

Road Salt and Water Quality

Objectives: The goal of this lesson is for the audience to understand that road salt and other items on roadways have the potential to **runoff** into local waterways. When **pollutants** like road salt enter a waterbody, they impact water quality and can harm local wildlife.

Materials

- Portable Refractometer
- Pipettes
- Kim wipes
- Various water samples with varying level of salt content
- Watershed Model (if desired)
- Photos from binder
- Salt shaker

Vocabulary: watershed, groundwater, impervious surface, pollution, runoff, salinity, brine, infiltration, refractometer, chloride

Facts:

- Water that cannot soak into the ground is called **runoff**. If a **pollutant** is on the ground, especially on an **impervious surface** like a roadway, it can be carried along with the runoff directly into a waterbody. Runoff can be a serious source of water **pollution**.
- Western New York and the Great Lakes region receive high amounts of snowfall. These areas use road salt to help melt the snow and ice. The most commonly used de-icing chemical is **sodium chloride (NaCl)** also known more commonly as **road salt**. Road salt is used to reduce the adherence of snow and ice to the pavement, preventing the formation of hard pack.
- Salt lowers the freezing point of water, but loses its effectiveness below 15-20°F. Salt crystals pull water molecules out of the ice on the ground. This forms a brine. This brine accelerates melting.
- Road salt enters our water supplies through **runoff** into surface waters and **infiltration** into groundwater.
- In Erie County, 50 cities, towns and villages pool together to get their road salt. A ton of road salt cost \$56 in 2018, increasing from years past.
 - According to Erie County Department of Public Works, the price in road salt contributed to a \$400,000 budget hit to the county.
- **Chloride** concentrations are increasing at a rate that threatens the availability of fresh water in the northeastern United States. Increases in roadways and deicer use can impact salinity and chloride content in fresh waters, resulting in degradation of habitat for aquatic organisms, and impacting large supplies of drinking water for humans throughout the region. Road salt is currently not regulated as a primary contaminant to fresh waters of the United States.
- **Salinity** is the saltiness or dissolved inorganic salt content of a body of water.
 - Seawater has a chloride ion concentration of about 19,400 mg/L (a salinity of 35.0 ppt or 35%)
 - Brackish water in tidal estuaries may have chloride levels between 500 and 5,000 mg/L (salinity of 1 to 10 ppt).
 - Freshwater streams and lakes have chloride levels that can range from 1 to 250 mg/L (salinity of 0.001 to 0.5 ppt or less than 0.05%).

Activity:

- Use a plastic pipette to collect water from one of the provided sample jars.
- Open the cover plate on the refractometer and place 2-3 drops on the prism surface (blue)
- Close the cover plate and ensure the water has spread out over the surface of the prism
- Wait for a few moments, then look into the eyepiece. Works best in a bright area.
- Read for Salinity. Compare to other water samples. ****Note, water quality can also be tested specifically for Chloride to indicate presence of Road Salt Runoff.*** We are using a salinity meter for educational purposes as the test can be replicated over and over again at a low cost.



Discussion Questions

1. After a snowstorm, describe what the roads are like near your home or school.
2. How can we test to see if road salt applied to roadways is in the waterway?
 - a. Test water supplies before and after road salting
3. How does road salt get into the waterway?
 - a. Road salt dissolves into melt water and can runoff into a waterway
 - b. Road salt can dissolve into water and move through the soil into groundwater
4. How would you expect stream water in an area with a lot of roads to compare to stream water in an area with a forest without many roads?
 - a. More salt will be used in areas with more roadways.
5. Is salt a normal part of a forest or freshwater ecosystem? How will Salt impact these ecosystems?
 - a. No, organisms in these environments are not adapted to excess salt
6. Do alternatives to Road Salt exist?
 - a. Sand, Sugar beet juice, various salty brines
 - b. Best Management Practices exist to help municipalities use the correct amount of road salt to keep drivers safe, but also protect waterways and wildlife. Ask your local government official to learn more.