



TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Lesson Plans for Teachers

www.tceq.state.tx.us/assistance/education.html

Don't Cry Over Spilled Oil

Grade level:

- 6th through 8th

Sample TEKS for grade 8: Science:

- 8.1b
- 8.3c
- 8.14b, c

Social studies

- 8.32a, b

Objectives:

The students will be able to:

- Investigate the Exxon Valdez oil spill
- Evaluate oil spill clean up procedures
- Understand long term effects of an oil spill on an ecosystem

Background:

While pollution of the world's oceans by oil is not a new problem, conferences were held as early as 1926, the growth of world production has increased the incidents of oil spills. While oil tanker accidents and offshore well blowouts often grab the headlines, more petroleum is lost in the routine operation of oil tankers.

Sources of Oil Pollution:

- 9.8% natural seepage
- 21.8% tanker operations
- 3.3% tanker accidents
- 9.8% other transportation activities
- 9.8% atmospheric fallout
- 1.3% offshore petroleum production
- 12.3% coastal facilities (sewage plants, refineries, etc)
- 31.1% river and urban runoff

Because oil is less dense than water and floats, it can quickly coat anything in the water. By cutting off the exchange of gas, organisms that live in the water column and require oxygen quickly die. This damage is particularly damaging in the tidal zone and near-shore environments. Not only does this zone support aquatic life, but also a variety of predators that feed on aquatic organisms. Birds and aquatic mammals can be most severely effected. A coating of oil on feathers reduces the birds' ability to fly and the feathers can no longer help the bird retain body heat. Oil on the fur of sea mammals, such as otters and seals, reduces the

animals' ability to stay warm. The ingestion of oiled water and prey will further weaken the animals.

While most of the volatile components of the oil quickly escape into the atmosphere, other more stable components can remain in the water column for many years. Some will disperse into the water, some are oxidized by sunlight, some are consumed by microorganisms and the remaining will be deposited as sediment.

Many methods of clean up have been employed in the aftermath of a major oil spill, including the use of microorganisms to "eat" the oil. Detergents have been used to disperse the oil, but have actually been found to do more damage than the oil itself. Burning the oil is ineffective due to the fact that the more volatile components quickly escape. Barriers and booms are often used to contain the spill while the oil is absorbed or siphoned off. Most attempts to clean up a spill have proven to be ineffective.

In the aftermath of the Exxon Valdez accident of 1989 there have been efforts to clean up Prince William Sound. In support of their efforts, Exxon has produced a video, Scientists and the Alaska Oil Spill. The video examines some of the methods currently employed in worldwide oil spill clean ups. The scenes of cleaning otters and birds as well as the shoreline will point out to students the magnitude of cleaning up a spill of this size.

Vocabulary:

- oil spill
- Exxon Valdez
- barriers
- booms
- microorganisms

Materials:

- 500 ml saltwater
- disposable containers for oceans (plastic or aluminum pans)
- shrub clippings
- small rocks
- 50 ml clean motor oil
- balance
- play money
- expenditure worksheet
- paper bathroom cup
- plastic zipper bag
- fur scraps
- feathers
- clean up materials: tweezers, Styrofoam peanuts, string, cotton balls, paper towel strips, medicine dropper, liquid detergent

Procedure:

Part One-Teacher preparation

- Bundle the money so that each group will have \$15,000,000
- Package the clean-up materials in bundles so that they can be easily distributed
- Cut the paper towels into 25-1" strips stapled together
- Cut the string to 12" lengths
- Fill sandwich bags with Styrofoam peanuts
- Sandwich bags with 25 cotton balls
- cups with small amounts of detergent

Set up one station with a pan of water and paper towels and label as the "Wildlife Rehabilitation Center." This station will only be used by one member of each team to clean any wildlife that becomes oil soaked. While at the center they can use any of the materials, but they cannot take them back to the spill sight to help with the shoreline clean-up.

Fake fur pieces can be found at craft stores or garage sales. Cut into small pieces.

Set up an example of an oil spill so that you can demonstrate how each of the clean-up materials are to be used.

Part Two-Day One-Student preparation of their oceans

- Students fill their containers about 2/3 full of saltwater. A little blue food coloring will increase visibility.
- Build a beach of rocks and gravel and add sprigs of leaves to simulate trees.
- Place feathers and /or fur scraps to simulate wildlife.
- Pour a small amount of motor oil into the paper cup and place in the center of the ocean. This is the oil tanker.
- To simulate the spill, poke a hole in the cup below the water line or slowly lay the cup on its side. Leave the cup in place, remember the tanker continued to leak oil for several days before it could be stopped.
- Observe how the oil spreads over the surface of the water. Do not disturb the ocean set-up until the next day.

Inform the students that their oil company has been allotted \$15,000,000 to clean up the spill. At this time it may be helpful to demonstrate how each of the clean-up materials are to be used.

Clean up material restrictions:

- each group must purchase at least one set of tweezers
- cotton balls, paper towels and Styrofoam peanuts cannot be touched with the fingers, only tweezers
- purchase of detergent allows one student the use of the "Wildlife Rehabilitation Center"
- One large zipper bag will be provided to dispose of all materials.
- Allow each group to discuss how they will spend their money. Once the money has been spent on Day two, they cannot get a refund.

Part Three- Teacher prep for day two

- (Remember: the students were told not to disturb their oceans and to be careful with them)
- During the night there is going to be a storm and the wildlife is going to get hungry.

- Shake up the trays and push the feathers and /or fur scraps into the water!!

Part Four-Day Two

Students return to find the effects of the surprise storm. The students will probably be upset when they see the condition of their spills. Remind them that nature doesn't stop just because there has been a spill.

Pass out money to each group and allow students to begin purchasing clean up materials from different areas of the room. Point out that clean up materials and equipment are seldom near the sight of an accident and may have to be transported from far parts of the world before the clean up can begin.

All used materials and oil should be placed in the large zipper bag.

Assessment:

After the students have cleaned as much as possible, line the oceans up with the bag of waste material in front. Let each group judge who was the most successful in their efforts. Discuss the most successful methods and the problems encountered.

Enrichment:

Due to the fact that no one group will be able to purchase all methods of clean-up, some groups may want to share. Allow them to set up a consortium to share their resources or pool their remaining money.

Sample Expenditure Worksheet

MATERIALS	COST	QUANTITY	TOTAL
Styrofoam	\$7,500,000		
string	\$1,000,000		
paper towels	\$5,000,000		
cotton balls	\$7,500,000		
medicine dropper	\$10,000,000		
tweezers (each)	\$1,000,000		
detergent	\$2,500,000		

Submitted by: Terri Dannenburg, TCEQ