



Pima County Drought Management Plan

June 2006

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Introduction

“Brief Break in Drought Forecast, Wet Weekend Will Do Little to Ease Problem,” reads the March 17, 2006, headline in the Arizona Daily Star. “The iron grip of ‘extreme drought’ is expected to continue through the spring, after the driest combined fall-winter season on record has left Southern Arizona almost 5 inches of rain behind normal since October 1,” reports Eric Swedlund. According to the National Weather Service, despite the recent rain, no changes to drought status were made across southeast Arizona, which remain under extreme drought conditions.

This report details impelling reasons to develop, implement, and enforce a drought management plan. An explanation of drought is presented including a definition, the risks and what can be done to reduce the devastating impacts.

A step by step approach is provided to assure a comprehensive and inclusive Drought Response Plan. Finally, an ordinance titled Drought Response Plan and Water Wasting is offered for discussion. (See Appendix A)

What is Drought?

Drought is a normal weather condition, which occurs in every climate zone. It starts with a shortage of rain over an extended period of time. The severity of the drought depends upon how dry it gets, how long there is no significant rain, and the size of the affected area. It can be described as dry weather that lasts long enough to cause serious problems such as crop damage or no crop yields, water supply shortages, loss of livestock and wildlife, or early onset of wildfire season resulting in loss of income and increased costs.

Sequence of Drought Impacts

In the desert southwest, the general definition of a drought as a period of unusual dryness does not really apply because long periods of dryness are common. With the reliance of groundwater in this area, the impact may not be felt early on. While a return of rain can quickly replenish the soil, groundwater will typically be slower to reach usual levels, and therefore be the last to recover at the end of a drought.

Under drought circumstances, vegetation in grassland and rangeland areas will decrease while shrubs increase. These conditions can result in significant fuel sources for wildland fires as described later in this document in the Pima County Office of Emergency Management and Homeland Security’s Wildfire Management Plan.

Mitigating Drought

In the last 20 years, significant progress has been made in proactive drought management, much of it at the state level. During the widespread drought of 1976-1977, only one of the states had a formal drought plan. Since 1996, there has been a rapid increase in drought planning in the southwest, south central, and southeast. The National Drought Policy Commission’s report, “Preparing for Drought in the 21st Century”, emphasizes the need for drought planning at the state, local, federal, and tribal levels of government.

Drought Mitigation Tools

Because the impacts of drought are complex, preparation and prior action is required to reduce its long term risk. The first steps involve writing a drought policy with clearly stated objectives, and developing a response plan that presents a strategy to achieve these objectives.

The goals of these plans are to reduce water shortage impacts, personal hardships, and conflicts between water and other natural resource users. Ultimately, response plans will improve: coordination within and between levels of government; procedures for monitoring, assessing, and responding to water shortages; information flow to consumers; and efficient resource allocation.

A 10-step process for developing drought response plans, created by Dr. Donald Wilhite, has been used by many governments. The process identifies vulnerable areas, population groups, and economic and environmental sectors; as well as data and informational gaps. This process will be used to guide the preparation of the drought plan for Pima County.

Monitoring Drought

Tracking the various drought indicators provides a crucial means of monitoring drought. The National Oceanic and Atmospheric Administration’s Drought Monitor provides a visual representation of drought conditions across the United States.



anic and Atmospheric Administration (NOAA), the Climate Prediction Center, the United States Department of Agriculture, and the National Drought Mitigation Center serve as the most comprehensive clearinghouses of drought monitoring and climate prediction in the United States.

NOAA provides quick access to U.S. and global weather data. Available data types include monthly, daily, and hourly U.S. or global surface data, and 15 minute and hourly U.S. precipitation data.

On each Thursday, the Climate Prediction Center, together with the United States Department of Agriculture, the National Drought Mitigation Center, and NOAA's National Climatic Data Center, issues a weekly drought assessment called the United States Drought Monitor. The Monitor provides national drought conditions. The Climate Prediction Center issues the Seasonal United States Drought Outlook each month in conjunction with the Thursday release of the temperature and precipitation outlooks.

There are several local agencies that provide drought monitoring data. CLIMAS (Climate Assessment for the Southwest), assesses changes in climate and the impacts it has on human and natural systems in the Southwest. The National Weather Service's Tucson Forecast Office, the U.S. Geological Survey and the University of Arizona's School of Natural Resources also provide crucial, time-sensitive information regarding drought conditions in Pima County and surrounding areas.



Challenges and Perceptions

During a drought, there is great interest in solving the problems it creates. However, when the event has passed, the tendency is to move on to other priorities. Drought issues capture neither public interest nor media attention during periods of abundant water.

The federal government has, in general, limited its programs to providing direct relief to drought victims. This involves providing water-resources information, technical assistance and financial relief for the costs incurred by the drought. Local government's traditional approach is to reduce the daily demand for water.

Drought planning appears to be given a low priority because of the unpredictability of drought, the limited resources for planning, the limited jurisdictions, and the federal government programs that provide disaster relief in times of crisis. Actions of decision makers are affected when the public does not support the aggressive steps needed to plan for droughts and manage water resources during droughts. The public tends to

believe that little can be done to reduce the impacts of drought before they occur and that the costs are affordable.

Current Drought Status

National

According to the National Drought Mitigation Center, as of February 28, 2006, eighteen states have areas with drought conditions. These range in intensity from moderate (drought conditions with high fire risk and potential water shortages) to exceptional (the most serious drought conditions with extreme fire risks and water shortages potentially creating water emergencies).

Of these, ten states (Arizona, Arkansas, Illinois, Indiana, Iowa, Kansas, Missouri, Nebraska, New Mexico, and Oklahoma) have areas where severe (drought conditions bringing very high fire risk and water shortages); extreme (drought with extreme fire danger and

widespread shortages) and/or exceptional drought conditions exist. In addition, thirteen other states have areas that are abnormally dry (the region is going into a drought experienced as short-term dryness and possible lingering water deficits).

Drought conditions will likely persist through or beyond May 2006. Some improvement is expected in areas of Arkansas, Illinois, Indiana, Iowa, Michigan, Missouri, Montana, Nebraska, North Dakota, Texas and

Wyoming. However, drought conditions will likely develop throughout Florida and into southern Georgia.

Southwest

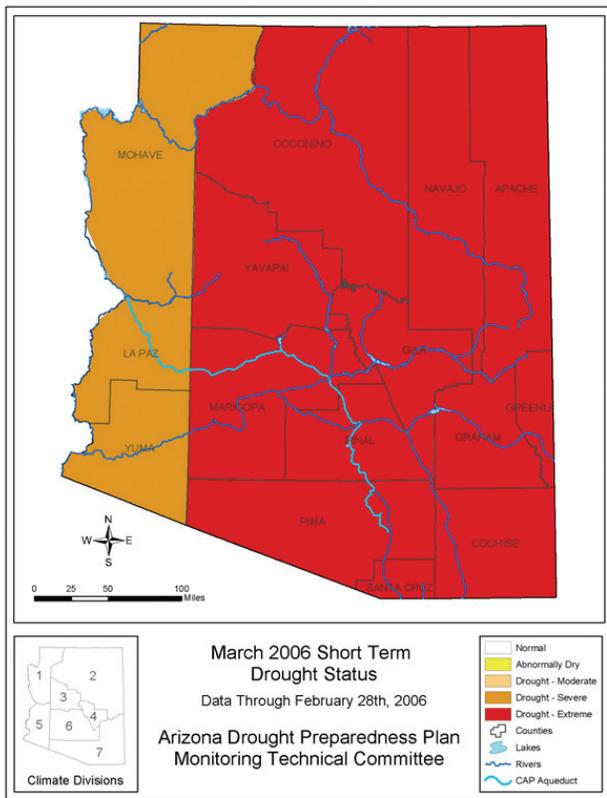
In the Southwest, classified by the National Drought Mitigation Center as Arizona, southern California, southern Nevada, New Mexico and southern Utah, record dry conditions will likely continue. This will probably cause drought conditions to develop, persist or intensify through or beyond May 2006.

This winter will become known as the driest on record for many areas of the Southwest. According to National Weather Service forecasts, there is an increased chance of below-average precipitation for most of the Southwest through May 2006. The areas with the highest probabilities for these conditions include southern Arizona, southwestern New Mexico and southern California.

Arizona

Drought conditions in Arizona currently range from abnormally dry along the western border of the state to extreme in the central and southeastern portions. The counties currently experiencing extreme conditions include Apache, Cochise, Gila, Graham, Green-

lee, Maricopa, Navajo, Pinal, Pima, and Santa Cruz. These conditions are expected to continue through or beyond May 2006, primarily due to below-average precipitation and above-average temperatures, which are forecasted through July 2006.



According to the Arizona Department of Water resources, drought conditions in January 2006 were severe, and by the end of February conditions escalated to extreme. The southeastern and east central regions of Arizona continue to struggle with long-term, low-level precipitation. The recent rain and snow had little effect on the drought that is now entering its 11th year. If conditions worsen, Arizona could experience the highest category of exceptional drought.

Pima County

Current drought conditions range from severe in the western part of Pima County, including Ajo and the Tohono O’odham Nation, to extreme in the eastern part of the County, including the greater Tucson metropolitan area. This is due to above-average temperatures and very dry conditions that have affected the County since September 2005. According to the National Weather Service, the period from September 2005 to January 2006 was the driest on record for Tucson in the past 111 years.

During mid-March, a Pacific storm system moved through southeast Arizona providing some short-term relief to drought conditions. However, according to the Climate Prediction Center, the area remains under extreme drought, and the seasonal outlook through June shows drought conditions will persist.

Current Initiatives

State of Arizona

Arizona places a high priority on managing its water resources to ensure that secure water supplies are available now and well into the future. Arizona’s arid climate dictates that water sources must be available to sustain Arizona’s economy and quality of life. Arizonans have benefited from nearly 25 years of water resources management. Two of the most current efforts include the Governor’s establishment of a drought task force and the legislative passage of a bill that requires system water plans.

On March 20, 2003, Governor Janet Napolitano signed Executive Order No. 2003-12, establishing the Governor’s Drought Task Force. Among the provisions of the Executive Order were two requirements that pertain directly to conservation:

- The development and implementation of a statewide water conservation strategy with the overall goal of achieving more efficient use of water.
- The establishment of a Conservation Education Task Force.

The Arizona legislature passed House Bill 2277 during the 2005 legislative session, which requires community water systems to develop and submit system water plans to the Arizona Department of Water Resources. The system water plan must evaluate and propose a strategy to meet the water supply needs in their service area. These plans will allow the state to identify data gaps and to increase public awareness regarding water supplies, local drought preparedness and response measures, and to promote statewide conservation practices.

Pima County

Sonora Desert Conservation Plan

In 1998, the Pima County Board of Supervisors began discussion on land use planning and conservation resulting in the development of the Sonoran Desert Conservation Plan. This plan gives high priority to preserving and protecting our natural resources and to complying with federal regulations that protect endangered species as the County continues to grow. The area covered in the Plan is 5.9 million acres located in Pima County including the Tucson metropolitan area. The conservation principles in the Plan will guide future land use decisions including projected water demands, where public money is spent to conserve open space, and how cultural and historic resources are protected. It is designed to benefit the natural systems and residents and to save the best lands and precious resources for future generations.

Pima County Flood Control District

The Pima County Flood Control District often acquires a substantial amount of land within the County’s major floodplains. Many of these areas are targeted for restoration, which will be sustained through a variety of non-potable water sources.

Several climatic variables, including groundwater and surface-water resources at Cienega Creek and Bingham Cienega Natural Preserve, are currently monitored by the Pima County Flood Control District Water Resources. It operates and maintains a network of sensors to collect hydrometeorological data, such as precipitation, stormwater runoff, and weather conditions affecting watersheds within Pima County.

Pima County Multi-Species Conservation Plan

Pima County has acquired over 75,000 acres of ranch land, preventing increased water demand which could result if the land was converted for residential or commercial use. The ranch land purchases increase the ability of the County to control herd size and implement grazing strategies during drought conditions.

Pima County Board of Supervisors Declaration of Drought Emergency

In June 2003, the Pima County Board of Supervisors ratified a proclamation declaring the existence of a drought and fire emergency in Pima County. During the existence of said emergency, the Chair of the Pima County Board of Supervisors may impose all necessary regulations to preserve the peace and order. To date, the proclamation remains in effect.

Tohono O'odham Nation Drought Relief Action Plan

The Tohono O'odham Nation established a drought task force consisting of several departments including the Natural Resources Department, Department of Public Safety, Tohono O'odham Utility Authority, Tribal Emergency Response Commission, and Natural Resources Conservation Services. The objectives of the Plan include assessing drought conditions, mitigating risks of drought, minimizing hardships to humans and livestock, assessing the effectiveness of the Plan, and generating a drought relief budget.

Tucson Water Emergency Water Conservation Ordinance

The Mayor and Council approved an Emergency Water Conservation Ordinance on March 20, 1995. The ordinance gives the Mayor and Council the authority to declare a water emergency and to implement mandatory water conservation measures targeting non-essential uses.

Altar Valley Fire Management Plan

The Altar Valley Fire Management Plan is a collaborative effort of the Altar Valley Conservation Alliance,

the Arizona Game and Fish Commission, the Arizona State Land Department, the U.S. Department of Agriculture Natural Resources Conservation Service, the Bureau of Land Management, the U.S.D.A.-Forest Service, the U.S. Fish and Wildlife Service, Pima County, the Nature Conservancy and others. The Plan proposes to implement both prescribed fire and natural wildfire use management to improve range conditions and watershed health. It will also ensure that such practices do not impede the goal of recovering and protecting federally listed species.

Arivaca-Sasabe Fire Management Plan

In October 2005, the Pima County Administrator directed the initiation of a Community Wildfire Protection Plan for Arivaca and Sasabe, and eventually Catalina. These areas present a significant wildland-urban interface, in that structures and other human development meet and intermingle with undeveloped wildland or vegetative fuels that may present substantial risks to life, property and infrastructure. An accepted Plan will provide the residents with the opportunity to influence how federal agencies implement fuel reduction projects on federal land in their area. The Plan will enable these communities to take advantage of federal grant funding for an array of projects including training and equipping local fire departments. Community Development Block Grant funds are being sought for developing the Plan.

Fire Management Plan Update for Bingham Cienega Preserve

Bingham Cienega Natural Preserve is a 285-acre property located in the floodplain of the San Pedro River, in the northwest corner of Pima County. This site was identified in numerous studies, including the Pima County Open Space Report (1988), as a top priority for habitat preservation. The Pima County Flood Control District acquired the property in 1989.

An update of the Bingham Cienega Preserve Fire Management Plan is required as the prescribed burn component has not been necessary. Secondly, the natural plants and unique resources require a highly adaptive management strategy. Third, updating the Plan ensures the information provided to fire control agencies reflects the current state of both vegetation and firefighting infrastructure.

Drought Planning

Introduction

The consequences of drought are greater than the impacts of other weather catastrophes such as floods, tornadoes and hurricanes, and affect more people than any other hazard. Drought does not have a definite beginning and end, therefore, response to drought has been inappropriate as illustrated by the hydro-illogical cycle in Figure 1.

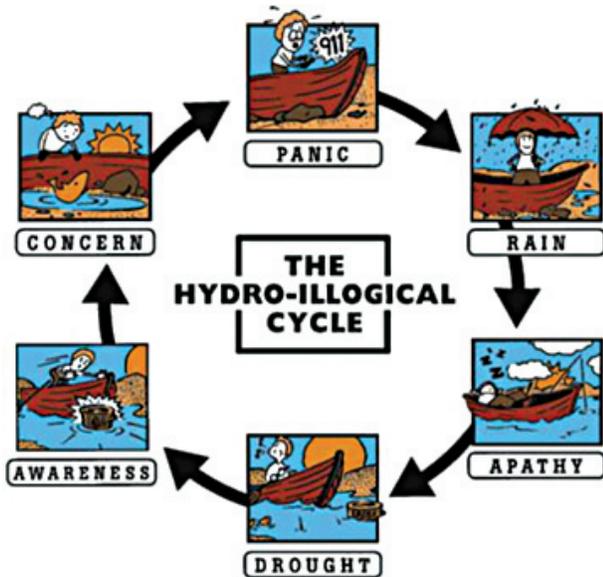


Figure 1: Hydro-illogical cycle
(Source: National Drought Mitigation Center, University of Nebraska, Lincoln, Nebraska, USA.)

Why plan for a drought?

One of the important reasons for planning is the economic losses associated with drought, which average \$6 to 8 billion every year in the United States. These losses occur primarily in agriculture, transportation, recreation and tourism, forestry, and energy.

Social and environmental impacts are considerable and are a major concern in Pima County. Our vulnerabilities to drought are influenced by population growth and shifts, social attitudes and practices, demographics, water use trends, technology, environmental appreciation, and governmental policies.

The impacts of drought can be decreased through mitigation and readiness. Planning allows the opportunity to minimize costs, both human and economic, rather than reacting in "crisis mode".

Proposed Drought Response Plan

Drought conditions in southern Arizona and Pima County are projected to persist or intensify through

May and likely well into the summer months. Temperatures are projected to be above average and precipitation below average.

Long range planning, voluntary water conservation and public education may well allow Pima County to endure the continuing drought without mandatory water use restrictions. However, stricter water conservation efforts may be imposed under ARS §11-251.17 to ensure public health and safety.

Beginning with an in-depth public education program, it is proposed that the following drought planning approach be taken to mitigate the social, economic and environmental effects of the drought in Pima County. The proposed approach has been used extensively throughout the U.S. to guide the development of drought response plans. When implemented in Pima County, it will significantly change the manner in which we prepare for and respond to drought. Rather than merely responding to drought related crises, the Plan will place greater emphasis on risk management and appropriate mitigation actions.

The method is designed to guide government and stakeholders through the process of evaluating and prioritizing impacts, and identifying actions and tools that can be used to mitigate present and future drought effects. Upon completion of the process, the following five fundamental issues will have been addressed and incorporated to become critical elements of the Drought Response Plan.

1. How do we know when there is a drought?
2. If there is a drought, who is in charge?
3. How will the use of water be modified?
4. How will compliance be assured?
5. How will the public be informed?

The 10-step planning approach, developed by Donald A. Wilhite as presented in the publication "Drought Preparedness Planning: Building Institutional Capacity", by Wilhite, Michael J. Hayes, and Cody L. Knutson, is designed to address each of these questions and to ensure effective community driven management of drought emergencies. Steps 1 through 4 are designed to ensure the right people are assembled to participate in the planning process. Step 5 presents the proposed organizational structure necessary to ensure an effective Pima County Plan is constructed. Steps 6 and 7 discuss the need for ongoing coordination between scientists and policy makers. Steps 8 and 9 address the need to constantly promote and test the Plan, and Step 10 calls for continual evaluation and refinement of the Plan to ensure its effectiveness.

Step 1	County Administrator to Form Drought Task Force and Other Committees
Step 2	State the Purpose and Objectives of the Drought Response Plan
Step 3	Seek Stakeholder Participation and Resolve Conflict
Step 5	Inventory Resources and Identify Groups At Risk
Step 5	Prepare/Write the Drought Response Plan
Step 6	Identify Research Needs
Step 7	Integrate Science and Policy
Step 8	Publicize the Drought Response Plan and Build Public Awareness
Step 9	Develop Education Programs
Step 10	Evaluate and Revise the Drought Response Plan

Step 1. County Administrator to Form Drought Task Force and Other Committees

The Pima County Drought Task Force will have two major roles. First, it will coordinate and oversee the development of the Drought Response Plan. Second, during times of drought, the Task Force will make recommendations to the County Administrator, as to when the Plan should be implemented. It will also coordinate and implement the Plan directed by the County Administrator.

The Task Force will reflect Pima County's demographic, economic, and political character and will be comprised of individuals formally trained and able to integrate science and policy. Members will combine their expertise, knowledge and experience to gather and synthesize the complex information that will form the foundation of the Plan.

The Task Force will be comprised of experts from appropriate environmental sciences, such as climate, water and soil; policy development; local government representatives; experts in the dissemination of information to the public; and others skilled in public participation. The Task Force as a whole will ensure all stakeholders, including vulnerable populations, are included in the process.

In addition to the appointment of a Drought Task Force, it is also recommended that a Monitoring Committee be formed. Led by a member of the Drought Task Force, the Monitoring Committee will include at a minimum representatives from agencies responsible for monitoring climate, area water supplies, economic sectors of the County, social groups and ecosystems most at risk from drought. During times of drought, the Committee will analyze critical drought related data, and provide timely, science-driven recommendations surrounding drought response actions to the Drought Task Force.

Step 2. State the Purpose and Objectives of the Drought Response Plan

As its first official action, the Drought Task Force will review the historical impacts of drought, the vulnerability of Pima County economic and social sectors, current trends in water use, principal environmental concerns caused by the drought, and the legal and social implications of the drought response. Considering these issues, the purpose of the Drought Response Plan is to reduce the impact of drought by identifying principal stakeholders, economic sectors and environmental concerns most at risk and developing mitigation actions aimed at altering these vulnerabilities.

The Task Force will then identify the specific objectives that support the purpose of the Plan including the following:

1. Define the duties and responsibilities of all governmental agencies, economic sectors, and members of the public with respect to Pima County's drought response.
2. Collect and analyze regional drought data in a timely and systematic manner, and analyze its potential affect in Pima County.
3. Establish and implement a strategy to ensure equitable allocation of water during shortages and establish incentives to encourage water conservation.
4. Review the legal criteria for declaring drought emergencies and triggering necessary mitigation and response activities.
5. Provide a mechanism to ensure timely and accurate assessment of the drought's impacts on agriculture, industry, governmental entities, wildlife, tourism, health, and other areas.
6. Establish a system that ensures a critical, inclusive and timely flow of information to principal stakeholders.
7. In conjunction with the County Administrator, keep the public informed about current conditions and response actions by providing accurate and timely information using print and electronic media, and an on-going public education program.
8. Identify and schedule mitigation actions to address vulnerabilities and drought impacts.
9. Identify and monitor drought affected areas within Pima County.
10. Develop systems to continually evaluate and refine the Drought Response Plan to ensure it consistently addresses the needs of Pima County.

Step 3. Seek Stakeholder Participation and Resolve Conflict

To diminish the possibility of miscommunication or disagreement between social, economic and environmental interests, the Drought Task Force will identify all stakeholders that have concerns, and take steps to

fully communicate with and understand their position on any given matter.

These groups will be involved early and continuously to ensure appropriate representation and inclusive drought planning. The Task Force will also act to protect the interests of stakeholders who may lack the financial resources or be otherwise hindered in their ability to serve as their own advocates.

Step 4. Inventory Resources and Identify Groups At Risk

It is important to determine the vulnerability of resources potentially affected by a drought. An inventory of Pima County's natural, biological, and human resources, will be accomplished by the Task Force.

From a planning perspective, it will be imperative to identify all possible barriers to the planning process and to the activation of various elements of the Plan well in advance of developing drought conditions. These barriers may be physical, financial, legal, or political in nature. The costs associated with plan development will have to be constantly weighed against the losses that will likely result if no plan is in place, or if the plan is not fully implemented, because critical elements were not prospectively addressed.

In addition, areas of high potential risk associated with the drought will be identified and action taken to reduce those risks before the serious effects of a drought occurs. Risk is defined by both the exposure of an area within Pima County to the drought and the vulnerabilities of that location to periods of water shortages. Vulnerability is affected by social factors such as where people live, where they work, water use trends, and economic and environmental issues. The Task Force will address these issues early and often in the planning process to ensure vulnerabilities throughout the County are properly mitigated.

Step 5. Prepare/Write the Drought Response Plan

Considering the elements identified in Steps 1 through 4, the Plan will have three primary components: (1) monitoring, early warning and prediction; (2) risk and impact assessment; and (3) mitigation and response. These components are further delineated later in this section.

Considering the planned operational precepts of the Pima County Drought Task Force, this step also identifies objectives of the Monitoring Committee and its role in developing and writing the Drought Response Plan. The following graphic shows the functional relationship between the Monitoring Committee, Drought Task Force, County Administrator, Board of Health and the Board of Supervisors. Policy direction flows downward from the Board of Supervisors and the County Administrator to the Task Force and the Monitoring Committee. Situational and assessment reports flow upward to the policy makers. Because of their expertise and knowledge, the Pima County Board of Health plays a critical role in analyzing the effect of drought conditions on public health and safety, and providing

the Board of Supervisors with mitigation recommendations. The graphic depicts their overarching role in the process.

Monitoring Committee

As previously indicated, the Monitoring Committee will be led by a member of the Drought Task Force. Committee members will be comprised of individuals skilled in monitoring climate, area water supplies, ecosystems, and economic and social impacts as a result of drought. Their expertise will be critical when data and information on each of the applicable indicators, such as precipitation, temperature, evapotranspiration, seasonal climate forecasts, soil moisture, and groundwater levels, are considered when evaluating the water shortages and future projections.

The Monitoring Committee will meet often and regularly report its observations, findings, and recommendations to the Task Force. It will be important for the committee to function with urgency, equity, cultural awareness, and consideration of the necessity for public input and collaboration.

The Committee will meet the following objectives:

1. Define and recommend an acceptable definition of drought. More than one definition may be necessary.
2. Establish drought management areas within Pima County which share hydrological, climatological, or other like characteristics.
3. Develop a drought monitoring system that allows the Monitoring Committee to collect, analyze and disseminate accurate, inclusive and timely information to the Drought Task Force.
4. Assess the quality and validity of traditional water resource information sources.
5. Develop, modify or supplement current information sources to ensure they meet the needs of the Monitoring Committee, Drought Task Force and, in turn, the Board of Supervisors.
6. Determine the direct social, economic and environmental consequences of the drought.
7. Consult primary users early and often to determine their information needs.
8. Develop or improve current communication systems in order to provide early warning of impending or changing drought conditions.

Understanding why specific drought impacts occur provides the opportunity to identify and address these vulnerabilities and adopt specific mitigation activities designed to lessen such impacts in the future. Specific tasks of the Monitoring Committee include:

1. **Drought Impact Assessment**
Drought impact assessment examines the consequences of drought, for example, disruption of water supplies, groundwater depletion and increased costs of water to consumers and businesses. The as-

assessment further examines the potential impact of health related low-flow problems such as sanitary needs, diminished sewage flows, reduced firefighting capability, and lack of available water for crops and livestock.

2. Ranking Impacts

The Monitoring Committee will identify and prioritize the most relevant drought impacts for Pima County. The ranking will take into consideration issues such as public health and safety, economic costs, potential trends over time, public opinion, fairness, and the projected time it will take an area to recover, or if recovery is at all possible.

3. Vulnerability Assessment

A vulnerability assessment provides the Monitoring Committee a framework for identifying the social, economic and environmental causes of drought impacts. The assessment provides policy makers with the information needed to bridge the gap between impact assessment and policy formulation by identifying the underlying causes of vulnerability.

4. Action Identification

Once the Monitoring Committee has established drought impact priorities and determined the underlying causes of vulnerability, it can begin identifying the sequence of actions designed to mitigate drought risk. The following questions will be used in identifying appropriate actions:

- a. Can the cause be mitigated and, if so, how?
- b. Can the cause be modified and, if so, how?
- c. If the cause cannot be modified, must it be accepted as a drought related risk for Pima County?
- d. What are the cost/benefit ratios for the action identified?
- e. Which actions will be considered feasible and appropriate?
- f. Which actions are sensitive to the environment?
- g. Do the actions address the right combination of causes to adequately reduce the relevant impact?
- h. Do actions address short and long term solutions?
- i. Which actions would fairly represent the needs of affected individuals and groups?

Step 6. Identify Research Needs

As research or other needs are identified during the drought planning and response process, the Task Force

will communicate those needs to the appropriate entities and recommend remedies. Collaborative partners will be encouraged to provide both the Task Force and the Monitoring Committee the resources necessary to fulfill their responsibilities.

Step 7. Integrate Science and Policy

An essential aspect of the drought planning and response process is the integration of science and policy. Policy makers need to understand the scientific issues and technological constraints involved in addressing the problems associated with drought. Likewise, scientists need to understand existing policy constraints in responding to a drought. Membership configuration within the Drought Task Force and the Monitoring Committee, along with effective communication between the disciplines, will ensure a holistic approach for determining solutions to the challenges of drought.

Step 8. Publicize the Drought Response Plan and Build Public Awareness

The Drought Task Force will work with public information officers, such as the Pima County Public Works Community Relations Group, and print and electronic media to keep the public informed of water supply status. Communications to the public will be in English and Spanish. Messages will include when conditions are approaching “trigger points” for voluntary or mandatory water use restrictions, and what changes people might be asked to make in response to different degrees of drought.



Actions presented in the Drought Response and Stages section of this document highlight the possible sequence of activities associated with responding to a drought from voluntary reductions to mandatory restrictions on outdoor watering and car washing. Throughout the process, it will be important to inform constituencies how the Drought Response Plan is expected to relieve the impact of drought in both the short and long term. Emphasis will be on the critical role everyone plays in a successful drought response.

Step 9. Develop Education Programs

A broad-based education program to raise awareness of short and long term water supply issues will be accomplished by the Pima County Public Works Community Relations Group to help ensure people know what their responsibilities are as Pima County responds to drought. Information will be in English and Spanish tailored to the needs of specific groups including schools, small businesses, industry, utilities, vulnerable populations and the general public.

Step 10. Evaluate and Revise the Drought Response Plan

A detailed set of procedures will be developed to ensure adequate plan evaluation. Periodic testing, evaluating, and updating of the Drought Response Plan will be essential in order to keep the Plan adaptable to changing needs of Pima County and to respond effectively to a potential drought emergency.

Included in these procedures will be ongoing efforts to keep track of new technology, new research, and new laws that may affect drought risk and the operational aspects of the Plan. Critical to the Plan evaluation will be post-drought review activities. Drought response efforts will be analyzed as to what worked or did not work to ensure future drought response refinement.

Board of Health Involvement

The Pima County Board of Health, appointed by the Board of Supervisors, plays a vital role in protecting and preserving public health throughout the County. Members of the Board include health and medical professionals and lay individuals strongly committed to public health who are keenly aware that long term drought can compromise the public's health and safety.

Long term drought may well result in water and air quality issues, can be linked to increased respiratory ailments and sanitation issues, and can potentially increase the incident of disease as a result of wildlife concentrations and vector transmitted disease. Additionally, long term drought conditions may compromise people's coping mechanisms and cause them to suffer emotional distress.

The Board of Health will play an important role in Pima County's Drought Response Plan by monitoring activities to ensure that public health and safety is preserved. The Board will remain engaged with the County Administrator to lend expertise to the planning and education effort, and make recommendations to the Board of Supervisors, as appropriate.

Drought Response and Stages

Response

Once the Drought Response Plan is developed by the County Administrator, endorsed by the Pima County Board of Health, and approved by the Board of Supervisors, the Task Force will shift its focus to active drought mitigation and response. As recommended in the National Drought Mitigation Center's "Planning for Drought, 2005", the specific responsibilities of the Task Force during active drought mitigation and response will be to:

1. Determine the appropriate mitigation and response methods or technologies for each drought impact, addressing the impact in both the short and long term.
2. Determine short term responses to be used during an active drought including voluntary and/or man-

datory water conservation guidelines for industry, agriculture, and the public.

3. Develop long term responses centered on keeping Pima County residents aware of conservation during non-drought periods, thereby helping to reduce long term vulnerability to on-going water shortages.
4. Consider all forms of assistance from Federal and State agencies, evaluating such programs for use in short and long term mitigation and drought response activities, and for making recommendations to the County Administrator concerning opportunities for outside assistance.
5. Monitor trigger points for water use restrictions, and recommend actions to the County Administrator.
6. Assist in developing a drought information website to disseminate information about monitoring, drought severity, and water use guidelines or restrictions.

Stages

The following mitigation and response sequence is provided to illustrate the manner in which Pima County will address short and long term drought induced water shortages. The response stages are designed to encourage voluntary water conservation in the short term, and may evolve into mandatory restrictions if the shortage becomes more severe.

Stage 1: Water Alert

- Voluntary reduction in water use
- Restaurants are asked to provide water only upon request
- Hotels and motels urged to conserve water
- Increased public education

Stage 2: Water Warning

- Continued public education
- Restaurants may provide water only upon request
- Hotels and motels urged to conserve water
- Landscape irrigation restrictions
 - Watering no more than 3 days per week
 - Even numbered addresses on Sunday, Tuesday, and Thursday
 - Odd numbered addresses on Monday, Wednesday, and Saturday
 - Watering only after 8 p.m. and before 8 a.m.
 - Outdoor use restrictions
 - No operation of outdoor misters
 - No use of public fountains or water features
 - Residential car washing only with bucket and shut-off nozzle
 - No charity car washes except at commercial car washes that recycle

- No overseeding of turf areas

Stage 3: Water Emergency

Additional conservation measures to Stages 1 and 2:

- Continued public education
- Landscape irrigation restrictions
 - Watering no more than 1 day per week
 - Even numbered addresses Saturday
 - Odd numbered addresses Sunday
- Outdoor use restrictions
 - No new residential pools filled; pool permits remain active for 3 months
 - No use of public fountains or water features
 - Only car washes that have water recirculation systems allowed to operate
 - Pools may be topped off only to maintain water level, no pools may be filled

Stage 4: Water Crisis

Additional conservation measures to Stages 1, 2 and 3:

- Landscape irrigation restrictions
 - Watering restricted to trees and shrubs
 - No turf or ground cover watering
- Outdoor use restrictions
 - No new pools filled; pool permits remain active for 3 months
 - No car washing
 - No parking lot or street cleaning
- Construction use restrictions
 - No potable water use in construction projects

Initiation and Termination

The County Administrator or the Board of Supervisors will declare drought stages. For drought stages 3 and 4, the Board's ratification will be required within ten days. Increased drought stages will be reported to the Board with the reasons for and expected duration of the drought stage, and a description of the drought response and conservation measures that will be implemented. If the drought lessens, the County Administrator could downgrade to a lower drought stage.

Violations and Variances

The Director of the Health Department will be authorized to review hardship cases and grant a variance for

health, safety or economic reasons. Violations will include written notification. Those found in violation will be given the opportunity to take corrective action. Failure to comply may result in the discontinuation of water service. Continued violations will be considered civil infractions with fines assessed to correlate with the drought stage in effect.

Water Wasting Ordinance

Water is a precious resource that we cannot afford to waste. Other than natural precipitation, water wasting is water that flows or sprays from a property to the public right-of-way or another private property. It not only wastes water resources, but degrades streets, and may create a public safety hazard. Water wasting prohibitions are included in the Drought Response and Water Wasting Ordinance (Appendix A).

Draft Resolution and Proclamation

Another drought planning tool is the implementation of an Emergency Water Conservation Resolution. In the case of a short term water shortage due to local water supply crisis, an emergency declaration will be made. Although it may never be needed, it is prudent to have a measure in place to prohibit non-essential water use to protect public health and safety. A draft resolution and proclamation to declare a water emergency is provided in Appendix B.

Summary

Water is our most valuable resource especially here in the desert. Unfortunately, drought conditions often remind us too late that we should give higher priority to water conservation programs. The Pima County Drought Management Plan initiative presented in this document is designed to minimize the effects of our current drought and mitigate the effects of future droughts.

As years pass, new information and developments will surface which will allow for more definitive drought response planning. In the event the current drought persists or is followed by another episode, the existence of an up-to-date Drought Response Plan will avoid unnecessary and wasteful crisis planning. Preplanning will allow those who are responsible to focus their efforts immediately on the current situation rather than developing a response profile which should already have been in place. The more decisions which can be made in advance of a crisis, the easier it will be to make decisions when a drought reappears.

Glossary of Terms

Acceptable Risk: A level of vulnerability that is considered to be “acceptable”, balancing factors such as cost, equity, public input, and the probability of drought.

Agricultural drought: The linkage between various characteristics of meteorological (or hydrological) drought to agricultural impacts, focusing on precipitation shortages, differences between actual and potential evapotranspiration, soil water deficits, reduced ground water or reservoir levels, and so forth.

Crisis Management: An approach for dealing with drought where responses and actions are made during the event with no prior planning, sometimes leading to ineffective, poorly coordinated, and untimely initiatives by individuals or governments.

Drought: A deficiency of precipitation from expected or “normal” that, when extended over a season or longer period of time is insufficient to meet demands. This may result in economic, social, and environmental impacts. It should be considered a normal, recurrent feature of climate. Drought is a relative, rather than absolute, condition that should be defined for each region. Each drought differs in intensity, duration, and spatial extent.

Drought Categories:

Abnormally dry (D0 intensity): Going into drought, the possible impacts include short-term dryness that slows planting and/or growth of crops pastures and an above-average fire risk. When coming out of drought, the possible impacts include some lingering water deficits and pastures/crops that are not fully recovered.

Moderate drought (D1 intensity): Possible impacts include some damage to crops/ pastures, high fire risk, low streams/reservoirs/wells and potential water shortages that are developing or imminent. Voluntary water use restrictions may be requested.

Severe drought (D2 intensity): During this stage of drought intensity, crop or pasture losses are likely, fire risk is very high, water shortages are common, and water restrictions are likely to be imposed.

Extreme drought (D3 intensity): The second-most serious intensity of drought. Possible impacts include major crop/pasture losses, extreme fire danger and widespread water shortages or restrictions.

Exceptional drought (D4 intensity): The most serious intensity of drought. Possible impacts include exceptional and widespread crop/pasture losses, exceptional fire risk and shortages of water in reservoirs, streams, and wells potentially creating water emergencies.

Drought Impact: A specific effect of drought. People also tend to refer to impacts as “consequences” or “outcomes.” Impacts are symptoms of vulnerability.

Drought Impact Assessment: the process of looking at the magnitude and distribution of drought’s effects.

Evapotranspiration: Loss of water from the soil both by evaporation and by transpiration from plants.

Hydrological drought: Drought conditions associated with the effects of periods of precipitation (including snowfall) shortfalls on surface or subsurface water supply (i.e., streamflow, reservoir and lake levels, ground water).

Hydrometeorological data: Data that provides a measurement of water in the atmosphere such as precipitation.

Meteorological drought: Drought defined usually on the basis of the degree of dryness (in comparison to some “normal” or average amount) and the duration of the dry period. Definitions of meteorological drought must be considered as region specific since the atmospheric conditions that result in deficiencies of precipitation are highly variable from region to region.

Mitigation: Short and long term actions, programs, or policies implemented in advance of drought, or in its early stages, to reduce the degree of risk to people, property, and productive capacity.

Preparedness: Pre-disaster activities designed to increase the level of readiness or improve operational capabilities for responding to a drought emergency. Preparedness is a mitigation action.

Response: Actions taken immediately before, during, or directly after a drought to reduce impacts and improve recovery. Response measures are an important part of drought preparedness but should only be one part of a more comprehensive mitigation strategy.

Risk: The potential adverse effects of drought as a product of both the frequency and severity of the hazard and corresponding vulnerability.

Risk Analysis: The process of identifying and understanding the relevant components associated with drought risk as well as the evaluation of alternative strategies to manage that risk.

Risk Management: The opposite of crisis management, where a proactive approach is taken will in advance of drought so that mitigation can reduce drought impacts, and so relief and recovery decisions are made in a timely, coordinated, and effective manner during a drought.

Vulnerability: Characteristics of populations, activities, or the environment that make them susceptible to the effects of drought. The degree of vulnerability depends on the environmental and social characteristics of the region and is measured by the ability to anticipate, cope with, resist, and recover from drought.

Vulnerability Assessment: Vulnerability assessment provides a framework for identifying or predicting the underlying causes of drought-related impacts. Drought may only be one factor along with other adverse social, economic, and environmental conditions that creates vulnerability.

Resource Credits

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