Title: Popcorn Spill

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

Theme: Winds and currents spread oil from a spill very quickly, making it difficult to contain and clean up.

Objectives:

- Students will estimate the environmental impact of a simulated oil spill.
- Students will understand the impact of winds and currents on an oil spill.

Duration: 60-90 minutes

Age Range: 6th-12th Grade

Materials:

- 20 liters of popped popcorn
- 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 x50 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

Background:

In spite of precautionary measures to prevent them, oil spills from ships, offshore drilling operations, pipelines, and natural seepage continue. As past spills have so tragically demonstrated, a major oil spill can take a devastating toll on wildlife. Inshore fisheries, shorebirds, intertidal organisms, and shallow subtidal organisms are most often harmed because spills usually occur in the shallow coastal areas where these organisms are concentrated. The environmental impact of an oil spill depends on the size of the spill, the prevailing wind and water conditions during the spill, and the variety and abundance of life (both wild and human) in the affected

area.

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. 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. 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.

Introduction:

Before you reach the site, discuss safety and assign a buddy system. Keep an eye on any non-swimmers.

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

Activities & Procedures:

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 oil.

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.

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.

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. Ask your environmental experts to begin their investigation. 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, discuss the following questions:

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 an oil spill be prevented from spreading?
5. Who should be responsible for cleaning up a spill?

Evaluation:

Listen as students describe their findings to each other during the SLICK TALK as a formative assessment. Observe participation, cooperation, and adherence to safety guidelines during group work.

Impact Challenge Cards

Impact Challenge Card #1 **Landscape** 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 covers. Water _____ sq. meters (length x width) Land _____ sq. meters (length x width) • Where did most of the oil end up? Why? • How might the underwater landscape be affected? • How did the oil spill change the general appearance of the landscape?	Impact Challenge Card #2 **Plant Life** Follow the spill and estimate its impact on plant life. • How many different types of plants were affected? • Which water plants and algae were hardest hit by the spill? Why? • How might an oil spill affect land plants? • How would animals that eat aquatic plants be affected?
Impact Challenge Card #3 **Animal Life** Follow the spill and estimate its impact on animal life. • How many different types of animals were covered with oil? • What animals were hardest hit by the spill? Why? • Which animals might be capable of escaping from an oil spill? Which animals might not be able to? • How might an oil spill affect animals that live under rocks along the shore?	Impact Challenge Card #4 **Human Activities** Follow the spill and estimate its impact on human activities. • How might an oil 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?

Popcorn Spill Standards

Science As Inquiry and Process: Students develop an understanding of the processes and applications of scientific inquiry.

SA1
Students develop an understanding of the processes of science used to investigate problems, design and conduct repeatable scientific investigations, and defend scientific arguments

The student demonstrates an understanding of the processes of science by:

[6, 7, 8, 9] SA1.1 asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating

[10, 11] SA1.1 asking questions, predicting, observing, describing, measuring, classifying, making generalizations, analyzing data, developing models, inferring, and communicating

SA2
Students develop an understanding that the processes of science require integrity, logical reasoning, skepticism, openness, communication, and peer review.

The student demonstrates an understanding of the attitudes and approaches to scientific inquiry by:

[9] SA2.1 formulating conclusions that are logical and supported by evidence

Concepts of Life Science: Students develop an understanding of the concepts, models, theories, facts, evidence, systems, and processes of life science.

SC3
Students develop an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy.

The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy by:

[11] SC3.2 analyzing the potential impacts of changes (e.g., climate change, habitat loss/gain, cataclysms, human activities) within an ecosystem

Science and Technology: Students develop an understanding of the relationships among science, technology, and society.

SE1
Students develop an understanding of how scientific knowledge and technology are used in making decisions about issues, innovations, and responses to problems and everyday events.

The student demonstrates an understanding of how to integrate scientific knowledge and technology to address problems by:

[6] SE1.1 recognizing that technology cannot always provide successful solutions for problems or fulfill every human need