

eBird Explorers: Youth Action for Birds



An Out-of-School Time Leader's Guide

eBird Explorers: Youth Action for Birds

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Production Team for *eBird Explorers: Youth Action for Birds*

Project Leader: Kelly Schaeffer

Cornell Lab of Ornithology Contributors: Susan Licher, Jennifer Fee, Mya Thompson, and Pat Leonard

Education Contributors: John Bowe, Timothy Fowler, Anna Harrod-McGrew, Alexa Maille, Sara Poggi-Decker, and Melissa Watkins

Evaluation Partners:

Sabrina Adams, Beth Bannister, Charmesa Brown, Sarah McCormick, and Sara Poggi-Decker

Designer: Janet Menninger

Cover Illustration: Elizabeth Wahid

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The findings and conclusions in this preliminary lesson guide have not been formally disseminated by the U.S. Department of Agriculture and should not be construed to represent any agency determination or policy.

If you have questions about any aspect of this resource, please contact us.

Email: K12Lab@cornell.edu

Phone: 607-254-2489

Post: 159 Sapsucker Woods Road, Ithaca, NY 14850

K-12 Education website: www.birds.cornell.edu/k12

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Introduction

Welcome to the *eBird Explorers: Youth Action for Birds* leader guide. This leader guide was created in partnership with New York State 4-H, and designed for youth between 8 and 15 years old in multiple out-of-school contexts including 4-H clubs, afterschool programs, and homeschool settings. We suggest a 1:10 instructor to participant ratio, but you may be guided by other programmatic needs. We hope that you will find this leader guide easy to follow and adaptable to your setting.

This leader guide uses birds as the spark to involve youth in participatory science while inspiring a connection to nature and their local environment. You can find birds wherever you are, any time of year, making them a great resource for teaching and building excitement. Whether you're an expert birder or just getting started, *eBird Explorers: Youth Action for Birds* will provide everything you need to teach confidently about birds, no matter your setting. These activities incorporate youth development best practices and are designed for adults to partner with youth and have fun building science skills. This leader guide provides tips, tools, and activities to help participants identify birds and submit data to the eBird participatory-science project.

Resource Site

You will find all the links and online resources, including the lesson slides on the resource site: birds.cornell.edu/k12/youth-action-for-birds-resources. You may want to bookmark this address because many lessons will refer you to the resource site for supplementary materials.

Lesson Goals

The goals of these lessons, provided below, were created in partnership with staff from 4-H and afterschool organizations. These goals are broken into three categories and designed to strengthen youth's connection to nature through birds while building life-long science skills.

Positive Youth Development

1. Youth feel a sense of belonging in their program and with their peers and mentors.
2. Youth feel a sense of belonging in the scientific community by engaging in participatory science.
3. Youth find and/or strengthen an interest related to birds, science, and the natural world.
4. Youth develop communication skills and share what they have learned and what they value.

Youth Are Scientists

1. Youth's natural curiosity is nurtured and appreciated.
2. Youth actively develop science skills.
3. Youth do science along with professional scientists by engaging in participatory-science projects.

Nature Connection & Birds

1. Youth and adults collaboratively develop projects and learn about the natural world.
2. Youth value and feel connected to their local environment and to the natural world more broadly.
3. Youth learn about the unique features of birds.
4. Youth develop bird identification skills.
5. Youth explore how local habitats support birds and other wildlife.

Participatory Science

Participatory science involves youth and adults all over the world following basic scientific protocols and submitting their observations to databases that scientists use to answer real-world questions. From stars to flowers and bugs to birds, participatory science is people-powered science that helps us understand and connect with our world.

When engaging in participatory science, youth are scientists; they make careful observations, follow protocols, and collect data, while taking pride in contributing to research that reaches beyond their backyard or neighborhood. Participating in real science is deeply engaging and can motivate youth to dig in and contribute more.

eBird

With more than 100 million bird sightings contributed each year by eBirders around the world, eBird is the world's largest biodiversity-related participatory-science project. It harnesses the power of birders in every country to document where birds are and when they are using different habitats. With eBird's simple online tools and easy-to-use mobile app, you and your youth partners can become part of a larger community of people helping scientists and birds.

Before using eBird with youth, we strongly recommend that you take the free *eBird Essentials* online course for an overview of how eBird works (academy.allaboutbirds.org/product/ebird-essentials/). In this short course, you'll learn how to enter data into the eBird database and how the data are used for research and conservation. This leader guide does not go into depth on how to use eBird and relies on the course to provide the necessary background information.

eBird is an ever-evolving resource. As a result, you may find some parts of eBird have changed location or function. If you come across any instructions that appear out of date, check the resource site for updates (birds.cornell.edu/k12/youth-action-for-birds-resources).

Merlin & Bird ID

To participate in eBird, you and your youth partners need to be able to identify birds. This can seem daunting when you first pick up a field guide and realize just how many bird species exist in your part of the world. But don't worry. Throughout this leader guide, we provide fun activities to teach bird ID, and we show you how to use today's tools that make bird ID easy and intuitive. Merlin Bird ID is a free app that helps you narrow down a mystery bird to a few most likely possibilities for your location and date. It's fun to learn the name of your mystery bird, and even the most novice birders will be successful from the start!

If you have access to smartphones or tablets, download the Merlin app and have it available for youth to use. The download process is two steps. First download the app, and then open it and select a bird pack for your region to download. Once you've installed the bird pack, the app is ready to use. Using the Step-by-Step ID function, practice going through the five identification questions before heading outside. You can do this by showing them still images or videos of birds. Be sure to show the range maps and sounds that are provided in the info section (reached by pressing the "i" icon below the bird description) for each bird. As you prepare to lead these lessons, you may wish to explore ways to share your phone screen via your computer or projector to demonstrate Merlin.

The Merlin Bird ID app has more functions to help you identify birds that we do not explore in these lessons, but that you may find useful. Sound ID listens to the birds around you and shows real-time suggestions for who's singing. You can then compare your recording to the songs and calls in Merlin to confirm what you heard. With Photo ID, you can snap a photo of a bird, or pull one in from your camera roll, and Merlin will offer a short list of possible matches. Photo ID works completely offline, so you can identify birds in the photos you take no matter where you are. Visit merlin.allaboutbirds.org for more information on these functions, including how-to videos.

Taking Kids Outside

One of the benefits of participating in eBird is the opportunity to engage youth in outdoor learning. If you are new to taking kids outside to observe nature, it can be helpful to build good outdoor habits even before beginning these lessons. You can start with short 10-minute outdoor walks to practice good birding skills, including watching and listening to detect and observe birds. You will often hear a bird before you see it, so practice using all your senses! You can make these walks part of your usual routine by adding them at the start, middle, or end of playground time, or build new routines together. Before taking youth outside, ask them, "How can we observe more birds?" or "How can we behave like scientists?" Create a list to highlight behaviors you want youth to practice such as: being quiet, being observant and looking all around, staying on the trail, and staying together. Encourage youth to practice those skills when they collect data outside. Learn more about taking kids outside on this guide's resource page (birds.cornell.edu/k12/youth-action-for-birds-resources).

Technology

This guide makes use of several kinds of technology including computers with internet access; printers/copiers for youth handouts; projectors, interactive whiteboards or other screens with speakers; and smart devices. The most crucial technology is that for sharing slideshows and videos. For others, there may be low-tech alternatives. We will not always call out these options in the lesson, so we recommend that you review each lesson in advance so you can consider adaptations.

There are activities in this guide for which participants need access to computers or smart devices to conduct research or use the Merlin Bird ID app. If that is not possible, providing access to field guides is a great alternative. You can purchase inexpensive used guides online, or borrow guides from your local library, bird club, or nature center. Even if you have access to technology, having field guides on hand is a great way to provide youth with experience using different tools.

Lesson 1: Who Are Scientists?

Big Idea: Everyone has scientific skills and traits, and we use these skills and traits every day. Youth can build science skills through participatory science.

TIME



LOCATION

Inside



Materials

- General Supplies
 - Projector or interactive whiteboard
 - Computer with internet access
 - Paper
 - Coloring utensils like pencils, colored pencils, crayons, and markers
- Leader Guide Handouts and Resources
 - Meet a Scientist reports (one report per youth or small group)
- On the web (birds.cornell.edu/k12/youth-action-for-birds-resources)
 - You Can be a Citizen Scientist video
 - eBird live submission map or downloadable eBird map

Getting Ready

- Review the lesson and determine if you need to make any adjustments.
- Gather blank paper and drawing supplies.
- Decide how you will facilitate sharing the Meet a Scientist reports and prepare accordingly.
- Cue the *You Can Be a Citizen Scientist* video, and eBird live submissions map or downloadable eBird map.

Background Information

Youth often think of scientists as people in labs who wear white coats and hold beakers of chemicals. However, this lesson emphasizes that scientists come from different cultures all over the world and work on projects indoors and outdoors according to their multiple interests. This lesson encourages youth to broaden their ideas of who scientists are and what they do. Youth will also be introduced to participatory science as a way that they can help professional scientists answer real-world questions.

Conducting the Lesson



Welcome & Connection

- Welcome participants to this program where they will learn about birds, explore their local habitat, and become participatory scientists. Share that science is a way of looking at the world that requires practice. Sometimes being a scientist means trying something new, failing, and trying again. Share that youth will have the opportunity to build their scientific skills together and help contribute to science.
- Have youth introduce themselves and share their name (if they don't already know each other) and what interests them about participating in this program. You can have youth share with the whole group, or pair up to introduce themselves in a small group before coming back together and sharing with everyone.



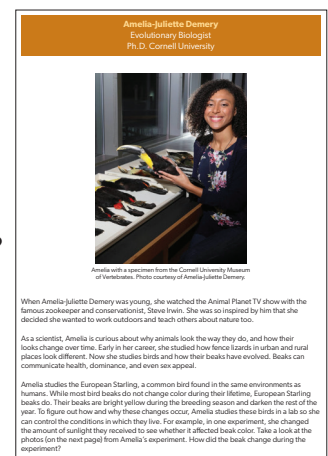
Activity 1 Draw a Scientist

- Share with youth that in this lesson we are going to explore what it means to be a scientist.
- Ask youth to think about a scientist at work. Invite them to imagine the details in the scene, such as:
 - Where is the scientist working?
 - What does the scientist look like? What is the scientist wearing?
 - What is the scientist doing and what tools are they using?
 - Is the scientist working alone or with others?
- Give youth about 5 to 10 minutes to draw a scientist at work.
- When youth are done, ask them to share some of the details about their scientists. Ask:
 - What gender is your scientist?
 - How old are they?
 - Where are the scientists working? Inside or outside?
 - What tools are they using?
 - Who drew a “mad scientist?” Why? What are some stereotypes about scientists and are they true?
 - Who drew a scientist doing something that you’d like to do? What do you like about what they are doing?
- When you’ve had a chance to view everyone’s drawings. Ask:
 - How do you know they are scientists?
 - Are they scientists because of how they look or how they act?
 - Who can be a scientist? (*Anyone can be a scientist. Science is a way of understanding the world.*)
 - Who are some scientists you know? (*These could be famous or even fictional scientists.*)
 - Who in your family or community has jobs related to science? What do they do?



Activity 2 Meet a Scientist!

- Read and discuss the Meet a Scientist reports. Divide youth into small groups. Tell youth that they will be introduced to a conservation scientist. Assign each group one of the scientists and allow them time to read. Invite them to discuss the scientist with their group and prepare to share what they learn.
- Have each group briefly describe their scientist to the rest of the class. Ask each group to share:
 - What does the scientist study, and what did you find interesting about it?
 - What has the scientist discovered, and what are their future plans?
- After each group has reported, discuss the following questions as a whole group, or in a quick partner share:
 - What do each of these scientists have in common? (*Possible answers include asking questions, collecting data, studying nature, and understanding the Earth/conservation.*)
 - How does the work of these scientists differ? (*Possible answers include studying different animals, working outside versus inside, traveling to and living in different locations around the country and in other parts of the world.*)



Leader Tip

Prefer a video alternative? Check the resource site for links to several scientist videos. Choose two to watch and discuss using the activity prompts.

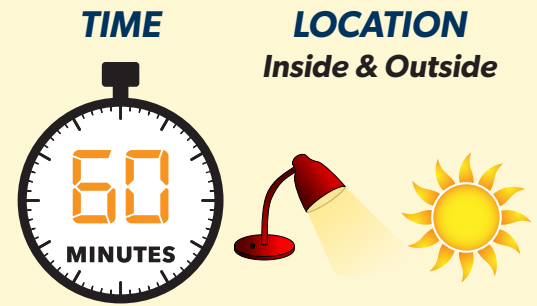


Activity 3 *Introduce Participatory Science*

- Share with youth that scientists can't be everywhere. Some professional scientists ask people just like us to be their eyes and ears and use their scientific skills to help understand our natural world. Together, you are going to learn to observe birds and share what you see through the participatory-science project called eBird. There's still a lot to learn about birds, and by sharing their observations, youth can help professional scientists make new discoveries by engaging in participatory science.
- Cue the video *You Can Be a Citizen Scientist*. Before playing the video, share with youth that participatory science used to be called citizen science. The name was changed because participatory-science projects like eBird take place across the world, and you don't need to be a citizen of any particular place to contribute. The name was changed to make sure everyone feels welcome. This video uses the old name, but it does a good job of describing what participatory science is and why it matters.
- After watching the video, explain that the next few activities are focused on becoming better scientists and birders by practicing their scientific skills and learning to identify their local birds so they can contribute to eBird. eBird is the largest biodiversity-related participatory-science project in the world.
- Go to the eBird live submissions map to show youth that people are submitting eBird checklists from many locations throughout the day. If you cannot access the internet, share the downloadable eBird map, which shows every location an eBird observation has been made. You may wish to highlight how many checklists have been submitted from around the world. The most up-to-date eBird numbers can be found on the eBird home page, but you must be logged into your eBird account to view them.
- Share with youth that some of the program goals are building their observation skills, becoming better scientists, learning how to identify birds, and sharing their observations with scientists through eBird.
- Ask youth what interested them in participating in this program and what goals they have for it? What would a successful program look like to them? Record their goals for the program so that you can revisit them at the end and even tailor some of your activities to help meet those goals.
- For the next meeting, encourage youth to think about what skills would help them be good scientists.

Lesson 2: Building Observation Skills

Big Idea: Observation is a foundational scientific skill that can be built through practice.



Materials

- General Supplies
 - Board or chart paper
 - Clipboards
 - Pencils or pens
- Leader Guide Handouts and Resources
 - Scientific Skills journal page (1/youth)
 - Rainbow Hike journal page (1/youth)
 - Sound Map journal page (1/youth)

Getting Ready

- Review the lesson and determine if you need to make any adjustments.
- Print the Scientific Skills, Rainbow Hike, and Sound Map journal pages for each youth.
- Decide how you would like to make and keep your scientific skills list.
- In preparation for the Rainbow Hike and Sound Map activities, be sure each youth has a clipboard, a pencil, and both journal pages. You may want to create your own sound map in advance to share what a sound map looks like.

Background Information

Scientists have many skills that help them ask and answer important questions about the world. Many of these skills youth already have and all of them can be built and enhanced with practice. Observation, or looking closely and noticing things with your senses, is one of the most important scientific skills. Scientists are professional observers! In this lesson, you will help youth build their observation skills by inspiring them to observe their surroundings, explore their environment, and discover the natural world with their senses.

Conducting the Lesson



Welcome & Connection

- Welcome youth to today's session. Remind them of the last session's content and how you explored different scientists and learned about participatory science.
- Invite youth to share any reflections they've had since your last session. Did they see any scientists in the media or their own community since you last met? What were they doing?
- Invite youth to share any interesting bird or other wildlife sightings.



Activity 1 *Brainstorm Scientific Skills*

- Tell youth that science is a way of looking at the world. Anyone can do science and think like a scientist!
- Invite youth to think back to the scientists they learned about in the last session. Challenge them to come up with a list of skills or practices that they think make a good scientist. Keep track of the list on a board, chart paper, or virtual space. You'll want to keep the list to reference in future sessions.
- Have youth look at the list and challenge them to reflect on what scientific skills they have already and when they've used those skills in their life. You can have them share their stories aloud or journal their reflections on the Scientific Skills journal page just for themselves.



Activity 2 *Rainbow Hike*

- Tell youth that they are going to work on building one of the most important scientific skills, observation. Take youth outside and challenge them to find all the colors of the rainbow on natural objects. Encourage them to look everywhere, on the ground, on plants, and in the sky. Have them record in their journal where they find each color and on what object. They may wish to sketch one of their findings.
- After 5-10 minutes of searching, bring the group back together and ask:
 - Which color was the easiest to find? The hardest?
 - Where did you find the most colors? On plants, on the ground, in the sky, or somewhere else?
 - How can noticing color help you as a participatory scientist counting birds? (*Birds can be identified by the unique color patterns of their feathers. Being a good observer of color is an important skill to build when identifying birds for science. In a future session, you'll learn how to describe a bird's color pattern, or where colors are located on a bird's body.*)



Activity 3 *Sound Map*

- Explain to youth that they are going to create a sound map of everything they hear (right). They can use any symbols they want to illustrate the different sounds they notice such as thin curly lines for the wind, a messy scribble for the loud rumbling of a truck, short lines to represent the sounds of a cricket, a stick figure dog for barking, whatever makes sense to them. Youth can also write words or descriptions next to their symbols.
- Go to an outside area where they can spread out, at least an arm's length apart. If conditions allow, have the youth sit. If not, this can be done standing. Tell youth that the "X" in the middle of their Sound Map journal page indicates their location. Tell them to close their eyes if it feels safe for them, or alternatively cast their eyes downward and concentrate on what they are hearing, and remain as quiet as possible, listening to all the sounds they can hear for about one minute. Then have youth open their eyes and continue to listen carefully. Every time they hear a sound, they



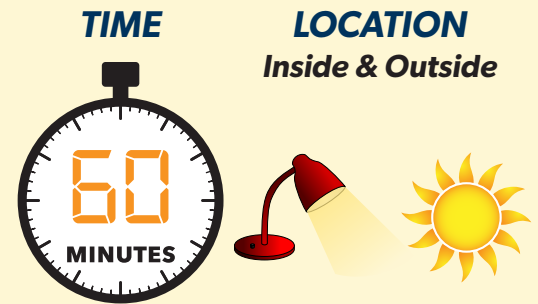
Anna Reiberg

should draw a symbol or picture on their journal page. Youth should indicate the direction and distance of the sounds from their "X" location.

- After 5-10 minutes of listening and drawing, or longer if youth are still engaged, gather youth together to share and discuss their sound maps. Ask:
 - Which noises stood out to you the most?
 - Were there any unknown sounds?
 - Could you tell the distance of the sounds? How?
 - Did you like any of the sounds? Were any sounds alarming? Surprising?
 - How do the sound maps differ based on location? Did you hear a sound that others couldn't? Can you describe or imitate the sound?
 - How many of you heard a bird? If you heard a bird, could you identify it? How did you depict it on your map?
 - If you were a participatory scientist counting birds, how might sound help or interfere with your count?
- Congratulate youth on practicing their observation skills and ask: Why do you think observation is an important skill for scientists?
- Encourage youth to reflect on what scientific skills they use between now and the next meeting.

Lesson 3: Introducing Birds!

Big Idea: Birds are a group of animals with two wings, a beak, and two legs that lay hard-shelled eggs. Birds are the only living animals with feathers.



Materials

- General Supplies
 - Projector or interactive whiteboard
 - Computer with internet access
 - Board or chart paper and markers
 - Smart devices or computers with internet access for youth
 - Field guides
 - Pencils
- Leader Guide Handouts and Resources
 - Life-size Bird images
- On the web (birds.cornell.edu/k12/youth-action-for-birds-resources)
 - Introducing Birds videos
 - All About Birds website

Getting Ready

- Review the lesson and determine if you need to make any adjustments.
- Choose and test one or more of the Introducing Birds videos to play.
- For the True or False? game, find an area large enough for youth to move from one side to the other—a gym, the playground, or your meeting space. Create a True sign and a False sign and put them up at opposite ends.
- Print and assemble your Life-size Bird images. You might want to attach each one to a piece of poster board so they can be easily displayed and carried.
- Decide how you will provide youth access to the internet or field guides to research the four common birds.

Background Information

Birds have a number of characteristics that separate them from other animals. They have hollow bones, beaks, two wings, two legs, and lay hard-shelled eggs. Birds are the only living animals with feathers. Feathers are made of keratin, the same protein that makes up bird beaks, lizard scales, mammal hair, human fingernails, and animal hooves and horns! Feathers help birds fly and keep them warm and dry. The color pattern of feathers, called “plumage,” can help birds stay camouflaged or attract mates.

Youth will be introduced to four common birds used for size comparisons in the Merlin Bird ID app: House Sparrow, American Robin, American Crow, and Canada Goose (below). This lesson introduces youth to these birds, provides an opportunity to compare and contrast their features, and helps youth develop terminology they can use to describe the birds they see.



Conducting the Lesson



Welcome & Connection

- Welcome youth to this session and show the list of scientific skills and descriptions created in the last lesson. Invite youth to share what skills they have used since the last time you met. Ask: Which scientific skills would you like to get better at?
- Share that in today's session they will be starting their journey toward becoming eBird participatory scientists by learning about birds.



Activity 1 What Do You Know About Birds?

- Project and play one or more of the Introducing Birds videos found on the resource website. Ask:
 - What type of animals are we watching? (*Birds.*)
 - How do you know these are birds? What is it about these animals' movements, behaviors, or appearance that lets you know they are birds? (*Accept all reasonable answers and make a list. Encourage youth to notice things about bird bodies and how they move. You'll want to save this list for review after the next activity.*)
- Do you recognize any of these birds? Where have you seen them before? Can you identify them? (*It could have been at home, at school, in a park, in a book... anywhere.*)
- Give youth the opportunity to share their bird experiences in a way that allows them to share more about themselves or their community. You could invite them to tell a story about birds in their life; share what birds mean for them, their family, or culture; consider who in their life or community is interested in birds; or even share their feelings about birds whether positive or negative.
- Thank youth for sharing their experiences. Emphasize that one of the great things about birds is that they are everywhere, which makes them great animals to observe for participatory-science projects like eBird!



Activity 2 True or False?

- Youth will confirm what they already know and dispel some myths about birds by playing this game. Show youth the True and False signs set up on either side of your chosen space. Invite the youth to run or move to one side or the other depending on whether they think the statements you read are true or false. Ask youth from both sides to explain why they think the statement is true or false. Allow youth to change sides based on the information discussed. Afterwards, reveal whether the statement was true or false.

1. Birds are the only living animals that have feathers.

(*True. Though some dinosaurs had feathers, birds are the only living animals with feathers. Feathers serve many functions including flight, regulating temperature, and keeping birds dry. Some birds have highly modified feathers, such as the fancy feathers on a peacock's tail.*)

Leader Tip

Can't do a moving True-False game? Print each of the statements on small strips of paper for youth to sort into true/false categories.

2. All birds fly.
(False. There are some flightless birds, such as kiwis, ostriches, and penguins.)
 3. All birds have two wings.
(True. All birds, including flightless birds, have wings. You may not always be able to see them, and they may be too tiny to be functional, such as the wings on a kiwi.)
 4. Birds lose and replace their worn or damaged feathers.
(True. Birds replace old and damaged feathers through molting. Molting generally occurs after nesting or before migration when the bird has enough resources and energy. Replacing damaged or old feathers helps birds maintain their ability to fly, keep warm, and shed water.)
 5. Birds are vertebrate animals.
(True. Birds are vertebrates with a backbone and internal skeleton—just like us!)
 6. All birds have thick, heavy bones that provide the strength they need to fly.
(False. Most birds' bones are hollow, with internal supports and pockets of air. This makes them strong but light. Many bird bones are fused together, increasing their strength without increasing weight. Some birds, however, do have thick bones. The bones of loons and penguins are thick and relatively heavy, which helps them dive underwater to search for food.)
 7. The female of all species of birds lay eggs.
(True. The females of every bird species lay hard-shelled eggs. Males do not lay eggs.)
 8. Most birds eat worms.
(False. Though some birds like the American Robin will eat worms, birds have a large variety of diets. Different bird species eat different foods, ranging from seeds, to nectar, insects, worms, fish, frogs, and other small animals.)
 9. All birds are warm-blooded.
(True. All birds are warm-blooded, or endothermic. This means that birds are able to regulate their body temperature through various internal means.)
 10. Male and female birds of some species look different.
(True. There are many species in which males and females look different. This is called sexual dimorphism. One example is the Red-winged Blackbird. The male's plumage matches his name, but the female is a dull brown with no red patches on her wings.)
- After the game, revisit the list of bird features you created in Activity 1, ask the group:
 - What characteristics do all birds have?
 - Did we capture them all on this list?

You may wish to record a new list on chart paper or a virtual space titled, "All Birds..." Before concluding the list, ensure that it includes these items: feathers, wings, eggs, tail, beak, two legs.



Activity 3 *Meet Four Common Birds*

- It's time to meet four common birds! Hold up the Life-size Bird images and tell youth they are going to get to know one of these birds, the House Sparrow, American Robin, American Crow, or Canada Goose, and share what they've learned with the rest of the group. Break youth into four groups and give each group one of the four birds.
- Have them review the All About Birds online bird guide to learn about their bird. From the site they can review videos, listen to sounds, and see more photos of each species. Challenge them to answer the following questions:
 - Where does the bird live?
 - What does it sound like?
 - Have you ever seen this bird? Where did you see it?
 - What is one cool fact that you learned from your research?
- After each group has had time to learn about their species, have them present what they learned to the other groups. Make sure they share the name of their bird and either play or imitate its sound.
- Once everyone has finished presenting, ask: How are these birds different from each other? You may wish to refer to some of the important clues to bird ID which include size and shape, color pattern, behavior, and habitat.



Activity 4 *Spotting Local Birds*

- Tell youth that they will be heading outside to practice their bird spotting skills. Remind them to use the observation skills they practiced in other lessons (you can revisit the list of scientific skills created in Lesson 2). They will be trying to find any of the four common birds and practice judging the size of any mystery birds they see. They don't need to worry about identifying any birds other than the four common birds. Ask for volunteers to carry the life-size bird images with them to make size comparisons.
- After the walk, ask:
 - Which of the four common birds did we see?
 - Where did we see the most birds? Why do you think that is?
 - What were the birds doing when you spotted them?
 - Is it easy or hard to tell the size of a bird from a distance?
- Congratulate youth on learning more about their local birds. Encourage them to notice birds and practice their observation skills before the next meeting.

Lesson 4: Introduction to Bird ID

Big Idea: There are many different kinds of birds. We can begin to identify them by comparing their size and shape.



LOCATION
Inside



Materials

- General Supplies
 - Projector or interactive whiteboard
 - Computer with internet access
 - Smart devices or computers with internet access for youth
 - Paper
 - Coloring utensils such as pencils, colored pencils, markers, and crayons
 - Merlin Bird ID app
 - Field guides (optional)
 - Pictures of your nine bingo birds (optional, see getting ready)
- Leader Guide Handouts and Resources
 - Life-size Bird images
- On the web (birds.cornell.edu/k12/youth-action-for-birds-resources)
 - All About Birds website
 - Lesson slides
- make any adjustments.
- Review and cue the slides for this lesson.
- Select a list of nine local birds for bird ID bingo based on the most common ones at your location. If you are less familiar with birds, you can use the Merlin Bird ID app to find your area's most common recent sightings. In the Merlin app, click the Explore button at the bottom and use the filter button in the top right to filter by Likely Birds on a particular date and location. In the Sort menu, make sure Most Likely is selected. This will show you the birds you have the best chance of seeing in your area at a specific time of year.
- Youth will need to see pictures of your nine local birds to draw them. Decide if you will project the images, print them, provide field guides, or give access to computers or smart devices. You can use the All About Birds website or Merlin app for images of your nine birds.
- Gather paper and coloring utensils for the bird bingo cards.

Getting Ready

- Review the lesson and determine if you need to

Background Information

Determining size and shape is the first step in bird identification. This helps put birds into the right group or family, which can narrow down your choices for identification. Size can often be hard to judge while in the field, so it can be very useful to compare unknown birds to those you already know well. Youth practiced this skill at the end of the last lesson, and you can continue to refer to the Life-size Bird images to help youth make these size comparisons.

Conducting the Lesson



Welcome & Connection

- Welcome youth to this session and invite them to share any observations or encounters they had with the four birds you introduced last session: House Sparrow, American Robin, American Crow, and Canada Goose.
- After everyone has an opportunity to share, ask: Did anyone notice birds more than they usually do? Why or why not?



Activity 1 Clues to Identifying Birds: Size and Shape

- Explain to youth that they are going to explore clues to identifying birds. The first clue is size and shape.
- Using a projector or interactive whiteboard, show the first part of the Inside Birding: Size and Shape video (see slideshow). Ask youth to focus on how Jessie and Chris describe the American Robin. Ask:
 - What size comparison did Chris and Jessie use for the American Robin? (*It's smaller than a crow but bigger than a sparrow. Refer back to the Life-size Bird images. Show that the American Robin is larger than a House Sparrow but smaller than an American Crow.*)
 - What were some features Jessie pointed out when describing the American Robin? (*It had a potbelly, long tail, and was a songbird.*)
- As a group, go through the remaining three Life-size Bird images (House Sparrow, American Crow, and Canada Goose) and have youth describe the size and shape of each bird. (*Example: the Canada Goose is larger than a crow, has a long neck, webbed feet, large belly and bottom, and a short tail.*)
- If youth are struggling to come up with answers, have them watch the video again and stop at key parts, such as when Jessie describes the American Robin (minute 3:02).
- Part of Jessie's description of the American Robin was classifying which group the American Robin belongs to: songbirds. Share the silhouette slides in this lesson's slideshow and ask youth to identify the groups of birds they know. Many youth will recognize a woodpecker, a goose, and an owl. As a whole group, identify all the bird groups. You can take this activity further by having youth look up example birds from those groups in a field guide.



Activity 2 Make a Local Bird ID Bingo Card

- Invite youth to learn more about the nine local birds you selected when preparing for this lesson. Demonstrate how to find information for one of the birds using the All About Birds website. Practice:
 - determining the relative size of the local bird by comparing with the Life-size Birds;
 - identifying the group the bird belongs to;
 - describing the bird's beak, wing, tail, belly, head, and overall shape, using the terms practiced in Activity 1.

- Watch the second part of the Inside Birding: Size and Shape video (see slideshow). Discuss with youth how the size of a bird is important by focusing on the woodpecker example from the video. Hairy and Downy Woodpeckers can be found throughout much of the United States, and often at bird feeders. When looking at Hairy and Downy Woodpeckers, not only is the Hairy Woodpecker larger than the Downy Woodpecker, but the Hairy Woodpecker also has a much longer bill than the Downy Woodpecker.
- Tell youth they are going to create a bird bingo card. Give them a sheet of paper and instruct them to draw a 3×3 grid on it (right). Project or display the names of the nine birds from your Merlin list and provide youth with pictures, or field guides, or allow them to use their computers or their smart devices. Have kids draw the birds and write their names, one in each box on their bingo cards. Encourage youth to be strategic about which birds they place where on their card. Don't forget to note important clues like the shape of the body and beak, and the color of different body parts.
- Tell youth that they will get to play bird bingo in the next meeting and have them write their names on their cards and collect them to return at the next session.
- Encourage youth to keep an eye out for their bingo birds before the next meeting.



Lesson 5: Practicing Bird ID

Big Idea: The data that youth collect to support participatory-science projects like eBird can help conserve bird species.



Materials

- General Supplies
 - Projector or interactive whiteboard (optional)
 - Computer with internet access (optional)
 - Clipboards
 - Pencils
- Leader Guide Handouts and Resources
 - Your Data Matters article (1/youth)

Getting Ready

- Review the lesson and determine if you need to make any adjustments.
- Determine if you will show the *You Can be a Citizen Scientist* video again and decide if you will need a space with a computer and internet access.
- Gather the bird ID bingo cards to hand back to youth.
- Print the Your Data Matters article, one per youth.

Background Information

eBird transforms the global birding community's passion for birds into a powerful resource for research, conservation, and education. With eBird data submitted from every country in the world, the eBird database plays an increasingly important role in science and conservation. Applications of eBird data range from research and monitoring to species management, habitat protection, and informing law and policy. Youth's eBird lists are an important part of the puzzle, adding observations to the database.

Conducting the Lesson



Welcome & Connection

- Welcome youth to this session and invite them to share any observations or encounters they had with birds since the last meeting. Ask: Were any of them birds on your bingo card? Where did you see them and what were they doing?



Activity 1 *Play Bird ID Bingo*

- Hand out the bird ID bingo cards, clipboards, and pencils. Have youth look at their finished cards. Encourage them to think about what they learned about bird ID in the last session. Ask:
 - How can we tell these nine birds apart?
 - Do you think you could identify these birds if you saw them outside?
- Explain that youth will now go on a bird bingo walk. Their goal is to try to identify any of the nine birds on their card and see if they can get a bingo! You may wish to remind youth what bingo looks like: checking off three boxes in a row, whether vertical, straight, or horizontal. Challenge them to come up with the rules they would like to play with. They can be creative! Do they want to play individually or in groups? What does bingo look like? Is it three in a row, the full card, or the four corners?
- Once they've decided how they would like to play, take the youth on a walk around your area or in a nearby green space to play bird bingo.
- If time allows, you can play several rounds. After the first round, give youth the opportunity to review what worked or didn't work with their rules, adjust them, or play a different way.



Activity 2 *Why Participatory Science?*

- Have youth reflect on why they are learning to identify birds. (*To be part of the eBird participatory-science project!*)
- Review the definition and idea of participatory science. (*Youth should recall from Lesson 1 that participatory science involves the general public in collecting data that is useful to scientists. If they need a refresher, you might have them watch the video again.*)
- Have youth read the Your eBird Data Matters! article. Ask: How has eBird and participatory science helped birds? Discuss with youth how they feel about participating in eBird.
- Share with youth that they will continue building their bird ID skills by learning how to describe bird body parts and the color patterns of their feathers, also called plumage. Encourage them to notice what colors are where on the birds they observe before the next meeting. (*i.e. an American Robin's chest is orange.*)

Lesson 6: Bird Body Parts & Field Marks

Big Idea: A bird's overall color pattern provides important clues for identification.



LOCATION
Inside



Materials

- General Supplies
 - Projector or interactive whiteboard
 - Computer with internet access
 - Smart devices or computers with internet access for youth
 - Merlin Bird ID app
 - Field guides (optional)
 - Two cups/containers
 - Coloring utensils such as colored pencils, crayons, or markers
- Leader Guide Handouts and Resources
 - Red Plover Game journal page (1/youth)
 - Red Plover Game leader cards (1 copy)
- On the web (birds.cornell.edu/k12/youth-action-for-birds-resources)

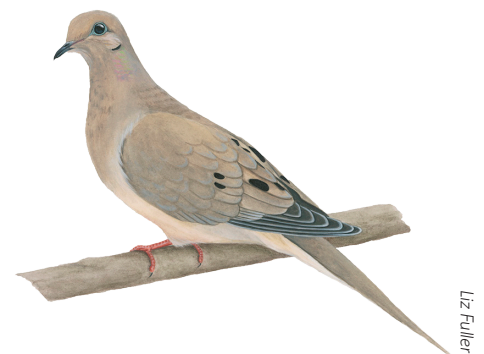
- Lesson slides

Getting Ready

- Review the lesson and determine if you need to make any adjustments.
- Review and cue the slides for this lesson. Pay special attention to the Red Plover Game body parts slide and review the terms.
- Print one Red Plover Game journal page for each youth. Cut the Red Plover Game leader cards. Place the "body" cards in one container and the "color" cards in another. Be sure the coloring utensils provided to youth have a matching Red Plover leader card. To play the Red Plover game, you will need a large, open space indoors or outside.

Background Information

After size and shape, color pattern is an important clue to identifying birds. Field marks are the distinctive colors and patterns of birds that are used to identify them. Wingbars (thin lines across the wings) and eye-rings (circles around the eyes) are common field marks. Knowing general bird anatomy can help with describing color patterns and field marks. To practice these skills, youth will be introduced to a mystery bird, the Mourning Dove (right). The Mourning Dove is one of the most common birds found throughout the United States.



Conducting the Lesson



Welcome & Connection

- Welcome youth to this session. Have youth reflect on the experiences they've had identifying birds so far. Was it easy or hard to identify the birds on their bird ID bingo cards? Have they encountered any birds they

weren't able to identify? What else could they learn that would help them in being able to identify birds?

- Share that today youth will be exploring bird body parts and field marks as tools to help them identify birds.



Activity 1 Red Plover

- Project the Red Plover Game image of bird body parts (see slideshow) and review the different parts with the whole group. Then, identify each body part on the Life-size Bird image of the American Robin. Ask:
 - Where is the American Robin's belly and what color is it? (White)
 - Where is the American Robin's head and what color is it? (Black)
 - Where is the American Robin's chest and what color is it? (Orange)
- Using the Red Plover journal page, youth will test their knowledge of body part locations while playing a game called Red Plover. First, have youth label the blank body parts of their journal page. Then, have them design a bird by coloring in the different body parts. They can use any of the colors you've provided for any bird body part they wish, but each individual body part should be one solid color (no stripes or spots).
- After youth have finished coloring their bird parts, take them to your open space to play the Red Plover Game. Have the youth stand with their completed Red Plover journal pages at one end of the room. Using the Red Plover Game leader cards, randomly pick one color card and one body part card. Read the two cards aloud by asking, for example, "Does anyone have a GREEN TAIL?" Youth with a green tail on their bird can take one step forward. Return the cards to the drawing pile so that GREEN and TAIL can be called again in different combinations. The game ends when someone makes it to the other side the room.



Activity 2 Using Field Marks

- Play the Inside Birding: Color Pattern video (see slideshow). Afterward, review the concepts of color pattern and field marks.
- Challenge youth to identify a mystery bird using what they've learned. Show a video of a Mourning Dove (see slideshow). Do not reveal the species name. In small groups, have youth discuss the size, shape, and color pattern. (*The bird has a tan/light brown head and belly; dark brown/gray back and wings; a white/blue eye-ring; a spot on its neck; spots on its wings; long and pointy tail; and a small head compared to the body.*) After small group discussions, come back together as a whole group to review the characteristics of this mystery bird.
- It's time to identify the bird. Either project or demonstrate Merlin Bird ID or allow the youth to use Merlin on their devices. Guide youth in identifying the mystery bird using Merlin Bird ID. Inform them that they can find the bird in their town at this time of year. (Exception: If you live in the northwestern U.S., Mourning Doves might not be seen in your area during the winter.) When selecting size, the bird is comparable to a robin. Youth can then enter up to three colors they saw. Finally, they will select where the bird was/what it was doing, such as in a tree or on the ground. A list of likely birds will appear. Encourage youth to look through the photos to match the color pattern and field marks they identified. What is it? It's a Mourning Dove!
- Have youth reflect on the clues to bird ID that they've learned so far: size and shape, color pattern, and field marks. Ask: Do any of these clues feel more important than the others? If so, which ones and why? If not, why?
- Encourage youth to practice their bird ID skills before the next meeting. What sort of field marks stand out to them the most?

Lesson 7: Focusing on Local Birds

Big Idea: Youth become bird ID experts on a focus bird.



Materials

- General Supplies
 - Smart devices or computers with internet access for youth
 - Field guides (optional)
 - Pencils
 - Paper
 - Coloring utensils
- Leader Guide Handouts and Resources
 - My Focus Bird journal page
 - eBird Data Sheet
- On the web (birds.cornell.edu/k12/youth-action-for-birds-resources)
 - All About Birds website

Getting Ready

- Review the lesson and determine if you need to make any adjustments.
- You will need each youth to have a focus bird from a list of local birds. Decide if you would like to assign

them a bird or if you would like to provide them the opportunity to choose. Decide if you would like this list to include the birds from your bingo card or be all new birds. Use the same process you used to create the bingo card list to generate an expanded list in Merlin. You will need one bird per youth, or you can choose to have two youth share one bird. You will also need to provide one My Focus Bird journal page for each youth and provide access to the internet, smart devices, or field guides to research their focus bird.

- Choose a location either at your meeting area or nearby to take youth on a practice walk. Print copies of the eBird Data Sheet for each group of two or three youth. If you have binoculars or field guides, you may want to bring them along for the groups to use. If you have smart devices available, download the Merlin Bird ID app and allow youth to use them to identify unknown birds. Each group should have one clipboard and pencil to complete their eBird Data Sheet.

Background Information

In this lesson, youth will use what they've learned about size and shape, color patterns, and field marks to get to know a single focus bird. Drawing birds is a great way to commit these important ID clues to memory.

Conducting the Lesson



Welcome & Connection

- Welcome youth to this session. Share that they will be getting a focus bird today, one that they will become the ID expert on, and then they will do a practice participatory-science walk.
- Ask youth to reflect on what they know about participatory science. Ask: Why do you think we are doing a

practice walk before completing our first eBird count? What skills have we been developing over the last few meetings? How will they help us be better scientists?



Activity 1 *Focus Bird*

- Assign or have youth choose one of the birds from the list of local birds you generated. The youth's challenge is to become an ID expert on this one bird. Tell youth that they may only get a glimpse of a bird in the field, so this is their chance to be the group expert on a bird so they can help the group make quick, accurate identifications. Using field guides, the Merlin Bird ID app, and the All About Birds website, allow youth 15–20 minutes to draw their focus bird on the My Focus Bird journal page. After sketching, they should label three to five identifying field marks and list the size of their bird. If there is time, have them research and fill out the back part of their focus bird sheet.
- Have youth share their focus bird with a partner. Encourage them to look for differences between the birds. Remind them that these differences—in color, shape, and size—can be used to tell the birds apart. Once the partners are done sharing, have each participant present their own or their partner's bird to the group.
- Display the drawings around the activity space to give everyone the opportunity to view them, or bind them together to make a group field guide for use as a reference on bird walks.



Activity 2 *Practice Participatory Science Walk*

- Tell youth it's now time to practice identifying and counting birds for eBird. Have them consider the birds they've learned across the four common birds, bird bingo, and focus bird activity. Ask: Do you feel confident you can identify the birds you've learned? If the youth don't feel confident, review some of the strategies for identifying birds through size and shape, color pattern, and field marks. Remind youth that their observations matter, and they need to accurately ID the birds that they see when they count birds for participatory science.
- Explain that they will now go on a practice participatory-science walk to identify the birds they've learned about. However, they may see birds they haven't studied. Ask: If we see a bird we can't identify, what information should we collect about that bird to identify it? (*Youth can look at the bird's size and shape, color pattern, and field marks. They may also want to note where the bird was and what it was doing.*) It's recommended that the youth sketch the unknown bird on the back of their eBird Data Sheet. Based on their observations and their sketch, youth can then use the Merlin app to help identify the bird they saw.
- Conduct a 15-minute walk around your area or in a nearby green space. This walk is for practice, but you should keep a count of the species seen using the eBird Data Sheet. If you have a large group, we recommend youth work in groups of two or three to spot birds, keep a bird list, and sketch any birds they may not be able to identify. Each group should have a clipboard, eBird Data Sheet, and pencil. If you have iPads or tablets available, allow the youth to use the Merlin Bird ID app for mystery species. If binoculars or field guides are available, encourage youth to use them, too.
- After the walk is over, have the groups discuss the birds they saw and practice creating one master list that combines everyone's sightings and numbers that could be submitted to the eBird database. If youth saw different numbers of the same species, you may need to guide them to choosing the most accurate number. See the Leader Tip: Summarizing Bird Counts for more guidance.
- Let youth know that in the next lesson, they will begin exploring habitats. Challenge youth to spot their focus bird before the next meeting and to notice where it is and what it is doing.

Leader Tip: Summarizing Bird Counts

This conversation was overheard as Mrs. Toth's groups summarized their bird data for the first time.

Mrs. Toth: What birds did you see when we were outside?

James: I saw three American Crows.

Mrs. Toth: Yes, I actually counted two crows. Are you pretty sure you saw three different birds?

James: Yes. Two were flying together and later I saw another one perched in a tree in another area. I don't think they were the same birds.

Mrs. Toth: Did anyone see more than three?

Resana: Katie and I wrote down five on our list. I think we saw the two flying ones that James saw, and we saw three that were perched in trees. I think they were all different birds, too.

Mrs. Toth: We'll write down five, then. What other birds did you see?

Xiomara: We also saw two seagulls.

Mrs. Toth: What kind of gulls? Aren't there several species of gulls around here?

Xiomara: I don't know what kind they were. I just wrote down "seagull."

Mrs. Toth: Did anyone who saw the gulls look them up in a field guide or sketch them?

Group: No.

Mrs. Toth: Well, we can list a general group of birds if we aren't able to identify them, but listing specific species is better. Let's look in our field guides. Next time we see gulls, what should we look for?

Group: The size of the gull... whether it has a ring around its beak... whether it has a red spot on its beak... what color its wings are.

Mrs. Toth: In this area, what are common gulls we might see?

Terry: The Herring Gull and the Ring-billed Gull. It says both are common. But the Herring Gull looks a lot bigger and has a different beak.

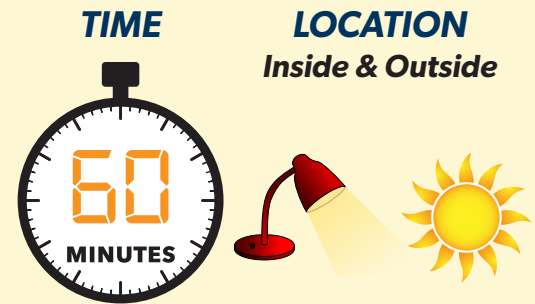
Mrs. Toth: Next time we see gulls, we should look for those field marks. Maybe we can figure it out during another count!

Bella: Could we list them just as "gull" so the scientists know we saw them?

Mrs. Toth: That's a great idea! I'll add two to the gull species category.

Lesson 8: Habitat and Adaptations

Big Idea: Birds live in many different habitats and have developed adaptations over time to survive and reproduce in their habitat.



Materials

- General Supplies
 - Projector or interactive whiteboard
 - Computer with internet access
 - Board or chart paper with markers
 - Paper
 - Pencils
 - Clipboards
 - Coloring Utensils
- On the web (birds.cornell.edu/k12/youth-action-for-birds-resources)
 - Lesson slides

Getting Ready

- Review the lesson and determine if you need to make any adjustments.
- Choose an outdoor location where youth will be able to create a habitat map. Each youth will need a clipboard, paper, and pencil.
- Review and cue the slideshow for Activity 2.
- Provide blank paper and coloring utensils for youth to use in designing their own habitat and bird.

Background Information

Habitats are the places that provide food, water, cover, and space for all living things, including birds. Habitats encompass all the basic components needed for living things to survive. Cover includes nesting areas, places to sleep or rest, and places to hide or escape. Space refers to having enough of the right habitat to allow plants and animals to survive. If a place does not provide adequate food, water, and cover, a plant or animal cannot live there. Adaptations are characteristics that allow a plant or animal to survive and reproduce. Animals have both physical and behavioral adaptations. For example, a heron's long legs would be a physical adaptation to fishing while standing in the water. A behavioral adaptation would be the heron slowly stalking along the pond shore so that it doesn't scare away their prey. Birds have a diverse range of adaptations that youth will explore in this lesson.

Conducting the Lesson



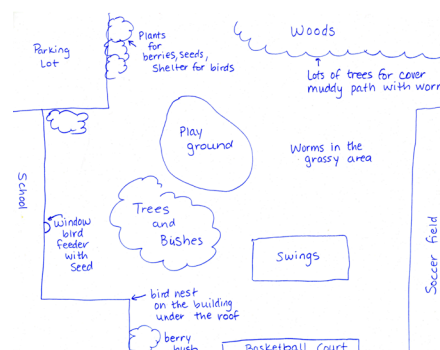
Welcome & Connection

- Welcome youth to this session. Ask if anyone saw their focus bird since your last meeting. Ask: Where did you see it and what was it doing? How were you able to recognize it?
- Share that they will be exploring their local habitat and learning about adaptations.



Activity 1 Habitat Inventory

- Have youth brainstorm a list of things birds need in their environment to survive and write their responses on a board, chart paper, or virtual space. Possibilities include seeds, ponds, fruit, nests, trees, bushes, feeders, etc. Group these items into the following categories: food, water, cover, and space. If you notice there are items missing from any of the categories, encourage deeper thinking. Youth might suggest that birds need “love” or “families”—these are not environmental needs and therefore not part of the definition of habitat. Put them in a separate place on the board for other non-habitat needs.
- Tell youth that each living thing needs a place that provides food, water, cover, and space—its habitat. If a bird or other animal cannot find these resources, it can’t survive and raise young there.
- Inform youth that they are now going to determine if the surrounding area provides a good habitat for birds. Assign youth to small groups and designate a space in your area for the groups to map. This could be a courtyard, garden, bird feeding area, parking lot, or lawn. If your area doesn’t include green spaces, that’s okay—map whatever area is available. We recommend the space have clear boundaries, such as a wall, fence, or sidewalk. The maps should be from a birds-eye view (above) and include structural features of the habitat (such as fences, pavement, and paths) along with other components such as trees, bushes, flowers, and bird feeders. Have youth label all the components on their maps. Provide youth with 10–15 minutes to map the area.
- Once their maps are complete, have youth do a bird count lasting 3–5 minutes and mark on their maps where they see birds. Challenge them to include the species name if they know it.
- After youth have completed their bird count, ask:
 - What did you include on your map that could provide food, water, or cover?
 - What birds did you see and where were they in the habitat?
 - Is this area a good habitat for birds? Why or why not?
 - What can we do to improve our habitat for birds? *(Have youth consider the diversity of food, water, and cover options. Can you plant native trees or flowers to attract insects or provide fruit? What about adding a birdbath or bird feeder? If you already have both, is there enough shelter from nearby trees to help birds feel safe from predators?)*

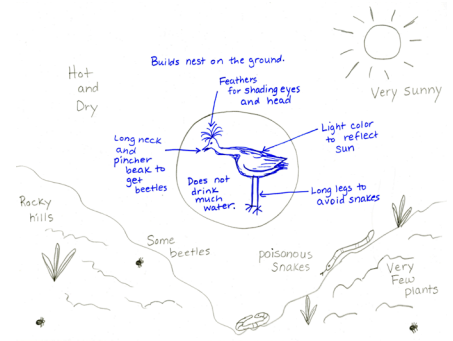


Activity 2 Design a Bird

- Share with youth that habitat can be an important clue to bird ID. What habitat you are in will determine the type of birds you see. For example, you wouldn’t expect to see a duck in the middle of the desert. In this activity, youth will explore the ways that habitat and the appearance of birds can be linked.
- Use the adaptation slides to introduce the concept of adaptation and ask youth which habitat they think the bird lives in and why. Inform youth that birds, like all animals, have adaptations or characteristics that help them survive in their habitat. Note that adaptations can be physical (such as the long beak on a heron) or behavioral, such as a heron stalking slowly along a pond shore. Challenge youth to design their own bird. Break into groups of three or four or have youth work individually. Each group should have a blank piece

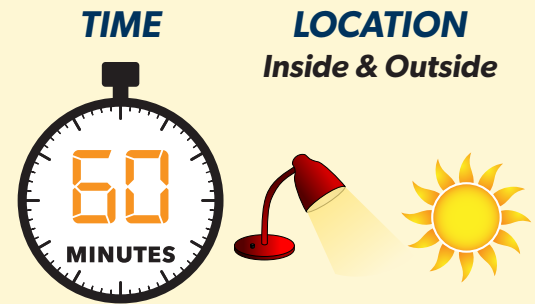
of paper. Ask them to draw a large circle in the center of the paper. Outside of the circle, each group should create a challenging habitat in which the bird will live. It does not have to be a real habitat. Give the groups or individuals 5–10 minutes to draw a habitat outside the circle, using labels or captions to enhance their drawing.

- Collect completed papers and randomly distribute one to each group or individual. Now the youth must look at the challenging habitat they've been given and design a new bird species that is adapted to that habitat. It can be as fantastical or realistic as they want. Youth will need to consider what the bird will eat, where it can get water, what it will use for shelter, and how it will defend itself from potential predators.
- Once youth have finished their drawings, have them show the finished results and share their reasoning for the adaptations they chose.
- Share with youth that in the next lesson they will use eBird to explore local habitats. Encourage them to observe what kinds of habitats are around them and how birds use them before the next meeting.



Lesson 9: Focusing on Local Habitats

Big Idea: Youth can contribute to the eBird database by submitting their bird sightings and explore the database to answer questions about their local habitats.



Materials

- General Supplies
 - Projector or interactive whiteboard
 - Computer with internet access
 - Board or chart paper with markers
 - Pencils
 - Clipboards
 - Smart devices
 - Field guides (optional)
- Leader Guide Handouts and Resources
 - eBird Data Sheets
- On the web (birds.cornell.edu/k12/youth-action-for-birds-resources)
 - Google Earth or other mapping software
 - eBird website
 - eBird Live Submission map

Getting Ready

- Review the lesson and determine if you need to make any adjustments.
- Pull up and prepare to share mapping software such as Google Earth and the eBird website.
- Decide if you will use eBird Data Sheets or the eBird Mobile app for your eBird count. If using data sheets, print enough for each group of youth.
- Load the eBird Live Submission map.

Background Information

In this lesson, youth will submit data to eBird. Many leaders are excited to take kids outside to watch birds but are hesitant about sharing youth's observations to eBird. One of the biggest concerns is whether their data are high enough quality for the eBird database. Yes, the data can be submitted to eBird! If you're unsure whether you're correctly identifying the species you see, you can:

1. enter the bird group, instead of the species. For example, if you see a bird that you know is a gull but aren't sure what species it is, you can always enter "gull sp." rather than reporting the exact species. This can be done for many bird groups such as sparrows and hawks. There are also species that are commonly confused, such as Downy and Hairy Woodpeckers. For these, you can choose the option "Downy/Hairy Woodpecker," indicating you know it's one of the two species but are unsure which one;
2. submit an incomplete checklist to eBird. This means that the data will not be used for professional-level scientific research, but the data will show up in your group's eBird profile and be available for use by your groups in future years. This can be quite useful for analyzing trends over time in your birding locations. As youth's identification skills improve, switch to submitting complete checklists.

Leader Tip

For the purposes of eBird, a complete checklist is one for which birding was your primary purpose, and every species you could identify to the best of your ability, by sight and/or sound, is reported. You do not need to see, hear, or know every bird you encountered to have a complete checklist.

Conducting the Lesson



Welcome & Connection

- Welcome youth to this session. Share that they will be exploring what birds live in different habitats locally and around the country.
- Ask youth to share an experience they have had visiting different kinds of habitats.



Activity 1 Local Habitat Comparison

- Use the group's knowledge or a mapping program such as Google Earth to come up with three areas in your county that have different habitats. Some habitat types to consider include urban, forest, grassland or field, marsh, and pond or lake. Record your three areas on a board, chart paper, or virtual space. Note that in a future part of the activity, you will be checking these areas for eBird hotspots. Not all areas in your county may have been visited by eBirders, so you may need to expand your search to similar habitats in nearby counties or statewide. You'll need two to three habitats with hotspots (birding locations in eBird) to complete the activity.
- Have youth consider what they know about birds, adaptations, and habitats. Ask: Do you expect these locations to have the same birds, different birds, or a mix of both? Why?
- Look up a hotspot in each habitat you've identified using the Explore Regions function under the Explore tab on the eBird website. Enter in your county name and then select the map icon in the upper right corner. From there you will be able to see hotspots in your county. When you click on a hotspot, select View Details. Select All New Species under eBirding This Month. From there, make sure Last Observed is selected for a list of most recently seen species. You will refer back to these lists in the next part of the lesson, so you may wish to print them or keep them open in a browser tab. Ask: How do the sightings align with our predictions? Which birds are different among them, which are the same? What might account for those similarities or differences? (*Different birds live in different habitats, so while there might be a lot of overlap between habitat types, a bird such as a duck or a heron is mostly seen in water habitats versus fields or forests. Youth may also note that the sites were visited most recently in different months, which could affect the number and types of species seen.*)
- Now that youth have had a chance to investigate some of their local habitats, challenge them to pick a location somewhere else in the country that represents a different type of habitat. Compare a hotspot in that area with the other hotspots you investigated. You can click on the name of any birds you don't recognize to see a species description and pictures. After comparing these habitat types, ask: How does habitat play a role in bird identification? (*Different habitats attract different birds. Knowing what birds you are likely to observe in each habitat can help you better identify them.*)



Activity 2 *eBird Walk*

- It's time to participate in eBird. If you have a large group, we recommend dividing youth into groups of three to count birds. Each youth can be assigned one of the following roles: spotting birds and looking for field marks; identifying the bird in the Merlin app or in a field guide; entering data on the eBird Data Sheet or via the eBird Mobile app. If using the mobile app, remind youth that you will only be submitting one list. Take youth on a 20-minute bird walk.
- At the end of your walk, summarize all the sightings just like you did in the practice walk. Create one master list, but do not submit it yet.
- Before you submit your list, open the eBird live submissions map and prepare to look for your submission to light up on the map.
- Submit the list through the eBird Mobile app or through the eBird website. Congratulations! You are eBird scientists! Did you see your list light up on the map?
- Let youth know that in the next lesson they will further explore eBird, participatory science, and other ways to help birds. Encourage them to think about ways they could help birds in their community.

Lesson 10: Local Action Leads to Big Impacts

Big Idea: Youth can make a difference for birds by engaging in participatory science and taking action in their own communities.

TIME



LOCATION

Inside



Materials

- General Supplies
 - Projector or interactive whiteboard
 - Computer with internet access
 - Pencils
 - Paper
 - Board or chart paper and markers (optional)
- On the web (birds.cornell.edu/k12/youth-action-for-birds-resources)
 - Lesson slides
 - 3 Billion Birds website
 - 3 Billion Birds Lost video
 - 7 Simple Actions website
 - Why Birds Matter website
- For Activity 3, decide what parameters you would like to set for your youth partners' action project. Consider whether you would like youth to complete individual, small group, or one big project; what timeframe they have to work with; and what resources are available. Decide if you will let youth design a project from scratch, or if you will provide them with a few options to choose from. The more open-ended you can make the process, the more leadership skills youth will be able to practice.
- Load the 3 Billion Birds website and prepare to play the 3 Billion Birds Lost video.
- Review and load the teaching slides for this lesson.
- Provide access to the 7 Simple Actions and Why Birds Matter sections of the 3 Billion Birds website.
- Gather materials for project planning, such as pencils, paper, whiteboard and dry erase markers, or chart paper and markers.

Getting Ready

- Review the lesson and determine if you need to make any adjustments.

Background Information

In this lesson, youth explore eBird models and discover the power of participatory-science data to help birds and conservation. Scientists and land managers use eBird data to help make conservation decisions on local to global scales. One powerful way of visualizing and using eBird data is through bird population models. These models provide a great opportunity for youth to see the value of participatory-science data and to develop their science skills in analyzing and interpreting data.

A 2019 study, published in the journal *Science*, revealed that since 1970 bird populations in the United States and Canada have declined by 29 percent, or by almost 3 billion birds. These tremendous losses occurred across diverse groups of birds and habitats. The scientists concluded that the disappearance of even common species indicates a general shift in our ecosystems' ability to support birdlife. While this study signaled a widespread ecological crisis, there is reason to hope. The study also documented a few promising rebounds among bird groups, such as waterfowl and raptors, where people have made concerted conservation efforts. As a follow-up to this study, researchers and organizations developed simple ways people can help birds. In this lesson, youth will use the 3 Billion Birds website, which was created to share information and provide simple ways that people can help birds, to create their own action plans.

Conducting the Lesson



Welcome & Connection

- Welcome youth to this session. Share that today youth will be exploring how participatory science helps birds and developing their own plan to help birds.
- Ask youth to reflect on their experience collecting data for eBird. What did they like or dislike about the process? Is it something they would like to keep doing? How confident are they feeling in their bird ID skills?



Activity 1 The Power of eBird

- Tell youth they are going to explore the power of eBird data and get a glimpse into why contributing to participatory science is one of the 7 Simple Actions. Show the Mystery Map (see slideshow) created with eBird data. Ask youth to observe the map, letting it run through multiple cycles. Draw attention to the bar showing the week of the year. Ask:
 - What do you think the map is showing?
 - What patterns do you see?
- Reveal that the map shows the migration of the Yellow Warbler (see slideshow). Explain that this map uses large data sets of bird observations to show the relative abundance of birds, or the number of birds you could expect to see in a certain area at a certain time of year. Ask: How might a map like this be useful for scientists? (*These maps help scientists understand the habitat use of different bird species during particular times of year. Maps like these can show where species gather during migration, breeding, and wintering cycles, and thus highlight areas important for the conservation of the species.*)
- Share that birds are bioindicators—organisms that can indicate the health of a habitat. For example, if a species of duck disappears from a particular lake, it might indicate that something is wrong with the lake. Youth help scientists know when and where different birds are whenever they participate in eBird. Knowing when and where birds are can show if bird populations are increasing, decreasing, or staying steady. This can help scientists understand the health of entire ecosystems, not just how birds are doing.



Activity 2 Participatory Science and Conservation

- Remind youth that one of the benefits of large, long-term participatory-science data sets is that they can show us how bird populations change over time. Ask:
 - Based on what you already know about birds and the environment, how do you think birds are doing? Do you think their populations are increasing or decreasing?
 - Do you think it's the same for all bird groups, such as songbirds, ducks, and birds of prey? Why or why not?
- Play the 3 Billion Birds Lost video (running time 2:49, on the web). After the video, ask:
 - How does the reality of bird declines compare with what we thought before?
 - According to the video, what is causing these declines? *Habitat loss, outdoor cats, glass collisions, pesticides, insect declines, and climate change.*
- Share that data from Audubon's Christmas Bird Count, which is one of the oldest participatory-science

projects in the United States and Canada, was used as a key part of this study and played an important role in detecting these population declines.

- Emphasize to youth that these declines can be reversed as shown by the increase in some birds such as the Bald Eagle. The many organizations who contributed to this study also put together seven simple actions to help birds.
- Review the 7 Simple Actions with youth (on the web). Highlight that contributing to participatory-science projects such as eBird is one of the actions.



Activity 3 Action Project Planning

- Tell the youth that they are going to have a chance to design a project to help birds after doing some research. Divide the group in half to gather information on how to help birds. Have one group explore the 7 Simple Actions section of the 3 Billion Birds website and the other explore the Why Birds Matter section. Have groups share the highlights of what they learned.
- Now that youth have the needed background information to plan a project, lay out your group's particular parameters, including whether they are doing individual or group projects, the amount of time they have, and what resources are available to them. Give them time and the materials needed to brainstorm action projects that they can do to help birds and their communities. Below are a few project ideas but we encourage you to help youth partners develop a project that is meaningful to them and their community. Possible projects could include:
 - Implementing any of the 7 Simple Actions in their homes or community spaces.
 - Continue collecting data for eBird counts
 - Design window crash solutions for a community building
 - Educating your local community about birds.
 - Design and implement a social media campaign or write a blog post. Topics could include Bird ID, participatory science, or any of the 7 Simple Actions to help birds. There are infographics on the 3 Billion Birds website that anyone can share on social media.
 - Help your community learn about your local birds by leading bird walks. Youth can take on leadership roles and share their bird ID knowledge.
 - Habitat improvement projects.
 - Plant native plants. Native plants provide important food sources for birds. Your local Cooperative Extension will have lots of resources around gardening and which plants are native in your area.
 - Adding bird feeders or baths to a landscape can make it more bird friendly by adding habitat features that may otherwise be missing. Youth may be able to ask local stores to donate or offer a discount on bird feeders and baths or run a fundraiser to purchase them.
 - Building and installing bird houses. NestWatch is a participatory-science project from the Cornell Lab of Ornithology that has a variety of resources on nesting birds. You can look up birds in your region, discover whether they are in decline, download bird house plans for your target species, and learn the best places to install them.

Leader Tip

How much time is needed for youth action projects? Depending on the project, youth may need several more sessions to implement some projects. Be clear on the amount of time they have for implementing their project. If you know you do not have enough time or resources to complete any action projects within your sessions, have youth focus on brainstorming projects they can do at home.

- Once a direction has been decided, encourage youth to begin planning their project. This may require additional sessions. Have youth sketch out or write down their plans, including the materials they'll need and how much time they think it will take them to implement their plan. Give feedback and suggestions during this process, encouraging youth to make a detailed and achievable plan.

Lesson 11: Project Implementation

Big Idea: Youth can make a difference for birds by taking action in their own communities.

Time and location will depend on the projects youth develop.

Materials

Materials will depend on the projects youth develop.

Getting Ready

- Review youth's project plans to determine if they need more planning time before beginning implementation.
- Determine if special meetings or additional time

will be needed to implement the project plans.

- Gather materials youth will need to implement their project plans.
- Reflection and celebration are important parts of project implementation. Review Activity 2 and determine how youth will reflect on and celebrate their work.

Background Information

This lesson's format is significantly different from the previous lessons. Much of the timing will depend on the projects that youth have designed and how you choose to acknowledge and celebrate their accomplishments.

Conducting the Lesson



Welcome & Connection

- Welcome youth to this session. Share that today youth will be working on their action projects.
- Ask youth to reflect on the plans. What are they most excited for? What might the most challenging part of the project be? How can they overcome those challenges?

Activity 1 Project Implementation

- The amount of time and resources needed to implement each project will vary greatly depending on the project your youth partners design. While implementing your project, you may wish to consider:
 - Continuing eBird counts as "brain breaks" during your working sessions. Lesson 9, Activity 2 outlines the main steps of an eBird walk and count.
 - Providing time for youth to reflect on problems and solutions.
 - Keeping your community informed about the work your youth partners are doing.

Activity 2 *Reflect & Celebrate*

- Have youth reflect on the process once the project is complete. You may wish to revisit the list of scientific skills you made in Lesson 2, Activity 1, and have youth reflect on which of these skills they used during the lessons and their project. You could ask:
 - How do you feel about the process and the final project?
 - What skills did you use?
 - How do you feel about birds now?
- Consider how you will celebrate the completion of your project and your time together. How can you recognize youth for their personal growth, leadership, or personal development? You may wish to have youth journal on their own or invite them to share positive growth they have seen in each other.



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159 Sapsucker Woods Road, Ithaca, NY 14850
K12Lab@cornell.edu
www.birds.cornell.edu/k12/

eBird Explorers: Youth Action for Birds

Resource Pages

eBird Explorers: Youth Action for Birds

Resource Pages

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Amelia-Juliette Demery

Evolutionary Biologist
Ph.D. Cornell University

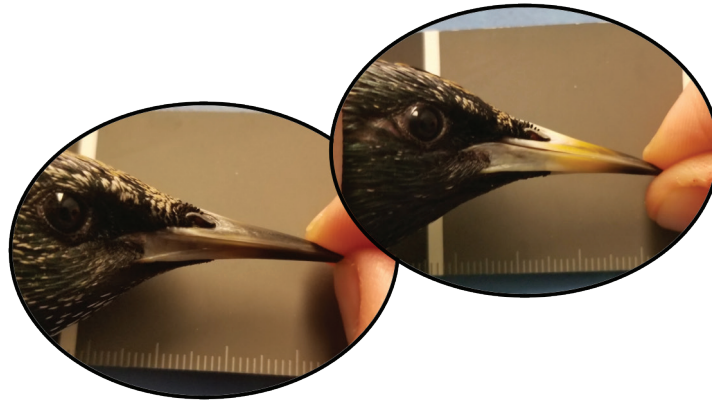


Amelia with a specimen from the Cornell University Museum of Vertebrates. Photo courtesy of Amelia-Juliette Demery.

When Amelia-Juliette Demery was young, she watched the Animal Planet TV show with the famous zookeeper and conservationist, Steve Irwin. She was so inspired by him that she decided she wanted to work outdoors and teach others about nature too.

As a scientist, Amelia is curious about why animals look the way they do, and how their looks change over time. Early in her career, she studied how fence lizards in urban and rural places look different. Now she studies birds and how their beaks have evolved. Beaks can communicate health, dominance, and even sex appeal.

Amelia studies the European Starling, a common bird found in the same environments as humans. While most bird beaks do not change color during their lifetime, European Starling beaks do. Their beaks are bright yellow during the breeding season and darken the rest of the year. To figure out how and why these changes occur, Amelia studies these birds in a lab so she can control the conditions in which they live. For example, in one experiment, she changed the amount of sunlight they received to see whether it affected beak color. Take a look at the photos (on the next page) from Amelia's experiment. How did the beak change during the experiment?



Left: European Starling's beak on day 0 of Amelia's experiment.

Right: European Starling's beak on day 63 of the experiment.

Photo credit: Amelia-Juliette Demery.

There are many things that could make bird beaks change color. Amelia studies sex hormones, environmental changes (such as sunlight and food), and neurobiology as their beak color changes. Amelia has discovered that beak color changes are not due to sex hormones, and she now wonders if genetic factors are causing the changes.

Beyond color changes, Amelia also studies how beak shape is evolving among distantly related birds, specifically birds in the tanager family. She found that more than half of the tanagers were evolving towards similar beak shapes. The problem is that these physical changes in beak shape have not kept up with the changes in the food available to tanagers. Climate change and other human influences have caused food availability to change rapidly, while beak evolution takes longer. This could lead to a mismatch between the physical ability of a bird to eat the food available to them. It is important to understand physical evolution in order to understand a bird's ability to adapt to climate change. Understanding evolution could help us protect these tanagers in the face of climate change.

In addition to her scientific research, Amelia is passionate about making research safer and more inclusive for scientists from all backgrounds. She recently wrote a manual with her friend and fellow scientist, Monique Pipkin, to promote safe and inclusive fieldwork. Their manual is being used to improve conditions for women and minoritized scientists across the country.

To learn more about Amelia's work, explore:

- Cornell University Student Spotlight: Amelia-Juliette Demery.
gradschool.cornell.edu/spotlights/student-spotlight-amelia-juliette-demery
- Women in STEM Series – Amelia-Juliette Demery, Ph.D. Student.
www.birds.cornell.edu/k12/amelia/
- Distantly Related Tanagers Independently Evolve Similar Beaks.
newscenter.sdsu.edu/sdsu_newscenter/news_story.aspx?sid=79101

Sebastian Alejandro Echeverri

Ecologist/Evolutionary Biologist

Ph.D. University of Pittsburgh



Sebastian taking photos of wildlife.
Photo credit: Yusan Yang, AAAS.

When you hear the word conservation, you might not think of spiders. Sebastian Echeverri is trying to change that. He is a scientist, science communicator, and wildlife photographer who studies spider behavior. While many people are afraid of spiders, they are an important predator and play a key role in controlling insect populations. By helping people understand and appreciate spiders and their behaviors, he advocates for their conservation.

Sebastian was captivated by the “sick dance moves” that male jumping spiders use to attract mates. During his Ph.D. program, Sebastian studied how these colorful spiders get their audience’s attention when performing their animated courtship dances. Jumping spiders can only see color with the eyes on the front of their heads; the eyes on the back of their heads can only see in black and white. But unexpectedly, the male jumping spider starts his courtship dance behind the female spider. Why? Sebastian discovered that these males wave their legs to grab her attention, and then she turns around to see him in all his glory!

Sebastian continues to study spiders and make new discoveries. Currently, he studies tarantulas. Even though all spiders have eight eyes, scientists have long believed that tarantulas don’t use their vision much. Sebastian noticed that arboreal (tree-living) tarantulas have larger eyes than terrestrial (ground-living) species. Why? He’s not sure but has discovered that this evolution in eyesight happened when some tarantula species moved from living on the ground to living in trees.

Like insects, spider populations are declining in total numbers and in species diversity around the globe. Maybe you won't have more than 20 pet spiders like Sebastian, but by understanding spiders, their cool behaviors, and the way they've evolved, we can make better decisions for saving them.

Sebastian is also passionate about using humor and entertainment to engage everyone in learning about nature. He is co-host of the weekly podcast *BBC Earth* where he invites you to listen, laugh, and learn about the natural world. He helped design the curriculum for *Crash Course: Zoology* that will take you on a rapid and deep dive into the wonderful world of animals. Plus, Sebastian has been a guest on the podcast *Ologies*, where he got to talk about those "sick dance moves" of the jumping spider. Sebastian proves that science isn't boring or lonely.



Sebastian conducting fieldwork. Photos courtesy of Sebastian Echeverri.

To learn more about Sebastian's work, explore:

- Scientist Sebastian Echeverri treats spiders with the dignity they deserve.
www.aaas.org/membership/member-spotlight/scientist-sebastian-echeverri-treats-spiders-dignity-they-deserve
- Sebastian A. Echeverri, Ph.D.
www.spiderdaynightlive.com
- Co-host on the *BBC Earth Podcast*.
www.bbcearth.com/podcast
- Guest on *Ologies Podcast* about jumping spiders.
www.alieward.com/ologies/dancingspiders
- Designing the curriculum for *Crash Course: Zoology* on YouTube.
www.youtube.com/playlist?list=PL8dPuuaLjXtNRgJI4gHRLftOD_r4hfjaF

Rhiannon Kirton
Wildlife Biologist
M.S. University of Western Ontario



Rhiannon outdoors.
Photo courtesy of Rhiannon Kirton.

Rhiannon grew up in Australia and England and loved all types of animals. When she was younger, she dreamed of being a veterinarian. Although she especially liked large carnivores (such as bears, tigers, and wolves), many of these animals are feared by most people. In high school, Rhiannon was determined to change the way people view wolves—they are often written about as bad or evil animals. She spent several days closely observing wolves at a local wildlife park to help understand and protect them.

In college, Rhiannon got to study many different animals. Her research allowed her to travel and study animals all over the world: Tasmanian devils, fruit bats, black-footed ferrets, grizzly bears, birds, antelope, prairie dogs, salmon, sturgeon, bats, frogs, and others!

Today, Rhiannon is researching how hunting impacts deer behavior. Hunting is an important part of deer management in North America, but little is known about its impacts on deer behavior. She uses the GPS positions of white-tailed deer to learn more about their habitat use and movement in response to predators, especially hunters. Studying how human activity changes deer behavior will help wildlife biologists make better population management decisions.

Outside of school and work, Rhiannon enjoys hiking, camping, fly fishing, hunting, exploring new places, and learning about the native people whose lands she spends time on. She also believes it is important to show and promote diversity in outdoor recreation spaces. She does this by being part of Black Birders Week and a representative for several outdoor recreation brands.



Rhiannon releasing a Tasmanian Devil (left) and collecting data on fish (right).
Photos courtesy of Rhiannon Kirton.

To learn more about Rhiannon's work, explore:

- Rhiannon Kirton.
rhiannonkirton.com/
- Rhiannon Kirton: Zoologist.
www.pbs.org/wnet/nature/blog/rhiannon-kirton/

Mei Lin Neo
Marine Ecologist
Ph.D. National University of Singapore



Mei Lin Neo collecting samples at the beach. Photo courtesy of Mei Lin Neo.

On a 45-minute boat ride to an uninhabited island off the coast of mainland Singapore, Mei Lin Neo saw her first giant clam in the wild. At the time, she was a student researching giant clams in the laboratory, but she found that seeing them in the wild was truly amazing! As the other survey volunteers asked her all about the giant clam, she discovered how much she enjoyed sharing her knowledge of science and marine life. Her excitement for the animal has earned her the nickname “Giant Clam Girl.”

Mei Lin was introduced to marine science as an undergraduate student during a visit to the St. John’s Island National Marine Laboratory. Meeting the marine scientists and seeing sealife up close sparked her interest in ocean life. She got involved in oceanic research as soon as possible and joined a research team before she even knew how to dive! Mei Lin believes in learning as you go... you shouldn’t let obstacles get in the way of your dreams.

Whales, dolphins, and other charismatic ocean creatures often get the most attention. Mei Lin is hoping to get more people to see that all sea creatures are amazing. Today, Mei Lin works as marine ecologist and science communicator living in Singapore. She wants to get people excited about her research and the giant clams she loves. She does this by showing how vital giant clams are for the reefs. For example, clams in the coral reef make up an important building block for the reef, adding shape to the seabed and serving as a nursery for many animals. Clams also serve as a food source and shelter for other sea animals. They filter the water around the reef.

Giant clams are an endangered species and Mei Lin wants to save them. She has worked to breed and raise young clams that will eventually be placed into reefs in the wild. Her current research focuses on improving restocking techniques for endangered marine species including cowrie snails and sea urchins. Because many people don't get a chance to peer into the murky ocean waters, Mei Lin is passionate about "bringing the seas closer to people."

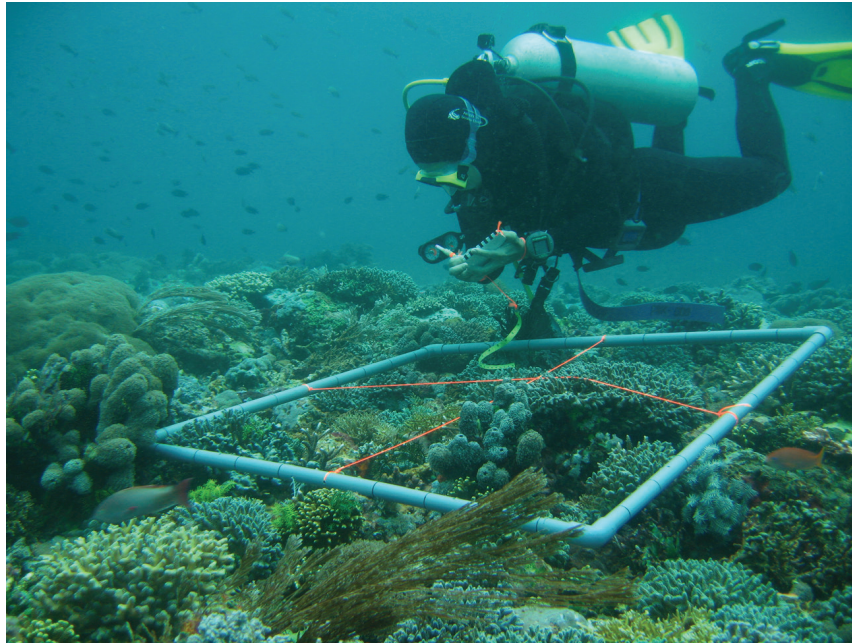


Mei Lin is holding a giant clam currently housed at the St. John's Island National Marine Laboratory.
Photo credit: Denise McIntyre.

To learn more about Mei Lin's work, explore:

- Mei Lin Neo.
meilin5giantclam.wordpress.com/about-me/
- Asia's rising scientists: Neo Mei Lin.
www.asianscientist.com/2016/06/features/asias-rising-scientists-neo-mei-lin-nus-giant-clams/

Tries Blandine Razak
Coral Reef Ecologist
Ph.D. University of Queensland



Tries collecting data on a coral reef site.
Photo credit: Sangeeta Mangubhai.

Tries (pronounced Tree-Yes) Blandine Razak is a marine biologist in Indonesia—a country made up entirely of islands in Southeast Asia. Growing up in a land-locked city, Tries only learned to swim at age 17 when she decided to study marine biology. She fell in love with coral reefs while swimming alongside sea turtles and vowed to dedicate her life to reef conservation. Now, Tries works to understand how coral reefs in Indonesia can be restored and protected.

Coral reefs are an important habitat for many fish and other sea creatures. Human activities, such as agriculture and fishing, can pollute waters and damage coral reef ecosystems. For example, blast fishing is a destructive practice that uses explosives to stun or kill schools of fish so they can be easily collected. This often destroys the surrounding habitat, including coral reefs that are so important for fish and other sea life.

Restoring coral reefs isn't easy. Corals must overcome many odds to survive. They start as tiny and highly sensitive larvae that can get swept away in the ocean before finding a place to grow. Larvae must find a substrate—or a material they can attach to—so they can grow. Even if larvae are able to find a good substrate, that location might not meet the other conditions it needs to survive. Plus, different coral species may need different environmental conditions.

Tries dives to various coral reef sites to measure conditions such as the water temperature, current, and clarity of the water. These conditions determine whether each coral species thrives or dies. Warmer ocean temperatures caused by climate change slow down the growth of the corals. Tries also uses satellite images and other technology to map out where coral reefs have been destroyed. In these destroyed ecosystems, she is studying how to stabilize the rubble and recreate better conditions for new coral.

Saving coral reefs is difficult and expensive, but numerous individuals and organizations worldwide are engaged in reef restoration efforts. Tries contributes to these efforts by assessing various reef restoration projects in Indonesia and understanding what makes a successful restoration program. Her love of the ocean, along with her scientific training and knowledge, allows her to be part of this amazing conservation effort.



Tries (second from the right) and her team out at sea.
Photo courtesy of Tries Blandine Razak.

To learn more about Tries' work, explore:

- Indonesia leads the way in restoring coral reefs, scientists say.
www.aljazeera.com/news/2021/11/2/indonesia-leads-the-way-in-coral-restoration
- Tries Blandine Razak, Ph. D.
www.pewtrusts.org/en/projects/marine-fellows/fellows-directory/2021/tries-blandine-razak

Peter Soroye
Conservation Biologist
Ph.D. University of Ottawa



Peter enjoys photographing the natural world. Photo courtesy of Peter Soroye.

Peter Soroye is a conservation scientist focused on saving bumblebees. He grew up surrounded by nature in Ontario, Canada. But it was a summer of studying butterflies as a research assistant that sparked his love for pollinators. Butterflies and other insects are small but play an important role in plant reproduction because they spread pollen, fertilizing plants along the way. Cute, buzzy, and fuzzy, bumblebees caught Peter's attention and he focuses his research on preserving them.

During the last 50 years, bumblebee populations have drastically decreased. Studies suggest that climate change is a key reason for the decline. As temperature and weather patterns change, plants and animals struggle to survive in their habitats. As a result, living things may go extinct or shift their range to areas where resources or conditions are better.

Peter and his research team investigate how bumblebee populations are affected by temperature. The team compared where 66 bumblebee species live now and where they lived 100 years ago. They found that bumblebees left areas that became hotter. Both the number of species in an area and the number of individual bees decreased as places grew warmer. Researchers believe the bumblebees either died or were forced to move elsewhere. Peter used this information to develop a computer model that predicts the changes in bumblebee populations.

Identifying at-risk populations is important for the survival of the species. Peter's research helps us better understand the impacts of climate change on bumblebees and what we can do to help. He suggests that you can help bumblebees by planting trees and shrubs that create cooler areas that protect bumblebees from the heat. You can also plant native, flowering plants to feed pollinators.



Peter with a tray of bumblebees. Photo credit: The University of Ottawa.

To learn more about Peter's work, explore:

- Peter Soroye.
www.petersoroye.com
- Taking the sting out of bumblebee extinction.
www.youtube.com/watch?v=LdVbeKe9SjE
- Five black conservationists making change in the world.
thestarfish.ca/journal/2020/08/five-black-conservationists-making-change-in-the-world

Your eBird Data Matters!

It doesn't matter who you are or where you live. You can help make conservation actions happen. Anyone can use eBird to share their bird sightings. Your data can be used to help understand and conserve birds. Here are some of the many ways that eBird data have helped protect bird species.

eBird

1. Listing Threatened Species—this bird is in decline!



The Tricolored Blackbird is a hard species to study: it's rare and it moves around a lot. There's no way a small group of scientists could make enough observations on their own. With lots of eBird data coming from observers, scientists were able to gather enough information to get the species listed as threatened under the California Endangered Species Act. eBird data showed that about half of the birds had disappeared in only 10 years! As a result, California farmers are working with conservationists to establish protected areas throughout the Tricolored Blackbird's range so it can safely and successfully breed.

2. Conserving Forests—this place is important!

The Maya Forest covers 35 million acres across parts of Mexico, Belize, and Guatemala. It is the largest tropical rainforest in North and Central America. Many species live there year round. It's also a very important wintering region for many migratory songbirds. Recent eBird models show that many species concentrate nearly their entire population in the Maya Forest during winter. This means that an entire species could die out if this habitat were lost. This understanding helped spark new efforts to conserve this ecologically important and beautiful region for birds and other animals.



Your eBird Data Matters! (Continued)

3. Declining Birds—these animals are connected.

The *rufa* subspecies of the Red Knot migrates incredibly far! It travels up to 20,000 miles a year between Tierra del Fuego (at the southern tip of South America) and the Arctic. It stops in places like the Delaware Bay to feast on horseshoe crab eggs. Humans caused massive decreases in horseshoe crab populations, leaving fewer eggs for *rufa* Red Knots to eat. Both animals' populations started to crash. eBird reports helped scientists understand the link between the horseshoe crab harvest and *rufa* Red Knot decline. The U.S. Fish and Wildlife Service decided to list the *rufa* Red Knot as Threatened under the Endangered Species Act in 2013.



Gregory Breese/USFWS

4. Protecting Birds from Disturbance—what is bothering these birds?



eBirders observed that drones flying in Florida's Tomoka State Park disturbed secretive wetland birds, causing them to become very quiet. For example, a type of bird called a rail remained silent for several days after being startled by a flying drone. Rails call to defend their territories and find mates. If the drones disturb them enough to make them silent, they might lose their territory or miss the opportunity to find a mate, so it is a problem for the health and safety of the species in that area. In 2015, partially in response to these findings, the use of drones was prohibited in all Florida state parks.

Red Plover Game Leader Cards



Cheek	Crown
Beak	Eye
Chest	Throat
Tail	Wing
Back	Belly
Red	Brown
Blue	Yellow
Black	White
Green	Brown

eBird Data Sheet

1. Where Did You Bird?

Name of Count Site: _____

2. Date and Effort

1. What type of count did you do? ☐ Stationary ☐ Traveling
2. When did you bird? Date: _____ Start time: _____ A.M./P.M.
3. Birding group size: _____ Duration (minutes) _____ Distance traveled _____

3. Checklist Information—What Did You See?

Are you reporting all the species you could identify? (Check one) ☐ Yes ☐ No

Species	Tally Count



Evan Barbour

Katherine Smith





Katherine Smith











eBird Explorers: Youth Action for Birds

Youth Journal

eBird Explorers: Youth Action for Birds

Youth Journal

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Scientific Skills

Scientific skills we brainstormed:

Some scientific skills I have are:

I have used my scientific skills when:

Some scientific skills I'd like to improve are:

Rainbow Hike

Color	Where was the color?
Red	
Orange	
Yellow	
Green	
Blue	
Purple	

Which colors were the hardest to find?

Which were the easiest?

Sound Map

Draw your bird below. Use the **X** to mark where you stand.

X

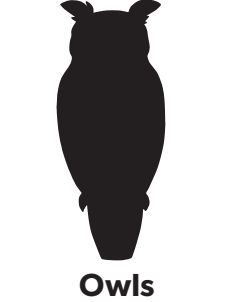
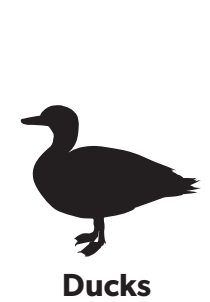
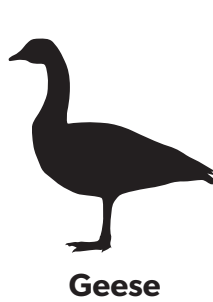
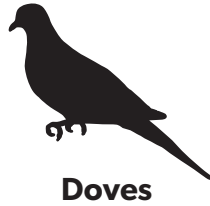
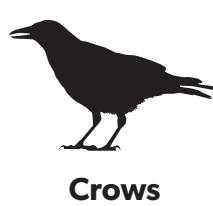
Meet a Local Bird

Bird Name: _____

How big is the bird? Draw an arrow on the scale below.

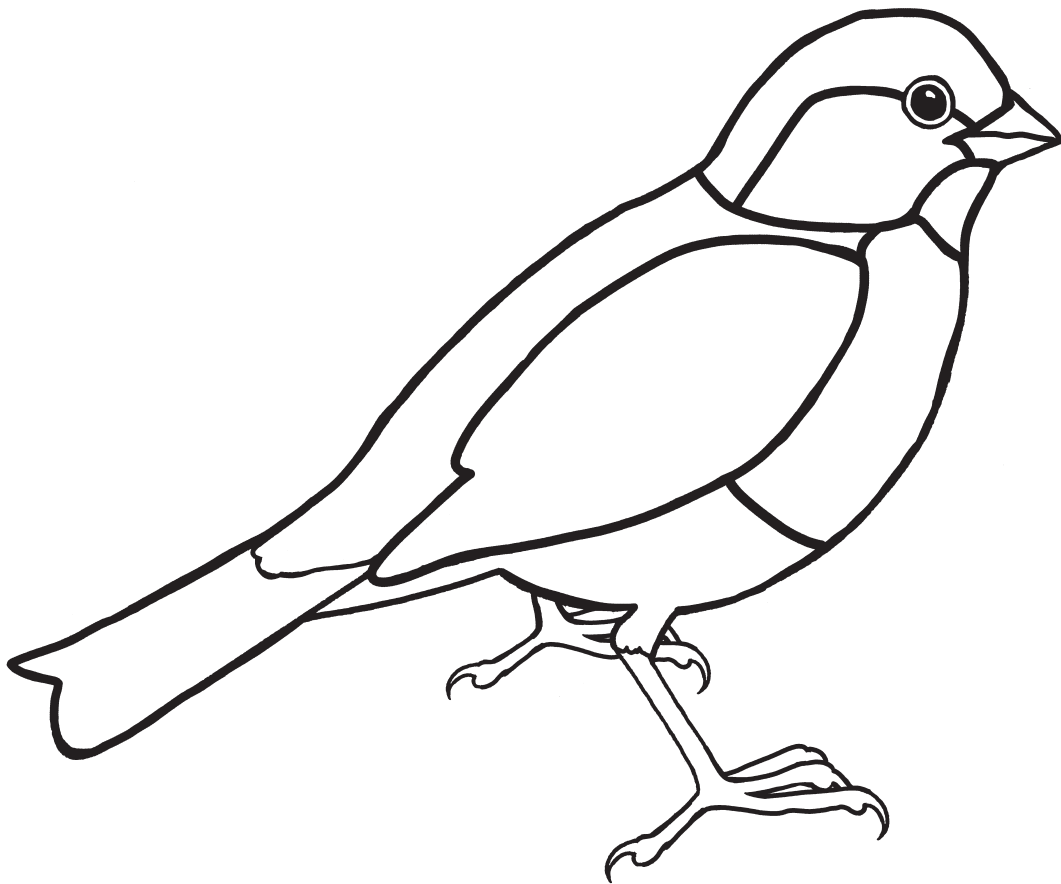


Circle the group the bird belongs to.



Describe the bird: _____

Red Plover Game



My Focus Bird

My bird is the: _____

Draw your bird below. Be sure to label three to five field marks to help identify your bird.

How big is the bird? Draw an arrow on the scale below.



My Focus Bird (page 2)

My bird lives in... _____

My bird eats... _____

My bird sounds like... _____

My bird looks similar to the... _____

I can tell them apart because of ... _____



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159 Sapsucker Woods Road, Ithaca, NY 14850
K12Lab@cornell.edu
www.birds.cornell.edu/k12/