Water Clean-up Crew

Learn about water quality and how to solve different water quality problems

**Overview of Lesson:** Students will work in small groups to try and improve a body of water.

**Minnesota Science Standards**

3.1.1.2.3 - Maintain a record of observations, procedures and explanations, being careful to distinguish between actual observations and ideas about what was observed. *For example:* Make a chart comparing observations about the structures of plants and animals.

4.1.2.2.2 - Generate ideas and possible constraints for solving a problem through engineering design. *For example:* Design and build an electromagnet to sort steel and aluminum materials for recycling.

4.1.2.2.3 - Test and evaluate solutions, considering advantages and disadvantages for the engineering solution, and communicate the results effectively.

5.1.1.1.4 - Understand that different models can be used to represent natural phenomena and these models have limitations about what they can explain. *For example:* Different kinds of maps of a region provide different information about the land surface.

5.1.1.2.3 - Conduct or critique an experiment, noting when the experiment might not be fair because some of the things that might change the outcome are not kept the same, or that the experiment isn't repeated enough times to provide valid results.
**Background Information:**

Minnesota is known as the land of 10,000 lakes, and actually has more than 11,800 lakes. Wisconsin has more than 15,000 documented lakes. There are also thousands of miles of rivers and streams in Minnesota and Wisconsin. With all this water and shoreline, what impacts do humans have on this natural resource?

Many things can negatively impact water quality including pollution, sedimentation, and excessive algae growth. In this lesson, students will explore some examples of water quality problems and potential solutions.

Water quality is a real life problem that scientists are still working to solve. Solutions are varied and depend on the location and circumstances of the problem. For example, sedimentation is typically dealt with by dredging a waterway. Algae can be scooped out or treated with chemicals that kill the plants. Oil spills can be contained using barriers, burned on the water’s surface, or vacuumed up by robots. Some spills have even been treated with biological agents such as oil eating mushrooms and oil absorbing moss. One researcher even used nylons fill with fur/hair to soak up oil! The EPA website provides good general information (links are found at the end of the lesson).

**Vocabulary**

- **Erosion** – The wearing down or washing away of soil by the action of wind or water.
- **Eutrophication** – A process in which a body of water is enriched by excessive nutrients such as phosphorus or nitrogen that can cause excess plant and algae growth.
- **Sedimentation** – The transport and deposition of soil particles in a body of water.

**Prior to Teaching:**

Locate a suitable area for the stations and all the tools. This activity can be done outdoors to minimize cleanup. Set up a number lakes, each with a specific problem – oil spill, sedimentation, eutrophication or sewage.

Fill each lake with water and add the “problem.”

Print out the scenario sheet and place at the appropriate station. Place an assortment of tools at each station and provide a second container for students to place the waste or “problem” as they remove it.

Gather clean up materials such as trash cans, towels and sponges.

**Lesson Outline:**

1. **Introduction (5 minutes)** – Show students pictures of two lakes - one that is clear (Lake A) and one that has algae problem (Lake B). Which would the students rather go swimming in?
II. **Stations (25 minutes)** – Split students into small (3 to 4 students) groups and assign them a station. Each station will have a body of water that has a water quality problem. Using the tools at the station and creativity, each group should try to improve quality.

(Note: depending on the size of the class, multiple groups may have the same problem to fix).

Encourage students to record what solutions they tried and tools they used in their science notebook. This will be helpful when answering questions at the end of the lesson.

Tools can include things such as sponges, aluminum foil, newspaper, clay or play dough, scissors, tape, toothpicks, straws, pipe cleaners, popsicle sticks, rubber bands, paper clips or sporks. Note that the tools listed are suggestions. You can provide a variety of art and craft supplies, or things commonly found in classrooms. Students should think creatively and use the available tools to solve the water quality problem.

Remind students of these expectations before they begin:

- They cannot pick up the lake and move it.
- They must use tools available for cleanup appropriately.
- They cannot ingest anything.
- Encourage students to record their ideas for clean-up and solutions they tried in their notebook.

a. **Station 1: Oil Spill**

Fill the aluminum pan approximately 2/3 full of water. Add a small amount of vegetable oil to the water. This represents the oil spill.

Student need to clean up the oil spill to the best of their ability.

b. **Station 2: Sedimentation**

Fill the aluminum pan approximately 2/3 full of water and add a small amount of sand to the tray. This represents erosion and sedimentation.

Students need to use their tools to remove as much of the sediment from the water as possible.

c. **Station 3: Eutrophication/Algae Bloom**

Fill the aluminum pan approximately 2/3 full of water. Rip up a green tissue paper into very small pieces and add them to the water. This represents algae growth.

Students need to reduce the amount of algae as much as possible using their tools.

d. **Station 4: Sewage**

Fill the aluminum pan approximately 2/3 full of water. Pour a small can of baked beans into the water. This represents sewage leaking into a body of water.

Students need to reduce the amount of sewage as much as possible using their tools.
III. **Group sharing (10 minutes)** – At the end of the time, have each group share with the class what problem they were given and how they tried to solve it.

IV. **Clean up stations (5 Minutes)**

V. **Journal time and discussion (10 minutes)**
   
a. Questions for students’ journal or discussion questions:
   
i. What could have caused the problem initially?
   
ii. Why should we try to remove the problem?
   
iii. How would you prevent this from happening in the future?
   
iv. How could this problem impact wildlife?
   
v. Did they find it difficult or easy to fix the problem?

**Extensions:**

If students figure out a solution to quickly, you can make things more challenging by place multiple “problems” in the lake or have the students repeat the activity by having to come up with a completely different solution.

Have students research a local water quality issue or water quality event.

**Resources:**

Minnesota DNR Lake Facts: [http://www.dnr.state.mn.us/faq/mnfacts/water.html](http://www.dnr.state.mn.us/faq/mnfacts/water.html)


EPA links on removing oil, sediments and algae from water ways.

[http://www.epa.gov/OEM/content/learning/oiltech.htm](http://www.epa.gov/OEM/content/learning/oiltech.htm)

[http://www2.epa.gov/nutrient-policy-data/control-and-treatment](http://www2.epa.gov/nutrient-policy-data/control-and-treatment)

[http://water.epa.gov/polwaste/sediments/cs/aboutcs.cfm](http://water.epa.gov/polwaste/sediments/cs/aboutcs.cfm)

Pictures from Wiki Commons

- [http://commons.wikimedia.org/wiki/Lake#/media/File:Jezioro_Dybrzyk.jpg](http://commons.wikimedia.org/wiki/Lake#/media/File:Jezioro_Dybrzyk.jpg)
- [http://commons.wikimedia.org/wiki/File:Oil_spill_in_San_Francisco_bay.jpg](http://commons.wikimedia.org/wiki/File:Oil_spill_in_San_Francisco_bay.jpg)
You are a part of a water treatment crew that has just been assigned to clean up this lake. Using the tools available to you, remove as much sedimentation as you can.
You are a part of a water treatment crew that has just been assigned to clean up this lake. Using the tools available to you, remove as much algae as you can.
You are a part of a water treatment crew that has just been assigned to clean up this lake. Using the tools available to you, remove as much of the oil spill as you can.
You are a part of a water treatment crew that has just been assigned to clean up this lake. Using the tools available to you, remove as much of the sewage as you can.