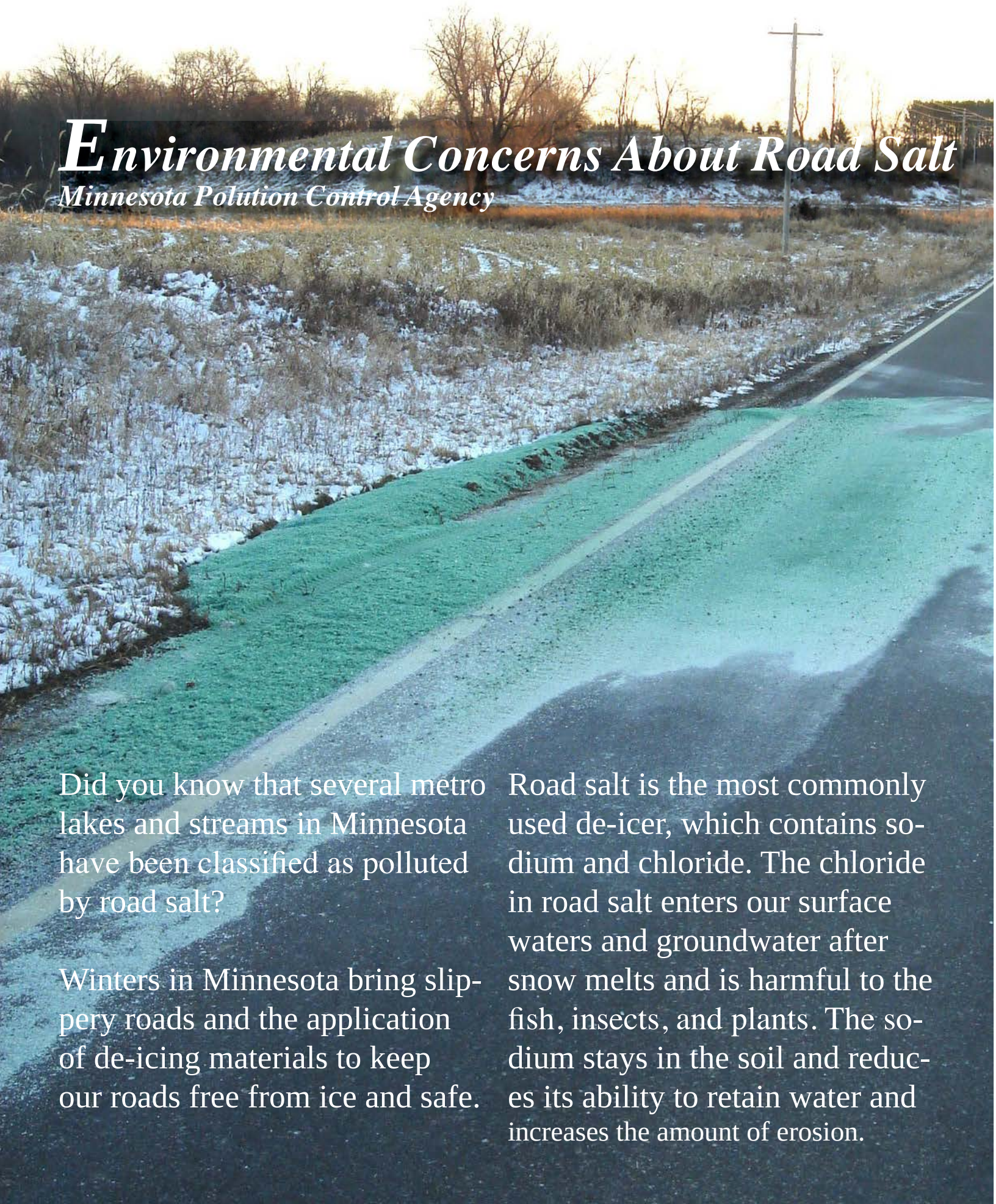
Environmental Concerns About Road Salt

Minnesota Polution Control Agency



Did you know that several metro lakes and streams in Minnesota have been classified as polluted by road salt?

Winters in Minnesota bring slippery roads and the application of de-icing materials to keep our roads free from ice and safe.

Road salt is the most commonly used de-icer, which contains sodium and chloride. The chloride in road salt enters our surface waters and groundwater after snow melts and is harmful to the fish, insects, and plants. The sodium stays in the soil and reduces its ability to retain water and increases the amount of erosion.

Too much salt results in costly damages and serious environmental consequences.

While progress in Minnesota has been made in these areas, there is still much work to do in order to meet water quality standards and achieve a high level of road safety. In 2010, the MPCA more than doubled the number of waters that are listed as impaired for chloride.

A study conducted by the University of Minnesota determined a chloride mass balance for the Twin Cities Metropolitan Area (TCMA) and found that approximately 78% of all chloride generated in the TCMA is being retained in the TCMA. This includes all of the main sources of chloride: chloride from road salt, wastewater treatment plants, water softeners, and other industrial sources.

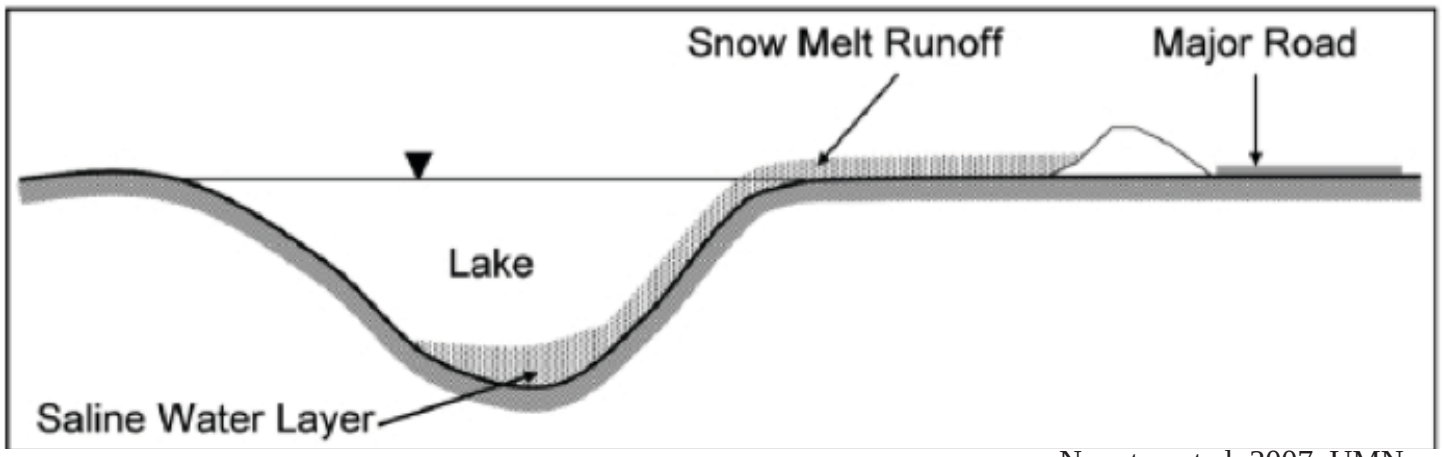
Chloride is a conservative ion (meaning it moves with water without being broken down or lost). Once the chloride is in the water, the only known technology for its removal is reverse osmosis through massive filtration plants, which is not economically feasible. This means that chloride will continue to accumulate in the environment. A high chloride concentration in both the aquatic and terrestrial environment has some of the following implications for human consumption, aquatic life, and plant life:

- At high concentrations chloride is toxic to fish and insects
- At lower levels chloride can negatively affect the fish and insect community structure, diversity and productivity
- Direct road salt splash can kill plants
- Sodium in the road salt destroys soil stability, decreases the soils ability to infiltrate water, and can increase soil erosion.
- Some animals living near or relying on chloride polluted waters are sensitive to road salt

While research does exist that identifies the negative impacts that chloride and specifically road salt has on the environment, there are still many unknowns. Continued research will help us to better understand how chloride interacts with the environment and therefore how to properly manage our water resources.

Follow these simple tips to protect our water!

There are many ways to reduce salt use while maintaining high safety standards.



Novotny et al. 2007, UMN

- Shovel. The more snow and ice you remove manually, the less salt you will have to use and the more effective it can be. Whether you use a shovel, snow blower, snow plow, or ice scraper, get out there as early as you can and keep up with the storm. You may even decide that salt isn't needed.
- 15°F is too cold for salt. Most salts stop working at this temperature. Use sand instead for traction, but remember that sand does not melt ice. Use the reference table below to apply the correct product for the conditions.
- Slow down. Drive for the conditions and make sure to give plow drivers plenty of space to do their work.
- Be patient. Just because you don't see salt on the road doesn't mean it hasn't been applied. These products take time to work.
- More salt does not mean more melting. Use less than 4 pounds of salt per 1,000 square feet (an average parking space is about 150 square feet). One pound of salt is approximately a heaping 12-ounce coffee mug. Consider purchasing a hand-held spreader to help you apply a consistent amount.
- Sweep up extra. If salt or sand is visible on dry pavement it is no longer doing any work and will be washed away. Use this salt or sand somewhere else or throw it away.
- Watch a video. This video, produced by the Mississippi River Watershed Management Organization, provides tips to homeowners about more environmentally friendly snow and ice removal: Improved Winter Maintenance: Good Choices for Clean Water. http://www.youtube.com/watch?v=qc8Y-_Nmfmo
- Share a brochure. Read and pass along Nine Mile Creek Watershed District's brochure about residential snow and ice care. You can find it on Nine MIle Watershed District's education page. http://www.ninemilecreek.org/EDUCATION/EducationPrograms.asp

- Check out other resources. If you are responsible for snow and ice removal somewhere other than your home, please check out our training and resources tab.

Know about the salt product

Salts can range from simple table salt to calcium chloride. Salts are used because they are able to decrease the freezing point of water. Whatever product you chose, make sure you know at what temperature it stops working. We recommend using the table below as labels may be misleading. Note that pavement temperatures are usually warmer than air temperatures. To find out the pavement temperature near you, search the Road Weather Information Service, http://www.rwis.dot.state.mn.us/.

Calibrate your equipment and know where you are applying your snow and ice removal chemistries. ***photo Ken Rost***

Winter Parking Lot and Sidewalk Maintenance

Key Information Needed:

- Pavement Temperature (it will be different than air temperature)
- Parking lot area (or drive lane distance) = Length x Width
- Amount of material your truck or sander delivers at each setting and speed.

Use less! About one tsp. of salt contaminates 5 gallons of water.

TIPS:

- De-icers melt snow and ice. They provide no traction on top of snow and ice.
- Anti-icing prevents the bond from forming between pavement and ice.
- De-icing works best if you plow before applying material.
- Pick the right material for the pavement temperatures.
- Sand only works on top of snow as traction. It provides no melting.
- Anti-icing chemicals must be applied prior to snow fall.
- NaCl (road salt) does not work on cold days, less than 15º F.

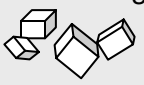
Help protect our lakes, streams, wetlands, and drinking water!

Use best practices for winter maintenance.

Melt Times for Salt (NaCl) at Different Pavement Temperatures

Pavement Temp. ºF	One Pound of Salt (NaCl) melts	Melt Times
30º	46.3 lbs of ice	5 min.
25º	14.4 lbs of ice	10 min.
20º	8.6 lbs of ice	20 min.
15º	6.3 lbs of ice	1 hour
10º	4.9 lbs of ice	Dry salt is ineffective and will blow away before it melts anything

Pick your material based on lowest practical melting temperature, not eutectic temperature which is often listed on the bag.



Melting Characteristics	
Chemical	**Lowest Practical Melting Temp.**
$CaCl_2$ (Calcium Chloride)	-20º F
KAc (Potassium Acetate)	-15º F
$MgCl_2$ (Magnesium Chloride	-10º F
NaCl (Sodium Chloride)	15º F
CMA (Calcium Magnesium Acetate)	20º F
Blends	Check with manufacturer
Winter Sand/Abrasives	Never melts—provides traction only

Variables affecting application rate

Increase rate:	*Decrease Rate:*
Compaction occurs & cannot be removed mechanically	Light snow or light freezing rain
There is a lot of snow left behind	Pavement temperature is rising
	Subsequent applications

Minnesota Pollution Control Agency

FORTIN CONSULTING, INC. serving the environment

CTAP Circuit Training and Assistance Program

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Scott Celebrating 150 Years

LTAP Minnesota Local Technical Assistance Program

GGP General Growth Properties, Inc.

October 2010 revision File available at www.pca.state.mn.us/roadsalt

Deicing Application Rate Guidelines for Parking Lots and Sidewalks

These rates are adapted from road application guidelines (Mn Snow & Ice Control Field Handbook, Manual 2005-1). Develop your own application rates using the guidelines as a starting point and modify them incrementally over time to fit your needs. The area should first be cleared of snow prior to applying chemical.

Pavement Temp. (ºF) and Trend (↑↓)	Weather Condition	Maintenance Actions	Application Rate in lbs. per 1000 square foot area			
			Salt Prewetted/ Pretreated With Salt Brine	Salt Prewetted/ Pretreated With Other Blends	Dry Salt	Winter Sand (abrasives)
>30º↑	Snow	Plow, treat intersections only	0.75	0.5	0.75	not recommended
	Frz. Rain	Apply chemical	1.25	1.0	1.5	not recommended
30º↓	Snow	Plow & apply chemical	1.25	1.0	1.5	not recommended
	Frz. Rain	Apply chemical	1.5	1.25	1.75.	not recommended
25 - 30º ↑	Snow	Plow & apply chemical	1.25	1.0	1.5	not recommended
	Frz. Rain	Apply chemical	1.5	1.25	1.75	not recommended
25 - 30º ↓	Snow	Plow & apply chemical	1.25	1.0	1.5	not recommended
	Frz. Rain	Apply chemical	1.75	1.5	2.25	3.25
20 - 25º ↑	Snow or Frz. Rain	Plow & apply chemical	1.75	1.5	2.25	3.25 for frz. rain
20 - 25º ↓	Snow	Plow & apply chemical	2.0	2.0	2.75	not recommended
	Frz. Rain	Apply chemical	2.5	2.0	3.0	3.25
15º to 20º ↑	Snow	Plow & apply chemical	2.0	2.0	2.75	not recommended
	Frz. Rain	Apply chemical	2.5	2.0	3.0	3.2
15º to 20º ↓	Snow or Frz. Rain	Plow & apply chemical	2.5	2.0	3.0	3.25 for frz. rain
0 to 15º ↑ ↓	Snow	Plow, treat with blends, sand hazardous areas	not recommended	3.0	not recommended	5.0 spot treat as needed
< 0º	Snow	Plow, treat with blends, sand hazardous areas	not recommended	4.5	not recommended	5.0 spot treat as needed

To determine the amount of material needed, take the application rate x parking lot area / 1000 ft^2 . ***Example:*** Given a 300,000 sq. ft. parking lot and an application rate of 1.5 lbs/1000ft^2 1.5 x 300,000 = 450,000 450,000/1000 = 450 lbs (nine 50 lb. bags).

Anti-Icing Guidelines

These are a starting point only. Adjust based on your experience.

Condition	Gallons/1000 sq. ft.		Other Products
	$MgCl_2$	Salt Brine	
1. Regularly scheduled applications	0.2 - 0.4	0.3 – 0.6	Follow manufacturers' recommendations
2. Prior to frost or black ice event	0.2 - 0.4	0.3 – 0.6	
3. Prior to light or moderate snow	0.2 - 0.4	0.3 – 0.8	

CAUTION: Too high an application rate may result in slippery conditions or tracking.