

Surface Water and Groundwater Supply Planning and Data Resources in Illinois

Walt Kelly

Groundwater Science Section

Jason Zhang

Hydrology and Hydraulics Section



ILLINOIS STATE
WATER SURVEY

PRAIRIE RESEARCH INSTITUTE



ILLINOIS

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Regional Water Supply Planning

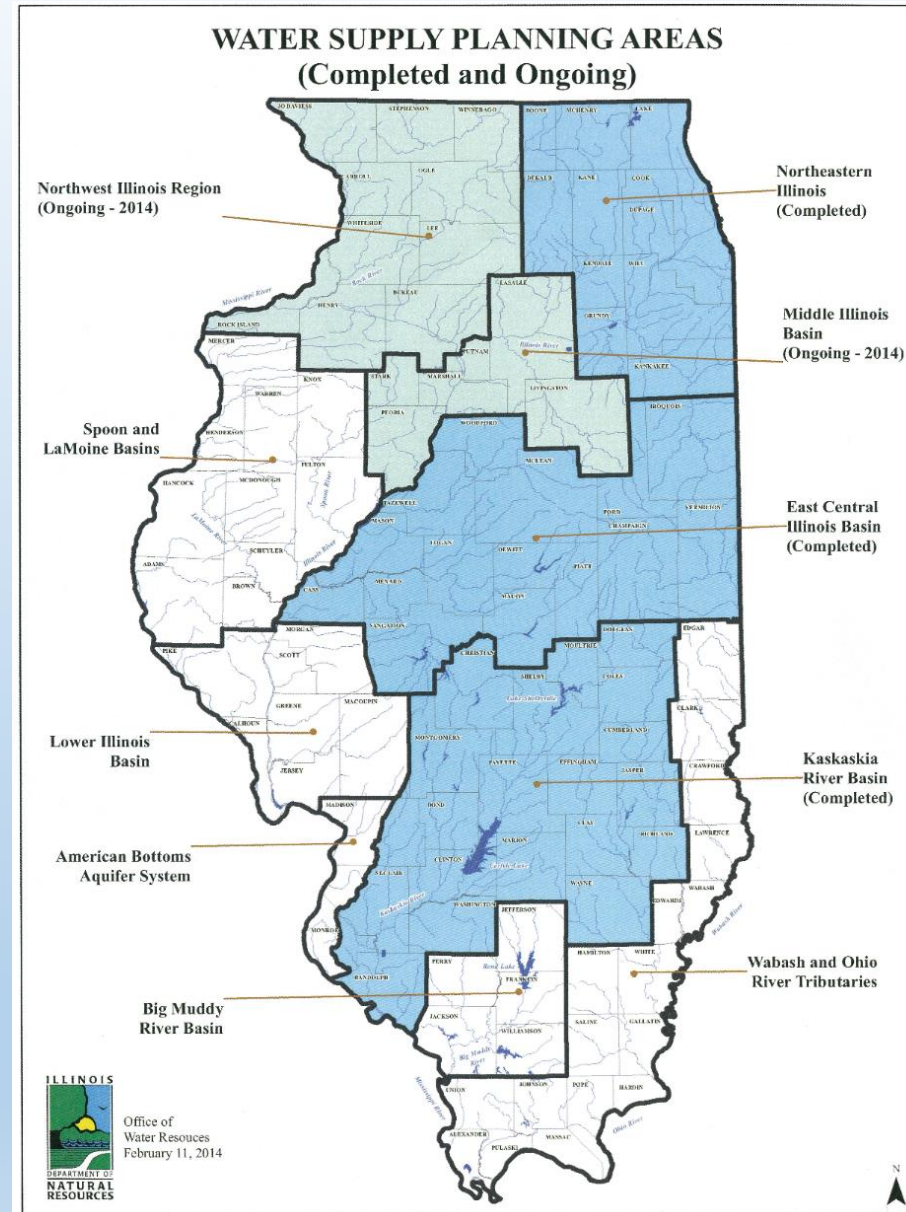


- Ensuring there are adequate and reliable supplies of clean water for all users at reasonable cost
- Two foundations required
 - Knowledge of available water supply [PRI: ISWS and ISGS]
 - Forecasts or scenarios of future water demand [PRI and RWSPCs]
- Regional water supply planning committees responsible for developing water demand scenarios (to 2060)
- IDNR-OWR provides oversight and funding



10 Water Supply Planning Regions

- 3 regions “completed”:
 - Northeastern Illinois
 - East-Central Illinois
 - Kaskaskia River Basin
- Middle Illinois, Kankakee, and Rock River Basins currently under study



Final Products: Regional Water Supply Plans and Scientific Reports

- Regional plans developed to guide planners and water supply entities and contain:
 - Currently available and possible future water supply
 - Water-demand scenarios
 - Water supply deficits or conflicts
 - Possible options for water supply/demand management to meet future water needs
- PRI produces companion scientific reports
- Water supply planning is never finished; should be updated periodically

A Plan to Improve the Planning and Management of Water Supplies in East-Central Illinois

This report has been a collaborative, joint effort organized by the Mahomet Aquifer Consortium and numerous other individuals including the following stakeholders:

Bradley Ulmer (Chair): Public; Jeff Smith (Vice Chair): Agriculture; Shannon Allen: Soil and water conservation; Maria Bell: Water utilities; Duane Stegeman: Environment; Robert Knechtberger: Small business; Frank Dunlavey: Rural water districts; Jay Henry: Electric generating utilities; Evelyn Heaver: Counties; Mark Sheppard: Industries; William Smith: Municipalities; Steve Wingman: Water utilities



Chicago Metropolitan Agency for Planning
CMAP

Water 2050

Northeastern Illinois Regional Water Supply/Demand Plan

Kaskaskia Basin & Vicinity 2050 Water Supply Assessment and Recommendations

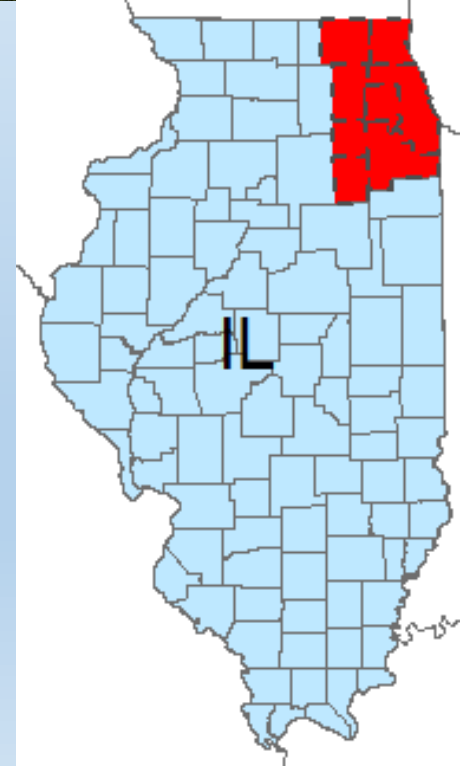
Kaskaskia Basin Water Supply Planning Committee

December 2012

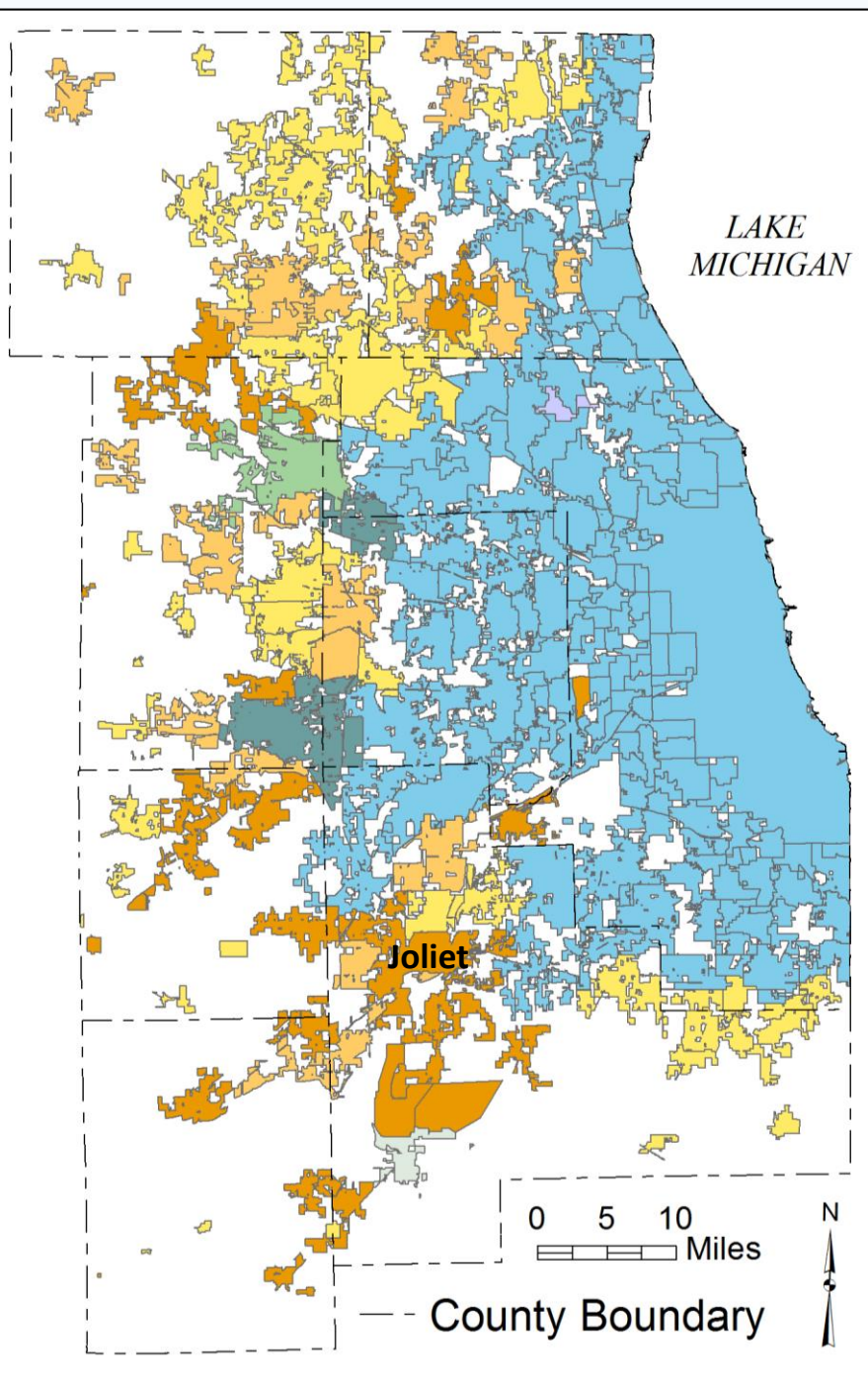
Looming Water Supply Crisis in Southwestern Suburbs of Chicago



- The sandstone aquifer in northern Will and Kendall Counties will not be a viable source of water in the next 15-25 years
- Many communities and industries will be forced to find alternative supplies within that time frame



Sources of Community Water Supplies



Groundwater (GW)

■ Sandstone

■ Sandstone (Partial)

■ Shallow Bedrock/Glacial

Surface Water

■ Lake Michigan

■ Fox River

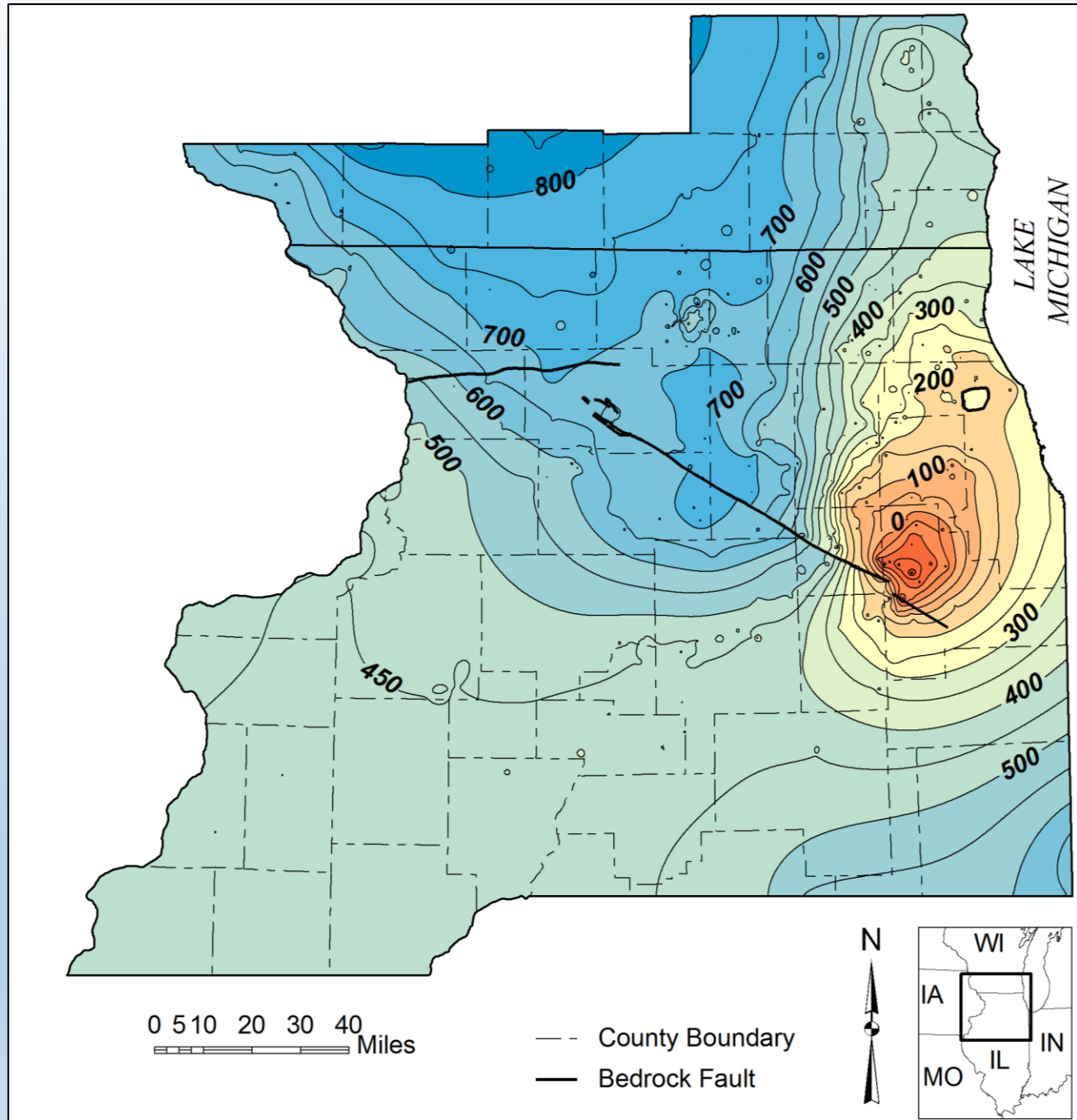
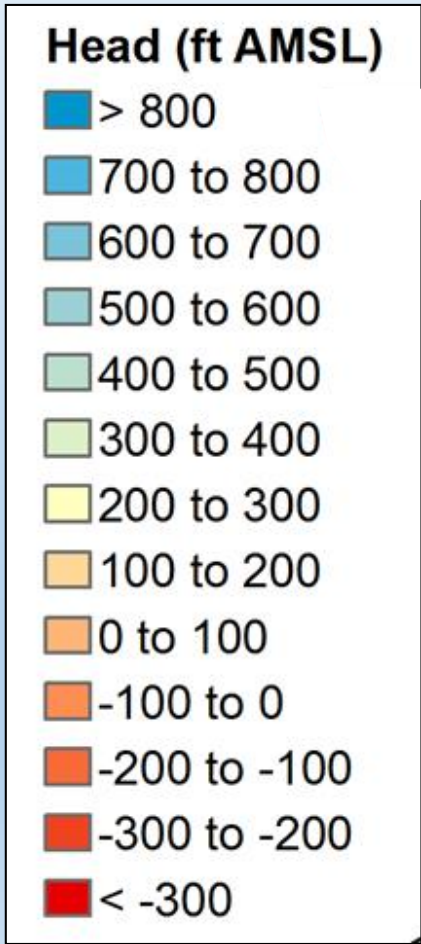
■ Kankakee River

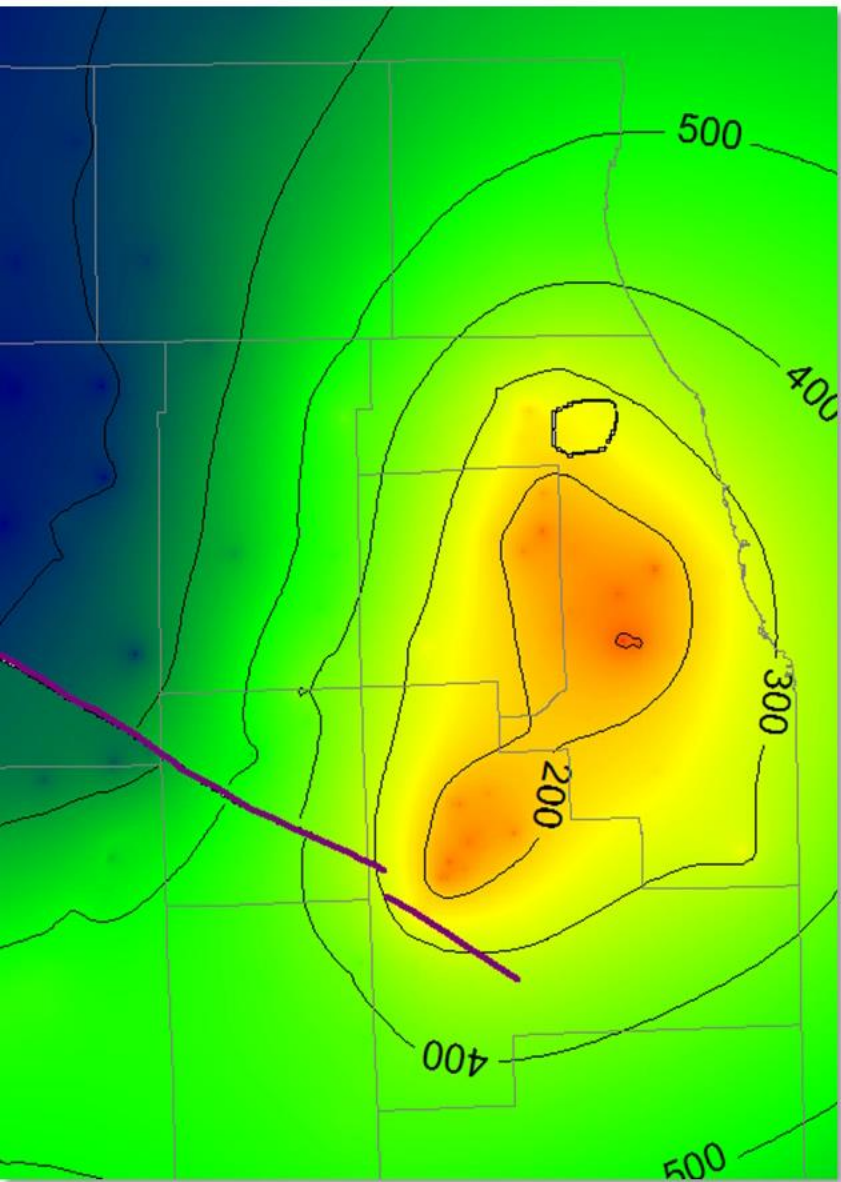
Mixed Sources

■ Fox River/GW

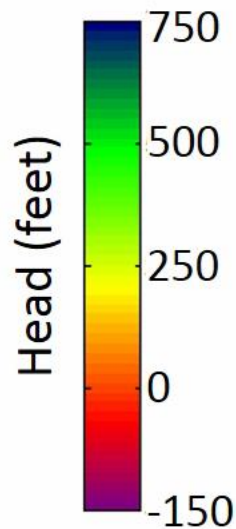
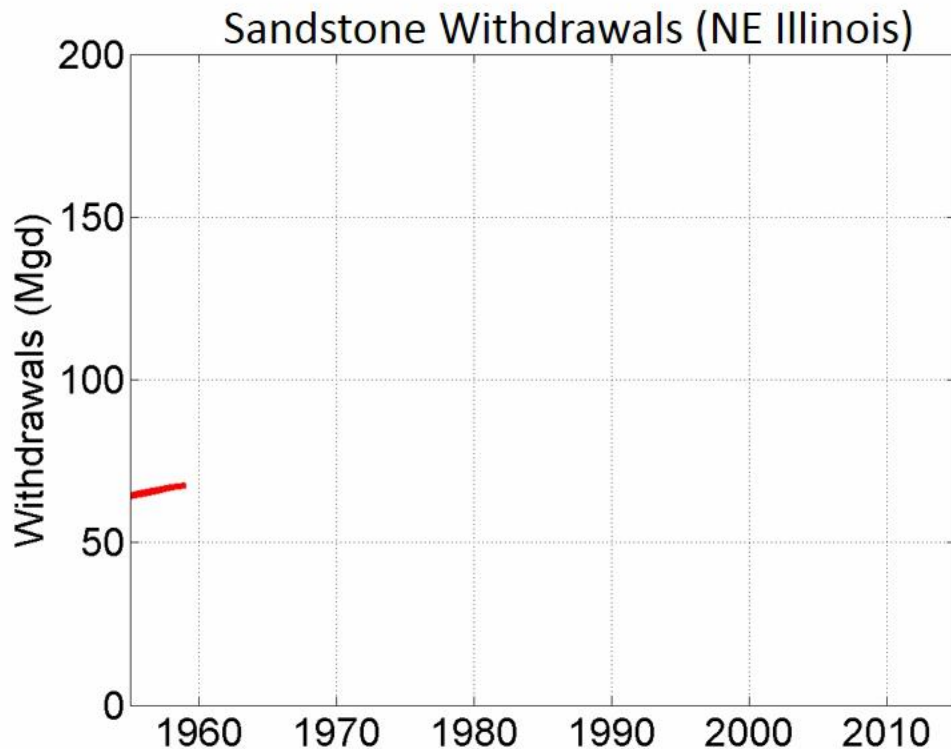
■ Lake Michigan/GW

2014 Potentiometric Surface





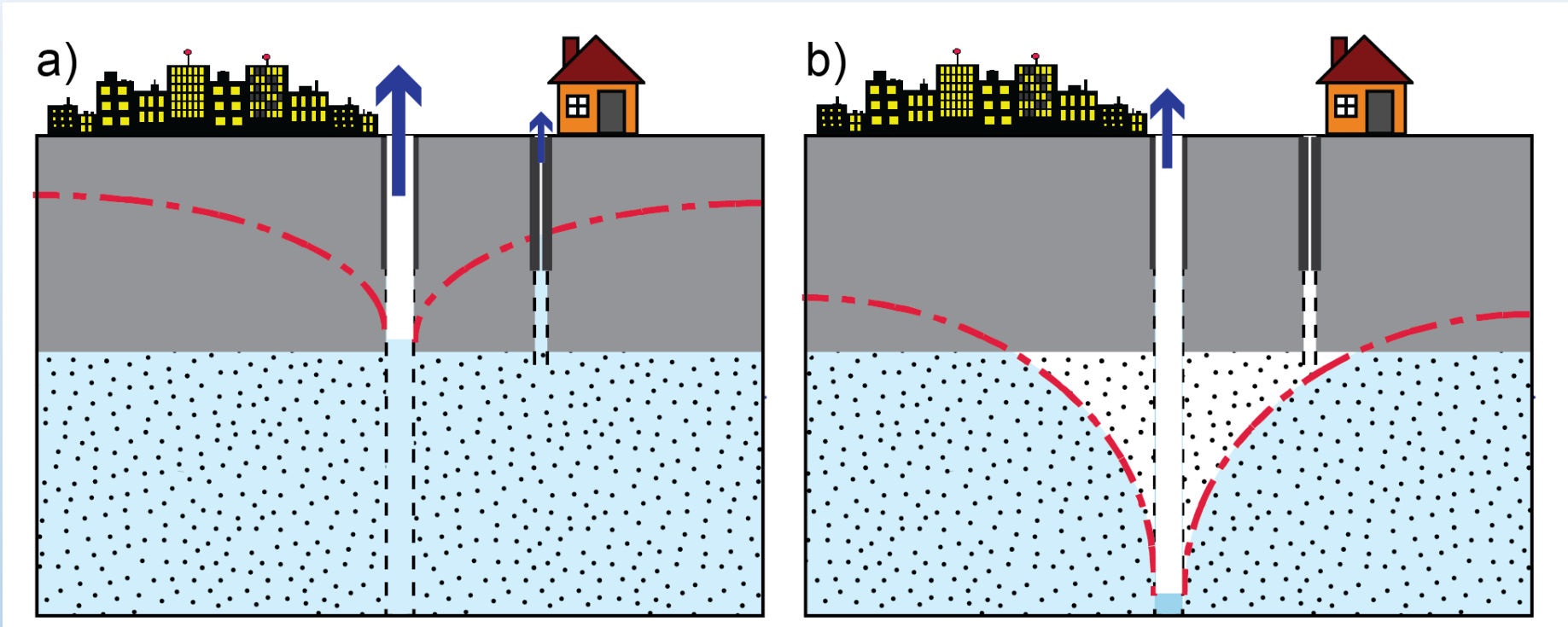
1959



ILLINOIS STATE
WATER SURVEY
PRAIRIE RESEARCH INSTITUTE

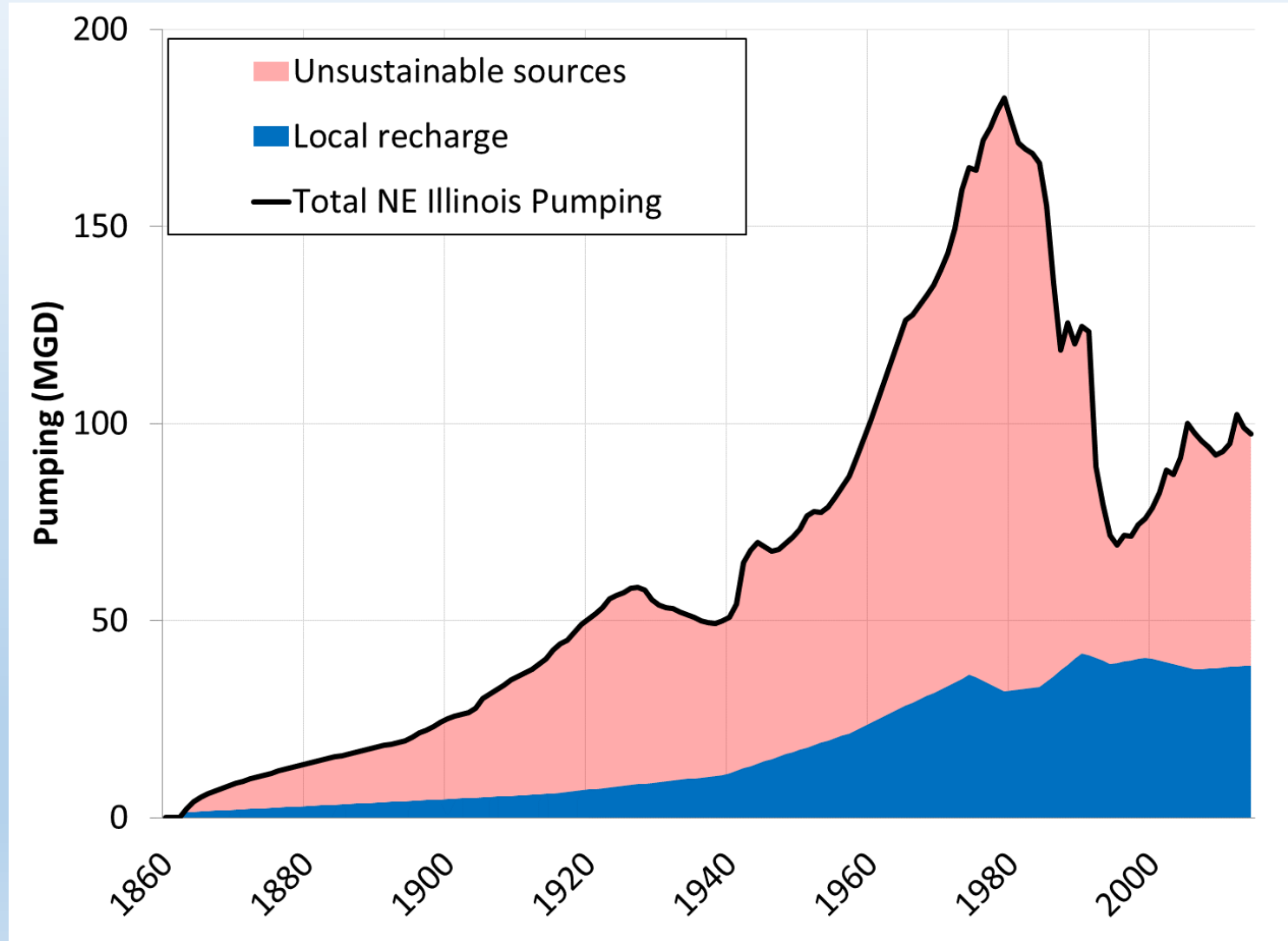
ILLINOIS

Desaturation of Sandstone

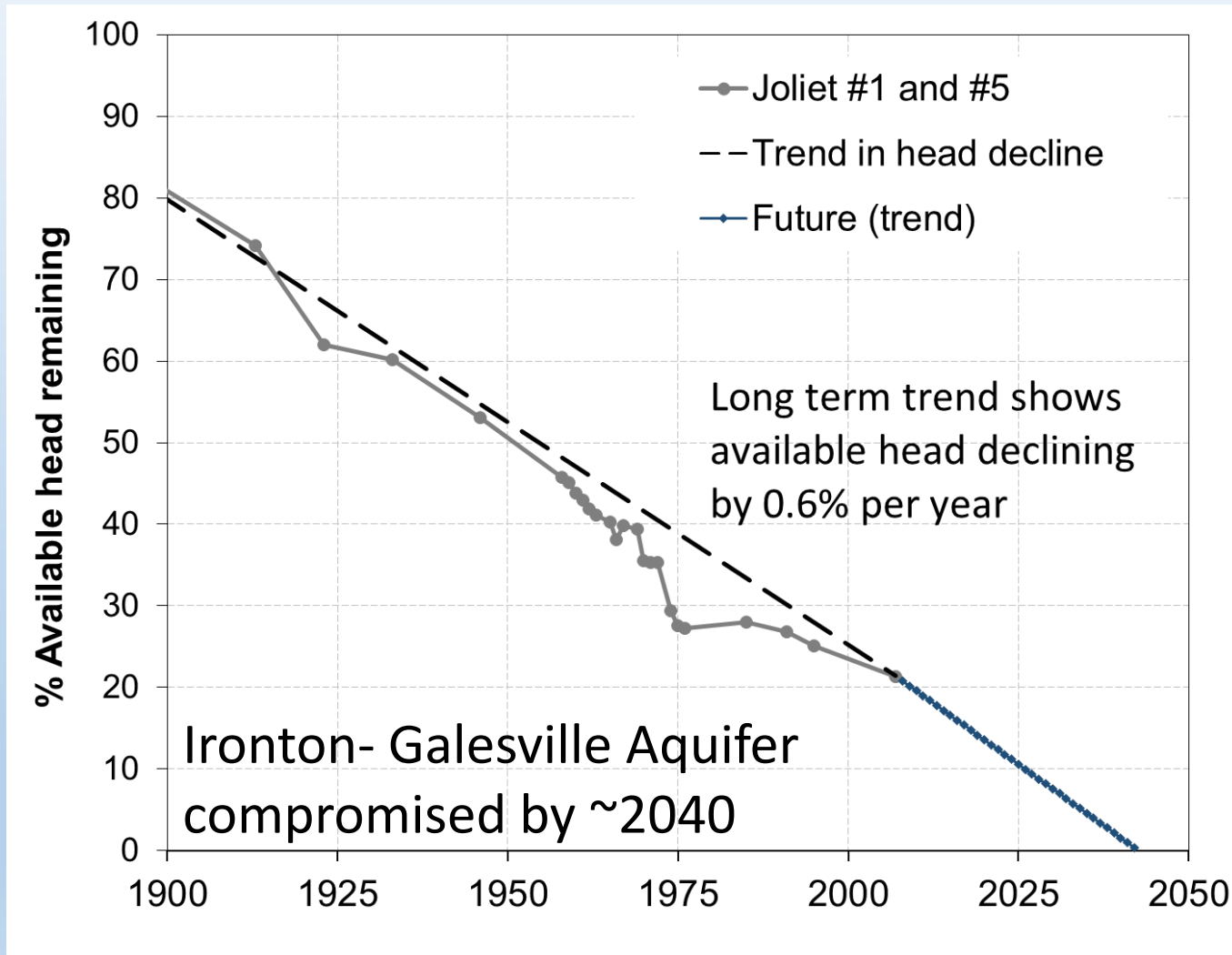


- Lost well capacity (including dry wells)
- Caving potential (well pumps sand)
- Possible water quality impacts

Water from Sandstone Aquifers in NE Illinois: 60% Unsustainable



Data Trends in the Joliet Region

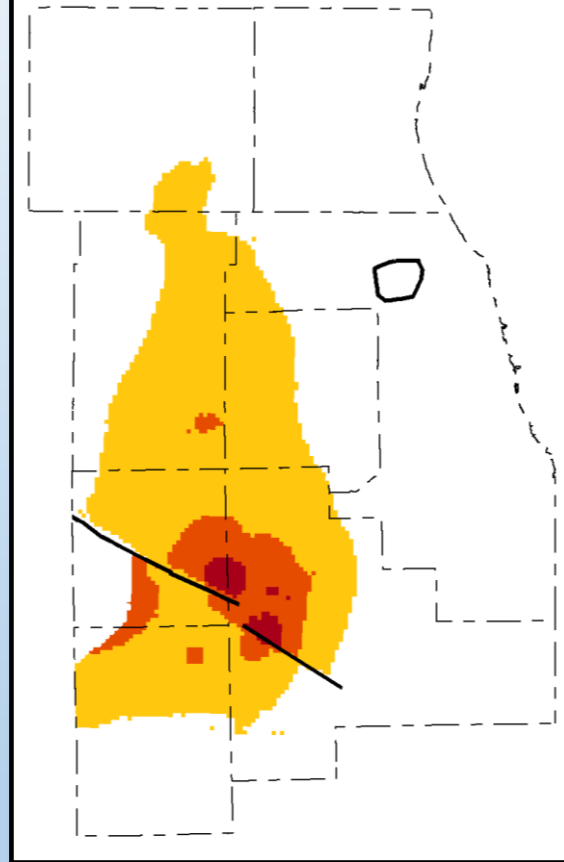
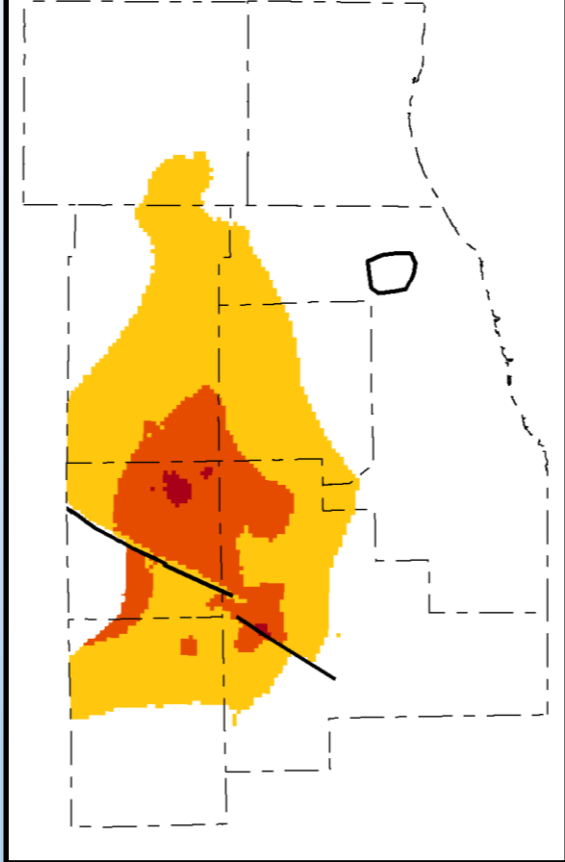
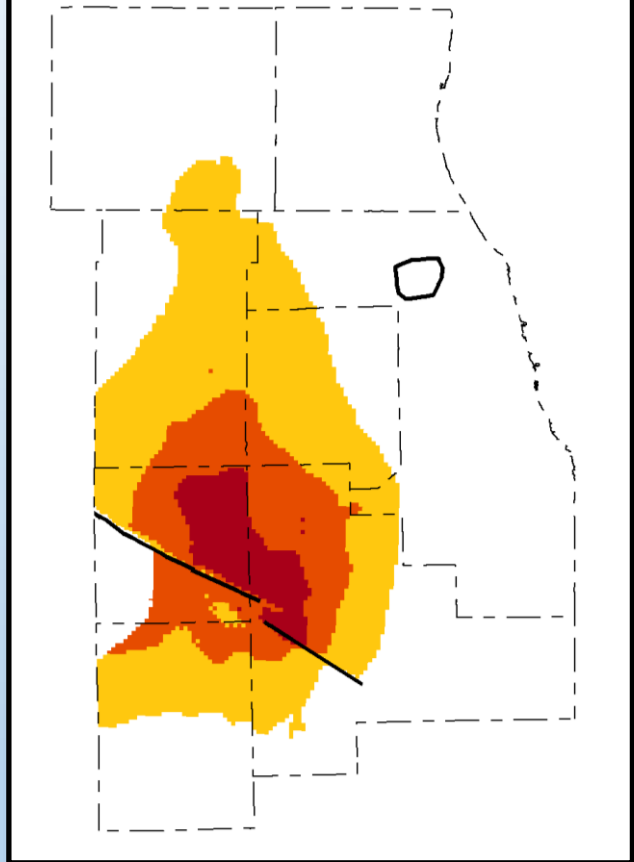


Model Simulations

Least resource intensive

Joliet switches from sandstone

Kendall County switches



2050 risk zones (St. Peter)

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

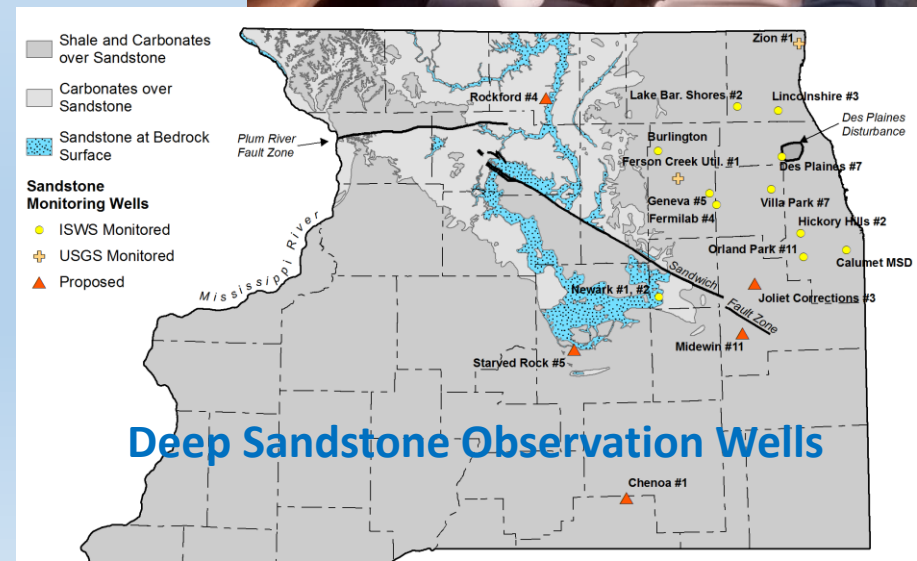
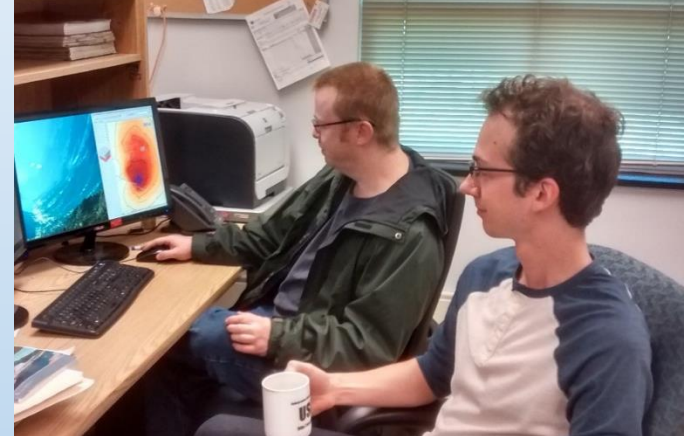
- County Boundary
- Bedrock Fault

Bottom Line

- **The sandstone aquifers 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**
 - **Most likely alternatives are rivers (Kankakee and Fox)**
 - **There is water available from Lake Michigan**
 - **Unconventional options**
 - **Water reuse (gray water)**
 - **Aquifer storage and recovery**

Ongoing ISWS Activities in Region

1. Collect water level data
2. Update groundwater flow model
3. Compile well construction and rehabilitation information
4. Water withdrawal data
5. Technical assistance
6. Public outreach



ISWS Proposing Partnerships with Stakeholders

Comprehensive regional planning for future water supply, accounting for both surface water and groundwater

Three phases:

1. Data collection: Withdrawals, water levels, water quality
2. Data analysis: Determine temporal and spatial trends in demands and impacts
3. Groundwater and surface water flow modeling: Evaluation scenarios

Illinois Streamflow Assessment Model (ILSAM)

- ILSAM produces streamflow statistics that are
 1. Representative of long-term climatic condition
 2. Accounting for man-made modifications such as reservoirs, water withdrawals, and effluents
- ILSAM has a web application version and desktop version
- ISWS will upgrade ILSAM to GIS-based web application

Illinois Streamflow Assessment Model (ILSAM)

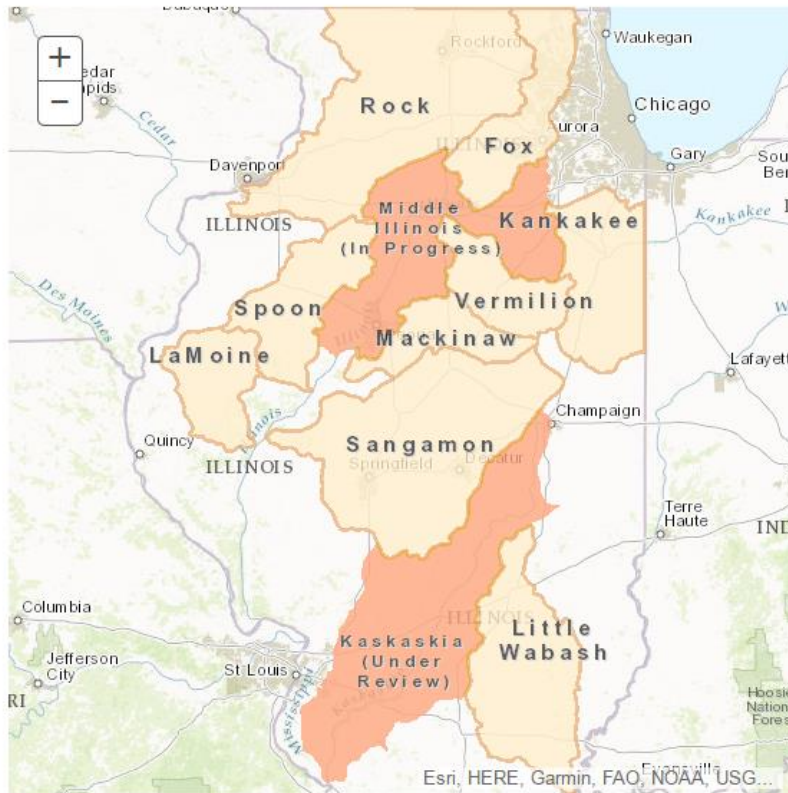
Step 1 Instructions for Selecting a Location:

1. Choose a watershed from the list below or click on a watershed in the map.
2. Select a stream from the list or click on a stream in the map.
3. Pick a mile from the list or click on a mile point in the map. Alternatively, enter a mile in the box provided.
4. Click the "Continue" button to choose a flow parameter, and then view data on that location.

Select a Watershed ▾

Select a Stream ▾

Select a Mile ▾



or

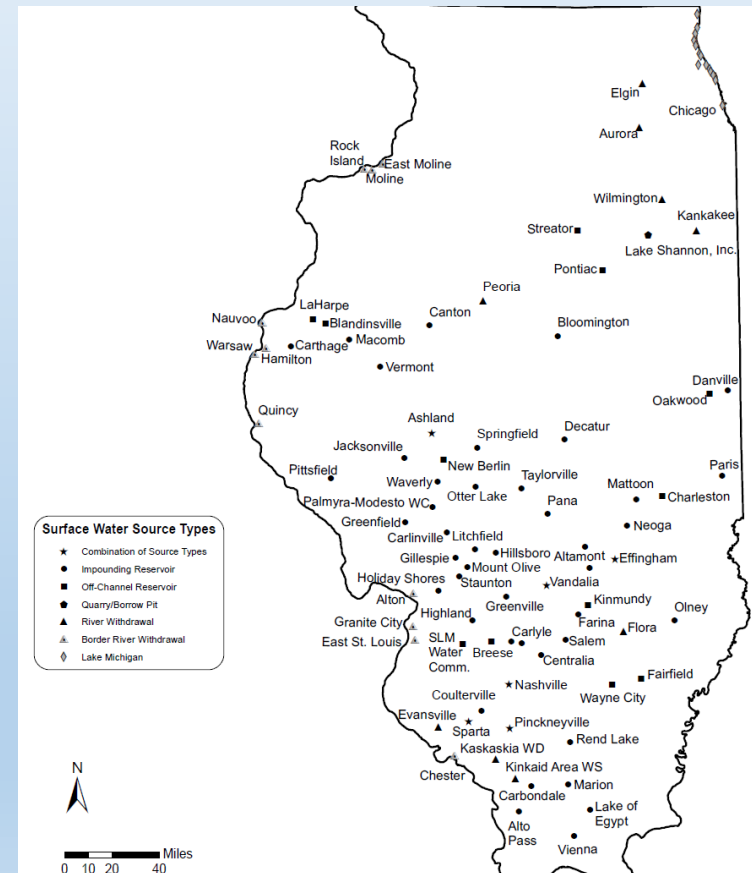
Enter a River Mile:

Continue

Reset

Surface Water System Vulnerability

- Systematically assess surface water PWS vulnerability
- Surface water systems are classified as adequate, at risk, and inadequate based on safe yield analysis
- Provide scientific basis for allocating resources of monitoring and managing surface water system

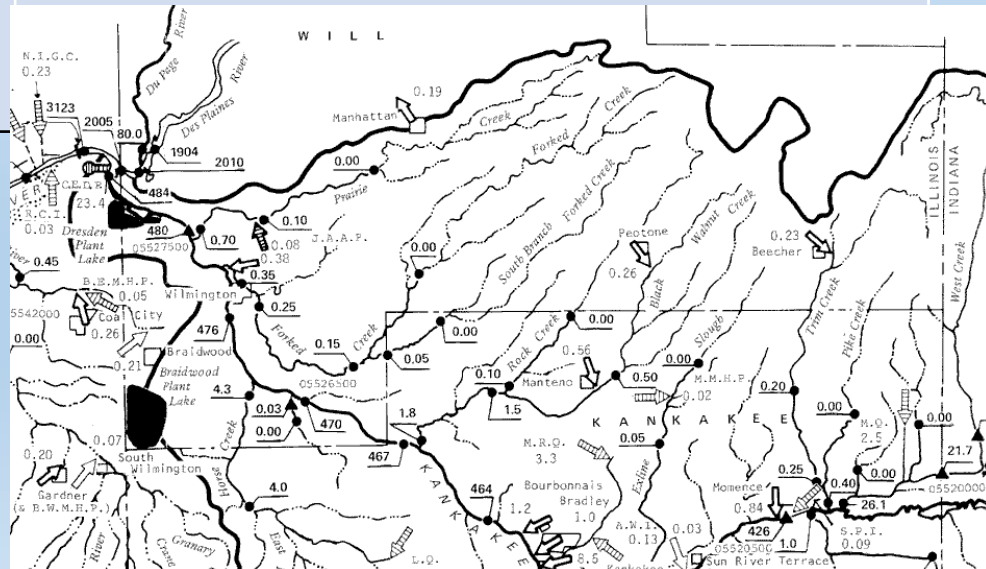


Water Supply Lakes Monitoring

Reservoir	Normal pool (feet)	Difference from normal (feet)	Monthly change (feet)	Years of record	April reported pumpage (mg)
Altamont	582.0	-0.1	-0.4	33	6.2
Bloomington	719.5	0.2	-0.3	30	N/A
Carlyle	445.0	5.7	4.7	39	N/A
Decatur	614.3	0.2	0.0	33	912.9
Evergreen	720.0	-0.1	-0.9	26	N/A

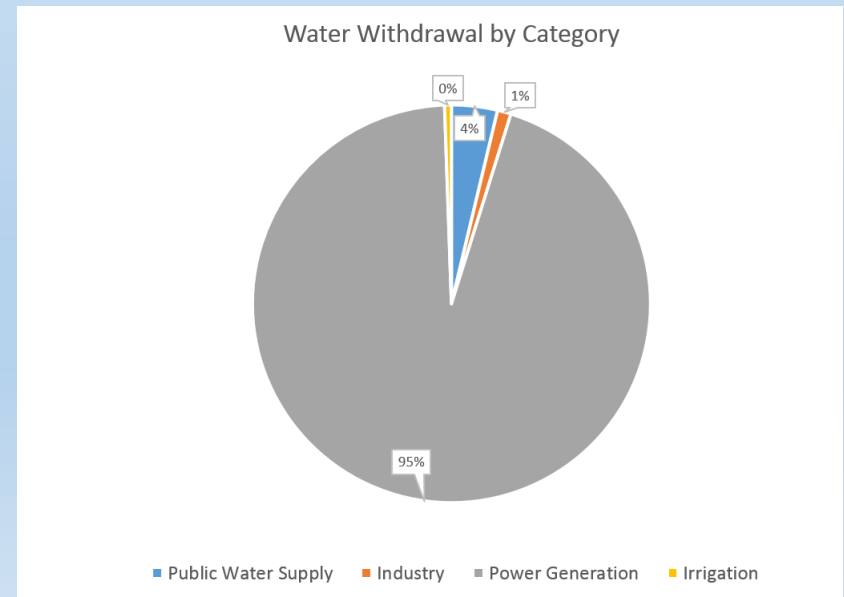
7-day-10-year ($Q_{7,10}$) Maps

Region	Year updated
NE Illinois	2003
Rock River, Sangamon, Kaskaskia, Little Wabash	2002
Kankakee, Spoon River, La Moine, Embarras, Southern Illinois, Illinois and Border Rivers	1988



Water-Energy Nexus Resilience

- Power generation is the largest user of water
- Both water and energy demand peak in summer when water availability is low
- Characterize water demand by power plants
- Analyze water-energy nexus resilience for a range of climate scenarios



Groundwater Data Housed at ISWS

- Water well construction reports/driller's logs
- Water well permits/applications (since 1997)
- Well sealing forms (since 1980)
- Field inventory notes
 - 1930s statewide
 - Selected local studies subsequently
- Water level measurements
- Pumping tests
- Water quality analyses (ISWS, IEPA)
- Illinois Water Inventory Program (IWIP) annual water use survey
- Community Water Supply (CWS) inspection reports
- Historic community reports



ISWS Groundwater Databases

- Well records inventory
 - 422,000 well records, mostly private (active and abandoned)
 - IWIP (high-capacity) wells database; > 11,000 at active facilities
 - 275,000 wells info scanned
 - 333,000 pages scanned
 - >2,000 folders of documents
- Illinois Water Inventory Program (IWIP) database (both SW and GW)
- > 60,000 samples in groundwater quality database



Thank You



Douglas Feltman