ILLINOIS STATE WATER SURVEY
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Groundwater Depletion in Chicago's Southwestern Suburbs

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Why?

Sandstone aquifers in Illinois have been important sources of water for municipalities and industries since the mid-1800s, and remain important in Will, Kendall, Kane, and McHenry Counties (Figure 1a). Long-term withdrawals have resulted in declining groundwater levels (also known as heads), with the greatest declines of over 900 feet in Will County, locally exceeding 1,100 feet when wells are pumping.

Multiple factors have contributed to large declines in the sandstone aquifers. First, the aquifers are hundreds of feet below the land surface, overlain by material that impedes the vertical movement of water, which prevents rainfall from replacing water withdrawn from the aquifers. Second, both municipal and industrial demands are increasingly concentrated along a fault zone, which further impedes the movement of water and exacerbates drawdown. With demands projected to increase in the coming decades, the future availability of water from the sandstone is in jeopardy.

Where?

Despite most of the eastern suburbs finding alternate water sources, the southwestern suburbs have seen historic low sandstone heads in recent years. In 2014, the Illinois State Water Survey (ISWS) measured water levels in more than 600 municipal and industrial production wells open to the sandstones over the northern half of the state. Using these data, we have mapped risk areas in the sandstone aquifers (Figure 1b).

High-risk areas (shown in red) will be unable to meet water demands in the near future due to decreased well production, wells going dry, or water quality problems introduced by dewatering the aquifer. In some areas of highest risk, the uppermost sandstone, the St. Peter, is already dry (Figure 2). The moderate-risk area in Figure 1b (shown in orange) will experience isolated problems during pumping, and may move into the high-risk category with any new development in the region, including development in communities that are not currently at risk.

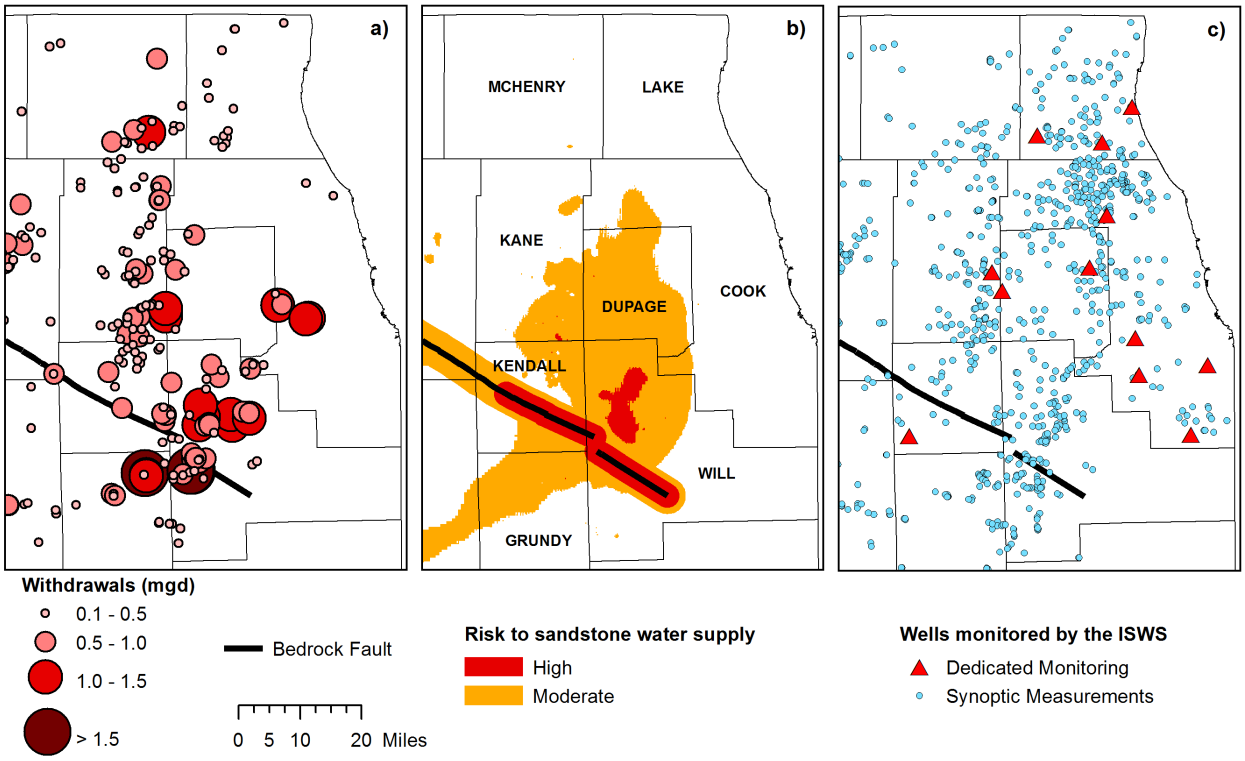

Figure 1. a) 2013 withdrawals in millions of gallons per day (mgd) from the sandstone aquifers, b) Risk to sandstone aquifers of northeastern Illinois based on the 2014 synoptic measurement study, c) Sandstone wells monitored by the ISWS.

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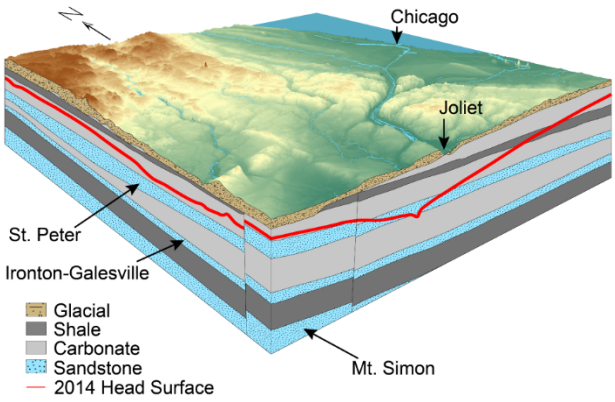

Figure 2. Conceptual image showing 2014 head in relation to the sandstone aquifers in northeastern Illinois

When?

The lowermost sandstone aquifer that can provide fresh water to Will and Kendall Counties is the Ironton-Galesville, which is generally 1,200 to 1,400 feet below the land surface in the region (Figure 2). This aquifer serves as the last line of defense for these counties, and is currently the primary aquifer supplying water to the city of Joliet and many industries.

ISWS scientists have monitored declining heads for over a century (Figure 3). When heads approach the top of the Ironton-Galesville, wells will likely be unable to meet demands, and an alternative source will be required. The regional trend suggests that no available head will remain by **2040** in the areas of highest risk. Furthermore, areas near or within the high-risk zones are very susceptible to new development, where model simulations have suggested **additional wells concentrated near high-risk areas will render all nearby wells unusable.**

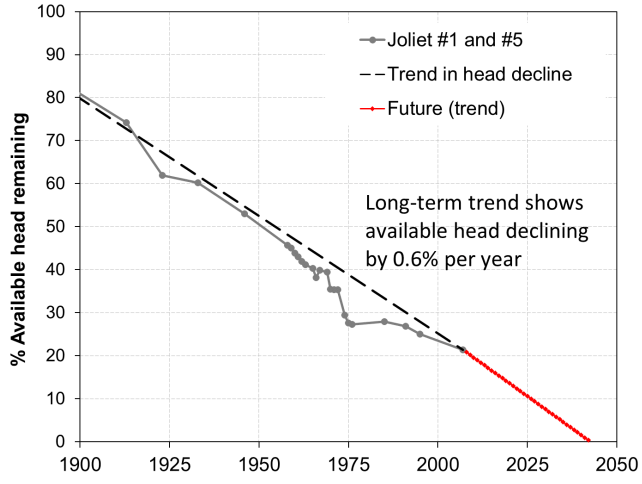

Figure 3. Percentage of available head above the top of the lowermost sandstone aquifer near the center of modern pumping (Joliet wells #1 and #5).

How much?

The ISWS has used a combination of data and modeling techniques to estimate the sustainable withdrawal rate in northeastern Illinois (Figure 4). To ensure the long-term viability of the sandstone aquifers, **withdrawals must be reduced by at least 40%** from the current 98 million gallons per day (mgd) to the sustainable inflow of 59 mgd. Some of this inflow, 12 mgd, is from outside the region, which may become unavailable with new development. **Long term, planners should anticipate the need for a 50% reduction in withdrawals** to the 47 mgd flowing from sustainable sources within northeast Illinois. This target offers the greatest water security for the region.

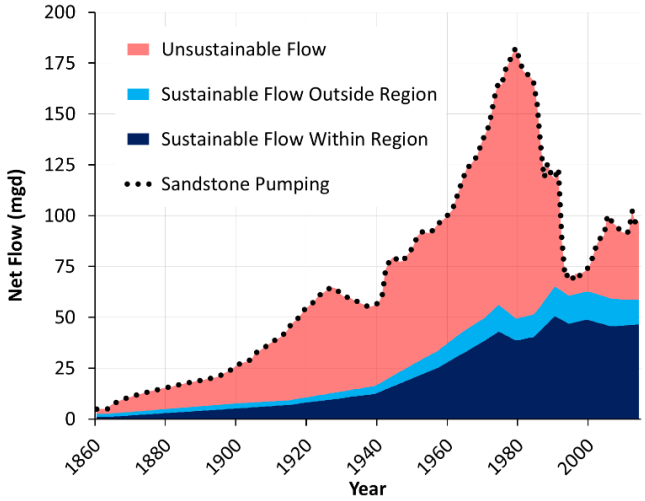

Figure 4. Water originating from a sustainable source both within and outside of northeastern Illinois.

Solutions?

A single entity switching from the sandstone aquifers will not resolve the regional decline in northeastern Illinois; rather, a regional solution will be required. Despite the looming problems in the sandstone aquifers, northeast Illinois is fortunately water-rich, where additional capacity is available from Lake Michigan and the Fox and Kankakee Rivers. Given the rapidly diminishing life span of the sandstone aquifers, coupled with the lengthy process of building infrastructure to accommodate new water sources, **it is imperative that at-risk entities start planning to develop alternative supplies immediately.**

Ongoing monitoring (Figure 1c) and advancements in groundwater modeling at the ISWS have enabled us to address both local and regional problems as they arise. As we improve our understanding of the system, we continue to seek collaboration with counties, municipalities, and industries to enhance these studies. Stay up-to-date on our newest findings at:
http://www.isws.illinois.edu/wsp/