

Citizen Science 2.0

45 Minute Lesson

Suggested Grades 9-12

All seasons

Why Water Matters

Background

The Cuyahoga River gained national attention when TIME magazine published the infamous burning river photograph in 1969. Though the incident helped propel improved standards in water quality nationwide and ultimately helped inspire the Clean Water Act, we continue to struggle as a nation with water quality issues. In countries that have less stringent standards, clean water is an even greater concern. In this activity, students will divide into 3 groups and be assigned an article to read and summarize. Groups will then share their summaries with their peers, and the entire class will discuss the similarities and differences between all three articles. Articles selected focus on the Cuyahoga River, Lake Erie, and rivers of Latin America.

Essential questions

* What are some historic and current water quality issues in the local watershed?
* What are the main causes of local and global water quality issues?

Learning objectives

Students will:

* Identify water quality issues affecting local and global waterways.
* Be able to discuss specific water quality issues existing in northern Ohio watersheds.

Materials

*For instructor:*

* Links or electronic copies of the articles to be shared with students

*For each student:*

* Article summary sheet
* Access to one of the following articles:
	+ “The burning river that sparked a revolution” from TIME, published in 2015
		- <https://time.com/3921976/cuyahoga-fire/>
	+ “Harmful algal blooms continue to plague Lake Erie, threaten drinking water, fish, pets” from Cleveland.com, published in 2017
		- <https://www.cleveland.com/metro/2017/08/harmful_algal_blooms_continue.html>
	+ “Latin American rivers among most polluted in the world, says new study” from The Telegraph, published in 2014
		- <https://www.telegraph.co.uk/news/worldnews/southamerica/argentina/10559685/Latin-American-rivers-among-most-polluted-in-the-world-says-new-study.html>

Lesson overview

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| **Activity** | **Estimated duration** |
| Opening questions | 5 minutes |
| Reading articles and answering summary questions | 25 minutes |
| Share-back | 10 minutes |
| Final reflection summaries | 5 minutes |
| Total | 45 minutes |

Key concepts and vocabulary

**Algal bloom** (from the National Oceanic and Atmospheric Administration (NOAA)):

occur when colonies of algae — simple plants that live in the sea and freshwater — grow out of control and produce toxic or harmful effects on people, fish, shellfish, marine mammals and birds.

**The Clean Water Act** (from the United States Environmental Protection Agency (EPA)):

33 U.S.C. §1251 et seq. (1972); The Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters.

**Watershed** (from the United States Geological Survey (USGS)):

an area of land that drains all the streams and rainfall to a common outlet such as the outflow of a reservoir, mouth of a bay, or any point along a stream channel.

 Activities

**Opening questions (5 minutes)**

Ask students the following questions:

* How clean do you think our local streams, rivers, and lakes are?
* Have our local waterways always been “clean”?
* Is water quality a local or global issue?

**Reading articles and answering summary questions (25 minutes)**

Divide the class into 3 groups. Assign the first article to group 1, second article to group 2, and third article to group 3. Distribute article summary sheets to each student. Within their group, have students read the article and answer the assigned questions. Students should then write a brief summary of the article in their own words. If time permits, students can share their summaries with one another to make a unified group summary of the article.

**Share-back (10 minutes)**

Groups will then share their summaries with the whole class. You may wish to make some notes on the board from the students’ verbal summaries of each article. From those summaries, students should then identify how the articles are similar and how they are different. A Venn diagram would be useful for organizing the comparisons. You may wish for students to record this graphic organizer in the blank space on the back of their article summary sheets.

**Final reflection summaries (5 minutes)**

Revisit the introductory question, “Is water quality a local or global issue?” Ask students to refine their initial thoughts and write a conclusion about the scope of water quality in the designated space on their article summary sheets.

Teaching objectives

* Understand the connectivity between waterways
* Students identify how water quality affects their lives
* Compare global and local issues around water quality

 Ohio’s Learning Standards

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| **Grade** | **Topic** | **Sub-Topic** | **Code** |
| 9-12 | Environmental Science | Earth Systems | ENV.ES.1 |
| 9-12 | Environmental Science | Earth’s Resources | ENV.ER.3 |
| 9-12 | Environmental Science | Global Environment Problems and Issues | ENV.GP.2 |
| 9-12 | Environmental Science | Global Environment Problems and Issues | ENV.GP.9 |
| 9-12 | Physical Geology | Earth’s Resources | PG.ER.3 |
| 9-10 | Reading for Informational Text | Key Ideas and Details | RL.9-10.1 |
| 9-10 | Reading for Informational Text | Craft and Structure | RL.9-10.4 |
| 11-12 | Reading for Informational Text | Key Ideas and Details | RL.11-12.1 |
| 11-12 | Reading for Informational Text | Craft and Structure | RL.11-12.4 |

 Next Generation Science Standards

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| --- | --- | --- | --- |
| **Grade** | **Topic** | **Sub-Topic** | **Code** |
| 9-12 | Earth and Space Sciences | Earth and Human Activity | HS-ESS3-1 |
| 9-12 | Earth and Space Sciences | Earth and Human Activity | HS-ESS3-4 |

**Why Water Matters:** Article Summary Sheet

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Article Title:

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Author: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Source: ­­­­­­­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Read the assigned article with the members of your group. As you read, record any unfamiliar concepts or vocabulary words. As a group answer the assigned questions.

New concepts and vocabulary:

Questions:

1. What is the primary body of water discussed in the article?

2. What water quality issues has this body of water faced?

3. What are the main causes of this water quality issue?

4. What if anything has been done to improve the water quality?

In your own words, write a brief summary of the author’s main point(s) in this article.

**Final reflection:** Is water quality a local or global issue?