Drought Response and Recovery

A Basic Guide for Water Utilities

Lynn Gilleland
U.S. EPA Region 1, Boston Office

July 16, 2020
Drought – A National Issue

• Drought is a slow moving natural hazard that affects water utilities in all areas of the United States

• Drought can deplete water sources, presenting major challenges to utilities

The U.S. Drought Monitor is jointly produced by the National Drought Mitigation Center at the University of Nebraska-Lincoln, the United States Department of Agriculture, and the National Oceanic and Atmospheric Administration. Map courtesy of NDMC-UNL.
Drought – Conditions Can Also Change Quickly


The U.S. Drought Monitor is jointly produced by the National Drought Mitigation Center at the University of Nebraska-Lincoln, the United States Department of Agriculture, and the National Oceanic and Atmospheric Administration. Map courtesy of NDMC-UNL.
Drought Response and Recovery Guide: Overview

• **Purpose:** provides actionable guidance for drinking water utilities that are currently *responding* to drought. It can also be used by utilities *preparing* for or *recovering* from drought.

• **Audience:** Targeted to small and medium-sized drinking water utilities.

• **Features:**
  – Clickable PDF, navigate like a website
  – Best practices and lessons learned from real utilities
  – Worksheets
  – Links and reference materials for more, related information
Drought Response and Recovery
Project Approach – Published in 2016; then updated 2018

- Captured lessons learned from six diverse case studies (varying location, system type, etc.) which helped to drive Guide content
- Worked with Water Sector Focus Group throughout Guide development

Case Study 8 Visits:
- Tuolumne Utilities District, CA
- Spicewood Beach Water System, TX
- City of Las Vegas, NM
- City of Hogansville, GA
- Cities of Hays and Russell, KS
- City of Clinton, OK
- N. Marin Water District, CA
- Castine Water Department, ME
Guide Home Page
Guide Navigation
Informational and Easy-To-Use

Explore the Drought Guide more easily through:

- Simple icons for tabs, worksheets and videos
- Separate boxes embedded throughout that represent certain types of info
- Sections broken up into key areas with bullets

Quick navigation between sections and pages
Guide Features
Best Practices, Worksheets, Links and More

**BEST PRACTICE:** Applying water conservation measures is one of the least costly “water supplies” that you can add to your portfolio. It can also help defer capital costs.

- **(Corix) Spicewood Beach Water System.** The Texas utility’s drought response plan established reduction goals and specific drought response measures to curtail non-essential uses and utilize alternate water sources. For example, during Stage 2 drought, the plan includes measures such as 10 to 20 percent reduction in water use, no more than twice per week irrigation during limited hours, no hydrant flushing, and additional measures for pools and outdoor water features.

---

**FOR MORE INFORMATION ON WATER DEMAND MANAGEMENT:**
- Alliance for Water Efficiency (AWE)
- AWWA Drought Portal
- EPA’s WaterSense
- AWWA Conservation and Resource Management

---

**Use Worksheet 5 to identify water demand management measures that can be implemented quickly.**

**Drought Response and Recovery: A Basic Resilience Guide for Water Utilities**

**Water Supply and Demand Management**

**Water Demand and Customer Use: Worksheet 5**

This worksheet focuses on water use reduction measures that can be implemented quickly during a drought. Add other items you would like to track at the bottom of the worksheet. Note that the action items do not need to be completed in the order listed. Save this worksheet to your computer before making any changes.

**SYSTEM EFFICIENCY**

1. Increase luck efficiency and record efforts to the distribution system. Ask your employees and field personnel to report leaks. Estimate costs of repairs and potential labor overtime or emergency contracts if needed to make repairs quickly. Coordinate with your financial department to make budget adjustments and ensure funds are available. Plan for more frequent rate indicator kit installations.

<table>
<thead>
<tr>
<th>Responsible Person</th>
<th>Start Date</th>
<th>End Date</th>
<th>Completion Date</th>
<th>First Photos</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Consider the following to save water in your systems:
- Fixing dripping faucets or leaky valves
- Installing backflow preventers at the head of your treatment plant

<table>
<thead>
<tr>
<th>Responsible Person</th>
<th>Start Date</th>
<th>End Date</th>
<th>Completion Date</th>
<th>Cat. Photos</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**After the Drought:**

- Continue to implement your leak detection and repair program that ensures a prompt response mechanism for utility staff to make repairs. Prioritize and repair or replace components in the water distribution network that could lead to leaks.
- Look for other ways to use water efficiently throughout your utility or other departments, such as installing low-flow fixtures, retrofitting landscapes and replacing inefficient irrigation systems.
- Initiate a program to conduct annual water loss audits.
Drought Response and Recovery Guide

What’s covered?

1) Staffing, Response Plans and Funding
   • Developing your drought response team and drought plan
   • Training on and exercising drought response (tools and tips)
   • Recovering revenue, finding sources of funding

2) Water Supply and Demand Management
   • Estimating available groundwater/surface water supplies
   • Improving system efficiency and reducing customer demand
   • Identifying options for additional water supplies

3) Communication and Partnerships
   • Communicating drought issues/solutions to customers and decision-makers
   • Examples of unique partnerships and outreach efforts
   • List of suggested partners to consider reaching out to
Drought Response and Recovery Guide

Case Studies and Videos

CASE STUDIES AND VIDEOS

The following case studies highlight small and medium-sized utilities that successfully responded to drought. Reflecting a broad range of situations — diverse geographies, water resources, response actions and funding approaches — these utilities’ actual stories demonstrate solutions that work.

They provide examples of proven ways to reduce demand, access additional water supplies, communicate effectively, secure funding and develop partnerships to survive drought. Lessons learned by your peers may help you plan for and respond to drought by finding solutions that work for you and your community.

Note that your state may have specific rules that could prevent use of some of the case study utilities’ actions, so first check with your state regulators or legal counsel; even if that is the case, these innovative solutions may inspire other ideas to help your utility and community become drought resilient.

Click on the Images to learn about solutions from each case study.

Click on the map to to exit the Drought Response and Recovery Guide and navigate to a website featuring a geoplatform map that hosts short videos on each case study.
Case Studies and Videos

Two-page summary on water utility that includes:

- System details
- Drought response measures taken

Links to external Case Studies Map and Videos
Welcome to the Case Studies Map for the U.S. Environmental Protection Agency's (EPA) Drought Response and Recovery Project for Water Utilities. This site contains Overview, Case Studies, Drought Action Videos, and Utility Stories tabs that describe the experiences of small and medium-sized drinking water utilities that successfully responded to drought.

The background image on the overview map to the right is taken from the United States Drought Monitor and corresponds to current drought conditions.

How to use this site:
- Click on the dots on any map to learn basic information about each utility.
- Navigate to the Case Studies tab to further explore how each of the water utilities responded to and recovered from the impacts of drought and to see each utility’s peak drought conditions.
- View how specific drought challenges were overcome by the case study utilities by clicking on the Drought Action Videos tab.
- Visit the Utilities Stories tab for short descriptions from water systems like you who have shared their own drought response stories. Submit your drought story today by contacting EPA at WSD-Outreach@epa.gov — EPA will work with you to add your story to the site.

For more information on these case studies and other drought response activities, visit...
Case Studies Map and Videos
Geoplatform – Clinton, OK

Drought Response and Recovery Project for Water Utilities

City of Clinton, Oklahoma

Clinton’s Story:

Utility overview: 4,182 connections
- Customers: 45% residential, 55% commercial or industrial

Drought summary: water levels reached a historic low and surface water source went dry; had an existing interconnection, but incurred approximately $1 million per year in "average fees" costs to gain additional supply; purchased supply source began to run dry

Drought response actions: implemented water use restrictions, increased the amount of water purchased from existing interconnections; raised water rates by 49% to promote water conservation and provide revenue stability; started constructing new groundwater wells, a 7-mile conveyance system and a reverse osmosis (RO) water treatment plant

their website for contact information. Clicking on a link to their
Drought Guide – 2018 Updates

New resources include:
1. A customizable Drought Response Plan template for utilities
2. Two additional video case studies for the Geoplatform/Map
3. A “share your story” section of the Geoplatform/Map
Drought Response Plan Template

Instructions

2 SYSTEM OVERVIEW AND UTILITY PROFILE

Including background information on the utility in its drought response plan provides important context for the public and organizations that may need to review or approve the plan. This information also helps utility planners and developers outline drought stages and response measures described in Section 3. This section includes descriptions of your water supplies, historical droughts, basic system components, your customer base and essential and non-essential users. Distinctions of ongoing water conservation or water efficiency measures that may already be in place are also included in this section.

Exercise: System Overview and Water Source Vulnerabilities

The current water supply for the City of Fargo consists of the Red River of the North and the Sheyenne River. The City also has water rights for Lake Sakakawea, located on the Sheyenne River, upstream from Valley City, North Dakota. These surface water sources are subject to the same wet/dry cycles during drought years. The City of Fargo, being the largest population center in eastern North Dakota, is extremely susceptible to these factors. *Source: City of Fargo, North Dakota: Drought Management Plan, Update (2015)*

3 DROUGHT RESPONSE

5.1 Declaring and Terminating Drought and Emergency Response Stages

Many times, drought declarations occur in drought stages, which are reactive or warning stages. This section describes the factors that constitute when declaring and terminating drought stages. The standards for declaring drought stages should provide some flexibility so that utilities and utilities to decide a drought stage are not required or prohibited from using it. When a drought stage is declared, all personnel should take the following actions:

- Assist water and wastewater utilities with developing a drought response plan
- Instructions guide users through the process
- Diverse examples of drought response plans
- Addresses 3 key components
  1. Policy, purpose and objectives
  2. System overview and utility profile
  3. Drought response actions

Table 1. Example Drought Stages and Trigger Levels

<table>
<thead>
<tr>
<th>DROUGHT ADVISORY / DROUGHT MONITORING</th>
<th>DROUGHT WATCH</th>
<th>DROUGHT WARNING</th>
<th>DROUGHT EMERGENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standardized Precipitation Index &lt; 1.0 to &gt; 1.49</td>
<td>Standardized Precipitation Index &lt; 1.5 to &gt; 1.99</td>
<td>Standardized Precipitation Index &lt; 2.5 to &gt; 2.9</td>
<td>Standardized Precipitation Index &lt; 2.5 and below</td>
</tr>
<tr>
<td>Palmer Drought Severity Index &lt; -2.0 to &gt; -3.9</td>
<td>Palmer Drought Severity Index &lt; -3.0 to &gt; -3.9</td>
<td>Palmer Drought Severity Index &lt; -4.0 to &gt; -4.8</td>
<td>Palmer Drought Severity Index &lt; -4.0 and below</td>
</tr>
<tr>
<td>Watershed characteristics, such as precipitation, snowpack, streamflow, wind and soil moisture indicate short-term and prolonged dryness</td>
<td>Watershed characteristics, such as precipitation, snowpack, streamflow, wind and soil moisture indicate severe drought and prolonged dryness</td>
<td>Watershed characteristics, such as precipitation, snowpack, streamflow, wind and soil moisture indicate extreme drought and prolonged dryness</td>
<td>Watershed characteristics, such as precipitation, snowpack, streamflow, wind and soil moisture indicate extreme drought and prolonged dryness</td>
</tr>
<tr>
<td>Stream flow &lt; 70% to 100% of normal for time of year</td>
<td>Stream flow &lt; 70% to 100% of normal for time of year</td>
<td>Stream flow &lt; 70% to 100% of normal for time of year</td>
<td>Stream flow &lt; 70% of normal for time of year</td>
</tr>
<tr>
<td>Determination of water quality caused by low flow conditions</td>
<td>Water treatment plant production reduced by 15% due to water quality deterioration caused by low flow conditions</td>
<td>Water treatment plant production reduced by 30% due to water quality deterioration caused by low flow conditions</td>
<td>Water treatment plant production reduced by 50% due to water quality deterioration caused by low flow conditions</td>
</tr>
<tr>
<td>Reservoir levels drawn down to minimum storage levels</td>
<td>Reservoir levels drawn down to minimum storage levels</td>
<td>Reservoir levels drawn down to minimum storage levels</td>
<td>Reservoir levels drawn down to minimum storage levels</td>
</tr>
<tr>
<td>Water elevation levels 5 feet below normal for time of year</td>
<td>Water elevation levels 10 feet below normal for time of year</td>
<td>Water elevation levels 15 feet below normal for time of year</td>
<td>Water elevation levels 20 feet below normal for time of year</td>
</tr>
<tr>
<td>Projected available stored water in the reservoir greater than 50% and 55% full on July 1</td>
<td>Projected available stored water in the reservoir greater than 50% and 55% full on July 1</td>
<td>Projected available stored water in the reservoir greater than 50% and 55% full on July 1</td>
<td>Projected available stored water in the reservoir greater than 50% and 55% full on July 1</td>
</tr>
</tbody>
</table>

Example:

Stream flow < 70% to 100% of normal for time of year
Water treatment plant production reduced by 15% due to water quality deterioration caused by low flow conditions
Reservoir levels drawn down to minimum storage levels
Water elevation levels 5 feet below normal for time of year
Projected available stored water in the reservoir greater than 50% and 55% full on July 1
Drought Response Plan Template
Fillable Template

- Customizable, fillable document
- Flexible and adaptive to unique utility needs
Share Your Drought Story

Utility Story

- NEWEST Section of the Drought GeoPlatform
  - The utilities here have shared their approaches and successes in responding to drought. If you would like to share your drought story, email the EPA at WSD-Outreach@epa.gov.
Other WSD Drought Related Products

Drought Incident Action Checklist

- One of twelve “Rip and Run” style checklists that utilities can use to help with preparedness, response and recovery

Also available in EPA’s Water Utility Response-On-the-Go app! Download on your smartphone or tablet
A Few Lessons Learned Along the Way

• Have a water shortage plan
  • Conduct training on the plan. What does it really require to truck in water?

• Water audits are great
  • They are work upfront, but worth it to find out where your real losses and apparent losses are, can save water and money

• Have a short-term and a long-term plan
  • Capital improvements take time and money (including getting approvals). Have a 6-month, 5-year and 10-year plan

• It usually always comes down to money
  • Asset management is key, esp. evaluating rate structures (many systems moving toward higher base rates)

• Don’t ever assume you have enough water
  • If you think you have enough now, then start planning for the next source. No easy water sources anymore.
Drought Response and Recovery Contacts

Access the Guide/Download the PDF at:

.. or Google: “EPA Drought Response Guide”

Questions?

EPA Region 1:
Lynn Gilleland, gilleland.lynn@epa.gov, 617-918-1516
EPA Drought Guide Project Contact:
Dawn Ison, ison.dawn@epa.gov, 513-569-7686

Other EPA Water Resiliency Resources:
https://www.epa.gov/waterutilityresponse and
https://www.epa.gov/waterresilience