

Popcorn Spill



Adapted from the Alaska Oil Spill Curriculum, Prince William Sound Regional Citizens Advisory Council

Originally adapted and used with permission from OBIS Oil Spill, Delta Education, Box M, Nashua, New Hampshire, 03061.

Objectives:

Students will estimate the environmental impact of a simulated oil spill, containership spill, or other pollution and will understand the impact of winds and currents on marine pollution.

Concept:

Winds and currents spread pollutants such as oil or debris very quickly, making it difficult to contain and clean up. Coastal organisms such as fish, shorebirds, and intertidal invertebrates are most often harmed by oil spills from ships, offshore drilling, pipelines, and natural seepage because these usually occur in the shallow coastal areas where these organisms are concentrated. Container ship spills and other sources of marine debris can have significant impacts on both open-ocean environments and coastal areas when the debris is washed ashore. Other sources of pollutants include spills, leaks, and improper disposal of chemicals onshore that are washed into the marine environment. The environmental impacts of pollution depend on the size of the spill, the type of pollution, the prevailing wind and water conditions during the spill, and the variety and abundance of life (both wild and human) in the affected area.

Materials:

- ⊙ Science notebooks
- ⊙ Pencils
- ⊙ 20 liters of popped popcorn
- ⊙ Handout: Impact Challenge Cards
- ⊙ Pencils
- ⊙ Guides for identifying saltwater/freshwater organisms
- ⊙ 1 plastic bucket or can with a metal handle (about 20 liters in volume)
- ⊙ 1 50 cm x 50 cm piece of plastic window screen, nylon mosquito netting, or several 50 cm x 50 cm sheets of small mesh cheese cloth
- ⊙ 1 large rubber band, strip of inner tube, or elastic band that will fit snugly around the plastic bucket
- ⊙ 3 100-cm lengths of wide duct tape or masking tape
- ⊙ 25 meters of heavy twine or light rope marked off in 5-meter intervals
- ⊙ 1 mini-hacksaw, jigsaw, or serrated knife
- ⊙ Permanent marker

Preparation:

To make a popcorn slinger, cut out the bottom of the bucket with a hacksaw, jigsaw, or knife. With the bucket turned upside down, place the screen material over the open end of the bucket. Let the material drape over the side. With the duct tape or masking tape, tightly tape the edge of the screen material to the bucket. Firmly tie the 25-meter line to the metal handle on the bucket and tie a loop (large enough to go over a nearby rock or post) at the other end of the line.

Determine the location for your simulated spill. Although developed for the seashore, this activity may also be conducted at a lake, river, or stream. Reduce the amount of popcorn for smaller bodies of water.





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The activity will be more exciting if you choose a site with strong dispersal features (such as water currents and wind) and an abundance of life. Breakwaters or docks are convenient places from which to toss popcorn into the water.

Decide if you would like to simulate an oil spill, container ship spill, or other source of pollution. If you conduct the activity at an inland site where oil spills rarely occur, tell students that the activity simulates a toxic chemical discharge from an industrial or agricultural source. The “Impact Challenge Cards” are designed for an oil spill, so you will need to adapt them if you choose another source of pollution.

Introduction:

Before you reach the site, discuss safety and assign a buddy system. Keep an eye on nonswimmers.

At the site, tell the students that they are environmental impact experts who have been rushed to the scene of an oil spill or other source of pollution to estimate its impact on the environment. Say that you will simulate the spill by tossing out a large bucket of popcorn to represent the pollution. Explain you are using popcorn because it will not harm the environment, and it floats like refined oil or plastic debris.

Explain to your group of “experts” that they are responsible for estimating the impact of the spill on (a) the landscape, (b) the plant life, (c) the animal life, and (d) human activities. Divide the group into four smaller groups (keep buddies together), and give each group an Impact Challenge Card. Tell the teams to assume that anything the popcorn touches will be covered with pollution.

Before you toss out the popcorn, ask the students to predict in which direction the spill will move and how long it will take to reach the shore. Ask someone to measure the time it takes for the spill to reach the shore or some other reference point.

Now you are ready to use your popcorn slinger. With the loop of the rope anchored to a rock or post, practice tossing the bucket a few times before putting in the popcorn. Take a strategic but secure position on a dock, breakwater, or large rock. The rope should be loosely coiled on a flat surface below your tossing arm so the rope will fly out freely when the bucket is tossed. Make sure you are not standing on the rope.

When you are ready, grab the rope about a meter from the metal handle and start swinging the popcorn slinger over your head. When the bucket has gathered momentum, let it fly out over the water. Try to pick a location where you can toss the bucket with the wind instead of against it.

After you have gotten the knack for tossing the bucket, place a small flat rock (about 200 grams) in the bucket and then put in about 20 liters of popcorn. With the teams ready to time and follow the spill, toss out the slinger.

After landing, the rock will help pull the bucket under the water and the buoyant popcorn will be forced out the top of the bucket. Let the bucket sink beneath the surface before hauling it in so the spill won’t be disturbed.

Count the marked intervals on the rope as you haul in the bucket to determine the spill’s starting distance from the shore.



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Ask your environmental experts to begin their investigation, working with their groups to answer the questions on their Impact Challenge Cards in their science notebooks.

Join in and follow the movement of the spill with the rest of the group.

Near the end of the allotted time or after the spill has been thoroughly dispersed, gather the students together to have a Slick Talk to report their findings.

If you would like, you can give students a chance to (safely) attempt to remove the popcorn from the water using a variety of techniques.

Wrap-Up:

At the end of your Slick Talk, have students reflect on the following questions in their science notebooks. Then discuss their answers.

1. How quickly did the spill reach the shore?
2. What agents dispersed the spill?
3. How might different wind or water conditions affect the spill?
4. How could a spill be prevented from spreading?
5. Who should be responsible for cleaning up a spill?

Extensions & Lesson Connections:

An excellent way to extend this lesson is to incorporate ROVs (remotely operated vehicles) and allow students to design and use ROVs for clean up efforts. The Prince William Sound Science Center has developed an excellent ROV & Oil Spill Response kit with funding from the Oil Spill Recovery Institute.

In this lesson, Students will work cooperatively to design and build an ROV (remotely operated vehicle) in response to a mock oil spill and demonstrate how to operate equipment similar to real-life oil response equipment.

Contact the Prince William Sound Science Center (<http://www.pwssc.org>, 907-424-5800) to request the ROV Teaching Kit. They provide many of the materials required to build the ROVs, as well as handouts, PowerPoint presentations, and directions for setting up a challenge course. The PWSSC lesson materials focus on an arctic environment, but can be adapted to other environments if you so choose.

Evaluation:

Review science notebooks for thorough and reasonable reporting of popcorn spill data in each expert group. Observe expert groups and presentation for successful participation and cooperation. Evaluate understanding based on student reflection in their science notebook.





Impact Challenge Cards

<p style="text-align: center;">Impact Challenge Card #1 Landscape</p> <p>Follow the spill and estimate its impact on the landscape. Get the 25-meter length of rope from the popcorn slinger and use it to estimate the area the spill covered.</p> <p>Water _____ sq. meters (length x width) Land _____ sq. meters (length x width)</p> <ul style="list-style-type: none">• Where did most of the pollution end up? Why?• How might the underwater landscape be affected?• How did the spill change the general appearance of the landscape?	<p style="text-align: center;">Impact Challenge Card #2 Plant Life</p> <p>Follow the spill and estimate its impact on plant life.</p> <ul style="list-style-type: none">• How many different types of plants were affected?• Which water plants and algae were hardest hit by the spill? Why?• How might this spill affect land plants?• How would animals that eat aquatic plants be affected?
<p style="text-align: center;">Impact Challenge Card #3 Animal Life</p> <p>Follow the spill and estimate its impact on animal life.</p> <ul style="list-style-type: none">• How many different types of animals were covered with by the spill?• What animals were hardest hit by the spill? Why?• Which animals might be capable of escaping from a spill? Which animals might not be able to?• How might a spill affect animals that live under rocks along the shore?	<p style="text-align: center;">Impact Challenge Card #4 Human Activities</p> <p>Follow the spill and estimate its impact on human activities.</p> <ul style="list-style-type: none">• How might a spill affect recreation like fishing, swimming, kayaking, and beachcombing?• How might boats, docks, breakwaters, and other structures be affected?• How might drinking water or food be affected?• How might the local industries be affected?