

Great Lakes Piping Plover Survival: Lesson Plan

Synopsis

Age: Upper elementary through middle school students

Goals :

To educate students about the Piping Plover, specifically with regard to the following areas:

1. habitat needs
2. behavior and general characteristics
3. response to human activity
4. threats to the species
5. ways to protect the species

Objectives:

Upon completion of this activity, students will be able to:

1. describe the life history of the Piping Plover
2. describe the necessary components of suitable Piping Plover nesting habitat
3. explain how various limiting factors impact the Piping Plover
4. identify ways that wildlife biologists protect the Piping Plover
5. describe positive and negative impacts of our behavior on the survival of Piping Plovers

Key Vocabulary Terms:

Adaptation, beach, behavior, breeding season, brood, camouflage, captive-rearing, display, disturbance, endangered, enclosure, fledge, habitat, management, migration, nest, precocial, predation, recreation, shorebird, territory

Lesson Plan Overview

Introduction

This lesson plan is designed to actively engage students in learning about the Piping Plover. The plan involves a simulation game in which students simulate the feeding behavior of the birds and explore factors that disturb both the feeding and nesting of the plover. The lesson utilizes and develops skills in reading, cooperative learning and creative problem solving.

Piping Plover Background Information

Before beginning the lesson the teacher should ask the students what they already know about Piping Plovers. Have they ever had any personal experiences related to Piping Plovers? The students' responses should be recorded and used in later discussions. The teacher could also ask the students what they would like to learn about Piping Plovers and add the responses to the list.

It is important that the students have some understanding of Piping Plover natural history and ecology before participating in the lesson. The students should individually read the Piping Plover background information which is provided with the lesson. The teacher may also ask the students to take turns reading the information to the rest of the class. After reading the background material the teacher can use the accompanying questions to guide a student discussion related to the Piping Plover. The students could also work individually or in groups to provide written answers to the questions by searching the background information.



Additional Resources Focusing on Piping Plovers

[Piping Plover Summer](#) by Janet Riegle (2008 Raven Publications, Inc. Ely, MN) — Picture book with accurate information about Piping Plover behavior, biology and protection.

www.fws.gov/endangered/i/B69.html — US Fish and Wildlife Service website about Great Lakes Piping Plovers.

www.waterbirds.umn.edu/Piping_Plovers/piping1.htm — University of Minnesota website about Great Lakes Piping Plovers.

www.nps.gov/slbe/naturescience/pipingplover.htm — Sleeping Bear Dunes National Lakeshore Piping Plover information.

www.ecos.fws.gov/docs/recovery_plan/030916a.pdf — US Fish and Wildlife Service document. Great Lakes Piping Plover Endangered Species recovery plan.

www.birds.cornell.edu/ — A great deal of general bird information and many citizen science projects. Also a sound and video library. Cornell's information about Piping Plovers —

www.birds.cornell.edu/AllAboutBirds/BirdGuide/Piping_Plover.html

Piping Plover Survival: A Simulation Game

Overview

Students engage in an activity that simulates 1) the feeding behavior of the Piping Plover, and 2) factors that disturb both feeding and nesting of endangered Great Lakes Piping Plovers. This activity is designed to get students actively thinking about the Piping Plover's needs and the things that are threatening this species' survival.

Concepts

1. Feeding behavior of the Piping Plover:

Piping Plovers feed on small invertebrates by pecking at them on the sand or gleaning them off of dune grass and other beach plants.

Piping Plovers move somewhat like a Robin while feeding – run, stop, peck.

2. Human impact on feeding and Piping Plover survival:

Humans, by their presence, may prevent plovers from feeding.

People leave trash on the beach and this attracts animals that prey on the Piping Plovers, chicks and eggs.

Kites and kiteboards look like predators and cause Piping Plovers to stop feeding and expend energy trying to protect their chicks from the kite.

Off-road vehicles on the beach directly or indirectly kill chicks.

3. The impact of predators on Piping Plover feeding and survival:

Dogs, cats, skunks, foxes, raccoons and Merlins (a type of small falcon) prey on adult Piping Plovers and their eggs and chicks.

Crows and gulls prey on Piping Plover eggs and chicks.

The presence of a predator causes plovers to expend time and energy defending themselves and their chicks rather than feeding.

Materials

- Area: outdoors or indoors (with room enough to move around freely)
- 4 small bags or sacks (sandwich bags or lunch bags will work)
- 1 beach ball or frisbee, small ball, etc. (something two people might use on the beach)
- 1 rope (min. 16 ft. long marked off in 4 ft. intervals) or 5 orange goal cones or other markers to establish boundaries
- soda cans, candy in wrappers, a couple of bags of chips, or other such snacks
- 1 - 2 bags of dried beans (pinto, kidney, split pea, etc.) (The activity will work best if the beans blend into the floor or ground where you will be running this activity. Paper dots can be used instead of beans if you will be doing this inside and can easily clean up the mess.)
- 1 kite (optional activity)
- 1 large sheet of paper or whiteboard with appropriate writing implement for recording data. Alternatively you can use a copy of the data chart at the end of this document.

Part 1- Feeding Habitat and Behavior

Introduction to the Piping Plover

Introduce students to the concept of threatened and endangered species. Tell them that they will be studying the Piping Plover which is an endangered species in the Great Lakes. There are also populations on the Atlantic coast and Northern Great Plains that are threatened. (Refer to the included Piping Plover information sheet and additional resources listed on its last page.) Explain that they are about to participate in an activity that is designed to help them understand some of the Piping Plovers' behavior and needs as well as the things that are threatening the lives of these birds.

Set-up Information

Ask students if they have ever seen small birds on the beach. If so, what did they observe? Were the birds feeding? How did you know? Explain that Piping Plovers move around looking for small invertebrates. When they locate food they stop and peck to pick it up. Ask for four volunteers: two to model the behavior of adult Piping Plovers and two to model the behavior of the chicks. (Have the adults wear black neck or head bands so that you can distinguish between the adults and chicks.) If this is a young group, there will probably be little hesitancy to participate - this is more like a game than work! If the group is older, stress the idea that you are all modeling behavior in order to see what can actually happen on the beach. Models are frequently used by scientists to try and determine what is happening in nature.

Explain that in this model, or simulation, the plovers (played by the students) will be feeding on beans (the beans, if that's what you've chosen to work with, represent the small invertebrates found on the beach and in dune plants). If you haven't already done so, spread the beans (or whatever you've chosen to use for "food") on the ground or floor near "the shore" and hand out small sacks or bags to each of the four Piping Plovers. When they find a bean, they put it in the sack that represents their stomach. They can only pick up one bean at a time, with the one hand representing their bill - the other hand must be holding their "stomach."

Round 1: Establishing Standards for a Healthy Diet

The student Piping Plovers (adults and chicks) will model run-stop-peck feeding behavior for approximately 30 seconds. Count each Piping Plover's beans at the end of this time.

It is important that students understand right away that the Piping Plover needs a certain amount of food (beans) to survive. The necessary amount of food is determined in this round.

Record the number of beans that each bird obtained on a large sheet of paper or board. (A suggested chart is shown at the end of this plan.) The range of beans collected during this round will be your standard for a healthy diet. During the following rounds, if a plover collects only half this amount, it will survive, but be unhealthy. If the plover collects only one quarter of this number, it won't survive.

Part 2- Human Impact on Feeding

Set-up Information

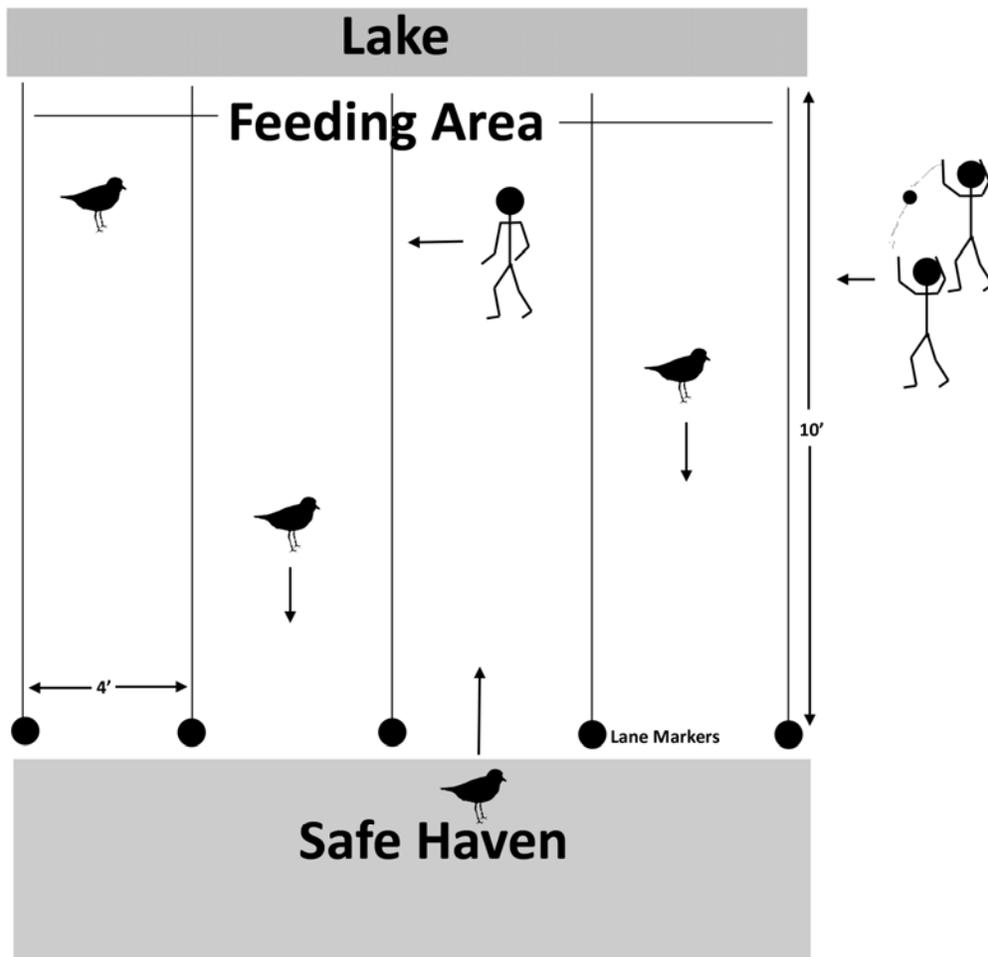
Ask the students if this is what the beach is normally like when the Piping Plovers return in mid-April and early May and choose nesting sites. (birds feeding on a deserted beach) At this time of year there are seldom any people on the beach. How does it change when summer comes? (Lots of people begin using the beach) At this time the adults will be either incubating eggs or caring for small chicks. Ask the students to describe different types of people-related activities that occur on beaches. (What do you do when you go to the beach? What do other people do? Do people ever eat on beach? Do they ever leave their garbage behind?) Get a variety of responses from the students. Make sure they include some sort of game activities (like playing frisbee, catch, kite flying, etc.)

Ask the students what they think will happen to the plovers if people or animals, like dogs, come near. Most students will know that the birds will move away. Ask them if the plovers can feed when this happens.

Explain to the students that Piping Plovers are sensitive to human disturbance. If people approach while plovers are feeding, they will run to a safer area like the dunes or vegetation.

Establish an area that will be a "safe haven" for the plovers. This should be located at least 10 feet away from where they are feeding at the water's edge. Mark off this area with the second rope, goal cones, or other objects. This area can represent the fenced-off area of the beach where people are not allowed.

Establish 4 ft. wide "corridors" through which the plovers will move from the water's edge to the safe haven, if they are disturbed. (See diagram.)



Explain to the students that each Piping Plover will have a corridor in which to feed and move. He or she must stay (for the sake of the game) within his or her corridor. If a person is in a plover's corridor, that plover has to be in the "safe haven." In other words, the plovers must anticipate the approach of a human and run to the safe haven before the person is actually in their corridor. Typically, the plovers will first freeze (their coloration will cause them to blend in with the environment and this will help prevent predation from animals) and then they will move quickly to safety.

Note: In real life, Piping Plovers sometimes move long before people get as close as they do in this simulation game. They have been known to respond to pedestrians who are as far away as 50 meters (150 feet), though they often wait until the people are much closer. It might be interesting to discuss this with the students after playing this next round and estimate how far away that actually is. In addition, the distance that the plovers must move from water's edge to a safe haven is usually much further than that used in this simulation.

Ask for six students to volunteer for the next round, in addition to the four plovers. (If you want to involve more students you can use new "plovers").

Round 2:

Have the Piping Plovers resume feeding. Send two students (beach hikers) to walk along the water's edge at normal walking pace. When they are through...

Send two students (kids playing ball or Frisbee) to move through the area. They are to act like they normally would at the beach (fooling around, etc.). As they pass out of the area...

Send two more students (people carrying soda cans, bags of chips, and other snacks) throughout the area. They should walk along dropping some of their snacks.

Count and record the number of beans obtained by each Piping Plover. Compare the results with those of the first round. Bear in mind more time was spent on this round!

Discuss the number of beans obtained. Will these be healthy Piping Plovers? Will they even survive on this beach?

Ask the Piping Plovers how they feel physically. Are they tired? Given that real Piping Plovers will actually be running further than the 10 feet established in this game, what has the class learned about how much energy the birds must expend to obtain food? Point out to the students (if they don't bring it up) that with human interference, the Piping Plovers are using more energy to obtain less food.

Part 3- Predation and Survival

Set-Up Information

Ask the students if the trash left by the pedestrians in the last round affected the plovers' ability to feed. Explain to the students that when people leave trash in an area, it attracts other kinds of animals like dogs, raccoons, skunks, foxes, crows and gulls.

Gulls and crows are birds that prey on Piping Plover eggs and chicks. When a gull (or other predator) approaches an adult plover feeding with their young chicks, both chicks and adults respond. The adult gives a warning call to tell the chicks to hide and if the predator is close, may also move away faking an injury (like a broken wing) with the intent to lead the predator away from the chicks. In spite of their good camouflage and watchful parents, about half of all Piping Plover chicks don't survive long enough to learn to fly.

Ask for a volunteer to model the behavior of a gull or crow. He or she will be moving through the beach area. If during this time they can tag a plover chick, this constitutes an attack (and the plover dies). During this round, as before, whenever possible the plovers are feeding. Assume that adults are parents feeding with their young chicks. Chicks are “safe” if they squat and freeze in place, since they are very well camouflaged in the sand. However the chicks can’t remain “frozen” for long or they won’t collect enough food to survive. For the purposes of the simulation, gulls and crows aren’t allowed to wait near a “frozen” chick waiting for it to move. In reality they wouldn’t know it was there.

Round 3:

Plovers should resume feeding. Allow the gull or crow to enter the area for 30 seconds. Count and record the beans and living Piping Plovers after this time. Discuss the impact of a gull or crow in the area on the ability of a plover to feed and survive. (Note: The adult's ability to feed isn't affected by the presence of the gulls or crows unless their chicks are with them.) One of the most important things for students to understand is that gulls or crows specifically prey on the Piping Plover chicks and eggs. Remind them that the trash we leave behind helps attract predators like the gull or crow. And, when we bring pets like dogs along with us, we are bringing along another predator!

Play additional rounds as described below if you want to spend more time on this, or begin the debriefing. NOTE: Do not substitute an additional round for the debriefing. It is essential that the students begin thinking about resolving the problems posed by this simulation, both for preparation for the next activity and for the sake of the Piping Plover's survival!

Evaluation

Ask the students to summarize what’s happened to the plover's ability to obtain food based on number of beans recorded at the end of each round. Ask the plovers (chicks and adults) how they felt during all of this. Ask the students to translate emotional frustration to physical stress on the birds as they try to meet their biological needs. They may respond by saying they felt tired or frustrated. Then ask them how this interference might affect the plovers’ ability to feed.

Ask the students to summarize what has happened to the size of the Piping Plover population on this beach. How big is the population now compared to what we started with? Will the plovers continue to nest here? If not, where will they go? What if the same types of problems occur on other beaches? What does this mean for the survival of this bird?

Resolutions

Plovers need space and so do people. Ask the class what can be done so that both the plovers' and peoples' needs can be met. Listen to all of their ideas and try to get the class to agree on one. This idea should involve some sort of beach management. Have the class try to come up with things that might prevent this idea from working. What happens if people don't want to go along with the management plan? What kinds of things can be done about this? You may want to try one more round to see if their idea works. Explain to the students that people are implementing management programs right now where Piping Plovers nest. The students’ management plans may end up being much like those that are actually in use.

Rotate new students into the roles of the Piping Plovers for Part 4 if you haven’t already done so.

Part 4- The Kite and Kiteboard: Another Predator?

Set-up Information

To Piping Plovers, kites and kiteboards look like large, predatory birds. In fact, they have been known to respond to the presence of a kite that was over 100 meters (309 feet) away. Explain this to the students and ask one or two of them to volunteer to fly a kite on the beach. By running around, the kite can be kept in the air for brief periods of the time (assuming there is little wind wherever you are). Every time the birds see the kite in air, the adults should give a warning "Peep", then they must all stop feeding and seek protection in the dunes or vegetation (in the "safe haven").

Round 4:

Have the birds resume feeding and let the student(s) fly the kite nearby for 30-60 seconds depending on their success at getting it up. Count and record the beans the plovers have picked up.

Additional Discussion - Off Road Vehicles

Information

An off-road-vehicle or ORV is any vehicle that is driven outside of roadways. ORVs on beaches affect Piping Plover chicks in several ways. The deep tracks they create generally run parallel to the water's edge so the plover chicks must cross them to get to the shore for food and water. As they try to cross, chicks often get stuck in the tracks and can't get out. In addition, while they are stuck, they are frequently run over by a second ORV. Plover chicks' natural defense of freezing in place to hide from danger, also makes them likely to be run over. The ORV driver isn't likely to even see the chick hidden in the sand ahead. ORVs on beaches are a very real and significant problem for plovers.

There are regulations governing where ORVs may be used. Have the students research the ORV regulations in their region that may impact Piping Plover populations. If you're a responsible ORV operator, does this mean you won't affect the survival of Piping Plover chicks?

Lesson Assessment Strategies

The following strategies and questions can be used to review the main concepts and objectives addressed by the simulation activity. The strategies could also be used to assess the students' understandings based on their learning experience.

1. List and describe three human activities and how they change the Piping Plovers' chances for survival.
2. How might a human behave while in Piping Plover habitat to increase chicks' chances for survival? Students could develop possible solutions or behaviors to minimize human impacts on Piping Plovers.
3. Ask the students to create either a visual image or a piece of creative writing that describes the life history and ecology of a Piping Plover.
4. How did the simulation help you to understand the ecology of the Piping Plover and your connections to this species? Ask the students what seemed realistic about the Piping Plover simulation and what did not. Students could compare and contrast the simulation with what actually happens in nature.
5. Students could make a story book about Piping Plovers based upon what they learned in the activity.

6. Students create an educational message (poster, pamphlet, story, etc.) about Piping Plovers to share with the community. The students would devise methods and strategies to convey the educational message to the public. These educational messages could be sent to agencies with properties that contain Piping Plover populations.

Original Piping Plover simulation lesson by Barbara A. Beers for the New England Field Office of the U.S. Fish and Wildlife Service. Edited by Susi von Oettingen and Linda Morse, New England Field Office, U.S. Fish and Wildlife Service, Concord, New Hampshire, 1993.

Edited and modified for the Great Lakes Piping Plover Population by Dr. Dennis Yockers, University of Wisconsin – Stevens Point and Alice Van Zoeren, Great Lakes Piping Plover Research and Recovery Team. Sleeping Bear Dunes National Lakeshore, National Park Service, 2009.



Piping Plover Survival: Data Chart

	Adult #1		Adult #2		Chick #1		Chick #2	
	# of beans	health						
Round 1 (Undisturbed)								
Round 2 (pedestrian disturbance)								
Round 3 (Predator disturbance)								
Round 4 (Kite/ Kiteboard disturbance)								

Dietary Standards (To be determined in Round 1)

Healthy Range _____ beans

Unhealthy Range _____ beans

Dangerous Range _____ beans
(may result in death)

Piping Plover Simulation Review Sheet

Name _____

1. What are three human beach activities that can affect Piping Plover survival?

A.

B.

C.

2. How do each of these activities impact the survival of Piping Plover adults and chicks?

3. What are four things people can do to help the Great Lakes Piping Plover population recover?

A.

B.

C.

D.

