

# SUSTAINABLE SNOW?

In recent years, the industry has seen a shift in focus that extends beyond environmentally friendly products

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**THE ENVIRONMENTAL IMPACT** of snow and ice management operations is well-known. But a maturing industry must take a more sustainable approach to make a true impact. This section takes a look at how far the industry has come and the work still to be done.

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**T**he issues and opportunities associated with green practices for the snow and ice management industry have evolved since SIMA and *Snow Business* magazine reported on the topic in September 2007. Being “green” means more than it did eight years ago, particularly for the snow and ice management industry. Terms like “carbon footprint,” “environmentally friendly” and “global warming” were most closely associated with opportunities for fuel efficiency, reduction in carbon emissions and the use of materials that were branded (sometimes erroneously) as “environmentally friendly.” Today there is a more diverse set of issues upon which the snow and ice management profession has an opportunity to influence and make a positive impact.

### Green versus sustainable

One striking comparison from eight years ago is the term “green” compared to today’s more recent focus on sustainability. The principal focus of being green is environmental. The principles of sustainability are a holistic focus of economic responsibility, environmental stewardship and social license to operate — particularly related to the reputation of an individual, business or company. In the business world, the principles of sustainability are sometimes referred to as “triple bottom line.” Since beginning the discussion on green snow practices eight years ago, several terms (some confusing) have been introduced, leaving us to question what the correct terms are and what we should focus on as in industry.

### Carbon reduction vs. salt reduction

In the previous decade, the greatest influence being promoted for the environment was how we contribute and affect our carbon footprint. As an industry this boiled down to controlling what we drive, how we drive it and what type of fuel we used to power it. The overarching theme and facts from SIMA’s initial green report in 2007 remain virtually the same. Diesel fuel technology continues to be the most cost-efficient, carbon-efficient fuel to use when possible, particularly for

larger vehicles and equipment. Most of the new engine technology and clean fuel research that’s been developed in the past decade is available to the general public, is strongly supported and mandated by government regulation and is becoming more affordable for all industries to implement.

Today there is more research and more facts than ever that show the greatest environmental effect the snow & ice management industry can influence is through water quality.

### Water quality impacts

From a sustainability perspective, causes for alarm include the environmental effects salt has on freshwater resources; damages caused to infrastructure and landscapes; and the reputation of a virtually unregulated snow and ice industry that contributes to these issues.

A majority of contractors surveyed by the University of Waterloo iTSS lab reported applying excess salt to avoid slip-and-fall claims. Seventy-five percent reported 10% or more salt could be saved if litigations and insurance premiums were not a concern. (Hossain, 2014). Furthermore, a majority of contractors surveyed are charging extra for salting and are charging by the quantity of salt used rather than for the quality of the results achieved.

Framed by the principles of sustainability, responsible salt application requires a balanced approach of environmental stewardship with economic benefit and social responsibility of protecting your neighbors’ drinking water. A sustainable approach to applying deicing salt is not possible to achieve so long as those who are applying salt continue to be compensated for the amount of salt that is applied rather than being compensated for responsibly achieving a desired result.

According to *the Global Risks 2014 Insight Report* published by the World Economic Forum, two of the top 10 global risks of highest concern in 2014 directly relate to the snow and ice management Industry: No. 3 is “water crisis” and No. 6 is “greater incidence of extreme weather events.” When thinking of water crisis, people typically think of water shortages more so than water quality. In regions of North America where snow and water are in abundance, our attention as an industry requires us to focus on how our practices for applying salt affect the quality of freshwater resources, including open source lakes and streams, watersheds and underground aquifers, all of which can be sources for drinking water.

### Salt’s effects

Many research studies and white paper publications focusing on chloride and sodium contamination in lakes, streams and rivers have been conducted since the September 2007 *Snow Business* article was published. For example:

► Streams in New York, Maryland and New Hampshire with sodium chloride concentrations as high as 5 g/l (25% of the concentration of sea water) were measured in some urban streams during the winter. During the summer, concentrations were upward of 100 times higher than unpolluted streams in undeveloped forest regions. (Kaushal et al., 2005).

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► A study conducted by the University of Minnesota in 2007 included an analysis of sodium chloride concentrations in Waterloo, Ontario, where urban wells revealed as much as 40% of salt loading can be attributed to salt application on private roads, parking lots and sidewalks. (Novotny et al., 2007)

► Researchers in New Hampshire determined that 50% of salt introduced into the I-93 corridor / Policy-Porcupine Brook watershed was from parking lots and 36% was contributed by state and municipal roads (Burack et al., 2008).

► A 20-year study in upstate New York found a doubling in salt concentrations in the watershed, with 91% attributed to road salt application and 9% to sewage and water softeners (Kelly et al., 2008). In the Mohawk River Basin in Upstate New York, estimated concentrations of Calcium (Ca), Magnesium (Mg) and Potassium (K) ions during the 1990s were similar to estimates from the 1950s, with all three showing a modest increase of around 10%. Sodium (Na) and Chloride (Cl) ions, on the other hand, increased by 130% and 243%, respectively. Researchers reported the only plausible source of Na and Cl that could account for the large mean daily yields was road salt (Godwin et al., 2003).

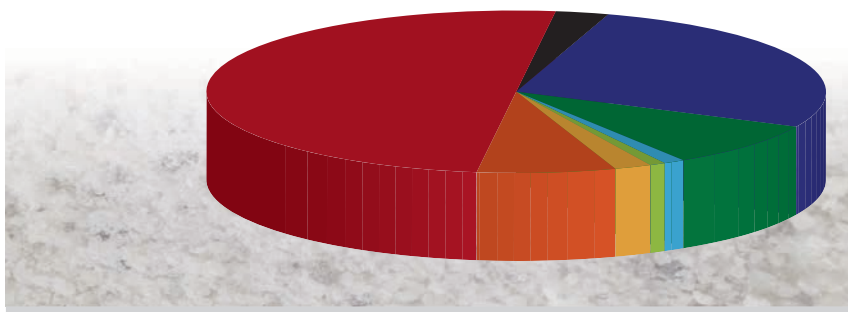
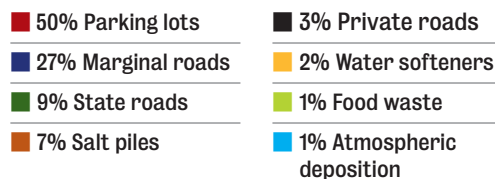
Road deicing salt (NaCl) also

## TROUBLE IN NEW HAMPSHIRE

A 2008 study on chloride contamination along the I-93 corridor helped lead to the creation of New Hampshire's Green SnowPro certification.

Total imports:  
4,814 tons/yr

Imports divided  
by drainage area:  
473 tons/sq mile



SOURCE: BURACK ET AL. 2008

influences the chemistry of the soils it infiltrates. Research has proven Chloride ions are conservative substances that have little effect on soil chemistry. However, Sodium ions take part in a chemical process that changes the soil properties and affects its fertility (Novotny et al., 2007). This is why turf and landscape plant damage is observed in areas where salt applications have been overused beyond the target surfaces.

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Today there is more research and more facts than ever that show the greatest environmental effect the snow & ice management industry can influence is through water quality.

# 3x

Salt levels have tripled in Lake George, NY, since 1980 and are more than 30 times above the natural background characteristic of Adirondack lakes in undeveloped watersheds

*Source: Fund for Lake George*

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### Environmental progress

From an environmental perspective, the industry hasn't changed much in the past decade. There continues to be a lack of environmental regulations, standards and licensing that specifically apply to snow and ice management. We are an industry that, in most cases, is still allowed to apply as much salt deemed necessary without any required education or licensing and without any formal oversight, regulations and standards by which to abide. Simultaneously there is an increasing focus on freshwater quality that has sparked debates at local, state, federal and international levels, both in the public and private sectors.

A number of state and provincial organizations throughout North

## ANTI-ICING APPLICATION GUIDELINES

	With Liquid Salts	With Regular Solid Salt
Lowest Practical Temperature °C (°F)	-7° (-19°)	-9° (-16°)
Event Conditions	Less effective for wet snow and heavy event	Less effective for dry snow and heavy event
Recommended Application Rate	3L per 1,000 sq. ft. (0.032 L/m <sup>2</sup> )	5 lbs. per 1,000 sq. ft. (24 g/m <sup>2</sup> )
Additional Treatments	To make the most of the anti-icing operations, snow should be plowed in a timely fashion. After the site is plowed, a low amount of salt could be applied to melt the remaining snow.	
Other Notes: Liquid salts are typically more effective than solid salt for anti-icing. ¹Liquids salts tested were brine, Caliber M1000, Snowmelt and Fusions.		

America have been formed over the past decade to address the growing effects salt is contributing to their freshwater resources. Some organizations have been successful in influencing voluntary regulation of salt usage through training and legislation:

**Smart About Salt Council** is a non-

profit organization established in the region of Waterloo, Ontario, Canada, with a mission "to protect freshwater from winter salt applied on facilities." It offers a voluntary training certification for anyone willing to improve their salt application practices. Learn more at [www.smartaboutsalt.com](http://www.smartaboutsalt.com).

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## RECOMMENDED BASE APPLICATION RATES FOR UP TO 2 CM (0.8 IN) SNOW

Rates shown are pounds per 1,000 square feet (grams per square meter)

Average Pavement Temp of the Event, °C	Bare Pavement Regain Time (hours)		
	1~2	3~4	5~6
-1 to -3 (30 to 27°F)	15 (73)	6 (29)	4 (20)
-4 to -6 (25 to 21°F)	45 (220)	15 (73)	10 (49)
-7 to -9 (19 to 16°F)	84 (415)	35 (171)	20 (98)

The University of Waterloo, in partnership with SIMA and other industry organizations, is working to develop best practices for application rates of deicing materials. The tables above and at left show some of their preliminary research.

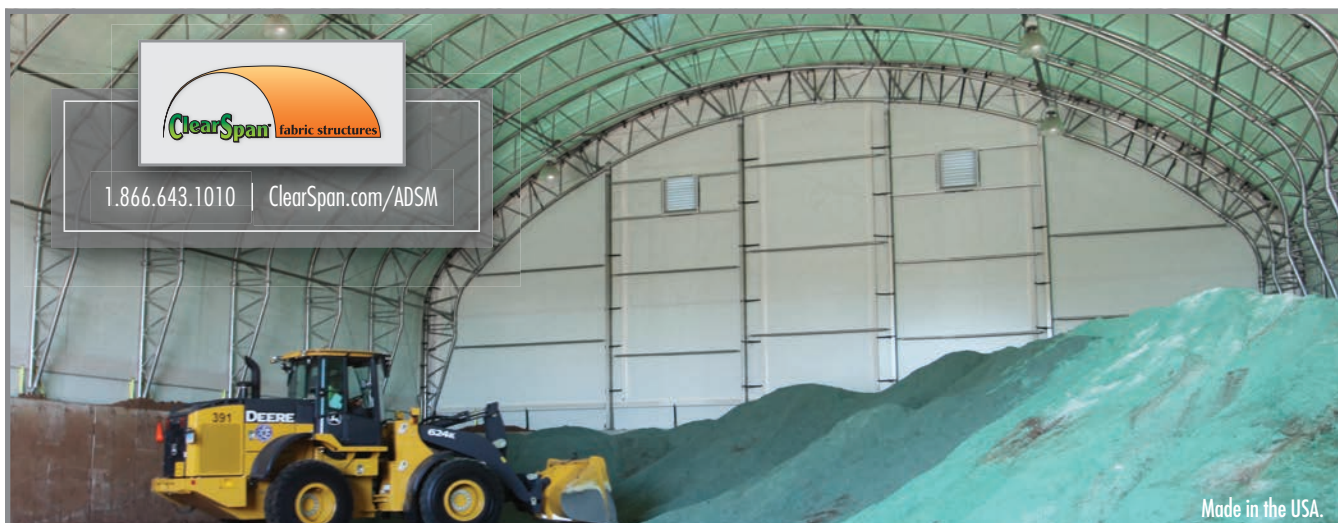
**The Green SnowPro certification** was developed in New Hampshire as part of a joint initiative between the New Hampshire State Legislature and the New Hampshire Department of Environmental Services with a goal of reversing the effects of chloride

contamination in surface water throughout the state, particularly along the I-93 corridor. For the past two years, SIMA has partnered with New Hampshire DES and the University of New Hampshire to provide continuing education requirements for the Green

SnowPro certification and education curriculum for the New Hampshire annual Salt Reduction Symposium. Learn more at [www.des.nh.gov](http://www.des.nh.gov).

**The FUND for Lake George** is a not-for-profit, privately funded organization dedicated to the protection of Lake George in New York. Formed in 1980, the FUND applies a science-guided approach to protection focused on Lake George water quality and the overall health of the Lake George watershed. Recently, the organization sought help from SIMA and the local departments of public works that apply salt near the 32-mile-long lake in developing salt reduction strategies and training with a goal of reversing the increasing effects salt has had on the lake over the past 30 years. Studies have shown the levels of sodium chloride in Lake George are

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Booth #106

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### >> Brine Making Step-By-Step

Thursday, June 25,  
2:00 p.m.



### >> Using Liquids To Cut Costs & Grow Profits

Thursday, June 25, 3:30 p.m.

### >> Contractor Panel Discussion: How To Get Property Owner 'Buy- In' on Liquids

Thursday, June 25,  
5:00 p.m.



### >> The X Factor in Liquid Deicer Performance

Friday, June 26, 10:00 a.m.

### >> Liquid Application Strategies

Friday, June 26,  
11:30 a.m.



All programs are 30-45 minutes  
each followed by Q&A.



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30 times what they were in 1985. The organization, in partnership with SIMA, is planning a salt reduction symposium later this year. Learn more at [www.fundforlakegeorge.com](http://www.fundforlakegeorge.com).

**Waterloo's iTSS Research Lab** (in collaboration with SIMA and Landscape Ontario) is working to validate and revise application rates that have been developed during a three-year academic research project and control study co-sponsored by SIMA and conducted by the university entitled "Snow and Ice Control for Parking Lots and Sidewalks."

The next phase of research includes a validation process being performed by SIMA members who are applying and measuring salt at a practical level and comparing their results with the initial application rate recommendations developed by the university. To download the report, visit [www.sima.org/resources](http://www.sima.org/resources).

**Baseline statistics and standards for salt application** began to be compiled last snow season. SIMA, in collaboration with former University of Waterloo research associate and current CEO of Viasys Inc., Raqib Omer, is working with SIMA members on consistent equipment calibration, salt application rates, and salt usage totals throughout the season. The goal is to develop standardized methods for determining the most environmentally responsible application rates that affordably meet typical levels of expectation (LOS), provide safe conditions, and are defensible against slip-and-fall claims. Initial results from

SIMA's goal is to develop standardized methods for determining the most environmentally responsible application rates that affordably meet typical levels of expectation, provide safe conditions, and are defensible against slip-and-fall claims.

the first season will be presented at the 2015 Snow and Ice Symposium in Schaumburg, IL. If you are interested in learning more or participating in the SIMA Salt Research project, contact Phill Sexton at [phill@sima.org](mailto:phill@sima.org).

### Where can progress be made?

For the industry to make any legitimate progress, snow and ice management professionals must begin to take steps to become environmental stewards of the industry. Following are five opportunities where the industry can begin to make an impact.

**Calibrate and measure.** A survey by the University of Waterloo indicated nearly half of the contractors and municipal organizations surveyed don't use or don't have guidelines for determining the best application rates for salt application. Furthermore, more

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than 70% do not have equipment that accurately measures the amount of salt being used at different locations (Hossain, 2014).

The ability to reduce the amount of salt you are applying first requires you to be able to consistently measure how much you apply. Choose a consistent method to calibrate and adjust the flow rate of salt, and establish a uniform ground speed for operators to apply salt that will enable consistency for measuring.

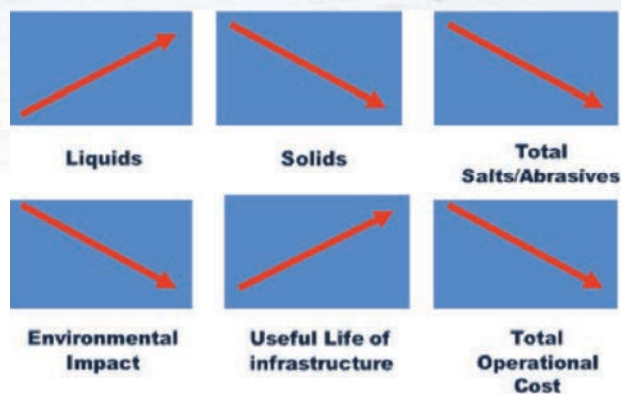
**Anti-icing** is the proactive method of applying salt to prevent the bond of snow and ice to paved surfaces. This method is typically applied in a liquid form (brine) and can also be applied as a solid. The benefits of anti-icing include maintaining friction on the surface, which helps to alleviate the risk of slip and falls, and enables a cleaner scrape when plowing accumulated snow. Research has shown this proactive method requires only a quarter (or less) the amount of salt that is required to reactively melt snow and ice that has bonded to a paved surface.

**Charging for the quantity of salt applied** (by the pound or ton) no longer makes sense for our industry. Charging for salt with no consideration for standard methods or rates is not sustainable. The solution? Changing to a pricing method that accounts for meeting LOS expectations and providing accessible and safe conditions — not for the amount of salt used. The last



### EFFECTS OF ANIT-ICING WITH BRINE

Contractors who increase their use of liquids can help lower their environmental impact, increase the useful life of infrastructure and lower costs.



two seasons of salt inventory shortages throughout North America have proven we, as an industry, are capable of using less salt and achieving the minimum required results when forced.

**Developing a budget strategy** to consistently upgrade the quality of your fleet can be a benefit. New engine technologies and government fuel efficiency mandates are introduced to market on a regular cycle that promote cleaner and more efficient fuel alternatives. Additionally, new plowing and ice management equipment and technologies are continuously being introduced that

support our ability to use less salt.

**Become a leader** and get involved with the research. Contact Phill Sexton to learn more about how you can be involved in future salt research efforts being led by SIMA and their research partners.

**Be informed** by obtaining resources and training that can help you implement these sustainable practices. Visit SIMA's Resources 24/7 Training Center at [www.sima.org/resources](http://www.sima.org/resources) or contact the SIMA office 414-375-1940. ✱

*Phill Sexton is Director of Outreach and Chief Knowledge Officer for SIMA. Contact him at [phill@sima.org](mailto:phill@sima.org).*

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