Teacher Information
and
Classroom Activities
for

Adaptation and Survival
A Bird’s-Eye View

Materials to supplement a fieldtrip to:

Rancho Santa Ana Botanic Garden
1500 N. College Avenue
Claremont, California 91711
Education Department (909) 625-8767, ext. 224  www.rsabg.org
Adaptation and Survival: A Bird’s-eye View
2 hr. Program

BACKGROUND INFORMATION FOR TEACHERS

The Education Department at Rancho Santa Ana Botanic Garden is looking forward to working with your class in the program, Adaptation and Survival: A Bird’s-eye View. In order to have your students receive the maximum benefit from their experience here, we recommend some pre-visit preparation. In the following pages we have outlined the organization and activities of the program. Also provided is background information about the main concepts explored at each station.

PROGRAM ORGANIZATION

Classes will be met in the Visitor Parking lot and will be returned there at the conclusion of the program. The two hours that volunteer Nature Interpreters dedicate to conducting this program do not include time for a nutrition break or an escorted visit to the California Garden Shop. After the conclusion of the program, teachers are welcome to walk students back to the Garden Shop and enter the shop in small groups.

Adaptation and Survival: A Bird’s-eye View has been organized to accommodate an optimal number of 60 students. If a single class is coming from your school, you may be paired with a single class from a different school. On arrival, students will be divided into groups of approximately ten. Each group of ten students must have two parents, teachers or other adult chaperons from the school to accompany them during the program. Name tags should be worn by all students and adults while on tour.

A Nature Interpreter will accompany each group as they rotate through five stations and a bird observation habitat walk (not necessarily in the following order), each lasting approximately 15 minutes.

1. **Nests** – A collection of real bird nests and some corresponding taxidermy birds reveal the diversity of materials and methods used in nest construction. The purpose and function of nests are discussed. Different bird eggs on display show diversity in size and coloration.

2. **Observation and Guided Activity** – Students will be provided with a Bird Checklist and Tic-Tac-Toe Scavenger Hunt to complete along the tour. This is a “stop-look-and-listen exercise.

3. **Beaks and Feet** – What Do Birds Eat? Taxidermy birds are used to compare and contrast the beaks and feet of various birds. Students will discover how physical traits and inherited characteristics enable a bird to survive in a particular niche.

RSABG 7/2016
4. **Feathers and Bones** – What Makes a Bird a Bird? Participants discuss and compare the size of a condor with that of a hummingbird. The question of how an animal as large the condor can fly will be answered by examination of specialized structures. Various feather types are displayed. Bird bones and mammal bones will be compared.

5. **Bird Identification** - Taxidermy birds will be used so students see the bird they are hearing and recognize identifying audio and visual features. Students will listen to an audiotape of common Southern California birds with the names of the birds announced. A second recording will be played, this time without the name of the birds, and the students will be asked to identify each bird by its call or song. Visual identifying characteristics of birds will be pointed out and discussed.

**Habitat Walk** - This walk will focus on the ecological niches of the birds at Rancho Santa Ana Botanic Garden. Food sources and nesting materials will be identified. Pictures of birds common to the Garden will assist with bird identification. At this stop, students may complete a Tic-Tac-Toe game of bird-related clues and identify birds visiting a feeding station.

RSABG 6/2006
BIRD NESTS

A great variety of animals build nests, but of them all, certain birds are by far the most expert and most industrious nest-builders. They build nests of many different materials, in a bewildering variety of forms, and locate them in more varied sites than do any other animals.

Birds use their nests to protect themselves, their eggs, and particularly their developing young from predatory animals and adverse weather during the breeding season. The nest also helps maintain the warmth necessary for the incubation of eggs and rapid development of the baby birds.

Nests can be as tightly woven as the cup-shaped nest "sewn" to the underside of a palm frond by the Hooded oriole or as minimal as the nest of the California condor, who simply lays an egg on leaf litter or a bare rocky ledge. Swifts collect nesting material in midair by catching floating fibers in their beaks. Swallows make their nests entirely out of mud. Anything that can be carried away may end up in a bird nest. Scrub jay and crow nests often contain string, bits of paper, clothes dryer lint, foil, and cigarette butts tucked in with more conventional nesting materials such as grass and twigs.

Some bird species build massive stick nests that are used and added to each year. Some birds lay their eggs in the nests of other birds and never build their own!

A bird can use only its beak and feet to gather materials and build a nest. If you could only use the thumb and forefinger of one hand (in place of a beak) and your feet, what kind of a nest would you build? Where would you build it? Remember: Your nest has to protect and shelter you and your family!
FILL THE BILL

A bird's beak is like a tool which the bird uses to collect food. Look at the tools listed below. Look at the foods listed in the boxes. Write the name of the tool you would use to collect the food in each box. Now look at the birds in the circles. Draw a line connecting the food box to the bird whose beak is similar to the tool you chose.

- STRAW

- CHOPSTICKS

- PLIERS

- DIP NET

- TWEETERS

SEEDS

CATERPILLARS
& OTHER INSECTS

NECTAR

WORMS
IN MUD

FISH & WATER
CREATURES

SNIPE

GROSBEAK

WARBLER

HUMMINGBIRD
BIRDS OF THE FOOTHILLS
(SAN DIMAS TO UPLAND)

Birds are arranged in order of descending size.
Description indicates:
Common name -- length in inches
Plumage
Common sighting area
Distinguishing characteristics or habits

Red-tailed hawk -- 18"
Brown above, light below
Flying
Reddish fan-shaped tail
Flies in large circles in sky

Scrub jay -- 10"
Blue head, wings and tail
Gray breast
Tree tops, telephone wires
Noisy and conspicuous
Glides at end of flight

American Crow -- 17"
Entirely black
Sky, residential area
Loud "CAW, CAW" sounds,
squared tail, large flocks

California thrasher -- 10"
Brown
Ground, under bushes
Long down-curved bill
Prefers running to flying

Rock dove, domestic or feral, pigeon -- 11"
Highly variable
City parks
Iridescent green and purple
Neck gray body and wings,
two dark bars on each wing,
gray tail, dark tip

Northern mockingbird -- 9"
Grey and white
Wires and roofs
White wing and tail markings
Wide variety of songs

Mourning dove -- 10 1/2"
Brownish gray
Telephone wires, ground
Long, pointed, slender tail
Wings whistle on take-off

American robin -- 8 1/2"
Deep rusty-orange breast, dark back
Lawns, tree tops
Dark stripes on white throat

Northern flicker -- 10 1/2"
Grey with black spots, red moustache
Black crescent on breast
Tree trunks

Acorn woodpecker -- 8"
Black back and mask, white belly
And rump, bright red crown
Cling vertically to tree trunks
Oak groves, oak-pine canyons
California quail – 8”
Brown, bluish gray; black plume on head, males have black face
Ground, under bushes
Usually seen in groups (coveys), runs more frequently than flies

Spotted towhee – 7 ¼”
Orange sides, black or brown back, white belly, white spotted back
Ground, shrubs
Rummages noisily through dead leaves

California towhee – 7 ¼”
Plain brown, rust color under tail, faint streaks on throat
Ground, shrubs

Nuttall’s woodpecker – 6 ¾”
Black and white, barred, ladder-like pattern on back, striped face, red patch on back of head
Tree trunks

Phainopepla – 6 ¼”
Shiny black, white wing patches visible in flight
Tree tops, top of fence posts
Crested head

European starling – 6”
Black or heavily speckled, iridescent in spring with yellow bill, dark bill in winter
Cities
Short tail, stocky, whistles, clicks and “chuckles”

Black phoebe – 5 ¾”
Black back, white belly
Residential areas
Bobs (flicks) tail

House sparrow – 5 ¼”
Brown and gray, black bib, gray cap on head, chestnut nape of neck
Ground, trees, wires
Travels in large flocks

House finch – 5 ½”
Soft red and brown; red crown, breast and rump
Tree tops, wires, roofs
Thick hill, often seen in large flocks

Bewick’s wren – 4 ½”
Brown, white eyebrow
Bushes
Erect tail

Bushtit – 3 ½”
Grey
Oak trees, bushes
Very small bird with long tail, flits nervously, “squeaky toy” sound heard in flocks

Anna’s hummingbird – 3 ½”
Iridescent green, white, red; red on head and throat of male
Perching on tips of branches, hovering near flowers

Black-chinned hummingbird – 3”
Green, white, violet, black chin, violet throat, white collar
Perching on tips of branches, hovering near flowers
<table>
<thead>
<tr>
<th>WINGS</th>
<th>TAILS</th>
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<tbody>
<tr>
<td><strong>Bird wings are their tools of flight, and there is a close relationship between the shape of the wings and the bird’s style of flight.</strong></td>
<td><strong>Bird tails come in a variety of sizes and shape: The main function of the tail is to acts as a rudder in flight and brake for stopping.</strong></td>
</tr>
<tr>
<td>Swallows, swifts, etc., have long, pointed wings for speedy skimming flight when pursuing flying insects.</td>
<td>The erratic, graceful, skimming flight of a swallow is made possible by its long, forked tail.</td>
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<tr>
<td>Short, rounded wings of many ground birds (quail, pheasants, etc.) provide for quick take-off and short rapid flight when danger is near.</td>
<td>The stiff tail of a woodpecker acts as a prop or brace when it climbs a tree trunk and hammers its beak against the wood.</td>
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<tr>
<td>Most birds of prey (hawks, eagles, etc.) have long, broad wings for strong soaring flight.</td>
<td>Mockingbirds, catbirds and thrashers have long, rounded tails.</td>
</tr>
<tr>
<td><strong>What shape are the wings and tail of a roadrunner? How are they used? Draw them in the boxes below.</strong></td>
<td>Many chicken-like birds (grouse, quail, etc.) have wide, rounded tails.</td>
</tr>
</tbody>
</table>
All-purpose wings for flying among trees or over long distances along the coast. (Duck, Warbler)

Short and wide for quick flight from bush to bush. (Wrentit, Song Sparrow)

Long and wide for soaring over the land. (Hawk, Turkey Vulture)

Short and narrow for “flying” underwater. (Common Murre, Tufted Puffin)

Long and narrow for riding ocean winds. (Albatross, Shearwater)
FEATHERS

Parts of a Feather

Quill (or Calamus) — lower, hollow portion of the shaft before the beginning of the vane

Shaft - hollow center tube of feather

Vane - rest of feather; made up of hundreds of barbs

Barbs – individual parts projecting off the shaft in parallel rows

Barbules – tiny projections on each side of the barb which allow the barbs to “zip” together

Each feather consists of a shaft which projects from the skin; branches or “barbs” line each side of the shaft. Each of these barbs, in turn, has barbules projecting from it. The barbules have rolled edges on one side and tiny hooks on the other that interlock like Velcro or a zipper. If a feather becomes ruffled or the connections separated, a bird will run the feather through its beak from base to tip and “zip” it together again.

Types of Feathers

Flight feathers – wing and tail feathers
  Tail feather – vane even on both sides
  Wing feather – leading edge smaller than trailing edge

Down feather – fluffy to trap air for warmth

Contour feather – body feathers and small wing and tail feathers which give shape and coloration

Filoplume – typically emerges in small groups around the base of body feathers

Bristle – fairly stiff, lacking a vane and sometimes completely barbless

Feathers are an extension of a bird’s body, just like the hairs on your arms are an extension of yours. Feathers provide a lightweight body covering, waterproofing and insulation for the bird.

Bird feathers are replaced at least once each year. The process is called molting. Major feathers are lost symmetrically, one from each side, so the bird can still fly. Feathers are lost and replaced gradually, they do not fall out all at once.

The entire primary wing feather was used in colonial times (and earlier) as a pen and referred to as a “quill”.
PARTS OF A BIRD

Directions: Label the parts of the bird with the words below. Match the numbered part name to the numbered blank in the picture.

1. upper mandible
2. forehead
3. crown
4. nape
5. secondaries
6. back
7. primaries
8. rump
9. tail
10. lower tail coverts
11. upper tail coverts
12. flank
13. tarsus
14. belly
15. side
16. shoulder
17. breast
18. throat
19. chin
20. lower mandible

Choose any three parts and describe their functions here

________________________

________________________

________________________

________________________

________________________
Bird Songs: Musical Messages

Why do birds sing? And why especially in the Spring? Song plays an important role in the annual cycles of many birds as it signals the courtship proceedings and defines the territorial holdings vital to producing and successfully rearing their young. When one considers the small size of birds, the distances that may separate them, and the many obstacles that act as visual barriers, like leaves and trees, it is no wonder that songs and calls, are the most effective ways to communicate.

Songbirds form the group of birds known as passerines, or perching birds. The name passerine comes from the Latin "passer" which means sparrow. Being small, and often having to migrate hundreds or thousands of miles annually, their life spans are relatively short. It would be unusual for both partners to live through many seasons, thus songbirds do not mate for life, but rather find a mate each season. It is possible that the same mate which instinctively flew back to the same territory could respond to the previous year's mate, but it is thought that the pair bond does not last beyond caring for the young in most species. The song is thus very important to reproductive success, as it quickly and effectively announces the presence of a particular species of bird, its desire to mate, and the territory which that particular bird has established.

It is important to emphasize that each species of bird has its own specific song, although there are, occasionally, regional dialects. This species-specific song is what enables potential mates to recognize, respond to and find each other, and also what causes a flight or fight response in a bird that intrudes into the territory of a like bird. Within the song pattern of a given species there are, however, individual characteristics that enable birds to distinguish their mate's songs. Sophisticated recordings and visual renditions of songs in sonograms have allowed researchers to study subtle differences otherwise undetected by humans.

Male birds are usually the songsters because they most often establish the territory, attract a female into it and defend it. There are common exceptions in which females occasionally sing as well, such as the bluebird, the northern oriole, the cardinal and the white-throated sparrow.

Birds do not have vocal chords. Their songs by controlling the frequency of vibrations made by the membranes in the syrinx, or voice box. Air, when released from the lungs under a certain amount of pressure, causes these membranes to vibrate. The number of syringeal muscles in a given species of bird determines its ability to vary the vibrations. Pigeons, with their simple cooing, have only one pair. Crows and mockingbirds, which produce a great variety of sounds have eight pairs of muscles.
Some birds are born with the ability to sing their species’ song; others have to hear it and practice. Young birds begin singing anywhere from eight days to thirteen weeks after hatching. Their early songs are called “subsong” and consist of notes or phrases from the species’ primary song. When reared among members of its own species, the young bird usually has perfected its song by the spring after its year of birth.

The time of year when birds sing is related to their reproductive cycle, which in turn is timed to coincide with the maximum food supply for the offspring, usually spring and summer. It is thought that the length of day (increasing daylight in late winter and early spring) stimulates the production of hormones that result in breeding behavior and readiness. The ability and desire to sing is part of that process. When they cease to sing varies; some stop as soon as mating has occurred, others continue until all care of the young is completed.

The daily song cycle also varies. Most birds sing early in the morning with the amount of light again triggering the impulse. Members of the thrush family are often the first heard at dawn, followed by insect eaters which can find their flying food outlined against the early morning sky. Many seed-eating and hole nesting birds seem to wait for better light. In the heat of the day most birds are quiet, although one account described a red-eyed vireo that sang its song 22,000 times in the course of ten hours. Toward evening, many birds resume their singing.

Songs serve well to attract mates and to mark territories, but there are other messages that need to be communicated: aggression, alarm, location of food. Most of these are conveyed by brief, relatively simple call notes, such as the blue jay’s warning scream.

The study of bird songs can last a lifetime. First, one becomes aware of differences among the sounds. Gradually, certain songs are associated with specific birds, until eventually it is ears even more than eyes that tell the experienced birder what birds are in the area. To learn about birds and their songs is to give new dimension to the world around you.

**Suggested References:**


CALIFORNIA QUAIL

The California Quail is the state bird of California. It is a plump bird with gray, brown, black and white feathers and a black “topknot” feather curving over its forehead. A group of quail is called a “covey”. There may be as many as 1000 or as few as 5 or 6 quail in a covey. They will stay together except when it is time to nest.

Quail are like chickens in their habits. They spend most of their time on the ground eating seeds and tender leaves. They eat in the morning, rest during the middle part of the day, and then eat again in the late afternoon. At night they fly up to a tree or shrub to roost. They will also fly up into a tree to escape danger.

When a male and female leave the covey to nest, the male is very alert. He will assume a lookout position from a rock, stump or branch and give a loud warning call if danger is near. The other quail stop and stay perfectly still until the male signals it is safe.

Many animals, including skunks, house cats and ground squirrels, eat quail eggs and chicks. The Indians of California used traps and snares to catch quail for food. The black topknot feathers were used to decorate baskets. Some people still hunt and shoot quail.

Quail Calculations

A pair of quail mate and the female lays twelve eggs. All of the eggs hatch. All of the chicks grow into adults. If each of these adults mate and hatch twelve eggs, and none of the quail have died, how many quail (including their mates) are there now?

However, what if...

Out of the original twelve eggs, 1/6 of them are eaten by skunks, how many eggs are left?

The remaining eggs hatch into chicks, but 1/2 of the chicks are eaten by snakes, how many chicks are left?

The remaining chicks become adults, but 3/5 of the new adults are eaten by coyotes, how many of the chicks of the twelve eggs laid have lived to start new families?
HUMMINGBIRDS

Hummingbirds inhabit only the mainland and islands of North, Central and South America. These amazing birds can not only fly upward and forward, but can hover in mid-air like a helicopter. They are the only birds that can fly backward. In addition to their aerial acrobatics, hummingbirds are also known for their beautiful iridescent feathers and small size. The bee hummingbird of Cuba is the smallest bird in the world. It is only 2¼ inches long and weighs only 1/15 of an ounce.

The Anna’s hummingbird lives all year at Rancho Santa Ana Botanic Garden. It is 3½ to 4 inches long and weighs 1/5 of an ounce—about the weight of a penny. It has a red crown and a red throat. Other hummingbirds just stay at the Garden for part of the year. The Rufous hummingbird can be seen here for only a few weeks in February as it travels north from Mexico.

The female hummingbird builds a nest about the size of a walnut. She gathers cottonwood down and other soft material and binds it with spider silk. Lichen and moss are used on the outside to camouflage the nest. Two eggs about the size of jelly beans are laid in the nest. They take only two weeks to hatch. The mother hummingbird feeds her babies small insects. After about three weeks, the babies are ready to leave the nest. A lucky “hummer” can live for ten years.

Hummingbirds need large quantities of food to stay alive. Their wings beat at up to 78 times per second which uses a lot of energy! They eat insects and lap nectar from flowers. Nectar is very sweet and it has been estimated that a hummingbird needs half its weight in sugar every day.

Brain Game: How much weight would you gain in a week if you ate half your weight in sugar every day?

Calculation Information:

One pound of sugar contains 1800 calories.
A 90 pound student needs about 1400 calories per day.
3500 extra calories per day cause the student to gain a pound per day.
Sharing Our Habitats/What Bird Is That?

Which types of birds are found in your area? Have students draw on their own experiences, field guides and other appropriate references to determine what specific birds are found in your area. You might assign different groups of students different categories of birds to investigate. Categories should be shorebirds and wading birds, predatory birds, ground-dwelling birds, swimming birds and perching birds. Perching birds is a large category, so you will need several groups of students working on that one. Have students present their findings to the class in whatever manner you or they choose. Now that the students have some idea about which birds are found in your area, take them bird watching to see which birds you can find and identify. Your trip could be a simple walking tour close to school or a trip to a specific habitat.

Wingbeat Math

<table>
<thead>
<tr>
<th>The Wingbeat Chart</th>
<th>Wingbeat/10 seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bird</td>
<td></td>
</tr>
<tr>
<td>Crow</td>
<td>20</td>
</tr>
<tr>
<td>Robin</td>
<td>23</td>
</tr>
<tr>
<td>Pigeon</td>
<td>30</td>
</tr>
<tr>
<td>Starling</td>
<td>45</td>
</tr>
<tr>
<td>Chickadee</td>
<td>270</td>
</tr>
<tr>
<td>Hummingbird</td>
<td>700</td>
</tr>
</tbody>
</table>

Look at the wingbeat chart and calculate:

a. How many wingbeats in one minute from:
   - a hummingbird? (4,200)
   - a chickadee? (1,620)
   - a crow? (120)

b. Which combination would make the most flaps?
   - a hummingbird flapping for 45 seconds
   - ten crows flapping for 60 seconds
   - sixteen starlings flapping for 1 minute
   - a pigeon, chickadee, and robin flapping for 3 minutes
     (The pigeon, chickadee, and robin - 5,184.)

c. If a crow, a robin, a pigeon and a starling flew 48 kilometers per hour (30 miles per hour), how many times would each one flap if
   - the crow flew 16 kilometers (10 miles)? (2,400 flaps)
   - the robin flew 64 kilometers (40 miles)? (10, 800 flaps)
   - the pigeon flew 128 kilometers (80 miles)? (28,800 flaps)
   - the starling 8 kilometers (5 miles)? (2,700 flaps)
Season Determines Behavior

Birds exhibit different behaviors at different times of the year. Have students examine the behavior calendar for a common bird, the American robin, and answer the questions that follow:

a. Your neighbor calls you on the phone and informs you that a pair of robins has laid eggs and is incubating them in a nest in a tree in your backyard. You look at the calendar and note it is October. Possible? (No. Early August marks the end of the breeding and nesting season.)

b. Your neighbor calls again and says that a baby robin has fallen from nest in a tree in your backyard. The calendar says June. Possible? (Yes.)

c. You look out your window and see an adult robin in your backyard. The calendar says January. Possible? (Yes. Behavior calendars are approximations of the cyclic behavior of birds. The robin might be a very early migrator returning, or perhaps a mild winter has caused the robin to stay in the area and not migrate.)

My Nest, My Home

Divide your class into teams of two each (nesting pairs). Let each pair select a nest site somewhere on school grounds or inside if weather demands. Present the class with nesting material—sticks of various sizes, newspapers, rags and assorted pieces of cardboard and styrofoam. Challenge the pairs to construct a nest from the materials provided at the site of their choice. This activity allows students to model nest-building and will give them an appreciation of the difficulties involved in building a nest. You might make this activity even more challenging by requiring the students to use only their feet, legs and arms. Do not allow them to use their hands and, for health reasons, the nesting materials should not be put in the mouth.

Writing

a. Challenge students to learn more about birds by having them do a formal library report on a specific bird of their choice.

b. Bird expressions abound in our language. Have students determine the accuracy or inaccuracy of the following phrases:
   “like water off a duck’s back” (accurate)
   “eagle-eyed” (accurate)
   “wise as an owl” (not accurate)
   “birds of a feather flock together” (accurate most of the time)
   “eats like a bird” (not accurate in the sense of not eating much because birds consume 20 percent of their body weight a day in food)
   “happy as a lark” (not accurate)
   “crazy as a loon” (not accurate)
Now challenge students to write their own bird expressions or phrases, accurate and inaccurate. Students could present their expressions to the rest of the class and have classmates determine which are accurate and which are not.

c. Have students describe the life and times of a bird as seen through the eyes of a bird.

**Fine Arts**

a. Have students compose a song, limerick, or a poem about any aspect of a bird’s existence. For example, there is a verse that describes the pelican as a bird whose bill can hold more than its “belican.”

b. Have students paste colored pictures of birds onto heavy paper or thin cardboard and cut around the pictures. Attach the pictures with string to a coat hanger or other wire frame. A silhouette mobile could be a useful identification tool.

c. Use the songs and calls of birds for different activities:
   - Have teams of students invent their own songs and calls for the following situations: attracting mates, defending territory, warning of danger, and directing young birds to food or water. Have students present their compositions to the rest of the class and challenge the other students to determine what category of song or call is being presented. Encourage students to use any musical instruments they play along with their own voices in their songs and calls.
   - Hold a contest to see who is the best bird imitator. Play a song or call from a bird recording and have several students try to imitate it. The rest of the class can vote on who did the best job. Pick another song, or call, select several new students, and repeat the contest. Make sure everyone who wants to participate gets the chance to “sing like a bird.” This would be an appropriate place for older, more advanced, or interested students to investigate why some birds copy the songs and calls of other birds (mimicry).

**Social Studies**

a. **History.** Birds as symbols abound throughout history. For example, the United States is symbolized by the bald eagle and Chile by the Andean condor.
   - Assign individual students or teams specific countries or businesses and have them develop a bird symbol appropriate for that country or business. Have students develop their symbols on posters and present them to the rest of the class.
   - Have each student develop a family coat of arms that features a bird symbol. Ask them to explain their choice of bird(s) and its meaning as a symbol on their coat of arms.

b. **Geography.** Have students research the distribution and migration patterns of birds.
   - Challenge individual students or teams to investigate the distribution of selected birds or types of birds in North America or worldwide. Have students consult
appropriate references and field guides. Students could present their findings on posters containing colored pictures of the bird or bird group they investigated along with colored or shaded maps to show its distribution.

- Challenge individual students or teams to investigate the migratory patterns of selected birds - if possible, birds that migrate through your area. Students could present their findings on posters containing pictures and information about the bird along with colored or shaded maps showing the migration routes of the birds.

- Assign teams of students to study specific birds that migrate long distances. Challenge each team to prepare a flight plan for its bird. Have them trace on a blank map the route the bird will follow and label all countries, bodies of water, or other natural features the bird will fly over on its journey.
QUESTIONS, QUESTIONS
How many can you answer?

1. Birds are one group of vertebrates. What are the four others?
2. Birds evolved from which group of vertebrates?
3. Name two characteristics that birds have in common with reptiles.
4. What did feathers evolve from?
5. Name two things feathers help birds do.
6. Give one reason that birds sing.
7. Name five things birds might eat.
8. True or false: Parent birds teach their young to fly.
9. Are birds warm-blooded or cold-blooded?
10. Name three things that help birds fly.
11. True or false: Birds can see color.
12. Name two things that all birds need to survive.
13. What is preening?
14. What happens when birds molt?
15. True or false: During molting, birds lose all of their feathers at once.
16. True or false: The nests of some birds are built by the female alone.
17. Name three ways different birds use their feet.
18. True or false: Only one-third of all North American birds migrate.
19. What are two things birds might use to help them find their way during migration?
20. Name three ways different birds use their beaks.
21. Describe two ways birds defend themselves.
22. Name two birds that have become extinct.
23. Describe some of the ways people have caused bird populations to decline.
24. What is a person who studies birds called?
25. True or false: A bird that hatches from its egg naked, helpless and with its eyes closed is called a “precocial bird”.
26. Name one bird that has precocial chicks.
27. True or false: Eggs must be fertilized in order to be laid.
QUESTIONS, QUESTIONS
(Answers, Answers)

1. Reptiles, amphibians, fish and mammals
2. Reptiles
3. Partially hollow bones, scales, similar skull and ear bones, both lay eggs
4. Reptilian scales
5. Fly, stay warm, attract a mate
6. Stake out territory, defend territory attract a mate
7. Fish, insects, seeds, nuts, nectar, plants, small mammals, birds, dead animals, lizards
8. Flying is an innate behavior in birds, although young birds do need to practice.
9. Warm-blooded
10. Air sacs, feathers, wings, streamlined shape, light bones
11. True
12. Food, water, shelter, space to mate and raise young
13. Preening is the way a bird keeps its feathers clean by pulling them through its bill, nibbling them, and fluffing them out.
14. When birds molt their old feathers fall out and are replaced by new ones.
15. False. Birds lose only a few feathers at a time.
16. True
17. Swimming, climbing, running, perching, grasping, scratching
18. True
19. Sun, stars, landmarks, odors, sound, the earth’s magnetic pull
20. Straining, spearing, drilling, cracking, sipping, scooping, ripping, tweezing
21. Flocking together, “freezing” in place, mobbing, flee away
22. Dodo, passenger pigeon, great auk, Labrador duck, heath hen, Carolina parakeet
23. Spraying pesticides, introducing exotic species, over-hunting, destroying habitat, collecting,
24. Ornithologist
25. False. It is called an altricial bird
26. Ducks, geese, grouse, pheasants
27. False. Female birds can lay fertilized or unfertilized eggs, but embryos will only develop in and hatch from fertilized eggs.
BIRDS AND WORDS

The word *niche* describes where a plant or an animal fits into the world around it. The niche of a robin could be described as: daytime feeder, ground and berry eater, food for hawks, tree nester, fall and spring migrator. Humans have niches also. Try to describe your niche with four short phrases.

1. 

2. 

3. 

4. 

The *Orange-crowned warbler*, *White-throated swift* and *Blue gray gnatcatcher* are birds which can be found at Rancho Santa Ana Botanic Garden. Their descriptive names provide certain information about each bird. Make up a descriptive name for each of the people listed below. Could your teacher be a *Brown-haired paper passer*?

1. You

2. Your friend

3. A family member

4. Your teacher
BIRD SEARCH

Junco
Towhee
Pigeon
Vireo
Bushtit
Wings
Finch
Flicker
Kestrel
Wren
Tail
Sparrow
Lark
Vulture
Nuthatch
Flight
Hawk
Woodpecker
Bluebird
Robin
Beak
Hummingbird
Flycatcher
Wrentit
Thrush
Bill
Swallow
Kinglet
Eagle
Blackbird
Fly
Quail
Creeper
Owl
Starling
Swift
Warbler
Chickadee
Dove
Jay
Soar
Hover
Nest
Egg

N U T H A T C H B O P C T S
R S O I P B L U E B I R D V
P I W S J U I M A R G E F C
W T H R U S H M K P E E L O
M R E P N H B I L L O P Y S
E O E M C T I N P K N E C R
Y B A N O I W G U I M R A P
F I N C H T O B E N S I T L
L N S T A R L I N G W A C Y
I M O V T W J R F L I G H T
C C H I C K A D E E F R E W
K S C R I E Y E O T T P R E
E Q I E B S D F D V A N R B
R K U O C T E A G L E U S L
A G S A W R E N T I T G T A
C T P F I E N O F L Y L G C
N W A R B L E R U H H H A W K
B I R I G M S V S O A R U B
O N R O L R T F O V P K Y I
R G O T W O O D P E C K E R
Y S W A L L O W V R N B C D

Rancho Santa Ana Botanic Garden
VOCABULARY

Adapt: slowly evolve or change to fit the environment. For example, ducks have webbed feet and are adapted to swimming in water.

Calls: bird vocalizations that are not songs. Calls are made during courtship, feeding and migration, or as warnings.

Camouflage: protective coloration that helps hide an animal from its predators or prey

Clutch: number of eggs laid by a female during one nesting cycle

Crop: sac at the bottom of the esophagus in many birds that is used to store food for later digestion

Down: soft feathers next to the body that provide insulation

Fledge: to fly for the first time. Birds that have just fledged are often called "fledglings".

Gizzard: muscular part of a bird's stomach that grinds hard-to-digest food

Habitat: the natural "home" of a plant or animal. For example, the habitat of a meadowlark is a meadow or open grassy area.

Innate: behavior that is inherited, not learned. Some birds' songs are innate, which means the birds can sing them even if they have never heard them before.

Incubate: to warm eggs so they develop properly

Migrate: to travel seasonally from one region to another. For example, a hawk might migrate from Canada to Central America for the winter.
Mobbing: an attack made on a hawk, owl or other predator by a group of smaller birds

Molt: to shed old feathers and grow new ones

Ornithology: the study of birds. An ornithologist is a scientist who studies birds.

Plumage: A bird's feathers referred to collectively

Preen: to clean, straighten and fluff the feathers. Preening is a bird's way of grooming itself.

Soaring: a method of flight where hawks, eagles, vultures and other birds with large, broad wings are carried on rising thermal air currents

Song: notes repeated by a bird over and over in a regular pattern. Birds use song to help defend territories and sometimes attract mates.

Territory: the space a bird defends from other birds (usually of the same species) for mating or feeding

Warm-blooded: being able to maintain a constant body temperature independent of the outside temperature. All birds are warm-blooded.