

## Water Quality and Human Impacts

### Lessons 1-3: Topographic mapping, Runoff and BOD, Impervious surfaces

Why is water quality important? How is water quality measured? Water quality in the United States remains a growing concern as the demand for clean freshwater continues to grow. Through three different lessons, this unit exposes students to the effect of topography on water quality, the impacts of impervious surfaces on water quality, and the relationship between biological oxygen demand and its effect on the recovery of that water source.

#### Sequence

This unit plan contains lessons 1-3: *Water Quality and Human Impacts*

- Lesson 1: Topographic Mapping (*e-learning course included*)
- Lesson 2: Runoff and BOD
- Lesson 3: Impervious surfaces

#### Ohio Science Standards

##### Biology

- B.C.2: Cellular processes
- B.DI.2: Ecosystems
- B.DI.3: Loss of diversity

##### Environmental Science

- ENV.ER.3: Water and water pollution

##### Physical Geology

- PG.ER.3: Water

#### Time

Three class periods, 50 minutes each.

\*Note: This could be turned into an inquiry lab if students create their own water samples. Creating the samples may take up to two weeks to allow algae to grow.

#### Grade Level

9-12

#### Materials

e-Learning course (Lesson 1, [link](#))

Topographic maps PDF (Lesson 1, [link](#))

Washable markers (Lesson 1)

Rulers (Lesson 1)

*The Impacts of Impervious Surfaces on Water Resources* article (Lesson 3, [link](#))

Impervious Surfaces PDF (Lesson 3, [link](#))

Water quality student document (Lesson 2, [link](#), "water-quality-bod.pdf")

Water quality impact cards (Lesson 2, [link](#))

BOD chart 1 (Lesson 2, [link](#))

BOD chart 2- *teaching resource* (Lesson 2, [link](#))

Water sample creation instructions- *teaching resource* (Lesson 2, [link](#))

- Pond water
- Sediment
- Algae (if available)
- Gravel/stones
- Fertilizer
- Mason jars or small aquariums (1 per group of students)

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- pH test strips

Computer with internet access (Lessons 1-3)

### Objectives

Students will analyze the effects that topography has on water quality. (Lesson 1)

Students will investigate the influence of impervious surfaces on water quality. (Lesson 2)

Students will test water samples and record data pertaining to water quality factors. (Lesson 3)

### Vocabulary

Water, water quality, abiotic, biotic, pH, lentic, lotic, biological oxygen demand, topography, dissolved oxygen, temperature, pollutants, impervious surface

### Prior Knowledge

Students should understand that freshwater is a resource that should be preserved on Earth. A basic comparison between usable freshwater and total water on Earth should be made for students before they begin these activities. Students should also understand that pollutants enter the environment, where they are collected and transported by water.

### 5E Plan

#### Engage

Day 1

Begin by directing your students to the Water Quality e-Learning course. Discuss the e-learning course with your students as they are completing it and after they have completed it. On a post-it or small piece of paper, have your students record as many biotic or abiotic factors that affect water quality they can remember from the e-learning course, then post them in the front of the room.

Direct your students to the Topographic Maps document. Students should use the internet to search for topographic maps of certain regions. They should look for regions that have both lentic and lotic watersheds, or regions with both stationary and moving water. Take some time to find appropriate maps, then have them complete the Topographic Maps document. You may wish to instead print topographic maps ahead of time for your students to use.

Discuss any questions related to the document that your students may have.

#### Explore

Day 2

Prepare the lesson ahead of time by creating water samples for students to investigate. Use the water sample creating instructions on the unit page to prepare your samples, ensuring that you have a sample for each zone. In addition, print off the biological oxygen demand chart for your students to use as a resource during the activity, as well as the impact cards that they will use to answer reflection questions during the Explain stage.

Direct your students to complete the lab activity: Water Quality: An Important Issue. Do not move on to the impact cards until the next stage.

#### Explain

After students have completed the data portion of the lab activity, have them move on to the impact cards. Discuss the impact cards as a class, then have students share their data with another group in the classroom.

After students have discussed their impact cards, have them create their own impact cards. They need to create the data and create a scenario in which they think that their water sample might have been collected. For example, students should discuss what biotic and abiotic factors influenced their water quality sample and produced the data on their impact card.

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### Extend

Day 3

Have your students move on to Lesson 3: Impervious Surfaces. Have them read and discuss the article *The Impacts of Impervious Surfaces on Water Resources*. When they are finished reading they should move on to the Impervious Surfaces student document. During this activity, students are required to find two water resources that they can collect samples from. One sample should be close to an impervious surface, the other should be far from an impervious surface. Have your students conduct the tests and discuss their data.

If collecting samples is not possible, students may complete the first section by comparing water resources on Google Earth. Students should view water resources both near and away from impervious surfaces and complete the data tables that do not require testing. Have your students discuss their answers when finished.

### Evaluate

To assess your students' understanding of water quality your students should take the water quality e-learning course again and compare their scores both before and after Lessons 1-3.

### Additional Resources

[U.S. Senate passes changes to federal Harmful Algal Bloom and Hypoxia Research and Control Act](#) - Article from Ohio's Country Journal

[What is a Harmful Algal Bloom?](#) - Article from NOAA

[What is a Red Tide?](#) -Video from NOAA

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