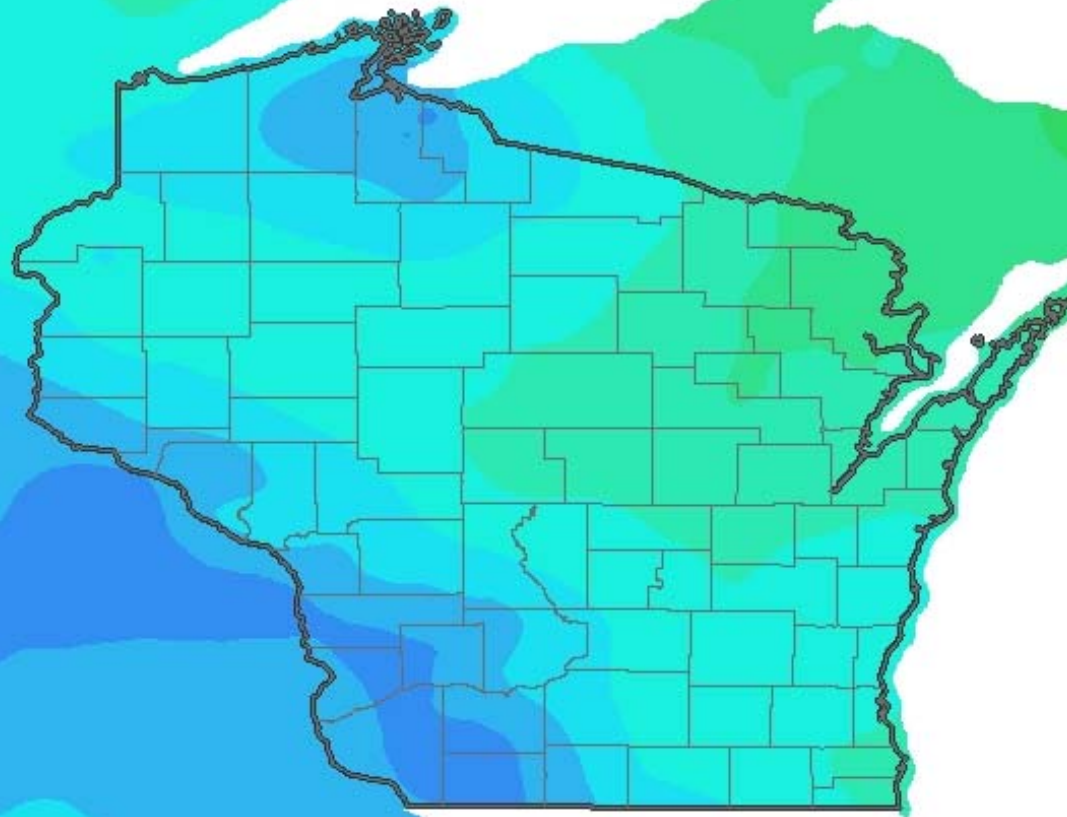


USDA - NRCS Implementation of NOAA Atlas 14



Annette Humpal, P.E.
USDA – NRCS
Hydraulic Engineer

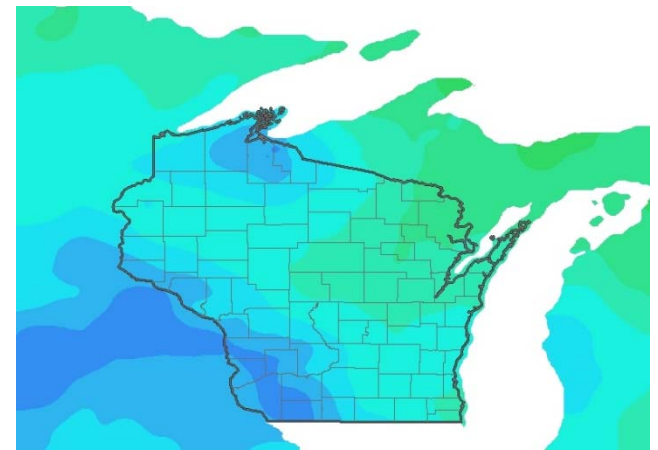


NRCS Work to Implement NOAA Atlas

14

Background:

- ◆ NRCS Priority to Coordinate Nationwide to provide consistent methods for analyzing and using Atlas 14 data
- ◆ NRCS National Water Quality and Quantity Team (WQQT) assisted NRCS State Hydraulic Engineers in this work
 - ◆ WQQT had done considerable analysis of the previously released Atlas 14 volumes
 - ◆ Methods developed from their previous studies were used in WI



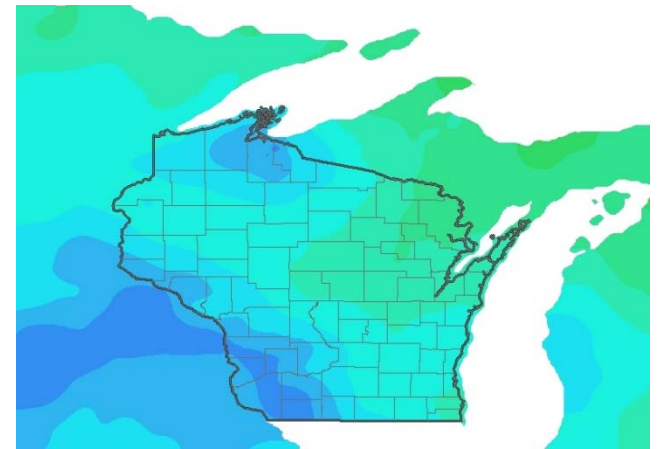


NRCS Work to Implement NOAA Atlas

14

NRCS Implementation of Atlas 14:

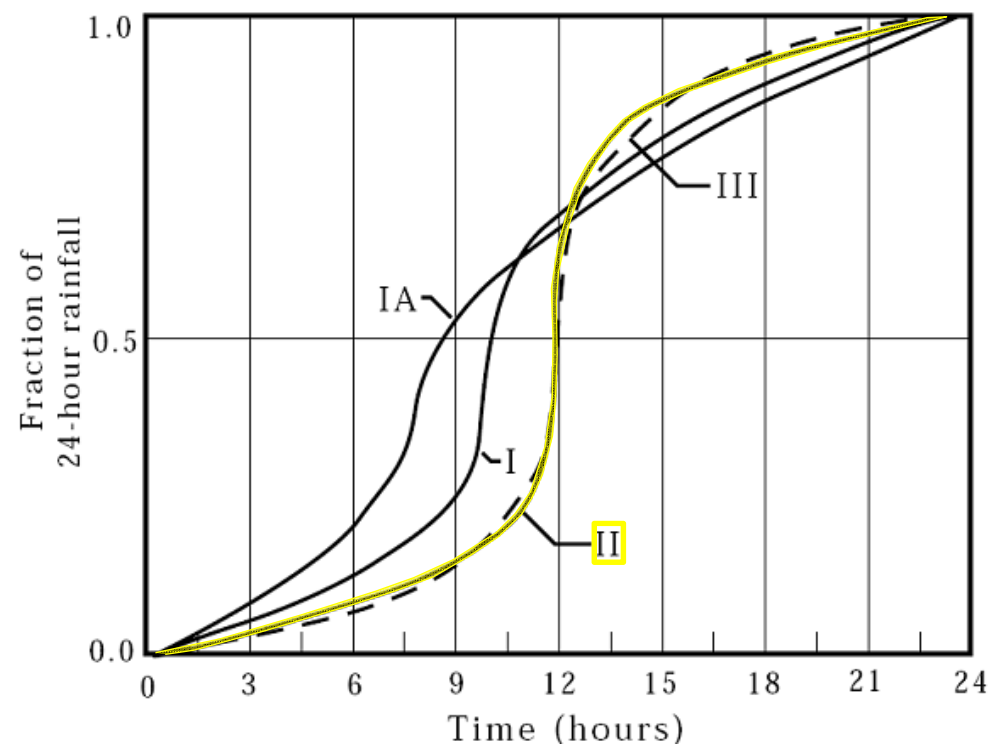
- Analyzed the Atlas 14 data using GIS
 - Developed Generalized Atlas 14 Precipitation Depths by County
 - Developed New NRCS Temporal Storm Distributions based on Atlas 14 Data
- Developed precipitation databases by County for use in NRCS Hydrology Programs





“Previous” NRCS Wisconsin Precipitation Data Use

- Technical Paper No. 40, (TP40), “Rainfall Frequency Atlas of the U.S.”, 1961
- NRCS Type II Storm Distribution





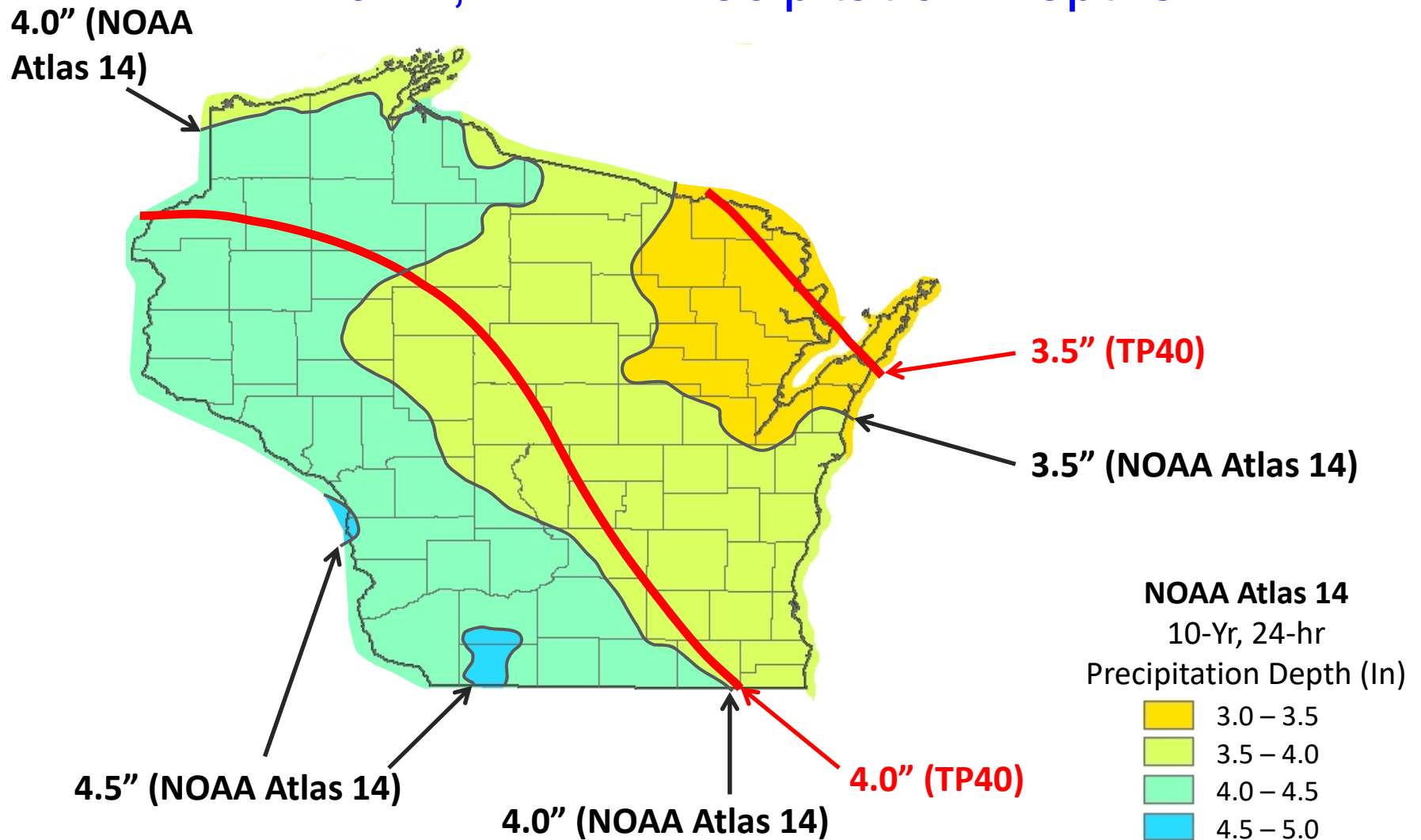
Comparing New Versus Old Data

Comparing the Precipitation **Depths** for
the New Atlas 14 versus the Old TP40
Data...



NOAA Atlas 14 Versus TP40 Data

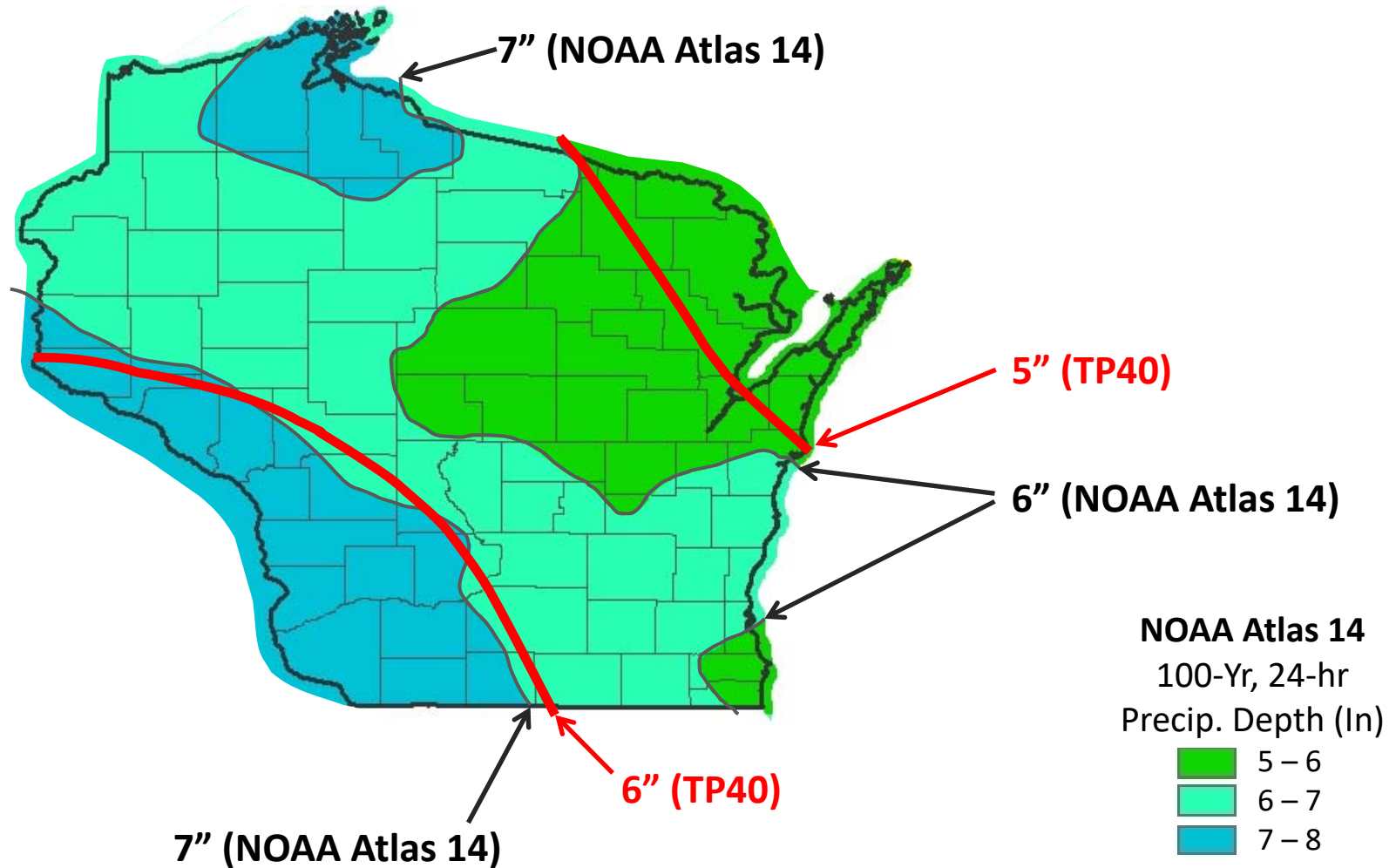
10-Yr, 24-Hr Precipitation Depths





NOAA Atlas 14 Versus TP40 Data

100-Yr, 24-Hr Precipitation Depths





NRCS Development of Precipitation Depths by County

Development of Generalized Precipitation Depths by County:

- The NRCS National WQQT used GIS to analyze the Atlas 14 partial duration series based **grid data** and develop mean precipitation depths **by County** and return interval (storm frequency)
- **Representative Locations** for each WI County were then selected from the Atlas 14 grid data. These were selected such that the Atlas 14 precipitation depths at these (point) representative locations:
 - **Equal** to the County Mean for the 100-year, 24-hour precipitation
 - Within -1.0% and +1.9% (within 1 standard deviation) of the County Means for the 1-yr through 50-year, 24-hour precipitation
- Precipitation Depths for representative County locations were used in NRCS Hydrology Program Databases

- The intent of using “representative locations” is to prepare for



TP40 Versus NOAA Atlas 14 Precipitation Depths

10-Yr, 24-Hr Precipitation Depths

Percent Change From TP40 to NOAA Atlas 14 (Representative Location)

Iron County:

TP40: 3.80"

Atlas 14 (Mean): 4.03"

Atlas 14 (Rep. Loc.): 4.05"

Increase (Rep. Loc.): 6.6%

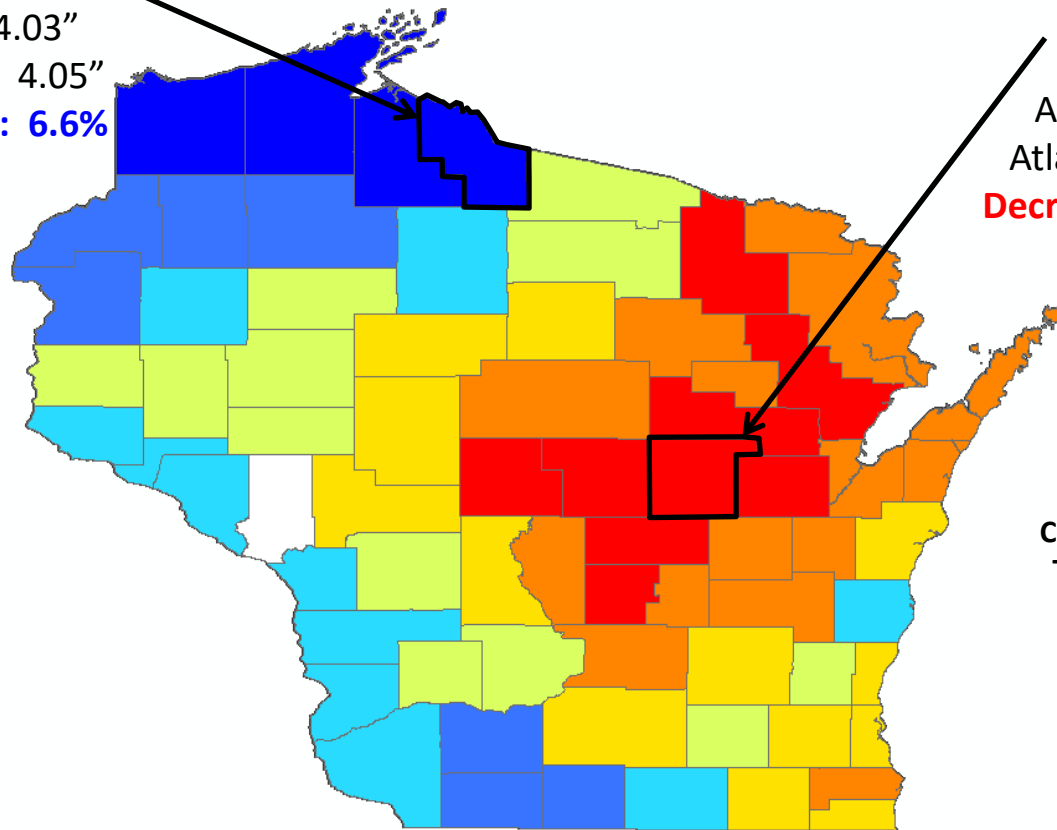
Waupaca County:

TP40: 3.90"

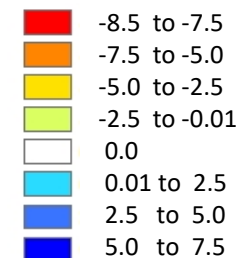
Atlas 14 (Mean): 3.57"

Atlas 14 (Rep. Loc.): 3.60"

Decrease (at Rep. Loc.): 7.7%



**Change in Precipitation Depth From
TP40 to NOAA Atlas 14 (Rep. Loc.)
10-Year, 24-hour (Percent)**





TP40 Versus NOAA Atlas 14 Precipitation Depths

100-Yr, 24-Hr Precipitation Depths

Percent Change From TP40 to NOAA Atlas 14 (Representative Location)

Ashland County:

TP40: 5.40"

Atlas 14 (Rep. Loc. = Mean): 7.37"

Increase 36.5%

Shawano County:

TP40: 5.40"

Atlas 14 (Rep. Loc. = Mean): 5.40"

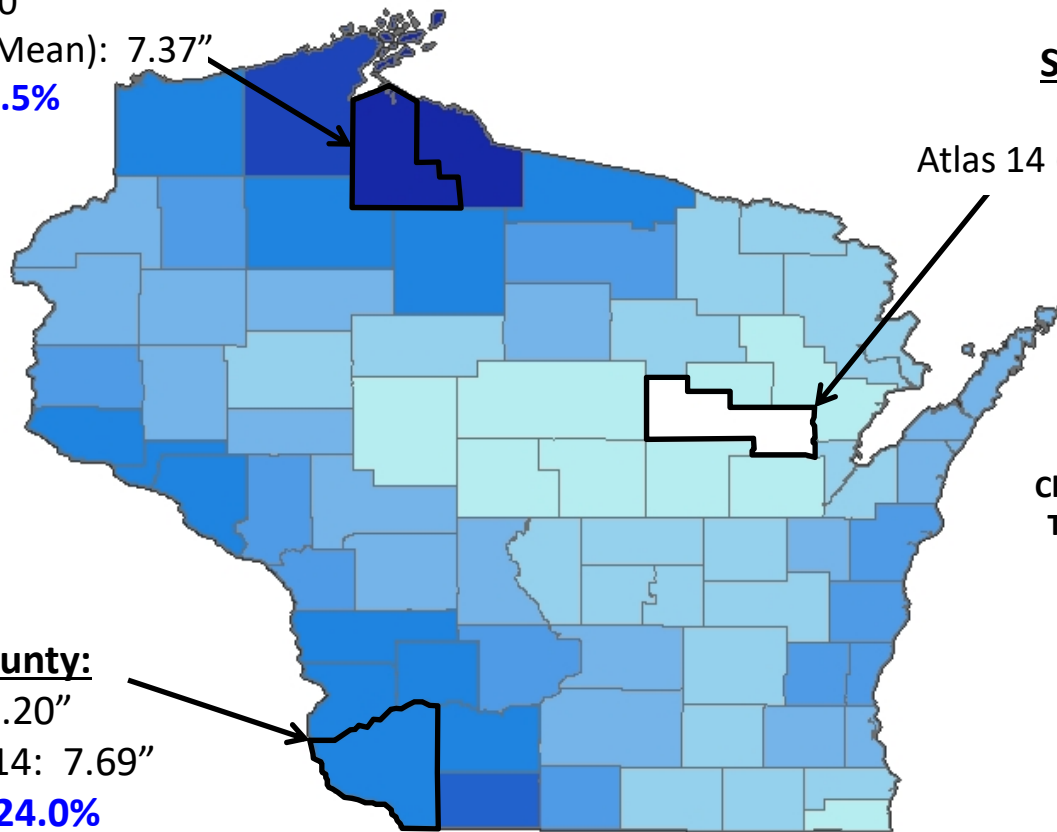
No Change

Grant County:

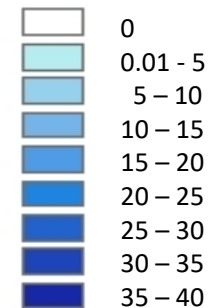
TP40: 6.20"

NOAA Atlas 14: 7.69"

Increase 24.0%



Change in Precipitation Depth From
TP40 to NOAA Atlas 14 (Rep. Loc.)
100-Year, 24-hour (Percent)





TP40 Versus NOAA Atlas 14 Precipitation Depths

100-Yr, 24-Hr Precipitation Depths

Percent Change From TP40 to NOAA Atlas 14 (Representative Location)

Ashland County:

TP40: 5.40"

Atlas 14 (Rep. Loc. = Mean): 7.37"

Increase 36.5%

Shawano County:

TP40: 5.40"

Atlas 14 (Rep. Loc. = Mean): 5.40"

No Change

Grant County:

TP40: 6.20"

NOAA Atlas 14: 7.69"

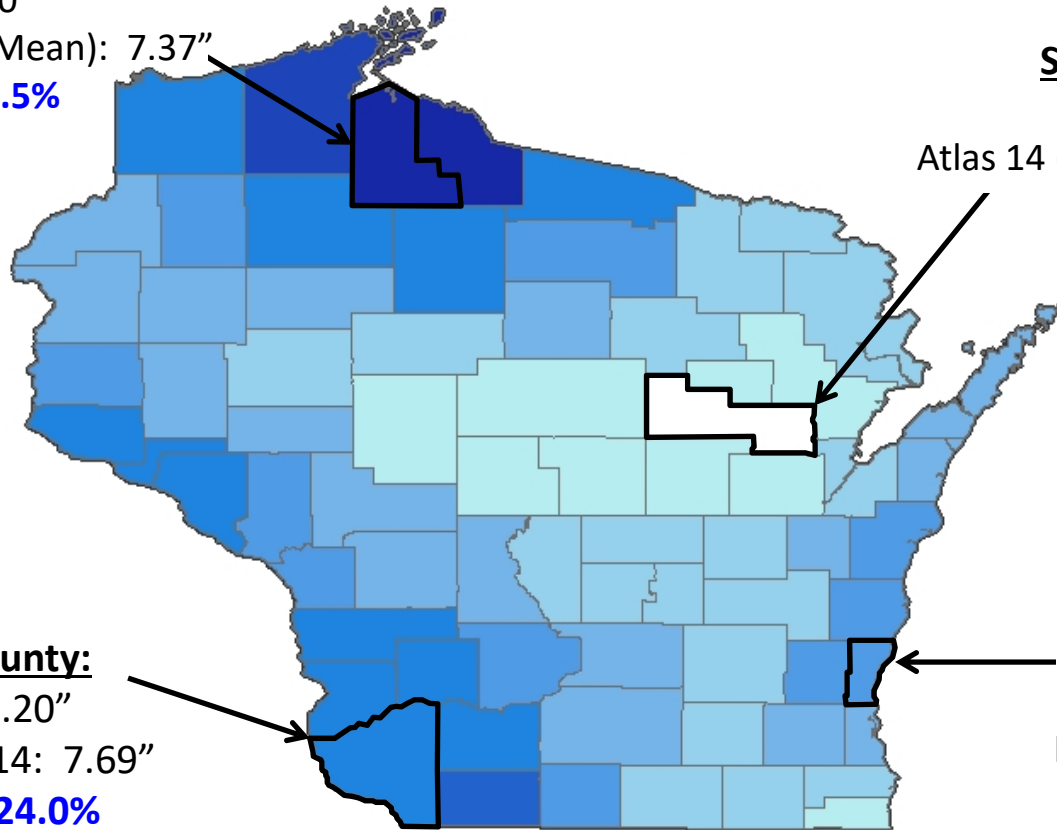
Increase 24.0%

Ozaukee County:

TP40: 5.40"

NOAA Atlas 14: 6.38"

Increase 18.1%

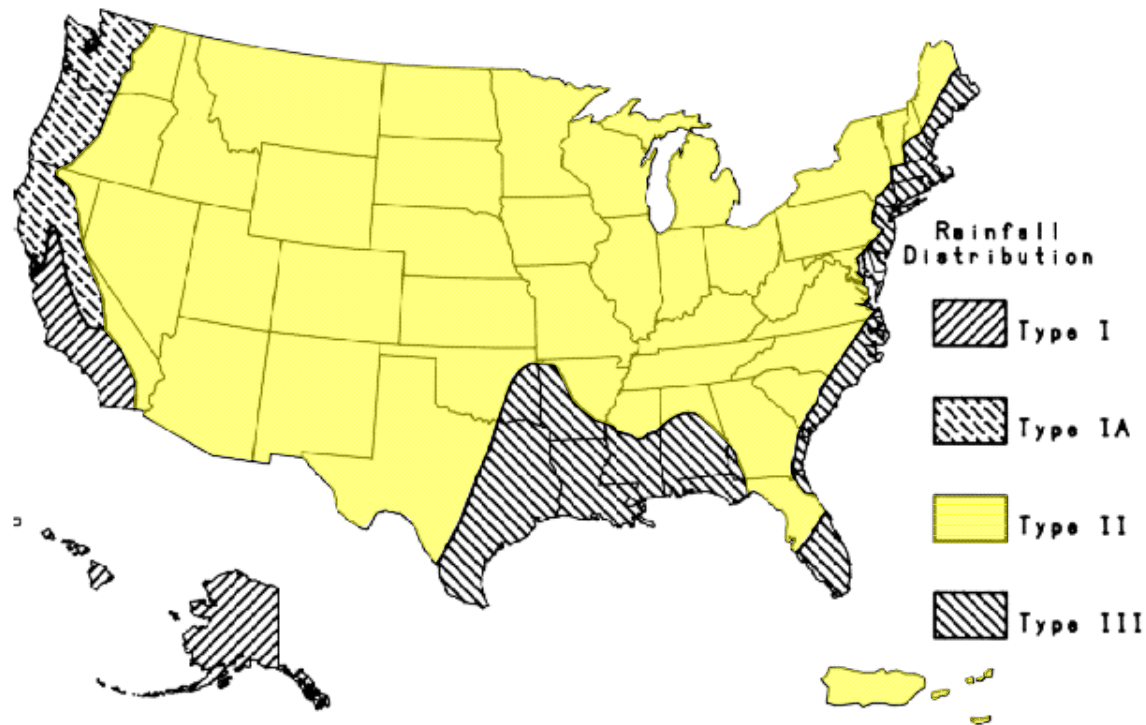




Development of NRCS Temporal Distributions

From their analysis of the *previously completed* NOAA Atlas 14, Volumes, the NRCS [WQQT](#) concluded ...

- The NRCS Type II Storm distribution **should not** be used with NOAA Atlas 14 precipitation depths.
- The use of rainfall distributions that cover large geographic regions (such as Type II), could lead to over- or under-estimation of peak discharge





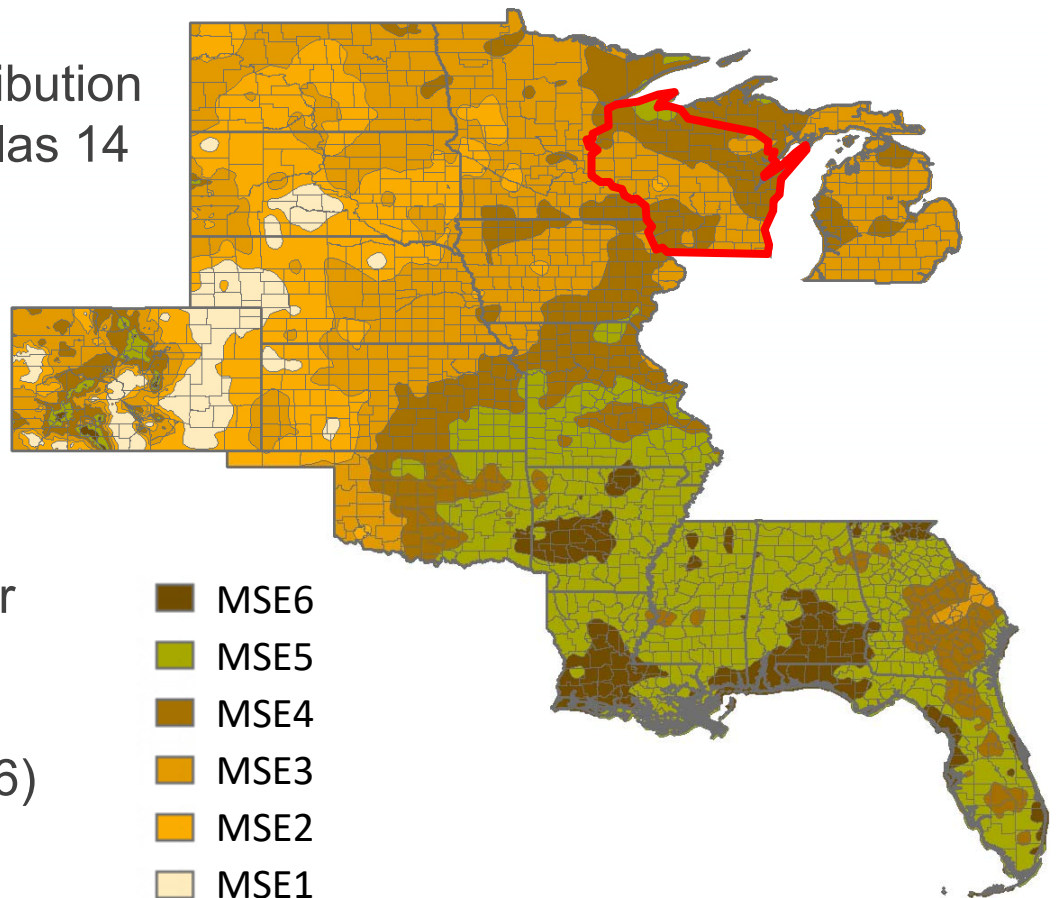
Development of NRCS Temporal Distributions

The NRCS WQQT developed a procedure Using ArcGIS 10.0 for deriving temporal storm distributions for a wide range of climate conditions (tropical to arctic) which occur in the US.

Developed temporal storm distribution Regions for MW and SE US (Atlas 14 Volumes 7 and 8)

Based on ratios of the Atlas 14 (25-yr, 1-hr)/(25-yr, 24-hr) precipitation depths

Since these were developed for the MW and SE US, the distribution Regions were titled MSE (e.g. MSE1 through MSE6)







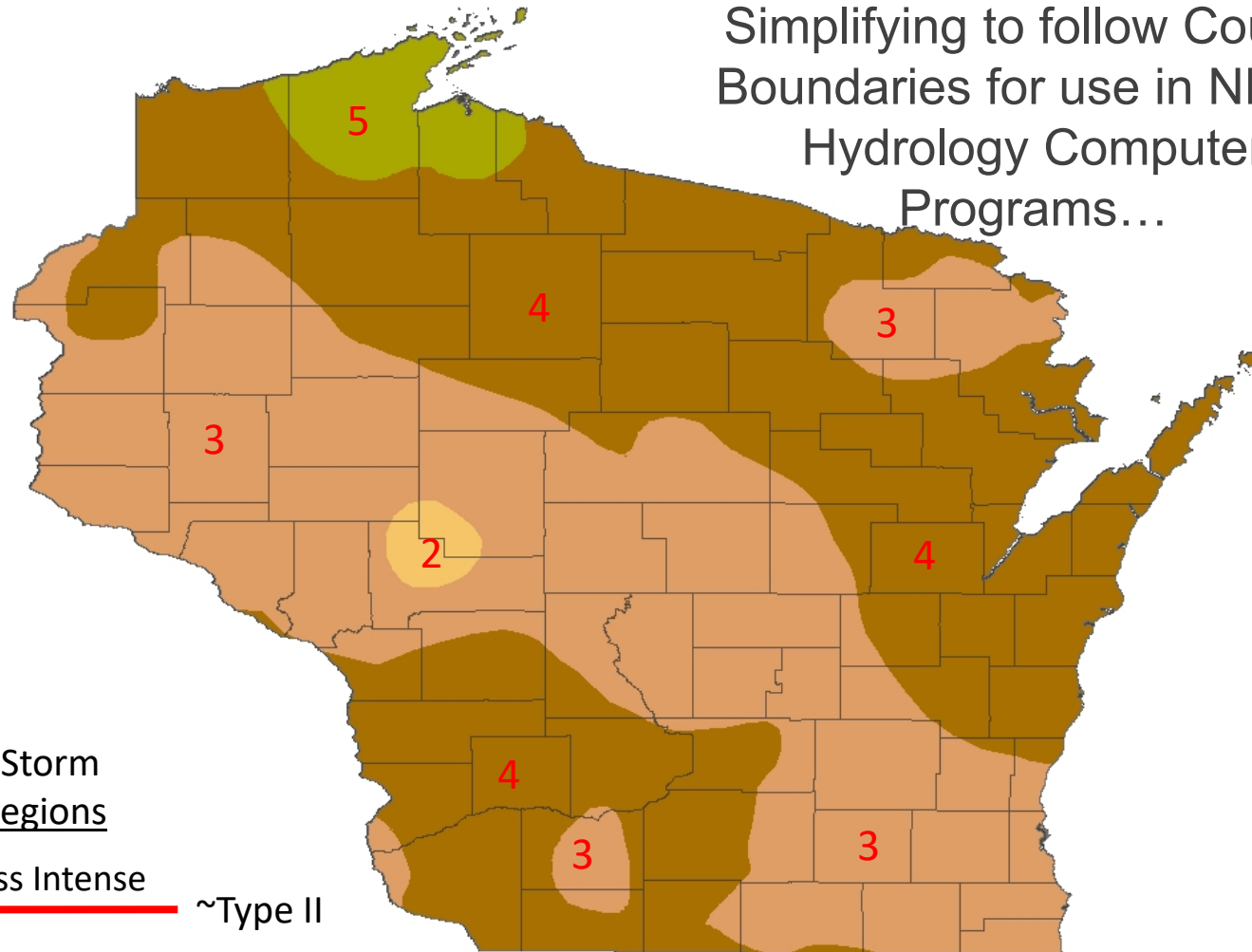


NRCS WQQT Storm Distribution Regions - WI

Simplifying to follow County Boundaries for use in NRCS Hydrology Computer Programs...

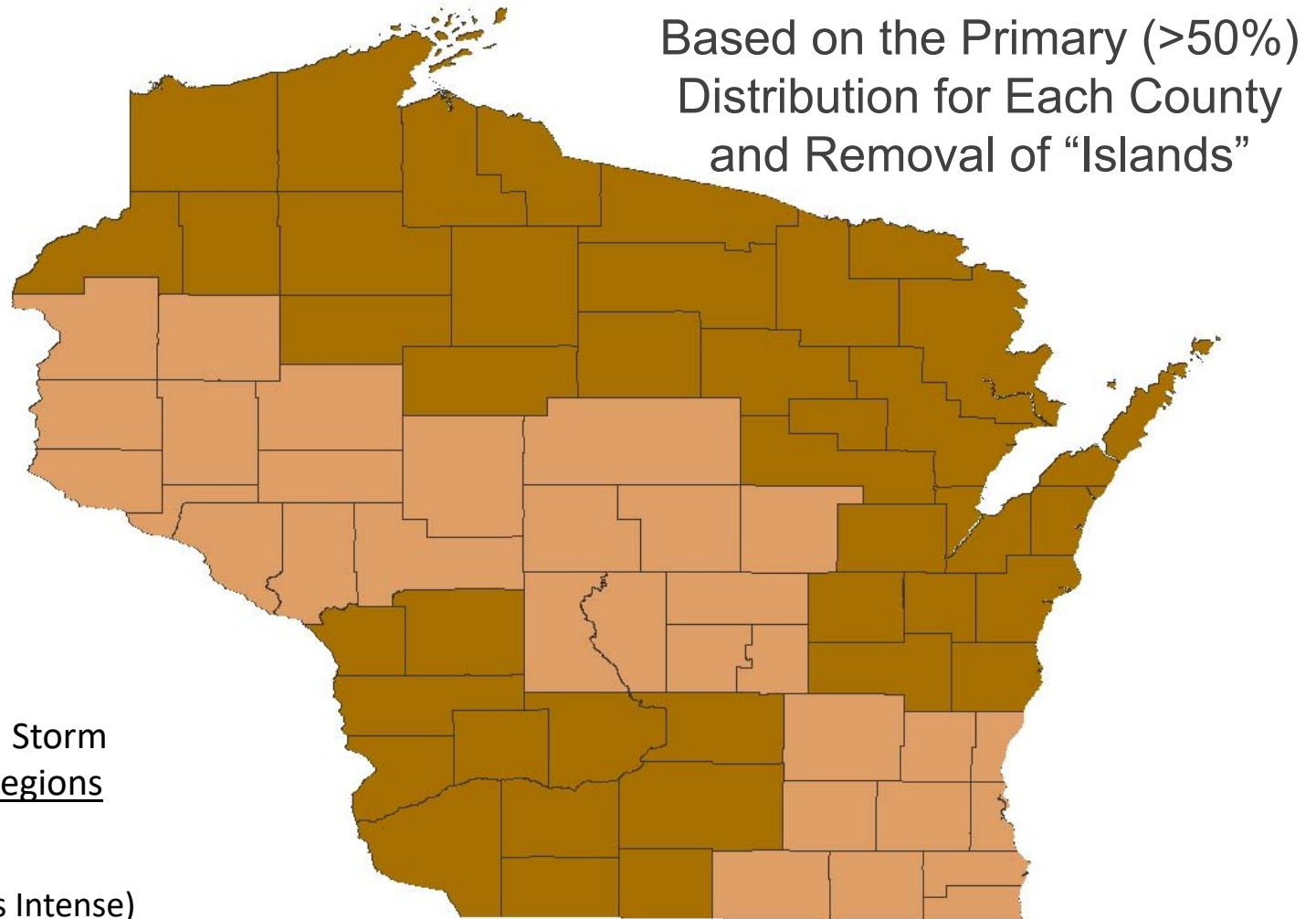
Initial WQQT Storm Distribution Regions

-  MSE5 ← Less Intense
-  MSE4 ← ~Type II
-  MSE3
-  MSE2 More Intense





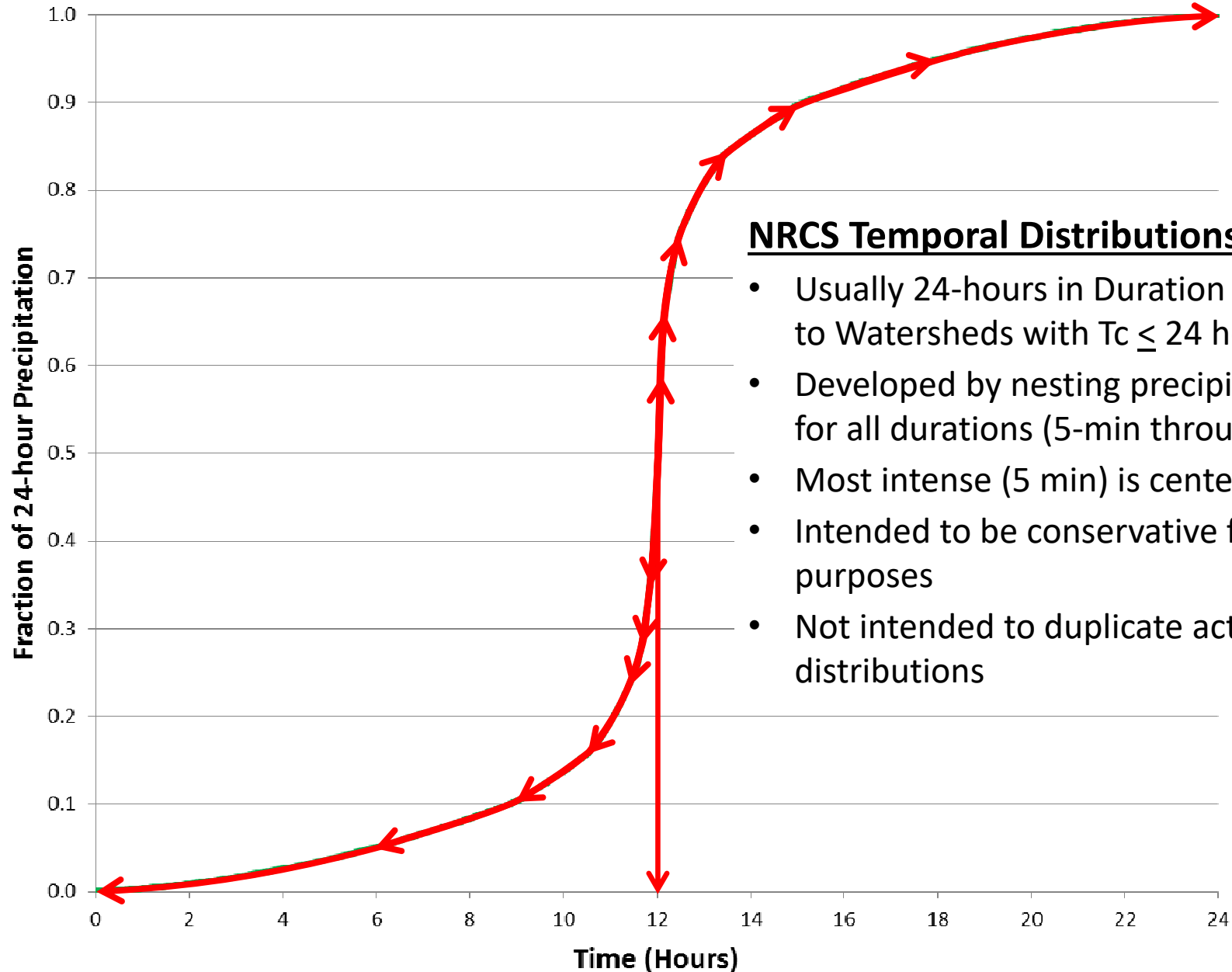
NRCS WI Storm Distribution Regions - Final



The New NRCS Storm Distributions were Applied by County in the Hydrology Program Precipitation

Databases

Development of a NRCS Temporal Storm Distribution



NRCS Temporal Distributions are:

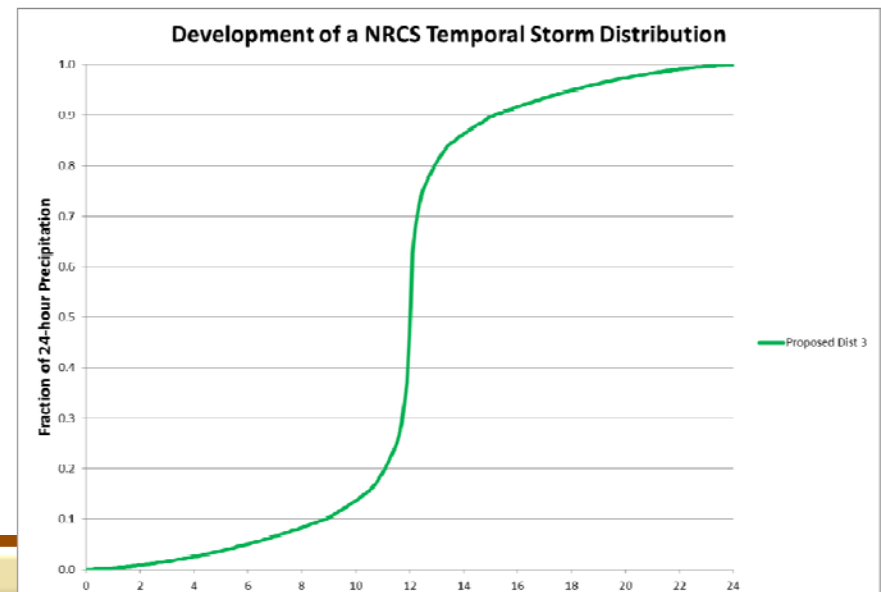
- Usually 24-hours in Duration – applicable to Watersheds with $T_c \leq 24$ hours
- Developed by nesting precipitation depths for all durations (5-min through 24-hr)
- Most intense (5 min) is centered at 12 hrs
- Intended to be conservative for design purposes
- Not intended to duplicate actual storm distributions



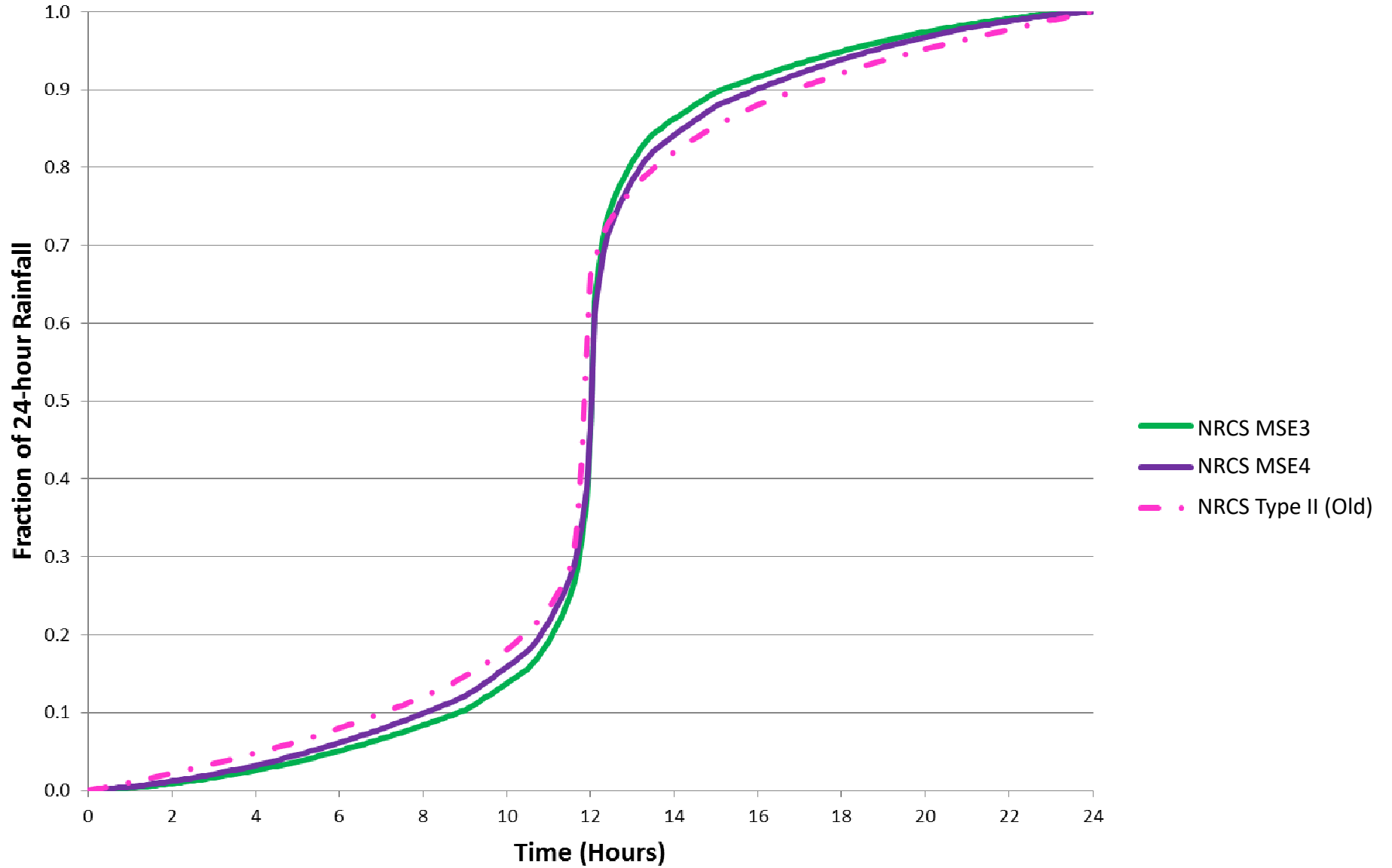
NRCS Temporal Distributions

NRCS Purpose in Nesting All Durations within the 24-hr Temporal Distribution:

- The storm duration producing the largest peak discharge is generally approximately equal to the time of concentration of the watershed to the design point (NRCS NEH Ch 4)
- Thus, the NRCS 24-hour Temporal Distribution is applicable to any watershed with a T_c less than 24 hours



Comparison of Storm Distributions





NRCS WQQT New Storm Distributions

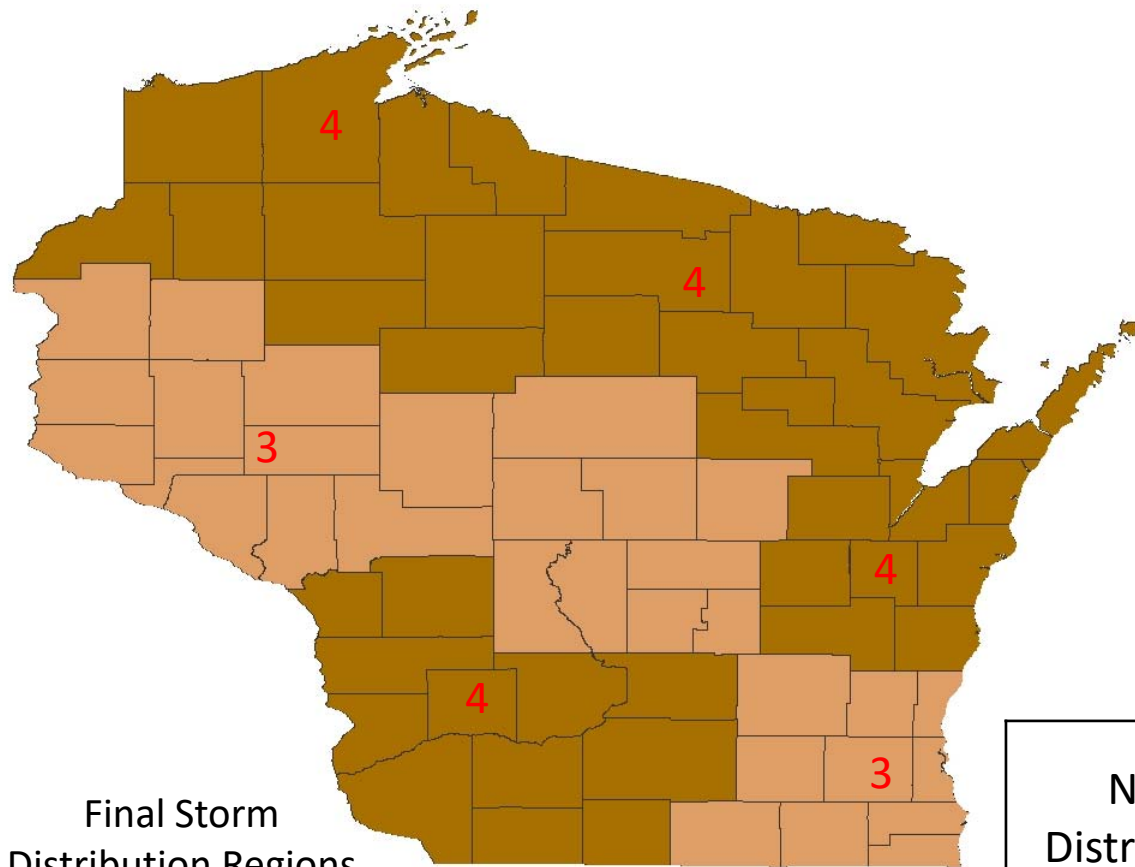
How will the New NRCS Storm Distributions Impact Computed Peak Discharge Values?





NRCS WQQT New Storm Distributions

Impact on Peak Discharge – Initial findings



Final Storm Distribution Regions

- MSE4 (Less Intense)
- MSE3 (More Intense)

NRCS Distribution	Change in Peak Discharge Versus for Type II Distribution
MSE3	~12% Increase



Proposed Temporal Storm Distributions

NRCS Plans in Neighboring States?




Minnesota tentatively plans to have All Dist-3

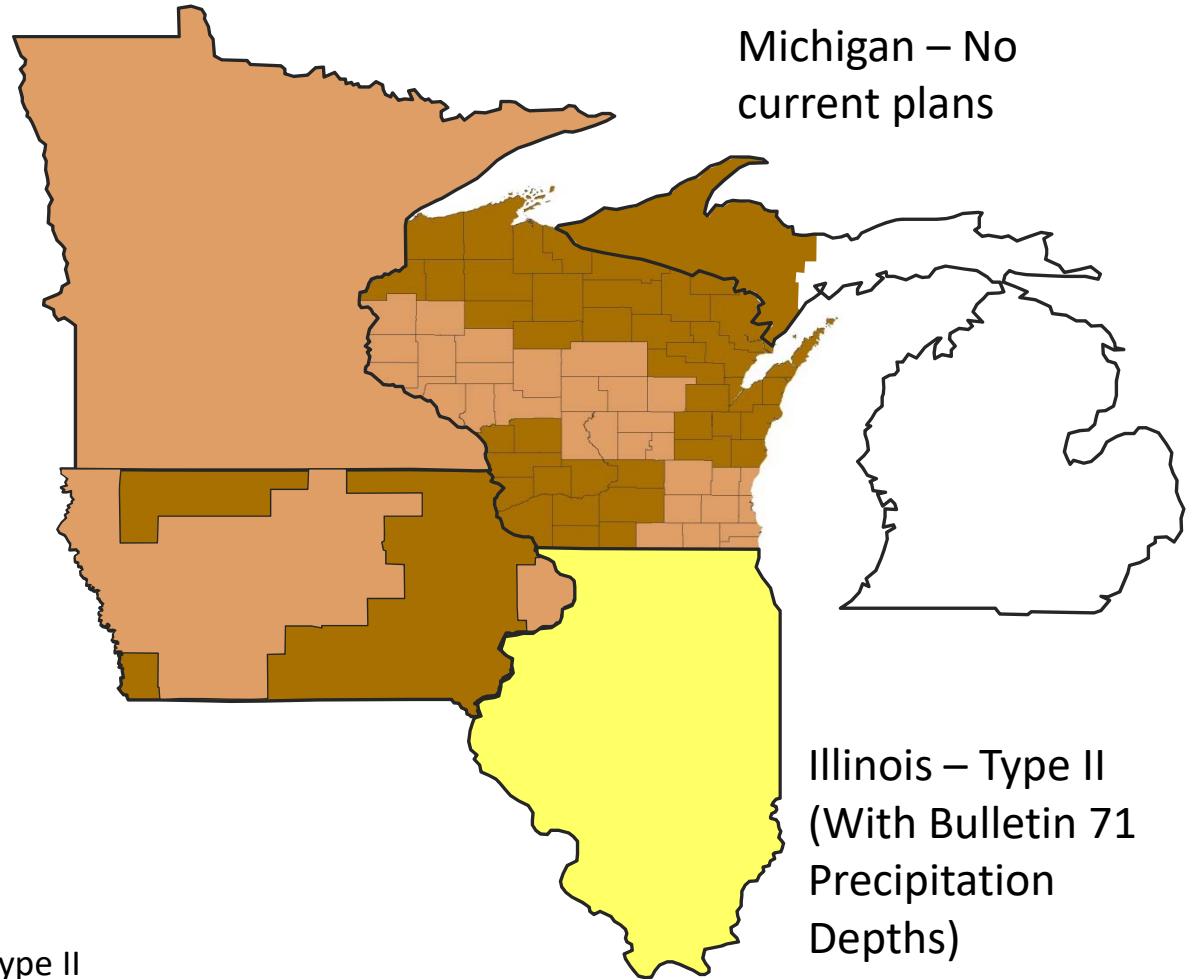
Iowa – Currently on Hold, but eventually plans to have 2 Regions (Dist 3 and Dist 4)

Michigan – No current plans

Illinois – Type II (With Bulletin 71 Precipitation Depths)

Tentative Storm Distribution Regions

-  MSE3 (More Intense)
-  MSE4
-  MSE5 (Less Intense) ← ~Type II





Transitioning to Atlas 14 Data Use

NRCS WI Engineers plan to start using NOAA Atlas 14 precipitation data **after** the 2014 construction season (Early 2015)

Roll-out of NRCS WI Atlas 14 Data includes:

- ◆ Release of **National** NRCS Hydrology Programs (EFH2, WinTR-55) with updated precipitation databases - Online 2015?
- ◆ Release of updated NRCS **Wisconsin** Hydrology (EFH2 and TR55) spreadsheets – Online January 2015
- ◆ Release of NRCS Engineering Field Handbook, **Wisconsin** Supplement – Online January 2015
- ◆ Google “NRCS Wisconsin Hydrology Hydraulics” to find NRCS Wisconsin Engineering Hydrology, Hydraulics webpage, or use web address:

<http://www.nrcs.usda.gov/wps/portal/nrcs/main/wi/technical/engineering/>

Questions?

USDA



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