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Chandler E. Woodcock
COMMISSIONER

September, 2016

Dear 4th grade Teachers and Public Librarians:

Enclosed please find a complimentary copy of Maine Department of Inland Fisheries and Wildlife's (MDIFW) beautiful new poster: "*Maine's Endangered and Threatened Species*". This poster provides a comprehensive description of all 51 Maine animals on the state Endangered Species list; from Piping Plovers and Peregrine falcons to Blanding's turtles and Brook floaters.

In addition, the teacher packet includes 3 Project WILD activities, aligned with Maine's Learning Results, that will support and enhance the use of this poster by classroom teachers and librarians. Project WILD is a hands-on wildlife and conservation activity guide filled with over 100 great activities. It is available to teachers and other educators after participation in a 6-hour teacher workshop. For more information about Project WILD, visit our website at www.mefishwildlife.com.

For your information and reference, there are also links to additional MDIFW publications and reports, where you and your students may find more detailed information about rare or nongame wildlife species and their important habitats. We hope all of these materials will be of value to you and your students interested in learning more about Maine's special wildlife heritage

This project was made possible from a grant from the Maine Outdoor Heritage Fund; conserving wildlife and open spaces through the sale of instant, scratch lottery tickets. With proceeds from ticket sales, grants are awarded twice a year, totaling approximately \$700,000 annually. All 790 4th grade teachers and all 266 public libraries in Maine received this poster and teacher packet mailing!

If you could take the time to go to: www.surveymonkey.com/r/EndangeredSpeciesPoster, this short survey will provide us with information about how you found the poster and materials most useful. We'd certainly appreciate your input!

Sincerely,

Chandler Woodcock,
Commissioner, Maine Department of Inland Fisheries and Wildlife

ADDITIONAL RESOURCES

Maine Department of Inland Fisheries & Wildlife (MDIFW)

maine.gov/ifw/wildlife/endangered

MDIFW has extensive additional information about Maine's endangered species online.



MDIFW Research & Management Report

maine.gov/ifw/wildlife/reports/research_management

This annual report, available both online and as a booklet, has much detailed information about current projects implemented by Maine biologists to conserve endangered and other wildlife.

(Maine) State Wildlife Action Plan (SWAP)

maine.gov/ifw/wildlife/reports/MWAP2015

Maine's Wildlife Action Plan identifies 378 fish and wildlife species, and their habitats, that are in greatest need of conservation. The Plan identifies steps to be taken over the next ten years to prevent these species from becoming more rare.



How you can support Maine's endangered & threatened wildlife

maine.gov/ifw/wildlife/support

The purchase of a Loon License Plate, Sportsman License Plate, contributions to the Chickadee Check-off on the state income tax return, or purchase of a Birder Band or Maine Outdoor Heritage Fund lottery ticket all help fund endangered and threatened wildlife conservation in Maine.



Maine Outdoor Heritage Fund (MOHF)

maine.gov/ifw/MOHF

The Maine Outdoor Heritage Fund conserves wildlife and open spaces through the sale of instant, scratch lottery tickets. With proceeds from ticket sales, grants are awarded twice a year; helping to fund critical wildlife and conservation projects throughout the state since it was created by the Maine Legislature in 1996.

This project was funded through an MOHF grant!

Project WILD, Aquatic WILD, Flying WILD, Growing Up WILD

projectwild.org

Project WILD is a wildlife-focused conservation education program for K-12 educators and their students; linking them to wildlife through its mission to provide wildlife-based conservation education that fosters responsible actions toward wildlife and related natural resources.



US Fish & Wildlife Service

fws.gov/endangered

The principal federal partner responsible for administering the Endangered Species Act (ESA), taking the lead in recovering and conserving the Nation's imperiled species by fostering partnerships, employing scientific excellence, and developing a work force of conservation leaders.



Maine Mathematics and Science Alliance (MMSA)

mmsa.org

MMSA develops and applies research and best practices in science, technology, engineering, and math (STEM) education. MMSA staff developed the Maine Learning Results alignments to the Project WILD activities in your teacher packet.



School Field Trips with Endangered Species Programming @ Maine Wildlife Park & Swan Island

www.maine.gov/ifw/education/schools_teachers/field_trips

Wildlife programming is offered in May, June, Sept. and Oct. at the Wildlife Park in Gray and Island in Richmond.

Department of Marine Resources

www.maine.gov/dmr/science-research/species/protected/

Here Today, Gone Tomorrow

Next Generation Science Standards: Disciplinary Core Ideas*

Standard & Grade Band Endpoints	Evidence of Alignment
<p><u>LS2.C: Ecosystem dynamics, functioning, and resilience</u></p> <p><i>By the end of grade 5.</i> When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce...and some die.</p>	<p><u>Procedure #3</u> ...develop a master list of the animals according to the category in which they can be classified...and the principal factors affecting the animal.</p> <p><u>Procedure #4</u> ...Discuss the findings. What seem to be the most prevalent factors affecting the animals ...?</p> <p><u>Also:</u></p> <ul style="list-style-type: none"> • Technology Connection #3 • Extension #1 • Aquatic Extensions 1 and 2 • Evaluation 4
<p><u>ESS3.C: Human impacts on Earth systems</u></p> <p><i>By the end of grade 5.</i> Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. For example, they are treating sewage, reducing the amounts of materials they use, and regulating sources of pollution such as emissions from factories and power plants or the runoff from agricultural activities.</p>	<p><u>Procedure #3</u> ...develop a master list of the animals according to the category in which they can be classified...and the principal factors affecting the animal.</p> <p><u>Procedure #4</u> ...Discuss the findings. What seem to be the most prevalent factors affecting the animals ...?</p> <p><u>Also:</u></p> <ul style="list-style-type: none"> • Technology Connection #3 • Extension #1 (<i>For Younger Students</i>) • Extension #1 (<i>For Older Students</i>) • Aquatic Extensions 1 and 2 • Evaluation 4

* Alignment based on *A Framework for K-12 Science Education*

Suggested Application of Poster

- (a) Use the poster as one of the resources for gathering information about and discussing factors that may limit the survival of each of the species shown.
- (b) When students or groups select an animal to research during Procedure #2, have them select from the species on the poster.

Additional Resources

Note: The readability of these reports is beyond elementary students, but can serve as good background information for teachers.

1. Maine Department of Inland Fisheries and Wildlife *Research Management Report*: Contains more detailed information about several species on the poster, including factors contributing to their status and efforts made to protect them.
2. *Maine's Wildlife Action Plan*: Element 1, Table 1-3 is accessible online and contains links to reports for each species, detailing stressors of various degrees of importance as well as conservation approaches being taken.

Here Today, Gone Tomorrow

Summary: *Here Today, Gone Tomorrow* is from the *Project Wild K-12 Curriculum and Activity Guide*. The major purpose of this activity is to provide students with a working knowledge of various wildlife designations, such as “endangered” and “threatened”, and factors affecting potential elimination of wildlife species. This lesson can be used in conjunction with the Maine’s Endangered Wildlife poster, depicting all 51 endangered and threatened species in the state. The poster includes habitat descriptions, species-specific background information, and a numbered key to the illustrations.

Recommended Grade Levels: 3-5

Maine Learning Results

Standard & Descriptor
<p>C3- Science, Technology & Society <u>3-5</u> Students identify and describe the influences of science and technology on people and the environment.</p>
<p>E2- Ecosystems <u>3-5</u> Students describe ways organisms depend upon, interact with, and change the living and non-living environment as well as ways the environment affects organisms.</p>

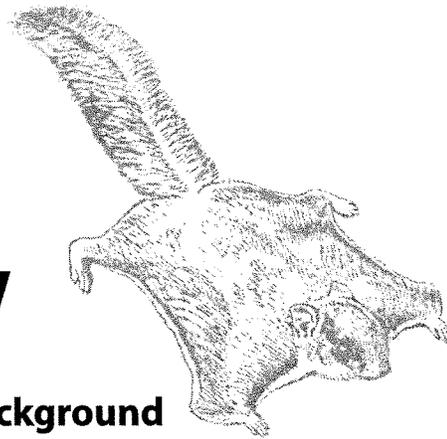
Performance Indicator	Evidence of Alignment
<p><u>C3- Science, Technology & Society</u></p> <p>b. Give examples of changes in the environment caused by natural or man-made influences.</p>	<p><u>Procedure #4</u> ...Discuss the findings. What seem to be the most prevalent factors affecting the animals ...?</p> <p><i>Note:</i> Have students identify factors that are natural vs. those that result from human influences.</p>
<p><u>E2- Ecosystems</u></p> <p>a. Explain how changes in an organism’s habitat can influence its survival.</p>	<p><u>Procedure #4</u> ...Discuss the findings. What seem to be the most prevalent factors affecting the animals ...?</p> <p><u>Also:</u></p> <ul style="list-style-type: none"> • Technology Connection #3 • Extension #1 (<i>For Younger Students</i>)

Next Generation Science Standards: Science and Engineering Practices

For more detail, see attached description of the Practices, and also Appendix F of the NGSS (<http://www.nextgenscience.org/get-to-know>).

Practice & Evidence of Alignment	Evidence of Alignment
<p><u>Practice 8: Obtaining, Evaluating, and Communicating Information</u></p> <p>Scientists and engineers must be able to communicate clearly and persuasively the ideas and methods they generate. Critiquing and communicating ideas individually and in groups is a critical professional activity. Communicating information and ideas can be done in multiple ways: using tables, diagrams, graphs, models, and equations as well as orally, in writing, and through extended discussions.</p>	<p><u>Procedure #2</u> ...Ask each student or group of students to select an animal to research.</p> <p><u>Procedure #3</u> ...develop a master list of the animals according to the category in which they can be classified...and the principal factors affecting the animal.</p> <p><u>Also:</u> Technology Connection #3; Extension #1 (<i>For Younger Students</i>)</p>

Here Today, Gone Tomorrow



Objectives

Students will (1) identify and describe causes of extinction within animal species; (2) define “threatened,” “rare,” and “endangered” as applied to wildlife; and (3) identify any local threatened or endangered animals.

Method

Students become familiar with the various designations of animals such as “threatened,” “rare,” and “endangered;” conduct research; and make a master list of threatened and endangered animals locally or nationally, including factors that affect the animals’ condition.

Materials

Information from state and federal agencies about threatened and endangered animals, poster board and other supplies for making posters, writing materials

Grade Level: 5–8

Subject Areas: Science, Environmental Education

Duration: two 30- to 45-minute sessions

Group Size: any

Setting: indoors

Conceptual Framework Reference:
BDIA3, BDIIC

Key Terms: endangered, critically endangered, threatened, rare, extinct, peripheral

Appendices: Using Local Resources, Agencies and Organizations

Background

NOTE: This activity can be modified to include plant as well as animal species.

Pinpointing an exact number of species that become extinct each year is difficult. Many plants and animals still are unnamed and unknown. Controversy surrounds the estimates of the extinction rates for plants and animals. Some scientists estimate that human activity is responsible for the extinction of 100 plants and animals each day. Other scientists offer lower figures, but few experts disagree with the belief that the rate of species extinction is being accelerated by human actions.

As of June 2013, the U.S. Fish and Wildlife Service (USFWS) listed 1,152 plants and animals in the United States as being endangered, with an additional 324 listed as threatened. Many other species are under review for classification as threatened or endangered.

To list, reclassify, or delist a species, the USFWS must follow a strict legal process for proposing a new rule. The rule is first proposed in the *Federal Register*, a U.S. government publication. After a public comment period, the USFWS decides if the rule should be approved, revised, or withdrawn. (Source: U.S. Fish and Wildlife Service)

Although extinction is a natural process, excessive and intensive human activities in the environment have caused a dramatic increase in its rate. Loss of habitat as a result of human activity is considered to be the most pervasive cause of species extermination. Other major causes of species extermination and endangerment include habitat modification, unregulated or illegal commercial and personal

use, disruption of migration routes and breeding behaviors, contamination by pollutants, human disturbance, predator control, competition or predation from introduced species, and natural causes.

Generally accepted definitions of the terms to be used in this activity are as follows:

extinct: complete disappearance of a species

critically endangered species: will not survive without direct human intervention

endangered species: in immediate danger of extinction

threatened species: present in its range, but threatened because of a decline in numbers

rare species: not presently in danger, but of concern because of low numbers (Some species always were rare because of their position in the food web or because of habitat preference.)

peripheral: scarce in area because it inhabits the fringe or marginal habitat

Listings of animals in your state currently in these categories may be obtained from state wildlife agencies.

A list of species endangered in the United States is available from

U.S. Fish and Wildlife Service
Endangered Species Program
4401 N. Fairfax Drive, Room 420
Arlington, VA 22203
or online at www.fws.gov/angered/.

State and federal listings of endangered, threatened, and rare species may vary because areas encompass different habitat conditions within their boundaries. An animal or plant may have been lost within one state's boundaries, but may be abundant in another and therefore, not considered threatened. The *U.S. Endangered Species Act of 1973* gives authority to protect endangered species to the U.S. Secretaries of the Departments of Interior and Commerce, with responsibilities further delegated to the U.S. Fish and Wildlife Service and the National Marine Fisheries Service.

The major purpose of this activity is to provide students with a working knowledge of the terminology and factors affecting potential elimination of wildlife species.

Procedure

1. Contact your state's wildlife agency, and request a list of animals that are classified as endangered, critically endangered, threatened, rare, extinct, or peripheral. Ask for information regarding the reasons that each of the species was placed in each of the classifications. For older students and those wanting more in-depth information, write to the U.S. Department of Interior regarding any comparable information available at the national level. (See the Background for the address.) Also contact local chapters of conservation organizations (e.g., National Wildlife Federation, National Audubon Society, Defenders of Wildlife) for additional information on species and habitats of concern.
2. Review and discuss with the students the definitions of threatened, endangered, rare, extinct, and peripheral—as used in wildlife conservation, as well as in a dictionary. Understand that words defined in a standard dictionary may have additional legal connotations. Ask each student or group of students to select an animal to research.
3. Ask one or more students to take the information accumulated from the wildlife agencies and private conservation groups and to develop a master list of the animals according to the category in which they can be classified, on state and national levels, and the principal factors affecting the animals. (See sample chart on page 156.)

continued

Animal Name	State or Province						National						Factors Affecting Animal's Status
	Extinct	Endangered	Critically Endangered	Threatened	Rare	Peripheral	Extinct	Endangered	Critically Endangered	Threatened	Rare	Peripheral	

Or the educator can divide the class into teams so all students can participate in constructing this chart (e.g., one team classifying mammals; others classifying reptiles, birds, fish, insects, and so on).

4. Make copies of this information for all the students. Discuss the findings. What seem to be the most prevalent factors affecting the animals (e.g., habitat loss, pollution, impact from introduced species)?

NOTE: The U.S. Fish and Wildlife Service listed the following numbers of endangered and threatened species in the United States in 2013: Endangered—69 mammals, 78 birds, 14 reptiles, 12 arachnids, 16 amphibians, 83 fish, 30 snails, 72 clams, 19 crustaceans, 57 insects, 702 plants = 1152 endangered species; Threatened—16 mammals, 15 birds, 22 reptiles, 10 amphibians, 70 fish, 13 snails, 12 clams, 3 crustaceans, 57 insects, 151 plants = 324 threatened species.

Technology Connections

- Use the Internet to research state threatened and endangered animals and plants. (See page 532 for a link to information on maximizing web searches.)
- Create an electronic chart listing state and national threatened and endangered animals and plants.

- Use digital presentation software to develop a slide show defining the reasons animals and plants become threatened or endangered.
- Create a blog for students to post poems or stories about state endangered or threatened animals or plants.

Extensions

For Younger Students

1. Make a poster display showing the principal reasons that endangered animals are endangered. Poster displays could be made separately for both state and national endangered species.
2. Have a contest in which the students create posters honoring endangered species—from plants to wildlife.
3. Write a short essay, poem, or song about plants and animals facing extinction. What are these organisms “worth”? What are humans losing from the extinction of plants and animals?

For Older Students

1. Find out what is being done concerning the endangered plants and animals in your state or province, at the national level, at the international and worldwide levels. What can each of us as individuals do?

2. Have each student choose an endangered animal to research. What would be the consequences of the disappearance of this species? What are the benefits and challenges involved in saving it? What alternatives are available? What contributions does the animal make ecologically? Economically? Medicinally? Aesthetically? Intrinsically? Discuss the students' findings.
3. What animals and plants are known to be extinct? In each instance, what seems to be the causes?
4. Explore the possibility that extinction can apply to human cultural forms (e.g., traditional languages, native peoples).
5. In 10 minutes, name as many animals as you can that are not legally endangered or threatened. Find out what species have been taken off the endangered species list, how, and why.
6. Research, analyze, summarize, and interpret findings related to the following question: Why care about endangered species?

Aquatic Extensions

1. What kinds of habitats do aquatic species depend on? Research the conditions affecting each aquatic species, their current status, and projections for their future.
2. Are factors affecting threatened and endangered aquatic species significantly different from those affecting terrestrial species? If yes, why? If no, why not?

Evaluation

1. Arrange the following terms in a list so that they progress from the least amount of danger to a species to the greatest amount: endangered, rare, threatened, extinct, critically endangered.
2. Describe two reasons for possible concern when animal species become extinct.
3. Who decides what species are listed as endangered or threatened, and how do they decide?
4. Describe a principal cause for extinction.



Migration Headache

Summary: *Migration Headache* is from the *Aquatic Wild Curriculum and Activity Guide*. In this lesson, students examine limiting factors that affect habitats and populations of migrating water birds, and consider the importance of suitable habitat for these migratory birds, as well as describing the effects of habitat loss and degradation. This lesson can be used in conjunction with the *Maine's Endangered Wildlife* poster, depicting all 51 endangered and threatened species in the state. The poster includes habitat descriptions, species-specific background information, and a numbered key to the illustrations.

Recommended Grade Levels: 3-8

Maine Learning Results

Standard & Descriptor
<p>A1- Systems <u>3-5</u> Students explain interactions between parts that make up whole man-made and natural things.</p>
<p>C3- Science, Technology, and Society <u>3-5</u> Students identify and describe the influences of science and technology on people and the environment.</p>
<p>E2- Ecosystems <u>3-5</u> Students describe ways organisms depend upon, interact with, and change the living and non-living environment as well as ways the environment affects organisms.</p>

Performance Indicator	Evidence of Alignment
<p><u>A1- Systems</u> a. Give examples that show how individual parts of...ecosystems... can influence one another. b. Explain ways that...ecosystems... may not work as well...if a part is missing...mismatched, or misconnected.</p>	<p>As the class engages in Procedure steps 3-7, and in the follow up conversation in Procedure step 8, all of these standards are addressed. For example:</p> <ul style="list-style-type: none"> • The teacher explanations in steps 3, 5, and 6, as well as the Habitat Scenarios used for step 7 address A1.a, C3.b, and E2.a. Students revisit all of these again, as well as A1.b when all of the suggested discussion questions are used during Procedure step 8. • The set of Habitat Scenarios represent various natural and man-made influences on the environments (C3.b) of the migratory water birds, and in the follow up discussion, students are asked to identify some of each. • As each Habitat Scenario is read and the relevant number of “bases” added or removed, students observe the influence of changes in the habitat (E2.a) in the number of students (representing the birds) entering or leaving the game field. • Student responses to Evaluation question 1 provide students an opportunity to demonstrate their understanding of all listed Performance Indicators.
<p><u>C3- Science, Technology, and Society</u> b. Give examples of changes in the environment caused by natural or man-made influences.</p>	
<p><u>E2- Ecosystems</u> a. Explain how changes in an organism’s habitat can influence its survival.</p>	

Migration Headache

Next Generation Science Standards: Science and Engineering Practices

For more detail, see attached description of the Practices, and also Appendix F of the NGSS (<http://www.nextgenscience.org/get-to-know>).

Practice & Evidence of Alignment	Evidence of Alignment
<p><u>Practice 4: Developing and Using Models</u></p> <p>A practice of both science and engineering is to use and construct models as helpful tools for representing ideas and explanations. These tools include diagrams, drawings, physical replicas, mathematical representations, analogies, and computer simulations.</p>	<p>This activity is a simulation, a type of model, designed to help students understand the cause and effect relationship between organisms and changes in their environments.</p>

Next Generation Science Standards: Disciplinary Core Ideas*

Standard & Grade Band Endpoints	Evidence of Alignment
<p><u>LS2.A: Interdependent relationships in ecosystems</u></p> <p><i>By the end of grade 5. ...Organisms can survive only in environments in which their particular needs are met.</i></p> <p><i>By the end of grade 8. Organisms and populations of organisms are dependent on their environmental interactions both with other living things and with nonliving factors. Growth of organisms and population increases are limited by access to resources...</i></p>	<p>As the class engages in Procedure steps 3-7, and in the follow up conversation in Procedure step 8, all of these standards are addressed. For example:</p> <ul style="list-style-type: none"> • As students progress through Procedure steps 3-7 and the follow up discussion in Procedure step 8, they address LS2.A. • As each Habitat Scenario is read and the relevant number of “bases” added or removed, students observe the influence of changes in the habitat (LS2.C) in the number of students (representing the birds) entering or leaving the game field. • The Habitat Scenarios describe numerous human activities that influence ecosystems, and several include efforts made to protect resources and environments (ESS3.C). • Student responses to Evaluation question 1 require applying understanding of all three standards. • Teacher explanations during Procedure steps 3-7, will help students develop responses to Evaluation question 3 (LS2.A).
<p><u>LS2.C: Ecosystem dynamics, functioning, and resilience</u></p> <p><i>By the end of grade 5. When the environment changes in ways that affect a place’s physical characteristics, temperature, or availability of resources, some organisms survive and reproduce...and some die.</i></p> <p><i>By the end of grade 8. Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all of its populations.</i></p>	
<p><u>ESS3.C: Human impacts on Earth systems</u></p> <p><i>By the end of grade 5. Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth’s resources and environments...</i></p>	

* Alignment based on *A Framework for K-12 Science Education*

Migration Headache

Common Core State Standards- Math, grade 3

Standard & Description	Evidence of Alignment
<p><u>3.MD.B.3</u></p> <p>Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. For example, draw a bar graph in which each square in the bar graph might represent 5 pets.</p>	<p>The "NOTE" in the Procedure says that the migrations can be graphed as shown in the sidebar on the following page. This could be done as a bar graph, with each student representing thousands of birds, as described in the paragraph above the start of the Procedure.</p> <p>A bar graph can be used to consider what types of events have the greatest impact on migrating water birds.</p> <p><i>Note:</i> there are two Habitat Scenarios involving a removal of one or more "habitat havens," followed by the addition of one. Students will need to decide how to represent this in their graphs.</p>

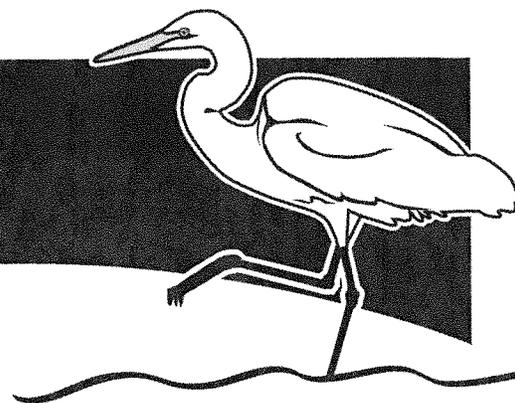
Suggested Application of Poster

- (a) Choose a specific threatened or endangered water bird from the poster for students to represent (Procedure step 2) during the activity. (Alternatively, do Extension 1, with the species selected from the poster.)
- (b) Use the poster to identify endangered and threatened migratory birds in Maine. Have students identify whether Maine is their winter, stopover, or nesting habitat. Have students research then discuss human and natural impacts on these birds' Maine habitats.

2016 Maine Endangered Species List

<u>Taxa group (class)</u>	Common Name	Scientific Name	Legal Status (year listed)
Birds (Class Aves)			
	American Pipit	<i>Anthus rubescens</i>	Endangered (1997)
	Arctic Tern	<i>Sterna paradisaea</i>	Threatened (1997)
	Atlantic Puffin	<i>Fratercula arctica</i>	Threatened (1997)
	Bald Eagle	<i>Haliaeetus leucocephalus</i>	Recovered (2009) / Threatened (1996) / Endangered (1978)
	Barrow's Goldeneye	<i>Bucephala islandica</i>	Threatened (2007)
	Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	Endangered (2015) / Threatened (2007)
	Black Tern	<i>Chlidonias niger</i>	Endangered (1997)
	Common Moorhen	<i>Gallinula chloropus</i>	Threatened (2007)
	Golden Eagle	<i>Aquila chrysaetos</i>	Endangered (1987)
	Grasshopper Sparrow	<i>Ammodramus savannarum</i>	Endangered (1987)
	Great Cormorant	<i>Phalacrocorax carbo</i>	Threatened (2007)
	Harlequin Duck	<i>Histrionicus histrionicus</i>	Threatened (1997)
	Least Bittern	<i>Ixobrychus exilis</i>	Endangered (2007)
	Least Tern	<i>Sternula antillarum</i>	Endangered (1984)
	Peregrine Falcon	<i>Falco peregrinus</i>	Endangered (1975)
	Piping Plover	<i>Charadrius melodus</i>	Endangered (1987)
	Razorbill	<i>Alca torda</i>	Threatened (1997)
	Roseate Tern	<i>Sterna dougallii</i>	Endangered (1997) / Threatened (1987)
	Sedge Wren	<i>Cistothorus platensis</i>	Endangered (1987)
	Short-eared Owl	<i>Asio flammeus</i>	Threatened (2007)
	Upland Sandpiper	<i>Bartramia longicauda</i>	Threatened (1997)
Fish (Class Actinopterygii)			
	Redfin Pickerel	<i>Esox americanus americanus</i>	Endangered (2007)
	Swamp Darter	<i>Etheostoma fusiforme</i>	Threatened (1997)
Insects (Class Insecta)			
	Boreal Snaketail	<i>Ophiogomphus colubrinus</i>	Threatened (2007)
	Clayton's Copper	<i>Lycaena dorcas claytoni</i>	Threatened (2015) / Endangered (1997)
	Cobblestone Tiger Beetle	<i>Cicindela marginipennis</i>	Endangered (2015)
	Frigga Fritillary	<i>Boloria frigga</i>	Endangered (2015)
	Edwards' Hairstreak	<i>Staryium edwardsii</i>	Endangered (1997)
	Hessel's Hairstreak	<i>Callophrys hesseli</i>	Endangered (1997)
	Juniper Hairstreak	<i>Callophrys gryneus</i>	Endangered (2007)
	Katahdin Arctic	<i>Oeneis polixenes katahdin</i>	Endangered (1997)
	Pine Barrens Zanclognatha	<i>Zanclognatha martha</i>	Threatened (1997)
	Purple Lesser Fritillary	<i>Boloria chariclea grandis</i>	Threatened (2007)
	Rapids Clubtail	<i>Gomphus quadricolor</i>	Endangered (2007)
	Ringed Boghaunter	<i>Williamsonia lintneri</i>	Threatened (2007)
	Roaring Brook Mayfly	<i>Epeorus frisoni</i>	Threatened (2015) / Endangered (2007)
	Sleepy Duskywing	<i>Erynnis brizo</i>	Threatened (2007)
	Tomah Mayfly	<i>Lycia rachelae</i>	Threatened (1997)
	Twilight Moth	<i>Erynnis brizo</i>	Threatened (2007)
Mammals (Class Mammalia)			
	Eastern Small-footed Bat	<i>Myotis leibii</i>	Threatened (2015)
	Little Brown Bat	<i>Myotis lucifugus</i>	Endangered (2015)
	New England Cottontail	<i>Sylvilagus transitionalis</i>	Endangered (2007)
	Northern Bog Lemming	<i>Synaptomys borealis</i>	Threatened (1987)
	Northern Long-eared Bat	<i>Myotis septentrionalis</i>	Endangered (2015)
Molluscs (Class Bivalvia)			
	Brook Floater	<i>Alasmidonta varicose</i>	Threatened (2007)
	Tidewater Mucket	<i>Leptodea ochracea</i>	Threatened (1997)
	Yellow Lampmussel	<i>Lampsilis cariosa</i>	Threatened (1997)
Reptiles (Class Reptilia)			
	Black Racer	<i>Coluber constrictor</i>	Endangered (1987)
	Blanding's Turtle	<i>Emydoidea blandingii</i>	Endangered (1997) / Threatened (1987)
	Box Turtle	<i>Terrapene carolina</i>	Endangered (1987)
	Spotted Turtle	<i>Clemmys guttata</i>	Threatened (1987)
Snails (Class Gastropoda)			
	Six-whorled Vertigo	<i>Vertigo morseii</i>	Endangered (2015)

Migration Headache



Grade Level: Middle School

Content Areas:

Science, Environmental Education, Expressive Arts

Method:

Students portray migrating waterbirds traveling between nesting habitats and wintering grounds.

Materials:

Large playing field or gymnasium; one base (paper plates or carpet squares, for example) for every two or three students

Activity Time:

one 45-minute session

People Power: 20 to 40 students or more

Setting: outdoors or large indoor area

Conceptual Framework

Topic Reference:

WPIIA2b2, WPIIA2a2a

Terms to Know: migration, limiting factors, habitat, wetlands, waterbirds, shorebirds

Appendices:

Using Local Resources, Agencies and Organizations, The Ecosystem and Project WILD, Climate Change

If you were a bird, would you survive your winter trek down south?

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 ranges. 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 many species of waterfowl (ducks, geese, and swans) to rebound from near 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 pocket prairies 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

WILD Work

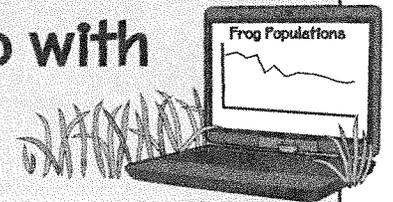
A Wetlands Scientist is

responsible for field data collection (plant and animal surveys, soil sampling, etc.), data analysis, and report writing. Education requirements to become a Wetlands Scientist typically include a bachelor's degree in biology or environmental science and expertise in wetland ecology and waterfowl and shorebird biology. This type of scientist often works outdoors in various weather conditions. To find more information on this occupation, visit www.projectwild.org/aquatic.



In Step with STEM

Conduct a web search to identify and map sites designated as Important Bird Areas in your state or region.



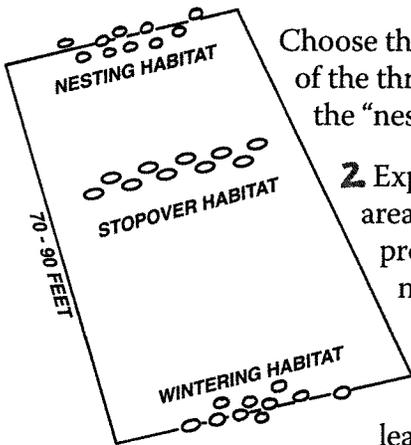
*Many migrating birds—
ducks, geese, cranes,
herons, rails, terns, and
plovers, for example—
require wetlands in their
breeding, stopover, and
wintering grounds.*

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:



Choose the number of bases so that there is one base for every two or three students at each of the three areas on the field. Designate one end the "wintering habitat," the other end as the "nesting habitat," and the area in the middle as the "stopover 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 "flap 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 this activity. Educators may want to appoint two students as monitors to remove and add bases (habitats) as required for each scenario.

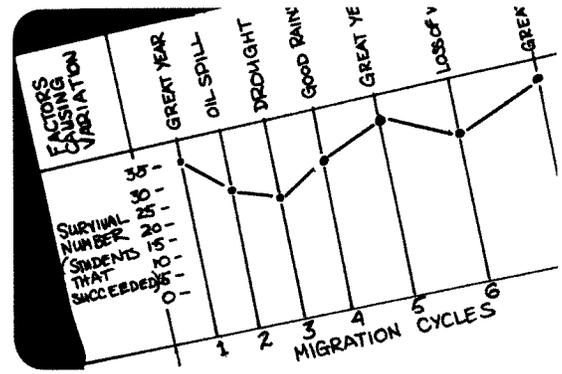
8. After the activity, ask students to identify factors that caused waterbird populations to decline or increase. What are the short- and long-term effects of the decline or increase? Which factors are human-caused? Which are natural? Which factors reduced or enhanced the quality of the habitat? What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

Extensions

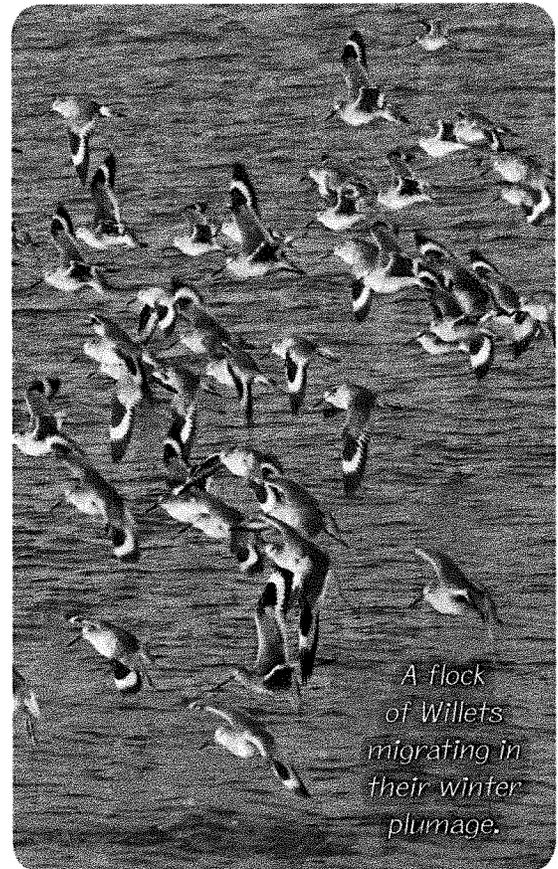
1. Research a species of waterbird. Conduct this activity again with each student representing a specific kind of waterbird.
2. Explore the major factors affecting habitat loss and alteration, or gain and restoration, in your area. Research the causes for long-term habitat loss, as well as any major 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 unprotected 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.



Birds that migrate depend not just on having one suitable habitat, but two and often three habitats.



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 *nesting* 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* habitat.**

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.**

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 racoons 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.

Bird Friend or Foe?

Next Generation Science Standards: Disciplinary Core Ideas*

Standard & Grade Band Endpoints	Evidence of Alignment
<p><u>LS2.C: Ecosystem dynamics, functioning, and resilience</u></p> <p><i>By the end of grade 5.</i> When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die.</p>	<p><u>Taking Flight!</u></p> <ol style="list-style-type: none"> 1. Ask participants to sort the items on the table into two categories: 1) those that are helpful to birds, and 2) those that are potentially harmful to birds. 2. Ask participants why they put each item in a particular category. If they got any items wrong, review the correct answer with them.
<p><u>ESS3.C: Human impacts on Earth systems</u></p> <p><i>By the end of grade 5.</i> Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments...</p>	<p><u>Quiz Your Guests</u></p> <ol style="list-style-type: none"> 1. Suggest actions that people can take to reduce some hazards to birds. 2. Suggest actions that people can take to actively help birds. <p><u>What Did You Learn?</u></p> <ol style="list-style-type: none"> 1. ...Describe one thing that people can do to lessen or reduce one of these dangers to birds. 2. ...Describe three things that people can do around a home or school to help birds.

* Alignment based on *A Framework for K-12 Science Education*

Suggested Application of Poster

- (a) Have students or small groups of students select one of the bird species on the poster. Provide them with a copy of the poster text for their selected bird species, and also provide time for them to do a little research to answer the question, "What actions are humans taking to help this species of bird?" Have everyone share what was learned.
- (b) Have students research the factors that cause one of the non-bird species from their region of Maine to be endangered or threatened. Give students time to discuss with their families one thing they could do to help this species.

Additional Resources

Note: The readability of these reports is beyond elementary students, but can serve as good background information for teachers.

1. Maine Department of Inland Fisheries and Wildlife *Research Management Report*. Contains more detailed information about several species on the poster, including factors contributing to their status and efforts made to protect them.
2. *Maine's Wildlife Action Plan*: Element 1, Table 1-3 is accessible online and contains links to reports for each species, detailing stressors of various degrees of importance as well as conservation approaches being taken. Element 3, sections 3.2 and 3.3 describe stressors to Species of Greatest Conservation Need and to their habitats.

Bird Friend or Foe?

Summary: *Bird Friend or Foe* is from *Flying Wild: An Educator's Guide to Celebrating Birds*. The major purpose of this activity is for participants to discover how to take simple actions to protect birds against dangers found around home and beyond. This lesson can be used in conjunction with the *Maine's Endangered Wildlife* poster, depicting all 51 endangered and threatened species in the state. The poster includes habitat descriptions, species-specific background information, and a numbered key to the illustrations.

Recommended Grade Levels: 3-5

Maine Learning Results

Standard & Descriptor
<p>A1- Systems <u>3-5</u> Students explain interactions between parts that make up whole man-made and natural things.</p>
<p>E2- Ecosystems <u>3-5</u> Students describe ways organisms depend upon, interact with, and change the living and non-living environment as well as ways the environment affects organisms.</p>

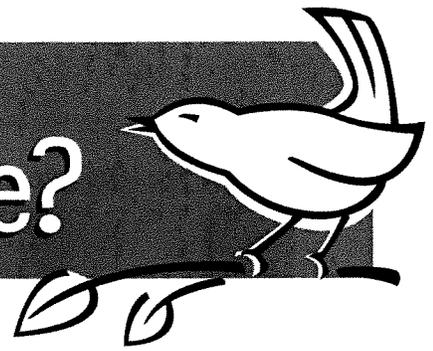
Performance Indicator	Evidence of Alignment
<p><u>A1- Systems</u></p> <p>a. Give examples that show how individual parts of...ecosystems... can influence one another.</p>	<p><u>Taking Flight!</u></p> <p>1. Ask participants to sort the items on the table into two categories: 1) those that are helpful to birds, and 2) those that are potentially harmful to birds.</p> <p>2. Ask participants why they put each item in a particular category. If they got any items wrong, review the correct answer with them.</p>
<p><u>E2- Ecosystems</u></p> <p>a. Explain how changes in an organism's habitat can influence its survival.</p>	<p><u>Taking Flight!</u></p> <p>2. Ask participants why they put each item in a particular category. If they got any items wrong, review the correct answer with them.</p> <p>3. ...listen to participants' reasons for placing items in the helpful or potentially harmful category. Give suggestions for additional ways to protect birds.</p>

Next Generation Science Standards: Science and Engineering Practices

For more detail, see attached description of the Practices, and also Appendix F of the NGSS (<http://www.nextgenscience.org/get-to-know>).

Practice & Evidence of Alignment	Evidence of Alignment
<p><u>Practice 1: Asking Questions and Defining Problems</u></p> <p>A practice of science is to ask and refine questions that lead to descriptions and explanations of how the natural and designed world works and which can be empirically tested...</p> <p>...Both scientists and engineers also ask questions to clarify the ideas of others.</p>	<p><u>Question for Reflection</u></p> <p>Can you think of one action that you can take around your home today that would help birds? This can be something to reduce a hazard or to actively benefit birds. Consider what it will take to make certain you follow through with this action when you go home today.</p>

Bird Friend or Foe?



NEED TO GET

- 1 large table
- Cell phone
- Cell phone charger
- Toy car
- Bird feeder
- Edible berries
- Shade-grown coffee
- Cup of water
- Pesticide container, empty (for safety reasons)
- Picture of a cat or a cat collar (with a bell)
- Picture of a plate-glass window or a mirror
- Several copies of the Potentially Harmful and Helpful Items lists (for activity leaders)

TIME

Preparation: 30 minutes
Activity: 30 minutes

A variety of items found around a typical home can be hazardous to birds.



Participants discover how to take simple actions to protect birds against dangers found around home—and beyond.

Need to Know

Communication towers, automobiles, outdoor cats, birdfeeders, edible berries, and a plate-glass window. For a bird, which of these is a friend or foe?

A variety of items found around a typical home can be hazardous to birds. In this activity, participants take a close look at a variety of common household items and try to determine whether they are harmful or helpful to birds. Participants then think about simple ways they can reduce the hazards.

Getting Ready

To set up the table before participants arrive, place as many of the suggested items (from the Need to Get section) that you've gathered on your table. Mix up the items that are helpful and potentially harmful. Keep the Potentially Harmful or Helpful Items lists handy so you know which items are helpful and which are hazardous, and why.

Taking Flight!

Festival participants take a close look at several items found around a typical home and decide whether the items are helpful or potentially harmful to birds.

- 1.** Ask participants to sort the items on the table into two categories: 1) those that are helpful to birds, and 2) those that are potentially harmful to birds. Give participants several minutes to do this.
- 2.** Ask participants why they put each item in a particular category. If they got any items wrong, review the correct answer with them.
- 3.** Encourage discussion and listen to the participants' reasons for placing items in the helpful or potentially harmful category. Give suggestions for additional ways to protect birds.

Quiz Your Guests

- 1.** Suggest actions that people can take to reduce some hazards to birds.
- 2.** Suggest actions that people can take to actively help birds.

Items Potentially Harmful To Birds

1. PLATE-GLASS WINDOWS

- Why? Birds often fly into plate-glass windows used on most homes and buildings because the glass is transparent and reflective. According to some estimates, more than 100 million North American birds die from flying into windows each year.
- What to do? Hang large black silhouettes of birds of prey or strips of string or other material, on the outside of windows to alert birds that something is there.

2. OUTDOOR CATS

- Why? Cats are excellent hunters. They kill millions of birds each year in America. (Bells don't scare birds, so putting one on a cat's collar won't help.)
- What to do? Encourage people to keep their cats indoors. It reduces the risk that the cat may be exposed to harmful parasites, viruses, and other diseases or hit by a car.

3. AUTOMOBILES

- Why? Collisions with vehicles kill tens of millions of birds each year in the United States.
- What to do? Change our driving habits. Slowing down especially during spring and fall migration periods will help avoid collisions with birds, and other wildlife.

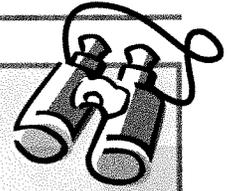
4. PESTICIDES

- Why? Pesticides are substances used to control, destroy, or repel pests. A serious danger of pesticides is that they may harm things they are not intended to harm. Experts estimate that tens of millions of birds die annually due to pesticide use.
- What to do? Reduce the amount of pesticide use by researching and trying safe alternatives. Developing simple habits may reduce or eliminate the need for insect and rodent pesticides around a home. Carefully sealing garbage cans discourages visits from unwanted guests, like ants and mice.

5. POWER LINES AND COMMUNICATIONS TOWERS

- Why? Scientists estimate that 50 million birds die each year due to collision with guy wires that hold up radio and TV communication towers, as well as collisions with power lines.
- Research these problems on the Internet (start with the American Birding Conservancy and www.abcbirds.org/abcprograms/policy/collisions/index.html) to learn more about making power lines and communications towers safer for birds.

ZOOM IN,
ZOOM OUT!



You may want to invite experts who are involved in bird conservation efforts to assist with this activity. Find them through state departments of natural resources, nature centers, zoos, park departments, universities, local Audubon chapters, and non-profit conservation groups. These bird conservation specialists may have ideas for additional items to discuss and also can help answer difficult questions. He or she can use this opportunity to review simple actions that people can take to help birds around their homes.

*Cats—known
to be excellent
hunters—kill
millions of birds
each year in
America.*

Providing plants
that produce
berries and other
food sources
for birds
is an excellent
way to help birds.

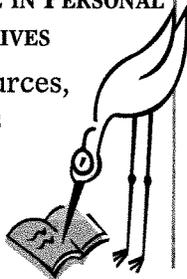
IN STEP WITH SCIENCE STANDARDS

STANDARD C: LIFE SCIENCE

- Diversity and adaptations of organisms

STANDARD F: SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES

- Populations, resources, and environments
- Natural hazards



Items Potentially Helpful To Birds

1. BERRIES, GRAPES, AND NATURAL FOOD SOURCES

- **Why?** Providing plants that produce berries and other food sources for birds is an excellent way to help birds. Native plants are well suited to the area where you live and provide especially reliable food sources.
- **What to do?** Plant a variety of native plants around your home to provide the berries, seeds, nuts, and nectar that different bird species need throughout the year.

2. BIRDHOUSES AND FEEDERS

- **Why?** All birds need homes, as well as food that is high in protein and fat to provide the energy they need.
- **What to do?** Providing possible places to live and a variety of bird food, especially during harsh weather, can help birds survive. *Note: Once you start feeding birds, you must clean the feeder regularly to avoid the risk of disease. See Appendix C for a list of books and websites that prepare you to properly select and position the birdhouse or feeder, and maintain it successfully.*

3. WATER

- **Why?** All birds need a source of clean water.
- **What to do?** Provide birds around your home with a water source, such as a bird bath. To avoid spreading diseases among birds, develop a plan to keep the water fresh and clean. The water must be fresh because stagnant water can be a breeding ground for mosquitoes, which can be harmful to birds as well as humans.

4. ORGANICALLY GROWN COFFEE & CACAO

- **Why?** In the case of organically grown coffee and cacao (the plant that chocolate comes from), the plants are allowed to grow naturally in the shady rainforest environment of the Tropics. Growing in shade does not require cutting the forest to create room for plantation-style crops. Organically grown plants also avoid the use of pesticides, which are often hazardous to birds. Shade-grown coffee plantations in the Tropics support some of the highest numbers of migratory birds—some of whom may migrate from your neighborhood.
- **What to do?** Encourage stores to carry organic, shade-grown coffee and cacao so that you and other people can purchase products grown in a way that benefits birds.

Following Up

Bird Friend or Foe?

What Did You Learn?

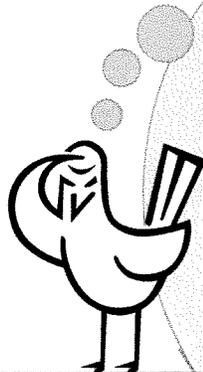
1. Pesticides, cats, automobiles, windows, and tall communication towers can be very dangerous to birds. Describe one thing that people can do to lessen or reduce one of these dangers to birds.
2. People can do many simple things to help birds. Describe three things that people can do around a home or school to help birds.

Wanted: Your Feedback

1. What new information did participants learn from the “Bird Friend or Foe?” activity?
2. What other props could you use to represent household items that can help or harm birds?
3. What would you change about this activity?

Question for Reflection

Can you think of one action that you can take around your home today that would help birds? This can be something to reduce a hazard or to actively benefit birds. Consider what it will take to make certain you follow through with this action when you go home today.



ENDANGERED SPECIES POSTER

ADDITIONAL HABITAT INFORMATION

Coastal waters and offshore islands (# 1 - # 8)

MDIFW recognizes eight birds as Endangered or Threatened species in the Gulf of Maine. Six nest in colonies on coastal islands during the spring-summer breeding season. Nesting islands are safe havens relatively free from most development and disturbance threats. Biologists install signs to remind boaters not to land on important nesting islands. Two rare ducks visit in Maine during fall, winter, and spring from breeding areas further north in Canada. They frequent coastal Maine but occasionally appear at inland waters.

Coastal beaches, dunes and salt marshes (# 9 - # 10)

Two birds have a precarious life nesting in coastal beach systems of southern Maine. Intensive efforts have helped their continued presence and may be necessary for many years to come. Biologists install wire fencing around nests to protect plover and tern eggs from predators, and rope off small sections of beach inhabited by wandering youngsters before they are able to fly. Many beaches prohibit unleashed dogs that can kill or disturb shorebirds. Enjoy your visits to the beach, but please respect the special needs of Piping Plovers, a bird also protected by the U.S. Endangered Species Act.

Small rivers and streams (# 11 - # 16)

MDIFW has identified six vulnerable invertebrates that live primarily in freshwater habitats with high flow rates or special niches. However, knowledge of many invertebrate taxa is limited. More discoveries of rare species are likely in the future. Citizen scientists often volunteer efforts to help systematic inventories of key invertebrate groups. Freshwater mussels are among the most threatened animal taxa in the world because many are sensitive to water quality and their larval stages are dependent upon mobility of certain fish hosts.

Two rare dragonflies in Maine rivers are protected under the state Endangered Species Act. Another population or two of these species is possible, but biologists and volunteers recently completed an extensive, multi-year survey of Maine dragonflies without additional discoveries. Dams, pollution, and reduced water quality from inadequate riparian buffers are key threats. Biologists promote shoreland zoning and land conservation to protect known populations, search for new ones, and consult with bridge or dam projects to minimize impacts.

Lakes, ponds, and large rivers (# 17 - # 20)

Maine's list of Endangered and Threatened wildlife includes four animals that live in bodies of freshwater that have only modest flow. The key threats to most freshwater fish and wildlife are barriers in river systems, impaired water quality, and introductions of exotic species that disrupt ecological balances due to new pressures of predation, competition, disease, or altered food resources. Two fish species are Endangered and Threatened Species in Maine.

Two Threatened freshwater mussels live mostly in coastal rivers but sometimes inhabit lakes, ponds or impoundments in Maine. Like Brook Floaters, their range is only in watersheds that drain into the Atlantic Ocean between Nova Scotia and Georgia. Many local populations across their range have been lost or are in decline. In Maine, biologist and volunteers relocate freshwater mussels when removal or repair of dams leads to drastic changes in water levels. Research in Maine found marked genetic diversity of populations in different rivers that may be invaluable to range-wide conservation of these rare species.

Freshwater wetlands and peatlands (# 21 - # 32)

Wetlands are often a hotspot of biodiversity and are tremendously important to hydrology and water quality. MDIFW has listed twelve animals in these habitats as Endangered or Threatened. Animals protected under the Maine Endangered Species Act that are associated with wetland habitats include four invertebrates: one dragonfly, two butterflies, and one land snail.

The three listed butterflies in Maine wetlands have vastly different ranges relative to Maine. All approach their range limits in the state. One lives primarily to the south, another occurs only further north, and one lives nowhere

else than Maine! The transition of major vegetation zones from south-to-north across Maine reflects changes in climate and soils that influence both plant communities and the animal populations that they support.

There are more questions than answers for many types of invertebrate animals. Among nearly 100 different species of snails and slugs native to Maine, one tiny land snail is very rare.

Turtles have a life history strategy based on longevity. High adult survival offsets the delayed age of first breeding and high death rates of their offspring. Deaths of turtles on roadways are an increasing problem as pressures from land development and habitat fragmentation mount. Biologists may resort to fencing to steer turtles away from crossing unsafe roads.

Grasslands and shrublands (# 33 - # 37)

Shrublands and young forests are a natural stage of vegetation changes and a specialty niche for two Endangered Species in Maine: one a mammal and one snake. A mosaic of these habitats was more prevalent when farms dominated Maine's landscape. Most lands naturally revert to forests without active management. The loss of early successional habitats is threatening these two species with extirpation from the state.

Three rare Maine birds that are not at all related to each other have a special affinity for large "grasslands." They are ground nesters that reside here from mid-April to mid-September. Details of their life history vary, but all benefit from some form of land management that perpetuates open conditions. Natural sandplain grasslands in southern Maine are mostly lost to land development. Patches of suitable habitat remain in blueberry barrens, openings around airports, or large agricultural fields (pastures, hayfields, or idle farmland) that are not cropland.

Dry forests and barrens (# 38 - # 44)

Four butterflies and moths that are Endangered or Threatened in Maine are dependent on the pitch pine barrens of southwestern Maine. This rare natural community occurs in sandplains formed by the melting of glaciers more than 12,000 years ago. Many areas of southern Maine that once offered this habitat have been lost to land development. Only seven locations in York or Cumberland County now remain suitable. Some benefit from permanent land conservation, but this community is also dependent on periodic fires. Since wildfires are controlled to prevent property damage, biologists conduct controlled burning to perpetuate the habitat and to reduce fuel loads that naturally build up in fire-dependent habitats.

Caves and talus fields (# 45 - # 47)

The so-called "cave bats" include five of the eight different species of bats that live in Maine. Most overwinter in underground in caves or abandoned mines but they are widespread in virtually all upland habitats in summer. They may aggregate in large numbers at these winter hibernacula, and some gather in maternity colonies when pupping. MDIFW recently listed three species under the Maine Endangered Species Act after a fungal pathogen accidentally introduced from Europe led to widespread deaths among cave bats. The dramatic, rapid spread of the disease known as White Nose Syndrome (WNS) has resulted in millions of bat deaths in North America, especially in the Northeast following discovery of the problem at a New York cave. There is great concern among farmers, foresters and most citizens for the sudden rarity of bats and their important ecological role as major consumers of insects.

Alpine areas and cliffs (# 48 - # 51)

Two Endangered birds traditionally nest primarily on ledges of large cliffs. Biologists monitor cliffs for both species, work cooperatively with landowners to maintain suitable habitats there, and manage recreational uses (rock climbing and some hiking trails) to prevent disturbance.

Two other Endangered Species inhabit alpine or sub-alpine habitats on high elevation mountains. In fact, the two (one bird and one butterfly) reside only on the summit of Mount Katahdin, Maine's tallest peak. Biologists work with Baxter State Park staff to ensure that recreational hikers remain on trails. Sensitive alpine vegetation is key to survival of both species.