

# Drought Planning for Small Community Water Systems

Edited by  
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Drought can occur in virtually any climate. It has occurred in the past, will occur again in the future, and has many serious effects on people's lives. "One of the costliest weather disasters in U.S. history, purely in terms of economic damage, was not a hurricane, flood, or tornado," says *Environment Writer*. "It was the drought of 1988, which caused an estimated \$40 billion in losses."

Having reasonably priced water supplies that are adequate, secure, and safe is a cornerstone of social and economic development as well as national security. When drought strikes, however, it can have two major impacts on small community water systems: a reduced water supply typically for surface waters and shallow groundwater and an increased demand for water.

This combination can result in major stresses on the ability of water systems to meet demand.

Many Western states have experienced widespread, severe economic and environmental impacts of "worst-case" droughts in recent years.

Because of these experiences, many small systems now recognize that water supply planning and management are important issues, including being prepared for drought.

Even with these insights, many system managers in the Midwest Technology Assistance Center (MTAC) region may not yet have evaluated their capability to meet water demand during major droughts, nor have they developed and practiced adequate plans to deal with such emergencies. The MTAC region incorporates the 10 states of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, Ohio, and Wisconsin.

To combat the impacts of drought, MTAC funded a project through the Illinois State Water Survey. The goals of this project were:

1) to provide basic information about initial assessments of drought preparedness for small community water systems that serve less than 10,000

people in the 10 states in the MTAC region; and

2) to produce recommendations to small community water systems in the MTAC region about conducting drought-sensitivity studies.



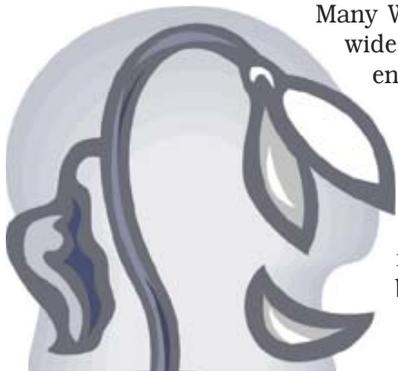
Although most small community water supply systems in the Midwest depend on groundwater for their drinking water supplies, there are still many systems that depend on surface water sources, particularly in areas where groundwater supplies are limited. Systems that depend on surface water and shallow groundwater are highly vulnerable to water shortages during major drought periods.

Some of the surface water systems obtain water directly from rivers and streams, but, more commonly, reservoirs are constructed to store water from high flow periods for use during periods of flow less than demand.

To ascertain the current drought planning status at the state level and to evaluate how these state plans potentially impact small community water systems, researchers acquired state drought plans and additional information where formal state drought plans are not available.

To define the extent of potential water shortages due to climate variability, researchers first identified and characterized small community water systems. Researchers then developed basic data to evaluate the risk of systems experiencing potential water shortages. The evaluation framework is a water budget including reservoir volume, evaporation, reservoir levels, aquifer properties, well-field operations, water withdrawals, and appropriate models.

Within the 10-state MTAC region, researchers identified which small systems depend on surface water or groundwater as well as the available information about water supply under various drought scenarios. Using this information, the researchers



recommended methods for evaluating water budgets and system adequacies under drought conditions.

The main contents of the report are as follows:

1. An inventory of contacts and data sources for characterizing small community water systems in the MTC region: such as location, water supply, water withdrawal, system capacity, and water-demand forecasts.
2. Identification and assessment of the availability of climate, surface water, and groundwater data and analytical tools within the MTAC region that can be used to conduct drought analyses.
3. A review of approaches for using real-time climate and hydrological data products to identify the thresholds for potential water supply impacts due to drought:
  - a. Analysis of methods used to relate magnitude/duration thresholds of climatological drought to potential surface water and groundwater supply or demand impacts.
  - b. Examination of schema used in states in the MTAC region for relating climate thresholds to water supply impacts in drought watch and drought warning systems.
4. Recommendations for conducting drought-sensitivity studies for small community water systems in the MTAC region.

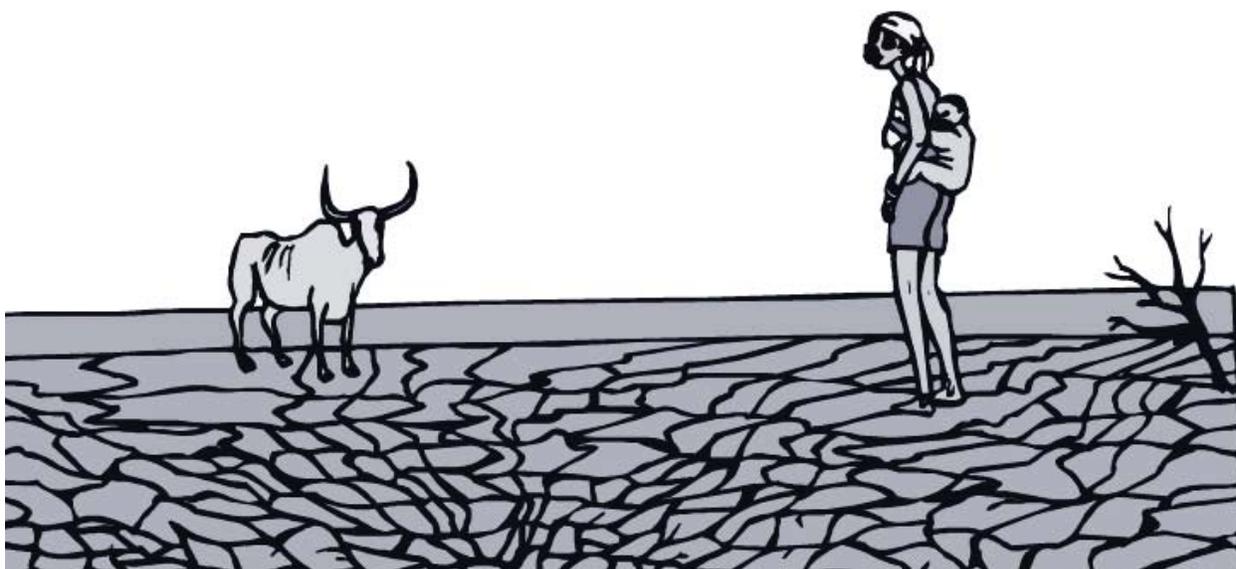
The report provides a framework for improving drought preparedness planning for small community water systems in the MTAC region. This plan also may be useful in drought-preparedness planning in other regions.

A major finding is that hydrologic droughts in the MTAC region were more frequent and severe in the first 60 years of the 20th century than in the last 40 years. Researchers recommended that small community water supply operators evaluate the capabilities of their systems to cope with severe and protracted droughts.

### For More Information

Drought Planning for Small Community Water Systems by Derek Winstanley, James R. Angel, Timothy P. Bryant, H. Vernon Knapp, Michael A. Palecki, Amy M. Russell, H. Allen Wehrmann was funded by the Midwest Technology Assistance Center. The University of Illinois at Urbana-Champaign and the Illinois State Water Survey sponsored the report. Copies of the final report are available by calling (217) 333-9321 or at [mtac.sws.uiuc.edu/](http://mtac.sws.uiuc.edu/).

MTAC provides technical assistance to small public water systems as well as water systems serving Native American communities. Their mission is to provide small system administrators and operators with the information necessary to make informed decisions about planning, financing, selecting, and implementing technological solutions to address needs.



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