1990

# 9 Drought

Donald A. Wilhite
*University of Nebraska - Lincoln*, dwilhite2@unl.edu

Published as chapter 9 in Handbook of Emergency Management: Programs and Policies Dealing with Major Hazards and Disasters, edited by William L. Waugh, Jr., and Ronald John Hy (New York: Greenwood Press, 1990).

# 9

# Drought

*Donald A. Wilhite*

Drought is a normal feature of climate. Although scientists disagree on what constitutes a drought (Wilhite and Glantz, 1985: 111), it represents a common experience that, in a sense, binds certain regions together (e.g., the Great Plains). During the past century, the United States has been plagued by numerous major drought episodes (e.g., 1890s, 1930s) and innumerable dry spells. In fact, it is unusual for drought not to occur somewhere in the United States each year. Recent short-term droughts that have resulted in substantial damage include the drought and heat wave of 1980 in the southwestern, southern, and central plains, and southern Corn Belt states; the 1983 drought in the Corn Belt; the 1985 drought in the northern and central Great Plains and the Northeast; the 1986 drought in the Southeast; and the 1988 drought in the Corn Belt and northern Great Plains states.

Although severe drought generally occurs more frequently in some parts of the United States than others, no part of the nation is immune (Karl and Knight, 1985). Severe drought is generally associated with cumulative moisture deficiencies of sufficient magnitude that, when extended over a substantial length of time, result in far-reaching impacts over a rather large geographical area. For example, the drought of July and August 1983 was so severe that the federal government designated 1,123 counties in twenty-two states as drought disaster areas. In addition to the designations that were made in the Great Plains states of Nebraska, Kansas, New Mexico, and Texas, the federal government also declared parts

of Alabama, Georgia, Virginia, West Virginia, Tennessee, Kentucky, South Carolina, Pennsylvania, and parts of most Midwest states eligible for low-interest disaster loans because of drought.

The actions of the federal government in responding to the 1983 drought are not unique. In fact, these actions seem almost inconsequential when compared to the massive drought relief programs formulated in response to the major episodes of severe drought that have occurred in the United States during the twentieth century. For example, during the droughts of the mid-1970s the federal government was responsible for the largest drought relief program in U.S. history. The General Accounting Office (1979: 29) calculated the cost of the drought program to four federal agencies alone at more than $5 billion during 1976-77. D.A. Wilhite and his colleagues (1984) estimated expenditures by all federal agencies involved in the response effort, plus administrative costs at both the federal and state level, to be $8 billion from 1974 to 1977.

Since each drought relief effort in the United States has relied, to some extent, on the precedents set in previous episodes, it is not surprising that mistakes and failures have been repeated. This chapter documents and evaluates efforts to respond to drought in 1976/77, the last major drought episode for which large-scale federal relief efforts are documented. Although ten years have elapsed since this episode, little has been done by the federal government to prepare for, and thus respond more effectively to, the inevitable recurrence of severe drought in the United States. Considerably more progress has been made by state governments. Recommendations are given on ways to improve the effectiveness of federal and state governments' response to future droughts. The concept and advantages of drought planning and a ten-step planning process will be discussed.

## FEDERAL RESPONSE TO DROUGHT (1976/77)

That the federal government would attempt to mitigate some of the most severe impacts of widespread drought during the mid-1970s was not unexpected. Droughts of greater intensity and duration during the 1930s and 1950s had produced similar responses. Although the organizational structure for administering drought relief and the forms of assistance available changed significantly during the fifty years before the mid-1970's drought, the fundamental approach did not.

During the mid-1970s, the Federal Disaster Assistance Administration (FDAA) was responsible for

administering grants to presidentially declared disaster areas from the president's disaster relief fund. Moreover, FDAA was responsible for directing and coordinating the assistance efforts of all federal agencies (FDAA, 1975). The number of federal disaster assistance programs available in 1975 was extensive. Few, if any, of these programs had been designed specifically to respond to problems caused by drought.

The actions of state and federal agencies that resulted in response to the drought of 1976-1977 are described in detail below. Table 9.1 provides a chronology for these actions.

## The 1976 Federal Drought Response

The first federal actions were initiated during the last year of the Ford administration in response to requests from Governor Richard F. Kneip and Representative James Abdnor of South Dakota in July 1976. The governor requested federal agencies to provide maximum assistance to the severely stricken drought areas in his state (Kneip, 1976). This request prompted the president to direct the Domestic Council to review the socioeconomic impacts of drought in the Dakotas, Minnesota, and Wisconsin and to determine if additional assistance could be provided under existing federal laws and programs (May, 1976). The governor's letter was followed by a request from Representative Abdnor to the secretary of agriculture for the creation of a special task force to review and improve current drought assistance programs (Abdnor, 1976). In response to Abdnor's request, a special cabinet-level drought committee was formed by the president in late October. The committee's objectives included the development of a drought monitoring scheme and a comprehensive plan and program for delivering short-term assistance to drought-affected areas.

The special cabinet-level drought committee reported to President Ford on December 28, 1976. By this time, 325 counties had been declared emergency disaster areas. Basically, the report provided a summary of federal response to date, a status report of the current situation, and an indication of problem areas. The committee's findings suggested that current programs "may not be able to cope effectively if the situation deteriorates much further" (Bell, 1976). The report concluded that, "when drought occurs it is difficult to determine the nature and extent of federal assistance required, and some emergency programs are not designed to cope with agricultural drought."

**Table 9.1**
**State and Federal Response to the 1976/1977 Drought**

| Action/Date | Response/Date |
|---|---|
| **1976** | |
| Request for action from South Dakota governor and others--July | Domestic Council directed by President Ford to review socioeconomic impact--September |
| Request by Rep. Abdnor (South Dakota) for the creation of a drought task force--July | President Ford appoints special cabinet-level task force--October Task force issues report--December |
| **1977** | |
| States form regional alliances, Western Governors' Task Force on Regional Policy Management meets to discuss drought conditions--January | Western States Water Council begins to monitor drought--January |
| Western governors meet with Secretary Andrus--January | Commitments by federal and state governments for action; President Carter and governors appoint drought coordinators--January to early March |
| Federal drought coordinator requests drought-related information from 13 federal agencies--February | Drought appraisal report prepared under leadership of the U.S. Army Corps of Engineers for submission to President Carter--mid-March |
| Presidential drought package for $844 million submitted to Congress --March 23 | Drought package passed almost intact by Congress, except for two items--April to early May |
| Formation of an Interagency Drought Coordinating Committee to designate Emergency Drought Impact Areas under the president's drought program--April | 2,145 counties declared Emergency Drough Impact Areas by this committee between April 25 and September 12 |
| Drought conditions improve between April and August in the Great Plains and Upper Midwest states, and by December in the Far West states | Federal drought assistance estimated between $7 and 8 billion for 1976/77 |

The drought committee's report reached President Ford on January 3, 1977, seventeen days before the end of his term in office. The committee's report provided only a cursory examination of the drought problem and did not deal with the questions of long-term policy cited among the committee's original objectives. As table 9.2 shows, the report included a tabulation indicating federal assistance in presidentially declared emergency areas up to December 1, 1976.

Federal drought response during the Ford administration is best summarized as reaction-oriented. Little if any planning was done to develop alternative actions for possible future conditions. No new programs were developed and no coordinated effort was made to respond to deteriorating conditions.

## The 1977 Federal Drought Response

In January 1977, regional alliances put added political pressure on Washington for action. On January 23, 1977, the Western Governors' Task Force on Regional Policy Management met to discuss the scope and magnitude of the western drought (WESTPO, 1978). Following this meeting, the lead agency for water policy and development, the Western States Water Council (WSWC), began to monitor the drought situation at regular intervals. The governors met with the secretary of the interior, Cecil Andrus, to discuss state needs and federal actions to mitigate the societal impact of drought. Although many areas of the nation were entering their second, and a few locations their third, consecutive year of drought, this was the first such joint discussion of mitigation alternatives by state and federal officials.

The meeting with Secretary Andrus concluded with several commitments by the secretary and the governors. The secretary agreed to seek the appointment of a federal drought coordinator and to encourage the president to discuss the drought issue at the National Governors Conference. The governors also agreed to consider the need for alternative approaches to cooperative, multilateral drought response actions and to designate state drought coordinators.

In response to these initiatives, President Carter appointed Jack Watson to be federal drought coordinator. One of Watson's first actions was to request each of thirteen federal agencies to prepare a report by March 3 (a lead time of less than one week) that would include: (1) a brief evaluation of the impacts and drought-related problems in each agency's area of responsibility; (2) a list and description of drought assistance programs; (3) a statement of administration or funding problems; (4) an evaluation of complaints from state and local governments and drought victims; and (5) suggestions of legislative changes or initiatives that might help to better organize and deliver federal assistance in support of state and local government efforts (Watson, 1977).

The agency reports submitted to Watson totaled several thousand pages and were, not surprisingly,

lacking in uniformity and consistency. Watson recognized the inability of his staff to restructure the raw information provided by the agencies into a format that would be useful in the decision-making process (Kallaur, 1977). The U.S. Army Corps of Engineers was asked to coordinate this assimilation process. The Corps accepted this task and completed it within one week, as directed. The thirteen reporting agencies became known as the White House Drought Study Group. The Drought Appraisal Report, as it was called, was completed on March 18 and served as the basis for President Carter's drought program.

The Drought Appraisal Report described drought conditions in the United States and addressed questions of water conservation, water supply augmentation, and management measures; it also suggested possible immediate mitigating actions. The report concentrated heavily on drought impacts in the Far West, sometimes to the point of downplaying, if not neglecting, those areas plagued by extreme drought in the Midwest and northern plains states.

Federal response activities continued to expand during March as drought conditions intensified and encompassed larger geographic areas. Emergency loans from FmHA were made available to 706 counties in twenty-seven states. Livestock feed assistance was provided in 436 counties in twelve states by ASCS. By the end of March FDAA was providing aid to sixteen states, by presidential declaration, through three assistance programs (FDAA, 1977). The three programs provided assistance for hay transportation, cattle transportation, and emergency feed. USDA was responsible for coordinating most of the assistance activities in the agricultural sector.

President Carter sent a request to Congress on March 23 for $844 million in loans and grants for farmers, ranchers, communities, and businesses stricken by drought. The president's request for this program was passed intact by Congress, except for the Small Business Administration legislation and a reduction in funds, from $225 to $175 million, for the Economic Development Agency (EDA) loan and grant program (Crawford, 1978: 143). The water bank bill was signed by the president on April 7. Other portions of the "package" were delayed until early May. Program funds were to be expended or committed by September 30, 1977.

## Table 9.2
## Federal Grant and Loan Programs Providing Assistance in Disaster Areas Through December 1, 1976

| Agency/Program | Applications Received | Estimated Amount | Applications Payments | Amount Paid |
|---|---|---|---|---|
| Federal Disaster Assistance Administration, DHUD | | | | |
| Hay and Cattle Transportation Assistance | 18,456 | $83,312,926 | 9,701 | $7,154,121* |
| Small Business Administration | | | | |
| Economic Injury Disaster Loans | 31 | $1,101,500 | 19 | $701,500 |
| Agricultural Stabilization and Conservation Service, USDA | | | | |
| Disaster Payment Program | 151,869 | $172,050,000 | 70,712 | $65,497,000 |
| Emergency Livestock Feed Program (now being phased out due to lack of CCC-owned feed grain stocks) | N/A | $4,300,000 | N/A | $4,300,000 |
| Farmers Home Administration, USDA | | | | |
| Emergency Loans | 7,300 | $207,263,000 | 2,956 | $133,263,000 |
| Economic Development Administration, DOC | | | | |
| Economic Development-Special Economic Development and Adjustment Assistance Program | 22 | Undetermined** | 8 | $1,556,000* |

Source: Bell, 1976.
*Partial payments on some applications
**Amount to be determined after further evaluation

Note:
This summmary reflects applications for grants and loans received and funds requested therein following the presidential emergency declarations and through November 1976 in the States of Minnesota, Missouri, North Dakota, South Dakota, Virginia, and Wisconsin. Eleven counties in Arkansas were declared eligible for assistance on December 3, 1976. The data contained herein was limited to assistance provided in the areas covered by the presidential emergency declarations due to drought. The assistance included in this report was provided through emergency and regular program authorities.

In April the Interagency Drought Coordinating Committee (IDCC) was created. The major function of IDCC was to designate areas eligible for federal assistance. This federal assistance, however, referred only to programs authorized in President Carter's "drought package." Members of IDCC included representatives of the U.S. Department of Agriculture (chairman), the Small Business Administration and the Departments of Interior and Commerce. Geographic areas designated by IDCC were referred to as Emergency Drought Impact Areas (EDIAs).

During the first formal meeting of IDCC, held on April 25, 1977, the committee designated 1183 counties as EDIAs. Of these, 842 had already received presidential or secretarial declarations (Stockton, 1977). The EDIAs were located in 24 western and midwestern states. The list of declarations grew during the summer months. By September 12, 1977, the date of the last declaration, 2,145 counties (70 percent of all counties in the United States) were included as EDIAs. These designations were to expire on September 30.

In the early stages of IDCC there were no distinct criteria for the designation of EDIAs. At least half of the counties designated during this time period were so designated with no supporting documentation. The need for such criteria was discussed during the third meeting of IDCC on May 3. It was agreed that ASCS would draft a list of criteria, which was presented to and approved by the committee on May 20. The list included the Palmer Drought Severity Index (PDSI). This index was apparently the principal criterion used by IDCC to determine eligibility for drought assistance (General Accounting Office, 1979: 29).

Considerable confusion appears to have developed over IDCC designations. Many federal and state officials assumed that counties were automatically eligible for all federal programs after they had been designated by IDCC. Although it is not so specified in the original memorandum of agreement, IDCC designations were intended to apply only to programs included in the presidential drought package. Following IDCC designation, counties automatically became eligible for only one of the many drought package programs, FmHA's Emergency Loan Program. To qualify for other programs in the package, counties had to meet the special eligibility requirements of each program. Eligibility for programs not included in the presidential drought package was determined on a program-by-program basis and was not linked to IDCC designations.

The only distinction between IDCC-designated and non-IDCC counties was that the former had access to the special drought funds associated with the president's drought package. IDCC designations were sweeping, usually focusing on states rather than individual counties. The detailed, county-level evaluation process was left to the several involved federal agencies.

Although the presidential drought package was substantial ($844 million)--one of the largest single appropriations for drought relief in the nation's history--it represented only a small portion of the total federal drought assistance program. Forty programs were available to provide assistance to the private sector during 1976/77. However, six programs accounted for the vast majority of funds disbursed: (1) the Farmers' Home Administration's Emergency Loan Program; (2) the Small Business Administration's Disaster Loan Program; (3) the Department of Commerce's Community Emergency Drought Relief Program; (4) the Bureau of Reclamation's Emergency Fund Program; (5) the Bureau of Reclamation's Emergency Drought Program; and (6) the Farmers' Home Administration's Community Program Loans and Grants. The authorizations and activities associated with each of these programs during the 1976/77 drought have been summarized in a General Accounting Office report (1979: 29) entitled "Federal Response to the 1976-77 Drought: What Should Be Done Next?" GAO reported that the Departments of Agriculture, Commerce, and Interior and SBA alone administered more than $5 billion in drought relief programs to water users during 1976/77. However, if the cost of programs administered by other federal agencies is included, as well as the cost of the relief programs of 1974 and drought-related administration costs to states during 1974-77, the total cost of the drought to the government can be conservatively estimated at $7 to 8 billion (Wilhite et al., 1984).

## IMPROVING FEDERAL RESPONSE TO DROUGHT

In view of the experiences of the mid-1970s and previous drought relief efforts, certain lessons emerge about ways to improve governmental response to periods of widespread and severe drought. Based on the foregoing information, four basic requirements for more effective response by federal government are suggested: (1) reliable and timely information and dissemination plans; (2) objective and reliable impact assessment procedures; (3) objective and timely designation procedures; and (4) appropriate disaster

programs and efficient program administration and delivery systems.

**Information Products and Dissemination Plans**

The drought response efforts of the mid-1970s were not based on adequate and systematic provision of timely information on drought conditions and impacts to persons and agencies involved in administering programs. Although the availability of reliable, current, and properly formated information does not ensure correct and timely decisions on the part of government officials, it is at least reasonable to believe that good decisions are less likely to be made on the basis of inadequate or incorrect information.

Many types of information are needed during periods of drought if the wide-ranging impacts associated with water shortages are to be adequately addressed. For example, meteorological data is necessary to describe the degree of water shortage and to identify those geographical areas most affected. Such data, in conjunction with information on soil moisture conditions, can be used for early projections of yield. Commodity prices, in conjunction with projected yield figures, can be used to estimate monetary losses for principal grain, vegetable, and hay crops. Data on stream flow and ground water depletion rates provide important information on the outlook for water supply to the agricultural, municipal, and industrial sectors.

A common requirement for all types of drought-related information is that it be reliable, effectively organized, and timely. In almost all cases during the mid-1970s' drought, government agencies did not make assessments of the drought situation until drought conditions had reached critical proportions.

To improve the ability of government to respond effectively in times of drought, the drought situation and its consequent impacts must be continually monitored. Since weather data form the basis for virtually all other assessments, special attention should be given to providing relevant observations of precipitation and calculations of evapotranspiration and soil moisture status. Networks of automated weather stations (such as the one developed in Nebraska, South Dakota, Colorado, Kansas, Wyoming, and Iowa under partial support of the National Climate Program Office) can provide the data needed for the aforementioned calculations. This network currently provides near-real time data for seven meteorological parameters--solar radiation, wind direction and speed, precipitation, humidity, temperature, and soil

temperature (Hubbard et al., 1983: 213; Hubbard, 1987: 97).

Regional automated weather networks in drought-prone areas and terrestrial sensors in space can provide the data base for drought early warning and surveillance systems. Atmospheric scientists have a significant contribution to make in the improved collection and interpretation of weather data for drought management.

**Impact Assessment Procedures**

A long-standing problem in responding to drought has been the lack of reliable procedures for assessing probable impact. Because drought normally has its most immediate and substantial impact on the agricultural sector, improved techniques for assessing, in near-real time, the impact of weather conditions on crops and rangeland should greatly improve our ability to identify (and therefore speed assistance to) areas affected by drought.

Historically, the most common government criterion to identify areas stricken by drought has been amount of normal precipitation. This information and local reports of crop, pasture and livestock conditions, and human distress were used extensively during the 1930s and 1950s.

During 1976/77 PDSI was used by federal agencies and IDCC to establish eligibility of areas for drought relief (General Accounting Office, 1979: 29). A map showing the distribution of PDSI values was (and is) published regularly in the Weekly Weather and Crop Bulletin. PDSI is intended to describe long-term moisture conditions. More recently, the Crop Moisture Index (CMI), a modification of PDSI and more agriculturally appropriate, has been used by federal agencies to assess short-term moisture conditions (Palmer, 1968: 157; National Weather Service, 1977). CMI was not widely used during 1976/77.

PDSI has been increasingly criticized in recent years by scientists (Changnon, 1980: 5; Wilhite, 1983: 22; Alley, 1984: 22). Inconsistencies have been noted between PDSI and actual severity of the drought impacts observed. There are several reasons for the lack of agreement between calculated PDSI values and actual drought severity, particularly with respect to agricultural drought. Specific crop responses to drought were not considered in the derivation of the index, nor do they figure in the calculation of index values. Yet, PDSI is used, qualitatively, to assess drought impacts on crops. Additionally, the Thornthwaite method (Thornthwaite, 1948: 38) of

estimating evapotranspiration (ET) is used in the calculation of PDSI values. The Thornthwaite method is unable to account for sensible heat advection, a major source of the energy that drives the ET process in the Great Plains region. Thus, there is concern that the Thornthwaite method severely underestimates ET in subhumid and semiarid regions (Rosenberg et al., 1983) and, accordingly, that the PDSI tends to overestimate the amount of water remaining in the soil (Smith, 1983).

Regional differences in land use and cropping systems should be considered in the impact assessment issue. For example, a PDSI of -3.0 in July may signal substantial reduction in yield of nonirrigated corn because of destruction of reproductive tissue. Were moisture conditions to improve, corn yield would still be low but soybeans, whose reproductive activity continues through much of the growing season, may produce near-normal yields.

Clearly, new techniques must be developed to enhance our drought impact assessment capability. Impacts are most precisely estimated on a crop-specific basis. Agricultural meteorologists and agronomists, working together, have the skills needed to develop crop-specific drought indices. Automated weather data networks are now providing the data to support the development and operation of these indices in some drought-prone regions. These data can also support numerous other assessment-related activities of state government. Therefore, states should play an important role in supporting the development and maintenance of these networks.

## Drought Designation Procedures

The development of objective and timely procedures to determine eligibility for federal disaster assistance is a necessary condition for the improvement of government response to drought. Although standby legislation and response plans may reduce delays in program formulation and implementation, the lack of appropriate designation procedures and reliable, objective criteria on which to base those designations hampers the delivery of programs to the affected area and leads to ineffective response.

Procedures for designating counties eligible for assistance have changed with each drought episode. During a particular episode, procedures may have been altered in response to deteriorating weather conditions. Changes in political administration in the middle of a drought can also be expected to result in changing designation procedures. During the mid-1970s'

drought the procedure for designating counties eligible for disaster assistance was more complicated and confusing than it had been in previous droughts, partly because more agencies and committees were involved in administering the programs (Wilhite et al., 1984).

The General Accounting Office (1978: 95) has summarized the substantial differences in the disaster declaration procedures used by major agencies--FmHA and SBA--during 1977. The effect of these differences in disaster declaration procedures was such that, during the period July 1977 through January 1978, FmHA and SBA operated their programs in forty-five and fourteen states, respectively. Within states where both agencies operated, certain counties were covered by only one of the two agency programs.

One examination and evaluation of the function, procedures, and actions of IDCC has identified several specific problem areas (Wilhite et al., 1984). First, the existence and precise function of IDCC were poorly understood by government officials, especially at the state level. In many cases, designations by the committee were interpreted by government officials as an automatic qualification of their state or county for all federal disaster assistance programs. FmHA's Emergency Loan Program was the only government program actually enabled by IDCC action.

Second, IDCC designations were broad and sweeping, and impacts identified by states were not verified by the committee on the basis of a common set of objective data. No IDCC evaluation criteria were actually available until early June, and then they were not widely understood. Of the 2145 counties designated by IDCC between April 25 and September 12, 1977, approximately 1575, or 73 percent, were approved before the criteria had been properly defined. Although entire states were often designated by IDCC, actual impact areas were of limited geographical extent. For example, the primary impact area in Nebraska in 1977, in terms of production losses of the principal grain crops, was confined to a nine-county area in the extreme southeastern corner of the state. IDCC designated the entire state (ninety-three counties) on April 25. These sweeping designations provided many counties throughout the nation not affected by the severe drought with access to FmHA emergency loans. This action also led to the illusion of a severe nationwide drought. Such an illusion can, in the long run, be detrimental to the establishment of drought relief programs.

Third, the criteria established by IDCC were not fully reliable for the purpose of identifying affected

areas, although they were probably the best available at the time. Assessments by federal agencies were improvised from the data at hand. However, these needed data were not available to the committee that was charged with evaluating all requests for assistance. Also, the data available to the committee was, in some cases, out of date. Therefore, decisions were, at times, based on information that may not have represented the situation accurately.

## Disaster Programs, Administration, and Delivery Systems

As many as forty separate programs were available to provide assistance to drought victims in the form of loans, grants, and insurance during the mid-1970s (see table 9.3). These programs can be clustered into two broad categories. The first included short-term actions to avoid or lessen the impact of drought by augmenting water supplies. This was the primary objective of President Carter's drought program. The second group involved programs designed to make loans to farmers to compensate them for production losses and to provide them with working capital. The wide range of assistance programs available reflects the variety of groups and economic sectors affected by drought and the lack of a coordinated federal disaster response plan.

Two characteristics of these disaster programs can be noted. First, only a few of the programs available in the mid-1970s were designed to address the specific problems associated with drought. Rather, they were orginally formulated by Congress to respond to problems of soil and water conservation and to other natural disasters such as flooding. Second, other than the on-going programs implemented in response to previous twentieth-century drought episodes (e.g., Great Plains Conservation Program), the programs of the mid-1970s were intended to be short-term or tactical. No new long-term program initiatives were instituted during this period.

The General Accounting Office (1979: 29) indicated four major problem areas in its study of the programs and the administration of programs that were part of the 1976/77 federal drought response effort. First, several drought programs were enacted too late to lessen the effects of drought. For example, President Carter's drought program did not receive congressional approval until April and, in some cases, May. In the Far West it had been apparent since January 1977 that a water shortage would occur during the irrigation season. As another example, delays in

congressional approval also sharply reduced the effectiveness of certain programs. For example, $75 million was authorized to the Bureau of Reclamation for the Water Bank Program. However, only $4.8 million was spent in this manner because most growers of lower-value annual crops had already planted by the time the program was implemented. It was too late to reallocate water to the higher-value perennial crops.

Second, many projects that were approved violated congressional intent to augment water supplies on a short-term basis. Several projects were initiated so late that water could not be supplied during the drought for which the aid had been given. Construction of other projects did not even begin until after the drought had ended. Also, drought loans and grants appear to have been used to provide a low-cost source of federal financing for nondrought-related projects.

Third, eligibility and repayment criteria for emergency drought programs were inconsistent, inequitable, and confusing. Although substantial differences in criteria existed between many disaster programs, the differences between the FmHA's Emergency Loan Program and SBA's Disaster Loan Program are, perhaps, the most interesting because they were directed to the same target groups. (For specific differences between these two programs, see the 1978 GAO report). Loans obligated through the two programs totaled $4.63 billion during 1976/77.

Fourth, inadequate coordination among agencies led to program overlap and nonuniform standards for determining eligible drought relief projects. GAO cites several specific examples of loan applicants applying to two agencies. In some cases, applications were approved by both agencies, and applicants could choose the loan with the most favorable terms.

The General Accounting Office (1979:29) concluded its examination of the 1976/77 federal drought response effort with the recommendation that Congress direct the four primary agencies administering assistance programs (USDA, SBA, Departments of Interior and Commerce) to assess the problems encountered in providing emergency relief. Based on the findings of this assessment, GAO recommended that a national drought plan be developed to provide assistance in a more timely, consistent, and equitable manner. According to GAO, this plan should identify the respective roles of agencies to avoid the overlap and duplication that has been associated with previous drought response efforts. GAO recommended that Congress consider legislation that would more clearly define those roles. GAO also recommended standby legislation (i.e., authorizing assistance programs) to

permit more timely response to drought-related problems.

In light of past experiences, the recommendations of GAO appear eminently sensible. The number of agencies participating in drought assistance activities during 1976/77, as well as the number of programs available, indicates the obvious need for an assessment and response plan organized under the leadership of a single agency. In the process of developing such a plan, all disaster assistance programs should be reviewed in terms of their consistency, efficiency, and equity, as well as their relevance in dealing with the problems and impacts associated with drought. Most assistance programs were originally developed to address problems resulting from the occurrence of natural hazards other than drought or in response to specific water supply problems. During droughts these programs have simply been redirected. Also, more attention needs to be given to alleviating drought impact and facilitating recovery in the agricultural sector.

Multidisciplinary studies should be initiated to define the impacts of past droughts. In addition, scenarios should be used to help evaluate probable impacts of future drought. The results of such studies could aid in identifying real needs for drought assistance programs, reduce the number of such programs, and lead to improved efficiency in their administration.

## DROUGHT POLICY AND THE DEVELOPMENT OF PLANS

### The Goals and Objectives of Drought Policy

The underlying question in this discussion is: Should government be involved in providing assistance to those economic sectors or persons that experience hardship in times of drought? Because of the frequency, severity, and spatial extent of drought, governments in the United States and elsewhere have elected to provide assistance through a wide range of measures. These drought assistance measures are the instruments of a de facto policy that has evolved over the past fifty years. The decision on whether to provide aid has been based more often on political than economic reasoning. Thus, government involvement in drought relief seems to be a political reality, and one that should be dealt with in a more effective and efficient manner.

Previous discussion has concentrated on government response to a recent episode of widespread, severe drought in the United States. This drought

relief effort has been shown to be largely ineffective, poorly coordinated, and untimely. Governments have reacted to, rather than prepared for, recurrent and inevitable episodes of drought.

For purposes of contingency planning, the goals of government drought policy must be stated explicitly. Without clearly stated drought policy goals, contingency planning will lack direction and purpose. Also, the effectiveness of drought assessment and response actions will be difficult to evaluate.

Three goals for drought policy are proposed here. First, assistance measures should not discourage agricultural producers, municipalities, and other groups from adopting appropriate and efficient management practices to help alleviate the effects of drought. Second, assistance should be provided in an equitable, consistent, and predictable manner to all without regard to economic circumstances, industry, or geographic region. Third, the importance of protecting the natural and agricultural resource base must be recognized. Although these goals may not be achievable in all cases, they do represent a model against which recent drought policies and measures--the instruments of that policy--can be evaluated. Drought policy goals are also the foundation of any planning effort by federal and state governments.

The specific objectives of drought policy will, of course, vary between levels of government and from country to country. In the United States, for example, the objectives of a national drought policy might be:

1. To prepare an organizational structure for assessing and responding to drought-related problems and water shortages

2. To develop standby legislation that adequately addresses the impacts of drought through relevant assistance measures

3. To encourage and support basic and applied research leading to the development of appropriate management strategies for all drought-prone regions

4. To foster and support water planning and management activities at both the state and regional level

To be successful, whether in the United States or elsewhere, drought planning must be integrated within the national and state--or provincial--levels of government, involving existing regional (multistate)

organizations as well as the private sector where applicable. At the national level in the United States, however, the diversity of impacts associated with drought and the multitude of federal agencies with responsibility for drought assessment and response make it difficult for a single federal agency to assume leadership in the development of a national drought assessment and response plan. The development of a national policy requires an interagency approach in these instances, under the leadership of a single agency. For this as well as other reasons, such as unique local water management problems, Wilhite and his colleagues (1986: 22) have suggested that where a complex federal bureaucratic structure exists, as it does in the United States, drought planning efforts may be most effective if first initiated at the state level. In other settings, such as in less-developed countries, the drought planning process may be coordinated more easily at the national level since the bureaucratic structure may be less formidable.

The objectives of drought policy at the state level will differ from those at the national level, reflecting the unique physical, environmental, socioeconomic, and political characteristics of a particular area. For example, drought policy objectives might be:

1. To develop a monitoring system that provides early warning of impending drought conditions and impacts

2. To develop an organizational structure that enhances drought preparedness and response by linking levels of government

The development of the organizational structure referred to in the second objective will provide the necessary integration with drought policies at the national level and should ensure adequate coordination between the two levels.

Regional actions should be directed toward fulfilling at least three objectives:

1. To improve data collection and dissemination efforts between states

2. To identify or establish a regional organization to facilitate much of the drought planning effort and to improve coordination and cooperation within and between levels of government

3. To develop a strategy whereby the designated organization can focus federal attention on drought-stricken areas so that they receive appropriate assistance in a timely manner

Successful regional drought planning efforts have three prerequisites. First, the governors of the region in question must be convinced of the advantages of risk versus crisis management. This usually requires an event or series of events (i.e., the occurrence of a severe drought) to first capture their attention. An intensive educational effort must then be directed toward these decision makers. Second, states must have the full cooperation of federal agencies. Water planning and management is a complex problem, one whose solution involves all levels of government. Federal agencies can play a key role in identifying and implementing solutions to these problems. Third, drought planning should begin at the state level and then progress to the regional and national level. States that are cooperating in a regional planning effort must first establish the necessary institutional infrastructure within their state. This action will facilitate the planning effort at higher levels of government.

**DROUGHT POLICY FEATURES**

The principal features of drought policy are grouped into three categories: organization, response, and evaluation.

Organizational features are planning activities that provide timely and reliable assessments, such as a drought early warning system, and procedures for a coordinated and efficient response, such as drought declaration. These characteristics would be the foundation of a national or state drought plan. Only a few states in the United States have drought plans (Wilhite and Wood, 1985: 21).

Response features refer to assistance measures and associated administrative procedures that are in place to assist individual citizens or businesses experiencing economic and physical hardship because of drought. Numerous assistance measures are available in the United States, but few are intended specifically for drought. An all-risk crop insurance program has been evolving in the United States since 1939 (Federal Crop Insurance Corporation, 1980), although the level of participation by farmers is quite low.

Evaluation of organization procedures and drought assistance measures in the postdrought recovery period is the third category of drought policy features.

Governments in some countries (e.g., Australia) have been more conscientious in their evaluation of recent drought response efforts. In the United States, the government does not routinely evaluate the performance of response-related procedures or drought assistance measures. An evaluation of the 1976/77 drought response activities was made by the General Accounting Office (1979: 29) at the request of the chairman of the Subcommittee on Environment, Energy, and Natural Resources, the late Congressman Leo J. Ryan. Wilhite and his colleagues (1984) evaluated government response to the mid-1970s' drought under the sponsorship of the National Science Foundation. These were the first systematic evaluations of federal drought response efforts in the United States. Earlier efforts were only documentations of federal, and possibly state or private, involvement in drought relief, avoiding judgments of its effectiveness (Murphy, 1935; U.S. Executive Office of the President, 1959).

## DROUGHT PLANNING: WHAT IS IT?

Drought planning can be defined as actions taken by government, industry, individual citizens, and others in advance of drought for the purpose of mitigating some of its effects. Drought planning should include, but is not limited to, the following activities:

1. A monitoring/early warning system to provide decision makers at all levels with information about the onset, continuation, and termination of drought conditions and their severity

2. Operational assessment programs to reliably determine the likely impact of the drought event

3. An institutional structure for coordinating government actions, including information flow within and between levels of government and drought declaration and revocation criteria and procedures

4. Appropriate drought assistance programs with predetermined eligibility and implementation criteria

5. Financial resources to maintain operational programs and to initiate research required

to support drought assessment and response activities

6. Educational programs designed to promote the adoption of appropriate drought mitigation strategies among the various economic sectors most affected by drought

As figure 9.1 illustrates, drought planning has been described by D. A. Wilhite and W. Easterling (1987) as a ten-step process. This process is intended to be flexible so that it can be easily adapted to many sociopolitical situations and levels of government. Continuous evaluation and updating of the procedures included within each step of the process are recommended to ensure that the plan remains most responsive to the needs of the region involved. This process should be useful to governments desiring to implement some level of drought contingency planning activity.

## FEDERAL AND STATE DROUGHT PLANNING: CURRENT STATUS

Earlier in this chapter, four basic requirements were suggested as necessary to improve the effectiveness of federal drought response efforts: (1) reliable and timely information and dissemination plans; (2) objective and reliable impact assessment procedures; (3) objective and timely designation procedures; and (4) appropriate disaster programs and efficient program administration and delivery systems. A national drought plan has been suggested as the best way to attain significant progress in each of these four areas.

Although debate on the need for a national drought plan continues, no movement toward the development of such a plan has occurred. Some improvement in the delivery of reliable and timely information to decision makers during the 1988 drought can be noted. Much of the credit for this improvement must be given to the leadership provided by the Joint Agricultural Weather Facility of the U.S. Department of Agriculture and the National Oceanic and Atmospheric Administration. However, the actions of government in responding to widespread and severe drought remain uncoordinated because of the lack of an organizational structure within the federal government. Clearly, the Federal Emergency Management Agency (FEMA) must play a major coordinating role in this effort. It should also be recognized that the speed with which the Congress passed the 1988 drought

relief legislation can be attributed largely to an election year spirit of cooperation among members of Congress. If drought continues into 1989, impacts will be even more pervasive, requiring more comprehensive assistance programs. Such bipartisan actions should not be expected in future droughts. A national drought policy needs to be established that defines goals and objectives of federal drought assessment and response programs.

**Figure 9.1**
**A Ten-Step Drought Planning Process**

Appointment of
Drought Task Force
**(STEP 1)**

Statement of Purpose
and Objectives
**(STEP 2)**

Inventory of Natural and Human
Resources, Financial Constraints
**(STEP 3)**

Development of Drought Plan
**(STEP 4)**

Identification of Research Needs
and Institutional Gaps
**(STEP 5)**

Synthesis of Drought Management
Science and Policy
**(STEP 6)**

Identification of Response Options
**(STEP 7)**

Implementation of Drought Plan
**(STEP 8)**

Development of Educational
and Training Programs
**(STEP 9)**

Development of
System Evaluation Procedures
**(STEP 10)**

State governments in the United States have typically played a passive role in assessing and responding to drought. This was certainly the case in the mid-1970s and in earlier drought episodes as well. In recent years, state governments across the nation have made impressive strides in preparing for drought-related water shortages. For example, in 1982 only three states had prepared formal drought plans--Colorado, South Dakota, and New York. At present, about twelve states have plans and another ten states are developing plans. Certainly, the widespread occurrence of severe episodes of drought in the United States over the past decade, and especially since 1985 in the Southeast and Far West, has demonstrated the vulnerability of our society to drought impacts and highlighted the importance of government actions as a mitigation tool.

Today, a number of resources are available that can help state governments prepare for the recurrence of drought. First, states can learn from the planning experiences of other states. The Colorado Drought Plan is probably the most duplicated approach. Second, a model drought plan developed by the Western States Water Council in the fall of 1987 helped many Western states hastily assemble some plan of action in 1988. This model is based on the Colorado plan but incorporates ideas and elements from other plans. Finally, the ten-step planning process referred to in the previous section of this chapter provided some focus and direction to a few states during 1988. This ten-step process is now being expanded with funding from the National Science Foundation to incorporate a model drought plan that will be applicable to all regions of the United States (Wilhite and Easterling, 1988). The availability of this model in the spring of 1989 should facilitate the development and revision of plans in drought-prone areas.

## CONCLUSION

The U.S. government often responds to drought through crisis management. This was the case in the mid-1970s as well as in previous episodes of widespread and severe drought. In crisis management the time to act is perceived by decision makers to be short. Reaction to crisis often results in the implementation of hastily prepared assessment and response procedures that lead to ineffective, poorly coordinated, and untimely response. If planning were initiated between periods of drought, the opportunity would exist to develop an organized response that might more effectively address issues and specific problem areas.

Also, the limited resources available to government to mitigate the effects of drought might be allocated in a more beneficial manner.

In 1979 the General Accounting Office recommended the formulation of a national drought plan to provide assistance in a more timely, consistent, and equitable way to drought-affected areas (GAO, 1979: 29). GAO proposed that this plan identify the respective roles of agencies involved in drought response to avoid overlap and duplication; the need for legislation to more closely define these roles; and the need for standby legislation to permit more timely response to drought-related problems.

This chapter has identified four requirements for effective response to drought by government. First, reliable and timely information on drought conditions and drought-related impacts must be developed and properly assembled and disseminated. This requires near-real time meteorological data on which informational products can be based. Second, impact assessment techniques must be improved. In the case of agriculture, usually the first economic sector to experience the hardships of drought, new types of analyses must be developed to provide decision makers at all levels with the types of information necessary to understand the severity of drought and its impacts so that appropriate actions can be implemented in a timely manner. Third, designation procedures must be centralized under a single agency or committee with complete authority to determine eligibility for all assistance programs. Criteria must be determined in advance of drought, well-publicized when drought occurs, and applied in a consistent manner. Finally, assistance programs must be developed in advance of drought to avoid the delays in program formulation and congressional approval that occurred in the mid-1970s. These programs should be administered by a single agency through the mechanism of an interagency committee composed of representatives from all federal agencies with responsibility in drought assessment and response. State and/or regional representatives should be included in the membership of this committee. Assistance programs must address the specific problems associated with drought.

GAO's recommendation for a national drought plan has considerable merit. For such a plan to be effective, however, states must take a more active role in planning for drought. In the past, most states have played a passive role, relying almost exclusively on the federal government to rescue residents of the drought area. Although federal government has, for lack of an alternative, accepted this role, improving

government response to drought requires a cooperative effort. States must develop their own organizational plans for collecting, analyzing, and disseminating information on drought conditions. This information should form the basis for more objective and timely assessments of impact. Today, more than twenty states have developed or are developing drought plans. Each plan is unique, reflecting the water supply characteristics and problems of the state and potential impact areas. However, state plans should be linked to a national drought plan through the interagency committee(s) with responsibility for drought designation and program administration. Because of the limited resources available to states, they can be expected to provide only a minimal level of financial assistance to drought disaster victims.

One unique aspect of the mid-1970s' drought was the effectiveness of regional organizations of states in focusing the attention of federal government on the problem. The Western Region Drought Action Task Force, the Western Governors' Policy Office, and the Western States Water Council, working in concert, were able to make a more unified representation to federal officials. This lesson should not be forgotten. Regional organizations are sure to play an even more important role in the future.

It is proposed that drought planning efforts be initiated at various levels of government and that these efforts be closely coordinated. A ten-step planning process is proposed that is adaptable to each level of government and should facilitate the development of drought plans. Regional organizations, such as the Tennessee Valley Authority, the Ohio River Basin Commission, and the Western Governors Association, must be included in this planning process. Regional organizations should consider centralizing their monitoring and assessment activities as one means of improving the efficiency and accuracy of information flow to the federal government and, by so doing, increasing their influence on drought policy.

**REFERENCES**

Abdnor, J. (1976). Letter to Secretary of Agriculture Earl Butz, August 24, Gerald R. Ford Library, Ann Arbor, Michigan.

Alley, W. M. (1984). "The Palmer Drought Severity Index: Limitations and Assumptions," Journal of Climate and Applied Meteorology 23.

Bell, R. E. (1976). Letter to President Ford, December 28, Official Secretary of Agriculture files, Records Section, Washington, D.C.

Changnon, S. A. (1980). "Removing the Confusion over Droughts and floods: The Interface between Scientists and Policy Makers," Water International 5.

Crawford, A. B. (1978). "State and Federal Responses to the 1977 Drought," in North American Droughts, ed. N. J. Rosenberg (Boulder, Colo.: Westview, AAAS Selected Symposium 15).

Federal Crop Insurance Corporation (1980). An Inside Look at All-Risk Crop Insurance (Washington, D.C.: Federal Crop Insurance Corporation).

Federal Disaster Assistance Administration (1975). FDAA Digest (Washington, D.C.: Federal Disaster Assistance Administration).

___ (1977). FDAA Bimonthly Report (March 31).

General Accounting Office (GAO)(1978). Difficulties in Coordinating Farm Assistance Programs Operated by Farmers' Home Administration and the Small Business Administration (Washington, D.C.: U.S. General Accounting Office).

___ (1979). Federal Response to the 1976-77 Drought: What Should Be Done Next? (Washington, D.C.: General Accounting Office).

Hubbard, K. G.; N. J. Rosenberg; and D. C. Nielsen (1983). "Automated Weather Data Network for Agriculture," Journal of Water Resources Planning and Management 109.

Hubbard, K. G. (1987). "Surface Weather Monitoring and the Development of Drought and Other Climate Information Delivery Systems," in Planning for Drought: Toward a Reduction of Societal Vulnerability, eds. D. A. Wilhite and W. E. Easterling (Boulder, Colo.: Westview).

Kallaur, W. (1977). "Memo for Members of the Drought Study Group" (March 11).

Karl, T. R., and R. W. Knight (1985). "Atlas of Monthly Palmer Hydrological Drought Indices for the Contiguous United States," Historical Climatology Series 3-6 (1895-1930) and 3-7 (1931-1938), National Climate Data Center, Ashville, N.C.

Kneip, R. F. (1976). Letter to President Ford, July 11, Gerald R. Ford Library, Ann Arbor, Mich.

May, F. L. (1976). Letter to Governor Kneip, August 11, Gerald R. Ford Library, Ann Arbor, Mich.

Murphy, P. G. (1935). Drought of 1934: The Federal Government's Assistance to Agriculture,

report to the President's Drought Committee, July 15, Washington, D.C.: National Agricultural Library, Beltsville, Md.

National Weather Service (1977). Memo to Recipients of Technical Procedures Bulletin No. 204: Crop Moisture Index, National Weather Service, Silver Springs, Md.

Palmer, W. C. (1968). "Keeping Track of Crop Moisture Conditions Nationwide: The New Crop Moisture Index," Weatherwise 157.

Rosenberg, N. J.; B. L. Blad; and S. B. Verma (1983). Microclimate: The Biological Environment, 2d ed. (New York: Wiley).

Smith, D. T. (1983). "A Comparison of Techniques for Estimating Potential Evapotranspiration in Nebraska," CAMaC Progress Report 83-6, Center for Agricultural Meteorology and Climatology, University of Nebraska-Lincoln.

Stockton, B. (1977). Memo to Cliff Ouse Concerning Emergency Drought Impact Designation, July 6, Washington, D.C., Official Secretary of Agriculture files, Records Section, Washington, D.C.

Thornthwaite, C. W. (1948). "An Approach Toward a Rational Classifiacation of Climate," Geographical Review 38.

U.S. Executive Office of the President (1959). "Drought, a Report," Washington, D.C.

Watson, J. (1977). Memo to John F. O'Leary, Federal Energy Administration, reply to drought information request, February 25, Official Secretary of Agriculture files, Records Section, Washington, D.C.

WESTPO (1978). Managing Resource Scarcity: Lessons from the Mid-Seventies Drought (Denver, Colo.: Western Governors' Policy Office).

Wilhite, D. A. (1983). "Government Response to Drought in the U.S. with Particular Reference to the Great Plains," Journal of Climate and Applied Meteorology 22.

___ (1986). "Drought Policy in the U.S. and Australia: A Comparative Analysis," Water Resources Bulletin 22: 425-438.

Wilhite, D. A., and W. Easterling (1987). Planning for Drought: Toward a Reduction of Societal Vulnerability (Boulder, Colo.: Westview).

Wilhite, D. A., and M. H. Glantz (1985). "Understanding the Phenomenon of Drought: The Role of Definitions," Water International 9.

Wilhite, D. A., and D. A. Wood (1985). "Planning for Drought: The Role of State Government," Water Resources Bulletin 22.

Wilhite, D. A.; N. J. Rosenberg; and M. H. Glantz (1984). "Government Response to Drought in the United States: Lessons from the Mid-1970's," Center for Agricultural Meteorology and Climatology Progress Reports, 84-1 TO 84-4, University of Nebraska-Lincoln.

Wilhite, D. A.; N. J. Rosenberg; and M. H. Glantz (1986). "Improving Federal Response to Drought," Journal of Climatology and Applied Meteorology 25.