

Snow and Ice Economics.....Staying Ahead of the Curve

Michigan
Winter Operations Conference
2014



Agenda

- Overview
 - Weather patterns
 - Statistics
- Costs & Supplies
- Impacts
- Resource Management
- Liquids in S&I Control
 - Pre-wetting
 - Anti-icing
- Technological Advancements
 - Weather
 - Controllers
 - GPS
- Resource Management & Thinking Outside the Box



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Questions for Today...

- What are your main issues of concern?
- What were the major issues last season?
- What has changed since last season?
- How can you best address the issues?
- Do you have a work plan or road map?
- What are your goals and objectives?
- What tools are available to you to address the issues?



Days Gone By.....



Clearing snow from Fifth Avenue, New York City.

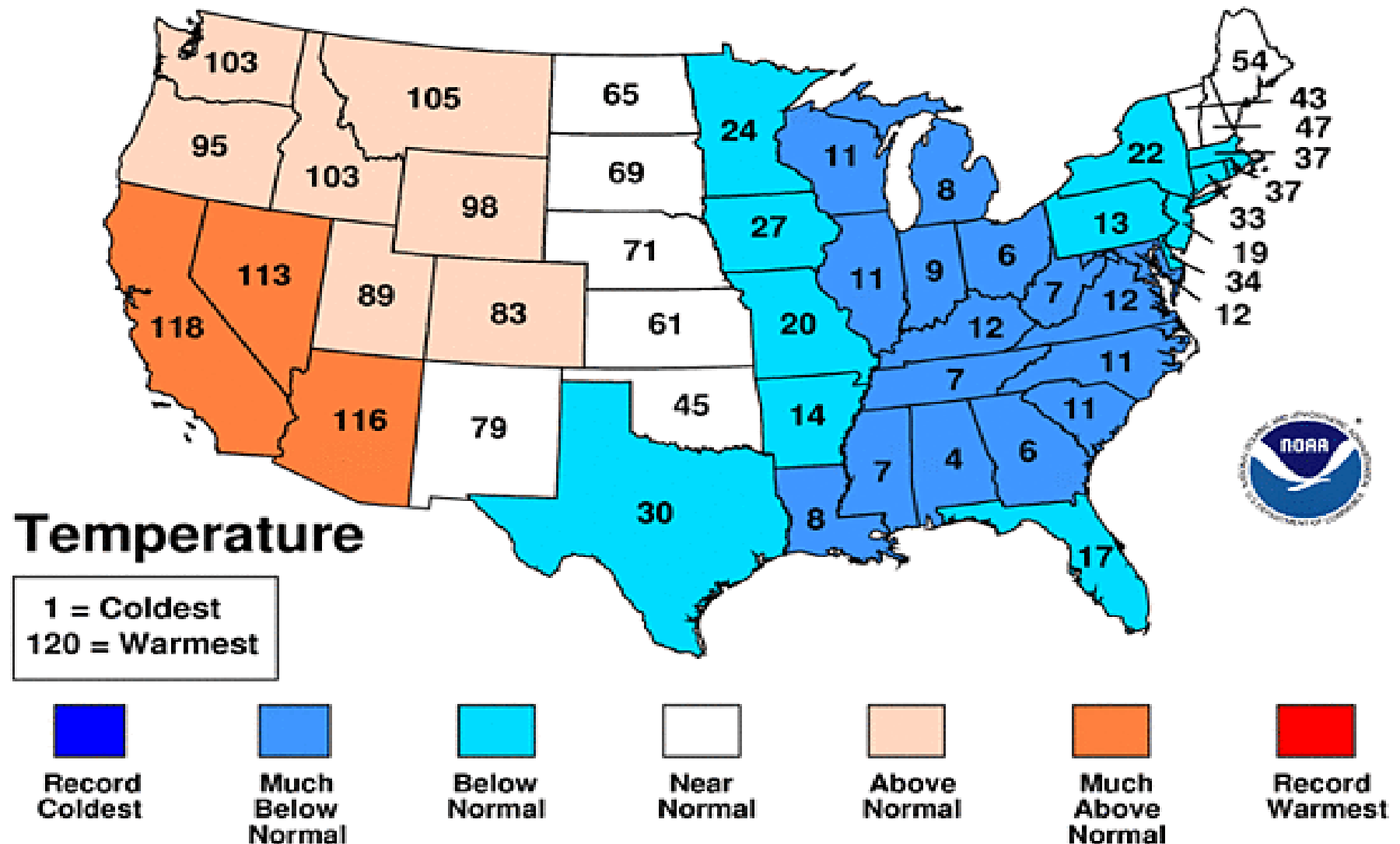


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January 2014 Statewide Ranks

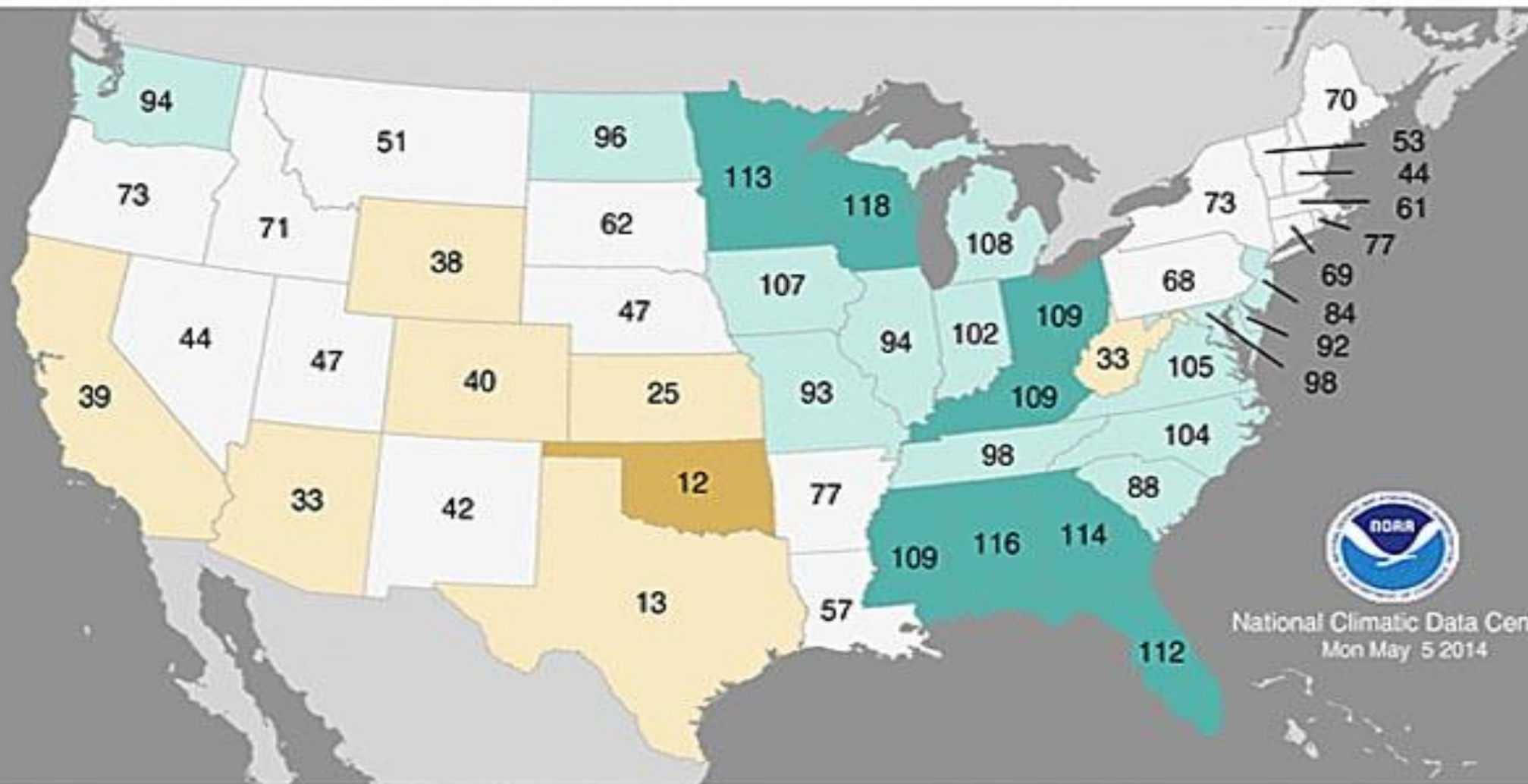
National Climatic Data Center/NESDIS/NOAA



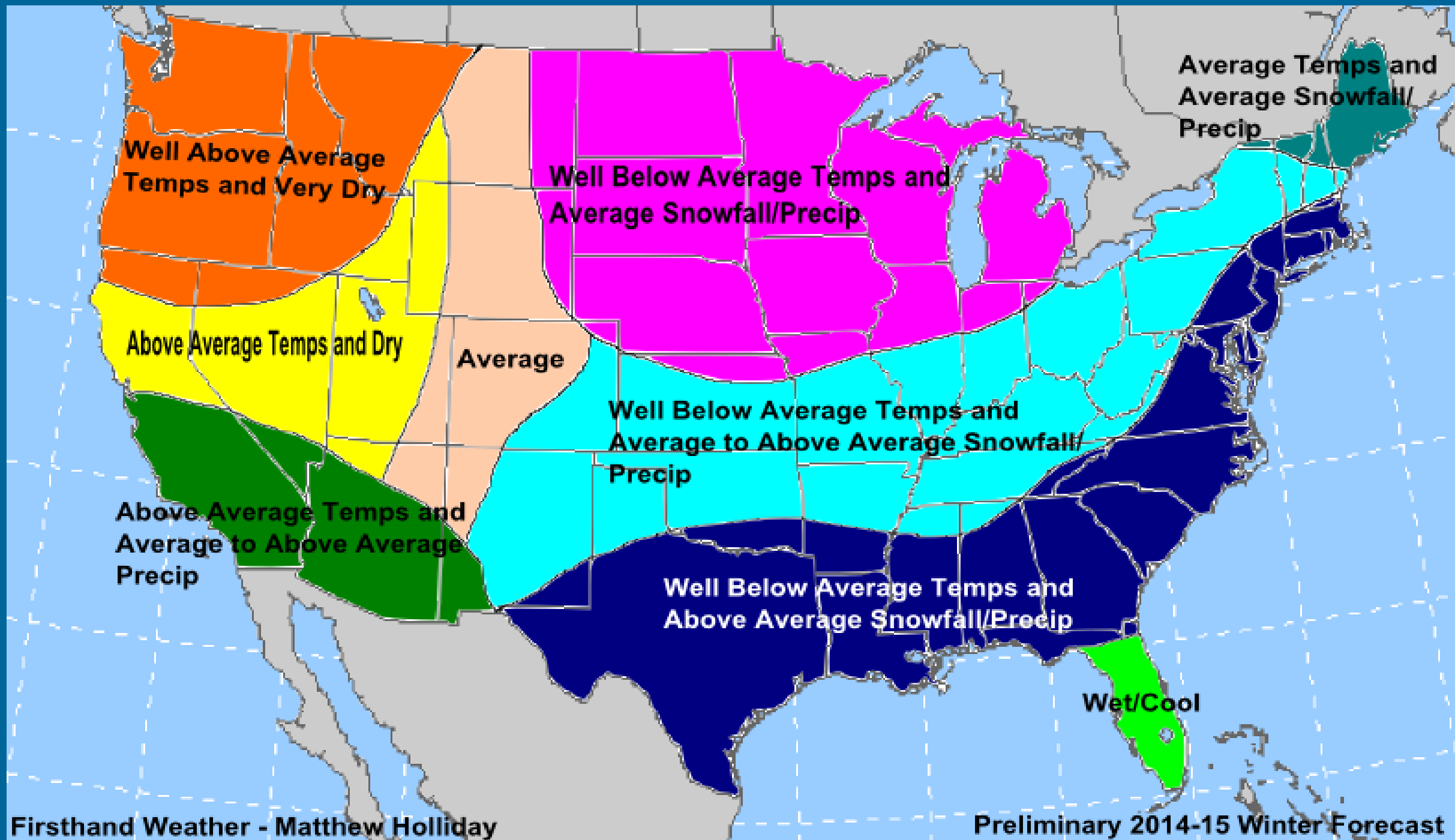
Statewide Precipitation Ranks

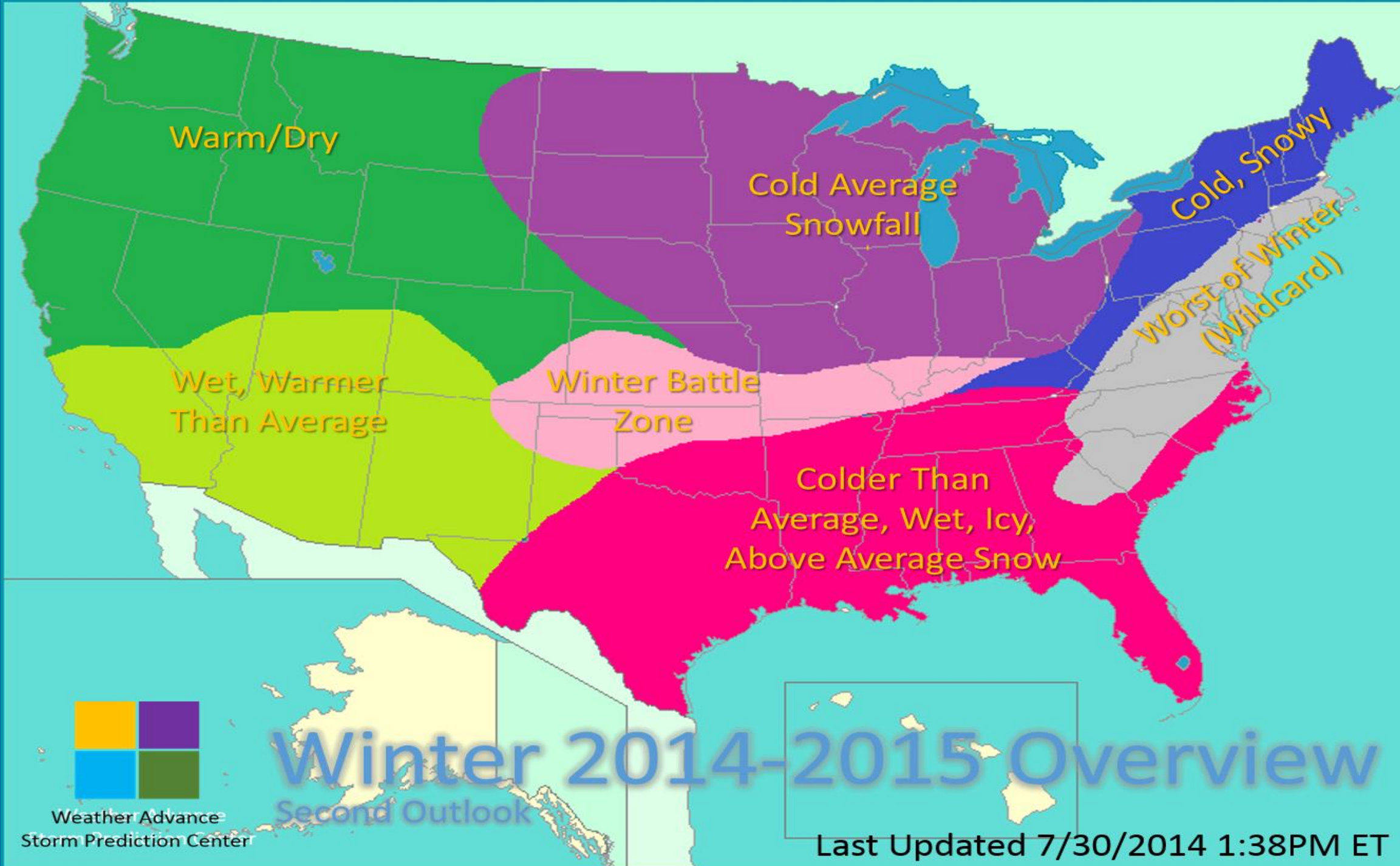
April 2014

Period: 1895-2014



National Climatic Data Center
Mon May 5 2014





Warm/Dry

Cold Average
Snowfall

Cold, Snowy

Worst of Winter
(Wildcard)

Wet, Warmer
Than Average

Winter Battle
Zone

Colder Than
Average, Wet, Icy,
Above Average Snow



Weather Advance
Storm Prediction Center

Winter 2014-2015 Overview

Second Outlook

Last Updated 7/30/2014 1:38PM ET

Pushing Snow.....



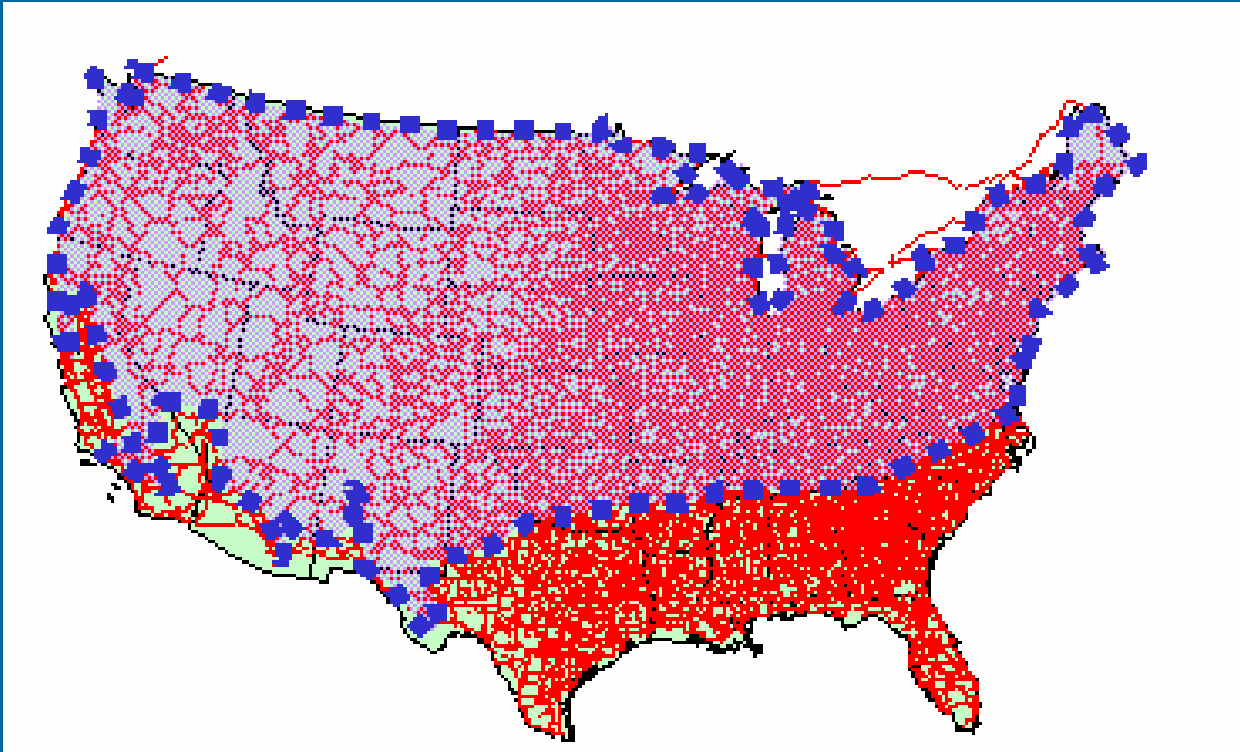
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Spreading Rock Salt.....or a Mix



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National Statistics



- 70% of the Nations roads are in snow regions
- Winter Maintenance is critical to mobility and transportations andto the economy

Economic Costs of Poor Service

According to a Global Insight study:

- A one-day major snowstorm can cause a state \$300-\$700 million in direct and indirect costs.
- The economic impact of snow-related closures far exceeds the cost of timely snow removal.
- Snow related shutdowns harm hourly workers the worst.

Source: Salt Institute



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February 2014...Atlanta

- “Get off the roads and stay off”
- Up to three-quarters of an inch of ice in Atlanta and up to 10 inches of snow and sleetin Raleigh and Charlotte



Source: Atlanta
CNN & CBS



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25% to 45%

Of the Total Operating Budget

For the average year.....



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MATERIAL COSTS.....

UP TO 50%

**Of the TOTAL COST of Snow & Ice
Operations**

For the average year.....

ABC News....

“A Summary of Snow States' Road Salt Problems”

- Road salt was used in record amounts across the U.S. last winter, leaving supplies tight and costs highto prepare for this winter.
- Salt prices have increased an average 46 percent across Michigan, though road officials in Washtenaw County — hit by record-breaking snow last year — is paying 120 percent more for salt this year....

Other States.....

- Indiana's salt supplies also were hit hard last winter, and prices have jumped an average of 57 percent statewide.....
- Increased salt prices may have hit hardest in Ohio, where most counties are paying between 43 percent and 128 percent more for salt this year compared to last year. Some counties rejected bids that were too expensive or received none.
- Illinois officials say this season's prices range from \$75 a ton to more than \$130 per ton, up from last year's statewide average of about \$55..... but many still didn't receive bids.

Infrastructure Impacts

- Structures (bridges, buildings)
- Roadway pavement & walkways
- Vehicles & equipment



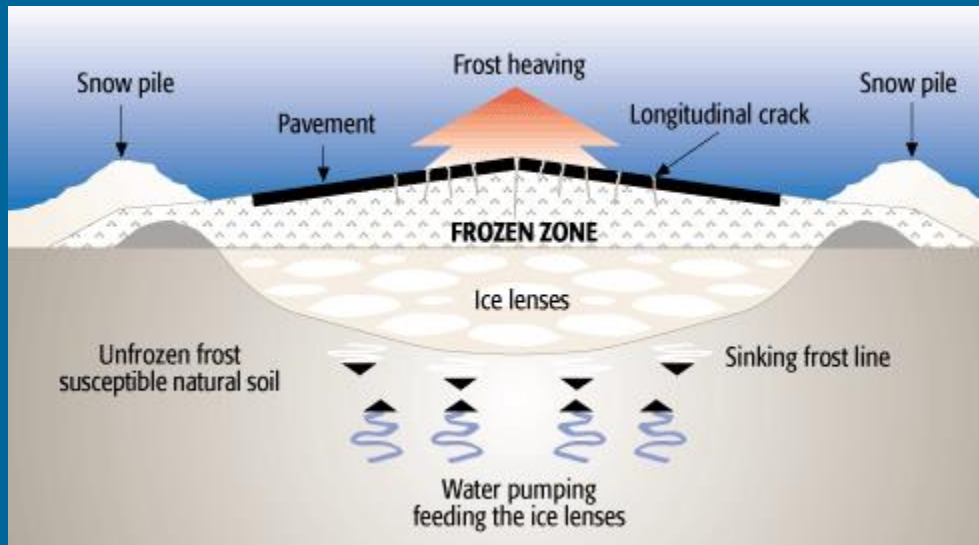
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Bridges



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Freeze and Thaw (Frost Heave)



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Concrete Surfaces



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Vehicles & Equipment



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Corrosion...on Metal

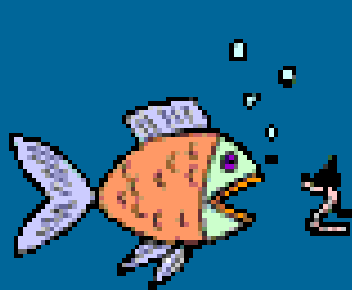
- More corrosive
 - Calcium Chloride
 - Sodium Chloride
 - Magnesium Chloride
 - CMA
 - Urea
- Less Corrosive



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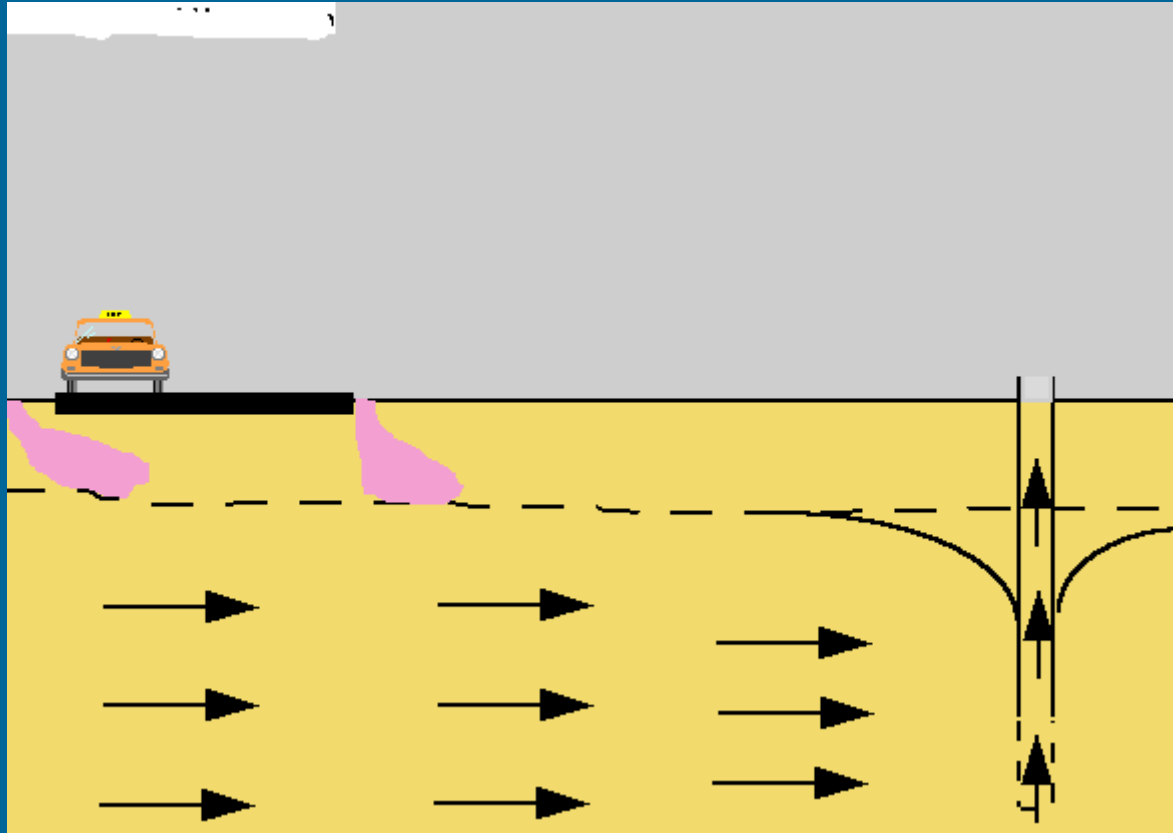
Environmental Impacts

- Soil
- Animals
- Vegetation
- Water
- Air
- Human Health



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Groundwater



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Landscape



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Snow Removal

**Low
Performance**

**Average
Performance**

**High
Performance**

Snow and Ice Resource Management

- Effective - Defined by the Level of Service
 - What end result are we trying to achieve?
 - Bare and wet surfaces?
 - Prioritized areas?
 - Access around major traffic generators?
- Efficiency - Available Resources
 - Labor, Equipment, and Materials
 - How is the outcome or performance measured?



Winter Maintenance

- Storm Management
 - Doing the right thing at the right time
 - **Timely Assessments**
 - **Proper Adjustments**
 - **Flexible Operations Strategy**



Winter Maintenance Materials

- What materials are available for use in winter operations?
- How do these materials work?
- How effective are these materials?
- How do we use these materials?

.....WE ARE RESPONSIBLE FOR WHAT WE PUT ON THE ROAD!!

Liquids in Snow & Ice Control



- Pre-wetting solids
- Direct application –
Anti-icing



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Pre-wetting

Pre-wetting salt
as it is discharged



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Prewetting Salt: Benefits

- Less bounce & scatter
- Faster reaction time
- More effective melting action
 - Quicker return to desired surface condition
- Less salt needed resulting in:
 - Achieving goals despite product availability issues
 - Reduced environmental and infrastructure concerns
 - Saving money



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Anti-icing

Direct application
to the surface prior
to the event



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Anti-icing

- Anti-icing is a proactive operation:
Spreading material before the storm starts — prevents snow and ice from bonding to the road and preventing frost

versus

- Deicing is a reactive operation: Spreading material after storm starts — allows bonding of snow and ice to road surface causing use of more salt and more time to break the bond and achieve melting



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Anti-icing Benefits

- Provides a pro-active approach to weather event
- Manage resources during supply shortages
- Expand upon service options
- Provides flexible and timely treatments
- Increase effectiveness and efficiency
- Achieve desired levels of service
- Cut costs

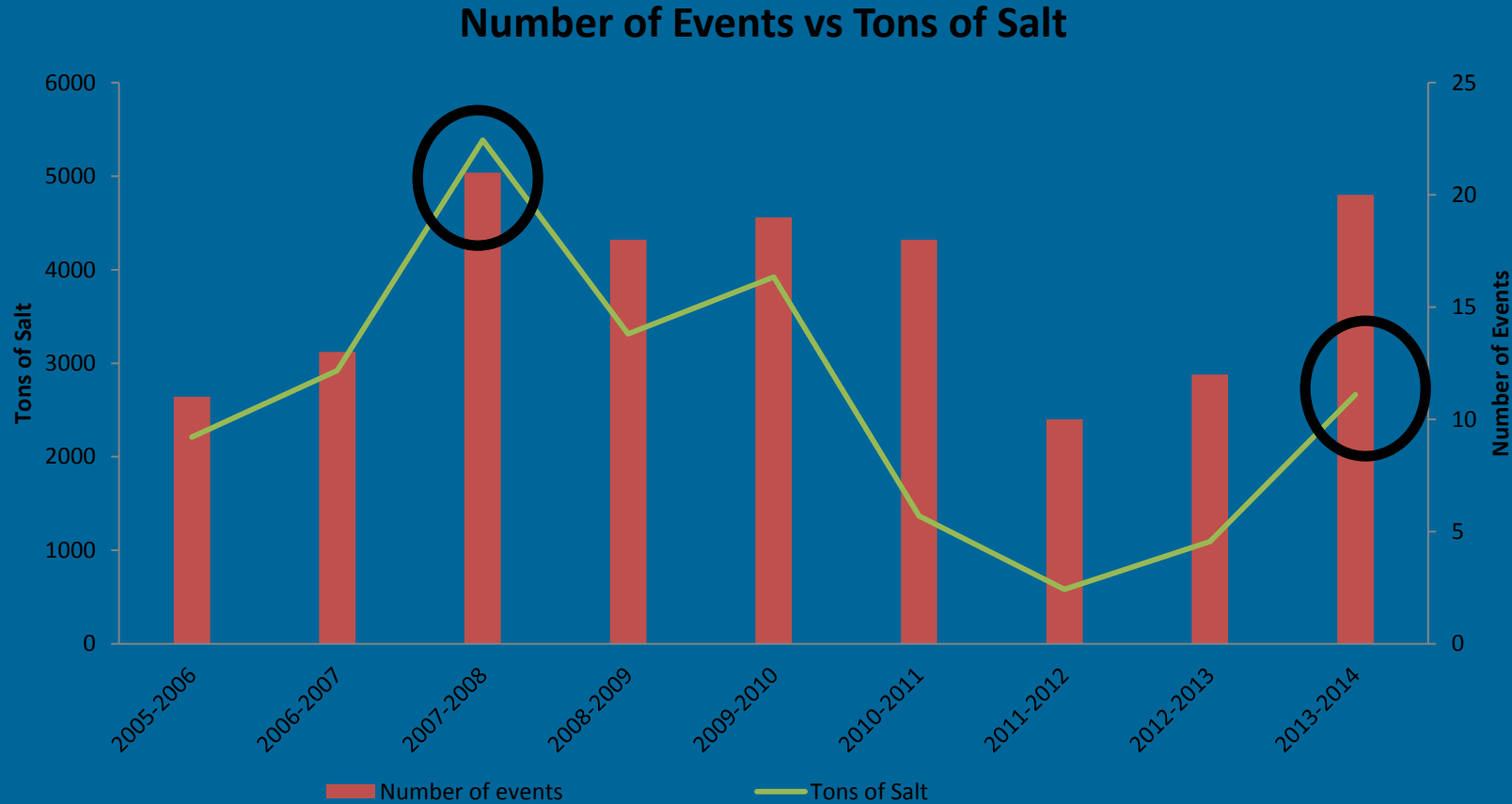


What Do Others Say?

- Farmington Hills, Michigan – Cut overall material usage by 25%
- Plain Twp Stark County, Ohio – 40% reduction in salt use
- Auglaize County, Ohio – 20% reduction in overall cost
- Private Contactor – Salt savings of a minimum of 25% and up to 40%
- Private Contractor – Reduced salt application by 50% through pre-treating stock pile



West Des Moines Iowa



**Reduced use from 5,400 tons to 2,600 tons
for the same # of events**



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Technological Advancements

- Weather forecasting and data
- Automated controllers and calibration
- GPS



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Weather Forecasting

- Understanding a Forecast
- Predominant Storm Types
- Tracking the Weather
- Precipitation Types
- Weather Concepts
- Dew Point and Pavement Temperatures
- Frost & Black Ice
- Tracking Surface Conditions



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Truck mounted Temperature Sensors



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Automated Controllers

- Ground speed controllers – Correlate output of material with vehicle speed to maintain constant application rates
 - Ensure accuracy of material application
 - Allow for accurate adjustment of rates to conditions
 - Provide data related to material applications
 - Measure outcomes for process improvement



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Ground speed controllers

“Regardless of the type of spreader/controller used, it is extremely important to calibrate the system” 2009 Clear Roads report



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Calibration

- New equipment when received
- Annually
- Following vehicle maintenance or modifications (hydraulics, controller and/or auger)
- Upon change of material being applied
- Any signs of application issues

Calibration relates to the entire system..the controller, the vehicle, and the material

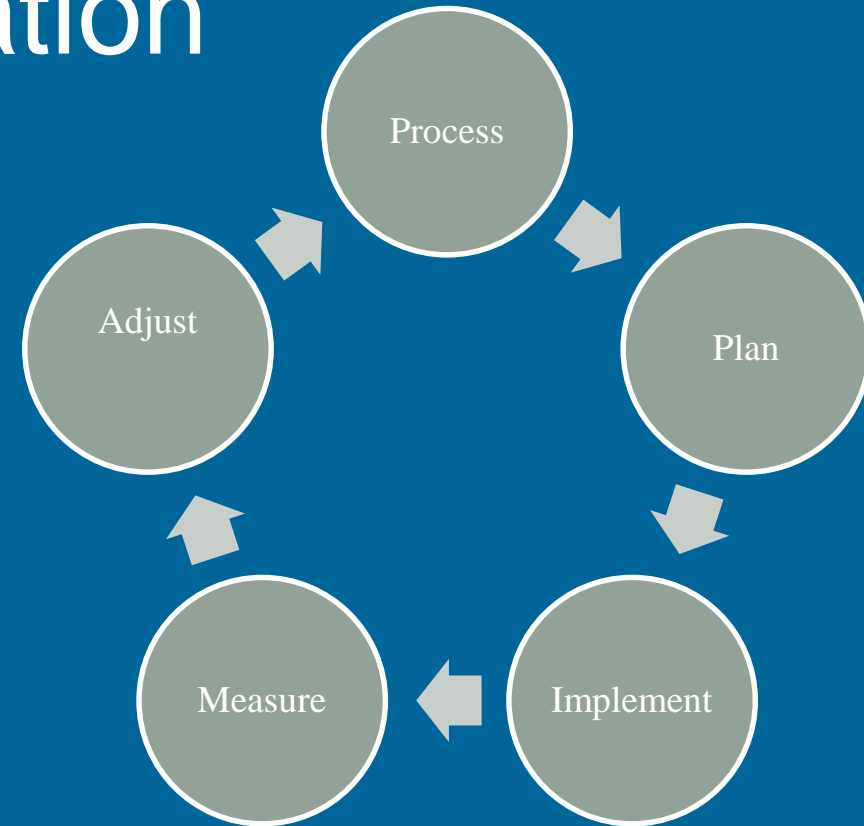


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Calibration

- How we measure output
- How we adjust output
- How we improve output



The primary way to evaluate and improve



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GPS Benefits.....

- Resource planning
- Improved production
- Cost effectiveness
- Customer service
- Safety
- Improved dispatching
- Improved reporting



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GPS is a Tool for.....

- Resource management providing flexibility and real-time adjustments
- Validating service
- Building effectiveness and efficiency
- Data collection and information tracking



The Business of Snow & Ice Control...

- Defining the level of service
 - Review and understand all available resources
- Factors and Operational Items
- What are others doing?
 - What Best Practices are available?
 - How can we achieve sustainability?



Resource MANAGEMENT

- Storm Management
 - Doing the right thing at the right time
 - Results in effective and efficient operations
 - Achieving the desired level of service
 - Use less materials (1/3 or more)
 - Less wear and tear on equipment
 - Prolonged equipment life through improved maintenance
 - Less chlorides to the infrastructure and environment
 - Measuring results to allow for improvements
- Achieving Sustainability – Economically, Environmentally, and Societal



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Think Outside of the Box

- Learning and understanding weather factors...using pavement temperatures
- Alternative treatments and understanding materials
- Using the right material in the right amount for the given situation
- Adding and using liquids – pre-wetting and anti-icing
- Calibration of equipment and measuring output and results
- Changing the “mindset” to one of conservation
- Sharing services
- Revising your snow and ice plan and LOS
- Communications



Summary

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Questions?????

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