Case Study:

SHOREBIRDS OF THE FRASER RIVER ESTUARY

Motus Wildlife Tracking System

PHOTO: DAVID BRADLEY

OISEAUX CANADA BIRDS CANADA

SHOREBIRDS

Shorebirds are a diverse group of birds classified together in the Order Charadriiformes, which include sandpipers, plovers, yellowlegs, avocets, turnstones and snipes.

There are more than 80 species of shorebirds in the America's. They characteristically share long bills for probing and feeding, long pointed wings for fast flight, long legs for walking in wet habitats and a mottled plumage for camouflage.

Shorebirds generally select habitats near water, such as shorelines, wetlands, estuaries and intertidal regions to feed on a variety of aquatic invertebrates and biofilm.

SANDERLING (JADEN BARNEY)

SEMIPALMATED SANDPIPERS (JADEN BARNEY)

Many shorebirds are migratory, moving between breeding and non-breeding (winter) habitats.

Migration is timed with the seasons, and the availability and abundance of food. They feed on a variety of nutrient-rich invertebrates, small crustaceans and mollusks, and biofilm. This resource supports the energy required for long flights and reproduction.

Migrating shorebirds will often stop in specific locations for safe rest and abundant, nutrient-rich food. They often congregate in large flocks, protecting each other from predation during the rest stop.

Shorebird murmuration at Sonoma Creek Marsh (Audubon California): https://youtu.be/_JWitLWXOAU

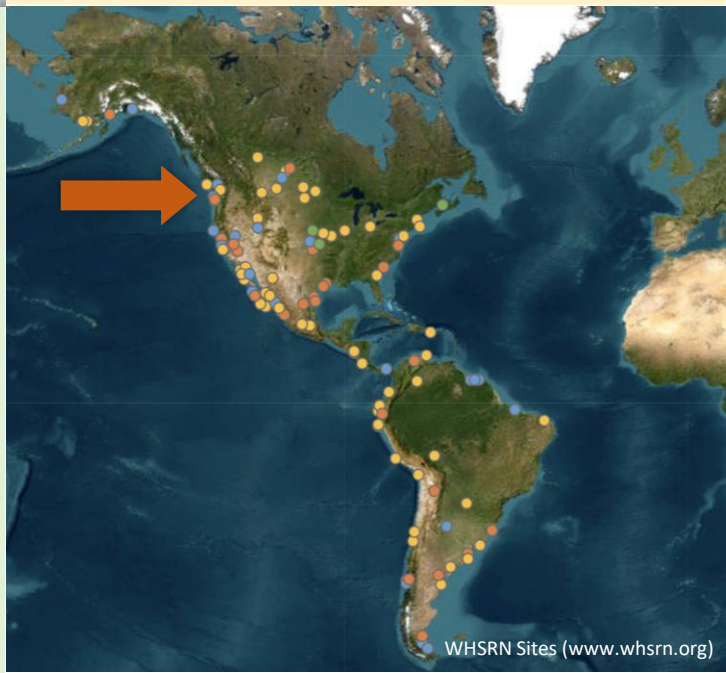
Shorebird populations have declined 40% since 1970. To help conserve shorebirds, many organizations are working together to protect the important habitats and stopover sites that shorebirds depend on. These sites support a significant number of birds from the population, and together form a network of stopover habitats that connect the wintering area to the breeding habitats.

This Case Study explores an important shorebird stopover site located at the Fraser River Delta in British Columbia, Canada.

WHSRN
WESTERN HEMISPHERE SHOREBIRD RESERVE NETWORK

KBA
KEY BIODIVERSITY AREAS

nabci
North American Bird Conservation Initiative



WHSRN Sites (www.whsrn.org)

WHY CONSERVE THE FRASER RIVER DELTA?

Why conserve the Fraser River Delta?

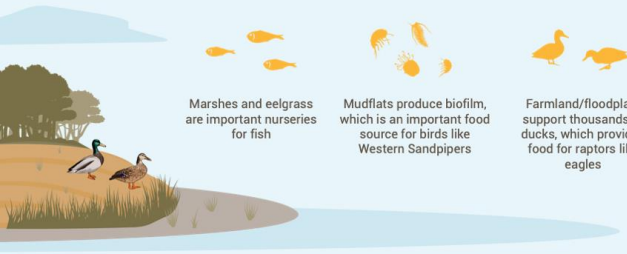
1.7 million waterbirds
use the delta annually.

A key site for birds in the western hemisphere

One of **Canada's** premier places for birds
Over 90,000 birders visit the delta annually.

Traditional home for **Coast Salish** people
who have utilized the natural abundance of the delta to support their communities and culture for millennia.

The delta provides food and shelter necessary for birdlife, livelihoods, and culture.



Marshes and eelgrass are important nurseries for fish

Mudflats produce biofilm, which is an important food source for birds like Western Sandpipers

Farmland/floodplain support thousands of ducks, which provides food for raptors like eagles

Development pressure poses challenges to sustain birds for the future

The ecology of the Fraser River Delta is being challenged by industrial and urban developments, and from climate change driven sea level rise. We need to address these challenges to benefit wildlife and people that live in this area.

Vision for the future

Thanks to pro-active initiatives in farmland stewardship, habitat protection and contaminant controls, many species of birds on the Fraser River Delta have fared well since 1987, **but nearly 70 species need our help.**

We need to **unite under a common vision for the Fraser River Delta to preserve nature, livelihoods and cultures.** Read our paper for a full list of recommendations.
https://bcbirds.bcfo.ca/special-issue/

BIRDS CANADA / OISEAUX CANADA
Pacific WildLife Foundation

Robert W. Butler, David W. Bradley and James Casey. The status, ecology and conservation of internationally important bird populations on the Fraser River Delta, Canada.

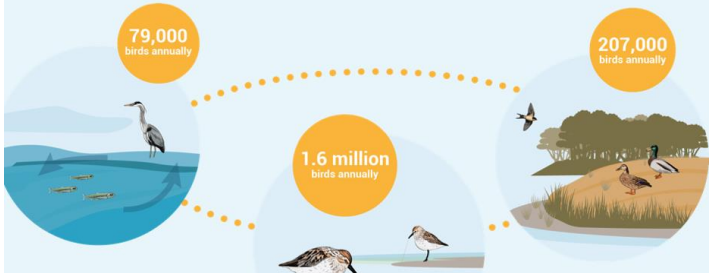
Designed by Alice Sun

Managing the Fraser Delta for birdlife, livelihoods, and culture

For long-term conservation of the Delta, we need to understand how the estuary benefits birdlife and our communities. Here's what we found:

Ecological processes lead to a functioning estuary

The delta is interconnected via a large food web. Maintaining the ecological processes supporting this food web can help us conserve the delta for the future.



ESTUARINE WATERS
Healthy estuarine waters support abundant small fish here to feed and reproduce, providing food for fish-eating birds.

INTERTIDAL FLATS
Eelgrass meadows, biofilm, and marshes provide an important food source for many migratory birds.

FLOODPLAIN
Managed farmlands support waterfowl, which benefits predators, recreation, and culture. Upland forests also provide food for many at-risk species.

Current conservation initiatives only partially protect the ecological functions of the delta.

Thanks to pro-active initiatives in farmland stewardship, habitat protection and contaminant controls, many species of floodplain birds on the Fraser River Delta have fared well since 1987. However, demands to develop the delta potentially threaten to uncouple the hard won conservation efforts.

Vision for the future

We recommend a partnership be established to guide use of the delta to ensure birds are conserved for economic, social and cultural values. Read our paper for a full list of recommendations.
https://bcbirds.bcfo.ca/special-issue/

BIRDS CANADA / OISEAUX CANADA
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RESEARCH IN FOCUS:

Adapted from Motus Wildlife Tracking System Projects:
Fraser Estuary Overwintering Shorebirds (#349)
Pacific Shorebirds (#191)

Tracking movements of shorebirds in the Fraser Estuary

The Fraser River Estuary is the largest estuary on the Pacific Coast of North America and is an important stopover site for many species of migrating shorebirds. This research aims to understand when and how shorebirds are using the estuary to help conserve and protect the important habitat from natural and human-related threats.

SCIENCE GOALS:

- Determine stopover locations, and arrival and departure dates
- Estimate the length of stay during migration
- Understand intertidal habitat use

METHODS:

To study shorebird movements, scientists catch the birds using a 'mist-netting' technique. A series of vertical nets are installed on the mudflats at low tide before dusk. The birds are unable to see the nets in the dark as they move around. Once captured, the birds are quickly and safely removed from the net and tagged before being released:.

1. Measurements of each bird are collected: wing cord, culmen length, tarsus length, fat and weight.
2. A white flag with a unique number is attached to the leg. This visual tag can be re-sighted by observers to determine individual birds.
3. A battery-powered nanotag is glued to feather stubble on the back of the bird. The tag will emit a unique signal, which can be detected by the radio antennas across the landscape. This radio transmitter helps scientists track daily movements and habitat use.


REMI TORRENTA


YOUSSIF ATTIA


EVE FERNANDEZ

Birds Canada: Tagging Dunlin (03:23) https://youtu.be/rw3BUvXRztQ

WESTERN SANDPIPER

LATIN: *Calidris mauri*
FRENCH: Bécasseau d'Alaska
SPANISH: Correlimos de Alaska

BREEDING

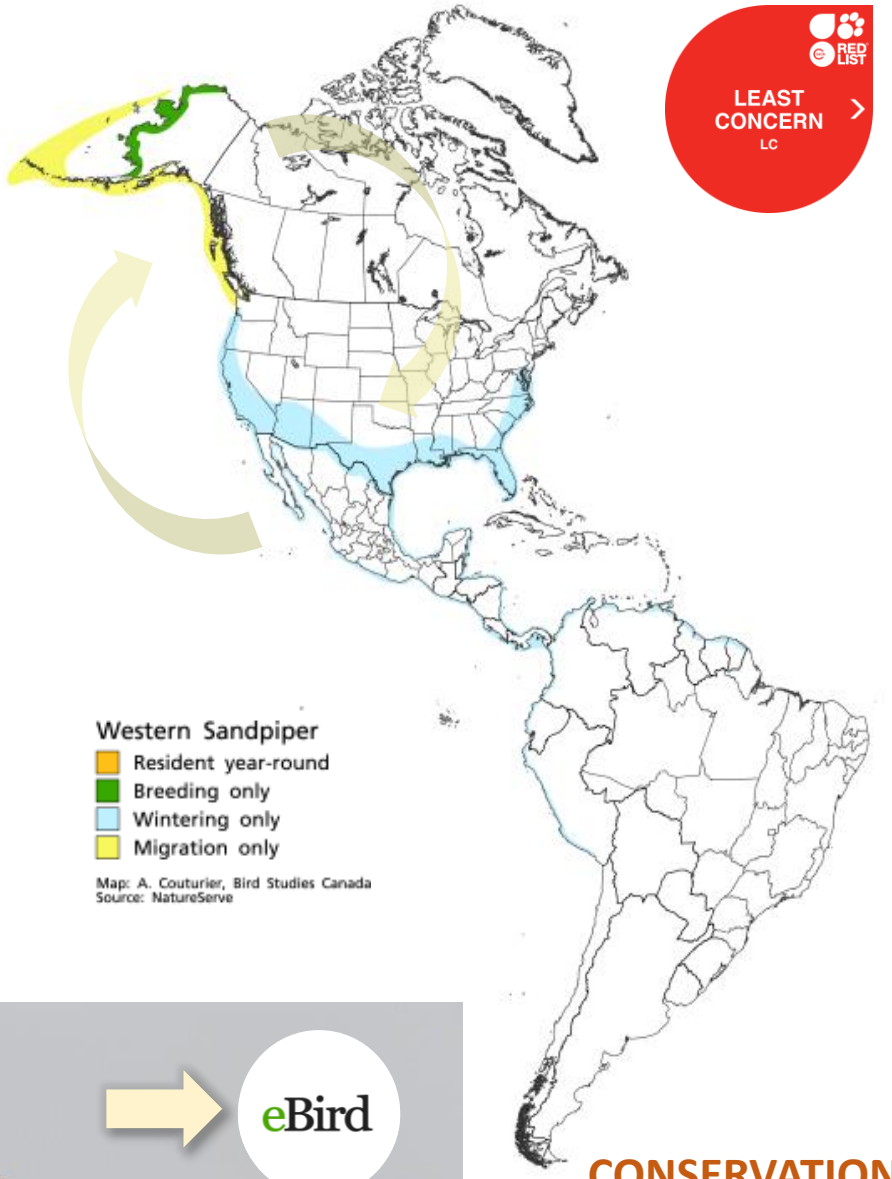
Western Sandpipers breed in coastal tundra habitats of Alaska. Males sing and perform display flights to attract a mate, and build shallow nests on the ground under low shrubs. Four eggs are incubated for 21 days. The young birds leave the nest a few hours after hatch, foraging for insects and spiders.

MIGRATION

Western Sandpipers make a series of stopovers along the Pacific coast. These sites have important food reserves needed to fuel the long migration. The birds can be seen probing the mud to feed on small invertebrates and biofilm.

NON-BREEDING

Western Sandpipers overwinter in coastal or wetland regions of the US, Mexico and South America, feeding on insects, crustaceans and molluscs.



RED LIST
LEAST CONCERN
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CONSERVATION

Western Sandpiper's are the smallest shorebird in the Sandpiper family. Currently, the IUCN conservation status is Least Concern, despite declining populations worldwide. Threats include:

- *Loss of stopover habitat*
- *Unregulated hunting of wintering populations*
- *Loss of wetland habitats*

DUNLIN

LATIN: *Calidris alpina*
FRENCH: Bécasseau variable
SPANISH: Correlimos Común

BREEDING

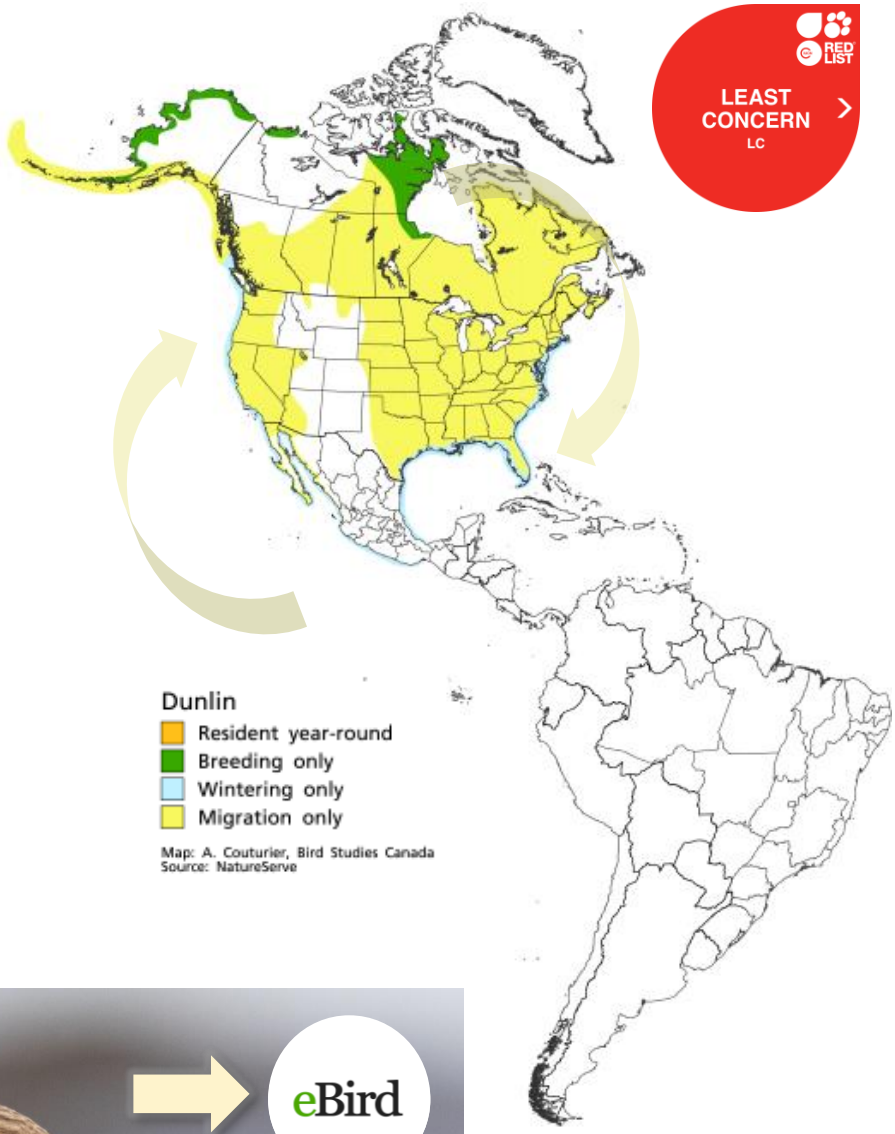
Dunlin breed in coastal tundra habitats across arctic regions of Canada and US. Males trill and display over breeding territory to attract a mate. The ground nest is well camouflaged with leaves and grass. Males and females alternate incubating 4 olive green eggs for nearly 3 weeks. Females depart after the eggs hatch. The young birds forage for insects in the tundra, and small invertebrates in intertidal habitats.

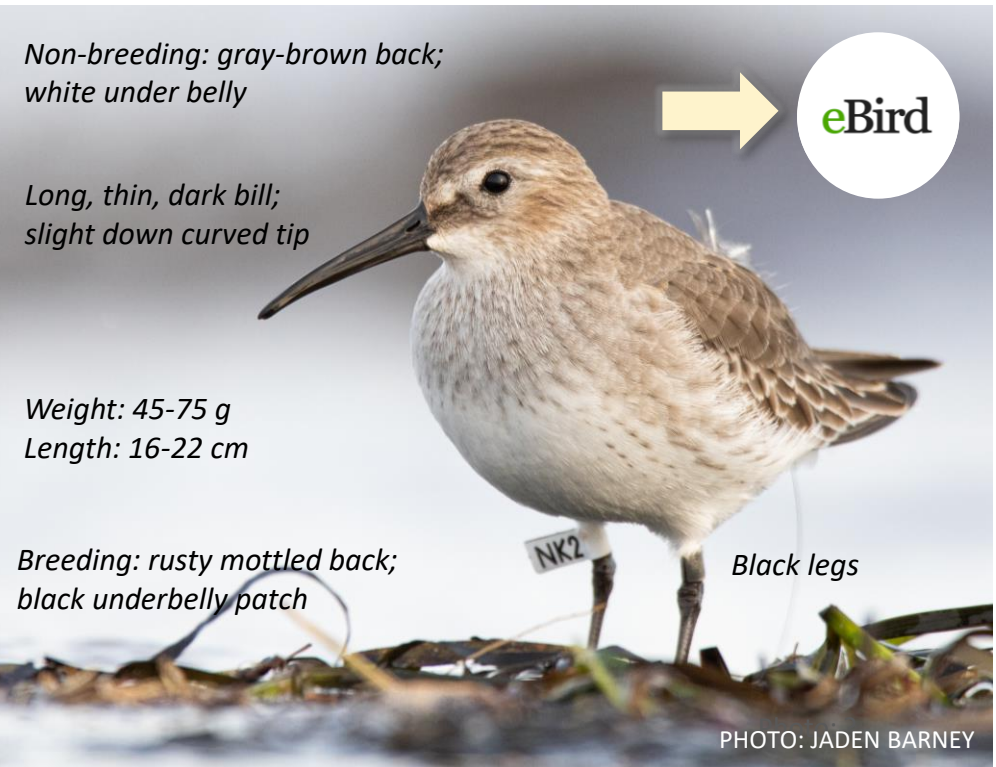
MIGRATION

Dunlin are short-distance migrants, making frequent stops in coastal or wetland habitats to rest and regain energy.

NON-BREEDING

Dunlin spend the winter feeding in flocks along North American coastlines and intertidal mudflats, probing for insects, crustaceans, molluscs and worms.





CONSERVATION

Dunlin populations are in decline across it's range, and currently the IUCN conservation status is Least Concern. Threats include:

- *Change or loss of migratory stopover habitats*
- *Draining of wetlands in wintering habitats*
- *Change in habitat and food in breeding habitats due to global warming*

ACTIVITY 1

PHOTO: DAVID BRADLEY

WHY DO SHOREBIRDS VISIT THE FRASER RIVER ESTUARY?

Watch the short video below to learn about shorebirds in the Fraser River Estuary.

Birds Canada: Shorebirds, Mudflats, and Biofilm - A New Conservation Priority for Migratory Shorebirds (02:35) (https://youtu.be/XX7p7VNXJKk)

- *Why do shorebirds stop at the Fraser River Estuary during migration?*
- *How are shorebirds adapted to eat on the mudflat?*
- *What is biofilm?*

WHEN DO SHOREBIRDS VISIT THE FRASER RIVER ESTUARY?

Millions of shorebirds use the Fraser River Estuary throughout the year. However, the timing of each species may differ due to stage of annual life cycle, specific food and habitat preferences and migration distance.

eBird is a global Citizen Science database of bird sightings, submitted by birdwatchers from around the world, all year long. This data informs scientists where and when birds are observed, and what habitats they are using. We can use the eBird data to determine when shorebirds are using the Fraser River Estuary.

1) Explore eBird data for each species below by clicking on the shorebird name.
2) Scroll down the page to view: Weekly Bar Chart
3) Shade in the month each bird is present in the Fraser Valley in the chart below:

	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
DUNLIN												
WESTERN SANDPIPER												
SPOTTED SANDPIPER												
WILSON'S SNIPE												

- *What life stage are the birds in when they visit the Fraser River Estuary?*
- *Where do they go when they are not in the Estuary?*

PHOTO: JASON PUDDIFOOT

HOW LONG DO INDIVIDUAL BIRDS STAY IN THE FRASER RIVER ESTUARY?

The presence of birds at a location is related to the annual life stage and natural range of the population. However, it is important to know how long *individual animals* visit a location to estimate population size and habitat use. To better understand birds in the Fraser River Estuary, scientists have attached radio-transmitter Motus tags onto shorebirds to track movements around the habitat. This activity explores 5 tagged birds of each Dunlin and Western Sandpiper.

1) Observe the data collected from nanotags on individual Western Sandpiper and Dunlin below.
2) Calculate the average number of days each species spent in the Fraser River Estuary. Calculate the variance of the mean (standard deviation) for each species. You may need to use a calculator or MS Excel for assistance.
3) Plot the average days for each species in a bar graph. Include standard deviation error bars to demonstrate the variation of days for individual birds.

SPECIES	MOTUS TAG	DATE OF FIRST DETECTION	DATE OF LAST DETECTION	TIME (DAYS)
Dunlin	49146	2020-12-06	2021-01-10	35
Dunlin	49152	2020-12-04	2021-01-04	31
Dunlin	49156	2020-12-03	2021-04-06	124
Dunlin	49166	2020-10-20	2020-12-01	42
Dunlin	49168	2020-12-04	2021-02-06	64
Western Sandpiper	44264	2020-07-15	2020-07-19	4
Western Sandpiper	48903	2020-08-27	2020-09-04	8
Western Sandpiper	48906	2020-08-27	2020-09-14	18
Western Sandpiper	48907	2020-08-27	2020-09-07	11
Western Sandpiper	48919	2020-08-27	2020-09-10	14

- *Considering the dates of detection, what is the life stage of each species when it is in the Fraser River Estuary?*
- *Which species spends more time in the Fraser River Estuary? Why?*

DISCUSSION

PHOTO: DAVID BRADLEY

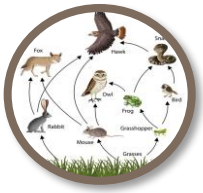
List and discuss human-related threats to shorebirds. What are examples of stewardship efforts and conservation action?

CONSERVATION THREAT	STEWARDSHIP ACTION

EXTENSION ACTIVITIES

LEARN ABOUT BIRDS NEAR YOU:

Explore and observe local birds. Take note of field marks, colors and patterns, size and shapes, habitats and behaviors. Use field guides, websites and local expertise to help with identification. Have fun!



ECOLOGICAL CONNECTIONS:

Design a food web model to display connections of selected bird species to their ecological community.

BIRD ART:

Sketch or model a selected bird species using pencil; paints; clay; or using computer graphics (using software such as Adobe Illustrator).

SCIENTIFIC LITERATURE:

Use the school library database, or Google Scholar, to explore the peer-reviewed scientific literature related to this Case Study. Search by 'key words' or research personnel, and select one article to review. Summarize each section of the scientific method conducted in this research.

MEET AN ORNITHOLOGIST:

Scientists are excited to share their research! Contact the project team to inquire about a virtual meeting with your classroom.

CITIZEN SCIENCE:

Participate in Citizen Science to learn more about birds in your area and contribute observations for science and conservation. Explore:

- **Great Backyard Bird Count**
- **Global Big Day**

SCIENCE COMMUNICATION:

Investigate a research topic and present information in a creative communication. For example, an infographic, news article, comic, brochure, slide show, poem, short story, or blogpost.

CELEBRATE BIRDS:

Participate in nature and bird festivals in your community, or visit World Migratory Bird Day for ideas!

STEWARDSHIP AND CONSERVATION:

Initiate or participate in a stewardship activity that helps reduce or mitigate impacts of threats to birds in your community.