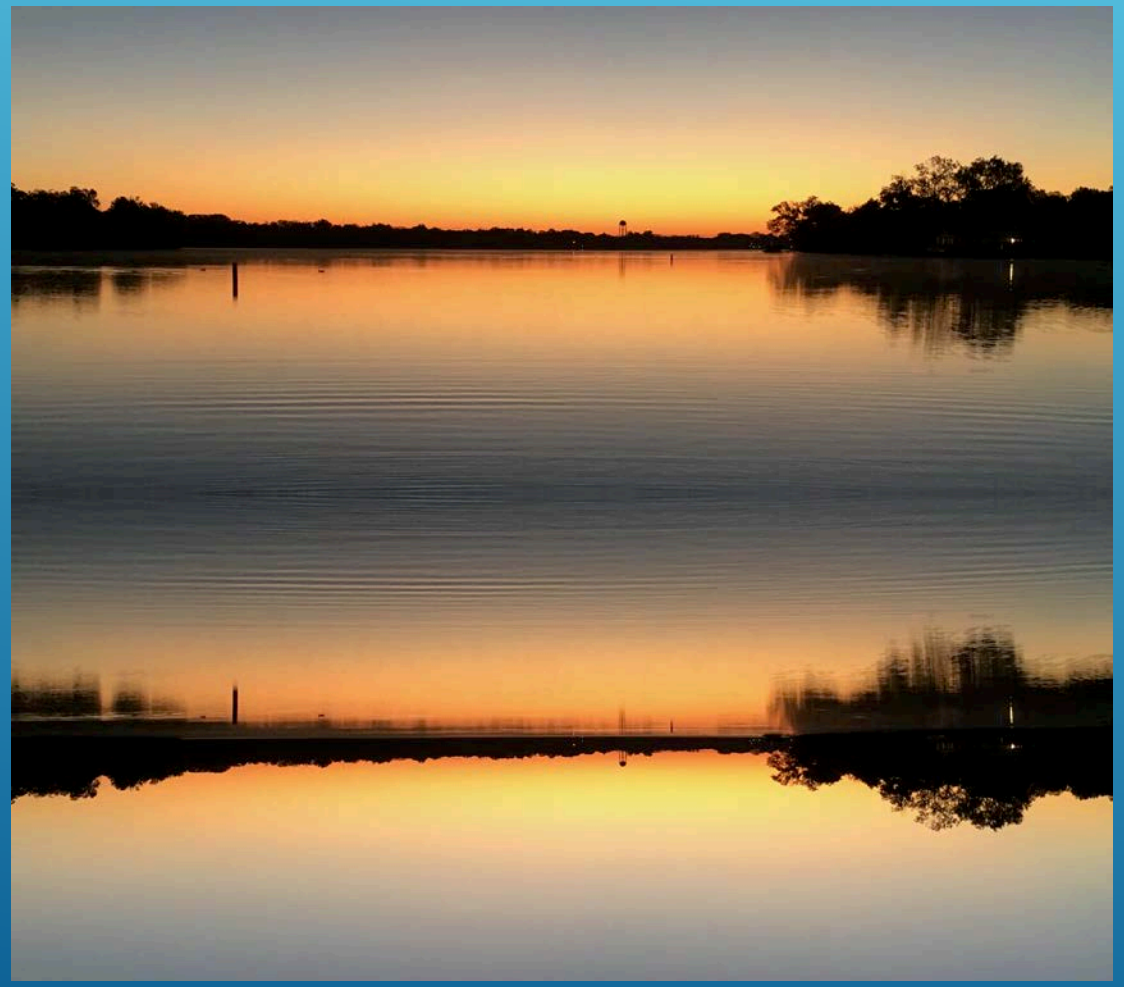
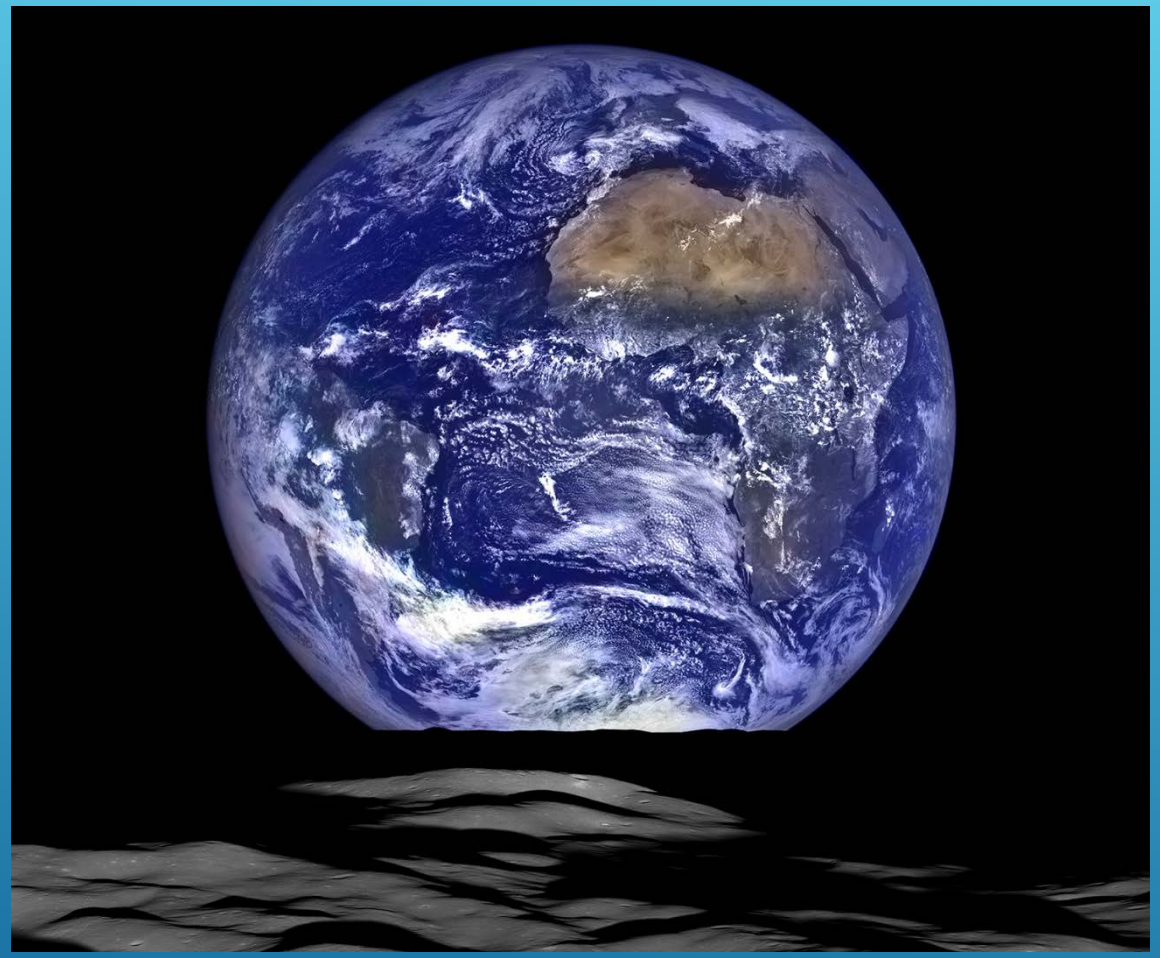
Water Resources in McHenry County

A Brief Reflection On All We've Learned So Far

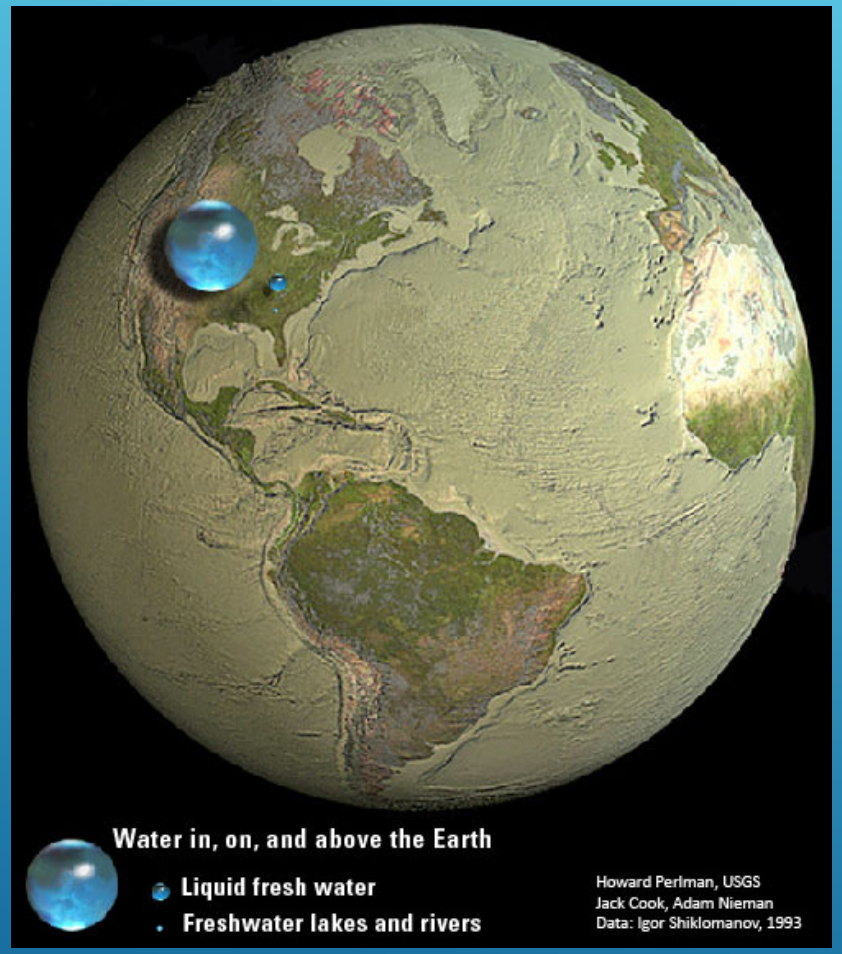


Consider this…



We live on a blue planet where about 75% of the Earth's surface is covered with water…

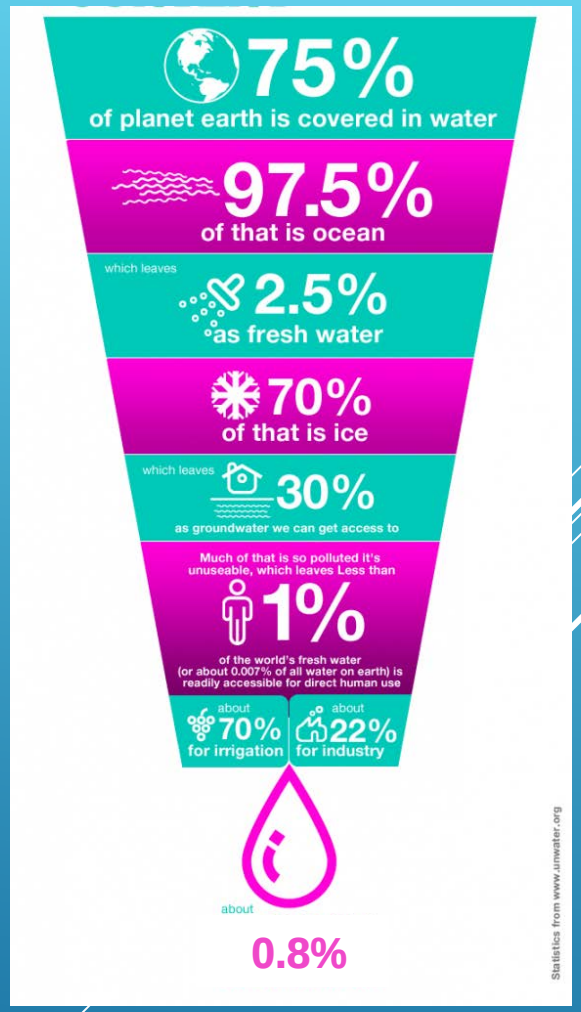
Consider this…



2.5% Fresh Water

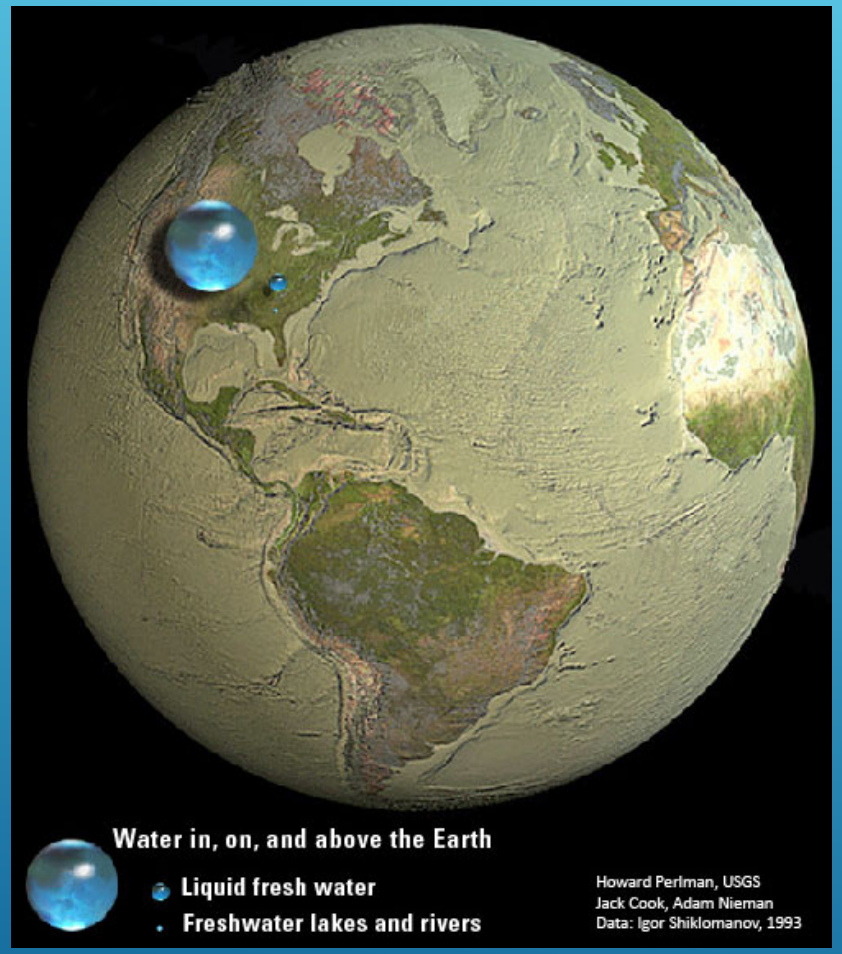
- 70% of that is ice

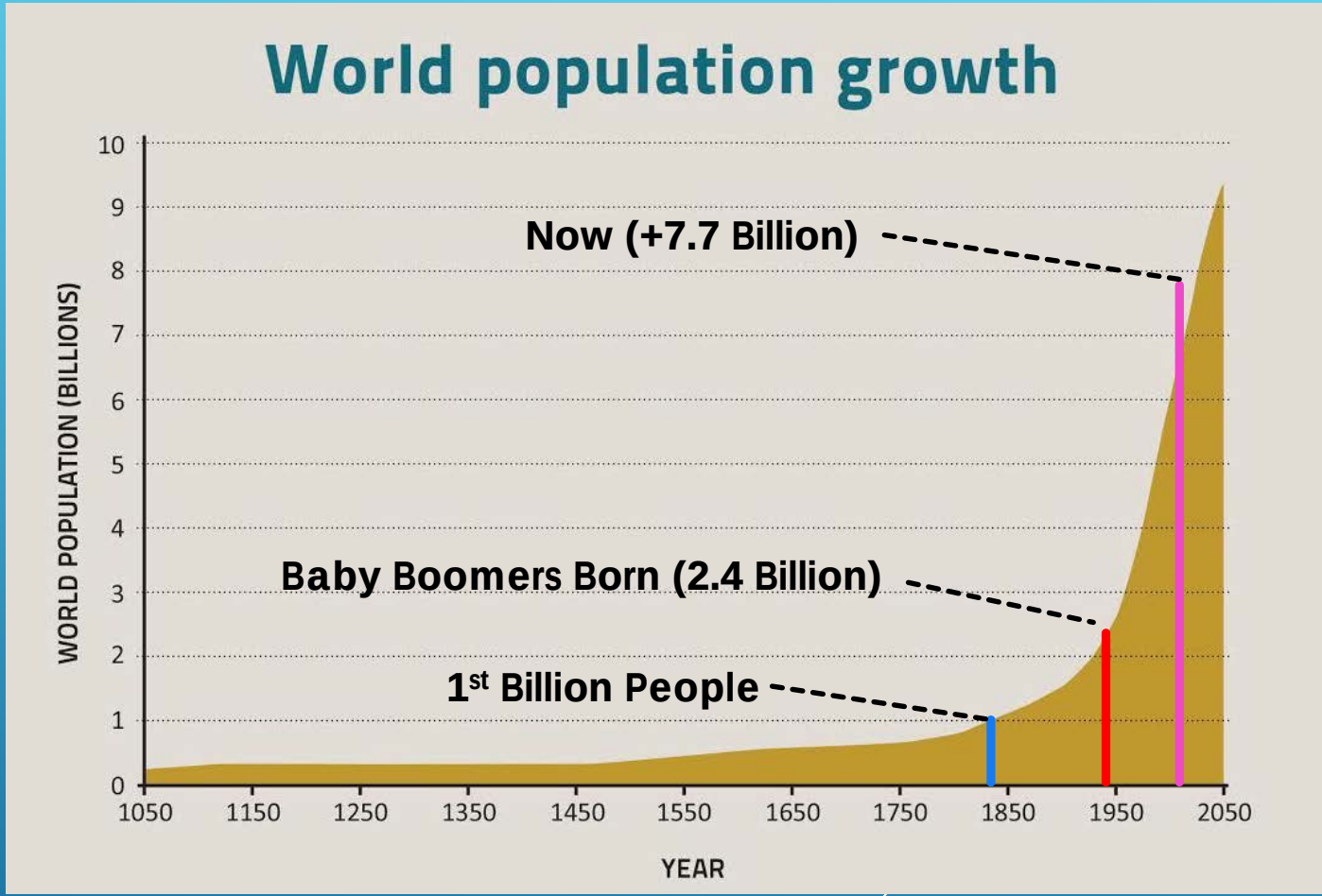
- Only 1% is clean & accessible
  - 70% used for Irrigation
  - 22% used for Industry
  - 0.8% for domestic use



Only about 0.8 % of all the fresh water on the planet is available for domestic use

CONSIDER THIS…





200 thousand years for 1st billion people, only 200 years for the next 8 billion people

More people Depending on the 0.8% of available fresh water

Our actions are polluting the 0.8%

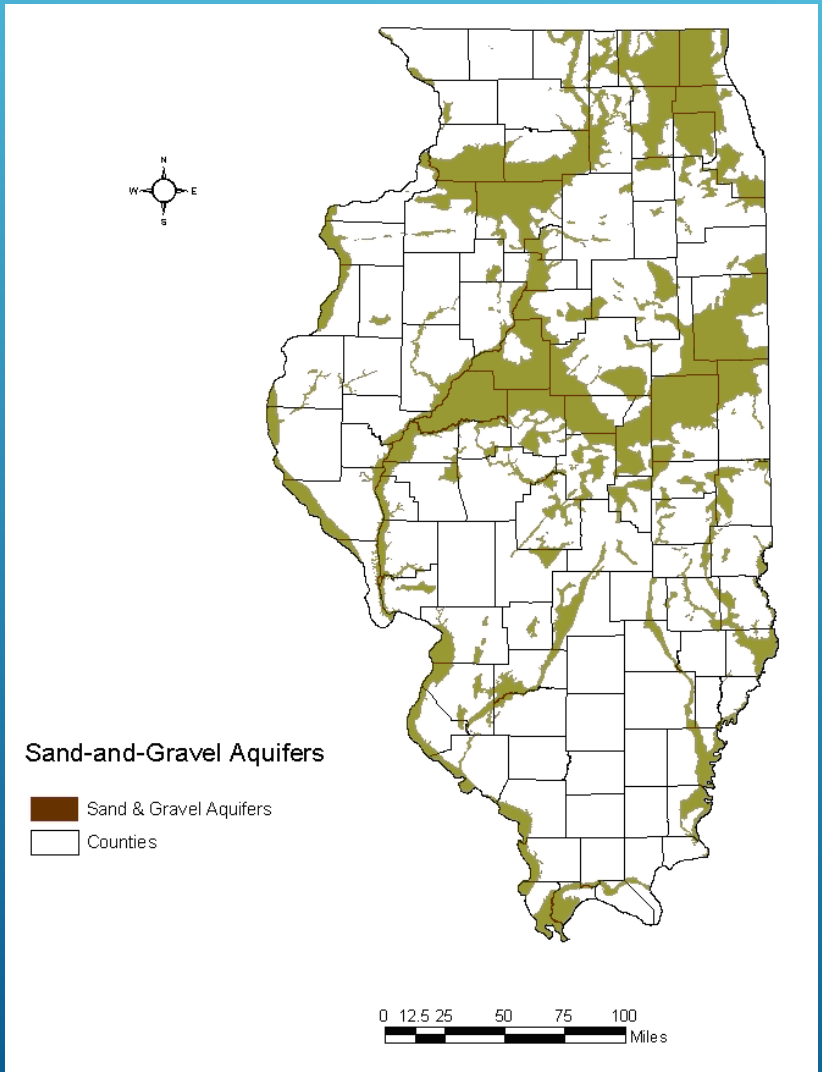
Water is Not Evenly Distributed Around the World

- **By 2025:** **2/3 of worlds population under water stress**

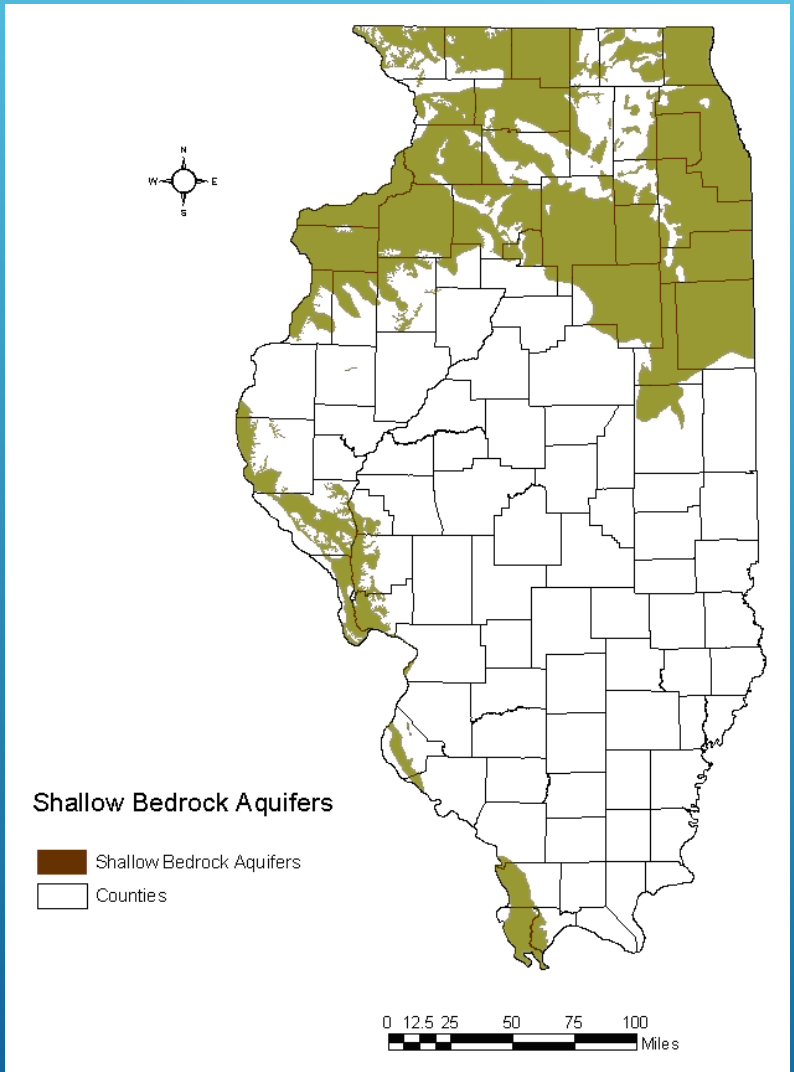
  1.8 billion people in <u>absolute</u> water scarcity

Groundwater Aquifer Distribution in Illinois

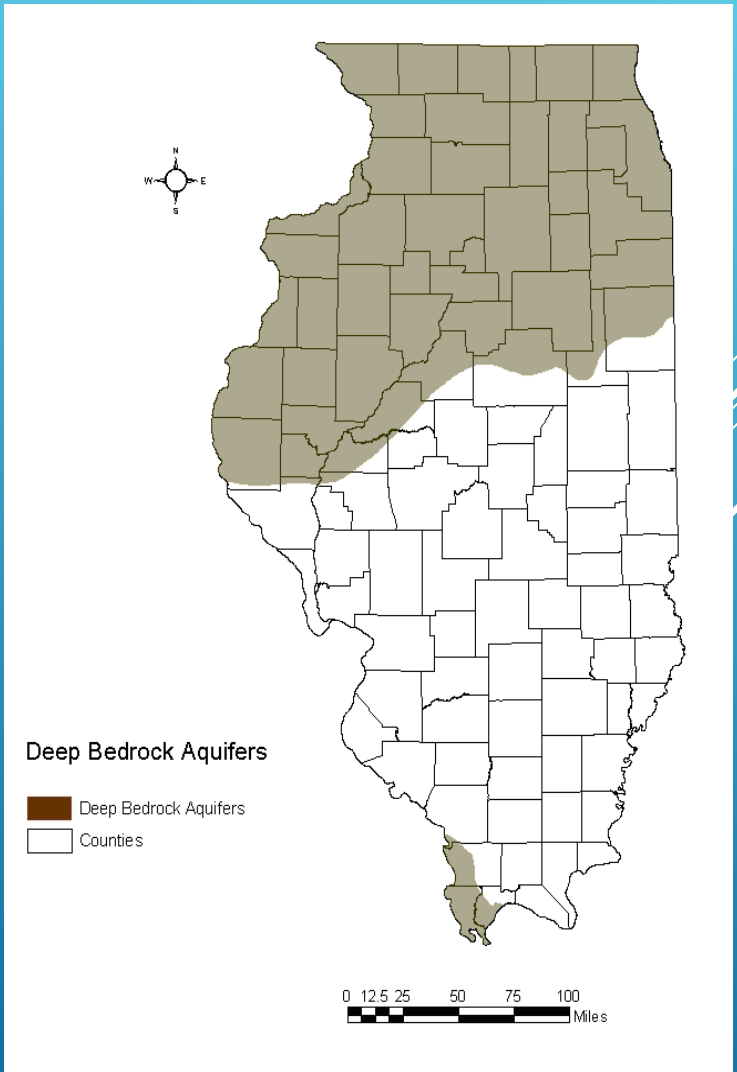
Sand & Gravel



Limestone



Sandstone



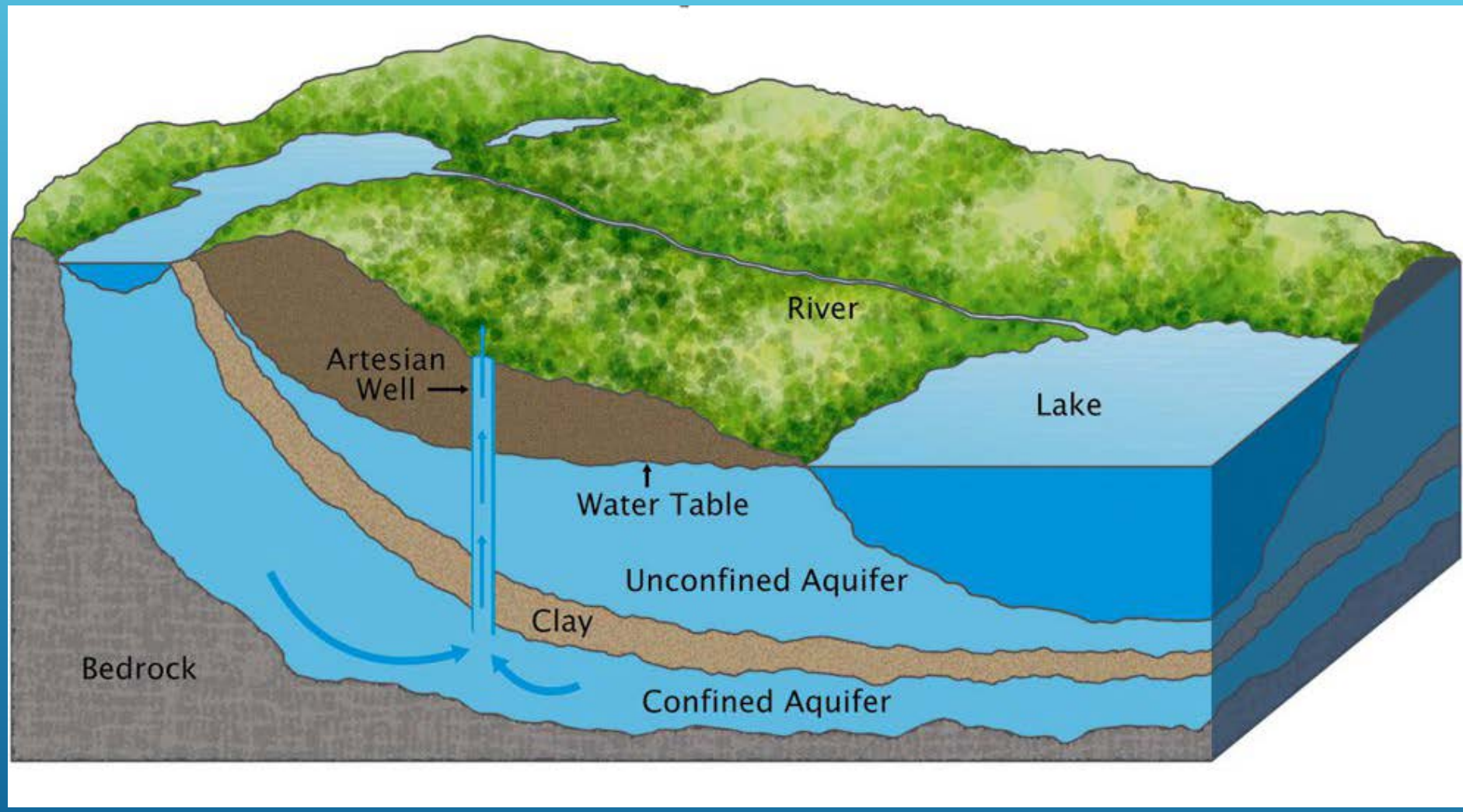
McHenry County is fortunate to have safe, sustainable water…

Only if we protect it!

One Water

All Water is connected

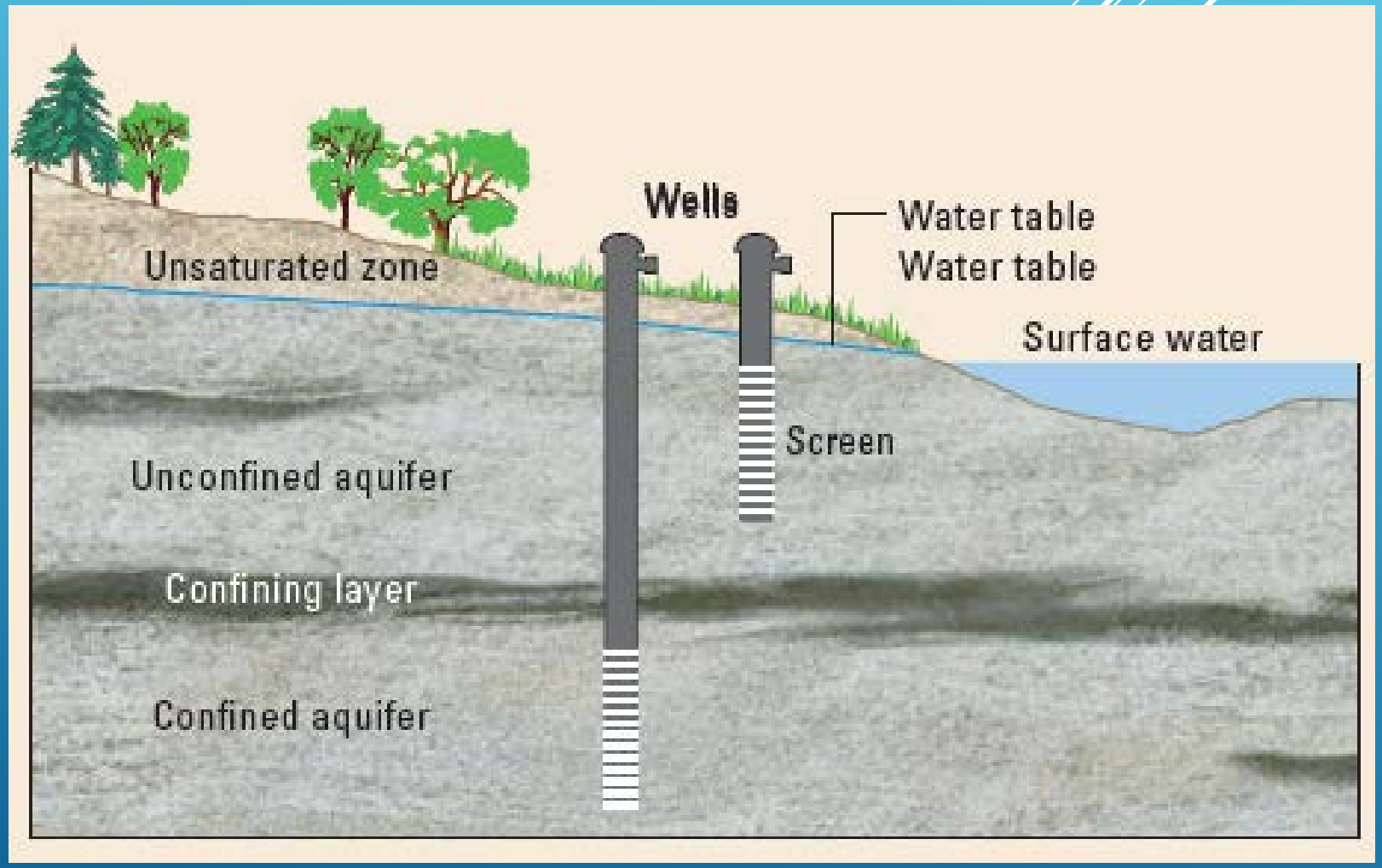
- Evaporation
- Precipitation
- Lakes
- Rivers
- Streams
- Wetlands
- Groundwater
- Storm Water
- Drinking Water
- Waste Water

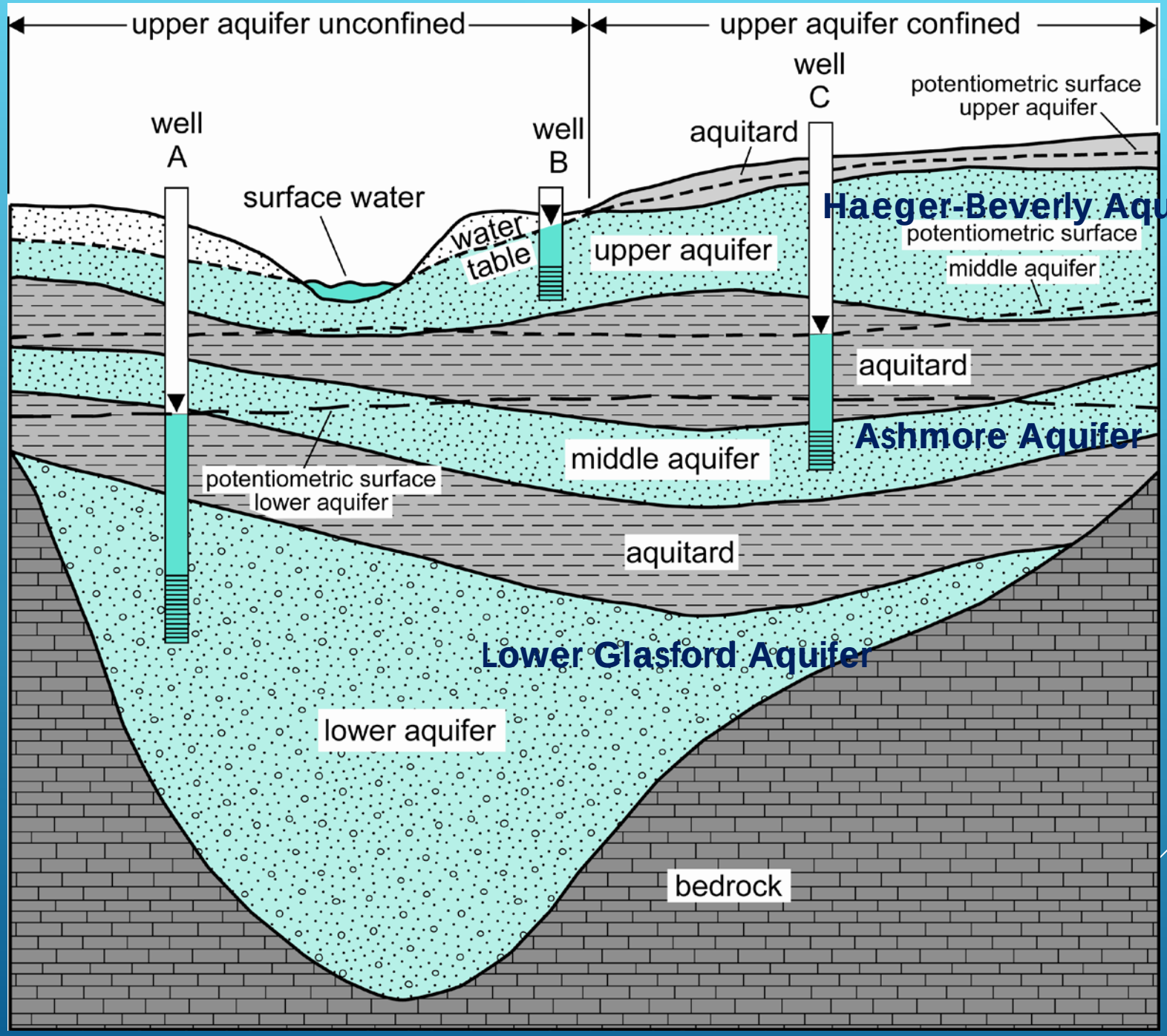


McHenry County Drinking Water
100% Groundwater

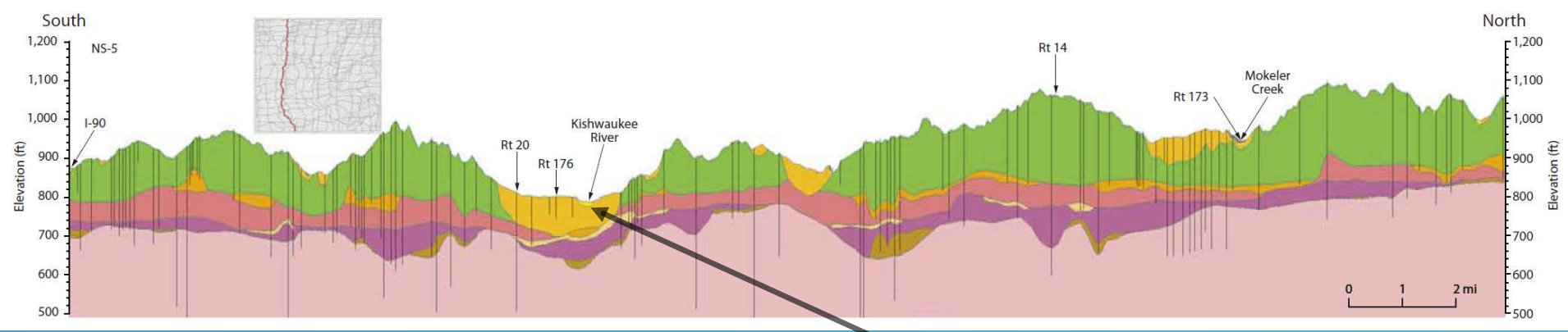
Groundwater is stored in underground aquifers:

- **Sand and Gravel**
- **Limestone (shallow bedrock)**
- **Sandstone (deep bedrock)**

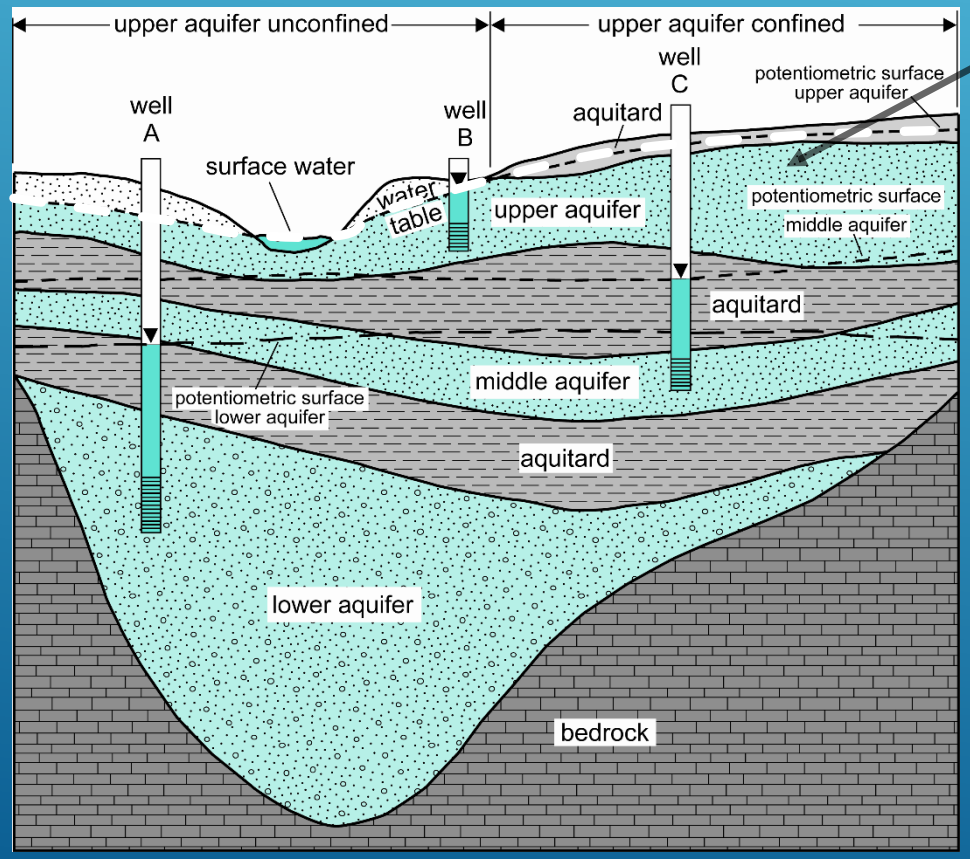




ILLINOIS STATE GEOLOGICAL SURVEY
PRAIRIE RESEARCH INSTITUTE



Haeger-Beverly Aquifer



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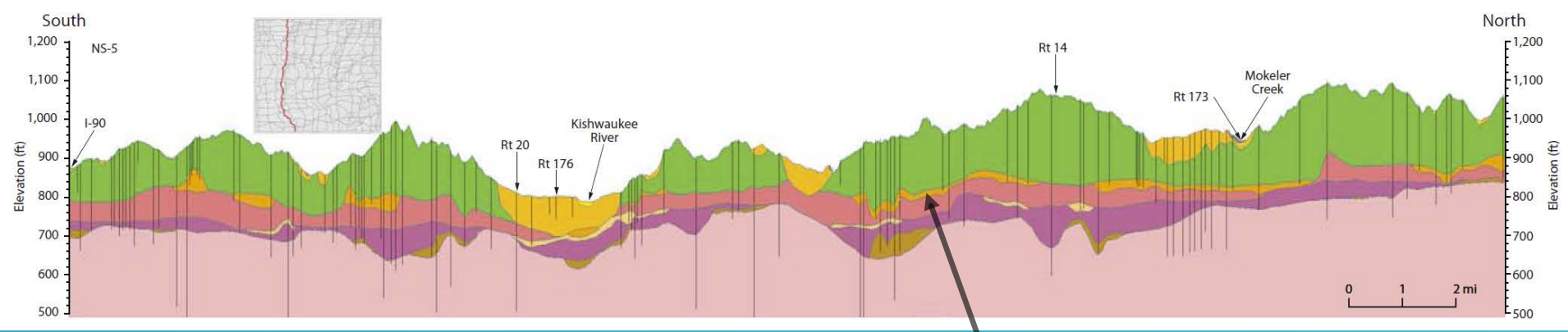

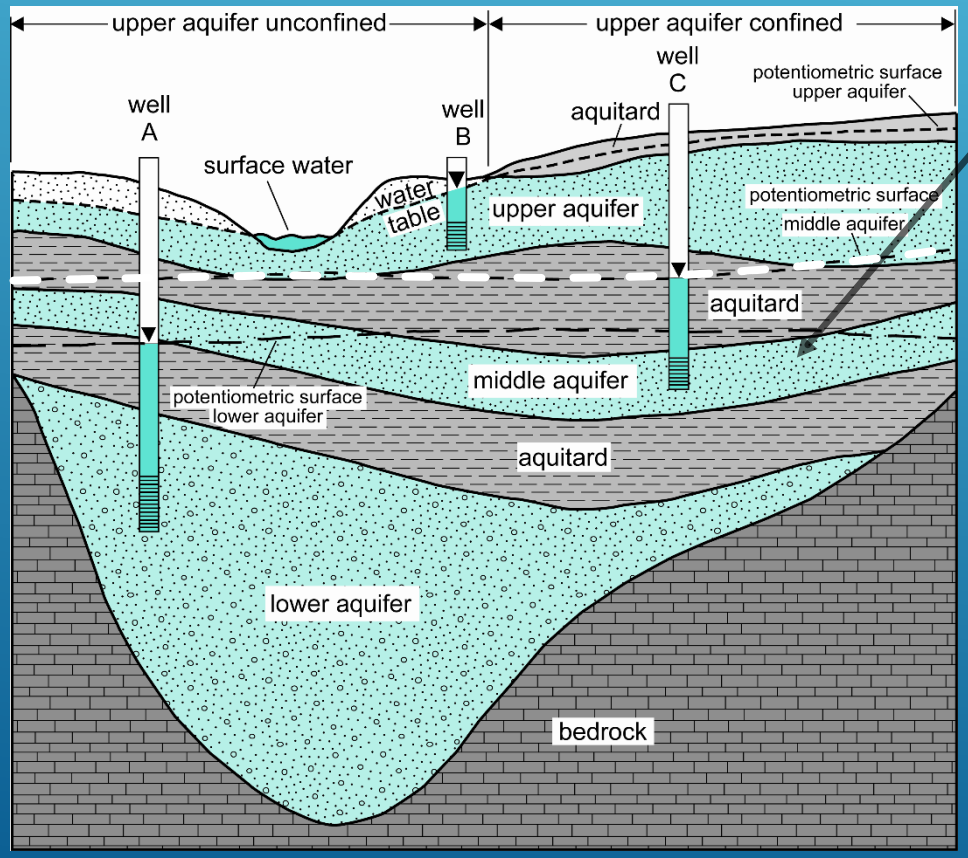

Ashmore Aquifer

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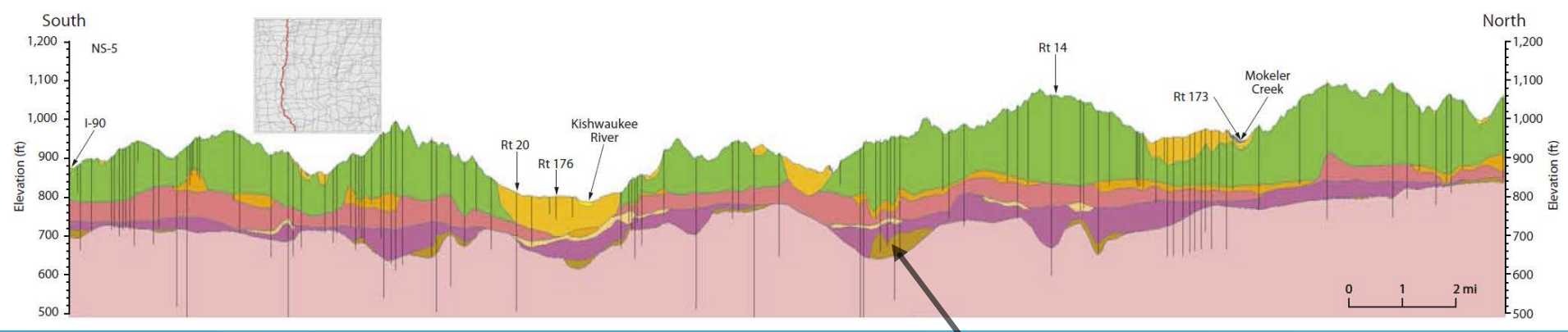

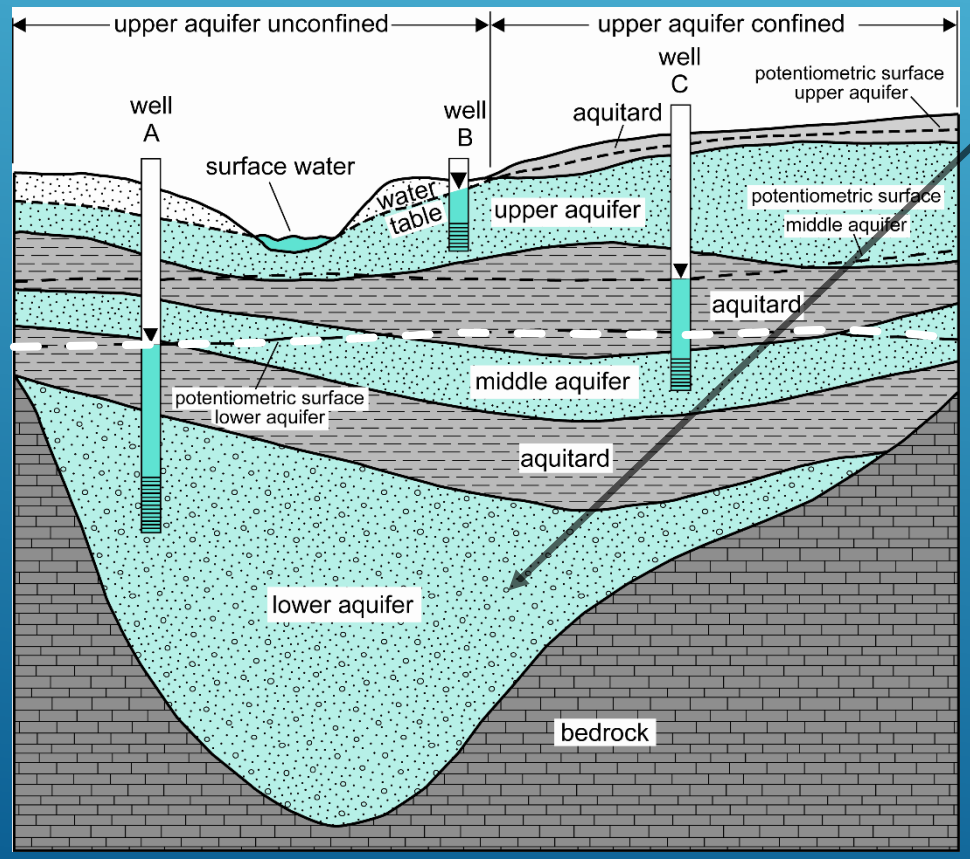

Lower Glasford Aquifer (lower)

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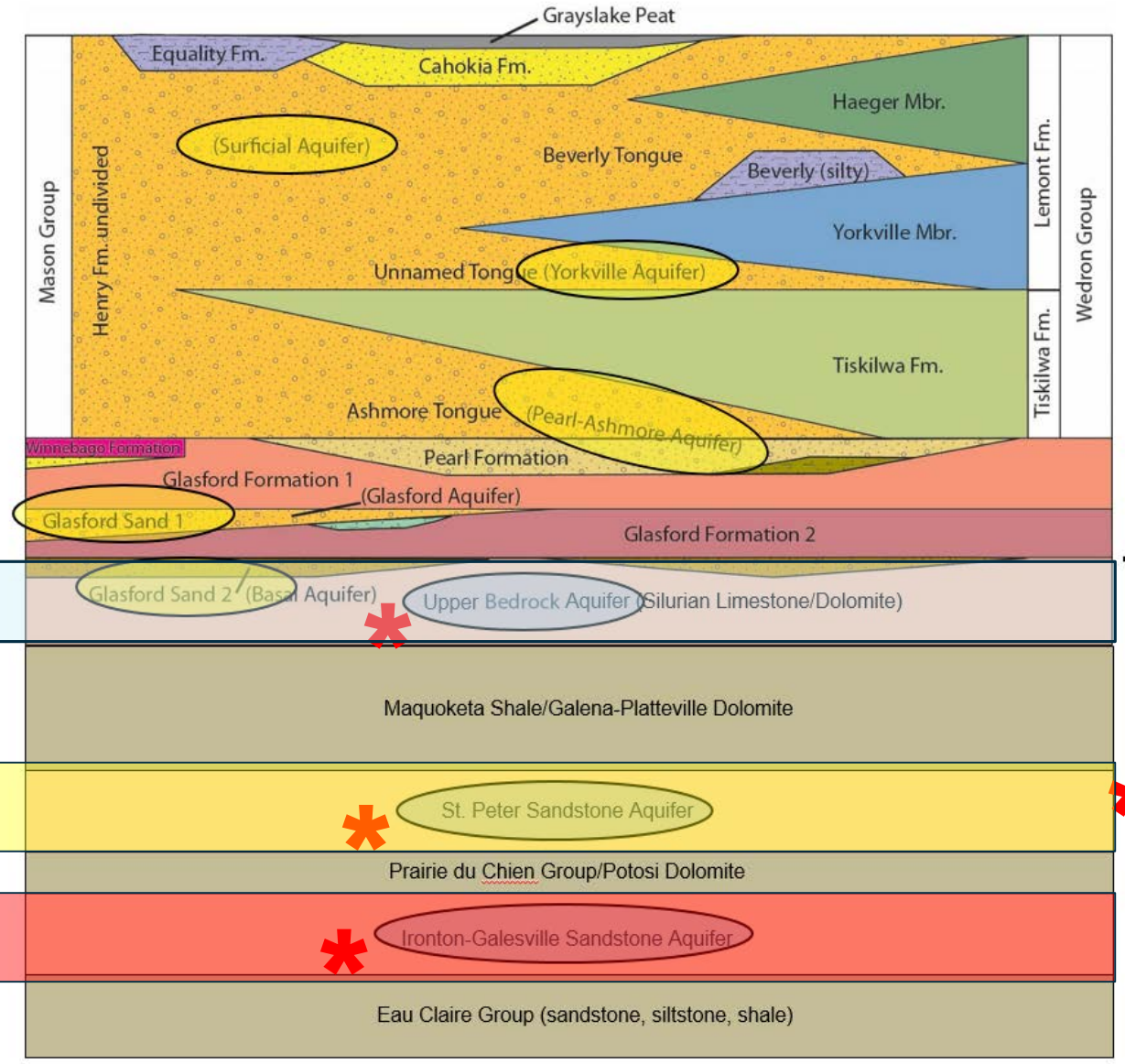
McHenry County Groundwater Aquifers

Sand & Gravel Aquifers



Limestone Aquifer

Sandstone Aquifer

Sandstone Aquifer

Shallow Sand and Gravel Aquifers
0-300 ft deep

(Supplies 75% of water)

Bedrock Aquifers
100-2,000 ft deep

(Supplies 25% of water)

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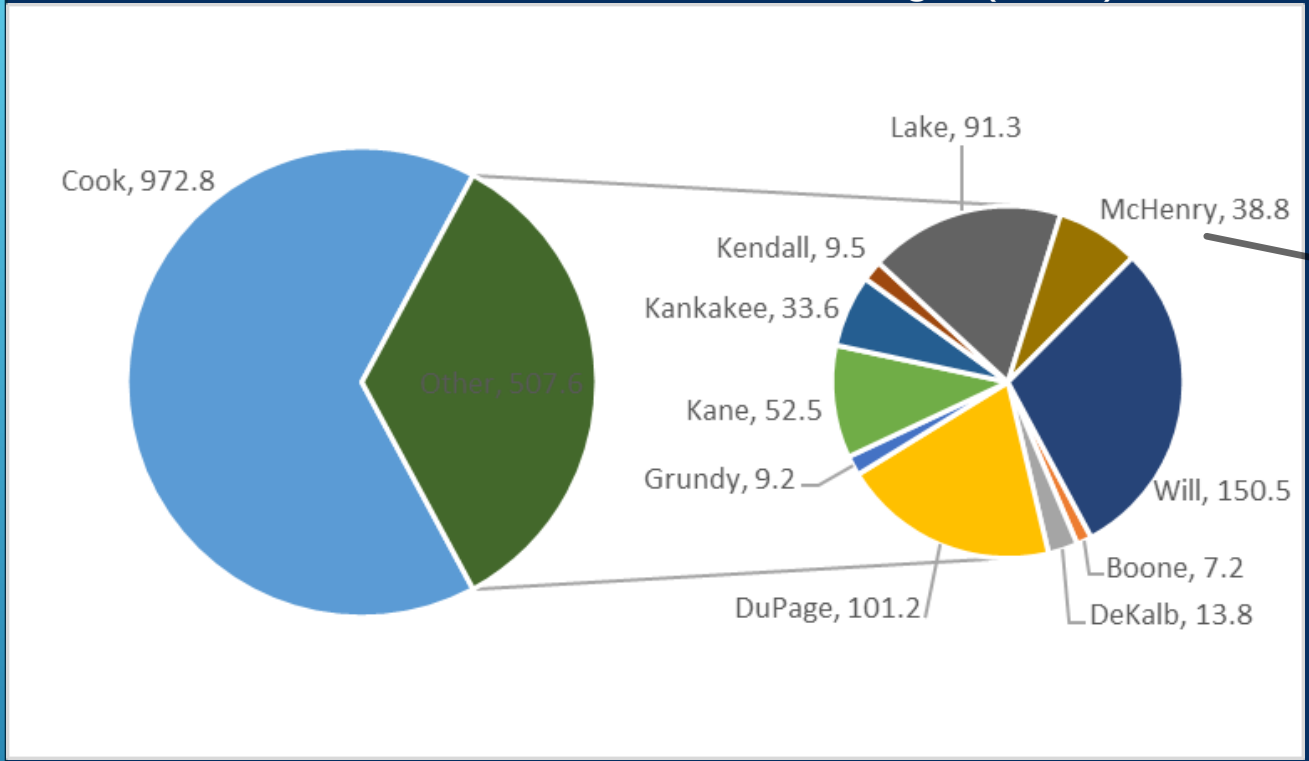
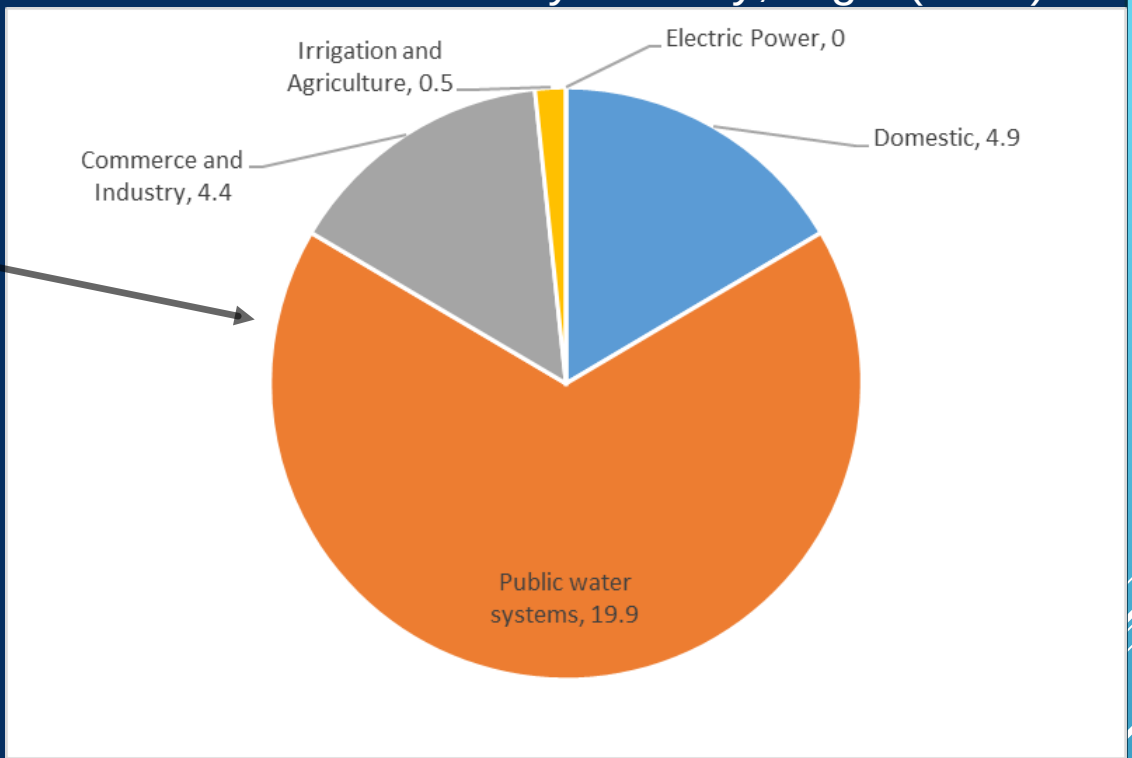
Our Ground Water is Vulnerable…

- Over-Consumption (Finite Supply)
- Loss/Modification of Recharge Area
- Drought (supply decreases/demand increases)
- Contamination

Withdrawals Northeast Illinois, Mgd (2005)



Withdrawals McHenry County, Mgd (2009)



- McHenry County withdraws approximately 40 MGD
- Most withdrawls for public and residential wells
- Water consuming industry or rapid development could completely change rates and ratios

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How much water is sustainable?

Deep Bedrock Aquifers

	MGD Withdrawals		
County	**Safe Yield**	**Sustainable Yield**	**Current Demands**
Cook and DuPage	35	9	10
Grundy	7	7	9
Kane	19	16	26
Kendall	7.5	3	9
Lake	7	5	5
McHenry	8	8	9
Will	17.5	12	30
Total	**101**	**60**	**98**

Illinois State Water Survey (Dan Abrams)

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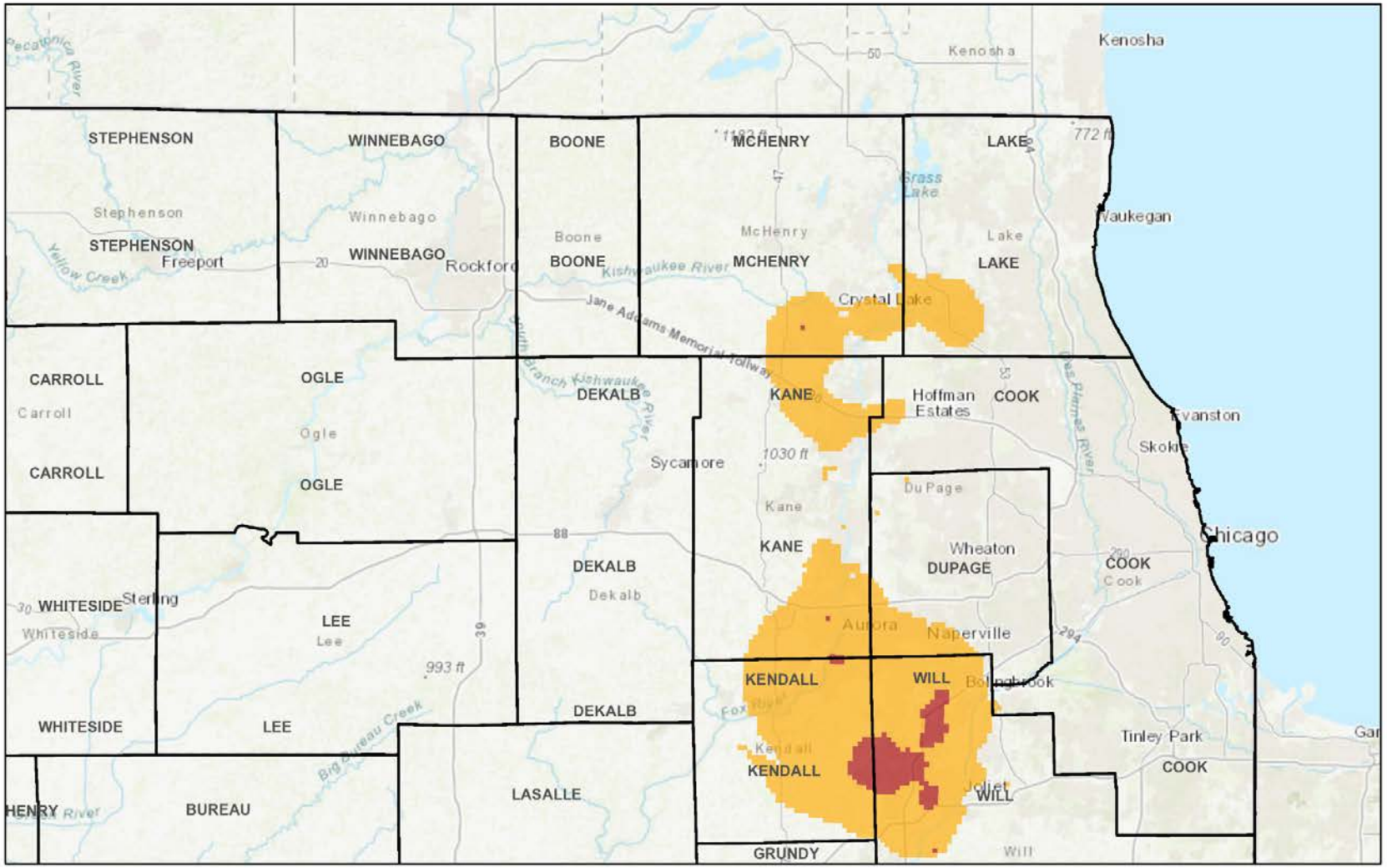
Ironton-Galesville Risk

Deep Aquifer in Southeast McHenry County at Risk of Desaturation



7/23/2018, 6:19:15 PM

Counties

Future

Ironton-Galesville Sandstone Risk Area

Current

1:1,155,581

0 5 10 20 mi

0 10 20 40 km

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Web AppBuilder for ArcGIS

Esri, HERE, Garmin, FAO, USGS, NGA, EPA, NPS | ISWS, ISGS |

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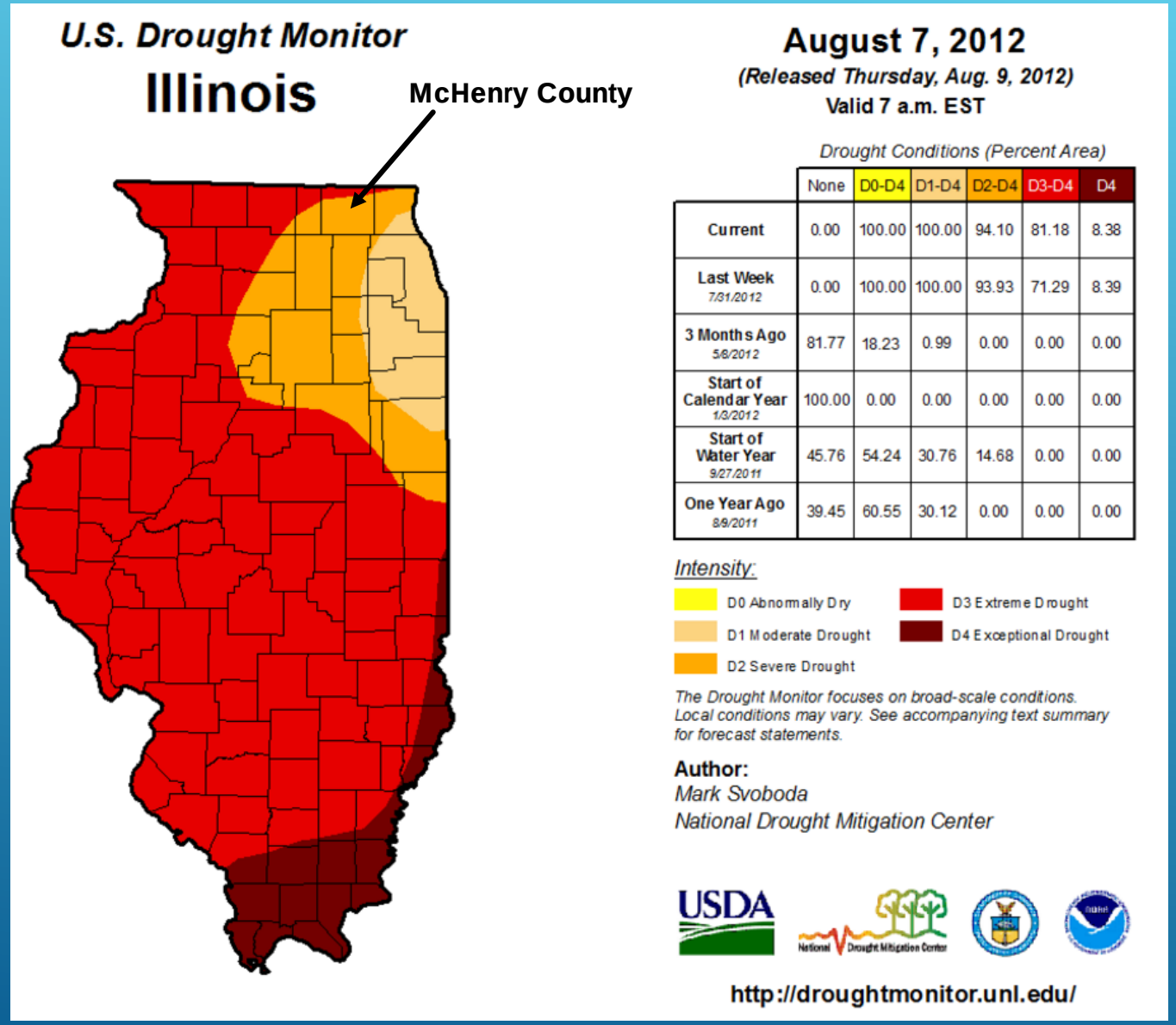
Loss of Groundwater Recharge/Natural Hydrology…

Drought conditions in 2012



	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	100.00	94.10	81.18	8.38
Last Week 7/31/2012	0.00	100.00	100.00	93.93	71.29	8.39
3 Months Ago 5/8/2012	81.77	18.23	0.99	0.00	0.00	0.00
Start of Calendar Year 1/3/2012	100.00	0.00	0.00	0.00	0.00	0.00
Start of Water Year 9/27/2011	45.76	54.24	30.76	14.68	0.00	0.00
One Year Ago 8/9/2011	39.45	60.55	30.12	0.00	0.00	0.00

2012 Drought
Major Drop in Water Levels

CONTAMINATION…

Important Contaminants in McHenry County Groundwater (Regional Scale)

- Natural
  - Arsenic (sand & gravel)
  - Radium (deep bedrock)
  - Barium (deep bedrock)
- Human
  - Nitrate (agriculture, sewage)
  - Total dissolved solids (road salt runoff)
  - Other !!! (Petroleum, solvents, CEC's, etc.)

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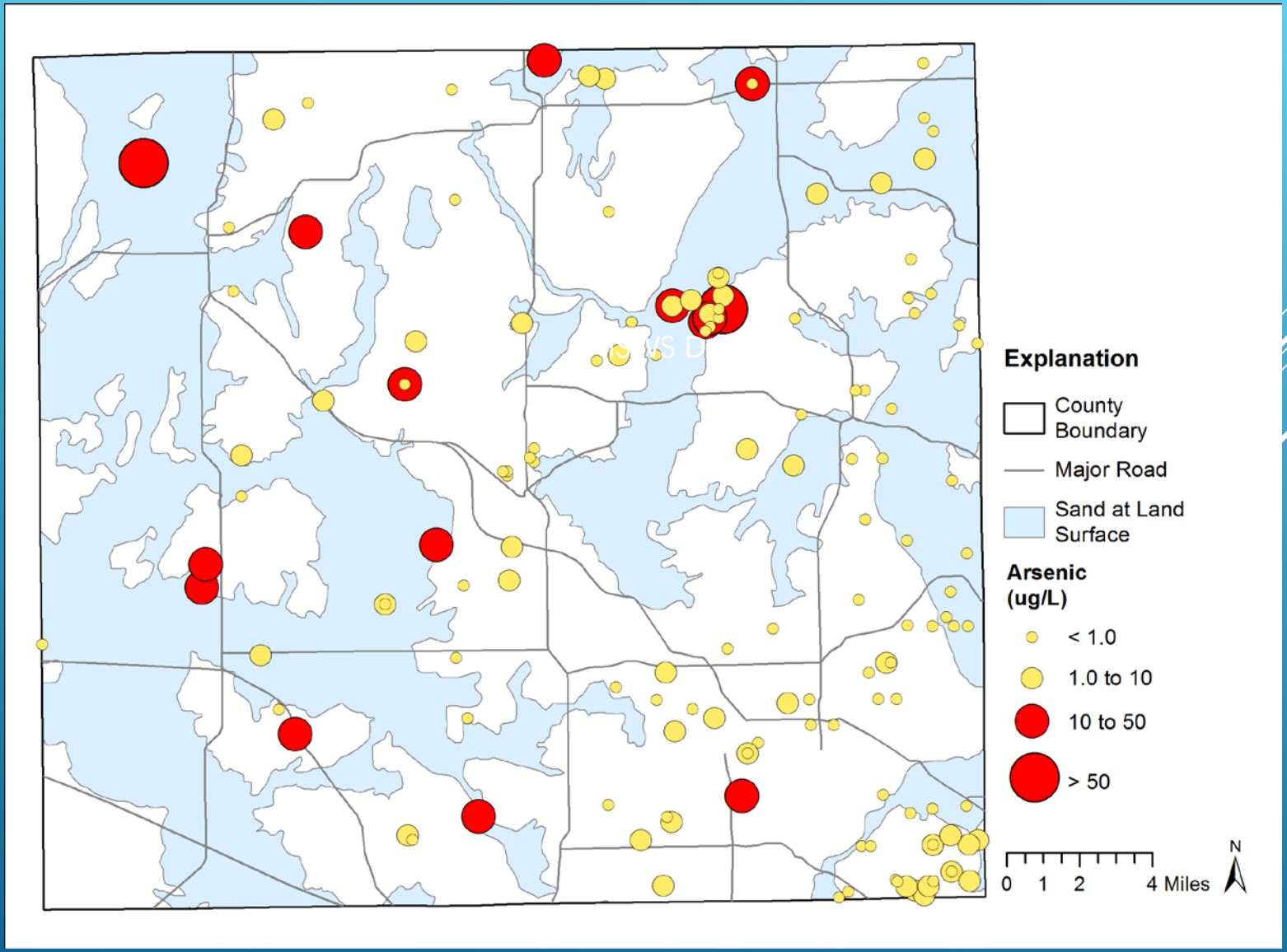
Arsenic in Sand & Gravel Aquifers

- Naturally Occurring
- Difficult to predict
- Testing recommended!
- Multiple forms
- Treatment options costly



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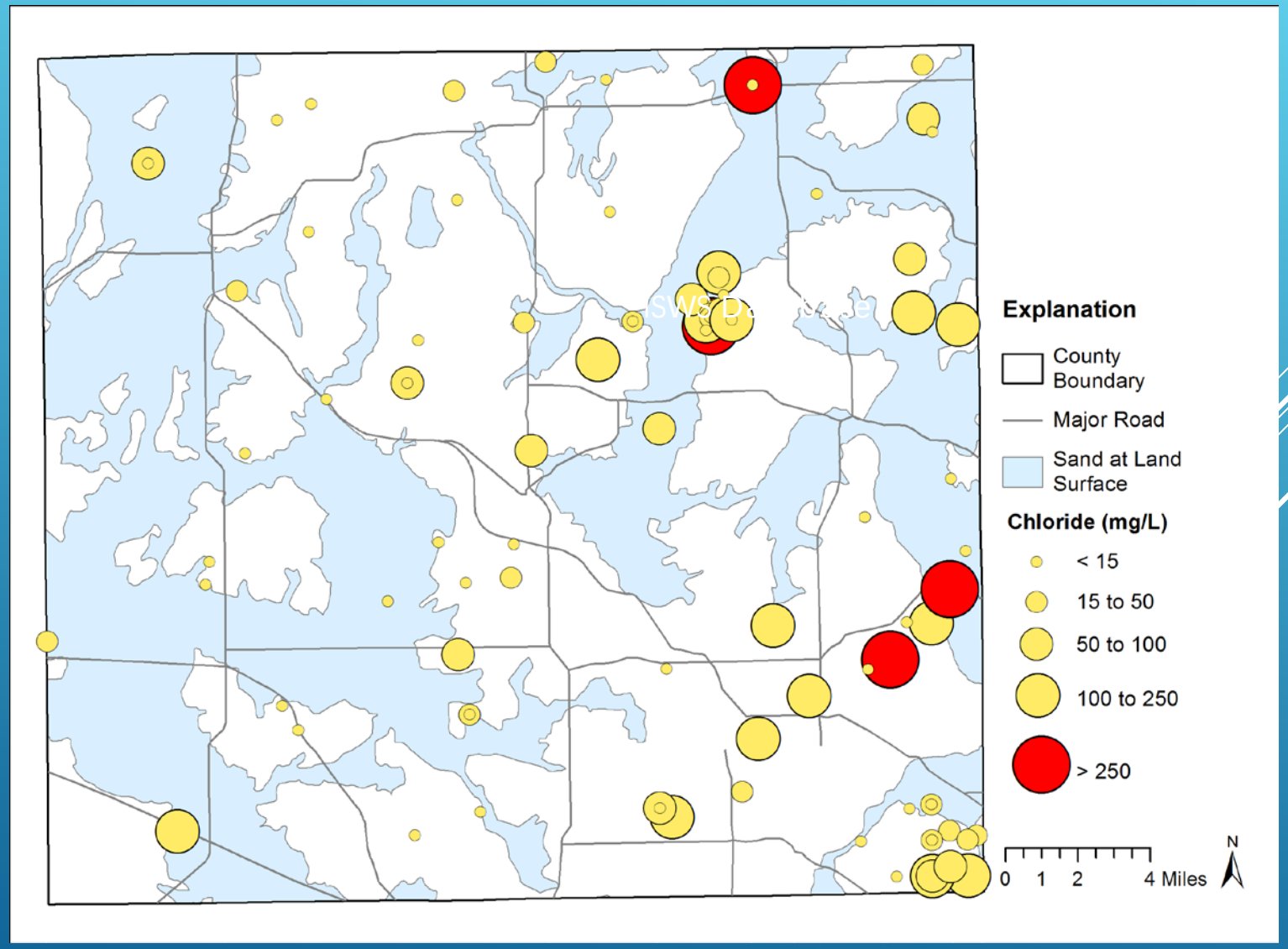
Chloride in Sand & Gravel Aquifers

- Chlorides accumulating
- Primarily road salt
  - Also Water Softeners
- 250 mg/l tastes salty
- Toxic to fish, wildlife vegetation
- Corrodes Infrastructure
- Treatment options costly



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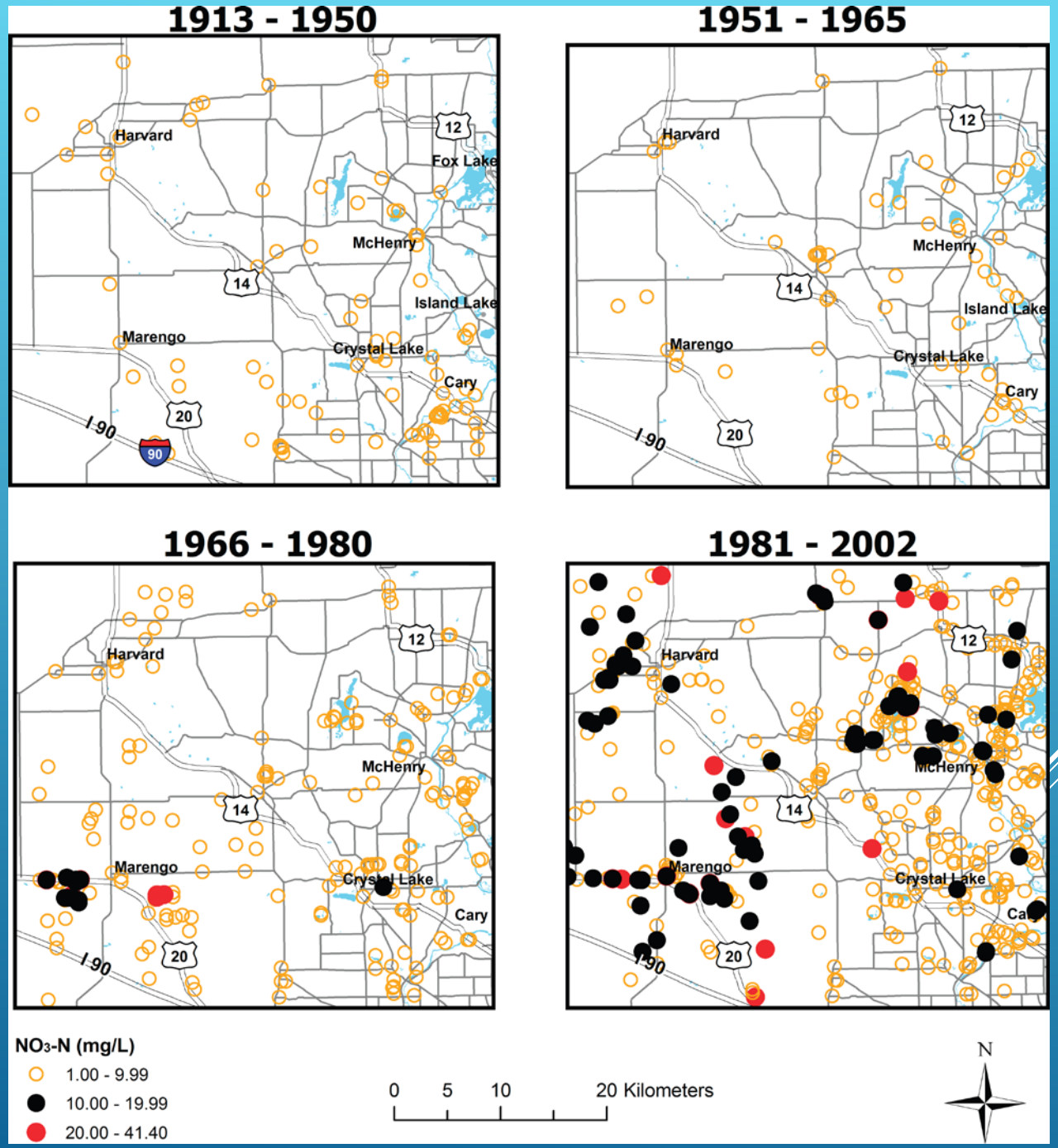
Nitrate-N: Historical Data

- Agriculture & sewage
- Nitrate increasing



ISGS Study

Hwang et al., 2015. *Environmental & Engineering Geoscience*, XXI(2):75.

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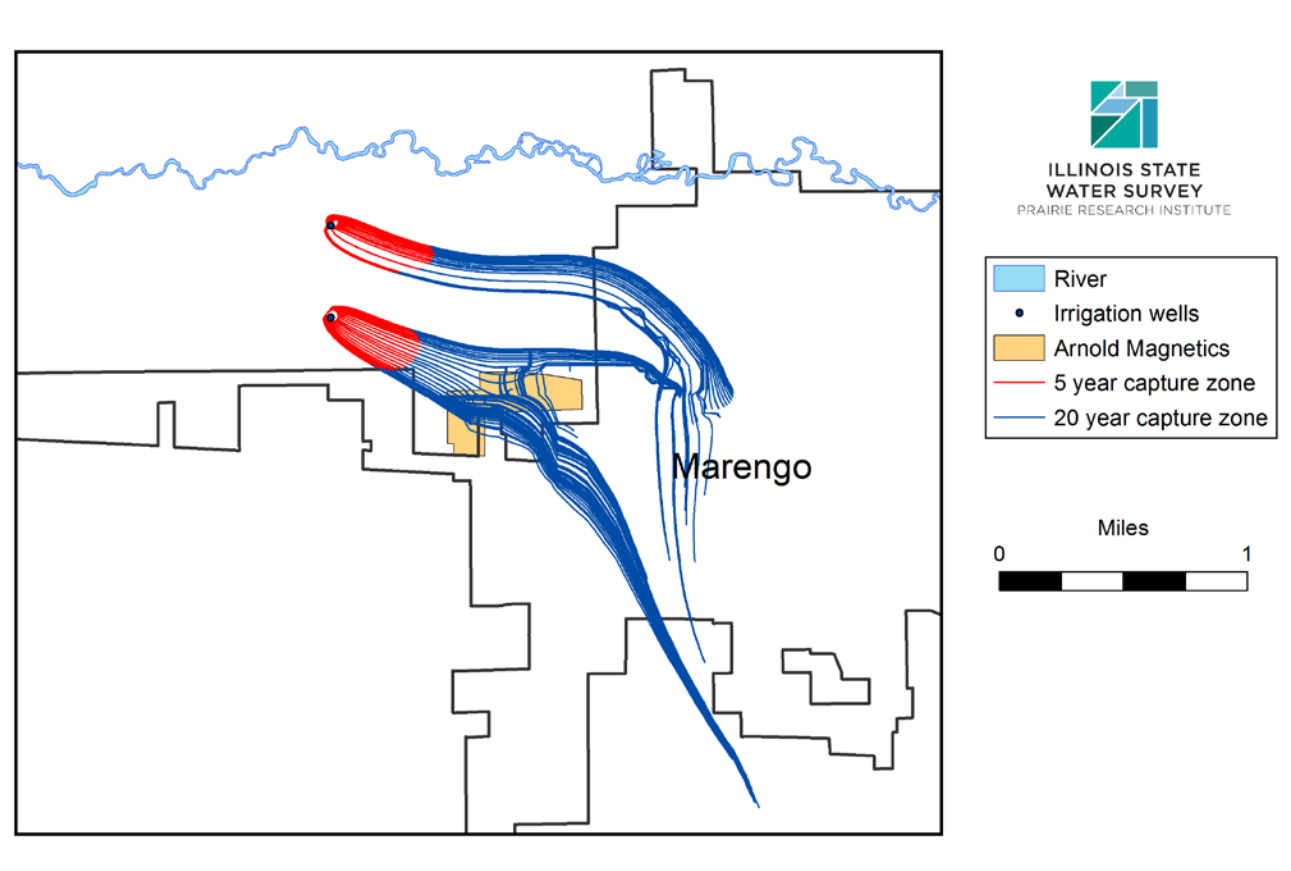
Groundwater Contamination

- Many pollutants in groundwater move
- Can contaminate wells downgradient from plume
- Legacy pollution & new sources
- Groundwater pollution difficult to study
- Treatment options costly



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Contaminants of Emerging Concern

U.S. EPA Definition:

- Recently 'discovered' due to updates or improvements in analysis or detection
- Detected at low levels in surface water
- Concern about impacts on aquatic life
- No regulatory standards

Sea Grant
ILLINOIS-INDIANA

Contaminants of Emerging Concern

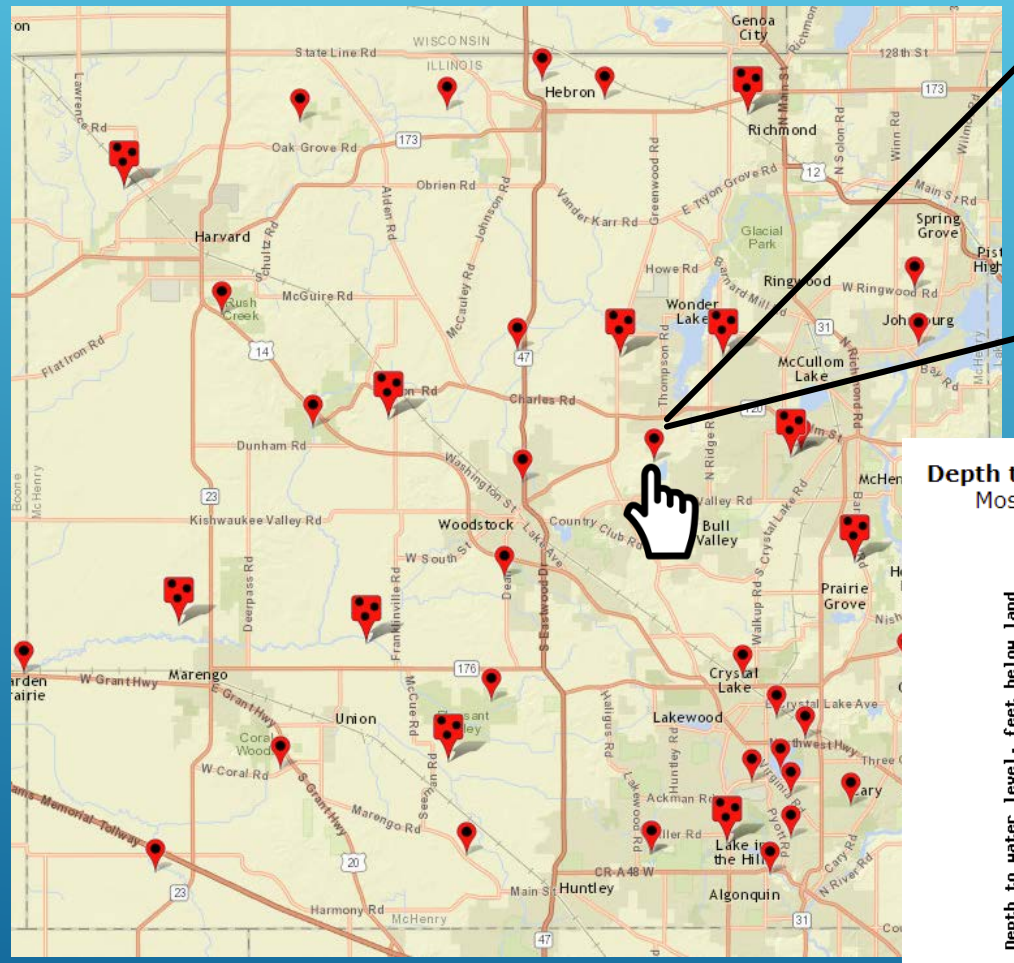
Include:

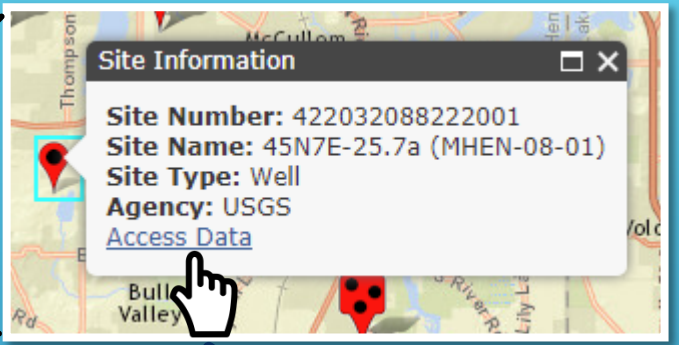
- PFAS, PFOA
- Micro-Plastics
- Pharmaceuticals and Cosmetics
- Coal Tar Sealants

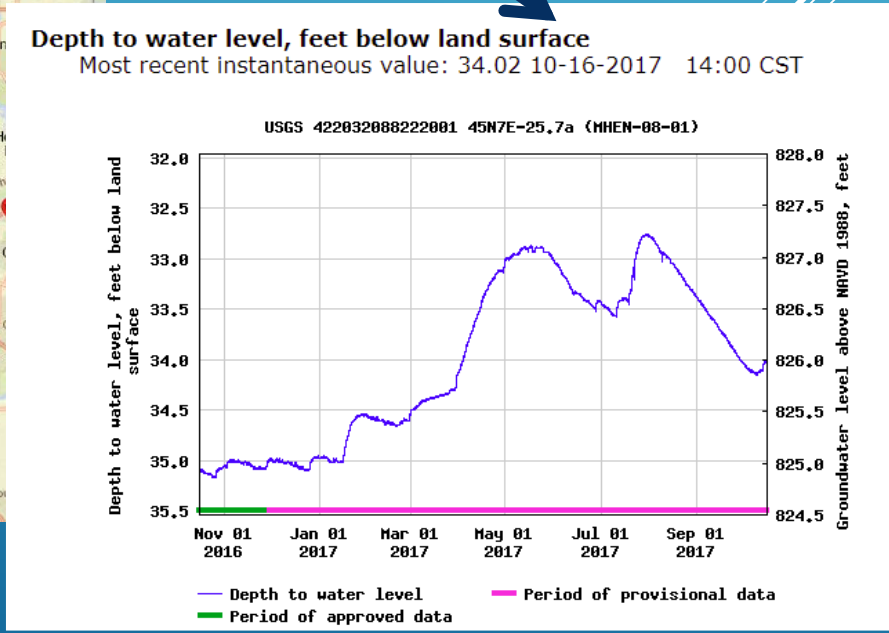
Sea Grant
ILLINOIS-INDIANA

NATIONAL WATER INFORMATION SYSTEM: ON-LINE

HTTPS://MAPS.WATERDATA.USGS.GOV/MAPPER/

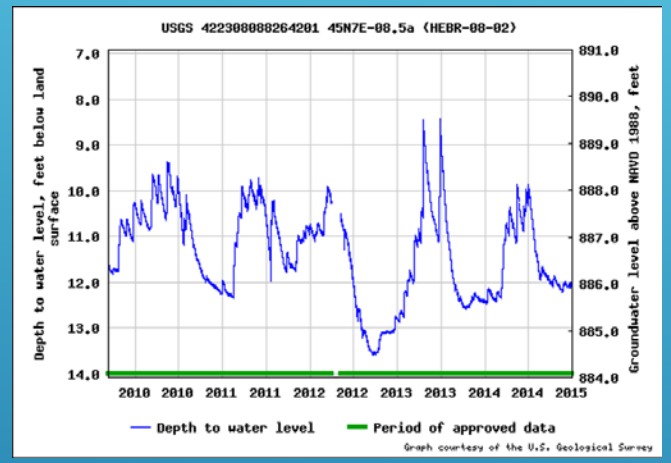




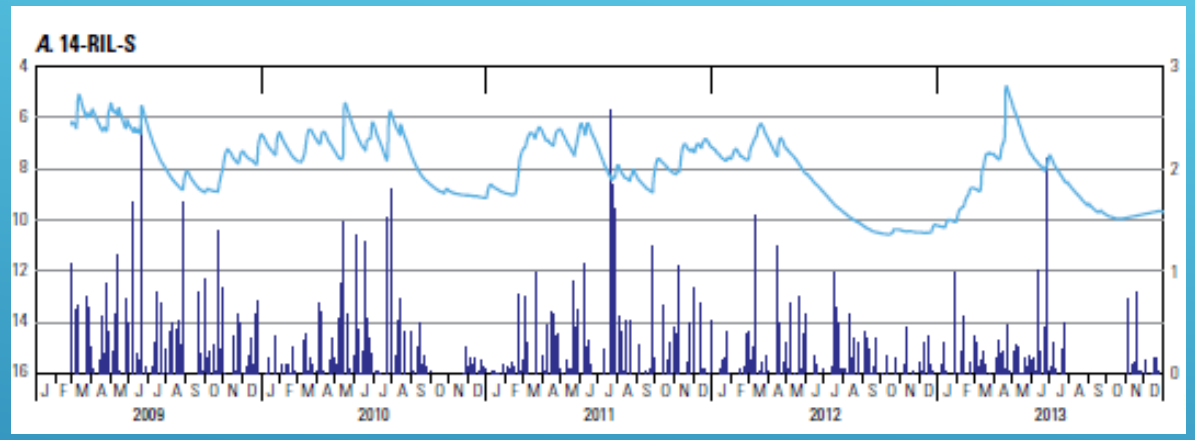


USGS Monitoring Wells – Uses of Data

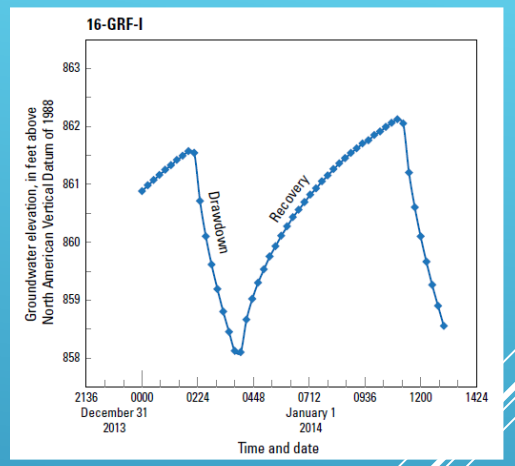
Groundwater Levels



Water Recharge/Discharge Areas

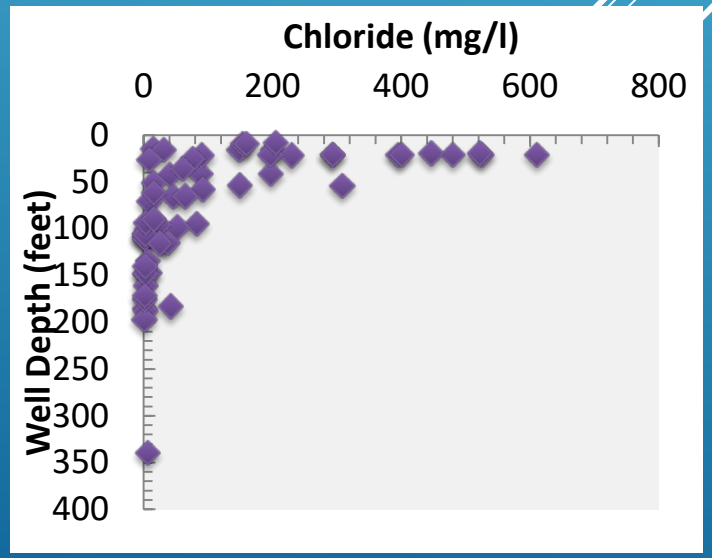


Pumping influences

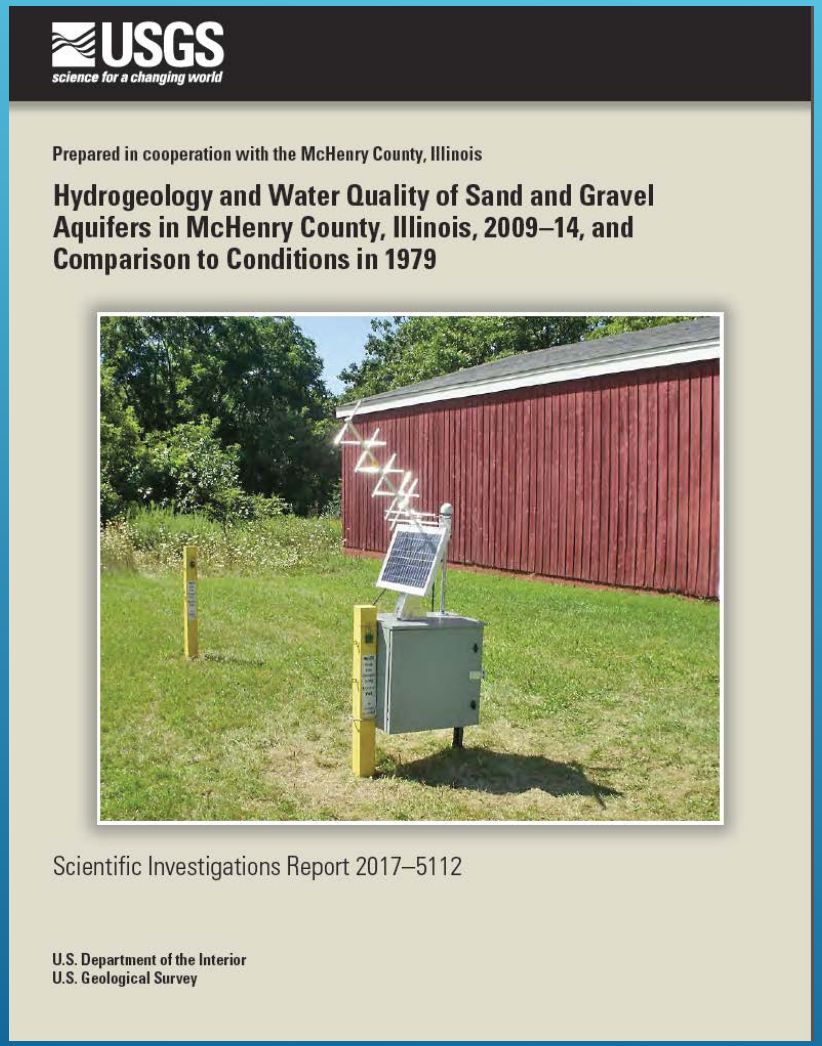


Drought Planning

Water Quality



USGS Water Quality Report (2017)


USGS
science for a changing world

Prepared in cooperation with the McHenry County, Illinois

Hydrogeology and Water Quality of Sand and Gravel Aquifers in McHenry County, Illinois, 2009–14, and Comparison to Conditions in 1979

Scientific Investigations Report 2017–5112

U.S. Department of the Interior
U.S. Geological Survey

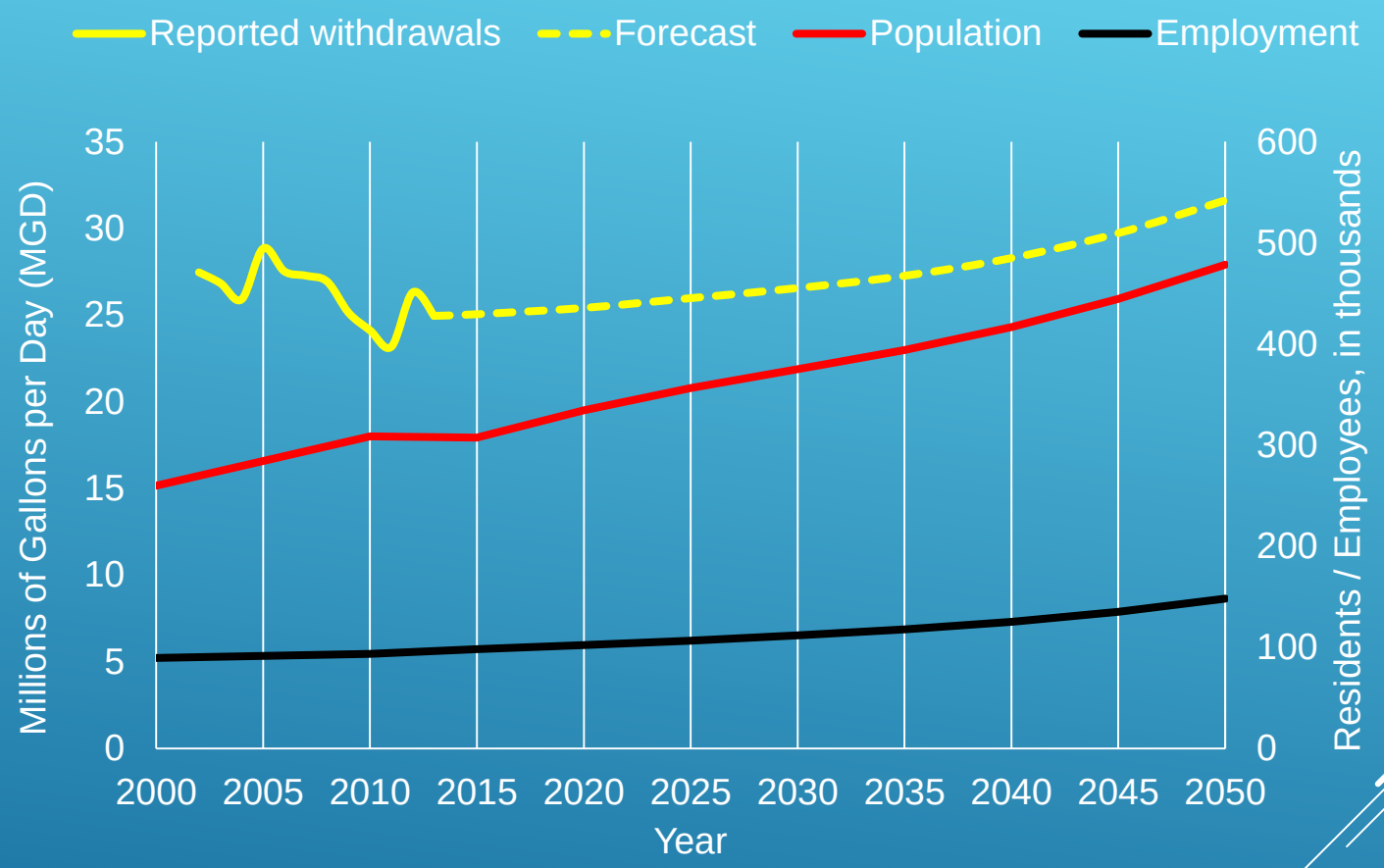
- Conducted water quality testing in 2010
- **Established baseline conditions for comparison with future studies**
- Recent report summarized water quality findings of 2010 study
- Hope to replicate every 10 years and add CEC's

McHenry County demand for water by 2050

McHenry County Water Demand and Socioeconomic Forecast

Note: Private residential wells are not included.

Source: CMAP ON TO 2050 Regional Water Demand Forecast CMAP ON TO 2050 Socioeconomic Forecast.



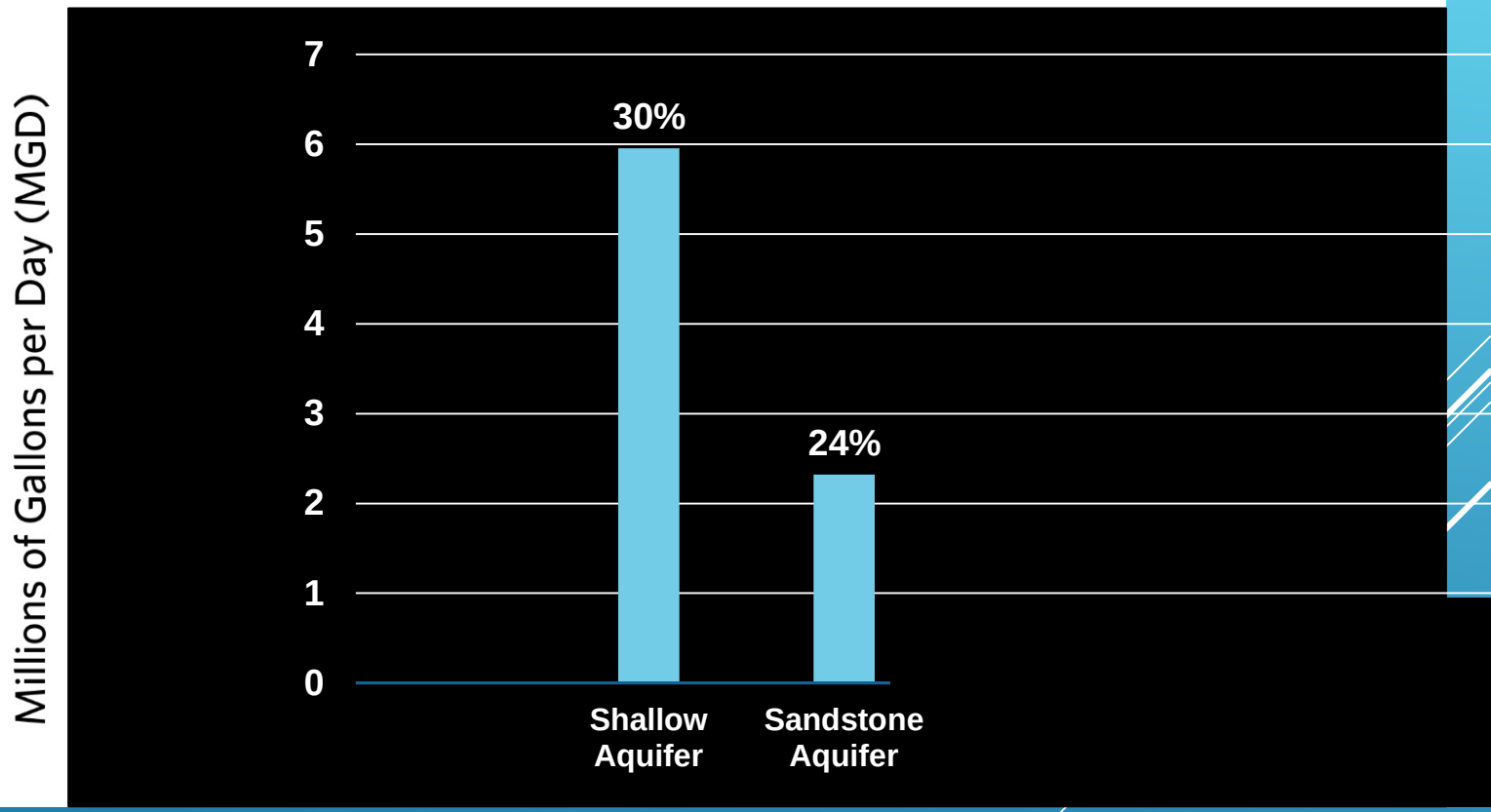
478,639

- Population projected to increase to 478,639 by 2050
- Modest increase in project water use ASSUMES continued conservation trends

McHenry County demand by source

Projected changes in water demand by water source, 2011-50

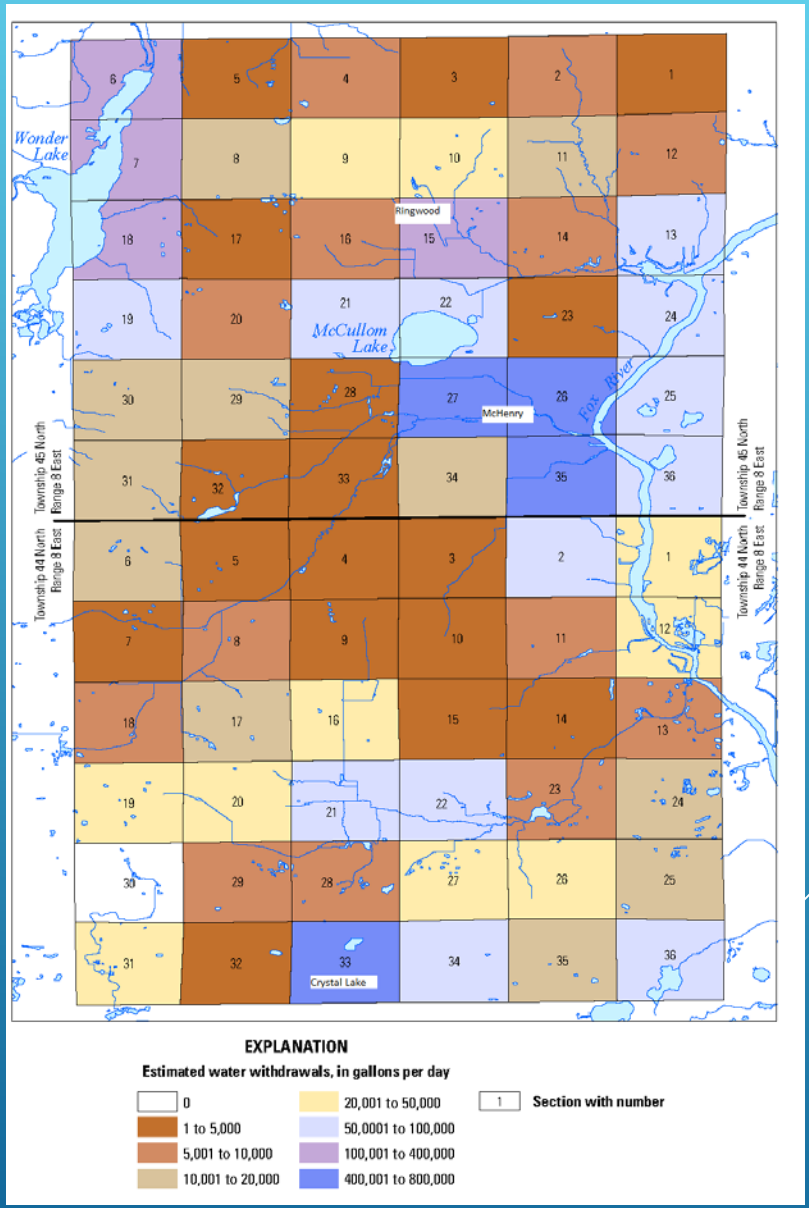
Source: CMAP ON TO 2050 Regional Water Demand Forecast.



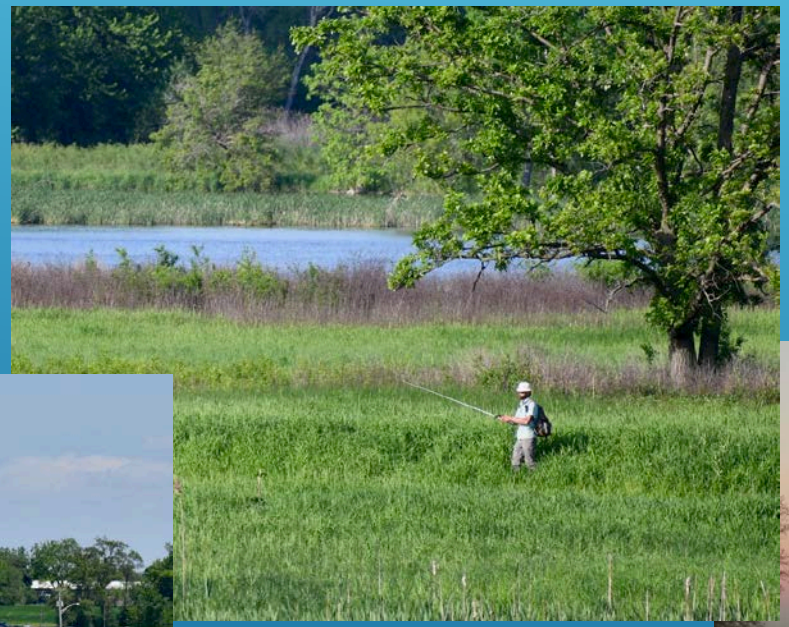
- Withdrawls from Deep Sandstone Aquifers already exceed sustainable yield
- Aquifers in southeast at risk of desaturation

USGS Water Demand Studies

- Have tools to study water demand and withdrawls
- Can study specific aquifers
  - Sand and gravel
  - Shallow bedrock
  - Deep bedrock

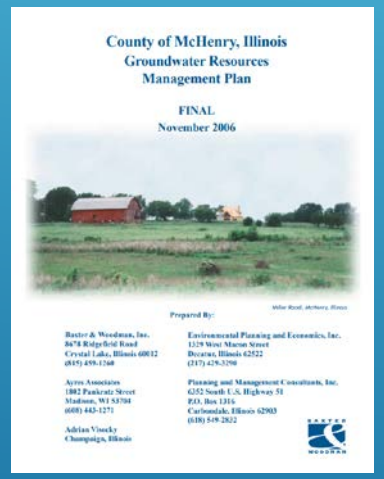


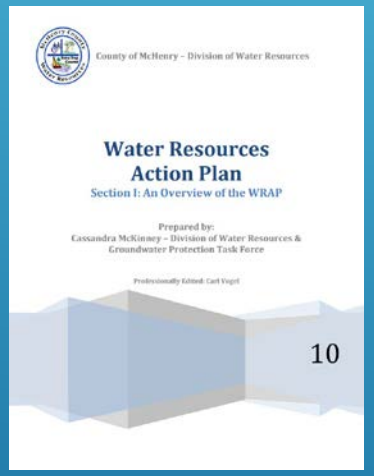
McHenry County Water Resources Deserve Protection

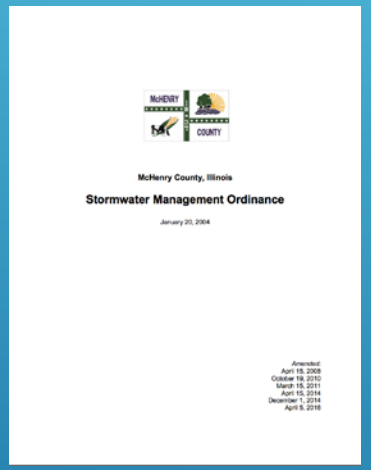


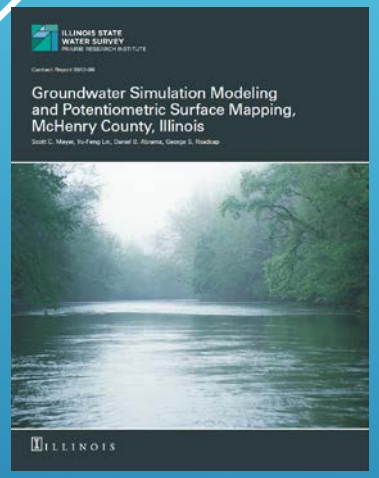
McHenry County has been a Leader in Protecting Water Resources

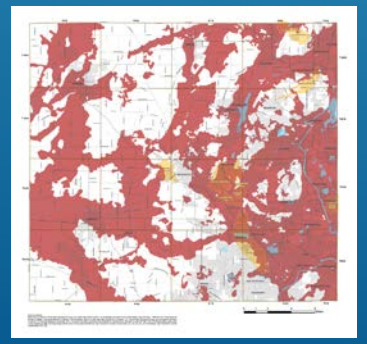
Research - Plans - Practices - Ordinances - Education - Action

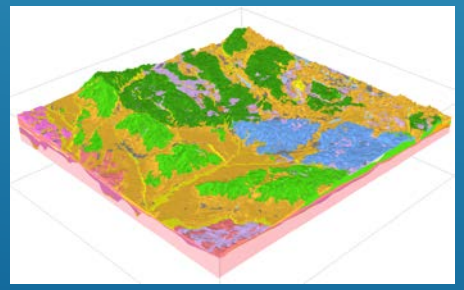








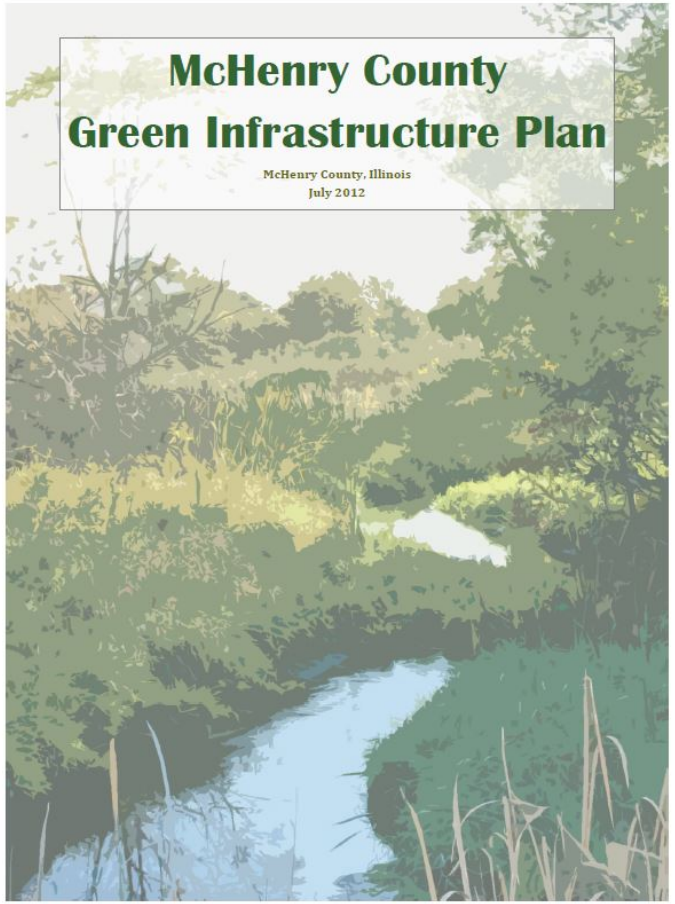


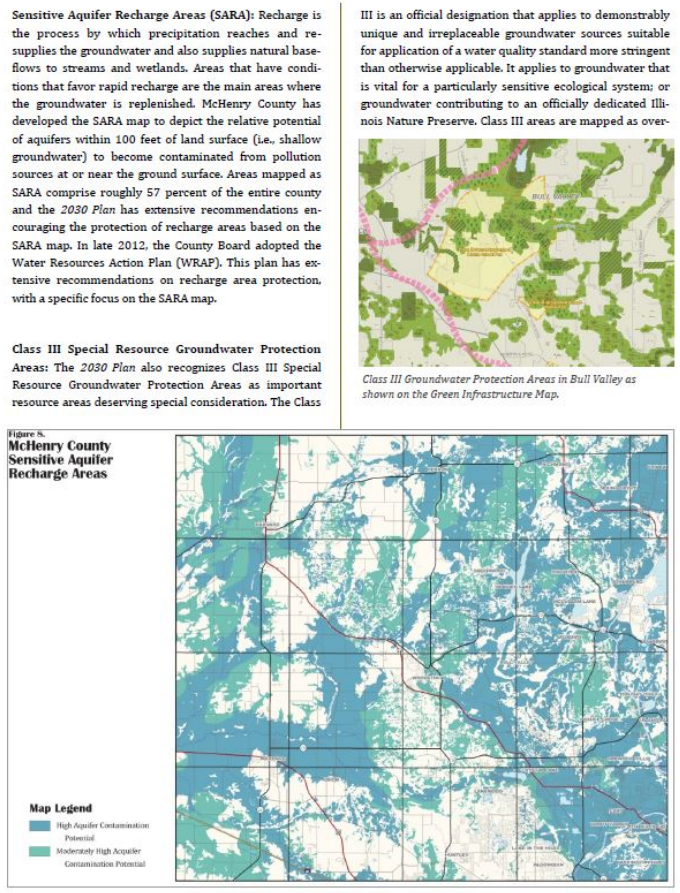


The Next Step is to Update the Water Resources Action Plan (WRAP)

- Identify threats to water resources
- Provide Best Management Practices to address each threat
- Design it to be functional, polished and easy to use

WRAP Format





Sensitive Aquifer Recharge Areas (SARA): Recharge is the process by which precipitation reaches and re-supplies the groundwater and also supplies natural base-flows to streams and wetlands. Areas that have conditions that favor rapid recharge are the main areas where the groundwater is replenished. McHenry County has developed the SARA map to depict the relative potential of aquifers within 100 feet of land surface (i.e., shallow groundwater) to become contaminated from pollution sources at or near the ground surface. Areas mapped as SARA comprise roughly 57 percent of the entire county and the *2030 Plan* has extensive recommendations encouraging the protection of recharge areas based on the SARA map. In late 2012, the County Board adopted the Water Resources Action Plan (WRAP). This plan has extensive recommendations on recharge area protection, with a specific focus on the SARA map.

Class III Special Resource Groundwater Protection Areas: The *2030 Plan* also recognizes Class III Special Resource Groundwater Protection Areas as important resource areas deserving special consideration. The Class III is an official designation that applies to demonstrably unique and irreplaceable groundwater sources suitable for application of a water quality standard more stringent than otherwise applicable. It applies to groundwater that is vital for a particularly sensitive ecological system; or groundwater contributing to an officially dedicated Illinois Nature Preserve. Class III areas are mapped as over-

Class III Groundwater Protection Areas in Bull Valley as shown on the Green Infrastructure Map.

Figure 5.
McHenry County Sensitive Aquifer Recharge Areas

Map Legend
High Aquifer Contamination Potential
Moderately High Acquifer Contamination Potential

The SARA map. Image taken from the 2030 Plan.

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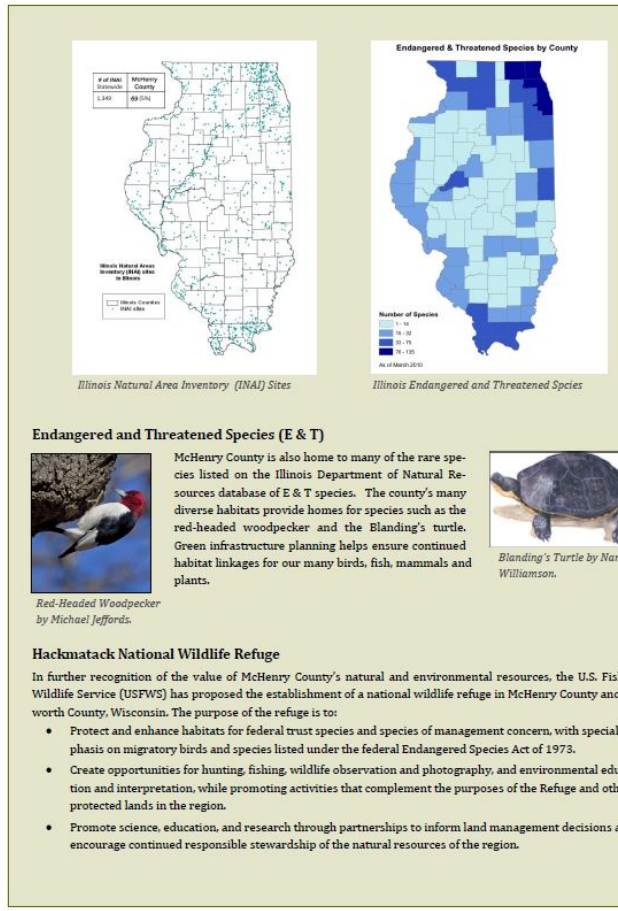

Illinois Natural Area Inventory (INAI) Sites

Illinois Endangered and Threatened Spcies

Endangered and Threatened Species (E & T)

McHenry County is also home to many of the rare species listed on the Illinois Department of Natural Resources database of E & T species. The county's many diverse habitats provide homes for species such as the red-headed woodpecker and the Blanding's turtle. Green infrastructure planning helps ensure continued habitat linkages for our many birds, fish, mammals and plants.

Red-Headed Woodpecker by Michael Jeffords.

Blanding's Turtle by Nancy Williamson.

Hackmatack National Wildlife Refuge

In further recognition of the value of McHenry County's natural and environmental resources, the U.S. Fish and Wildlife Service (USFWS) has proposed the establishment of a national wildlife refuge in McHenry County and Walworth County, Wisconsin. The purpose of the refuge is to:

- Protect and enhance habitats for federal trust species and species of management concern, with special emphasis on migratory birds and species listed under the federal Endangered Species Act of 1973.
- Create opportunities for hunting, fishing, wildlife observation and photography, and environmental education and interpretation, while promoting activities that complement the purposes of the Refuge and other protected lands in the region.
- Promote science, education, and research through partnerships to inform land management decisions and encourage continued responsible stewardship of the natural resources of the region.

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- **Maximize Space on Pages**
- **Call Outs: Topics, Case Studies**

Contributions from Task Force Members

- **Case Studies** – Provide examples of how water resources are appreciated or protected in your communities
  (e.g. Restoration Projects, Best Management Practices, Plans, Ordinances).
- **Quality photos or graphics** that represent topics covered in WRAP.
- **Best Management Practices** for water quality or quantity that have been demonstrated to be effective.

INTRODUCTION

History of Water Resource Planning in McHenry County

McHenry County

- Demographics
- Geology
- Land Cover
- Climate
- Environment
- Watersheds

Land Uses

- Residential
- Commercial
- Transportation
- Agricultural
- Natural Areas/Open Space

WATER RESOURCES

General Hydrology

- Hydrologic Cycle
- Surface Water
- Groundwater
- Natural vs Urbanized Hydrology

General Water

- Biology
- Health
- Ecology/Environment
- Economy
- Threats (Contamination, Over-Use, Drought)
- Regulation (Federal, State, Local)
- Total Maximum Daily Load (TMDL)
- **One Water Concept**

McHenry County <u>Ground Water</u>

3 main types of drinking water aquifers

- Shallow Aquifer – Sand and Gravel
- Shallow Bedrock – Limestone
- Deep Bedrock – Sandstone (2 main aquifers)
  - St. Peters Sandstone (upper)
  - Ironton Galesville Sandstone (lower)

Water Quality

Water Quantity

Supply and Demand

Scientific Studies and Technical Resources

McHenry County <u>Surface Water</u>

Lakes, rivers, streams, wetlands

Watersheds

Stormwater

Floodplain

Water Quality

Water Quantity

Plans, Studies, Reports, Ordinances

MAJOR WATER ISSUES & BEST MANAGEMENT PRACTICES

Climate Change

Water Infrastructure

- Drinking Water
- Waste Water
- Storm Water
- Water Reuse

Water Conservation

- Municipal
- Commercial/Business
- Residential

Flooding

Drought Planning

LAND USES AFFECTING WATER & BEST MANAGEMENT PRACTICES

- Residential/Business Development
- Industrial/Heavy Commercial Development
- Transportation
- Gravel Pits
- Agriculture
- Golf Courses
- Natural Areas/Open Space
- Recreation And Health

LAND USES AFFECTING WATER & BEST MANAGEMENT PRACTICES

Miscellaneous

- Coal Tar Sealants
- Lawn-Chemicals
- Auto Salvage Yards
- Improperly Abandoned Wells
- Aboveground and underground Storage Tanks
- Abandoned Landfills
- Fly Dumping

WRAP Process

- Draft Sections Will be Posted to Website in advance of Meetings
- Task Force Will Discuss Draft Sections During Last 1/3 of Meeting
- Email comments, suggested edits to wrap@mchenrycountyil.gov
- Edits Will be Applied as Appropriate
- Task Force to Review Final Draft During Last 2 meetings
- Completed WRAP to County Board for Adoption in Spring 2020

Thank You

Questions?

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