Planning for Climate Variability: The Illinois State Water Survey and Statewide Framework for Drought and Water Supply Planning

Overview

In addition to the projected increased demand for water throughout Illinois, the uncertainty associated with climatic variability is a key factor in water supply planning. The role of the Illinois State Water Survey (ISWS) is to provide scientific data and evaluations that will be informative for water-supply planning and management by quantifying the past and future variability of water availability. ISWS translates science and analyses into meaningful data and information for developing risk-based State and Regional water supply plans. Outcomes of Illinois' efforts include the ability to evaluate the capacity of State water supply facilities (e.g., drinking water utilities), project future demands, determine potential impacts, and adopt strategies to improve water supply resilience. Before the project began, fragmentation limited state water planning activities. ISWS efforts supplied data that allowed increased coordination across regional water supply planning committees and provided a consistent framework to prepare for climate change effects on water resources.

Background

Expanding population and climate change concerns force Illinois to deal with a variety of challenges surrounding the quality, availability, and demand of water. While droughts can create water shortages, floods often damage wastewater facilities and adversely affect water quality. Due to projected population growth, Illinois could require 20 to 50 percent more water in coming decades. Preparing for this increased demand for water is complicated by uncertainty related to climate change. In reviewing possible climatic changes, the State concluded, "Based on 150 years of climate conditions in Illinois, climate trends, and the results of climate scenarios generated by different global climate models, 10-year average annual precipitation in Illinois could change by +/- 20 percent and 10-year average annual temperature possibly could increase by up to 7° F, or decrease by 1° F" (see *Framework for Drought and Water-Supply Planning)*.

In 2006, State Executive Order 2006-01 called for the development of State and regional water-supply plans. Under that effort, DNR and ISWS were responsible for developing and implementing a statewide plan in each of the State's Priority Water Planning Areas. The State agencies organized water supply planning pilots in three priority regions to assess water availability and evaluate the impacts of climate change on the ability to meet future water demands.

Program Partners: Illinois State Water Survey, the Illinois Department of Natural Resources (IDNR), the Illinois State Geological Survey (ISGS), and University of Illinois Urbana-Champaign Prairie Research Institute

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Planning to Ensure Illinois' Water Supply

To implement the Executive Order, the IDNR Office of Water Resources and ISWS created a coordinated approach for state and regional water supply planning and management. ISWS and the State Geological Survey were also responsible for updating water resource information in each Priority Water Quantity Planning Area.

A Statewide Planning Effort: The Illinois State agencies developed a *Framework for Drought and Water-Supply Planning*. As a scientific basis for planning, ISWS and ISGS conducted studies to provide data and information for water supply managers and planners, including:

- Analyses of drought severity, frequency, and impacts based on historical records; as well as impacts of floods on water supplies.
- Analyses of water budgets, at-risk supplies, and future climate change and water demand scenarios to provide information on possible future water-supply conditions and issues in Illinois.

- Identifying priority Water Quantity Planning Areas most at risk for water shortages, based on ISWS water supply and demand data. Use-to-yield ratios provided a method for evaluating changes in water availability.
- Guidance for evaluating current and future local or regional water supplies. Scientific information and mathematical computer models were developed for each priority area to support the evaluation of water management strategies to meet needs through 2050.

As part of the larger study, ISWS examined historical climate data and future climate scenarios to improve the understanding of the effects of climate change on water resources. The study investigated the effects of changes in temperature and precipitation patterns on surface and groundwater sources (e.g., on evapotranspiration, streamflow, and groundwater recharge) by contrasting different climate model simulations to illustrate a range of future conditions that could occur in 2040, and the resulting issues for sustainable water supply planning.

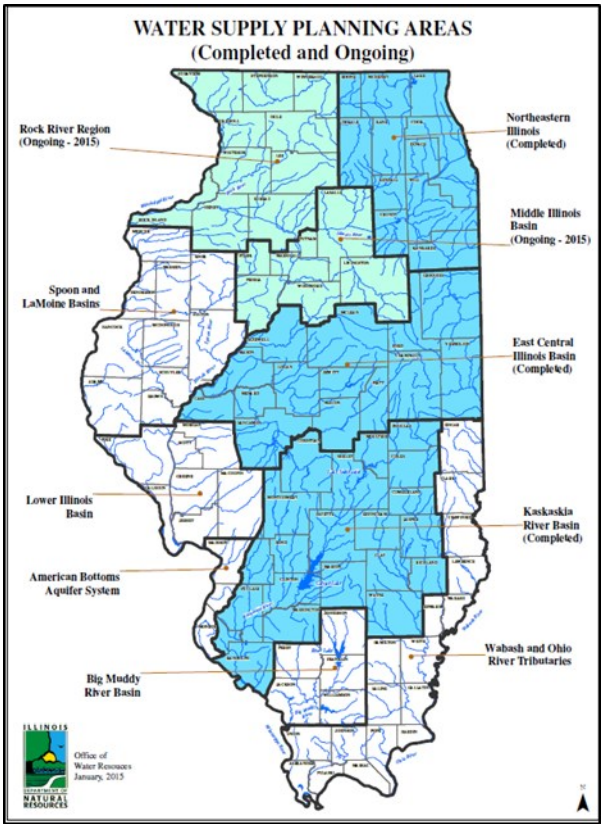

Figure 1. From top to bottom the Northeastern Illinois, East Central Illinois, and the Kaskaskia Region are depicted as the three Priority Planning Areas for the pilot projects. Two additional regions and one sub-region are currently being studied. These include the Middle Illinois, the Rock River, and the Kankakee.

The data and information collected helped water supply planners and managers understand the variability of water supply in Illinois, and allowed them to incorporate climate risks and uncertainties in evaluations of drinking water utilities' ability to meet future water demands.

Priority Regional Pilots: As part of the effort, regionally led pilots in three priority planning regions were completed in the Northeastern Illinois, East Central Illinois, and the Kaskaskia Region (Figure 1). Priority Water Quantity Planning Areas were defined as regions with limited available water supply, significant population growth, and where planning was needed to avoid overuse. Regional Water Supply Planning Groups were formed for each pilot and were responsible for developing effective plans with support from State agency partners.

Of principal interest was the evaluation of the potential impacts of drought and climate variability on water withdrawals and uses. Project staff examined water availability, demand, and cost under projected population changes and various climate change scenarios. The pilots assessed future temperature and precipitation conditions using publicly available global climate models, incorporated those conditions into surface water and groundwater models for their regions, examined use-to-yield estimates, and evaluated revisions to existing water resource policies and regulations under the *Framework*.