



## The Basics of Drought Planning

The core of a successful drought plan is bringing together three groups of people — it is also one of drought planning's biggest challenges to get these groups to communicate effectively with one another. The three groups that need to be involved are:

- Climatologists and others, who monitor how much water is available now and in the foreseeable future. (Monitoring Committee)
- Natural resource managers and others who determine how lack of water is affecting various interests, such as agriculture, recreation, municipal supplies, etc. (Impact Assessment Committee)
- High-level decision makers, often elected and appointed officials, who have the authority to act on information they receive about water availability and drought's effects. (Drought Task Force)

Getting these three groups to function together is one step in a generalized 10-step plan originally published by Dr. Donald A. Wilhite in 1990 as the result of a three-year research project funded by the National Science Foundation. The plan can be tailored to the needs of an individual region, state or country. Its steps are:

1. Appoint a drought task force
2. Define the purpose and objectives of the drought plan
3. Anticipate and resolve conflicts between different water users
4. Identify natural, human and biological resources, as well as financial and legal constraints
5. Develop a drought plan that includes monitoring, impact assessment and decision making
6. Identify research and institutional needs
7. Integrate science and policy perspectives
8. Announce and test drought plan
9. Teach the general public and the media about drought and water supply

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10. Keep the drought plan up to date, and evaluate it after droughts

Each of these steps are detailed in the following sections.

## Step 1: Appoint a Drought Task Force

A Drought Management Plan is initiated through the appointment of a drought task force (DTF). The task force has two purposes. First, during plan development, the task force 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 task force will assume the role of policy coordinator -- reviewing and recommending alternative policy response options to the governor.

The task force should include representatives from the most relevant mission agencies within government and from universities. The makeup of the task force 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 task force or can serve on an advisory council (see Step 3), as appropriate. The task force 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: Develop Drought Policy and the Plan's Purpose and Objectives

As its first official action, the drought task force should 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 task force 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. Collect, analyze and disseminate drought-related information systematically and quickly.
2. Establish criteria for declaring drought and for when government agencies should begin various assessment and response activities during droughts.
3. 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. This structure should be integrated with national drought policies (if they exist) to ensure adequate coordination between the federal and state governments.
4. 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. Provide a mechanism to ensure timely and accurate assessment of drought's impacts on agriculture, industry, municipalities, wildlife, health, and other areas.
6. Keep the public informed of current conditions and response actions by providing accurate and timely information to media and others.
7. 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. Establish a set of procedures to continually evaluate and revise the plan so it will stay responsive to the needs of the state.

### Step 3: Anticipate and Resolve Conflict Between Water Users

Political, social, and economic values often clash as competition for scarce water resources intensifies.

#### Keep People Informed

To reduce the risk of conflict between water users during drought, it is essential for the public to receive a balanced interpretation of changing conditions through the media. The Drought Task Force (DTF) should ensure that frequent, thorough, and accurate news releases are issued to explain changing conditions and complex problems.

#### Elicit Public Participation and Resolve Conflict

To lessen conflict and develop satisfactory solutions, it is essential that the views of citizens and public and environmental interest groups be considered early in the drought planning process. 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 are likely to impede progress in the development of plans if they are not included in the process.

A citizens' advisory council should be established to facilitate public participation. The advisory group should be a permanent feature of the drought plan, helping the task force keep information flowing and to resolve conflicts between water users.

States should consider whether local advisory councils should also be established. Local groups 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 group should be included in the membership of the state's citizens' advisory council to represent the interests and values of their constituencies. The state council can then make

recommendations and express concerns to the task force as well as respond to requests for situation reports and updates.

## Step 4: Inventory Resources and Constraints

The drought task force should inventory resources and constraints that might enhance or inhibit fulfillment of the objectives of the planning process. Resources include natural resources, human expertise, infrastructure, and capital available to government. This systematic survey should include local, state and federal resources as well as the resources available at universities.

### Natural and Biological Resources

In most cases information on resources is already available to states, 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. 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.

### People's Time and Expertise

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. The task force should consider the capabilities of various local, state, or federal agencies.

### Financial Constraints

Financial constraints 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

Legal constraints include 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.

## Step 5: Organize Monitoring, Impact Assessment and Response

A drought plan should have three primary organizational tasks: monitoring, impact assessment, and response. Each task may need to be assigned to a separate group, but the groups need to work together well, with clearly established communication channels.

### Monitoring

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 the value of this information increases markedly.

The monitoring committee should include representatives from agencies with responsibilities for forecasting and monitoring the principal meteorological, hydrological, and agricultural indicators (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. The monitoring committee should meet regularly, beginning in advance of the peak demand season.

Following each meeting, reports should be prepared and disseminated to the state's drought task force, relevant state and federal agencies, and the media. It may be a good idea for the

chairperson of the monitoring committee to be a permanent member of the drought task force. If conditions warrant, the task force would brief the governor about the contents of the report, including any recommendations for specific actions that would require his or her decision.

It is essential for the public to receive a balanced interpretation of changing conditions through the media. The committee should ensure that frequent, thorough, and accurate news releases are issued to explain changing conditions and complex problems.

The monitoring committee has 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. Many states rely on one or more drought. In considering emergency measures such as rationing, it is important to remember that the impacts of drought may vary significantly from one area to the next, depending on the sources and uses of water. Imposing emergency measures on people who do not perceive a serious problem may be difficult.

A related consideration is that some municipal water systems may be out of date or in bad condition, so that even moderate drought strains a community's ability to supply customers with water. Identifying and upgrading inadequate water supply systems may be part of a long-term drought mitigation program.

2. Establish drought management areas — in other words, subdivide the state into more conveniently sized districts, by political boundaries, by shared hydrological characteristics, by the climatological divisions of the National Weather Service, or by other means such as floating boundaries that reflect areas of drought impact.

3. Develop a drought monitoring system. Most states already have a good data collection system for monitoring water availability and identifying potential shortfalls. But responsibility for collecting, analyzing and disseminating the data is divided between many state and federal agencies. The monitoring committee's challenge is to coordinate and integrate analysis so that decision-makers and the public are aware of drought as soon as it begins.

4. Inventory data quantity and quality from current observational networks. The monitoring committee needs to be sure all necessary data is being collected. Meteorological data is an important part of the system, but other physical indicators must be monitored, too, to reflect impacts of drought on agriculture, households, industry and other water users. Helpful technology includes:

A. Automated weather data networks, where equipment stationed strategically throughout the state automatically reports readings to a central computing system for analysis.

B. Advanced Very High Resolution Radiometer (AVHRR) digital data transmitted from a National Oceanic and Atmospheric Administration satellite is useful in detecting early changes in vegetation due to lack of water.

5. Determine the data needs of primary users. Developing new systems for collecting and analyzing data works best when the people who will be using the data are consulted early and often.

6. Develop and/or modify current data and information delivery systems. People need to be warned of drought as soon as it is detected, but often aren't. Information needs to reach people in time for them to use it in making decisions. In establishing information channels, the monitoring committee needs to consider when people need what kinds of information.

## Impact Assessment

During drought, impacts cut across economic sectors and normal divisions of responsibilities of state (and federal) agencies. An impact assessment committee should represent those economic sectors most likely to be affected by drought. The committee's chairperson should be a permanent member of the drought task force. The impact committee 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 to advise agency officials of policy alternatives. The impact committee should consider both direct and indirect losses resulting

from drought, since its effects ripple through the economy. Because of the obvious dependency of the impact committee on the monitoring committee, 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, such as 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 impact committee 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 committee would chair one of the working groups. The leader of each working group, as a member of the committee, would report directly to it. With this model, the responsibility of the impact committee is to coordinate the activities of each of the working groups and make recommendations to the drought task force.

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.

## Drought Task Force

The drought task force or a similar group of senior-level officials acts on the information and recommendations of the impact assessment committee, and evaluates the state and federal programs available to assist agricultural producers, municipalities, and others during times of emergency.

During the plan development process, the task force 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 task force 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: Identify Research Needs and Institutional Gaps

As research needs and institutional gaps become apparent during drought planning, the drought task force should compile those deficiencies and make recommendations on how to remedy them to the governor, to relevant state agencies or to the legislature.

For example, the monitoring committee 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 task force may find it desirable to create a

multidisciplinary scientific advisory panel that includes some members of the monitoring committee and the impact assessment committee to study these proposals further before making recommendations to the appropriate state agency or legislative committee, or the governor. Agency responsibilities or missions may need to be modified to support activities of the drought plan. These modifications may require legislative action.

## Step 7: Synthesize Science 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.

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. Communication and understanding between the science and policy communities is poorly developed and must be enhanced if the planning process is to be successful. 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 drought task force should consider various alternatives to bring these groups together.

## Step 8: Publicize and Implement the Drought Plan

The drought plan should be unveiled and presented to the public in a way that gives maximum visibility to the program and credit to the agencies and organizations that have a leadership or supporting role in its operation. For purposes of gaining publicity and attention, it may be a good idea to announce and implement the plan just before the most drought-sensitive season. 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 best time for an announcement. All or a portion of the system should be tested under simulated drought conditions before it is implemented.

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 drought task force this person should be an invaluable resource in carrying out this step of the planning process.

## Step 9: Teach People About Drought

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 drought task force 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 when there is no drought.

## Step 10: Evaluate the Drought Plan

The final step in the planning process is to create a detailed set of procedures to ensure adequate system evaluation. Periodic evaluation and updating of the drought plan is essential to keep the

plan responsive to state needs. To maximize the effectiveness of the system, two modes of evaluation must be in place:

### Ongoing Evaluation

An ongoing or operational evaluation keeps track of how societal changes such as new technology, new research, new laws, and changes in political leadership may affect the drought plan. Drought planning is a process, not an event.

### Post-Drought Evaluation

A post-drought evaluation documents and analyzes the assessment and response actions of government, nongovernmental organizations, and others, and implements recommendations for improving the system. Without post-drought evaluations, it is difficult to learn from past successes and mistakes, as institutional memory fades quickly.

Post-drought evaluation should include an analysis of the physical aspects of the drought: its impacts on soil, ground water, plants, and animals; its economic and social consequences; and the extent to which pre-drought 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. Evaluations of previous responses to severe drought are also a good planning aid.

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.

### Postscript: How the 10-Step Process Came to Be

The 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 time line. 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.