Oil Spill

Age: Middle School

Objective

- **To educate students on the disastrous effects of an oil spill event in nature.**
- **To encourage students to consider possible methods of oil spill cleanup.**

Background Lesson

An oil spill is an accidental release of petroleum hydrocarbon into the environment. On land, the effects of an oil spill are relatively localized and can be remediated fairly easily. In a marine environment, however, the effects of an oil spill are far reaching and considerably more difficult to eliminate. It can take months or even years to clean up a marine oil spill.

The environmental damage of an oil spill is vast, affecting hundreds of organisms of which marine birds, dolphins, seals, turtles, insects and plants are only a few. Sticky oils such as crude oil coat the organism in a thick layer of adhesive liquid. Non-sticky oils, such as refined petroleum products, do not coat the organism but are extremely poisonous to wildlife. Some fish may even be attracted to an oil spill because it looks to them like food floating on the water.

When oil penetrates the plumage of birds, the insulating ability of the plumage is reduced making the birds more vulnerable to temperature alterations. Also, the buoyancy of the feathers is decreased, making it difficult for the birds to stay afloat on water. As the bird attempts to prune, it unknowingly ingests this poisonous substance leading to ailments such as kidney damage, liver failure, and digestive tract infection. Marine mammals are affected in much the same way as birds. The oil alters the insulating properties of their fur, leaving them susceptible to diseases such as hypothermia. When mammals ingest the oil they suffer from dehydration as well as digestive problems.

There are several methods of oil spill cleanup, none of which are exceptionally rapid or effective. One method includes the use of detergents. These substances cluster around oil globules allowing it to dilute out throughout the ocean. Bioremediation is the use of microorganisms which ingest and break down the oil. In some cases, sorbents such as animal hair and synthetic compounds are used in an attempt to absorb the oil out of the environment.

The Activity

Materials

- **4-cup size measuring cup**
- **Water**
- **Vegetable oil**
- **3 different sorbents - examples include cotton, straw, feathers, hair, coconut husks, etc.**

- Dishwashing detergent
- Strainer
- Stopwatch

Preparation

Cut the sorbents into thumbnail sized pieces so that they can be placed in a bowl. For each sorbent, you want 3 bowls approximately 1 cup in size. This allows you to do multiple trials for each sorbent.

Create a table as follows. This table will be used to compare the absorbance efficiency of each of the sorbents.

Sorbent 1: _____	Ratio of Water to Oil After 30s (Amount of Water/Total Amount Minus Amount of Water)
Trial 1	
Trial 2	
Trial 3	
Sorbent 2: _____	**Ratio of Water to Oil After 30s (Amount of Water/Total Amount Minus Amount of Water)**
Trial 1	
Trial 2	
Trial 3	
Sorbent 3: _____	**Ratio of Water to Oil After 30s (Amount of Water/Total Amount Minus Amount of Water)**
Trial 1	
Trial 2	
Trial 3	

A second table will be used to assess the effect of the detergent on dilution of the oil.

Dishwashing Detergent	Ratio of Water to Oil After 30s (Amount of Water/Total Amount Minus Amount of Water)
Trial 1	
Trial 2	
Trial 3	

Procedure

1. Set up your workstation. You may want to lay a newspaper on the desk to help with cleanup. Set up the 4-cup measuring cup, strainer, piles of

sorbents, and have your dishwashing detergent, oil and stopwatch on hand.

2. Fill up the measuring cup 3 out of 4 cups full with water. Top up the last cup with vegetable oil.
3. Place the first trial of the first sorbent into the metal strainer and lower into the measuring cup.
4. Keep the sorbent in the oil for 30s and then remove it. Place the sorbent into a garbage can.
5. Record the ratio of water to oil remaining in the measuring cup.
6. Top up the water and oil to the initial level and repeat the experiment for each of the trials and each of the sorbents.
7. Add one drop of detergent to the oil and let it sit for 1 minute. Repeat this twice more for a total of 3 trials.

Post Activity Discussion

- Which sorbent was the best? What type of features make for a good sorbent?
- Where would the oil go in the real world if a dispersant such as the detergent was used?
- How would land animals be affected by a marine oil spill?
- What other ideas do students have for alternative methods of oil spill cleanup?
- What measures could be taken to reduce or even eliminate the risk of a future oil spill?

Possible Assignments

Have the students research famous oil spills that have occurred in the past. Some examples of famous oil spills include the Megaborg, Jupiter, Ixtoc I, Exxon Valdez, and the Gulf Coast. Focus of study could be on why the spill occurred, what wildlife was affected and how the oil spill was cleaned up.