WATER RESOURCES ISSUES

DROUGHT IN THE LATE '80s: PREDICTIONS AND POLICIES

Clifford S. Russell*

A depressingly long time ago I worked with geographers Arey, Baumann, and Kates on the very severe drought that hit the northeastern United States in the mid-1960s (roughly the 1963-1966 water years). Because of the nature of the area affected, this was principally a problem for municipal water supply systems, and we concentrated our efforts on developing long-range capacity planning tools for such systems. These planning rules of thumb took advantage of the lessons of this 1,000-year event--especially the evidence on the size of resulting losses. In the process of our background research and interviews we were heavily exposed to the view that the only acceptable drought loss is zero, and that water storage should be large enough to make expected losses (though this technical term was not used) as close to zero as physical site availability would allow.

Periodically, I have had the chance to look at other drought events and to compare reactions and results. Seldom have I been disappointed in my quest for quotable quotes expressing the traditional view that if droughts, like snow storms, succeed in intruding into our lives in any significant way it is because someone in power has fouled up. One example will have to suffice: On February *15*, 1981, an analyst at the New York Times wrote after one very dry summer:

> This (the necessity for water use restrictions) has raised the question why something was not done to prevent the shortages, especially when water resource experts were saying that even in times of drought there was plenty of water in the region for all essential uses.

Now, the several misconceptions in this sentence are not the point of this piece, but were I a "water resource expert" who had commented on the mid-Atlantic situation I'd want to explain to this person about what "essential uses" might and might not be, why "in the region" might not mean "available in New York City" and, most important, about the costs of "preventing" the occasional need for restrictions.

But one of the most interesting features of the drought of 1988 (and 1987,dependingon where you. live) is that this kind of material is scarce. The publicized reactions to this very severe and very widespread event have been generally different, and generally more interesting than the standard, "Where the hell is the reservoir?" of the past. Because the nature of these new reactions has been influenced by the character of the recent drought, let me summarize some evidence on extent, severity and effects before coming back to recorded reactions.

Evidence on Scope and Severity

There are several ways to look at the 1988 drought, each of which illuminates a slightly different facet of the event. First, we can see that in much of the lower 48 states the experience of the summer of '88 really continued an event that began sometime in 1987. This is illustrated by the graphs in Figure 1 of average stream flow conditions for six regions from the Southeast to California. Further note from these graphs that average regional monthly flows in '88 were often *50* percent or more below the corresponding median figures for the period 1951 through 1980.

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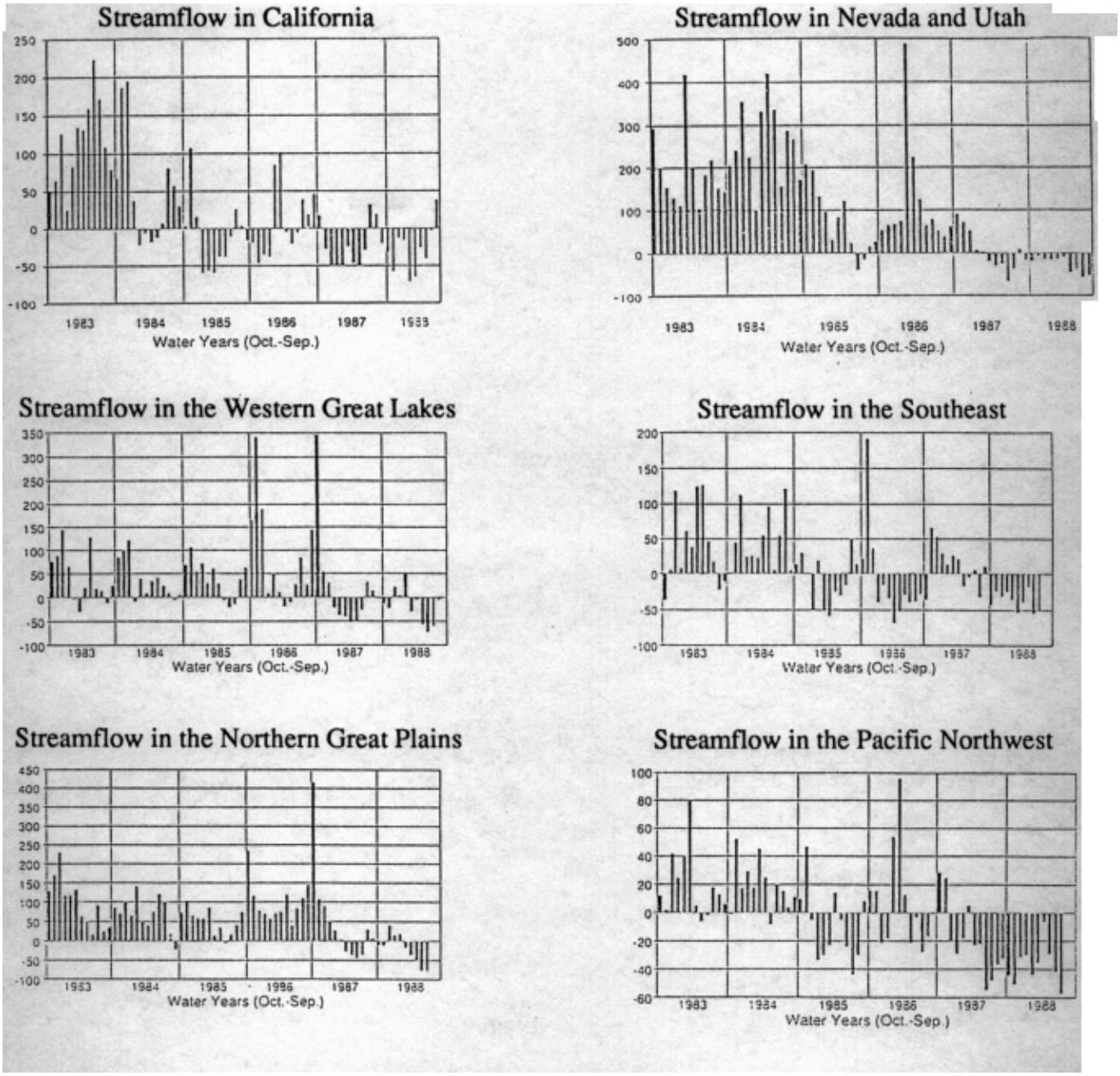
Figure 1. Stream Flows in Six Regions
(Percent Departure of Actual Monthly Mean Discharge from 1951-80 Medians)



Source: U.S. Geological Survey, *National Water Conditions*, July 1988.

Another view of the severity and scale of the drought of 1988 is given in Figure 2 by the crop moisture and Palmer Drought Index patterns as of July 30, 1988. The longer term Palmer Index shows a very large part of the lower 48, including the transmontane Southeast, most of the plains west of the Great Lakes, and a great swath of the far western states in the grip of severe to extreme drought. The crop moisture situation shows that in most of that same enormous area crops were facing "excessively, severely or extremely dry" conditions at the end of July.

In smaller scale areas, really extreme conditions could be found. For example, the USGS reported that in July the Minnesota River near Jordan, MN

carried 91 percent less than its long-term median flow and the Red River at Grand Forks, ND was 89 percent below its median. But again, to see how powerful an event this was it is useful to look at bigger rivers that integrate spatially as well as temporally. Table 1 shows the summer flow pattern for five large rivers, including the three largest draining the lower 48 states. All were flowing at rates below their 195 1-80 medians during those months; and only the St. Lawrence was not at least 30 percent below that figure. The Mississippi in June recorded its lowest flow ever for that month. So the dryness was ubiquitous.

TABLE 1
AVERAGE FLOWS IN FIVE **MAJOR U.S. RIVERS DURING THE SUMMER MONTHS OF 1988** - WITH **COMPARISON TO 1951-80 MONTHLY MEDIANS**

	May	June July	August	
Columbia (The Dalles, OR)	**202.4 (63)**	**182.0 (58)**	**75.4 (42)**	**163.5 (68)**
St. Lawrence (Massena, NY)	**153.7 (86)**	**162.0 (89)**	**157.0 (89)**	**158.3 (93)**
Mississippi (Vicksburg, MS)	**260.8 (48)**	**136.0* (39)**	**108.2 (40)**	**105.2 (48)**
Missouri (Herman, MO)	**40.1 (67)**	**30.0** (54)**	**28.7 (39)**	**27.8 n.a.**
Ohio (Louisville, KY)	**62.0 (73)**	**17.0 (41)**	**19.8 (62)**	**16.2 n.a.**

Flows are in billions of gallons per day.
Numbers in parenthesis are the percent of 1951-80 monthly medians.
* Lowest June flow on record.
** Third lowest June flow on record.

At the same time that soil moisture and stream flows were low, temperatures were high for long periods, especially in June and mid-July. This exacerbated the effect of rainfall shortfall on crops, including grass and ornamental plants, and made people more sensitive to climatic events generally. By contrast, during the Northeast drought of the mid-60s, air temperatures tended to be cooler than usual, and the lack of rain tended to be seen as making for great recreation rather than natural ‘‘disaster.”

Reactions, Predictions, and Policy

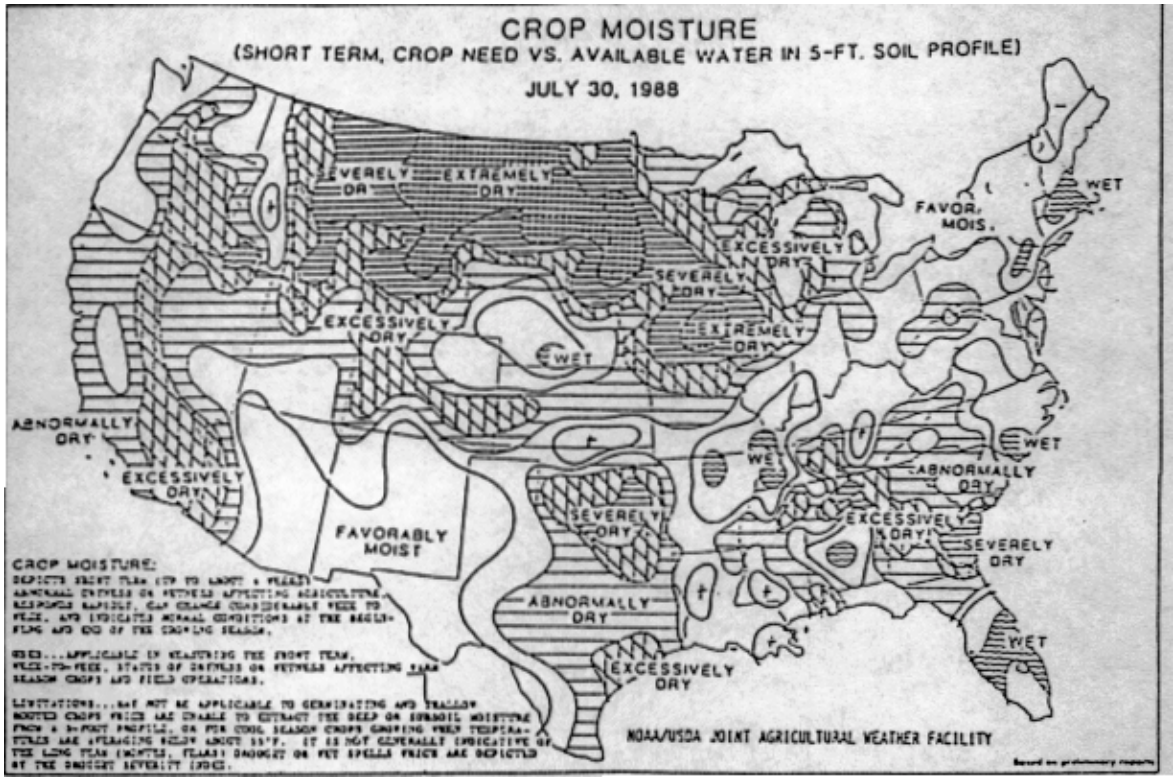
As I said above, what I find extraordinary about this event is how different public reactions and analysis have been from earlier droughts--some of even greater magnitude, though none so widespread. First, what is not being said. In particular, I have been able to find no evidence of calls for building our way out of droughts by increasing storage capacity. Rather, a favorite theme of commentators has been the ‘88 drought as evidence of the arrival of the “greenhouse.”

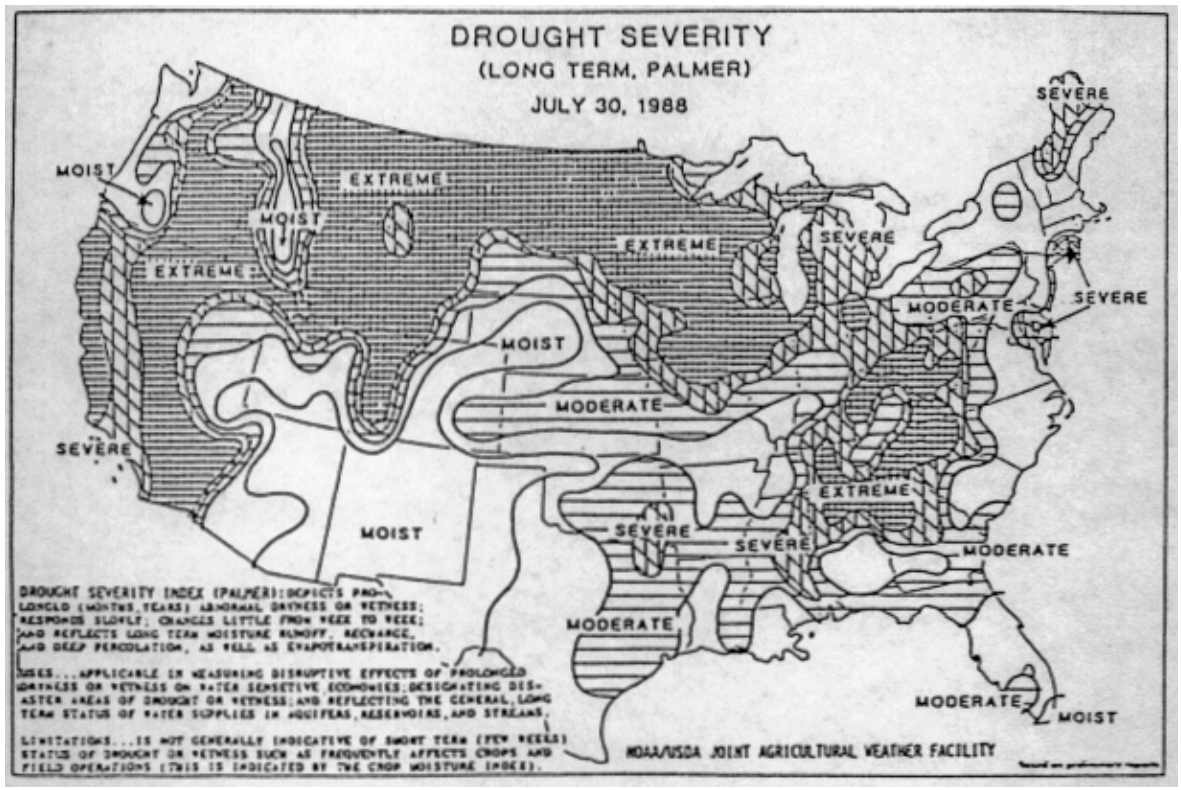
In part, the lack of calls for storage capacity expansion may be attributed to the largely agricultural nature of the drought. Few large cities, depending on surface storage for water supply, have been seriously inconvenienced. (Though some were about to be when rainfall increased a bit in late July and August. For example, New Orleans’ water supply intake was threatened by a wedge of salt water advancing up the Mississippi. And Memphis’ water intake was about to become useless because of the low flows in that river.)

But those same agricultural impacts might have been expected to produce calls for additional agriculturally-directed storage on the rivers of the Mississippi and Missouri basins. Instead, so far, the natural cost-sharing policy enacted in 1986, which has substantially reduced the tastiness of the pork in the Congressional barrel, seems to be secure. Congressional staffers for key committees, and staff members of lobbying organizations all talked about the need for conservation and for flexibility in transferring water rights out of agriculture when asked about the policy implications of the ‘88 drought. The Emergency Drought-Aid Bill, (HR 5015;PL100387) concentrates on getting money to farmers. Its only even moderately long-term provisions dealt with crop insurance purchases next year as related to relief payments for this year’s losses. No studies were directed or commissions established.

The second fascinating line on this drought is what is being said about climate change and future prospects. Even before James Hansen of NASA,

Figure 2. Indices of Drought Scope and Severity





Source: U.S. Geological Survey, *National Water Conditions*, July 1988.

testifying to Congress in the early summer, called the drought and heat wave conclusive evidence that the predicted greenhouse effect was occurring, some scientists of a variety of backgrounds were saying privately that this year was only a precursor of things to come. The pattern of the drought as well as the several very hot years experienced in the 1980s seemed to them consistent with the predictions of the climate models that purport to take account of the effects of buildup of greenhouse gases.

There has not, surprisingly, been a corresponding skepticism expressed by others. For example, some point out that long-range, large-scale climate models, lacking the greenhouse mechanism, can produce runs of years like the 1980s, with extremely high temperatures, but without those runs implying any trend. Others say that long-term cooling is at least as likely as warming, based on very long-term climate swings for the earth, and that recent events are only blips on that trend.

It does seem clear that deciding which position is correct will take years, probably decades. But in the meantime, the advocates of the greenhouse explanation make the argument that the rational, risk-averse policy is to work toward reducing greenhouse gas emissions now, because if we wait for decisive statistical evidence it will be too late.

Thus, in a sense, the drought of 1988 has been swallowed up in a larger policy debate--about world economic development, population growth, and energy policies--because it has been linked to the temperature-increase predictions that are driving this larger debate. In combination with the apparent power of the cost-sharing coalition on Capital Hill, this has produced a very different set of reactions to what the student of past droughts and water policy developments would have expected. Perhaps the most hopeful note in all this for national water policy is that the stress on conservation and water-rights markets in the West is so far surviving the stress of low rainfall and high temperature.

IMPACT OF THE 1988 DROUGHT ON AGRICULTURE

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During the peak growing months of the summer of 1988, the heart of the Nation's Farm Belt was gripped in the most pervasive drought everrecorded. As a result of the drought, livestock producers were forced to reduce herds as forage, water supplies diminished and crop producers suffered heavy losses.

Production and Prices

Pastures and ranges in the United States averaged near-record poor condition throughout the summer. Hay production is estimated to be down 12 percent from 1987 despite a 9 percent increase in harvested acreage including hay cut from acreage idled under farm programs. Short forage supplies have increased cow sales and some of these are going to slaughter, while some are going to producers who have forage available. Weekly cow slaughter is now down from early summer and for the year to date cow slaughter is off about 6 percent from 1987. Utility cow prices are $48-$49 per cwt, near prices in early May and up from around $40 per cwt in late June, at the onset of the drought.

This year's prospective grain and soybean harvests have been reduced by the drought but production prospects have stabilized since mid-August. Total supplies--including stocks at the start

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