



AREA BEST LINKED TO

Eutrophication and algae were recurring themes in the local watersheds of the districts. This issue is relevant to the District Municipality of Muskoka, region of Trent Severn Waterway, County of Haliburton and City of Kawartha Lakes. Potential causes identified included agricultural run off, waterfront development, lawn fertilizers and aging infrastructure, especially septic systems. Specific lakes identified were Three Mile Lake in the Muskoka District, Lake Simcoe in the Trent Severn Waterway region, Sturgeon Lake in City of Kawartha Lakes and Elephant Lake and Head Lake in Haliburton County. This is an important issue as the entire community can attribute to effects on the watershed and are impacted by the watershed.



OBJECTIVES

- Students learn to assess human impacts on biodiversity, and identify ways of preserving biodiversity.
- Students demonstrate an understanding of biodiversity, its contributions to the stability of natural systems, and its benefits to humans.
- For students to understand the process of eutrophication and what causes it and how it influences lake and river habitats.



CURRICULUM LINKS

Grade Four: The grade four Science and Technology curriculum includes Understanding Life Systems: Habitats and Communities. This theme includes analysing the effects of human activities on habitats and communities, analysing the positive and negative impacts of human interactions with natural habitats and communities and evaluating ways of minimizing the negative impacts, identifying reasons for the depletion or extinction of a plant or animal species (depletion of fish population in a eutrophic environment), evaluating the impacts on the rest of the natural community, and proposing possible actions for preventing such depletion or extinction from happening, demonstrating an understanding of habitats and communities and the relationships among the plants and animals that live in them and describing ways in which humans are dependent on natural habitats and communities.

Grade Five: The grade five Science and Technology curriculum includes Understanding Life Systems: Human Organ Systems which includes analysing the impact of human activities and technological innovations on human health, assess the effects of social and environmental factors on human health, and proposing ways in which individuals can reduce the harmful effects of these factors and take advantage of those that are beneficial. This relates as eutrophication effects the quality of drinking water.

Grade Six: The grade six Science and Technology curriculum includes Understanding Life Systems: Biodiversity. This theme includes assessing human impacts on biodiversity, and identifying ways of preserving biodiversity. This relates to the effects of eutrophication on aquatic biodiversity such as a decrease in fish populations.



MATERIALS

- Boxes (approximately 16 inches by 16 inches or 40 cm by 40 cm; slightly smaller or larger will work as well): one for every three or four students (keep in mind the size of the box should be appropriate for the number of students in a group)
- A styrofoam bowl for each group of students.
- Foam or sponges (assortment of various colours and sizes)
- Scissors
- Straws
- Tape
- Yellow food colouring
- Blue food colouring
- Plastic wrap
- One recycled plastic water bottle (.5 litres)
- Soil/dirt (optional)
- Plastic Water bottles

Ask students to bring in any appropriate sized boxes they have lying around their house ahead of time for the activity. Depending on the number of boxes the groups for the activity will permit. Boxes can also be obtained from local grocery stores. Groups of three or four would be efficient. Poke a hole in the top of the plastic water bottle (this is for teacher's use only).



BACKGROUND INFORMATION

Eutrophication results from nutrient pollution. Nutrients cause algal growth which affects aquatic plants and fish. These excess nutrients are nitrogen and phosphorous. In fresh water phosphorous is the limiting nutrient because it is the nutrient in shortest supply. Excess nutrients can cause an increase in algae and aquatic vegetation. The lack of phosphorus "limits" the growth of floating aquatic plants. Visible algae blooms form, due to rapid growth and spread of algae. The algae settle to the bottom of the water body where they decompose and in the process deplete the oxygen to the point that fish cannot live. This effects the ecosystem as oxygen is depleted, having negative effects on fish populations. A potential result of eutrophication is a cloudy green lake colour. The blue-green algae can be toxic, representing a health risk of eutrophic lakes and rivers when they are a source of drinking water. Pollution sources which cause eutrophication include wastewater from municipal and industrial sources, runoff and leaching from waste disposal systems, runoff and infiltration from animal feedlots, runoff from mines, oil fields, unsewered industrial sites, overflows of combined storm and sanitary sewers, runoff from construction sites, untreated sewage, runoff from agriculture, runoff from pasture, urban runoff from areas that are not properly sewered, septic tank leaching, runoff from abandoned mines, atmospheric deposition over a water surface and other land activities generating contaminants. Buffer zones of plants such as grasses, shrubs and most effectively trees can help delay run off from entering aquatic ecosystems and remove some of the pollutants.



TIMELINE AND WORK PLAN

Give an example of a eutrophic lake in your community. For example, Three Mile Lake in Muskoka, Simcoe Lake in the Trent Severn Waterway, Sturgeon Lake in City of Kawartha Lakes, Head Lake or Elephant Lake in Haliburton County. Ask the class what might cause these lakes to turn green. Brainstorm ideas and write them on the chalk board. **(10 minutes)**

Give an explanation of eutrophication. **(5 minutes)**

Eutrophication is caused when there are excess nutrients in a lake or river. Explain that these nutrients include nitrogen and phosphorous and identify the pollution sources that they can come from.

Brainstorm pollution sources on chalk board. Assign each group a pollution source such as agricultural run off, lawn fertilizer and sewage. **(5minutes)**

Refer to pollution sources locally. For example, Sturgeon Lake in City of Kawartha Lakes, agriculture comprises half of the land draining into the watershed, making excessive nutrients such as phosphorous an issue of concern. Three Mile Lake also has significant agricultural lands surrounding the watershed as well as residential development which could result in septic pollution. Lake Simcoe is impacted by rural and urban watershed development and agriculture. Fish habitat has become a concern and aging infrastructure have been of high concern. Head Lake in Haliburton would have concerns of municipal run off since the village of Haliburton is located on this lake.

Steps of Activity: **(30 minutes)**





CREATE A LAKE ECOSYSTEM



1. A circle slightly larger than the bowl will be cut out of the bottom of the box.



2. Place the bowl within the holder in the box the rim of the bowl will keep it in place.



3. Line the rest of the box with plastic wrap.



4. Fill the bowl with a small amount of water with a small amount of blue food colouring. Stir with a straw to mix in the food colouring.



5. Students will develop a model of a lake ecosystem impacted by a pollution source. For example, sewage can be demonstrated by using the straws to represent sewage pipes, or make a cow from sponge and foam material (refer to photo in step 6). Each group will get pieces of foam or Bristol board to cut out aspects of the landscape such as plants, animals and any infrastructure. Other aspects can be included in the lake ecosystem model such as plants, fish, buildings, etc.



6. Yellow food colouring will be added to the model where the pollution sources are located. It will represent the various pollution sources such as chemicals, animal waste or fertilizers. Once students have completed their lake model the teacher will approach each group and apply the food colouring to the pollution source for each group (example: sewage pipe, agriculture, etc.). Dirt or soil can be added if desired.



7. The teacher will poke a hole in the top of the water bottle. The water bottle will be used to apply water onto the model to transfer the yellow food colouring from the pollution source to the body of water, representing run off (refer to photo). This will cause a green colour in the model lake (refer to photo).

WRAP UP

- Ask students to write down their observations. (5 minutes)
- Explain to the students that the lake is unhealthy when it turns green, which effects the fish population and your drinking water that comes from that lake. (5 minutes)
- Ask the students how we can prevent the pollution from getting to the lake. (5 minutes)
- Explain the idea of buffer zones and how vegetation can decrease run off. (5 minutes)
- Ask students to cut out trees from the sponges and put them around their lake system as a barrier to absorb the run off. (10 minutes)
- Students will write down how they will commit to prevent pollution from entering their lakes and rivers. Have a copy for each student to sign and leave a blank line for them to write why they shouldn't pollute their lakes and what they will do to help their lakes. For example, reading labels and avoiding products that are toxic and hazardous, never putting chemicals such as cleaners, solvents and pharmaceutical products down drains or sewers, respecting regulations or by-laws regarding the use of fertilizers and pesticides and carefully following instructions when applying chemical fertilizers and pesticides on lawns and gardens, not applying chemical fertilizers and pesticides near waterways, maintaining trees and shrubs along shorelines, and properly installing and maintaining household septic systems by educating others.

EXAMPLES OF A COMMITMENT

- I will encourage my family to use natural cleaners and will read labels on the bottles to prevent any harmful chemicals to pollute our lakes.
- I will plant a tree near the shoreline in our backyard to decrease run off into the lake. (10 minutes)

Students will bring their commitment home and will be encouraged to show their family and put it on their fridge.



REFERENCES/RESOURCES

- US Environment Protection Agency: Water Quality Criteria for Phosphorous and Nitrogen
<http://water.epa.gov/scitech/swguidance/standards/criteria/nutrients/>
- Environment Canada: Water Quality
<http://www.ec.gc.ca/indicateurs-indicators/default.asp?lang=En&n=FC756737-1>
- Ministry of the Environment: Lake Simcoe
http://www.ene.gov.on.ca/environment/en/local/lake_simcoe_protection/index.htm
- Kawartha Conservation: Sturgeon Lake
<http://www.kawarthaconservation.com/sturgeonlake/aboutsturgeonlake.html>
- Muskoka Watershed Council
<http://www.muskokaheritage.org/watershed/index.asp>
- Health Canada: Water Quality
<http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/index-eng.php>
- Fisheries and Oceans Canada: Protecting the Health of Canada's Lakes
<http://www.dfo-mpo.gc.ca/regions/central/pub/ela-rlc/index-eng.htm>



FEEDBACK

We appreciate the 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!
- Send us a copy of your classes commitment!

Please send comments and photos to: iheaven@outtolearn.ca

