

Introducing the NCDENR Division of Water Resources Catastrophic Drought Response Measures Toolbox

Duane Verner, AICP
URS Corporation

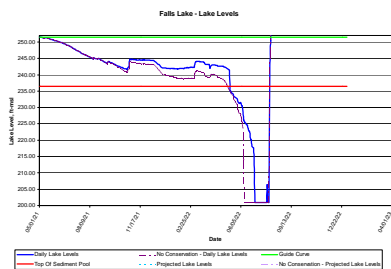


Background

- Due to worsening drought conditions in early 2008 NCDENR undertook a project to assist local water systems in their drought response planning
- Major components of this project included:
 - Interagency Tabletop Exercise
 - Response Planning Workshop
 - Catastrophic Drought Response Measures Toolbox



Context



Purpose

- Avoid the depletion of a water supply to ensure that adequate water is available to protect the health and safety of all water customers
- Provide for the equitable distribution of water during an emergency



How to use this Toolbox

- To assist communities with reducing the demand for water
- To prolong the life of the existing water supply
- Some tools may not be appropriate in all communities
- Some tools may be most effective when combined with other tools



Tool Categories

- Water Reduction Tools
- Alternate Water Supplies
- Drastic Measures



Triple Bottom Line

Provides an evaluation framework enabling water utilities to make informed, defensible management decisions that consider:

Public Health	Environmental Protection	Socioeconomic Considerations
General sanitation	Prevention of long-term or short-term damage to source of supply waters	Community reputation, impact on industry and tourism
Prevention of gastrointestinal disease	Potential impact on downstream waters if contaminants released	Consumer perceptions of utility, impact on water sales and revenues
Water for human consumption	Impacts on water-based industries and marine food sources	Differing understanding and perceptions of sub-populations
Prevention of water system cross-connections	Impacts on fire protection	News media demands and possible misinformation



Select Water Usage Reduction Tools

- To assist communities with reducing the demand for water, and to inevitably prolong the life of the existing water supply
- Where possible, the potential percentage of demand reduction is presented, based upon reductions reported by other communities or assumptions and rough projections

These tools are divided into the following groups:

- Outreach
- Consumer Incentives
- Limitations
- Demand Reduction



WATER USAGE REDUCTION TOOLS - OUTREACH

Customer Education Program

Description:

A customer/public education program involves teaching water consumers how they can make changes in their normal routines to conserve water and use water more efficiently.

How:

Public education can be accomplished at a multitude of levels including through mailers, news media, information booths at civic events, and educational programs at schools. Competitions between neighborhoods or communities have been used to encourage water reduction as competing neighborhoods work to make changes to reduce their water usage. Other water systems have had success with targeted programs that focus on excessive users.

As water systems disseminate information to their system users, such as the stages of their drought response plans, such measures are much more effectively received when nearby water systems use the same plan stages and terminology. While differences between systems must be recognized, plans and terminology should be consistent in an area to the extent possible.

The Public Information Officer (PIO) for a water system and/or community should be able to help get the educational information out to the public through traditional media communications and other alternative methods.

Benefits:

A good public education program will help teach water customers ways that they can comply with use restrictions by reducing water waste. This builds positive relationships between the water system and the community. In contrast to antagonistic approaches, such as harsh penalties. An intensive public education campaign can be a highly effective means of reducing water consumption.

Costs:

A public education program may take time to get the public to make meaningful changes to their water use habits if the policy lacks a financial incentive for compliance. This tool will work best when coupled with a fixed water billing system or other incentives.

Context:

Most communities already provide some sort of public outreach. The City of Grand Junction, Colorado has found that, based on past experience of other domestic water providers, they can expect to achieve between 10 and 20 percent reduction in water consumption by adjusting drought water rates and increasing public information to reinforce the need for extreme measures, including the possibility of penalties.

Suggested Resources:

International Association for Public Participation: <http://www.iap2.org/ia2p03.htm>
Grand Junction Drought Response Plan: <http://www.freddywater.com/GrandJunctionDroughtResponsePlanApril2003.pdf>



WATER USAGE REDUCTION TOOLS - CONSUMER INCENTIVES

Rapid Customer Feedback

Description:

Rapid customer feedback provides water users with frequent updates of their water use. The goal is to reduce the typical lag time between water use and bills.

How:

In using this tool, water systems provide more frequent billing cycles or periodic non-bill usage updates, such as online access to consumer accounts. Billing cycles should be on a monthly basis at a minimum to provide customers with a shorter lag time.

Benefits:

Rapid customer feedback improves the consumers ability to see the results of the efforts they put into conserving water. Analysis after the California drought ending in 1992 showed a key activity for realizing the water conservation potential from residential customers is to let them know that their actions are producing results. Besides press releases and public announcements about the success of community efforts to reduce water use, providing customers with information quicker about their own use aids this process.

Costs:

Depending on the current billing system and meter reading system, rapid customer feedback may be time-consuming and expensive to implement.

Context:

Seattle Public Utilities piloted a program where customers were able to track their electricity use using online accounts. This rapid feedback proved successful in helping consumers reduce their electricity usage between 3 and 10 percent.

Suggested Resources:

Seattle Meter Water Utility Customer Feedback to Build an Internet-Based Energy Use Service: <http://www.ci.seattle.wa.us/DocumentCenter/View/3444>



WATER USAGE REDUCTION TOOLS - LIMITATIONS

Mandatory Consumption Limits

Description:

Establishing mandatory consumption limits requires allotting each customer a given amount of water, based on a method of allotment developed by the state or local government taking into consideration the essential water needs of customers. Common methods include basing the mandatory consumption limits on a percentage of previous usage or on a specific daily quantity per capita or per connection.

How:

Mandatory consumption limits can be accomplished through a metering/billing system that penalizes water customers for using more water than a given allotment. Rationing can also be accomplished with flow restriction devices.

Benefits:

Consumer response to mandatory consumption limits is more predictable than other approaches, and is generally one of the most effective programs to achieve significant demand reduction.

Costs:

Mandatory consumption limits may require additional staff and/or computer programming to develop individualized allotments and respond to increased demand for customer services. Those who were already conserving may be penalized and those customers that were not conserving may receive a benefit especially if allotments are based on previous usage levels. Additionally, this measure may be difficult to implement on a per capita basis without detailed occupancy information.

Context:

Water rationing programs have been implemented in several municipalities in California. Locations with the percent reductions achieved have included Marin Municipal Water District (65 percent), East Bay Municipal Utility District (40 percent), San Francisco Water Department (50 percent), Los Angeles Department of Public Works (16 percent), Sunnyvale Water Department (20 percent), and Santa Clara Valley Water District (26 percent).

Suggested Resources:

Utah Drought Guide 2008 Update: State of California, Department of Water Resources, Office of Water Use Efficiency and Transfer: <http://www.water.ca.gov/conservation/0804/UtahDroughtGuide2008Update1201091230cc.htm>
The Pennsylvania Code, Local Water Rationing Plans: <http://www.pennstate.edu/conservation/0804/UtahDroughtGuide2008Update1201091230cc.htm>
Living Texas Drought Contingency Plan: http://www.cityofhouston.org/water/utahdroughtguide_0804_0310091230cc.htm



WATER USAGE REDUCTION TOOLS - DEMAND REDUCTION

Alternate Sanitary Devices

Description:

Portable toilets will help reduce water demand.

How:

Placement of portable toilets near residents, offices, businesses and entertainment complexes can help meet basic sanitation needs while at the same time reducing the demand on the water system.

Benefits:

The use of portable toilets reduces the water demand and usage when there is a limited supply. The process would also help extend the number of days that a water service provider is able to remain operational.

Costs:

Cost of providing portable toilets will be an additional expense that will need funding. Additionally, the extent to which consumers would utilize these devices is unknown. Public health issues may arise.

Context:

These types of resources have typically only been employed after a water system has been compromised. Examples are far reaching, but include large-scale scenarios, such as New Orleans following Hurricane Katrina. At least one industrial operation chose to use this option for its employees during the drought in 2002 allowing them to use their limited supply to maintain operations and minimize impacts to employees due to layoffs.



WATER USAGE REDUCTION TOOLS – DEMAND REDUCTION

Moratorium on New Water Services

Description:

A moratorium on new water service stops the connection of new customers to the water system. The general message is to help insure that the water system is only providing service to those that it can offer water to and not continue to over-extend its supply.

How:

Local governing bodies have the authority to not provide new water service. Water systems should consider at what point in the process that they will deny or inform people seeking new water service that they will not be approved.

Benefits:

Water systems are not adding new water customers that will continue to drain a system's limited resources. A moratorium on new connections may ease backlash from existing customers that may feel that allowing new customers to connect to a system that is depleted undermines their water conservation efforts. Additionally, a moratorium may serve as a wake-up call to existing customers as to the severity of the drought.

Cons:

Preventing new water service can impact the local economy and impact development, businesses, and the overall growth of a community. Backlash from the business and development communities could be severe. Financial impacts could loom if it comes after a building is constructed versus prior to the issuing of a building permit.

Context:

The North Carolina Division of Environmental Health imposed a moratorium on new water connections in Elizabeth City. The moratorium was implemented over concerns that the city's water source was overproducing beyond its permitted capacity.

Moratoriums on new water service under drought circumstances have been proposed for the Denver, Colorado Water System; however it was never implemented.



WATER USAGE REDUCTION TOOLS – DEMAND REDUCTION

Urgent Media Events

Description:

Organizing large-scale media events will help dramatize the severity of drought conditions. This can be done through various methods, including prayer vigils, rain dances, and proposals or discussions of alternative methods of bringing rain to an area, such as cloud seeding.

How:

This tool involves organizing a large scale event, such as a prayer vigil, through partner organizations that will draw people, possibly controversy, and attention from the media.

Benefits:

The very talk of extreme measures will help send out the message of the severity of the drought conditions and water shortages. This message will help bring people together in their efforts to minimize water usage. Community events will help build cohesion among water customers for achieving a common goal of reducing water usage.

Cons:

The majority of these tactics are unproven measures that may bring false hope to water customers. Additionally, some water customers could view these tactics as controversial.

Context:

Leaders in some drought stricken areas have suggested that prayer is a highly effective means to galvanize community awareness and implement drought response efforts. In November 2007, the Governor of Georgia organized a prayer vigil during a severe drought that impacted much of Georgia.

Suggested Resources:

Community leaders and organizers who can help bring people together.



Select Alternate Water Supply Tools

- Tools describe methods of tapping water sources that may be readily available, but are not typically used as a water supply
- Approval from the Division of Environmental Health-Public Water Supply Section is required for the use of alternative sources
- Early consultation with this agency will minimize delays if alternative sources need to be brought online



ALTERNATE WATER SUPPLIES

Use of Stored Water below Existing Intakes

Description:

Using water not usually factored in calculations of available supply such as a dead pool or the water just below the existing intakes involves drawing raw water from lower sections of supply reservoirs, not normally used for drinking water purposes.

How:

Using water from a lower level in the water reservoir may require activating a seldom-used existing intake opening or installing temporary facilities to pump water into an existing intake.

Benefits:

This process makes additional water available to meet essential water needs of your customers.

Cons:

Variations in raw water quality may necessitate treatment process changes. Additionally, additional equipment, regulatory approvals or special permits may be required. If the installation of temporary pumps is required providing and storing fuel for the pumps will need to be arranged. If the pump has to be located on a barge protecting source water from potential fuel contamination must be given higher priority. During widespread drought conditions acquiring temporary pumps can become difficult.

Context:

The City of Raleigh sought permission from the United States Army Corps of Engineers (USACE) to draw water from the sedimentation pool during the drought in 2007-2008; however, water from this level was not used. Several North Carolina water systems made provisions for installing temporary pumps during droughts in 2002 and 2007. Some chose to contract with pump rental companies in anticipation of the possibility of needing pumps to guarantee access if they were needed.



ALTERNATE WATER SUPPLIES

Drawing Water from Other Sources (Aquifers and Surface Water)

Description:

Many water systems have alternative water supplies located in or near their service area. Alternative water sources can include surface water sources such as water reservoirs, quarries, and local rivers or streams as well as groundwater sources. This alternative may be especially helpful if the alternative source is located in an area not experiencing as severe shortages.

How:

Water can be drawn from an alternate source by the use of a portable pumping station and/or treatment equipment. Agreements with clear terms and conditions, stipulations, and/or permits for drawing from the alternative supply will need to be in place prior to using the alternative source.

Aquifers may be available to draw water that could be pumped into a community's already established water supply (e.g. into a river or stream that leads into the community's water reservoir). Additionally, communities that already draw on aquifers for their water supply may have alternate aquifers available in or near their community to draw upon.

Identifying potential alternative sources prior to the onset of a water shortage will provide much needed time for evaluating equipment needs and identifying where they can be procured. Prior regulatory approval will also speed installation of equipment if it is needed.

Benefits:

The alternative water source can supplement a limited water supply for a community and provide additional water to meet customers essential water needs.

Cons:

If existing infrastructure, resources, or equipment is not in place, it may be costly and time-consuming to acquire this capability. Additionally, drawing water from an alternative source could have impacts on other water systems and/or self-supplied users that may also draw directly or indirectly from the same source.

Context:

Many water systems throughout North Carolina and the United States have alternative water supplies which they can draw upon in situations, such as a drought, to help offset a water shortage from their normal water supply.

The City of Decatur, Illinois owns and operates a well field north of the community that pumps water from an aquifer during emergency drought conditions. This water pumped from the aquifer discharges into a river that supplies water to the city's water reservoir.

Suggested Resources:

City of Decatur, Illinois, Water Management <http://www.ci.decatur.il.us/watermanagement.htm>



Select Drastic Measures Tools

- To be used as the final step in a drought response, when a community faces a water supply crisis due to exhausting its water supply and supplemental sources
- To be implemented when, or just prior to, a shutdown of the water system due to all water sources being depleted



DRASTIC MEASURES

Bottled Water

Description:

Distributing bottled water can be used as an emergency stop-gap for short, temporary interruptions in service and to provide lead time prior to an evacuation. Bottled water can also be used when a system is operating on a non-potable basis.

How:

North Carolina state and county Emergency Management agencies would be engaged to assist in the distribution of bottled water. A water system may choose to move to the distribution of bottled water when they are still operational, but have a limited reserve for fire suppression and other necessary functions.

Benefits:

Bottled water provides a short-term, stop-gap source of potable water.

Cons:

Bottled water is only a short-term solution that is costly to provide and requires a massive distribution effort.

Context:

Bottled water has been issued in communities when water systems have had breakdowns or other system problems that have prevented a system from producing potable water.



DRASTIC MEASURES

Mandatory Evacuation

Description:

Evacuation is the process of requiring residents of a community to leave the area and seek shelter outside of the local water distribution system.

How:

Mandatory evacuations require preplanning. It will be crucial to have a clear understanding of the time required to successfully evacuate the folks that comprise the various user classes in your system. For some users, such as residential health care facilities or correctional facilities, it will be important to identify alternative accommodations as well as modes of transportation. If conditions are serious enough to require evacuations it may be impossible to determine how long the system will be without water. Early use reductions in face of drought will help extend existing supplies and help avoid the need for an evacuation. North Carolina state and county Emergency Management agencies have evacuation plans and procedures in place.

Benefits:

Residents are able to access water in another community.

Cons:

Evacuation would have drastic social, environmental, and economical impacts on the community, state, and region.

Context:

New Orleans, post Hurricane Katrina.

Suggested Resources:

North Carolina State and county Emergency Operation Plans.



Questions/Comments?

Contact Information:

duane_verner@URScorp.com

1600 Perimeter Park Dr., Suite 400
Morrisville, NC 27560

919-461-1228

