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Drought Planning: A Process for State Government

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Drought Planning: A Process for State Government

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Abstract
Drought has been a prevalent feature of the American landscape during the latter part of the 1980s, producing serious socioeconomic and environmental consequences. These recent experiences with drought have renewed concern about the inadequacy of federal and state contingency planning efforts and the lack of coordination for assessment and response efforts between these levels of government. This paper presents the results of research aimed at facilitating the preparation of drought contingency plans by state government in conjunction with a state's overall water management planning activity. The ten-step drought plan development process reported is intended to improve mitigation efforts through more timely, effective, and efficient assessment and response activities. Officials in appropriate state agencies should examine the proposed framework and alter it to best address drought-related concerns, adding or deleting elements as necessary.

Keywords: drought, climate variability, water management, planning, state government

Introduction

Drought is a normal feature of climate. During the past century, the United States has been plagued by numerous major drought episodes and innumerable dry spells. In fact, it is unusual for drought not to occur somewhere in the nation each year. Droughts of both long and short duration produce significant impacts in the country, a fact policy officials in state and federal government have become increasingly aware of in the past ten years

or so. This awareness was heightened by the widespread occurrence of severe drought during 1988 and its serious socioeconomic and environmental consequences (Riebsame et al., 1990). For much of the nation, drought conditions continued through 1989 and into 1990. In the fall of 1990, severe to extreme drought was still affecting approximately 25 percent of the nation, principally the western, north central, and southeastern states. These recent experiences with drought have renewed concern about the inadequacy of federal and state contingency planning efforts and the lack of coordination between these levels of government.

Often, impacts of both short-term and multiyear drought have been aggravated by poorly conceived or nonexistent assessment and response efforts by governments (Wilhite and Wood, 1985; Wilhite et al., 1986). The lessons of these past efforts strongly suggest that the "risk management" or proactive approach to drought management is a more effective mitigation tool than the "crisis management" or reactive approach. Sharply focused contingency plans, prepared in advance, could greatly assist government and others in the early identification of drought, lessen personal hardship, improve the economic efficiency of resource allocation, and, ultimately, reduce drought-related impacts and the need for government-sponsored assistance programs.

In the past decade, considerable concern has been expressed within scientific and policy communities about the inability of governments to respond to drought in an effective and timely manner. This concern has resulted in "calls for action" by regional, national, and international organizations. Partially in response to these calls, a significant number of state governments in the United States have begun to develop and implement drought planning activities, at times as a part of their overall state water management planning activity. In light of a possible increase in the frequency and severity of extreme events in association with changes in climate, a recent Environmental Protection Agency report (Smith and Tirpak, 1989) has called for the development of a national drought policy to coordinate federal response to drought.

The primary purpose of this paper is to present a planning process that can facilitate the preparation of drought contingency plans by state government decision makers. This process can be followed by government decision makers to develop and implement plans to improve drought mitigation efforts through more timely, effective, and efficient assessment and response activities. The framework presents the principal steps in the planning process. In most states a portion of this framework is already in place, although it may not have been formalized under a state plan. In each case, states must examine the proposed framework and alter it to best address drought-related concerns, adding or deleting elements as necessary. Although this framework may be most instructive to states without plans, states that have a plan or those currently developing a plan can use the framework to evaluate and revise their current organizational structure and assessment and response procedures and capability.

Methods

This study was initiated in the fall of 1987 with the selection of seven states to participate in the development process. The principal criteria used in the selection process were geographic location (particularly in relation to the state's water supply and use characteristics), expressions of interest by state water officials, the status of drought planning (i.e., states with plans, states without plans, and states in the plan development process), occurrence of recent drought, and potential drought impacts and the diversity of economic sectors affected. The purpose of working with a subset of states was to garner pertinent information from their recent experiences with drought, specific assessment and response procedures, and organizational structure attributes that might expedite the drought planning process in other states. Participating states were Pennsylvania, South Carolina, Kentucky, Oklahoma, Montana, Colorado, and Oregon. The drought-related experiences of the other 43 states were also incorporated in the plan development process through direct contact with the governors' offices of those states.

In January 1988, a workshop was held for the seven state representatives participating in the project in order to discuss the purpose and objectives of the project, proposed methodology, and research timeline. Visits were made to each of these seven states during the spring and summer of 1988 to acquaint state and federal agency officials with the purpose and objectives of the project. During these visits, information was requested about the individual needs of each of these states and their concerns and recommendations regarding unique problems encountered in plan preparation and impediments to the drought planning process.

In February 1989, representatives of the seven states met to review and evaluate the first draft of the planning process. Their comments and those of their colleagues were considered for inclusion in the second draft of the document. The second draft was distributed in June 1989 to nearly 200 persons in the United States and elsewhere. The comments from this draft were incorporated in the final report (Wilhite, 1990).

Results and Discussion

Planning for Drought: Where to Begin

The primary stimulus for the development of a drought plan may vary considerably from state to state. The stimulus may be the occurrence of severe drought and concomitant impacts that significantly affect the economy of the state, region, or nation. Experience, the expectation of future droughts, and the desire to improve future response efforts are all key factors in the decision to pursue plan development. The key factors inhibiting drought planning actions at the state level in the United States are an inadequate understanding of drought and the uncertainty about the economics of preparedness.

It is important to remind decision makers and policy officials that, in most instances, drought planning efforts will use existing political and institutional structures at appropriate levels of government, thus minimizing start-up and maintenance costs. It is also quite likely that some savings may be realized as a result of improved coordination and

the elimination of some duplication of effort. Also, drought plans should be incorporated into general natural disaster and/or water management plans wherever possible.

The Planning Process

In the discussion that follows, the development of a drought plan by state government is presented as a process involving ten steps (fig. 1). This process is intended to be flexible so that it can be easily adapted to various geographic regions with widely disparate water supply characteristics and water management problems. The first four steps actually involve mustering the necessary resources to initiate development of the plan and gaining public support for the process. Steps 5 through 8 are concerned with the development and implementation of the plan. Steps 9 (development of public education programs) and 10 (development of drought plan evaluation procedures), while not part of the plan development process, are a significant component of the overall planning process and are critical to the overall success of the activity.

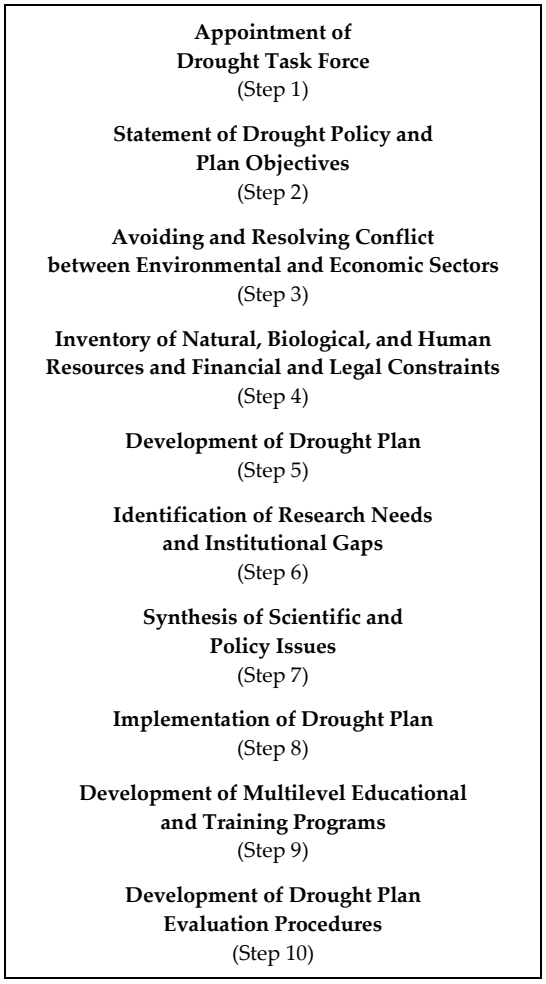

Figure 1. The Ten-Step Drought Planning Process

Step 1: Appointment of Drought Task Force

The process is initiated through the appointment of a drought task force (DTF). The DTF has two purposes. First, during plan development, the DTF will supervise and coordinate the development of the plan. Second, after the plan is implemented and during times of drought when the plan is activated, the DTF will assume the role of policy coordinator—reviewing and recommending alternative policy response options to the governor.

The DTF should include representatives from the most relevant mission agencies within government and from universities. The makeup of the DTF should recognize the multidisciplinary nature of drought and its impacts and include representatives of both state and federal government. Environmental and public interest groups can be included on the DTF or can serve as an advisory body (see Step 3), as appropriate. The DTF should include a representative of the governor's office. It may also be desirable to include a representative of the media in an advisory capacity so that the proper mechanisms are incorporated into the plan to ensure public awareness of drought severity and the actions implemented by government. The actual makeup of this task force would be highly variable between states, reflecting the variety of economic sectors affected and each state's political infrastructure.

Step 2: Development of Drought Policy and the Plan's Purpose and Objectives

As their first official action, the Drought Task Force will develop a drought policy that specifies the general purpose for the drought plan. State officials should consider many questions as they define the purpose of the plan, including the purpose and role of state government in drought mitigation efforts, the scope of the plan, the most drought-prone areas of the state, the most vulnerable sectors of the state's economy, the role of the plan in resolving conflict between water users during periods of shortage, the resources (human and economic) that the state is willing to commit to the planning process, the legal and social implications of the plan, and the principal environmental concerns caused by drought. Answers to these and other questions should help to determine the objectives of drought policy and sharply focus the drought planning process. A generic statement of purpose for a plan is "to provide government with an effective and systematic means of assessing and responding to drought conditions." It is imperative that the plan contain both an assessment (monitoring and estimations of impact) and a response component, with well-defined linkages.

The DTF should then identify the specific objectives of the plan. Drought plan objectives will, of course, vary between states and should reflect the unique physical, environmental, socioeconomic, and political characteristics of each state. At the state level, these objectives will place less emphasis on financial assistance measures (traditionally a role of the federal government) than would the objectives of a national plan. Technical assistance is a common element of state agency missions. Support for educational and research programs is typically a shared responsibility of state and federal government. Objectives that states should consider include the following:

1. To provide timely and systematic data collection, analysis, and dissemination of drought-related information.
2. To establish proper criteria to identify and designate drought-affected areas of the state and to trigger the initiation and termination of various assessment and response activities by governmental agencies during drought emergencies.
3. To provide an organizational structure that assures information flow between and within levels of government and defines the duties and responsibilities of all agencies with respect to drought. To ensure adequate coordination between the federal and state governments, this structure should be integrated with national drought policies (if they exist).
4. To maintain a current inventory of state and federal programs used in assessing and responding to drought emergencies and provide a set of appropriate action recommendations.
5. To provide a mechanism to improve the timely and accurate assessment of drought impact on agriculture, industry, municipalities, wildlife, health, and other areas as appropriate.
6. To provide accurate and timely information to the media and others in order to keep the public informed of current conditions and response actions.
7. To establish and pursue a strategy to remove obstacles to the equitable allocation of water during shortages and to provide incentives to encourage water conservation.
8. To establish a set of procedures to evaluate and revise the plan on a continuous basis in order to keep the plan responsive to the needs of the state.

Step 3: Avoiding and Resolving Conflict between Environmental and Economic Sectors

The drought of 1988 was a stark reminder of our continuing vulnerability to periods of water shortage. Drought may shrivel crops, dewater rivers, drain reservoirs, desiccate wetlands, and contribute to the incidence of forest fires. Consequently, political, social, and economic values often clash as competition for scarce water resources intensifies. These conditions can cause conflicts for which compromise is often difficult. To reduce the risk of conflict between water users during periods of shortage, it is essential for the public to receive a balanced interpretation of changing conditions through the media. The DTF should ensure that frequent, thorough, and accurate news releases are issued to explain changing conditions and complex problem areas.

To lessen conflict and develop satisfactory solutions, it is essential that the views of citizens and public and environmental interest groups be considered in the drought planning process at an early stage. Although the level of involvement of these groups will no doubt vary notably from state to state, the power of public interest groups in policy making is considerable. In fact, these groups may impede progress in the development of plans if they are not included in the process. If it is determined that the public should be involved in drought planning, that involvement should commence early in the planning process. A drought advisory council (DAC) should be established by the DTF to provide the input

necessary to facilitate this involvement. The DAC should be a permanent feature of the drought plan, assisting the DTF in the flow of information and the resolution of conflicts between water users during severe drought periods.

States should consider whether local DACs should also be established. Local DACs could be developed to bring neighbors together to discuss their water use problems and seek cooperative solutions. At the state level, a representative of each local DAC should be included in the membership of the state DAC to represent the interests and values of their constituencies. The state DAC can then make recommendations and express concerns to the DTF as well as respond to requests for situation reports and updates.

Step 4: Inventory of Natural, Biological, and Human Resources and Financial and Legal Constraints
An inventory of natural, biological, and human resources, including the identification of financial and legal constraints, may need to be initiated by the DTF. In most cases much information is already available to states with regard to resources available, particularly in the natural and biological resource areas. It is also important to determine the vulnerability of these resources to periods of water shortages that result from drought. (*Resources* include natural resources, human expertise, infrastructure, and capital available to government.) The most obvious *natural resource* of importance is water: where is it located, how accessible is it, of what quality is it? *Biological resources* refers to the quantity and quality of grasslands/rangelands, forests, wildlife, and so forth. *Human resources* include the labor needed to develop water sources, lay pipeline, haul water, haul hay, process citizen complaints, provide technical assistance, and direct citizens to available services. In addition, representatives of government determine what local, state, or federal agencies may be called into action. *Financial constraints* would include the costs of hauling water or hay, new program or data collection costs, and so forth. These costs must be weighed against the losses that may result in the absence of the drought plan. It should also be recognized that the financial resources available to government vary annually and from one administration to another. This may provide an additional incentive for states to formalize drought plans through a state statute (see Step 1), thus assuring that funds to carry out existing programs are available. *Legal constraints* include user water rights, methods available to control usage, the kinds of public trust laws in existence, requirements for contingency plans for water suppliers, and the emergency and other powers of the governor or state agencies during water shortages. In the western states, for example, the Appropriation Doctrine serves as an institutional mechanism for the allocation of scarce water during periods of shortage.

The inventory would reveal the assets and liabilities that might enhance or inhibit fulfillment of the objectives of the planning process. This systematic survey should include both state and federal resources and the resources available at universities. A comprehensive assessment of available resources would provide the information necessary for further action by the task force.

Step 5: Development of Drought Plan
A drought plan should have three primary organizational tasks: monitoring, assessment of impact, and response. These tasks will be conducted by three distinct committees, but

formal linkages will need to be incorporated in the plan for it to function properly and be responsive to state needs and changing conditions. The linkages and suggested components of the drought plan are shown in figure 2. The three organizational components are discussed below.

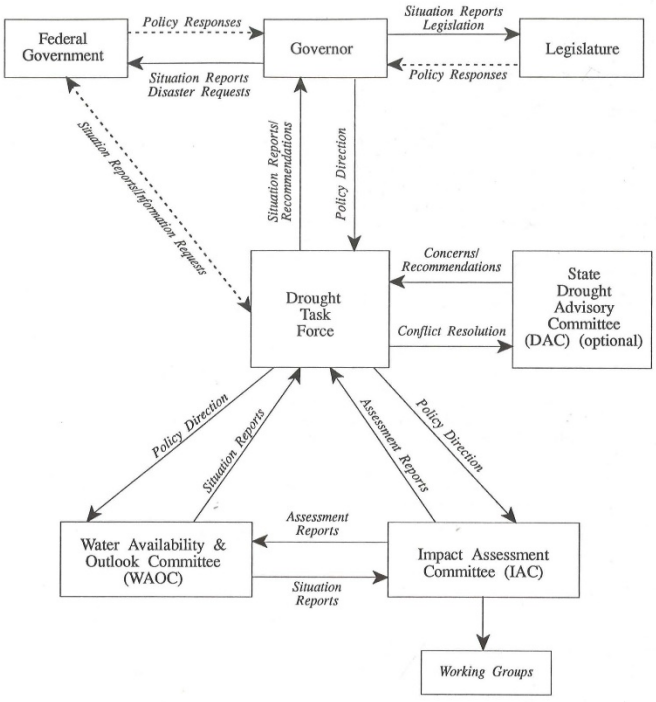

Figure 2. Linkages and Suggested Organizational Components of the Drought Plan

Monitoring: The Water Availability and Outlook Committee (WAOC). A water availability and outlook committee (WAOC) must be established to monitor current and estimate likely future water availability and moisture conditions (i.e., precipitation, soil moisture, snow pack, surface water storage, ground water, and streamflow). The chairperson of this committee should be a permanent member of the DTF. The WAOC would have six primary objectives: (1) adopt a workable definition of drought that could be used to phase in and phase out levels of state and federal actions in response to drought; (2) identify drought management areas; (3) develop a drought monitoring system; (4) inventory data quantity and quality from current observational networks; (5) determine the data needs of primary users; and (6) develop and/or modify current data and information delivery systems. For a description of the activities included in these objectives, see Wilhite (1990).

Membership of the committee should include representatives from agencies with responsibilities for forecasting and monitoring the principal meteorological, hydrological, and agricultural indicators (e.g., precipitation, temperature, evapotranspiration, long-range weather forecasts, climatological probabilities, soil moisture, streamflow, ground

water, reservoir and lake levels, and snowpack). It is recommended that data and information on each of the applicable indicators be considered in the committee's evaluation of the water situation and outlook for the state. The agencies responsible for collecting, analyzing, and disseminating data and information on each of these variables will vary according to the state organizational structure and by geographic region.

It is recommended that WAOC meet on a monthly basis, beginning in advance of the peak demand season. An accurate assessment of water availability and its outlook for the near- and long-term is valuable information in both dry and wet periods. During drought periods the value of this information increases markedly. Following each meeting, reports should be prepared and disseminated to the DTF, relevant state and federal agencies, and the media. If conditions warrant, the DTF would brief the governor about the contents of the report, including any recommendations for specific actions that would require his/her decision. It is essential for the public in general to receive a balanced interpretation of changing conditions as expressed by the media. Leadership should ensure that frequent, thorough, and accurate news releases are issued to explain changing conditions and complex problem areas.

Impact: Impact Assessment Committee (IAC). During periods of drought, impacts will be far-reaching and cut across economic sectors and the responsibilities of state (and federal) agencies. The impact assessment committee (IAC) will represent those economic sectors most likely to be affected by drought. The IAC chairperson should be a permanent member of the DTF. The IAC should be composed of an interagency (state and federal) team of agency heads or their representatives. It may also be important to include university representatives with expertise in early estimations of impact in order to advise agency officials of policy alternatives. The IAC should consider both direct and indirect losses resulting from drought since its effects ripple through the economy. Because of the obvious dependency of the IAC on the WAOC, frequent communication is essential.

Two approaches are proposed to assess the magnitude and diversity of the impacts that are likely to result from drought. The first model is simpler and will be appropriate in some states. In this instance, the IAC is responsible for determining impacts, drawing information from all available reliable sources. This approach will likely be successful in those states where impacts are concentrated in relatively few economic sectors (i.e., predominantly agricultural states). The disadvantage of this approach is that unless an adequate reporting structure is installed to ensure that all impacts are identified and evaluated correctly, less obvious effects may go undetected. Unfortunately, the assessment (and quantification) of drought impacts is often so complicated, and some impacts may be so subtle, that detection is most difficult without a team of experts from each impact sector working in concert.

The second approach draws largely on the experiences of Colorado in the structure of their drought plan. This approach establishes a series of impact working groups responsible for anticipating and identifying drought-related impacts in each economic sector. Members of the IAC may not have the expertise to identify and quantify impacts in some cases; to remedy this situation, working groups composed of specialists in each impact sector could be created. In most cases, each member of the IAC would chair one of the

working groups. The leader of each working group, as a member of the IAC, would report directly to the IAC. With this model, the responsibility of the IAC is to coordinate the activities of each of the working groups and make recommendations to the DTF.

The number of impact areas or working groups will vary considerably between states. Colorado has identified eight impact working groups: municipal water, wildfire protection, agricultural industry, commerce and tourism, wildlife, economic, energy loss, and health. Idaho's drought plan outlines the responsibilities of five subcommittees: water data, public information, agriculture, municipal supplies and water quality, and recreation and tourism.

Response: Drought Response Committee (DRC) or Drought Task Force (DTF). A Drought Response Committee (DRC), comprising senior-level officials, will act on the information and recommendations of the IAC and evaluate the state and federal programs available to assist agricultural producers, municipalities, and others during times of emergency. The makeup of the response committee is envisioned to be roughly the same as the DTF. Therefore, for maximum efficiency, the DTF could assume this function once the plan has been implemented, formulating policy responses based on the assessments of the IAC.

During the plan development process, the response committee should inventory all forms of assistance available from local, state, and federal government during severe drought and evaluate these programs for their ability to address short-term emergency situations and long-term mitigation programs to reduce vulnerability to drought. Assistance should be defined in a very broad way to include all forms of technical and relief programs available. Rational response options must be determined for each of the principal impact sectors identified by the IAC. Program inventories have been done in association with many existing plans (for example, the Colorado Drought Response Plan), in anticipation of the development of a plan (Oklahoma), and by regional organizations, such as the Western Governors Policy Office (1977) in response to the 1976–77 drought. Because available assistance programs are ever changing, it is essential that this inventory be updated annually. The DRC or DTF should also be aware of the proper protocol for requesting federal assistance. During periods of severe drought, the committee will make recommendations to the governor about specific actions that need to be taken.

Step 6: Identification of Research Needs and Institutional Gaps

The purpose of this step is to identify research needed in support of the objectives of the drought plan and to recommend research projects and other actions necessary to remove deficiencies that may exist. Research needs and institutional gaps will become apparent to the WAOC, IAC, and DRC/DTF as they address the various issues discussed in Step 5. The DTF should be responsible for compiling information on research needs and institutional gaps and recommend appropriate items to the governor or legislative committees for support. For example, the WAOC may recommend establishing or enhancing an existing groundwater monitoring program. Another recommendation may be to initiate research on the development of a water supply index to help monitor the status of water conditions. The DTF may find it desirable to create a multidisciplinary scientific advisory panel that includes some members of the WAOC and IAC to study these proposals further before

making recommendations to the appropriate state agency or legislative committee, or the governor.

Institutional deficiencies should be identified as part of Step 6. Agency responsibilities or missions may need to be modified to support activities of the drought plan. These modifications may require legislative action.

Step 7: Synthesis of Scientific and Policy Issues

Previous steps in the planning process have considered scientific and policy issues separately, concentrating largely on assessing the status of the science or on the existing or necessary institutional arrangements to support the plan. An essential aspect of the planning process is the synthesis of the science and the policy of drought and drought management. This is the purpose of Step 7.

The policy maker's understanding of the scientific issues and technical constraints involved in addressing problems associated with drought is often negligible. Likewise, scientists generally have a poor understanding of existing policy constraints for responding to the impacts of drought. A panel of researchers and policy experts recently concluded that communication and understanding between the science and policy communities is poorly developed and must be enhanced if the planning process is to be successful (Wilhite and Easterling, 1987). Direct and extensive contact is required between the two groups in order to distinguish what is feasible from what is desirable for a broad range of science and policy issues. Integration of science and policy during the planning process will also be useful in setting research priorities and synthesizing current understanding. The DTF should consider various alternatives to bring these groups together.

Step 8: Implementation of Drought Plan

The drought plan should be implemented by the DTF to give maximum visibility to the program and credit to the agencies and organizations that have a leadership or supporting role in its operation. All or a portion of the system should be tested under simulated drought conditions before it is implemented. It is also suggested that announcement and implementation occur just before the most drought-sensitive season to take advantage of inherent public interest. In an agricultural setting, this would be in advance of planting or at some other critical time during the growing season. Where municipal water supplies are the primary concern, in advance of the peak water use season would be the most appropriate time for an announcement. The cooperation of the media is essential to publicizing the plan, and they must be informed fully of the rationale for the plan as well as its purpose, objectives, assessment and response procedures, and organizational framework. If a representative of the media is included on the DTF, this person should be an invaluable resource in carrying out this step of the planning process.

The implementation of the drought plan does not represent the end of the planning process. The process is not complete until two longer-term issues are adequately addressed by the DTF: (1) the development of educational and training programs in drought/water conservation and (2) the development of acceptable procedures to periodically evaluate and revise the drought plan.

Step 9: Development of Multilevel Educational and Training Programs

Educational and training programs should concentrate on several audiences. First, a greater level of understanding must be established to heighten public awareness of drought and water conservation and the ways in which individual citizens, industry, and government can help to mitigate impacts in the short run. This educational process might begin with the development of a media awareness program. It would include provisions to improve the media's understanding of the drought problem and the complexity of the management issues involved as well as a mechanism to ensure the timely and reliable flow of information to all members of the media (via news conferences, toll-free numbers, and so forth). Second, the DTF should initiate an information program aimed at educating the general population about drought and drought management and what they can do as individuals to conserve water in the short run. Educational programs must be long-term in design, concentrating on achieving a better understanding of water conservation issues for all age groups and economic sectors. If such programs are not developed, governmental and·public interest in and support for water conservation during periods of drought will wane during periods of nondrought conditions.

Step 10: Development of Drought Plan Evaluation Procedures

The final step in the planning process is the creation of a detailed set of procedures to ensure adequate system evaluation. Periodic evaluation and updating of the drought plan is intended to keep the plan most responsive to state needs. To maximize the effectiveness of the system, two modes of evaluation must be in place:

1. An ongoing or operational evaluation program that considers how societal changes such as new technology, the availability of new research results, legislative action, and changes in political leadership may affect the operation of the system.
2. A post-drought evaluation program that documents and critically analyzes the assessment and response actions of government, nongovernmental organizations, and others as appropriate and implements recommendations for improving the system.

The first mode of evaluation is intended to express drought planning as a dynamic process, rather than a discrete event. The operational evaluation program is proposed to keep the drought assessment and response system current and responsive to the needs of society. Following the initial establishment of the plan, it should be monitored routinely to ensure that societal changes that may affect water supply and/or demand or regulatory practices are considered for incorporation. Drought plans developed in Colorado, New York, and South Dakota, for example, have been revised on several occasions since their inception.

A post-drought evaluation should be conducted or commissioned by state government in response to each major drought episode. Institutional memory fades quickly following drought as a result of changes in political administration, natural attrition of persons in primary leadership positions, and the destruction of critical documentation of events and actions taken. Post-drought evaluation should include an analysis of the physical aspects

of the drought: its impacts on soil, groundwater, plants, and animals; its economic and social consequences; and the extent to which predrought planning was useful in mitigating impacts, in facilitating relief or assistance to stricken areas, and in post-drought recovery. Attention must also be directed to situations in which drought-coping mechanisms worked and where societies exhibited resilience; evaluations should not focus only on those situations in which coping mechanisms failed. Provisions must be made to implement the recommendations emanating from this evaluation process. Evaluations of previous responses to severe drought are recommended as a planning aid to determine those actions (both technical and relief) that have been most effective. To ensure an unbiased appraisal, governments should place the responsibility for evaluating drought and societal response to it in the hands of nongovernmental organizations such as universities and/or specialized agencies or corporations.

Summary

A ten-step planning process was proposed to facilitate the preparation of drought contingency plans by state government in the United States. This process should also be helpful to states that already have plans, particularly in the revision of assessment and response procedures. The first step in the planning process is the appointment of a Drought Task Force (DTF) to supervise and coordinate the development of the plan. Although the makeup of the DTF would vary considerably from state to state, it should include representatives from the most relevant state and federal mission agencies and universities. The leadership of the DTF is critical since this group oversees all aspects ofplan development.

The DTF, as their first official action, will proceed to formulate the state's drought policy and the purpose and objectives of the plan (Step 2). In many states the task force will also need to include a formal mechanism to avoid or resolve conflict between water users during periods of shortage (Step 3). In order to ensure that the views of citizens and public and environmental interest groups are considered in the planning process, it may be helpful to form drought advisory committees at the state and local level to incorporate their concerns and ensure their participation in and support for the process. The DTF will also need to undertake an inventory of natural, biological, and human resources available to the state and determine financial and legal constraints that may exist with regard to plan formulation and implementation (Step 4).

The actual development of the plan begins with Step 5. A drought plan possesses three essential elements: monitoring, impact assessment, and response. These elements are the basis for three committees: (1) Water Availability and Outlook Committee, (2) Impact Assessment Committee, and (3) Drought Response Committee or Drought Task Force. The organizational and operational responsibilities of these committees were specified in considerable detail. For example, the Water Availability and Outlook Committee's activities would include defining drought and developing triggers, identifying drought management areas, developing a monitoring system for drought, completing an inventory of observation networks, determining primary users and their needs, and developing data and information delivery systems.

During plan development, the DTF should identify research needs and institutional gaps to strengthen the plan (Step 6). The DTF must also synthesize scientific and policy issues (Step 7) to determine what is feasible, given the broad range of options and resources available. The culmination of the planning process is the implementation of the drought plan (Step 8) by the DTF. At this point an organizational structure is in place to address the issues critical to the management of water during periods of shortage. The implementation of the plan should coincide with the peak demand or most drought-sensitive season to take advantage of inherent public interest.

Although Steps 9 and 10 are not a part of the plan development process, both are a significant component of the overall planning process and are critical to the success of the process. Step 9, the development of multilevel educational and training programs, is a long-term effort and will be an ongoing process after the implementation of the plan. Educational programs for children and adults should focus on the broad issues associated with water conservation issues during drought and nondrought periods. A media awareness program is an important part of this educational process.

The development of drought plan evaluation procedures (Step 10) is the critical final step in the planning process. A drought plan is not a static document, but one that must evolve continuously to meet the needs of a changing society. Two modes of evaluation were recommended. First, an ongoing or operational evaluation program was recommended that considers how new technology, legislation, changes in political leadership, and so forth may affect the operation of the plan and the need to revise operating procedures. The second recommendation calls for a post-drought evaluation program that documents and critically analyzes the assessment and response actions of government and recommends actions for improving the plan. This post-drought evaluation program attempts to build on the successes of the past while eliminating the failures. The post-drought evaluation process should be initiated soon after the drought has ended to take advantage of and preserve institutional memory.

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