

Title: *Oil vs. Ground: Which One Will Falter First?*

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Background Information

Crude oil is a toxic material and can cause environmental damage, physically and biochemically. One of the main problems with oil spills is when oil seeps into the benthic layers or coastal sediment and impacts the marine life. Even if the oil spill appears to be contained or the surrounding water seems to be decontaminated, there may still be traces of oil within the underlying sediment. Oil can penetrate to deeper layers of that sediment and affect everything within this habitat, from microbes to the larger infauna. Different toxic effects may include suffocation, alteration of redox conditions, decreased mobility, poisoning, and impairment of reproduction. The most recent and notable oil spill was the BP Deepwater Horizon incident which was responsible for releasing millions of barrels of oil into the Gulf of Mexico. This oil may eventually be leached into the surrounding sediment.



Louisiana State Standards (Grade-Level Expectations)

SI GLE: Predict and anticipate possible outcomes (SI-E-A2).

Design, predict outcomes, and conduct experiments to answer guiding questions (SI-M-A2).

Write and defend a conclusion based on logical analysis of experimental data (SI-H-A6) (SI-H-A2).

SI GLE: Select and use developmentally appropriate equipment and tools and units of measurement to observe and collect data (SI-E-A4).

Select and use appropriate equipment, technology, tools, and metric system units of measurements to make observations (SI-M-A3).

SI GLE: Choose appropriate models to explain scientific knowledge or experimental results (e.g., objects, mathematical relationships, plans, schemes, examples, role-playing, computer simulations) (SI-H-A4).

SI GLE: Pose questions that can be answered using students' own observations and scientific knowledge (SI-E-A1)

Generate testable questions about objects, organisms, and events that can be answered through scientific investigations (SI-M-A1).

Describe how investigations can be observation, description, literature survey, classification, or experimentation (SI-H-A2)

SI GLE: Use a variety of appropriate forms to describe procedures and express ideas about demonstrations or experiments (e.g., drawings, journals, reports, presentations, exhibits, portfolios) (SI-E-A6).



Record observations using methods that complement investigations (e.g., journals, tables, charts) (SI-M-3).

Plan and record step-by-step procedures for a valid investigation, select equipment and materials, and identify variables and controls (SI-H-A2).

SI GLE: Identify and use appropriate safety procedures and equipment when conducting investigations (e.g., gloves, goggles, hair ties) (SI-E-A7).

Given a description of an experiment, identify appropriate safety measures (SI-H-A7).

Use relevant safety procedures and equipment to conduct scientific investigations (SI-M-A8).

LS GLE: Identify what animals and plants need to grow and develop (LS-E-A1).

Explain how selected organisms respond to a variety of stimuli (LS-H-F3).

ESS GLE: Examine soils to determine that they are often found in layers (ESS-E-A1).

SE GLE: Analyze positive and negative effects of human actions on ecosystems (SE-H-A7).

Give examples and describe the effect of pollutants on selected populations (SE-H-A11).

SE GLE: Determine the interrelationships of clean water, land, and air to the success of organisms in a given population (SE-H-C1).

SE GLE: Identify and give examples of pollutants found in water, air, and soil (SE-M-A3).

Ocean Literacy Principles

Principle 5a: Ocean life ranges in size from the smallest virus to the largest animal that has lived on Earth, the blue whale.

Principle 5b: Most life in the ocean exists as microbes. Microbes are the most important primary producers in the ocean. Not only are they the most abundant life form in the ocean, they have extremely fast growth rates and life cycles.

Principle 5e: The ocean is three-dimensional, offering vast living space and diverse habitats from the surface through the water column to the seafloor. Most of the living space on Earth is in the ocean.

Principle 6e: Humans affect the ocean in a variety of ways. Laws, regulations and resource management affect what is taken out and put into the ocean. Human development and activity leads to pollution (such as point source, non-point source, and noise pollution) and physical modifications (such as changes to beaches, shores and rivers). In addition, humans have removed most of the large vertebrates from the ocean.

Time Requirement

The teacher should already have the ingredients (i.e., layers of material, infauna) separated in an easy access format for the students to use. The teacher should have also labeled the outside of the plastic bins before the start of this activity. Once the students start this



activity, minimal time is required. Allow the students to layer the plastic bin with material and infauna for 5-10 minutes. Students must measure appropriate amount of oil into beakers and then mix with food coloring; this should take 2 minutes. Afterwards, the time requirement is, essentially, the amount of time it takes to check the oil seepage at the appropriate increments and take notes.

Materials

Plastic bins
Sediment or dirt
Vegetable oil
Beakers
Food coloring
Grass
Leaves
Sticks
Gravel or pebbles
Gummy worms
Confetti glitter stars
Plastic eggs

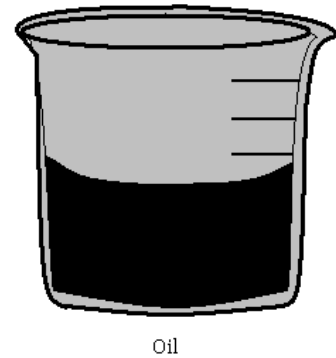
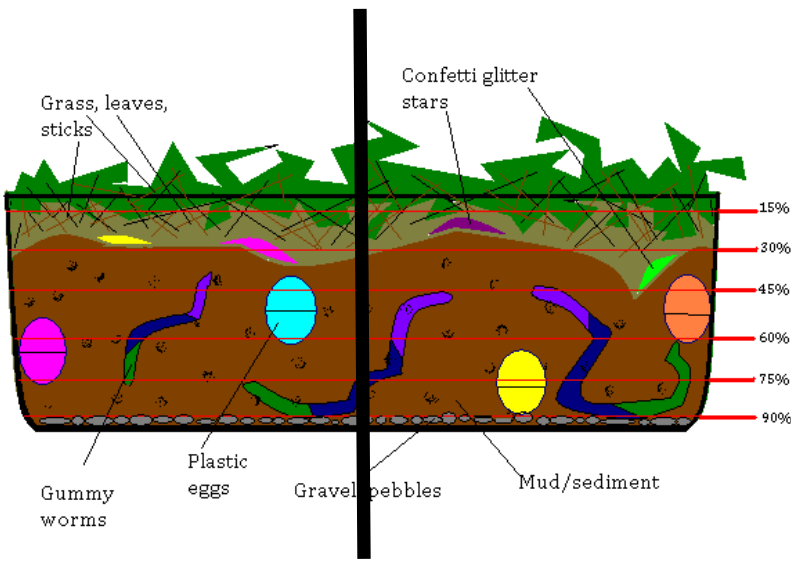
Lesson Description

Creating the Oil Leaching Project

1. Label the outsides of the plastic bins with lines that will denote the percentage of sediment impacted by oil leaching. This has been outlined on the illustration below.
2. Teachers should have already collected the gravel or pebbles, dirt, grass, leaves, and sticks. Place these ingredients next to the rest of the items to put in the plastic bin (e.g., confetti glitter stars, plastic eggs, etc.).
3. Allow groups of students to layer the bin with all the ingredients. Notify students to put the marine life (i.e., confetti, worms, eggs) next to the sides of the bins so it will be easy to see what gets impacted by the oil. Inform them of what should be placed in first to last (i.e, gravel, dirt, sticks, leaves, grass).
4. Add food coloring to each set of oil used by each group.

Methodology

Divide students in appropriate sized groups; this activity can be adjusted to use smaller or larger groups. The marine life are symbolized by plastic eggs (i.e., bivalves), gummy worms (e.g., Nematodes), and confetti glitter stars (i.e., starfish). After all the ingredients and marine life have been layered, pour 300 mL of food-colored oil into $\frac{1}{2}$ the bin and 200 mL into the other half. Place emphasis of pouring around the sides of the bins to accentuate visibility. Notify students they should be taking note of the percentage of sediment impacted by oil in increments of: 1 minute, 1 hour, 3 hours, and 24 hours.



Standard Evaluation (Student Deductions)

1. At what time increment was the greatest amount of oil leached?
2. Was there any major difference between the left and right sides of the bins?
3. Identify the organisms that may have been affected by oil leaching?
4. Research how oil pollution impacts infauna?
5. Predict what would happen if oil seepage was checked after 2 days? After 7 days?
6. Could this oil be beneficial to any organisms within this habitat?
7. Describe a general effect of oil pollution to this general benthic community?

The evaluation can be in the form of a test, essay, questions and answers worksheet, or any other mode of measuring retainment or comprehension of material.