



## AREA BEST LINKED TO

City of Kawartha Lakes, County of Haliburton and the District of Muskoka



## OBJECTIVES

- Provide students with fundamental knowledge about the challenging treatment process their wastewater must go through.
- Briefly introduce students to the importance of water quality guidelines.
- Through this trial and error activity, instill an appreciation for clean, clear water and the facilities available in the City of Kawartha Lakes, the County of Haliburton and the District of Muskoka that help to provide this resource.



## CURRICULUM LINKS

### Grade Four:

#### Science:

- 1.1: Analyse the positive and negative impacts of human interactions with natural habitats and communities (e.g., human dependence on natural materials)
- 2.1: Follow established safety procedures for working with soils and natural materials (e.g., wear gloves when handling soils to set up a working terrarium)

### Grade Six:

#### Arts:

- D1.4: Use a variety of materials, tools, techniques, and technologies to determine solutions to design challenges



## MATERIALS

- Rubber gloves (1 pair per student)
- Cut triangles of wire mesh screen (1, 12x12x21 inch triangle per group)
- Cut squares of nylon/panty hose (1, 11x11 inch square per group)
- Coffee filters (3 per group)
- Empty 2 litre drinking bottles (pop, water, etc) with labels removed (4 per group)
- Muddy "soiled" water (approximately 1.5 litres per group)
- Plastic pitchers (1 per group)
- Scissors
- Tape
- Elastic bands
- Resources for student research (books, encyclopedias, internet access, etc.)



## BACKGROUND INFORMATION

Throughout the City of Kawartha Lakes, the County of Haliburton and the District of Muskoka lives a mixture of both rural and urban residents. Those that live in urban areas have their wastewater treated by the nearest local wastewater treatment facility. This is a complex facility designed to remove harmful substances from municipal wastewater utilizing a series of system components such as settling tanks, aeration (pumping air into the water), microorganisms (bacteria that break down waste present in the water), flocculants (chemicals that cause the waste in the water to form larger masses of sludge that can be more easily removed), etc. All of this is done to ensure that the water being released from the wastewater treatment facility meets the regulatory water quality guidelines to mitigate hazards to human and environmental health.

Another portion of the residents in these regions live on septic systems that act as personal household wastewater treatment facilities. Generally in these systems water that has been used in the tub, tap or toilet is pumped into a septic tank where beneficial microorganisms work to break down harmful pathogens. It is then released into the soil for further natural treatment that occurs as it leaches through the ground and back to the household well.

A few alterations to these two common systems exist. One of which involves municipalities that may have one or more households drawing water from a single well in place of one household only obtaining water from a personal well that they are responsible for tending to. A second variation exists on rural properties that may not have a septic tank but instead have a holding tank where household wastewater is simply retained until it is pumped out periodically. This hands-on activity is meant to engage students in the wastewater treatment process by creating their own filtration system utilizing a few simple and common items.

## OPENING DISCUSSION

- Ask the class to consider and discuss what it is that they think happens to their wastewater?
- Discuss with the students whether they are aware of which wastewater treatment process their household makes use of?
- Encourage the class to describe what they are familiar with about their water system and inform them of what they are unaware of (see background information).
- Facilitate discussion surrounding some of the common sources of water contamination generated by households (i.e. cleaners, hygienic products, human waste, pharmaceuticals, etc.).

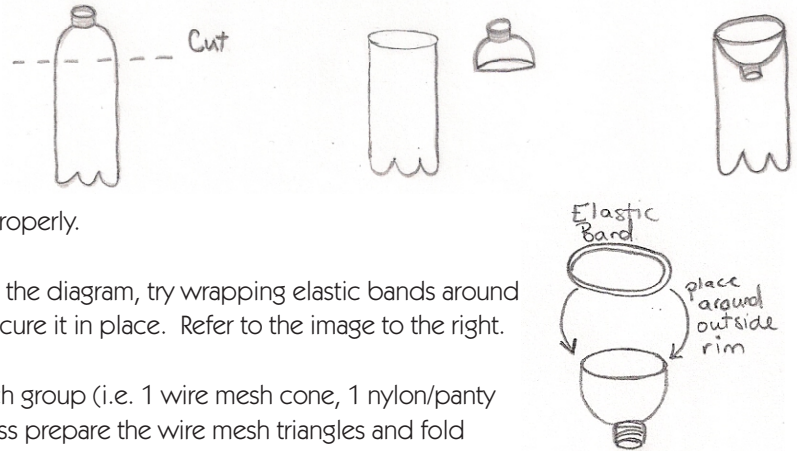


# WATER FILTER CONSTRUCTION

This activity would be best attempted by splitting the class into smaller groups and distributing the materials accordingly. The list of materials provided is a simple guide and can be expanded on to accommodate the teacher's available resources and ideas. Begin by asking the students to put on their rubber gloves.

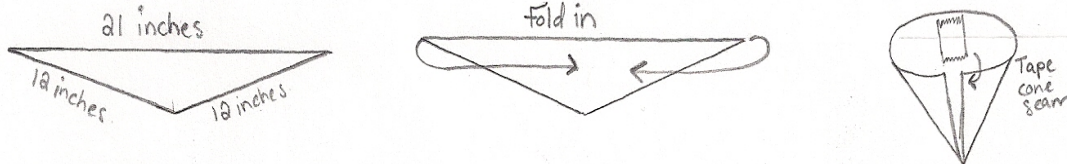
1. Obtain 1, 2 litre bottle/group of dirty water. It is best if it is approximately  $\frac{3}{4}$  full. This is to resemble wastewater and should have some soil, plant matter and gravel in it to allow students to clearly observe the filtration process. Give 1 of these to each group of students and ask them to agitate the mixture by shaking it. Place this bottle aside.

2. Provide each group with 3 empty 2 litre bottles. The teacher is encouraged to prepare these before class by doing the following. Un-lid the bottles and pre-cut the top "neck" portion off in a way that the students can turn it upside down and place it in the bottom portion of the bottle. Try to cut them as near the top as possible to ensure the coffee filters will fit in them properly.



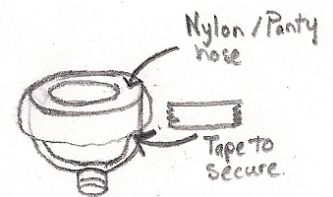
Also, if it becomes a challenge to make them fit as seen in the diagram, try wrapping elastic bands around the outside of the cut, top portion of the pop bottle to secure it in place. Refer to the image to the right.

3. Distribute a set of the three different water filters to each group (i.e. 1 wire mesh cone, 1 nylon/panty hose square and 3 coffee filters per group). Before class prepare the wire mesh triangles and fold them into cones. Fasten them with tape ensuring that there is no hole at the narrow end of the cone that large pieces of material in the water can escape through. Refer to the image below. Cut excess mesh that protrudes and does not contribute to the shape of the cone.



4. Ask each group to place their un-lidded bottle tops upside down in the bottle bottoms. Tape them in place if they do not remain stable.

5. Situate the wire mesh cone in the top of one of the bottle structures, the nylon in the second and approximately 3 coffee filters in the other. See the illustration below.



The nylon pieces should be relatively loosely fastened using tape so that they reach the bottom of the bottle top funnel. Refer to the above-right for an illustration of this. Make sure that each group has their separate filters in the order of wire mesh, nylon and then coffee filters.

1. Refer back to the, what should now be partially settled “wastewater.” Ask the class to comment on how it appears different from when they shook it. Most of the heavy material should be settle to the bottom much like what happens at municipal wastewater treatment facilities.
2. Slowly pour the water through the wire mesh filter system being careful to disturb as little of the bottom as possible. Once all of the water has been filtered through this first system remove the bottle top funnel and pour the water from the large bottom portion of the cut 2 litre pop bottle into the plastic pitcher.
3. Pour the partially “treated wastewater” through the nylon filtration system from the plastic pitcher. Proceed to pour the water into the rinsed plastic pitcher from the bottom cut portion of the pop bottle after it has been filtered by the second nylon/panty hose system.
4. Repeat with the final coffee filter filtration system. Leave the “treated wastewater” in the bottom of this system (the bottom of the pop bottle) so the class can observe and refer back to it to make comments throughout the discussion period.

## DISCUSSION QUESTIONS

- What did you notice when pouring the dirty water through the different strainers of the filtration system?
- Consider the difficulties of removing things that cannot be seen from the water. Do you think this might change the way you question what you put down the drain? Why?



## RESOURCES/REFERENCES

- Ministry of the Environment, Drinking Water Ontario:  
<http://www.ontario.ca/ONT/portal61/drinkingwater>
- The City of Kawartha Lakes:  
<http://www.city.kawarthalakes.on.ca/residents/water-and-wastewater>
- Canada Mortgage and Housing Corporation:  
[http://www.cmhc-schl.gc.ca/en/co/maho/gemare/gemare\\_009.cfm](http://www.cmhc-schl.gc.ca/en/co/maho/gemare/gemare_009.cfm)
- Ontario Clean Water Agency:  
<http://www.ocwa.com/>
- The Atlas of Canada – Water Consumption:  
<http://atlas.nrcan.gc.ca/site/english/maps/freshwater/consumption/1>



## FEEDBACK

### We appreciate your feedback! Please let us know...

- Did this activity continue the learning your students engaged in at the Water Festival?
- What curriculum requirements did this activity satisfy?
- Was the activity easy to facilitate to your class?
- Did students have fun and learn something new about water?
- Please send photos of your class using these activities!

Please send comments and photos to: [iheaven@outtolearn.ca](mailto:iheaven@outtolearn.ca)