

Operation Oil Spill Cleanup

Offshore oil drilling and the use of supertankers for transporting oil pose the risk of oil spills. Oil spills can damage commercial and recreational fishing areas, spoil beaches, kill marine birds, mammals, and other aquatic life, and destroy shellfish communities. A mere 3.8 L of oil can contaminate as many as 20 million liters of water!

Suppose you are a scientist or an engineer for Eco-Marine, Inc., an environmental remediation firm that specializes in resolving ocean pollution problems. Your supervisor has just distributed the memo below that describes your latest assignment.

Memo

To: All Eco-Marine Staff
From: Marina Waters, Lead Scientist
Re: Oil-Spill Cleanup Proposal

I would like to inform you that Del Mar Oil Company is accepting proposals for a cleanup plan that could be implemented in the event of an oil spill from one of the many supertankers that sail the seas. There are several top-notch companies competing for this contract, but I am confident that we at Eco-Marine, Inc. can develop the best plan for oil spill cleanups that is fast and effective yet has a minimum impact on the affected marine ecosystems.

I would like each team in my department to develop its own plan. The first part of your plan should test the various cleanup materials currently available. Phase two of your plan should involve using the materials to clean up on a small-scale oil spill along a model beachfront. Once all the plans have been tested, we will decide which to submit to Del Mar Oil Company.

Marina Waters, Lead Scientist

OBJECTIVES

Select various materials and use them to determine their effectiveness at cleaning up a model oil spill.

Design an experiment to clean up a model oil spill.

Test the plan and **evaluate** the results.

MATERIALS

- beaker (250 mL)
- cake pan, large rectangular
- clock or watch
- containers or bowls, small (2)
- cooking oil (100 mL)
- feathers
- gravel or sand
- measuring spoon
- pipe cleaners
- water

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- Potential cleanup materials: spoons, craft sticks, toothpicks, dip nets, drinking straws, plastic wrap, aluminum foil, pieces of plastic foam, string, pieces of brown paper bag, cotton balls, pieces of nylon stocking, pieces of sponge, paper towels, coffee filters, cloth, wood shavings, sawdust, liquid detergent, cat litter, baking soda, flour, vinegar

**Procedure****PART I—TESTING CLEANUP MATERIALS**

1. Work with a team of students as assigned by your teacher. Choose 8 items from the potential cleanup materials list which your group will use to clean up a model oil spill.
2. Use the measuring spoon to pour a spoonful of oil onto the surface of some water in one of the shallow containers or bowls. This represents an oil spill in the open ocean.
3. Pour a small amount of oil onto rocks, sand or gravel, pipe cleaners, and feathers in another container to test cleanup of a shoreline and wildlife. Note that the pipe cleaners represent sea mammals, and the feathers represent birds.
4. Test your cleanup materials to determine their effectiveness in the following categories: containing the oil spill, cleaning up the water and recovering spilled oil, and cleaning up the shore and affected wildlife. Also evaluate the potential environmental impacts of using a large quantity of each of your cleanup materials in the ocean.
5. Rate each material as *poor*, *average*, *good*, or *excellent*. Record your observations from step 4 in the table below.

Evaluation/Effectiveness of Cleanup Materials

Material	Containment	Water Cleanup Oil Recovery	Shore Cleanup	Wildlife Cleanup	Environmental Impact

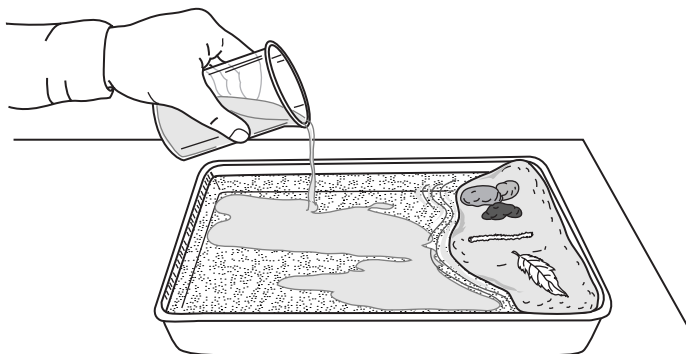
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PART II—DEVISING A PLAN

6. Work with the other members of your group to devise a plan for cleaning up an oil spill based on the results of the materials you tested. Note that your plan must specify which materials and techniques you will use for containing the spill, cleaning up the water and recovering the oil, cleaning up the shoreline, cleaning up the affected wildlife, and minimizing the impact on ocean ecosystems. Write your complete plan below. Use another sheet of paper if needed.

PART III—TESTING THE PLAN ON A MODEL BEACHFRONT

7. Build a model ocean shore in the cake pan. Create a beach using sand or gravel and a few rocks at one end of the pan as shown in the Figure below. Place a feather and a pipe cleaner on the beach as shown. Slowly add water to your model.



8. Use the small beaker to pour 50 mL of cooking oil into your model ocean. Gently blow the oil toward the shore.
9. Work together with the others in your team to implement your cleanup plan. Your goal should be to work as quickly and effectively as possible. For each cleanup task (oil containment, oil recovery, shore cleanup, and wildlife cleanup), have one member of your group record below the time it takes to complete the task and how well the task was completed.

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Analysis

- 1. Describing Events** Which containment method worked best? Which was least effective?

- 2. Analyzing Results** Which of the major cleanup tasks was the most difficult to carry out? Explain.

- 3. Analyzing Results** How much of the original spill was your group able to recover?

- 4. Describing Events** What happened when the oil reached your model beach? How effective was the cleanup of the sand or gravel and the objects representing wildlife?

Conclusions

- 5. Drawing Conclusions** How might the weather affect attempts to contain an actual oil spill?

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6. Applying Conclusions What factors make an actual oil spill different from your simulation?

7. Applying Conclusions What impacts might cleanup methods have on marine plant and animal life in an actual oil spill?

8. Evaluating Methods After each group has presented its results to the class, vote to determine which plan Eco-Marine, Inc. should submit to Del Mar Oil Company. Explain your choice.
