

U.S. Fish and Wildlife Service

Environmental Education Materials

Bird Migration

Bombay Hook
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Bird Migration

Lesson Plan Objectives:

1. Students will know what bird migration is.
2. Students will know why birds migrate.
3. Students will know how birds find their way on migrations.
4. Students will be able to name some of the hazards birds find on their migrations.
5. Students will know why many birds migrate at night.
6. Students will know what a “flyway” is, name the four flyways in North America, and know what a “route” is.
7. Students will be able to describe the migration patterns of some common birds (examples: greater snow goose, common [Atlantic] Canada goose, red knot).

Lesson Plan Overview:

The primary purpose cited for the establishment of Bombay Hook National Wildlife Refuge in 1937 was to provide habitat for migratory waterfowl. In fact, the first name of the refuge was “Bombay Hook Migratory Waterfowl Refuge.”

Many bird populations migrate, and the most common pattern involves flying north in the spring to breed in the temperate or Arctic summer, then returning in the fall to wintering grounds in warmer regions to the south. The longer days of the northern summer provide greater opportunities for breeding birds to feed their young. Many northern-breeding ducks, geese, and swans also are migrants, but need only to move from their northern breeding grounds far enough south to escape frozen waters.

Lesson Plan

What Is Bird Migration?

Bird migration is described as the regular, recurrent, seasonal movement of bird populations from one geographic location to another and back again. Birds require specific environmental resources for reproduction, and adequate food for the young is a primary determinant in where and when a species will breed. The most common pattern involves flying north in the spring to breed and returning in the fall to wintering grounds in warmer regions in the south.

The body structure and physiology of birds, unlike other animals, makes it possible for them to seek environments most favorable to their needs at different times of the year. Their ability to fly, their lungs and air sacs, and their metabolic abilities all contribute to this facility.

Questions:

1. What is bird migration?
2. Why are birds able to migrate better than other animals?

Why Do Birds Migrate?

The longer days and abundant food of the northern summer provide greater opportunities for breeding birds to feed their young. The extended daylight hours and food resources allow birds to produce larger clutches than those of related non-migratory species that remain in the tropics year round. As the days shorten in autumn and the breeding period is over, the birds return to warmer regions where the available food supply varies little with the season. Many northern-breeding ducks, geese, and swans are also migrants, but need to move from their northern breeding grounds only far enough south

to escape frozen waters. The advantages of migration offset the high stress, physical exertion, and other risks of the migration.

Day length is the primary environmental factor that prompts birds to prepare for migration. They have hormonal changes that increase their appetite and result in substantial weight gain, giving them the fat reserves that provide energy for their migratory flight. They also show increased activity at night which is when most birds migrate. While length of day is the primary stimulus for migration, birds also respond to temperature changes. For example, if a spring is late and temperatures are colder than normal, birds delay migration; if spring is early, birds also begin migration early.

The timing of the migratory cycle must allow birds to arrive on the breeding site so that there is time to establish a breeding territory, mate, incubate the eggs, and hatch the young before the optimum abundance of food is available to feed the young in the nest. Similarly, if birds waited until the climate in their northern breeding grounds became intolerable, there would be no time to gain the necessary weight that provides the energy surplus needed for their south-bound migration.

Questions for students:

1. Why do birds migrate?
2. How do birds know when to migrate?
3. How do birds time their migratory cycle?

How Do Birds Find Their Way on Migration?

Canada geese migrate as family units with several generations making up the migratory flight, including many of those who have traveled the route before. Therefore, landmarks learned in previous migrations by these birds probably are important contributors to their migrational navigation.

Migration with family groups, however, is not the typical pattern. Typically, parents and their young don't migrate together. Parents often leave before or after the young. The red knots and a number of other shorebirds are good examples. Shortly after the young have hatched, females red knots form flocks and head south, leaving the males behind to feed the young. About time the young have fledged (begun to fly), the males also take off and head

south. Then several weeks after they have gained enough fat reserves for the migratory flight, the young begin their 9,300 mile journey alone from their breeding grounds in Arctic Canada to Terra del Fuego at the southern tip of South America. How do they know where to go?

To make migration even more complex, many bird species follow one route on their late summer or early fall southbound trip and another in the spring on their northbound migration. Again, red knots are an example. In the spring they take three long non-stop flights, first from Terra del Fuego to the northeast coast of South America where they feed on clams and marine worms, then to the Delaware Bay to feast on horseshoe crab eggs, and then on to their high Arctic breeding ground. They return from the Arctic to beaches on the New England coast, followed by a non-stop crossing over the ocean to the northern tip of South America, and then work their way south until finally reaching Terra del Fuego.

To navigate, birds need to know three things: (a) where they are now, their current location; (b) where they are going, their destination; (c) the direction to travel to get there. We don't know how they do this, but it is believed that they use a combination of factors and that in their brain they have some kind of internal map.

Geographic features are an obvious navigational tool. In some cases specific landmarks may be used (as some speculate is the case with Canada geese); in others simply following a coastline or a mountain range may assist them. Young birds learn the environmental conditions and geographic features of the area where they were born and tend to return to that same place year after year.

It also is believed that birds have the ability to detect magnetic fields. Apparently they detect the north and south magnetic poles and, therefore, know to head south in the fall and north in the spring. The magnetic field varies in strength, stronger at the poles, weaker in the mid-latitudes, and birds may also be able to detect these variations to know where they are along the north/south axis.

The sun is thought to be an important compass that also allows birds find direction, but it requires them to know how to compensate for the passage of time and the sun's changing position. Therefore, they need some internal clock to know where the sun is at a given time.

Many birds, including many of the smaller birds (passerines), migrate at night. Star patterns and particularly the North Star may be another navigation tool used maintaining their direction. But night migration has other advantages: it is cooler; there is less turbulence in air currents; they can better

avoid predators; and they can refuel, eating and resting by day while flying by night.

Eagles, vultures, hawks and other soaring birds, on the other hand, migrate during the day using thermals created by differential heating of the earth's surface. They soar on the updraft of one thermal, then glide down to the next one, then rising again, using very little energy. Other birds also use the prevailing winds and frontal systems to assist their flights and to avoid headwinds.

The V-shaped flight pattern, similar to those used by geese and swans, uses less energy, and it has been shown that many birds migrate in flocks rather than as individuals for the same reason.

Storms are the most dangerous hazard facing birds during migration. For example, many birds die by being blown off course or meeting contrary headwinds when crossing large bodies of water. Predation is a second natural danger that takes many lives. Man-made hazards including tall buildings, communication towers, and other aerial obstructions take a heavy toll on migrating birds. Lights on tall structures and lighted windows in tall buildings kill many night migrants.

Questions for Students:

1. What three things does the bird need to know in order to find his way?
2. What are the things we believe birds use to find their way?
3. How do Canada geese and red knots differ after they hatch their young and start their migratory journey?
4. During migratory flights, why do birds fly in flocks or V formations?
5. Why do most birds migrate at night?
6. Name one group of birds that migrate during the day and tell why.
7. Name some of the hazards birds face on their migratory flights.

What Are Flyways and Routes?

There are four major North American flyways: the Atlantic, the Mississippi, the Central and the Pacific. Flyway boundaries are not sharply defined, and in the breeding areas in the north and in the wintering areas in the south there is overlapping of the four flyways.

The terms "migration route" and "flyway" are theoretical concepts. Flyways are wide arterial highways, broad areas in which migration routes are

found. Migration routes, on the other hand, are the lanes of travel from a particular breeding ground to the winter quarters used by specific bird populations.

The **Atlantic Flyway** extends from the offshore waters of the Atlantic Coast west to the Allegheny Mountains, then curving northwestward across northern West Virginia and northeastern Ohio, it continues across the prairie provinces of Canada and the Northwest Territories to the Arctic Coast of Alaska. A primary migration route from the northwest to the Atlantic coast is used by many migratory waterfowl. The coastal route which follows the shore line has its northern origin in the eastern Arctic islands and the coast of Greenland. This is a regular avenue of travel for shorebirds and greater snow geese. Another migratory route passes directly over the Atlantic Ocean from Labrador and Nova Scotia to the Lesser Antilles and then across a group of small islands to the mainland of South America. It also is used by several species of shore birds.

The eastern boundary of the **Mississippi Flyway** runs through southern Ontario to western Lake Erie, then southwest across Ohio and Indiana to the Mississippi where it closely follows the river to its mouth. This route is uninterrupted by mountains and there are no hills or ridges to interfere with migrating birds. The longest migration route in the Western Hemisphere lies in this flyway. Its northern terminus is on the Arctic coast of Alaska and its southern end is in Patagonia.

The western boundary of the **Central Flyway** follows closely along the eastern base of the Rocky Mountains, but after crossing the continental divide the flyway goes south across the Great Plains. It encompasses the entire region between the valley of the Mississippi River and the Rocky Mountains.

The **Pacific Flyway** follows the coast from Alaska and the Aleutian Islands to the Rocky Mountain and Pacific coast regions of Canada, the United States, and Mexico. The most important waterfowl route in the Pacific Flyway originates in northeastern Alaska and passes through the interior to winter quarters in California from the Sacramento Valley south to the Salton Sea and the tidal marshes near San Francisco Bay. The route of migratory land birds goes from the interior of California to the mouth of the Colorado River and then on south to the winter quarters in western Mexico.

Questions for Students:

1. What is a flyway?
2. What is the difference between a flyway and a route?
3. How many flyways are there in North America?
4. Name or describe one of the routes in the Atlantic Flyway.
5. Under the guidance of a teacher or an environmental education naturalist, use the eBird Trail Tracker to identify a migratory bird that is found on the refuge and see where its breeding grounds are and where its winter grounds are.
6. Explain the migratory patterns of a common bird that uses the Atlantic Flyway.

Lesson Plan Relates to Delaware Science Content Standards: (6-8; 1.1.D); (4-5;3,1,A); (6-8;3,1,A); (4-5;4.1,A); (K-3;5,2,A); (6-8;5,2,H); (4-5;6,3,A); (6-8;7,1,E)