



**Classroom Activity | Grades K–2**

# Designing Possible Solutions: Oil Spill Cleanup

## GUIDING QUESTIONS

- Why are oil spills dangerous to the natural environment?
- How are oil spills effectively cleaned up?

## LEARNING OBJECTIVES

Students will be able to:

- explain how oil spills affect the natural environment.
- share ways to reduce the use of oils that are harmful to the environment.
- sort or categorize scenarios as prevention or cleanup methods.
- use models that test the effectiveness of cleanup methods.

## OVERVIEW

On day one, students are introduced to the negative effects of oil spills on land, water, and living things. In groups, students identify and discuss ways to prevent or minimize the negative impact of oil on the natural environment. In preparation for the next session, they explore different ways to remove oil from water.

On day two, students conduct an investigation to determine the most effective way (skimming or soaking) to remove oil from water. Students use evidence to show which removal process is the most effective.

## NEXT GENERATION SCIENCE STANDARDS

- LS4.D: Biodiversity and Humans
  - 2-LS4-1: There are many different kinds of living things in any area, and they exist in different places on land and in water.
- ESS3.C: Human Impacts on Earth Systems
  - K-ESS3-3: Things that people do to live comfortably can affect the world around



them. But they can make choices that reduce their impacts on the land, water, air, and other living things.

- ETS1.A: Defining and Delimiting an Engineering Problem
  - K-2-ETS1-1: A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions. (secondary to KPS2-2)
  - K-2-ETS1-1: Asking questions, making observations, and gathering information are helpful in thinking about problems. (secondary to K-ESS3-2)
  - K-2-ETS1-1: Before beginning to design a solution, it is important to clearly understand the problem. (secondary to K-2-ETS1-1)
- ETS1.C: Optimizing the Design Solution
  - Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (secondary to 2-ESS2-1)

## LESSON TIME FRAME

Two 45-minute lessons

## BACKGROUND INFORMATION

Oil spills cause harm to the natural environment. There are many different types of oil that differ in viscosity (oil's resistance to flow), volatility (how quickly the oil evaporates), and toxicity (how poisonous it is). When there is a spill, responders must consider the type of oil, amount spilled, the location and where the oil will go, the weather conditions and the breeding cycle/migration patterns of local wildlife. Marine mammals, birds, and other wildlife can suffer or die from the effects of an oil spill. The way oil can affect marine mammals, birds, and other wildlife usually depends on the type of oil. "Light" oils, like gasoline, are volatile and evaporate quickly. They are also very toxic and can kill the animals and plants it touches. Other animals can be affected by eating animals that have absorbed oil into their tissues. "Heavy" oils, like bunker oils that fuel ships, can be very sticky and remain in the environment for a long time if they are not cleaned up. These oils are less toxic but can smother wildlife, cause health problems, and stick to the feathers of birds and fur of sea otters, causing them to lose the ability to keep warm, decreasing mobility that may prevent the escape from predators, and dehydration. It is important to prevent and efficiently clean up oil spills to minimize harm to living things and the natural environment.

## MATERIALS

### Teacher Materials/Prep

- 1 copy of *Oil Spill* by Melvin Berger
- 1 set of oil spill scenario cards



- Station Set Up for Oil Spill Exploration Day 1: fill clear plastic cups with equal amounts of water and oil (50 mL of water and 50 mL of oil). Practice qualitatively measuring the oil remaining after completing the three trials of each cleanup method using words like more or less to compare.
  - 2 clear plastic cups with oil and water
  - 1 empty clear, plastic cup to become our oil collection reservoir (trash)
  - 3 strips of absorbent paper towel
  - 3 cotton balls
  - paper towels for cleanup
- Station Set Up for Oil Spill Cleanup Investigation Day 2
  - 3 clear plastic cups with equal amounts of oil and water
  - 1 empty clear, plastic cup to become our oil collection reservoir (trash)
  - 3 strips of absorbent paper towel
  - 3 cotton balls
  - extra items the class has brainstormed to skim or soak oil (1 spoon, 3 sticks, 3 feathers, 3 pieces of a sponge, etc.)
  - paper towels for cleanup
- Timer
- Print/cut Stoplight Exit tickets for students (1 per student)
- Print Student Capture Sheet: Which Cleanup Method Works the Best?
- Print Home Connection Resource: Oil Spill Cleanup

## Student Materials

- “Which One is the Best?” student resource (define best = removes the most oil)
- “Prepare to Persuade” student resource
- safety goggles
- smock or apron

## Materials per Student Group

- 5 clear, plastic cups
- Corn oil
- Water
- 6 strips cut from absorbent paper towels
- 6 cotton balls
- A few other tools to skim or soak oil (cotton ball, plastic spoon, sponge cut into small pieces, string, feathers, popsicle stick etc.)



- 1 roll of paper towels for cleanup
- 1 cafeteria/lab tray to contain cups and possible spills (optional)
- Student Resource: Oil Spill Scenario Card Set

## CLASSROOM ACTIVITY

### Day 1

1. Set up oil spill exploration stations. (read above, teacher prep)
2. Read *Oil Spill* by Melvin Berger or a similar book. Ask students questions to check for understanding. How did the oil spill occur? What are some ways the oil spill harmed the living things and the environment? How did the oil spill responders try to clean up or contain the oil? Discuss how preventing oil spills and efficiently responding to oil spills by cleaning them up can help reduce the impact of oil on the natural environment.
3. **Grade 2:** Allow students to work in groups of 4.  
**Grades K–1:** Group students OR gather the class on the carpet or around the oil spill scenario card set.
4. **Grade 2:** Distribute scenario card sets to each group. Model reading two scenarios aloud with the class. After reading a scenario, pause and have students discuss if prevention or cleanup efforts are needed and how they would minimize the impact of oil on the natural environment with their group. Allow students to share and justify their thinking. Sort the cards into two groups: prevention and cleanup. Circulate and ask questions to guide students to reflect on their thinking. Review selections with the class and allow groups to share their thoughts.  
**Grades K–1:** Read scenarios aloud. Work together as a class to categorize the scenarios as prevention or cleanup. As students categorize the scenarios with you, have them explain what humans might do to prevent or minimize the impact of oil in each scenario. Prepare for the lab by creating student groups of three or four.
5. Model the methods of skimming, a scooping method to remove oil, and soaking, allowing for absorption, to remove oil from water.
6. Provide each group with two plastic cups containing a mixture of water and oil, 3 cut strips of an absorbent paper towel, and 3 cotton balls. Allow students to practice/ explore the two removal methods (skimming with the paper towel and soaking with the cotton ball).
7. Ask the young scientists to brainstorm other ways oil could be removed from water. What tools can you think of that could help remove the oil? Students may suggest other skimming or soaking materials like a spoon, small cup, cotton ball, feather, towel, or sponge. Collect a few of these items to allow students to test out one extra tool during the investigation on day 2. Celebrate with students. Tell them they are now ready to test the oil cleanup methods to determine which one works the best (removes the most oil).



## Day 2

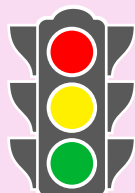
1. Set up oil spill cleanup investigation stations.
2. Put students in their groups.
3. Allow students to select one extra tool available to help remove oil from water. Have them discuss if this is a tool that skims or soaks.
4. Present the problem: Your job is to help determine the best way to remove oil from water. (Best = removes the most oil from the water)
5. Explain to students that it is important for them to keep the method consistent for all three timed trials to get accurate results.
6. Direct students to put on their safety goggles.
7. Tell students that they will test each cleanup method using a separate tank, skimming, soaking, and the team choice.
8. Tell students they will first test the method of skimming in the first tank.
9. Have students point to the first tank. Direct students to use a strip of paper towel to test the skimming (scooping) method for fifteen seconds.
10. Start the timer and stop students after fifteen seconds. Have students discard used strips in the oil collection reservoir, empty tank.
11. Instruct students to record and share some of their observations. Repeat two more times.
12. Move on to the second tank and repeat the process testing the soaking method. Then move onto the third tank to repeat the process to test the team choice method.
13. Ask students questions to prompt them to compare the effectiveness of methods such as, “Do you notice that one method is working better than another? How do you know?” or “Was more oil removed with the skimming or soaking method?” or “Are the cotton balls absorbing the oil? Explain your reasoning.”
14. Allow students to share their findings. Use the following class discussion questions to close up the lesson:
  - How do oil spills impact the natural environment?
  - Why is it important to try to prevent oil spills?
  - Why is it important to efficiently clean up oil spills?

## REFLECTION

Distribute one Stoplight Exit Ticket to each student. Students will complete the Stoplight Exit Ticket to show their understanding of the lesson. On their Stoplight Exit Ticket handout, students will color in the section of the stoplight that explains their understanding of the lesson.



Refer back to the Guiding Question for the lesson: Why are oil spills dangerous to the natural environment? Tell the students they should keep this question in mind while filling out their exit ticket.



### Stoplight Exit Ticket

- **Red:** I do not understand today's lesson.
- **Yellow:** I almost understand today's lesson.
- **Green:** I get it! I understand today's lesson.

## HOME CONNECTION

Send home the Home Connection Resource: Oil Spill Cleanup. This will help reinforce and apply the young scientist's understanding of the concepts addressed in this lesson.

- Ask the young scientist to explain why it is so important to focus on the prevention of oil spills. Hint: Even with efficient cleanup methods it is impossible to remove all of the spilled oil.
- Discuss how the family can decrease oil usage to help reduce the risk of oil spills.
  - Use less electricity (often generated by oil)
  - Use less gasoline (made from oil)
  - Read about and discuss a specific oil spill.

## LINKS TO ADDITIONAL RESOURCES:

- Oil Spill Recovery Institute [www.pws-osri.org](http://www.pws-osri.org)
- NOAA National Ocean Service Office of Response and Restoration <http://response.restoration.noaa.gov>
- California Coastal Commission Oil Spill Education <http://www.coastal.ca.gov/publiced/oilspills.html>
- Gulf of Maine Research Institute—Save the Bay <http://www.gma.org/surfing/human/savethebay.html>
- How does oil impact marine life? National Ocean Service <https://oceanservice.noaa.gov/facts/oilimpacts.html>
- NOAA Education Resources—Gulf Oil Spill [http://www.education.noaa.gov/Ocean\\_and\\_Coasts/Oil\\_Spill.html](http://www.education.noaa.gov/Ocean_and_Coasts/Oil_Spill.html)

- eGFI—Oil Spill Solutions  
<http://teachers.egfi-k12.org/lesson-plan-oil-spill-solutions>
- Minnesota Science Teachers Education Project—Exploring Effects of Oil Spills on Birds  
<http://serc.carleton.edu/sp/mnstep/activities/26016.html>
- 3M Sorbents Materials  
[https://www.3m.co.uk/3M/en\\_GB/company-uk/search/?Ntt=sorbents](https://www.3m.co.uk/3M/en_GB/company-uk/search/?Ntt=sorbents)



1. Oil slick needs to be absorbed.



2. A docked boat is leaking oil. A boundary needs to be established to contain the oil.



3. Protecting the garage floor and natural environment while changing the oil in a car.



4. Cleanup crews have discovered oil in the crevices between rocks on the shoreline.



5. An oil tanker truck crashes. Oil spreads down the street towards the storm drain.



Key: Prevention or Cleanup?

- 1. Cleanup
- 2. Prevention
- 3. Prevention
- 1. Cleanup
- 1. Cleanup



**Which Cleanup Method Worked the Best?**

Think back to when you explored skimming and soaking cleanup methods. Predict which one you think will remove the most oil. Use pictures or words to record your prediction in the space below.

**Prediction**

**Skimming** (scooping, strip of paper towel)

15 seconds each	Trial 1	Trial 2	Trial 3
Estimate of how much oil remains in the water after each trial. Circle one.	Most	Most	Most
	Some	Some	Some
	None	None	None

**Soaking** (absorbing, cotton ball)

15 seconds each	Trial 1	Trial 2	Trial 3
Estimate of how much oil remains in the water after each trial. Circle one.	Most	Most	Most
	Some	Some	Some
	None	None	None

Skimming or Soaking \_\_\_\_\_ (team choice tool)

15 seconds each	Trial 1	Trial 2	Trial 3
Estimate of how much oil remains in the water after each trial. Circle one.	Most	Most	Most
	Some	Some	Some
	None	None	None

1. Based on your data, which method removed the most oil? Circle one.

Skimming                      Soaking

2. Review the class data. Which cleanup method worked the best for the class? Circle one.

Skimming                      Soaking

3. Which cleanup method do you recommend as the best? Circle one.

Skimming                      Soaking

Use pictures or words to record information that supports your choice:

# STOPLIGHT EXIT TICKET



Color in the stoplight to show your understanding of today's lesson.

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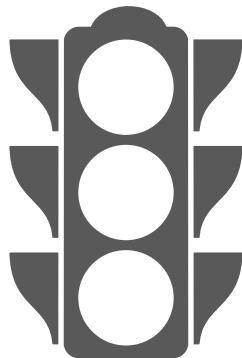
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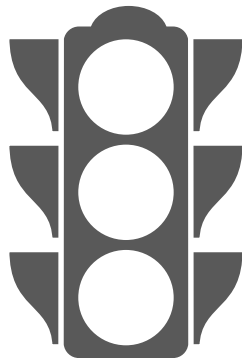
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# HOME CONNECTION RESOURCE: OIL SPILL CLEANUP

Dear Parent/Guardian,

Your young scientist has been learning about the impacts of oil spills on the natural environment. During this lesson, students learned about the importance of preventing and efficiently cleaning up oil spills to help protect living organisms and their habitats. They also explored different processes for removing oil from water.

Complete the following tasks together with your young scientist to help reinforce and apply their understanding of the science concepts addressed in this lesson:

- Ask your young scientist to explain why it is so important to focus on the prevention of oil spills. **Hint:** Even with efficient cleanup methods, it is impossible to remove all of the spilled oil.
- Discuss how your family can decrease oil usage to help reduce the risk of oil spills.
  - Use less electricity (often generated by oil).
  - Use less gasoline (made from oil).
  - Read about and discuss a specific oil spill.

For more family activities that support your student's learning: <https://www.youngscientistlab.com/parents/family-activities>.

We hope you continue learning together with us about the power of science.

See you in science class!

