Water
How humans impact this essential resource

Time Needed: 1 hour
Ages: 4th - 8th grades
Season: Any
Materials: copy paper, blue and red construction paper, markers, crayons, 100ml glass beaker, 100ml graduated cylinders, 10ml graduated cylinder; eye dropper

Lesson Outline:
I. Introduction – 5 minutes
II. Water front properties – 40 minutes
III. Journal – 10 minutes
IV. All the water in the World – 5 minutes

Overview of Lesson: Students will explore how individuals can impact water quality and where water is found on Earth. Our actions can affect humans and wildlife. For example, bald eagles are found primarily near water and rely on clean water and healthy aquatic habitats.

Minnesota Science Standards
4.3.2.3.1 – Identify where water collects on Earth, including atmosphere, ground, and surface water, and describe how water moves through the Earth system using the processes of evaporation, condensation and precipitation.

4.3.4.1.1 – Describe how the methods people utilize to obtain and use water in their homes and communities can affect water supply and quality.

5.3.4.1.3 – Compare the impact of individual decisions on natural systems.

5.4.2.1.2 – Explain what would happen to a system such as a wetland, prairie or garden if one of its parts were changed.

5.4.4.1.1 – Give examples of beneficial and harmful human interaction with natural systems.

7.4.4.1.2 – Describe ways that human activities can change the populations and communities in an ecosystem.

8.3.4.1.2 – Recognize that land and water use practices affect natural processes and that natural processes interfere and interact with human systems.
Introduction

Water is essential to life. We use it every day – to drink, cook, bathe, energy production, irrigate crops and play. Humans have changed the landscape by altering river routes, installing locks and dams and building manmade lakes.

Much of the planet is covered in water. However, only a small proportion of that water is available for humans to use. Approximately 96.5% of the water is salt water, found in the world’s seas and oceans. Only 2.5% of the world water is fresh water and the vast majority of that is groundwater or trapped in ice. It total, about 0.3% of the water is fresh water and available to humans.

Our activities can change the water quality. In this lesson, students will explore how human actions can impact a river and be introduced to point and non-point source pollution.

Vocabulary:
• **Pollution** - the introduction of contaminants into the natural environment that cause adverse change.
• **Non-point source pollution** - generally results from land runoff, precipitation, atmospheric deposition, drainage, seepage or hydrologic modification. Examples include: Excess fertilizers, herbicides and insecticides from agricultural lands and residential areas. Oil, grease and toxic chemicals from urban runoff and energy production. Sediment from improperly managed construction sites, crop and forest lands, and eroding stream banks.
• **Point source pollution** – contaminants that come from a single, identifiable source such as a pipe, ditch, container, concentrated animal feeding operation, or vessel.
• **Water quality** - refers to the chemical, physical and biological characteristics of water. It is a measure of the condition of water relative to the requirements of one or more biotic species and or to any human need or purpose. Common water quality measurements include dissolved oxygen, nitrogen, pH, salinity etc.

Prior to teaching

Riverfront property exercise:
Gather pieces of copy paper. Lay out on the floor in 2 rows, across the middle draw a blue line. Color the “river” in with blue. Number each piece of paper so that it can be put back together at a later time. (see example below).

![Riverfront property exercise](image)

Cut several pieces of blue and red construction paper into squares.
All the water exercise:
Gather all the materials needed. Measure out 100 ml of water.

Lesson Outline

I. **Human uses of water** – Have the students brainstorm ways humans use or interact with water.

II. **Riverfront property** – Tell the students that they have each just received a piece of river front property. They can develop it however they wish.

Pass out a piece of “property” to each student. The part that is blue is water; the rest of the property is land. They should draw what they would do on the property. Give students time to develop their property or assign it as homework.

Once all students have completed developing their land, move the class to an area that has a large open amount of floor space and reassemble the river (the numbers that were written on each piece prior to teaching). Go down river and have each student share what their piece of property now looks like.

Ask students if they think the developments improved the land or added negative things to environment. Each student should select a red square if the changes were negative, blue square if the changes were positive or yellow if they think a little of both. They can share with the class why they chose the color they did. (If students get stumped, the class can be asked what color square should be used).

Does the water stay in one place? No; students with water front property down river are impacted by what students did to change the landscape up river. Pollutants will flow downstream; have the blue and red squares of paper “float” down stream to demonstrate this as the class shares how they changed the landscape.

Introduce the students to water quality and pollution – nonpoint source and point source. Have them brainstorm examples of each. Are there any examples found in the river the class just did?

Debrief questions or journal activity:

a) What happened to the pollutants over time?
b) Where was the highest concentration of pollutants?
c) What are ways that individuals can limit their impact?
d) If they were a river animal, what part of the river would they like to live in?
e) Would they change how the altered their property if they could do it again?
f) How can water pollution impact their life?
g) Would they say the river is polluted or health?
III. All the water in the World

a) Remind the students that fresh water is a limited resource. Though much of the planet it covered in water, a small fraction of it is available to us for use.

b) Show the students the 1000 ml of water. This represents all the water in the world.

c) Pour 30ml of water into the 100ml graduated cylinder. This represents all the fresh water in the world. The remaining 970ml represents salt or ocean water.

d) Most of the fresh water is located at the poles or ice caps. Pour 6ml into a 10ml graduated cylinder. The 6 ml represents the non-freshwater on this planet.

e) Take the eyedropper and draw up one drop of water. This single drop represents all the unfrozen, surface fresh water (the water is available to us).
Extensions:

- Think local!
  - Ask your school, local parks or nature area if the students could do a trash clean up. An activity like this would be a great connection to students’ back yards.
  - Minnesota Water Quality Volunteering: Contact the Minnesota Pollution Control for more information or visit the website below.

- 3D Maps – These can be used to help students explore the water in their area. A large number of maps are available for including world, United States and Minnesota.
  https://repository.nced.umn.edu/browser.php?current=location&location=2&dataset_id=9
- EPA Kids Page
  http://water.epa.gov/polwaste/nps/kids/whatswrong/

Resources:

- Sum of the parts – Project WET
- Drop in the Bucket – Project WET
- Pollution Diagram - http://apesnature.homestead.com/chapter17.html