

Tier 1 Water Supply Planning Groundwater Updates: Shallow Groundwater Assessments, Groundwater Supply, and Ongoing and Upcoming Work

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About Me

Devin Mannix

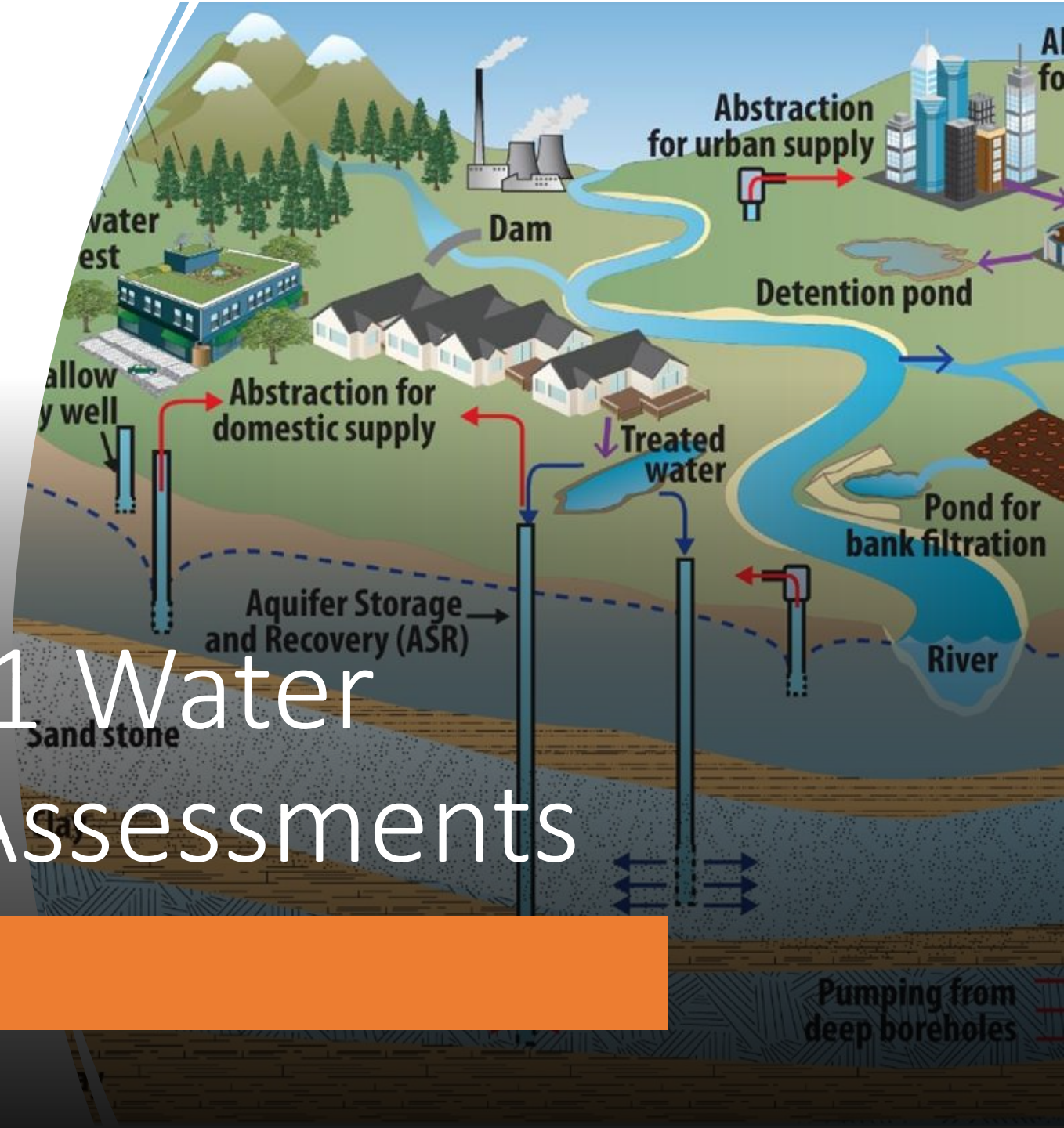
- Hydrogeologist at Illinois State Water Survey, 2013-Present
 - M.A. in Geology at SIU Carbondale, 2013
 - B.S. in Geology at SUNY Binghamton, 2010
- Currently leading groundwater investigations for the Illinois Department of Natural Resources Water Supply Planning Program



Presentation Overview

- Overview of Tier 1 Water Supply Planning Assessments
- April 2025 Updates to Groundwater Supply
- Tier 1 Shallow Aquifer Assessments
- Expanding Well Data Monitoring and Visualization Statewide
- Brief update on Managed Aquifer Recharge Feasibility Study

Overview of Tier 1 Water Supply Planning Assessments



Evolution of Tier 1 Water Supply Planning

- Tier 1 Assessments were developed to have a statewide understanding of water supply challenges in a common framework
- Aimed to achieve two primary goals:
 - Be updated on a continual basis as better data and tools become available
 - Understand relative impacts statewide to guide priorities for future work
- To date, Tier 1 Assessments take two primary forms:
 - County-aggregated Supply and Demand estimates per source and sector
 - Source-based assessments, visualization varies between County-aggregated metrics and the finest data resolution available

[About](#)[Supply And Demand](#)[User's Guide](#)

Economic expansion and population growth in certain areas of Illinois have increased the demand for water resources. However, despite the state's abundant water resources, this heightened demand, coupled with unsustainable usage practices, may lead to water scarcity issues in some regions. To address these challenges, Illinois updated the State Water Plan in 2022, with the following mission: "For state agencies to develop a concise plan for addressing the water issues facing the state in an efficient and unified front" (Illinois State Water Plan Task Force 2022). As part of this, the Illinois Department of Natural Resources- Office of Water Resources (IDNR-OWR) has teamed with the Illinois State Water Survey (ISWS) to "ensure Illinois has a sustainable water supply for all communities and users." The Illinois Water Budget Vista (IWBV) application provides supply and demand estimates throughout the state, as well as future water needs and usage patterns throughout regions and counties.

Disclaimer

- IWBV water supply and demand estimates are based on a range of simplified assumptions to allow county-based estimation.
- The IWBV app is intended as informational and to guide statewide planning, as well as to be used to facilitate regional discussions.
- This app is not intended to be used for local planning or engineering designs, for which analyses of finer spatial and temporal resolutions are needed.

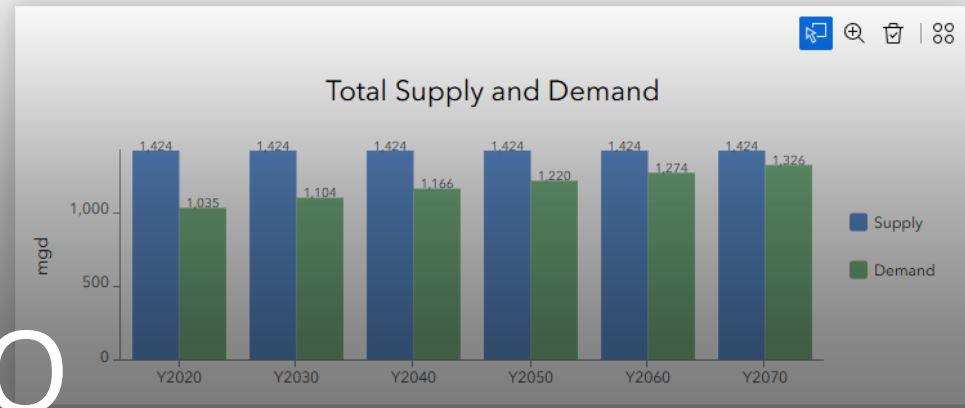
Related Resources

- Illinois Water Supply Planning Studies
 - a. [State and Regional Water Supply Planning Studies](#)
- Shallow Groundwater
 - a. [Shallow Groundwater Vulnerability to Contamination](#)
 - b. [Shallow Groundwater Assessments](#)
 - c. [Shallow Aquifer Risk](#)
- Deep Groundwater
 - a. [Changing Groundwater Levels in the Sandstone Aquifers \(arcgis.com\)](#)
- Rivers
 - a. [Illinois Streamflow Assessment Model](#)
- Reservoirs
 - a. [Drought Risk Analysis for Community Surface Water Systems](#)
- Water Demands
 - a. [Point Demands](#)
 - b. [Center Pivot Irrigation in Illinois 2012, 2014, and 2017 \(arcgis.com\)](#)

[WSP-Supply And Demand](#)

Note that the state/region/county total water supply/demand in IWBV does not include water supply/demand associated with power generation, which are much larger in magnitude. Power generation information can be separately viewed below, by sector. Future demands are based on simplified assumptions, driven by population. Where sectors are too complicated to predict easily, future demands are held constant at 2020 rates.

Water Use by USGS Category

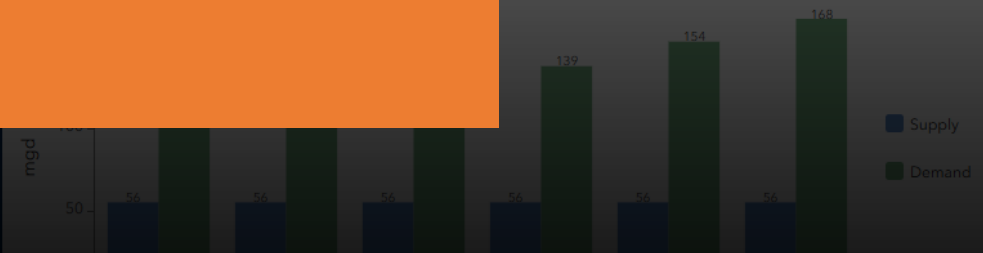


April 2025 Updates to Groundwater Supply

By Source

- Deep Groundwater
- Shallow Groundwater
- River
- Reservoir
- Lake Michigan

Deep Groundwater



April 2025 Groundwater Supply Updates

- Updates to supply were driven by statewide shallow groundwater model coming online, where we could begin systematically assessing recharge statewide
 - Total groundwater supply currently capped at **15% of county-aggregated recharge** as a proxy for reducing groundwater discharge to streams
 - Local impacts will be more severe
 - Deep supply capped at half the total groundwater supply, otherwise estimated by the maximum recharge rate that limits desaturation

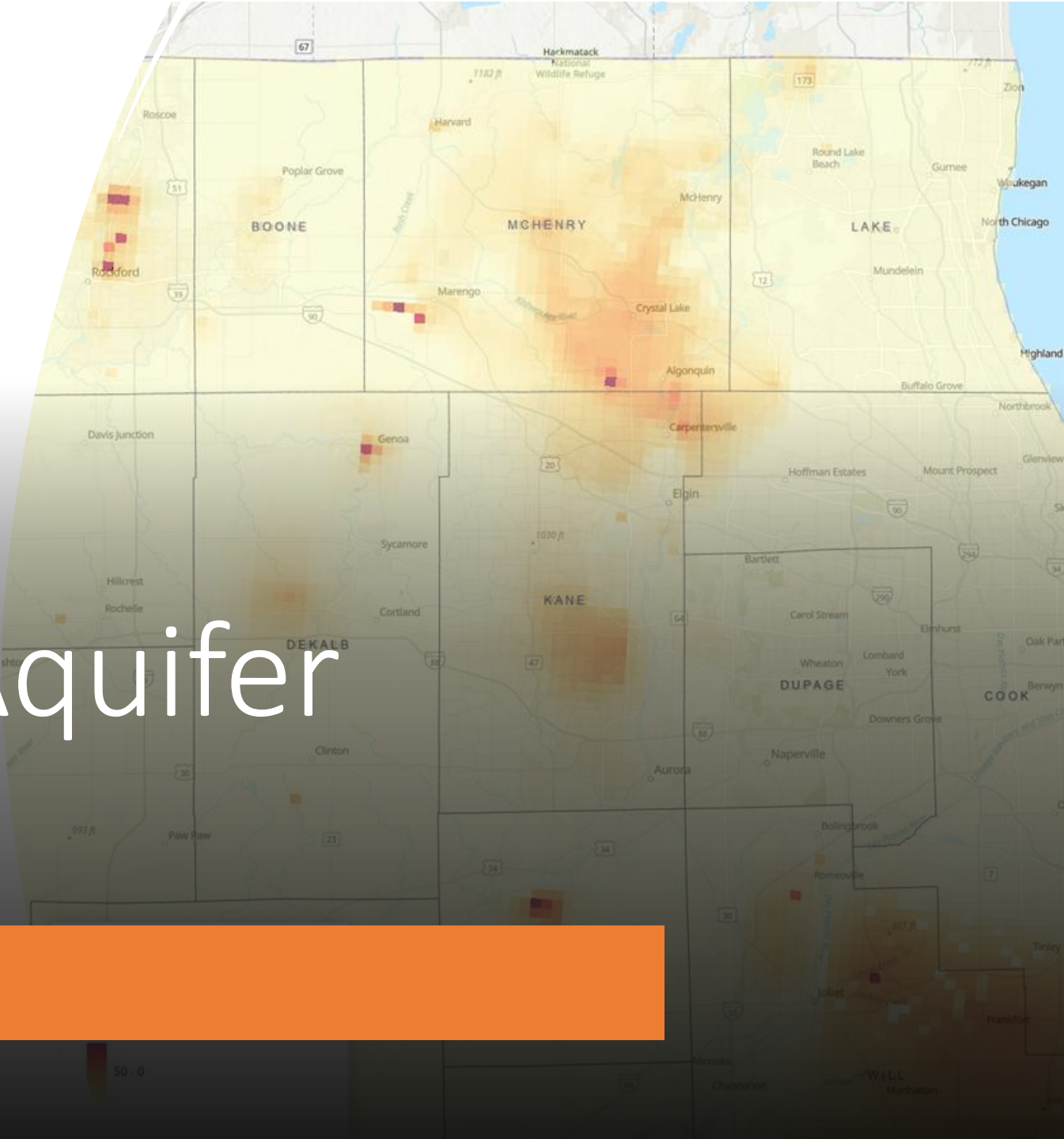
April 2025 Groundwater Supply Updates

- In the Northeastern region
 - **McHenry, Grundy, and DeKalb** saw reduced supply overall which propagated to both shallow and deep supply
 - In **Cook, DuPage, Lake, and Will**, shallow Supply was revised upward, with a more modest change in **Kendall**

Tier 1 Estimated Groundwater Supply

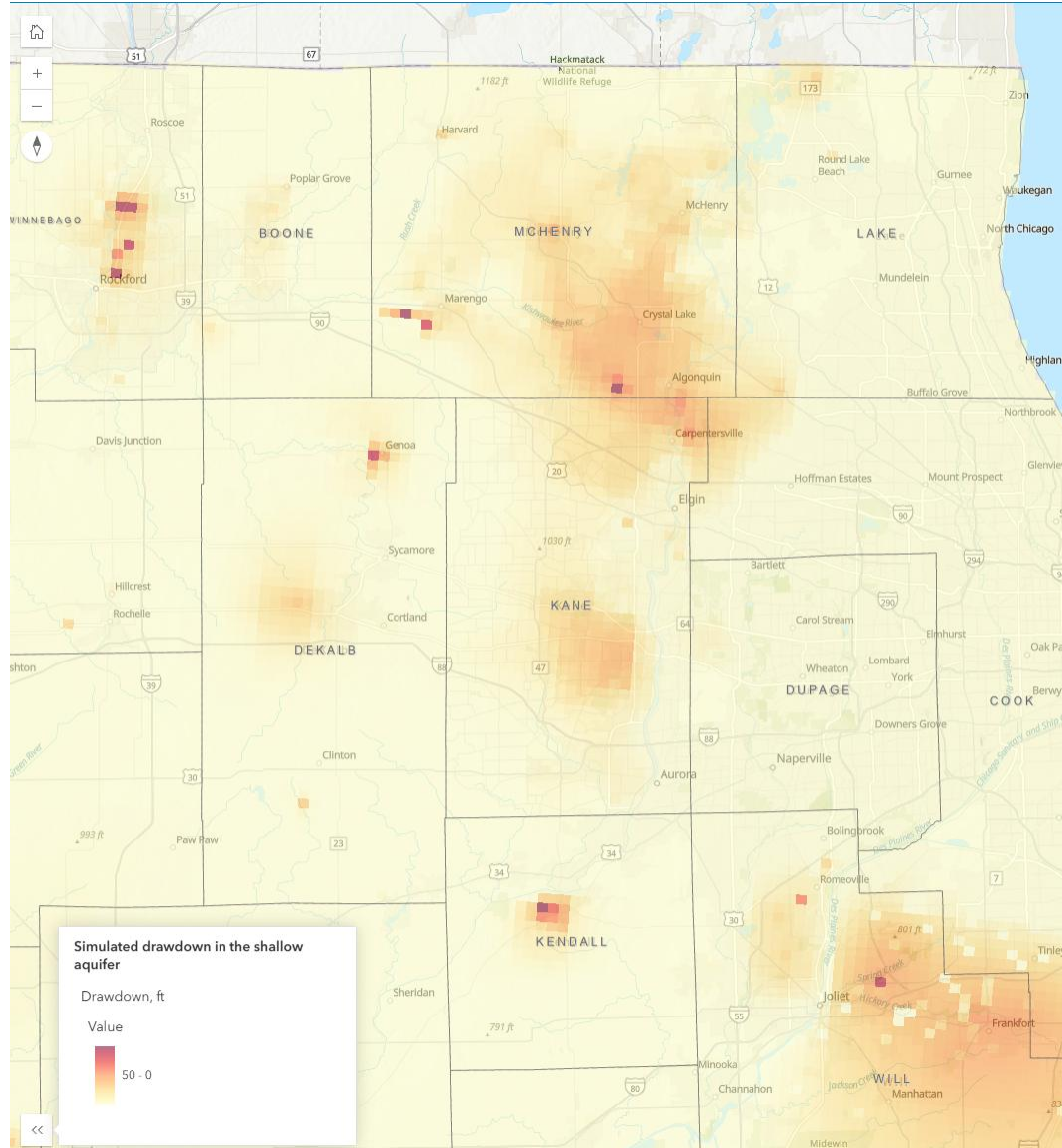
| COUNTY | Deep Groundwater | | Shallow Groundwater | | Total Groundwater | |
|----------|------------------|--------|---------------------|--------|-------------------|--------|
| | Supply | Change | Supply | Change | Supply | Change |
| COOK | 3.0 | 0.0 | 43.9 | 24.6 | 46.9 | 24.6 |
| DEKALB | 8.2 | -3.1 | 8.2 | -3.1 | 16.4 | -6.2 |
| DUPAGE | 0.5 | 0.0 | 16.9 | 12.5 | 17.4 | 12.5 |
| GRUNDY | 6.8 | -3.4 | 6.8 | -3.4 | 13.5 | -6.7 |
| KANE | 10.9 | -0.4 | 10.9 | -0.4 | 21.8 | -0.8 |
| KANKAKEE | 1.4 | 0.0 | 27.5 | 2.0 | 28.9 | 2.0 |
| KENDALL | 5.4 | 0.3 | 5.4 | 0.3 | 10.7 | 0.6 |
| LAKE | 2.3 | 0.0 | 17.7 | 9.6 | 20.0 | 9.6 |
| MCHENRY | 15.1 | -2.6 | 15.1 | -11.8 | 30.2 | -14.4 |
| WILL | 2.5 | 0.0 | 28.1 | 10.7 | 30.6 | 10.7 |

Tier 1 Shallow Aquifer Assessments

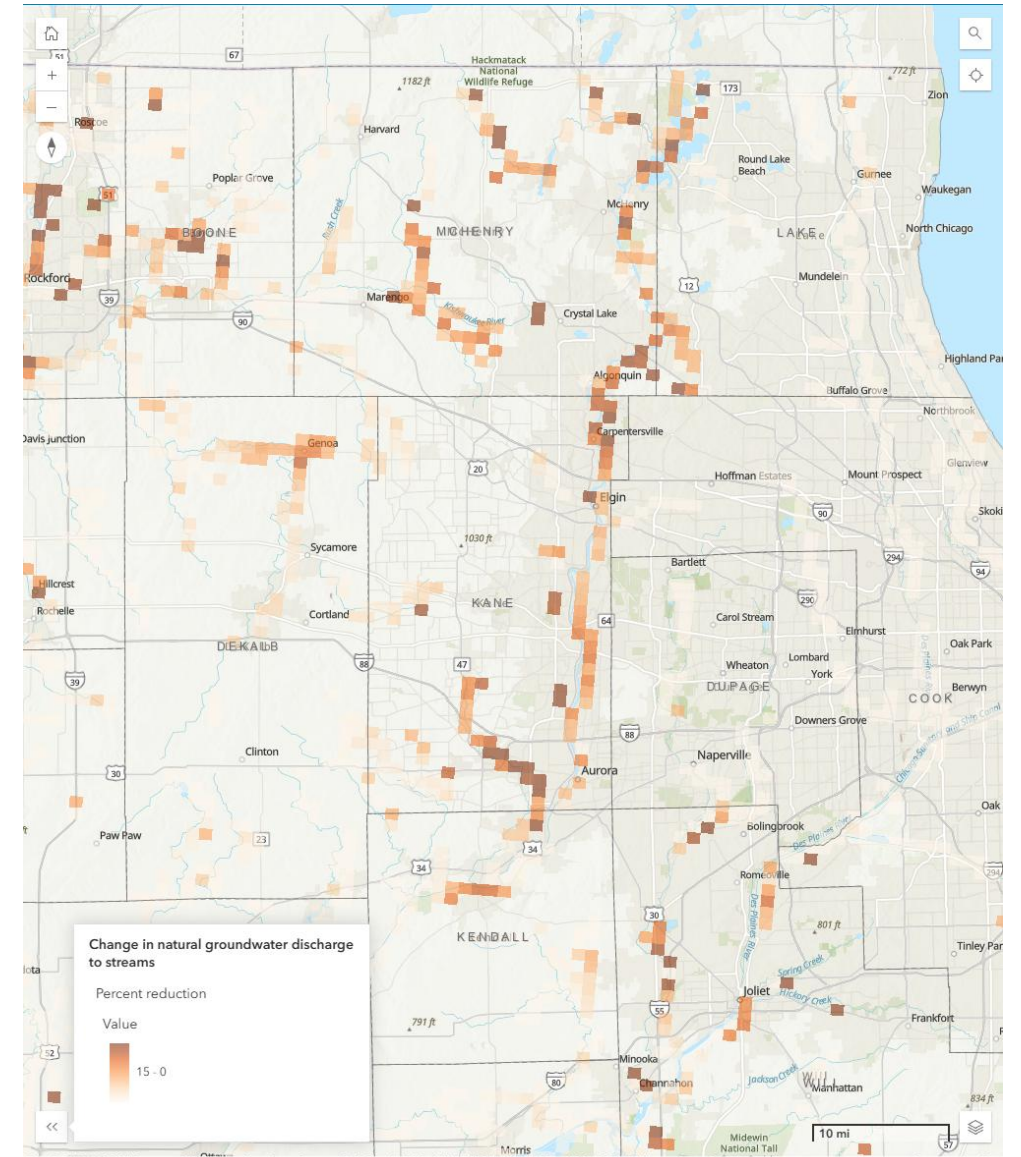


Shallow Aquifer

Drawdown

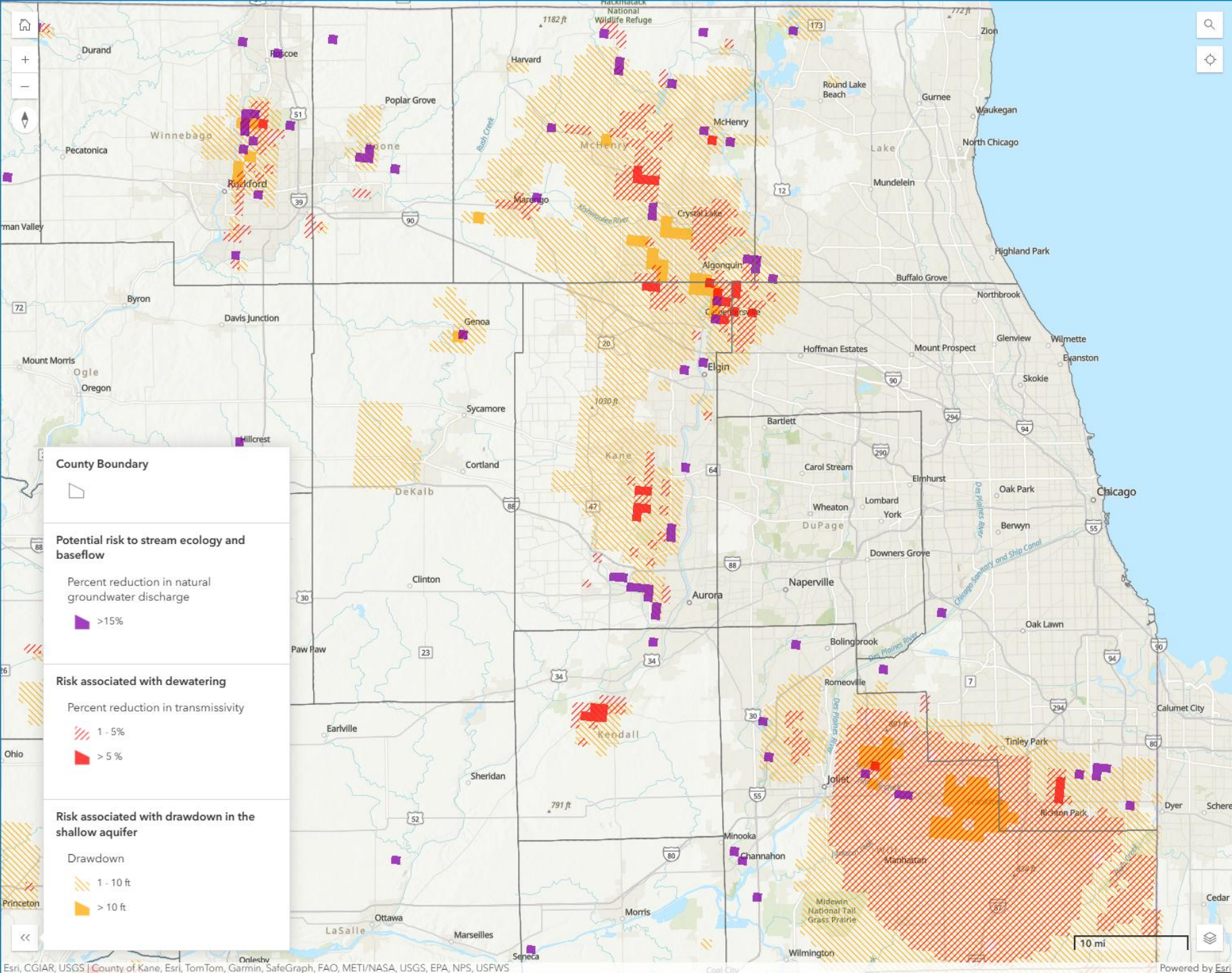


Reduction in natural groundwater discharge



Shallow Aquifer Risk Metrics

- Orange-hatched – drawdown
- Red-hatched – desaturation
- Purple – stream impacts



Evolution of Tier 1 Water Supply Planning

- Since Tier 1 inception, many regions have expressed interest in using these assessments for regional planning, especially where it has been many years since the Region was revisited, e.g.,
 - East-Central Illinois - 2011
 - Northeast Illinois – 2012
- Given the intermittent update cycle to meet statewide needs, we need to consider how to continue improving Tier 1 Assessments to expand their utility

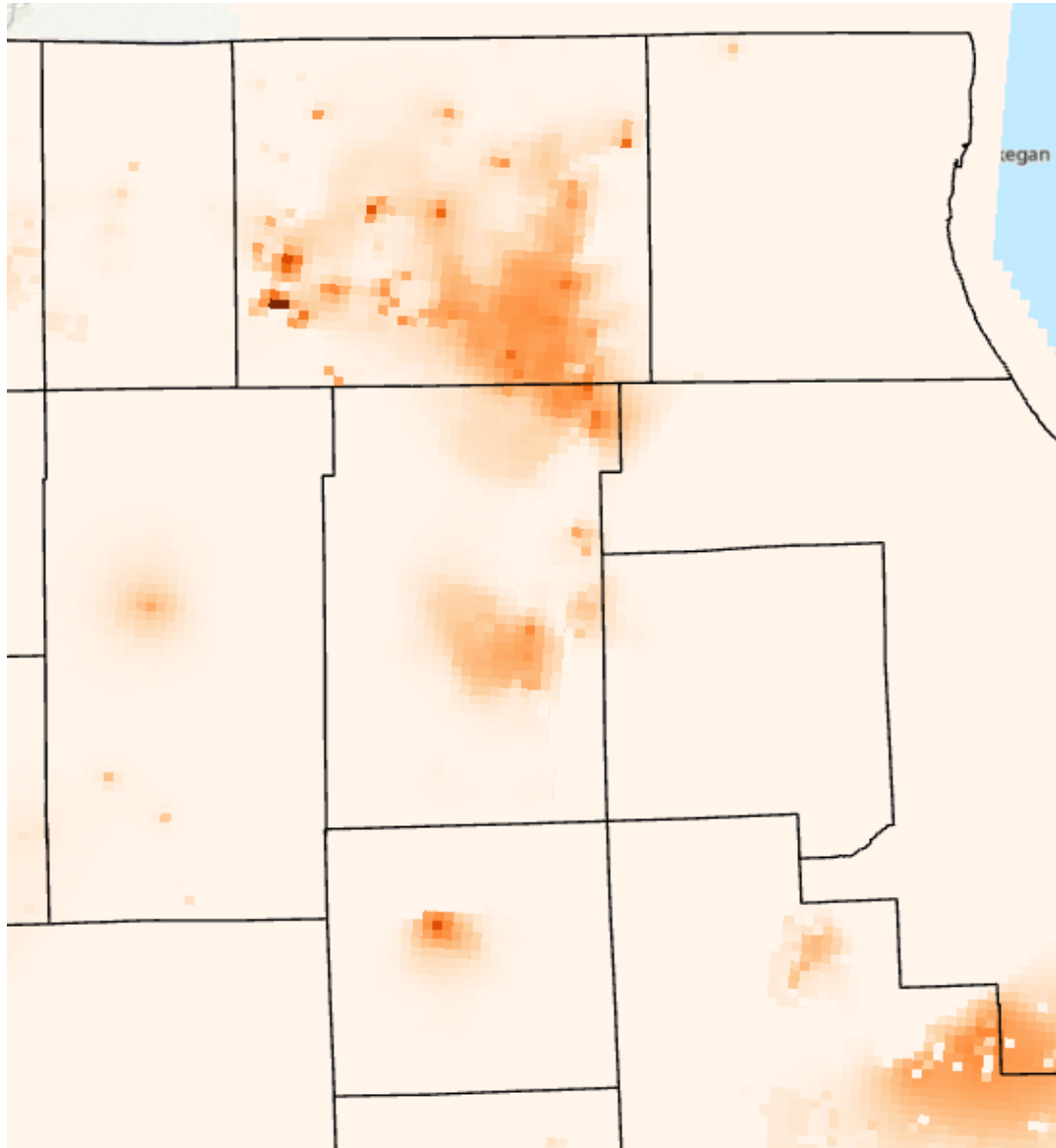
Short Term Groundwater Updates Coming to Tier 1 Assessments and Supply

- Groundwater model assessments out to 2070
 - Demand projections based on statewide municipal demand estimates out to 2070 or Regionally-vetted demand projections where available
 - Updated Supply and Demand to match Regionally-vetted changes
- Updated shallow bedrock geology – refinement of weathered bedrock conceptualization using water level data
- Targeting late winter / early spring for updated web products as part of effort on the Big Muddy River Region

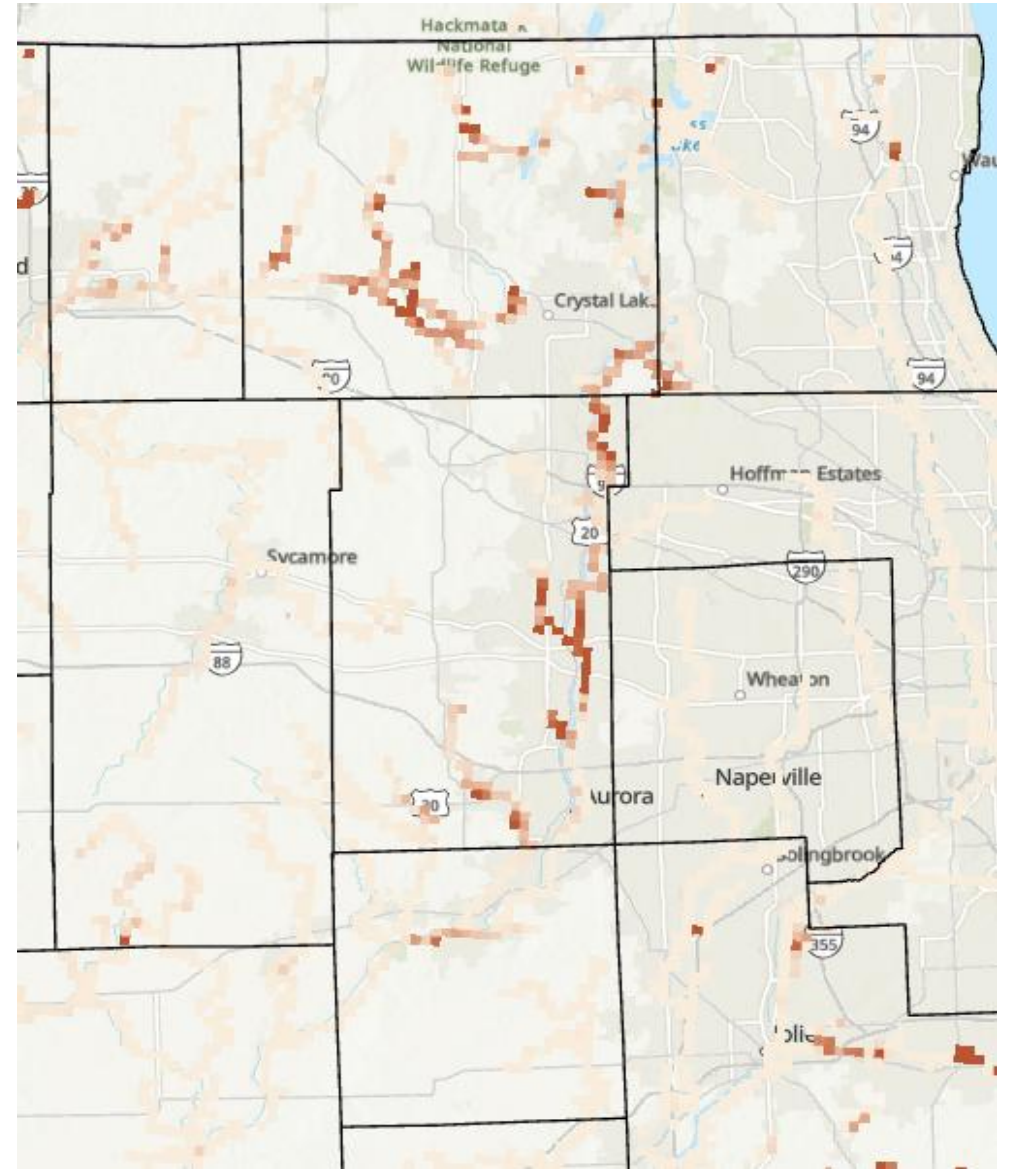
2070 Shallow Aquifer Results –

PROVISIONAL / NOT FOR PUBLIC RELEASE

Drawdown



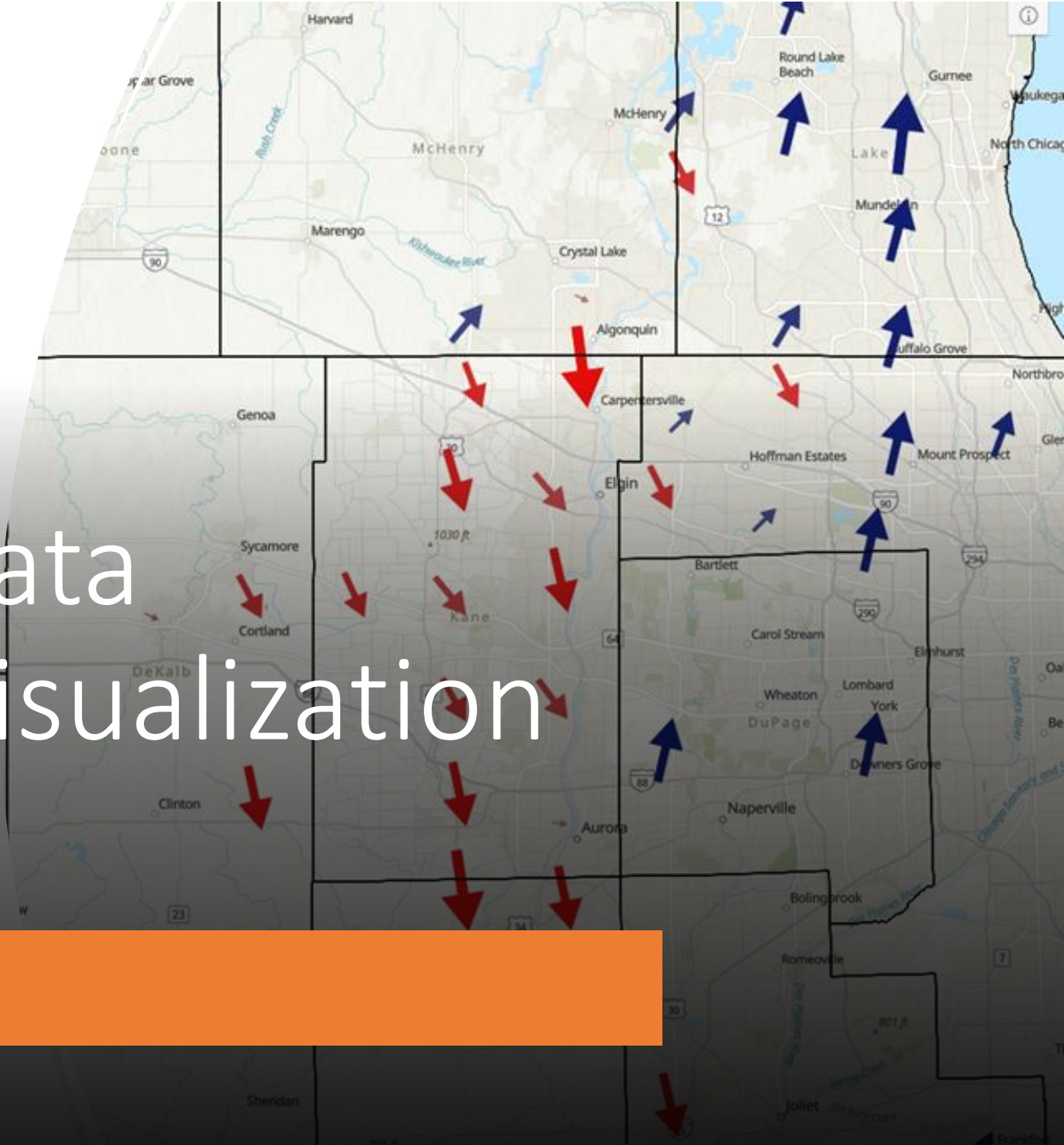
Reduction in natural groundwater discharge



Moderate to Long Term Groundwater Updates – Ongoing or Future ISWS Research

- Impact of effluent on groundwater discharge and supply estimates
- Refinement of recharge estimates
 - Lingering questions about the impacts from tile drains
 - Changing rainfall intensity influence on infiltration potential
 - Land use changes
- Refining Groundwater Supply beyond reduction in groundwater discharge to streams – which metrics and targets?
- Sub-County impacts – how to assess where local demands are unsustainable?

Expanding Well Data Monitoring and Visualization Statewide



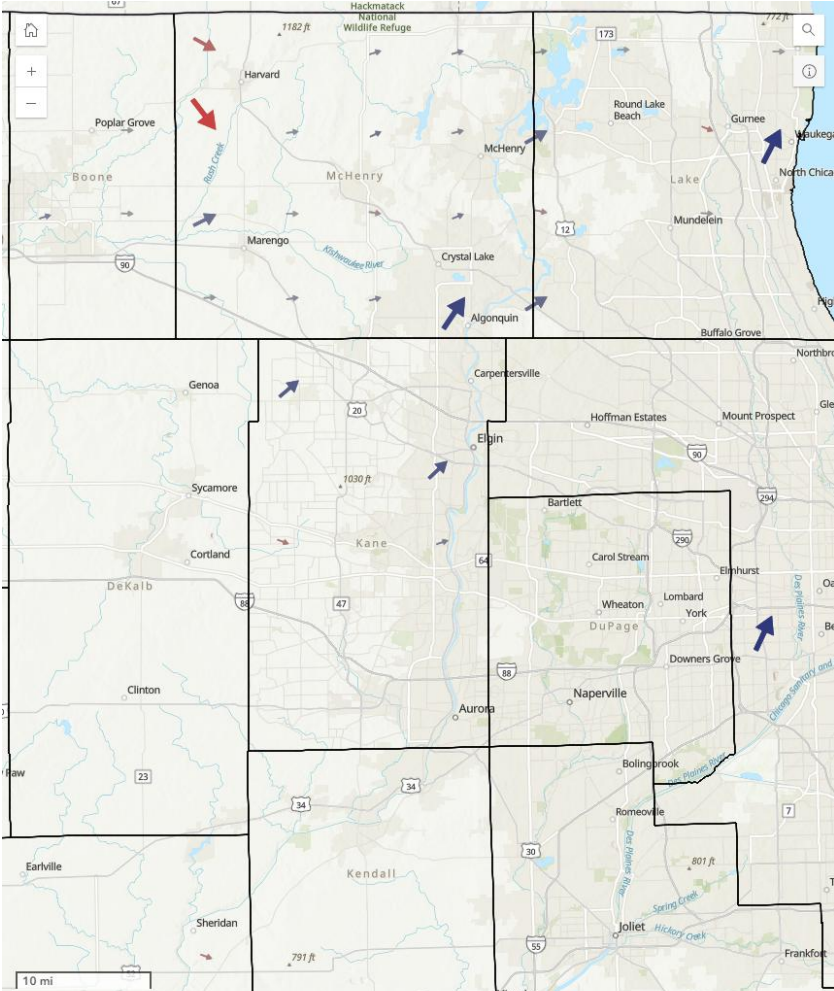
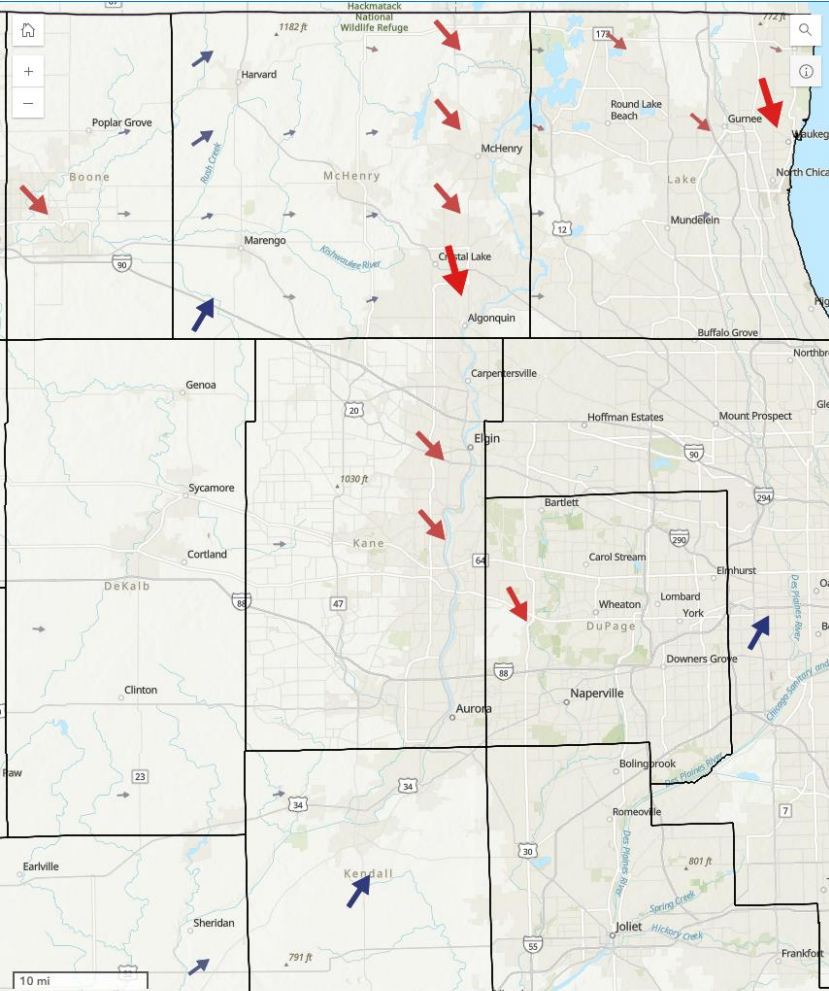
Short Term Groundwater Updates Coming to Tier 1

- Many regions have requested water level trends as a component of supply and sustainability evaluations
- However, statewide monitoring networks tend to be aquifer or subregion-focused, Tier 1 products should include the entire state
- Developed application to begin addressing these needs
 - Depicts trends in water levels and well depth by township and aquifer interval, as well as color map ranking of recent water levels in historic record
 - Minimum data requirements and weighted based in confidence
 - Well completion reports < IWIP-reported water levels < Monitoring well data

Shallow Well Trends, 2000 – 2025: < 100 ft depth

Water Levels

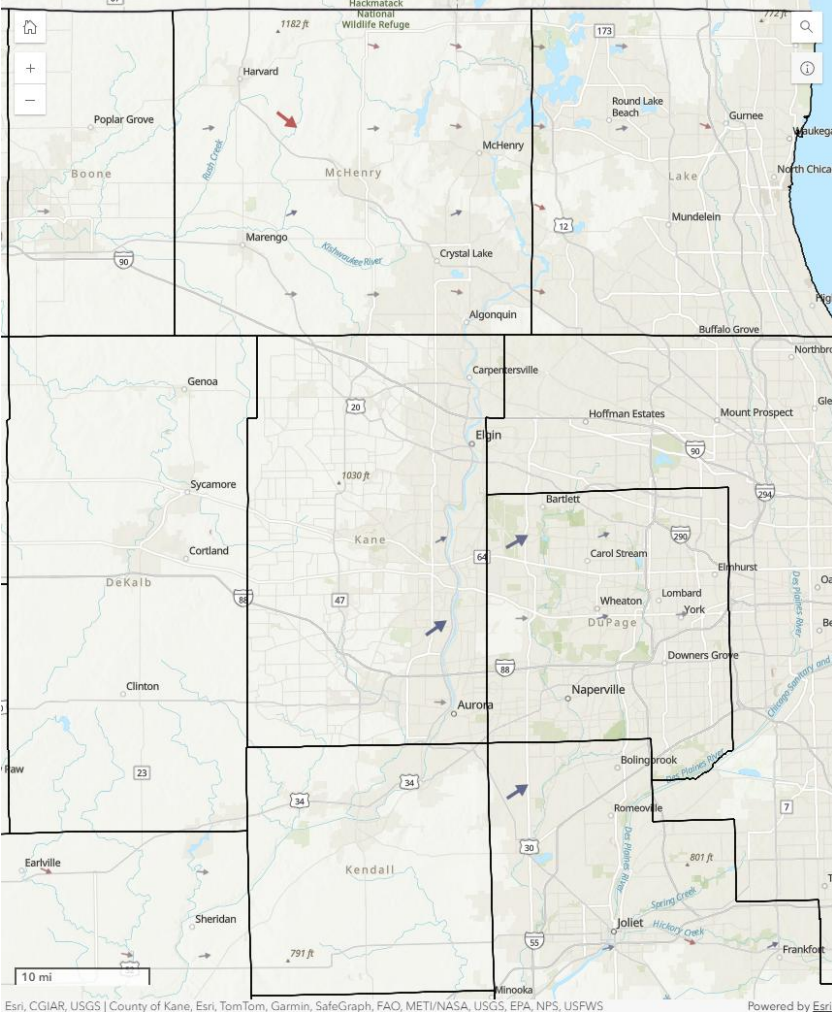
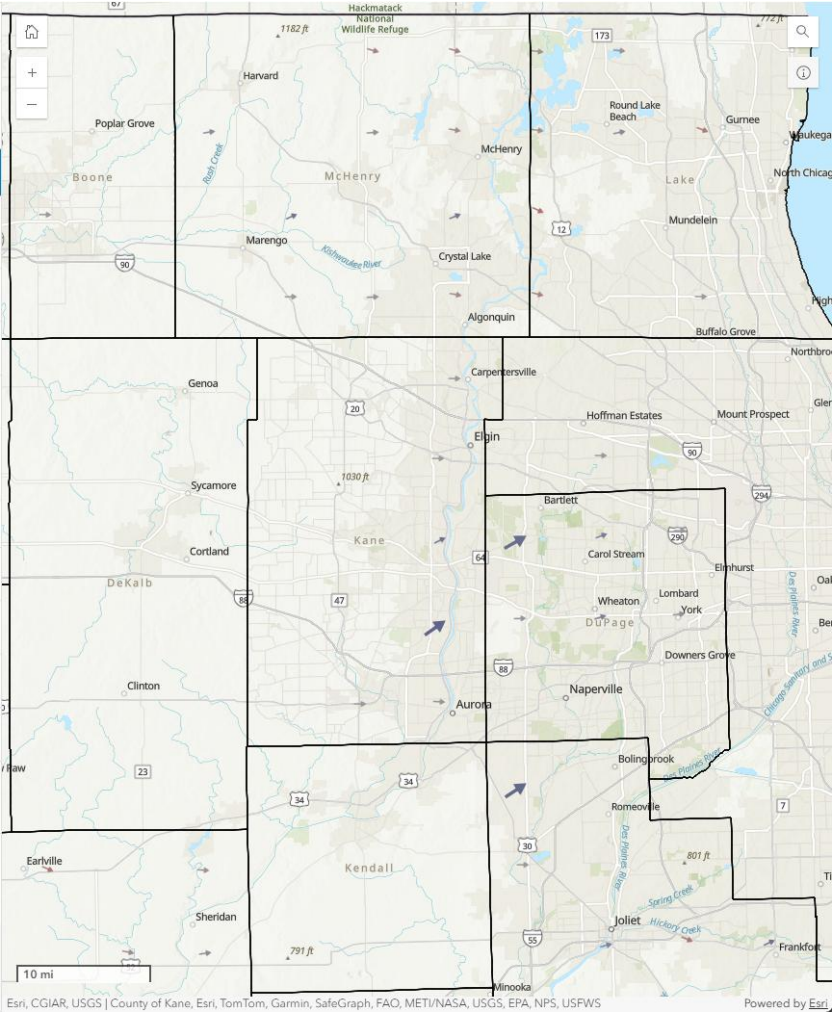
Well Depth



Shallow Well Trends, 2000 – 2025: < 100-150 ft depth

Water Levels

Well Depth



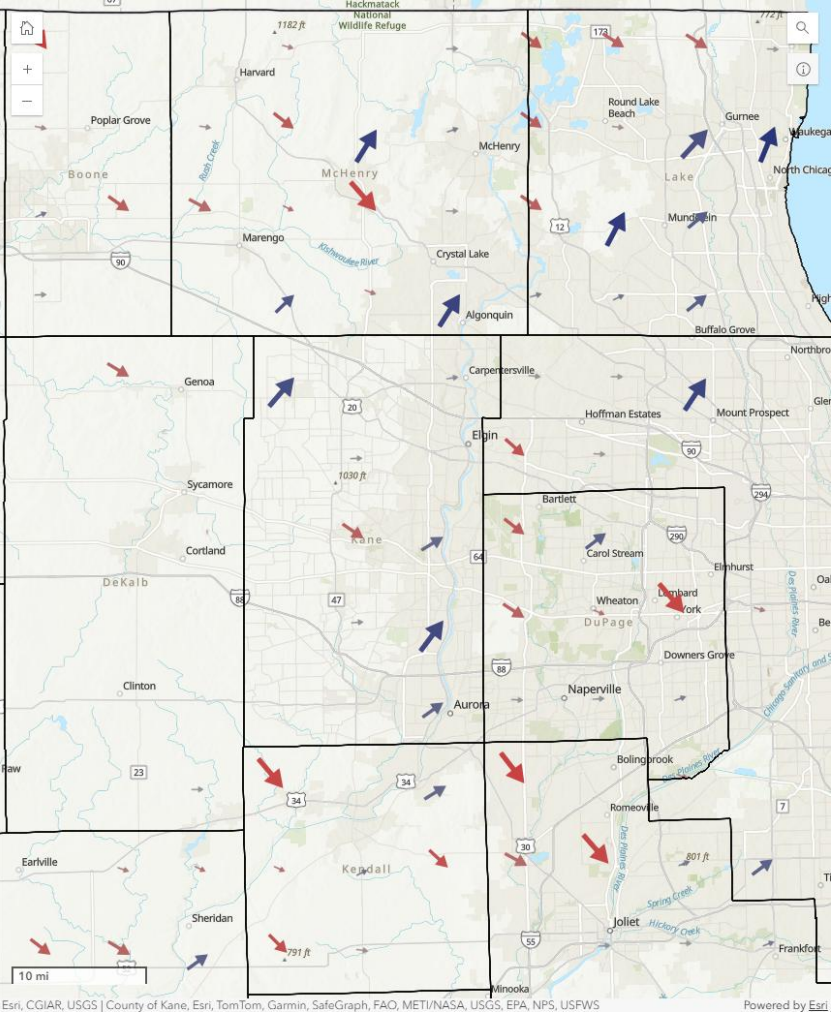
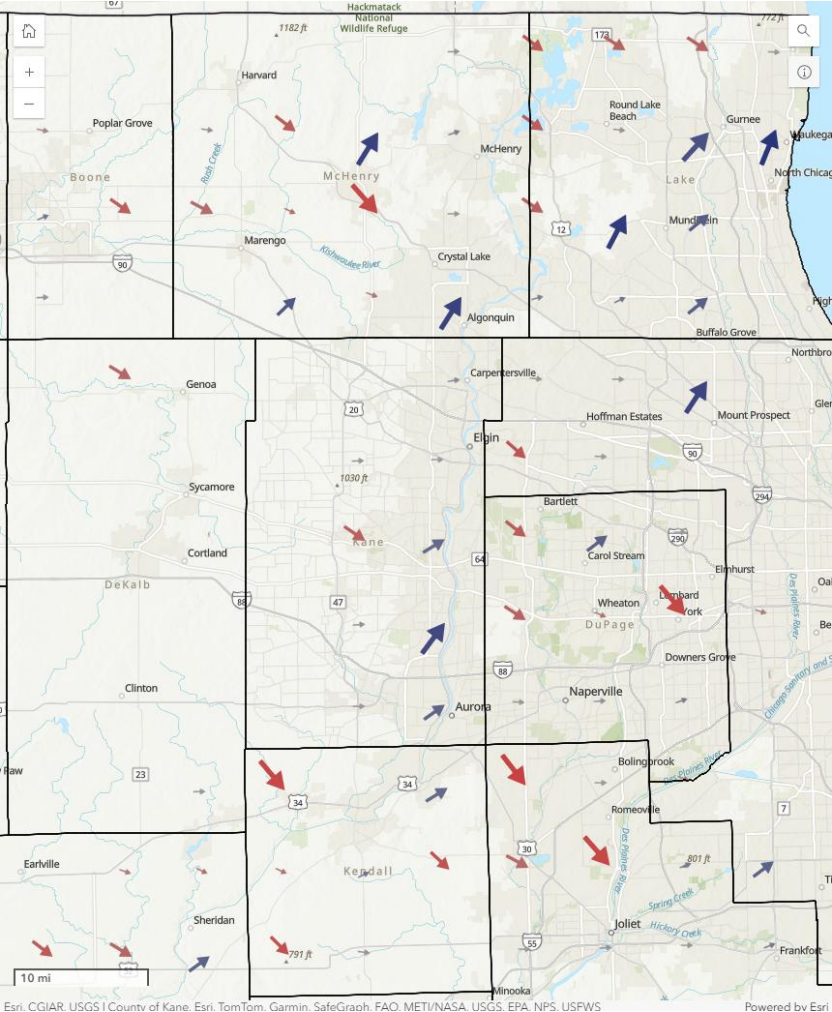
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Shallow Well Trends, 2000 – 2025: < 150-250 ft depth

Water Levels

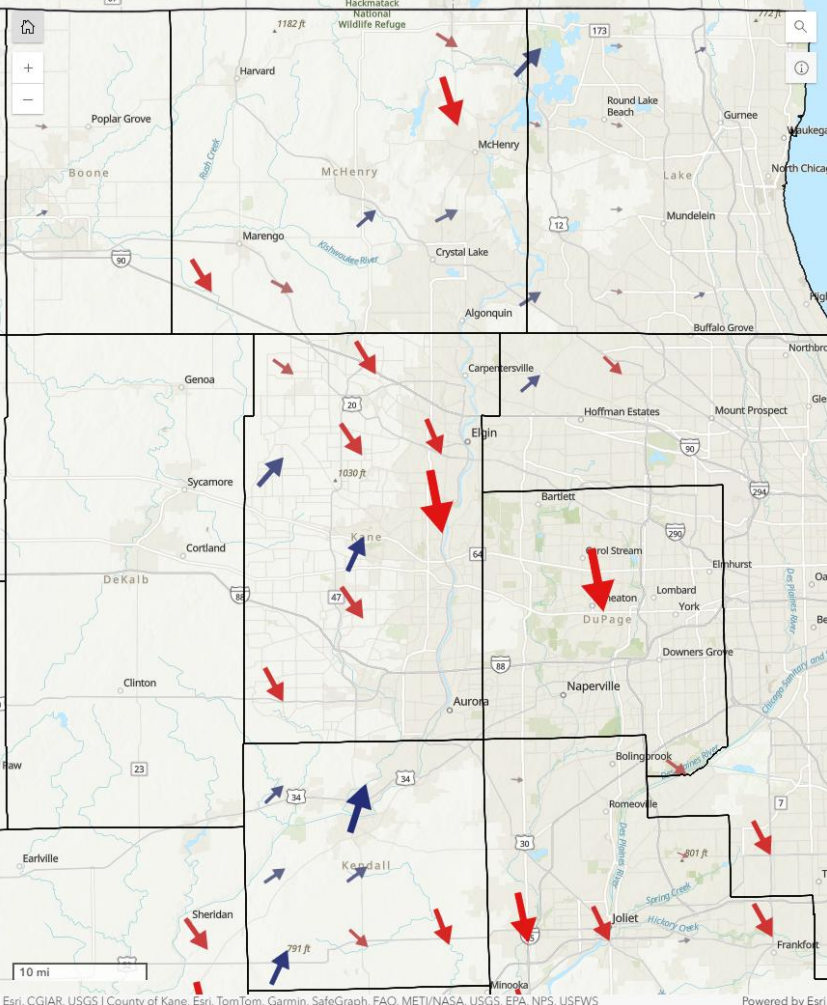
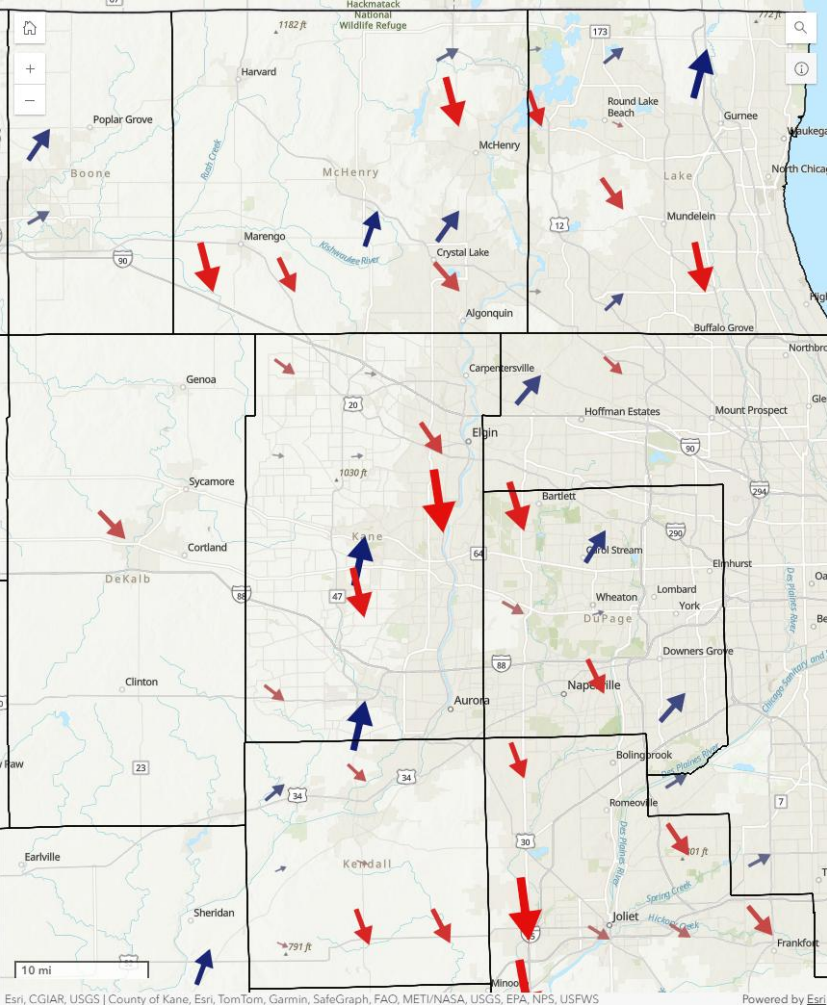
Well Depth



Shallow Well Trends, 2000 – 2025: < 250 - 500 ft depth

Water Levels

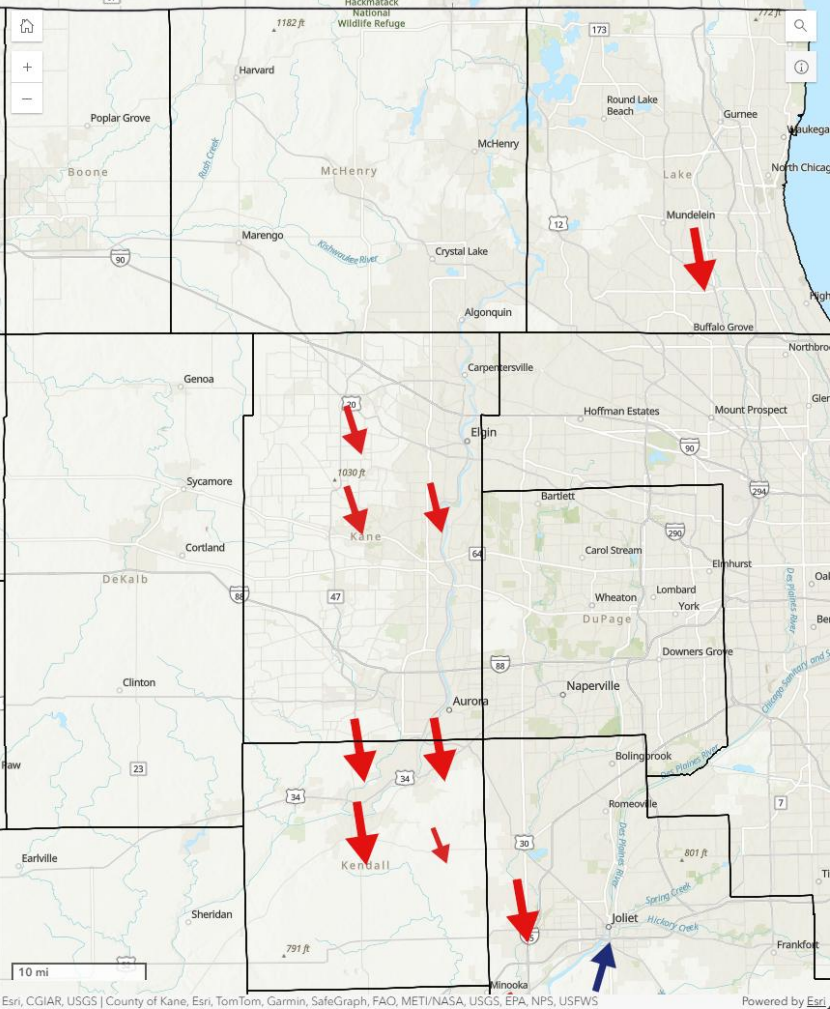
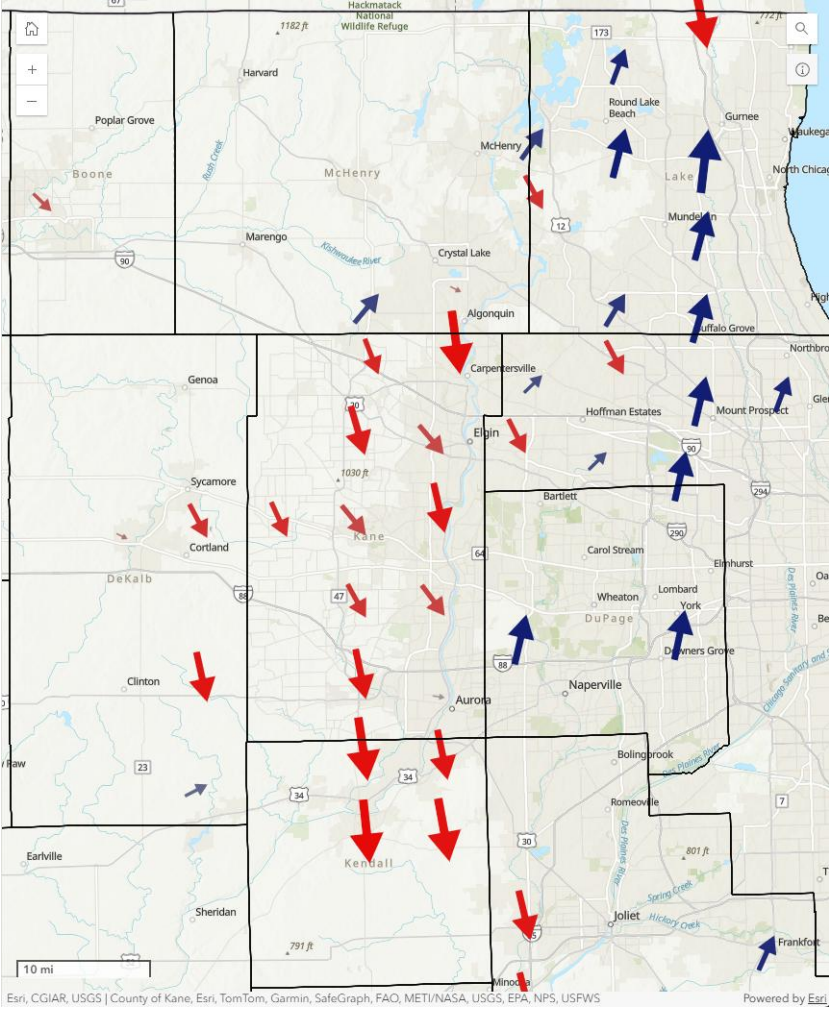
Well Depth



Shallow Well Trends, 2000 – 2025: > 500 ft depth

Water Levels

Well Depth



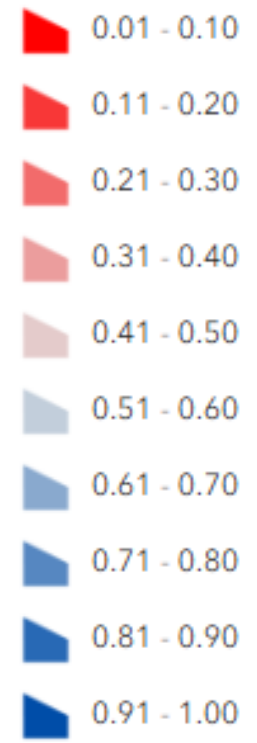
Color map of recent water levels rank for the last 25 years

Percentile Ranking

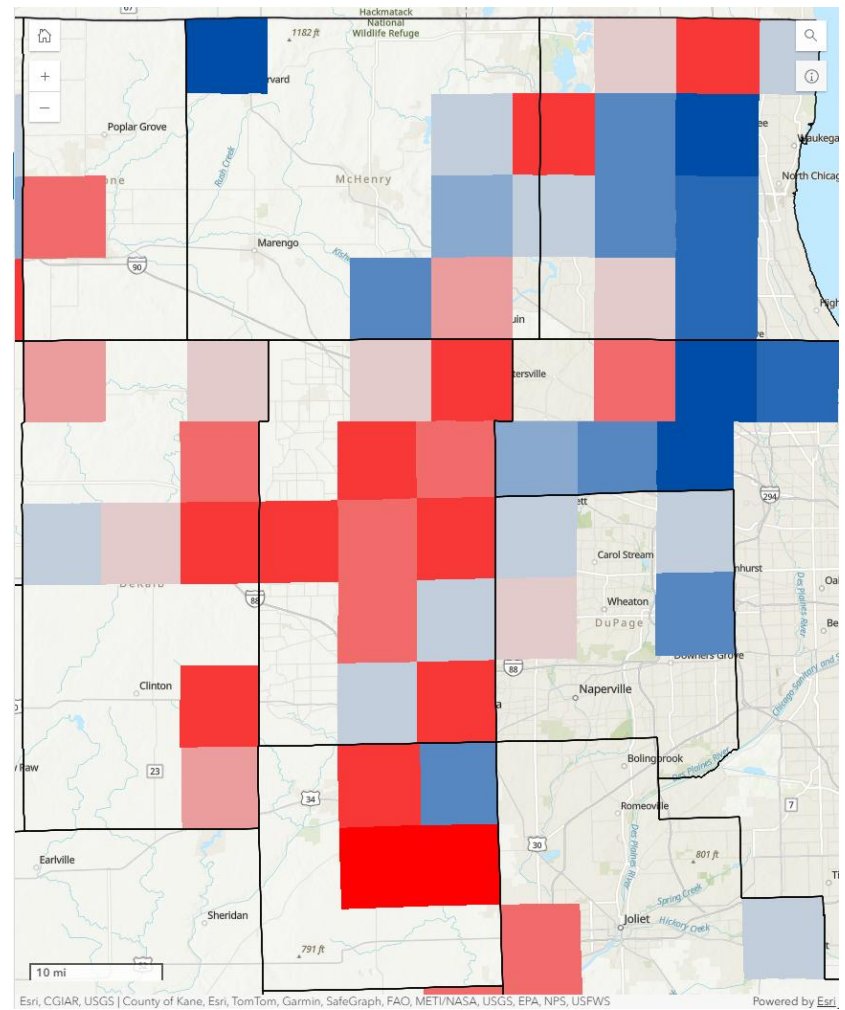
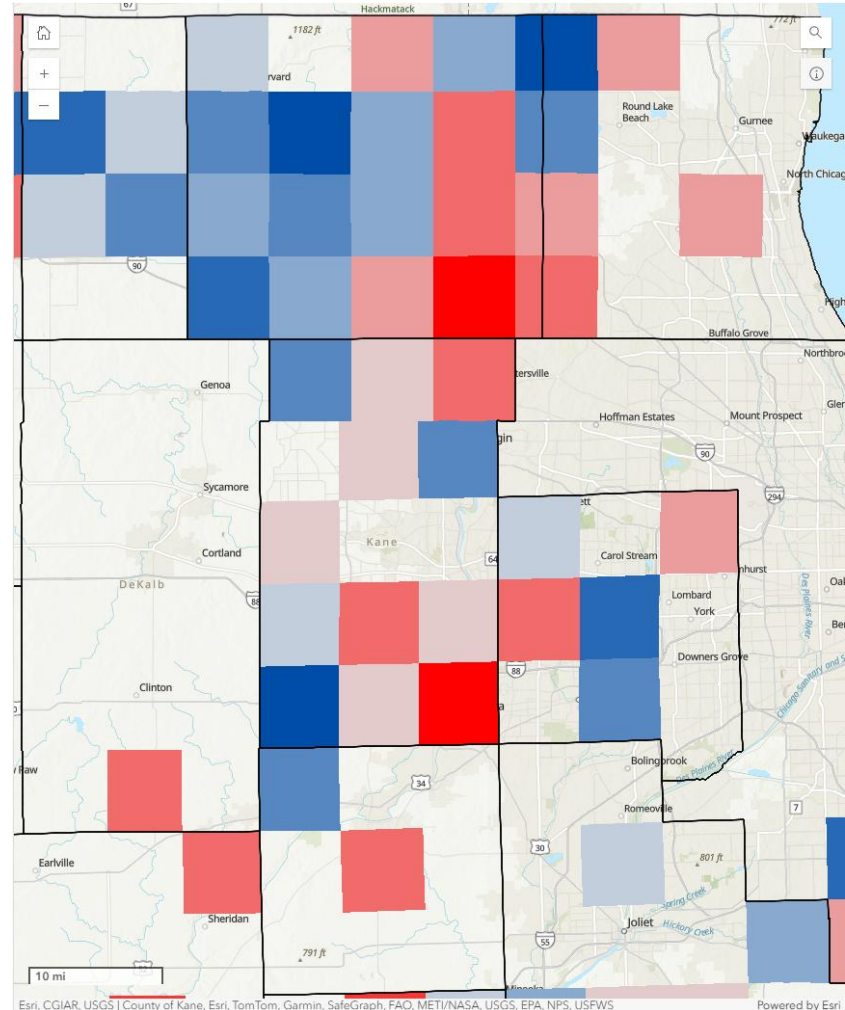
< 100 ft depth

> 500 ft depth

Near 0 / red (historic lows)



Near 1 / blue (historic highs)



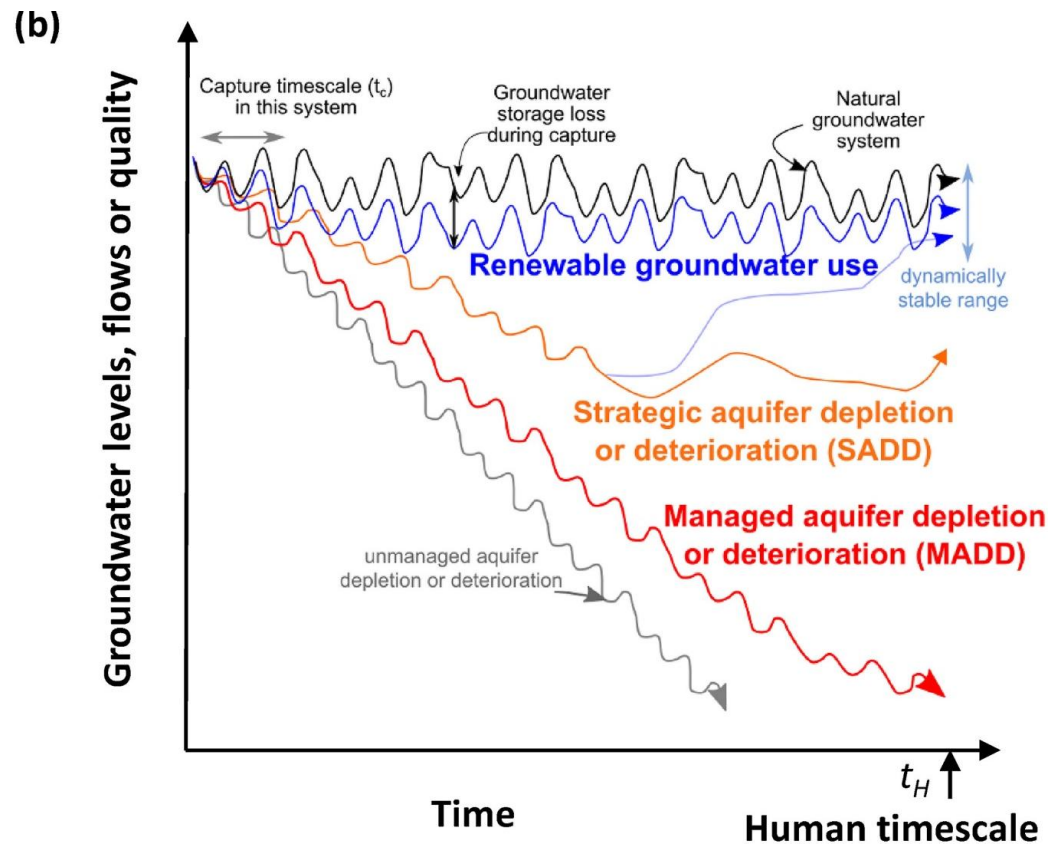
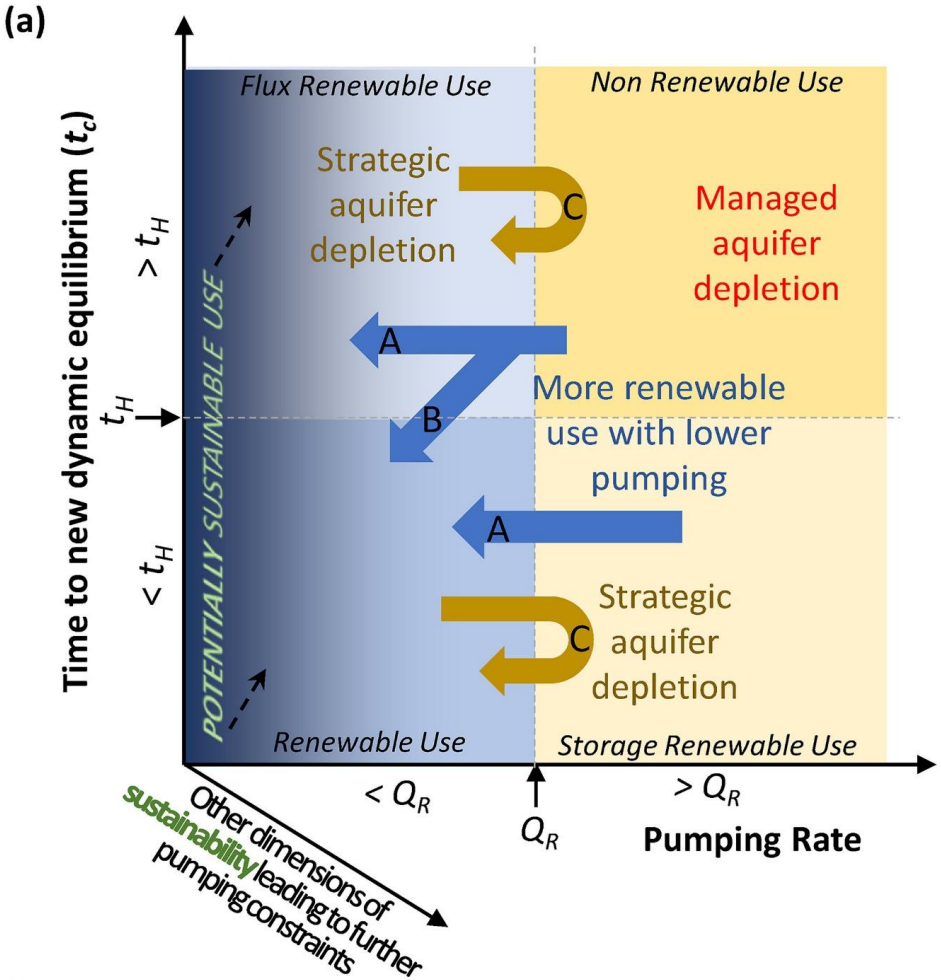
Broad observations

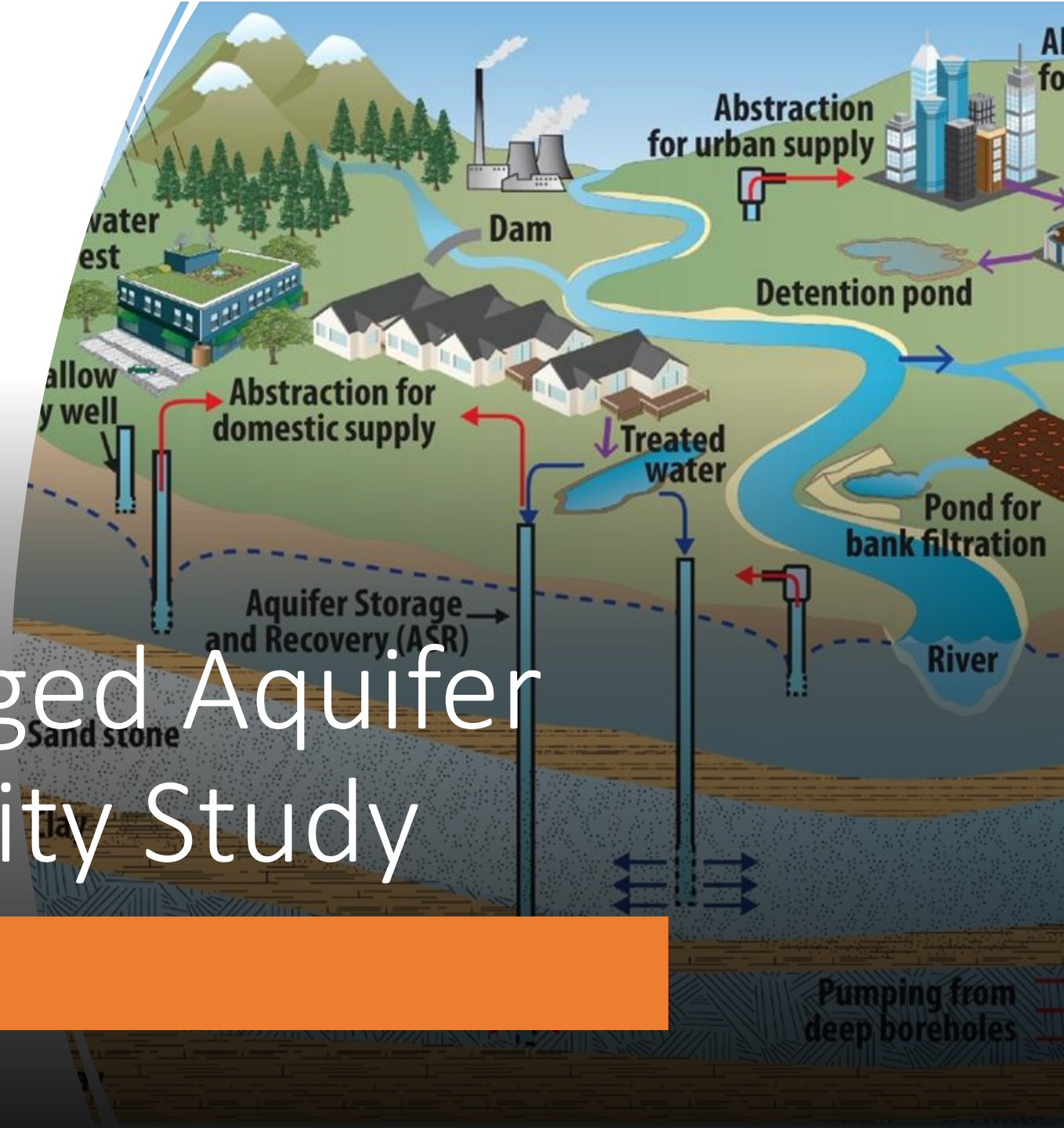
- Biggest changes seen in shallowest and deepest wells
 - 250-500 ft and > 500 ft wells have seen consistent deepening and water level decline in areas using groundwater
- Water level trends related to well depth trends – needs further work to refine spatially and temporally

Disclaimers about these visualizations

- Data is only as good as the period of record
 - Well trends (particularly well depth) biased towards new construction
 - Dependent on length of record, and color map currently only visualized based on the interval depicted (last 25 years)
- Snapshot in time for all wells, not just high-capacity wells
 - Trends in low-capacity wells are more variable
- Spatially aggregated trends across an area, not at single points
 - Embedded variability, work ongoing to improve normalization
- Dedicated monitoring wells still the gold standard... but this is great where there are no other options

How could water level trends inform supply?





Update on Managed Aquifer Recharge Feasibility Study

MAR

Pumping from deep boreholes

Project Hydrogeologist

Anteneh Abiy

Hydrogeology-ISGS Oct 2024–Present

- Ph.D., Hydrogeology, Florida International University (2020)
- M.S., Geosciences, Florida International University (2016)
- M.P.S., Biological & Environmental Engineering–Hydrology, Cornell University (2009)

Experience in groundwater flow and reactive transport modeling

Formerly conducted modeling on Biscayne Aquifer saltwater intrusion and Everglades hydrology



MAR stakeholder meeting – November 12

- Group discussions to understand shallow groundwater concerns in Will County and identify assessment needs
 - Persistent concerns about impacts of future industrial and commercial water demands
 - battery manufacturing, data centers, and other technology manufacturing water needs
 - Discussed need for systematic way to identify and report domestic well water challenges – dry wells
 - Many stakeholders interested in finding ways to utilize wastewater even if they couldn't personally benefit
 - A lot of enthusiasm despite murky regulatory waters



Timeline

- Provisional MAR feasibility assessment and web products completed by late fall of 2026, with a short report on Tier 1 evaluation potential soon after
- Work following on aquifer vulnerability and PFAS contamination in domestic wells in Will County

Questions?

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