



# 4-H Grab and Go: *Ocean in a Bottle*

**Concept:**

Recognize that what humans do on land can affect marine life.

**Age Level:**

Middle School: Grades 6-8

**Education Standard:**

NS.5-8.6 Personal and Social Perspectives: Populations, Resources & Environments

**SET Ability:**

Use Tools

**Life Skill:**

Concern for Others

**Success Indicator:**

Youth will be able to describe why some solutions do not mix.

**4-H Curriculum:**

Exploring Your Environment  
([www.4-H.org/curriculum/environment](http://www.4-H.org/curriculum/environment))

## PREPARATION

**Time:** 10 Minutes

**Space:** Classroom with access to water

**Materials:**

- 1 Recycled 16-20 oz water bottle/youth
- 5 Bottles of vegetable oil
- Water
- Pitcher
- 5 Bottles of blue food coloring
- 5 Funnels
- Dry-erase marker
- 5 Rulers (inches)
- Watch with secondhand

## Background Information:

Every droplet of water that is currently on the Earth has been here since before the dinosaurs. The ocean is a major player in the **water cycle** as it provides us with water on land in the form of rain. It is also the body of water into which many of our lakes, rivers, and tributaries feed. With 75% of the Earth's surface covered by water, the ocean is its largest aquatic **biome** (group of **ecosystems** within a region that have similar types of vegetation and climatic conditions).

Each of the areas in the **marine** (saltwater) **region** of the aquatic biome are at risk from global warming and pollution. The temperature of the ocean affects the level of algae that can grow in salt water. With an increase of algae, more carbon dioxide is produced which contributes to global warming. The **coral reefs** are home to a large number of colorful tropical fish and aquatic vegetation. Runoff of high nutrient levels from agricultural areas causes **algae bloom** which reduce the number of **phytoplankton** living in the waters here. When phytoplankton and **diatoms** die, there is a lack of food for whales and other marine life that feeds on single-celled organisms. The **inter-tidal zones**, where the saltwater of the ocean meets the freshwater of the tributaries, have also seen a decrease of life caused by man. For example, in the Chesapeake Bay, the blue crab population has decreased due to over-harvesting in conjunction with habitat loss due to a decrease in water quality.

## Instructions:

Have the youth bring in a recycled water bottle (clear plastic with cap) from home for this activity. Break the group into teams of 4-5 students. Instruct the youth to do the following:

1. Collect food coloring, a bottle of vegetable oil, a funnel, a ruler, and enough water to fill each bottle 1/3 of the way with water.
2. Return to their workstation and create their "ocean":
  - a. Measure the length of the water bottle from the shoulder (where it rounds up on top and moves down into the straight sides) to the bottom of the water bottle. Divide the length in inches by 3.
  - b. Using a funnel, fill the first 1/3 of the water bottle with water. Then, using the funnel, fill the remaining 2/3 with vegetable oil. Be careful not to get oil on the rim of the water bottle because if it gets on it, the cap will not seal properly.
  - c. Place 2-3 drops of blue food coloring into the water bottle.

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## Ocean in a Bottle (Continued)

### YOUTH DEVELOPMENT TIP

Allowing youth to work together in small groups facilitates learning and cooperation.

#### Checkpoint:

- What phenomenon allows us to keep water in the Earth's system? (*Water Cycle*)
- What shape was the drop of food coloring when it was added to the bottle? Why do you think it acted this way?
- What liquid was on the bottom of the water bottle? (*Water*) Why? (*More dense*)
- What liquids were miscible and what were immiscible? (*water and food coloring; water and oil*)
- After a rain, what clue do you see that tells you that oil is present on the roadways or parking lots? (*Rainbows in puddles*). Why is this important? (*Runoff, pollution*) What can we do to minimize its effect?

#### Open Ended Questions:

- Why does pollution that occurs in one place show up on someone else's shoreline?
- In thinking about the immiscibility of water and oil, what can this do to wildlife and microorganisms? (Think oil spill!)
- What is the risk of having miscible liquids that look like water, to wildlife and humans?
- What is a home water audit and how can it help you achieve your goals related to protecting natural resources? (Note: Review parent companion piece for youth to take home.)

3. Seal the bottle with its cap and let stand.

Note: When 2 liquids mix in whatever ratios that they are combined, they are considered **miscible** and form a solution. Liquids are considered **immiscible** if they do not form a solution, regardless of the proportions used.

4. Using the dry-erase pen, make a mark on the bottle where the 2 liquids meet. This is the line of immiscibility.
5. Then make a mark where the top liquid starts towards the top of the bottle.
6. Measure each of these marks from the bottom of the bottle upwards. Note these measurements on your paper.
7. Lay the bottle in their hand horizontally and with wrist motion (a cap to bottom rolling action) create a wave. *Have the liquids mixed? Do they need to shake the bottle harder to make them combine?*
8. Turn the bottle upright and sit it on the table. Time how long it takes for the water and oil to separate. At the same time, make a mark on the bottle to measure the height of the mixture.
9. Measure the length from the bottom of the bottle to this new mark. *Is it more or less than the original height of the two liquids when they were separated? What is the difference in measurements? Why is there a change in the space that the two liquids occupy? What is this measurement called?*
10. Additional group discussion: Discuss the role of waves and how oil slicks affect marine life. *What could be done to change or lessen the affects to the wildlife? Slicks don't always have to be created by an oil spill. What happens to the road when it hasn't rained in a long time and all of a sudden we get a heavy rain?*

#### Note: Parent Take Home – Home Water Audit

Have the youth take the water bottle home as a way to engage their parents in discussion about the beauty of the ocean and the problems that we, on land, cause for the marine life. Using the *Home Water Audit* accompanying activity, the youth will work with their parents to share what they have learned, complete a home water audit and return to the program to review the results. Opportunities for additional data collection will be offered to determine if families change behavior over time.