

Source Water Development and Protection: Balancing Demands with Supplies

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Developing a Water Supply

- What is the intended use of the water?
 - Drinking water
 - Manufacturing processes
 - Cooling
 - Irrigation
- What volume is needed?
- What are the quality needs?
 - Regulations: use and discharge
 - Treatment

Water Resources in Illinois

- Illinois is a “water-rich” state
- But Location is important
- Lake Michigan
- Rivers (Illinois, Fox, Kankakee, etc.)
- Reservoirs
 - Federal: Shelbyville, Carlyle, Rend
 - Municipal: Springfield, Decatur, Bloomington, etc.
- Groundwater
 - Bedrock
 - Shallow Sand & Gravel (glacial)
 - Generally lower treatment costs



Lake Michigan



- Almost all of Lake Michigan water used in Illinois is transferred to the Illinois River watershed
- 1967 Supreme Court Decree (amended in 1980) limits Illinois' diversion from Lake Michigan to 3,200 cubic feet per second (2.07 billion gallons per day)
- The Illinois Lake Michigan Water Allocation Program was developed to manage Illinois' diversion; managed by IDNR Office of Water Resources

Public Water Supplies: Surface Water Sources



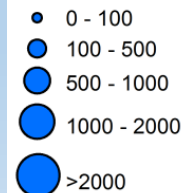
Power Generation

- Major water use in Illinois
- Mostly non-consumptive

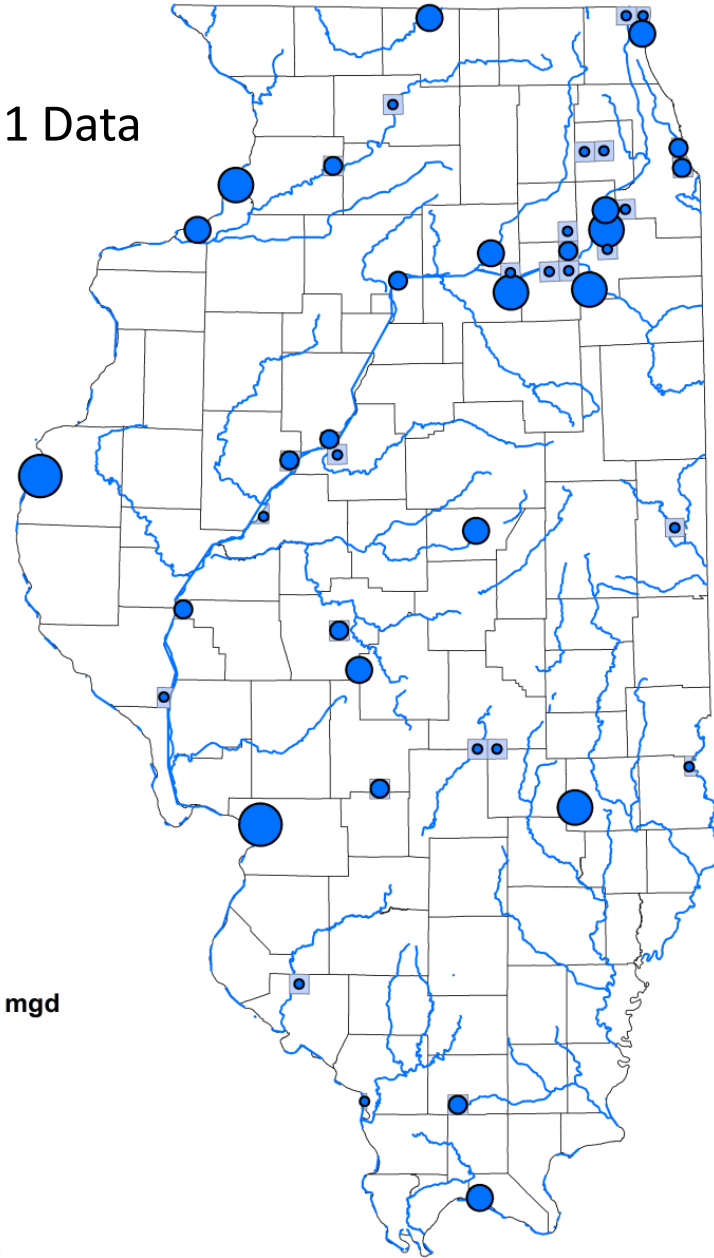


2011 Data

Withdrawals, mgd



— Major Rivers



Aquifers in Illinois



Deep Bedrock

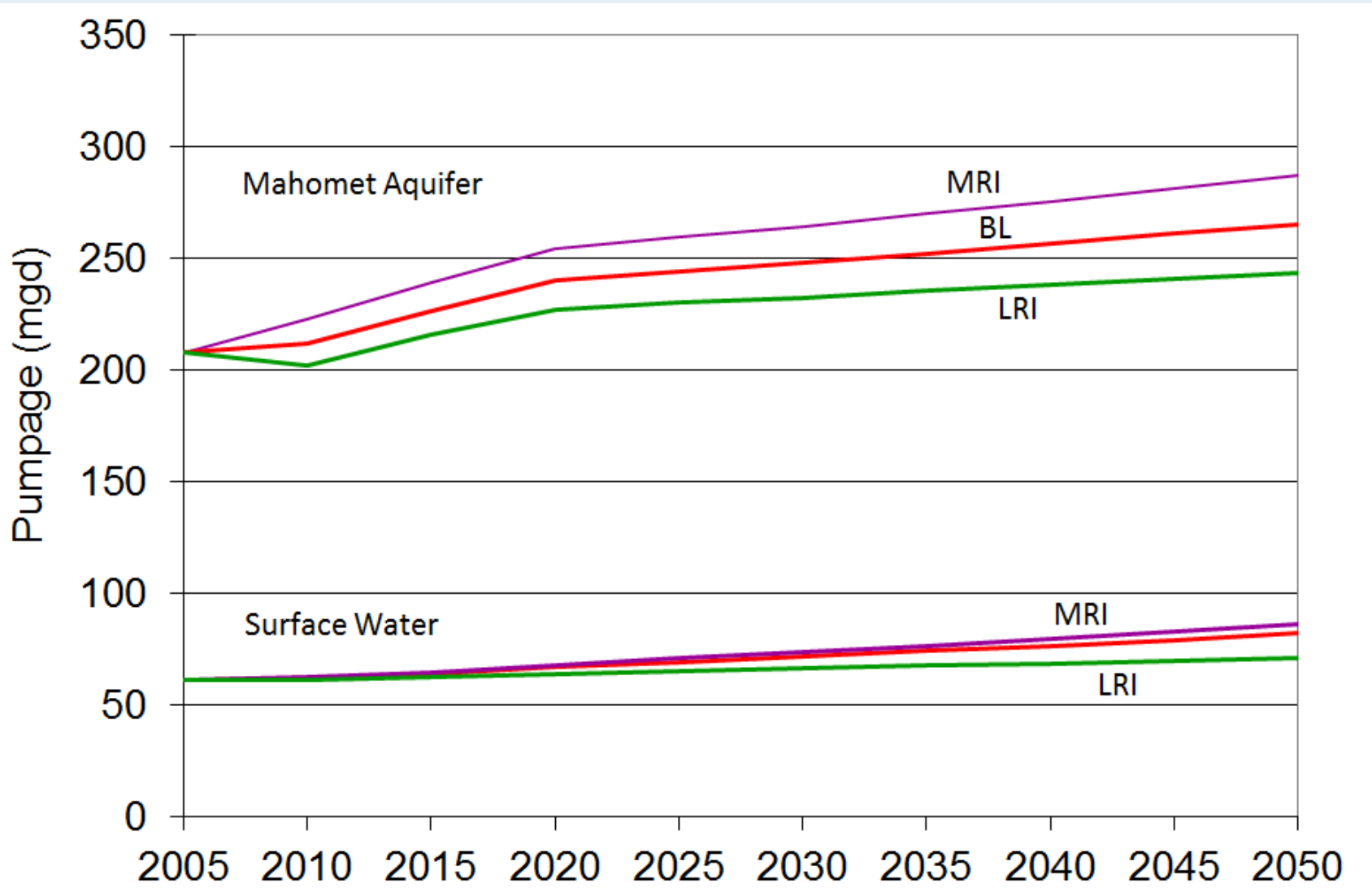


Shallow Bedrock



Sand & Gravel

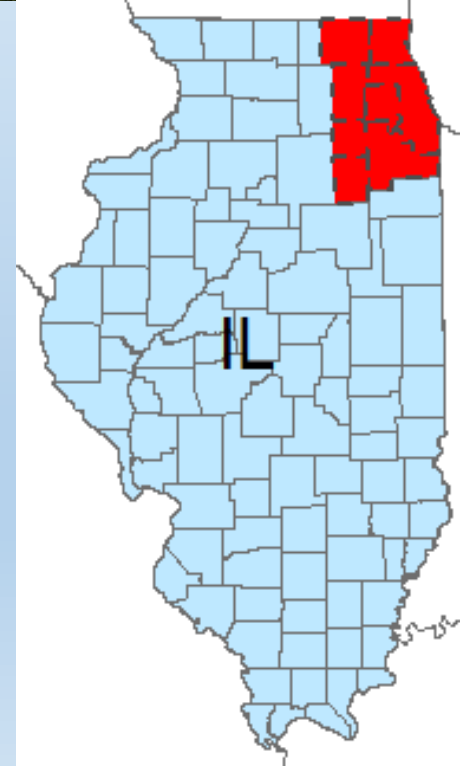
Water Demand Projections



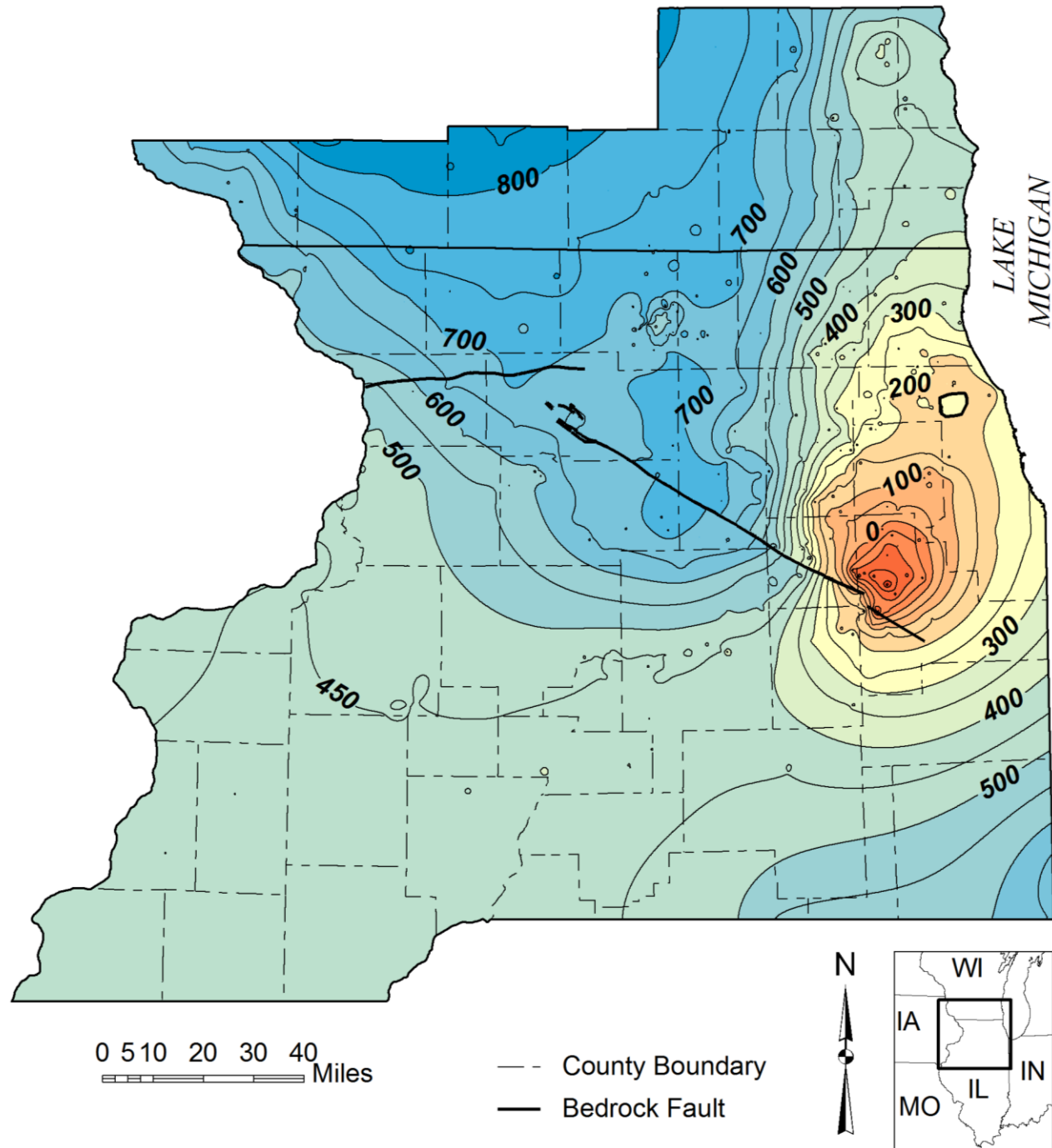
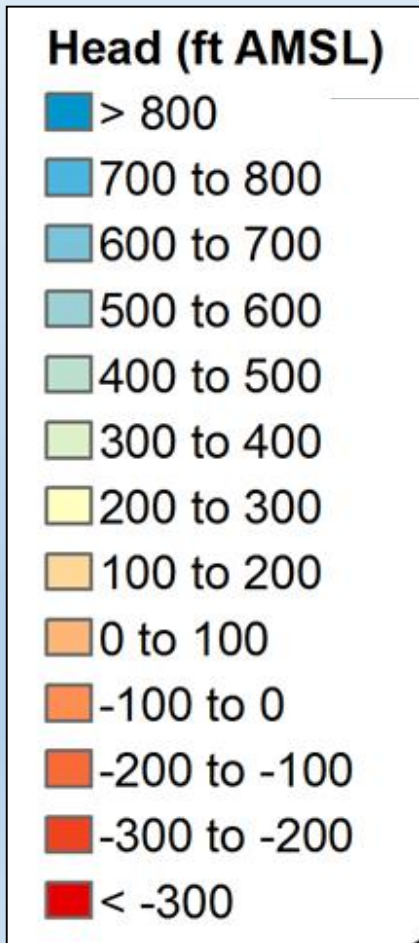
Looming Water Supply Crisis in Southwestern Suburbs of Chicago



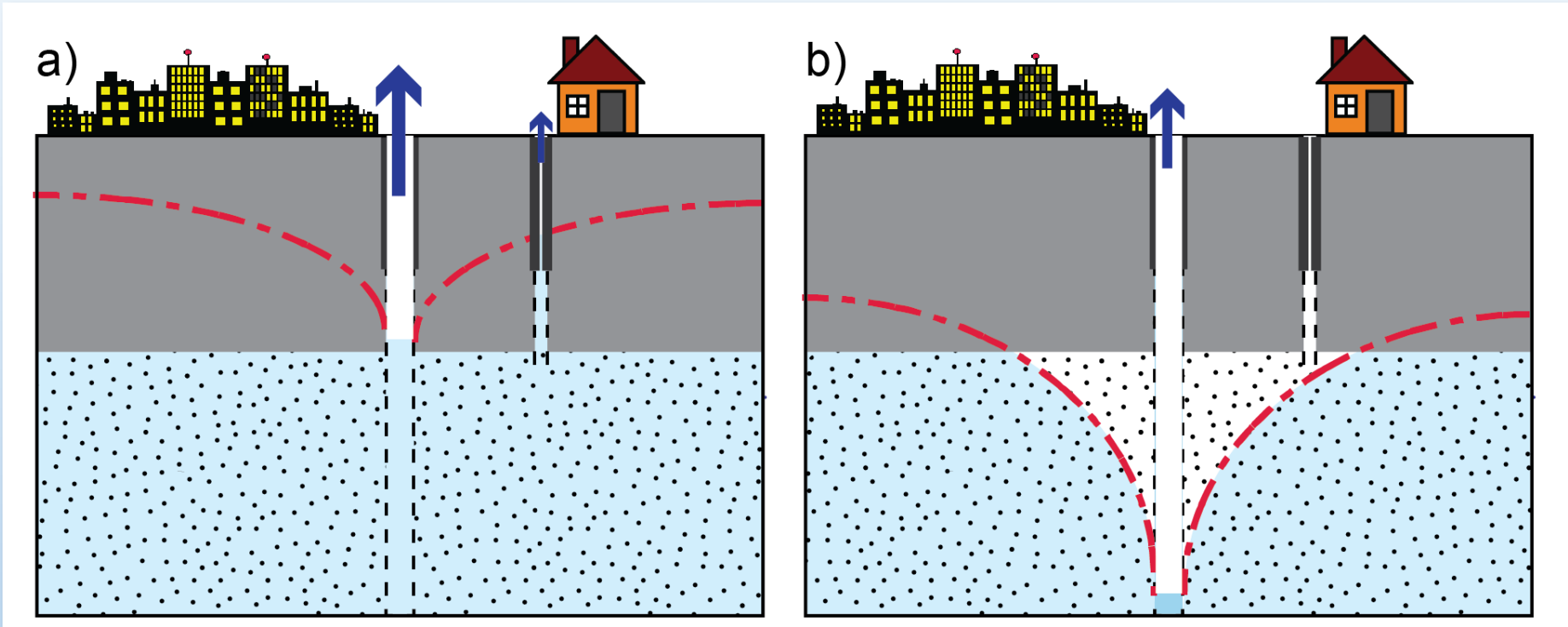
- Sandstone aquifers are the primary water supply for communities in northern Will and Kendall Counties, but current withdrawals are unsustainable
- The sandstone aquifer in northern Will and Kendall Counties will not be a viable source of water in the next 15-25 years



2014 Water Level Surface

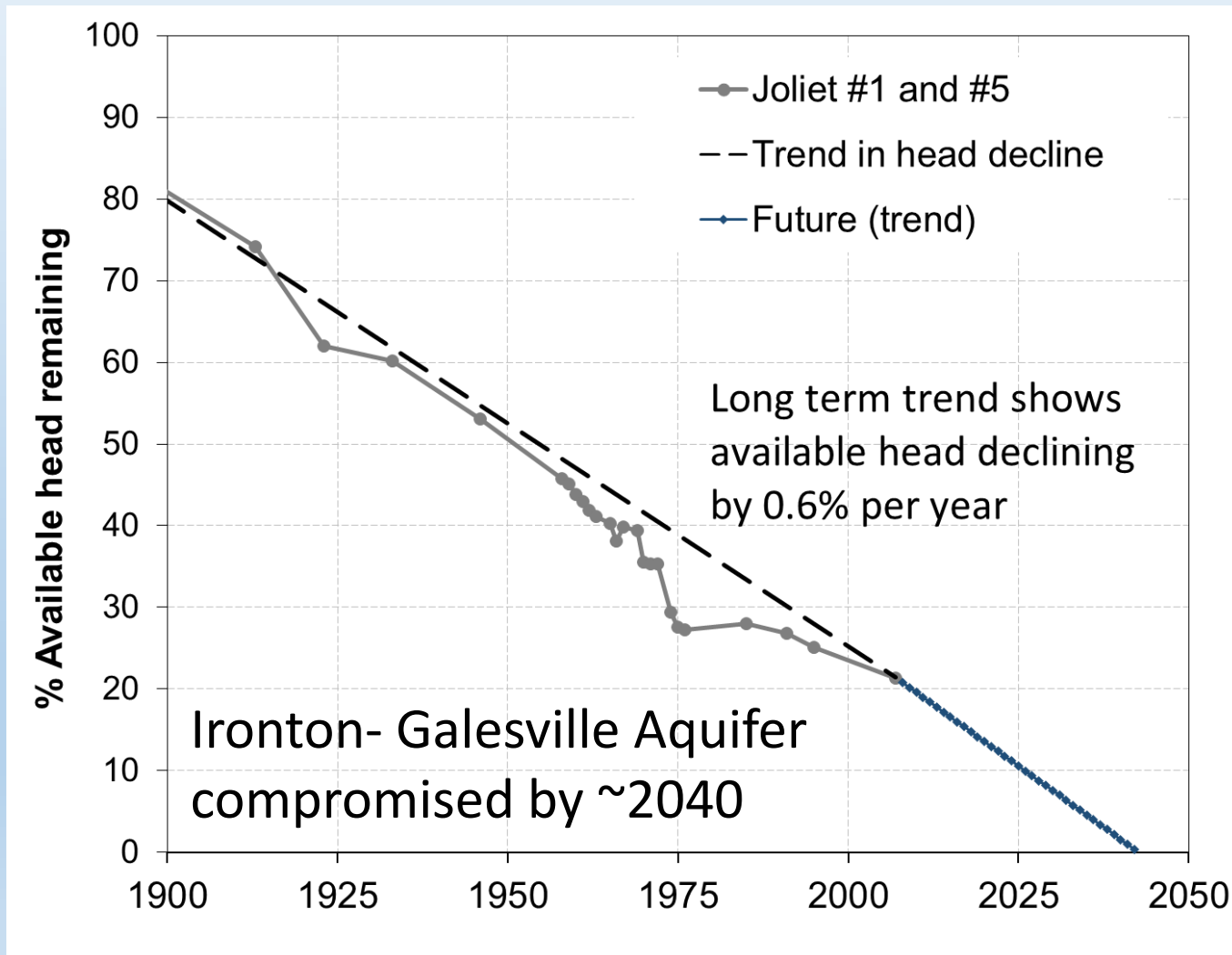


Desaturation of Aquifer

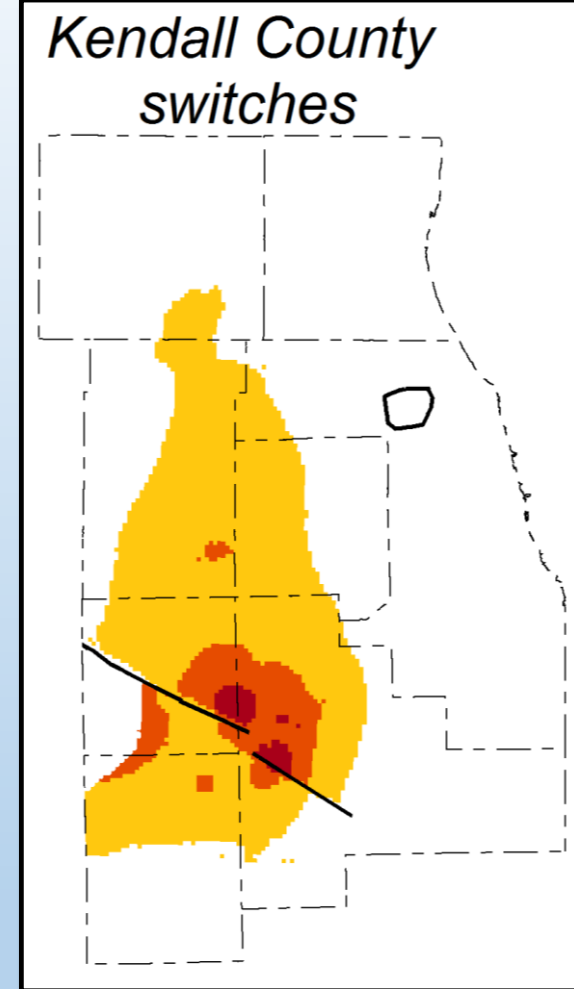
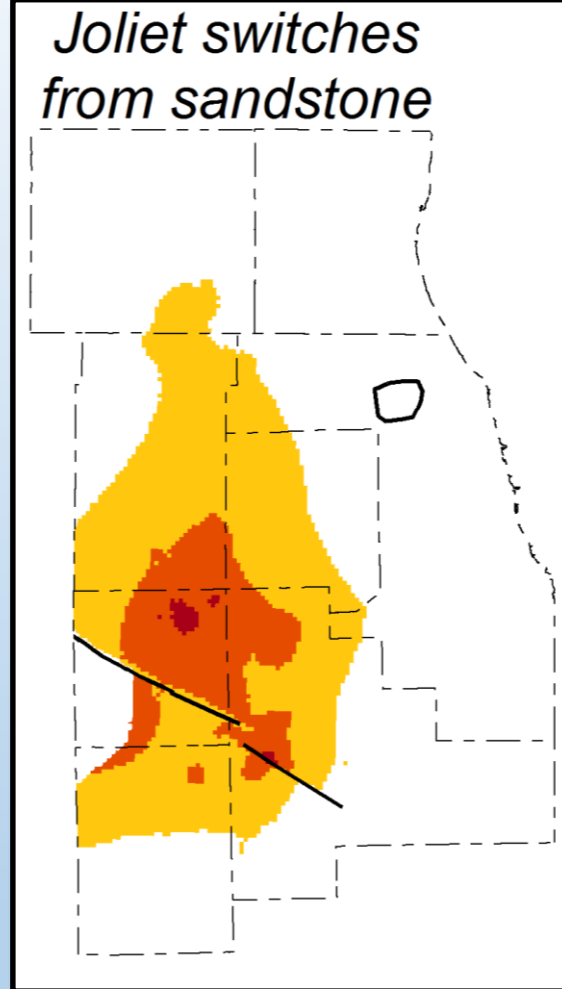
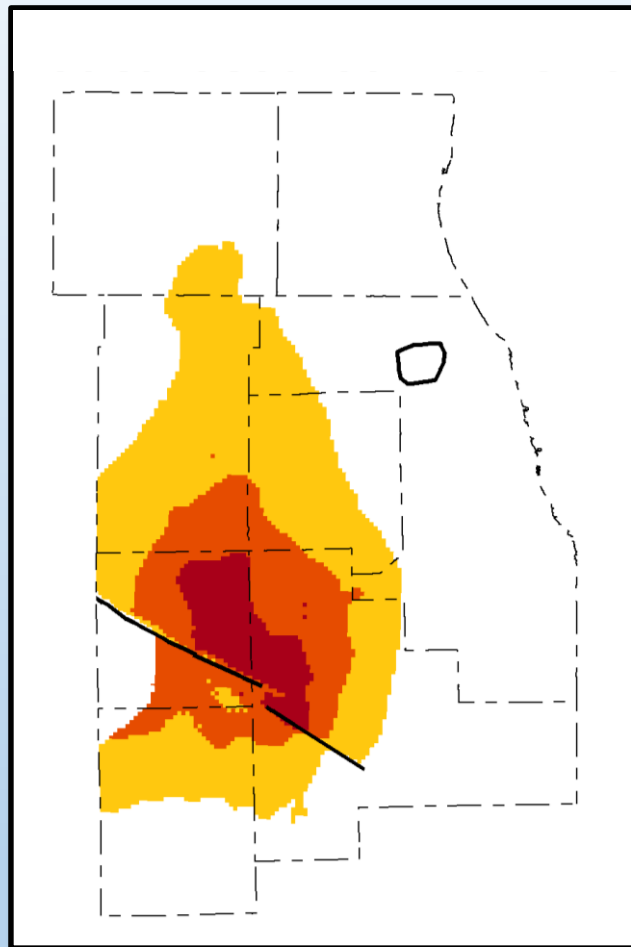


- Lost well capacity (including dry wells)
- Caving potential (well pumps sand)
- Possible water quality impacts

Data trends in the Joliet Region Indicate Shortfalls in 15-25 Years



Model Simulations

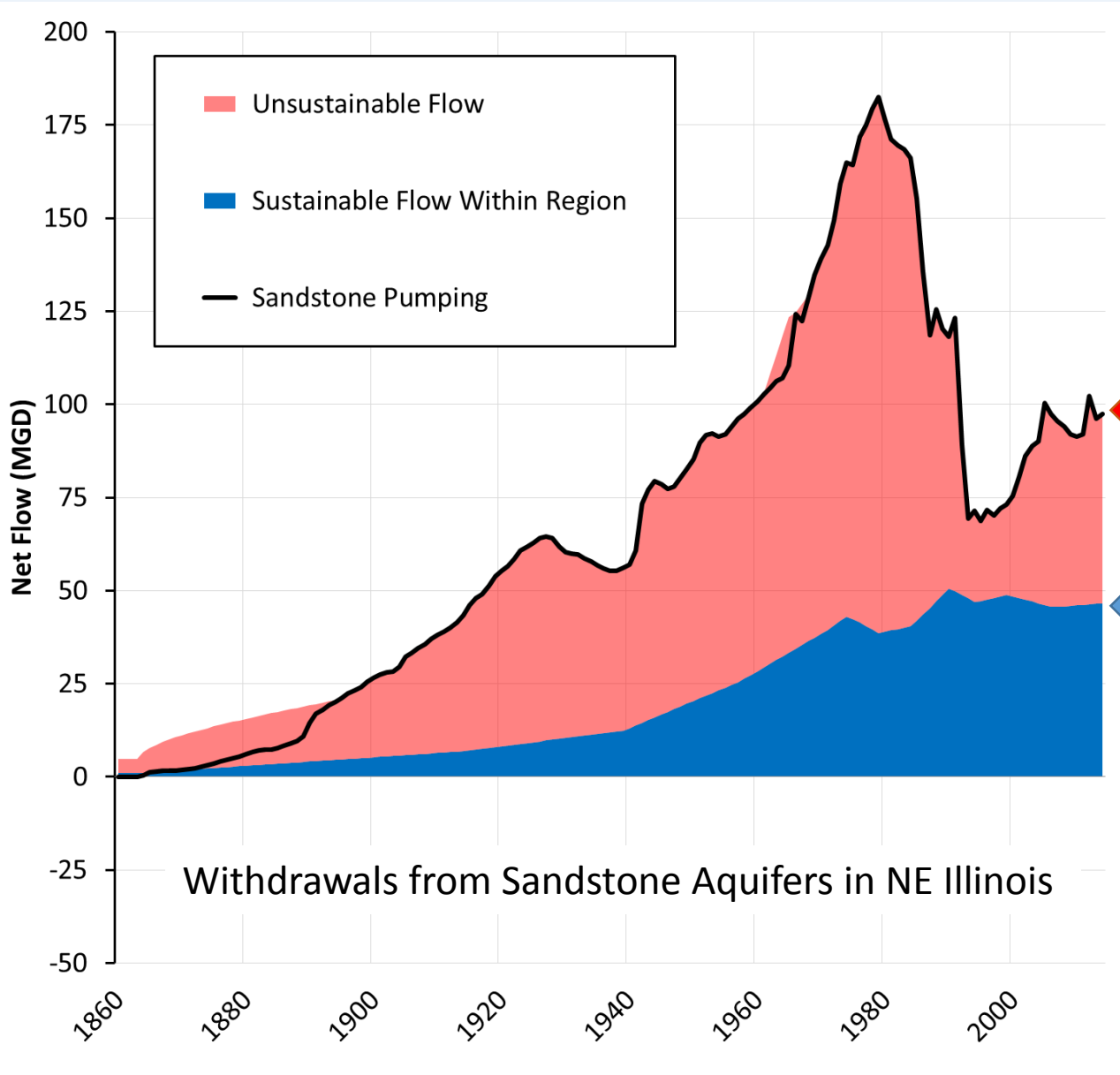


2050 risk zones (St. Peter)

- Partial desaturation (pumping)
- Partial desaturation (non-pumping)
- Complete desaturation

- - County Boundary
- Bedrock Fault

What is Sustainable?



Current Withdrawals:
Approx. 100 million
gallons per day (Mgd)

**Current Sustainable
Pumping Rate:**
Approx. 50 Mgd

Bottom Line

- **Both data trends and groundwater flow models indicate that the sandstone will only be a viable source of water for the next 15-25 years at the center of the cone of depression**
- **Alternative supplies will be necessary**
- **A regional problem**

Switching Water Sources

- Generally takes a fairly long time, sometimes a decade or longer
- Expensive due primarily to infrastructure costs
- Political resistance to raising water rates and/or taxes
- Recent negative example of Flint, MI

Potential Options

- Shallow aquifers
- Lake Michigan allocation
- Rivers (Fox and Kankakee)



Problems with Lake Michigan

- Currently under our Supreme Court mandated limit, water is available
- New infrastructure: pipeline
- Water rates: communities don't want to lose control of pricing, which is set by Chicago



Problems with Rivers

- Low flow restrictions
- New infrastructure: surface water is more difficult to treat than groundwater
- Water quality issues
 - Much flow can be treated wastewater
 - Algae and bacterial compounds (taste & odor)
 - Road salt runoff



Groundwater Depletion in Chicago's Southwestern Suburbs

Devin H. Mannix, Daniel B. Abrams, George S. Roadcap, Daniel R. Hadley, and Walton R. Kelly

Why?

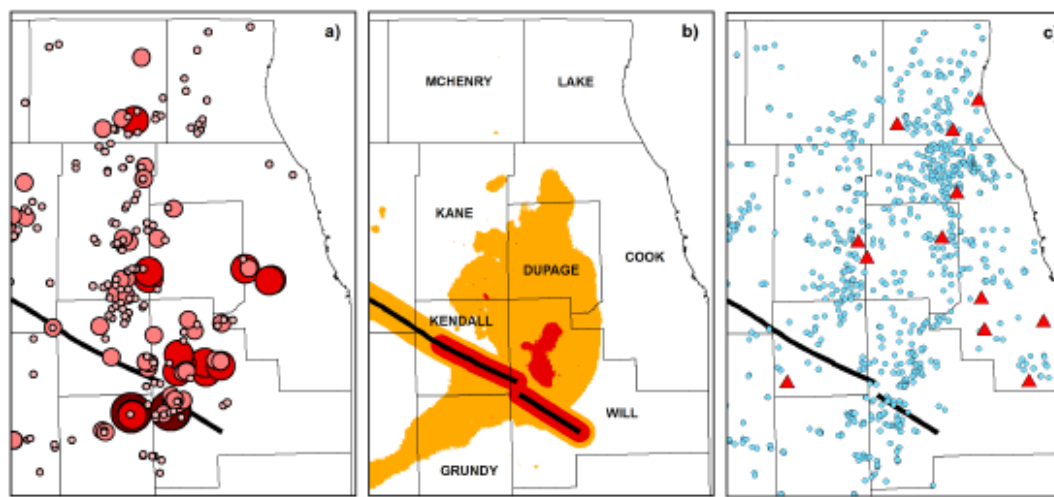
Sandstone aquifers in Illinois have been important sources of water for municipalities and industries since the mid-1800s, and remain important in Will, Kendall, Kane, and McHenry Counties (Figure 1a). Long-term withdrawals have resulted in declining groundwater levels (also known as heads), with the 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.



Thank You



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