

## Bird Adaptations

**Objective(s):** Students will (1) define the term adaptation, (2) identify adaptations that are unique to birds, and (3) describe how particular adaptations help birds survive in different environments.

### Overview

Students will describe how birds are uniquely adapted to their environment.

### Georgia Standard(s) of Excellence (GSE)

SKL2; S1L1; S2L1; S2E3; S3L2; S4L1; S5L1; S5L2; S7L1; S7L2; S7L4; S7L5; SB1; SB5;

### Essential Terms

Adaptation  
Bill  
Generalist  
Gizzard  
Specialist

### Materials

- LAB: Bird Adaptations Student Guide
- LAB: What's on the Menu?
- LAB: Know the Toes
- LAB: Build-a-Bird Cards

### Additional Resources

Check out these Cornell Lab of Ornithology websites:

- K-12 Education
- All About Bird Anatomy
- All About Feathers
- Wall of Birds
- Bird Cams

## Background

In a world of enormous biodiversity, birds provide the perfect example of **adaptation** to the environment. More than any other group of animals, they have adapted to every imaginable ecosystem around the world. Like amphibians, fish, mammals, and reptiles, birds are vertebrates, or animals with a spine (backbone). As a taxonomic class, Aves, birds have unique physical and behavioral traits that distinguish them from other vertebrates. This unit focuses on three physical features that distinguish birds from other wildlife: feathers, **bills**, and highly specialized feet. Other distinguishing features include hollow bones, wings, a **gizzard**, acute eyesight and hearing, oviparity (egg-laying), and a syrinx (the vocal organ in birds' throats).

## Adaptations at Work

Birds must be able to find food, escape predators, and withstand extreme weather. To survive, birds have several unique traits, or **adaptations**, both **physical adaptations** (such as wings), and **behavioral adaptations** (such as cavity nesting).

### Feathers

The one feature that distinguishes birds from all other animals is feathers. They fall into different categories based on their structure and location on the bird's body. In addition to facilitating flight, feathers provide insulation and may play a role in camouflage or breeding displays. Collectively, a bird's feathers are referred to as **plumage**. Plumage sometimes changes colors during different seasons (breeding vs. nonbreeding), and males often have different plumage than females (sexual dimorphism).



Contour feather



Down feather



Flight feather

In addition to these main types of feathers, birds have downy semiplumes, as well as filoplumes and bristles (like whiskers and eyelashes).

### Bills

Birds' bills are as diverse as birds themselves. The size and shape can tell you about a species' taxonomy, diet, and behavior. The beak, which covers the bill, is composed of keratin, the same protein found in fingernails, hair, antlers, and hooves.

### Feet

The feet and toes enable birds to expertly maneuver within their environments. Long, flexible toes are useful for perching and creeping up and down tree trunks; stilt-like legs and webbed toes can wade through mucky marshes; and talons with sharp claws grip small prey with ease.



*What do a heron's bill and feet tell you about its habitat and diet?*

Great Blue Heron

Many adaptations work together to allow birds to fly. In addition to feathers and wings, some key traits that facilitate flight are:

- Fused, hollow bones make the body of a bird very lightweight. Many of these bones have struts, or thin pieces of bone, inside to help support them.
- The keel is a flattened ridge of bone on the sternum that provides a place for flight muscles to attach.
- Lack of teeth, speedy digestion, and egg-laying keep birds from carrying added weight.



Although the terms "beak" and "bill" are commonly used interchangeably, "beak" technically refers to the keratin coating that covers the bony skeletal structure that is the bill.

## Preparing for Flight

Before reviewing the student guide with the class, ask students the following questions to prompt discussion and gauge prior knowledge:

- What are the three key characteristics that set birds apart from other animals?
- What adaptations, physical or behavioral, allow birds to fly?
- What can we learn by studying birds' feet and bills?

## Activity 1: Adaptation Match

**Students will examine the relationship between birds' physical features and their diets and habitats.**

Distribute *LAB: What's on the Menu?* and *LAB: Know the Toes* and review instructions together.

1. Have students complete the handouts. These activities will give them an idea of how bills and feet are adapted to help birds obtain food and survive in their habitats. Reiterate that although birds have preferred diets, species will eat other food items based on environmental conditions (drought, seasonal changes, etc.).
2. Ask students questions to challenge their critical thinking. For example, how do bill shape and diet influence bird behavior? Ask them to describe how different species feed or hunt.
3. Based on the pictures, have students guess each species or what types of bird may possess the pictured features.

## Activity 2: Build-a-Bird

**Students will create a new species of bird they piece together with randomly drawn cards.**

To prepare for this activity, copy and cut out the *LAB: Build-a-Bird Cards*, which includes sets of six different bills, feet, and wings. Place each set of cards in a separate container.

1. Explain to students that they will "build a bird" based on the cards they draw. Their birds will be randomly generated—students will pick one card from each bin and design their species based on the physical features they select.
2. Each student should have three cards in total. Explain that students should also decide what type of food and habitat their bird prefers. (Some habitats include forest, open water or ocean, shoreline, swamp, grasslands/open fields, and city/urban environments. This can also be narrowed to specific eco-regions.) They should also decide how their bird moves and raises its young.
3. Distribute paper and drawing materials. Give students enough time to name and draw their birds and sketch a habitat. Remind students that their bird must be adapted to survive in its environment; therefore, its features should reflect its diet and behaviors. (Their habitat must match at least one of their adaptations, and some birds may be able to survive in more than one habitat depending on what they have chosen.)
4. Once complete, have each student describe their species to the class. A collage of unique bird species can be displayed.

**Extension Ideas:** Have student create a 3-D model of their bird using craft supplies (straws, sponges, cardboard, feathers, etc.) or write a narrative about their bird, describing its habitat and key behaviors (foraging, roosting, breeding, nesting, etc.).

**Type:** Conical (cone-shaped)  
**Adaptation:** Wide, pointed bill for cracking open nuts and seeds



Bill  
(Example: Northern Cardinal)

**Type:** Large scoop bill  
**Adaptation:** Large pocket-like bill for scooping fish



Bill  
(Example: Brown Pelican)

**Type:** Straw-like, with a long tongue  
**Adaptation:** Thin, pointed bill for reaching into flowers



Bill  
(Example: Ruby-throated hummingbird)

**Type:** Hooked, sharp bill  
**Adaptation:** Sharp, curved bill for ripping and tearing



Bill  
(Example: Osprey)

**Type:** Long bill, sometimes curved  
**Adaptation:** Long and/or pointed for probing into sand, mud, and soil to catch worms, snails, and other prey



Bill  
(Example: Curlew)

**Type:** Chisel bill  
**Adaptation:** strong, triangular, and pointed bill for drilling holes



Bill  
(Example: Red-headed woodpecker)

**Type:** Wide bill; works like a strainer  
**Adaptation:** Rounded bill lined with ridges for straining insects and plants in water



Bill  
(Example: Mallard Duck)

**Type:** Passive, soaring wings  
**Adaptation:** Long, broad wings for soaring high for long periods of time, soaring on heat thermals (vertical columns of hot air)



Wings  
(Example: vultures)

**Type:** Active, soaring wings  
**Adaptation:** Long, narrow wings for soaring for long periods of time



Wings  
(Example: albatrosses)

**Type:** Elliptical wings  
**Adaptation:** For short bursts of speed, quick takeoff, tight, acrobatic movements in flight



Wings  
(Example: sparrows)

**Type:** Hovering wings  
**Adaptation:** Small wings with specialized nerves and muscles for quick, sustained movements



Wings  
(Example: Ruby-throated hummingbird)

**Type:** High-speed wings  
**Adaptation:** Long and thin, shorter than active, soaring wings. Can maintain speed.



Wings  
(Example: Chimney Swifts)



Build a Bird Card



Build a Bird Card



Build a Bird Card



Build a Bird Card



Build a Bird Card



Build a Bird Card



Build a Bird Card



Build a Bird Card



Build a Bird Card



Build a Bird Card



Build a Bird Card



Build a Bird Card



**Type:** Paddle-like with webbed toes  
**Adaptation:** For swimming, paddling, walking and diving through water



Feet/Toes  
(Example: cormorants)

**Type:** Tall legs, long and spread  
**Adaptation:** For walking in soft, wet habitats like lakes and marshes



Feet/Toes  
(Example: Great Blue Heron)

**Type:** Zygodactyl (two toes in front, two in back)  
**Adaptation:** Strong grip for climbing up, down, and around tree trunks



Feet/Toes  
(Example: Eastern Screech Owl)

**Type:** Sharp talons, strong grip  
**Adaptation:** For capturing, carrying, and holding prey



Feet/Toes  
(Example: Red-Shouldered Hawk)

**Type:** Long, independent, flexible toes  
**Adaptation:** Interlocking muscles that help toes grasp and perch on branches



Feet/Toes  
(Example: Carolina Wren)

**Type:** Sharp claws, thick toe pads  
**Adaptation:** Thick feet and toe pads for scratching, running, and kicking



Feet/Toes  
(Example: Chickens)

**Type:** Wide bill, works like a strainer  
**Adaptation:** Rounded bill lined with ridges for straining insects and plants in water



Bill  
(Example: Mallard Duck)

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