

Day 1

Bird beginnings





Introduction

This day focuses on where birds come from, what makes them unique, and why it's valuable to get outside and observe birds. Birds are one of two types of animals that evolved from dinosaurs and still exist today; the other is reptiles. Over 10,000 [species](#) (kinds) of birds exist in the world today, and about 750 species occur regularly in North America.



Birding Basics: For information about planning your daily Bird Walk, using binoculars, and setting up an indoor Observation Station, see pages 5-11.

Questions to guide explorations and experiments

- How do birds differ from other animals? What makes birds unique?
- What do reptiles and birds have in common?
- Why are a bird's feathers so important?
- What can you learn from birds?



Books and activities

- **Books:** all about birds, their ancestors, and their characteristics
- **Activities:** learn about the evolution of birds, explore flight, discover unique bird characteristics, start a bird journal, and take a Bird Walk



Children's Books

Fiction

- *Are You My Mother?* by P.D. Eastman (Ages 4-8)
- *Aviary Wonders Inc. Spring Catalog and Instruction Manual: Renewing the World's Bird Supply Since 2031* by Kate Samworth (Ages 9-12)
- *Birds* by Lemniscates (Ages 3-6)
- *Chicken Frank, Dinosaur!* by S. K. Wenger (Ages 6-9)
- *Feathers for Peacock* by Jacqueline Jules (Ages 4-8)
- *Gone Again Ptarmigan* by Jonathan London (Ages 6-9)
- *How to Make a Bird* by Meg McKinlay (Ages 4-8)
- *Lali's Feather* by Farhana Zia (Ages 4-8)
- *Tyrannosaurus Rex vs. Edna the Very First Chicken* by Douglas Rees (Ages 4-8)
- *Owl Diaries series* by Rebecca Elliot (Ages 4-8)
- *Wings* by Christopher Myers (Ages 6-9)

Poetry

- *Dinosaur Feathers* by Dennis Nolan (Ages 4-8)
- *Hawks Kettle, Puffins Wheel and Other Poems of Birds in Flight* by Susan Vande Griek (Ages 6-9)

Nonfiction

- *Animals in Flight* by Steve Jenkins and Robin Page (Ages 4-8)
- *Beautiful Blackbird* by Ashley Bryan (Ages 4-8)
- *The Big Book of Birds* by Yuval Zommer (Ages 6-9)
- *The Boy Who Drew Birds: The Story of John James Audubon* by Jaqueline Davis
- *Children's Encyclopedia of Birds* Claudia Martin (Ages 6-9)
- *Dinosaurs Are Not Extinct: Real Facts About Real Dinosaurs* by Drew Sheneman (Ages 4-8)
- *Feathered Dinosaurs of China* by Gregory C. Wenzel (Ages 6-9)
- *Feathers: Not Just for Flying* by Melissa Stewart (Ages 6-9)
- *Monster Fliers: From the Time of the Dinosaurs* by Elizabeth MacLeod (Ages 6-9)



Bird Words

The parts of a bird

When is a leg not a leg?

In this diagram, the part labeled “leg” is generally called leg, but is it? Actually, what is called the “leg” is really the foot of the bird. Birds walk on their toes. The joint above the label “leg” is the ankle.

To help kids get a sense of this bird feature, have kids sit in chairs and bring one of their legs back along the side of the chair until their heel is under their hip. Which way is their ankle bending?

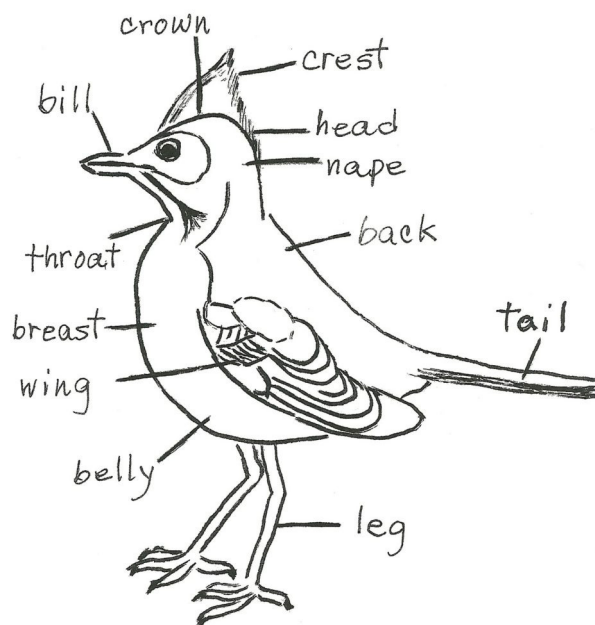


Diagram from Jake’s Nature Blog: <https://jakesnatureblog.com/2016/07/30/bird-diagram/>



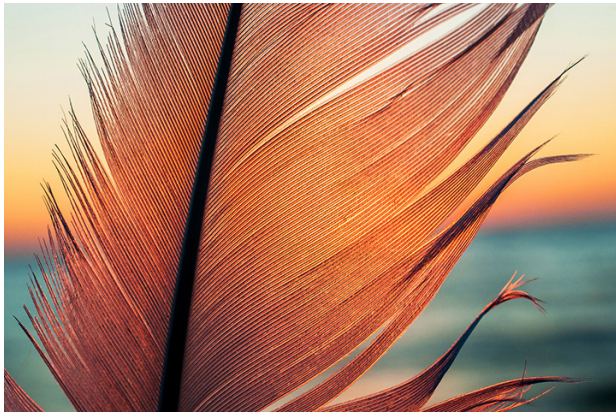
Bird Words

Aerodynamics

The way objects move through air

Barb

Feather within a feather that contains even smaller parts that hook together to keep the main feather smooth



Bipedal

Using two legs for walking

Carnivore

Animal that eats a diet of mostly meat

Dinosaurs

Prehistoric reptiles that lived about 250 million years ago

Evolved

Developed slowly into something else

Evolution

The changes of characteristics of a species over time

Extinction

The dying off of a species

Fossil

The remains or impression of a prehistoric organism

Lift

The forces on an object that force it to move perpendicular to the direction of flow. Lift can be in any direction, but we usually think of objects going up.

Paleontologist

A scientist who studies the record of life on Earth left as fossils

Preening

Straightening and cleaning the feathers with the bill

Reptiles

A class of animals that includes snakes, lizards, turtles, tortoises, and crocodiles

Species

Group of living things (such as birds) with similar characteristics and are able to produce young. There are more than 9,000 bird species.

Theropods

A diverse group of bipedal dinosaurs that include the largest terrestrial carnivores and the ancestors of birds



Activity 1: Flying Dinosaurs

Introduction

As the only living descendants of dinosaurs, birds have an extremely long and complex history. What birds look like now, where they live, how they act, and how they communicate, are all connected to how they evolved in relation to each other.

Birds evolved from a group called the theropod dinosaurs that included bipedal carnivores such as *Tyrannosaurus rex* and *Velociraptor*. The meteor strike that caused the extinction of the dinosaurs 65 million years ago also may have started the rapid evolution of bird species. Kids can explore the common ancestry of theropods and birds and “evolve” their own dinosaur into a bird that flies.

Supplies

- Images of different birds
- Images of theropod dinosaurs
- Blank white paper and/or construction paper
- Scissors
- Markers or crayons
- Stapler, glue, tape
- Paper Cclips
- Tape measure
- Stopwatch or stopwatch app



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Get kids thinking ...

Ask: What makes a bird a bird? How are birds different from other animals? Make a list (birds lay eggs, most fly, have beaks or bills, have wings and feathers, many build nests, etc.) together so that everyone can see and agree on what all birds have in common. While looking over the list, ask kids to think about other animals and consider what is unique about birds (feathers).



Activity 1: Flying Dinosaurs

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Share that the oldest known bird *Archaeopteryx* had feathers, teeth, claws on the wings, and a bony tail as long as the rest of the body.

Archaeopteryx provides fossil evidence that birds are close relatives to reptiles. But which reptiles? (Dinosaurs)

Ask: Do dinosaurs still live among us? Why don't we see a *T. rex* or *Velociraptors* when we go outside? What happened to these animals?



Talk about how some dinosaurs became extinct while some evolved. Share images of a variety of birds and theropod dinosaurs (Cornell Lab's Bird Academy Wall of Birds academy.allabout-birds.org/features/wallofbirds/ is a good resource for both) to explore and discuss the similarities and differences of birds and their dinosaur ancestors.

Let's get started!

Archaeopteryx was probably capable of flight, but many theropod dinosaurs could not fly even though many had traits needed for getting airborne, such as feathers and light, hollow bones. And not all birds fly the same way. Some birds, like hummingbirds, hover and zip around. Other birds soar through the air.

Ask kids to think about what accounts for these differences in flight and apply their ideas to creating a dino bird or modern bird paper airplane.

Step 1: Choose a bird or theropod. Wing and body shape affect how both a bird and a paper airplane will fly. Let kids get another look at images of a variety of birds and avian theropod dinosaurs and choose one that they will reimagine and make into a paper airplane.

Step 2: Take time to explain lift and why wing shape is important to flight. Lift is what's needed to overcome gravity. Lift is a force that is created when something solid moves through air. Without air or motion, there is no upward force of lift. Demonstrate how it works by holding a strip of paper below your bottom lip and blow air over it.

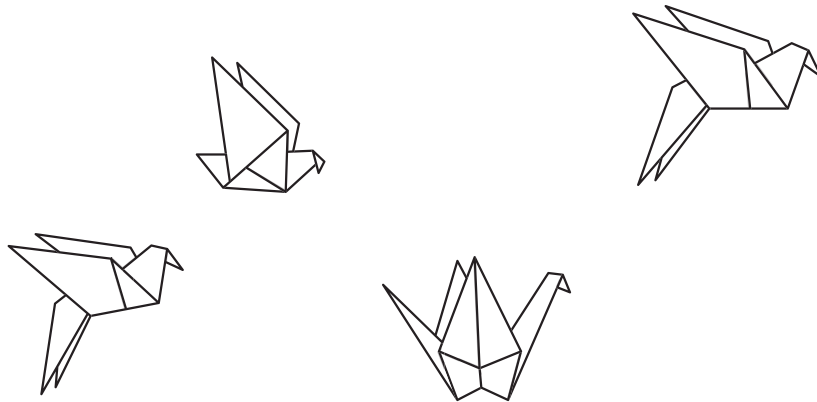


Activity 1: Flying Dinosaurs

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Step 3: Provide paper and some basics on folding paper airplanes. Some kids may want to use a template, but encourage everyone to experiment with a variety of folding techniques that will result in creating a plane with wings and a body shape that represents the dino bird or modern bird they have chosen to make. Allow for test flights of planes before kids draw, color, cut out, and add distinguishing characteristics, such as:

- Wing feathers
- Tails
- Tail feathers
- Beak (bill)
- Teeth
- Legs and feet
- Claws
- Eyes



Step 4: Build the paper planes. Provide a stapler, glue, and/or tape for attaching bird or dino bird parts. Encourage kids to use markers or crayons to add any additional features to their creation. Counterweights may need to be added to some planes to help stabilize planes with generous additions of distinguishing characteristics. Offer paper clips and let kids do test runs to get weight in the right places.

Step 5: Once planes are ready, have kids observe them in flight: how far each flies, its flight pattern, how long it stays up, etc. Then set up a test to compare the flights of the modern bird planes with the dino birds to discover which will fly the furthest or which stays in the air the longest.

It's easier to measure if each plane gets thrown one at a time, but have planes paired — one modern bird and one dino bird — for each test. Before a plane is thrown, have kids look at both planes and offer their hypotheses on distance and hang time. Have each plane thrown from the same starting point and have someone time how long each plane stays in the air. Then have someone measure the distance it traveled. Kids can write observations in the results table (see next page) for their own planes or collect data on all the planes.

Hypothesis

I think _____



Activity 1: Flying Dinosaurs

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Results

Name of Bird or Dino Bird	Time	Distance

Step 6: After each plane has flown in a test, have everyone take a look at the data and see what conclusions kids come up with. Look at which type of plane model went the furthest, which flew the longest, and ask kids why they think that's the case. Have them share their ideas about wings and body shape, size, weight, and feathers.

More flying activities

These Paper Airplanes Fly Like Birds (Audubon for Kids)

<https://www.audubon.org/news/these-paper-airplanes-fly-birds>

Bird Inspired Paper Plane Experiment (Wild & Immersive)

<https://wildlearnings.ca/paper-planes>

Flying Paper Birds (Project BEAK)

http://www.projectbeak.org/teacher/pdf/adaptations_wings_and_flight_paper_airplances.pdf

Birds and the Wind Shape

<https://www.birds.cornell.edu/k12/wp-content/uploads/2018/09/BirdWingTypes-Handout.pdf>

Paper Airplane Designs

<https://www.foldnfly.com/>



Activity 2: Fantastic Feathers

Introduction

Feathers make flight possible, give birds their color and markings and, in some cases, allow them to stand out when trying to attract a mate or blend in with surroundings when hiding from a predator. Feathers also provide the bird with a “raincoat” and a warm winter “jacket.” Kids can examine real feathers and explore how feathers function and offer protection to birds.

Supplies

- Large feathers from the craft store. NOTE: The **Migratory Bird Treaty Act** prohibits people from collecting feathers of migratory bird species. Learn more here: <https://www.fws.gov/birds/policies-and-regulations/laws-legislations/migratory-bird-treaty-act.php>
- Water
- Vegetable oil
- Containers for water, oil, and soap
- Paper towels for drying the feathers
- Eye dropper
- Mineral oil or baby oil in a small spray bottle
- Liquid detergent

Get kids thinking ...



Birds spend a lot of time **preening** their feathers. A feather can only be replaced by growing a new one, so birds work to keep their feathers in the best condition.

Ask: What do feathers do for birds? How? What happens to the bird if something happens to its feathers?

What Actually Makes Water Roll Off a Duck's Back?

<https://youtu.be/Q-8GXk9r0ik>



Activity 2: Fantastic Feathers

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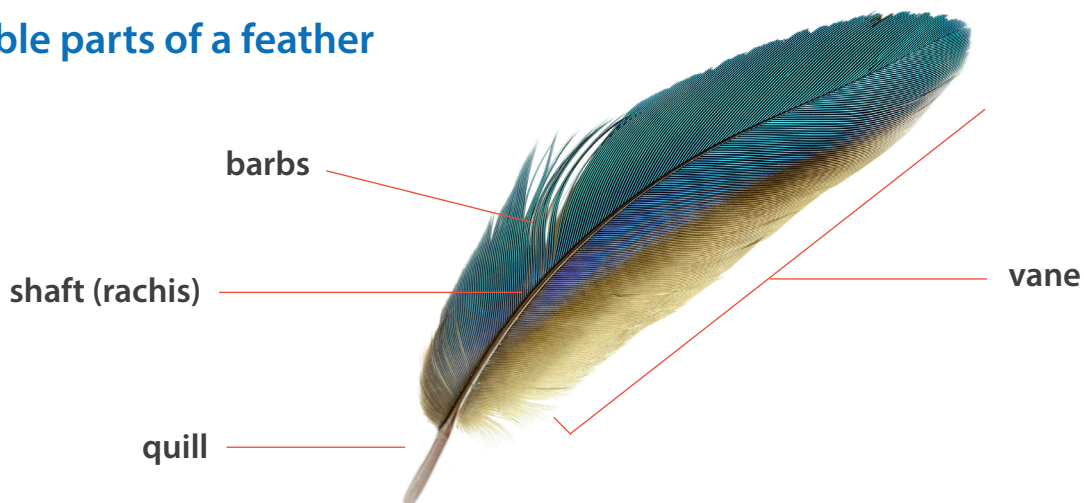
Let's get started!

Step 1: Download the Feather Biology Slide Collection:

<https://academy.allaboutbirds.org/feather-biology-slide-collection/>

Show different types of feathers and ask kids how they think they are of use to birds before handing everyone a feather. Use the Parts of the Feather diagram or share the Feather Biology Slide Collection to have kids examine their feathers and identify the parts. Kids may want to draw their feathers and label their drawings.

Visible parts of a feather



- **Shaft:** base to tip of feather — supports all the other pieces of the feather
- **Quill:** part of the shaft that attaches the feather under the skin
- **Vane:** grows out from the shaft on both sides and contains the barbs
- **Barbs:** grow out of the shaft and contain barbules that hook the parts of the feather together to keep it smooth. You need a magnifying glass to see the barbules.



Activity 2: Fantastic Feathers

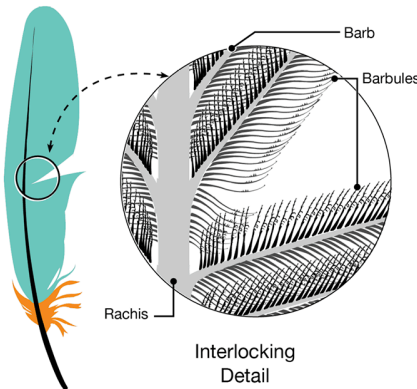
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Types of feathers



(Image via Bird Academy/Cornell Lab of Ornithology)

- **Down feathers:** more delicate feathers that are located beneath the outside feathers and provide insulation for the bird
- **Contour feathers:** the visible feathers that one can see on the bird; they provide the color of the bird and hook together to keep the rain out
- **Flight feathers:** contour feathers of the wing and tail that make it possible for the bird to fly



(Image via Bird Academy/Cornell Lab of Ornithology)

Talk about how the feathers work and why. Encourage them to pull the **barbs** apart — separate the barbs so there are gaps between them. Then have them zip the barbs back together by starting at the bottom and running their fingers up the feather (like zipping up a jacket).

Ask: What’s happening to the feather? How do birds manage this movement?



Activity 2: Fantastic Feathers

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Birds zip up their barbs by using their beaks. In addition to hooking the barbs together again, they add a little waxy, oily coating to the feather. This waxy coating comes from a gland on their rump. Have kids test to see if their feathers still have this coating.

Oil Spill Experiment

Step 1: Have kids lay their feathers on a table and use an eye-dropper to place a few drops of water on the feather. **Check with them:** Does the water bead up? If not, have kids spray just a bit of the baby oil on their feather, then put a few drops of water on the feather again. **Ask:** Does the water bead up now? Why? The baby oil is working in place of the bird's natural oil.

Step 2: Next, have kids dip their feathers into a container of water, then separate the barbs and zip the feather back together. **Check with them:** What happens to the feather? Does it return to its original state? Why or why not?

Step 3: Now, have kids add oil to their container of water, and then drag their feathers through the container. Remove the feathers from the container and have them repeat the process of pulling the barbs apart and zipping them back together. **Check with them:** What happens now? How does this affect the birds' ability to keep dry?

Kids can see that the barbs won't zip when coated in oil.

Oil and other pollutants that birds might encounter when they swim, bathe, migrate, or look for food, coat the barbs and barbules and prevent them from locking together. When barbs can't "zip" up, feathers can't keep water out or keep the bird warm and the bird could drown or have a dangerously low body temperature. Unzipped barbs also affect [aerodynamics](#) of flight feathers, leaving birds unable to fly away.

Step 4: Cleaning the feathers. Have kids conclude by swishing their oily feathers in a container with soapy water to remove the oil, dry the feather and then repeat the separation and zipping up process. **Check with them:** Does it work? Why or why not?

Open up a discussion about what they learned from their experimentation. Encourage kids to share their ideas and concerns.



Activity 2: Fantastic Feathers

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More oil spill activities

Oil Spill! (U.S. Fish & Wildlife Service)

https://www.fws.gov/rachelcarson/toolkit/Environmental_Contaminants/Oil_Spill_activity.pdf

Oil Spill Challenge

<https://www.startwithabook.org/sites/default/files/Oil-Spill-Challenge.pdf>



Bird rehabilitation specialists clean a juvenile brown pelican after a Gulf coast oil spill.
(Public domain photo by Tom MacKenzie, USFWS)



Activity 3: My Bird Journal

Introduction

Journaling gives kids the opportunity to use drawing and writing together to show their observations, document their discoveries, pose questions, note their ideas, and learn to see and hear more. Keeping a bird journal is a great way to get your Bird Buddies outdoors to explore and record their responses to and reflections about the natural world and keep track of what they're learning. Get Bird Buddies' started on their journals with information that will help them identify birds and provide them with some of the words they'll need to record their observations.

Supplies

- Blank spiral notebook or sketchbook (or fold 10 sheets of paper in half and staple along the fold to create a booklet)
- Bird Buddies journal cover (optional)
- Writing tools
- Drawing materials



Get kids thinking ...



Ask: What is a journal? Have you ever kept a journal? Who else might keep a journal? Why?

Talk about how scientists and naturalists keep field notes and journals of their observations and experiments. Writers keep journals of their observations and feelings about people and places.

As Bird Buddies, how do they think they could use a journal?



Activity 3: My Bird Journal

(continued from previous page)

Let's get started!

Step 1: As you pass out blank notebooks, let kids know that their journals can look however they want them to look! Kids can freely draw, write, or add photographs. It can be a place to brainstorm, keep notes and vocabulary words, make lists, sketch, or write poems. Tell them it is their place to write and draw their observations, thoughts, questions, and ideas, and as Bird Buddies, they will have a chance to make all kinds of observations.

Step 2: Make writing and drawing materials available and ask kids to sketch a picture of a bird from memory in their journal. As kids sketch, help them understand that they don't ever have to draw beautiful "perfect" pictures — their journal's best use is to document their observations and draw what they think is important to remember.

Step 3: After they've finished sketching, let kids pair up and compare their bird pictures. Have pairs share what the birds in their drawings have in common and what's different. As a group, chart of all the similarities and differences. From these lists and your discussion, choose words that help you draw a bird and all its key parts for the group. **Ask kids** to help and refer to **Parts of a Bird on page 14** to label your bird's key parts.

Step 4: Have kids add the Parts of a Bird to their journal. Let them know that knowing these parts will help them to better describe, sketch, or even identify the birds they will get to observe. Kids may also want to include some additional notes in their journal about things that could be helpful in identifying or journaling about birds they see, such as noting size or visual field marks — things you can see on the bird, such as wing bars (white bars on the wing), eye-rings (rings around the eyes), patches of color, spots on the breast, leg type, and bill type.

Get them thinking more about how to use their Bird Journals:

Keeping a prompt or series of prompts in your journal can help you get started if you are feeling stuck. Try these sentence starters:

- I see ...
- I hear ...
- I wonder ...
- I was surprised by ...
- I feel ...



Activity 3: My Bird Journal

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When using your journal out in the field, include the date, location, and weather information with each journal entry in order to be able to compare your observations.

When making field observations, answering these questions can help you include detailed descriptions in your journal:

- How does it move?
- What does it sound like?
- What is its habitat? Where does it spend its time?
- Was it alone?
- What is unusual about the way that it looks? Does it have interesting patterns or colors?
- What are its main colors?
- What does it eat?

More journal activities

Wildlife Projects for Kids: Making a Nature Journal (Great Stems)

<http://www.greatstems.com/2013/05/wildlife-projects-for-kids-making-a-nature-journal.html>

How to Teach Nature Journaling (John Muir Laws)

<https://johnmuirlaws.com/product/how-to-teach-nature-journaling/>

Opening the World through Nature Journaling (California Native Plant Society)

<https://www.cnps.org/education/students/parents-teachers/nature-journaling-curriculum-request>

Draw with a Park Ranger: Spotted Owl (Yosemite National Park)

<https://www.nps.gov/yose/planyourvisit/upload/howtodrawanOWL.pdf>

Draw with a Park Ranger: Steller's Jay (Yosemite National Park)

<https://www.nps.gov/yose/planyourvisit/upload/howtodrawaSTELLERSJAY.pdf>

BIRD WALK



Your first Bird Walk should focus on helping kids become active observers.

Talk about where you are taking your Bird Walk and let kids know about common birds in the area by showing them photographs from a field guide, website, or app. Take along pencils and Bird Journals or something for taking notes and drawing pictures and a field guide. You can also bring binoculars, but as many bird behaviors are more readily observed by birding with the naked eye than by detailed analysis through binoculars, you can make this first Bird Walk more about getting to know birds and their habitats.

Get kids planning for when they see their first bird. **Ask:** What birds do they think they might see? What birds would they hope to see? What can they learn by observing?

Tell them when they see their first bird to take their time and take a really good look at it. Have them plan to then write down five or more things about the bird they just saw — the bird's color, patterns, size, shape, sounds, what it was doing, where it is, or anything else they notice, wonder, or imagine about it. Let kids know that making notes like these will help them become better observers and better birders.



Writing About Birds

Diary of a bird

Have kids develop diary entries from a bird's point of view. Ask them to write and draw about their daily life as a bird. Offer as a starting point: You are a bird. How do you know that you are a bird? What kind of bird are you? What does it feel like to fly? What do you see around you? What do you like about being a bird? What do you not like?

Field guide to local birds

Set additional purpose to field journaling by having kids use their observations and journals to develop a field guide to local birds. The information, ideas, and questions they include in their journal notes and drawings will lead to ideas about what to include in a field guide. The more information they collect, the more helpful the field guide will be!

Have kids choose birds from their field journals and do some research about each bird they decide to include in the field guide, such as where it can be found, what it looks like, and how to identify it. Creating a field guide will help kids develop a deeper understanding of local species of birds.

Kids can author and illustrate a guide by themselves or work together, with each contributing at least one species to the guide. You can format the guide as a PDF to easily share digital copies, but also print and bind the guide and let kids put it to use in the field!

Sample field guides:

[Creating a Field Guide to Your Backyard](https://blog.nwf.org/2008/04/creating-a-field-guide-to-your-backyard-part-1/)

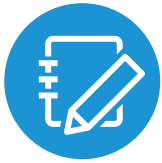
<https://blog.nwf.org/2008/04/creating-a-field-guide-to-your-backyard-part-1/>

[A Natural Integration: Student-created field guides seamlessly combine science and writing](https://web.nmsu.edu/~susanbro/educ451/docs/A_natural_integration.pdf)

https://web.nmsu.edu/~susanbro/educ451/docs/A_natural_integration.pdf

[Molly of Denali Field Guide Family Activity](https://www.pbslearningmedia.org/resource/field-guide-activity-document/a-field-guide-to-birds-molly-of-denali/)

<https://www.pbslearningmedia.org/resource/field-guide-activity-document/a-field-guide-to-birds-molly-of-denali/>



Writing About Birds

Science fiction adventure!

Offer this prompt to kids: Tell the story of a time-traveling bird who wings it back to the Mesozoic Era, meets his or her dinosaur ancestors, and makes an important discovery. Encourage them to do some research to add some historical accuracy to their sci-fi adventure!

Acrostic poem

Have kids write an acrostic poem about a bird of their choice. It can be about their favorite bird or any bird they've seen or been learning about. An acrostic poem is one that uses all the letters in a word or name as the first letter of each line of the poem.

Robin

Red breast

Often feeds on lawns

Bobs along

Insect eater

Nests made of mud

Encourage kids to write an acrostic poem whenever they are enthusiastic about a new bird!



Kid-friendly Digital Media

Websites

Wall of Birds (Cornell Lab's Bird Academy)

<https://academy.allaboutbirds.org/features/wallofbirds/>

Flap to the Future — The Flight Adaptations Game (Cornell Lab's Bird Academy)

<https://academy.allaboutbirds.org/features/flaptothefuture/>

All About Feathers (Cornell Lab's Bird Academy)

<https://academy.allaboutbirds.org/features/all-about-feathers/#what-is-unique-to-birds.php>

The Feather Atlas (U.S. Fish and Wildlife Service)

<https://www.fws.gov/lab/featheratlas/browse.php>

Project Beak

<http://projectbeak.org/>

Educational apps

Merlin (The Cornell Lab)

<https://merlin.allaboutbirds.org/>

The Audubon Bird Guide App (free)

<https://www.audubon.org/app>

Podcasts

Dinosaurs Take Flight! How Birds Evolved To Fly

<https://www.npr.org/2019/05/31/728756629/dinosaurs-take-flight-how-birds-evolved-to-fly>

Kid-friendly Digital Media

Video

Dinosaur Animation: From Dinosaur to Bird

<https://youtu.be/EFkc3Yq2mfs>

Why are birds the only surviving dinosaurs? (The Natural History Museum, U.K.)

<https://www.nhm.ac.uk/discover/why-are-birds-the-only-surviving-dinosaurs.html>

Great Transitions: The Origin of Birds (HHMI BioInteractive)

<https://www.biointeractive.org/classroom-resources/great-transitions-origin-birds>

It's a Bird! It's a Plane! It's a DINOSAUR! (SciShow Kids)

<https://youtu.be/syAwnjoLNV8>

Learn to Draw Birds with David Sibley

<https://www.audubon.org/magazine/summer-2020/learn-draw-birds-david-sibley>