CONSERVANCY of Southwest Florida
OUR WATER, LAND, WILDLIFE, FUTURE.

Protecting Southwest Florida's unique natural environment and quality of life ... now and forever.

Predators of the Sky
Pre and Post-Program Activities

Grade Level: 9-12

Next Generation Sunshine State Standards

- SC.912.L.17.9; SC.912.L.15.13; SC.912.L.17.1; SC.912.L.1.5; SC.912.L.17.8

Program Overview

From tiny screech owls to majestic bald eagles, Southwest Florida is a vital habitat for many bird species- including raptors! Explore unique adaptations of birds of prey and discover the importance of each species in the ecosystem. Discuss human introduced threats and how students can help to make a difference to protect birds and their habitats.

Learning Objectives Students will be able to:

1. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.
2. Describe the conditions required for natural selection.
3. Identify the characteristics of populations, such as species abundance, density, and distribution.
4. Recognize the consequences of the losses of biodiversity due to human activity and the introduction of invasive, non-native species.

Pre-Program Activity 1: Population Dynamics

Duration of Activity: ~1 hour

Adapted from Project WILD

Materials: provided dataset, graphing paper or online graphing system

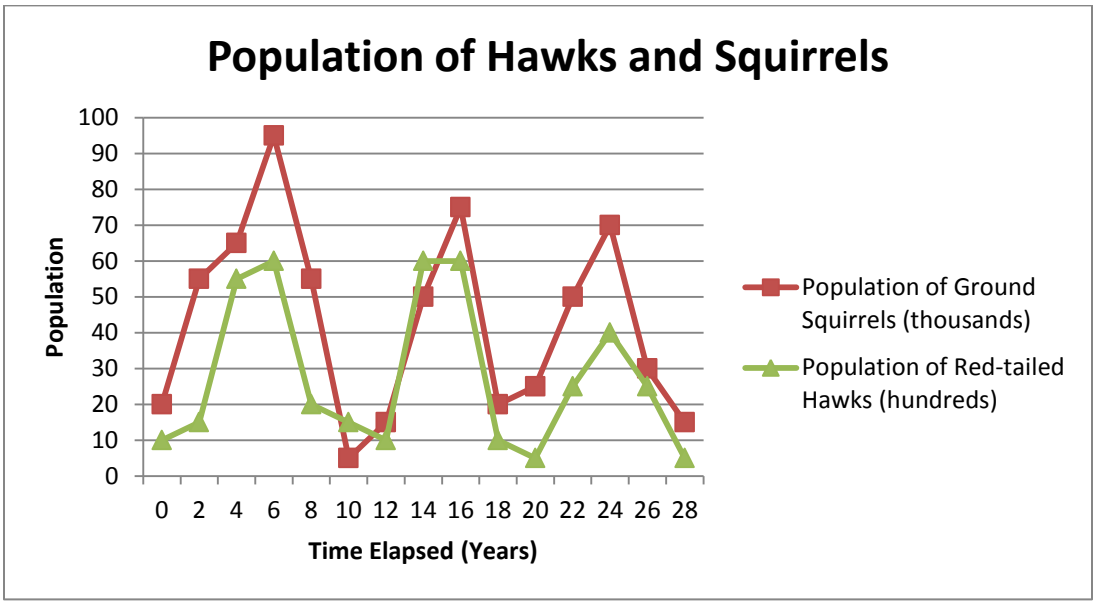
Background: Southwest Florida holds a large concentration of Red-tailed Hawks. These birds prey on a variety of species including small mammals, birds and reptiles. One of their main prey items is the ground squirrel. Each year the populations of these two species fluctuate.

Directions:

1. Using the provided dataset on hawk and ground squirrel populations, have students plot the data in a single graph. Instruct them to connect the lines to show trends. Graphs should resemble the one depicted on next page.
   Squirrel & Hawk Population Dataset:

Time elapsed years	Population of Ground Squirrels (thousands)	Population of Red-tailed Hawks (hundreds)
0	20	10
2	55	15
4	65	55
6	95	60
8	55	20
10	5	15
12	15	10
14	50	60
16	75	60
18	20	10
20	25	5
22	50	25
24	70	40
26	30	25
28	15	5

Example Graph:



2. Once graphs have been made, have the students answer the following questions:
    - What do you observe happening?
    - What factors contribute to the higher number of squirrels in the population? To the hawks?
    - What factors limit the number of squirrels in the population? Limiting factors for the hawks?
    - What trends do you notice?
    - How do you think the squirrel population is being affected by the hawk population?
    - How do these populations seem to be related?

3. Ask students to offer hypotheses. Have an open discussion of interdependent species in ecological systems. Which species was dependent on which in this example? Have students suggest other examples of interdependence. Are there ecosystems that are not made of interdependent parts? Generalize that all ecosystems are part of an interdependent system and that wildlife populations are in long-term, dynamic equilibrium with one another. Have students discuss external factors that can affect wildlife populations.

Source: "Project WILD K-12 Curriculum & Activity Guide", Council for Environmental Education 2011 edition, pg. 111-113

Pre-Program Activity 2: Migration

Duration of Activity: ~1 hour

Adapted from National Wildlife Federation

Materials:

- Notebook
- Pencils
- Computer

Background: Many migrating raptors follow distinct routes during autumn and spring migrations. Topography and water barriers largely define these routes, which vary among species and are influenced by human, ecological and meteorological factors. The paths that migrants follow and the geographic patterns they demonstrate vary among species and populations. There are many ecological implications of migration. The sequence of migratory movement is closely integrated with the annual cycle of ecosystems that are characterized by productivity fluctuations. The food resources of some regions could not be adequately exploited without bird populations moving. Migratory behavior occurs in species located at specific trophic levels where maximum fluctuation in food production occurs in both breeding and wintering regions. Many migrant birds avoid primary equatorial forests where productivity is usually constant throughout the year and food surpluses do not occur. They do, however, congregate in areas where productivity varies with the seasons

Directions:

1. Assign or have students choose a migratory bird of prey species from the U.S. Fish & Wildlife Service Migratory Bird Treaty Act Protected Species List, https://www.fws.gov/birds/management/managed-species/migratory-bird-treaty-act-protected-species.php.
2. Students will use the Cornell Lab of Ornithology website, http://www.allaboutbirds.org/guide/search.aspx, to discover more about the migratory bird they were given or chose. Questions and answers should be recorded in a science notebook.
3. Have each student sketch their bird utilizing best practices for a scientific drawing, such as at http://www.biolympiads.com/2014/08/scientific-drawings.html (can be generalized for all scientific sketches in high school) and answer the following questions about their bird:

    1) What does the bird of prey species eat? Using your judgement, what features/adaptations allow it to capture and eat its prey?
    2) What are its habitat requirements for food, water, and shelter?
    3) What are its habitat requirements for raising young?
    4) How far does it migrate?
    5) Predict challenges it faces during migration. Possible answers include: predation by native or invasive species, hunting practices, human-made structures, weather, and food availability. Ask students to visualize what challenges they would face if they had to migrate to find warmer weather, food, shelter, or water.

4. Now compare the distances of different species migration routes. Ask students to gather distances from four other groups. Create a chart and or bar graph in the science notebook that denotes the migratory bird species and the distance flown during its migration. Be sure students are including all applicable labels on the graph or chart. An optional or additional task would be to create the migration distance to scale outside, using string and tape measures or meter sticks. For example, one foot on the schoolyard could equal 200 miles. Students could then sketch what they observe and write answers to these questions:

    1) Which species has the longest migration? The shortest?
    2) Why do you think birds would travel on these long journeys?
    3) What makes the journey worthwhile for them? Why not just stay?
    4) Many migratory species are protected to increase their chance of survival. Think about the food chain. If an animal were to become extinct, how would this affect the surrounding environment?

Post-Program Activity 1: Bird ID

Duration of Activity: 45 minutes

Adapted from Flying WILD online source

Materials:

- Bird field guide (provided)- laminate, if possible
- Notebooks

Directions:

1. Bring students to a natural area where birds are likely to reside. The area around your school will likely be sufficient.
2. Separate students into groups with ~5 per group. Bring a couple of copies of the provided field guide for each group (if teacher has a personal bird field guide, this will work as well).
3. Walk around the area looking and listening for birds, remembering to keep voices down. Have students identify the birds using their guide based on visible characteristics, habitat, bird call, and other external knowledge.
4. Have students keep track of the birds identified in a notebook. If bird cannot be identified with guides, try to take a picture of the bird or make a recording of its call and have students identify the species later on!

After exploring the area for a while, have students gather and answer the following questions:

1. What types of information did you use to help identify the birds observed?
   Possible answers: size, shape, color, pattern, leg color, unique markings, beak shape, beak size, tail shape, song
2. In addition to these clues, what are some other examples of clues that could be helpful in identification?
   Possible answers: habitat (land, shore, water), location in canopy, time of day, season (time of year)
3. Of the birds identified, which are migratory and which are year-round residents?

If migratory birds are identified:

4. What time of year are you more likely to see migratory birds? Why?

Source: http://www.flyingwild.org/guide/TheBirdingBeat.pdf

(See Bird ID Guide Below)

 Brown Pelican	 Great Blue Heron	 Tricolored Heron	 Little Blue Heron
 Frigate Bird	 Green Heron	 Yellow Crowned Night Heron	 Great Egret
 Snowy Egret	 Cattle Egret	 White Ibis	 Roseate Spoonbill
 Red Tailed Hawk	 Red-Shouldered Hawk	 American Kestrel	 Great Horned Owl

Screech Owl

Burrowing Owl

Barn Owl

Barred Owl

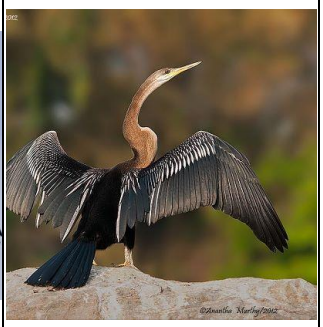
Turkey Vulture

Black Vulture

Bald Eagle

Osprey

Swallow-Tailed Kite



Anhinga

Northern Mockingbird

Red-Winged Blackbird

Common Grackle

Red-Bellied Woodpecker

Blue Jay

Northern Cardinal

Post-Program Activity 2: Survival of the Fittest

Duration of Activity: ~1 hour

Adapted from Learning Bird

Materials:

2) 5 Plastic knives, 5 spoons, 5 forks
3) Tape
4) Paper cups one for each student
5) 100 dried beans (example kidney, lima, red beans, etc.)
6) Grassy field outside
7) Graph paper
8) 5 colored pencils

Background: All birds live in a particular environment and environments can be very diverse! Each has many specific characteristics, like the kind of food available, how much water there is, what kinds of plants it has, etc. These characteristics act as a kind of pressure on the birds that live there, and the birds that have more adequate traits survive the longest and breed the most. Over time, these selective pressures help the birds become more adapted to their environment. Most raptors have adapted the same technique for catching prey. They have sharp, hooked beaks that they use to catch prey, pull off fur, tug away skin, pluck out feathers, and tear meat into bite-sized, easy-to-swallow chunks.

Directions:

1. Review with students the concepts of evolution, natural selection, and adaptations.
2. Have students participate in the following activity to simulate natural selection of birds and beak adaptations for obtaining food. This activity will mimic how the variations of Darwin's finches compete for food source.
3. Arrange students into five groups of roughly equal size. Give each student a cup for collecting their "food", which is represented by the beans.
4. Assign each group a beak adaptation represented by the following (fork, spoon, knife, taped thumb, and hand). The purpose of taping the thumb down is to remove the use of the opposable thumb. Give each student group member the tool assigned to that beak adaptation.
5. Spread out the 100 beans equally on a grassy area outside by throwing them randomly in the air in a 20 x 10 foot area in the grass to represent the "food" the "bird beaks" will collect.
6. Have students pick up as many beans as they can using only their assigned beak adaptation and put the beans in their cups for 2-4 minutes.
7. The students should then count and record the total of beans collected for their group using the data table below.
8. The students should then calculate how many of each "seed" were eaten and then

subtract that number from 100 to calculate the number of beans left in the grass.

9. Assume that all the beans in the grass reproduce and have one offspring. Distribute an additional number of beans, equal to the number left in the grass.
10. For the 2nd through 4th generations, double the remaining seeds left in the grass each time. For each generation, the lowest bean amount adaptation becomes extinct and no longer participates in the activity.
11. The activity ends when there is one type of adaptation left and the rest have become extinct. This will demonstrate to students which adaptation was best suited for the environment.
12. Have students compile the class data on the data table (next page). Have students create a line graph with the generations on the *x*-axis and the total number of beans on the *y*-axis using a legend and colored pencils to graph all of the five-beaked adaptations.

Have students work in groups of 2–3 to develop a written explanation of how this lab provides evidence for natural selection and adaptation. Engage students in discussing and critiquing each explanation.

Students should answer the following questions to check for their understanding of the lab activity:

1. Identify the independent variable, dependent variable, and constants in the activity.
2. Which bird beak adaptation became extinct first? Explain why it was not the adapted for survival.
3. Which bird was best adapted for survival?

Student Data Table:

	Knife	Spoon	Fork	Taped Hand	Hand	Total beans
1st generation						100 - ____ (# beans "eaten") = _____
2nd generation						____- previous survivors = _____
3rd generation						____- previous survivors =_____
4th generation						____- previous survivors =_____