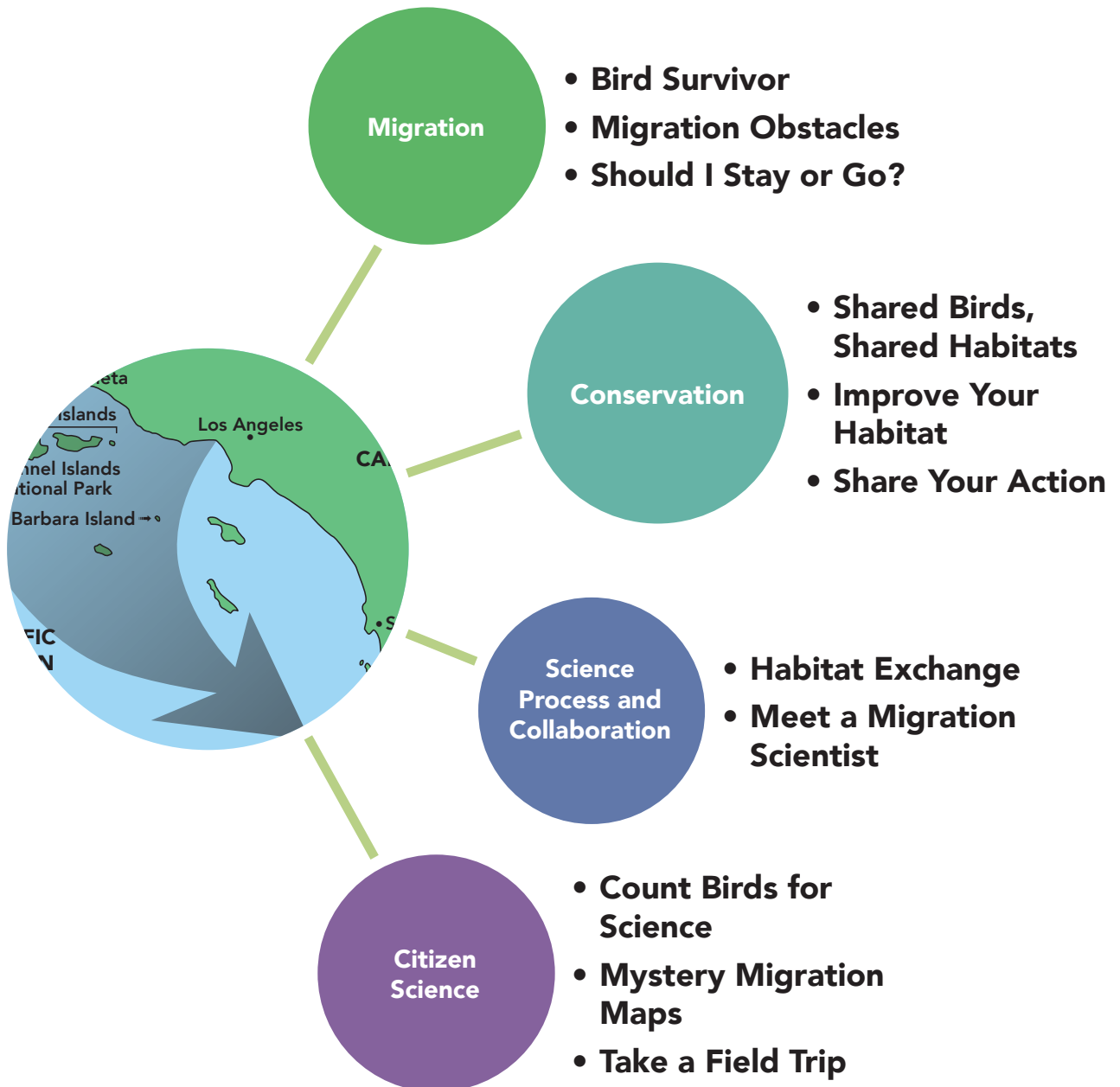




Connecting Kids Through Birds

TEACHER'S GUIDE





Teacher's Guide

Connecting Kids Through Birds

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Introduction to BirdSleuth: Connecting Kids Through Birds

Welcome to BirdSleuth

Teachers, thank you for helping us connect kids to each other through birds!

Our goal is to connect children with nature and build their scientific and environmental literacy through school-based and field experiences focusing on birds and their habitat needs. Birds provide an accessible hook for getting children outside, observing and connecting to the environment and understanding first-hand the importance of where they live. Though birds are part of our everyday lives, they still capture our imaginations—with their ability to fly, their colorful plumage, and their amazing capacity for song. Wherever you are, and what ever the season, you can find bird species in your area.

And while you can observe some bird species at any time of year, some species are truly international citizens, traveling between countries and continents on their yearly migrations. Through these spectacular and mysterious migrations, birds can connect us—quite literally—to other places, people, cultures and environmental issues. Looking at a small songbird, and considering the thousands of miles that it has traveled, is a vivid way to connect students with other places and habitats. These migratory species depend on habitat in more than one geographic area, they have a unique ability to connect people for conservation.

The lessons in this module are divided into four categories: Migration, Conservation, Inquiry Investigations and Collaboration, and Citizen Science. You'll find overlap between each of these areas. Essentially, lessons can be completed in any order; however, we have suggested the lessons in a numerical order that we think works well. Links to each of these lessons can be found along the left navigation bar. The lessons are arranged thematically, here:



Curriculum Background

Migration

When scientists speak of migration, they are usually referring to seasonal migration: the large-scale annual movement of all or some of a population between its breeding (summer) and nonbreeding (wintering) grounds. Migration is a cycle that some bird species repeat each year in response to the change of seasons, almost always based on the availability of food. Birds need to eat a lot to keep going, and they need even more food when they are feeding their nestlings. Access to food is critical during migration and when birds are raising young.

The need to feed and raise nestlings is the main reason many birds don't just stay in the warm tropics all year round. Although the tropics have a good climate, there is also a lot of competition for food. Going north in the summer offers migrating birds a huge explosion of food sources, such as insects. But it's a balancing act, because migration is dangerous and many birds die during their journey. Some bird species migrate, and others don't (see table below).

	Tropical Residents	Migrants	Temperate Residents
Survival Rate	High survival rate (avoid hazards of migration and harsh winter weather)	Moderate survival rate (due to hazards of migration)	Low survival rate (due to cold and starvation)
Number of Young Raised per Year	Few young raised per year (food for young is less abundant)	Moderate number of young raised per year (due to abundant food in breeding areas)	Many young raised per year (due to abundant food)

To summarize, some birds don't face the challenges of migration: some species stay in the tropics where they raise fewer young (tropical residents), and others face a hard winter but get first pick of the best nesting spots in the spring (temperate residents). Migrants risk the danger of migration, but have the benefit of raising their young in the food-rich temperate region without having to survive the winter there.

Conservation

For researchers, birds are ideal objects of study for a whole range of scientific questions. Birds have world-wide distribution and they are abundant in species and rich in adaptation. And because they share their habitats with humans more than any other animal group,

they act as important biological indicators. In 1962 her book *Silent Spring*, Rachel Carson brought to the public's attention the role of birds as indicators of environmental health, and more people got involved in conservation action. For Example, the pesticide DDT was linked to reproductive failure in birds, especially raptors, and was subsequently banned with public support. Since then, birds have demonstrated their importance as bioindicators and keystone species in ecosystems.

Bird conservation—the preservation, protection or management of birds and their habitats—aims to ensure the health of bird populations and the habitats on which they depend. Bird conservation has been a national priority in the United States since the early 1900s, when scientists realized that humans could negatively impact the long-term sustainability of bird populations. The biggest threats to birds in the United States and globally are habitat loss and degradation due to human actions. Without sufficient habitat, bird species cannot survive. Habitat conservation is a key component of conserving our birds. Each habitat is unique, facing distinct threats, and posing specific conservation challenges. Recent findings indicate that about one-third of North America's bird populations declined during the last half of the 20th century, and there is wide recognition that global climate change will affect habitats and the birds that depend on them. There is clearly a continued need for bird conservation at local, state, regional, national, and continental scales.

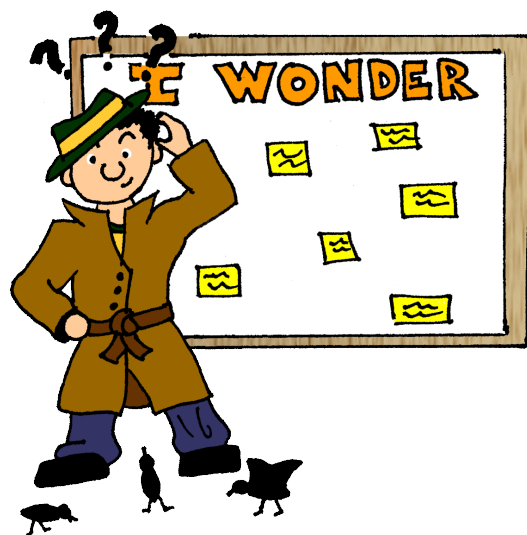
While the problem is large, we don't want kids to get discouraged: there's much hope! These lessons aim to engage students not only by helping them to understand habitats and bird migration, but also by empowering them to see themselves as part of the solution for bird conservation. For example, monitoring birds through citizen science provides important scientific knowledge about local areas and can contribute to understanding, conserving, and managing the earth's natural systems. By engaging children in local environmental monitoring and explicitly teaching them about its importance, we can empower students to see themselves as part of a positive force that is working to ensure healthy ecosystems locally and globally, now and into the future.

Science Process and Collaboration

One of the most exciting aspects of teaching science is engaging students in the process of discovery. Science is a particular way of understanding the natural world and is built upon our natural curiosity. We use our senses and extensions of those senses (instruments) to make observations and collect information about the world around us. Scientists always base their explanations or conclusions on evidence, using data from their investigations and experiments. But they have to stay open-minded and be willing to change or discard their ideas when new or more reliable evidence is found. Scientific results are always subject to testing and possible revision. The Scientific Process is commonly thought to be linear, with a straight forward starting and stopping point. It is much more three dimensional than this, with ideas and conclusions building a intricate matrix of knowledge. This Science can be especially fun because it uses creativity and imagination (with a good bit of logic thrown in)!

We want kids to understand science content, but we also aim to build students' critical thinking skills through participating in inquiry investigations. The goal of BirdSleuth investigations is to enable students to be real scientists as they identify useful research questions, design and conduct appropriate experiments, and then interpret, communicate, and justify their findings. Some students conduct research by examining eBird data, collected by birders around the country. Others ask questions based on their own bird observations and then carry out field studies to address their questions. Through such activities, students experience science as an exciting, dynamic process, and they learn that they can design and conduct investigations to address their own questions both in the computer lab and in the field.

An "I Wonder" Board provides a way to track student questions throughout the investigations. Questions might arise during class that you can't explore because of time constraints, or because you are not sure how to address them, or because you want students to consider them more. Keep track of these questions on a class "I Wonder" list (this might be a bulletin board). Recording questions will eliminate pressure for



you to provide immediate answers and might encourage students to think about or answer their own questions. You'll also prevent the problem of losing questions in the "That's a great question. Let's come back to it later," vacuum. Some teachers have given kids post-it notes to keep handy for recording questions to place on the board.

If you have time and interest to go further with student investigations, we've developed **BirdSleuth: Investigating Evidence**, a complete set of online lessons that will help teachers guide their students through the

processes of observing birds, asking questions based on observations, gathering data to address questions, and sharing findings in a student research journal. This optional unit help you and your students conduct your own investigations about birds, perhaps addressing some of the "I wonders" your students have come up with. Progressing through the five lessons in the Investigating Evidence online module, students start by considering what is science and finish by presenting the results of an investigation that they have designed and conducted to address a research question of their choice. This free module includes lesson plans, journal pages, and online resources that will help your students ask scientific questions, craft and test hypotheses, collect and organize data, draw meaningful conclusions, and publish their work.

Citizen Science

Citizen Science is a partnership between scientists like the ones at the Cornell Lab of Ornithology and the public, including people like you! Citizen Science is quickly becoming

a powerful tool for scientists to answer continental questions, and teachers showing students how to observe their natural surrounding is among the first steps towards creating the next generation of citizen scientists. Remember, even if your students can't identify many birds, accurate observations is the first steps towards creating a valuable citizen scientist.

Through the Cornell Lab's citizen science projects, people around the world collect data about their local birds and contribute these observations to databases that are used by researchers, students, and the public to better understand bird distribution, abundance, and population trends. Citizen science works because a lot of people, like the children in your group, are knowledgeable about birds and enjoy watching them! Cornell Lab offers a variety of citizen science projects (such as Celebrate Urban Birds, YardMap, NestWatch, and Project Feederwatch) which differ in the kinds of information we people to collect. Developing a local bird count, whether in the schoolyard or another local area, is a great way for your students to better understand local bird species and to participate in the protection of birds! It is also an ideal opportunity for a science inquiry lesson based on field study. For students, participation in citizen science projects is motivational because their data are put to use addressing real-world issues of local and global concern.

The eBird citizen science project is one of the world's largest and fastest growing biodiversity data resources, currently receiving over one million bird observations per month entered by participants. This project asks people to conduct a local bird count (for as long or short a time as desired) and report the kinds and numbers of birds they see. Because of its flexible nature and the fact that data can be collected anywhere in the world in any habitat, eBird is popular among educators. In addition, students also can use the outputs of the eBird database to investigate intriguing questions about bird abundance and distribution at a variety of spatial and temporal scales.

A citizen science handout, describing three projects that are popular with teachers (eBird, Project FeederWatch, Celebrate Urban Birds) can be found in the resource pages.

Getting Started with the Wiki

Welcome to our Wikispace!

Besides being fun to say, a wiki can be fun to use! A wiki is a simple website that can promote transparent collaboration within projects. Our main wiki site is **<http://connectingkidsthroughbirds.wikispaces.com>**. Please regularly refer to this wiki as it contains links for almost every lesson.

Here are the four wikis you will be using.

- ☐ Connecting Kids through Birds
This wiki contains the curriculum, and the many of the online resources.
- ☐ Habitat Exchange
This wiki is where you will collaborate with other schools about your habitat.
- ☐ Share Your Action
This wiki is where you will show others some actions your classroom has taken.
- ☐ BirdSleuth Help
Are you lost? Need help? Hopefully this wiki will answer any questions you have.

You will regularly use these wikis throughout this Field Test.

Connecting Kids Through Birds Wiki

Dear Teachers,

We are very thankful for your participation in this pilot test of our new EPA-sponsored curriculum. We need your feedback to make this curriculum as exciting and easy-to-use as possible!

The ten lessons in this curriculum are listed along the left navigation bar. They are listed in a recommended order, but we think you'll find that these lessons can actually be completed in almost any order. Migration and Conservation are the main content themes of these lessons, and inquiry and citizen science are additional themes. Below is a diagram of the lessons, by theme.



We welcome and encourage your feedback about these lessons. You can send us your feedback—comments about everything from our recommended order, to classroom usability and content—in writing or online. Keep in mind, we need your feedback by the end of the school year OR by June 1, 2012... whichever comes first. We hope that you'll try most, if not all, of these lessons with your students. However, if there are lessons you can't complete with your students, please read these over and let us know if you see any potential "red flags."

These lessons were developed by a project team, with support from the Environmental Protection Agency (EPA). We hope you'll routinely be in touch with the educator at your partner site. These educators will help convey your responses to us and hopefully observe a few lessons as you teach them. Educators from around the country are collaborating on this project. These partners include:

Margaret Scaglione, Yonkers Public School District (Yonkers, NY);

Kim Check, Ward Museum of Wildfowl Art, Salisbury University (Salisbury, MD) ;

Katie Levedahl and Alberto Lopez-Torres, Sciencenter (Ithaca, NY);

Lori Nicholson, North Florida National Refuge Complex (Tallahassee area, FL);

Sharon Kassing, Saint Louis Zoo (St. Louis, MO);

Ben Jones, Trinity River Audubon Center (Dallas, TX);

Missy Wipf, PRBO Conservation Science (Petaluma, CA).

We hope to link students in these regions in exciting ways. As pilot test teachers, you can help us discover how these connections can work. YOU and your assistance will truly make this curriculum usable by teachers and students all throughout the country. We thank you!

Sincerely,

Jennifer Fee

K-12 Programs Manager

Cornell Lab of Ornithology

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Habitat Exchange Wiki

<http://habitatexchange.wikispaces.com>

Introduction

Earth is home to an astonishing diversity of organisms and habitats. Yet within that diversity there is also uniformity. By sharing information about your back yard you are providing others with your piece of a larger puzzle. With each piece, classrooms can begin to see how their local landscape and birds fit in across the United States. By looking at other classrooms you will begin to notice trends with common birds and uncommon birds, and with different habitats. These are the same trends that real scientists look at when they are developing conservational strategies. While knowledge is critical to conservation, collaboration is equally important to its success. On this wiki you will become familiar with this real life collaboration process.

Here's how to get started:

1. Click the New Page button in the top left-hand side of the wiki to create your school's habitat exchange wiki page (see [help video] if you need some help).
2. Type in the name of your school, including your state. For example: Britain Acres Elementary School (CA).
3. Select the "Habitat Exchange school name" template from the template drop down menu.

Share Your Action Wiki

<http://shareyouractions.wikispaces.com>

Introduction

With great knowledge, comes even greater responsibility. Through the knowledge you have gained in this curriculum, you now have a responsibility to fulfill in the stewardship of our ecosystems. No matter the size, your actions have meaning and play a critical part in the health of our natural world. Imagine the impact of the collective actions of Connecting Kids Through Bird's students alone! Do your part, and let others know, your efforts could be their inspiration!

You can earn badges for your bird conservation efforts.

Here's how to get started:

1. Click the New Page button in the top left-hand side of the wiki to create your school's wiki page (see [help video] if you need some help).
2. Type in the name of your school, including your state. For example: Britain Acres Elementary School (CA).
3. Select the "Share Your Actions school name" template from the template drop down menu.
4. Tag your school's page with the badges you plan to earn.

BirdSleuth Help! Wiki

<http://birdsleuthhelp.wikispaces.com>

Introduction

A wiki is a simple website that can promote transparent collaboration within projects. In this wiki, we are inviting collaboration between classrooms. Your students can post images, slideshows, maps, podcasts, videos, PowerPoints, graphs, and tables. Plus, not only can your students articulate their own ideas, they can read, edit, and critically review their peers' work.



Activity 1

Habitat Exchange

Before You Start



Time and Place

Two 45-minute periods

Materials Needed

Curriculum components

- “What’s That Habitat?” ([RESOURCE](#) page 1)
- [HABITAT EXCHANGE WIKI](#)
- Google Earth Tour (linked from online [TEACHER’S GUIDE](#))

You provide

- United States map
- Internet access projected for the class (to view the Google Earth tour and post to the collaboration wiki)

Getting Ready

- Get ready to show the Google Earth tour.
- Examine the Habitat Exchange Wiki and make a plan about how to post your schools information.

Big Idea

Students will characterize their habitat, communicate their findings to other classrooms via a wiki, and compare their habitat and birds with those at schools.

Learning Objectives

1. Students will be able to identify four key features of a habitat and relate each one to the specific function it serves for a bird.
2. Students will be able to relate habitat to bird diversity.
3. Students will be able to describe why collaboration is important to bird conservation.

Background

If you traveled from a rural area toward the city, you’d see an urban gradient of increasing roads, buildings, and parking lots. At one end of this spectrum are sites showing little influence of urbanization, such as, state parks and nature preserves. On the other extreme are metropolitan centers. Worldwide, urban areas are expanding both in size and number. Expansion of urban areas reduces native vegetation and increases impervious surfaces (such as buildings, marking lots, and roads).

For people working to conserve species, a key question is: what happens to the habitat value of undeveloped land as we move along the rural-urban gradient? Human settlements have a strong influence on bird communities. Many conservation biologists have focused predominantly on the protection of “natural” ecosystems, and haven’t placed as much importance on urban and suburban areas. However, some studies have shown that these areas can have value for birds. Cities typically are located near large water bodies, rivers and estuaries, or along coastlines. Large urban parks and reserves might still support high species diversity because these protected areas are the habitat fragments of highly diverse ecosystems. In addition, many urban and suburban areas are located close to undeveloped native areas or forests, so birds may respond directly to the plants and parks within urban habitats, and may also respond to



Habitat Exchange

broader landscape features including large forested areas that are nearby.

Finally, some species are well adapted to urban life. Peregrine falcons typically lay on cliff ledges however city sky scrappers provide adequate nest sites for these birds. Many invasive species that are found across the United States are well adapted to urban life such as European Starlings and House Finches. No matter where you live, your habitat is important for birds.

Conducting the Activity

1. What's in Your Neighborhood?

- a. Ask students to think about the neighborhood that their school is in. Brainstorm a list of about 10 phrases they would use to describe the site to someone who had never visited the are. Make a list of these phrases/features on the board so that you can later add them to your wiki site.

Ask:

- *How many plants are here? What types (e.g. trees, bushes, lawns, etc.)? For example: "Lots of trees around the school."*
 - *What human-created things do you see (e.g. buildings—large and small, roads—wide or narrow, parking lots, etc.)? For example, "There are lots of houses and buildings."*
 - *How much space is "green" versus "developed"? For example, "There's lots of green space around the school, but not much at the mall."*
- b. Decide which one of these six categories you think your school should be classified into. If the class cannot reach consensus, take a vote... this classification scheme is open to interpretation.
 1. Urban: skyscrapers, office buildings, parking lots/structures, some trees, streets.
 2. Urban residential: apartment buildings, houses/condos, trees, parking lots, streets
 3. Suburban/small city: houses, apartment buldings, lawn, bushes, trees, yards, golf course, mall
 4. Rural agriculture: farm fields, houses, lawn, bushes, trees, yards, farm buildings, pasture, ranch land, small roads
 5. Rural residential: houses, lawn, bushes, trees, yards, state parks, preserves, golf course, forest, parking lots
 6. Coastal or lake community: ocean/lake, houses, lawn, bushes, trees, yards, state parks, preserves, parking lots

Later, ou will compare your school to other schools both within the same and different categories.

2. What's It Like for Birds?

- a. Ask students to brainstorm essential things that animals get from their environment to help them survive and reproduce. If they have difficulty, suggest some examples of things that humans need to survive such as food, water to drink, and a place to live. Make a class list of "What do Birds Need from Their Habitat to Survive and Reproduce?" on the board. Divide the habitat needs into these categories:
 1. Food
 2. Water
 3. Cover (nesting areas, roosting areas, places to hide or escape, shelter)
 4. Space (such as hunting and feeding areas, and migration routes; species also need enough of the right habitat to fulfill their needs)



Habitat Exchange

Note: Students may suggest that living things need air. This is true, but it is not included as habitat unless you consider it as part of “space.” Students might suggest that birds need things like mates or families—this is also true, but these are not environmental needs and therefore not part of the habitat. You may want to hand out or post “What is Habitat?” (**RESOURCE** page 1)

Ask:

- *Do you think this is a good place for birds to live? Why or why not?*
- *Does our site meet these habitat needs and if so, how?*
- *Will our habitat be a good place for birds to nest? Why or why not?*
- *Do you think all birds would live and/or nest here? Why or why not?*
- *Why do different birds prefer different habitats? (All birds have these four habitat needs, but birds differ in how they meet these needs. For example, a robin needs very different food than a Red-Tailed Hawk [robins eat invertebrates, especially worms, and fruit; hawks are birds of prey and eat vertebrates like squirrels and mice.] A Mallard Duck has a different need for water than a hawk or robin because the duck swims and filter feeds in water. Food availability and the adaptations of the bird are the primary factors determining where each species lives and breeds.)*

3. Introduce Other Schools

- a. Explain to the students that children all around the country are learning about bird migration and habitat through this project. If possible, project the Google Earth tour (**<http://habitatexchange.wikispaces.com/home>**) of partner sites. If you cannot display the tour, then show a map of the United States and tell students where these partner schools are located.

Ask:

- *How do you think the habitats are different in these locations (including level of urbanization and extent of natural habitats found there)?*
- *Do you think you would find different birds in these areas? Why or why not?*
- *What sites do you think have the most similar birds? Why do you think that?*
- *Which sites do you think have the most different birds? Why do you think that?*
- *How have certain birds adapted to urban environments? (Sample answer: these birds take advantage of human food, even at places like garbage dumps. They also often nest in human-supplied locations.)*

4. Comparing Schools

Ask students if they have ever heard of a “wiki” and what they think a “wiki” is. Introduce the wiki as an online space where people can collaborate by editing documents together and by sharing ideas or information. Introduce the Habitat Exchange Wiki where you will create a wiki page that they can use to share what they are doing with others. Tell the students that they will be collaborating with students from other schools, within their state and throughout the US. They will do this by sharing information they learned during the previous and upcoming lessons with other students participating in this project.

- a. Ask students to categorize their site and add it to the table.
- b. Create your school page using the template.
- c. Add information that your class has gathered about your habitat to your page within the **HABITAT EXCHANGE WIKI**. Add your site in the table. Browse the other schools listed on the wiki find out what other students have learned about birds in their area—select one school in the same habitat category and at least one school in another habitat category.



Habitat Exchange

Ask

- *How is our habitat similar and different? Do we share similar habitat descriptors? Do we share similar birds?*
- d. Then, compare their school to another school in the same category, and to another school in a different category.





Activity 2

Bird Survivor

Before You Start



Time and Place

45 minute period and 15 minutes follow-up.

Materials Needed

Curriculum components

- “Nesting Birds” quiz (**JOURNAL** **PAGE** 1; key is located on **RESOURCE** page 2)
- 24 Bird Survivor! Game Cards (see **RESOURCE** pages 3–6)

Getting Ready

- Copy and cut out the 24 Bird Survivor cards from the Resource Guide. For durability, you may wish to paste the statements onto note cards or have them laminated.
- Copy “Nesting Birds” Quiz, 1 per student (**JOURNAL** page 2)
- Make space in the classroom for Bird Survivor! Game

Goal

Students will explore what they already know about nesting birds, then play a game that introduces some of the challenges that nesting birds face.

Learning Objectives

1. Students will be able to list the steps of the bird nesting cycle.
2. Students will be able to describe several challenges that nesting birds face.
3. Students will be able to compare and contrast strategies that different birds use to successfully produce young.

Conducting the Activity

1. “Fact or Fiction?” Nesting Birds Quiz

- a. Give students about 5 minutes to individually fill out the quiz about nesting birds (**JOURNAL** page 1). Emphasize that they are taking the quiz just to explore their own knowledge and ideas at this point, and their responses will not be graded.
- b. After students have filled in their responses, read each question aloud. For each question, have students raise their hands and vote for the answer they think is best.

For a more active experience, establish “Fact” and “Fiction” sides of the classroom, and ask students to move between the sides of the room depending on their opinion. You may wish to reveal answers as you go (a key is located on **RESOURCE** page 2), or simply allow discussion and let the facts get uncovered as the lesson unfolds! Be sure to privately note any widely-held misconceptions.

2. Introductory Discussion

- a. Introduce the activity by having a few students share stories about their experiences with bird nests and young birds.



Bird Survivor

Ask:

- Why do birds build nests? (Nests protect eggs and young.)
- What do bird nests look like? Where are they found? What kinds of materials might a bird use to build a nest? (sticks, leaves, moss, vines, feathers, spider webs, human-made materials such as string or scraps)
- Have you seen a bird build a nest? At what time of year? At what time of year have you seen nests? Did it have eggs in it at that time of year? (Nests are used during the breeding season. Birds don't live year-round in nests, so nests seen at other times of the year are abandoned or will not be used until next year, if ever again.)
- Some animals, such as humans, can have babies any time of year. But most birds only breed in the spring and summer. Why do you think that is? (Food and water availability is highest at those times of the year.)
- Have you seen a baby bird? Where was it? What did it look like?

3. Learn the Steps of Bird Breeding

a. Write the following "Stages of the Bird Breeding Cycle" on the board:

1. Find and defend a territory
2. Find a mate
3. Build a nest and lay eggs
4. Incubate eggs
5. Feed and raise nestlings
6. Nestlings fledge

4. Bird Survivor Game

- Prepare to play the Bird Survivor Game. Ask for five volunteer "birds" to stand at one end of the room and name them Bird 1, Bird 2, Bird 3, Bird 4, and Bird 5. Tell these students that they are going to try to successfully complete a breeding cycle.
- Shuffle the Bird Survivor! Game Cards (**RESOURCE** pages 3–6) and distribute ALL of the cards to the remaining students, even if some students receive more than one card. At the top of each card, one of the breeding stages is listed. Below that is a breeding event that will be read aloud and directed to one of the 5 volunteer birds.
- Ask the five students who have a "Find and Defend a Territory" card to stand up. Pick one of the students to read his or her card to Bird 1, who follows the instructions on the card. Have the remaining four students holding the "Find and Defend a Territory" cards each read their card to a "bird," continuing with Bird 2 and progressing through the remaining "birds." Continue the game by repeating this step, picking cards in the order of the "Stages of the Bird Breeding Cycle"(previous page).
- If a "bird" is told that the game is over for them, they should step out of the line-up. During the game, be sure to discuss any terms that are unfamiliar to students. Continue the game until all 24 cards are read.
- Follow the game with a game discussion.



Ask:

- Which birds do you think were the most successful? (The most successful is the bird that successfully raised the most young. The bird that took the most steps may not actually be the most successful bird.)
 - Which birds had the least success? (Possible answers include: the bird that died early, the bird that did not raise any young. Emphasize to students that in order for a nesting attempt to be successful, at least one offspring must survive. Note that even the bird who took the fewest steps forward was successful, since he/she still fledged young despite the challenges.)
 - Do you think all birds follow these steps of the nesting cycle in this order? If not, how do bird life cycles differ? (Some species, like many geese and ducks have precocial young, meaning that their babies can follow them and gather their own food shortly after hatching. Some species keep their mate year-after-year, so they don't have to do that step every year.)
- b. Discuss some of the factors that affect nesting birds.

Ask:

- What were some of the challenges the nesting birds faced? (Habitat destruction/fragmentation; invasive/non-native species such as European Starling; bad weather; predators such as hawks, snakes, raccoons; pesticides; cowbird nest parasitism; dead mate; mites)
- What are some positive or "lucky" things that happened to some of the birds? (Protected habitat, nest boxes, good weather, good mate, lots of food)

4. Extension

Activity #1.

Ask children to act out the different stages of the breeding cycles in a "Guess the Life Cycle" charade game, using the six life cycle stage categories.





Activity 3

Migration Obstacles

Before You Start



Time and Place

60 minutes in a gym or outdoor space.

Materials Needed

Curriculum component

- Migration Obstacles Visuals (**RESOURCE** pages 7–14)

You provide

- A world map
- Stopwatch or wristwatch
- Dry erase board and marker
- Clear plastic wrap and chairs or poles to attach plastic wrap between (windows)
- Heavy string or rope, 5–6 pieces, each 5–15 feet long (various uses: start line, power lines, to designate an area for a wildlife refuge)
- Tarp or plastic bags with yellow road lines marked on it or tape on the ground (road)
- Cardboard boxes (city buildings)
- Cat head band or costume (optional, for cat)

Getting Ready

- Gather the materials you need and determine a site large enough for the Obstacle Course. Set up the course (see details under the 'Course Layout' at the end of this lesson, and image in **RESOURCE** page 15.)

Big Idea

Students will discover the obstacles birds face during their amazing migratory journeys.

Learning Objectives

1. Students will be able to define migration.
2. Students will be able to list potential hazards that birds face during migration.
3. Students will be able to identify ways to help reduce negative impacts on migrating birds.

Conducting the Activity

1. Play the Game

- a. Let students know they will discover bird migration through a migration obstacle course. Explain the RULES of the game:
 1. **PRETEND:** You have to pretend you're a bird all the way through by flapping your wings and vocalizing a bird song or call.
 2. **DON'T TOUCH:** If you touch any of the obstacles, you instantly fail to migrate! Stand to the side.
 3. **STAY IN BOUNDS:** If you go out of bounds, you instantly fail to migrate! Step to the side.
 4. **CHEER:** The students waiting in line can urge the birds through the course by clapping and cheering—preferably in bird-like sounds!
- b. First, play the game doing the spring migration from “south to north.” As the teacher, be the “example bird” that goes through the obstacle course to demonstrate how to play and conquer all obstacles:
 1. Begin at the start line
 2. Move under “windows” (Plastic wrap)
 3. Jump over the pesticide-ridden field (image)
 4. Jump over “power lines” (rope)
 5. Fly” around wind farm (getting tagged by stationary student)



Migration Obstacles

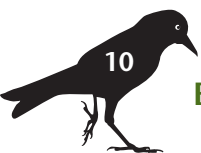
6. Run around habitat destruction (image)
 7. Fully stop before the road (black plastic), look both ways, and walk slowly across
 8. Try not to get hit by the cars (one student slowly going back and forth on the road)
 9. "Fly" around "buildings" (card board boxes)
 10. Try not to get caught by the cat (getting tagged... once a "bird" is caught by the cat, it fails to migrate.)
 11. Cross the finish line and successfully migrate!
- c. Depending on how much space you have, ask between 1–3 students to go through at a time. Depending on group size and time constraints, you may wish to have a shorter course with fewer obstacles.
 - d. Once a student successfully reaches the end of the course, have them line up lengthwise to the course to watch and cheer on the other students. If a student fails an obstacle, they do not survive migration, and must step to the side. After the entire class has completed the course, record how many students successfully completed the northern migration and review survivorship (How many made it? What percent did not survive?). You may also review race times and calculate mean times. (See Extensions.)
 - e. Option:
 1. Set-up "wildlife refuges" with rope or tape along the obstacle course to represent safe haven for migratory birds. Time the birds with and without refuges, and determine mean race time and survivorship.

2. Discussion about Obstacles

- a. Finish the game by asking students follow-up questions.

Ask:

- What obstacles do birds encounter during their migration (both examples from the game, and others they might know)?
- What else do you think makes it hard for birds to survive migration? (possible answers: confused about their direction by bright lights, fly into buildings, bridges and towers, die from eating foods with pesticides, pushed out by exotic species (e.g. European Starlings, House Sparrows), or eaten by predators (e.g. cats, raptors, snakes), having enough energy to go the distance).
- Of the obstacles you experienced, in which do humans play a role? (Many of them!)
- What can you do to help? Have students brainstorm actions they can take. (Some possible answers: keep cats indoors, plant bird habitats, clean up polluted or littered habitat, don't use pesticides on lawns, remove exotic plants, turn off lights at night, etc.)
- What would happen to birds who were slowest in their migration? (The slower birds would have the last choice in food, territory, and mates. Some have to fight for these things. Do you think you'd have the energy to fight after migrating? If you arrived too late, you may not survive at all!)
- Why do they think that males normally arrive first? (Males need to set up and defend their territories prior to the females arriving. The first males have the better territories, and attract the best females.)



Migration Obstacles

- b. Summary: discuss that a bird's life can be full of dangers, but not all birds will encounter all of these obstacles. Each day they migrate, they travel long distances and are likely to face challenges along the way. The biggest threat is human disturbance of habitat. Many migrating birds need a place to rest and eat during their long journeys, and if they can't find suitable stopover locations, they will not have enough energy for migration.

3. Introduce Real Bird Migrants

- a. Show students the map and point out how far different species migrate. Discuss what obstacles the students think these species might face along the way.
1. The Golden-Crowned Sparrow migrates from Alaska and the Yukon Territory to/from the California coast and Mexico.
 2. The Yellow-Rumped Warbler migrates from most of Canada and the Klamath Basin in the United States to/from the southern United States, Mexico, and Central America.
 3. The Arctic Tern travels up to 25,000 miles between the North and South Poles every year.
 - Remind the students how it feels to travel in a car, bus, or plane for more than two hours. If you had a perfectly straight road from the North Pole to the South Pole, it would take you 280 hours straight in the car (that's almost 12 full days!) driving at highway speed without stopping, eating, or drinking.

3. Extensions

Activity #1.

Math/Graphing: You may wish to time each student as they race through the course, recording times on a class data sheet or on the board. (See table below)

Activity #2.

Compare and contrast the race times and survivorship for the main course and any optional habitat improvements you choose to make.

Activity #3.

Brainstorm the top migration hazards in your area and determine whether they are natural or man-made hazards. Add new hazards from the final discussion to the obstacle course. After the final discussion, brainstorm about what individuals can do to help, and add conservation actions to the obstacle course.

ACTIVITY #1 TABLE

Name	1st Migration	2nd Migration	Average
Lisa Derado	45 seconds	40 seconds	42.5 seconds





Activity 4

Should I Stay or Should I Go?

Before You Start



Time and Place

45 minute period, plus follow-up

Materials Needed

Curriculum components

- 12 game cards, cut apart (**RESOURCE** pages 16–17)
- “My Favorite Bird” (**JOURNAL** page 2)

You provide

- 40 “Survival Chips” (consider using pennies, pebbles, poker chips, popsicle sticks or any small trinket)
- 3 name tags or stickers to designate student volunteers as 1) “Migrant,” 2) “Temperate Resident,” 3) “Tropical Resident”
- Online and print bird species information for student research (field guides, books and websites such as All About Birds)

Getting Ready

- Gather supplies and cut apart the “Should I Stay or Should I Go” game cards. You may wish to laminate or paste them on index cards for durability.

Big Idea

There are costs and benefits to migration. Some bird species migrate while others do not.

Learning Objectives

1. Students will be able to identify the costs and benefits of migration.
2. Students will be able to mention “food availability” as one key indicator of whether a bird species will migrate or remain in one area year-round.
3. Students will be able to define temperate resident, tropical resident, and migrant.

Conducting the Activity

1. Migration Discussion

- a. Initiate a discussion of your students’ thoughts about migration:

Ask:

- Have you seen any movies about bird migration (such as “Winged Migration”)?
- Do some bird species stay in our area year-round? If yes, what birds do you see here year-round
- Where do birds migrate?
- When do birds migrate?
- Why might birds migrate?
- Do all birds migrate?

2. “Should I Stay or Should I Go?”

- a. Select three student volunteers and ask them to the front of the class. Using name tags, designate one as “tropical resident,” one as “temperate resident,” and one as “migrant.” (The tags refer to where the birds are found throughout the year, “tropical residents” complete their life cycle at southern latitudes, “temperate residents” complete their life cycle in more northern latitudes, and “migrants” complete their life cycle in both.) Give each of these three students 10 “survival chips” (cards, tokens,



Should I Stay or Should I Go?

coins, etc) that signify “success.” Hold the other chips in case you need to give some out.

- b. Pass out each of the 12 game cards (**RESOURCE** pages 16–17) to 12 other students. One-by-one, ask them to read each card aloud. Some cards pertain to only one bird (the migrant, for example), others pertain to more than one bird (for example, birds that breed in the temperate zone both residents and migrants). Decide as a class which bird(s) the card pertains to, and give “survival chips” or take them from the appropriate bird(s) as directed.
- c. Following the demonstration, count how many “survival chips” each bird has, and discuss the costs and benefits of each strategy. Make the point that although one bird may have ended up with more, in real life, there is no “winner”—some strategies work better one year than the next, and success also varies among bird species. You may wish to cite the example of strictly insectivorous birds, which would find it impossible to spend their winters in a cold region where there are no insects.

3. Table Summary

- a. Ensure that students understand that the primary reason why birds leave the warm tropics is to feed and raise nestlings. Although the tropics have a good climate year-round, birds face significant competition for food. Going north in the summer offers migrating birds a huge variety and quantity of food sources, such as insects. But it’s a balancing act, because migration is dangerous and many birds die during their journeys. Some bird species migrate, and others don’t. You may wish to summarize by drawing a table at the front of the class. (See below.)

4. Research a Favorite Bird

- a. Ask each student to select one favorite bird (you may wish to specify that they select a bird found in the US or locally, or let them choose any bird in the world). Encourage students to go to the All About Birds online field guide website and/or use bird field guides to explore where their bird is found throughout the year. Using a range map and their own research, challenge students to determine where this species is found throughout its yearly cycle and record their findings on **JOURNAL** page 2. If their species is migratory, they might indicate the flyway(s) the bird takes, and whether some or all individuals of this species are migratory.

5. Compare and contrast strategies

- a. Have students share their maps and reports with the rest of the class. Alternatively, you could first ask “migrators” to raise their hands and have a class discussion exploring that strategy (i.e.: Which species travels the farthest? Are there any species in which ALL members of the species migrate? Do any species change their strategy depending on the year?). Follow up by having the “temperate residents” share their strategy for surviving the winter (i.e.: What do temperate residents eat during the winter?).

TABLE SUMMARY

	Tropical Residents	Migrants	Temperate Residents
Survival Rate	High survival rate (avoid hazards of migration and harsh winter weather)	Moderate survival rate (due to hazards of migration)	Low survival rate (due to cold and starvation)
Number of Young Raised per Year	Few young raised per year (food for young is less abundant)	Moderate number of young raised per year (due to abundant food in breeding areas)	Many young raised per year (due to abundant food)





Activity 5

Meet a Migration Scientist

Before You Start



Time and Place

One 45 minute period plus additional time for extensions.

Materials Needed

Curriculum components

- "Draw My Scientist" (**JOURNAL** page 3)
- "Meet a Scientist" (**JOURNAL** page 4)
- "Me, the Scientist" (**JOURNAL** page 5)
- My "I Wonder" Questions (**JOURNAL** page 6)
- "Meet a Scientist" Report (**RESOURCE** page 18)

You provide

- Paper and pencils, colored pencils, markers, or crayons (for "Draw a Scientist")
- Computer/projector to display video of Nate Senner's work

Getting Ready

- Copy the 'Meet the Scientist' Report and the 'Kinds of Questions' article if you are giving them out to students. Familiarize yourself with the video and blog posts about Nate's work, and decide how you will let students view these resources. Prepare your projector or computers for displaying the video clips (optional). (Request permission to view the video from LD85@cornell.edu if you plan to show it.)

Big Idea

Scientists use tools to gather and interpret data and create meaningful information.

Learning Objectives

1. Students will be able to identify and describe the components of a scientific investigation.
2. Students will be able to analyze a "Meet the Scientist" report to identify the purpose of the scientist's investigation, the questions asked, and methods used for collecting data.
3. Students will understand the importance of asking questions and will learn about types of resources/methods they can use to answer their questions.

Conducting the Activity

1. Draw a Scientist

- a. Ask the students what they think scientists are and what they do. Give them about five minutes to draw and describe a scientist at work on **JOURNAL** page 3. Ask students to share their drawings. You may want to tape them up at the front of the class grouped by similarity (for example, Do most scientists wear a white lab coat? Do most drawings contain chemicals? Instruments? How many scientists are male? Female? Are any of the scientists outdoors? How do scientists do science?), and discuss these ideas.

2. Meet the Scientist

- a. Write these questions on the board, or refer to **JOURNAL** page 4.

Ask:

- What questions did Nate Senner and his team ask?
- Why was he interested in those questions?



Meet a Migration Scientist

- *What kind of information and data did they collect? What kind of tools did they use or how did they collect this information?*
 - *What has Nate learned as a result of his investigation?*
- b. Show the video “In the Field” (16 minutes, Note: Request Permission) and “The Tools I Use” (4 minutes) about Nate Senner’s work (**RESOURCE** page 18).
If that is not possible, give the students 5 minutes to read the “Meet the Scientist” summary report on Nate Senner.
- c. Then, discuss the answers to the questions. Finally, compare and contrast Nate’s work with the work of the scientists they drew.
- d. Depending on time, you may also ask the students to discuss the following questions within small groups or as a class:

Ask:

- *What are the challenges that Nate and his team might face?*
- *If you met Nate Senner and his team, what questions would you ask them about their work?*

3. Nature of Science

- a. Emphasize the following aspects of “the nature of science” on the board.
1. Scientists collect data and information. They look for evidence that will help them draw conclusions.
 2. Scientific ideas change and grow. One observation or experiment often leads to new questions. There is always something new to learn!
 3. Scientists are creative in the questions they ask and the methods they use to answer them.
 4. Scientists work together, getting ideas from each other as well as from their own experience and research.
- b. Encourage the students to discuss these aspects by sharing examples from the scientific investigations they have read about, seen on TV, done themselves or know about because they know a scientist personally. You may also discuss how these aspects of science relate to Nate Senner’s investigation.

Ask:

- Would you like to be a scientist like Nate or other people you mentioned? Why or why not?
- What might be fun about his job?
- What might be difficult?

4. Extensions

Activity #1.

- a. Extend this unit by doing our free online investigating evidence unit. Continue to keep track of “I Wonder” questions (see **JOURNAL** page 6), and consider using the Investigating Evidence resource to address them (See **JOURNAL** page 5).

Ask students to go back to their small groups and assign one group scribe. Ask the students to spend three minutes brainstorming questions with the following prompt:

What questions do you have about migratory birds (or birds in general)?



Meet a Migration Scientist

- b. Emphasize that the group should write down whatever questions come to their minds and write as many questions as possible within the allotted time. After three minutes, ask the students to pick one question they would want to answer the most. Write this question on **JOURNAL** page 5. Then, brainstorm methods to answer this question for 3 minutes, recording ideas in the Journal.

Ask:

- *What different ways (resources/methods) did you come up with to answer your questions?*
 - *Why do different questions require different ways of finding out answers?*
- c. Continue the lesson by covering Investigation 1 of Investigating Evidence. As part of class, or for homework, consider having the students read the article “Kinds of Questions” from the Investigating Evidence resource guide. Tell the students that questions can be classified into four categories based on the ways in which they are answered. Introduce the four categories:
1. Questions answered by **REFERENCE MATERIALS**: These are questions for which you “look up” answers or ask answers from experts. Often, you have to read and put together information from several reliable sources before reaching a conclusion about your question. The references you are looking at are based on the findings of scientists (or experts in any field) who did research before.
 2. Experts themselves can be references. By talking to a scientist, you can learn about his/her research and about other good resources for finding answers to your question. This is one way to find out about very current information.
 3. Questions answered by **Data Exploration**: You’ll look at other people’s data to answer these questions.
 4. Questions answered by **Observational Study**: If you want to answer these kinds of questions, you’ll need to collect data as you observe the natural world.
 5. Questions answered by **Experimental Study**: If you want to answer these kinds of questions, you’ll generate the data yourself by conducting an experiment.
- d. Have the students write down answers to these questions/activities in class or for homework:
1. Put some of the questions you generated in class in each of these categories (**REFERENCE MATERIALS**, Data Exploration, Descriptive Study and Experimental Study). Write extra questions for the categories that don’t have any questions.
 2. Is it important to ask different types of questions? Why or why not?
 3. What kinds of questions do you ask most of the time?
 4. Think back to Nate Senner’s work. What types of questions did he ask? Are there types of questions that are most useful to scientists? If so, what? (Scientists use a combination of all these types of questions to carry out their research.)





Activity 6

Shared Birds, Shared Habitats

Before You Start



Time and Place

Two 45 minute periods

Materials Needed

Curriculum components

- 6 migratory bird cards, cut apart (sent in the package we mailed, **RESOURCE** pages 21–22)
- 10 habitat photos: 5 tropical and 5 temperate (sent in the package we mailed, **RESOURCE** pages 23–32)
- Copies of Journal Page 7 (Making a Difference for Migrating Birds)
- Conservation Challenges and Actions Table
- Habitat Name Slip (**RESOURCE** page 19)
- **SHARE YOUR ACTION WIKI**

You provide

- Large wall map of North and South America (or world map)

Getting Ready

- Place each of the habitat images on tables/shelves around the room before students arrive.
- Cut out the 10 habitat name slips so they can be placed on the map to give students more perspective. (**RESOURCE** page 19)
- Cut apart the 6 migratory bird cards. (**RESOURCE** pages 21–22)
- Print **JOURNAL** page 8 (copy 1 per student or group)

Big Idea

Conservation of a migratory species requires protection of key habitats needed in the breeding and wintering seasons, as well as on the migratory path.

Learning Objectives

1. Students will be able to name three conservation challenges that birds face.
2. Students will be able to name three actions they could take to help reduce negative habitat impacts on birds.

Background

A top priority for bird conservation in the 21st Century is to conserve habitats and ecosystem functions. We need to reverse bird population declines and keep common birds common. This can be achieved by preserving healthy habitats and addressing the most pressing threats to bird populations. Because the majority of birds are migrants that use habitat across the new world, and sometimes across the Northern hemisphere, connecting people is important.

Conducting the Activity

1. Show “State of the Birds” video

- a. The 2009 State of the Birds introductory video provides an excellent overview to introduce students to threats faced by birds in today’s world. If possible show this video before the activity. The video is 6:30 minutes long.

2. Habitat Activity

- a. Walk around the room showing the students the habitat photos, both temperate and tropical (**RESOURCE** pages 23–32). Discuss where in the world these habitats exist, referring to the world map and the map key (**RESOURCE** page 20. Add the name slips (**RESOURCE** page 19) to the map so students have a perspective idea of location. What type of habitat is common in your area?
- b. Hand out **JOURNAL** page 7 to each student. Students will fill this out as they explore the various habitats and



Shared Birds, Shared Habitats

birds represented in the activity.

- c. Divide students into seven groups, giving each group one of the six migratory bird cards (**RESOURCE** pages 21–22) to begin.
- d. Ask: Which habitat do your migratory birds live in during the summer? Have students place their migratory bird in front of the habitat picture (**RESOURCE** pages 23–32) corresponding to that bird's breeding (summer) habitat. Have the student group read the conservation challenge at that site, and if they can, come up with an action that they could take to help with that challenge. Then, encourage the students to also brainstorm actions that they would recommend to adults (such as their parents or to government leaders). Thoughts can be recorded on **JOURNAL** page 7.
- e. Ask: Where is your bird in winter? Players then "migrate" their game piece to the picture of their bird's winter habitat and read about the threats to that habitat. Again, ask the student to brainstorm conservation actions and record them at the bottom of Journal Page 8. Students can also look at the tropical resident birds that share habitat with "our" birds during the winter, to learn about the challenges these tropical resident birds face all year on their habitat.
- f. This could be a breaking point between lessons. Ask students to go home and think about birds and threats their habitats face.
- g. Discussion: Why is it important to conserve North American habitat where we live, and the South American habitat? (Migratory birds are found in the U.S. and Canada in spring and summer, then migrate to spend the non-breeding (winter) months in the tropics where they share habitat with many year-round tropical residents. Managing the tropical habitat wisely is just as important for these migratory birds as managing their North American breeding habitats. Some of these tropical residents are of high conservation concern, so managing the southern habitats will benefit them year-round.)
- h. Discussion: If you have done the Migration Obstacles lesson, ask students about where these birds are during migration. If you haven't done this lesson, ask students where they think these birds are during migration, and what types of obstacles they could face. Do students think that the areas these birds use during migration are likely to face similar conservational threats as their summer and winter habitats?
- i. Finally, ask students to share the conservation actions they brainstormed with the class. Summarize the kinds of things that students can do that will benefit all habitats, such as:
 1. Using less "stuff." Reduce and Reuse.
 2. Recycle!
 3. Help conserve non-renewable energy by using less gas and power.
 4. Eating "lower on the food chain" by consuming less meat and eating more locally grown produce.

3. Extensions

Activity #1.

Research threats to bird habitats in the area in which you live, or another region of interest. Encourage students to do something positive for the environment (for example, see if you can reduce paper usage in class, urge the school to use fewer disposables, put up signs in school restrooms encouraging water and towel conservation, make sure school buses or parents aren't idling at pick-up and drop-off times). Be sure to share any actions you take on the **SHARE YOUR ACTION WIKI**.



Shared Birds, Shared Habitats

Activity #2.

a. Discuss with students the relationship between morphology and habitat. Coastal birds look and act very different than forest birds. Why is this? Can students categorize birds based on appearance into what environment they would be found in? Natural selection and evolution have shaped birds to excel in their environments, and based on morphological features such as bill/beak, wing, leg, and eyes, we can begin to understand their niche in the environment. Show students the tropical habitat cards (**RESOURCE** pages 28–32) and see if they can come up with different morphological features that dictate each bird's role in its ecosystem. Here are some examples.

1. Snowy-crowned Tern: Long wings, a black eye stripe to reduce sun glare, and a long beak make this bird built to spend days at sea feeding on fish.
2. Crested Duck: Round bill, webbed feet, and waterproof feathers make this bird ideal for swimming and dabbling. (Dabbling refers to how some ducks feed, moving the bill around in shallow water)
3. Mexican Wood-nymph: A long skinny bill allows this bird to drink nectar from flowers.
4. Highland Guan: Powerful legs allow this bird to spend a lot of time on the ground.
5. Aplomado Falcon: Strong talons, a black eye stripe called a malar stripe in falcons, a hooked bill, and a slender body allows falcons to hunt other birds.
6. Scarlet Macaw: A large powerful beak allows macaws to crack open nuts and logs.

b. Many features are hard to see on a single photo. Have students research one of the tropical residents, or a bird of their choice, and come up with a complete list of morphological adaptations that make it possible for them to survive in their environment.





Activity 7

Count Birds for Science

Before You Start



Time and Place

45 minute period outdoors, plus 10–30 minutes/day in the future, to regularly count birds.

Materials Needed

Curriculum components

- Bird Watch Report (**JOURNAL** page 8)
- Citizen Science Brochures
- Celebrate Urban Birds kit
- “Pick a Project”
- “You Can be a Citizen Scientist” video (linked on the **CONNECTING KIDS WIKI**)
- Cornell Lab of Ornithology Citizen Science brochures (included in the mailing)
- Celebrate Urban Birds kit (included in the mailing)
- Stopwatch (included in mailing)
- Optional: BirdSleuth Game cards, Pocket Naturalist guides (for purchase from BirdSleuth), or field guides

You provide

- Clipboard and pencils
- Watch to time counts
- Optional: Class set of binoculars

Getting Ready

- In order to be a citizen scientist, you’ll have to pick a project! Register with one of the programs to get started. Read the project website carefully to make sure you’re ready to start a given project. Use the bird poster, or make a PowerPoint presentation to present the most common birds in your area.

Big Idea

Your data about birds and their habitat is important and can help scientists understand the ecology of bird populations in your area and throughout the world.

Learning Objectives

1. Students will be able to define “citizen science.”
2. Students will be able to describe why scientists identify and count birds.
3. Students will be able to identify at least five local birds.
4. Students will be able to demonstrate the ability to collect and organize data during a local bird count.

Background

Ideally teachers and students will have some knowledge of bird identification before beginning citizen science. The take home message is not bird identification, but that everyone can help through citizen science. Do not get bogged down in teaching your students bird identification, but rather emphasize that their observations about the natural world are valuable. Citizen scientists should be confident about the observations they report, even if they only know 5 species. There are a wide range of citizen scientist projects and activities for teachers to choose from based on their interests and knowledge of bird identification.

Conducting the Activity

1. Introduce Citizen Science

- a. Start a conversation about what you have learned about birds so far.

Ask:

- *Think about what you know about birds. How do you learn about birds? (Some students may have parents or teachers that are birders, others may watch Animal Planet or the Discovery Channel. Others may have a bird feeder or yard where they occasionally watch birds. Many skilled bird watchers learn one bird at a time. If you see something that interests you, research it!)*
- *How do you think scientists learn about birds? (You may wish to introduce the word ORNITHOLOGY). Ornithology*



Count Birds for Science

is the study of birds. Many ornithologists learn about birds through observation and research.

- *What other kinds of people know a lot about birds, even if they aren't research scientists? (Vets, zoo-keepers, bird feeder watchers, hikers)*
- *What can we learn by studying/counting birds on our school campus or at a nearby nature area? (You can look at how your local birds are doing compared to other areas/schools. Students can start to look at how different types of habitat attract which species. By adding what you know to the wiki, students can compare what they are seeing.)*
- *Why is it important to study birds and know which ones are on our campus? (Birds are bio-indicators, in the sense that their populations can reflect the overall health of the environment. Healthy, stable bird populations are supported by healthy and stable environments.)*

b. Introduce citizen science by showing a video.

Ask:

- *How should we make observations about birds? What should we look for? (Species, number, habitat, behavior, diet, reproduction, and songs are just some categories of observations that can be made about birds.)*
 - *What could a scientist do if he or she wanted to know about the birds found in your area? Should s/he come to visit? Is there someone s/he could ask for the information instead of traveling there in person? (Accurate science often means having as many data sets as possible. Citizen Science allows scientists to feasibly generate these large data sets without traveling to each location in person. Many scientists come up with standardized surveys for people to complete.)*
 - *Have you heard of citizen science? What do you think it means?*
- c. Introduce the Citizen Science project you chose to participate in. If you chose "Celebrate Urban Birds," share the associated posters with your group. If you've chosen to use eBird, share any other bird resources, such as the feeder poster or focus cards, if you've purchased them.

2. How to Identify Birds

- Emphasize to children that, no matter which project you choose, the most important first step in being a good citizen scientist for birds, is to be able to accurately identify the birds.
- If you've chosen to purchase or create and use focus cards, hand out the bird focus cards for birds in your area, one per child. Ask the children to notice differences among the birds. Explain that looking at physical characteristics (including size, shape, and color pattern) and field marks (spots, stripes, colors and other distinct features) of these birds is good preparation for going outside to identify and distinguish between birds in nature. Outside, bird identification will be more challenging because the birds are moving and may be far away.

If you are unsure about what birds are common in your area here are some ideas:

1. eBird: Seasonal Patterns of Bird Occurrence for your location
(<http://ebird.org/ebird/GuideMe?cmd=changeLocation>)
 2. Check with your local bird club or Audubon Society for a list of common local species
- c. Ask each student to become an expert in recognizing his or her focus bird, so that when the class is outdoors and someone sees that bird, he or she can help the rest of the class identify it. That way, the class as a group will know how to identify as many birds in the field as there are students in the class! You may wish to give the students time to research their bird and present what they learn to the class.



Count Birds for Science

- d. Here are some additional resources on teaching kids to identify birds. For resources 1–5, go to alaboutbirds.org and select Bird ID Skills under heading Birding Basics:
1. All about Birds: Recognizing Size and Shape
 2. All about Birds: Color Pattern
 3. All about Birds: Behavior
 4. All about Birds: Field Marks
 5. All about Birds: Sound and Calls
 6. Celebrating Urban Birds: Bird Identification Fact Sheet (<http://www.birds.cornell.edu/celebration/birds/bird-guide/celebrate-urban-birds-bird-guide>)

3. Look for Birds!

- a. Either go outside in your area, or take a hike in a natural area or local park, or find a comfortable place to watch your feeder.
- b. Ask students to record the characteristics of birds they see. Ask the students to identify them if possible or mark them as unknown. (Journal Page 9)
- c. After about 15 minutes, call students together. While outside, review the names and characteristics of any birds the students identified, and make sure they agree that those species are correctly named. Ask students to work in pairs or threes to identify the “mystery” birds and then count the birds that they can identify accurately. Students should write the names and numbers of all these birds on a tally sheet.
- d. Make a master list of birds sighted by the class, showing the number of individuals of each species. If students cannot agree on the number of birds of each species, make your best estimate or come to consensus.

3. Be a Citizen Scientist

- a. Closely follow the instructions for the projects in which you plan to participate. For most projects, you and your group can count birds as often as you like. Keep data sheets together and enter the data each time you count or every few times you count. Make it a regular activity!
- b. You can also build new feeders, plant a bird-friendly garden, make bird art, write an article using citizen science data, and many other projects depending on the program you are participating in.
- c. The data you contribute as a citizen scientist helps us understand where and when birds are in your area. We’d like to hear about your sightings on the [HABITAT EXCHANGE WIKI](#). Summarize what kind of birds you often see so that other schools can compare. As you count

3. Class Discussion

- a. Your “I Wonder” List ([JOURNAL](#) page 6) can quickly fill up with questions when you’re doing citizen science. Encourage students to record their questions.

Ask:

- Was it harder or easier to identify birds than you thought it would be?
- Do you think we accurately identified the birds we named?
- Where were the birds on our walk? What were they doing?
- Why is it important that we identify and count accurately? (Citizen science works only if people are accurate with their observations. As with all science, accurate data is necessary for valid results!)



Count Birds for Science

- *What do you think we could do differently next time to see more birds? To be better able to identify the birds we see?*
- *How do you think scientists use the data we collect about birds? What kinds of questions can they answer? (Because citizen scientists collect data on a continental and even global scale, scientists can answer vast questions about our ecosystems. The State of the Birds report shows the results of analyses based on eBird data and other variables. Citizen science data are proving essential in designing management strategies for protection of bird populations across the U.S. and increasing throughout the world).*
- *How do you think citizen science can help us understand the effects of things like the oil spill on birds? (Many citizen scientist projects like eBird help ornithologists look at how bird populations fluctuate on a yearly basis. When either natural or non-natural disasters occur, citizen scientists observe how bird populations are affected.)*

3. Extensions

The value of your data and the power of your students' curiosity will grow as you continue counting birds! Again, consider beginning the BirdSleuth Investigating Evidence online curriculum. Here are some other simple project ideas to consider:

Activity #1: Habitat Comparison

Project: eBird or Celebrate Urban Birds

Location: 3 different habitats

Duration: Monthly, over the school year

Details: Students will formulate hypotheses about the kinds (characteristics) of bird species that will be found at a wetland, meadow, and riparian area (banks of rivers, streams, or lakes). They can also create hypotheses about which habitat will have highest/lowest abundance, or greatest/least diversity of birds. Students will observe birds found in all three locations and record data on their tally sheets. After the count is complete, students will create graphs with their collected data and draw conclusions on their hypotheses.

Activity #2: Activity vs. Time of Day

Project: eBird

Location: bird feeder or courtyard area

Duration: One week with three daily observations: morning, lunch, and end of school day

Details: Students formulate hypotheses about when they think birds are most active and why. Students observe birds at feeders and record data about the numbers and types of birds that are present. They may also record observations of the birds' behavior. After the count is complete, students create graphs with their collected data and draw conclusions.

Activity #3: eBird Outputs

Project: eBird

Location: In class

Duration: one or more class sessions

Details: Explore the data on the eBird website, including maps, graphs and lists. Your class can also collect and upload their own data to eBird and then explore their "My ebird" site, and learn to manage, summarize, and download their data. This could be a short intro to eBird or could extend over a week or more. An extended lesson would allow changes in the lists and charts in My eBird to be noted.





Activity 8

Mystery Migration Maps

Before You Start



Time and Place

45 minute period

Materials Needed

Curriculum components

- Mystery maps (linked in online [CONNECTING KIDS WIKI](#))
- Photo of featured birds (linked in online [CONNECTING KIDS WIKI](#))

You provide

- Projector and Internet connection to display maps for the class

Getting Ready

- Review the details about the eBird occurrence maps at this site: <http://ebird.org/content/ebird/about/occurrence-maps/occurrence-maps>

Big Idea

Students will use critical thinking skills to draw conclusions about a map created with citizen science data.

Learning Objectives

1. Students will be able to define “migration”.
2. Students will be able to compare and contrast an animated range map for a migratory versus non-migratory species of bird.
3. Students will be able to describe how citizen science supports the efforts of research and conservation scientists.

Conducting the Activity

1. Show “Mystery” Animated Map

- a. Show the students this “mystery” animated map. Ask them what they think the map might be showing. Note all answers at this time and don’t yet give hints or provide correct answers.

2. Show second “Mystery” Animated Map

- a. Show the students a second animated map. Again, ask what they think the map might be showing. If possible, show both maps at the same time (perhaps using the double page option on an interactive white board).

Ask:

- What do you think these maps might be showing?
- Does our state “light up” in either map?
- How do the maps differ? (you may wish to draw a Venn Diagram)

3. Map background

- a. Reveal the type of data portrayed on these maps: the distribution of a migratory species (Olive-sided Flycatcher) over the course of a year, and the same for a non-migratory bird (Northern Cardinal). Show the students photos (or project a photo) of the cardinal and flycatcher. Tell the students that these two bird species are similar in



Mystery Migration Maps

size and have some overlapping habitat needs. Give students relevant background on the maps as you see fit:

1. eBird excels at using citizen scientists from around the world to collect information about the birds in their area. This online database is available for users to submit and review checklists of birds they have seen. These Spatio-Temporal Exploratory Model, (STEM) maps are created using eBird's citizen data. The location where each checklist is filled out is combined with remotely-sensed information on habitat, climate, human population, and demographics. By relating these environmental variables to observed occurrences of birds in different areas, the models make predictions about occurrences of each species at un-sampled locations and times. Using eBird, scientists can monitor many bird species year-round on a continental scale.
2. While some of these maps match the known distribution of birds very well, some maps show highlighted regions in areas where we know the species does not occur. This tends to happen in regions where eBird data are sparse, such as northern Minnesota, northern Maine, much of Nevada, sparsely-settled regions in the upper Great Plains, Montana. In some other areas (southern Florida, for example), there is not enough habitat information to understand the landscape as it relates to bird occurrence. In all of these cases, we believe that more eBird checklists from these regions will improve the STEM model's ability to accurately show when and where various bird species occur.
3. These maps show the probability of occurrence of each selected bird species at each particular time and place. For example, probability of 25% indicates that one out of every four checklists submitted at that time in place would be expected to include that species.

Ask:

- *What do these maps tell us?*
- *Why do you think that one species migrates long distances and the other does not? (Hint: what do you think Northern Cardinals eat? What do you think that a flycatcher eats?)*
- *Where do you think the flycatcher goes during the winter? (You could challenge students to research this and find out).*
- *Why do you think that one species is found more in the eastern United States, and the other is found more in the west?*

5. Show a New Animated Map

- a. Show students at least one new animated map. Try the Wood Thrush for an eastern bird. You can also try the Western Tanager for a western bird. For a bird that is found across the U.S. but shows a different pattern in the migration map, try the American Pipit, a bird that breeds in the Rocky Mountains and the Arctic. Ask students to draw conclusions about this new bird species.

Ask:

- *What are these birds ranges?*
- *Are these birds migratory? What makes you say that it is or is not?*
- *How are these birds ranges similar to or different from the ranges of two previous species?*
- *What do you predict that this bird eats?*
- *Can you tell anything about the species habitat preferences from the map?*





Activity 9

Improve Your Habitat

Before You Start



Time and Place

Several periods both in class and outdoors

Materials Needed

Curriculum Components

- Habitat Sketch (**JOURNAL** page 9)
- Habitat Design (**JOURNAL** page 10)
- Outdoor Bird Observation (**JOURNAL** page 11)
- Take Action! (**JOURNAL** page 12)
- Access to **SHARE YOUR ACTION WIKI**

Getting Ready

- Make copies of the Student Journal pages. Discuss your plans for the habitat project with your school administrators, if necessary.

Big Idea

Students will inventory their habitat and improve it for birds.

Learning Objectives

1. Students will review four key features of a habitat and relate each one to the specific function it serves for a bird.
2. Students will be able to inventory a habitat.
3. Students will be able to investigate and create a plan for a small habitat restoration/conservation project.

Background

Improving your habitat comes in many forms, from planting native trees to putting in feeders and bird baths. This lesson takes what students have learned about birds and their habitat and applies it to the real world. Students get a chance to plan, and hopefully also carry out a habitat restoration/conservation project.

Conducting the Activity

1. Investigate
 - a. Review the four key features a bird needs from its habitat (food, water, cover, space). Remind students that every living thing has a place that supplies its particular food, water, and shelter requirements—its habitat. If a bird cannot find these things in an area and in the “right” arrangement (the definition of “right” depends on the species), it cannot survive there. See Lesson 1 for more background on habitats.
 - b. Take students outside to map a habitat in their schoolyard. In **JOURNAL** Page 9, have the students draw a map of the site and list all of the natural features or structures that are currently found there. Refer to **JOURNAL** Page 10 for example. Also have students pick one bird to observe and write their observations in **JOURNAL** Page 11.
 - c. Extension activity: Conduct a bird count to see what species are currently found in that habitat. Discuss which



Improve Your Habitat

bird species you would like to attract/support in this habitat.

2. Plan

- a. Take students back to the classroom to discuss their findings and make a list of improvements.

Ask:

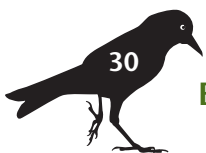
- Describe the habitat of our area. Do you think this is a good place for birds to live? To nest? Why or why not?
 - What are the specific needs of the birds we have counted or seen in this area? Do they all have the same needs regarding food, water, cover, and space?
 - How has our habitat been modified by people? What positive and negative effects do you think these have had on the species that live here?
 - How have certain birds adapted to urban environments? (Sample answer: these birds take advantage of human food, even at places like garbage dumps. They also often nest in human-supplied locations.)
- b. What could we do to make this schoolyard a more bird-friendly habitat? Create a list on the board. Ask them to decide on a section of their schoolyard or backyard habitat that they would like to improve. If possible, photographing their section of yard might help them to map and visualize changes.
 - c. Take students to the computer lab to research the birds they would like to attract to their site and determine what they can do to attract them. Discuss what could be added or changed at the site to create a bird habitat, including native plants and other measures to attract their chosen birds. See Section 3 for ideas and online resources on landscaping and attracting birds. If you are having students create a habitat improvement plan you expect to implement, you may want them to think about how to pay for the improvements. They could research funding sources that might be willing to give your class a donation for supplies such as native plants, bird feeders, bird seed, and bird houses. Consider taking and posting photos around the classroom before and after your changes have occurred.
 - d. After discussion, look over Journal Page 13 with students and have them sign to commit to bird and habitat conservation.

2. Carry out the Project

- a. Collect any materials that you will need to complete the project, plan out the project and get started! Schedule times during class or after school to work as a team to improve your site. Share your plans with your BirdSleuth Coordinator and on the Share Your Action wiki.
- b. Once you've made the improvements to your backyard or schoolyard habitat, continue monitoring the site to see which birds visit it and when they visit. Use the "Count Birds for Science" activity (see Lesson 7) and observe the habitat whenever possible. If you have installed feeders,

Ask:

- How long does it take the birds to discover the feeder?
 - Will all birds eat from this feeder? Why or why not?
 - Which birds eat from the feeder? Do some feed on the ground?
 - When do the birds come to the feeder? Do all of the different birds come at the same time?
 - Why do birds eat from the feeder? (To get energy, because feeders are an easy way to find food, because there may be a shortage of "natural" foods in the habitat.)
- c. Consider taking photos after your changes have occurred. Post them on the Share Your Action wiki.



3. Suggestions for Creating Bird Habitat

- a. Plant native plants in mixed species clumps.
- b. Create an understory using native grasses, shrubs, and wildflowers.
- c. Leave dead or dying trees when possible. Leave brush piles and pruned debris through the winter.
- d. Avoid mowing, spraying insecticides or fertilizers, brush clearing and building activities from mid-April through July (or during your local bird-nesting season).
- e. Reduce predators—keep cats indoors and eliminate outdoor sources of food which attracts rats, opossums, skunks, foxes, and jays. These are all nest predators that will eat bird eggs and young.
- f. To discourage non-native bird predators such as House Sparrows and European Starlings, take down (or clean out) nest boxes being used by these species.
- g. Support birds' habitat needs in your schoolyard by providing a source of food. Consider planting native "food" plants in addition to a bird feeder. Food plants include ones that produce berries or flowers, but there are many other plants that don't fruit and still support insects and provide seed for birds as well. See the Landscaping for Birds section of the All About Birds website for more information on the best plants and trees for birds. If you want to put up a bird feeder, try making one of these feeders depending on the materials and resources you have available:
 1. Bagel Feeder: Coat a bagel with peanut butter, lard, or shortening, roll it in mixed birdseed, and hang it on a tree branch.
 2. Pine Cone Feeder: Coat a pine cone with peanut butter, lard, or vegetable shortening; add raisins, cranberries, or other dried fruit (optional). Roll in mixed birdseed. Hang or place in your habitat.
 3. Circle Cereal String: String Cheerios (or other round cereal with a hole) on a 24-inch length of string or yarn. String on bushes.
- h. See also the following links:
 1. <http://www.birds.cornell.edu/celebration/gardening>
 2. <http://www.birds.cornell.edu/celebration/gardening/ten-ways-to-landscape-for-songbirds>
 3. <http://www.allaboutbirds.org/attractingbirds-landscaping>





Activity 10

Take a Field Trip

Before You Start



Time and Place

Time varies from one-two hours to a full day, depending on the field trip activities and site.

Materials Needed

You provide

- Gather data sheets, pencils and clipboards needed to conduct a citizen science count (CUBS or eBird) while at the site, as well as drawing materials for mapping/drawing the site. We have included a general scavenger hunt for you to adapt to guide students through a casual “inventory” of the field site. You may also want to ask for pre-visit materials from the field trip coordinator or education staff at your field trip site.

Getting Ready

- If necessary, contact the site to schedule a visit. Seek administrative approval, funding, recruit chaperones, arrange transportation, and review expectations as needed. Ask students to compile a “necessary materials and equipment” list to take along. You may need to do prior research on the habitat and diversity of bird species of the site, to guide the students.

Big Idea

Students, like professional scientists, will use field research to make direct observations of the natural world.

Learning Objectives

- Students will be able to make direct observations in nature.
- Students will be able to compare the habitat(s) and animals at the field site with those of their schoolyard.

Background

Field experiences come in all forms and sizes. From an hour or two spent in a nearby park, to an overnight trip camping outside the city, field experiences present opportunities for teachers to extend their lessons beyond the classroom. These experiences also give students a chance to engage in hands-on, experiential learning in an outdoor setting while exploring exciting real-world environments.

For many teachers, the easiest place to bring students is a nearby park or natural area. Other ideas for places to go include:

- bird banding station
- bird observatory
- nature center or preserve
- state or county park

Education staff at these sites will assist you in scheduling the visit and provide details for the trip. Some sites have pre-visit materials you can use, and may even be able to help you connect the lessons from this curriculum to the resources at their site. Please contact your local BirdSleuth Coordinator for details on local field experience resources or use the following web site to locate a park or natural area near you:

<http://www.nwf.org/naturefind/>.

Conducting the Activity

1. Before the Field Trip

- Be sure to do Lesson 7: Count Birds for Science if you plan to conduct a bird count at the field site.



Take a Field Trip

- b. Introduce the field trip visit, date, location, etc. with students. Provide a list of the things they need for the trip.
- c. Ask students what they already know about the field experience site, including the habitat(s). Ask them to research more about the site and habitat to share with the class before the field trip. You may want to divide the class into groups and assign a different aspect for each group to research, for example different areas and/or habitats at the site and the plants/animals/habitat features found there; or birds, mammals, reptiles & amphibians, shrubs, trees, and flowers.
- d. Request a bird list for the site or ask students to research before the visit and compile a list of likely birds according to season and habitats within the field site.
- e. Prepare and review with students any handouts.
- f. Review expected field trip conduct / behavior.

2. During the Field Trip

- a. Participate in the activities planned by the field trip coordinator or site education staff (if applicable).
- b. Ask each student to take a notebook with them to the field site. Ask the students to make observations about the birds and the habitat they see. They may also take photographs or record videos.
- c. Conduct a citizen science bird count or scavenger hunt. Bird count: based on the bird species list that was given to you (or that your class compiled) ask the students to count the bird species they observe. Scavenger hunt: have students make a list of plants and animals found at the field site, using the scavenger hunt.
- d. If possible, discuss their findings in the field (if not, discuss in the classroom).

3. Follow-Up Discussion

- a. Discuss with students the following questions in a journal entry

Ask:

- *What did you enjoy the most during this field trip? How was this experience different than what you would have learned in a classroom?*
- *What did you find surprising about the field trip?*
- *Do you think it is important for there to be preserved natural areas in communities? Why or why not?*

4. Extension:

Activity #1.

Ask students to create a virtual field trip using photos, videos, or sketches from their field trip. The students can create interview guides and narration to guide someone through the site. In this project, ask them to highlight important features of the habitat and discuss the bird diversity data they collected. Share this virtual field trip on your **HABITAT EXCHANGE WIKI** class page and check out virtual field trips on the websites of other classes.



Take a Field Trip

Resources to find local field sites and outreach resources:

- a. A resource for bird educators to find supplies, resources, and advice.
<http://birdday.org/resources>
- b. Find local and regional bird banding stations and observatories here.
<http://www.birding.com/banding.asp>
- c. A listing of Audubon Society centers and sanctuaries in the United States.
<http://www.audubon.org/locations/type/302>
- d. Resources for teachers on how to teach about birds, habitats, and conservation
<http://www.prbo.org/teachbirds>
- e. Resource for finding natural areas in your neighborhood
<http://www.nwf.org/naturefind/>





Activity 11

Share Your Action!

Before You Start



Time and Place

45 minute period, possible extension time outside depending on your Action.

Materials Needed

Curriculum component

- Pick a Project! (**RESOURCE** page 33)

You provide

- Internet access projected for class (for posting to the **SHARE YOUR ACTIONS WIKI**).

Getting Ready

- Think about how you might like to use the **SHARE YOUR ACTIONS WIKI** and what types of projects you might collaborate on with other classes.
- Optional: Complete Lesson 1 (Habitat Exchange) and Lesson 7 (Count Birds for Science) in advance.

Big Idea

Students will share their positive actions for bird conservation with others.

Learning Objectives

1. Students will be able to name three ways to improve habitat for birds.
2. Students will be able to identify two non-habitat related ways to help bird conservation.
3. Students will be able to synthesize ideas from the Habitat Exchange and Count Birds for Science lessons in order to take action for bird conservation.
4. Students will be able to share and compare their conservation actions with those of other classrooms around the United States using a collaboration wiki.

Conducting the Activity

1. Complete a Conservation Action

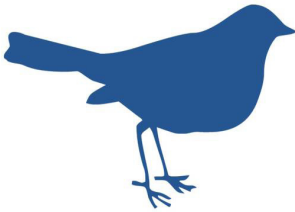
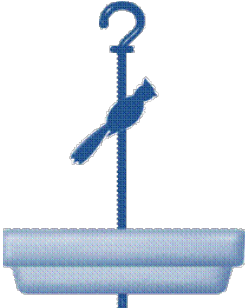
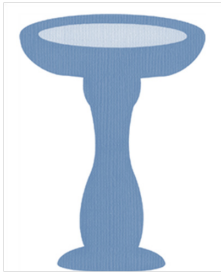



- a. Brainstorm with your students about what action(s) they would like to take for birds. You can:
 1. Participate in Citizen Science (you may have done this already in Lesson 7);
 2. Improve your schoolyard habitat for birds by providing food, water, and shelter (you may have done this already in Lesson 9);
 3. Take action towards sustainability in your school community; and/or
 4. Build community awareness and appreciation for birds.

For more projects, read **RESOURCE** page 33 with students.

- b. Online Conservation Badges will be awarded to schools who have taken steps to help birds! Possible actions by area may include:



Share Your Action!

	Citizen Scientists <ul style="list-style-type: none"> • Submitting data to eBird • Submitting data to CUBS • Submitting data to another citizen science program
	Food Habitat Helpers <ul style="list-style-type: none"> • Putting up bird feeders • Planting a garden for birds
	Water Habitat Helpers <ul style="list-style-type: none"> • Adding a bird bath • Adding a pond • Creek or beach clean up
	Shelter Habitat Helpers <ul style="list-style-type: none"> • Planting trees and bushes • Putting up nest boxes • Schoolyard clean-up
	Sustainability Stars <ul style="list-style-type: none"> • Reduce, reuse, recycle • Lowering your carbon footprint • Taking action at school to help the environment
	Community Builders <ul style="list-style-type: none"> • Raising money for bird conservation • Sharing what you know with others • Participating in a community event centered around birds

Share Your Action!

- c. Once you've agreed on your action(s), share your plans with your BirdSleuth Coordinator and get going! If you decide to complete a Habitat Helper project, consider taking photos before and after your changes have occurred. You will probably notice a difference in the number of birds frequenting the schoolyard!

2. Share Your Actions

- a. Go to the **SHARE YOUR ACTIONS WIKI** and follow the instructions at the bottom of the home page to create your school's wiki page. Once you have created your wiki page, you can tag the actions you plan to complete and describe the actions you have already completed. Type text directly into the wiki. Add photos and videos to your page using the Widget button in the edit toolbar. Upload podcasts using the File button in the edit toolbar. Continue to update your page throughout the year as you take more actions for birds. Browse other school's pages to see what others are up to; you can get ideas for further action on your own or connect with classrooms doing similar projects that may be interested in collaborating on a project.

3. Get Recognized for Your Actions

- a. The BirdSleuth team will monitor the **SHARE YOUR ACTIONS WIKI** throughout the year as you continue to post your conservation actions. Look out for the Conservation Badges you've earned to appear on your wiki page!

