



### Grade Level

Fourth Grade

### Setting

Bear River Migratory Bird Refuge

### Time Involved

30 minutes

### Key Vocabulary

Adaptation, Natural Selection, Adaptive Radiation

### Utah 4<sup>th</sup> Grade

### Science Connections

Standard 5

# Wetland Wonders

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## Avian Adaptations

### Summary

This is an activity designed to provide students with a hands-on activity to help them explore animal adaptations, namely the shape of a bird's beak in relation to their food source.

### Objectives

- Gain in understanding of diversity and adaptations of organisms through an exploration of bird beaks

### Materials

- **Beaks:** 2 eyedroppers, 1 pliers, 5 sets of chopsticks, 4 tweezers, 1 shoestring, 1 sponge strip, 1 straw, 1 wrench, 2 slotted spoons, 1 strainer, 3 tongs, 1 envelope, 1 turkey skewer;
- **Food:** colored water in a long narrow container, gummy worms, sunflower seeds, puff cereal, popped popcorn, rice, marshmallows, loose tea; and
- **Other:** 6 foot table, dry erase board, bird photos, potting soil, shallow pans, 8 boxes, data tables for each student, 8 cups, vase or graduated cylinder, pictures of various birds with corresponding environment/habitat and food source

### Background

*Scientific Explanation:* What are animal adaptations? Animal adaptations are any body shape, process, or behavior that allows an organism to survive in its environment. Animals change over time to fit the needs of their environment. Why do birds have different shaped beaks? Birds have many different kinds of beaks, depending on what they eat and where their food source is. For instance, birds may find their food in water, mud, flowers, seeds, or in wood. A hummingbird has a long, thin bill that allows it to sip the nectar from inside flowers. The different shapes of beaks allow easier access to these various food supplies. If an environment was altered, organisms within the area would need to change or *adapt* in order to survive.

*Natural selection* is the process by which organisms best suited to the environment survive and reproduce, thereby passing their genes to the next generation. *Adaptive radiation* is the change of a population over time. For example: Bird populations shift with rainfall, whereby selection for bills with physical characteristics to be able to crack larger harder seeds occurs. As a result of adaptive radiation, we have 300 billion birds of 10,000 species on the planet. Birds are 155 million years old. *Extinction* is the end of a genetic line where a complete loss of a species is seen. For example: The Dodo is the classic case of extinction of a vulnerable bird species by human beings in the 16<sup>th</sup> century. Once living on a remote tropical island in the Indian Ocean, the Dodo was a large, flightless, turkey-sized pigeon that ate fruit and grew fat. The Dodo (name indicates stupidity) was easily captured by sailors as a convenient source of food. The Dodo did NOT adapt flight capability or did NOT learn to fear humans quickly enough to survive in their changing environment.

## Set Up

1. Have supplies close at hand.
2. Have the white board and marker where all the students can see.

## Warm Up –Focus Phase

1. Explain to the students that - (Be sure to use the Dodo example information in the Background section.) Adaptation basically means organisms changes in order to better live in their environment. Examples of adaptation can be physical or behavioral. (In the case of the Dodo bird, adaptation to the rapidly changing environment required both physical (developing larger pectoral muscles for flight) and behavioral (learning fear of humans).
2. Ask students these questions:
  - a. Besides the example of the Dodo bird, can you think of any examples of other behavioral adaptations in birds? (migration, colonialism, territoriality, etc.)
  - b. Can any of you think of examples of a bird's physical characteristics that helps them to survive? (Make a list on the dry board.).
  - c. What do birds need to survive? What kinds of food do they think birds eat? (Insects, seeds, berries, and meat are among the most common.).
3. Examine an avian skull. Identify the brain case, upper/lower mandibles, and scleral ossicles. Show an example of an adaptive bill to food source.
4. Explain - According to the theory of “survival of the fittest”, the individuals with the best combinations of inherited traits were the most likely to survive and reproduce. Natural selection means that over time, populations of these animals are more numerous than populations without special adaptations. Adaptations are what make a heron better at catching fish than a woodpecker. Living organisms are often adapted in several different ways to the environment in which they live and can accommodate to a range of environmental conditions. The finch's beak has repeatedly adapted to changing environments. The owl has a disc shaped face that allows them to have incredible hearing for hunting. The Clark's Nutcracker has a beak that is exactly long enough to plant white bark pine seeds when the

bird is storing food for later in the ground. The crossbill has a beak that allows it to open strong pinecones.

### **Activity** - Challenge Phase:

#### **1.** In front of the class, arrange:

1. A tall, thin vase filled with colored water.
2. A dish of oatmeal with gummy worms buried throughout.
3. Sunflower seeds spread throughout a pan.
4. A dish of water with puff cereal floating in shallow water.
5. A dish of water with loose-leaf tea or herbs.
6. Popped popcorn
7. Rice grains tucked into the bark of a log
8. Marshmallows skewered on wooden kabob holders

**2.** Tell students that each of these items represents a type of food eaten by various birds. Ask students if they can hypothesize what each bird would have to do in order to reach their food supply. Does the shape of a bird's beak limit their food supply?

Note:

1. Nectar (colored water) will need to be sucked out. (Hummingbird)
2. Worms (gummy worms) need to be dug and pulled out.
3. Seeds (sunflower seeds) need to be cracked open. (Sparrows, Finches)
4. Fish (rice) will probably need to be scooped out of the water. (Heron)
5. Fine bits of vegetation (tea or herbs) will need to be carefully scooped out of water. (Waterfowl-Ducks, Geese, Swans)
6. Flying insects (popcorn) need to be caught in wide openings. (Swallows)
7. Small insects (rice) will need to be picked and pried out of small crevices. (Woodpeckers)
8. Meat (marshmallows) will need to be pulled off of bones. (Owls, Hawks)

**3.** Divide students into 3 groups (there will be eight different group challenges). Assign students their "challenges" and equipment for each group. (Each group gets a different food source and a set of three different utensils, which they are to use as sample "beaks.") After reading their card, ask students to identify which "beak" they predict will work best for "eating" their specific "food". Groups will be given 5 minutes to explore the ease of getting "food" with their utensils. (Have students see their challenge cards).

*Application Phase:*

*Challenge #1* You have been given a graduated cylinder as a food source. You have also been given sample beaks: 1) a shoestring, 2) a medicine dropper, and 3) a sponge strip. Your challenge is to find out how which "beak" it takes to most easily get 5 mL of water from the graduated cylinder to the cup.

*Challenge #2* You have been given gummy worms as your food source. You have also been given sample beaks: 1) eye dropper, 2) chopsticks, and 3) a wrench. Your challenge is to find out which beak it takes to remove the gummy worms from the oatmeal.

*Challenge #3* You have been given sunflower seeds as your food source. You have also been given sample beaks: 1) pliers, 2) chopsticks, and 3) tweezers. Your challenge is to find out which beak it takes to crack the shell and remove the seed inside.

*Challenge #4* You have been given floating cereal as your food source. You have also been given sample beaks: 1) chopsticks, 2) tweezers, and 3) a slotted spoon. Your challenge is to find out how which "beak" it takes to remove all of the rice puffs from the water.

*Challenge #5* You have been given tea as your food source. You have also been provided sample beaks: 1) a slotted spoon, 2) a strainer, and 3) tweezers. Your challenge is to find out which beak it takes to get all of the tea from the water.

*Challenge #6* You have been given popped popcorn as your food source. You have also been provided sample beaks: 1) tongs, 2) an envelope, and 3) chopsticks. A group member will gently toss some kernels into the air. Your challenge is to find out which "beak" captures 5 kernels most easily. The kernels must be caught while they are in the air.

*Challenge #7* You have been given rice as your food source. You have also been provided sample beaks: 1) a medicine dropper, 2) tongs, and 3) tweezers. Your challenge is to find out which "beak" removes 15 grains of rice from the bark of a tree most easily.

*Challenge #8* You have been given skewered marshmallows as your food source. You have also been provided sample beaks: 1) chopsticks, 2) tongs, and 3) a turkey skewer. Your challenge is to find which "beak" removes five marshmallows from the skewers most easily. Try this several times.

## Wrap Up

1. Have students support or clarify which "beak" matched with a given food supply. Look around the wetland environment and predict which bills are best suited to obtaining food (i.e., wet soils, open water, grassland, emergent vegetation leaves, insects) and identify the birds that might consume those foods (i.e., white-faced ibis, mallard duck, long-billed curlew, Canada geese, swallows). Which birds are more specialized with their adaptive bills? Which are generalists?
2. As a final question, ask students to relate what might happen to a bird population if its natural environment experienced a natural disaster where all the flora or fauna were wiped out. What would happen if a farmer used an insecticide that killed off all the insects? What would happen to woodpeckers or other birds that eat small bugs? What would happen if the old trees and snags were cut down? Where would osprey and eagles watch for their meal?

## Literature Resources

- Birding Field Guides (Birds of North America, Sibley, ...) – you may check these out from the education center at Bear River MBR.

## Classroom Extensions

1. Record on a piece of paper or their journal what they have learned.
2. Collect pictures of different birds and help students identify which foods they would likely eat by looking at their beaks.

## Classroom Assessment

1. Give a quiz with beaks on one side and the food/adaptations on the other. (matching)

# Beaks and Bills

## Trunk Inventory

### Beaks:

5 sifters/strainers

Chopsticks

5 black slotted spoons

5 pairs of tongs

3 pliers/wrenches

9 tweezers

4 eye droppers/pipettes

2 clear salad tongs

### Food sources:

1 large log (drift wood)

Rice

Bamboo skewers (turkey skewers)

Marshmallows

1 bin of oats and gummy worms

Rice puff cereal

3 plastic bottles

Sunflower seeds

Tea bags

Popcorn

### Misc:

8 challenge cards

12 bird photos

Plastic cups

Quaker oatmeal

6 plastic bins

2 lids

2 clothes pins