Drought and Wildland Fire Risks

6 February 2014
Jim Oberhofer KN6PE

Agenda

Drought

- Definitions
- Measures
- History
- Causes

Water

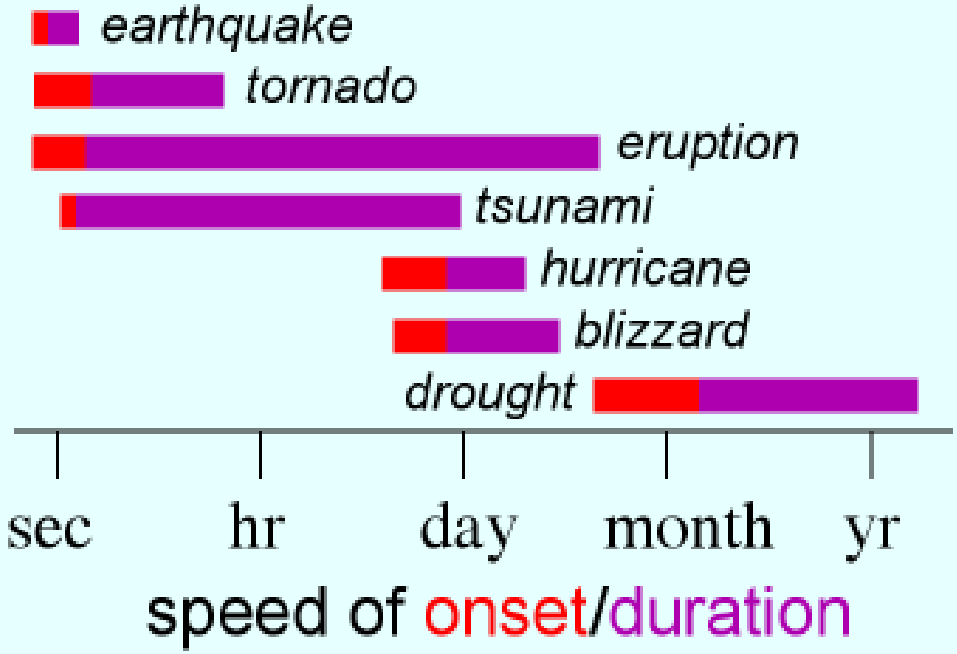
Fire

What does this mean to us?

Definitions

Drought

- **A long period of abnormally low rainfall, especially one that adversely affects growing or living conditions.**
- Can be short term or long term.
- There can be short term moist spells in the midst of a long term drought.
- **Hazard profile**
  - slow onset
  - prolonged duration
  - widespread



Measures

PDSI – Palmer Drought Sensitivity Index

- An index that that states the severity of meteorological drought in a location.
- Ranges from –4 (extreme drought) to +4 (extremely moist)
- Most widely used drought index in the US.
- Takes a supply-and-demand approach to the surface water balance.
- PDSI is a good measure of long-term drought; over several months.
- In addition to drought, PDSI provides information about wet spells.

Measures

PDSI – Palmer Drought Sensitivity Index

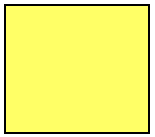
Variables that go into the PDSI calculation

- climate data
- soil moisture
- stream flow
- ground water
- reservoir and lake levels
- snow pack
- short, medium, and long range forecasts
- vegetation health/stress and fire danger

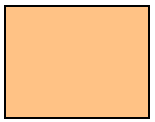
Measures

PDSI – Palmer Drought Sensitivity Index

Intensity Categories



D0 Abnormally Dry (30%tile)



D1 Drought – Moderate (20%tile)

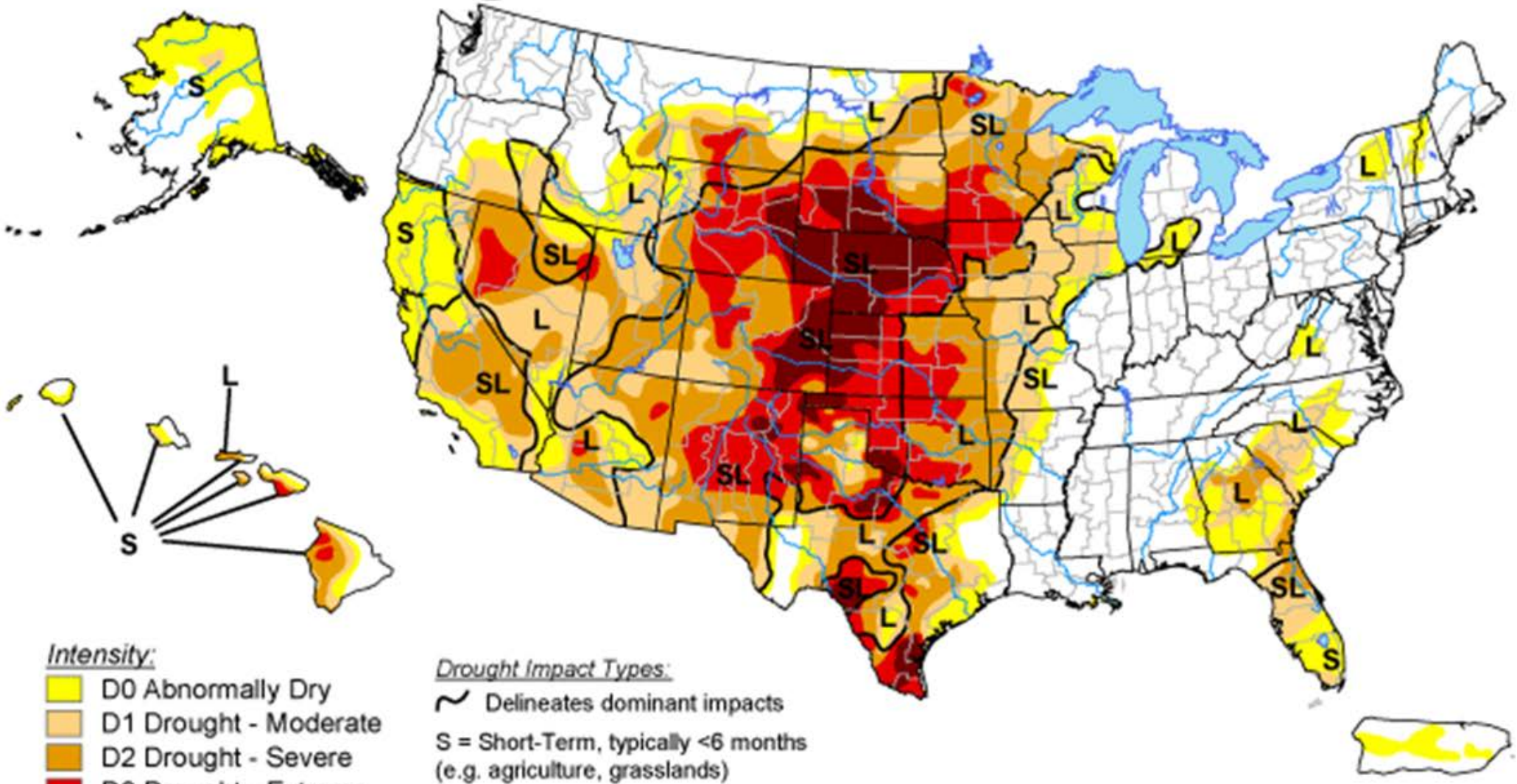
D2 Drought – Severe (10%tile)

D3 Drought – Extreme (5%tile)

D4 Drought – Exceptional (2%tile)

U.S. Drought Monitor

March 5, 2013
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/

Released Thursday, March 7, 2013

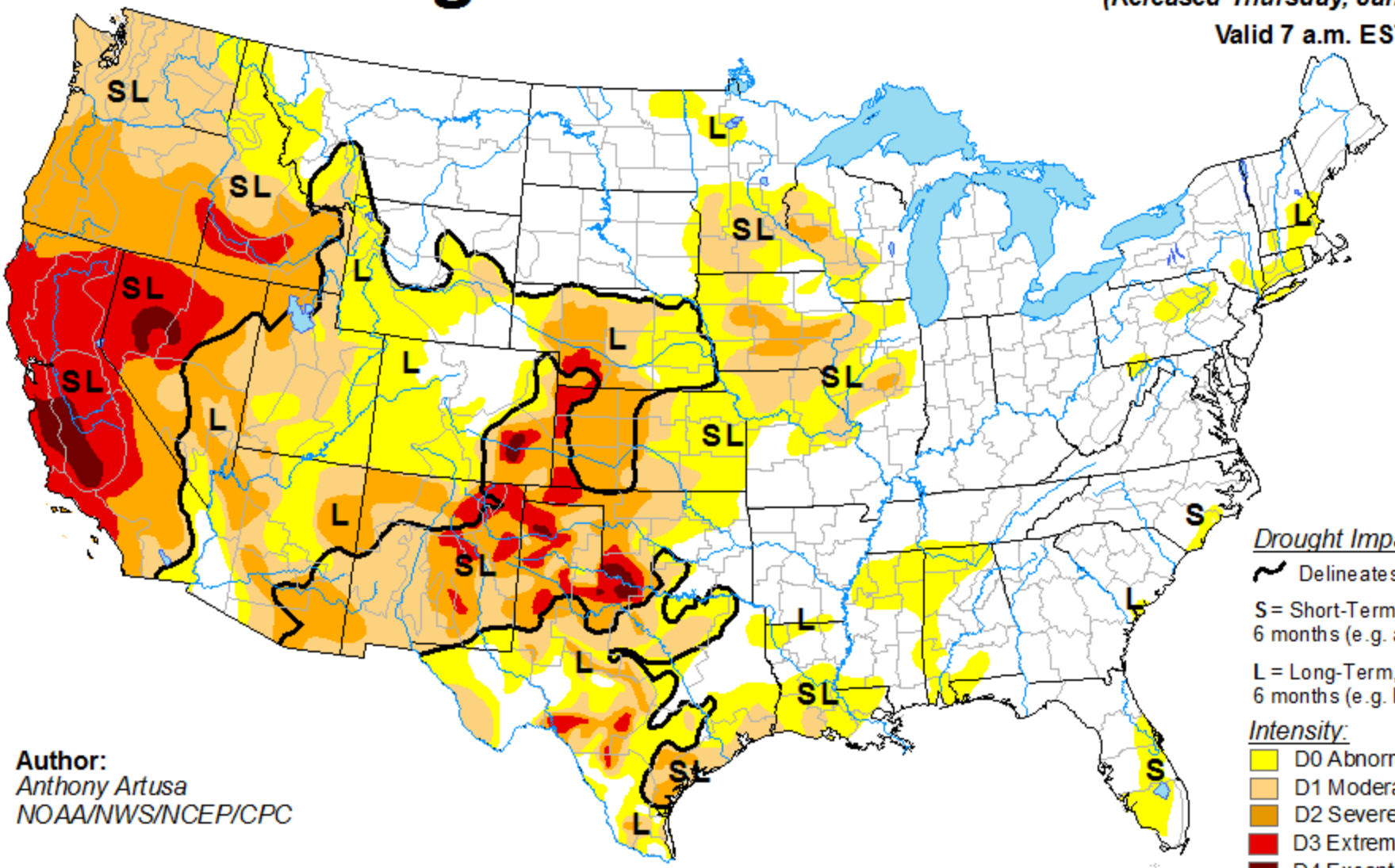
Author: Matthew Rosencrans, NOAA/NWS/NCEP/CPC

U.S. Drought Monitor

January 28, 2014

(Released Thursday, Jan. 30, 2014)

Valid 7 a.m. EST



Author:
Anthony Artusa
NOAA/NWS/NCEP/CPC

Drought Impact Types:

Delineates dominant impacts

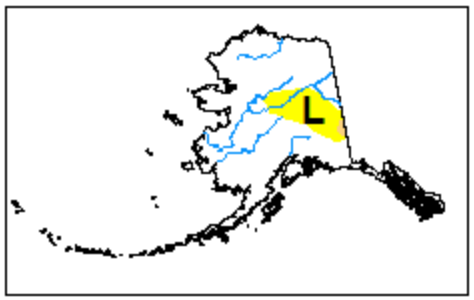
S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)

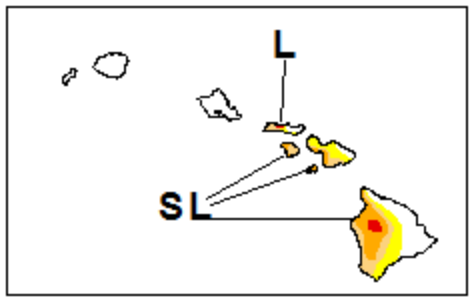
L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

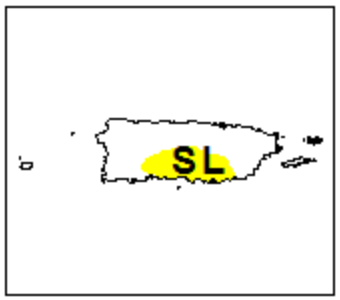
Intensity:

- 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.





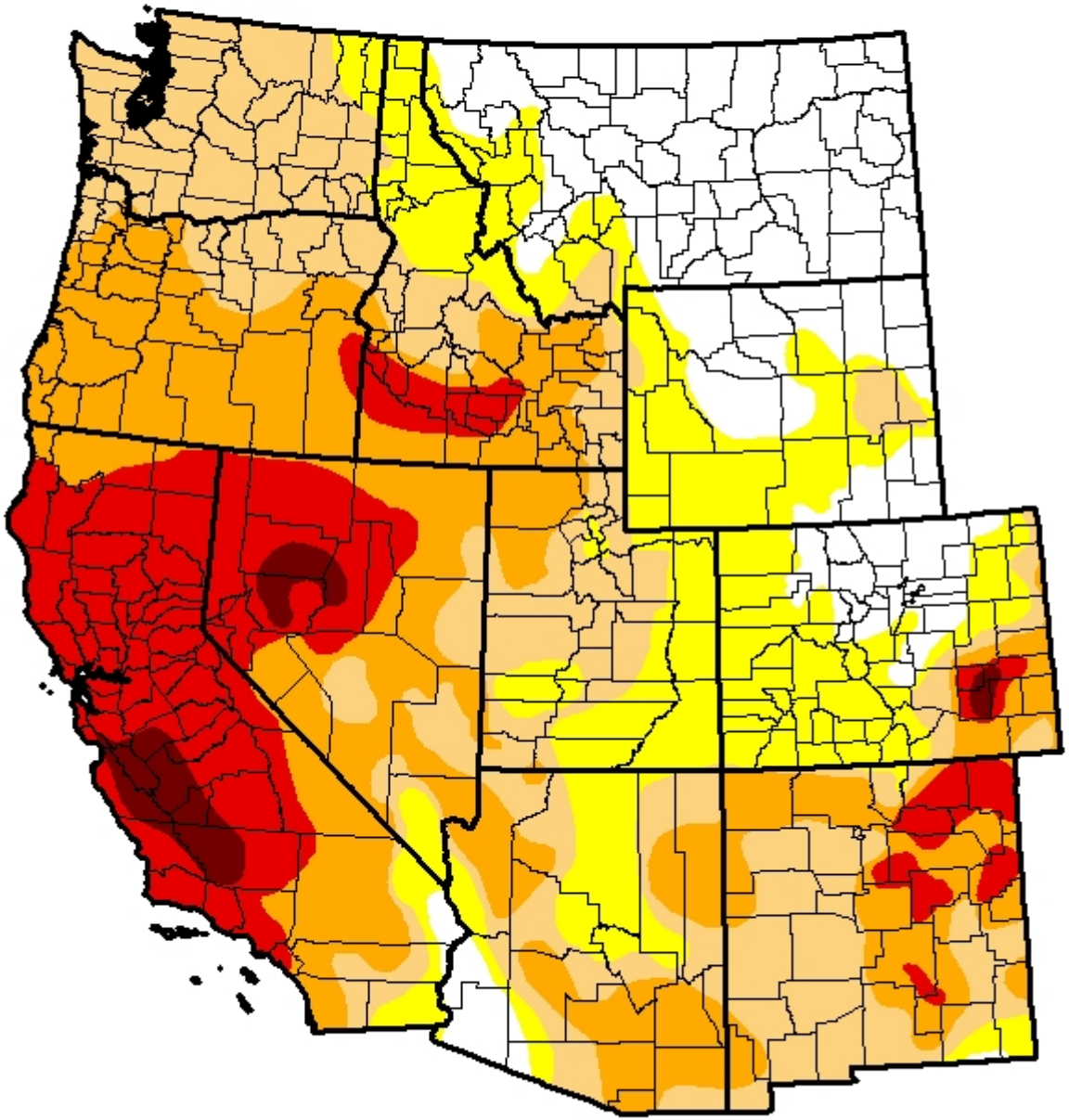


USDA

National Drought Mitigation Center

http://droughtmonitor.unl.edu/

U.S. Drought Monitor
West



January 28, 2014
(Released Thursday, Jan. 30, 2014)
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	17.38	82.62	63.50	39.67	15.29	1.80
Last Week *1/21/2014*	18.74	81.26	60.81	36.99	13.78	0.63
3 Months Ago *10/29/2013*	27.90	72.10	53.62	32.25	5.34	0.63
Start of Calendar Year *12/31/2013*	22.20	77.80	51.44	31.11	7.75	0.63
Start of Water Year *10/1/2013*	25.25	74.75	58.96	34.18	5.57	0.63
One Year Ago *1/29/2013*	23.58	76.42	66.52	44.01	16.39	2.15

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.

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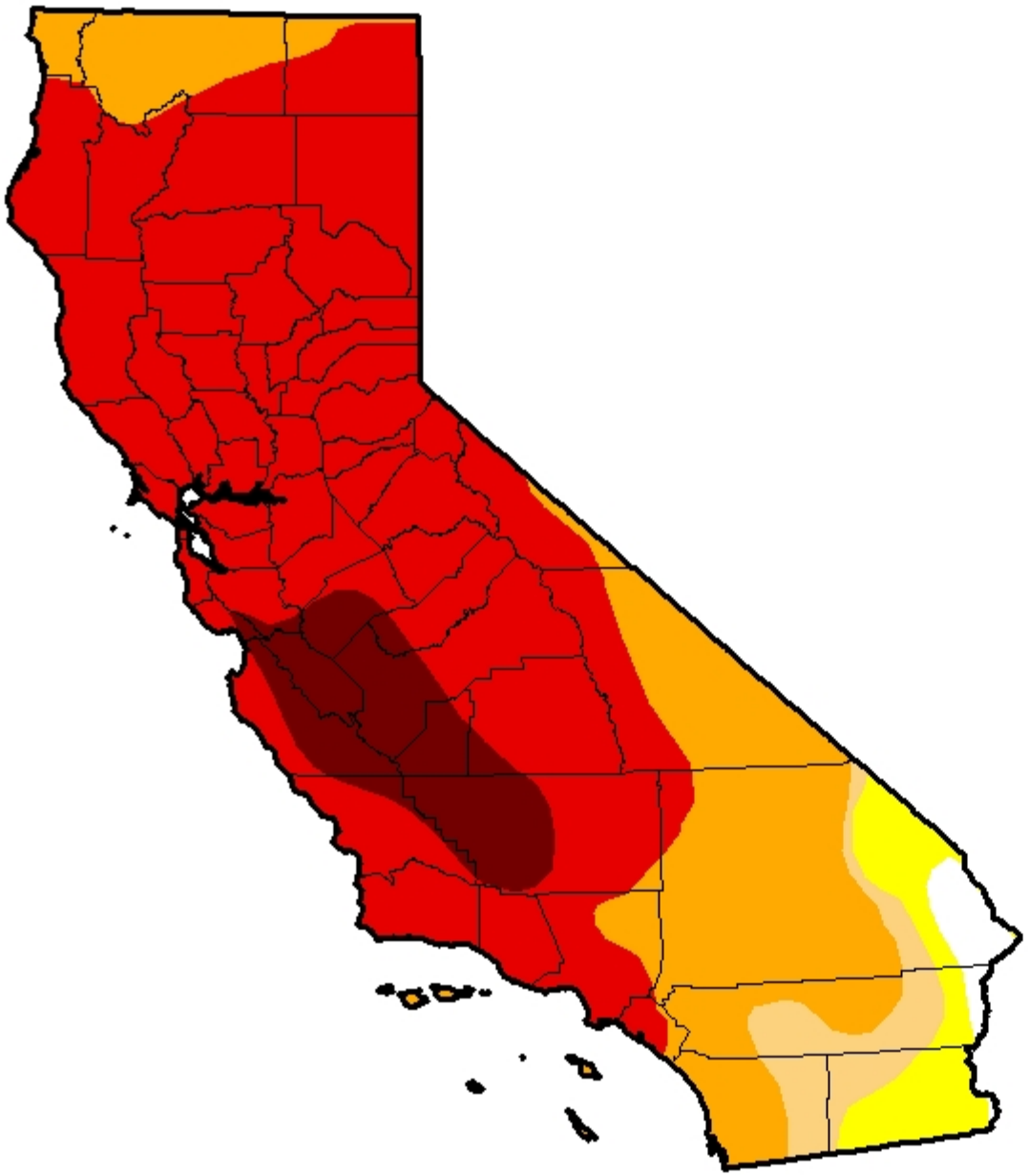
U.S. Drought Monitor

California



January 28, 2014

(Released Thursday, Jan. 30, 2014)

Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	1.43	98.57	94.18	89.91	67.13	8.77
Last Week *1/21/2014*	1.43	98.57	94.18	89.91	62.71	0.00
3 Months Ago *10/29/2013*	2.66	97.34	95.98	84.12	11.36	0.00
Start of Calendar Year *12/31/2013*	2.61	97.39	94.25	87.53	27.59	0.00
Start of Water Year *10/1/2013*	2.63	97.37	95.95	84.12	11.36	0.00
One Year Ago *1/29/2013*	34.20	65.80	47.18	21.57	0.00	0.00

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.

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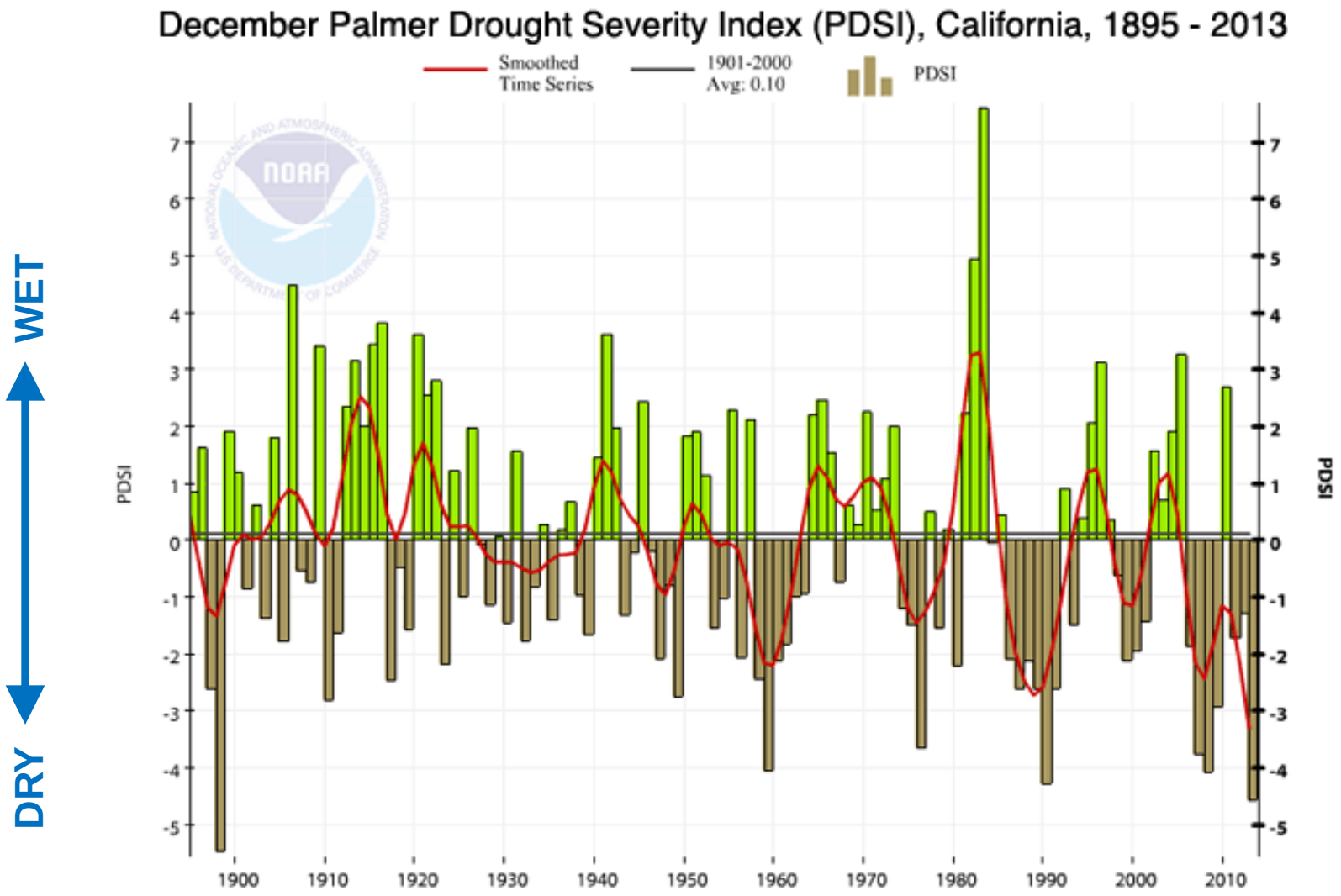
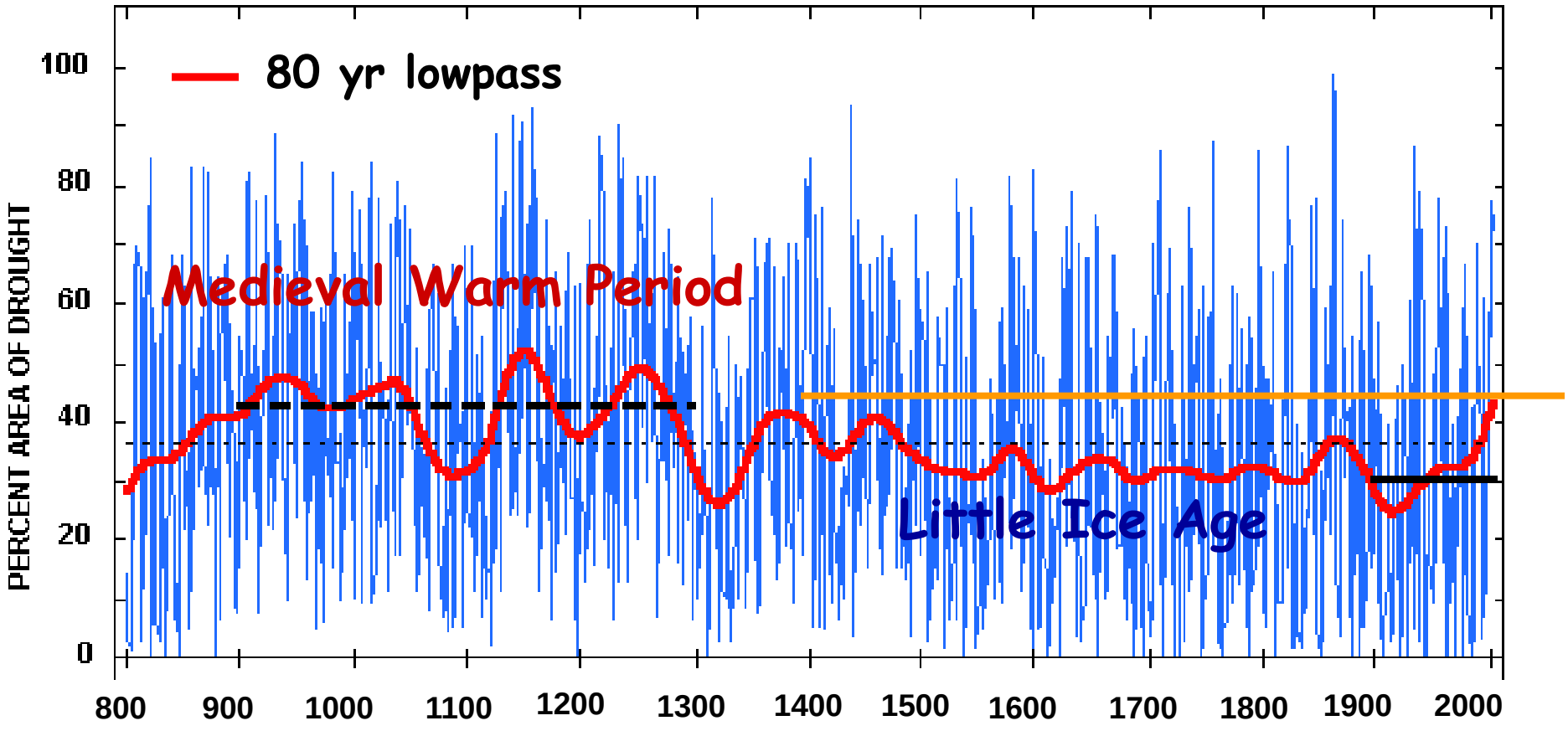
http://droughtmonitor.unl.edu/

History


December Palmer Drought Severity Index (PDSI), California, 1895 - 2013
Smoothed Time Series
1901-2000 Avg: 0.10
PDSI
WET
DRY
PDSI
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010

History

Western US Drought Area Index (-1 PDSI)



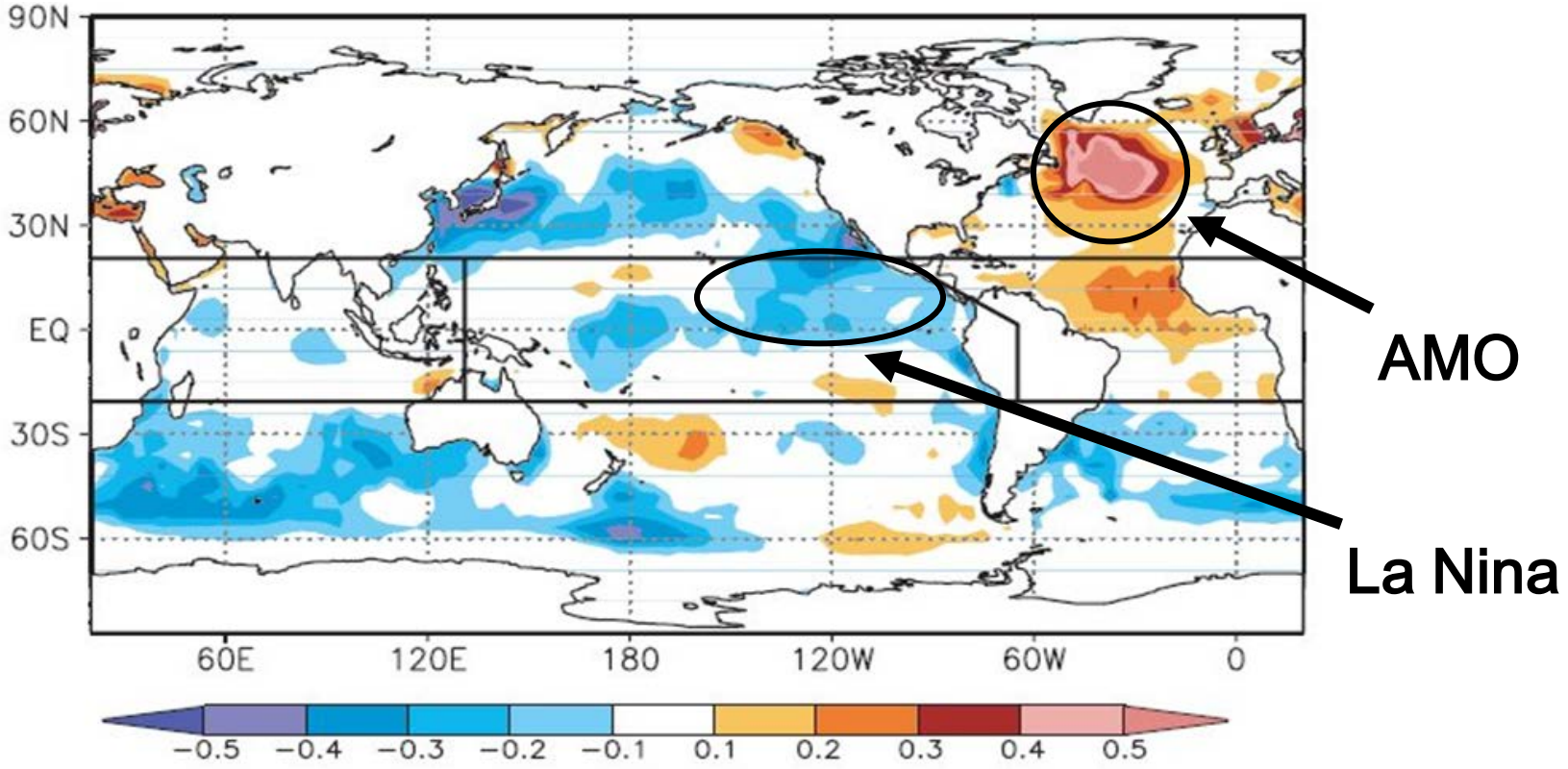
Ref: Krusik & Cook (2004) North American Drought Atlas

Possible causes of drought

La Nina's cool things down

There is evidence that La Nina is a significant cause of persistent drought in the U.S. …but there also is a signal in the North Atlantic.

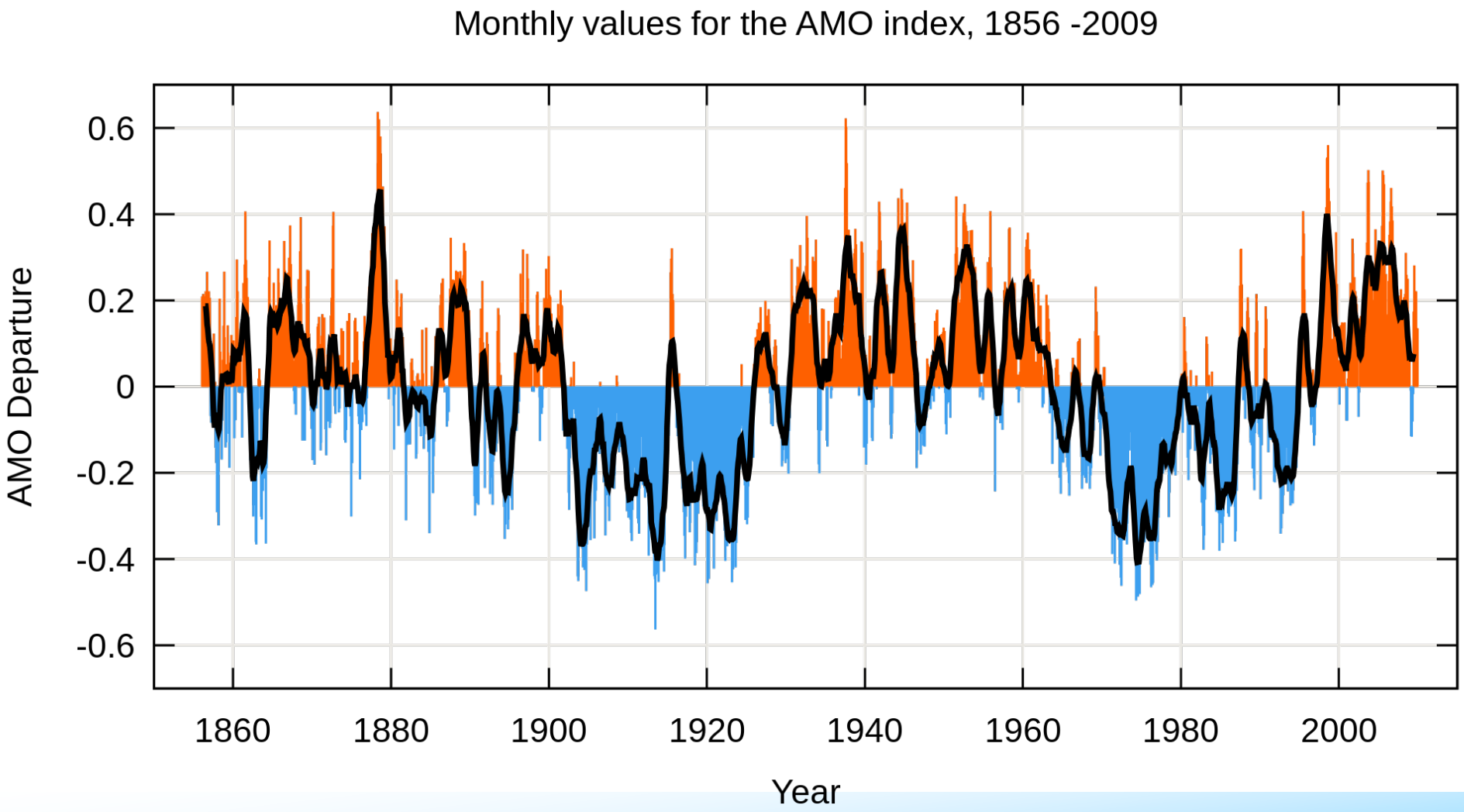
Composite Sea Surface Temperatures (SSTs), 1930s drought (1942 – 1938)



AMO - Atlantic Multidecadal Oscillation

Atlantic Multidecadal Oscillation

(BACK)

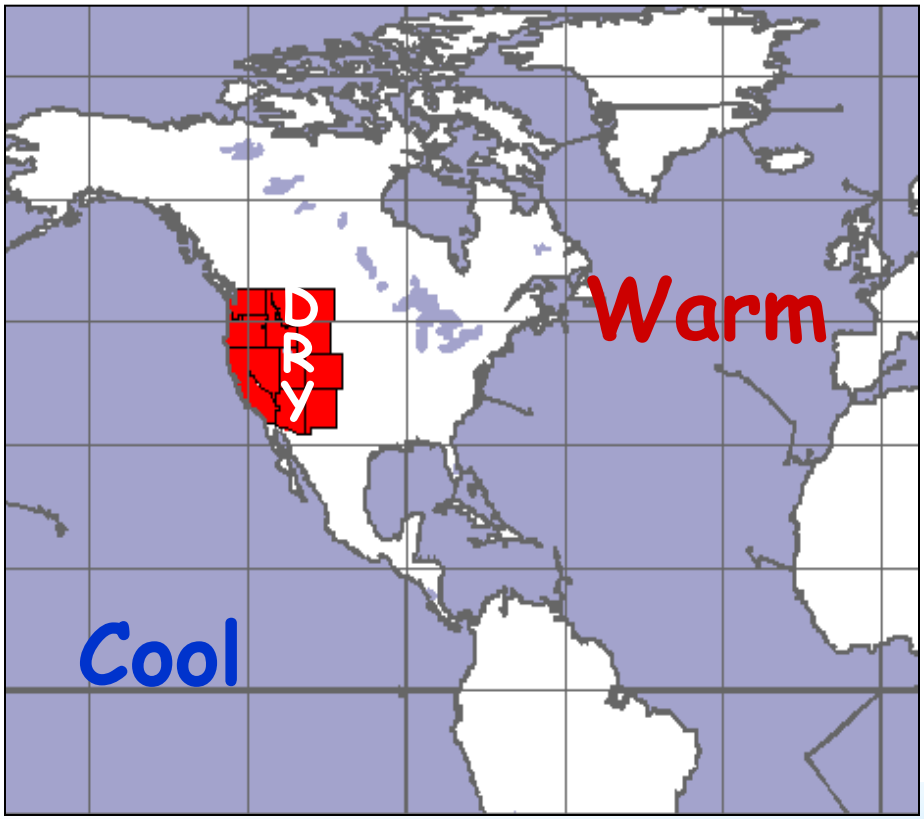


Possible causes of drought

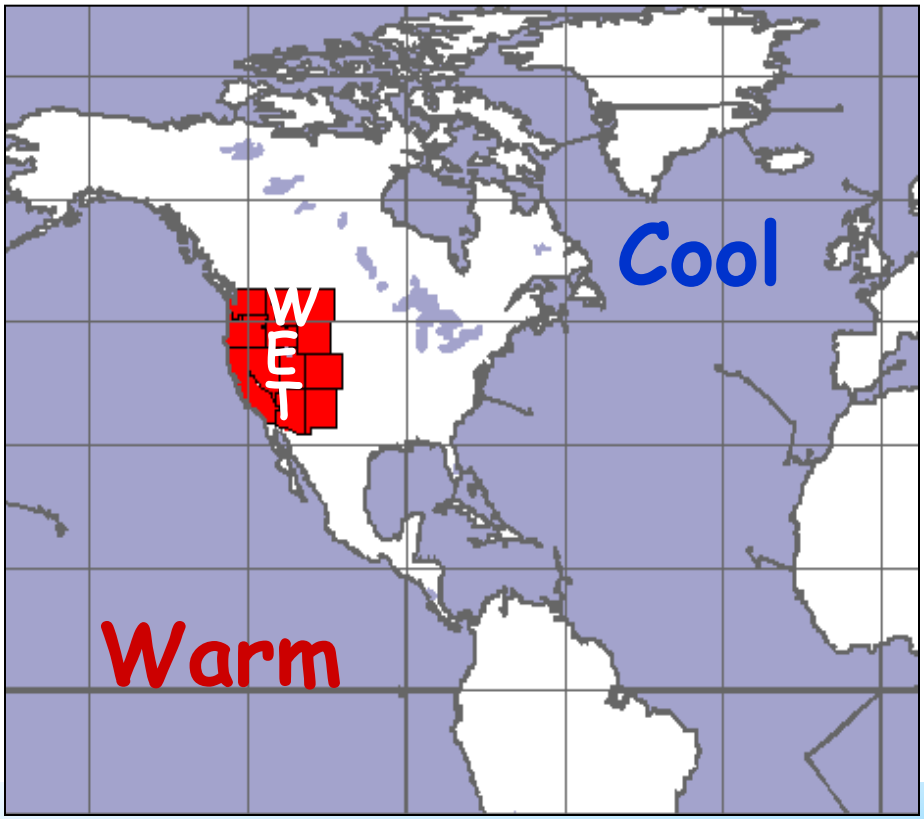
Cycles of La Nina's and El Niño's

Interaction between Pacific and Atlantic Sea Surface Temperatures (SSTs) also may govern centennial-scale trends in western U.S. drought.

Medieval Warm Period
AD 900-1300

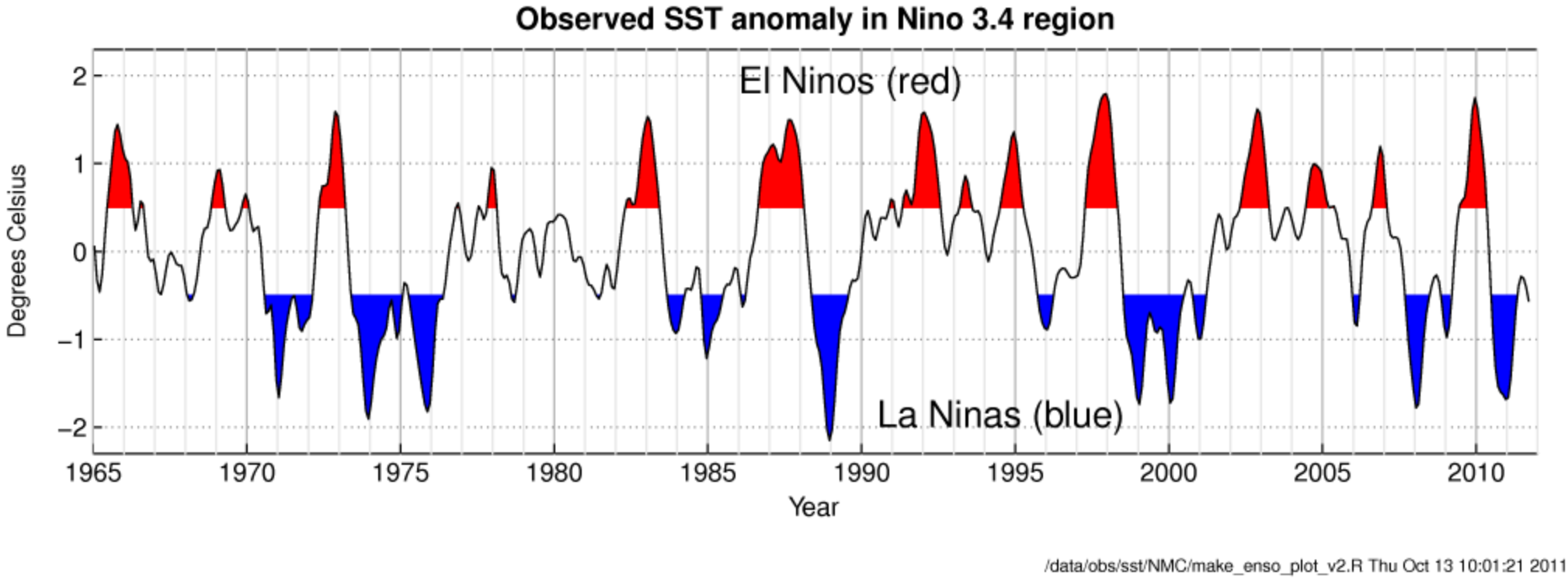


Little Ice Age
AD 1400-1850



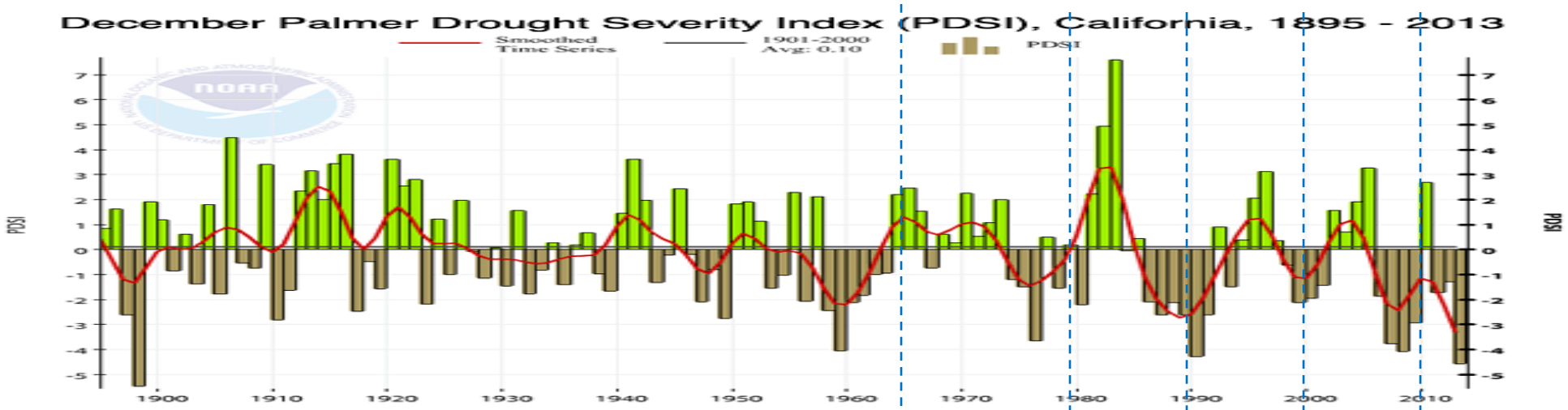
Possible causes of drought

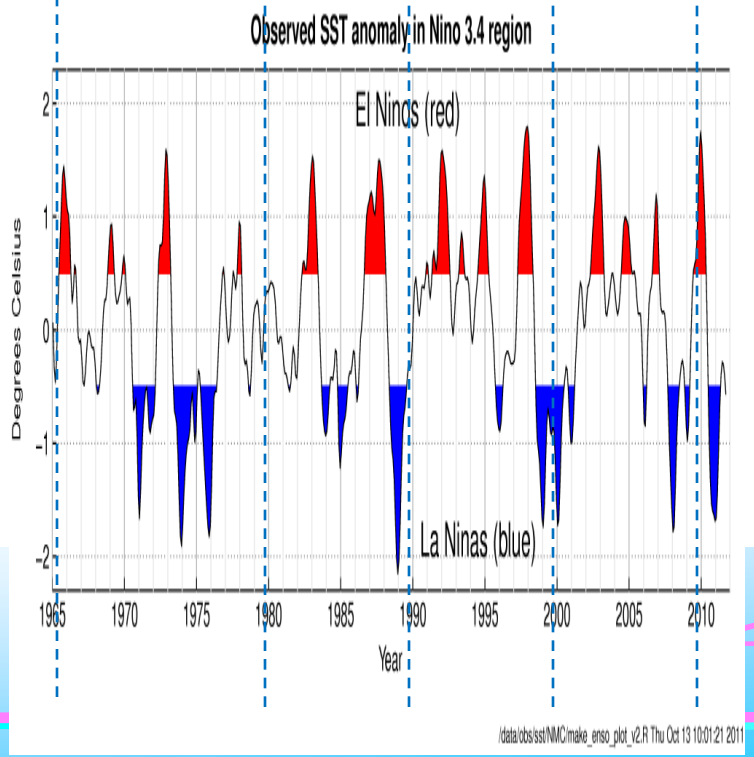
Cycles of La Nina's and El Niño's



- **When the difference from average conditions gets above 0.5 Celsius or so (red areas), you're in a warming period that is probably an El Niño.**
- **When the difference from average conditions gets below -0.5 Celsius (blue areas), it's in what's called the "cold phase", or "La Nina".**

Correlation between Drought & La Nina's?

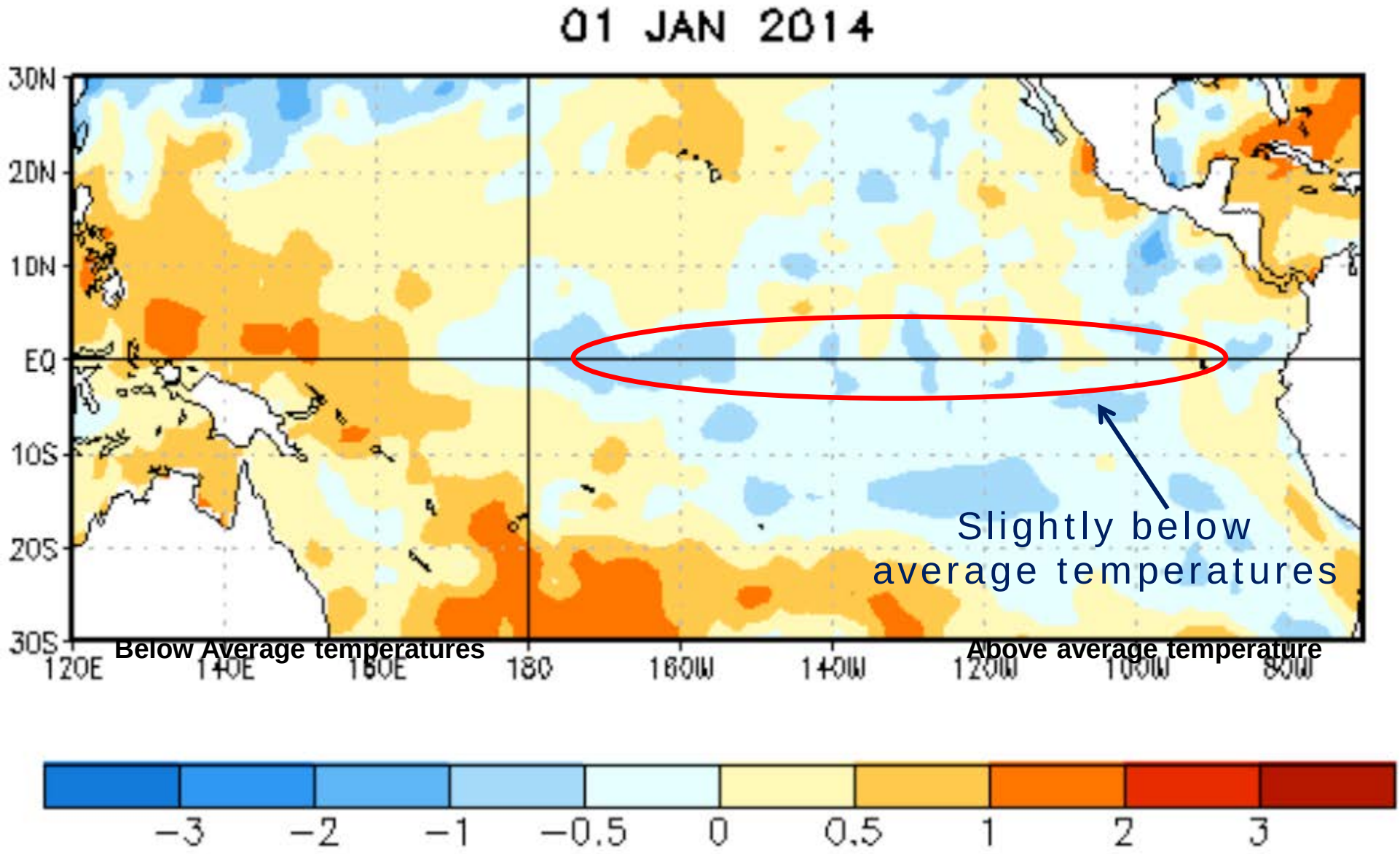




Possible causes of drought

So, are we have a La Nina or El Niño?

Average Surface Sea Temperature Anomalies (°C)

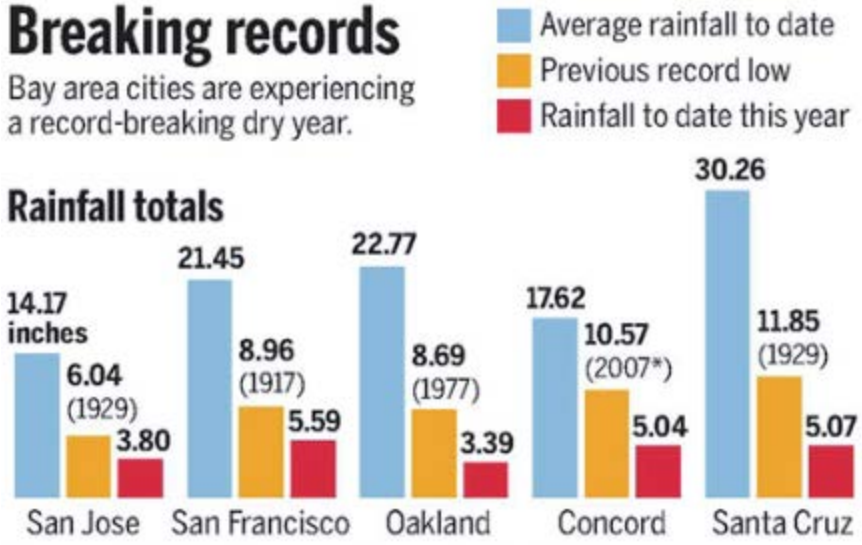


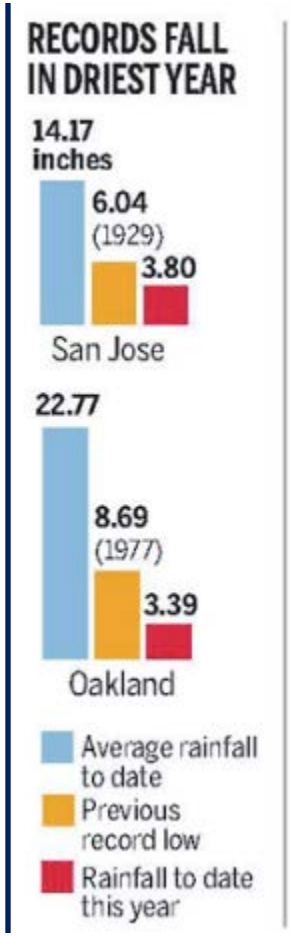
To summarize

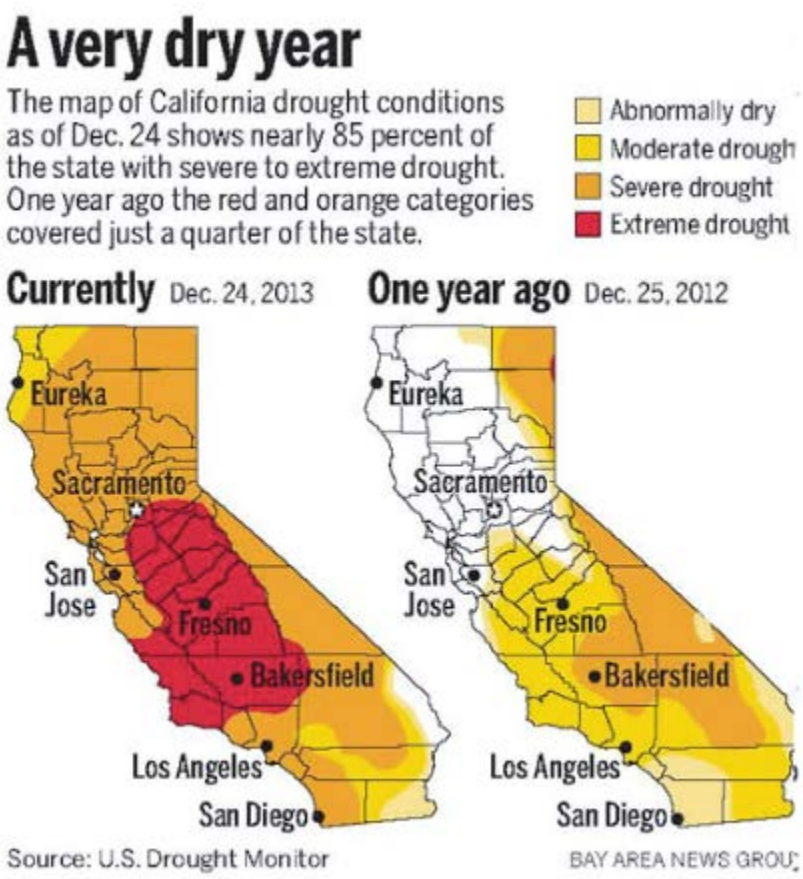
1. **Strong trade winds are blowing westward from South America toward Asia…**
2. **Slightly below-normal surface height and temperatures (no El Nino)…**
3. **Surface water cools the air above, forming high pressure systems…**
4. **In a High, cool, dry air sinks back to the surface and there is no precipitation…**
5. **No precipitation means we have a drought.**

Its all about the water

Impacts of Drought





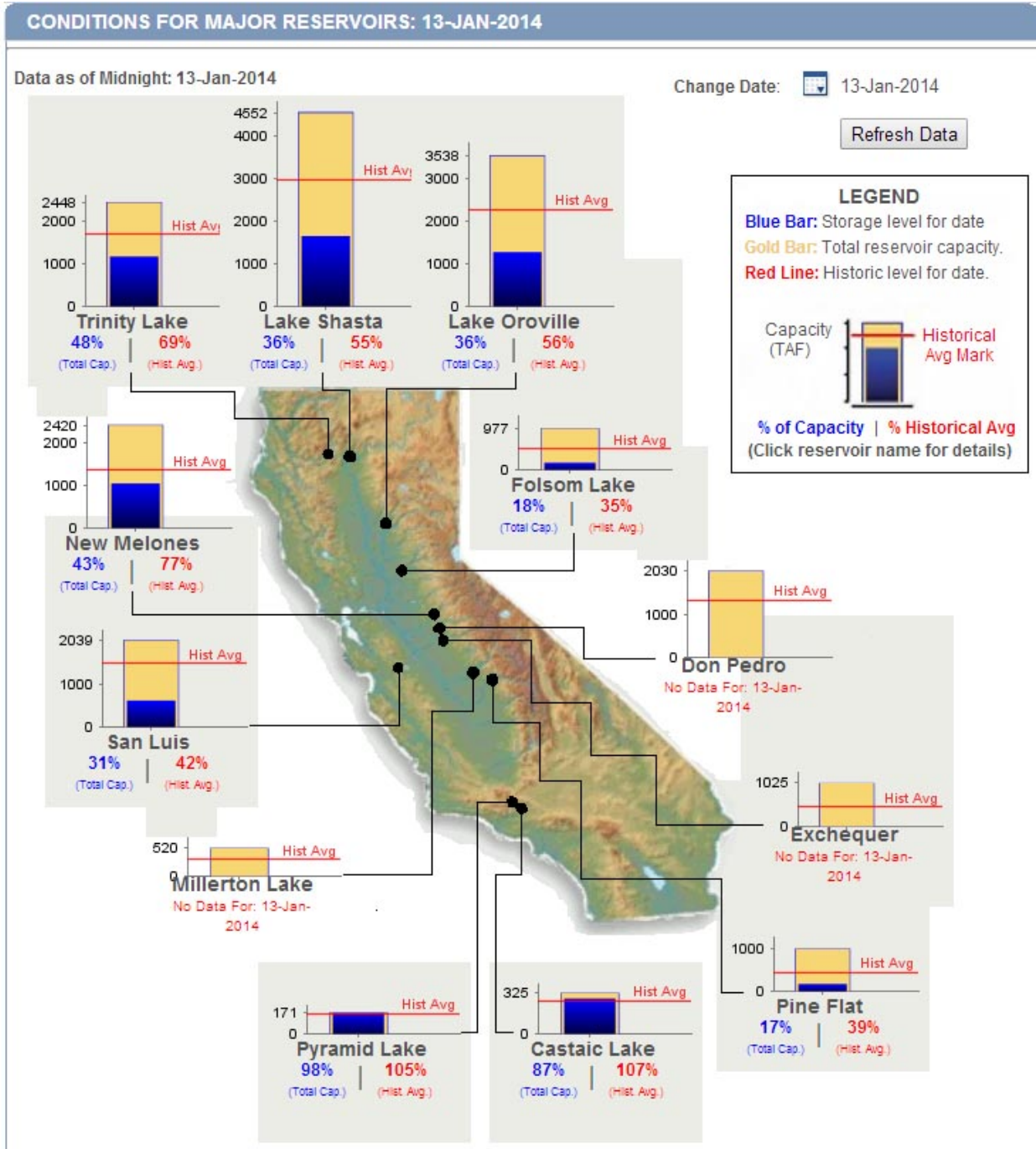


Water drives our economy

Impacts of Drought

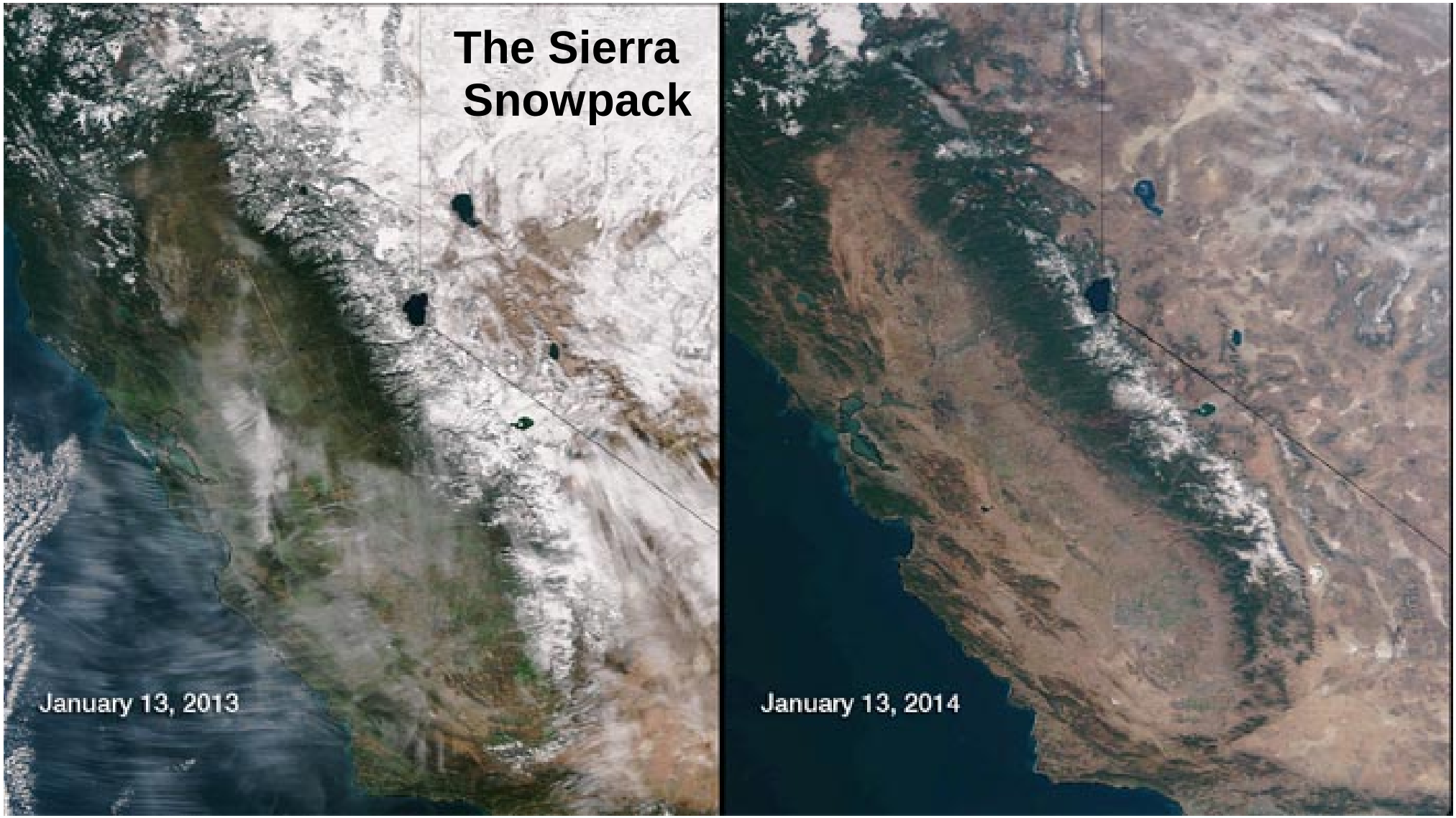
California is…

- **the #1 state in cash farm receipts with 11.3% of the U.S. total.**
- **Accounts for 15% of national receipts for crops and 7.1% of the U.S. revenue for livestock and livestock products.**
- **the state produces nearly half of U.S.-grown fruits, nuts and vegetables.**
- **the nation's largest agricultural exporter.**



Its all about the water

Impacts of Drought



Images from NOAA

SCVWD Reservoir Status Report

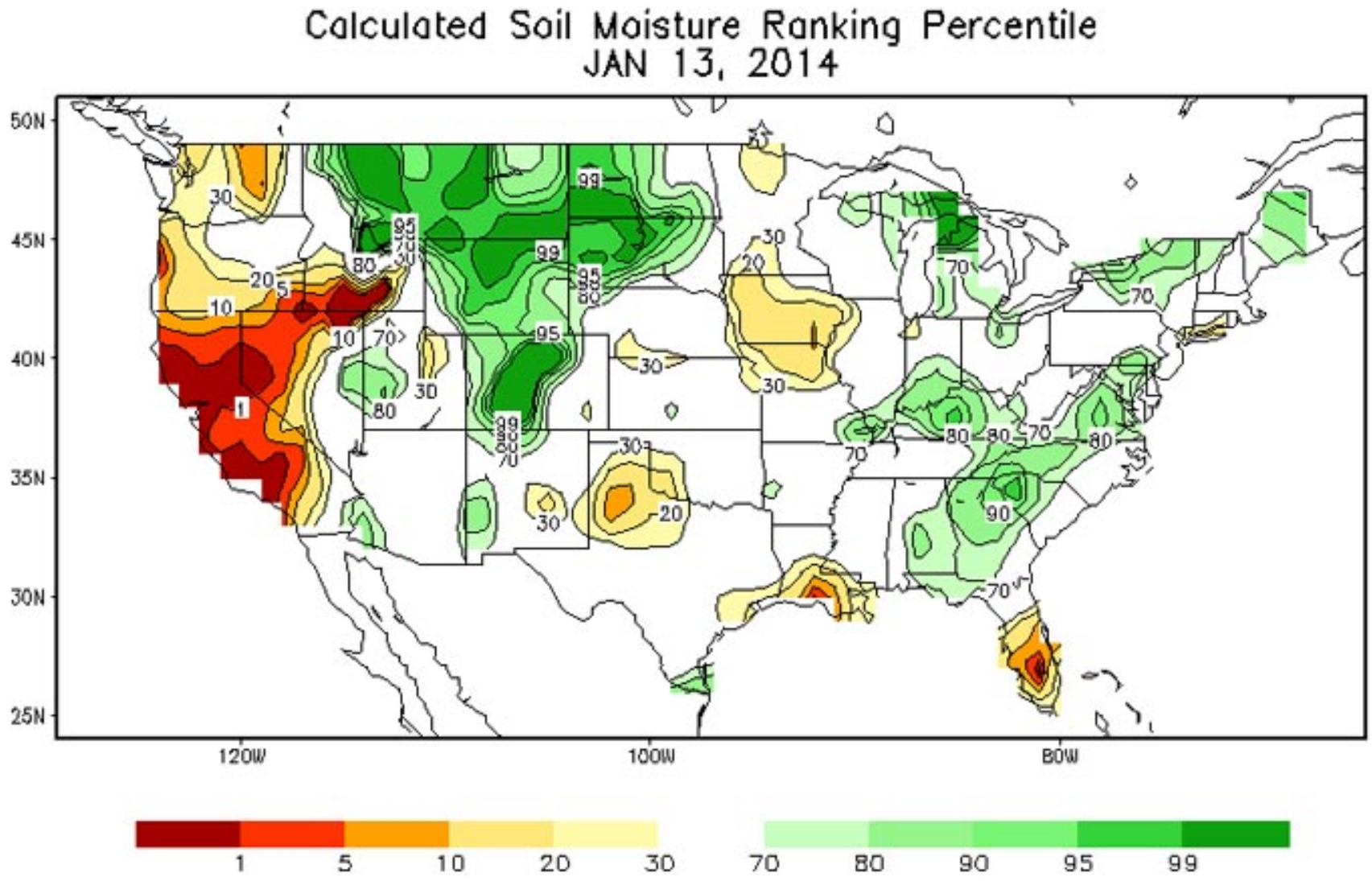
For the period 01/1/2014 TO 02/01/2014

RESERVOIR DATA

Reservoir	Capacity at Spillway	Storage 06:00 01/1/2014 (ac-ft)	Storage 06:00 02/01/2014 (ac-ft)	Storage Change (ac-ft)	Percent Capacity	Percent of Seasonal Average to Date
Almaden	1,586	50	49	(1)	3.1%	6%
Anderson	90,373	35,681	34,397	(1,284)	38.1%	59%
Calero	9,934	4,146	4,057	(89)	40.8%	67%
Chesbro	7,945	1,086	936	(150)	11.8%	20%
Coyote	23,244	7,849	7,556	(293)	32.5%	68%
Guadalupe	3,415	372	278	(94)	8.1%	15%
Lexington	19,044	6,110	5,745	(365)	30.2%	61%
Stevens Creek	3,138	168	96	(72)	3.1%	4%
Uvas	9,835	590	193	(397)	2.0%	3%
Vasona	495	317	308	(9)	62.2%	95%
TOTAL	169,009	56,369	53,615	(2,754)	31.7%	53%

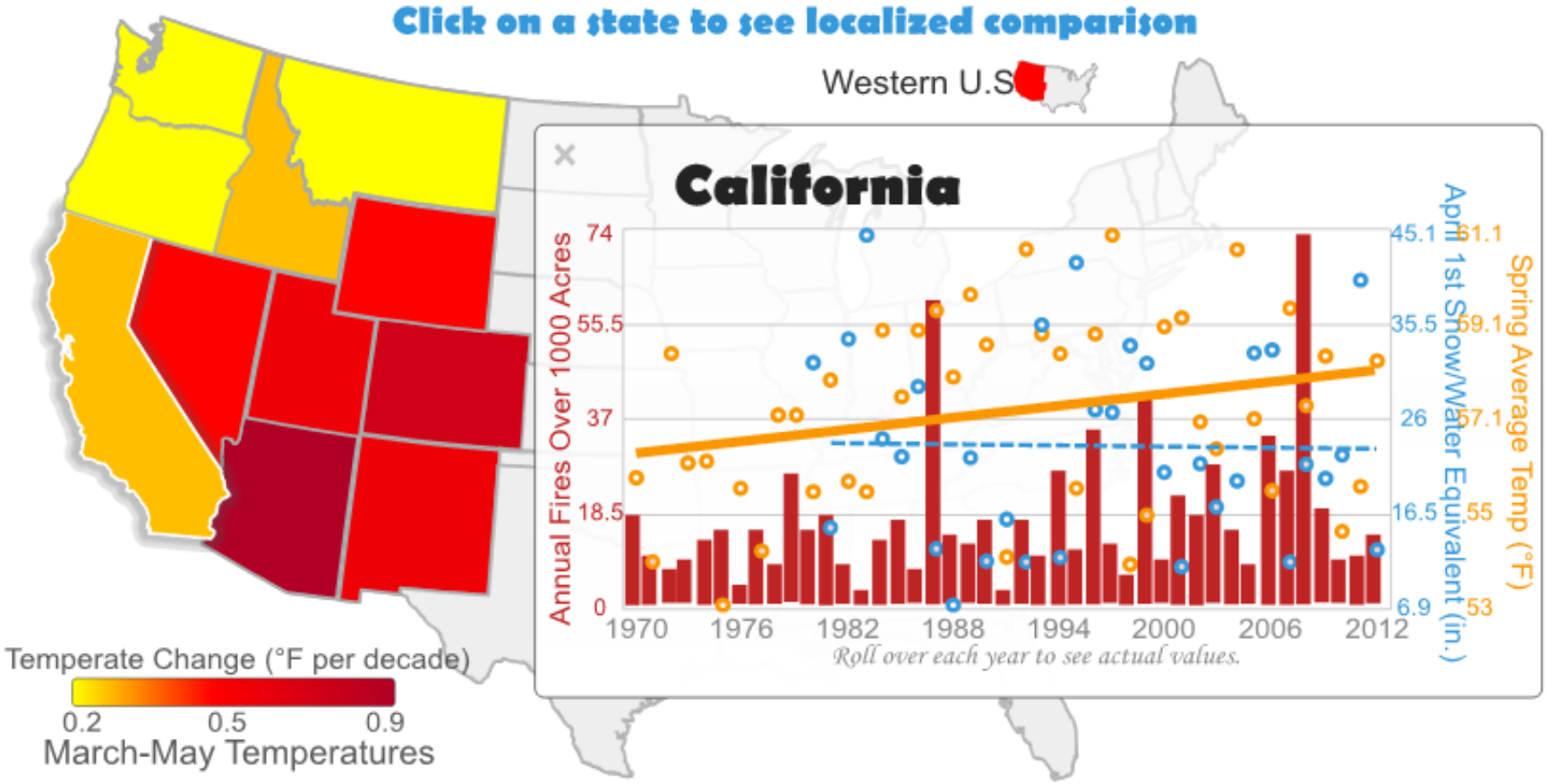
Its all about the water

Impacts of Drought



Western Wildfires On the Rise

Warmer Temperatures and Less Spring Snowpack Increase Fire Risk



Western U.S. wildfires have increased dramatically since 1970. Years with warmer sprin and summer temperatures and reduced spring snowpack tend to have the most fires. In the coming decades, more war

CLIMATE CENTRAL

The fire risk

Impacts of Drought

CAL FIRE NEWS RELEASE

California Department of Forestry and Fire Protection

CONTACT: Daniel Berlant
Information Officer
(916) 651-FIRE (3473)
@CALFIRE_PIO

RELEASE DATE: January 28, 2014

Drought Prompts CAL FIRE to Increase Statewide Staffing

Expected Prolonged, Elevated Threat of Wildfire Due to Dry Conditions

Sacramento – With unseasonably high temperatures, limited rainfall and moisture levels resembling the state's peak fire season, the California Department of Forestry and Fire Protection (CAL FIRE) announced today that it has hired 125 supplemental firefighters in Northern California and extended seasonal firefighting forces in Southern California due to dry winter conditions.

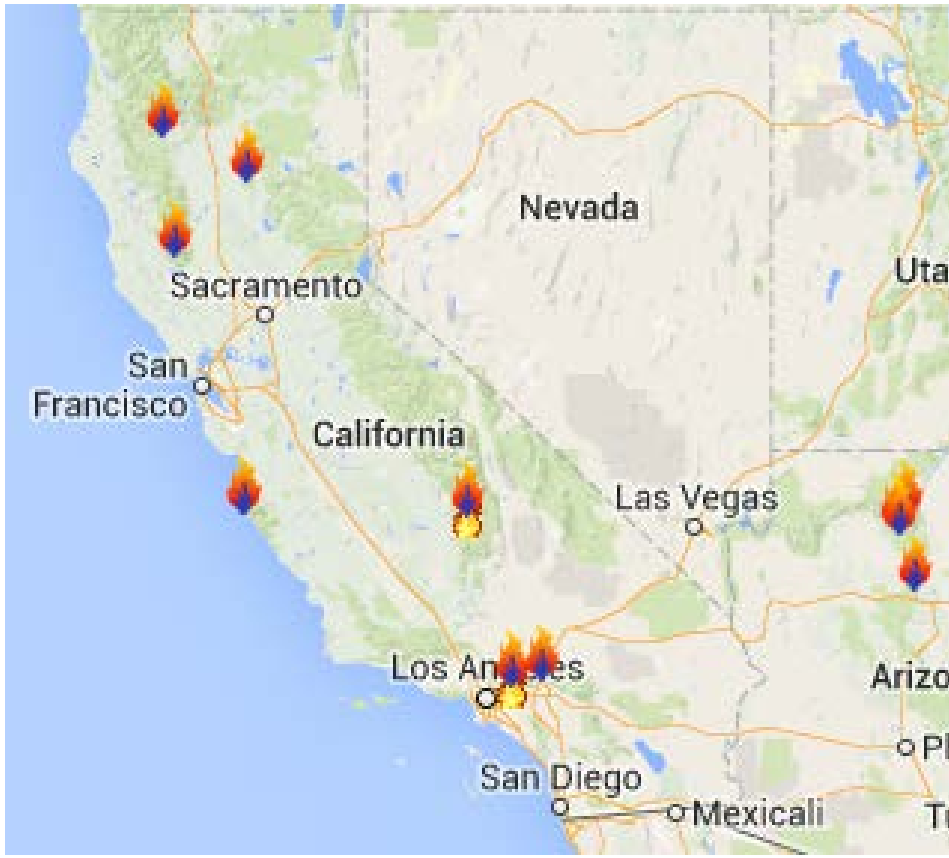
Today's announcement follows Governor Edmund G. Brown Jr.'s drought State of Emergency earlier this month.

"In order to maintain a sufficient depth of resources to address the prolonged, elevated threat of wildfire due to drought, we have staffed 25 additional fire engines and have retained aerial firefighting assets at five air attack bases that would normally be closed this time of year," said Chief Ken Pimlott, director of CAL FIRE. "We have a well exercised mechanism for addressing short term elevations in the threat of wildfire, but these prolonged conditions warrant an even more aggressive action in order for us to be prepared to protect the people, property and natural resources of California."

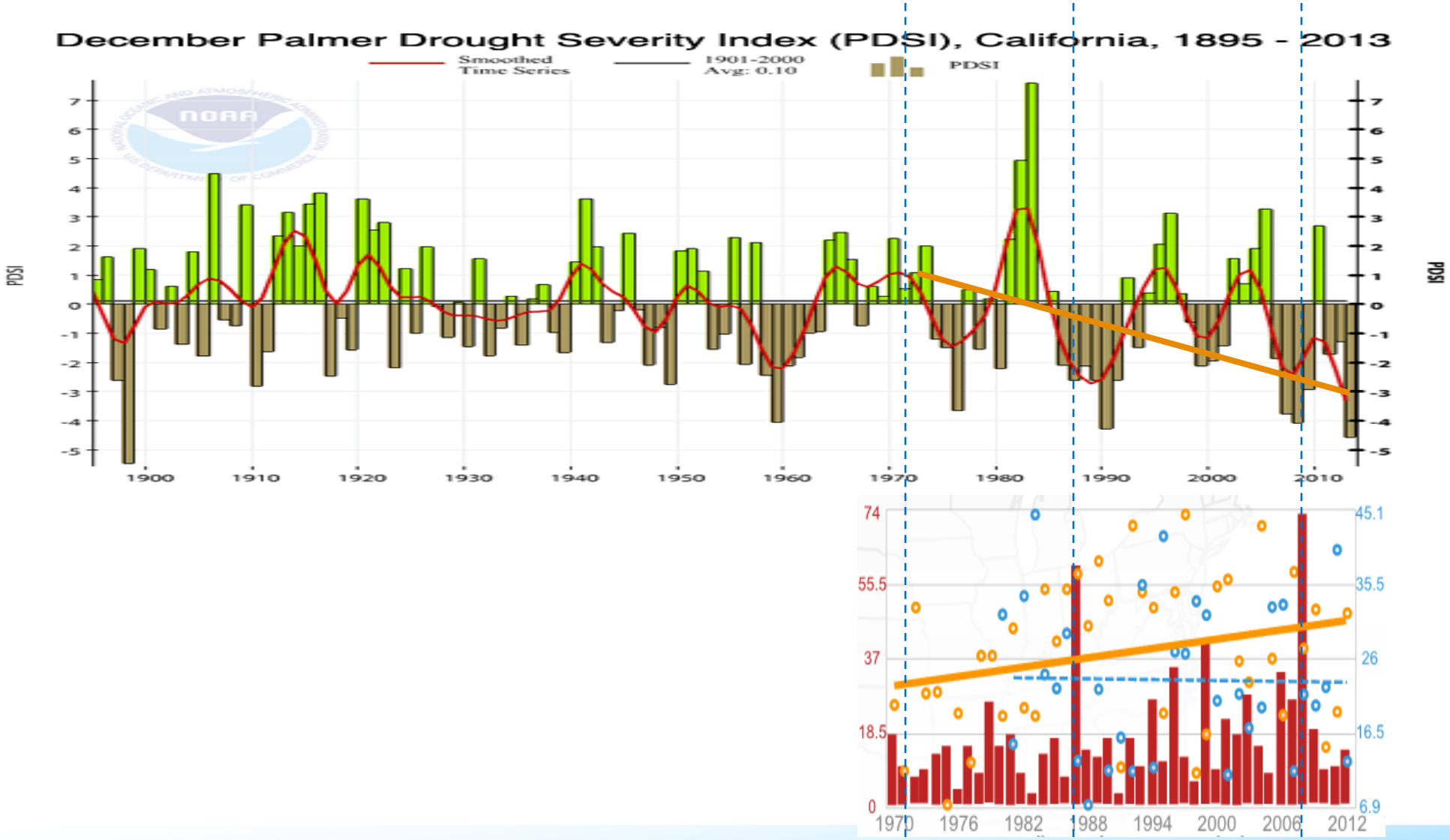
Fires in CA today

28 January 2014

Incident	Type	Unit	Acres
Soda Fire	Wildfire	Sequoia Nat'l Forest	1,274
Shf Prescribed Fire	Prescribed Fire	Shasta–Trinity Nat'l Forest	0
Colby	Wildfire	Angeles Nat'l Forest	1,952
Campbell Fire	Wildfire	Lassen Nat'l Forest	865
Pfeiffer Fire	Wildfire	Los Padres Nat'l Forest	917
Kern River/ Sequoia	Prescribed Fire	Sequoia Nat'l Forest	140
High Glade Fire	Wildfire	Mendocino Nat'l Forest	305
Prescribed burn	Prescribed Fire	Stanislaus Nat'l Forest	0



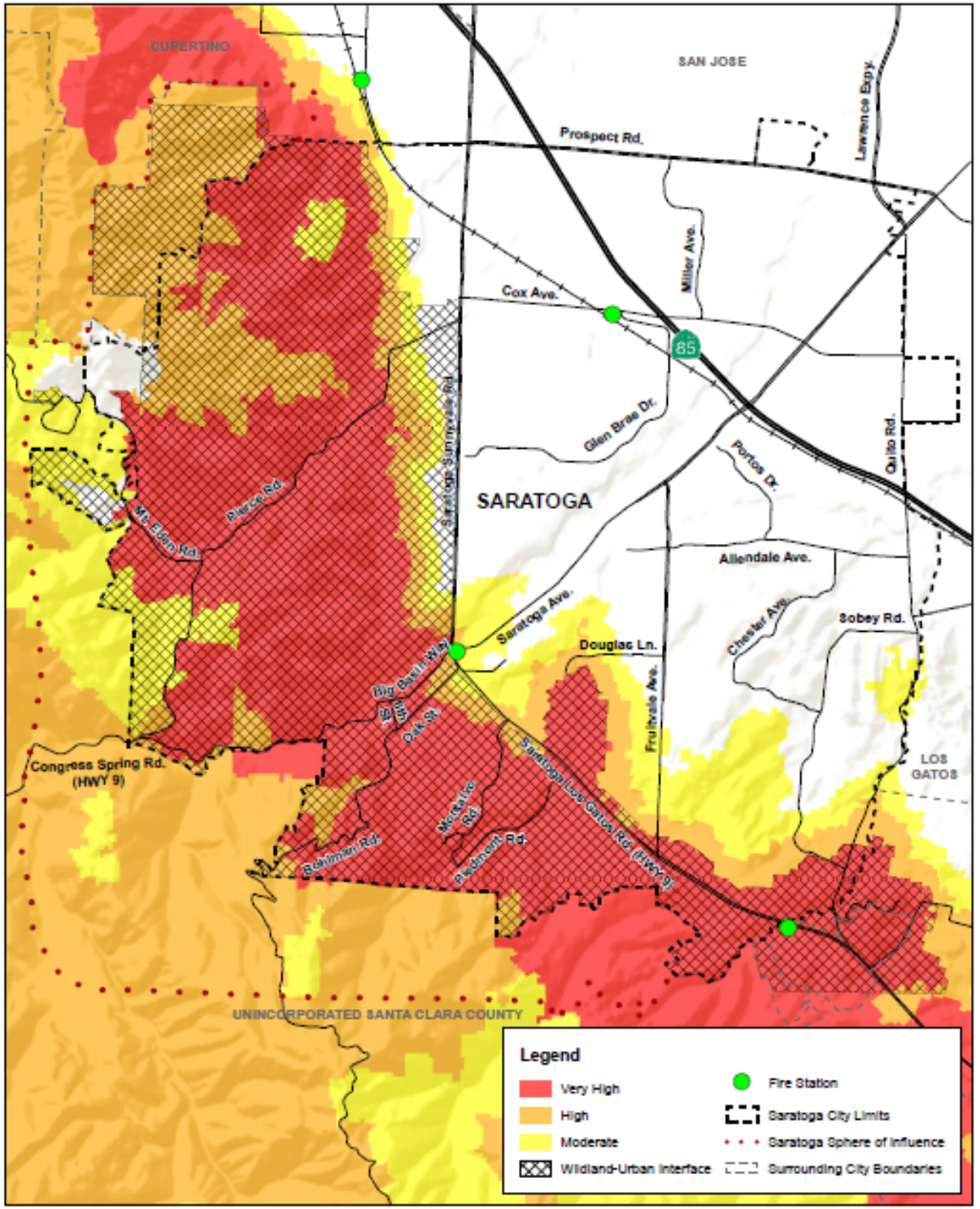
Correlation between Drought & Fires?



Backyard risks

Wildland Urban Interface

A wildland–urban interface refers to the zone of transition between unoccupied land and human development. Communities that are within 0.5 miles of the zone may also be included. These lands and communities adjacent to and surrounded by wildlands are at risk of wildfires.



CITY OF SARATOGA California

Prepared by RBF Consulting: 12/04/2012

Sources: City of Saratoga - Zoning Map (2010) Wildland-Urban Interface Fire Area Map (2009) ; ESRI Terrain Basemap
County of Santa Clara - CityLimits (2010) StreetEdge (2009) ; CA Dept of Forestry and Fire Protection (2007)

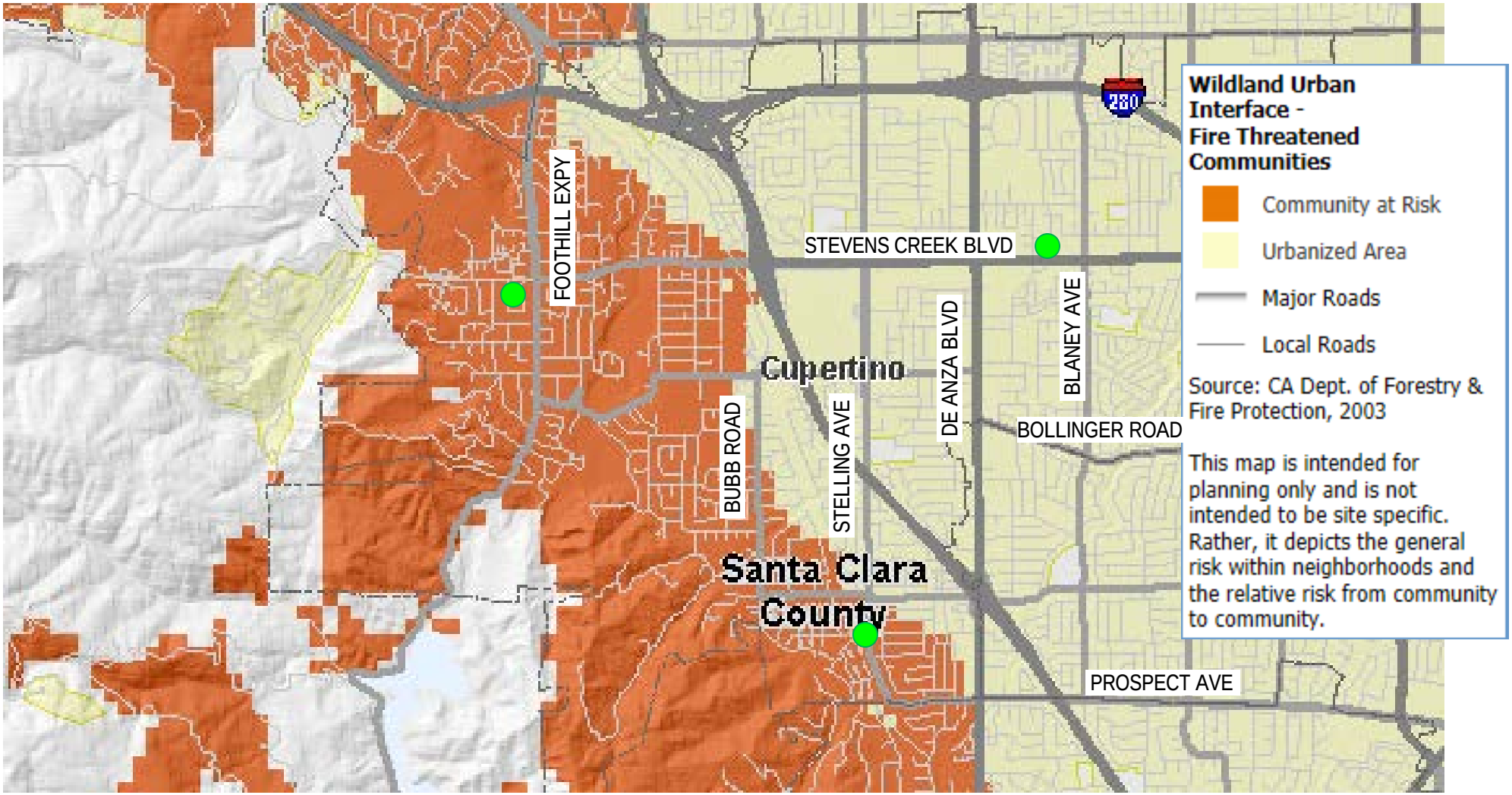
SAFETY ELEMENT

Fire Hazard Zones

Exhibit 7

Cupertino's Wildland Urban Interface

Backyard risks



REF: http://gis3.abag.ca.gov/Website/Fire_Threat_WUI/viewer.htm

City Hazard – Wildland Fire

Field Battalion Three (Greater Los Gatos area) Fire History

The major wild land fire occurrence has been in the remote and sparsely populated South western portion of the Battalion Three.

Big Events:

- 1987 Lexington Fire
- 2002 Croy Fire
- 2008 Summit Fire
- 2009 Loma Fire

Local Events: On August 30, 2007, fire broke out in the hills west of the Cupertino in an unincorporated area of Santa Clara Valley, burning 151 acres.

City Hazard – Wildland Fire

Probability

The Cal Fire identifies *State Responsibility Area* (SRA) Fire Hazard Severity Zones as Moderate, High, and Very High based on land, fuel loading, slope, and fire weather.

Field Battalion Three is divided into 3 sections:

- South Section (Loma Prieta area) is assessed to be a VERY HIGH
- Center section (West Santa Clara Valley Foothills) is MODERATE, and
- North Section (Hwy 85 and I-280) is HIGH.

Mapping Disasters to Capabilities

Disasters	Potential Problems	Response Requirements	Response Capabilities
• Earthquakes	• People – Injuries	• Mass care shelters	• Safety Assessments
• Flooding by dam failure	• People – Trapped	• Evacuations	• Shelter Staff
• Flooding by rain	• People – Homeless	• Field First Aid stations	• Search & Rescue
• Wildland fire	• People – Hungry	• Mass care, feeding	• First Aid
• Large urban fire	• People – Sick	• DC/Fire Suppression	• Fire Suppression
• Manmade disasters (BNICE)	• Structures Damaged	• DC/Prelim Safety	• Watches (creek, fire, traffic, incident, etc.)
	• Structures Burning	• Mass Prophylaxis	• Communications (Field, Shadows, etc.)
	• Utilities – Power	• Search and Rescue	• General resource
	• Utilities – Gas main	• Information Outreach	
	• Utilities – Sewage	• Information Gathering	
	• Utilities – Water		
	• Access problems		

Wild land, Urban Fire

Disasters	Potential Problems	Response Requirements	Response Capabilities
• Earthquakes	• People – Injuries	• Mass care shelters	• Safety Assessments
• Flooding by dam failure	• People – Trapped	• Evacuations	• Shelter Staff
• Flooding by rain	• People – Homeless	• Field First Aid stations	• Search & Rescue
• Wildland fire	• People – Hungry	• Mass care, feeding	• First Aid
• Large urban fire	• People – Sick	• DC/Fire Suppression	• Fire Suppression
• Manmade disasters (BNICE)	• Structures Damaged	• DC/Prelim Safety	• Watches (creek, fire, traffic, incident, etc.)
	• Structures Burning	• Mass Prophylaxis	• Communications (Field, Shadows, etc.)
	• Utilities – Power	• Search and Rescue	• General resource
	• Utilities – Gas main	• Information Outreach	
	• Utilities – Sewage	• Information Gathering	
	• Utilities – Water		
	• Access problems		

Wild land, Urban Fire

Disasters	Potential Problems	Response Requirements	Response Capabilities – CARES
• Earthquakes	• People – Injuries	• Mass care shelters	• **Safety Assessments**
• Flooding by dam failure	• People – Trapped	• Evacuations	• **Shelter Comms**
• Flooding by rain	• People – Homeless	• Field First Aid stations	• Search & Rescue
• Wildland fire	• People – Hungry	• Mass care, feeding	• First Aid
• Large urban fire	• People – Sick	• DC/Fire Suppression	• Fire Suppression
• Manmade disasters (BNICE)	• Structures Damaged	• DC/Prelim Safety	• **Watches (creek, fire, traffic, incident, etc.)**
	• Structures Burning	• Mass Prophylaxis	• **Communications (Field, Shadows, etc.)**
	• Utilities – Power	• Search and Rescue	• General resource
	• Utilities – Gas main	• Information Outreach	
	• Utilities – Sewage	• Information Gathering	
	• Utilities – Water		
	• Access problems		

What is our plan for this year?

- Plan: May communications drill with a focus on supporting the city during a wild-fire event
- Goal: Message handling between the field assignments and the EOC
- Approach:

1. work with County Fire on plausible CARES and Cupertino Citizen Corps response scenarios
2. make it interesting

References

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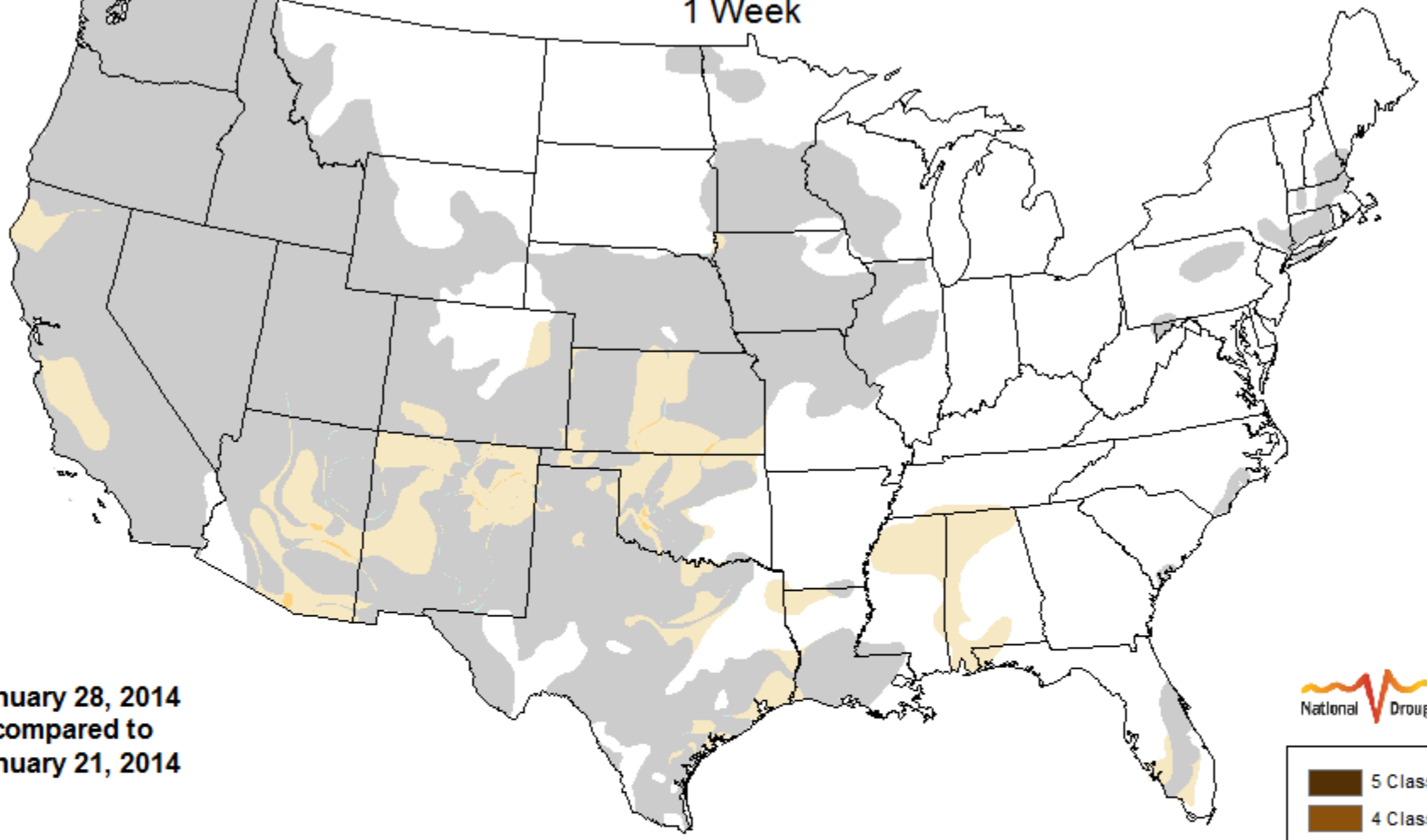
14. *"Wildland Urban Interface, Fire-threatened Communities"*, ABAG GIS; http://gis3.abag.ca.gov/Website/Fire_Threat_WUI/viewer.htm

Thank you

Any Questions?

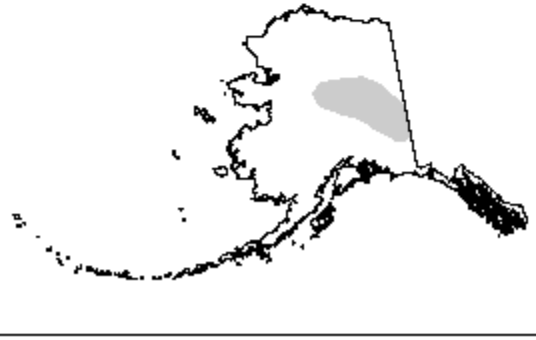
U.S. Drought Monitor Class Change

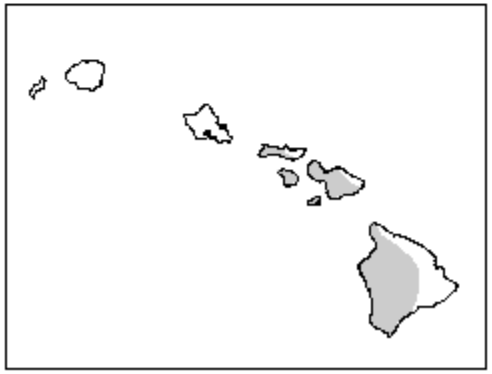
1 Week

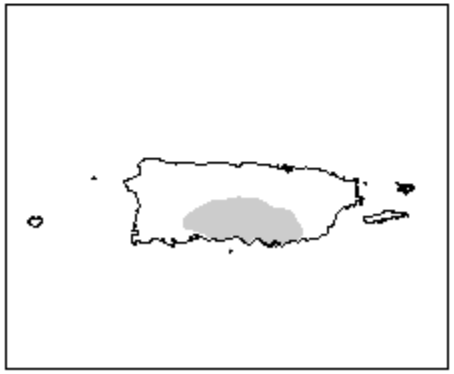


January 28, 2014
compared to
January 21, 2014

National Drought Mitigation Center





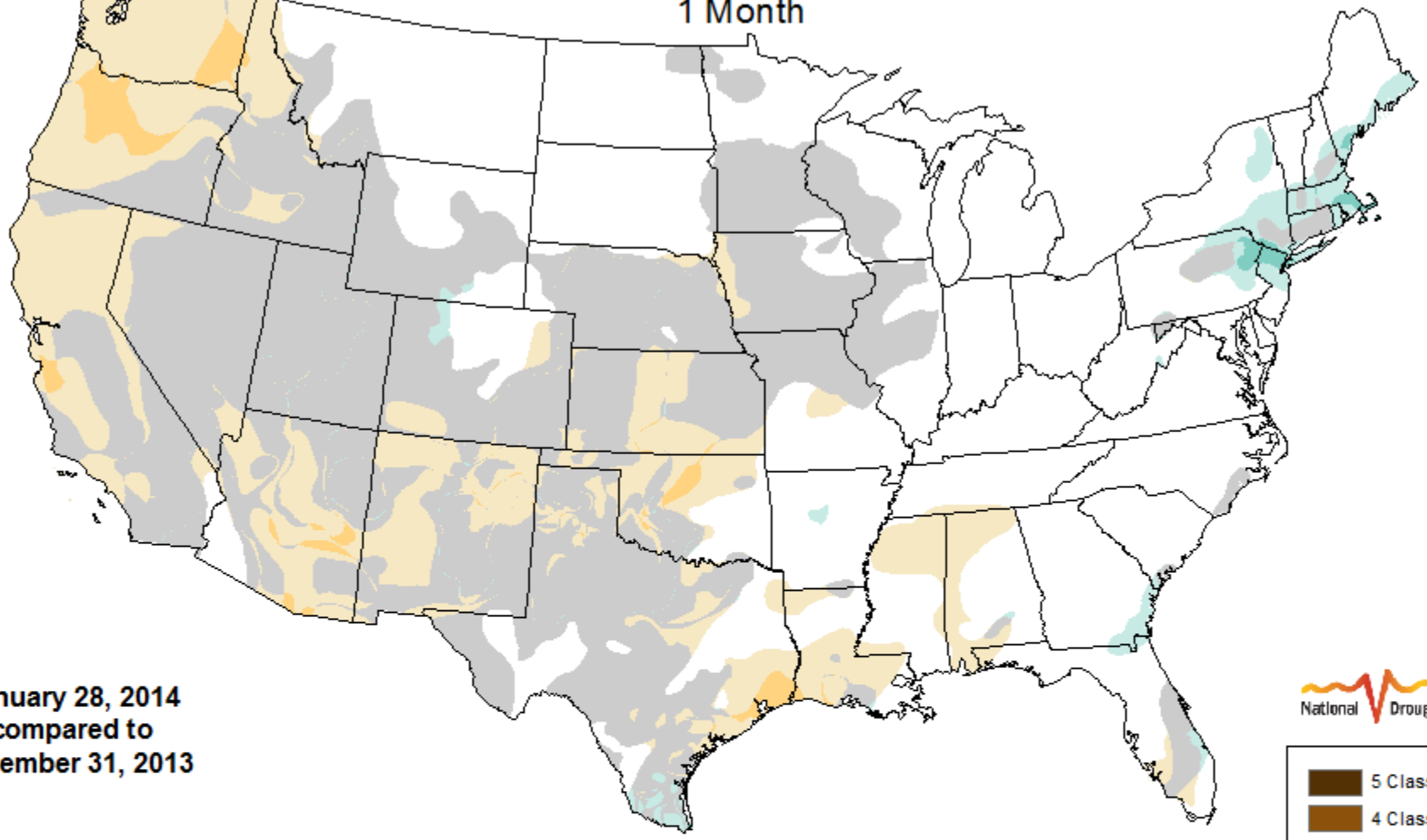


- 5 Class Degradation
- 4 Class Degradation
- 3 Class Degradation
- 2 Class Degradation
- 1 Class Degradation
- No Change
- 1 Class Improvement
- 2 Class Improvement
- 3 Class Improvement
- 4 Class Improvement
- 5 Class Improvement

http://droughtmonitor.unl.edu

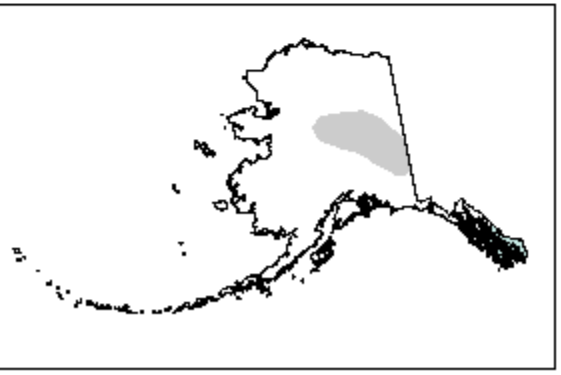
U.S. Drought Monitor Class Change

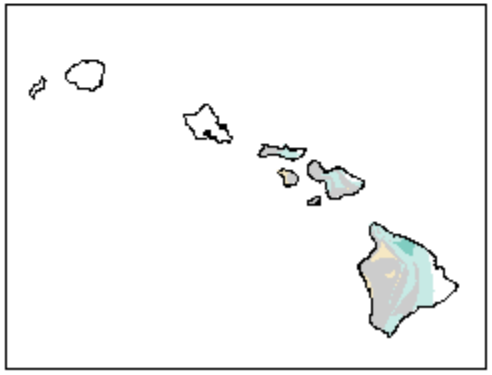
1 Month

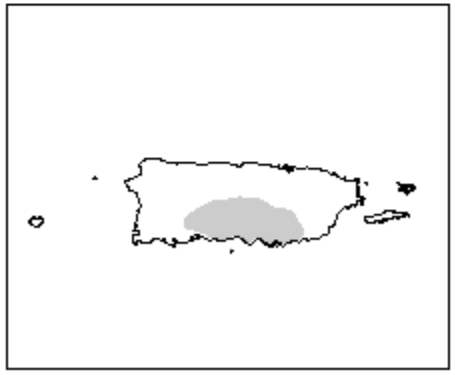


January 28, 2014
compared to
December 31, 2013

National Drought Mitigation Center







- 5 Class Degradation
- 4 Class Degradation
- 3 Class Degradation
- 2 Class Degradation
- 1 Class Degradation
- No Change
- 1 Class Improvement
- 2 Class Improvement
- 3 Class Improvement
- 4 Class Improvement
- 5 Class Improvement

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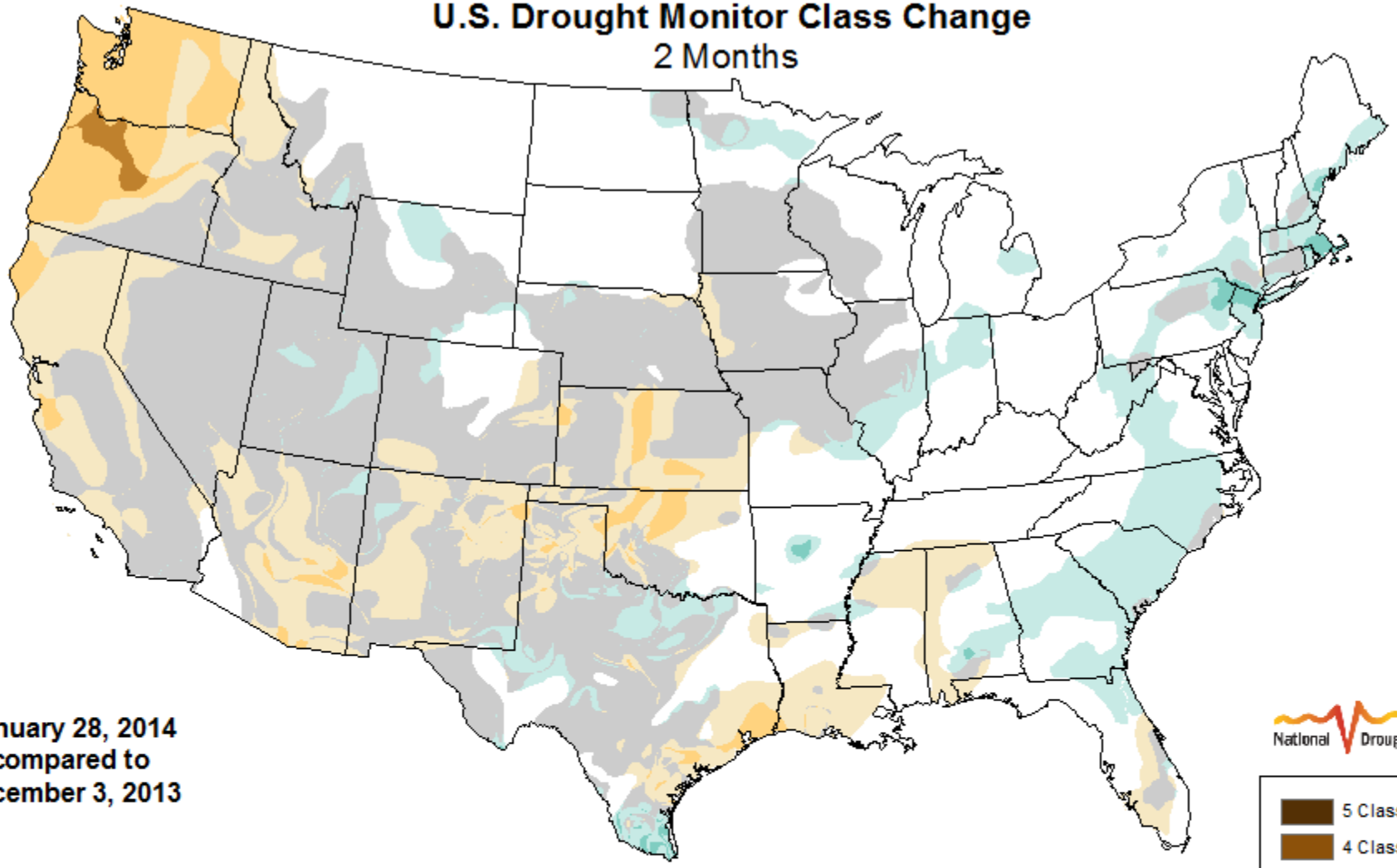
U.S. Drought Monitor Class Change

2 Months



January 28, 2014
compared to
December 3, 2013

National Drought Mitigation Center

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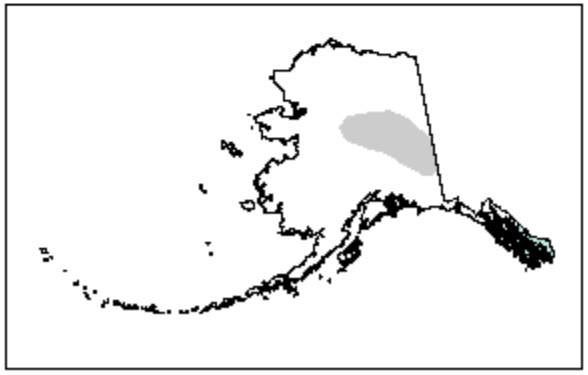
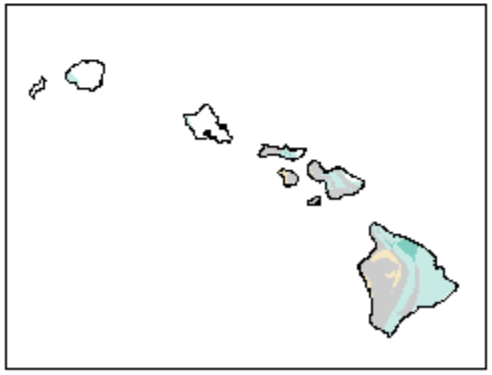
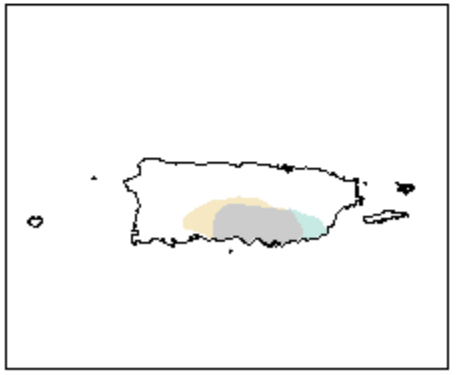
- No Change
- 1 Class Improvement
- 2 Class Improvement
- 3 Class Improvement
- 4 Class Improvement
- 5 Class Improvement



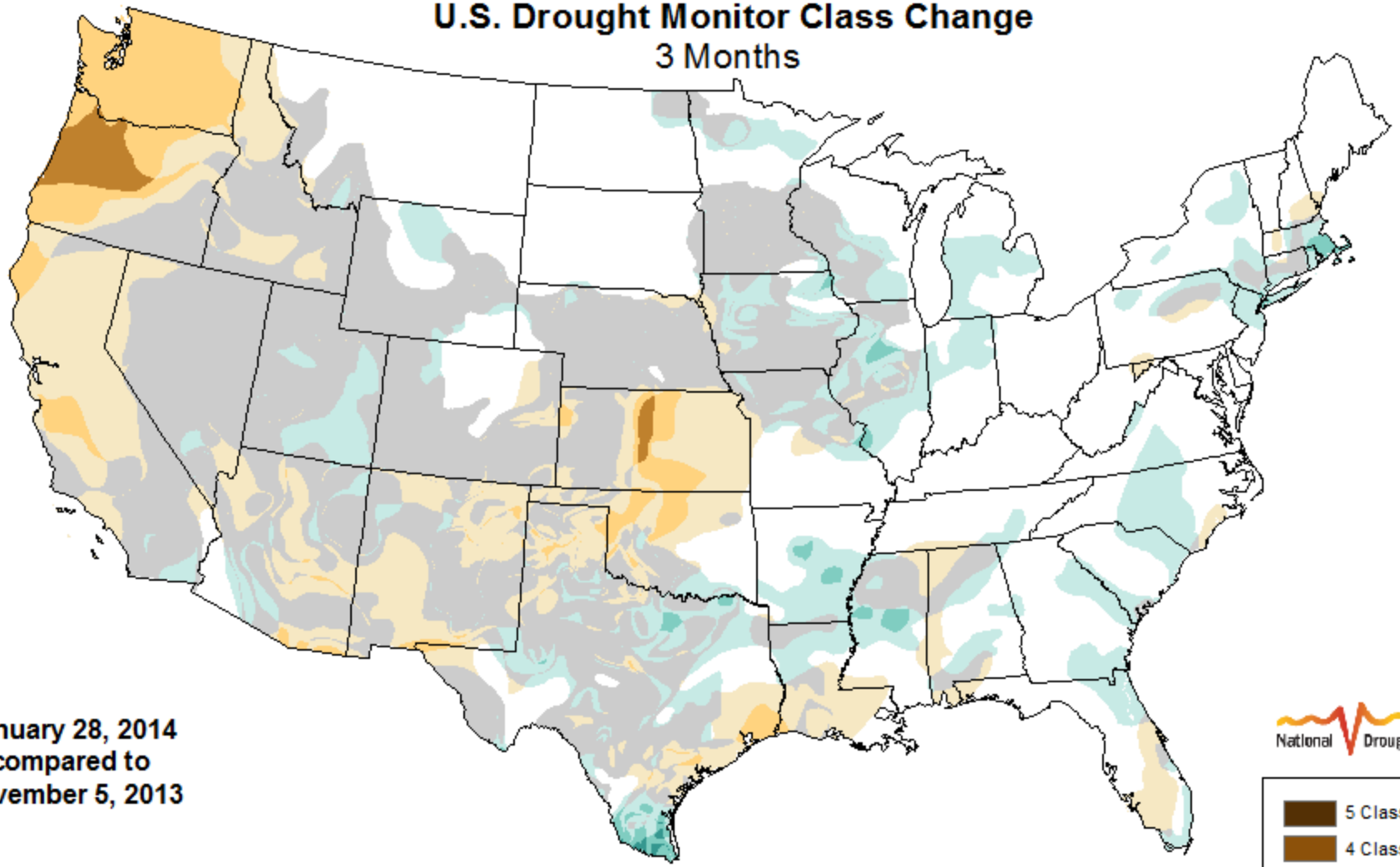




http://droughtmonitor.unl.edu

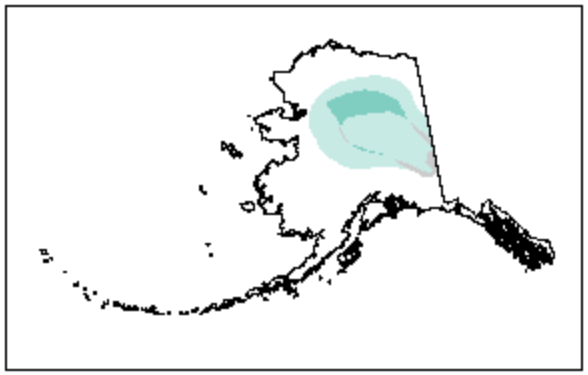
U.S. Drought Monitor Class Change

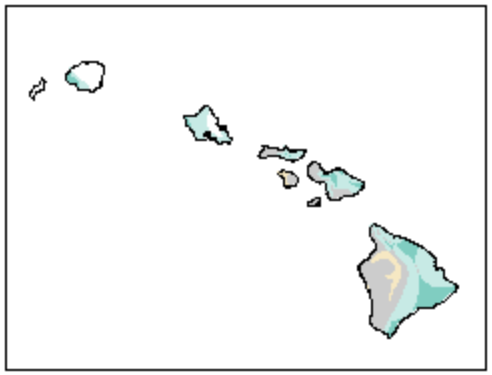
3 Months

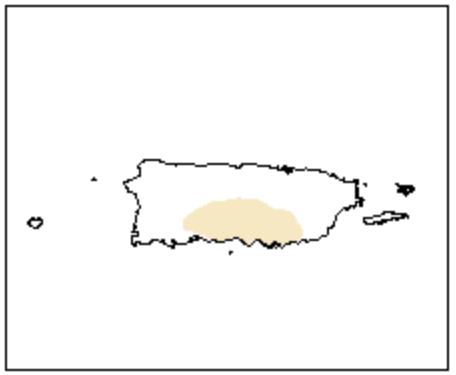


January 28, 2014
compared to
November 5, 2013

National Drought Mitigation Center







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- 4 Class Degradation
- 3 Class Degradation
- 2 Class Degradation
- 1 Class Degradation
- No Change
- 1 Class Improvement
- 2 Class Improvement
- 3 Class Improvement
- 4 Class Improvement
- 5 Class Improvement

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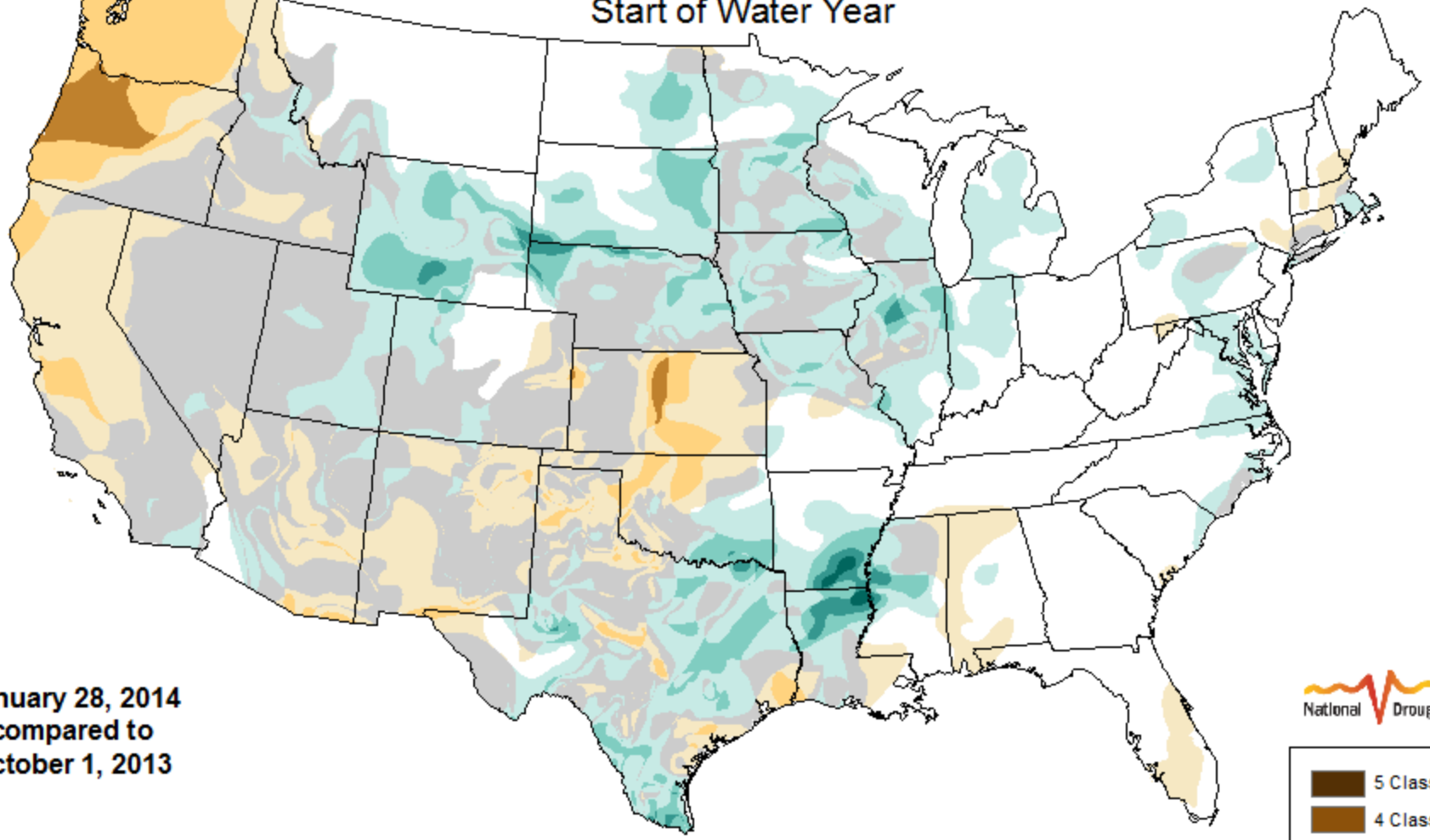
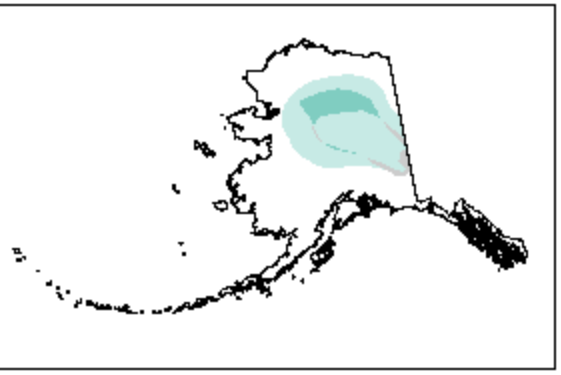
U.S. Drought Monitor Class Change

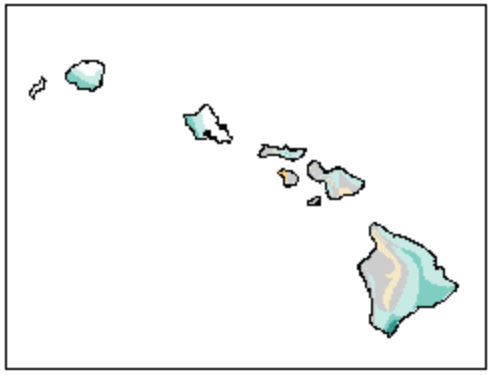
Start of Water Year

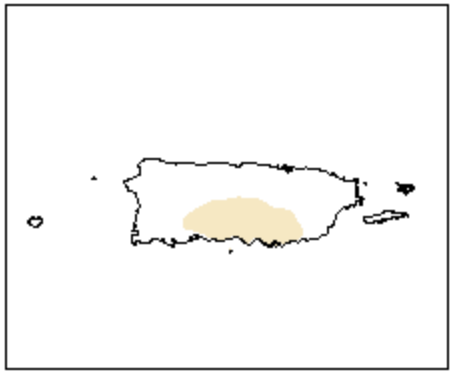


January 28, 2014
compared to
October 1, 2013

National Drought Mitigation Center







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- 3 Class Degradation
- 2 Class Degradation
- 1 Class Degradation
- No Change
- 1 Class Improvement
- 2 Class Improvement
- 3 Class Improvement
- 4 Class Improvement
- 5 Class Improvement

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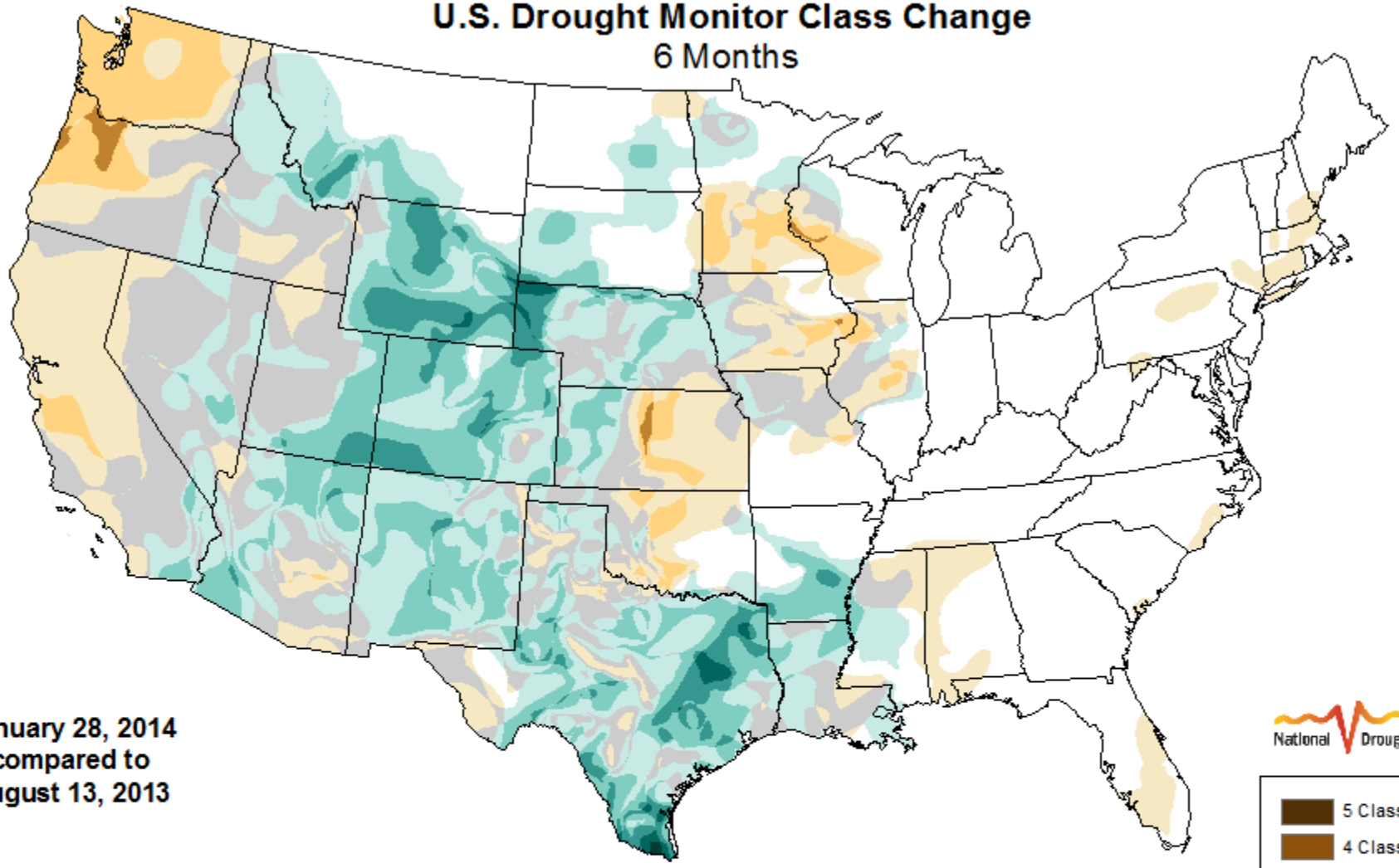
U.S. Drought Monitor Class Change

6 Months



January 28, 2014
compared to
August 13, 2013

National Drought Mitigation Center

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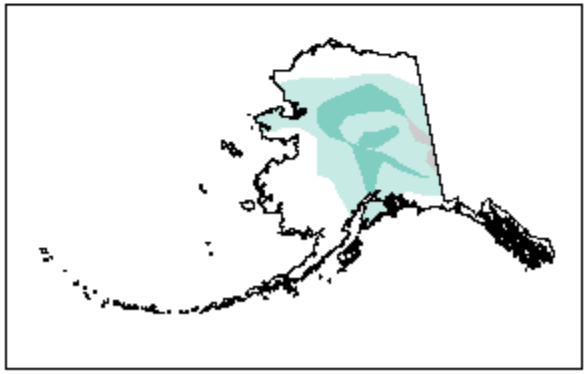

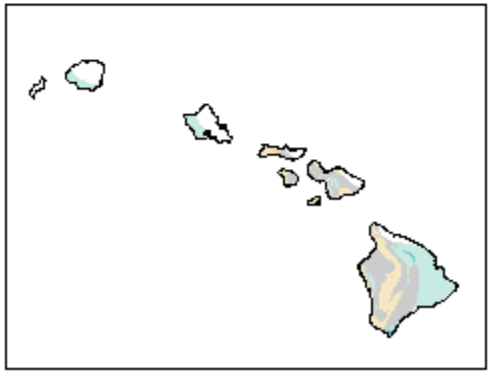

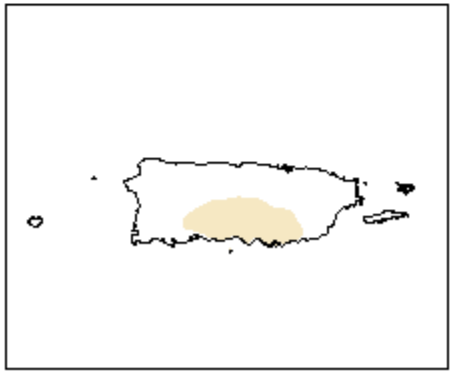

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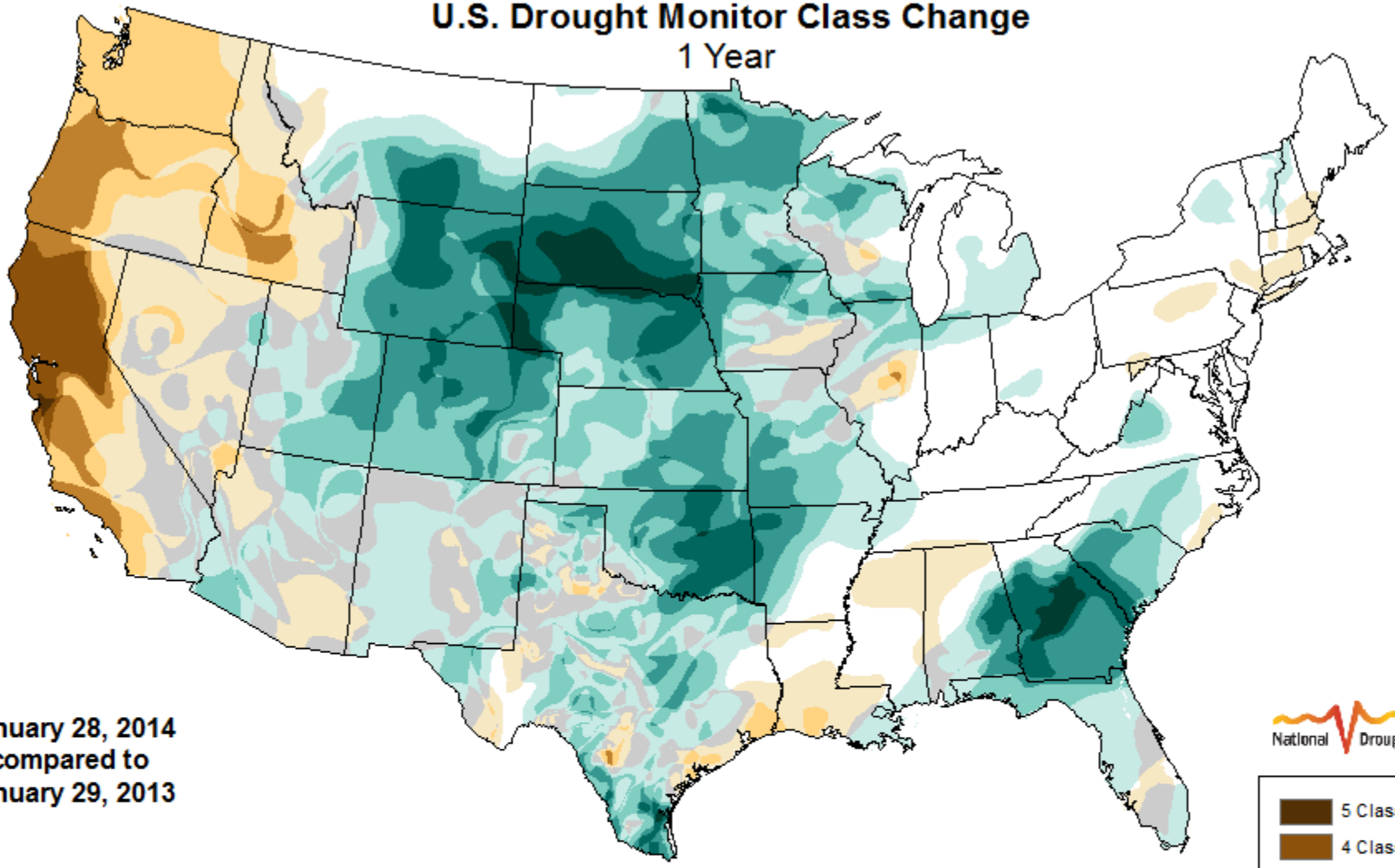
U.S. Drought Monitor Class Change

1 Year



January 28, 2014
compared to
January 29, 2013

National Drought Mitigation Center

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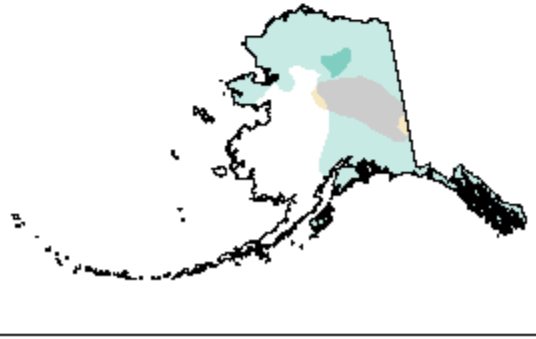
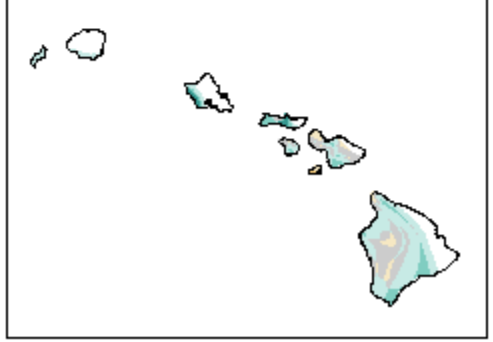
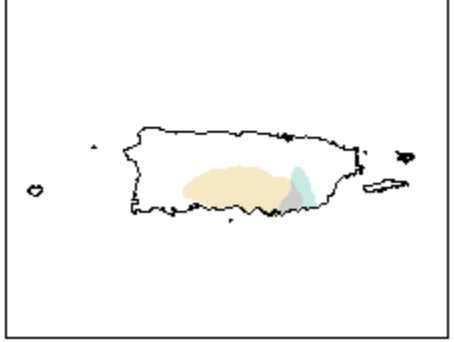
- 3 Class Improvement
- 4 Class Improvement
- 5 Class Improvement







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