

8b.3 The Great Lakes: Sewage and Fresh Water?

Story Extension for This Lesson:

As Sam and Alex travel along the Great Lakes, they see and smell large sewage treatment plants, as well as water treatment plants.

It amazes them that the natural resource from which we draw our drinking water is the same resource into which our sewage and some industrial waste is dumped.

Grade: 8

Strand: Systems in Action

Big Ideas:

- Systems are designed to accomplish tasks. (Overall expectations 1, 2, and 3)
- All systems include an input and an output. (Overall expectations 2 and 3)
- Systems are designed to optimize human and natural resources. (Overall expectations 1 and 3)

Overall Expectations:

1. assess the personal, social, and/or environmental impacts of a system, and evaluate improvements to a system and/or alternative ways of meeting the same needs
2. investigate a working system and the ways in which components of the system contribute to its desired function
3. demonstrate an understanding of different types of systems and the factors that contribute to their safe and efficient operation

Specific Expectations:

- 1.1 assess the social, economic, and environmental impacts of automating systems
- 1.2 assess the impact on individuals, society, and the environment of alternative ways of meeting needs that are currently met by existing systems, taking different points of view into consideration
- 2.6 use appropriate science and technology vocabulary, including mechanical advantage, input, output, friction, gravity, forces, and efficiency, in oral and written communication
- 3.1 identify various types of systems
- 3.2 identify the purpose, inputs, and outputs of various systems (e.g., a garden's purpose: to grow things; input: seeds, water, fertilizer; output: flowers, food)
- 3.3 identify the various processes and components of a system (e.g., robot, front-end loader/backhoe, heating system, transportation system, health care system) that allow it to perform its function efficiently and safely
- 3.8 describe systems that have improved the productivity of various industries

Inquiry Skills:

Searching, Gathering Data, Analyzing, Reporting

Instructions:

Part 1:

Rio de Janeiro, which hosted the Summer Olympics in 2016, has a population of about 6 million. It also has a massive water pollution problem. Before watching a CBC news feature about the water problem, remind students to think about systems as they watch the video. Why is there still an ongoing water crisis in Rio (reasons include lack of political will, lack of infrastructure, possibly lack of money, and long standing behaviours, with few alternatives, from people living in the favelas)? Watch the **CBC video** about the problem, which includes some stunning aerial pictures of polluted waterways, and then debrief:

- CBC video: <http://www.cbc.ca/news/world/rio-olympics-sewage-1.3704804>

Part 2:

The Great Lakes basin is home to approximately 35 million people, who rely on it for fresh water.

- Resource: <http://www.glerl.noaa.gov/pr/ourlakes/facts.html>

The Lakes are not only the source of fresh water, but also the main sewage outlet for all those people. In this activity, have students research either sewage treatment or how lake water is turned into drinkable tap water. Have students analyze the treatment process, and identify the inputs, outputs, and processes involved.

- Sewage treatment resource: <http://home.howstuffworks.com/home-improvement/plumbing/sewer3.htm>
- Lake water to drinkable water resource: <http://www1.toronto.ca/wps/portal/contentonly?vgnextoid=baa807ceb6f8e310VgnVCM10000071d60f89RCRD>

The end product should be a systems flowchart, similar to this one:

- Example flowchart: <http://www.bbc.co.uk/schools/gcsebitesize/design/systemscontrol/workingwithsystemsrev1.shtml>

Extend:

Although the Great Lakes are a huge reserve of fresh water, and water treatment systems usually work well, sometimes the system does not work as planned. Have students read the Toronto Star article detailing how well water was contaminated in Walkerton, Ontario.

- Toronto Star article: <https://www.peelregion.ca/pw/waterstory/pdf/activities/case-study>

Based on the article, have students use their systems thinking to detail how the system was supposed to work, and how it broke down. Additional research may be needed—as with the breakdown of any complex system, there were a number of factors that led to the Walkerton disaster, including government cutbacks, human error, and unused wells that allowed waste water directly into the water table.

Materials List:

- laptops or tablets for student research.

Connections:

Language: Reading

Handouts/Assessments:

- Water Treatment Process

Assessment Strategy:

Formative: This assignment is the students' first attempt looking at a sophisticated working system. Give students feedback regarding the inputs, processes, and outputs, as well as their systems thinking.

How is lake water turned into drinking water?

The City of Toronto produces potable (drinking) water by treating and cleaning raw water taken from Lake Ontario. Clean water is important to our daily lives. We use it for many things such as drinking, cooking and bathing. Hospitals, restaurants and other businesses also rely on fresh, clean water for their operations.

