# ­­Lesson Title: Water Treatment

## Lesson Overview

Students will build a simple, cheap, working water filter. Students will then use the included diagram showing “**How Lake Water is Turned into Drinking Water**” to compare the parts of their water filter to a full scale municipal water treatment plant. This activity is best done either before or after a field trip to your local drinking water treatment plant. However, some municipalities, like Toronto, no longer conduct public tours so this activity can stand on its own.

## Connections to Environmental Education

Students will use experiential learning to understand how technology allows us to treat fresh water so it can be used as a renewable resource. Students will have an opportunity to appreciate that life depends on the fresh water resources of a finite planet.

## GRADE 8: SCIENCE AND TECHNOLOGY and LANGUAGE

## Curriculum Expectations

Science and Technology (2007) – Understanding Earth and Space Systems: Water Systems

1. Students will assess the impact of human activities and technologies on the sustainability of water resources.

2. Students will investigate factors that affect local water quality.

2.2 Students will investigate how municipalities process and manage water.

2.5 Students will use technological problem-solving skills to design, build, and test a water system device that performs a practical function or meets a need.

Language (2006) – Media Literacy

1. Students will read and demonstrate an understanding of a variety of literary, graphic, and information texts, using a ­­range of strategies to construct meaning.

## Learning Goals

At the end of this lesson, students will

- be able to build and test a simple water filter

- know the names and functions of the parts of their water filter

- understand the process of municipal treatment of fresh water to make safe drinking water

- know why chlorine, alum and fluoride are added to drinking water

- understand how to interpret informational graphics and relate the ideas to their own knowledge

- appreciate that life depends on the resources of a finite planet

## INSTRUCTIONAL COMPONENTS AND READINESS

## Readiness

Knowledge of mixtures, solutions, and mechanical separation processes.

## Terminology

filtration, conservation of water, environmental impact, flow rate, pollution

## Materials

**BLM 1 – Drinking Water Filter – Student Activity**

**BLM 2 – Drinking Water Filter – Teacher Guide and Answer Key**

**BLM 3 – Treating Drinking Water – Student Activity**

**BLM 4 – Treating Drinking Water – Teacher Guide and Answer Key**

**“How is lake water turned into drinking water?”** poster from the City of Toronto <http://www.toronto.ca/water/supply/supply_facilities/rcharris/pdf/water_filtration_process.pdf>

“**Protecting our water”** poster 6081e from the Ontario Ministry of the Environment [http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/std01\_079793.pdf](http://www.ene.gov.on.ca/stdprodconsume/groups/lr/%40ene/%40resources/documents/resource/std01_079793.pdf)

“**We are all connected to water”** poster 6080e from the Ontario Ministry of the Environment [http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/std01\_079792.pdf](http://www.ene.gov.on.ca/stdprodconsume/groups/lr/%40ene/%40resources/documents/resource/std01_079792.pdf)

Water Filter Equipment:This is enough for 8 teams of 4 students.
This material can be set up for about $30 and can then be kept in a storage bin to be reused every year.
8 empty 1 L plastic drink bottles from recycling

20 large plastic beer cups

8 scissors

8 small plastic spoons

Sand – about 8 cups

Gravel – about 8 cups

Cheesecloth cut in 10 cm x 10 cm squares

Strong elastics

Alum (from grocery store or bulk food store, used for making pickles)

4 - 100 mL labelled dropper bottles with 50 mL bleach added to 50 mL of water per bottle

Paper towel

Plastic bin with dirty water (tap water mixed with a trowel full of dirt, leaves and twigs, use the actual storage bin!)

Bucket of clean rinse water

Sieve to separate sand and gravel

2 plastic bags or bins (large for underneath separating sand and gravel, small for garbage)

Trowel

## MINDS ON

Groups of 3-4 students. Complete **BLM 1 - Drinking Water Filter - Student Activity** Minds On and Materials sections.

### Minds On: Assessment

Formative (as learning): All the students in a group must show the completed Minds On answers before proceeding to build the water filter.

## ACTION!

Groups of 3-4 students build and test a water filter. Diagrams of the equipment setup and observations of how well dirty water is filtered are recorded.

Teacher must ensure that the safety rules are enforced: 1. Wear googles. 2. Do **not** drink the water.

Read the Teacher Guide for other safety instructions.

This activity is best done out in the school yard so there is little worry about making a mess and having to clean up.

It is best to carry clean water outside and then add the dirt with a trowel or shovel.

### Action: Assessment

Formative (as learning): Students test their filter to see what happens to the dirty water. Observations are recorded which can then be formatively assessed by the teacher for completion. Students show the teacher their completed observation chart and completely cleaned up materials.

### Action: Differentiated Instruction

Students who need additional challenge can be asked how the design could be improved.

Students needing support can be given a premade filter and then just record the observations.

## CONSOLIDATION

Individual.
Students relate their water filter to a diagram of “**How is lake water turned into drinking water?**” <http://www.toronto.ca/water/supply/supply_facilities/rcharris/pdf/water_filtration_process.pdf> Project the diagram if possible or provide paper copies of the diagram. Paper copies could be collected and reused. This informational graphic and text is used along with their water filter diagram to answer the consolidation questions in **BLM 3 - Treating Drinking Water – Student Activity**. In the second part of the consolidation students extract conservation information from the “**Protecting our water”** poster [http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/std01\_079793.pdf](http://www.ene.gov.on.ca/stdprodconsume/groups/lr/%40ene/%40resources/documents/resource/std01_079793.pdf)

### Finally, students use the “We are all connected to water” poster [http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/std01\_079792.pdf](http://www.ene.gov.on.ca/stdprodconsume/groups/lr/%40ene/%40resources/documents/resource/std01_079792.pdf) to demonstrate the environmental education attitude that students will appreciate that human life depends on the resources of a finite planet.

### Consolidation: Assessment

Summative (of learning): Use **BLM 4 - Treating Drinking Water - Teacher Guide and Answer Key** to evaluate students understanding of how municipal water is treated.