



What birds are flying around your schoolyard?

PREPARED BY CAP-LTER EDUCATION TEAM

REFER TO *Chain Reaction 4: Urban Ecology*



Grade Level

5 and up

Time

Approx: 10 weeks

Essential Questions

What kinds of birds are in my school yard?

Do different parts of our school yard have different kinds of birds?

Description

The Ecology Explorers program (<http://caplter.asu.edu/explorers>) provides teachers with an opportunity to study concepts in population ecology relating to how plant and animal populations vary over time and space in their local school yard. This specific learning activity introduces students to the initial phases of naturalistic or field inquiry. This process includes learning scientific protocols used by scientists to study bird populations and then analyzing the data looking for patterns. Students should develop hypotheses relating to these patterns and design research projects to test their hypotheses. These student-generated studies may be the basis for long-term projects relating to bird populations in your local schoolyard.

Arizona Science Standards

1SC-E1. Identify a question, formulate a hypothesis, control and manipulate variables, devise experiments, predict outcomes, compare and analyze results, and defend conclusions

(Grades 4-5)

- PO 1. Distinguish between a question and a hypothesis
- PO 2. Describe the functions of variables in an investigation
- PO 3. Predict an outcome based on experimental data
- PO 4. Draw a conclusion based on a set of experimental data

1SC-E3. Organize and present data gathered from their own experiences, using appropriate mathematical analyses and graphical representations

(Grades 4-5)

- PO 1. Organize gathered data into an appropriate format
- PO 2. Construct a representation of data (e.g., bar graph, line graph, frequency table, Venn diagram)

1SC-E4. Identify and refine questions from previous investigations

(Grades 4-5)

- PO 1. Identify questions from previous investigations
- PO 2. Refine questions from previous investigations

4SC-E1. Construct classification systems based on the structure of organisms

(Grades 4-5)

- PO 1. Construct a simple classification system based on physical characteristics
- PO 2. Arrange several organisms into a classification system

4SC-E7. Explain and model the interaction and interdependence of living and non-living components within ecosystems, including the adaptation of plants and animals to their environment

(Grades 4-5)

- PO 1. Describe the components of an ecosystem
- PO 2. Describe how living and non-living components interact within an ecosystem
- PO 3. Describe how living and non-living components are interdependent within an ecosystem
- PO 4. Explain how plant species adapt to their environment

Materials:

- Meter Sticks
- String
- Location Markers
- Timer
- Binoculars (useful, but not necessary)
- Data Sheets
- Pencils

Learning Objectives

Students will be able to:

- identify and count local birds
- follow a scientific protocol
- characterize habitat structure
- enter their data into a spreadsheet/database
- analyze and graph the data
- formulate questions relating patterns in bird diversity and abundance in the urban environment
- design simple studies to answer their questions

Advance Preparation

- Read “The Good Life for Birds” in Chain Reaction 4: Urban Ecology and/or “Phoenix: A City for the Birds” in Chain Reaction 2: Sonoran Desert Creatures. Explorer the Ecology Explorers Website at <http://caplter.asu.edu/explorers>
- Check out the resources available at <http://caplter.asu.edu/explorers>. The House Finch, Starling, House Sparrow, Mourning Dove, Inca Dove, Pigeon (Rock Dove) and Great-tailed Grackle tend to be the most common birds in schoolyards.

- Background

The Sonoran Desert has one of the most diverse native plant and animal species of any desert in the world. Many birds are uniquely adapted to living here and they are part of food webs that include animals and plants that also are adapted to desert living. Phoenix is an ever-expanding urban area located in the Sonoran Desert. Scientists from the Central Arizona—Phoenix Long-Term Ecological Research (CAP LTER) project are studying the impact of this urbanization on bird communities. This project is administered by Arizona State University’s Center for Environmental Studies.

In the article “The Good Life for Birds”, scientists Ann Kinzig and Paige Warren studied the abundance (how many) and richness (what kind) of birds in 15 neighborhood parks. Their study was part of the larger bird project associated with CAP LTER project. The goals of the CAP LTER bird project are (1) to document the changes in avian richness and abundance over time and space, and (2) to determine the biotic/abiotic and socio-economic/political factors that cause these changes to occur. To accomplish these goals, the CAP LTER scientists are

conducting bird censuses in four key habitats in the CAP LTER study area. The point count surveys are conducted four times a year (January, April, July and October) to document the abundance and distribution of birds in four habitats in 51 sites: urban (18) desert (15) riparian (11) and agricultural (7). During each session each point is visited by three birders who count all birds seen or heard for 15 minutes. The CAP LTER scientists also use satellite images, high aerial photography, and vegetative ground surveys to study the effects of landscape structure on avian populations. They will also look at how zoning ordinances and city regulations in and around the point count influence bird abundance and richness.

Your school can be part of this CAP LTER project by conducting your own bird surveys within your schoolyard or backyard. The bird surveys done in schoolyards reflects the desire of the LTER Project to sample many urban habitats. Schools are located throughout differently landscaped neighborhoods in the Phoenix metropolitan area and consequently each school may find different bird communities in their location.

Procedure

Engagement: one or two class periods

Read "The Good Life for Birds" in Chain Reaction 4: Urban Ecology and/or "Phoenix: A City for the Birds" in Chain Reaction 2: Sonoran Desert Creatures. Explorer the Ecology Explorers Website at <http://caplter.asu.edu/explorers>

Exploration: six-eight weeks, perhaps longer

1. Learn to identify local birds (*two-three weeks*)
 - a. students must be able to identify birds prior to conducting surveys
2. Conduct Point Count Surveys
 - a. Select several point count site (one class period)
 - b. Describe the habitat in the point count sites (one to two class periods)
 - c. Conduct a point count (10 minutes) *two times per week for four weeks*

How to conduct the bird protocol

1. Decide on a location or several locations in your schoolyard to conduct the point count survey. Assign a number to each location. Position the sampling points in different areas, such as in the middle of a lawn, near trees and bushes, near asphalt, near the edge of the property, etc. If one of the areas you select to do a point count is a large grassy area, then you should randomly select the point count site within that area. The easiest way to do this is to face away from the grassy area and then toss a coin/rock over your back. The center of the point count will be where the coin/rock landed in the grassy area.
2. Mark out a circle with a 20-meter radius at each of the points you intend to survey. Make sure there are no large obstructions within the circle. For example, if a block wall were near the center of the circle you might not be able to see over it to count birds on the other side. You could position the circle so the block wall was near the perimeter of the circle. If you just don't have enough space for a 20-meter radius circle, then you need to note the size of the study area on the data sheet.
3. Complete a habitat description (see below for procedure to describe habitat structure) for each of your point count locations. Record your findings on the habitat description data sheet. **YOU ONLY NEED TO DO THIS ONCE PER COUNT SITE.**

Describing Habitat Structure

The following technique can be used to estimate the land cover in your 20m radius circular study area:

1. Take two pieces of string and divide the plot into four equal sections, so the strings cross in the middle.
2. Mark the string every four meters. Start marking the first string at meter zero, and the second string at meter one.
3. At each point place a meter stick. In the first column of the data table, record the type of cover beneath your feet and less than 0.15m. Also, in the appropriate column, record the vegetation that is between 0.15m to 1.5m tall and that which is taller than 1.5m. Only write down the type of land cover that is at that point and touching your meter stick. The land cover type can be "building" or "cement" as well as plants.
4. For each type of ground cover, add the number of times it was recorded, divide by the total number of points and multiply by 100. For example if you recorded "shrubs" at five of the points and there were 20 points, then shrubs would be 25% of the land cover (5/20 times 100).

4. Decide on a time of day to do the survey and always do it at the same time of day. The best time of day is in the early morning (before 9:30 am), but if several classes are doing it throughout the day they can see how time of day affects the census.
5. Census the point twice per week for at least four consecutive weeks.
6. Have only **one** person stands in the middle of the circle and counts all the birds within the survey area for **10** minutes. Other students can help by keeping time and recording the counts on the data sheet.
8. Use the data sheet to record the number of individuals from each species that you have seen. Count each bird only once.
9. Compile the bird count data collected over several weeks into a spreadsheet.
10. Analyze and graph the data. Look for patterns in the data. Do the number of bird species or the total number of birds vary depending on the location of the point count? Or the time of day? Or has it changed over the time you have been collecting data?
11. Formulate questions relating to bird diversity and/or abundance around your schoolyard. Develop tentative explanations (hypotheses) for the patterns you observed.
12. Design simple studies to answer your questions and/or test your hypotheses.

Explanation: *one to two class periods*

Create a database of the data collected over the sampling period and create appropriate graphs. Look for patterns in the data.

Elaboration: *one class period*

Develop questions or hypotheses relating to patterns found in the data.

Evaluation: *one class period or longer*

Design research projects that answer the questions or hypotheses. These can be long-term research projects if time is available.

**If you would like to enter your students' data into the CAP LTER database, your school must be in the Phoenix metropolitan area and you must contact the Ecology Explorers education team at ecology.explorers@asu.edu*

Formative Assessment

Students exhibit the following:

- Are able to recognize and name local birds from photographs or drawings. (4SC-E1)
- Are able to conduct a scientific protocol and complete a data sheet (1SC-E3)
- Are able to complete a habitat structure data sheet (4SC-E7)
- Are able to compile data collected over several weeks into a spreadsheet (1SC - E3)
- Are able to produce a graph of some aspect of the data (1SC - E3)
- Are able to develop a simple questions/hypotheses relating to patterns in bird diversity and/or abundance (1SC-E4)
- Are able to design a simple study to answer question/test hypotheses (1SC-E1)

Extension/Modification

Teachers may continue to conduct year-long or year-to-year studies of bird populations in their schoolyard. This introduction to conducting bird population studies in the schoolyard could be incorporated into a larger unit on ecology and ecosystems.

Safety Precautions

Sunscreen

Adult supervision while in the schoolyard

Resources

Additional resources at <http://caplter.asu.edu/explorers/resources/resources.htm>

Data Table For Describing Land Cover in your Point Count Circle

Point	0-0.15m				0.15-1.5m	>1.5m
	LAWN	GRAVEL OR SOIL	PAVEMENT OR BUILDING	OTHER VEGETATION	SHRUBS	TREE CANOPY
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

Totals

$$\text{Lawn } \frac{\boxed{}}{20} = \boxed{} \%$$

$$\text{Gravel/Soil } \frac{\boxed{}}{20} = \boxed{} \%$$

$$\text{Shrubs } \frac{\boxed{}}{20} = \boxed{} \%$$

$$\text{Other Vegetation } \frac{\boxed{}}{20} = \boxed{} \%$$

$$\text{Tree Canopy } \frac{\boxed{}}{20} = \boxed{} \%$$

Habitat Description

You should keep a description of the habitat structure at each point count location. This description includes the amount and type of vegetation (or non-vegetation) at different heights in your point count area. This description will provide an additional piece of data to use when analyzing your bird survey results.

School

Street Address

Site ID

Site Name

Site Location (i.e. SW corner of school)

Habitat Description within Point Count (0 - 0.15 m, 0.15 - 1.5 m , > 1.5 m)

0 - 0.15 m

% gravel or soil

% lawn

% other vegetation

% pavement or building

0.15 - 1.5 m

% shrubs or other vegetation

> 1.5 m

% tree canopy

