The 2012 Drought in Historical Perspective

- Describing drought
- Soil water reservoir
- Outlook

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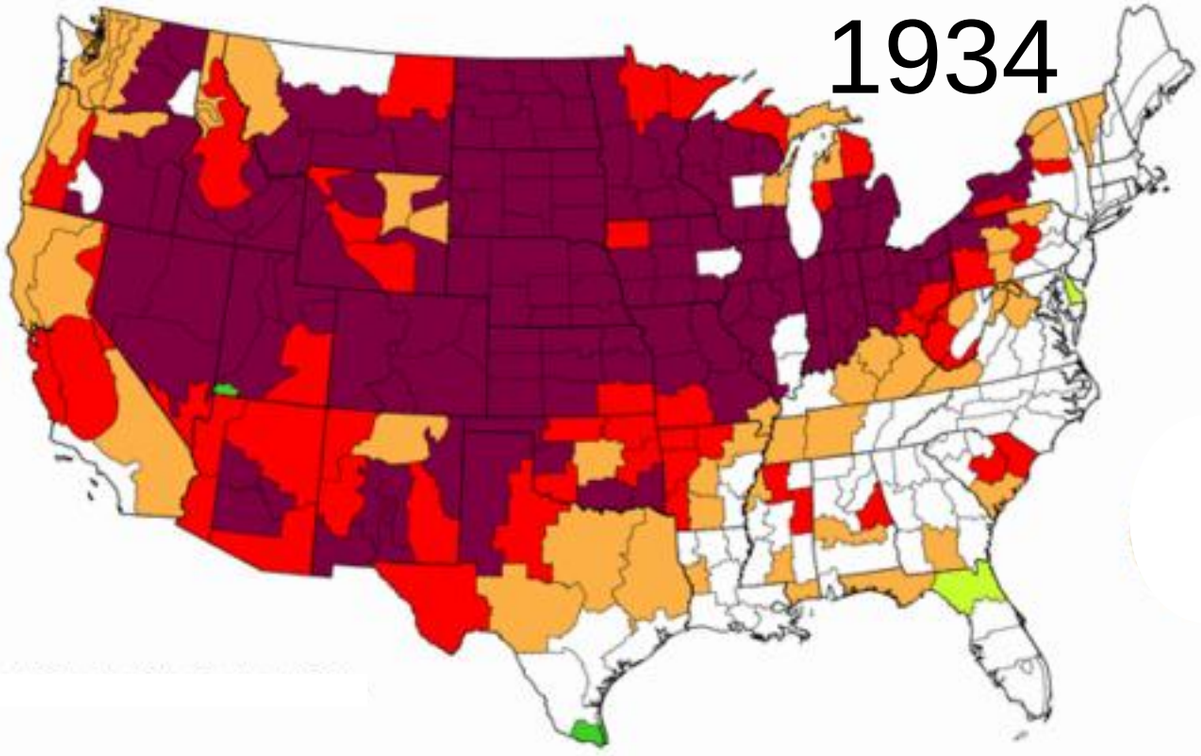
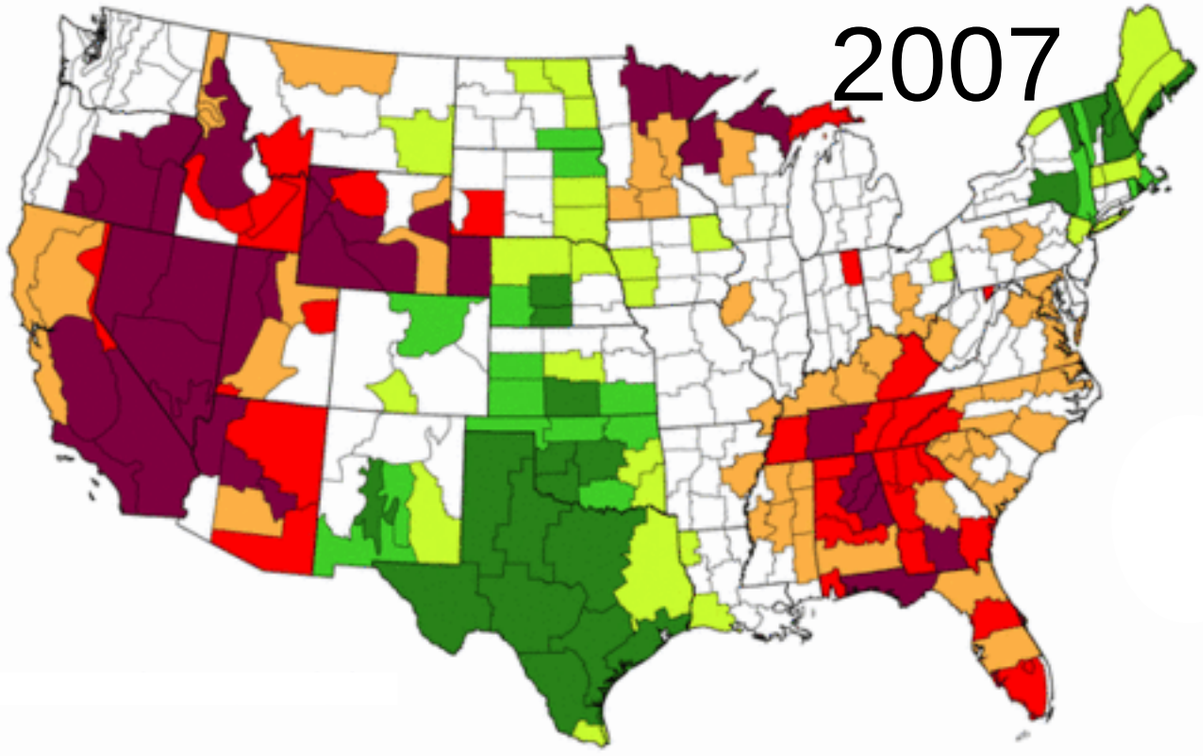
Palmer Drought Severity Index - July

1934

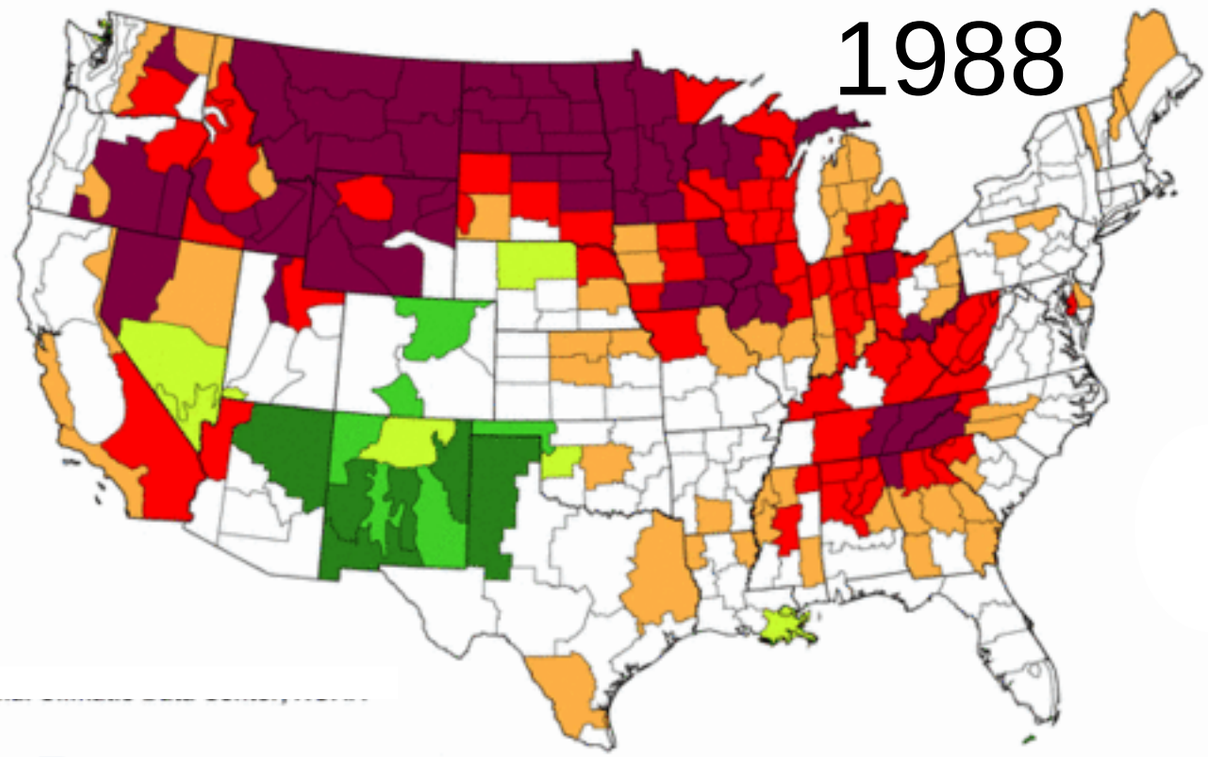


2007

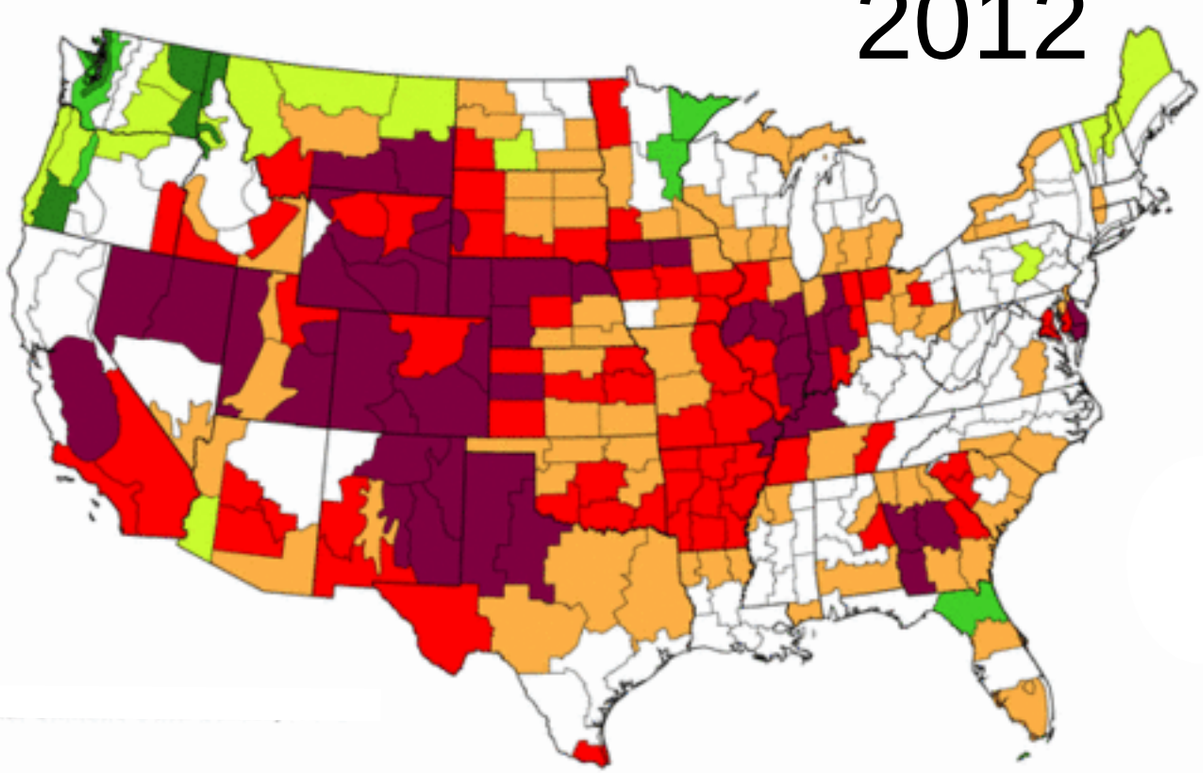


extreme drought	severe drought	moderate drought	mid–range	moderately moist	very moist	extremely moist
−4.00 and below	−3.00 to −3.99	−2.00 to −2.99	−1.99 to +1.99	+2.00 to +2.99	+3.00 to +3.99	+4.00 and above

1988



2012



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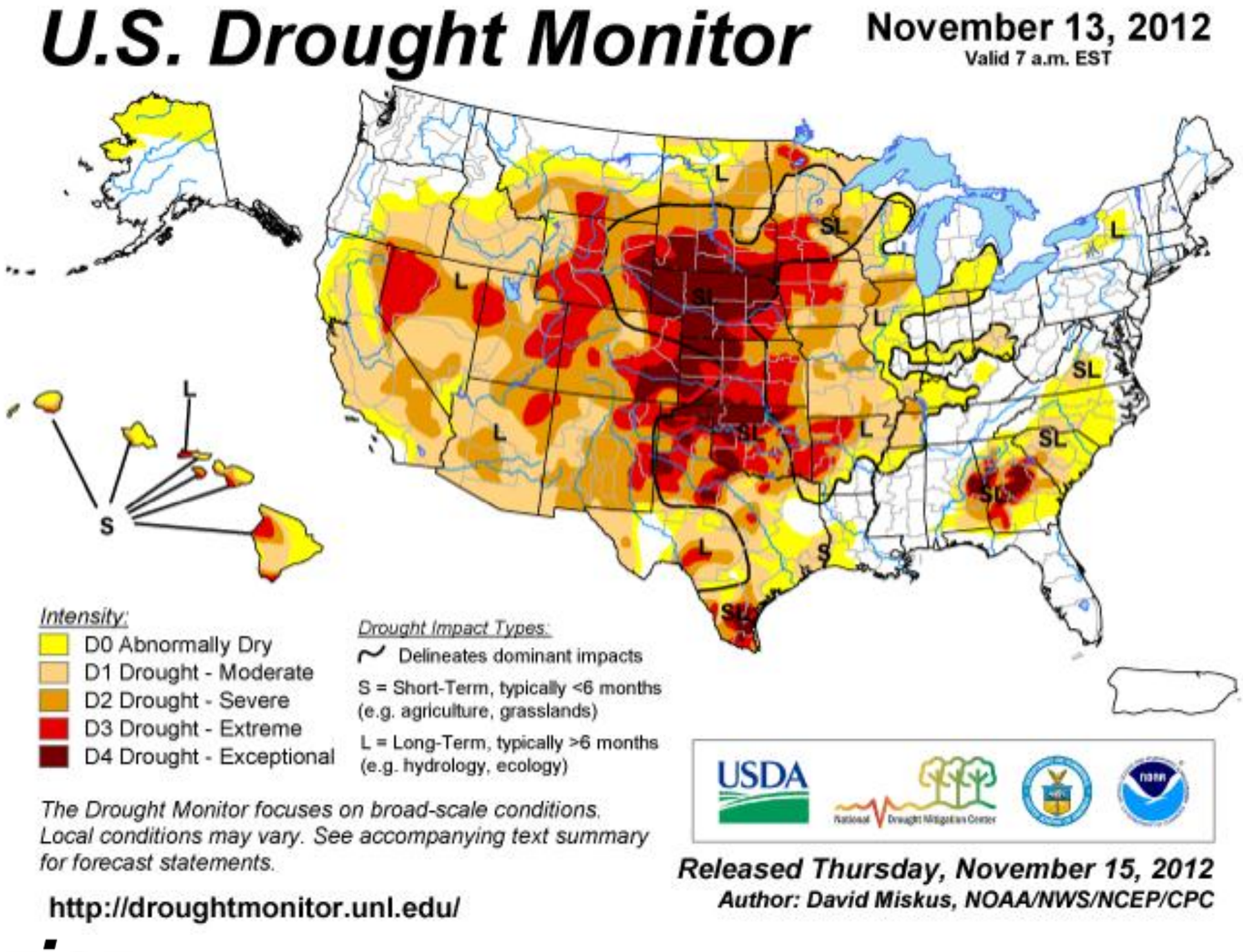
http://www.ncdc.noaa.gov/temp-and-precip/drought/historical-palmers.php

The latest -- a subjective blend



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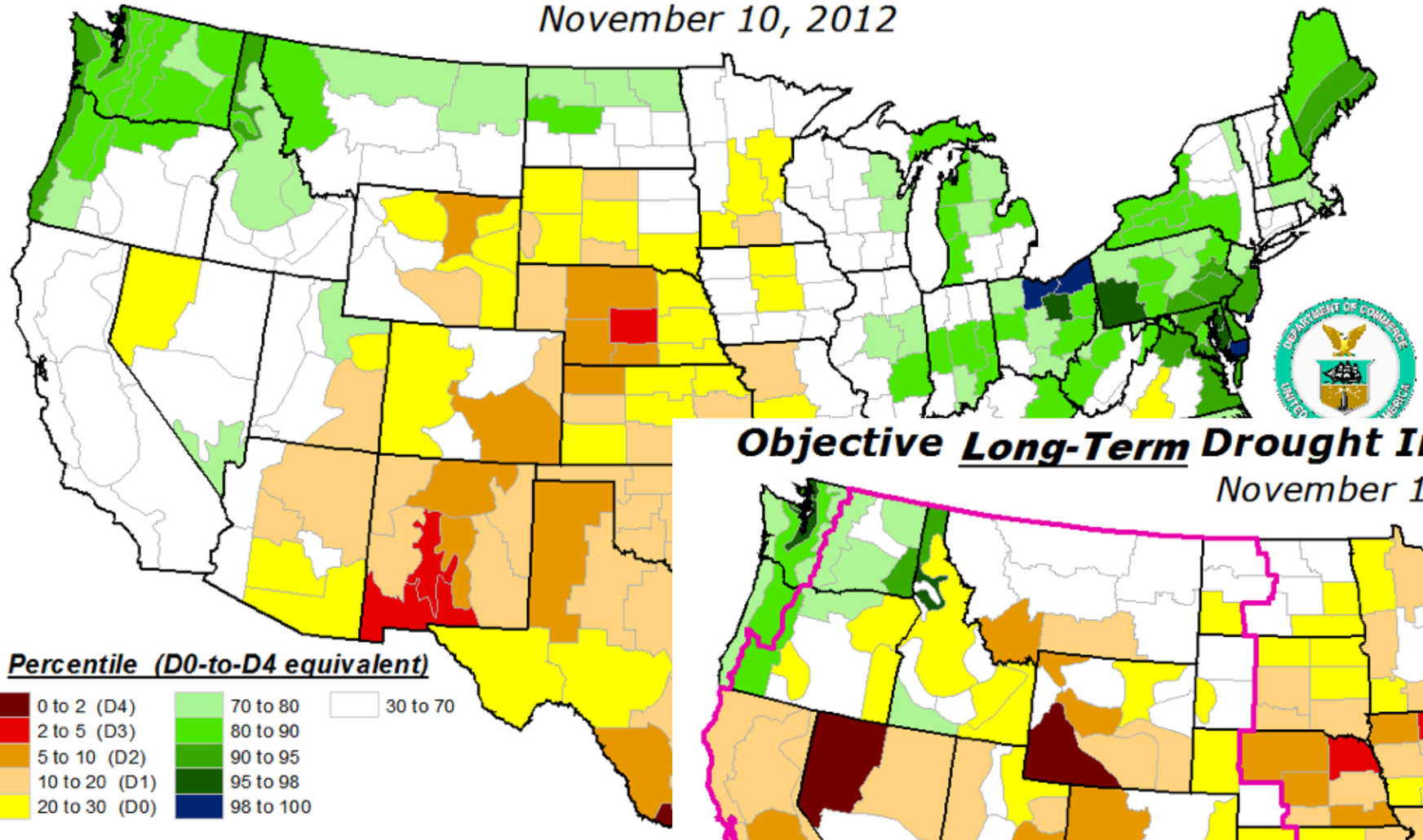
Objective *Short-Term* Drought Indicator Blend Percentiles

November 10, 2012



Percentile (D0-to-D4 equivalent)

0 to 2 (D4)	70 to 80	30 to 70
2 to 5 (D3)	80 to 90	
5 to 10 (D2)	90 to 95	
10 to 20 (D1)	95 to 98	
20 to 30 (D0)	98 to 100	

Inputs (as percentiles):

35% Palmer Z-Index
25% 3-Month Precipitation
20% 1-Month Precipitation
13% CPC Soil Moisture Model
7% Palmer Drought Index

This m
a few
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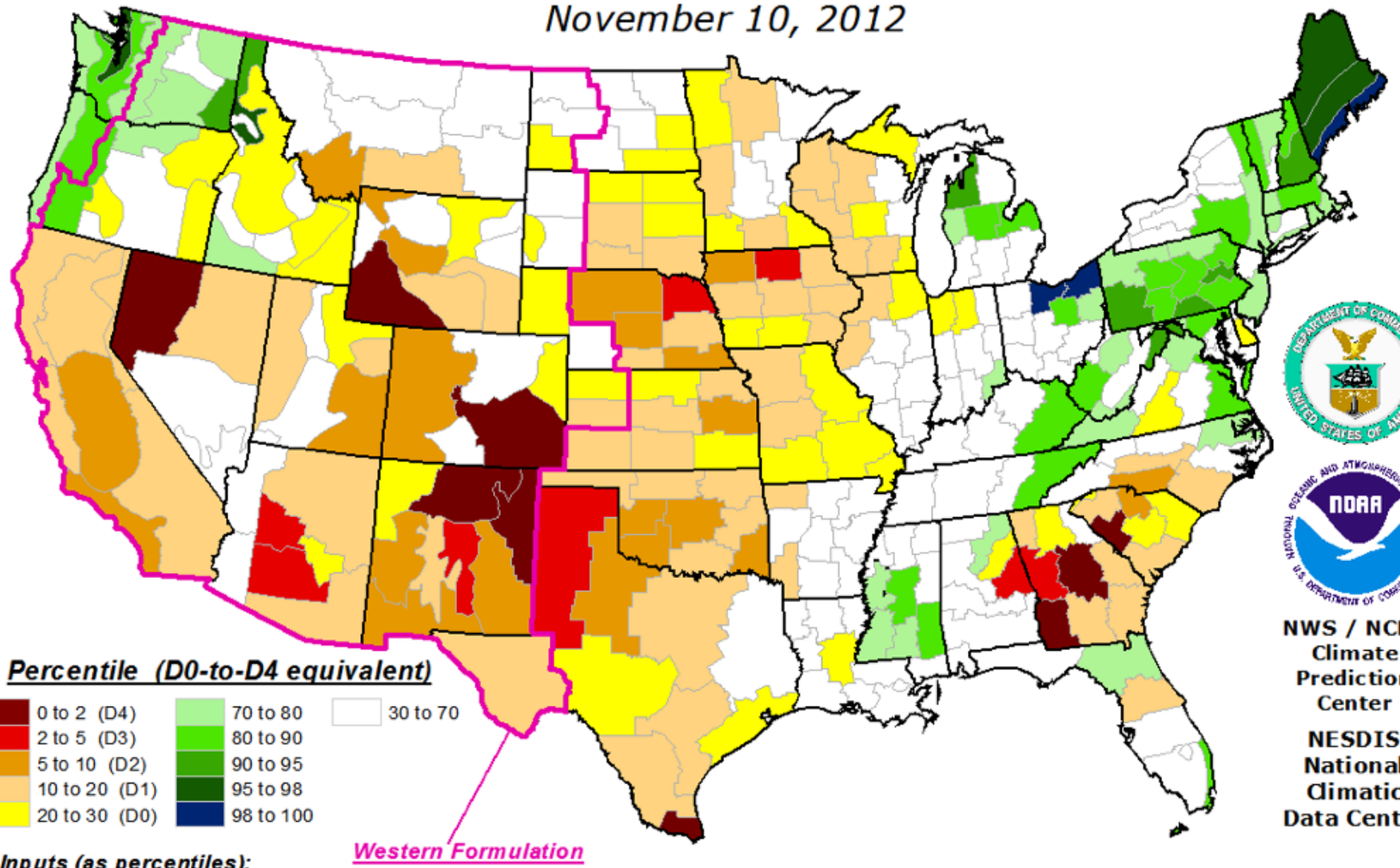
can va

Searching for just the right blend...

Objective *Long-Term* Drought Indicator Blend Percentiles

November 10, 2012



Percentile (D0-to-D4 equivalent)

0 to 2 (D4)	70 to 80	30 to 70
2 to 5 (D3)	80 to 90	
5 to 10 (D2)	90 to 95	
10 to 20 (D1)	95 to 98	
20 to 30 (D0)	98 to 100	

Inputs (as percentiles):

25% Palmer Hydrologic Index
20% 24-Month Precipitation
20% 12-Month Precipitation
15% 6-Month Precipitation
10% 60-Month Precipitation
10% CPC Soil Moisture Model

Western Formulation
Inputs (as percentiles):

30% Palmer Hydrologic Index
30% 60-Month Average Z-Index
10% 60-Month Precipitation
10% 24-Month Precipitation
10% 12-Month Precipitation
10% CPC Soil Moisture Model

NWS / NCEP Climate Prediction Center

NESDIS National Climatic Data Center

Inputs (as percentiles):

25% Palmer Hydrologic Index
20% 24-Month Precipitation
20% 12-Month Precipitation
15% 6-Month Precipitation
10% 60-Month Precipitation
10% CPC Soil Moisture Model

This map approximates impacts responding to precipitation over the course of several months to a few years, such as reservoir content, groundwater, and lake levels. HOWEVER, THE RELATIONSHIP BETWEEN INDICATORS AND WATER SUPPLIES CAN VARY MARKEDLY WITH LOCATION, SEASON, SOURCE, AND MANAGEMENT PRACTICE. Do not interpret this map too literally.

This map is based on preliminary climate division data. Local conditions and/or final data may differ. See the detailed product suite description for more details.

Drought Indices

- PDSI - Palmer Drought Severity Index
- Crop Moisture Index
- Drought Monitor (current)
- Drought Indicators: Short-term, Long-term

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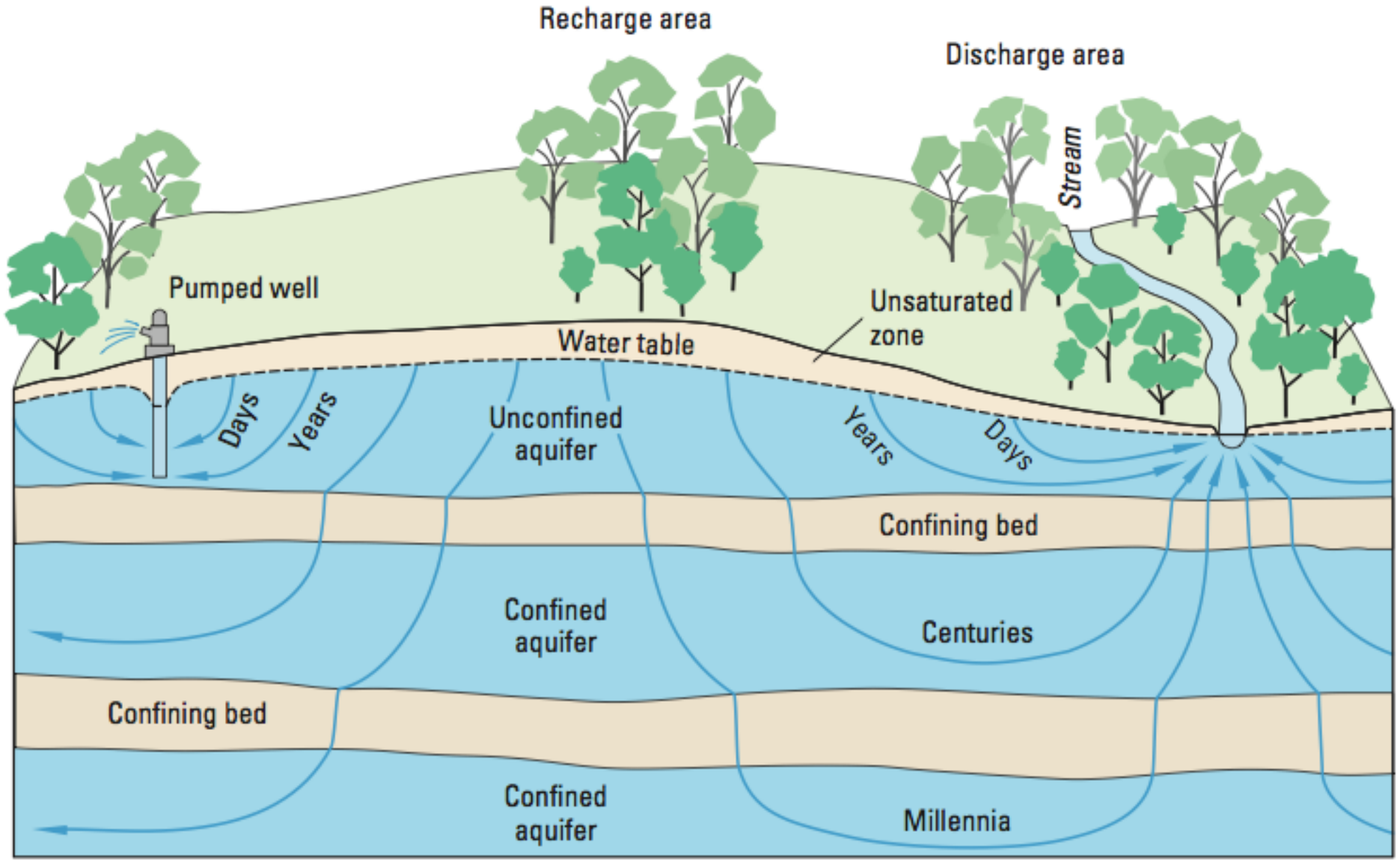

Barlow, P.M., and Leake, S.A., 2012, Streamflow depletion by wells—
Understanding and managing the effects of groundwater pumping on
streamflow: U.S. Geological Survey Circular 1376, 84 p.
(Also available at http://pubs.usgs.gov/circ/1376/.)

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March

April

USGS

2012

Hydrologic Drought

Explanation - Percentile classes							
Low	<10	10-24	25-75	76-90	>90	High	No Data
	Much below normal	Below normal	Normal	Above normal	Much above normal		

Sept

Oct

May 2006

Sep 2006

2006-2007
Drought
NW Wisconsin

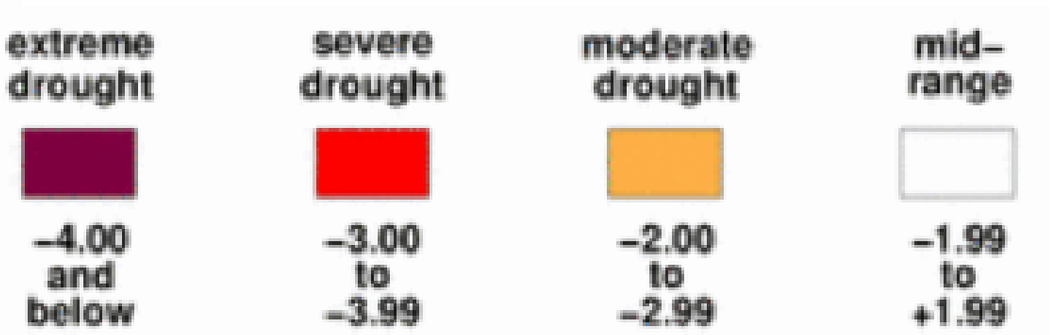
June 2006

Oct 2006

Emerged June 2006
persisted through end of year

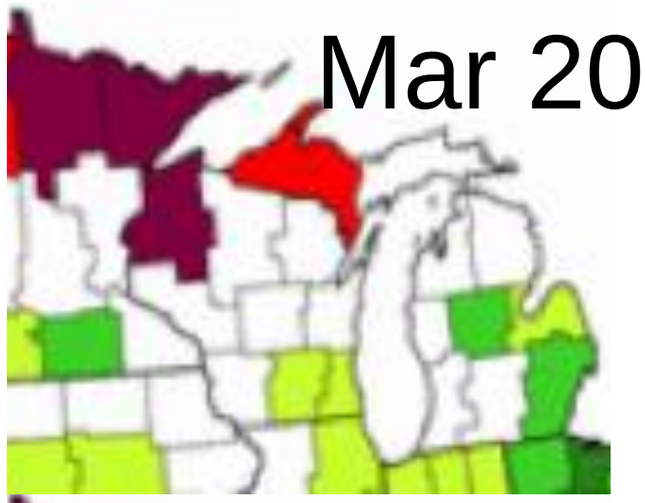
July 2006

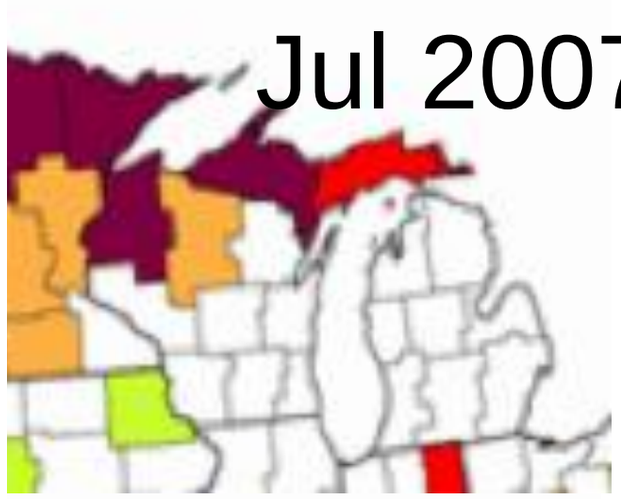
Nov 2006



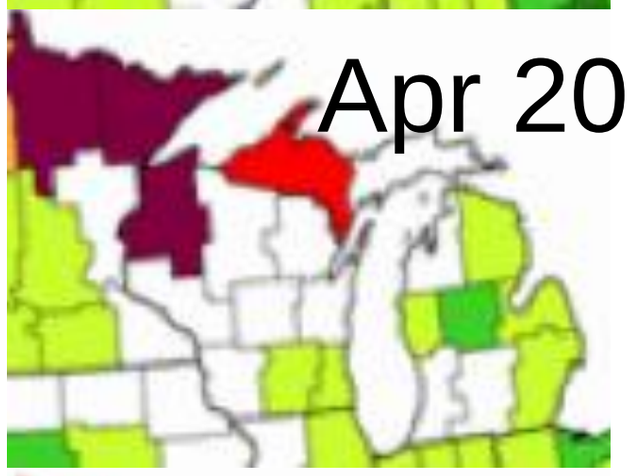
Aug 2006

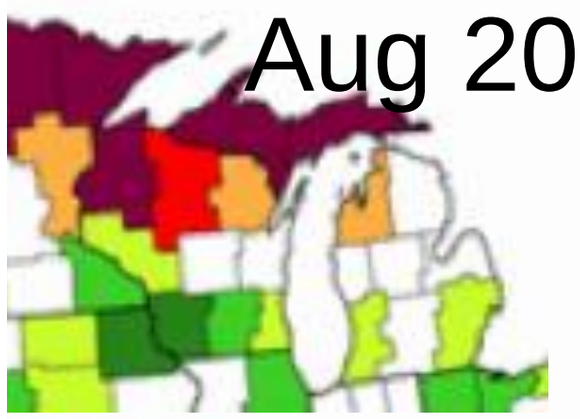
Dec 2006

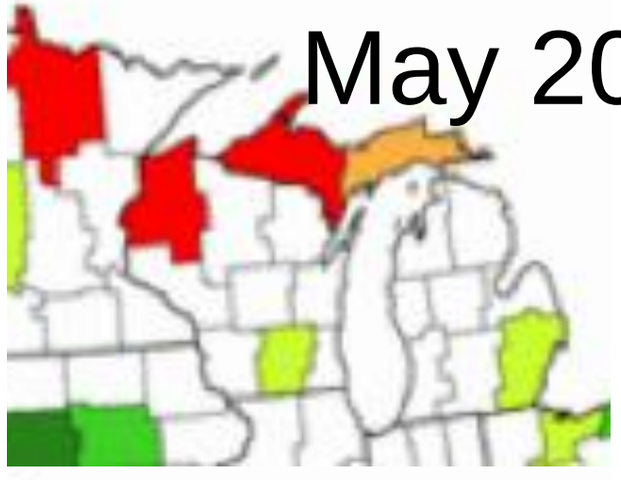


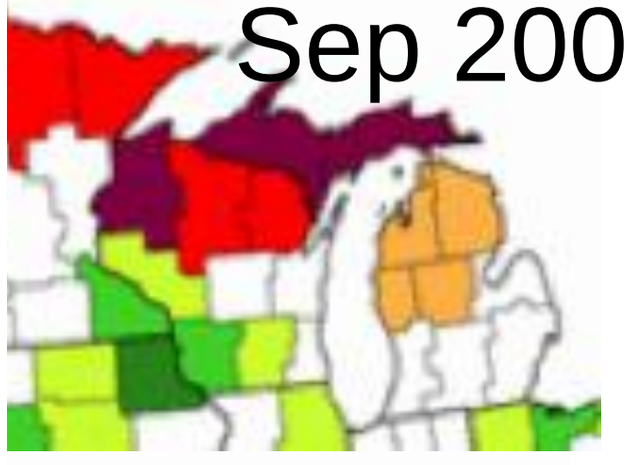


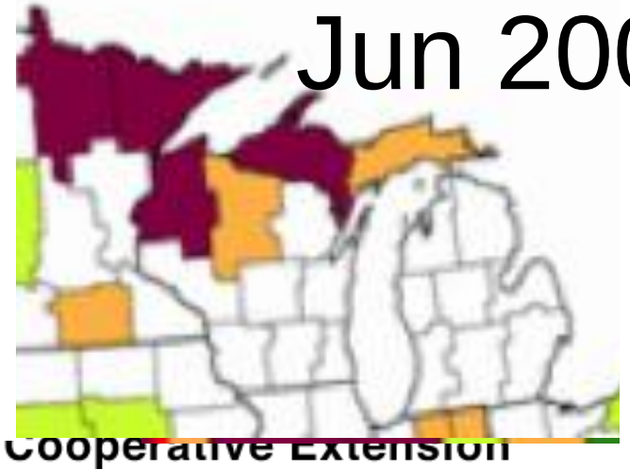
Drought Continued Through Growing Season

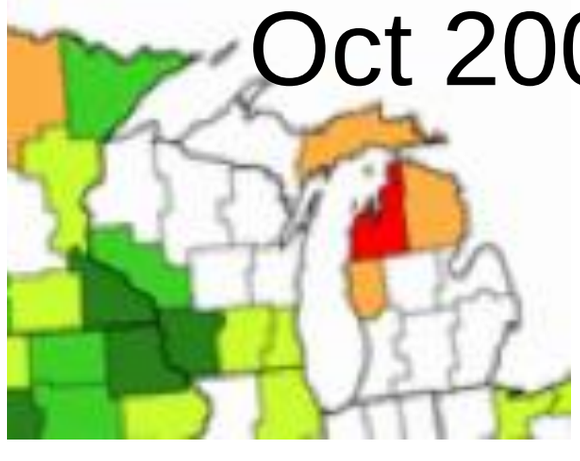












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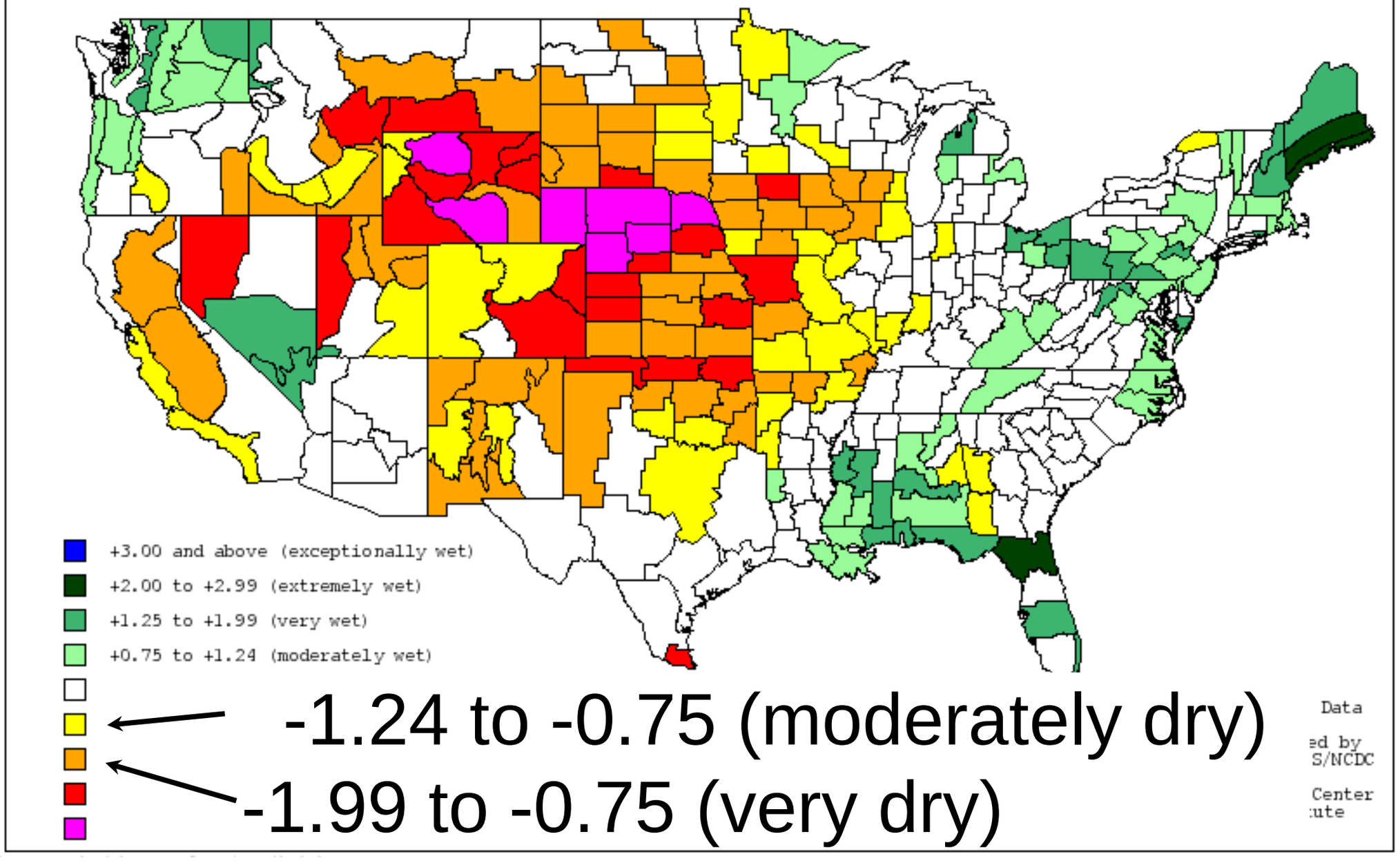
Standardized Precipitation Index

Compared to 1895-present statistics



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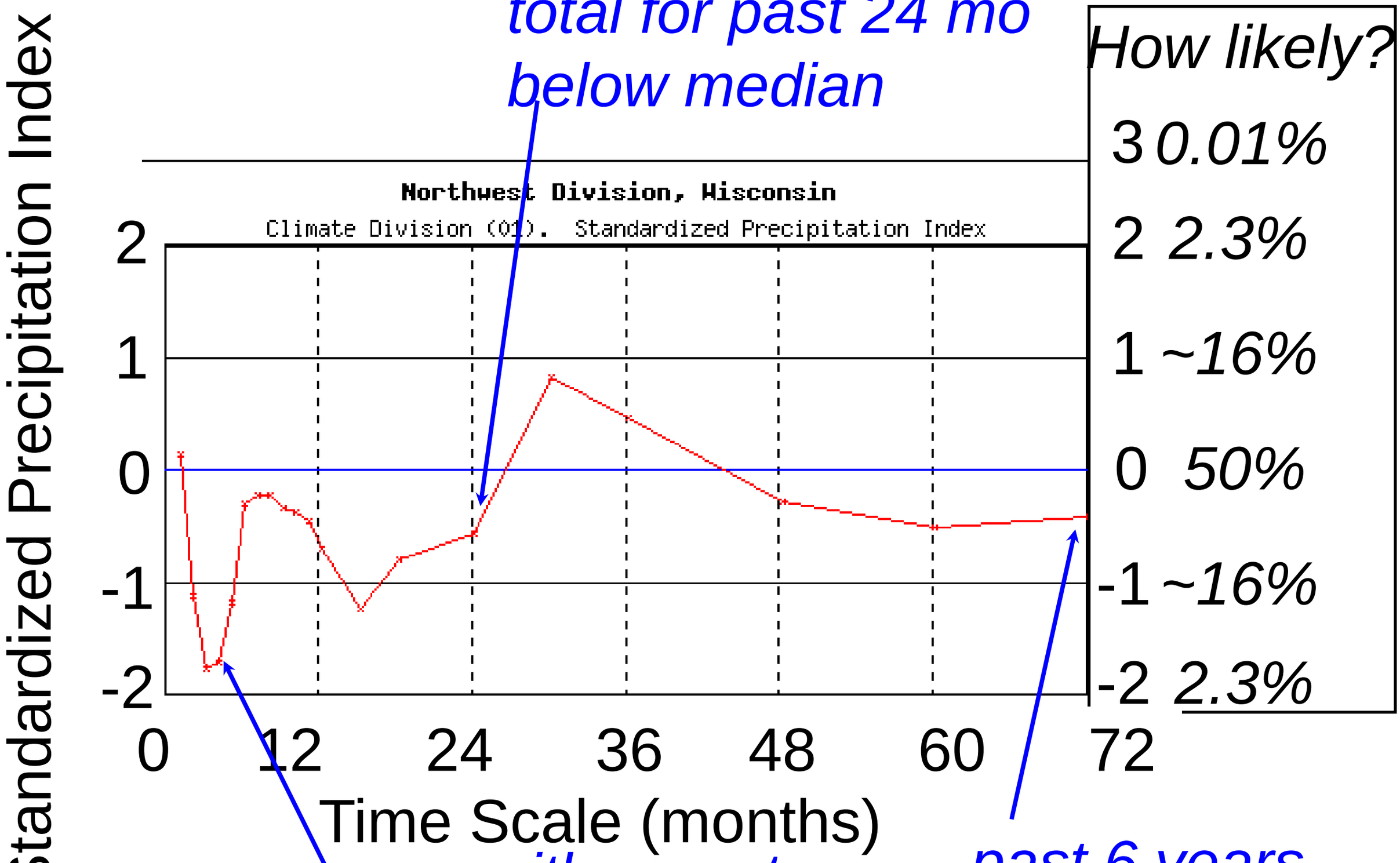
SPI: 6-months, ending October

total for past 24 mo below median



even with recent rains, 3-, 4-, 5-mo totals very unusual

past 6 years drier than normal

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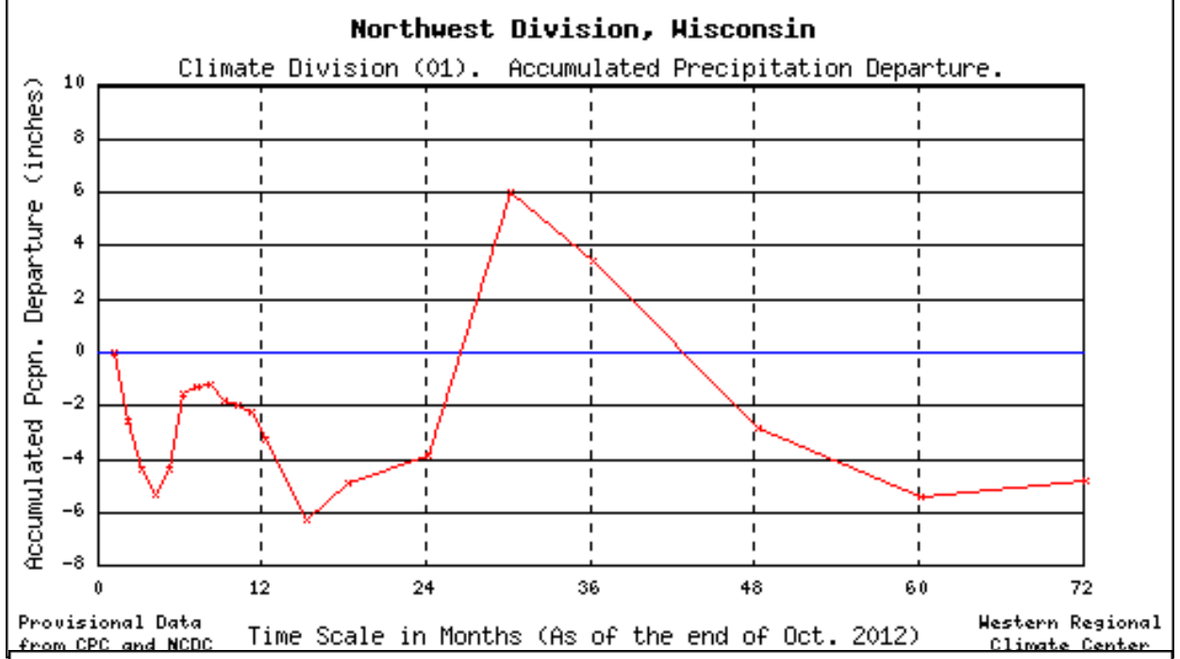
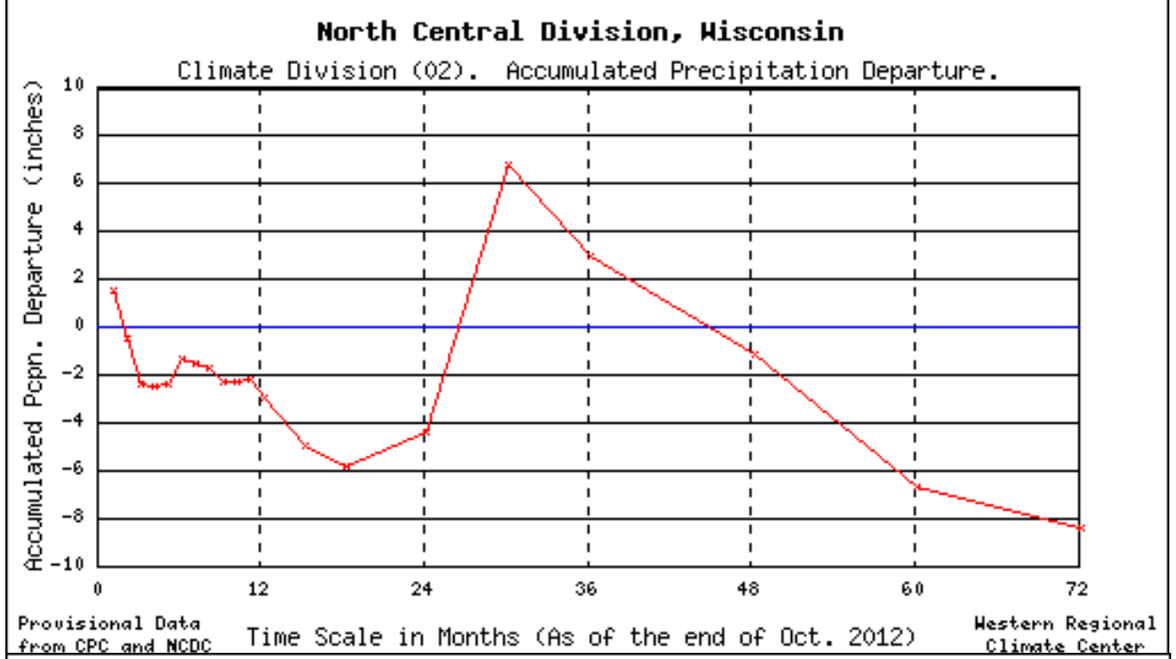
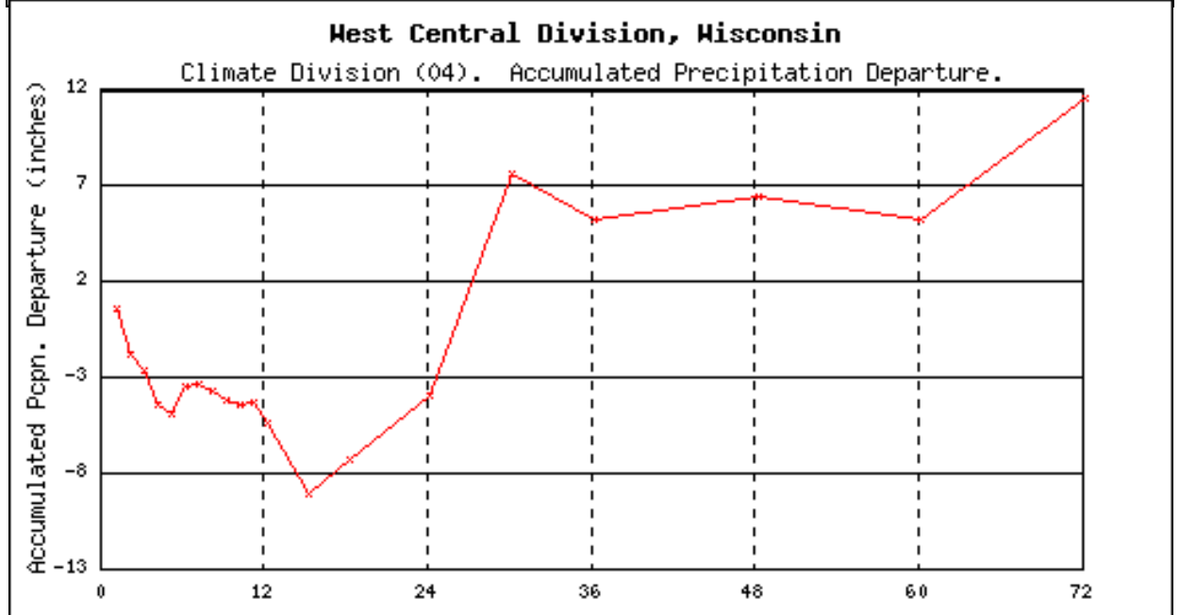
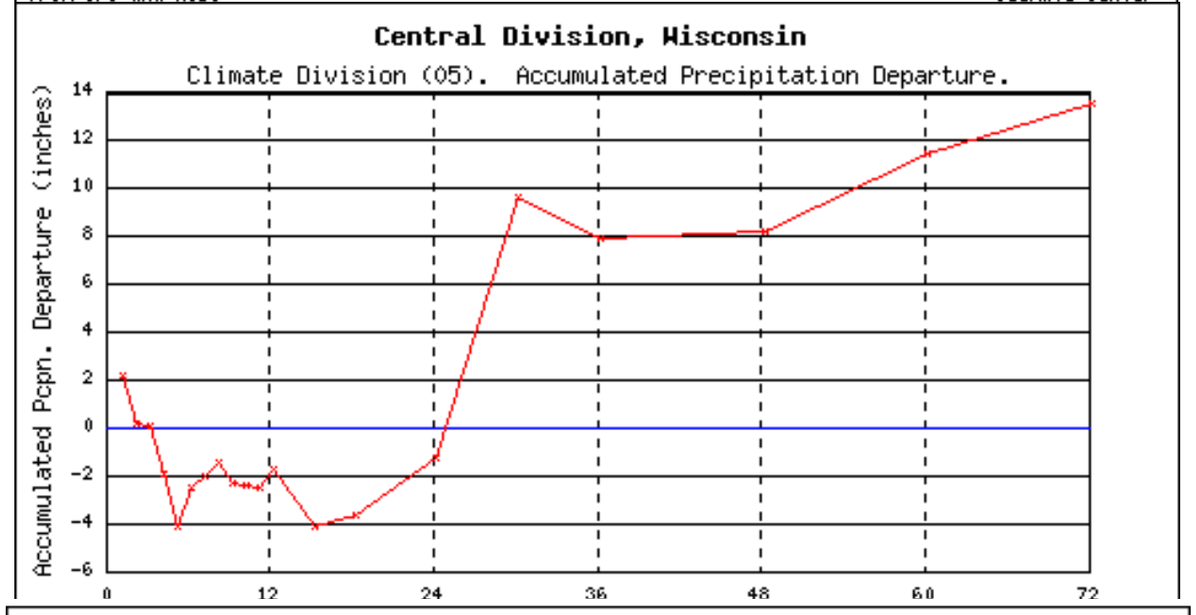
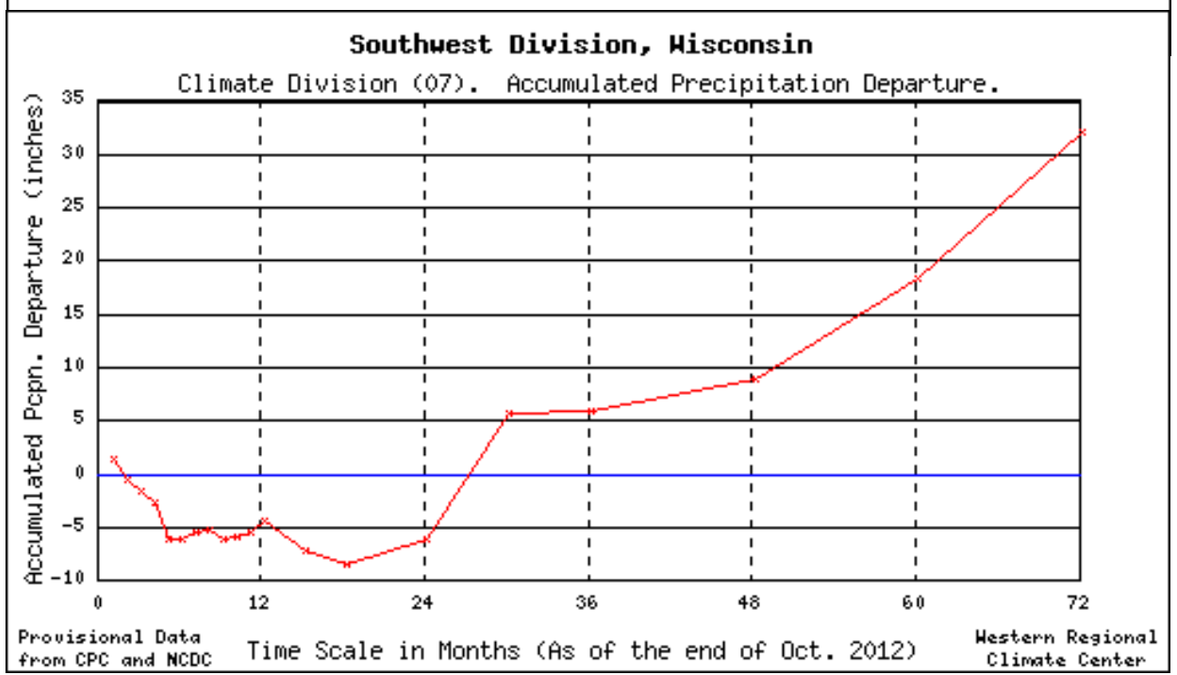
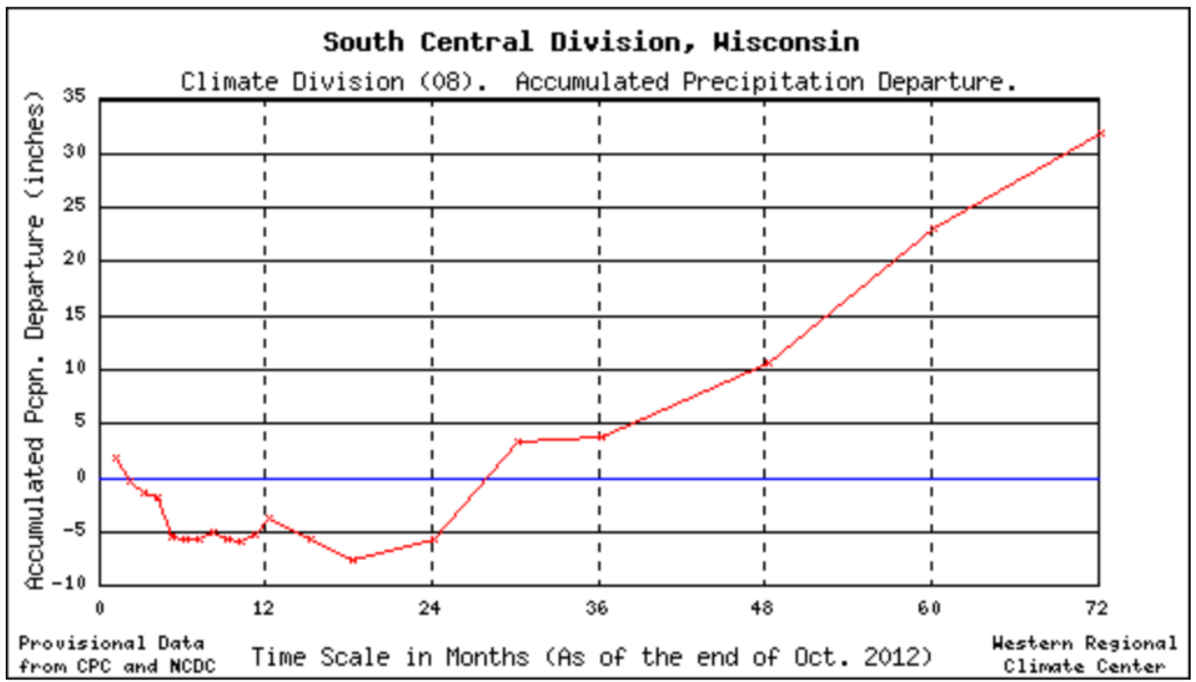

Northwest Division, Wisconsin
Climate Division (01). Accumulated Precipitation Departure.
Accumulated Pcpn. Departure (inches)
10
8
6
4
2
0
-2
-4
-6
-8
0
12
24
36
48
60
72
Provisional Data from CPC and NCDC
Time Scale in Months (As of the end of Oct. 2012)
Western Regional Climate Center


North Central Division, Wisconsin
Climate Division (02). Accumulated Precipitation Departure.
Accumulated Pcpn. Departure (inches)
10
8
6
4
2
0
-2
-4
-6
-8
-10
0
12
24
36
48
60
72
Provisional Data from CPC and NCDC
Time Scale in Months (As of the end of Oct. 2012)
Western Regional Climate Center


West Central Division, Wisconsin
Climate Division (04). Accumulated Precipitation Departure.
Accumulated Pcpn. Departure (inches)
12
7
2
-3
-8
-13
0
12
24
36
48
60
72


Central Division, Wisconsin
Climate Division (05). Accumulated Precipitation Departure.
Accumulated Pcpn. Departure (inches)
14
12
10
8
6
4
2
0
-2
-4
-6
0
12
24
36
48
60
72


Southwest Division, Wisconsin
Climate Division (07). Accumulated Precipitation Departure.
Accumulated Pcpn. Departure (inches)
35
30
25
20
15
10
5
0
-5
-10
0
12
24
36
48
60
72
Provisional Data from CPC and NCDC
Time Scale in Months (As of the end of Oct. 2012)
Western Regional Climate Center


South Central Division, Wisconsin
Climate Division (08). Accumulated Precipitation Departure.
Accumulated Pcpn. Departure (inches)
35
30
25
20
15
10
5
0
-5
-10
0
12
24
36
48
60
72
Provisional Data from CPC and NCDC
Time Scale in Months (As of the end of Oct. 2012)
Western Regional Climate Center

SPI-months
end May 3/9
end Aug 3

Wet
Dry

1.3/.6
1.0

.4/.5
.4

.2/.8
.6

.2/1.3
1.4

.2/.8
1.3

.8/.5
.8

.6/.7
.2

1.2/.5
.9

1.0/.6
.4

.1/.3
.8

.4/0
1.2

.3/.4
.6

.4/.2
1.5

.3/.2
1.6

.3/.2
1.3

2012

.1/.3
.8

.3/.8
1.1

.2/1
.6

2007

1.5/1.1
2.3

.6/1
2.2

1.7/.6
2.1

1.6/1.3
2.6

1.6/.8
2.5

1.8/.4
3

2/1.1
3.1

1.3/.3
3.1

1.6/.4
3.1

1988

0/1
2.3

.4/.1
1.6

1.1/.9
1.5

1/.6
2.2

1.8/1.5
2.4

2.2/1.1
2.7

2.5/1.8
2.2

2.8/1.8
1.1

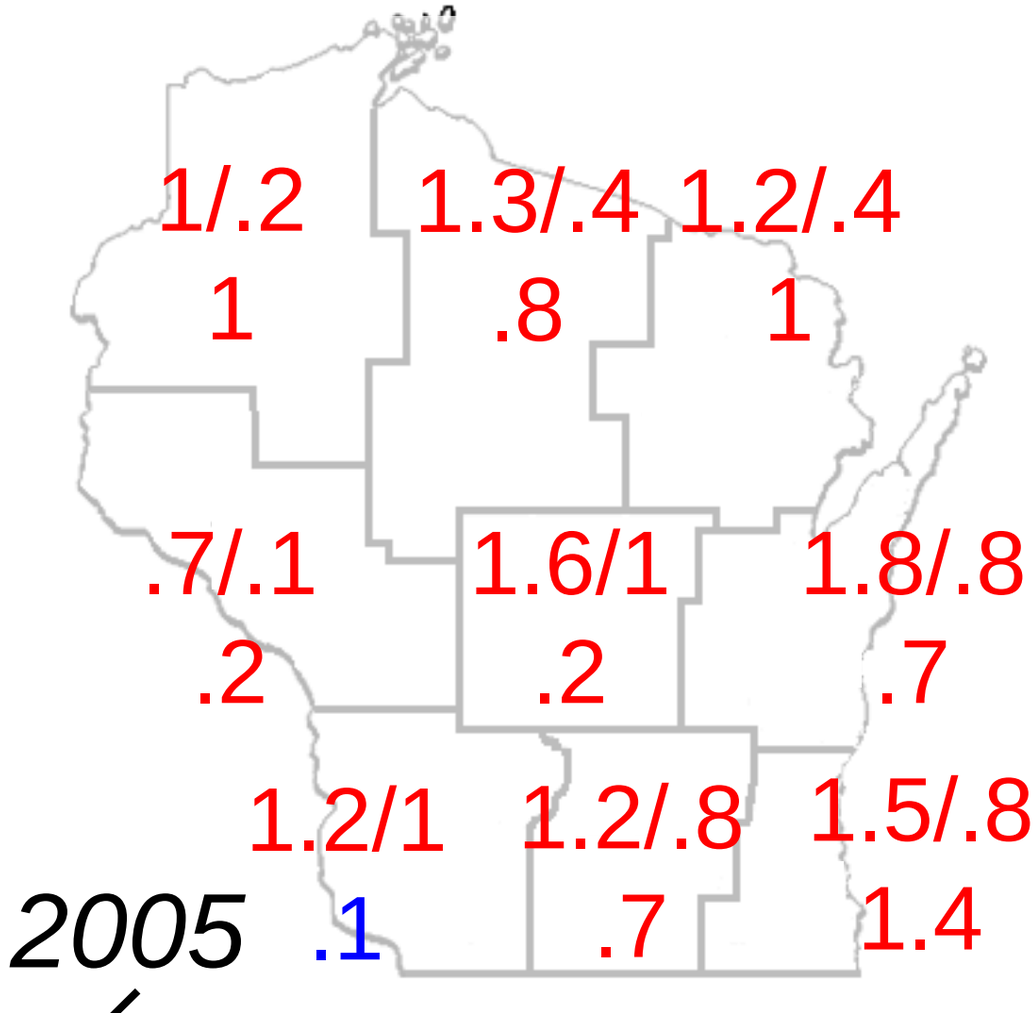
2.4/1.1
2.3

1936

So just below-average rainfall not enough for drought

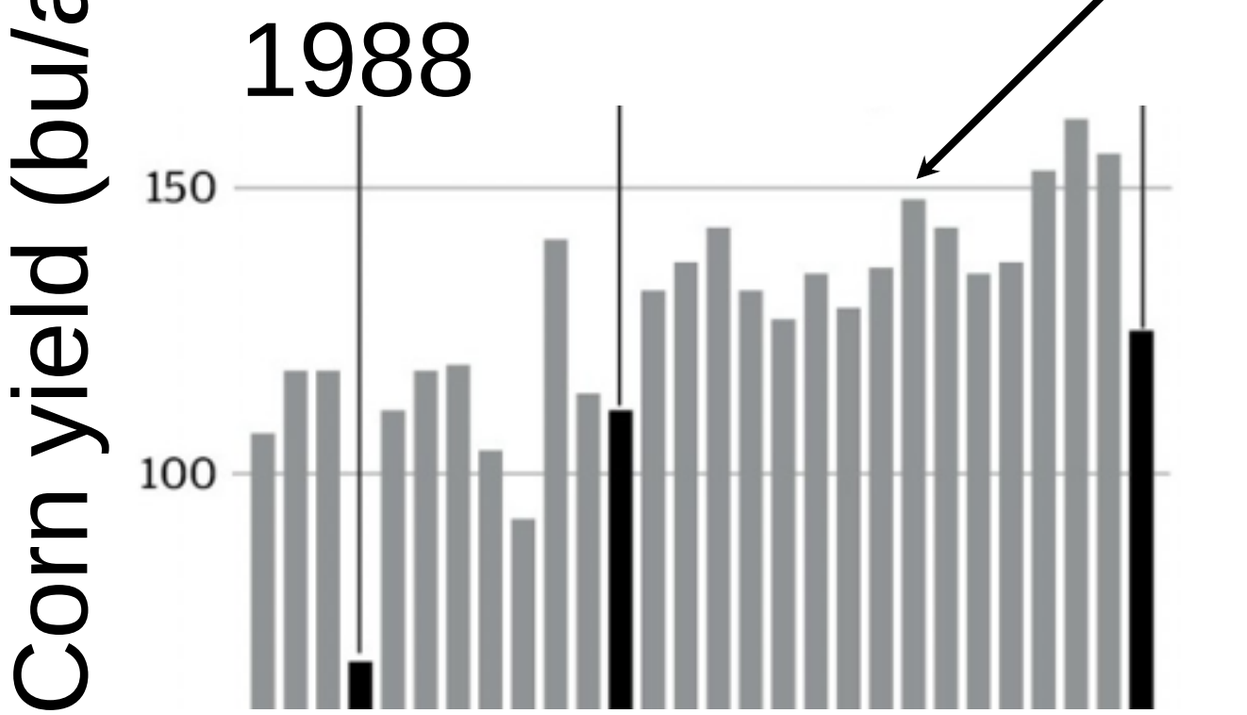
SPI-months
end May 3/9
end Aug 3

Wet
Dry



2005

Wisconsin



Outlook

- how depleted is subsoil moisture?
  - hangover effect
- do global conditions give clues about upcoming months?
  - ENSO, etc

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Depth (cm)	Field texture	FC (-33 kPa)	PWP (-1500 kPa)	VMC (%)	deficit (cm)
0-15	Silty loam	31	11	8.3	3.4
25-35	Silty loam	31	11	11.7	1.9
50-60	Silty clay loam	38	22	14.2	2.4
80-90	Silty clay loam	38	22	16.7	2.1
110-120	Silty clay	41	27	19.2	2.2
140-150	Silty clay	41	27	27.5	1.4

Total deficit ***29 cm***

(with some interpolation) ***~12 in***

Edmund series

7/10, Verona, WI

Evans and Hartemink

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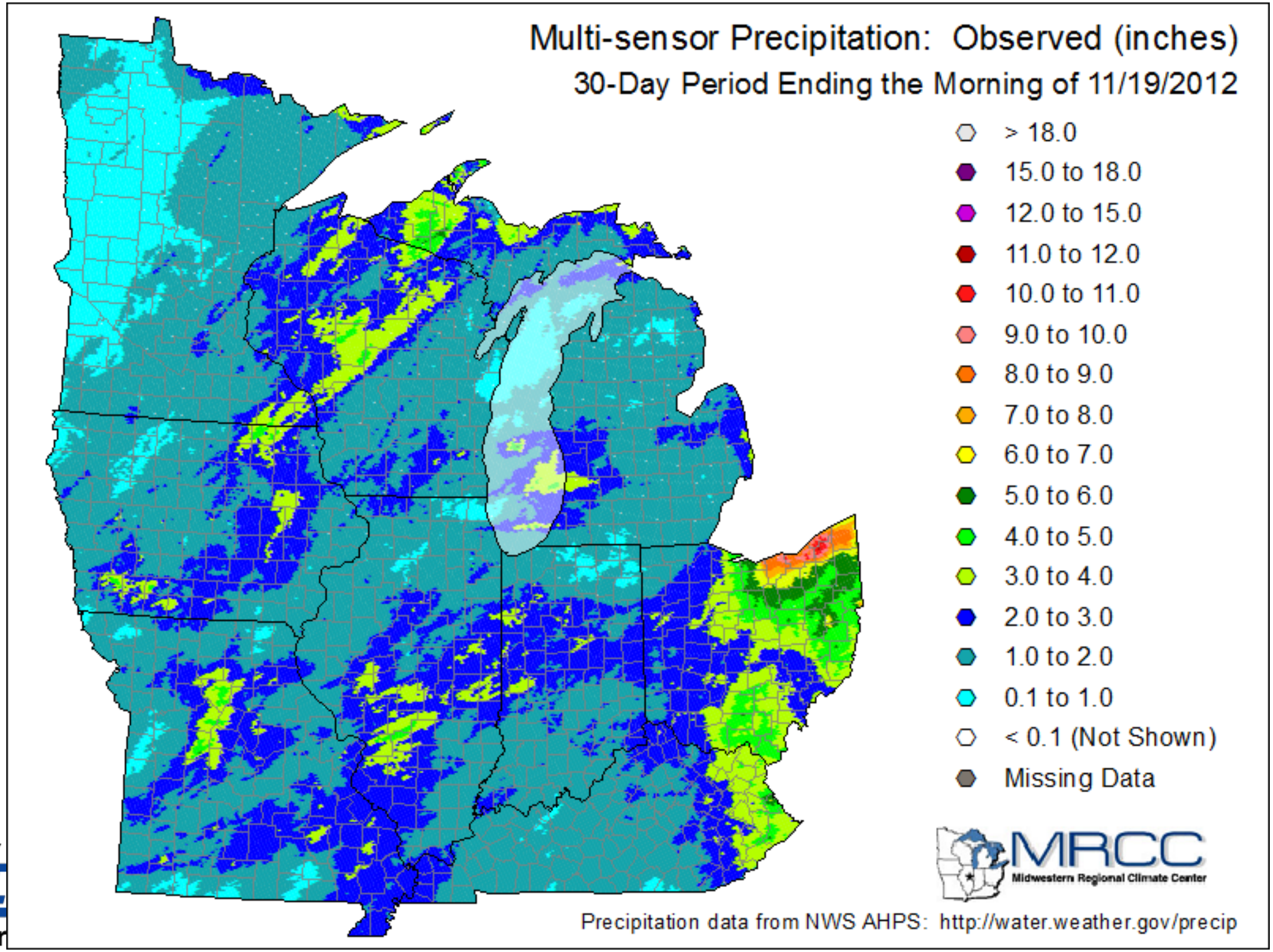
Since start September, 5”-7” statewide



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Dec-Jan-Feb normals

3”- 5”

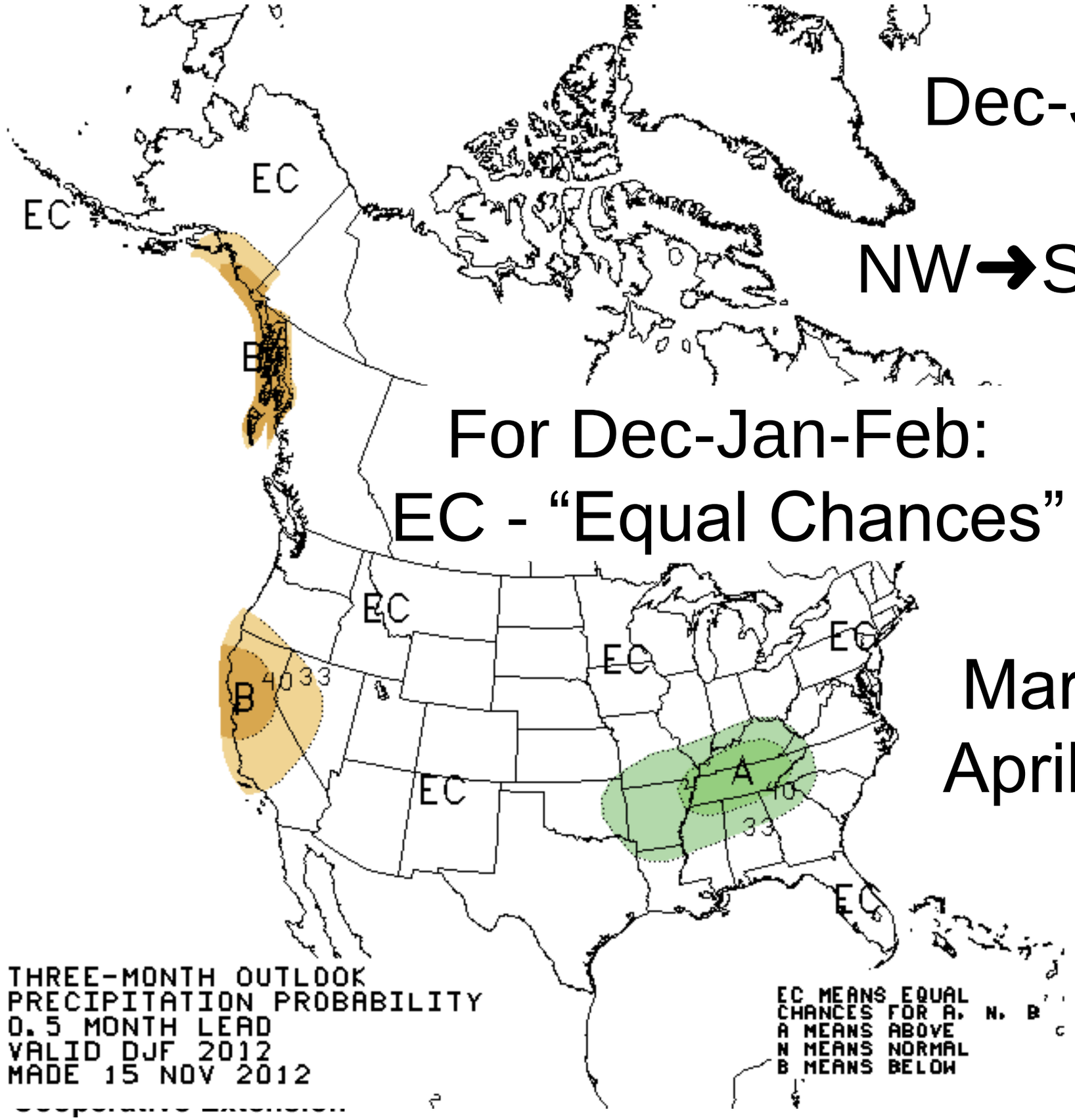
NW➜SE axis, more in SE

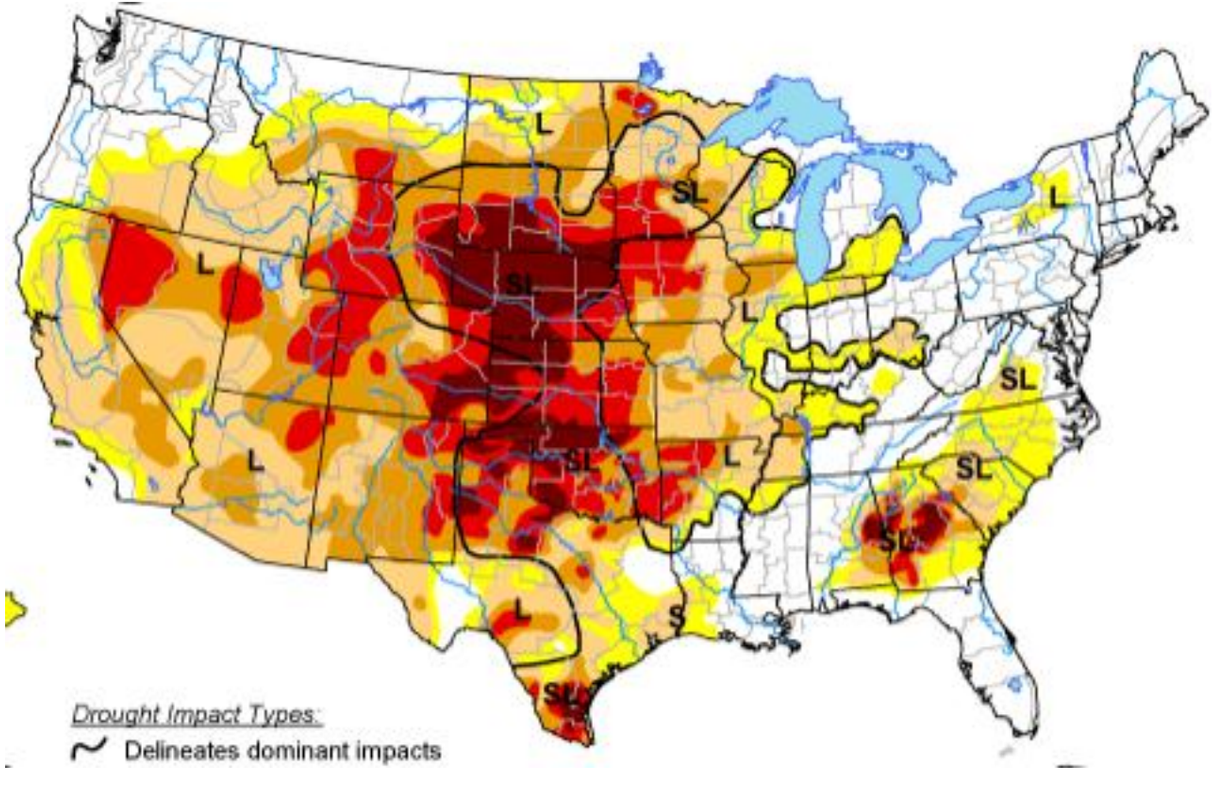
For Dec-Jan-Feb:

EC - “Equal Chances”

March ~2” statewide

April 2”- 4” (NW drier)





Summary

- about 1/2-way to being sure of soil profile refill statewide
- have EC of above-below normal winter precip
- many different drought indices in use

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