Tools for Assessing Drought Regionally and Nationally

U. S. and Potomac Basin Drought Monitors

Drought Monitoring in the Metropolitan Washington Council of Governments Region [Workshop]

Loudon Water
Ashburn, VA
March 19, 2018

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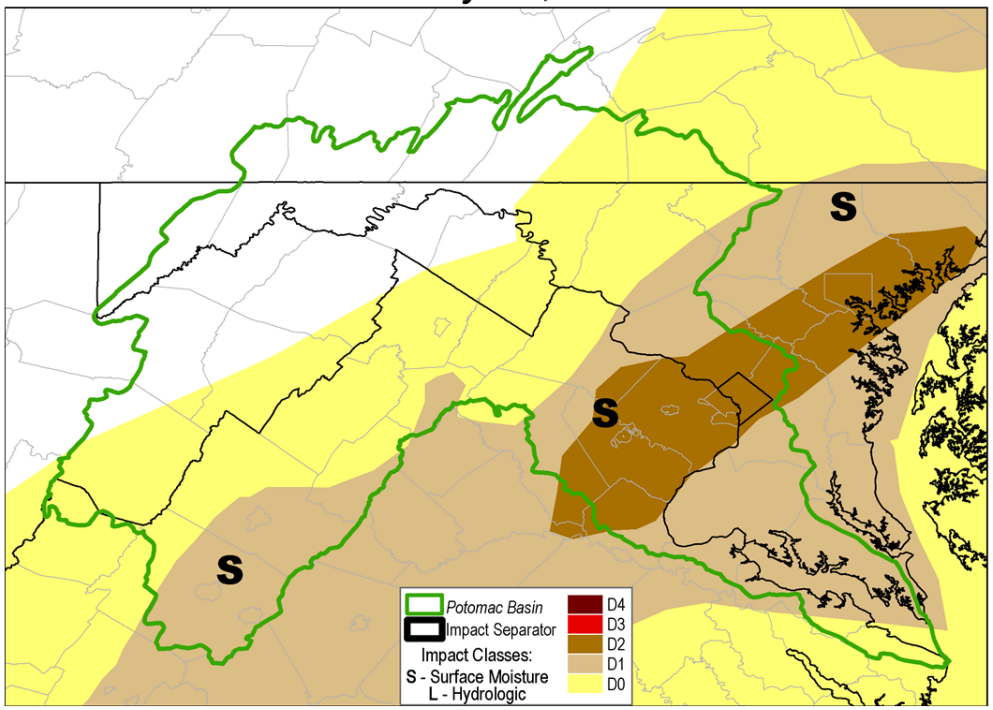
rich.tinker@noaa.gov (your best bet) 301-683-3411

Potomac Basin Drought Monitor

January 30, 2018



Selected Basin-Average Indices on January 28, 2018

	Raw Value	Anomaly	Percentile
Palmer Drought	-0.58	-0.51	40.8 [--]
Palmer Hydrologic	-0.44	-0.40	43.4 [--]
Palmer Z	-0.77	-0.77	37.2 [D0]
CPC Soil Moisture	n/a	n/a	19.4 [D1]
1-Month Precipitation	1.98"	-0.90"	26.5 [D0]
3-Month Precipitation	5.19"	-3.86"	9.3 [D2]
6-Month Precipitation	15.55"	-4.82"	19.8 [D1]
12-Month Precipitation	38.78"	-1.46"	41.6 [--]
24-Month Precipitation	77.18"	-3.20"	36.2 [--]

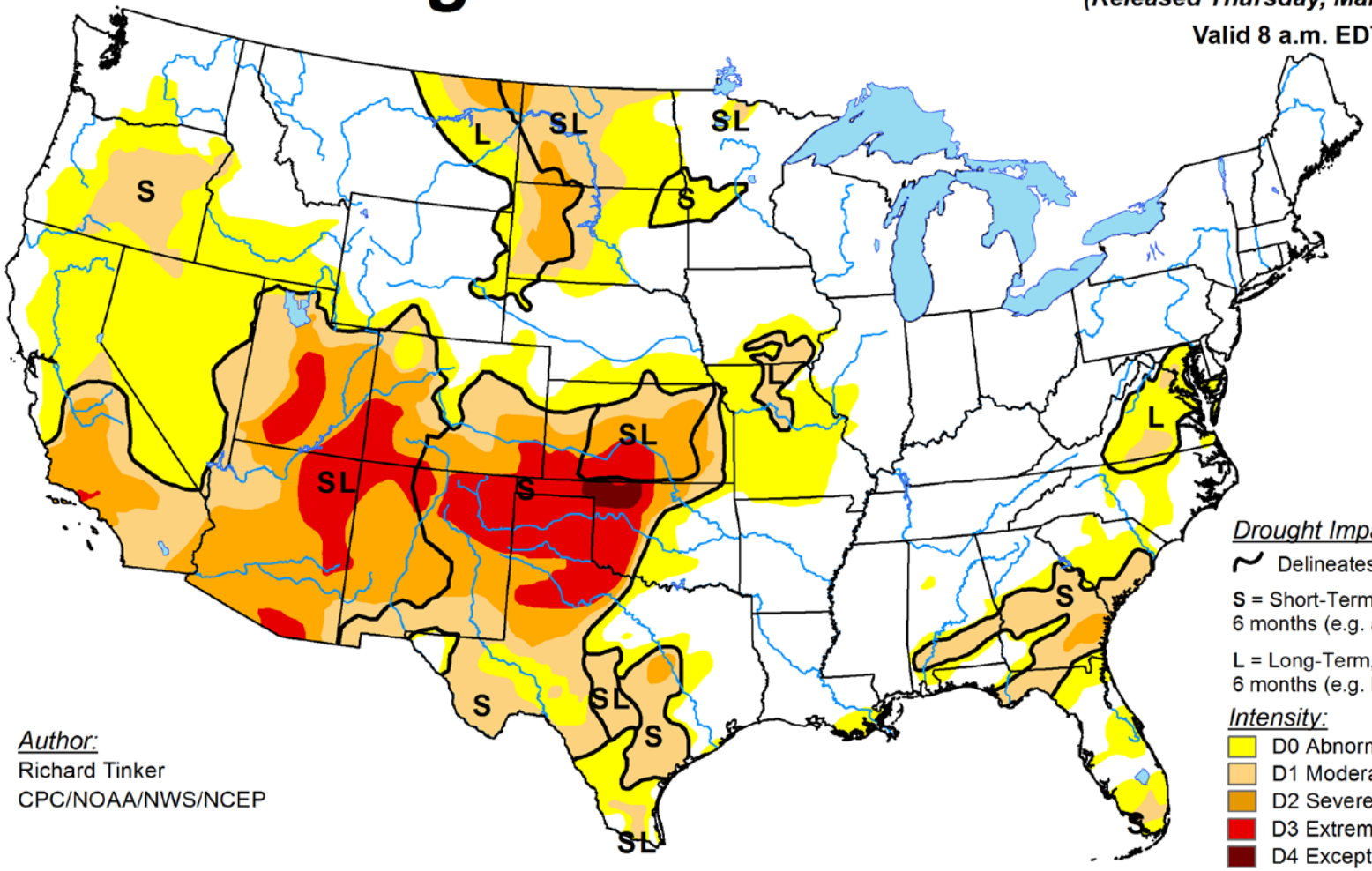
Basin Coverage: **27.3**% Not Dry **38.1**% D0 **25.1**% D1 **9.5**% D2 *Basin Average*: **D{+0.16}**

U.S. Drought Monitor

March 13, 2018

(Released Thursday, Mar. 15, 2018)

Valid 8 a.m. EDT



Author:
Richard Tinker
CPC/NOAA/NWS/NCEP

Drought Impact Types:

~ Delineates dominant impacts

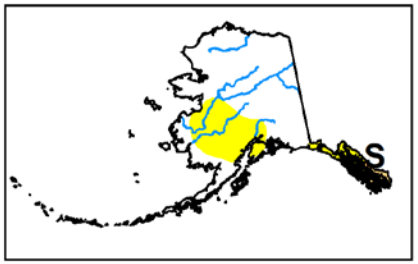
S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)

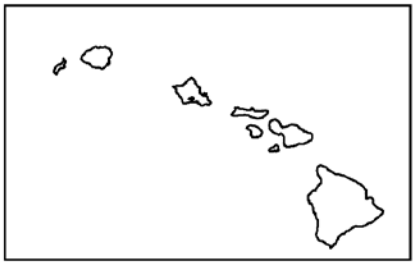
L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

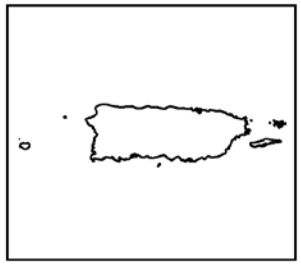
Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

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







USDA NDMC DEPARTMENT OF COMMERCE NOAA

http://droughtmonitor.unl.edu/

U.S. Drought Monitor Authorship
Dec. 5, 2000 – Feb. 27, 2018

Current Authors	Shifts
x Tinker, 2000-18	123
x Miskus, 2000-18	112
x Rippey, 2000-18	89
Heim, 2001-18	72
Fuchs, 2006-18	67
Luebehusen, 2008-18	46
Artusa, 2009-18	41
Simeral, 2012-18	27
Fenimore, 2015-18	12
Bathke, 2016-18	8
Blunden, 2017-18	6
Riganti, 2018	1

x pre-2001 author

Former Authors	Shifts
x Svoboda, 2000-16	86
x Le Comte, 2000-07	54
Brewer, 2008-15	33
x Hayes, 2000-05	29
Rosencrans, 2009-15	28
Edwards, 2008-12	19
Tankersley, 2003-06	10
Guttman, 2006-07	9
Lawrimore, 2007-08	9
Heddinghaus, 2006-07	7
Stephens, 2001-02, '07	6
Unattributed	3
M. James, 2008	2
Gleason, 2001	1

x pre-2001 author

Drought Severity Classification

			Ranges				
Category	Description	Possible Impacts	Palmer Drought Severity Index (PDSI)	CPC Soil Moisture Model (Percentiles)	USGS Weekly Streamflow (Percentiles)	Standardized Precipitation Index (SPI)	Objective Drought Indicator Blends (Percentiles)
D0	Abnormally Dry	Going into drought: • short-term dryness slowing planting, growth of crops or pastures Coming out of drought: • some lingering water deficits • pastures or crops not fully recovered	-1.0 to -1.9	21 to 30	21 to 30	-0.5 to -0.7	21 to 30
D1	Moderate Drought	• Some damage to crops, pastures • Streams, reservoirs, or wells low, some water shortages developing or imminent • Voluntary water-use restrictions requested	-2.0 to -2.9	11 to 20	11 to 20	-0.8 to -1.2	11 to 20
D2	Severe Drought	• Crop or pasture losses likely • Water shortages common • Water restrictions imposed	-3.0 to -3.9	6 to 10	6 to 10	-1.3 to -1.5	6 to 10
D3	Extreme Drought	• Major crop/pasture losses • Widespread water shortages or restrictions	-4.0 to -4.9	3 to 5	3 to 5	-1.6 to -1.9	3 to 5
D4	Exceptional Drought	• Exceptional and widespread crop/pasture losses • Shortages of water in reservoirs, streams, and wells creating water emergencies	-5.0 or less	0 to 2	0 to 2	-2.0 or less	0 to 2

Short-term drought indicator blends focus on 1-3 month precipitation. Long-term blends focus on 6-60 months. Additional indices used, mainly during the growing season, include the USDA/NASS Topsoil Moisture, Keetch-Byram Drought Index (KBDI), and NOAA/NESDIS satellite Vegetation Health Indices. Indices used primarily during the snow season and in the West include snow water content, river basin precipitation, and the Surface Water Supply Index (SWSI). Other indicators include groundwater levels, reservoir storage, and pasture/range conditions.

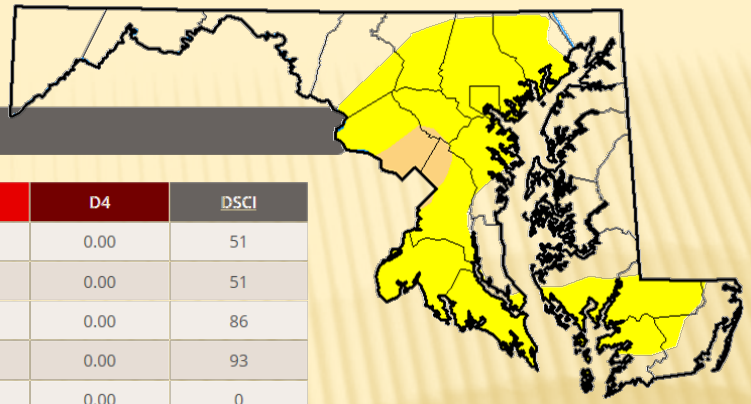
Area type: County | Area: Fairfax County (VA) | Statistics type: Categorical Percent Area | USDM | 7-day Change

Percent Area in U.S. Drought Monitor Categories

Show 25 entries | Search:

Week	None	D0	D1	D2	D3	D4	DSCI
2018-03-13	0.00	10.47	89.53	0.00	0.00	0.00	190
2018-03-06	0.00	10.47	89.53	0.00	0.00	0.00	190
2018-02-27	0.00	10.47	89.53	0.00	0.00	0.00	190
2018-02-20	0.00	10.47	89.53	0.00	0.00	0.00	190
2018-02-13	0.00	10.47	89.53	0.00	0.00	0.00	190
2018-02-06	0.00	0.00	1.46	98.54	0.00	0.00	299
2018-01-30	0.00	0.00	1.46	98.54	0.00	0.00	299
2018-01-23	0.00	0.00	100.00	0.00	0.00	0.00	200
2018-01-16	0.00	0.00	100.00	0.00	0.00	0.00	200
2018-01-09	0.00	0.00	100.00	0.00	0.00	0.00	200
2018-01-02	0.00	0.00	100.00	0.00	0.00	0.00	200

Statistics



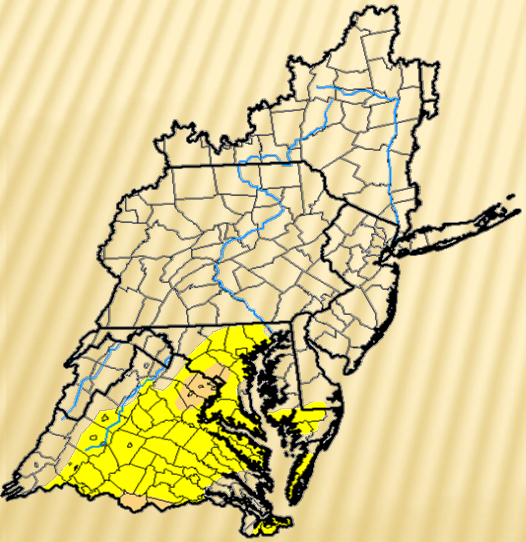
Statistics type: Categorical Percent Area | Display: Statistics | Export table: CSV XLS

Week	Date	None	D0	D1	D2	D3	D4	DSCI
Current	2018-03-13	52.40	44.50	3.10	0.00	0.00	0.00	51
Last Week	2018-03-06	52.40	44.50	3.10	0.00	0.00	0.00	51
3 Months Ago	2017-12-12	42.62	28.53	28.85	0.00	0.00	0.00	86
Start of Calendar Year	2017-12-26	40.97	24.97	34.05	0.00	0.00	0.00	93
Start of Water Year	2017-09-26	100.00	0.00	0.00	0.00	0.00	0.00	0
One Year Ago	2017-03-14	23.32	44.26	24.21	8.21	0.00	0.00	117

Estimated Population in Drought Areas: 560,354 View More Statistics

U.S. Drought Monitor

Mid Atlantic Watershed



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Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	79.30	20.70	1.83	0.00	0.00	0.00
Last Week 03-06-2018	79.30	20.70	1.71	0.00	0.00	0.00
3 Months Ago 12-12-2017	51.02	48.98	6.24	0.00	0.00	0.00
Start of Calendar Year 01-02-2018	36.07	63.93	23.69	0.00	0.00	0.00
Start of Water Year 09-26-2017	91.66	8.34	0.00	0.00	0.00	0.00
One Year Ago 03-14-2017	41.92	58.08	34.08	4.68	0.00	0.00

Intensity:

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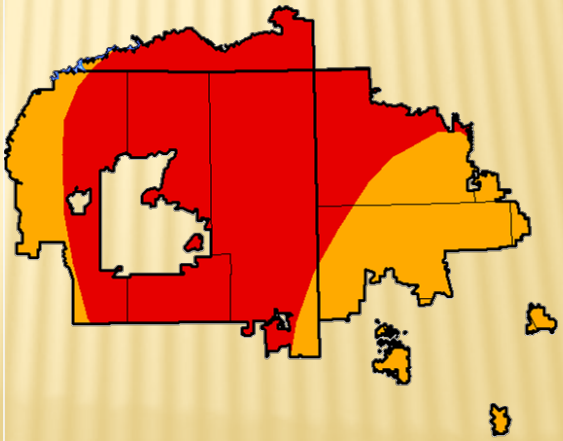
U.S. Drought Monitor

Navajo



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Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	100.00	100.00	67.72	0.00
Last Week 03-06-2018	0.00	100.00	100.00	100.00	67.72	0.00
3 Months Ago 12-12-2017	0.00	100.00	89.36	0.00	0.00	0.00
Start of Calendar Year 01-02-2018	0.00	100.00	100.00	52.05	0.00	0.00
Start of Water Year 09-26-2017	47.70	52.30	0.00	0.00	0.00	0.00
One Year Ago 03-14-2017	100.00	0.00	0.00	0.00	0.00	0.00

Intensity:

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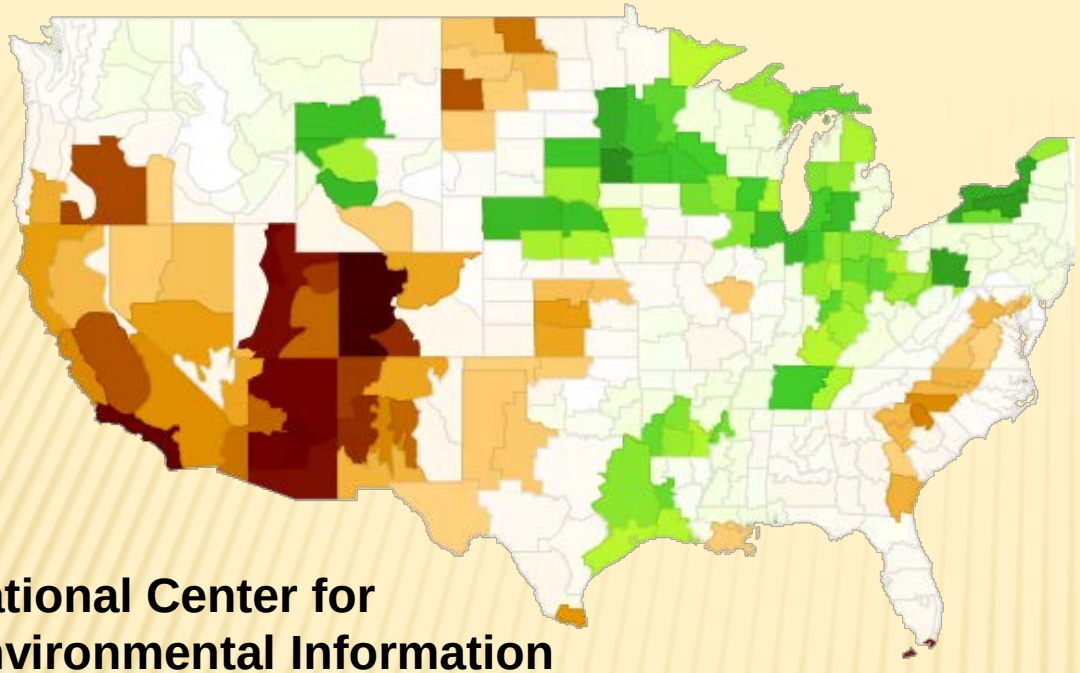
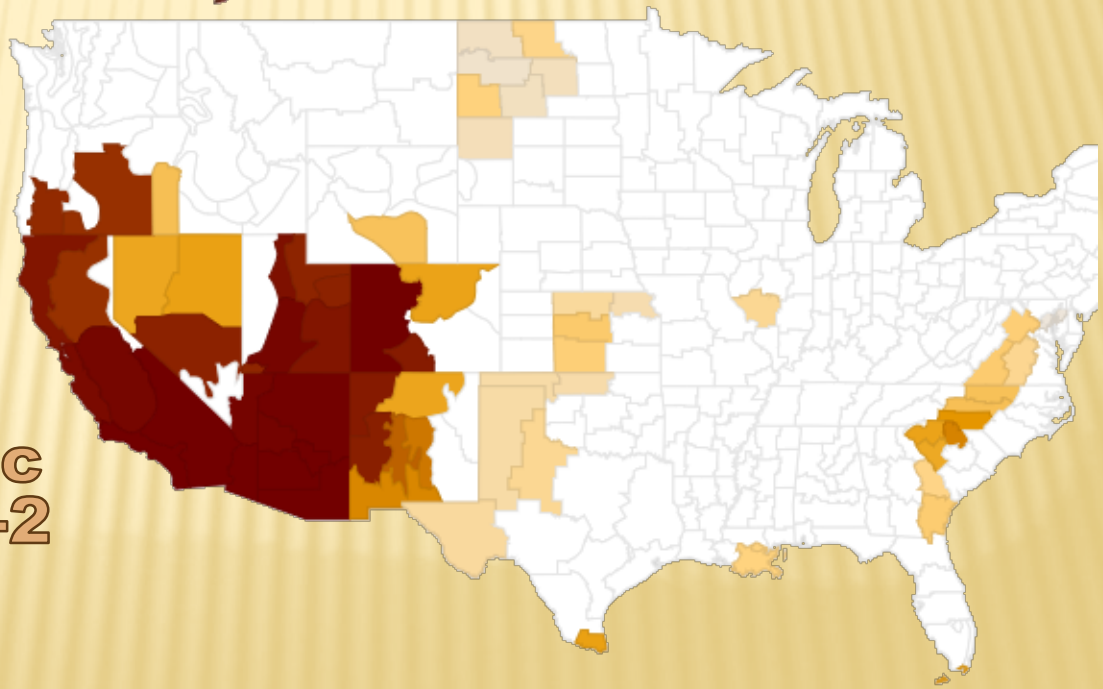


Palmer Hyrologic Drought Index

March 13, 2017

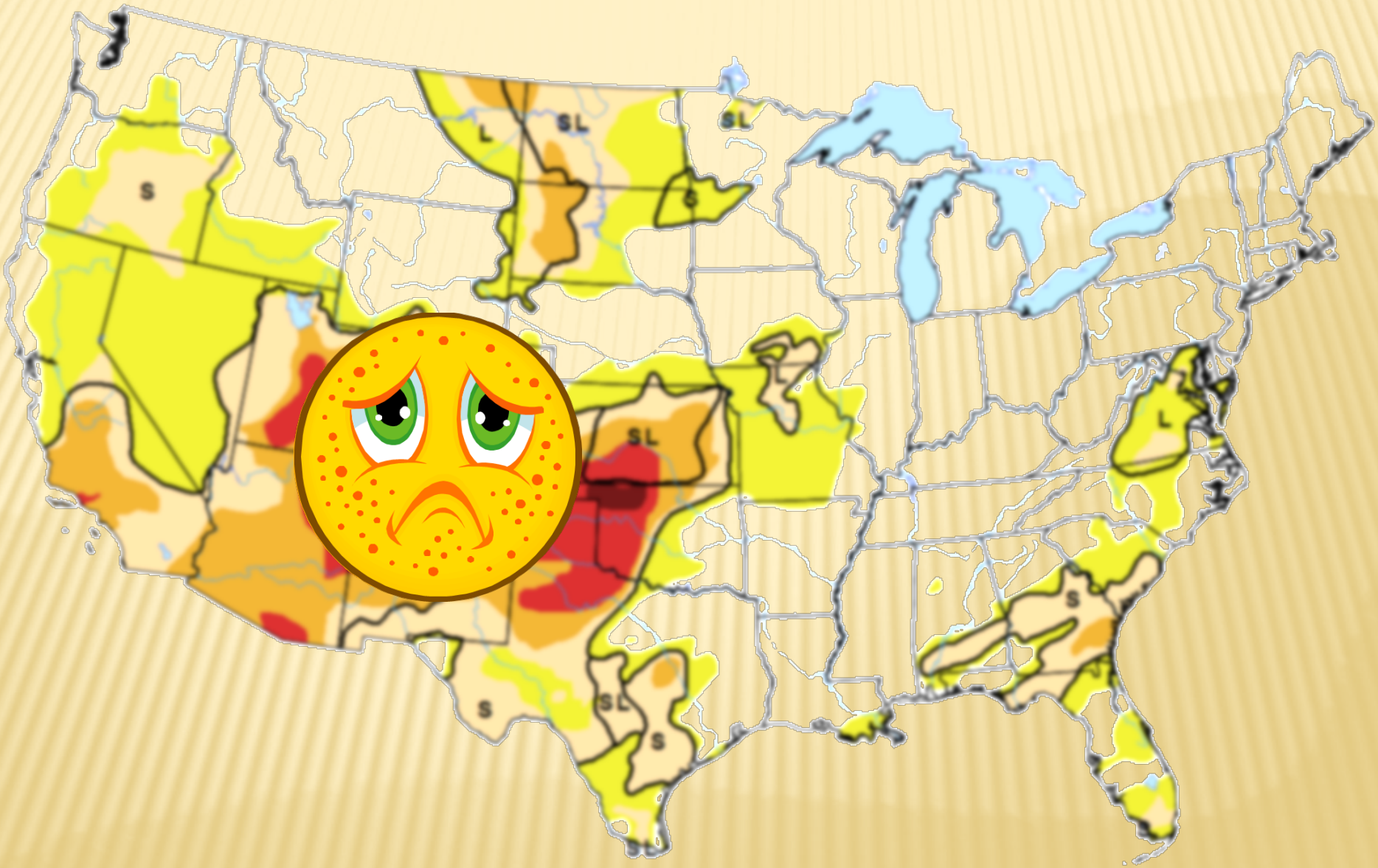
National Center for Environmental Information



Probability of Amelioration

(Palmer Hyrologic Drought Index > -2

3 Months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Definition of *Drought:*

Definition of *Drought*

(as far as we could agree):

Some sort of precipitation shortage

On some significant time scale (weeks to multiple years)

Having an affect on something [impacts]

Definition and Assessment *of Drought Depends on Aspect/Interest:*

Agriculture:

- **Weeks to a Few Months**
- **Sensitivity varies by location and time of year [Midwest in summer; High Plains in winter]**
- **Other factors, especially summer temperatures and humidity, play a role**
  - **Water usage, evaporation from soil and plants (evapotranspiration), etc.**
- **Recovery can be swift [heavy rainfall episode]**

Definition of *Drought*
Depends on Aspect/Interest:

Wildfire Threat:

- Weeks to months
  - Prior wet spell contributes (growth to dry out, serve as fuel)
- Other factors beside precipitation
  - Low humidity
  - Strong winds
- Humidity & calm winds aid control
  - Improve without precipitation

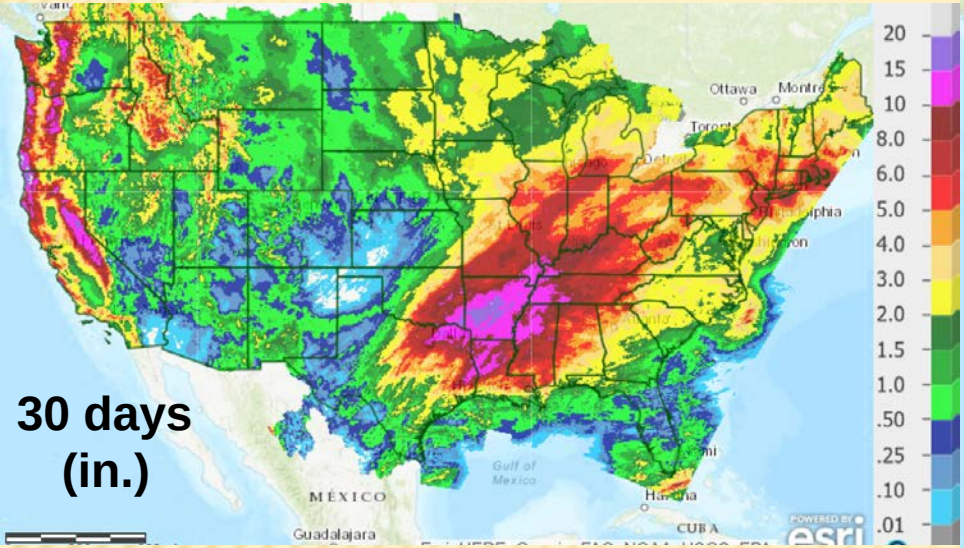
Definition of *Drought*
Depends on Aspect/Interest:

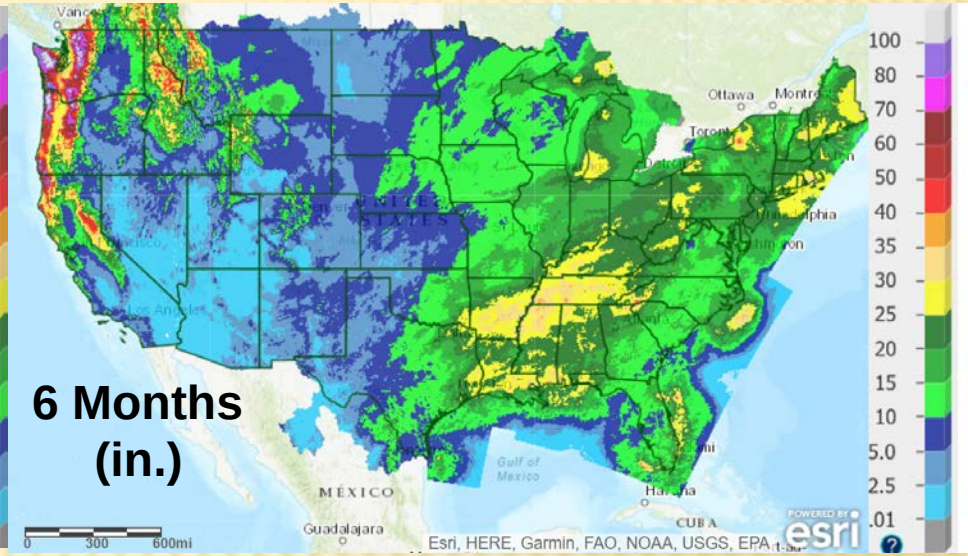
Water Supplies / Hydrology:

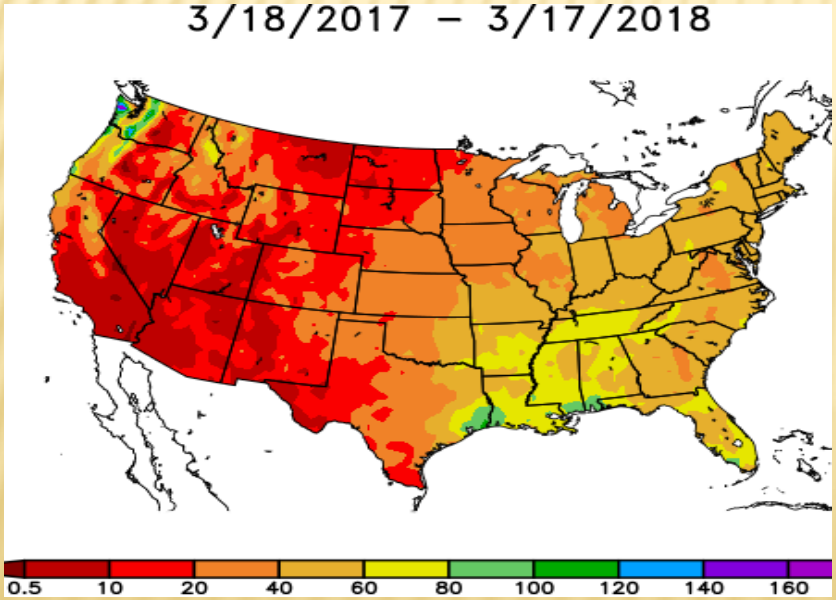
- Months to Multiple Years
- Sensitivity varies less with season [still relevant]
- Sensitivity can vary markedly by location
  - Can be discontinuous depending on source of water, management practices, etc.
  - Longer-term temperature plays a role, especially where supply relies on snowpack
    - Snowpack is temperature & precipitation in concert

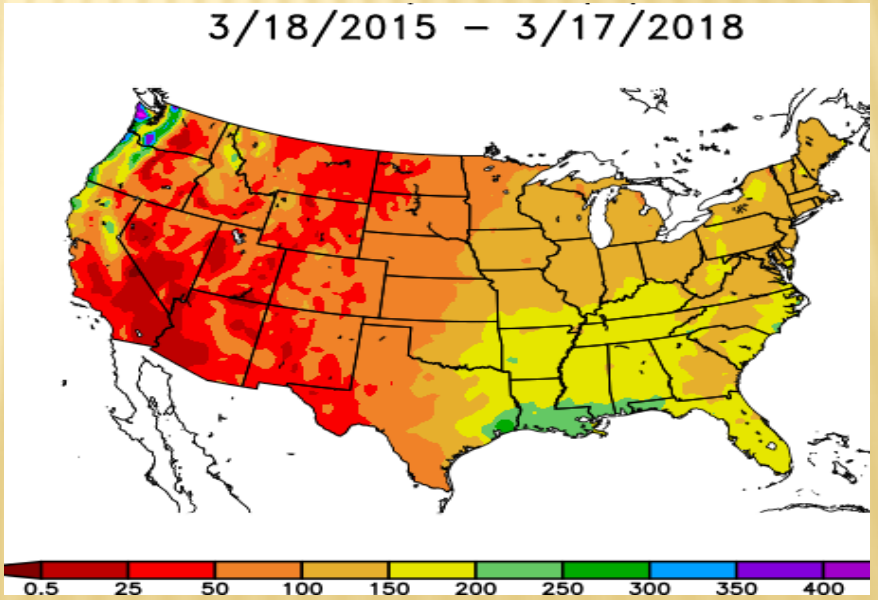
Precipitation

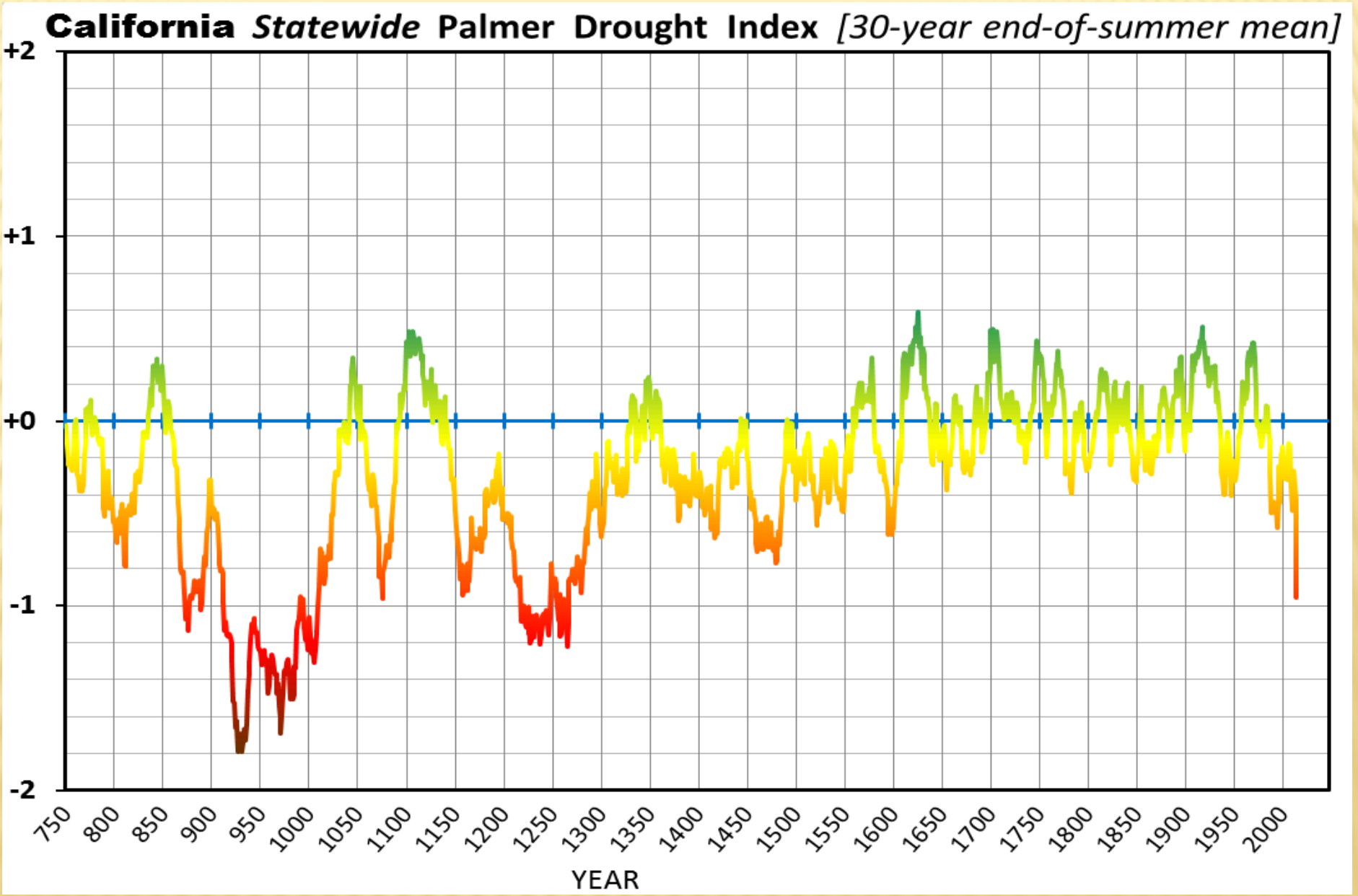
How Hard Is Precipitation?



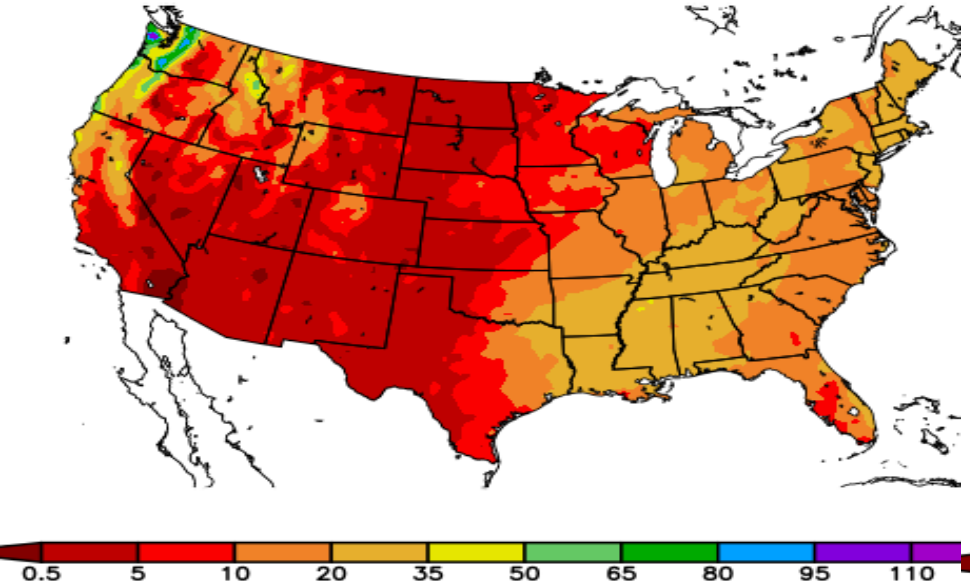






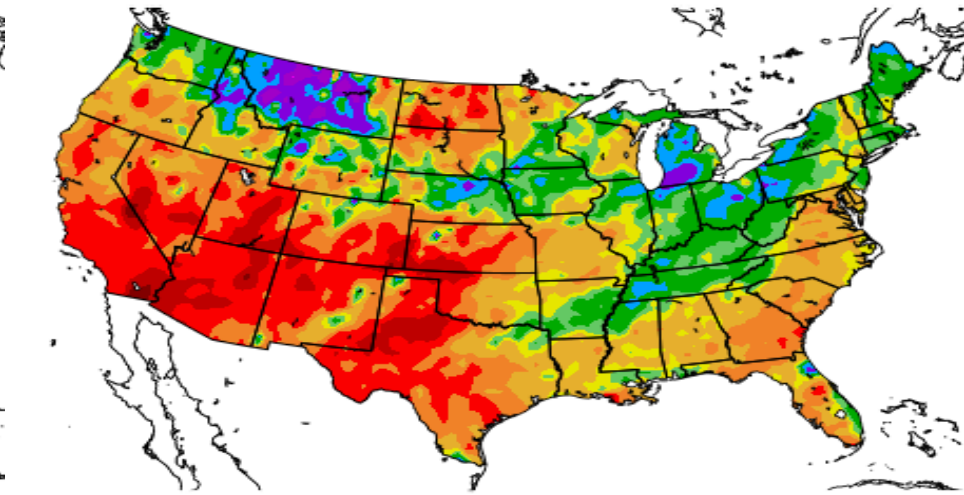

California Statewide Palmer Drought Index [30-year end-of-summer mean]
+2
+1
+0
-1
-2
750
800
850
900
950
1000
1050
1100
1150
1200
1250
1300
1350
1400
1450
1500
1550
1600
1650
1700
1750
1800
1850
1900
1950
2000
YEAR

Precipitation (in)
10/1/2017 – 3/17/2018



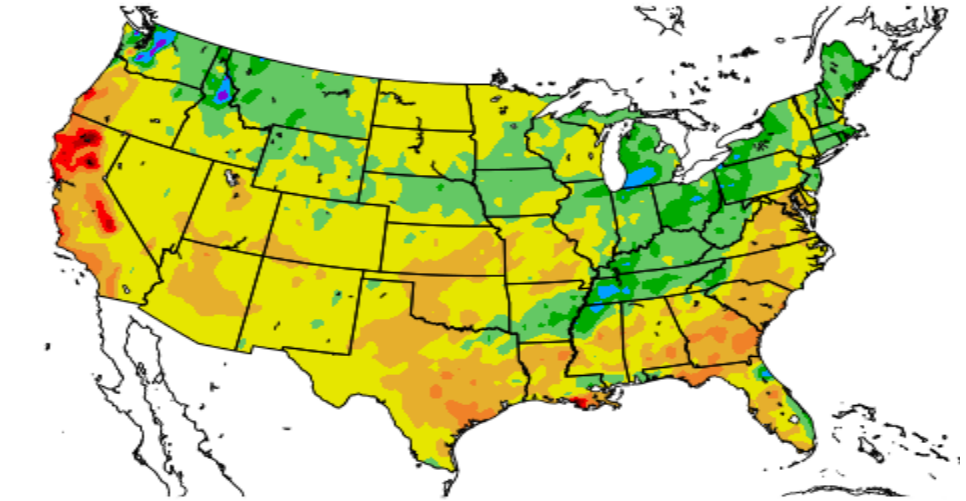
0.5 5 10 20 35 50 65 80 95 110

Percent of Normal Precipitation (%)
10/1/2017 – 3/17/2018



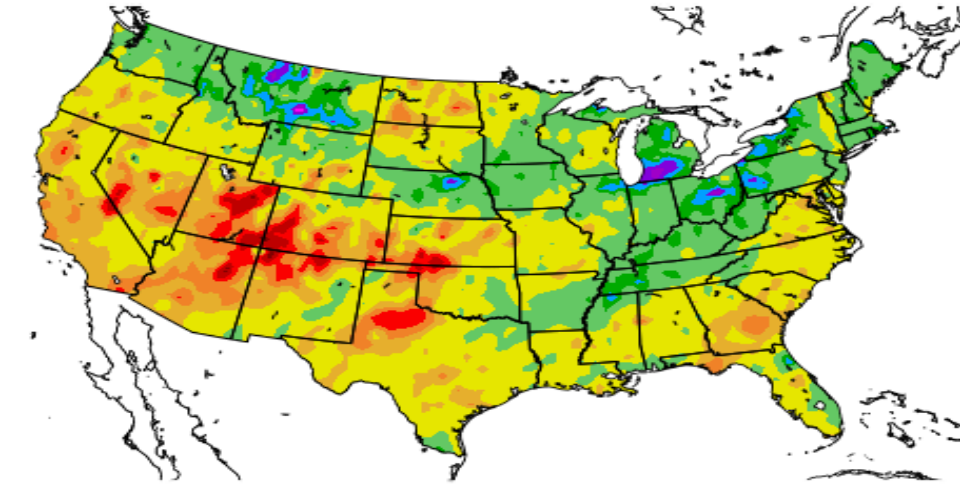
5 25 50 70 90 100 110 130 150 200

Departure from Normal Precipitation (in)
10/1/2017 – 3/17/2018



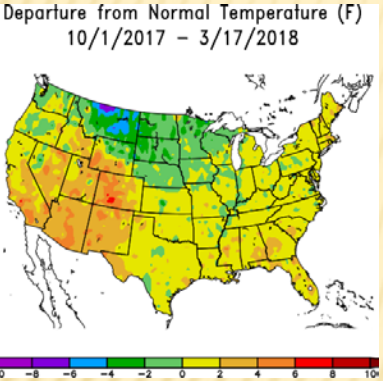
−20 −16 −12 −8 −4 0 4 8 12 16 20

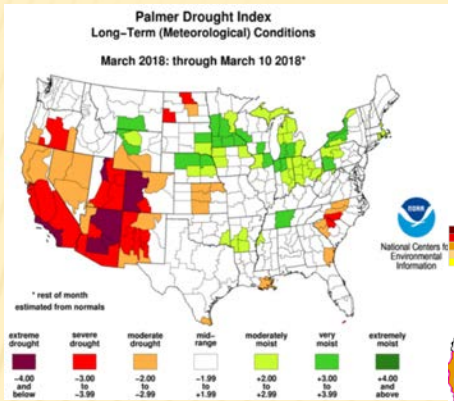
Water Year SPI
10/1/2017 – 3/17/2018

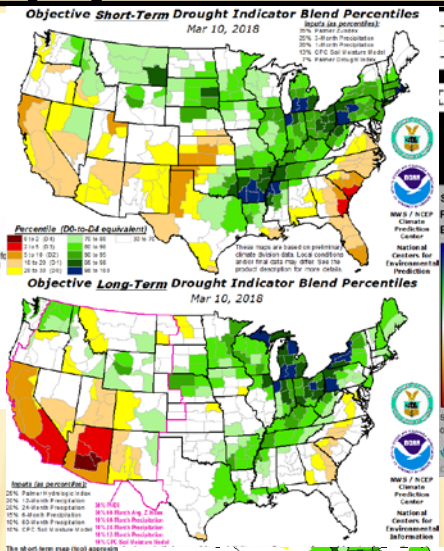


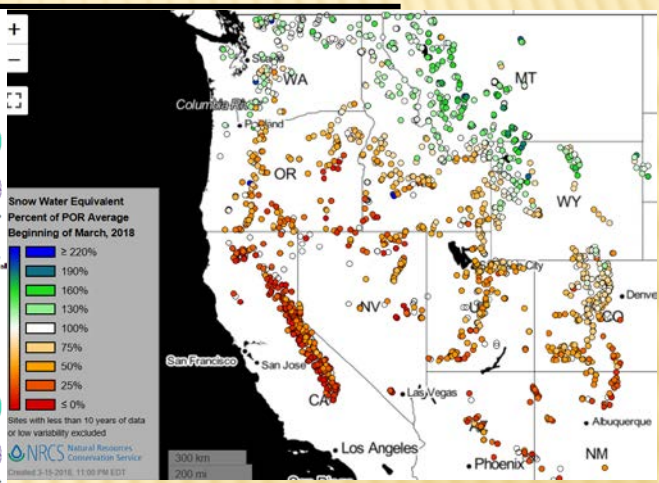
−3 −2.5 −2 −1.5 −1 0 1 1.5 2 2.5

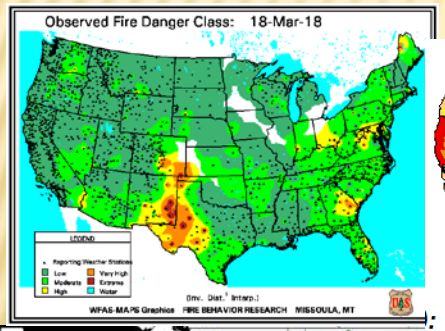
Sorting it All Out (1) – Other Parameters

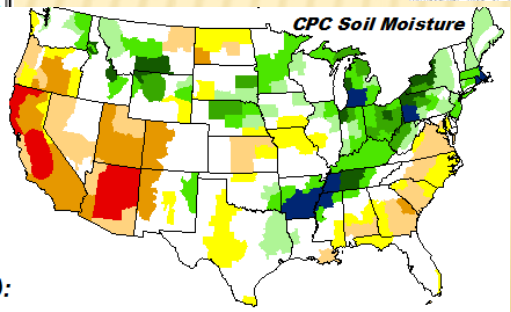


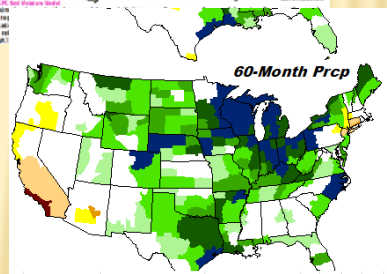


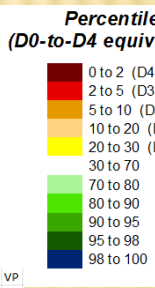


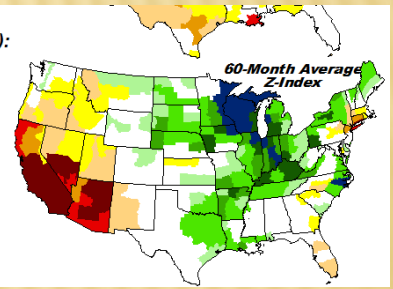




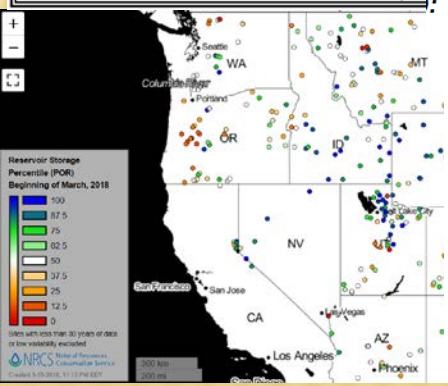


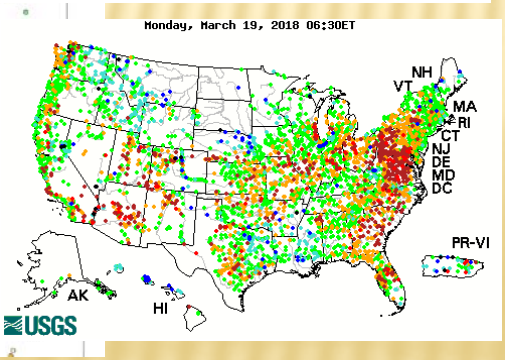


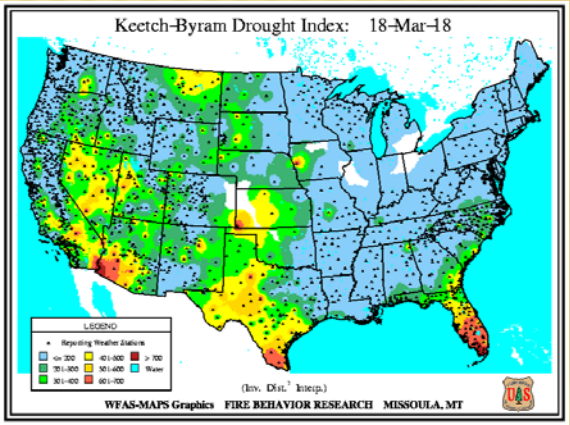




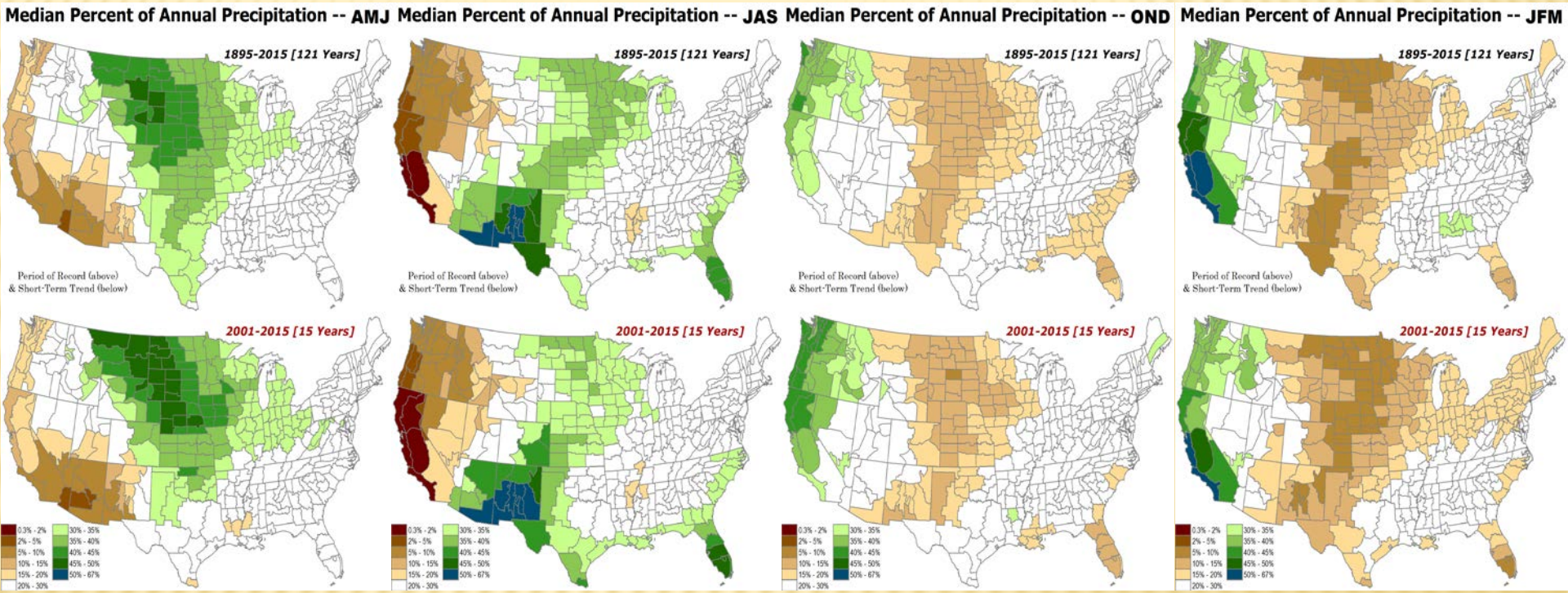
Week Ending	State	Data Item	EX	GD	FA	PO	VP
25-Feb-18	WEST VIRGINIA	WHEAT, WINTER	14	55	30	1	0
25-Feb-18	NORTH CAROLINA	WHEAT, WINTER	4	74	20	2	0
25-Feb-18	TENNESSEE	WHEAT, WINTER	10	53	35	2	0
25-Feb-18	MICHIGAN	WHEAT, WINTER	20	54	22	2	2
25-Feb-18	VIRGINIA	WHEAT, WINTER	7	71	18	4	0
25-Feb-18	KENTUCKY	WHEAT, WINTER	8	54	33	4	1
25-Feb-18	MONTANA	WHEAT, WINTER	8	46	41	3	2
25-Feb-18	NEBRASKA	WHEAT, WINTER	5	38	52	5	0
25-Feb-18	OHIO	WHEAT, WINTER	10	61	24	4	1
25-Feb-18	INDIANA	WHEAT, WINTER	11	46	34	7	2
11-Mar-18	LOUISIANA	WHEAT, WINTER	3	33	55	9	0
25-Feb-18	MISSOURI	WHEAT, WINTER	3	32	56	9	0
11-Mar-18	ARKANSAS	WHEAT, WINTER	5	54	28	11	2
25-Feb-18	ILLINOIS	WHEAT, WINTER	5	40	39	8	8
11-Mar-18	MISSISSIPPI	WHEAT, WINTER	1	44	39	14	2
25-Feb-18	NORTH DAKOTA	WHEAT, WINTER	2	28	52	14	4
25-Feb-18	WYOMING	WHEAT, WINTER	4	19	54	15	8
25-Feb-18	COLORADO	WHEAT, WINTER	3	28	42	22	5
25-Feb-18	UTAH	WHEAT, WINTER	2	19	49	21	9
25-Feb-18	SOUTH DAKOTA	WHEAT, WINTER	0	19	49	28	4
11-Mar-18	KANSAS	WHEAT, WINTER	1	11	35	36	17
11-Mar-18	TEXAS	WHEAT, WINTER	1	12	34	23	30
11-Mar-18	OKLAHOMA	WHEAT, WINTER	0	7	21	45	27
25-Feb-18	NEW MEXICO	WHEAT, WINTER	0	4	22	41	33







Sorting it All Out (2) – Context/Season

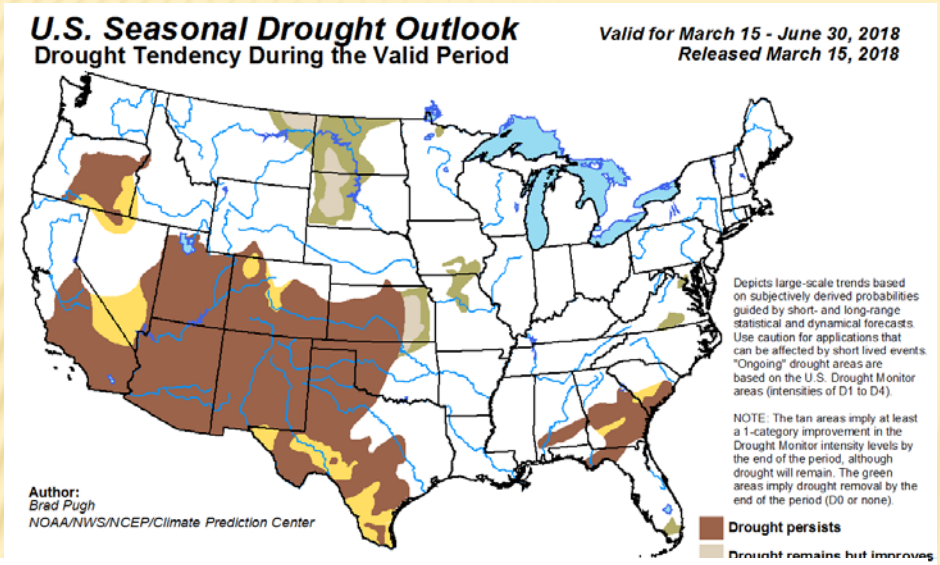


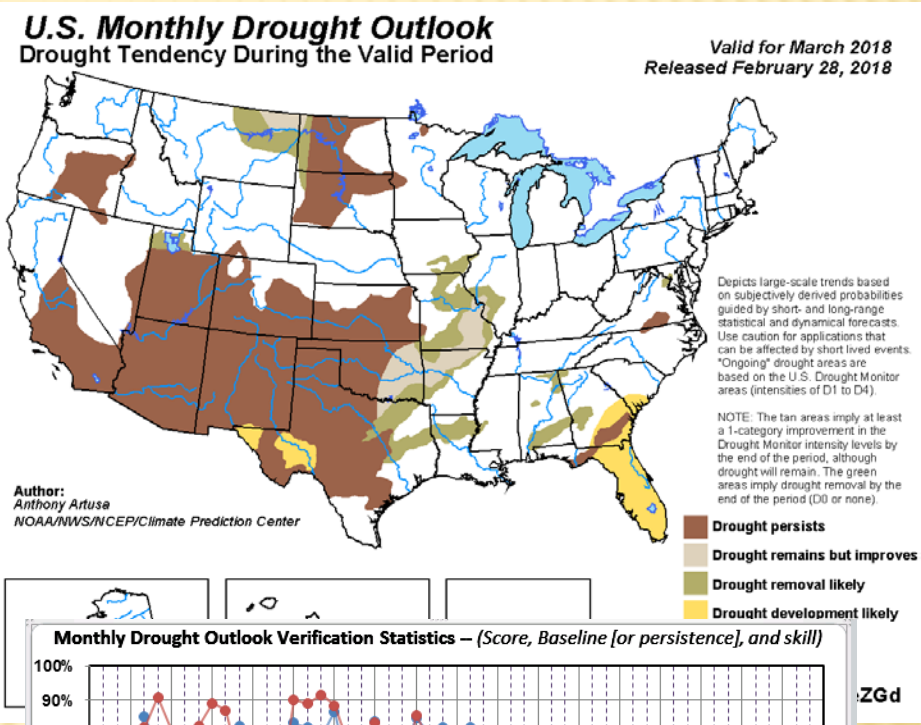
Sorting it All Out (2) – Feedback

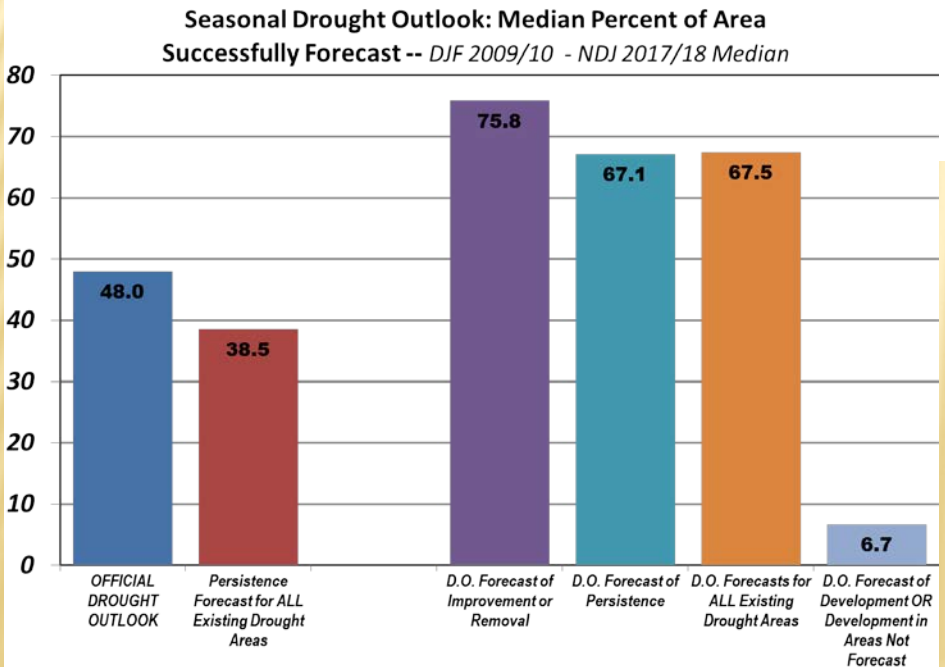
- Drafts disseminated to email list of 300+ participants
  - *Local Weather Forecast Offices*
  - *Local/Regional hydrologists*
  - *State Climatologists*
  - *USDA Climate Hubs*
  - *Regional Climate Centers*
  - *Academic/Research Institutions*
  - *Agricultural Experts (regional, national)*
  - *Local/regional water suppliers*
- Feedback
  - *Individuals with off-the-cuff comments/thoughts*
  - *Coordinated responses from states, other entities*
    - *NC, FL, TX, CA/NV, Colorado Basin*
- Adjustments
- Iterative Process Until Final Map Completed
  - *Author makes final call*

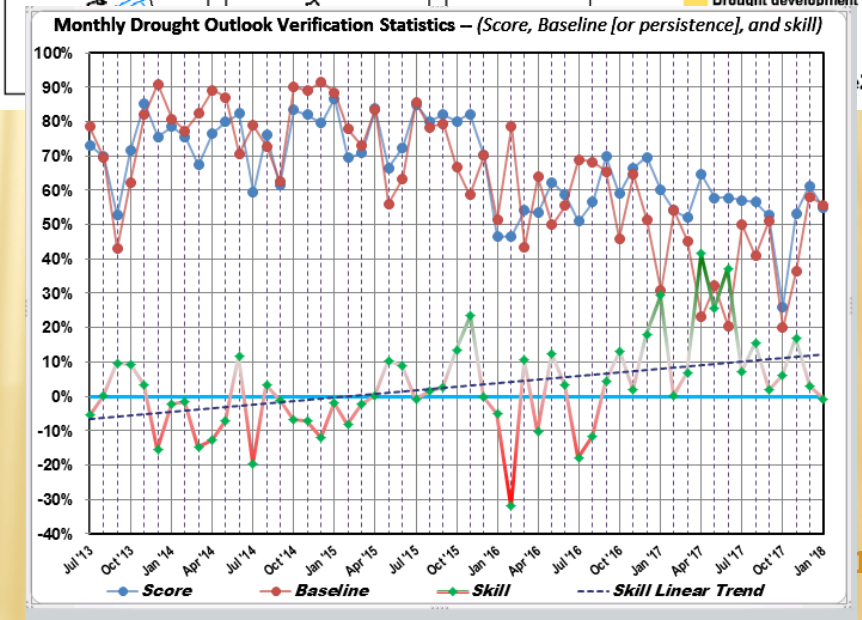
Drought Outlooks

Available at Climate Prediction Center: www.cpc.ncep.noaa.gov









Fin!