

**Erratum to Activity: The Impact of Climate Change on Prairie Potholes  
Activity 1: Wetlands/Migration Simulation**

Under "References"

First reference, "Template for Entrance/Exit Slips", correct URL is:  
<http://www.uncp.edu/wac/faculty/bright/exitslips.html>

### The Impact of Climate Change on Prairie Potholes Activity 1: Wetlands/Migration Simulation

**Region:** Prairie Grasslands

**Grade Level(s):** Intended for Middle School, but can be adapted to other grade levels

**Time Required:** Two 45-minute class periods (90 minutes)

**Focus Question:**

- What happens to the Mallard Duck population when the prairie potholes disappear?

**Learning Objectives:**

- The students will be able to understand the importance of the prairie potholes to the waterfowl population that depend on this region for reproduction.
- The students will be able to recognize the correlation between the quality and quantity of prairie potholes and the waterfowl that use this region for reproduction.

**Materials:**

- *The Paddy O'Mallard Story* (<http://www.fws.gov/mountain-prairie/pfw/paddy1.html>)
- 10 hula hoops (or more for larger class sizes); packing peanuts (for “duck food”)
- Exit slips (See References section for more information on exit slips)

**Background:**

- Refer to Prairie Grasslands Case Study

**Procedures/Instructional Strategies:**

1. Have students read *The Paddy O'Mallard Story* for background on prairie potholes and waterfowl. Discuss with students the key themes of the story, which will help them to understand the next part of the activity.
2. Spread the hula hoops across one end of an outside area or gym/multipurpose room. Put packing peanuts in and around each hula hoop space. Explain that each hula hoop represents a different “pothole” in the Northern Great Plains or “prairie pothole region” of the U.S. and the packing peanuts are food for ducks who come there.
3. Pair students so that each pair occupies one pothole (one will be a male and the other a female duck). Each pair has a brood of ducklings. Additional students in the class can represent these broods of ducklings.
4. Tell the students that now their breeding pair and offspring must migrate south for the winter, so they must move to the “south” end of the area or room.
5. Remove one or two hula hoop(s) and the peanuts inside them. Explain that a drought

caused these potholes to be destroyed, and that droughts can result from warming temperatures.

6. Tell the students that they must now migrate North again and find a pothole to inhabit. This time, there is not enough habitat to support the breeding pairs. Discuss how a lack of available habitat can negatively affect waterfowl. For the purposes of the game, explain that pairs that cannot find a pothole may not be able to find sufficient food or proper breeding grounds to reproduce, and they may not survive.
7. Have the remaining students/ducks migrate South, then remove another one of the hula hoops/potholes. Explain that this time a farmer drained the pothole, leading to habitat destruction.
8. When the students/ducks migrate back to the Northern Plains this time, even less habitat is available and more ducks are in distress.
9. Model other scenarios of prairie pothole destruction, such as complete destruction, where all the hula hoops are removed. Discuss with students how they were affected by the destruction of the potholes. Explain how destroyed potholes affect waterfowl, in that less habitat is available for feeding and breeding.
10. Have students discuss the following questions:
  - Where is the prairie pothole region, and how were prairie potholes formed? ([see Prairie Grasslands Case Study for more information](#))
  - How does this game represent migration? ([finding a new pothole represented migration; when less potholes were available, this made migration difficult](#))
  - Why are wetlands important for birds that migrate? ([they provide habitat and food](#))
  - What do birds need during the mating period ([habitat, food, breeding partner](#))
  - What do you think would happen if much of the prairie pothole region were to be destroyed? ([there will not be as much habitat available for the waterfowl to breed, which would lead to a decrease in their population](#))
  - Why is it important to save the wetlands? ([to provide habitat for species](#))
11. Have the students fill out the exit slip question before they leave:
  - What is the relationship between prairie pothole destruction and the population of ducks?
12. Evaluate students answers based on the following criteria:

Check plus	Makes the correlation between quality and quantity of potholes and duck population
Check	Has the right idea but needs some clarification
Check minus	Is not on the right track and needs assistance
13. The following day, pair students who received a “check plus” with those that received a “check minus” or “check” (sometimes “checks” may be paired with other “checks”). Give the students 5 minutes to discuss the question and revise their work.

### Extensions:

- Art connection:  
U.S. Fish and Wildlife Service: Federal Junior Duck Stamp Program  
<http://www.fws.gov/juniorduck/>

### National Science Education Standards:

#### Regulation and Behavior

- Behavior is one kind of response an organism can make to an internal or environmental stimulus. A behavioral response requires coordination and communication at many levels, including cells, organ systems, and whole organisms. Behavioral response is a set of actions determined in part by heredity and in part from experience.
- An organism's behavior evolves through adaptation to its environment. How a species moves, obtains food, reproduces, and responds to danger are based in the species' evolutionary history.

#### Populations and Ecosystems

- A population consists of all individuals of a species that occur together at a given place and time. All populations living together and the physical factors with which they interact compose an ecosystem.
- Populations of organisms can be categorized by the function they serve in an ecosystem. Plants and some micro-organisms are producers--they make their own food. All animals, including humans, are consumers, which obtain food by eating other organisms. Decomposers, primarily bacteria and fungi, are consumers that use waste materials and dead organisms for food. Food webs identify the relationships among producers, consumers, and decomposers in an ecosystem.
- For ecosystems, the major source of energy is sunlight. Energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis. That energy then passes from organism to organism in food webs.
- The number of organisms an ecosystem can support depends on the resources available and abiotic factors, such as quantity of light and water, range of temperatures, and soil composition. Given adequate biotic and abiotic resources and no disease or predators, populations (including humans) increase at rapid rates. Lack of resources and other factors, such as predation and climate, limit the growth of populations in specific niches in the ecosystem.

#### Diversity and Adaptations of Organisms

- Biological evolution accounts for the diversity of species developed through gradual processes over many generations. Species acquire many of their unique characteristics

through biological adaptation, which involves the selection of naturally occurring variations in populations. Biological adaptations include changes in structures, behaviors, or physiology that enhance survival and reproductive success in a particular environment.

- Extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient to allow its survival. Fossils indicate that many organisms that lived long ago are extinct. Extinction of species is common; most of the species that have lived on the earth no longer exist.

### Earth Science – Structure of the Earth System

- Water, which covers the majority of the earth's surface, circulates through the crust, oceans, and atmosphere in what is known as the "water cycle." Water evaporates from the earth's surface, rises and cools as it moves to higher elevations, condenses as rain or snow, and falls to the surface where it collects in lakes, oceans, soil, and in rocks underground.
- Water is a solvent. As it passes through the water cycle it dissolves minerals and gases and carries them to the oceans.
- Clouds, formed by the condensation of water vapor, affect weather and climate.
- Global patterns of atmospheric movement influence local weather. Oceans have a major effect on climate, because water in the oceans holds a large amount of heat.

### Physical Science

- The sun is a major source of energy for changes on the earth's surface. The sun loses energy by emitting light. A tiny fraction of that light reaches the earth, transferring energy from the sun to the earth. The sun's energy arrives as light with a range of wavelengths, consisting of visible light, infrared, and ultraviolet radiation.

### Additional Resources:

- Episode on Prairie Potholes, Upper Midwest Aerospace Consortium (UMAC)  
<http://www.umac.org/ocp/videos/prairiePotholes.html>
- "Wetland Birds of the Northern Great Plains", USGS: Northern Prairie Wildlife Research Center (NPWRC)  
<http://www.npwrc.usgs.gov/resource/habitat/grlands/wetbirds.htm>
- "Waterfowl in the Prairie Pothole Region", USGS: Northern Prairie Wildlife Research Center (NPWRC)  
<http://www.npwrc.usgs.gov/resource/habitat/grlands/waterfwl.htm>
- EPA's book list for wetlands  
<http://www.epa.gov/OWOW/wetlands/science/readlist.html>
- EPA: The Wetlands Program Across the Country  
<http://www.epa.gov/owow/wetlands/regions.html>

- EPA: Wetlands: Prairie Potholes  
<http://www.epa.gov/owow/wetlands/types/pothole.html>
- Iowa State University  
<http://www.ag.iastate.edu/centers/iawetlands/Pothole.html>
- Iowa State University  
<http://www.ag.iastate.edu/centers/iawetlands/mammal.html>

### References:

1. Template for Entrance/Exit Slips  
<http://webpages.sedona.k12.az.us/~goldsmith/FOV2-0001BF8C/FOV2-0001BF90/Templates%20for%20Entrance%20or%20Exit%20Slips.doc?FCItemID=S00676495>
2. Information About Exit Slips  
<http://wblrd.sk.ca/~bestpractice/exit/resources.html>
3. Article About Exit Slips  
[http://www.education-world.com/a\\_curr/profdev/profdev091.shtml](http://www.education-world.com/a_curr/profdev/profdev091.shtml)