Drought Basics

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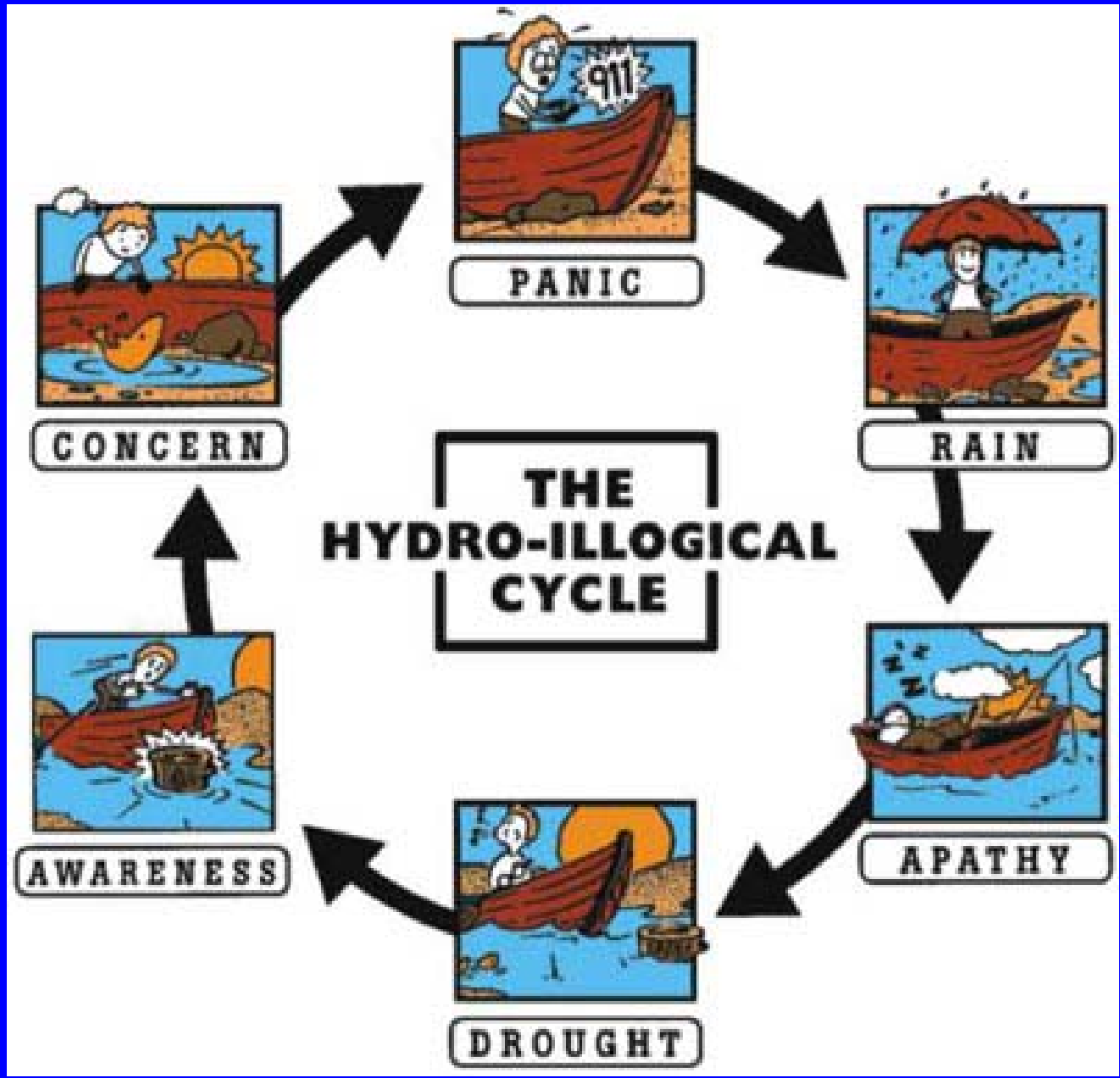
http://www.srh.noaa.gov/abq



National Drought Mitigation Center

What is Drought?

- Drought is a normal, recurrent feature of climate.
- It occurs almost everywhere, although its features vary from region to region.
- Defining drought is therefore difficult; it depends on differences in regions, needs, and disciplinary perspectives.

Signs of Drought

New Mexico Drought Contingency Plan Definition

Drought is a complex physical and social process of widespread significance. It is not usually a statewide phenomenon, with differing conditions in the state often making drought a regional issue. Despite all of the problems that droughts have caused, drought has proven to be difficult to define and there is no universally accepted definition because:

New Mexico Drought Contingency Plan Definition (cont.)

- Drought, unlike floods, is not a distinct event
- Drought is often the result of many complex factors such that drought often has no well-defined start nor end
- The impacts of drought vary by affected sector, thus often making definitions of drought specific to particular affected groups

New Mexico Drought Plan Definition (cont.)

- The most commonly used definitions are based on these aspects:

- **meteorological**
- **agricultural**
- **hydrological**
- **socioeconomic**

New Mexico Drought Plan Definition (cont.)

- **Meteorological Drought -** usually defined by a period of substantially diminished precipitation

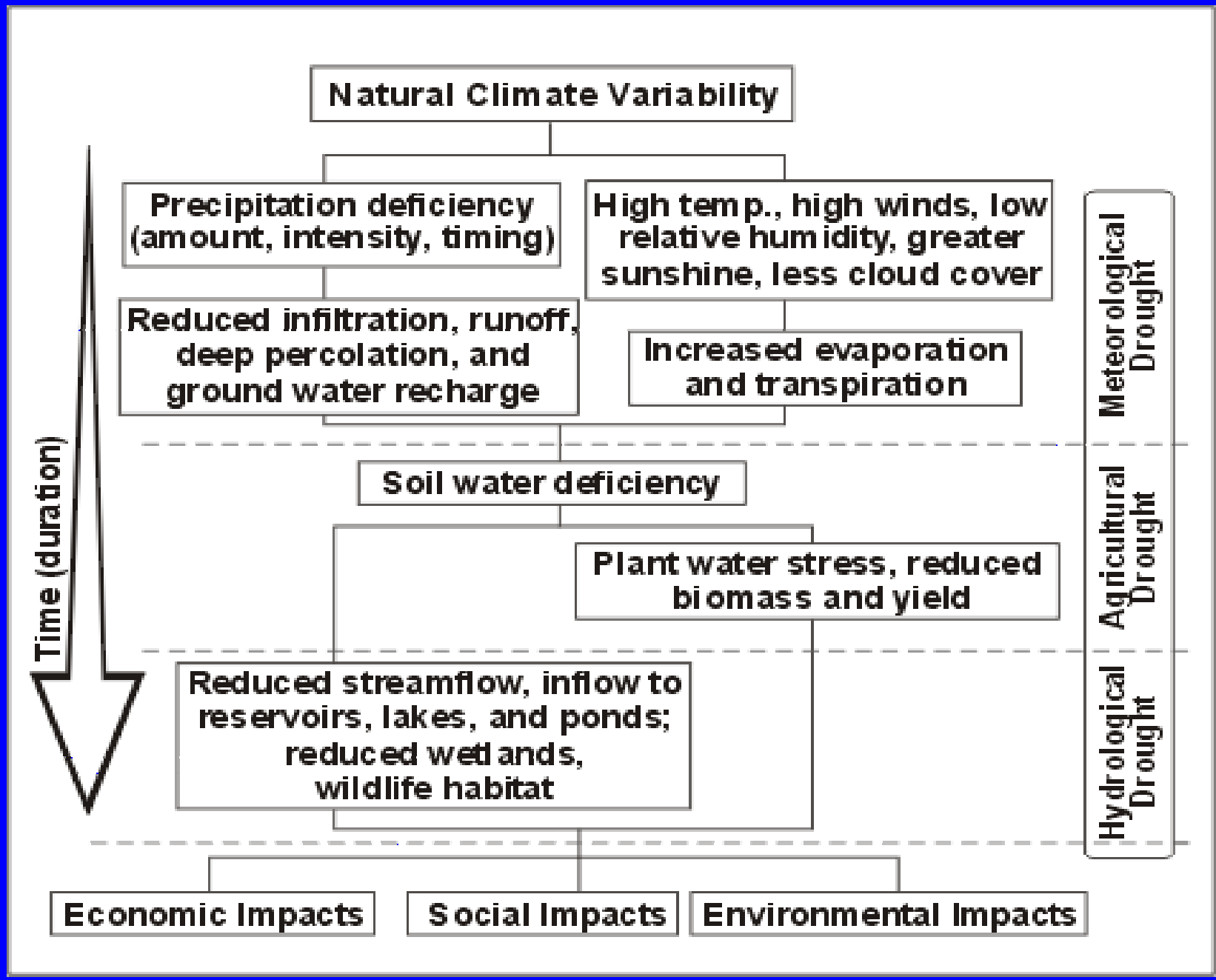
- **Agricultural Drought -** occurs whenever there is not adequate soil moisture to meet the needs of a particular crop at a particular time. Usually occurs during or after evidence of meteorological drought

New Mexico Drought Plan Definition (cont.)

- **Hydrological Drought -** refers to deficiencies in surface and subsurface water supplies. Evidence is provided by reductions in stream flow, snow pack, reservoir and groundwater levels. Occurrence is usually after meteorological and agricultural droughts have been identified

New Mexico Drought Plan Definition (cont.)

- **Socioeconomic Drought -** occurs when water shortages begin to affect the health, well-being, and quality of life of the people, or when the drought starts to affect the supply and demand of an economic product


Natural Climate Variability
Precipitation deficiency (amount, intensity, timing)
High temp., high winds, low relative humidity, greater sunshine, less cloud cover
Reduced infiltration, runoff, deep percolation, and ground water recharge
Increased evaporation and transpiration
Soil water deficiency
Plant water stress, reduced biomass and yield
Reduced streamflow, inflow to reservoirs, lakes, and ponds; reduced wetlands, wildlife habitat
Economic Impacts
Social Impacts
Environmental Impacts
Time (duration)
Meteorological Drought
Agricultural Drought
Hydrological Drought

Defining Drought is a Moving Target

- Population changes (not only numbers, but where people live)
- Demands Change
- Laws Change

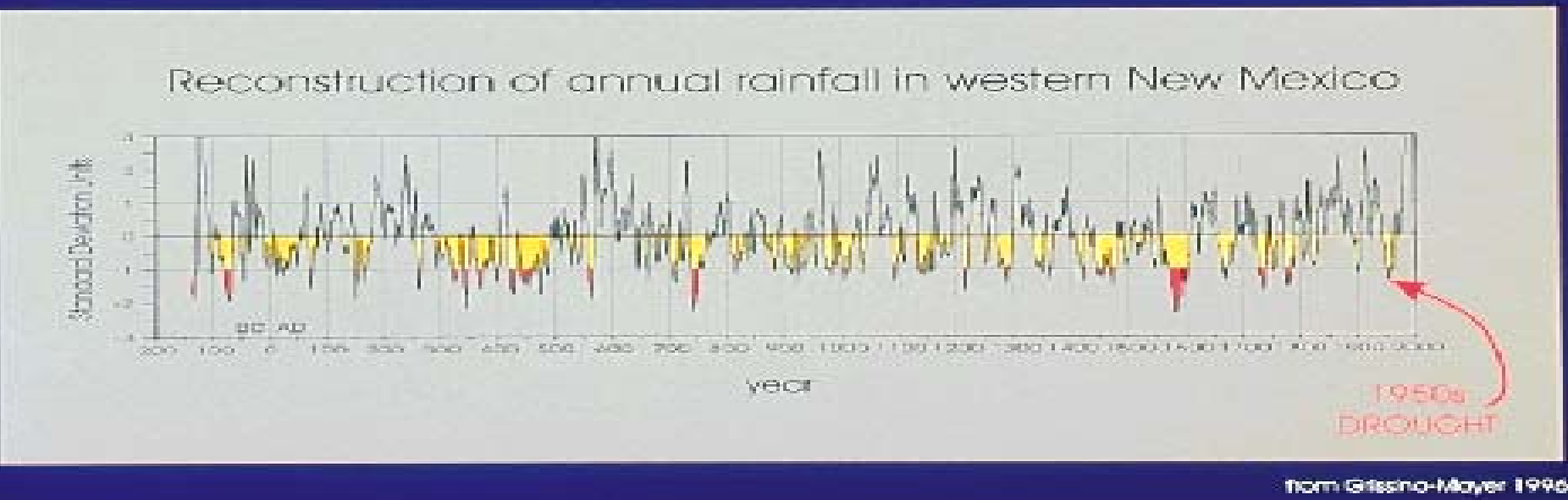
Do We Need Yet Another Drought Definition??

- Instead of looking at indices, should we shift to more of a "supply and demand" approach?
- Is it okay to call it a drought when precipitation has been "normal?"
- Do we skip the "meteorological drought and go straight to the "deeper" stages of drought?

Where and How Often do Droughts Occur in the United States?

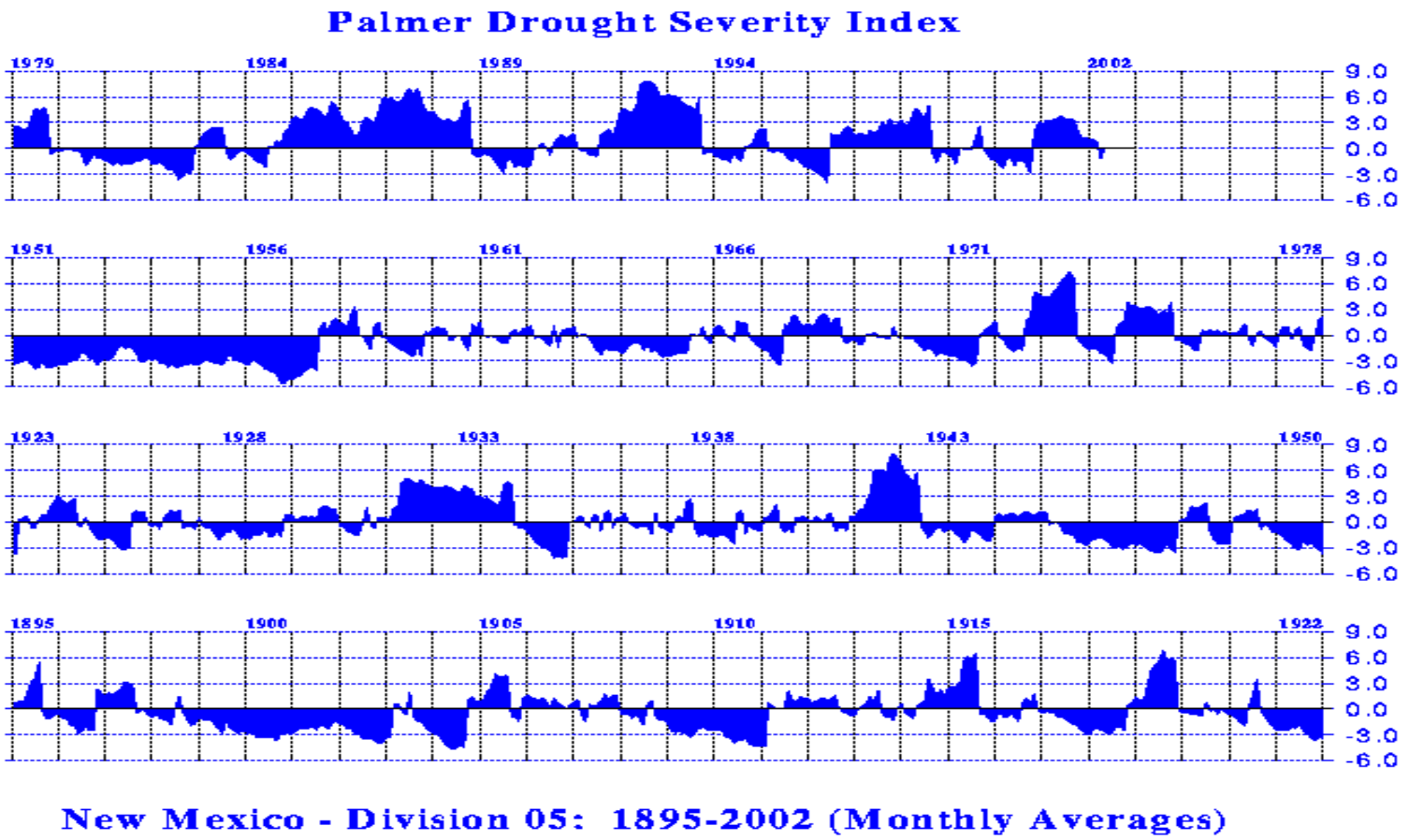
- Drought is a normal, recurrent feature of climate.
- It occurs almost everywhere, although its features vary from region to region.

Over 2000 Years of Tree Ring Records

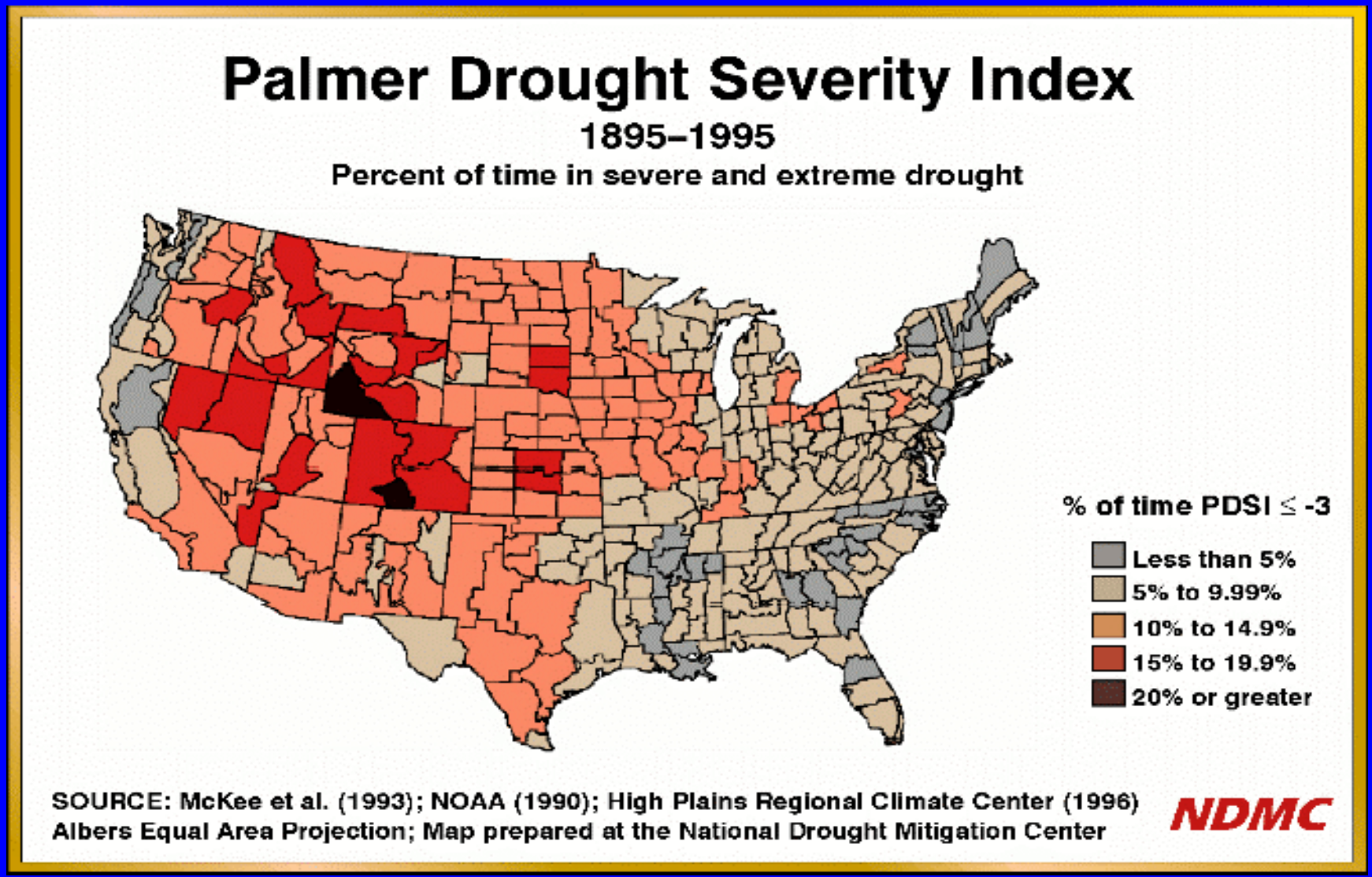


Grissino-Mayer - El Malpais tree ring

Recent Drought Based on Meteorological Records



Drought Frequency in the U.S.



Recent Droughts in New Mexico

Severe and Extreme Droughts in New Mexico

YEAR	#Months (SVR/EXTREME)	Worst Area Affected	Lowest PDSI
1896	2	South	-3.2
1899-1905	64	Most of state	-6.6
1909-1911	20	Most of state	-5.2
1913	1	Southeast	-3.1
1917-1918	16	Eastern Plains	-4.2
1925	4	Nrn/Cntrl Mtns	-4.6
1928	1	Northwest	-3.2
1934-1935	18	Most of state	-5.5
1943	4	Northeast	-3.9
1946	5	Northeast	-3.5
1947-1948	12	Central Mountains	-5.2
1950-1957	67	Became statewide	-6.9
1959-1965	22	Mainly Northwest	-5.1
1967	5	Northern Mountains	-4.8
1971	5	Southwest	-4.3
1972	5	Northwest	-4.7
1974	4	Most of state	-4.2
1976-1977	12	Northwest	-4.3
1981	9	Northern Mountains	-4.3
1989-1990	10	Northwest	-4.0
1994-1996	15	Became statewide	-5.9
2000	5	Became statewide	-5.1
2001-2003	12	Became statewide	-6.9

Drought Facts for New Mexico

- Severe to extreme drought has affected at least a portion of New Mexico in 60 of the 108 years (1896-2003). That is 56 percent of the time.

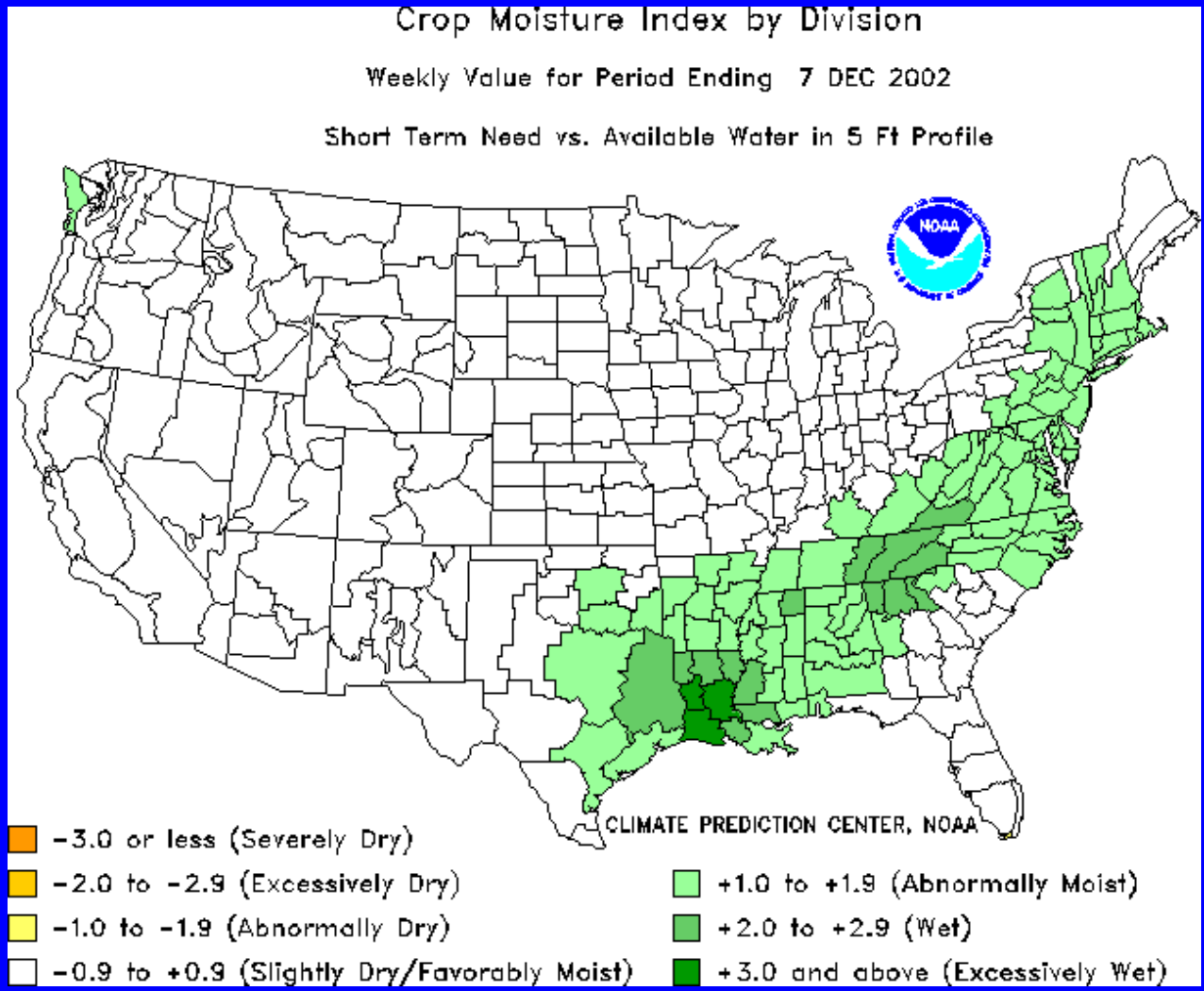
- Each climate division in New Mexico is in severe to extreme drought approximately 8 to 15 percent of the time.

- Colorado division 5 (The Rio Grande Basin) is in severe to extreme drought approximately 20 percent of the time.

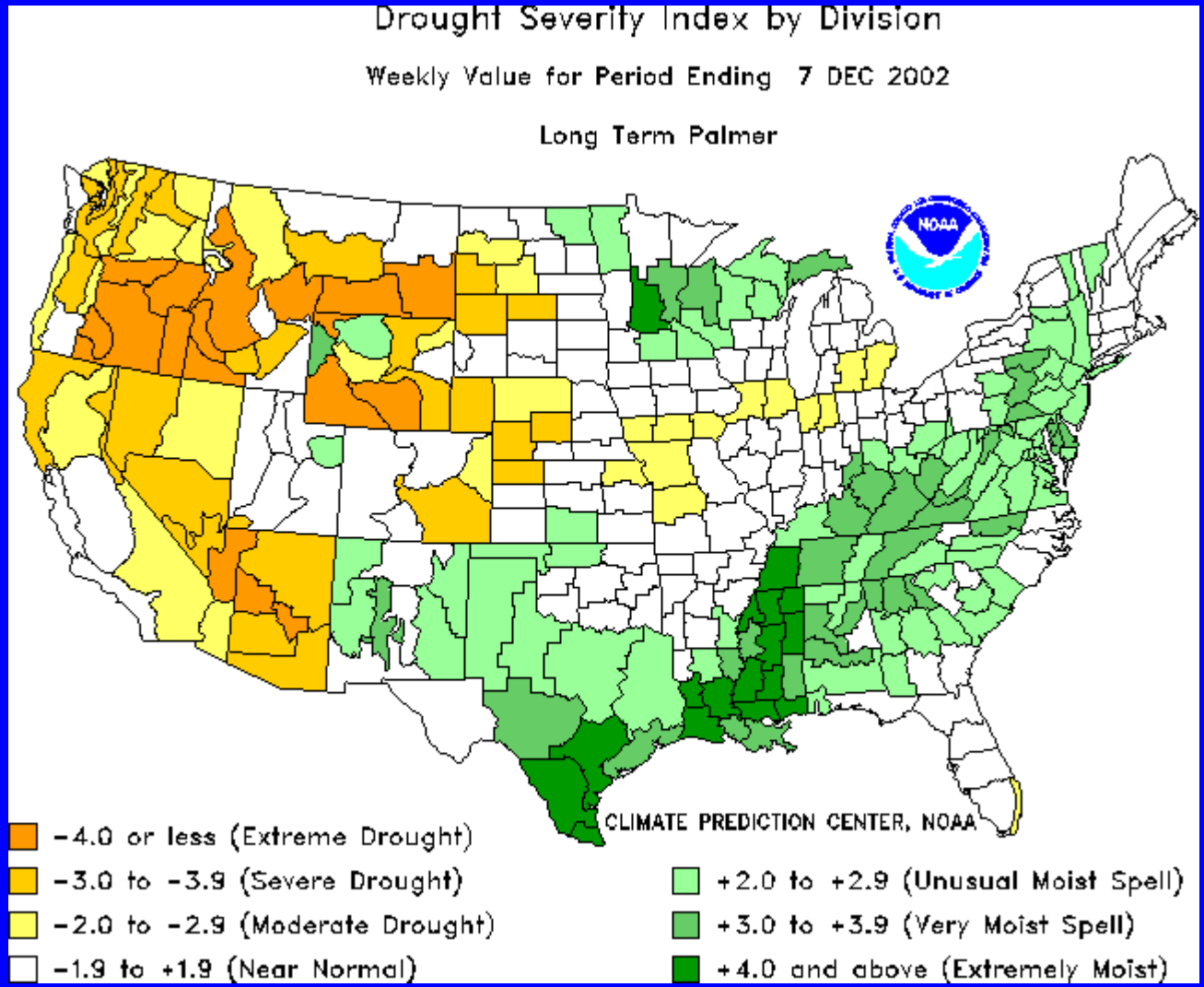
How do We Monitor Drought?

- Drought is usually defined by various indices that show the relationship between recent (month, season, year, etc.) precipitation and what is expected (climatic normal)

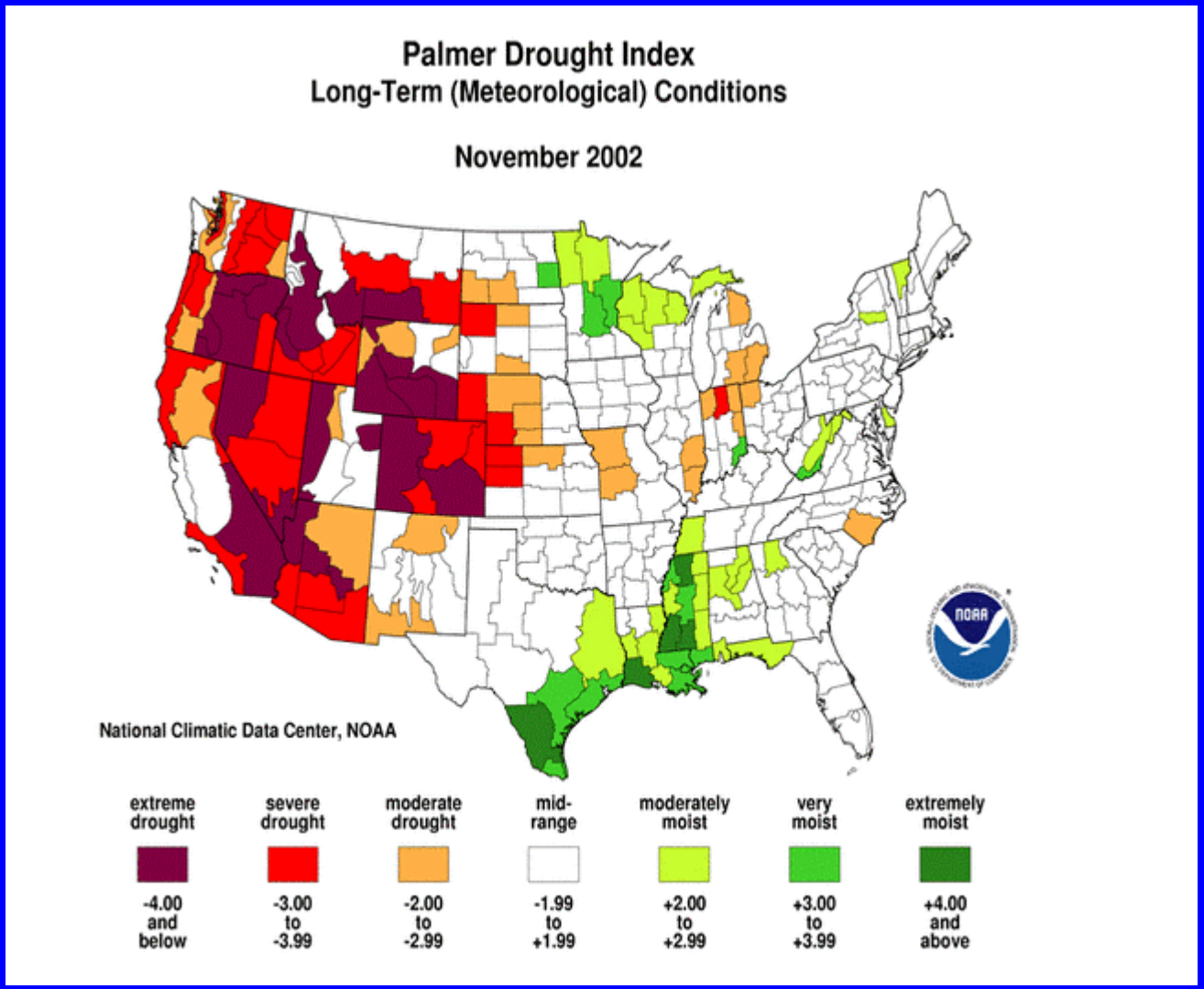
Crop Moisture Index



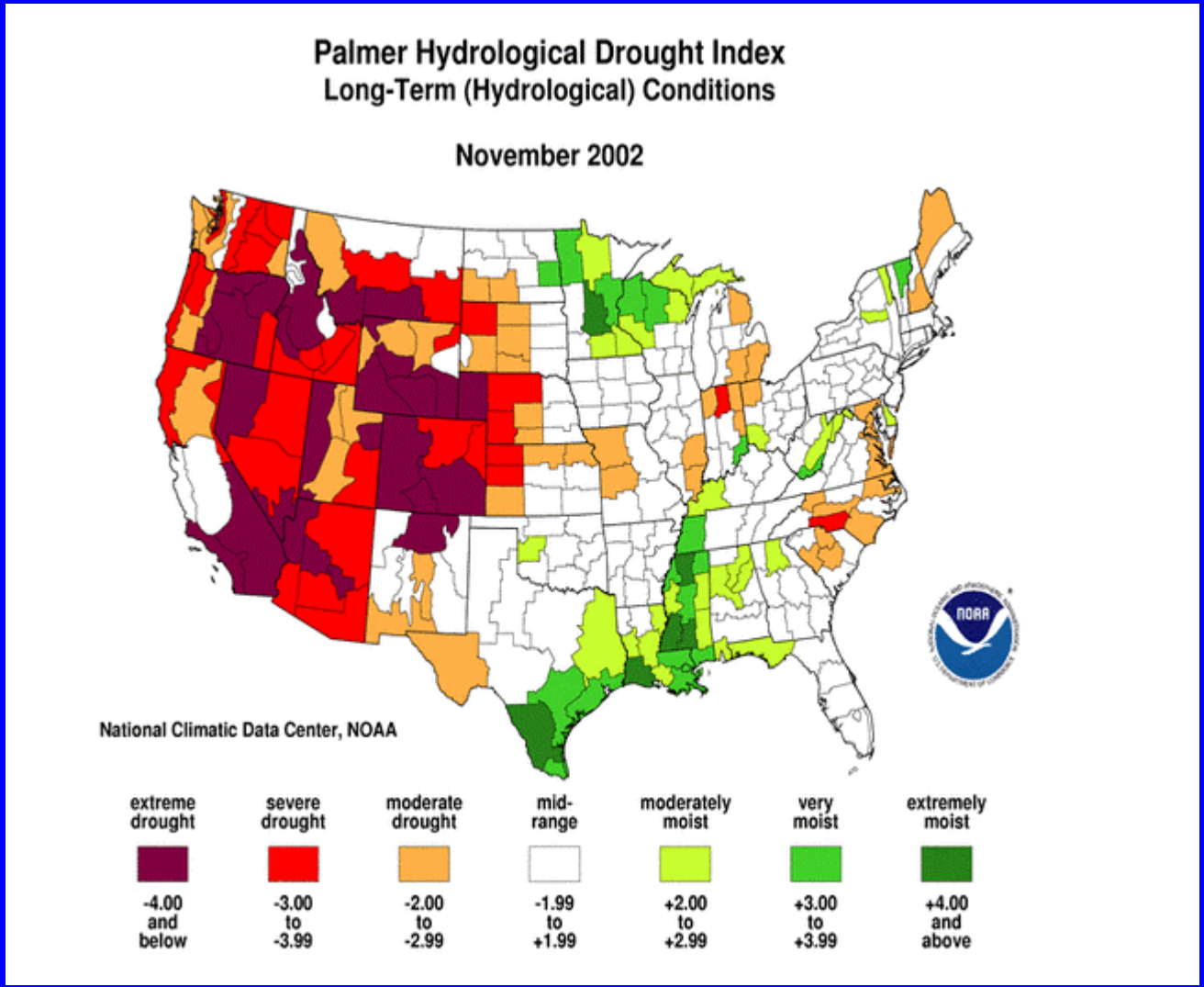
Palmer Index (weekly)



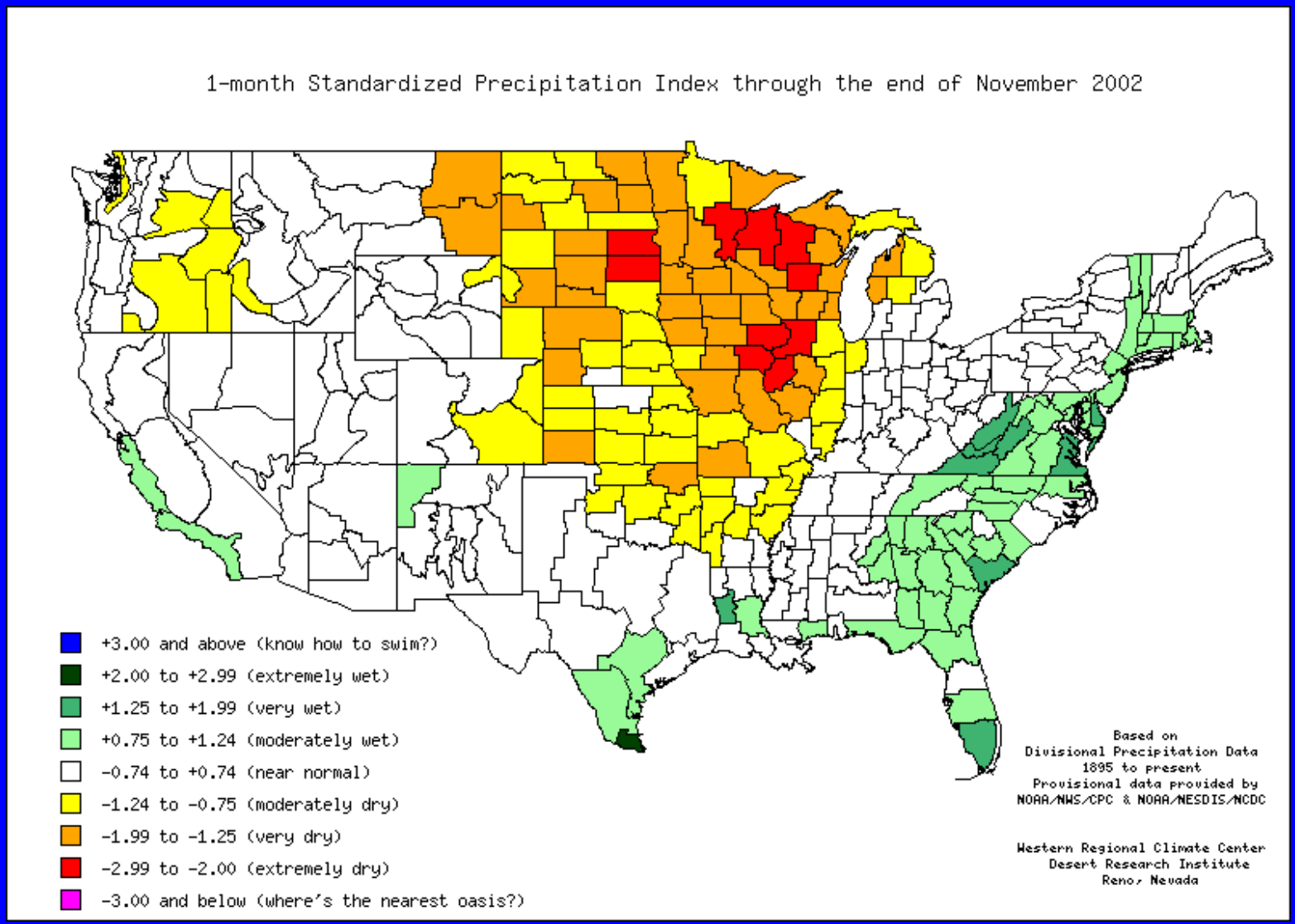
Palmer Long Term



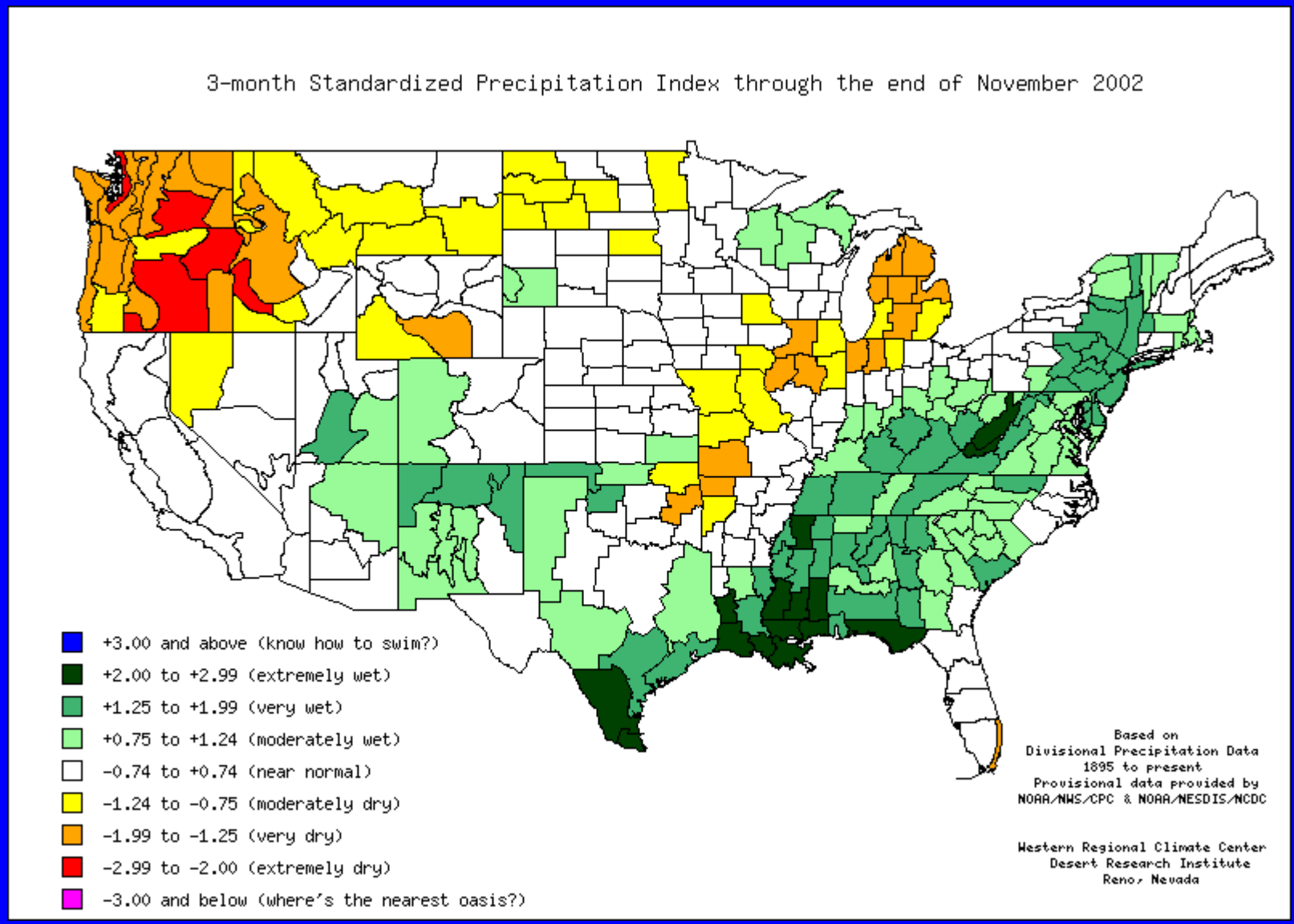
Palmer Hydro



SPI (1 month)


1-month Standardized Precipitation Index through the end of November 2002
+3.00 and above (know how to swim?)
+2.00 to +2.99 (extremely wet)
+1.25 to +1.99 (very wet)
+0.75 to +1.24 (moderately wet)
-0.74 to +0.74 (near normal)
-1.24 to -0.75 (moderately dry)
-1.99 to -1.25 (very dry)
-2.99 to -2.00 (extremely dry)
-3.00 and below (where's the nearest oasis?)
Based on
Divisional Precipitation Data
1895 to present
Provisional data provided by
NOAA/NWS/CPC & NOAA/NESDIS/NCDC
Western Regional Climate Center
Desert Research Institute
Reno, Nevada

SPI (3 month)


3-month Standardized Precipitation Index through the end of November 2002
+3.00 and above (know how to swim?)
+2.00 to +2.99 (extremely wet)
+1.25 to +1.99 (very wet)
+0.75 to +1.24 (moderately wet)
-0.74 to +0.74 (near normal)
-1.24 to -0.75 (moderately dry)
-1.99 to -1.25 (very dry)
-2.99 to -2.00 (extremely dry)
-3.00 and below (where's the nearest oasis?)
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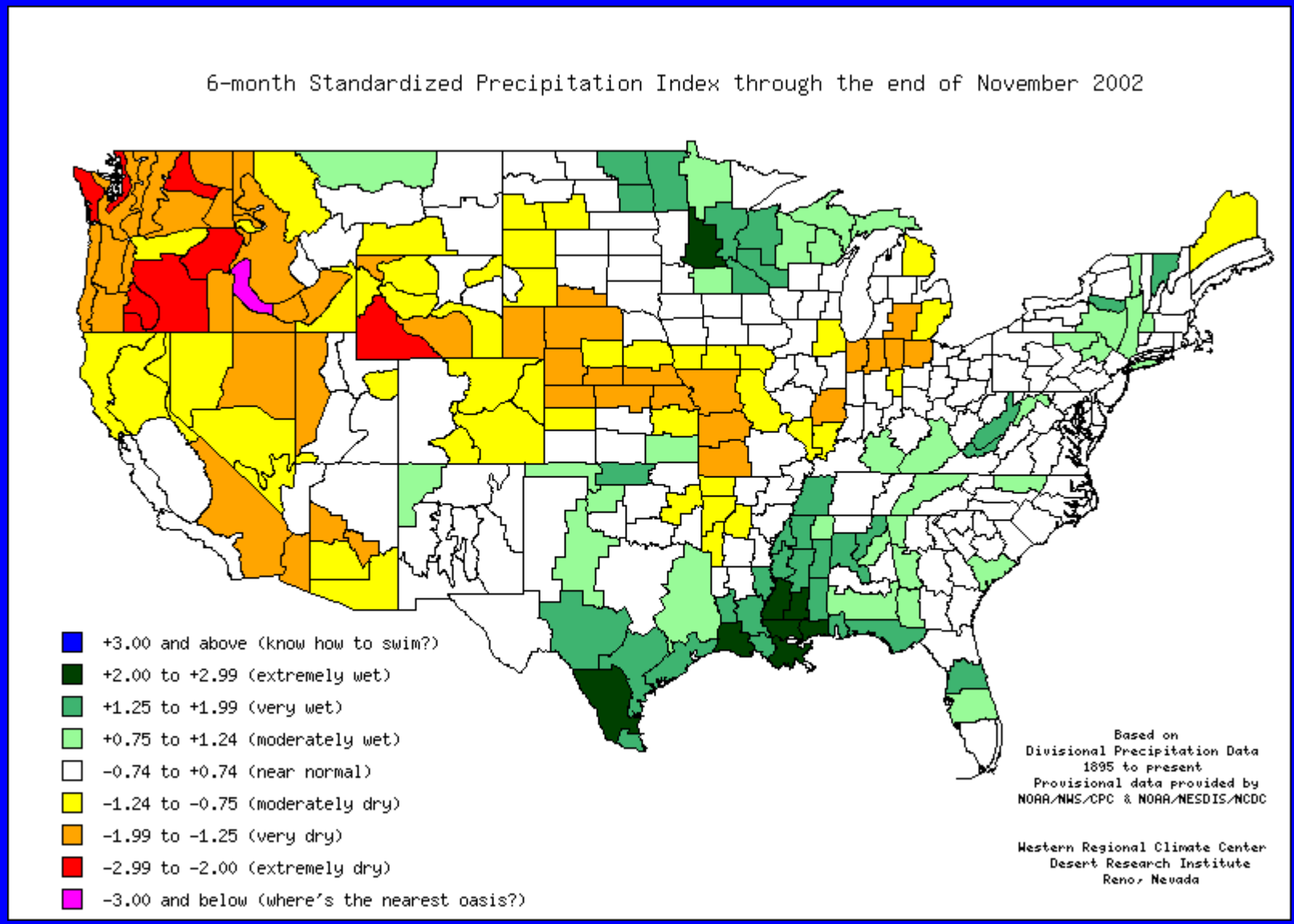
SPI (6 month)


6-month Standardized Precipitation Index through the end of November 2002
+3.00 and above (know how to swim?)
+2.00 to +2.99 (extremely wet)
+1.25 to +1.99 (very wet)
+0.75 to +1.24 (moderately wet)
-0.74 to +0.74 (near normal)
-1.24 to -0.75 (moderately dry)
-1.99 to -1.25 (very dry)
-2.99 to -2.00 (extremely dry)
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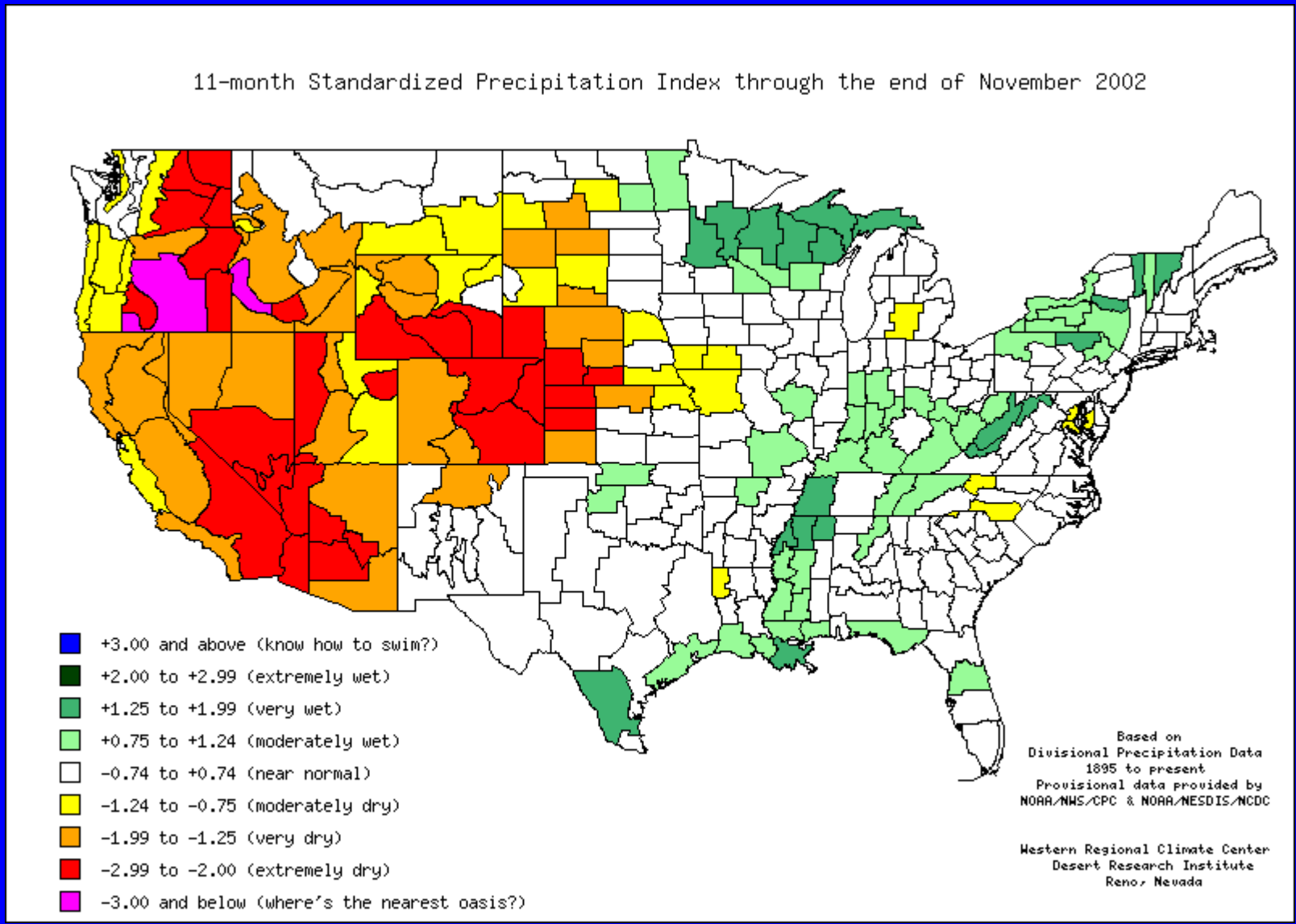
SPI (11 month)


11-month Standardized Precipitation Index through the end of November 2002
+3.00 and above (know how to swim?)
+2.00 to +2.99 (extremely wet)
+1.25 to +1.99 (very wet)
+0.75 to +1.24 (moderately wet)
-0.74 to +0.74 (near normal)
-1.24 to -0.75 (moderately dry)
-1.99 to -1.25 (very dry)
-2.99 to -2.00 (extremely dry)
-3.00 and below (where's the nearest oasis?)
Based on
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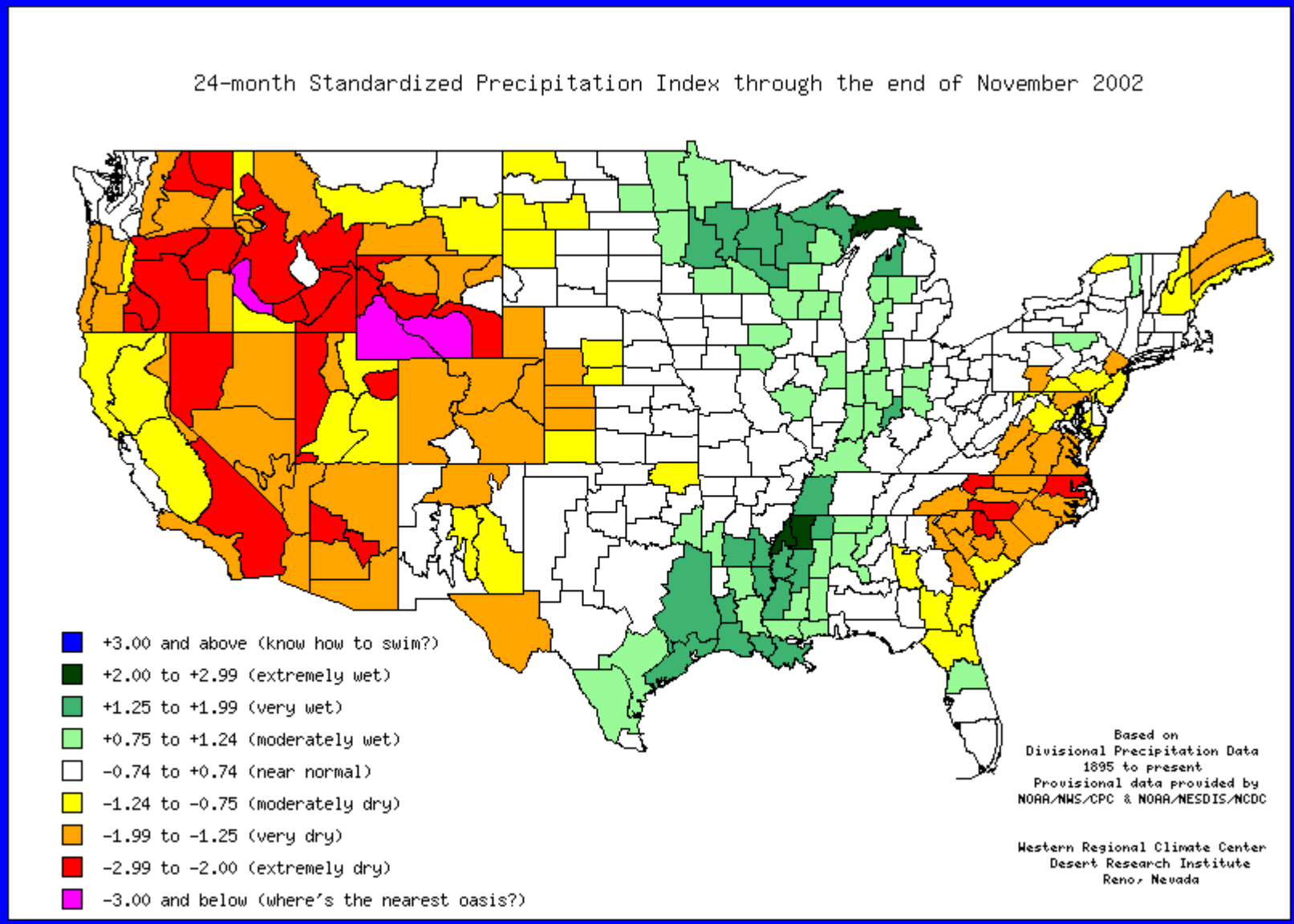
SPI (24 month)


24-month Standardized Precipitation Index through the end of November 2002
+3.00 and above (know how to swim?)
+2.00 to +2.99 (extremely wet)
+1.25 to +1.99 (very wet)
+0.75 to +1.24 (moderately wet)
-0.74 to +0.74 (near normal)
-1.24 to -0.75 (moderately dry)
-1.99 to -1.25 (very dry)
-2.99 to -2.00 (extremely dry)
-3.00 and below (where's the nearest oasis?)
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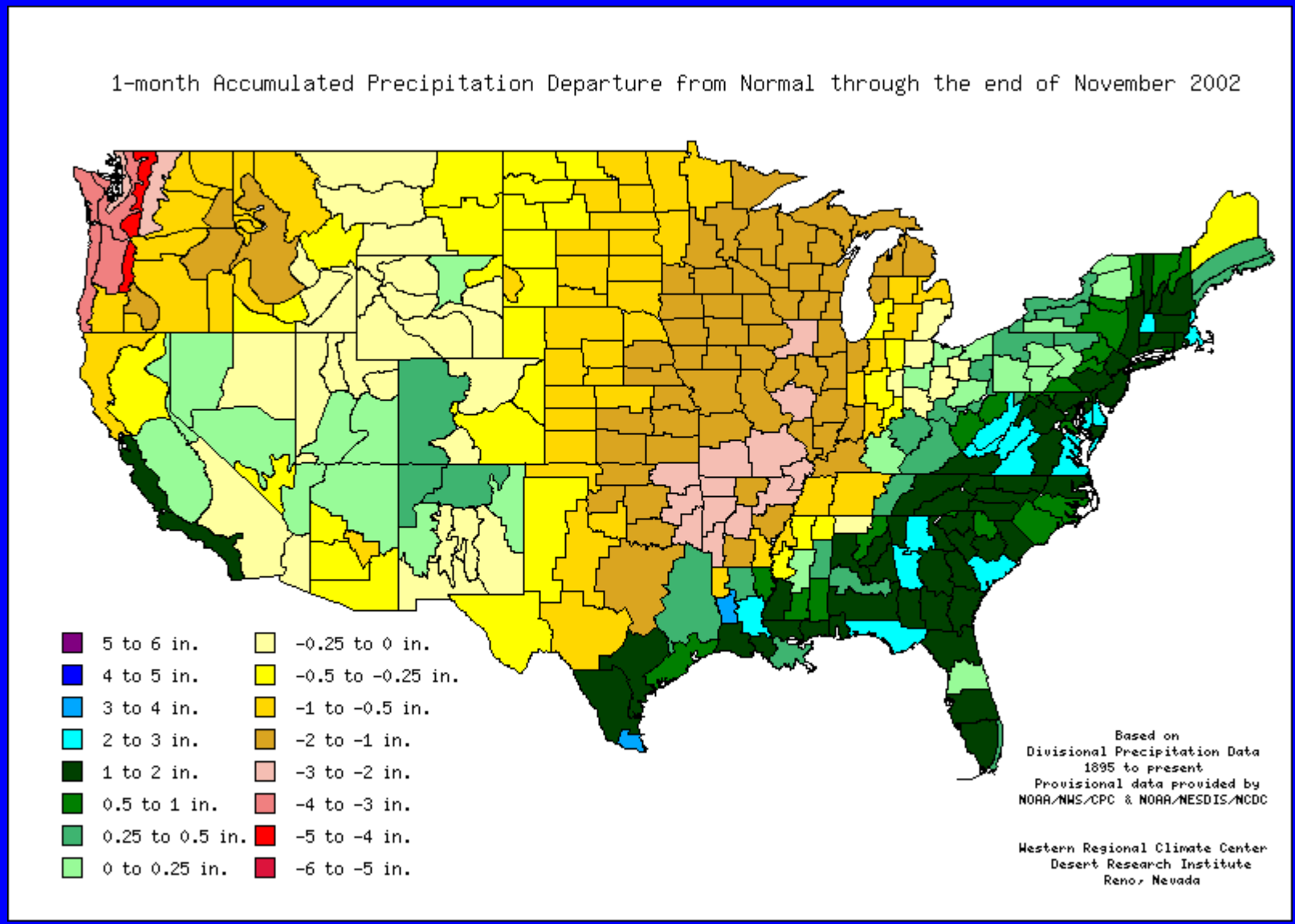
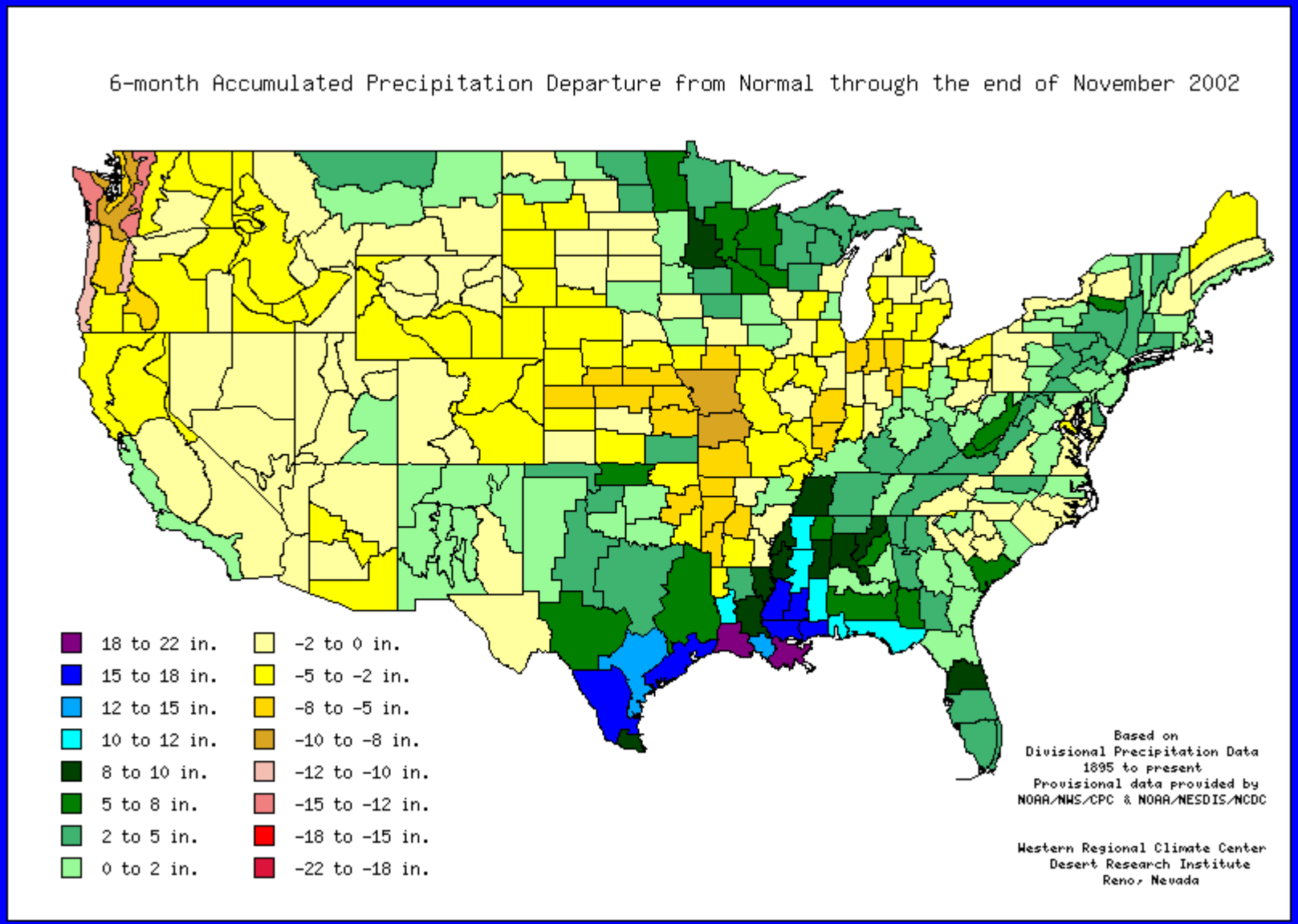
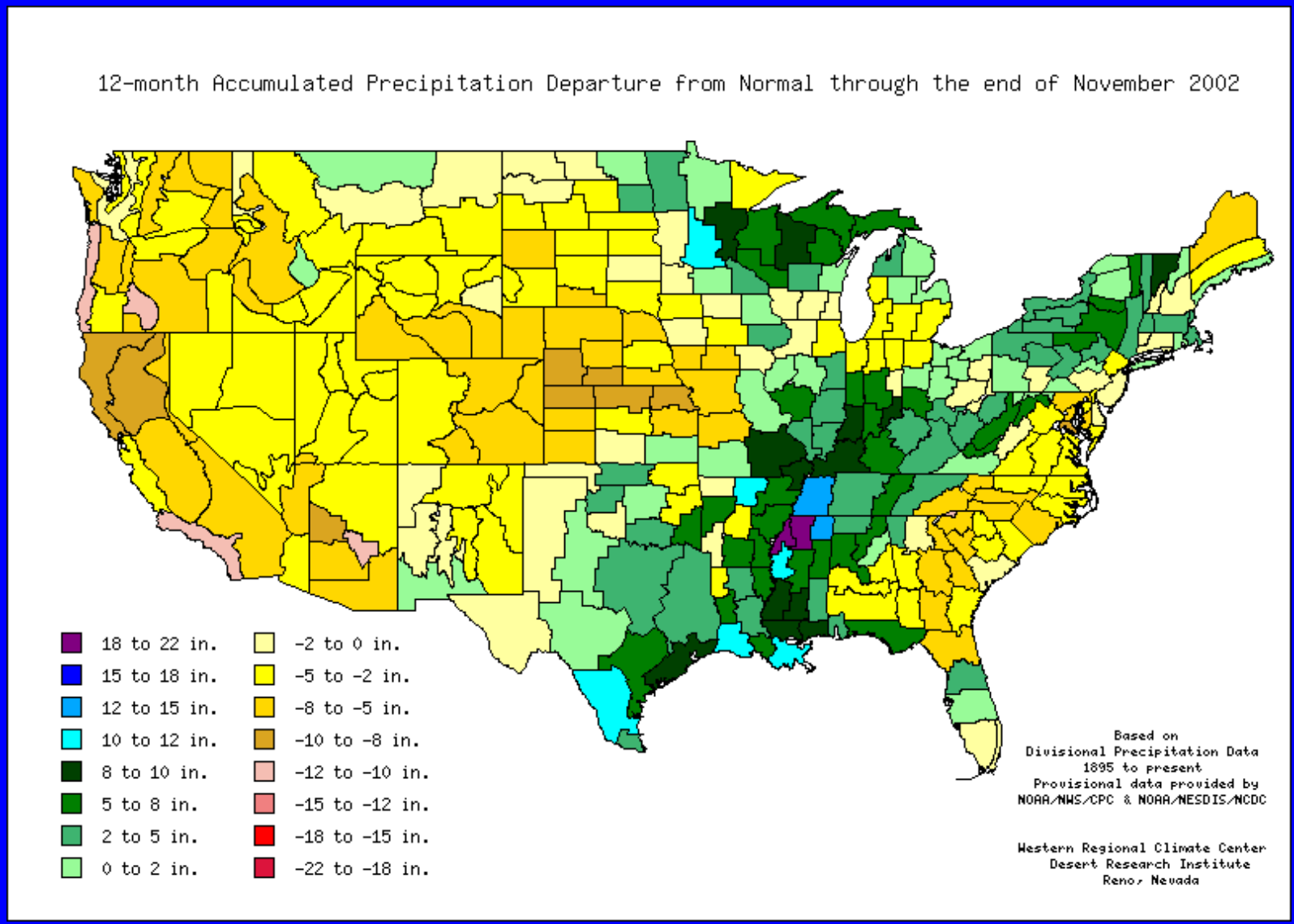
SPI (Precip departure 1 month)



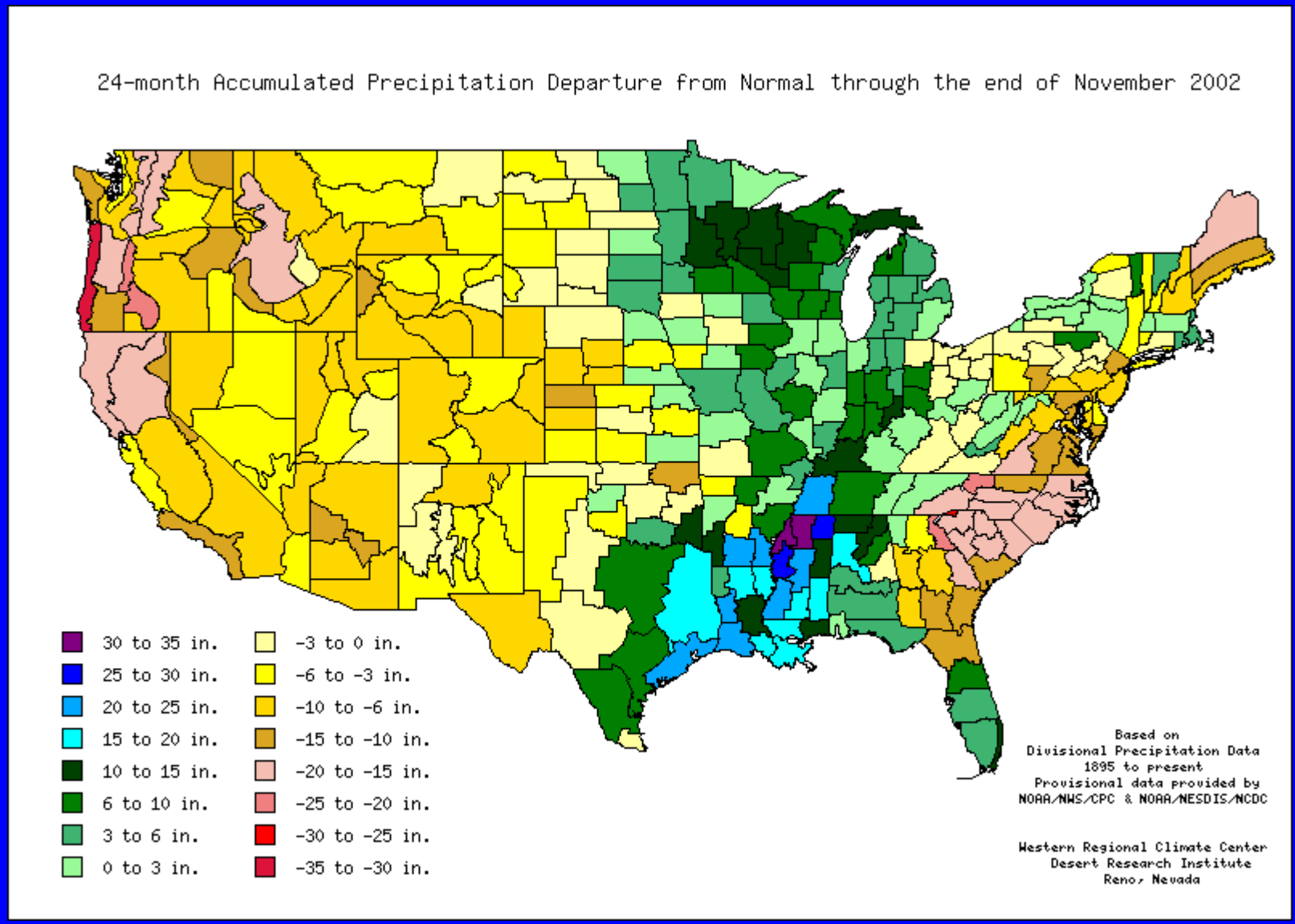
SPI (Precip Departure 6 month)



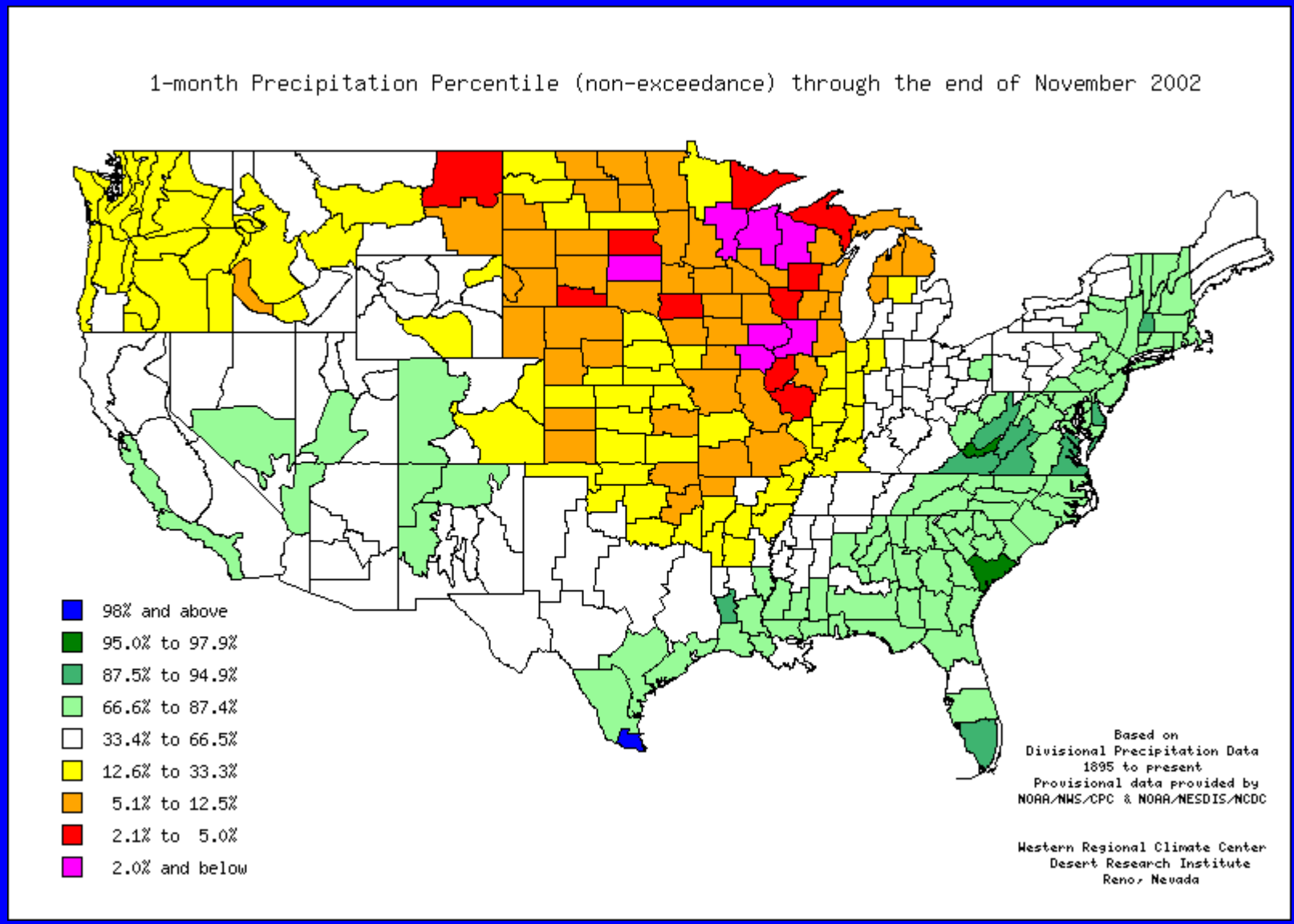
SPI (Precip departure 12 month



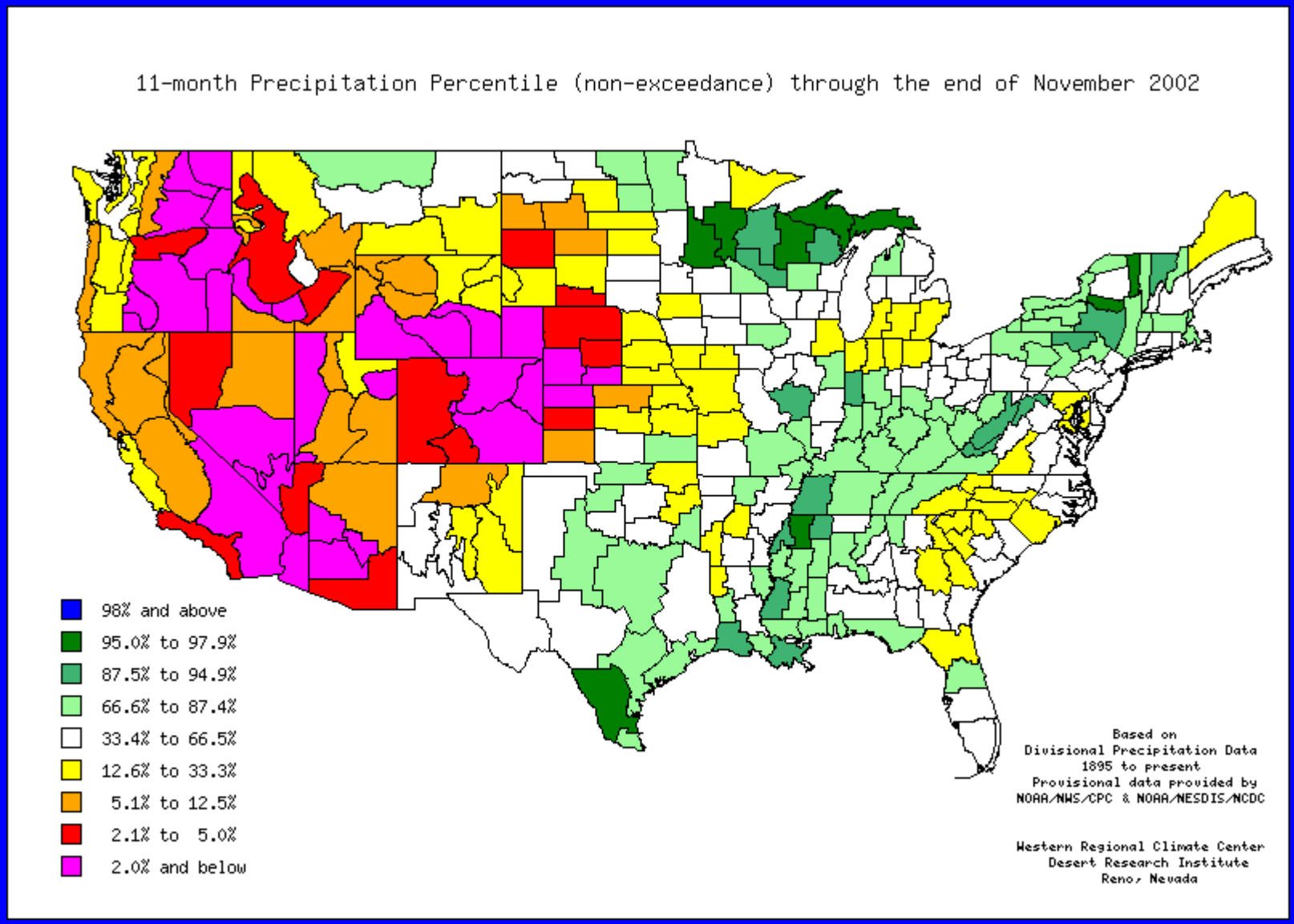
SPI (Precip departure 24 month



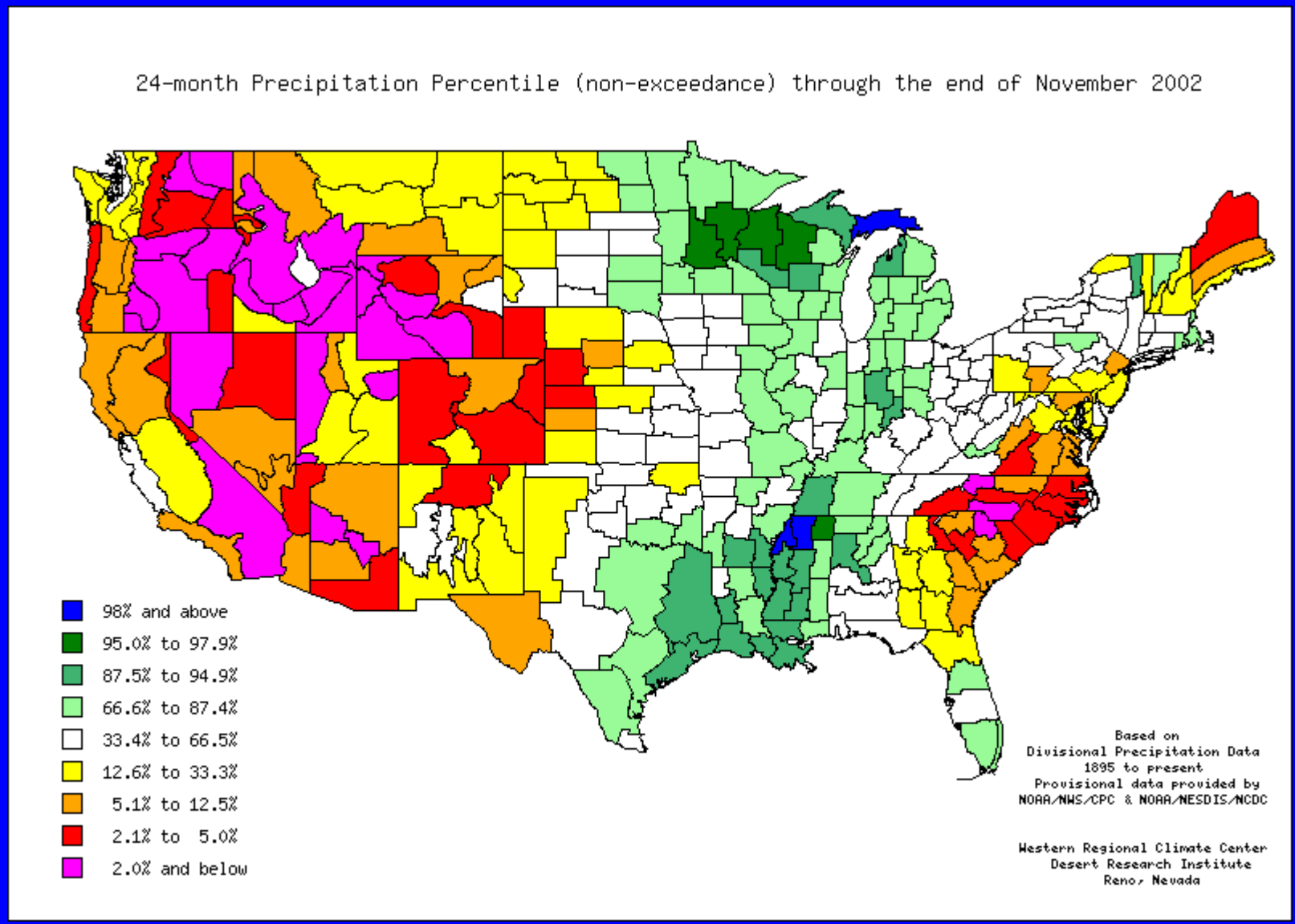
SPI (Precipitation Percentiles)



SPI (Precip Percentile 11 month



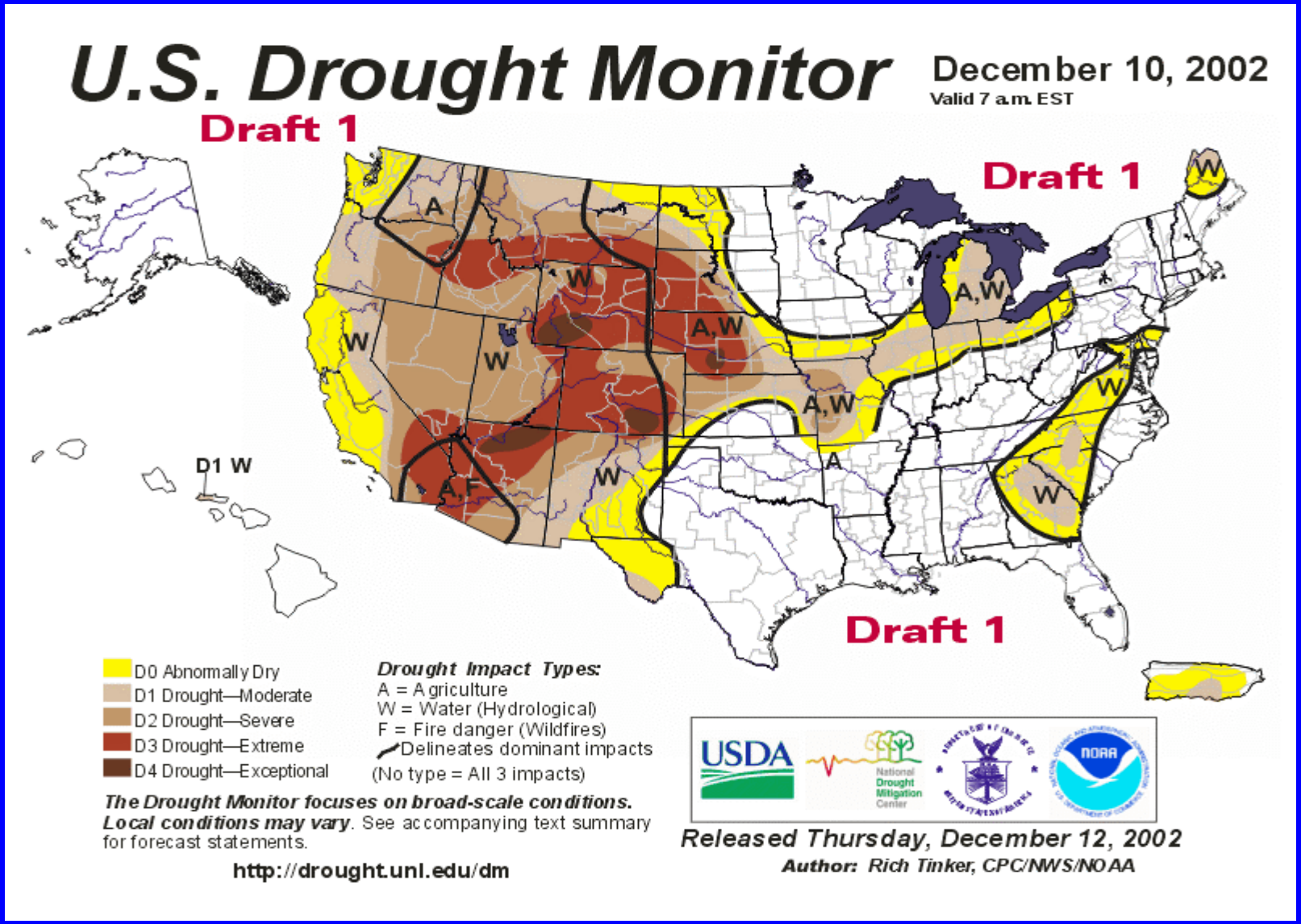
SPI (Precip Percentile 24 month



Which graphic has the Truth?

- Numerous indices and variations of indices
- Blends of indices weighting various choices
- Drought assessment requires a wide spectrum of input from an array of perspectives.

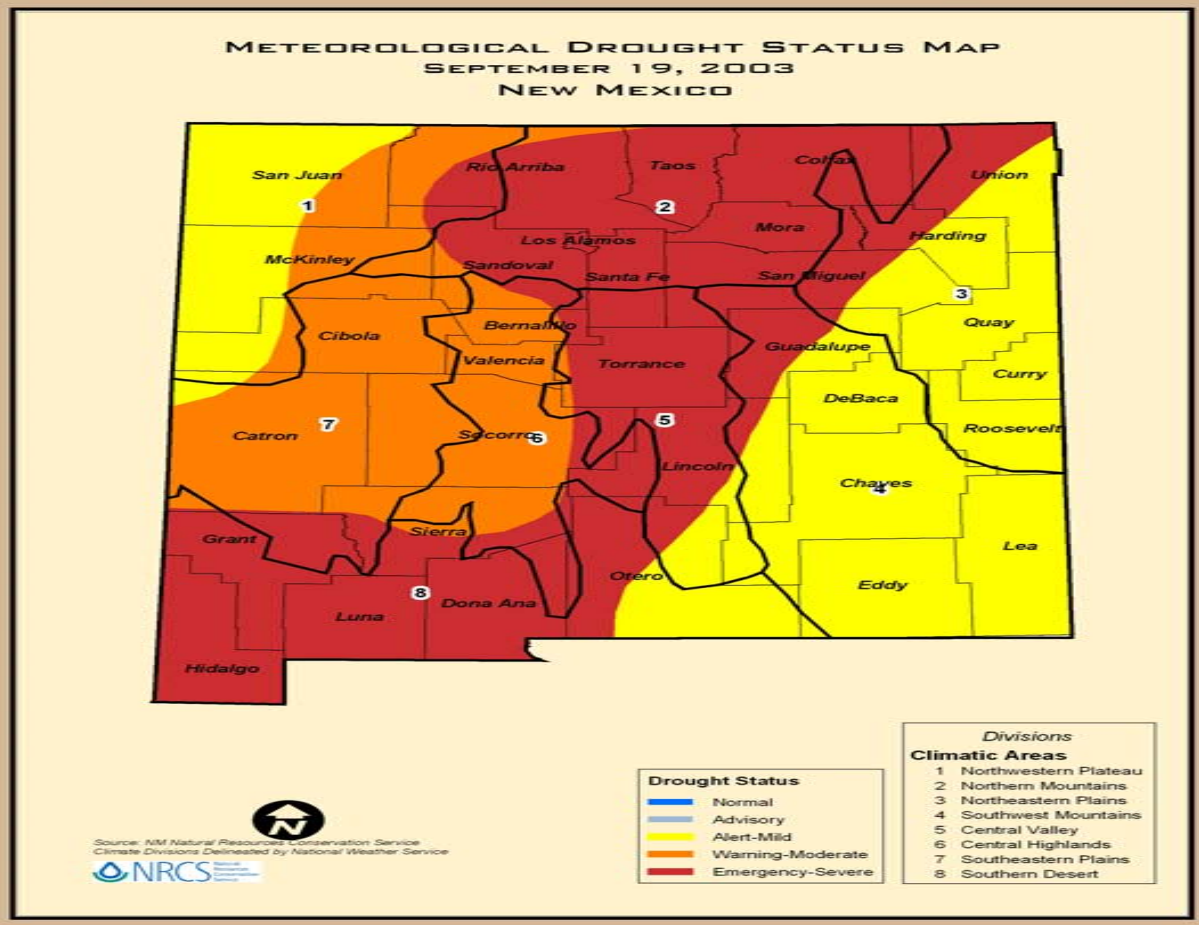
Drought Monitor



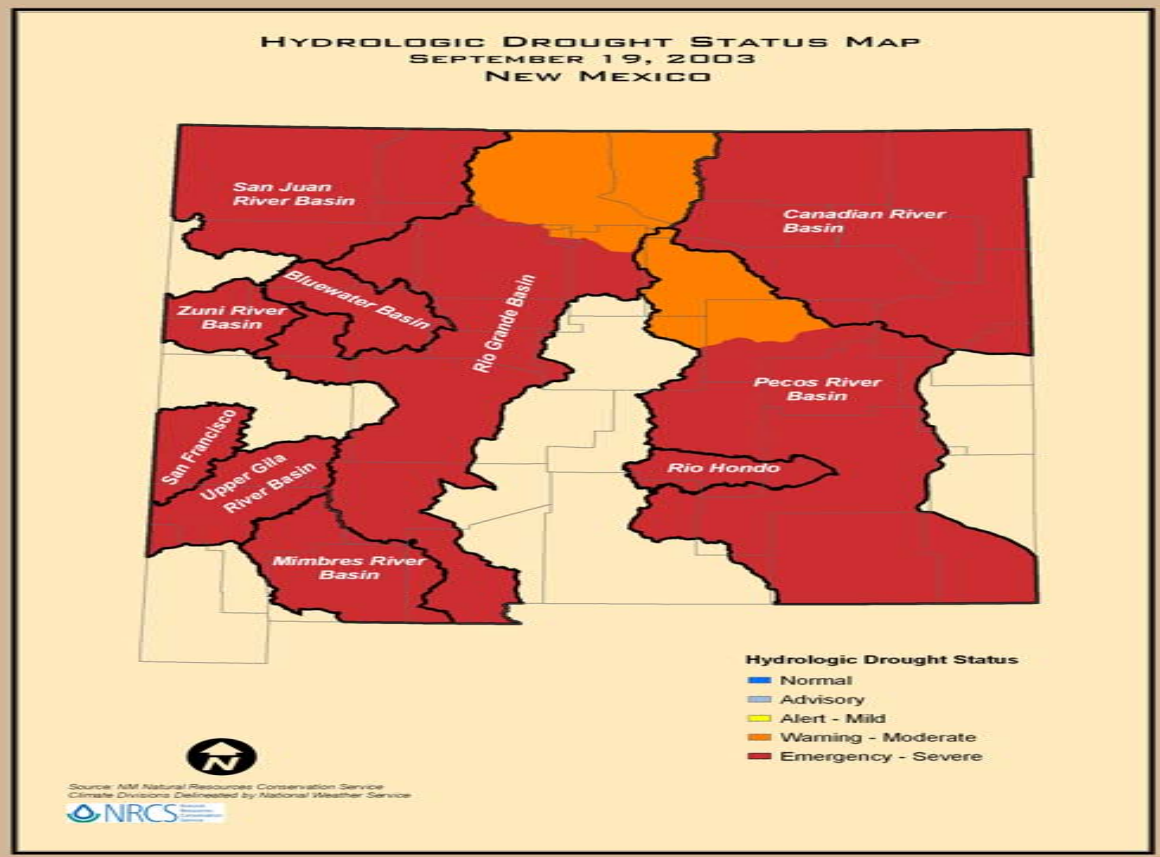
New Mexico Drought Monitor

- New Mexico Department of Agriculture
- National Weather Service
- USDA - Natural Resource Cons. Service
- USDA - Farm Service Agency
- United States Geological Survey
- New Mexico State University
- New Mexico Department of Public Safety
- USDI - Bureau of Land Management
- US Army Corps of Engineers
- USDA - Forest Service
- Interstate Stream Commission

New Mexico Drought Monitor
State of the Land



New Mexico Drought Monitor
State of the Hydrology



Drought Response

Besides detecting and monitoring drought conditions, what can be done?

Drought Preparedness Plan Components

(1) a comprehensive early warning system

(2) risk and impact assessment procedures

(3) mitigation and response strategies.

These components complement one another and represent an integrated institutional approach that addresses both short- and long-term management and mitigation issues.

El Ninny Effect

Peter Nicholson of "The Australian" newspaper