

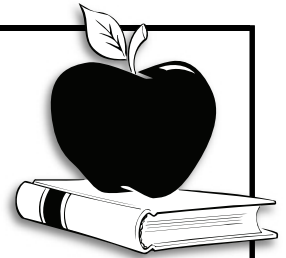
SUGGESTED GRADE LEVEL: 4

NEXT GENERATION SCIENCE STANDARDS: 4-LS1-1

SKILLS/PROCESSES: observation, classification

OBJECTIVE: Students will be able to identify the three characteristics by which birds are defined.

TEACHER'S GUIDE



UNIT 1 ■ LESSON 1

What Makes a Bird a Bird?

BACKGROUND

There are more than 9,000 species of birds in the world, with about 800 found in North America. More than 400 species have been recorded in Illinois, and more than 200 bird species have been recorded as nesting in the state.

Birds evolved from small reptiles more than 160 million years ago. They still share some characteristics with reptiles, such as laying eggs and having scales on their legs and feet. Development of the ability to fly required not only feathers and wings but good eyesight, a sense of balance and fine muscle coordination.

Like mammals, birds are **warm-blooded** vertebrates, meaning their internal body temperature is maintained at a constant level regardless of external conditions. This characteristic allows birds to maintain high levels of energy and a **metabolic rate** necessary for flight. By comparison, reptiles and amphibians are cold-blooded, meaning they rely on the temperature of the air and/or water to regulate their body temperature.

Birds have three characteristics that distinguish them from other animals: feathers; hard-shelled eggs; and hollow bones.

FEATHERS: Feathers are an adaptation of reptilian scales. They range in size from 0.05 inch on a bird eyelid to the tail feathers of a male peacock (*Pavo cristatus*) which may be five feet long. In number they range from 1,000 on a hummingbird to 25,000 on a swan, and generally comprise 15-20 percent of the entire weight of the bird. Feathers perform a variety of functions, such as flight, regulation of body temperature (**thermoregulation**), protection of the body and skin, attraction of mates and differentiation of species.

The feathers most commonly observed are contour and down feathers. **Contour feathers** cover the body of a bird and have a strong, hollow **shaft** and network of hooks or

barbules (see diagram on page 2). The contour feathers on the tail and wings have been modified for flight. **Down feathers** are small and lie under the contour feathers. The purpose of these feathers is to insulate the bird from the cold and protect against sunburn.

Birds must take care of their feathers so they can continue to fly and remain warm. **Preening** feathers spreads oils over the feathers and "re-hooks" the barbules. Even though they are kept clean, feathers become worn and are usually replaced at least once a year. This process is called **molting**.

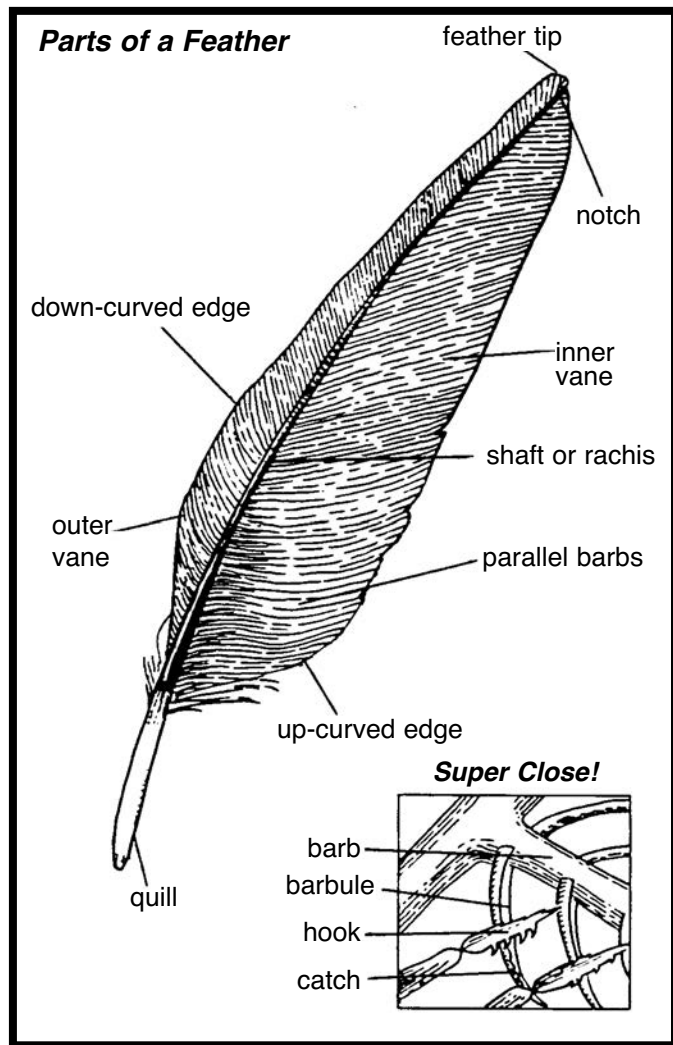
HARD-SHELLED EGGS: Birds lay hard-shelled eggs made mostly of **calcium carbonate**. The hard shell keeps an egg from **dehydrating** and allows parents to sit on the eggs during **incubation**. Even though bird eggs are hard-shelled, they possess microscopic pores which allow oxygen to pass into and carbon dioxide to exit the shell.

Eggs come in a variety of colors and patterns. Colored and speckled eggs are laid in areas where they need to be **camouflaged**. Blue or green eggs are laid by birds that nest in shady places such as trees or shrubs (American robin). Eggs in these locations are less visible in the dappled sunlight. White eggs are laid by birds nesting in **cavities** (owls, wood duck). Patterned eggs blend in with grass or small stones and are laid by birds that nest on the ground (gulls, sandpipers).

The shape of the egg is related to where the bird nests. The most common shape for eggs is oval. Birds that lay their eggs on ledges need eggs with a pointed end so they will not roll off the ledge (vultures). Round eggs are generally laid by birds nesting in a protected area, such as a cavity (owls). Birds that lay many eggs typically have eggs that are pointed, allowing incubation of several eggs in a small area (northern bobwhite). The number of eggs laid varies by species from as few as one for a seabird to nearly 30 for the northern bobwhite.

The texture of an egg may vary from smooth (smaller birds) to coarse (chicken, *Gallus gallus domesticus*). The smallest eggs (one-half inch) are laid by a hummingbird, the largest (eight inches) by an ostrich (*Struthio camelus*).

HOLLOW BONES: Simply having feathers does not permit birds to be creatures of the sky. Extremely light-weight bones are also necessary for flight. Bird bones are strong and hollow, with internal braces (see diagram in Student's Guide). Many bird bones are fused together which increases the strength of the bones.



PROJECTS AND ACTIVITIES

State and federal laws prohibit possession of **migratory** bird feathers. You can purchase feathers legally to use in this activity at a craft supply store or in the craft section of other stores.

1. By displaying a feather on an overhead projector and by using a hand lens, students will discover the major parts of a feather (quill, shaft, **vane**, barbule, **barb**).
2. After discussing background information on types of feathers, provide students with feathers or photo-

graphs of feathers and ask them to identify various types of feathers. Compare an owl feather, which has a filled shaft and fringed edges to cushion sound, with a rock pigeon feather, which is hollow.

3. Examine cleaned chicken or turkey bones which have been cracked or cut open. Discuss why most bones are hollow (aids flight).

EVALUATION

1. Ask students to make educated guesses and support their ideas about the purposes and usefulness of specific types of feathers.
2. Have students list and discuss in a paragraph the three characteristics of birds.
3. Bring a down jacket to school. Have students compare the warmth of a down jacket to another type of coat or no coat. Birds have adapted to remain warm in winter by fluffing their feathers and to not over-heat in summer by compressing their feathers.

EXTENSIONS

- Invite students to attempt to crush a raw chicken egg in their hands. They'll discover it is not possible because the shape of the egg distributes the pressure points.
- Research and conduct an experiment on how natural and artificial oils and soaps affect feathers. Discuss oiled birds and how they are cleaned.
- Reconstruct a chicken or turkey skeleton and label the parts.
- Research the uses of feathers by humans through history. Include such uses as feather pens, head-dresses, pillow/mattress stuffing, clothes, art and more.
- Research and discuss the theory of evolution of birds and how birds are related to reptiles.

VOCABULARY

barbs	incubation
barbule	metabolic rate
calcium carbonate	migratory
camouflaged	molting
cavity	preening
contour feather	shaft
dehydrating	thermoregulation
down feather	vane
	warm-blooded

What Makes a Bird a Bird?

STUDENT'S GUIDE

There are more than 9,000 species of birds in the world. More than 400 species have been recorded in Illinois. Birds are warm-blooded vertebrates. They have three characteristics that distinguish them from other animals: feathers; hard-shelled eggs; and hollow bones.

WARM-BLOODED

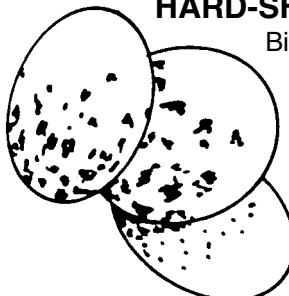
Like mammals, birds are warm-blooded, meaning that their body temperature stays the same no matter how hot or cold it is outside. This characteristic allows birds to maintain the high levels of energy needed for flying.

FEATHERS

Birds use their feathers in many ways, such as flight, regulation of body temperature (thermoregulation), protection of the body, attraction of mates and identification of species.

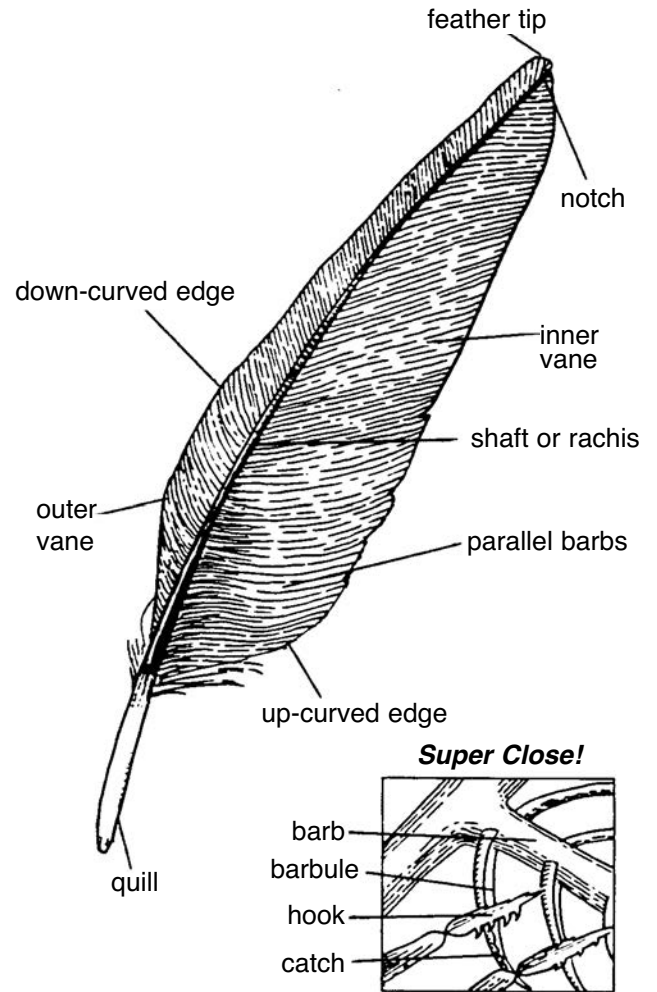
Contour feathers cover the body of a bird and have a strong, hollow shaft and network of hooks. Down feathers are small and are located under the contour feathers. The purpose of these feathers is to insulate the bird from the cold.

HARD-SHELLED EGGS



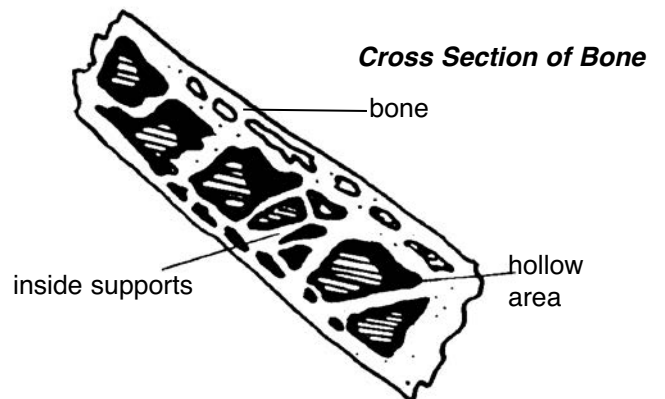
Birds lay hard-shelled eggs. The hard shell keeps an egg from drying out and allows parents to sit on the eggs during incubation. Even though bird eggs are hard-shelled, they have microscopic pores that allow oxygen to pass into and carbon dioxide to exit the shell.

Eggs come in a variety of colors, patterns, shapes and textures. Colors and patterns on eggs vary depending on the need for camouflage. The shape of the egg depends on where the bird nests. Most eggs are oval. Birds that lay their eggs on ledges need eggs with a pointed end so they will not roll off the ledge. The texture of an egg may vary from smooth (hummingbirds) to coarse (chicken, *Gallus gallus domesticus*).



HOLLOW BONES

Simply having feathers does not permit birds to be creatures of the sky. Extremely lightweight bones are also necessary for flight. Bird bones are strong and hollow with inside supports.

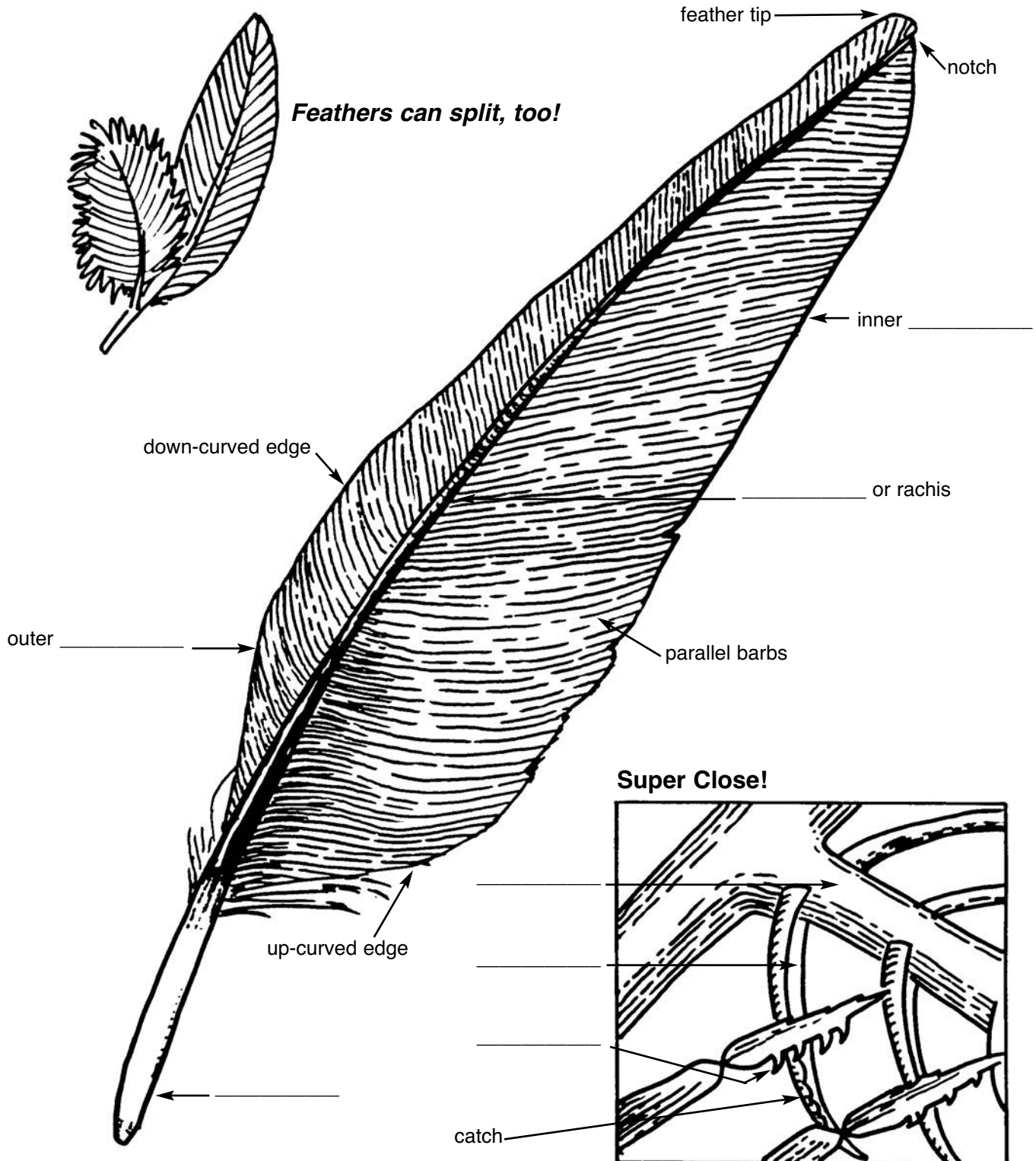


ACTIVITY PAGE

Oh, Bird Feathers!

How many feathers are there on a bird? Many, ranging from 1,000 or less to as many as 25,000 or more! There are different kinds of feathers with special functions, and each has many different parts.

Compare this diagram with a real feather that your teacher provides. Feathers are very complex. Label these parts: **vane**; **barb**; **barbule**; **shaft**; **quill**; and **hook**.



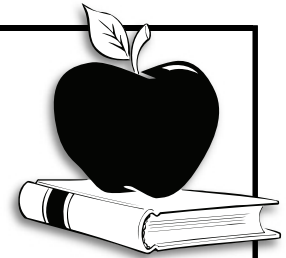
SUGGESTED GRADE LEVELS: 3 - 4

NEXT GENERATION SCIENCE STANDARDS:
3-LS4-3, 4-LS1-1, 4-LS1-2

SKILLS/PROCESSES: observation, classification, inference, prediction

OBJECTIVE: Students will be able to identify the four major **habitats** of Illinois and generalize how habitats provide for the specific needs of birds. Students will also recognize that birds may live in many different areas.

TEACHER'S GUIDE



UNIT 1 ■ LESSON 2

Home Tweet Home

BACKGROUND

Habitat consists of food, **cover**, water and **space**. These components are necessary for all living things to survive. Food is the material a species consumes, allowing it to perform life functions. Cover provides protection for animals, enabling them to nest, hide, sleep and travel. All wildlife needs water. Some drink water; others obtain it from food they eat. The area required by an animal to survive is called space.

At the time of pioneer settlement, Illinois consisted largely of three habitat types: **wetland**; **prairie**; and **forest**. Today, Illinois has four basic habitat types: wetland; forest; **agricultural**; and **urban**/suburban. The plants and animals typical of each habitat type are unique. Additional variation is possible based on geographic distribution and, for birds, the season.

Wetlands, which are low-lying areas filled with water at least part of the year, support water-loving plants. The basic categories of wetlands in Illinois are ponds, marshes, lakes, reservoirs, swamps, fens, peatlands, rivers and streams.

Wetlands provide a variety of feeding and nesting opportunities for birds. Herons, egrets and kingfishers feed mostly on fishes, with an occasional frog, mussel or crayfish eaten. Ducks feed primarily on aquatic plants but may also eat aquatic insects, clams, snails, frogs, small fishes and worms. Migrating shorebirds use shallow wetlands and mudflats for feeding areas. **Shelter** for birds residing in wetlands may include natural or human-made features. Natural features include trees in swamps and along rivers and streams and cattails around ponds and marshes. Humanmade structures enhance nesting habitats for birds and vary from nest platforms for cormorants, egrets and herons to nest boxes for wood ducks and nest cones for Canada geese.

Forests covered almost 14 million acres of Illinois prior to settlement. Now, only slightly more than four million

acres remain. Forest communities are classified by the dominant tree species. Oak-hickory, elm-ash-cottonwood, maple-beech-birch, oak-gum-cypress, white-red-jack pine, oak-pine and loblolly-shortleaf pine are the major forest communities in Illinois.

Forests provide a diversity of food sources for resident and visiting birds. Many species (thrushes, wild turkey, ruffed grouse) prefer fruits, berries and nuts produced by woodland trees and shrubs. Woodpeckers, nuthatches, warblers, vireos and many other birds feed on insects found on trees. Some woodland birds eat other animals: the American woodcock feeds primarily on worms; and owls feed on mice and small birds. Birds find a variety of shelter in woodlands, from high in the trees to leaf litter on the ground, as well as cavities in trees.

Prairies once covered 22 million acres of Illinois. Grasses and **forbs** (flowering plants) were the primary plants in these fire-dependent communities. Fire not only removed dead leaves and stems, but also kept trees and shrubs from taking over the prairies.

In the early 1830s farmers found that prairie soils were more fertile than forest soils and began to convert prairie to agricultural land. This change, followed by conversions for industrial and urban needs, has left fewer than 2,300 acres of prairie in Illinois. Today, many of our remaining prairies are in small, isolated areas, such as along cemeteries, roadsides, railroad tracks, hilltops and areas too wet or sandy to cultivate.

Many birds typical of prairie and agricultural habitats are insect-eaters or seed-eaters (meadowlarks, horned lark). Populations of some grassland-dependent species, such as the upland sandpiper, greater prairie-chicken and Henslow's sparrow, have declined due to the loss of prairie, pasture and old **field** habitats and are now uncommon. Grassland birds find nesting shelter within the dense grasses and forbs.

Urban and suburban areas also are plant and animal habitat types. Cities have changed dramatically over time. What were once small communities have become large metropolitan areas. The forests, wetlands and prairies that once surrounded cities have been replaced by businesses and residential areas. Trees, shrubs and other plants have been removed and replaced with buildings, concrete or asphalt.

Even though natural habitats are lost or altered due to urbanization, new habitats are created and some wildlife species adapt and move into the area. Parks, cemeteries, golf courses, ponds and backyards all provide habitat for urban birds. Animals that are common to urban areas tolerate humans and are able to adapt to urban foods and home sites. House sparrows, rock pigeons and European starlings have adapted to feeding on insects, seeds and garbage found even in concrete canyons. Northern cardinals, blue jays, mourning doves and American robins nest in suburban yards. Juncos, goldfinches, tree sparrows and chickadees are winter visitors to bird feeders. Peregrine falcons have been introduced to the Chicago and St. Louis areas where they feed on rock pigeons and live on ledges of tall buildings. It is important to note, though, that some species do not tolerate the change in habitat. Conserved areas just for habitat preservation are vital to the survival of these species.

Many birds use more than one habitat. For instance, the American robin feeds on worms and berries from yards but may visit wetlands to gather nest materials. Sandhill cranes roost in wetlands and marshy areas but move to upland areas in search of food. Many birds require different foods at different ages. For example, pheasant and duck chicks require large numbers of insects during the growing stage, but these foods may be unimportant to the birds as adults.

The habitat picture is not all gloom and doom. Efforts to preserve and manage habitats occur at various levels throughout the state and nation. Habitat programs range from national programs such as the agricultural land Conservation Reserve Program and the North American Waterfowl Management Plan to state efforts involving land acquisition, wetland restoration, prairie burns and landowner assistance programs. At the local level, county forest preserves and park districts are actively managing and preserving habitats. Private organizations, such as Ducks Unlimited, Quail Unlimited, the Wild Turkey Federation and Pheasants Forever, undertake a variety of habitat projects.

PROJECTS AND ACTIVITIES

1. Find photographs that represent the four basic Illinois habitats. Name one example of a bird species typical of each area. Is it present as a nesting or year-round resident? What does it eat?
2. Develop a wildlife habitat area on the school grounds. Use it to attract birds.
3. Make a habitat diorama, 3-D drawing or sculpture using arts and crafts materials to represent plants and animals typical of a select habitat type.

EVALUATION

1. Discuss the impact of **urban sprawl** and habitat loss on birds. Discuss bird species that have adapted well to human (urban) habitat and why it is important for some to adapt. Are there species that do not adapt? What happens to those birds?
2. Have students identify their habitat needs. What are their daily requirements for food, cover, space and water? Do those needs ever change? How are their habitat needs similar and different from those of birds?
3. Have students name the four habitat types in Illinois, describe them and give two examples of birds that inhabit each.

EXTENSION

- Have students develop a variation of the game featured on the activity page by adding hazard cards such as predators, pesticides and habitat destruction or modification.

VOCABULARY

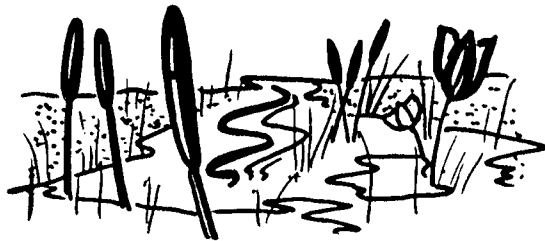
agricultural	prairie
cover	shelter
field	space
forb	urban
forest	urban sprawl
habitat	wetlands

Home Tweet Home

STUDENT'S GUIDE

Habitat consists of cover, shelter, water and space. These are all components necessary for all living things to survive. Food is the material a species takes in allowing it to perform life functions. Cover provides protection for animals, such as places they use to nest, hide, sleep and travel. All wildlife needs water. The area required by an animal to survive is called space.

Illinois has four basic habitat types: wetland; forest; grassland; and urban (cities and towns).



Wetlands, which are low-lying areas filled with water at least part of the year, support water-loving plants. A variety of foods are available in wetlands including fishes, frogs and aquatic plants. Shelter for birds living in wetlands may include natural vegetation or humanmade structures.



Prairies are fire-dependent communities of grasses and flowering plants. Prairie soils are very rich and have been almost entirely changed to agricultural land. Today, many of our remaining prairies are in small areas, such as along cemeteries, roadsides and railroad tracks. Many of the birds found in these areas are insect-eaters or seed-eaters. Grassland birds find nesting shelter within the thick grasses.

Forests are classified by the main species of tree in the community. They provide a variety of foods for resident and visiting birds. Fruits, berries, nuts, insects, worms, mice and small birds are all common foods for woodland birds. Birds live in the branches of trees and on the ground. Some birds live in tree holes.



Cities and towns are also homes for birds. Parks, cemeteries, golf courses, ponds and backyard habitat areas all provide habitats for birds. Animals common to city areas tolerate humans. They even change to find foods and home sites in the city.



ACTIVITY PAGE

Be a Bird! Be a Bird!

Cut out the cards below. Keep the "BIRD" cards separate and shuffle the other cards together. Have the students form two lines and pass out the food, shelter and space cards. Give "BIRD" cards to five students. Each "bird" walks down the lines and tries to match the "FOOD," "SHELTER" and "SPACE" cards appropriate for their bird. Determine which "birds" would survive and which would not. This game board is designed with correct answers found in horizontal rows as printed.

BIRD	FOOD	SHELTER	SPACE
CHICKADEE	SUNFLOWER SEEDS	TREE CAVITIES AND NEST BOXES	2 ACRES
BIRD	FOOD	SHELTER	SPACE
CANADA GOOSE	GRAINS AND AQUATIC PLANTS	WATER AND ISLANDS	30-40 ACRES
BIRD	FOOD	SHELTER	SPACE
MEADOWLARK	INSECTS	GRASSLANDS AND PRAIRIES	3-4 ACRES
BIRD	FOOD	SHELTER	SPACE
BELTED KINGFISHER	FISHES	STREAMS AND RIVER BANKS	1/2 MILE LINEAR SPACE
BIRD	FOOD	SHELTER	SPACE
RED-TAILED HAWK	SMALL MAMMALS AND BIRDS	FOREST-PRAIRIE EDGES	MORE THAN 300 ACRES

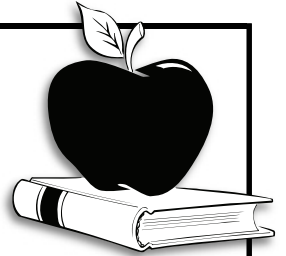
SUGGESTED GRADE LEVELS: 3 - 4

NEXT GENERATION SCIENCE STANDARDS:
3-LS4-2, 4-LS1-1

SKILLS/PROCESSES: observation, classification, data collection, writing

OBJECTIVE: Students will distinguish the major classifications of birds and the characteristics of related birds.

TEACHER'S GUIDE



UNIT 1 ■ LESSON 3

Birds of a Feather

BACKGROUND

Scientists use **keys** to classify relationships of birds. Keys list **primitive** birds first and the more advanced birds, requiring more steps to identify, later in the key. Birds that have similar characteristics are placed together in a category known as a "family." The major families of birds common to Illinois are listed below in order from the least to most advanced.



heron, bittern

These large, fish-eating birds wade rather than swim.



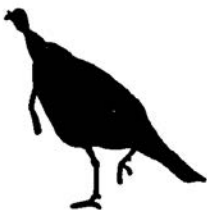
duck, goose, swan

These birds are common to wet areas and usually have webbed feet. Their eggs are not spotted.



hawk

Hawks are **diurnal** (day) birds of prey.



pheasant, turkey

Birds in this family have relatively short, rounded wings, are more apt to walk than fly and are year-round residents.



owl

Most owls are **nocturnal** (night) birds of prey. Their feathers are modified to allow them to fly quietly, and their eyes are adapted for ability to judge distances.



pigeon

Birds in this family have a plump body, small head and small beak. Pigeons are known for their "homing" ability.



cuckoo

Cuckoos have short legs with two toes forward and two back. Their bill is heavy and curved.



nighthawk

Having a weak bill and a large mouth, nighthawks feed at night by sweeping insects out of the air as they fly.



hummingbird

Birds in this family are small and have a long, thin bill. They can hover when feeding.



kingfisher

The kingfisher has a large head and bill. It feeds by diving into water to catch fishes.



woodpecker

These birds drill into trees searching for insects. They have two toes pointing forward and two backward.



flycatcher

These birds perch upright while waiting for insects, which they catch in flight. Their flat bill has bristles at the base.

PROJECTS AND ACTIVITIES

1. Have students develop a key of classmates using characteristics such as boys/girls, color of hair, length of hair, color of eyes, hometown and does/doesn't have a dog. Ask the principal to come into the class and, using the key, locate one particular student.
2. Conduct a visual exercise to compare and contrast two birds. Using two, slightly overlapping circles, note shared features in the overlapping section and unique features of each bird in the remaining portions of the circles (see Example 1).
3. Use the *Illinois' Natural Resources Trading Cards* from the Illinois Department of Natural Resources to find bird species to represent each family. What are the features common to birds in each family?

2. Have students list five traits used in the classification of birds and give some variations in each trait.

EXTENSION

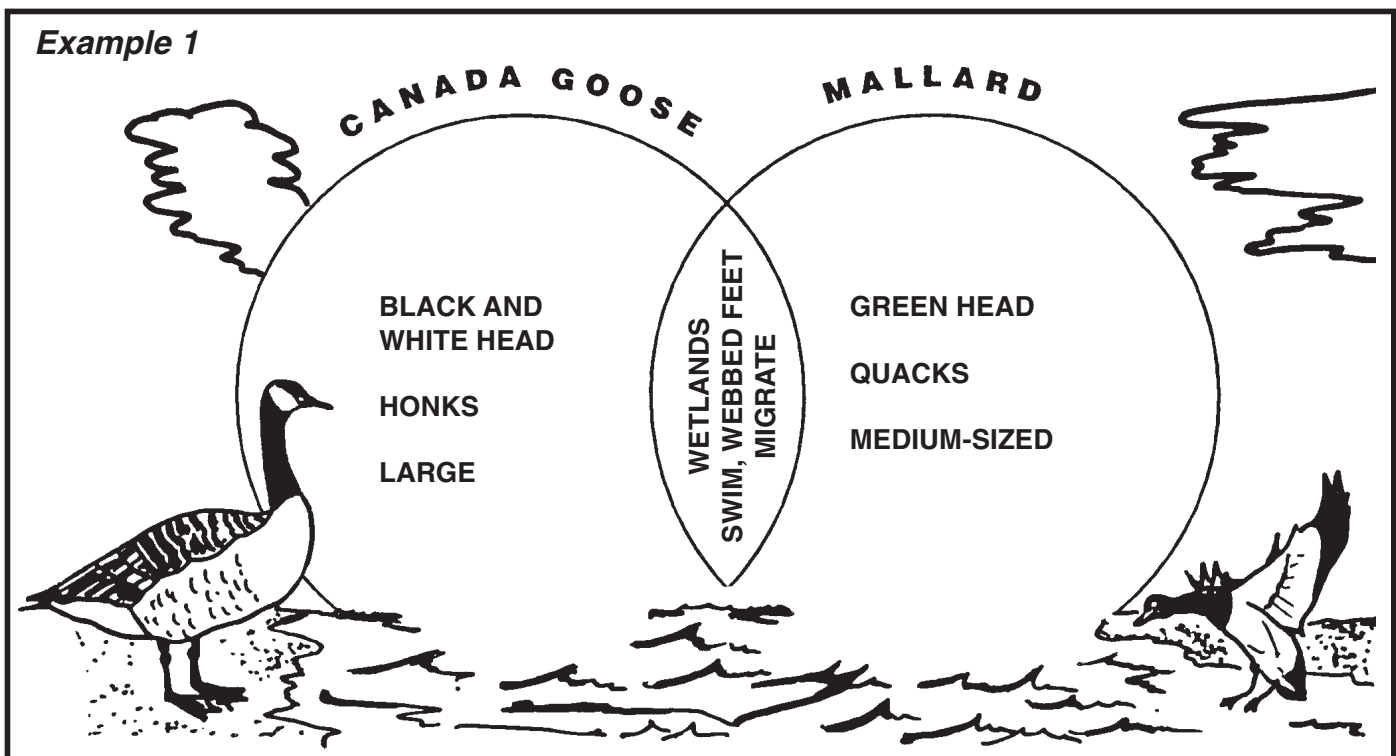
- Using **field guides**, show how birds are placed into families based on physical characteristics. The most "primitive" birds are depicted first in the books. Ducks are more primitive than owls, and owls are more primitive than sparrows.

EVALUATION

1. Have students classify into families the bird species commonly seen on the school grounds or in a local park. Discuss similarities and differences of the birds, such as habitat needs and how they obtain food.

VOCABULARY

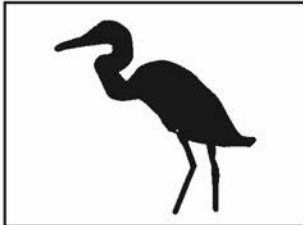
characteristics	nocturnal
classification	prey
diurnal	primitive
field guide	scientists
key	



Birds of a Feather

STUDENT'S GUIDE

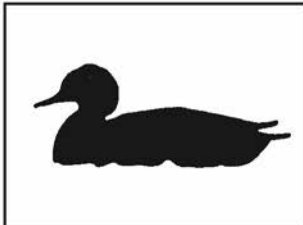
Birds that have similar characteristics are placed in a category known as a "family." The major families of birds common to Illinois are listed below.



heron
large body; eat fishes; wade rather than swim



cuckoo
heavy, curved bill; two toes face forward and two toes face backward



duck, goose, swan
live in wet areas; usually have webbed feet



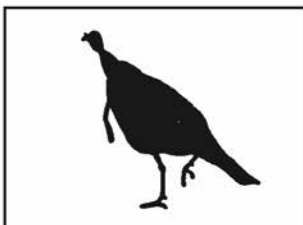
nighthawks
fly at night to feed by sweeping insects out of the air; weak bill; large mouth



hawk
diurnal (active during the day); catch prey to eat



hummingbird
small body; very long, thin bill; hover when feeding



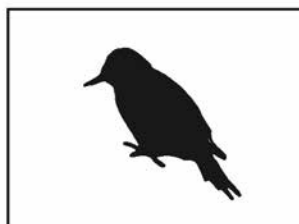
pheasant, turkey
relatively short, rounded wings; more likely to walk than fly



kingfisher
large bill; dive into water to catch fishes; large head



owl
nocturnal (active at night); catch prey to eat



woodpecker
strong beak is used to drill into trees for insects; two toes point forward and two backward



pigeon
plump body; small head; small beak; known for "homing" ability



flycatcher
flat bill with bristles at base; catch insects while flying

ACTIVITY PAGE

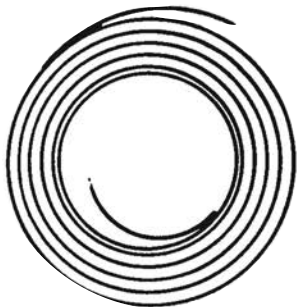
Make Your Own Bird!

Have you ever noticed the variety of birds? Imagine that you can create a new variety of bird. What would you make?



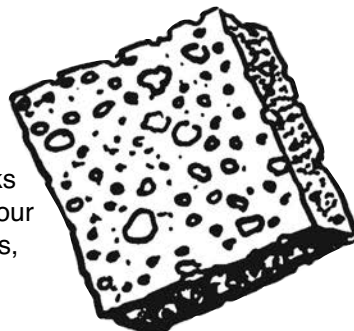
First, decide what kind of habitat your bird will live in. Be creative and think of an interesting environment.

Second, collect some materials to make a model or illustration of your bird. You can use string, paints, block prints, sponges, wire or anything else. Use your imagination.



Third, explain how your bird has adapted to its environment. What makes its bill, feet or color special?

Finally, fill in the answer to the blanks as you document your bird's characteristics, habits and habitat.



BIRD NAME:

BIRD SIZE:

BIRD COLORS:

FAVORITE FOODS:

AREA WEATHER:

HABITAT CHARACTERISTICS:

NESTING MATERIALS:

PREDATOR PROTECTION:

OTHER UNIQUE CHARACTERISTICS
(BILL AND FEET):

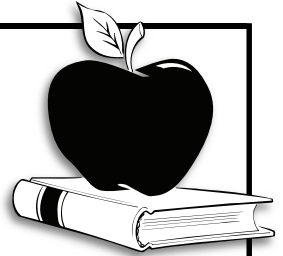
SUGGESTED GRADE LEVELS: 3 - 4

NEXT GENERATION SCIENCE STANDARDS:
3-LS4-3, 4-LS1-1

SKILLS/PROCESSES: observation, classification, comparison

OBJECTIVE: Students will recognize general types of bird beaks and the food each beak is best adapted for.

TEACHER'S GUIDE



UNIT 1 ■ LESSON 4

Natural Tools

BACKGROUND

The bird world contains an amazing variety of beaks. Beaks are used for eating, defense, feeding young, gathering nesting materials, building nests, **preening**, scratching, courting and attacking. The shape and size of each **species'** bill is specific for the type of food it gathers. Northern cardinals and sparrows have a heavy thick bill used to crack seeds. Meat-eaters, like the bald eagle, have a sharp, hooked bill to tear flesh. American robins and other birds with a varied diet have a bill shape that allows them to eat a variety of foods, such as worms and fruit. The American woodcock has a **prehensile** tip on its bill adapted for grasping, which allows it to probe the soil and grab earthworms.

Birds use their tongue for a variety of functions, also. Not only is the tongue used to drink, but also to hold,

pierce and tear food. Since birds consume great amounts of food, they have a **crop** (sac) which stores food until it is transferred to the gizzard. Small stones and grit picked up with food remain in the gizzard, grinding the food to aid digestion. The gizzard is made of extremely strong muscles, which in the wood duck can break down a whole acorn and in the canvasback duck grind fingernail clams to aid in the digestive process.

Birds have a high **metabolic rate** and, to survive, must frequently eat large quantities of food. Small birds eat large amounts of food in proportion to their size. Hummingbirds must eat twice their weight daily, while perching birds consume 10 to 30 percent of their weight each day. Most birds must continually search for food. Only a few birds, such as blue jays, woodpeckers, American crows and nuthatches store food for future use.



*ruby-throated
hummingbird*



bald eagle



*American
goldfinch*



*great crested
flycatcher*

PROJECTS AND ACTIVITIES

1. Set up eight different stations, each with a special type of "food" that fits one of the eight beaks described. At each station you will need three different tools. Also, have a sign at each station that tells what type of food is represented (Station #1, fish in shallow water; Station #2, flying insects). Identified below are a selection of tools and the one (*) that best fits each type of food.

STATION 1: rubber erasers in a container of water to represent fish in a shallow water area (fish-eating beak)

Tools

needlenose pliers* (bird examples: great blue heron, kingfisher)
eyedropper or straw
spatula

STATION 2: popcorn or tiny marshmallows tossed and caught in the air to represent flying insects (insect-catching beak)

Tools

envelope or fishnet* (bird examples: swallows; whip-poor-will; flycatchers)
tweezers
chopsticks

STATION 3: whole walnuts or other nuts to represent seeds with hard coverings (seed-eating beak)

Tools

nutcracker or pliers* (bird examples: sparrows; rose-breasted grosbeak; northern cardinal)
tongs
slotted spoon

STATION 4: bunch of grapes hanging from a string to represent fruit hanging on a tree (fruit-, insect-eating beak)

Tools

tweezers* (bird examples: cedar waxwing, brown thrasher, American robin)
strainer
nutcracker

STATION 5: large container with tiny marshmallows to represent aquatic plants and animals (water and mud-sifting beak)

Tools

slotted spoon* (bird examples: mallard, Canada goose)
tablespoon
chopsticks

STATION 6: rice scattered on and in a small log with a hole (or rice in a container with a small opening) to represent insects in a hollow tree (chisel beak)

Tools

tweezers or forceps* (bird examples: woodpeckers, nuthatches, brown creeper)
spoon
pliers

STATION 7: bread to represent a mouse or other small animal (preying beak)

Tools

channel-lock pliers* (bird examples: hawks, owls, eagles)
straw
tweezers

STATION 8: bowl filled with dry oatmeal with gummy worms on the bottom to represent worms buried in mud (probing beak)

Tools

forceps, tweezers* (bird examples: sandpipers, snipe)
straw
screwdriver

2. Divide the group into eight teams and have them rotate around the stations. From the three tools at each station the group is to decide which is most efficient for the specific food type. Encourage students to try each tool.
3. Afterward, discuss the beak and tool choices. What particular features made one tool "fit" better than others? Since the straw was not used in this activity, have students name a bird whose beak would function like a straw (hummingbird as a nectar-sipper).

EVALUATION

1. Have students review pictures of birds they commonly see, such as sparrows, woodpeckers, rock pigeons, northern cardinals, American crows and ducks. Classify the birds' feeding habits based on the type of bill (straining, cracking, etc.).



EXTENSIONS

- In the schoolyard look for birds and set up a feeding station with seeds, fruits and **suet** (winter only) and see which types of birds visit the feeders and what type of beak they have. Look for evidence of feeding activity, such as a tree ringed with yellow-bellied sapsucker holes, opened nuts, pellets or piles of butterfly wings left after the bodies have been eaten. Discuss your observations with the class.
- Discuss loss or modification of **habitat** and the resulting loss of food supplies for birds. Include in the discussion the fact that different species of birds require specific food types and that they do not

change their feeding habits because the preferred food is not available.

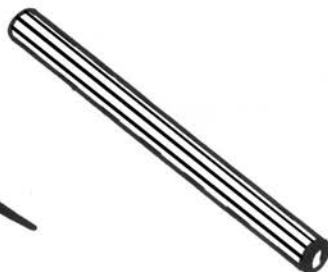
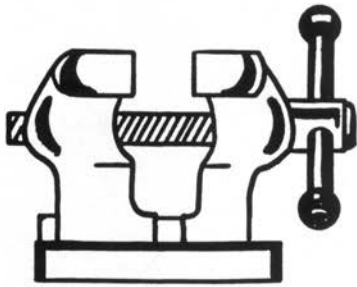
- Use the “3-D Eagle and Prey” activity to help students gain a better understanding of the bald eagle and its feeding habits

VOCABULARY

■ adapted	preening
■ crop	prehensile
■ habitat	species
■ metabolic rate	suet

Natural Tools

STUDENT'S GUIDE



The bird world contains an amazing variety of beaks (bills). Beaks are used for eating, defense, feeding young, gathering nesting materials, building nests, preening, scratching, courting and attacking. The shape and size of each species' bill is specific for the type of food it gathers. Northern cardinals have a heavy, thick bill used to crack seeds. Meat-eaters, like the eagle, have a sharp, hooked bill to tear flesh. American robins have a varied diet and a bill shape that permits eating a variety of foods (worms, fruits). Ruby-throated hummingbirds have a thin bill to sip nectar.

Birds use their tongue for a variety of jobs, also. Tongues are used in drinking and also to hold, pierce and tear food.

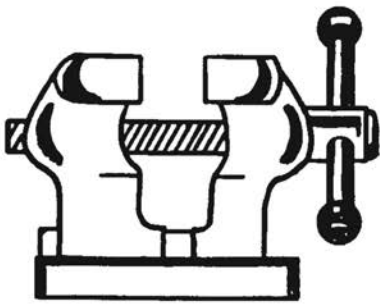
Since birds consume great amounts of food, they have a crop (sac) which stores food until it moves to the gizzard. Small stones and grit in the gizzard grind the food. The gizzard is made of strong muscles. In the wood duck those muscles can break down a whole acorn.

Birds have a high metabolic rate and must eat often to survive. Most birds must continually search for food. Only a few birds, such as American crows and nuthatches, store food for future use.

ACTIVITY PAGE

Beak Performance

Birds perform many tasks using their beak as a tool. Draw lines to match each beak to its corresponding human tool. Then draw a line to the correct name of the bird. Finish the activity with a line to its proper habitat.



bald eagle

great crested flycatcher

American goldfinch

ruby-throated hummingbird



red flowers
nectar-eater



river
fish-eater



grassland
seed-eater



dead tree
insect-eater