



Historical SPC Watch to Warning Lead Time

- Data Last Updated on 07/16/2024

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Goals

- Evaluate Severe Thunderstorm and Tornado Watch to Warning lead times across the forecast area (CWA).
 - Look for trends over time, both in specific counties and also the county warning area (CWA) as a whole.
 - Demonstrate both the average lead time, in addition to the best and worst case scenarios for each county.
- Evaluate how often Severe/Tornado Watches precede a Warning.
 - Look for variations across the CWA of watches correctly predicting warnable severe weather.
- Demonstrate the variability in lead times on a per event basis.
 - Look at graphically, the lead times for all events in the dataset for the most populous counties in the CWA: La Crosse and Olmsted.

Methodology



- Source of data was the Iowa Environmental Mesonet Archive of NWS watch, warnings, and advisories (WWA).
- Data collected from the Storm Prediction Center for severe thunderstorm and tornado watches issued from 2006+ by county.
- Data was analyzed using Python.
- Severe Thunderstorm Watch or Tornado Watch led to a check of the next issued product to determine whether a Severe Thunderstorm Warning or Tornado Warning was issued.
- If warning occurred during active watch, then the watch to warning time difference was recorded as the lead time in minutes.
- Lead time data was further analyzed to calculate mean, percentiles, and watch to warning predictability for each county

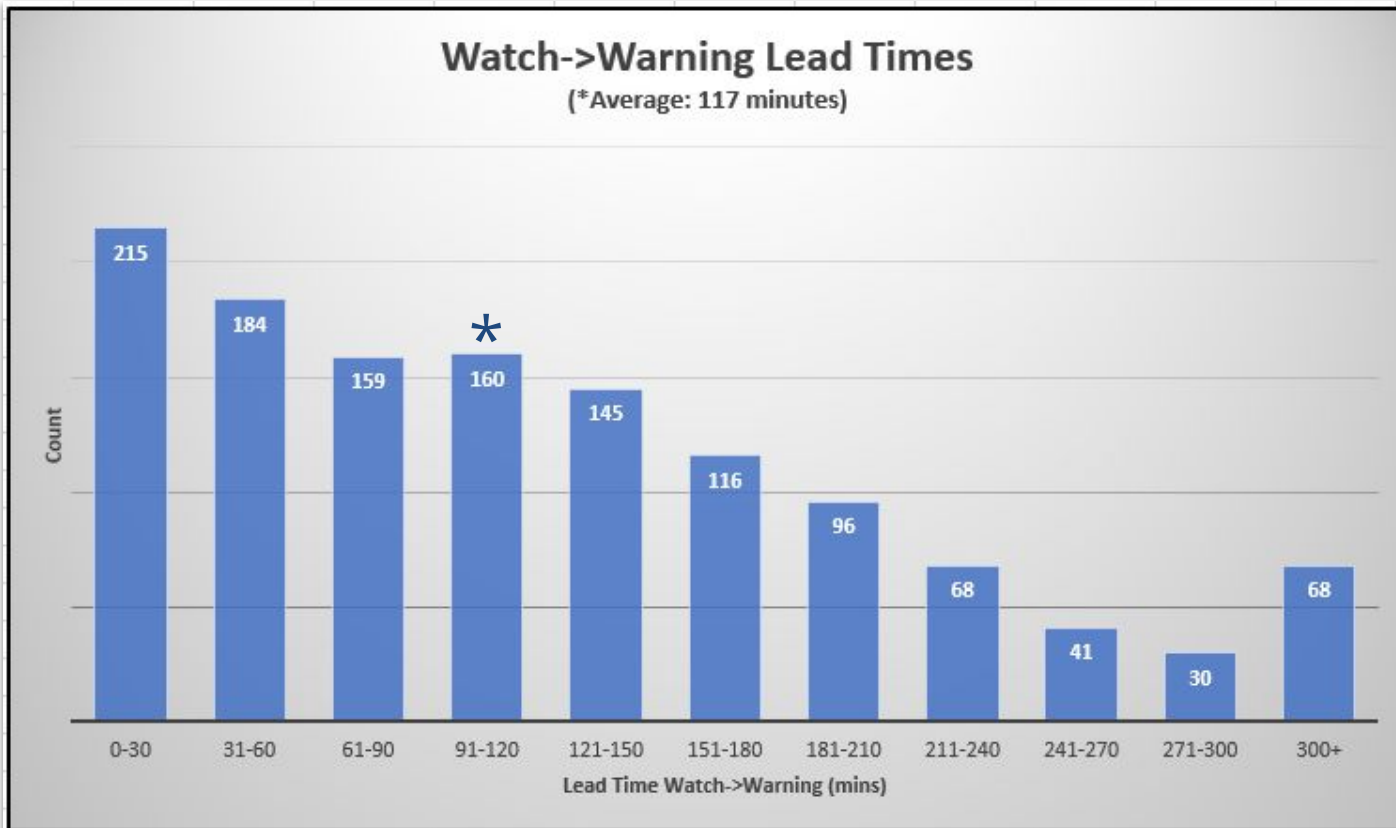
Methodology (cont.)



- Mean data was also split into three ranges of years (2006-2011, 2012-2017, and 2018-2024)
- Events were chronologically graphed using Excel for both La Crosse and Olmsted County.
- Occurrence of lead time ranges were counted and graphed using Excel.



Results





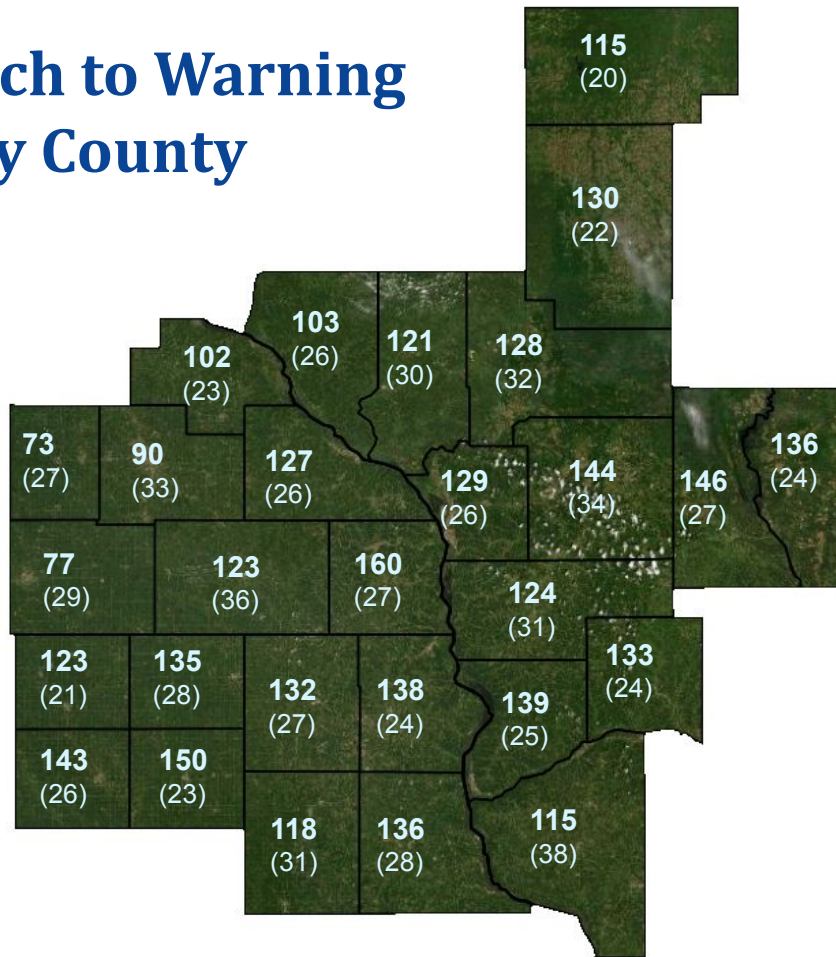
Average Watch to Warning Lead Time by County

(Since 2006)



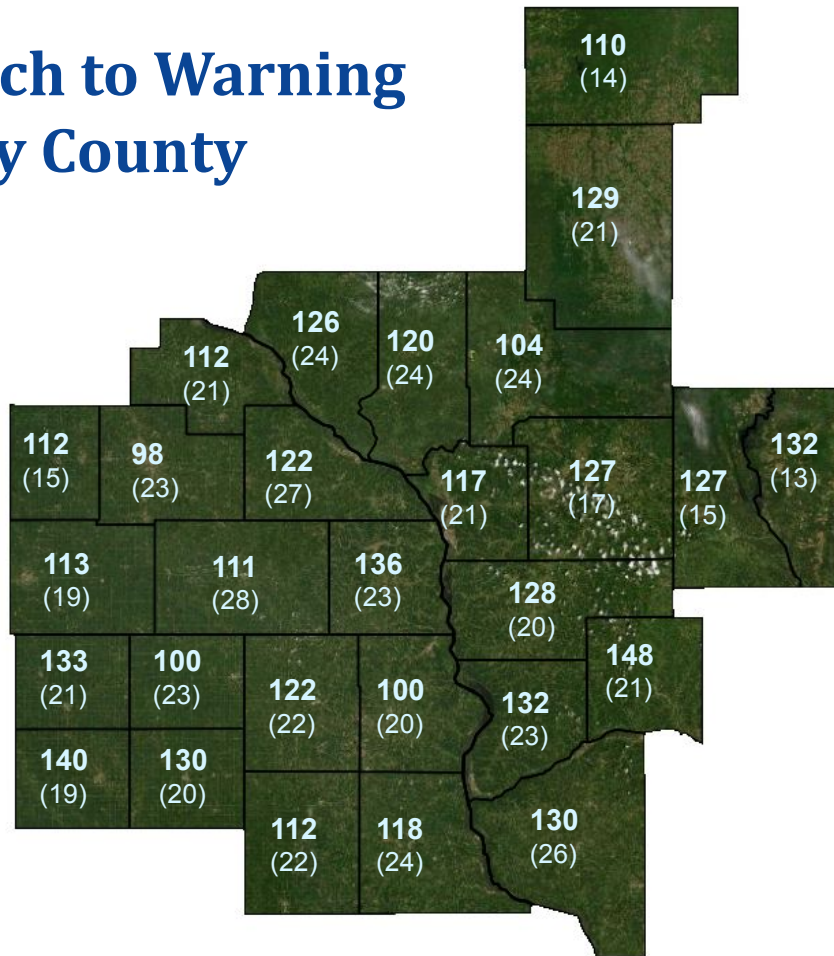
Mean Lead Time in Minutes
(Total Number of Events)

Average Watch to Warning Lead Time by County (2006 to 2011)



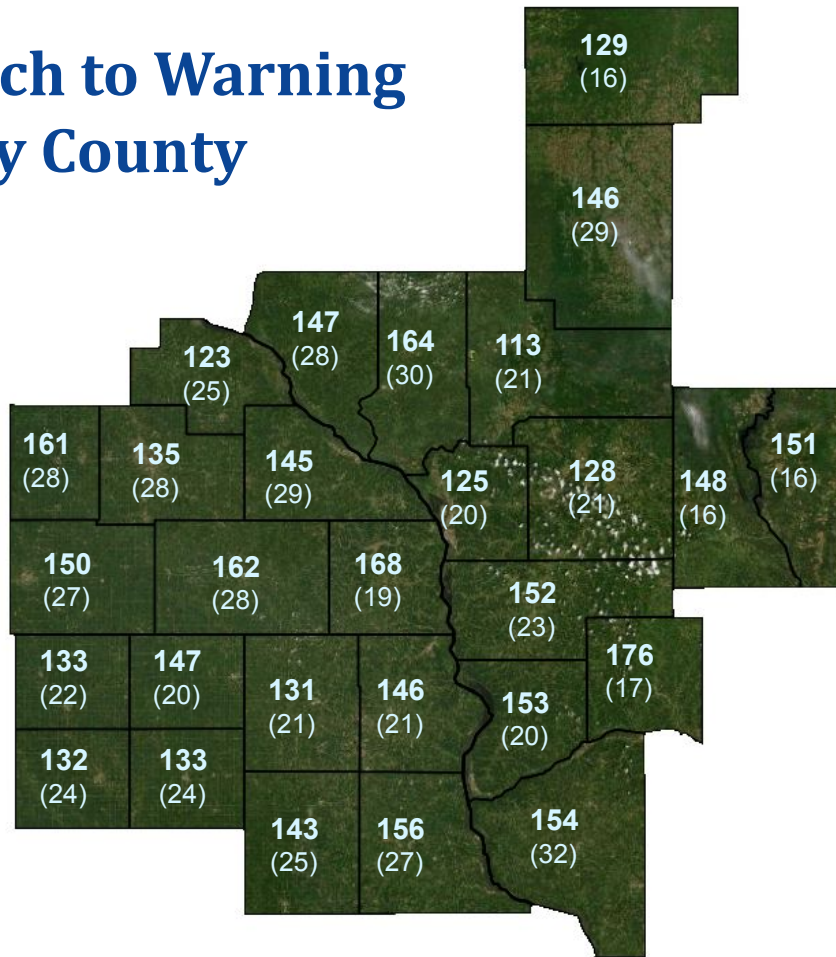
Mean Lead Time in Minutes
(Total Number of Events)

Average Watch to Warning Lead Time by County (2012 to 2017)



Mean Lead Time in Minutes
(Total Number of Events)

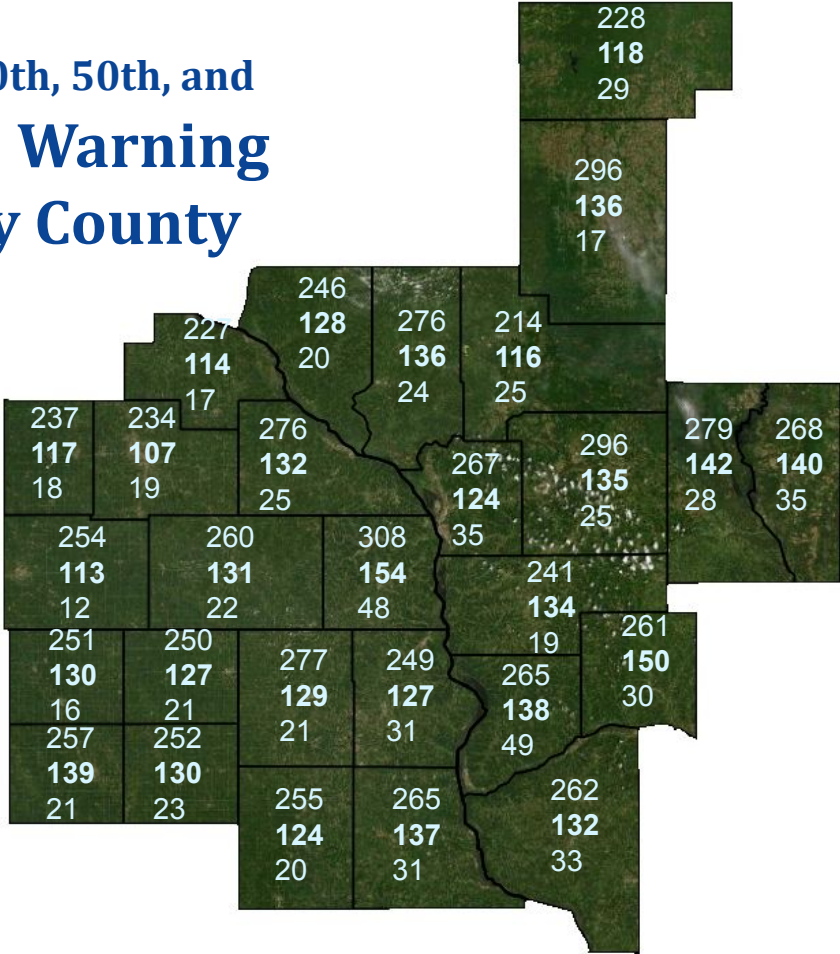
Average Watch to Warning Lead Time by County (2018 to 2024)



Mean Lead Time in Minutes
(Total Number of Events)



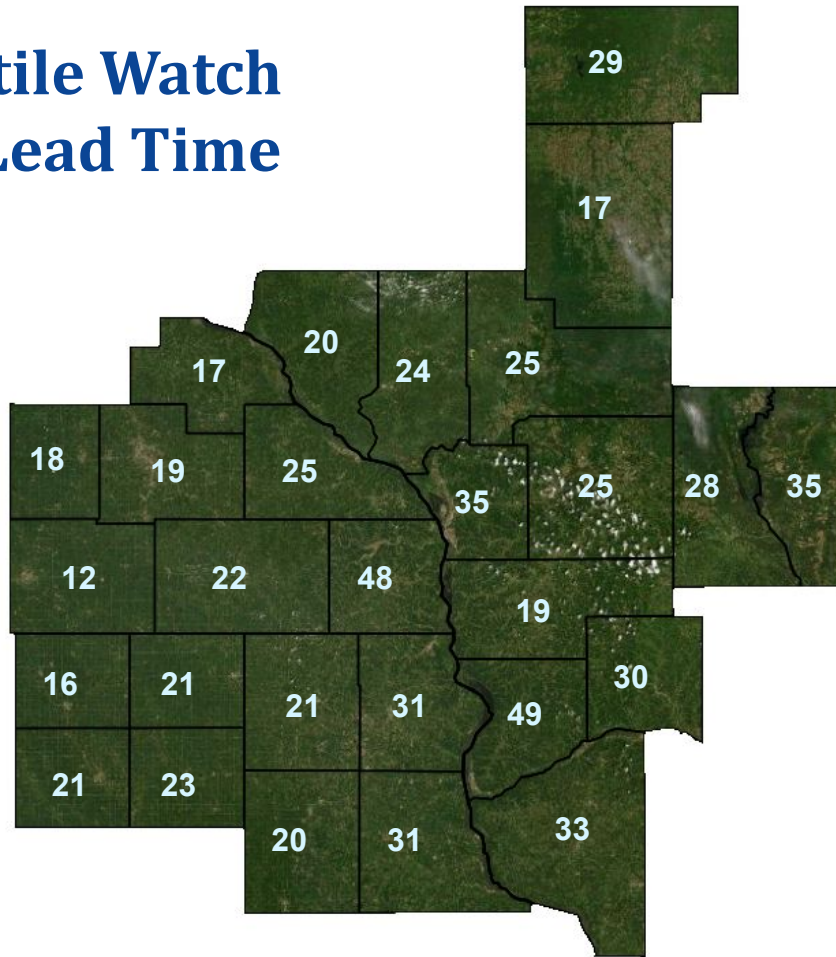
Percentile (90th, 50th, and 10th) Watch to Warning Lead Time by County (Since 2006)



90th Percentile
50th Percentile
10th Percentile



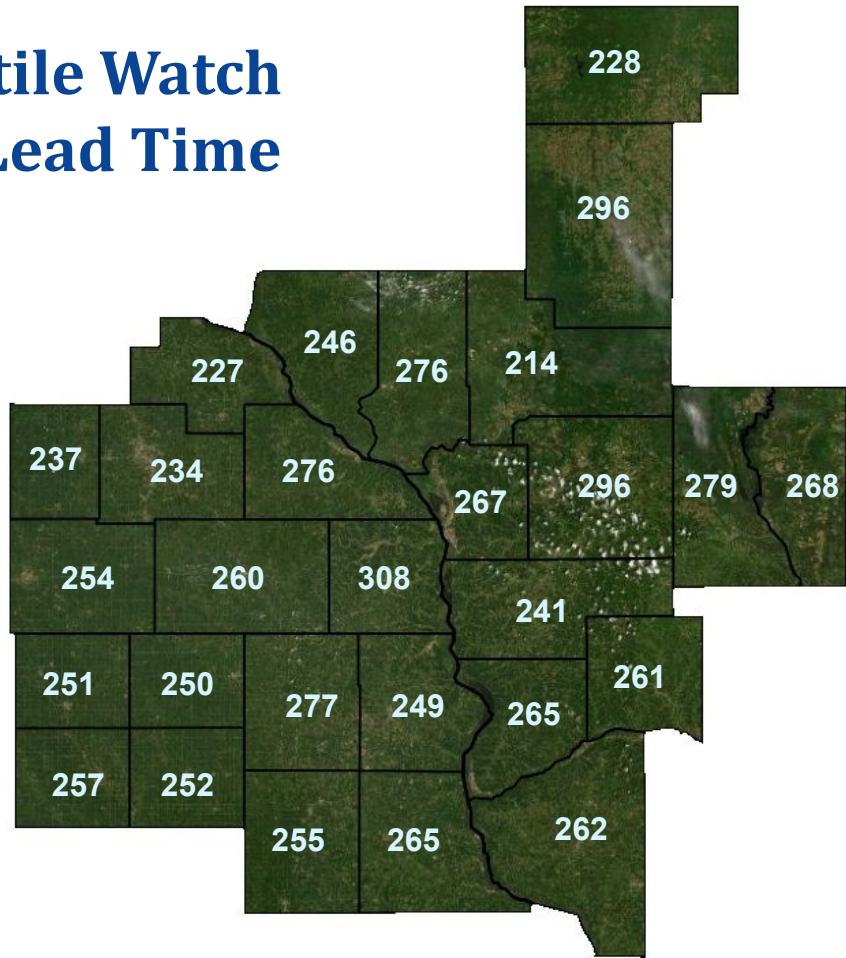
10th Percentile Watch to Warning Lead Time by County (Since 2006)



10th Percentile



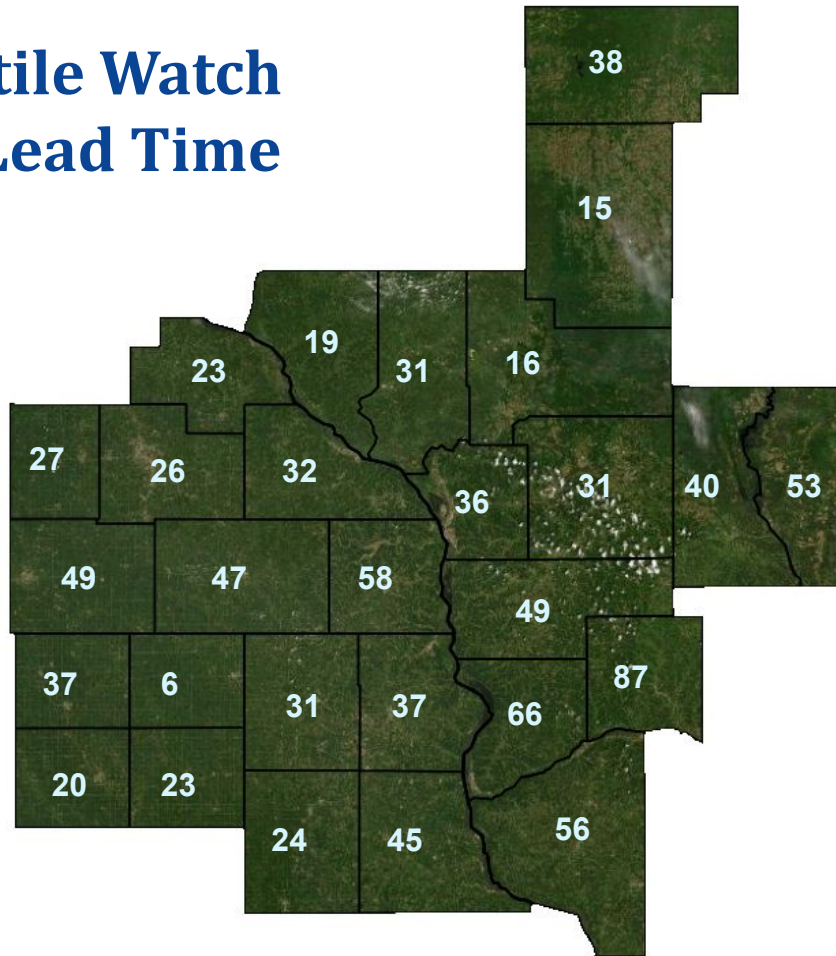
90th Percentile Watch to Warning Lead Time by County (Since 2006)



90th Percentile



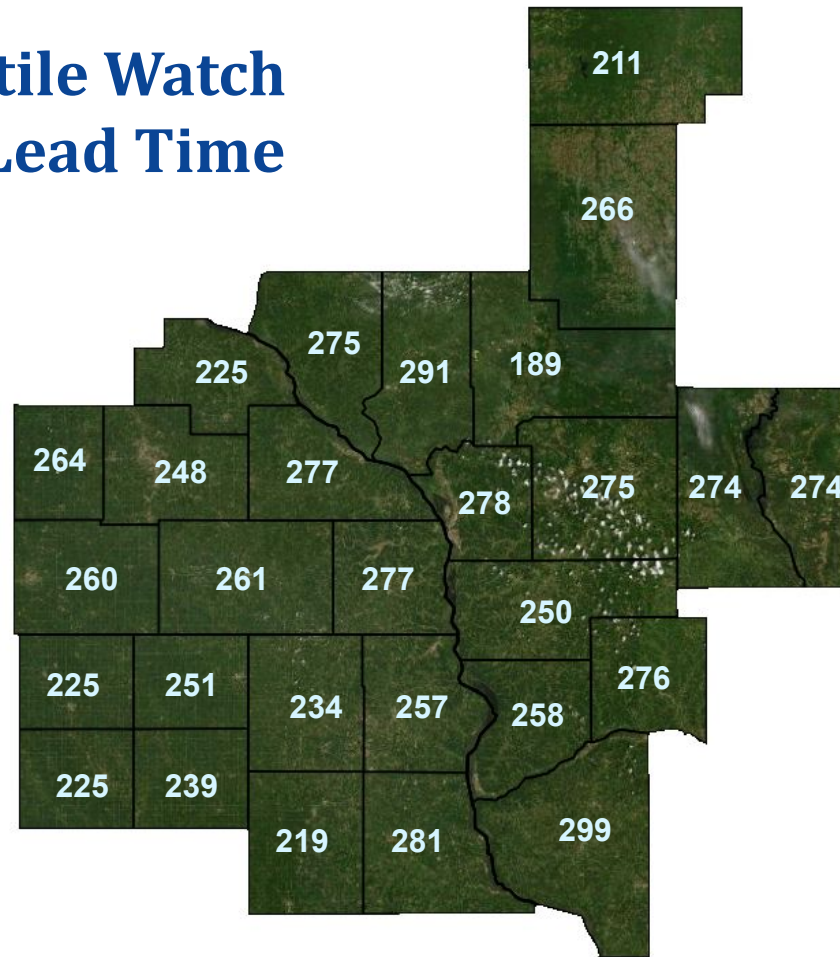
10th Percentile Watch to Warning Lead Time by County (Since 2018)



10th Percentile



90th Percentile Watch to Warning Lead Time by County (Since 2018)

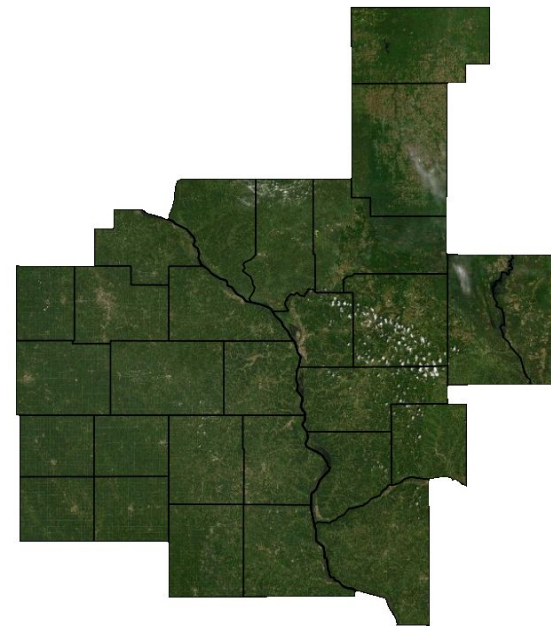


90th Percentile

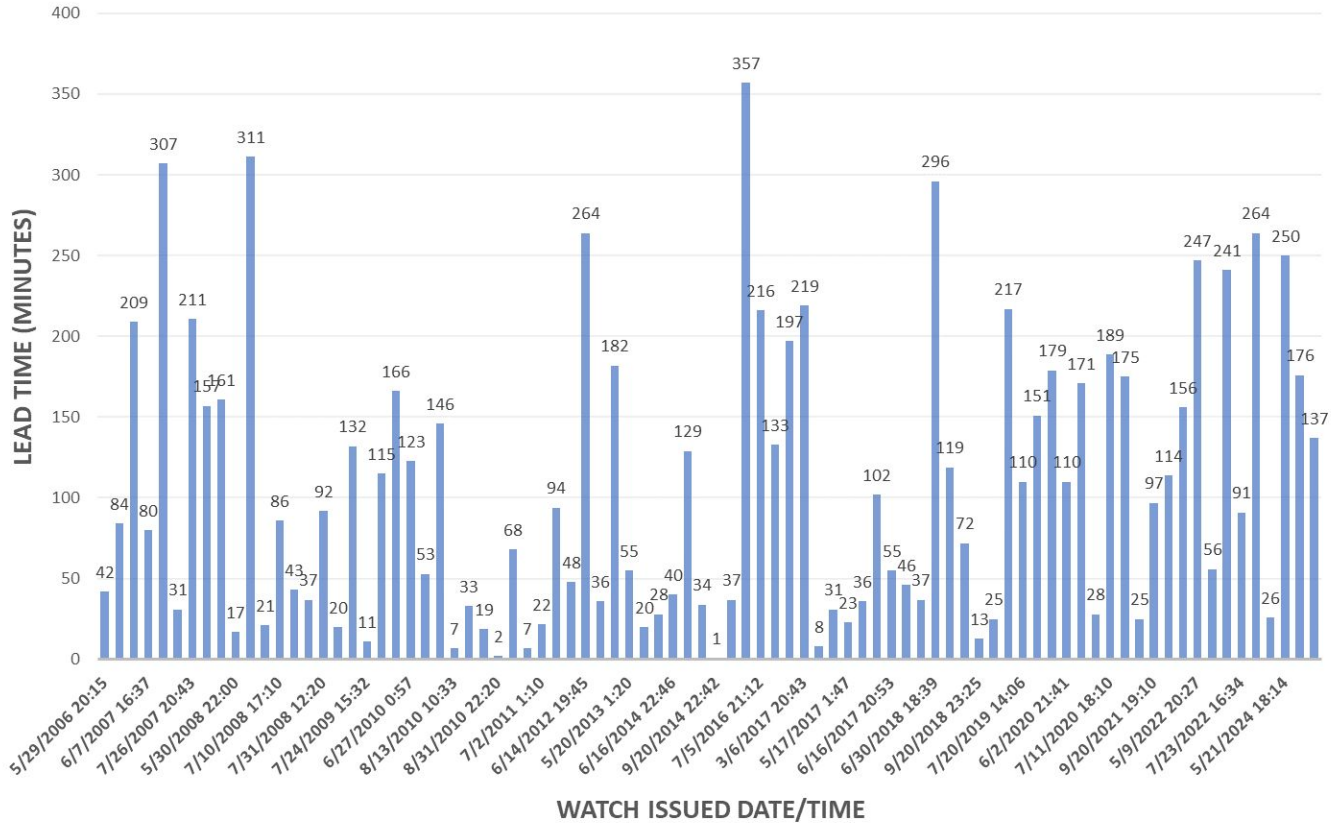


Watch to Warning Lead Time

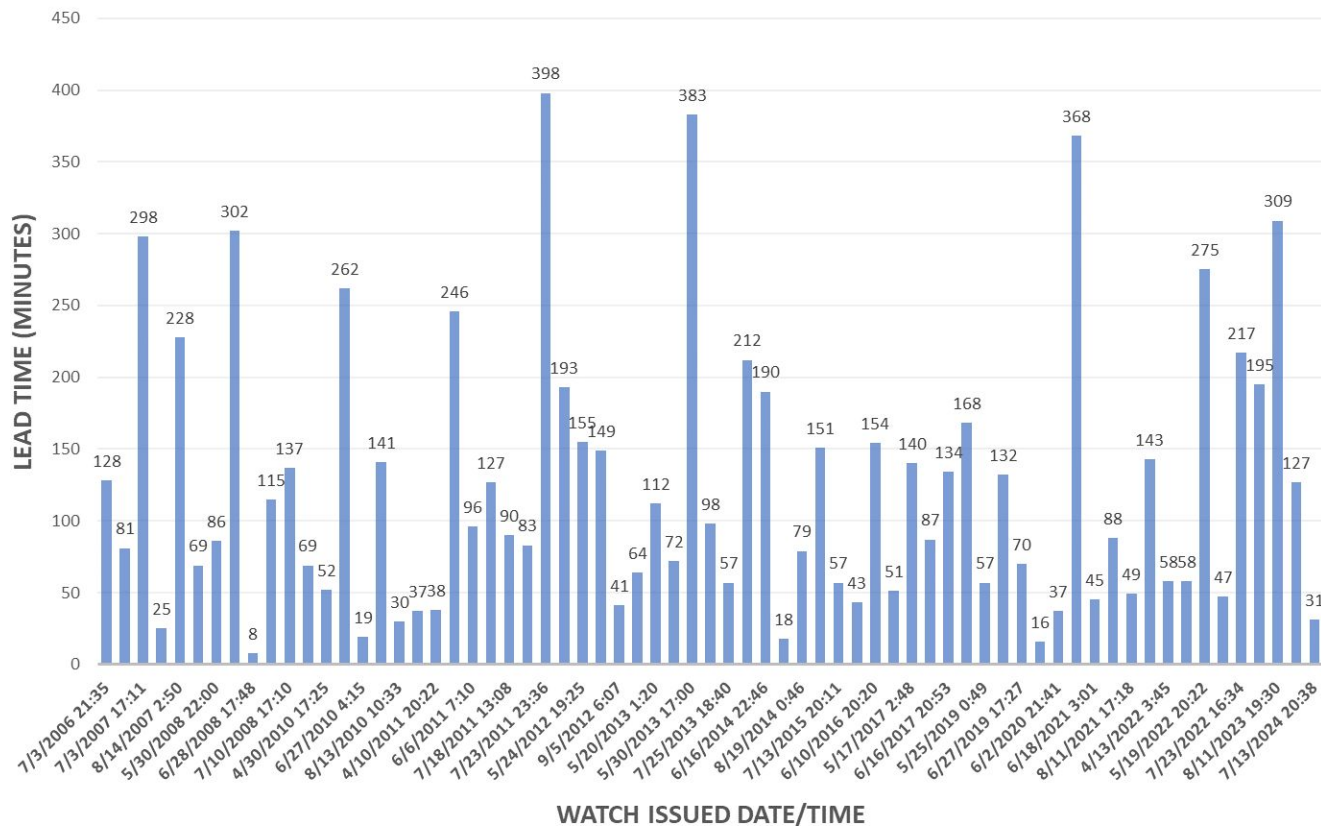
Case	2006-2017	2018-2024
“Worst”	20 Minutes	37 Minutes
“Average”	122 Minutes	145 Minutes
“Best”	234 Minutes	278 Minutes



Time (2006-2024) Versus Event Lead Time for Olmsted County

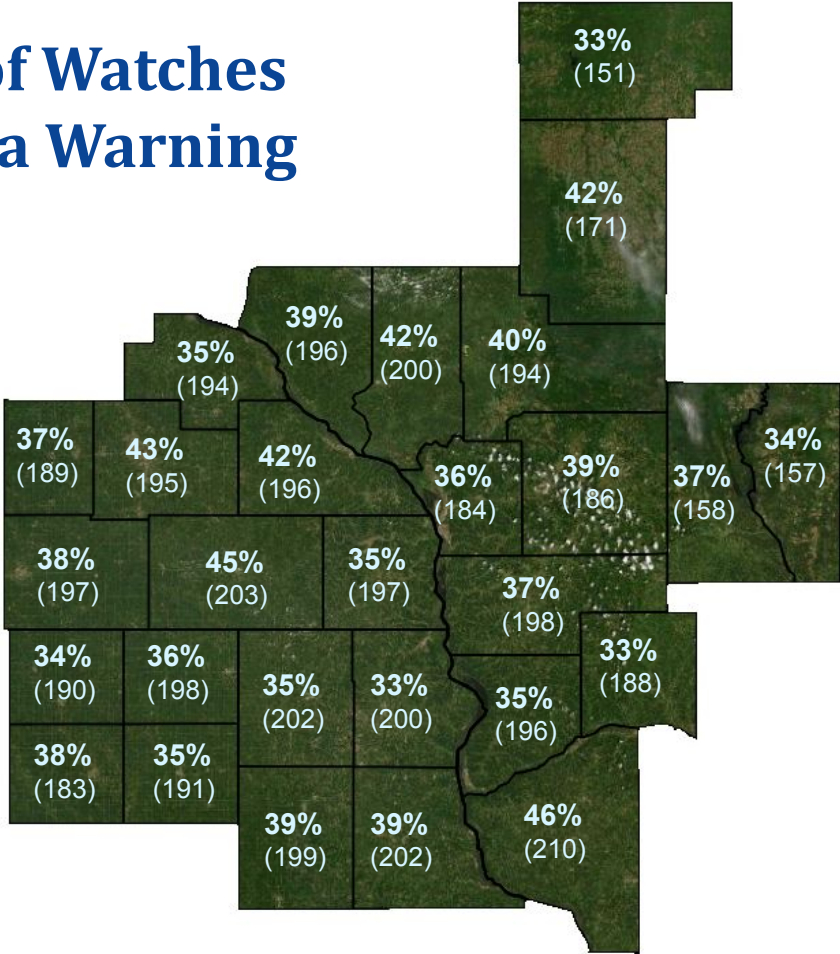


Time (2006-2024) Versus Event Lead Time for La Crosse County





Percentage of Watches Followed By a Warning (Since 2006)



**Watch to Warning
Percentage**
(Total Number of Watches)

Summary



- Average lead time from Watch->Warning is about 2 hours areawide in recent years (2018+).
 - Best case scenario: lead time around 4 hours (90th percentile)
 - Worst case scenario: lead time around 30 minutes (10th percentile)
- Lead times have mostly increased across the entire CWA between 2006 and present day, with the most prominent improvements coming in Dodge, Olmsted, and Mower Counties.
- Event to event, lead time can be highly variable.
- Watches accurately predicting warnable severe weather is relatively consistent across the CWA (~35-45%).

Summary (cont.)



- Amount of events per each county is relatively consistent across the entire CWA for all time periods.
- During the current period (2018+), all lead time case levels have improved from 2006-2017.
- Limitation: Low sample sizes for recent period (2018+) means updated data can more easily alter statistics.

Future Research



- Statistical analysis of both trends and differences between counties, in order, to determine significance.
- Compare lead time data and trends with neighboring forecast offices.
- A deeper dive into the percentage of watches followed by a warning.
- Look into warnings that were issued without a previously issued watch.
- Determine correlation between lead time and injuries.