Improving Sub-Seasonal and Seasonal Precipitation Forecasting for Drought Preparedness

Sponsored by
Western States Water Council and California Department of Water Resources

May 27 – 29, 2015

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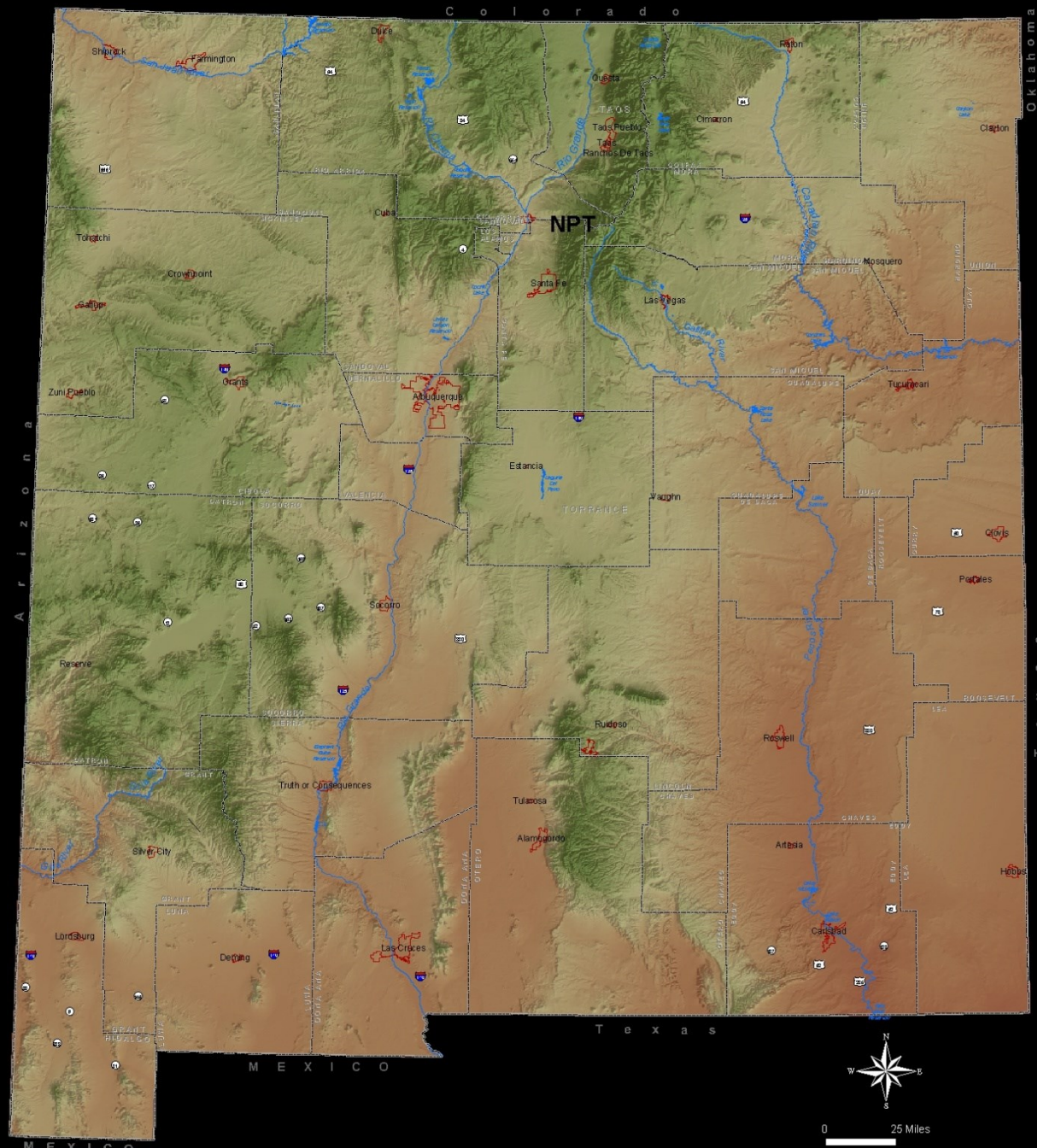
Introduction

- Brief Overview of NM climatology
- What NMOSE reviews when assessing for drought conditions
- What do we need?
- Drought Response Administration
- Sample report, what we summarize for public/political presentations

Brief Overview of NM climatology

New Mexico


Colorado
Oklahoma
Arizona
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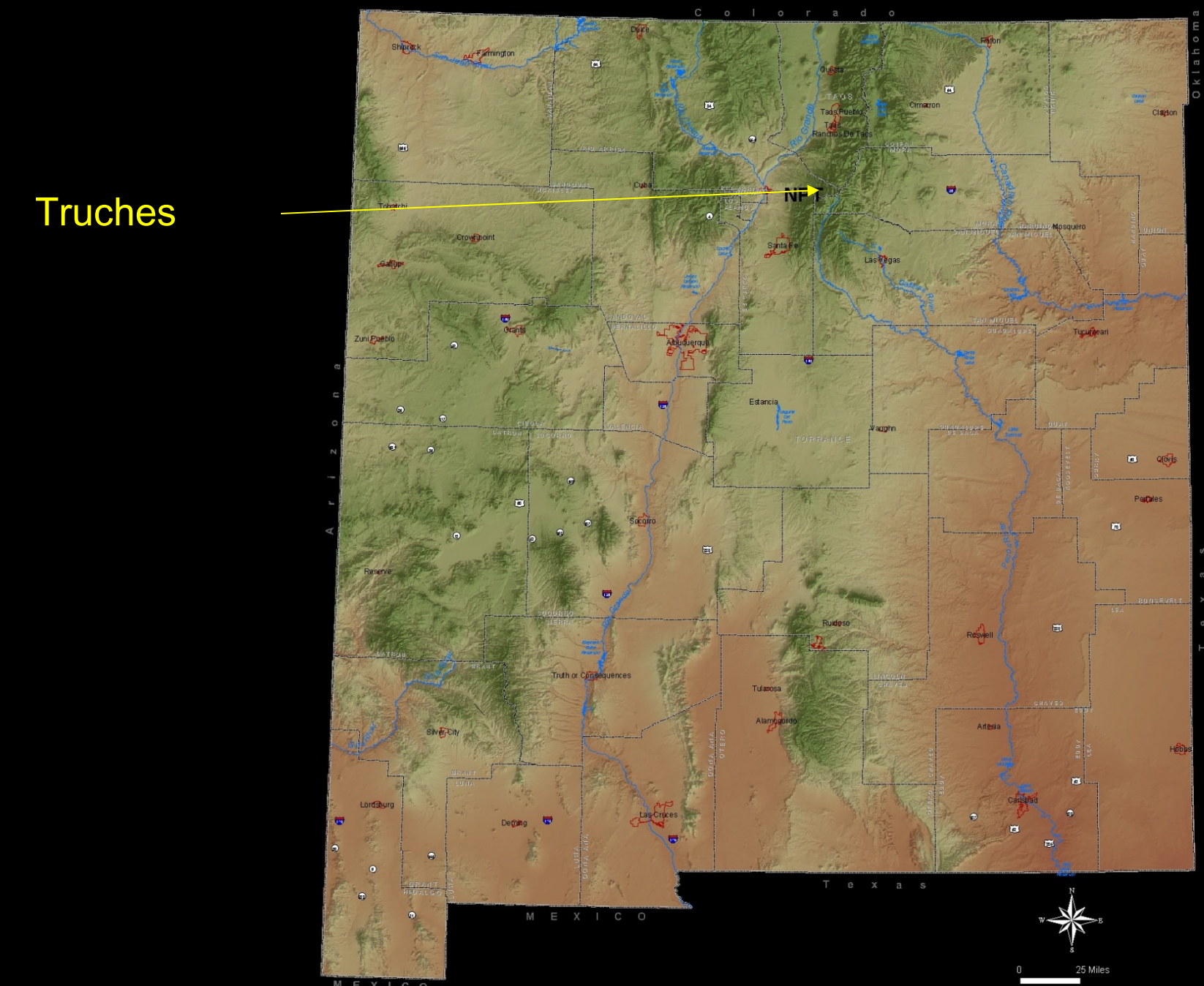
MEXICO
NPT
Shiprock
Farmington
Dulce
Raton
Questa
Taos
Taos Pueblo
Ranchos De Taos
Cimarron
Clayton
Cuba
Torreon
Crownpoint
Gallup
Santa Fe
Las Vegas
Mosquero
Zuni Pueblo
Grants
Albuquerque
Tucumcari
Estancia
Vaughn
Clovis
Portales
Socorro
Reserve
Ruidoso
Roswell
Truth or Consequences
Tularosa
Alamogordo
Artesia
Hobbs
Silver City
Lordsburg
Deming
Las Cruces
Carlsbad
N
W
E
S
0
25 Miles

Climate

- New Mexico is semi-arid
  - 20” to 30” in high mountains
  - 8 to 12 inches of precipitation in lower elevations (most of State)
  - Precip can change quickly

New Mexico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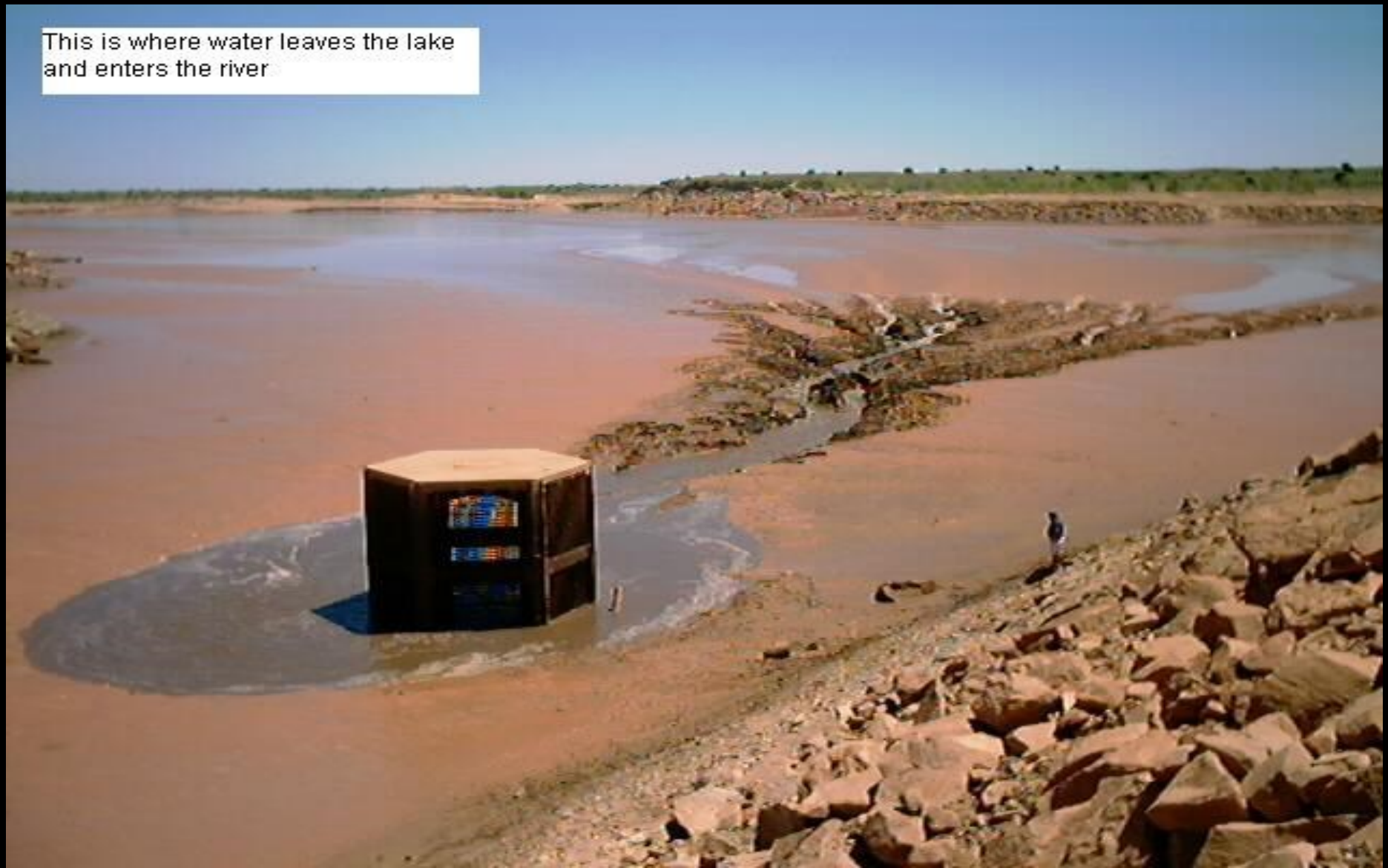
25 Miles

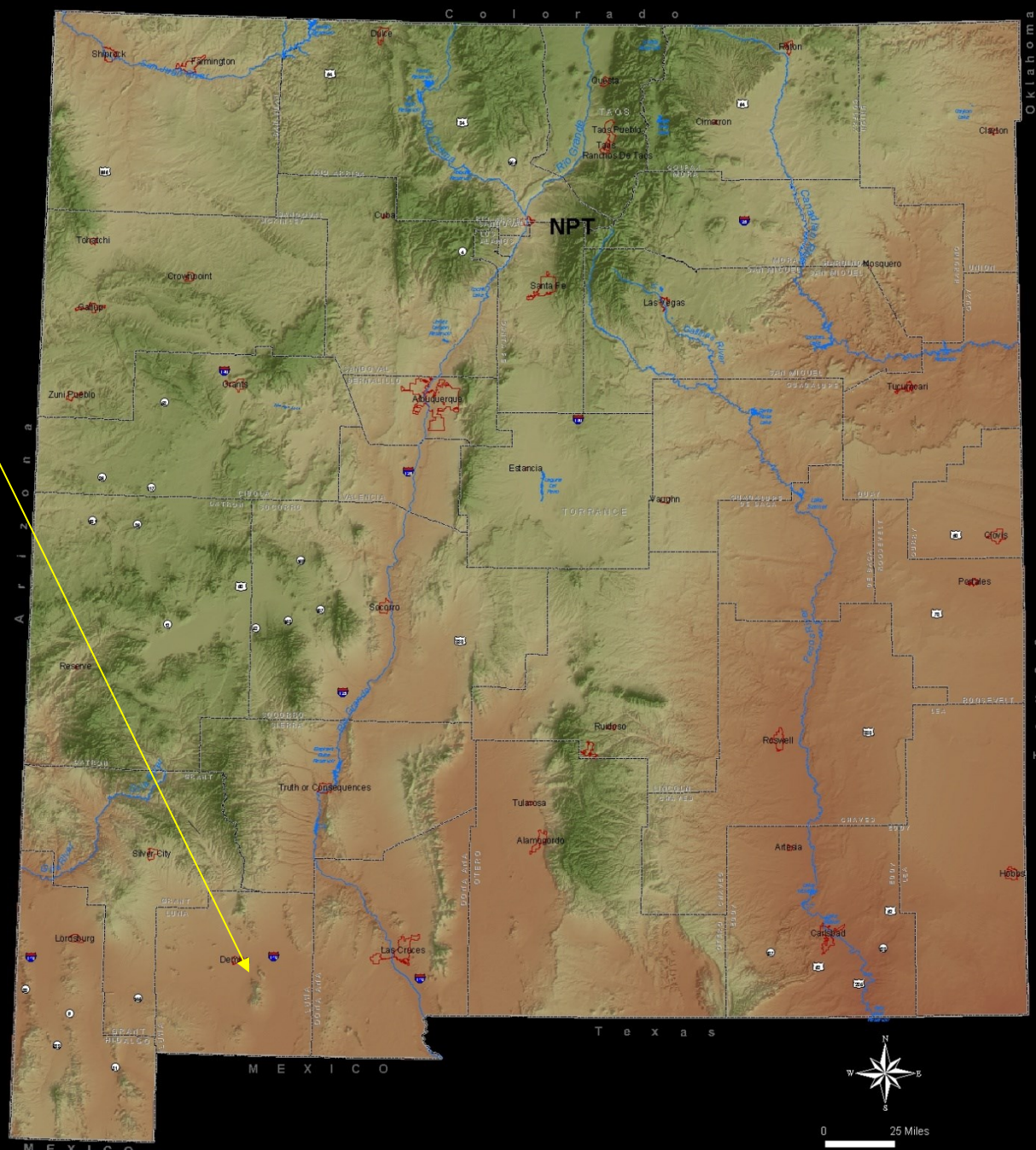
Truchas Peak, Northern NM

Fort Sumner – Effects of 2002-03 winter



New Mexico

Chihuahuan Desert (Salt Flat)

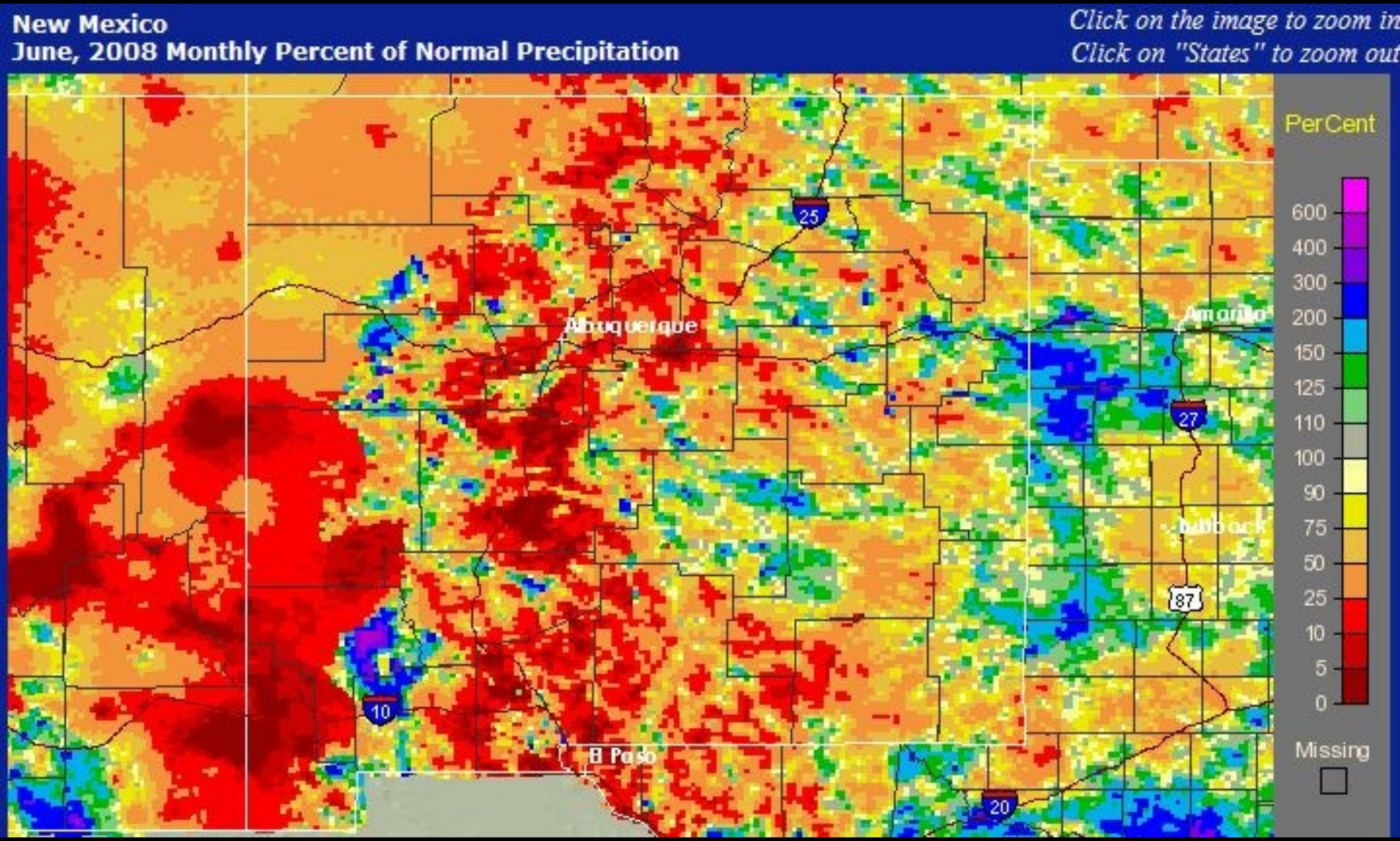


Chihuahuan Desert (Salt Flat)

Hatch Flood 2006

June 2008 Percent of Normal Precip

(Multi-sensor precip analysis of near real-time data)



July 2008 Percent of Normal Precip

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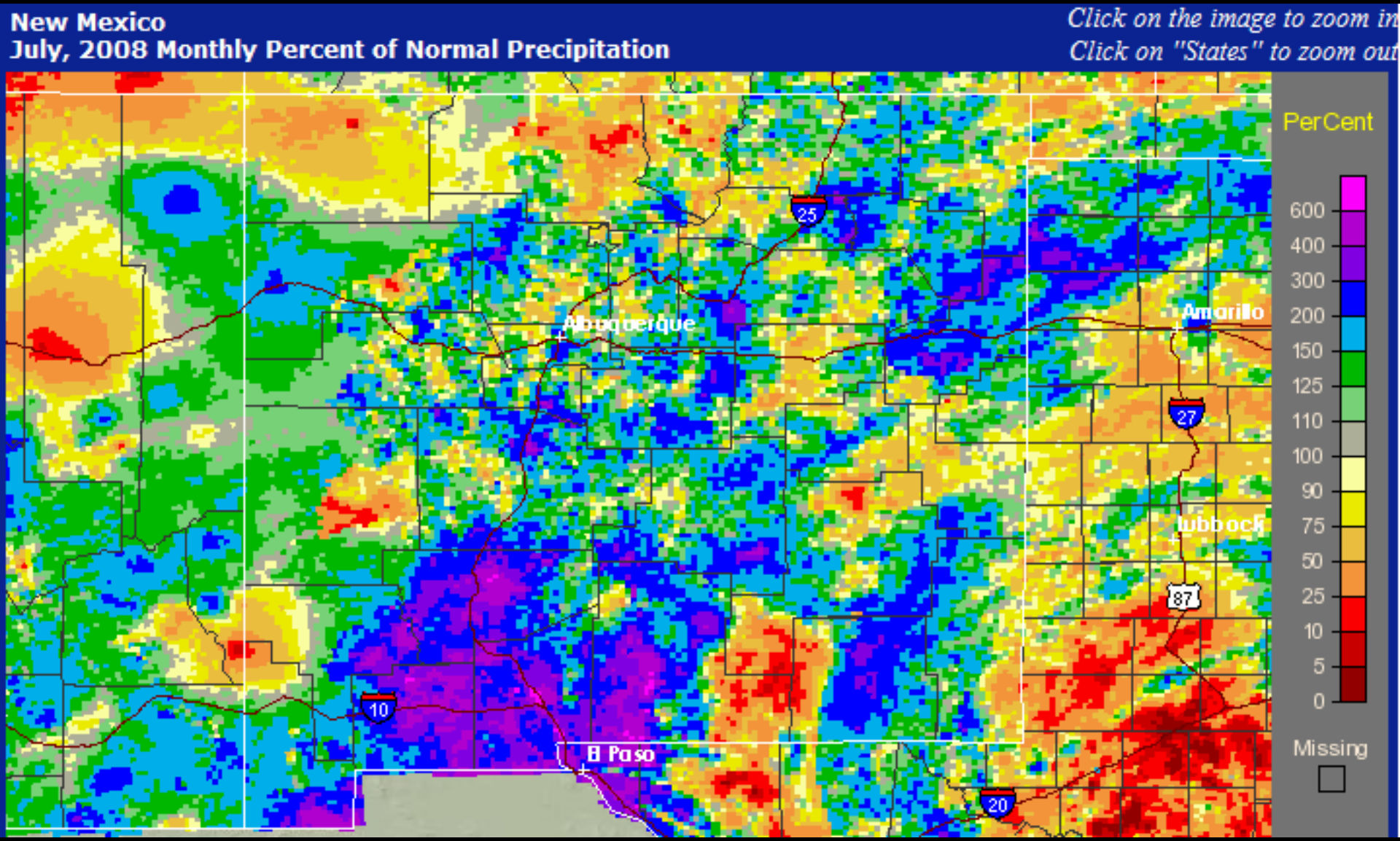


What NMOSE reviews when assessing for drought conditions

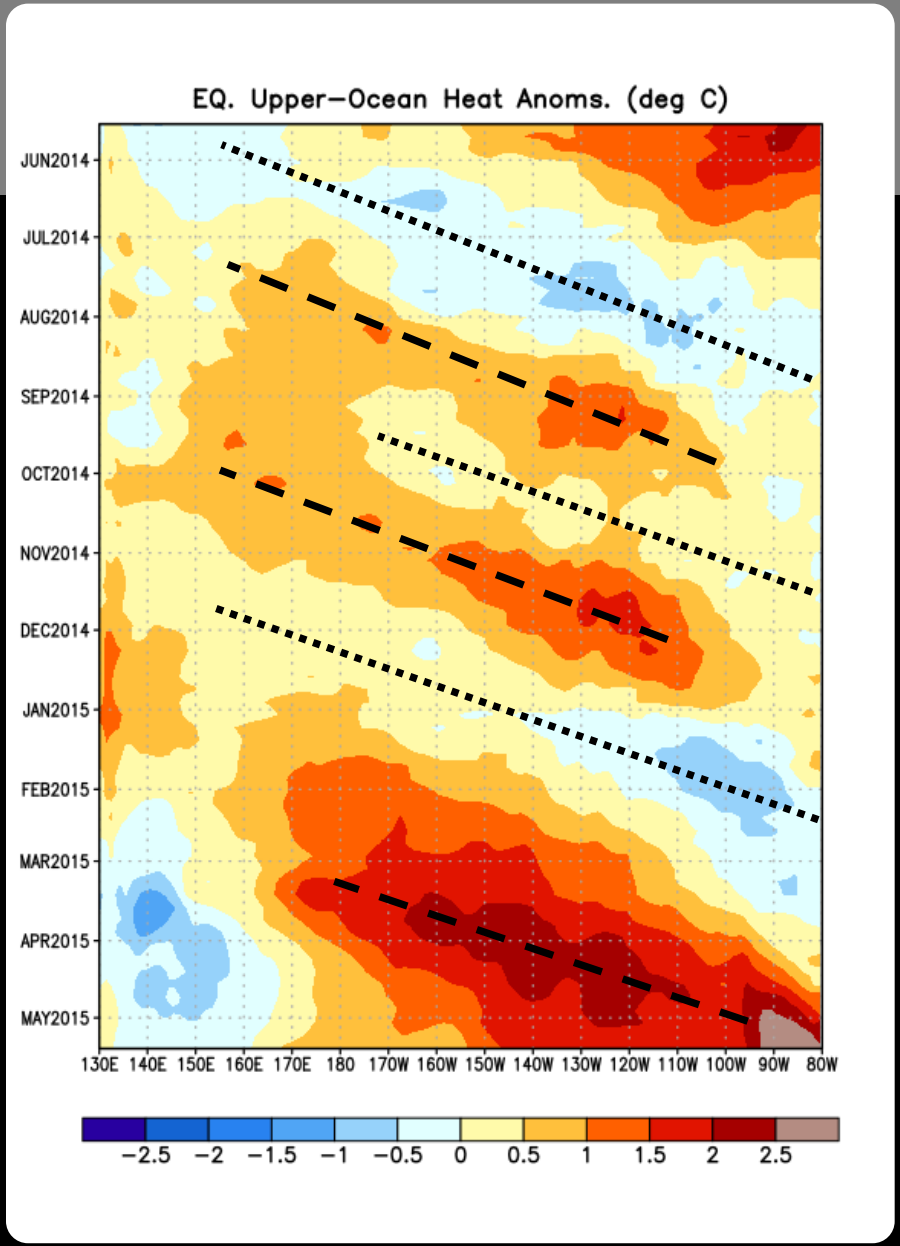
Weekly Heat Content Evolution in the Equatorial Pacific

The upwelling phase of a Kelvin wave propagated eastward during May-July.

During October-November, positive subsurface temperature anomalies increased and shifted eastward in association with the downwelling phase of a Kelvin wave.

During November - January, the upwelling phase of a Kelvin wave shifted eastward.

During January through April, another downwelling phase of a Kelvin wave pushed eastward.



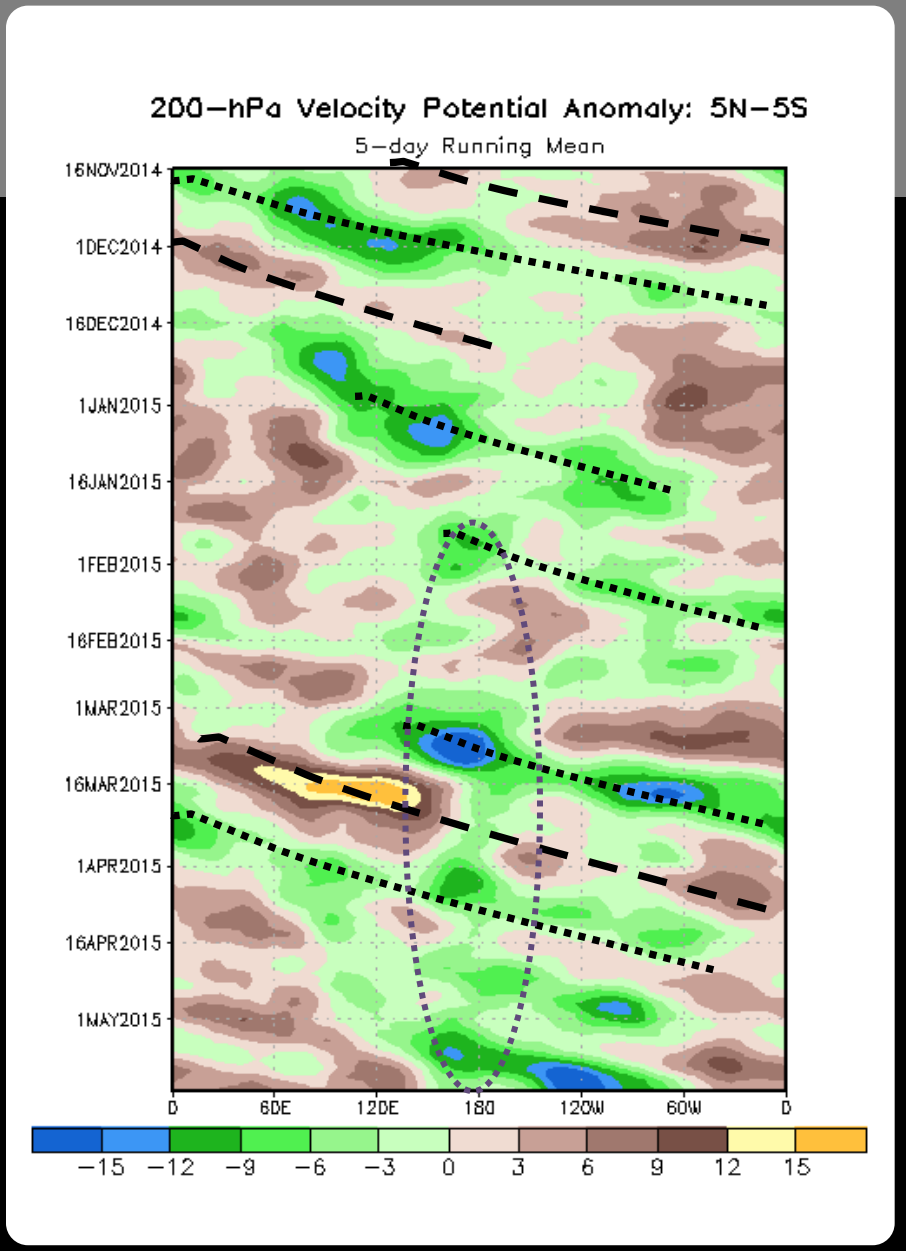
Oceanic Kelvin waves have alternating warm and cold phases. The warm phase is indicated by dashed lines. Down-welling and warming occur in the leading portion of a Kelvin wave, and up-welling and cooling occur in the trailing portion.

Upper-level (200-hPa) Velocity Potential Anomalies

During November through mid-December, the Madden-Julian Oscillation (MJO) emerged.

During March 2015, an MJO was associated with eastward propagating velocity potential anomalies.

Since mid-January 2015, negative anomalies and anomalous upper-level divergence (green shading) has prevailed near the Date Line.

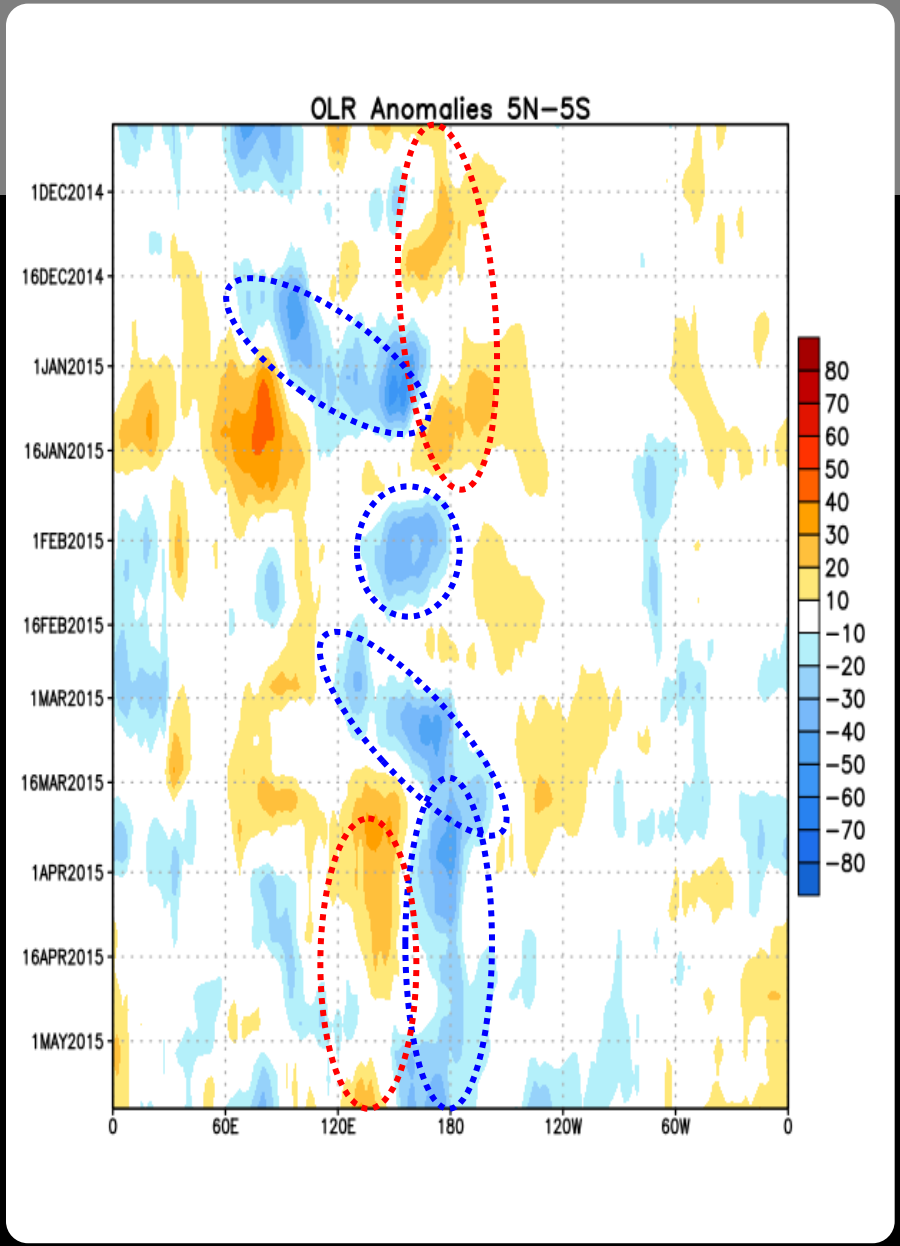


Unfavorable for precipitation (brown shading)
Favorable for precipitation (green shading)

Outgoing Longwave Radiation (OLR) Anomalies

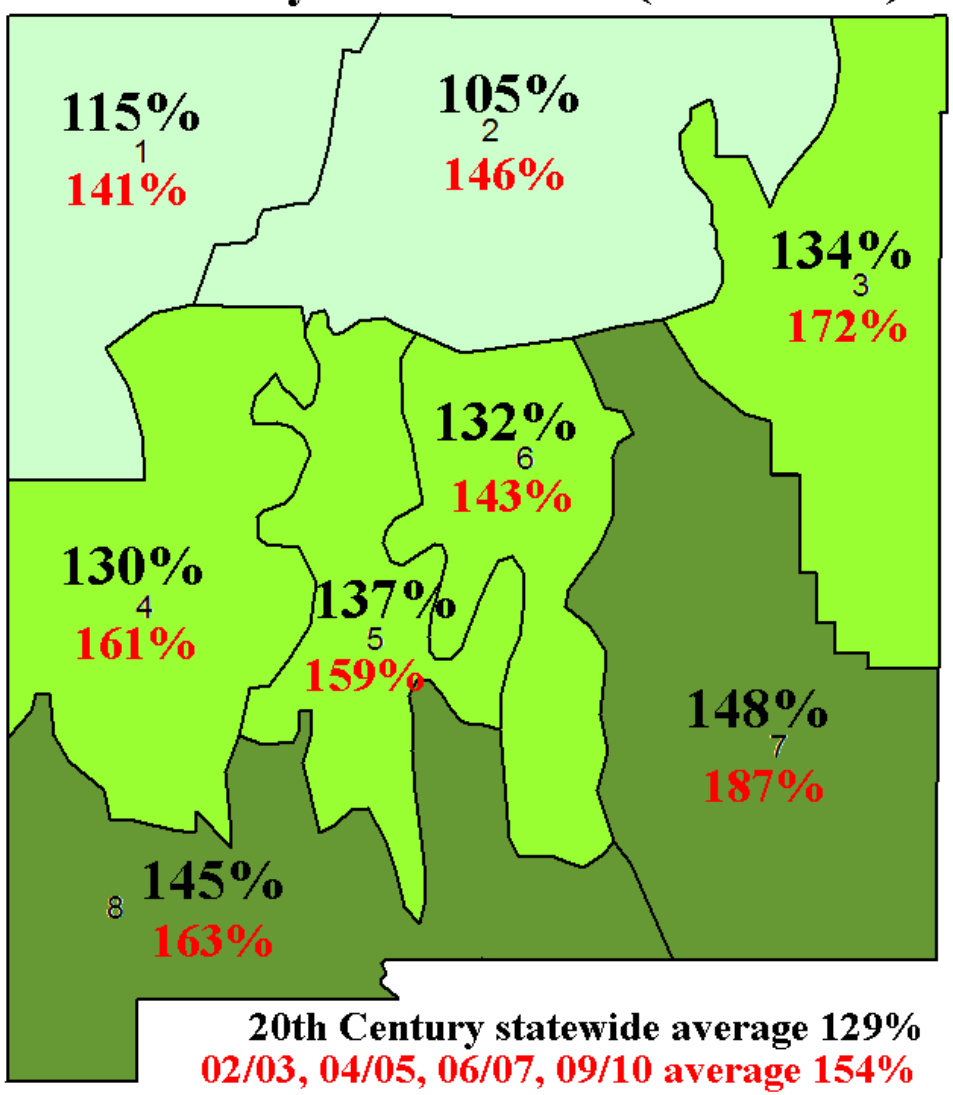
During November- mid January, positive OLR anomalies were observed near the Date Line.

During early March, negative OLR anomalies shifted from Indonesia to the Date Line, where they have persisted.



Drier-than-average Conditions (orange/red shading)

Wetter-than-average Conditions (blue shading)



Winter Precipitation (percent of normal) during the El Nino events of 2002/03, 04/05, 06/07, and 09/10.

If El Niño was to develop…

Winter precipitation during **El Niño** events had been generally higher in southern and eastern NM in the 20th century, and that pattern had been *further enhanced* for the first four **El Niño** events since 2000.

(Southeast NM "wetter" than northwest NM.)

IRI/CPC Pacific Niño 3.4 SST Model Outlook

The majority of the models indicate Niño 3.4 SST anomalies will remain greater than or equal to +0.5C through the end of 2015.

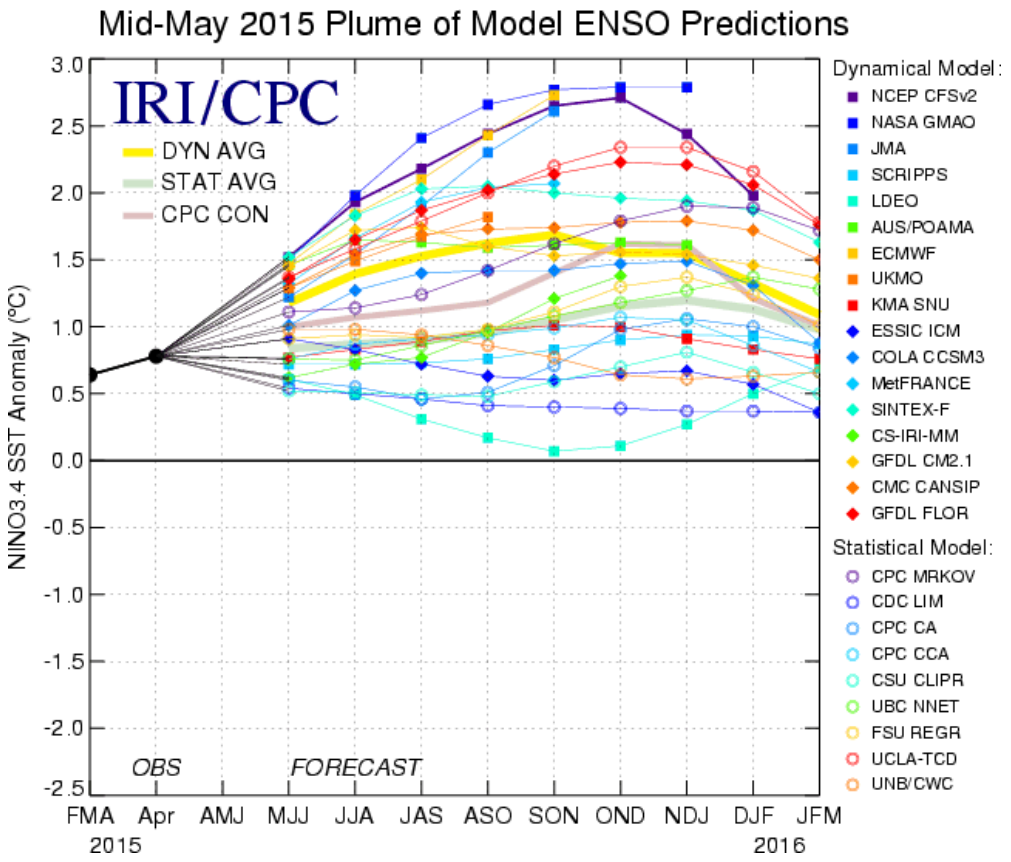
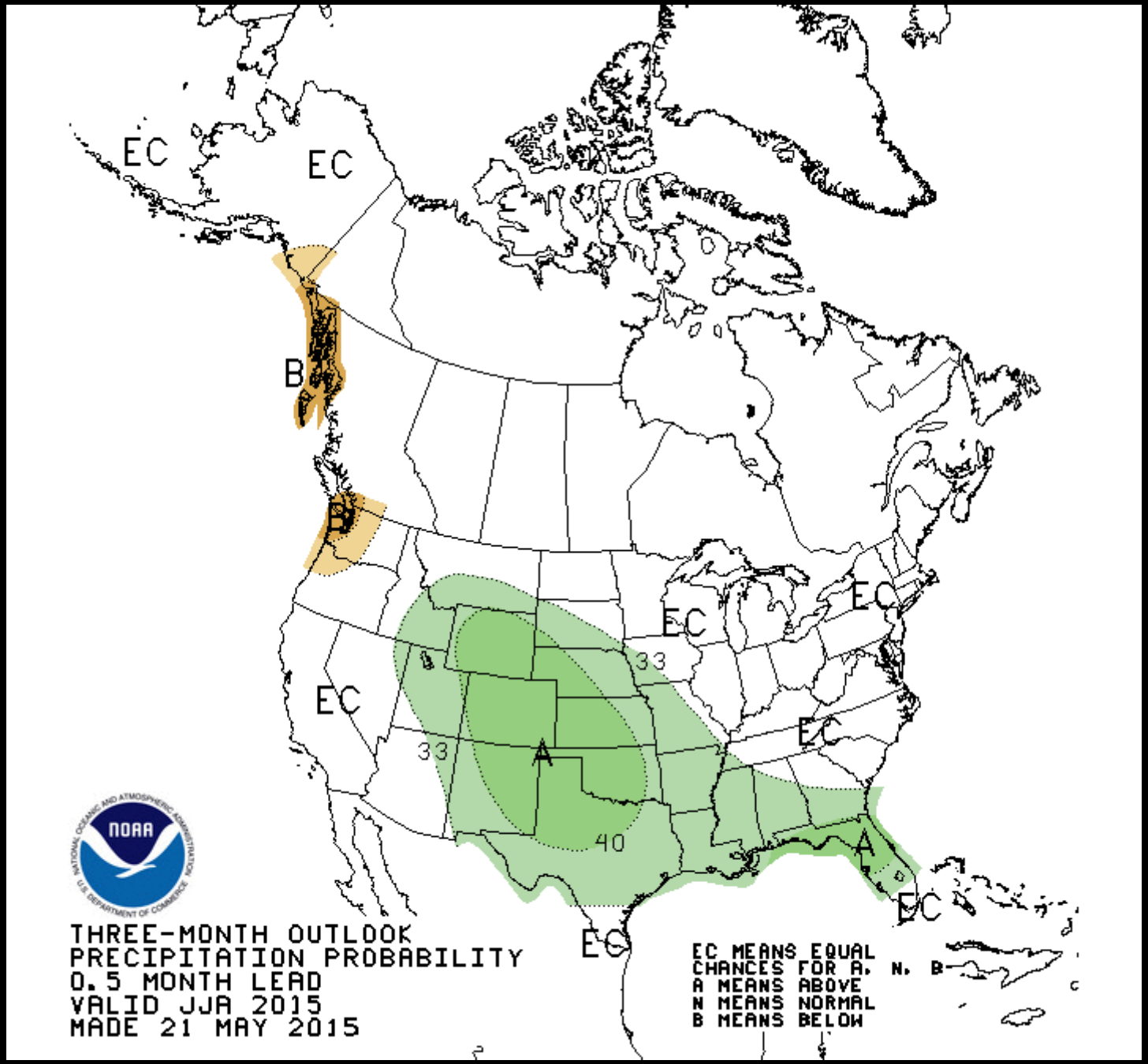


Figure provided by the International Research Institute (IRI) for Climate and Society (updated 14 April 2015).


EC
EC
B
B
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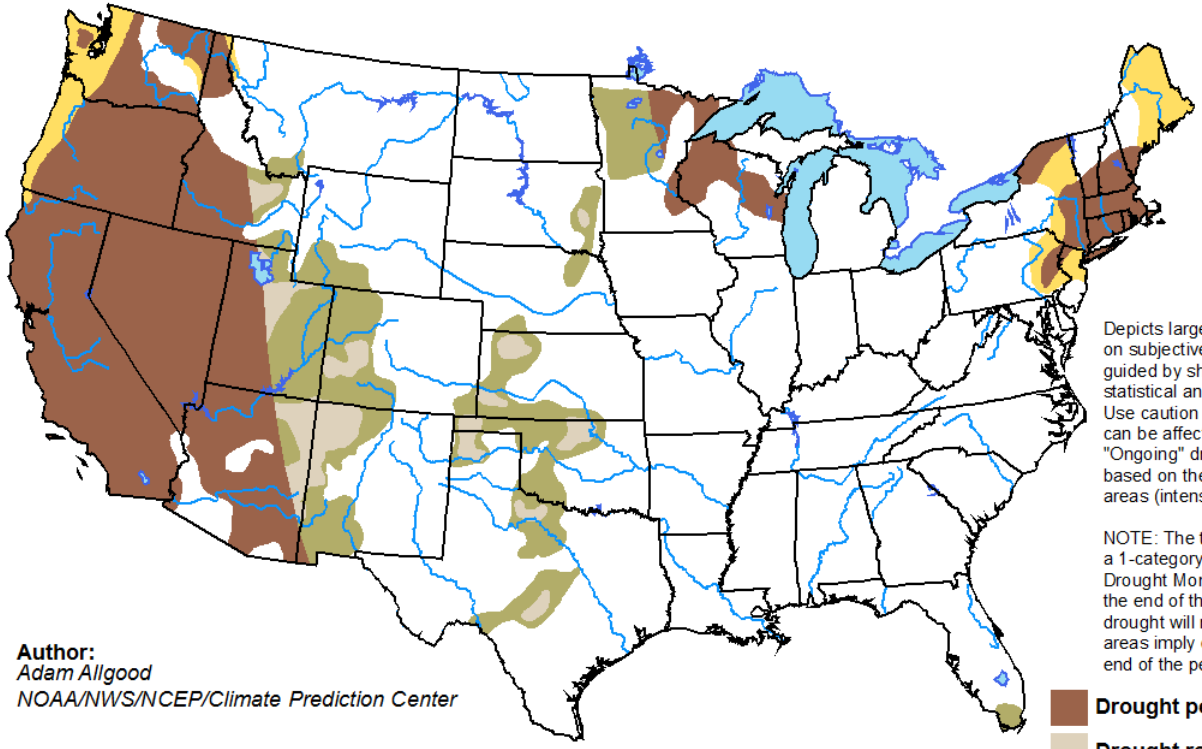
EC
33
EC
33
A
EC
40
A
EC
EC
EC MEANS EQUAL CHANCES FOR A. N. B
A MEANS ABOVE
N MEANS NORMAL
B MEANS BELOW
THREE-MONTH OUTLOOK
PRECIPITATION PROBABILITY
0.5 MONTH LEAD
VALID JJA 2015
MADE 21 MAY 2015

U.S. Seasonal Drought Outlook

Drought Tendency During the Valid Period

Valid for May 21 - August 31, 2015
Released May 21, 2015



Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Use caution for applications that can be affected by short lived events. "Ongoing" drought areas are based on the U.S. Drought Monitor areas (intensities of D1 to D4).

NOTE: The tan areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period, although drought will remain. The green areas imply drought removal by the end of the period (D0 or none).

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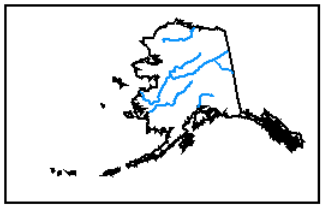
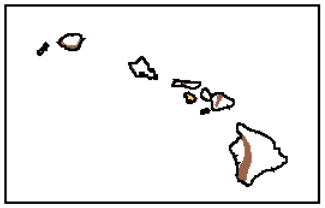
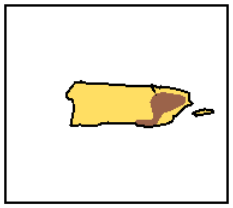
NOAA/NWS/NCEP/Climate Prediction Center







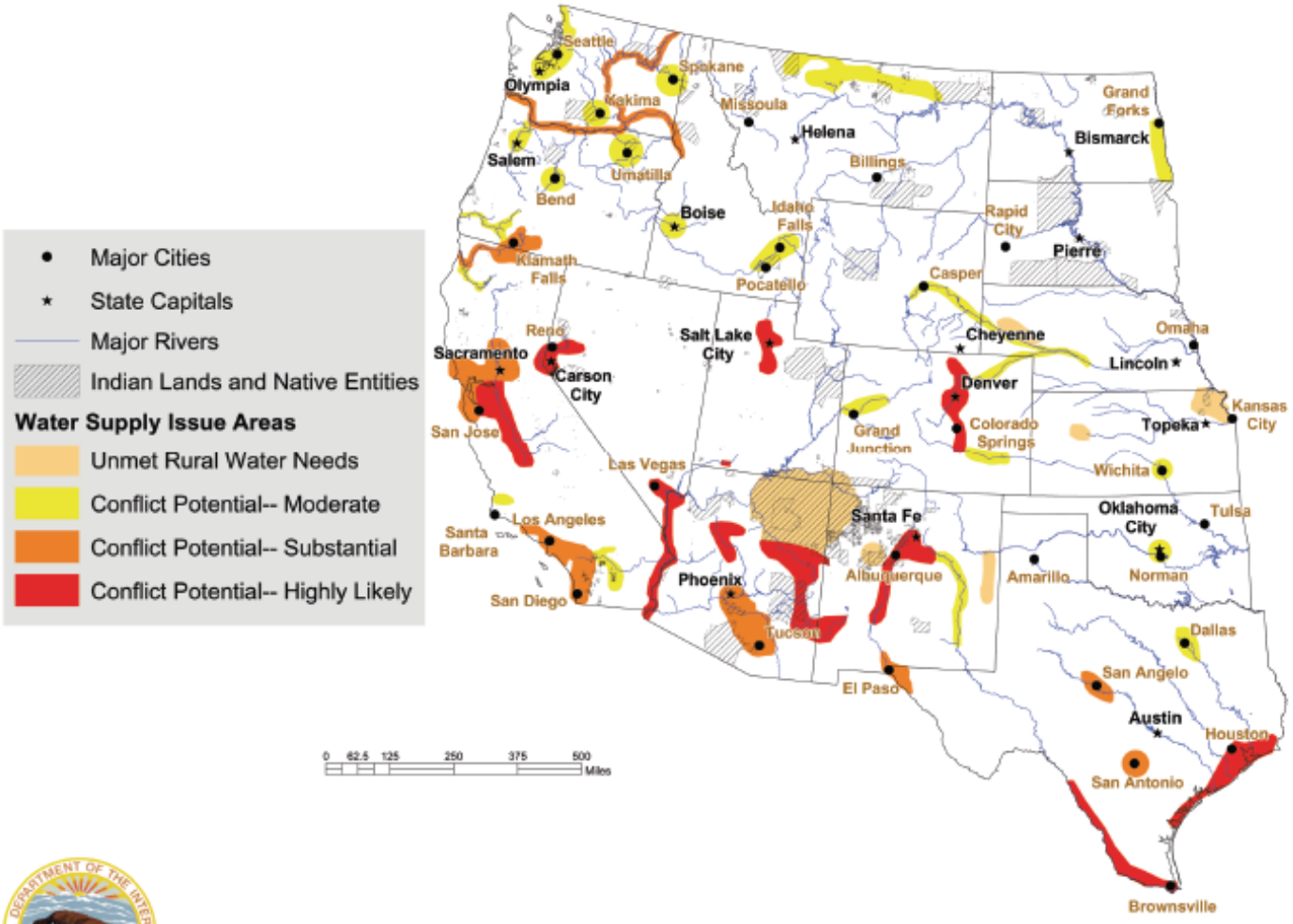
- **Drought persists/intensifies**
- **Drought remains but improves**
- **Drought removal likely**
- **Drought development likely**

http://go.usa.gov/hHTe

What do we need?

Potential Water Supply Crises by 2025

(Areas where existing supplies are not adequate to meet water demands for people, for farms, and for the environment).



May 2003

Real Examples of Forecast/Target

		Seasonal	Subseasonal		
Sector	Purpose	Forecast Date #1	Forecast Date #2	Forecast Date #3	Target Date
Irrigation	Storage	October	January	March	March
Endangered Species	Shape and duration of flow	January	March		May for shape, July for duration
Forestry (Other variable needed)	Fire Conditions	March			June (earlier for drought conditions)
Interstate Compacts	Settlements and Decree	See slide			See next slide
Tourism	Many	Yes	Yes		Yes
Water Right Administration	Continued development	?	Yes		Eventually

The Pecos Example

Summary of Projected and Actual Project Water Supply

Pecos Settlement Augmentation Triggers*			**2015**		
Projection Date	Target Date	Target Supply (AF)	Projected Supply on Projection Date (AF)	Actual Supply on Target Date (AF)	Amount Pumped Between Projection and Target Date (AF)**
November 1	March 1	50,000	118,556	118,005	0
March 1	May 1	60,000	121,180	121,710**	0
May 1	June 1	65,000	126,830**		
June 1	July 15	75,000			
July 15	September 1	90,000			

*See pages 11 and 12 of the 2003 Settlement Agreement.
**Values used for projection and supply from April 26 instead of May 1 due to ongoing block release.

Drought Response Administration

NM Drought Task Force

- Members
  - Natural Resource Agencies
  - Tourism, Indian Affairs, Governor Rep
  - Budget Agencies
- Focus on:
  - Mitigation and Response
  - Policy
  - Budget
- Inventory forms of assistance
- Development of Website and other communication
  - Local Communities
  - Counties
  - State Legislature
  - Governor

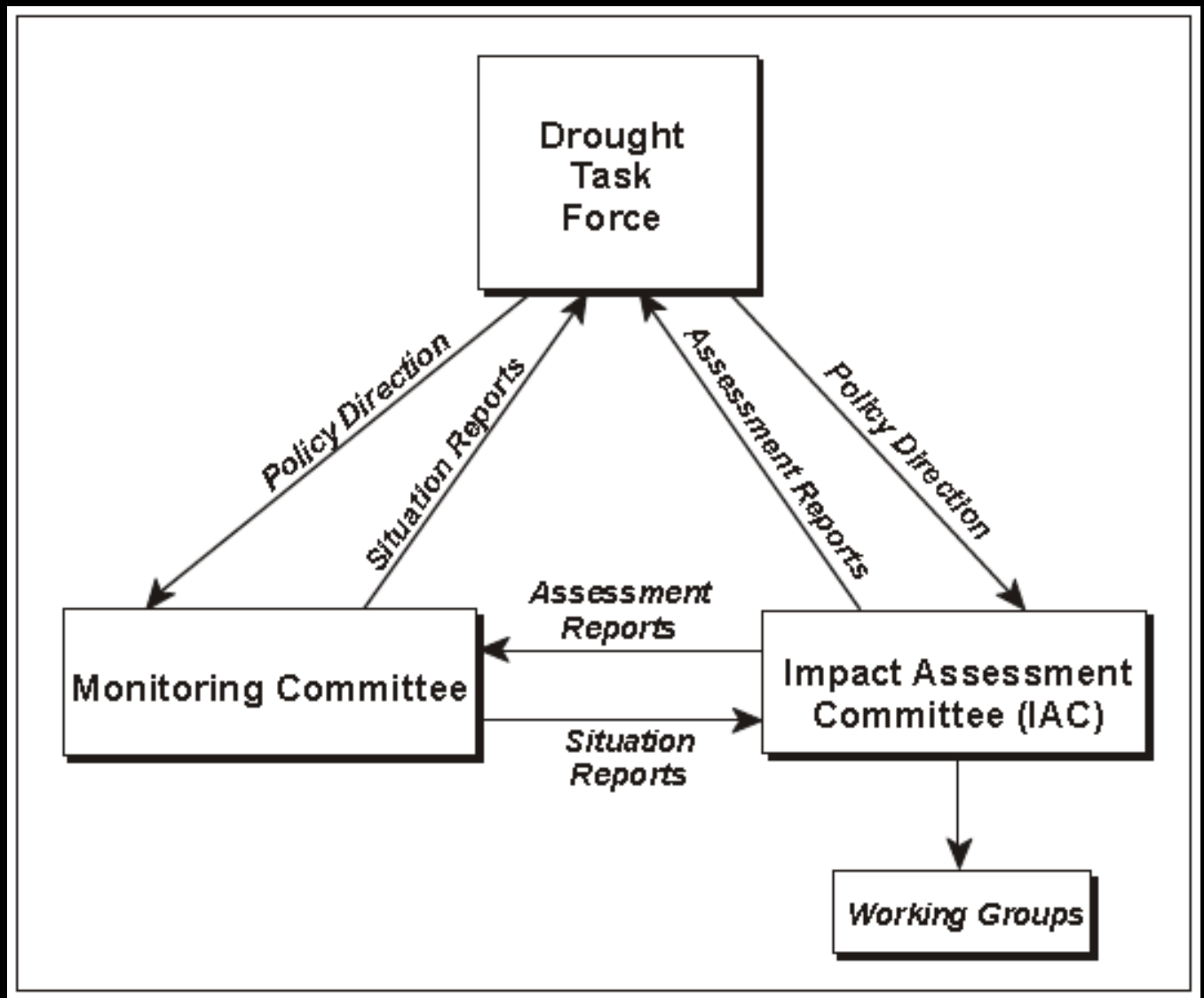


Figure 1. Linkages and suggested components of a drought plan.

Role of Monitoring Workgroup

- Formed in late 1990's to support DTF
- Active members include
  - Chair is State Climatologist
  - NWS, NRCS, USBR, ACE, USGS, FSA
    - DM Author, Southern Regional HQ
  - NMDA, NMDPS, NMOSE/ISC, NM State Forestry
  - Other members include USFS, USBLM, Taos Pueblo, Navajo Nation, University of AZ (CLIMAS)
- Reduces stove pipes
- Provides to the DTF a synthesis of met/ climatological data, including
  - Existing conditions of temp/precip amounts
  - Snow pack conditions
  - Temp and precip outlooks
  - Runoff outlooks
  - Current stream flow conditions
  - Reservoir storage
  - Soil moisture conditions

Sample report, what we summarize for public/political presentations

SUMMER 2013

Take Home (mid 2013)

- Previous 24 months have produced some of the most intense drought conditions on record
  - 1950's drought was longer, but
    - 1950's were relatively cooler
    - This episode is not over
- Current conditions remain exceptional
  - Lost almost 1 year of rain in the last 3 yrs
- Outlooks continue to favor drier than normal and warmer than normal conditions
  - Does not preclude normal or even wet conditions
- To return to normal, either
  - An exceptional event
  - It may take a while

Summary

Summary

- Brief Overview of NM climatology
- What NMOSE reviews when assessing for drought conditions
- What do we need?
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Thank You

Questions

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