

Oil Behavior and Beach Sediments

This activity was developed by NOAA for Earth Science Week 2026.

Introduction

When NOAA responds to an oil spill, the differences in how oil behaves on various sediments are important. Beaches are made up of sediments, which can range from fine-grained clay and mud, to coarse-grained sand or gravel. These differences affect our predictions of what the oil will do if it reaches the beach: Is it likely to remain on the beach surface? How much will it penetrate into the beach sediment? It's much harder to clean up oil that quickly sinks into the sediment than oil that stays on the beach surface. When we expect spilled oil to sink in quickly, we know that it must be cleaned up as quickly as possible.

In this experiment, you will use molasses to simulate a heavy oil, such as a fuel oil for ships, and mineral oil to simulate a lighter oil, such as a light crude or diesel oil to explore how lighter and heavier oils behave differently when spilled onto fine-grained, medium-grained, and coarse-grained sediment.

Materials

- 3 wide-mouth containers
- measuring cup
- coarse-grained sand or gravel
- medium- to fine-grained sand
- clay or mud
- molasses
- mineral oil

Instructions

Note: You can perform this experiment using either wet or dry sediment, or you can run it twice—once with wet sediment and once with dry—and then compare your results.

1. Fill each container about two-thirds full with one of the three sediment types.
2. In each container, create two slight but uniform depressions by pressing your finger or another small object in each container.
3. Measure equal volumes of molasses and mineral oil.
4. Choose one of the sediments. At the same time, pour the molasses into one of the depressions and mineral oil into the other.
5. Observe the immediate behavior of the liquids.

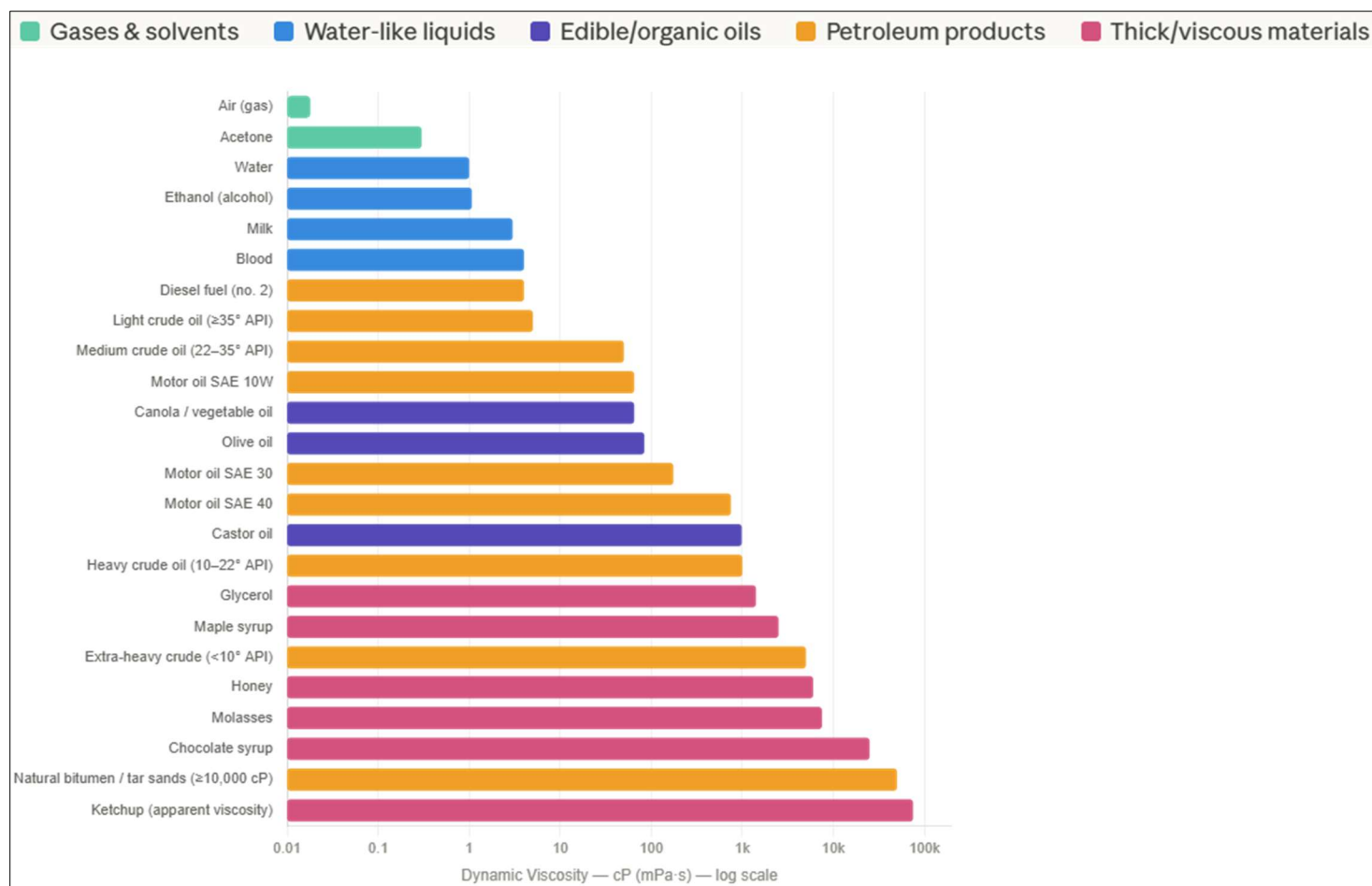


- Do they penetrate the sediment? How fast does this happen?
- What differences between the two liquids do you see?

6. Repeat these steps for the other two sediments, and then compare the results.

Analysis

1. In this activity, what minerals were your sediments made of?
 - a. How do you think the composition of your sediments impacted your results?
 - b. Try the experiment again with sediments of the same grain size but made of different materials.
2. How did the viscosity of the fluids affect their movement on or into the sediment?
 - a. Consider the viscosities of different fluids shown in the graph below. Which fluids do you think would move most easily through sediments? Which would move more slowly or not at all? Use evidence from your observations in the activity to support your thinking.



3. In what ways might oil behave differently on a sandy beach versus a muddy wetland, and why does that matter for cleanup efforts?

Extensions

Learn more about sand at <https://oceanservice.noaa.gov/facts/sand.html>.

Find more activities from NOAA's Office of Response and Restoration at <https://response.restoration.noaa.gov/resources/education>. Explore all of NOAA's educational resources at <https://www.noaa.gov/education>.

