

# MIGRATION STUDIES

Teacher resource pages for use with Middle and High School students exploring the mysteries of migration and how wildlife managers track our bird populations.





This resource guide has been developed through a partnership education program between the British Columbia Waterfowl Society and Ducks Unlimited Canada.

We gratefully acknowledge the financial assistance provided for this program development by the Vancouver Foundation and the BC Habitat Conservation Trust Fund.

## INTRODUCTION

**Migration Studies** provides basic fact sheets and activity sheets for teachers and older students from Grades 6 to 12, and is intended to complement field trips to the Sanctuary, an internationally-reknown migration stopover point for birds.

This package includes materials to introduce the following topics to students:

### The Migration of Birds and Other Animals The Significance of Estuary Ecosystems to Migration Wrangel Island Lesser Snow Geese Wintering Waterfowl Surveys The Conservation of Migratory Birds and Their Habitats

The responsibility for the conservation and management of Canada's migratory birds lies with the Canadian Wildlife Service (CWS), which is part of Environment Canada. The Pacific & Yukon Regional headquarters of CWS is at the Alaksen National Wildlife Area adjacent to the Sanctuary, and the CWS website provides official reference materials about wildlife and wildlife conservation programs.

In particular, the CWS websites on Snow Geese feature the specific population which visits the Vancouver area. Secondary students and teachers may also be interested in Ducks Unlimited Canada's set of website lesson plans for Grades 9 to 12, as the plans use a different population of Snow Geese (the Central Flyway population) as a basis for a mix of math, science, and social studies investigations. In addition, some conservation programs have created curriculum-based education materials and opportunities for classes to participate in web-based migration studies for specific Pacific coast migrants. Examples of these include the Sister Shorebird School program and the Brant Goose Monitoring Project.

Website addresses included in these pages were current at the time of preparation. Please visit our website at <u>http://www.reifelbirdsanctuary.com</u> for up-to-date website addresses and links to explore these programs and materials.

The George C. Reifel Migratory Bird Sanctuary Teacher's Guide- Migration

## WHAT IS MIGRATION?

### What is Migration?

Migration is the seasonal movement of animals from one habitat to another. Animals generally migrate between their wintering and breeding habitats.

### What animals migrate?

Birds are well-known for their migrations, but butterflies, salmon, turtles, toads, caribou, lemmings and whales are just some examples of other animals which make migrations with the seasons. These animals travel seasonally along specific routes and move to areas which are seasonally beneficial to them because of the inherent needs of the species (such as breeding ponds or mild weather and abundant food).

### Why do birds migrate?

Migration allows birds to take advantage of seasonally-beneficial climates and food supplies and to avoid the adverse conditions occurring in these sites at other times of the year. More than 700 North American bird species migrate throughout their annual life cycle. There are more than 300 species of birds found in BC, most of which migrate to a greater or lesser extent.

The fact that birds are migratory and visit different spots throughout their life cycle is recognized by the countries around the world. For example, nearly a century ago (1916), the governments of Canada and the United States signed the Migratory Birds Convention, which recognizes that migratory birds are vulnerable to different factors across North America, and that countries need to adopt common approaches in order to manage and conserve their populations.

Birds in North America migrate in a north-south pattern along established routes or "flyways". For waterfowl and shorebirds in particular, four such flyways are recognized: the Pacific, Central, Mississippi and Atlantic. The Fraser River estuary is critical habitat for birds migrating along the Pacific Flyway.

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### NORTH AMERICAN FLYWAYS



## MIGHTY & MYSTERIOUS FLIGHTS

The longest species migration is likely that of the Arctic tern, which summers in the Canadian Arctic and winters at the southern tip of South America and Antarctica.

Birds often take advantage of high-pressure weather fronts to get assistance from tailwinds, so sometimes even small birds such as the western sandpiper can make 2500 km flights between Alaska and Vancouver in a non-stop flight of less than 2 days.

Many waterfowl and shorebirds fly between anywhere from almost sea level to 20,000 feet (6 km) and at about freeway speeds, but there are many odd reports of migrants which make us realize we sometimes don't know as much as we thought we did. Airline pilots over Ireland have seen whooper swans flying at 29,000 feet (nearly 10 km!). The Vancouver airport radars pick up local snow geese whenever they arrive in the Vancouver area in a large compact flock together.

Some species such as sanderlings load up on food and nearly double their weight prior to setting out on migration. Most long-distance migrant birds fly at night, and can use a combination of stars, landmarks and the earth's magnetic field to find their way. Routes often take these birds vast distances over relatively inhospitable terrain such as oceans, deserts and high mountain ranges. Bar-headed geese, for example, fly over the Himalayan Mountains (8500 m).

Many small birds fly amazing distances considering their size, but do so to follow a specific food source. Ruby- throated hummingbirds migrate more than 3,000 km. Many insectivorous " neo-tropical" migrant species fly great distance from our northern forests to spend winters in tropical rainforests.

Many hawks migrate during the daylight hours and take advantage of rising warm air ("thermals") to soar and drift with upper air currents along mountain ridges. They tend to avoid routes that involve long ocean crossings, and thousands converge over Panama during migrations to and from South America.

## ART AND POETRY IDEAS

Make a list of all the words connected to migration and use these to create different types of poetry..

Haiku	Line 1 = 5 syllables	Snow geese fill the air		
	Line 2 = 7 syllables	Wings flapping, loud calling		
	Line 3 = 5 syllables	November is here.		
Pyramid	Line 1 = Noun (the subject of this poem)			
	Line 2 = 2 words describing subject			
	Line 3 = 3 verbs (action words) about subject			
	Line 4 = 4 words (2 short statements or questions)			
Acrostic	Millions of birds	Shape poem		
	In the sky	Draw the outline of a goose.		
	Going north	Around the outline, inside or out, list		
	Rapidly	migration words to fill the shape.		
	Away they fly			
	To faraway places			
	Intent on their journey			
	One goal			
	Nesting			

Try your hand at a big mural scattered with "thumbprint sandpipers", a diorama in a shoebox, paper mache birds, murals with flocks of birds printed from inked styrofoam bird shapes.



Thumbprint sandpiper made from a student's inked thumb and a pen for details

## A CLASS STUDY OF MIGRATION

This project is intended more for middle school grades and involves working as a team to define migration as it occurs locally in the Fraser River delta.

### Learning Outcomes:

1. Through scientific investigation, students will demonstrate knowledge of local organisms (birds) survival adaptations (migration).

2. Students will explore the reasons for endangerment or extinction of species.

3. Students will demonstrate their ability to collect, analyze and interpret scientific data.

### Preliminary assessment

Students will break into small groups and list 'what we know about migration" and "what we want to know about migration".

Class findings are recorded on charts under the headings:

WHO -list possible species found in this area and thought to migrate.

WHY - list hypotheses why species migrate, (to be adjusted later).

WHEN - list months for spring and fall migrations.

HOW - list hypotheses e.g. how do birds know when to start migrating? How fast can they fly? How far can they travel each day? What are the shortest and longest journeys?

WHERE - list where migration journeys begin and end.

### <u>Research</u>

Individual students conduct research projects on these species.

Suggested species to study: American Wigeon, Northern Shoveler, Blue-winged Teal, Arctic Tern, Snow Goose, Trumpeter Swan, Sandhill Crane, Brant, Western Sandpiper, Rufous Hummingbird, Snowy Owl, Yellow-rumped Warbler, Barn Swallow, Barred Owl, Peregrine Falcon.

### <u>Evaluation</u>

As a class, alter these charts to reflect the new information. Students will break into small groups and discuss the 'Big" question, "Why do species migrate?" Their hypotheses will be shared with the class.

## WEBSITES TO INVESTIGATE

### Journey North: http://www.learner.org/jnort

(global assortment of wildlife migration lesson plans and activities, opportunities to track diverse species ie the spring 2002 migration of bald eagles, caribou, hummingbirds, manatees, butterflies, robins, cranes, and grey whales).

**Migration watch:** http://www.bto.org/migwatch/text/now\_works.htm (a general reference site with lots of facts, and featuring some better known European migratory birds)

### Geese in Space: http://www.ducks.ca/geese/index.html

(Ducks Unlimited Canada's tracking of the annual migration of radio-collared geese through satellite technology)

### Bird Studies Canada: http://www.bsc-eoc.org/

(hundreds of links to all sorts of site full of information; information on the Beached Bird Surveys, Coastal Waterbird Surveys, Owls surveys active in BC)

### Winging Northwards: A Shorebirds Journey

http//shorebirds.pwnet.org/shorebirds\_fieldtrips.htm (opportunities to view shorebirds arriving in Alaska via satellite hook-ups)

**International Brant Monitoring Project:** http://www.sd69.bc.ca/~brant/ (Curriculum based lesson plans, ways to participate by by submitting records).

**Bird Monitoring in North America:** http://www.im.nbs.gov/birds.html (An excellent list of reference links and satellite tracking projects)

### Sister Shorebird School : http://sssp.fws.gov/

(Pacific flyway migration studies of shorebirds, and materials such as maps and lesson plans and opportunities to track species and send in records).

**Wild Wings Heading South:** http://www.pbs.org/audubon/wildwings/ (Creative classroom exoplorations of migration ie "The Airfare of Migration" which has students calculating the calories required to fly migration routes).

## MIGRATION TERMINOLOGY

bird-banding-	the act of individually marking birds by placing small metal bands on their legs
carrying capacity- census-	ability of habitat to support a population using it count or survey of animals in the wild using a specific technique
circumpolar- dispersal- endemic-	(a species) distributed in northern areas around the globe spread of animals from their original home site or home range confined to a specific geographic area
flyway-	vast geographic regions with extensive breeding habitats at the north end and wintering areas at the southern end, and connected by a complex system of migration routes
global-	found around the world; type of distribution around the world
geomagnetism-	the ability (of birds) to sense the earth's magnetic field
holarctic-	found mainly in the Northern Hemisphere
longevity-	length of life; lifespan
migration-	the seasonal movement of animals from one habitat to another.
navigation- neotropical-	the ability to maintain a direction independent of landmarks nesting in northern temperate areas (ie USA and Canada) and migrating to wintering grounds in more tropical Central America and South America.
orientation-	taking up a direction as a course to follow
ornithologist-	biologist who studies birds
population-	the number of animals of the same type living in an area; (often defined very generally if a species is spread over a large breeding area but migrates to a common wintering area)
recruitment-	the addition of young to the population; the degree of population growth due to the addition of young.
resident-	remaining in one place; non-migratory
staging-	concentration of animals prior to long-distance migratuons
telemetry-	use of transmissions (ie radio or satellite) to measure distances or location
temperate-	moderate; not extreme (for example, the BC coast would be considered a temperate rainforest, not a tropical one)

## MIGRATION RESEARCH PROJECT

Assign students to do a research project on the migration of a local species. A report on a migratory bird species could include the following topics:

### Current distribution and status of the species.

- including special terms such as endemic, circumpolar, global, to describe the distribution pattern

- including special terms such as endangered, vulnerable or common, to describe the current official status as based on population trends.

### The needs of the species in summer and winter

- what kinds of nesting habitat are needed, what kind of diet, what are the special needs of the young, what is different in winter

### Likely reasons for migration between summer and winter ranges.

- ie if the species is mainly insectivorous, would it survive in a northern forest after the winter set in?

## Maps or figures showing migration routes, summer and winter distribution, and major landmarks.

-see following pages for maps which could be used.

### Types of protection possible for the species and its habitat

Many Pacific Coast migrants are currently the target of international research and conservation initiatives. In Canada, the management of migratory birds is the responsibility of Environment Canada's Canadian Wildlife Service, and their website (<u>http://www.cws-scf.ec.gc.ca/</u>) contains information on many key species and programs in both english and french. For more information and additional websites sources for student or class projects, go to the Sanctuary website (<u>http://www.reifelbirdsanctuary.com</u>) and follow the links.

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## IDENTIFYING MIGRATION ROUTES

Bird banding is a universal and indispensable technique for studying the movement, survival and behavior of birds. The banding of birds in North America is jointly managed by the United States Department of the Interior and Environment Canada's Canadian Wildlife Service since 1923. Their respective banding offices have similar functions and policies and use the same bands and database.



Bird-banding involves the capture of birds to place uniquely numbered bands on their legs. Records are kept of where and when each bird is banded, how old it is, what sex it is, and any other information.

Whenever a band is found and reported, it contributes to the general understanding of the distribution and movements of species, population trends, life-spans and mortality causes. The knowledge obtained from band records helps scientists to identify how best to manage and conserve the birds and their habitats.

Many researchers use additional markers to allow them to identify specific individual birds at a distance without having to recapture them. Plastic neck collars on geese, nasal markers on ducks, dyes and colored plastic leg bands are just some of these markers. Radio transmitters are also used to track birds from a distance, sometimes via satellites.

This information has been extracted from the website of the North American Bird Banding Laboratory (<u>http://www.pwrc.usgs.gov/</u>), which retains all bird banding record data for the continent. In Canada, Environment Canada's Canadian Wildlife Service administers the banding program. For more information, go to the Sanctuary's website <u>http:///www.reifelbirdsanctuary.com</u> and follow the links.

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The following band record forms have come back after bands have been reported to the Bird Banding Office. For each one, see if you can figure out the following types of information for the bird:

- 1. Was the bird male of female?
- 2. When was it first banded?
- 3. When was it reported?
- 4. How old was it when it was first banded?
- 5. Using # 2-5 above, what was its minimum lifespan?
- 6. Where was it banded?
- 7. Where was the band reported from the second time?
- 8. Locate both of these sites on a map, using the map coordinates provided.
- 9. Has this bird been crossing international borders?
- 10. What is the minimum distance it has travelled?
- 11. Based on the time of year for banding and the time of year for the band records, what is the most likely migration pattern of this bird?

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These are actual band records, courtesy of the Canadian Wildlife Service.



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These are actual band records, courtesy of the Canadian Wildlife Service.

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These are actual band records, courtesy of the Canadian Wildlife Service.

## PLOT THE LOCATIONS OF THE BIRDS



## MIGRANTS OF THE FRASER ESTUARY

Estuaries have sheltered waters, associated lowlands (deltas), plentiful foods from the rivers and the ocean, and remain ice-free all winter. The George C. Reifel Migratory Bird Sanctuary is located right in the heart of the Fraser River estuary which is internationally-recognized for its significance to birds migrating along the Pacific coast.



Migration paths of many migrant birds converge at the Fraser River delta. Its location mid-way along the Pacific Coast makes it an international crossroad of bird migration routes from 20 countries and three continents. Waterfowl and shorebirds from breeding grounds in Siberia, Alaska, Yukon, and other arctic and prairie areas all stop to refuel in the Fraser River estuary on their way to wintering grounds in California, Mexico, Central and South America or the South Pacific.

The Fraser River forms the largest estuary along the Pacific Coast of North America and drains over 200,000 square kilometers of BC. River sediments meet the currents of the Strait of Georgia and are deposited onto the nearly 30,000 hectares of the estuary's intertidal marshes and mudflats (Sturgeon Banks, Roberts Bank and Boundary Bay). The climate is mild, and there are plentiful foods ranging from marine fish and invertebrates to grasses, rodents and amphibians. Millions of waterfowl and shorebirds, and over 20 species of birds of prey consequently all congregate at the mouth of this river, providing a wonderful wildlife viewing spectacle for the millions of people in the Vancouver area. Mallard, Green-winged Teal, American Wigeon, Gadwall, Northern Shoveler, Northern Pintail, Lesser Snow Geese, Trumpeter Swans are the most commonlyobserved waterfowl species seen inshore. In deeper waters, large rafts of diving ducks such as Greater and Lesser Scaup and Surf Scoters congregate, along with Double-Crested Cormorants, Western Grebes and many species of gulls. Dunlin and Western Sandpipers feed in flocks of thousands on intertidal mudflats, marshes and lowland habitats inland of the dykes. Bald Eagles, Northern Harriers, Red-tailed Hawks, Peregrine Falcons and Short-Eared Owls are just some of the birds of prey to be seen in the river delta. For some species such as the Barn Owl, the delta represents the only site in Canada with mild enough winters for the species to remain year-round.

The Fraser River is not just a stopover point for birds. It is the largest producer of salmon on the entire Pacific Coast of North America. Annually, millions of anadromous (migratory) adult salmon migrate upstream to spawn along small streams along its length and up into the connected waterways of the Pitt, Lilloett, Chilliwack, Nechako, Chilkotin, Thompson, Stuart, Adams, and Quesnel Rivers. Millions of young fish hatching in these areas spend their early life cycle in these upper reaches, and eventually descend to the estuary on their way out to oceanic habitats. Estuarine marshes, mudflats, floodplains, sloughs and river channels are all critical feeding and rearing areas for these and other fish during their transition between river and marine stages of their life cycle. Pacific Herring, Sturgeon, Eulachon, and Smelt are also abundant fisheries locally, as are Dungeness crab, Shrimp and other invertebrates.

Please visit our website <u>http://www.reifelbirdsanctuary.com</u> for links to sites for downloading parts or the complete 120-page versions of **Discover Your Estuary**, a 1992 publication by Environment Canada. This teacher's guide to the Fraser River estuary is available in English and French.

## DOWN ON THE FARM

To get to the Sanctuary, visitors pass through the small community of Ladner and through farmland of West Delta and Westham Island. Fields along this scenic route are highly valued for their fertile soils and agricultural crop potential, but are also frequently used by wildlife.



Did you know.....?

Hawks, owls, eagles and even great blue herons hunt in fields for the Townsend's Vole, a small rodent which is common in pastures, old fields and tall grasses along field edges.

Swans, geese, most dabbling ducks and pheasants all like to feed on grain and vegetable crops, and often feed on remnant crops in fields long after the commercial harvest.

Swans, Snow Geese, Canada Geese and American Wigeon all consume grass and congregate in pastures or other areas

A special land stewardship program for both farmers and wildlife is operating in the Delta area. The above colouring book is full of information about the program and can be downloaded from the Sanctuary's website (see next page for details). The colouring book "Wildlife and Farms" has been reprinted several times since it first created a decade ago. In 2002, education program grants financed its conversion to a digital format so that teachers could download pages as required from the Sanctuary website at <u>http://www.reifelbirdsanctuary.com</u>.

It provides a review of the inter-relationships between farming and wildlife in the Delta and explains the Greenfields program in the form of cartoon-like colouring pages drawn by artist Tom Godin..

The Greenfields Program is a cooperative farm and wildlife extension program in the Municipality of Delta. It aims to maintain wintering waterfowl populations in harmony with successful farming. Initially, the focus was on the thousands of American Wigeon which winter in the Fraser Delta. This waterfowl species grazes on eelgrass and algae on tidal flats, but also feeds in large flocks in pastures and other agricultural fields. Concentrated waterfowl feeding and grass consumption sometimes causes economic losses to farms such as dairy operations relying upon grass for their livestock. Snow Geese, Trumpeter Swans and Canada Geese also forage on grasses.

Since 1990, the Greenfields project has promoted the use of green, growing grass cover or "cover crops" which are planted in the fall on cultivated fields after commercial cash crops such as potatoes have been harvested. These cover crops provide good alternative winter feeding areas for the birds, help lure them away from dairy farms and other crops susceptible to damage, help reduce soil erosion and provide extra organic content to the soil. The project also now includes stewardship programs such as grass-field set-asides and other farm management procedures which benefit both landowners and many coastal wildlife species.

Historically, Environment Canada provided the majority of project funding and Ducks Unlimited Canada administered the project. The participation of local farmers and agriculture-based organizations has been very important to the project since its beginnings. The project is currently administered by Delta Farmland & Wildlife Trust, (DF&WT) which represents farmers and local environmental groups of Delta. Recent funding has been provided by Environment Canada, Ducks Unlimited Canada, the British Columbia Waterfowl Society, and the Delta Agriculture Society.

## MOBILES TO MAKE

The following art projects can be made of postercard, with fine threads or wires glued to each bird and tied to a structure so that each bird is suspended as part of a flock.

Suggestions for the attachment structure:

a) a long dowel allows all birds to be suspended in a line but at different depths.

b) a coat-hanger unbent and wrapped into a circle allows birds to be suspended in a circular or spiral arrangement.

c) a long irregular piece of driftwood has endless possibilities of arrangements.

When all birds are attached, find the balance point from which to suspend the attachment structure itself.

Each student in the class can contribute a bird to a class project, or could build their own mobile using the shapes from the following pages (or their own creations).





The George C. Reifel Migratory Bird Sanctuary Teacher's Guide-Migration

## SNOW GOOSE POPULATIONS

A "population" is the number of animals of the same type living in an area. For example, there are four recognized populations of lesser snow geese and one of greater snow geese across North America. The birds visiting the Fraser estuary are part of the Wrangel Island (Pacific) population and make up a special subpopulation that winters in the Fraser and Skagit estuaries. Other Wrangel Island birds winter in California. The Wrangel Island nesting population is measured in the spring and currently numbers about 100,000 birds. Our Fraser-Skagit subpopulation (part of it) has numbered over 60,000 birds in the past few years.

In this class exercize, students learn about what affects populations of migratory birds by playing the role of the birds themselves. Cards are read out outlining the scenario encountered by a flock of geese arriving on their nesting grounds, and then on their wintering grounds. These cards can affect either the amount of "habitat" (in the form of paper plates) or a cause of mortality in the birds, and each fall, the number flying "south for the winter" is counted and graphed. After 20 yearly migration cycles, assess the resulting population graph.

NOTE: This activity is **Project Wild**'s "Migration Headache", but uses real-life scenarios specific to the Fraser Skagit population of Lesser Snow Geese.

**Project Wild** workshops are held at the Sanctuary each fall, and this activity is explained in greater detail in the workshop and the manual. For more information about Project Wild, go to the BC website (<u>http://www.hctf.ca/wild.htm</u>).

The snow goose is particularly appropriate to use for this purpose because: 1. It is a well documented population with approximately 40 years of data. 2. It is a species which is still hunted, so there are hunter sample data on its age and sex ratios, and an international agreement to close the hunting season if populations drop too low.

3. It now has special habitat areas set aside for it in Canada, USA and Russia, and has been the target of numerous research projects, so the characteristics of migration factors are better understood.

## INSTRUCTIONS

This activity is set up so that the students are a "population" of snow geese, and need to come home "safe" to habitat in their wintering grounds and again in their nesting grounds.

At one end of the room, winter habitat (ie the Lower Mainland) is set up as paper plates spread over the floor. At the other end of the room, breeding habitat (ie Wrangel Island) is set up the same way with plates.

The activity requires 1 plate per every three students at each end of the room. For a class of 30 students, 10 plates should be set up on the breeding area, and 10 on the wintering area. When the students migrate back and forth, in order to survive they need to find a plate to stand by, and only three students are allowed per plate. The activity also requires an "off-side" area where students ("geese") go when they have died for whatever reason. These students are only out of the game temporarily, and are "recruited" by successful nesters and brought back into the game as young.

Make up the scenario cards, and keep fall and spring migration scenarios in separate piles.

The objective of the game is to track both conditions and population trends over the years. Just prior to the fall migration, a fall scenario card is drawn and read out. The habitat at the far end and the number of birds migrating to it are adjusted accordingly, and students are told to migrate. Any student unable to find a spot on a plate is considered "dead". For the migration northward, pull a spring migration scenario card and adjust the habitat and birds accordingly, then allow the "migration". The official "population" for the purpose of this exercise is the number of birds flying south in the fall to the wintering grounds each year. For each fall population tally, keep a related record of the scenarios. The end product can be a graph prepared by the students showing the annual population variations, along with an explanation of what caused them.

**NOTE**: Rules on some cards regarding the hunting season mimic the way actual hunting regulations would be adjusted. In this case, after the population of 30 students "declines" to below 15 students or 50%, the hunting season would be closed. (If the population "rose" above 30, the bag limit, or number of birds allowed to each hunter, would likely be increased).

The George C. Reifel Migratory Bird Sanctuary Teacher's Guide- Migration

### FALL MIGRATION SCENARIOS

It was a successful nesting season, (RECRUIT 1 BIRD PER 1 REMAINING )(The flock can recruit a "bird" if available from the "dead" pile). The amount and location of winter habitat has not changed from last year. MIGRATE!! Anyone not on a plate (DEAD).	It was a successful nesting season (RECRUIT 1 BIRD PER 1 REMAINING) The Fraser River has had a major oilspill event, and most of your intertidal feeding areas and roosting areas are too contaminated (REMOVE 5 PLATES) MIGRATE !! Anyone not on a plate (DEAD)
There was a freak summer snowstorm on Wrangel Island, most nests suffered along with adults (SEND 10 to the DEAD pile, RECRUIT no young). The amount and location of wintering habitat has not changed from last year. MIGRATE!! Anyone not on a plate (DEAD)	It was a warm long summer (RECRUIT 1 BIRD PER 1 REMAINING) Down south, a community has gone ahead with an expansion of an industrial facility which makes part of your wintering area unavailable. (REMOVE 2 PLATES) MIGRATE!! Anyone not on a plate (DEAD).
A small settlement on Wrangel Island has been raising domestic reindeer, which got loose and trampled 50% of your nests (RECRUIT 1 BIRD PER 4 REMAINING) The amount of wintering habitat has not changed from last year. MIGRATE!! Anyone not on a plate (DEAD)	It was a moderate and cool summer (RECRUIT 1 BIRD PER 2 REMAINING) Some of your favourite farmland has been turned into a housing complex (REMOVE 2 PLATES). MIGRATE!! Anyone not on a plate (DEAD)
Arctic foxes and parasiticjaegers discovered the nesting colony this summer and robbed most nests (RECRUIT NONE) Wintering habitat remains the same as last year. MIGRATE!! Anyone not on a plate (DEAD)	Moderate nesting success this year (RECRUIT 1 bird per 3 REMAINING) Wildlife agencies have acquired and managed several additional properties (ADD 2 PLATES) MIGRATE!! Anyone not on a plate (DEAD)
Russian scientist have finally managed to establish special protection for the nesting colony, and everyone has a successful nesting season (RECRUIT 1 BIRD PER 1 REMAINING) Wintering habitat remains the same as last year. MIGRATE!! Anyone not on a plate (DEAD)	Predators destroy half the nests (RECRUIT ONLY 2 BIRDS) Winter habitat in good condition, same acreages as last year. MIGRATE!! Anyone not on a plate (DEAD)

### SPRING MIGRATION SCENARIOS

#### TEMP= temporarily remove the plates until after migration, then replace them.

The winter feeding was excellent. If the flock size is under 15 right now, there was no hunting season. If the flock size is over 15, there was some hunting mortality (REMOVE 3 BIRDS) The nesting area habitat is in good condition. MIGRATE!! Anyone not on a plate (DEAD).	It was a mild warm winter and everyone is well fed If the flock size is under 15 right now, there was no hunting season. If the flock size is over 15, there is an open hunting season (REMOVE 3 BIRDS) Part of the nesting colony habitat is in less than optimal condition (TEMP REMOVE 2 PLATES) MIGRATE!! Anyone not on a plate (DEAD)
All winter, there were heavy storms, which killed off cover crops, a potential food source, so some birds are in poor condition (REMOVE 2 BIRDS). If the flock size is over 15, there was some hunting mortality (REMOVE 3 BIRDS) The nesting area habitat is in good condition. MIGRATE!! Anyone not on a plate (DEAD)	It was a cool winter but all found enough food. If the flock is under 15, no hunting season. If the flock size is over 15, there was some hunting mortality (REMOVE 3 BIRDS) En route to Wrangel Island, you find Alaska is still iced in, and some starve (REMOVE 2 BIRDS) Nesting areas are frozen (TEMP REMOVE 2 PLATES) MIGRATE!! Anyone not on a plate (DEAD)
Coyotes and eagles have increased on your wintering areas and have killed some birds(REMOVE 3 BIRDS). If the flock size is over 15, there was some hunting mortality (REMOVE 3 BIRDS) The nesting area habitat is in good condition. MIGRATE!! Anyone not on a plate (DEAD)	It turned out to be a cold winter, and the Fraser Valley was covered in snow until late February. All birds were concentrated in the Skagit estuary, and disease killed many (REMOVE 5 BIRDS). If the flock size is over 15, there was some hunting mortality (REMOVE 3 BIRDS). Snow cover is late to melt(TEMP REMOVE 2 PLATES). MIGRATE!! Anyone not on a plate (DEAD)
Airport authorities don't want you near the runway in case of bird/airplane collisions so over the winter they hired a falconer to train hawks to hunt you (REMOVE 1 BIRD) If the flock size is over 15, there was some hunting mortality (REMOVE 3 BIRDS) The nesting area habitat is in good condition. MIGRATE!! Anyone not on a plate (DEAD)	The flock has stayed within the boundaries of safe areas all winter and there has only been a few mortalities because of eagles (REMOVE 2 BIRDS). On the breeding grounds, scientists notice that many tundra nest sites are flooded because of unnaturally warm spring and sudden snow melt (TEMP REMOVE 3 PLATES). MIGRATE!! Anyone not on a plate (DEAD)
Local farmers don't want you grazing on their dairy pasture, so they encourage more hunters onto their farm (REMOVE 4 BIRDS)* (Unless the flock size is under 15, in which case hunting is closed and no birds are removed) The nesting area habitat is in good condition. MIGRATE!! Anyone not on a plate (DEAD)	It was a cool dry long winter and new shoots of grass and marsh plants were delayed in spring, so you don't leave right away for the north. If the flock size is over 15, there was some hunting mortality(REMOVE 3 BIRDS) California flock of geese get to Wrangel Is first and take over nest sites (TEMP REMOVE 3 PLATES) MIGRATE!! Anyone not on a plate (DEAD)

## A FLIGHT OF THE IMAGINATION

In this exercise, students imagine themselves as snow geese, and write a story about a year in their lives, what is important, where they have traveled and their personal perceptions of the habitats they fly over, feed in and nest in. Encourage them to describe these things using some of the senses a snow goose might use (ie sense of smell, taste, the onset of winter and cooler temperatures, the dangers presented by predators and hazards of migration routes, etc).

Use the Snow Goose Q & A sheets to determine some of the factors affecting their annual life cycle. Students should also feel free to research the topic more fully through websites, the library and interviews with biologists.

This is an excellent activity to link with journal writing and encourages assimilation and creative expression of what students have learned about this species.

### Extensions:

Encourage students to take the reverse viewpoint and explore literature for stories and legends about snow geese to see what kinds of beliefs and perspectives there are in different cultures and countries.

In 1996, a book by Mary Burns was published by UBC Press and featured stories and different perspectives of the flock of the Sanctuary's wintering snow geese from Wrangel Island.

**The Private Eye: Observing Snow Geese** is comfortable reading for secondary students, and its mix of perspectives from First Nations, scientist, bird-watchers, artists, hunters and farmers may help integrate science, resource management and social studies curriculum goals.

## COMMON Q&A'S ABOUT SNOW GEESE



The Sanctuary receives over 60,000 annual visitors who are generally very curious about the snow geese. The following pages consist of common questions and the answers as determined from various sources, including Canadian Wildlife Service staff such as Dr. Sean Boyd who has conducted years of research on this population of arctic geese.

This brief synopsis is only intended as an introduction to the many aspects of migratory bird management. The conservation and management of a migratory bird species such as the snow goose requires research and regulations at the international government level, and the willingness to work with local interest groups, communities and landowners. The Canadian Wildlife Service (CWS) takes on this responsibility. The snow geese are featured on several excellent CWS reference websites which are available in both french and english:

Hinterland's Who's Who <u>(http://www.cws-scf.ec.gc.ca/hww-fap/index\_e.cfm)</u> Its basic biology, status, and general ecology.

**Ecoinfo** (http://www.ecoinfo.org/env\_ind/region/snowgeese/snowgeese\_e.cfm) Its population trends in past decades, along with discussions for some of the reasons for variations. This species is considered an ecosystem indicator species for birds in the Strait of Georgia.

For assistance finding these links and additional source information, go to the Sanctuary's website (<u>http://www.reifelbirdsanctuary.com</u>), and follow the links.

The George C. Reifel Migratory Bird Sanctuary Teacher's Guide- Migration

What is the latin name for a snow goose?	Anser caerulescens
What is the global distribution of snow geese?	This is an arctic nesting species found in parts of eastern Siberia, and most of Canada's arctic shorelines. Different populations winter in the Fraser estuary (and Skagit), California, Mexico, along the Mississippi delta and along the Atlantic seabord.
What is the difference between Lesser and Greater Snow Geese?	They are two subspecies, with Lesser Snow Geese making up the majority and being slightly smaller than Greaters.
What is a Blue Goose?	A colour phase (not a race) which occurs in Lesser Snow Geese. It is common in the Central Flyway population.
What are the grey birds in the flock?	This summer's full-grown young. They do not acquire the pure white plumage of the breeding adults until their second year of life.

What is the wingspan of a Snow Goose?	38-46 cm
What is the weight of a Lesser Snow Goose?	About 2.5 kg (female) -2.7 (males) (about 2X that of a mallard, but less than most Canada Geese).
How many Snow Geese winter in here?	In the past few years, the Fraser- Skagit populations have been over 60,000 birds. Roughly half winter here in the Fraser estuary.
What is Canada's total population of Snow Geese?	Probably 5-8 million nesting in Canada
Can you tell the difference between male & female Snow Goose just by looking at one?	No, males are usually bigger than females, but not by much. Best to wait until one lays eggs.

Why are the snow goose heads orange?	Because the mud on the foreshore has an iron-rich layer, and stains their head feathers when they are digging holes. Trumpeter swans and other birds which dig in the mud also get orange staining.
How can you tell the difference between Snow Geese and Ross's Geese?	Ross' geese do not have black markings ("grin") on their bills, and are smaller birds.
Why do the Snow Geese dig holes in the intertidal areas?	They are seeking one of their preferred natural foods- the rhizomes of marsh plants. They often get together and make a "crater" more than a meter wide and up to a meter deep.
Where do the snow geese wintering in this area come from (nest), and do they stop anywhere during their migration?	They nest on Wrangel Island Russia. On the way southwards, they stop on the north slope of Alaska, then the southern shoreline, and sometimes the mouth of the Stikine River.
How long a flight do our migrating Snow Geese make at one time?	Transmitter-carrying birds have been recorded making a 2500 km non-stop flight across the ocean from Alaska directly to here over about a 36 hour period.

There are two sub-populations of Lesser Snow Geese nesting on Wrangel Island. One winters here. Where do the other snow geese winter?	Part of the nesting colony consists of birds that winter in California, in the the Central Valley, San Joaquim Valley, Sacramento, and the Klamath Basin area.
The Fraser population is sometimes absent in mid-winter. Where do our birds disappear to?	The Skagit River estuary, just south of the small town of LaConnor, between the cities of Mount Vernon and Everett, Washington.
How far is it between the Fraser River estuary and the Skagit River estuary?	Roughly 1.5 hours drive from the Canada/ USA border and probably less than 100 km as the snow goose flies direct.
Where is Wrangel Island compared to the Arctic Circle and the Siberian Peninsula?	It is north of the Arctic Circle at 71 degrees; 200 km north of the Siberian peninsula; and northwest of Alaska.
How big is Wrangel Island?	4,700 square km (Vancouver Island is 30,000 sq km)

What is the Russian name for Wrangel Island?	Ostrov Vrangelya
How big is the Fraser River estuary (intertidal area)?	About 300 sq. km. surrounded by about 80 sq, km of farmland in Delta and more similar habitats in Surrey
Why is this Snow Goose population of birds a high priority for Russian Scientists?	It is the last nesting colony in Asia. This species was formerly much more abundant, and birds from nesting colonies on the Russian mainland migrating to winter in places such as Japan.
Why are Americans concerned about the wintering snow goose population of California/ Oregon?	Although our Fraser Skagit goose population appears to be relatively stable , the more southerly population (which was once twice as large) <b>seems</b> to be declining at a rate of approximately 1% per year.
Is our Fraser-Skagit Snow Goose population healthy and doing well?	Yes, for the last 7 years, the "recruitment" (growth of the population resulting from successful rearing of young to adulthood) has been fairly good and is attributed to good weather on the breeding grounds.

What is the impact of hunting on our local population of wintering snow geese?	Annual harvest of snow geese in the Fraser and Skagit estuaries is between 5 and 10 % of the population.
Is the population in danger because of hunting pressures?	No, for the population to remain stable and neither increasing or decreasing, a harvest of about 7-8% is desirable to balance the recruitment of young every year.
Would hunting of Snow Geese be continued if the populations dropped for any reason?	Hunting regulations are adjusted annually to reflect the ability of the population to sustain a hunting harvest. Hunting would be closed if the population dropped to a less than desirable level.
What are the main factors negatively impacting this population of birds?	Factors negatively influencing this population are the weather conditions on Wrangel Island, arctic foxes, winter harvest by hunters, and winter habitat conditions.
Is the local wintering snow goose population likely to experience problems as the mid-continental population of snow geese? (NOTE: the mid-continental snow geese have become so numerous, that their arctic bredding ground habitats are being damaged by overuse)	If the hunter harvest can continue to be managed to balance the population growth each year due to young birds, and the birds remain fit and healthy with good wintering conditions, this local population will do very well.

Why do our local Snow Geese move between the Fraser and Skagit estuaries?	It is likely a tradition based on a trade- off between the hazards of different hunting seasons and food availability. Our snow geese often leave for the Skagit as early as mid-December and stay a month or two.
Is there a difference in the Snow Goose hunting seasons in Washington and British Columbia?	Yes, BC's fall season ends late November, then re-opens in mid February for a month. In Washington, the fall season goes until the end of December or early January, then is closed.
Why do these geese feed in farm fields?	Local farm fields provide food in the form of remnant crops and grasses. They are popular spots for family groups of geese to feed when tides make marshes unavailable.
What local habitat management programs support the needs of these geese?	The Greenfields Project promotes the planting of winter cover crops after the harvest of commercial crops such as potatoes. The geese forage regularly on this green growth throughout the fall.
Are there programs in the Skagit to support the needs of these birds?	Yes, south of the border, a similar program is called Barley for Birds, and provides the same population with a type of fall-maturing barley for the winter.

Who funds the Greenfields program which encourages the planting of green cover for the winter?	Environment Canada, the British Columbia Waterfowl Society, Ducks Unlimited Canada, and other partners. The Delta Farmland and Wildlife Trust. coordinates it with local farmers, who plant the cover.
What kind of laws protect the habitat and the birds here?	Canada Wildlife Act Federal & Provincial Hunting regulations Migratory Birds Convention Act
What do the neck collars on snow geese signify?	Each bird was at one point captured by a researcher and had a collar attached so that its own individual migration patterns and life history could be tracked.
How do researchers catch snow geese to put these collars on?	Most geese on breeding grounds in mid- summer moult their flight feathers and can be herded into enlosures for this purpose.
What do the different colours of neck collars mean?	All researchers are allocated certain codes and colour regimes to use. Researchers of this population use red collars with different lettering and numbers for different projects.

## PLACE NAMES AND HISTORY

### Where in the world is Wrangel Island?



Early explorers in the Arctic region endured incredible hardships in the pursuit of knowledge, fame, trade routes and the claiming of new-found land on behalf of their countries. Many of these people live on in the form of places, plants and animals bearing their names.

Assign students to discover who the following people were, when they explored the arctic, why they were there, and what was named after them:

WRANGEL, BARROW, STELLER, ELLESMERE, BERING, BEAUFORT, MACKENZIE.

## COUNTING WINTER WATERBIRDS

In order to determine population trends, wildlife biologists rely on the results of surveys or counts. In winter, waterbirds such as waterfowl, shorebirds and other wading birds all congregate in large flocks, and it is easy to lose track while counting. Biologists often estimate flock size by counting a sample of the flock and applying the results to the rest of the flock.



To count the above geese, for example, count just what is in one square and **extrapolate** how many birds in total by multiplying the square's total by 8. See what happens when you count a different square. Do you get the same results? What happens if you take the average counts from a square with few birds and a square with lots, and multiply it by 8?

## NOW YOU SEE IT, NOW YOU DON'T

Birds can fly. A researcher can be in the middle of a careful detailed count and suddenly.....away flies the flock.. Perhaps the flock was in flight as he or she reached a survey site, and all of the birds will be completely out of sight in two minutes. The ability to do a relatively close estimate in a short period of time is a valuable skill, but requires "training the brain". Scientists become proficient at estimating flock numbers by practicing.. In some cases, photographs of flocks in flight can be used for estimation practices, with the photo then placed under magnification and birds counted one by one to determine the actual numbers, then compared against the estimate.

The following activity is a home-made estimation practice using kidney beans.

SPILL THE BEANS			
Instructions			
Spill a small container of kidney beans onto a tabletop. Study for 5 seconds, then cover with a sheet of paper. Write your estimate in the column. Uncover beans and count them. Print the actual number in the # column.			
Repeat with different size containers. After practising, your estimate will be closer to the actual number.	My estimates	Actual # spilled	

## WATERFOWL IDENTIFICATION

(Excerpt with permission from Marshworld, Ducks Unlimited Canada)



The upper surface of a duck's wings are particularly important in identifying the various species. Waterfowl biologists can also separate young-of-the-year from adults and determine the sex of most species by examination of the wings alone.

## LEARNING BIRD ID ON THE WEB

Waterfowl are some of the first birds to be identified by people just starting to learn about birds. Ducks, geese and swans are all relatively large birds compared to other species groups, and they are often in plain view in the middle of open water.

The recognition of waterfowl species usually relies upon a good look at the plumage under these good viewing conditions, but other characteristics such as flight patterns, calls and very specific marking patterns can also assist with identification.

Several websites provide interactive practice of waterfowl and shorebird identification skills. These are just a few examples of sites which exist now.

Ducks Unlimited Canada has a series of fact sheets and sound clips of common marsh inhabitants. The Ducks Unlimited Inc website (USA) is more comprehensive. (http://www.ducks.ca/naturenotes/index.html) (Canada) (http://www.ducks.org/waterfowling/gallery/index.asp) (USA)

The Shorebird Sister Schools program has a comprehensive mix of identification guides, activities an opportunities for participating in shorebird research at an elementary grade level.

### (http://sssp.fws.gov/index.cfm)

**Ducks at a Distance** is a very comprehensive field guide to waterfowl identification and has been used extensively in its original form as a small paperback by all kinds of beginning bird-watchers. It was developed for use throughout the long-standing tradition of waterfowl hunting across North America. Waterfowl hunters are required to be able to effectively identify waterfowl to hold a license.

This small pocket guide is now accessible in digital format through the Northern Prairie Wildlife Research Center website (http://www.npwrc.usgs.gov/) under their biological resources section.

### WATERBIRD ID CHALLENGE #1

During winter bird surveys, the viewing light is often poor, and a biologist can often just make out the pattern of light and dark, not the specific colours. This puzzle was drawn several years ago by artist Tom Godin as a competition quiz for Ducks Unlimited Canada's younger members, and has been reproduced here with the consent of both parties. Try match the duck heads below with their bodies on the following pages. A field guide could be used to better identify patterns. Beside each body, put a l etter for the matching head, and name all of the ducks on the blanks below.





The George C. Reifel Migratory Bird Sanctuary Teacher's Guide- Migration



The George C. Reifel Migratory Bird Sanctuary Teacher's Guide- Migration

## WATERBIRD ID CHALLENGE #2

Sometimes a biologist doing a bird survey only catches a glimpse of a bird. However, some species have key distinguishing characteristics which can seen at a glance and immediately confirm its identity.

Try to identify the following birds from the partial views below.



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## WATERBIRD SURVEY DATA FORM

Date	_ Time	School	
Weather			
Area Surveyed			

SPECIES	TALLY	COMMENTS

Comments	
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## MORE INFORMATION SOURCES

"Birds" - The Little Guides, by Joseph M. Forshaw. ISBN 1-875137-73-4 Published by Fog City Press, San Francisco. (info on characteristics, habitat, diet, social behaviour, maps, migration) "Birds" - Firefly Pocket Guides, by Barbara Taylor. ISBN 1-895565-41-3 Published by Firefly Books, Ontario.

(small book packed with interesting information)

"Focus on Birdwatching", by Rob Hulme. ISBN 0-600-57366-4 Published by Hamlyn Children's Books. (Pictures, easy to read text, abundance of information)

"Garden Bird Facts", by Marcus Schneck. ISBN 1-86160-287-1 Published by Prospero Books. (facts, evolution, physiology, flight, species, diet, migration)

Stokes "Beginner's Guide to Shorebirds", by Donald & Lilian Stokes ISBN 0316816965. Published by Back Bay Books. (shorebird ID, photos, migration patterns & maps, & more)

Discovery Channel -" Birds" (an Explore Your World handbook) ISBN 1 56331 800 8. Published by Random House. (info on feathers, flight, migration, ID, photos, resources)

"Everything You Never Learned About Birds", by Rebecca Rupp. ISBN 0 88266 345 3 Published by Storey (facts, legends, stories, migration, activities, projects)

### Video Suggestions:

"Pacific Estuaries - Where Rivers Join the Sea" Ducks Unlimited (30 mins.)

"Wetlands" Ducks Unlimited (30 mins.)

### WILD BC AND PROJECT WILD



Project WILD is an interdisciplinary, supplementary environmental and conservation education program for formal and non-formal educators of young people. Through workshops, instructions and a guidebook of ecology-oriented activities based on sound teaching and biological principles. Project Wild seeks to assist educators to help people of all ages to develop environmental awareness, knowledge, skills, and the ability to make informed decisions and act responsibly towards the environment. Although the primary audience of the program is educators, it is equally useful for anyone involved in teaching others in formal or informal educational settings.

Wild BC is a BC government sponsored education program that receives its base funding form our main partner, the Habitat conservation Trust Fund. We work co-operatively with many organizations at local, provincial and national levels in order to provide quality environmental education programs and resource materials to people in British Columbia. We invite partnership opportunities that will provide educators with access to a variety of programs, resources, workshops and other projects that encourage knowledge and respect of our natural world.

Beginning in 1987 with Project WILD, and the addition of more resources in 1995, Wild BC has trained over 20,000 people of all ages in environmental education. Wild BC now provides a family of resources and programs for a variety of audiences related to environmental education initiatives.

The Wild BC Office is located in Victoria.			
Office Address:	Wild BC, 4th Flr - 297	75 Jutland Rd, Victoria, BC V8T 5	5 <b>J</b> 9
Mailing Address:	Wild BC, PO Box 9354	4 STN PROV GOVT, Victoria, BC	V8W 9M1
Phone and Fax:			
Victoria: <b>(250) 356-7</b> Fax: <b>(250) 952 - 668</b>	111 4	Toll Free: 1 - 800 - 387 - 98	53 ext 4
Email Address: wild@	gems5.gov.bc.ca	Website :( <u>http://www.hct</u>	f <u>.ca/wild.htm</u> ).
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