

# A Look Back at the 2019 Growing Season from a Climatologist's Perspective

***Dr. Beth Hall***

*Director, Indiana State Climate Office*

***December 2019***



# Common Themes

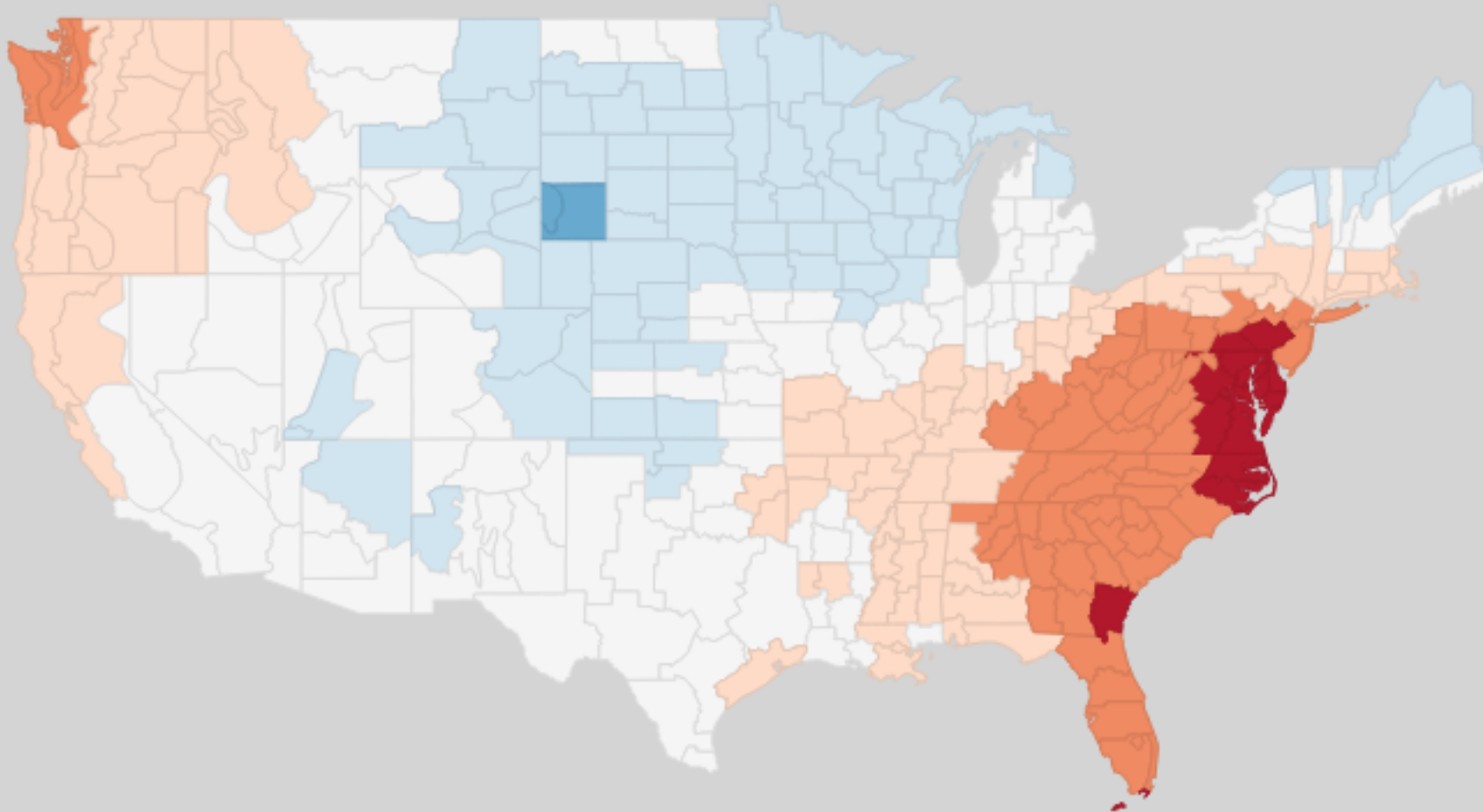
- Cool, wet spring → Delayed planting
- No major heat wave → minimal heat stress
- Dry fall → Increased growing progress
- Fear of early frost → Harvests, yield impacts



***The Journal Times** (Racine, WI): “Area farmers still water-logged and waiting to plant”*

# Spring (April – May)

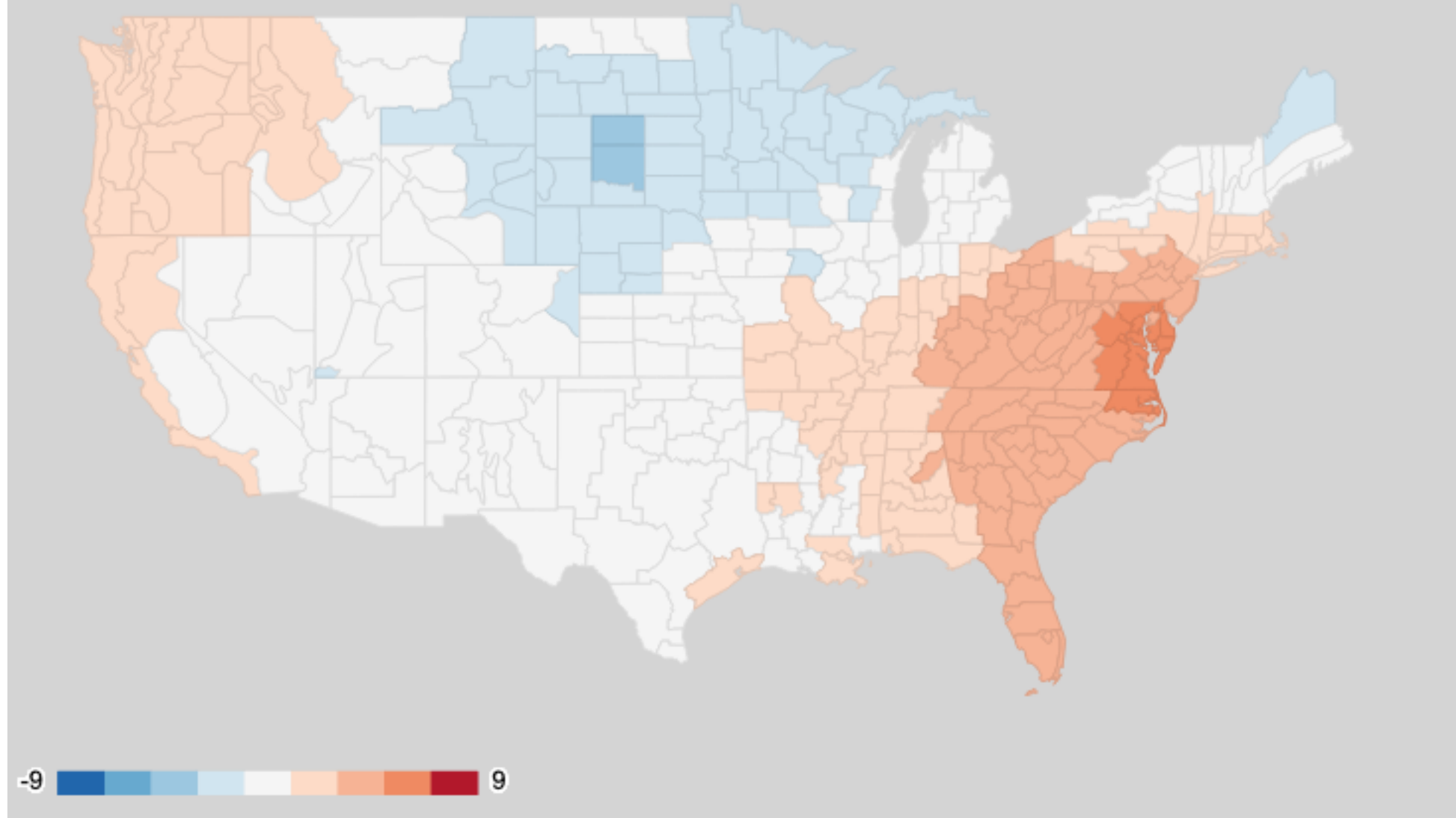
Temperature ranks – Apr-May 2019



1 125

# Spring (April – May)

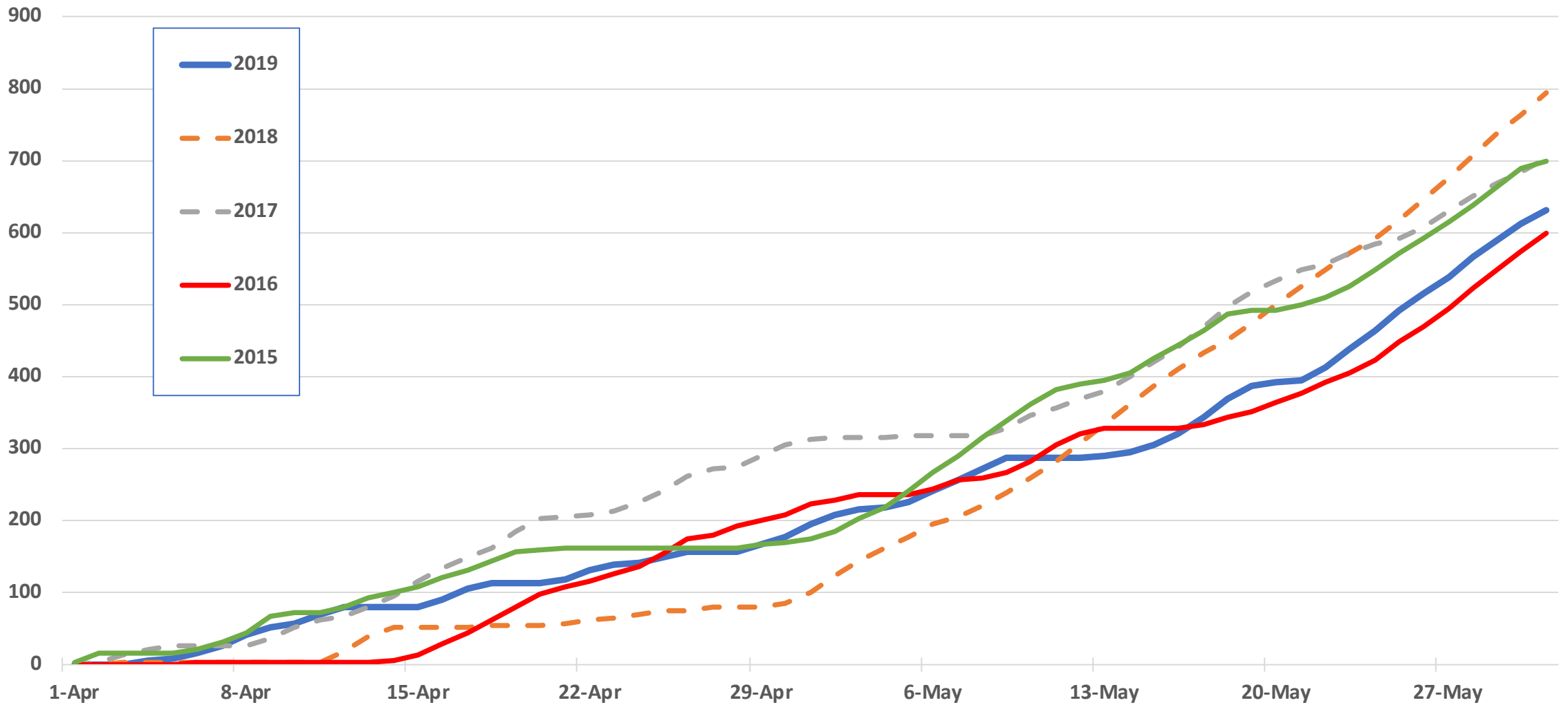
## Temperature anomalies – Apr-May 2019





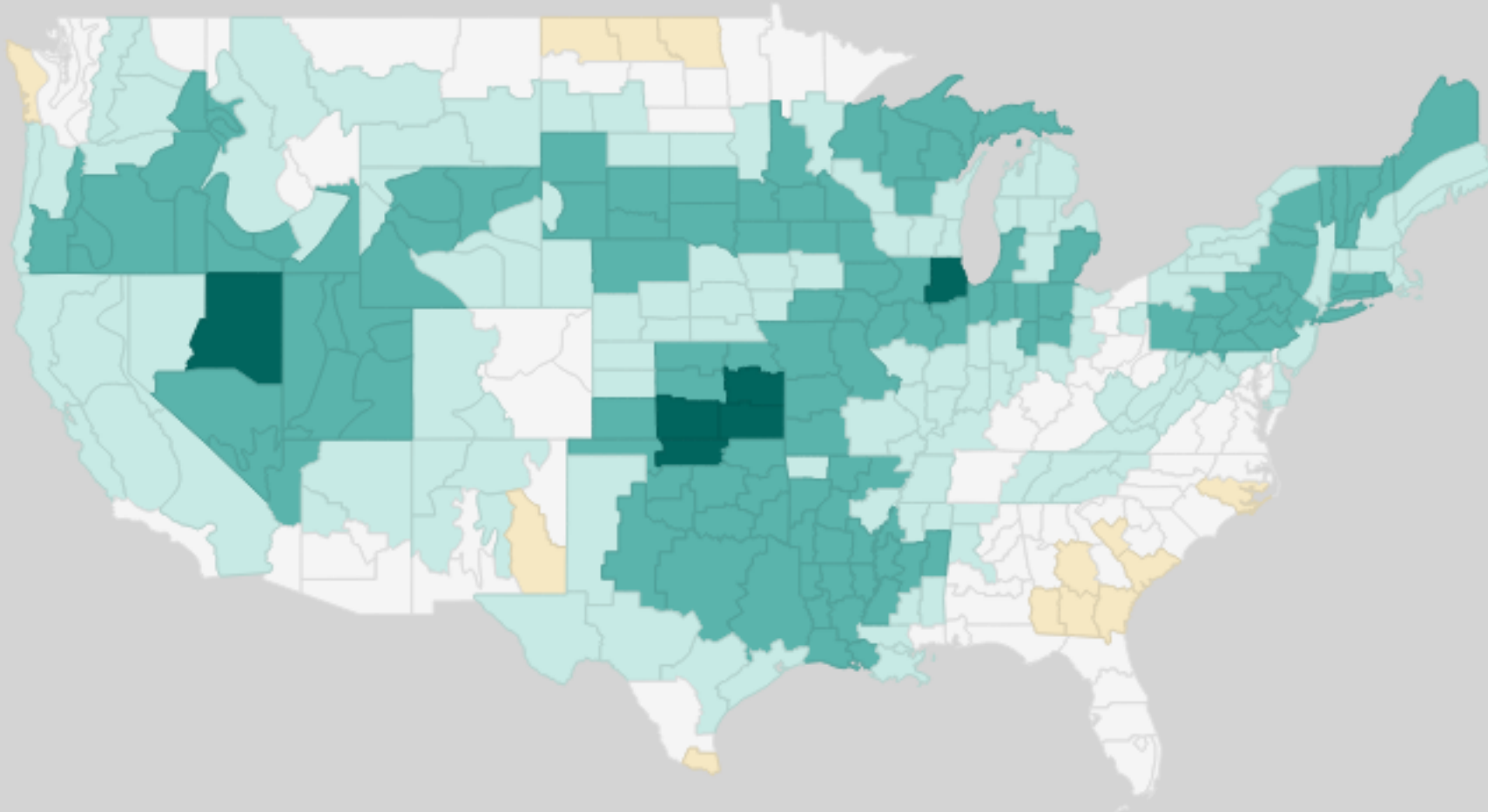
# Spring (April – May)

Accumulated Growing Degree Days - Indianapolis, IN



# Spring (April – May)

## Precipitation Ranks – Apr-May 2019

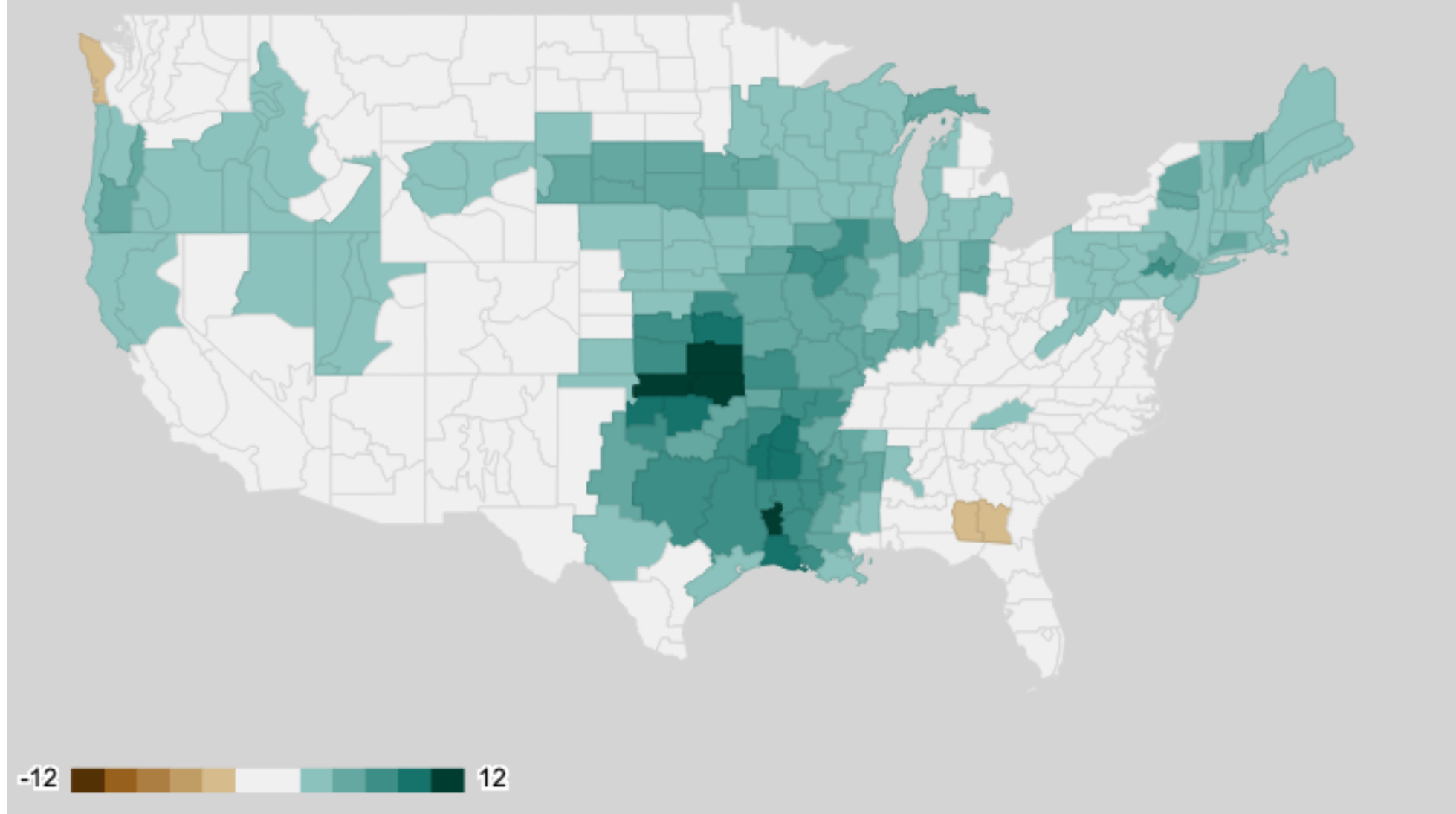


1 125

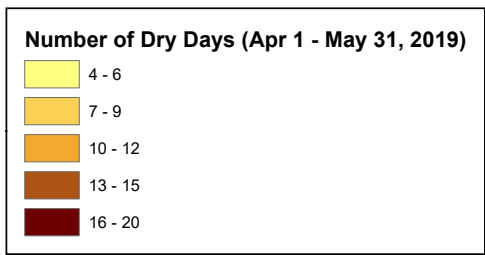
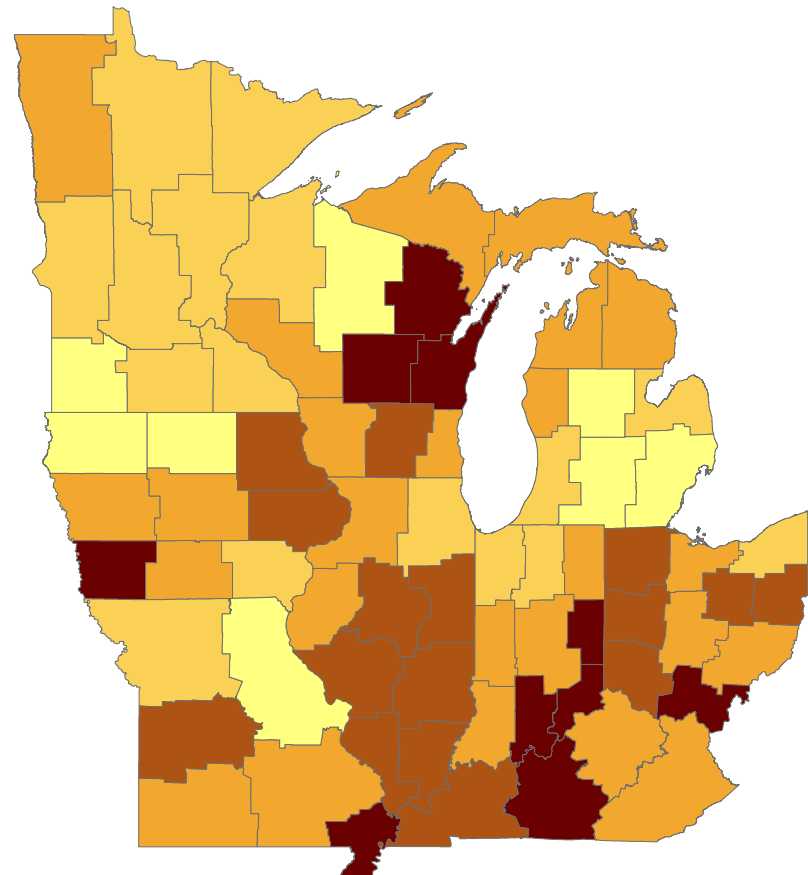


# Spring (April – May)

## Precipitation anomalies – Apr-May 2019

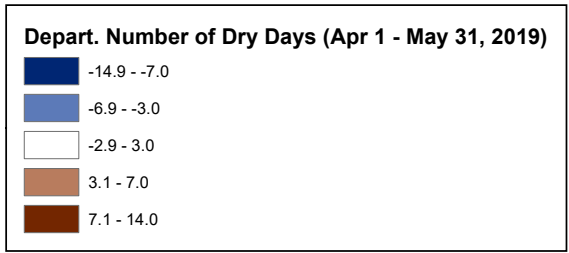
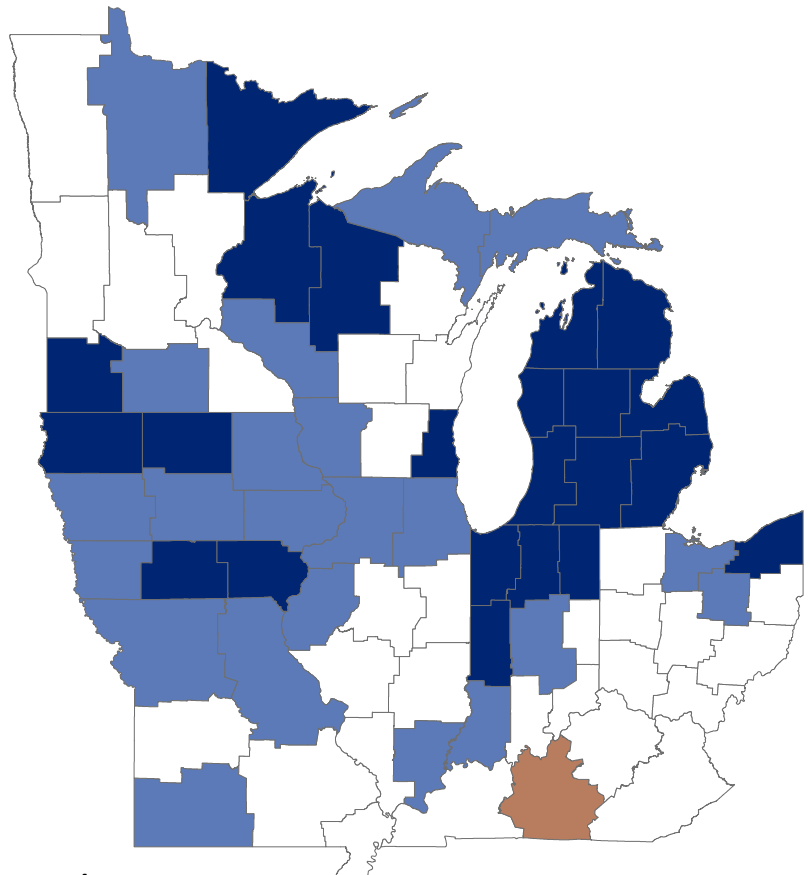


# Spring (April – May)



0 115 230 460 Miles

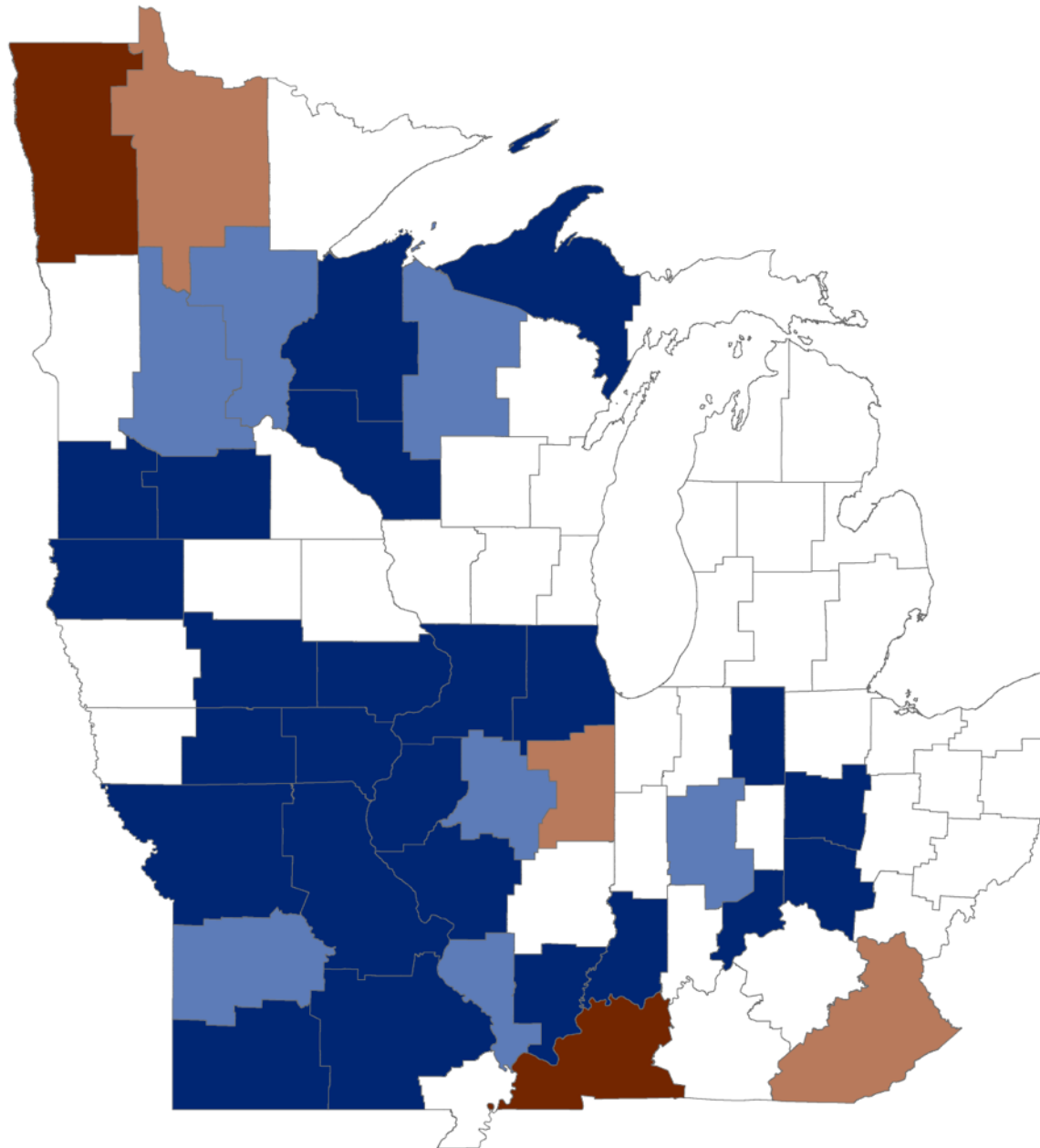
*Relative to 1981-2010 climatology*



0 115 230 460 Miles



# Spring (April – May)



**Depart. Days w/ Precip  $\geq$  2" (Apr 1 - May 31, 2019)**

 -1.9 - -1.5

 -1.4 - -1.0

 -0.9 - 1.0

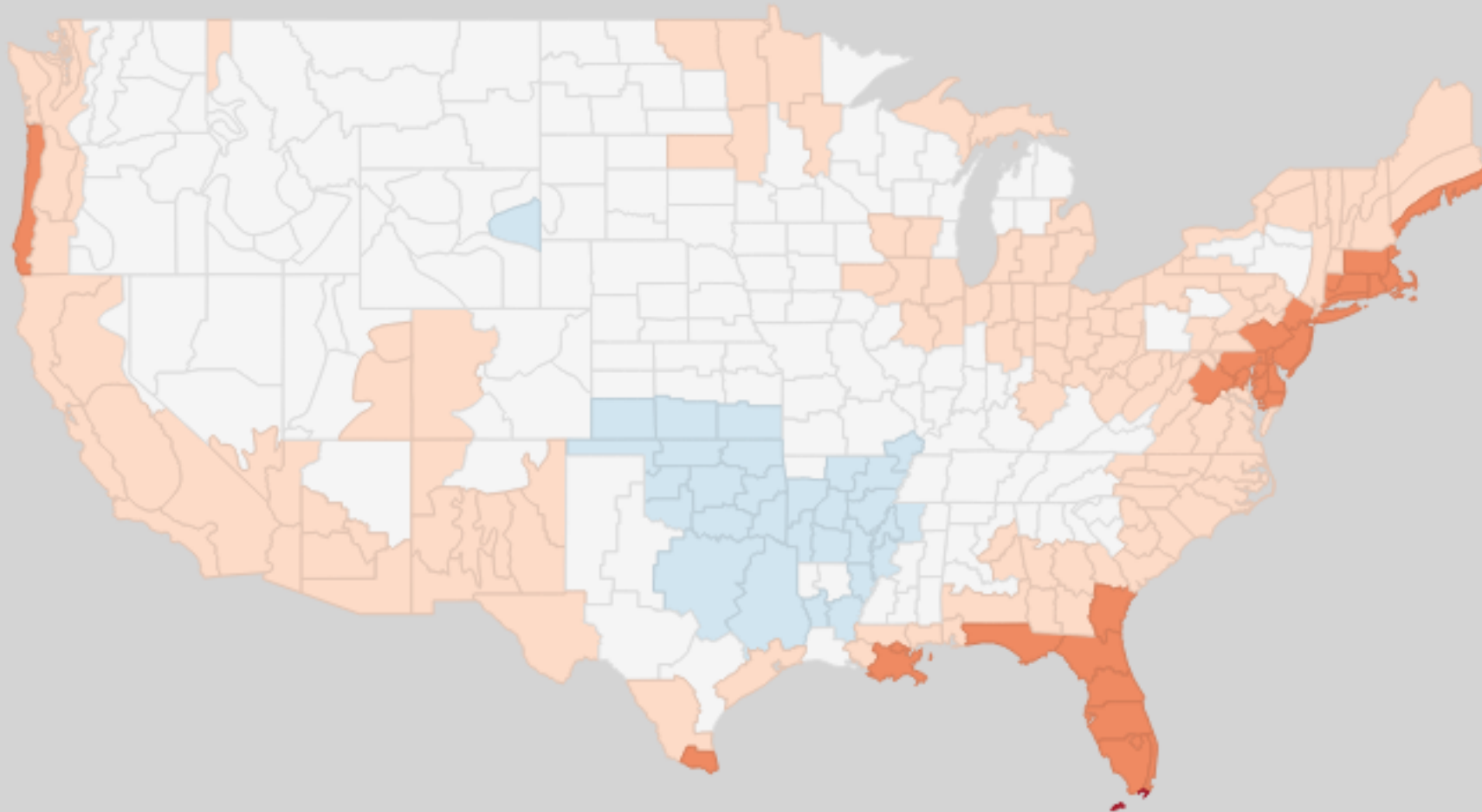
 1.1 - 1.5

 1.6 - 6.0

*Relative to 1981-2010 climatology*

# Summer (June – July)

Temperature ranks – Jun-Jul 2019

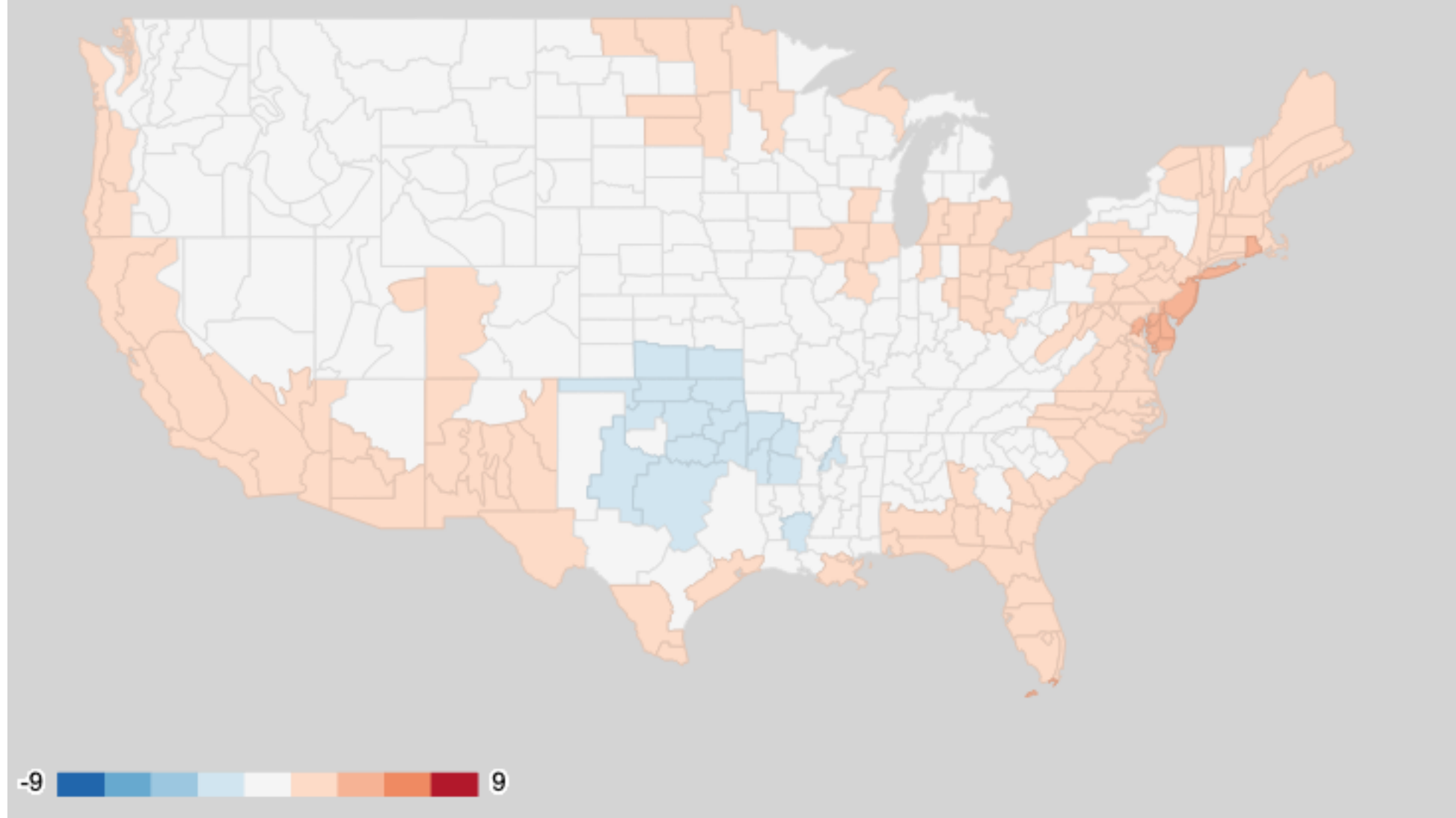


1 125



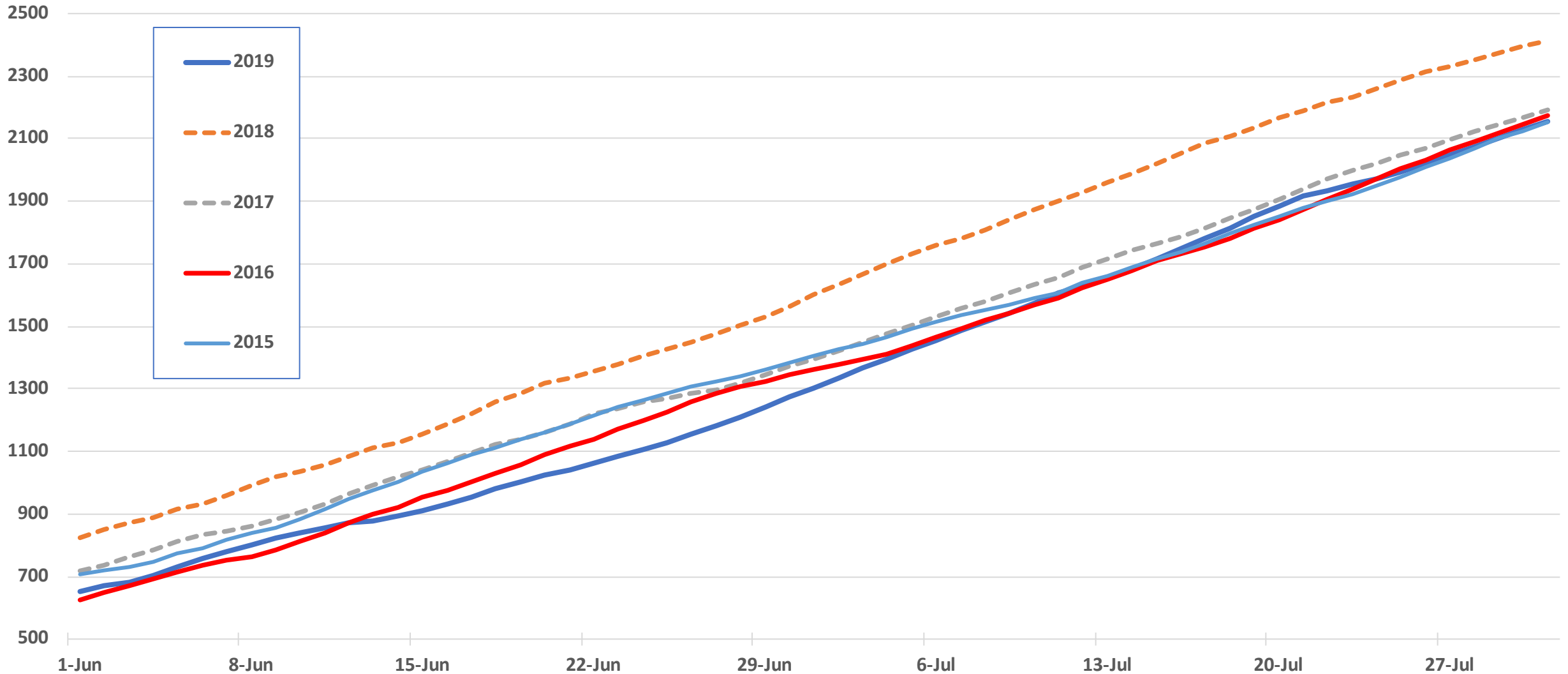
# Summer (June – July)

## Temperature anomalies – Jun-Jul 2019



# Summer (June – July)

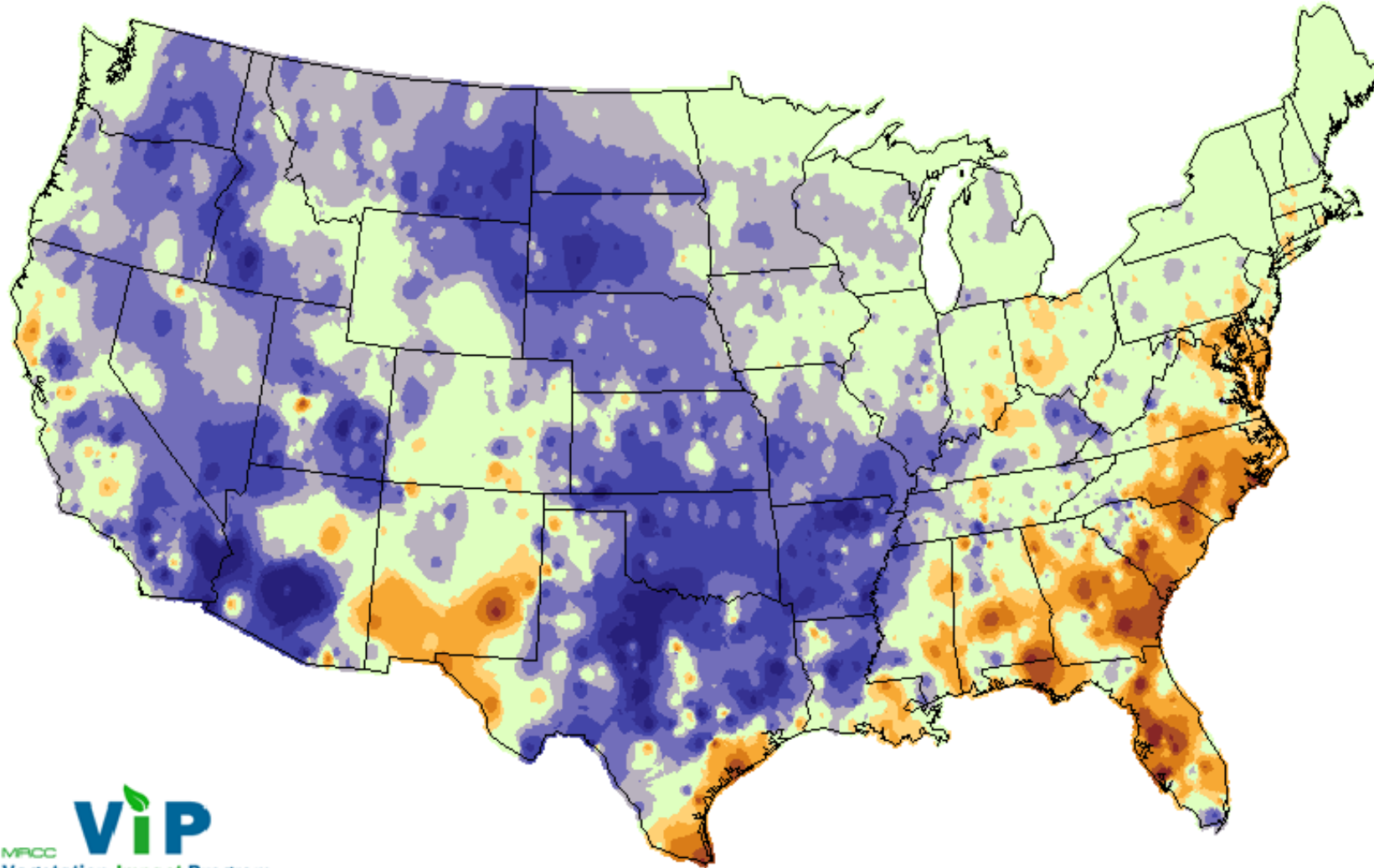
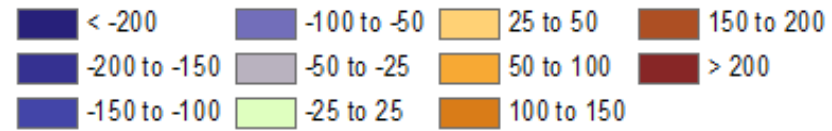
Accumulated Growing Degree Days - Indianapolis, IN





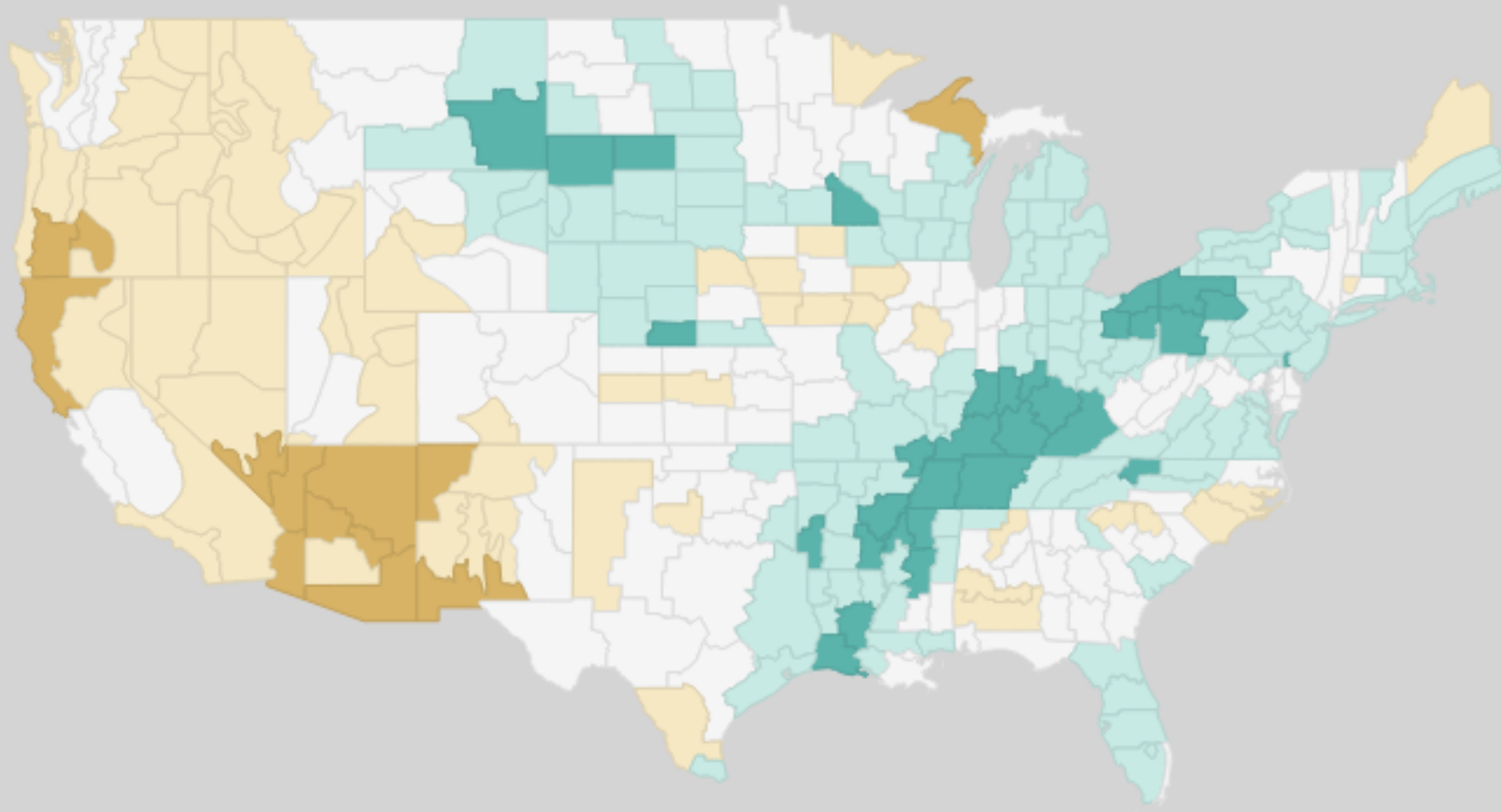
# Summer (June – July)

Modified Stress Degree Days (base 86°F)  
for Corn Plants, Departure From Normal  
Accumulation January 1 to 7/31/2019



# Summer (June – July)

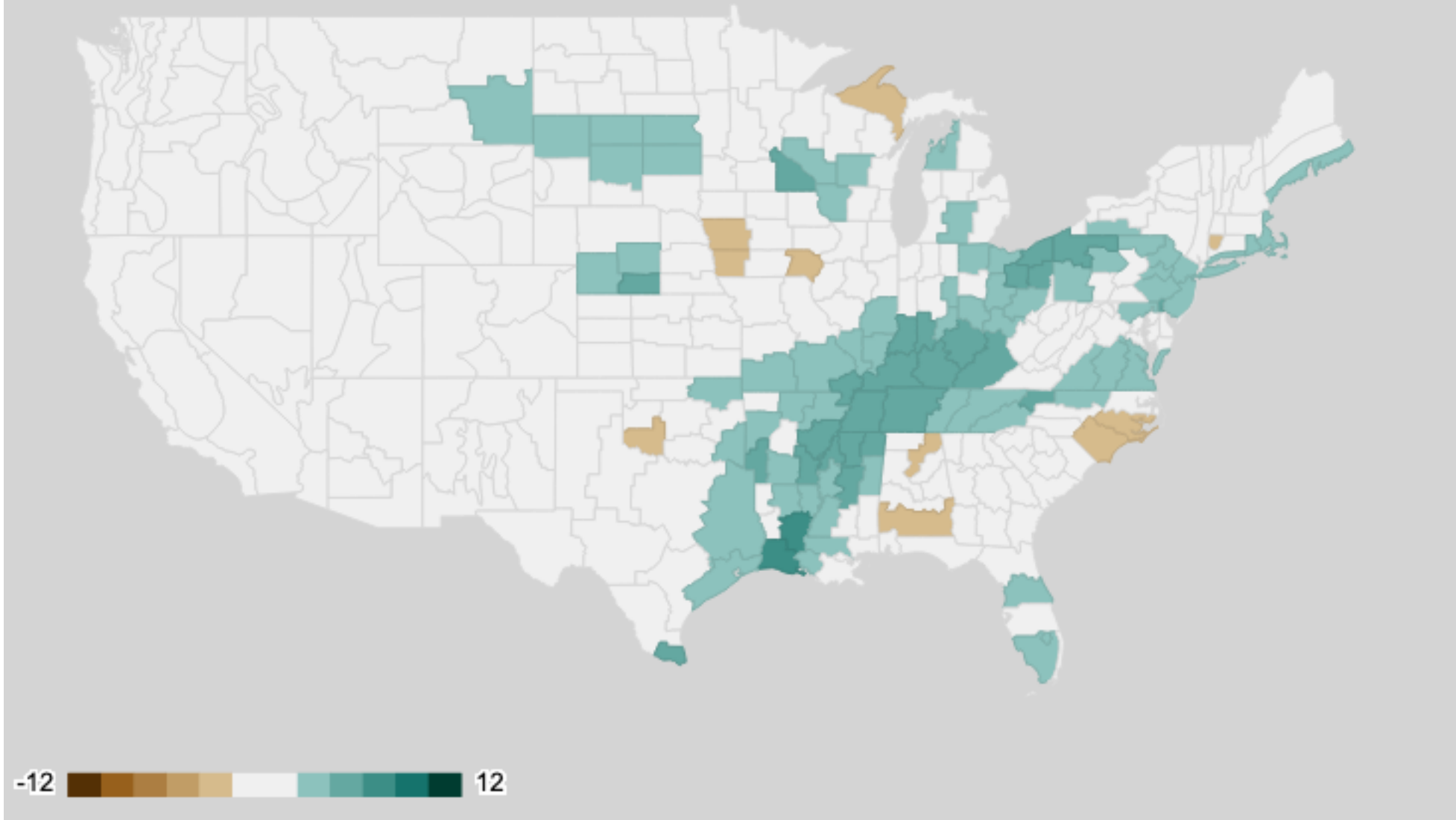
## Precipitation Ranks – Jun-Jul 2019



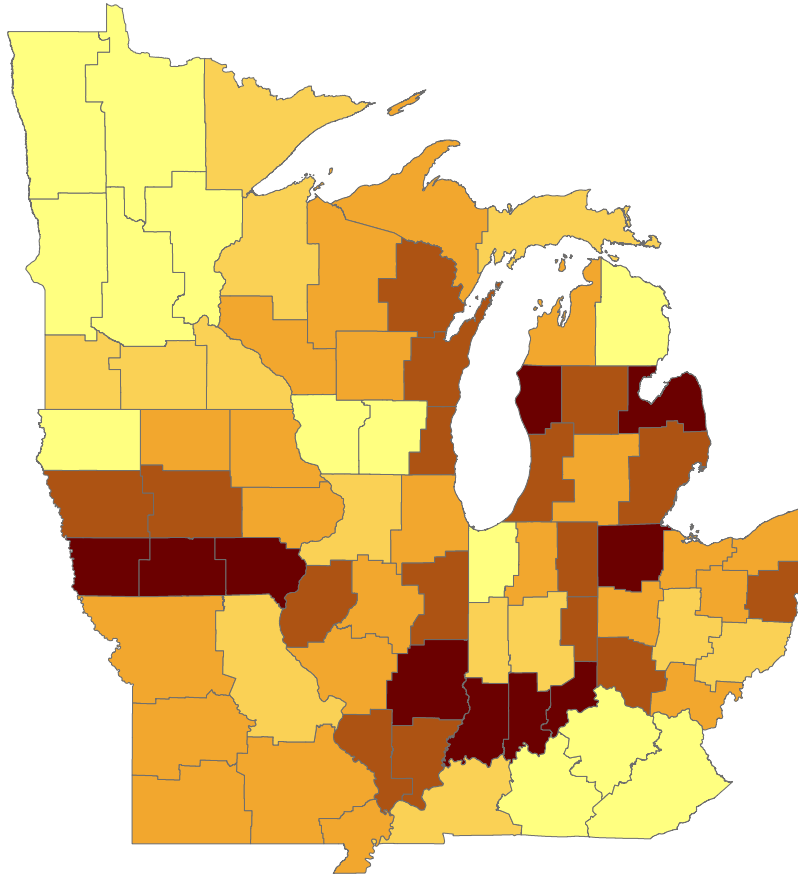
1 125

# Summer (June – July)

## Precipitation Anomalies – Jun-Jul 2019

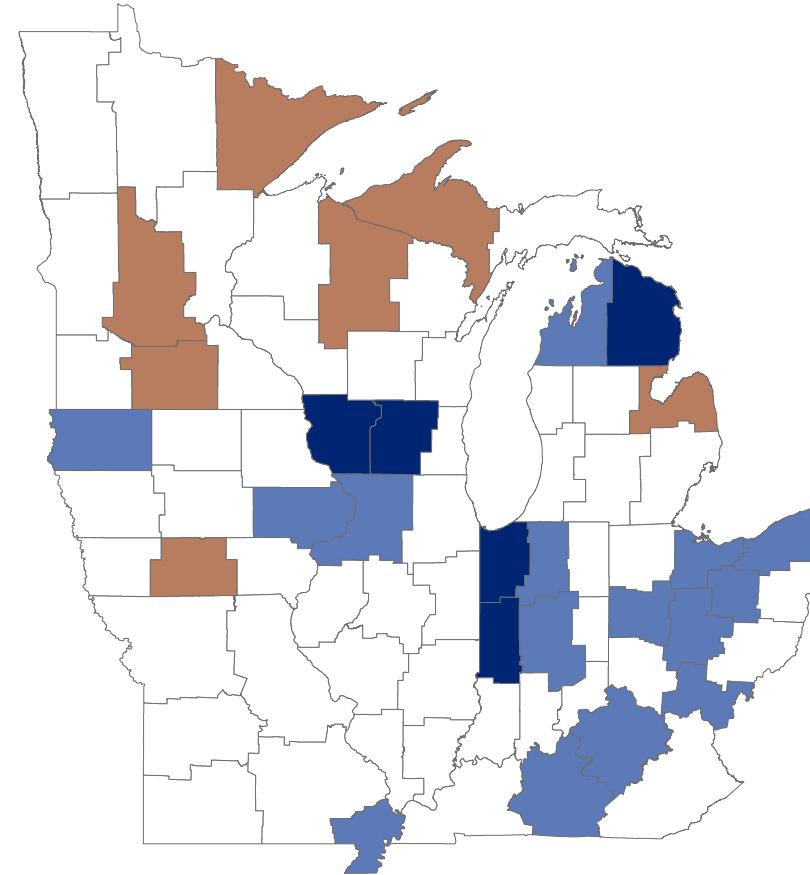


# Summer (June – July)



0 115 230 460 Miles

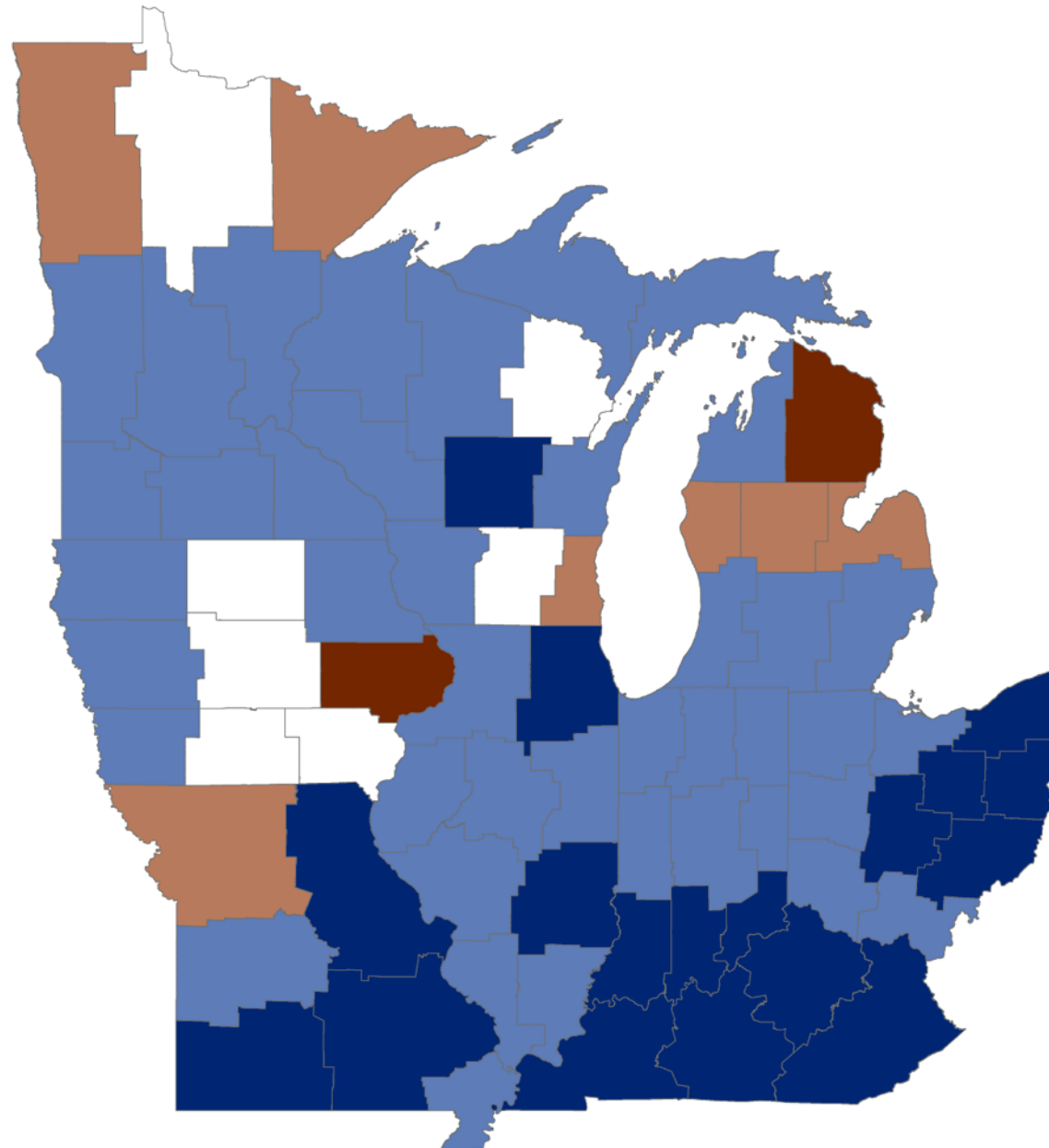
*Relative to 1981-2010 climatology*



0 115 230 460 Miles

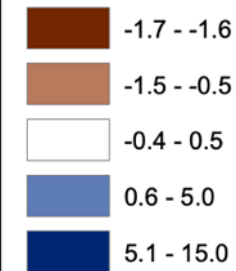


# Summer (June – July)



Days with 24-hour precip  $\geq 2''$   
compared to 1981-2010 average

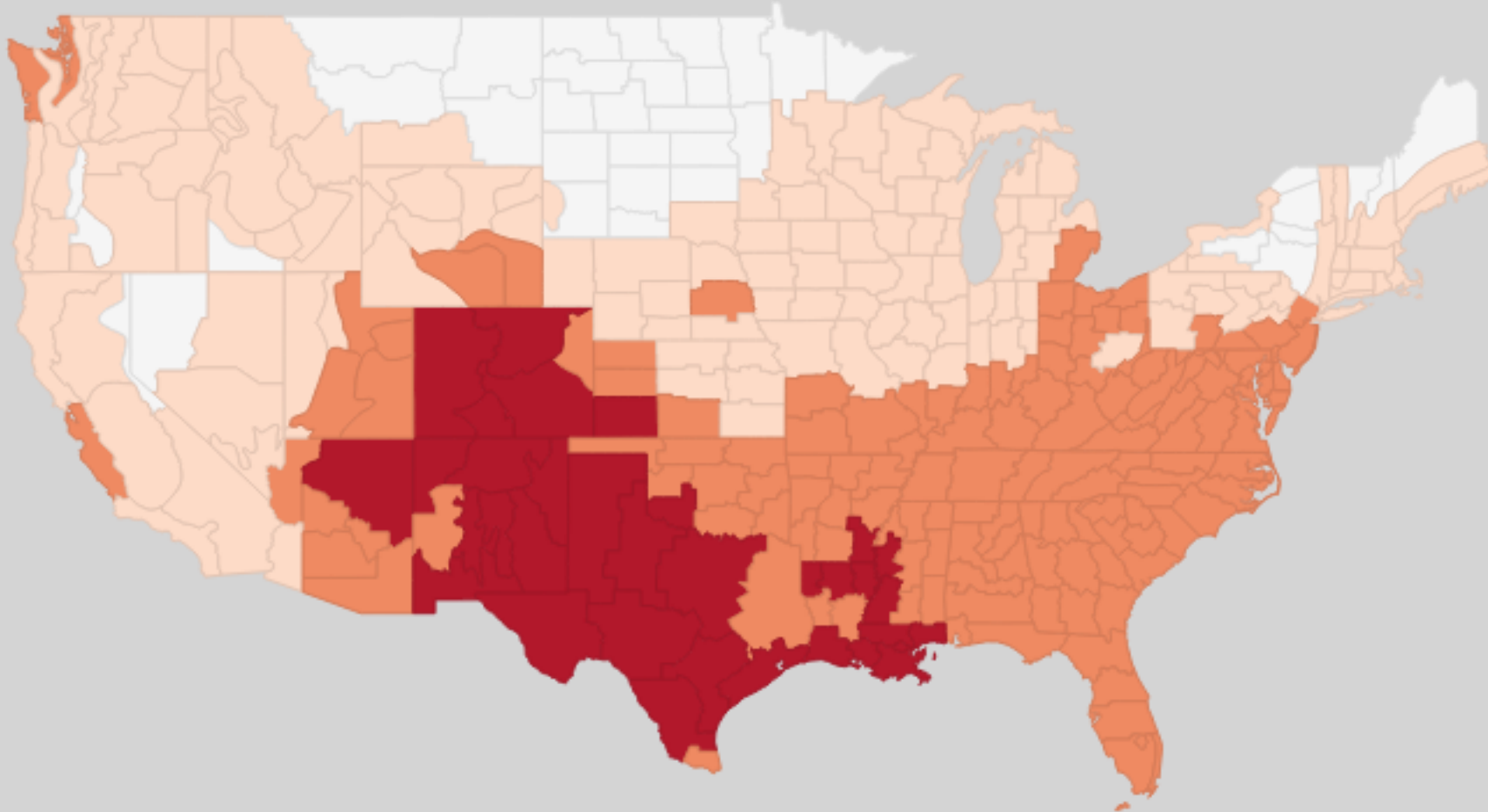
**Depart. Days w/ Precip  $\geq 2''$  (Jun 1 - Jul 31, 2019)**



*Relative to 1981-2010 climatology*

# Late Summer (August-September)

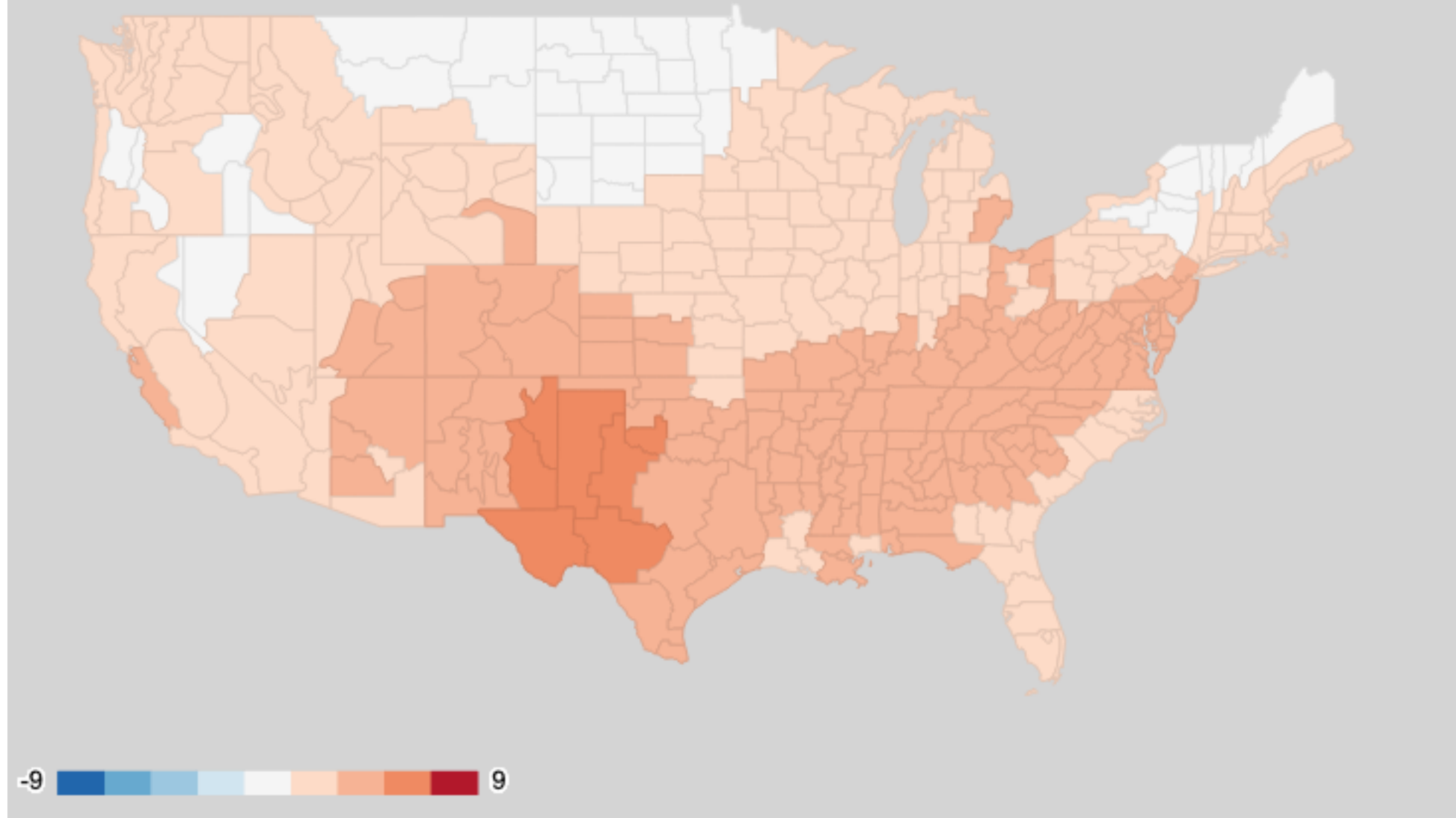
Temperature ranks – Aug-Sep 2019



1 125

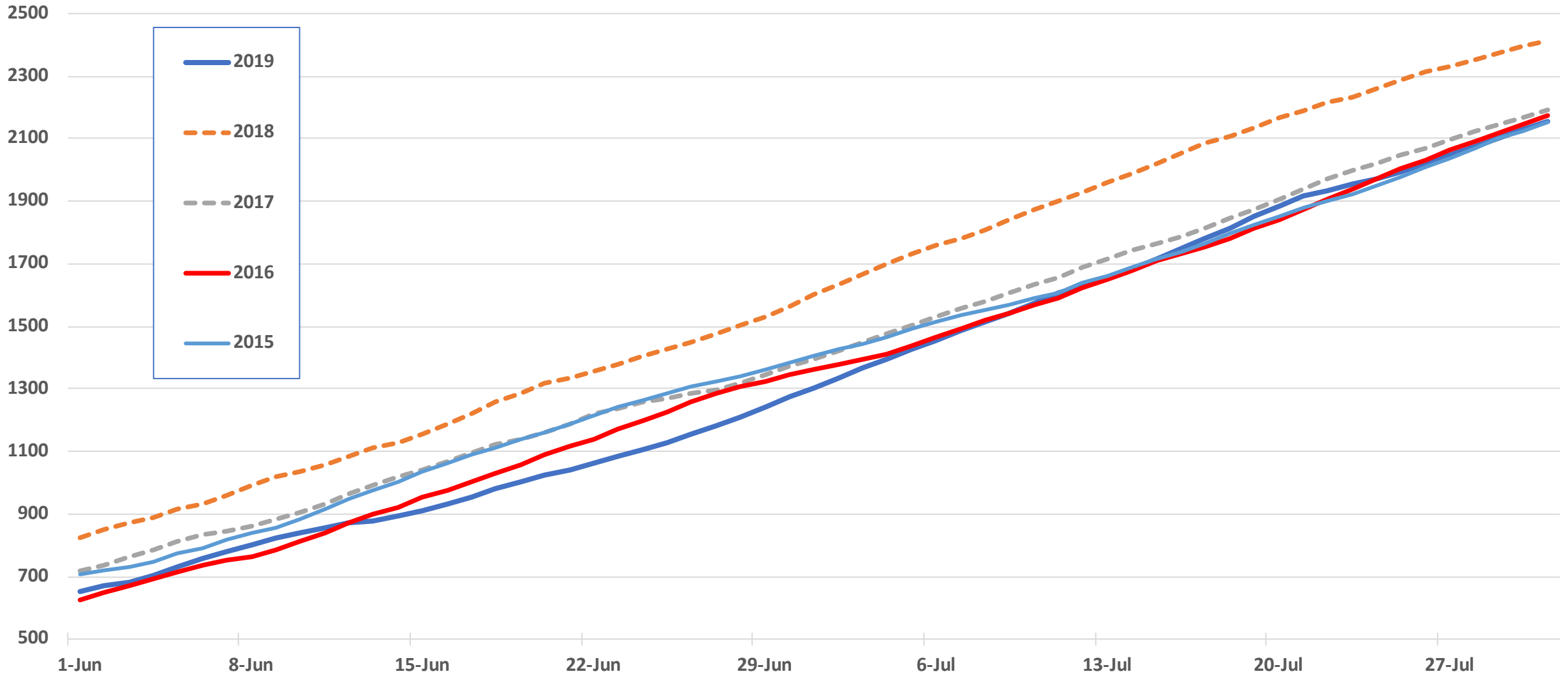
# Late Summer (August-September)

Temperature anomalies – Aug-Sep 2019



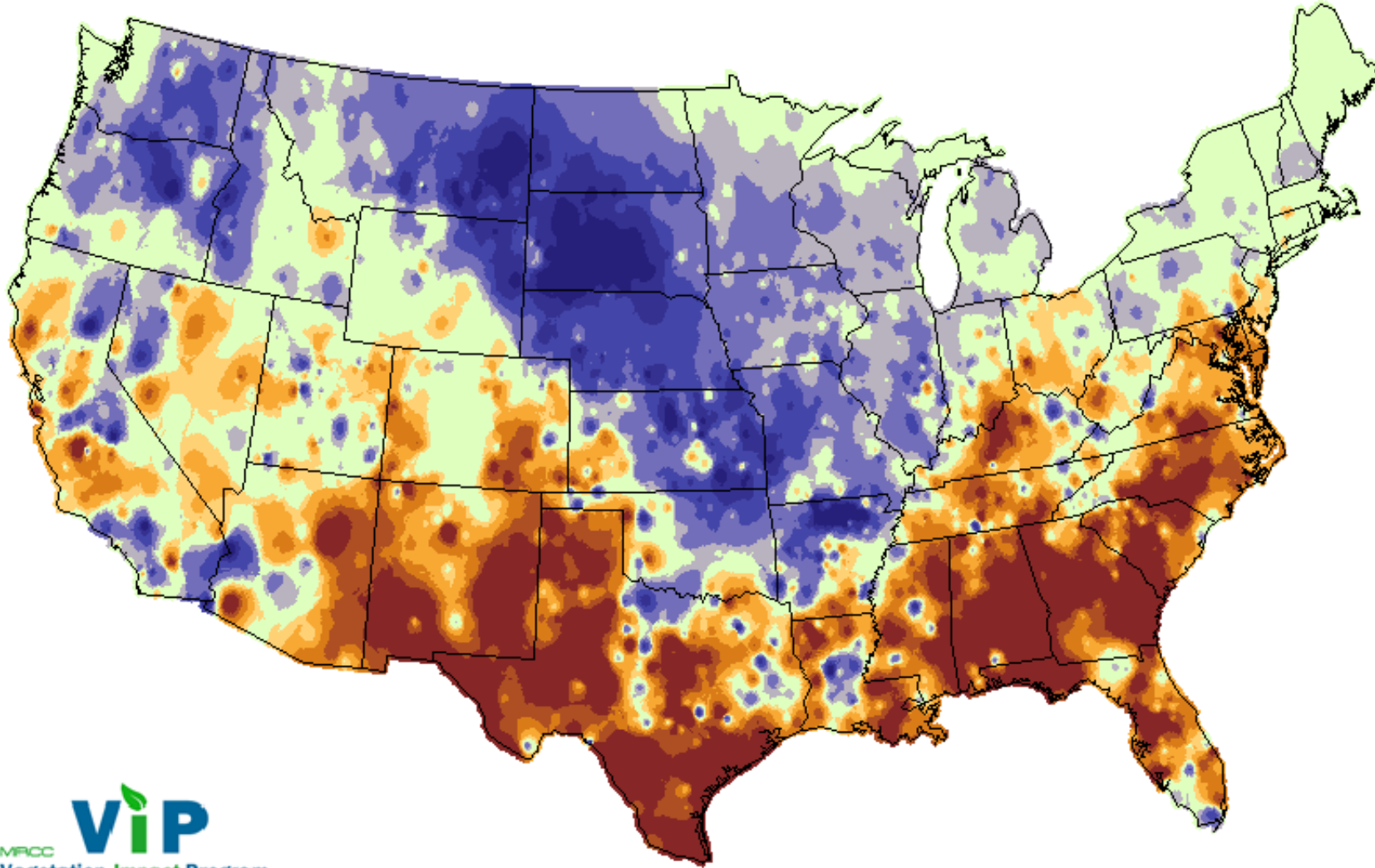
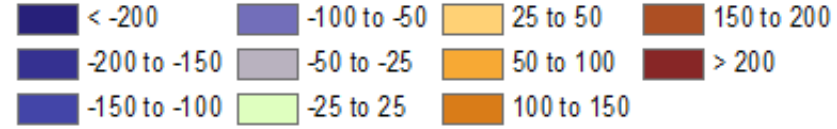
# Late Summer (August-September)

Accumulated Growing Degree Days - Indianapolis, IN



# Late Summer (August-September)

Modified Stress Degree Days (base 86°F)  
for Corn Plants, Departure From Normal  
Accumulation January 1 to 9/30/2019





# Late Summer (August-September)

## U.S. Drought Monitor Midwest

**July 23, 2019**

*(Released Thursday, Jul. 25, 2019)*

Valid 8 a.m. EDT

*Drought Conditions (Percent Area)*

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	94.66	5.34	0.00	0.00	0.00	0.00
<b>Last Week</b> <i>07-16-2019</i>	97.82	2.18	0.00	0.00	0.00	0.00
<b>3 Months Ago</b> <i>04-23-2019</i>	100.00	0.00	0.00	0.00	0.00	0.00
<b>Start of Calendar Year</b> <i>01-01-2019</i>	99.27	0.73	0.00	0.00	0.00	0.00
<b>Start of Water Year</b> <i>09-25-2018</i>	81.26	18.74	8.55	1.71	0.37	0.01
<b>One Year Ago</b> <i>07-24-2018</i>	64.51	35.49	10.97	4.86	2.27	0.00

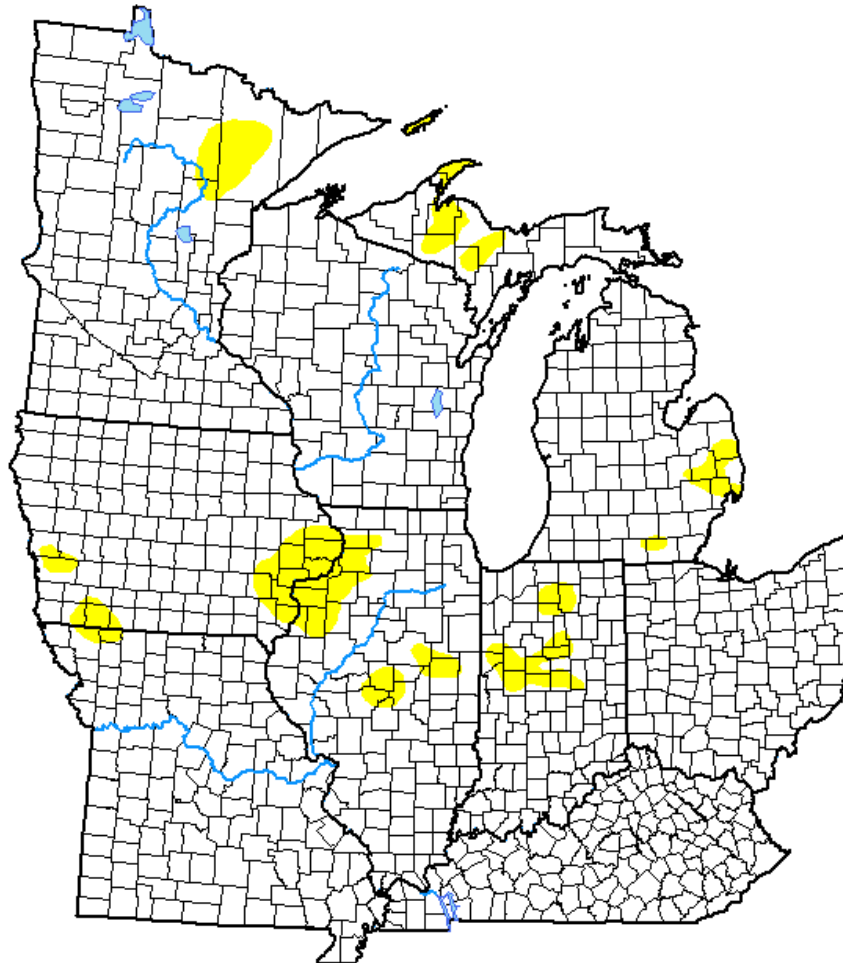
### Intensity:

None	D2 Severe Drought
D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought

*The Drought Monitor focuses on broad-scale conditions.  
Local conditions may vary. See accompanying text summary  
for forecast statements.*

### Author:

Brad Rippey  
U.S. Department of Agriculture



[droughtmonitor.unl.edu](http://droughtmonitor.unl.edu)

# Late Summer (August-September)

## U.S. Drought Monitor Midwest

**July 30, 2019**

*(Released Thursday, Aug. 1, 2019)*

Valid 8 a.m. EDT

*Drought Conditions (Percent Area)*

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	91.97	8.03	0.00	0.00	0.00	0.00
<b>Last Week</b> <i>07-23-2019</i>	94.66	5.34	0.00	0.00	0.00	0.00
<b>3 Months Ago</b> <i>04-30-2019</i>	100.00	0.00	0.00	0.00	0.00	0.00
<b>Start of Calendar Year</b> <i>01-01-2019</i>	99.27	0.73	0.00	0.00	0.00	0.00
<b>Start of Water Year</b> <i>09-25-2018</i>	81.26	18.74	8.55	1.71	0.37	0.01
<b>One Year Ago</b> <i>07-31-2018</i>	64.38	35.62	14.05	4.87	2.53	0.00

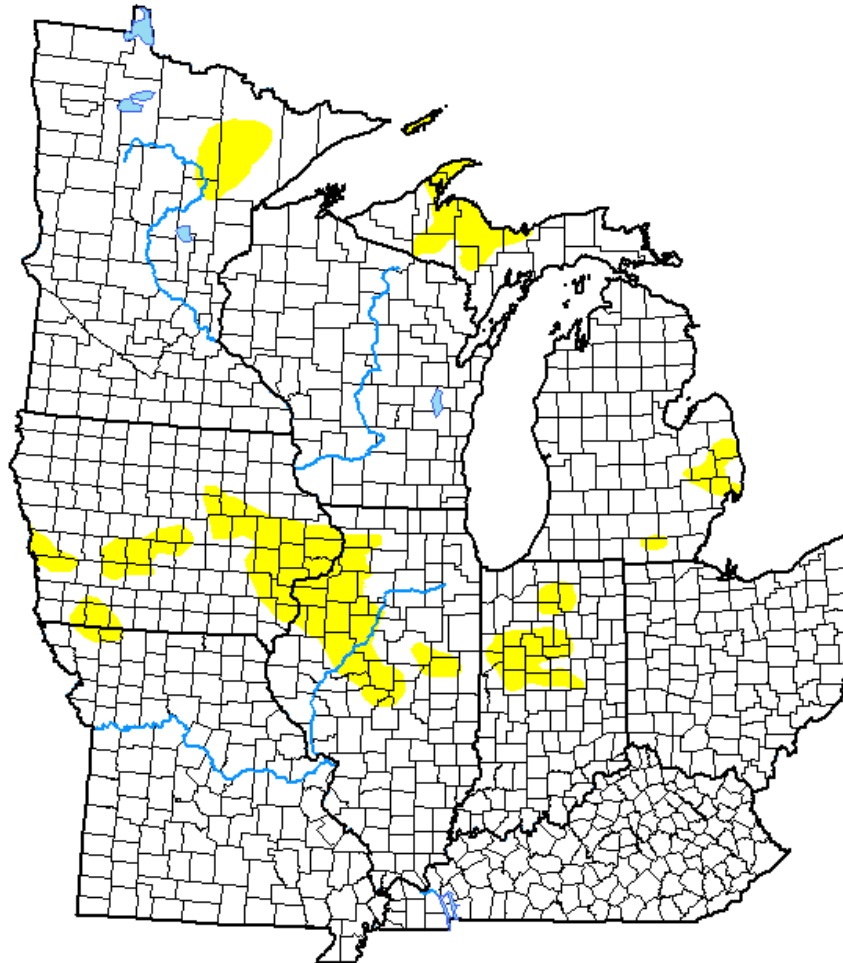
### Intensity:

None	D2 Severe Drought
D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought

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Local conditions may vary. See accompanying text summary  
for forecast statements.*

### Author:

Curtis Riganti  
National Drought Mitigation Center



[droughtmonitor.unl.edu](http://droughtmonitor.unl.edu)

# Late Summer (August-September)

## U.S. Drought Monitor Midwest

**August 6, 2019**

*(Released Thursday, Aug. 8, 2019)*

Valid 8 a.m. EDT

*Drought Conditions (Percent Area)*

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	84.17	15.83	0.00	0.00	0.00	0.00
<b>Last Week</b> <i>07-30-2019</i>	91.97	8.03	0.00	0.00	0.00	0.00
<b>3 Months Ago</b> <i>05-07-2019</i>	100.00	0.00	0.00	0.00	0.00	0.00
<b>Start of Calendar Year</b> <i>01-01-2019</i>	99.27	0.73	0.00	0.00	0.00	0.00
<b>Start of Water Year</b> <i>09-25-2018</i>	81.26	18.74	8.55	1.71	0.37	0.01
<b>One Year Ago</b> <i>08-07-2018</i>	63.02	36.98	16.16	6.58	2.80	0.03

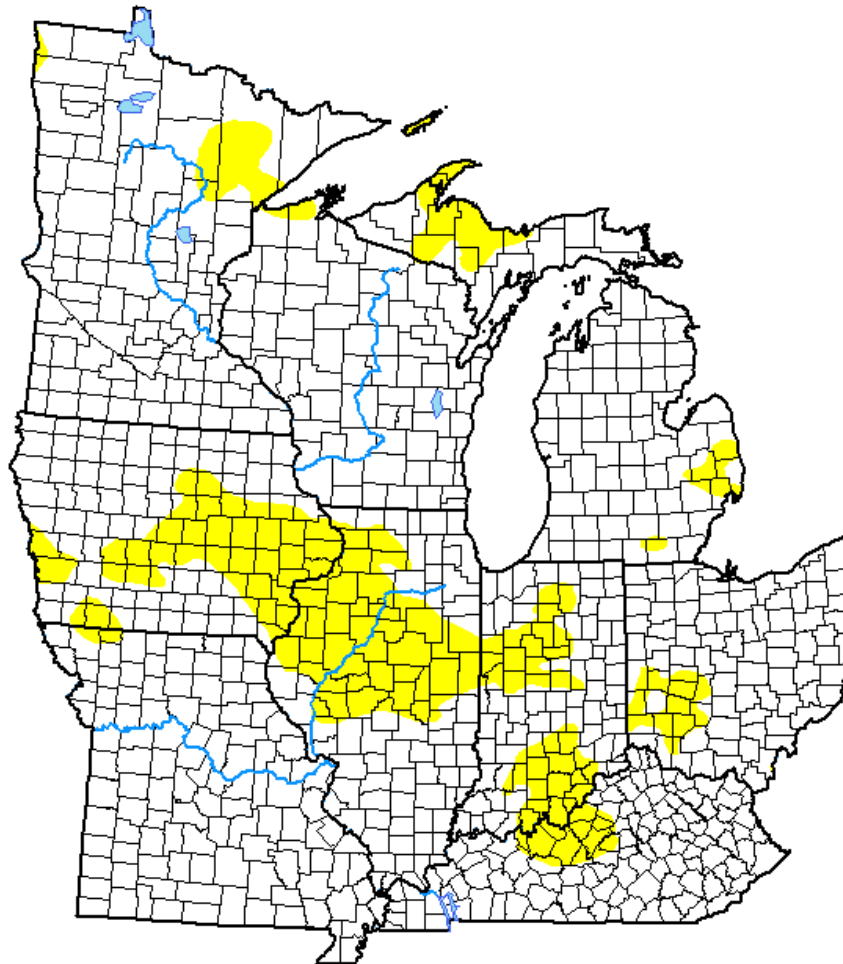
### Intensity:

None	D2 Severe Drought
D0 Abnormally Dry	D3 Extreme Drought
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Local conditions may vary. See accompanying text summary  
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### Author:

Richard Tinker  
CPC/NOAA/NWS/NCEP



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# Late Summer (August-September)

## U.S. Drought Monitor Midwest

**August 13, 2019**

*(Released Thursday, Aug. 15, 2019)*

Valid 8 a.m. EDT

*Drought Conditions (Percent Area)*

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	77.95	22.05	1.84	0.00	0.00	0.00
<b>Last Week</b> <i>08-06-2019</i>	84.17	15.83	0.00	0.00	0.00	0.00
<b>3 Months Ago</b> <i>05-14-2019</i>	100.00	0.00	0.00	0.00	0.00	0.00
<b>Start of Calendar Year</b> <i>01-01-2019</i>	99.27	0.73	0.00	0.00	0.00	0.00
<b>Start of Water Year</b> <i>09-25-2018</i>	81.26	18.74	8.55	1.71	0.37	0.01
<b>One Year Ago</b> <i>08-14-2018</i>	56.53	43.47	19.42	8.22	3.65	0.77

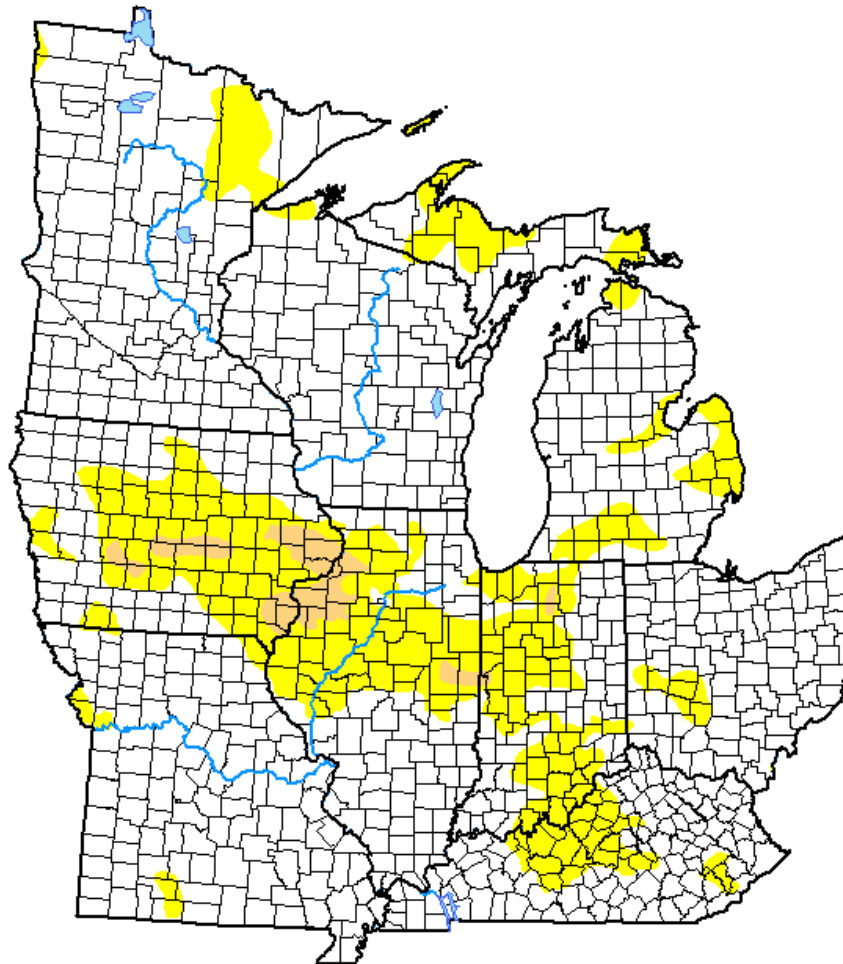
### Intensity:

None	D2 Severe Drought
D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought

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Local conditions may vary. See accompanying text summary  
for forecast statements.*

### Author:

Richard Tinker  
CPC/NOAA/NWS/NCEP



[droughtmonitor.unl.edu](http://droughtmonitor.unl.edu)

# Late Summer (August-September)

## U.S. Drought Monitor Midwest

**August 20, 2019**

(Released Thursday, Aug. 22, 2019)

Valid 8 a.m. EDT

*Drought Conditions (Percent Area)*

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	73.96	26.04	2.54	0.00	0.00	0.00
<b>Last Week</b> 08-13-2019	77.95	22.05	1.84	0.00	0.00	0.00
<b>3 Months Ago</b> 05-21-2019	98.79	1.21	0.00	0.00	0.00	0.00
<b>Start of Calendar Year</b> 01-01-2019	99.27	0.73	0.00	0.00	0.00	0.00
<b>Start of Water Year</b> 09-25-2018	81.26	18.74	8.55	1.71	0.37	0.01
<b>One Year Ago</b> 08-21-2018	58.03	41.97	18.39	7.51	2.66	0.65

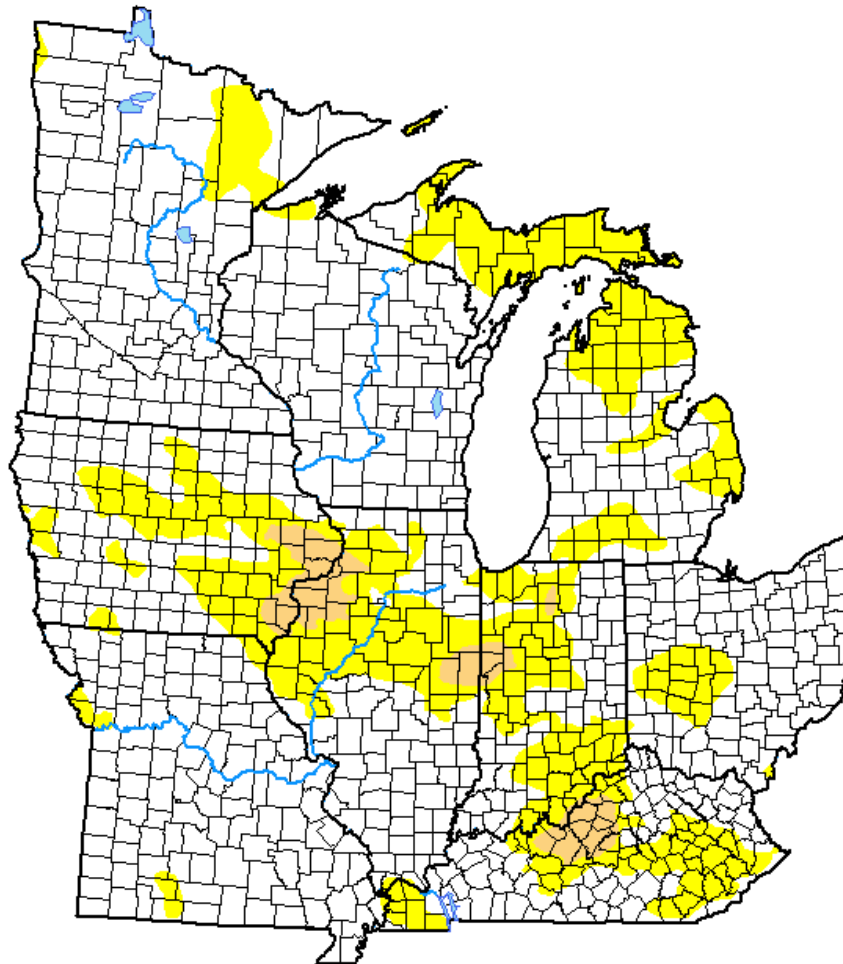
### Intensity:

None	D2 Severe Drought
D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought

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Local conditions may vary. See accompanying text summary  
for forecast statements.*

### Author:

Jessica Blunden  
NCEI/NOAA



[droughtmonitor.unl.edu](http://droughtmonitor.unl.edu)



# Late Summer (August-September)

## U.S. Drought Monitor Midwest

**August 27, 2019**

(Released Thursday, Aug. 29, 2019)

Valid 8 a.m. EDT

*Drought Conditions (Percent Area)*

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	75.37	24.63	2.56	0.00	0.00	0.00
<b>Last Week</b> <i>08-20-2019</i>	73.96	26.04	2.54	0.00	0.00	0.00
<b>3 Months Ago</b> <i>05-28-2019</i>	96.03	3.97	0.00	0.00	0.00	0.00
<b>Start of Calendar Year</b> <i>01-01-2019</i>	99.27	0.73	0.00	0.00	0.00	0.00
<b>Start of Water Year</b> <i>09-25-2018</i>	81.26	18.74	8.55	1.71	0.37	0.01
<b>One Year Ago</b> <i>08-28-2018</i>	62.08	37.92	16.34	7.06	2.03	0.56

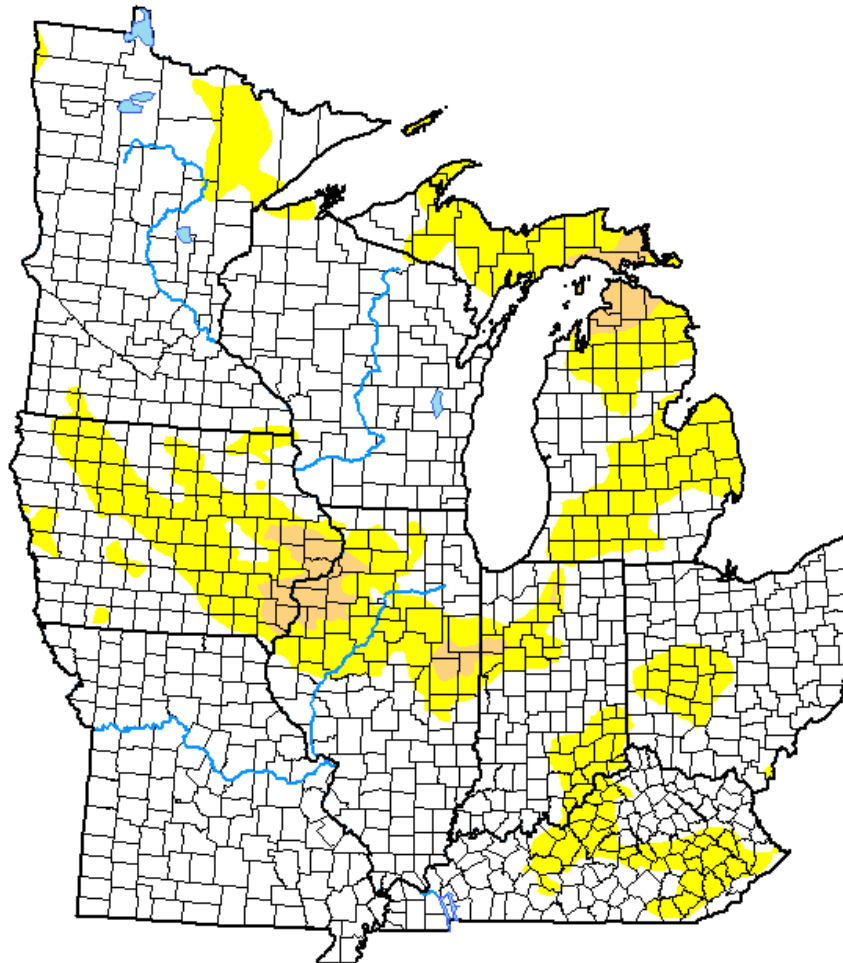
### Intensity:

None	D2 Severe Drought
D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought

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Local conditions may vary. See accompanying text summary  
for forecast statements.*

### Author:

Jessica Blunden  
NCEI/NOAA



[droughtmonitor.unl.edu](http://droughtmonitor.unl.edu)

# Late Summer (August-September)

## U.S. Drought Monitor Midwest

**September 3, 2019**

(Released Thursday, Sep. 5, 2019)

Valid 8 a.m. EDT

*Drought Conditions (Percent Area)*

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	74.35	25.65	5.03	0.00	0.00	0.00
<b>Last Week</b> 08-27-2019	75.37	24.63	2.56	0.00	0.00	0.00
<b>3 Months Ago</b> 06-04-2019	95.97	4.03	0.00	0.00	0.00	0.00
<b>Start of Calendar Year</b> 01-01-2019	99.27	0.73	0.00	0.00	0.00	0.00
<b>Start of Water Year</b> 09-25-2018	81.26	18.74	8.55	1.71	0.37	0.01
<b>One Year Ago</b> 09-04-2018	72.29	27.71	12.14	3.37	0.95	0.01

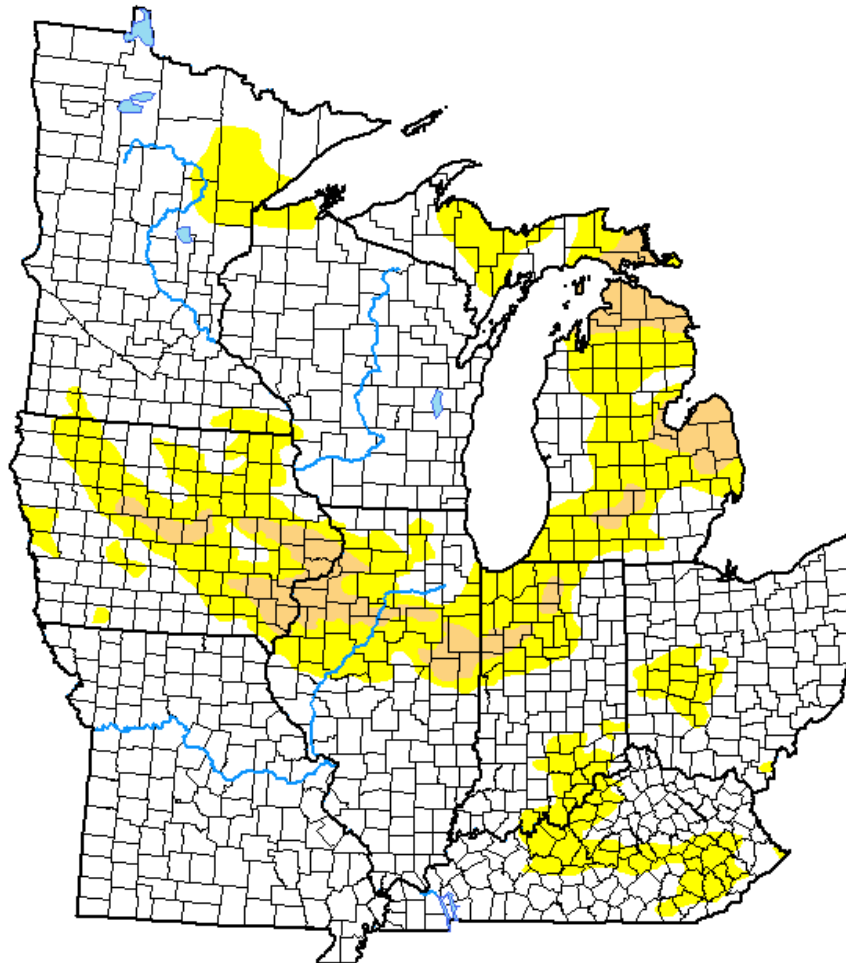
### Intensity:

None	D2 Severe Drought
D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought

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for forecast statements.*

### Author:

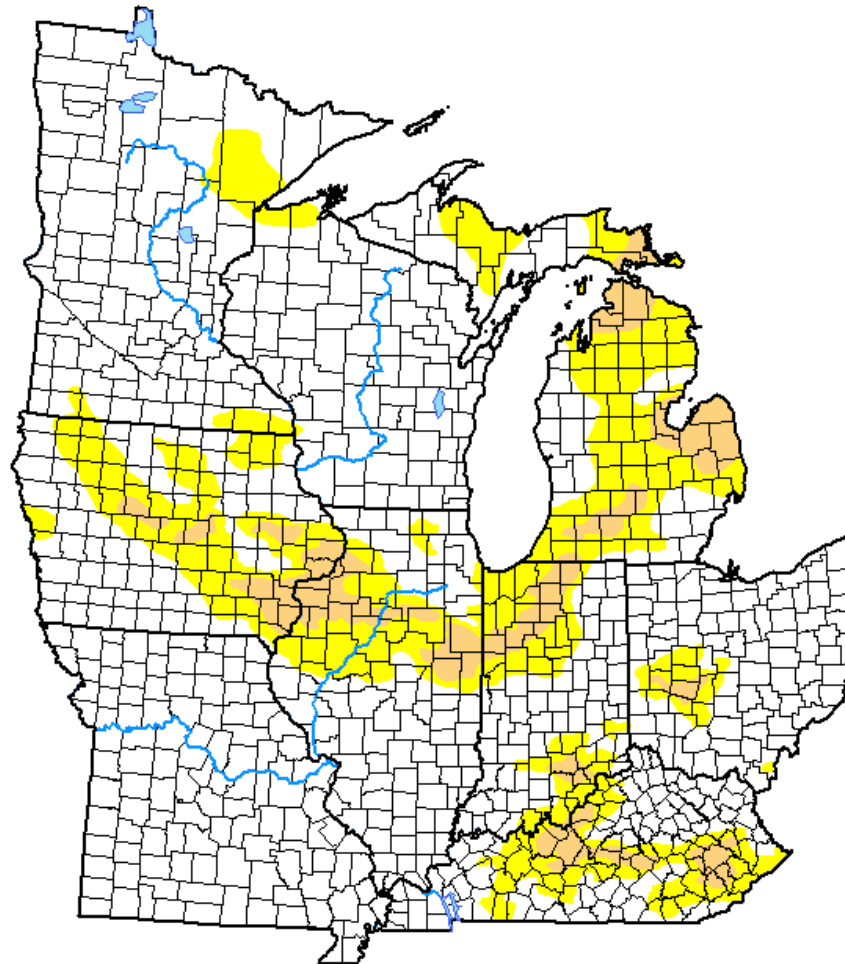
David Miskus  
NOAA/NWS/NCEP/CPC



[droughtmonitor.unl.edu](http://droughtmonitor.unl.edu)

# Late Summer (August-September)

## U.S. Drought Monitor Midwest



**September 10, 2019**

*(Released Thursday, Sep. 12, 2019)*

Valid 8 a.m. EDT

*Drought Conditions (Percent Area)*

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	75.28	24.72	6.21	0.00	0.00	0.00
<b>Last Week</b> <i>09-03-2019</i>	74.35	25.65	5.03	0.00	0.00	0.00
<b>3 Months Ago</b> <i>06-11-2019</i>	97.96	2.04	0.00	0.00	0.00	0.00
<b>Start of Calendar Year</b> <i>01-01-2019</i>	99.27	0.73	0.00	0.00	0.00	0.00
<b>Start of Water Year</b> <i>09-25-2018</i>	81.26	18.74	8.55	1.71	0.37	0.01
<b>One Year Ago</b> <i>09-11-2018</i>	80.02	19.98	8.63	1.72	0.37	0.01

### Intensity:

None	D2 Severe Drought
D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought

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Local conditions may vary. See accompanying text summary  
for forecast statements.*

### Author:

David Miskus  
NOAA/NWS/NCEP/CPC



[droughtmonitor.unl.edu](http://droughtmonitor.unl.edu)

# Late Summer (August-September)

## U.S. Drought Monitor Midwest

**September 17, 2019**

*(Released Thursday, Sep. 19, 2019)*

Valid 8 a.m. EDT

*Drought Conditions (Percent Area)*

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	77.77	22.23	5.39	0.00	0.00	0.00
<b>Last Week</b> <i>09-10-2019</i>	75.28	24.72	6.21	0.00	0.00	0.00
<b>3 Months Ago</b> <i>06-18-2019</i>	96.86	3.14	0.00	0.00	0.00	0.00
<b>Start of Calendar Year</b> <i>01-01-2019</i>	99.27	0.73	0.00	0.00	0.00	0.00
<b>Start of Water Year</b> <i>09-25-2018</i>	81.26	18.74	8.55	1.71	0.37	0.01
<b>One Year Ago</b> <i>09-18-2018</i>	80.02	19.98	8.63	1.71	0.37	0.01

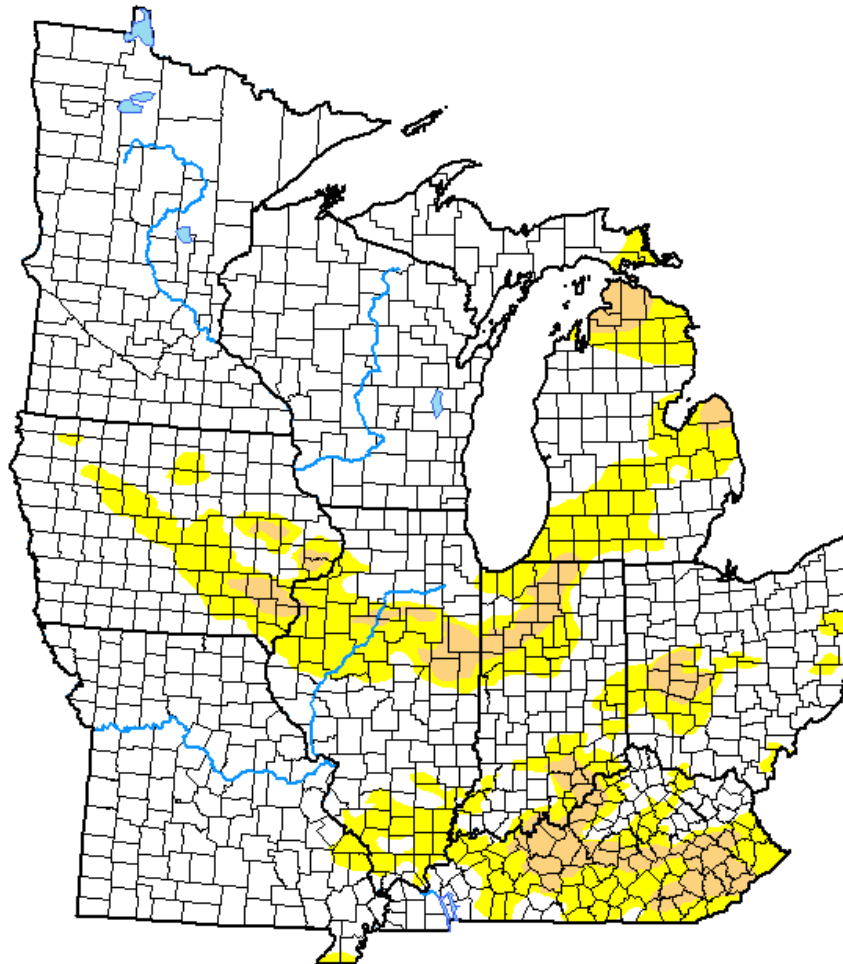
### Intensity:

None	D2 Severe Drought
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D1 Moderate Drought	D4 Exceptional Drought

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Local conditions may vary. See accompanying text summary  
for forecast statements.*

### Author:

Eric Luebehusen  
U.S. Department of Agriculture



[droughtmonitor.unl.edu](http://droughtmonitor.unl.edu)

# Late Summer (August-September)

## U.S. Drought Monitor Midwest

**September 24, 2019**

*(Released Thursday, Sep. 26, 2019)*

Valid 8 a.m. EDT

*Drought Conditions (Percent Area)*

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	73.41	26.59	7.80	0.81	0.00	0.00
<b>Last Week</b> <i>09-17-2019</i>	77.77	22.23	5.39	0.00	0.00	0.00
<b>3 Months Ago</b> <i>06-25-2019</i>	97.03	2.97	0.00	0.00	0.00	0.00
<b>Start of Calendar Year</b> <i>01-01-2019</i>	99.27	0.73	0.00	0.00	0.00	0.00
<b>Start of Water Year</b> <i>09-25-2018</i>	81.26	18.74	8.55	1.71	0.37	0.01
<b>One Year Ago</b> <i>09-25-2018</i>	81.26	18.74	8.55	1.71	0.37	0.01

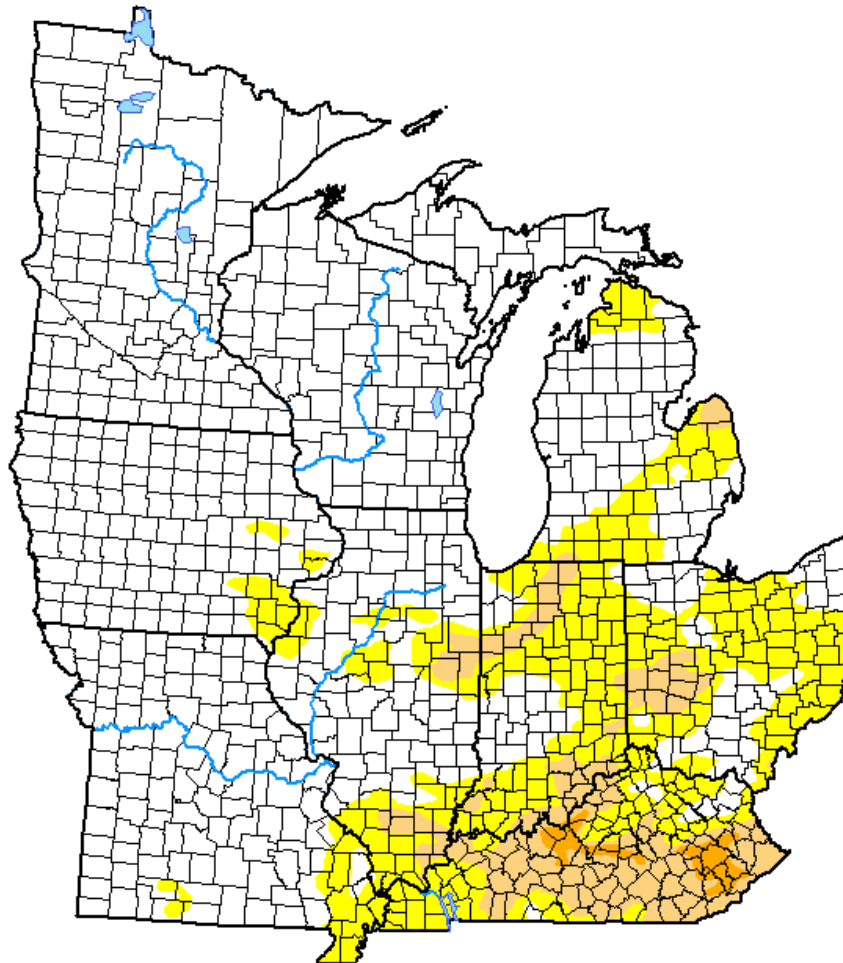
### Intensity:

None	D2 Severe Drought
D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought

*The Drought Monitor focuses on broad-scale conditions.  
Local conditions may vary. See accompanying text summary  
for forecast statements.*

### Author:

Eric Luebehusen  
U.S. Department of Agriculture



[droughtmonitor.unl.edu](http://droughtmonitor.unl.edu)

# Late Summer (August-September)

## U.S. Drought Monitor Midwest

**October 1, 2019**

*(Released Thursday, Oct. 3, 2019)*

Valid 8 a.m. EDT

*Drought Conditions (Percent Area)*

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	74.06	25.94	11.99	5.07	0.32	0.00
<b>Last Week</b> <i>09-24-2019</i>	73.41	26.59	7.80	0.81	0.00	0.00
<b>3 Months Ago</b> <i>07-02-2019</i>	96.09	3.91	0.00	0.00	0.00	0.00
<b>Start of Calendar Year</b> <i>01-01-2019</i>	99.27	0.73	0.00	0.00	0.00	0.00
<b>Start of Water Year</b> <i>10-01-2019</i>	74.06	25.94	11.99	5.07	0.32	0.00
<b>One Year Ago</b> <i>10-02-2018</i>	83.04	16.96	8.42	1.71	0.37	0.01

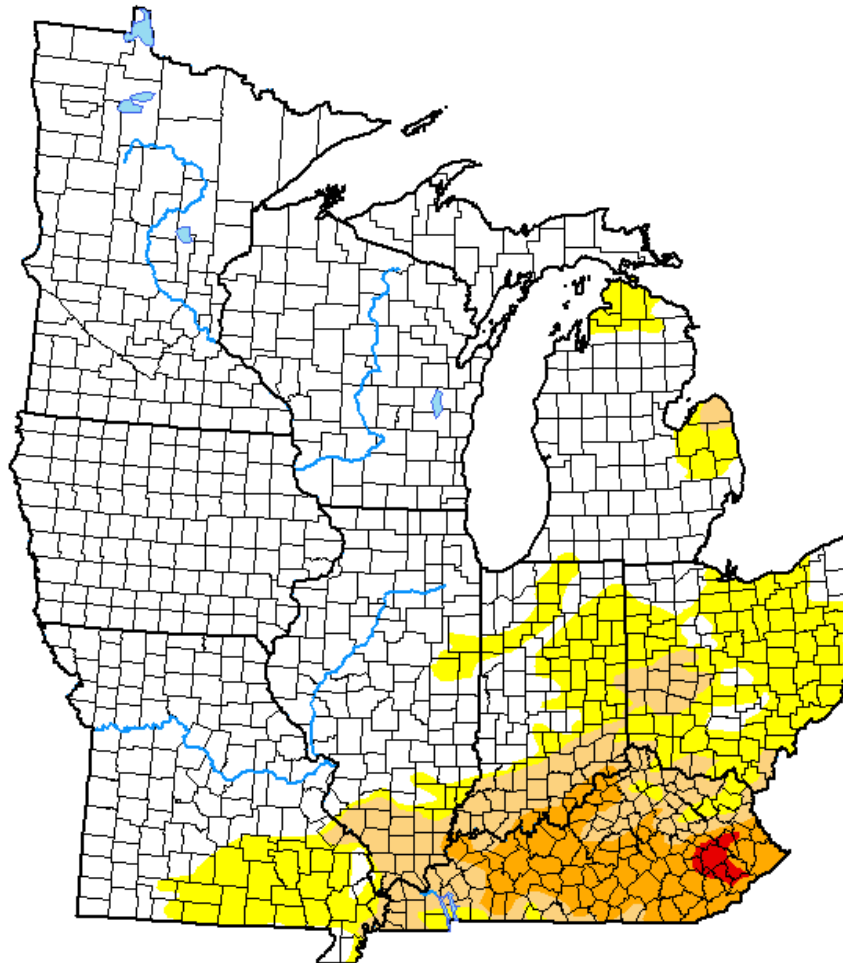
### Intensity:

None	D2 Severe Drought
D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought

*The Drought Monitor focuses on broad-scale conditions.  
Local conditions may vary. See accompanying text summary  
for forecast statements.*

### Author:

Brian Fuchs  
National Drought Mitigation Center



[droughtmonitor.unl.edu](http://droughtmonitor.unl.edu)



# Late Summer (August-September)

## U.S. Drought Monitor Midwest

**October 8, 2019**

*(Released Thursday, Oct. 10, 2019)*

Valid 8 a.m. EDT

*Drought Conditions (Percent Area)*

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	76.30	23.70	10.50	1.48	0.09	0.00
<b>Last Week</b> <i>10-01-2019</i>	74.06	25.94	11.99	5.07	0.32	0.00
<b>3 Months Ago</b> <i>07-09-2019</i>	95.49	4.51	0.00	0.00	0.00	0.00
<b>Start of Calendar Year</b> <i>01-01-2019</i>	99.27	0.73	0.00	0.00	0.00	0.00
<b>Start of Water Year</b> <i>10-01-2019</i>	74.06	25.94	11.99	5.07	0.32	0.00
<b>One Year Ago</b> <i>10-09-2018</i>	90.06	9.94	2.37	0.14	0.00	0.00

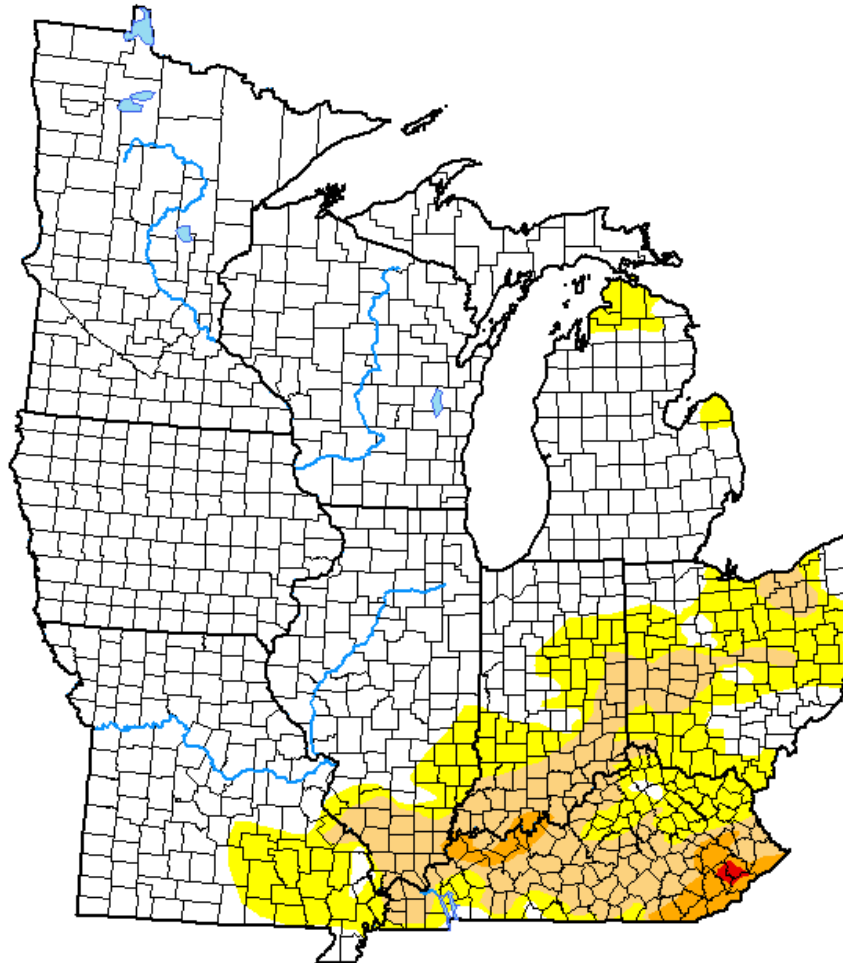
### Intensity:

None	D2 Severe Drought
D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought

*The Drought Monitor focuses on broad-scale conditions.  
Local conditions may vary. See accompanying text summary  
for forecast statements.*

### Author:

Brian Fuchs  
National Drought Mitigation Center



[droughtmonitor.unl.edu](http://droughtmonitor.unl.edu)

# Late Summer (August-September)

## U.S. Drought Monitor Midwest

**October 15, 2019**

*(Released Thursday, Oct. 17, 2019)*

Valid 8 a.m. EDT

*Drought Conditions (Percent Area)*

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	77.92	22.08	10.42	1.83	0.33	0.00
<b>Last Week</b> <i>10-08-2019</i>	76.30	23.70	10.50	1.48	0.09	0.00
<b>3 Months Ago</b> <i>07-16-2019</i>	97.82	2.18	0.00	0.00	0.00	0.00
<b>Start of Calendar Year</b> <i>01-01-2019</i>	99.27	0.73	0.00	0.00	0.00	0.00
<b>Start of Water Year</b> <i>10-01-2019</i>	74.06	25.94	11.99	5.07	0.32	0.00
<b>One Year Ago</b> <i>10-16-2018</i>	93.44	6.56	0.43	0.00	0.00	0.00

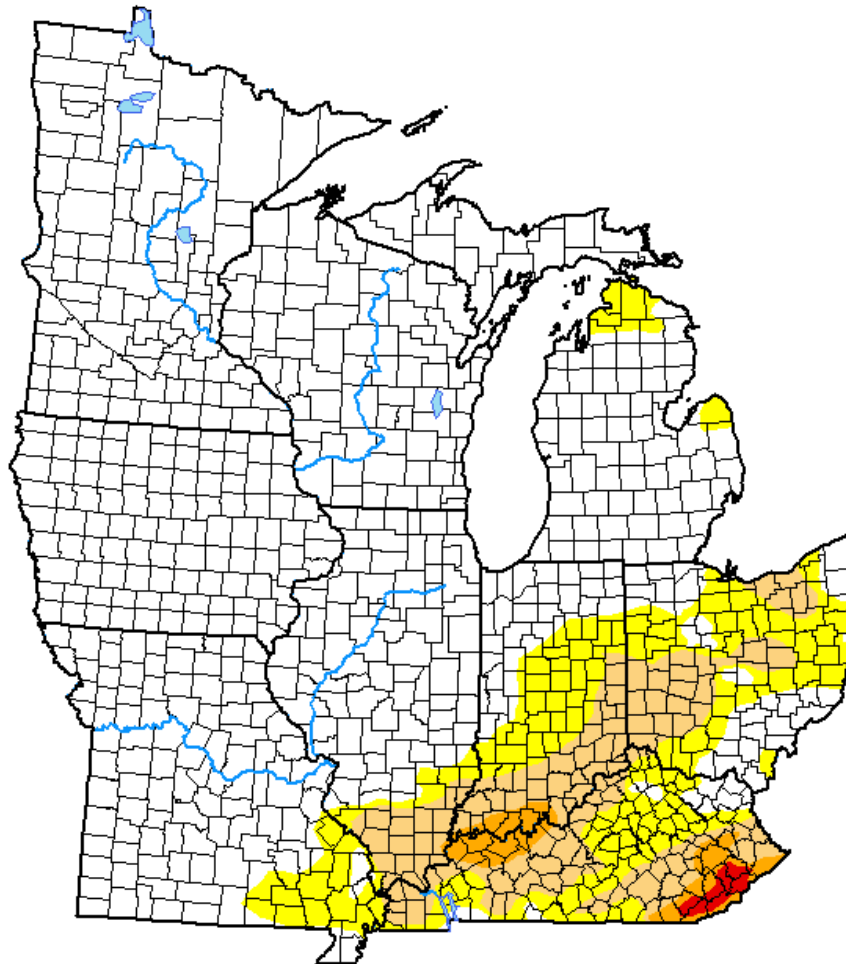
### Intensity:

None	D2 Severe Drought
D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought

*The Drought Monitor focuses on broad-scale conditions.  
Local conditions may vary. See accompanying text summary  
for forecast statements.*

### Author:

Richard Heim  
NCEI/NOAA



[droughtmonitor.unl.edu](http://droughtmonitor.unl.edu)

# Late Summer (August-September)

## U.S. Drought Monitor Midwest

**October 22, 2019**

(Released Thursday, Oct. 24, 2019)

Valid 8 a.m. EDT

*Drought Conditions (Percent Area)*

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	83.21	16.79	6.50	0.80	0.00	0.00
<b>Last Week</b> <i>10-15-2019</i>	77.92	22.08	10.42	1.83	0.33	0.00
<b>3 Months Ago</b> <i>07-23-2019</i>	94.66	5.34	0.00	0.00	0.00	0.00
<b>Start of Calendar Year</b> <i>01-01-2019</i>	99.27	0.73	0.00	0.00	0.00	0.00
<b>Start of Water Year</b> <i>10-01-2019</i>	74.06	25.94	11.99	5.07	0.32	0.00
<b>One Year Ago</b> <i>10-23-2018</i>	93.44	6.56	0.18	0.00	0.00	0.00

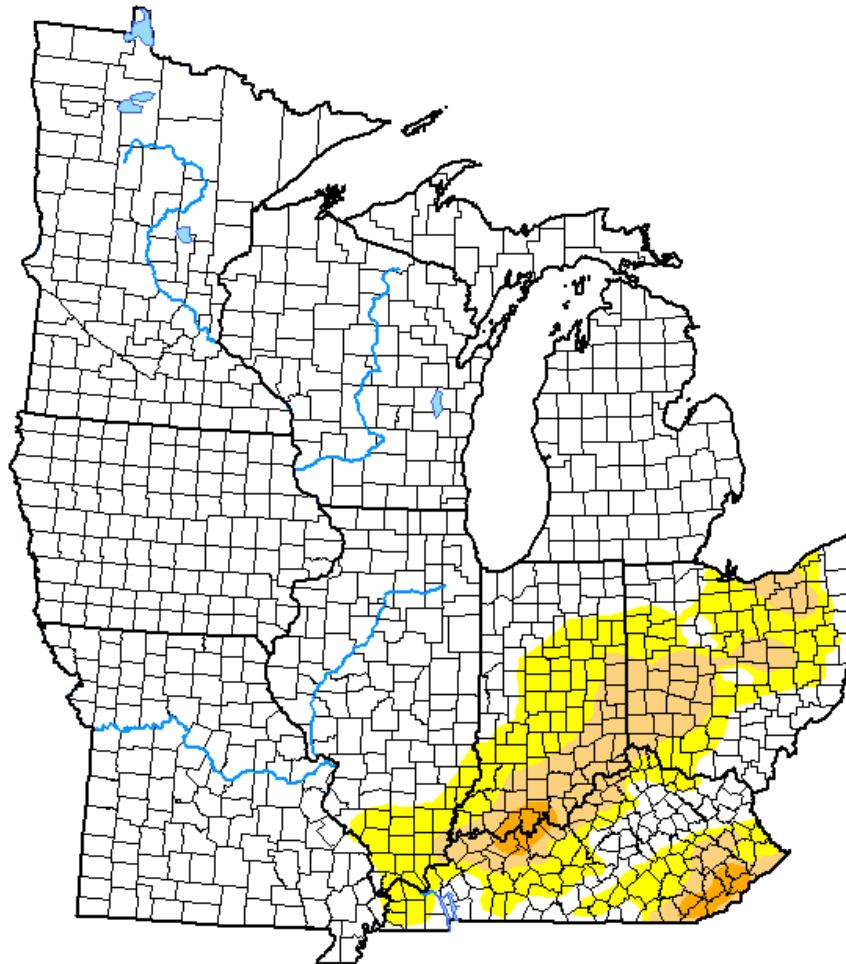
### Intensity:

None	D2 Severe Drought
D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought

*The Drought Monitor focuses on broad-scale conditions.  
Local conditions may vary. See accompanying text summary  
for forecast statements.*

### Author:

Richard Heim  
NCEI/NOAA



[droughtmonitor.unl.edu](http://droughtmonitor.unl.edu)

# Late Summer (August-September)

## U.S. Drought Monitor Midwest

**October 29, 2019**

*(Released Thursday, Oct. 31, 2019)*

Valid 8 a.m. EDT

*Drought Conditions (Percent Area)*

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	86.95	13.05	3.12	0.00	0.00	0.00
<b>Last Week</b> <i>10-22-2019</i>	83.21	16.79	6.50	0.80	0.00	0.00
<b>3 Months Ago</b> <i>07-30-2019</i>	91.97	8.03	0.00	0.00	0.00	0.00
<b>Start of Calendar Year</b> <i>01-01-2019</i>	99.27	0.73	0.00	0.00	0.00	0.00
<b>Start of Water Year</b> <i>10-01-2019</i>	74.06	25.94	11.99	5.07	0.32	0.00
<b>One Year Ago</b> <i>10-30-2018</i>	94.40	5.60	0.14	0.00	0.00	0.00

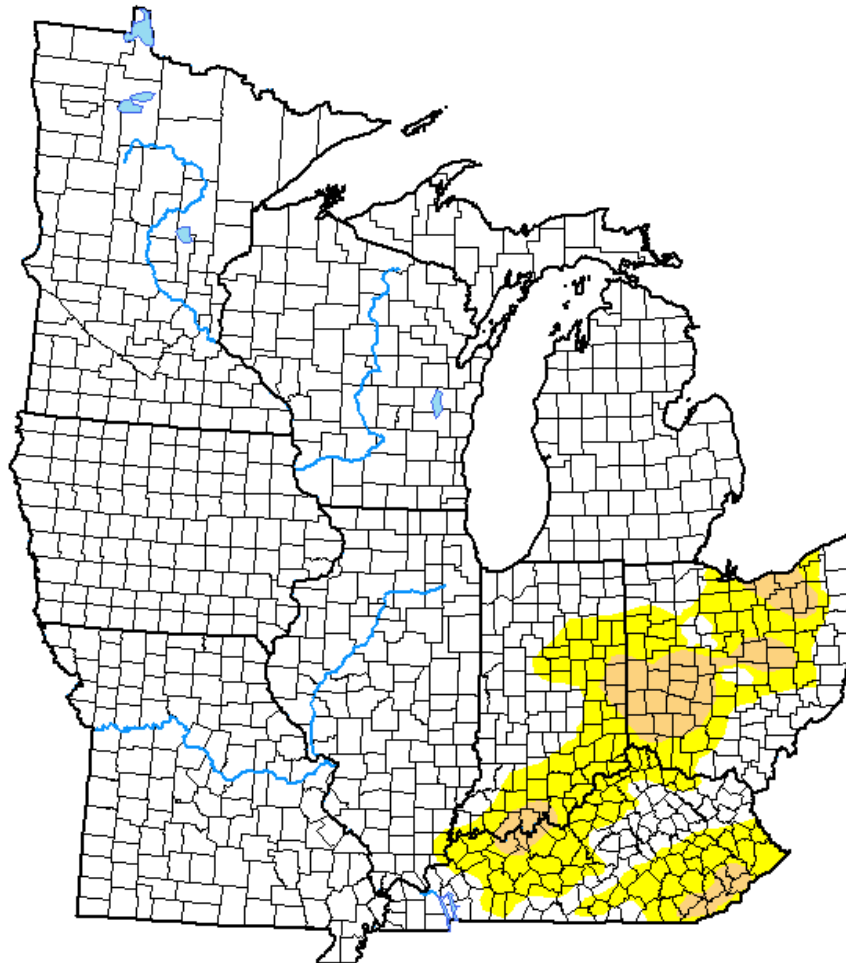
### Intensity:

None	D2 Severe Drought
D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought

*The Drought Monitor focuses on broad-scale conditions.  
Local conditions may vary. See accompanying text summary  
for forecast statements.*

### Author:

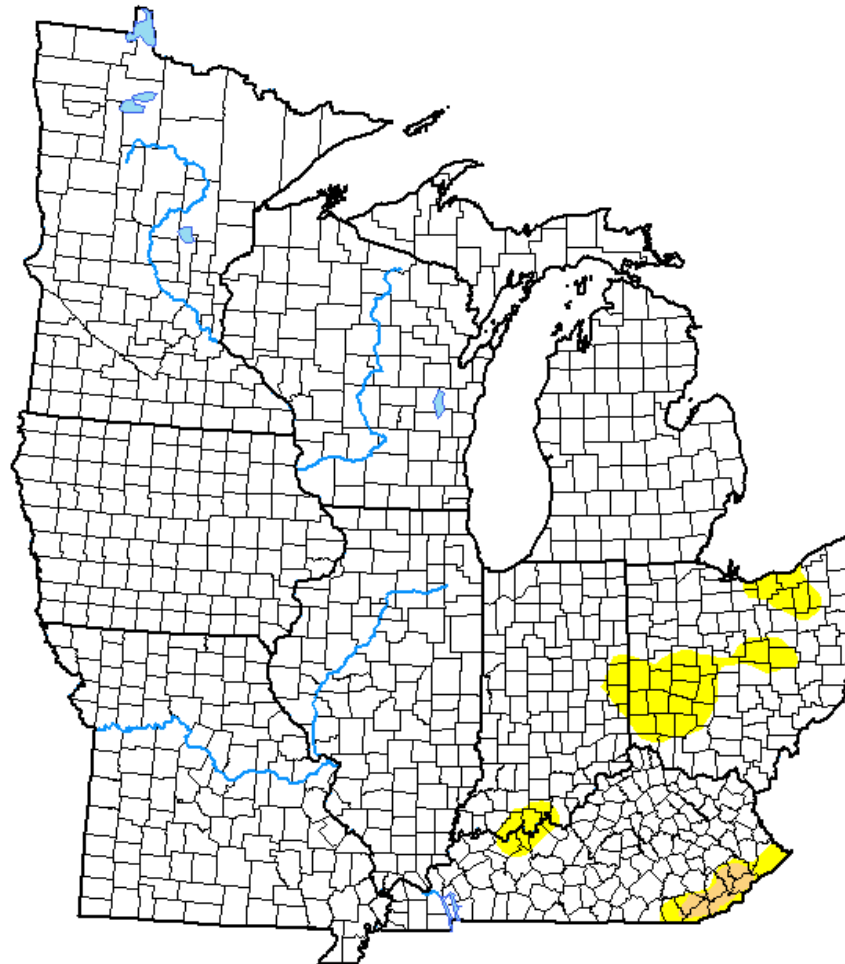
David Simeral  
Western Regional Climate Center



[droughtmonitor.unl.edu](http://droughtmonitor.unl.edu)

# Late Summer (August-September)

## U.S. Drought Monitor Midwest



**November 5, 2019**

*(Released Thursday, Nov. 7, 2019)*

Valid 7 a.m. EST

*Drought Conditions (Percent Area)*

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	96.45	3.55	0.38	0.00	0.00	0.00
<b>Last Week</b> <i>10-29-2019</i>	86.95	13.05	3.12	0.00	0.00	0.00
<b>3 Months Ago</b> <i>08-06-2019</i>	84.17	15.83	0.00	0.00	0.00	0.00
<b>Start of Calendar Year</b> <i>01-01-2019</i>	99.27	0.73	0.00	0.00	0.00	0.00
<b>Start of Water Year</b> <i>10-01-2019</i>	74.06	25.94	11.99	5.07	0.32	0.00
<b>One Year Ago</b> <i>11-06-2018</i>	97.79	2.21	0.01	0.00	0.00	0.00

### Intensity:

None	D2 Severe Drought
D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought

*The Drought Monitor focuses on broad-scale conditions.  
Local conditions may vary. See accompanying text summary  
for forecast statements.*

### Author:

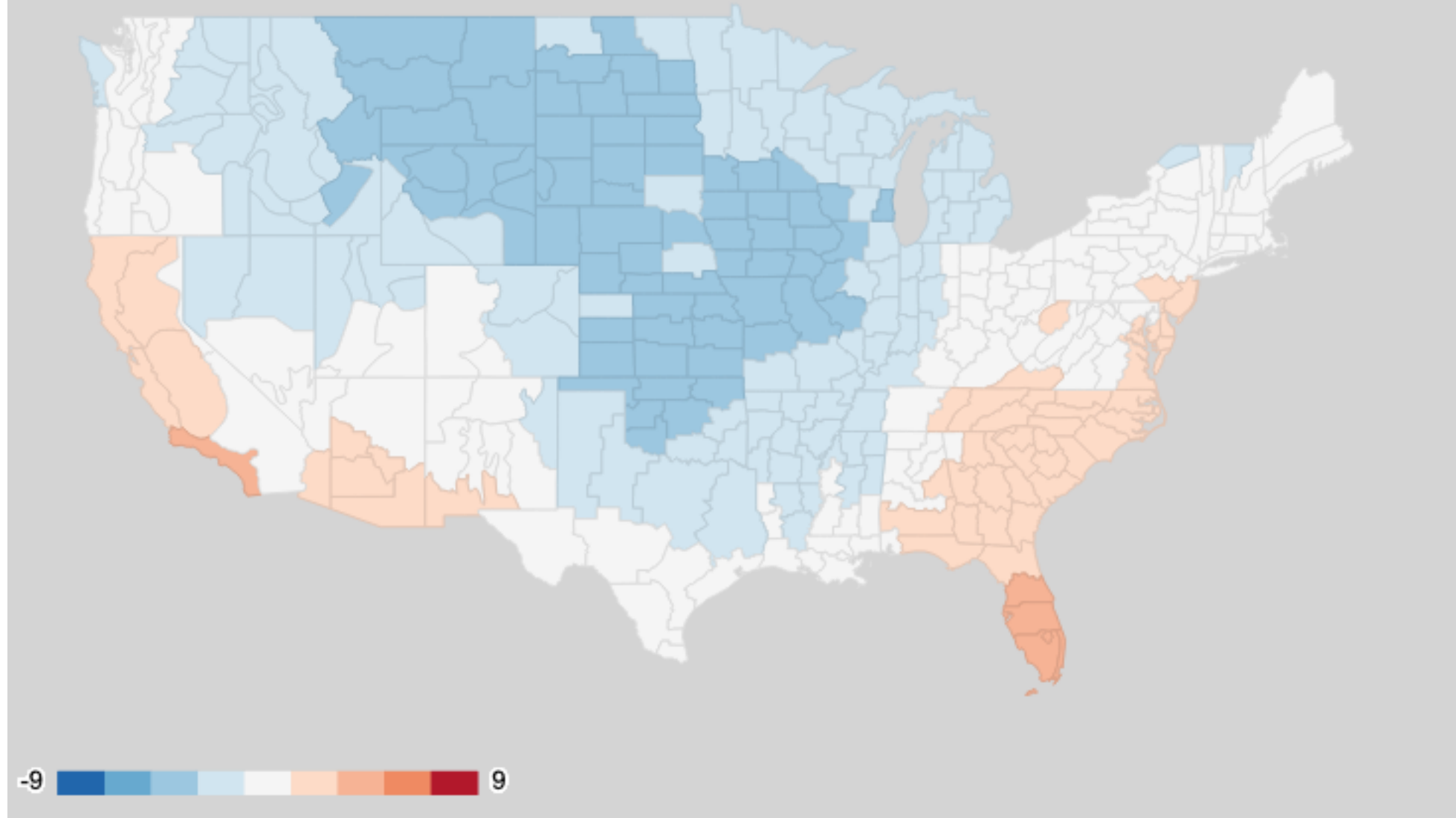
David Simeral  
Western Regional Climate Center



[droughtmonitor.unl.edu](http://droughtmonitor.unl.edu)

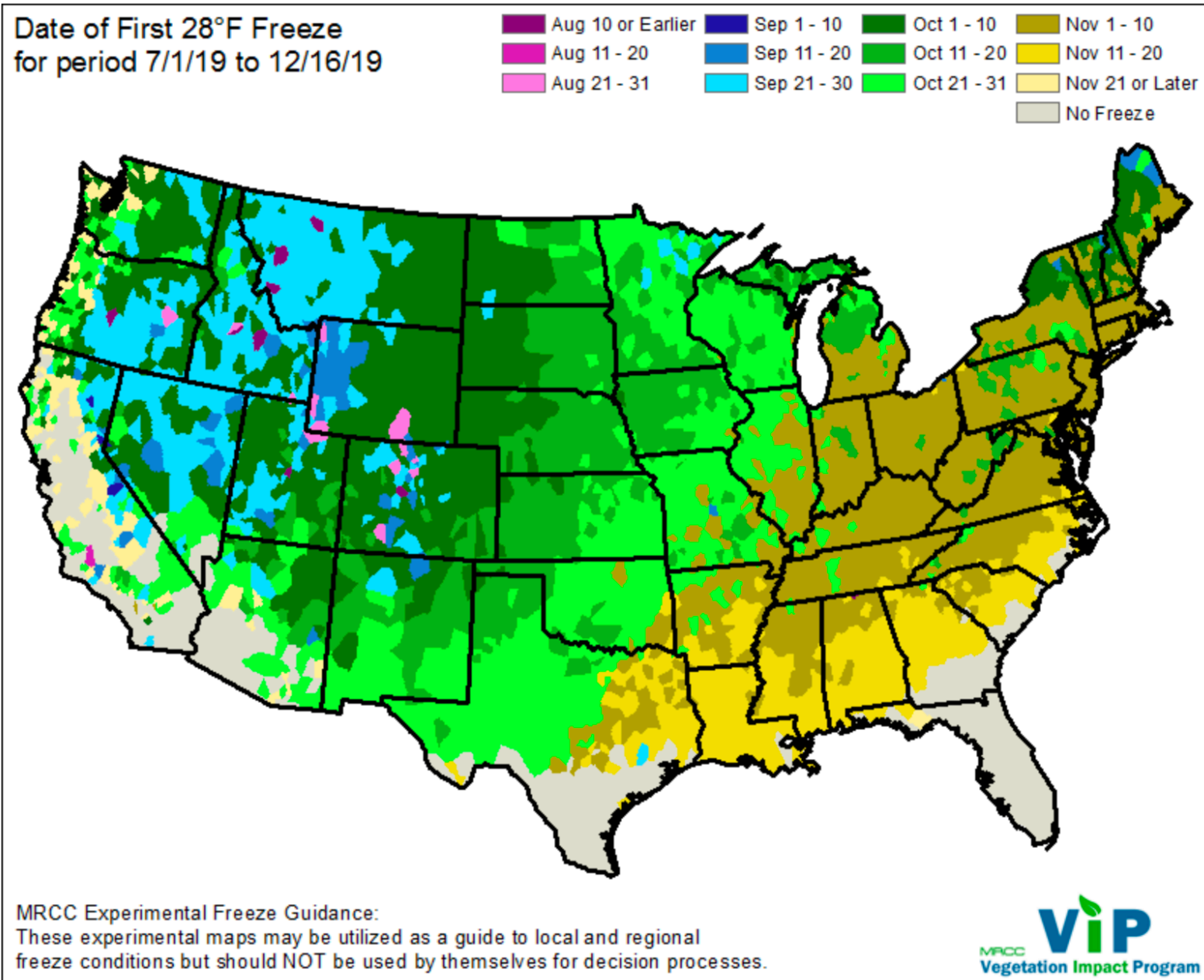
# Fall Harvest (October-November)

Temperature anomalies – Oct-Nov 2019

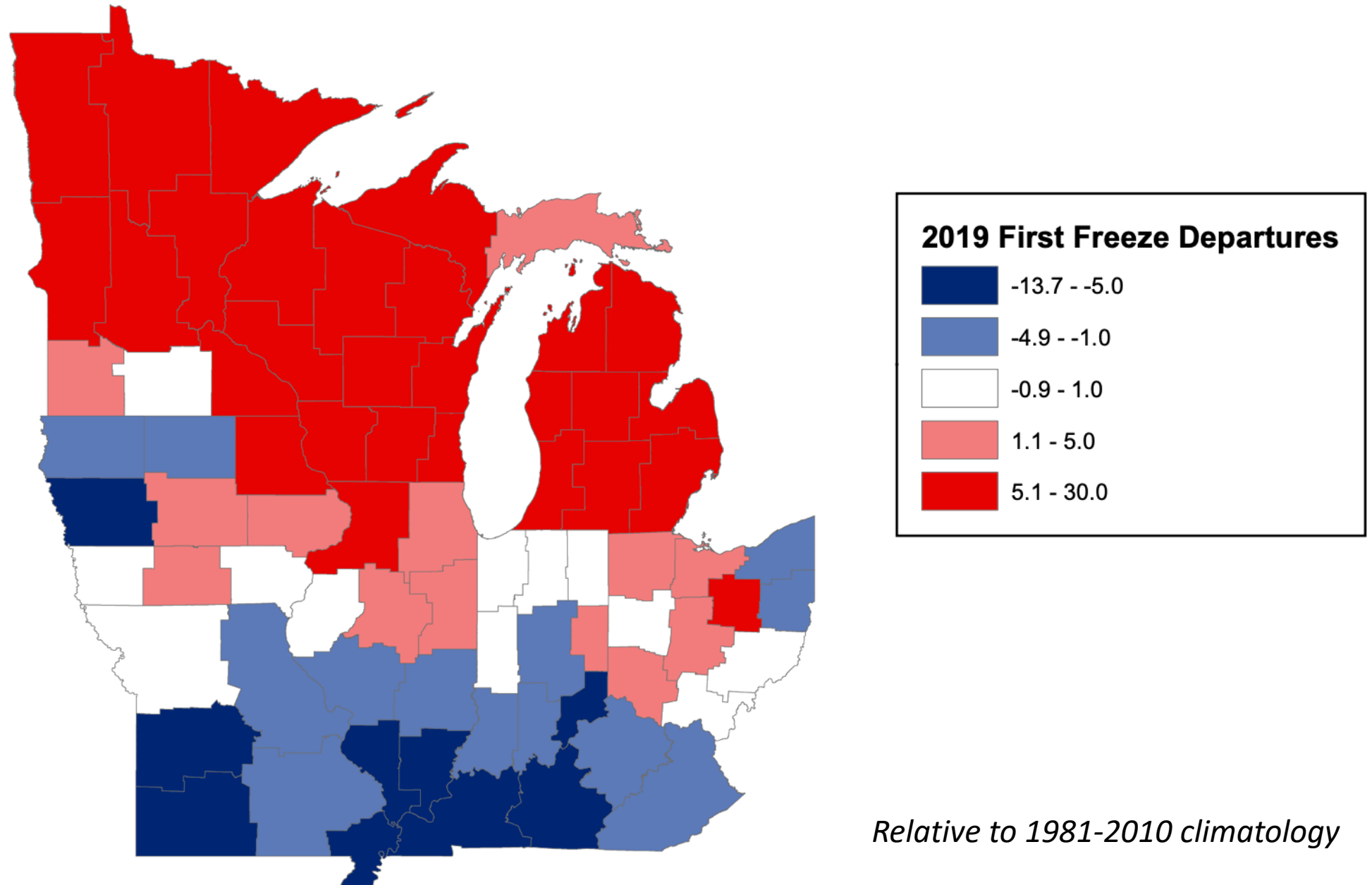




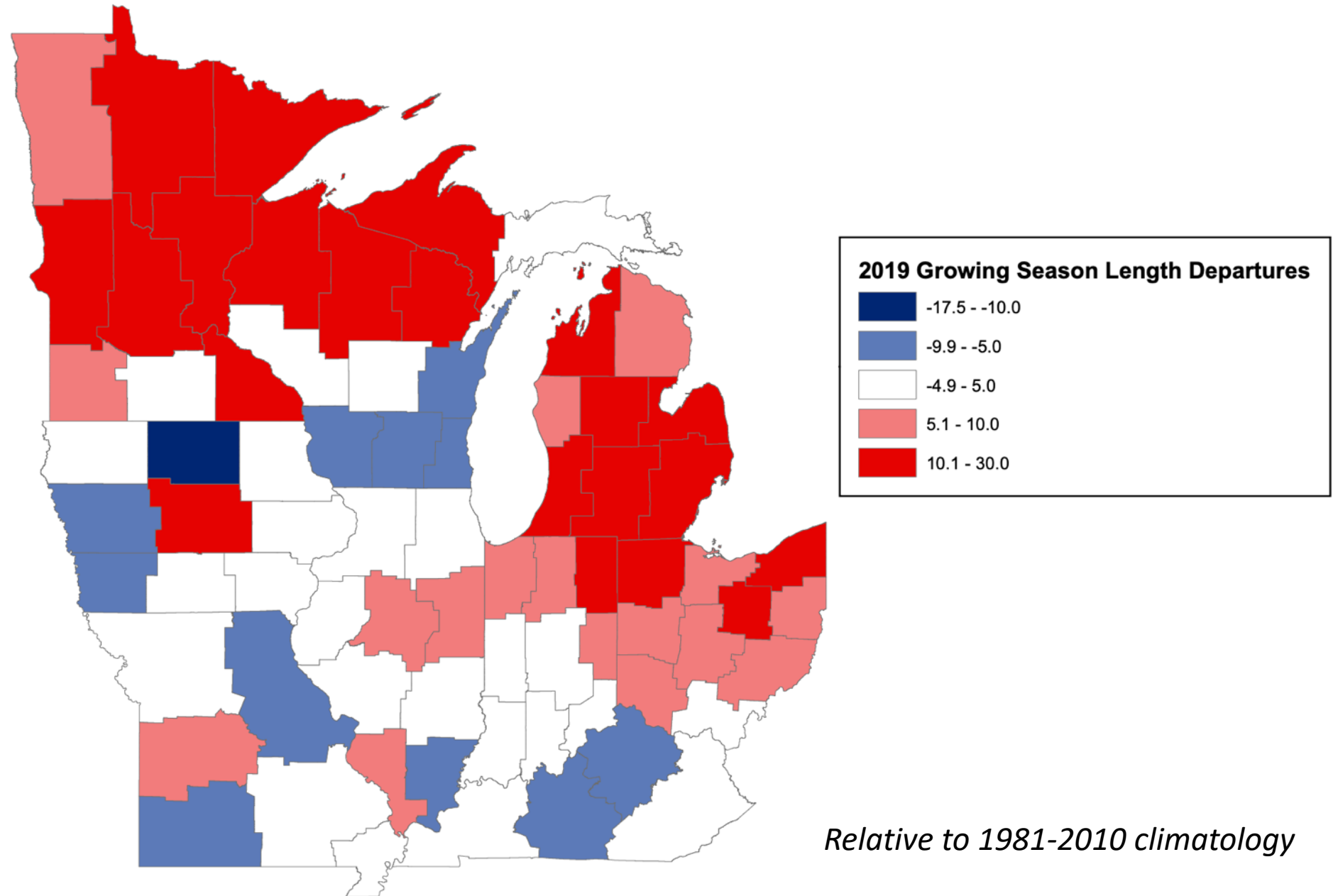
# Fall Harvest (October-November)



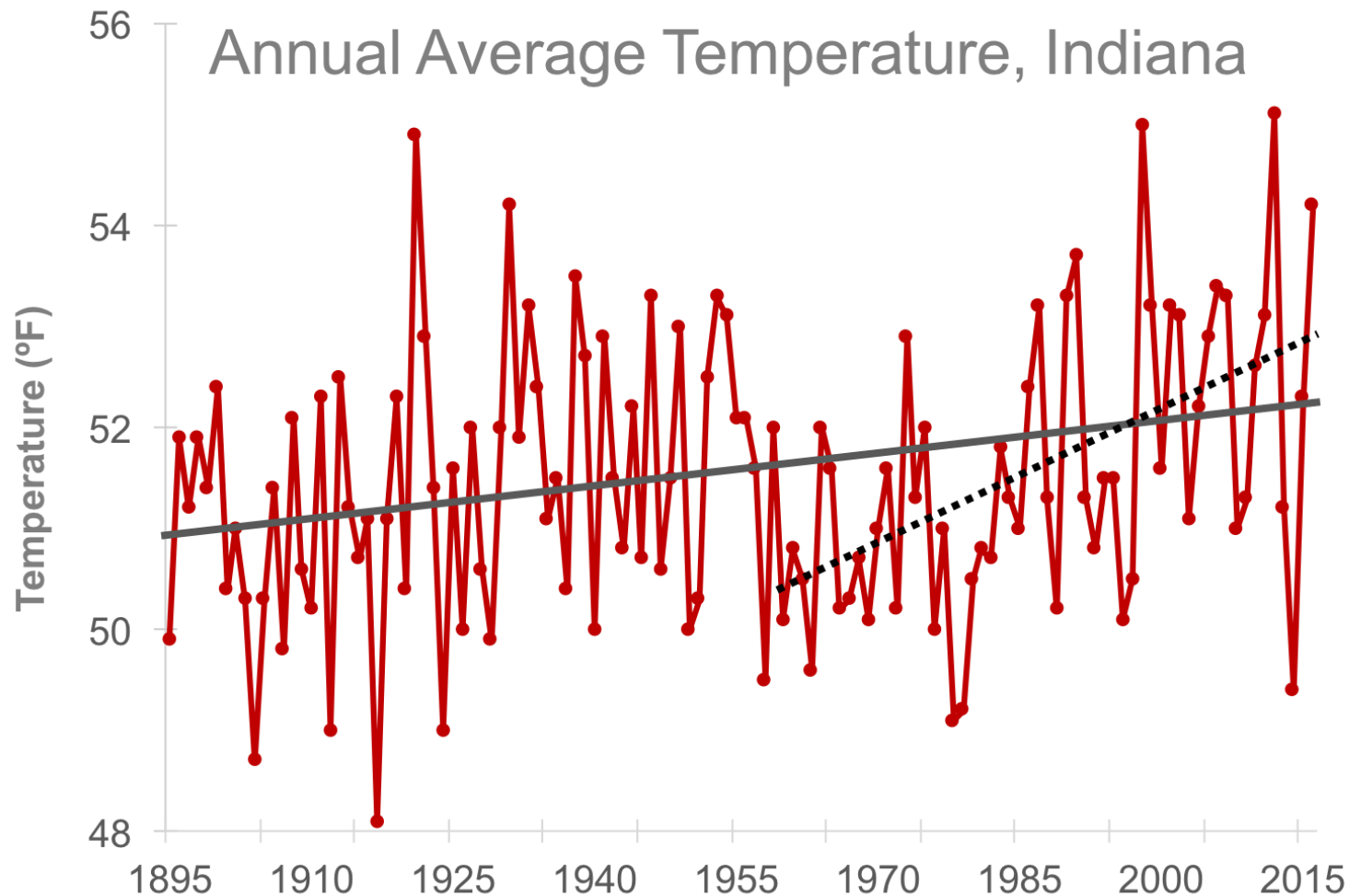
# Fall Harvest (October-November)



# Fall Harvest (October-November)



## Indiana is getting warmer



## Indiana is getting warmer

Indiana Temperature Trends (1895 to 2016)

Variable	Winter	Spring	Summer	Fall	Annual
<b>Tmax</b>	0.1°F	0.1°F	- 1°F	0°F	0°F
<b>Tavg</b>	0.1°F	0.2°F	0°F	0.1°F	0.1°F
<b>Tmin</b>	0.2°F	0.2°F	0.1°F	0.1°F	0.2°F

Units = °F per decade

## Indiana will get **warmer**

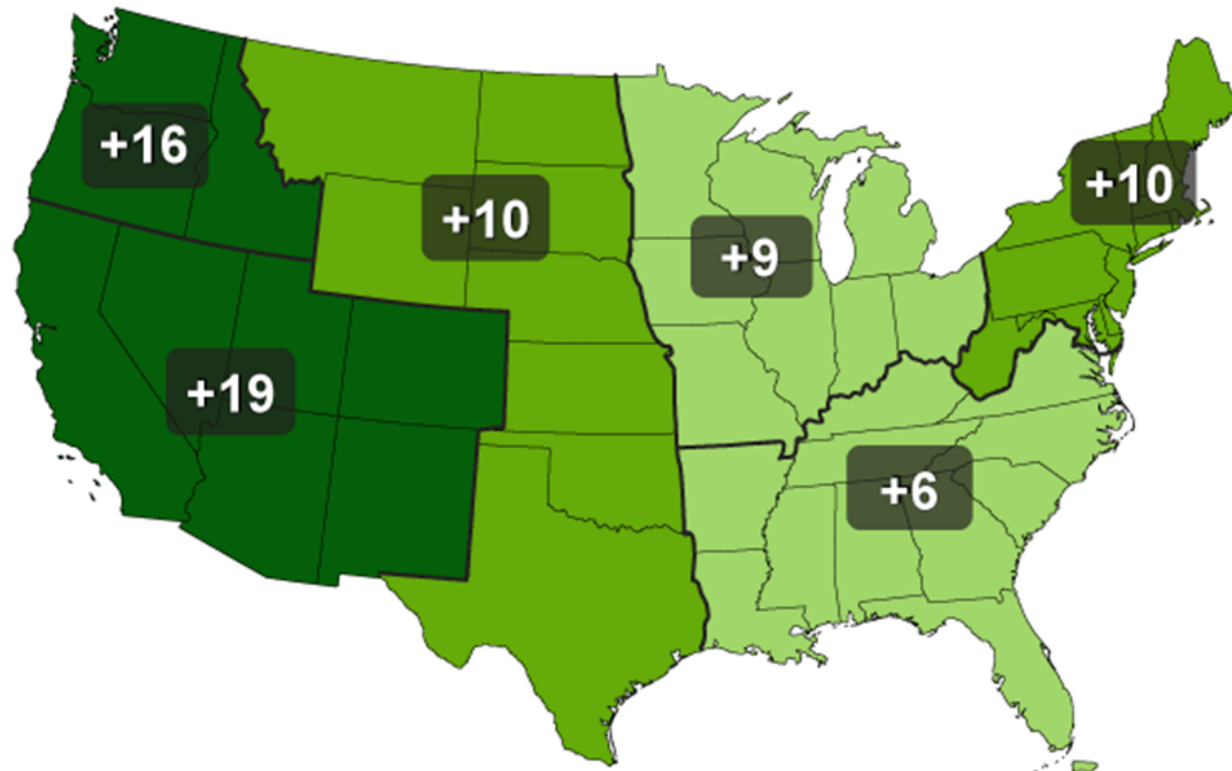
**5°F to 6°F of warming expected  
by mid-century.**

- Warming expected in ALL seasons
- Longer growing season
- More frequent and intense extreme heat



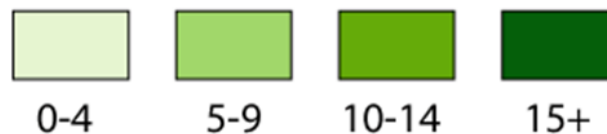
# Seasonal Trends

## Observed Increase in Frost-Free Season Length



The frost-free season length, defined as the period between the last occurrence of 32°F in the spring and the first occurrence of 32°F in the fall, has increased in each U.S. region during 1991-2012 relative to 1901-1960. Increases in frost-free season length correspond to similar increases in growing season length. (Figure source: NOAA NCDC / CICS-NC).

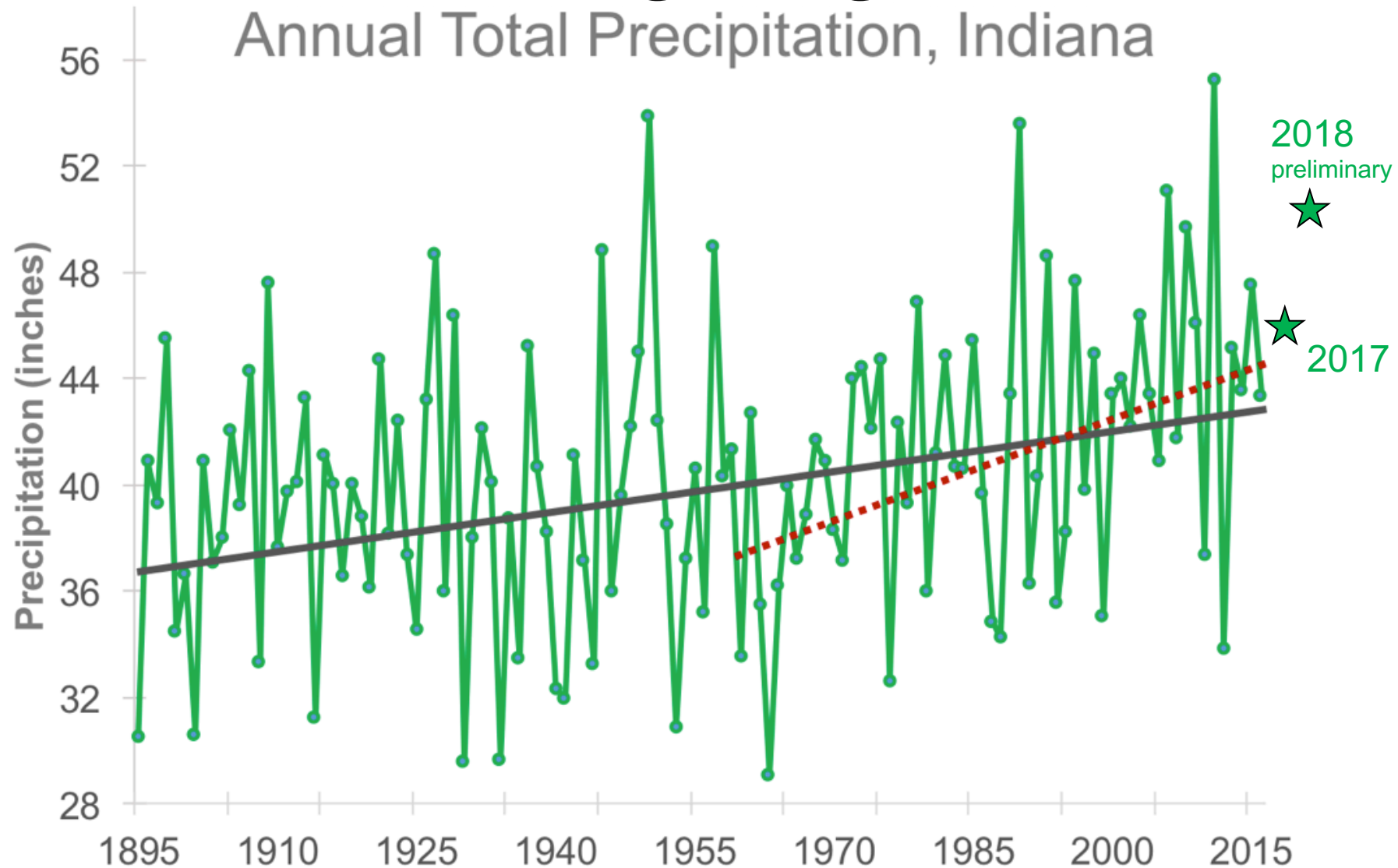
Change in Annual Number of Days



Midwest Climate Hub  
U.S. DEPARTMENT OF AGRICULTURE

## Indiana is getting **wetter**

Annual Total Precipitation, Indiana

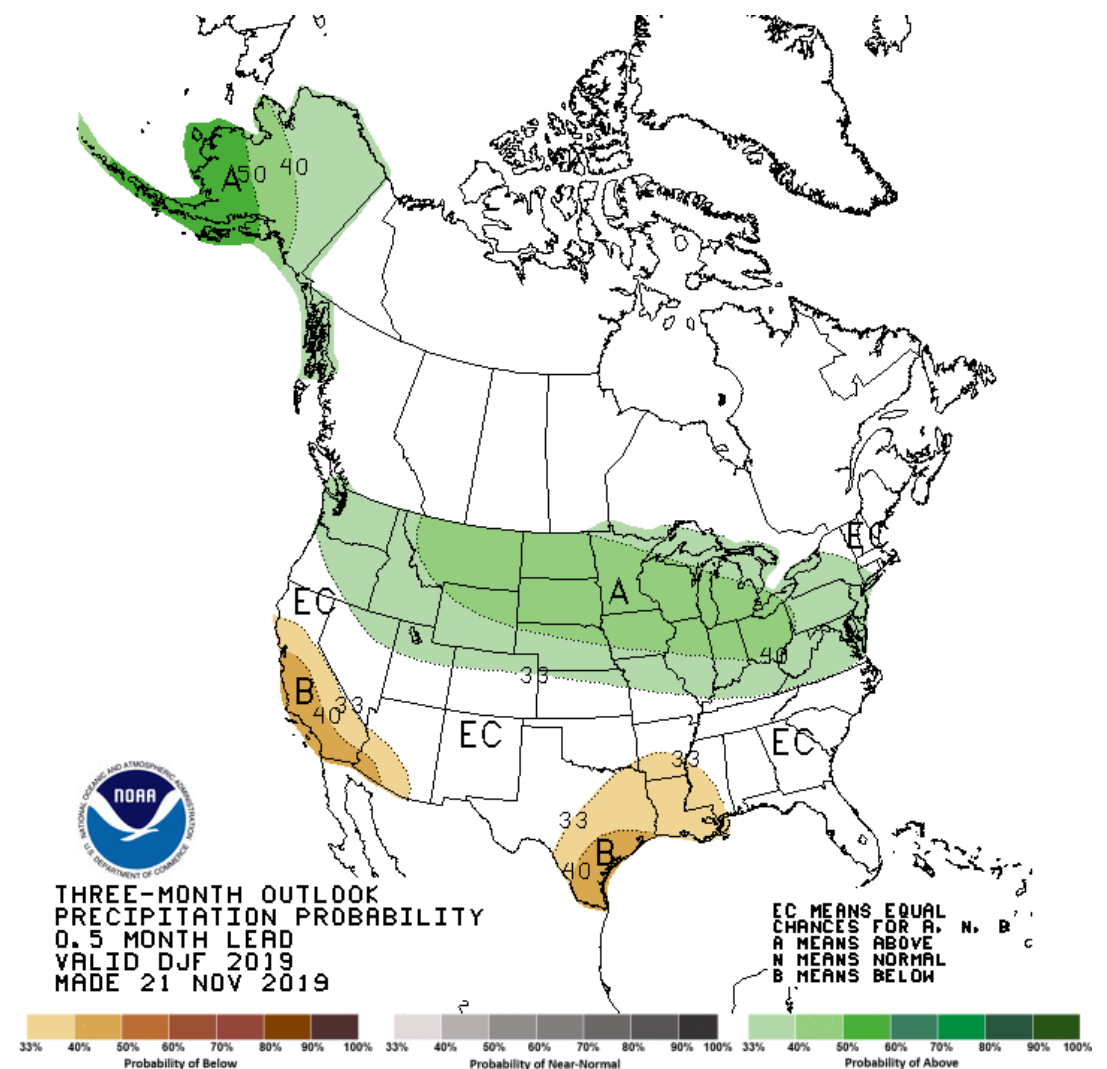
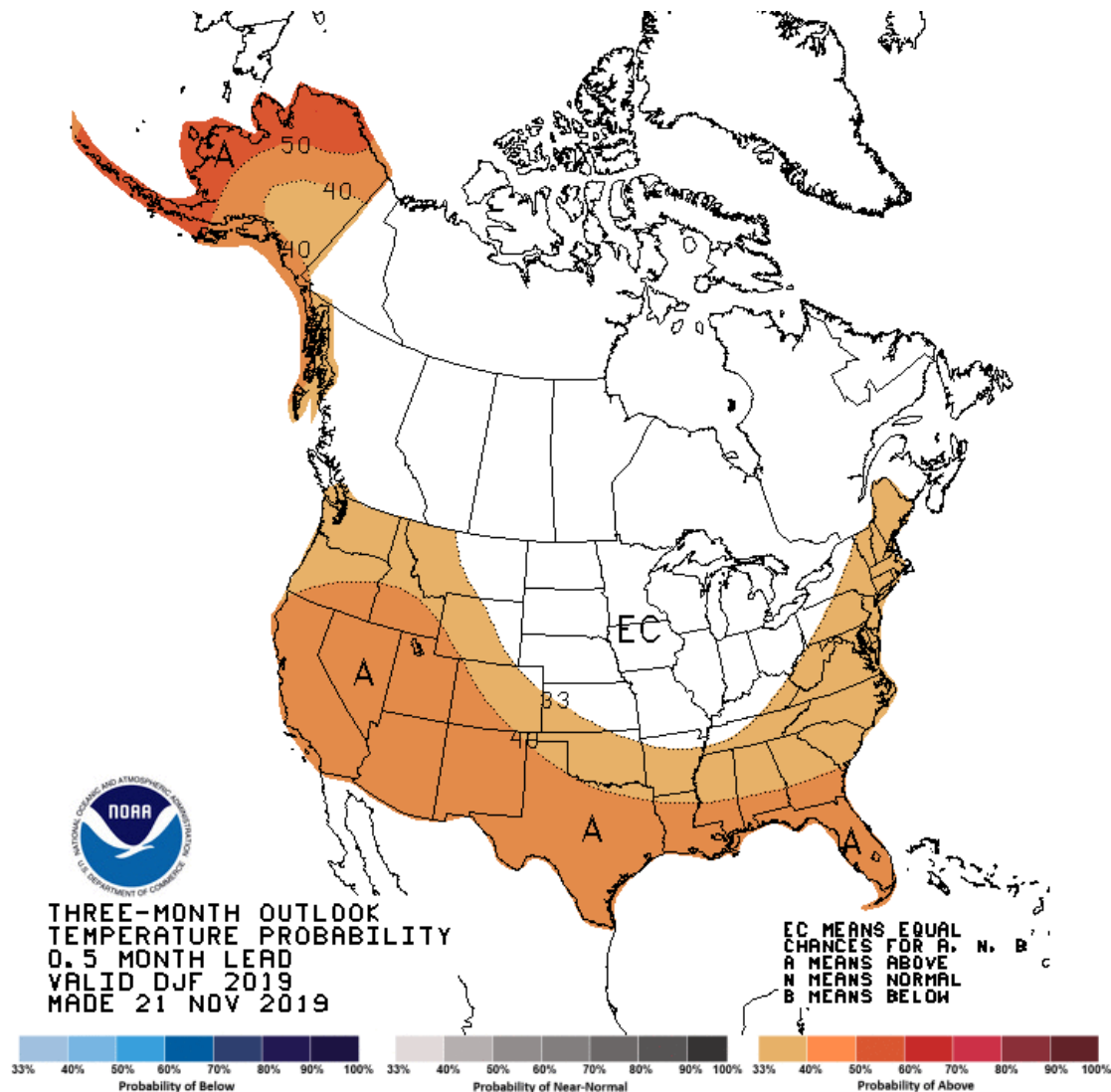


# Seasonal Trend Takaways

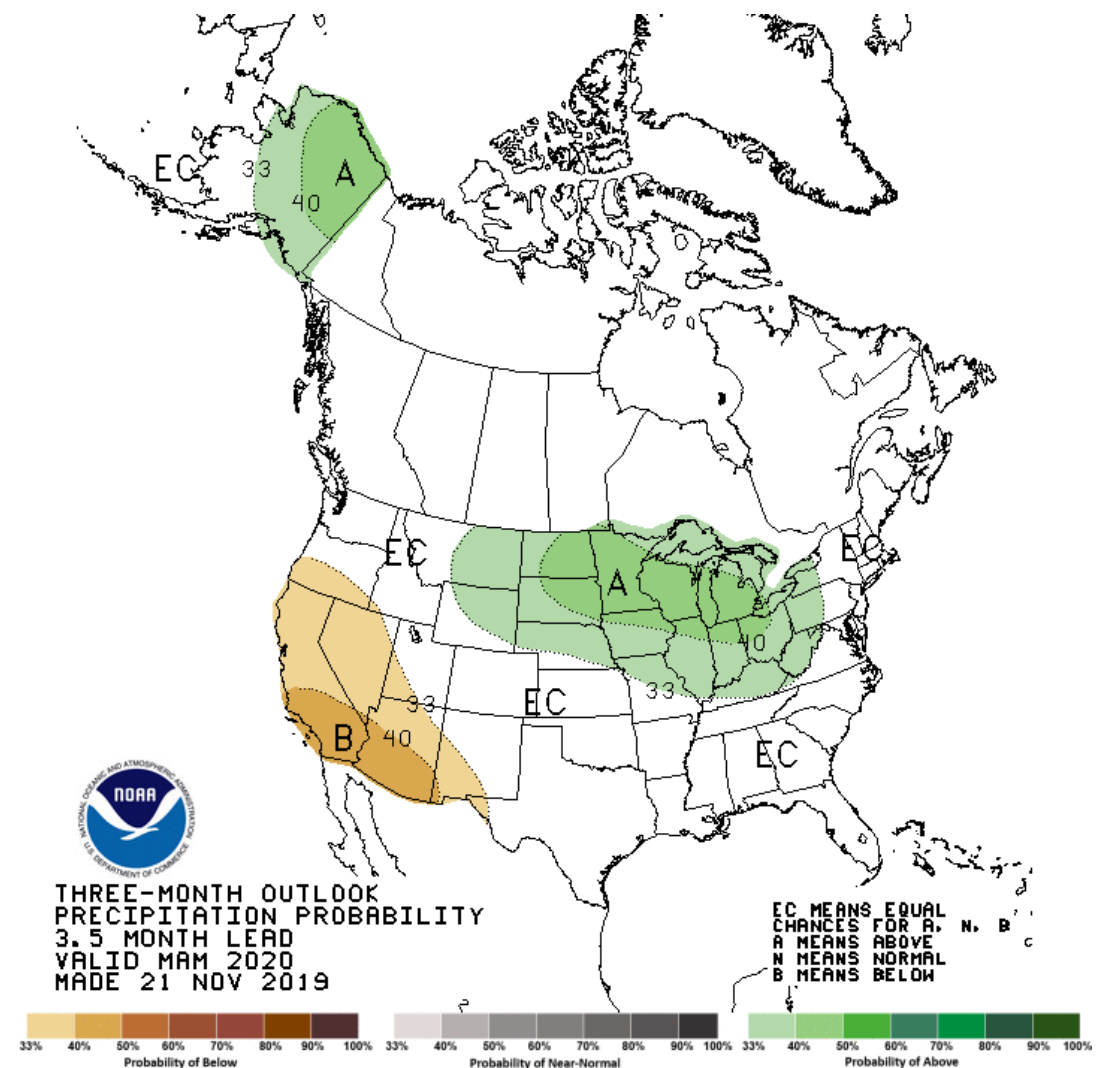
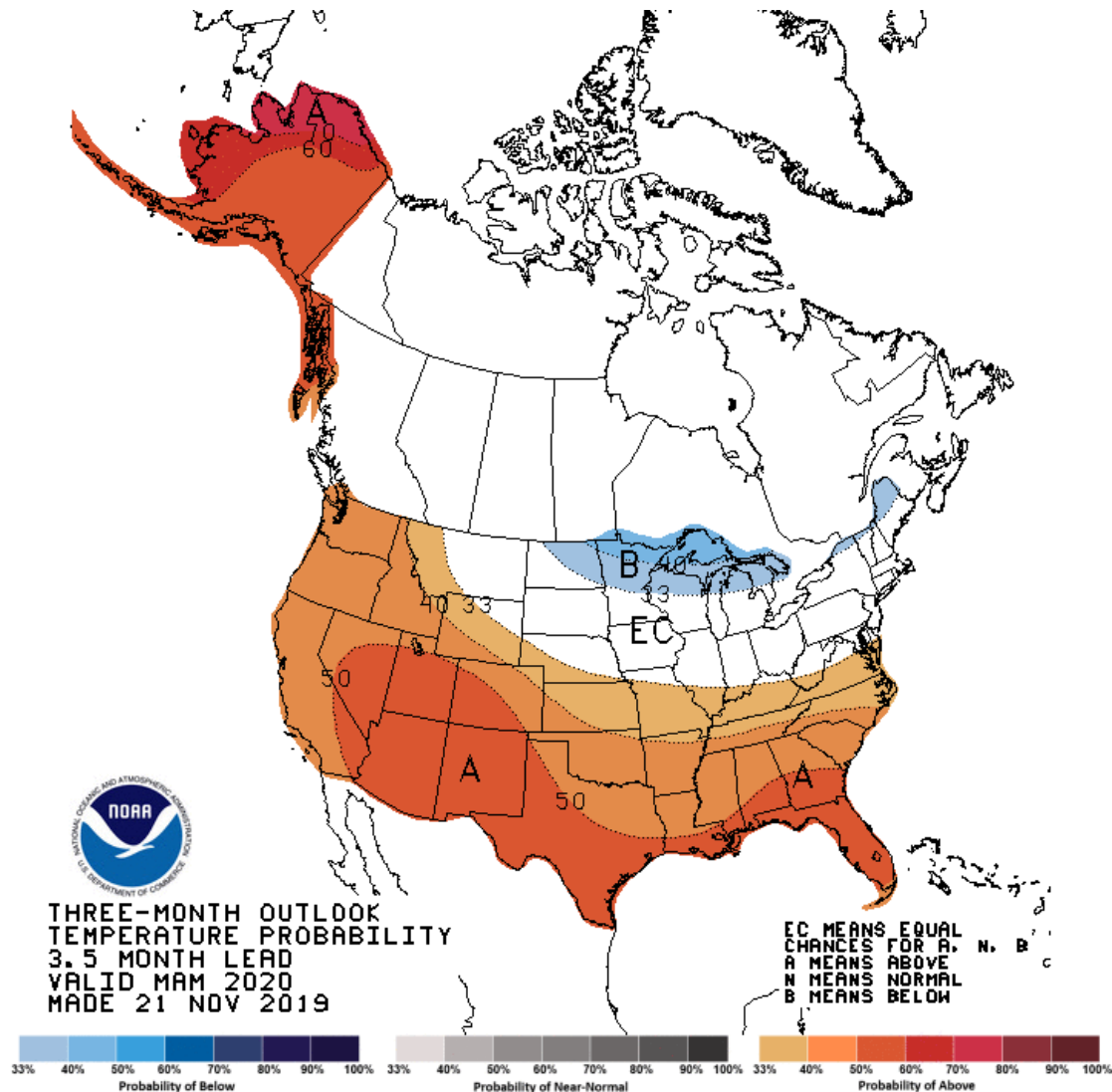
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- Wetter springs
- Short droughts – perhaps untimely
- Extremes, variability throughout season
- Trends can wash out risks

## Winter Outlook – December-February



## Spring Outlook – March - May





Questions?

Thank you!

