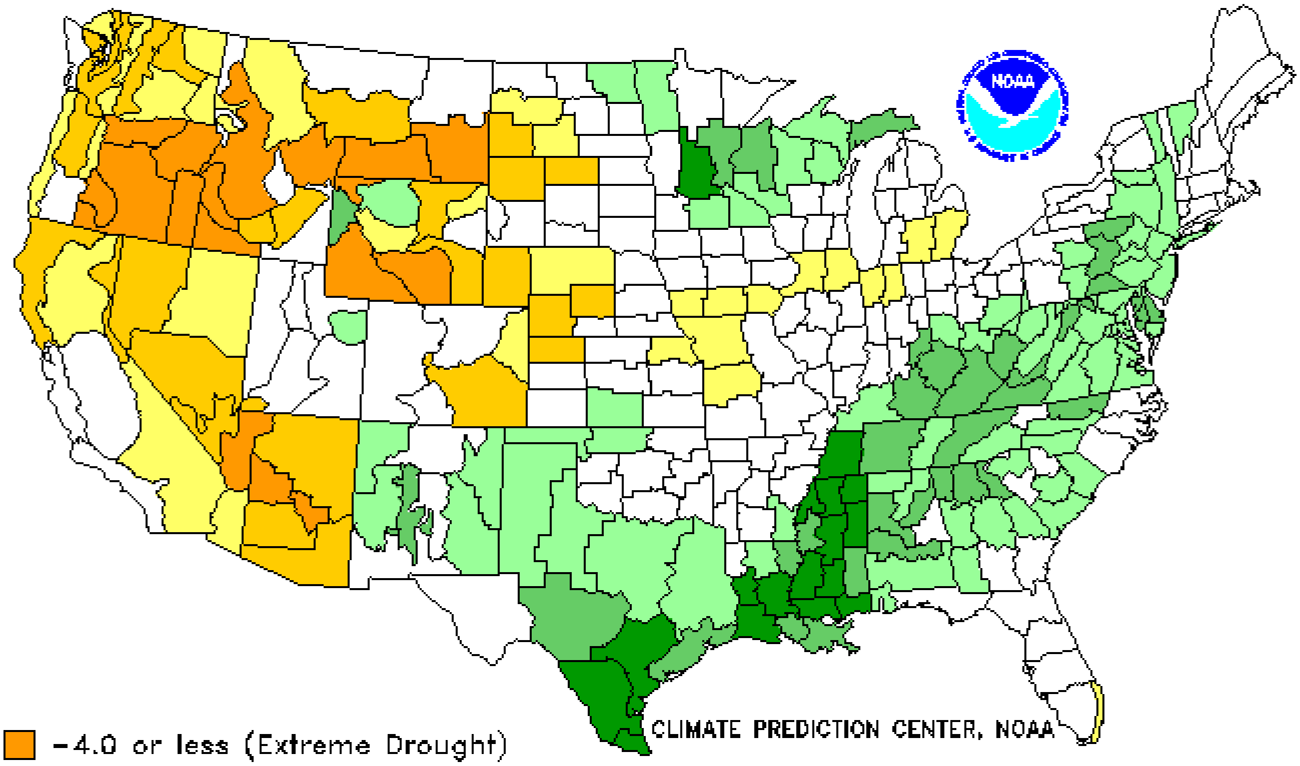
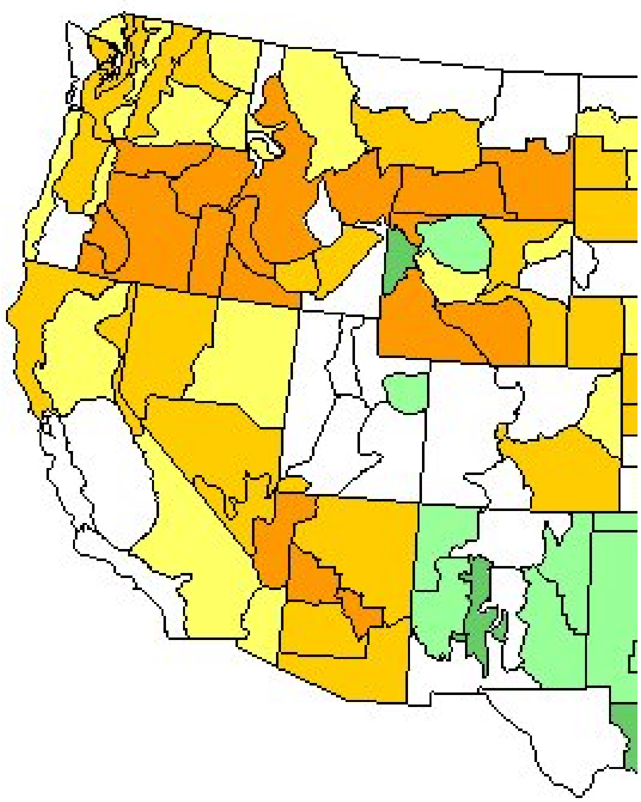
Drought Severity Index by Division

Weekly Value for Period Ending 7 DEC 2002

Long Term Palmer



- −4.0 or less (Extreme Drought)
- −3.0 to −3.9 (Severe Drought)
- −2.0 to −2.9 (Moderate Drought)
- −1.9 to +1.9 (Near Normal)
- +2.0 to +2.9 (Unusual Moist Spell)
- +3.0 to +3.9 (Very Moist Spell)
- +4.0 and above (Extremely Moist)



Summary Briefing Points – Drought Conditions and Forecast for Idaho and the West

- Idaho and the much of the West are in the third year of severe to extreme drought – exceeding all historic records.

- Evidence of the severity of drought for Idaho and much of the West includes historically low precipitation, streamflows, reservoir levels, and soil moisture, and poor vegetation conditions.

- In Idaho, historically (>100 years) low flows have been exceeded this water year for the Snake, Boise, Payette, Weiser, Owyhee, Portneuff and Bear Rivers.

- Elsewhere in the West, the Colorado River Basin and Plateau are in the third year of extreme drought (>125 years) with streamflows and reservoir levels at 15% to 20% of normal (80% to 85% below normal).

- The forecasts for the probabilities of ending the drought during the next three to six months (the most critical part of the water year) range from 0 to 40% depending on the river basin.

- The foregoing conditions are evidenced in the attached color analyses that are the joint work of several key agencies and research institutions including NOAA/ NWS/ NCAR/USDA/NRCS/NASA/USGS/etc. They are updated weekly.

- Why are we experiencing this sustained drought?

- 1) The dominant high-pressure area over the Great Basin and Idaho has both strengthened and broadened. The results are: A) The northern jet stream (the normal carrier of winter storms for the NW, Idaho, Montana, Wyoming and Nevada) is diverted farther north -- into southwestern Canada, then into Minnesota and Illinois, and back up into Ohio, New York and New England; and B) The southern jet stream (the normal carrier of winter storms for the Colorado River Basin and Plateau) is diverted farther south -- along the US–Mexico border, across southern and central Texas, then into Louisiana, Mississippi, Georgia and up the eastern seaboard. There are occasional anomalies and fluctuations in the foregoing, but these and anomalies and fluctuations have been and are forecast to be temporary for this water year.

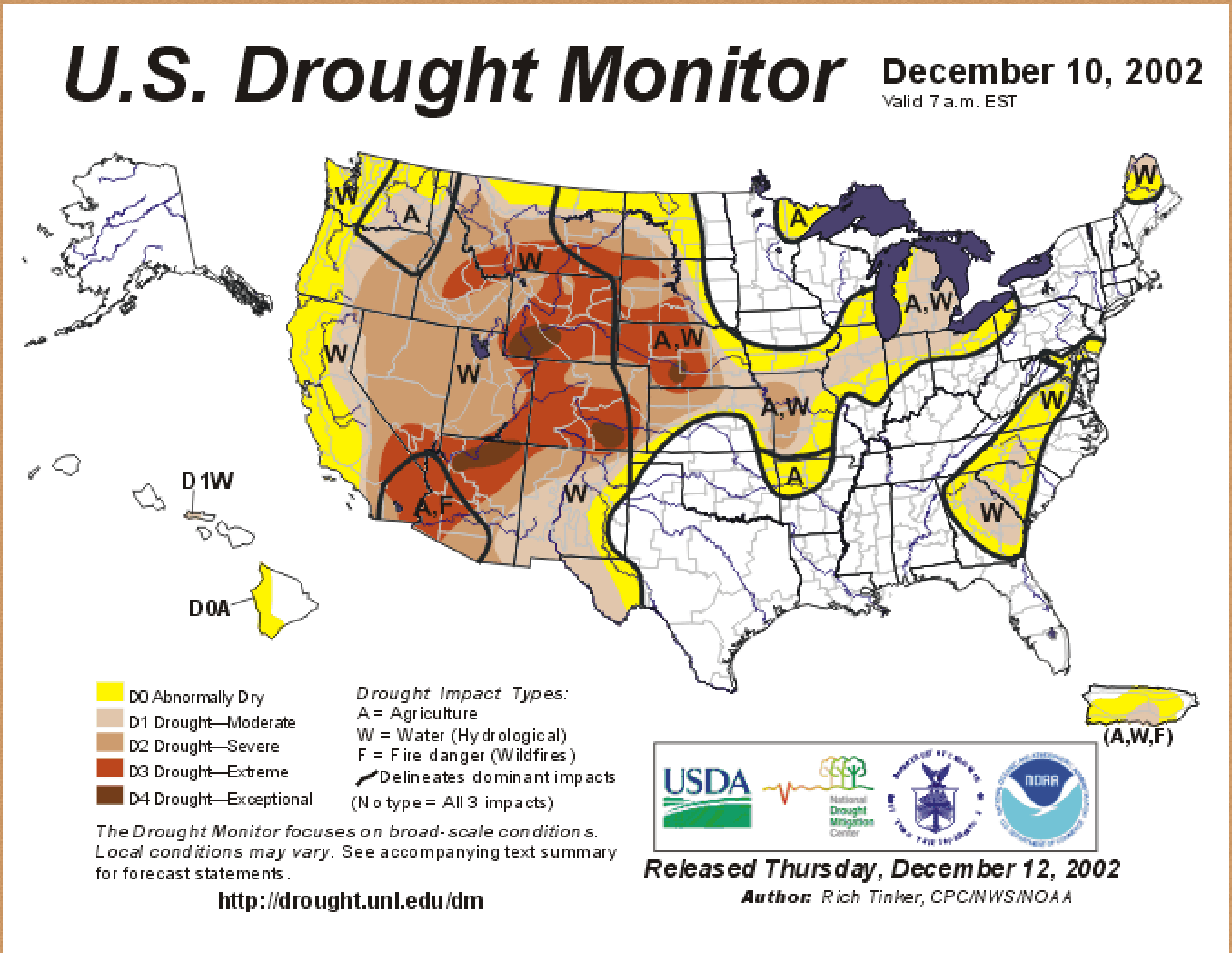
- 2) The ENSO (El Nino Southern Oscillation) is in its warm phase and is strengthening. The warm phase ENSO also moves winter storms south to Mexico, Texas, the SE US, and Eastern Seaboard, and contributes to the extreme weather events that have been experienced in that region.

- The foregoing is posing major implications for irrigated agriculture, range and forest conditions, fire conditions, hydroelectric generation, outdoor recreation, salmon recovery and the economies of the western states and communities.

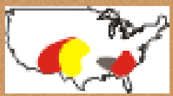
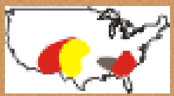
Please see accompanying attachments.

Prepared by Jack G. Peterson, Resources Division, Idaho State Office.
December 11, 2002.

The data cutoff for Drought Monitor maps is Tuesday at 8 a.m. Eastern Standard Time. The maps, which are based on analysis of the data, are released each Thursday at 8:30 a.m. Eastern Time.



Click on the icons below for animated maps.

6 weeks.....12 weeks

The drought indicators that are synthesized into the Drought Monitor map are on this website, under Forecasts and Current Conditions.

This summary map is based on a multi-index drought classification scheme.
For local details and impacts, please contact your State Climatologist or Regional Climate Center.
Other Drought Monitoring Links
Contact People

National Drought Summary -- December 10, 2002

The East: A strong winter storm brought a swath of heavy precipitation (generally 1 to 2 inches) through the southern half of the Appalachians, northern Georgia, northwest South Carolina, most of North Carolina, and southern Virginia during December 3 - 6. This precipitation fell as freezing rain in parts of the Carolina Piedmont and Appalachian foothills, where damaging ice accumulations were reported. Farther north, moderate precipitation (0.5 to 1.0 inch) fell on the remainder of Virginia and most of Maryland, southern Pennsylvania, and New Jersey, primarily as snow. Six-month precipitation totals are near to slightly above normal across the D0(W) and D1(W) areas, but substantial longer-term precipitation deficits persist (24-month totals are between 1 and 2 feet below normal) and groundwater levels, though improving, remain below normal in many areas and near record lows at some locations. As a result, only limited improvement was introduced this week, including the elimination of some D0(W) across the mid-Atlantic, and the removal of D1(W) in parts of southern Virginia and northern North Carolina.

Elsewhere, only light precipitation, if any, was reported in central South Carolina, across most of Georgia between the mountains and the coast, and in central and northern Maine, leaving D0(W) and D1(W) conditions intact through these areas.

The Midwest and Plains: In the areas of dryness and drought, measurable precipitation was restricted to regions from central Missouri and southeastern Kansas southward through northwestern Arkansas and adjacent Oklahoma. Totals generally exceeded 1 inch across southernmost Missouri, northeastern Oklahoma, and northwestern Arkansas while 0.2 to 1.0 inch fell on adjacent areas north of this region. This precipitation was beneficial, but still left a large area near the Arkansas/Kansas/Missouri triple point 6 to 9 inches below normal since early September, so D0(A) and D0(A,W) to D2(A,W) conditions in this region remained intact.

Farther north, the dry week resulted in D0(A,W) conditions expanding into southern Wisconsin, northernmost and east-central Illinois, eastern Iowa, and the central Dakotas. Also, D0(A) was introduced in northeastern Minnesota, where short-term dryness has led to an unseasonably low snowpack. Most other areas remained as they were the previous week, but some changes in the D1(A,W) to D3(A,W) areas in central and western South Dakota were introduced based on a re-assessment of longer-term precipitation patterns (as opposed to the effects of the dry week).

The West: Moderate precipitation (0.5 to 1.0 inch) fell on coastal sections of Washington, Oregon, and California while light amounts (0.2 to 0.5 inch) were measured in other parts of these states from the Cascades westward. Only scattered totals below 0.5 inch were noted in other areas from the Rockies westward to the Pacific Coast, maintaining or slightly deteriorating dryness and drought across these regions. D0(W) was expanded to include the entire Pacific coasts of Oregon and California while Western Utah, northern Nevada, northeastern California, and south-central Oregon all declined from D1(W) to D2(W) this past week. Farther east, the D4(W) area in southwestern Wyoming expanded slightly. The only improvement introduced this week was in southeast New Mexico, where D0(W) conditions were eliminated. This region received moderate precipitation last week, and 6- to 12-month accumulated precipitation totals are now near normal.

Hawaii: In Hawaii, long-term moderate drought (D1) conditions still exist on western Molokai, causing some hydrological impacts. Meanwhile, D0 conditions were introduced across western portions of the Big Island where precipitation deficits have begun to affect agricultural and pasture conditions.

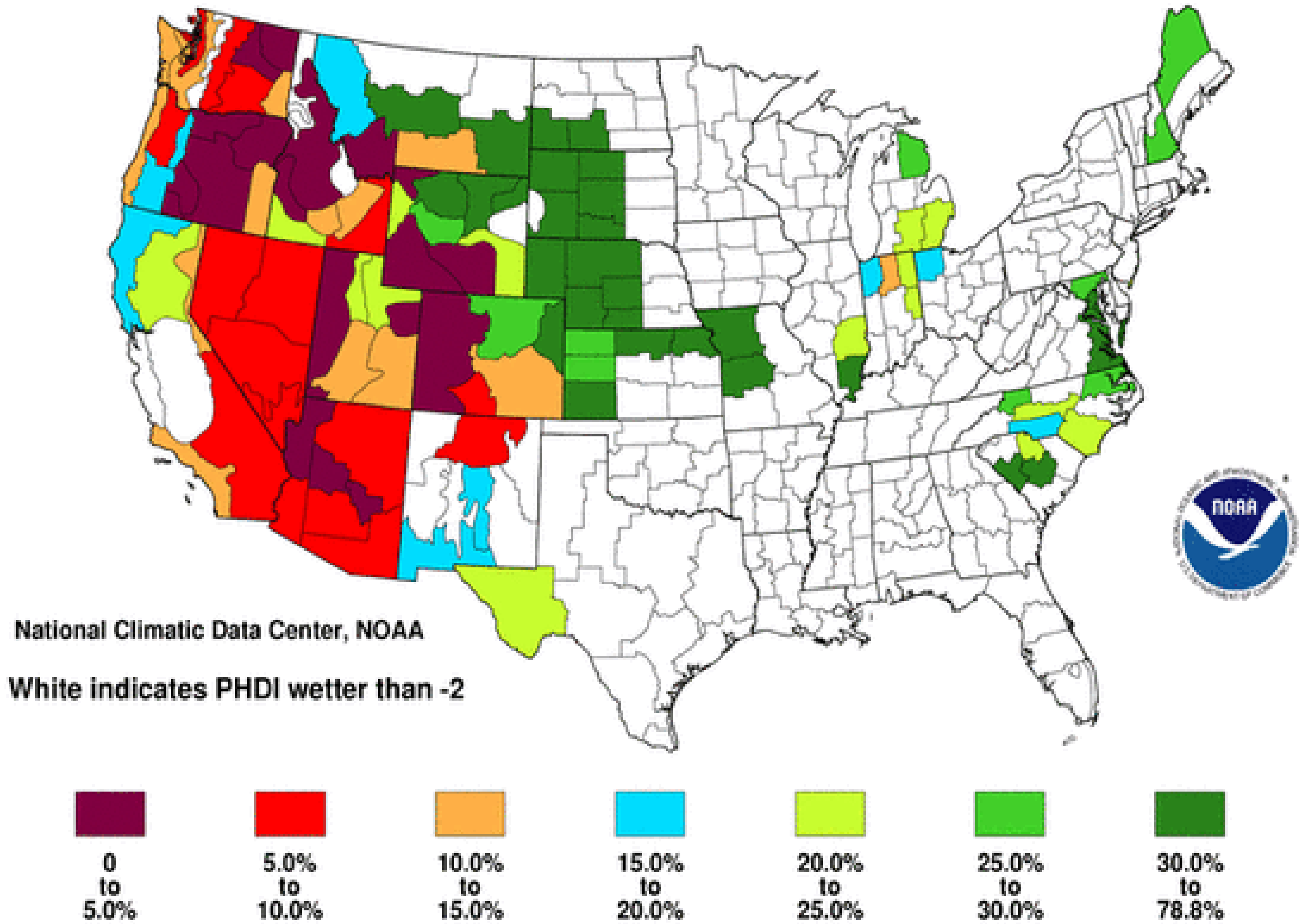
Puerto Rico: D0 conditions persisted following a week with light to locally moderate rainfall, and D1 conditions were introduced across south-central portions of the Island, where only 0.5 to 3.0 inches of rain fell during the last 8 weeks (about 5% to 35% of normal).

Looking Ahead: A series of storms is expected to traverse the western states during the next 5 to 10 days, bringing substantial precipitation to much of the immediate West Coast and the central and northern sections of the Intermountain West and Rockies. December 11 - 15 should bring at least 0.5 inch of precipitation to areas from the western sections of Wyoming and Montana westward through all of Idaho and Washington, most of Oregon, central and northern California, and western Nevada. Potentially inundating amounts of 7 to 15 inches are forecast from west-central California and the northern Sierra Nevada northwestward through west-central Oregon. Farther east, the 5-day period should bring moderate or heavy precipitation (1 to 3 inches) to the D0(W) areas in the mid-Atlantic, but most other dry areas across the country should expect near- to somewhat below-normal precipitation. No measurable amounts are forecast in the western Great Plains, the central and southern High Plains, the southern Rockies, and the desert Southwest during December 11 - 15. For the ensuing 5 days (December 16 - 20), the odds favor above-normal precipitation from the northern Intermountain West, central High Plains, and southern Rockies westward to the Pacific coast. Surplus precipitation also appears likely from the central Great Lakes, central Great Plains, and eastern Texas eastward through the Southeast, Ohio Valley, Appalachians, and Atlantic Seaboard. The only currently-dry areas where the odds favor below-normal precipitation for the 6- to 10-day period are those in the northern reaches of the Rockies, Plains, and upper Mississippi Valley.

Author: Rich Tinker, Climate Prediction Center / NCEP / NWS / NOAA

Probability of Precipitation Required to End Current Drought Conditions in Six Months

November 2002



Drought Monitor: State-of-the-Art Blend of Science and Subjectivity

What You See

D0-D4: The Drought Monitor summary map identifies general drought areas, labelling droughts by intensity, with D1 being the least intense and D4 being the most intense. D0, drought watch areas, are either drying out and possibly heading for drought, or are recovering from drought but not yet back to normal, suffering long-term impacts such as low reservoir levels.

A, W and F: Since "drought" means a moisture deficit bad enough to have social, environmental or economic effects, we generally include a description of what the primary physical effects are:

A = agricultural effects, both crops and livestock
W = water supplies, rivers, groundwater and reservoirs
F = fire danger (wildfires)

The Thinking Behind the Map

Drought intensity categories are based on six key indicators and numerous supplementary indicators. The accompanying drought severity classification table shows the ranges for each indicator for each dryness level. Because the ranges of the various indicators often don't coincide, the final drought category tends to be based on what the majority of the indicators show. The analysts producing the map also weight the indices according to how well they perform in various parts of the country and at different times of the year. Also, additional indicators are often needed in the West, where winter snowfall has a strong bearing on water supplies.

Drought Severity Classification									
		RANGES							
Category	Description	Possible Impacts	Palmer Drought Index	CPC Soil Moisture Model (Percentiles)	USGS Weekly Streamflow (Percentiles)	Percent of Normal Precip	Standardized Precipitation Index (SPI)	Satellite Vegetation Health Index
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures; fire risk above average. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered.	-1.0 to -1.9	21-30	21-30	<75% for 3 months	-0.5 to -0.7	36-45
D1	Moderate Drought	Some damage to crops, pastures; fire risk high; streams, reservoirs, or wells low, some water shortages developing or imminent, voluntary water use restrictions requested	-2.0 to -2.9	11-20	11-20	<70% for 3 months	-0.8 to -1.2	26-35
D2	Severe Drought	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed	-3.0 to -3.9	6-10	6-10	<65% for 6 months	-1.3 to -1.5	16-25
D3	Extreme Drought	Major crop/pasture losses; extreme fire danger; widespread water shortages or restrictions	-4.0 to -4.9	3-5	3-5	<60% for 6 months	-1.6 to -1.9	6-15
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; exceptional fire risk; shortages of water in reservoirs, streams, and wells, creating water emergencies	-5.0 or less	0-2	0-2	<65% for 12 months	-2.0 or less	1-5

Additional indices used, mainly during the growing season, include the USDA/NASS Topsoil Moisture, Crop Moisture Index (CMI), and Keetch Byram Drought Index (KBDI). Indices used primarily during the snow season and in the West include the River Basin Snow Water Content, River Basin Average Precipitation, and the Surface Water Supply Index (SWSI).

Reality Check

Though the maps are based on the key indices and other measures of moisture, the final maps are tweaked to reflect real-world conditions as reported by numerous experts throughout the country.

The Partners

A partnership consisting of the U.S. Department of Agriculture (Joint Agricultural Weather Facility and National Water and Climate Center), the National Weather Service's Climate Prediction Center, National Climatic Data Center, and the National Drought Mitigation Center at the University of Nebraska Lincoln produces the Drought Monitor. However, advice from many other sources is incorporated in the product, including virtually every government agency dealing with drought.

This Does Not Replace Local Information

The Drought Monitor is intended to provide a general and up-to-date summary of current drought conditions across the 50 states, Puerto Rico, and the Pacific possessions. This national product is designed to provide the "big picture" so the general public, media, government officials, and others can see what is happening around the country. To keep the map from becoming too complex, the drought categories shown represent typical drought intensities, not every drought intensity, within the area. The map is not designed to depict local conditions or to replace drought warnings and watches issued by local or regional government entities. Local or state entities may be monitoring different indicators than those used in the Drought Monitor to meet specific needs or to address local problems. As a consequence, there could be water shortages or crop failures within an area not designated as drought, just as there could be locations with adequate water supplies in an area designated as D3 or D4 (extreme or exceptional) drought.

Updated May 3, 2001

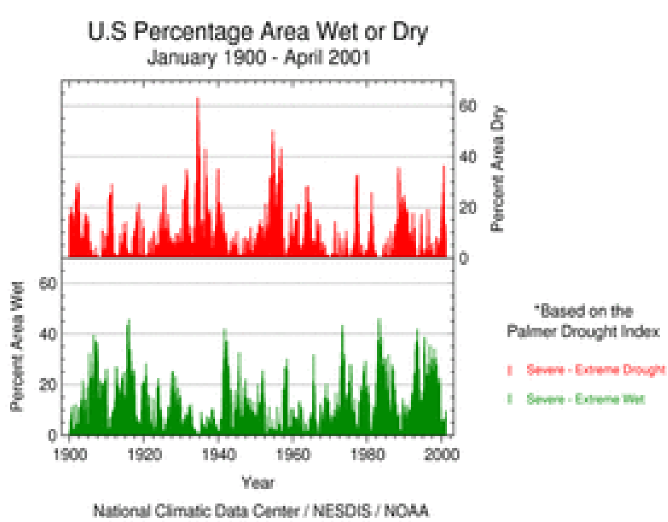
Drought Termination and Amelioration Background


photos courtesy of the U.S. Department of Agriculture

Drought in the U.S.

The incidence of drought in the United States has varied greatly over the past century. From the dust bowl years of the 1930's to the major droughts of 1988 and 2000, much of the U.S. has suffered from the effects of drought during the past century. While annual and seasonal precipitation totals have generally increased in the United States since 1900, severe drought episodes continue to occur.

The nation's most devastating drought occurred in the 1930's during what many refer to as the 'Dust Bowl' years. The drought affected almost the entire Plains and covered more than 60% of the US during its peak in July 1934. It brought devastating economic impacts to many and caused the migration of millions of people from the Plains to other parts of the country, many to the Western US. Although the nation has not since experienced a drought as severe as the drought of the 1930's, subsequent droughts (e.g. those of the 1950's, 1988 and 2000) have also had serious economic and societal impacts.



Although a variety of weather related phenomena have the potential to cause great economic and personal losses in the US, drought has historically had the greatest impact on the largest number of people. Since 1980, 48 weather-related disasters have each caused at least 1 Billion dollars in economic losses. Of these 48 disasters, the greatest losses have been attributed to drought. Economic losses exceeded 40 Billion dollars in the droughts of 1980 and 1988, and the combination of drought and heat-related deaths totaled more than 5000 in each event. The drought of 2000 resulted in losses of 4 Billion dollars and 140 deaths.

Although not as widespread as the droughts of the 1930's and 1950's, persistent above normal temperatures and below normal precipitation across much of the Western and Southern US in 1999 and 2000 brought drought to these regions by the summer of 2000. More than 1/3 of the country suffered from severe to extreme drought by August leading to heavy agricultural losses, water rationing for many, and one of the worst wildfire seasons in the last 50 years. While some parts of the nation have received drought-ending precipitation since that time, parts of the nation continue to suffer from severe precipitation deficits through the spring season of 2001.

Defining Drought

The wide variety of disciplines affected by drought, its diverse geographical and temporal distribution, and the many scales drought operates on make it difficult to develop both a definition to describe drought and an index to measure it. Common to all types of drought is the fact that they originate from a deficiency of precipitation resulting from an unusual weather pattern. If the weather pattern lasts a short time (e.g., a few weeks or a couple months), the drought is considered *short-term*. But if the weather or atmospheric circulation pattern becomes entrenched and the precipitation deficits last for several months to several years, the drought is considered to be a *long-term* drought.

Many quantitative measures of drought have been developed in the United States, depending on the discipline affected, the region being considered, and the particular application. The most frequently used indicators of drought are those developed by Wayne Palmer in the 1960's. These include the Palmer Drought Severity Index (PDSI), the Palmer Hydrological Drought Index (PHDI), the Palmer Z Index and the Crop Moisture Index (CMI). These indices have been used in countless research studies as well as in operational drought monitoring during the past 35 years. The Palmer drought index has proven to provide one of the best indications of drought for much of the United States. It is superior to other drought indices in many respects because it accounts not only for precipitation totals, but also for temperature, evapotranspiration, soil runoff and soil recharge.

The Z Index measures short-term drought on a monthly scale while the CMI measures short-term agricultural drought on a weekly scale. The PDSI measures drought duration and intensity of long-term drought-inducing circulation patterns and responds fairly quickly as meteorological patterns often quickly change from one regime to another. However, a reflection of the long-term effects of drought on systems affected by long-term precipitation deficits is measured by the PHDI, a measure of the hydrological impacts of drought. These impacts, such as reservoir levels, groundwater levels, etc., take longer to develop and it takes longer to recover from them. It is from this index, the PHDI, that we calculate the precipitation amounts and probabilities of ending or ameliorating drought.

The Amount of Precipitation Needed to End a Drought (Based on the PHDI)

Because of the far-reaching societal and economic impacts of drought, there is considerable interest in determining how much precipitation is required to end a drought as well as the probability that a region may receive the necessary amount of precipitation. Ending a hydrological drought requires that the moisture needs associated with recharge, demand and runoff have been brought back to normal or above normal.

Many factors affect the quantity of precipitation required to end or ameliorate (reduce the severity of) a drought. Knowledge of the severity of the drought, as defined by the Palmer Hydrological Drought Index (PHDI), is the essential starting point for determining the needed precipitation. The typical conditions that a region experiences during each month and season of the year (i.e., that region's climatology) is also essential. Given a drought of equal magnitude in a dry and wet climate, the wetter region requires more precipitation to end the drought.

The season in which the precipitation falls can also greatly influence the quantity of precipitation required to end a drought. During a typically moist month (such as those experienced in the winter and spring along the West Coast) more precipitation may be required to end a drought than during the typically dry months of the summer. Because soil moisture conditions are generally lower in the dry months, the precipitation needed to bring soil conditions back to normal may be less than that required to return soil moisture conditions to normal during a generally wetter season. Nevertheless, regardless of a region's climate, over a sufficiently long period of time, near-normal precipitation is often sufficient for ending a drought with moisture conditions gradually returning to normal.

However, the quantity of precipitation needed to end a drought says nothing about the probability that a region will actually receive that amount of precipitation. A region, such as the West Coast, that does not typically experience excessively heavy precipitation during the summer season, may be less likely to receive a quantity sufficient for ending a drought than a region which has a record of experiencing extreme precipitation events during the same season. The months which have the greatest probability of receiving substantially more precipitation than normal would be those with precipitation distributions with the largest positive skew (that is, those subject to more extreme precipitation events), not necessarily those months that normally receive the greatest amount of precipitation.

The technical details associated with the calculation of precipitation totals needed to end or ameliorate drought and the probability of receiving the required precipitation can be found in "Drought Termination and Amelioration: It's Climatological Probability" by Tom Karl et al. 1987.

Maps of Precipitation Totals and Probability

More than 2000 maps of the contiguous U.S. are provided which show the precipitation totals needed to end or ameliorate drought from periods of 1 month to 6 months based on PHDI values from -2 to -6. These data were calculated for each month of the year and include precipitation values for each of the 344 contiguous U.S. climate divisions. The end of a drought is defined by a PHDI value of -0.5 while drought amelioration is achieved when a PHDI value of -2.0 is reached. Maps showing the probability of receiving the necessary amount of precipitation are also provided.

Maps of precipitation needed to end or ameliorate a drought for those divisions currently experiencing drought are also available. Values are provided in all divisions with a monthly PHDI less than -2.0. Precipitation needed over periods from 1 month to 6 months is included as well as the associated probability of receiving that quantity of precipitation. These maps are replaced on a monthly basis with the values reflecting conditions in the previous month.

To the Top