

# Agricultural Drought USDA Perspectives

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USDA

## Billion Dollar U.S. Droughts

**1980: Drought/Heat Wave, \$55.4B**  
 1983: Heat Wave, NOT LISTED  
 1986: Drought/Heat Wave, \$2.4B  
**1988: Drought/Heat Wave, \$71.2B**  
 1989: Northern Plains Drought, \$1.7B  
 1993: Southeast Drought/Heat, \$1.4B  
 1996: Southern Plains Drought, \$6.8B  
**1998: South Drought/Heat Wave, \$9.5B**  
 1999: East Drought/Heat Wave, \$1.2B  
 2000: Drought/Heat Wave, \$4.8B  
**2002: 30-State Drought, \$11.4B**  
 2005: Midwest Drought, \$1.0B  
 2006: Widespread Drought, \$6.2B  
 2007: Plains/East Drought, \$5.0B  
 2008: Widespread Drought, \$2.0B

## Billion Dollar Wildfire Outbreaks

**1991: Oakland Firestorm, \$3.9B**  
 1993: California Wildfires, \$1.4B  
 1994: Western Fire Season, \$1.4B  
 2000: Western Fires, \$2.4B  
 2002: Western Fires, \$2.3B  
**2003: S. California Wildfires, \$2.8B**  
 2006: Numerous Wildfires, \$1.0B  
 2007: Western Wildfires, \$1.0B  
 2008: U.S. Wildfires, \$2.0B

## 1980-2008 Billion Dollar U.S. Weather Disasters

(Damage Amounts in Billions of Dollars and Costs Normalized to 2007 Dollars Using GNP Inflation / Wealth Index)



1980	Drought / Heat Wave e \$55.4 ~10,000 Deaths			
1983	Hurricane Alicia \$6.3 21 Deaths	Florida Freeze ~\$4.2 No Deaths	Gulf Storms / Flooding ~\$2.3 ~50 Deaths	W Storms / Flooding ~\$2.3 ~45 Deaths
1985	Florida Freeze ~\$2.3 No Deaths	Hurricane Elena \$2.5 4 Deaths	Hurricane Juan \$2.9 63 Deaths	
1986	Drought / Heat Wave \$2.4 ~100 Deaths			
1988	Drought / Heat Wave e \$71.2 ~7,500 Deaths			
1989	Hurricane Hugo > \$15.3 86 Deaths	N Plains Drought > \$1.7 No Deaths		
1990	S Plains Flooding > \$1.6 13 Deaths	California Freeze \$5.5 No Deaths		
1991	Hurricane Bob \$2.3 18 Deaths	Oakland CA Firestorm ~\$3.9 25 Deaths		
1992	Hurricane Andrew ~\$40.0 61 Deaths	Hurricane Iniki ~\$2.7 7 Deaths	Nor'easter \$2.3 19 Deaths	
1993	E Storm / Blizzard \$7.9 ~270 Deaths	SE Drought / Heat Wave ~\$1.4 ~16 Deaths	Midwest Flooding ~\$30.2 48 Deaths	CA Wildfires ~\$1.4 4 Deaths
1994	SE Ice Storm ~\$4.2 9 Deaths	Tropical Storm Alberto ~\$1.4 32 Deaths	Texas Flooding ~\$1.4 19 Deaths	W Fire Season ~\$1.4 No Deaths
1995	CA Flooding > \$4.1 27 Deaths	SE / SW Severe Wx \$7.5 32 Deaths	Hurricane Marilyn e \$2.9 13 Deaths	Hurricane Opal > \$4.1 27 Deaths
1996	Blizzard / Flooding ~\$4.0 187 Deaths	Pacific NW Flooding ~\$1.3 9 Deaths	S Plains Drought ~\$6.8 No Deaths	Hurricane Fran > \$6.6 37 Deaths
1997	Midwest Flood / Tornadoes e \$1.3 67 Deaths	N Plains Flooding ~\$4.8 11 Deaths	W Coast Flooding ~\$3.9 36 Deaths	
1998	New England Ice Storm e \$1.8 16 Deaths	SE Severe Wx > \$1.3 132 Deaths	MN Severe Storms / Hail > \$1.9 1 Death	S Drought / Heat Wave \$9.5 > 200 Deaths
	Hurricane Georges e \$7.4 16 Deaths	Texas Flooding ~\$1.3 31 Deaths	California Freeze \$3.2 No Deaths	Hurricane Bonnie ~\$1.3 3 Deaths
1999	AR - TN Tornadoes ~\$1.6 17 Deaths	OK - KS Tornadoes > \$2.0 55 Deaths	E Drought / Heat Wave > \$1.2 e 502 Deaths	Hurricane Floyd e > \$7.4 77 Deaths
2000	Drought / Heat Wave e > \$4.8 ~140 Deaths	Western Fires > \$2.4 No Deaths		
2001	Tropical Storm Allison e ~\$5.6 > 43 Deaths	Midwest / OH Valley Hail / Tornadoes > \$2.2 > 3 Deaths		
2002	30-State Drought e > \$11.4 No Deaths	Western Fires > \$2.3 ~21 Deaths	Severe Wx / Tornadoes > \$1.9 7 Deaths	
2003	Severe Wx / Hail > \$1.8 3 Deaths	Severe Wx / Tornadoes > \$3.8 51 Deaths	Hurricane Isabel ~\$5.6 55 Deaths	S California Wildfires > \$2.8 22 Deaths
2004	Hurricane Charley e ~\$16.5 35 Deaths	Hurricane Frances e ~\$9.9 46 Deaths	Hurricane Ivan e > \$15.4 57 Deaths	Hurricane Jeanne e > \$7.7 26 Deaths
2005	Hurricane Dennis e > \$2.1 > 15 Deaths	Hurricane Katrina e ~\$133.8 > 1833 Deaths	Hurricane Rita e ~\$17.1 ~119 Deaths	Midwest Drought e > \$1.1 No Deaths
2006	Numerous Wildfires > \$1.0 28 Deaths	Widespread Drought e > \$6.2 * Deaths	Severe Storms e > \$1.0 10 Deaths	Northeast Flooding > \$1.0 20 Deaths
	MW / Ohio Valley Tornadoes ~\$1.1 27 Deaths			MW / SE Tornadoes > \$1.5 10 Deaths
2007	Great Plains / East Drought > \$5.0 ~ Deaths	Western Wildfires > \$1.0 12 Deaths	Spring Freeze > \$2.0 No Deaths	East / South Severe Weather > \$1.5 9 Deaths
2008	Southeast / Midwest Tornadoes > \$1.0 57 Deaths	MW / Ohio Valley Svr Wx / Tornadoes > \$2.4 13 Deaths	MW / Mid-Atl. Svr Wx Tornadoes > \$1.1 18 Deaths	Midwest Flood e > \$15.0 24 Deaths
	Hurricane Dolly > \$1.2 3 Deaths	Hurricane Gustav > \$5.0 43 Deaths	Hurricane Ike > \$27.0 > 100 Deaths	U.S. Wild Fires > \$2.0 16 Deaths
			Widespread Drought > \$2.0 No Deaths	

e = estimated > = greater than/at least ~ = approximately/about  
\* = undetermined

< 5 5-20 20-30 30-40 > 40

Amounts in Billions of Dollars

Source: NOAA's National Climatic Data Center Asheville, NC 28801-5001  
www.ncdc.noaa.gov/oa/reports/billionz.html

# USDA Perspective of Agricultural Drought

- Needs for research, operational applications, and the integration of decision-making products into risk assessment that require accurate and timely weather and climate information.
- Examples include:
  - Agricultural yield and productivity (NASS, FAS, OCE)
  - Natural resource conservation (NRCS)
  - Forest fire potential (FS)
  - Reinsurance and compliance programs (FSA)
  - Crop disaster assistance / emergency relief programs (FSA)
  - Integrated pest management (ARS, ES)
  - Crop yield modeling (ARS, ES)

# USDA Drought Activities

- Office of Chief Economist
  - OCE publishes the monthly World Agricultural Supply and Demand Estimates (WASDE) report, showing U.S. farmers, policymakers, and traders the latest update of farm commodity forecasts.
  - OCE houses the Joint Agricultural Weather Facility, which produces the Weekly Weather and Crop Bulletin, an international summary of crop-related weather developments.
- National Agricultural Statistical Service
  - Provides timely, accurate, and historical statistics for U.S. agriculture.

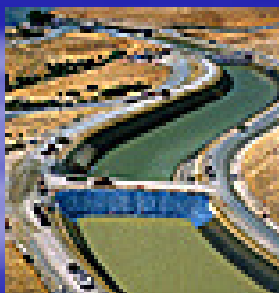


# Background Information

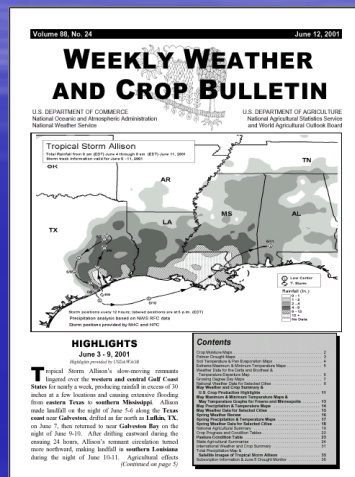
The United States Department of Agriculture has numerous interests in the field of weather monitoring and impact assessment:



**Fire Weather**



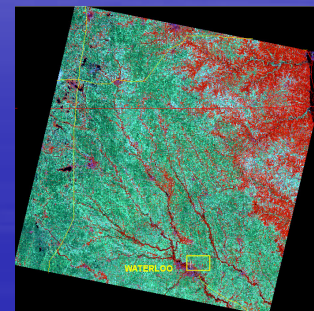
**Western Water  
Supply Forecasting**



**Global Monitoring  
and Assessment**



**Research**



**Ground Truth for  
Remote Sensing**



**Crop Insurance Programs**



**World Agricultural Outlook Board**

# WEEKLY WEATHER AND CROP BULLETIN

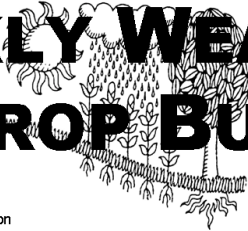


Volume 95, No. 38

<http://www.usda.gov/oc/waob/jawf/wwwcb.html>

September 16, 2008

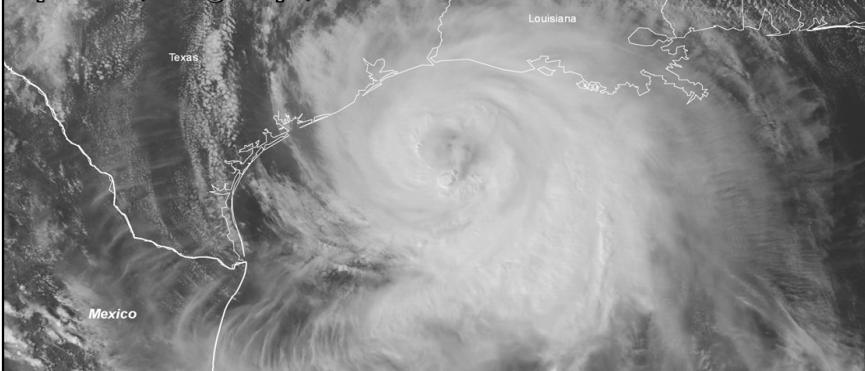
## WEEKLY WEATHER AND CROP BULLETIN



U.S. DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
National Weather Service

U.S. DEPARTMENT OF AGRICULTURE  
National Agricultural Statistics Service  
and World Agricultural Outlook Board

GOES-East Visible Image  
September 12, 2008 @ 4:15 pm, EDT



Ike, once a category 4 hurricane with maximum sustained winds near 145 m.p.h., never regained its status as a major hurricane after battering Cuba from September 7-9. Nevertheless, Ike was still a formidable category 2 hurricane at landfall (2:10 a.m. CDT on September 13) on Galveston Island, TX, with sustained winds near 110 m.p.h. Prior to reaching the U.S., Ike's landfalls as a category 3 or 4 hurricane included the U.K.'s Turks Islands (135 m.p.h. on the night of September 6-7); Great Inagua Island, Bahamas (135 m.p.h. on the morning of September 7), and near Cabo Lucrecia, Cuba (125 m.p.h. during the late evening of September 7).

### HIGHLIGHTS

September 7 - 13, 2008

Highlights provided by USDA/WAOB

**H**urricane Ike made landfall on Galveston Island, TX, at 2:10 a.m. CDT on September 13. Maximum sustained winds were near 110 m.p.h., making Ike the third category 2 hurricane (along with Dolly and Gustav) to strike the U.S. this year. Ike was the sixth consecutive named Atlantic Basin tropical system to make landfall in the U.S. (following Dolly, Edouard, Fay, Gustav, and Hanna), breaking the satellite-era record of five storms in a row set on several occasions, most recently in August-September 2004.

(Continued on page 7)

### Contents

Crop Moisture Maps .....	2
Palmer Drought Maps .....	3
September 9 Drought Monitor Map & Total Precipitation Map .....	4
<b>U.S. Crop Production Highlights .....</b>	<b>5</b>
Extreme Maximum & Minimum Temperature Maps .....	6
Temperature Departure Map .....	7
<b>Track of Hurricane Ike &amp; Record Reports Map .....</b>	<b>8</b>
Growing Degree Day Maps .....	9
Agricultural Weather Data Compiled by USDA's Stoneville Field Office .....	10
National Weather Data for Selected Cities .....	11
<b>August Crop Summary .....</b>	<b>14</b>
<b>Summer Weather Review .....</b>	<b>15</b>
<b>Summer Precipitation &amp; Temperature Maps .....</b>	<b>16</b>
<b>Summer Weather Data for Selected Cities .....</b>	<b>17</b>
Crop Progress and Condition Tables .....	18
National Agricultural Summary .....	22
State Agricultural Summaries .....	23
International Weather and Crop Summary .....	30
Subscription Information .....	36

## History

- Product of 100+ years of evolution
- 1872: *Weekly Weather Chronicle*
  - published by U.S. War Department
  - brief summary of domestic weather
- 1888: *Weather Crop Bulletin*
  - basic crop weather analyses for U.S.
- Since then, undergone several name, content, management changes
- 1924: final name change
- Comprehensive collection of text, tables, and maps describing weather impacts on domestic and international crop production



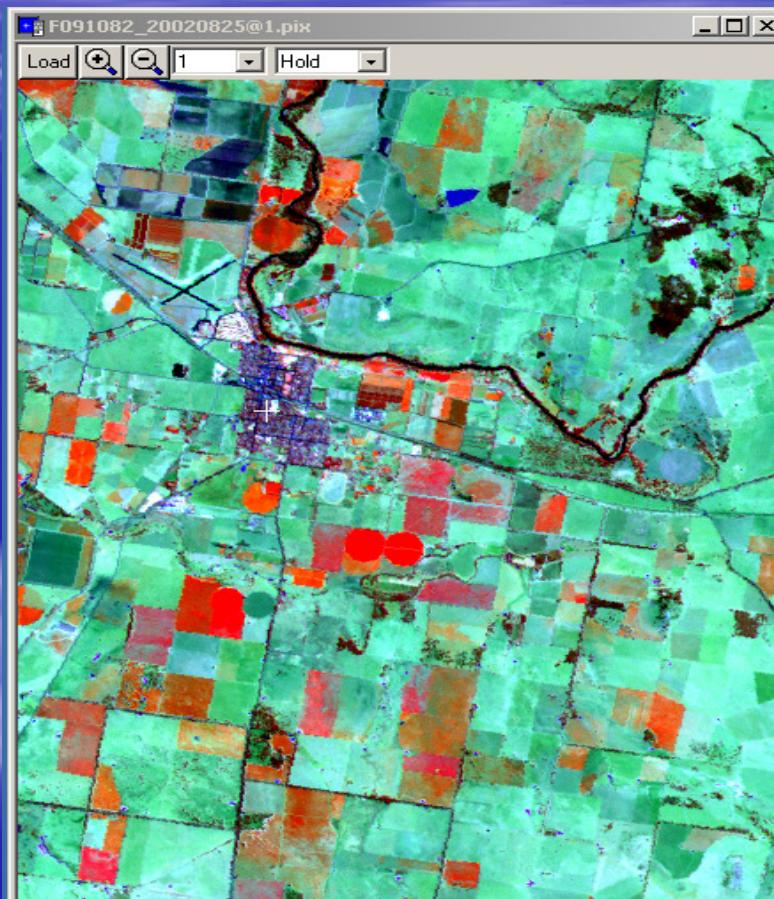


# WEEKLY WEATHER AND CROP BULLETIN

## Remote Sensing

Effective means for assessing temporal changes in agriculture

Poor



Good



Source: PECAD

# USDA Drought Activities

- **Natural Resources Conservation Service**
  - **The NRCS is working closely with landowners on practices and projects aimed to increase irrigation efficiency, and achieve net reductions in water use.**
  - **Ground and Surface Water Conservation (GSWC) component of the Environmental Quality Incentives Program.**
  - **Emergency Watershed Protection Program.**



# Water Supply Forecasting



# Water Supply Forecasts

- Snowmelt provides approximately 80 percent of the streamflow in the West
- Are used in the operation of reservoirs to satisfy agricultural water demands, among others.
- Are used to mitigate flood damages in levied areas and downstream from reservoirs.
- Support fish and wildlife management activities associated with species protection legislation.
- During 2001 - 9,007 seasonal water supply forecasts at 709 locations.
- Over 17,000 users accessed these forecasts during water year 2001.

# USDA Drought Activities

- **Natural Resources Conservation Service**
  - **Snow Survey and Water Supply Forecasting Program.**
  - **Operate the SNOTEL and SCAN data collection networks.**
  - **Creation, distribution and interpretation of water supply forecasts for the western U.S. through state and county offices.**
  - **Climate services for natural resource management.**
  - **Active in state drought planning and mitigation activities.**





**U.S Forest Service**

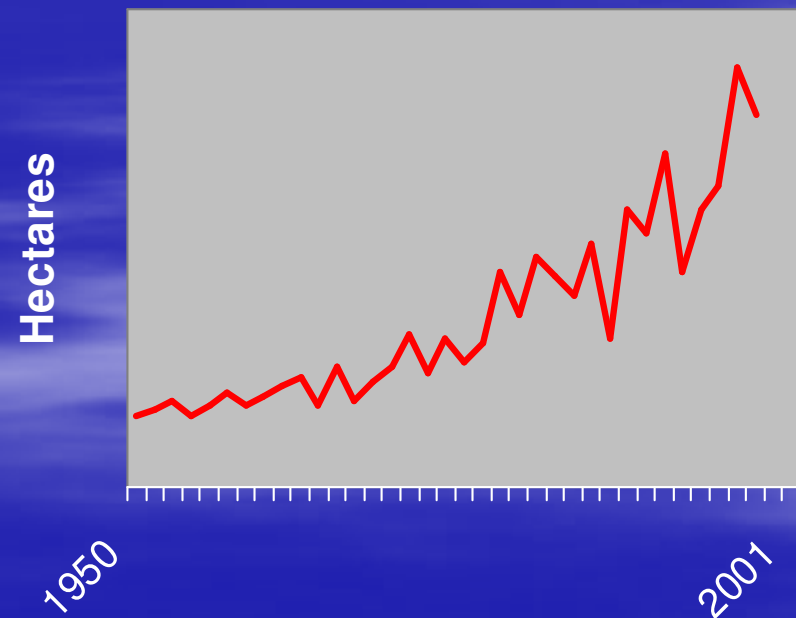
**USDA**      **U**

# Issue: Wildfires are a serious and growing problem in the US.

In 2000:

- 3,000,000 hectares of wild lands burned
- US\$ 2 billion was spent to fight forest fires
- \$ billions in losses of property and resources
- Human lives lost

Forest Area  
Severely Burned



# Climatology and Wildfires

**Extreme wildfire years are caused at least in part by antecedent drought and summer blocking pattern by a middle tropospheric ridge.**

(From Gedalof et al. (2004))



# Fire Danger Assessment Technology Remote Sensing

- Remote sensing is a developing technology for wildfire monitoring and fire danger assessment. AVHRR (Advanced Very High Resolution Radiometer) and MODIS (Moderate Resolution Imaging Spectroradiometer) instruments provide global high-resolution products like NDVI (Normalized Difference Vegetation Index) and surface temperatures which are related to fuel moisture status.

# USDA Drought Activities

- **USDA/Agricultural Research Service (ARS) national program area focuses on several specific priorities:**
- **Enable improvements of air quality via management and mitigation of emissions from agricultural operations**
- **Develop knowledge and technologies for reducing atmospheric greenhouse gas concentrations through management of agricultural emissions and carbon sequestration**
- **Enable agriculture to adapt to climate change**
- **Maintain and enhance soil resources**

# USDA Drought Activities

- **Farm Services Administration**
  - **USDA Farm Service Agency's (FSA) Emergency Conservation Program (ECP) provides emergency funding and technical assistance for farmers and ranchers to rehabilitate farmland damaged by natural disasters and for carrying out emergency water conservation measures in periods of severe drought.**
  - **ECP is administered by state and county FSA committees.**



# USDA Drought Activities

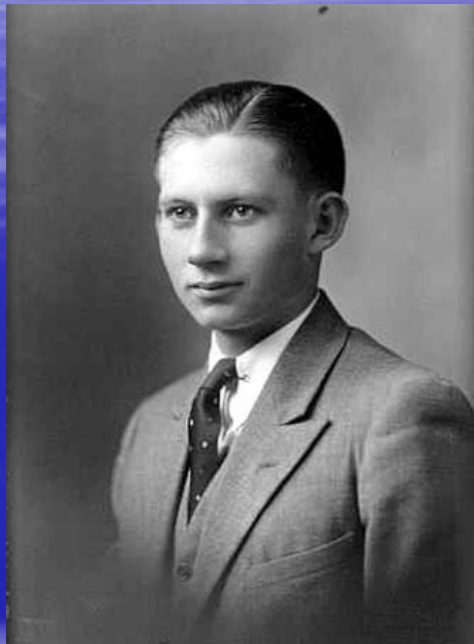
- **Farm Services Administration**
  - **2004 Nonfat Dry Milk Livestock Feed Assistance**
  - **Emergency Disaster Designation and Declaration Process**
  - **Emergency Haying and Grazing Assistance**
  - **Emergency Loan Assistance (EM)**
  - **Noninsured Crop Disaster Assistance Program (NAP)**
  - **Tree Assistance Program (TAP)**

# USDA Drought Activities

- Risk Management Agency
  - Crop Revenue Coverage (CRC), provides revenue protection against a yield loss, a price decline, or a combination of both.
  - Provides grants to develop new drought tools.

# Wayne C. Palmer, 1916-2000

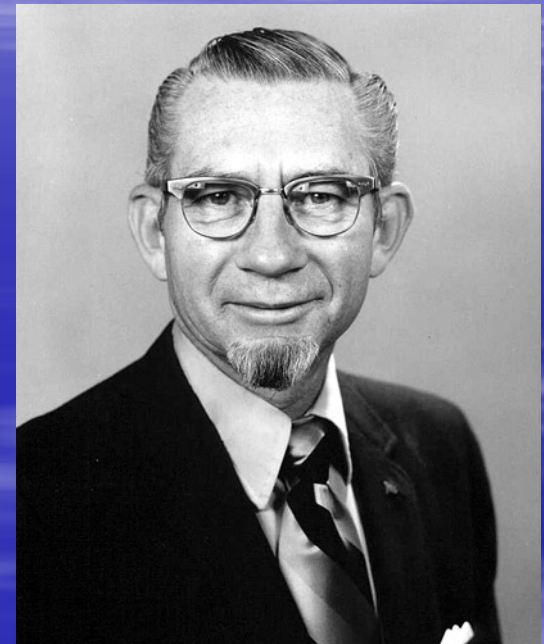
## “Father of U.S. Drought Monitoring”



Senior Portrait,  
Nebraska, USA



New York City,  
1943



Wayne Palmer,  
1971

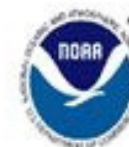
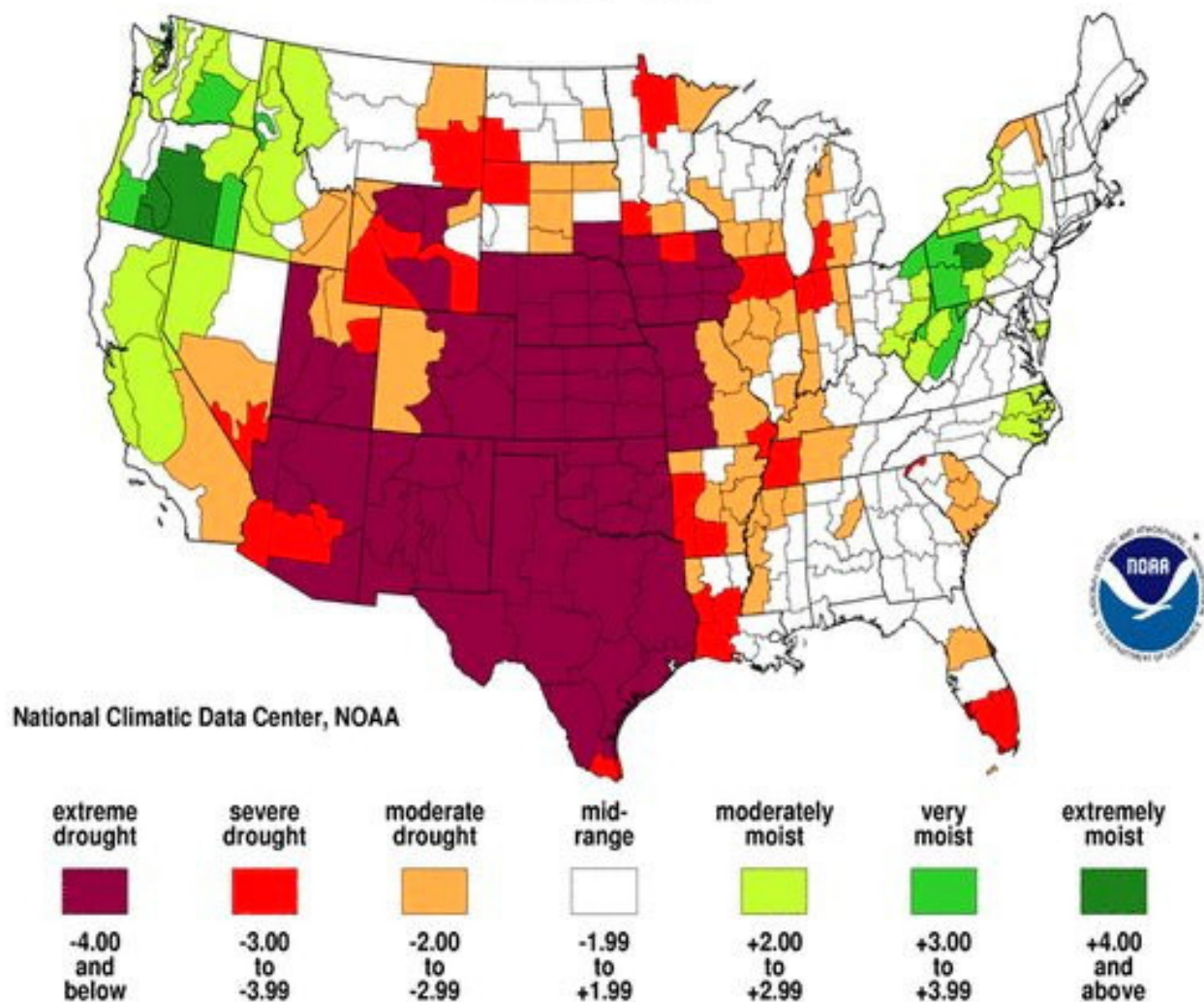




The Palmer Drought Index also affords the opportunity to review past droughts.

## Palmer Hydrological Drought Index Long-Term (Hydrological) Conditions

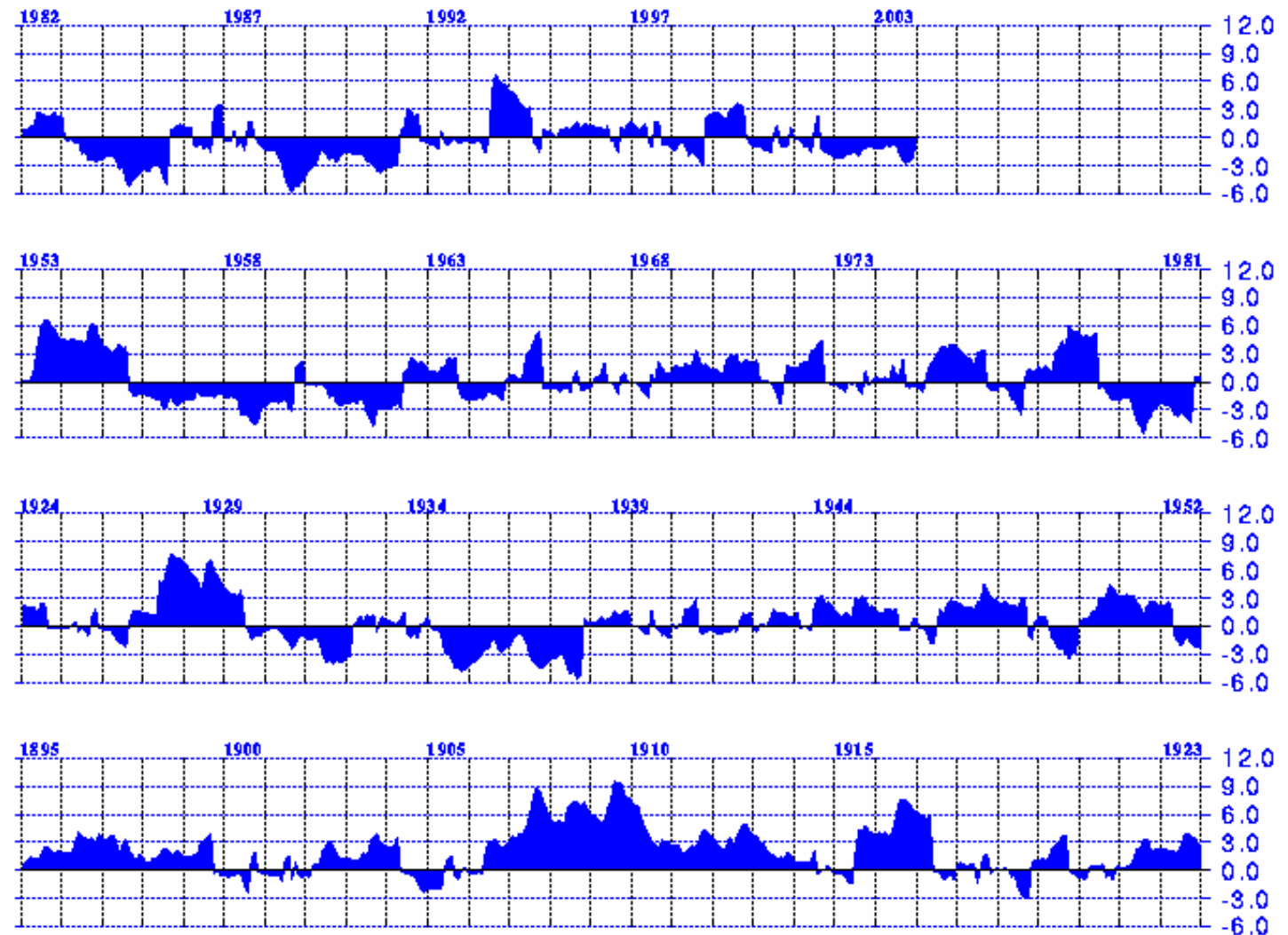
October 1956



Palmer's work allowed scientists to compute drought severity to 1895, the beginning of "reliable" record-keeping, although values prior to 1900 are often discarded to allow the index to "set" itself.

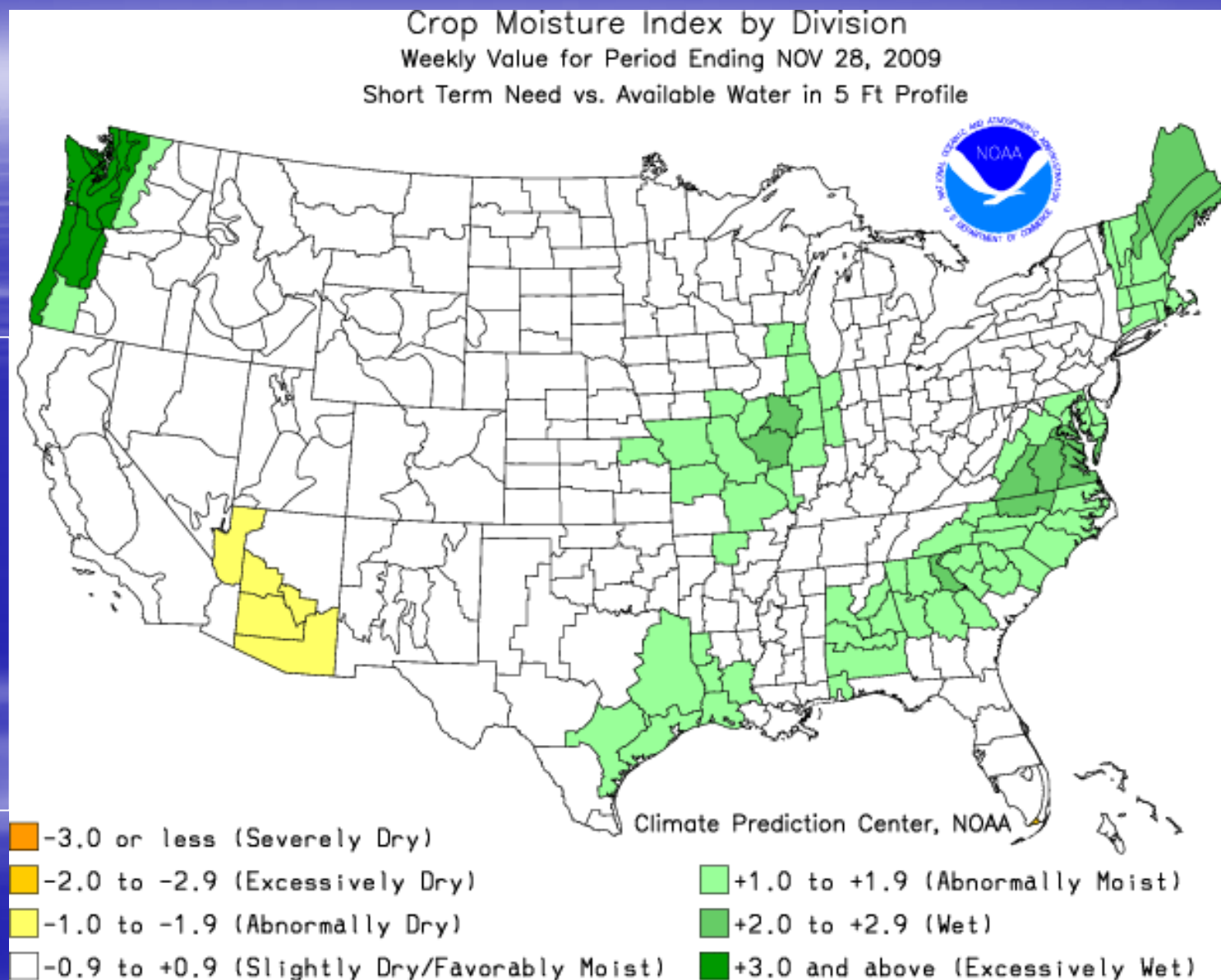


## Palmer Drought Severity Index



Montana - Division 06: 1895-2003 (Monthly Averages)

Palmer realized that his work also had promise for monitoring short-term, or agricultural, drought. He formally introduced the CMI in 1968.





# Background

- In 1998, Congress passed the National Drought Policy Act, creating the NDPC.
- Why did Congress act?
- Droughts of varying degrees of severity and magnitude occur repeatedly in all climatic regimes of the United States.
- Severe drought episodes during every decade since the 1930's.

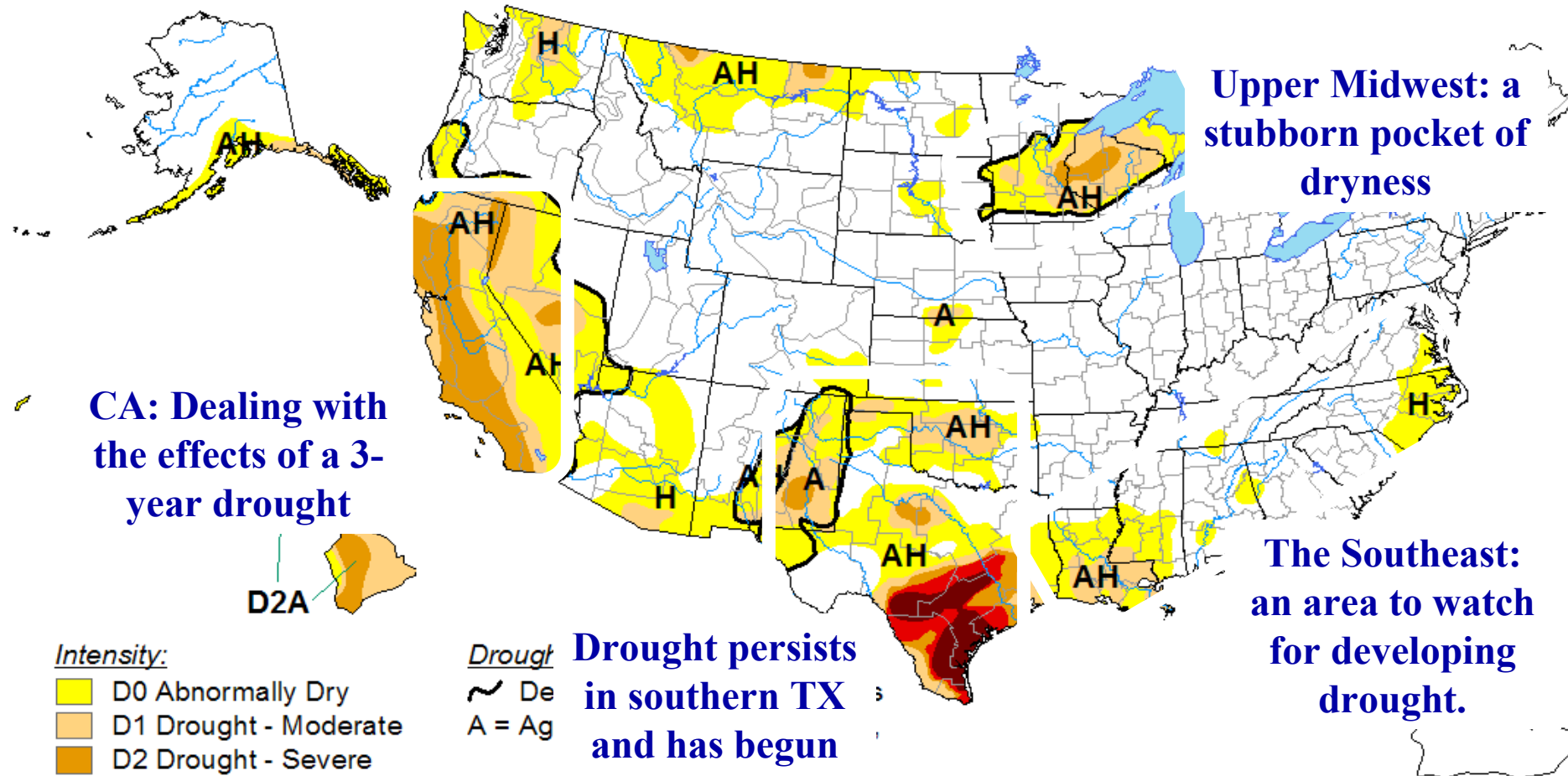
# Past Response to Drought

- 88 federal programs in the last 10 years alone, focused on preparedness, information, insurance, or emergency relief.
- 30 states had drought plans, mostly oriented to relief.
- Regional, local and tribal plans were fragmented and often relied on federal response.

# U.S. Drought Monitor

June 30, 2009

Valid 8 a.m. EDT



## Intensity:

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

## Drought

- De
- A = Ag
- H = Hy

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, July 2, 2009  
Author: Rich Tinker, CPC/NCEP/NWS/NOAA



# The National Integrated Drought Information System (NIDIS)

- *An information system for drought early warning and adaptation*
- Public Law 109-430 authorizing NIDIS signed by President in December 2006
- Led by NOAA, a multi-agency partnership of Federal, State, and Local cooperators
- A clearinghouse for drought mitigation and response innovations
- Coordination of drought plans among states, communities of a common river basin
- Strengthening monitoring networks

# USDA Disaster Relief and the U.S. Drought Monitor: A Brief History

**USDA Announces Implementation of Livestock Disaster Assistance Programs**

**Beginning Today, Producers May Sign Up to Participate in these Programs**

**WASHINGTON, Sept. 14, 2009 - Agriculture Secretary Tom Vilsack today announced that producers may begin applying for benefits under the provisions of the *Emergency Assistance for Livestock, Honeybees, and Farm-Raised Fish Program (ELAP)* and the *Livestock Forage Disaster Program (LFP)*. These permanent disaster programs, authorized in the 2008 Farm Bill, replace previous ad-hoc disaster assistance programs and are funded through the Agricultural Disaster Relief Trust Fund...**

**For losses due to drought, qualifying drought ratings are determined using the U.S. Drought Monitor located at [www.drought.unl.edu/dm/monitor.html](http://www.drought.unl.edu/dm/monitor.html)... Producers must have suffered losses that occurred on or after Jan. 1, 2008, and before Oct. 1, 2011.**



- U.S. Drought Monitor Usage by FSA
- *Food, Conservation, and Energy Act of 2008 (“Farm Bill”) authorizes the Livestock Forage Disaster Program (LFP)*
  - Grazing loss because of drought on owned or leased grazing land or pastureland that is physically located in a county experiencing:
    - D2 intensity for at least 8 consecutive weeks during normal grazing period will be eligible to receive payment equal to 1 monthly payment
    - D3 intensity during the normal grazing period will be eligible to receive a payment equal to 2 monthly payments
    - D3 intensity for at least 4 weeks or a D4 intensity any time during the grazing period will be eligible to receive a payment equal to 3 monthly payments



- ***2008 “Farm Bill” Livestock Forage Disaster Program (LFP) Payouts*** (financial assistance to producers who suffered grazing losses due to drought or fire on or after January 1, 2008, and before October 1, 2011, during the calendar year in which the loss occurs):
  - 2008 calendar year: \$147,109,381
  - 2009 calendar year: \$77,608,125
- **For more information:**  
<http://www.fsa.usda.gov/FSA/webapp?area=home&subject=diap&topic=lf>

## Other U.S. Drought Monitor Usage by FSA

State FSA Committees are authorized to *approve emergency haying and/or grazing of certain land enrolled in the Conservation Reserve Program (CRP) for an area or county within their State when the U.S. Drought monitor attains D3 or D4.*

Informs FSA at the National Office of conditions in areas seeking approval of emergency haying and/or grazing of CRP which has attained D3 or D4.

Informs FSA at the National Office of drought conditions to *support requests for funding under the Emergency Conservation Program.*

Lack of moisture verification for prolonged precipitation deficiencies that exceed the D2 level for *reviewing prevented planted claims for nonirrigated crops.*

- Previous U.S. Drought Monitor Usage by FSA
- 2006 Livestock Assistance Grant Program – \$50 Million in state block grants - County must have experienced D3 or D4 during March 7, 2006, to August 31, 2006.
- 2003 Surplus Non-fat Dry Milk Sales for Feed Program – Producers in counties must have met one of the two following criteria to be eligible:
  - County was included in D4 as determined on March 13, 2003
  - County has been located in D4 at any time between September 1, 2003, and March 13, 2003, and was located in a D3 category on March 13, 2003.



Thank you