LESSON 1: A Year in the Life of a Migratory Bird

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OVERVIEW

Lesson One will provide foundational knowledge regarding the annual cycle of migratory birds (wintering, migration, and breeding) through the use of maps and tracking data.

ENGAGE	Which animals migrate?	Students identify animals that migrate. Teacher then focuses on birds and students brainstorm how we know where birds go when they migrate.	10 minutes
EXPLORE	What is a bird's annual cycle?	Students receive information about a bird and record what the bird is doing during each season. Students are introduced to the annual cycle diagram.	50 minutes
	What does live tracking data teach us?	Students use a table generated from live tracking data to map the annual cycle of the black-crowned night-heron.	30 minutes
ENGAGE	Where's that bird?	Students are given latitude and longitude coordinates and try to find objects on the school grounds.	50 minutes
EXPLAIN	What are the habitats of black-crowned night-herons?	Students use a map of the world to explain the different ecosystems the birds utilize in their annual cycle.	50 minutes
ELABORATE	What is happening to the long-billed curlew?	Students use the long-billed curlew to see how populations of migratory birds are impacted by changing land use within their range.	50 minutes
EVALUATE	Exit Ticket	Students explain the annual cycle of migratory birds.	10 minutes

DISCIPLINARY CORE IDEAS

MS-LS2-1: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

OVERARCHING UNDERSTANDING

Migratory birds move large distances throughout their annual cycle. Tracking allows us to understand how these species interact with their environment.



Black-crowned night-heron hoto by Stan Bysshe, Smithsonian's National Zoo



ESSENTIAL QUESTIONS

- 1. What is an annual cycle of a bird?
- 2. What can tracking data tell us about the annual cycle of migrating birds?
- 3. How can habitat impact migratory birds?

RELATED MISCONCEPTIONS

- Students may think all birds migrate in the winter.
- Students may not understand the importance of looking at the full annual cycle of migratory birds in order to manage bird populations.

KNOWLEDGE

Students will know...

- The annual cycle of migratory birds.
- That Smithsonian scientists track birds in real time and over long periods of time.
- That birds face many hazards while migrating.

SKILLS

Students will be able to ...

- Illustrate the annual cycle of migratory birds.
- Look at the full annual cycle of a bird to make informed decisions about managing bird populations.
- Determine how land use might affect migratory bird populations.
- Interpret live tracking data.

PRIOR STUDENT KNOWLEDGE:

- Students should have a basic knowledge of what migration is and know that some birds migrate.
- Students should have a general understanding that migratory birds move to warmer climates during colder months.

SCIENCE AND ENGINEERING PRACTICES:

- Asking questions
- Using mathematics and computational thinking
- Analyzing and interpreting data
- Obtaining, evaluating and communicating information

CROSSCUTTING CONCEPTS:

- Systems and system models
- Cause and effect
- Patterns

SAFETY CONSIDERATIONS:

 When taking students outdoors in Activity 4, look for areas that may have poison ivy, or other potentially hazardous materials. Do not place objects in areas that have a water depth of more than three inches, or are difficult for students to access.

TERMS: annual cycle • habitat • migration

Refer to the Glossary in the <u>Appendix</u>



TEACHER BACKGROUND INFORMATION

Refer to the <u>Follow that Bird! website</u> for information about annual cycles and the long-billed curlew. Information about annual cycles is located under "<u>The Full Annual Cycle of Migratory Birds</u>" in the menu and nformation about the long-billed curlew is located under "Species Profiles."

In addition, the following website: https://nationalzoo.si.edu/migratory-birds/news/texas-shorebird-expedition-blog has some excellent background information and videos on tagging and monitoring migratory birds (including curlews) that you may want to consider showing your students. On this page, there is also an interesting blog where Smithsonian Migratory Bird Center scientists Amy Scarpignato, Autumn-Lynn Harrison, and Pete Marra document a season of tracking birds.

MATERIALS:

Activity 1: ENGAGE

• Whiteboard, chalkboard or large paper to record student ideas

Activity 2: EXPLORE 1

- Internet access for each group of two to three students
- Activity Sheet 1: Seasonal Cycle

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• Reference Sheet: Annual Cycle Diagram

ACTIVITY 3: EXPLORE 2

- Internet access for each group of two to three students
- Journals
- Activity Sheet 2: Mapping the Black-crowned Night-Heron
- Green, purple, red, and blue colored pencils or crayons

ACTIVITY 4: ENGAGE

- 10-12 stuffed animal birds or pictures of birds (preferably in color)
- Map of the school property
- Field journal
- Google maps (optional)
- GPS units (optional)
- Binoculars (optional)

ACTIVITY 5: EXPLAIN

- Internet access for each group of two to three students
- Activity Sheet 1: Seasonal Cycle (same handout from Activity 2: Explore 1)
- Optional Reference Sheet: Black-bellied
 Plover Map

Activity 6: ELABORATE

- Internet access for each group of two to three students
- Map of North and South America
- Green, purple, red, and blue colored pencils or crayons

Activity 7: EVALUATE

• Annual Cycle Exit Ticket

ACTIVITY 1 ENGAGE - Which animals migrate?

- 1. Activate students' prior knowledge. Have students brainstorm examples of animals they know migrate.
 - Ask: What are some animals that you know migrate? Record students' answers on the board so everyone can see. If there aren't any birds listed, prompt students by pointing out the groups of animals listed (mammals, fish, etc.) but then asking them what is missing.
 - Then ask: *How do we know where they go*? Record student's answers on the board so everyone can see.
- 2. Introduce the topic of tracking birds.
 - Circle the birds listed on the board and tell students they are going to focus on birds for the rest of this unit (approximately two weeks).
 - With birds in mind, ask students if there is anything more they want to add to the second question, "how do we know where they go." Record any new responses.

ACTIVITY 2

EXPLORE 1 - What is a bird's annual cycle?

- 1. Read the bird profiles.
 - Break students up into groups of three or four.
 - Assign each group a bird: Pacific loon, brown pelican, or black-bellied plover.
 - Instruct students to read about their assigned bird on the <u>Follow that Bird!</u> <u>website</u>. All descriptions are located under "<u>Species Profiles</u>". Students should avoid clicking on the other links at this point.
 - In their small groups, have students summarize the reading in two to three sentences.
- 2. Fill in the Seasonal Cycle activity sheet.
 - Hand out Activity Sheet 1: Seasonal Cycle to each student.
 - Using their bird profile, have students fill in

each quadrant according to what the bird is doing during the specified time of year. They should work as a group but every student should fill out the activity sheet.

- 3. Discuss findings as a large group.
 - Have each group report on their findings.
 - Allow the opportunity for all groups to report out.



- 4. Introduce the Annual Cycle.
 - Show students the Annual Cycle diagram. Ask: Do you notice any similarities between this diagram and your Seasonal Cycle sheet?
 - Instruct students to do the following:
 - Cross out "Seasonal Cycle," and replace it with "Annual Cycle."
 - Cross out the months above each quadrant, and replace them with Breeding, Migrating South, Overwintering, and Migrating North.
 - Students will need this sheet for a future activity. Either collect sheets and redistribute later or instruct students to keep this for future use.



ACTIVITY 3

EXPLORE 2 – What does live tracking data teach us?

Prior Knowledge: *Students should have a general knowledge of latitude and longitude.*

- 1. Remind students of the migration discussion.
 - Ask: Where do the birds go? Allow for a few responses from students.
 - Then say: Today we are going to look at one bird in particular: the black-crowned night-heron. Scientists from the Smithsonian Migratory Bird Center have been tracking individuals of this bird species. We will look at their data and map out where these birds go throughout the entire year.
- 2. Find out about the black-crowned night-heron.
 - Break students up into groups of two to three and have them go to a computer.
 - Have them visit the <u>Follow that Bird! website</u> to find out background information about the <u>black-crowned night-heron</u>. They should record the following information in their journals:
 - How big is it?
 - Where can it be found?
 - What does it eat?
 - Where does it breed?
 - Are populations currently stable?
 - Draw a sketch of the bird (optional)

MENU

Introduction to Migratory Birds	•
The Full Annual Cycle of Migratory Birds	•
Species Profiles	•
Tracking Devices	•
Migratory Birds Tracking Map	•
Migratory Birds Tracking Table	•
Meet Smithsonian Scientists	•
Teacher Resources	×.



- 3. Introduce students to live tracking data.
 - Hand out Activity Sheet 2: Mapping the Black-crowned Night-Heron.
 - Direct students to the <u>Follow that Bird!</u> website.
 - Give students a "tour" of the interface. Point out the following:
 - Students can access the tracking table and map by clicking on the appropriate links in the Menu.
 - The tracking map shows where the birds have been, and the tracking table provides the latitude and longitude of their locations.
 - In the upper left corner of the map, the + and – symbols will allow students to zoom in and out.
 - The drop-down menus on both the tracking map and table pages will allow students to refine their search to look at specific data.

Migratory Birds Tracking Table

Bird species:	
Black-bellied plover	,
Identity of bird:	
20	,
Date range:	
2017-07-05	
to	
2017-11-29	



ecies	birdID	date	longitude	latitude
ack-bellied plover	20	2017-07-06	-166.2646	64.8634
ack-bellied plover	20	2017-07-08	-166.2561	64.8711
ack-bellied plover	20	2017-07-08	-166.2634	64.8693



Screen capture of the menu on the Follow that Bird! website.

RI:

4. Start with the tracking map.

- Below the map, have students choose the black-crowned night-heron from the drop-down menu under "Bird species."
- As a group, let students choose either Parker or Smith to follow and select the name from the drop-down menu under "Identity of bird." Those are names given to two individual birds that have been tagged.
- Tell students to mentally note where the bird has been.

Bird species:

Black-crowned night heron	
Identity of bird:	
Parker	٣
Date range:	
2016-06-23	
to	
2017-08-27	

- 5. Examine the data from the tracking table.
 - Have students choose the black-crowned night-heron from the drop-down menu under "bird species" and the same "Identity of bird" (Parker or Smith). The table shows a chronological order of where the individual bird was at a given time.
 - Hand out Activity Sheet 2: Mapping the Black-crowned Night-Heron and have students map these locations according to the annual cycle of the bird (Parker or Smith) they have chosen. Students should work directly from the data tables on the *Follow that Bird!* website.
- 6. To assess for understanding, collect student sheets and check for completion.

ACTIVITY 4 ENGAGE - Where's that bird?

- 1. Prepare the activity.
 - The morning of the activity, place 10 to 12 stuffed animal birds or pictures of birds around the school yard. Place them on tree limbs, hidden in the grass, perched on a soccer goal, or other places you might find a bird.
 - Optional:
 - Place the birds in locations around the school property and get their latitude/longitude by using a GPS unit or app. You can also use the following free websites:
 - https://www.gps-coordinates.org/
 - https://www.maps.ie/coordinates.html
 - <u>Google Earth</u>
 - Create a map of the locations of the birds using <u>Google Maps</u>.
 - Create a handout with pictures of the birds you placed in the field.
- 2. Prepare students to track the birds.
 - Break students up into groups of three or four.
 - Explain that they will be bird scientists trying to find 10 birds (or however many you placed in the field).
 - Show students the map of the school property and orient them to the different landmarks.
 - Show them pictures of the birds they are looking for. Tell them to leave the birds where they are (do not collect them).
 - Let them know the boundaries of their search.
 - Go over proper behavior for outdoor learning and give them a time limit for finding the birds.
 - Optional:
 - If you are using GPS units or other mapping technology, explain how to use it.
 - Explain how to use the latitude/ longitude map and give students the lat/long locations of the birds.



- Hand out binoculars and other equipment you choose to use for this activity.
- 3. Have students find the birds.
 - Give groups 20 to 30 minutes to find the birds.
 - Have students record where they found each bird (in a tree, on a building, on the ground, etc.). They should note how easy or difficult it was to find each bird.
- 4. Wrap up the activity with a group discussion.
 - When students are back in the classroom, use the following discussion questions to get students thinking about the ease or difficulty of finding birds in the field:
 - Which birds were easy to find? Which were difficult?
 - What kind of problems do you think scientists would run into finding birds they've tracked.
 - What could they do to make it easier to find the birds?

ACTIVITY 5 EXPLAIN - What are the habitats of black-

crowned night-herons?

Prior Knowledge: Students should know: migratory birds have an annual cycle and that throughout their annual cycle, migratory birds live in different places.

- 1. Discuss the black-crowned night-heron as a class.
 - Ask: When we looked at information about the black-crowned night-heron, what was its southern-most range? What was its northern-most range? Allow students to respond.
 - Ask: You probably have never been to Cuba or Nicaragua, and maybe you've never been to Washington, D.C., but do you think the habitat is the same in both places? Would the birds occupy the same types of habitat in both places? Have a discussion about this and define "habitat", if needed.
 - Tell students: Today we are going to look at different types of habitats throughout North

and South America. You will use your activity sheets (Activity Sheet 1) from the first annual cycle diagram you filled out and add to it.

- 2. Look at different habitats throughout North and South America.
 - Break students up into small groups. Have students navigate to the <u>Follow</u> <u>that Bird! website</u> to examine various habitats.
 - Ask: Does your migratory bird occupy more than one habitat?
 - Ask: If yes, how do you think that bird survives in these different places?
 - Is it eating different foods?
 - Does it occupy different spaces? For example, maybe it lives on the beach when overwintering, but occupies forests during migration.

EXPLAIN Assessment

Have students complete a Venn Diagram comparing and contrasting different habitats.



Black-crowned night-herons in a tree Photo by Stan Bysshe, Smithsonian's National Zoo

ACTIVITY 6 ELABORATE - What's happening to the long-billed curlew?

Prior Knowledge: *Students should know: migratory birds occupy various habitats during their annual cycle.*

- 1. Read for understanding about the long-billed curlew.
 - In small groups, have students read about the long-billed curlew by visiting the <u>Follow</u> <u>that Bird! website</u> and selecting long-billed curlew under "<u>Species Profiles</u>". Have students note the following:
 - What does it look like?.
 - What is its habitat during its annual cycle?
 - What are its current threats?
 - Next, have students examine data for the long-billed curlew. Students can access the data by selecting "Migratory Birds Tracking Table" from the menu.
 - Have them map out the annual cycle data like they did for the black-crowned nightheron, using appropriate colors to indicate *Breeding, Overwintering, Migrating North,* and *Migrating South* activities for the birds.
- 2. Look at an image depicting cropland expansion in the USA.
 - Scroll to the bottom of the long-billed curlew description page and look at the image showing tracking data in their habitat.
 - Say: We will use the image to see if it can help us understand what is happening to the long-billed curlew.
 - Ask students:
 - What is happening to long-billed curlew habitat?
 - Given what we know about the longbilled curlew, how might this affect their populations?
 - Why are bird scientists concerned about long-billed curlew habitat?



ACTIVITY 7 EVALUATE - Exit Ticket

- 1. Create an annual cycle.
 - Hand out the Exit Ticket.
 - Have students create their own annual cycle of the long-billed curlew. They should use the appropriate colors to represent breeding, migrating south, overwintering, and migrating north.
 - Give students 10 minutes to complete the activity.

Long-billed curlew Photo by Tim Romano, Smithsonian's National Zoo



EXTENDING THE LESSON

- 1. Act out the annual cycle.
 - Use different-colored rope to make an outline and represent the US (including Alaska), Central America and Canada.
 - Using the Annual Cycle sheets for the long-billed curlew and black-crowned night-heron, have students "migrate" along the same routes, recording what the birds are doing in each part of the cycle.
- 2. Watch the <u>career connection video</u> (page 20).
- 3. Discuss what students can do to protect birds (page 20).

Long-billed curlew footprints Photo by Tim Romano, Smithsonian's National Zoo

CAREER CONNECTION

SPOTLIGHT ON: CALANDRA STANLEY, PHD CANDIDATE



LIKE SCAVENGER HUNTS AND SAVING SPECIES?

Meet Calandra Stanley, a PhD Candidate at the Smithsonian Migratory Bird Center. She is studying a small species called the wood thrush whose population has been dropping for years. In this career connection video, learn about Calandra's scavenger hunt-like quests to track and locate the birds so she can reverse their decline.

HOW CAN YOU HELP? Taking Action to Protect Birds!

As you've learned in this lesson, migratory birds live in and visit many different habitats throughout the year. **You can help** by making your yard, neighborhood, and/or schoolyard bird-friendly for migratory and resident birds! Here are some tips...

- Create habitats for wildlife: plant native trees, bushes and flowers to provide food and shelter.
- Provide a water source year round.
- Avoid chemical pesticides and fertilizers.
- If you put up bird feeders or bird baths, clean them regularly.
- Don't throw trash on the ground.



Name:

Seasonal Cycle

for the (circle one):

Black-bellied Plover Brown Pelican Pacific Loon

Directions: Using your migratory bird profile, fill in bird activities during each of the months indicated. It is OK if the months do not exactly match up with the bird's activities.



Name: _

Mapping the Black-crowned Night-Heron

Directions: Using the tracking table on the Follow that Bird! website, map the annual cycle of the black-crowned night-heron you chose (Parker or Smith). Place dots on the map using the appropriate colors:

Red - overwintering Blue - migrating north Green - breeding Purple - migrating south

Finally, connect all the dots with the appropriate color.



Annual Cycle Diagram



Black-bellied Plover Map

Image source: https://dcbirds.si.edu/bird/black-bellied-plover

Name:

Annual Cycle Exit Ticket

Directions: Fill in the annual cycle chart below. You don't need to pick a specific bird (although you may); rather, make sure you describe each part of the annual cycle and what the migrating birds are doing.

Black-crowned Night-heron Photo by Stan Bysshe, Smithsonian's National Zoo