Migration Headache

Grade Level: lower elementary, upper elementary/lower middle school
Duration: one 40-minute class period
Skills: vocabulary, discussion, comparison, observation, data collection and interpretation; using technology (with additional activity)
Subjects: science, language arts, math, and physical education; technology and social studies (geography) (with additional activity)

Concepts:
- During each year of their lives, most shorebirds migrate between habitats located in different geographic areas.
- Shorebirds migrate between northern breeding areas and southern wintering areas to take advantage of seasonal food resources.
- Arctic-nesting shorebirds undertake some of the longest migrations of any animals.
- Migratory shorebirds depend on habitat in at least three areas: breeding, nonbreeding, and migratory stopover sites.
- Because shorebirds fly together in large numbers their populations are extremely vulnerable to threats along their migratory routes.
- Most important migratory stopovers are nutrient-rich habitats, like estuaries, that also provide resources desirable to humans, making them vulnerable to alteration, pollution, disturbance, and destruction.

Vocabulary
- migration
- limiting factor
- habitat
- habitat loss
- breeding areas
- nesting site
- nonbreeding site
- wintering area

Overview
Students become "migrating shorebirds," traveling between nesting and wintering habitats. Along their journeys they experience some of the threats that affect the survival of migratory shorebird populations.

Objectives
After this activity, students will be able to:
- Define the term migration.
- List three limiting factors that can affect the populations of migrating shorebirds.
- Classify these limiting factors as natural or human-caused.
- Predict the effects of habitat loss and degradation on populations of shorebirds.

Materials
- Large playing field or gymnasium
- Two paper plates for every three students (Clearly mark the plates, perhaps with a large X on one side, to differentiate top from bottom.)
- Additional plates based on one-fourth of the total number of plates from calculation above.
- *Factors Affecting Survival Cards or Habitat Scenarios* listed below
- Flip chart and several colored markers

Introduction
Migration is a challenging task for migratory shorebirds. For many species it involves flying tremendous distances, facing difficult weather, and depending on stopover habitats and food resources that have been available for many generations.

There are approximately 49 different species of shorebirds throughout North America. Most of these shorebirds spend their summers at northern *breeding areas* in the United States and Canada and migrate to *wintering areas* in the southern United States, Central America, and South America. The White-rumped Sandpiper, for example, migrates each year from the Arctic Circle to the southernmost tip of South America and back, a round trip of 20,000 miles! However, not all shorebirds migrate such long distances. Some, like the American Avocet, breed in the northern part of the United States and winter in the southern part of the United States.

There is a wide variety of *limiting factors*, both natural and man-made, that affect whether or not these birds reach their nesting or wintering grounds. Understanding what these factors are and how they affect shorebird populations is the key to shorebird conservation.

To learn more about shorebird migration and threats to shorebird survival, read *Magnificient Shorebird Migration* and *Threats to Migrating Shorebirds* found in the *Shorebird Primer*.

Activity Preparation
1. Photocopy one set of the game cards (included in this activity) on cardstock paper. Each card lists one factor (from the table below) affecting shorebird survival on one side and the number of plates lost or gained as a result of this factor on the other side. *Additional Habitat Scenarios that may be used along with, or in place of, the*

Factors Affecting Shorebird Survival are provided; however, the additional habitat scenarios are not laid out as game cards.

2. Select an area about 20 meters (about 70 feet) in length (indoors or out) where the students can race back and forth.

Habitat Scenarios

Educators may want to photocopy these scenarios before beginning the activity.

These scenarios can be used during the activity to assist educators with the factors that may reduce or enhance a wetland habitat.

- A marsh has been dredged to allow a marina to be built. Remove one habitat (plate) from the stopover habitat.
- A landowner has agreed to reflood fields after harvesting, increasing acreage for wintering birds. Add one habitat (plate) to the wintering habitat.
- A joint federal and state wetland restoration project involve the removal of drain tiles, allowing a former wetland to flood and return to its natural state. Add one habitat (plate) to the stopover habitat.
- A large increase in the number of cats, dogs, and raccoons has reduced the value of a marsh nesting area. Remove one habitat (plate) from the nesting habitat.
- Wintering habitat is reduced by the conversion of wetlands to cropland. Remove one habitat (plate) from the wintering habitat.
- New legislation restricts boat traffic on a number of lakes and large marshes, reducing the human disturbance to wildlife. Add one habitat (plate) to stopover habitat.
- Several years of sufficient rain and snow have replenished the water supply, thus increasing the food supply. Add one habitat (plate) to the nesting habitat.
- A timber company has agreed to preserve grassland with scattered wetlands in exchange for tax credits. Add one habitat (plate) to the stopover habitat.
- Wintering habitat is reduced by the conversion of beach to condominiums. Remove one habitat (plate) from the wintering habitat.

Procedure

1. Select a large playing area about 70 feet in length. Place an equal number of bases in three areas on the playing field. (See illustration.) Choose the number of bases so that there is one base for each two or three students at each of the three areas on the field. Designate one of the end areas as the "wintering habitat," the other end as the "nesting habitat," and the area in the middle as "stopover habitat."

2. Explain to the students that they are shorebirds and will migrate among these three areas at your signal. Tell the students that the bases represent suitable shorebird habitat such as wetlands and grasslands. At the end of each migration, the students will have to have one foot on a base in order to be

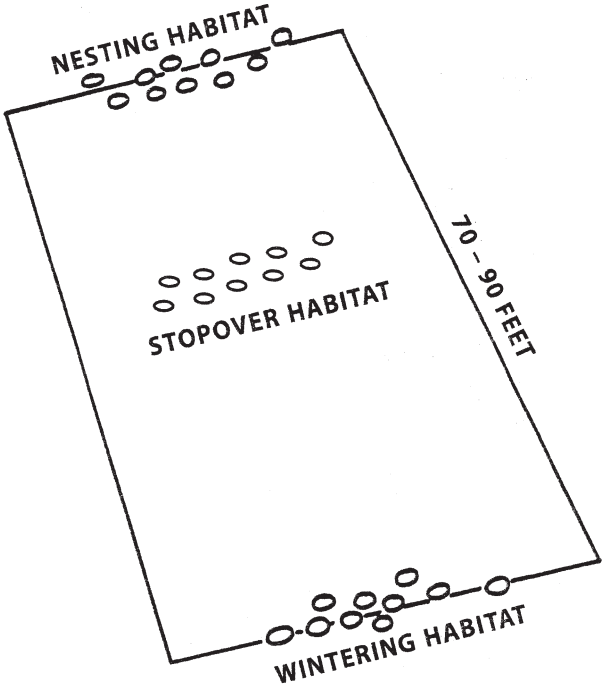
Factors Affecting Shorebird Survival

Factors Reducing Survival	*Number of plates lost**	*Factors Favoring Survival*	*Number of plates gained**
Urban expansion	5	Preservation of wetlands and grasslands	4
Wetland drainage	5	Dynamic balance with predators	4
Conversion of wetlands and grasslands to farmland	4	Improvement/addition of habitat	3
Pollution (e.g., oil or chemical spill or runoff)	3	Education about habitat for wildlife	3
Drought	3	Normal rainfall (i.e., neither drought nor flood)	2
Disturbance to resting and feeding shorebirds	2	Education about hunting	1
Pollution of food supply	1	Farm management for crops, cattle, and shorebirds	3
Illegal hunting	1		

* Number of plates lost/gained: These numbers are only suggestions and are not necessarily accurate or directly proportional to the size of the threat, percentage of change in survival, etc. This will vary between particular places or incidents.

allowed to continue (survive). Tell the students that only two (or three, as decided in Step 1) shorebirds can occupy a habitat (base) at one time. If they can not find a habitat that is not "filled," that means they have not found any suitable habitat. They "die," and have to move, at least temporarily, to the sidelines. During migration, the students may want to "flap their wings," moving their arms like birds in flight.

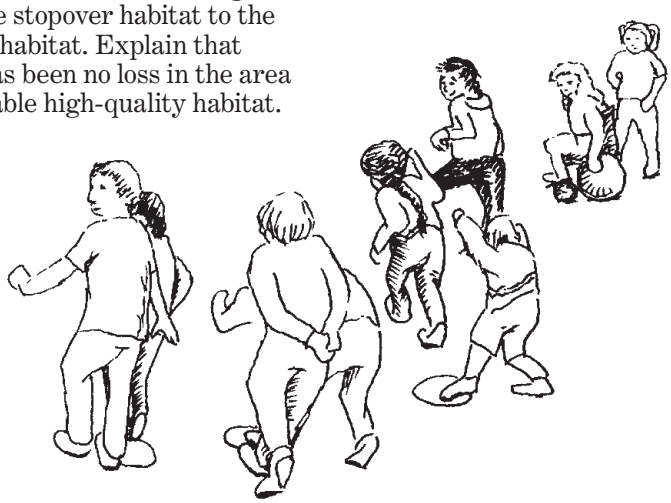
3. Explain to the students that many factors will limit the survival of populations of migrating shorebirds. Some involve changes in the wintering, stopover, and nesting habitats. There will be periods of time in which food, water, shelter, and space are suitably arranged to meet the habitat requirements of the birds. There will be other times when the habitat is stressed, with many factors limiting the potential for the birds' survival.



4. Begin the activity with all students at the wintering habitat. Announce the start of the first migration. Have the students migrate slowly until they become familiar with the process. Then they can speed up. On the first try, all the birds will successfully migrate to the stopover habitat.

5. Explain that most shorebirds need these areas to rest and eat before continuing the migratory journey. Then have them migrate from the stopover habitat to the nesting habitat. Explain that there has been no loss in the area of available high-quality habitat. Thus, a successful nesting season is at hand.

6. Before the students migrate back "south," turn over four plates in the breeding habitat. This represents a catastrophic loss. Tell the students that this is the result of a period of unusually heavy rain that flooded many of the nests. Instruct the students to migrate. This results in a large number of students waiting

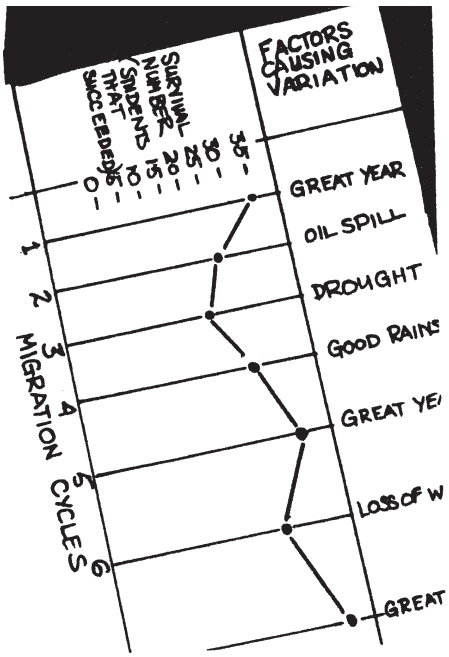


on the sidelines to re-enter the nesting habitat. Tell the students that these birds died as a result of habitat loss. Remind any "deceased" birds that they will have a chance to get back into the activity. They can come back as surviving hatchlings when favorable conditions prevail and there is habitat available in the nesting ground.

7. Continue the migrations by reading the *Factors Affecting Survival Cards* or the *Habitat Scenarios*. Educators may want to appoint two students as monitors to remove and add bases (habitats) as required on the cards. Use your discretion to ensure that too many plates are not added or removed, and that "dead shorebirds" have an opportunity to re-enter the game.

8. Repeat the process for eight or ten migration cycles. Remember, overall the availability of suitable habitats for shorebirds are diminishing. The activity should end with fewer areas of available habitat than can accommodate all the birds. *The greatest long-term threat to the survival of populations of shorebirds is the loss and degradation of habitat.*

9. As you move through the game, chart the number of shorebirds that survive each round, using the flip chart and markers as shown below. Make a note on the chart indicating what caused serious shorebird deaths and what caused good breeding years for students to refer to later.



10. After the activity, ask the students to identify factors that caused shorebird populations to decline or increase. What are the short- and long-term effects of the decline or increase? Which factors reduced or enhanced the quality of the habitat? What are the benefits and liabilities related to these factors for the community?

    - Have students summarize what they have learned about the factors that affect shorebird migration.

    - Divide these factors into two lists-human-caused factors and environmental factors.

    - Compare similarities and differences among these limiting factors. Which pose the most significant long-term threat to shorebird survival?

    - What threats exist to your local shorebird habitat?

11. Have students study the graph you created during the game.
    - What were the causes of the biggest population declines?

    - Ask students to imagine how long these factors might affect a shorebird population (one breeding season, two….?).

    - Distinguish between catastrophic effects and gradual changes.

■ What kinds of things can be done to protect and restore habitats for migrating bird populations? Discuss potential trade-offs related to any recommendations for humans and other organisms (including shorebirds).

Additional Activities

Cultural Connections

■ Facilitate a student discussion about what might be the culturally-influenced viewpoints of the peoples' actions in the "Affecting Shorebird Survival" and "Habitat Scenarios" towards the environment.

■ Have students research the impact of the Exxon Valdez oil spill on the local communities affected and on the shorebirds migrating through.

Research a Species of Shorebird
Conduct this activity again with each student representing a specific kind of shorebird.

Research Habitat Loss Causes in Your Community
Explore the major factors affecting habitat loss and alteration-or gain and restoration-in your area. Research the causes for long-term habitat loss, as well as any major efforts underway to prevent these increasing losses. Find out how wetlands have changed or remained the same in your community throughout the past 100 years. Are there wetland regulations or zoning laws in your community?

Research Other Migratory Animals
What other animals migrate? Are the problems they face similar to those of migratory birds?

Research Laws Protecting Migratory Species
There are national laws and international treaties protecting migratory species. Find out about some of these. What is their history? Are they effective? Are there problems enforcing them? What migrating species, if any, are unprotected by such laws?

Track Shorebird Migration Around the World
Use the Shorebird Sister Schools Website at *http:// sssp.fws.gov* to monitor shorebird migration throughout the world. Look at the reports scientists and students are posting. Look for sightings of shorebirds in your area. Post your own shorebird observations on the Web site too!