

OIL SPILL CLEANUP: INTRODUCTION

In the event of an oil spill, many members of a coastal community may be involved in the cleanup and recovery of the area. After a spill, oil and waxes stick together and usually float on top of the water, forming a thin layer called a "slick" as they are spread out by winds and currents. There are several methods of oil spill response. Mechanical methods involve a piece of equipment called a boom, which is used to contain the oil in a certain area on the surface of the water and prevent it from spreading. Another piece of response equipment is a skimmer, which separates oil and water. Mechanical skimming is considered to be the method that is least harmful to the environment, but it is also very time consuming and has several steps in which errors could occur. Chemical responses include dispersants, dilution, and solidifiers. Oil may also be removed from the environment by burning in open water areas, shoreline cleanup, and bioremediation, which uses bacteria and microbes to actually consume the oil. Each method has its benefits and potential problems.

KEY WORDS

mechanical
containment
boom
skimmer
chemical methods
dispersants

bioremediation
absorbent
petroleum
direct and indirect
effects
producers

consumers
decomposers
migration
spawning
breeding

FOCUS QUESTIONS

1. What type of equipment works best to trap the oil?
2. What type of equipment works best to soak up the oil?
3. How does the local environment affect the kinds of equipment needed to respond to an oil spill?
4. What are some direct effects of oil on animals?
5. What are some indirect effects of oil on animals?
6. How does the timing of an oil spill affect animals?

LEARNING OBJECTIVES

The student will:

- define equipment used for oil spill responses.
- explain how technology is used in real-world environmental applications, such as ocean exploration and clean-up.
- demonstrate how hard it is to clean-up an oil spill.

MATERIALS

Student lab books with worksheets

- Lab and activity worksheets

Alaska Oil Spill Game

- Newsprint
- Crayons
- Colored magic markers
- Tempera paint (include the color black)
- Globe
- State map of Alaska
- Paper
- Pencils
- 100-150 plastic balls or other small objects
- Red and blue ribbon or flagging
- tape

Oil Spill Cleanup Activity

- Water
- Stopwatch/Timer
- Shallow long pans (1 per group)
- Blue food dye
- Vegetable/mineral oil
- Cocoa powder
- Oil Spill Equipment Price Sheet
- Materials to represent plants/animals/coast (feathers, fur, hair, seaweed, wood, rocks)
- Materials to trap oil (medicine dropper, rollers, nylon, thick rope)
- Materials to soak up oil (cotton balls, oil absorbent pads, straw, paper towels, sponge)
- Tools to move oil (popsicle sticks, straws)
- Materials to clean oil (different kinds of dish detergent)
- Metal disposal container for oiled materials (1 per group)

AUDIO-VISUAL MATERIALS

- Computer, projector/monitor, flash drive, screen
- Slideshow: “Oil Spill Response Equipment”

LEARNING PROCEDURE

See “Lesson 5 Activity Instructions” for details.

- A. Show slideshow “Oil Spill Response Equipment” as students answer focus questions **(45 minutes)**
- B. Begin Alaska Oil Spill Game, to be completed in 3 periods **(40 minutes)**
- C. Oil Spill Cleanup Activity **(60 minutes)**
- D. Wrap-up Questions **(5 minutes)**

STANDARDS

Alaska State Standards:

- SA** The student will demonstrate an understanding of the processes and applications of scientific inquiry.
- (5) SA1.1** asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring and communicating.
 - (5) SA1.2** using quantitative and qualitative observations to create their own inferences and predictions.
- SA1** The student will develop an understanding of the processes of science used to investigate problems, design and conduct repeatable scientific investigations, and defend arguments.
- SA2** The student will develop an understanding that the processes of science require integrity, logical reasoning, skepticism, openness, communication, and peer review.
- (5) SA2.1** supporting their statements with facts from a variety of resources and by identifying their sources.
- SA3** The student will develop an understanding that culture, local knowledge, history, and interactions with the environment contribute to the development of scientific knowledge, and local applications provide opportunity for understanding scientific concepts and global issues.
- (5) SA3.1** identifying the limiting factors (e.g., weather, human influence, species interactions) that determine which plants and/or animals survives.

National Science Education Standards

Content Standard A: Scientific Inquiry

All students will develop abilities necessary to do scientific inquiry.

Identify questions that can be answered through scientific investigations.

Design and conduct a scientific investigation.

Use appropriate tools and techniques to gather, analyze and interpret data.

Develop descriptions, explanations, predictions and models using evidence.

Think critically and logically to make the relationships between evidence and explanations.

Communicate scientific procedures and explanations.

All students will gain an understanding about scientific inquiry.

Different kinds of questions suggest different kinds of scientific investigations.

Technology used to gather data enhances accuracy and allows scientists to analyze and quantify results of investigations.

Scientific explanations emphasize evidence, have logically consistent arguments and use scientific principles, models and theories.

Content Standard B: Physical Science

All students will develop an understanding of properties and changes of properties in matter.

A substance has characteristic properties, such as density, a boiling point, and solubility, all of which are independent of the amount of the sample. A mixture of substances often can be separated into the original substances using one or more of the characteristic properties.

Substances react chemically in characteristic ways with other substances to form new substances (compounds) with different characteristic properties. In chemical reactions, the total mass is conserved. Substances often are placed in categories or groups if they react in similar ways; metals are an example of such a group.

Content Standard E: Science and Technology

All students will develop understandings about science and technology.

Technological designs have constraints. Some constraints are unavoidable, for example, properties of materials or effects of weather and friction; other constraints limit choices in the design, for example, environmental protection, human safety and aesthetics.

Technological solutions have intended benefits and unintended consequences. Some consequences can be predicted and others cannot.

Content Standard G: History and Nature of Science

All students will develop an understanding of the history of science.

Many individuals have contributed to the traditions of science. Studying some of these individuals provides further understanding of scientific inquiry, science as a human endeavor, the nature of science, and the relationships between science and society.

Ocean Literacy Standards

6. The ocean and humans are inextricably interconnected.
 - e. 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 (point source, non-point source and noise pollution) and physical modifications (changes to beaches, shores and rivers). In addition, humans have removed most of the large vertebrates from the ocean.
 - g. Everyone is responsible for caring for the ocean. The ocean sustains life on Earth and humans must live in ways that sustain the ocean. Individuals and collective actions are needed to effectively manage ocean resources for all.
7. The ocean is largely unexplored.

- b. Understanding the ocean is more than a matter of curiosity. Exploration, inquiry and study are required to better understand ocean systems and processes.
- c. Over the last 40 years, use of ocean resources has increased significantly, therefore the future sustainability of ocean resources depends on our understanding of those resources and their potential and limitations.
- d. New technologies, sensors and tools are expanding our ability to explore the ocean. Ocean scientists are relying more and more on satellites, drifters, buoys, subsea observatories and unmanned submersibles.

RESOURCES

Oil Spill Response Equipment Power Point Presentation –
W. Scott Pegau, Ph.D. www.pws-osri.org

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FEEDBACK

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Acknowledgements

This lesson was developed and written for the PWSSC Discovery Room Program with funding from the Oil Spill Recovery Institute.