



Clean Water & Safe Roads: Finding the Balance



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**EPA WEBCAST: WINTER O&M FOR
GREEN INFRASTRUCTURE
NOVEMBER 3, 2015**



**Minnesota Pollution
Control Agency**

Chloride & Water Quality



What's the problem with salt?

- Chloride is a permanent pollutant
 - Cannot be treated or filtered with traditional BMPs
- 78% of the chloride applied in the TCMA is retained here (Stefan et al. 2008)
- Chloride concentrations in streams in the Northern US have approximately doubled from 1990-2011 (Corsi et al. 2015)
- Contaminates groundwater



**1 tsp. of road salt pollutes
5 gallons of water**

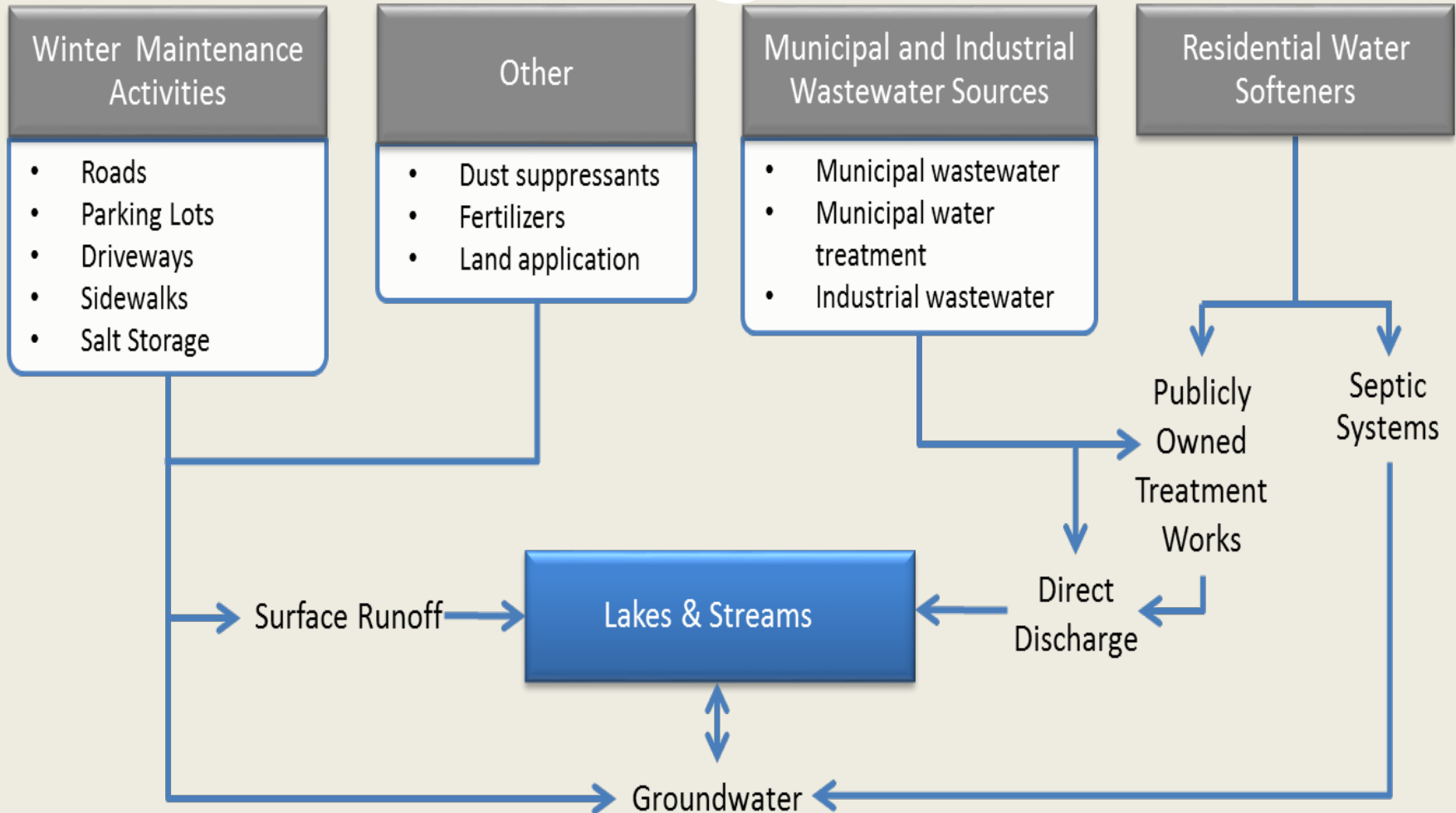


What's the problem with salt?

- Chloride is toxic to aquatic life
 - 230 mg/L- long-term
 - 860 mg/L- short-term
- Chloride can disrupt the natural mixing process in lakes
- Impacts vegetation and wildlife
- Corrodes road surfaces/bridges and damages reinforcing rods
- Potential human consumption concerns

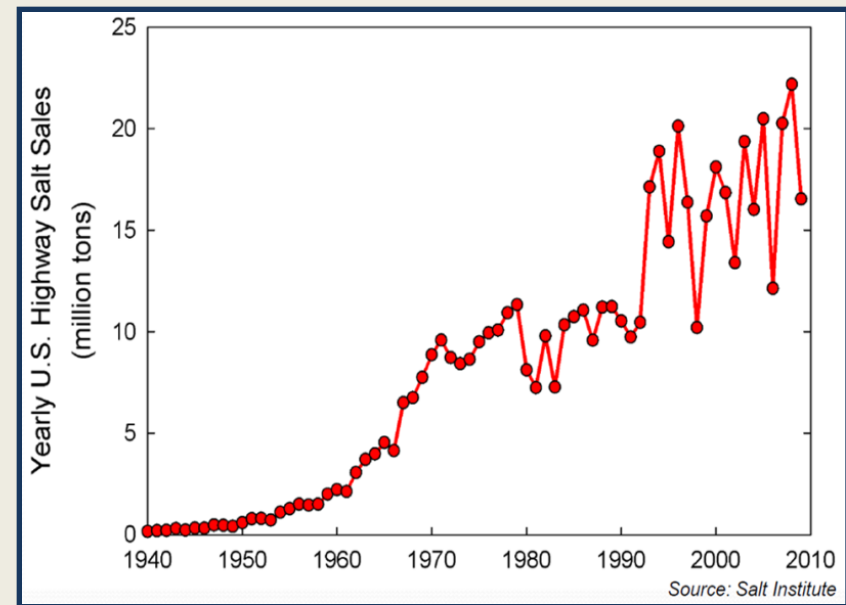


Sources of Chloride



Public Safety: Winter Salt

- Safe roads, parking lots and sidewalks are essential
 - Public expectations are difficult to meet
- Currently no alternative de-icer without negative impacts to the environment
- Fear of slip and fall lawsuits
- 349,000* tons of salt applied each year in the TCMA (*purchasing records)



Chloride in Surface Waters



cityparksblog.org



en.wikipedia.org/wiki/Interstate_Park

- 19 lakes, 14 streams and 4 wetlands impaired for chloride
- 39 waters determined to be “High Risk”
 - Values ≥ 207 mg/L or at least one exceedance
- Increase in chloride in Mississippi, Minnesota and St. Croix Rivers (Metropolitan Council 2014)

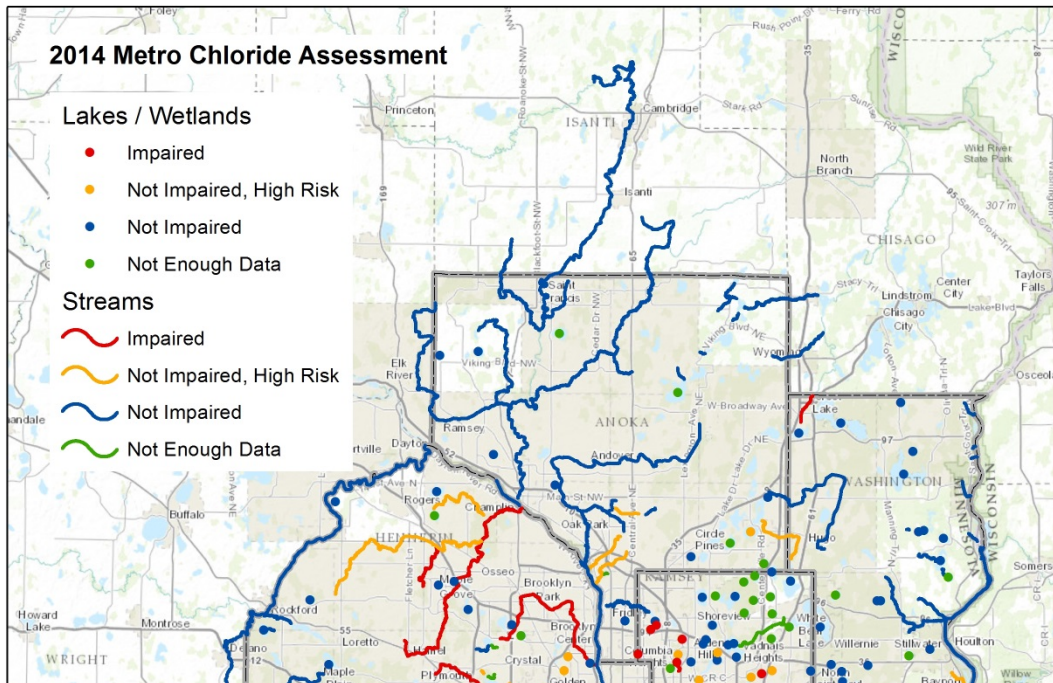
2014 Metro Chloride Assessment

Lakes / Wetlands

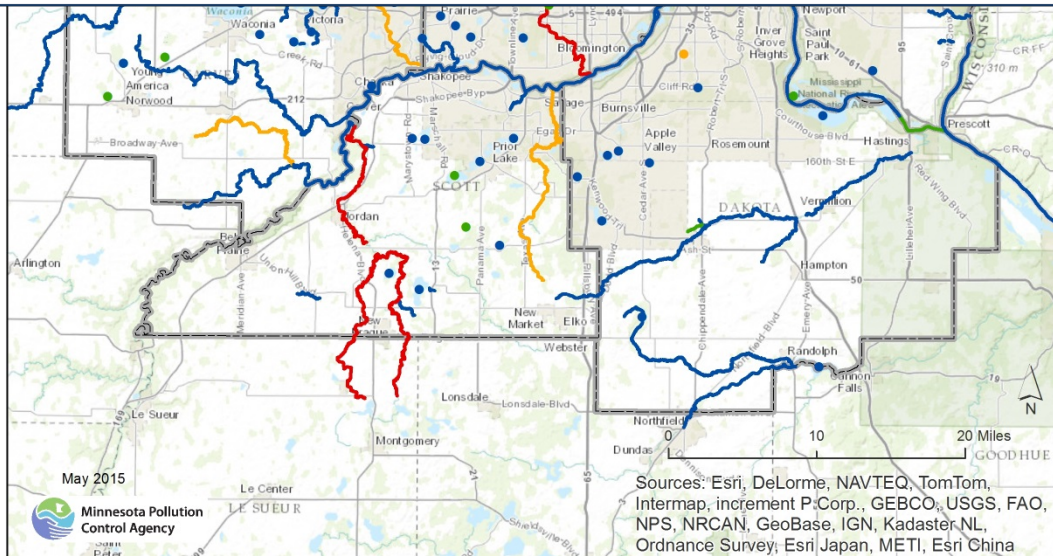
- Impaired
- Not Impaired, High Risk
- Not Impaired
- Not Enough Data

Streams

- Impaired
- Not Impaired, High Risk
- Not Impaired
- Not Enough Data



www.pca.state.mn.us/programs/roadsalt.html



Long-term Chloride Trends in Lakes

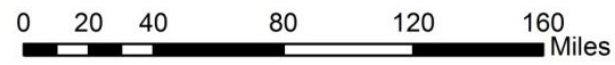
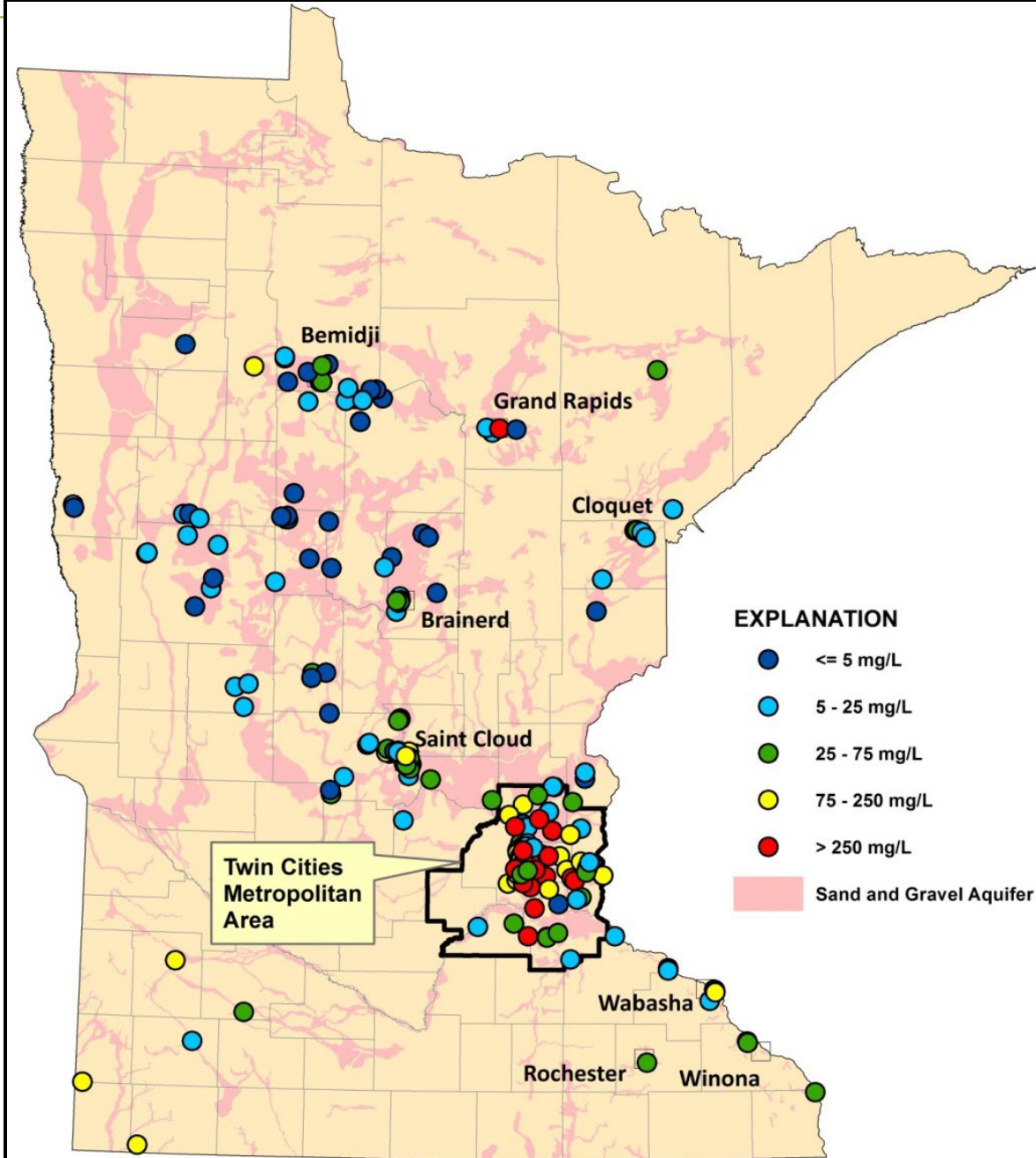
Lake	Period	Percent change/year	Trend Description
Beaver	1984-2014	+2.42%	Increasing
Bennett	1984-2014	--	No trend
Calhoun	1991-2014	+1.74%	Increasing
Carver	2004-2014	--	No trend
Como	1984-2014	--	No trend
Gervais	1983-2014	+3.72%	Increasing
Hiawatha	1994-2014	--	No trend
Johanna	1988-2014	+3.37%	Increasing
Keller (Main Bay)	1983-2014	+3.85%	Increasing
Kholman	1983-2014	+3.62%	Increasing
Lake of the Isles	1991-2014	--	No trend
Loring	1995-2014	--	No trend
McCarron	1985-2014	+2.41%	Increasing
Powderhorn	1994-2014	--	No trend
Silver	1979-2014	+2.92%	Increasing
South Long Lake	1984-2014	+3.66%	Increasing
Spring	1995-2014	+4.34%	Increasing
Tanners	2004-2014	+3.63%	Increasing
Valentine	1990-2014	+5.56%	Increasing
Wabasso	1984-2014	+1.92%	Increasing
Wakefield	1984-2014	--	No trend
Wirth	1994-2014	+2.49%	Increasing

Chloride in Groundwater



- Shallow groundwater in the TCMA is impacted by high chloride concentrations
- 30% of shallow monitoring wells in the TCMA above standard (230 mg/L)
- About one-third of wells showed increased concentrations over time
- Impact on baseflow concentrations in surface waters

Land Use	Chloride (mg/L)
Residential	45
Commercial/ Industrial	60
Undeveloped	15





TCMA

Twin Cities Metropolitan Area

Chloride Management Plan

DRAFT

July 2015

ment Plan



wq-iw11-06ff

Chloride Management Plan

Purpose - Scope - Audience

Purpose

- Highlight the impacts of chloride on TCMA water quality
- Develop an appreciation of the competing demands of level of service and reduced salt usage
- Set performance-based goals for restoration and protection
- Inform and guide implementation of improved winter maintenance practices and policy needs
- Demonstrate the success and economic benefits of improved practices

Scope

- Status and trends of chloride levels in lakes, wetlands, streams, and groundwater
- Sources of chloride
- Restoration and protection goals
- Implementation strategies to reduce chloride impacts
- Educational and training resources
- Continued monitoring, tracking and adaptive management

Audience

- Local working groups (local governments, watershed management groups, etc.)
- Winter maintenance groups (MnDOT, local governments, private applicators, commercial property owners, residents, etc.)
- Elected officials and policy-makers
- State agencies (MPCA, MnDOT, DNR, BWSR, etc.)

Inter-Agency Advisory Team

MPCA, MnDOT, Met Council, BWSR, DNR, USGS, Dept. of Health, U of M

Monitoring Sub-Group

MPCA, DNR, Met Council, USGS, local partners

Implementation Plan Committee

Winter Maintenance Professionals, Cities, Counties, MnDOT, WMOs/WDs

MPCA project team

Technical Advisory Committee

WMOs, WDs, Cities, Counties, MnDOT

Outreach Group

WMOs, WDs, MS4s, road salt applicators, Citizens

Technical Expert Group

Hands-on road salt applicators and suppliers

Education & Outreach Committee

MPCA, MnDOT & local education specialists

Protection and Restoration Strategy



- Provide high level strategies for reducing chloride
- Winter Maintenance Assessment tool to allow for detailed BMP selection tailored to each program
- Included some tried & true BMPs for consideration
- Offer non-traditional strategies for consideration
- Provide suggested training opportunities
- Considerations for private applicators
- Discussion on Citizens Attitudes & Practices
- Includes Education & Outreach resources

EXAMPLE: YEARS 1-2

- Better understand environmental impacts of salt use and ways the constituents contribute.
- Understand options for reducing chloride use.
- Support the implementation of the TCMA CMP.
- Develop a limited liability law to protect private contractors from being sued if they are following BMPs, similar to New Hampshire. Fear of law suits often drives over application of salt.
- Create an ordinance for city that all salt and salt/sand piles must be store indoors and on an impermeable surface.
- Discuss lower levels of service with constituents.

Policy Makers

Chloride Reduction Strategies: Winter Maintenance Practices

- Shift from granular to liquids
- Improved physical snow removal
- Snow and ice pavement bond prevention
- Training for maintenance professionals
- Education for the public and elected officials
- Winter Maintenance Assessment tool



Success Stories

University of Minnesota, Twin Cities

- Made changes to winter maintenance program 2006

Material	Use (tons/yr) (1997-2005)	Use (tons/yr) (2006-2008)	Reduction
Rock Salt	775	462	40%
ICE MELT (MgCl ₂)	131	64	51%
ICE MELT (MgCl ₂ - CaCl ₂)	131	59	55%
Sand	1965	20	99%

- purchased new equipment for ~ \$10,000
- saved \$55,000 the first year the BMPs were implemented

City of Waconia

- 2010 updated “Snow and Ice Policy” to a “Winter Maintenance Policy” – proactive focus opposed to reactive
- Addition of ordinances reflective of policy guidelines
- Calibration and equipment changes resulted in 70% reduction in rates
- Addition of pre-wet practices and material savings results in yearly \$8,600 cost savings

Winter Maintenance Assessment tool (WMAAt)





Winter Maintenance Assessment tool



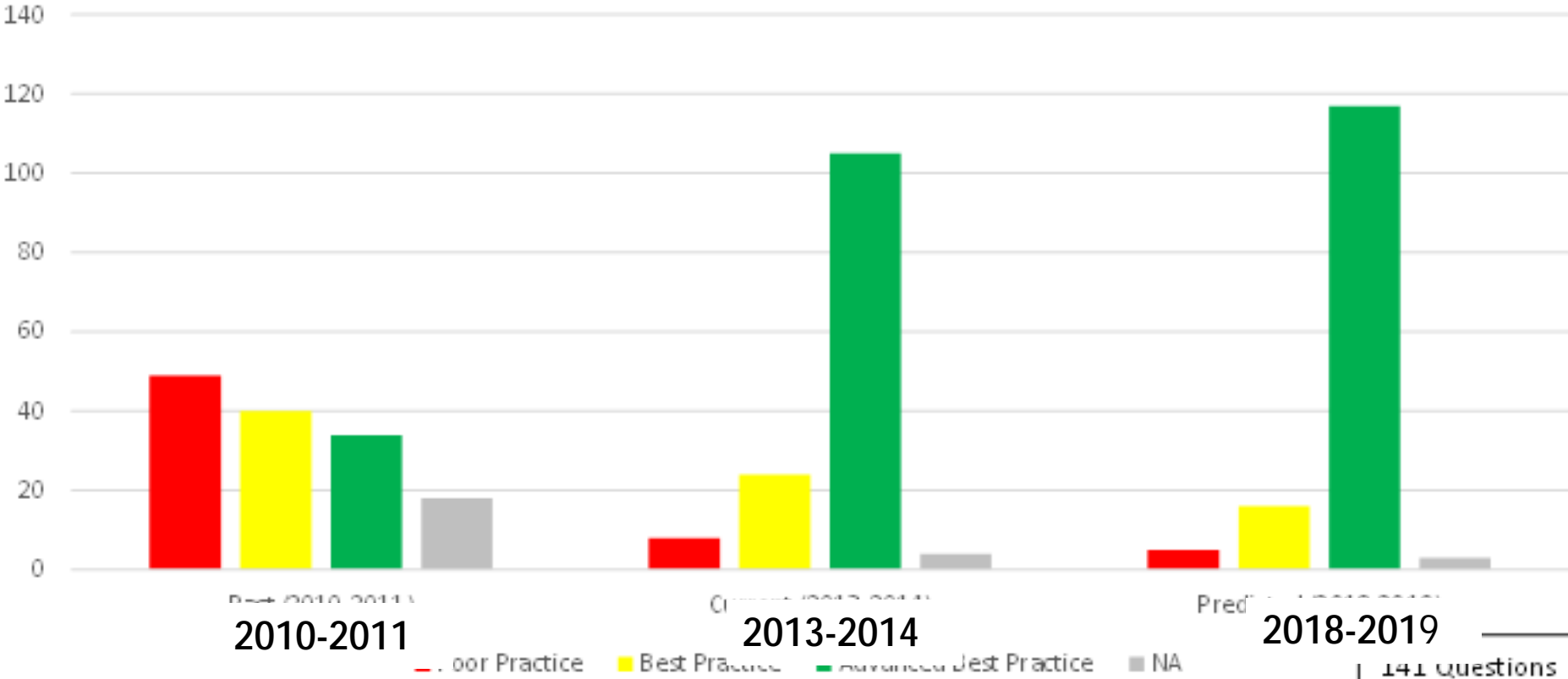
Goal of tool is to assist winter maintenance organizations to:

- Document current practices
- Chart a path towards salt reduction
- Develop a strategy unique to operation
- Evaluate small areas of winter maintenance
- Provide insight into current operations
- Shows user recommended practices (learning tool)
- Allow a flexible approach for implementing BMPs
- Educational opportunity for operators
- Track goals and progress in achieving
- Assist with MS4 permit requirements

City #1



3 Seasons Comparison City 1



Current (2012-13) Poor Practices

Question #	Question	Response
1	How often do you calibrate spreaders?	Most equipment every other year
3	How many liquid pre-wet systems do you calibrate? (Pre-wet refers to a system that discharges liquids onto granular products)	Less than half
8	What % of your fleet is set up for liquids (of the trucks that apply salt)?	0-49%
12	What materials do you calibrate for?	Don't calibrate
19	For parking lots / sidewalks, what is your most common anti-icing rate for straight magnesium or calcium chloride liquid?	More than 0.4 gallons per 1000 sq. ft (18 gal. per acre)
26	Are your application rates based on pavement temperatures?	Don't have application rate charts
31	How is the blast button set?	1000 lbs
36	How do you treat frost?	Apply granular salt after frost is formed
40	What is the first step you take with slush that will refreeze?	Salt it
41	For roads, what do you do with a light snow (< 1" total for event)?	Without plowing, salt or sand it if needed
43	For parking lots, what do you do with a light snow (< 1" total for event)?	Without plowing, salt or sand it if needed
44	Do you use weather prediction systems better than the TV news?	No
48	How do you salt when plowing in tandem?	Most plow trucks salt; nothing done to prevent loss of salt from plowing.
59	Do you have the ability to plow continuously throughout the storm?	Snow removal is only at end of storm
60	Is your response to snow events the same during weekdays hours and weekend/evening hours?	No
62	Do you use a sand/salt mix as your primary deicer?	Yes
68	Do you understand the practical pavement temperature range of your deicers?	No
69	We select the appropriate material for the pavement temperature:	Don't adjust our product selection based on pavement temperatures
70	When pavement temps are below 15 degrees how often do you use dry rock salt?	All of the time

City of Saint Paul Winter O&M

Tuesday, November 3, 2015



1. Clear Maintenance Expectations

Questions to ask your agency leaders:

1. Does all maintained surface and green infrastructure need to be open during the winter?
2. Do you need a bare pavement policy?
3. What is the expectation for recovery time?



2. Winter Parking Restrictions



No Parking
3am - 7am
Dec. 1 - Apr. 1

No Parking
When snow is
Over 2" deep

Tow Zone

Chicago, Illinois

**SNOW
ROUTE**

NO PARKING
WHEN SNOW IS
OVER 2 INCHES DEEP

TOW-AWAY ZONE

NO PARKING
3AM - 7 AM
DEC. 1 - APR. 1

TOW-AWAY ZONE
CITY OF CHICAGO

WINTER PARKING

NO STREET PARKING
1:00 AM to 7:00 AM
NOV. 1st to APRIL 1st

AFTER 2 INCH SNOWFALL
NO PARKING ANYTIME
UNTIL PLOWED CURB TO CURB

Chanhausen, MN

**WINTER
PARKING RESTRICTION
REMINDER**

From December 1st through February 28th, the Village's winter parking restrictions are in effect.

During this time, on-street parking is not allowed between the hours of 1:00 a.m. and 6:00 a.m.

It is also unlawful to park on Village streets within 12-hours after a snowfall of three inches or greater.

Cary, Illinois

3. Equipment Calibration

- Salt & Liquids
- Calibrate every year



Scale-Tec

4. Specialized Equipment



5. Right Equipment



FALLS SPREADER with 9-Inch Auger

6. Response to an Event

Deploy the right resources on-time when needed



Dublin, Ohio

7. Liquids – Anti-Ice or De-Ice



8. Plow, Plow, Plow

Spokane, WA



Syracuse, NY



Ottawa, Canada

9. Advanced Snow Removal

- Heated Sidewalks and Properties
- Anti-ice systems - Bridges



Ballpark Authority



Visit the Road Salt &
Water Quality website:

<http://www.pca.state.mn.us/programs/roadsalt.html>

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