Texas Estuarine Resource Network Program (TERN)

Final Report

Figure 1. Frazier Elementary, February 2023. TERN student's spotting a Snowy Egret flying across the school park. *Photo credit: Alexandria Sands.*

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Abbreviations

CASE	Center for Afterschool, Summer and Enrichment
HCDE	Harris County Department of Education
TCEQ	Texas Commission on Environmental Quality
TEKS	Texas Essential Knowledge and Skills
TERN	Texas Estuarine Resource Network
US EPA	United States Environmental Protection Agency

Executive Summary

The Texas Estuarine Resource Network (TERN) is a program implemented by Audubon Texas that utilizes citizens to assist monitoring bird populations along the upper Texas coast. This project was developed to identify schools in Harris County Department of Education (HCDE) district where the TERN program would be used to engage and train students and teachers in citizen-science conservation work alongside biologists and wardens in the Galveston Bay watershed through the TERN program created by Audubon Texas Coastal Program.

Issues associated with COVID-19 provided challenges including a lack of interest and availability from teachers and schools willing to participate as part of their classroom instruction. These complications led project managers to adjust the program to be implemented with the Harris County Center for Afterschool, Summer and Enrichment (CASE) programs. This adjustment allowed Audubon Texas to hire an intern to offer the TERN program at nine schools over 17 weeks and engage 119 students.

While challenges early in the project forced project managers to adapt the program to a different format, the afterschool program partnership was a success and achieved the goal of engaging and educating students about local birds and citizen-science observation programs.

Introduction

The TERN is an Audubon Texas program developed to monitor birds along the Texas Coast and was successfully adapted to bring the program to school-age children. The goal of the classroom program was to provide training and access to hands-on experience in scientific monitoring, data collection, and bird observation. The program was a partnership between HCDE and Audubon Texas, and included a field trip to an outdoor site where teachers and students could learn and practice the skills they learned in the classroom. All activities were Texas Essential Knowledge and Skills (TEKS)-aligned to reinforce scientific concepts both during and after Audubon Texas's involvement. The project began during COVID, which made it difficult to conduct in-person learning and field trips. After implementing the program with a small number of teachers and classrooms, Audubon Texas and HCDE pivoted the program to an afterschool approach. Through a partnership with CASE, the program was adapted to become a weeklong afterschool program that trained students in data collection and submission, bird identification, binocular use, and field observation. Working with CASE, the afterschool program—called "Observe a Bird"—was successfully implemented in nine schools from October 2022 through April 2023.

Challenges During COVID

The program was originally launched during COVID which limited Audubon Texas's ability to perform in-person trainings and field trips. During the winter of 2021 we

were able to offer virtual training sessions to interested teachers, however, we had very little participation. Recruitment leads often led to unanswered emails or phone calls. Scheduling field trips with classrooms was also challenging due to low interest from teachers, but we were able to conduct one field trip with middle schoolers in the spring of 2022. It is because of the low participation and teacher recruitment opportunities that Audubon Texas and HCDE decided to pivot the program to an afterschool program.

Adapting the Program to an Afterschool Program

After making the decision to adapt the TERN program to an afterschool enrichment program, Audubon Texas began working with CASE. Through a collaboration with CASE, we were able to successfully implement the program—now called "Observe a Bird—in nine schools in HCDE. The curriculum was developed so that students received one hour of instruction each day for a week. In addition, Audubon Texas developed a one-page resource to share with participating schools so that they can continue to use the donated resources, such as binoculars and bird identification tools.

Project Significance and Background

The project adapted an existing community science program for school-age children in HCDE to develop a baseline knowledge of watersheds, wildlife, and natural resources in the Galveston Bay region. Through this work we are taking steps to engage students in local environmental issues. Providing access to natural spaces and skills to identify common birds creates an opportunity for students to observe and appreciate their natural surroundings. This baseline understanding and information is necessary in building environmental stewards.

The project trains teachers and students to identify key birds and habitats that are important to the Galveston Bay area. The provided teacher training was designed to create opportunities for citizen-based science (students and teachers as citizens) in their local areas—like schools and other waterways—to show them how their outlook can positively affect Galveston Bay. Observing wildlife through citizen science monitoring makes a direct connection between humans and their natural resources. This program promoted long-term monitoring in local waterways and wetlands near their homes, where participants are likely to become invested in the health of natural resources and observe changes in their environment.

Methods

- Train teachers in TERN program so they can implement environmental monitoring and science activities beyond Audubon Texas participation.
  - Recruit interested teachers from HCDE schools.
  - Provide in-person training for teachers.
- Adapt program for afterschool application.

  - Recruit schools participating in CASE afterschool program.
  - Develop weeklong curriculum for afterschool program.
- Provide in-person training to students at participating schools in HCDE.
  - In class lessons in classrooms of participating teachers.
  - Weeklong curriculum (Table 1) to schools participating in HCDE's afterschool program.

Table 1. Description of weeklong curriculum for the "Observe a Bird" afterschool program.

Day	Activities	Goal
Monday	Name games Group contract Bird Yoga Science journals (draw a bird, learn about adaptations)	Build trust with students and get them familiar with bird identification. Get students excited to learn about birds for the rest of the week
Tuesday	Name game/ice breaker Introduction to binocular use Practice using binoculars Practice spotting birds Learn field marks	Students will understand how binoculars are an important tool for scientists who study birds and the basics of field marks.
Wednesday	Review binoculars Learn local birds (characteristics, range, sounds) Practice spotting and identifying birds by sight and call	Students will understand each bird has special characteristics which identify the bird as a specific species.
Thursday	Mindful breathing Learn about scientific observation and counting Why monitoring matters Practice counting and recording data	Students will understand how scientists count birds and why it matters
Friday	Bird Yoga Counting vs. Estimating Migration Game Birding adventure (student bird ID and eBird entry)	Students review activities from the week in fun, engaging ways.

- Provide resources to continue instruction beyond Audubon Texas participation.
  - Donate binoculars and bird identification guides to participating classrooms and afterschool programs.
  - Share end of year project resources with participating teachers.
  - Share one-page resource with participating afterschool programs.

Results and Observations

Audubon Texas partnered with HCDE to adapt a community science program for children in HCDE schools. HCDE worked to recruit teachers (recruitment flyers included in Appendix A), however the launch of this program was negatively affected by COVID. Schools were shifting to virtual learning and teacher interest was difficult to sustain. Audubon Texas was able to successfully train two teachers in December of 2021 and followed up with one of the interested teachers to complete two field trips and trainings with her students. Through this effort Audubon Texas completed a field trip to Bay Area Park and Robinson Park with seventh and eighth graders from Brookside Intermediate School (Clear Creek Independent School District) on March 7, 2022. Students were shown how to use binoculars, collect data, and report data to eBird. A second field trip occurred at Sweet Oaks Houston Audubon Preserve on April 14, 2023, with 17 students from a new class of seventh and eighth graders who attend Brookside Intermediate School. Again, the students were shown how to use binoculars, collect data, and report data to eBird. The teacher shared positive feedback with Audubon Texas about participation in the program:

> *I wanted to take the time and express my gratitude in becoming a part of the T. E.R.N. Program. This year I was able to build an entire course for my science magnet based upon the knowledge and guidance I learned. I started last year never using binoculars nor identifying a bird. With the skills I learned, I created a course on how to use binoculars, journal, and identify local birds. My students use the Cornell Merlin app, and eBird. These techniques have created lifelong learners and community scientists as they educate families and their community.*
>
> **Nicola Clemmer, Teacher, Brookside intermediate**

After receiving limited interest from additional teachers, Audubon Texas worked with HCDE and TCEQ to transition the TERN program to an afterschool enrichment program. This new approach led to a partnership with CASE and great success with the program. Audubon Texas adapted the curriculum (Appendix B) to be taught to students for one hour each day during a weeklong afterschool program. Audubon Texas decided to expand the student training from 30 minutes to a weeklong program to build more trust with students which led to more meaningful interactions and experiences outdoors. Our goal was to have students familiar and comfortable collecting data, using binoculars, and identifying five local birds by the end of the week. In order to accomplish this goal, the program progressed from name games and introductory games to build trust into teaching new ideas and exposure to data collection tools (e.g., binoculars, eBird). Audubon Texas then worked with students to coordinate shared bird identification experiences later in the week which led to a final day where the students independently identified birds and submitted data. The program was successfully implemented in nine schools from October 2022 to April 2023 (Table 2) and reached 119 students. Audubon Texas was also able to create an education internship to do the in-person program. CASE shared the following positive

feedback about the "Observe a Bird" program, and specifically the education intern, Alexandria Sands:

> *In speaking with my programs and having the opportunity to observe Alex in action with the students, she has been a true asset. Her patience with the students and her passion for making the connection between the curriculum and the world in which they live will benefit them and enhance their lives for years to come—in more ways than just through bird watching but also by teaching them the importance of focus and awareness and embracing new ideas and opportunities. We are grateful to have had the time she spent with our students and would welcome her back with opened arms. We wish Alex great success in anything she chooses in her future.*
>
> **Brandi Nichols, Program Coordinator—Partnership, HCDE, CASE for Kids**

The students who participated in the program were enthusiastic participants and eager to learn new skills. They enjoyed having the opportunity to learn about their outdoor surroundings and common bird species. Photos of the students and education intern at work are included in Appendix C. After completing this program, Audubon Texas sees the opportunity and interest from schools to develop more outdoor programs that can be applied to afterschool programs. Audubon Texas developed a one-page leave behind resource (Appendix D) that is intended to provide resources for schools to continue to use the donated supplies for environmental education.

Table 2. "Observe a Bird" afterschool program implementation metrics.

School	Number of program weeks	Number of students reached	Dates
Burnet Elementary	2	15	Oct. 31-Nov. 11, 2022
Lyons Elementary	3	16	Nov. 14-18, and Nov. 28-Dec. 9, 2022
Briscoe Elementary	1	10	Dec. 12-16, 2022
Benbrook Elementary	3	26	Jan. 9-27, 2023
Frazier Elementary	1	8	Jan. 30-Feb 3., 2023
Academy of Accelerated Learning Chimney Rock	3	13	Feb. 6-24, 2023
Academy of Accelerated Learning Bellfort	2	7	Feb 27-Mar. 10, Mar 20-24, 2023
Davila Elementary	1	15	Mar 27-Apr 3, 2023
JP Henderson Elementary	1	9	April 3-7, 2023
Total	**17**	**119**	

Discussion

This project was a learning experience for the project partners working together to implement a hands-on program through COVID. Throughout the program we had challenges due to poor communication and staff turnover. There were also multiple issues with the contracting process between HCDE and Audubon Texas that led to delays in implementation of the work. These difficulties in administration were resolved as we shifted engagement from direct engagement with teachers to direct engagement with the CASE Program. CASE staff were responsive and engaged throughout the program which led to successful implementation at schools in HCDE.

After we adapted the program to an afterschool enrichment activity, we were successful in reaching 119 students. The direct connection to students participating in afterschool enrichment allowed us to build relationships and repeated connections directly with students. We were also successful in building an internship into the program which provided workforce development to a young professional. This was a huge success because it allowed us to mentor a graduate of our Audubon Conservation

Leaders program, an Audubon Texas initiative, and provide her with a diverse set of experiences and skills.

Overall, this success was also our biggest lesson learned. We learned that implementing a program that fills an ongoing need—such as afterschool enrichment—is more successful than trying to recruit teachers to a new program. Because of COVID we knew that teachers and educators were feeling burnout and we believe this limited their interest in the program. The flexibility of the partners was also critical to the success of the program. After running into obstacles with teacher recruitment both HCDE and TCEQ were open to exploring new ways to implement the program which led to new opportunities with CASE. We also learned that repeated engagements over a week instead of during a one-time field trip allowed the educator to build deeper connections with the students and this led to more opportunities for meaningful engagement. This approach to environmental education was very effective for the TERN program and could be a repeated model for environmental education.

Adapting the TERN Program to become the "Observe a Bird" afterschool program was a very rewarding experience for all the Audubon Texas staff involved. Although the program struggled to get off the ground in its original format, we feel that it was ultimately a success.

Appendix A. Recruitment Flyers

Figure 2. Original TERN in the classroom flyer.

Figure 3. Second TERN in the classroom flyer.

Appendix B. "Observe a Bird" Afterschool Program Curriculum

Lesson Plan 1 – Monday

Theme: Introduction to Birds
Goal: Students will be excited to talk about birds today and for the rest of the week.
Objective: Students will be able to:

- Learn everyone's name in the group.
- List three special features of birds
- Share ideas about how birds use natural items

Materials:

- Name tags; one for Staff and each participant
- Clipboards; personal clipboard for staff and one for each participant
- Copy of lesson plan
- Journal pages
- Rolling bag or container to carry everything
- Pencils for each student, plus plenty of extras
- Student binoculars
- Staff binoculars
- Pre-written contract
- Markers for students to sign contract
- Chromebook, Sibley guide

Introduction
Outcome: Everyone knows your name, where you work, and you know everyone's name.
Time: approximately 10 minutes.

- Welcome everyone to the program:
    - Students will respond to energy of the leader; smile big, use appropriately energetic tone and volume.
- Tell everyone your name and where you work:
- Tell everyone the first thing we will do together is go outside to our learning area and learn each other's name:
    - Considerations: You may need to walk backwards a little, or turn around frequently, to make sure everyone is staying together.
    - If you see any pushing, shoving, or hands on other students, correct it immediately.
    - You will need to bring group contract, markers, clipboards, pencils, and journals with you outside.
- Once you arrive in your outdoor space, put down your items and tell everyone to form a circle:
    - Help students form a circle, as needed.
    - Introduce the name game: This name game is called 'Three times me'. **Each of us will say our name three times, and the whole group will**

repeat our name the same way. I will go first, and everyone will repeat after me.
    - While pointing to yourself, say your name in a high-pitched voice, then point to all the students and encourage them to repeat it the same way.
    - Repeat twice more, with different voices or body movements. Have students repeat you each time.
  - Say '**Now you!**' as you point the student on the right. Make sure everyone does the same voice and body after each time the student says their name.
  - Go around the whole group.
  - When everyone has gone, say '**thank you all for helping me learn your names! The next thing we are going to do is talk about how we will learn and play together for the week. Please sit down exactly where you are**.' Demonstrate sitting down.

Group Contract (pg. 1 of journal)
Outcome: The group has behavior guidelines
Time: Approximately 10 minutes

- Tell students we are going to set up a group contract. Tell them if they have an answer to a question, they will raise their hand.
  - **IMPORTANT**: For each question you ask, call on one or two students; use their name. If you don't remember their name, ask them to tell you!
  - **IMPORTANT**: For each question, once you've heard from a few students, ask everyone to put their hands down. This will keep the activity on time.
- Review safety guidelines with students; ask them for ideas on staying safe.
  - Good examples of safety: Stay together, look where we walk so we don't fall, look out for ants so we don't get bit, etc.
- Review how can we make sure we respect all wildlife when we are outside.
  - Good examples of respecting wildlife: Keeping a good distance from animals, using quiet voices to not scare them, keeping their world clean, keeping our bodies calm.
- Review how we respect people in our group.
  - Good examples of respecting people: Keep our hands to ourselves, help each other, use kind words.
- Review tools with students, and expectations for taking care of the tools. (Tools include binoculars, any sort of writing utensil, clipboards, etc.)
  - Good examples of taking care of tools: place binoculars gently on the ground or tables, keep our fingers away from the lens, use the straps so we don't drop them, write gently, and return pencils/journals at end.
- Review language expectations.
  - Good examples: Please and thank you, nice job, I liked when you did… The goal is for students to understand how they can use kind words to help their friends do the best thing for the birds and group.
- Review learning expectations.

    - Good examples: not talking when the leader is talking, following directions, looking where the leader asks you to look. The goal is for students to understand your expectations for learning behavior.
- Review listening skills and expectations.
    - Good examples: Looking at the speaker, standing or sitting with our hands together, not talking when someone else is talking.
- Review 'hands to ourselves' expectations
    - Good examples: no one likes to be pushed or shoved, keeping our hands to ourselves is safe for everyone.
- Have students initial the contract with all 8 actions on it.

Stretch Break! Bird Yoga
Outcome: Get a little energy out, be goofy for a moment
Time: 5 minutes

- Ask students to stand up where they are in a circle.
- Ask students to step back from the circle and put their hands out to the side. Their fingertips should barely touch. Ask students to put their feet about a foot apart. Demonstrate. Ask students to bend their arms and put their hands on their hips. Say '**These are your wings. Stretch your wings backwards and look to the sun!**' Demonstrate then look down to make sure the students are doing it. Say '**Flap your wings like a chicken!**' Demonstrate. Say '**Crow like a chicken!**' Demonstrate. Say '**Arms down**.' Demonstrate.
- Say '**We going to use our arms like hummingbirds! Hummingbirds move their wings backwards and forwards, not up out and in like most other birds**.' Demonstrate this by putting your arms straight out to your sides, palms up, and drawing a figure eight with your fingertips by rotating your wrist back and forth. Ask students to put their arms straight out from their sides. Demonstrate. Say '**Hummingbirds move their wings super-fast. Go as fast as you can!**' Let them go crazy for 5-10 seconds. Say '**Hands down**' loudly and demonstrate putting your hands to your thighs.
- Say '**Last bird pose for today! Birds often rest by standing on one foot. Stand on one foot.**' Demonstrate. Say '**Bird tuck their leg up close to their bodies. How close can you get your foot to your body without falling over?**' Demonstrate either as a quad stretch or glute stretch. Give them 5 seconds or so to try. Say '**Nice job! What about the other foot? Is one leg stronger than the other? Try with your other leg!**' Demonstrate.
- Say '**Nice job with your bird stretches! Let's sit back down for our next action. Everyone take one big step forward so we're sitting a little closer together**.' Demonstrate. When everyone has stepped in, say '**perfect, now sit down**' Demonstrate.

Science Journals (pg.1 of journal)
Outcome: Students set up journal for the week and get to talk about what makes birds special.
Time: 15 minutes.

- Handout science journals to each student, have them write their name on the appropriate line. Help with writing/spelling as necessary.

- Tell students they are going to spend a few minutes drawing birds.
    - Suggestions: It can be a real or imaginary bird. If students are stuck/unsure, ask them to imagine the size of the bird, the bill shape, the leg/feet shape, how the bird eats, etc.
    - Tell students the different features that make birds special are called Adaptations. Call on a student, by name, and ask them to explain what 'adaptation' means.
    - If no one knows what the word means, share this definition with them: An adaptation is a special feature an animal has that helps it survive. For example, birds have lots of different beak shapes because they are adapted to eat lots of different foods.
    - Tell students 'When we are done drawing our birds, each of them will share an adaptation from your bird.'
- Give students 5 minutes to draw birds; use your phone or watch to keep track of time. Give students a 2-minute warning and a 1-minute warning. Ask if anyone wants to share their bird. If no one raises their hand, call on a student. Ask her/him for their bird's name, ask about the special feature.
    - Go through the whole group this way.
- When everyone has presented, congratulate the group on their fabulous birds, then direct the conversation to the special adaptations that all birds share.
    - Ask 'What adaptations to all birds have but no other animal has?'
    - **IMPORTANT**: the goal answers are **feathers, hard-shelled eggs, and hollow bones**. Anytime someone says the right feature, have everyone write it down. Help with spelling as necessary. If they get it wrong or only partially correct, ask students more questions to direct them to correct answers.

Wrap Up
Outcome: Students summarize what we did and get ready for our next day together
Time: 10 minutes

- Say '**We have just a few minutes left. In a moment, but not yet, we're going to search for a piece of nature. It can be anything: a dead bug, a leaf, flower, feather, shell. It can also be from humans, like trash. Who remembers our first part of our group contract?**' Call on someone who raises their hands.
    - **IMPORTANT**: The best answer is 'Stay safe'. If the student says anything else, positively correct them. If they list one of our agreement points, say 'that is one of our agreements, but what I was looking for is 'stay safe'. How can we practice staying safe while we look for our for piece of nature?'
    - If it's way off, say something like, 'I like how you're thinking, but I was looking for the first item on our agreement; Stay Safe.'
    - You want to guide students to say they'll avoid masks, food, dog waste, stay close to the group, etc.
    - It's important that you state the boundaries of the area! If you can't see past a certain point in the yard, if there are lots of building or nooks, you need to state firm boundaries of where students can explore.

    - ALTERNATIVE: If the school doesn't have green space, students can add nature parts to their bird drawing instead of finding them.
- Say '**When time is up, I'll practice our Chicken crow sound again, and you'll come back to me. Let's practice our chicken sound together so we all know what it sounds like**'. Demonstrate the Chicken pose and sound again (first yoga pose).
- Say **'Okay, you have 90 seconds to find some piece of nature. Please stay in the safe zone. Go!'**.
- Keep track of time, call students back to the group. When everyone has gathered, ask them to show you what they found by raising it up; say '**Everyone have something? Show the group like this**' then demonstrate holding up an item.
- Say **'Nice job! Next, I want you to turn to a partner and talk about how a bird might use your nature item OR how the human trash might hurt a bird. I will tell you who your partner is**'. Put the kids in pairs by going around the circle and telling them who their partner is. Say '**alright, you know who your partner is. Share how you think a bird could use your item.**'
- Give everyone 2 minutes to talk. Listen in on few groups. Depending on what students found, here are some ways birds can use items:
    - Grass, leaves, and/or sticks: parts of nests, shelter.
    - Bugs, berries, seeds, acorns: food sources.
    - Human trash: can make birds sick.
    - **IMPORTANT**: you will need to imagine how their found object can be helpful or harmful to birds.
- Loudly call time and ask everyone to put hands down, months closed. Say '**TIME! Hands down, months closed. Shhhh**…' Put finger over month when saying shhhh (like you're a librarian).
- When you have everyone's attention again say '**Alright friends, if you have a natural item, put them down right here. If you have human trash, we need to put it in the trash can when we go inside, which we are going to go to do right now. We are done for today. I'll be back tomorrow, and we'll learn to use binoculars. Please pass me your clipboard and pencil.**' Collect each clipboard and put it back in your case. Say '**Raise your hand if you had fun today.**' Give everyone a moment to respond, then say '**I did too! Please form a straight line so we can go back in. I'll be line leader; follow me.**' Walk students back into the indoor gathering space, and alert afterschool staff.
-
- Clean up your space.

Lesson Plan 2 – Tuesday

Theme: Introduction to Binoculars
Goal: Students will understand how binoculars are an important tool for scientists who study bird and the basics of field marks.
Objective: Students will be able to:

- State the 5 parts of the binoculars.
- Properly use binoculars.
- Explain what a field mark is.

Materials

- Name tags; one for Staff and each participant
- Clipboards; personal clipboard for Audubon staff and one for each participant
- Copy of lesson plan
- Journal pages
- Crayons
- Rolling bag or container to carry everything.
- Pencils for each student, plus plenty of extras
- Student binoculars
- Audubon Staff binoculars
- Laminated pictures of birds (Ideally local birds. Can be from magazines, calendars, etc. Confirm ID of birds before using).
- Chromebook, Sibley guide

Name Game
Outcome: Refresh on all the student names
Time: Approximately 5 minutes.

- Welcome everyone to the program:
    - After-school providers may have students gathered and sitting, or may send students to you individually as they pull them from other activities; welcome people as they arrive into the group.
    - Students will respond to energy of the leader; smile big, use appropriately energetic tone and volume.
- Start the day with a question. Say '**Who remembers my name? Raise your hand!' Call on someone; if they get it right, offer them a high five and say, 'Nice Job'.**
- Next, you're going to take them outside. Say '**We are all going outside again today, to learn about birds and try a new science tool. I need everyone to line up in a single-file line, like we did yesterday**.' Give them a moment to accomplish this, then say '**Let's go!**' when they're ready.
    - Considerations: You may need to walk backwards a little, or turn around frequently, to make sure everyone is staying together.
    - If you see any pushing, shoving, or hands on other students, correct it immediately.
    - You will need to bring binoculars for each student, clipboards, pencils, and laminated photos for birds.
- Once you arrive in your outdoor space, put down your items and tell everyone to form a circle:

    - Say '**Well done, now, let's form a circle.'** Help students form a circle as needed.
- Say '**Today's name game is going to be short and sweet. Each of you will say your name and one good thing from today. I'll go first. My name is _____, and one good thing from today is _____. Now you**!' Select a child and ask them to go next; go clockwise from them until each student has gone.
    - Remind students to say their name if they forget, even if you know their name.

Introduction to Binoculars
Outcome: Students will learn the different parts of the binoculars
Time: 5 minutes

- Tell students you are going to hand out a new science tool to them. Say '**Thanks for sharing your good thing from today! Now, I need your best listening ears for this next part. I am going to hand out a new science tool to you and it's very important that we respect them.**' Hold up a pair of binoculars, say '**How can you take care a tool? Raise your hand if you have an idea**'. Call on a few students.
    - IMPORTANT: You want students to understand they should **avoid dropping or swinging around the binoculars**. They should understand that these binoculars will be used by other students and it's important they don't break. **It's very important to not touch the lens on either side (eye or objective).** Guide the conversation to this point. Finally, **students should not look directly at the sun with binoculars.** It will permanently damage their eyes. **Students who purposely look at the sun through their binoculars will give their binoculars back and be dismissed from the afterschool program for the day**.
- '**Okay, I am going to hand out the binoculars. I will put them at your feet. When everyone has a pair in front of them, that's when we'll pick them up**.' Pass out the binoculars; make sure they're out of the case. Don't give the case to students - one less thing to keep track of, just keep it in your carrying-case.
- Once all the kids have binoculars in front of them, say '**Ok, let's pick them up. Don't put them up to your eyes yet!**'
- Once everyone has the binoculars in their hands, say '**We're going to take a moment and learn the different parts of the Binoculars. Has anyone used binoculars before?**' Wait for students to respond. Say '**Awesome. Do any of you know the parts of binoculars? Raise your hand**'. Call on them.
    - If they get parts correct, give a positive compliment like 'You're right' correct!'
    - If they get parts incorrect, give a gentle correction 'Great guess, but that's not what I'm looking for'
    - After 2-3 responses, take the conversation over by saying '**We're on the right track, but I want to make sure we learn each part correctly**.'
- You are going to point and name each part of the binocular, then students will repeat after you. Say '**Repeat after me:'**
    - **'Eye Cup'** (Point to the plastic eye cup, give them a moment to repeat).

- **'Focus Wheel'** (Point to the wheel, give them a moment to repeat).
- **'Lens barrel'** (point to side of binocular).
- For the lens, tell students to not put their fingers on the lens. Fingers can transfer dirt, oil, and potentially scratch the lens so it's best to never touch either lens. **'This part goes up to your eye and it's called the eye lens'** (point to eye lens).
- **'The opposite side is the objective lens. If you're looking at a bird, insect, or tree that's the object you see through the objective lens. Say Objective lens'**.

Figure 4. Image showing the parts of a pair of binoculars which was used to teach students how to use binoculars.

Practice Using Binoculars
Outcome: Students can properly operate the binoculars
Time: 10 minutes

- Students need to practice adjusting binoculars to their face and looking through them. Say **'Ok everyone, now we know the parts, it's time to use our new tools. Holding the binoculars in both hands, gently straighten and bend them a few times.'** Demonstrate. Then say '**Binoculars are adjustable because each of our faces are different. We are going to all look at _____ (identify large, obvious, non-moving object), everyone turn and face it. Bend the binoculars as far as they'll go, then raise them to your eyes. Put the eye cup against your eyebrow. Looking through the binoculars at _____ (the object), slowly straighten your binoculars. If you see a dark patch or crescents in the center**

or on the sides, the binoculars are too close. If you see two circles or see two images, the binoculars are too far apart. When you only see one _____ (object) with no circles, the binoculars are the right fit for your face. Use the focus wheel to make the image clear'. You will need to visit with each child during this time. You will have to trouble shoot a bit. It may be obvious:
    - the eye cups need to be adjusted
    - bend in the binoculars to too much or too little
    - The binoculars are the right location, but the focus needs to be adjusted.
- As students get good with the binoculars, tell them to explore their area by looking at new objects through the binoculars. They may rotate their body, but they can't leave our circle yet. Remind them to use the focus wheel to adjust looking at objects closer or farther away.
- Once everyone has properly adjusted the binoculars and has spent a few minutes looking at different objects, gather the student's attention again.
- Say '**Ok friends, Binoculars down, eyes on me. I want to hear from a few people. What did you see with your binoculars?**' Call on a few students. Ask them to share their observations.
    - How did they focus?
    - Were they able to see objects in focus with both eyes?
    - What adjustments did they make?

Practice Finding Birds
Outcomes: Students can practice finding and observing birds with binoculars.
Time: 15 minutes

- Say '**Give me a thumbs up if you feel you know how to use your binoculars well'** Demonstrate and look at each student. '**Our next job is to use binoculars to find birds! Birds are really good at hiding and sometimes the best way to find them is to listen first. Let's stand with our feet wide, and our hands behind our backs. We are going to listen to all the outside sounds for 15 seconds. No talking, just listening. Nod your head if you're ready**.' Demonstrate and look at students. '**Great. On your mark, get ready, Listen!**' silently count to 15 then say, '**Raise your hand if you think you heard a bird noise'** Call on a student, ask them if they can repeat the bird noise they think they heard.
- Say '**Nice job listening. I have one more skill for us to practice before we start looking at birds. When we study birds, we look for birds first with our human eyes and then we bring our binocular up. Like this**' Demonstrate by looking at the same object from earlier, then bring your binoculars up to your eyes. '**This is not the correct way to use binoculars**' Demonstrate exaggerated swiveling of head with binoculars. '**Does anyone know why this doesn't work to find birds?**' Take a few guesses from students.
    - **IMPORTANT**: The answer has to do with the limited field of vision through binoculars. It is hard to locate birds when only looking through binoculars.

- Say '**Good birders always look with their eye first, then bring their binoculars up. Let's practice**.' Call out 3 different places for students to look first with their naked eye, then bring the binoculars up.
- Now you're ready to practice looking at birds, say '**Let's go practice our new skill with actual birds**'.
- If there are trees and power lines nearby, or obvious birds in the area, take students closer to those birds to practice.
    - Remind students that birds can scare easily and fly away, so we won't get too close.
    - Remind students that loud voices can scare birds, so let's use indoor/quiet voices.
    - Remind students to look at the color, shape, or behavior of any birds they see.
    - Remind students to use their eyes first, then lift the binoculars to their faces.
- **OR** if there are no birds around, get the laminated photos out.
    - Say '**Since we don't have real birds close to us, we're going to practice with pictures. Let's form a nice straight line right here'** Help students get in a straight line facing you. When they're in position, say '**I want you all to stay there. I am going to take a couple of steps back and we're going to practice our binocular skills**.' Step back about 10-15 large steps (you want about 20-30 feet distance, average footstep is about 2 feet) Hold up a picture, call back to students '**Once you've locked eyes on the photo, raise your binoculars up!**' Give everyone a moment to get their binoculars in position. Call out '**Next picture!**' Change the picture and the position you held it in. Students should practice removing binoculars, finding the image again with their eyes, then using the binoculars.
    - **IMPORTANT**: if at any time when using the pictures, a real bird comes into view, take advantage of that moment.

Learning Field Marks
Outcome: Students learn and practice the vocabulary of birders.
Time: 10 minutes

- Gather the students back to you. If there are outdoor tables, take students there. If there are no outdoor tables, find a comfortable, shady spot to sit on the ground. It's time to hand out the clipboards to each student. Match the name on the journal with the student.
- Once everyone has their clipboard and journal, have them open to the page with the bird picture. Say '**We are going to spend some time learning the parts of the bird we can see with binoculars. Birds have special colors and feathers on different parts of their bodies and each species looks a little different. A visible mark that can be used to identify a species is called a field mark. We are going to color these different parts of the bird and mark up the sheet too. Everyone pick up a crayon**.' Wait for all students to have a crayon.

- Say '**We're going to start on the very top of the bird, on the top of their head** (Touch the top of your head) **This is called the crown. Everyone color just the top part of the bird** (show them your paper). Give them just a moment to color the top**. 'Great, now use that same crayon and color next to the word CROWN**' Point to the word and demonstrate. (See example of field mark journal page on following page)
- Repeat for each part of the body, showing approximately where on their body the same part is. Make sure students are following along, using different colors and successfully marking up the journal page.
    - For Wing bars, you may need to say something like 'Wing bars are a thin line of different color on the feathers, on the top part of the wing'.
- When everyone is done coloring the different part of the birds, you can have them draw with crayons a bird or other nature they observed today. Say '**Now that we're done with the parts of the bird, let's use this part of our journal to try and remember a bird we saw and a field mark on the body. Let's draw it to the best of our ability here**' Point them to the bottom of page 2 in the science journal, where it says 'Draw anything you saw today'.
    - If you used the laminated pictures today, break them out again so students can look.
    - Talk to individual students and ask them questions about what they saw. Try to help them remember what they saw.
    - Use the chrome book and ID apps to bring up pictures of birds seen together.

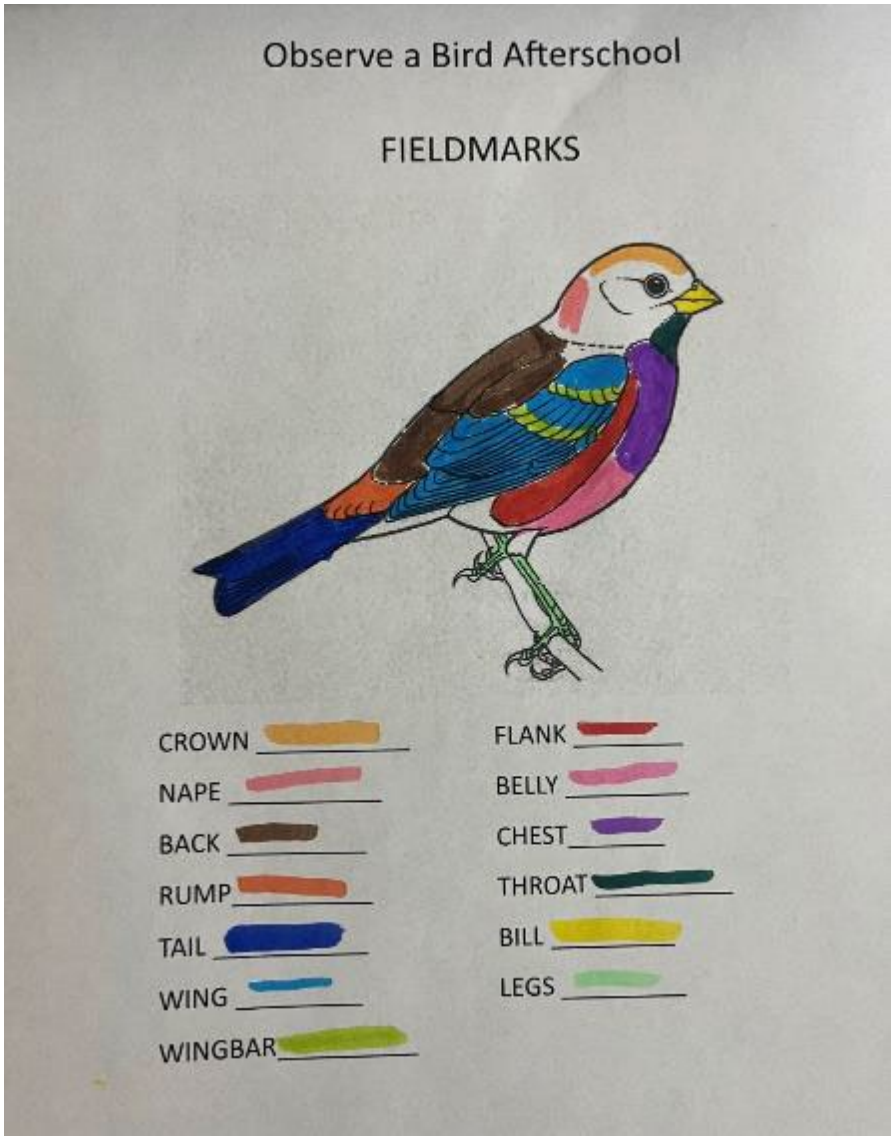


Figure 5. Illustrated guide showing field marks used to identify birds.

Outcome: Close out the day, all materials are returned.
Time: 5 Minutes

- Get your students' attention. Say '**Alright friends. We need to clean up and head in. Put all the crayons back in my box. Put your science journal on your clipboard so I can see your name. Hand in your clipboard.**'
- Once you have everyone's clipboard and all crayons are returned, gather all the binoculars. It's good practice for the students to put them back in the case. Hand a case to each student and say '**Please return your binoculars to a case. Remember, we are respecting our science tools and that means we protect them and put them away when we're done**.' You may need to help students get them in properly. Demonstrate the right way, if necessary.

- When everything is put away, stand everyone up, form a straight line and return them to the afterschool gathering space. Follow any sign out procedures.

Clean up your space.

Lesson Plan 3 – Wednesday

Theme: Introduction to Local Birds
Goal: Students will understand each bird has special characteristics which identify the bird as a specific species.
Objective: Students will be able to:

- Remember at least 7 field mark locations on a bird body
- Practice using binoculars
- Learn at least 3 correct names for common birds

Materials

- Clipboards; personal clipboard for staff and one for each participant
- Copy of lesson plan
- Journal pages
- Rolling bag or container to carry everything
- Guides: Chromebook, Sibley
- Pencils for each student, plus plenty of extras
- Student binoculars
- Staff binoculars
- Laminated pictures of birds. (Ideally local birds. Can be from magazines, calendars, etc. Confirm ID of birds before using).
- Folding guides for students

Review Game
Outcome: Students are energized and remember the names of field mark locations.
Time: approximately 10 minutes.

- Welcome everyone to the program:
    - After-school providers may have students gathered and sitting or may send students to you individually as they pull them from other activities; welcome people as they arrive into the group.
    - Students will respond to the energy of the leader; smile big, use appropriately energetic tone and volume.
- Say '**Hey buddies, let's get outside! Everyone line up for me!**' This is the fourth time they've lined up for the program now, they should do it without much issue.
    - Considerations: You may need to walk backwards a little, or turn around frequently, to make sure everyone is staying together.
    - If you see any pushing, shoving, or hands on other students, correct it immediately.
    - You will need to bring binoculars, folding guides, clipboards, pencils, and journals with you outside.
- Once you arrive in your outdoor space, put down your items and tell everyone to form a circle:
    - Say '**You know the drill, where's my circle?'** Help students form a circle as needed.
    - Say '**We need our brains to be wide awake for birds today! We're going to do a quick game to get our blood moving. Everyone take a step**

backwards' Demonstrate. **'Let's use our arms to make sure we have enough space between us. Everyone put your arms straight out from your sides'**. Demonstrate. If you see anyone who is too close/hands touching, ask them to take another step backwards.

- Say '**We're going to play a quick came of Simon says. Raise your hand if you know how to play.**' Look for how many hands go up:
  - If only two or three kids raise their hand, you may need to explain the basic rules.
  - If the majority raise their hands, move to the next instruction.
- Say '**We have one different rule. Normally, when you play Simon Says, if you do something but Simon didn't say so, what happens?**' Answer: You're out. Positively acknowledge the correct answer, then say '**In our game, just give yourself a point. No one gets out. You want to keep your personal score low. Any questions?**' Pause for questions, answer a few that arise.
- Say '**Our final twist for the day is we're going to use our field mark terms from yesterday! If Simon says touch your crown, where do your hands go?**' Touch top of your head and affirm those who do it too.
- Briefly review the other terms. You can have a journal open to the page as necessary.
- When ready, say '**The game of Simon Says has officially begun!**' Then run through the different body parts. Keep it simple; always say '**Touch your _____** (insert field mark)', then do the Simon Says for the same part. Go as quickly as you can. Add a few 'Hands down, Simon Says hands down'
  - Example: say '**touch your crown, Simon says touch your crown. Hands down. Simon Says hands down. Touch your beak. Simon says touch your beak. Touch your chest. Simon says touch your chest. Hands down. Simon says hands down…'**
- When you've gone through each field mark once, you can decide if you want to stop or do another round.
- Students should be kind of silly, giggly afterwards.
- Ask if anyone remembers how many points they 'earned'.

Review Binoculars
Outcome: Students will practice adjusting binoculars for their face, then practice looking at any visible birds or insects with the binoculars.
Time: 10 minutes

- Gather students, say '**Alright, thanks for reviewing field marks with me. Let's also review using binoculars. Who remembers what this part is?**' Point to a part, let students call it out. Confirm or correct. Point to one other part; confirm or correct. '**Yesterday we practiced taking care of our tools. Who remembers one way we can respect our tool?**' Possible answers: avoid dropping them, keep fingers off lens, never looking at sun, putting them away properly…

- Say '**I am going to give everyone a pair again today. Who remembers how we make them fit to our face? Raise your hand**' Call on someone, confirm or correct a response. '**Who remembers how we can adjust the focus?**' Confirm or correct a response.
- Say '**When you get your pair, go ahead and adjust them. Try to look for a bird, insect, or plant. Stay within in our safe zone, but you can move around a bit while using the binoculars.**' Help students as need be.
    - As students get more comfortable, encourage them to look at really close objects and really far away items.
    - Remind them to use the focus wheel to make the vision clear.
    - Take time to talk to each student. Give everyone at least 5 minutes of exploration.
- While students are doing their own exploration, it's important that you, as the adult birder, keep an eye out for potential birds for them to see.
- Call students back to you and ask one or two people to share what they saw.

Learning Local Birds
Outcome: Students are able to properly ID 5 local bird species.
Time: 30 minutes

- Thank students for sharing what they observed with the binoculars. Ask them to sit in a circle.
- Say '**Using binoculars is only part of being able to study birds. When we want to learn about birds, we have to think about their habitat. What does the word 'habitat' mean?**' Call on a few students; confirm or correct. Simple answer: Habitat is the home of the bird.
- Say '**What are some of the habitat's you might find a bird in?**' Possible answers: in the forest, around our school, the ocean, lakes, grassy areas, icy places (Antarctic); confirm student ideas.
- Say '**Birds are found everywhere. But is every bird found in every habitat? Are we going to see a penguin walking around Houston?**' Let students shout out the answer: No!
- Say '**ok, so only certain birds live in certain habitats. Do all birds act the same? Is a Hawk going to act like a duck?**' Let students shout out the answer: No!
- Say '**Ok, got it. Not all birds live in the same area and they don't behave the same. Are they all the same size? Is an eagle the same size as a hummingbird?**' Let students shout out the answer: No!
- Say '**Well, if they don't live in the same place, act the same, and they're not the same size, then at least they all have the same color, right?**' Let students shout out the answer: No!
- Say '**Great job. You all know there are a lot of differences between different types of birds. Scientist also know all of these differences. A scientist who only studies birds is called an Ornithologist. Can you guys say that with me? OR-NI-THOL-O-GIST! Ornithologist. Ornithologists have put all these different characteristics into books that we call guidebooks. When people want to**

learn more about what type of bird they see, they use all this information (size, color, habitat, behavior) to narrow down what species they are looking at. When we have a general idea of the bird, then we can look through a guidebook, read more about that bird, and confirm we identified the bird correctly. We are going to practice looking at a guidebook to learn about our Houston birds. I am going to use an electronic book, and I'm going to have you help me. Ready?'

- Break out the Chrome book. Open the Audubon app. You will use this to show pictures to students of 5 common birds:
    - Black-bellied Whistling duck
    - Great Egret
    - Red-shouldered Hawk
    - Blue Jay
    - Great-tailed Grackle
- For each bird:
    - Show picture (bring the c-book close to each student)
    - Have the students repeat the name of the bird with you.
    - Have students look at 3-4 field marks:
        - Color and shape of beak
        - Color and shape of legs
        - Color of plumage
        - Color of eye
    - Show the range map
    - Listen to one or two of the calls/songs.
        - IMPORTANT: ***before*** you play the sounds say '**birds are very sensitive to calls and songs because birds use song to protect their homes. It's important that we don't play sounds loudly or for long periods.**'
        - You can have students imitate the bird sound with you; it's a fun, goofy way for them to embed the sound into their memory.
- Ask students why it is important to recognize birds as the right species.
    - Answers will vary. Tell students birds show us how healthy our environments are. When we have lots of different types of birds in the right habitat, it tells us the habitat has enough food, shelter, and water for animals. When we find birds in the wrong habitat it may tell us the bird is sick or injured.
- Tell your students that they will be combining three powerful tools to identify and make observations about birds in the field: binoculars, field guides, and, most importantly, their own observations!
- Stand students up. Say '**One of the most important ways to observe birds is to listen first. We are going to do a quick listening exercise. Everyone put everything down on the ground; your hands need to be empty**.'
- Once everyone has their hands free, say '**We are going to give ourselves owl ears! Owls have special facial disk that help direct sound into their ears!**' Gently cup your hands behind your ears and ask everyone to do the same.

- Say '**Ok, with our owl ears we're going to listen for birds in each direction. Everyone face this way!**' Point in one direction and make sure students turn their body to listen in that direction (not just swivel their heads). Tell them we'll listen for 10 seconds and then turn to the right. You're basically turning 90˚, listening in each 'direction'. Make sure you tell the kids when to rotate.
- When time is up, if you heard a bird sound you can say something like '**I heard a bird over there! Let's gather our binoculars and do a bird walk!**
- Spend the next 10-15 minutes looking for any and all birds.
- Use your knowledge to ID them and encourage students to talk about the field marks and behavior. Use page 4 in the science journal to mark down any bird you see with the students.
    - Mark where it is with just the letter representing the space.
    - Mark what it is doing with just the letter representing the action
    - Write in actions or locations in the extra spots, if needed. Help students spell and abbreviate
    - If you find a species you don't know, you can write in 'M-bird' for mystery bird and still observe it. If you find a bird and you can ID it but it's not on the list, write that in too.
    - The goal is observing birds and identifying field marks, behavior, and habitat. It's less important to be 100% correct on the species. Have fun with it!
    - Finally, if there are no birds around, you can ask students what bird from the list they want to study; you can continue to use the chrome book as your tool to explore birds.
        - Show the pictures
        - Play sounds
        - Look at range maps

Wrap Up
Goal: Students reflect on what they learned today.
Time: 10 minutes or less

- Let students know our day together is almost over. Have them hand in science journals. Then gather all the binoculars. It's good practice for the students to put them back in the case. Hand a case to each student and say '**Please return your binoculars to a case. Remember, we are respecting our science tools and that means we protect them and put them away when we're done**.' You may need to help students get them in properly. Demonstrate the right way if necessary.
- Gather them into a circle again.
- Say '**We learned a lot today! Who can remind me how the Blue Jay sounds?**' Call on a student. Confirm or correct their sound. Ask everyone to repeat it together.
- Say '**What color did the Whistling ducks have on their legs and bill?**' Call on a student; confirm or correct (Answer: Bright Pink or Red.) Ask the same student

what is a good habitat for a duck? (Answer: Like all ducks, they live near water. AND they nest in trees! - this is a fun fact for kids to learn!)

- Ask them one or two more questions about what birds you saw today or the ones they 'studied' from their journal list.
    - Ask them to describe beak shape, what the bird might eat, or any other fact you feel confident talking about.
- Have everyone form a line and walk them back into the building.

Done!

Lesson Plan 4 – Thursday

Goal: Students will understand how scientists count birds and why it matters
Theme: Introduction Bird Estimates
Objective: Students will be able to:

- Explain the difference between an estimate and counting.
- Explain why some birds use flocks.
- Explain why scientists count birds.

Materials

- Name tag for staff.
- Clipboards; personal clipboard for staff and one for each participant
- Copy of lesson plan
- Journal pages
- Rolling bag or container to carry everything
- Pencils for each student, plus plenty of extras
- Student binoculars
- Staff binoculars
- Laminated pictures of birds. (Ideally local birds. Can be from magazines, calendars, etc. Confirm ID of birds before using).
- Chromebook, Sibley guide
- Game ring from camp
- Ping pong balls
- Frisbees
- 2 shirts/bandanas large enough to fully cover the Frisbees

Mindful Breathing
Outcome: Students enjoy a relaxing moment together before learning how to estimate
Time: 5 Minutes

- Welcome everyone to the program:
    - After-school providers may have students gathered and sitting, or may send students to you individually as they pull them from other activities; welcome people as they arrive into the group.
    - Students will respond to the energy of the leader; smile big, use appropriately energetic tone and volume.
- Say '**Happy Thursday, let's get outside! Everyone line up for me!**'
    - Considerations: You may need to walk backwards a little, or turn around frequently, to make sure everyone is staying together.
    - If you see any pushing, shoving, or hands on other students, correct it immediately.
    - You will need everything today!
- Once you arrive in your outdoor space, put down your items and tell everyone to form a circle: Say '**Circle up!**' Help students form a circle as needed.
    - Say '**We're going to start today by practicing our owl ears. If you have anything in your hands, go ahead and put it on the ground'** Give students a moment to clear hands.
    - Say '**Everyone take a step backwards'** Demonstrate. **'Let's use our arms to make sure we have enough space between us. Everyone put your**

arms straight out from your sides'. Demonstrate. If you see anyone who is too close/hands touching, ask them to take another step backwards.
    - Say '**Good! Let's also make our stance strong. Spread your feet a little bit**' Demonstrate. Help students fix their feet as needed.
- Say '**Hands down to your sides**.' Demonstrate.
- Say '**We're going to take three deep breaths together, so we can practice being quiet and calm, like Owls. First, we're going to breath in through our Noses.**' Demonstrate (be loud if possible, make it theatrical so students can really see you're taking a big breath). '**Then breathe out with a sigh**' Demonstrate, (a little dramatically).
- Say '**Ready? Let's begin. In through your nose**.' Demonstrate. Hold for a brief moment. Say '**Exhale**' Demonstrate. Repeat twice more. Get a little quieter with each breath.
- In a quiet, calmer voice say '**Nice job, Owls. I feel pretty quiet. I'm ready to listen to nature. Show me Owl Ears!**' Demonstrate. When everyone is in position, say '**Let's all face this way'** (Turn your whole body in one direction. Confirm kids who do it well, correct those who need help.)
- When everyone is in position say '**We'll listen quietly for a few moments. When I turn my body to a new direction, you turn your body with me'**. Demonstrate listening.
- The goal is to spend about a minute quietly listening and moving through a full circle.
    - If someone doesn't see you turn your body, gently remind them to turn the right direction.
    - If someone is talking or not following directions, quietly correct them.
- When you've gotten through the whole minute/full rotation, say '**Ok Owls, ears down. If you heard a bird, stand on one foot**' Demonstrate.
- Say '**If you know what bird it was, raise your hand**'
    - You may or may not have heard their bird. They may or may not correctly ID it.
        - If they're sincere and really trying, ID a sound, encourage them.
        - If they say something silly like they heard a California Condor, then you can give them a silly response.

Counting Birds
Outcome: Students understand why ornithologists count birds
Time: 15 minutes

- Ask students to take two steps inwards; close up the circle. Have students sit down close to each other. Make sure the ground is level where you are sitting and there no safety hazards (fire ants, dog poo, trash). Take out the Chromebook.
- Tell students we're going to spend a little time thinking about numbers and groups. Say '**We've been learning about birds and science tools this week. Today, we're going to keep learning and practicing. We're going to focus on**

how ornithologists count birds. There's our word from yesterday! Let's say it all together again. OR-NI-THOL-O-GIST! Ornithologist! Who remembers what that means?' Call on a student; confirm or correct. Simple answer: someone who studies birds.

- Say **'Does anyone want to take a guess why we should count birds? Raise your hand if you have an answer'** Call on a few students. Answers will vary, give positive feedback.
- Say '**Scientists count birds for a lot of reasons. Some scientists only study one type of bird. When you only study one bird, you want to know exactly how many of that bird are alive in an area. If we only have a few individuals, that bird may need help from people! Yesterday, we studied the Great Egret. Does anyone remember what that bird looks like?'** Call on someone, confirm or correct their description.
- Say '**One hundred years ago, people hunted that bird to make fancy hats. Scientists counted how many birds were killed and how many were alive, then decided those birds needed help. We made new laws to help Great Egrets. Now we can see Great Egrets all over Houston!**'
- Say '**Sometimes, scientists want to know how many birds live together. For example, all along Texas coast in the Springtime, we can see lots of different birds living together in nest colonies. Nest colonies are a mix of birds raising baby birds together. Scientists might count how many adult birds and how many young birds there are. Scientists know that when lots of birds live together, the baby bird are more likely to grow up and learn to fly.'** (Show picture of nest colony).
- Say '**Not only do bird scientists like to count birds, but we also like to count them many times! Sometimes we go to the same place every week to count them. Why would we keep counting them again and again?**' Call on a student, give positive feedback on their idea.
- Say '**Birds move around every day! And they sometimes move really far away. We call that Migration. By counting birds in the same spot many times throughout the year, we can learn about changes in habitat and learn more about a bird's life!**'
- Say '**There are two ways we can count birds. If we see just a few birds at a time, we can count each one. Sometimes we see HUGE amounts of birds at once and we can't count all of them. When that happens, we take our best guess. A thoughtful guess is called an estimate**.'
- Say '**Remember that birds can scare easily; sometimes we only see the group for a really short amount of time before they all fly away! We are going to use some 'fake birds' to practice our counting and estimating, before finding real birds.'**
- Say '**I am going to hand out your science journals. You will open to page 5**.' Hand out Journals and pencils. Help students open to page 5 and reattach to clipboard as necessary.

- Get Frisbees, ping pong balls, and covers. Set up the Frisbees so one is all yellow balls, and one is all white balls. You don't have to fill it each one, but put a good amount in. Cover them both up so students can't start counting yet.
- Say '**On our Journal page, we are going to practice both counting and estimating. In the first box (Point to it), write 'white bird'.**
    - You may need to spell it out, you will need to check in on each student as they write.
- Say '**In the second box, write 'yellow bird**.'
    - You may need to spell it out, you will need to check in on each student as they write.
- Say '**in a moment, but not yet, I will uncover one of our 'flocks'. When I do, you will count each ball. Remember, the ball represents a bird! You will write your number here** (point to the number box). **Ready?**' Wait for students to nod or say yes. Uncover one Frisbee and let them count.
    - Students may need to lean in or stand up to count better, some may count aloud. No need to correct unless they're in someone's way or really loud.
    - Remind students to write down their number.
- When everyone has a number, say '**we're going to count them all together so we have the same numbe**r' Count all the balls in one Frisbee aloud. Students can correct their number if they got it wrong.
- Repeat actions with other color. Make sure students write down their number in the correct line.
- Next, say '**Ok, so we know exactly how many we have and we had a nice long time to count each Flock. Now, we're going to practice estimating. I am going to cover each Frisbee and remove some 'birds'**. **When we're ready, I will remove the cover for just a few moments. And you're going to do your best job at guessing how many birds are there! Write your estimate here** (point to the estimate column).'
    - As discretely as possible, remove a handful of balls from each Frisbee.
    - Don't take the same amount from each tray; estimates should be different.
    - If you want to be tricky, you can act like you took something away, but actually add or leave it exactly as is.
- When you're ready, lift the cover for 3 seconds. Count aloud and cover when you reach 3. Remind students to write down their estimate for that color flock.
- Repeat for the other flock.
- Ask a few students to share their new guess.
- Then count them again together. Encourage students for their good efforts.
- Finally, mix the flocks; cover the Frisbees and discreetly add/subtract balls so the groups are totally different. Say '**we're going to practice estimates again. This time we're making it harder by having mixed flocks. Let's get our data sheet ready. On this new line write Mix 1 – white.**' Show students where to write, help them spell as necessary. '**On the next line, write Mix 1 – yellow**' Show students where to write, help them spell as necessary. '**On the next two**

lines write 'Mix 2 –white, Mix 2 – yellow' Wait until everyone has their lines written; help as necessary.

- Say '**This first flock is Mix 1. You will have 6 seconds to estimate white birds and yellow birds. Write the estimate for each color in the correct box**' Point to the estimate boxes for each line.
- Say '**Ready?**' and wait for a few students to respond. Raise the first cover. Say '**Estimate the white 1…2…3… Write your estimate down! Now the yellow 1…2…3…'** cover and tell students to write their yellow estimate.
    - Repeat with the second dish.
    - Ask students if this was hard.
    - Ask students to share their estimates from mix 1 and mix 2.
    - Remove covers and count actual numbers. Have everyone write it down in the right spot.

Count Real Birds
Outcome: Students practice their new bird counting/estimating skills in real life
Time: 20 minutes

- Thank students for practicing their counting skills and tell them we're going to practice all of our bird skills now.
- Say '**This week we started using binoculars, learned field marks, we learned names of local birds, and now we learned how to count or estimate like a scientist. We're going to spend some time practicing all 4 of these skills with any birds we can see. Let's put away our science journals and pencils. We don't need to carry those.**' Have students close journals (go back to page one) and attach them to the clip board. Have some students help put away Frisbees and ping pong balls.
- Get the Chromebook and open eBird and Audubon ID.
- Introduce the eBird app. Say '**Ok Bird friends, we are going to practice our counting and identifying skills. I will capture our science data with this app called eBird. eBird is used by scientists all over the world. It keeps track of how long we look at birds, where we walk, what we see, and how many we counted.**'
- Turn the app towards them. Show them the steps as you start the checklist .
    - Date, time, tracking on the first screen
    - Location and map on second screen
- Remind students the Chromebook is an important tool for the program and tell them you will carry it to keep it safe. Tell students they can help add data when we find and ID birds.
    - As you find and ID birds with students, you can ask different students to type in the bird's name and how many they counted or estimated.
- Use the remaining time to look for birds!
    - Since we can't control which birds show up, think of it more as a nature walk. Let kids feel grass, encourage picking up pollution if there are wrappers or trash around (avoid unsafe items; if there is poop, needles, beer cans, etc. alert afterschool support or pick it up after the program is

done). If you find nests or feathers, encourage students to think about who's home that is, why birds lose feathers, etc.
    - Let students ask questions, use binoculars to view human and animals. Have fun with it!
    - If students get bored because there are truly no birds around, gather them in the shade and use laminated photos or ID app photos to practice counting/estimating as well as bird ID.
- When there are just 5 minutes left, gather students. Hand out binocular cases and have students store their binoculars correctly.
- Form a line, walk them back into the afterschool room/gathering spot.

Done!

Lesson Plan 5 – Friday

Theme: Week Wrap up

Goal: Students review activities from the weekly in fun, engaging ways.

Objective: Students will:

- Recall 3 species we studied.
- Be able to state the difference between an estimate and a count of birds.
- Students will be able to list 3 different tools scientists use to study birds.

Materials:

- Name tag for staff.
- Clipboards; personal clipboard for staff and one for each participant
- Copy of lesson plan
- Journal pages
- Rolling bag or container to carry everything
- Pencils for each student, plus plenty of extras
- Student binoculars
- Staff binoculars
- Laminated pictures of birds. (Ideally local birds. Can be from magazines, calendars, etc. Confirm ID of birds before using).
- Chromebook, Sibley guide
- Dice
- Copies of Flying Wild Migration game
- Bag full of ping pong balls (counted!)

Bird Yoga
Outcome: Get energized together, be goofy for a moment
Time: 5 minutes

- Welcome everyone to the program:
    - After-school providers may have students gathered and sitting, or may send students to you individually as they pull them from other activities; welcome people as they arrive into the group.
    - Students will respond to the energy of the leader; smile big, use appropriately energetic tone and volume.
- Say '**It's feisty Friday, let's get outside! Everyone line up for me!**'
    - Considerations: You may need to walk backwards a little, or turn around frequently, to make sure everyone is staying together.
    - If you see any pushing, shoving, or hands on other students, correct it immediately.
    - You will need everything today!
- Once you arrive in your outdoor space, put down your items and tell everyone to form a circle:
    - Say '**You know the drill, where's my circle?'** Help students form a circle as needed.
- Ask students to step back from the circle and put their hands out to the side. Their fingertips should barely touch. Ask students to put their feet about a foot apart. Demonstrate. Ask students to bend their arms and put their hands on their hips. Say '**These are your wings. Stretch your wings backwards and look to the sun!**' Demonstrate then look down to make sure the students are doing it. Say '**Flap your wings like a chicken!**' Demonstrate. Say '**Crow like a chicken!**' Demonstrate. Say '**Arms down**.' Demonstrate.
- Say '**We going to use our arms like hummingbirds! Hummingbirds move their wings backwards and forwards, not up out and in like most other birds**.' Demonstrate this by putting your arms straight out to your sides, palms up, and drawing a figure eight with your fingertips by rotating your wrist back and forth. Ask students to put their arms straight out from their sides. Demonstrate. Say '**Hummingbirds move their wings super-fast. Go as fast as you can!**' Let them go crazy for 5-10 seconds. Say '**Hands down**' loudly and demonstrate putting your hands to your thighs.
- Say '**Last bird pose for today! Birds often rest by standing on one foot. Stand on one foot.**' Demonstrate. Say '**Bird tuck their leg up close to their bodies. How close can you get your foot to your body without falling over?**' Demonstrate either as a quad stretch or glute stretch. Give them 5 seconds or so to try. Say '**Nice job! What about the other foot? Is one leg stronger than the other? Try with your other leg!**' Demonstrate.
- Say '**Nice job with your bird stretches! Let's sit back down for our next action. Everyone take one big step forward so we're sitting a little closer together**.' Demonstrate. When everyone has stepped in, say '**perfect, now sit down**'

Review of Counting Versus Estimating
Outcome: Students review why they use one method or the other.
Time: 5 minutes

- Ask students what we did yesterday; tell them to raise their hand and call on a few. Confirm or correct responses as needed.
- Ask students when you should count individual birds vs estimating how many they are. Simple Answer: when there are a just a few individuals that you can see, count them. When there are large flocks, you have to estimate.
- Tell students we're going to do some fast practice. Get your bag of ping pong balls. Say '**I'm going to put some birds into the center, you're going to count the white and yellow ones separately. Count as fast as you can; raise your hand when you have a number for each bird type.**'
    - Grab a random handful or two, roll them into the center space of the group; they should be spread out but not rolling out of the circle.
    - When the first hand goes up, call on that student. Then ask if others got the same number. Have students roll the balls back to you and count them.
    - Repeat one more time.
    - When the balls are returned to you, add them back into the Ziploc bag.
- Say '**Great job counting. Ready to estimate?**' wait for nods or responses to be called out. Take the whole bag, not open, and put it in the middle. Give them 10 seconds to estimate.
- Ask students if they found it difficult to estimate; call on a few to respond.
- Ask if anyone wants to share their estimate; call on a few. See if there are similar values. If the numbers are really different, ask students why they estimated too high or low.
- Reveal the true number.
- Remind students why scientists count birds: Birds tell us if there is enough food, shelter, and space. Sometimes the numbers and locations of birds tells us if the habitat is ok or if humans need to clean it up and protect it.

Migration Game
Outcome: Students connect some of the dangers to birds with where they are and how many there are.
Time: 10-15 minutes.

- Say '**Are you ready to try something new?**' Give students a moment to respond.
- Say '**We're going to play a migration game. Remember, people count birds again and again at the same place because bird species and amounts change throughout the year due to migration. Migration happens in the spring and fall. Bird come to Texas in the spring to have babies and eat lots of good food. They leave Texas in the fall to go South America and eat there for a few months.**'
- Ask '**Do all birds leave in the fall?**' Let students shout out the answer: No!

- Say '**That's right. In fact, a lot of birds migrate from some place up north and stay here in Houston with us all winter long. Then there are some species who never leave Texas. They're with us all year round**.'
- Say '**Let's think about being a bird that will leave Texas and then come back. Do you think it's easy to move someplace new for a few months?**' Let students shout out the answer: No!
- Say '**Migration is actually pretty hard and dangerous. We're going to pretend to be a bird. Let's pretend we're a Blue Jay from Wednesday. Does anyone remember what they sound like?**'
    - Let's students make bird noises for a moment.
    - If no one remembers, remind them Blue Jays make lots of sounds but the most common is the 'Jay-Jay' sound.
    - You can show kids a picture of the bird if you want.
- Say '**The game is simple. First, we are going to line up in a straight line and we're all going to face this way**' Help students stand shoulder to shoulder and all face one direction. Stand at the end of the line with them.
    - You will need a large flat area where you and the group can walk forward together, like football players at kickoff.
- Say '**Next, we will determine how we advance in our Migration path by using this die**' Show students one of the squishy dice.
- Say '**I have a list of different possibilities (point to your sheet). I will read aloud our migration story then we'll act it out; you will follow my lead. Ready?**' Wait for 'yes!' or nods.
- Say '**Everyone take one step forward**' (you can make it a goofy/big step forward, if desired. Then read the first action step aloud (square 1). Act it out with the students.
- Give the die to one student and ask them to roll.
- Say '**What's one plus ____** (whatever the die says)? Let students call out the answer. Confirm or correct as necessary.
- Take that many steps forward and read the next action aloud. Act it out with students.
- Repeat until the group survives or dies.
    - If the group survives, have a dance party.
    - If the group dies, ask students if they want to try their luck again. Turn the line around, take 2 steps forward (start on the second action) and repeat rolling the die to see if something else happens!

Birding Adventure
Outcome: Students get a final opportunity to observe birds in their school yard.
Time: 15 minutes.

- Thank students for playing Migration. Ask if they feel different about migration now that they know how hard it is. Call on 2 students to share.
- Tell students that we are going to spend some time looking for and appreciating the local birds. Say '**We should practice our observation and listening skills with an added twist today. When we observe birds, think about how hard their life may be. They have to find all their own food. They have to build their own house. They may travel really long distances. They have to deal**

with predators. And! They have to live in a world where humans sometimes hurt them on accident.'

- Get the chrome book out, open eBird.
- Remind students that good scientists will count and keep data on the birds they see.
- Handout binoculars.
- Walk students around the school yard.
    - If there are visible birds, ask questions about the field marks, ask students what kind of bird they think they see. Use the time to review and use Merlin Bird App as needed to identify them.
    - If there are no birds around, let student explore with binoculars.

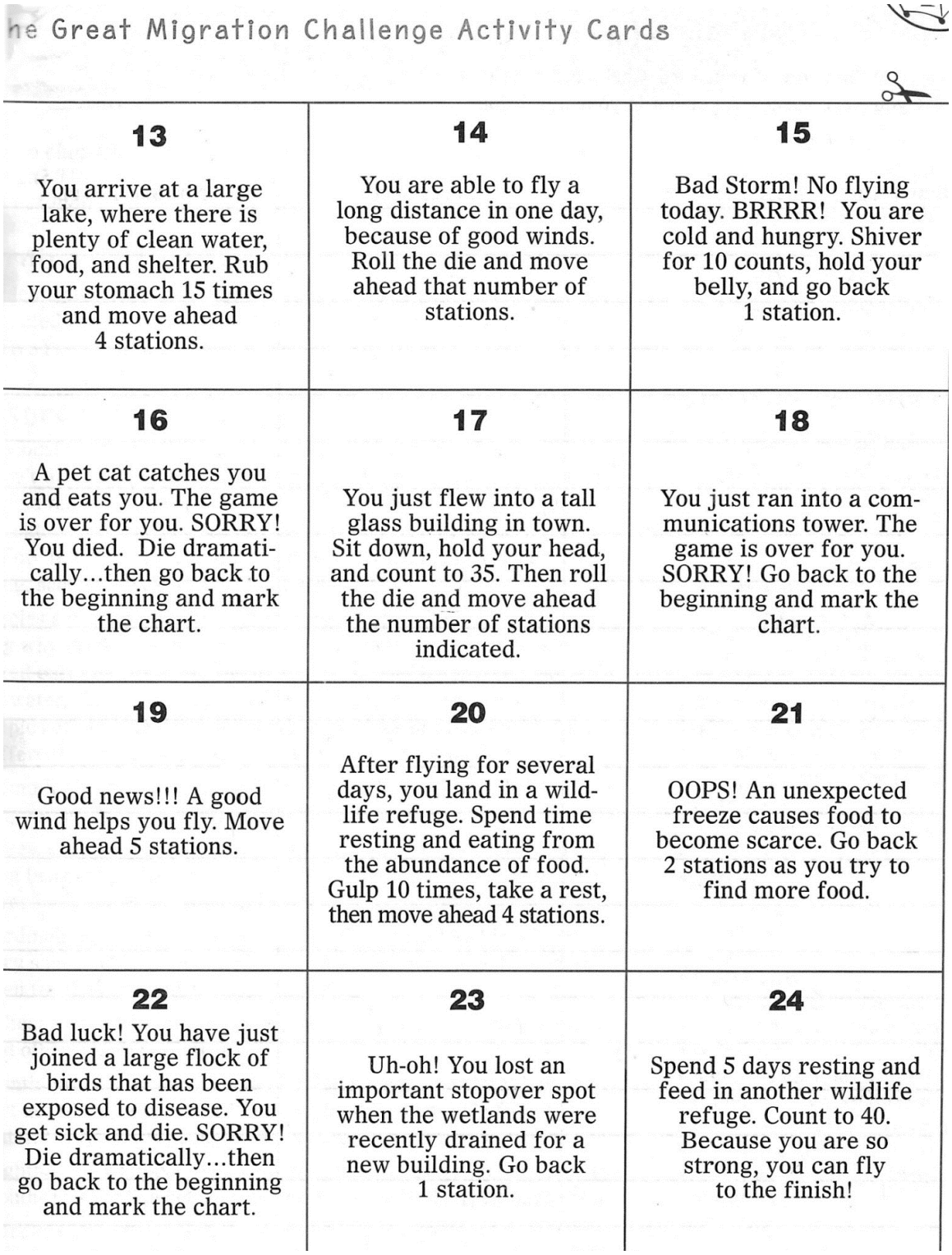
Wrap Up
Outcome: Students get their journals to keep and do the bird pledge.
Time: 5 minutes

- Gather students' attention back to you. Thank them for birding with you one last time.
- Have students put the binoculars away correctly.
- Have students form a final circle. Say '**Friends it's the end of our week together. I've had a great time practicing science skills and learning birds with you. I am going to give you your science journals to take home. When I call your name, come get your journal. We can high five, handshake, or bow to each other. Your choice**.'
- Pick up the first journal, call the student over to you and say, '**Would you like a handshake, high five, or a bow?**' Whatever the child chooses, do it enthusiastically! Give them their journal and say '**Please got back to your spot in the circle'**
- Go through each student this way.
- When everyone has their journal, turn it over and point to the pledge. Say '**There are many things each of you can do to help birds in migration and all year. Will someone help me read the first line?**' call on someone to read and point to the line "put up bird feeders, bird houses, and birdbaths!"
- Repeat reading aloud with a different student the steps students can take to help birds.
- Thank students for reading and say '**line up! Time to go back inside'**

- Clean up and say goodbye.

The Great Migration Challenge Activity Cards

1 Watch out! Power lines ahead. Don't hit them! Crawl ahead 5 feet. Then roll the die and move ahead the number of stations indicated.	**2** Good news! Food is plentiful. Many berries, seeds, grains, and insects are available in this overgrown field near a river. Smack your "beak" 10 times and move ahead 5 stations.	**3** Bad news. You land by a polluted marsh and become sick from the food you eat. Sit down, hold your stomach and count to 30. Groan 10 times. Then move ahead 1 station.
4 Watch out for the predator—it wants to eat you! Freeze, count to 40, and then sneak ahead 2 stations.	**5** You escape capture by a predator, but slightly sprain your wing in the escape. Get it back in shape. Slowly swing your left arm around 10 times. Move ahead 1 station.	**6** Scientists catch you for research. They put a metal band on your leg and set you free. Tie a piece of flagging around your ankle. Move ahead 2 stations.
7 You get tangled in fishing line and can't eat. You are weak from hunger. A wildlife rehabilitator cuts the line and feeds you. Hop on 1 leg in a circle, count to 40, then move ahead 4 stations.	**8** You land at a school where students created a schoolyard habitat. There is a bird feeder, you eat seeds, fruit, insects, and nectar. Peck or sip 20 times. Roll the die, then move ahead that number.	**9** It's raining, it's pouring, and you don't want to fly in this rainstorm. Count to 50 while you wait for the storm to stop, roll the die, then move ahead that number of stations.
10 Strong winds from the wrong direction keep you from migrating. Roll the die and blow back that many stations.	**11** You can't find last year's resting spot because a new shopping mall has been built there. Walk around in 3 wide circles searching for rest and food. You are still hungry, and only have strength to move ahead 1 station.	**12** Whew! While flying near a large city, you almost collide with a jet. Go back 3 stations while you recover.



he Great Migration Challenge Activity Cards

13 You arrive at a large lake, where there is plenty of clean water, food, and shelter. Rub your stomach 15 times and move ahead 4 stations.	**14** You are able to fly a long distance in one day, because of good winds. Roll the die and move ahead that number of stations.	**15** Bad Storm! No flying today. BRRRR! You are cold and hungry. Shiver for 10 counts, hold your belly, and go back 1 station.
16 A pet cat catches you and eats you. The game is over for you. SORRY! You died. Die dramatically...then go back to the beginning and mark the chart.	**17** You just flew into a tall glass building in town. Sit down, hold your head, and count to 35. Then roll the die and move ahead the number of stations indicated.	**18** You just ran into a communications tower. The game is over for you. SORRY! Go back to the beginning and mark the chart.
19 Good news!!! A good wind helps you fly. Move ahead 5 stations.	**20** After flying for several days, you land in a wildlife refuge. Spend time resting and eating from the abundance of food. Gulp 10 times, take a rest, then move ahead 4 stations.	**21** OOPS! An unexpected freeze causes food to become scarce. Go back 2 stations as you try to find more food.
22 Bad luck! You have just joined a large flock of birds that has been exposed to disease. You get sick and die. SORRY! Die dramatically...then go back to the beginning and mark the chart.	**23** Uh-oh! You lost an important stopover spot when the wetlands were recently drained for a new building. Go back 1 station.	**24** Spend 5 days resting and feed in another wildlife refuge. Count to 40. Because you are so strong, you can fly to the finish!

Figure 6. Migration Game used during the "Observe a Bird" afterschool program.

Appendix C. Project Photos

Figure 7. Lyons Elementary, November 2022. Students water coloring birds in their nature journals. *Photo Credit: Alexandria Sands*

Figure 8. Frazier Elementary, February 2023. Students spotting birds on the swings. *Photo Credit: Alexandria Sands*

Figure 9. Academy of Accelerated Learning, February 2023. Students birding indoors on a rainy day. *Photo Credit: Alexandria Sands*

Figure 10. Davila Elementary, March 2023. Students identifying birds from their playground equipment. *Photo Credit: Yvette Stewart.*

Figure 11. Frazier Elementary, February 2023. Students identifying an Orchard Oriole on a power line near the school park. *Photo Credit: Alexandria Sands*

Figure 12. Academy of Accelerated Learning, February 2023. Students identifying Northern Mockingbird along the school's park. *Photo Credit: Alexandria Sands*

Figure 13. Academy of Accelerated Learning, February 2023. Student identifying a flock of Great-tailed Grackles along a power line. *Photo Credit: Alexandria Sands*

Figure 14. Davila Elementary, March 2023. Alexandria Sands, Audubon Texas intern, teaching students about bird identification. *Photo Credit: Yvette Stewart.*

Appendix D. One Pager Resource

BIRD-FRIENDLY COMMUNITIES

Audubon Texas

Observe a Bird Afterschool

Continued Engagement Resource Page

Additional Activities

Elementary-age students are natural-born scientists; they're inquisitive, creative, and open-minded. We want to encourage both school leaders and parents to help keep their young scientists thriving and connected to the study of ornithology by sharing a variety of activities, websites and resources for further engagement.

FOR PARENTS AND STUDENTS

- Continue learning about bird ID and sounds by downloading free bird apps on phones or tablets: Audubon Bird ID and Merlin ID
- Continue observing birds by making and hanging bird feeders from recycled materials. Check out: The Homeschool Scientist for suggestions.
- Use eBird to record your sightings and gather data for scientists to use.
- Participate in Great Backyard Bird Counts or other community science programs like City Nature Challenge
- Connect with local Audubon chapters and centers, like Houston Audubon, for family and bird-friendly programming.
- Look for budget-friendly binoculars on Amazon or ask local parks if they have loaner programs.

FOR SCHOOL LEADERS

In addition to the parent resources, which can easily be used in a classroom setting too, there is a wealth of curricula that is ready to be deployed by classroom teachers or modified for afterschool activities. We encourage interested parties to check out the below websites for additional information.

- Cornell Lab of Ornithology developed the Bird Sleuth program and offers both paid-for curricula and plenty of downloadable, free activities.
- Project Flying Wild is an excellent resource guide and training available through TPWD and the Association of Fish and Wildlife
- Texas Wildlife Association has free education trunks on a variety of natural topics including birds. They can be rented for two weeks at a time and have lots of hands-on activities.
- Consider bringing in movement and listening skills when students have lots of energy. Teachers can practice Bird Yoga or Sound Mapping with students.
- North American Association of Environmental Educators hosts an annual conference with both virtual and in-person components to engage teachers with more outdoor activities

PREPARED IN COOPERATION WITH THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY AND U.S. ENVIRONMENTAL PROTECTION AGENCY

Audubon TEXAS

Figure 15. Audubon Texas leave behind one-page resource guide for schools participating in the "Observe a Bird" afterschool program.