Module 10: Environmental Oceanography
Topic 1 Application: Oil Spill Clean-Up Scientific Investigation Report

Before you begin the scientific investigation below, make sure to download the Oil Spill Clean-Up Scientific Investigation Report. As you complete this scientific investigation, fill in any needed information on the report template. If you need more information about each section of the report, please visit the Developmental Module.

Introduction

An oil spill occurs when oil is released into the ocean by tankers, drilling equipment, natural oil seeps, or other sources. In marine environments, oil spills can take weeks, months, or years to clean up, depending on the severity of the spill, the temperature of the water, and the location of the spill. Government response teams, private industry, and scientists have devised many ways to control the spread of oil and to clean it up after an oil spill occurs. Some of these methods include:

- Booms: a floating barrier set up to contain an oil spill. Booms form a loop to enclose the oil and prevent it from spreading.
- Skimmers: a machine that collects oil from the surface of the water. Skimmers separate the hazardous material from the non-hazardous material.
- Sorbents: a material used to absorb spilled oil.
- Chemical Agents: chemical detergents used to help break down spilled oil.

In this scientific investigation, you will create your own oil spill and then use a variety of methods and materials to clean up and/or contain the spilled oil.

Objectives

In this scientific investigation, you will:

- review the various equipment used in oil spill response, including booms, skimmers, sorbents, and chemical agents.
- evaluate the effectiveness and cost of different oil spill methods.
- analyze the impact of oils spills on the marine environment.

Hypothesis

Using the Procedure and Data Collection section, read through the procedural information for this scientific investigation. Based on your understanding of the procedure, develop your own hypotheses which describe your expected results. Record these hypotheses in the Hypothesis section of your Oil Spill Clean-Up Scientific Investigation Report.

Equipment and Materials

- One 9" x 13" baking pan
- Water
- Blue food coloring
- 50 mL of liquid dish detergent
- 200 mL vegetable oil

- Five cotton balls
- Three bendable drinking straws connected to form a loop
- Medicine dropper
- Five small rocks
- Moss or peat
- Three small feathers

Procedure and Data Collection

1. Prepare your marine environment by filling the pan two-thirds full of water. Add five drops of blue food coloring and place the rocks, moss or peat, and feathers around the pan to simulate where rocks, plants, and animals would be found in a real-world marine environment. You may want to arrange these items so that some of them are above the water line, while others are below the water line.
2. Add 200 mL vegetable oil to the water and allow the oil to disperse for two minutes. In the Data section of your Oil Spill Clean-Up Scientific Investigation Report, record the impact of the oil "spill" on the rocks, plants, and animals located in your pan in the Notes area.
3. The goal of this scientific investigation is to clean up the oil "spill" within a time limit of fifteen minutes. Each of the items listed in the data table below can be used in your clean up efforts; however, there is a cost to use each item.
4. Begin a timer and try to use the straws, medicine dropper, cotton balls, and detergent to clean up the oil in the pan. You may want to try using the items in conjunction with one another or in different orders to help. As you complete your scientific investigation, record the time that you used each method and the number of items that you used in the Data section your Oil Spill Clean-Up Scientific Investigation Report. Also, record any qualitative information about the difficulty of each clean-up method in the Notes area.
5. Once the fifteen minutes has expired, calculate the total cost of each clean-up method by multiplying the number of minutes that you used each method by that method's cost per minute.

Data

Use the table provided on your Oil Spill Clean-Up Scientific Investigation Report to record your data from this scientific investigation. The data table is also shown here:

Method	Time (Minutes)	Cost/Minute	Total Cost (Minutes x Cost/Minute)
Booms (Straws)		$25.00	
Skimmers (Medicine Dropper)		$75.00	
Sorbents (Cotton Balls)		$50.00	
Chemical Agent (Detergent)		$25.00	

Data Analysis

In the Data Analysis section of your Oil Spill Clean-Up Scientific Investigation Report, provide responses to the following questions:

1. What was the effect of the oil spill on the rocks, plants, and feathers placed around the pan?
2. Which method allowed you to clean up the oil in the least amount of time?
3. What were some of the challenges that you faced when cleaning up the oil? Do you think that there would be additional challenges in a real-world environment? What types of challenges?
4. How do you think that your results would have varied if you had used a different type of pan or another type of oil?
5. Why would the element of time be important to this scientific investigation and in a real-world marine environment?

Conclusion

Using the Conclusion section of your Oil Spill Clean-Up Scientific Investigation Report, compose three to four sentences describing an overall conclusion based on your data. Were your hypotheses true or false, and how do you know? Use the data and notes that you collected from your investigation to form your conclusion. Make sure that you include information that you gained from data analysis to support your conclusion.

Experimental Sources of Error

On your Oil Spill Clean-Up Scientific Investigation Report, provide responses to the following questions: Are there any sources of error? If so, what are they, and what could be done to minimize error?

Once you have completed the Oil Spill Clean-Up Scientific Investigation Report, please submit your work to the dropbox.