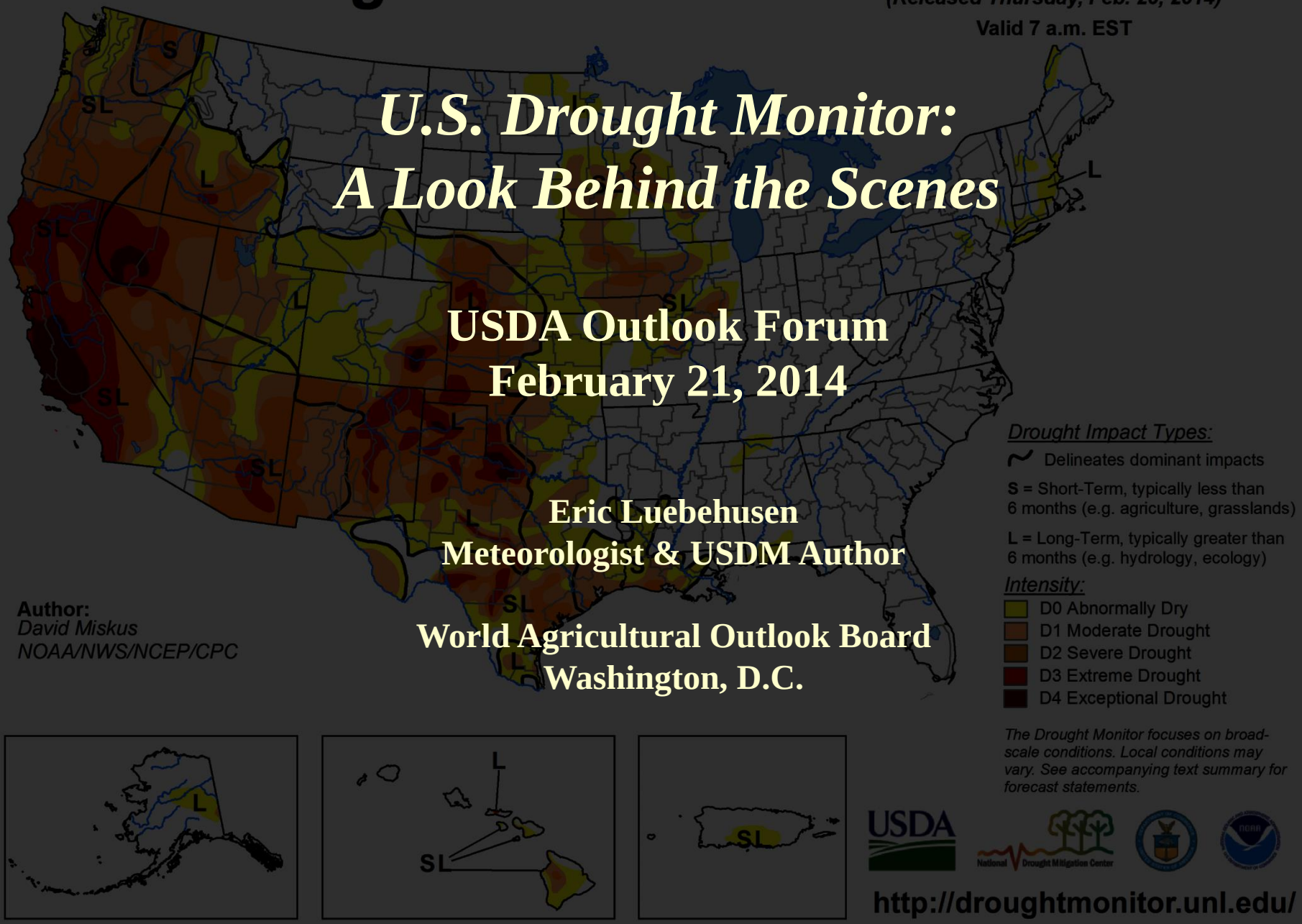


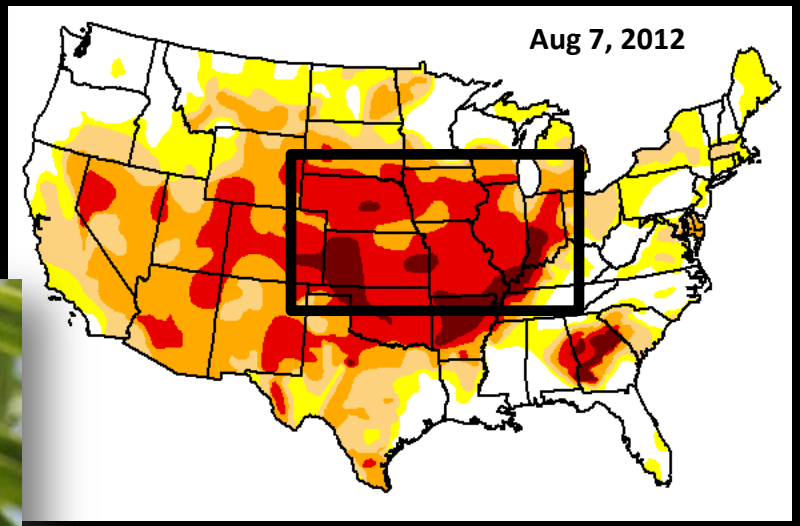
U.S. Drought Monitor: A Look Behind the Scenes

USDA Outlook Forum
February 21, 2014

Eric Luebehusen
Meteorologist & USDM Author

World Agricultural Outlook Board
Washington, D.C.

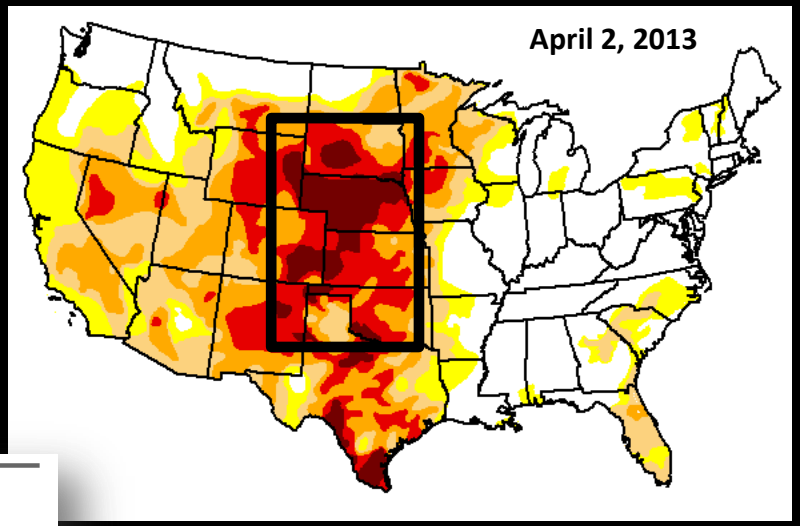
In 2012, Midwestern Heat and Drought were a BIG story.



By spring 2013, the drought story shifted onto the Plains.

U.S. Drought In 2013 Hurts Cattle Ranchers With Dry, Poor Wheat Crop

Reuters | Posted: 01/14/2013 1:00 am EST



U.S. Drought In 2013 Hurts Cattle Ranchers With Dry, Poor Wheat Crop

Reuters | Posted: 01/14/2013 1:00 am EST

REUTERS

* Wheat pastures wither as drought persists

* Cattle moved to feedyards sooner than expected

* Record high cattle, beef prices seen this year

By Theopolis Waters

CHICAGO, Jan 14 (Reuters) - Oklahoma rancher Kent Donica has given up. The drought that has
the region has won.

Since last September, Donica has sold nearly all of his 800 cattle because there is no pasture to
nearby to make ends meet until it rains again.

Last autumn he had hoped his winter wheat crop would feed his cattle and keep his ranching bus
need to buy high-priced feed like corn, which would wipe out earnings from the cattle he fattens ar

But the worst dry spell in half a century stopped the wheat crop from sprouting properly, depriving
have sustained it through winter.

In 2013, Drought Is Worsening In Midwest And Plains States, Despite U.S. Winter Weather

Reuters | Posted: 01/28/2013 8:35 am EST

REUTERS

* Light showers not enough to ease drought

* U.S. hard red winter wheat in Plains at risk

* Corn, soybean crops grown in the west also at risk

By Sam Nelson

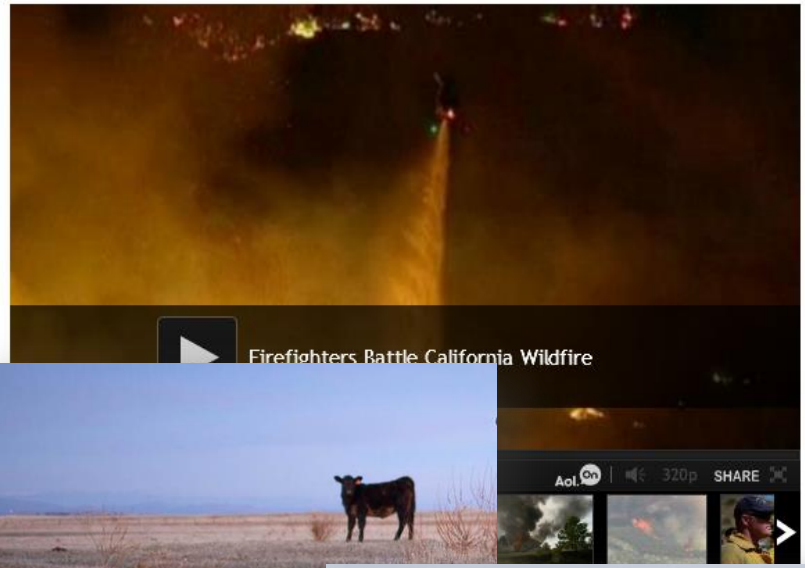
CHICAGO, Jan 28 (Reuters) - Dry weather continues to plague the drought-stricken U.S. Plains and western Midwest with only light showers and snowfall expected this week, an agricultural meteorologist said on Monday.

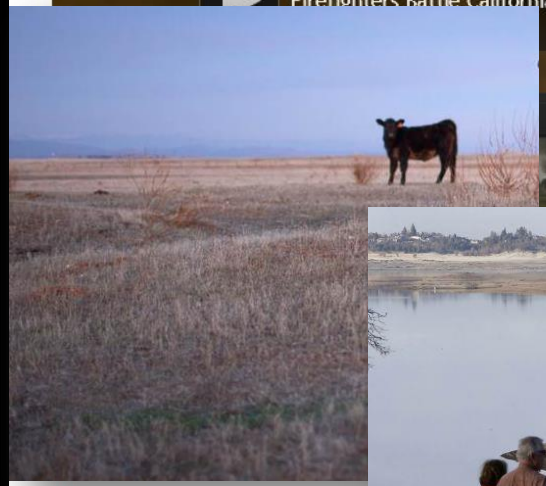
"The Plains and the northwest Midwest will still struggle with drought, there's not a whole lot of relief seen," said John Dee, meteorologist for Global Weather Monitoring.

Dee said there would be some light rain in the eastern portions of Kansas, Oklahoma and Texas late Monday and Tuesday, with heavier rainfall seen for the eastern and southeastern Midwest late Tuesday and Wednesday.

California Drought 2013: January, February Were Driest On Record

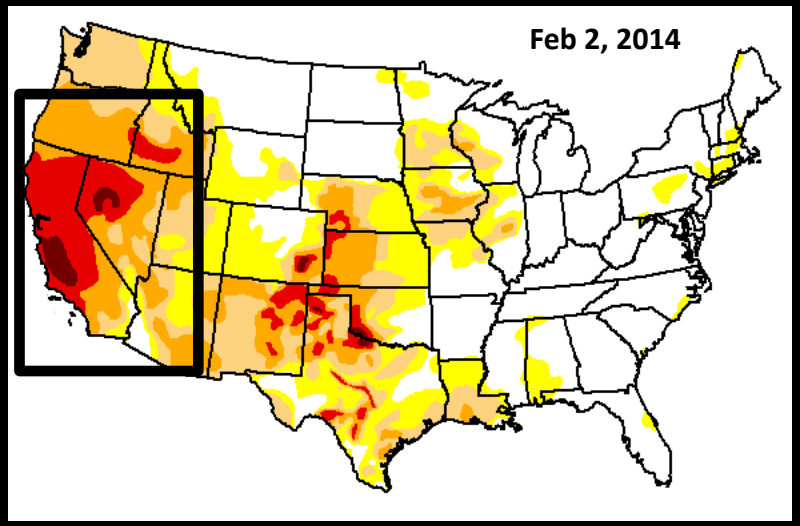
AP | By By TRACIE CONE and RICH PEDRONCELLI
Posted: 03/01/2013 9:08 am EST | Updated: 05/01/2013 2:39 pm EDT

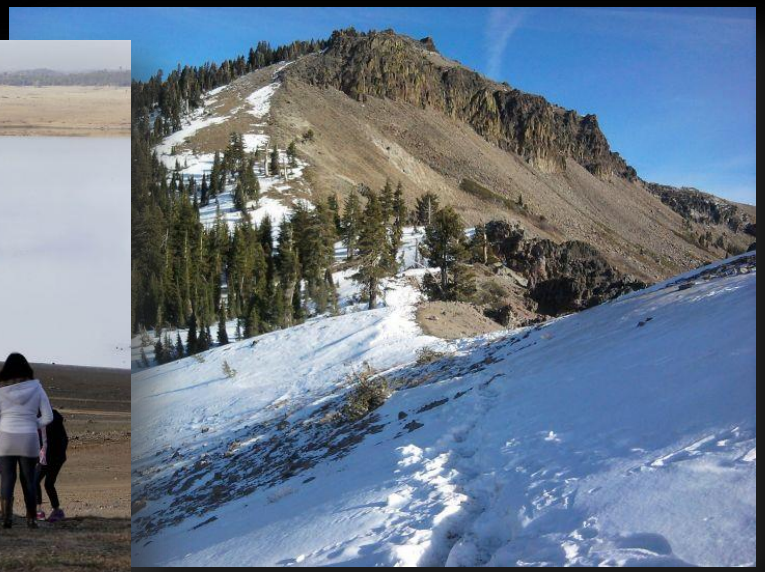




The monthly snow survey, anticipa
snowmelt to supplement water sup
despite a few good dumps the state
ease water managers' worries.

In early 2014, drought-impact stories emanated from the West.



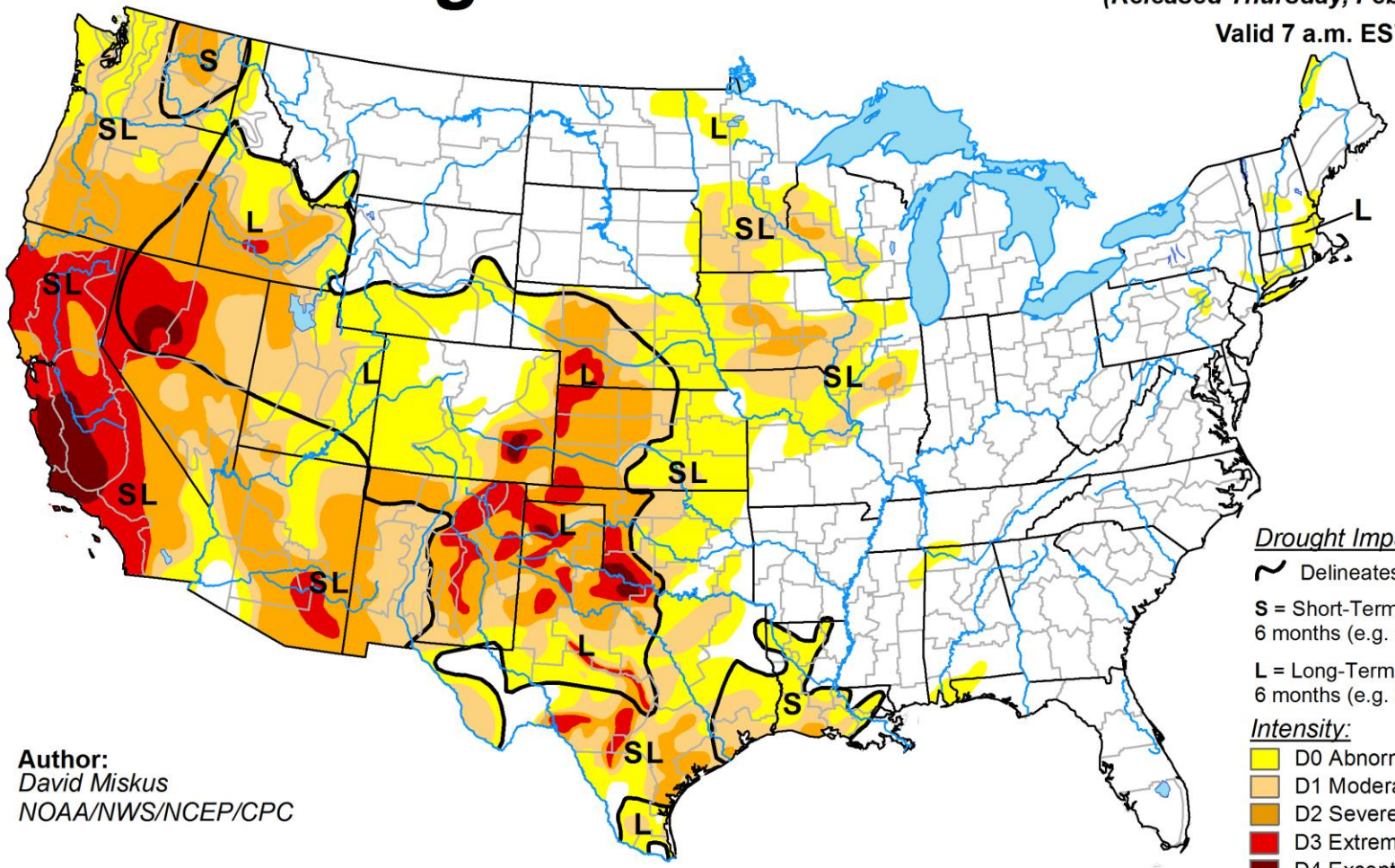


U.S. Drought Monitor

February 18, 2014

(Released Thursday, Feb. 20, 2014)

Valid 7 a.m. EST



Author:
David Miskus
NOAA/NWS/NCEP/CPC

Drought Impact Types:

~ Delineates dominant impacts

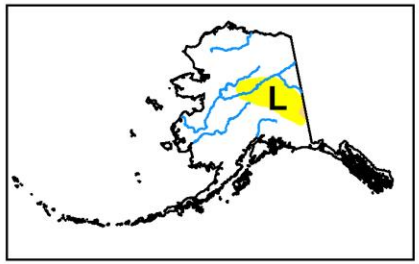
S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)

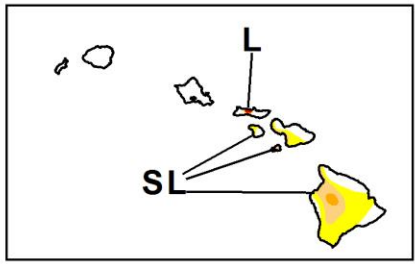
L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

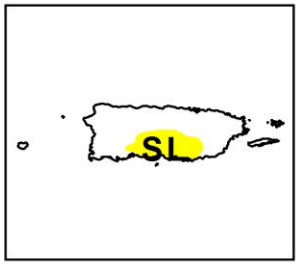
Intensity:

- 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 National Drought Mitigation Center

http://droughtmonitor.unl.edu/

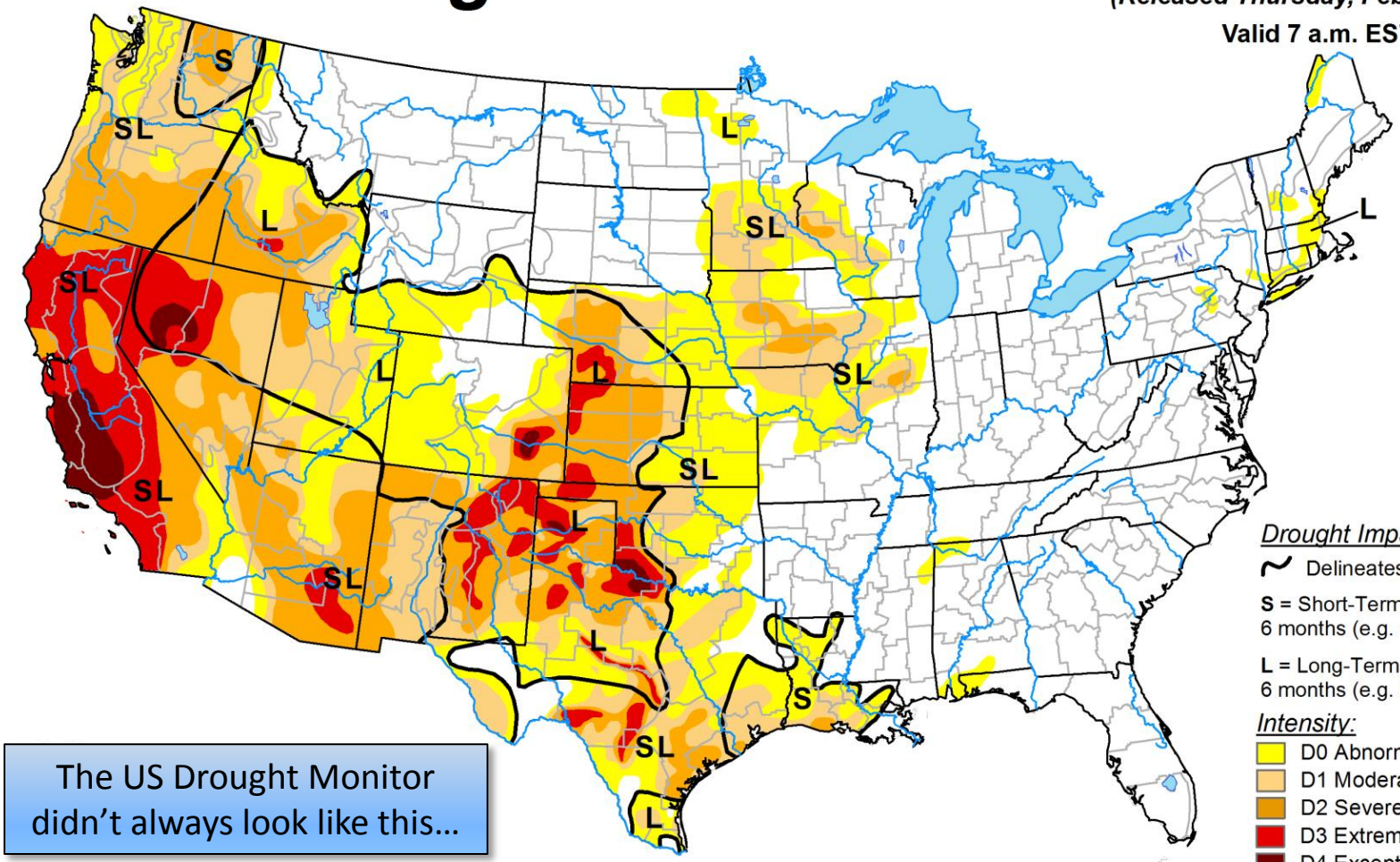
History of the USDM

U.S. Drought Monitor

February 18, 2014

(Released Thursday, Feb. 20, 2014)

Valid 7 a.m. EST



The US Drought Monitor didn't always look like this…

Drought Impact Types:

Delineates dominant impacts

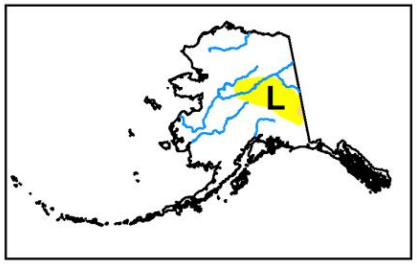
S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)

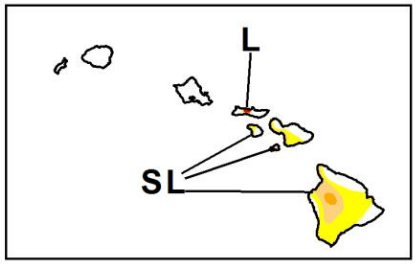
L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

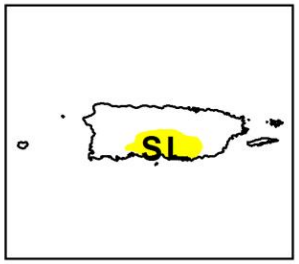
Intensity:

- 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.

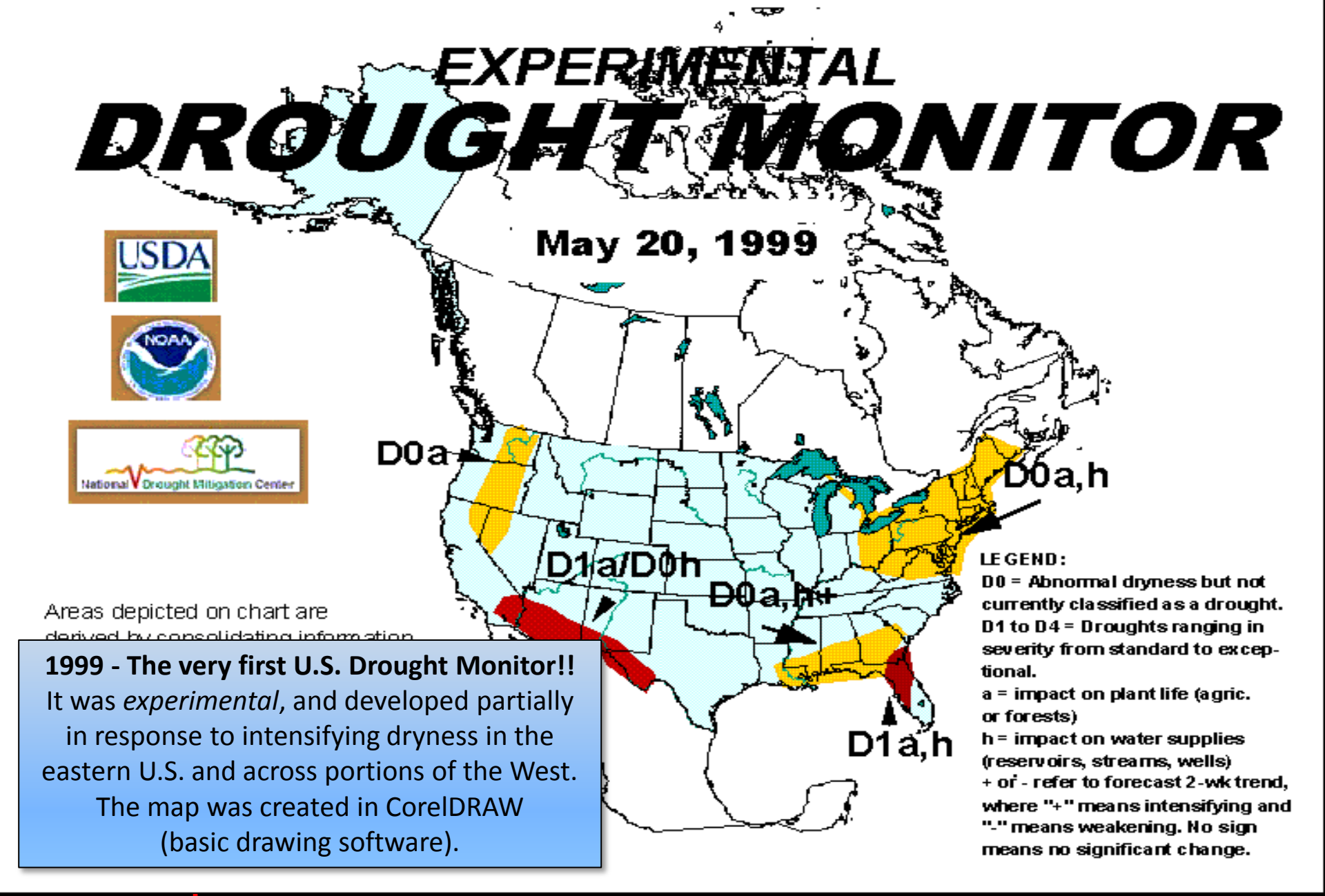






USDA National Drought Mitigation Center

http://droughtmonitor.unl.edu/

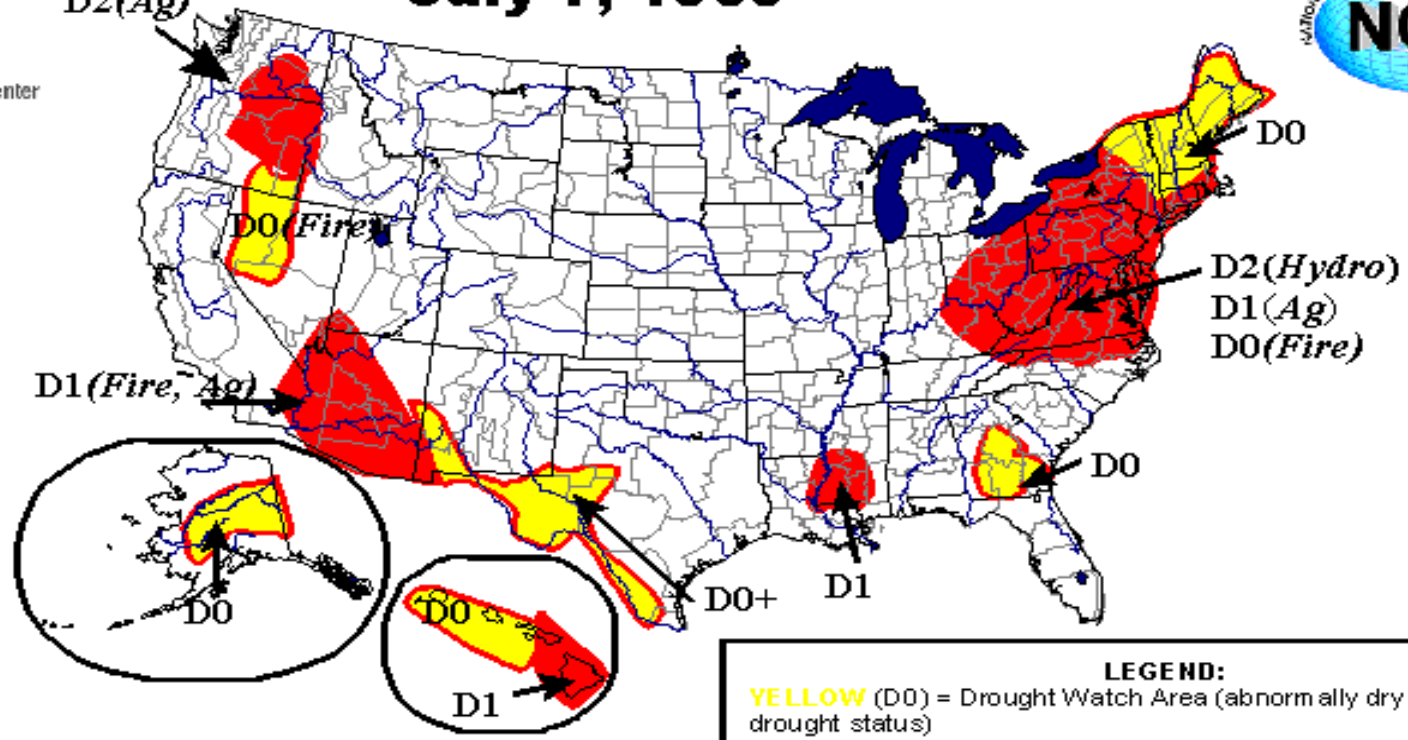


1999 - The very first U.S. Drought Monitor!!
It was *experimental*, and developed partially in response to intensifying dryness in the eastern U.S. and across portions of the West. The map was created in CorelDRAW (basic drawing software).

1999 | 2001 | 2003 | 2005 | 2007 | 2009 | 2011 | 2013

Experimental U.S. DROUGHT MONITOR

July 7, 1999



LEGEND:

YELLOW (D0) = Drought Watch Area (abnormally dry but not full drought status)

RED (D1-D4) = Current drought ranging in severity from standard (D1) to severe (D2-D3) to extreme (D4)

Drought Type: *Used when impacts differ*
Ag = agricultural (crops, grasslands)
Fire = forestry (wildfire potential)
Hydro = hydrological (rivers, wells, reservoirs)

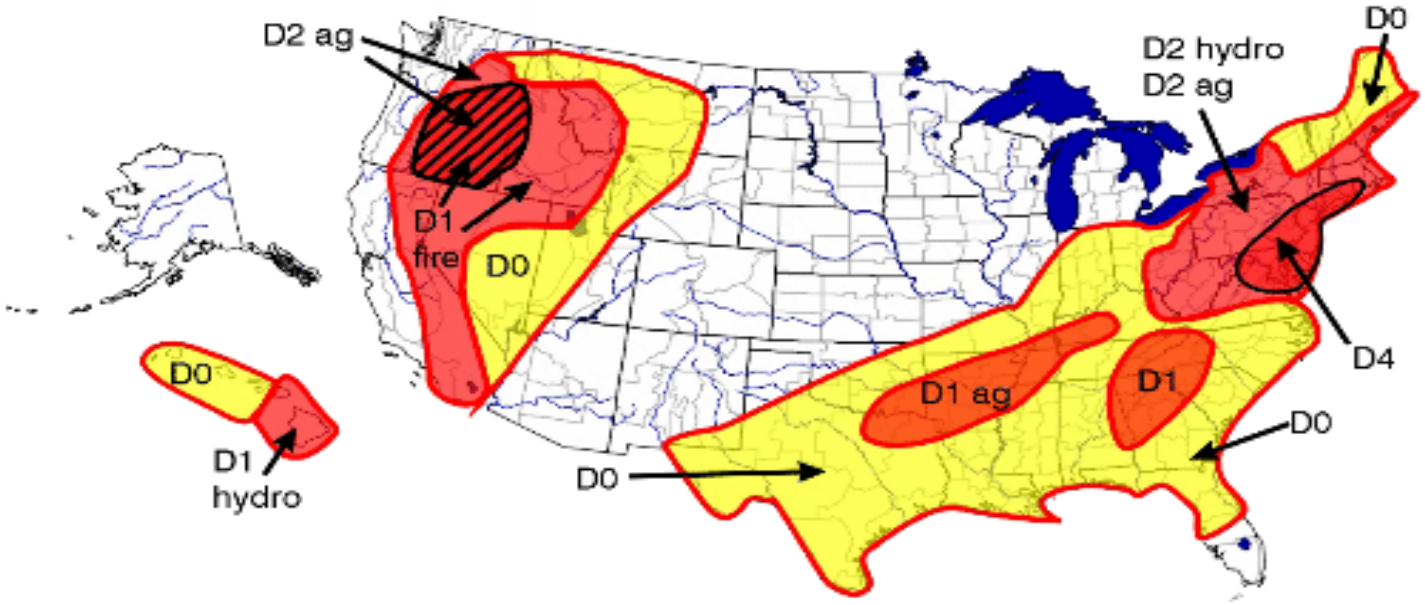
Plus = Forecast to intensify; Minus = Forecast to diminish

Summer, 1999 - Authors **refined the map areas and tweaked the colors,** altho it is readily apparent there weren't any Arts Majors on the team!

1999 | 2001 | 2003 | 2005 | 2007 | 2009 | 2011 | 2013

August 11, 1999 *(revised as of 12:00 pm CDT)*

Experimental U.S. Drought Monitor



Aug 11, 1999 - The revised map was presented to senior-level government officials at a **White House Briefing**. They liked it so much…

Yellow (D0) = Drought Watch Area (abnormally dry but not full drought status)

Red (D1–D4) = Current drought ranging in severity from standard (D1) to severe (D2–D3) to extreme (D4)

Crosshatching ( ) = Overlapping drought type areas

Drought type: Used when impacts differ

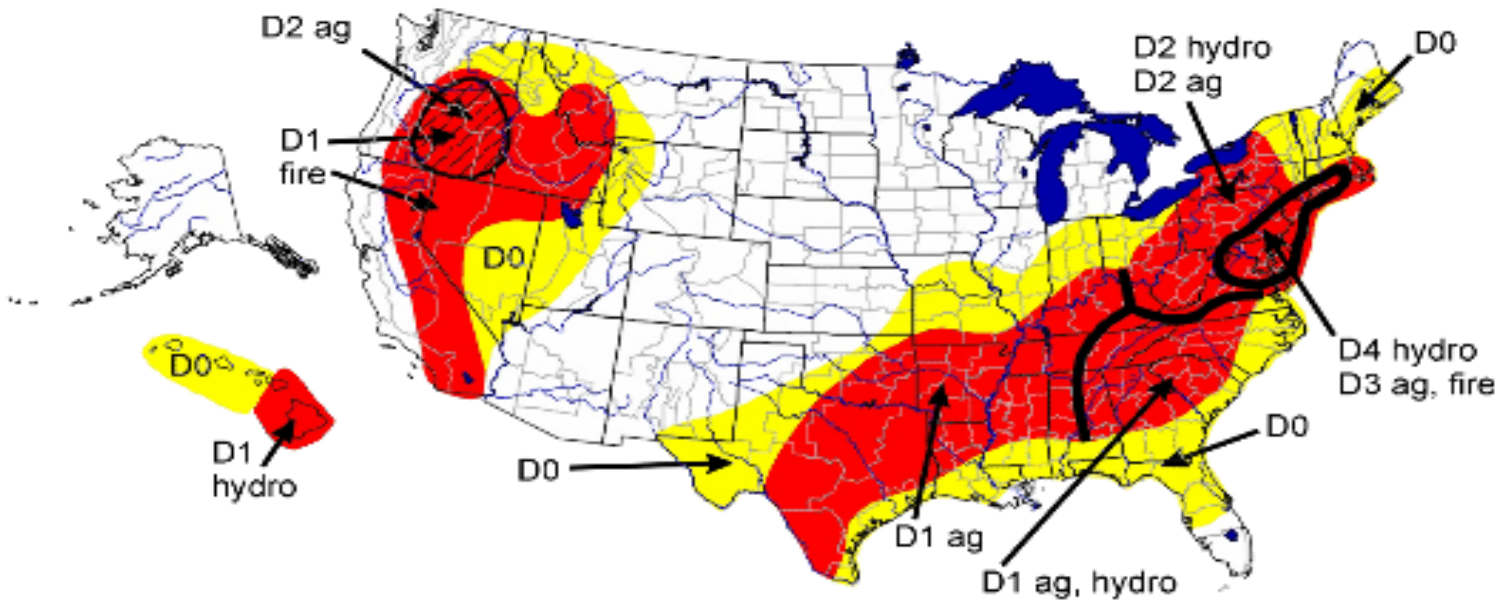
Ag = agricultural (crops, grasslands)
Fire = forestry (wildfire potential)
Hydro = hydrological (rivers, wells, reservoirs)

Plus (+) = Forecast to intensify next two weeks
Minus (-) = Forecast to diminish next two weeks

1999 | 2001 | 2003 | 2005 | 2007 | 2009 | 2011 | 2013

August 18, 1999 (scheduled release time Thursday a.m.)

U.S. Drought Monitor



…the following week, it went operational, making this **the first "official" U.S. Drought Monitor!** This might have be the fastest ***Experimental*** to ***Operational*** product in government history!

Yellow (D0) = Drought Watch Area (abnormally dry but not full drought status)

Red (D1–D4) = Current drought ranging in severity from standard (D1) to severe (D2–D3) to extreme (D4)

Crosshatching ( ) = Overlapping drought type areas

Drought type: Used when impacts differ

- Ag = agricultural (crops, grasslands)
- Fire = forestry (wildfire potential)
- Hydro = hydrological (rivers, wells, reservoirs)

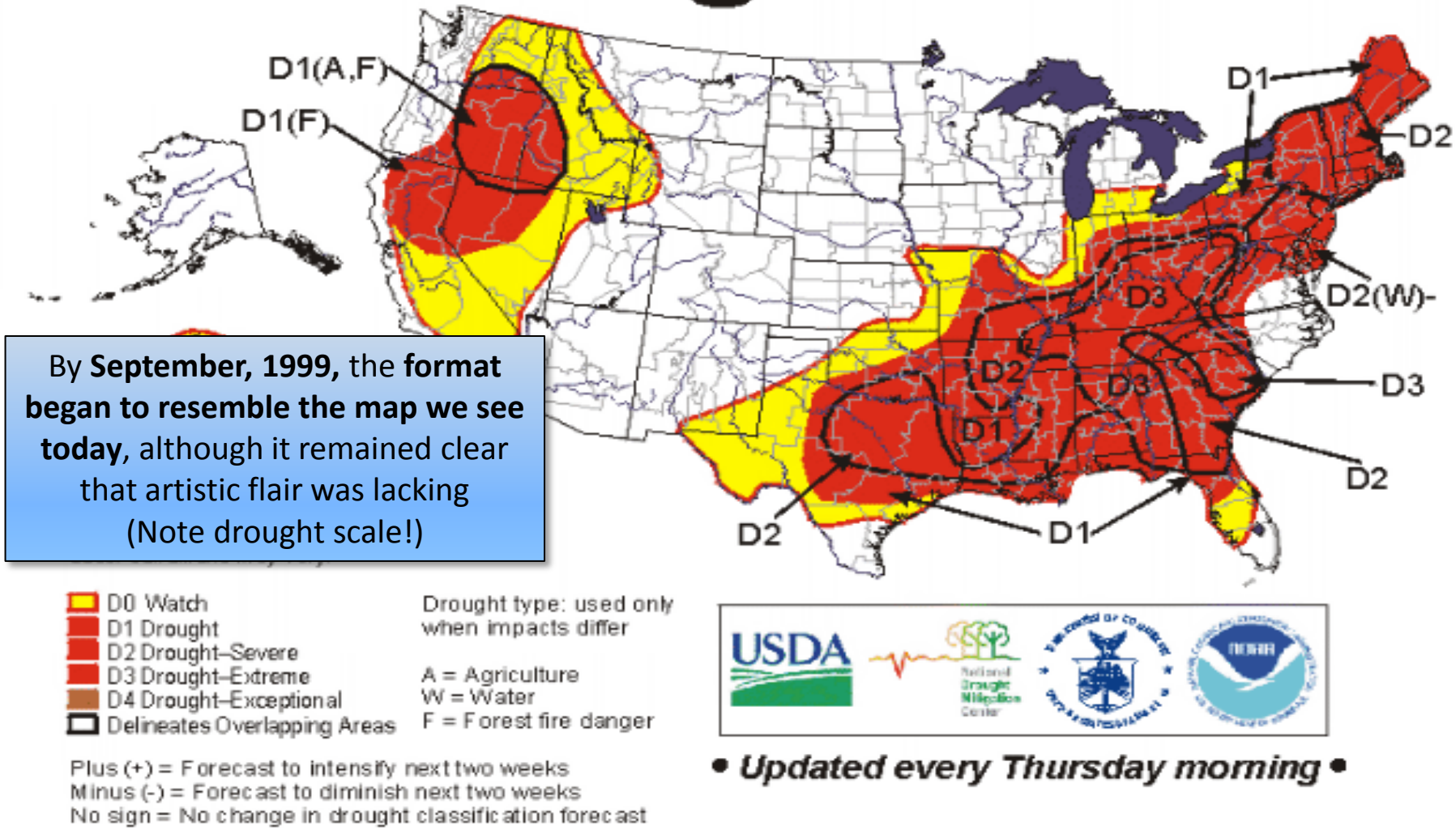
Plus (+) = Forecast to intensify next two weeks

Minus (-) = Forecast to diminish next two weeks

1999 | 2001 | 2003 | 2005 | 2007 | 2009 | 2011 | 2013

September 7, 1999

U.S. Drought Monitor

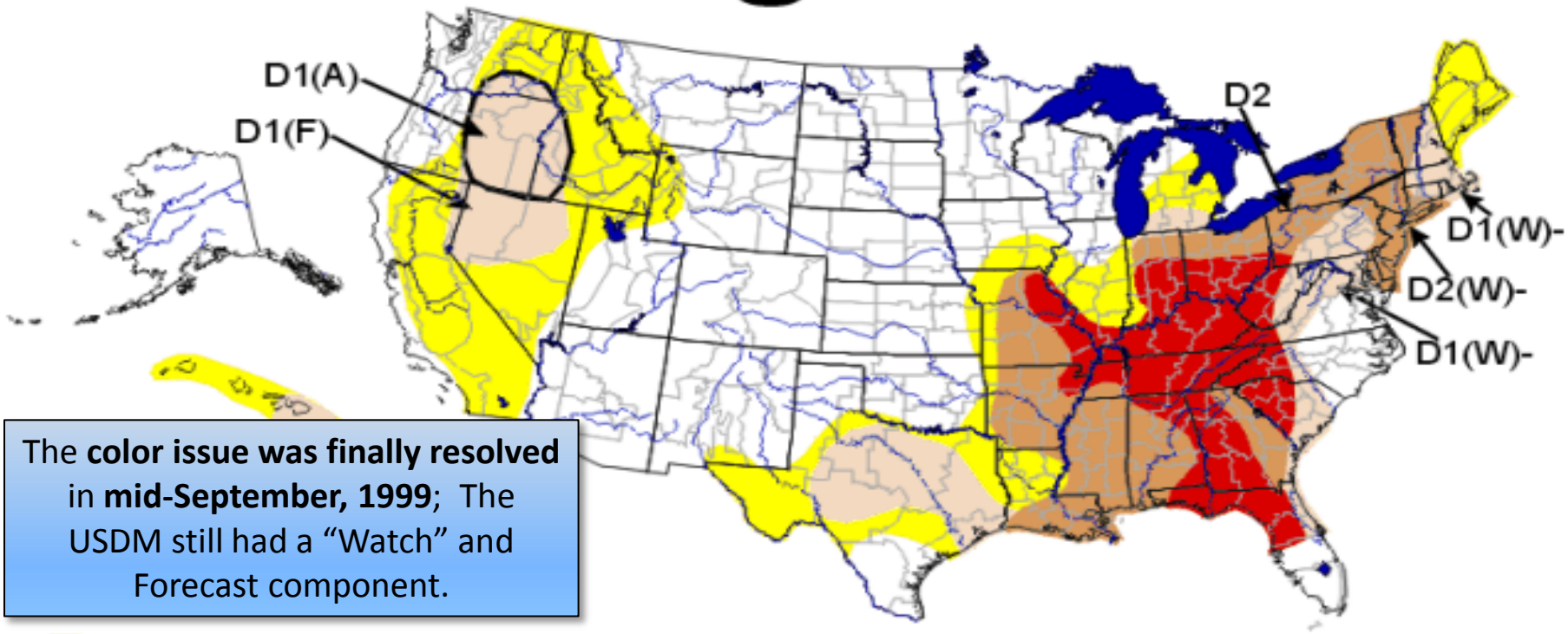


By **September, 1999,** the **format began to resemble the map we see today**, although it remained clear that artistic flair was lacking (Note drought scale!)

1999 | 2001 | 2003 | 2005 | 2007 | 2009 | 2011 | 2013

September 15, 1999

U.S. Drought Monitor



The **color issue was finally resolved** in **mid-September, 1999**; The USDM still had a "Watch" and Forecast component.

D0 Watch
D1 Drought
D2 Drought–Severe
D3 Drought–Extreme
D4 Drought–Exceptional
Delineates Overlapping Areas

Drought type: used only when impacts differ

A = Agriculture
W = Water
F = Forest fire danger

Plus (+) = Forecast to intensify next two weeks
Minus (-) = Forecast to diminish next two weeks
No sign = No change in drought classification forecast

USDA

National Drought Mitigation Center

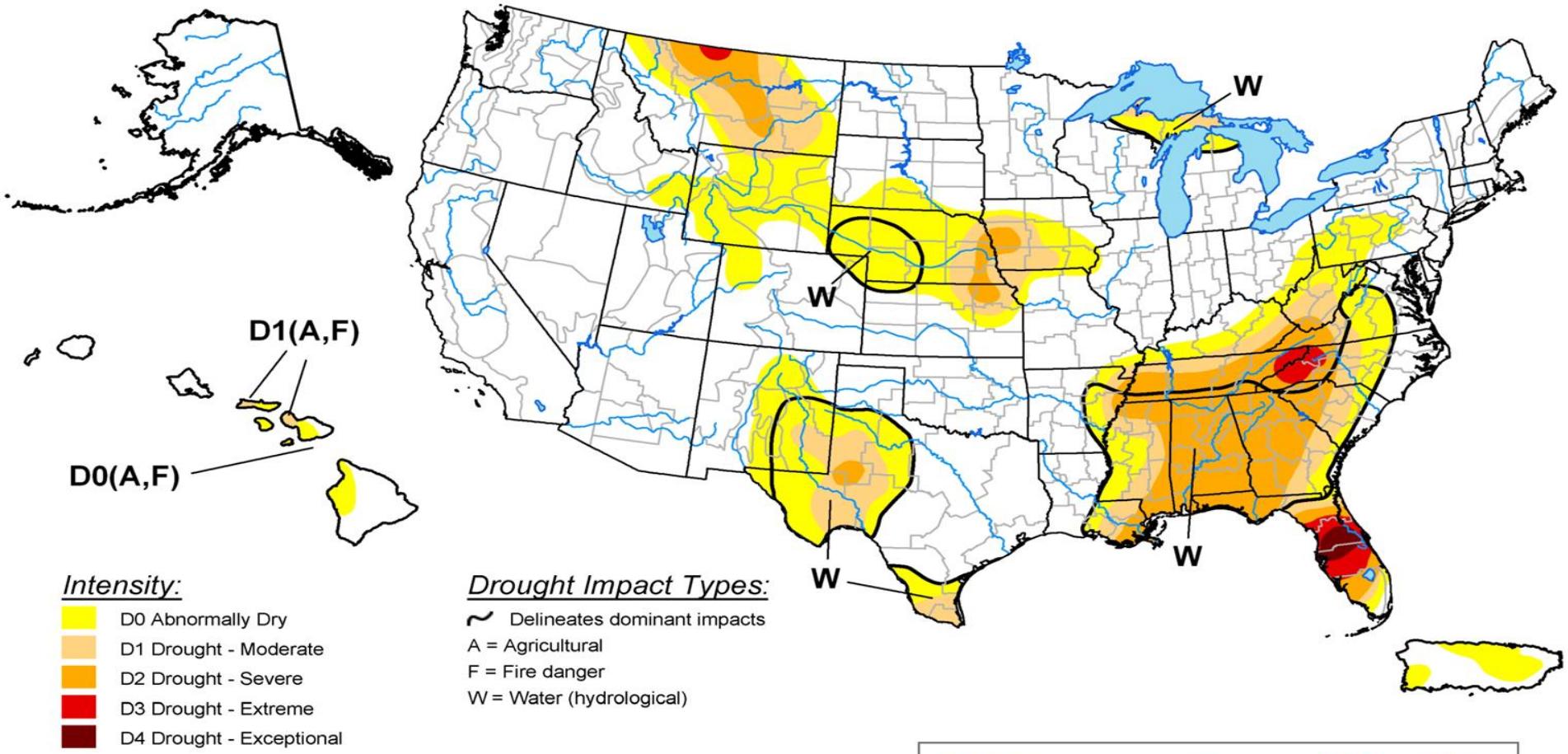
NOAA

• *Updated every Thursday morning* •

1999 | 2001 | 2003 | 2005 | 2007 | 2009 | 2011 | 2013

U.S. Drought Monitor

December 12, 2000
Valid 7 a.m. EST



USDA National Drought Mitigation Center

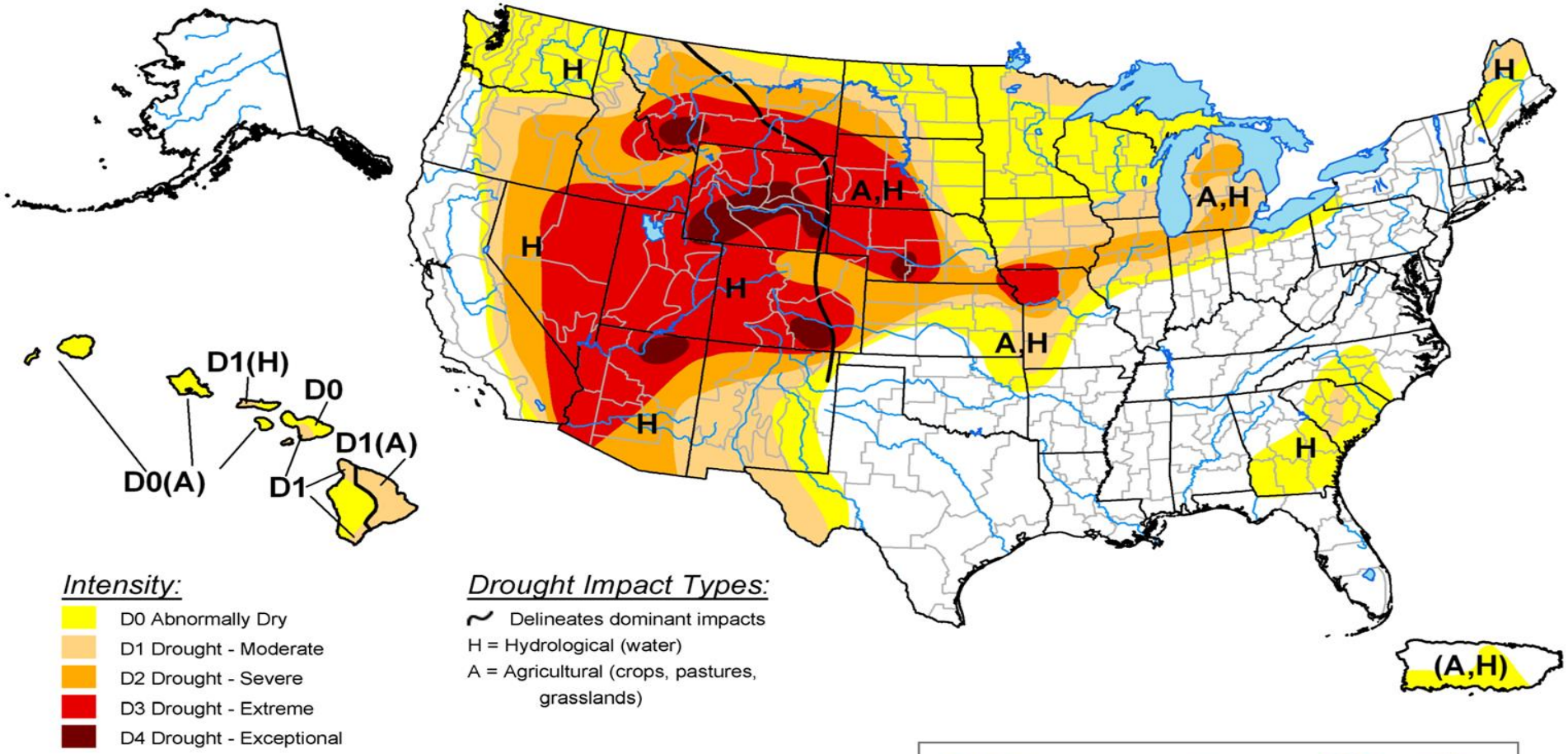
eleased Thursday, December 14, 2000
Author: David Miskus, NOAA/CPC/JAWF

December, 2000 – Forecast Component is dropped, D0 goes from "Watch" to "Abnormally Dry" (going into and coming out of drought) & authors put their names on the map.

1999 | 2001 | 2003 | 2005 | 2007 | 2009 | 2011 | 2013

U.S. Drought Monitor

February 18, 2003
Valid 7 a.m. EST



USDA National Drought Mitigation Center

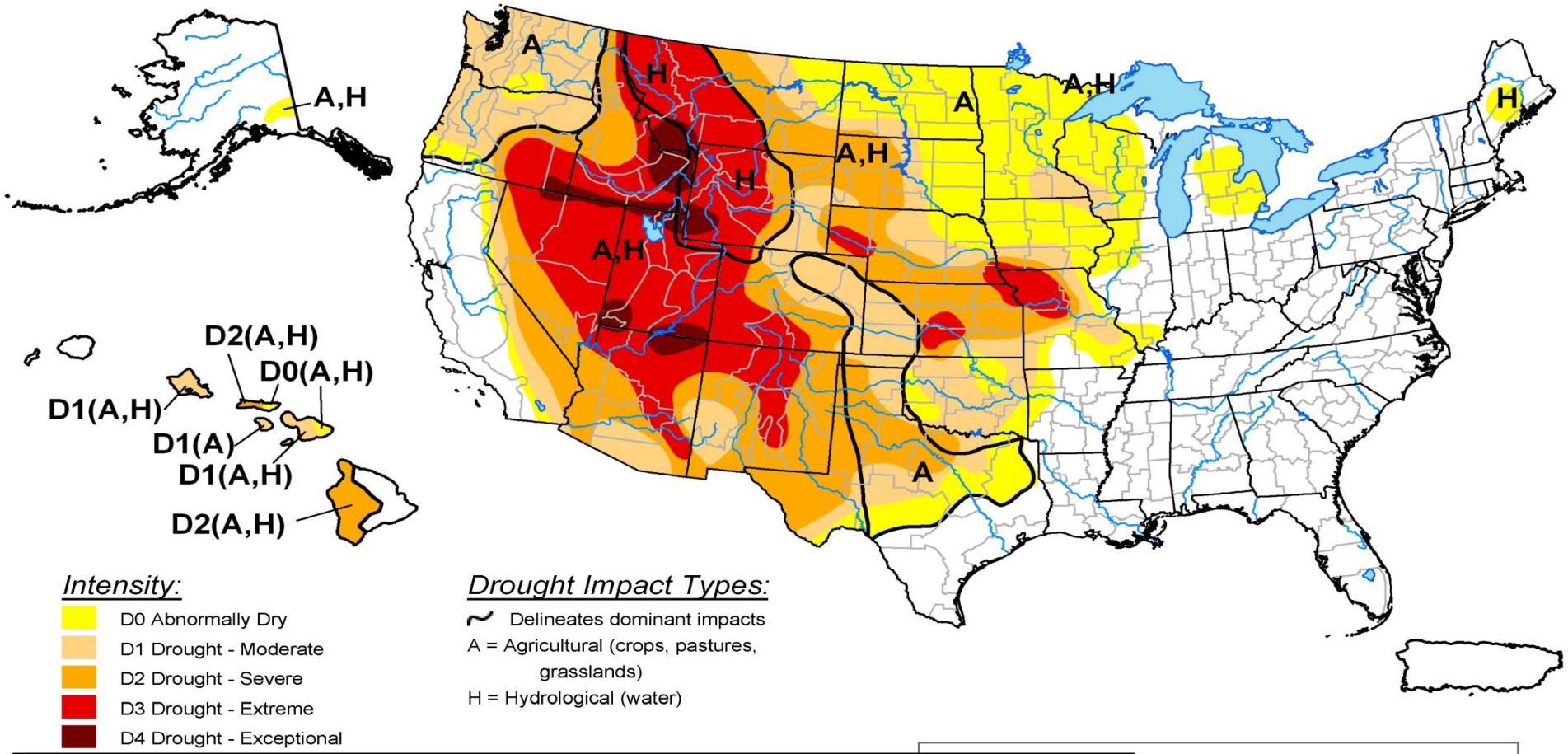
sed Thursday, February 20, 2003
layes, National Drought Mitigation Center

The Fire ("F") Impact type was dropped in early 2003 b/c fire is not really a good drought indicator; too many other factors that have nothing to do with drought can lead to wildfires.

1999 | 2001 | 2003 | 2005 | 2007 | 2009 | 2011 | 2013

U.S. Drought Monitor

August 19, 2003
Valid 7 a.m. EST



August, 2003 - authors make a transparent switch from **CorelDRAW to GIS** (Geographic Information System) to create the map. There was a steep learning curve, but made the USDM a leader on the GIS front and would pay big dividends down the road.

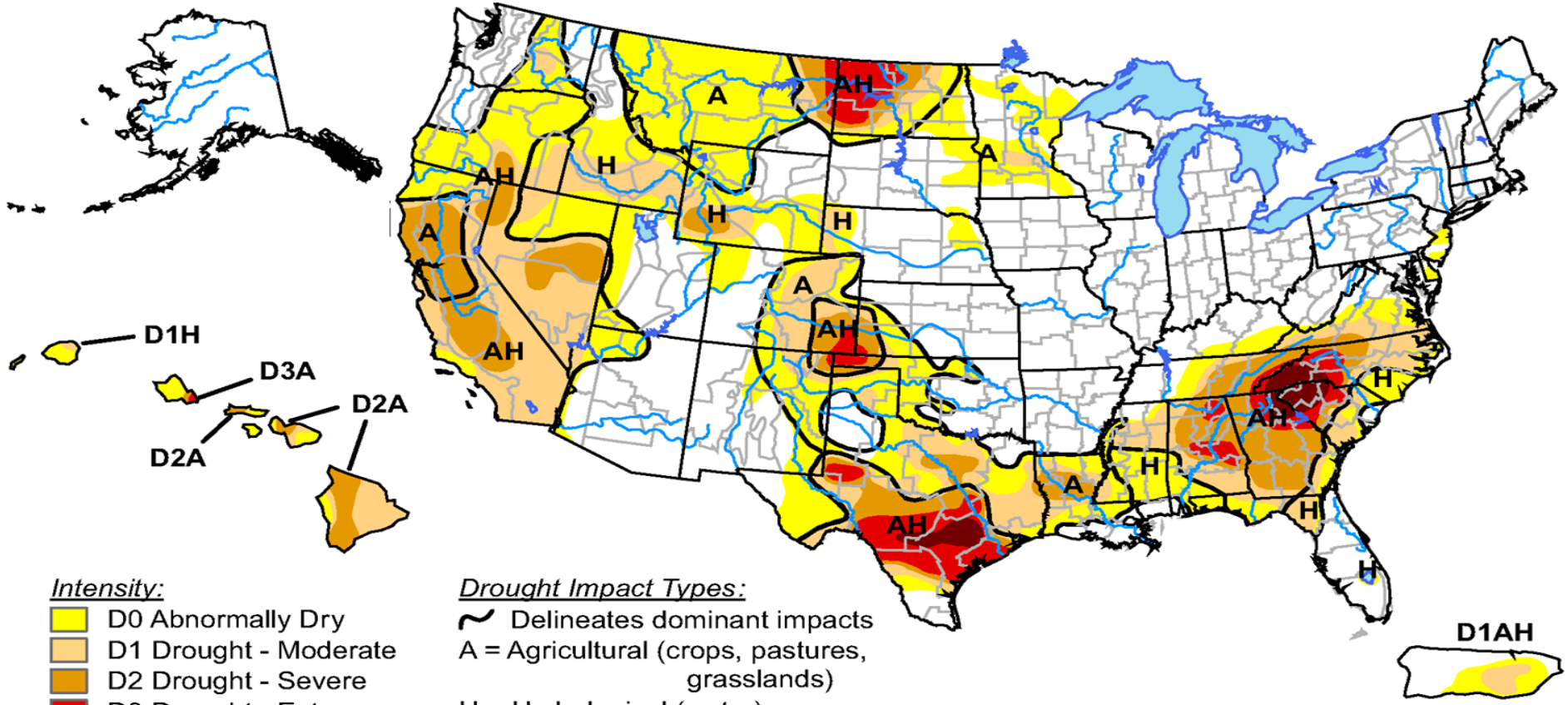
Drought Mitigation Center

rsday, August 21, 2003
/Richard Heim, NOAA/NCDC

1999 | 2001 | 2003 | 2005 | 2007 | 2009 | 2011 | 2013

U.S. Drought Monitor

August 12, 2008
Valid 8 a.m. EDT



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

Drought Impact Types:
- Delineates dominant impacts
- A = Agricultural (crops, pastures, grasslands)
- H = Hydrological (water)

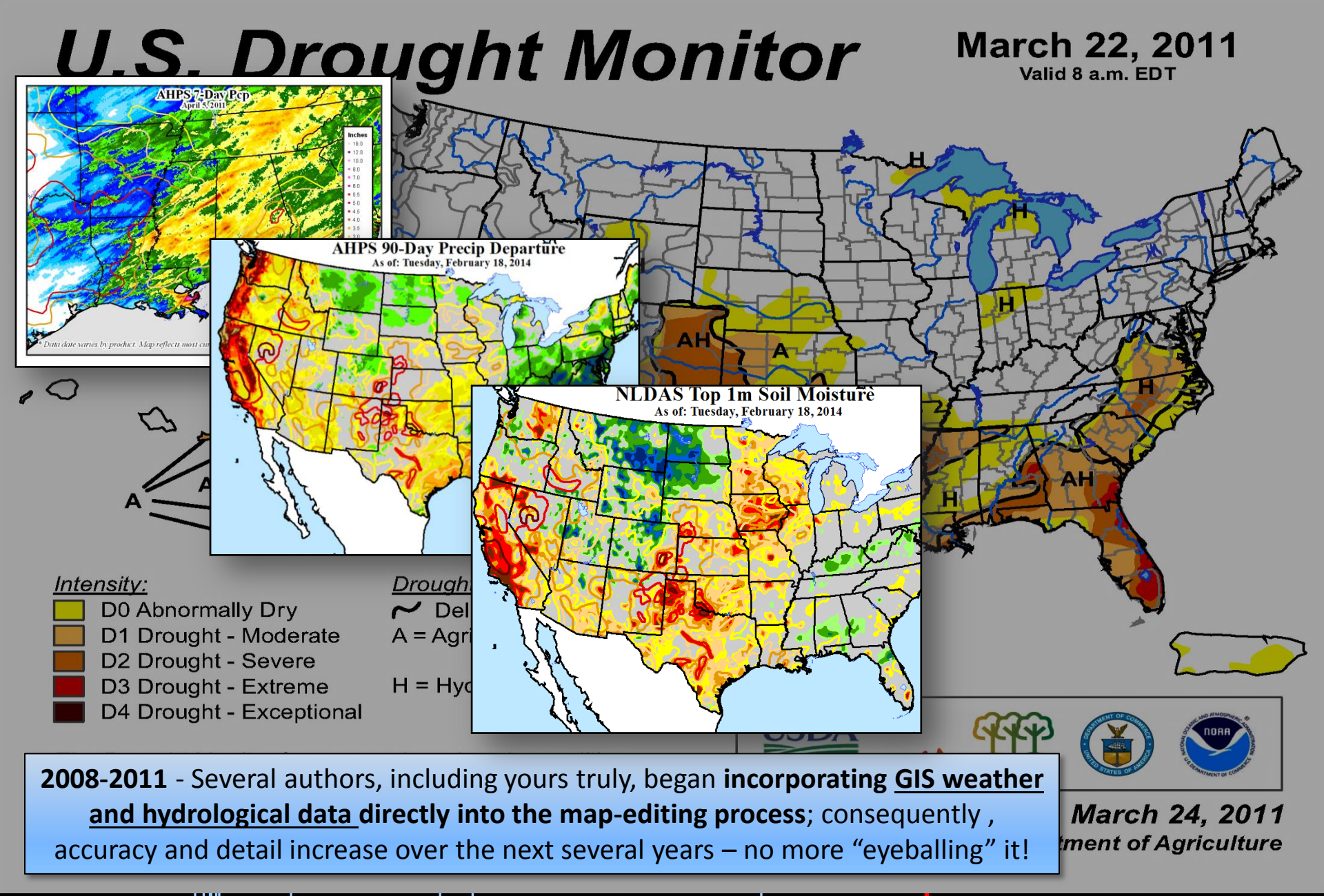
I joined the USDM team in August, 2008.

mary
for forecast statements.

http://drought.unl.edu/dm

Released Thursday, August 14, 2008
Author: Eric Luebehusen, U.S. Department of Agriculture

1999 | 2001 | 2003 | 2005 | 2007 | 2009 | 2011 | 2013

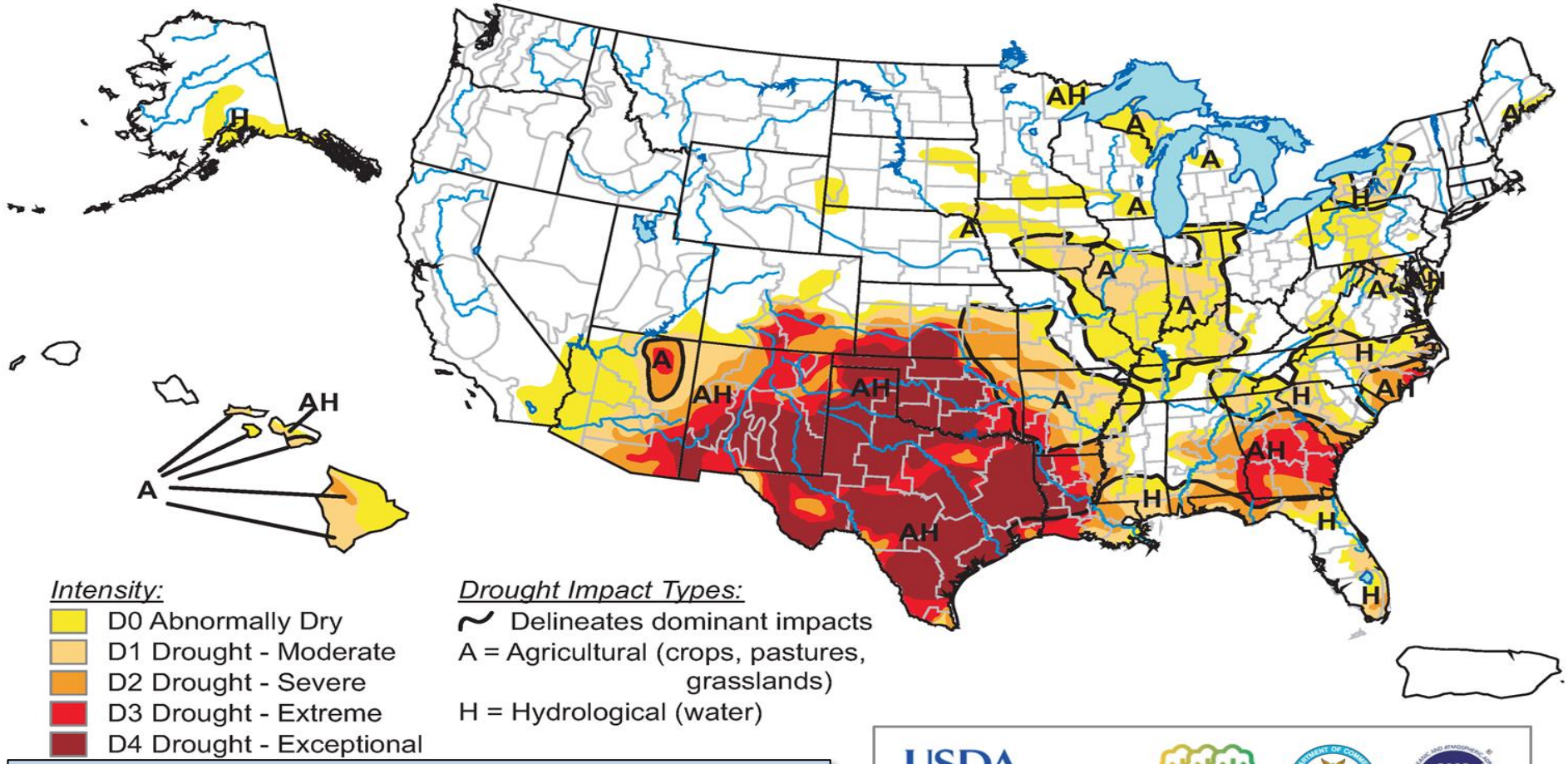


2008-2011 - Several authors, including yours truly, began **incorporating <u>GIS weather and hydrological data</u> directly into the map-editing process**; consequently , accuracy and detail increase over the next several years – no more "eyeballing" it!

1999 | 2001 | 2003 | 2005 | 2007 | 2009 | 2011 | 2013

U.S. Drought Monitor

August 23, 2011
Valid 8 a.m. EDT



Not even the famed D.C Earthquake could stop the USDM, which happened to hit on a Tuesday as I was saving Draft 2. Laura (co-author) was not actually my backup; my backup was evacuated with me in D.C..

USDA National Drought Mitigation Center

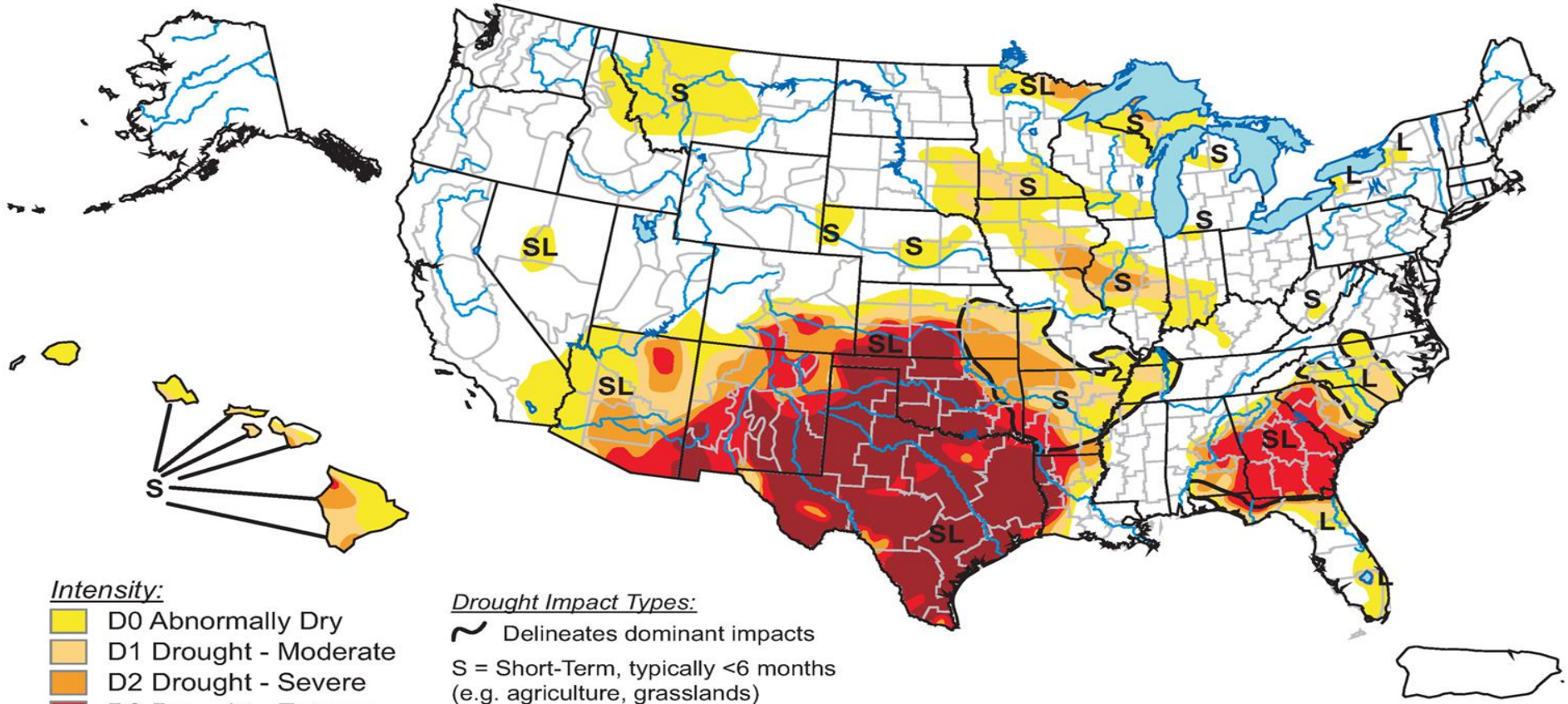
Released Thursday, August 25, 2011

s: Eric Luebehusen, U.S. Department of Agriculture
Laura Edwards, Western Regional Climate Center

1999 | 2001 | 2003 | 2005 | 2007 | 2009 | 2011 | 2013

U.S. Drought Monitor

September 27, 2011
Valid 8 a.m. EDT



USDA

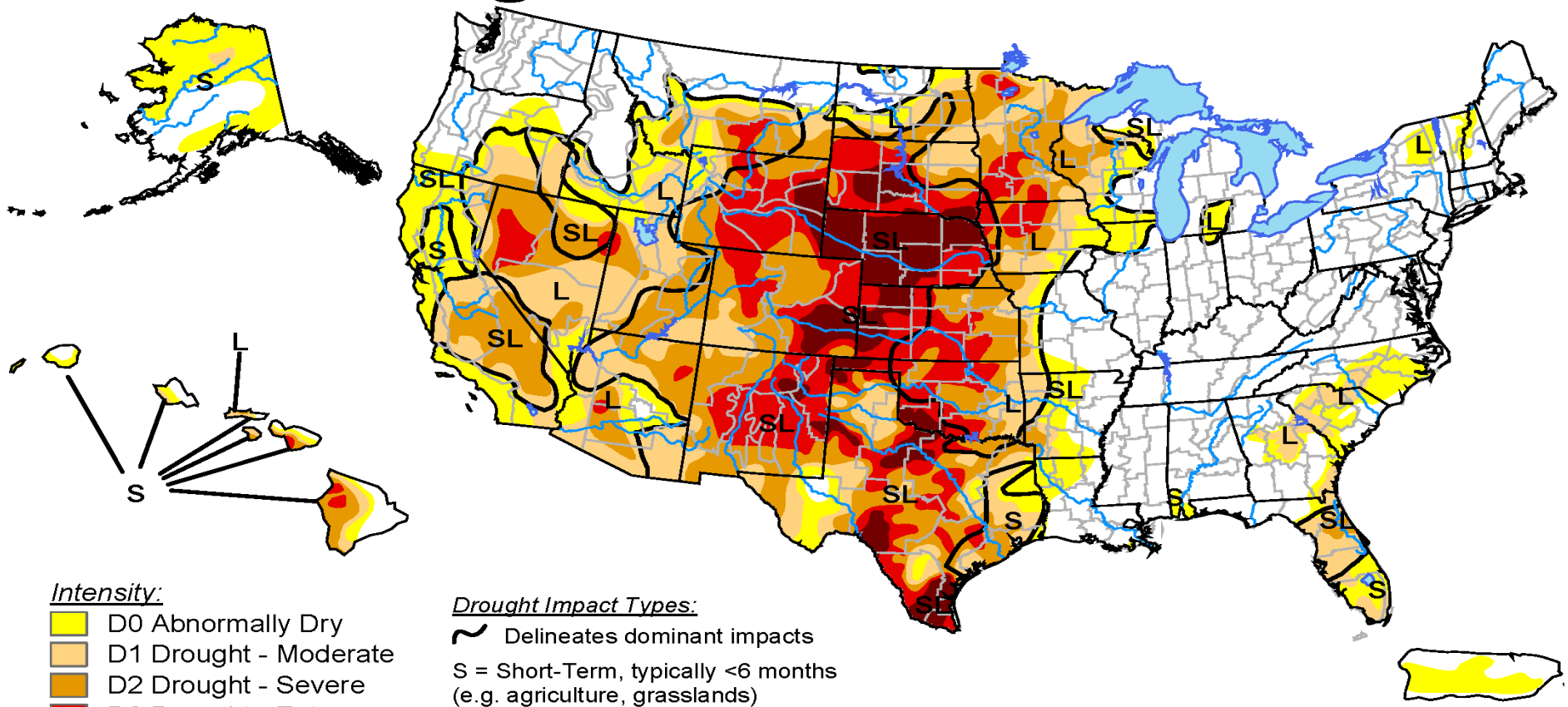
eptember 29, 2011
, NOAA/NESDIS/NCDC

September, 2011 - authors **changed the *Drought Impact Types* from** "A" (Agricultural) and "H" (Hydrological) to "S" (Short-Term) and "L" (Long-Term), removing ambiguity and confusion that was repeatedly reported.

1999 | 2001 | 2003 | 2005 | 2007 | 2009 | 2011 | 2013

U.S. Drought Monitor

March 26, 2013
Valid 7 a.m. EDT



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

Drought Impact Types:
- Delineates dominant impacts
- S = Short-Term, typically <6 months (e.g. agriculture, grasslands)
- L = Long-Term, typically >6 months (e.g. hydrology, ecology)

USDA | National Drought Mitigation Center | NOAA

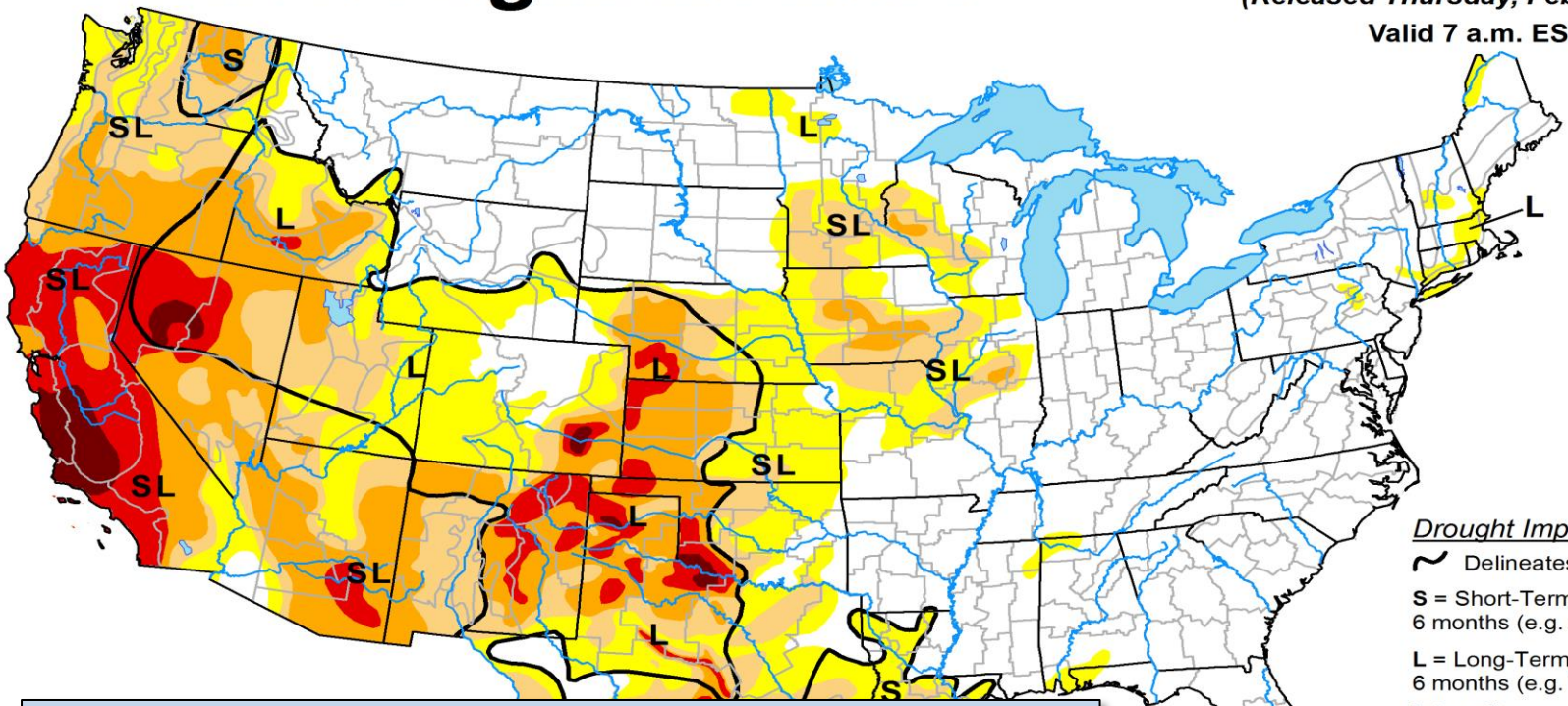
eleased Thursday, March 28, 2013
or: Anthony Artusa, NOAA/NWS/NCEP/CPC

Early 2013 - the **National Drought Mitigation Center took over the final map production** so the map is 100% consistent week to week in projection, size, and colors. (USDM authors still modify drought areas)

1999 | 2001 | 2003 | 2005 | 2007 | 2009 | 2011 | 2013

U.S. Drought Monitor

February 18, 2014
(Released Thursday, Feb. 20, 2014)
Valid 7 a.m. EST



Drought Impact Types:

Delineates dominant impacts

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

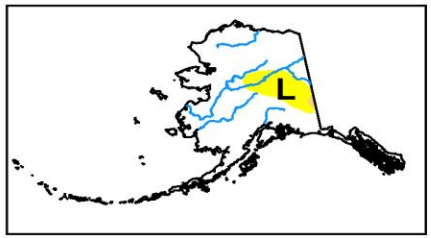
L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

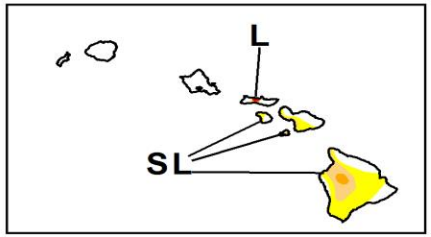
Intensity:

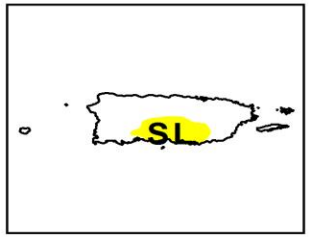
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

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

Late 2013 - the **NDMC changed the final map layout** to make sure the non-CONUS areas are clearly depicted as being as such, and are on their own scale.



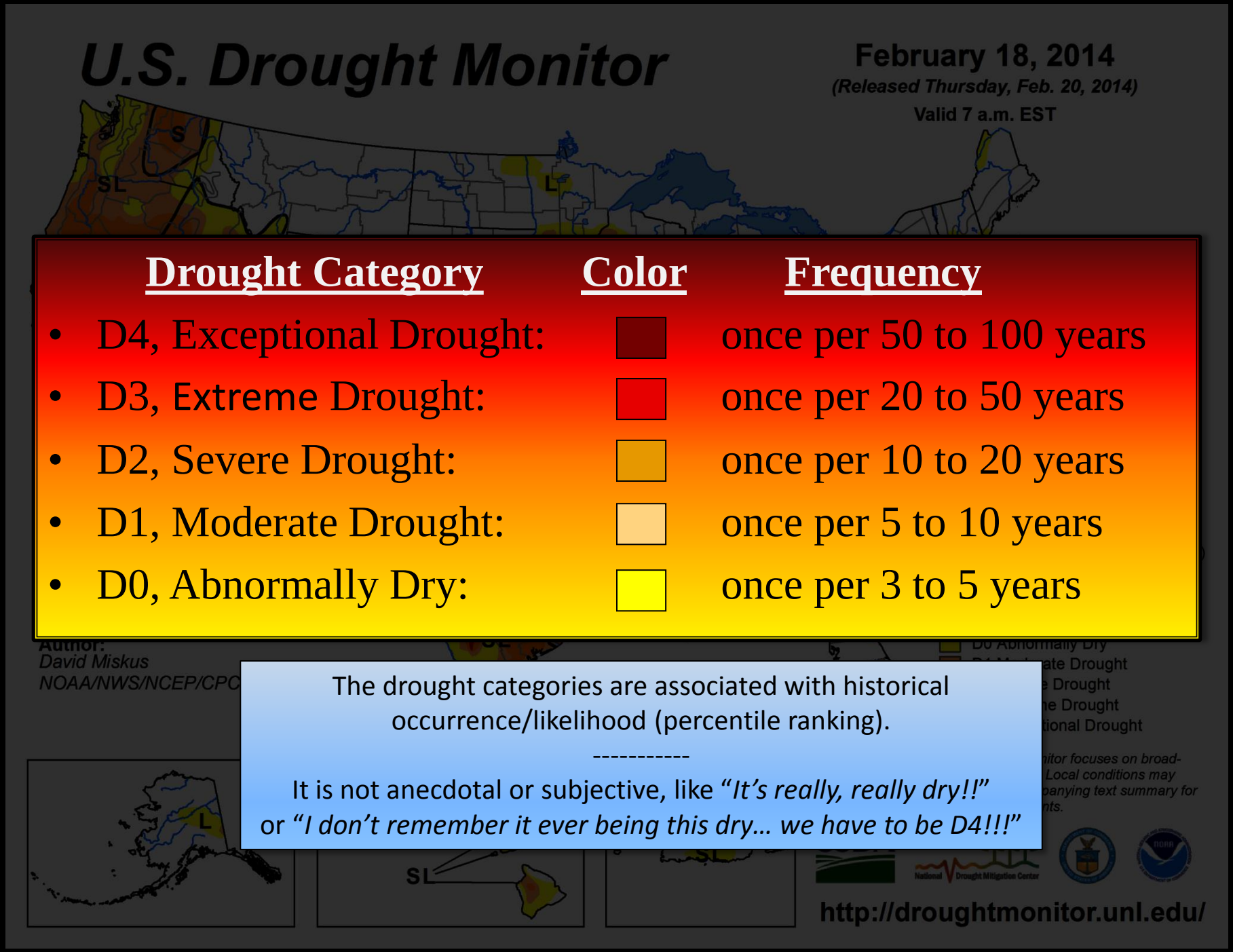




USDA National Drought Mitigation Center

http://droughtmonitor.unl.edu/

1999 | 2001 | 2003 | 2005 | 2007 | 2009 | 2011 | 2013



Drought Category	Color	Frequency
• D4, Exceptional Drought:		once per 50 to 100 years
• D3, Extreme Drought:		once per 20 to 50 years
• D2, Severe Drought:		once per 10 to 20 years
• D1, Moderate Drought:		once per 5 to 10 years
• D0, Abnormally Dry:		once per 3 to 5 years

The drought categories are associated with historical occurrence/likelihood (percentile ranking).

It is not anecdotal or subjective, like *"It's really, really dry!!"* or *"I don't remember it ever being this dry… we have to be D4!!!"*

Category	Description	Possible Impacts
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
D1	Moderate Drought	Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested
D2	Severe Drought	Crop or pasture losses likely; water shortages common; water restrictions imposed
D3	Extreme Drought	Major crop/pasture losses; widespread water shortages or restrictions
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies

Schedule & Process

Requirement: Authors **must** work at a regional or national "center", government or academia/research
There are currently 11 authors, and all are ***volunteers.***

USDA Agricultural Weather Assessments
World Agricultural Outlook Board

January						
Su	Mo	Tu	We	Th	Fr	Sa
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

February						
Su	Mo	Tu	We	Th	Fr	Sa
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28		

March						
Su	Mo	Tu	We	Th	Fr	Sa
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

April						
Su	Mo	Tu	We	Th	Fr	Sa
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

May						
Su	Mo	Tu	We	Th	Fr	Sa
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

June						
Su	Mo	Tu	We	Th	Fr	Sa
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

July				
Su	Mo	Tu	We	Th
	1	2	3	4
7	8	9	10	11
14	15	16	17	18
21	22	23	24	25
28	29	30	31	

August						
Su	Mo	Tu	We	Th	Fr	Sa

September						
Su	Mo	Tu	We	Th	Fr	Sa
		3	4	5	6	7
7	8	10	11	12	13	14
14	15	17	18	19	20	21
21	22	24	25	26	27	28
28	29					

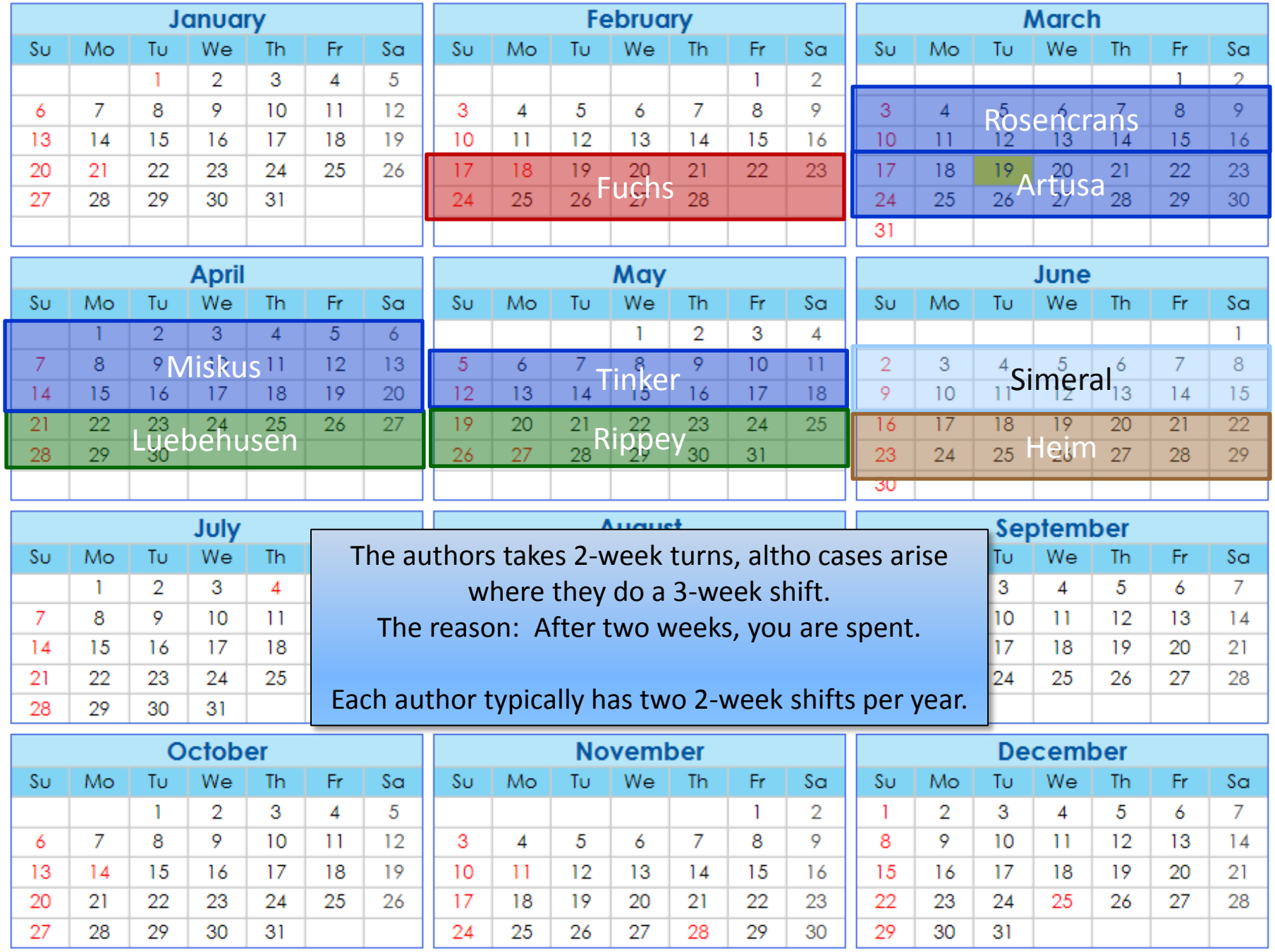
The authors takes 2-week turns, altho cases arise where they do a 3-week shift.
The reason: After two weeks, you are spent.

Each author typically has two 2-week shifts per year.

October						
Su	Mo	Tu	We	Th	Fr	Sa
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

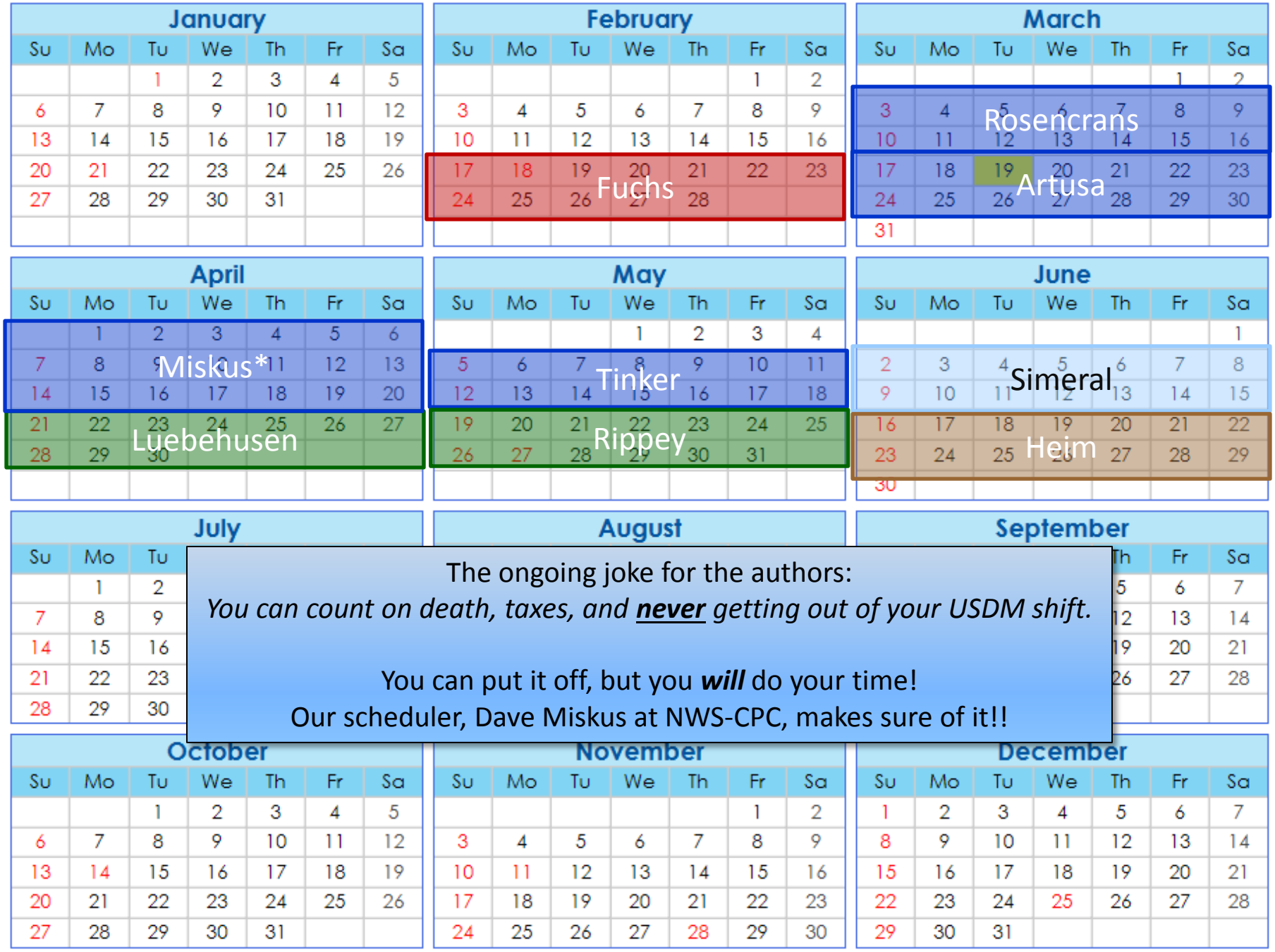
November						
Su	Mo	Tu	We	Th	Fr	Sa
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

December						
Su	Mo	Tu	We	Th	Fr	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				



The authors takes 2-week turns, altho cases arise where they do a 3-week shift.
The reason: After two weeks, you are spent.

Each author typically has two 2-week shifts per year.



The ongoing joke for the authors:

*You can count on death, taxes, and **never** getting out of your USDM shift.*

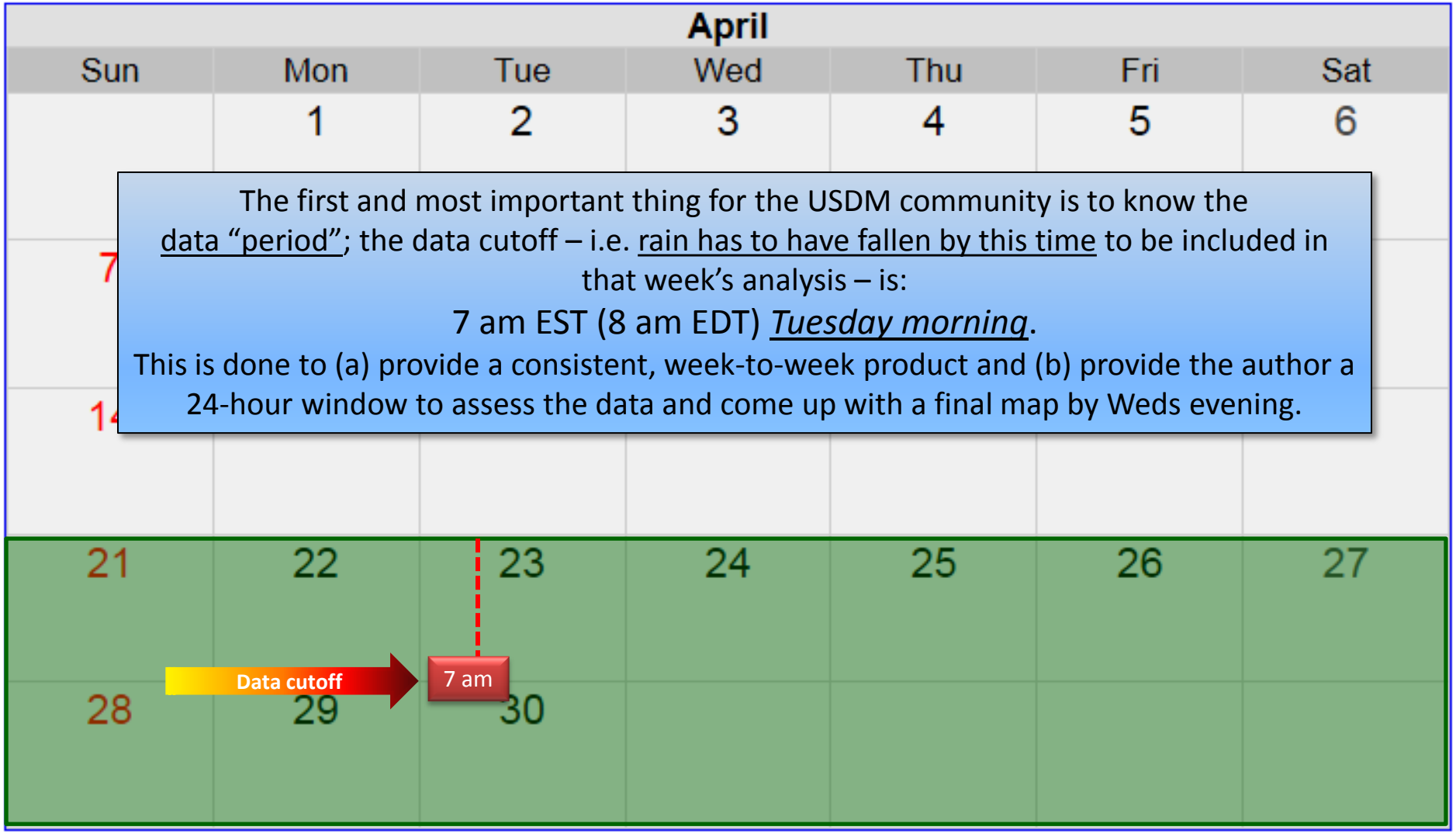
You can put it off, but you ***will*** do your time!

Our scheduler, Dave Miskus at NWS-CPC, makes sure of it!!

April						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6
7					12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

The two-week shift is broken down into two separate weekly cycles, with deadlines set in stone, except for Thanksgiving and any potential major holiday which happens to fall on the official release day.

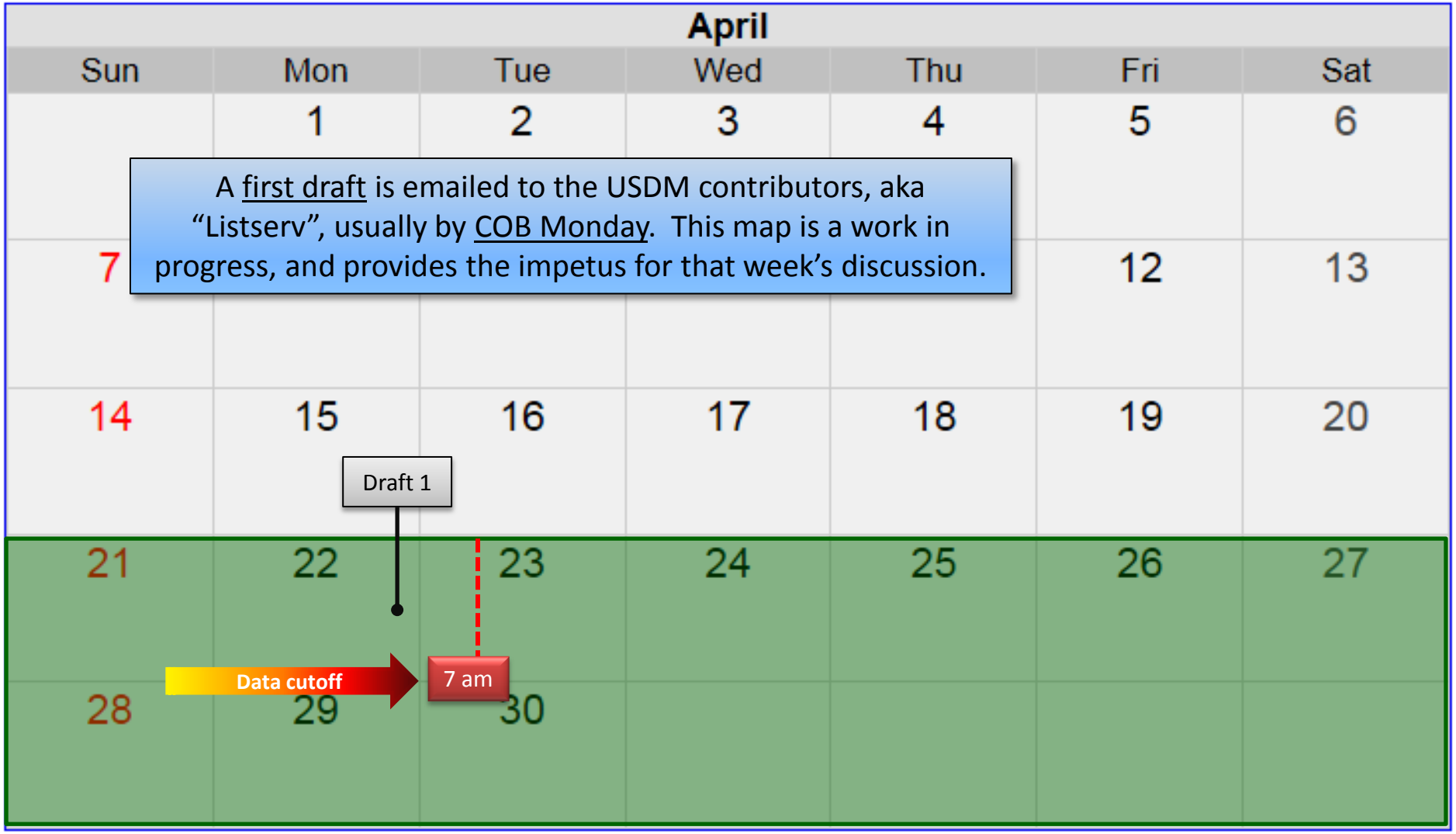
Luebehusen

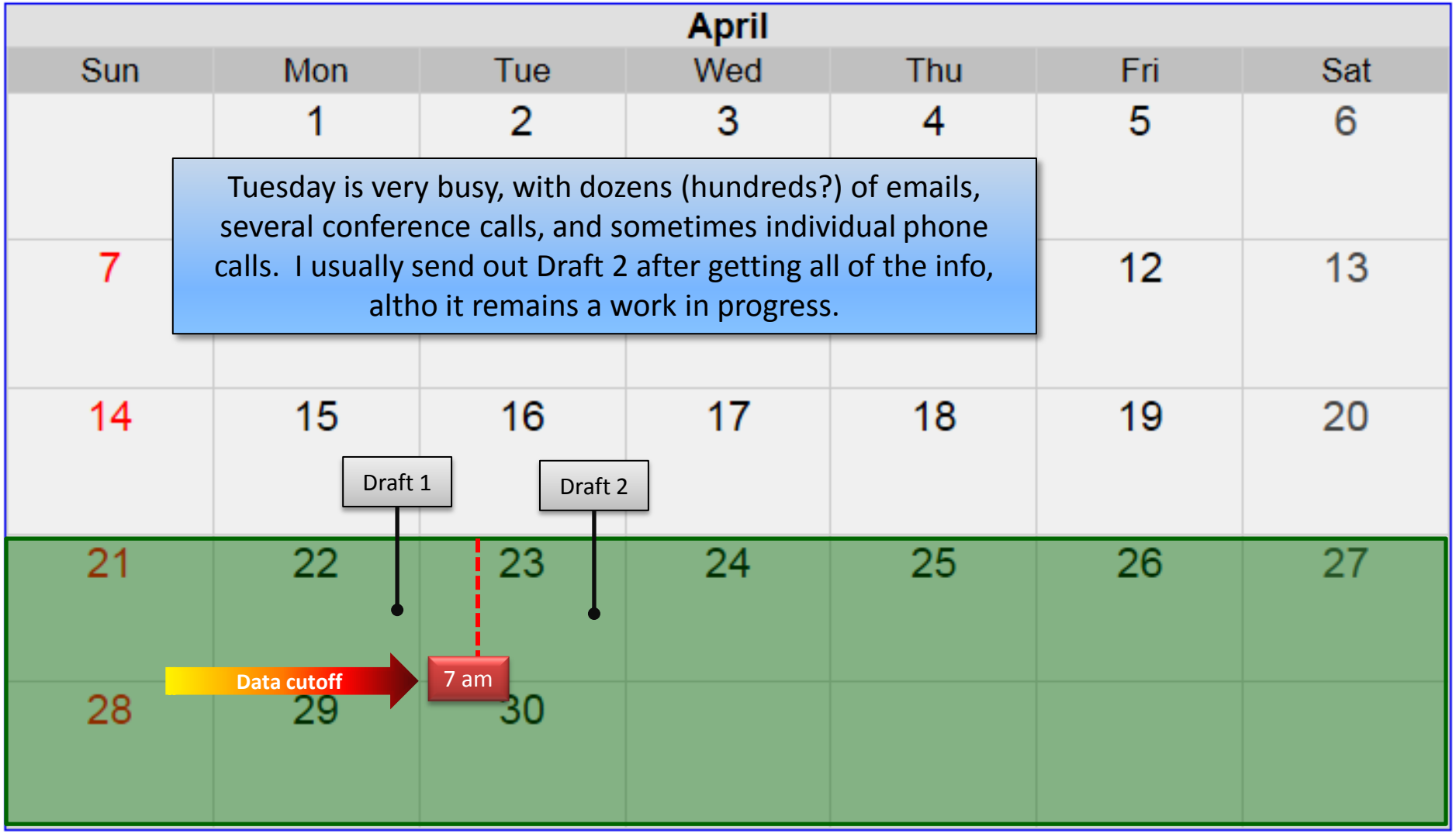


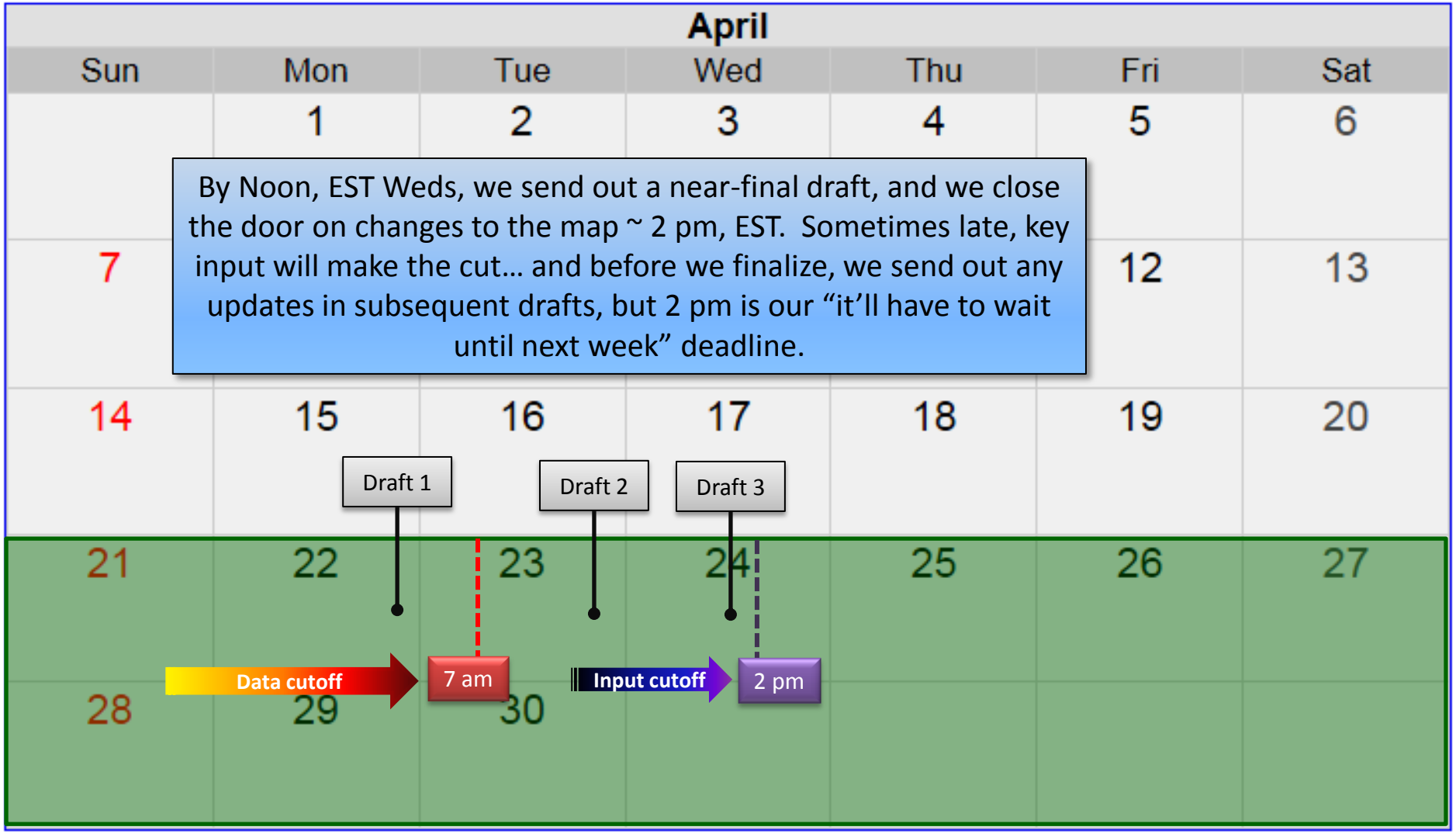
The first and most important thing for the USDM community is to know the data "period"; the data cutoff – i.e. rain has to have fallen by this time to be included in that week's analysis – is:

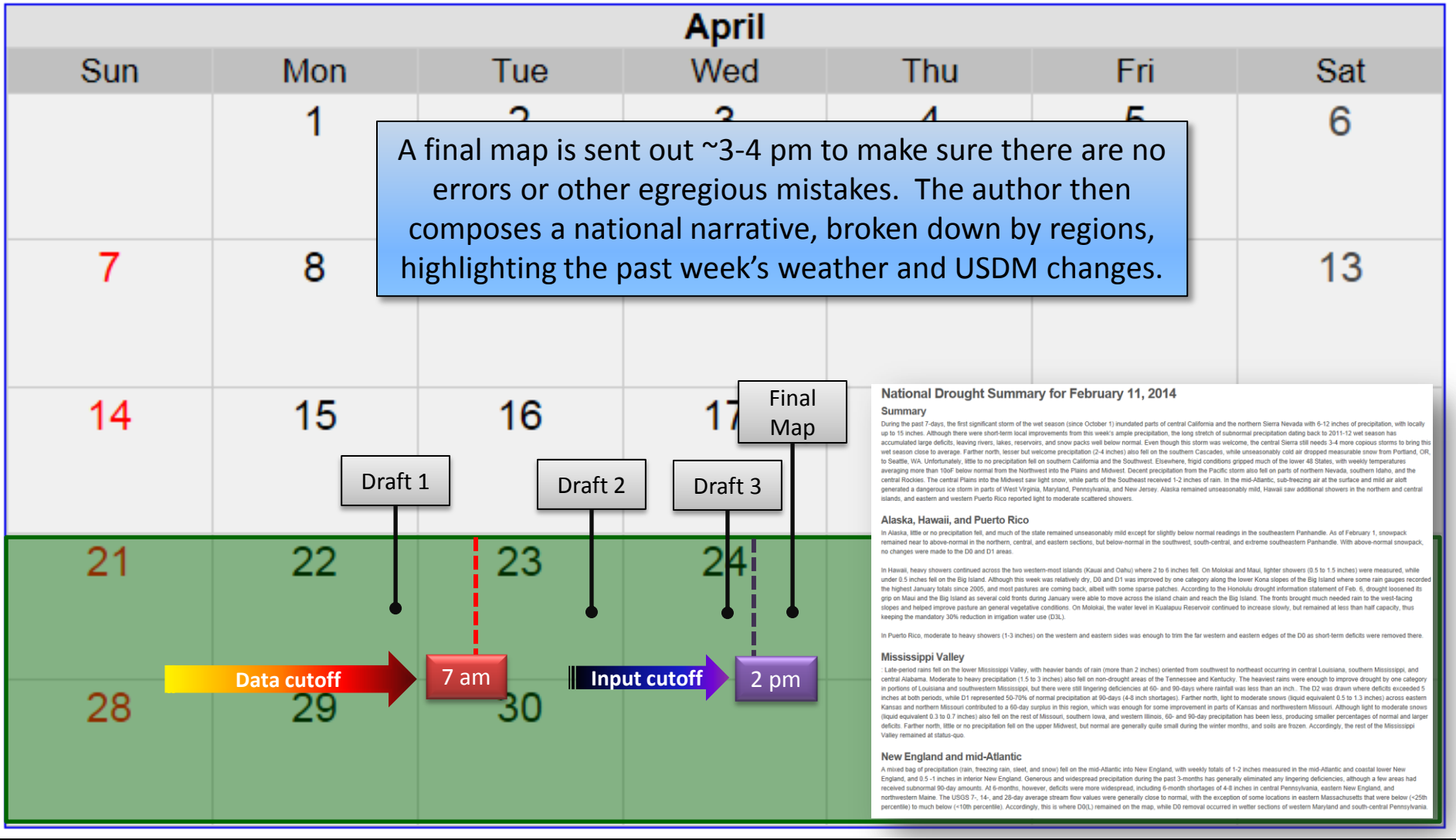
7 am EST (8 am EDT) *Tuesday morning*.

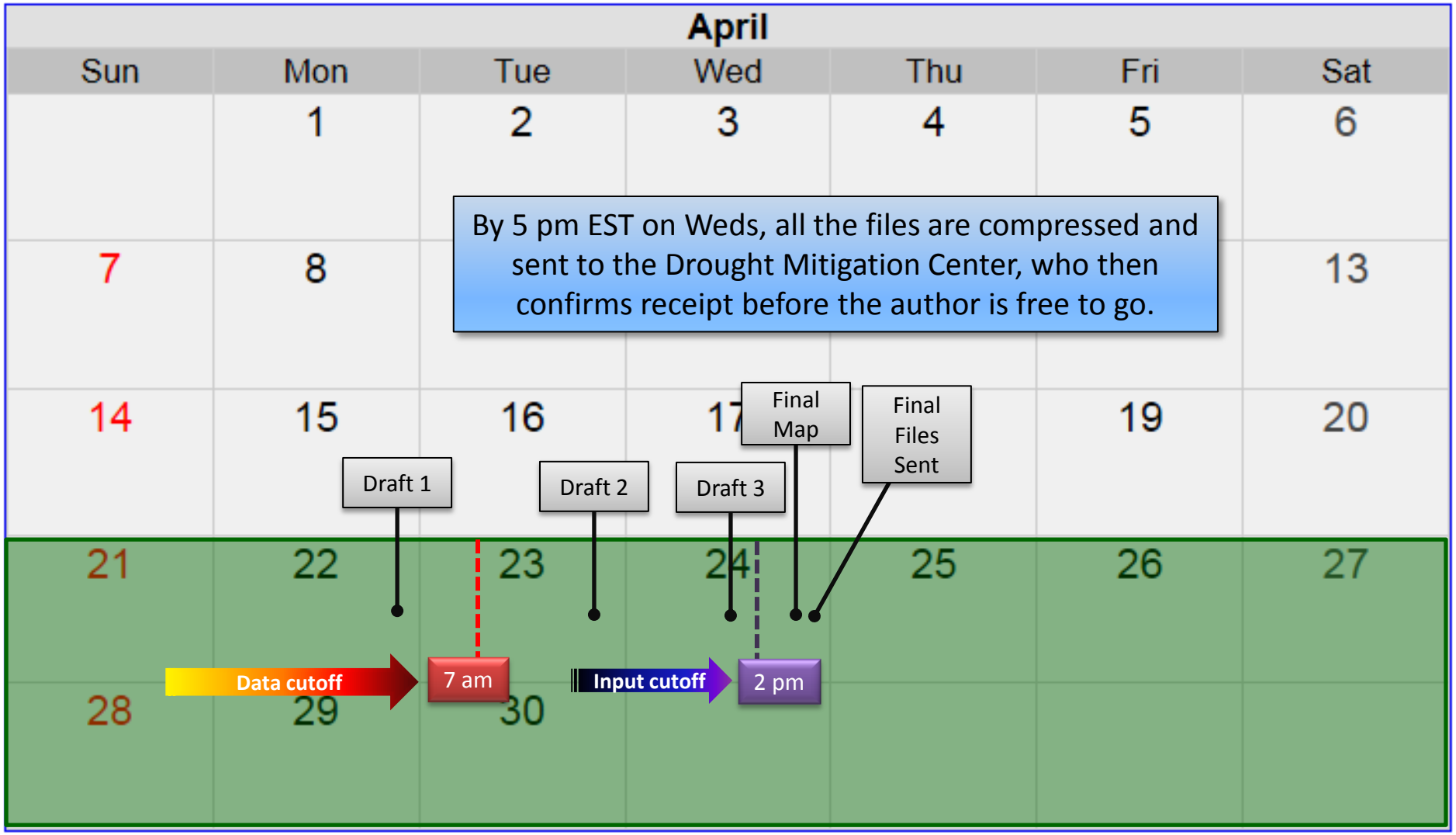
This is done to (a) provide a consistent, week-to-week product and (b) provide the author a 24-hour window to assess the data and come up with a final map by Weds evening.

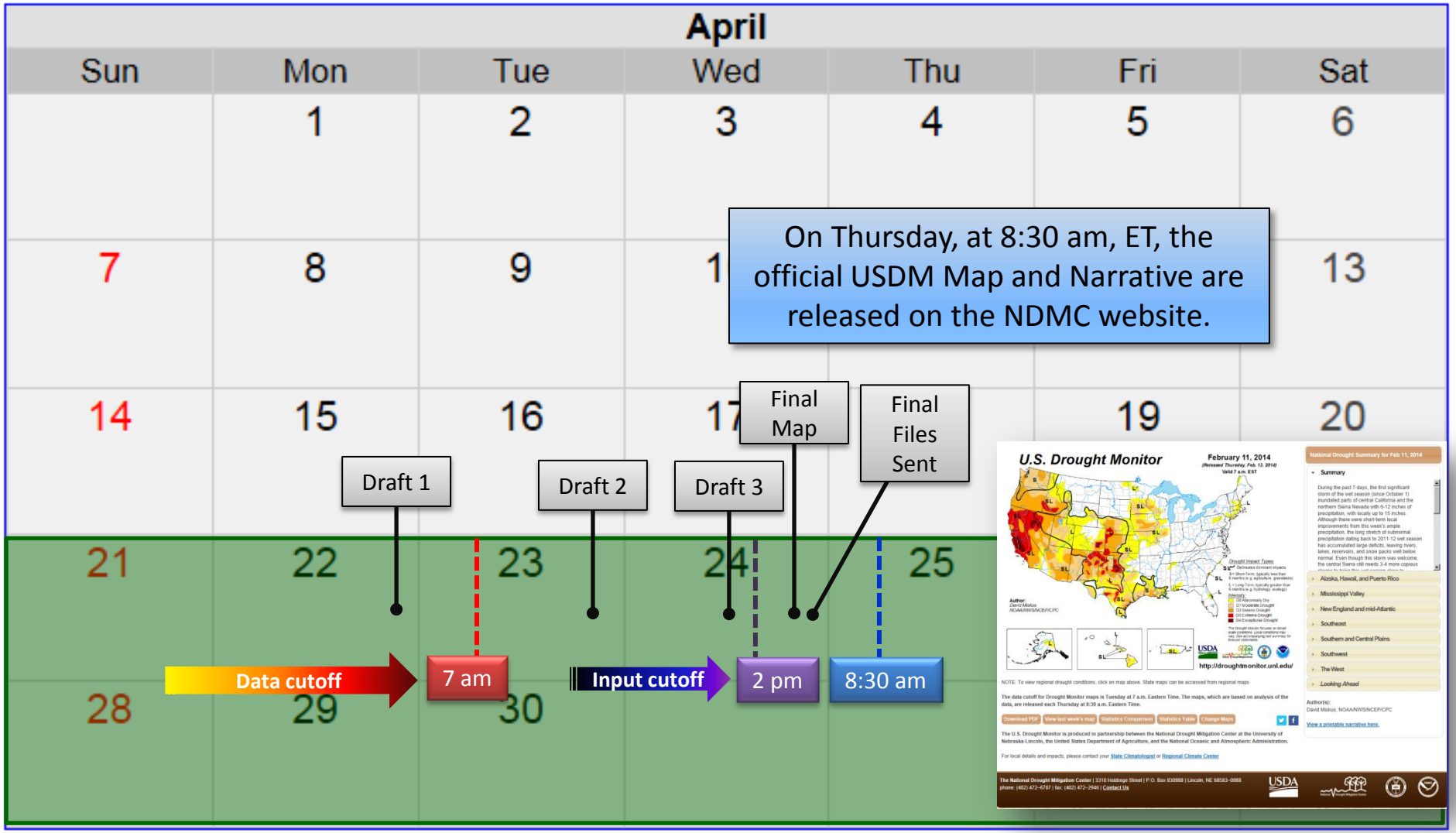

April
Sun
Mon
Tue
Wed
Thu
Fri
Sat
1
2
3
4
5
6
7
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
A first draft is emailed to the USDM contributors, aka "Listserv", usually by COB Monday. This map is a work in progress, and provides the impetus for that week's discussion.
Draft 1
Data cutoff
7 am


April
Sun
Mon
Tue
Wed
Thu
Fri
Sat
1
2
3
4
5
6
7
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
Tuesday is very busy, with dozens (hundreds?) of emails, several conference calls, and sometimes individual phone calls. I usually send out Draft 2 after getting all of the info, altho it remains a work in progress.
Draft 1
Draft 2
Data cutoff
7 am

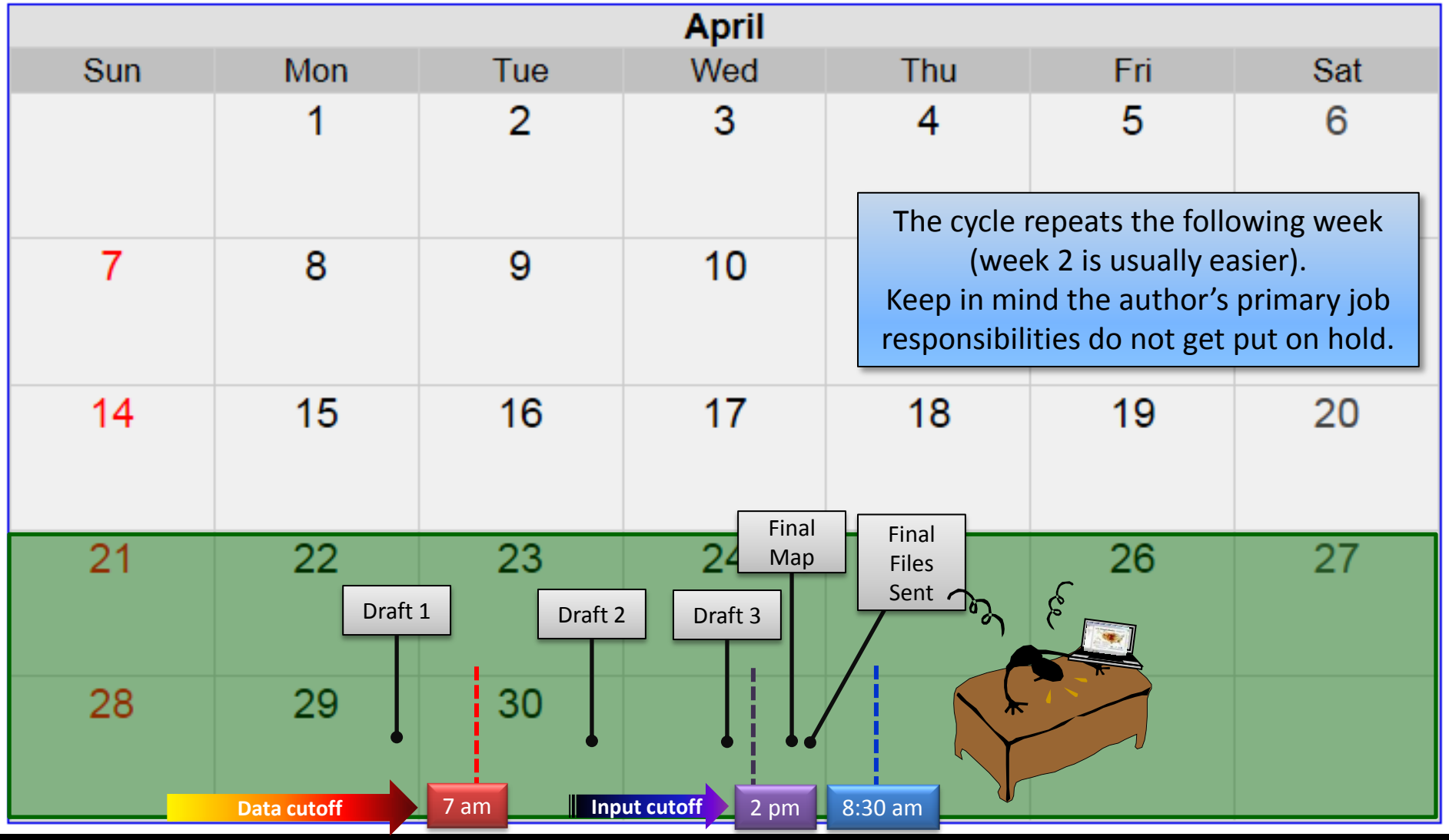

April
Sun
Mon
Tue
Wed
Thu
Fri
Sat
1
2
3
4
5
6
7
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
By Noon, EST Weds, we send out a near-final draft, and we close the door on changes to the map ~ 2 pm, EST. Sometimes late, key input will make the cut… and before we finalize, we send out any updates in subsequent drafts, but 2 pm is our "it'll have to wait until next week" deadline.
Draft 1
Draft 2
Draft 3
Data cutoff
7 am
Input cutoff
2 pm


April
Sun
Mon
Tue
Wed
Thu
Fri
Sat
1
6
7
8
13
14
15
16
17
21
22
23
24
28
29
30
A final map is sent out ~3-4 pm to make sure there are no errors or other egregious mistakes. The author then composes a national narrative, broken down by regions, highlighting the past week's weather and USDM changes.
Final Map
Draft 1
Draft 2
Draft 3
Data cutoff
7 am
Input cutoff
2 pm
National Drought Summary for February 11, 2014
Summary
During the past 7-days, the first significant storm of the wet season (since October 1) inundated parts of central California and the northern Sierra Nevada with 6-12 inches of precipitation, with locally up to 15 inches. Although there were short-term local improvements from this week's ample precipitation, the long stretch of subnormal precipitation dating back to 2011-12 wet season has accumulated large deficits, leaving rivers, lakes, reservoirs, and snow packs well below normal. Even though this storm was welcome, the central Sierra still needs 3-4 more copious storms to bring this wet season close to average. Farther north, lesser but welcome precipitation (2-4 inches) also fell on the southern Cascades, while unseasonably cold air dropped measurable snow from Portland, OR, to Seattle, WA. Unfortunately, little to no precipitation fell on southern California and the Southwest. Elsewhere, frigid conditions gripped much of the lower 48 States, with weekly temperatures averaging more than 10oF below normal from the Northwest into the Plains and Midwest. Decent precipitation from the Pacific storm also fell on parts of northern Nevada, southern Idaho, and the central Rockies. The central Plains into the Midwest saw light snow, while parts of the Southeast received 1-2 inches of rain. In the mid-Atlantic, sub-freezing air at the surface and mild air aloft generated a dangerous ice storm in parts of West Virginia, Maryland, Pennsylvania, and New Jersey. Alaska remained unseasonably mild, Hawaii saw additional showers in the northern and central islands, and eastern and western Puerto Rico reported light to moderate scattered showers.
Alaska, Hawaii, and Puerto Rico
In Alaska, little or no precipitation fell, and much of the state remained unseasonably mild except for slightly below normal readings in the southeastern Panhandle. As of February 1, snowpack remained near to above-normal in the northern, central, and eastern sections, but below-normal in the southwest, south-central, and extreme southeastern Panhandle. With above-normal snowpack, no changes were made to the D0 and D1 areas.
In Hawaii, heavy showers continued across the two western-most islands (Kauai and Oahu) where 2 to 6 inches fell. On Molokai and Maui, lighter showers (0.5 to 1.5 inches) were measured, while under 0.5 inches fell on the Big Island. Although this week was relatively dry, D0 and D1 was improved by one category along the lower Kona slopes of the Big Island where some rain gauges recorded the highest January totals since 2005, and most pastures are coming back, albeit with some sparse patches. According to the Honolulu drought information statement of Feb. 6, drought loosened its grip on Maui and the Big Island as several cold fronts during January were able to move across the island chain and reach the Big Island. The fronts brought much needed rain to the west-facing slopes and helped improve pasture an general vegetative conditions. On Molokai, the water level in Kualapuu Reservoir continued to increase slowly, but remained at less than half capacity, thus keeping the mandatory 30% reduction in irrigation water use (D3L).
In Puerto Rico, moderate to heavy showers (1-3 inches) on the western and eastern sides was enough to trim the far western and eastern edges of the D0 as short-term deficits were removed there.
Mississippi Valley
: Late-period rains fell on the lower Mississippi Valley, with heavier bands of rain (more than 2 inches) oriented from southwest to northeast occurring in central Louisiana, southern Mississippi, and central Alabama. Moderate to heavy precipitation (1.5 to 3 inches) also fell on non-drought areas of the Tennessee and Kentucky. The heaviest rains were enough to improve drought by one category in portions of Louisiana and southwestern Mississippi, but there were still lingering deficiencies at 60- and 90-days where rainfall was less than an inch. The D2 was drawn where deficits exceeded 5 inches at both periods; while D1 represented 50-70% of normal precipitation at 90-days (4-8 inch shortages). Farther north, light to moderate snows (liquid equivalent 0.5 to 1.3 inches) across eastern Kansas and northern Missouri contributed to a 60-day surplus in this region, which was enough for some improvement in parts of Kansas and northwestern Missouri. Although light to moderate snows (liquid equivalent 0.3 to 0.7 inches) also fell on the rest of Missouri, southern Iowa, and western Illinois, 60- and 90-day precipitation has been less, producing smaller percentages of normal and larger deficits. Farther north, little or no precipitation fell on the upper Midwest, but normal are generally quite small during the winter months, and soils are frozen. Accordingly, the rest of the Mississippi Valley remained at status-quo.
New England and mid-Atlantic
A mixed bag of precipitation (rain, freezing rain, sleet, and snow) fell on the mid-Atlantic into New England, with weekly totals of 1-2 inches measured in the mid-Atlantic and coastal lower New England, and 0.5 -1 inches in interior New England. Generous and widespread precipitation during the past 3-months has generally eliminated any lingering deficiencies, although a few areas had received subnormal 90-day amounts. At 6-months, however, deficits were more widespread, including 6-month shortages of 4-8 inches in central Pennsylvania, eastern New England, and northwestern Maine. The USGS 7-, 14-, and 28-day average stream flow values were generally close to normal, with the exception of some locations in eastern Massachusetts that were below (<25th percentile) to much below (<10th percentile). Accordingly, this is where D0(L) remained on the map, while D0 removal occurred in wetter sections of western Maryland and south-central Pennsylvania.

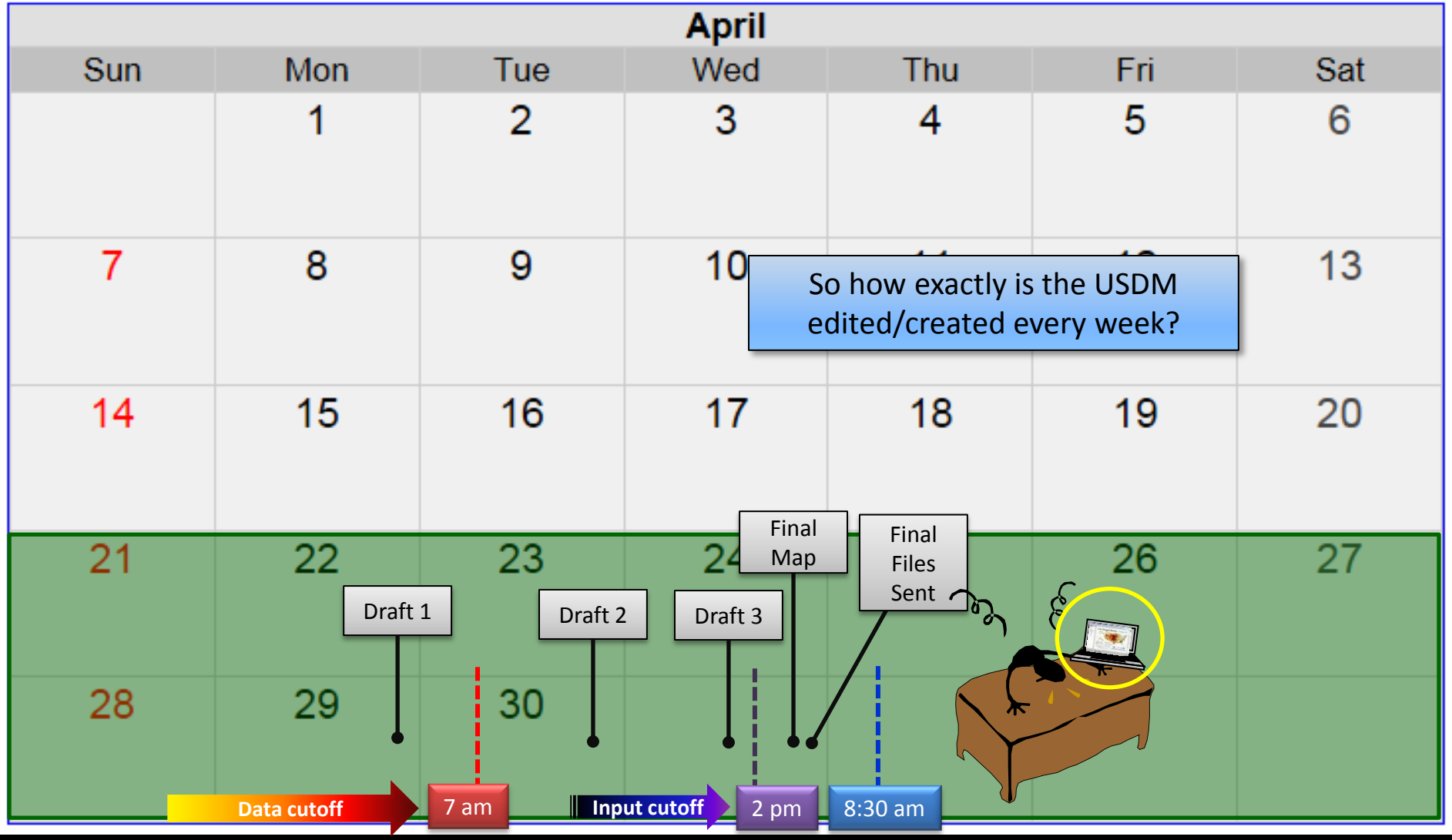

April
Sun
Mon
Tue
Wed
Thu
Fri
Sat
1
2
3
4
5
6
7
8
13
14
15
16
17
19
20
21
22
23
24
25
26
27
28
29
30
By 5 pm EST on Weds, all the files are compressed and sent to the Drought Mitigation Center, who then confirms receipt before the author is free to go.
Draft 1
Draft 2
Draft 3
Final Map
Final Files Sent
Data cutoff
7 am
Input cutoff
2 pm



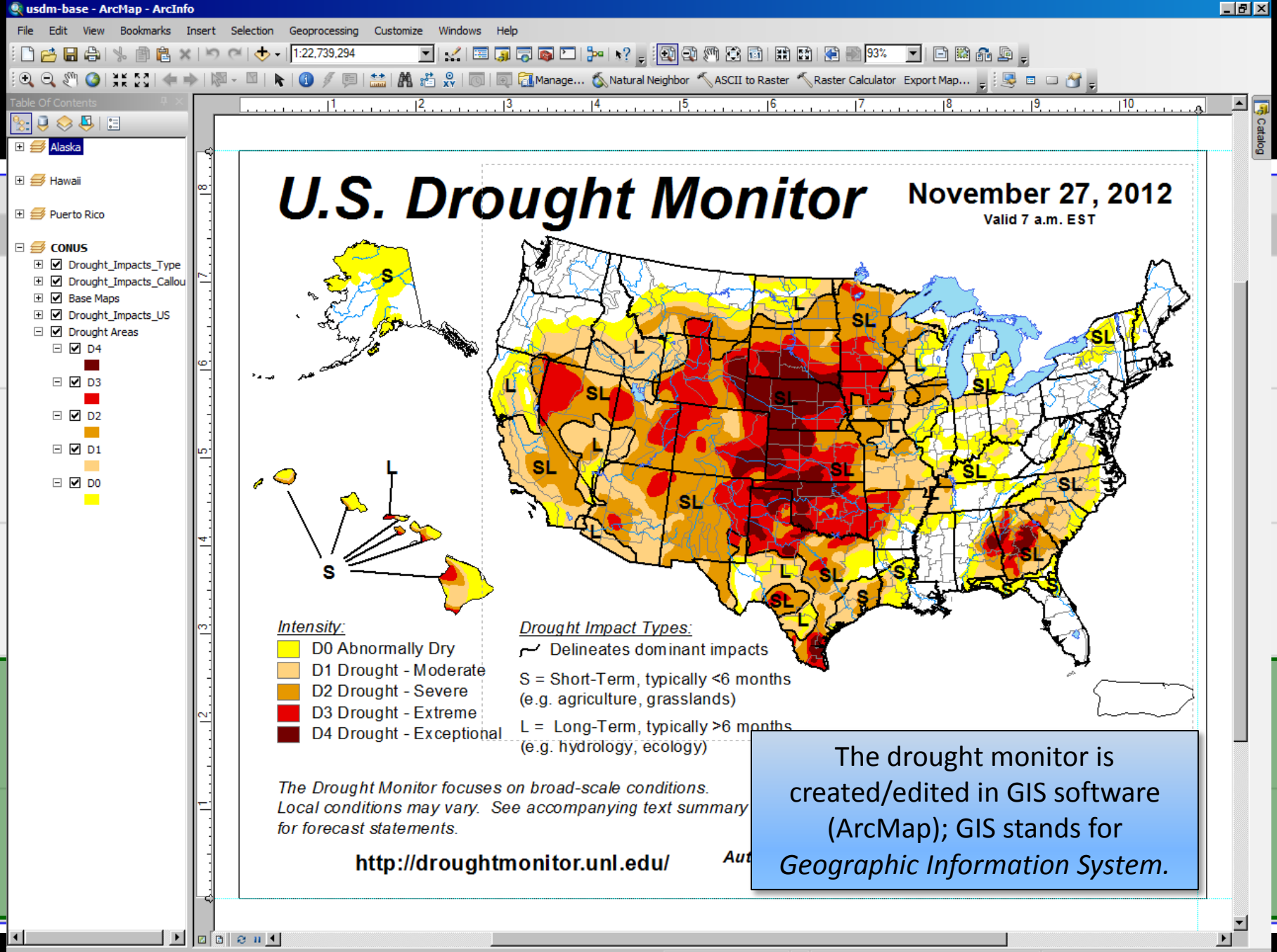
http://droughtmonitor.unl.edu/



http://droughtmonitor.unl.edu/



http://droughtmonitor.unl.edu/

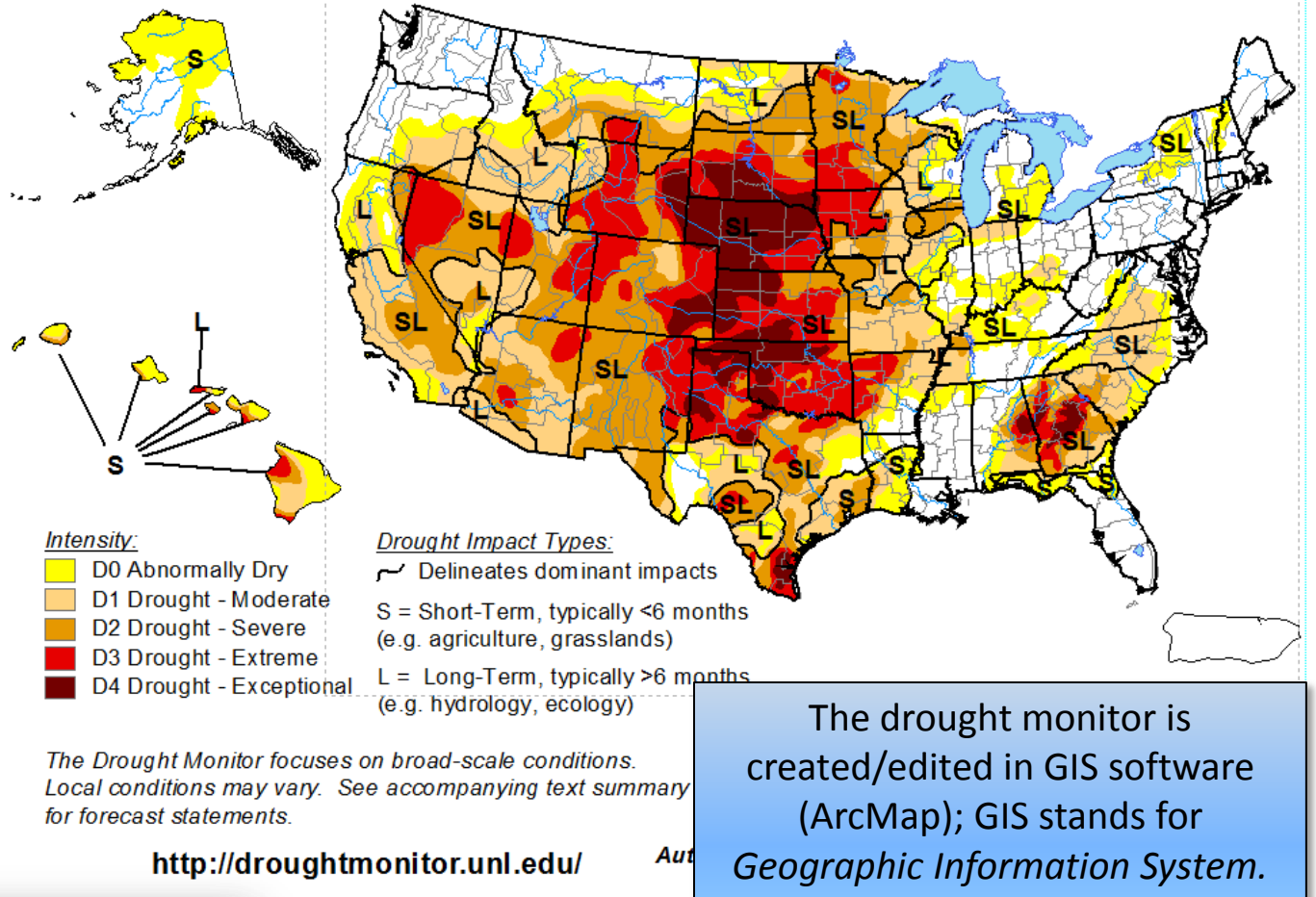

usdm-base - ArcMap - ArcInfo
File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
Manage... Natural Neighbor ASCII to Raster Raster Calculator Export Map...
Table Of Contents
Alaska
Hawaii
Puerto Rico
CONUS
Drought_Impacts_Type
Drought_Impacts_Callou
Base Maps
Drought_Impacts_US
Drought Areas
D4
D3
D2
D1
D0
U.S. Drought Monitor
November 27, 2012
Valid 7 a.m. EST
Intensity:
D0 Abnormally Dry
D1 Drought - Moderate
D2 Drought - Severe
D3 Drought - Extreme
D4 Drought - Exceptional
Drought Impact Types:
Delineates dominant impacts
S = Short-Term, typically <6 months
(e.g. agriculture, grasslands)
L = Long-Term, typically >6 months
(e.g. hydrology, ecology)
The Drought Monitor focuses on broad-scale conditions.
Local conditions may vary. See accompanying text summary
for forecast statements.
http://droughtmonitor.unl.edu/
The drought monitor is created/edited in GIS software (ArcMap); GIS stands for Geographic Information System.
9.39 0.71 Inches
Start
2:44 PM
3/19/2013

usdm-base - ArcMap - ArcInfo

File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help

Table Of Contents

- Alaska
- Hawaii
- Puerto Rico
- CONUS
  - Drought_Impacts_Type
  - Drought_Impacts_Callou
  - Base Maps
  - Drought_Impacts_US
  - Drought Areas
    - D4
    - D3
    - D2
    - D1
    - D0

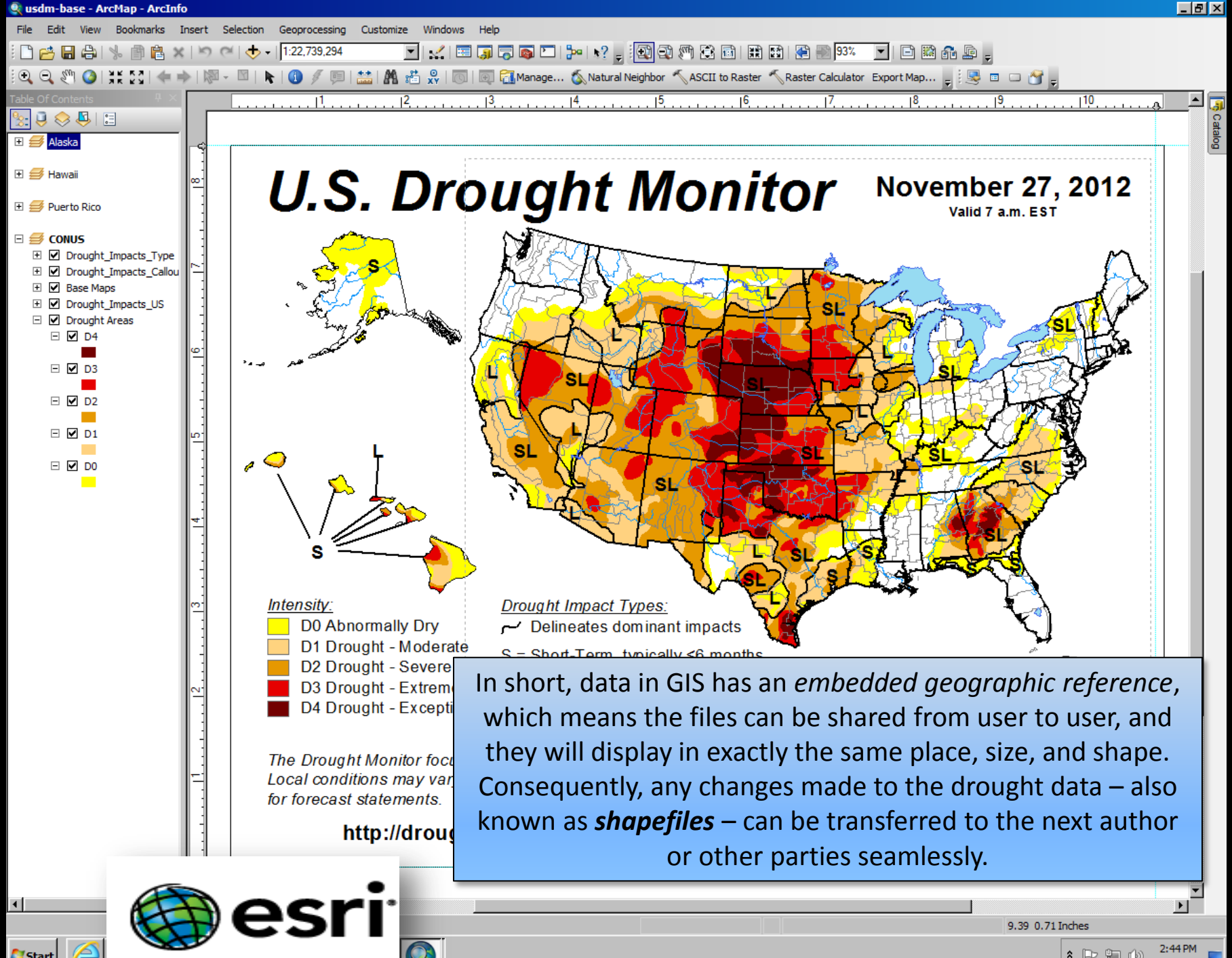


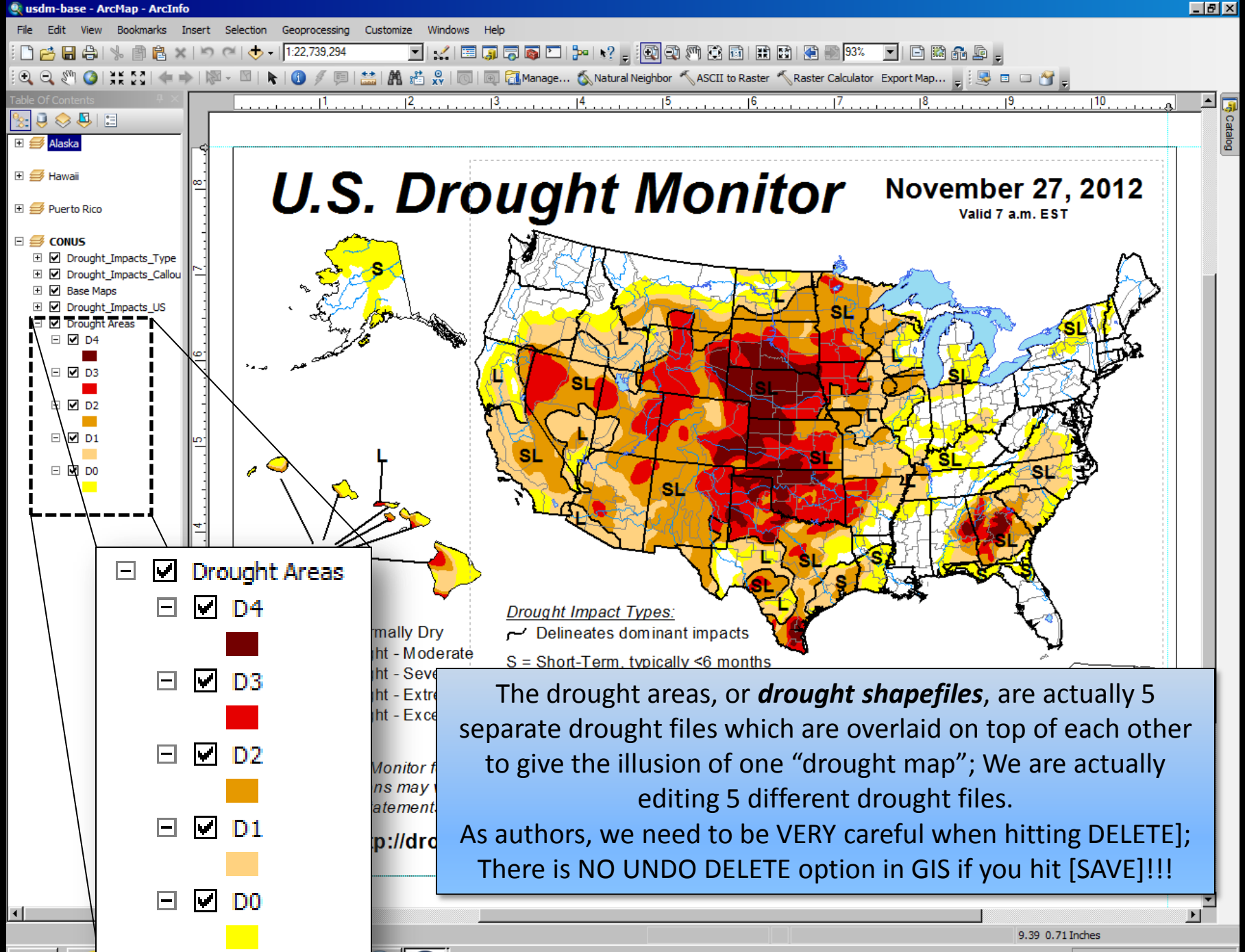
The drought monitor is created/edited in GIS software (ArcMap); GIS stands for *Geographic Information System.*

esri

9.39 0.71 Inches

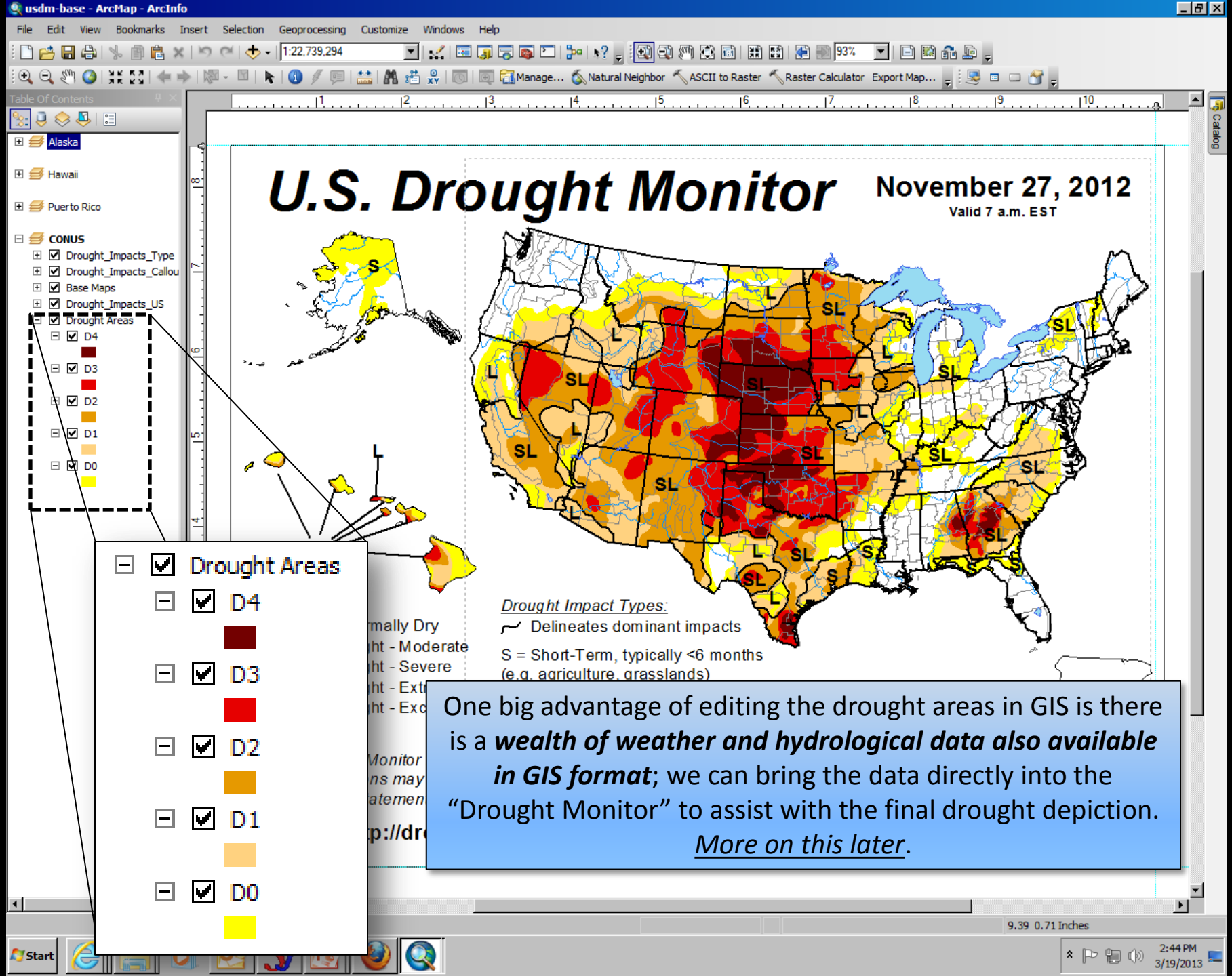
Start 2:44 PM 3/19/2013


usdm-base - ArcMap - ArcInfo
File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
Manage... Natural Neighbor ASCII to Raster Raster Calculator Export Map...
Table Of Contents
Alaska
Hawaii
Puerto Rico
CONUS
Drought_Impacts_Type
Drought_Impacts_Callou
Base Maps
Drought_Impacts_US
Drought Areas
D4
D3
D2
D1
D0
U.S. Drought Monitor
November 27, 2012
Valid 7 a.m. EST
Intensity:
D0 Abnormally Dry
D1 Drought - Moderate
D2 Drought - Severe
D3 Drought - Extrem
D4 Drought - Excepti
Drought Impact Types:
Delineates dominant impacts
S – Short-Term, typically <6 months
The Drought Monitor focu
Local conditions may var
for forecast statements.
http://droug
In short, data in GIS has an *embedded geographic reference*, which means the files can be shared from user to user, and they will display in exactly the same place, size, and shape. Consequently, any changes made to the drought data – also known as ***shapefiles*** – can be transferred to the next author or other parties seamlessly.
esri
Start
9.39 0.71 Inches
2:44 PM
3/19/2013



The drought areas, or ***drought shapefiles***, are actually 5 separate drought files which are overlaid on top of each other to give the illusion of one "drought map"; We are actually editing 5 different drought files.

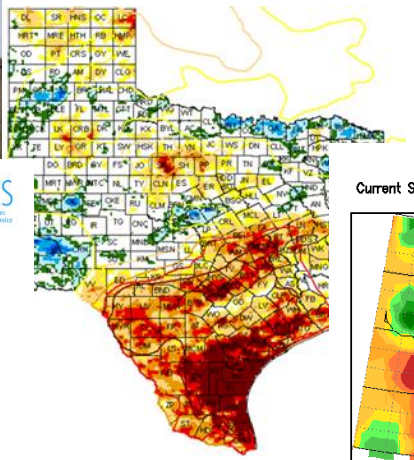
As authors, we need to be VERY careful when hitting DELETE]; There is NO UNDO DELETE option in GIS if you hit [SAVE]!!!

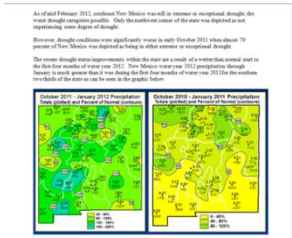


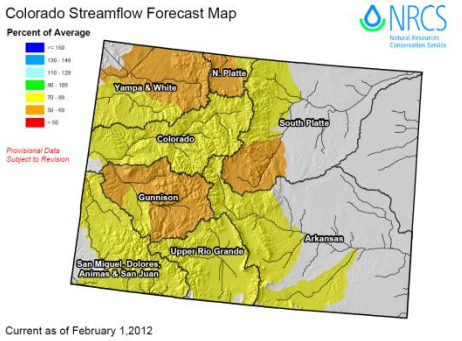
One big advantage of editing the drought areas in GIS is there is a ***wealth of weather and hydrological data also available in GIS format***; we can bring the data directly into the "Drought Monitor" to assist with the final drought depiction. *More on this later*.

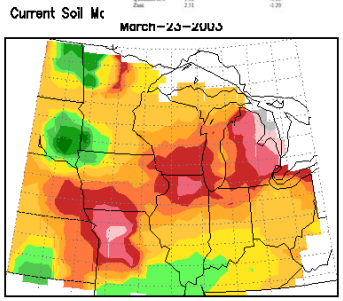
The Importance of Local Expert Input

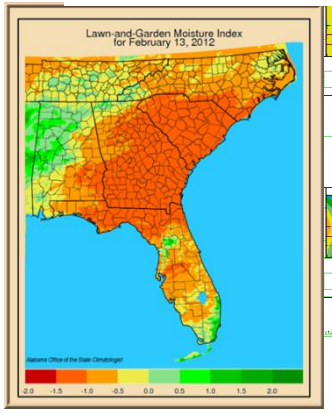
- **The U.S. Drought Monitor Team Relies on Field Observation Feedback from the Local Experts for Impacts Information & "Ground Truth"**
  - ***Listserver (~350 Participants: 2/3 Federal, 1/3 State/Univ.)***
- **Local NWS & USDA/NRCS Offices**
- **State Climate Offices**
- **State Drought Task Forces**
- **Regional Climate Centers**

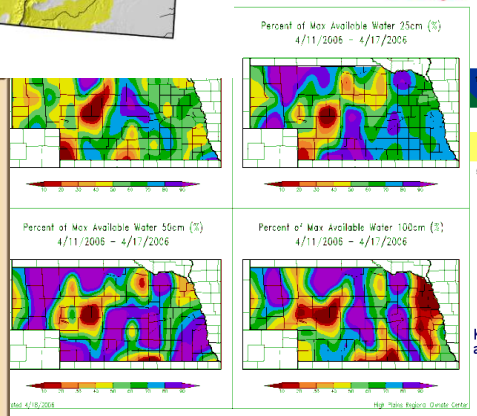


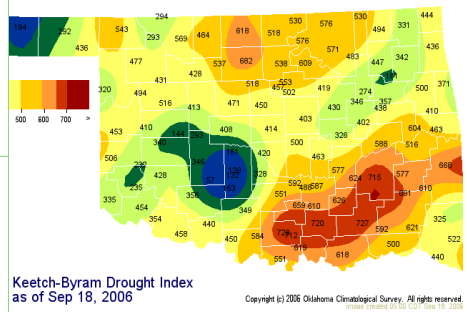








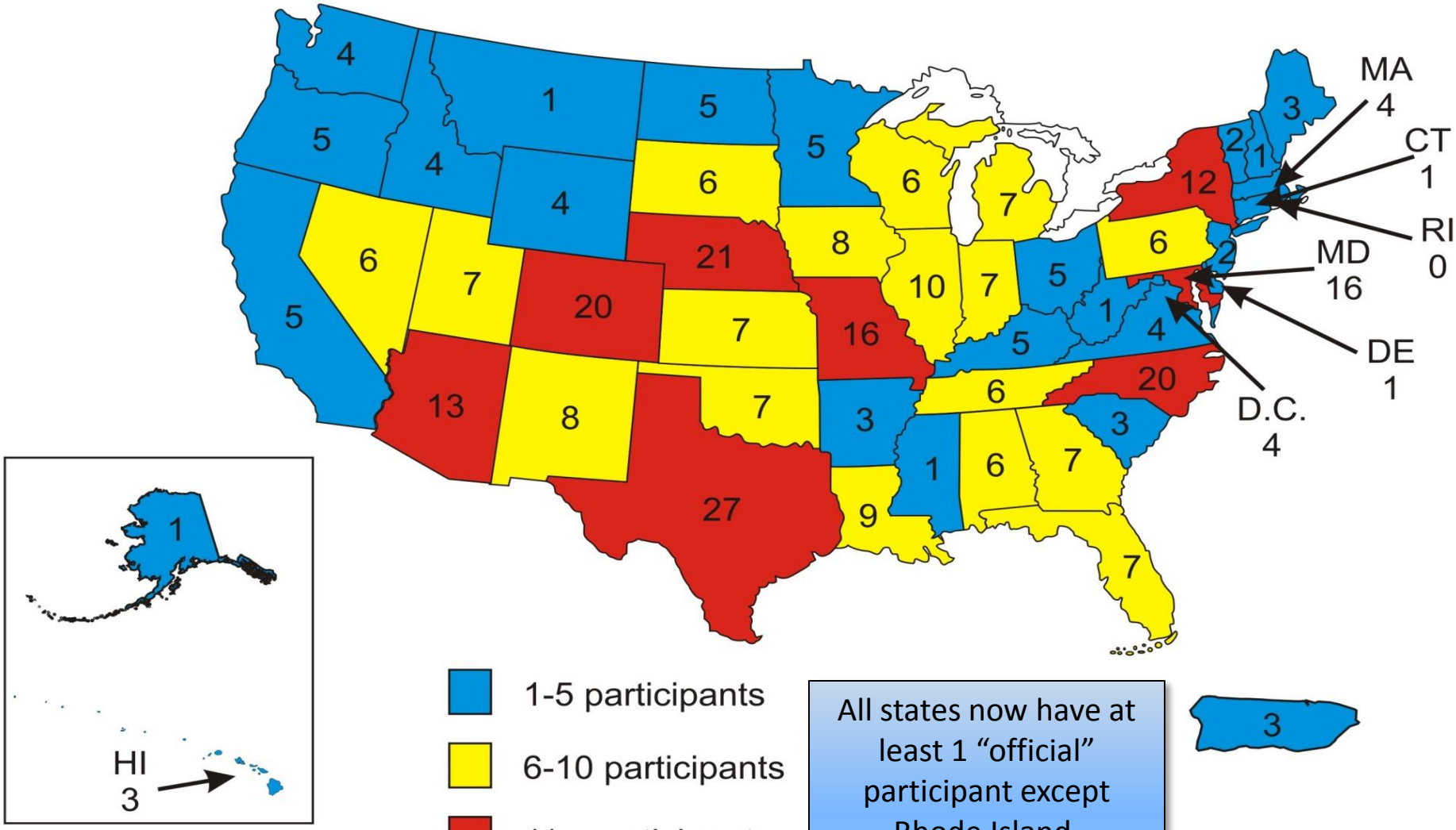




The primary means of communication with our "eyes in the field" is thru email; The email "Group" is called the ***USDM Listserver***

USDM Listserve Subscribers

(as of November 1, 2013)



All states now have at least 1 "official" participant except Rhode Island.

Total: 345 (does not include 1 participant from Canada)

Search Week-2 (Ctrl+E)

From	Subject	Received	S..	Cat...
Eric Oglesby - NOAA Fed...	Re: Florida Discussion	Tue 11/27/2012 12...	6..	
Victor Murphy NOAA Fe...	GA: one more suggest--Monroe Co	Tue 11/27/2012 12...	3..	
John Nielsen-Gammon	Re: [DROUGHT] Draft 1 - TX	Tue 11/27/2012 12...	1..	
Steven Fleegel - NOAA F...	Re: [DROUGHT] Draft 1 - All	Tue 11/27/2012 12...	2..	
Zierden, David	Florida Discussion	Tue 11/27/2012 12...	5..	
Victor Murphy NOAA Fe...	Re: Florida Discussion	Tue 11/27/2012 12...	1..	
John Nielsen-Gammon	Re: TX Panhandle Drought...for Next Week...	Tue 11/27/2012 11...	3..	
Steven Fleegel - NOAA F...	Re: [DROUGHT] Draft 1 - All	Tue 11/27/2012 11...	1..	
Victor Murphy NOAA Fe...	Re: [DROUGHT] GA Drought Photos (impacts)	Tue 11/27/2012 11...	6..	
Brian Fuchs	RE: [DROUGHT] GA Drought Photos (impacts)	Tue 11/27/2012 11...	4..	
Victor Murphy NOAA Fe...	Re: [DROUGHT] GA Drought Photos (impacts)	Tue 11/27/2012 11...	3..	
Gary McManus	Re: [DROUGHT] GA Drought Photos (impacts)	Tue 11/27/2012 11...	1..	
Victor Murphy NOAA Fe...	Re: [DROUGHT] Logistics	Tue 11/27/2012 11...	1..	
Victor Murphy NOAA Fe...	TX Panhandle Drought...for Next Week...	Tue 11/27/2012 11...	2..	
Brian Fuchs	Re: [DROUGHT] percent of Missouri and Uppe...	Tue 11/27/2012 10...	4..	
Brian Fuchs	Re: [DROUGHT] percent of Missouri and Uppe...	Tue 11/27/2012 10...	2..	
Johnson, Angel - NASS				
Bill Lawrence - NOAA Fe...				
Victor Murphy NOAA Fe...				
Gary McManus				
Kristopher White - NOA...				
Al Sandrik				
Ray Wolf - NOAA Federal				
Bill Lawrence - NOAA Fe...	Re: [DROUGHT] Logistics	Tue 11/27/2012 9:...	2..	
Nielsen-Gammon, John W	Re: [DROUGHT] Draft 1 - TX	Tue 11/27/2012 9:...	1..	
Shaughnessy, Geoff	RE: D0 for South Florida	Tue 11/27/2012 9:...	8..	
John Christy	AL DM Team for 27 Nov: No. 2	Tue 11/27/2012 8:...	2..	
Patricia Tanner - NOAA F...	Re: [DROUGHT] Draft 1 - All	Tue 11/27/2012 7:...	2..	
Barry Baxter - NOAA Fed...	Re: D0 for South Florida	Tue 11/27/2012 7:...	2..	
Zimmer, Edward (EEC)	Re: Draft 1 Partial	Mon 11/26/2012 8...	2..	
Mark Shafer	Re: [DROUGHT] OK wheat in desperate need ...	Mon 11/26/2012 6...	1..	
Eric Oglesby - NOAA Fed...	Re: Time for FL Drought Krewe to Reassemble....	Mon 11/26/2012 6...	5..	
Victor Murphy NOAA Fe...	Re: [DROUGHT] DM Overlays Updated	Mon 11/26/2012 6...	1..	
Victor Murphy NOAA Fe...	Fwd: Re: [DROUGHT] Draft 1 Partial (TX)	Mon 11/26/2012 5...	2..	
Nancy Selover	RE: [DROUGHT] Draft 1 Partial	Mon 11/26/2012 4...	2..	
Ray Wolf - NOAA Federal	Re: [DROUGHT] Draft 1 Partial	Mon 11/26/2012 4...	1..	
Mary Knapp	Re: [DROUGHT] Draft 1 Partial	Mon 11/26/2012 4...	1..	
Mary Knapp	Re: [DROUGHT] Draft 1 Partial	Mon 11/26/2012 4...	1..	
Zimmer, Edward (EEC)	RE: Draft 1 Partial	Mon 11/26/2012 4...	2..	
russell.martin	Re: [DROUGHT] Draft 1 Partial	Mon 11/26/2012 3...	1..	
Akyuz, Adnan	Re: [DROUGHT] Draft 1 Partial	Mon 11/26/2012 3...	3..	
Gary Woodall - NOAA Fe...	Fwd: [DROUGHT] Draft 1 Partial	Mon 11/26/2012 3...	1..	

While we are doing much of our drought work using GIS software, our main method of correspondence is through email – the "Listserv". The email traffic can get overwhelming at times.

Re: Florida Discussion

Eric Oglesby - NOAA Fede

Sent: Tue 11/27/2012 12:53 PM
To: Zierden, David
Cc: Victor Murphy; Barry Baxter - NOAA Fede ; David Zierden; Richard J Lanier;

All,

I have no problem holding off introducing D0 to west central and southwest Florida. There is definitely short term dryness the past six weeks or so. But since November is one of the driest months of the year climatologically, the overall rainfall deficits are not that great. The percent of normal looks really bad, but this time of year isn't necessarily representative of drought because average monthly rainfall is only 2 to 2.5 inches...which can be made up in one or two events. It all depends what scale you want to look at on the drought

See...

The "hole" of D2 between MCN and ATL likely needs to start being filled in some. Was wondering if the D3 over Macon could be nudged northward to cover Monroe County.

Perhaps some increase in the amount of D3 for Mitchell County is in order? Similarly, can the D3/D2/D1 be pushed southward some in Grady County in southwest GA? Arguably, you can extend the D1 eastward near TLH in north FL to cover northern Leon County which would assist you here. Other than that, consider GA a "wrap" for the week.

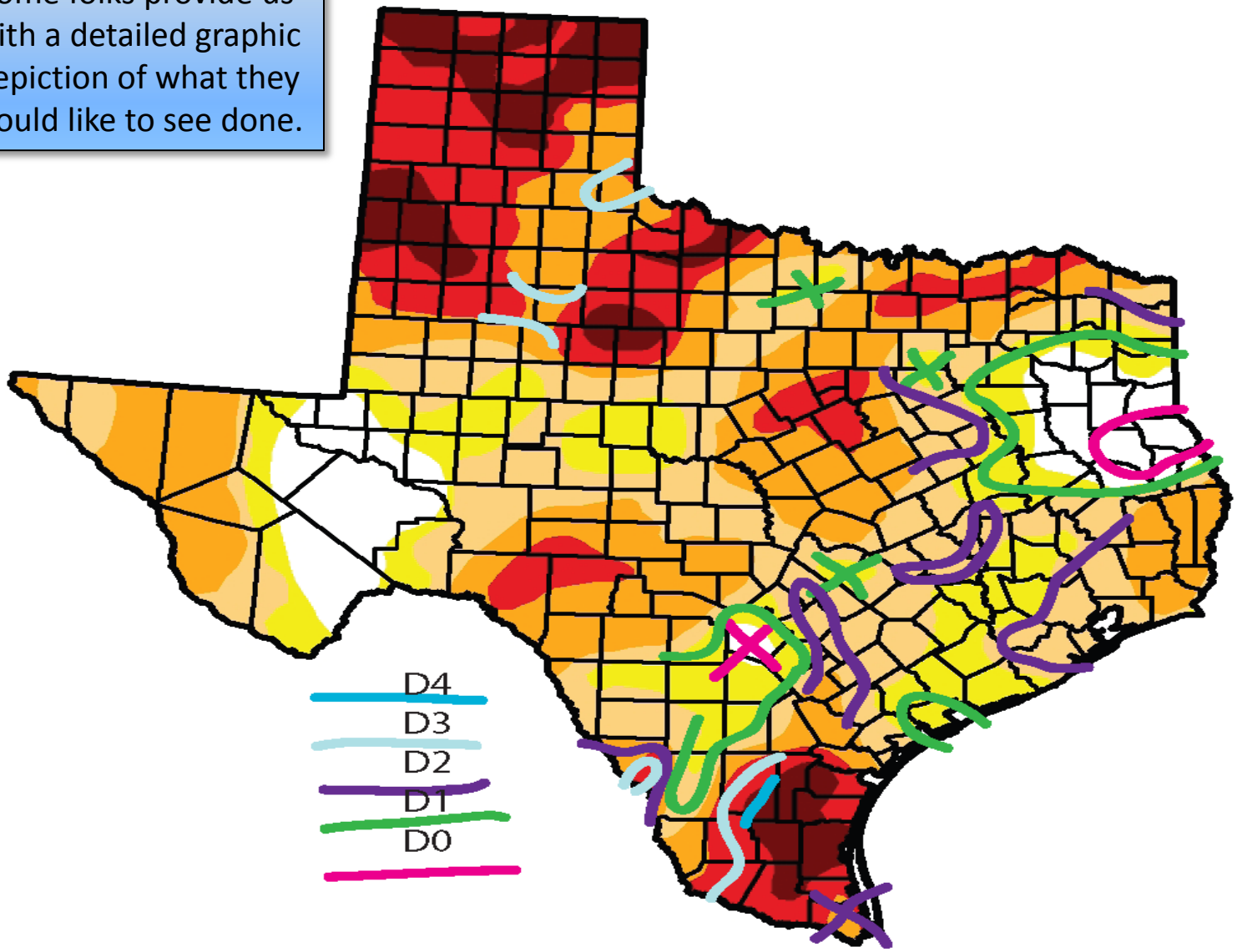
Based on our Texas coordination call this morning, recommendations are below. We're being especially sensitive to short-term drought in the winter wheat areas of the state. We project that October-November will rank somewhere between 2nd and 4th driest on record for Texas.

I'm a little concerned that the eastern sections of the Appomattox Basin in Virginia have slipped out of D1. Precip departures, especially over 90 days, are not horrible, but there is still a deficit. And with streamflows running quite low, groundwater running low, and a drought watch in effect, I think that the D1 should be expanded eastward to include all of Buckingham, all of Campbell, Cumberland, southwest Powhatan, and Amelia Counties.

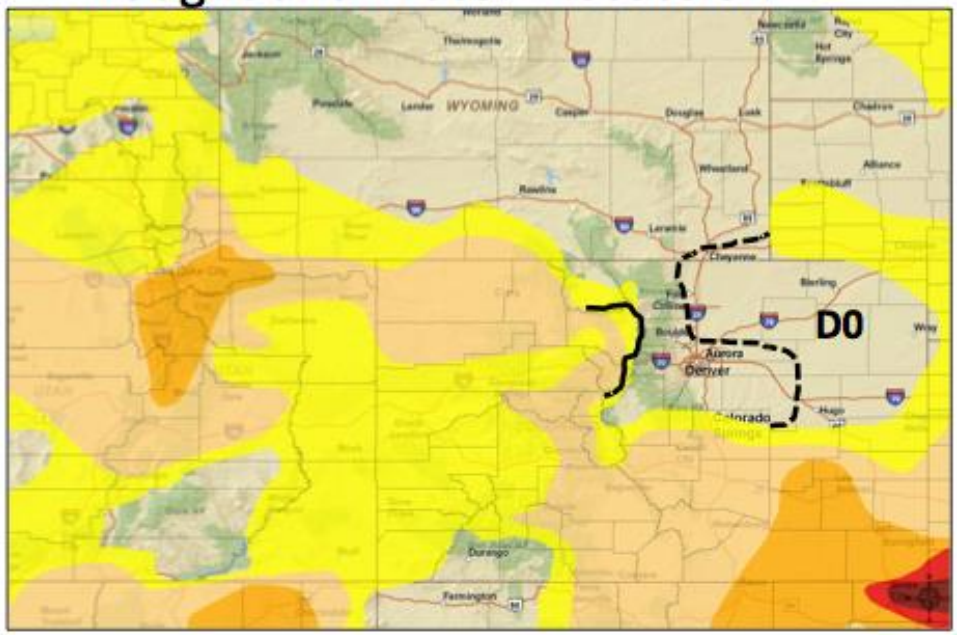
South Florida - Here there are differing opinions on whether or not to introduce D0 to Collier and Monroe counties. While these areas, especially coastal Collier County, have been dry in the short term, the wet season was very good and hydrologic systems are in good shape.

These actual email snippets are a very small sample of the type of detailed information and suggestions we receive. County lists are actually preferred, altho we recv everything from highways to mountain ranges to river basins. In GIS, it's all very doable

Some folks provide us with a detailed graphic depiction of what they would like to see done.



Drought and Water Discussion



Drought – Exceptional		0 to 2 (D4)
Drought – Extreme		2 to 5 (D3)
Drought – Severe		5 to 10 (D2)
Drought – Moderate		10 to 20 (D1)
Abnormally Dry		20 to 30 (D0)

Drought categories and their associated percentiles

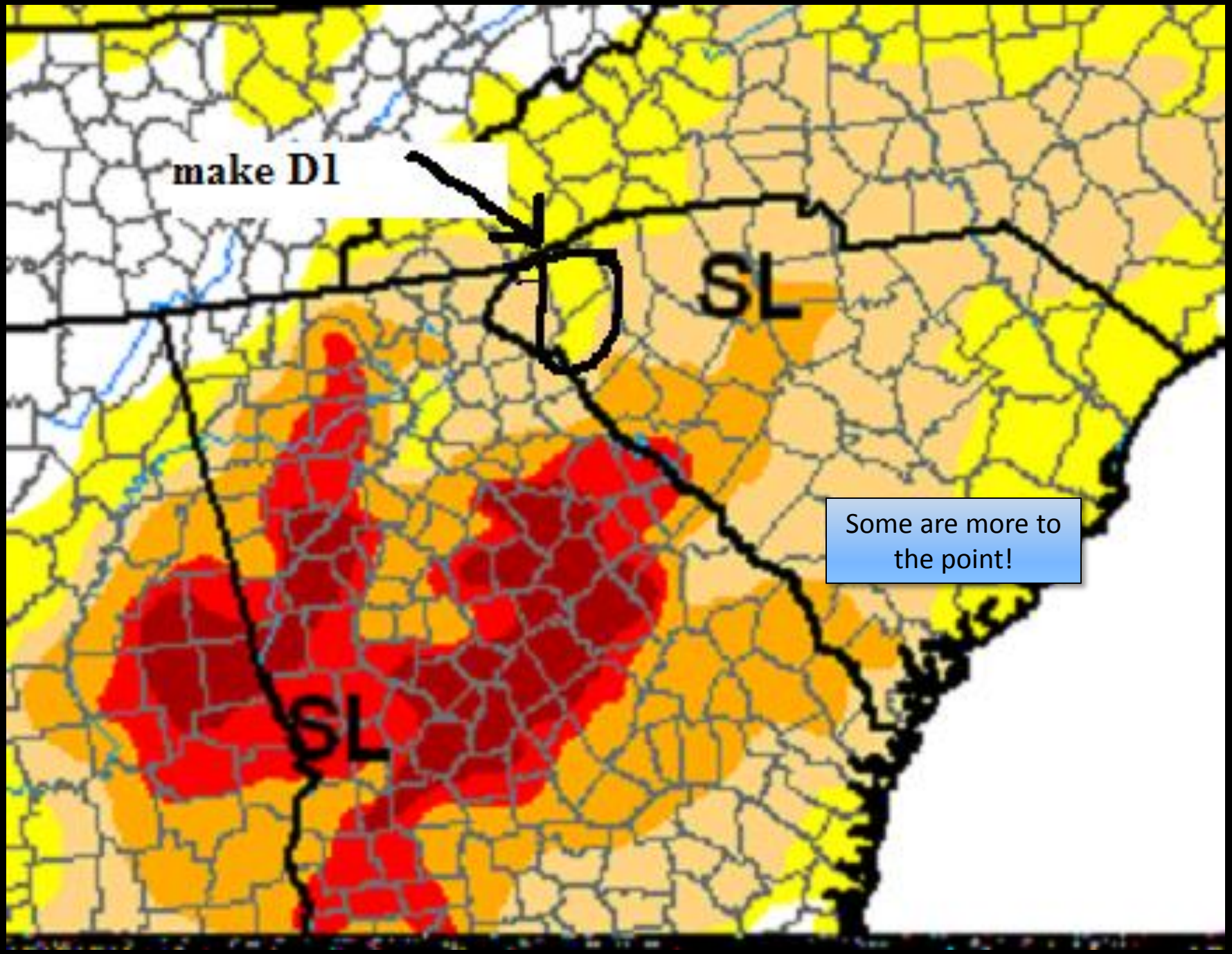
The Colorado group sends out a full presentation to back up their suggestions after their Conf Call.

Fig. 9: March 13th release of U.S. Drought Monitor for the UCRB.

On the current depiction of the U.S. Drought Monitor (USDM) map (Fig. 9), the USDM author has decreased the area of D2 in the Wasatch range in the UCRB based on recent precipitation. In the northern CO mountains (Grand County), it is recommended that the D1 be adjusted slightly and expanded eastward along the Continental Divide (Fig. 9, solid black line). This will set up a very sharp gradient at and west of the Divide, which is representative of conditions in that area and will match better with SNOTEL precipitation percentiles.

In northeast CO, a further expansion of D0 is recommended (Fig. 9, dashed black line). In the past 30 days, this area has experienced little to no precipitation, much warmer than average temperatures, low relative humidities, high winds, and wildfire dangers. 30-day SPIs are very low, VIC soil moisture shows drying, and D0 will better represent that short-term dryness being experienced there.

Status quo is recommended for the rest of CO and the rest of the UCRB.

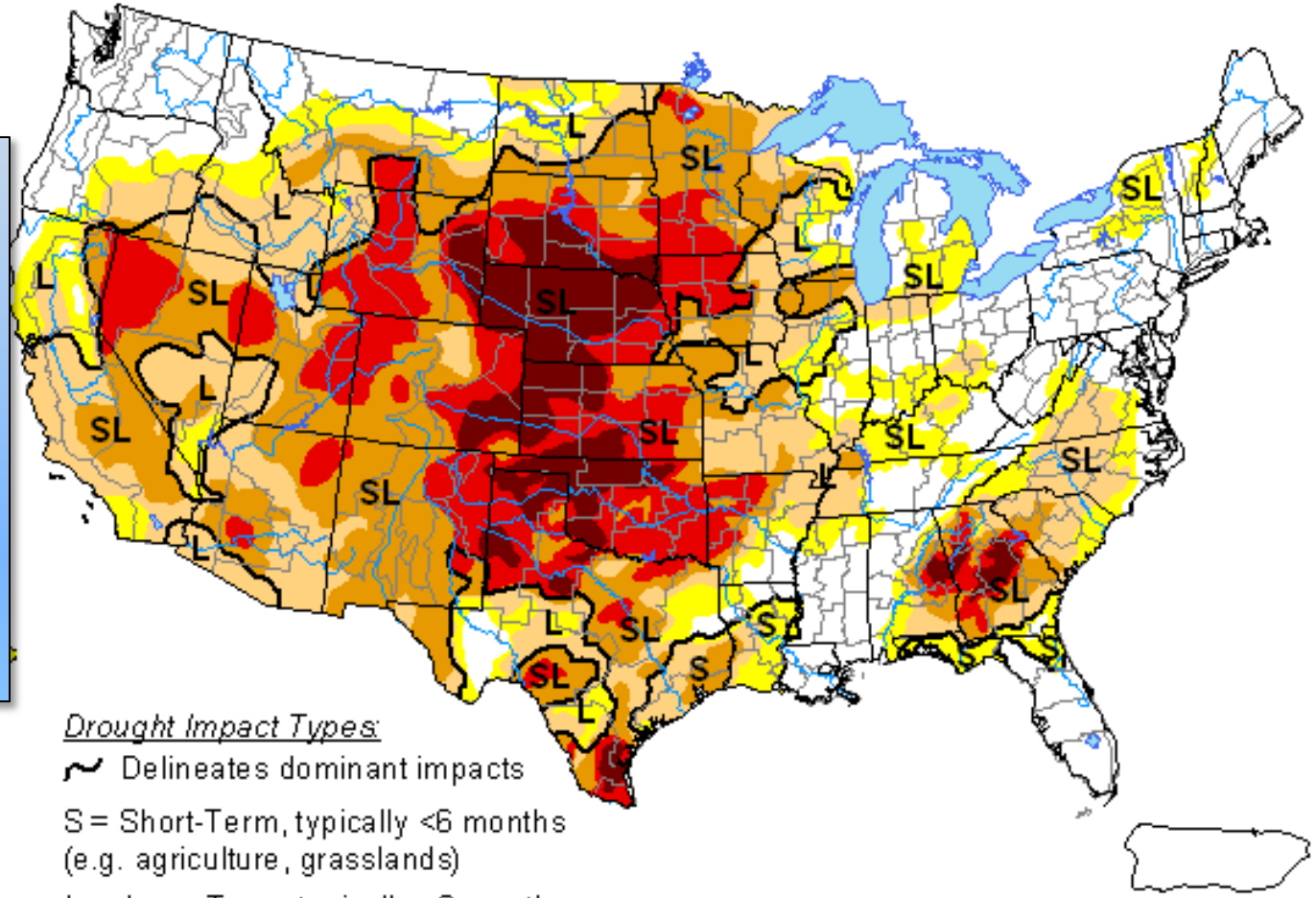

make D1
SL
SL
Some are more to the point!

U.S. Drought Monitor

November 27, 2012
Valid 7 a.m. EST

Ultimately, authors make the final call, as our name is on the map; we often get questions/press interviews once the map is released.

Need to be able to support our depiction with data or impacts.



Intensity:

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

Drought Impact Types:

Delineates dominant impacts

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

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

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

http://droughtmonitor.unl.edu/

Released Thursday, November 29, 2012

Author: Eric Luebehusen, U.S. Department of Agriculture

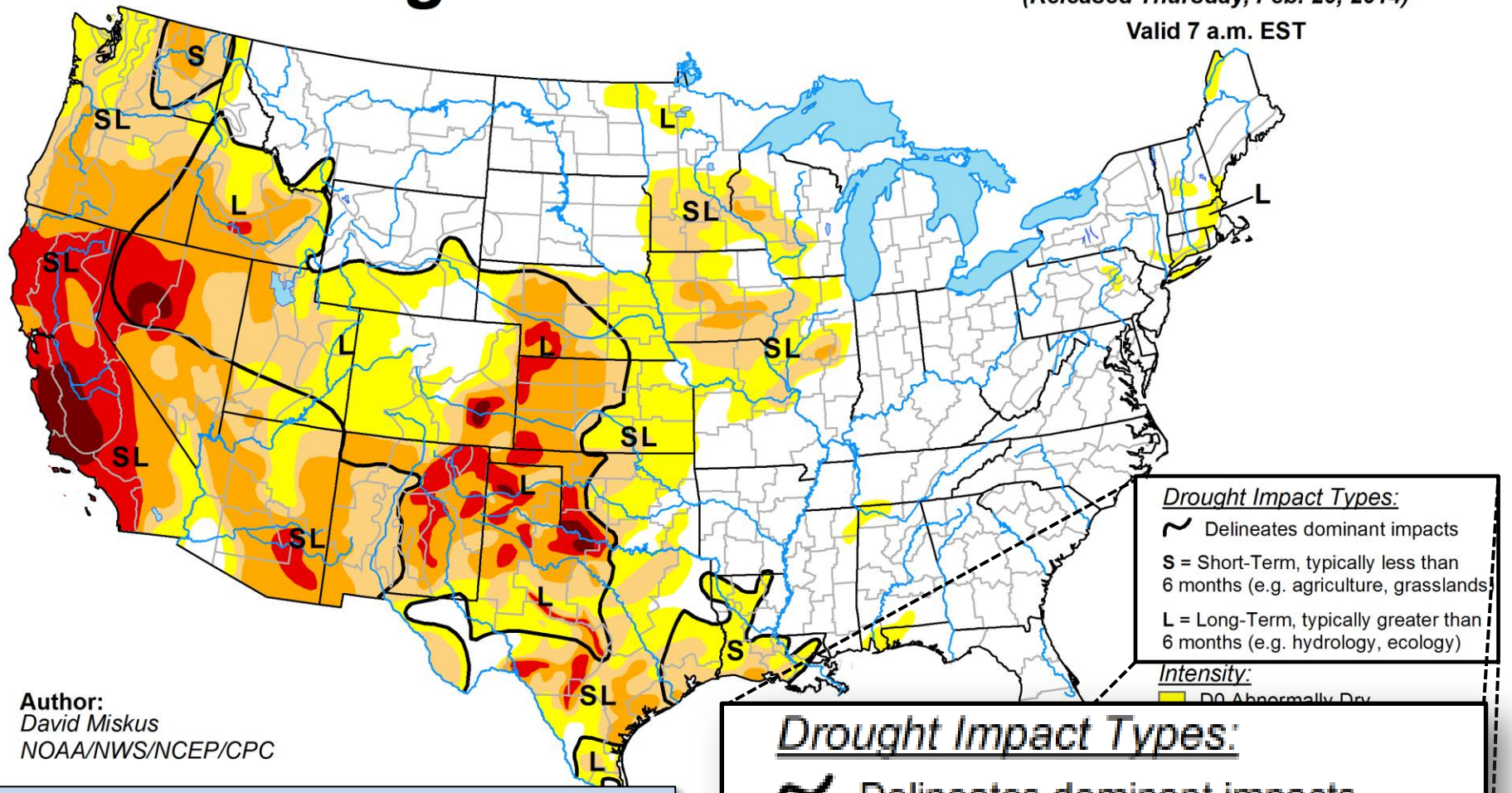
Tools, Data, & Methodology

U.S. Drought Monitor

February 18, 2014

(Released Thursday, Feb. 20, 2014)

Valid 7 a.m. EST



Author:
David Miskus
NOAA/NWS/NCEP/CPC

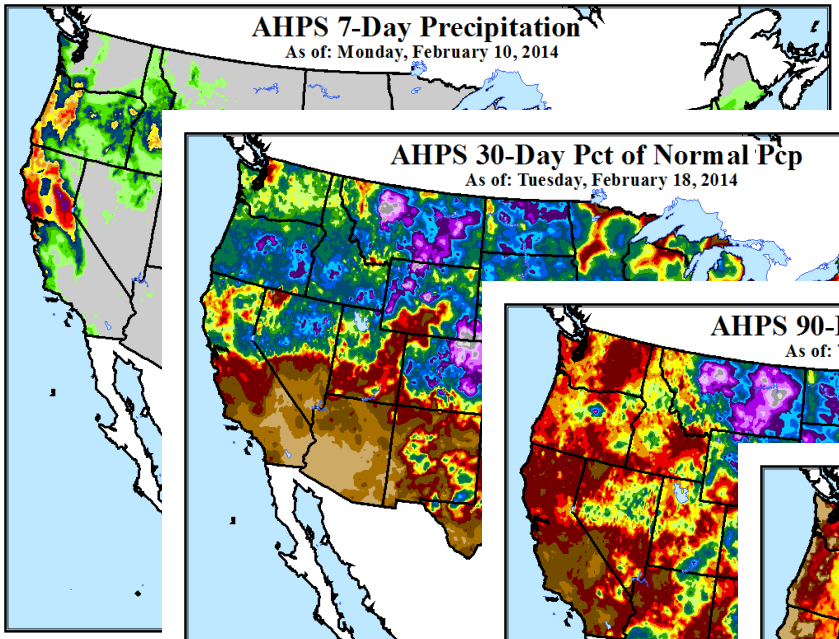
The USDM tries to capture both Short-Term (6 months or less) and Long-Term Drought on a single map, concentrating on IMPACTS. This is the most daunting task facing the authors. To assist, we have a myriad of products and data at our disposal….

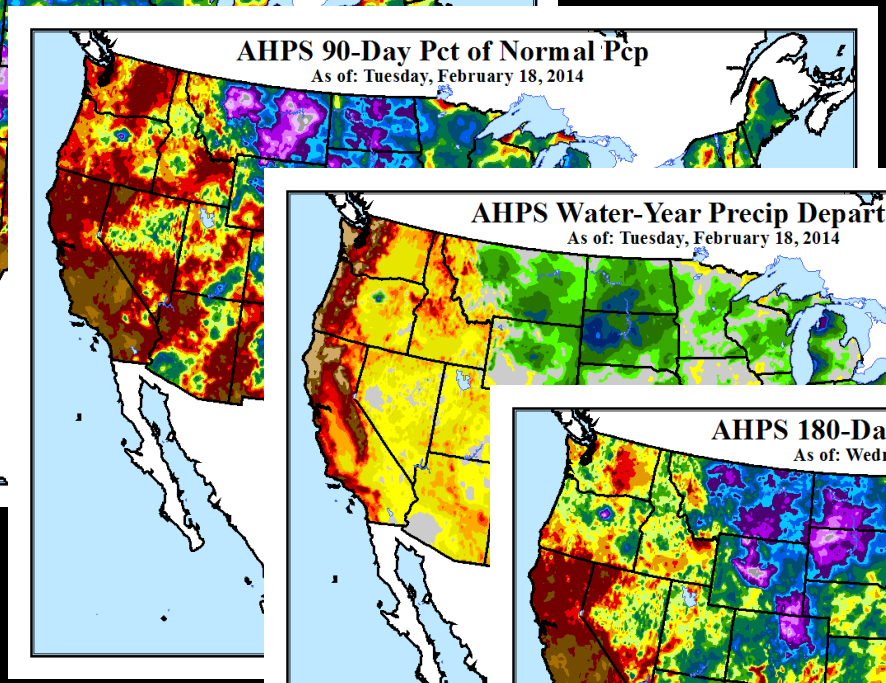
Drought Impact Types:

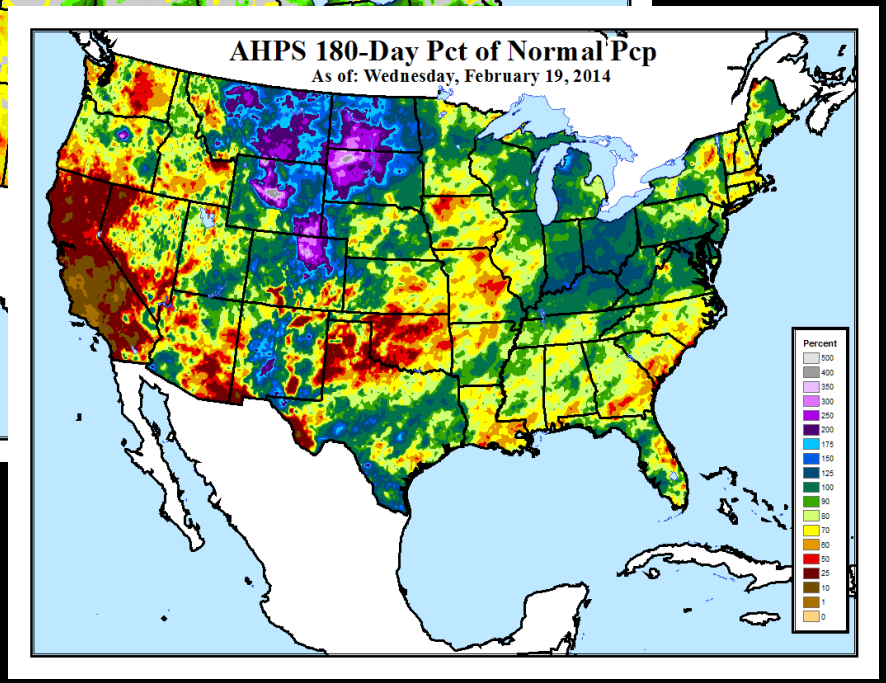
Delineates dominant impacts

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

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

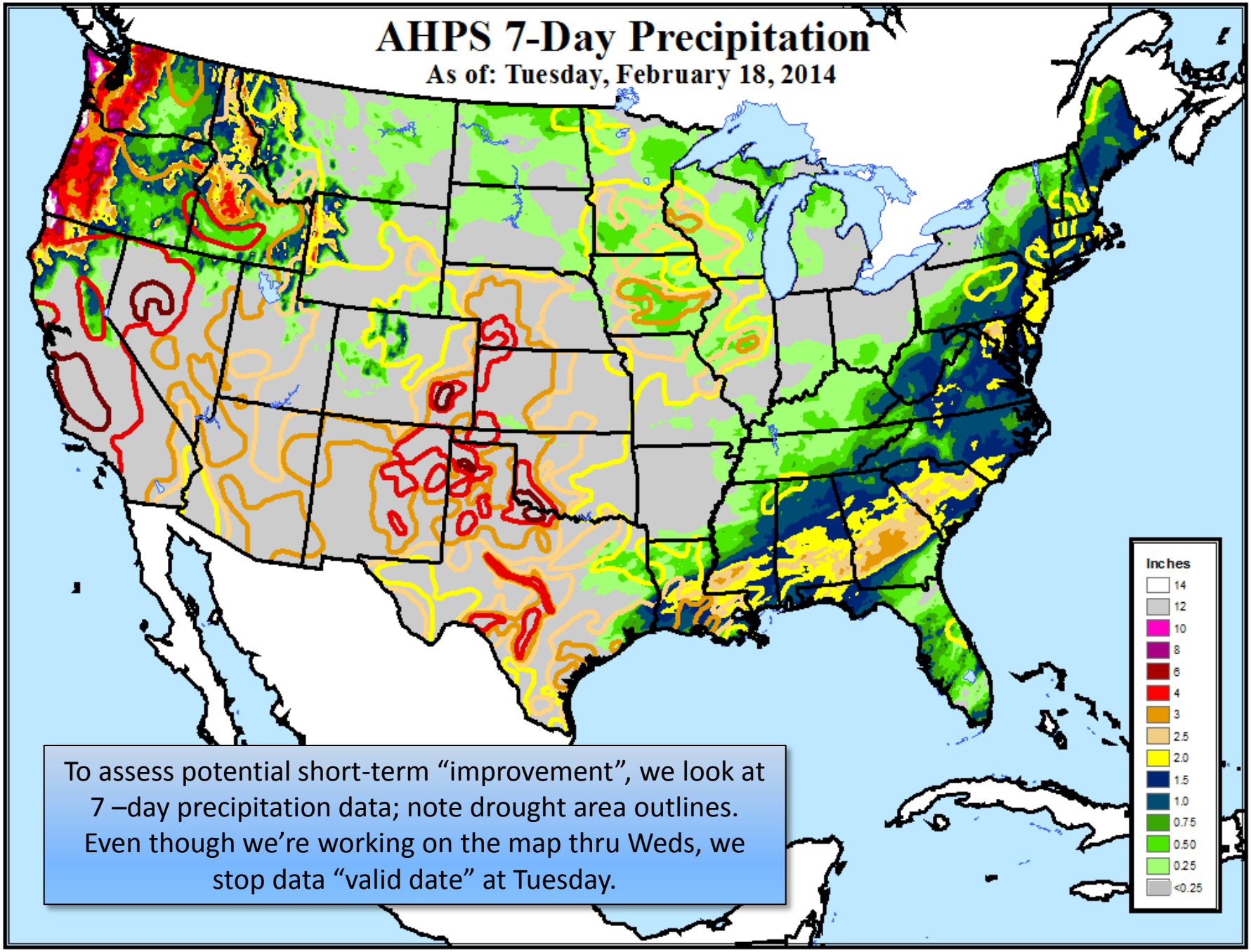




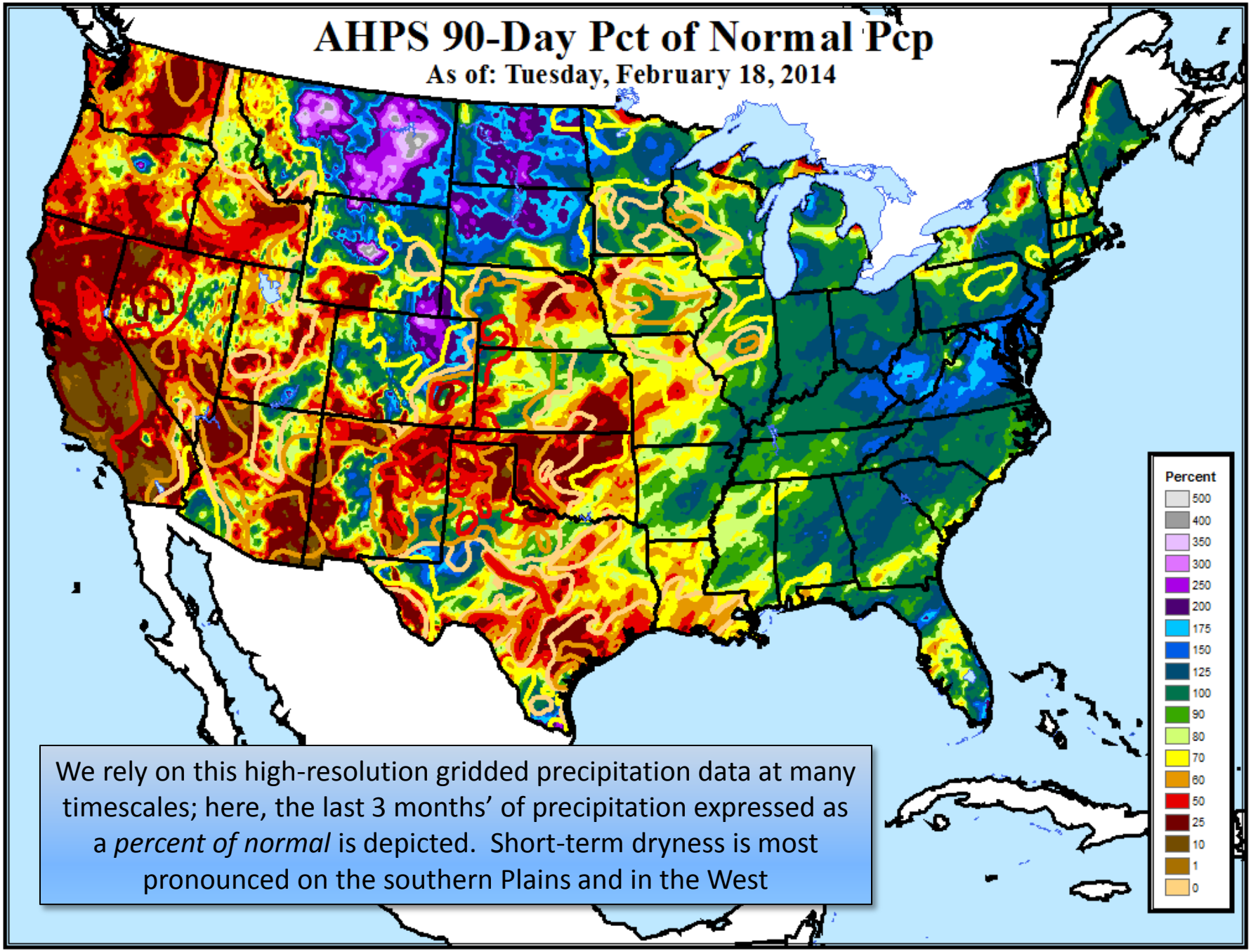


Authors use a gridded precipitation dataset called "AHPS" – *Advanced Hydrological Prediction Service* – which supplies total precipitation, precipitation departure, and percent of normal at numerous timescales.

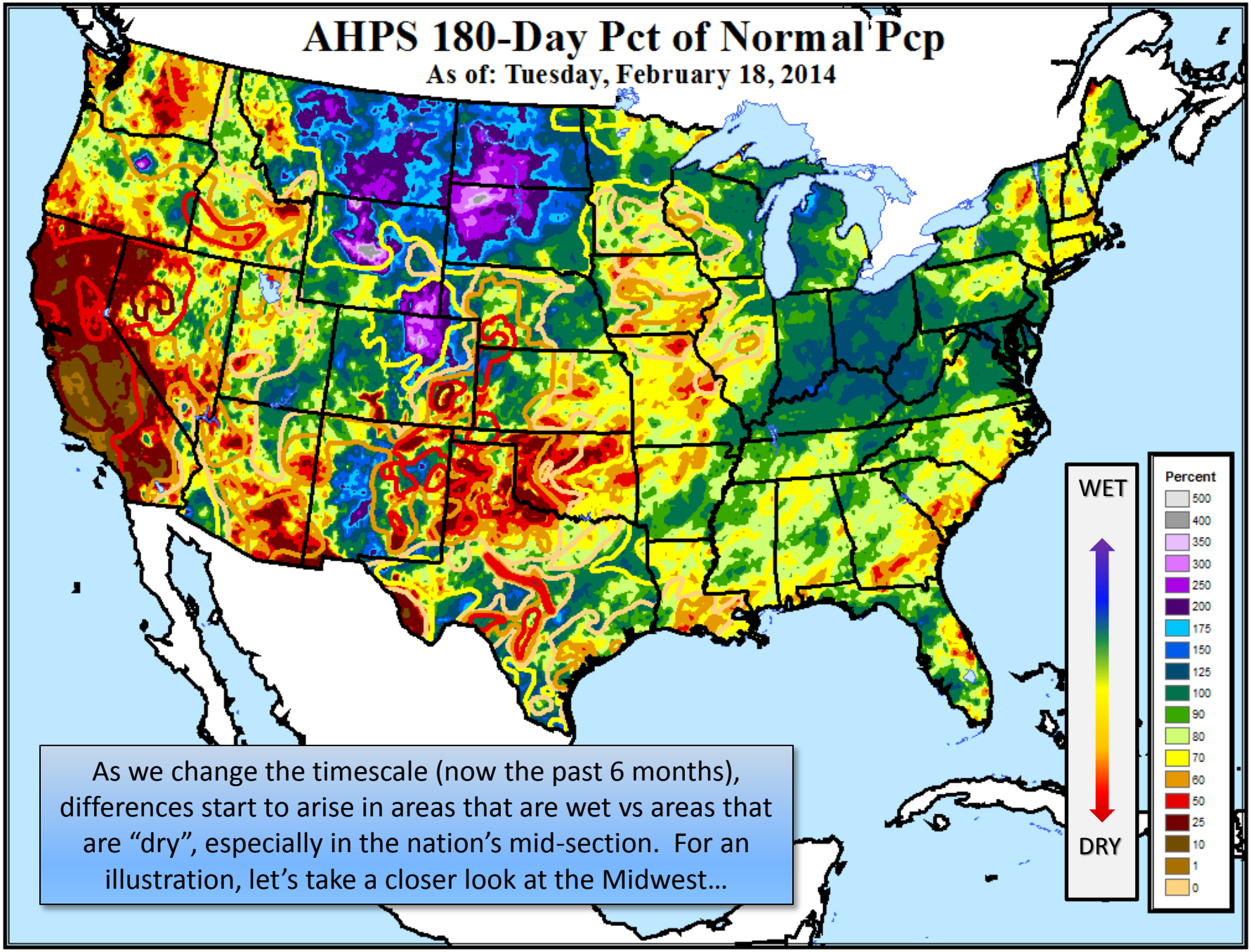
Data - http://water.weather.gov/precip/



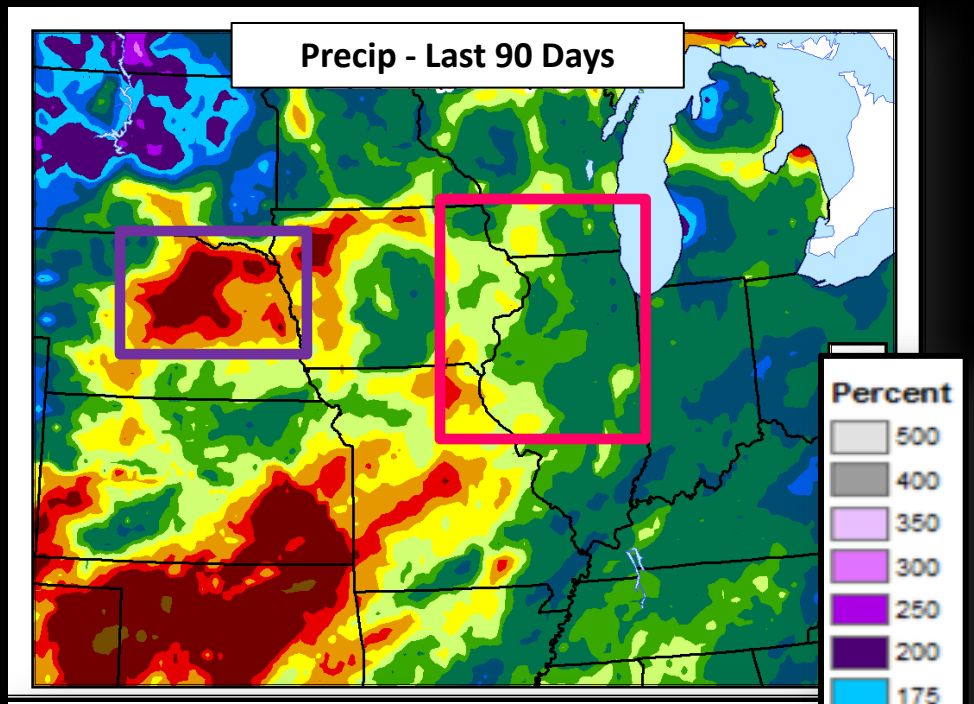
To assess potential short-term "improvement", we look at 7 –day precipitation data; note drought area outlines. Even though we're working on the map thru Weds, we stop data "valid date" at Tuesday.

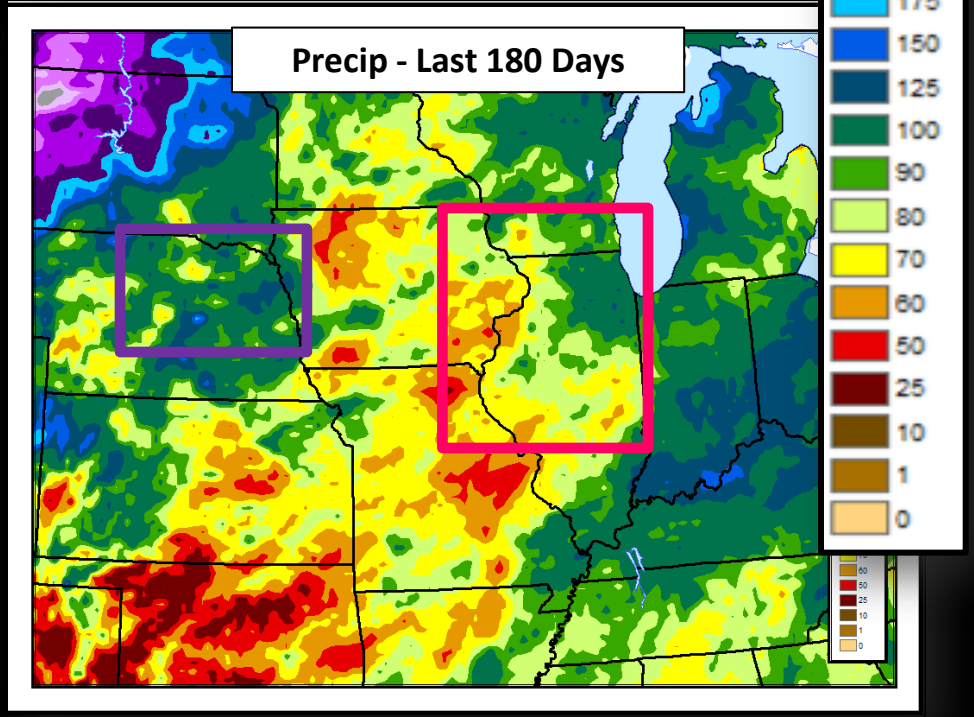


We rely on this high-resolution gridded precipitation data at many timescales; here, the last 3 months' of precipitation expressed as a *percent of normal* is depicted. Short-term dryness is most pronounced on the southern Plains and in the West

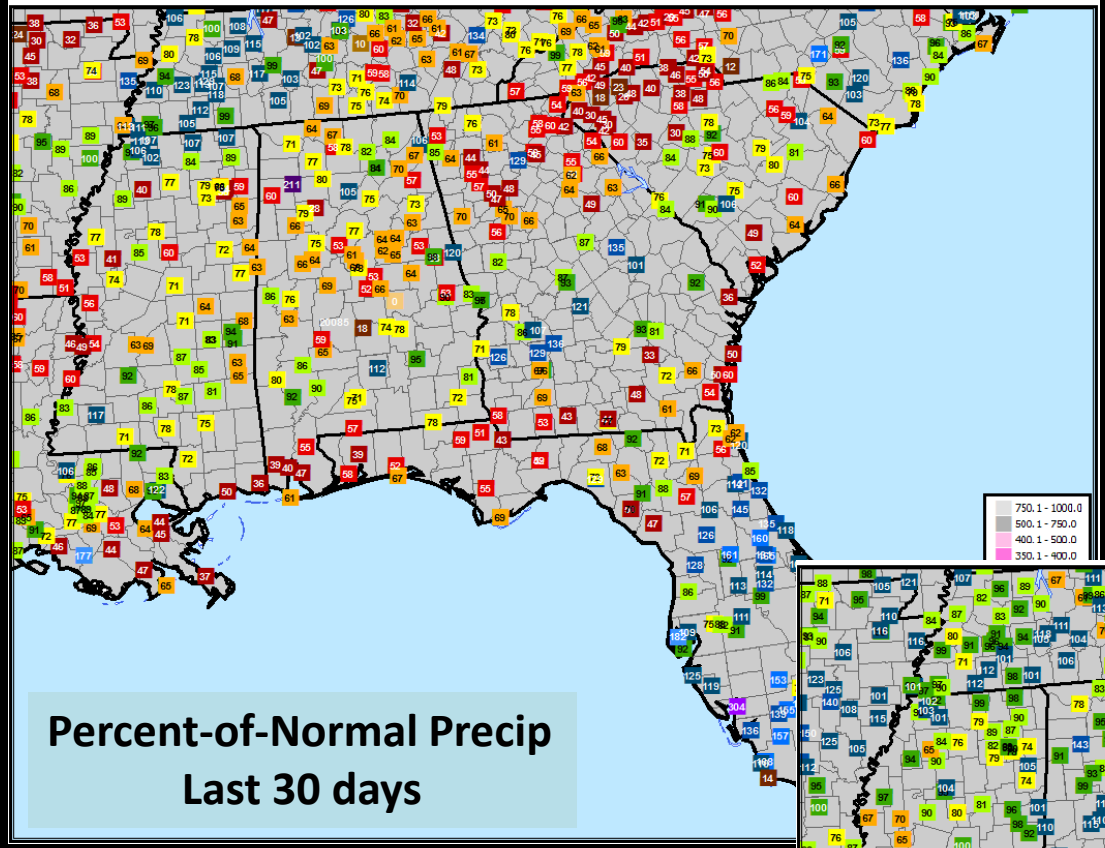


As we change the timescale (now the past 6 months), differences start to arise in areas that are wet vs areas that are “dry”, especially in the nation’s mid-section. For an illustration, let’s take a closer look at the Midwest…

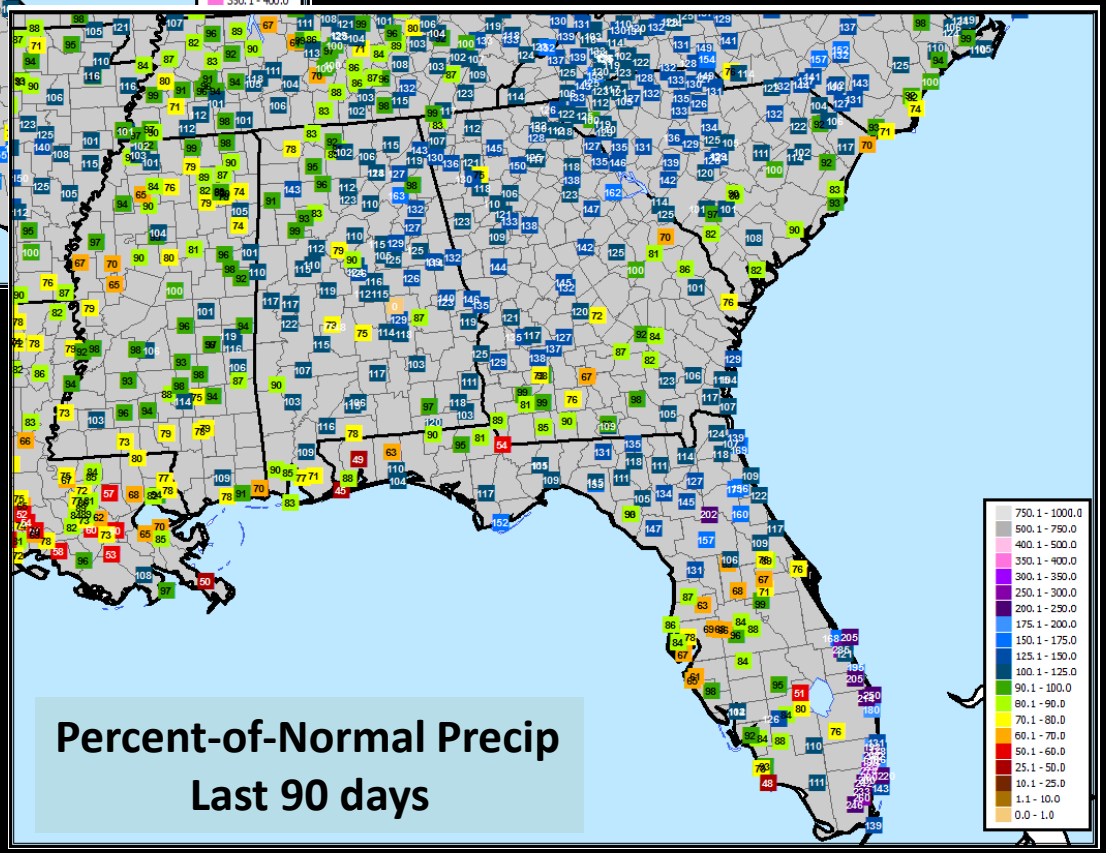




In the **central Corn Belt**, mostly a “Long-Term” (L) component to the drought exists, while in the **western Corn Belt**, mostly a “Short-Term” (S) component to the drought exists.

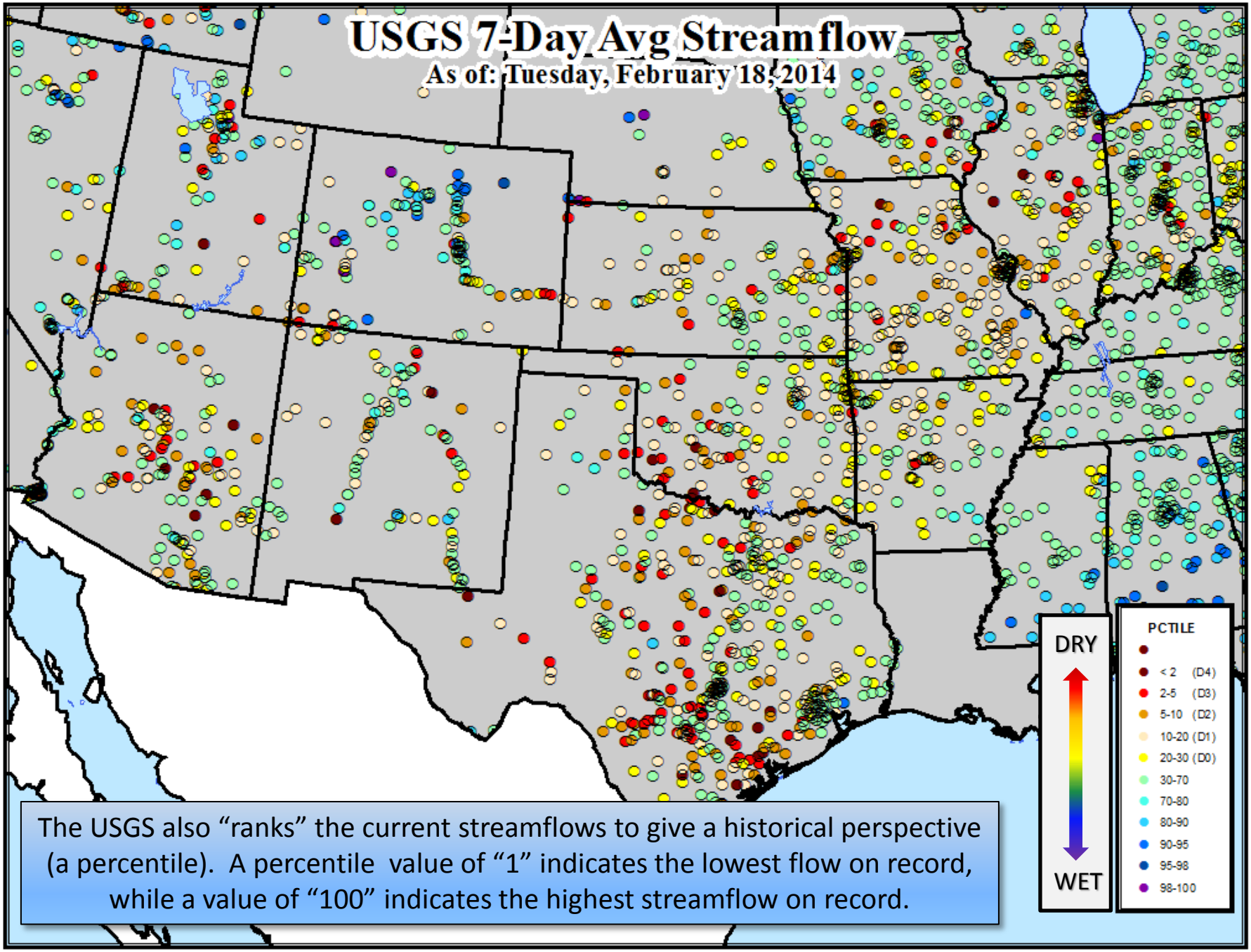


Percent-of-Normal Precip
Last 30 days

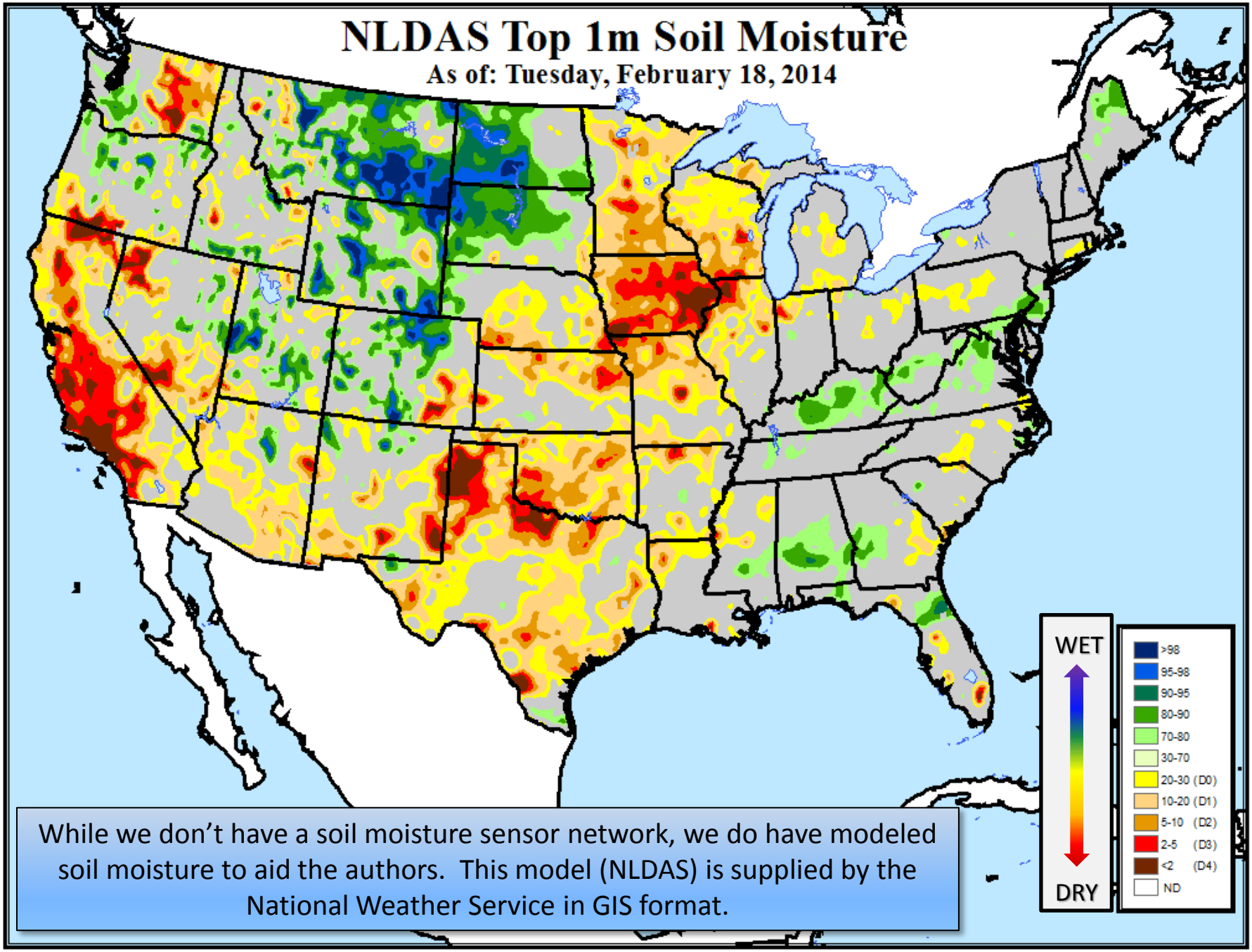


Percent-of-Normal Precip
Last 90 days

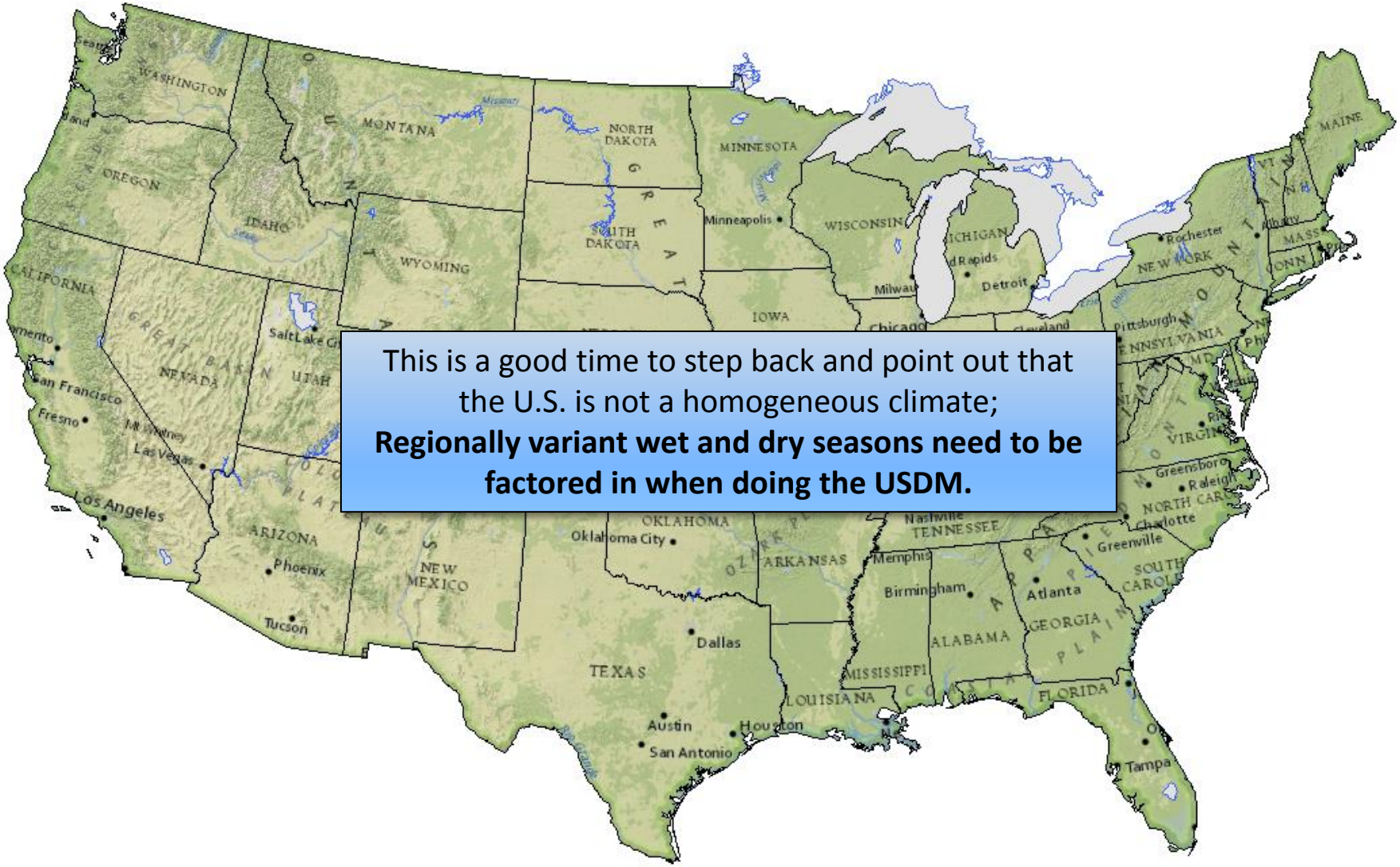
We cross-check the gridded data (which uses radar) with station data. Station data are often superior in areas where terrain interferes with radar beams, or where/when snow is the dominant precip type.



The USGS also "ranks" the current streamflows to give a historical perspective (a percentile). A percentile value of "1" indicates the lowest flow on record, while a value of "100" indicates the highest streamflow on record.



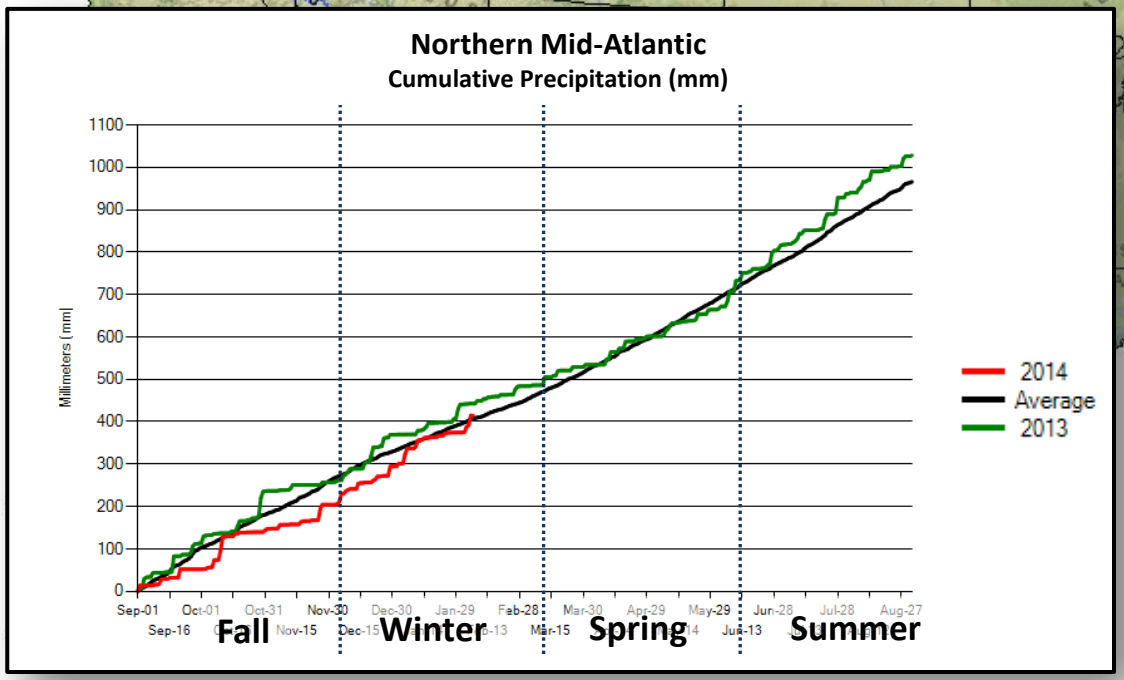
While we don't have a soil moisture sensor network, we do have modeled soil moisture to aid the authors. This model (NLDAS) is supplied by the National Weather Service in GIS format.



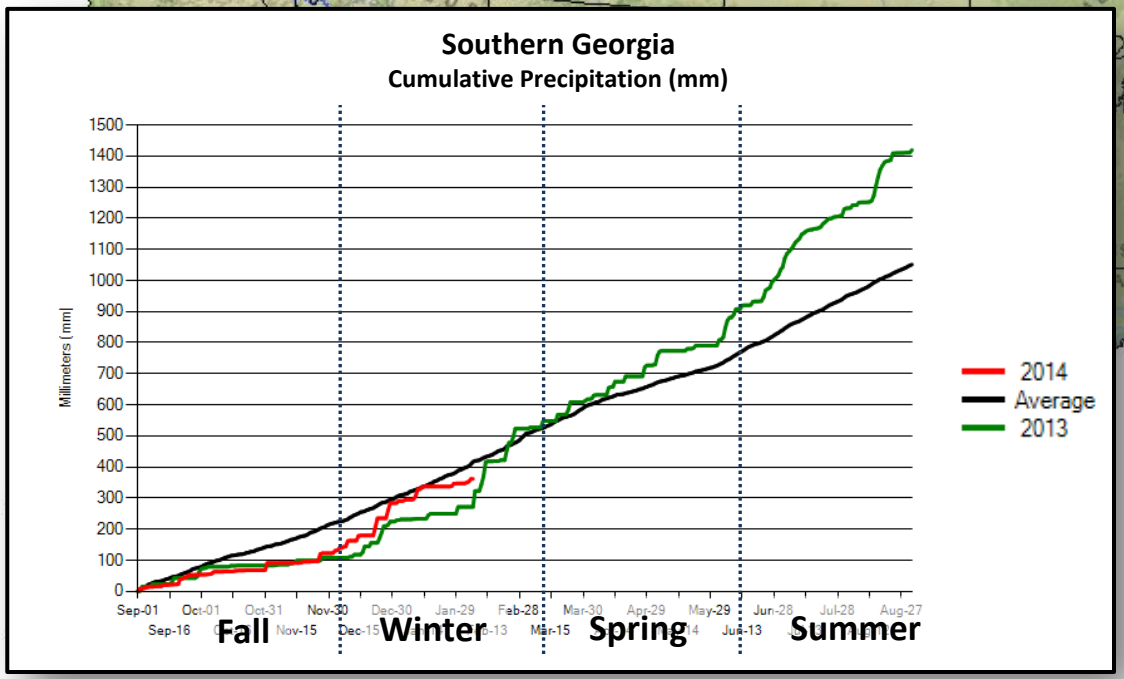
This is a good time to step back and point out that the U.S. is not a homogeneous climate;
Regionally variant wet and dry seasons need to be factored in when doing the USDM.

USDA Agricultural Weather Assessments
World Agricultural Outlook Board

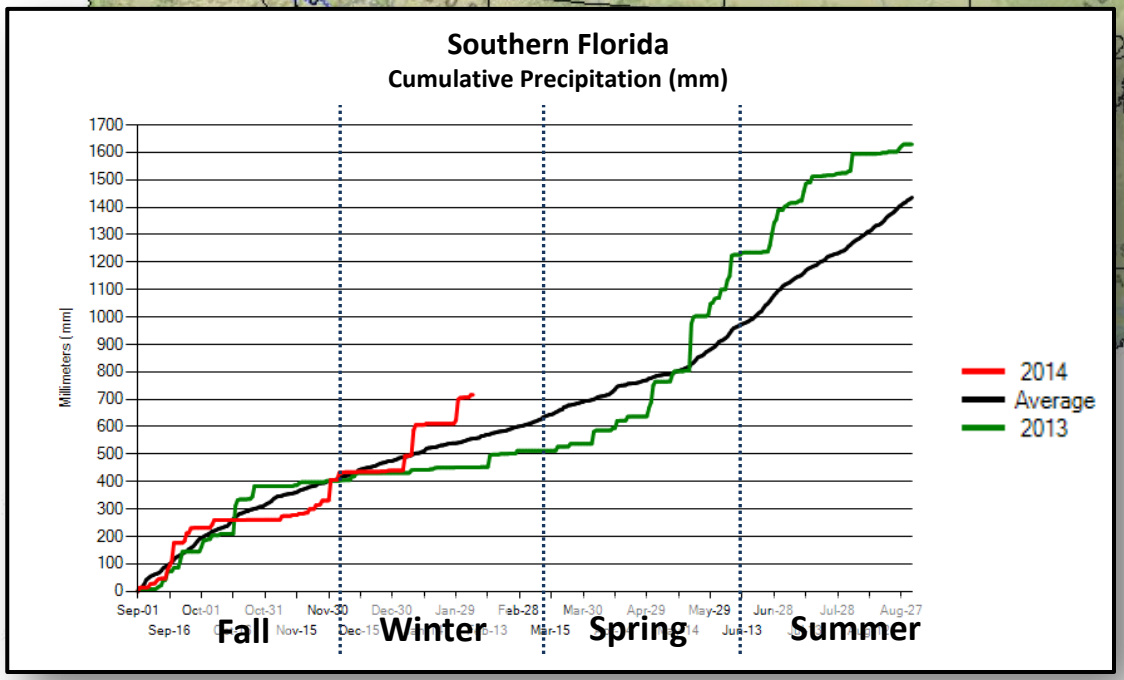
The Mid-Atlantic is one of the few areas in the country that has a consistent year-long wet signal, which makes it difficult for the region to stay in drought for a prolonged period.



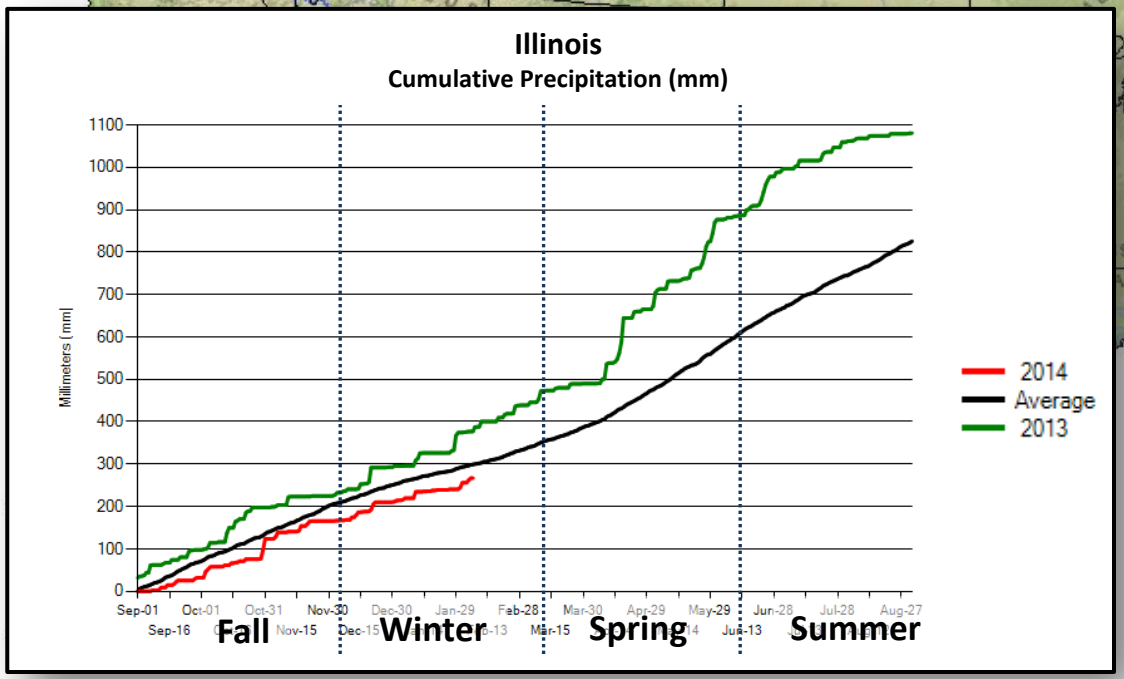
This signal extends down the East Coast into srn Georgia, at which point a sharp transition occurs…



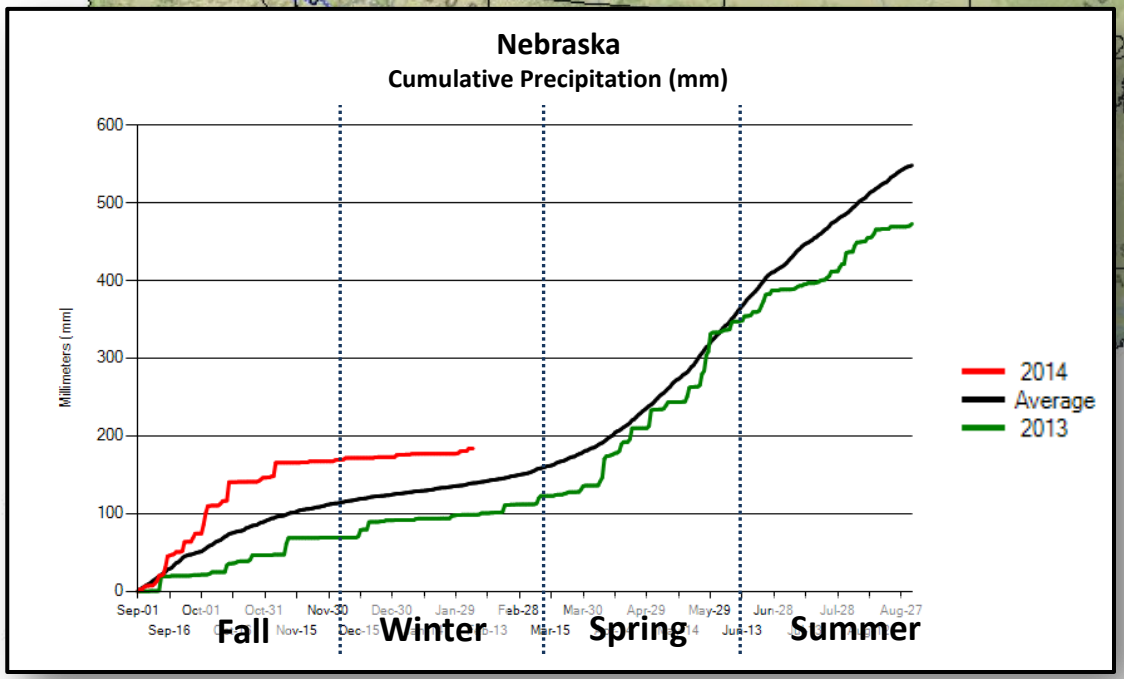
Southern Florida sees a summer-time tropical climate, while dry winters and springs do not carry the same weight in the USDM since that is their “dry season”.



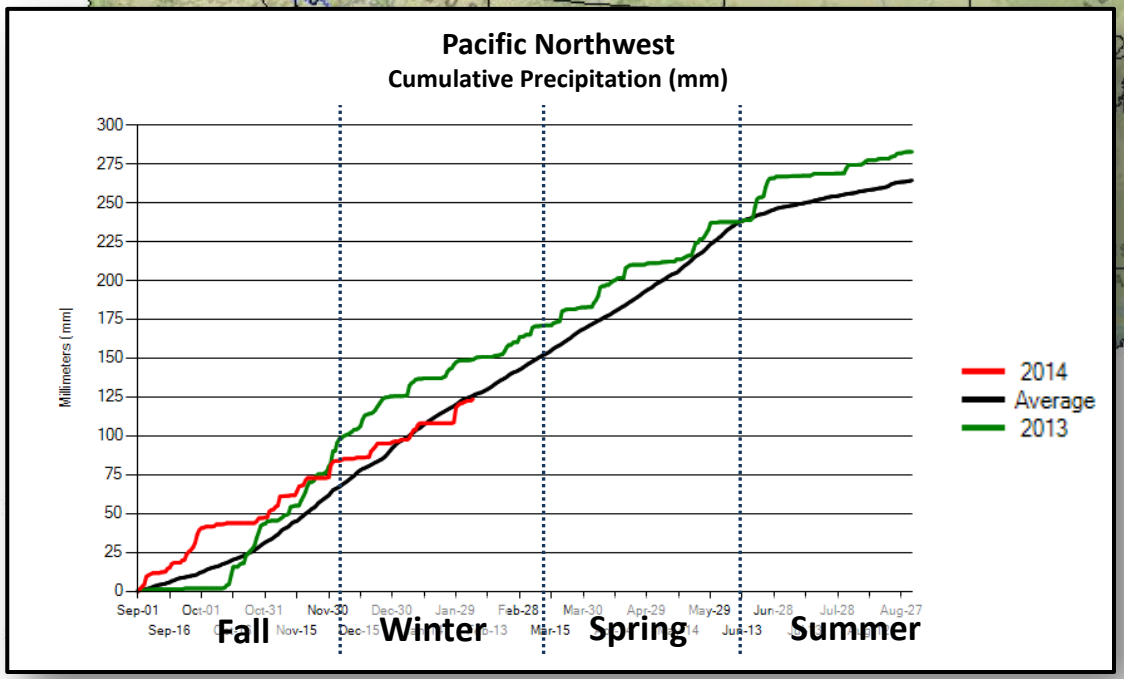
In the Corn Belt, the dry winter signal is present, but not as pronounced.



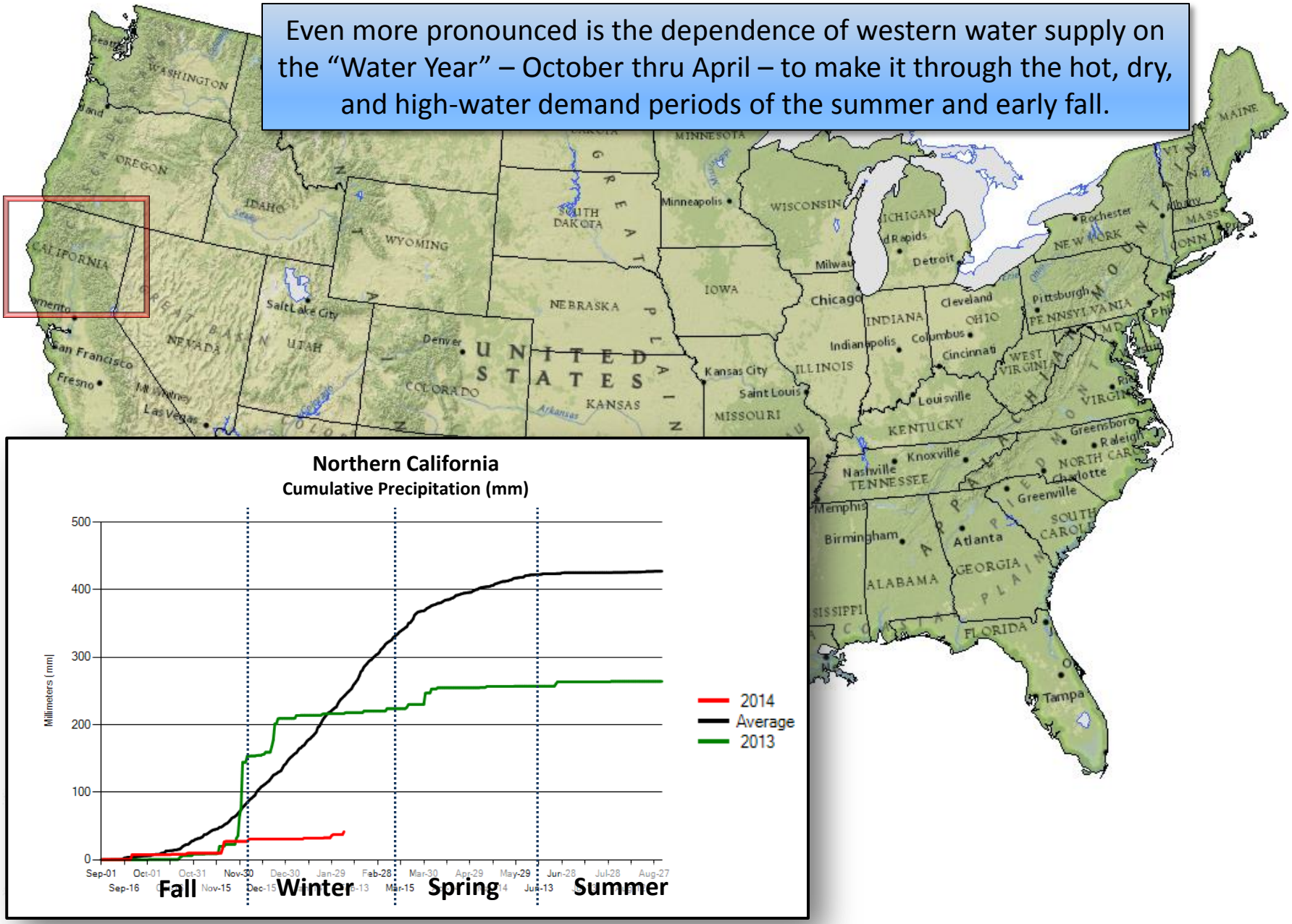
Not far away, a climatological bone-dry winter signal is evident… so a lack of moisture in the winter has minimal impact, while a dry summer will easily carry over into the following year.

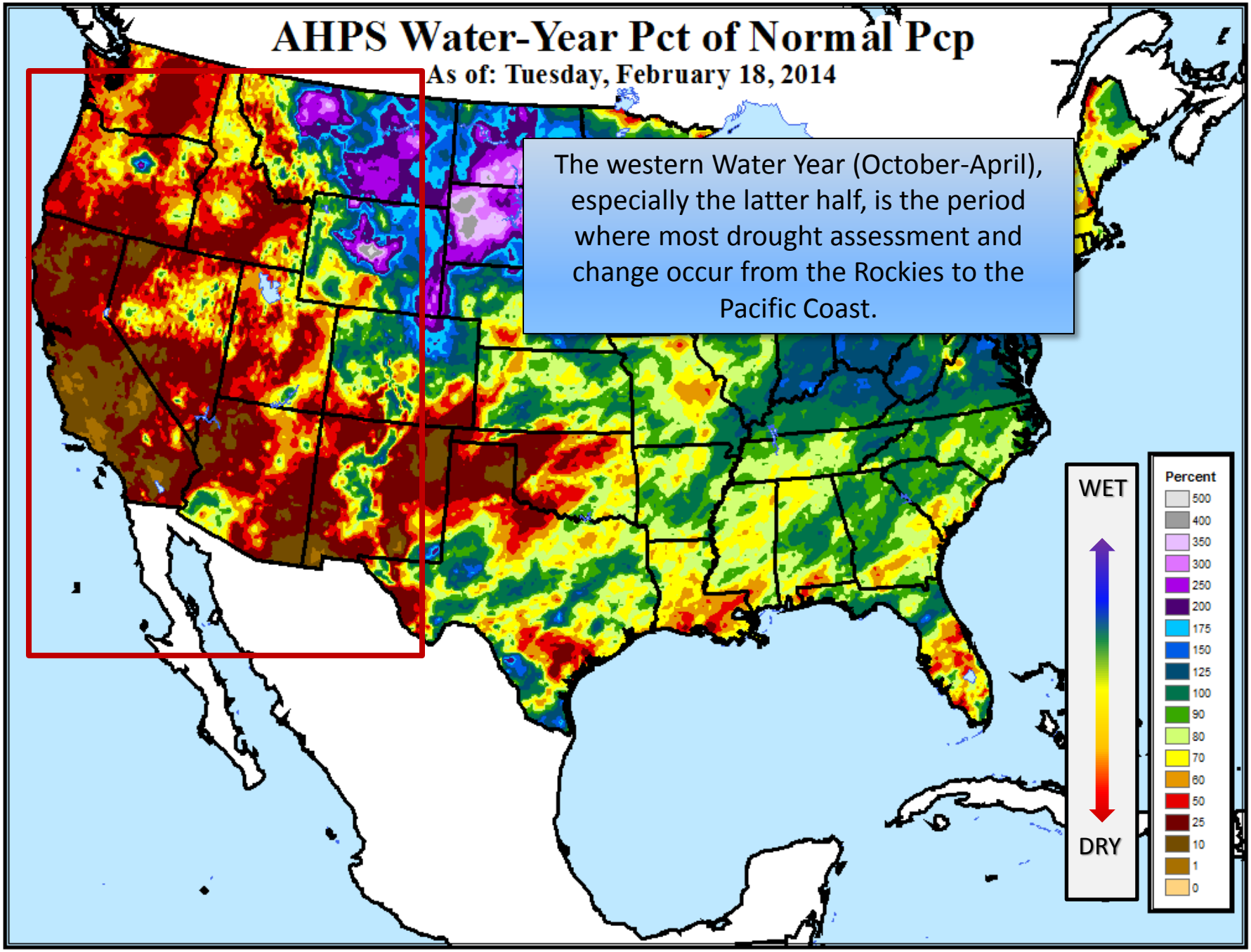


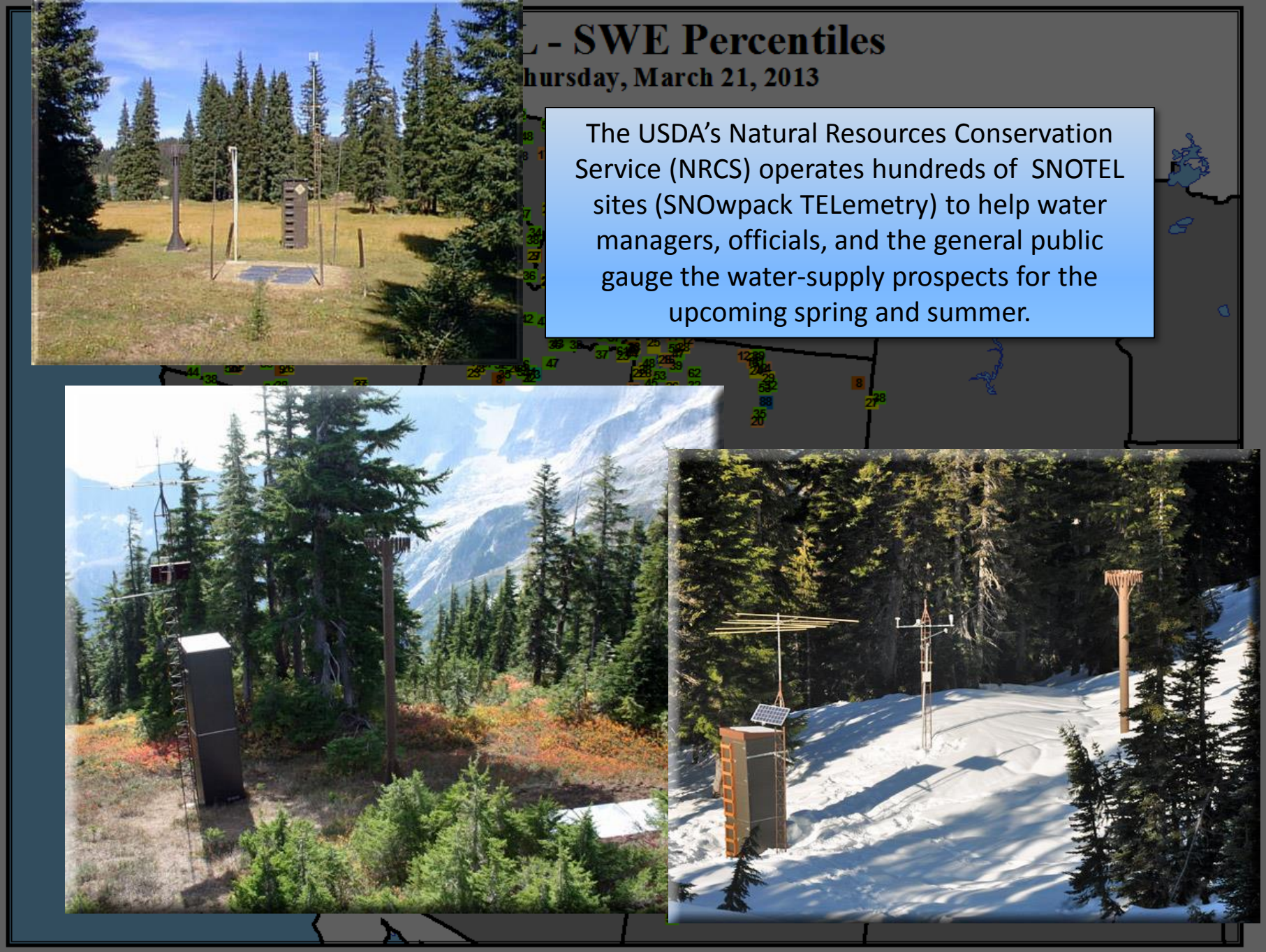
Conversely, the valleys of the Pacific Northwest rely heavily on winter-spring rain and snow.



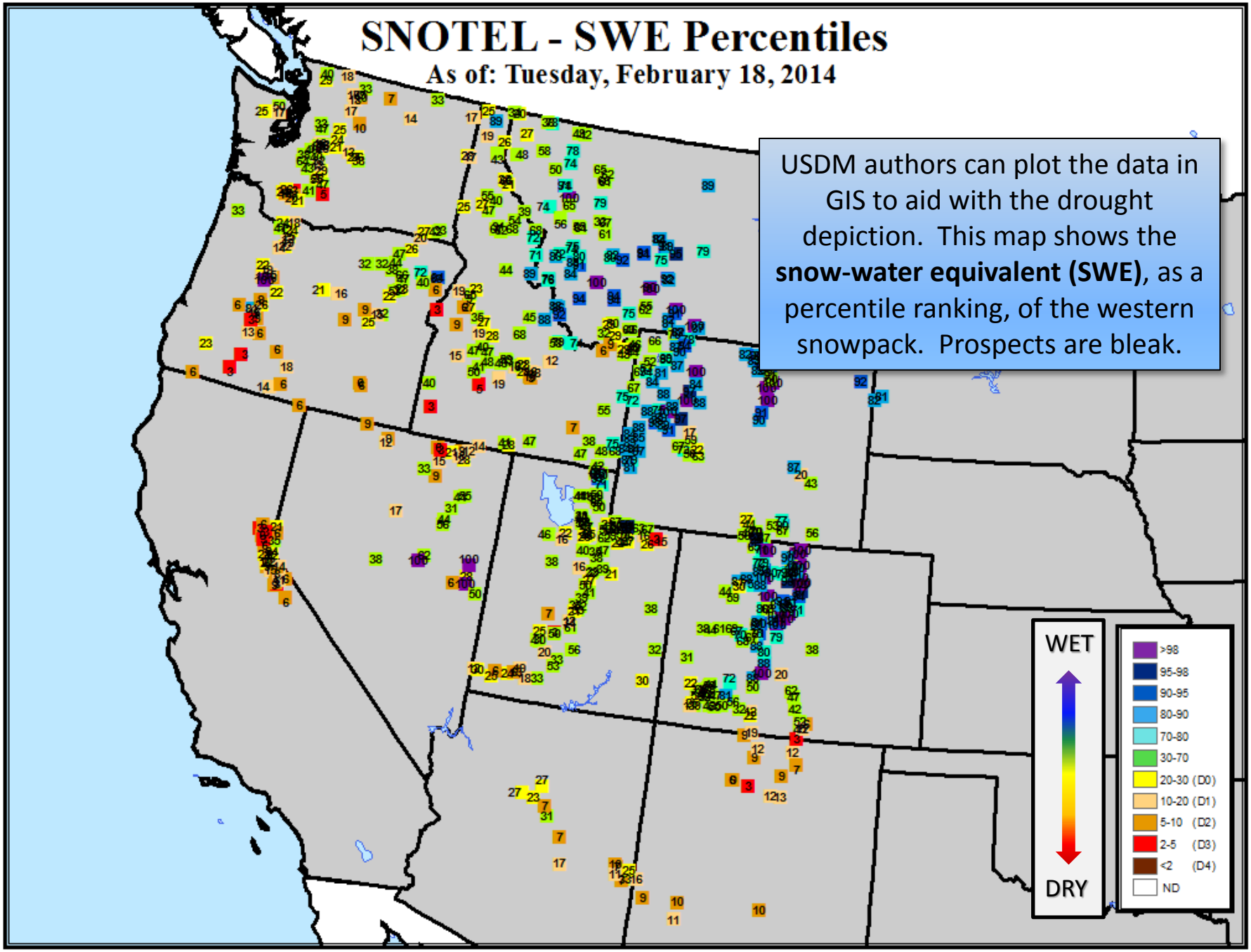
Even more pronounced is the dependence of western water supply on the “Water Year” – October thru April – to make it through the hot, dry, and high-water demand periods of the summer and early fall.

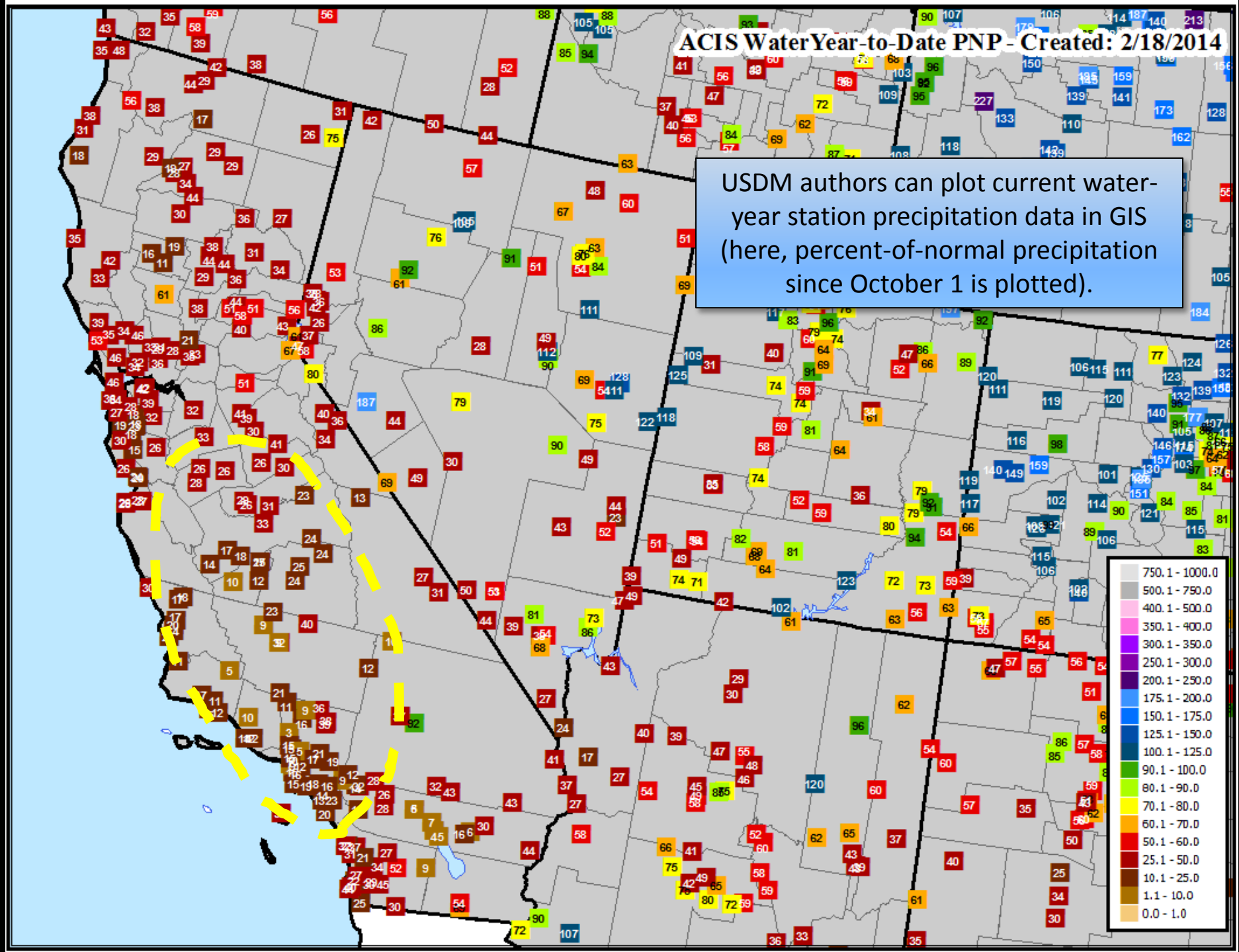



AHPS Water-Year Pct of Normal Pcp
As of: Tuesday, February 18, 2014
The western Water Year (October-April), especially the latter half, is the period where most drought assessment and change occur from the Rockies to the Pacific Coast.
WET
DRY
Percent
500
400
350
300
250
200
175
150
125
100
90
80
70
60
50
25
10
1
0



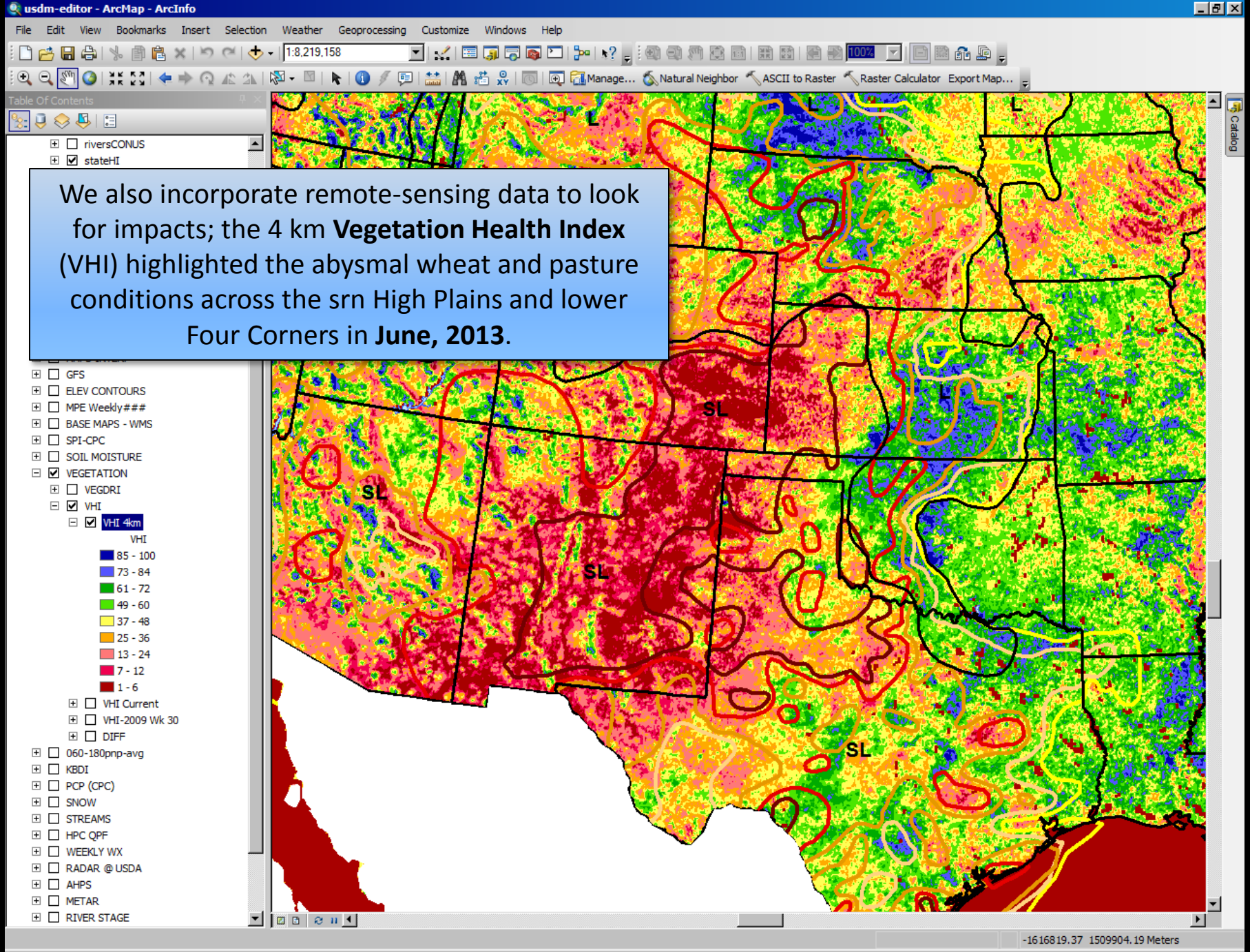
The USDA's Natural Resources Conservation Service (NRCS) operates hundreds of SNOTEL sites (SNOwpack TELemetry) to help water managers, officials, and the general public gauge the water-supply prospects for the upcoming spring and summer.

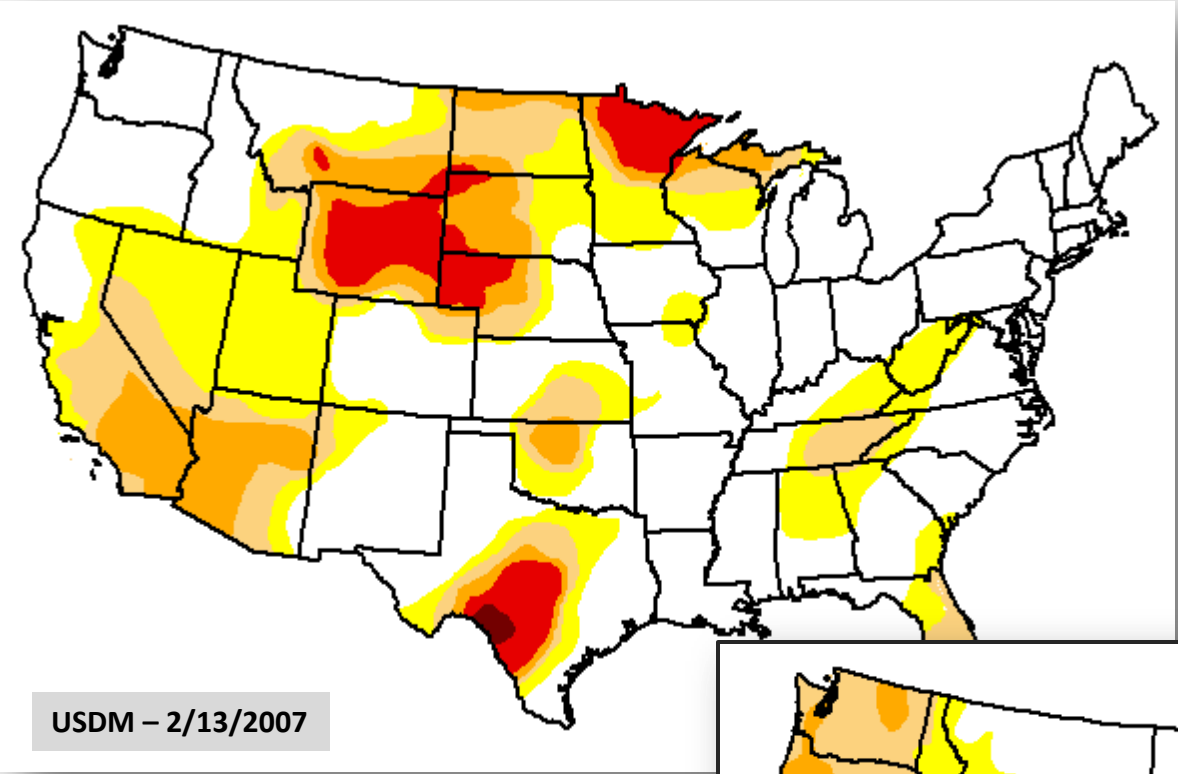

SNOTEL - SWE Percentiles
As of: Tuesday, February 18, 2014
USDM authors can plot the data in GIS to aid with the drought depiction. This map shows the **snow-water equivalent (SWE)**, as a percentile ranking, of the western snowpack. Prospects are bleak.
WET
DRY
>98
95-98
90-95
80-90
70-80
30-70
20-30 (D0)
10-20 (D1)
5-10 (D2)
2-5 (D3)
<2 (D4)
ND

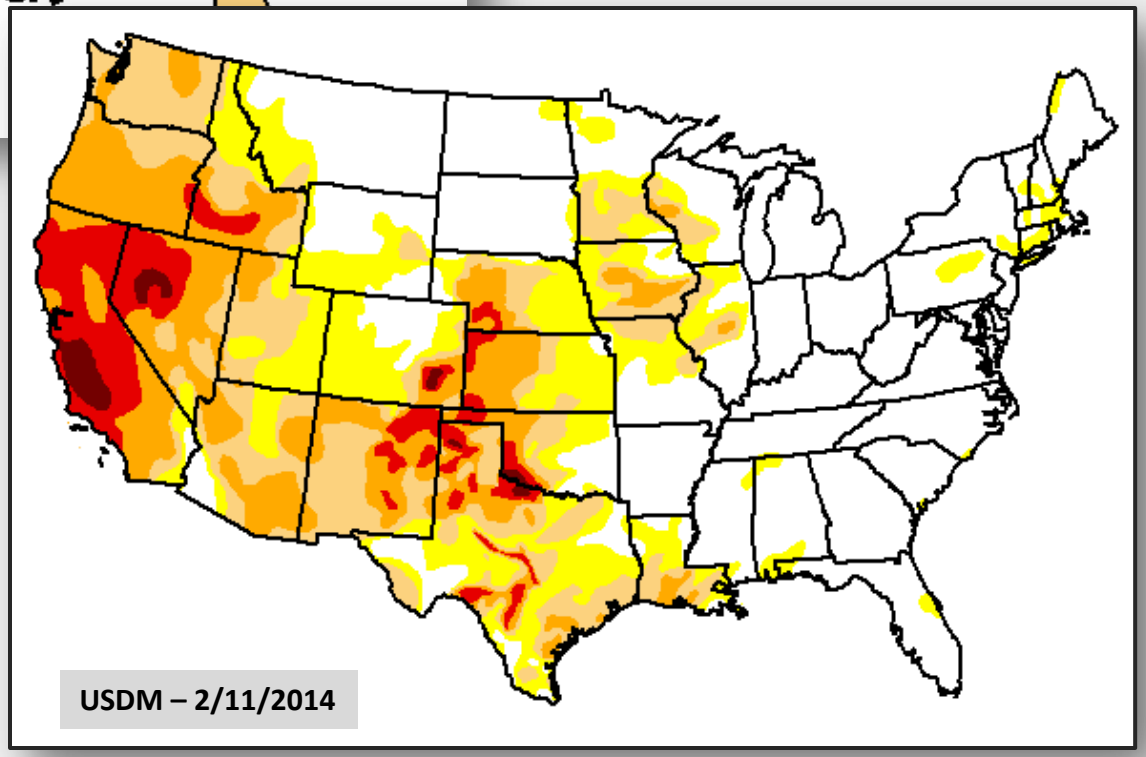


USDM authors can plot current water-year station precipitation data in GIS (here, percent-of-normal precipitation since October 1 is plotted).

We also incorporate remote-sensing data to look for impacts; the 4 km **Vegetation Health Index** (VHI) highlighted the abysmal wheat and pasture conditions across the srn High Plains and lower Four Corners in **June, 2013**.







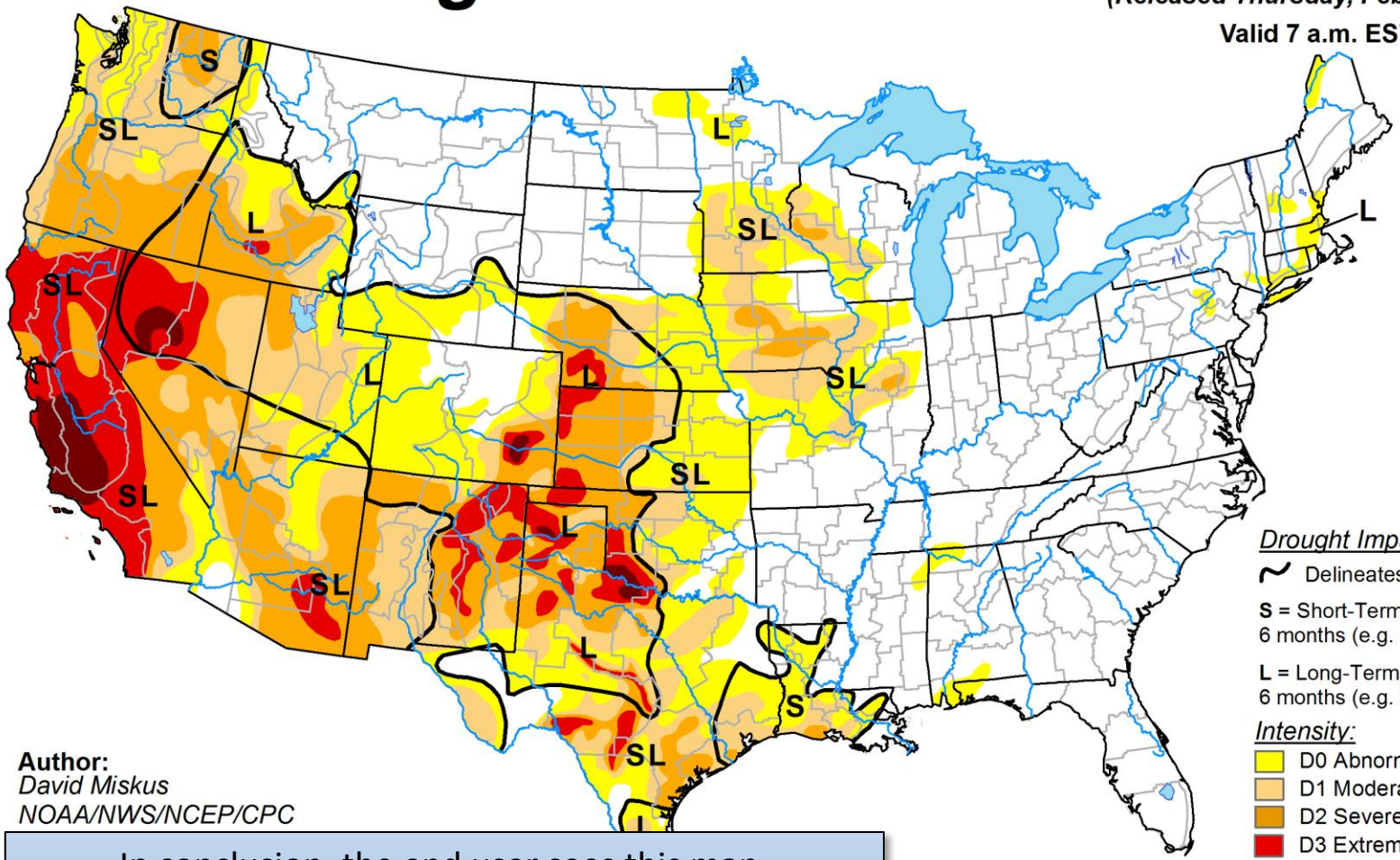
With more input from local experts and higher-resolution datasets, the level of detail in drought depiction has increased considerably over the past 7 years.

U.S. Drought Monitor

February 18, 2014

(Released Thursday, Feb. 20, 2014)

Valid 7 a.m. EST



Author:
David Miskus
NOAA/NWS/NCEP/CPC

Drought Impact Types:

~ Delineates dominant impacts

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

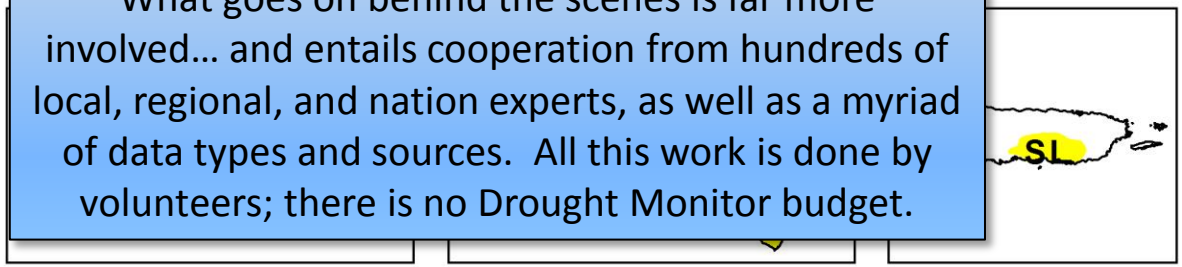
L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

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.

In conclusion, the end user sees this map. What goes on behind the scenes is far more involved… and entails cooperation from hundreds of local, regional, and nation experts, as well as a myriad of data types and sources. All this work is done by volunteers; there is no Drought Monitor budget.



USDA National Drought Mitigation Center

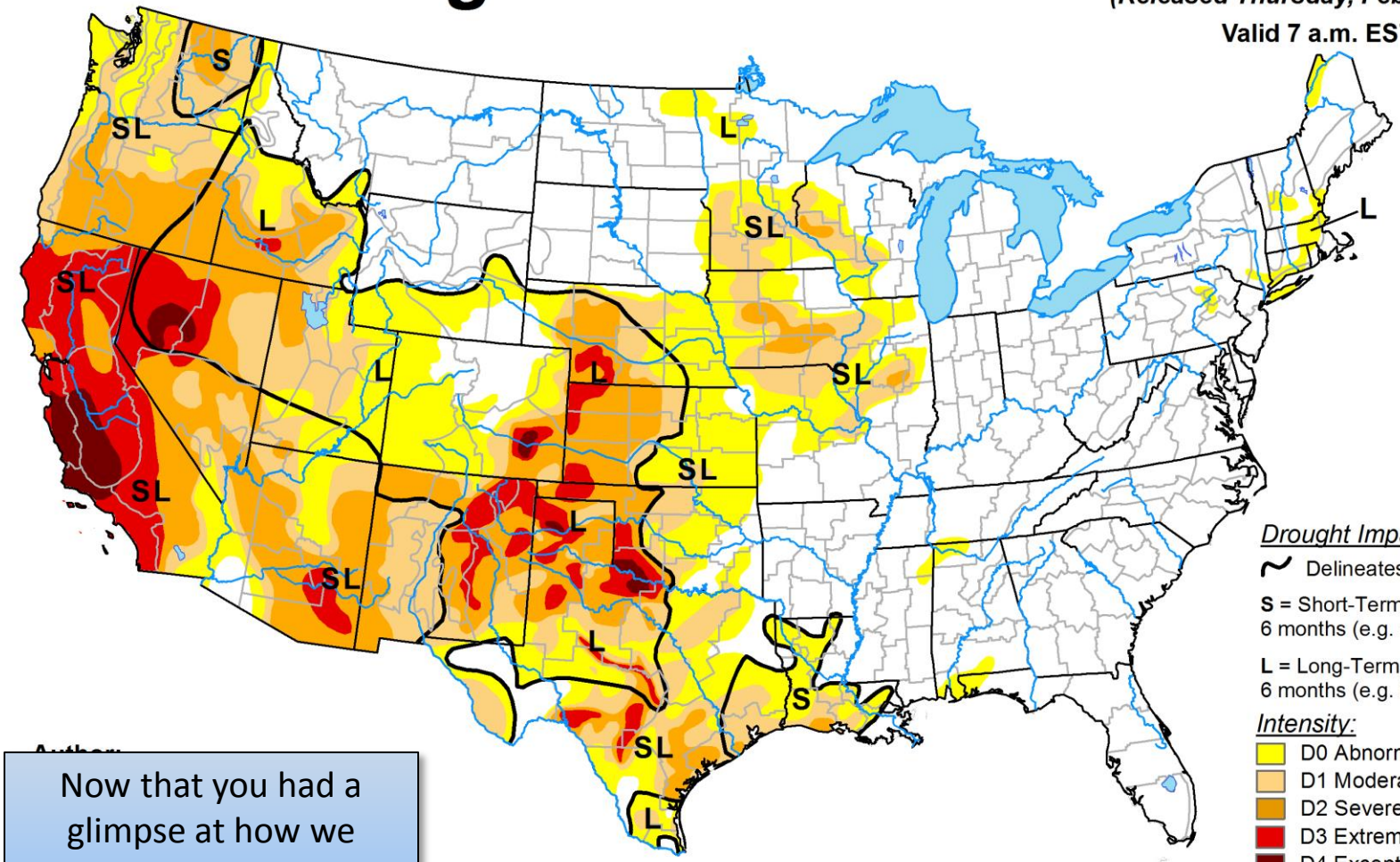
http://droughtmonitor.unl.edu/

U.S. Drought Monitor

February 18, 2014

(Released Thursday, Feb. 20, 2014)

Valid 7 a.m. EST



Drought Impact Types:

~ Delineates dominant impacts

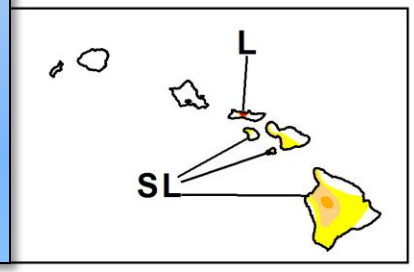
S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)

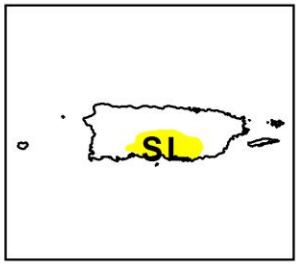
L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

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.

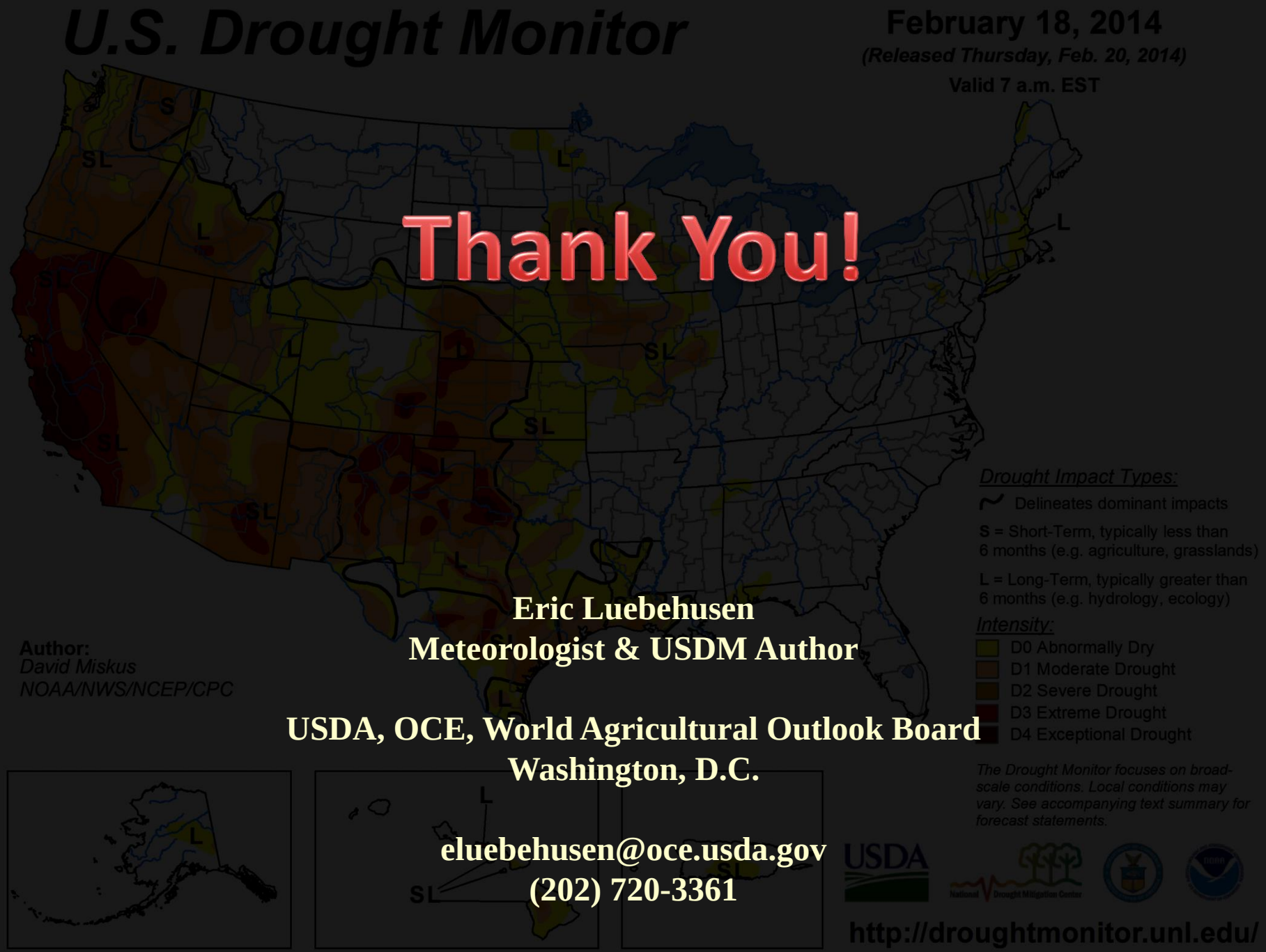




USDA National Drought Mitigation Center

http://droughtmonitor.unl.edu/

Now that you had a glimpse at how we create the U.S. Drought Monitor, it's time to turn the page and look at the ***Current Drought*** situation and the ***Weather Outlook***.



Thank You!

Eric Luebehusen
Meteorologist & USDM Author

USDA, OCE, World Agricultural Outlook Board
Washington, D.C.

eluebehusen@oce.usda.gov
(202) 720-3361