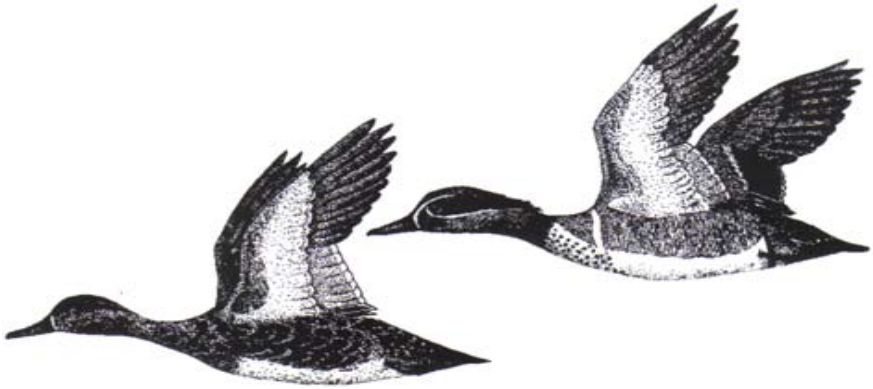
Chapter 8



Migration Studies

Migration Studies Overview

Theme

The Pacific Flyway is a route taken by migratory birds during flights between breeding grounds in the north and wintering grounds in the south. Steigerwald Lake National Wildlife Refuge plays an important role in migration by providing birds with a protected resting area during their arduous journey. Migration makes it possible for birds to benefit the most from favorable weather conditions; they breed and feed in the north during the summer and rest and feed in the warmer south during the winter. This pattern is called return migration — the most common type of migration by birds. Through a variety of activities, students will learn about the factors and hazards of bird migration on the Pacific Flyway.

Background

The migration of birds usually refers to their regular flights between summer and winter homes. Some birds migrate thousands of miles, while others may travel less than a hundred miles. This seasonal movement has long been a mystery to humans. Aristotle, the naturalist and philosopher of ancient Greece, noticed that cranes, pelicans, geese, swans, doves, and many other birds moved to warmer places for the winter. Like others of times past, he proposed theories that were widely accepted for hundreds of years. One of his theories was that many birds spent the winter sleeping in hollow trees, caves, or beneath the mud in marshes.

Through natural selection, migration evolved as an advantageous behavior. Birds migrate north to nest and breed because the competition for food and space is substantially lower there. In addition, during the summer months the food supply is considerably better in many northern climates (e.g., Arctic regions). Over much of the world, bird migration has become the rule rather than the exception. Various species of mammals, insects, fish, reptiles, and amphibians also migrate. In the spring, some of these species migrate to regions that were uninhabitable earlier in the year. Migrant species are usually assured of adequate space and ample food upon arrival at their summer habitat. Nonmigratory species, ones that stay behind to nest, benefit from the migration of other species because it reduces competition.

How and When Birds Migrate

Several senses and adaptations enable birds to migrate. Most migratory birds have very powerful flight muscles. Like most birds, they also have a highly developed respiratory system, hollow bones, internal air sacs, and specialized body shapes. All of these features enable them to fly high, fast, and for long periods of time.

Times of annual migrations are not the same for all birds. Shorebirds begin their fall migration in early July, but other species, such as geese, do not begin until late fall. Some birds have a leisurely migration, while others fly swiftly to their destinations. Generally speaking, spring migrations are faster than fall migrations because of the stimulus to breed and nest. Migratory birds may travel during the day, night, or continuously, depending upon weather conditions and the bird species.

Our feathered friends do not recognize political boundaries, traveling across both international and state borders. Protection of these birds within the United States is in the hands of the Department of the Interior's U.S. Fish and Wildlife Service. Treaties with Canada and Mexico extend protection throughout the North American Continent. Protective laws regulating hunting of ducks and geese are established according to flyways. Depending on population sizes, the hunting of certain bird species may be restricted or banned.

Migratory Bird Data Center

Banding (the attachment of identification tags to individual birds and other kinds of wildlife) has facilitated the determination of many migration routes. Amateur naturalists in Europe pioneered bird banding, and biologists worldwide subsequently adopted the practice. There are several dozen banding centers throughout the world, but we in North America are fortunate to have a facility where many of these activities are coordinated. This is the Department of the Interior's Bird Banding Laboratory in Maryland. In cooperation with the Canadian Wildlife Service, this center coordinates the banding activities of about 4,000 professional and amateur ornithologists throughout North America and several foreign countries.

Hunters and others send band numbers that they find on birds, and facts of their recovery, to the Bird Banding Laboratory. This information helps scientists to understand population dynamics and migration routes of birds. The center's scientists use computers to keep track of the thousands of recoveries sent in each year.

How Can You Help?

Most birds are banded on a leg with a metal band. If you see a bird with a bird band, record the numbers on the band as well as the date and location of the sighting.
Send, or call in, this information to: U.S. Fish and Wildlife Service, Bird Banding Laboratory, Office of Migratory Bird Management, Laurel, Maryland 20708 (1-800-327BAND). You will be sent a Certificate of Appreciation, and the person who banded the bird will be notified of your report.

EALRs

Geography: 2.1

History: 2.2

Migration Madness

Objective
Students will learn about the factors of survival for migratory shorebirds and waterfowl.

Materials

Strings (20 cm long)

Marking pens

Migration chart map (located at end of lesson)

EALRs
Writing: 2.2
Math: C 1.1.2, 3.3.2, S 1.2.3, 1.4.2, 2.3.1, 4.3.1, 5.2.2
Science: CH03 1.3.7, 1.3.9, 1.3.10, IQ02 2.1.3
History: 3.2
Geography: 1.1.1, 2.3, 3.1.1

Background
Migrating birds travel long distances between wintering and nesting areas. Timing of migration is correlated with seasonal temperature changes. During the spring, most birds do not migrate north faster than the 35° F isotherm (an imaginary line that represents 35° F across an area; north of this line is cooler than 35° F and south of this line is warmer than 35° F). This ensures that when the birds reach their nesting areas, the ground will not be frozen. In the fall, temperatures affect the amount of available food (i.e., insects and plants die off in cooler temperatures), so the birds keep moving south to places where food is abundant enough to sustain their migration to the wintering areas. Wetlands are important because they provide a place for migrating birds to feed and rest. Without these local wetland areas that supply food to sustain their energy, many birds would not be able to survive their migrations.

The Pacific Flyway is the migration route chosen for this activity. Many of the shorebirds and waterfowl seen at Steigerwald Lake NWR migrate via this flyway between wintering areas in South America and nesting areas in the Arctic portions of Alaska and Canada. In the United States, 28 percent of total flyway wetlands are found in California, 15% in Oregon, and 10% in Washington. If a bird flies between Argentina and Alaska, it covers 7,000 to 8,000 air miles. Approximately 15% of migrating birds fly at elevations below 10,000 feet, however, many have been observed at elevations of 29,000 feet by airline pilots. Most birds do not fly nonstop between these areas although they are capable of it. Generally, birds fly for a few hours and then rest and feed for 1 to 3 days before resuming migration. Birds fly faster as they approach their northern nesting grounds, because the time to nest and raise young before freezing weather comes is limited. Birds using the Central Flyway have been recorded flying 23 miles per day (mpd) up the Mississippi Valley, 40 mpd across southern Canada, 72 mpd to northern Canada, 116 mpd to Arctic Canada, and those going on to Alaska at 150 mpd. One duck was reported to have flown from Alberta, Canada to Venezuela, and South

American in 1 month (approximately 125 mpd); this trip usually takes 2 to 3 months!

Methods

Follow the instructions below:

1 Cut one piece of string that is 20 cm long. Hold an end of the string at the end of one of the migratory paths drawn on the migration map. Lay the string along the path so that it follows it exactly. Mark the end of the path on the string with a marking pen.

2 The string now represents the distance of the migratory path. Compare the string to the mileage scale located next to the map and calculate how many miles the bird traveled.

3 Repeat steps 1 and 2 for the other paths shown on the map, using a different pen color for each path. Write your answers in the spaces provided below the map.

4 After calculating the distance traveled by each bird, determine how long it would take each bird to reach its northern nesting grounds if it traveled at 40 mpd and at 72 mpd. Record your answers in the appropriate place below the map.

Discussion

Generate a list of factors that limit or favor the survival of migratory birds. (Use the following lists as supplements.) Discuss how the factors would affect a bird's migration success. Could some of them be avoided?

Extensions

Research the migration path of another bird that uses the Pacific Flyway. Draw its migration path on the migration map and label it with the bird's name.

Factors Limiting Survival

- Wetland drainage
- Drought
- Pollution and contamination of water
- Urban expansion
- Conversion of wetlands to farm land
- Disease
- Conversion of natural waterways to canals
- Illegal hunting
- lead shot from hunting in food supply

Factors Favoring Survival

- Preservation of wetlands
- High rainfall
- Restoration of habitat
- Balance with predators
- Human action aimed at protecting and restoring wetlands
- Regulation of hunting and human predation

Adapted from Seasonal Wetlands, Santa Clara Audubon Society

Alaska
CANADA
Ridgefield NWR
Wash.
UNITED STATES
MEXICO
0
Miles
1000
(each block = 100 miles)
Dusky Canada goose
Long-billed dowitcher
Purple martin

Record Your Calculations Below			
Bird	*Distance Travelled*	*How long at 40 mpd*	*How long at 72 mpd*
Dusky Canada Goose			
Long-billed Dowitcher			
Purple Martin			
Bird researched			

Migration Math Questions

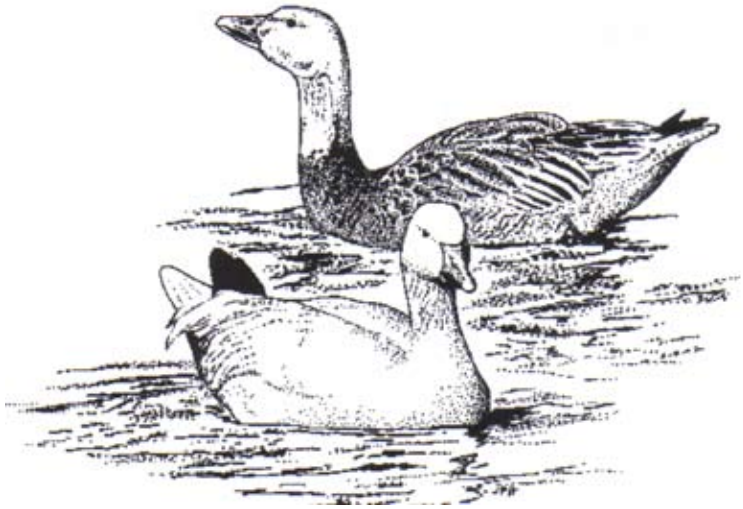
Classroom Grades: 2-8

Objective
Students will be introduced to environmental and economic subjects while doing a math exercise.

EALRs
Writing: 2.2, 2.3 Communication: 2.1.1
Math: N 1.1.2, C 1.1.2; S
1.2.1, 1.2.2 Science: CH03 1.3.10 Economics: 1.3.1, 1.3.2

Methods

After planning your field trip, prepare the students for their migration to Steigerwald Lake National Wildlife Refuge. The questions below are suggestions for a math exercise. Discuss the type of migration you and your students will be making (return migration--you will migrate to the refuge and then back to school). Bring math action into the field trip by preparing a page of Great Blue Heron Addition, Mallard Multiplication, Swan Subtraction, and Duck Division.



1) Estimate the number of miles between Steigerwald Lake National Wildlife Refuge and your school. How many miles would a round trip be?
2) How many gallons of gas (a nonrenewable fuel) will be used?
3) At _____ dollars per mile for a car or _____ dollars per mile for a bus, how much will the trip cost?
4) Discuss how to make the trip “worth it.”

Migratory Mapping

Classroom Grades: 4-7

Objective
Students will learn the migration route of a common migratory bird, the Canada goose. This will be done by compiling and mapping data from actual band records.

Materials (for the class)
Bird Banding Reports (five copies)
Paper bag or hat

Transparencies — Bird Banding Map Flyway Map

Materials

(for each student)

Colored pencils/ crayons

Bird Banding Map

Reference Map

EALRs
Science: CH03 1.3.9,
IQ03 2.1.3
Geography: 1.1.1, 1.1.2,

Background
The family Anatidae, composed of ducks, geese, and swans, is characterized by the behavioral and adaptive phenomenon known as migration. Only a few species of waterfowl are nonmigratory, and portions of some migratory species do not journey when they reside in the southern parts of their breeding ranges. Although still not completely understood by scientists, it seems that waterfowl migrate for survival; their wetland breeding habitat freezes over with the advent of winter, making food inaccessible.

Ducks, geese, and swans make long migratory flights, usually along one of four major North American corridors known as flyways. Steigerwald Lake Refuge is located in the Pacific Flyway, which is located along the western coast of the United States. To its east are the Central, Mississippi and Atlantic Flyways. (See map on page 84.)

Bird banding activities conducted by biologists revealed the existence of these four migratory flyways. In the United States, bird banding is administered by the U.S. Fish and Wildlife Service. Licensed bird banders around the country operate stations where migratory birds are safely captured. After recording and applying numbered aluminum leg bands, the banders record information on location and date of capture, species, age, and sex of the birds. The birds are then released back into the wild. Most North American waterfowl are

banded on their breeding grounds, where the juveniles and adults molting their flight feathers are easier to capture. When birds are recaptured, or if they die and their bands are recovered, the U.S. Fish and Wildlife Service uses the numbers from the bands to learn about their migration routes. Band returns also yield information on areas of hunting pressure, annual reproductive success, and the longevity of individual species. This activity will allow your students to use data from banded Canada geese to explore the concept of waterfowl migration.

Methods

1. The banding reports contain 30 banding results. Make seven copies of these reports (for a class of 30). Cut the copies into 210 strips and put these into two shoeboxes or paper bags, keeping sets A and B separate. Note: These band reports are simplified versions of real data that have been turned into the U.S. Fish and Wildlife Service.
2. Make overhead transparencies of the Bird Banding Map and Flyway Map.
3. Lead the students in a discussion of bird banding. Banding is done to provide information about birds' migration routes. Through recovery of bands, data on direction and duration of migration is obtained. The Fish and Wildlife Service can also determine the success of goose reproduction and longevity and learn about areas of hunting pressure. This information is used to adjust the rules for the following hunting season.
4. Hand out copies of the Bird Banding Map (page 82) and Reference Map (page 83).
5. Tell the students they are wildlife biologists compiling banding returns. Data is being sent to them regarding true locations of banded Canada geese. Their job is to map Canada goose migration — spring and fall — based on the reports. Students will each receive data from seven bands. While bands are recovered throughout the year, the information students receive will be primarily from the summer breeding and fall migration periods. (Have the students suggest why more bands might be recovered at these times of the year. The primary banding period occurs during the summer when adults return to breeding grounds, and bands are returned by hunters from geese they harvest during the fall hunting season).

Students can tell the difference in seasons by the dates as identified in the chart below. Have the students use different colored crayons or felt markers as indicated for migration, breeding, and wintering periods.

Time of Year	Months	Color
Wintering Period	December, January, February	Blue
Spring Migration	March, April, May	Green
Breeding Season	June, July, August	Red
Fall Migration	September, October, November	Black

6. Pass the boxes or bags around the classroom. Each student should take seven strips (representing band reports) from one of the containers. Have each student mark the

locations of the reports on their Bird Banding Map with the appropriate color indicating the time of the return. If the students receive two of the same report, they should plot both.
7. Have the students form groups of four to compare data and map the banding reports of the other group members on their individual maps. Based on the additional information, the students should then draw a circle around the areas they think represent spring and fall migration routes, breeding grounds, and wintering areas. Their data will indicate that the Canada geese used in this activity breed mostly in Alaska or Canada, and migrate along either the Pacific or Mississippi Flyway.
8. Make an enlargement of the Bird Banding Map using a transparency and overhead projector, then plot the band reports from all the students. Have each group come up and plot their returns, with each student using a different color marker representing a different period in the bird's life. Continue collecting information from the class and plotting it until all reports have been shown. Like the students have done on their individual maps, draw a circle around the areas they think represent spring and fall migration routes, breeding grounds, and wintering areas. Discuss why there might be differences between the large map and the individual maps.

Discussion

After you have put all the data on your map, introduce the students to the idea of flyways, which are generalized migration corridors. Although species' actual migrations do not strictly conform to these flyways, they are a useful way of generalizing migration routes. Band recoveries help to indicate along which flyways species migrate (for instance, the dusky Canada goose which winters on Ridgefield Refuge uses only the Pacific flyway). Use the Flyway Map (page 84) transparency to illustrate the idea and locations of flyways.

Follow-up

1 Have students choose one of the four flyways and research its geography. Generate a class list of possible problem areas and favorable habitats (refuges, rivers, estuaries, etc.) that Canada geese might encounter on that route.
2 Through research and observations made throughout the school year, students can note the varying numbers, types, and/or species of birds in the area and determine which migrate and which do not.

They can then study one migratory species they have identified in the neighborhood and use a map and bird guides to examine where the species migrates. Research should include the route and timing of migration, obstacles encountered, and traditional habitats used during migration.

Adapted from Central Valley Habitat Fun Pack, U.S. Fish and Wildlife Service

1 Goose caught by hand in northern Alaska, 8/6/91.

2 Neck-collared goose observed by person in northwestern Oregon, 2/28/91.

3 Goose found dead by hunter in Ridgefield, Washington, 10/16/91.

4 Band number of goose read from by an observer in northern Alaska, 7/9/91.

5 Hunter reports band from Central Valley, California, 11/12/91.

6 Goose caught after being forced down and weakened by bad weather in southeastern Oregon, 11/30/87.

7 Goose shot by hunter in northern California, 11/11/88.

8 Goose band sent in from south central Alaska with no information about recovery or cause of death, 8/4/91.

9 Hunter reports goose that was taken by his party in southwestern Washington, 10/13/91.

10. Goose banded in Oregon was identified and reported from southeastern Alaska by resident, 9/8/91.

11. Skeleton of banded goose found and reported from Aleutian Islands, Alaska, 9/8/91.

12. Goose recaptured almost a year later in the same place where banded in Alaska Peninsula, Alaska, 10/8/91.

24. Goose banded in Ohio found injured in Michigan, 8/4/91.

25. Goose first banded 10/11/77 in Wisconsin, accidently killed when

13. Goose banded along west central Alaska coast killed by a hunter in central California, 10/31/91.

14. Goose inadvertently caught by fur trapper in western British Columbia, 10/10/91.

15. Goose banded in Yukon Territory shot by hunter in southeastern Oregon, 10/26/91.

16. Injured goose caught in Iowa, 2/28/91.

17. Goose banded 1/2/73 south of Portland, Oregon, and shot by hunter 18 years later in southwestern Washington, 11/22/91.

18. Goose banded in Manitoba shot three months later in Missouri, 11/8/91.

19. Goose banded in Manitoba 7/19/78 and recaptured near place of banding, 7/30/91.

20. Goose caught in southern Illinois after being hit by a vehicle, 2/29/91.

21. Goose banded in the eastern Northwest Territories, Canada, shot in Ohio three months later, 10/21/91.

22. Goose found dead near Portland, Oregon, 2/27/91.

23. Goose killed in WI. by hunter, 10/29/91. recaptured in banding operation in Illinois, 2/26/91.

26. Goose banded in Manitoba shot almost 13 years later along the Gulf Coast of

Texas, 12/2/91.

27. Goose banded in Oregon identified by neck collar in central California, 2/5/91.

28. Goose found dead on highway in southern Ontario, 9/1/91.

29. Goose collected for scientific specimen in Ohio, 4/27/91.

30. Goose found dead in Illinois along Mississippi River, 3/17/81.

31. Goose banded in Arkansas shot almost 17 years later in South Dakota, 10/20/88.

32. Goose found entangled in fishing gear in Michigan, 1/5/89.

33. Goose recaptured at the place of banding one year and one day later in south central Alaska, 6/22/91.

34. Goose captured after it joined a flock of domestic birds in Portland, OR., 6/2/91.

35. Goose shot by hunter along the coast of British Columbia 40 days after it was banded, 9/3/91.

36. Band reported from western Manitoba with no information regarding bird circumstances, 6/15/91

37. Goose found dead in Minnesota, 2/30/91.

38. Goose found as the result of death by an unknown animal in central Manitoba, 7/23/81.

39. Goose banded in Kansas 2/14/80 shot in Saskatchewan, 11/9/91.

40. Goose found injured near Boise, Idaho, 6/28/90.

41. Goose found dead in southwestern Washington almost seven years after banding, 5/27/80.

42. Two geese banded on the same day were found dead a year later near a highway in Wisconsin, 1/5/82.

43. Goose banded in southeastern Oregon 7/1/86 recaptured in central Valley of California by another bander, 1/28/90.

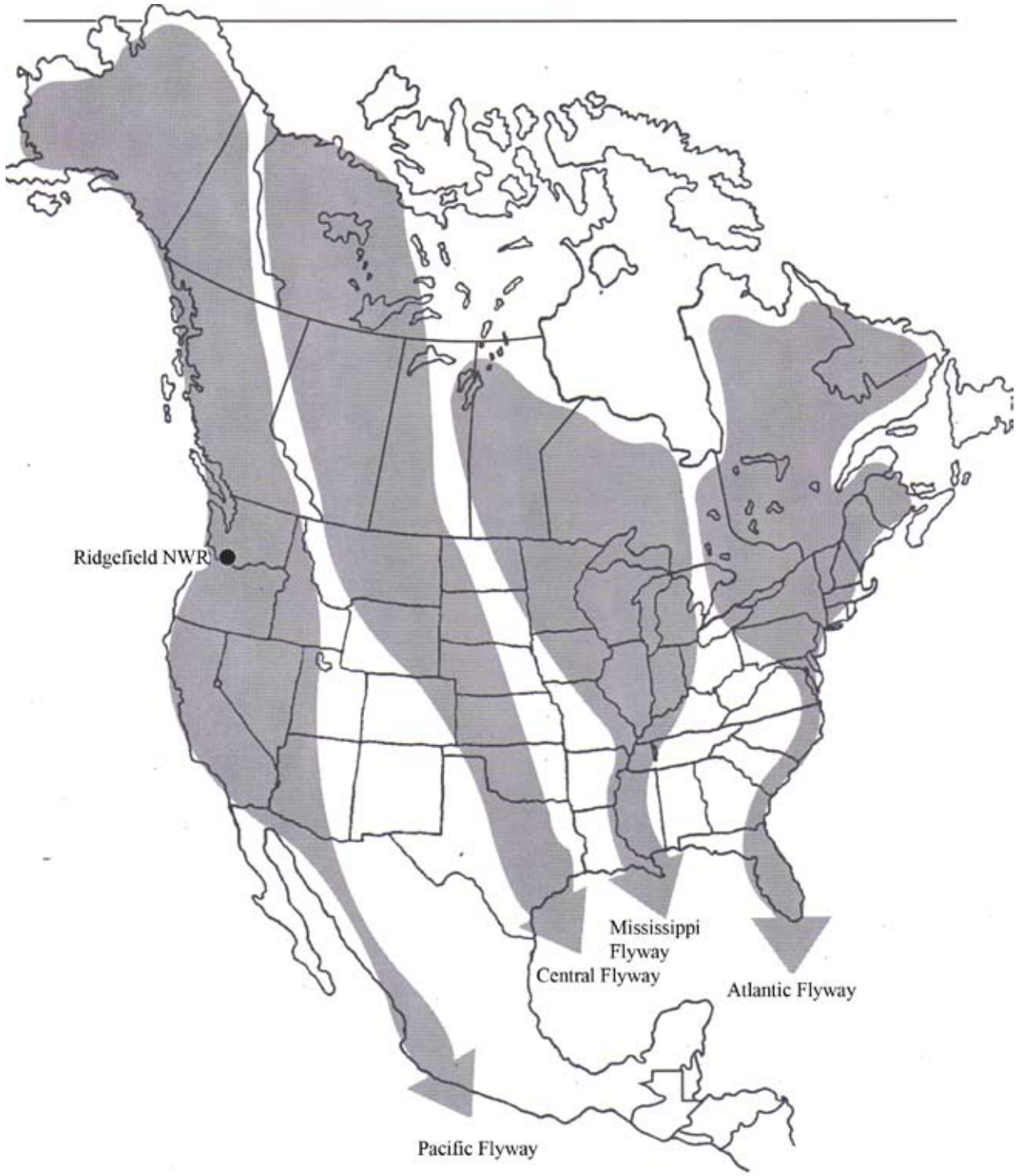
44. Goose caught by a dog in northern Minnesota, 5/28/89.

Bird Banding Map

Ridgefield NWR
0
Miles
1000
(each block = 100 miles)

Reference Map

Flyway Map


Ridgefield NWR
Mississippi
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