BIRDS
HABITATS & POPULATION TRENDS

Lesson Plan
grades 4-6

Themes
Birds, Habitats, & Protected Areas
Hands On Learning
Inquiry Based Learning

Concepts
Making Observations
Gathering Evidence
Scientific Reasoning
Patterns
Interconnectivity
Stewardship & Sustainability

Learning Outcomes
Learners will:
Analyze avian diversity
Investigate bird population trends and discuss implications for habitat conservation
Expand observations through the use of tools like binoculars

CONTENTS

This lesson plan was written by: Becky Parker, NatureNS Executive Director, with input from: Bob Bancroft, NatureNS President; Andy Horn, Dalhousie University; Amy Mui, Dalhousie University; Marina McBride, NatureNS Education & Outreach Assistant

---

For more on birds and other natural history topics:
www.naturens.ca info@naturens.ca

BACKGROUND

On Migratory & Non-Migratory Birds in Nova Scotia: for the benefit of the educator's understanding and for helping to facilitate class discussion.

This backgrounder serves as a short, high-level introduction to bird form and function covered in our P-3 lesson plan as well as introducing habitat needs and the value of protected areas. The following pages have visual references you can share with students, as well as print-outs and instructions for activities students can do individually or in groups.

WHAT ARE BIRDS?

Birds are feathered theropod dinosaurs. That's right, dinosaurs! Birds are the only dinosaurs still living today! They belong to the evolutionary Class Ornithurae, which belongs to the Clade Theropoda, a branch of Dinosauria, making them not only descended from dinosaurs, but from a taxonomic perspective, dinosaurs themselves. They share many things in common with their dinosaur ancestors, including the ability to walk on two legs, egg-laying, a wishbone, and feathers. Birds have evolved many adaptations that allow them to live in the environments they do, to get around, find mates, and to eat different kinds of food. Some birds have similar anatomies because they are closely related to each other, like goldfinches and purple finches, and some birds have similar anatomies because of convergent evolution (where they develop the same adaptations independently), like hawks and falcons. But, whether adapted for running, swimming, hunting, or hiding, most birds share the same general body plan.

In flying birds, a specialized sternum (or "keel") supports powerful flight muscles. In some non-flying birds, like the penguin, the keel supports swimming muscles. Other non-flying birds, like ostriches and emus, don't have a keel at all. There are no flightless birds in Nova Scotia, though you might find that some seabirds, like the puffin, share some traits with penguins! Many flying birds, like chickadees, have hollow bones, making their skeletal systems light enough for flight, while some diving birds, like puffins, have tough and thick bones that anchor strong swimming muscles.

Birds have the largest eyes relative to their size in the whole animal kingdom! They also have very keen eyesight, thanks partly to a structure called the pecten oculi, partly to their ability change the shape of the lens very quickly, allowing them to switch focus from near to far very quickly, and partly to the flatter shape of their eye, allowing more of their view to be in focus. Forward facing eyes allow hunting birds to calculate distance. Side-positioned eyes allow birds to see more around them.

Bird wings also take many forms. All wings are made up of the same components (primaries, coverts, secondaries, etc) but in different relative sizing. Passive soaring wings have long primary feathers that catch rising warm air. Active soaring wings are long and narrow, good for catching wind currents. Elliptical wings are shorter and thicker, allowing for fast take off and quick maneuvers. High-speed wings are not quite a long as soaring wings and not quite as thick as elliptical wings, allowing for fast flight but also fast maneuvering, especially good for catching

fast prey. Hovering wings are small and light. Hovering birds also typically have specialized muscles allowing them to move their wings rapidly.

Feathers are specialized keratin structures that fulfill a number of needs, from insulation to flight capabilities to showy reproductive displays. They are surprisingly complex, arranged in a branching structure with overlapping segments that give the feather strength and flexibility. Birds also have scales, mostly found on their feet. Ruffed grouse grow specialized scales on the edges of their toes called pectinations that expad the surface area of the foot, acting like snowshoes.

Like many reptiles, birds tend to be uricotelic, meaning their kidneys extract and excrete waste as uric acid instead of urea or ammonia, as in mammals. They do not have bladders or urethras, so uric acid and faeces are expelled together as a semi-solid mass (or “guano”). Did you know that people used to harvest seabird guano for agricultural fertilizer? In fact, we still do in some places! The United States had a guano law that partly prompted the country’s annexation of several Pacific islands, where seabird colonies provided an ample guano supply. Countries have gone to war over bird poop!

BIRD LIFE HISTORIES

In ecology, “life history” refers to an organism's overall strategy for survival and reproduction throughout its life, and usually refers to organism’s at the species level, as a generalization of how all or most individuals behave. It encompasses the traits that influence an organism's development, reproduction, and survival. Essentially, it's the "story" of how an organism lives, from birth to death.

All birds are oviparous, meaning they reproduce by laying eggs outside their bodies. Most birds share the work of raising young, typically with a female staying close to the nest and a male foraging for food for the family. In Red-necked Phalaropes, though, it’s the opposite, and the males tend to the young and the females forage. In some bird species, like hummingbirds, only one parent takes care of a nest and the other parent isn’t involved at all. Some birds will pair with others of the same sex, even raising young from other birds’ nests. Some birds pair for life and some just for the season. Some birds are regular brood parasites, meaning they lay their eggs in other birds’ nests and leave them to be raised by the other bird, even birds of other species! Some bird species are more likely than others to engage in cooperative breeding, where helpers, usually older young, stick around to help raise the youngest birds in the family. Every now and then, researchers will spot an intersexed bird displaying a combination of male and female traits and participating in various roles within their families. The bird world is extremely diverse and fascinating, just like ours!

Songbirds and most seabirds have altricial young, meaning the hatchlings are helpless and dependent on their parents for care. They remain in a nest for some time while their parents feed and protect them. Precocial species, including many ducks and shorebirds, are hatched fully

feathered and mobile and they tend to spend less time in a nest, though their parents may continue to care for them as they learn about their environments.

Some birds live in Nova Scotia all year round. Some birds migrate south in the winter and north in the summer. Many warblers, for example, go South to Central and South America in the winter, while many Arctic-breeding ducks spend their winter vacation along the coasts of "Southerly" Nova Scotia. Some birds migrate only over short distances, either to slightly milder conditions or to inland or coastal locations where there is more food. Common loons in Nova Scotia, for example, spend the winter along the coast and the summer breeding season on inland freshwater lakes. Some species are also partly migratory, with some individuals migrating and some staying in the same area year-round, like the American robin. Climate change is altering these patterns.

The route that many migratory birds take on their Northerly or Southerly trips is called the Atlantic Flyway and it goes as far as Greenland in the North to the tropics of South America. Most birds follow the coast, but some may migrate directly over the ocean, flying hundreds or thousands of kilometres before stopping. The Atlantic Flyway contains important feeding and stopover habitats for migrating birds so it is crucial that the countries the route intersects cooperate with each other to protect birds throughout every life stage.

MONITORING BIRDS

Birds are interesting enough on their own to warrant scientific research, but they're also useful environmental indicators. Birds are ubiquitous throughout the landscape, with many different species occupying different habitats, some with continent-wide ranges, and some have very specialized needs, so observing changes in their populations can tell us something about our shared environments.

Scientists monitor bird populations in many ways. Sometimes researchers track individual birds, using technology like leg bands, tiny GPS units or satellite transmitters, and sometimes researchers monitor specific locations, looking for birds passing through. Motus Stations help researchers study birds carrying miniaturized tags that transmit their location information as they move. There are Motus Stations across Nova Scotia, picking up tagged birds' signals and helping scientists understand bird movements. Learn more about Motus at www.motus.org

Citizens can play an important role in monitoring bird populations by reporting sightings and volunteering on monitoring and stewardship projects. New to bird identification? You might try an app like Merlin, which can help identify birds by sight and sound. You can then report the birds you observe to eBird, where hobby birders and scientists alike keep track of local and global bird populations. Learn more at www.ebird.org

PROTECTING BIRD HABITATS

Bird habitats are protected through a number of legal and procedural processes and at varying levels of government.

The federal government adopted the Kunming-Montreal Global Biodiversity Framework (KMGBF) in December 2022, at the 15th meeting of the Conference of the Parties to the Convention on Biological Diversity (COP15), and with it a set of goals and targets to work towards over the next few years. A major focus of the KMGBF mission is halting and reversing biodiversity loss by 2030 and restoring biological diversity levels by 2050. Canada's goals within the GBF include protecting 30% of lands and waters by 2030, respecting the rights and roles of Indigenous peoples, and addressing key drivers of biodiversity loss.

The Important Bird and Biodiversity Areas Program is a global initiative to conserve birds and their habitats, predating the KMGBF. Important Bird Areas (IBAs) play a critical role in national bird conservation efforts, encouraging legal protections, habitat stewardship, and promoting nature appreciation. IBAs are not legally protected in their own right, but, because they are vital for the conservation of many species, many IBAs do contain formal protected areas and infrastructure for public education, so they are important for achieving the goals of the KMGBF. View them online at: www.ibacanada.com

An older key conservation area-identifying effort, the Ramsar Convention, binds Canada and all other signed parties to work towards the wise use of all their wetlands through national land-use planning, appropriate policies and legislation, management actions, and public education. It was adopted as the first of the modern global nature conservation conventions and, today, is a highly regarded and active multilateral environmental agreement. Canada joined the Convention in 1981 and has had made strides in peatlands and carbon conservation, grasslands wetland restoration, economic valuation, and resolving mitigation issues in the time since. Canada has designated 37 Wetlands of International Importance (Ramsar sites) under the Convention, 3 of which are in Nova Scotia: the Musquodoboit Harbour Outer Estuary, Southern Bight-Minas Basin, and the Chignecto National Wildlife Area. Like IBAs, Ramsar sites aren't necessarily given legal protections but do tend to contain national, provincial, or other formal protected areas.

The protected areas system in Nova Scotia includes National Parks, National Wildlife Areas, Migratory Bird Sanctuaries, Provincial Parks, Wilderness Areas, Nature Reserves, and private Conservation Lands stewarded by land trusts. Each of these areas has a legal status as a protected area and receive varying levels of protection from development and human use that could threaten birds and other wildlife. You can explore protected areas in Nova Scotia using the province's online viewer at: www.novascotia.ca/parksandprotectedareas/plan/interactive-map

In Canada, a law called the Species At Risk Act (SARA) requires the federal government to study and protect species that committees of scientists consider to be at risk of extinction. Nova Scotia also has a provincial law called the Endangered Species Act (ESA) which mandates government to create reports outlining our current understanding of these rare species and to make plans for how we can all work together to save them. These laws also prohibit anyone from harming listed species at risk or their habitats. In addition to the ESA, bird populations in Canada and Nova Scotia are supported by several long-standing protections, including the federal Migratory Birds Convention Act, which safeguards migratory birds and their nests, and provincial laws such as the Wildlife Act and Beaches Act, which help conserve important habitats. Under both SARA and the ESA, Critical (also called "Core) Habitat must be identified for listed Species At Risk. This habitat is considered crucial for species recovery but, to date, no regulations or orders protecting species at risk critical habitat have ever been issued under the Nova Scotia ESA. As more species are listed under SARA and federal and provincial processes for protecting rare species are increasingly criticized, consensus has emerged on the need for a prioritized, multi-species, stewardship-based approach to better focus on recovery outcomes and undertake needed actions in an effective and timely manner. The federal government, provinces and territories, Indigenous Peoples, and other conservation partners have been working together to implement this approach, called the Pan-Canadian Approach, since 2018, concentrated on priority places, species, and sectors. Eleven priority places have been established that are hotspots for species at risk, one of which is located in Nova Scotia: Kespukwitk / Southwest Nova Scotia. You can learn more about these priority places and species at https://environmental-maps.canada.ca/CWS_Storylines/index-ca-en.html#/en/priority_places-lieux_prioritaires

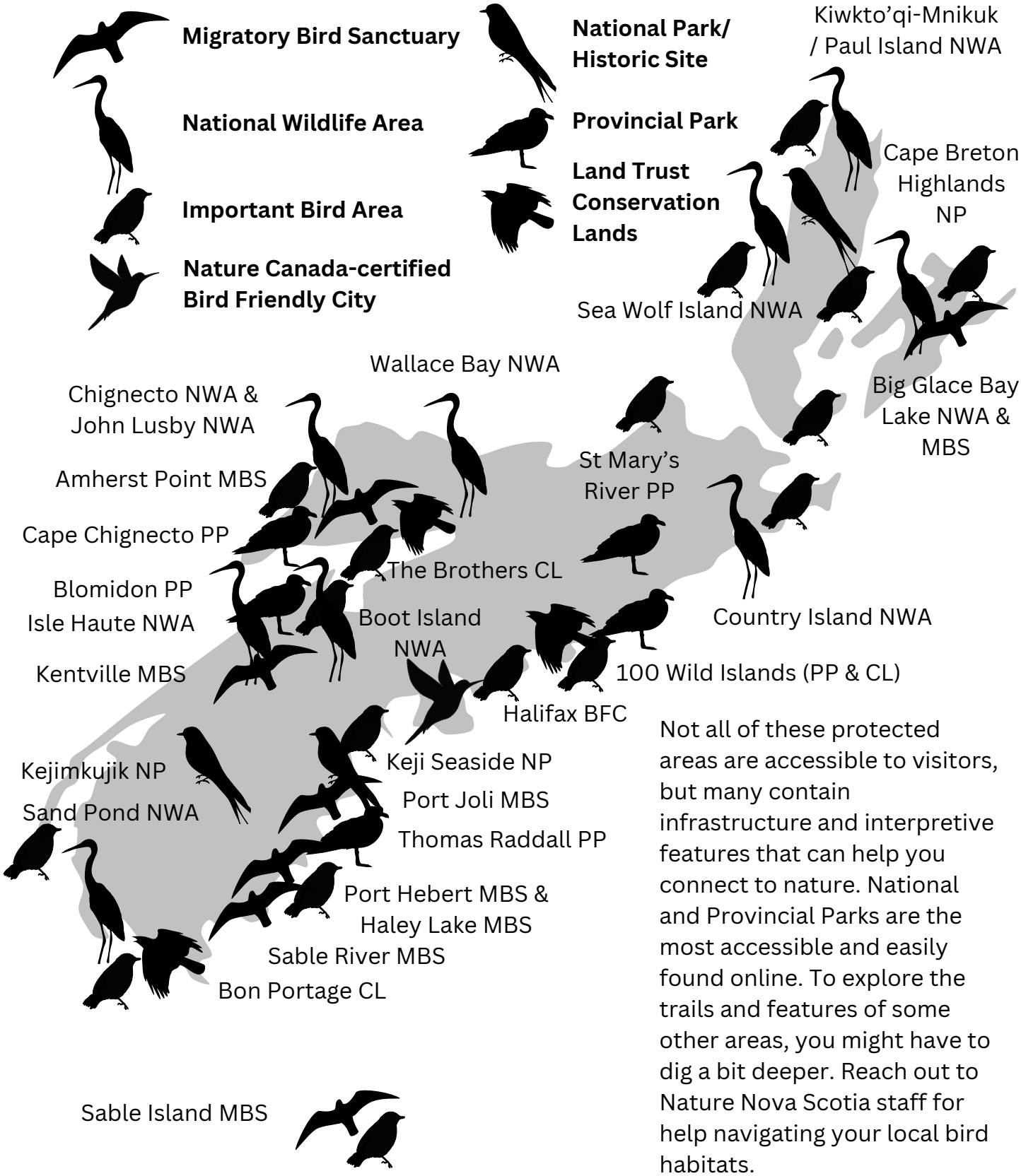
SPOTLIGHT ON NATIONAL WILDLIFE AREAS & MIGRATORY BIRD SANCTUARIES

Environment and Climate Change Canada (ECCC) establishes National Wildlife Areas under the authority of the Canada Wildlife Act and Migratory Birds Sanctuaries (MBS) under the Migratory Birds Convention Act. National Wildlife Areas (NWAs) are created and managed for the purposes of wildlife conservation, research, and interpretation and selected based on a combination of factors related to their unique biodiversity, habitats supporting large proportions of a species' population in Canada, and/or for cultural heritage. Migratory Bird Sanctuaries (MBSs) provide similar refuge for migratory birds in terrestrial and marine environments. The Canadian Wildlife Service is the agency responsible for NWAs and MBSs, although the sanctuaries can be located on federal, provincial or private land, and they are often stewarded by local community and conservation groups. We're lucky to have 10 NWAs and 8 MBS in Nova Scotia. Did you know that, altogether, the Port Joli, Port L'Hebert, and Sable River MBSs in Kespukwitk/Southwest Nova Scotia support 4,000 - 5,000+ Canada geese each year; over 40% of the birds of this species that spend the winter in the Atlantic Provinces! American black ducks are also present in large numbers during the fall and winter months, when they are attracted to the rich eelgrass beds, sometimes exceeding 1,000 birds!

BIRD MAP

Nova Scotia is located on unceded Mi'kmaq territory. Mi'kma'ki is part of the Dawnlands, or Wabanaki, a name given to the broader North East at least by the time of the Wabanaki Confederacy.

Nova Scotia contains some great bird habitats! Here are just a few places the birds in this book call home:

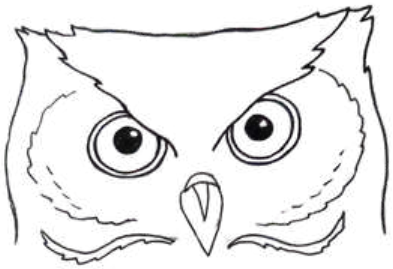


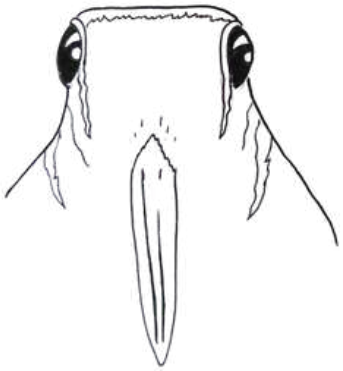
Not all of these protected areas are accessible to visitors, but many contain infrastructure and interpretive features that can help you connect to nature. National and Provincial Parks are the most accessible and easily found online. To explore the trails and features of some other areas, you might have to dig a bit deeper. Reach out to Nature Nova Scotia staff for help navigating your local bird habitats.

REFERENCE IMAGES

Diversity in Bird Eyes

Great Horned Owl



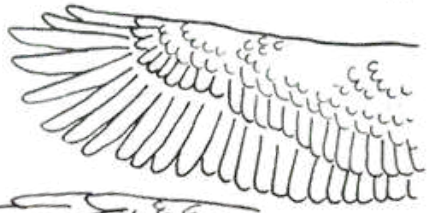


American Woodcock

Wings

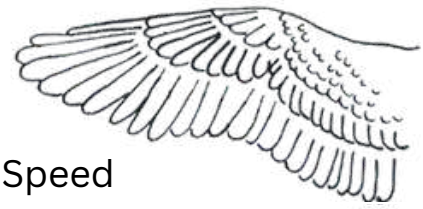
Passive Soaring

Active Soaring



Elliptical

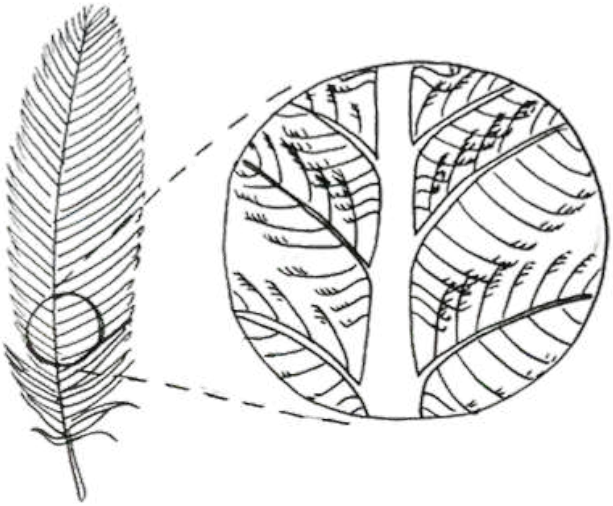
High-Speed



Hovering

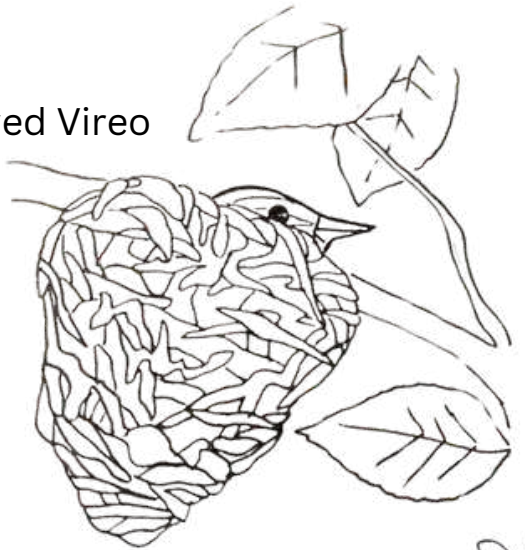
Scales

Feathers



Nests

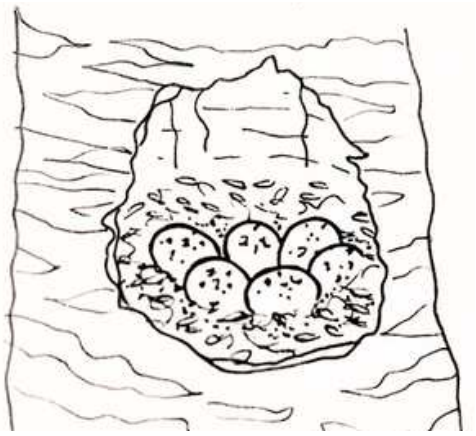
Red-eyed Vireo



Goldfinch

Barn Swallow

Black-capped Chickadee



Winter Residents

Goldfinch

Red Knot

Harlequin Duck

Black-capped Chickaee

Birds in Nova Scotia all year long

The Atlantic Flyway

Blackpoll Warbler

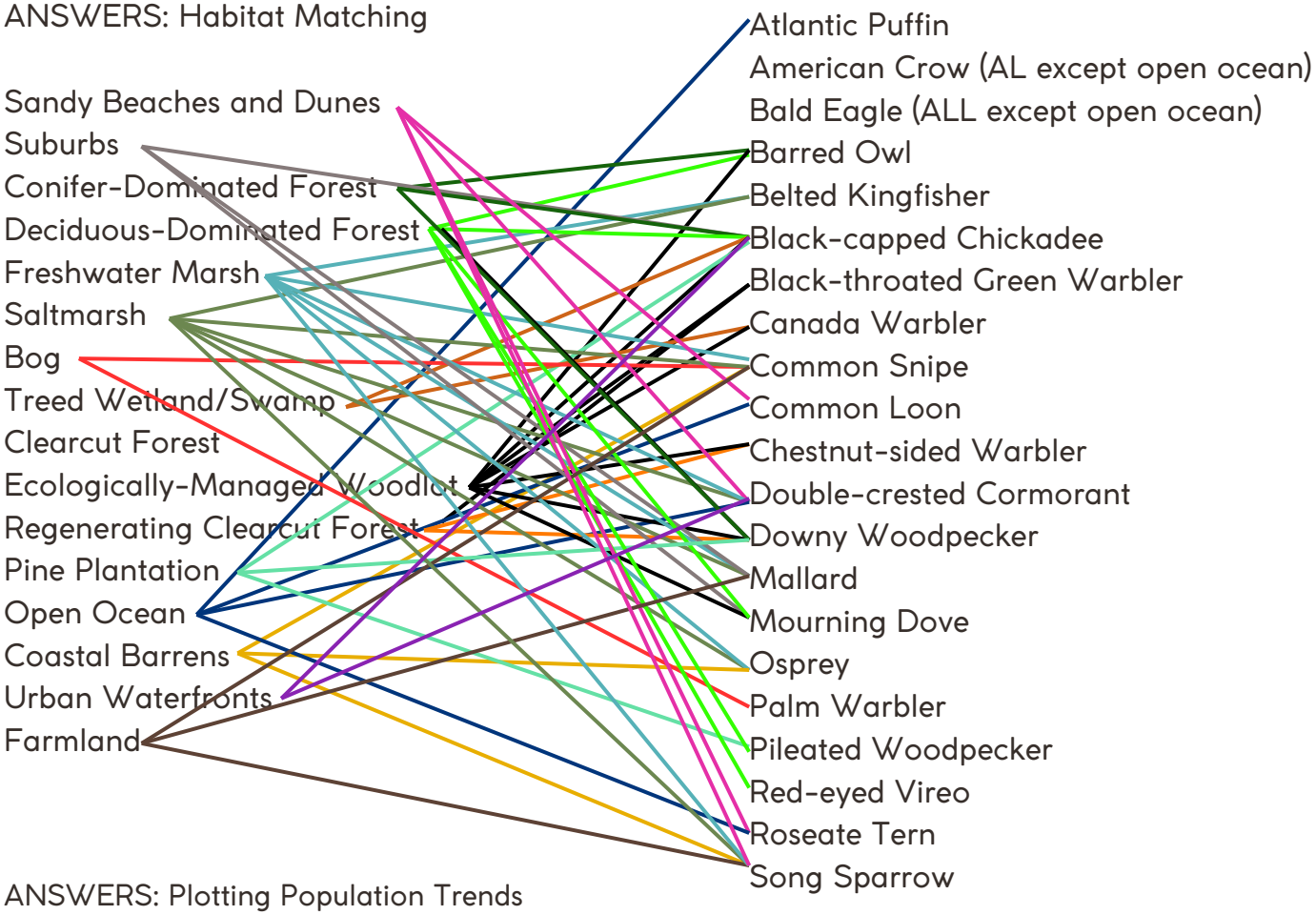
Canada Warbler

Piping Plover

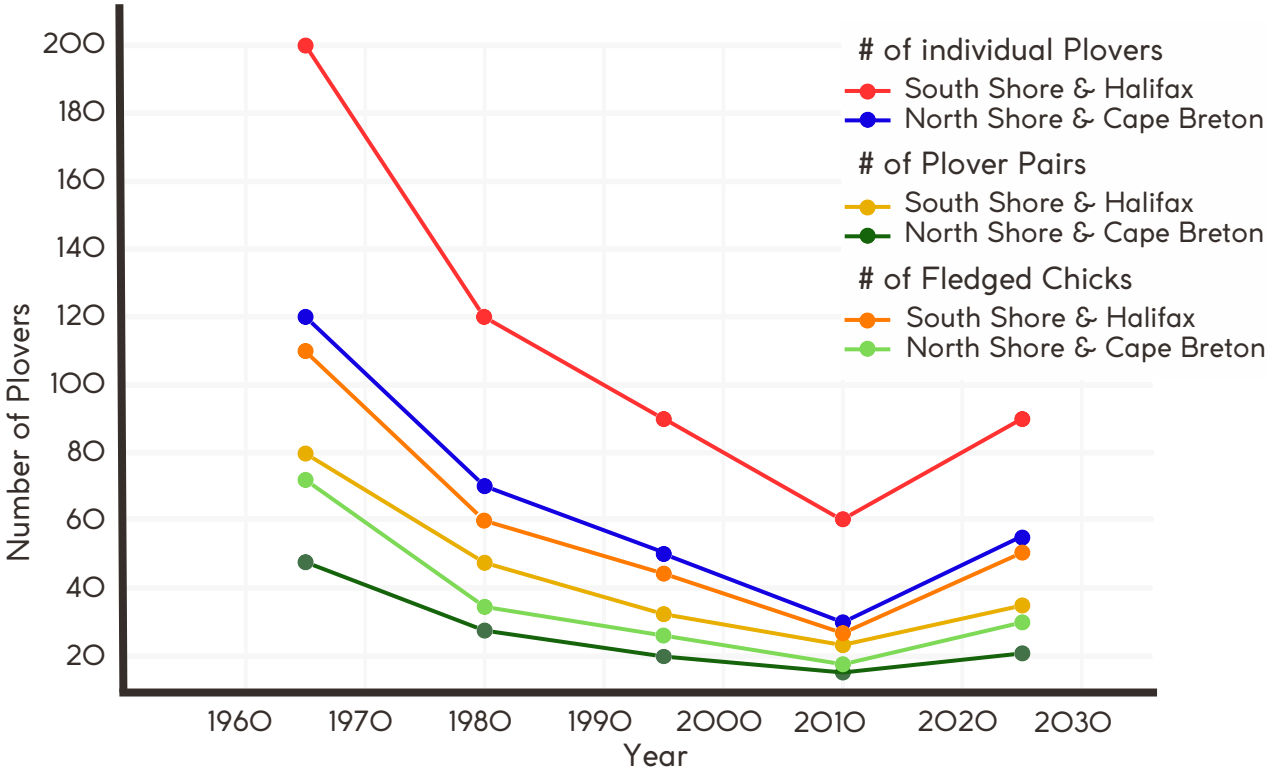
Summer Residents

ANSWERS TO ACTIVITIES AND WORKSHEETS

ANSWERS: Habitat Matching



ANSWERS: Plotting Population Trends



ANSWERS: Species At Risk Case Studies

SPECIES	What is the current federal (SARA) status listing for this species?	What is the current provincial (ESA) status listing?	What are this bird's habitat needs?	What are the species' main threats?	Where in Nova Scotia can prime habitat for this bird be found? Are those areas formally protected?
Roseate Tern 	Endangered	Endangered	Sandy barrier islands, on rocky islands, and occasionally on islands or hummocks in saltmarshes	Predation by fox, mink, and gulls, climate change, and habitat degradation due to human development	Roseate terns currently breed at 3 sites in Canada, all 3 of which are in Nova Scotia: North Brother Island (NWA), Country Island (Private Conservation Lands), and Sable Island (National Park)
Red Knot 	Endangered	Endangered	Mudflats, especially in the Bay of Fundy, and Saltmarshes	Overharvesting of horseshoe crab prey in United States, climate change, and habitat degradation due to human develpment	Large mudflats and beaches with lots of food: Minas Basin, South Shore, Chezzetcook-Musquodoboit, SE Cape Breton. Some of these areas contain formal protected areas
Peregrine Falcon 	Not At Risk	Vulnerable	Cliffsides and open hunting grounds, especially in the Bay of Fundy. Some find success nesting in urban skyscrapers	Ongoing lasting effects of DDT, even after the ban. Possibly other chemical pollutants as well	Areas where there are cliffs and open hunting grounds such as mudflats, marshes, backlands, etc: Annapolis Valley, Halifax

For additional context to possible student answers, see species Status Reports and Recovery Plans at:
Federal: https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html
Provincial: https://novascotia.ca/natr/wildlife/species-at-risk/

ACTIVITY
HABITAT MATCHING

Print the habitat images on the following pages and erect them around the room, or reproduce them in whatever way works for your class, print out and cut out the species photos, then work together to place each species in the best representative habitat type. If students aren't familiar with these birds already, you could start the activity with individual or group-led information seeking to determine each species' habitat needs. After all the species have found a home, ask students why they think that habitat was the best choice. Some species may be suited to more than one habitat type, or perhaps the habitat options given are too simplistic or generalized to confidently place a species You can print more than one copy of each species if you like. Use uncertainty as an opportunity for group discussion.

Go further! Leave the habitats and bird species up for a while. Divide students into teams or have them work individually to provide a list of current threats to each habitat type. Have students or teams present to the class on their findings and, as a group, discuss ways that each of us might make a difference and better protect those habitats and the birds that depend on them.

Provide research prompts such as:
How much beach is under private vs public ownership in Nova Scotia?
How much old forest is left in Nova Scotia?
How much forest is clearcut every year? What sources did you use and can you trust them to be accurate?
How much wetland area has been lost? Are we still losing wetlands?
How might threats differ between urban environments and rural environments?
How has the amount or quality of bird habitat changed in Nova Scotia over time, and what factors have caused these changes?

Belted Kingfisher

Mourning Dove

Red-eyed Vireo

American Crow

Roseate Tern

Canada Warbler

Mallard

Double-crested Cormorant

Bald Eagle

Barred Owl

Song Sparrow

Pileated Woodpecker

Black-capped Chickadee

Common Loon

Atlantic Puffin

Palm Warbler

Common Snipe

Osprey

Black-throated Green Warbler

Chestnut-sided Warbler

Downy Woodpecker

SANDY BEACHES AND DUNES

SUBURBS


CONIFER-DOMINATED FOREST


DECIDUOUS-DOMINATED FOREST

FRESHWATER MARSH

SALTMARSH


BOG


TREED WETLAND/SWAMP


FRESHLY CLEARCUT FOREST


ECOLOGICALLY-MANAGED WOODLOT


REGENERATING CLEARCUT FOREST


PINE PLANTATION


OPEN OCEAN


COASTAL BARRENS

URBAN WATERFRONTS

FARMLAND

WORKSHEET

PLOTTING POPULATION TRENDS

The Piping Plover is Endangered in Nova Scotia. Use the data below to plot a population trend chart for the species. These numbers are simulated and do not represent real data, but they reflect the true population trend.

YEAR	# INDIVIDUAL PLOVERS		# PLOVER PAIRS		# FLEDGED CHICKS	
	SOUTH SHORE & HALIFAX	NORTH SHORE & CAPE BRETON	SOUTH SHORE & HALIFAX	NORTH SHORE & CAPE BRETON	SOUTH SHORE & HALIFAX	NORTH SHORE & CAPE BRETON
1965	200	120	80	48	110	72
1980	120	70	48	28	60	35
1995	90	50	36	20	45	25
2010	60	30	24	12	26	15
2025	90	55	36	22	50	30

WORKSHEET

SPECIES AT RISK CASE STUDIES

Let's learn about a few bird species at risk! Individually or in your teams, find and record the missing information below. Be sure to list your sources. When you're done we'll share our findings.

SPECIES	What is the current federal (SARA) status listing for this species?	What is the current provincial (ESA) status listing?	What are this bird's habitat needs?	What are the species' main threats?	Where in Nova Scotia can prime habitat for this bird be found? Are those areas formally protected?

Roseate Tern

Red Knot

Peregrine Falcon

ACTIVITY

HABITAT MAPPING CHALLENGE

Map your own habitat! Instruct students to think about their school or home and direct them through the following scenarios. What does this place give you that you need? Shelter from the elements, food, a place to grow up and learn? Draw a floor plan including all the areas you use as part of a normal day (or as part of your "life history") They should label the places they eat, sleep, play, learn, or do anything else they think is a normal part of the day.

Now, just for fun, let's imagine a border wall divides the house/school in half. How does that affect their daily lives? Now, a wind turbine has popped up in a hallway! How does that change things? It's getting hotter every year, and your fridge stops working. Now what? Then, a storm blows the roof off (instruct some students, maybe one row of desks, to crumble up their paper). Where do you go? Your neighbours let you move in with them (instruct some students to "move in" with the student next to them, share a desk), but it's getting crowded and you start to fight. Then another storm comes, and you both have to move (instruct both students to move another desk over and join a third student). Is there enough food in the fridge for all of you?

TAKE ACTION

BIRD FRIENDLY GARDEN DESIGN CHALLENGE

Some birds have adapted to living in cities, some birds like edge habitats like the borders of clearings, and some birds need large remote areas undisturbed by humans. You can foster bird habitat at school by leaving dead standing trees, creating brush piles, planting native flowers, fruits, and nut trees, and making sure there are lots of vertical layers to your garden.

Have students work individually or in groups researching bird-friendly garden design principles. When their research is complete, have them draw a birds-eye-view plan for a garden, labelling the species used and other features they feel are important. Can you get permission from school to make the garden real?

See https://www.birdscanada.org/you-can-help/bird-gardens for more on bird-friendly garden design and https://www.td.com/ca/en/about-td/ready-commitment/funding/fef-grant for information about school greening grants.

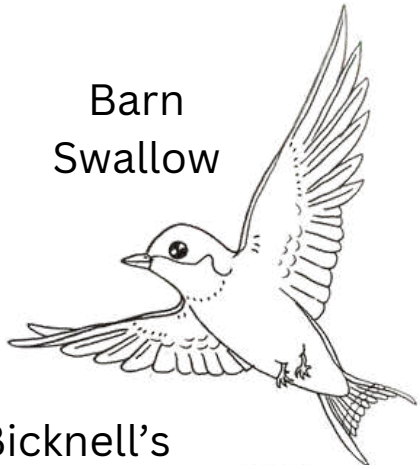
Has your garden become real? Let us know! Contact Nature Nova Scotia staff at info@naturens.ca

COLOURING SHEET

BIRDS AT RISK

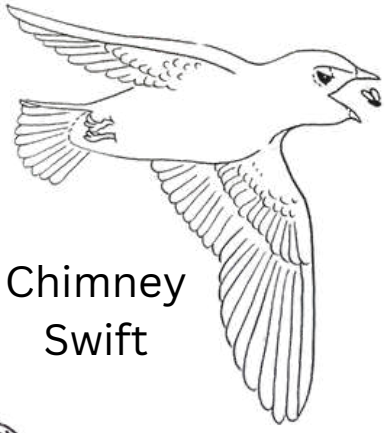
Nature NOVA SCOTIA

Colour the bird species at risk. Talk about these birds with your teacher and friends. What can you do at school or home to help these species?



Barn Swallow

Bank Swallow

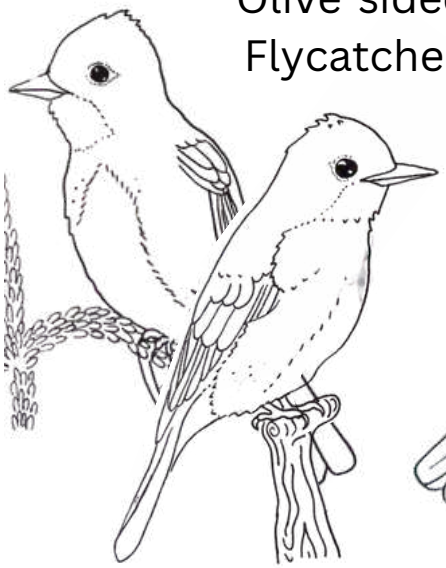


Chimney Swift

Bicknell's Thrush

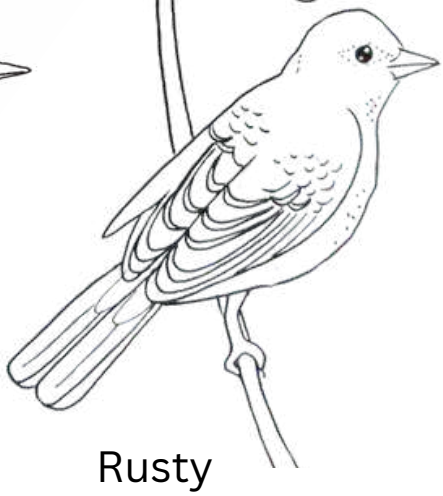
Bobolink

Canada Wabler

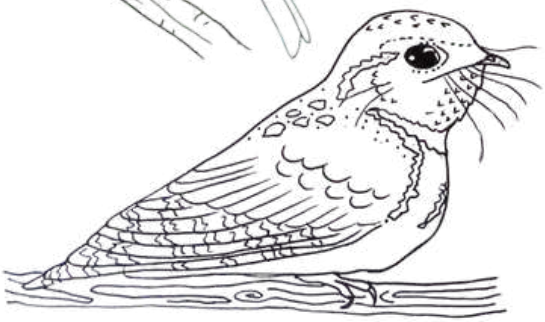


Olive-sided Flycatcher

Evening Grosbeak



Rusty Blackbird



Eastern Wood Pewee

Eastern Whip-poor-will

TAKE ACTION

FEEDERWATCH

Project FeederWatch is a joint research and education project of Birds Canada and the Cornell Lab of Ornithology that relies on volunteer observations to collect data on bird numbers over the winter feeder season (November 1 through April 30 each year.) Participants identify and count the birds they see at their feeders, and submit bird observations to Project FeederWatch. Your bird counts help keep track of birds at your own feeders, and help scientists track long-term trends in bird distribution and abundance.

If your school doesn't already have one, get a bird feeder you can place in a central, easy to access location that isn't dangerous for the birds (not too close to a window, not in an area with lots of outdoor cats, etc) Make sure you're following good bird feeder stewardship practices, cleaning the feeder regularly and taking it down in the warm season to avoid the risk of spreading diseases between birds. Then sign up for Feederwatch and report your students' seasonal observations to Birds Canada! Learn more at https://www.birdscanada.org/discover-birds/bird-friendly-schools/citizen-science-at-school

SEND BIRD ART TO YOUR MP, MLA, OR COUNCILOR

Members of Parliament, Legislative Assembly, and City/Town Council can take your concerns and desires for birds to the departments, committees, and other places they need to go to achieve action. Instruct students to choose a bird they learned about recently and draw a picture of it. Include features from it's habitat or life history, like where it lives, what it eats, etc. Mail your artwork to your decision maker with a thank you note for what they've done already for birds and a request to do more. For example, you might write to your MP to thank them for the federal governments' adoption of the KMGBF Framework and a reminder that they have committed to protecting 30% of land and water in Canada by 2030. You can write individual letters or one letter from the whole class. Here's an example letter addressed to your MP.

"Honourable [name],

My name is [name] and I am a [grade] student at [school]. I just learned about the Kunming-Montreal Global Biodiversity Framework and Canada's commitment to protecting 30% of lands and waters by 2030. I also just learned about [bird]. Did you know they [cool bird fact]? The Protected Areas System in Nova Scotia is important for protecting the [bird] so I wanted to thank you for Canada's commitment to further land protections in Nova Scotia and to tell you that I hope you will meet this important goal.

Sincerely, [name]"