CPASW - East Lansing

NWS DSS and Partnerships

With Michigan's Transportation Sector

Brandon Hoving

NOAA/NWS Grand Rapids

Meteorologist & Observing Program Leader

Overview

- ➔ Top level highlights of NWS partnerships with Michigan road agencies
- ➔ Closer look at support of Michigan DOT and road data access
- ➔ Closer look at support of local and county road agencies

Highlights of NWS Partnerships

With Michigan Road Agencies

Michigan Department of Transportation (MDOT)

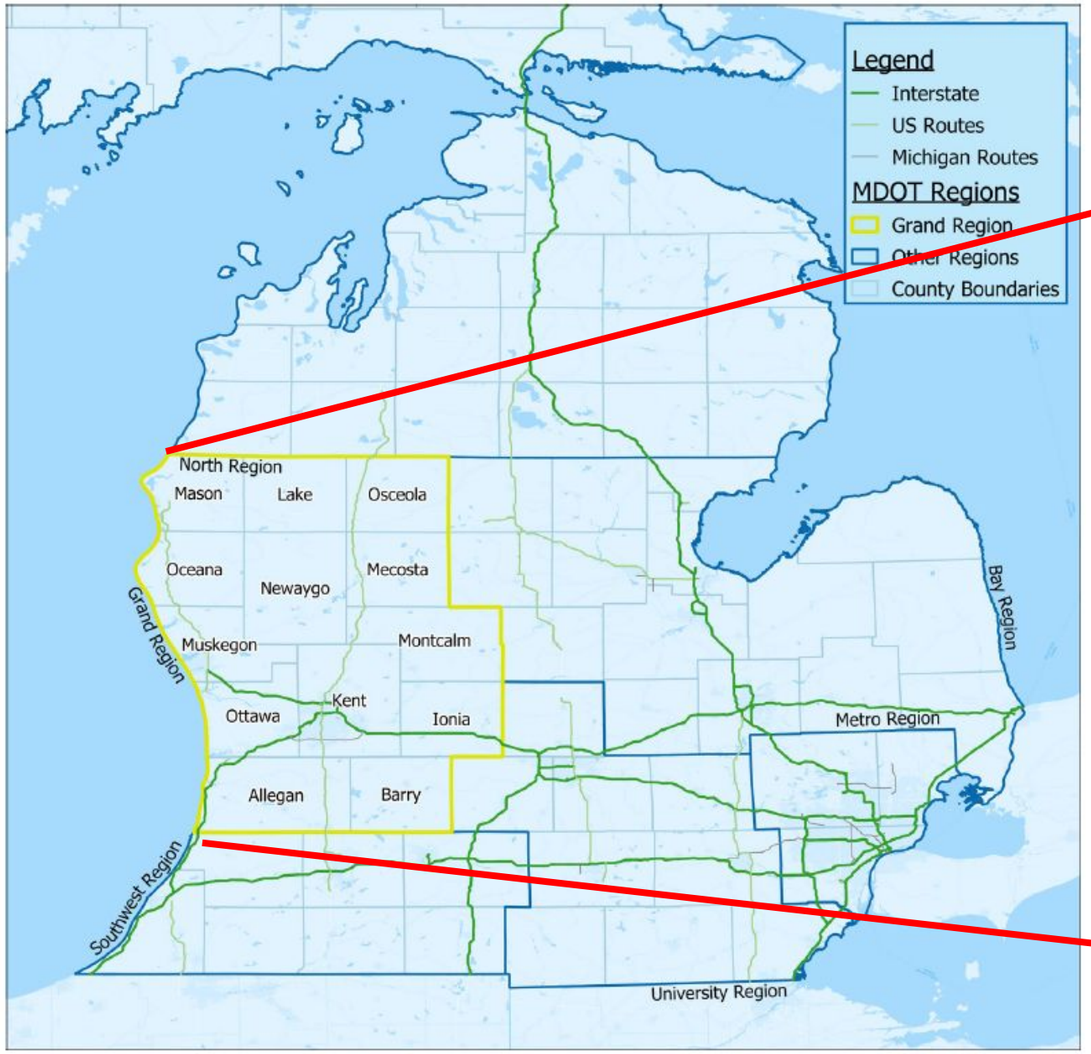
- Involvement in Road Weather Information System (RWIS) long term planning
- Provision of subseasonal to seasonal (S2S) forecast information via monthly state-level briefings
  - Seasonal risk factors for flooding
  - Long term precipitation analysis
  - Long term Great Lakes water levels
  - Monthly and seasonal observations and trends: temperature, precipitation, soil moisture, streamflow
- An MDOT supervisor is an official NWS Cooperative Observer in Ionia, MI

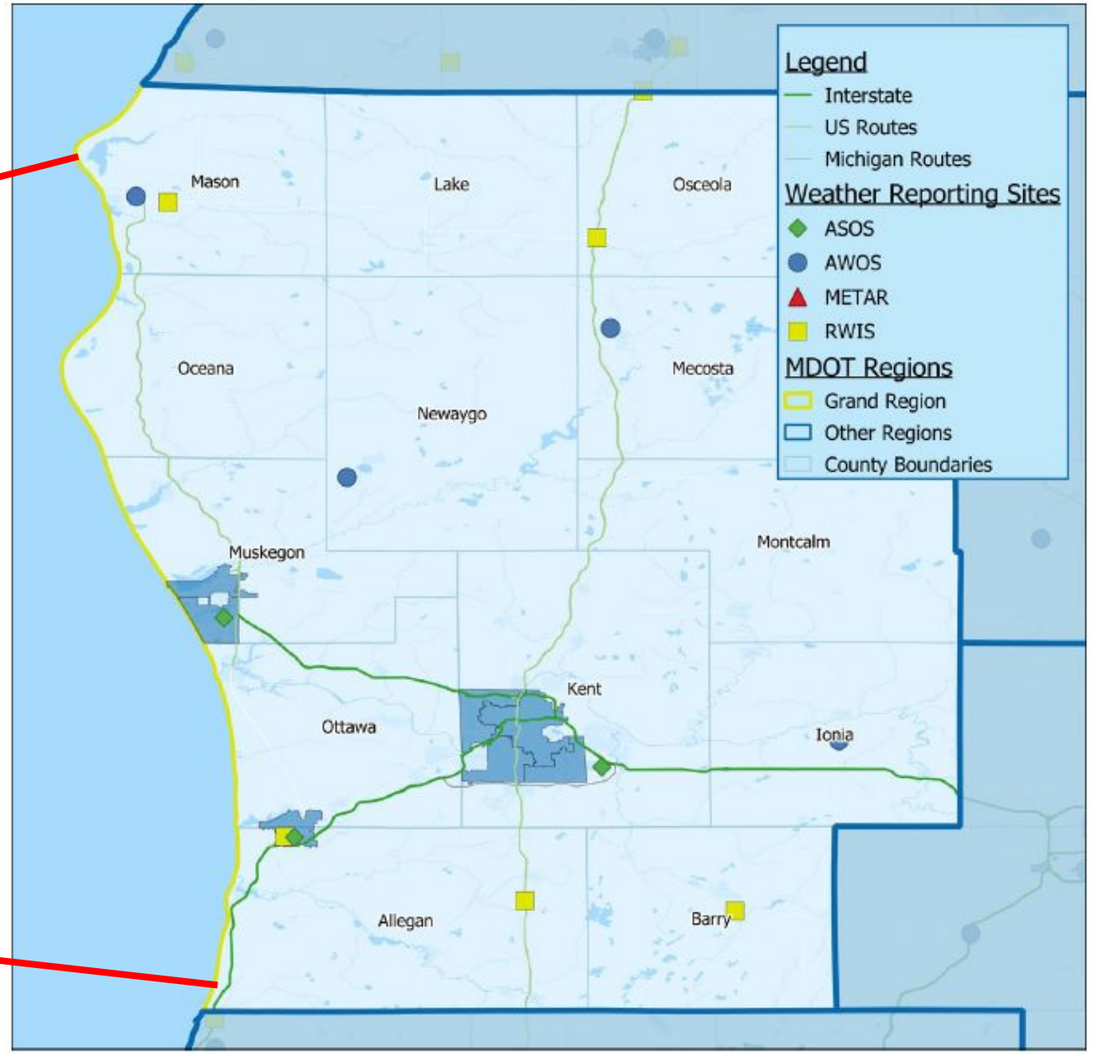
Local and County Level Road Agencies

- Winter trends and seasonal forecast Webinar provided in the fall to superintendents
- On-demand Decision Support Services (DSS) provided as requested for their operational needs

MDOT - Grand Region

Existing Road Weather Information Systems (RWIS) Locations

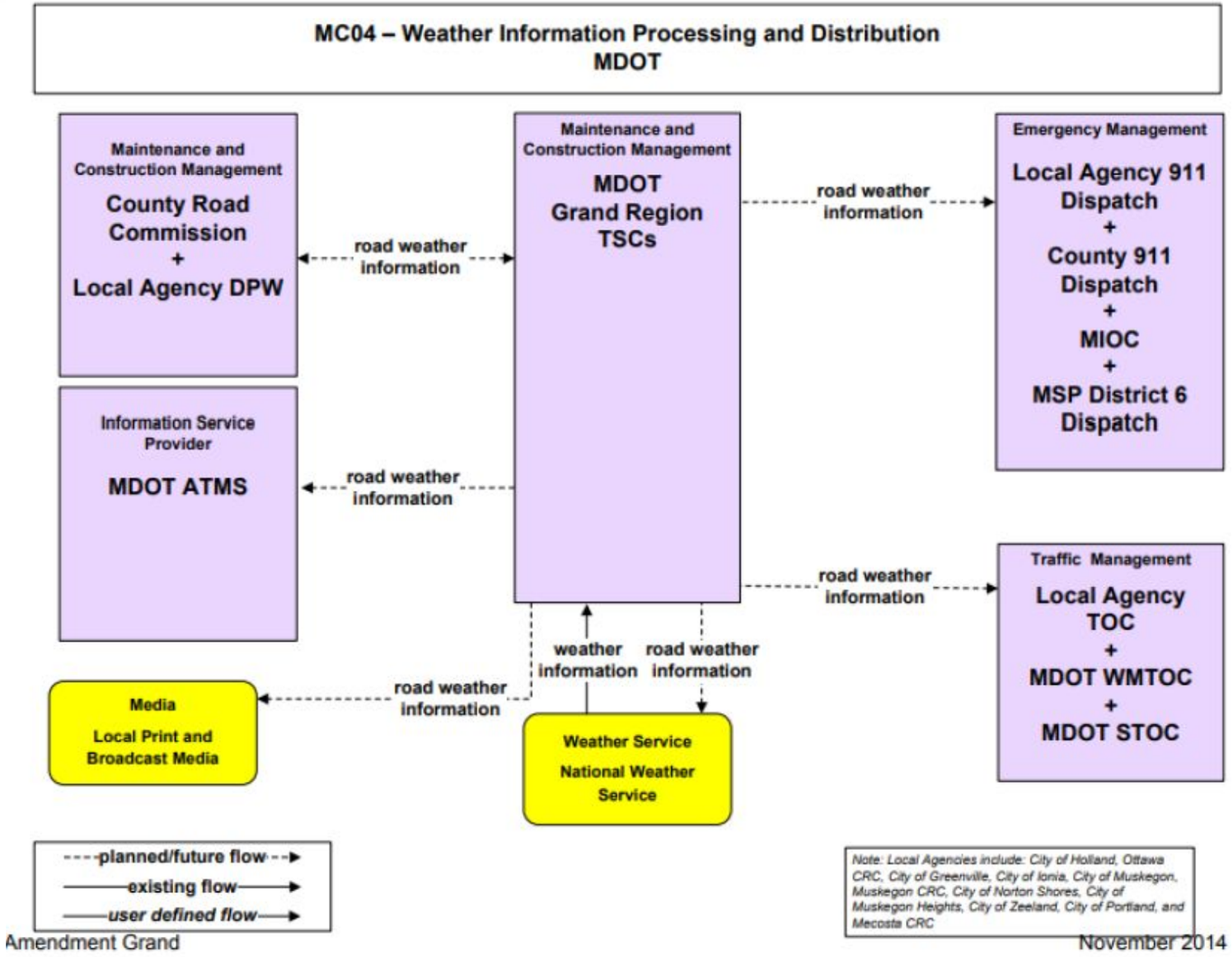




Images courtesy of MDOT

MDOT - Grand Region

RWIS Pictures and Data Processing/Distribution



Images courtesy of MDOT

MDOT - Grand Region: Stakeholder Workshop

In 2020, the group identified needs for an expansion to the RWIS network.

Stakeholders

MDOT
County Road Commissions
Law Enforcement
NWS*
County EOCs

***The NWS provided input for additional RWIS locations based on climatological needs across lake effect snow regions in particular**

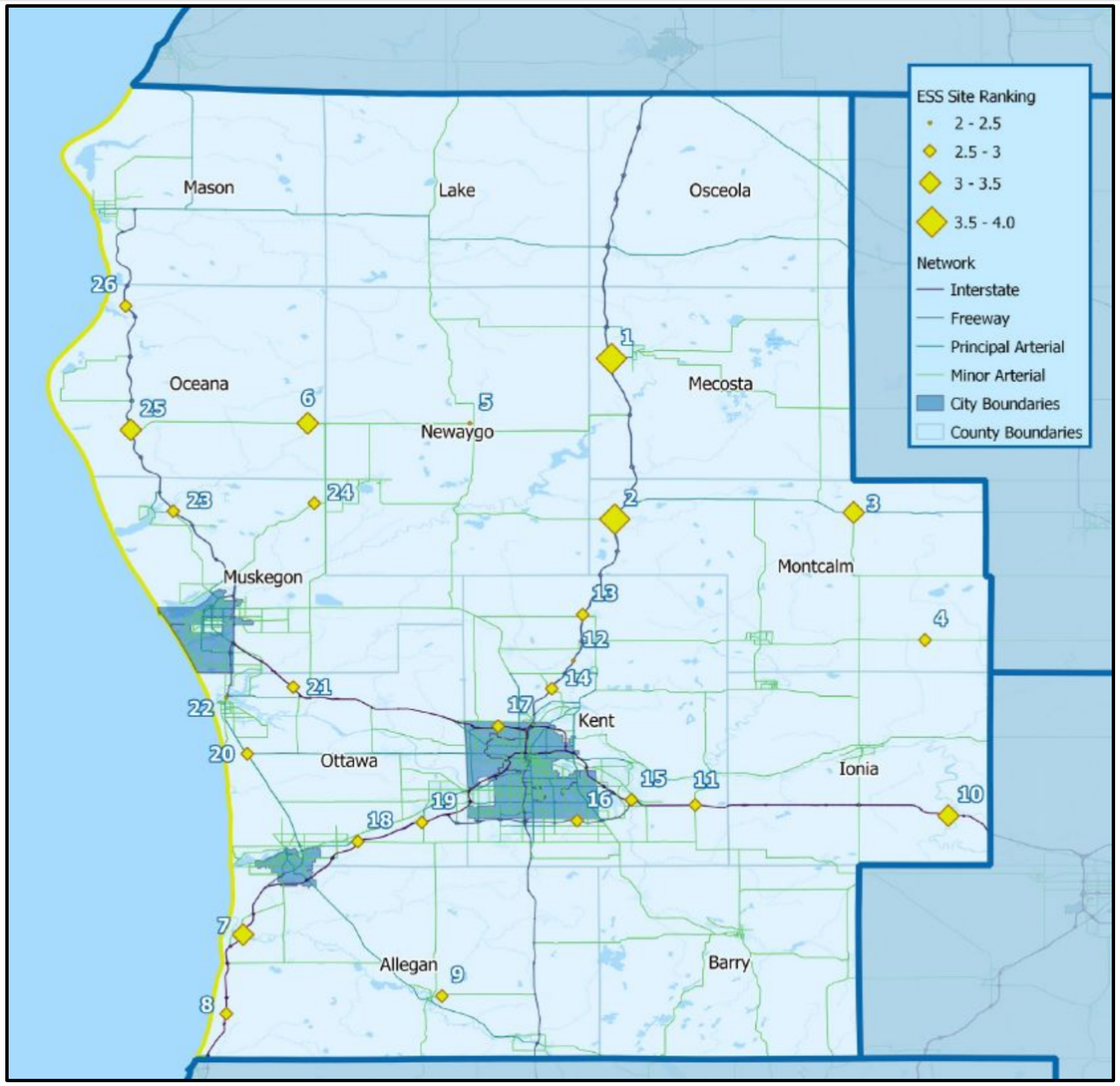
1.1 – The system should enhance the NWS ability to monitor the movement of large storms.
1.2 – The system should provide regional data to monitor the intensity and location of lake effect snow.
1.3 – The system should make the regional data available to MDOT, county road commission, and local agency stakeholders in the region.
1.4 – The system should integrate with the Statewide Terraform Manager software.
1.5 – The system should allow the stakeholders to monitor and evaluate existing conditions.
1.6 – The system should provide specific data in a concise format for field personnel.
1.7 – The system should make weather conditions available to MSP and local public safety agencies.
1.8 – The system should supplement existing atmospheric data points with road surface condition data points.
1.9 – The system should support the improved coordination between neighboring winter maintenance agencies.
1.10 – The system should provide ground temperature readings as required for the management of weight restrictions.

Images courtesy of MDOT

MDOT - Grand Region: Stakeholder Workshop

Top 10 "Wish List" for New RWIS Sites and Map of All Proposed "Wish List" Sites

Site #	Location	Nearest City	Weighted Average	Ranking Result
1	US-131 @ M-20	Big Rapids	3.64	1
2	US-131 @ M-82	Howard City	3.55	2
7	I-196 over the Kalamazoo River	Douglas	3.36	3
6	M-20 west of Hesperia	Hesperia	3.18	4
25	US-31 @ M-20	New Era	3.18	5
3	M-66 @ M-46	Edmore	3.09	6
10	I-96 @ Kent Street	Portland	3.09	7
16	M-6 East of Kalamazoo Avenue	Caledonia	3.00	8
21	I-96 @ the Fruitport Rest Area	Nunica	3.00	9
26	US-31 @ Hammett Road	Pentwater	3.00	10



Images courtesy of MDOT

MDOT - Grand Region: Stakeholder Workshop

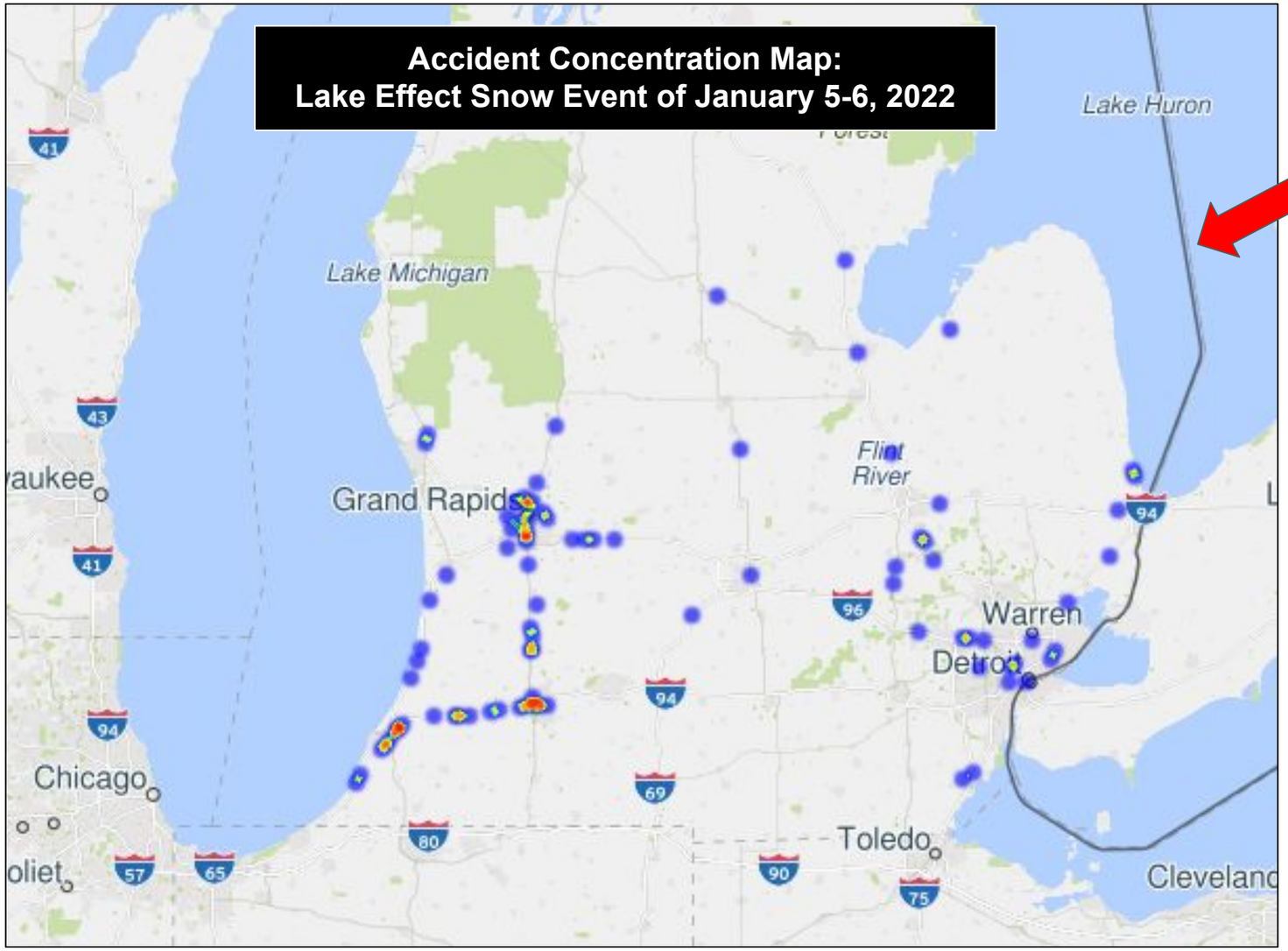
Metrics for Success: Why Add More RWIS locations?

Objective	Performance Measure	Source
Improved Safety due to reduced crash risk	Crash Rate	MSP Crash Data
Increase mobility due to restored capacity, delay reductions and more uniform traffic flow	User Delay Costs, Speed regain time after winter storm	RITIS
Improved efficiency in Winter Maintenance Staffing (MDOT, Law Enforcement)	Labor and overtime Costs	MDOT, MSP
Improved efficiency in winter maintenance operations (equipment and materials use)	Equipment repair costs, material costs	MDOT
Improve public understanding of winter maintenance operations	Customer Satisfaction	MDOT Attitudes and Perception (A&P) Survey

Images courtesy of MDOT

Historical Road Data Availability: RITIS

Post Mortem Analysis for Winter Weather Events. Could we refine climatological impacts?



Accident Concentration Map:
Lake Effect Snow Event of January 5-6, 2022

Regional Integrated Transportation Information System (RITIS)

Ways to Utilize Historical Data

Assess driving behavior in various winter events

Detect trends that emerge

Retrieve key events back to 2001

Work with MDOT to identify problem spots

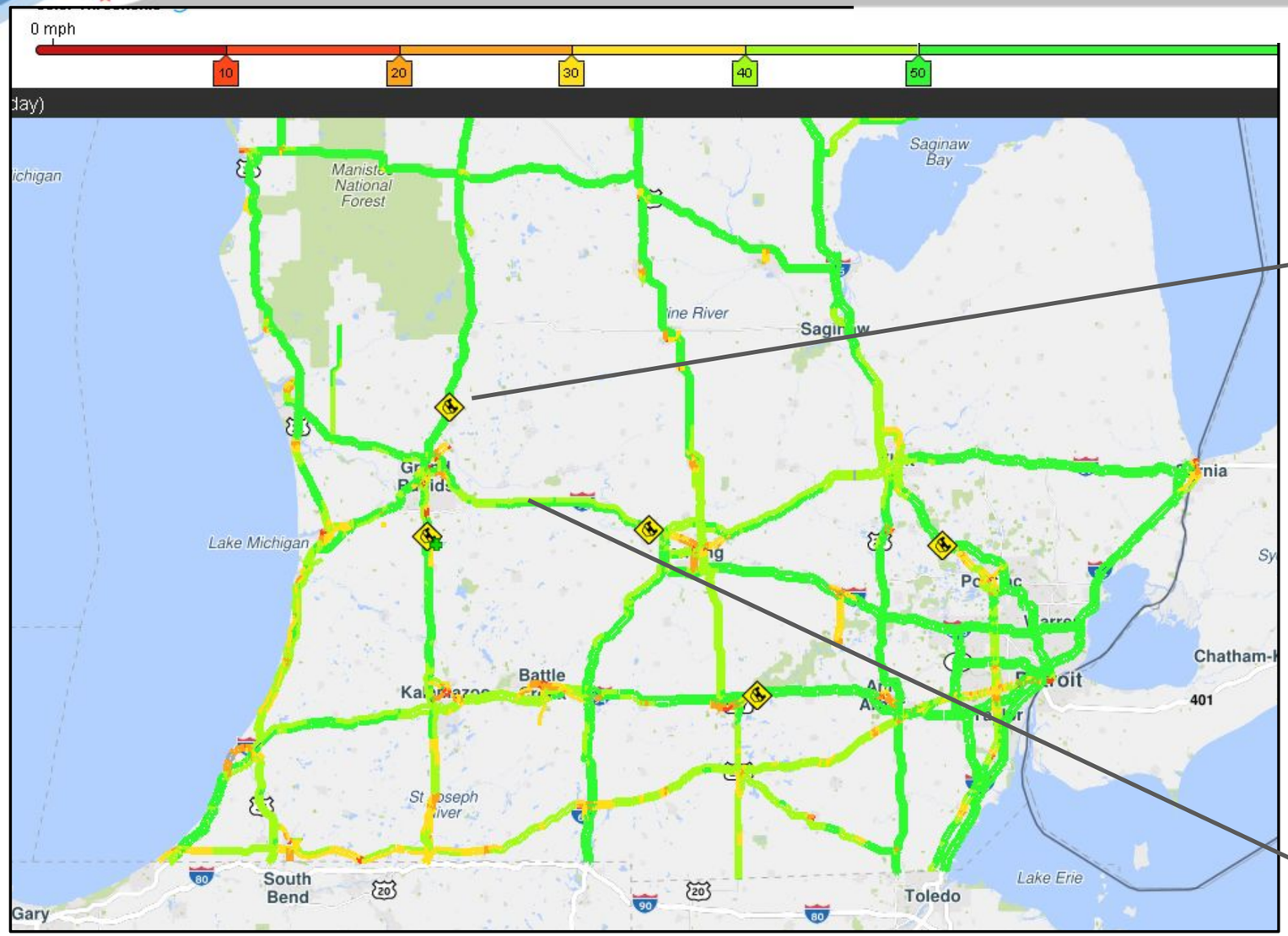
Leverage findings to improve public messaging

MDOT: Target known problem spots with digital signage?

Images courtesy of RITIS

Historical Road Data Availability: RITIS

Post Mortem Analysis for Winter Weather Events. Could we develop accident climatology?



February 2, 2022
Winter Storm - 9am Snapshot

Collision	
Location	SB US-131 after M-57/14 Mile Rd (Exit 101)
Started	Feb 02, 2022 8:22 AM
Ended	Feb 02, 2022 9:19 AM
Duration	56 m 58 s
Updated	Feb 02, 2022 8:29 AM

Road: **I-96**
Intersection: **NASH HWY/EXIT 59**
Direction: **WESTBOUND**
Code: **108+04897**
Speed: **48mph**

Images courtesy of RITIS

Sampling of Subseasonal to Seasonal Webinar Material Presented to State Level Partners, Including MDOT

NWS DSS Examples

For State Level Partners, Including MDOT

2022 Spring River Flooding: Risk Factors

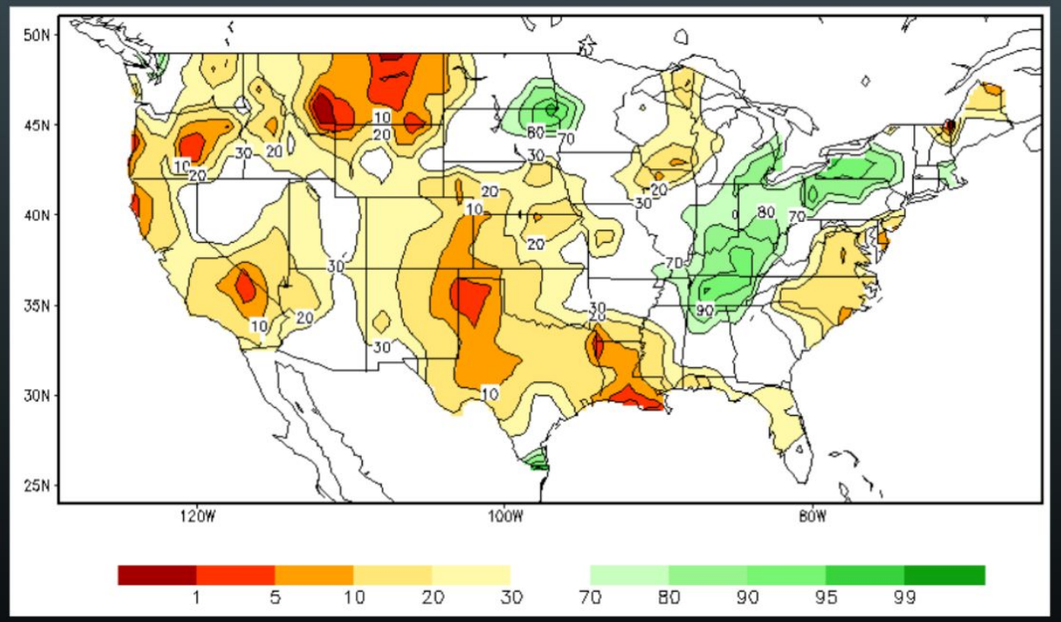
How Wet is the Soil

Southeast Michigan
No Room for Water in the Soil

Everyone Else
Thawed Ground Will Hold Water

Soil Moisture – March 2022

Compared to All Other Years



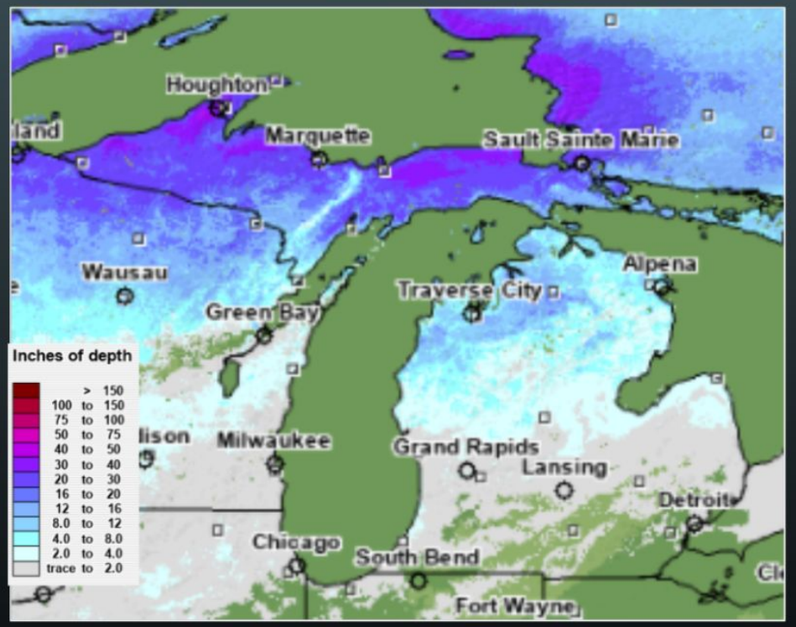
National Weather Service...Helping to Build a Weather-Ready Nation

NWS DSS Examples

For State Level Partners, Including MDOT

Snow on The Ground – March 9, 2022

2022



2021

2020

2019

2018

Behind Many of Our Recent Winters

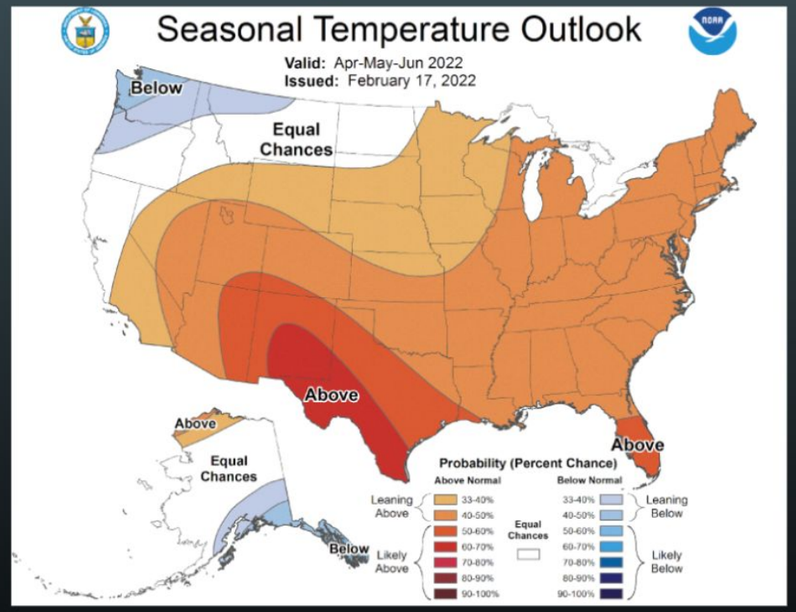
Historically - A Little Low for Mid-Feb

NWS DSS Examples

For State Level Partners, Including MDOT

Outlook: April, May, June

Temperature



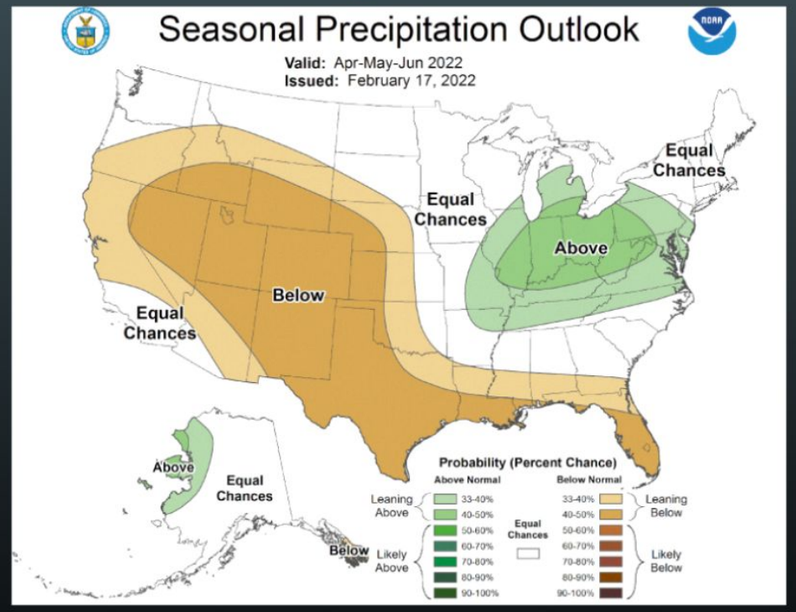
Milder Few Months?

Models Say Yes… But…

Cold Takes Longer to Move Out &

Wet March Usually Means Cooler Late Spring

Precipitation

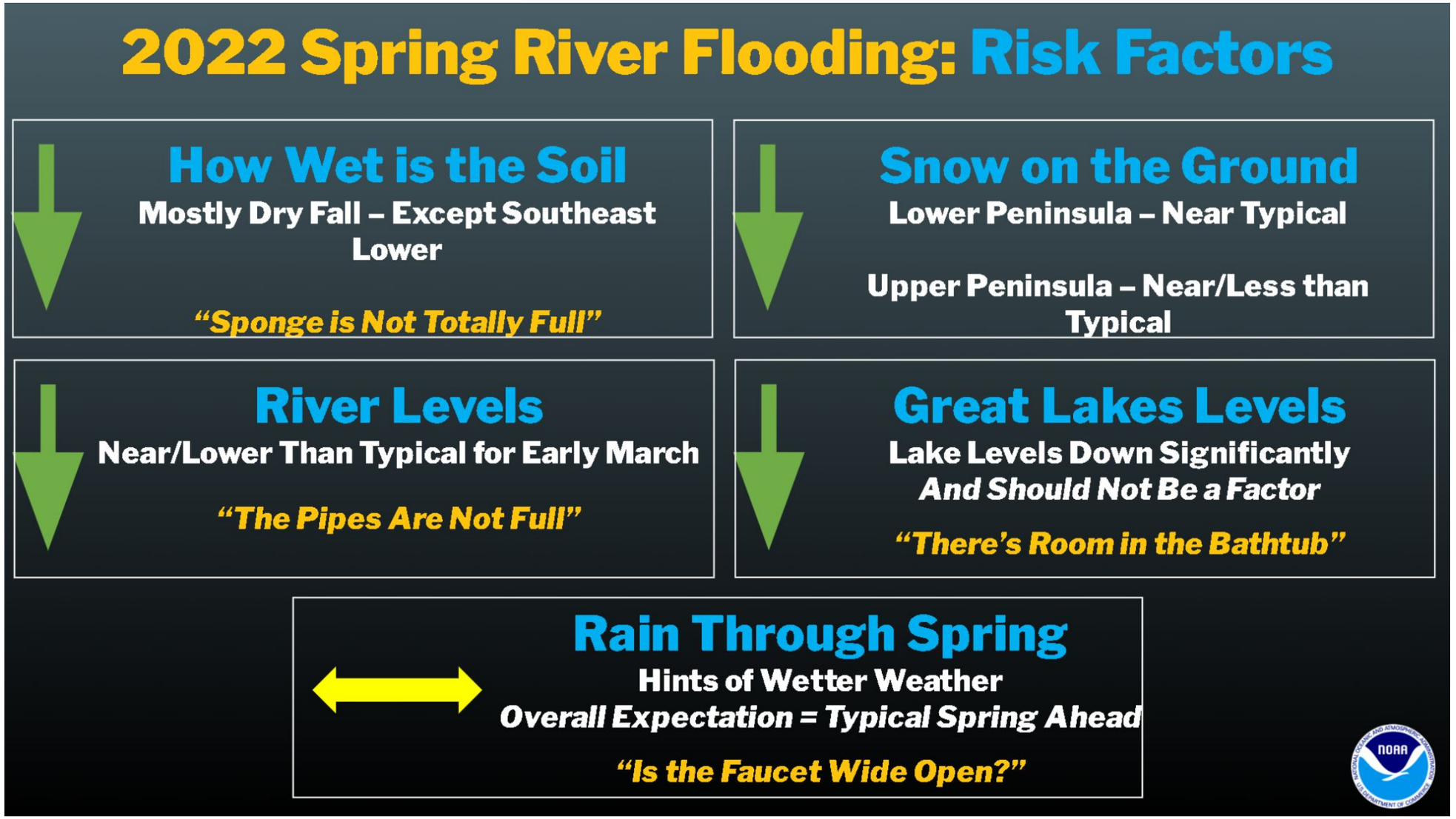


Wet Pattern?

Watch for Quick Changes from Cold to Very Warm for Severe Weather

NWS DSS Examples

For State Level Partners, Including MDOT



Sampling of Seasonal Forecast Webinar Material Presented to Road Agency Superintendents

Winter is Coming...

What Goes Into the Winter Forecast?

Factors We Consider...

Winter Trends

- ➔ Shorter periods of cold weather
- ➔ More frequent freeze/thaw cycles
- ➔ Snow pack usually doesn't last all winter

Our Experience

- ➔ Is this pattern easily recognizable?
- ➔ What could make the forecast bust?
- ➔ What lessons have we learned before?

Analogs

- ➔ Matches current pattern to past results
- ➔ Gives forecast confidence a boost
- ➔ Provides statistics for past weather

Computer Models

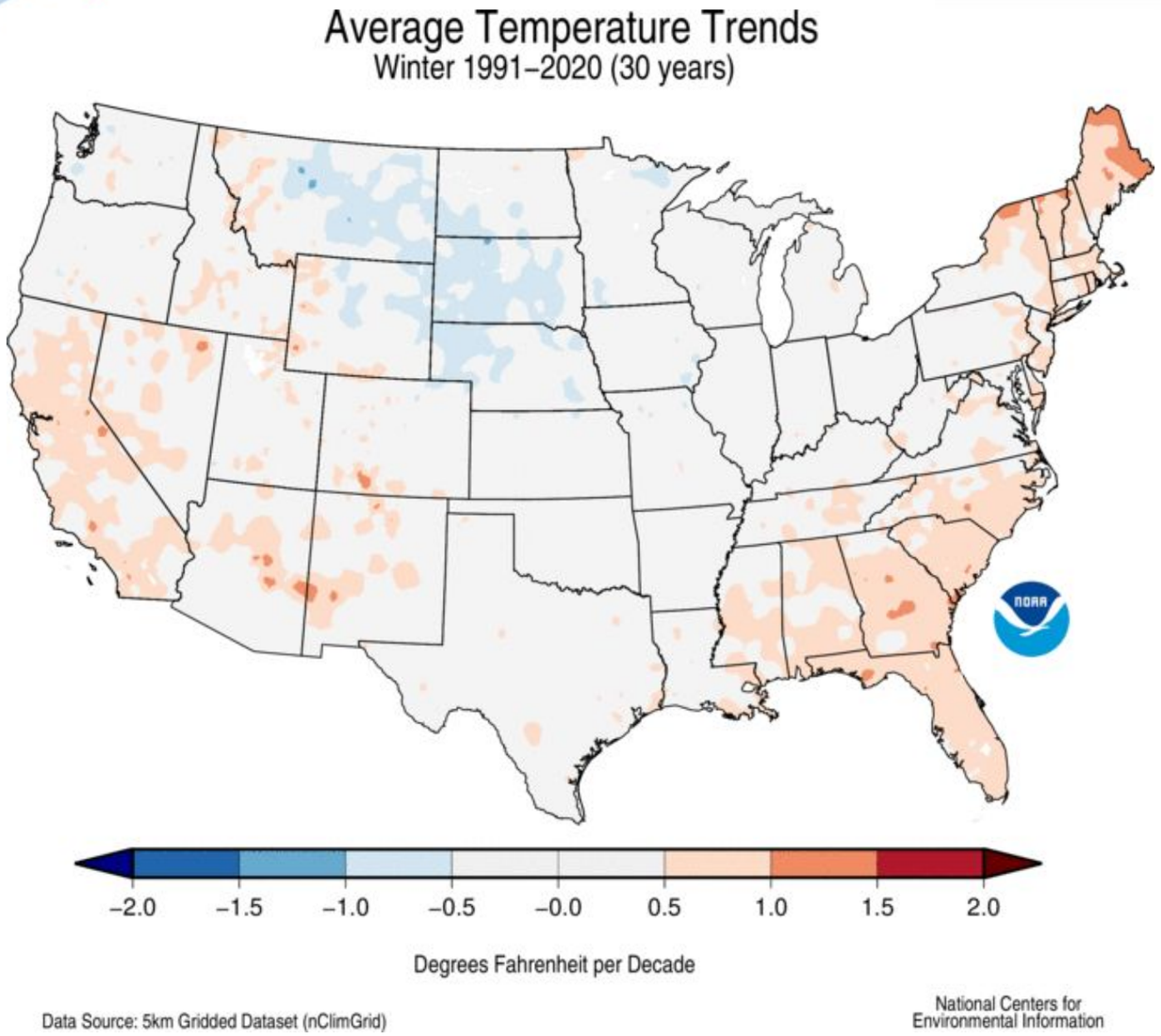
- ➔ Long range models can give a clue
- ➔ Help project atmospheric patterns
- ➔ Indicate wet, dry, cold, and mild patterns

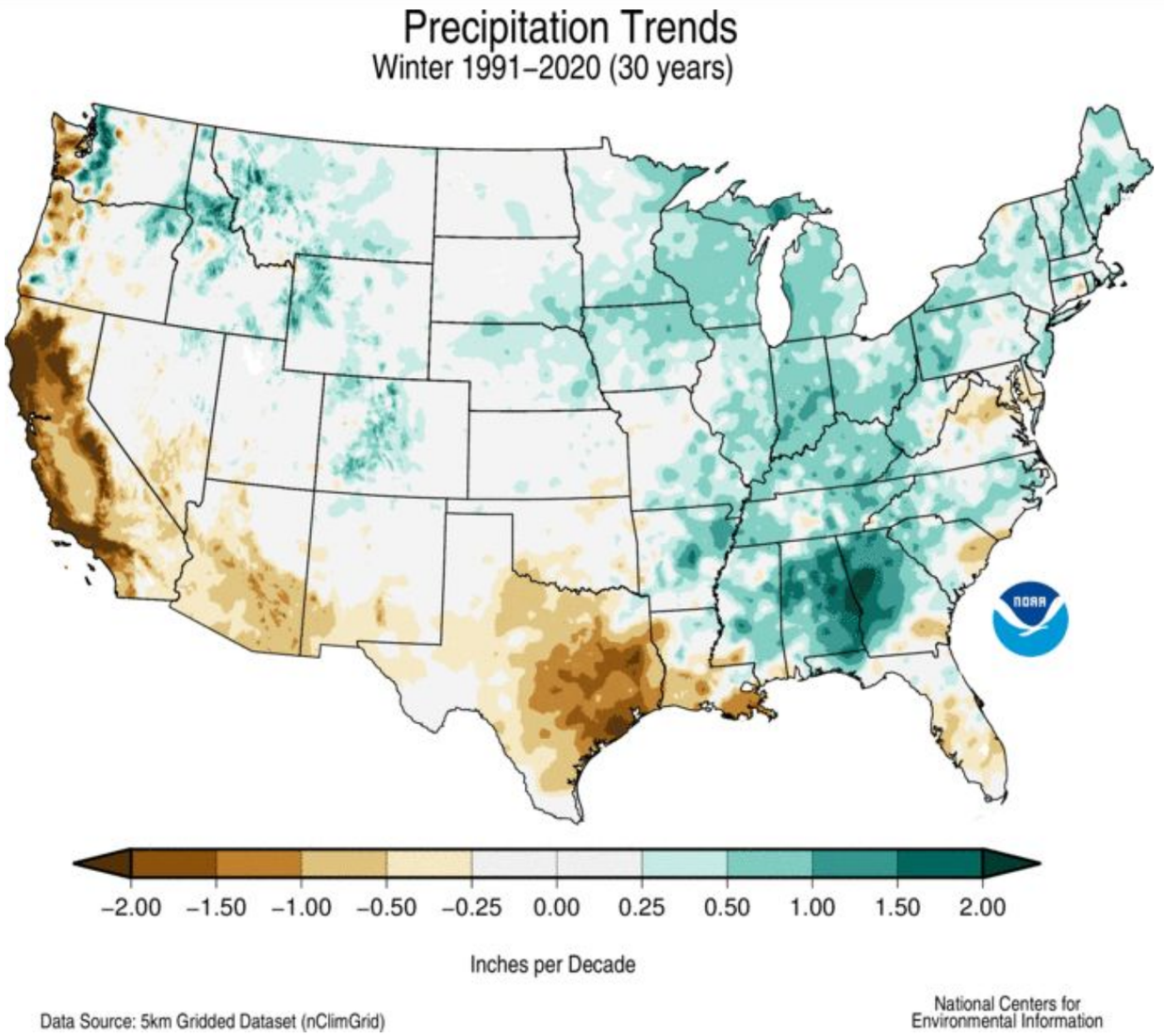
ENSO

- ➔ El Niño, La Niña, or "neutral"
- ➔ Impacts large scale patterns
- ➔ Strength is important

Wintertime Trends: Temperature and Precipitation

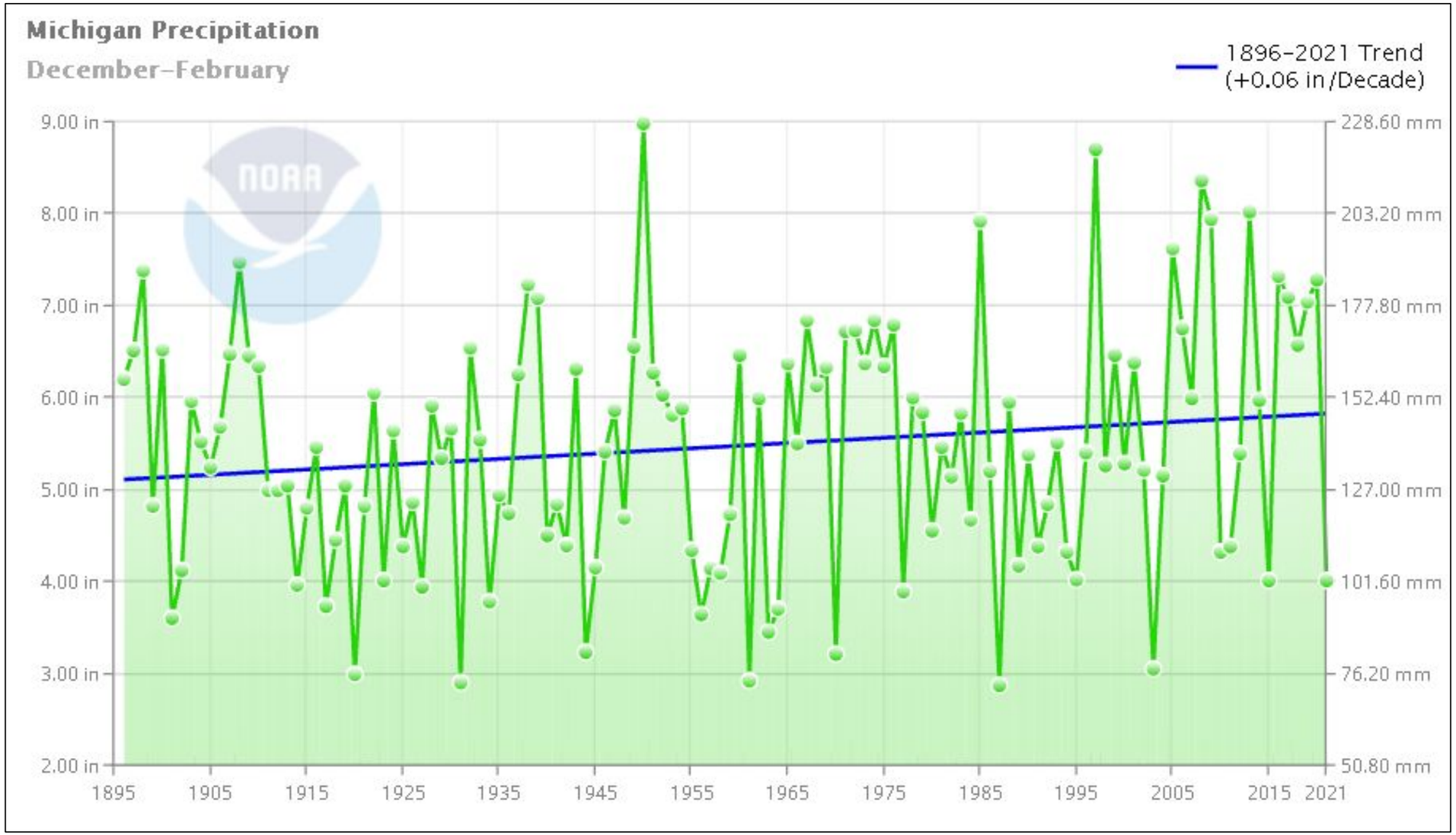
Big Difference Between the Two





Michigan Winter Precipitation (Liquid Equivalent)

An Increase of About 0.06 Inch Per Decade (NCEI Climate at a Glance)

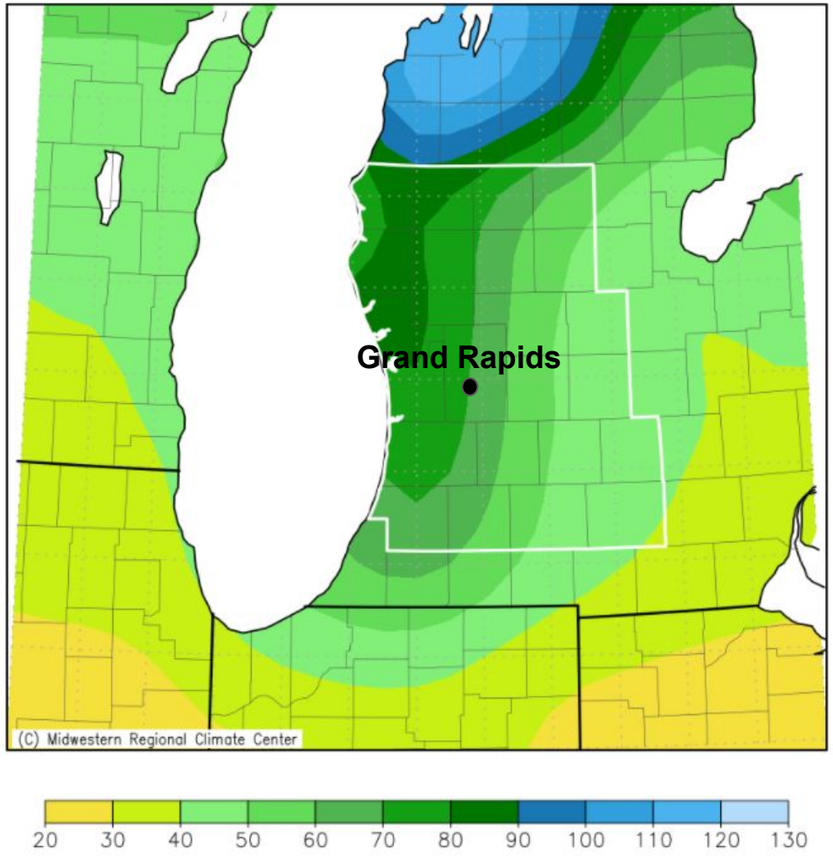


Lower Michigan Snowfall Trends Since The 1970s

Western Michigan Seeing a Slight Upward Trend in Snow Totals Due to Lake Effect

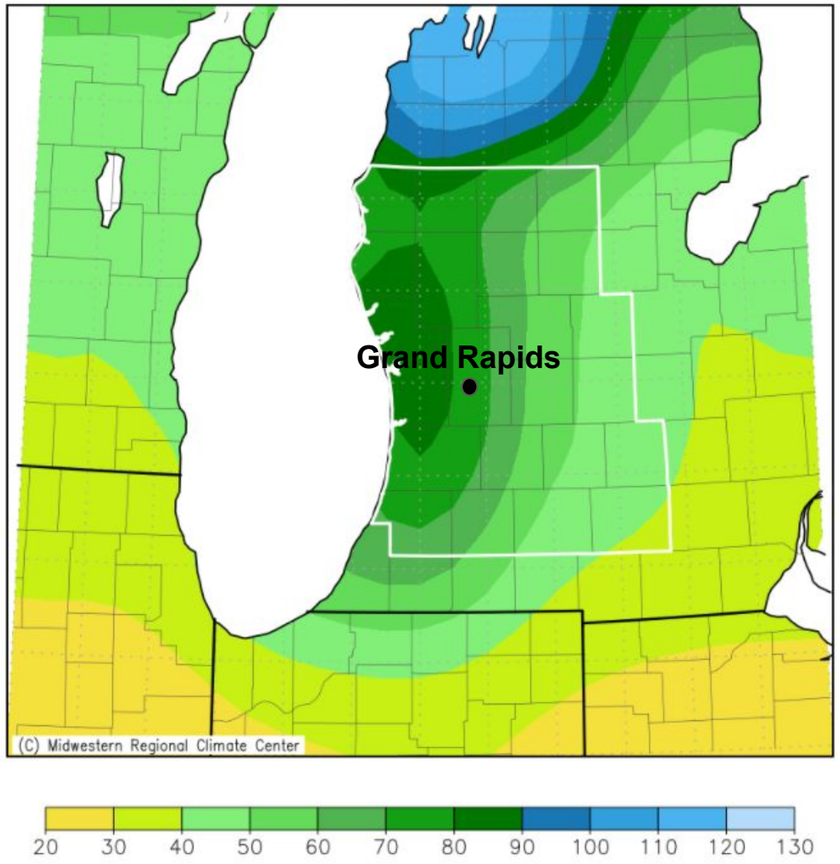
Accumulated Snowfall (in): July 1 to June 30

Averaged over 29 years: 1971–72 to 1999–2000



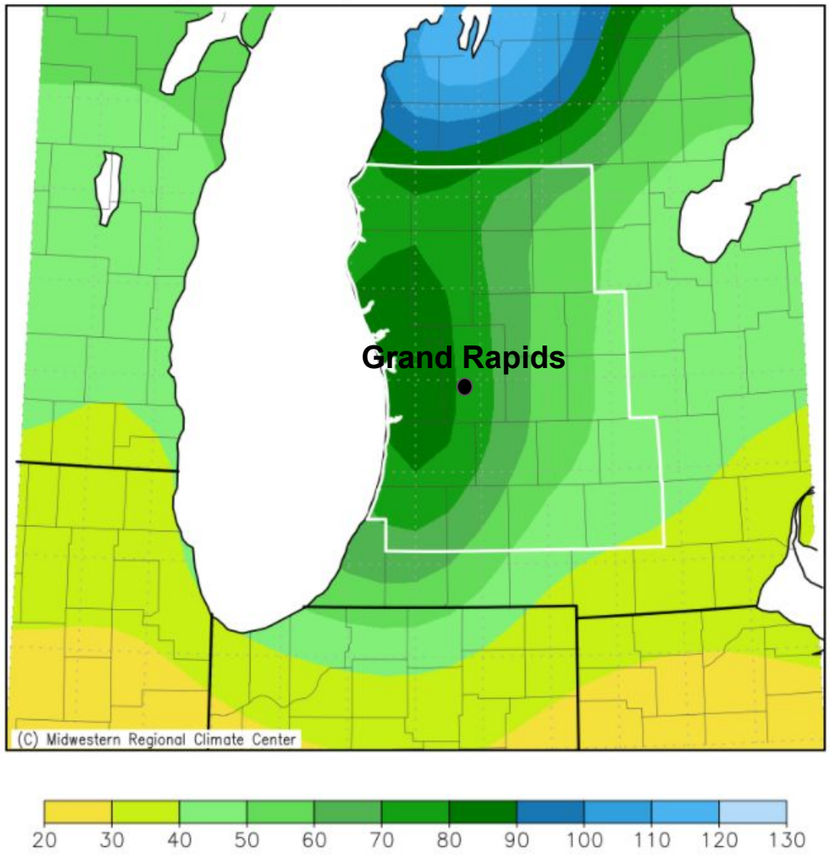
Accumulated Snowfall (in): July 1 to June 30

Averaged over 29 years: 1981–82 to 2009–10



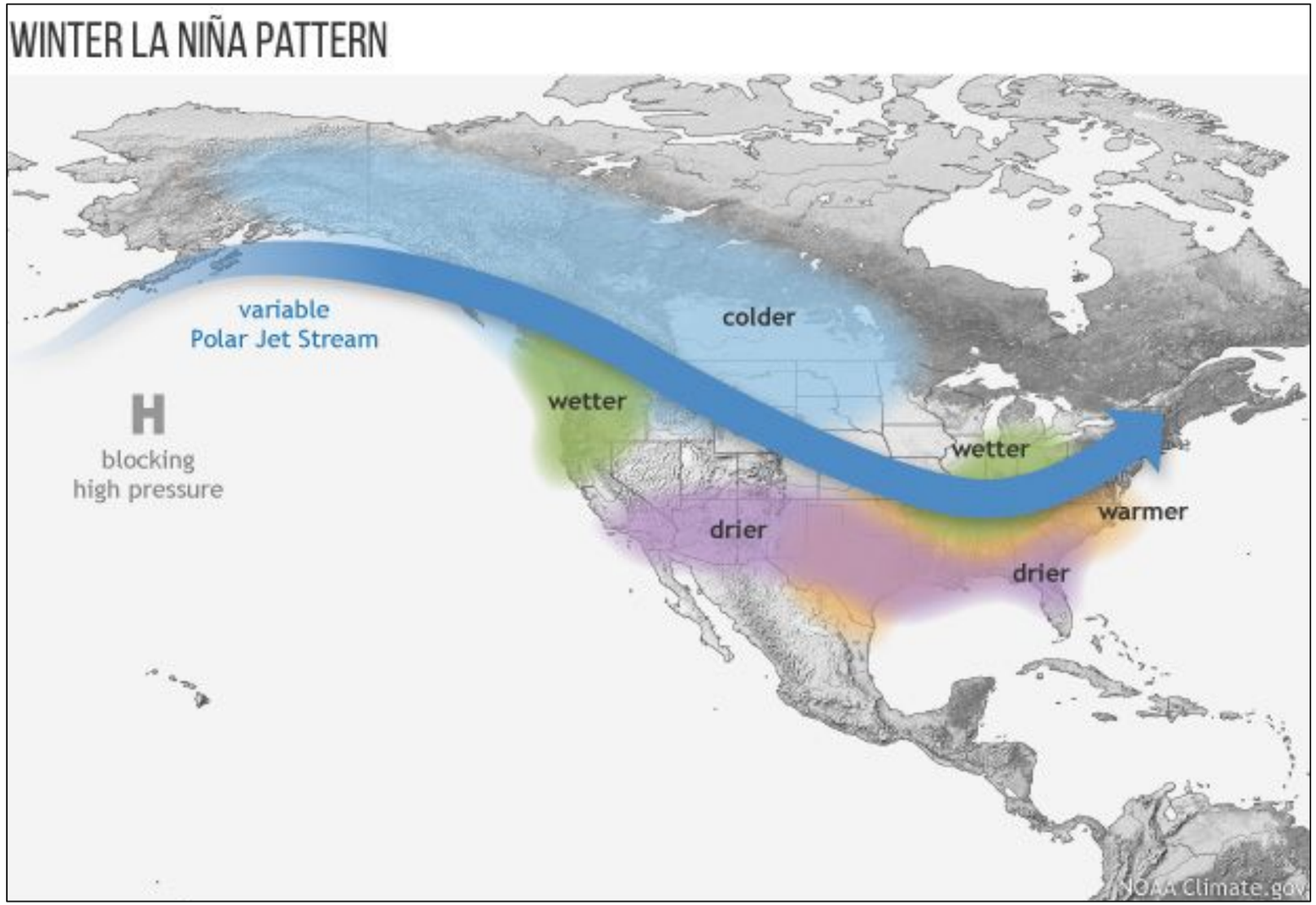
Accumulated Snowfall (in): July 1 to June 30

Averaged over 29 years: 1991–92 to 2019–20



This Winter's Pattern Will Be La Niña

Colder Than Average Pacific Ocean Temperatures Along Equator



Important Points

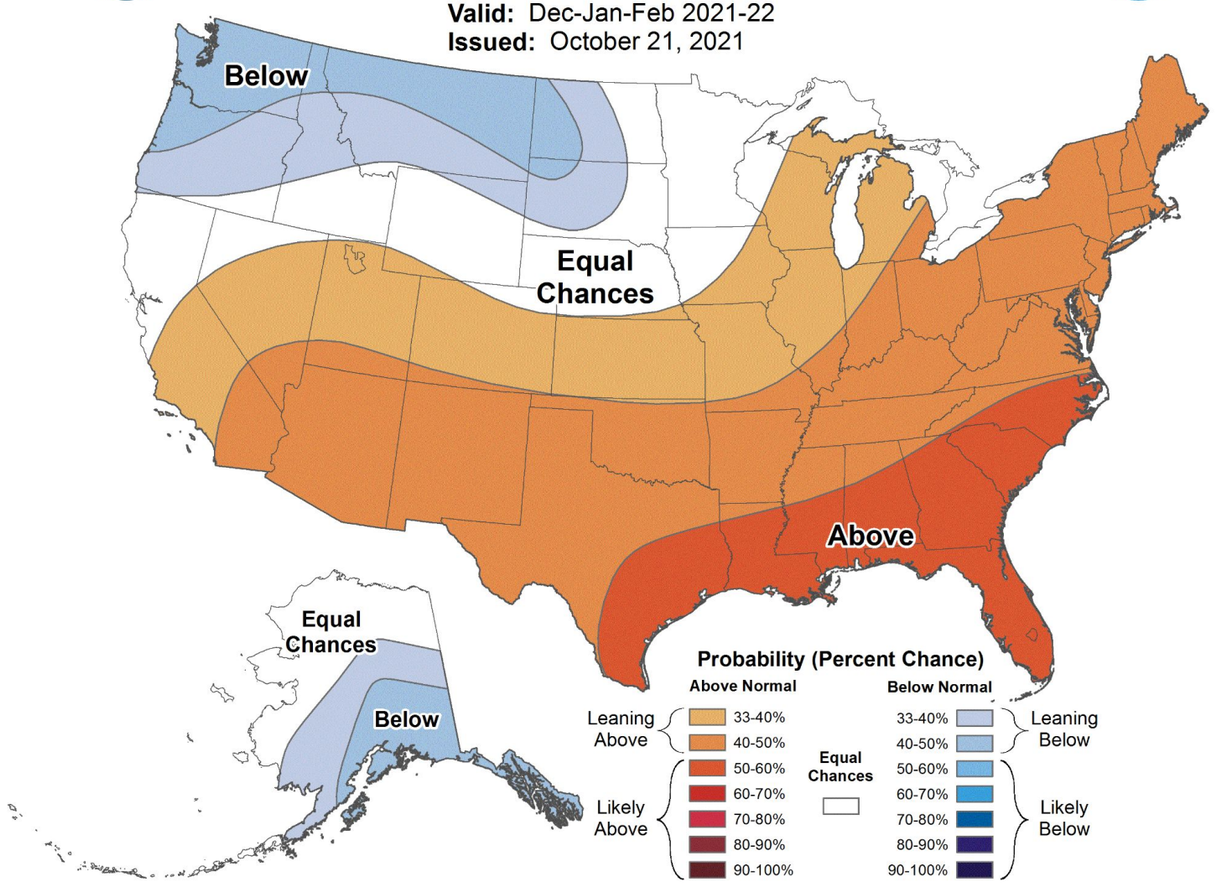
- ➔ Not every La Niña event behaves this way. Some events are stronger and some weaker.
- ➔ Last year's La Niña did not feature wetter than normal conditions for our area. It was further south over KY/WV/VA.
- ➔ This year's event, so far, is following the typical La Niña pattern. If it continues, we could have a busy winter.
- ➔ La Niña is easily observable and predictable, but other factors on smaller spatial and time scales are not, and they could interfere with La Niña (reducing the impacts) or actually amplify it (increasing the impacts). Examples: Arctic Oscillation, Polar Vortex, Random Variances in Weather

This Year's Winter Forecast (Dec 2021 - Feb 2022)

Temperature and Precipitation Probabilities are Similar to Last Year

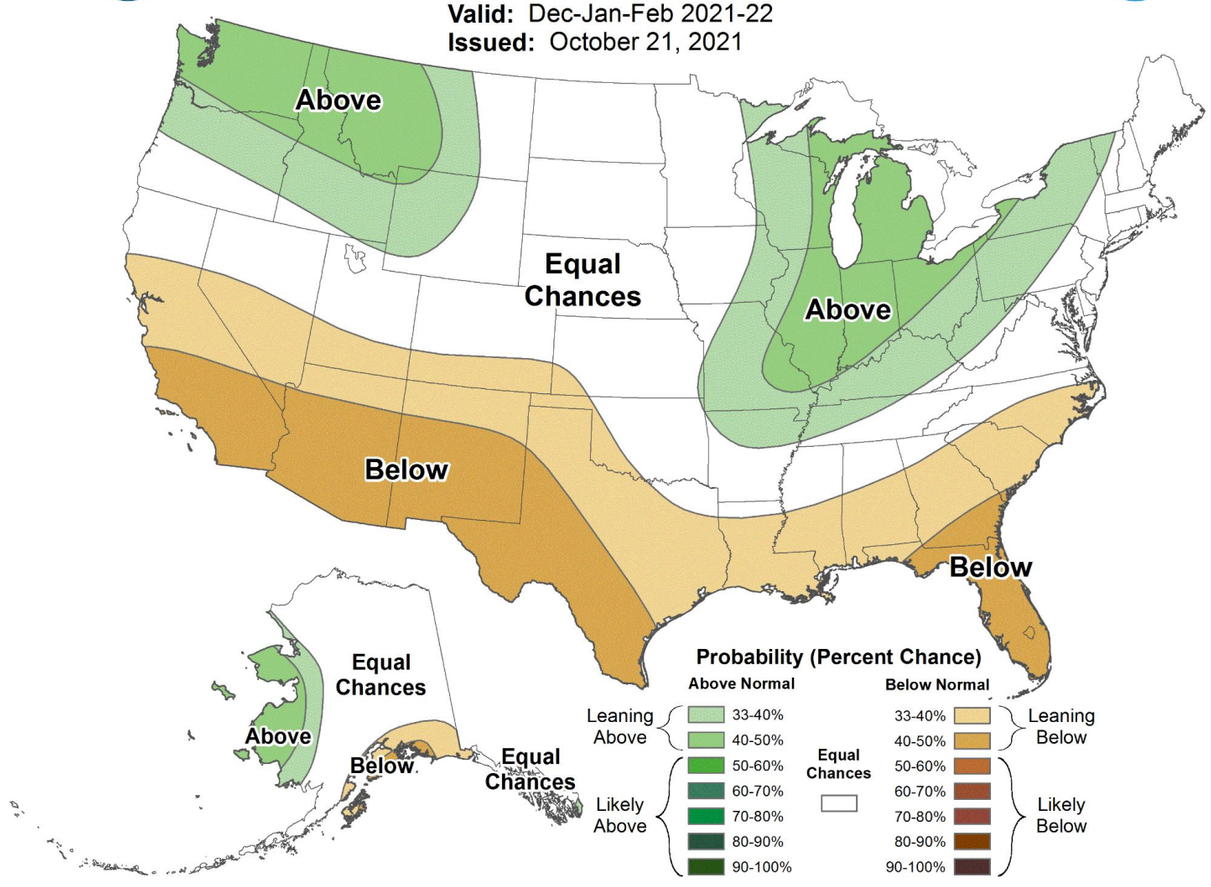
Seasonal Temperature Outlook

Valid: Dec-Jan-Feb 2021-22
Issued: October 21, 2021



Seasonal Precipitation Outlook

Valid: Dec-Jan-Feb 2021-22
Issued: October 21, 2021



This Year's Winter Forecast (Dec 2021 - Feb 2022)

Additional Detail about Three Month Forecasts

What The Odds Actually Tell Us

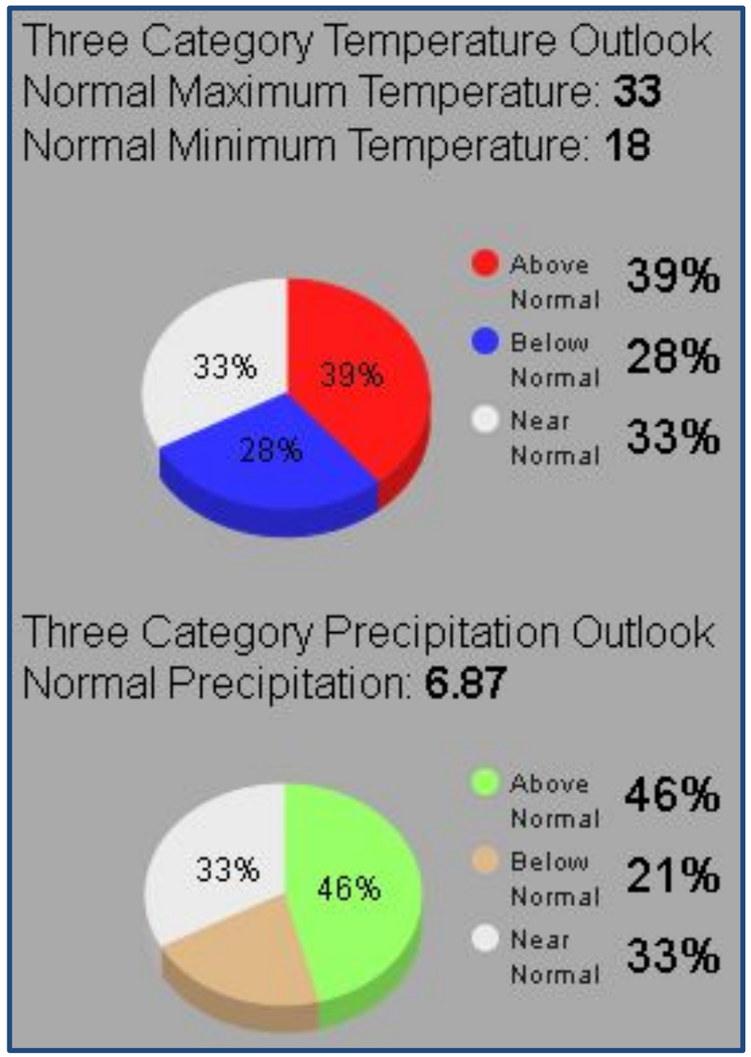
- Describe probabilities averaged over a 3 month period
- Are weighted heavily toward the El Niño Southern Oscillation (ENSO). This means the odds are impacted by El Niño and La Niña formation.

What The Odds Don't Tell Us

- Day to day weather variations
- Extreme weather patterns on shorter time frames
- Whether record cold, warm, wet, or dry patterns will emerge
- The intensity of individual winter storms

This Year's Winter Forecast (Dec 2021 - Feb 2022)

Additional Detail about Three Month Forecasts



Temperature Odds

Precipitation Odds

Explanation

- **Temperature**
  - Warmer than normal is the most likely outcome, followed by near normal and then colder than normal
- **Precipitation**
  - Wetter than normal is the most likely outcome, followed by near normal, then drier than normal
- **Snowfall**
  - Given warmer than normal overall, snow totals may stay near normal

Winter Webinar Feedback

From The Superintendents

A five question survey was emailed to the superintendents, but only two responded 😞. The two best Q&A takeaways…

1. **Does a monthly or seasonal forecast ever influence your decision making?**

- **Respondent 1: No, actually we plan for the worst and hope for the best. We need to be prepared in our line of work.**
- **Respondent 2: We use [these] to inform staff about potential shift start/end dates; material procurement; equipment readiness**

2. **What would your utility be of forecast information that is 1 to 2 weeks out? What about 3 to 4 weeks out?**

- **Respondent 1: 1-2 weeks is even a stretch for us. With lake effect patterns anything much further out is hard to predict. Big picture patterns i.e. a storm forming out West could be a blizzard for us is useful.**
- **Respondent 2: This information is the most beneficial, no matter what the season is. Would like it to be more accurate and allows us adequate time to prepare with some confidence.**

NWS DSS and Partnerships

With Michigan's Transportation Sector