

# SCIENCE AT HOME

# ECOSYSTEMS AND OIL SPILLS

GRADE: **11**

**SVN3M, SVN3E**

**SUBJECT:** Environmental Science

**STRAND:** Scientific Solutions to Contemporary Environmental Challenges, Human Impact on the Environment

**TOPIC:** Cleaning up an oil spill

**EXPECTATIONS:** SVN3M: A1.3, A1.5, A1.6, A1.7, A1.9, A2.1, B1.1, B2.1, B2.2, B2.5

SVN3E: A1.5, A1.6, A1.7, A1.8, A1.2, B1.1, B3.5, E1.1, E1.2

**VIDEO:** [youtu.be/nAEReCp3u04](https://youtu.be/nAEReCp3u04)

## INTRODUCTION:

It's hard to overstate the value of the ocean. The ocean makes up almost 97% of our "hydrosphere" — the planet's water component — and provides numerous environmental services. It is central to the water cycle of the planet and influences its climate. The ocean is the habitat for mammals, fish, crustaceans, and reptiles and provides billions of people with their primary source of protein. It also provides livelihoods: the ocean contributes more than \$31 billion to Canada's gross domestic product (GDP), a measure of economic output. And beyond this, the ocean provides aesthetic, cultural and spiritual benefits that are hard to measure in dollars.

With the industrial revolution came a "paradigm shift" — from a focus on subsistence agriculture, where farmers grow enough for their own communities, to a focus on industrial growth and development. We have become careless with the ocean, and our dependence on oil, in particular, has had a huge environmental cost. Spills during drilling and transportation have been devastating.

We need to find ways to reduce our oil consumption. In the meantime, we have to do everything we can to prevent a spill, and if we fail, to know how to clean it up. Using a simulated oil spill, your task is to figure out which techniques work best.



## ACTIVITY: Save this ecosystem

There has been an oil spill off the east coast of Canada. A tanker has spilled much of its contents into the Atlantic Ocean. You have been hired to come up with ways to clean up the oil and do basic testing to determine which method works best.

**TIME:** 20 minutes

## SAFETY:

Ask the adults in your home if it's okay to use these materials.

Don't set anything on fire.

Cooking oil is considered household hazardous waste and shouldn't go down the drain. Put the extracted cooking oil into your compost bin or follow your local regulations.



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## WHAT YOU NEED:

- Shallow container like a dishpan or baking dish (large enough to hold at least 1L)
- Measuring cups
- Measuring spoons
- Water (enough to fill your container at least 5 cm deep)
- Cooking oil (roughly 100 mL)
- Kitchen scale (optional)
- Cotton balls, cardboard, paper towels, sponges, soap, aluminum foil, or anything else you think might help clean up an oil spill
- Cup to hold the oil that has been recovered

## WHAT YOU DO:

- Fill your container with at least 5 cm of water.
- Create an oil slick by carefully adding 100 mL of oil to the centre of the container.
- Observe how the oil and water interact.
- Use some of your materials to absorb or skim oil from the water.
- Measure how much oil you remove, either by volume or by weight. (If you are using a scale, you can weigh materials like cotton balls before and after using them.)
- Repeat the experiment using different materials to recover the oil.
- Use the chart to record your results. Fill in the blank rows with your own ideas.

Material or method used	Amount of oil extracted (ml or g)
Cotton balls	
Cardboard	
Paper towels	
Sponges	
Soap	
Aluminum foil	

- Which method removed the greatest amount of oil?
- Which method was easiest?
- Can you improve your success by combining two methods? Test your idea and add your observations to the chart.



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## WHAT YOU DO: (continued)

- How could you adapt your method for stormy weather with lots of waves? Test your idea and add your observations to the chart.
- You were hired to provide potential solutions to an oil spill. What combination of methods would you recommend? What data would you use to support your recommendation?

## WHY THIS MATTERS:

The ocean is one of our greatest natural resources, not just for what's in it, but for what it does for our environment. The ocean holds onto carbon that would otherwise be in our atmosphere. It helps to break down pollutants over time. It provides a habitat for innumerable species that live both in it and on its shores. All of this is affected by an oil spill.

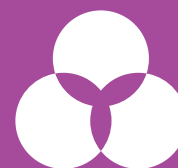
The effects of an oil spill can be long lasting and deep. Half a century after a large spill in Buzzards Bay, Massachusetts, for instance, researchers still see erratic behaviour in local fiddler crabs. Other species have had trouble reproducing. The food chain was disrupted. Contact with the oil caused increased erosion of the shoreline. Whenever key species are directly contaminated by oil, or lose their habitats because of it, the entire ecosystem suffers.

There are many different methods for cleaning up oil spills, but not all of them are safe. The dispersant used to clean up the Deepwater Horizon spill in 2010, for instance, coated and killed off corals, leading to habitat destruction. As well, about 50,000 people involved in the cleanup suffered severe lung damage from the chemicals used. That's why we need you to keep thinking and experimenting: the more methods we can come up with, the better we can clean up oil spills.

## TAKING IT FURTHER:

It's one thing to contain an oil spill while it's in the water, but another altogether once it reaches wildlife. Dip some pipe cleaners or feathers in your oil slick and see how much of the oil you can remove from them in 10 minutes. Use a measuring cup to quantify how much oil you can get out. Use the materials you have available and whatever strategies you can think of.

You can also repeat the experiment by mixing the oil slick into the water as much as possible. This simulates the effects of ocean currents. Is the oil as easy to remove now? Are the methods you used earlier still as effective?



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## MORE ONLINE:

Gulf Oil Spill

<https://ocean.si.edu/conservation/pollution/gulf-oil-spill>

Oil Spill Clean-up Experiment

[https://www.youtube.com/watch?v=wt7O4xi0\\_wM](https://www.youtube.com/watch?v=wt7O4xi0_wM)

How Canada responds to Ship-Source Oil Spills

<https://www.tc.gc.ca/eng/marinesafety/how-canada-responds-ship-source-oil-spills.html>



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