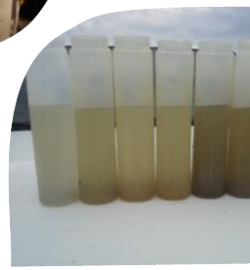
Sustainable Technologies
EVALUATION PROGRAM

Salting the Earth: The Unintended Impacts and What We Can do to Prevent Them

Lake Ontario Evening
November 22, 2018

Tim Van Seters, TRCA



STEP Water is a partnership between:

Toronto and Region Conservation for The Living City

Credit Valley Conservation inspired by nature

Lake Simcoe Region conservation authority

Salting the Earth

"Romans sack the city ….razing the land…passing the ploughshare over the site….sowing salt in the furrows…the emblem of barrenness and annihilation"

Over 2000 years later….

10 – 20 million tons used today in US (5 million tons in Canada)

1942
5000 tons spread nationwide

1938
road salts used in New Hampshire

Declared as ‘toxic’ in 2001

1995-2000

- 5 year federal science assessment of environmental impact of road salt under Canadian Environmental Protection Act (CEPA)

2001

- Concludes that road salts harm freshwater ecosystems, vegetation, drinking water, and wildlife
- Declared as ‘toxic’ under section 64 of CEPA

2003-2004

- Multi-stakeholder developed voluntary Code of Practice for the environmental management of salt
- Private parking lots and sidewalks largely ignored

Salt is not Regulated

- No licensing
- No permitting
- No registration
- No mandatory standards
- No reporting requirements

Widespread impacts

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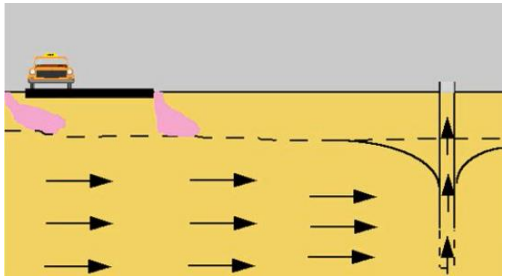
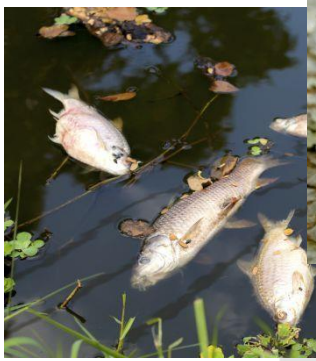
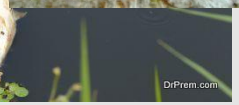
Soil Structure



Groundwater

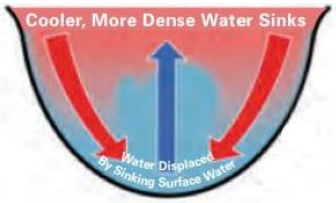




Fish and Wildlife

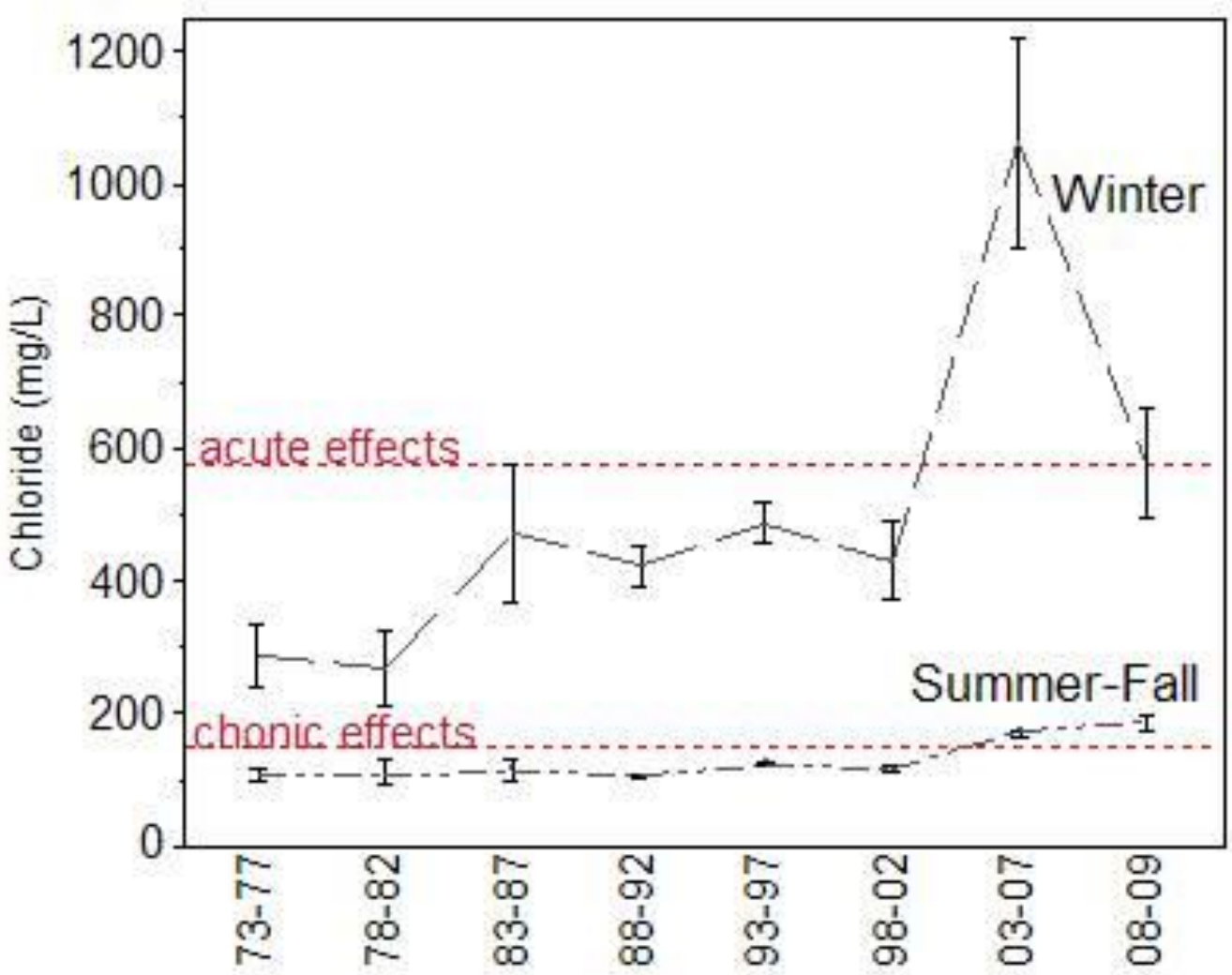
Vegetation

Infrastructure

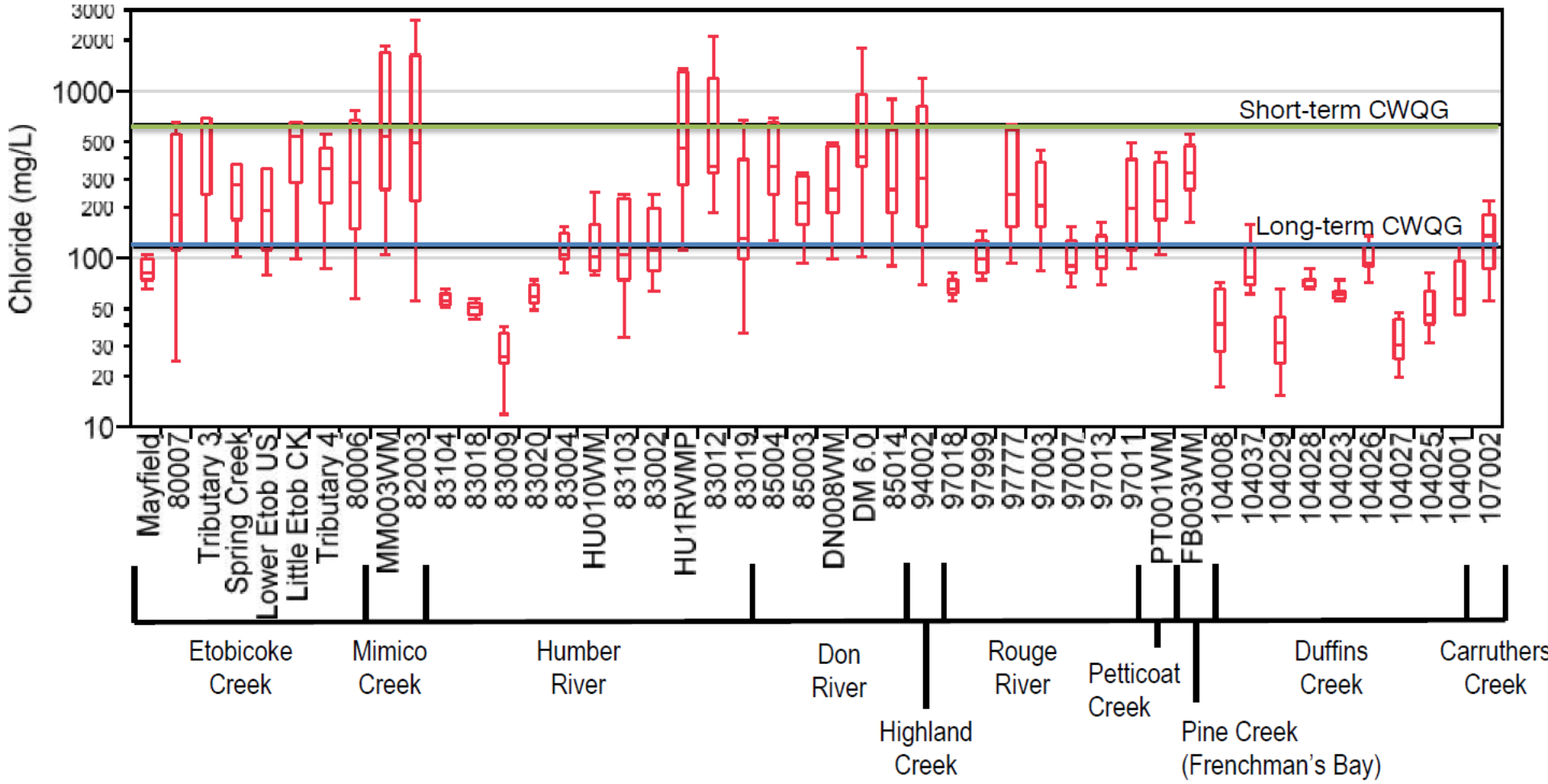


Lake Turnover;
Stormwater
Pond function

Rising Trends in Toronto Streams



Regular exceedance of toxicity thresholds



Lots of media attention!

NEWS

FEBRUARY 17, 2017 AT 5:00 PM | 12 COMMENTS

Road Salt Is Toxic And Should Be Regulated

Each winter, more than 120,000 tonnes of salt is dumped on Toronto pavement.

BY CATHERINE MCINTYRE

BROUGHT TO YOU BY TORONTO AND REGION CONSERVATION.

Road salt is devastating for the city's buildings, infrastructure and wildlife, not to mention clothes and our pet's paws. Torontoist Flickr photo courtesy of user Benjamin Moogk.

THE STAR

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News · World

How road salt is contaminating North America's lakes

By BEN GUARINO The Washington Post
Mon., April 10, 2017

Corrosion by water, road salt key in Ontario mall collapse

Former Elliot Lake mall maintenance manager testifies at public inquiry

CBC News · Posted: Mar 19, 2013 11:40 AM ET | Last Updated: Mar 19, 2013 5:54 PM ET

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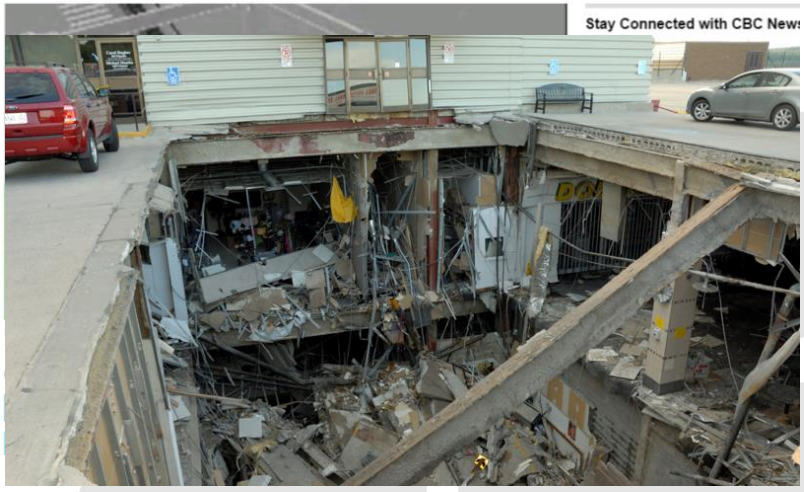

News / Insight

Blue crabs in Mimico Creek an urban mystery

Where did the salt-water creatures come from? Since they were discovered last summer, experts have been trying to solve the riddle.

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JACQUELYN MARTIN / AP

NATIONAL POST

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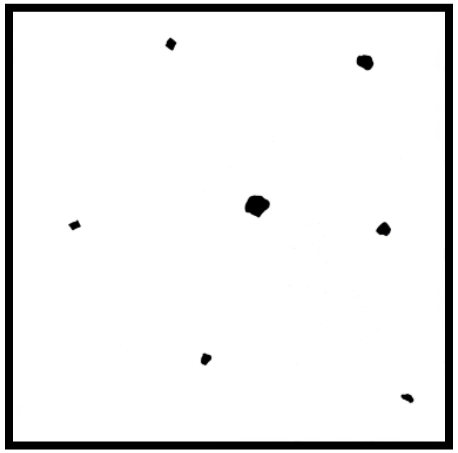
How Canada's addiction to road salt is ruining everything

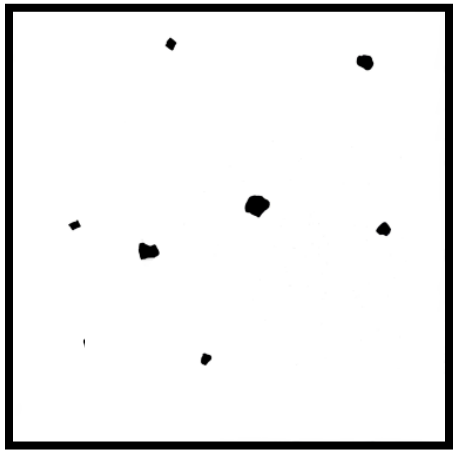
Bringing down bridges, melting cars, poisoning rivers; it's hard to think of something salt isn't ruining

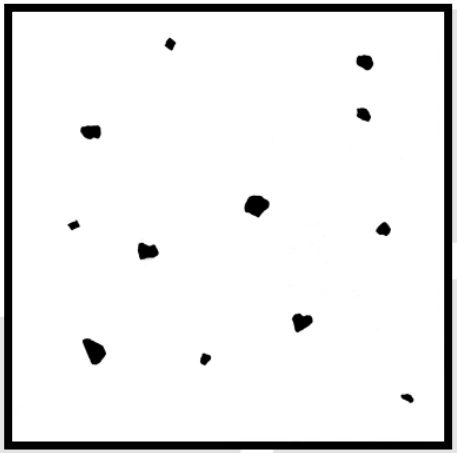
So What Can be Done?

Reduction is Critical: But what does 'enough' look like?

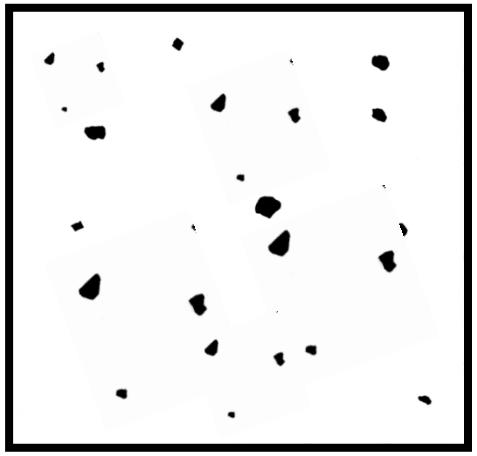


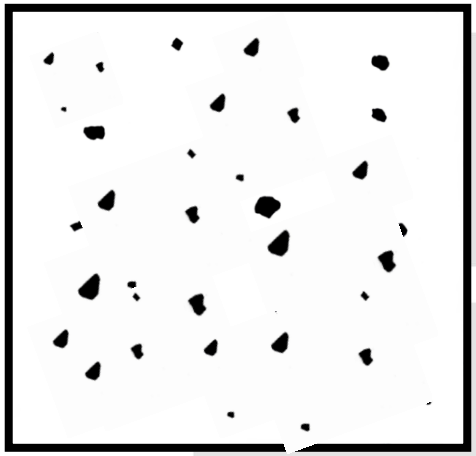
MTO mean rate: 20 g/m^2

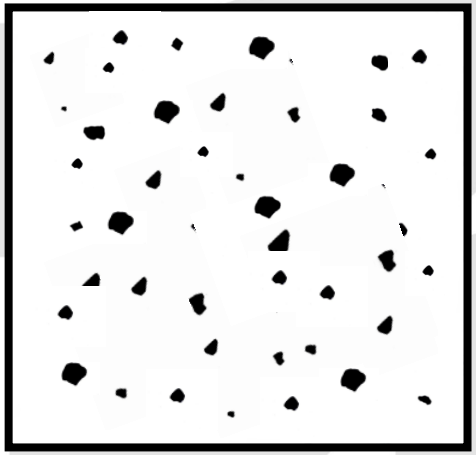




Parking Lot mean rate: 58 g/m^2
SIMA/U of Waterloo

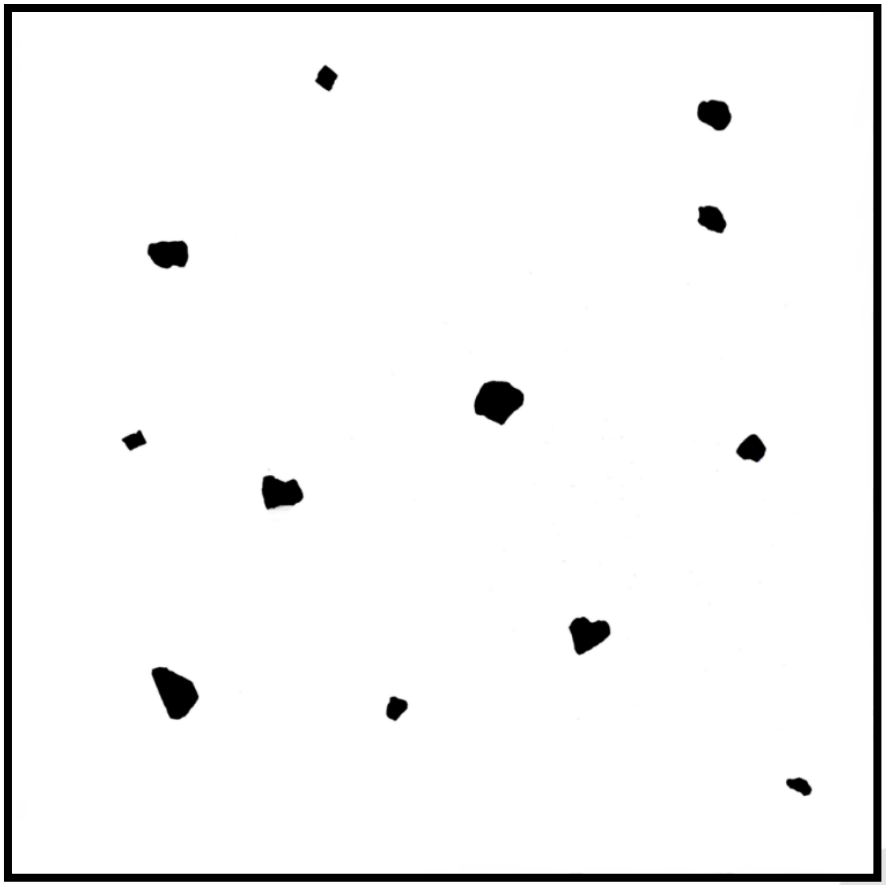






Typical Parking Lot Rate

Real World Visuals



58 g/m²

60 g/m²

Photos: LSRCA

Real World Visuals

488 g/m²

656g/m²

4,766 g/m²

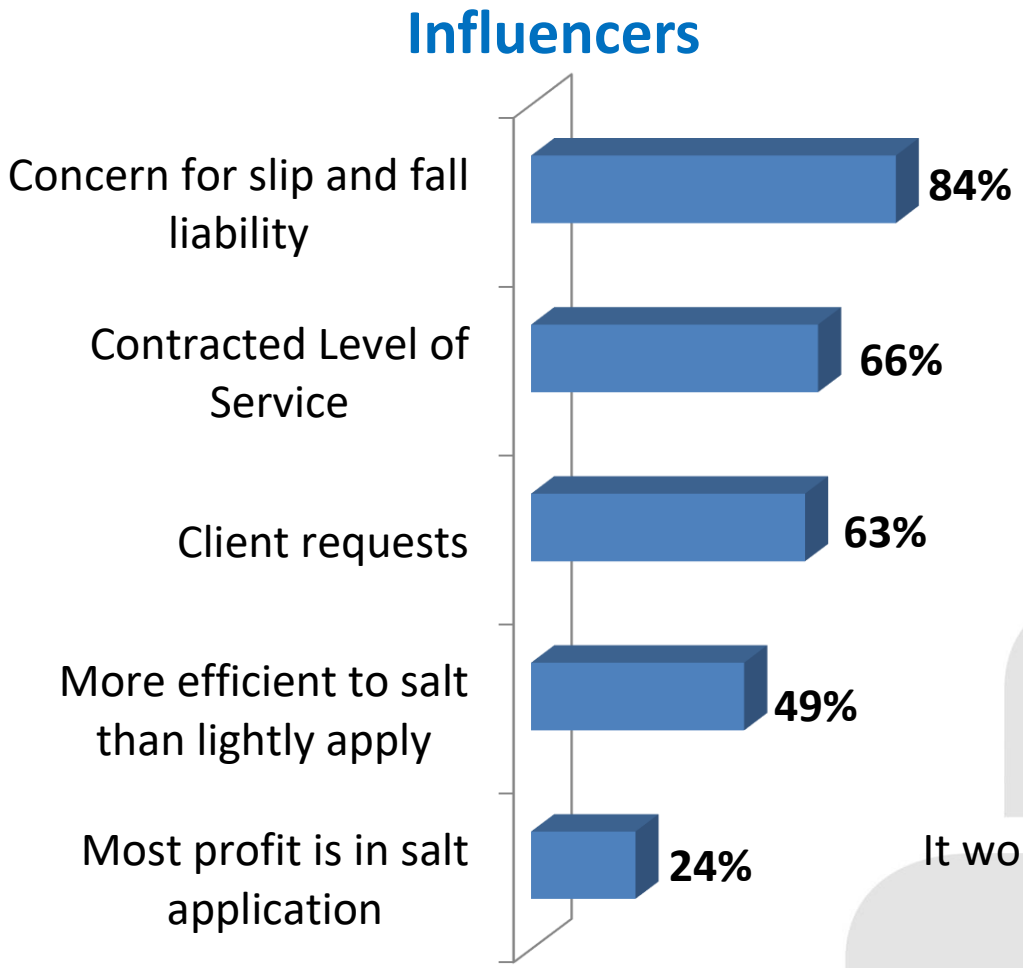
Cutting sidewalk applications down to 58 g/m² can save between 12 and 23% of salt on a typical parking lot

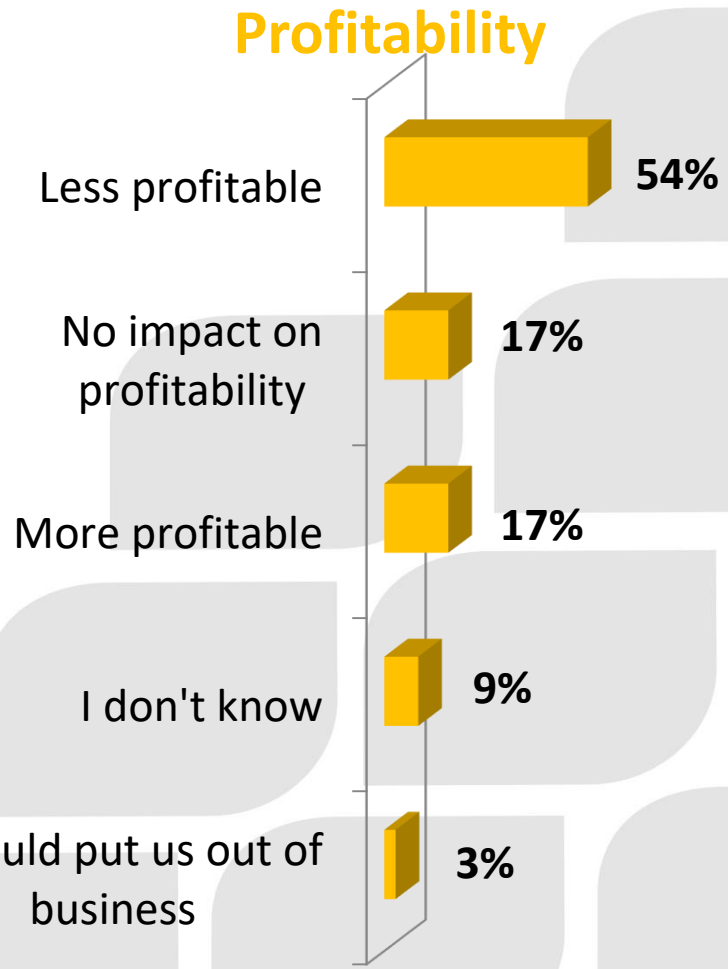
Photos: LSRCA

Public vs Private

- Municipalities are adopting best practices
  - Anti-icing
  - Alternatives to salts
  - Equipment updgrades/better tracking
  - Improved storage and snow dump facilities
- Private contractors have been slow to adopt best practices
  - Not subject to federal voluntary reporting requirements

Understanding the Drivers of Over-salting





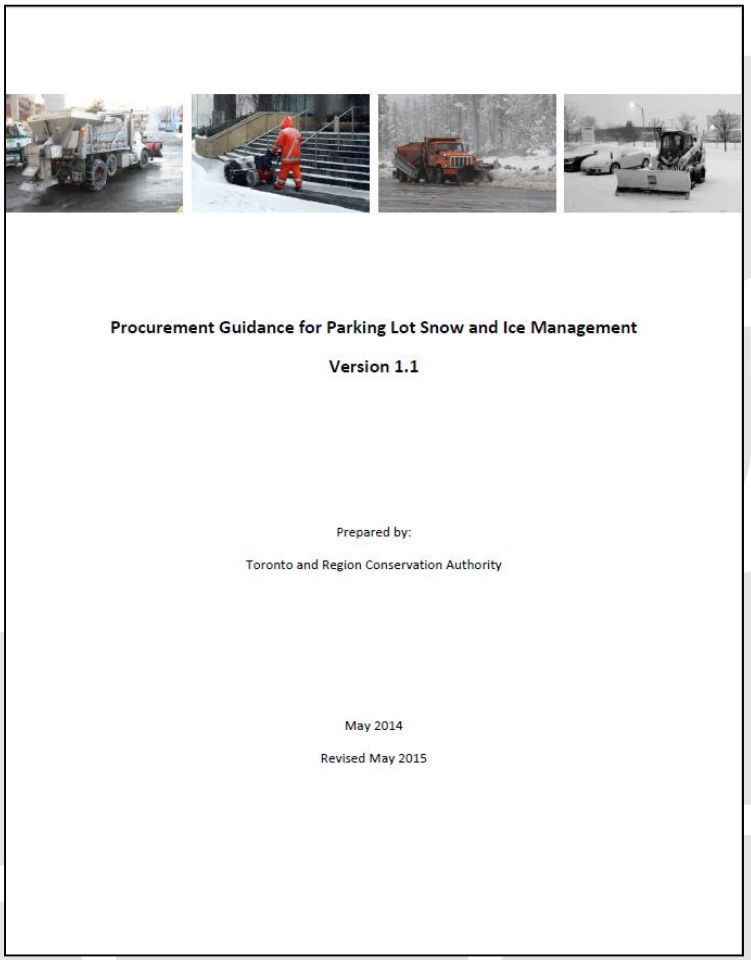
Source: Sexton, 2016

Building a Due Diligence Defense

- Closed loop ground speed controllers
- Equipment Calibration documentation
- GPS Tracking software
- Road Weather Information Systems
- Good record keeping

Service Contracts that Encourage Effective Salt Management

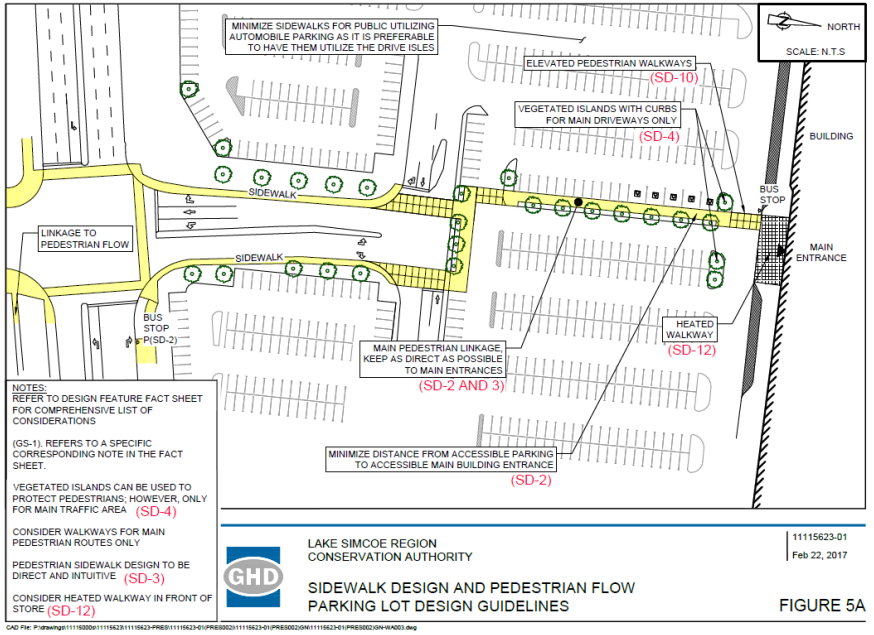
- Effective pricing of services
- Improved equipment
- Better methods
- Low chloride alternatives
- Reduced application rates
- Reporting and tracking requirements
- Well informed decision making
- Professional Training and Certification



Procurement Guidance v1.1
www.sustainabletechologies.ca

Parking Lot Design

- Designated snow storage locations
- Improved sidewalk design and pedestrian flow
- Improved drainage



Parking Lot Design guidelines, typical design details

https://www.lsrca.on.ca/parking-lot-guidelines

Private walkways and driveways

- Shoveling is key
- Shovel early and often
- Don’t let the snow melt and refreeze
- Clear melted snow/slush after sun goes down

Certified Professionals

- Clear requirements
  - Equipment
  - Methods
  - Supporting tools
  - Reporting
- Training
- **Auditing**
- Recognition

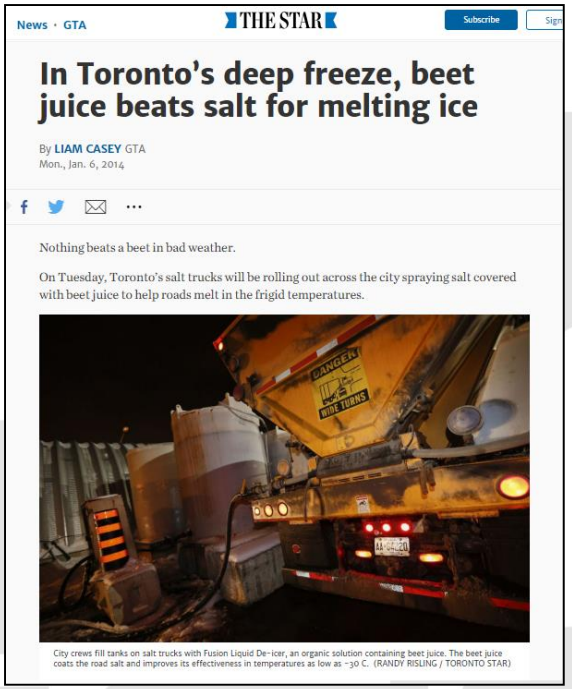
smart about salt™

NEW HAMPSHIRE CERTIFIED
GREEN SnowPro

Certified contractors in New Hampshire are granted liability protection by state for slip and fall claims

Alternatives to Salt

- Left over juices/brines from beet sugar, pickle and cheese processing
- Work at lower temperatures than NaCl (-20ºC rather than -12 ºC)
- Stick to surfaces very well
- Applied as brine or as treated rock salt
- Cost more (2x), slight odour
- Increasingly used by progressive municipalities
- Up to 30% reduction in chloride



News · GTA

THE STAR

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In Toronto's deep freeze, beet juice beats salt for melting ice

By LIAM CASEY GTA
Mon., Jan. 6, 2014

Nothing beats a beet in bad weather.

On Tuesday, Toronto's salt trucks will be rolling out across the city spraying salt covered with beet juice to help roads melt in the frigid temperatures.

City crews fill tanks on salt trucks with Fusion Liquid De-icer, an organic solution containing beet juice. The beet juice coats the road salt and improves its effectiveness in temperatures as low as -30 C. (RANDY RISLING / TORONTO STAR)

…But they are not without drawbacks

Composition:

Salt Brine: 23% NaCl, 77% water

Fusion (Beet Juice): 13% NaCl, 50% beet juice, 38% proprietary ingredients (unknown)

SnowMelt: 15-20% Glycerine, 10-20% Polymer, 6-16% other, water to balance

Caliber M1000: 27% Mg/Cl, 6% carbohydrate, 67% water and proprietary ingredients

Evaluation of Organic Anti-icing Materials for Winter Maintenance

TECHNICAL BRIEF

Salt Management

Approximately five million tonnes of road salts are applied in Canada every year. Road salts have been shown over years of use to reduce accidents, injury and mortality associated with icy and snowy conditions. However, the salts also pollute groundwater, damage roadside vegetation, alter the hydrologic properties of soils, and drain into streams and lakes where they pose a threat to aquatic ecosystems. Salt is also a significant factor contributing to the corrosion of bridges, buildings and vehicles, resulting in substantially higher maintenance costs.

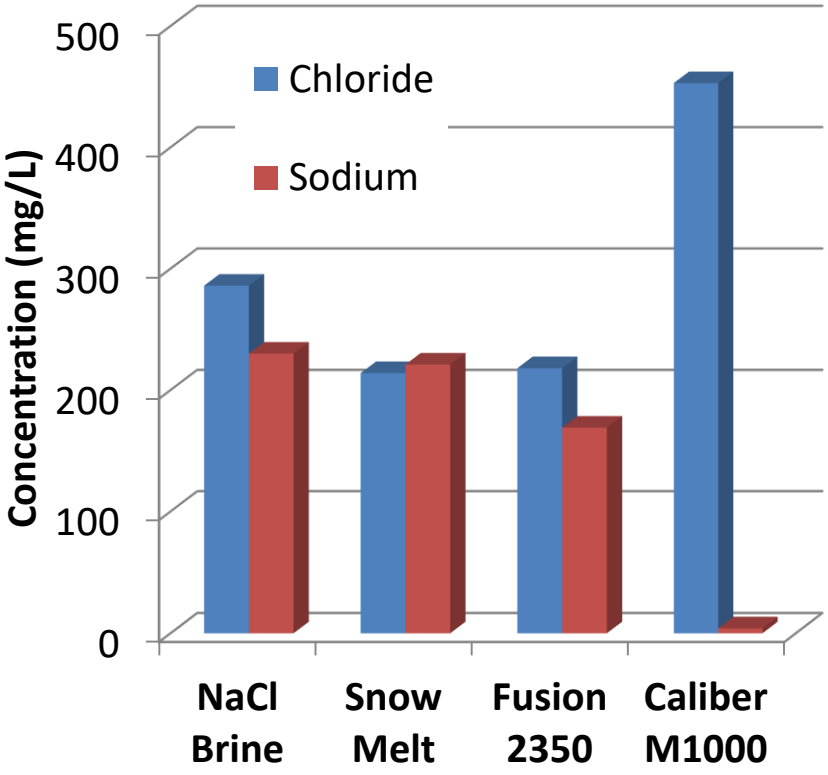
The practice of anti-icing, in which liquid brine solutions are applied to paved surfaces before or at the onset of winter storms to help prevent ice and snow from bonding to the surface, has been shown to significantly reduce the quantity of salt needed to remove compacted snow and ice after storms. New liquid organic and semi-organic alternatives with low chloride content have become available but lack independent data on performance at different application rates. This study compares the performance of liquid road salt (brine) to three types of organic/semi-organic alternatives applied on a university parking lot in Waterloo, Ontario. Products are evaluated as anti-icers (applied pre-snowfall) based on the coefficient of friction (CoF). The results indicate that in general, anti-icing treatments improved friction levels by 10-40% relative to a control without any application of anti-icers. Despite containing less chloride, the organic and semi-organic products performed as well as traditional sodium chloride brine at similar application rates. It was also found that an application rate as low as 3L/1000 ft² was sufficient for parking lot snow and ice management, which is 25% less than the current practice of applying 4L/1000 ft². Although organic anti-icers contributed less chloride into receiving streams, they contain higher concentrations of nutrients and organic content, which may limit their applicability in some contexts.

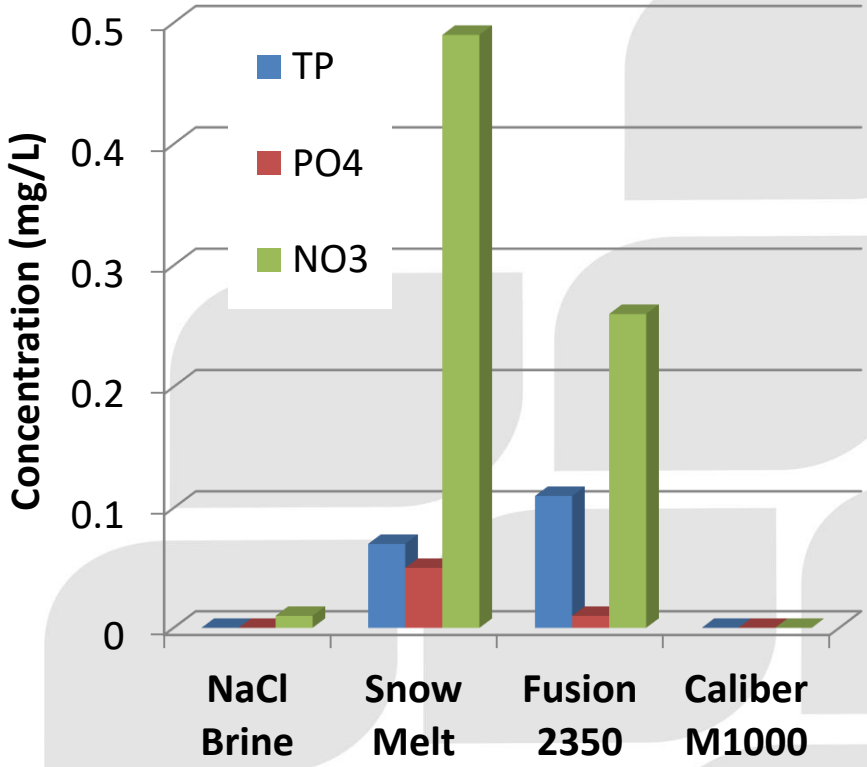
In 2001, following a comprehensive review of scientific literature on the effects of road salts on the environment, Environment Canada and Health Canada recommended that road salts be considered 'toxic' under section 64 of the Canadian Environmental Protection Act (EC and HC, 2001).

Sustainable Technologies Evaluation Program
www.sustainabletechnologies.ca

An Initiative of: Conservation

Hypothetical Runoff Concentrations





High organic content products have lower chloride and sodium than NaCl brine

….but higher P and N

Making snow tires mandatory

- Quebec implemented policy in 2008
- 36% reduction in fatal or serious injury accidents (2011 report)

- Some municipalities adopted ‘white road’ policies for designated roads
  - Salt only during extreme weather
  - Improved mechanical plowing
  - Use of sand/gravel to improve traction

Questions?

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www.sustainabletechnologies.ca