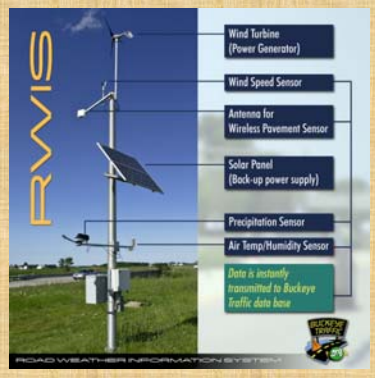
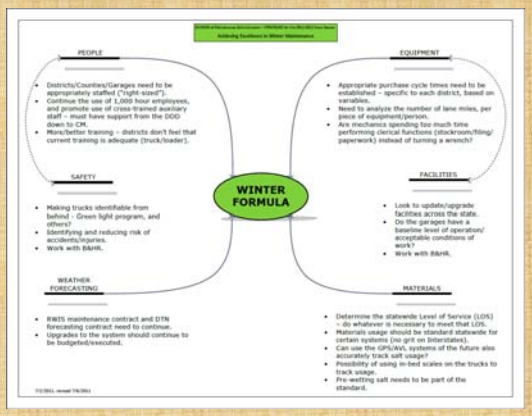
RWIS in ODOT's Winter Plan





Overview
Our Responsibility

- **43,000 Lane-miles**
- **Ohio roads carry the 5th largest volume of traffic in the US**
- **$1.3 trillion in freight crosses Ohio annually**
- **33,664 Snow and Ice related accidents annually**
  - **9,063 Injuries**
  - **53 deaths**

Overview
Impacts of Snow and Ice

- Budget Impact
  - $2.3 billion annually nationwide
- Essential Services Impacts
  - Police, medical, fire and rescue,
- Individual Impacts
  - Increased accidents, fatalities, property damage, insurance costs, lost wages
- Economic Impacts
  - Lost productivity, late shipments, additional fuel and lost sales
- Environmental & Infrastructure Impact
  - Over $5 million annually in repairs

Overview - Impacts of Snow and Ice

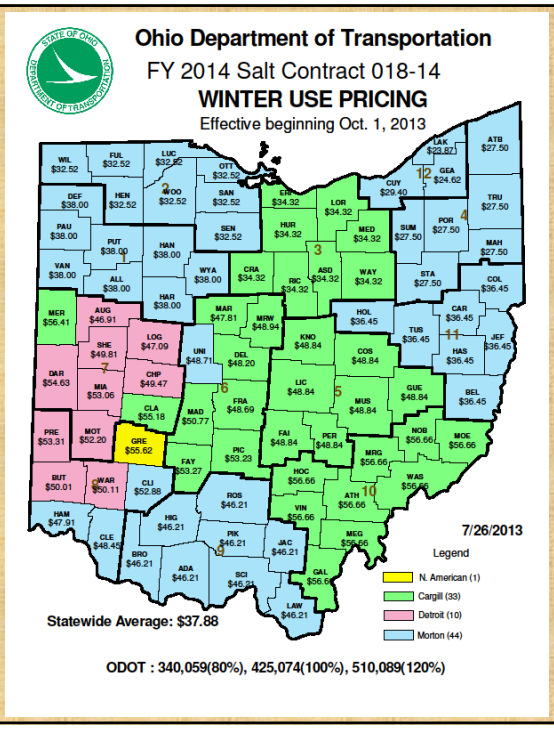
Annually, ODOT:	Can we really spend $50 Million on Rock Salt per year?
• Spends $50 million on rock salt • Uses over 650,000 tons of salt • 7-9 Million gallons of brine • 500,000 gallons of other chemicals • 3,000 CDL employees involved in snow and ice control • 1,700 trucks • 200 garage facilities	• Cost – 2013 FY average $40.91 per ton • 8 tons per single axle truck = $327.28 • 3 Loads per truck per shift = $981.84 • 15 trucks = $14,727.60 per shift • 2 shifts per day = $29,455.20 • Average of 8 counties per district = $235,641.60 per day for just one district • There are 12 districts in Ohio = $2.8 million

Overview Impacts of Snow and Ice

2012/2013 Winter Statistics

Equipment Usage	Stock Usage	Labor Charge
27,043 per hr. = $987,800 9,767,803 mi. = $24.6 **$25.6 m**	723,205 tons of Salt = $37.5m 731,147 gal. Salt Brine = $158,800 Other Materials = $1.3m **$39.4m**	344,300 OT hr. = $33.7m 27,798 Aux hr. = $344,900m 445,443 Reg. hr. = $28m **$62.1m**

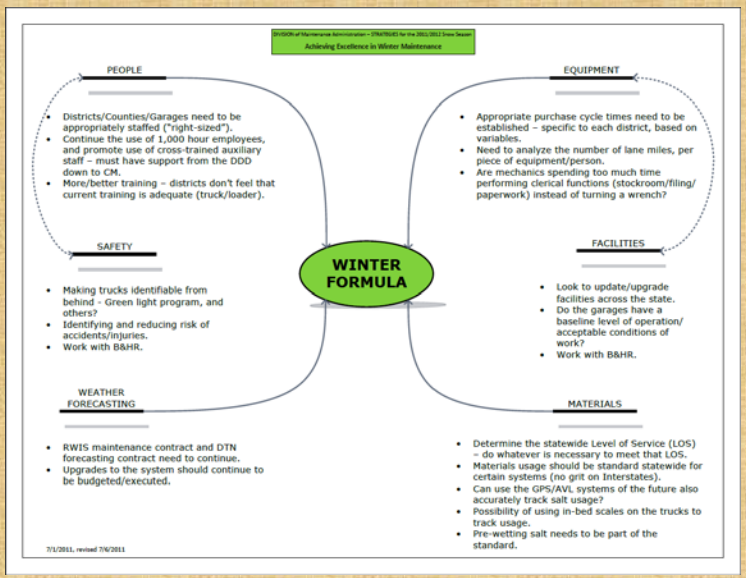
Over $127 million in Snow and Ice control costs for the year



Overview

Plowing is the Primary tool for snow & ice removal

ODOT Winter Formula



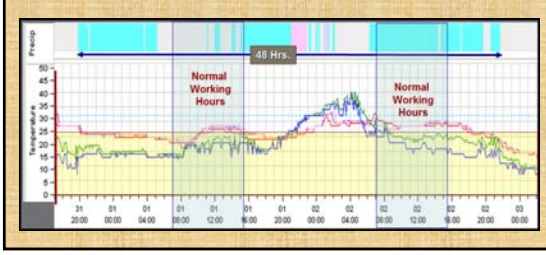
Materials

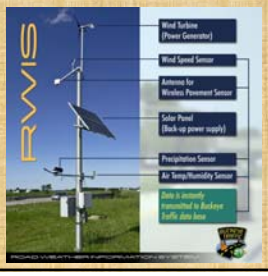
- Chemicals
  - Salt (Rock and Brine)
  - CaCL
  - Some GeoMelt/IceBite/Clear Lane, etc

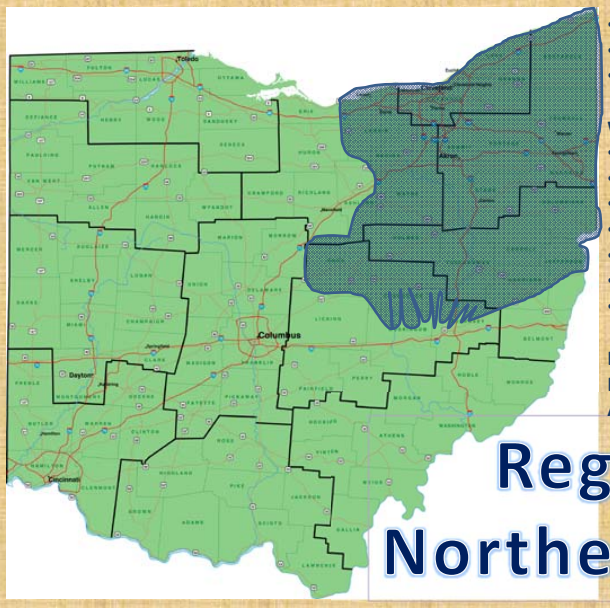
Equipment

- Pre-Trip Inspections
- During Ops Inspections
- After Ops Inspections
- Cleaning

WEATHER FORECASTING







- Generally Cold Climate
- Impact From Lake Erie
- Hilly Terrain / Wooded

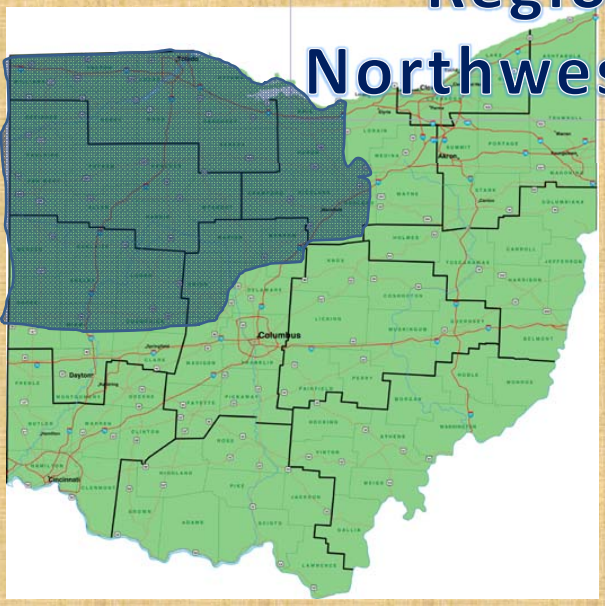
Winter Storms Characterized by:

- 8”-12” Snow Falls
- Lake Effect Snowfalls
- Lake Enhanced Snowfalls
- Heavier Snows
- Black Ice
- Sleet
- Freezing Rain

Lake Can Produce Non-Storm Related Snowfalls of 20” or More And Last for Days

Region 1
Northeast Ohio

Region 2
Northwest Ohio

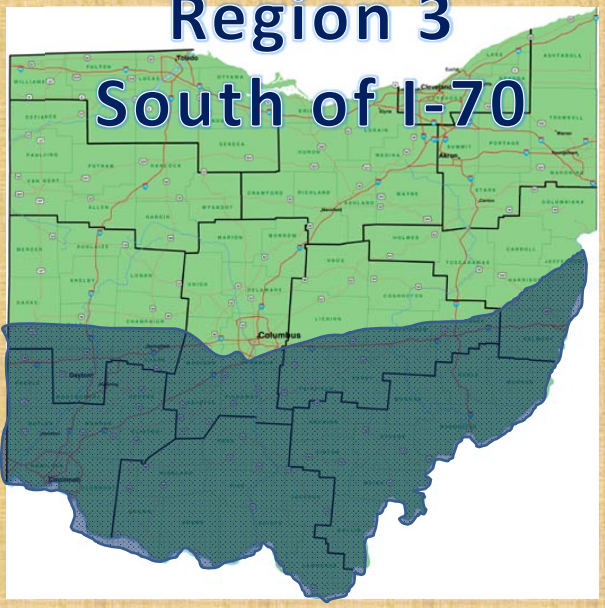


- Generally Coldest Climate
- Impact From Lake Michigan
- Flat Terrain / Not Heavily Wooded

Winter Storms Characterized by:
- 3”-6” Snow Falls
- Higher Winds
- Heavier Drifting
- Black Ice
- Sleet
- Freezing Rain

Higher Number of ‘Nuisance’ Snow Falls of 2” or Less from Lake and Clippers.

Region 3
South of I-70

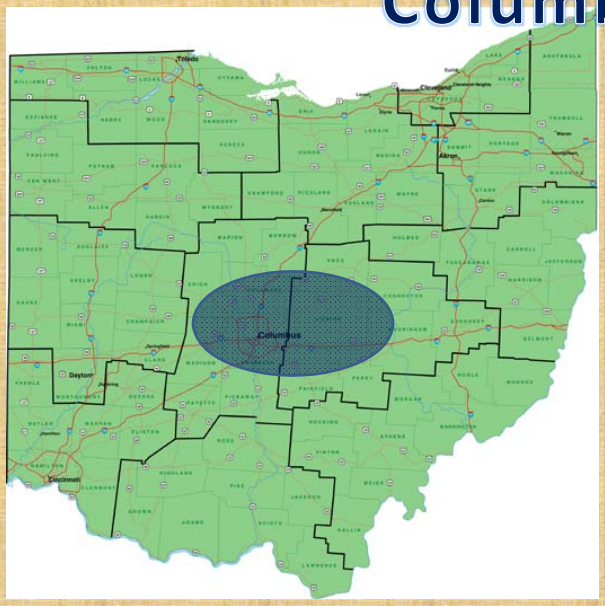


- Generally Milder Climate
- Less Impact From Lakes
- Partially Shielded By Mountains

Winter Storms Characterized by:
- 1”-3” Snow Falls Mixed With:
- Black Ice
- Sleet
- Freezing Rain
- Ice Mist or Fog

Brining is Difficult Because Most Big Storms Begin as Rain, Then Changes.

Columbus Area



- Ridged Topography Around City

Winter Storms Characterized by:
- 1”-3” Snow Falls Mixed With:
- Black Ice
- Sleet
- Freezing Rain
- Ice Mist or Fog

Columbus Area Winter Storms Can Be Impacted Any Region Depending Storm Makeup And Track.

TWO KEY SNOW & ICE QUESTIONS:

“What Am I Going To Get?”

Composition

- Precipitation Type?
- Intensity?
- Wind?

AND

“When Am I Going To Get It?”

Timing

- Begins?
- Changes?
- Ends?

Watching Winter Conditions

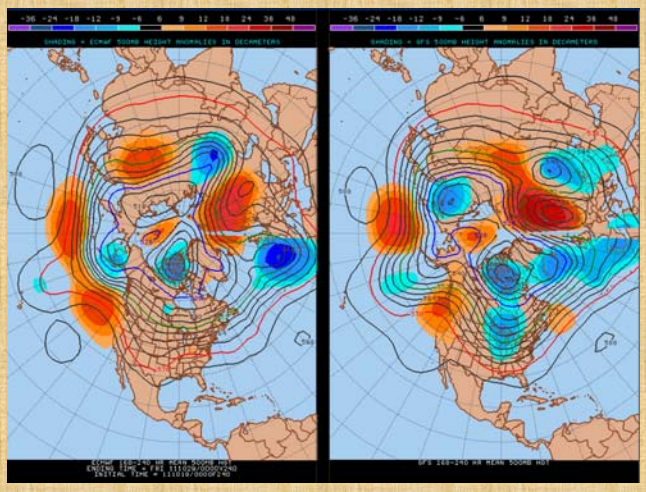
1. Take Notice of Potential Events 3-5 Days Out
   a. NWS Forecasts, Private Forecast Services, etc.

2. Monitoring forecast progression
   a. Lead time for maintenance or repairs
   b. Stock up on resources (fuel, salt, etc.)
   c. Plan for potential upcoming snow and ice shifts

WHAT GOES INTO A FORECAST?

- Data
- Discussions

Data: 500 mb Forecast (2 Models)



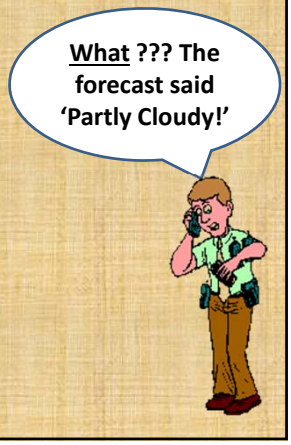
➢ 15,000 Ft Upper Level Flow, Euro and GFS

No Forecast is Perfect!

Sudden Forecast Changes, or Complete Misses are Not Uncommon:

This can lead us to:

1) **Scramble or Recall Crews**
2) **Change Operational Tactics (Storm Makeup)**
3) **Adjust Staffing (Long storms)**

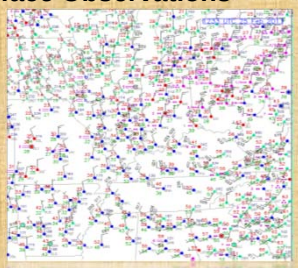


Weather in Real Time

NWS Radar

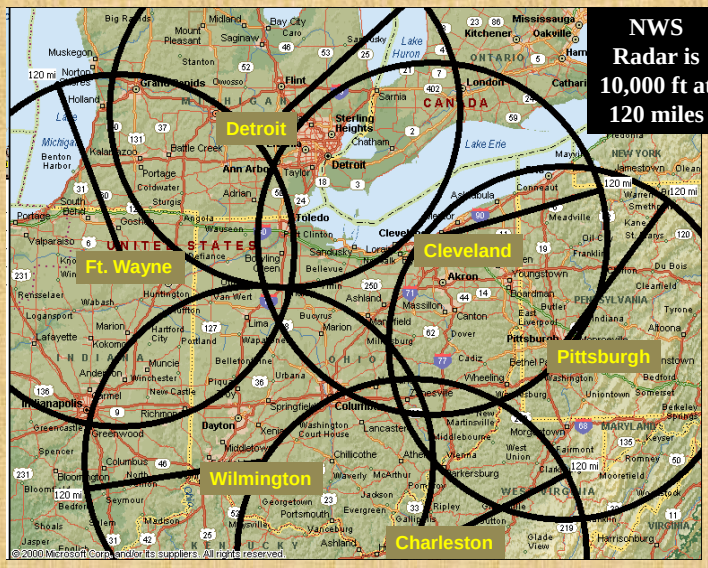
NWS Satellite

NWS Surface Observations



RWIS

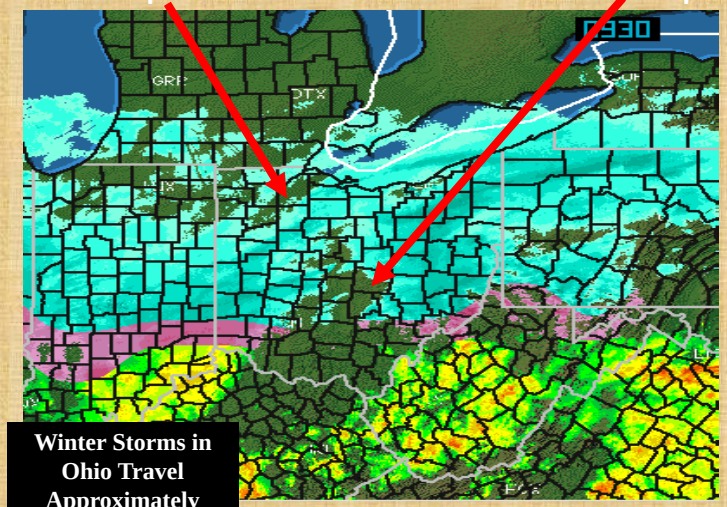
Radar

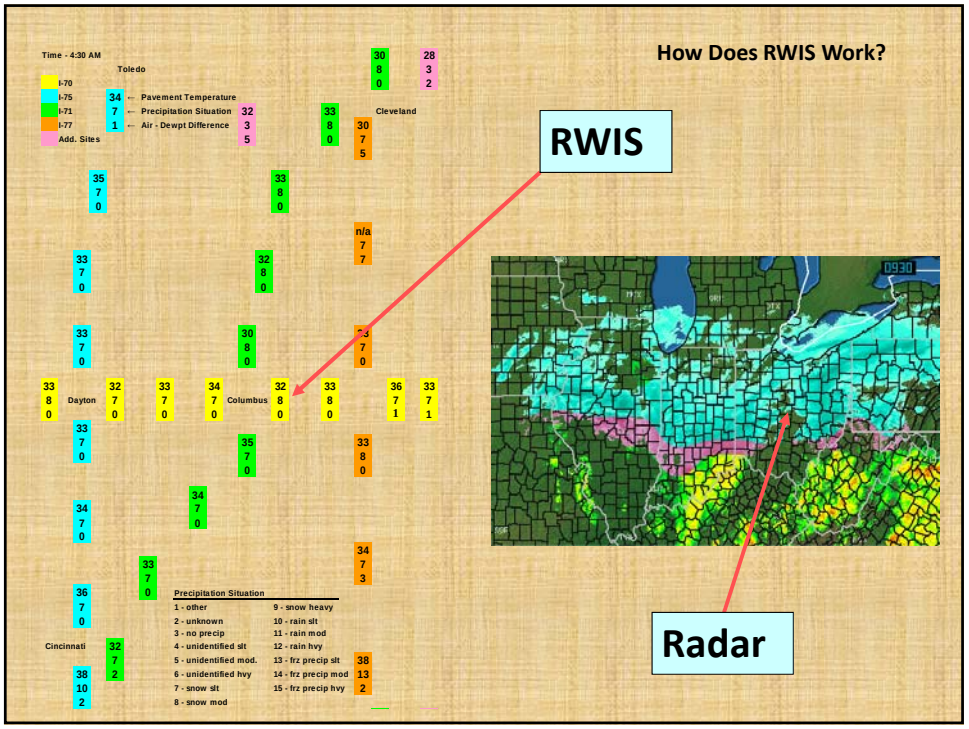

NWS Radar is 10,000 ft at 120 miles
Detroit
Cleveland
Ft. Wayne
Pittsburgh
Wilmington
Charleston

Radar


Snow & Sleet are lower in the atmosphere.
Effective distance for Snow: 100 Miles
Radar Gap
Detroit
Cleveland
Ft. Wayne
Pittsburgh
Wilmington
Charleston

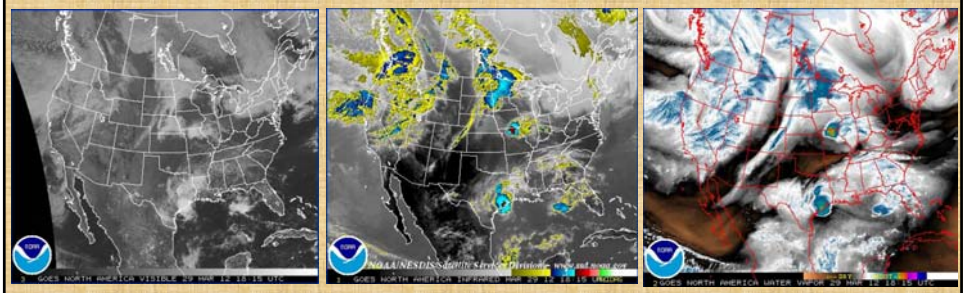
Radar


Radar Gap
Radar Gap
0930
Winter Storms in Ohio Travel Approximately 35mph

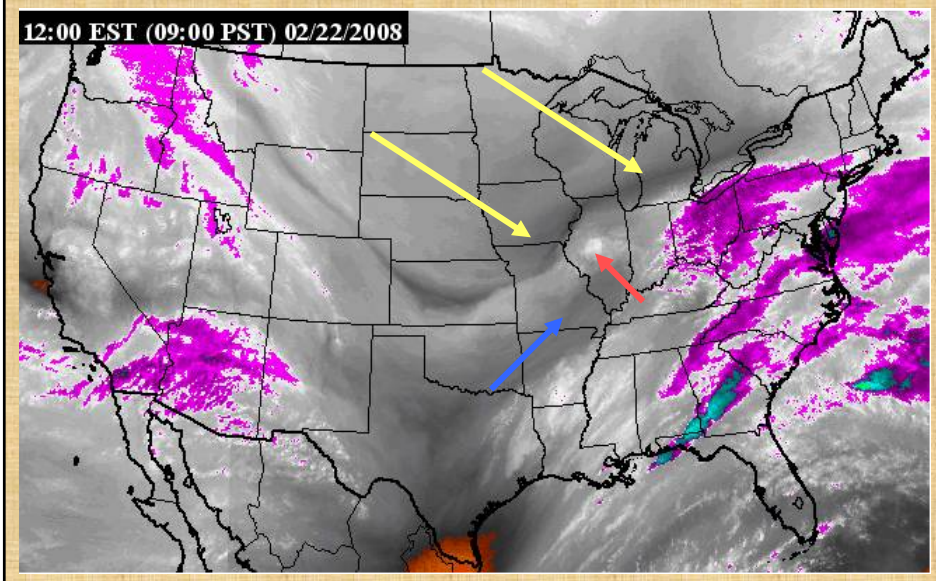

How Does RWIS Work?
RWIS
Radar
Time - 4:30 AM
Toledo
Cleveland
Dayton
Columbus
Cincinnati
I-70
I-75
I-71
I-77
Add. Sites
← Pavement Temperature
← Precipitation Situation
← Air - Dewpt Difference
Precipitation Situation
1 - other
2 - unknown
3 - no precip
4 - unidentified slt
5 - unidentified mod.
6 - unidentified hvy
7 - snow slt
8 - snow mod
9 - snow heavy
10 - rain slt
11 - rain mod
12 - rain hvy
13 - frz precip slt
14 - frz precip mod
15 - frz precip hvy

Freezing rain, drizzle & sleet

Satellite

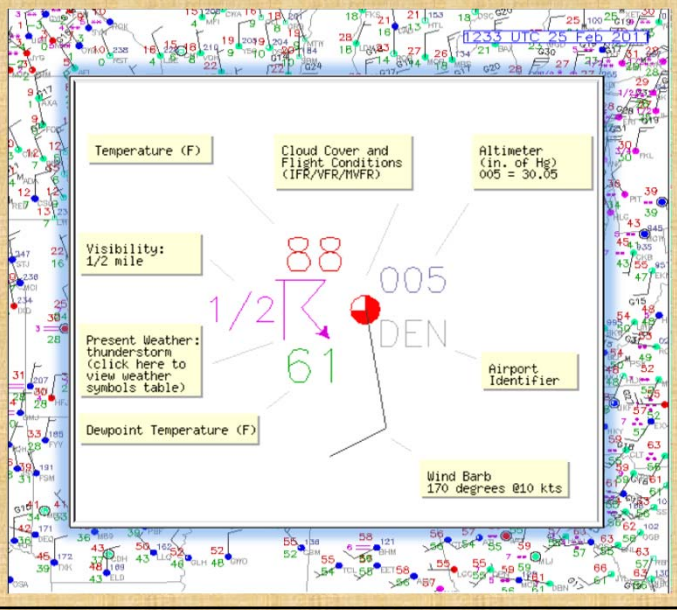


Visible | Infra Red | Water Vapor

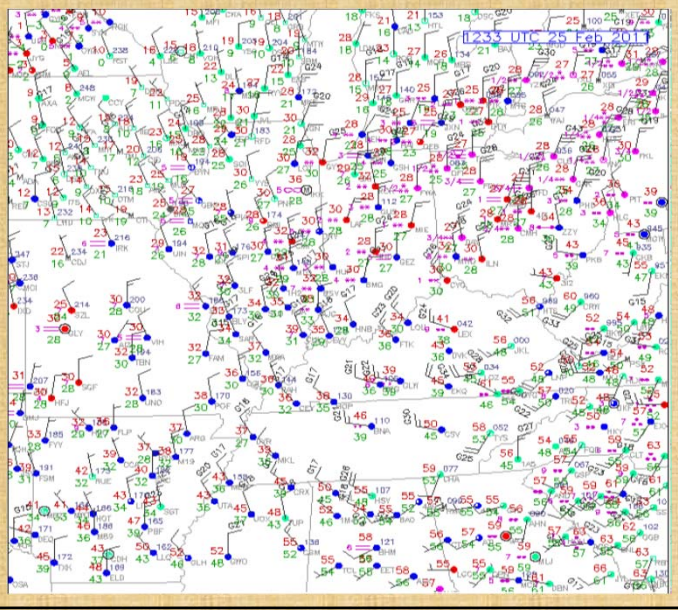


NWS Surface Observations

(Can Help To Verify Radar Returns)



NWS Surface Observations
(Can Help To Verify Radar Returns)



….and now, a word about Black Ice……

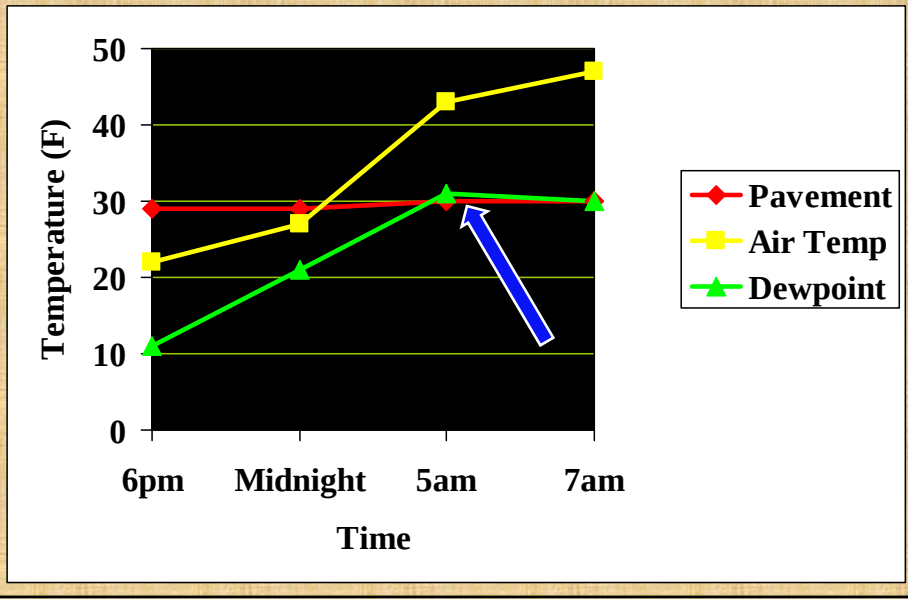
…and that word would be…….

March 5, 2012 – Central Ohio

Pavement Temperature

Determines Type, Timing & Duration of S&I Operations

Black Ice Due to Warm Air Advection



Black Ice Due Cold Sub-Surface

RWIS

(Road & Weather Information Systems)

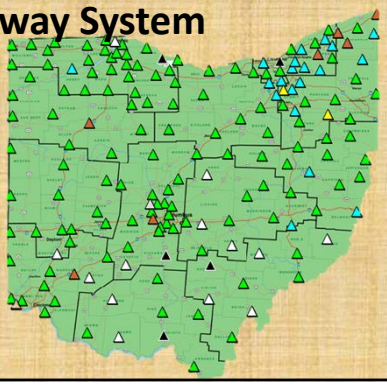
RWIS

- 172 Sites
- 5 Minute Updates
- All Counties
- Air Temperature
- Dew Point
- Relative Humidity
- Precipitation Type
- Wind Direction & Speed
- 450+ Surface & Sub Surface Sensors
  - Pavement Temperatures
  - Pavement Conditions

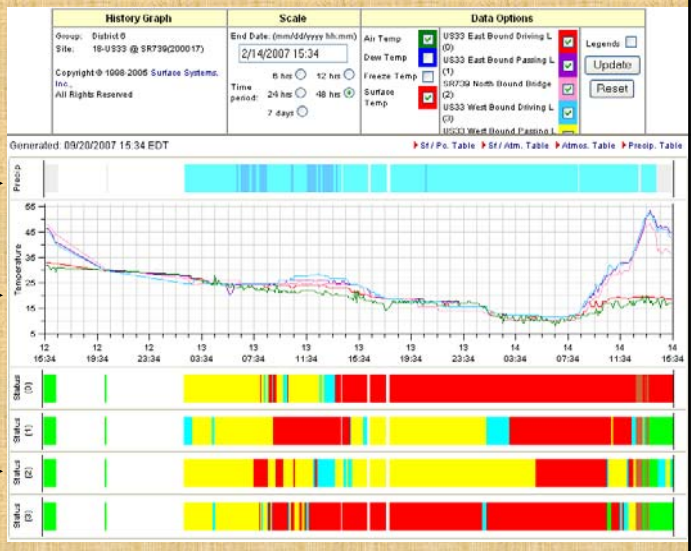
ODOT RWIS

What Is RWIS?

- Surface Observations with:
  - Actual Pavement Temperature
  - Actual Pavement Condition
  - Sub-Surface Temperature
  - Located on Our Highway System



RWIS



Precipitation:
(Snow / Freezing Rain)

Temperatures
Green = Air
Blue = Dew Point
Red = Surface

Surface Condition
Green = Dry Surface
Blue = Wet > 34 deg
Yellow = Wet < 34 deg /w Salt Detected
Red = Wet/<34deg/No Salt Detected

Comments or Questions?

THANKS!

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RWIS Coordinator
Ohio Department of Transportation
614-466-4859