

Pollution Prevention for Snow & Ice Removal

November 2, 2021

★ ★ ★ DEPARTMENT
OF ENERGY &
ENVIRONMENT



GOVERNMENT OF THE
DISTRICT OF COLUMBIA
MURIEL BOWSER, MAYOR

TAG THIS PRESENTATION: @DOEE_DC

AGENDA

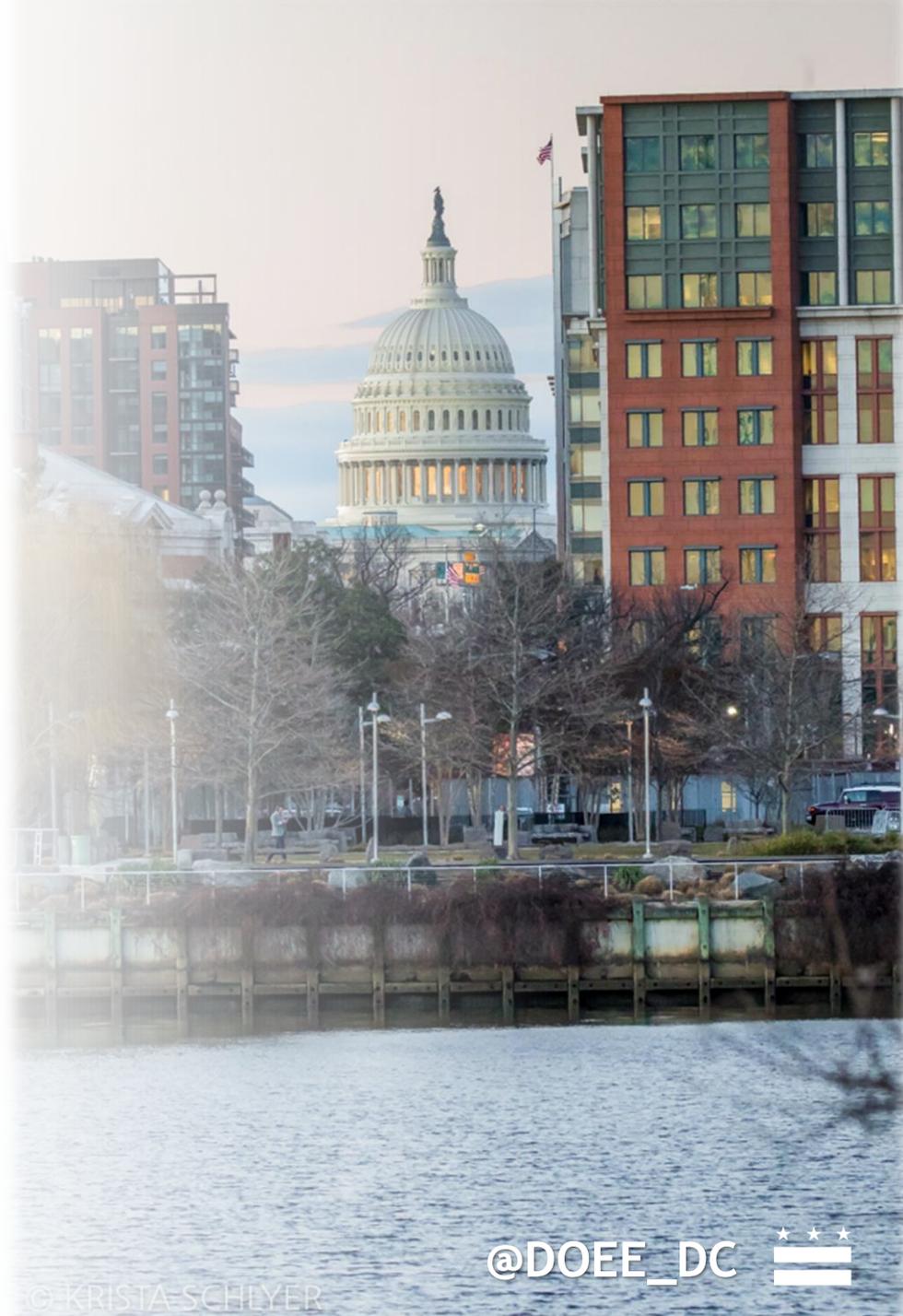
Salt in the
District

What You
Can Do

Ice
Management
Survey

Conclusion

Salt in the District



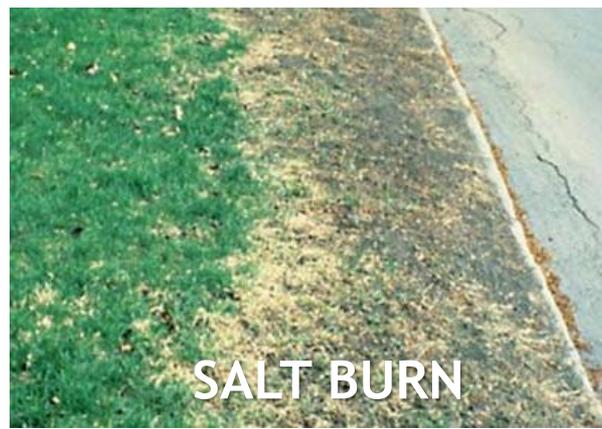
Salt Pollution

While salt is naturally occurring, too much is destructive

Growing concern

- Harmful to children and pets
- Drinking water quality
- Health of rivers and streams
- Stress plants
- More complaints

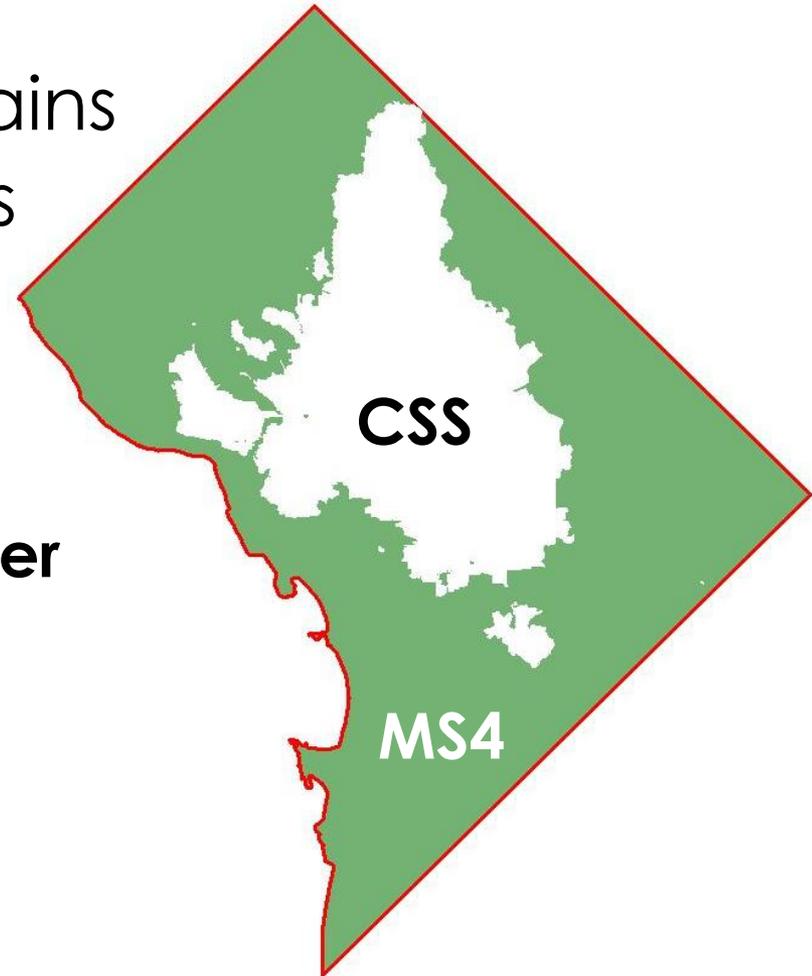
Extremely difficult to remove once it's in water



Two Types of Sewers

2/3 of the District's land drains directly into local waterways *with little to no treatment*

- **Municipal Separate Storm Sewer System (MS4)**
- **Combined Sewer System (CSS)**

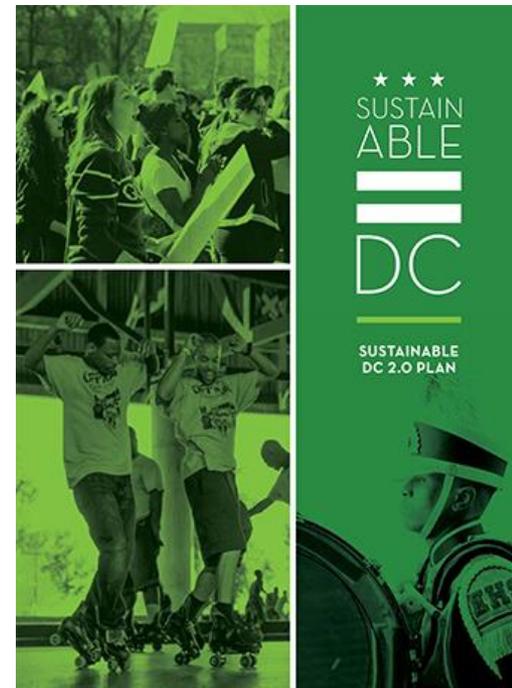
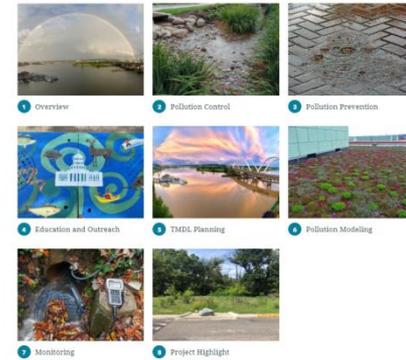


District Salt Priorities

- **Municipal Separate Storm Sewer System Permit (2018 MS4 Permit)**
 - Section 2.6 - District Salt Pilot
 - Section 3.3.8. - Snow and Ice Management
 - Manage application of ice-removal products to minimize their impact on water quality
- **Sustainable DC 2.0 Plan's Actions on Water, WT1.3**
 - Study alternatives to reduce reliance on road salt by 2022
 - Work with Business Improvement Districts (BIDs), Main Streets, and large property owners

COLLECTION
DOEE 2020 MS4 Annual Report
The DOEE 2020 MS4 Annual Report is presented as a collection of Story Map chapters, as shown on the right. Select any chapter to learn more about that topic. Other chapters can then be accessed along the top as links. Best viewed on desktop/laptop.

Get started



Current Efforts & Incentives

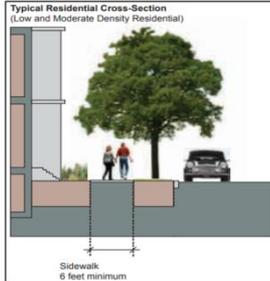
- Priority has been municipal roadway operations
- Commercial Property Workshops
- **DOEE Webpage:** go to <https://doee.dc.gov> and search for “snow”
 - How to protect human health and the environment during winter
 - Salt Application Rate Calculator
- **Green Building Act of 2006**
 - Site Management (LEED O+M: Existing Buildings v4.1 - LEED v4.1)

 **District of Columbia**
Department of Energy and Environment
Sidewalk Deicing Recommendations

Question 1. Please select the current outdoor temperature (degrees Fahrenheit):

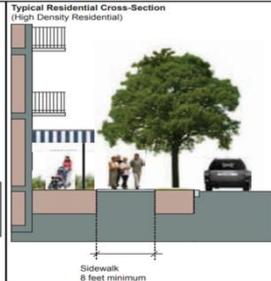
Question 2. Please select the type of sidewalk (examples showing common widths below):

Typical Residential Cross-Section
(Low and Moderate Density Residential)



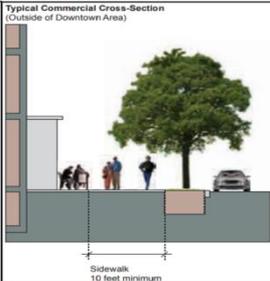
Sidewalk
6 feet minimum

Typical Residential Cross-Section
(High Density Residential)



Sidewalk
8 feet minimum

Typical Commercial Cross-Section
(Outside of Downtown Area)



Sidewalk
10 feet minimum

Question 3. Please select the approximate length (feet) of the area to be treated:

Recommended Application Rate (lbs/1,000 sq. ft.)	
Total Amount of Salt to Apply to Sidewalk Area (cups)	

What You Can Do



STRATEGIES

1. Alternative products
2. Techniques to minimize product use
3. Smart management and storage



1. ALTERNATIVE PRODUCTS

1. Alternative Chemicals*

- Calcium magnesium acetate (CMA)
- Magnesium Carbonate (Magnesium CA)
- Alternative chlorides (MgCl)



2. Traction - sweep up after

- Sand
- Non-clumping kitty litter



3. Snow Melting Mats



**NOTE: These have different application rates than rock salt.
Consult packaging*

LIQUID PRODUCTS

1. Hot mix and brine lasts 5-10 days
 - 23.3% salt = Good brine mix
 - Sustainable Alternatives: beet juice
2. Allows rock salt to melt ice below 15° F
3. Melts ice faster

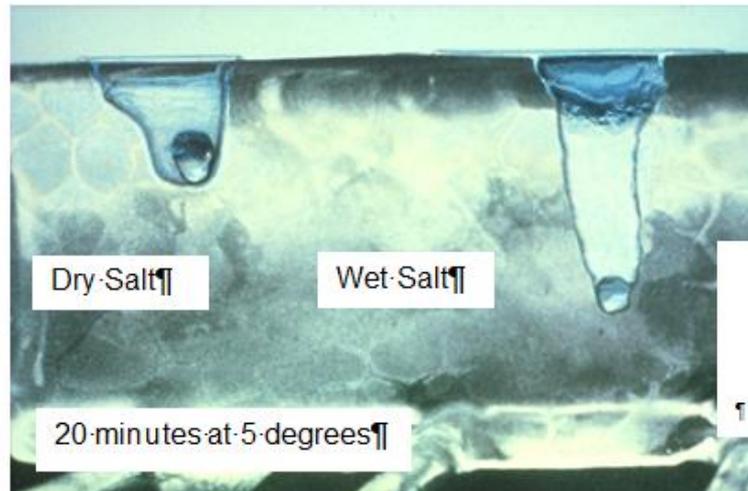
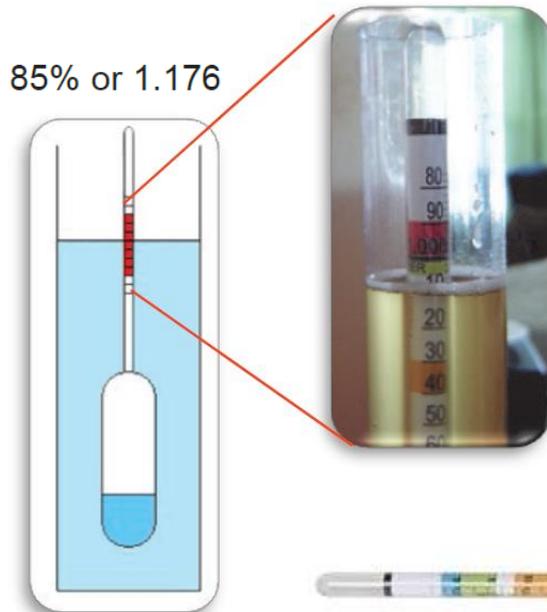


Photo-courtesy
of Wisconsin
DOT
transportation
bulletin #22

MAKING & APPLYING BRINE

Making Brine:

- 23.3% solution, ~2.5 lbs salt/gal
- Use hot water
- Verify salinity with hydrometer or salometer



2. TECHNIQUES TO MINIMIZE PRODUCT USE

1. Don't apply when it's above freezing or is expected to rain!
2. Apply beforehand
3. Use an application rate
4. Clear accumulated snow beforehand
5. Be patient - melting takes time
 - Apply a small amount first
 - Wait at least 30 minutes before applying more
6. Sweep up excess after the event

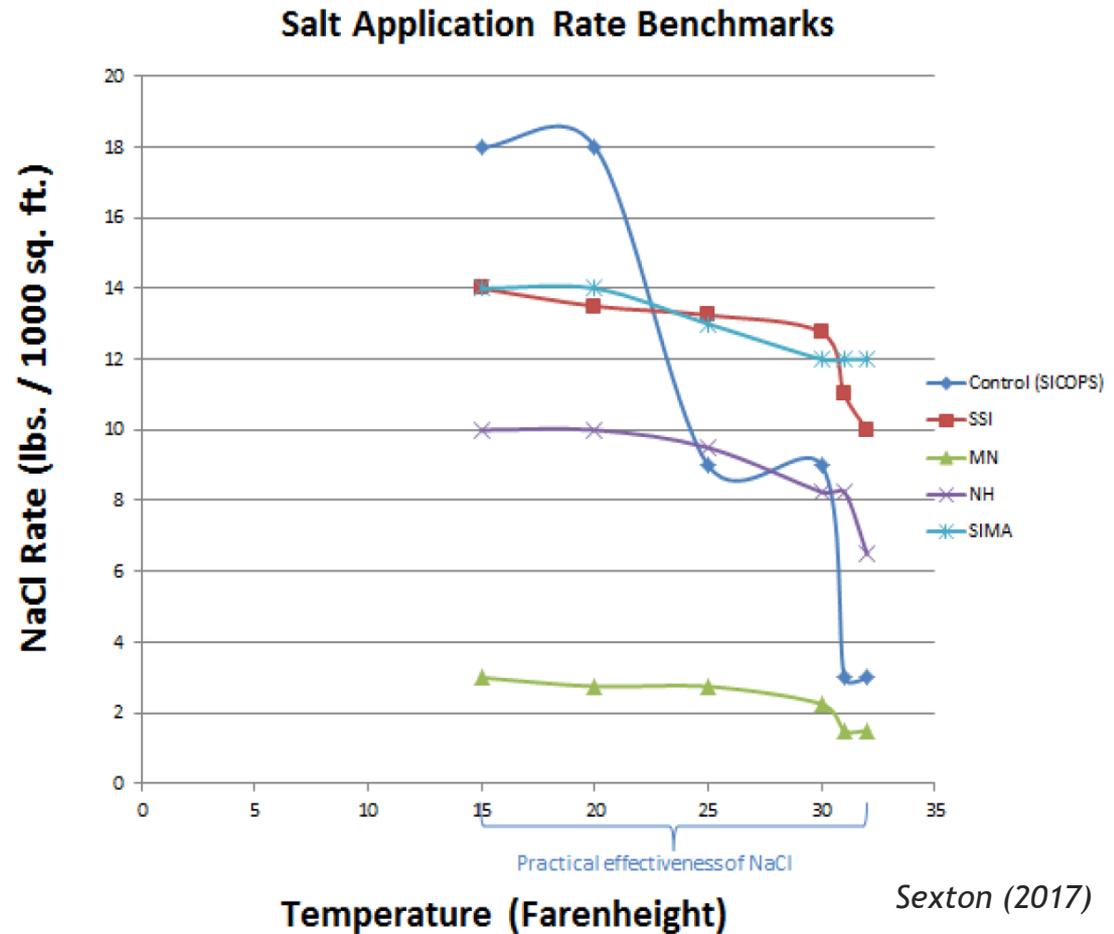


USE ENOUGH SO THE GROUND IS BARE BUT NOT SO MUCH THAT PRODUCT IS STILL VISIBLE

RECOMMENDED APPLICATION RATES

Salt application rates

- Not standardized
- Depends on ground temperature
- Depends on type and amount of precipitation



Key: SICOPS = University of Waterloo Study
SSI = Sustainable Salt Initiative
MN = Minnesota

NH = New Hampshire
SIMA = Snow and Ice Management Association

SALT APPLICATION RATES – NEW HAMPSHIRE

NH Road Salt Application Rates for Deicing Parking Lots
(Pounds per 1000 sq.ft.)

Pavement Temp. (°F) and Trend (↑ ↓)	Weather Condition	Maintenance Actions	Application Rate (lbs/per 1000 sq.ft.)			
			Salt Prewet/ Pretreated with salt brine	Salt Prewet/ Pretreated with other blends	Dry salt	Winter sand
>30 ↑	Snow	Plow, treat intersections only	4.5	4	4.5	Not recommended
	Frz. Rain	Apply chemical	5.75	5.25	6.5	Not recommended
30 ↓	Snow	Plow and apply chemical	5.75	5.25	6.5	Not recommended
	Frz. Rain	Apply chemical	6.5	5.75	7	Not recommended
25 - 30 ↑	Snow	Plow and apply chemical	5.75	5.25	6.5	Not recommended
	Frz. Rain	Apply chemical	6.5	5.75	7	Not recommended
25 - 30 ↓	Snow	Plow and apply chemical	5.75	5.25	6.5	Not recommended
	Frz. Rain	Apply chemical	7	6.5	8.25	10.5
20 - 25 ↑	Snow or frz. Rain	Plow and Apply chemical	7	6.5	8.25	10.5 for frz. Rain
20 - 25 ↓	Snow	Plow and apply chemical	5.75	7.5	9.5	Not recommended
	Frz. Rain	Apply chemical	7	7.5	10	10.5
15 - 20 ↑	Snow	Plow and apply chemical	7.5	7.5	9.5	Not recommended
	Frz. Rain	Apply chemical	8.75	7.5	10	10.5
15 - 20 ↓	Snow or Frz. Rain	Plow and apply chemical	8.25	7.5	10	10.5 for frz. Rain
0 to 15 ↑ ↓	Snow	Plow, treat with blends, sand hazardous areas	Not recommended	10	Not recommended	13 and spot-treat as needed
< 0	Snow	Plow, treat with blends, sand hazardous areas	Not recommended	23	Not recommended	13 and spot-treat as needed

Table 19. Application Rates for Deicing

NH 2014

These rates are based on road application guidelines (Mn Snow & Ice Control Field Handbook, Manual 2005-1). Develop your own application rates by adjusting your current rates incrementally downward toward these guidelines. Where temperature categories overlap, select the rate most applicable to your situation.



SALT APPLICATION RATES - MINNESOTA

Pavement Temperature	Application Rate	High-density Residential	Low-density Residential
°F	Pounds per 1,000 ft ²	Teaspoons per 8 x 10 ft sidewalk	Teaspoons per 6 x 10 ft sidewalk
Above freezing (>32 °F)	Do not apply salt. Ice will not form.		
30-32 °F	0.75	2.5	2
25-30 °F	1.5	5	4
20-25 °F	2.25	7.5	5.75
15-20 °F	2.75	9.25	7
Below 15 °F	Salt does not melt ice below 15 °F without adding heat or an additional chemical to assist with melting		
Maximum rate	3	10 (~¼ cup)	7.5 (~⅛ cup)

When to adjust:

1. Salt is on the ground from the last event
2. Falling temperatures
3. Freezing rain
4. Heavy snow fall



Rates are based on **Ground Temperature**

Based on Minnesota's Application Rate Table for Sidewalks and Parking Lots (2015).

Applications rates make a big difference



GOOD



BAD



AHHHHHH

SPREADERS

Typical Spreaders



DIY Spreader



CALIBRATION OF SPREADERS

Tells how much is applied at each setting

- Auger / Conveyor system
 - Choose a setting, run the spreader for a timed interval, weigh the discharge

CALIBRATION CHART FOR AUGER OR CONVEYOR SYSTEMS

DATE _____ SPREADER # _____ MATERIAL _____

SETTING	POUNDS PER MINUTE	5 MPH (x12)	10 MPH (x6)	15 MPH (x4)	20 MPH (x3)
1					
2					
3					

Form from MN Winter
Parking Lot and Sidewalk
Maintenance Manual (2015)

Figure 10: Blank calibration form

CALIBRATION OF GRAVITY FED SPREADERS

- **Gravity fed**

- Mark out 10-ft stretch, apply at constant speed, sweep up, and weigh
- Use a tarp to make weighing easy
- Make permanent marks on the equipment if it has no numbers for the positions

Calculate application rate:

Equipment: _____ Material: _____ Date: _____

A	B	C	D	E	F	G
Speed	Lever position or gate setting	Pounds spread in 10 feet*	Spread width in feet	Coverage area in sq. ft. (D x 10)*	Application rate in lbs./1000 ft ² (1000/E x C)	Application rate in lbs./lane mile (12' width) (F x 63.4)
.....EXAMPLE.....						
20 MPH	Half-closed	0.4 lbs.	13 feet	130 sq. ft.	3.1 lbs. per 1000 sq. ft.	196 lbs./mile

Form from MN Winter Parking Lot and Sidewalk Maintenance Manual (2015)

* If changing the test strip length, adjust the title in column C and the multiplier in column E.

Figure 14: Example calibration chart for gravity flow equipment

3. PREVENT AND CLEANUP SALT SPILLS



- Never overfill equipment
- Clean up spills ASAP
 - Sweep up excess and use at a later date/throw out or
 - Sweep it to an area that hasn't been treated yet



STORAGE

Prevent contact with stormwater

- Keep it inside
- If outside:
 - Elevate and use waterproof cover
 - Locate pile where no stormwater can run underneath



This pile is placed on the uphill edge of a curbed parking lot where no runoff can leach salt from under the pile

SUMMARY OF WHAT YOU CAN DO

There are many things you can do to minimize salt pollution this winter:

1. Use alternative products
2. Be smart with your application technique to minimize how much is used
3. Store salt in a place that is protected from rain and sweep up excess



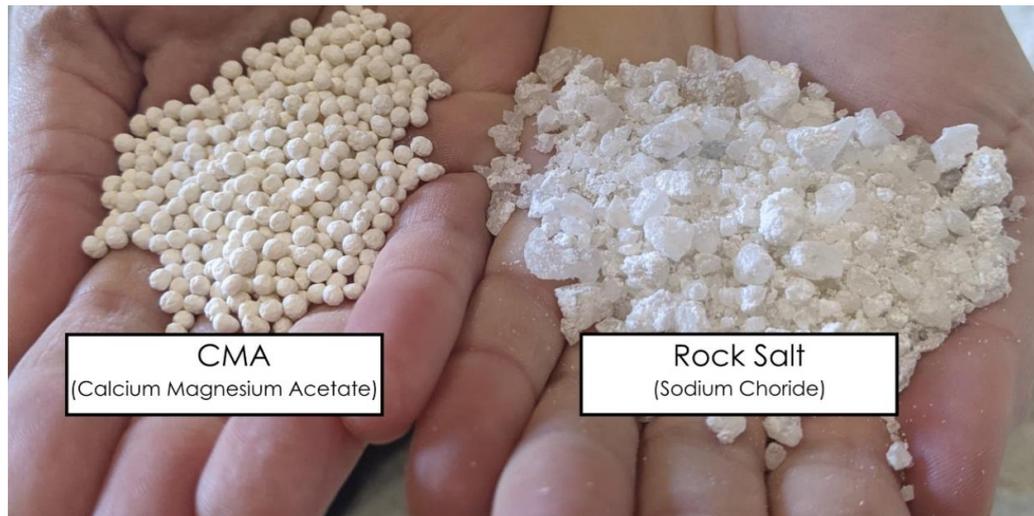
District Ice Management Survey



Salt Management Survey

Goal: Identify a strategy to encourage commercial properties and places of worship to switch to environmentally-safe alternatives to road salt for managing icy sidewalks, parking lots, and driveways

- Identify current trends and opinions
- Investigate opportunities and barriers to switch to environmentally-friendly alternatives
- Share findings with ice removal operations at District-owned properties



Target Audiences

- **Commercial Properties**

- Includes shops, office buildings, apartment buildings, condos, and mixed use
- 6.28% of District land is high density residential, mixed use, and commercial
- 11 established Business Improvement Districts (BIDs)
 - Over 130 miles of sidewalk maintained
- 26 Main Streets in the District
 - 84.9 miles of streets \approx 160 miles sidewalk

- **Places of Worship**

- Churches, Mosques, Synagogue, Temples, et al.
- 775 Places of Worship in 749 locations in the District



Methodology – Online Survey

- **10-minute anonymous online survey** with 15 questions
- **Four Main Sections**
 1. Type of organization
 2. Current ice management practices, with deep dive into product application
 3. Satisfaction with current strategy
 4. Encouraging a switch - motivations and resources
- **Data Collection**
 1. Online Survey: email followed by phone calls
 2. Direct Outreach
 - a. Target audience: follow up questions by phone
 - b. Snow and Ice removal contractors: market research by phone

Online Survey Results



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DEPARTMENT OF ENERGY & ENVIRONMENT

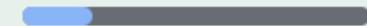
Ice Management Survey

In the District of Columbia when salt that is applied to sidewalks and roadways to melt ice, most of it is eventually flushed out into our streams and rivers. District waterways are fresh water, so this influx of salty water harms the animals and plants that call our streams and rivers home. With more people using salt on their sidewalks, driveways, and parking lots to manage ice than in the past, the environmental impacts of salt in the District are becoming more intense. There is a growing concern over the use of salt to manage ice in the winter months in the District of Columbia and surrounding region as we see increasing impacts to our waterways and to our drinking water, which comes from the Potomac River.

The Department of Energy and Environment (DOEE) is asking you to fill out this short, 10-minute survey. The survey will help the District better understand what strategies are currently being used by commercial buildings and places of worship to manage ice and how to best encourage a voluntary shift to more environmentally-friendly practices.

For additional information about these efforts, please contact DOEE's Stormwater Pollution Prevention Team at DOEE.P2@dc.gov or call 202-281-7174.

Next



Page 1 of 5

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Online Survey Responses

Duration: 3 months, March 15th - May 15th 2021

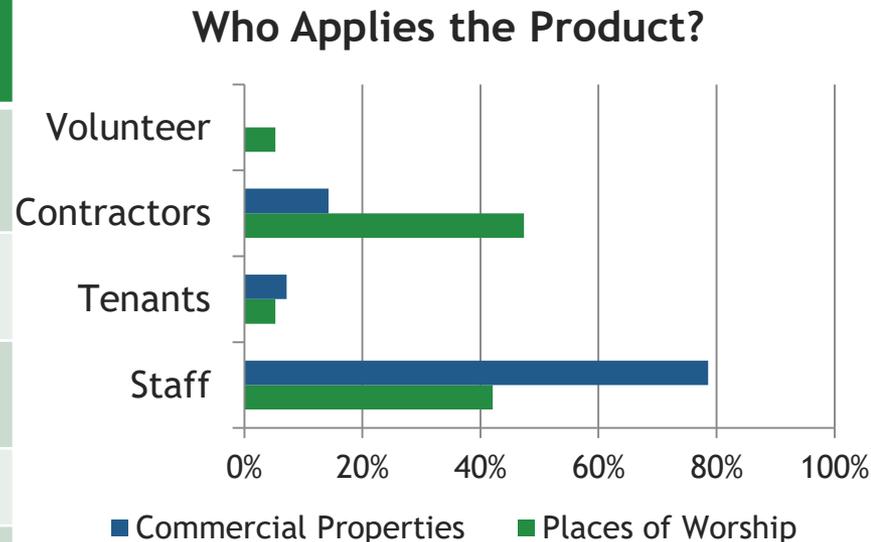
Type	# Responses
Commercial Property	13
Multi-Family Units*	2
Commercial Property	9
BID/Main Street	2
Places of Worship	19
Churches	9
Synagogue	1
Unknown	9
Grand Total	32

**Apartment buildings and condos*

Survey: Current Trends

- 87.5% apply products that melt ice
- No one uses traction or snow melting mats
- Who applies the product
 - Places of Worship: 50/50 Contractors and Staff
 - Commercial Properties: Staff
- Everyone is satisfied with their methods

Strategy	# Responses	Satisfaction*
Deicer, like salt or salt-alternative	28	8.2
Traction, like sand or sawdust	0	0
Snow melting mats or other heating methods	0	0
Physically Remove	2	8.5
Other: both physically remove and use deicer	2	9.0

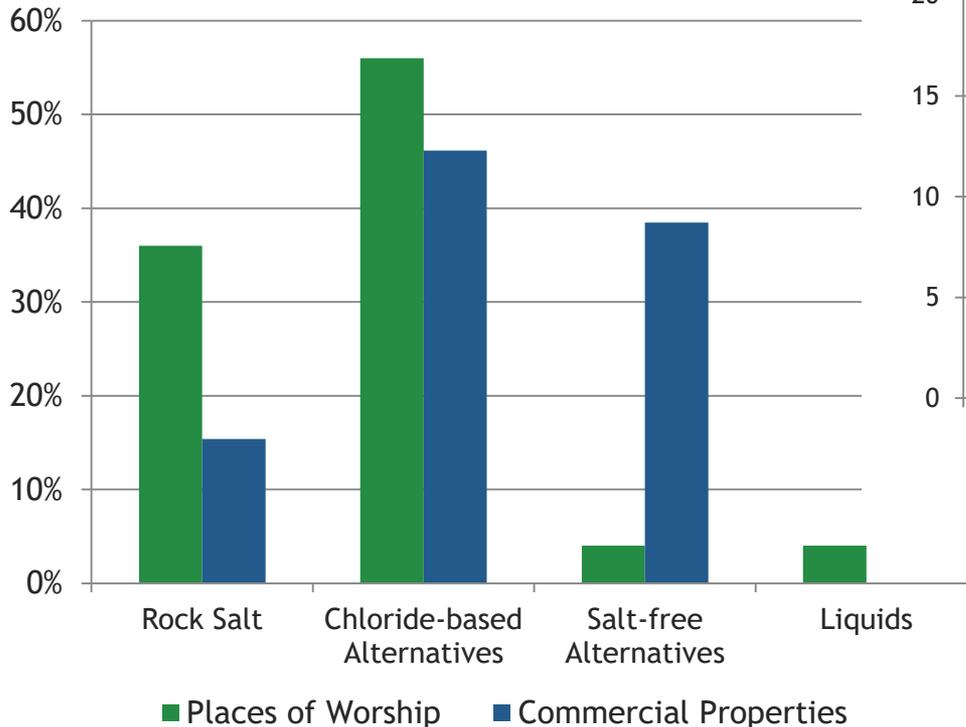


* On a scale of 1 being least satisfied and 10 being the most satisfied

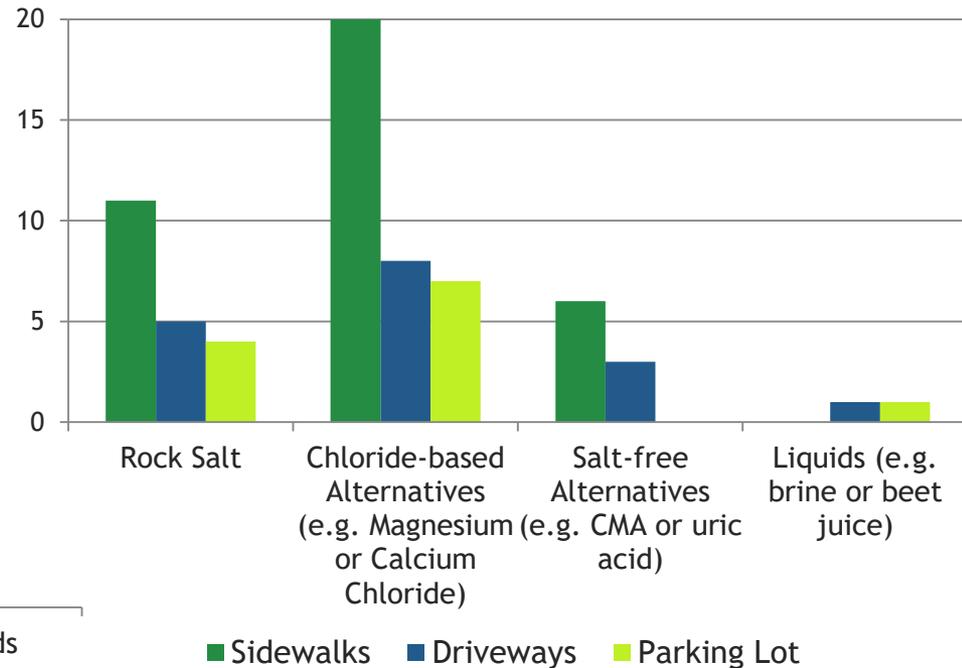
Survey: Product Type

1. Chloride-base alternatives are the most popular
2. Commercial Properties are more likely to use chloride-free alternatives
3. Places of Worship are most likely to use rock salt
4. Few places use liquids and they are only being used on driveways and parking lots

Products Type by Audience



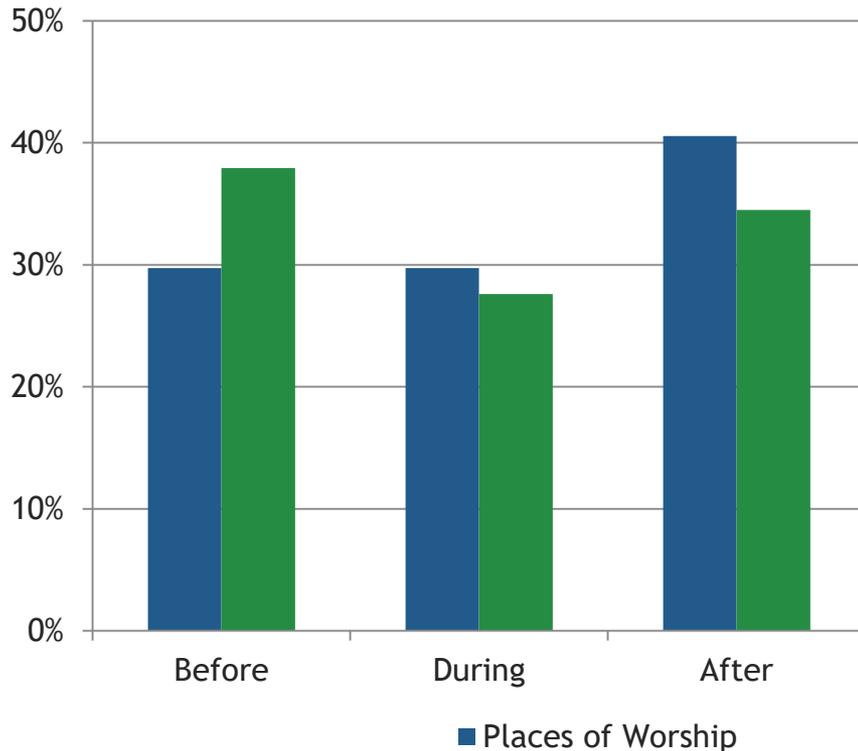
Product Type by Infrastructure Type



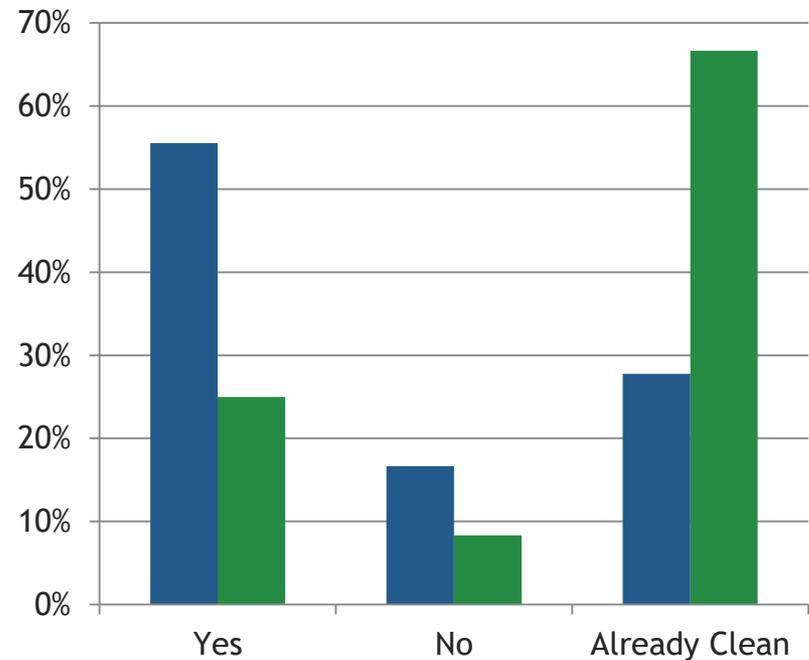
Survey: Techniques

1. Both audiences apply product before, during, and after the event
2. Commercial properties are already cleaning up leftover product
3. Places of worship are willing to start cleaning up product

When Product is Applied



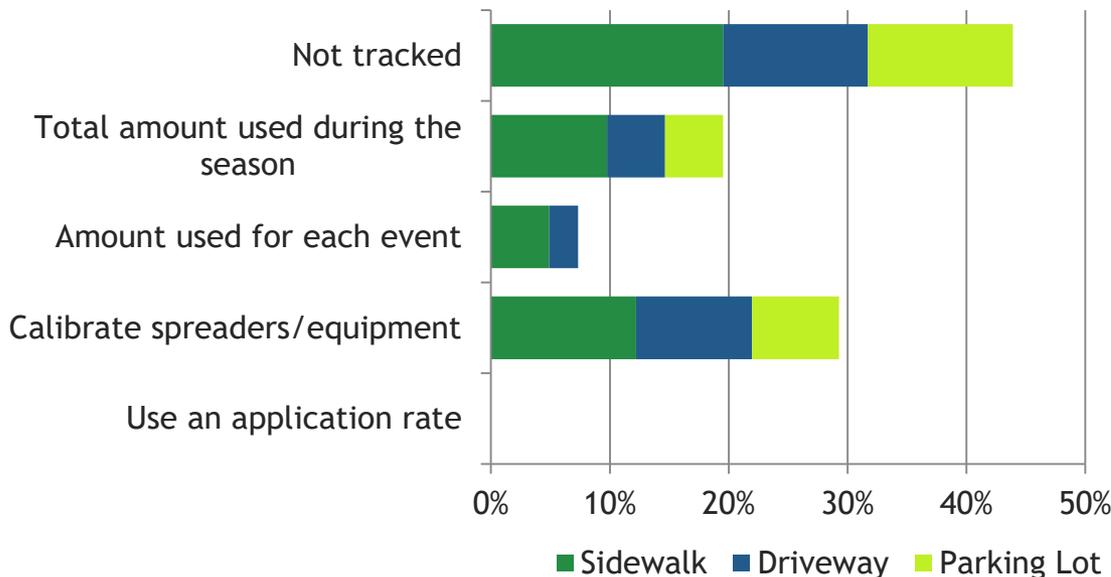
Willing to Cleanup Leftover Product



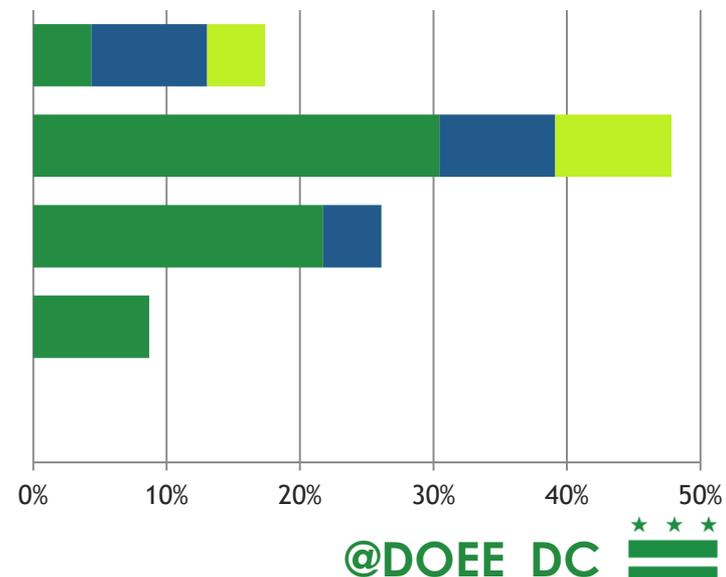
Survey: Tracking

1. Sidewalks are the most common type of infrastructure to be treated
 - Commercial properties didn't report treating as many driveways and parking lots as places of worship
2. Places of worship least likely to track how much they use
3. Most popular method of tracking is total amount used for the season
4. Places of worship are most likely to calibrate their equipment, but nobody reported following an application rate

Places of Worship



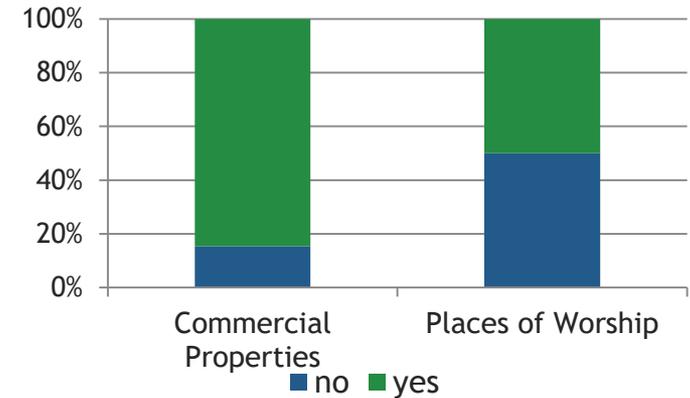
Commercial Properties



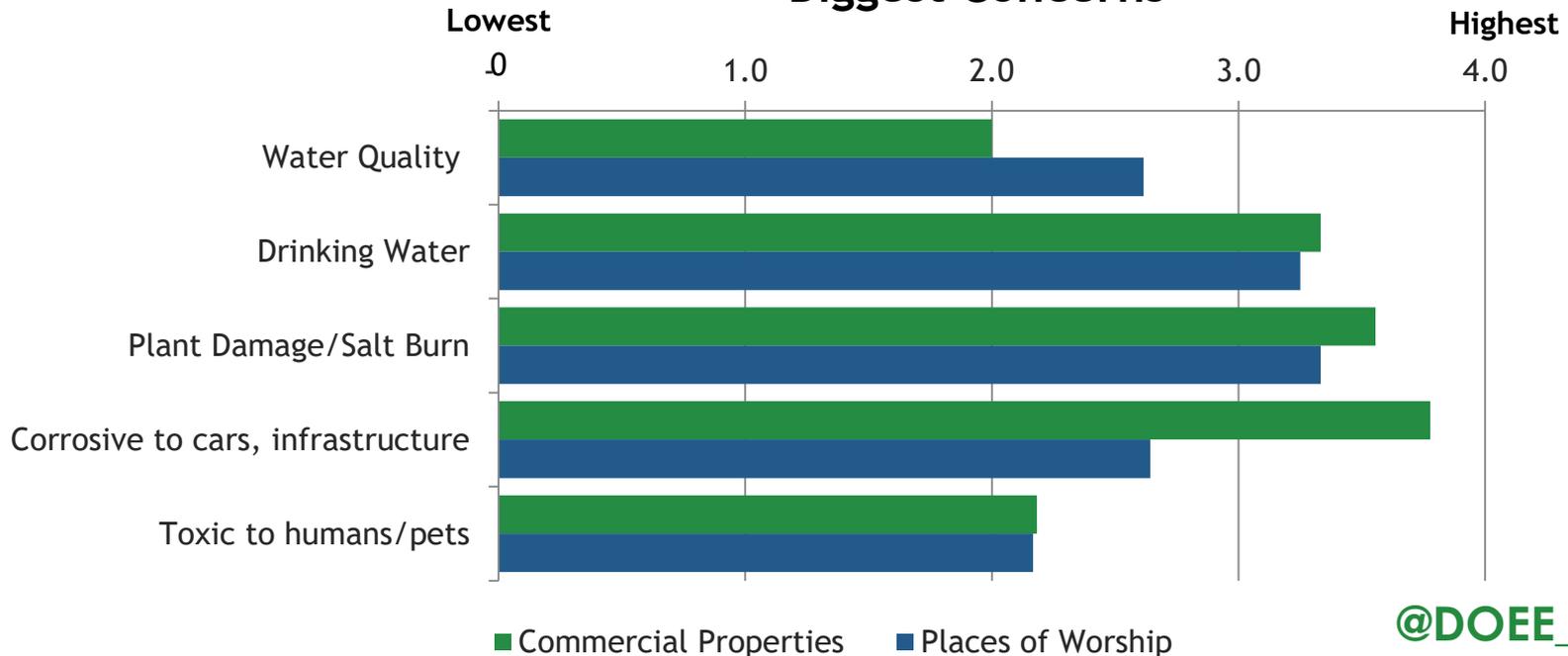
Survey: Environmental Knowledge

1. Places of worship are less aware of the environmental impacts of salt. They are most concerned about drinking water and damage to plants.
2. Commercial properties are concerned with salt's impact to infrastructure, plants, and drinking water

Knows that Salt is Bad for the Environment

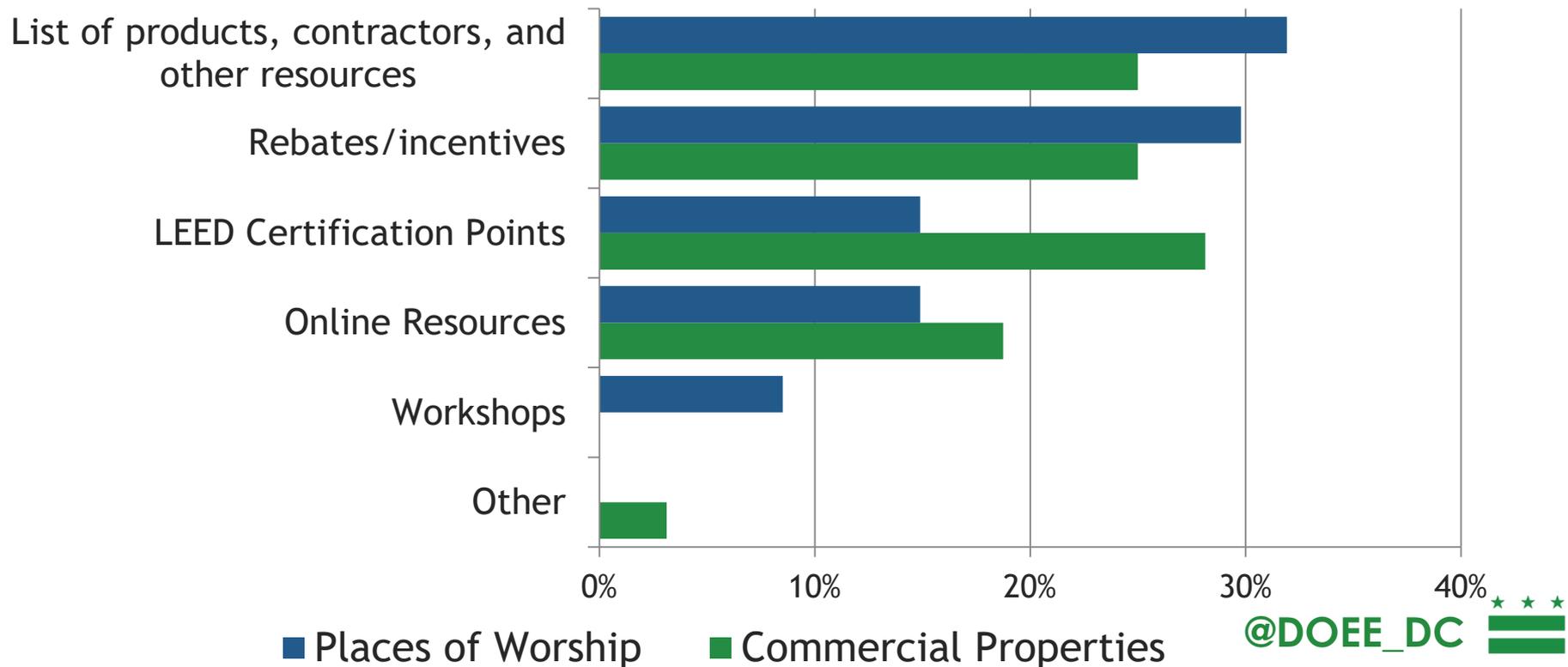


Biggest Concerns



Survey: Encouraging a Switch

1. Minimize additional costs through rebates, incentives, etc.
2. Provide a list of products, contractors, and resources
3. Places of worship interested in testimonials
4. Commercial properties interested to know more about LEED certification and instructions
5. Few interested in workshops, online resources instead



Contractor Outreach Results

Few were willing or had time to talk

- **Confirmed landscaping businesses provide snow and ice removal**
- **Current market**
 - Only one said customers specifically asked for environmentally-friendly products
- **Environmentally-friendly services**
 - Most would not discuss costs over the phone
 - Most only use one product
 - Only one business provides options for deicers



Conclusions

- **Overall**
 - Many have already switched to chloride-based alternatives
 - Interested in alternatives, but costs are a concern
 - Rebates or incentives could help address these concerns
- **Places of Worship**
 - As non-profits they have tight budgets
 - More likely to use rock salt and use contractors
 - Willing to learn about and make changes, e.g. cleaning up leftover product
 - Slightly less happy with their current methods
- **Commercial Properties**
 - Ahead of the curve with adopting alternative products, and already clean up leftover product
 - Concerned with impacts to infrastructure
 - Appear to be happy with and proud about current practices

Take Home Messages

- The most cost-saving technique was not being used - **application rates**
- Those that used alternatives to rock salt were more satisfied
- If you use a contractor, ask them to use an alternative
- It's easy to sweep up deicers left after an event



What would encourage you to adopt alternatives?

Clara Elias

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Watershed Protection Division**

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doee.dc.gov



Resources:

Department of Energy and Environment. Protecting the Environment in Winter Weather - What You Can Do. <https://doee.dc.gov/service/protecting-environment-winter-weather-what-you-can-do>

Minnesota Pollution Control Agency. Winter Parking Lot and Sidewalk Maintenance Manual, Third Edition. June 2015. https://stormwater.pca.state.mn.us/index.php?title=Keeping_surfaces_clear_for_winter_parking_lot_and_sidewalk_maintenance

New Hampshire Certified Green SnowPro. Training Materials for Best Management Practices for Winter Road, Parking Lot, and Sidewalk Maintenance. January 31, 2014. https://t2.unh.edu/sites/default/files/media/GSP/bmp_manual_and_training_program_2014.2018.pdf

Salt Institute. Various resources on salt application and storage. *Note: industry funded.* <http://saltinstitute.org/road/snowfighting/>

Sexton, Phillip Charles. 2017. Sustainability Analysis of the Commercial Winter Management Industry's Use of Salt. Master's thesis, Harvard Extension School. <https://dash.harvard.edu/handle/1/33826971>

Sustainable Salt Initiative (SIMA). Best Practices Guidelines for Sustainable Salt Use. https://www.sima.org/docs/default-source/best-practices-documents/bp_sustainablesalt_digital.pdf?sfvrsn=4

University of Waterloo iTSS Lab (SICOPS). Optimal Snow and Ice Control of Parking Lots and Sidewalks, a Summary Final Report. January 2015. <http://saltinstitute.org/wp-content/uploads/2015/02/Salt-Rate-Study-University-of-Waterloo-Final-Summary-Report.pdf>