



Massive Migrations



Goal:

Students will map and calculate the migration routes of Arctic species to learn about animals that spend part of their lives in the Arctic and how they are connected to other parts of the world for food and shelter.

Objectives:

- Measure the distances traveled by migratory Arctic bird species.
- Calculate percent difference between migratory bird routes.
- Identify Arctic species that spend parts of the year in their own local areas.
- Explain how migratory Arctic species meet their habitat requirements in various regimes.

Grade Level: 9-12

Subject Areas:

science, math, and geography

Materials Needed:

- map of North America
- computer with internet access
- science notebook

Time to Complete:

50-60 minute class period

Background

A habitat is the place where a species' requirements for food, water, cover, and places to raise young are found (distinguished from an ecosystem, which is the set of interactions between living and nonliving components in the environment). Migratory birds require three different habitat types: breeding and nesting areas, where they lay their eggs; non-breeding areas (often used to find food, water, and shelter); and migratory stopover locations as the birds move from the breeding to the non-breeding areas. Some animals such as caribou migrate to areas where food is more plentiful and where they can safely have offspring. The caribou migrate from southern, inland areas of Alaska and Canada to arctic coastal plain in the summer. High winds on the coastal plain help keep away mosquitoes and warble flies which are parasites of the caribou.

Most arctic wildlife species are temporary residents; they move to more favorable climates during the harshest time of the year. However, some species spend the entire year in the arctic ecosystem. Year-round resident birds such as the ptarmigan, raven, ivory gull, bald eagle, and dovekie have thicker feather than migrants such as arctic terns, snow geese, eiders, and sandhill cranes. The best time of year for birds to live in the arctic is during the summer months with long days in which to find food, warm temperatures, and plenty of insects! In May, thousands of birds descend upon the thawing tundra to begin their reproductive cycle. As the top soil layer of the tundra thaws, the remaining permafrost below the surface prevents the melt waters from draining, creating standing pools, called "thaw lakes", and marshy soil. For migratory birds, the process of egg-laying and rearing of young must be a fast one, as the summer months are few and quickly pass.

Most tundra birds lay their eggs directly onto the ground, in a slight depression. Some, like the golden plover, line their nests with vegetation such as moss, grass and leaves. American golden plovers and black-bellied plovers have their young in the arctic during the summer months, then travel about 6,000 miles each winter to South America! They use Texas and other states on the way as a stopover, to take advantage of warm temperatures and plentiful food before completing their long journey. *Flight of the Golden Plover: The Amazing Migration between Alaska and Hawaii*, Debbie S. Miller (1996), is an informative book about the impressive migration of the golden plover.

Arctic terns make the longest migration of any species on earth, traveling from the northern arctic to the southern Antarctic each year, a distance of 25,000 miles (40,000 km) total or about 11,000 miles (17,700 km) each way.

Arctic loons breed on tundra lakes and winter mostly on the U.S. Pacific coast.

Snow geese nest in the arctic during the summer, traveling from their winter homes in the Gulf of Mexico, a distance of 2,000 miles.

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Snowy owls may migrate depending on prey availability—if there is enough prey in their home habitat, they don't need to migrate, but if there isn't enough prey, they will migrate south. Alaska's snowy owl s then to spend autumns in the prairies and marshlands of Canada.

Sandhill cranes breed and lay their eggs mainly in the marsh grasses of the arctic and winter in grasslands throughout the southern and mid-western U.S.

Caribou are well-known travelers across the tundra. These herbivores are attracted to the abundant lichens and grasses of the arctic, and spend winter farther south in the shelter of the taiga's trees. They are excellent swimmers, which is essential since there are many rivers to cross along their way.

The Porcupine caribou herd today numbers about 130,000 to 150,000 individuals. As spring approaches each year, the herd begins a 400-mile migration northward along three principal routes from its boreal forest wintering range. Their destination is the coastal plain of the Arctic National Wildlife Refuge. By mid-May, the first pregnant cows arrive, followed soon by the rest of the herd. Calving reaches a peak in early June. The narrow coastal plain between the Brooks Mountain Range to the south and the Arctic Ocean to the north is ideal for calving and the early nurturing of the young. Thick fields of protein rich cotton-grass provide nourishment. Ocean breezes deter swarms of mosquitoes. Predators in this season are few. The coastal plain is so well-suited for calving that, although it is only one-fifth the size of the calving area used by the Central arctic caribou herd, six times as many Porcupine caribou inhabit it. By early September, the young calves are strong enough to initiate their migration southward and the cycle begins again. *A Caribou Journey*, by Debbie S. Miller (1994) is a story of caribou migration, including information on the natural history of caribou which would complement this activity.

Preparation

Sign up for computer lab time.

Procedure

1. Assign students a migratory bird species from the U.S. Fish & Wildlife Service Arctic National Wildlife Refuge, <http://arctic.fws.gov/birdpost.htm>.
2. Students will use the Cornell Lab of Ornithology website, <http://www.allaboutbirds.org/guide/search.aspx>, to discover more about the migratory bird they were given or chose. Questions and answers should be recorded in the science notebook. Have each student sketch their bird utilizing best practices for a scientific drawing, such as at http://bioserv.fiu.edu/~biolab/labs/1011/supplemental_materials/Scientific%20drawnings.pdf, (can be generalized for all scientific sketches in high school) and answer these questions about their bird:
 - a. What does their species eat?
 - b. What are its habitat requirements for food, water, and shelter?
 - c. What are its habitat requirements for raising young?
 - d. How far do they migrate? Go to <http://www.infoplease.com/atlas/calculate-distance.html>. Type in "Arctic National Wildlife Refuge" for "from" and then the closest city and the state for your migratory bird for "to".
 - e. Predict challenges they face during migration? Ask students to visualize what challenges they would face if they had to migrate for to find warmer weather, food, shelter, and water...
3. Compare the distances of different species migration routes.
 - a. Ask students to gather distances from four other groups.
 - b. Create a chart and or bar graph in the science notebook that denotes the migratory bird species and the distance flown during its migration. Be sure students are including all applicable labels.
 - c. An optional or additional task would be to create the migration distance to scale outside, using string and tape measures or meter sticks. For example on foot on the schoolyard could equal 200 miles (or whatever increments make the most sense based on your pool of migratory birds). Students could then sketch what they observe and write answers to these questions.
 - i. Which species has the longest migration?
 - ii. The shortest?
 - iii. Why do you think birds would travel on these long journeys?

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- iv. What makes the journey worthwhile for them?
Why not just stay?

Assessment

Service Learning: Have your students commit to one of the service learning projects described via this link, Flying Wild, <http://www.flyingwild.org/aboutus/learning.htm>.

Create expectations for your students based on the service learning rubric found at <http://www.peacecorps.gov/wws/educators/servicelearning/pdf/rubric2010.pdf>.

Student Resources for Further Learning

- *Atlas of Bird Migration: Tracing the Great Journeys of the World's Birds*, editor, Jonathan Elphick
- The Audubon Society, <http://www.audubon.org>
- The Smithsonian Migratory Bird Center, <http://nationalzoo.si.edu/scbi/migratorybirds/default.cfm>
- Celebrate Urban Birds, <http://www.birds.cornell.edu/celebration/> – citizen science opportunity
- Careers in Ornithology, <http://www.ornithology.com/careers.html>

Resources:

- **List of Selected Arctic Birds and States They Migrate to or Through:** Check the list of Arctic birds below to see which bird is an example of a species that summers in Alaska and winters in your state. In addition to these, there are likely many other local species in your area with similar migration patterns.
- **Smithsonian National Zoological Park – Migratory Bird Center:** <http://nationalzoo.si.edu/scbi/MigratoryBirds/Education/default.cfm>
 - Songbird kit-loaner chest of all things birds
 - Computer-based games
 - Migration Game
 - Online Coloring Book
 - Citizen Science (all ages)
 - Neighborhood Nestwatch
- **U.S. Fish and Wildlife Service:** http://www.fws.gov/educators/E_birds.html. Has both educator and student pages.

List of Selected Arctic Birds and States They Migrate to or Through

Alabama – Ruby-crowned Kinglet	Montana – Golden Eagle
Alaska – Redpoll	Nebraska – Wilson's Warbler
Arizona – Fox Sparrow	Nevada – Green-winged Teal
Arkansas – Mallard	New Hampshire – Dunlin
California – Snow Goose	New Jersey – Canvasback
Colorado – Bohemian Waxwing	New Mexico – Sandhill Crane
Connecticut – Greater Scaup	New York – Semipalmated Sandpiper
Delaware – Black-bellied Plover	North Carolina – Semipalmated Plover
Florida – Peregrine Falcon	North Dakota – Rough-legged Hawk
Georgia – Gray-cheeked Thrush	Ohio – American Tree Sparrow
Hawaii – Golden Plover	Oklahoma – Savannah Sparrow
Idaho – Short-eared Owl	Oregon – Brant
Illinois – Northern Flicker	Pennsylvania – Lapland Longspur
Indiana – Dark-eyed Junco	Rhode Island – Horned Grebe
Iowa – Sharp-shinned Hawk	South Carolina – Ruddy Turnstone
Kansas – Smith's Longspur	South Dakota – Northern Shrike
Kentucky – Merlin	Tennessee – Yellow-rumped Warbler
Louisiana – Long-billed Dowitcher	Texas – White-crowned Goose
Maine – Least Sandpiper	Utah – White-crowned Sparrow
Maryland – Tundra Swan	Vermont – Snow Bunting
Massachusetts – Golden Plover	Virginia – Lesser Scaup
Michigan – Oldsquaw	Washington – Varied Thrush
Minnesota – Red-throated Loon	West Virginia – Rusty Blackbird
Mississippi – Northern Waterthrush	Wisconsin – Snipe
Missouri – American Pipit	Wyoming – Townsend's Solitaire

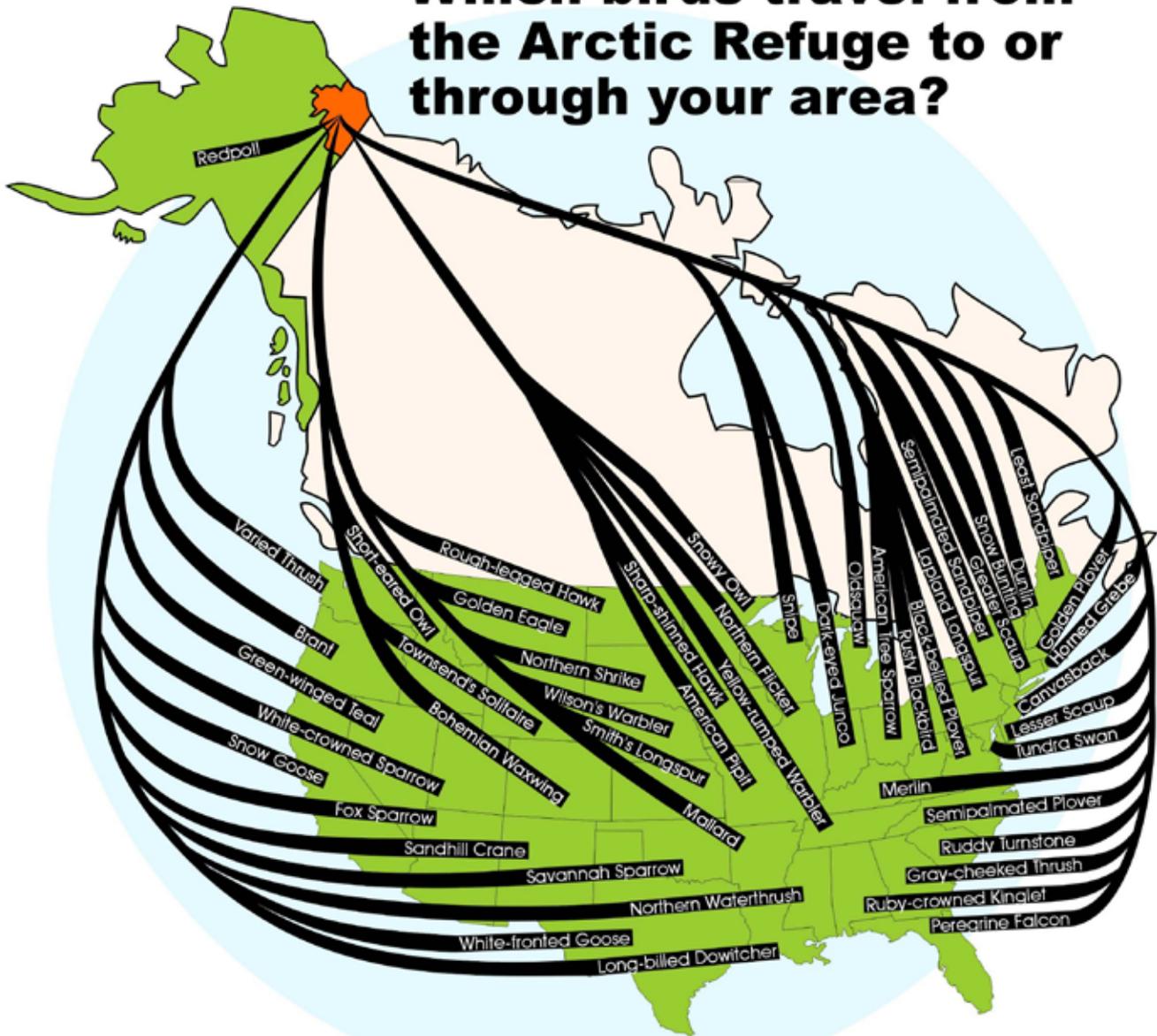
Source: US Fish and Wildlife Service, <http://alaska.fws.gov/nwr/arctic/birdpost.htm>



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Which birds travel from the Arctic Refuge to or through your area?



Each summer, birds use the Arctic Refuge to nest, raise young, feed, or rest. They then migrate to destinations in the States and beyond. This map shows some birds that may visit your area.

Arctic National Wildlife Refuge
 907/456 0250 800/362 4546
arctic_refuge@fws.gov
<http://arctic.fws.gov/>

AMERICA'S NATIONAL WILDLIFE REFUGE SYSTEM...
 Conserving the Nature of America



Source: US Fish and Wildlife Service, <http://arctic.fws.gov/pdf/isbirdmap.pdf>

