

About that Drought...

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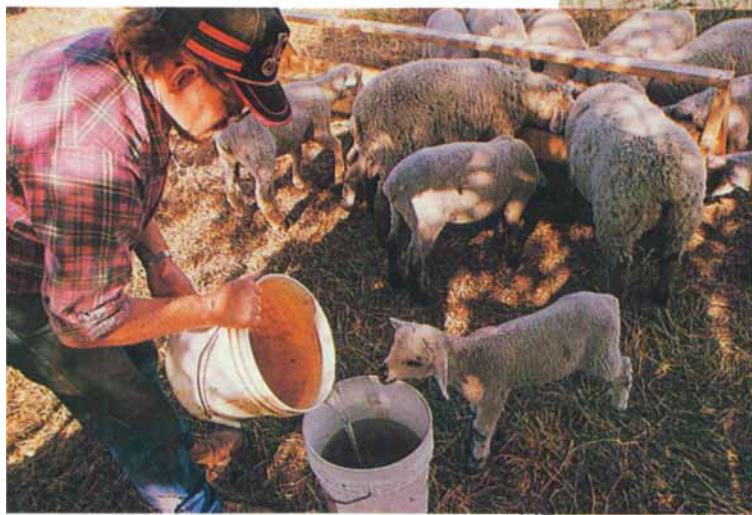


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AP PHOTO

Above: JAY BETTENGA of Mount Auburn, Iowa, brings water to his sheep. The drought stunted the growth of his lambs. Right: AN ARKANSAS RICE FIELD is baked dry.

More rivers have reached abnormally low levels this month than in any other July since the Weather Bureau started its record of river stages. . . . The Mississippi at St. Louis has had record-breaking low stages for every month but one so far this year.

These words sound familiar, but they were actually written in July 1934, not 1988. A *New York Times* reporter was describing the still-record drought of the 1930s, a devastation that made a "dust bowl" of much of the central United States.

When we look at the climatic records for the country, we find a multitude of droughts of various sizes, intensities, and durations alternating with a multitude of wet periods of similar variety. Droughts, it turns out, are a normal part of the climatic cycle.

And while the drought of 1988 afflicted a large part of the United States, it was not as bad as the droughts of the 1930s and 1950s—and probably other droughts that occurred before weather records were kept.

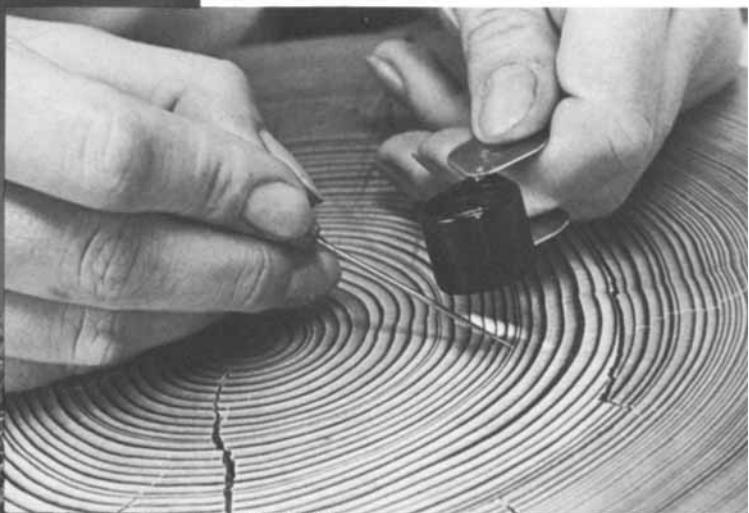
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AP PHOTO

ABOUT THAT DROUGHT. . .

by Richard R. Heim, Jr.



BOB BRODER

BRISTLECONE PINE (left): Such old, stressed trees provide the best tree-ring records (above) of seasonal variations in past climates.

during severe droughts in 1749, 1761, and 1762. The eastern states were also very dry in 1805 and 1822.

When we look at the climatic records for the country, we find a multitude of droughts of various sizes, intensities, and durations alternating with a multitude of wet periods of similar variety.

Drought Detective Work

Comprehensive weather records for the nation as a whole generally go back only to the 1890s. Other sources have to be sought to reconstruct the drought picture for earlier times—sources such as newspaper reports, crop-harvest statistics, and the width of growth rings in trees (generally, tree rings are wide when there is abundant rain and narrow when there isn't enough rain to support normal growth).

While studying tree rings from Nebraska, for example, dendroclimatologist Harry Weakly found 12 droughts (from 1220 to 1957) that lasted 10 years or more. The drought

that began in 1276 *lasted 38 years*. Climatologist Reid Bryson attributes the disappearance of several Indian civilizations in the Great Plains and Southwest to a shift to a drier climate between 1200 and 1400.

According to climatologist Ivan Tannehill, very little contemporary information is available for droughts prior to the Civil War. Climate historian David M. Ludlum has summarized what we do know in the *Weather Record Book*. As noted by Ludlum, drought plagued the colonists almost from the first day of settlement. The Pilgrims' crops were threatened by a lack of rain in 1621 and 1623, while fields of grain caught fire in eastern New England

In California, in the record dry season of 1850 and 1851, only 33 percent of normal rain fell at Sacramento and San Francisco, while the summer of 1854 brought widespread drought and crop failures from New York to Missouri. In the next decade, the two extremely dry seasons of 1862–63 and 1863–64 put an end to the extensive cattle industry in southern California.

According to a paper by climatologist Dean Bark, the years around 1860 were very dry in the central Plains and Midwest—the area including Kansas, Missouri, Illinois, Iowa, Minnesota, and Wisconsin. Professor Tannehill notes that the drought of 1860 was "the most severe recorded in this country up to that time."

Rainfall was plentiful in the Great Plains from the mid-1860s to the

mid-1880s, and a lot of farmers migrated to the area. Prolonged dry weather returned to the Plains in the late 1880s, however, culminating in a complete crop failure in 1894. Ludlum notes that fully half the settlers of Nebraska and western Kansas deserted the area during this drought.

Occasionally dust storms raged for days, and twice they overspread nearly half the United States.

The entire country east of the Mississippi River was hit by drought in 1881. Many of the wells, cisterns, and springs that failed, according to Professor Tannehill, "had never been dry before." Even the water supply of New York City failed and it was necessary to find new water sources.

Severe drought occurred in the southwestern and southeastern corners of the country around the turn of the century. Drought struck again, in the southern Plains, northern Plains, and northeastern region in 1910 and 1911 (1910 is still the driest year for the nation as a whole since 1895), and in the southern Plains in 1917 and 1918. The Far West was hit by extensive drought in 1924, as was the Southeast in 1925. These were generally short-lived events compared to those of the late 1800s and what was soon to follow.

The Greatest Weather Disaster in American History?

The drought of the 1930s has been called by Ludlum "the greatest disaster in American history attributable to meteorological factors." Drought dominated the entire decade, causing what hydrologist Luna Leopold called the period of lowest



The Worst Droughts of the 20th Century

by Patrick Hughes

On "Black Sunday," April 14, 1935, a dust storm engulfed Stratford, Texas, and despite their dust masks many people suffocated.

"These storms were like rolling black smoke. We had to keep the lights on all day. We went to school with the headlights on and with dust masks on. I saw a woman who thought the world was coming to an end. She dropped down on her knees in the middle of Main Street in Amarillo and prayed out loud: 'Dear Lord! Please give them another chance.' "

This is an eyewitness account of a Texas schoolboy during the dust bowl drought of the 1930s, when for four years great clouds of blowing topsoil often blotted out the sun over much of New Mexico, Colorado, Oklahoma, Kansas, and the Texas Plains.

The drought of the 1930s, which coincided with the economic disaster of the Depression, indelibly imprinted on American minds the image of dust-streaked Texas and Oklahoma farm families fleeing parched, dusty fields for the green promise of California. Much of this notoriety is a direct result of the terrible dust storms of 1935 to 1937, when unusually strong winds joined forces with the drought to produce a national disaster. Farming methods then in use were such that the soil just blew away.

For some parts of the country, the drought of the 1950s was worse. In Texas, it was the worst on record. Most of Texas' quarter of a million square miles did not have what old timers call "a public rain" for five or six years.

Dr. Edmund Schulman of the University of Arizona's Laboratory of Tree Ring Research, studying the concentric rings of thousands of trees, concluded that it was the worst drought to afflict the American Southwest in 700 years.

Major rivers could be jumped on foot, and the bottom of giant reservoirs lay naked and cracked. Irrigation canals—the life blood of farms in arid western States—ran dry. In a few places, dust storms actually created small, mobile deserts, with sand dunes moving forward in wavelike ripples with every breeze.

In five years the drought took \$2.7 billion from the pockets of Texas farmers and ranchers alone. Stockmen in Arizona, New Mexico, Oklahoma, Kansas, Colorado, and Nevada had to sell or butcher even their breeding stock, while dairy farmers of Kansas and Missouri, unable to find feed or water, were forced to liquidate herds they had spent their lives building.

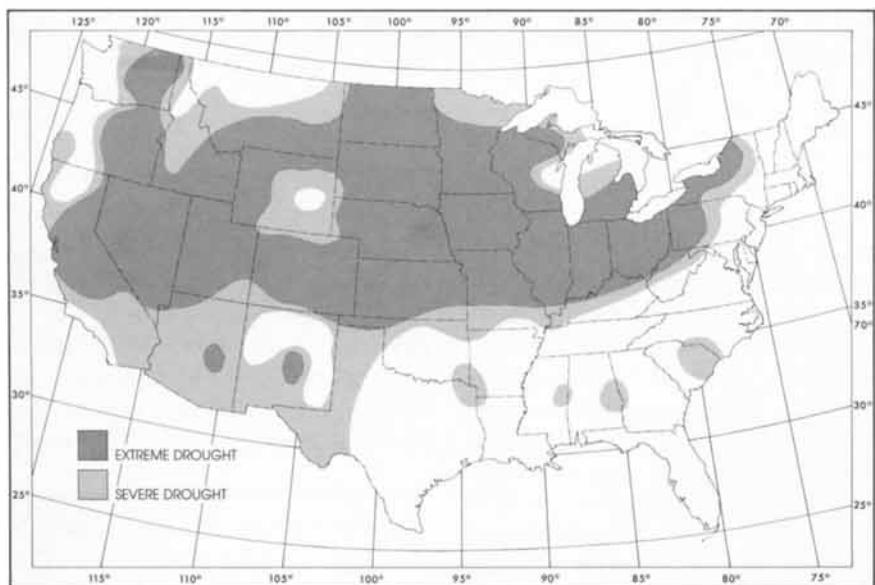
In Kansas, two-thirds of the State's 115,000 farmers had to find off-farm jobs, while in Oklahoma, farm families were moving off the land at the rate of 4,000 per day by 1957. In Texas, ranchers were pumping gas or working at the general store or roadside hamburger joints. Many of these men were working off their own land for the first time in their lives. The young men, in particular, moved to the cities.

Despite the scope and duration of this drought, the total misery of the dust bowl days was missing. With the national economy booming, jobs were available in nearby towns and factories, and most farmers and ranchers could ride out the hard times. And advances in farming practices such as irrigation, deep plowing, and the use of cover crops made it possible in many areas to save the soil from the wind. Even the dust storms were relatively few and far between, while the government's soil-bank payments, liberalized credit, subsidization of stock-feeds, and other measures helped the drought-stricken farmers and ranchers get by.

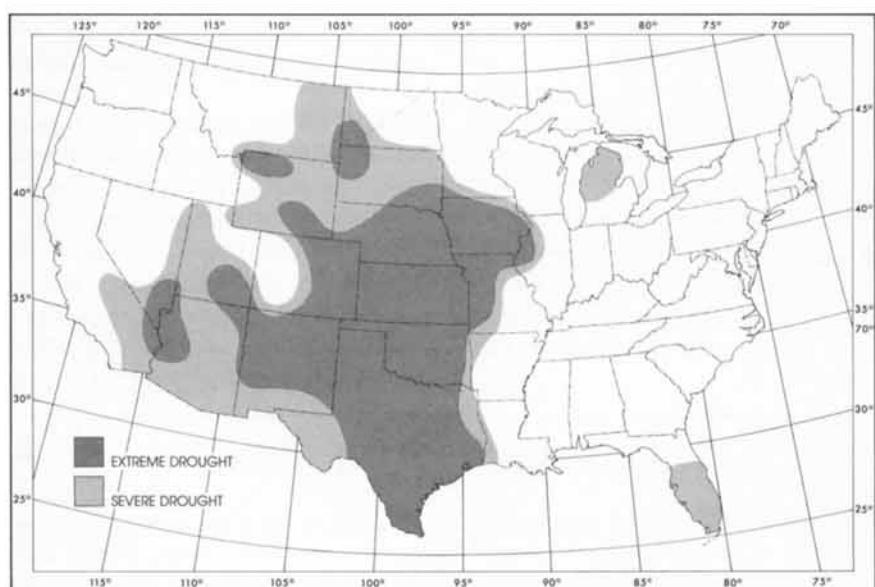
The situation even generated a kind of grim humor, such as the wry Texas story: "Well, the wind blew the ranch plumb into Old Mexico, but we ain't lost everything. We get to keep the mortgage." □

This is a condensed version of an article published in American Weather Stories, Government Printing Office, Washington, D.C., 1976.

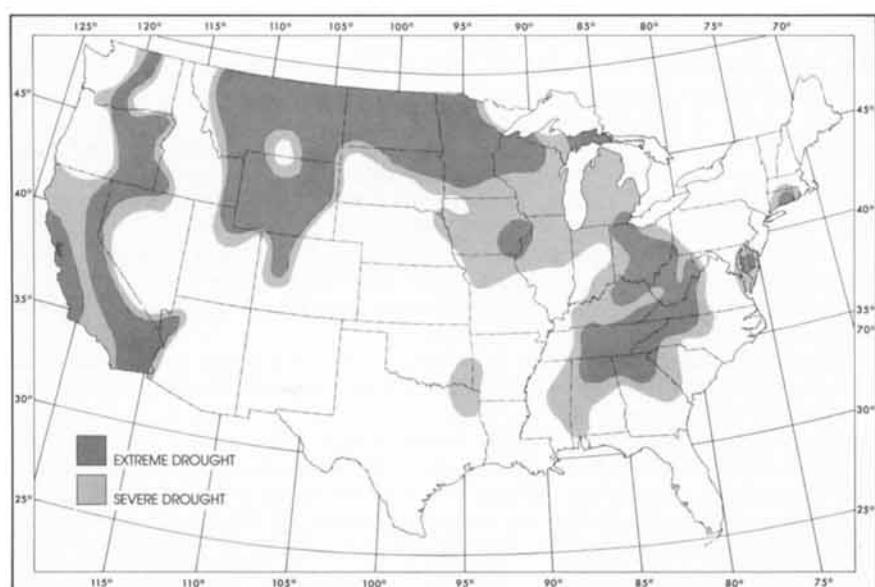
June 1934



June 1956



June 1988



**SEVERE AND EXTREME DROUGHT
in the United States.**

streamflow in the United States since river records began. It is the longest drought of the 20th century, afflicting some part of the country from 1930 to 1941. It also affected parts of Canada and Mexico.

The 1930s drought spread across large parts of the country during several peak periods—1930, 1934, 1936, and 1939 and 1940. During 1934 the dry region stretched solidly from New York and Pennsylvania across the Great Plains to the California coast, covering fully 61 percent of the country. A great “dust bowl” was created in the south-central Plains, covering some 50 million acres at its greatest extent, during the winter of 1935–1936. A *New York Times* reporter described the devastation seen from the air:

Today the whole landscape is a picture of desolation. For hundreds of miles, over one State after another, the plane roars, and hardly a drop of water is visible. In many long reaches not a tree is to be seen, not a blade of green grass, not an animal of any kind, not a single living thing. Below lie the beds of empty rivers and streams. . . .

As plants withered and the ground cracked, strong winds blew the soil into huge dust storms. “Occasionally dust storms raged for days, and twice they overspread nearly half the United States,” according to Lylyan Block, writing in a 1934 edition of the *Bulletin of the American Meteorological Society*. And once again there was “tremendous emigration from the Plains region.”

The 1940s brought generally wet weather to most of the nation, but widespread drought returned in the 1950s. During 1953 and 1954, severe drought stretched from the Southeast across the Ohio Valley and into the central Rockies and Great Basin,

at its peak covering 51 percent of the country. The dry area expanded again in 1956, covering the southern and central Plains. In sections of Texas, according to Ludlum, the first seven months of 1956 were the driest since 1934. At Amarillo in northwest Texas, "the worst drought of record" prevailed from mid-1952 to early 1957, when annual precipitation was only 61 percent of normal for that entire lengthy period. Dust storms once again swirled across the Great Plains.

Drought in the Midst of Moisture

Generally speaking, the United States has been in an overall *wet spell* since the 1950s. Indeed, eight of the twenty wettest years for the country as a whole have occurred in the 1970s and 1980s, based on records going back to 1895. (In comparison, the 1930s had six of the twenty driest years and the 1950s four of the 20 driest years.)

In spite of the relative overall wetness, significant regional droughts did occur in the 1960s and 1970s. The northern Rockies were dry during 1960 and 1961, as was much of the Midwest in 1963 and 1964. Moderate drought appeared in the Northeast in 1961, then worsened into the extreme category during 1964 to 1966. Water shortages developed when New York City reservoirs dropped to about 30 percent of capacity, and forest fires were widespread by the autumn of 1963.

Severe drought returned briefly to the Southwest and the southern Plains in 1971 and again in 1972 and 1974. Extreme drought occurred during 1976 and 1977 in the Far West and northern Plains-Great Lakes region. For some of the people in these areas, the 1976 and 1977 drought was their most *severe* drought of this century (as meas-

ured by the Palmer Drought Severity Index). Low rainfall and reservoir records were set in many parts of California.

Drought appeared briefly during 1980 and 1981 in scattered areas across the country. The drought of 1988, however, is the major drought of the 1980s. This summer, the Mississippi River reached near-record low levels at many gaging stations, restricting barge and towboat traffic. At Memphis, the river level was the lowest since 1872, the year records for Memphis begin.

Reservoir levels in California were also down, though not as low as in the 1970s. Farmers in the Plains and Midwest were suffering what *U.S. News and World Report* magazine called "potentially the worst crop disaster since the 1930s." Parts of the Southeast were experiencing the worst drought of the century.

The current drought has been going on in the West since 1987 and in the Southeast since 1984. It was the dryness of the 1987-1988 winter and following spring, however, that brought the regions together to form the national drought of 1988.

While much of the country was wilting, the Desert Southwest was being drenched by the wettest weather in decades.

The January through April 1988 period is the fifth driest such period for the nation as a whole in the last 93 years. The 1988 growing season (April through June) was the driest since 1895 for farmers in twelve percent of the country. Across much of the Plains and Midwest, only three months—June 1933, May 1934, and

The Greenhouse Effect

The hot, dry weather of 1988 has led some people to ask if we are finally seeing the results of the "greenhouse effect." The concentration of carbon dioxide and other trace gases in the atmosphere has been increasing steadily since the Industrial Revolution. Experts say these gases act like a greenhouse, letting sunlight in but keeping the infrared energy re-emitted by the earth from escaping into space. In theory, greater concentrations of "greenhouse gases" will keep more heat in, thereby raising the earth's temperature.

Computer models of the greenhouse effect differ considerably, but in general they predict steadily rising temperatures and a summertime decrease in soil moisture and rainfall in mid-continent areas.

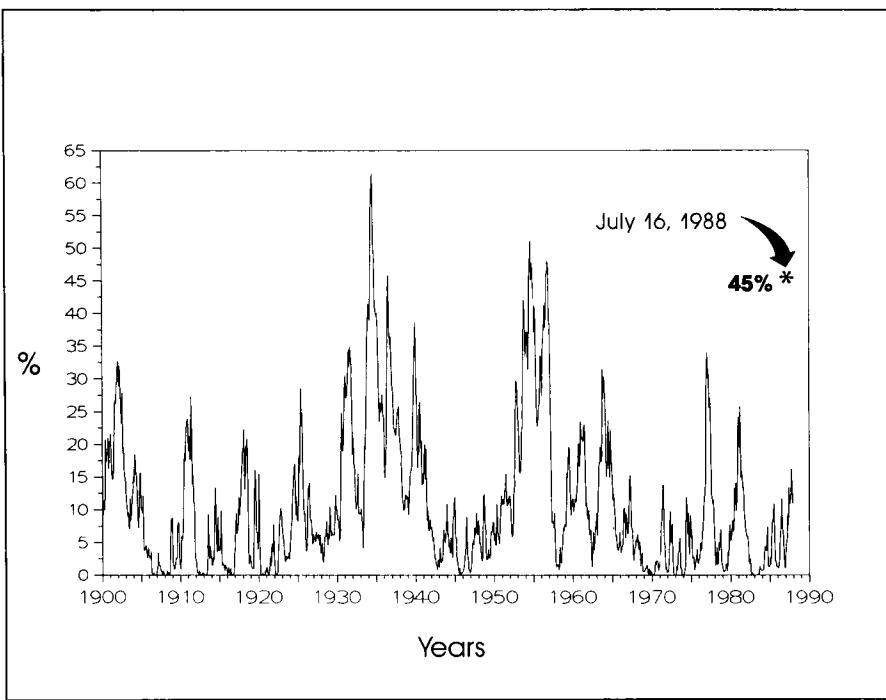
Some scientists believe such a warming trend is found in globally-averaged temperatures, which have been rising since the middle 1800s. However, according to researcher Phil Jones and colleagues, there was a pronounced cooling trend in the global temperature curve from about 1940 to 1965.

In addition to this discrepancy, the computer models of the greenhouse effect predict increased soil moisture over the Northern Hemisphere mid-continent *in winter*. Observations over the last few winters, however, show a mix of above- and below-normal precipitation amounts.

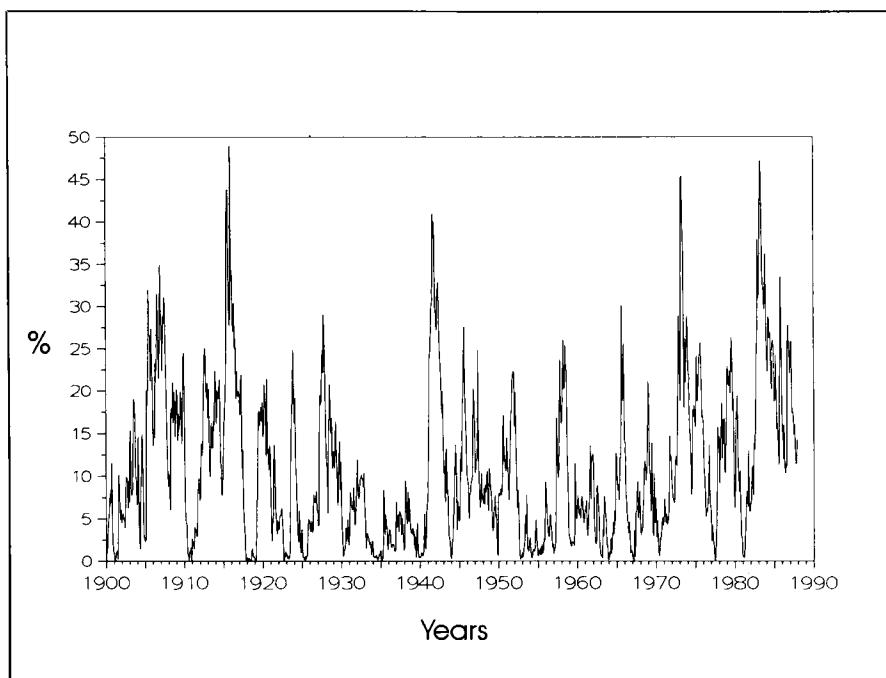
In the United States, the last two decades have had five of the twenty warmest years observed since 1895; however, these same two decades also have seen seven of the twenty coldest years.

Finally, Dr. William Sprigg, director of the Climate Office of the National Oceanic and Atmospheric Administration, points out that analyses of data on past climates show there was drought when CO₂ concentrations were relatively much lower than today, and states that the evidence relating the drought and heat wave of 1988 to the greenhouse effect "remains ambiguous."

—R. R. H.



SEVERE AND EXTREME DROUGHT in the United States. This year was the third worst in terms of area affected.



SEVERE AND EXTREME WETNESS in the United States. Eight of the twenty wettest years for the country as a whole have occurred in the 1970s and 1980s.

June 1936—have been drier than June 1988. By mid-July about 45 percent of the country was suffering severe-to-extreme drought.

Even this summer, though, while much of the country was wilting, the Desert Southwest was being drenched by the wettest weather in decades. And outside the United States, parts of the Soviet Union and Europe were wet, while other parts of the Soviet Union, China, and South America were dry.

Those Record-High Temperatures

Last summer, the drought was accompanied by extremely hot weather. Nearly 2000 *daily* record-high temperatures were set, mostly in cities in the northern and central Plains, Midwest, Ohio Valley, Great Lakes, and Northeast. *Monthly* record-high temperatures were set in 13 cities in May, 69 cities in June, 37 cities in July, and 31 cities in August. Nearly one-third of the days in June exceeded 100°F across much of the central Plains. Preliminary calculations indicate that June and July 1988 was the hottest June and July period since 1895 in parts of Idaho, Montana, Wyoming, North Dakota, Minnesota, and Wisconsin.

While 1988 has been hot, the 1930s set temperature records that still stand: most of the Great Plains and Midwest had their hottest June and July period in the 1930s. When temperatures are averaged across the entire country for the whole year, the 1930s show six of the twenty warmest years since 1895.

The 1988 drought has produced some of the driest and hottest weather of the twentieth century. When put into historical perspective, however, it is simply the latest in a long series of similar fluctuations that characterize the climatic history of our country. □