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Lake Champlain Deicing Conference | October 10, 2018
Road Salt (Sodium Chloride) Use is Increasing

Data Source: USGS:
Environmental Impacts

● Increased salinity

● Aquatic communities

● Drinking water risks

● Stratification

● No viable removal

Trombulak, S. C., & Frissell, C. A. 2000; Shi, Xie, & Gong, 2012; United States Dugan et al., 2017; Environmental Protection Agency 2017
Best Practices are Being Adopted by Municipalities

- Anti-icing
- Equipment calibration / variable application rates
- Alternative de-icing additives
- Weather information systems

https://c1.staticflickr.com/2/1405/5170709274_cd76d086a2_b.jpg
Best Practices are Being Adopted by Municipalities

- Anti-icing
- Brine
- Equipment calibration / variable application rates
- Alternative de-icing additives
- Weather information systems
- Usage expectations
Best Practices are Being Adopted by Municipalities

Environment Canada

- Up to 73% sodium chloride reductions from best management practice implementations

Environment and Climate Change Canada, 2013

https://c1.staticflickr.com/2/1405/5170709274_cd76d086a2_b.jpg
What About Private Contractors?
What About Private Contractors?

- Service areas
- Application materials and equipment used
- Practices used
- Barriers and motivations to reduced-salt practices

http://www.forconstructionpros.com
Impacts from Private Contractors May be Substantial

New Hampshire Total Mass Daily Load study

- Estimated 52.7% of all chloride inputs from private roads and parking lots

Trowbridge, 2007, 2010
The Study Has Three Objectives:

1. Characterize contractor practices
2. Identify barriers and motivations
3. Inform outreach to break down barriers to promote behavior changes
Census Design and Questions

- How much/what type of areas do contractors cover?
- What practices, application materials, and equipment do contractors currently use?
- What are the barriers and motivations for contractors to use best management practices?
- How can social marketing techniques be used?
Contractors in the Lake Champlain Basin

- 232 businesses across VT and NY
- Identified through publicly available information
- Advertising or listed as provided snow removal services in the Lake Champlain Basin
- 70 participants (30.2% response rate)
Average of 24 lane miles per contractor

1,042 lane miles reported from 19% of contractors

VTrans: 14,171 lane miles

Parking lots: 67%
Roadways: 19%
Driveways: 11%
Sidewalks: 2%
Other: 1%

n = 43
Types of Application Materials Used Vary

- Salt and sand mix
  - Yes: 60%
  - No: 20%
  - Not applicable: 20%
  - Unsure: 0%

- Sand
  - Yes: 80%
  - No: 10%
  - Not applicable: 10%

- Pure sodium chloride
  - Yes: 80%
  - No: 10%
  - Not applicable: 10%

- Packaged blend(s)
  - Yes: 80%
  - No: 10%
  - Not applicable: 10%

$n = 58$
Contractors Are Using Several Management Practices

- Adjustable equipment: Yes 100%
- Plow away from water: Yes 100%
- Frequent removal: Yes 93%
- Weather forecasting: Yes 98%

- No: Adjustable equipment 0%, Plow away from water 0%, Frequent removal 1%, Weather forecasting 1%

- Unsure: Adjustable equipment 0%, Plow away from water 0%, Frequent removal 1%, Weather forecasting 1%

$n = 66$
Contractors Are Using Several Management Practices

- Store piles on paved surfaces
- Anti-icing
- Measure pavement temperatures
- Pre-wet salt or brine

$n = 66$
Interviews

- 10 companies
- Selected based on number of clients, BMP usage, surface types
- Data verification
- Exploring behavior changes
- Exploring decision-making factors
Surface area vs. number of BMPs adopted

$r^2 = 0.192$
Statistically significant difference between the number of BMPs residential and commercial contractors adopt.

- **Mean residential:**
  \[4.7 \pm 1.4\]

- **Mean commercial:**
  \[6.6 \pm 1.8\]

\[t(56) = -3.524, \ p = 0.001\]
Factors for best management practices vary

- Liability or safety
- Customer expectations
- Cost
- Time
- Performance
- Environmental concerns
- Other

$n = 70$
No motivations or barriers are significantly related to measuring surface temperature
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- No apparent barriers
- Contractors are often unfamiliar with the practice
Time and customer requests as motivations are related to higher use of anti-icing
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- Time as a motivation related to higher use of anti-icing
- Customer requests as a motivation related to higher use of anti-icing

Time: $X^2(2), = 11.16, n=63, p < 0.01$
Customer requests: $X^2(2), = 6.71, n = 63, p < 0.05$
Environmental concerns are related to use of pre-wet salt/brine
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- Motivation: related to higher usage of pre-wet salt/brine

- Barrier: related to lower usage of pre-wet salt/brine

Motivation: $X^2(2), = 7.37, n = 63, p < 0.05$  
Barrier: $X^2(2), = 9.73, n = 63, p < 0.01$
Calibration may be used infrequently or misunderstood
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- Range of definitions for calibration.
- Represents time commitment to implement, materials savings and more predictable applications.
In-person trainings and online resources related to higher BMP adoption

- In-person workshops and trainings
- Websites and online resources

In-person trainings currently: $M = 7.06$, $SD = 1.92$
Other: $M = 5.36$, $SD = 2.28$, $t(62) = -2.72$, $p < 0.01$.

Websites currently: $M = 6.85$, $SD = 1.70$
Other: $M = 5.05$, $SD = 2.42$, $t(62) = -3.31$, $p < 0.01$. 
Contractors learn from peers and real-world examples

- Peer mentoring
- Technique trials
- Case studies
- Demonstrations
Contractors learn from peers and real-world examples

- Many resources here today!
- Online resources and trainings
- Sea Grant developing resources
Thank you! Questions?

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