Migration Headache

Objectives

Students will (1) list limiting factors affecting habitats and populations of migrating waterbirds; (2) predict the effects of such limiting factors; (3) describe the effects of habitat loss and degradation on populations of migrating waterbirds; and (4) make inferences about the importance of suitable habitat for migrating waterbirds.

Background

Birds that migrate depend not just on having one suitable habitat, but two and often three habitats. For example, some birds nest and raise their young in the northern limits of their range. The same birds may also require suitable habitat in the southern limits of their ranges to live during winter. Because migrating birds travel hundreds or thousands of miles between nesting and wintering grounds, resting and feeding sites (known as stopovers) are crucial.

A variety of remarkable migrating shorebirds and waterfowl inhabit the skies and waters of the United States. Many migrating birds—ducks, geese, cranes, herons, rails, terns, and plovers, for example—require wetlands in their breeding, stopover, and wintering grounds. Without wetlands, dozens of species of waterbirds face loss of necessary habitat.

Over the past 150 years, waterbird populations have been threatened by the alteration of habitats and direct mortality of birds. Numerous populations of waterbirds have declined, some significantly. Destruction of wetland habitat reduces the quantity of suitable nesting, feeding, and resting areas. Alteration of wetland habitats often reduces their quality, making them unsuitable for waterbirds. Wetland habitat, usually found in low, fertile plains along watercourses, was historically prized for conversion to farmland and settlements. Agriculture and development, both residential and industrial, have reduced the number and quality of natural wetlands.

Direct mortality of waterbirds occurs in various ways. The migration routes of North American waterbirds are well known. Before the passage of regulations regarding the hunting of waterbirds, market hunters of the 19th century and very early 20th century decimated flocks by taking advantage of the vast numbers of waterbirds that concentrated at strategic points along these routes. Pollution, through insecticides and herbicides, for example, has also taken a toll. Birds may ingest poisons that have been concentrated as they move through the food web, sometimes with lethal effects. In some cases, pesticides also kill the birds' food, reducing their food supply.

Many international, federal, state, and private groups recognize the importance of wetland habitat to wildlife conservation. In the early 1900s, several laws and treaties were enacted that regulated the hunting of waterbirds and protected the habitat on which they depended. Laws that conserve and enhance wetland habitats have slowed the alteration of these habitats. The Clean Water Act of 1977 and the Farm Bill of 1985 are two major pieces of such legislation. In addition, techniques have been developed to build new wetlands as well as enhance the quality of existing wetlands. The U.S. Fish and Wildlife Service (USFWS) has principal legal responsibility in the United States for managing migratory wildlife at the federal level. State wildlife agencies share some responsibilities with the USFWS for conserving migratory waterbirds.

The effects of natural occurrences and human management efforts during the 1990s have produced mixed results. The North American Waterfowl Management Plan, coordinated by the USFWS, has worked through private-public partnerships to conserve and enhance waterfowl habitat in Canada, Mexico, and the United States. This effort, aided by several years of plentiful rain and snow, has allowed populations of most species of waterfowl (ducks, geese, and swans) to rebound from record lows in the 1980s and early 1990s to near historic high numbers. In fact the populations of many waterfowl species were larger in 2012 than they were in 1986. Conversely, shorebirds like plovers, terns, and the Red Knot continue to suffer losses because of habitat loss and alteration along coastal regions. In 2001, the U.S. Supreme Court removed isolated wetland ecosystems such as Texas prairie wetlands from protection under the Clean Water Act and determined that waterfowl cannot be the sole justification for preserving natural space. In 2006, the Supreme Court once again suggested narrowing the scope of the Act by only including waters with a relatively permanent flow. Many organizations are working to reverse these decisions.

In addition, many waterfowl conservationists are now studying predicted effects of climate change on waterbirds. Rising sea levels could contribute to coastal habitat loss and unusual weather conditions.
conditions may disrupt migration patterns for many waterbird species. Increasingly warmer seasons across the upper Midwest have altered some insect life cycles, affecting the timing of food availability for arriving birds. Resources and research are needed to understand shifting conservation concerns for waterbirds in decades to come.

In this activity, each student (assuming a class of 30) represents thousands, if not tens of thousands, of waterbirds. Thus, occasional losses to predation and other events of relatively minor magnitude during the course of migration are not emphasized in the simulation. The major purpose of this activity is for students to dynamically experience some important factors that affect habitat quality and the associated survival of migratory waterbird populations.

**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 as shown below:

![Diagram of three areas: Nesting Habitat, Stopover Habitat, Wintering Habitat]

2. Explain to students that they are waterbirds and will migrate between these three areas at your signal. Tell students that the bases represent wetlands. These wetlands provide suitable habitat for waterbirds. At the end of each migration, students will need to have one foot on a base in order to be allowed to continue (survive). Tell students that only two or three as decided in Step 1) waterbirds can occupy a habitat (base) at one time. If they can’t find a habitat that isn’t “filled,” that means they have not found any suitable habitat. They “pass away,” and have to move, at least temporarily, to the sidelines. During migration, students may want to “flip their wings,” moving their arms like birds in flight.

3. Explain to students that many factors will limit the survival of populations of migrating waterbirds. Some involve changes in the wintering, stopover, and nesting habitats. There will be periods of time when 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 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 waterbirds 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 of available high-quality habitat in the area. Thus, a successful nesting season is at hand.

6. Before students migrate back “south,” remove one base from the stopover habitat. Explain that a developer has received a permit to drain a wetland to build a mall. Repeat the instruction to migrate, and send the birds to the stopover habitat. Have students who could not find available habitat stand on the sideline. Tell 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.

**NOTE:** The migrations can be graphed as shown in the sidebar on the following page.

7. Continue the migrations by reading Habitat Scenarios at the end of the activity. Educators may want to appoint two students as monitors to remove and add bases (habitats) as required for each scenario.

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

**Extensions**

1. Research a species of waterbird. Conduct this activity again with each student representing a specific kind of waterbird.

2. 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.

3. Using a map, plot the major migratory routes of North American birds.

4. Visit a national wildlife refuge, state wildlife area, bird observatory, private sanctuary, seashore, or other habitat for migratory waterbirds.

5. What other animals migrate? Are the problems they face similar to those of migratory birds? Research these questions online.

6. There are national laws and international treaties protecting migratory species. Identify some of these. What are their histories? Are they effective? Are there problems enforcing them? What migrating species, if any, are unproctected by such laws?

7. 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?

**Evaluation**

1. Name two human activities and two environmental factors that might interfere with waterbird migration. For each activity and factor, describe the possible effects on waterbirds.

2. Distinguish between effects on individual birds and effects on populations of birds. Indicate if an effect is short term or long term.

3. Why is suitable habitat important for migrating waterbirds? Include in your response a description of the different kinds of habitat that are needed by migrating waterbirds.

4. Is habitat loss a greater threat to the survival of migrating populations than for stationary populations of wildlife? Explain your answer.
Habitat Scenarios

A marsh has been dredged to allow a marina to be built. **Remove one habitat from the stopover habitat.**

A landowner has agreed to re-flood fields after harvesting, increasing acreage for wintering birds. **Add one habitat to the wintering habitat.**

A joint federal and state wetland restoration project involved removing "drain tiles" (perforated pipes), allowing a former wetland to flood and return to its natural state. **Add one habitat to the stopover habitat.**

A large increase in the number of mink and raccoons has reduced the value of a marsh nesting area. **Remove one habitat from the wintering habitat.**

Wintering habitat is reduced by the conversion of bottomland hardwood forests to cropland. **Remove one habitat from the wintering habitat.**

New legislation restricts motorboat traffic on a number of lakes and large marshes, reducing the human disturbance to wildlife. **Add one habitat to stopover habitat.**

Several years of sufficient rain and snow has replenished the water supply, thus increasing the food supply. **Add one habitat to the nesting habitat.**

A timber company has agreed to preserve a forested wetland in exchange for tax credits. **Add one habitat to the stopover habitat.**

Filling and diking reduces the amount of tidal wetlands available to waterfowl. **Remove one habitat from the wintering habitat.**

A large condominium development has been built on a drained marsh that was prime duck wintering habitat. **Remove one "habitat haven" from the wintering habitat.**

A large oil spill from a supertanker has severely damaged a number of salt marshes that were prime wintering areas. **Remove three "habitat havens" from the wintering habitats.**

A canal was constructed to remove boat traffic from a river that was used by a large number of waterfowl years ago. It is returning to its natural state. **Add one "habitat haven" to the stopover habitat.**

A number of consecutive dry years have occurred, resulting in numerous small wetlands drying up. **Remove one "habitat haven" from the nesting habitat.**

A prime wetland area has just been included in a new National Park. Because human disturbance is reduced in the area, add one "habitat haven" to the wintering habitat.

A coastal resort town has annexed a nearby area containing a wetland, which it has drained to allow tourist hotel development. **Remove one "habitat haven" from the wintering habitat.**

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Habitat Scenarios

A "cookie cutter" (machinery that removes some vegetation and exposes a small area of water) has been brought to a marsh to improve waterfowl habitat. **Add one "habitat haven" to the nesting habitat.**

Acid rain has reduced the number of invertebrates needed by hens during nesting. **Remove two "habitat havens" from the nesting habitat.**

A marsh has been dredged to allow a marina to be built. **Remove one "habitat haven" from the wintering habitat.**

Prime waterfowl habitat has been severely damaged by the use of a marsh as an irrigation pond. **Remove one "habitat haven" from the stopover habitat.**

Water in a human-made marsh has been drawn down to speed decomposition and consolidate the bottom. **Remove one "habitat haven" for a season and then add two "habitat havens" the next season because of the improvement in nesting habitat.**

A large increase in the number of mink and raccoons has reduced the value of a marsh as a nesting habitat for waterfowl. **Remove one "habitat haven" from the nesting habitat.**

The muskrat population explodes, "eating out" cattails in a dense marsh. This makes the marsh more suitable for waterfowl. **Add one "habitat haven" to the nesting habitat.**

The owners of fragile wetland areas agree to place their lands in a wetland conservation program. **Add one "habitat haven" to the wintering habitat.**

A new dam is built on a river, creating a lake that covers the wetlands above it. **Remove two "habitat havens" from the wintering area.** However, the following year the area below the dam is declared a wildlife sanctuary. **Add one "habitat haven" to the wintering habitat.**

Pesticides infiltrate marsh water, altering the food web and affecting resistance to disease. **Remove one "habitat haven" from the nesting habitat.**

Rough fish, such as carp, that stir up bottom sediments are prevented from entering a wetland by a fish trap. This improves the water quality and habitat for waterfowl. **Add one "habitat haven" to the stopover habitat.**

Filling and diking reduces the amount of tidal wetlands available to waterfowl. **Remove one "habitat haven" from the wintering habitat.**

New federal laws ban the use of lead shot nationwide. This reduces waterfowl deaths due to lead poisoning. **Add one "habitat haven" to the stopover habitat.**

Heavy spring rains in the nesting habitat stimulate aquatic plant and invertebrate growth, creating more food sources for waterfowl. **Add one "habitat haven" to the nesting habitat.**

A new water treatment plant reduces the amount of pollutants released into a wetland. **Add one "habitat haven" to the nesting habitat.**