SCIENCE AT HOME

ECOSYSTEMS AND OIL SPILLS

GRADE: **9**

SNC1D, SNC1P
SUBJECT: SCIENCE
STRAND: BIOLOGY
TOPIC: EFFECT OF OIL SPILLS ON ECOSYSTEMS
EXPECTATIONS: SNC1D: A1.1, A1.5, B2.1, B3.1, B3.2, B3.5
SNC1P: A1.1, A1.5, B2.1, B2.2, B3.2, B3.5
VIDEO: youtu.be/ONvs76uwVXs

INTRODUCTION:

An ecosystem includes all the "biotic" (living) and "abiotic" (non-living) factors in an environment. In an aquatic ecosystem, biotic factors might include things like mammals, birds, plants and bacteria. Abiotic factors might include water, sunlight, soil or even temperature.

When there's an oil spill in an aquatic environment, the cleanup is challenging. You are going to create your own simulated oil spill and test out different methods for removing and containing the oil. You'll also be asked to think about how oil can be cleaned from the biotic and abiotic parts of aquatic ecosystems.

ACTIVITY: Aquatic Oil Spill Cleanup

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.

WHAT YOU NEED:

- Shallow container like a dishpan, baking dish or sink (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 the large 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.

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WHAT YOU DO (continued):

- 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 below to record your results. Fill in the blank rows with other materials and methods you'd like to test.

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

WHAT YOU DO (continued):

- 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.
- How could you adapt your method for stormy weather with lots of waves? Test your idea and add your observations to the chart.

WHY THIS MATTERS:

Our society is heavily dependent on oil. Not only do we use it to power most of our cars, but oil and oil byproducts are found in everyday products like lipstick, tennis rackets and smartphones. Since we routinely transport oil by tanker and even extract it from below the ocean floor, there is an ever present risk of oil spills in aquatic ecosystems.

Both the oil itself, and the methods used to clean it up, can have far-reaching negative effects on local ecosystems. Take the example of what happens when sea otters find themselves in an oil spill. They spend a lot of time at the water's surface, so they are likely to get coated in oil. Often they end up ingesting it as well. Both disrupt a sea otter's ability to regulate its temperature, which can lead to hypothermia and death.

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WHY THIS MATTERS (continued):

In the kelp forests off the coast of British Columbia, sea otters are a "keystone" species — they have a huge effect on the ecosystem, even though their population may be small in number. That's because sea otters eat sea urchins, and sea urchins feed on underwater kelp forests. With fewer sea otters, the population of sea urchins explodes, and they ravage the kelp forests. This in turn affects all the other species that depend on the kelp forests for survival.

All you might see is sick sea otters, but the effects ripple throughout the ecosystem — all the way down to the plants at the very bottom of the food web, taking the entire ecosystem out of equilibrium, and causing its collapse.

In the long run, we should find ways to reduce our oil consumption. In the meantime, however, our dependence on oil means that we have to do everything we can to prevent a spill, and if we fail, to know how to clean it up.

TAKING IT FURTHER:

Oil has a devastating effect on aquatic ecosystems. You have had practice removing oil from the water, but what else can you do to protect the ecosystem?

Fill your dish pan with water again, and this time add some items that represent the shore line — rocks, blocks or anything you can think of. Then add some floating items to represent wildlife — cut-up pipe cleaners, feathers, or something else that floats. Add the oil again, and this time, see what you can

TAKING IT FURTHER (continued):

do to contain the oil before it reaches the shoreline or the wildlife. If you can't contain the oil, find a way to clean these biotic and abiotic factors and make your ecosystem healthy again.

MORE ONLINE:

How Canada responds to ship-source oil spills:
https://www.tc.gc.ca/eng/marinesafety/how-canada-responds-ship-source-oil-spills.html

7 Surprising Uses of Oil:
https://www.livescience.com/24752-surprising-oil-uses.html

Learn about biotic factors in Canada's Atlantic waters:
https://www.dfo-mpo.gc.ca/oceans/publications/soto-rceo/2018/atlantic-ecosystems-ecosystemes-atlantiques/index-eng.html

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