndScience/MigratoryBirds/Video/video.cfm?id=hp_bfoMVWJ0)

*A video of a male and female Wood Duck swimming in a pond. A bit blurry, but recognizable.*

#### **National Geographic News: Video: Baby Duck "Parajumpers" Take the Plunge**

[http://video.nationalgeographic.com/video/player/specials/editors-picks-specials/animal-moms/duck\\_leavingnest.html](http://video.nationalgeographic.com/video/player/specials/editors-picks-specials/animal-moms/duck_leavingnest.html)

*A wonderful video shot from inside a Wood Duck box of babies hatching and then leaving the nest. Excellent!*

#### **Cornell Lab of Ornithology – All about Birds: Wood Ducks**

[http://www.birds.cornell.edu/AllAboutBirds/BirdGuide/Wood\\_Duck\\_dtl.html](http://www.birds.cornell.edu/AllAboutBirds/BirdGuide/Wood_Duck_dtl.html)

*Excellent information on Wood Ducks, including maps and biological information, bird call, pictures of male and female ducks.*

#### **NRCS Wildlife Habitat Management Institute: Wood Duck**

[ftp://ftp-fc.sc.egov.usda.gov/WHMI/WEB/pdf/woodduck\(1\).pdf](ftp://ftp-fc.sc.egov.usda.gov/WHMI/WEB/pdf/woodduck(1).pdf)

*Detailed information about Wood Ducks biology and management. Drawings of a duck box.*

### **Other resources**

Barnes-Svarney, Patricia. (2002). *A House for Wanda Wood Duck*. Ducks Unlimited, Inc. 32pp. ISBN-13: 9780961727956

*Two children and their father provide a new nesting site for a Wood Duck hen. Includes instructions for building a Wood Duck nest box. Children, ages 4-8.*

Barrack, Jerry. (2005). *Duck Enough to Fly*. In the Presence of Nature Publishing. 32 pp.

*This photographic book captures baby Wood Ducks leaving home and taking their first great leap of faith. The book contains a simple, inspirational message about facing life's challenges. The book also emphasizes the importance of protecting Wood Ducks and their habitats. Children, ages 7-10.*

Irvin-Marston, Hope. (2004). *My Little Book of Wood Ducks*. Windward Publishing, Inc. 32 pp.

*A wonderful story of the birth and growth of a Wood Duck family. Children, ages 7-10.*

Loomis, Jennifer. (1996). *A Duck in a Tree*. Stemmer House Publishers, Inc. 33 pp.

*Text and photographs follow a male and female Wood Duck through their breeding season in Maine, as they choose a nesting site in a tree, mate, watch the eggs hatch, and protect and rear their ducklings. Includes instructions for building a Wood Duck nest box. Children, ages 7-10.*

# Wood Ducks

This is a male Wood Duck.



This is a female Wood Duck.





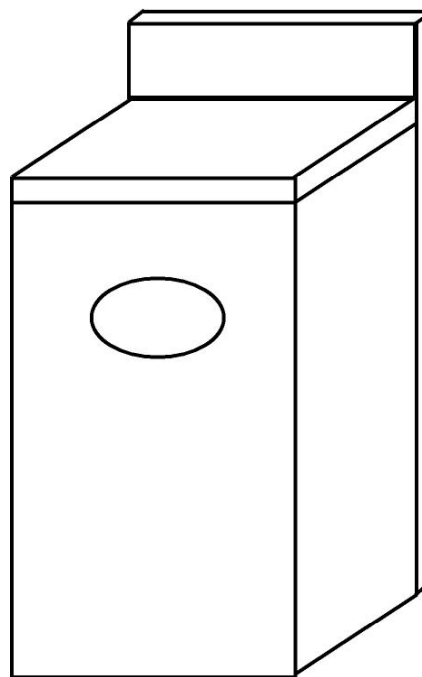
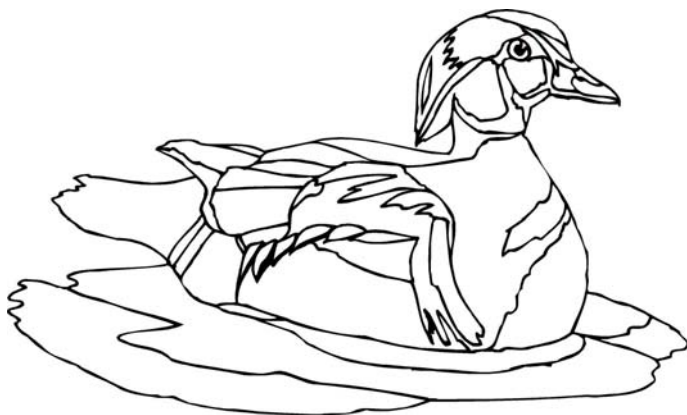
This is a baby Wood Duck.



## Instructions for assembling a Wood Duck house model

1. Cut out the three figures (sides & roof, back & floor, steps).
2. On Figure 1,
  - a. Cut out the Wood Duck box hole.
  - b. With Figure 1 lying flat on the table, fold the two edges up along the dotted lines. Fold down along the dashed lines to form the sides of the Wood Duck box.
3. On Figure 2,
  - a. Write the Student's name on the line at the top of the back panel of the Wood Duck box.
  - b. With Figure 2 lying flat on the table, fold the floor up along the dotted lines. Fold up the flaps along the dashed lines on the bottom of the Wood Duck box.
4. Accordion fold Figure 3.
5. Placing Figure 1 face down on the table, glue the baby Wood Duck steps just beneath the opening to the Wood Duck box. Stretch the steps down toward the bottom of the box.
6. Glue the two side flaps on Figure 1 to the left and right edge of Figure 2.
7. Fold the floor of Figure 2 up to meet the sides of Figure 1 and glue.
8. Add nesting material (shredded paper).
9. The top flap can be left unglued so students can see inside the box.
10. If desired, students can decorate their Wood Duck box by painting it with water color or poster paints

# I know about Wood Ducks and their houses

This image shows a blank sheet of handwriting practice paper. It features four identical sets of horizontal guidelines arranged vertically. Each set includes three lines: a solid top line, a dashed middle line, and a solid bottom line, providing a structured space for practicing letter formation and alignment.



# Bird Families

## Baby birds and their parents

Lower Elementary

### Focus/Overview

In this lesson, students will learn that not all baby birds look exactly like their parents. Students will match baby birds with their parents and describe how they are similar and different from their parents.

### Learning Objectives

The learner will...

- Match baby birds with their parents.
- Use a Venn Diagram to organize their observations about similarities and differences between parents and offspring

### Louisiana Science Grade Level Expectations

K: GLE-29	Match models of baby animals with their parents (LS-E-B3)
1: GLE 31	Describe how animals and their offspring are similar and how they are different (LS-E-B3)

### Materials List

- **Blackline Master #1** (1 per group of students)
- **Blackline Master #2** (1 for each student)
- Overhead projector (optional)
- Overhead projector pen (optional)

### Background Information

Some bird offspring look remarkably like their parents. This is the case for the Snowy Egret. The baby and juvenile Snowy Egrets both have white feathers, but are distinguished by the color of their bills (beaks). Another bird that looks very similar as a juvenile and an adult is the Roseate Spoonbill. The juvenile has the same bill shape as the adult, and the only difference is that the juvenile has feathers that are a lighter shade of pink. Other species' adult and juveniles, such as the Brown Pelican, look very distinct from one another. While the adult Brown Pelican has a brown body and a white neck and head, the juvenile Brown Pelican has an entirely white body, neck and head. The adult has an orange bill, while the juvenile has a light tan bill. They both have pouches. Juvenile Purple Martins look more like their mother and very little like their dad.

This lesson focuses on making observations based on photographic images, and then organizing these observations into similarities and differences using a Venn Diagram. The images are a combination of nestling and fledgling photos. No distinction is made between the two in this lesson, however your students may ask. A **nestling** is confined to and has not yet left the nest and a fledgling has developed the ability to fly to and from the nest. **Fledglings** also have developed the ability to grip branches with their feet. Please refer to the "Orphaned" Baby Birds (Cornell Lab of Ornithology) for information about what to do if a baby bird is found on the ground.

### BTNEP Connection

Birds

### Grade Level

K, 1

### Duration

30 minutes

### Subject Area

science

### Setting

classroom

### Extension Area

art, language arts

### Vocabulary

characteristic, trait, down



[www.btneep.org](http://www.btneep.org)



#### Background References:

California State University, Bakersfield; Facility for Animal Care and Treatment. (no date). *How to care for baby birds*. Accessed July 1, 2009, at Smithsonian National Zoological Park: Friends of the National Zoo. (no date). Birds: Fact Sheets - Emergency Care for Baby Birds. Accessed December 12, 2010, at <http://nationalzoo.si.edu/Animals/Birds/Facts/FactSheets/emergencycare.cfm>

Cornell Lab of Ornithology: All About Birds. (no date). *"Orphaned" Baby Birds*. Accessed July 1, 2009, at <http://www.birds.cornell.edu/AllAboutBirds/attracting/challenges/orphaned>

### Advance Preparation

1. Obtain a copy of ***Are You My Mother?*** by P.D. Eastman. Pre-read the story.
2. Run off enough copies of **Blackline Master #1** for each student or student group. This is best printed in color.
3. Make copies of **Blackline Master #2** for each student OR run copies off on overhead projection sheets.

### Procedure

#### Engage

1. Read P.D. Eastman's ***Are You My Mother?*** Ask students, "How do you think the little bird will recognize his mom?" What characteristics, or traits, will tell him he's found the correct mother?

#### Explore

1. Tell students that they are going to be looking at some baby birds and their parents. They will need to write the traits that the baby birds share with their parents, as well as traits that they have that are different. What are some traits that we could observe about baby birds and their parents? Record student suggestions to the board (shape and color of beaks, color of feathers, color of their eyes, shape and color of feet, etc.)
2. Distribute the baby bird and parents cards (**Blackline Master #1**) to students (or student group) – one bird per group.
3. Have student groups identify the baby bird characteristics (traits) that are similar and different from their parents.

#### Explain

1. Draw the Venn Diagram (**Blackline Master #2**) on the board (or have it ready on an overhead projection sheet). Ask each student group to come up and explain how their baby is similar or different from their parents. Record their observations in the appropriate location. Demonstrate this recording process in the beginning, and then ask the students to tell you where to write each characteristic. Here are a few observations you can
  - **Color:** Is the bird the same color all over, or is it lighter or darker in some areas? Does it have stripes or patches of color?
  - **Feathers/Down:** Is the bird's entire body covered with feathers, or are there places that do not have feathers? If there is down, is the down stringy or fluffy? **VOCABULARY NOTE: Down feathers appear very fluffy and fine and are found under the tougher outer feathers on a bird's body. Down is a great insulator and provides good padding for young bird.**
  - **Feet & Toes:** Are the toes connected by webbing? If the picture shows the bird perching on a tree limb, how many of the toes face forward and how many face backward?
  - **Beak:** Is the bird's beak straight, hooked, or some other shape? What color is the beak? Is the beak small or large?
  - **Neck:** Is the neck short or long? Is there a neck pouch?

#### Expand

1. Give students their own copy of the Venn Diagram (**Blackline Master #2**). Give them a different set of the Bird Family photos (from **Blackline Master #1**) and have them write two things that are similar about their parent and baby bird and two things that are different.

## Assessment

- The student Venn Diagrams can be assessed.

## Blackline Masters

1. Bird Families
2. My Bird Family

## Extensions

- ART. As a class, have students create a “baby book” of illustrations about the baby birds and their parents. Have students draw their own picture of one of the bird species (adult and baby) and write out how they would “know their mother.”
- LANGUAGE ARTS. Have students bring a picture that shows themselves and their parents (or a relative). Have students write a short paragraph that tells how they are similar and different from their parents based on the observable characteristics in the picture.

## Resources

### BTNEP publications

- Breeding Wood Warblers (2009 calendar) – Black-and-White Warbler (February 2009)  
[http://www.btnep.org/Libraries/Calendars/2009\\_Birding\\_Calendar.sflb.ashx](http://www.btnep.org/Libraries/Calendars/2009_Birding_Calendar.sflb.ashx)
- Louisiana Raptor (2008 calendar) – Osprey (August 2008)  
[http://www.btnep.org/Libraries/Calendars/2008\\_Birding\\_Calendar.sflb.ashx](http://www.btnep.org/Libraries/Calendars/2008_Birding_Calendar.sflb.ashx)
- Louisiana’s Waders (2007 calendar) – White Ibis (January 2007); Roseate Spoonbill (April 2007); Snowy Egret (June 2007)  
[http://www.btnep.org/Libraries/Calendars/2007\\_Birding\\_Calendar.sflb.ashx](http://www.btnep.org/Libraries/Calendars/2007_Birding_Calendar.sflb.ashx)
- The Habitats of Barataria-Terrebonne: Their importance to Migratory and Resident Birds (2007)
- Wings Over the Wetlands video
- Migratory Flyway Poster

### Recommended Field Guides

- Sibley, D.A. (2000). *The Sibley Guide to Birds*. Audubon Society Nature Guides. Random House, Inc.
- Peterson, R., and Peterson, V. (2002). *A Field Guide to the Birds of Eastern and Central North America*. Peterson Field Guide Series. Houghton Mifflin Harcourt.
- Alderfer, J. (ed.) (2005). *National Geographic Complete Birds of North America*. Random House, Inc.

### Internet Sites

#### **Cornell Lab of Ornithology, All About Birds: “Orphaned Baby Birds”**

<http://www.birds.cornell.edu/AllAboutBirds/attracting/challenges/orphaned>  
*What to do if you find a baby bird.*

### Other resources

Eastman, P.D. (2007). *Are You My Mother?* Random House Children’s Books, 24 pp.  
*A baby bird, fallen from his nest, sets out to find his mother. Age Range: 4 to 8 years.*

DK Publishing. (2008). *Animal Families*. DK Publishing, Inc. 64 pp.  
*Pictures of human families are set beside animal clans to show charming similarities, as lion cubs fight over a stick, flocks of birds travel together to warmer climates, and a mother monkey comforts her baby when he hurts himself. Children will delight in recognizing their own family dynamics in nature, and learning about members of the animal kingdom in an accessible and memorable new way (quote from DK Publishing). Age Range: 5 to 8 years.*

## Bird Family Photos

WOOD DUCK		
		
<a href="http://site.westernplainsanimalrefuge.org/images/wood_duck_chuck_5_29_kyqj.jpg">http://site.westernplainsanimalrefuge.org/images/wood_duck_chuck_5_29_kyqj.jpg</a>	Photo credit: Charlie Hohorst Female Wood Duck	Photo credit: Charlie Hohorst Male Wood Duck
BROWN PELICAN		
		
<a href="http://animal.discovery.com/guides/baby-animals/birds/gallery/brown-pelican.jpg">http://animal.discovery.com/guides/baby-animals/birds/gallery/brown-pelican.jpg</a>	Photo credit: Paul Conover	thundafunda.com
SWALLOW-TAILED KITE		
		
<a href="http://www.peregrinefund.org/explore_raptors/kites/media/swalt3.jpg">http://www.peregrinefund.org/explore_raptors/kites/media/swalt3.jpg</a>	<a href="http://www.riograndedelatadubon.org/Images/NwLtrMay07/Swallow-tail-Kite750.jpg">http://www.riograndedelatadubon.org/Images/NwLtrMay07/Swallow-tail-Kite750.jpg</a>	Photo credit: Greg Lavaty



## ROSEATE SPOONBILL



*Roseate Spoonbill chicks, Lake Martin, La*  
Image copyright 2004 Arthur Morris/BIRDS  
AS ART [www.birdsasart.com/bn139.htm](http://www.birdsasart.com/bn139.htm)



Photo credit: Paul Conover



<http://nationalzoo.si.edu/Animals/PhotoGallery/Birds/14.cfm>

## PURPLE MARTIN



[http://4.bp.blogspot.com/\\_qmLOexsvi3I/RpgIXNYVVqI/AAAAAAAAAbQ/qWdLIPTIDEg/s320/PUMA\\_17do\\_July12\\_2007Gourd14\\_C.JPG](http://4.bp.blogspot.com/_qmLOexsvi3I/RpgIXNYVVqI/AAAAAAAAAbQ/qWdLIPTIDEg/s320/PUMA_17do_July12_2007Gourd14_C.JPG)



Male on left, Female on right

<http://purplemartinstory.org/id3.html>



<http://duncraft.atom5.com/attracting-purple-ma-4077.html>

## SNOWY EGRET













Syd Johnson



Photo credit: Paul Conover



John R French

ROYAL TERN		
		
<a href="http://birdsofsanibel.free.fr/new_page_4.htm">http://birdsofsanibel.free.fr/new_page_4.htm</a>	Paul Conover	<a href="http://www.thedailygreen.com/environmental-news/latest/birds-gulf-oil-spill-0519">http://www.thedailygreen.com/environmental-news/latest/birds-gulf-oil-spill-0519</a>
WHITE IBIS		
		
<a href="http://romps.org/blog/">http://romps.org/blog/</a>	<a href="http://birdsofsanibel.free.fr/new_page_4.htm">http://birdsofsanibel.free.fr/new_page_4.htm</a>	<a href="http://stlucieaudubon.org/photos.htm">http://stlucieaudubon.org/photos.htm</a>
BLACK SKIMMER		
		
John Dindo, PhD	Paul Conover	<a href="http://www.texasescapes.com/TexasAnimals/Coastal-Birds-of-Texas-by-Ken-Rudine.htm">http://www.texasescapes.com/TexasAnimals/Coastal-Birds-of-Texas-by-Ken-Rudine.htm</a>
BLACK AND WHITE WARBLER		
		
<a href="http://www.birdingmaine.com/bird-versus-window.htm">http://www.birdingmaine.com/bird-versus-window.htm</a>	Paul Conover	Jessica D. Yarnell



## OSPREY



Doc Baldwin



<http://wdfw.wa.gov/wildwatch/ospreycam/>



<http://www.flickr.com/photos/35303070@N02/4478748049/>

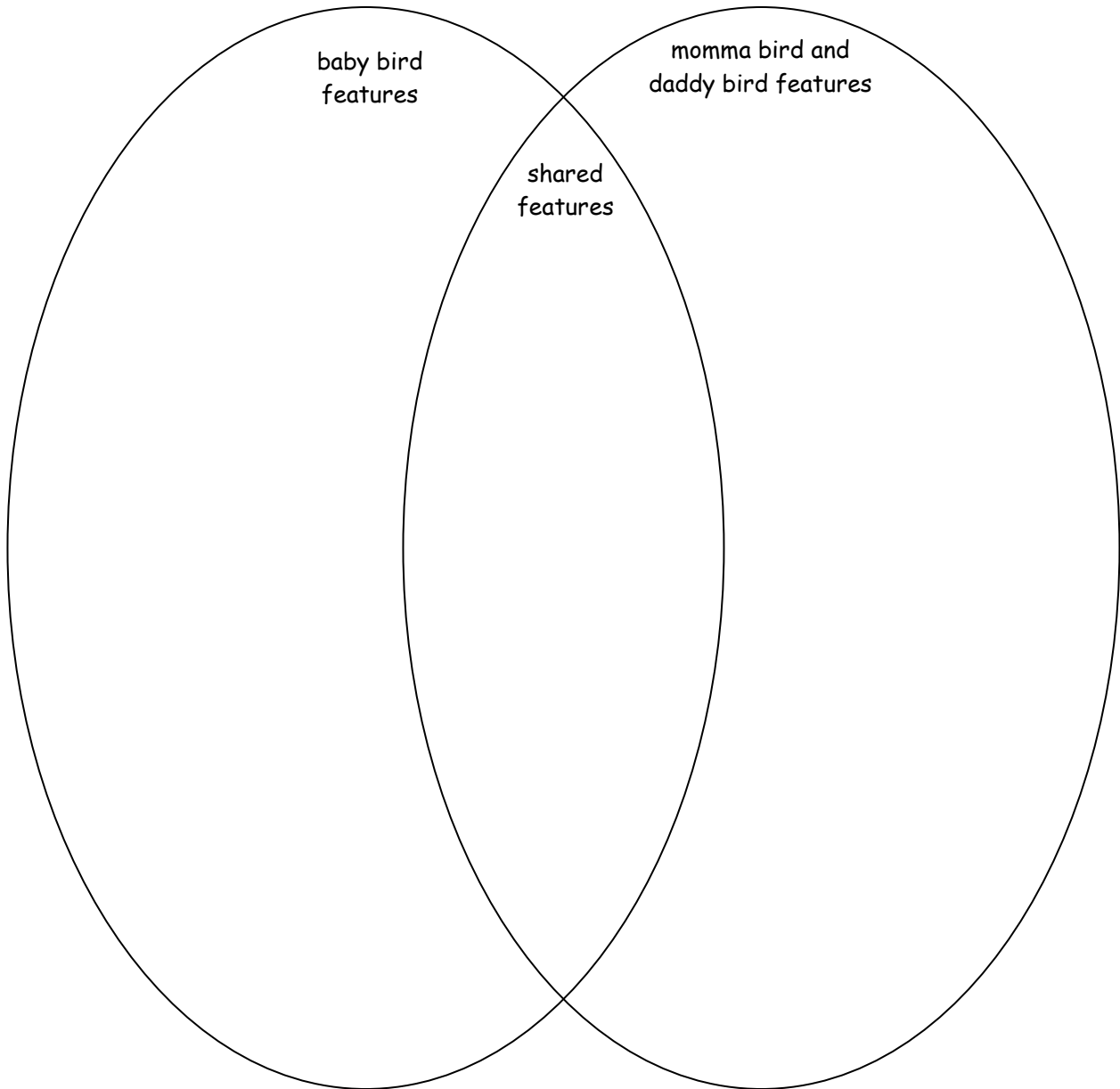


**Black winged Stilt and babies, Photo by John Dindo**

Student Name \_\_\_\_\_ Date \_\_\_\_\_

My Bird Family is the \_\_\_\_\_.

Describe how your baby bird is alike and different to its parents. You can write words or draw pictures to show the difference.



**Color:** Is the bird the same color all over, or is it lighter or darker in some areas?

**Feathers/Down:** Is the bird's entire body covered, or are there places that do not have feathers? If there is down, is the down stringy or fluffy?

**Feet & Toes:** Are the toes connected by webbing? If the picture shows the bird perching on a tree limb, how many of the toes face forward and how many face backward?

**Beak:** Is the bird's beak straight, hooked, or some other shape? What color is the beak? Is the beak small or large?

**Neck:** Is the neck short or long? Is there a neck pouch?





# Wingspans: How Big is an Eagle?

Upper Elementary

## Focus/Overview

In this lesson, students will use metric and standard unit measurements to graphically compare the wingspans of Bald Eagles to a number of other Louisiana bird species.

## Learning Objectives

The learner will...

- measure and record length in appropriate metric and standard units.
- express data graphically.
- compare the wingspans of Louisiana birds using graphs.

## Louisiana Science Grade Level Expectations

3: SI GLE-7 4: SI GLE-8	Measure and record length, temperature, mass, volume, and area in both metric system and U.S. system units (SI-E-A4)
3: SI GLE-9 4: SI GLE-10	Express data in a variety of ways by constructing illustrations, graphs, charts, tables, concept maps, and oral and written explanations as appropriate (SI-E-A5) (SI-E-B4)
3: GLE 19	Select the appropriate metric system and U.S. system tools for measuring length, width, temperature, volume, and mass (PS-E-A2)
4: GLE 23	Determine linear, volume, and weight/mass measurements by using both metric system and U.S. system units to compare the results (PS-E-A2)
5: SI GLE 11	Construct, use, and interpret appropriate graphical representations to collect, record, and report data (e.g., tables, charts, circle graphs, bar and line graphs, diagrams, scatter plots, symbols) (SI-M-A4)
5: GLE 1	Measure a variety of objects in metric system units (PS-M-A1)

## Louisiana Math Grade Level Expectations

3: GLE-25 4: GLE-22	Select and use the appropriate standard units of measure, abbreviations, and tools to measure length and perimeter, area, capacity, and weight/mass (M-2-E)
4: GLE-20	Measure length to the nearest quarter-inch and mm (M-2-E) (M-1-E)
4: GLE-34	Summarize information and relationships revealed by patterns or trends in a graph, and use the information to make predictions (D-1-E)
4: GLE-36	Analyze, describe, interpret, and construct various types of charts and graphs using appropriate titles, axis labels, scales, and legends (D-2-E) (D-1-E)
4: GLE-37	Determine which type of graph best represents a given set of discrete data (D-2-E) (D-1-E)

## BTNEP Connection

Birds

## Grade Level

3-5

## Duration

1 hour

## Subject Area

science

## Setting

classroom

## Extension Area

graphing  
art

## Vocabulary

wingspan



[www.btnep.org](http://www.btnep.org)



5: GLE-28	Use various types of charts and graphs, including double bar graphs, to organize, display, and interpret data and discuss patterns verbally and in writing (D-1-M) (D-2-M) (P-3-M) (A-4-M)
5: GLE-29	Compare and contrast different scales and labels for bar and line graphs (D-1-M)
5: GLE-30	Organize and display data using spreadsheets, with technology (D-1-M)

## Materials List

- wingspans table (**Blackline Master #1**)
- yardsticks, meter sticks, rulers, or measuring tapes
- sentence strips or other long pieces of paper (about 25 meters/27 yards per group)
- markers
- tape or sticky tack
- scissors (one pair per group)
- large sheets of bulletin board paper (optional)
- printer paper (optional)
- 2008 BTNEP Raptors calendar  
[http://www.btnep.org/Libraries/Calendars/2008\\_Birding\\_Calendar.sflb.ashx](http://www.btnep.org/Libraries/Calendars/2008_Birding_Calendar.sflb.ashx)
- bird field guides, internet sites, and BTNEP resources

## Background Information

There are many ways to measure the size of a bird. Weight, mass, length, and wingspan are the most common measurements used. Wingspan, the distance from wingtip to wingtip, is a common method used to compare the size of birds. Why? Because the best looks we have at birds are often when they're flying, wingspan is a good way for people to visualize how "big" a bird is.

With a wingspan of 80 inches (200 centimeters), the Bald Eagle is the largest bird of prey species found in Louisiana. For visualization purposes, its wingspan is the equivalent of two meter sticks laid end to end. For comparison, the Louisiana bird with the shortest wingspan is the Ruby-throated Hummingbird. At 4½ inches (11.3 cm), its wingspan is about the width of an adult's hand.

Add photo of  
soaring eagle?

## Advance Preparation

1. A variety of materials can be used, but long pieces of paper will need to be used for the wingspans of the larger species. Colorful sentence strips are ideal, as they are both long enough and contrasting enough to make each individual species stand out. Rolls of adding machine paper or colorful art paper are good as well. Each group will need about 25 meters/27 yards of paper strips.
2. Locate pictures of the Bald Eagle in flight to show students (Engage #3). One excellent photo resource is at <http://www.baldeagleinfo.com/eagle/eagle8.html>. Other photos can be located easily using any Internet search engine.
3. Each group will locate pictures of birds in flight. Find images of a variety of birds – both large and small. Several of these pictures can be found in the bird calendars printed by BTNEP (both raptors and wading birds). You may want to laminate these images and keep them for future use.
4. Bring several bird field guides (listed under Resources at the end of this lesson) in for reference use by the students.

## Procedure

### Engage

1. Choose three students to come to the board (be sure to choose students of different heights). Have them stretch out their arms as far as they will reach and mark the tip of where their fingers hit the black board. Draw a line from each of their fingers' marks and label it with their name. Have a student mark the teacher's arm span on the board. Who had the largest arm span? The smallest arm span?



2. Have two student volunteers each take a meter stick and stand before the class. Have the students join the ends of the meter stick, and have them “flap” the sticks like the wings of a bird. Ask, “*If we just drew the width of our arm spans on the board, what do you suppose we can call the width of an eagle’s wings?*” Explain that the Bald Eagle’s wings, a native Louisiana species, can grow to be that exact length of two meter sticks held end to end.
3. Use the BTNEP Raptors calendar to show the students pictures of the Bald Eagle. Have students look through field guides, bird books or magazines, and BTNEP publications to view other birds big and small.

### Explore/Explain

1. Divide students into groups and hand out wingspan tables (**Blackline Master #1**), rulers, paper strips, scissors, tape or sticky tack, and markers to each group. Have students look at the measurements of the birds in the table and have each group select **nine** birds, plus the Bald Eagle, from the table. Each group will have a total of 10 birds.
2. Explain to the students that they will be making a life-size graph comparing the wingspans of the birds their group has chosen to the wingspan of the Bald Eagle.
3. Have students measure strips of paper to the match the wingspan of the species they have chosen. Using markers, label the strips with the species name and the length of the wingspan in both standard and metric units.
4. Have each group construct a graph with their wingspan paper strips. [Graphs can be constructed either on an open wall or on large sheets of bulletin board paper.] The wingspan paper strips that they have measured will become the bars of their bar graphs. Some groups may make simple bar graphs. Other options, especially if groups are using a variety of colors of strips, include folding strips in the middle, laying the longest strip on the bottom and increasingly smaller strips on top of it, and matching the center of each strip to make a “middle-out” graph.
5. Graphs will need to be titled and labeled on their x- and y-axes. [Additional paper strips may be needed for these labels.] Depending on the layout of the graph, x- and y-axes placement may vary. One axis will be labeled, “Bird Species,” with the individual species names written next to their corresponding bars on the scale. The other axes label will describe what is being measured, and in what units (e.g., “Length in metric and standard units”).
6. Because the species names and measurements will be written on the strips already, graph scales will not be absolutely necessary; however, 4<sup>th</sup> and 5<sup>th</sup> grade Math GLEs call for students to use appropriate scales. In this case, because a group’s measurements may range from a few centimeters to over two meters, intervals of about 20-25 cm might be appropriate.
7. Have students verbally (or in writing) explain what their graphs tell them about the wingspans of the birds on their list.

### Expand

1. Have students choose four or five birds that are not on their list of 10 species and create a graph that shows the relative size of their wingspans. Birds can be chosen from **Blackline Master #1** or from another bird or BTNEP resource.
2. Have students write a short paragraph that compares these four or five birds’ wingspans to each other and to the Bald Eagle.

### Assessment

- Assess students on the accuracy of their graphs, including measurements, and the inclusion of all appropriate parts of a graph (labels, titles, etc.).
- Student work on graphs in Expand can be accessed.

### Blackline Master

1. **Wingspans of Some Louisiana Birds**

### Extensions

- MATH: Use wingspan data to create scaled-down bar graphs on paper.



- MATH: Use wingspan data to create graphs in Excel or other graphing software.
- MATH: Have students draw and cut out flight silhouettes of each species to the proper scale and lay the silhouettes atop one another to create a large pictograph.

## Resources

### **BTNEP publications**

- *2008 Louisiana Raptors Calendar* (available online at [http://www.btnep.org/Libraries/Calendars/2008\\_Birding\\_Calendar.sflb.ashx](http://www.btnep.org/Libraries/Calendars/2008_Birding_Calendar.sflb.ashx))
- *The Habitats of Barataria-Terrebonne: Their Importance to Migratory and Resident Birds*
- *Vanishing Before Our Eyes* (video)
- *Wings Over the Wetlands* (video)
- *Migratory Flyway Poster*
- *Louisiana Raptors: Birds of Prey BTNEP resource*

### **Recommended Field Guides**

- Sibley, D.A. (2000). *The Sibley Guide to Birds*. Audubon Society Nature Guides. Random House, Inc.
- Peterson, R., and Peterson, V. (2002). *A Field Guide to the Birds of Eastern and Central North America*. Peterson Field Guide Series. Houghton Mifflin Harcourt.
- Alderfer, J. (ed.) (2005). *National Geographic Complete Birds of North America*. Random House, Inc.

### **Internet Sites**

#### **American Bald Eagle Information**

<http://www.baldeagleinfo.com/>

This website features general information relating to Bald Eagles, including data, range, and assorted natural history information.

#### **Patuxent Wildlife Research Center's Pictures of Common U.S. and Canadian Birds**

<http://www.mbr-pwrc.usgs.gov/id/pictlist.html>

This government website is a resource for bird banders. It includes pictures and accounts of the bird species commonly found in the United States.



## Wingspans of Some Louisiana Birds

Bird Species	Wingspan (in inches)	Wingspan (in centimeters)
White Pelican	108	270
Brown Pelican	79	197½
Magnificent Frigatebird	90	225
Great Blue Heron	72	180
Great Egret	51	127½
Snowy Egret	41	102½
Roseate Spoonbill	50	125
Snow Goose	56	140
Mallard	30	75
Northern Pintail	34	85
Blue-winged Teal	23	57½
Turkey Vulture	67	167½
Northern Harrier	43	107½
Red-tailed Hawk	49	122½
<b>Bald Eagle</b>	<b>80</b>	<b>200</b>
Osprey	63	157½
Killdeer	24	60
Laughing Gull	40	100
Mourning Dove	18	45
Great Horned Owl	44	110
Ruby-throated Hummingbird	4½	11⅓
Fish Crow	36	90
Purple Martin	18	45
Carolina Chickadee	7½	19
American Robin	17	42½
Northern Mockingbird	14	35
Common Yellowthroat	6¾	17
Northern Cardinal	12	30
Red-winged Blackbird	13	32½
House Sparrow	9½	24



# Hummer Heartbeats

Activity 6

Upper Elementary

## Focus/Overview

Ruby-throated Hummingbirds are the only hummingbirds that nest in Louisiana. Students can use interesting facts about these hummingbirds as a starting point to explore their own biology, and to design investigations to test hypotheses about their observations.

## Learning Objectives

The learner will...

- compare hummingbird and human biology.
- pose questions that can be answered using observations.
- conduct investigations to answer questions.
- generate data using measuring devices.
- display data graphically.

## Louisiana Science Grade Level Expectations

3: Inquiry GLE 1	Ask questions about objects and events in the environment (e.g., plants, rocks, storms) (SI-E-A1)
3: Inquiry GLE 2	Pose questions that can be answered by using students' own observations, scientific knowledge, and testable scientific investigations (SI-E-A1)
3: Inquiry GLE 3	Use observations to design and conduct simple investigations or experiments to answer testable questions (SI-E-A2)
3: Inquiry GLE 4	Predict and anticipate possible outcomes (SI-E-A2)
3: Inquiry GLE 5	Use a variety of methods and materials and multiple trials to investigate ideas (observe, measure, accurately record data) (SI-E-A2)
3: Inquiry GLE 6	Use the five senses to describe observations (SI-E-A3)
3: Inquiry GLE 7	Measure and record length, temperature, mass, volume, and area in both metric system and U.S. system units (SI-E-A4)
3: Inquiry GLE 8	Select and use developmentally appropriate equipment and tools (e.g., magnifying lenses, microscopes, graduated cylinders) and units of measurement to observe and collect data (SI-E-A4)
3: GLE 39	Compare organisms from different groups (e.g., birds with mammals, terrestrial plants with aquatic plants) (LS-E-A4)

## Louisiana Math Grade Level Expectations

3:GLE 19	Measure length to the nearest yard, meter, and half-inch (M-1-E)
3: GLE 21	Measure weight using grams and ounces (M-1-E)
3: GLE 25	Select and use the appropriate standard units of measure, abbreviations, and tools to measure length and perimeter, area, capacity, and weight/mass (M-2-E)

## BTNEP Connection

birds

## Grade Level

3

## Duration

1-2 class period

## Subject Area

science

## Setting

classroom

## Extension Area

math-graphing

## Vocabulary

pulse, heart rate, hypothesis, conclusion



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## Materials List

- Hummingbird Video – see Advance Preparation #5 for ideas
- Hummingbird Fact Sheet (**Blackline Master #1**) (one copy per group)
- Thermometer strips or digital thermometer for measuring body temperature (one per group)
- Yardsticks or meter sticks (one per group)
- Stopwatch or clock with second hand (one per group)
- Bathroom scale
- Graph paper or poster board for drawing graphs (one per group)

## Background Information

Hummingbirds are specially adapted to feeding on nectar, the sugary liquid made by flowers. Because each flower has so little of the nectar that hummers need, hummers must visit thousands of flowers every day to survive. To go from flower to flower all day long, hummers must be quick and must use a lot of energy. This high-speed, high-energy lifestyle means that hummingbirds must be tiny and have high heart rates to power their lives. It also means that hummingbirds have to find ways to save energy when they can't find food, for instance at night or when the weather is cold. One way that hummers can save energy is by lowering their body temperatures about 30° Fahrenheit on cold nights.

Humans, on the other hand, don't need to rush from meal to meal. Human bodies can afford to be bigger, slower, and to burn much less energy than a hummingbird. Although we can change our heart rate through activity, we can't lower our body temperature in the way hummers do.

## Advance Preparation

1. Run off copies of **Blackline Masters #1** and **#2**, one copy per group. We recommend three students per group.
2. Get thermometer strips or external digital thermometers to measure student's body temperatures, one thermometer per group. Because of safety concerns, we recommend thermometer strips that can be held to a student's forehead. Another option is to use digital thermometers that take temperature readings in the ear canal. If this second option is used, be sure to have enough of the disposable caps to ensure sanitary conditions. We also recommend that the teacher operate the digital thermometer for safety reasons.
3. Obtain yardsticks or meter sticks and standard or metric scales to measure students' heights and weights, respectively.
4. Obtain a stopwatch or clock with a second hand to measure students' heart rates or speed.
5. Ensure that you are able to view the Engage video of a Hummingbird in flight. There are a number of videos to choose from listed below for your convenience:
  - **A Hummingbird in slow motion.**  
<http://www.wildlifetheater.com/video9.html>  
One 17-second clip slowed down to 3 minutes.
  - **Hummingbirds: Magic in Air.**  
<http://www.pbs.org/wnet/nature/episodes/hummingbirds-magic-in-the-air/video-full-episode/5475/>  
A whole PBS special on PBS. Chapter 1 is on flight. If you choose this video, preview it so that you can select a short segment for students to view during the Engage. The remaining video is very interesting, but not directly relevant to this lesson.

## Procedure

### Engage

1. Watch the hummingbird video you selected for students to view (see #5 in Advance Preparation above for video selection). And discuss the students' observations about hummingbird size, speed, and activities. Have students informally compare and contrast hummingbirds and humans.
2. Demonstrate the use of all of the measurement devices with the students. Show students how to find their pulse on their wrist or on the side of their neck, and how to calculate their heart rates by counting for a minute or by counting their heartbeats for 15 seconds and then multiplying by 4.



### Explore/Explain

1. Distribute **Blackline Master #1**, “Hummingbird Fact Sheet” (one per group) and discuss the facts regarding weight, heart rate, size, and body temperature of the Ruby-Throated Hummingbird. Let students make predictions about how humans might differ from hummingbirds in these categories. Write these predictions on the board for each of the five parameters.
2. Distribute **Blackline Master #2** and have students record their group member names on the sheet. Have each student or group choose one of the predictions and write it out in the form of a hypothesis in the appropriate space on the **Blackline Master #2**. Remind students that hypotheses are educated guesses that can be proved to be either correct or incorrect. One way to help students come up with hypotheses is to have them start with the words, “I bet that...” For instance, a student might say, “I bet that hummingbirds have lower temperatures than people.” Once they have completed their hypotheses, they can remove the “I bet,” and decide how to test their hypotheses.
3. Have students design investigations to test their hypotheses, and write out their plans in a step-by-step way. For some investigations, the plan might be as simple as taking temperature and comparing it to the temperature of hummingbirds. Other investigations may be more complex, for instance, if students decide to compare their speed to the speed of hummers they’ll need to find a way to measure speed. Students that decide to compare their heart rates to those of hummers may decide to speed up their own heart rates through exercises. Students that decide to compare the number of “flaps” per second may need to convert hummingbird flaps per second to flaps per minute instead.
4. Let students conduct their investigations, recording all of the data they generate on **Blackline Master #2**, “Comparing Hummingbirds to Humans”. Remind students to use the proper units. Have students create bar graphs for their comparison data from **Blackline Master #2**. Guide the students in the best graph intervals.
5. Have each student or group write a brief report on their findings, including their hypothesis, how they decided to test their hypothesis, the results of their investigations, and their conclusion. Based on their results, was their hypothesis correct?

### Expand

1. Have students compare their findings with the heart rates of other types of animals, including some that are similar to humans and some that are very different, such as amphibians or reptiles. What might account for similarities and differences between different groups of animals?

### Assessment

- Assess student reports, graphs, investigations, and methods.

### Blackline Masters

1. **Facts about Ruby-throated Hummingbirds**
2. **Comparing Hummingbirds to Humans**

### Extensions

- Have students compare their findings with other types of animals, including some that are similar to humans and some that are very different, such as amphibians or reptiles. What might account for similarities and differences between different groups of animals?

### Resources

#### BTNEP publications

- *The Habitats of Barataria-Terrebonne – Their Importance to Migratory and Resident Birds*
- *Vanishing Before Our Eyes – Louisiana Cheniere Woods and the Birds that Depend on Them Booklet*
- *Wings Over the Wetlands – Video*

#### Internet Resources

Hummingbirds: Magic in Air.



<http://www.pbs.org/wnet/nature/episodes/hummingbirds-magic-in-the-air/video-full-episode/5475/>

*A whole PBS special on PBS. Chapter 1 is on flight. If you choose this video, preview it so that you can select a short segment for students to view during the Engage. The remaining video is very interesting, but not directly relevant to this lesson.*

### **Cornell Lab of Ornithology: All About Birds**

<http://www.birds.cornell.edu/AllAboutBirds>

*This website features a variety of information about birds. The “Bird Guide” tab allows viewers to search for information about specific birds.*

### **Hummer/Bird Study Group**

<http://www.hummingbirdsplus.org/>

*This site provides information about a number of hummingbirds.*

### **Hummingbirds.net**

<http://www.hummingbirds.net/>

*This site is devoted to and has a wealth of information about hummingbirds.*

### **Operation Rubythroat**

<http://www.rubythroat.org/default2.html>

*This website is dedicated to hummingbirds, especially Ruby-throated Hummingbirds.*

## Facts about Ruby-throated Hummingbirds

**Length:** A Ruby-throated Hummer measures about 8-9 cm (3-4 in) from the tip of the bill to the tip of the tail

**Wingspan:** A Ruby-throated Hummer measures 8-11 cm (3-4½ in) from wingtip to wingtip when the wings are spread.

**Weight:** A Ruby-throated Hummer weighs about 3-4g (less than a nickel!)



**Wing Beats:** Ruby-throated Hummers flap about 50-80 times per second in normal flight

**Heartbeats:** The heart of a Ruby-throated Hummer beats about 250 times per minute when it is perched and resting, but over 1,000 times a minute while it is flying

**Breathing:** Ruby-throats breathe about 250 times a minute while at rest.

**Body Temperature:** The normal body temperature of a Ruby-throated Hummer is about 105° Fahrenheit, but this may drop to about 70° Fahrenheit on cold nights when the bird needs to save energy.

**Speed:** Normal flight about 25 miles per hour, which is about the same as 40 kilometers per hour. In other words, a Ruby-throat can go about 667 meters, or 729 yards, in a minute. Another way of looking at it is that it takes a Ruby-throated Hummingbird about 8 seconds to fly the length of a football field.

# Comparing Hummingbirds to Humans



Student name: \_\_\_\_\_

Group members: \_\_\_\_\_

The prediction I am interested in investigating is: \_\_\_\_\_

My hypothesis: I bet that \_\_\_\_\_



Ruby-throated Hummingbird	
Body Length	7-9 cm 3-4 in
Wingspan	8-11 cm 3-4½ in
Weight	0.004 kg
Wing Beats	50-80 times/ <u>second</u> (3000-4800 wing beats/ <u>minute</u> )
Heartbeats	<b>AT REST:</b> 250 beats/minute  <b>AT WORK:</b> 1,000 beats/minute
Breathing (at rest)	250 times/minute
Body Temperature	105° F
Speed	667 meters/minute

Human	
Body Height	_____ cm _____ in
Width of spread arms	_____ cm _____ in
Weight:	_____ kg
"Wing Beats"	_____ beats/minute
Heartbeats	<b>AT REST:</b> _____ beats/minute  <b>AT WORK</b> _____ beats/minute
Breathing (at rest)	_____ times/minute
Body Temperature	_____ °F
Speed	_____ meters/minute



# Homeward Bound

Activity 7

Upper Elementary

## Focus/Overview

Louisiana is an important stopover site for migrating birds. In the fall, birds stop here to fatten up and gather the energy they'll need before flying across the Gulf of Mexico. In the spring, birds that have made the difficult, dangerous crossing over the Gulf of Mexico stop here to rest and regain their strength and energy before continuing on their way north. Coastal areas of Louisiana are especially important for migrating birds.

## Learning Objectives

The learner will...

- Research bird migration and the importance of Louisiana during migration.
- Create and write a fictional story about the migration of a bird across the Gulf of Mexico.

## Louisiana Science Grade Level Expectations

3: GLE 56	Describe the interrelationships of <i>living (biotic)</i> and <i>nonliving (abiotic)</i> components within various ecosystems (e.g., terrarium, swamp, backyard)
3: GLE-58	Describe how humans have had negative and positive effects on organisms and their environments
4: GLE 50	Explain how some organisms in a given habitat compete for the same resources
4: GLE 72	Predict and describe consequences of the removal of one component in a balanced ecosystem (e.g., consumer, herbivores, nonliving component) (SE-E-A2)
5 GLE 48	Determine the ability of an ecosystem to support a population (carrying capacity) by identifying the resources needed by that population (SE-M-A2)
5 GLE 50	Describe the consequences of several types of human activities on local ecosystems (e.g., polluting streams, regulating hunting, introducing nonnative species)

## Louisiana ELA Grade Level Expectations

3 GLE 25	Develop organized one- and two-paragraph compositions using description and narration (ELA-2-E4)
4 GLE 24	Develop paragraphs and compositions of at least three paragraphs using the various modes (i.e., description, narration, exposition, and persuasion), emphasizing narration and description
5 GLE 23	Use the various modes to write compositions, including stories that incorporate dialogue, characters, plot, setting, and sensory details

## BTNEP Connection

Birds

## Grade Level

3, 4, 5

## Duration

2 hours

## Subject Area

Science, English  
Language Arts (ELA)

## Setting

classroom

## Extension Area

science

## Vocabulary

headwind, tailwind,  
altitude, chenier, habitat



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## Materials List

- copy of BTNEP resources
  - *Vanishing Before Our Eyes – Louisiana Cheniere Woods and the Birds that Depend on Them*
  - *Wings Over the Wetlands* video (BTNEP Video Collection #1)
  - *BTNEP Migratory Bird Poster*
  - *The Habitats of Barataria-Terrebonne. Their importance to Migratory and Resident Birds*

## Background Information

Hundreds of millions of birds cross the Gulf of Mexico every year on their migration between North America and Central America. As many as 2 million birds might arrive or depart on any day of migration. Under the best of conditions the flight is long and dangerous. The distance between the Louisiana coast and the Yucatan Peninsula of Mexico is about 600 miles, and there are no safe places to land during the journey. Storms or even strong wind can make migration difficult or deadly.



Donna Dittmann

Most migration is nocturnal, with birds taking off at sundown. Most small birds fly between 20-30 miles per hour. With a tailwind, a wind coming from behind them and pushing them forward, birds travel faster. With a headwind, a wind in their face, they can be slowed greatly. Birds usually migrate at an altitude of 5,000-10,000 feet. As they grow tired, they fly lower and lower. Flying through storms is dangerous, and many hundreds of thousands probably die because of storms every year. Those birds that fail in migration fall into the sea.

Birds that survive the crossing can often continue flying for hundreds of miles after reaching land. However, birds that are weaker or that have suffered difficult crossings often drop down as soon as they reach land. These birds need cover and food. When large numbers of birds make landfall together, it's known as a "fallout," because birds seem to be falling out of the sky.

Surviving the flight across the Gulf isn't the last obstacle that migrating birds face. Many songbirds depend on coastal woodlands, or cheniers, for safety and survival. Unfortunately many cheniers have been damaged or destroyed by the activities of people.

Many species of birds have declined in numbers over the past few decades, for a variety of reasons. The difficulties of migration and the increasing difficulty of finding adequate stopover sites are probably part of the reason for the decrease in songbird numbers.

## Advance Preparation

1. Obtain copies of the following BTNEP resource:
  - *Vanishing Before Our Eyes – Louisiana Cheniere Woods and the Birds that Depend on Them* (p. 3)
  - *Wings Over the Wetlands* video. Preview the video to find about a 5 minute segment that highlights the species of birds that fly over the Gulf to and through Louisiana. The first 5-8 minutes of the video gives a great overview of the importance of the BTNE to migrating and resident bird populations.
  - *The habitats of the Barataria-Terrebonne: Their Importance to Migratory and Resident birds* (p. 29)



2. Get a classroom map, atlases (found in many Social Studies texts), or internet mapping site that shows the landmasses surrounding the Gulf of Mexico. Here are two maps you might consider:
  - World Atlas map of the Gulf of Mexico (<http://www.worldatlas.com/aatlas/infopage/gulfofmexico.htm>)
  - Major cities and states of southern US and Mexico (<http://www.gulfmex.org/map.htm>)

## Procedure

### Engage

1. Read and discuss page 3 of *Vanishing Before Our Eyes – Louisiana Cheniere Woods and the Birds that Depend on Them* with your class. The first paragraph puts the reader in the place of a migrating hummingbird, and describes a few of the challenges such a bird would face in making a migratory flight over the Gulf of Mexico.
  - Ask students what other dangers and obstacles a bird crossing the Gulf of Mexico might face.
  - What factors might actually help a bird that's trying to cross the Gulf?
2. View a segment of the *Wings Over the Wetlands* video, noting specific types of birds that migrate across the Gulf of Mexico and through Louisiana.

### Explore

1. Using a map or an atlas (as in most Social Studies textbooks; see Advanced Preparation #2), have students find the Yucatan Peninsula of Mexico and the Gulf Coast of Louisiana, and estimate the distance between them. Have students look for islands or other places where a small bird might land to rest while flying across the Gulf if it grows tired or if storms pop up.
2. Let students choose a species of bird from the BTNEP booklet, video, or flyway poster, and ask the students to pretend to be a bird of that species, ready to start out across the Gulf. Many questions must be considered: What preparations would be necessary? What would be the best time to start? What dangers might be encountered, and what could a tiny bird do to survive them? Will every bird survive? If a bird does manage to make it across, is the struggle over?
3. Through the eyes of a bird, let students write a narrative of a migratory journey across the Gulf. Ask students to involve as many of the senses of their readers as they can so that readers can see what it must feel like to be a migrating bird. Remind them to incorporate all of the elements of a story as well. You might consider allowing students the freedom to be creative with their formats, such as producing illustrated texts or comic books for or in addition to their main assignment.
4. Let students discuss their stories and projects with their classmates.

### Expand

1. Let students create, design, and illustrate a “bird rest stop” in the middle of the Gulf of Mexico. What would they build the rest stop on? What features and materials would they need to include so that birds could survive there while they rest?

## Assessment

- Assess stories for mastery of ELA composition skills, science content, creativity, or both.

## Blackline Master

None.

## Extension

- SCIENCE. Using oil rigs as locations have students design “rest areas” for birds. What would be needed to make a rest area that wouldn't require people to take care of it? Make a diagram with labels, and locate the rest area on a map of the Gulf.



## Resources

### BTNEP publications

- *The Habitats of Barataria-Terrebonne – Their Importance to Migratory and Resident Birds*
- *Vanishing Before Our Eyes – Louisiana Cheniere Woods and the Birds that Depend on Them*  
*Booklet*
- *Wings Over the Wetlands* – Video, Available in BTNEP Video Collection #1 (description at <http://www.btnep.org/BTNEP/resources/downloads/videos.aspx>)
- Migratory Flyway Poster



# Who Lives Here?

Activity 8

Upper Elementary

## Focus/Overview

By examining the parts of a bird's body, we can gain important insights into the adaptations that allow birds to live in different habitats. In this lesson, students will explore the connection between form and function in birds, and between a bird's habitat and its physical features. Then, students will use their knowledge to "create" a new bird species adapted to a specific habitat.

## Learning Objectives

The learner will...

- explore the connection between form and function in the bodies of birds.
- adaptations that allow birds to survive in different habitats.

## Louisiana Science Grade Level Expectations

3: GLE 57	Describe the interrelationships of <i>living (biotic)</i> and <i>nonliving (abiotic)</i> components within various ecosystems (e.g., terrarium, swamp, backyard) (SE-E-A1)
4: GLE 41	Describe how parts of animals' bodies are related to their functions and survival (e.g., wings/flying, webbed feet/swimming) (LS-E-A3)
4: GLE 52	Describe how some plants and animals have adapted to their habitats (LS-E-C2)
4: GLE 53	Identify the habitat in which selected organisms would most likely live and explain how specific structures help organisms to survive (LS-E-C2)
5: GLE 29	Describe adaptations of plants and animals that enable them to thrive in local and other natural environments (LS-M-D1)

## BTNEP Connection

Birds

## Grade Level

3-5

## Duration

1 to 2 class periods

## Subject Area

science

## Setting

classroom

## Extension Area

Music, Language Arts

## Vocabulary

ecosystem, niche, abiotic, adaptation, habitat,



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## Materials List

- Blackline Masters
- Posterboard or construction paper
- Markers or crayons
- BTNEP resources
  - 2007 BTNEP *Louisiana Wading Birds Calendar*
  - 2008 BTNEP *Louisiana Raptors Calendar*
  - 2009 BTNEP *Louisiana Warblers Calendar*
  - *The Habitats of Barataria-Terrebonne – Their Importance to Migratory and Resident Birds*
  - *Wings Over the Wetlands – Wading Birds of Louisiana* (Booklet)
  - *Vanishing Before Our Eyes – Louisiana Cheniere Woods and the Birds that Depend on Them* (Booklet)
  - *Wings Over the Wetlands* (Video)
- Bird field guides
- Nature magazines with bird photos



## Background Information

Adaptations allow organisms to survive in certain **ecosystems**. An ecosystem is the interaction of a community of living organisms as well as their physical environment. We generally think of ecosystems as an area within the natural environment in which the living (**biotic**) and non-living (**abiotic**) parts interact to form a stable system. Ecosystems can be thought of on different scales. For instance, both a pond and an ocean can be thought of as ecosystems, even though their size is very different. Some other ecosystems that are found in Louisiana include a swamp, a fresh-water marsh, a salt water marsh, marsh in general, a beach, a dune, a river, a coastal forest, a barrier island.... The list could go on and on.

Animals develop adaptations that allow them to be successful in one or more of these ecosystems. Some adaptations are related to the way a bird finds food. For instance, birds of prey have talons for catching prey, herons have long sharp beaks for spearing fish, and penguins have flipper-like wings for swimming. Other adaptations allow birds to deal with the abiotic, or non-living, elements of their ecosystems. Herons have long bare legs for wading in water, ptarmigans molt white feathers during the winter to blend in with snow, and many waterbirds have oily feathers to allow them to stay dry underwater. Other adaptations allow birds to move in search of food and warm weather. Flight allows birds to travel great distances, and the ability of some birds to find their way across thousands of miles of Earth and then return to their exact starting spot months later gives birds the freedom to follow the warm weather as the seasons change.

The size and shape of birds plays a large role in determining what type of life they lead. A careful study of the features of a bird gives an observer a good idea about a bird's lifestyle. At the same time, looking carefully at different habitats gives us clues about what adaptations might be necessary to allow a bird to take advantage of the habitat.

## Advance Preparation

1. Get copies of the BTNEP resources listed below, as well as field guides or nature magazines that illustrate a variety of bird species and show their behavior and their habitats.
2. Assemble art supplies.
3. Make copies of **Blackline Master #1**.
4. Preview BTNEP's *Wings over the Wetlands* video (request this free DVD from BTNEP). Select a 5-10 minute portion of the video to show students. The first 5-8 minutes of the video gives a great overview of the importance of the BTNE to migrating and resident bird populations. Teachers should preview the remaining video to see if there is an additional segment that would enhance their lesson.

## Procedure

### Engage

1. Discuss well-known birds and the adaptations that they have for survival. For instance, what does a hummingbird eat, and what features help a hummingbird take advantage of that type of food? How do the unique adaptations of penguins, ostriches, and roadrunners help them? Would these adaptations work as well if these birds traded habitats?
2. Share the 5 to 10 minute segment of the *Wings Over the Wetlands* video with your class. Can students get a good idea of the lifestyles of different birds by looking at different parts of their bodies?
3. Study pictures of different ecosystems. Can students think of features that might help birds fit into those habitats successfully?

### Explore/Explain

1. Have students complete **Blackline Master #1**, "What's My Habitat?" in groups. Discuss their results.
2. Have students or groups choose a specific ecosystem and list the physical features of the ecosystem. What are the important biotic and abiotic factors of the ecosystem? Taking these features into account, students will "create" a new bird species designed to fit into the ecosystem.
3. Students will make an illustrated poster showing the bird they created, and will include a description of the bird and its adaptations to its surroundings. Students will describe its lifestyle and its niche, and how its adaptations allow it to be successful.

## Expand

1. Have students take well-known birds like pelicans and hummingbirds, and “adapt them” to different habitats. For example, if lakes and rivers dried up, what might pelicans do to survive? If hummingbirds couldn’t find flowers to feed on, what other food source might they turn to? How would their bodies help them in their new roles?

## Assessment

- Assess student worksheets and the posters they’ve created. Look for signs that students understand the connection between habitats and the organisms that inhabit them, and how adaptations allow organisms to be successful in different ecosystems and food sources.

## Blackline Masters

1. **What’s My Habitat?**

## Extensions

- MUSIC/LANGUAGE ARTS. Students can compose a song about their newly created bird. The lyrics should include at least three verses on the physical description of their bird, the habitat that the bird is adapted to and how the bird got its name. The refrain should focus on the special adaptations of this new species. Music to accompany the song can be located and downloaded from the Internet. A useful music site is NIEHS Kid’s Pages: Sing-Along Songs (Midis and Lyrics), which can be found at <http://kids.niehs.nih.gov/music.htm>.

## Resources

### BTNEP publications

- **2007 BTNEP Louisiana Waders: Wings over the Wetlands**
  - Entire 2007 calendar: [http://www.btnep.org/Libraries/Calendars/2007\\_Birding\\_Calendar.sflb.ashx](http://www.btnep.org/Libraries/Calendars/2007_Birding_Calendar.sflb.ashx)
- **2008 BTNEP Louisiana Raptors: Birds of Prey**
  - Entire 2008 calendar: [http://www.btnep.org/Libraries/Calendars/2008\\_Birding\\_Calendar.sflb.ashx](http://www.btnep.org/Libraries/Calendars/2008_Birding_Calendar.sflb.ashx)
- **2009 BTNEP Breeding Wood Warblers**
  - Entire 2009 calendar: [http://www.btnep.org/Libraries/Calendars/2009\\_Birding\\_Calendar.sflb.ashx](http://www.btnep.org/Libraries/Calendars/2009_Birding_Calendar.sflb.ashx)
- ***The Habitats of Barataria-Terrebonne – Their Importance to Migratory and Resident Birds***
- ***Wings Over the Wetlands – Wading Birds of Louisiana*** (Booklet)
- ***Vanishing Before Our Eyes – Louisiana Cheniere Woods and the Birds that Depend on Them*** (Booklet)
- ***Wings Over the Wetlands*** (Video) description is available at <http://www.btnep.org/BTNEP/resources/downloads/videos.aspx> and activity sheet is available at [http://www.btnep.org/Libraries/Lessons/Wings\\_Over\\_the\\_Wetlands\\_Video\\_Activity\\_Sheet.sflb.ashx](http://www.btnep.org/Libraries/Lessons/Wings_Over_the_Wetlands_Video_Activity_Sheet.sflb.ashx).

### Field Guides

- Sibley, D.A. (2000). *The Sibley Guide to Birds*. Audubon Society Nature Guides. Random House, Inc.
- Peterson, R., and Peterson, V. (2002). *A Field Guide to the Birds of Eastern and Central North America*. Peterson Field Guide Series. Houghton Mifflin Harcourt.
- Alderfer, J. (ed.) (2005). *National Geographic Complete Birds of North America*. Random House, Inc.



# What's My Habitat?

Analyze the drawings of birds or the close-ups of their features. Use your observations of their features to describe the type of habitat in which they might live, what type of food they might eat, or how they might use their special adaptations to survive in their habitat.



What's My Habitat? \_\_\_\_\_

What do I eat? \_\_\_\_\_

What are my adaptations, and how do they help me?



What's My Habitat? \_\_\_\_\_

What do I eat? \_\_\_\_\_

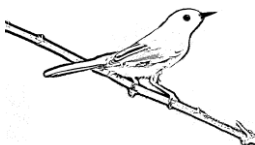
What are my adaptations, and how do they help me?



What's My Habitat? \_\_\_\_\_

What do I eat? \_\_\_\_\_

What are my adaptations, and how do they help me?



What's My Habitat? \_\_\_\_\_

What do I eat? \_\_\_\_\_

What are my adaptations, and how do they help me?



# At the Top

## A look at the Bald Eagle's diet

Middle School

### Focus/Overview

In this lesson, students will learn about the Bald Eagle's diet. In the activity, students will collect data, by drawing paper chips randomly from a bag, that represent animals that a Bald Eagle typically eats. They will display their data in the form of bar graph. Students will analyze the relationships among the animals and plants in a representative food chain for the Bald Eagle's diet. In addition, students will examine a food web for a Bald Eagle to determine energy transfer among the organisms in the web.

### Learning Objectives

The learner will...

- collect data and sort it into categories.
- express data graphically.
- learn about the diet of the Bald Eagle.
- describe a simple food web and the energy transfer within the web.
- determine relationships among plants and animals within the food web.

### Louisiana Science Grade Level Expectations

7: SI GLE 11	Construct, use, and interpret appropriate graphical representations to collect, record, and report data (SI-M-A4)
7: SI GLE 12	Use data and information gathered to develop an explanation of experimental results (SI-M-A4)
7: GLE 24	Analyze food webs to determine energy transfer among organisms (LS-M-C2)
7: GLE 27	Identify the various relationships among plants and animals (e.g., mutualistic, parasitic, producer/consumer) (LS-M-C4)

### Louisiana Math Grade Level Expectations

7: GLE 32	Describe data in terms of patterns, clustered data, gaps, and outliers (D-2-M)
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### Materials List

- paper or plastic bags (1 per student)
- Blackline Masters #1 and #2 (1 per student)
- Blackline Master #1 – one copy, cut into cards, and laminated
- Blackline Master #3 – one copy, cut into cards and laminated
- scissors (1 per student)
- 1000 g of dried beans or rice
- 4 large beakers
- scale or balance

### BTNEP Connection

Birds

### Grade Level

7

### Duration

1 to 2 class periods

### Subject Area

science, math

### Setting

classroom

### Extension Area

science, math

### Vocabulary

food chain, diet, opportunistic, producer, consumer, carrion, herbivores, omnivores, carnivores, scavengers, producers, autotrophs





## Background Information

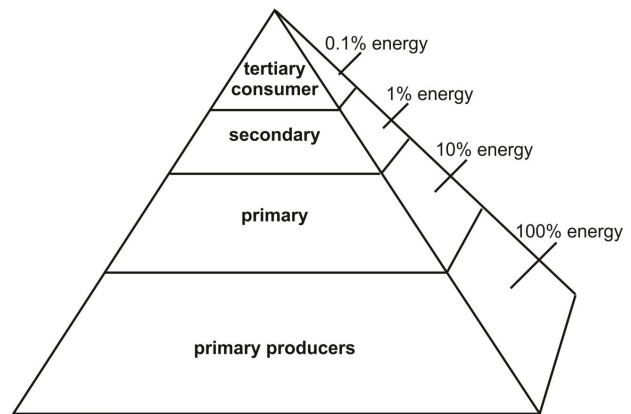
Bald Eagles (*Haliaeetus leucocephalus*; *haliaeetos* (Greek) - "sea eagle"; *leucocephalus* (Greek) - "white-headed") are **carnivores** and **opportunistic** feeders. This means that they will eat whatever meat they happen upon, whether it is alive or dead (**carrion**). They will take food (alive or dead) from smaller birds if the opportunity presents itself.

Since Bald Eagles typically live near coastlines, their diet often consists largely of fish. Researchers in a study of nesting Bald Eagle diets in the lower Chesapeake Bay, found that fish constituted 94.1% of the **biomass** delivered, birds 1.0%, mammals 4.1%, and reptiles 0.9% (Markham and Watts, 2008). In another study in Vancouver, British Columbia, researchers reported that the diet of the Bald Eagles studied there consisted of 52% birds (mostly Gulls), 34% fish (mostly Ling Cod and rockfish), 12% marine invertebrates (mostly crabs and clams), and 2% mammals (mostly carrion) (Vermeer et al. 1989). Sometimes, Bald Eagles' diets vary even in a relatively small geographic area. For instance, on Adak and Tanaga Islands in the Aleutian Islands, fish made up most (56%) of the Bald Eagle diets, then birds (25%) and mammals (19%), while on Amchitka and Kiska Islands, birds comprised the majority (60%) of bald eagle diets, followed by mammals (30%) and fish (10%) (Anthony et al., 1999). The average daily food consumption for an average size Bald Eagle (9-14 pounds) is from 250-550 grams per day (0.5-1.5 pounds per day), or between 5-10% of an eagle's body weight.



Eagles use their beaks to tear apart the food that they catch into smaller pieces. They do not chew their food. They swallow the bits of food and it goes into a crop, a swelling at the base of the esophagus. They can store food here for a while and so they can quickly eat their prey and avoid sharing it with other animals. Fur, bones, fish scales, claws, beaks, and feathers are not digested. Instead, these items are formed into a pellet that is regurgitated (called 'casting a pellet') before their next big meal. The soft meat of their prey continues on in their digestive system to the Bald Eagle's stomach, where it is digested (Pitt, 2007).

Scientists study the transfer of energy by making models of the relationships between **predators** and **prey**. These relationships are drawn as **food chains** and **food webs**. Food chains show who (predator) eats whom (prey). When you look at the amount of energy that is represented by a food chain, it is most often drawn as a pyramid. Each level of the pyramid is a food level or "**trophic level**" ("trophic" in Greek means "food" – provided as Blackline Master #4). At the bottom of pyramid it is widest and **producers** are found at this level. Producers get their energy from the sun. At the top of the pyramid is the narrow top point and carnivores are found at this level. It takes a lot of producers to fuel the energy for all the animals that are above them in the pyramid. As one moves up the food chain, the pyramid shows that fewer and fewer animals are supported at each trophic level. This is because lots of food energy is lost as one moves up the pyramid. This loss of energy happens for many reasons, including, growth, reproduction, digestion, respiration, and work, and some is lost in the form of heat. There is a rule known as the **10% Rule** that describes the amount of energy that is transferred from one trophic level to the next: only 10% of the energy in each trophic level is passed up to the next trophic level. For example, an eagle converts only about 10% of the food that it eats into its own body mass. Thus, the other 90% is used in life



Ecological Trophic Level Pyramid

processes or released as heat. As you move up the pyramid, there are fewer organisms because there is less energy available.

#### Background References:

- Markham, A.C. and Watts, B.D. (2008). The influence of salinity on the diet of nesting Bald Eagles. *Journal of Raptor Research*, 42(2):99–109; accessed January 10, 2009 at <http://www.princeton.edu/~amarkham/PDFs/Markham%20and%20Watts%202008b.pdf>
- Anthony, R.G., Miles, A.K., Estes, J.A., and Isaacs, F.B. (1999). Productivity, diets, and environmental contaminants in nesting bald eagles from the Aleutian archipelago. *Environmental toxicology and chemistry*, 18 (9): 2054-2062; accessed January 10, 2009 at <http://cat.inist.fr/?aModelle=afficheN&cpsidt=1939043>
- Pitt, R. (December 01, 2007). Food habits of the Bald Eagle. *Hancock Forum Newsletter*, 6, obtained January 10, 2009, at <http://www.hancockwildlifechannel.org/article.php/20071201141457798>

### Advance Preparation

1. Run off enough copies of Blackline Masters #1 and 2 for each student.
2. Measure out 1000 grams of beans or rice. Have three empty beakers ready.
3. Cut out Blackline Master #3 into four cards and laminate.
4. Preview BrainPop video (Expand) - <http://magma.nationalgeographic.com/ngexplorer/0309/quickflicks/brainpop/foodchain/mysteries.swf>

### Procedure

#### Engage

*Materials needed: 1000 g of dried beans or rice, 4 large beakers (for 4 trophic levels or organisms in the food chain), a scale, Bald Eagle Food Chain Cards [GREEN ALGAE (producer), MINNOW (primary consumer), LARGE-MOUTHED BASS (secondary consumer), and BALD EAGLE (tertiary consumer or top predator)]*

1. Ask for four volunteers. Give each volunteer one of the four **Bald Eagle Food Chain Cards** (green algae, minnow, large-mouthed bass, Bald Eagle – **Blackline Master #3**). Ask the volunteers to line up in the order of a food chain (without talking). How did they do? How did they know which order to stand in? Have them explain their order in terms of predator-prey relationships. Can an animal be both predator and prey? (Yes. The large-mouthed bass is one example of a species that is both predator and prey. Bass eat minnows, and Bald Eagles eat bass.)
2. Display **Blackline Master #4 (Ecological Trophic Level Pyramid)** as you move through this simulation. Put 1000g of beans in the first beaker, this represents the amount of available energy. Hand this beaker to the algae, or the producer. *Note: you can either use this as a demonstration in front of the class, or use students as volunteers to represent each trophic level or organisms in a food chain.*
3. The producer gets eaten by a minnow (primary consumer). Have the algae mass out 100 grams, or 10%, of the beans into a second beaker. Have them hand this 2<sup>nd</sup> beaker to the primary consumer, the minnow. This is the amount of “available energy” for the first trophic level.
4. Repeat the process for the remaining trophic levels: the minnow weighs out 10% of 100 grams (= 10 grams) and puts the “energy” represented by the beans in a third beaker. This beaker is handed to the secondary consumer, the large-mouth bass. The large-mouth bass weighs out 10% of 10 grams (=1 gram) and puts the energy represented by the beans into a fourth beaker. This beaker is handed to the Bald Eagle.
5. What happened to the level of available energy as you move up the food chain? [It decreases by 90% at each level.] Why aren't there food chains that support an infinite number of links? [There isn't enough energy available at higher trophic levels to support a large abundance or populations of organisms. Only about 10% of the prey's mass will be transferred up to the next trophic level. Hence the shorter the food chain the more efficient it is. In general, we assume 10% efficiency from one trophic level to the next, meaning that 10% of the energy (material) is transferred, 90% goes back to the environment.]

### Explore/Explain

1. Distribute a paper bag, a pair of scissors, **Blackline Master #1**, **Blackline Master #2** (two pages) to each student. Students can also work in pairs.
2. Have students cut apart the prey chips on **Blackline Master #1** and place them in their paper bag.
3. Have the students follow the directions on **Blackline Master #2**. Students should record their data in the data table and construct a bar graph. You might want to review the distinction between dependent variables (the things we observe; in this case, the type of prey) and the independent variables (the things that we intentionally change; in this case, the days of the week). Also, when students begin to create their graph, if necessary, review the distinction between continuous data and categorical data. Continuous data can be subdivided into smaller units that make sense (like temperature, time, mass, etc.), while categorical data is not divided into smaller units that make sense (like, days of the week, types of animals, months of the year, etc.)
4. Have students stand with their graphs and orally describe the types and numbers of foods that their Bald Eagle ate.

### Expand

1. Review with students the meaning of the words “predator” and “prey”. Write the words herbivores, omnivores, carnivores, scavengers, and producers (autotrophs). Discuss the meaning of these words.
2. Watch the BrainPop video on Food Chains and Webs:  
<http://magma.nationalgeographic.com/ngexplorer/0309/quickflicks/brainpop/foodchain/mysteries.swf>
3. Identify animals that would be in a Bald Eagle’s ecosystem that would fit within each of the categories [herbivores, omnivores, carnivores, scavengers, and producers (autotrophs)]. As a class, list at least 2-3 animals/organisms/plants in each category.
4. Have students create a food web on a sheet of their notebook paper using the organisms listed in #3 using arrows to show how energy moves through the ecosystem. Students must include the sun in their web AND every organism in their web must connect to another organism in some way.
5. Have students recall the ecological pyramid we started off class with and place the organisms from their food web into their appropriate place in the pyramid (primary producer, primary consumer, secondary consumer, tertiary consumer/top predator). Have students explain what the pyramid shape tells us about how much *energy* each type of organism (primary producers, primary consumers, secondary consumers, and tertiary consumers) contributes to an ecosystem.

### Assessment

- Graphs and completed worksheet (Blackline Master #2) can be graded based on whether the student correctly grouped and counted the different types of prey that the Bald Eagle eats.

### Blackline Master

1. **Bald Eagle Prey Chips**
2. **Bald Eagle Diet Investigation (two pages)**
3. **Bald Eagle Food Chain Cards**
4. **Ecological Trophic Level Pyramid**

### Extensions

- SCIENCE/MATH. Students can manipulate variables to see how producers and consumer numbers affect population growth and balance. The computer model uses oak trees, squirrels, and Red Tailed Hawks.
- SCIENCE. National Geographic’s *Strange Days on Planet Earth* video and curriculum [<http://www.pbs.org/strangedays/>] outlines how we have changed our environment on earth and the ultimate results. The relevant volume in this series is the “Predator” video, which describes how removing the species from the highest trophic levels has far-reaching effects. The accompanying curriculum can be downloaded from National Geographic’s website and includes background information and hands-on activities.

### Resources



### **BTNEP publications**

- 2008 Louisiana Raptors Calendar (available online at [http://www.btnep.org/Libraries/Calendars/2008\\_Birding\\_Calendar.sflb.ashx](http://www.btnep.org/Libraries/Calendars/2008_Birding_Calendar.sflb.ashx))
- *The Habitats of Barataria-Terrebonne: Their Importance to Migratory and Resident Birds*
- *Wings Over the Wetlands* (video)
- *Migratory Flyway Poster*

### **Recommended Field Guides**

- Sibley, D.A. (2000). *The Sibley Guide to Birds*. Audubon Society Nature Guides. Random House, Inc.
- Peterson, R., and Peterson, V. (2002). *A Field Guide to the Birds of Eastern and Central North America*. Peterson Field Guide Series. Houghton Mifflin Harcourt.
- Alderfer, J. (ed.) (2005). *National Geographic Complete Birds of North America*. Random House, Inc.

### **Internet Sites**

New Hampshire Public Television: NatureWorks Series

<http://www.nhptv.org/natureworks/nwep.htm>

*Has multiple links that explain food webs (Episodes 9, 10, and 11).*

Gould League: Food Web Activities

[http://www.gould.edu.au/foodwebs/kids\\_web.htm](http://www.gould.edu.au/foodwebs/kids_web.htm)

*Website with food web game.*

Marietta College Environmental Biology

<http://www.marietta.edu/~biol/102/ecosystem.html>

*Info about food webs and biomagnification. At good level for middle school.*

Interesting Facts about Food Chains

<http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/F/FoodChains.html>

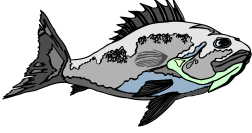
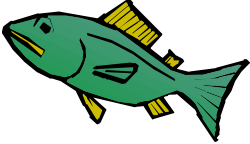
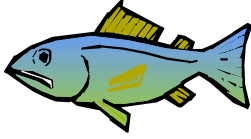
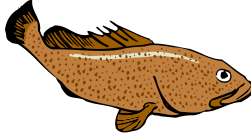
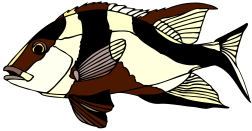

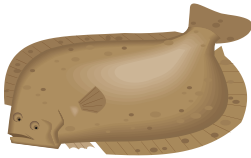
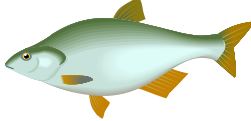
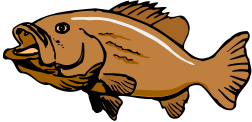
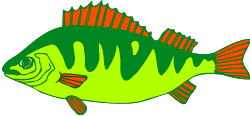
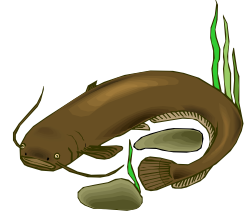
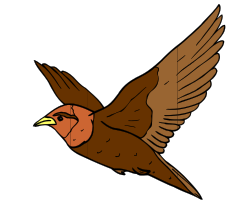
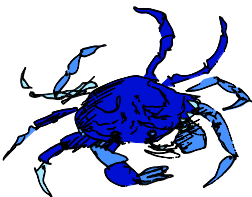


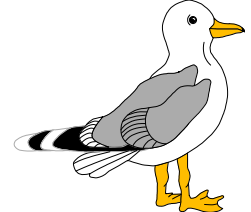
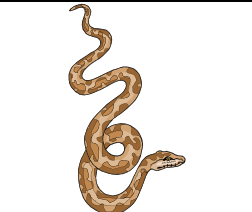



*Thorough discussion of energy flow through food chains.*

### **Other resources**

Kennedy, P. (2007). *Fun with Birds of Prey Stencils*. Dover Publications, 6 pp.

*Create realistic drawings of a Condor, Bald Eagle, Screech Owl, Peregrine Falcon, Osprey, and Swallow-tailed Kite with six brightly colored open stencils. Age Range: 4 to 6 years.*

## Bald Eagle Prey Chips

			
Fish	Fish	Fish	Fish
			
Fish	Fish	Fish	Fish
			
Fish	Fish	Fish	Bird
			
invertebrate	mammal	Bird	Bird
			
snake	mammal	Bird	Bird

Student Name \_\_\_\_\_

## Bald Eagle Diet Investigation

**Instructions.** You are a researcher who is studying Bald Eagles' diets. Every time you observe a Bald Eagle eating, you must record the type of prey in your field notebook.

STEP 1. To simulate a Bald Eagle hunting, you will draw a food chip out of your chip bag. The animal on the chip has fallen prey to the Bald Eagle. Record the category of animal that is on the chip on the day of your observation by placing a tally mark in the correct column and row of your data table. Return this food chip to the paper bag. You will begin your observations on "Monday." Shake the bag and draw another food chip. Record your data below. Do this 10 times on each of the five "days" you observed the Bald Eagle.

STEP 2. Calculate the average number of birds, fish, snakes, mammals and invertebrates that fell prey to your Eagle for each of your five days.

STEP 3. Convert these averages into percentages.

Independent variable	Dependent Variable				
Observation Day	bird	fish	snake	mammal	invertebrate
Day 1					
Day 2					
Day 3					
Day 4					
Day 5					
Total					
Average over five days					
Average in PERCENT					



**Blackline Master #2 (con't)**

STEP 4. Create a bar graph to display your percentages of each of the types of prey that your Bald Eagle dined on over the course of the five days of your observations. Remember to put a title on your graph and to label both the x and y axes. Since your data is in five categories or types, you will use a bar graph to display your data rather than a line graph.


STEP 5. Looking back over your table of data and above at your graphed data, describe what your data tells you about your Bald Eagle's diet over the five days of your observation.

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## Bald Eagle Food Chain Cards



**GREEN ALGAE**



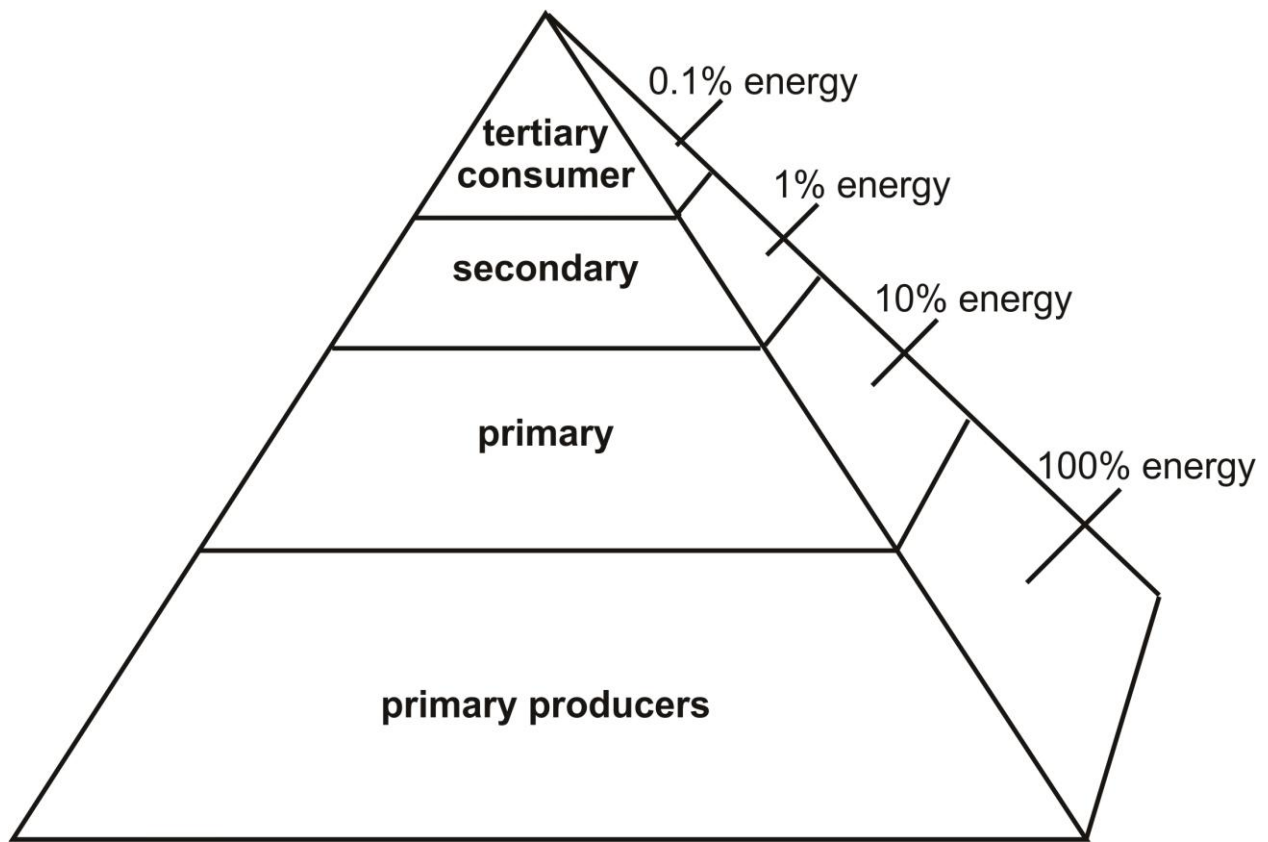
**MINNOW**



**LARGE-MOUTHED BASS**



**BALD EAGLE**



## Ecological Trophic Level Pyramid



# American Robin Migration

Activity 10

Middle School

## Focus/Overview

In this lesson, students will examine the relationship between the American Robin's migration and the 36°F isotherm using maps and information from the Journey North website.

## Learning Objectives

The learner will...

- make observations about feeding and nesting habits of the American Robin based on videos of the species.
- Identify the major biomes that the American Robin is native to in North America.
- make observations and draw conclusions about the spring migration of the American Robin and the connection with the 36°F isotherm.

## Louisiana Science Grade Level Expectations

7: GLE 25	Locate and describe the major biomes of the world (LS-M-C3)
7: Inquiry GLE 13	Identify patterns in data to explain natural events (SI-M-A4)
7: Inquiry GLE 22	Use evidence and observations to explain and communicate the results of investigations (SI-M-A7)

## Louisiana Social Studies Grade Level Expectations

5: GLE 3	Interpret a map, using a map key/legend and symbols, distance scale, compass rose, cardinal or intermediate directions, and latitude and longitude (G-1A-M2)
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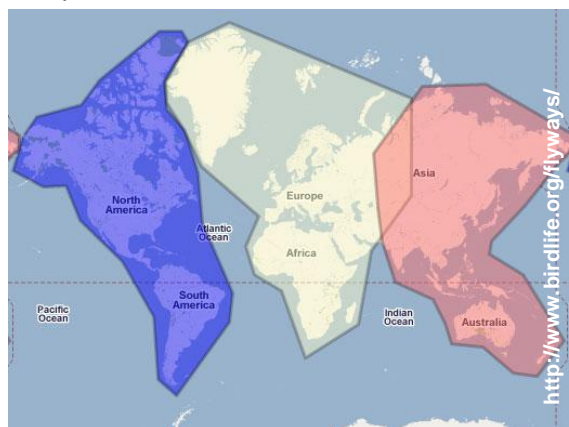
## Materials List

- Internet connectivity
- BTNEP's *Seasonal Abundance of Birds of Southeast Louisiana* (p. 14).
- Copies of Student Guide (Blackline Master #1) - one per student
- Global Biome map (Blackline Master #2) - overhead sheet or a print version

## Background Information

### Flyways

The routes that migratory birds take between their wintering or breeding grounds is referred to as a "migration routes." These routes can be simple or very complicated, and often, it requires a great deal of scientific research to understand timing of a species migration, how fast the birds are actually flying, and the actual path (or paths) that a species takes on their journey. Most of this research involves using radio telemetry (on the larger bird species) and observation of banded and flagged birds. These routes have been



Three main global flyways.

## BTNEP Connection

Birds

## Grade Level

6-8

## Duration

55 minutes

## Subject Area

science

## Setting

classroom

## Extension Area

geography

## Vocabulary

isotherm, flyway, biome



[www.btnep.org](http://www.btnep.org)



generally grouped into larger groupings called “flyways.” There are three main global flyways: African-Eurasian Flyway, the American Flyway, and the East-Asian-Australasian Flyway. The American Flyway is divided into several flyways: the Atlantic Flyway, the Mississippi Flyway, Central Flyway, and the Pacific Flyway (for additional information on the American Flyways see Birdnature.com in references).

### American Robins

American Robins (*Turdus migratorius*) are easy to identify with their orange chests and dark gray backs [To see pictures of male, female and fledging American Robins, visit Cornell’s Ornithology website, [http://www.allaboutbirds.org/guide/American\\_Robin/id](http://www.allaboutbirds.org/guide/American_Robin/id), and look at “Field Marks.” This site also has pictures of other birds that look similar to the American Robin. In the middle of this page is an excellent recording of a typical American Robin song, see “typical voice” link.].

Robins are dependent on berries for most of their diet, but they also eat earthworms. Because they forage for food on our lawns (a ground forager), they are vulnerable to poisoning by pesticides. Some research indicates that only 50% of Robins alive in any year will actually be alive in the next year. During the winter, Robins like to live in moist woods, where their favorite food, berries (chokeberries, dogwood, sumac fruits and juniper berries), are plentiful.

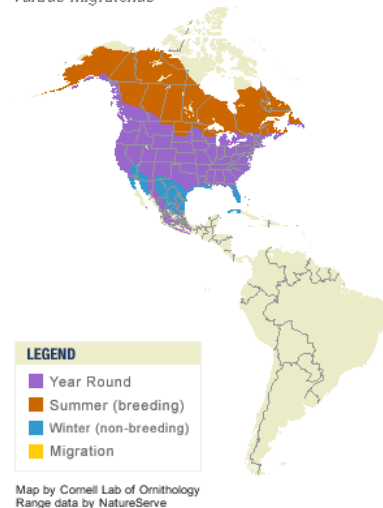
#### American Robin Taxonomy

Class: Aves  
Order: *Passeriformes*  
Family: *Turdidae*  
Genus: *Turdus*  
Species: *migratorius*



Photo by Paul Conover.

American Robin  
*Turdus migratorius*



The female American Robin builds a nest in trees that is made of twigs, mud and grass. The nest measures about 6-8 inches (15.2 – 20.3 cm) tall and 3-6 inches (7.6-15.2cm) deep. The female lays three to five eggs in each clutch, and she can produce up to three clutches each breeding season. American Robin eggs, which are sky blue or blue green in color, are just over an inch (2.5 cm) in length and about ¾” in (1.9 cm) width. The female Robin incubates the eggs around two weeks. The baby Robins are born nearly naked and stay in the nest about two weeks. Robins can raise up to three sets of baby birds a year, but only about 25% of these fledglings survive to the following fall.

American Robins are short-distance migratory birds. They can be found year round anywhere south of Canada. Birds that breed in Canada head south in the fall and overwinter in the southern United States and Mexico. The American Robin is a “harbinger” of spring, as they migrate northward in the spring just behind the above freezing **isotherm**. An isotherm can be thought of as a line on a map that represents the same temperature. In the case of the American Robin, they migrate based on where the “just above freezing” (36° F) isotherm, or line of equal temperatures, is located.

#### Background References:

The Cornell Lab of Ornithology: All About Birds (n.d.) American Robin, retrieved November 22, 2009, at [http://www.allaboutbirds.org/guide/American\\_Robin/id](http://www.allaboutbirds.org/guide/American_Robin/id)



Explore the World with Shorebirds (no date). Shorebird Migration Flyways, retrieved January 5, 2010, at <http://migration.pwnet.org/pdf/Flyways.pdf>  
Birdnature.com (no date). North American Migration Flyways. Retrieved January 5, 2010 at <http://www.birdnature.com/flyways.html>

## Advance Preparation

1. Preview videos on the All About Birds website [[http://www.allaboutbirds.org/guide/American\\_Robin/videos](http://www.allaboutbirds.org/guide/American_Robin/videos)]. Select several videos that show Robins eating, nesting and flying. Make sure that the videos can be streamed to your projection system in your classroom or download them to a CD or hard drive (Engage, Step 1).
2. Preview the Journey North website [[http://www.learner.org/jnorth/maps/robin\\_first\\_spring2009.html](http://www.learner.org/jnorth/maps/robin_first_spring2009.html)]. The American Robin migration information is something that the students will need to see several times in order for them to be able to analyze the data that is being displayed. Familiarize yourself with how the display works, especially how to click through the sighting database in the upper left margin of the map ("select date, week ending in...").
3. Make copies of the student guide (**Blackline Master #1**) and the Biomes Map (**Blackline Master #2**).

## Procedure

### Engage

1. Begin this lesson the American Robin by viewing several of the videos available at the All About Birds website [[http://www.allaboutbirds.org/guide/American\\_Robin/videos](http://www.allaboutbirds.org/guide/American_Robin/videos)]. Ask students what they already know about American Robins. Have students make observations about the American Robin based on the videos. When appropriate, share with students some of the background information (see above) about this bird.
2. Have students locate the American Robin in BTNEP's *Seasonal Abundance of Birds of Southeast Louisiana* (p. 14). Based on this document, what habitats does the American Robin frequent in Louisiana (ANSWER: WI= Widespread). When is the American Robin most common? (ANSWER: mid-December through the end of March). When is the American Robin least common? (ANSWER: Mid-November through mid-December).

### Explore/Explain

1. Hand out copies of **Blackline Master #1**. View the range map for the American Robin [see background information for this lesson or the Cornell Website at [http://www.allaboutbirds.org/guide/American\\_Robin/lifehistory](http://www.allaboutbirds.org/guide/American_Robin/lifehistory)]. What does this range map tell you about the presence of the American Robin in Louisiana? [The American Robin is present in Louisiana as a year round resident.] For residents of Canada, when can they expect to see the bird? [In the summer, during the Robin's summer breeding time.] Where does this species spend the winter? [In the central and southern parts of the United States and in northern Mexico.]
2. Show students the map of the global biomes (**Blackline Master #2**). What are the major biomes that the American Robin lives within? [Arctic and Alpine Tundra, Temperate Boreal Forest, Grassland, Temperate Deciduous Forest, Desert, Chaparral, Tropical Rainforest]. If necessary, review the characteristics of these biomes. (See <http://www.physicalgeography.net/fundamentals/9k.html> for further biome information.)
3. There is a theory that the American Robin migrates northward in the spring along the 36°F temperature line (this is called an *isotherm*, which is a line that connects places with the same average temperatures). What is the significance of this temperature? [This temperature represents conditions just above freezing, which means that water will have thawed and more food would be available at the time of their arrival.] If the American Robin arrives with above freezing temperatures in the spring, let's look at an animated map of global air temperatures to see when the American Robin would be expected to arrive in the northern parts of the United States and Canada. Go to [http://geography.uoregon.edu/envchange/clim\\_animations/gifs/tmp2m\\_web.gif](http://geography.uoregon.edu/envchange/clim_animations/gifs/tmp2m_web.gif). There you will find an animated map of global air temperatures. To use this map, you will need to convert 36°F into centigrade (the temperature unit on the map). Click on the Centigrade to Fahrenheit converter link [<http://www.wbuf.noaa.gov/tempfc.htm>], type in 36°F and click outside the box. Note the centigrade unit [ANSWER: 2.22°C] and return to the global air temperature map to identify the color of this



temperature. [ANSWER: it is a light yellow color]. Observe the color that you identified as the “36°F” color [light yellow] and determine what month this temperature range arrives in the northern parts of the United States and Canada. When do above freezing temperatures of around 36°F arrive near the Great Lakes region in the spring? [ANSWER: Approximately March or April – the animation runs very fast... so you will probably need to watch several times to get a feel for when the color swath crosses the Great Lakes.]

4. Go to the Journey North website for the American Robin [[http://www.learner.org/jnorth/maps/robin\\_first\\_spring2009.html](http://www.learner.org/jnorth/maps/robin_first_spring2009.html)]. This will load a map that depicts the reported first sightings of the American Robin during the Spring 2009 northward migration. Have students click slowly through the sighting database in the upper left margin of the map (“select date, week ending in...”).
  - What do you notice about the sightings before February 22, 2009? [ANSWER: They are all across the southeastern U.S. There is no apparent pattern or trend.]
  - As you click on dates later into the spring of 2009, what pattern do you see develop? [ANSWER: The sightings are farther and farther north.]
  - Take another look at the animated map of global air temperatures. Do you see a connection between the reported first spring sightings and the 36°F air temperature line (or isotherm)? [ANSWER: Yes, the 36°F line is also moving north at about the same time.]
5. Ask students to summarize their understanding of the American Robin’s spring migration to their northern breeding grounds. In their summary, they should include the timing of the journey northward, the winter range, and the link (if any) to the 36°F isotherm.

#### **Expand (optional)**

1. Ask students to view the Journey North’s Whooping Crane migration map for Fall 2009. How does the Whooping Crane’s migration journey compare to the American Robin’s? There’s a lesson plan and advice on how to analyze the migration and the accompanying maps at <http://www.learner.org/jnorth/tm/crane/MapFall.html>.

#### **Assessment**

- Ask students to explain why the American Robin is a “harbinger” of spring based on the data that they discussed in this lesson.

#### **Blackline Masters**

1. **Student Exploration of the American Robin Migration**
2. **American Robin Range**

#### **Extensions**

- GEOGRAPHY. Have students investigate the three main global flyways: African-Eurasian Flyway, the Americas Flyway, and the East-Asian-Australasian Flyway. A good site to begin this investigation is <http://www.birdlife.org/flyways/index.html>.

#### **Resources**

##### **BTNEP publications**

- Habitats of Barataria-Terrebonne
- Wings Over the Wetlands
- Migratory Flyway Poster
- Seasonal Abundance of Birds of Southeast Louisiana (p. 14)

##### **Recommended Field Guides**

- Sibley, D.A. (2000). *The Sibley Guide to Birds*. Audubon Society Nature Guides. Random House, Inc.
- Peterson, R., and Peterson, V. (2002). *A Field Guide to the Birds of Eastern and Central North America*. Peterson Field Guide Series. Houghton Mifflin Harcourt.
- Alderfer, J. (ed.) (2005). *National Geographic Complete Birds of North America*. Random House, Inc.



## Internet Sites

### Prince William Network: Migration Science and Mystery

<http://migration.pwnet.org/pdf/Flyways.pdf>

*A very helpful and formative handout on general flyway information as well as the American and Pacific flyways, with emphasis on shorebirds. The home website (<http://migration.pwnet.org>) has webcasts, classroom tested lesson plans (US Fish and Wildlife Service) about habitat, shorebirds, and migration.*

### American Robins in Alaska

<http://www.go2moon.com/AmericanRobin.html>

*A website with a gallery of great photos on the American Robin, including nesting photos.*

## Other resources

Arnold, C. (1997). Hawk Highway in the Sky: Watching raptor migration. Harcourt Children's Books. 48 pp.

*Provides information about hawks, eagles, and falcons and efforts to study them, especially the HawkWatch International Raptor Migration Project in the Goshute Mountains in Nevada. Age Range: 8 to 12 years.*

Banas, S.L. 2009. Animal Migration. Chelsea House Publishers (Animal Behavior Series). 120 pp.

*Looks at migration for a number of animal groups (whales, salmon, birds). Age Range: Young adult.*

Cherry, L. (1997). Flute's Journey: The life of a Wood Thrush. Houghton Mifflin Harcourt. 40 pp.

*Looks at the first migration for a young Wood Thrush. Age Range: Young adult.*

Dunphy, M. 2008. Peregrine's Journey: A story of a migration. Web of Life Children's Books. 31 pp.

*Follows a Peregrine Falcon's 8,000 mile annual migration from Alaska to Argentina. Based on US Fish and Wildlife Service tracking data for an actual bird.. Age Range: 5-9 years.*

Eiserer, L. (1976). The American Robin. Nelson-Hall Publishers, Inc.

*A book about the American Robin. Age Range: Adults.*

Gans, R. (1996). How Do Birds Find Their Way? HarperCollins Publishers. 32 pp.

*Explores the mysteries of bird migration, including theories on how birds find their way and how scientists learn about migration. Age Range: 5-9 years.*

Poyet, G. (2004). Winged Migration: The junior edition. Editions du Seuil. 48 pp.

*This book is a companion to the Oscar-nominated film Winged Migration. It includes fifteen tales of bird migration and an audio CD with bird songs and calls.*

Wauer, R.H. (1999). The American Robin. University of Texas Press. 103 pp.

*This book offers a complete natural history of the American Robin for the general public. The author also explores the legends and lore surrounding robins and gives suggestions for attracting them to your yard. Age Range: Adults.*

Willis, N.C. 2006. Red Knot: A Shorebird's Incredible Journey. Independent Publishers Group. 32 pp.

*Follows the Red Knot's 20,000 mile migration from the tip of South America to the Arctic Circle. Discusses dwindling food supplies at stopover points along the migration route and how bird-banding and the protecting of the horseshoe crab are part of the conservation for this species. Age Range: 5-9 years.*

## Video

Winged Migration (Sony Pictures). 85 minutes

<http://www.sonyclassics.com/wingedmigration/home.html>

*All manner of man-made machines were employed, including planes, gliders, helicopters, and balloons, and numerous innovative techniques and ingeniously designed cameras were utilized to allow the filmmakers to fly alongside, above, below and in front of their subjects. The website that accompanies the video Winged Migration has an interactive map that shows the migration routes of birds featured in the film (click on "Migration Patterns"). If you click on the featured bird, you go to more detailed information about that bird.*

Student Name \_\_\_\_\_ Date \_\_\_\_\_

## Student Exploration of the American Robin Migration

- View the range map for the American Robin on the Cornell Website at [http://www.allaboutbirds.org/guide/American\\_Robin/lifehistory](http://www.allaboutbirds.org/guide/American_Robin/lifehistory).
  - What does this range map tell you about the presence of the American Robin in Louisiana?  
\_\_\_\_\_
  - For residents of Canada, when can they expect to see the bird?  
\_\_\_\_\_
  - Where does this species spend the winter?  
\_\_\_\_\_
- There is a theory that the American Robin migrates northward in the spring along the 36°F temperature line (this is called an *isotherm*, which is a line that connects places with the same average temperatures).
  - What is the significance of this temperature (36°F)?  
\_\_\_\_\_  
\_\_\_\_\_
- If the American Robin arrives with above freezing temperatures in the spring, let's look at an animated map of global air temperatures to see when the American Robin would be expected to arrive in the northern parts of the United States and Canada. Go to [http://geography.uoregon.edu/envchange/clim\\_animations/gifs/tmp2m\\_web.gif](http://geography.uoregon.edu/envchange/clim_animations/gifs/tmp2m_web.gif). There you will find an animated map of global air temperatures. To use this map, you will need to convert 36°F into centigrade (the temperature unit on the map). Click on the Centigrade to Fahrenheit converter link [<http://www.wbuf.noaa.gov/tempfc.htm>], type in 36°F and click outside the box.
  - What is the answer in centigrade? \_\_\_\_\_
  - Return to the global air temperature map. What color is this temperature? \_\_\_\_\_
- Observe the color that you identified as the "36°F" color on the animated map of global air temperatures in Question #3 above.
  - What month does this temperature range arrive in the northern parts of the United States and Canada? When do above freezing temperatures of around 36°F arrive near the Great Lakes region in the spring?  
\_\_\_\_\_  
\_\_\_\_\_
- Go to the Journey North website for the American Robin [[http://www.learner.org/jnorth/maps/robin\\_first\\_spring2009.html](http://www.learner.org/jnorth/maps/robin_first_spring2009.html)]. This will load a map that depicts the reported first sightings of the American Robin during the Spring 2009 northward migration. Have students click slowly through the sighting database in the upper left margin of the map ("select date, week ending in...".
  - What do you notice about the sightings before February 22, 2009?  
\_\_\_\_\_
  - As you click on dates later into the spring of 2009, what pattern do you see develop?  
\_\_\_\_\_
  - Take another look at the animated map of global air temperatures. Do you see a connection between the reported first spring sightings and the 36°F air temperature line (or isotherm)?  
\_\_\_\_\_  
\_\_\_\_\_
- Summarize your understanding of the American Robin's spring migration to their northern breeding grounds. In your summary, include the timing of the journey northward, the winter range, and the link (if any) to the 36°F isotherm.  
\_\_\_\_\_  
\_\_\_\_\_

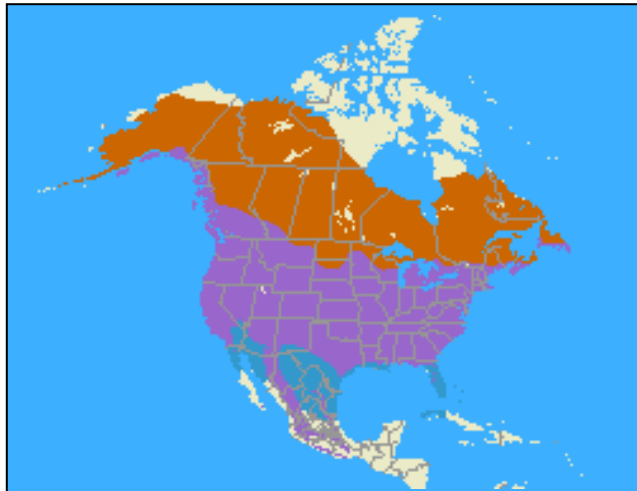
Student Name \_\_\_\_\_ Date \_\_\_\_\_

## American Robin Migration

### EXPLORE/EXPLAIN

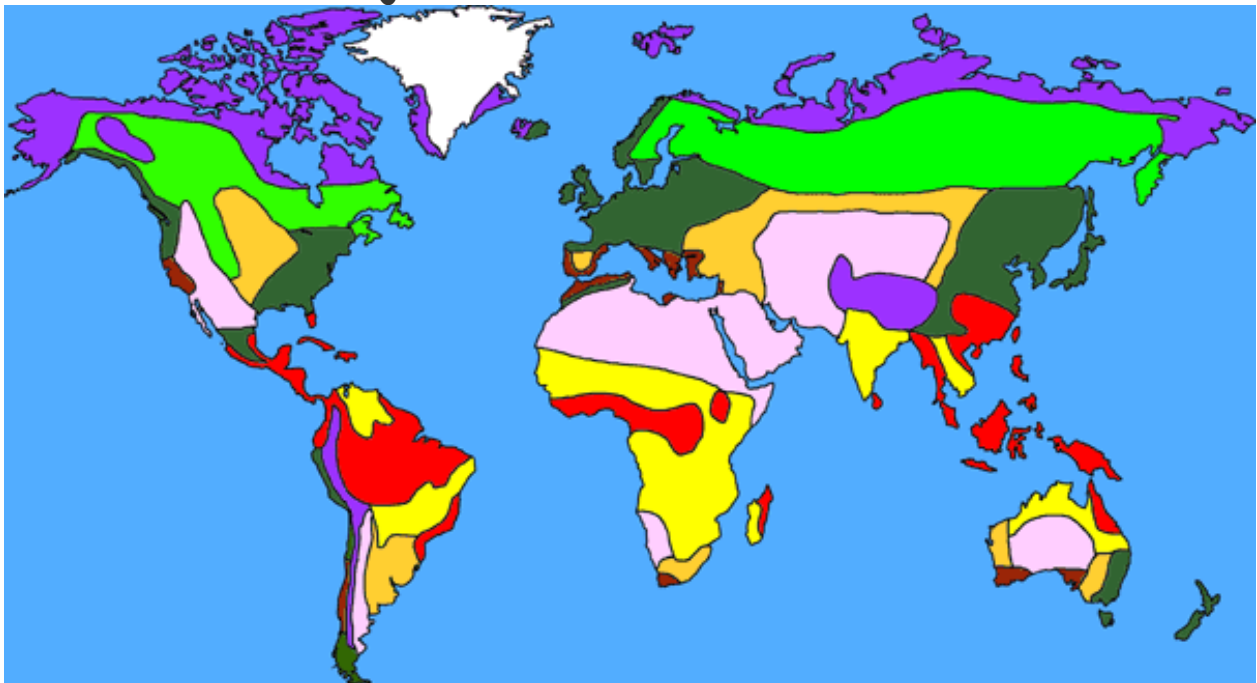
- View the range map for the American Robin.
  - What does this range map tell you about the presence of the American Robin in Louisiana? **[ANSWER: The American Robin is present in Louisiana as a year round resident.]**
  - For residents of Canada, when can they expect to see the bird? **[ANSWER: In the summer, during the Robin's summer breeding time.]**
  - Where does this species spend the winter? **[ANSWER: In the central and southern parts of the United States and in northern Mexico.]**
- There is a theory that the American Robin migrates northward in the spring along the 36°F temperature line (this is called an *isotherm*, which is a line that connects places with the same average temperatures).
  - What is the significance of this temperature (36°F)? **[ANSWER: This temperature represents conditions just above freezing, which means that water will have thawed and more food would be available at the time of their arrival.]**
- If the American Robin arrives with above freezing temperatures in the spring, let's look at an animated map of global air temperatures to see when the American Robin would be expected to arrive in the northern parts of the United States and Canada. Go to [http://geography.uoregon.edu/envchange/clim\\_animations/gifs/tmp2m\\_web.gif](http://geography.uoregon.edu/envchange/clim_animations/gifs/tmp2m_web.gif). There you will find an animated map of global air temperatures. To use this map, you will need to convert 36°F into centigrade (the temperature unit on the map). Click on the Centigrade to Fahrenheit converter link [<http://www.wbuf.noaa.gov/tempfc.htm>], type in 36°F and click outside the box.
  - What is the answer in centigrade? **[ANSWER: 2.22°C]**
  - Return to the global air temperature map. What color is this temperature. **[ANSWER: it is a light yellow color].**
- Observe the color that you identified as the "36°F" color on the animated map of global air temperatures in Question #3 above.
  - What month does this temperature range arrive in the northern parts of the United States and Canada? When do above freezing temperatures of around 36°F arrive near the Great Lakes region in the spring? **[ANSWER: Approximately March or April – the animation runs very fast... so you will probably need to watch several times to get a feel for when the color swath crosses the Great Lakes.]**
- Go to the Journey North website for the American Robin [[http://www.learner.org/jnorth/maps/robin\\_first\\_spring2009.html](http://www.learner.org/jnorth/maps/robin_first_spring2009.html)]. This will load a map that depicts the reported first sightings of the American Robin during the Spring 2009 northward migration. Have students click slowly through the sighting database in the upper left margin of the map ("select date, week ending in...").
  - What do you notice about the sightings before February 22, 2009? **[ANSWER: They are all across the southeastern U.S. There is no apparent pattern or trend.]**
  - As you click on dates later into the spring of 2009, what pattern do you see develop? **[ANSWER: The sightings are farther and farther north.]**
  - Take another look at the animated map of global air temperatures. Do you see a connection between the reported first spring sightings and the 36°F air temperature line (or isotherm)? **[ANSWER: Yes, the 36°F line is also moving north at about the same time.]**
- Summarize your understanding of the American Robin's spring migration to their northern breeding grounds. In your summary, include the timing of the journey northward, the winter range, and the link (if any) to the 36°F isotherm.

## American Robin Range



Map by Cornell Lab of Ornithology  
Range data by NatureServe

## Major Biomes of the Earth



### Legend



Pidwirny, M. (2006). "Characteristics of the Earth's Terrestrial Biomes". *Fundamentals of Physical Geography*, 2nd Edition. January 5, 2010. <http://www.physicalgeography.net/fundamentals/9k.html>





# LA Waders Jeop-Birdy

Activity 11

Middle School

## Focus/Overview

In this lesson, students will use the information found in BTNEP's 2007 Louisiana Waders calendar to answer questions in a Jeop-Birdy game. The five topics that this game covers are bird beaks and names, feathers, physical descriptions, nesting habitats, and foods. The game requires students to read and comprehend information about Louisiana wading birds featured in the 2007 BTNEP calendar and to make observations about the photos featured in the calendar.

## Learning Objectives

The learner will...

- read information about specific birds and answer questions about the habits of some of Louisiana's wading birds.

## Louisiana Science Grade Level Expectations

7: GLE 24

Analyze food webs to determine energy transfer among organisms (LS-M-C2)

## Materials List

- three copies of the 12 months of the BTNEP's 2007 Louisiana Waders: Wings over the Wetlands
  - Entire 2007 calendar can be downloaded at:  
[http://www.btnep.org/Libraries/Calendars/2007\\_Birding\\_Calendar.sflb.ashx](http://www.btnep.org/Libraries/Calendars/2007_Birding_Calendar.sflb.ashx)
- InFocus Projector
- computer with Microsoft PowerPoint
- overhead projector sheet pens – one per student
- laminating machine (optional)
- overhead projector sheets – one per student [optional]

## Background Information

Background information for this activity can be found in the BTNEP's 2007 Louisiana Waders calendar. Teachers should familiarize themselves with this information before beginning the lesson.

## Advance Preparation

- Obtain three color copies of the BTNEP's 2007 Louisiana Waders calendar. Entire 2007 calendar can be downloaded at:  
[http://www.btnep.org/Libraries/Calendars/2007\\_Birding\\_Calendar.sflb.ashx](http://www.btnep.org/Libraries/Calendars/2007_Birding_Calendar.sflb.ashx)  
Run two of the three copies through a laminating machine. (Laminating is recommended so students can highlight, with overhead projector sheet pens, important information about the bird. If you do not have access to a laminating machine, students can use an overhead projector sheet held on top of the calendar and mark important information with an overhead projector pen.) Make sure that you keep the image and the information about the image together. For instance, the March 2007 featured bird is the Night-Heron. When this link is clicked on, one page is a beautiful photo of the bird and the other is the calendar and information about the bird.
- Prepare a point tally chart on the board.
- Make a copy of **Blackline Master #1** to keep track of what questions have been answered on the Jeop-Birdy Board.

## BTNEP Connection

Birds

## Grade Level

7

## Duration

1 hour

## Subject Area

reading

## Setting

classroom

## Extension Area

Geography

## Vocabulary

no new vocabulary

NOTE: This word "Jeop-Birdy" was first used by the Flying Wild curriculum [<http://www.flyingwild.org>].





## Procedure

### Engage

1. Have students brainstorm a list of wading birds that they have seen in Louisiana.
2. Give the color copies of the pictures from the BTNEP's 2007 Louisiana Waders calendar to the students. Note which birds students were able to name.
3. Have students describe common characteristics of wading birds based on their observations of the 12 calendar photos.

### Explore/Explain

1. Divide students into two groups. Give each group of students the 12 written calendar descriptions of the featured birds. Using the jigsaw teaching strategy, have students read the information about each of the 12 wading birds. As they read the information, they can highlight the information with overhead projection pens to aid recall during the game. Allow 15-20 minutes for students to read and comprehend the material.
2. Post the point tally chart. Post the Game Board sheet (**Blackline Master #1**) to keep track of questions that are answered.
3. Play LA Wader Jeopardy with standard rules and procedures. IMPORTANT NOTES:
  - Use the links provided in the PowerPoint to navigate between the game board and the questions.
  - Once a team has a "question," click **once** to reveal the correct question, and then a **2<sup>nd</sup> time** to reveal which calendar month the bird is featured on. To continue play, click on the "back to the board" link to continue with choosing the next question. If you happen to click a 3<sup>rd</sup> time, you will progress to the next question in that category.
  - As you play, remember to keep score and to note which questions have been answered (**Blackline Master #1**)
  - **Blackline Master #2** contains all the questions and the correct answers.

### Expand

1. Have students create their own categories and questions based on the information in BTNEP's 2007 Louisiana Waders calendar or another one of the BTNEP bird calendars (i.e Raptors, sparrows)

## Assessment

- Assessment can be based on student participation and/or which team wins.
- Student questions that were created in Expand can also be graded.

## Blackline Master

1. Louisiana Wader Jeop-Birdy Game Board
2. Questions and Answers for Louisiana's Waders Jeop-Birdy

## Extensions

- GEOGRAPHY. Students can go online or research through bird books and other resources to develop maps of each bird's range and migratory patterns.

## Resources

### BTNEP publications

- BTNEP's 2007 Louisiana Waders: Wings over the Wetlands  
Entire 2007 calendar: [http://www.btnep.org/Libraries/Calendars/2007\\_Birding\\_Calendar.sflb.ashx](http://www.btnep.org/Libraries/Calendars/2007_Birding_Calendar.sflb.ashx)  
The Habitats of Barataria-Terrebonne: Their importance to Migratory and Resident Birds.
- Wings Over the Wetlands video
- BTNEP Migratory Flyway Poster

### Recommended Field Guides

- Sibley, D.A. (2000). *The Sibley Guide to Birds*. Audubon Society Nature Guides. Random House, Inc.



- Peterson, R., and Peterson, V. (2002). *A Field Guide to the Birds of Eastern and Central North America*. Peterson Field Guide Series. Houghton Mifflin Harcourt.
- Alderfer, J. (ed.) (2005). *National Geographic Complete Birds of North America*. Random House, Inc.

## Louisiana Wader Jeop-Birdy Game Board

Bird Beaks	Birds of a Feather	Eye of the Beholder	Nest Addresses	Dining Out
100	100	100	100	100
200	200	200	200	200
300	300	300	300	300
400	400	400	400	400
500	500	500	500	500

## Questions and Answers for Louisiana's Waders Jeop-Birdy

### Bird Beaks and Names

- 1 Called *bec croche*, or "crooked beak" by the Cajuns. [What is the Ibis? January 2007]
- 2 Old genus name means "Queen of the Water." [What is the Tricolored Heron? December 2007]
- 3 Called *gras becs*, or "big beaks" by the Cajuns. [What is the Night-Heron? March 2007]
- 4 Mix of blue and white features during molt earns this bird the name "calico crane." [What is the Little Blue Heron? July 2007]
- 5 This beak fades from yellow to red. [What is the Cattle Egret? May 2007]

### Birds of a Feather

- 1 Sports bright pink feathers. [What is the Roseate Spoonbill? April 2007]
- 2 Mating plumage produces a "lion's mane" appearance. [What is the Reddish Egret? October 2007]
- 3 19<sup>th</sup> and 20<sup>th</sup> century plume hunters almost hunted this bird to extinction. [What is the Great Egret? February 2007]
- 4 Sports bright yellow feather "crown". [What is the Yellow-Crowned Night-Heron? March 2007]
- 5 Sports two-toned blue-white feathers on underside of body. [What is the Tricolored Heron? December 2007]

### Eye of the Beholder

- 1 Reddish legs, black beak and yellow crown feathers. [What is a Yellow-Crowned Night Heron? March 2007]
- 2 Black legs and yellow feet. [What is the Snowy Egret? June 2007]
- 3 Dark-tipped blue-gray bills and yellow eyes. [What is the Little Blue Heron? July 2007]
- 4 Brown feather-less head and neck. [What is the Wood Stork? August 2007]
- 5 Largest North American heron or egret. [What is the Great Blue Heron? November 2007]

### Nest Addresses

- 1 "Bird City" on Avery Island, Louisiana, is one of this bird's addresses. [What is the Snowy Egret? June 2007]
- 2 Is found on six of seven continents across the world. [What is the Great Egret? February 2007]
- 3 Original home was in Europe, Asia, and Africa. [What is the Cattle Egret? May 2007]
- 4 Only lives near beaches and salt marshes. [What is the Reddish Egret? October 2007]
- 5 Prefers nesting sites located away from trees. [What is the Tricolored Heron? December 2007]

### Dining Out

- 1 Favorite food is grasshoppers and crickets. [What is the Cattle Egret? May 2007]
- 2 Uses the "drunken sailor" hunting technique. [What is the Reddish Egret? October 2007]
- 3 Known to eat turtles, wood rats and baby alligators. [What is the Wood Stork? August 2007]
- 4 Will eat eggs and chicks of other birds. [What is the Black-Crowned Night Heron? March 2007]
- 5 Only wading bird known to dive into water after prey. [What is the Green Heron? September 2007]



# Songbird Migration: Researching Purple Martins and Wood Thrushes

High School Biology

## Focus/Overview

In this lesson, students will study the migration time and routes for Purple Martins and Wood Thrushes, based on data from Dr. Stutchbury's research in 2007-8, which followed these two species of birds as they migrated roundtrip from spring nesting area Pennsylvania to their winter habitats in Central and South America.

## Learning Objectives

The learner will...

- State how a new technology helped Dr. Stutchbury be able to capture data that helped her understand migration information on Wood Thrushes and Purple Martins.
- Relate basic information about the migration routes for Wood Thrushes and Purple Martins.

## Louisiana Science Grade Level Expectations

7:Inquiry GLE 21	Distinguish between <i>observations</i> and <i>inferences</i> (SI-M-A7)
7: Inquiry GLE 29	Explain how technology can expand the senses and contribute to the increase and/or modification of scientific knowledge (SI-M-B3)
7: Inquiry GLE 30	Describe why all questions cannot be answered with present technologies (SI-M-B3)
7: GLE 6	Compare the life cycles of a variety of organisms, including non-flowering and flowering plants, reptiles, birds, amphibians, and mammals (LS-M-A3)

## Louisiana Math Grade Level Expectations

7:GLE 5	Multiply and divide positive fractions and decimals (N-5-M)
7:GLE 10	Determine and apply rates and ratios (N-8-M)

## Louisiana Social Studies Grade Level Expectations

8:GLE 14	Analyze, evaluate, and predict consequences of environmental modifications on Louisiana landforms, natural resources, and plant or animal life (G-1D-M1)
8:GLE 17	Identify a contemporary Louisiana geographic issue, and research possible solutions (G-1D-M4)
8:GLE 78	Describe and analyze the impact of Louisiana's geographic features on historic events, settlement patterns, economic development, etc (H-1D-M4)

## Materials List

- Internet
- Elmo or Infocus Projector
- Copies of the Blackline Masters 1-3 (one per student or student pair).
- Copies of BTNEP resources
  - Habitats of the Barataria-Terrebonne: Their importance to migratory & resident birds (2007)*
  - Seasonal Abundance of Birds of Southeast Louisiana (2008)*
  - Attracting Wildlife with Native Plants*

## BTNEP Connection

Birds

## Grade Level

7

## Duration

2 class periods

## Subject Area

science, math

## Setting

classroom

## Extension Area

science

## Vocabulary

migration; geolocator



[www.btnep.org](http://www.btnep.org)



## Background Information

Recently, in February 2009, Dr. Bridget Stutchbury and her research group from York University in Toronto, Canada, published groundbreaking information about the migration patterns of two migratory songbirds, the Purple Martin and the Wood Thrush. Previous to Dr. Stutchbury's research, satellite technology had been used to study larger bird migration routes. This was accomplished by mounting a satellite receiver to the back of a bird and then monitoring the movements of the bird by satellite telemetry. This equipment was much too heavy to use on migratory songbirds. Dr. Stutchbury and her research team figured out a way to use a much smaller piece of technology called a geolocator. Unlike the satellite telemetry equipment, this piece of equipment records sunrise and sunset data on a small computer chip. The geolocator, once mounted on the back of a songbird, is very light and doesn't interfere with mating or flying. The birds in her study were captured in their nesting area in New York and were fitted with the devices and then set free. The birds migrated and were recaptured a year later after their migration journey. The data was downloaded from the computer chip and locations (latitude and longitude) were calculated for the sunrise/sunset data.

To hear more about Dr. Stutchbury's research, listen to ***Tracking Device Reveals Songbirds' Travels*** the February 13, 2009 broadcast of NPR's All Things Considered, by Richard Harris:

<http://www.npr.org/templates/story/story.php?storyId=100539101>.

### Purple Martin

Purple Martins (*Progne subis*) are the largest members of the North American swallow family, measuring 7.5 inches (19 cm) long and weighing 1.9 ounces (55 grams). The males bluish-back all over, while the females have a gray brown chest and a gray collar around the back of their necks.

Purple Martin's mate for life. They share the duties of building their nest, which is made of grass, twigs, and mud. Females lay up to seven eggs, which hatch after fifteen days of incubation. The baby birds are fed insects caught by their parents and after about a month are ready to fledge, or leave the nest. Purple Martins spend the breeding season in North America and the non-breeding season in Brazil. The older individuals tend to arrive first and are returning to where they nested in previous years. Younger martins return to North America several weeks later.

In the eastern part of North America, Purple Martins nest in housing that is supplied by humans. This tradition started with Native Americans, who hung up empty gourds for the Purple Martins to nest in. Elsewhere they nest in abandoned woodpecker nest cavities.

Martins, like all swallows, are insectivores. They eat only flying insects, which they catch in flight. Their diet is diverse, including dragonflies, damselflies, flies, midges, mayflies, stinkbugs, leafhoppers, Japanese beetles, June bugs, butterflies, moths, grasshoppers, cicadas, bees, wasps, flying ants, and ballooning spiders. Purple Martins also drink in flight. It skims the surface of a bayou or lake and scoops up the water with its lower bill.

Martins are not heavy consumers of mosquitoes as is so often claimed by companies that manufacture martin housing. An intensive 7-year diet study conducted at PMCA headquarters in Edinboro, PA, failed to find a single mosquito among the 500 diet samples collected from parent martins bringing beakfuls of insects to their young. The samples were collected from martins during all hours of the day, all season long, and in numerous habitats, including mosquito-infested ones. Purple Martins and freshwater mosquitoes rarely ever cross paths. Martins are daytime feeders, and feed high in the sky; mosquitoes,

#### Purple Martin

Kingdom: *Animalia*  
Phylum: *Chordata*  
Subphylum: *Vertebrata*  
Class: *Aves*  
Order: *Passeriformes*  
Family: *Hirundinidae*  
(swallows)  
Genus: *Progne*  
Species: *subis*



Purple martins on a bird house.  
Photo credit: Paul Conover.



on the other hand, stay low in damp places during daylight hours, or only come out at night. Since Purple Martins feed only on flying insects, they are extremely vulnerable to starvation during extended periods of cool and/or rainy weather.

### Wood Thrush

The Wood Thrush is a common backyard bird in the eastern part of the United States. It is brown with a white chest that has large brown spots. It likes wooded locations best. It is about the size of an American Robin. It is between 7.5–8.3 in (19.1 – 21.1cm) length, with a wingspan of 11.8–13.4 in (30–34cm), and weighs in at 1.4–1.8 oz (39.69–51.03g). Wood Thrushes often return to the same breeding ground in successive years, and parents share the duty of feeding the hatchlings. Their nests are made of dead leaves and grasses and are lined with mud. They are placed among the leaves on the lower branches of trees and shrubs, usually near the trunk of the tree. It takes the female about three to six days to build her nest. The female will lay 3 or 4 eggs in the nest, which are smooth and blue-green in color. Young Wood Thrushes are fed insects and fruit.



Woodthrush.

Photo credit: Unknown. Smithsonian Migratory Bird Center, <http://nationalzoo.si.edu>

Unfortunately, the Wood Thrush population has been in decline over the last several decades in the United States. Since 1966, its population has declined by 43%. Researchers think that this is due in part to the species' need for large tracks of mature forest. Tropical deforestation in Central America is thought to be negatively impacting this bird species. In addition, the Brown-headed Cowbird frequently parasitizes the nests of Wood Thrushes, which is also a problem (See Lesson #20 on Brown-headed Cowbird.)

Wood Thrushes eat insects year round, and in the late summer and fall include a variety of fruit in their diet, including, blueberry, holly, elderberry, Virginia creeper, pokeweed, dogwood, black cherry, and black gum.

#### Wood Thrush

Kingdom: *Animalia*  
Phylum: *Chordata*  
Subphylum: *Vertebrata*  
Class: *Aves*  
Order: *Passeriformes*  
Family: *Turdidae*  
(thrushes & robins)  
Genus: *Hylocichla*  
Species: *mustelina*

### Background references

Purple Martin Conservation Society. (no date). *Attracting and managing Purple Martins*. Accessed August 6, 2009, at <http://purplemartin.org/main/mgt.html>

The Cornell Lab of Ornithology (2009) *All About Birds: Wood Thrush*. Accessed September 13, 2009, at [http://www.allaboutbirds.org/guide/Wood\\_Thrush/lifehistory](http://www.allaboutbirds.org/guide/Wood_Thrush/lifehistory)

The Cornell Lab of Ornithology (2009) *All About Birds: Purple Martin*. Accessed September 13, 2009, at [http://www.allaboutbirds.org/guide/Purple\\_Martin/lifehistory](http://www.allaboutbirds.org/guide/Purple_Martin/lifehistory)

### Advance Preparation

1. Copy **Blackline Master #2** in color. If this is not possible, have the map displayed in color on an overhead projector or using an Infocus or Elmo projector.
2. Ensure that you can show students the National Geographic video in Engage, Step #1, and that students can access the Cornell website in Explore, Step #1.

### Procedure

#### Engage

1. Show students the National Geographic video entitled: "Migratory Songbird Mystery Solved" (1 min. <http://news.nationalgeographic.com/news/2009/02/090212-migratory-songbird-tracking-missions.html>).

2. Have students read the National Geographic article (**Blackline Master #1**) about Dr. Bridget Stutchbury's research on songbird migration. She is a biologist from York University in Toronto, Canada.
3. Some discussion questions:
  - What makes Dr. Stutchbury's research on songbirds a breakthrough? [Prior to Dr. Stutchbury's research in 2008, scientists had been unable to study individual songbird migration journey's because the birds were too small to wear the equipment necessary to study them with satellite tracking technology.]
  - How is Dr. Stutchbury's technology different from what was used previously? [Dr. Stutchbury uses a different technology in her research, one that uses sunrise and sunset times to determine the bird's position. This new technology is called a "geolocator." The difference between a satellite telemetry technology and geolocators is that satellite telemetry uses a transmitter that is attached to an animal, in this case, a bird. The transmitter then communicates with a satellite, which transmits the location and other environmental data in real time back to the researcher. This allows the researcher to follow the tagged animal over time. With a geolocator, the device is attached to the animal and data is recorded to a device's memory and after the bird is recaptured the next time by the researcher, the data is downloaded to a computer.]
  - What was so surprising about what Dr. Stutchbury found out regarding the songbird's migratory flights? [Scientists had been underestimating how far and how fast songbirds could fly. Her research showed that one bird flew a whopping 358 miles (577 kilometers) a day, shattering previous estimates for songbirds of 93 miles (150 kilometers) a day.]

### Explore/Explain

1. Divide students into two groups. One group will focus on Purple Martins and the other on Wood Thrushes. Have students visit the Cornell Lab of Ornithology website to learn about the life history of their assigned songbird species. Students should investigate this material for 15 minutes.  
 The Cornell Lab of Ornithology (2009) *All About Birds: Wood Thrush*. Accessed September 13, 2009, at [http://www.allaboutbirds.org/guide/Wood\\_Thrush/lifehistory](http://www.allaboutbirds.org/guide/Wood_Thrush/lifehistory)  
 The Cornell Lab of Ornithology (2009) *All About Birds: Purple Martin*. Accessed September 13, 2009, at [http://www.allaboutbirds.org/guide/Purple\\_Martin/lifehistory](http://www.allaboutbirds.org/guide/Purple_Martin/lifehistory)
2. Give each of the groups the guided inquiry worksheets on their species (**Blackline Master #2** – Purple Martin Migration, and **Blackline Master #3** – Wood Thrush Migration). The worksheets can be done individually or in pairs. Allow 30 minutes for students to complete the worksheets.
3. When groups are finished, have them present what they understand about each of their species' migration journeys. Students should address the following questions in their explanation:
  - What route did their bird species follow on their migration journey?
  - What role do you think Louisiana landforms and resources play in these songbirds' migration journeys? How has the human development of the coastal plain possibly affected the migration of these songbirds?
  - Where did the songbird species spend the winter? How long did they linger there? Did the two species begin their northward migration simultaneously?
4. Once the two groups have presented their bird's migration story, have them compare the two species' migration journeys.
  - Which of the two bird species had a longer migration journey?
  - How does the timing of their migration journeys compare? For instance, which species crossed the Gulf of Mexico first on their migration south? How about on their way back across the Gulf of Mexico on their way north?
  - What was Dr. Stutchbury's reasoning for the one Wood Thrush's route back to the United States over land? (You will have to listen to the NPR report (See Engage, Step #1).
  - Did all the birds migrate through the Yucatan Peninsula?

### Expand

1. Read a related National Geographic News story: "[Where Are All the Migratory Birds Going?](http://news.nationalgeographic.com/news/2009/02/090216-bird-migration-missions.html)" at <http://news.nationalgeographic.com/news/2009/02/090216-bird-migration-missions.html>. Have

students discuss what scientists understand about songbird migration, the problems that songbirds encounter on their migrations and how scientists collect this research data.

2. Since a major songbird migration route is through Louisiana, what can Louisiana citizens do to support songbird migration? A review of the following BTNEP publications may be helpful:
  - *Attracting Wildlife with Native Plants: Residents' Guide*
  - *The Habitats of Barataria-Terrebonne: Their importance to migratory and resident birds* (2007)

## Assessment

- Completed worksheets
- Contributions to discussion during the explanation of student learning

## Blackline Master

1. **National Geographic News: Migratory Songbird Mystery Solved**
2. **Purple Martin Migration**
3. **Wood Thrush Migration**

## Extensions

1. Participate in **BirdSleuth** at <http://www.birdsleuth.net>.  
York University and the Stutchbury lab is a partner in **Birds in the City**, an environmental education program whose mission is to use migratory songbirds to connect people to environmental health and sustainability. The Stutchbury lab is working with the Faculty of Education and Faculty of Environmental Studies at York University to help schools and teachers use **BirdSleuth**, a fun inquiry-based curriculum that gets kids (grades 4-8) outdoors and learning about how to help save birds and the environment. *BirdSleuth* was developed by the Cornell Lab of Ornithology.



## Resources

### BTNEP publications

- *Habitats of the Barataria-Terrebonne: Their importance to migratory and resident birds* (2007)
- *Seasonal Abundance of Birds of Southeast Louisiana* (2008)

### Recommended Field Guides

- Sibley, D.A. (2000). *The Sibley Guide to Birds*. Audubon Society Nature Guides. Random House, Inc.
- Peterson, R., and Peterson, V. (2002). *A Field Guide to the Birds of Eastern and Central North America*. Peterson Field Guide Series. Houghton Mifflin Harcourt.
- Alderfer, J. (ed.) (2005). *National Geographic Complete Birds of North America*. Random House, Inc.

### Internet Sites

The Cornell Lab of Ornithology (2009) *All About Birds: Wood Thrush*. Accessed September 13, 2009, at [http://www.allaboutbirds.org/guide/Wood\\_Thrush/lifehistory](http://www.allaboutbirds.org/guide/Wood_Thrush/lifehistory)

The Cornell Lab of Ornithology (2009) *All About Birds: Purple Martin*. Accessed September 13, 2009, at [http://www.allaboutbirds.org/guide/Purple\\_Martin/lifehistory](http://www.allaboutbirds.org/guide/Purple_Martin/lifehistory)

*This site gives species specific information about bird species, including habitat, migration routes, audio recordings, and ecology.*

Journey South. (1998). *Peregrine Falcon Migration Updates: Fall, 1998*. Accessed October 10, 2009, at <http://www.learner.org/jnorth/fall1998/falcon/>

*This page includes links to each of Geoff Holroyd's reports to Journey North and suggestions for classroom activities.*

# NATIONAL GEOGRAPHIC NEWS

NATIONALGEOGRAPHIC.COM/NEWS

## Migratory Songbird Mystery Solved

Hayley Rutger, for [National Geographic magazine](#) February 12, 2009

Source: National Geographic Society, accessed August 6, 2009, at <http://news.nationalgeographic.com/news/pf/83285029.html>.

For the first time, scientists have tracked entire migration routes of individual songbirds, following them thousands of miles further than in earlier studies and revealing that [birds](#) fly two to three times faster than previously known. The new information will aid future conservation efforts.

The researchers equipped 14 wood thrushes and 20 purple martins with tiny **geolocators**—the first tracking devices small and light enough for songbirds to carry—to map their round trip between North America and the tropics with unprecedented accuracy.

They tracked two purple martins for about 9,300 miles (15,000 kilometers), from [Pennsylvania](#) to the Amazon basin and back, and tracked five wood thrushes to Central America and back.

"This is a real breakthrough," said Bridget Stutchbury, a biologist from York University in [Toronto](#) and lead author of a paper detailing the results, which appears this week in the journal *Science*. Her team, she said, was able to "accurately track where the birds spent the winter and how they got there" from their breeding ground in Pennsylvania.

"For most people studying migratory birds, this has been a daydream for years," said Stutchbury, who received funding for the study from the National Geographic Society's [Committee for Research and Exploration](#) and worked in collaboration with the Purple Martin Conservation Association.

(Read a related National Geographic News story: ["Where Are All the Migratory Birds Going?"](#))

### Super-Fast Birds "Breaking All the Rules"

Stutchbury and her team released their birds in summer 2007 and snagged returnees the next spring, along with data on their routes and migration rates.

The birds' travel speeds astounded them. All flew two to six times faster during their spring return journey than in fall. One female purple martin dashed back north in 13 days at a speed of about 358 miles (577 kilometers) a day, shattering previous estimates for songbirds of 93 miles (150 kilometers) a day.

"Maybe this is some kind of super-bird, but still I was really impressed that any bird can do this," Stutchbury said. "These birds are traveling really fast and breaking all the rules."

Until now, ornithologists had been stymied by the details of songbird migration, a source of concern since many of these birds are declining in population and no one knows exactly why.

Songbirds—about 46 percent of Earth's bird species—are too dainty to lug around the most accurate tracking devices, satellite tags that relay their locations immediately to computers. So scientists have mainly relied on "snapshots" of songbird travels, by observing large flocks on weather radar screens or marking birds and trying to re-capture them in transit.

One thrush was tracked with a radio transmitter for an unrivaled 940 miles in 1973.

Thanks to miniaturized tracking technology, Stutchbury's team has blown this record away.

Their breakthrough was made possible with dime-sized geolocators, battery-powered devices weighing a fraction of an ounce that record light and store data on sunrise and sunset times, which vary with latitude and longitude. Stutchbury rigged the birds with mini-versions of devices that were first developed by the British Antarctic Survey to track albatrosses.

### Conservation for Songbirds in Decline

In addition to showing the birds flew faster than previously known, the geolocators also revealed that some birds engaged in leisurely stopovers during their fall migration—three to four weeks in [Mexico](#)'s Yucatan for the purple martins.

Stutchbury learned as well that wood thrushes stuck closely together on their winter grounds in [Honduras](#) and [Nicaragua](#). Both sets of information may be useful for future conservation efforts.

Until this study, "We didn't know where—or if—they stopped along their spring or fall migrations," said Duke University conservation ecologist Stuart Pimm, who did not participate in Stutchbury's work.

"This new study reveals where those stopovers are, and that they are important feeding spots."

The Honduras-Nicaragua region is a crucial area to protect, Stutchbury said, because wood thrushes have declined in number by about 30 percent over the past four decades, possibly from threats like deforestation and habitat loss in this region.

"Many species of migratory songbirds over the past 40 years have been in a tailspin. The magic of geolocators is that they will help us direct conservation for individual species. The problems might be different for a thrush, a bobolink, or a shrike."

Overall, it's important to protect songbirds, Stutchbury emphasized, because many control insects or help maintain forests by dispersing seeds. "I like to think of migratory songbirds as nature's blue-collar workers," she said. "They do important jobs."

Many small songbirds like warblers and vireos are still too puny to track with geolocators. But someday, that, too, may be possible—along with other advances, like tracking songbirds with temperature-sensing geolocation.

Russell Greenberg, director of the Smithsonian Migratory Bird Center in Washington, DC, which has also started using geolocators on songbirds, hopes someday to use such devices on birds that winter in the temperate zone, where changing weather may strongly influence migrations.

"There's a lot of research that shows that birds are being affected by climate change," Greenberg said. "If the temperature warms up in January, do they start moving north again?"

Now that Stutchbury and her team have made the initial breakthrough with geolocators, Greenberg said, questions like this may finally be answered.

"It opens up an incredible door to things people didn't think they could do with songbirds."

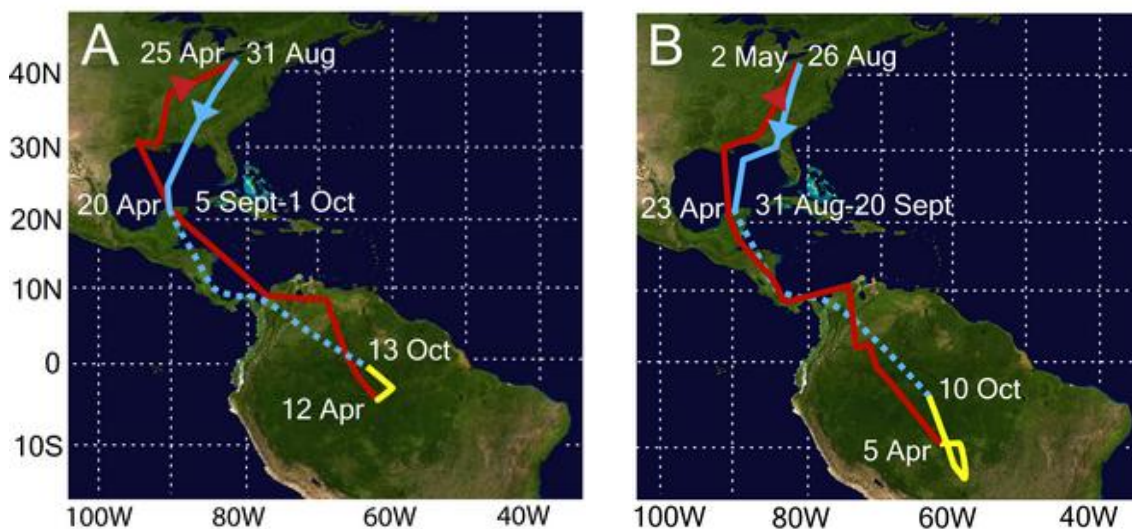




## Purple Martin Migration

For the first time Dr. Bridget Stutchbury and her colleagues at York University in Toronto, Ontario, Canada have tracked the entire migration routes of individual songbirds. In the past, this was not possible because the technology was not available to fit small songbirds. Dr Stutchbury fitted 14 wood thrushes, a species of song birds that migrates between North America and Central and South America, with light weight light-level geolocators. This tiny piece of technology records the time of sunset and sunrise each day. The sunrise and sunset data is retrieved from the memory chip in the geolocators when the birds are recaptured after their roundtrip migration. Once Dr. Stutchbury and her research associates downloaded the information from the memory chips, they used it to reconstruct migration routes of the birds. They were able to determine both the routes that the birds took to their southern migration territories, as well as how long it took them to get to the locations. They also determined how long the birds spent at stopovers along the way and at the southern migration area.

Here are the interpolated migration tracks for two of the Purple Martins that Dr. Stutchbury recaptured. In the images below blue lines indicate fall migration routes, yellow lines indicate winter range movements, and red lines indicate spring migration. Dotted lines link locations where latitude could not be determined with certainty.



Here are some questions about two Purple Martins that Dr. Stutchbury recaptured and her analysis of their geolocator data:

1. How many days elapsed between when they...
  - a. left Pennsylvania and arrived at the Yucatan Peninsula?  
Bird A \_\_\_\_ days    Bird B \_\_\_\_ days
  - b. left the Yucatan Peninsula (use the latest date) and arrived in their wintering area?  
Bird A \_\_\_\_ days    Bird B \_\_\_\_ days
  - c. arrived in their wintering area and started back north on their northward migration?  
Bird A \_\_\_\_ days    Bird B \_\_\_\_ days

- d. left their wintering area and arrived back in the Yucatan Peninsula?  
Bird A \_\_\_\_ days    Bird B \_\_\_\_ days
- e. left the Yucatan Peninsula and arrived back in Pennsylvania?  
Bird A \_\_\_\_ days    Bird B \_\_\_\_ days
2. Dr. Stutchbury observed the arrival and departure dates for the two Purple Martins in the table below. Complete the table by making the appropriate calculations.

	Fall Migration					Spring Migration				
	Depart Date	Arrival Date	Duration (days)	Distance Traveled (km)	Overall Speed (km/day)	Depart Date	Arrival Date	Duration (days)	Distance Traveled (km)	Overall Speed (km/day)
Purple Martin A	Sept 1, 2007	Oct 13, 2007		6,700 km		Apr 13, 2008	Apr 25, 2008		7,500 km	
Purple Martin B	Aug 27, 2007	Oct 10, 2007		6,800 km		Apr 13, 2008	Apr 25, 2008		7,600 km	

3. In which migration, the Fall or the Spring Migration, did the birds fly with the greatest speed? \_\_\_\_\_
4. In what country did the two Purple Martin's overwinter? \_\_\_\_\_  
(You may need to consult a world map.)
5. Both birds appear to have passed through Florida on their way down to the Yucatan Peninsula. In what state did the birds first make landfall when they returned across the Gulf of Mexico? \_\_\_\_\_
6. In science it is important to recognize the difference between observations and inferences. Give an example of an observation that Dr. Stutchbury made in her research: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- Give an example of an inference that Dr. Stutchbury made based on her observations: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
7. Summarize the information on Purple Martins provided in the bird distribution chart on page 57 in BTNEP's *The Habitats of Barataria-Terrebonne: Their Importance to Migratory and Resident Birds* (2007) or page 13 of *Seasonal Abundance of Birds of Southeast Louisiana* (2008). Purple Martins are found in a variety of habitats. They are rarely seen from the later part of January to mid parts of February. They are commonly observed in late February through mid-July and abundant in late July through August. Sightings taper off again in September and they are rarely seen in late September and October.
8. Read page 28-29 in BTNEP's *The Habitats of Barataria-Terrebonne: Their Importance to Migratory and Resident Birds* (2007). Why is the Barataria-Terrebonne area important to the migration of Purple Martin's? It is a great starting and stopping point on their migration journey. The productive habitat has plenty of food for migrating birds year round.



## Wood Thrush Migration

For the first time Dr. Bridget Stutchbury and her colleagues at York University in Toronto, Ontario, Canada have tracked the entire migration routes of individual songbirds. In the past, this was not possible because the technology was not available to fit small songbirds. Dr Stutchbury fitted 14 wood thrushes, a species of song birds that migrates between North America and Central and South America, with light weight light-level geolocators. This tiny piece of technology records the time of sunset and sunrise each day. The sunrise and sunset data is retrieved from the memory chip in the geolocators when the birds are recaptured after their roundtrip migration. Once Dr. Stutchbury and her research associates downloaded the information from the memory chips, they used it to reconstruct migration routes of the birds. They were able to determine both the routes that the birds took to their southern migration territories, as well as how long it took them to get to the locations. They also determined how long the birds spent at stopovers along the way and at the southern migration area.

Here are some latitude and longitude data points for Wood Thrush A's migration journey taken from its geocator.

Date	Latitude	Longitude	Location (country)
2007-08-30	42.3° N	77.1° W	
2007-10-12	34.9° N	76.9° W	
2007-10-28	29.6° N	84.0° W	
2007-10-29	18.9° N	86.3° W	
2007-11-07	13.2° N	87.6° W	
2007-11-15	10.7° N	84.8° W	
2007-12-01	13.5° N	85.0° W	
2008-12-31	11.0° N	84.8° W	
2008-01-27	14.5° N	85.6° W	
2008-02-14	13.3° N	84.4° W	
2008-04-17	18.6° N	91.3° W	
2008-04-21	32.1° N	90.3° W	
2008-04-26	48.0° N	79.5° W	
2008-05-20	45.9° N	79.6° W	

**Step 1.** On the map on the following page, use the latitude and longitude data to map these birds' migration routes. For each point you plot on the map, write the date that the bird arrived at that location.

**Step 2.** For each location, identify the country where the bird is located in the above table.

**Step 3.** On your map, use the following color key to show the parts of the Wood Thrush's trip: blue lines indicate fall migration routes, yellow lines indicate winter range movements, and red lines indicate spring migration.

### Wood Thrush A



### Questions to think about

1. On what day was Wood Thrush A closest to your home? \_\_\_\_\_
2. Use the distance scale on the map to measure how far this Wood Thrush fly on October 28, 2007. The Wood Thrush flew about \_\_\_\_\_ km.
3. How many kilometers did the Wood Thrush cover between April 21 and 24, 2008? \_\_\_\_\_
4. In what countries did this Wood Thrush spend the winter? \_\_\_\_\_

### Using technology to get precise measurements:

Go to "Calculate distance, bearing and more between two Latitude/Longitude points" which can be found at <http://www.movable-type.co.uk/scripts/latlong.html>

To find the exact number of kilometers that this Wood Thrush flew between October 28 and 29, 2007, enter the latitude and longitude for each of the days into the appropriate boxes. Be sure to put a "negative sign" in front of the longitude points to indicate that we are in the Western Hemisphere. For example, a longitude of 90.3° W would be entered "-90.3".

- A. How far did this Wood Thrush fly on October 28? \_\_\_\_\_
- B. What is the rate of speed in km/hr that this bird flew during this 24 hour period? \_\_\_\_\_
- C. What is the rate of speed in miles per hour? (To convert km per hour to miles per hour, you will need to multiply your answer in B by 60.2) \_\_\_\_\_

## Wood Thrush Migration

For the first time Dr. Bridget Stutchbury and her colleagues at York University in Toronto, Ontario, Canada have tracked the entire migration routes of individual songbirds. In the past, this was not possible because the technology was not available to fit small songbirds. Dr Stutchbury fitted 14 wood thrushes, a species of song birds that migrates between North America and Central and South America, with light weight light-level geolocators. This tiny piece of technology records the time of sunset and sunrise each day. The sunrise and sunset data is retrieved from the memory chip in the geolocators when the birds are recaptured after their roundtrip migration. Once Dr. Stutchbury and her research associates downloaded the information from the memory chips, they used it to reconstruct migration routes of the birds. They were able to determine both the routes that the birds took to their southern migration territories, as well as how long it took them to get to the locations. They also determined how long the birds spent at stopovers along the way and at the southern migration area.

Here are some attitude and longitude data points for Wood Thrush A's migration journey taken from its geocator.

Date	Latitude	Longitude	Location (country)
2007-08-30	42.3° N	77.1° W	USA - southwest of Ithaca, NY
2007-10-12	34.9° N	76.9° W	USA - North Carolina coast
2007-10-28	29.6° N	84.0° W	USA - just off Florida coast, south of Tallahassee
2007-10-29	18.9° N	86.3° W	Mexico - over the Caribbean Sea, east of the Yucatan Peninsula
2007-11-07	13.2° N	87.6° W	Honduras
2007-11-15	10.7° N	84.8° W	Costa Rica
2007-12-01	13.5° N	85.0° W	Nicaragua
2008-12-31	11.0° N	84.8° W	Honduras
2008-01-27	14.5° N	85.6° W	Mexico (Yucatan Peninsula)
2008-02-14	13.3° N	84.4° W	USA -south of Jackson, MS
2008-04-17	18.6° N	91.3° W	Canada
2008-04-21	32.1° N	90.3° W	Canada

**Step 1.** On the map on the following page, use the latitude and longitude data to map these birds' migration routes. For each point you plot on the map, write the date that the bird arrived at that location.

**Step 2.** For each location, identify the country where the bird is located in the above table.

**Step 3.** On your map, use the following color key to show the parts of the Wood Thrush's trip: blue lines indicate fall migration routes and red lines indicate spring migration.

### Wood Thrush A



#### Questions to think about

1. On what day was Wood Thrush A closest to your home? **Around April 20 or so.**
2. Use the distance scale on the map to measure how far this Wood Thrush fly on October 28, 2007. The Wood Thrush flew about \_\_\_\_\_ km. **(700 km)**
3. How many kilometers did the Wood Thrush cover between April 21 and 24, 2008? **About 1000 km.**
4. In what countries did this Wood Thrush spend the winter? **The Wood Thrush spent the winter in the countries of Mexico, Honduras, Costa Rica and Nicaragua.**

#### Using technology to get precise measurements:

**Go to "Calculate distance, bearing and more between two Latitude/Longitude points" which can be found at <http://www.movable-type.co.uk/scripts/latlong.html>**

To find the exact number of kilometers that this Wood Thrush flew between October 28 and 29, 2007, enter the latitude and longitude for each of the days into the appropriate boxes. Be sure to put a "negative sign" in front of the longitude points to indicate that we are in the Western Hemisphere. For example, a longitude of 90.3° W would be entered "-90.3".

- A. How far did this Wood Thrush fly on October 28? **(1212 km)**
- B. What is the rate of speed in km/hr that this bird flew during this 24 hour period? **50.5 km/hr**
- C. What is the rate of speed in miles per hour? To convert km per hour to miles per hour, you will need to multiply your answer in B to 60.2. **The Wood Thrush flew at a speed of 31.4 miles/hour that day.**





# Operation Eagle

Activity 13

High School Biology

## Focus/Overview

Thanks to conservation efforts, the number of Bald Eagles in Louisiana has increased tremendously over the last 30 years. However, changes in habitat and land use may well present a threat to these birds in the future. In this activity, students will play the role of scientists to plot the locations of Louisiana Eagle nests using Google Earth, and determine appropriate sites for constructing Bald Eagle nesting locations.

## Learning Objectives

The learner will...

- use computer mapping to analyze nesting preferences of Bald Eagles.
- evaluate the possible limiting factors on the population of Bald Eagles.
- determine suitable nesting locations for Bald Eagles, and explain and be prepared to defend their decision.

## Louisiana Science Grade Level Expectations

HS Inquiry: GLE 5	Utilize mathematics, organizational tools, and graphing skills to solve problems (SI-H-A3)
HS Inquiry: GLE 6	Use technology to enhance laboratory investigations and presentations of findings (SI-H-A3)
HS Biology: GLE 26	Analyze the dynamics of a population with and without limiting factors (LS-H-D3)

## Louisiana Social Studies Grade Level Expectations

HS: Geography GLE 5	Construct a map based on given narrative information (G-1A-H1)
HS: Geography GLE 6	Construct a chart, diagram, graph, or graphic organizer to display geographic information (G-1A-H1)
HS: Geography GLE 40	Analyze or evaluate strategies for dealing with environmental challenges (G-1D-H3)

## Materials List

- computers with Internet access and access to Google Maps or Google Earth.
- copies of Blackline Masters 1 and 2 (1 per student or group)
- copy of BTNEP resources
  - ◆ *Habitats of the Barataria-Terrebonne: Their importance to migratory and resident birds*
  - ◆ *Louisiana Raptors: Birds of Prey*

## BTNEP Connection

Birds

## Grade Level

High School

## Duration

1-2 periods

## Subject Area

biology

## Setting

classroom

## Extension Area

geography

## Vocabulary

limiting factor, raptor, DDT



[www.btnepp.org](http://www.btnepp.org)



## Background Information

Bald Eagles suffered disastrous declines in the past half-century due to contamination by pollution, especially the synthetic pesticide known as DDT (which is short for its chemical name: dichlorodiphenyltrichloroethane). In the 35 years since DDT has been banned, Bald Eagle numbers have recovered significantly. Now, the population of Bald Eagles in Louisiana has increased to the point that they are relatively common in some areas, especially the wooded areas of the Mississippi River floodplain, which includes the Barataria-Terrebonne Estuary region. In other areas of the state, however, Bald Eagles remain scarce or absent.

Bald Eagles prefer to place their nests in strong, tall trees, although in some areas they will nest on the ground. In Louisiana, however, the ground is often not suitable for nesting, especially in wet areas. A common place for Bald Eagle nests is where a combination of open water where fish can be caught and trees large enough to support nests can be found. Bald Eagle nests are used year after year, with birds adding sticks to the nest each year. In time, these nests can reach almost ten feet in diameter and weigh thousands of pounds. Large nests sometimes cause trees to collapse.

Because suitable large trees aren't always available in areas where food is abundant, many areas that can support Bald Eagles as predators can't support them as nesters. However, throughout the world, raptor (birds of prey) numbers have increased through the placement of nesting platforms that enable birds to quickly and securely construct nests, especially in areas where nest sites are the limiting factor.

## Advance Preparation

1. Run off **Blackline Master #1**, Bald Eagle Nest Location Coordinates, for each student or group.
2. Run off **Blackline Master #2**, Directions for Mapping using Google Maps [<http://maps.google.com/>] and Google Earth [<http://earth.google.com/> to download].
3. Make sure that computers have Google Earth loaded or can access Google Maps via the Internet. Be sure to familiarize yourself with how Google Earth works prior to doing this lesson. See Blackline Master #2 for specific steps.
4. **Blackline Master #3** can be used to familiarize students with the latitude and longitudes of Louisiana and the Barataria-Terrebonne National Estuary.

## Procedure

### Engage

1. View the BioDiversity Research Institute's Bald Eagle's Nest Webcam. From what the students can see, what might be important factors for Bald Eagle nest selection? Where might students expect to find Bald Eagle nests in Louisiana?
2. Share pages 39-41 in the *The Habitats of Barataria-Terrebonne* with students, as well as the habitat map on pages 32-33. How might this map be helpful in determining where Bald Eagles might nest in the state?
3. Give students a tour of Louisiana using Google Maps or Google Earth (or similar program). Are the features from the habitat map visible on satellite photos? What are some land and land use features that are visible from the satellite photos? You can also use **Blackline Master #3** to help familiarize students with latitude and longitude.

### Explore/Explain

1. Explain the mission to the students. See inset box on the next page.  
Divide students into groups and assign them computers. Make sure each group or student has a copy of **Blackline Masters #1 and #2**.
2. Model map creation and placemarking using Google Earth or Google Maps with the students as they follow along on **Blackline Master #1**.
3. Ask students to choose any 15 sets of coordinates from **Blackline Master #1** to placemark.
4. Once students have placemarked their coordinates, have them look for common features among the 15 sites. Do all of the sites correspond to specific habitat types or land features? Which sites do students think would be most successful, and why? Which might be least successful?





- Have students select five sites where they think nest platforms could be placed with a good chance of success. Have them placemark the sites, and record the coordinates.
- Have students complete a brief report on their findings, explaining what common features they felt existing nests shared, and what features they looked for in placing their nesting platforms. Make sure students describe the features in terms of habitat types according to the habitat map, and identify possible limiting factors in other habitat types that might have made them unsuitable for nesting platform placement.

### **The Bald Eagle Mission**

Goal: To increase the Bald Eagle population in the Barataria-Terrebonne Estuarine Basins.

Students will take the role of biologists in order to determine locations where Bald Eagle nest platforms can be placed with a good chance for success. The first step will be for students to plot out and placemark the coordinates of known Eagle nests (these coordinates are not actual, but are in general areas of Bald Eagle nesting) using Google Maps or Google Earth. Students should then evaluate the locations to identify their common features. Once students have determined what factors are required for Eagle nesting locations, as well as possible limiting factors, students will propose locations that seem to offer the best combination of factors for placing five Eagle nest platforms. Finally, they must explain why they feel their choices are appropriate sites for successful Bald Eagle nesting.

### **Expand**

- On a class Google Map, have each group placemark the five sets of coordinates they selected for their nesting platform locations.
- Discuss the students' findings. What seemed to be the most important factors that Eagles looked for in choosing their nesting sites? Did students look for similar sites to place their nesting platforms?
- Compare the Bald Eagle map in the Louisiana Breeding Birds Atlas at <http://www.manybirds.com/atlas/atlas.htm> with the habitat map on pages 32-33 of *The Habitats of Barataria-Terrebonne*. What habitat preferences does the Bald Eagle show in Louisiana? Did the student placemarks for their nesting platform locations show the same pattern?
- Did any students use novel approaches to place their platforms? For instance, did any suggest placing platforms in locations where food was plentiful, but trees were absent? What was the rationale behind novel ideas for placement?

### **Assessment**

- Assess student reports. Answers will vary, but any site selected must be grounded in sound rationale. Students should identify limiting factors that make some areas unsuitable for nesting,

### **Blackline Masters**

- Bald Eagle Nest Location Coordinates**
- Directions for Mapping Using Google Maps and Google Earth**
- Map of Louisiana and the Barataria-Terrebonne National Estuary**

### **Extension**

- Have students use the satellite photos to find the nearest locations to their homes or school where Bald Eagles might be found nesting. What features would they look for?

### **Resources**

#### **BTNEP publications**

- The Habitats of Barataria-Terrebonne: Their Importance to Migratory and Resident Birds*
- Wings Over the Wetlands* (video)
- Migratory Flyway Poster*
- 2008 Louisiana Raptors Calendar* (available online at [http://www.btnep.org/Libraries/Calendars/2008\\_Birding\\_Calendar.sflb.ashx](http://www.btnep.org/Libraries/Calendars/2008_Birding_Calendar.sflb.ashx))
- Louisiana Raptors: Birds of Prey*



### **Internet Sites**

#### **American Bald Eagle Information**

<http://www.baldeagleinfo.com/>

*This website features general information relating to Bald Eagles, including data, range, and assorted natural history information.*

#### **BioDiversity Research Institute's Bald Eagle's Nest Webcam**

<http://www.briloon.org/watching-wildlife/eagle-cam.php>

*This site features a live webcam of a Bald Eagle nest during the nesting season, and is linked to a blog detailing nesting activity.*

Wiedenfeld, David A., and M. Mark Swan. 2000. ***Louisiana Breeding Bird Atlas***.

<http://www.manybirds.com/atlas/atlas.htm>

*This site provides an online version of the Louisiana Breeding Bird Atlas.*

## Bald Eagle Nest Location Coordinates

Nest #	Latitude	Longitude
1	29° 46' 08.53"N	91° 38' 47.71"W
2	29° 45' 33.53"N	91° 10' 37.19"W
3	29° 42' 11.04"N	90° 56' 01.40"W
4	29° 45' 28.68"N	90° 58' 10.16"W
5	29° 36' 56.09"N	91° 02' 57.84"W
6	30° 15' 02.40"N	90° 44' 40.85"W
7	30° 14' 20.56"N	90° 23' 47.79"W
8	29° 53' 59.37"N	91° 08' 47.44"W
9	29° 57' 12.33"N	91° 15' 22.56"W
10	29° 30' 21.02"N	90° 44' 37.99"W
11	29° 25' 24.33"N	90° 45' 48.84"W
12	29° 35' 06.39"N	90° 38' 10.32"W
13	29° 31' 13.86"N	90° 35' 01.91"W
14	29° 33' 16.94"N	90° 18' 19.58"W
15	30° 03' 43.73"N	91° 01' 29.64"W
16	30° 8' 40.81"N	90° 42' 50.39"W
17	30° 12' 57.79"N	90° 40' 22.39"W
18	30° 08' 22.52"N	90° 27' 11.92"W
19	29° 56' 06.51"N	91° 34' 17.56"W
20	29° 46' 51.64"N	91° 20' 54.25"W
21	29° 42' 38.69"N	91° 19' 53.44"W
22	29° 57' 32.50"N	91° 22' 28.88"W
23	30° 19' 43.96"N	90° 26' 57.33"W
24	29° 38' 43.47"N	91° 23' 26.76"W
25	29° 39' 21.08"N	91° 35' 53.71"W
26	30° 08' 45.06"N	90° 33' 49.16"W
27	31° 08' 25.84"N	91° 40' 24.54"W
28	31° 08' 33.11"N	91° 46' 01.83"W
29	31° 45' 17.99"N	91° 24' 42.76"W
30	30° 15' 53.15"N	90° 35' 09.07"W

## Directions for Mapping Using Google Maps and Google Earth

Google Earth is a stand alone program that can be downloaded for free off of the Internet (<http://earth.google.com/>). It allows users to see the Earth as a collage of aerial photographs, and to interact by creating and saving personalized maps. Google Maps is a web application that can be accessed through the Internet without having to download any additional programs.

Google Earth and Google Maps share many features. However, in order to create a custom map on Google Maps, a user must sign in. This requires an account, which is free, but users need to provide an e-mail address and password. To access Google Maps and create an account, go to <http://maps.google.com>. Click on the «Sign in» link. This page will allow you to create a Google account.

### Google Maps users

1. On Google Maps, you'll need to set up your new map. Click «**My Maps**», then, «**Create new map**» and name your map. You'll want to view your map as a satellite photograph, so click the «**Satellite**» option in the upper right corner of the map.
2. Enter the coordinates of a nest into the search bar. For the following coordinates,  
 $29^{\circ} 46' 08.53''\text{N}$        $91^{\circ} 38' 47.71''\text{W}$   
 you can simply enter  $29^{\circ} 46' 08.53''\text{N}$   $91^{\circ} 38' 47.71''\text{W}$ . Click «**Search maps**» and you will be taken to the coordinates.
3. Once the program has taken you to the coordinates, set a placemark on the spot. In the top left corner of the map there is a row of icons. One icon, the placemark tool, looks like an upside down raindrop. Click on this icon, and it will turn your cursor into a placemark that you can place with a click.
4. Choose 15 sets of coordinates to place, and placemark each location.
5. Once you have your placemarks in place, you can use the + and - signs to zoom in and out, This will allow you to look at the natural features of individual nest locations, or the placement of all nests at once.
6. Click «**Done**» to save your map.

### Google Earth users

1. Enter the coordinates of a nest into the search bar. For the following coordinates,  
 $29^{\circ} 46' 08.53''\text{N}$        $91^{\circ} 38' 47.71''\text{W}$   
 you can simply enter  $29^{\circ} 46' 08.53''\text{N}$   $91^{\circ} 38' 47.71''\text{W}$ . Click the magnifying glass icon, and you will be taken to the coordinates.
2. Once the program has taken you to the coordinates, set a placemark on the spot. In the top left corner of the map there is a row of icons. One icon, the placemark tool, looks like a thumbtack or pushpin. Click on this icon, and it will set a placemark on the coordinates you have entered. Click «**OK**», and your placemark will be entered.
3. Choose 15 sets of coordinates to place, and placemark each location.
4. Once you have your placemarks in place, you can use the + and - signs to zoom in and out, This will allow you to look at the natural features of individual nest locations or the placement of all nests at once.
5. Under the «**File**» menu, choose, «**Save my places**» to save your map.



## Map of the Louisiana and the Barataria-Terrebonne National Estuary

[http://www.mapcruzin.com/free-state-maps/states/louisiana/louisiana\\_90.jpg](http://www.mapcruzin.com/free-state-maps/states/louisiana/louisiana_90.jpg)





# Google Mapping Ruby-throated Hummingbird Migration

High School Biology

## Focus/Overview

In this lesson, students will use computer mapping programs to plot and animate the course of bird migration. This will give students a “bird’s eye view” of the strategies, routes, and distances involved in migration.

## Learning Objectives

The learner will...

- Use computer mapping technology to map bird migration routes.

## Louisiana Science Grade Level Expectations

Biology: GLE #35	Explain how selected organisms respond to a variety of stimuli (LS-H-F3)
Biology: GLE #36.	Explain how behavior affects the survival of species (LS-H-F4)

## Louisiana Social Studies Grade Level Expectations

World Geography: GLE #3	Analyze or interpret a map to locate geographic information, using a variety of map elements (e.g., compass rose, symbols, distance scales, time zones, latitude, longitude) (G-1A-H1)
World Geography: GLE #4	Use a city or road map to plot a route from one place to another or to identify the shortest route (G-1A-H1)
World Geography: GLE #5	Construct a map based on given narrative information (e.g., location of cities, bodies of water, places of historical significance) (G-1A-H1)

## BTNEP Connection

birds

## Grade Level

High School

## Duration

1 or 2 class periods

## Subject Area

Science, social studies

## Setting

classroom, computer lab

## Extension Area

writing

## Vocabulary

placemark

[www.btnep.org](http://www.btnep.org)

## Materials List

- Computers with Google Earth software (free download)
- Copies of **Blackline Master #1** (one per student or student group)

## Background Information

Ruby-throated Hummingbirds are long-distance migrants that nest in eastern Northern America during the summer and migrate south into Mexico and Central America to spend the winter. Both the spring and fall migration routes of these hummingbirds pass through Louisiana. Some Ruby-throats use Louisiana as a departure or arrival point for a flight across the Gulf of Mexico. Others follow the contours of the coast to go around the Gulf.

Computer map programs allow users to plot out migration stops for hummingbirds to trace the route of migration. By animating the maps, users can get a sense of traveling the route themselves to gain a perspective of the great distances these birds cover twice a year.





## Advance Preparation

1. Check to make sure that the free Google Earth [<http://earth.google.com/>] mapping program is loaded on student computers. If you are unfamiliar with Google Earth and need assistance, visit the Google Earth Help page ([http://earth.google.com/support/bin/static.py?page=guide\\_toc.cs](http://earth.google.com/support/bin/static.py?page=guide_toc.cs))
2. Visit the Cornell website on the summer and winter ranges of Ruby-throated Hummingbird ([http://www.allaboutbirds.org/guide/Ruby-throated\\_Hummingbird/lifehistory](http://www.allaboutbirds.org/guide/Ruby-throated_Hummingbird/lifehistory)).
3. Make enough copies of **Blackline Master #1** for groups or individual students.
4. Become familiar with the instructions for mapping on **Blackline Master #1** before beginning the project with your class.

## Procedure

### Engage

1. Use Google Maps to “travel” around the world with your class. If possible, take an animated “guided tour” of various sites to demonstrate the animation capabilities of the program. For example, show students the “7 Wonders of the World Tour” - <http://www.googletouring.com/t.php?id=168> or a Google Earth tour of Washington, DC - <http://www.googletouring.com/t.php?id=55>.
2. Share the information and illustrations of Ruby-throated Hummingbirds from the BTNEP resources listed below, especially page 3 of *Vanishing Before Our Eyes – Louisiana Cheniere Woods and the Birds that Depend on Them* with your class. This section describes the obstacles that hummingbirds must face during migration.

### Explore/Explain

1. Distribute **Blackline Master #1**, which contains the instructions for this project. Have students follow the instructions carefully to create a series of migration stops that can be animated to create a moving map.
2. After completing their moving map, students should write several paragraphs describing how Ruby-throated Hummingbirds respond to the stimuli of changing seasons and how their migration enables their species to better survive. In their summation, students should reference at least three or four facts that they learned from reading the BTNEP and/or Cornell materials on the Ruby-throated Hummingbirds.

### Expand

1. Have students plot the year round migratory route of another bird species. One possibility is the Arctic Tern, which on average travels more every year than any other migratory bird species.

## Assessment

- Assess student Google Earth projects for accuracy of the route

## Blackline Master

1. **How to Use Google Earth to Make an Animated Migration Map**

## Extensions

- CREATIVE WRITING. Have students create a point-by-point account of the fictional individual hummingbird whose migration route they have created.

## Resources

### BTNEP publications

- **The Habitats of Barataria-Terrebonne: Their importance to Migratory and Resident Birds (2007)**
- **Vanishing Before Our Eyes: Louisiana cheniere woods and the birds that depend on them (2006)**
- **Wings Over the Wetlands: Wading Birds in Louisiana (2008)**
- **Wings over the Wetlands (video)**
- **BTNEP Migratory Flyway Poster**



### **Internet Resources**

#### **The Cornell Lab of Ornithology: All About Birds - The Ruby Throated Hummingbird**

[http://www.allaboutbirds.org/guide/Ruby-throated\\_Hummingbird/lifehistory](http://www.allaboutbirds.org/guide/Ruby-throated_Hummingbird/lifehistory)

*This website features a map of the breeding and winter range of the Ruby-throated Hummingbird.*

#### **Google Earth**

<http://earth.google.com/>

*This website has the free download for Google Earth, as well as a gallery of tours to view.*

## How to Use Google Earth to Make an Animated Migration Map

1. Open Google Earth. The icon should be on your computer's desk top or in your program list.
2. Along the top edge of the Google Earth screen, there is a horizontal row of buttons that control functions for Google Earth. You will need to use three of these: the **yellow pushpin button** that allows users to mark places, **the ruler button** that allows users to measure distances between points on the Earth, and the **blue-and-white rectangle button** that makes a sidebar visible on the left side of the screen. Use the navigation tools in the upper right hand corner to control your location.
3. If the sidebar isn't visible on the left hand side of the screen, click on the blue-and-white rectangle next to the pushpin. In the "Places" window, click on "My Places."
4. Using the map at the Cornell Lab website ([http://www.allaboutbirds.org/guide/Ruby-throated\\_Hummingbird/lifehistory](http://www.allaboutbirds.org/guide/Ruby-throated_Hummingbird/lifehistory)), pick a starting point somewhere in the northern part of the range of Ruby-throated Hummingbirds to begin your journey. Double click on the spot you've chosen to zoom in on the map.
5. After you've zoomed in, click on the yellow pushpin button. A yellow pushpin in a square box and a small window where you can name the placemark will appear on the screen. To move the pushpin where you want to place it, click on the pushpin inside of the box, hold the mouse button down, and slide the placemark into place. You can give each placemark a name or number; name this placemark #1. When you're ready to set your placemark, click the OK button. In the sidebar on the left hand of the screen, you should find the placemark you've just created.
6. With good winds, and without stopping along the way to fatten up, a Ruby-throat from the northern part of the species' range can travel south from its nesting grounds to the northern coast of the Gulf of Mexico in about 5 day. That's about 200 miles each day. You'll need to use the ruler tool to divide the distance between the starting point and Louisiana into 200-mile intervals. To measure distance, select the distance tool, click on the starting spot, and drag the cursor. The distance in miles will be displayed. At each 200-mile interval, place and name a placemark.
7. Once on the Gulf Coast, hummers have a choice of staying temporarily to fatten up for a flight across the Gulf of Mexico, or of continuing along the coast to go around the Gulf of Mexico. Decide whether your hummingbird will continue along over the land or make the non-stop flight over hundreds of miles of open water. Many hummingbirds probably die trying to cross the Gulf.
  - a. If you continue over land, you'll need many placemarks to take you around the Gulf Coast into Mexico. The distances between these stopping points should be about the same as the placemarks you've made so far. You can use the ruler tool or estimate.
  - b. If you decide fly over water, aim for the Yucatan Peninsula of Mexico for the shortest flight.
8. View the winter range of the Ruby-throated Hummingbird on the map at the Cornell Lab website ([http://www.allaboutbirds.org/guide/Ruby-throated\\_Hummingbird/lifehistory](http://www.allaboutbirds.org/guide/Ruby-throated_Hummingbird/lifehistory)). Once you reach the winter range, you can rest for a few months!
9. Winter's over, it's time to return to the nesting grounds. You will need to create more placemarks for the route back, but this time, you'll need to cross the Gulf of Mexico to get back to the United States. Retrace your path back to the nesting grounds; many birds return to the exact same spot to nest year after year.
10. When you have all of your placemarks positioned, right click on the "My Places" title in the sidebar, select "Save As," give your file a name, and save your placemarks as a KMZ file to the computer desktop.
11. Go to the menu and select "File," then "Open," and browse for your file. When you select it, it will appear in the sidebar. Click the "+" sign next to the KMZ folder, and the individual placemarks will become visible.
12. Click the play button. Your slideshow should begin playing, tracking from placemark to placemark along the migration route you've plotted, giving you a bird's eye view of migration.

### Internet Resources

The Cornell Lab of Ornithology: All About Birds - The Ruby Throated Hummingbird

[http://www.allaboutbirds.org/guide/Ruby-throated\\_Hummingbird/lifehistory](http://www.allaboutbirds.org/guide/Ruby-throated_Hummingbird/lifehistory)

*This website features a map of the breeding and winter range of the Ruby-throated Hummingbird.*





# Climate Change and Birds

Activity 15

High School Biology

## Focus/Overview

In this lesson, students will predict the effects of climate change on the distributions and abundance of bird species in Louisiana.

## Learning Objectives

The learner will...

- interpret maps and map data.
- make predictions based on data.

## Louisiana Science Grade Level Expectations

HS Biology: GLE 35	Explain how selected organisms respond to a variety of stimuli (LS-H-F3)
HS Biology: GLE 36	Explain how behavior affects the survival of species (LS-H-F4)

## Materials List

- Copies of **Blackline Master #1**
- Computers with Internet access
- Bird Field Guides
- Paper and pen

## Background Information

Predicted climate changes over the next century could have dramatic impacts not only on civilization, but also on the ecosystems of the world. Ecosystems might shrink, expand, or shift across the map if temperature and weather changes occur. Predicted changes in sea level will alter the coastlines of the world, inundating some coastal marshes and creating others where dry land now exists. Changes in rainfall amounts could transform entire ecosystems completely.

As ecosystems change, populations and communities of organisms either adapt or die out. Because of the mobility of birds, changes in weather can lead to changes in bird distribution. Climate changes might have a negative effect on some species that can currently be found in Louisiana, but might benefit others, and might allow other species to expand their ranges into the state. The birdlife of Louisiana in the next century might be significantly changed from that of the present.

## Advance Preparation

1. Procure enough field guides for all students to have access to them. The field guides listed below all feature range maps that will be necessary for this project.
2. Check the *Climate Change as Simulated by the National Center for Atmospheric Research's Community Climate System Model (CCSM)* [[http://vets.ucar.edu/vq/IPCC\\_CCSM3/index.shtml](http://vets.ucar.edu/vq/IPCC_CCSM3/index.shtml)]. You will need QuickTime installed on your computer to view the simulation. You can make the video full screen by clicking on the four arrows pointing outward on the bottom tool bar.
2. Access the websites listed below to make sure all are still current, and familiarize yourself with the helpful features of each.

## BTNEP Connection

Birds

## Grade Level

High School Biology

## Duration

1-2 class periods

## Subject Area

science

## Setting

classroom

## Extension

science

## Vocabulary

ecosystem



[www.btnepp.org](http://www.btnepp.org)



## Procedure

### Engage

1. Ask your students what they think Louisiana will look like in 50 years. Will it be a swamp? A desert? Will coastal towns and cities be underwater?
2. Discuss climate change with your class. Explain that scientists currently believe that temperatures and sea level will rise in the next century. If this does happen, our climate might become much more tropical, and some of our towns and cities will be in danger of either being flooded or being more easily damaged by hurricane storm surges.
3. There are many climate models that have been created based on data collected over the last centuries. Each model is different from the other because they either use different parts of the data set or give greater emphasis to one or more variables. Show students *Climate Change as Simulated by the National Center for Atmospheric Research's Community Climate System Model (CCSM)* [[http://vets.ucar.edu/vg/IPCC\\_CCSM3/index.shtml](http://vets.ucar.edu/vg/IPCC_CCSM3/index.shtml)]. Have students pay particular attention to what is happening in the northern part of the US and Canada (where many of our birds spend their summers), what is happening in Louisiana, and what is happening in Central and South America.

### Explore/Explain

1. Explain that if changes in climate happen they will cause changes in the types of plants that can grow, and the types of animals that will be able to survive. Some animals will be unable to relocate. Others, such as birds, might be able to adjust more quickly. However, as ecosystems change, we may begin to see new types of birds moving into the state, or birds whose populations increase as conditions become more favorable to them. For instance, if sea levels rise and marshes expand, some wading birds may benefit.
2. Hand out **Blackline Master #1**. Explain to the students that their climate change predictions will be used in predicting for the purpose of predicting the changes in the bird habitats of the state. Will ecosystems change slightly, or completely? What ecosystems will exist in Louisiana in 50 years?
3. Have the students access the websites listed on Blackline Master #1 to examine predicted changes in temperature, sea level, and precipitation.
4. Have the students describe the changes they expect to happen to the ecosystem and to the land. Have the students use their predictions about the ecosystems to predict the changes they expect to happen to the birdlife of Louisiana.
5. Have students study the range maps of birds in field guides, looking for birds whose ranges might shift toward or out of Louisiana if ecosystem changes happen, or for species that are already here that might benefit from future changes.
6. Have students write a brief report on the trends they expect to see among ecosystems and birds in response to climate change over the next 50 to 100 years.

### Expand

1. Have students expand their predictions to include other populations, for instance, reptiles and mammals.

## Assessment

- Assess students on the quality of their reports, looking for logical and reasonable predictions.

## Blackline Master

1. **Climate Change and Birds**

## Extension

- **SCIENCE.** Have students attempt to reconstruct what the ecosystems, especially the bird component of the ecosystem in Louisiana, would have been like during the Ice Age.

## Resources





### **BTNEP publications**

- **The Habitats of Barataria-Terrebonne: Their importance to Migratory and Resident Birds** (2007)
- **Vanishing Before Our Eyes: Louisiana cheniere woods and the birds that depend on them** (2006)
- **Wings Over the Wetlands: Wading Birds in Louisiana** (2008)
- **Louisiana Raptors: Birds of prey** (2010)

### **Recommended Field Guides**

- Sibley, D.A. (2000). *The Sibley Guide to Birds*. Audubon Society Nature Guides. Random House, Inc.
- Peterson, R., and Peterson, V. (2002). *A Field Guide to the Birds of Eastern and Central North America*. Peterson Field Guide Series. Houghton Mifflin Harcourt.
- Alderfer, J. (ed.) (2005). *National Geographic Complete Birds of North America*. Random House, Inc.

### **Internet Sites**

#### **U.S. Forest Service Description of the Ecoregions of the United States**

<http://www.fs.fed.us/land/ecosysmgmt/index.html>

This website features detailed ecosystem maps of the United States.

#### **Global Land Environments Since the Last Interglacial**

<http://www.esd.ornl.gov/projects/gen/nerc.html#maps>

This website features maps of the changes that have occurred over North America over the last 150,000 years, including the last Ice Age and the present.

#### **Global Warming: Early Warning Signs**

<http://www.climatehotmap.org/namerica.html>

This website features a clickable map showing the “fingerprints” of global warming.

#### **Scientific American: Climate Change Impacts**

<http://www.scientificamerican.com/article.cfm?id=climate-change-impacts>

This website features interactive maps showing the possible effects of global warming on temperature, precipitation, and other factors.

#### **U.S. Environmental Protection Agency: Future Temperature Changes**

<http://www.epa.gov/climatechange/science/futuretc.html>

This website features graphics showing possible results of global warming over the next century.

#### **U.S. Geological Survey**

<http://geonames.usgs.gov/pls/gnispublic>

This website features a form that allows users to look up the elevation of points in the United States.

#### **Utah Education Network Virtual Field Trips: Biomes of North America**

[http://www.uen.org/utahlink/tours/tourFames.cgi?tour\\_id=14051](http://www.uen.org/utahlink/tours/tourFames.cgi?tour_id=14051)

This website features a biome map of North America with links to information on each biome.



## Climate Change and Birds

Changes in climate will cause changes in the types of plants that can grow in a particular location, as well as the types of animals that will be able to survive in that place. Some animals will be unable to relocate. Others, such as birds, might be able to adjust more quickly. However, as ecosystems change, we may begin to see new types of birds moving into the state, or birds whose populations will increase as conditions become more favorable to them. For instance, if sea levels rise and marshes expand, some wading birds may benefit.

**STEP 1: Research Task:** Your task in this assignment is to predict the changes that could happen as climate change occurs and how these changes will affect bird populations in our state. Your primary questions are, How will ecosystems change (not at all, slightly, or completely)? What ecosystems will exist in Louisiana in 50 years? The websites below are good places to start your investigation. Use them to examine predicted changes in temperature, sea level, and precipitation.

### Internet Sites

#### **U.S. Forest Service Description of the Ecoregions of the United States**

<http://www.fs.fed.us/land/ecosysmgmt/index.html>

This website has detailed ecosystem maps of the United States.

#### **Global Land Environments Since the Last Interglacial**

<http://www.esd.ornl.gov/projects/gen/nerc.html#maps>

This website features maps of the changes that have occurred over North America over the last 150,000 years, including the last Ice Age and the present.

#### **Global Warming: Early Warning Signs**

<http://www.climatehotmap.org/namerica.html>

This website features a clickable map showing the "fingerprints" of global warming.

#### **Scientific American: Climate Change Impacts**

<http://www.scientificamerican.com/article.cfm?id=climate-change-impacts>

This website features interactive maps showing the possible effects of global warming on temperature, precipitation, and other factors.

#### **U.S. Environmental Protection Agency: Future Temperature Changes**

<http://www.epa.gov/climatechange/science/futureetc.html>

This website features graphics showing possible results of global warming over the next century.

#### **U.S. Geological Survey**

<http://geonames.usgs.gov/pls/gnispublic>

This website allows users to look up the elevation of points in the U.S.

#### **Utah Education Network Virtual Field Trips: Biomes of North America**

[http://www.uen.org/utahlink/tours/tourFames.cgi?tour\\_id=14051](http://www.uen.org/utahlink/tours/tourFames.cgi?tour_id=14051)

This website has a biome map of North America with links to information on each biome.

**STEP 2: Predicting climate change in Louisiana.** Based on your Internet research, how will the climate change in Louisiana? Write a short description below of how you predict the climate will look in Louisiana in the next 50 to 100 years.

**STEP 3. Choosing a Louisiana bird species.** Next, choose a bird that makes Louisiana its home at least part of the year. A good place to look at a bird list is Louisiana Ornithological Society's checklist [[http://www.losbird.org/la\\_checklist\\_0803.pdf](http://www.losbird.org/la_checklist_0803.pdf)].

The bird I choose is \_\_\_\_\_ (common name).

Its scientific name is \_\_\_\_\_.

Describe below how climate change will affect this species of bird. Consider its range, wintering grounds, migration, etc.



# Birdwatching with Radar

Activity 16

High School Biology

## Focus/Overview

In this lesson, students will use radar to predict the migratory movements of birds into and out of Louisiana.

## Learning Objective

The learner will...

- generate a testable hypothesis and use technology to test it.

## Louisiana Science Grade Level Expectations

HS Biology: Inquiry GLE #1	Write a testable question or hypothesis when given a topic (SI-H-A1)
HS Biology: Inquiry GLE #6	Use technology when appropriate to enhance laboratory investigations and presentations of findings (SI-H-A3)
HS Biology: GLE #36	Explain how behavior affects the survival of species (LS-H-F4)

## Materials List

- Computers with Internet access (enough for groups or individuals)

## Background Information

Over the past century, scientists have investigated many questions about the routes and timing of bird migration in Louisiana. For example, until a few decades ago, many scientists thought that it was impossible for migratory birds to perform “**trans-Gulf migration**,” that is, flight across Gulf of Mexico. Only by direct observation from land and from boats and oil rigs in the gulf was it proved that many species of birds actually do migrate over the water, sometimes non-stop for distances of over 500 miles.

Many questions still remain. However, one powerful tool that has recently emerged to investigate migration is weather radar. For years, radar watchers had noticed disturbances on the radar screen even when there were no storms present. Eventually, it was learned that some of these disturbances were actually “clouds” of migrating birds. **Ornithologists** (bird scientists) realized that radar could be useful for tracking migration. By comparing radar observations with observations of migration on land, such as checklists of sightings by birdwatchers from coastal birding “hotspots,” ornithologists have been able to make and test predictions about the weather patterns that birds need to make the long gulf crossing successfully. **NEXRAD** (**next** generation **radar**) radar running in clear-air mode, when no storms are near, is especially useful.

Weather radar such as NEXRAD works by shooting beams of energy into the sky. If the air is clear, the beam of energy travels on. If the beam of energy hits an object, part of the energy bounces back, or *reflects*, to the NEXRAD station where it is detected and displayed in color on the radar image NEXRAD sends to our computer screen. The beam of energy can be bounced back by rain, dust, and even swarms of insects and flocks of birds when there are no clouds or rain and the radar is in *clear air* mode. The

## BTNEP Connection

Birds

## Grade Level

HS Biology

## Duration

2 periods

## Subject Area

biology

## Setting

classroom/computer lab

## Extension Area

science

## Vocabulary

trans-Gulf migration, fallout, ornithologists, NEXRAD, radar



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larger the object is, the more energy is reflected. The amount of *reflectivity* determines the color of the image on the radar screen. Small objects show up in green on the screen. The color of images progress from green, to yellow, orange, red, and then pink as the size of objects increase. NEXRAD can also detect whether objects are moving toward or away from the radar. In *velocity mode* objects moving toward the radar are displayed in green, while objects moving away from the radar show up in red.

It has been learned that most migrating songbirds wait until the winds are blowing in the direction they will be flying, then take off after sunset and fly at night. If the winds stay good, the birds can cross the gulf by morning. If the winds turn around or storms pop up over the gulf, the flight can take much longer and become difficult, or deadly. Birds that survive difficult crossings often land as soon as they reach the coast, often in forested ridges that birdwatchers travel to in hopes of experiencing a “fallout.” During fallouts, birds seem to fall from the sky, and woods can quickly fill up with thousands of migrating birds of many types. By comparing wind speed and direction over the entire gulf, looking at weather conditions in the path of migration, and using radar to look for the presence of migrating birds, ornithologists can predict flights fairly accurately. They can often test their predictions by checking birdwatchers’ lists on birding newsgroups such as Louisiana’s LABIRD or Texas’s TEXBIRDS groups.

## Advance Preparation

1. Find access to enough computers with Internet access for groups to work on. Make sure that the websites listed in the Resources section, below, are not blocked, can be accessed on your school’s computers, and run correctly. If plug-ins are needed to run the animation, follow the prompts on the websites to load the plug-ins.
2. IMPORTANT NOTE: This activity is best done in the following time frame: March to May and from August to October, as this is when BadBirdz Reloaded is posting daily NEXRAD images of bird migration from the Florida peninsula. It is very important to familiarize yourself with the radar migration tutorials listed in the resource section – especially those of BadBirdz Reloaded. You may need to paraphrase the material for your students.
3. Review the geography of the Gulf of Mexico, concentrating especially on the Yucatan Peninsula of Mexico and the northern gulf coast of Louisiana and Texas. Here are a couple of helpful Internet sites:

A Tapestry of Time and Terrain: The Union of Two Maps - Geology and Topography.

<http://tapestry.usgs.gov/features/features.html> This map has a clickable feature that provides information on each of the physiographic regions of North America.

Library of Congress Portals to the World: Mexico.

<http://www.loc.gov/rr/international/hispanic/mexico/resources/mexico-geography.html>. This link provides resources relating to geography and environment in Mexico: online maps, links to map collections, and information about flags, weather, environmental and natural resources.

## Procedure

### Engage

1. View the animated loop on the following webpage with your class:  
[http://my.execpc.com/CE/5F/idzikoj/nexrad/nexweb/vel\\_loop\\_409-10grbay.gif](http://my.execpc.com/CE/5F/idzikoj/nexrad/nexweb/vel_loop_409-10grbay.gif). *Note: this is approximately a four hour time lapse sequence that runs in a loop.*
2. Ask students to guess what the cloud moving across the radar is. Explain that the cloud is a large group of migrating birds, probably many different kinds of songbirds.
1. Click through the NEXRAD (Next Generation Radar) tutorial at the following link with your class, explaining what they’re seeing: <http://virtual.clemson.edu/groups/birdrad/COMMENT.HTM>. Note that the migrating bird information is approximately 10-15 slides into this online PPT presentation.

### Explore

1. Divide students into groups and hand out a copy of **Blackline Master #1**. Have groups explore the websites, viewing tutorials, radar animations, and a sampling of posts to the birding mail groups.
2. Explain the basic of trans-Gulf migration students, including how winds out of the south are helpful to migrating birds in the spring, while north winds are helpful to southbound birds in the fall. Explain the dangers to migrants of wind shifts, headwinds, and storms.



- Have students formulate a hypothesis about the evening's migration from the Florida peninsula. Students can review the current bird migration conditions at BadBirdz website (see Blackline Master #1). Are winds and weather favorable? Should birds be migrating at this time? Will there be a night flight, and if so, will it make landfall on the coast or continue inland? At about what time the next day? What facts are these predictions based on?  
NOTE: Hypotheses can take a number of formats. One such format is the "if-then" statement: "if \_\_\_\_ (describe the change, or independent variable), then \_\_\_\_ (describe the resulting response)."
- Have students check the BadBirdz radar loops on the following day. Is there evidence of a flight on the loop? If so, at what time do the birds seem to be reaching land? Is their hypothesis confirmed or refuted?
- Have students complete a short report of their investigation, listing their interpretation of weather conditions, their hypotheses, and their findings.

### Expand

- Have students explain possible sources of confusion and error in their hypotheses and their findings. Are there any other factors that might explain what they think they're seeing? What difficulties do radar migration studies present?
- Have students check the birding mail groups for two days, looking for lists to be posted from coastal locations (Grand Isle, Cameron Parish, Plaquemines Parish, etc.). Does the information from the posts support their hypotheses?
- Discuss with students how they could check to see if their hypotheses are correct.

### Assessment

- Assess students on their reports. Check for understanding of the scientific process and the material covered.

### Blackline Master

#### 1. Web Resources

### Extensions

- SCIENCE. Use the BTNEP resources to study individual species that migrate across the gulf and the importance of coastal habitats.
- SCIENCE. Measure the distance across the Gulf of Mexico from the Yucatan Peninsula to the Louisiana coast. Calculate the time it would take for a bird that flies 25 mph to cross the Gulf. Calculate the time if the bird was aided by a 15 mph tailwind, or slowed by a 15 mph headwind.

### Resources

#### BTNEP publications

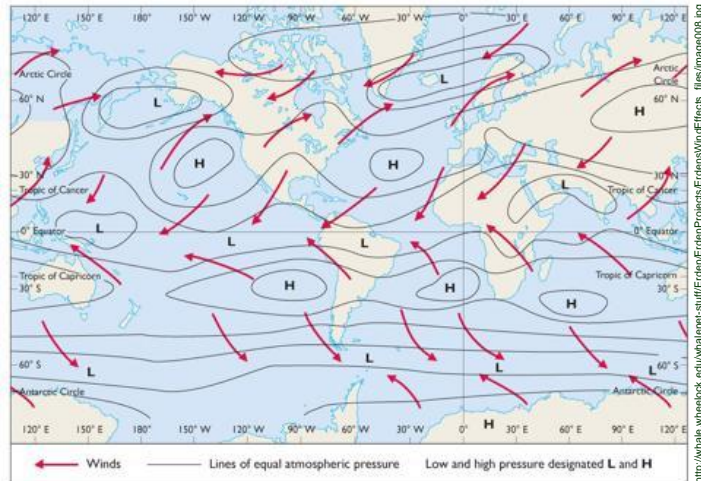
- The Habitats of Barataria-Terrebonne: Their importance to Migratory and Resident Birds** (2007)
- Vanishing Before Our Eyes: Louisiana cheniere woods and the birds that depend on them** (2006)
- Wings Over the Wetlands: Wading Birds in Louisiana** (2008)
- Louisiana Raptors: Birds of prey** (2010)
- BTNEP Migratory Bird poster**



## Web Resources for Birdwatching with Radar

- Examine the map to the right, which illustrates the prevailing winds across the world, to determine the prevailing winds over the Gulf of Mexico. In which direction do the prevailing winds blow in the Gulf of Mexico? During which of the four seasons are these winds helpful for migrating birds?

Keeping the current season in mind, are these winds good or bad for migrants right now? Why



- Have each group make a prediction about possibility that there will be a bird migration this evening. Students need to consider the following questions while making their prediction:  
*Are winds and weather favorable? Should birds be migrating at this time? Will there be a night flight, and if so, will it make landfall on the coast or continue inland? At about what time the next day? What facts are these predictions based on?*

Have students visit **Badbirdz - Reloaded** [<http://badbirdz2.wordpress.com>] to also help them make a prediction. This site, based in Florida, provides daily radar migration updates from March to May and from August to October illustrated and explained with radar images. We recommend reading the "Birds and Radar Primer" as well as the "Radar and Migration FAQ". They are relatively short and very helpful.

Our prediction is that birds will \_\_\_\_\_.  
 Our prediction is based on the following data:

- Have students check the Badbirdz radar loops on the following day. Is there evidence of a flight on the loop? If so, at what time do the birds seem to be reaching land?
- Write up a short report of your investigation, listing your interpretation of weather conditions, your prediction, and your findings. In your report, discuss how birds use prevailing wind direction to assist them in their migration and how this helps them to better survive this strenuous journey.

### Extension.

Have students check the birding mail groups for two days, looking for lists to be posted from coastal locations (Grand Isle, Cameron Parish, Plaquemines Parish, etc.). Does the information from the posts support their hypotheses?

### Radar sites

#### **National Oceanic and Atmospheric Administration's National Weather Service**

[http://www.weather.gov/radar\\_tab.php](http://www.weather.gov/radar_tab.php)

NOAA's official site provides a map of NEXRAD sites around the United States with links to animated radar loops.

#### **Weather Underground NEXRAD map**

<http://www.wunderground.com/radar/map.asp>

This weather site provides a map of NEXRAD sites around the United States with links to animated radar loops.

### Radar and Birds

#### **Badbirdz - Reloaded**

<http://badbirdz2.wordpress.com>

This site, based in Florida, provides daily radar migration updates from March to May and from August to October illustrated and explained with radar images. We recommend reading the "Birds and Radar Primer" as well as the "Radar and Migration FAQ". They are relatively short and very helpful.

#### **Radar Ornithology: Introduction**

<http://virtual.clemson.edu/groups/birdrad/COMMENT.HTM>

This website provides a tutorial on using NEXRAD radar to study migration. Follow the tutorial by clicking on the "next" links.

#### **Video tutorial for viewing nocturnal bird migration using radar**

<http://www.vimeo.com/2020985>

This site provides a video showing how to access and read radar images to watch migration online.

#### **Bird Migration and Movements on Nexrad Doppler Radar From Wisconsin and the Western Great Lakes**

<http://my.execpc.com/CE/5F/idzikoj/nexrad/nexweb/nex.htm>

This site provides animated examples of radar migration.

### Birding Mail Groups

#### **Birdingonthe.net: Regional Mail**

<http://birdingonthe.net/birdmail.html>

This site provides a portal for birding mail groups from across the world. Birders from states along the Gulf of Mexico often post lists of sightings from migration hotspots during the autumn and spring.



# The Eagle Soars Again

Activity 17

High School Environmental Science

## Focus/Overview

The Bald Eagle has made a spectacular comeback after nearly disappearing from our state just a few decades ago. In this lesson, students will use data generated by the Louisiana Department of Wildlife and Fisheries from Bald Eagle surveys done from 1975-2008 to create graphs showing the changes in eagle numbers.

## Learning Objectives

The learner will...

- use data to generate line graphs.
- use line graphs to interpret data on Louisiana's Bald Eagle population over time.
- make predictions based on graphed data.

## Louisiana Science Grade Level Expectations

HS Inquiry: GLE 5	Utilize mathematics, organizational tools, and graphing skills to solve problems (SI-H-A3)
HS EnvSci: GLE 6	Analyze the consequences of changes in selected divisions of the biosphere (e.g., ozone depletion, global warming, acid rain) (SE-H-A5) (SE-H-A7)
HS EnvSci: GLE 12	Give examples and describe the effect of pollutants on selected populations (SE-H-A11)
HS EnvSci: GLE 19	Determine the interrelationships of clean water, land, and air to the success of organisms in a given population (SE-H-C1)
HS EnvSci: GLE 26	Determine local actions that can affect the global environment (SE-H-D4)
HS EnvSci: GLE 27	Describe how accountability toward the environment affects sustainability (SE-H-D5)

## Louisiana Math Grade Level Expectations

11-12: GLE-22	Explain the limitations of predictions based on organized sample sets of data (D-7-H)
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## Materials List

- copies of Bald Eagle Data Sheet(**Blackline Master #1**) – one per student/group
- graph key (**Blackline Master #2**) – copy for teacher
- graph paper – one per student/group
- copy of BTNEP resources
  - Healthy Estuary, Healthy Economy, Healthy Communities: Environmental Indicators in the Barataria-Terrebonne Estuary System: 2002*

## BTNEP Connection

Birds

## Grade Level

High School

## Duration

45-minute

## Subject Area

environmental science

## Setting

classroom

## Extension Area

history

## Vocabulary

pesticide,  
bioaccumulation,  
bioamplification



[www.btnep.org](http://www.btnep.org)



## Background Information

During the 1960s and 1970s, the Bald Eagle nearly disappeared from our state. Although people could see that it was happening, it took scientists a long time to understand why. The reason was something that nobody could see. It was a synthetic chemical named DDT, or dichlorodiphenyltrichloroethane, that was used as a pesticide to kill everything from mosquitoes to roaches. Little by little, DDT had leaked into Louisiana's waterways. At first it wasn't a problem because only a little amount was present.

However, DDT soon got into the bodies of microscopic organisms. As small fish ate these microscopic organisms, the chemical got into their bodies. The DDT moved up the food chain as the smaller fish were eaten by bigger fish, and so on. By this time, the biggest predator fish had eaten so many smaller fish that the amount of DDT in their bodies had become a big problem. This process is called **bioaccumulation**.



As Eagles caught and ate the big fish, the amount of DDT in their bodies grew. Problems began to happen with the eagles. DDT made the eggshells of the birds so thin that the eggs would break when the mother eagles tried to brood them. Without eggs, there were no more young eagles, and eagles began to disappear. The nation's symbol became an endangered species and it was feared that Bald Eagles would go extinct.

In 1973, DDT was banned. With the absence of DDT, by the 1980s, Bald Eagle eggs were beginning to survive, and young eagles were again hatching. Bald Eagles have once again become common in Louisiana, and elsewhere in the United States. By 2007, the Bald Eagle had made such a great comeback that it was removed from the Endangered Species List.

## Advance Preparation

1. Make enough copies of the **Blackline Master #1** for groups or individuals.
2. Visit the National Wildlife Federation's EagleCam website (<http://www.nwf.org/eaglecam/webcam.cfm>) in advance to make sure that it is currently online and viewable.
3. Obtain copies of BTNEP's *Healthy Estuary, Healthy Economy, Healthy Communities: Environmental Indicators in the Barataria-Terrebonne Estuary System: 2002*

## Procedure

### Engage

1. Share goldfish crackers and water with your students. As they eat, ask them if they can tell what all of the ingredients in their snack are. Have the students read the list of ingredients. Are they familiar with all of the ingredients? Could there be chemicals in the crackers or water that aren't listed on the labels?
2. Share the story of the Bald Eagle and the problems it faced from pesticide pollution with the class (see Background Information). Did the eagles know what they were eating? Did people know?
3. Visit the BioDiversity Research Institute's Bald Eagle's Nest Webcam website (<http://www.nwf.org/eaglecam/webcam.cfm>) to see live footage of Bald Eagles, and their Bald Eagle Cam Blog (<http://baldeaglecam.blogspot.com/>) to view the discussion of the Eagles.

### Explore/Explain

1. Share and discuss the LDWF Bald Eagle Data Sheet (**Blackline Master #1**) with the students. Discuss which type of graph would be best to represent data that tracks changes in amounts over an extended period of time. What other types of graphs could also be used?
2. Have students use MS Excel or another computer graphing program, or graph paper, to create a double line graph using the data from **Blackline Master #1** for the total number of nests and the number of fledglings produced per year from 1976 to 2008. Students must include all necessary parts of a graph (title, axis labels, legends, and reasonable graph scales).



3. Discuss the trends that students are able to detect from the graphed data.
4. Have students explore alternative ways of determining reproductive success. For example, students might divide the number of fledglings produced by the number of active nests to determine the number of fledglings per nest per year, and plot this data versus number of nests and numbers of fledglings per year. What type of correlation do they see?
5. Have students write a brief report on MSWord with an inserted copy of their graphs to explain their findings and predictions.
6. Discuss student predictions. Based on the increasing numbers of Bald Eagles, can a prediction be made about Bald Eagle nest and fledgling numbers in Louisiana after another 10 years? What factors might influence the population increase of the species in the future? What factors might eventually cause limitations in the population increase?
7. Have students read about how threatened and endangered species are faring in the Barataria-Terrebonne National Estuary. A short article can be found on Bald Eagle nesting success on page 14 of BTNEP's *Healthy Estuary, Healthy Economy, Healthy Communities: Environmental Indicators in the Barataria-Terrebonne Estuary System: 2002*.

### Expand

1. A similar story can be told about the recovery of the Louisiana Brown Pelican. Have students write a short essay comparing the Bald Eagle and Louisiana Brown Pelican recovery. A short article can be found on Louisiana Brown Pelican nest abundance on page 15 of BTNEP's *Healthy Estuary, Healthy Economy, Healthy Communities: Environmental Indicators in the Barataria-Terrebonne Estuary System: 2002*. How are the two stories similar? How are they different?

### Assessment

- Assess graphs for accuracy and completeness (title, axis labels, legends, and reasonable graph scales).
- Assess student reports.

### Blackline Masters

1. **Bald Eagle Data Sheet**
2. **Bald Eagle Nesting [Graph Key]**

### Extension

- HISTORY. Have students use the Internet to research the contributions of Rachel Carson to the environmental movement. What impact did Carson have on the lives of American citizens? Although Carson is now considered a hero, how did people respond to her environmental warnings during her lifetime?
- SOCIAL STUDIES. Identify and research issues that are important to voters with regard to the environment.
- ENGLISH-LANGUAGE ARTS. Explain the term, "canary in a coal mine". How are like Bald Eagles like a "canary in a coal mine"? Are there other birds that reside or migrate through Louisiana that could be thought of as canaries?

### Resources

#### **BTNEP publications**

- 2008 Louisiana Raptors Calendar (available online at [http://www.btneep.org/Libraries/Calendars/2008\\_Birding\\_Calendar.sflb.ashx](http://www.btneep.org/Libraries/Calendars/2008_Birding_Calendar.sflb.ashx))
- *The Habitats of Barataria-Terrebonne: Their Importance to Migratory and Resident Birds* (see pages 38-41)
- *Healthy Estuary, Healthy Economy, Healthy Communities: Environmental Indicators in the Barataria-Terrebonne Estuary System: 2002* (see pages 14, 15)
- *Louisiana Raptors: Birds of Prey* (2010)



### **Recommended Field Guides**

- Sibley, D.A. (2000). *The Sibley Guide to Birds*. Audubon Society Nature Guides. Random House, Inc.
- Peterson, R., and Peterson, V. (2002). *A Field Guide to the Birds of Eastern and Central North America*. Peterson Field Guide Series. Houghton Mifflin Harcourt.
- Alderfer, J. (ed.) (2005). *National Geographic Complete Birds of North America*. Random House, Inc.

### **Internet Sites**

BioDiversity Research Institute's Bald Eagle's Nest Webcam

<http://www.briloon.org/watching-wildlife/eagle-cam.php>

*This website features a live webcam of an active Bald Eagle nest during the nesting season.*

Bald Eagle Cam Blog

<http://baldeaglecam.blogspot.com/>

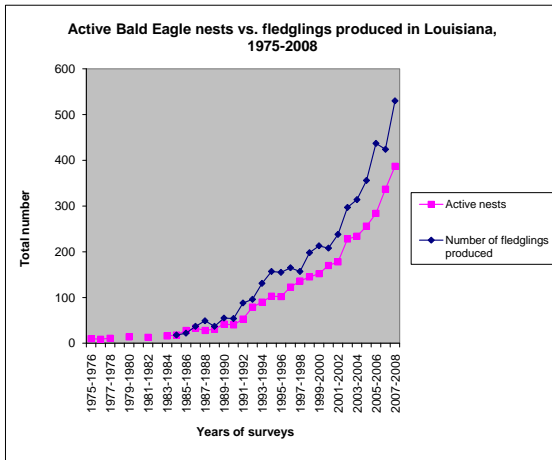
*This is a companion website to the National Wildlife Federation's EagleCam. Biologists use the blog to explain events captured by the webcam.*

## Bald Eagle Data Sheet

This table represents the status, productivity and number of known Bald Eagle nests in Louisiana based on LDWF annual surveys, 1975-2008.

Year	Nest Status			Nest Grand Total	Number of Fledglings Produced
	Active	Inactive	Unknown		
1975-1976	10			10	
1976-1977	9	2	1	12	
1977-1978	11	6	1	18	
1978-1979			15	15	
1979-1980	14	6		20	
1980-1981			13	13	
1981-1982	13	2	3	18	
1982-1983			18	18	
1983-1984	16	3	1	20	
1984-1985	18	2	2	22	18
1985-1986	28		1	29	22
1986-1987	33	2	3	38	37
1987-1988	28		10	38	49
1988-1989	31	1	13	45	37
1989-1990	42	8	3	53	55
1990-1991	40	10	6	56	54
1991-1992	53	9	2	64	88
1992-1993	79	23	2	104	96
1993-1994	90	23	1	114	131
1994-1995	103	17	5	125	157
1995-1996	102	24	3	129	155
1996-1997	123	24	2	149	165
1997-1998	136	36	10	182	157
1998-1999	145	45	4	194	198
1999-2000	152	43	6	201	213
2000-2001	170	42	6	218	208
2001-2002	178	56	2	236	238
2002-2003	228	66		294	297
2003-2004	234	84		318	314
2004-2005	256	95	4	355	356
2005-2006	284	85		369	437
2006-2007	337	111		448	424
2007-2008	387	129		516	530

## Graph Key





# Humming Along

High School Environmental Science

## Focus/Overview

During autumn migration, hummingbirds provide an excellent opportunity for inquiry learning.

## Learning Objective

The learner will...

- design and implement an experiment using dependent and independent variables and a control group.

## Louisiana Science Grade Level Expectations

HS Inquiry: GLE #1	Write a testable question or hypothesis when given a topic (SI-H-A1)
HS Inquiry: GLE #3	Plan and record step-by-step procedures for a valid investigation, select equipment and materials, and identify variables and controls (SI-H-A2)
HS Inquiry: GLE #4	Conduct an investigation that includes multiple trials and record, organize, and display data appropriately (SI-H-A2)
HS Inquiry: GLE #6	Use technology when appropriate to enhance laboratory investigations and presentations of findings (SI-H-A3)
HS Inquiry: GLE #9	Write and defend a conclusion based on logical analysis of experimental data (SI-H-A6) (SI-H-A2)

## Materials List

- Hummingbird feeders (2 per group)
- Sugar (5 lb bag)
- Water
- Food coloring (optional)
- Computer with Internet connection (to view video)
- Graphing software (optional)

## Background Information

Ruby-throated Hummingbirds are abundant migrants through Louisiana in the spring and fall, but they're especially easy to observe in the fall when they stop at suitable locations to fatten up for their southward migration. From the middle of August to the middle of October, a steady stream of hummers flows through the state on their way around the Gulf of Mexico to their wintering grounds in Mexico and Central America. During their passage, they're easily attracted to hummingbird feeders filled with nectar (sugar-water). Hummingbirds are so abundant during this period, especially during September, that they can be attracted in almost any setting, even in the middle of cities. The ready availability of hummers provides students with an excellent opportunity to design experiments using variables and controls to test, side-by-side, the feeder preferences of hummingbirds.

*Note: This lesson can easily be adapted to other types of birds that use feeders.*

## BTNEP Connection

Birds

## Grade Level

High School

## Duration

2 class periods

## Subject Area

Science as Inquiry

## Setting

Classroom/outdoors

## Vocabulary

Quantifiable, control  
independent variable  
dependent variable



[www.btneep.org](http://www.btneep.org)





## Advance Preparation

1. Purchase hummingbird feeders. You will need two feeders per group of students.
2. Fill a few of them with nectar. A good rule of thumb for the solution is to use 3 parts water to 1 part sugar. For example, a large batch of nectar can be made using 3 cups of water and 1 cup of sugar. Place several feeders outside a week in advance of conducting the experiments to attract hummingbirds to the area. For their experiments, students may choose to use the sugar to water ratio as a variable. This will not harm the birds. Students might also decide to use food coloring to change nectar color. In general, food coloring in nectar is not necessary and *should be avoided*, but it can be added to nectar on a short-term basis.
3. Download and test the Hummingbird Video posted on the BTNEP Louisiana's Birds website. You can also download and preview the following YouTube videos of Ruby-throated Hummingbirds at backyard feeders to make sure they will work on your computer system:  
Closeup at feeder - <http://www.youtube.com/watch?v=C9clw0BsdT8>

## Procedure

### Engage

1. Show the BTNEP Louisiana's Birds video of Ruby-throated Hummingbirds feeding. You can also show either or both of the following YouTube hummingbird videos to your class:  
Closeup at feeder - <http://www.youtube.com/watch?v=C9clw0BsdT8>  
Discuss how the geographic location of Louisiana on the migration route of Ruby-throated Hummingbirds provides a great opportunity to attract and observe these birds at feeders.
2. Discuss the lesson with your students. Show them the hummingbird feeders, and demonstrate how to make nectar.

### Explore

1. Divide students into groups and distribute 2 feeders to each group. Handout copies of **Blackline Master #1**. As students work through the following Explore steps, they can keep track of their experimental design on the worksheet.
2. Have students examine the feeders, and study the formula for nectar. Explain that one feeder will be kept completely unchanged as a **control**, and *only one feature* on the other feeder will need to be changed as an **independent variable**. What are some of the variables that can be changed (**independent variables**) to conduct an experiment? In the table below are some ways that the two basic materials, feeder and nectar, can be changed. Each of the items listed below the header rows represents a potential independent variable.

*NOTE: For their experiments, students may choose to change the sugar to water ratio as a variable. This will not harm the birds. Students might also decide to use food coloring to change nectar color. In general, food coloring in nectar is not necessary and many people avoid using it for fear of harming birds, but for short periods such as this experiment it will not harm birds.*

Feeder	Nectar
<ul style="list-style-type: none"><li>• shape of feeder</li><li>• color of feeder</li><li>• decorations on feeder</li><li>• location of feeder</li><li>• height of feeder off the ground</li><li>• number of nectar stations</li><li>• time of day</li></ul>	<ul style="list-style-type: none"><li>• amount of nectar</li><li>• sugar:water ratio</li><li>• color of nectar</li><li>• how often the nectar is changed</li></ul>

Students should choose only one variable to change from the lists above. This will be their independent variable for their experiment. All the remaining items listed above become things that students should hold **constant**.

3. In order to conduct their experiments, students will need to observe and count or measure some factor of hummingbird behavior (**dependent variables**), such as the number of times birds visit feeders, how long they visit feeders, how much nectar is left in the feeder after a certain number of minutes, or how many birds visit a feeder at one time. Whatever the students decide to measure, the data they collect must be **quantifiable**. These are just a few of the possible things that they can measure. In other words, the behavior must be **quantifiable**; its quantity must be measurable. Have students think about what they will measure, and how they will measure it.
4. Once students have determined what their independent variables will be, they need to develop a hypothesis to test.
5. Have students prepare their feeders. Remind them that only one feature can be changed, and that everything else must be as similar as possible, including the location where the feeders will be placed.
6. Have students place their feeders outside in a location where they can be observed easily. If hummingbirds have been attracted to the area in advance, they will quickly find the feeders. Students should be able to make their observations later that day, or the next. If hummingbirds haven't yet found the feeders, leave them in place for a few days.
7. When hummingbirds are visiting the feeders, have students make their observations. Observations should be fairly easy to make within a period of a few minutes; a number of trials can be made within a short time. The data that students gather should be in numerical form. *NOTE: Students can also videotape their feeder and then make observations off the video.*
8. Have students organize their data to be displayed in graphical form. Graphs can be drawn by hand, or created using graphing programs on the computer.
9. Have students complete a short report of their experiment, listing their hypothesis, their methods, and their conclusion.

### Expand

1. Have students explain difficulties in their methods, and possible errors in their findings. What difficulties arose in measuring hummingbird behavior?
2. Experiments like this often bring about improvements in the designs of products. Did the results of this experiment suggest any way that hummingbird feeders might be improved?

### Assessment

- Assess students on their reports. Check for understanding of the scientific process and content.

### Blackline Master

1. **Experimental Design Diagram**
2. **Build Your Own Hummingbird Feeder**

### Extensions

- SCIENCE. Photograph the stages of this experiment, and have students incorporate the photographs into PowerPoint reports. These reports can be used for presentations, and to print out to display in the class.
- SCIENCE. Have students build homemade feeders out of plastic water bottles. See **Blackline Master #2** for directions.

### Resources

#### BTNEP publications

- **The Habitats of Barataria-Terrebonne: Their importance to migratory and resident birds (2007)**
- **Vanishing Before Our Eyes: Louisiana cheniere woods and the birds that depend on them (2006)**
- **Wings Over the Wetlands: Wading Birds in Louisiana (2008)**
- **Wings over the Wetlands (video)**
- **BTNEP Migratory Flyway Poster**

#### Printed Resources

Cothron, Julia H., Giese, Ronald N., and Rezba, Richard J. 2000. ***Students and Research***, 3<sup>rd</sup> Edition, Dubuque, Iowa: Kendall/Hunt Publishing, 328 p.



## Experimental Design Diagram

Based on: Cothron, Giese, and Rezba, *Students and Research*, 2000.

*The Experimental Design Diagram is a concise way to describe an entire experiment.*

Title: The Effect of \_\_\_\_\_ (IV) on \_\_\_\_\_ (DP)

Hypothesis: If \_\_\_\_\_ (IV) is \_\_\_\_\_ (change, ↓↑),  
then \_\_\_\_\_ (DV) will \_\_\_\_\_ (change).

Independent Variable: \_\_\_\_\_ (unit of measure: \_\_\_\_\_ )

Levels of Independent Variable, Including the Control

(control)	
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How many repeated trials for each of the IV levels

--	--

Dependent Variable: \_\_\_\_\_ (unit of measure: \_\_\_\_\_ )

Constants:

Potential Variable	Level held constant	Potential Variable	Level held constant

Safety Considerations:

Measurement Tools Needed:

# Build Your Own Hummingbird Feeder!

Steps 1-4 of these directions are based on the following video: <http://www.youtube.com/watch?v=IUZ6v57Z9n8&feature=related>

## Materials

- Plastic soda or water bottle with its cap
- Hammer and large nail (or an electric drill)
- Plastic small, shallow tub (like a small butter tub) with lid
- Permanent markers (black and red)
- Sharp scissors
- Pliers (optional)
- Large zip tie (about 12" long)
- 2' piece of string or wire (for hanging)

**Step 1.** Using a hammer and large nail (or an electric drill), poke a hole in the cap of your plastic soda bottle. It is easiest to poke the hole through the cap from the inside of the cap. You need a hole about  $\frac{1}{4}$ " in diameter. Do this step on concrete or on an old piece of lumber. Be careful not to damage the nice surface of a countertop or desk. You may need to use pliers to pull the nail out of the cap.

**Step 2.** Take the plastic water bottle (without its lid) and use the open end to draw a circle in the middle of the plastic butter tub lid. Use your sharp scissors to cut out the circle. Be careful to cut on the line that you drew and do not make the hole that you are cutting any larger than your circle. Take your hammer and nail or electric drill and put four holes about  $\frac{3}{4}$ " from the outside of the lid equal distance apart.

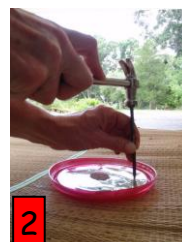
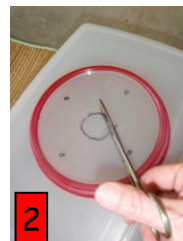
**Step 3.** Fit the butter tub lid (the outer side of the lid) over the open end of the plastic drinking bottle. The open end of the bottle should fit snugly through the hole you cut in the butter tub lid. Screw the cap of the water bottle on to the bottle. It should hold the butter tub lid firmly in place.

**Step 4.** Snap the lower portion of the butter tub onto its lid. Turn it so that your new feeder is now sitting on the butter tub. Place a large zip tie around the upper end of your water bottle. Leave room to run your string or wire underneath so that you will be able to hang your feeder. Tie your string or wire to the tie wrap and leaving about 12-18" of string to hang your feeder.

**Step 5.** Using a red permanent marker, draw petals of a flower around each of the four holes that the hummingbirds will sip from. You can also add additional decorations.

**Step 6.** Make your sugar water mixture. The recipe is *four parts of water to one part of sugar*. If your feeder holds about two cups of water (16 ounces), then you will need to add  $\frac{1}{2}$  cup of sugar to 2 cups of water. Stir the sugar and water until it completely dissolves. Store leftover sugar water mixture in the refrigerator for up to a week. Do not put food coloring into the water as it is not very healthy for the birds.

Over a sink (or outside), fill your feeder with the sugar water mixture. Place the butter tub lid on your bottle and then screw the cap on to secure the butter tub lid to the bottle. Snap the bottom of the butter tub onto its lid. Very carefully and slowly, turn the feeder over into its hanging position. You're ready to hang your new feeder!





# What's in the Food Chain?

High School Environmental Science

## Focus/Overview

In this lesson, students will focus on the Brown Pelican to trace the path of energy and pollutants up a food chain from the lowest trophic levels to the highest, and to compare the flow of the transfer rate of energy and pollutants.

## Learning Objectives

The learner will...

- create a food chain that ends with a Brown Pelican.
- trace the path of energy and pollutants through the food chain.
- design and create a graph to illustrate the flow of pollutants through the food chain.

## Louisiana Science Grade Level Expectations

HS Env Sci: GLE #3	Use the 10% rule and data analysis to measure the flow of energy as represented by biomass in a system (SE-H-A2)
HS Env Sci: GLE #8	Explain how species in an ecosystem interact and link in a complex web (SE-H-A7) (SE-H-A10)
HS Env Sci: GLE #12	Give examples and describe the effect of pollutants on selected populations (SE-H-A11)

## Materials List

- Poster paper
- Markers
- Dollar bills (about 10)
- Dimes (about 10)
- Pennies (about 10)

## Background Information

In the 1950s, the Louisiana population of nesting Brown Pelicans was in the tens of thousands. On East Timbalier Island alone there were 5,000 Brown Pelicans in 1955. However, eight years later, not a single Brown Pelican could be found in the entire state. The reason for the disappearance was unknown.

Soon, the mystery was solved. The chemical DDT (dichlorodiphenyltrichloroethane), a pesticide used throughout the world, had found its way into the bodies of the pelicans and destroyed their ability to lay healthy eggs. But how? Pelicans hadn't been directly exposed to the chemical.

It was determined that DDT had reached the pelicans through the food chain. DDT is fat -soluble and takes years to break down into less harmful chemicals. DDT washed into rivers and oceans, and became trapped in the fatty tissues of small organisms that were exposed to it. These organisms were at the beginning of a food chain that ended with Brown Pelicans, and the chemical was transferred step by step through all of the trophic levels of the food chain until it finally reached the pelicans. Unlike energy, of which 90% is lost in each step of the food chain, DDT simply passed from prey to predator and DDT levels continued to build up through each stage of the food chain. This buildup across levels in a food

## BTNEP Connection

Birds

## Grade Level

High School  
Environmental Science

## Duration

1 class period

## Subject Area

Environmental Science

## Setting

classroom

## Extension Area

science

## Vocabulary

DDT  
bioamplification[www.btnep.org](http://www.btnep.org)



chain is known as **bioamplification**. Eventually, through bioamplification, DDT built up to toxic levels in the Brown Pelicans.

To better understand bioamplification, imagine a very simplified example where each plankton organism at the beginning of a food chain has 1 part per million DDT. If the next organism in the food chain eats 99 plankton organisms, it has just gained 99 parts per million of DDT. It will continue to accumulate DDT as it eats more plankton, and will pass on its DDT load to the organism that eats it.

## Advance Preparation

1. Print out the money cards. You will need 16 copies of the ten dollar bill (one for each of your “plankton”), one dollar bill, dimes, and pennies cards.
2. Print out the food chain cards. Each student in the class should have a card. For a class of 25, copy the plankton page 8 times (16 plankton cards), the small fish page 3 times (6 small fish cards), and the big fish/pelican page 2 times (2 big fish and 2 pelicans). You will only use one of the pelican cards.
3. Be sure to have enough markers and poster paper for individual or groups in Explain Step #3. This activity can also be done with paper and pencil.

## Procedure

### Engage

1. Divide the class into 3 groups of varying sizes that will represent trophic levels in the food chain, with a big group (~ 16 students have plankton cards; each person in this group represents a swarm of plankton), a group of small fish (~ 6 students have small fish cards), a group of big fish (~ 2 students have big fish cards) and one Brown Pelican (1 student will have a Brown Pelican card). Give each member of the plankton group a ten dollar bill card. This dollar will represent the amount of energy in each plankton swarm. Have the members of the “small fish” group walk around, “eat” the plankton, and take the dollars. They have taken energy from the plankton, but now they must “pay a tax.” You will take 90% of their dollar, and give them a dollar bill in return for each dollar. Next have the “big fish” eat the “small fish”. As they feed, they collect the dollar bills from the fish they consume. Then they must pay the 90% tax – so give them a dime card in exchange for the dollar bill cards. Continue this activity with the Brown Pelican, taking 90% of their “earnings” and giving them a penny for each dime. Explain that this is how energy is passed through a food chain, with a 90% loss at each step. Only 10% is retained at each step; this is the “**10% Rule**”. By the time energy reaches the predator at the end, most of the energy is lost.
2. Divide the class into the same 3 groups. Each group will represent the same trophic levels as in the first activity. Give each member of the plankton group a ten dollar bill card. Each person in this group will represent a swarm of plankton, and each ten dollar bill card will represent the amount of DDT in the plankton. Have the members of the medium group walk around, eat the plankton, and take their dollars. There is no tax on this energy, so all of it will be passed on. Continue this activity with the Brown Pelican, the final predator in the chain, taking all of the ten dollar bill cards. Explain that this activity represents **bioamplification**, and that the last predator in the chain ends up with all of the DDT in the chain. The level of DDT in the pelican is the sum of all of the DDT in the food chain leading up to it.

### Explore/Explain

1. Discuss the two activities with the class, and compare the results of the two activities.
2. Draw and discuss the traditional energy pyramid of the food chain, illustrating the 10% Rule to show how energy is lost as it travels toward the top of the pyramid.
3. Give the class poster paper and markers, and tell them that their task will be to design a food chain that ends with a Brown Pelican. They must draw a diagram to represent the transfer of pollutants and illustrate the process of bioamplification. It can be drawn in any way that accurately shows how bioamplification works. Explain that diagrams may vary depending on how each student decides to represent the process.
4. Display the finished products and have students explain the rationale behind their diagrams.

### **Expand**

1. Have students create diagrams showing the simultaneous transfer of energy and pollutants, showing how energy is lost and how toxins are accumulated at each trophic level of the food chain.

### **Assessment**

- Assess diagrams for completeness and effort. There are many ways to represent bioamplification in a food chain, and the process can be difficult to visualize and illustrate. Some students may create entirely novel ways to address the issue.

### **Extensions**

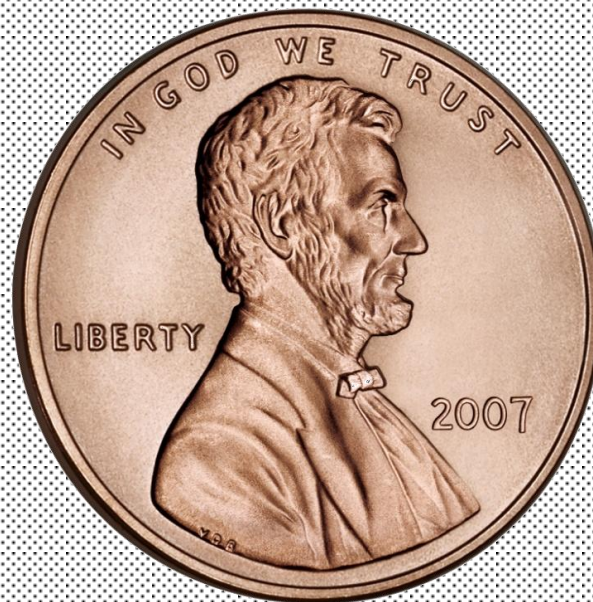
- SCIENCE. Have students research the issue of mercury in the human food web. What are unsafe levels for humans? What are the leading sources of mercury consumed by humans? Does mercury build up in our systems the way that DDT builds up in Brown Pelicans?

### **Resources**

#### **BTNEP publications**

- **The Habitats of Barataria-Terrebonne: Their importance to migratory and resident birds (2007)**
- **Vanishing Before Our Eyes: Louisiana cheniere woods and the birds that depend on them (2006)**





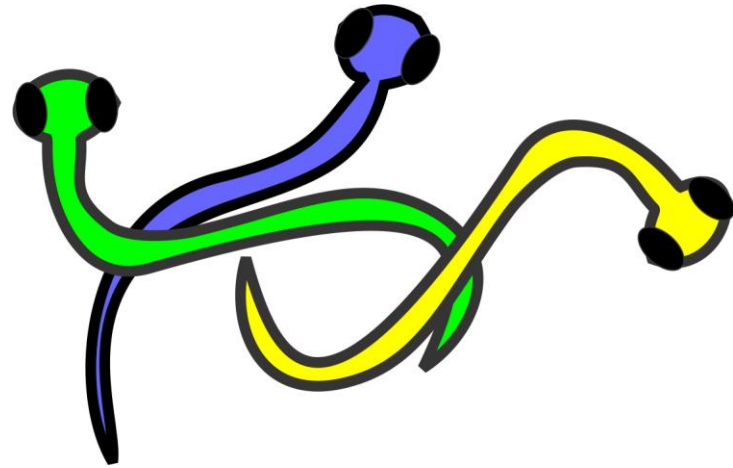




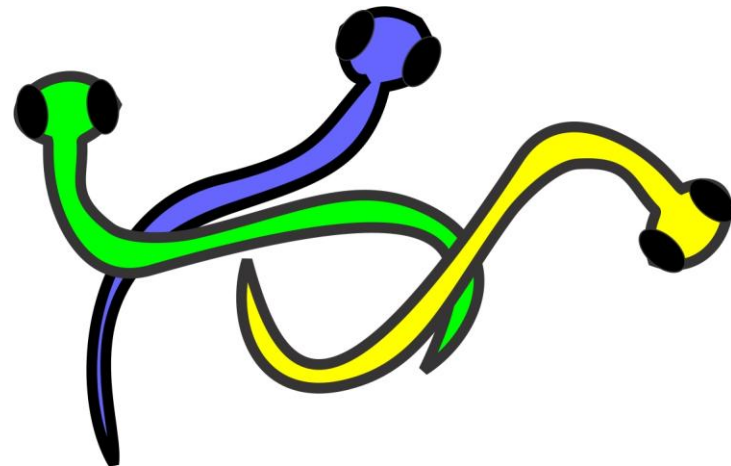




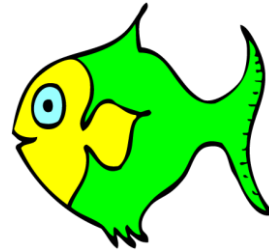
I'm  
plankton!



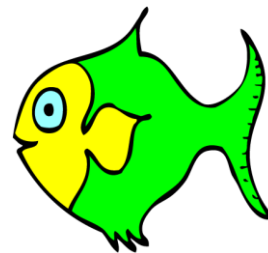
I'm  
plankton!



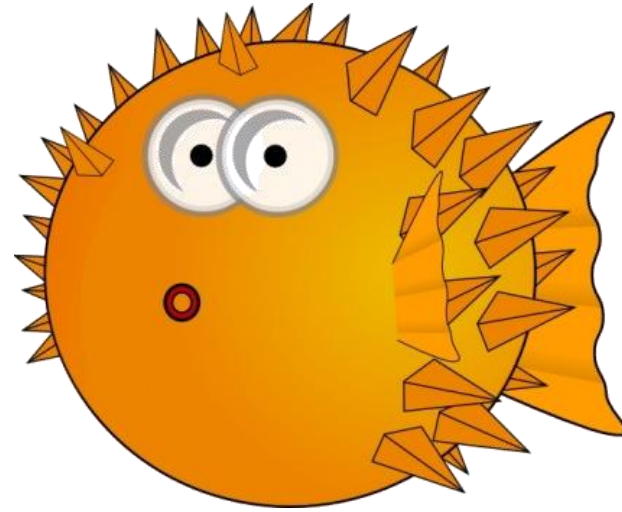
I'm a  
small fish!



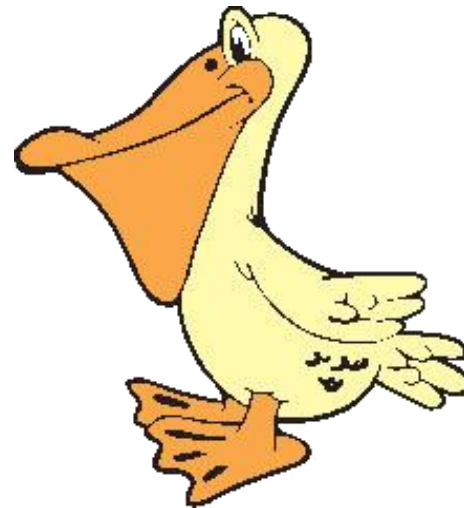
I'm a  
small fish!



I'm a  
**BIG** fish!



I'm a  
bird!







# The Cowbird

High School Environmental Science

## Focus/Overview

In this lesson, students will examine how the changes brought about by humans over the last few centuries in North America have allowed one bird species, the Brown-headed Cowbird, to prosper at the expense of other species.

## Learning Objectives

The learner will...

- analyze the effect of an invasive bird species on the environment.
- explain how organisms adapt to environmental pressures.
- debate opposing sides of a scientific issue.

## Louisiana Science Grade Level Expectations

HS Env Sci: GLE #8	Explain how species in an ecosystem interact and link in a complex web
HS Env Sci: GLE #9	Cite and explain examples of organisms' adaptations to environmental pressures over time (SE-H-A8)
HS Env Sci: GLE #10	Analyze the effect of an invasive species on the biodiversity within ecosystems (SE-H-A9)
HS Env Sci: GLE #11	Explain why biodiversity is essential to the survival of organisms (SE-H-A9)

## Materials List

- Computers
- Copies of Internet resources list (**Blackline Master #1**)

## Background Information

The history of the Brown-headed Cowbird provides an interesting illustration of how the actions of humans can produce unplanned and far-ranging effects in nature. Before the arrival of Europeans and their domestic animals, cowbirds survived by following buffalo herds, eating insects the buffalo kicked up and picking seeds from buffalo manure. When the immense buffalo herds migrated north or south with the seasons, the cowbirds followed. To stay on the move throughout the year, cowbirds developed the useful adaptation of laying their eggs—as many as 40 every nesting season - in the nests of other songbirds. This adaptation, known as **nest parasitism**, meant that Brown-headed Cowbirds never built their own nests or raised their own young; these jobs fell to their victims. However, even though some songbirds ended up raising a nest full of cowbirds, the cowbirds were only a problem until the buffalo moved on. Then the songbirds could raise their second brood, without baby cowbirds. The large buffalo herds were found on the western prairies, so cowbirds weren't a threat to birds of the eastern North American forests. The cowbirds were part of a balanced ecosystem that could survive their damage.



## BTNEP Connection

birds

## Grade Level

High School  
Environmental Science

## Duration

2 class periods

## Subject Area

science

## Setting

classroom

## Extension Area

research

## Vocabulary

nest parasitism



[www.btneep.org](http://www.btneep.org)





When European colonists arrived to settle North America, they changed North America in ways that would change the lifestyle of Brown-headed Cowbirds and have major consequences for hundreds of bird species throughout the continent. The Europeans brought with them domestic animals new to North America, and slowly began to clear the eastern forests. The newly opened pastures filled with horses and cows opened up a new niche for cowbirds, and soon huge flocks of cowbirds began to be seen year round near farms in parts of North America where they were once completely unknown. Wherever cowbirds appeared they parasitized the nests of the resident birds. Species that had never encountered parasitism by cowbirds had no defense against it, and their numbers greatly decreased. Today, cowbird nest parasitism is believed to be putting additional stress on many songbird species that are already facing great danger (see pp.36-37 in *Habitats of Barataria-Terrebonne*, and *Vanishing Before Our Eyes*), and programs to trap and kill cowbirds have been put in place to keep some endangered species from going extinct.

The explosion in cowbird numbers is important for many reasons. Each bird species has a vital niche in its ecosystem. Spreading seeds, pollinating flowers, and keeping insect numbers in check are just a few key roles that songbirds play. As songbird numbers decline, the balance of ecosystems begins to change in important ways. And, ironically, if the songbirds disappear, the cowbirds will soon die out, too, unable to find hosts for their eggs.

However, many observers have raised doubts about the level of damage that cowbirds cause to the environment. Some believe that the nesting losses caused by cowbirds can be safely absorbed by other species, and that cowbirds have become the scapegoat for declines in songbird numbers caused by other factors, especially human disturbance to the environment.

### Advance Preparation

1. Visit the Internet resources to read more about Brown-headed Cowbirds, including the articles that present dissenting opinions about the level of risk cowbirds present.
2. Make enough copies of the list of Internet resources for individuals or groups.

### Procedure

#### Engage

1. Describe an alien organism that invades and spreads by tricking other animals into raising its offspring instead of their own, somewhat like a virus. Tell them that natural forces had safely contained this organism for thousands of years, but that changes humans made to the environment allowed it to escape and spread across the United States. Let the students know that this is true, and let them discuss what type of organism you mean. Share the history of the Brown-headed Cowbird with the class, including the risk to endangered species. View one or both of the following videos featuring Brown-headed Cowbirds laying their eggs in other species nests.

**NOVA ScienceNOW - Gangster Birds** - <http://www.pbs.org/wgbh/nova/sciencenow/0407/03.html>

A mafia-style protection racket may be in operation in our backyards. — first broadcast August 25, 2009 (~10 minute video, choice of QuickTime and Windows Media).

**NestWatch07** — <http://www.youtube.com/watch?v=k3vAPMUW4CA>

A Brown-headed Cowbird has laid an egg in this Northern Cardinal nest. The cowbird has also removed one of the cardinal eggs and placed it on the rim, and possibly damaged the other. Brown-headed Cowbirds are nest parasites and lay their eggs in the nests of other species. View all live cams on nesting birds at <http://www.nestcams.org>. NestCams are a project of the Cornell Lab of Ornithology. — recorded April 20, 2009 (3 minute video).

2. Explain the opposing viewpoint to the class.

### Explore

1. Explain that after researching the topic the class will debate or discuss the cowbird issue. Half of the class will make the case that cowbirds are detrimental, pose an imminent threat to the environment as a result of their spread, and that they must be controlled. The other half will argue the opposite case, that cowbirds are a part of the environment, and that the environment can and will absorb the damage that cowbirds cause.
2. Distribute the list of Internet resources to the students (**Blackline Master #1**), and allow them to research the topic. Students may also search for alternative resources. Have the students make notes and cite their sources as they conduct their research. Have students compile their notes into a report.
3. Choose a forum for the debate or discussion, introduce the arguments, and moderate.

### Expand

1. Have students predict what effects Brown-headed Cowbirds will have on the environment if they are left alone. Will the effects reach beyond birds?

### Assessment

- Assess student notes and reports.
- Assess student participation in the research and discussion of the topic.

### Blackline Master

1. **Brown Cowbird Internet Resources**

### Extensions

- SCIENCE Have students research the effects of other birds that have invaded North America, such as the European Starling, House Sparrow, and Cattle Egret. What effects have these species had on the birds of this continent?

### Resources

#### BTNEP publications

- **The Habitats of Barataria-Terrebonne: Their importance to migratory and resident birds (2007)**
- **Vanishing Before Our Eyes: Louisiana cheniere woods and the birds that depend on them (2006)**

## Brown-headed Cowbird Internet Resources

**American Birding Association: Brown-headed Cowbirds: Villain or Scapegoat?**

<http://www.aba.org/birding/v36n4p374.pdf>

This article discusses the question of cowbird control.

**BirdFreak: Who's Afraid of the Big Bad Brown-headed Cowbird?**

<http://birdfreak.com/whos-afraid-of-the-big-bad-brown-headed-cowbird/>

This editorial defends the Brown-headed Cowbird.



**Birds in Forested Landscapes: Brood Parasite**

<http://www.birds.cornell.edu/bfl/speciesaccts/bnhcow.html>ProvP

Provides interesting behavior and display information about male and female Cowbirds, as well as nesting habits.

**Chipper Woods Bird Observatory: Brown-headed Cowbird**

<http://www.wbu.com/chipperwoods/photos/cowbird.htm>

The natural history of Brown-headed Cowbirds is discussed.

**Cornell Lab of Ornithology: Brown-headed Cowbird**

[http://www.birds.cornell.edu/AllAboutBirds/BirdGuide/Brown-headed\\_Cowbird.html](http://www.birds.cornell.edu/AllAboutBirds/BirdGuide/Brown-headed_Cowbird.html)

Photos, songs, and facts about Brown-headed Cowbird are presented in this entry.

**Golden-cheeked Warbler: Brown-headed Cowbird Parasitism**

<http://golden-cheekedwarbler.blogspot.com/2007/05/brown-headed-cowbird.html>

This webpage details the parasitism of the endangered Golden-cheeked Warbler by Brown-headed Cowbirds and efforts to control the cowbirds.

**Smithsonian National Zoological Park, Brown-headed Cowbirds: From Buffalo Birds to Modern Scourge**

[http://nationalzoo.si.edu/ConservationAndScience/MigratoryBirds/Fact\\_Sheets/default.cfm?fxsh\\_t=3](http://nationalzoo.si.edu/ConservationAndScience/MigratoryBirds/Fact_Sheets/default.cfm?fxsh_t=3)

This webpage features facts and details about Brown-headed Cowbirds.

**Trapping Brown-headed Cowbirds to Control Songbird Nest Parasitism**

[http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd\\_bk\\_w7000\\_1148.pdf](http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd_bk_w7000_1148.pdf)

This brochure details the effects of Brown-headed Cowbird on nesting songbirds, and provides plans for trapping cowbirds.

**U.S. Fish & Wildlife Service: Kirtland's Warbler**

<http://www.fws.gov/midwest/Endangered/birds/Kirtland/kiwafctsht.html>

This webpage discusses the effects of Brown-headed Cowbirds on the endangered Kirtland's Warbler in Michigan.