



# New Assessment Tools in Monitoring Drought

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**Climate Prediction Center,**

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Prepared for:

USDA's 84<sup>th</sup> Agricultural Outlook Forum

Session 38: Food Risk & Security,

U.S. Drought Monitor & Disaster Declarations

February 22, 2008, 1:45 p.m. – 3:15 p.m.



As Brad Rippey has just discussed, the weekly U.S. Drought Monitor has undergone numerous changes (improvements) from its inception in 1999.

Over time, the main focus has been to SIMPLIFY the map for the end user (**although with increased information available to the author, the author's tasks have gotten a tad more *COMPLEX***).

**Major changes to the USDMM since 1999.....**

# EXPERIMENTAL DROUGHT MONITOR

May 20, 1999



D0a

D0a,h

D1a/D0h

D0a,h+

D1a,h

#### LEGEND:

D0 = Abnormal dryness but not currently classified as a drought.  
D1 to D4 = Droughts ranging in severity from standard to exceptional.

a = impact on plant life (agric. or forests)

h = impact on water supplies (reservoirs, streams, wells)

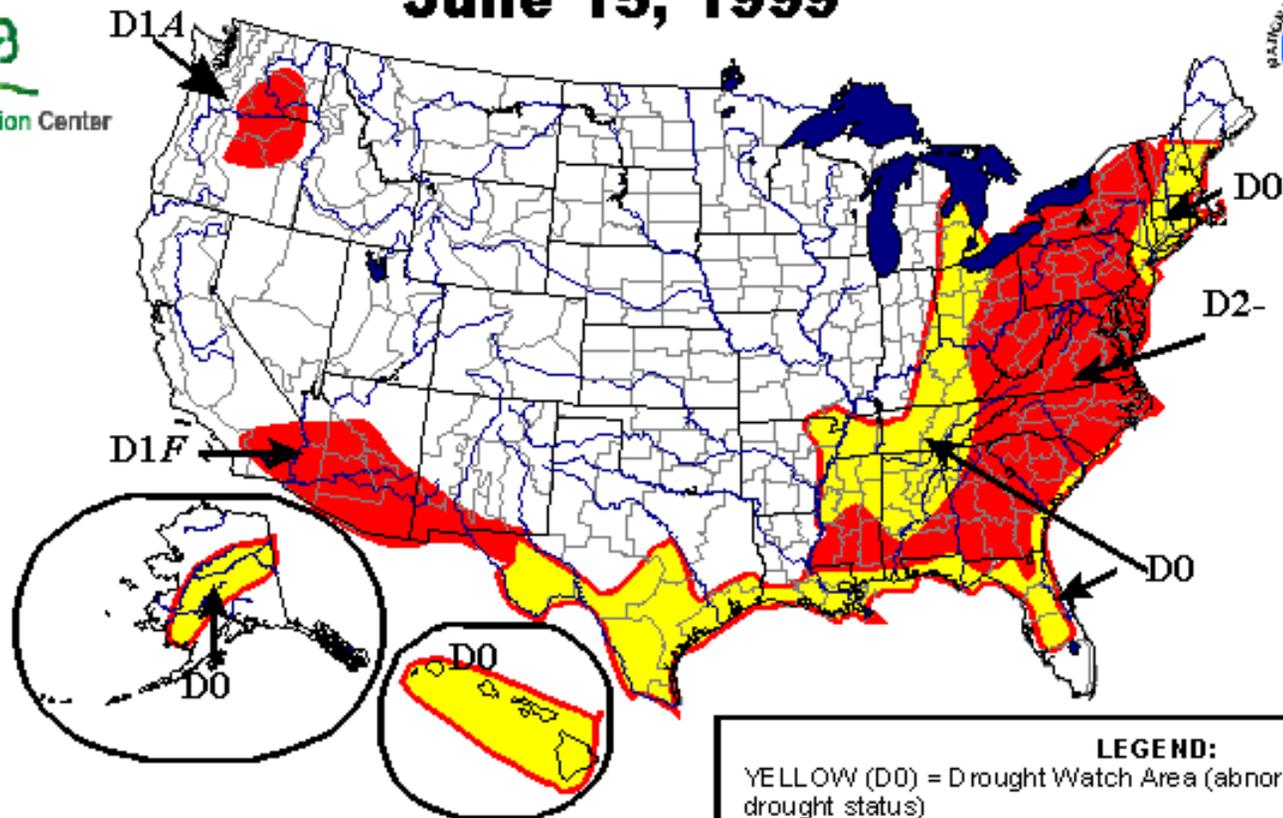
+ or - refer to forecast 2-wk trend, where "+" means intensifying and "-" means weakening. No sign means no significant change.

Areas depicted on chart are derived by consolidating information from a number of sources based on surface observation networks and satellite. "Drought" is used to mean abnormal moisture shortages resulting in imminent or actual damage to crops, or pastures; high wildfire risk; or water shortages. Only relatively large areas are shown; local conditions may differ markedly from those shown on the map.



# Experimental U.S. DROUGHT MONITOR

## June 15, 1999



Areas depicted on map are derived by consolidating information from a number of sources based on surface observations and satellite products. "Drought" is used to mean abnormal moisture shortages resulting in imminent or actual damage to crops or pastures; high wildfire risk; or water shortages. Only relatively large areas are shown; local conditions may differ markedly from those shown on the map.

**LEGEND:**

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

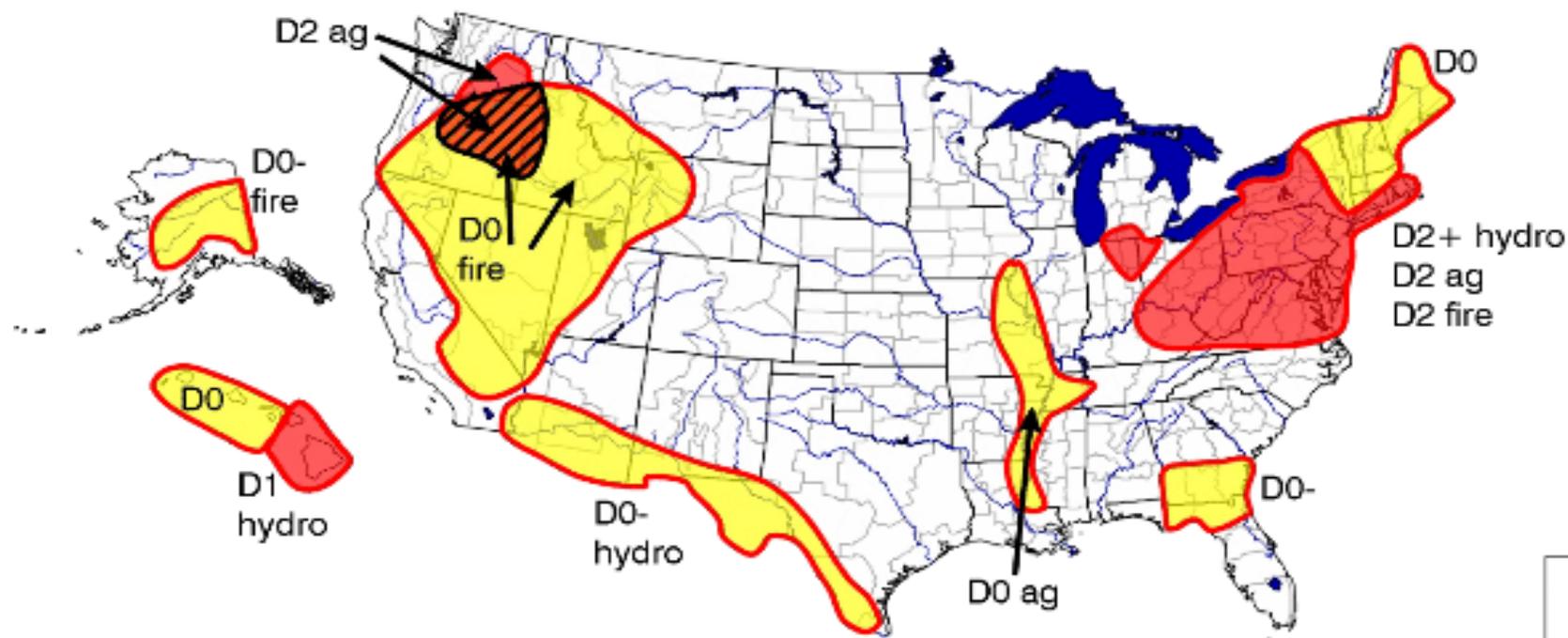
RED (D1-D4) = Current drought ranging in severity from standard (D1) to severe (D2-D3) to extreme (D4)

Drought Type: *Used when impacts differ*  
 A = agricultural (crops, grasslands)  
 F = forestry (wildfire potential)  
 H = hydrological (rivers, wells, reservoirs)

Plus = Forecast to intensify, Minus = Forecast to diminish

July 20, 1999

# Experimental U.S. Drought Monitor



"Drought" means moisture shortages leading to damaged crops or pastures, high wildfire risk, or water shortages. The map is based on information from many sources, including both satellite and surface data, and it focuses on widespread drought. Local conditions may vary.

**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

Minus (-) = Forecast to diminish

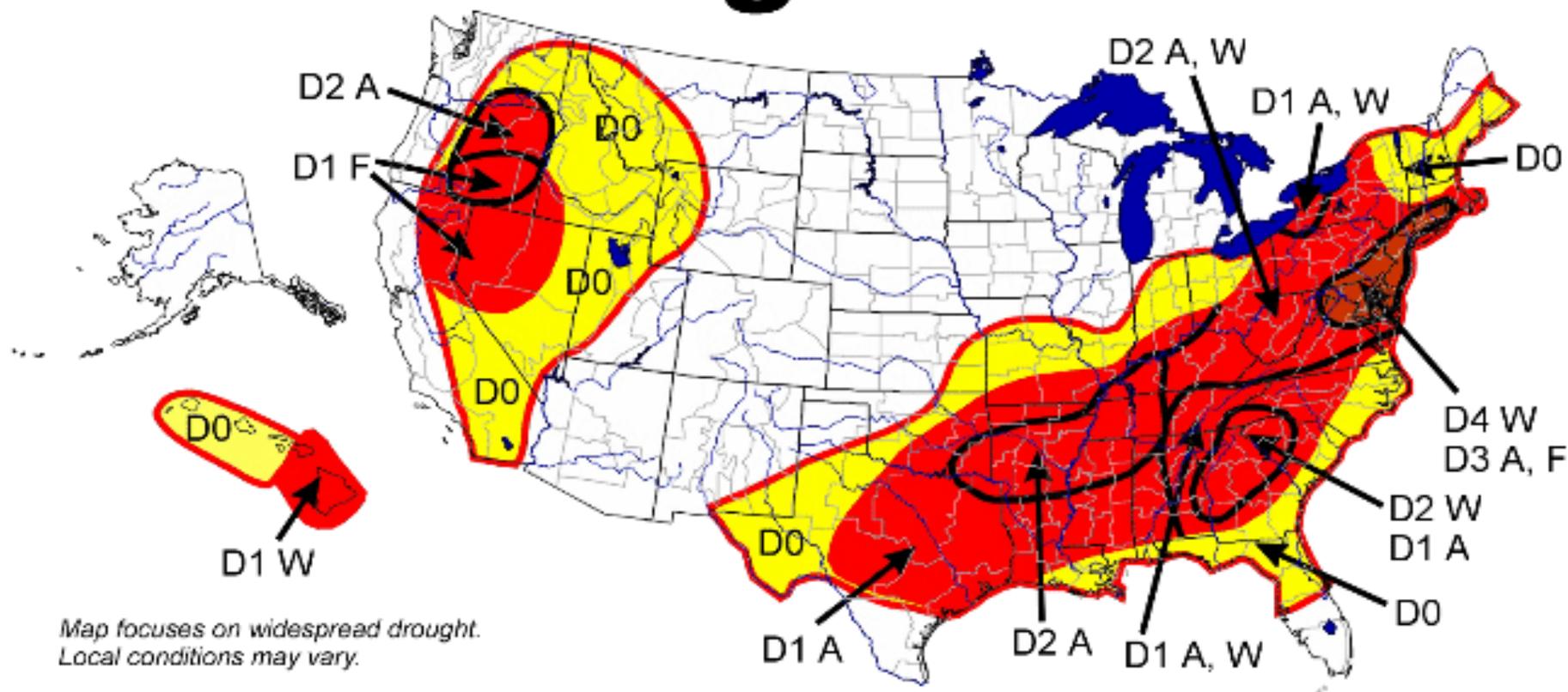


U.S. Drought Monitor



August 24, 1999

# U.S. Drought Monitor



Map focuses on widespread drought.  
Local conditions may vary.

- D0 Watch
- D1 Drought
- D2 Drought-Severe
- D3 Drought-Extreme
- D4 Drought-Exceptional

Drought type: used only  
when impacts differ

A = Agriculture  
W = Water  
F = Forest fire danger

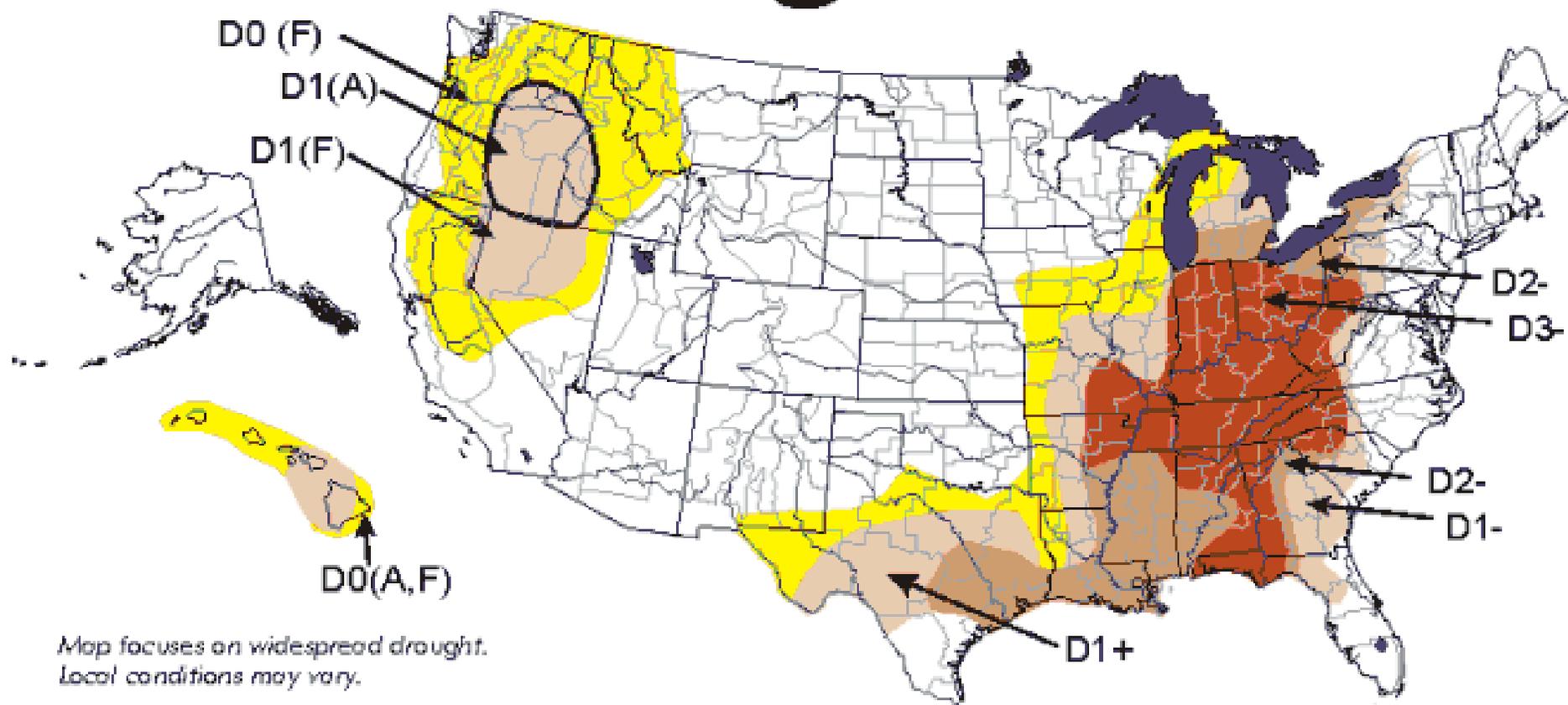


Plus (+) = Forecast to intensify next two weeks  
Minus (-) = Forecast to diminish next two weeks  
No sign = No change in drought classification forecast

• Updated every Thursday morning •

September 28, 1999

# U.S. Drought Monitor



Map focuses on widespread drought.  
Local conditions may vary.

- |                              |                                                |
|------------------------------|------------------------------------------------|
| D0 Watch                     | Drought type: used only<br>when impacts differ |
| D1 Drought                   |                                                |
| D2 Drought-Severe            | A = Agriculture                                |
| D3 Drought-Extreme           | W = Water                                      |
| D4 Drought-Exceptional       | F = Forest fire danger                         |
| Delineates Overlapping Areas |                                                |

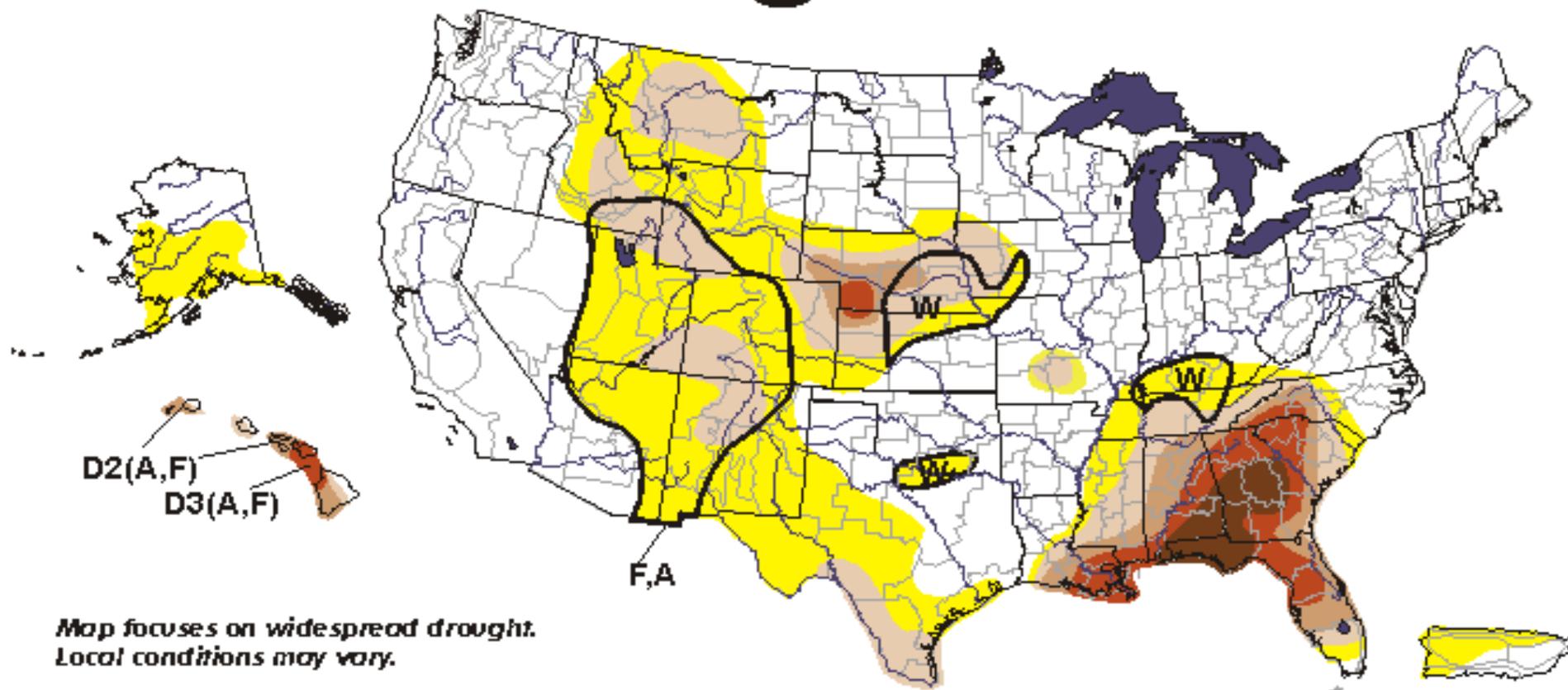
Plus (+) = Forecast to intensify next two weeks  
Minus (-) = Forecast to diminish next two weeks  
No sign = No change in drought classification forecast



• Released Thursday, Sep 30, 1999 •

July 11, 2000 Valid 7 a.m. EST

# U.S. Drought Monitor



*Map focuses on widespread drought.  
Local conditions may vary.*

-  D0 Abnormally Dry
-  D1 Drought—First Stage
-  D2 Drought—Severe
-  D3 Drought—Extreme
-  D4 Drought—Exceptional
-  Delineates Overlapping Areas

Drought type: used only when impacts differ

- A = Agriculture
- W = Water
- F = Wildfire danger

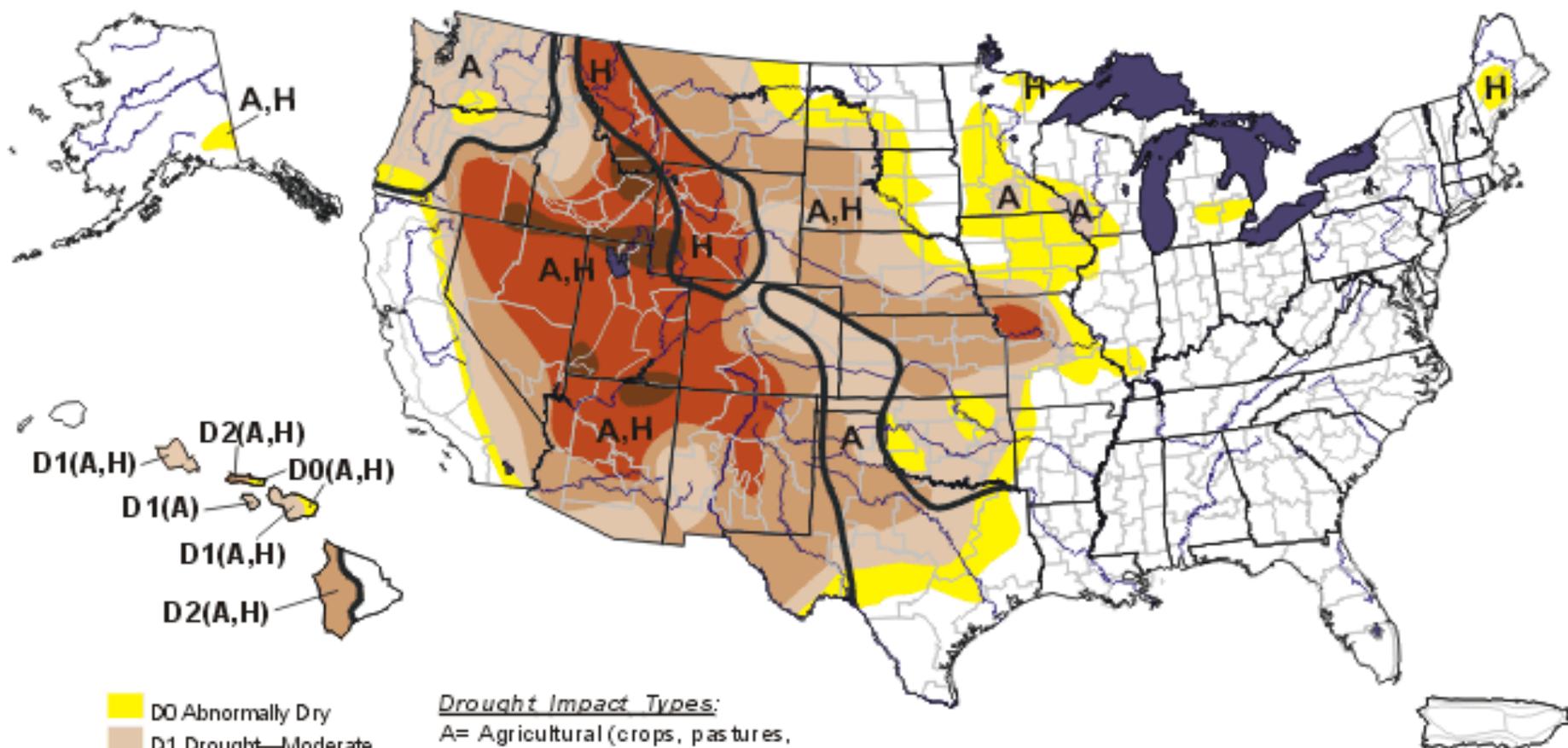


See accompanying text summary for forecast statements

● Released Thursday, July 13, 2000 ●

# U.S. Drought Monitor

August 12, 2003  
Valid 8 a.m. EDT



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

Drought Impact Types:  
 A= Agricultural (crops, pastures, grasslands)  
 H= Hydrological (water)  
 No type = both impacts  
 — Delineates dominant impacts

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

<http://drought.unl.edu/dm>



Released Thursday, August 14, 2003

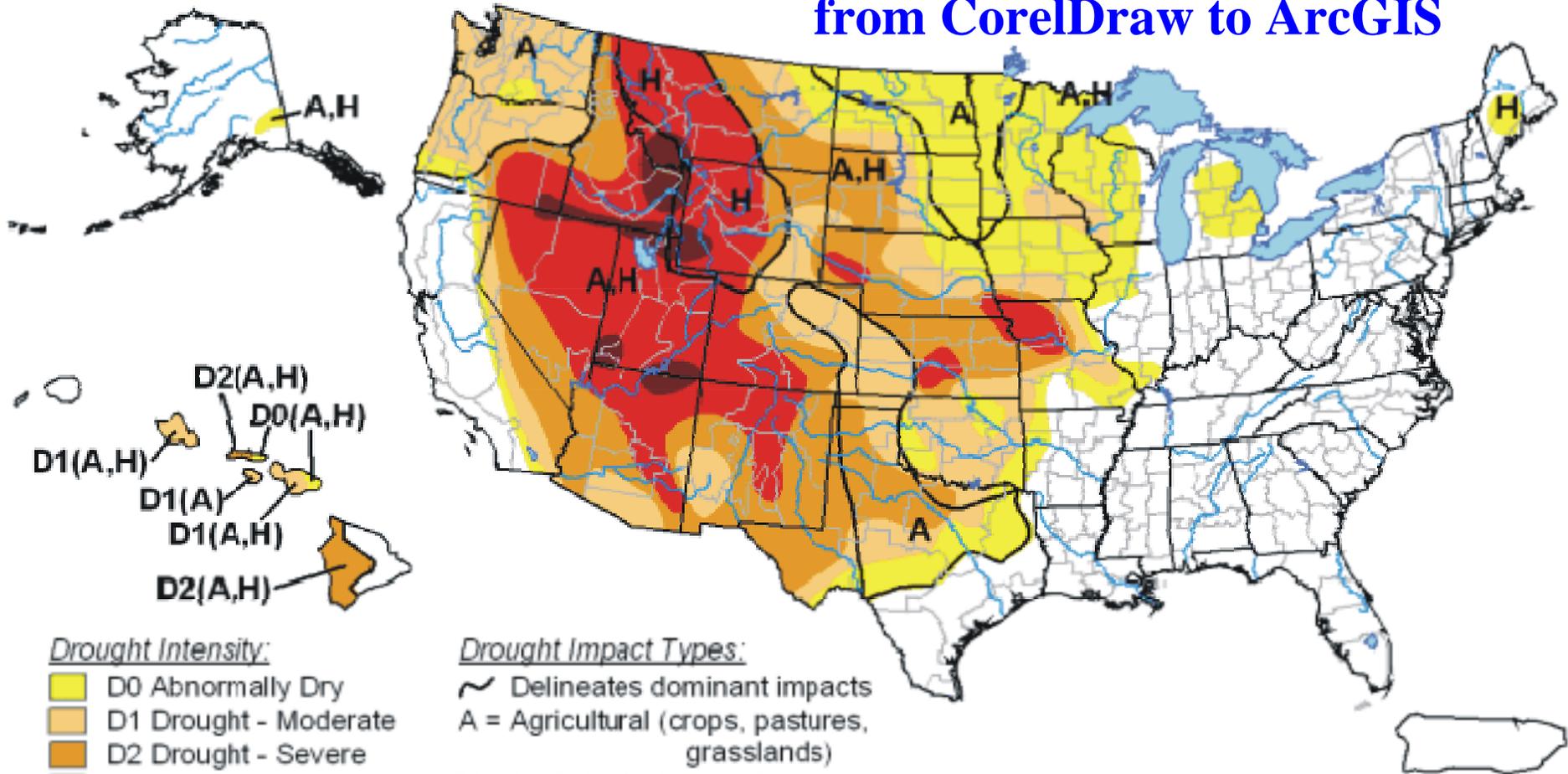
Author: Douglas Le Comte, NOAA A/CPC

# U.S. Drought Monitor

August 19, 2003

Valid 8 a.m. EDT

from CorelDraw to ArcGIS



## Drought 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)
- (No type = Both impacts)

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

<http://drought.unl.edu/dm>



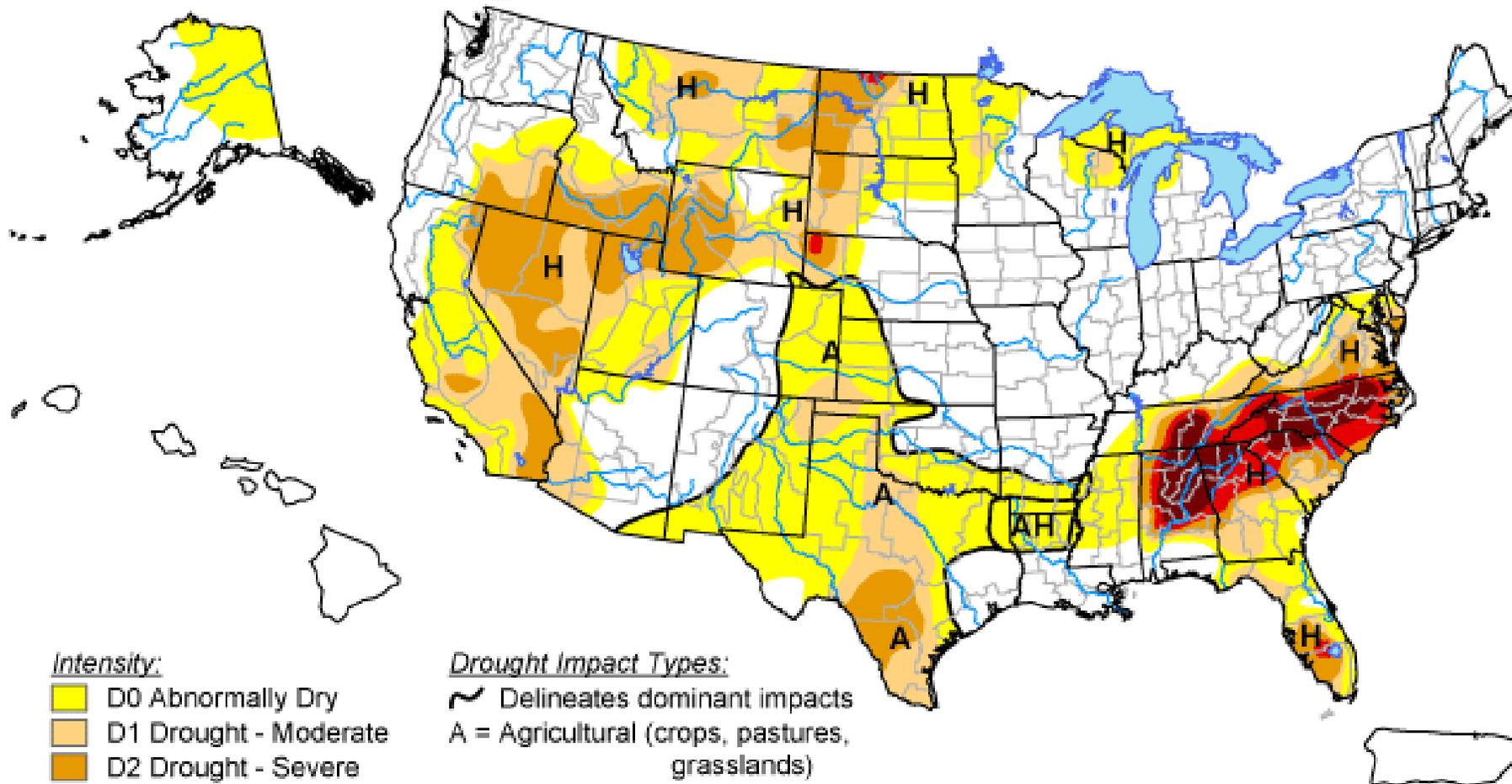
**Released Thursday, August 21, 2003**

Author: Candace Tankersley/Richard Heim, NOAA/NCDC

# U.S. Drought Monitor

February 12, 2008

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
- A = Agricultural (crops, pastures, grasslands)
- H = Hydrological (water)

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



Released Thursday, February 14, 2008

Authors: Jay Lawrimore/Liz Love-Brotak, NOAA/NESDIS/NCDC

<http://drought.unl.edu/dm>



# BACKGROUND

While trying to keep the USDAM 'simple' for the consumer, the author(s) require as much current and past information as possible (e.g. multiple indices, products, local expertise, etc.) in order to determine this week's drought analyses .... since no single definition of drought or index works for all circumstances.

So, as technology continues to improve, we have tried to utilize these upgrades to assist us in creating the weekly USDAM.

(Each of the following slides could be made into its own presentation)

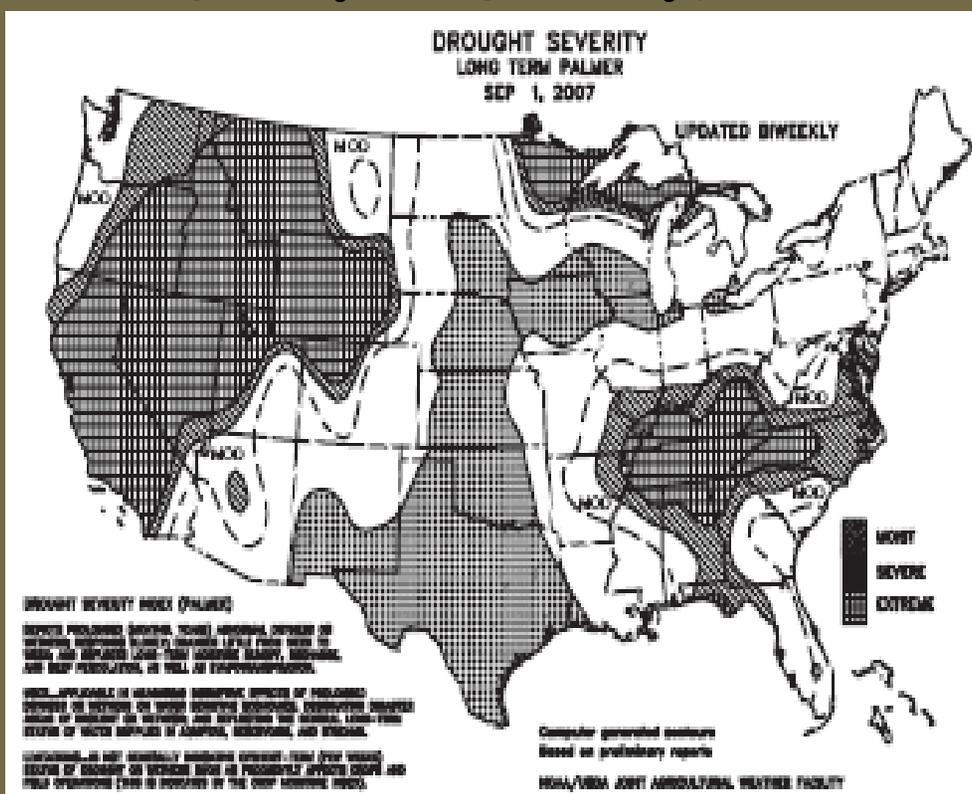
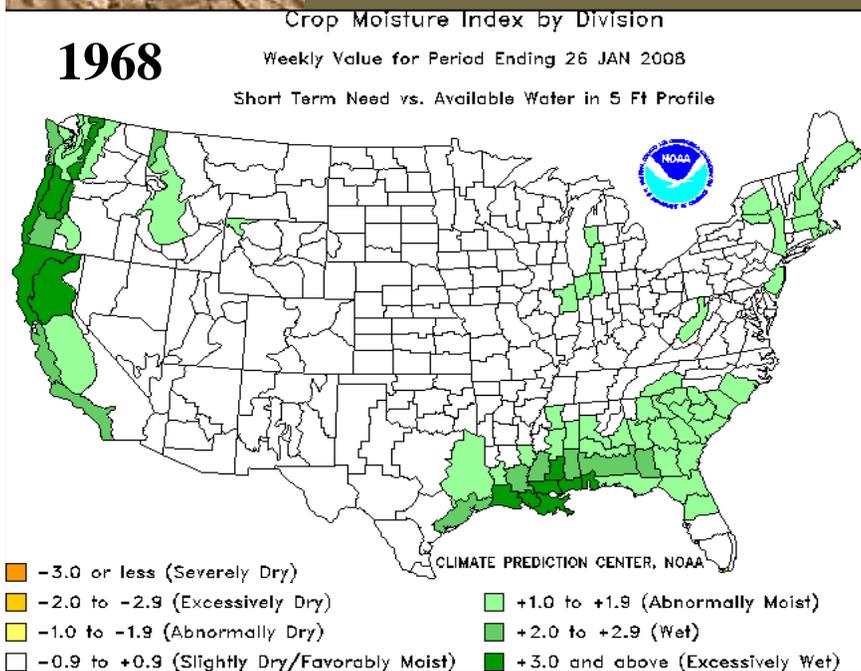
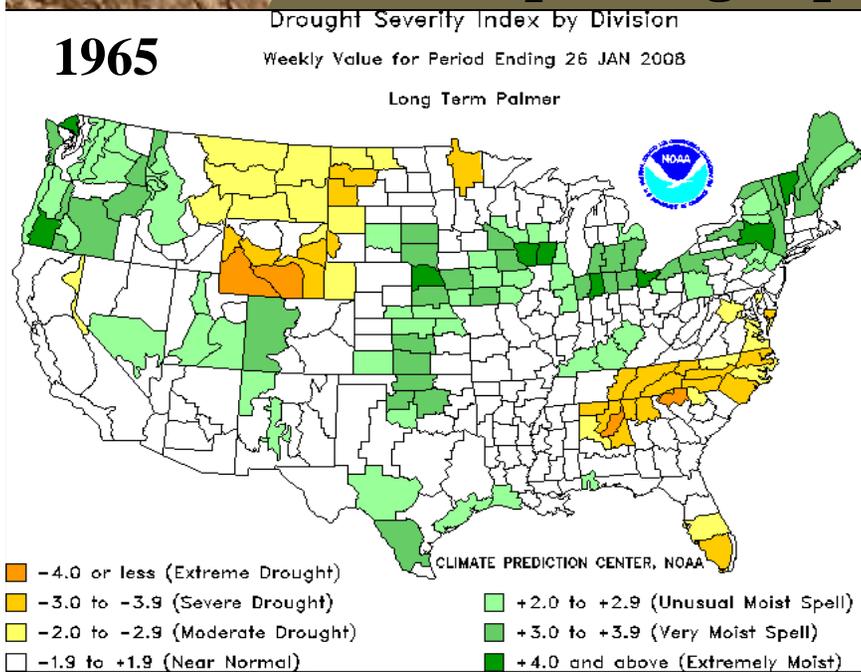


# OVERVIEW

## Modified or New Tools used in the Assessment of Drought in the Production of the USDM:

- 1) **Improving Input Data Quality & Quantity;**
- 2) **Creating New Products, Indices, or Blends for a more Objective Analyses, inc. Soil Moisture Models;**
- 3) **Differentiating between Temporal (Short vs. Long) & Regional (East vs. West) Drought Distinctions;**
- 4) **Migrating USDM Analyses & Production to State-of-the-Art Software (ArcGIS);**
- 5) **Consolidating all drought-related information to a “one-stop drought shop” (NIDIS & Drought Portal);**
- 6) **Expanding Drought Monitoring Beyond the U.S.;**
- 7) **Forecasting Drought (U.S. Seasonal Drought Outlooks);**

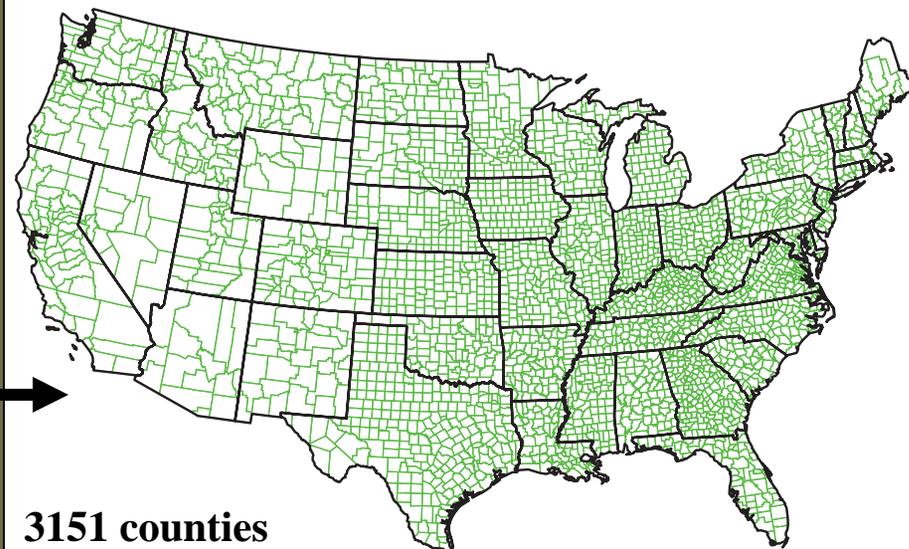
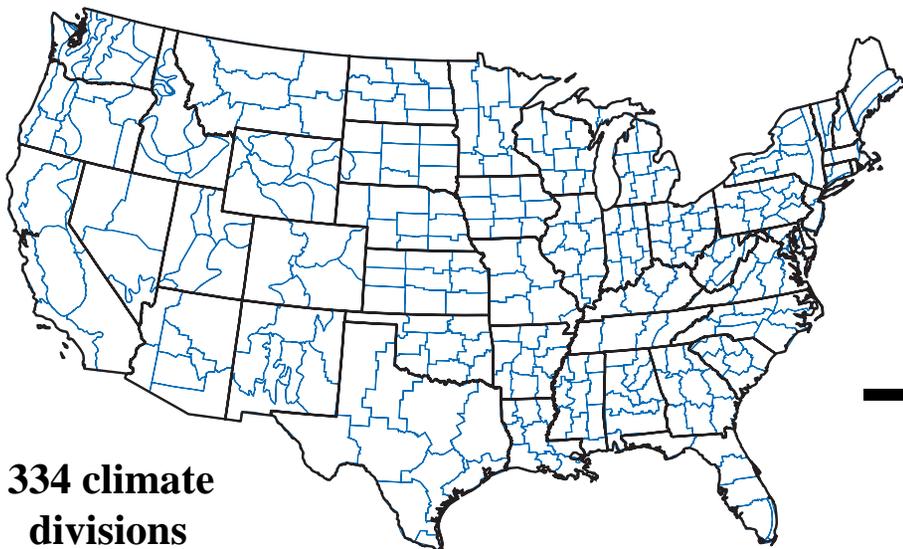
# 1) Improving Input Data Quality & Quantity;



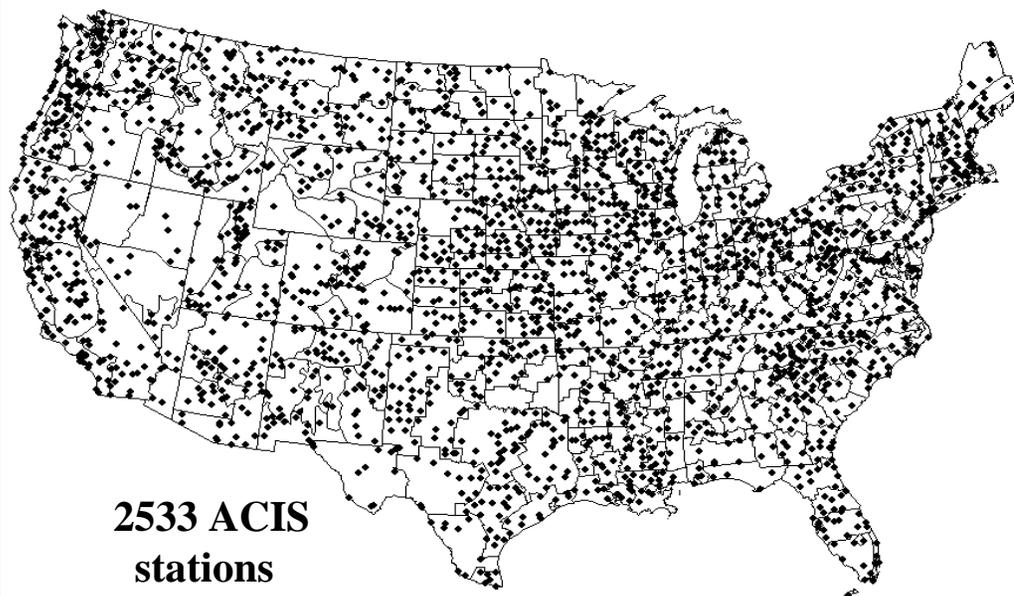
In the past, the **Palmer Drought Index** had been the standard for measuring drought in the U.S. (the **CMI** was developed 3 years later for short-term [ag] dryness)...

...but we've come a long way recently; increasing data quality & quantity, dissemination speed, user flexibility, and creating new products ....

# 1) Improving Input Data Quality & Quantity;



**Precipitation Stations After Gap Analysis  
With At Least 30 Years of Data**

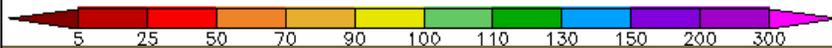
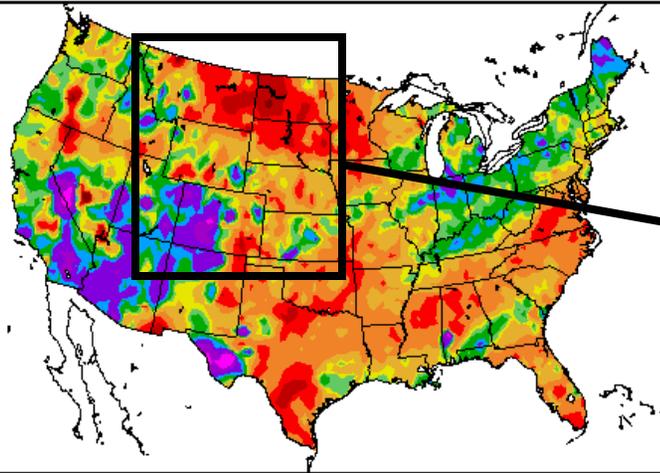


**...although we still need to transition from a rather low-resolution (climate divisions) to higher resolution (e.g. county level) or to individual stations (e.g. ACIS) ...where there is enough past quality data for statistics.**

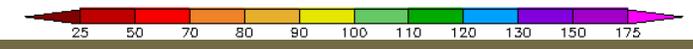
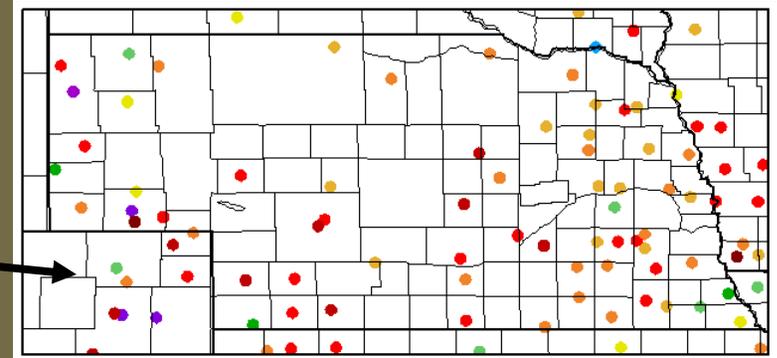
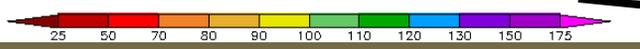
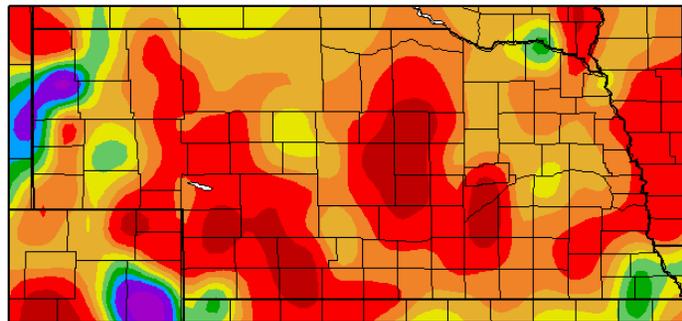
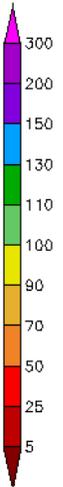
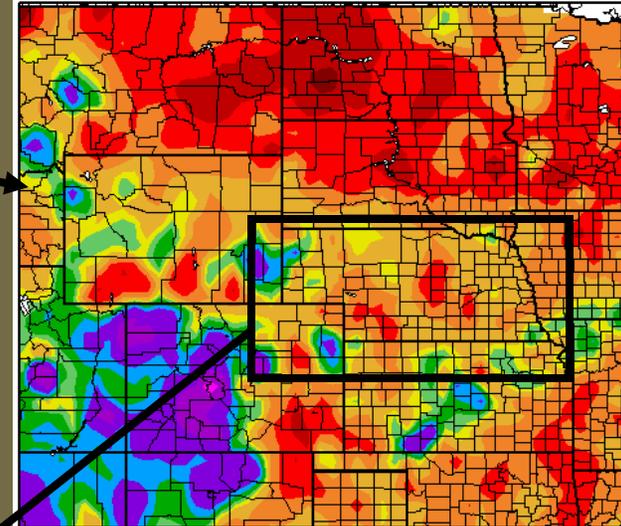
# 1) Improving Input Data Quality & Quantity;

## ACIS data

Percent of Normal Precipitation (%)  
11/1/2007 - 1/31/2008



Percent of Normal Precipitation (%)  
11/1/2007 - 1/31/2008



3-Month (Nov'07-Jan'08) PNP

High Plains  
Regional Climate Center

Home

About US

Current Climate Summa

Options

Select Product

- Total Precipitation
- Precip Departure from Normal
- Precip % of Normal
- Average Temperature
- Temperature Departure from Normal
- HDD - Heating Degree Days
- HDD Departure from Normal
- CDD - Cooling Degree Days
- CDD Departure from Normal
- SPI

Products Not Available for Selected Timescale.

Select a Timescale/Date Range

Select a Region

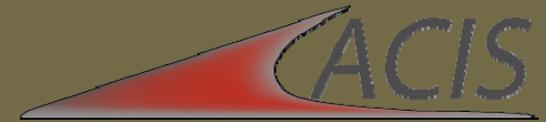
Select Map Style

- Shaded
- Dot

Selected Options

# Applied Climate Information System

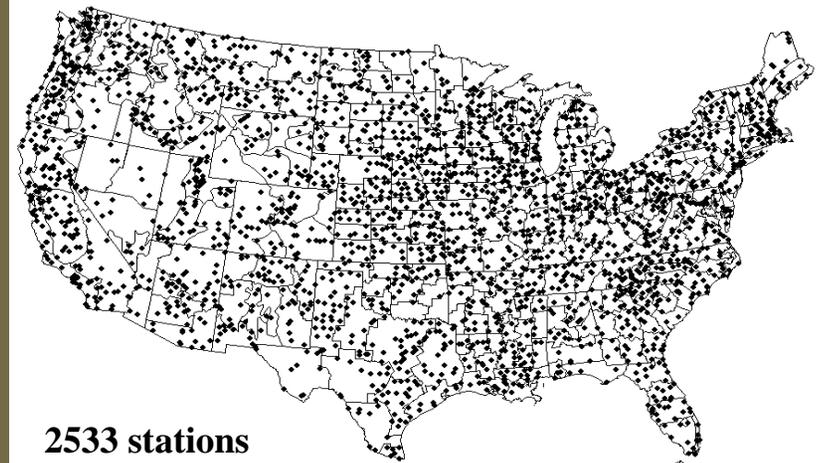
- Applied Climate Information System (ACIS)
  - NOAA Regional Climate Centers (RCCs)
- A framework for management of metadata and climate data:
  - Ingest, Quality Control, and Archive
  - Multiple Datasets
  - Networked/Robust System
  - Distributed Data Management
  - Manages climate data (so you don't have to!)



ACIS provides a platform for suites of climate products:

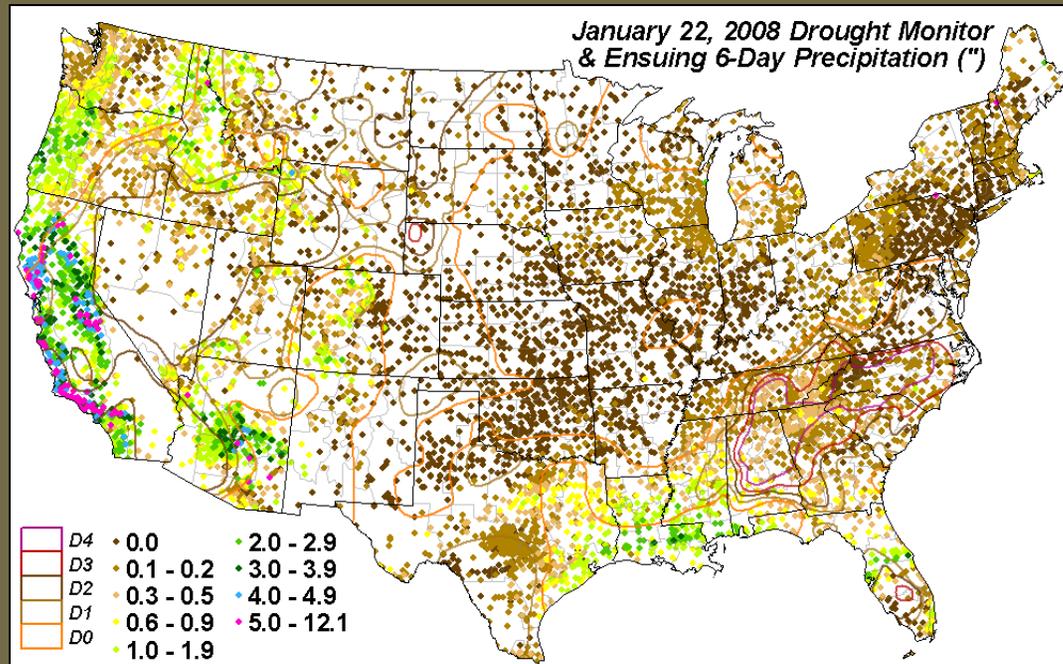
- \* CLIMOD (RCCs)
- \* xmACIS (NWS)
- \* NOWData (NWS)
- \* AgACIS (NRCS)

Precipitation Stations After Gap Analysis  
With At Least 30 Years of Data

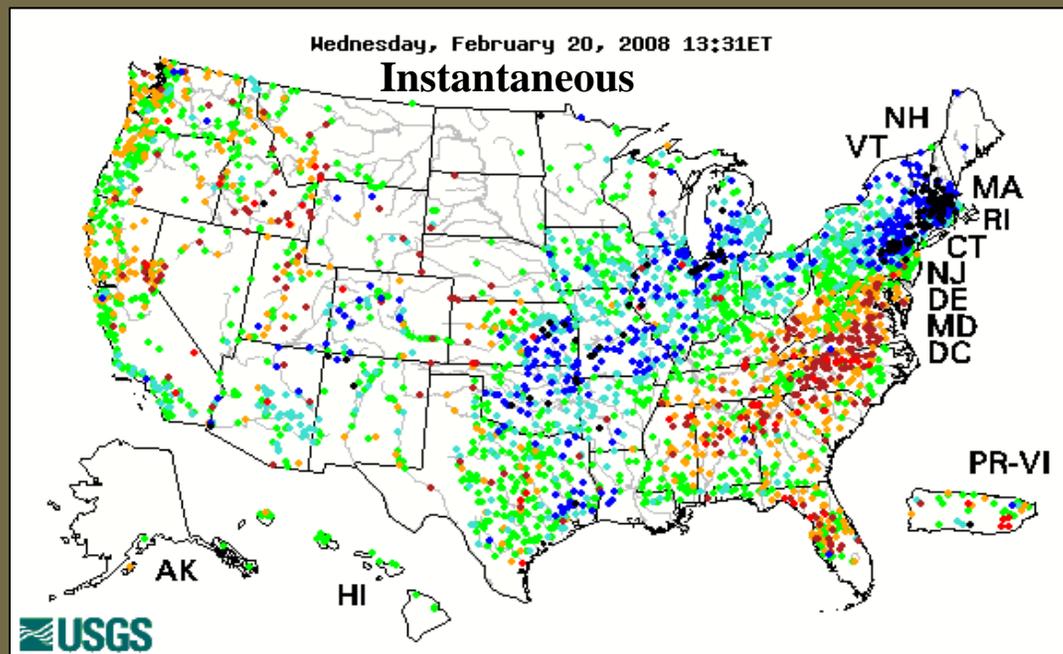


# 1) Improving Input Data Quality & Quantity;

RFC  
Network  
(n-days)



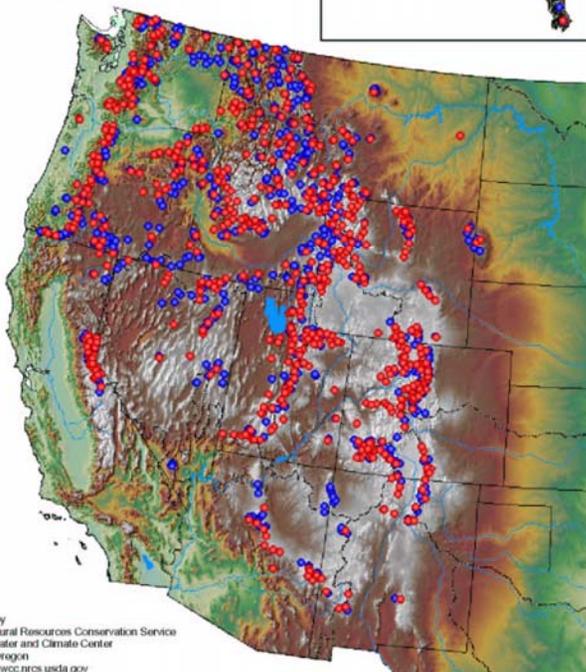
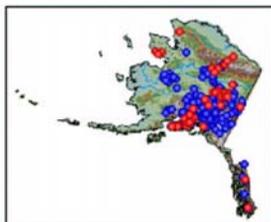
USGS  
Stream flow  
Network  
(Instant, 1-,  
7-, 14-, and  
28-days)



# 1) Improving Input Data Quality & Quantity;

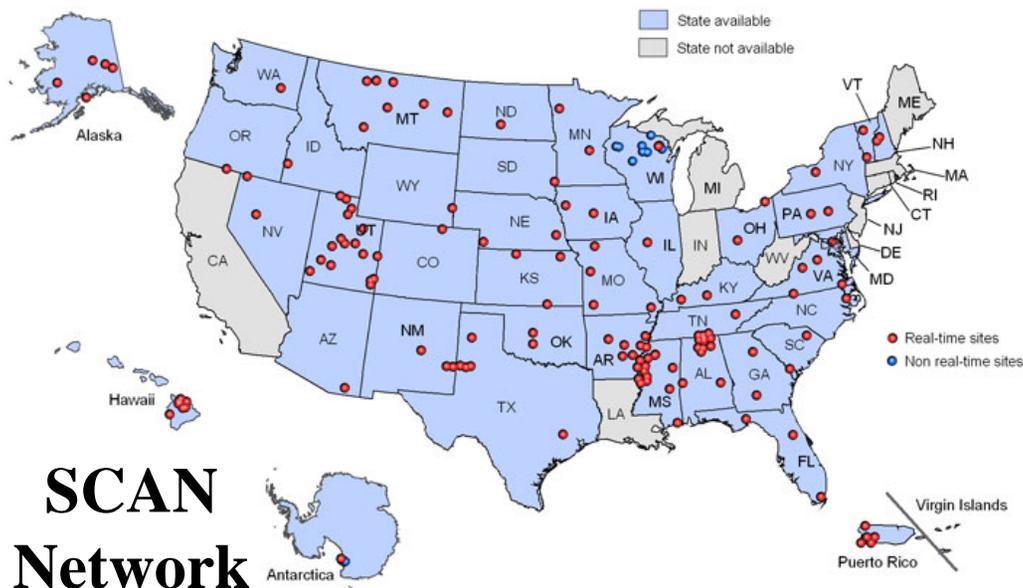
## SNOTEL Site and Snow Course Locations

- Legend**
- SNOTEL
  - Snow Course



Prepared by  
USDA, Natural Resources Conservation Service  
National Water and Climate Center  
Portland, Oregon  
<http://www.wcc.nrcs.usda.gov>

## SNOTEL Network

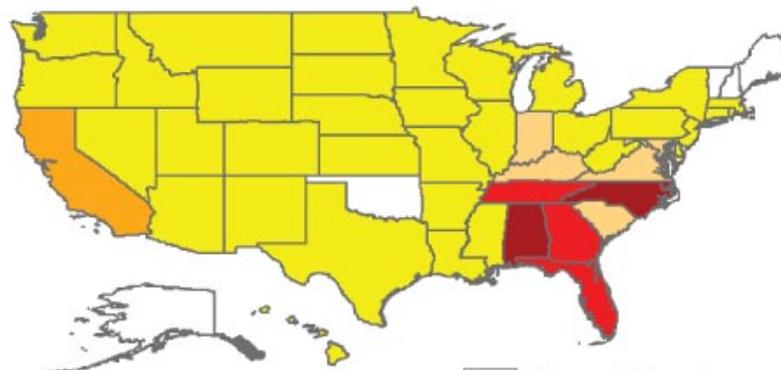


## SCAN Network

## Drought Impact Reporter

May - October 2007

National Drought Mitigation Center



- No reported impacts
- 1-19 reported impacts
- 20-37 reported impacts
- 38-55 reported impacts
- 56-73 reported impacts
- 74-92 reported impacts

NDMC



National Weather Service  
**Hydrologic Information Center**

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[Current Flooding](#)   [Outlooks](#)   [Hydrologic Conditions](#)   [Archive](#)   [Home](#)

## Drought

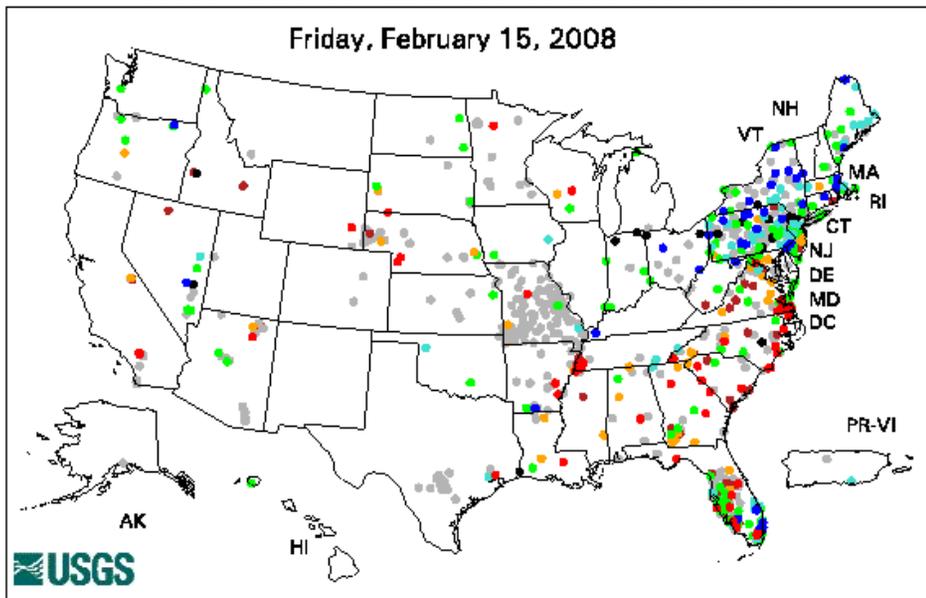
Drought statements issued by NWS Forecast Offices:

<ul style="list-style-type: none"> <li>• Bismark, ND [1/25/08]</li> <li>• Riverton, WY [2/15/08]</li> <li>• North Platte, NE [1/17/08]</li> <li>• Goodland, KS [2/3/08]</li> <li>• Amarillo, TX [2/5/08]</li> <li>• San Angelo, TX [2/15/08]</li> <li>• San Antonio, TX [2/7/08]</li> <li>• Corpus Christi, TX [2/7/08]</li> <li>• Brownsville, TX [2/9/08]</li> </ul>	<ul style="list-style-type: none"> <li>• Jackson, KY [2/1/08]</li> <li>• Morristown, TN [2/14/08]</li> <li>• Nashville, TN [1/12/08]</li> <li>• Huntsville, AL [2/14/08]</li> <li>• Birmingham, AL [2/14/08]</li> <li>• Mobile, AL [2/15/08]</li> <li>• Tallahassee, FL [2/15/08]</li> <li>• Miami, FL [2/15/08]</li> </ul>	<ul style="list-style-type: none"> <li>• Taunton, MA [1/23/08]</li> <li>• State College, PA [2/15/08]</li> <li>• Mt. Holly, NJ [2/17/08]</li> <li>• Blacksburg, VA [2/7/08]</li> <li>• Raleigh, NC [1/25/08]</li> <li>• Morehead City, NC [2/15/08]</li> <li>• Greenville-Spartanburg, SC [2/7/08]</li> <li>• Columbia, SC [2/7/08]</li> <li>• Charleston, SC [2/8/08]</li> <li>• Peachtree City, GA [2/7/08]</li> </ul>
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# 1) Improving Input Data Quality & Quantity;

## Real-Time Ground-Water Level Network

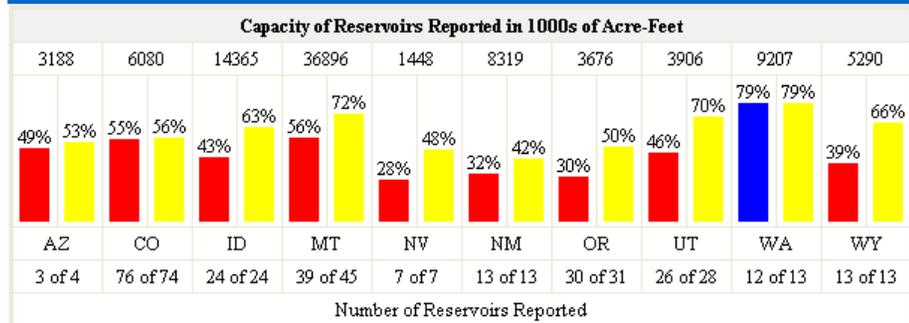
Friday, February 15, 2008



Explanation - Percentile classes							
<span style="color: red;">●</span>	<span style="color: red;">●</span>	<span style="color: orange;">●</span>	<span style="color: green;">●</span>	<span style="color: cyan;">●</span>	<span style="color: blue;">●</span>	<span style="color: black;">●</span>	<span style="color: gray;">●</span>
New Low	<10	10-24	25-75	76-90	>90	New High	Not Ranked
	Much Below Normal	Below Normal	Normal	Above Normal	Much Above Normal		

Real-Time Ground-Water Level Network Well Count: 1017

## Reservoir Storage as Percent of Capacity for January 1st, Water Year 2008



■ Storage is Below Average (% of Capacity)  
■ Storage is At or Above Average (% of Capacity)  
■ Average Storage as % of Capacity

\* = Data are not available for this state.

## NWS RFC Reservoir Network

NEW! Interactive Water Supply Publications

CBRFC Main > Res

Graphic List

### Colorado River Basin

#### Reservoirs

Legend. Map data updated 02/18:19:00 UTC, 02/18:12:00 MST. Click map to zoom.

Data Type: River | Snow

Click to: Select | Zoom Zoom to: 1x | 4x | 8x |

Zoom Mode: Topography | Satellite

#### Legend

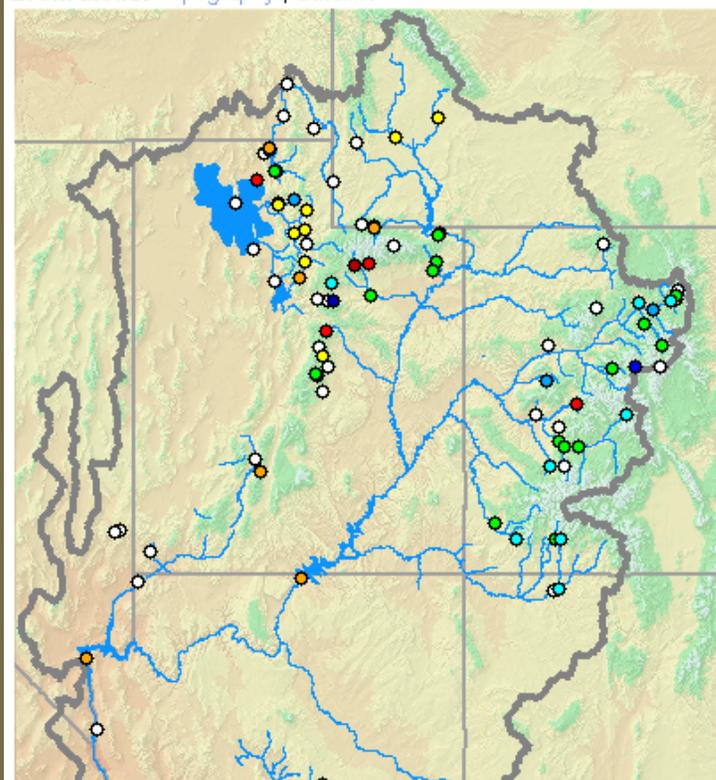
##### Storage (% Avg)

- No data
- < 25
- 25-50
- 50-75
- 75-90
- 90-110
- 110-125
- 125-150
- 150-175
- > 175

#### Display Options

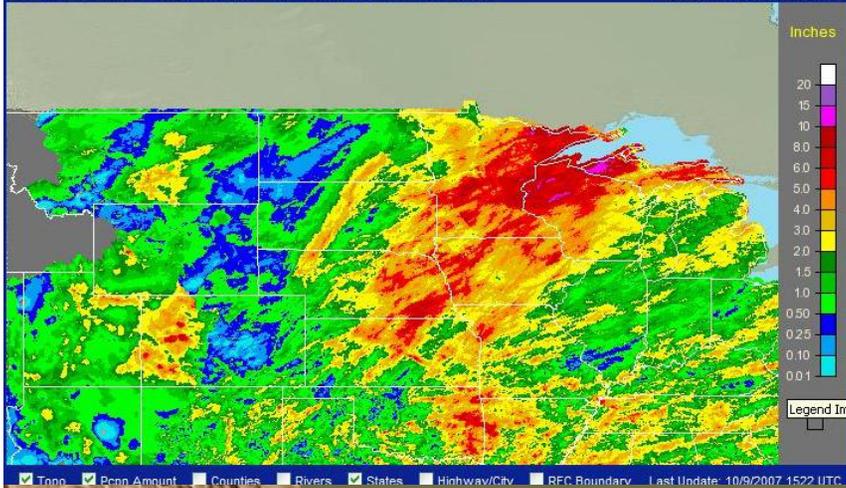
- Topography
- States
- RFC
- Rivers
- HSAs
- Basins
- Data Points
- Station Labels

Apply

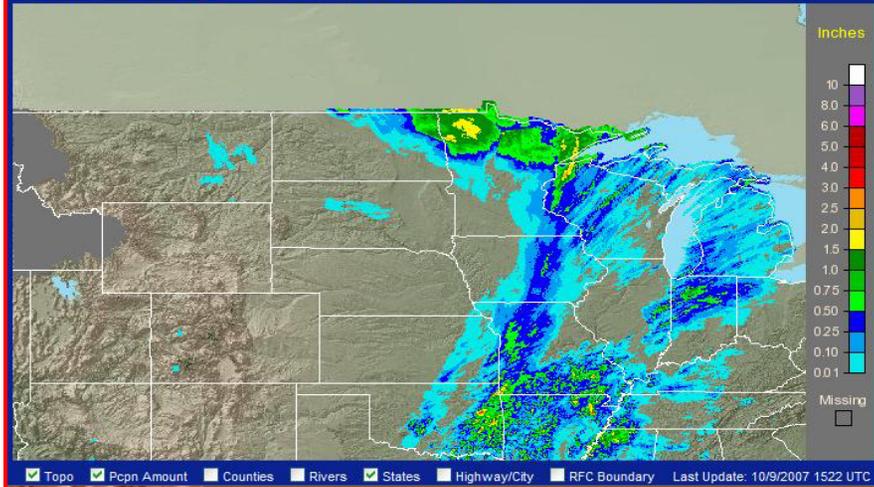


# 1) Improving Input Data Quality & Quantity;

NWS Central Region  
30-Day Observed Precipitation - Valid 10/9/2007 1200 UTC



NWS Central Region  
1-Day Observed Precipitation - Valid 10/9/2007 1200 UTC



1. Timeframe      » 2. Product      » 3. Location      » 4. Units

Current Data  
 Archive: Month/Year  
 Archive: Daily

October 9, 2007 - Today  
October 9, 2007 - Last 7 Days  
October 9, 2007 - Last 14 Days  
October 9, 2007 - Last 30 Days  
October 9, 2007 - Last 60 Days

Observed

States  
 NWS RFC/Regions  
 NWS WFOs

CONUS + Puerto Rico  
Alabama  
Arizona  
Arkansas  
California

English  
 Metric

Missing Data

Update URL for Bookmarking      Zoom Out to CONUS

Print/Save Map

<http://water.weather.gov>

**NOTE: If you would like to bookmark or share your current view, you must first click the "Update URL for Bookmarking" button. The URL in your browser window can then be bookmarked or shared.**

Ask questions about the Precipitation Analysis website

Images    Download    About NWS Precip Analysis    Other Useful Information    Survey & Feedback    Regional / RFC Precip Data

CONUS + Puerto Rico: Current 1-Day Observed Precipitation  
Valid at 10/9/2007 1200 UTC - Created 10/9/07 15:35 UTC

Inches

10  
8.0  
6.0  
5.0  
4.0  
3.0  
2.5  
2.0  
1.5  
1.0  
0.75  
0.50  
0.25  
0.10  
0.01

Missing Data

Topo  Pcpn Amount  Counties  Rivers  States  Highway/City  RFC Boundary

1. Timeframe      » 2. Product      » 3. Location      » 4. Units

Current Data  
 Archive: Month/Year  
 Archive: Daily

October 9, 2007 - Today  
October 9, 2007 - Last 7 Days  
October 9, 2007 - Last 14 Days  
October 9, 2007 - Last 30 Days  
October 9, 2007 - Last 60 Days

Observed

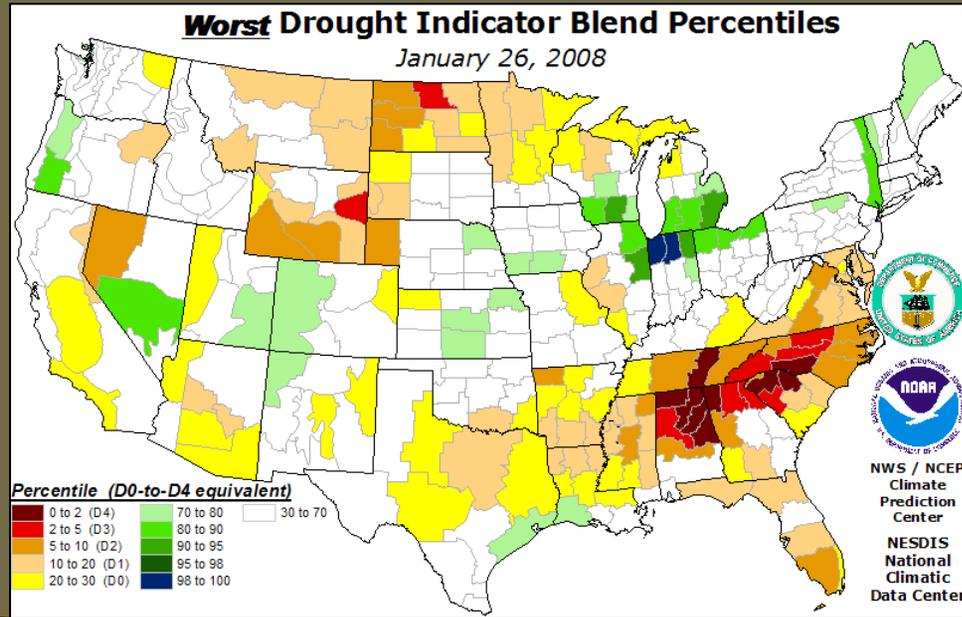
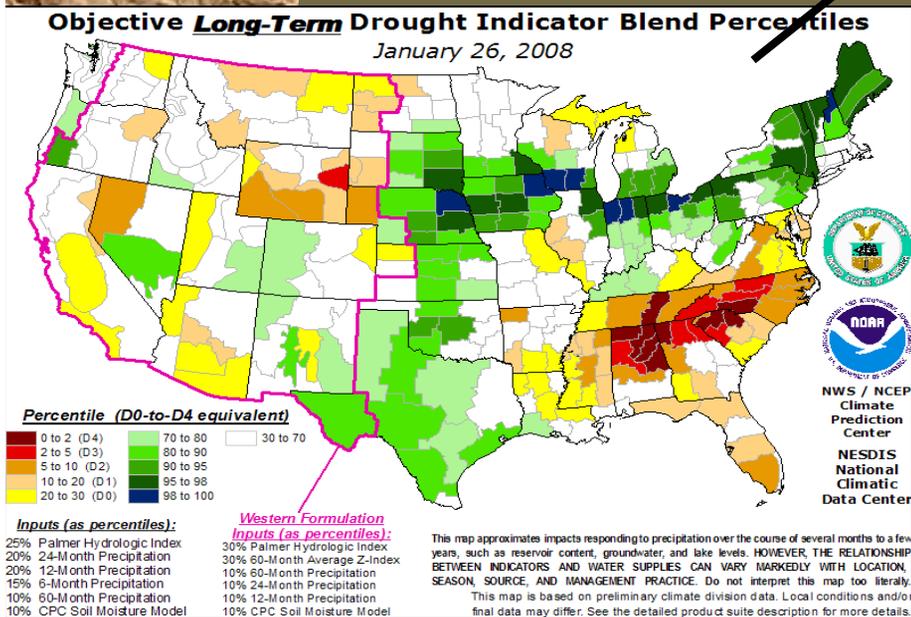
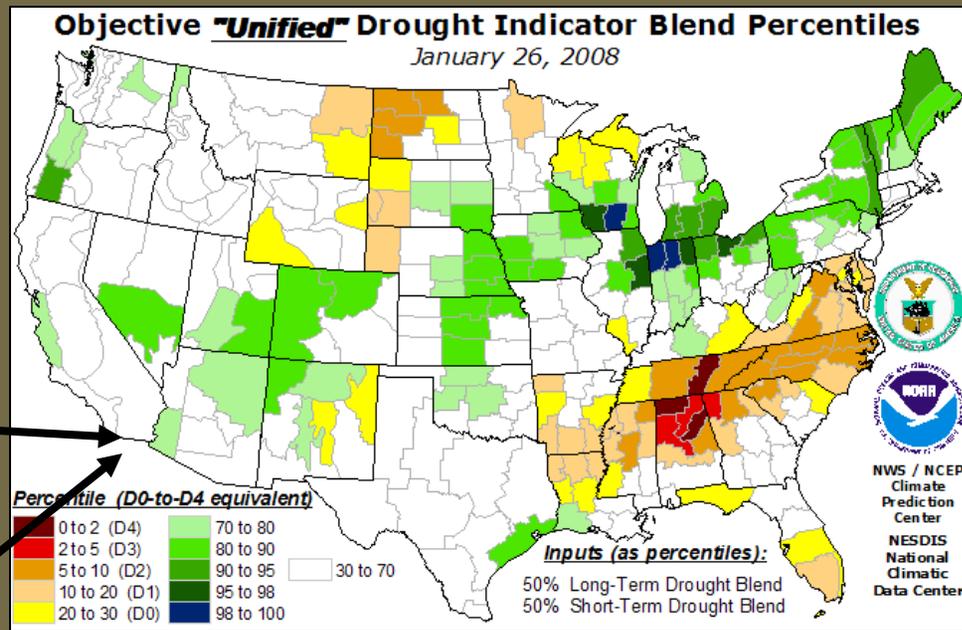
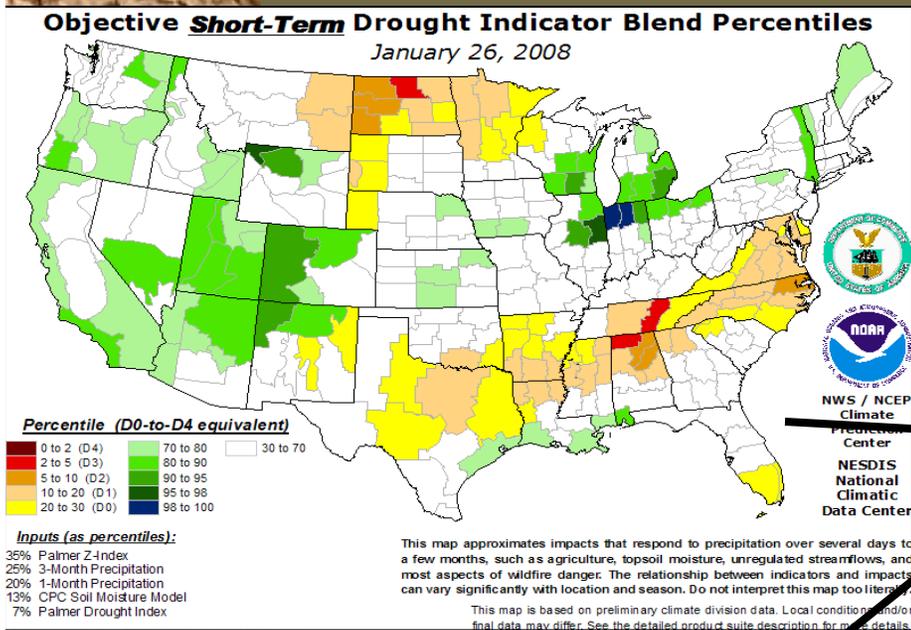
States  
 NWS RFC/Regions  
 NWS WFOs

CONUS + Puerto Rico  
Alabama  
Arizona  
Arkansas  
California

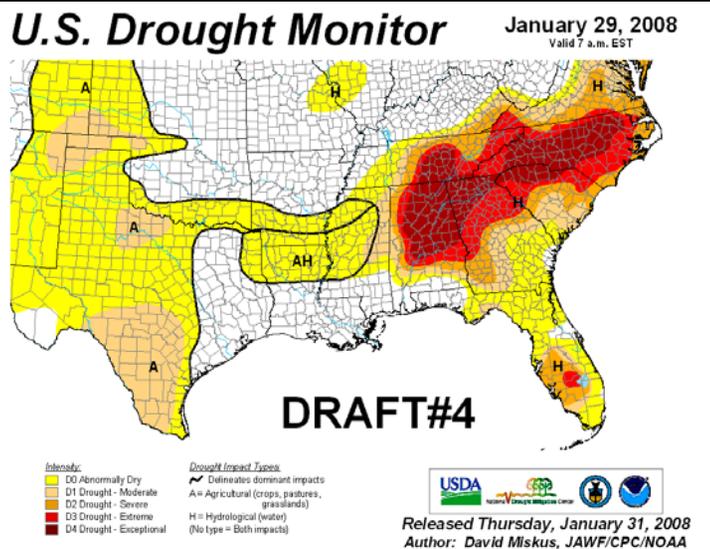
English  
 Metric

Missing Data

## 2) New Products, Indices, Blends for a more Objective Analyses, including Soil Moisture Models;

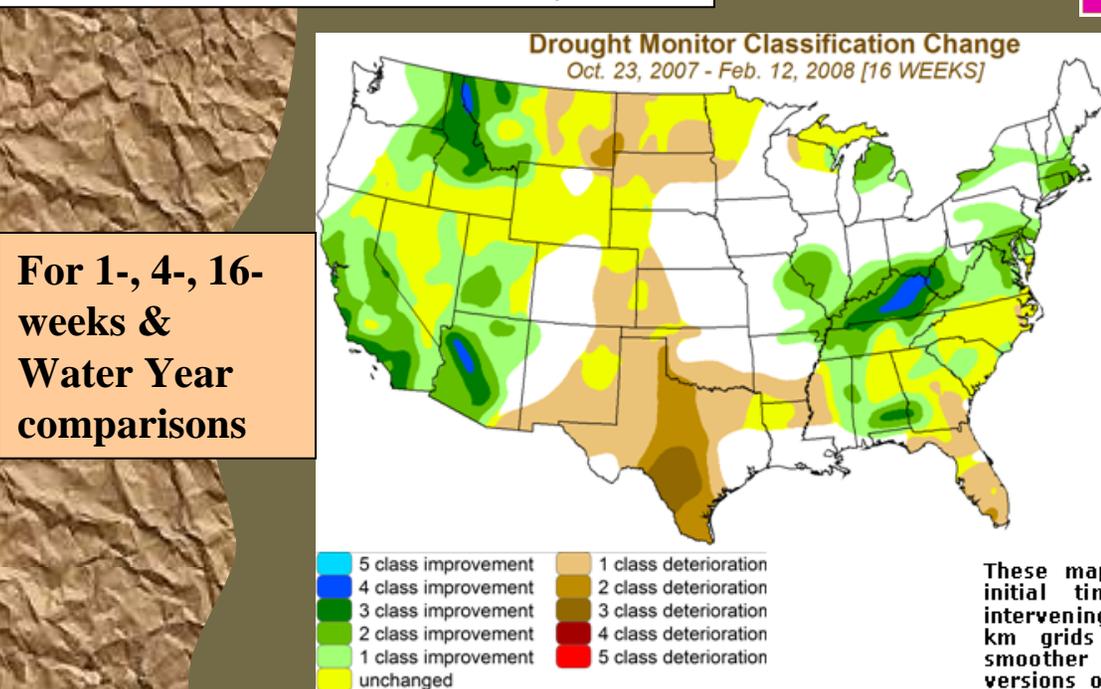
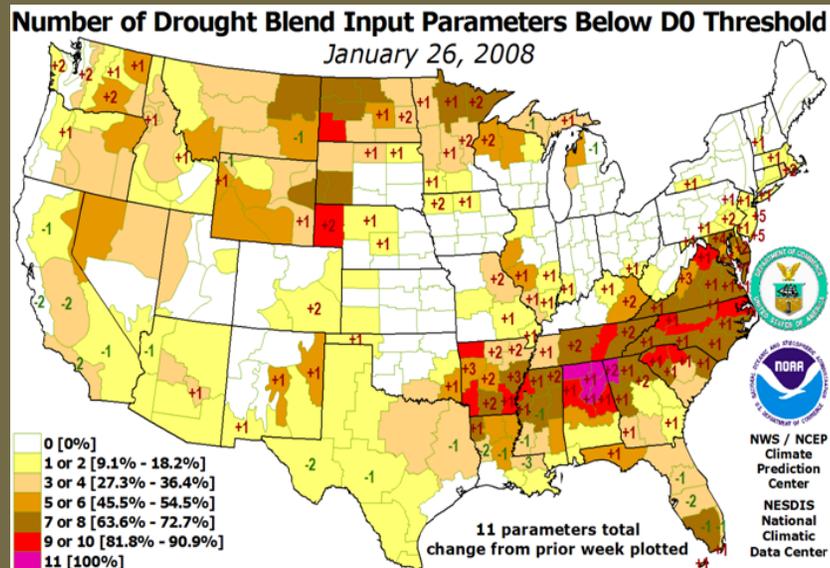


## 2) New Products, Indices, Blends for a more Objective Analyses, including Soil Moisture Models;



For D0-D4; 11 parameters & change from last week →

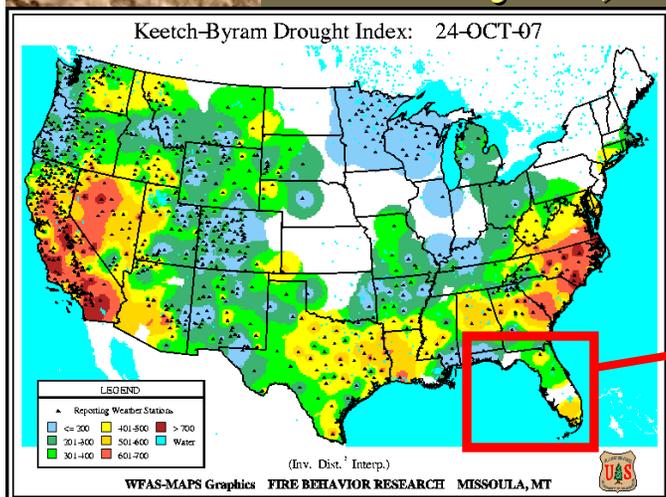
Four regional draft maps with counties ←



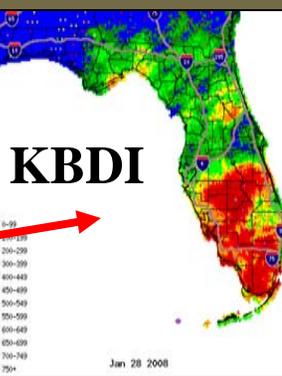
For 1-, 4-, 16-weeks & Water Year comparisons

These maps depict approximate changes in drought intensity from selected initial times to the current week, with no consideration given to intervening weeks. The difference calculations are based on interpolated 4 km grids of Drought Monitor classifications, and as a result, will be smoother than would similar products based directly on the published versions of the Drought Monitor.

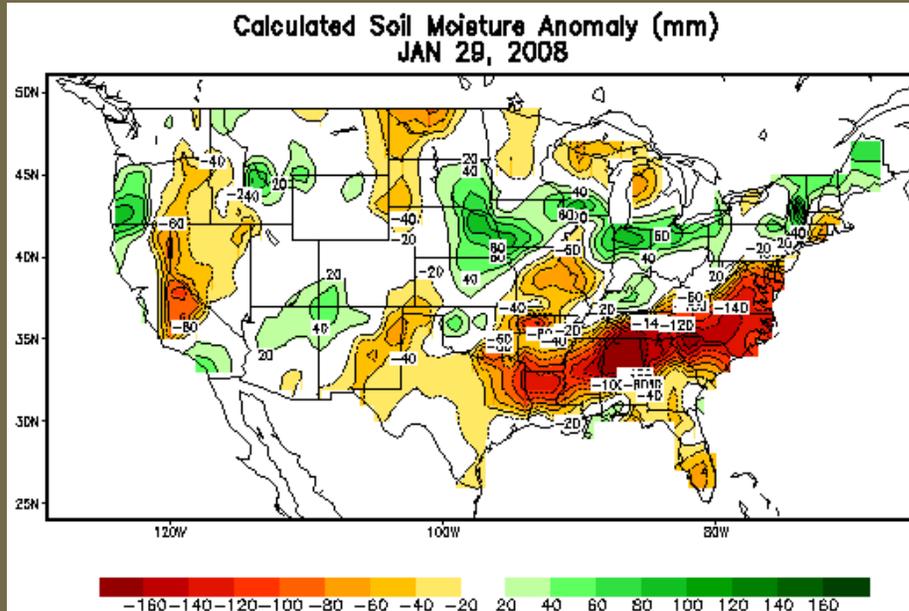
## 2) New Products, Indices, Blends for a more Objective Analyses, including Soil Moisture Models;



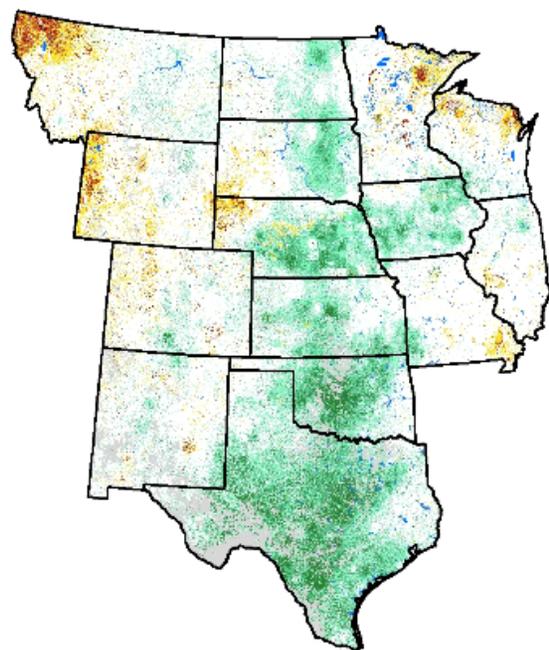
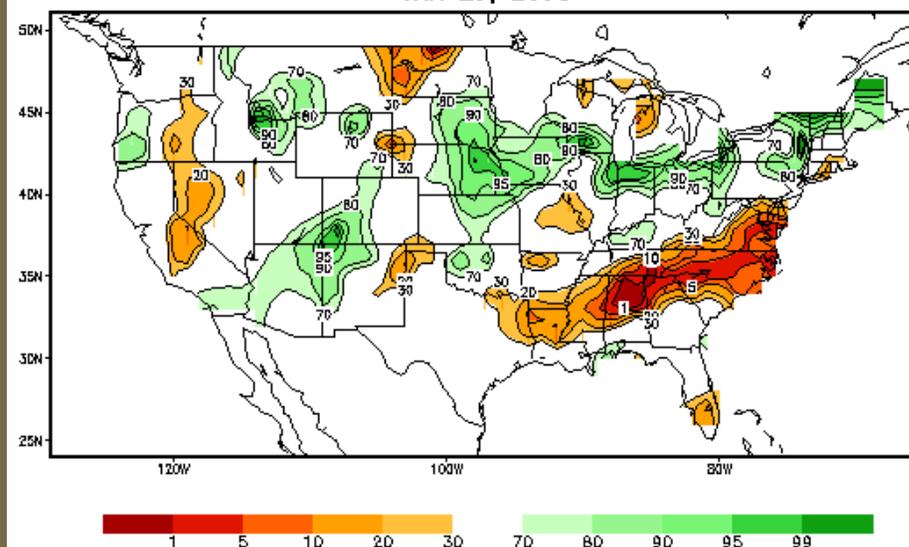
Vegetation Drought Response Index Complete



September 24, 2007



Calculated Soil Moisture Ranking Percentile  
JAN 29, 2008

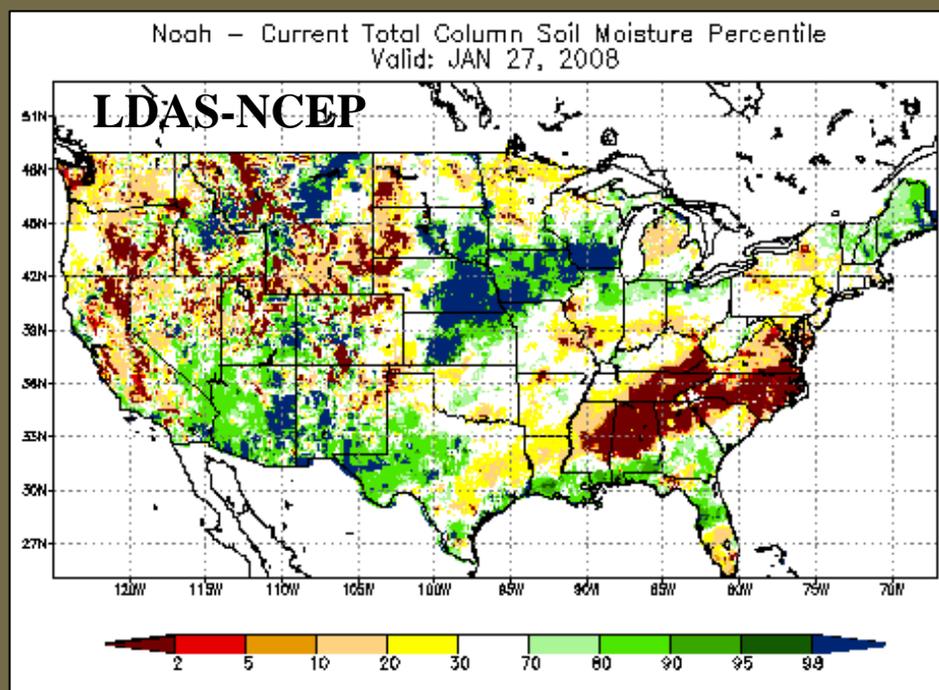
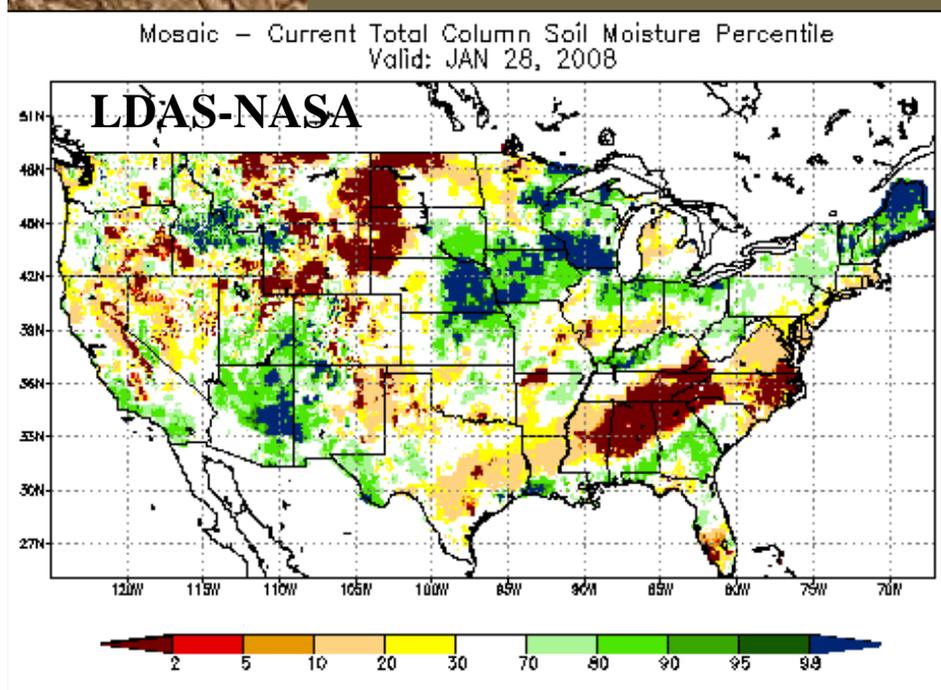
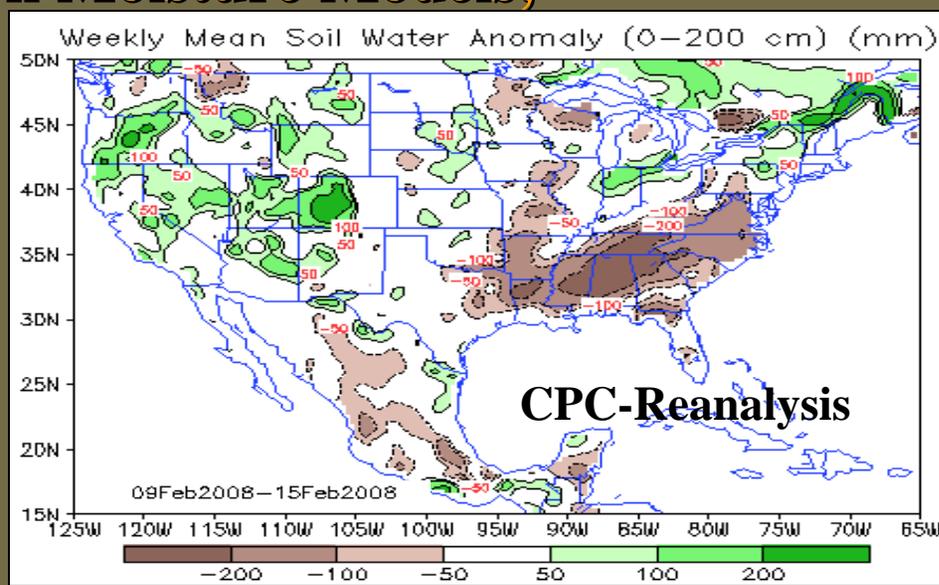
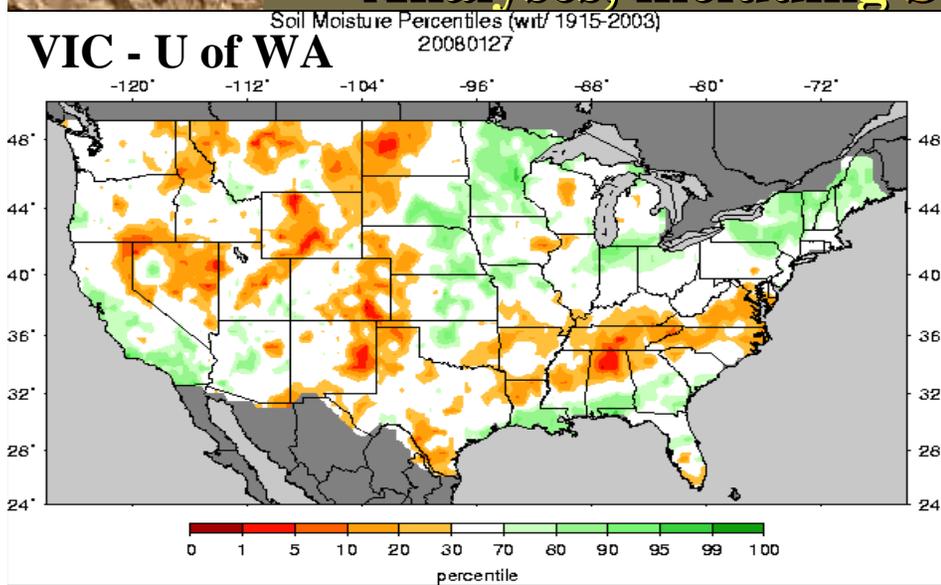


### Condition

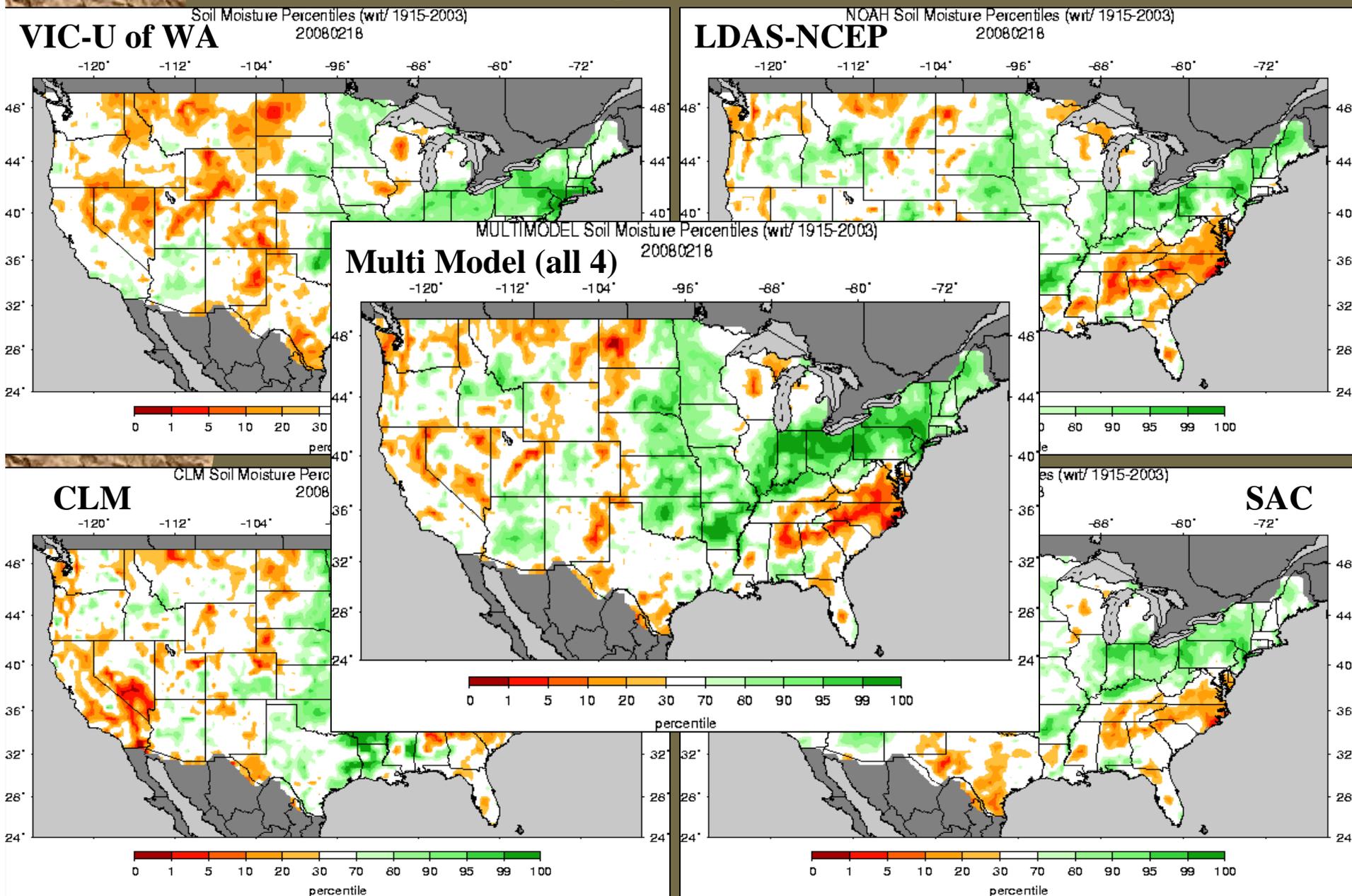
- Extreme Drought
- Severe Drought
- Moderate Drought
- Near Normal
- Unusually Moist Spell
- Very Moist Spell
- Extreme Moist Spell
- Out of Season
- Water



## 2) New Products, Indices, Blends for a more Objective Analyses, including Soil Moisture Models;



## 2) New Products, Indices, Blends for a more Objective Analyses, including Soil Moisture Models;

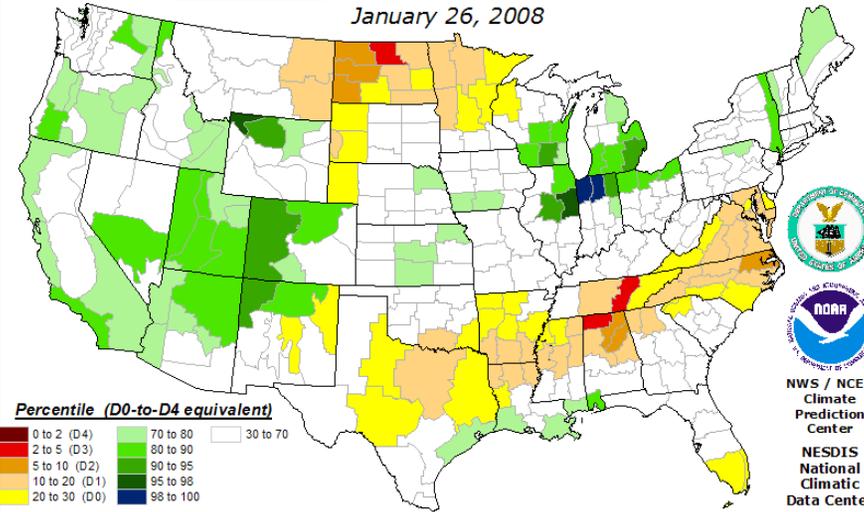


# 3) Temporal & Regional Drought Distinctions;

30-Days

## Objective **Short-Term** Drought Indicator Blend Percentiles

January 26, 2008

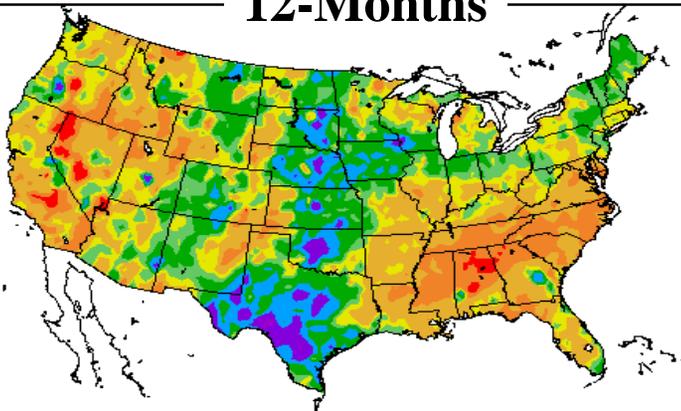


This map approximates impacts that respond to precipitation over several days to a few months, such as agriculture, topsoil moisture, unregulated streamflows, and most aspects of wildfire danger. The relationship between indicators and impacts can vary significantly with location and season. Do not interpret this map too literally.

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

Percent of Normal Precipitation (%)  
 1/30/2007 – 1/29/2008

12-Months

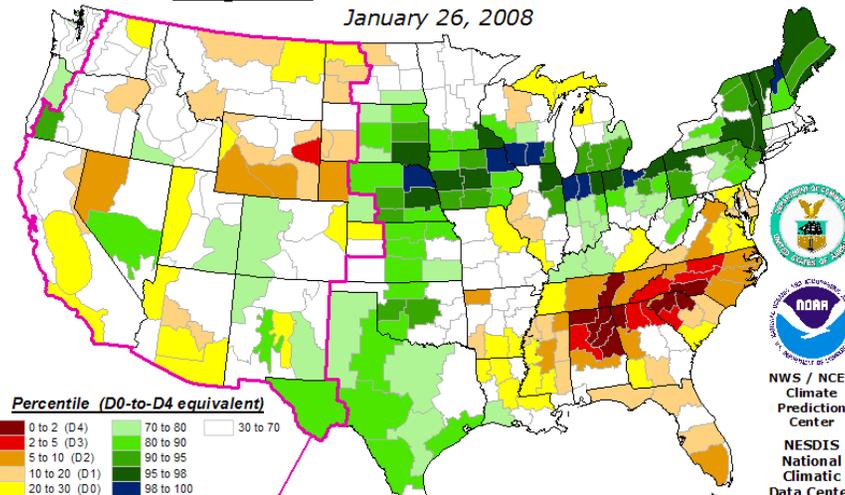


1/30/2008 at HPRCC using provisional data.

NOAA Regional Climate

## Objective **Long-Term** Drought Indicator Blend Percentiles

January 26, 2008

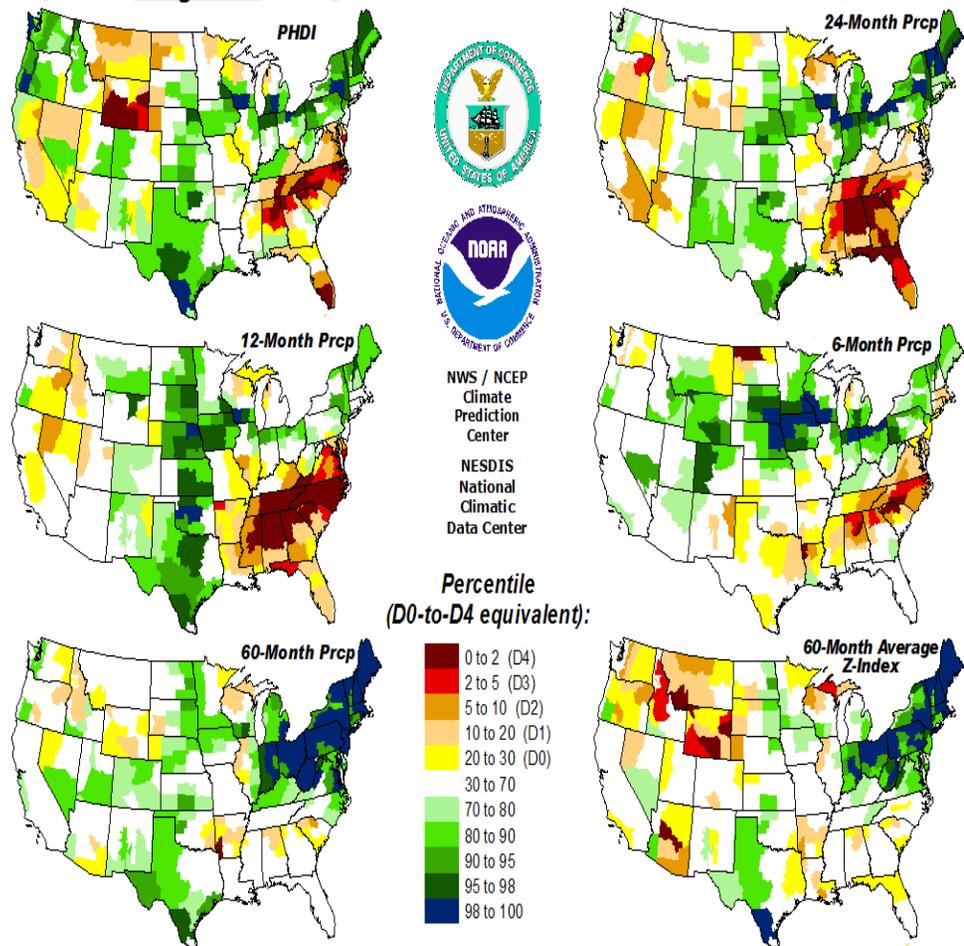


This map approximates impacts responding to precipitation over the course of several months to a few years, such as reservoir content, groundwater, and lake levels. HOWEVER, THE RELATIONSHIP BETWEEN INDICATORS AND WATER SUPPLIES CAN VARY MARKEDLY WITH LOCATION, SEASON, SOURCE, AND MANAGEMENT PRACTICE.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

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

### 3) Temporal & Regional Drought Distinctions;

Objective **Long-Term** Drought Indicator Blend Percentiles -- January 26, 2008



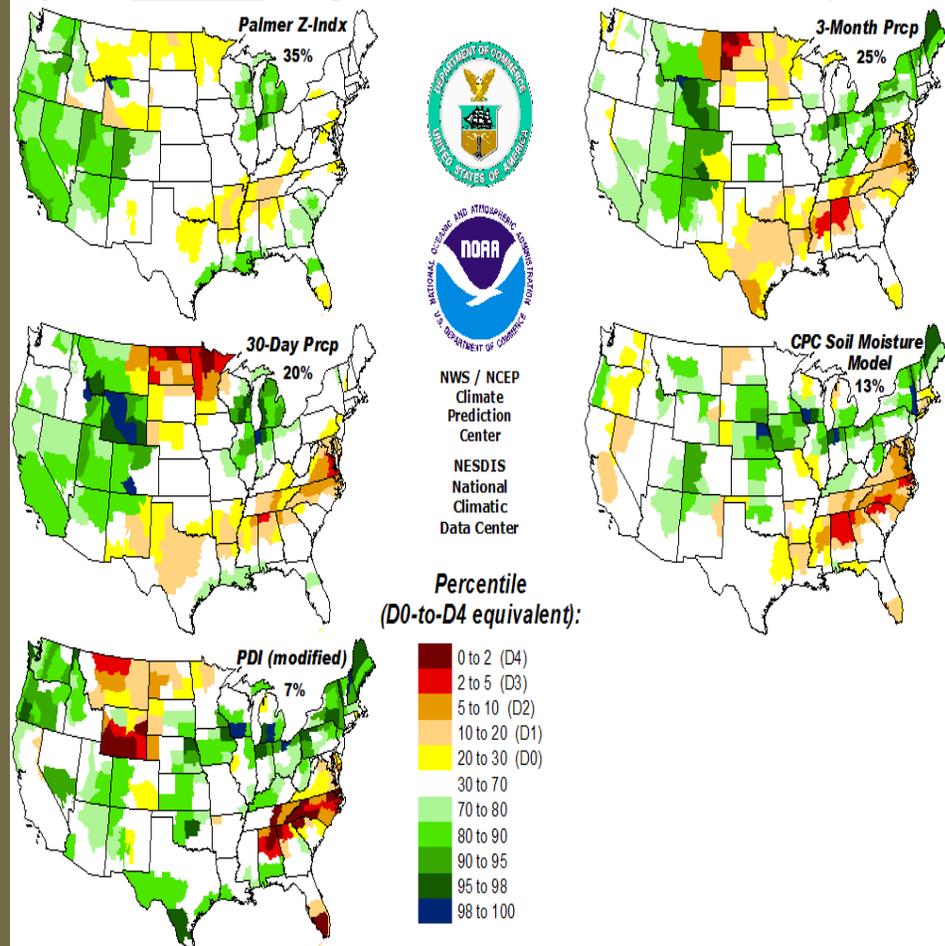
**Inputs (as percentiles):**

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

**Western Formulation Inputs (as percentiles):**

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

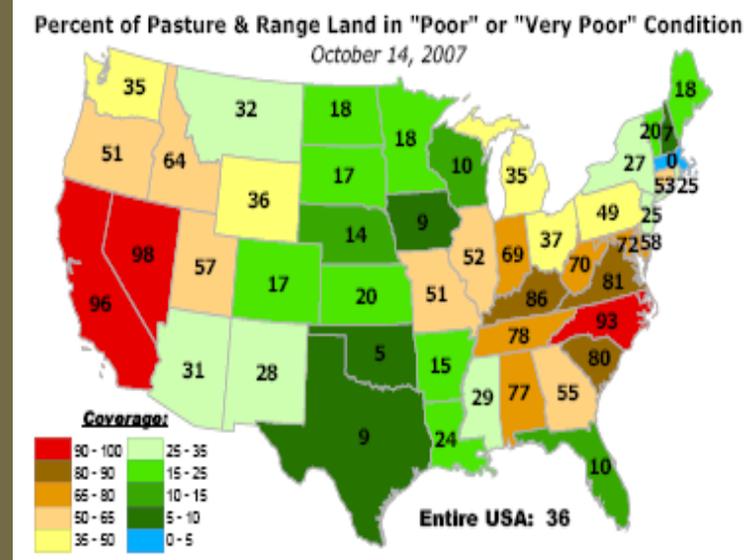
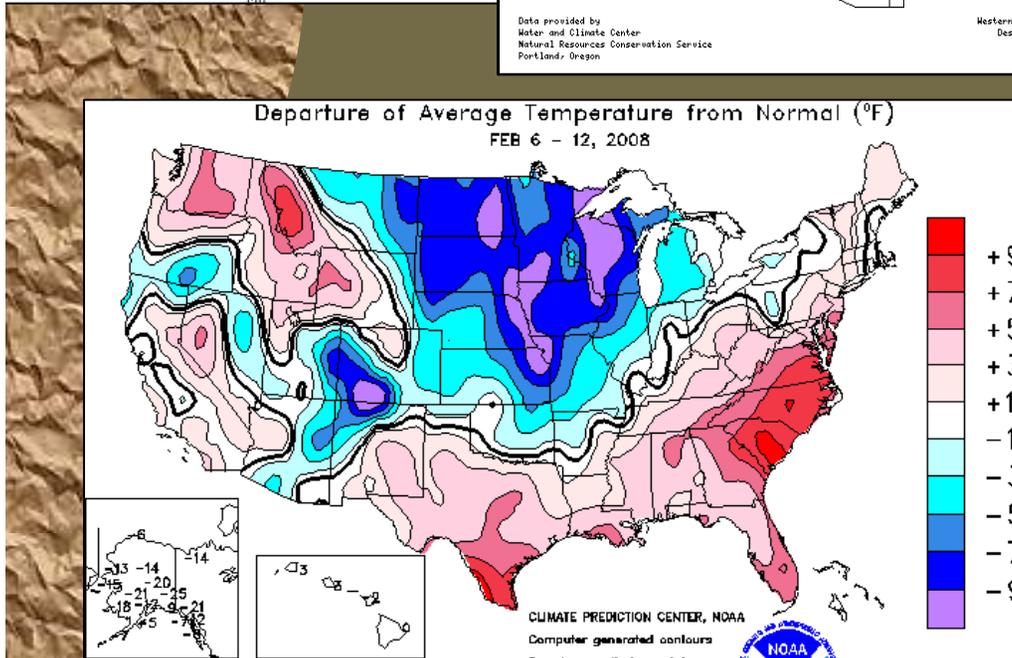
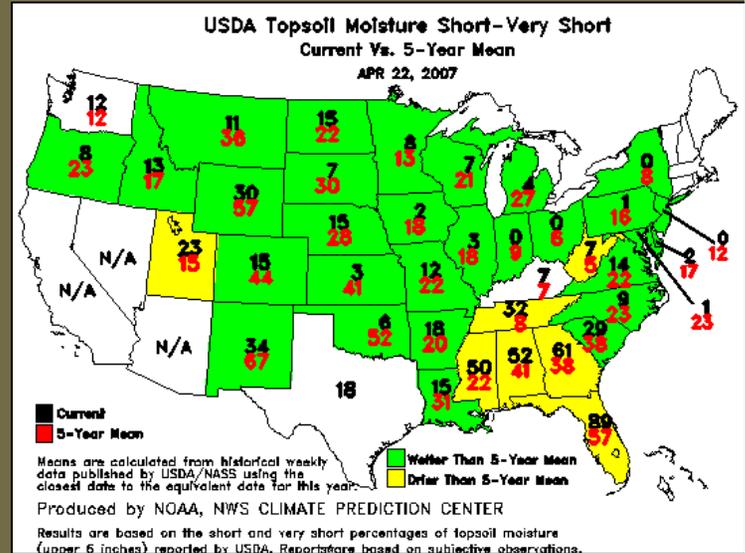
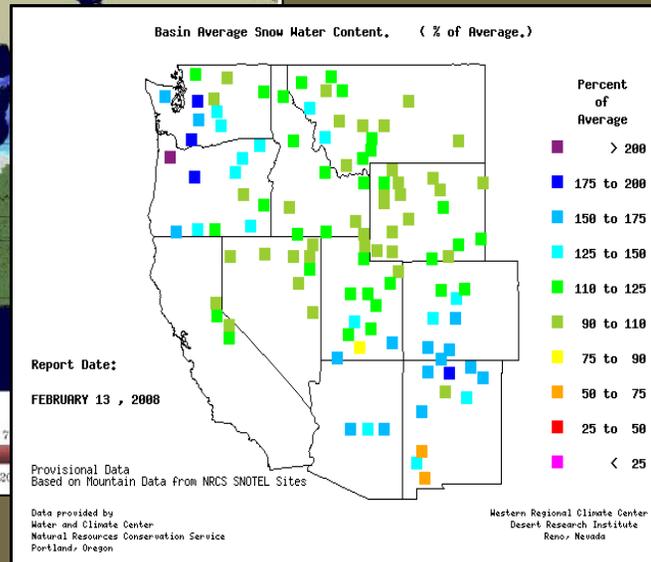
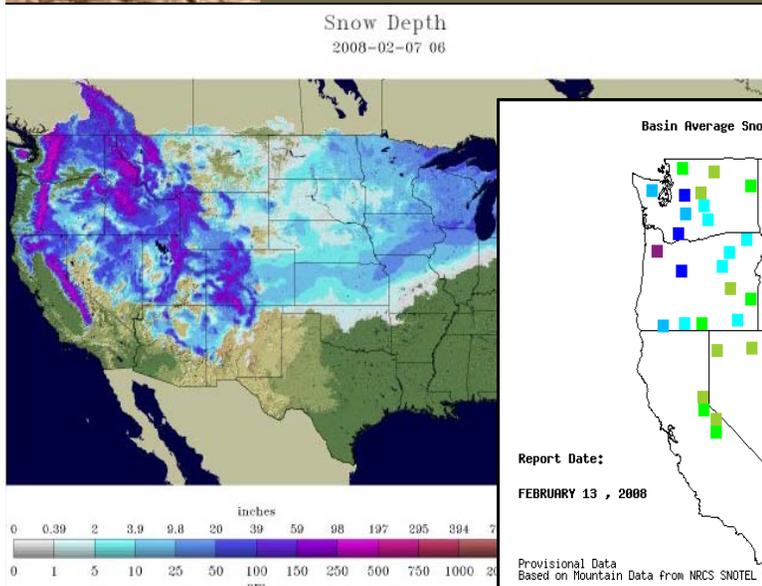
Objective **Short-Term** Drought Indicator Blend Percentiles -- January 26, 2008



**Inputs (as percentiles):**

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

### 3) Temporal & Regional Drought Distinctions; Seasons ... Winter vs. Summer

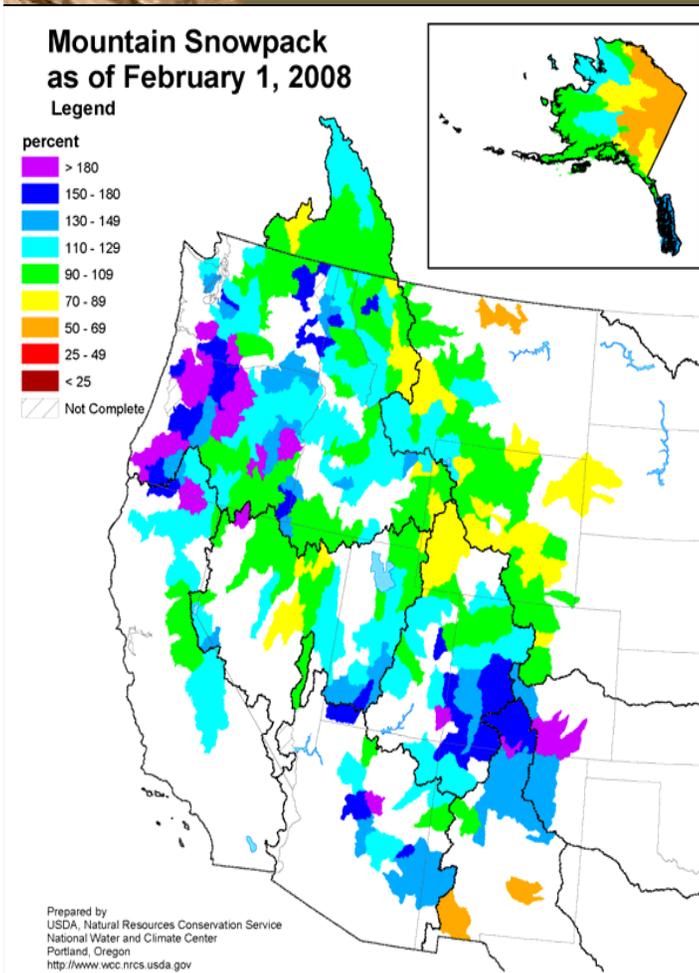


### 3) Temporal & Regional Drought Distinctions;

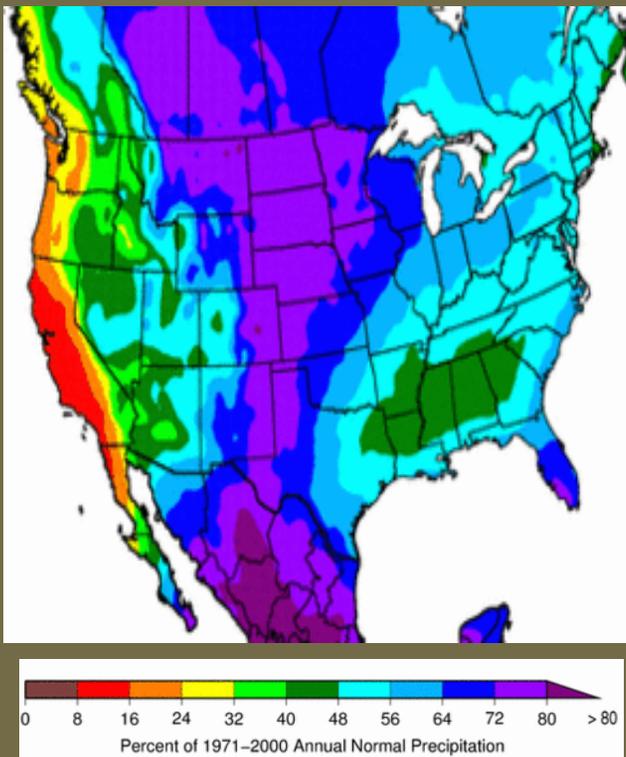
West

Plains

East & South

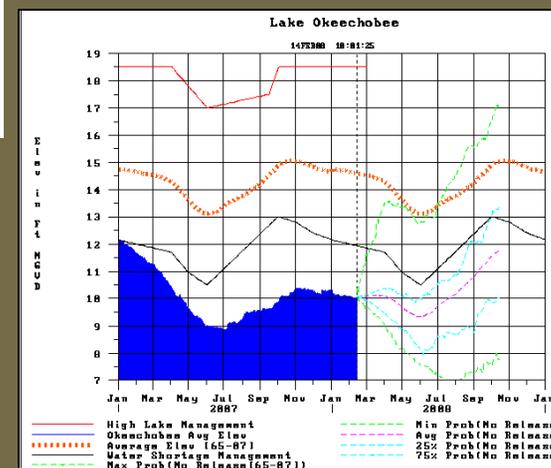
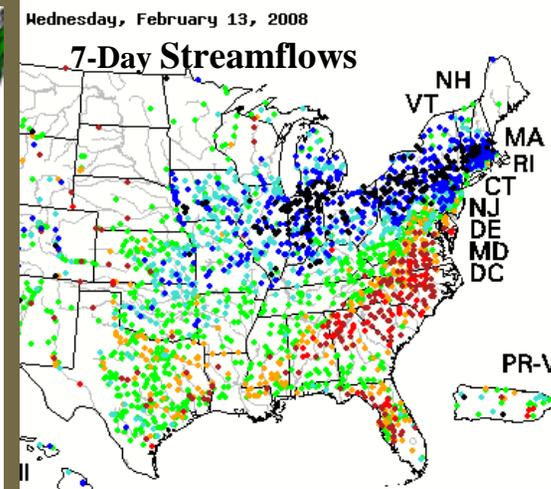


Winter Mountain Snowpack



Percent of Normal Annual Precipitation (Apr-Sep)

Spring & Summer (Growing Season)

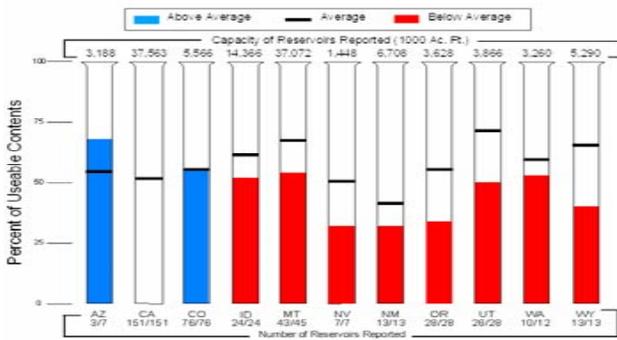


Year-Round (Even Precip Distribution)

# 3) Temporal & Regional Drought Distinctions;

West

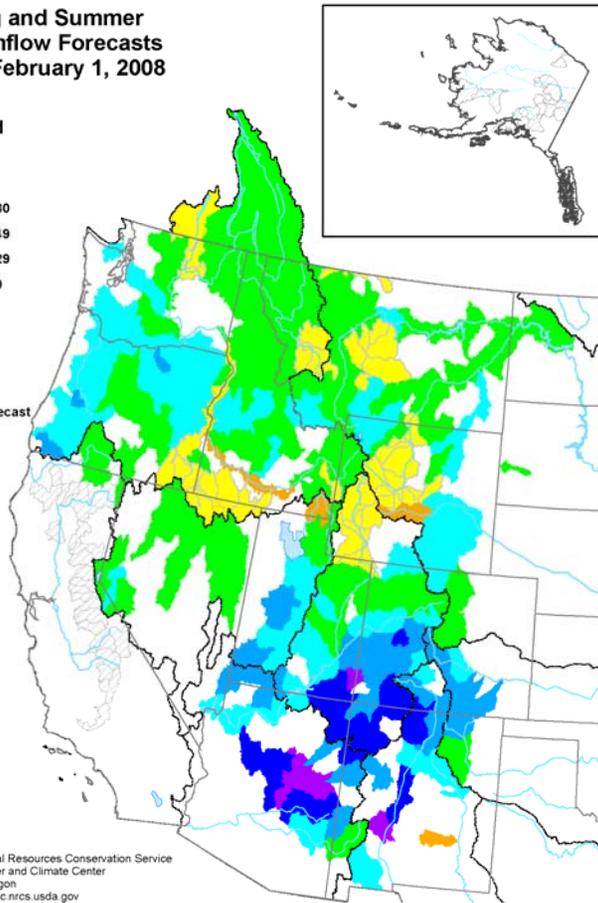
Reservoir Storage as of February 1, 2008



Prepared by: USDA, Natural Resources Conservation Service, National Water and Climate Center, Portland, OR  
<http://www.wcc.nrcs.usda.gov>

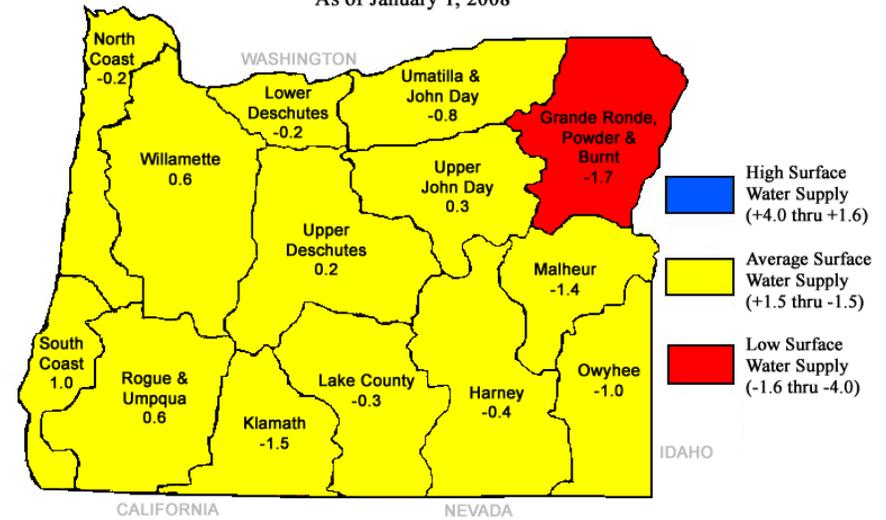
Spring and Summer Streamflow Forecasts as of February 1, 2008

Legend



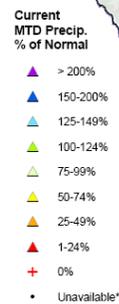
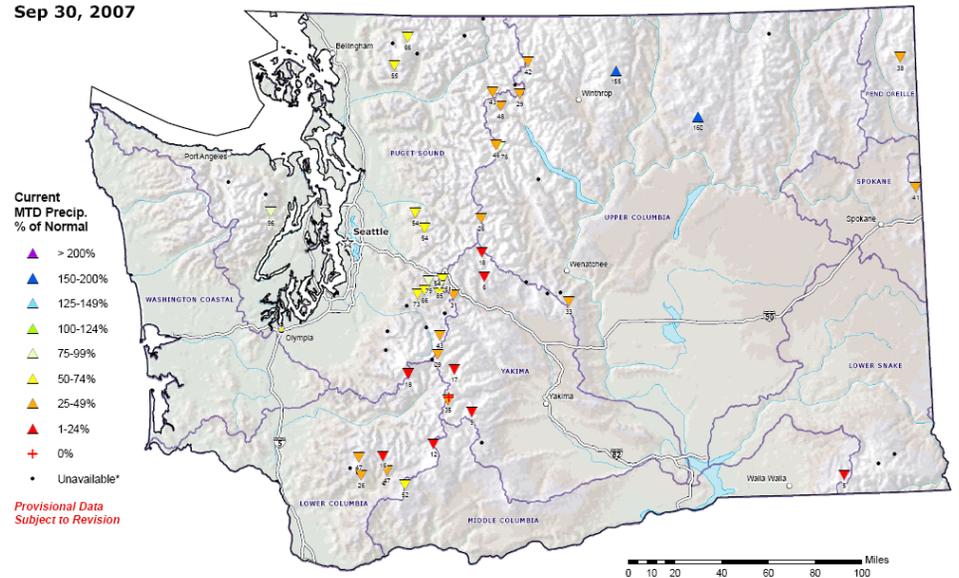
Prepared by  
 USDA, Natural Resources Conservation Service  
 National Water and Climate Center  
 Portland, Oregon  
<http://www.wcc.nrcs.usda.gov>

OREGON SURFACE WATER SUPPLY INDEX (SWSI)  
 As of January 1, 2008



Washington  
 SNOTEL Month to Date (MTD) Precipitation  
 % of Normal

Sep 30, 2007



Provisional Data  
 Subject to Revision



Prepared by the  
 USDA/NRCS National Water and Climate Center  
 Portland, Oregon  
<http://www.wcc.nrcs.usda.gov/gis/>

\* Data unavailable at time of posting or unavailable long-term normal

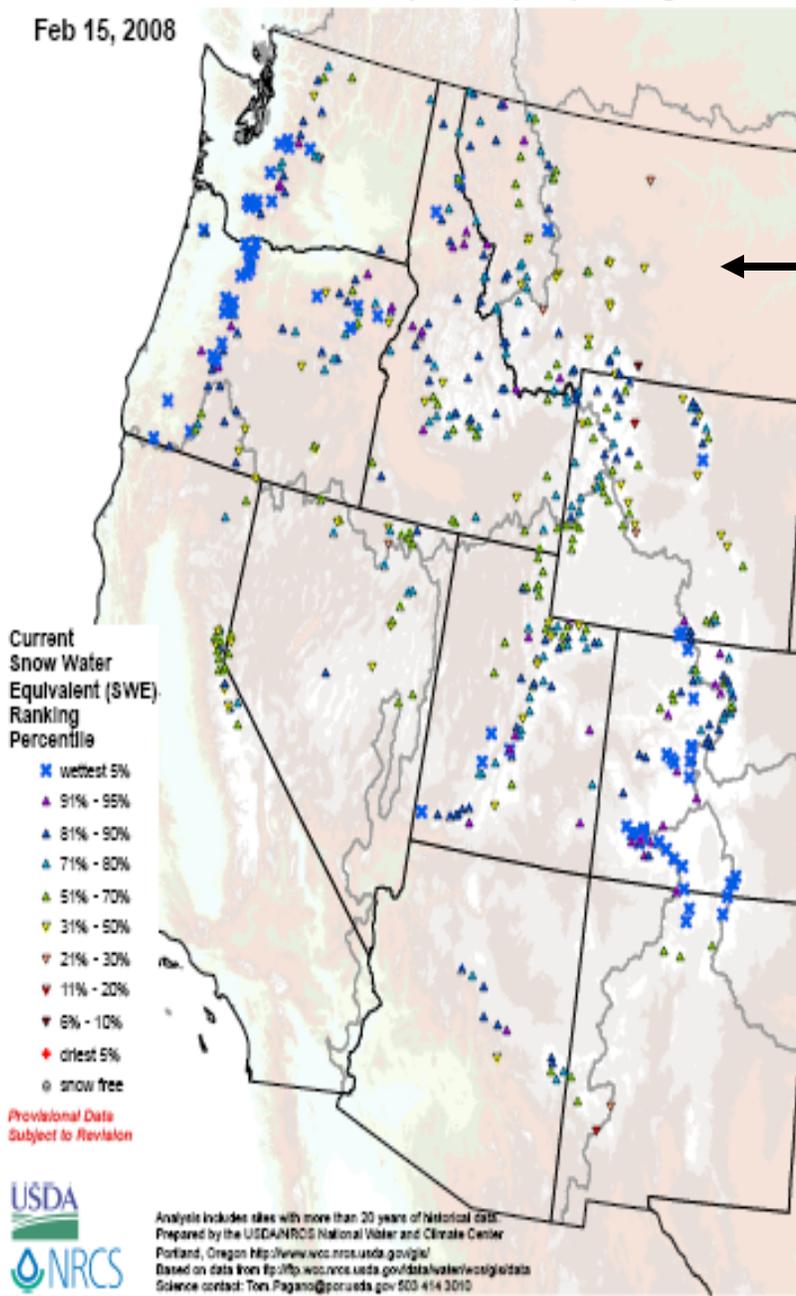
# 3) Temporal & Regional Drought Distinctions;

## West

## Snow

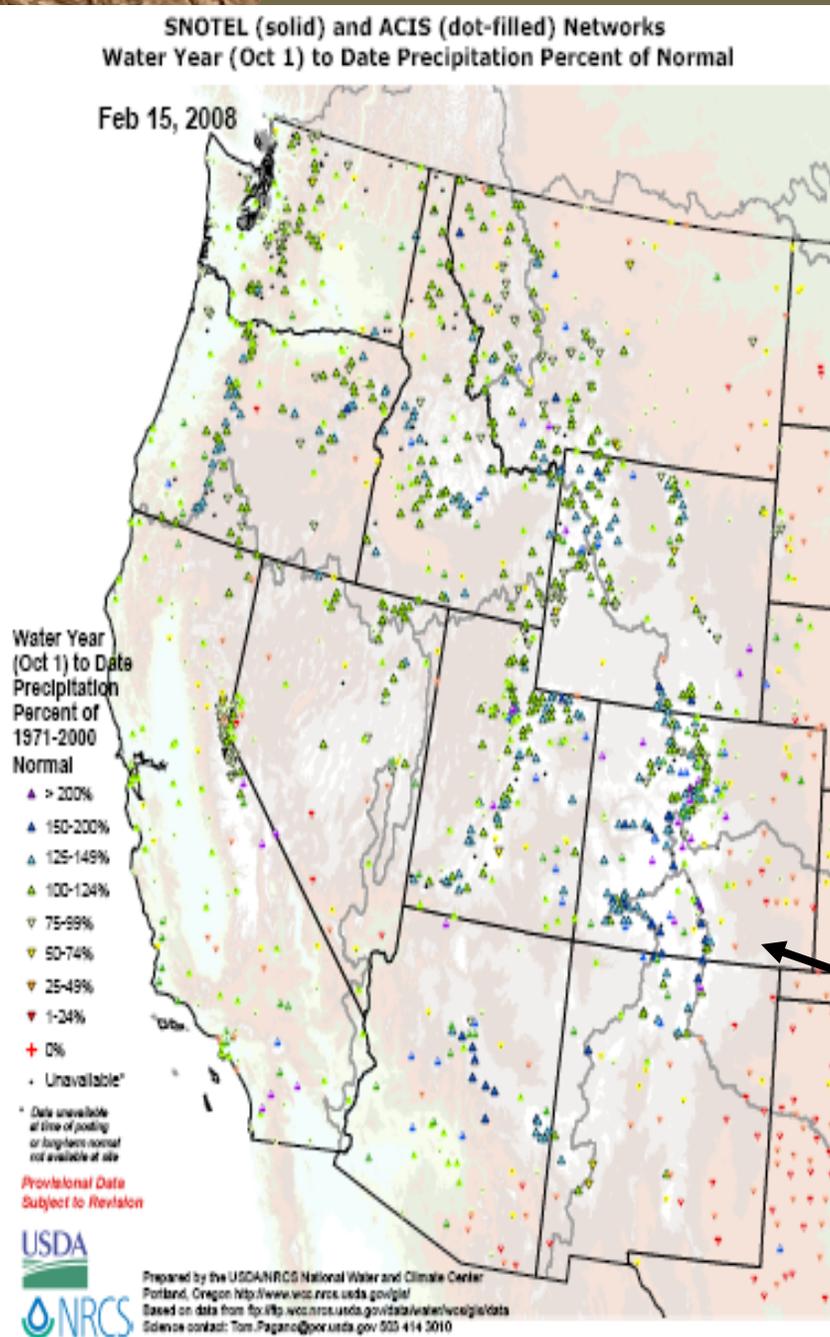
SNOTEL Current Snow Water Equivalent (SWE) Ranking Percentile

Feb 15, 2008

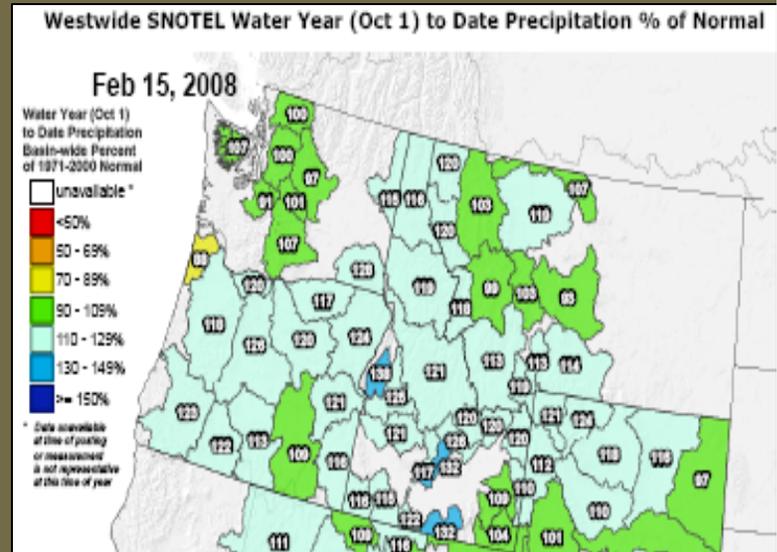


SNOTEL Snow Water Equivalent	Current	1st of Month	Change
West-wide maps	<input type="checkbox"/> % of Normal <input type="checkbox"/> Percentile <input type="checkbox"/> Record <input type="checkbox"/> % of Normal Peak	-	-
State maps <b>NEW</b>	<input type="checkbox"/> % of Normal Select a State	-	-
SNOTEL & Snow Course Snow Water Equivalent	Current	1st of Month	Change
West-wide maps	<a href="#">% of Normal</a>	-	-
State/basin maps	<a href="#">% of Normal for Alaska</a>  % of Normal by River Basin: <a href="#">Arkansas, Colorado and Rio Grande</a> <a href="#">Columbia</a> <a href="#">Great Basin and California</a> <a href="#">Missouri</a>	-	-
SNOTEL Snow Depth	Current	1st of Month	Change
West-wide maps	<input type="checkbox"/> Snow Depth	-	<input type="checkbox"/> 1 Day <input type="checkbox"/> 3 Day <input type="checkbox"/> 7 Day
State maps <b>NEW</b>	<input type="checkbox"/> Snow Depth Select a State	-	-
SNOTEL Snow Density	Current	1st of Month	Change
West-wide maps	<input type="checkbox"/> Snow Density	-	-
State maps <b>NEW</b>	<input type="checkbox"/> Snow Density Select a State	-	-

### 3) Temporal & Regional Drought Distinctions;



West



## Precipitation

#### GIS Products

#### Precipitation

### ACIS + SNOTEL data

Note: Please manually reload .PDF files in internet browser to ensure you have the latest data.

SNOTEL Precipitation	Month to Date	Water Year to Date
West-wide Maps	<a href="#">% of Normal</a> <a href="#">% of Monthly Total Normal</a>	<a href="#">% of Normal</a> <a href="#">% of Annual Total Normal</a> <a href="#">Percentile</a> <a href="#">Record</a>
State Maps <b>NEW</b>	<a href="#">% of Normal</a> Select a State	<a href="#">% of Normal</a> Select a State
SNOTEL & ACIS Precipitation	Month to Date	Water Year to Date
West-wide Maps	<a href="#">% of Normal</a>	<a href="#">% of Normal</a>
PRISM Precipitation	Month to Date	Water Year to Date
U.S. Maps	<a href="#">Total Monthly</a> <a href="#">Monthly % of Average</a>	-

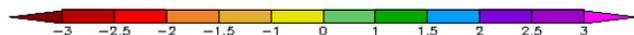
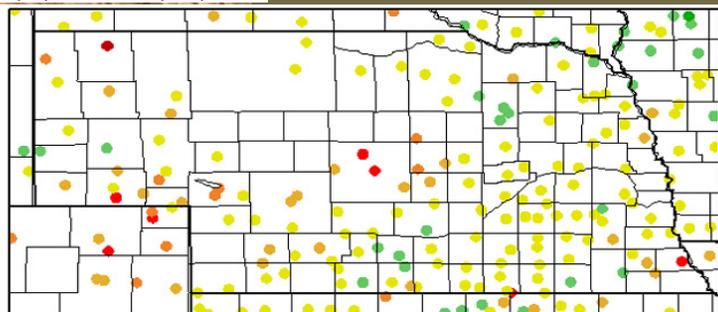
# 3) Temporal & Regional Drought Distinctions;

## Plains

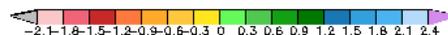
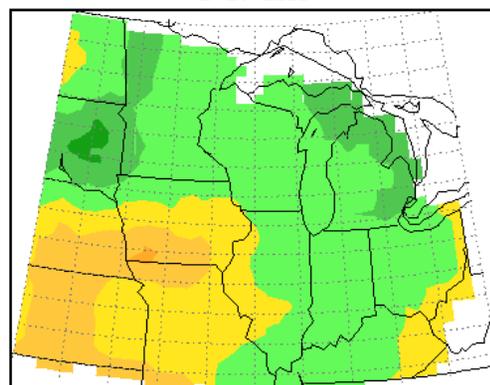
## Midwest

## East & South

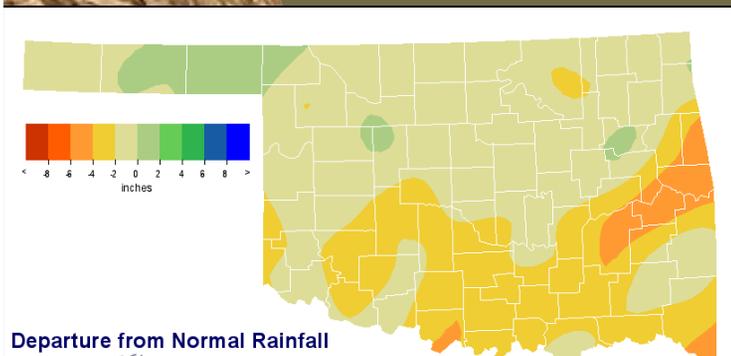
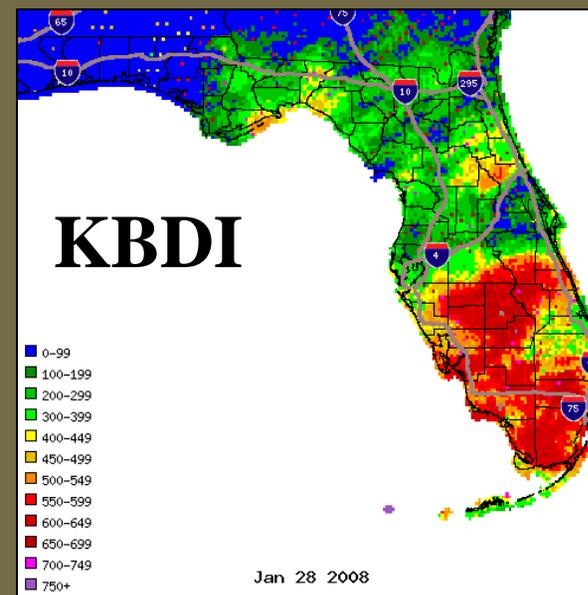
12-Month SPI  
9/1/2005 - 8/31/2006



Current Soil Moisture Deviation (inches), Depth = 0-12  
2-21-2008



Midwestern Regional Climate Center  
Illinois State Water Survey  
Champaign, Illinois

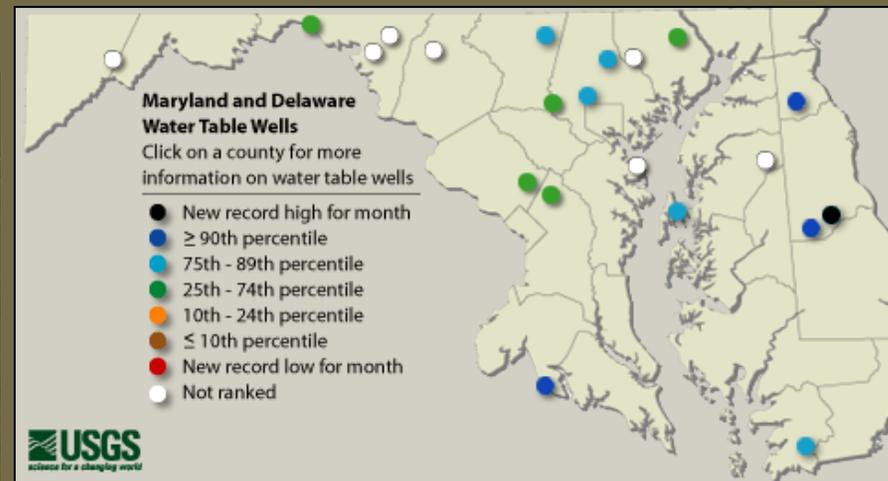


Departure from Normal Rainfall

Oklahoma Climatological Survey  
Last 90 Days  
Nov 16, 2007 through Feb 13, 2008  
Copyright © 2008 Oklahoma Climatological Survey. Rainfall data collected by Oklahoma Mesonet.

30-Day Precip for Texas  
Jan 15, 2008 through Feb 13, 2008

Climate Division	Total Rainfall	Departure from Normal	Pct of Normal	Driest since	Wettest since	Rank of 55 such periods	Driest on Record	Wettest on Record	30-day SPI (Amdt Score)	Most Like
Texas Statewide	1.25"	-0.37"	77 %	2003 (0.71")	2006 (1.78")	12th driest D4	0.42" (1943)	4.74" (1992)	-0.70 D6	1929 (9.38)
TX-CD1 (High Plains)	0.06"	-0.52"	11 %	1942 (0.04")	2006 (0.25")	2nd driest D3	0.04" (1942)	2.57" (1968)	-1.93 D3	1942 (9.77)
TX-CD2 (Low Rolling Plains)	0.09"	-0.93"	9 %	--	2006 (1.61")	1st driest D4	0.24" (1963)	4.76" (1990)	-2.96 D4	1988 (9.16)
TX-CD3 (N. Central)	1.15"	-0.91"	56 %	2003 (0.82")	2006 (3.07")	9th driest D1	0.54" (1988)	6.20" (1990)	-1.24 D1	1967 (9.52)
TX-CD4 (East Texas)	3.46"	-0.25"	93 %	2003 (1.45")	2006 (4.96")	19th wettest	0.62" (1943)	7.43" (2004)	+0.49	1966 (9.15)
TX-CD5 (Trans Pecos)	0.29"	-0.17"	63 %	1996 (0.24")	2006 (0.90")	4th driest D2	0.14" (1943)	3.96" (1992)	-1.64 D3	1962 (9.86)
TX-CD6 (Edwards Plateau)	0.32"	-0.84"	28 %	1996 (0.23")	2006 (1.48")	2nd driest D3	0.23" (1996)	6.23" (1992)	-2.20 D4	1943 (9.54)
TX-CD7 (S. Central)	2.06"	-0.16"	93 %	2006 (1.02")	2005 (2.94")	25th wettest	0.29" (1996)	7.14" (1992)	+0.13	1930 (9.27)
TX-CD8 (Upper Coast)	6.29"	+2.69"	175 %	2006 (2.40")	2004 (6.69")	3rd wettest	0.69" (1999)	8.20" (1992)	+1.75	1980 (8.22)
TX-CD9 (South)	0.92"	-0.26"	78 %	2006 (0.20")	2005 (1.52")	22nd driest	0.04" (1996)	4.94" (1941)	-0.20	1985 (9.44)
TX-CD10 (Lower Valley)	1.90"	+0.50"	136 %	2006 (0.19")	2001 (2.00")	18th wettest	0.02" (1943)	4.40" (1988)	+0.58	1989 (8.97)



Maryland and Delaware Water Table Wells  
Click on a county for more information on water table wells

- New record high for month
- ≥ 90th percentile
- 75th - 89th percentile
- 25th - 74th percentile
- 10th - 24th percentile
- ≤ 10th percentile
- New record low for month
- Not ranked



## 4) Utilizing State-of-the-Art Software (ArcGIS);

usdm-080129.mxd - ArcMap - ArcView

File Edit View Insert Selection Tools Window Help

1:22,728,066 56%

Task: Create New Feature Target:

Hawaii

- Drought\_Impacts\_Type
- Drought\_Impacts\_US
- stateHI
- maskHI
- Drought\_Areas\_US\_D2
- Drought\_Areas\_US\_D1
- Drought\_Areas\_US\_D0

Puerto Rico

- Drought\_Impacts\_Type
- cntryPR
- maskPR
- Drought\_Areas\_US\_D1
- Drought\_Areas\_US\_D0

CONUS

- Drought\_Impacts\_Type
- lakesCONUS
- stateCONUS
- riversCONUS
- climdivCONUS
- maskCONUS
- Drought\_Impacts\_US

**Can overlay a multitude of information**

**U.S. Drought Monitor** January 29, 2008  
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
- A = Agricultural (crops, pastures, grasslands)
- H = Hydrological (water)

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

<http://drought.unl.edu/dm>

USDA National Drought Mitigation Center

Released Thursday, January 31, 2008  
Author: David Miskus, JAWF/CPC/NOAA

Display Source Selection

Drawing Arial 24 B I U A

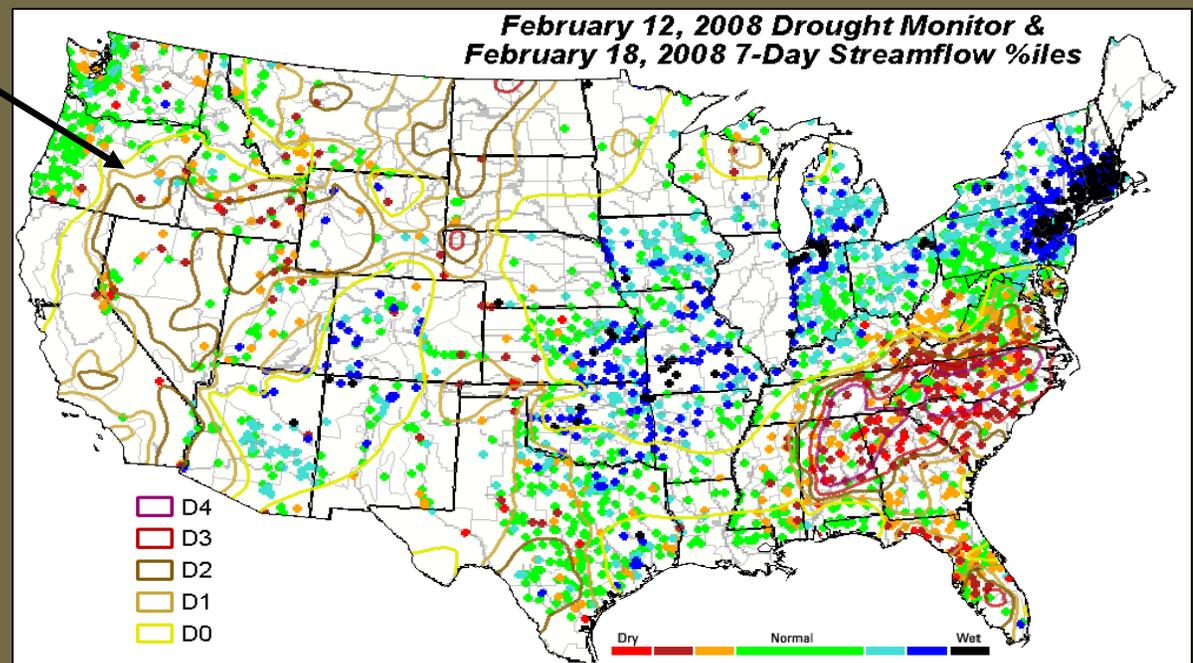
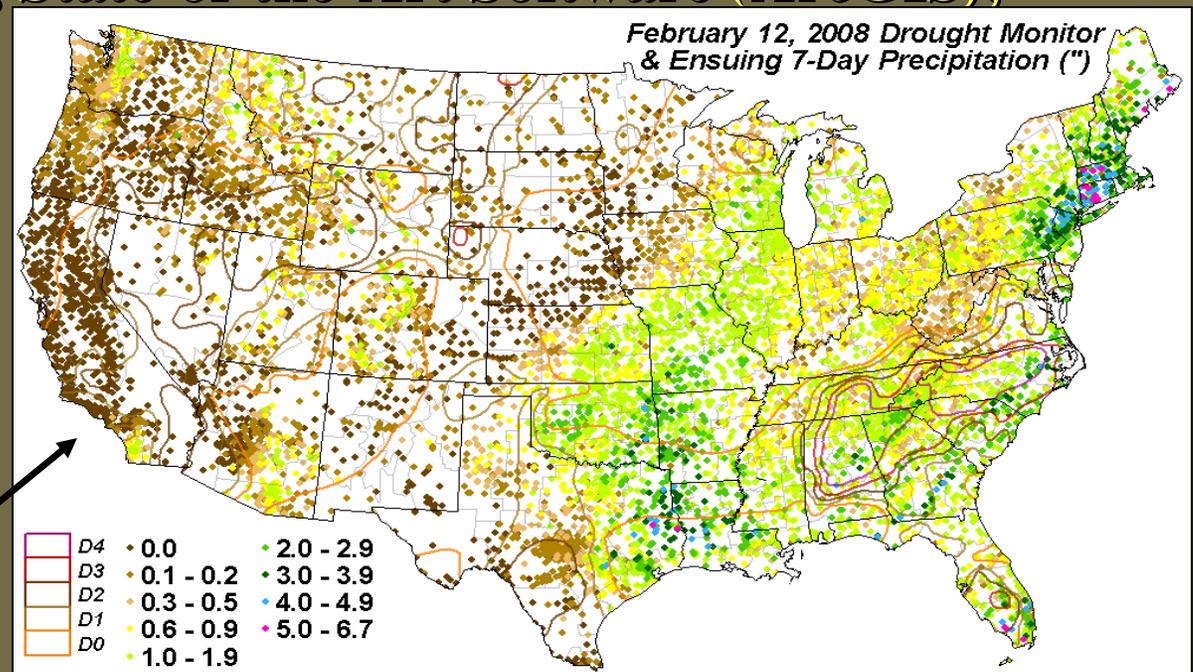
13.31 0.66 Inches

start DM-2008\_AgOutlook... usdm-080129.mxd - ... 2:35 PM

## 4) Utilizing State-of-the-Art Software (ArcGIS);

Some of our routine weekly GIS overlay products includes the past week's D0-D4 contours on the 7-day precipitation dot plot & on the 7-Day USGS stream flow percentiles

The same could be done to many of these other new USDM tools.

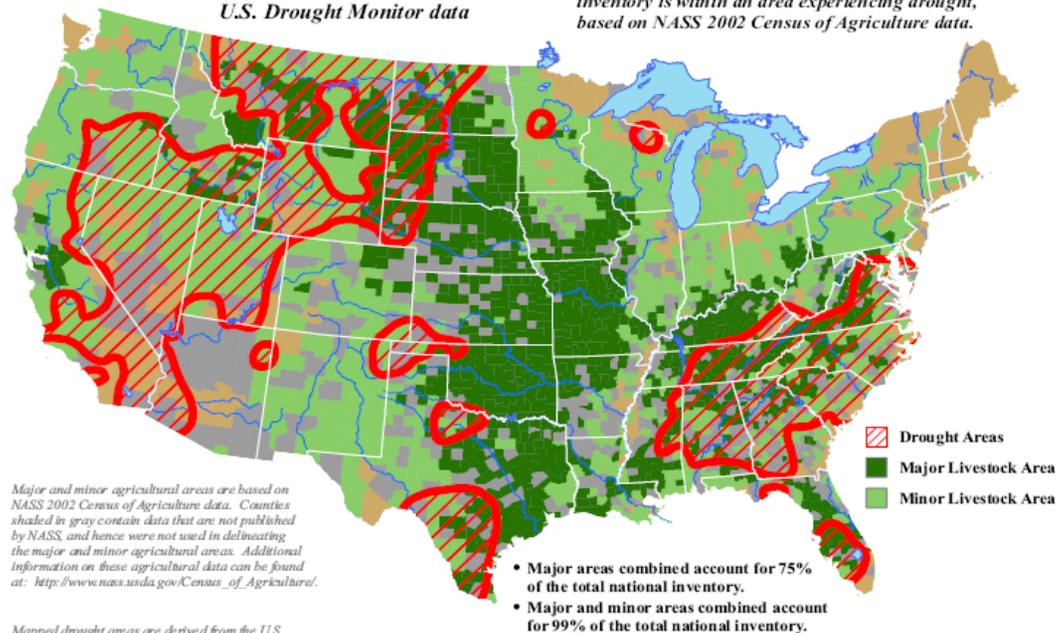


## 4) Utilizing the USDM with ArcGIS Applications;

### U.S. Beef Cow Areas Experiencing Drought

Reflects January 29, 2008  
U.S. Drought Monitor data

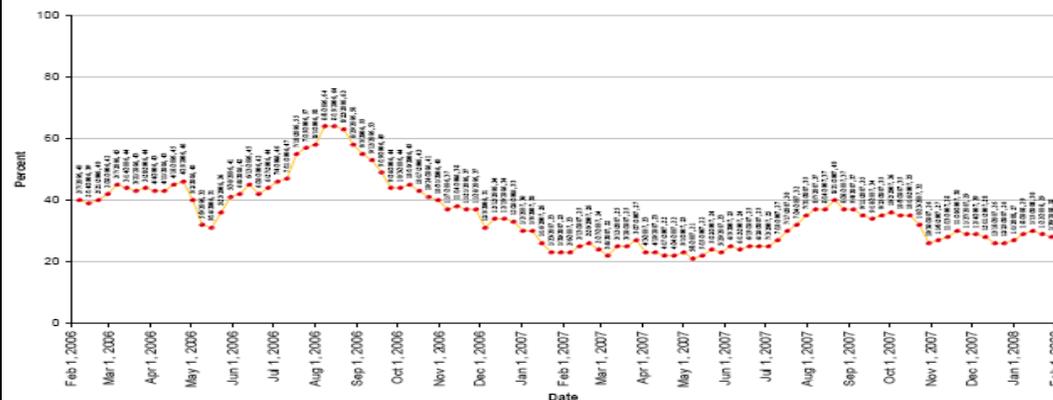
Approximately 28% of the domestic beef cow inventory is within an area experiencing drought, based on NASS 2002 Census of Agriculture data.



USDA World Agricultural Outlook Board  
Joint Agricultural Weather Facility

Shapefiles of the weekly USDM where drought  $\geq$  D1 are overlaid on U.S. Beef Cow area shapefiles, and weekly statistics are made.

United States Beef Cow Areas Located in Moderate or More Intense Drought (D1+)



USDA World Agricultural Outlook Board  
Joint Agricultural Weather Facility

## 5) One-Stop Drought Shopping = NIDIS;

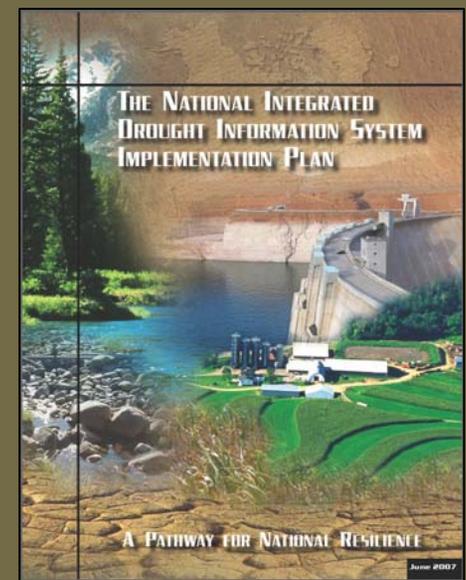
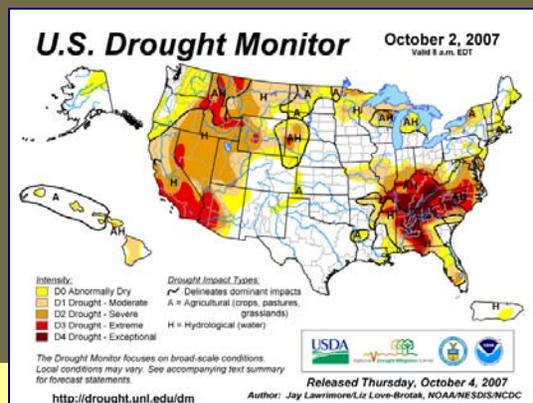
# What is NIDIS?

## A National Integrated Drought Information System (NIDIS)

### National Integrated Drought Information System

**NIDIS:** An integrated, **interagency** national drought monitoring and forecasting system that provides:

- An early warning & forecast system for drought.
- Drought impact and causation education.
- Information for drought mitigation.
- An interactive, web-based drought portal.
- Improved observational capabilities.



**NIDIS Builds Upon Collaborative Successes!**

# NIDIS Interagency Partners

## *Federal Level*

**U.S. Department of Agriculture (USDA):** Agricultural Research Service, Cooperative State Research, Education, Farm Service Agency, Forest Service, National Agricultural Statistics Service, Natural Resources Conservation Service, Risk Management Agency

**U.S. Department of Commerce (DoC):** International Trade Administration, National Oceanic and Atmospheric Administration

**U.S. Department of Energy (DoE):** Office of Electricity Delivery and Energy Reliability, Office of Energy Efficiency & Renewable Energy, Office of Science

**U.S. Department of Homeland Security (DHS):** Federal Emergency Management (FEMA) Directorate

**U.S. Department of the Interior (DoI):** Bureau of Indian Affairs, Bureau of Land Management, Bureau of Reclamation, National Park Service, U.S. Fish and Wildlife Service, U.S. Geological Survey,

**U.S. Department of Transportation (DoT):** Federal Aviation Administration, Federal Highway Administration, Surface Transportation Board

**Environmental Protection Agency (EPA)**

**Farm Credit Administration (FCA)**

**Federal Energy Regulatory Commission (FERC)**

**Internal Revenue Services**

**International Trade Commission (USITC)**

**National Aeronautics and Space Administration (NASA)**

**National Science Foundation (NSF)**

**Small Business Administration (SBA)**



# NIDIS Interagency Partners

## Regional, State, Tribal, and Local Levels

Western Governors' Association – a key sponsor of early NIDIS development efforts and ongoing concerns representing drought in the Western States;

Western States Water Council – represents water managers in the Western United States;

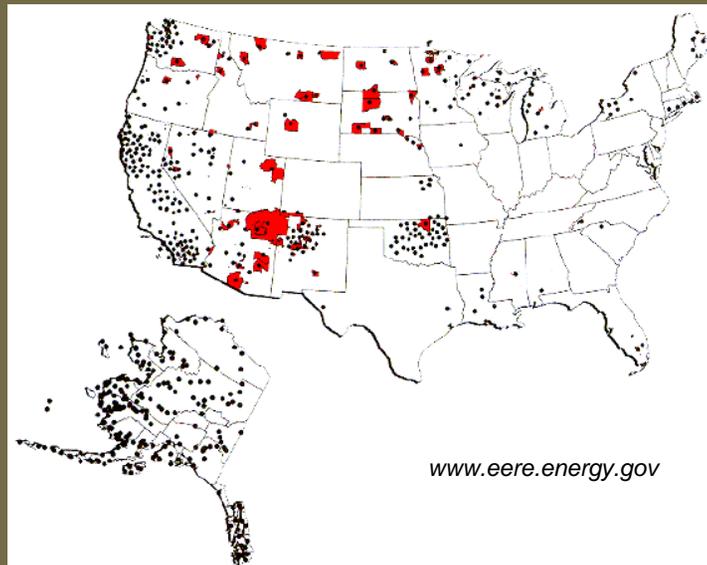
National Conference of State Legislatures – drought monitoring and mitigation activities will require state support, much of which require state legislative involvement

National League of Cities – water availability and quality issues

American Association of State Climatologists – an organization state-appointed individuals, many of whom are active participants in the Drought Monitor or serve on drought monitoring committees within their respective states. Most are housed at universities and also conduct applied climate research;

National Drought Mitigation Center – A national clearinghouse for drought-related information, research, mitigation measures, and operational home of the Drought Monitor and operational home of the Drought Monitor and Drought Impact Reporter;

Native American tribal governments – mostly located in arid regions in which water is a vital concern:



## 5) One-Stop Drought Shopping = Drought Portal; **NIDIS – U.S. Drought Portal**

**drought.gov: *A Window on Drought Information***

### **Why a Portal?**

**A Web site and services that improve the access, processing, and sharing of structured and unstructured information within and across a given “enterprise” through:**



**Portlets - Components of a portal web site that provide aggregated, reusable access to specific information sources or applications (e.g., remote web services, search engines). Access is standardized and reusable (using APIs [application programming interfaces]).**

**Web Services - Applications and utilities that allow data exchange in a highly interoperable, standardized language/vendor/platform-neutral manner. Crawlers and other content aggregation are supported.**

**Communities - A virtual workspace of a portal for collaboration, communication, and information dissemination/collection. Communities contain portlets and projects.**

**Projects - Workspaces within a community that involves subsets of Portal membership. Projects contain portlets and can be part of one or more communities, facilitating collaboration via overviews, discussions, and document/project management.**

Wildberry Client Review - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://www.wildberrygroup.com/Client/NIDIS/web\_mockup\_rd4\_2.html

Google EROS

Search Web

200 blocked

Check

AutoLink

AutoFill

Send to

EROS

Settings

Y! Mail My Yahoo! Fantasy Sports Football Games Music Answers Personals

**NATIONAL INTEGRATED DROUGHT INFORMATION SYSTEM** **DROUGHT.GOV**

Search: Everywhere

1. Current Drought 2. Impacts 3. Forecast

**Current Drought**

**U.S. Drought Monitor** August 28, 2007

**Where are Drought Conditions Now?**

The U.S. Drought Monitor integrates many types of data into a single map each week. It shows drought's location and intensity. Drought trackers look at climate and water data, satellite imagery, and reported impacts. Local resource managers establish their own criteria for stages of drought.

**Impacts**

**How is the Drought Affecting Me?**

Drought affects many activities, like agriculture, water supply and quality, energy, tourism, ecosystems, and communities. The Drought Impact Reporter compiles accounts from different sources, such as media, extension agents, the National Weather Service, and agricultural producers.

**Forecast**

**U.S. Seasonal Drought Outlook**  
Drought Probability During the Next Period  
Valid August 28 - November 30, 2007  
Released August 16, 2007

**Will the Drought Continue?**

Forecasting drought in the continental United States is still highly experimental. The U.S. Seasonal Drought Outlook is released each month, looking three months ahead. The Drought Outlook identifies areas where forecasters expect drought to appear, continue, get better or get worse.

**What's New**

The U.S. Drought provide comprehensive nation's drought Information System in 2004 and enacted

More about NIDIS

The NIDIS Implementation Plan, published in June 2007, provides a detailed overview of the NIDIS initiative (pdf version).

**Administration: (July 17, 2007)**  
2007 Starts Warmer, Drier Than Average for Much of U.S., Global Average

Done Internet

## Showcase Portlets:

- 1.) U.S. Drought Monitor (NOAA, USDA, NDMC)
- 2.) Drought Impacts Reporter (NDMC)
- 3.) Climate Prediction Center Seasonal Drought Outlook (NOAA)

# U.S. Drought Portal Home Page

## Showcase Portlets and Key Themes

**NATIONAL INTEGRATED DROUGHT INFORMATION SYSTEM** **DROUGHT.GOV**

1 2 3 4 5 6

Search:

What is NIDIS? Current Drought Drought-Related Forecasts Impacts Planning Educational Resources Drought-Related Research Contact Us | Log In

### Current Drought

#### U.S. Drought Monitor August 28, 2007

**Where are Drought Conditions Now?**

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### What's New

The U.S. Drought Portal was officially launched on November 1, 2007. It was created to provide comprehensive information on emerging and ongoing droughts, and to enhance the nation's drought preparedness. The Drought Portal is part of the National Integrated Drought Information System (NIDIS), which was recommended by the Western Governors Association in 2004 and enacted into law in 2006.

[More about NIDIS...](#)

The NIDIS Implementation Plan, published in June 2007, provides a detailed overview of the NIDIS initiative (pdf version).

### Media Resources

**National Oceanic and Atmospheric Administration: (August 15, 2007)**  
Record Warmth in Western U.S. in July, Drought Severity Worsened, Global Temperature 7th Warmest for July... (view article)

**National Oceanic and Atmospheric Administration: (July 17, 2007)**  
2007 Starts Warmer, Drier Than Average for Much of U.S., Global Average

- ### Key Themes
- 1) Current Drought
  - 2) Forecasts
  - 3) Impacts
  - 4) Planning
  - 5) Education
  - 6) Research

# U.S. Drought Portal Key Theme Example

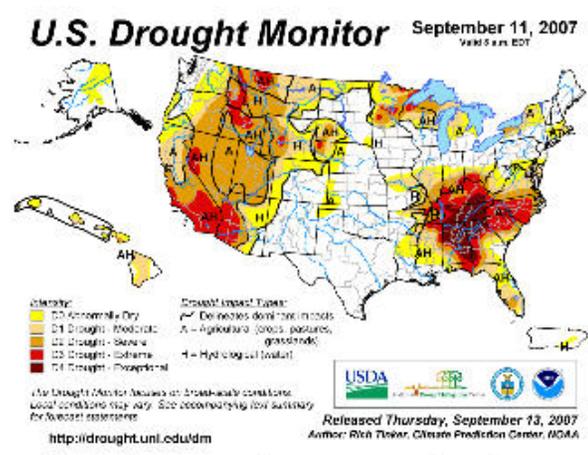
## Current Drought



- Supporting Data and Information  
(Expand all / Collapse all)
- Drought Indices
  - Hydrological Monitoring
  - Remote Sensing
  - Wildfire
  - Paleo-Climatic Data
  - Local, State and Regional
  - Water Quality
  - Map Viewer

Plenty of related info to view

### What areas are in drought now?



The U.S. Drought Monitor blending numeric measures of drought and experts' observations into a single map every Wednesday afternoon started in 1999 as a federal and academic partnership out of a Western Governors Association initiative to better understand and communicate information on water scarcity to policy makers.

The Monitor is produced by a group of authors from the Department of Agricultural and Natural Oceanic and Atmospheric Administration, and the Drought Mitigation Center. It incorporates review from 250 climatologists, experts, and others across the country.

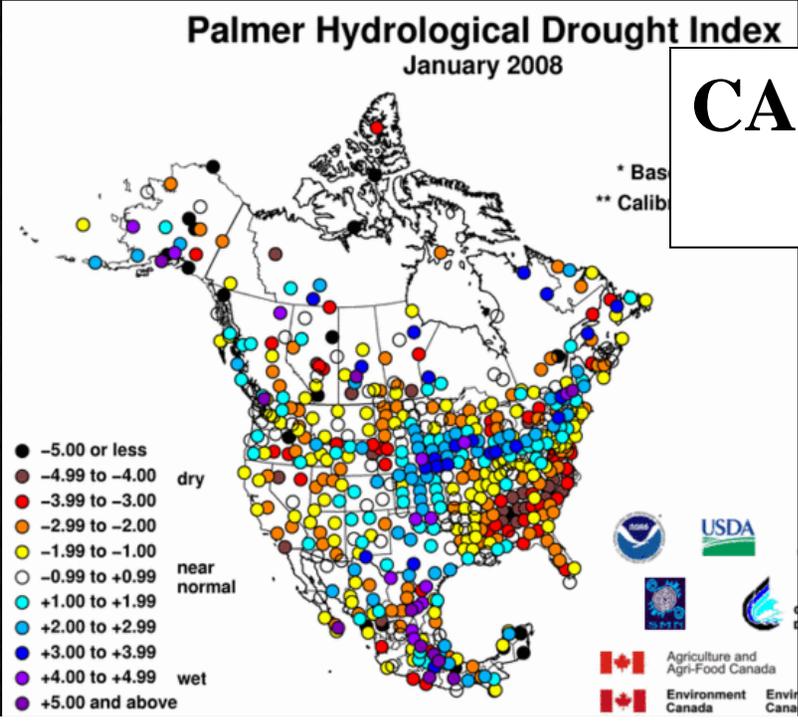
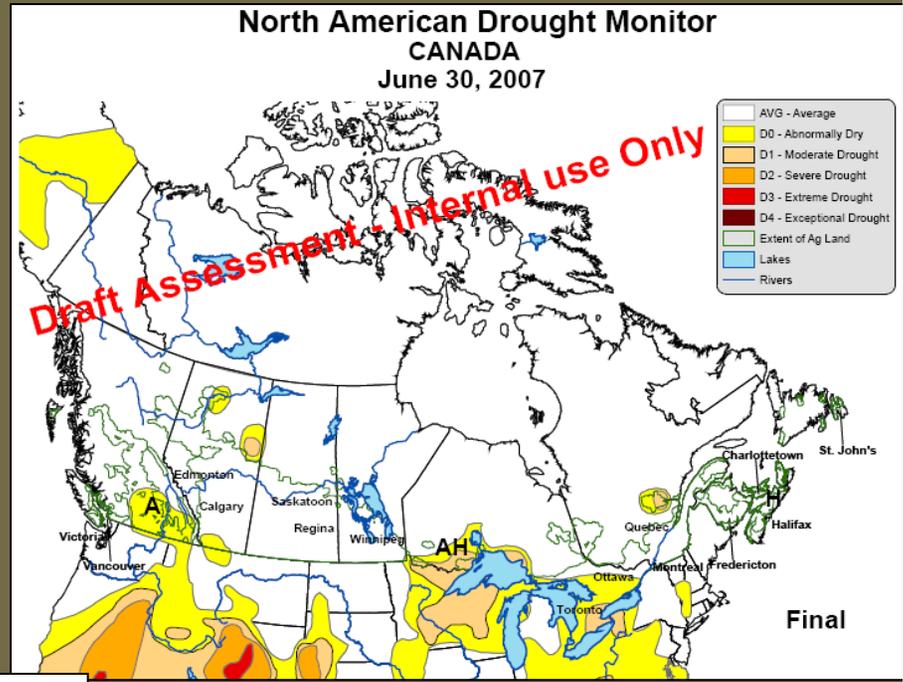
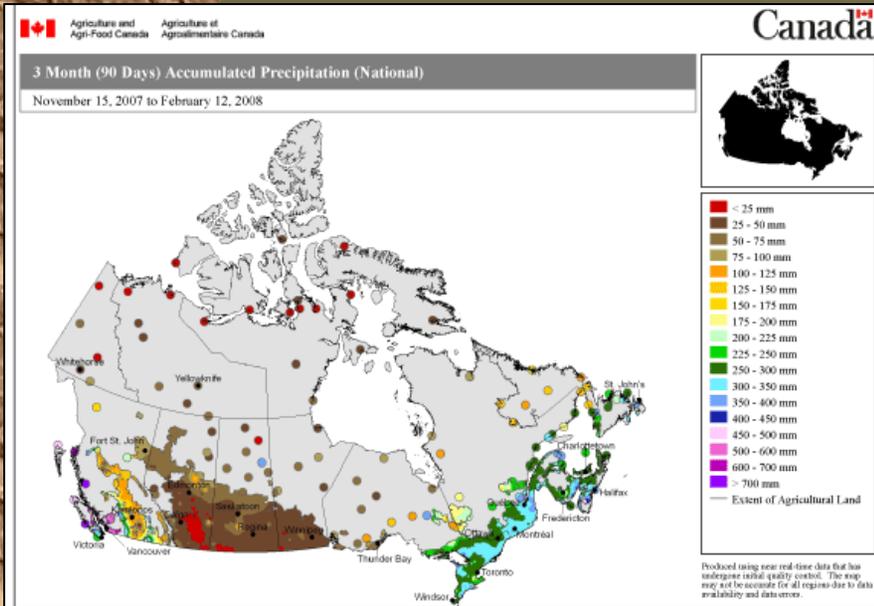
Each week the author revises the previous map based on rain, snow and other events, and reports of how drought is affecting crops, wildlife and other indicators. Authors balance data and reports to come up with a new map every Wednesday afternoon. It is released following Thursday morning.

Visit the US Drought Monitor for the current drought conditions...



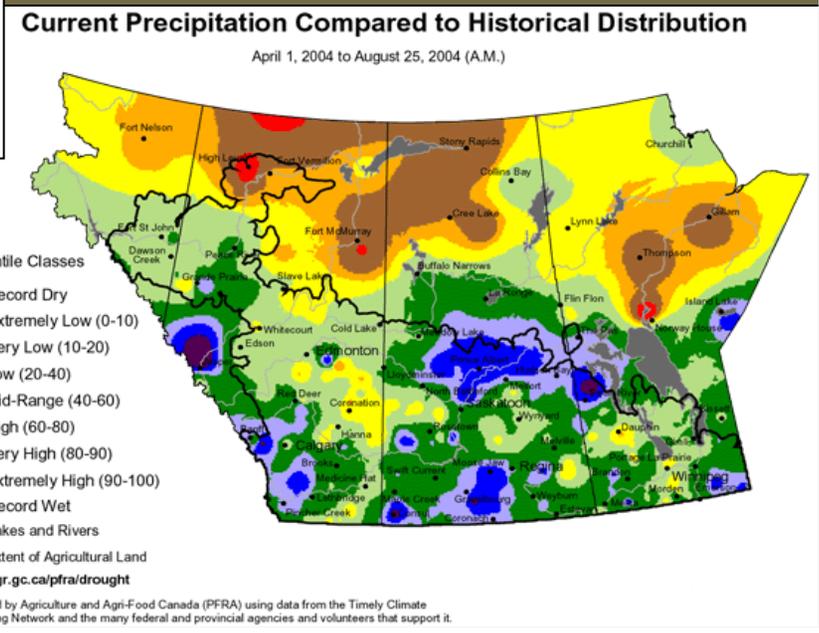
The North American Drought Monitor is a monthly monitoring map for the entire continent that has been produced in cooperation with Canada and Mexico since 2003.

# 6) Expanding Drought Monitoring Beyond the U.S.;



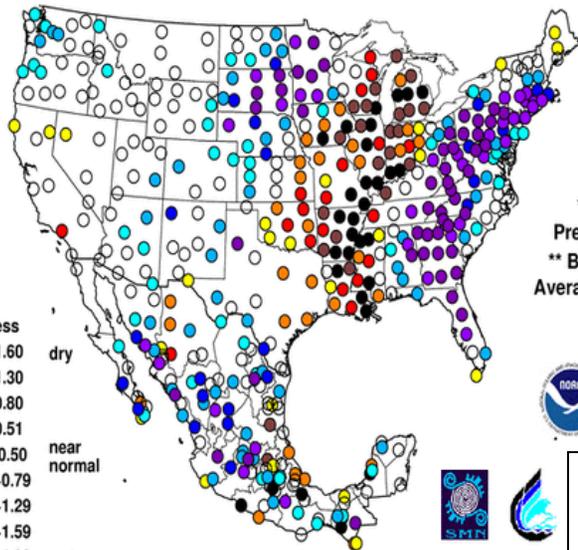
**CANADA**

+



# 6) Expanding Drought Monitoring Beyond the U.S.;

1-Month Standardized Precipitation Index  
September 2004



- -2.00 or less
  - -1.99 to -1.60
  - -1.59 to -1.30
  - -1.29 to -0.80
  - -0.79 to -0.51
  - -0.50 to +0.50
  - +0.51 to +0.79
  - +0.80 to +1.29
  - +1.30 to +1.59
  - +1.60 to +1.99
  - +2.00 or greater
- dry
- near normal
- wet

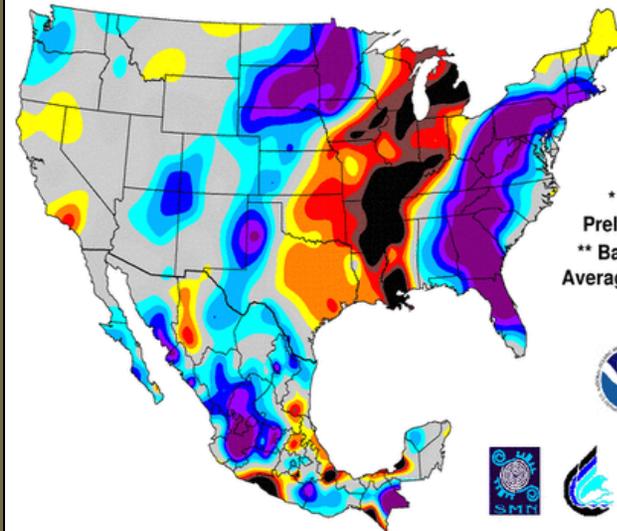
\* Based on Preliminary Data  
\*\* Base Period for Averages 1951 - 2001



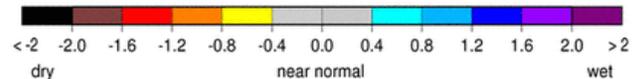
**MEXICO**

+

1-Month Standardized Precipitation Index  
September 2004

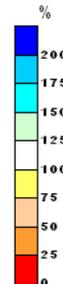
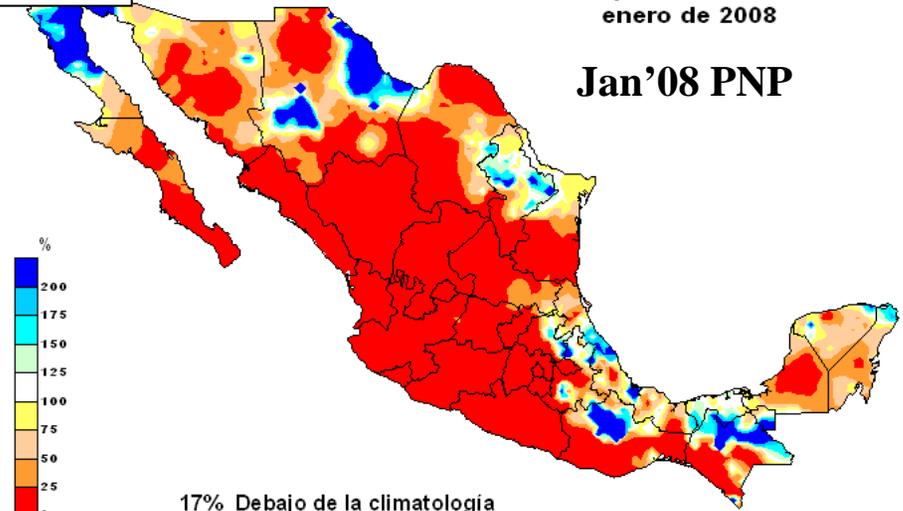


\* Based on Preliminary Data  
\*\* Base Period for Averages 1951 - 2001

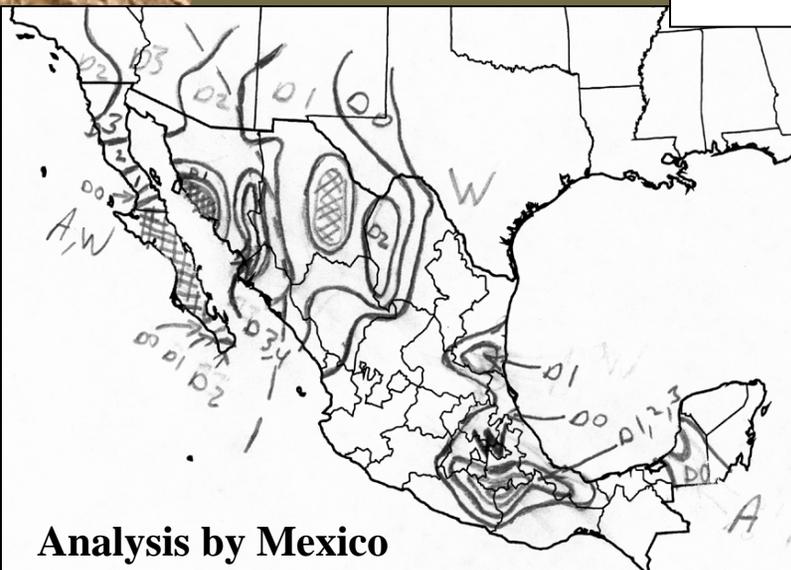


Anomalia porcentual de la lluvia  
enero de 2008

Jan'08 PNP



17% Debajo de la climatología



Analysis by Mexico

United States

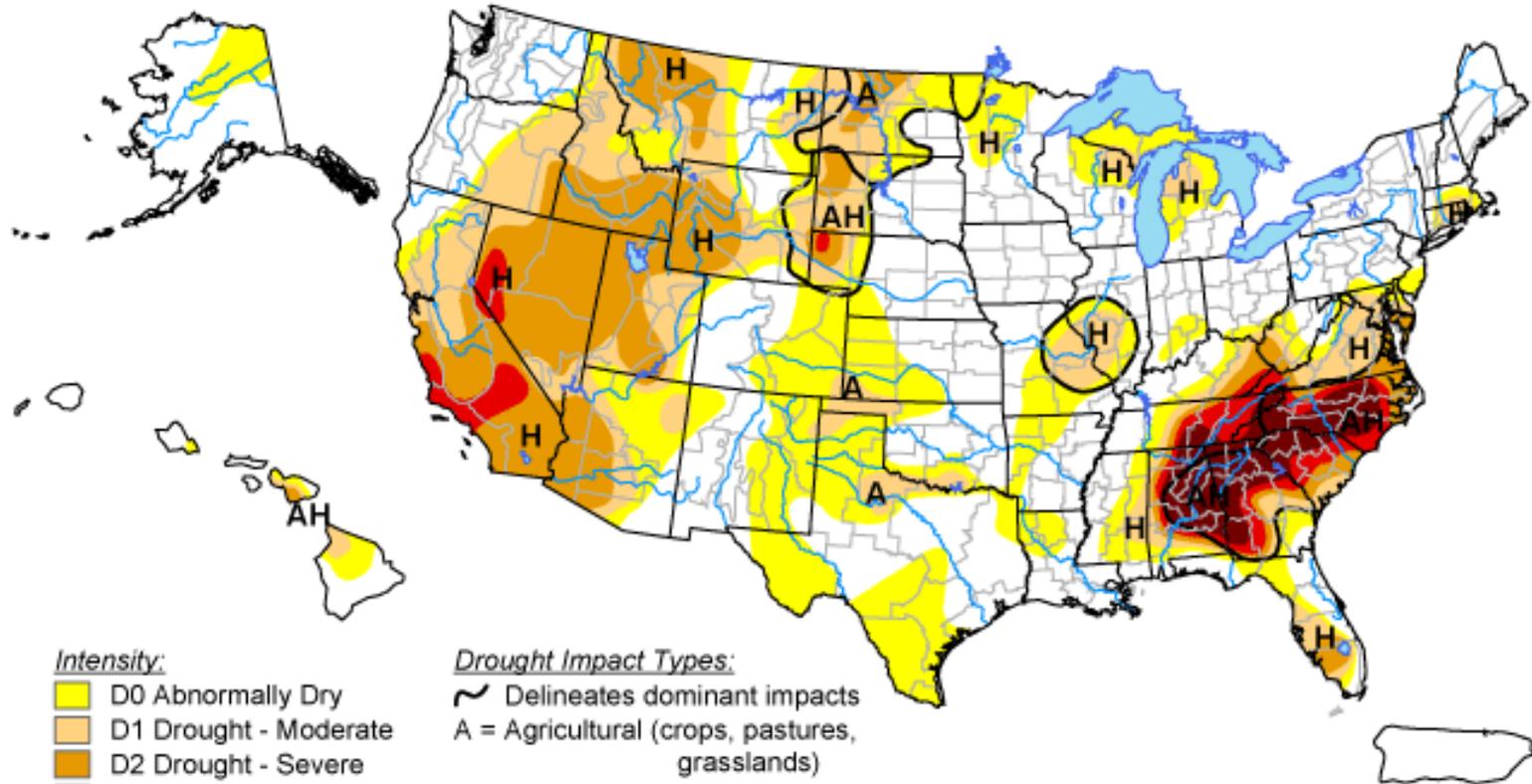
=

(USDM: end of month  
or start of next month)

# U.S. Drought Monitor

December 4, 2007

Valid 7 a.m. EST



Intensity:

- Yellow: D0 Abnormally Dry
- Light Orange: D1 Drought - Moderate
- Orange: D2 Drought - Severe
- Red: D3 Drought - Extreme
- Dark Red: D4 Drought - Exceptional

Drought Impact Types:

- Wavy line: Delineates dominant impacts
- A = Agricultural (crops, pastures, grasslands)
- H = Hydrological (water)

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

<http://drought.unl.edu/dm>



Released Thursday, December 6, 2007  
Author: Brad Rippey, U.S. Department of Agriculture

# North American Drought Monitor

December 31, 2007

Released: Wednesday, January 16, 2008

<http://www.ncdc.noaa.gov/nadm.html>

Analysts:

Canada - Trevor Hadwen  
Dwayne Chobanik

Mexico - Valentina Davydova  
Adelina Albanil  
Elvia Delgado  
Fernando Romero

U.S.A. - Richard Heim  
Jay Lawrimore\*  
Liz Love-Brotak

(\* Responsible for collecting analysts' input & assembling the NA-DM map)

## Intensity:

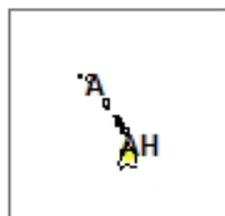
- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

## Drought Impact Types:

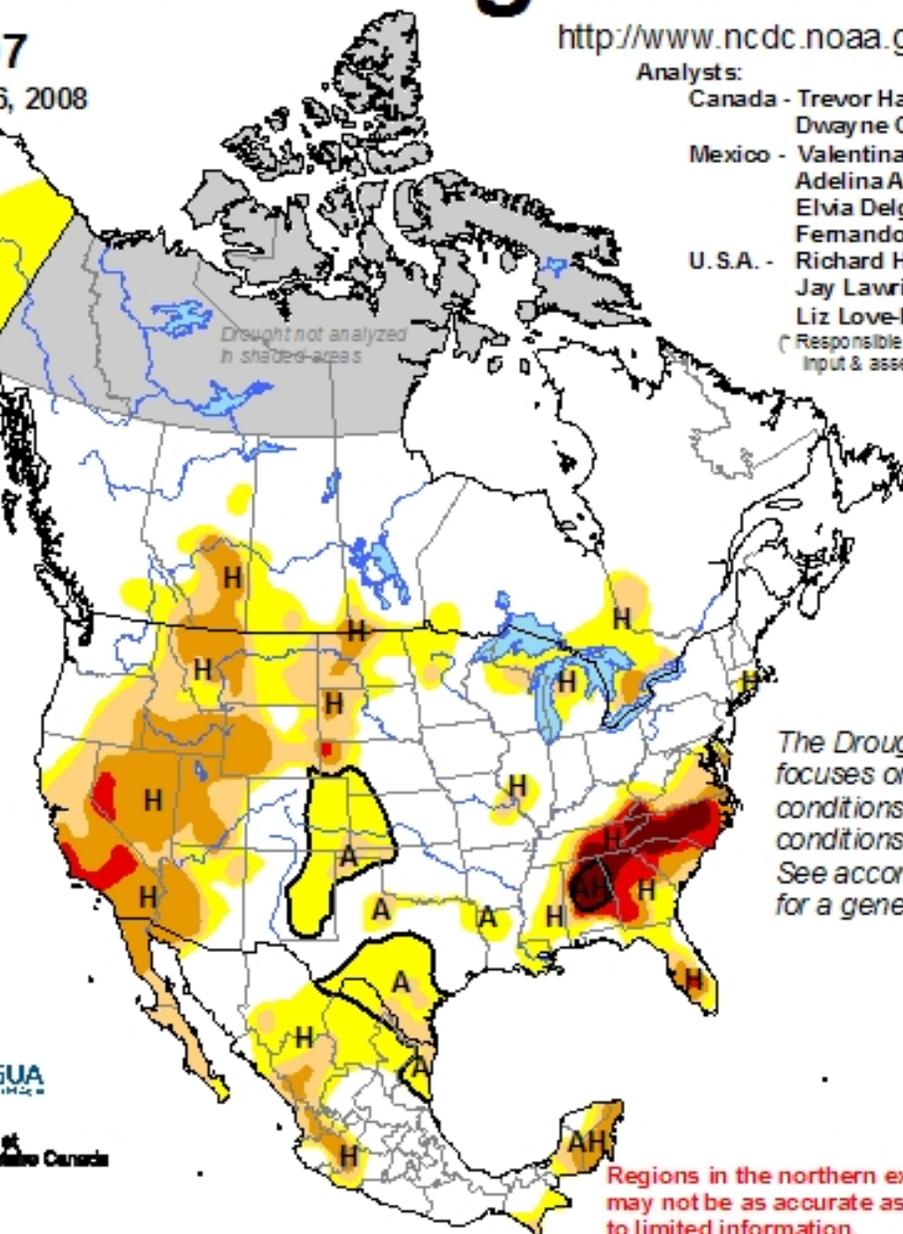
Delineates dominant impacts

A = Agriculture

H = Hydrological (Water)



Available in  
English



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



Agriculture and Agri-Food Canada

Agriculture of Agroministerio Canada  
Environment Canada

Regions in the northern extremes of Canada may not be as accurate as other regions due to limited information.

# Monitor de Sequía de América del Norte

Diciembre 31, 2007

Liberado: Miércoles, 16 de Enero de 2008

<http://www.ncdc.noaa.gov/nadm.html>

Analysts:

Canada - Trevor Hadwen  
Dwayne Chobanik  
Mexico - Valentina Davydova  
Adelina Albanil  
Elvia Delgado  
Fernando Romero  
U.S.A. - Richard Heim  
Jay Lawrimore\*  
Liz Love-Brotak

\* Responsable de la Integración del mapa

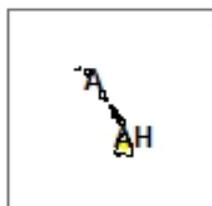
Intensidad de la Sequía:

- D0 Anomalmente Seco
- D1 Sequía - Moderada
- D2 Sequía - Severa
- D3 Sequía - Extrema
- D4 Sequía - Excepcional

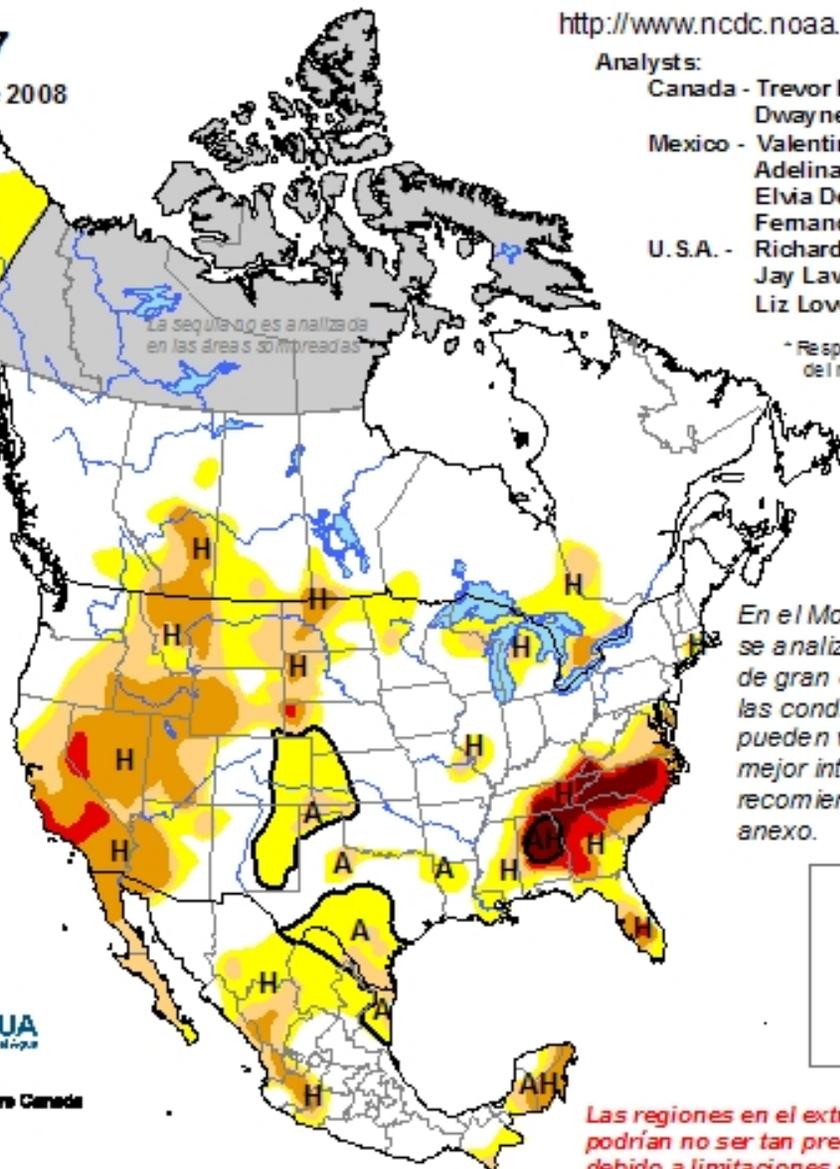
Delimita impactos dominantes

A = Agrícola

H = Hidrológica



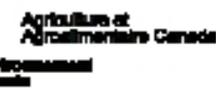
Available in  
Spanish



En el Monitor de Sequía se analizan condiciones de gran escala, por lo que las condiciones locales pueden variar. Para una mejor interpretación se recomienda ver el texto anexo.



Las regiones en el extremo norte de Canadá podrían no ser tan precisas como el resto, debido a limitaciones en la información.



# Outil de surveillance des sécheresses à l'échelle nord-américaine

<http://www.ncdc.noaa.gov/nadm.html>

31 Décembre 2007

Parution : Mercredi, le 16 Janvier, 2008

Analystes :

Canada - Trevor Hadwen  
Dwayne Chobanik

Mexique - Valentina Davydova  
Adelina Albanil  
Elvia Delgado  
Fernando Romero

É.-U. - Richard Heim  
Jay Lawrimore\*  
Liz Love-Brotak

\* Responsable d'assembler la carte de NA-DM et le texte

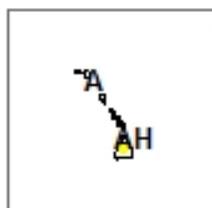
Intensité de la sécheresse :

- D0 Sécheresse anormale
- D1 Sécheresse modérée
- D2 Sécheresse grave
- D3 Sécheresse extrême
- D4 Sécheresse exceptionnelle

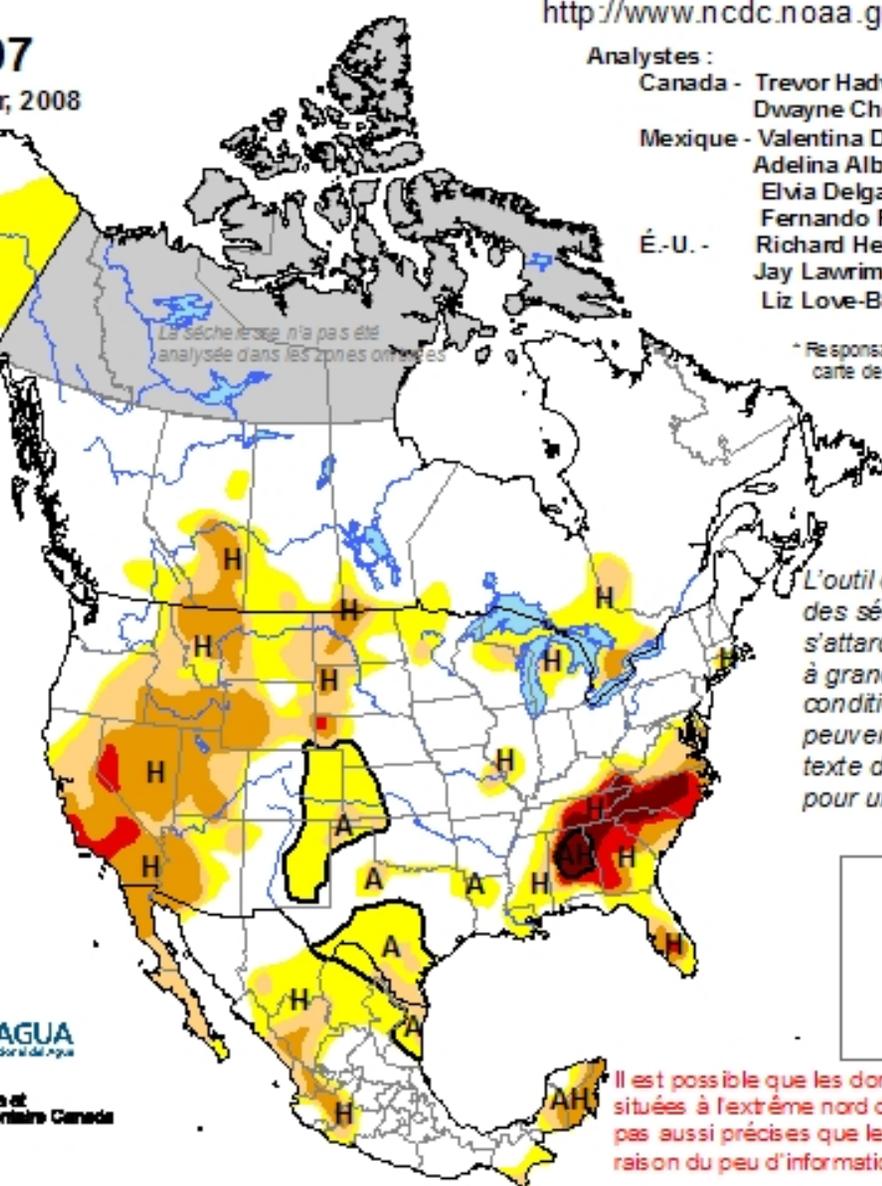
Délimite les impacts dominants

A = Agriculture

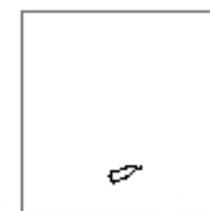
H = Hydrologique (eau)



Available in  
French



*L'outil de surveillance des sécheresses s'attarde aux conditions à grande échelle. Les conditions locales peuvent varier. Voir le texte d'accompagnement pour un sommaire général.*



*Il est possible que les données sur les régions situées à l'extrême nord du Canada ne soient pas aussi précises que les autres régions en raison du peu d'information disponible.*

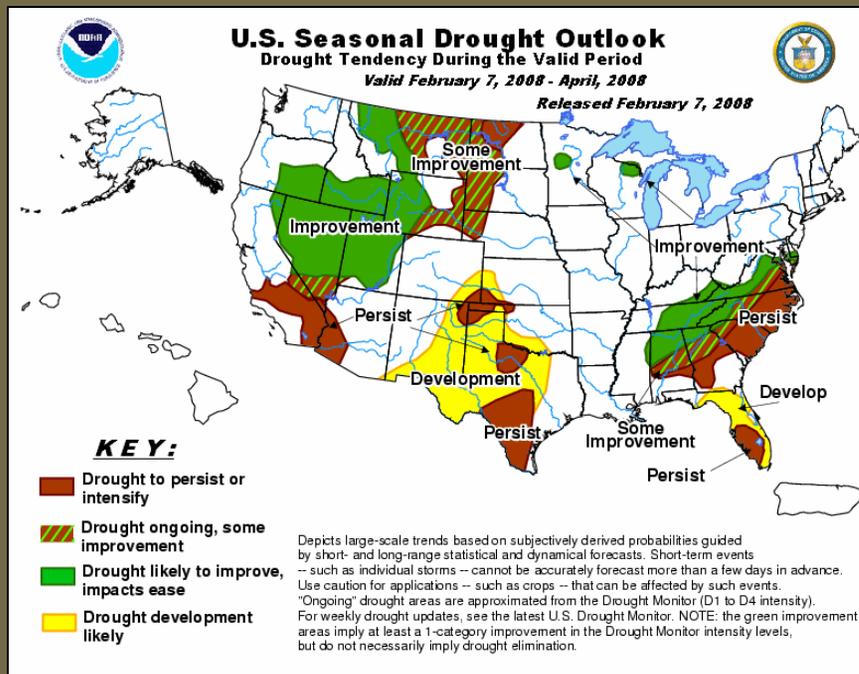




## 7) Drought Forecasts;

# Short and Long-Term Forecast Contributions

(see Douglas LeComte for more information)



Start with  
latest U.S. Drought  
Monitor D1 areas

+

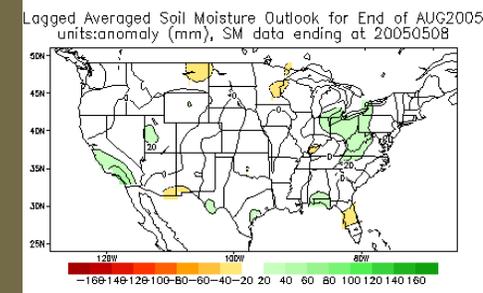
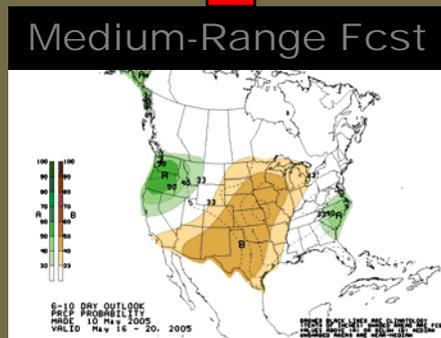
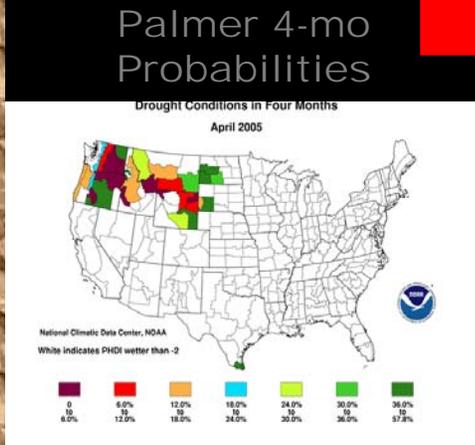
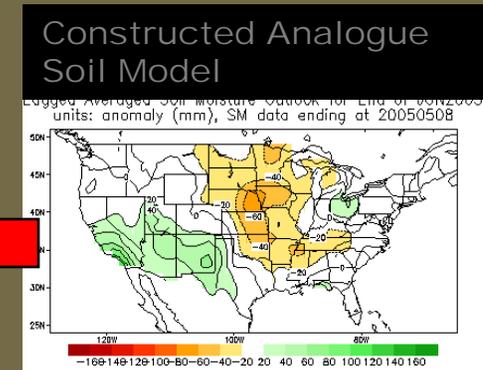
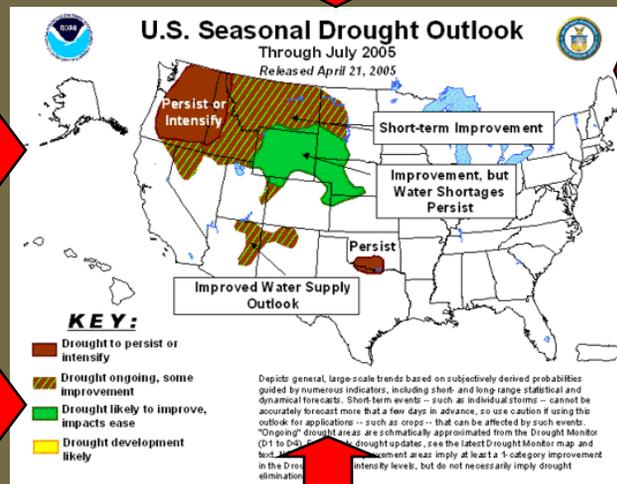
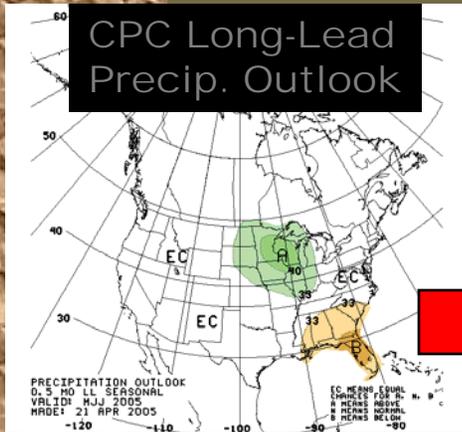
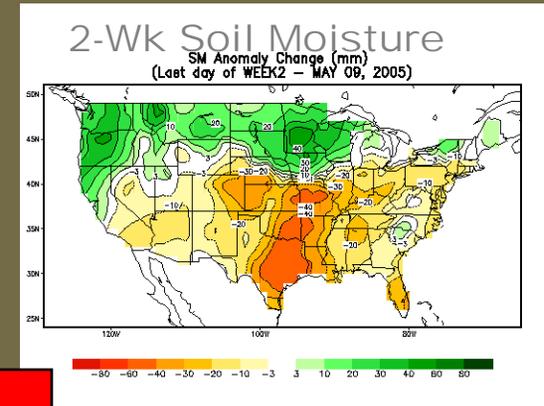
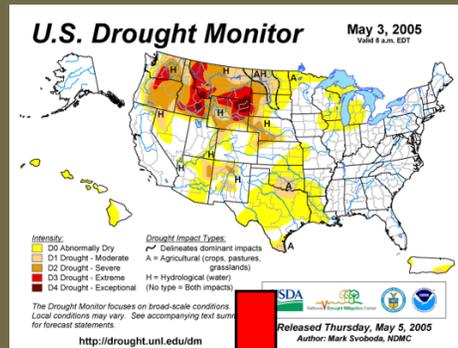
2-week  
Soil Moisture  
Forecasts

+

3-month  
Precipitation and  
Temperature  
Outlooks

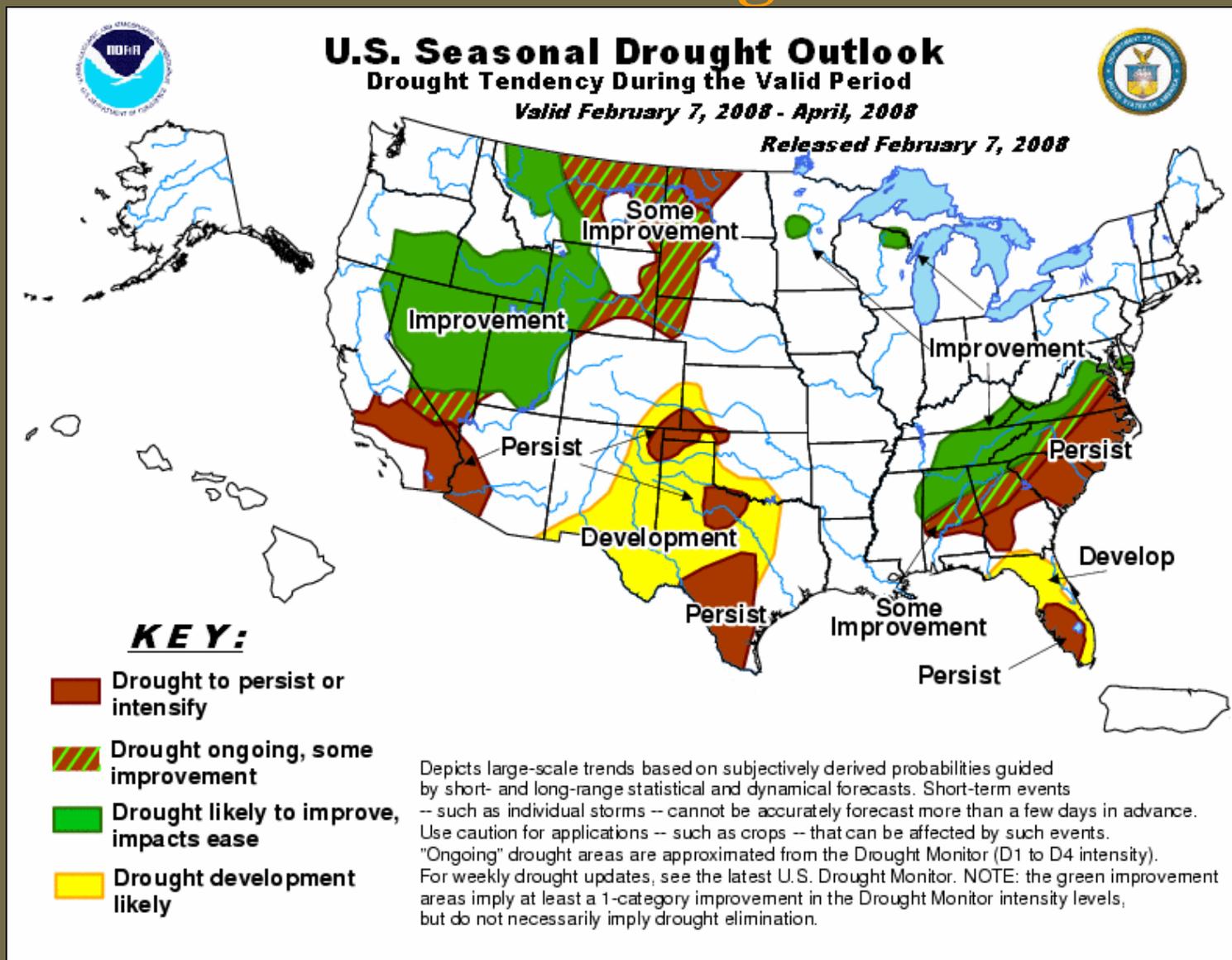


# 7) Drought Forecasts; Principal Drought Outlook Inputs





# 7) Drought Forecasts; Latest Seasonal Drought Outlook





# Thank You!

and to the many contributors  
of this presentation



Feb. 21-22, 2008