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DROUGHT PLANNING

FOR SMALL COMMUNITY WATER SYSTEMS

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The provision of adequate and secure supplies of clean water at reasonable cost is a cornerstone of social and economic development and national security. Major droughts have occurred in the past and will occur again in the future. Such droughts have two major impacts on small community water systems: water supply is reduced (surface waters and shallow groundwater) and water demand increases. The combination of these impacts can result in major stresses on the ability of water systems to meet demand. Many Western states have experienced widespread and severe economic and environmental impacts of “worst-case” droughts in recent years, and have recognized from these experiences the importance of improved water-supply planning and management, including drought preparedness. However, it is probable that many system managers in the Midwest Technology Assistance Center (MTAC) region have not evaluated their capability to meet water demand during major droughts, nor have in place 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.

The goals of this project are: 1) to provide basic considerations for an initial assessment of drought preparedness for small community water systems serving less than 10,000 persons in the 10 states in the MTAC region; and 2) to produce recommendations for conducting drought-sensitivity studies by small community water systems in the MTAC region.

Although most small community water supply systems in the Midwest depend on groundwater supplies for drinking water, many systems also depend on surface water sources, particularly in areas where groundwater supplies are limited. Supplies dependent on surface water and shallow groundwater are highly vulnerable to 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, state drought plans were acquired and additional information obtained where formal state drought plans are not available.

To define the extent of potential water shortages due to climate variability the small community water systems first are identified and characterized. Basic data are developed 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, wellfield operations, water withdrawals, and appropriate models. Within the 10-state MTAC region those small systems dependent on surface water or groundwater are identified, as is the general availability of basic systems data necessary to evaluate water availability under various drought scenarios. On the basis of data availability, methods for evaluating water budgets and system adequacies under drought conditions are recommended.

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: e.g. location, water supply, water withdrawal, system capacity, 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 regional 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. It is recommended that small community water supply operators evaluate the capabilities of their systems to cope with severe and protracted droughts.