REDUCING ROAD SALT USE

IN ST. LOUIS COUNTY

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Road salt is used in the winter to melt snow, sleet, and ice on roads, sidewalks, and parking lots. While effective at improving road conditions, salt use is a problem for many reasons:

- Salt damages roads, bridges, and automobiles.
- Salt is toxic to plants, including lawns, landscape plants, and street trees.
- Salt is also toxic to freshwater fish and other animals that live in the streams and lakes where the salt eventually travels.
- Salt accumulates in groundwater and other drinking water sources.

Most road salt is sodium chloride (like table salt), although sometimes calcium chloride or potassium chloride are used as well. The chloride pollution from road salt is a common problem in cities where winter precipitation includes snow, sleet, and ice.

The US EPA has determined that chloride above 860 mg/l for short periods or above 230 mg/l for longer periods is harmful to the animals that live in lakes, streams, and rivers. (1) Missouri has adopted these levels as part of the state water quality standards.

Road salt storage facilities (top) hold tons of salt that are applied to roads (middle) as needed. Representatives from Saint Louis University, Metropolitan St. Louis Sewer District, area public works departments, the Missouri Department of Natural Resources, and several Missouri Stream Teams met to discuss chloride (bottom).

Managing Road Salt

Many urban water pollutants, like sediment and nutrients, can be decreased by increasing the amount of rainfall that soaks into the soil. This is done with rain gardens and stormwater basins that are often found near parking lots and in newer developments. The stormwater carries pollutants into these basins and takes advantage of the natural chemical and biological abilities of soil and plants.

Unfortunately, these same processes do not remove chloride. The salts remain dissolved and are carried into groundwater, causing further contamination. (2) Unlike other pollutants, there is no effective method for removing dissolved salts. The only way to reduce the amount of chloride in urban stormwater is to use less salt on our roads, sidewalks, driveways, and parking lots.

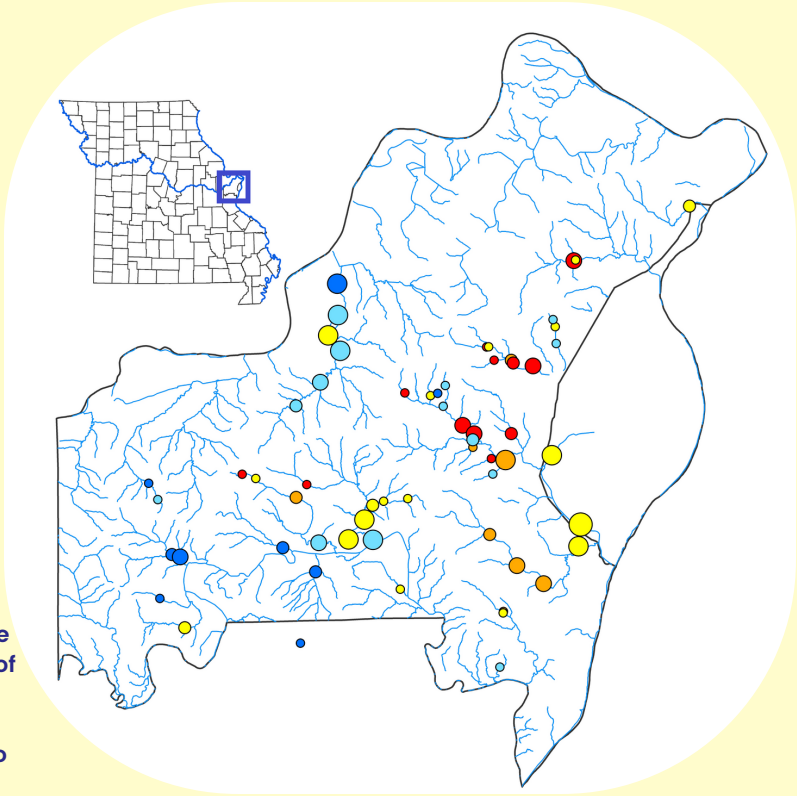
Several best management practices (BMPs) may be used to cut salt application during winter storms. (3) Those used in St. Louis and other nearby communities include adjusting equipment based on pavement temperature, accounting for vehicle speed, and using brine pre-treatment. The brine pre-treatment uses the same salt, but it is dissolved in water and spread on roads in advance of the forecasted storm, allowing a salt reduction of 25-75%. (4,5)

There are many potential advantages, both economic and environmental, to using brine as an anti-icing agent. Less salt is used which saves money, decreases damage to roads and cars, reduces impacts to aquatic life, and improves public safety. The City of Jennings reported a 46% decrease in salt use in the first year of brine application, despite a 26% increase in snowfall over the prior year. (6) Also, a study in 1992

Salt in Saint Louis County Streams

Chloride levels in many streams of St. Louis County increase following winter storms, often reaching amounts high above EPA recommendations.

Volunteers with the Missouri Stream Team program have been measuring chloride in local streams since 2012. They have found that chloride reaches higher levels in more densely populated areas.



Peak chloride levels measured in St. Louis County streams by Stream Team volunteers (2012-2018). Circle size indicates the size of the watershed. Circle color indicates the amount of chloride: dark blue is 230 mg/l or less; light blue is 231 to 860 mg/l; yellow is 861 to 1720 mg/l; orange is 1721 to 2400 mg/l; red is 2401 to 8000 mg/l.

Uncovered salt piles can waste materials and money as well as increasing chloride in nearby streams.

estimated infrastructure repair costs of $615 per ton of salt applied. (7) Other studies show that pre-treated roads allow pavement to remain free of snow and ice cover for a greater proportion of storm duration; this should lead to a decrease in the number and severity of motor vehicle accidents. (4)

While brine use is largely beneficial, there are potential drawbacks, particularly in areas like St. Louis where winter weather is often hard to predict. Brine might be applied in anticipation of a weather forecast of snow or sleet. If the storm begins when temperatures are above freezing, there is a strong likelihood that the brine will wash away before the rain changes to ice or snow, causing an increased expense and a larger amount of salt in streams. (4) If the use of brine pre-treatment is to be recommended as a BMP, it is important to determine if its use will, in fact, decrease the amount of salt applied to roads and the amount of chloride delivered to streams.

Application of road salt (left) and brine pre-treatment (right) on highways to keep roads safe during winter storms.

References

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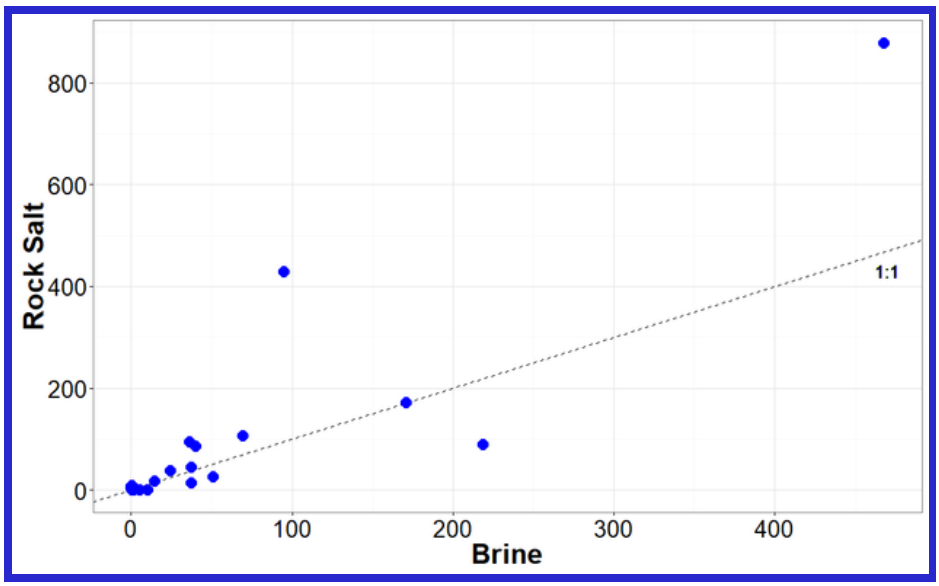
Brine Pre-Treatment as a Best Management Practice

Researchers at Saint Louis University have been working in cooperation with the Metropolitan St. Louis Sewer District (MSD) and US EPA to learn if brine pre-treatment is effective in our region. We compared levels of chloride coming from three cities that use brine (Jennings, Webster Groves, and Ballwin) to neighboring cities that rely entirely on rock salt (Ferguson, Rock Hill, and Manchester).



Comparison of chloride measured in cities that use brine versus neighboring cities that use only rock salt. If their use was the same, the points would fall on the dashed 1:1 line. Instead, most of the points are above the line, indicating that the community using brine used less chloride. Units are grams of chloride per square meter of roadway.

Dataloggers placed in the stormwater pipes in these cities were used to estimate the amount of chloride being carried from roads to local streams. These amounts were then compared between neighboring cities during 12 storms in the winters of 2016-17 and 2017-18:

- Differences from one storm to another show that city managers and their road crews consider the characteristics of each storm when selecting best management practices to use when applying salt for a given storm.
- Both Jennings and Ferguson use very little road salt.
- In the other two pairs, the city that uses brine used notably less salt during most storm events.

Dataloggers in the stormwater pipes.

Individual Responsibility

We can all do something to reduce chloride pollution.

Be an Example:
Avoid using salt on your property. Shovel first and use sand as needed. Or just wait a day - the snow will probably melt.

Be Informed:
Join the Missouri Stream Team and monitor chloride in your local streams.

Be an Advocate:
Talk to your neighbors about road salt, especially schools, churches, and businesses that salt their parking lots and walkways.

Best management practices (BMPs) described here are not intended as policy for winter deicing, but as a source of information on BMPs.

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