Geology and Groundwater in McHenry County

Jason Thomason
Illinois State Geological Survey

Water Resources Action Plan meeting
April 10, 2019

ILLINOIS STATE GEOLOGICAL SURVEY
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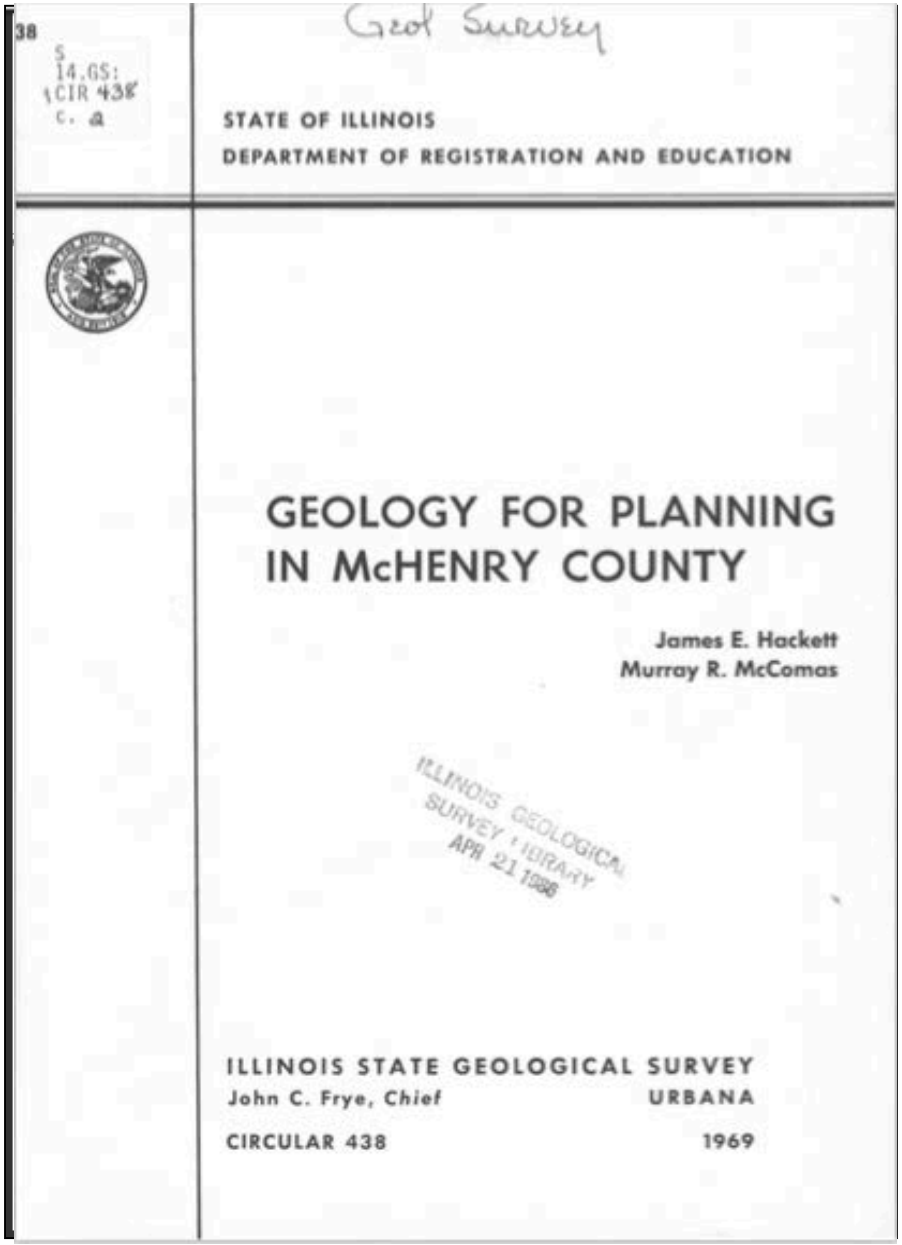
Colossal Collaboration!

- McHenry County
  - Water Resources Division
    - Scott Kuykendall, Joanna Colletti, Dennis Sandquist
  - Conservation District
    - Ed Collins
  - Soil and Water Conservation District
    - Ed Weskerna
  - Municipalities, private home/business owners
- Illinois State Water Survey (ISWS)
  - Scott Meyer (ret.), Daniel Abrams, Dan Hadley
- USGS
  - Amy Gahala, Jon Hortness
- Illinois State Geological Survey (ISGS)
  - Tim Larson, Ahmed Ismail, Steve Sargent, Mike Barnhardt (ret.), Don Keefer (ret.), Brandon Curry, ISGS drilling crews, +10…

ISGS McHenry County Resources and Land-use Studies 1962 and 1969



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CIR 438
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Geol Survey

STATE OF ILLINOIS
DEPARTMENT OF REGISTRATION AND EDUCATION

GEOLOGY FOR PLANNING IN McHENRY COUNTY

James E. Hackett
Murray R. McComas

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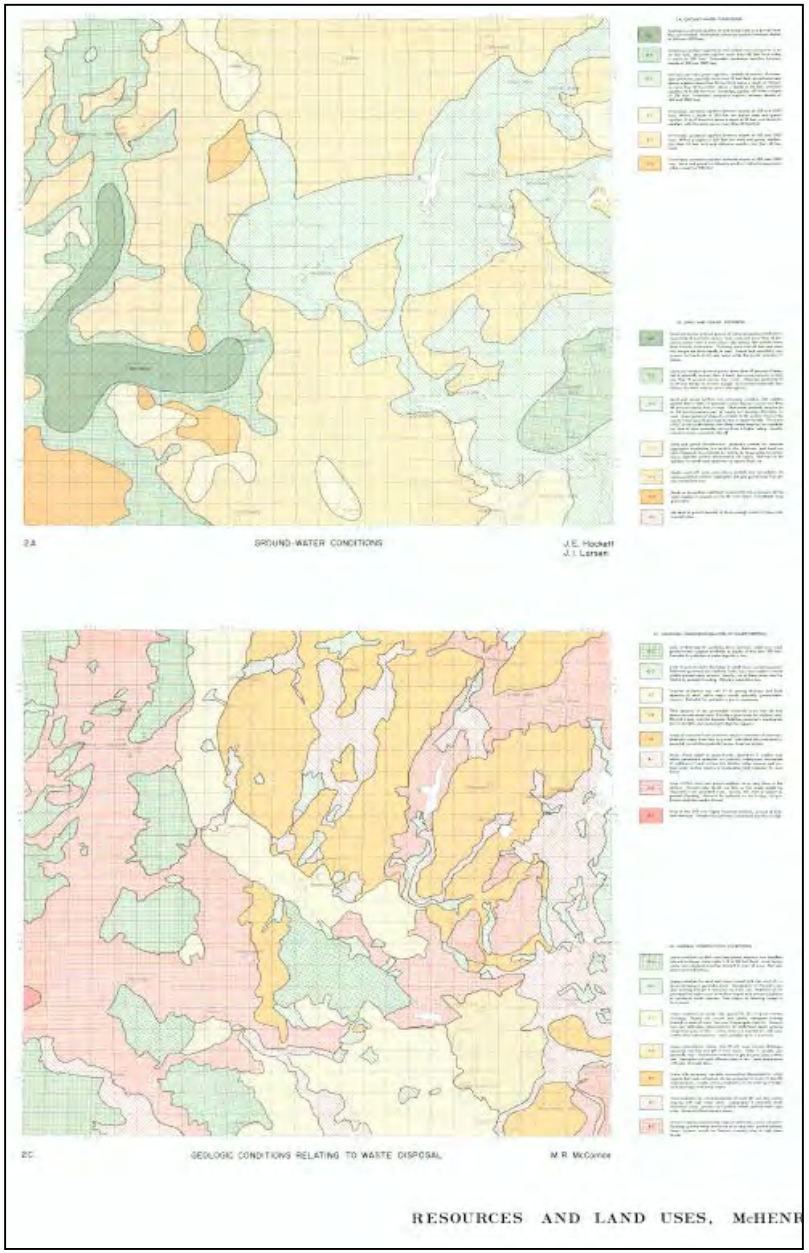
ILLINOIS STATE GEOLOGICAL SURVEY
John C. Frye, Chief — URBANA
CIRCULAR 438 — 1969



2A GROUND-WATER CONDITIONS J.E. Hackett J.I. Larsen

2C GEOLOGIC CONDITIONS RELATING TO WASTE DISPOSAL M.R. McComas

RESOURCES AND LAND USES, McHENR

Northeast Illinois 1919

STATE OF ILLINOIS
DEPARTMENT OF REGISTRATION AND EDUCATION

DIVISION OF THE
STATE GEOLOGICAL SURVEY
FRANK W. DeWOLF, Chief

BULLETIN NO. 34

THE ARTESIAN WATERS OF NORTHEASTERN ILLINOIS

By Carl B. Anderson

PRINTED BY AUTHORITY OF THE STATE OF ILLINOIS

URBANA, ILLINOIS
1919

a rather moderate amount of mineral matter but would form some scale if used untreated in boilers.

A 2,527-foot well was drilled in 1893 for the Illinois Condensing Company. From the very incomplete record of the strata the bottom of the St. Peter sandstone appears to be at 860 feet. Sandstone strata are again mentioned at 1,185 and 1,710, and red sandstone at 2,080 feet which probably continued to the bottom of the well. The water corroded the pipes extensively so that its use was discontinued over twenty years ago.

Flowing drift wells have been obtained in the vicinity at points of low elevation.

CRYSTAL LAKE

The village has a dug well 35 feet deep and 8 feet in diameter; the lining is 2 rows of 4-inch cement blocks. The driller's record is as follows:

Driller's log of well at Crystal Lake

Description of strata	Thickness *Feet*	Depth *Feet*
Soil and clay	2	2
Gravel, coarse	4	6
Gravel, fine, and sand	29	35

The static water level is 16 feet below the surface and lowers only 3 feet after pumping all day at the rate of over 200 gallons per minute. The average daily consumption is 20,000 gallons.

The water contains considerable calcium and magnesium carbonates, and some magnesium sulphate; no hydrogen sulphide was noted in contrast to the rock well water at North Crystal Lake.

HARVARD

The city has two wells, 742 feet and about 1600 feet in depth, but no drilling records seem to have been kept. However, the rock succession can be determined from the driller's log of a well drilled in 1910 for the Chicago and North Western Railway Company.

Driller's log of Chicago and North Western Railway well, Harvard

Elevation—935± feet Description of strata	Thickness *Feet*	Depth *Feet*
Soil, clay, sand and gravel	97	97
Limestone, "chalky"	83	180
Shale, green	75	255
Shale, brown	71	326
Limestone	322	648
Sandstone (*St. Peter*)	187	835
Sandstone, red	55	890
Limestone	10	900
Shale, green	19	919

The water level in this railroad well at completion was 60 feet below the surface; on a pumping test it delivered 310 gallons per minute. The well is 12 inches in diameter at the surface and probably 8 inches at the bottom.

The municipal water plant is located on low land in the southwest part of the city and about 200 feet from a creek. The old 1,600-foot well, which has a diameter of 10 inches at the top and 6 inches at the bottom, is seldom used; the capacity is given as about 200 gallons per minute with the working barrel of the pump at 115 feet. The 712-foot well is 8 inches in diameter at the surface and 6 inches at the bottom; the working barrel is at a depth of 95 feet. The normal water level is 20 feet below the surface but when pumping at a rate of 150 gallons per minute the level recedes to below the pump barrel. The average daily consumption is 200,000 gallons. The water is moderately mineralized and contains some scale-forming solids.

McHENRY

The village water plant is located in the valley of an intermittent stream tributary to the Fox River lowlands; the river is approximately a quarter of a mile away. Two flowing wells have been obtained from depths of 68 and 72 feet. The wells are 6 and 8 inches in diameter and the water is from a sand and gravel stratum.

The Borden Dairy Company has two wells about 170 feet in depth, but it is not known whether bed rock was penetrated.

MARENGO

The source of the municipal water supply is a dug well 14 feet deep and 20 feet in diameter. The entire depth, except for an upper 3-foot layer of black soil, is through a stratum of sand and gravel. The maximum yield during dry weather is about 100,000 gallons per day. The appended analysis indicates a moderately mineralized water which would form some scale if used for boiler purposes.

The dug wells in the village vary greatly in depth. Those in the gravel plain along Kishwaukee River are only 20 to 25 feet, whereas those on the slope of the moraine in the south part of the village are 60 to 80 and occasionally 125 feet in depth. Bed rock has not been reported.

NORTH CRYSTAL LAKE

The water supply for the village is obtained from a 285-foot well that is said to have penetrated the bed rock to a depth of 25 feet. The diameter is given as 8 inches at the surface and 6 inches at the bottom.

The water level is approximately 60 feet below the surface; at least 225 gallons per minute can be pumped for a number of hours. The amount of recession in the water level at the above pumping rate is not known. The average daily consumption is 55,000 gallons.

The water contains only a moderate amount of mineral matter in comparison with other wells of this depth. No excessive scale would be formed if it were used for boiler purposes. Enough hydrogen sulphide is present to be distinctly noticeable when the water is delivered by the pump. The shallow wells in the vicinity are about 60 or 75 feet deep and draw water from sand and gravel beds in the drift.

RINGWOOD

A well 1,641 feet in depth was recently drilled for the Pullman Dairy Company, but no record of the strata was kept. The depth to bed rock was given as 215 feet.

The water level is reported to be about 80 feet below the surface. No analysis of the water has been made.

WOODSTOCK

Three deep wells ranging in depth from about 1,000 to 2,079 feet have been drilled for the city. The succession of strata as indicated by the driller's log is given.

Driller's log of Woodstock city well No. 2
Elevation—915 feet
Authority: J. P. Miller Artesian Well Co., Chicago

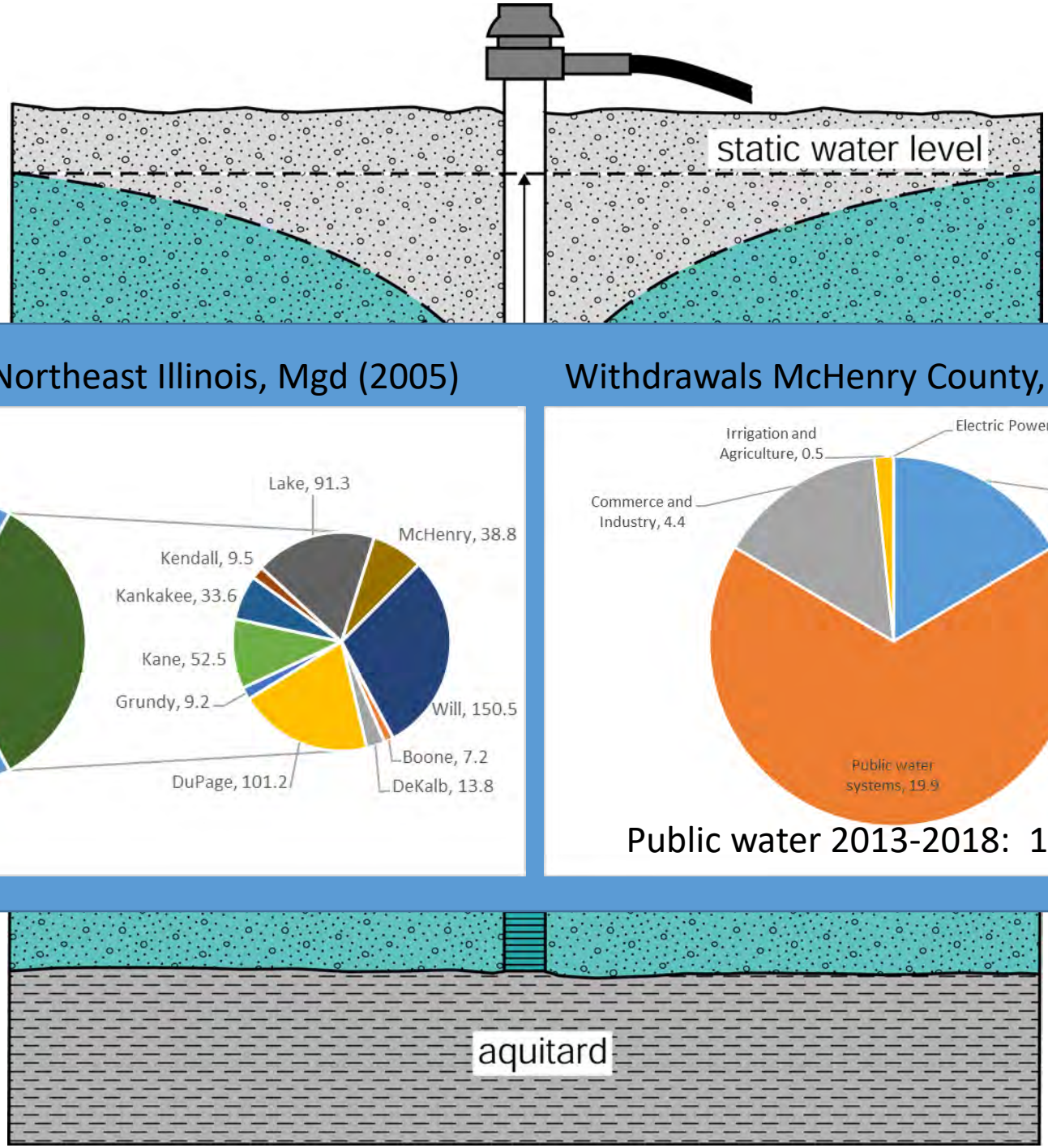
Description of strata	Thickness *Feet*	Depth *Feet*
Soil, clay, sand, and gravel	209	209
Limestone	66	275
Shale	34	309
Limestone, "caves"	81	390
Shale	30	420
Limestone	335	755
Sandy limestone	41	796
Sandstone, hard (*St. Peter*)	139	935
Marl, red	62	997
Sandy limestone	207	1204
Marl and sandstone	48	1252
Limestone and shale	70	1322
Sandstone	74	1396
Limestone	181	1577
Limestone and sandstone	9	1586
Limestone	17	1603
Sandstone, red	207	1810
Sandstone, hard	203	2013
Sandy shale	9	2022
Sandstone, hard	17	2039
Limestone	33	2072
Sandstone	7	2079

Science-based questions for natural resource management

- Water Resources
  - Groundwater
    - 1000's of domestic wells (>20,000)
    - 100's of irrigation wells (?)
    - Dozens of municipal/industry wells
- Natural resource- aquifers
  - Where are they?
  - What are they like?
  - Where is water moving?
  - How can we use them?
  - How are they replenished/protected?

Science-based questions for natural resource management

- Answers are dependent on:
  - Geologic framework (distribution, thickness, depth)
  - Characteristics (gravelly, sandy, silty, mixed)
  - Rates and locations of withdrawal (pumping scenarios)
  - Land-use planning (chemical applications, development)
- Implications for
  - Withdrawal/supply balance
  - Recharge pathways
  - Contamination pathways and risk
  - Habitats and ecological resiliency
  - Flooding



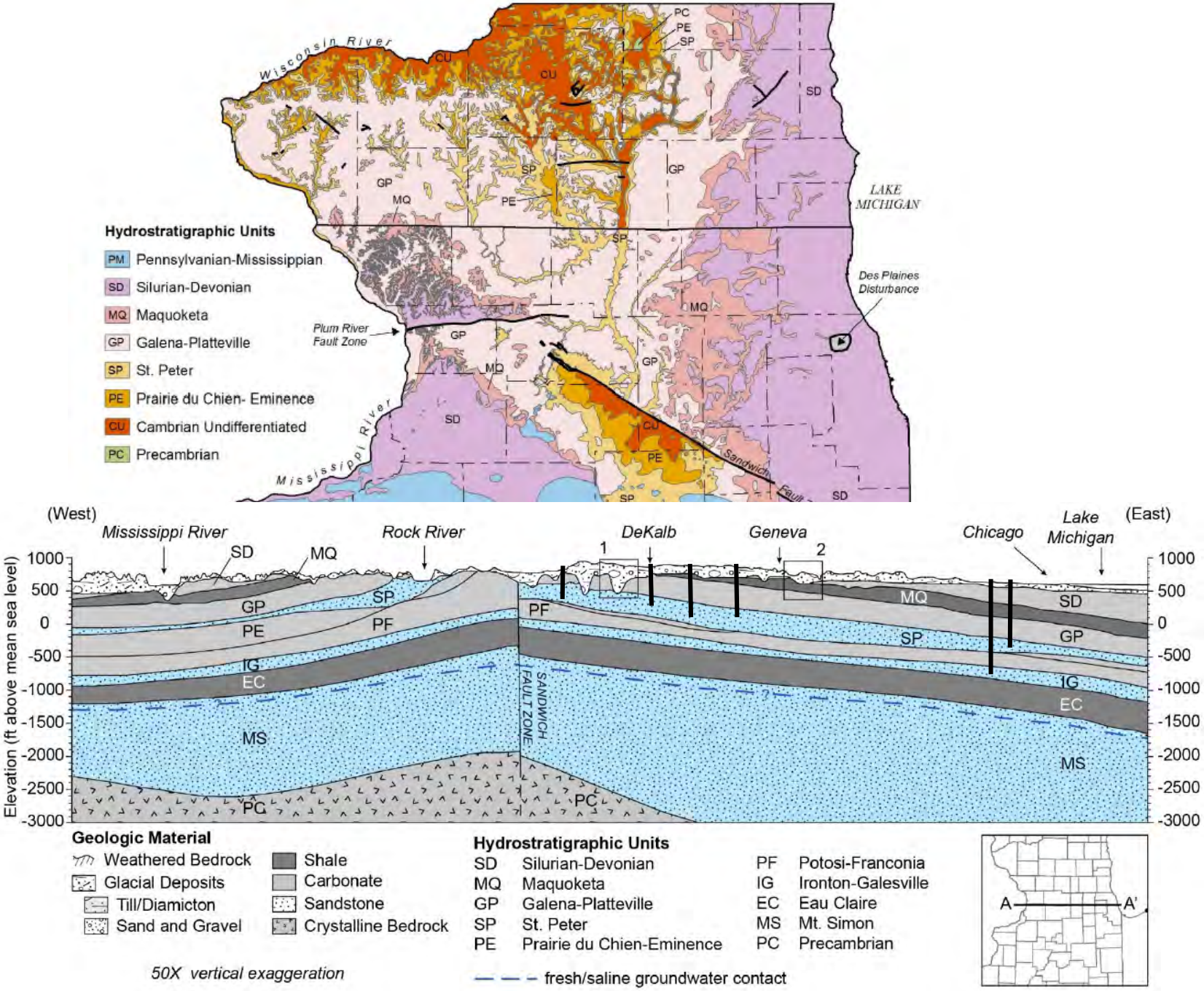
Withdrawals Northeast Illinois, Mgd (2005)

Withdrawals McHenry County, Mgd (2009)

Public water 2013-2018: 18.6 Mgd

Outline

- Geology and water resources
  - Bedrock aquifers
  - Sand/gravel aquifers
  - Groundwater concepts
- Models of McHenry County
  - Geologic models
  - Groundwater flow models and predictions
- Data sharing and online tools/viewers


Wisconsin River
Mississippi River
LAKE MICHIGAN
Des Plaines Disturbance
Plum River Fault Zone
Sandwich Fault
Hydrostratigraphic Units
PM Pennsylvanian-Mississippian
SD Silurian-Devonian
MQ Maquoketa
GP Galena-Platteville
SP St. Peter
PE Prairie du Chien- Eminence
CU Cambrian Undifferentiated
PC Precambrian
(West)
(East)
Mississippi River
Rock River
DeKalb
Geneva
Chicago
Lake Michigan
Elevation (ft above mean sea level)
SANDWICH FAULT ZONE
Geologic Material
Weathered Bedrock
Glacial Deposits
Till/Diamicton
Sand and Gravel
Shale
Carbonate
Sandstone
Crystalline Bedrock
Hydrostratigraphic Units
SD Silurian-Devonian
MQ Maquoketa
GP Galena-Platteville
SP St. Peter
PE Prairie du Chien-Eminence
PF Potosi-Franconia
IG Ironton-Galesville
EC Eau Claire
MS Mt. Simon
PC Precambrian
50X vertical exaggeration
fresh/saline groundwater contact
A
A'

Outline

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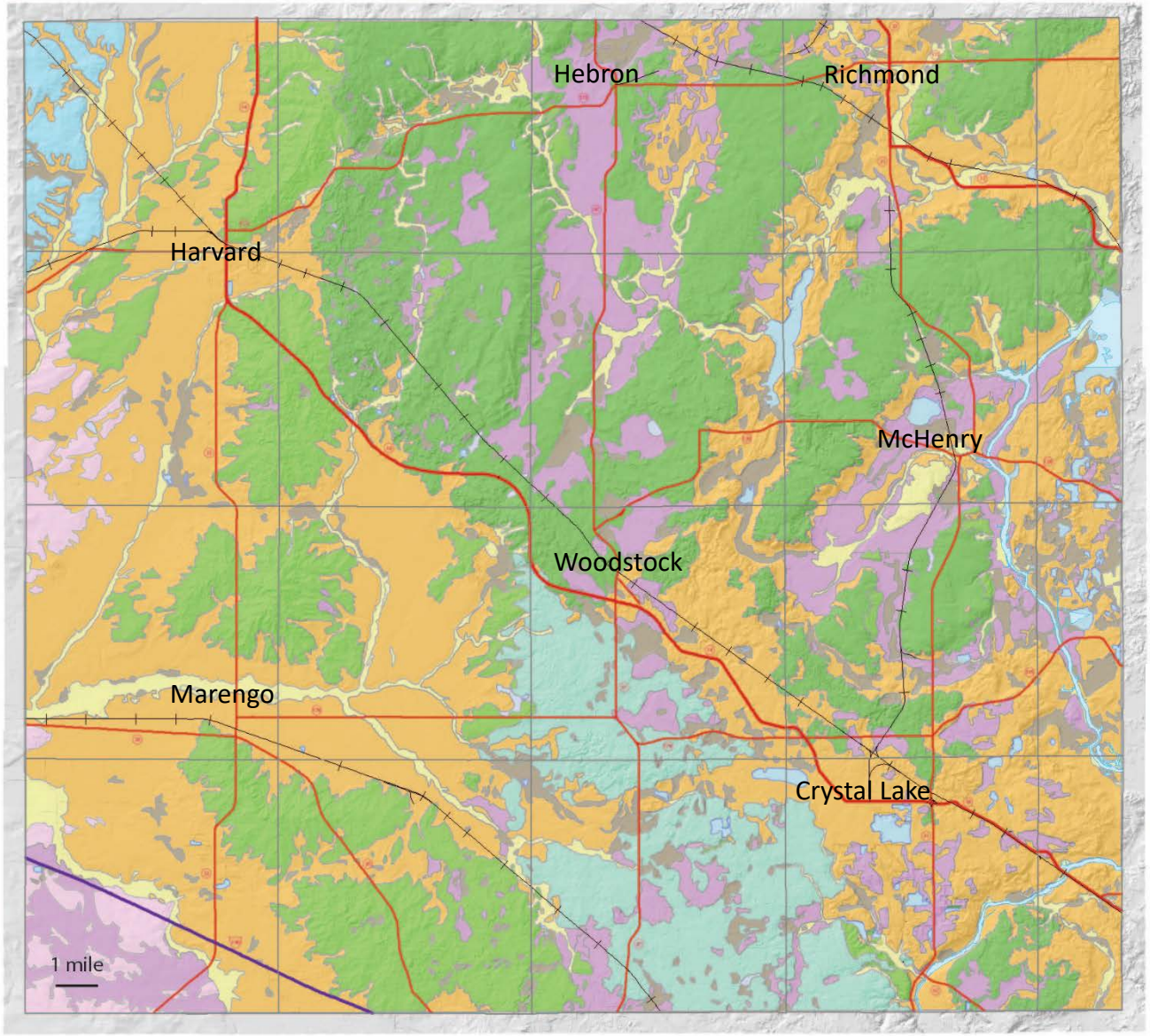
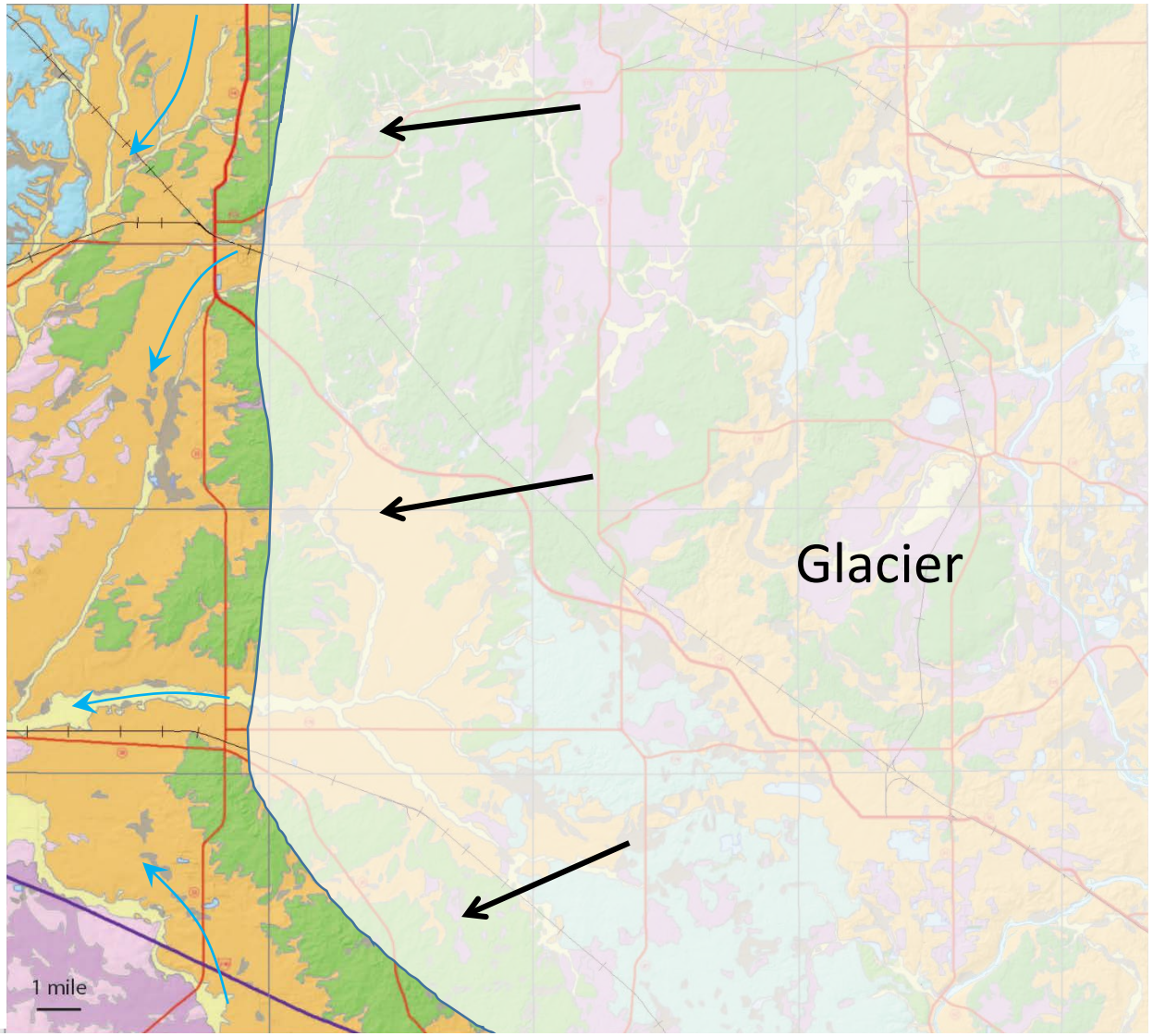
180,000-10,000 years ago

Glacial Geologic Map of McHenry County



- Water
- Disturbed Ground
- Colluvium
- Grayslake Peat (peat)
- Cahokia (alluvium)
- Equality Fm (lake seds)
- Henry Fm (outwash)
- Haeger Member (till)
- Yorkville Dm (till)
- Tiskilwa Dm (till)
- Winnebago Fm (till)
- Glasford Fm (till)

28,000 years ago



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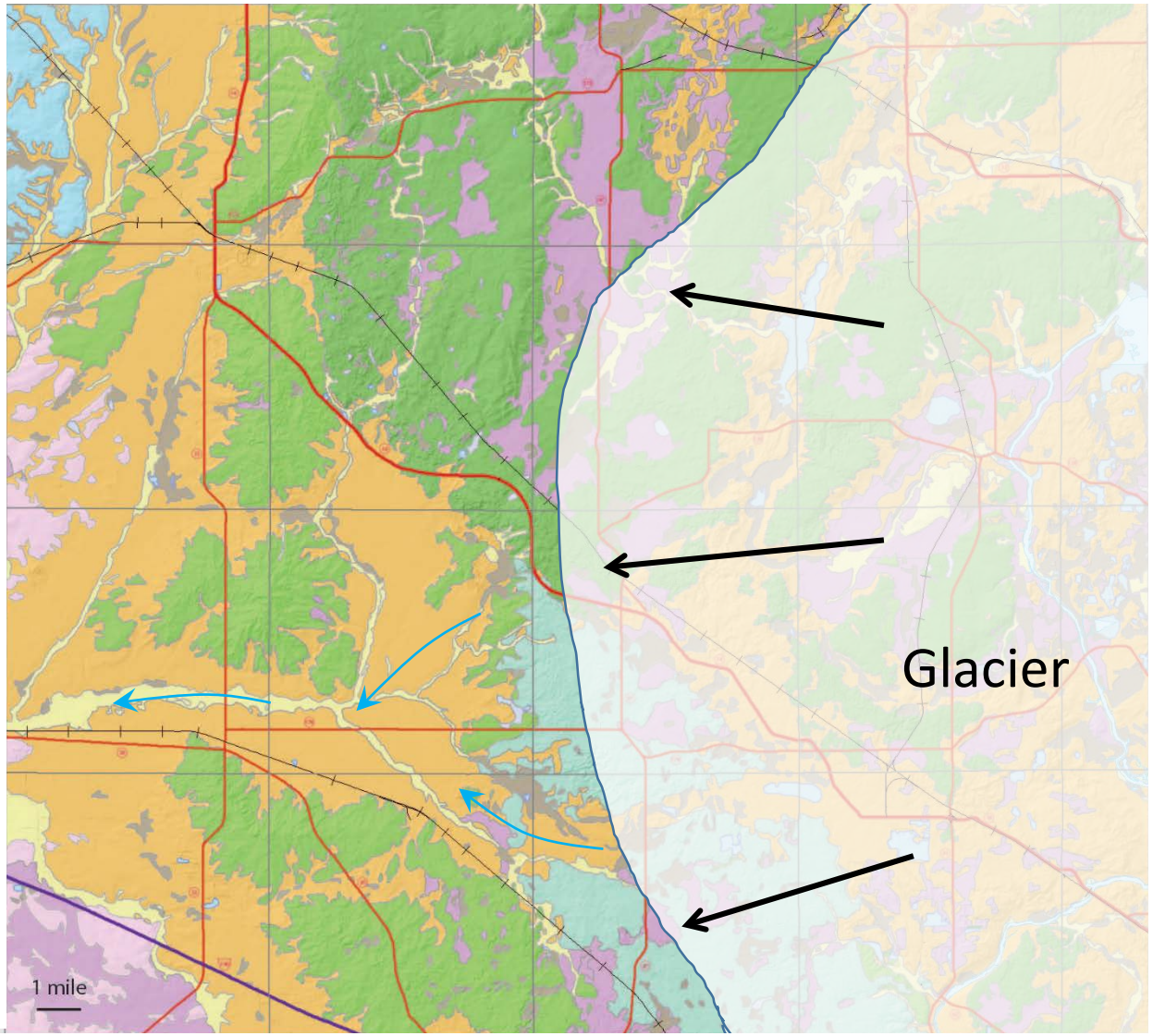
- Glasford Fm (till)

21,500 years ago



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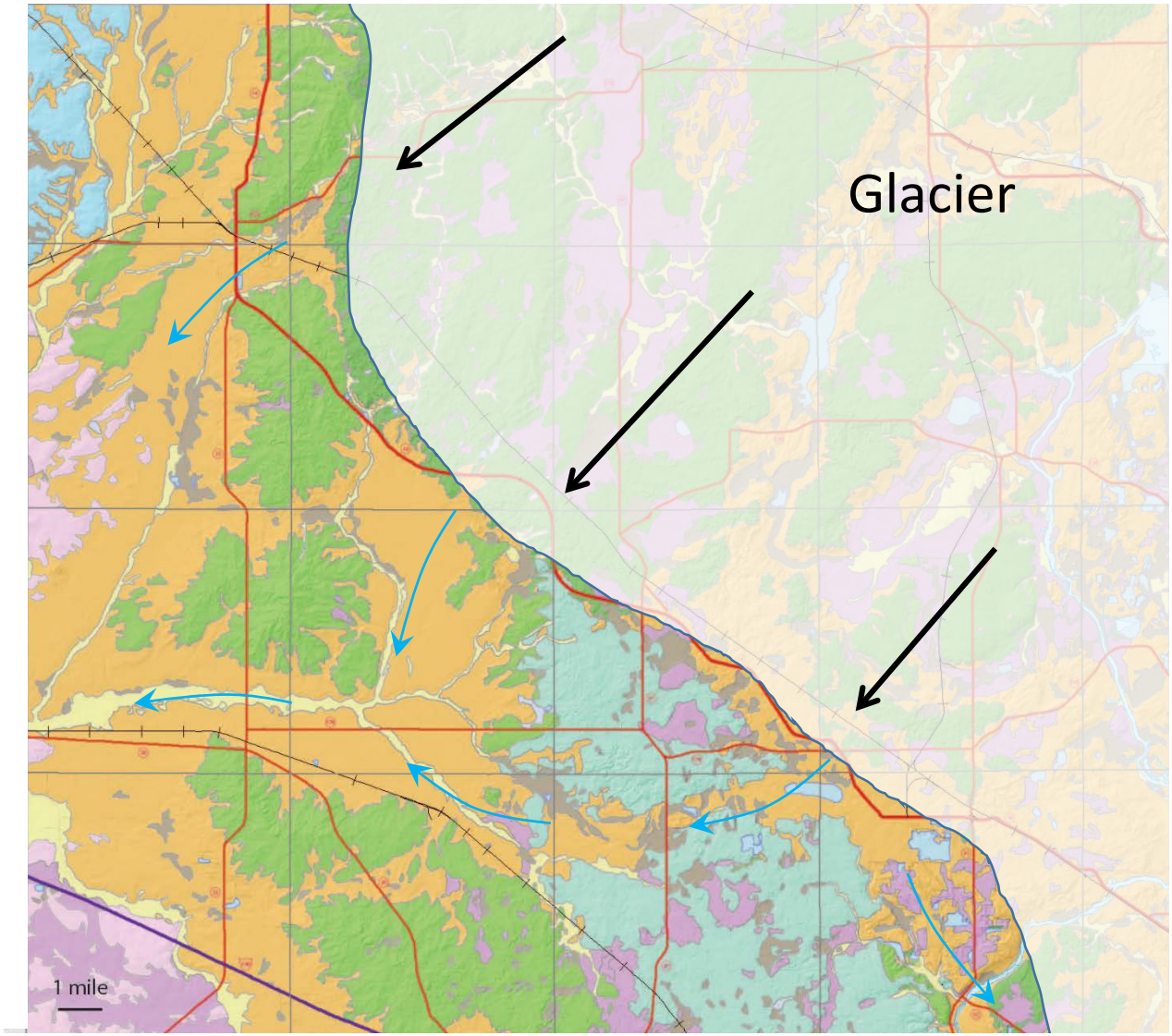
- Winnebago Fm (till)
- Glasford Fm (till)

20,500 years ago



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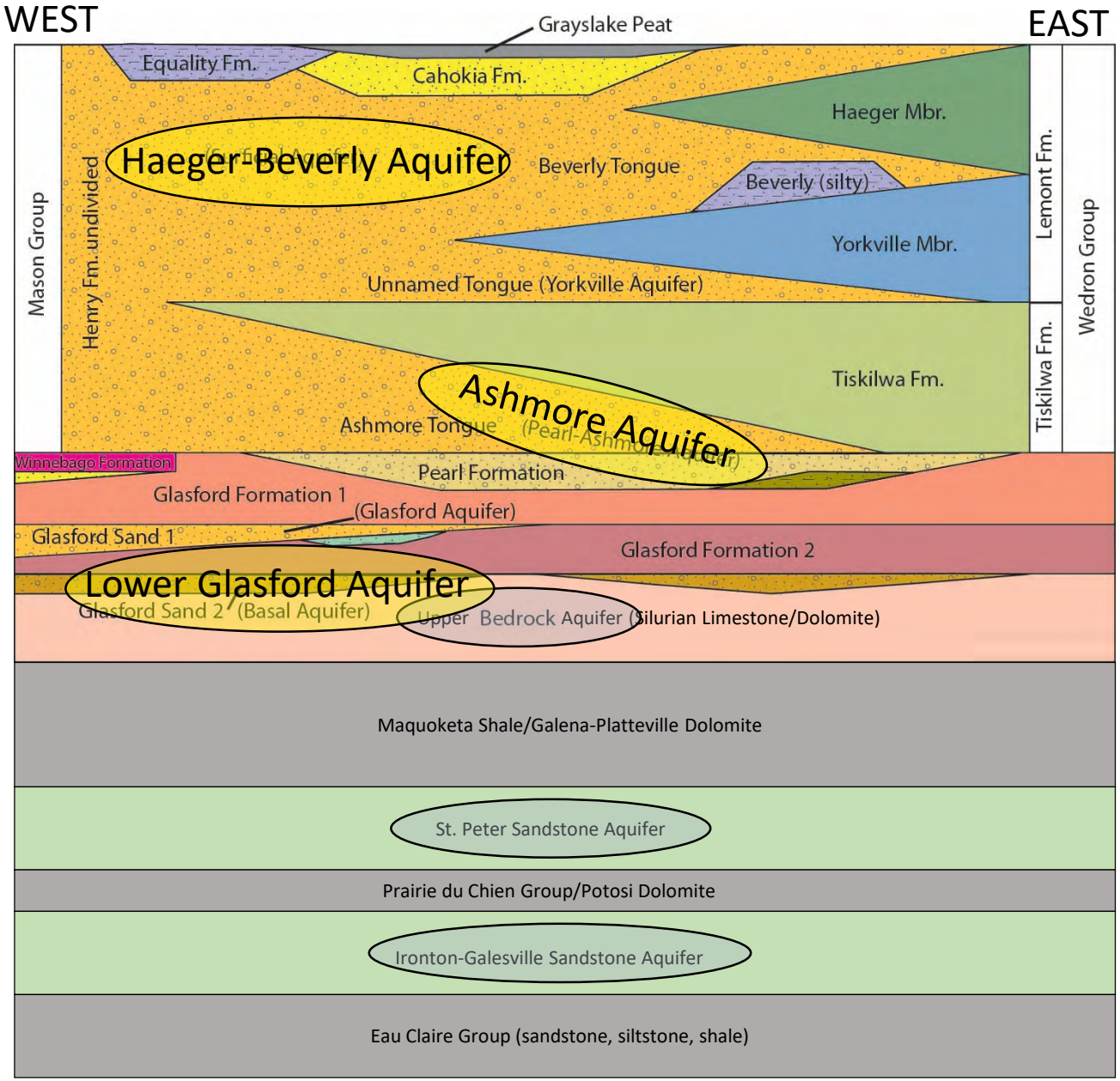
Conceptual Geologic Framework



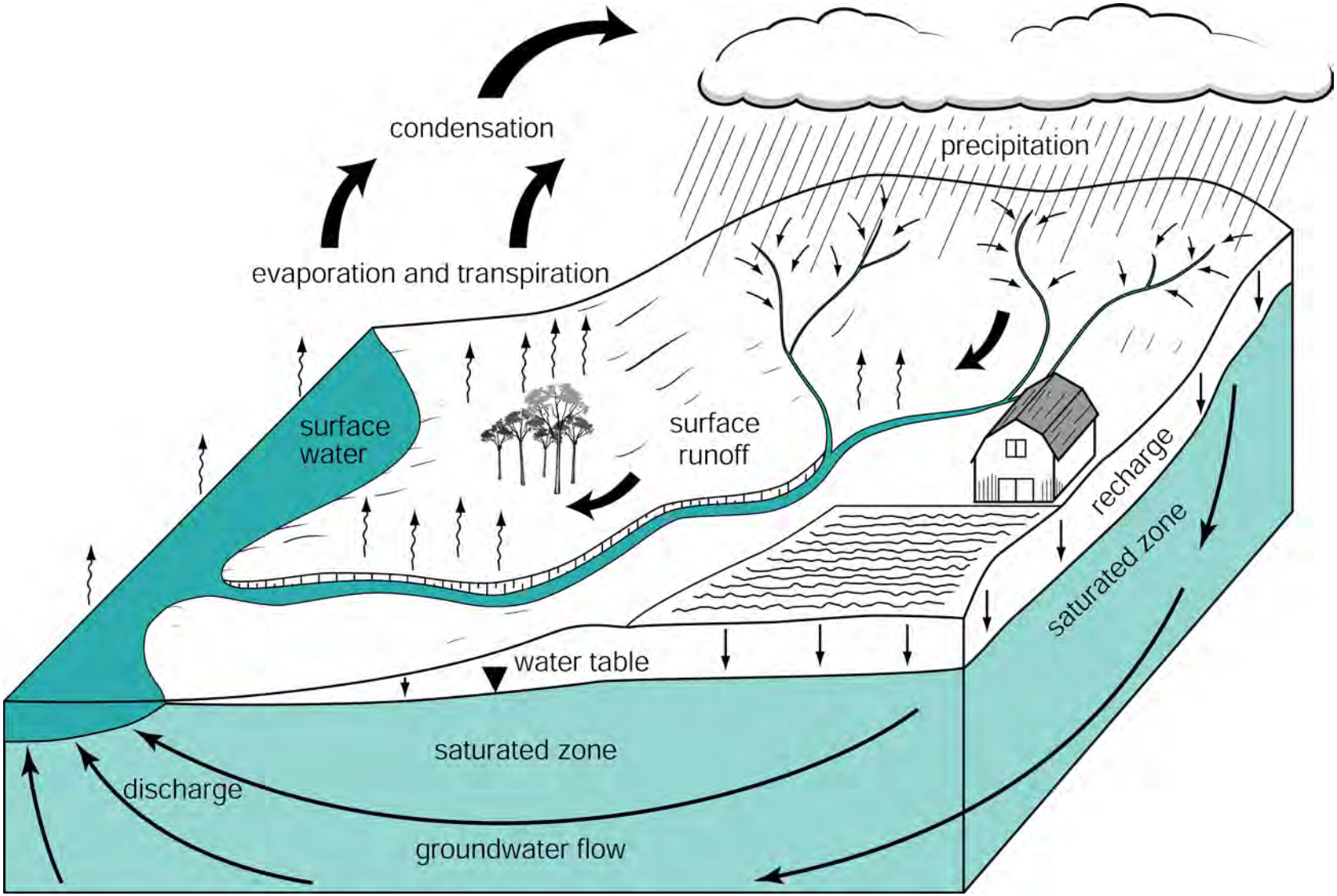
Shallow Sand and Gravel Aquifers 0-300 ft deep

Bedrock Aquifers 100-1200 ft deep

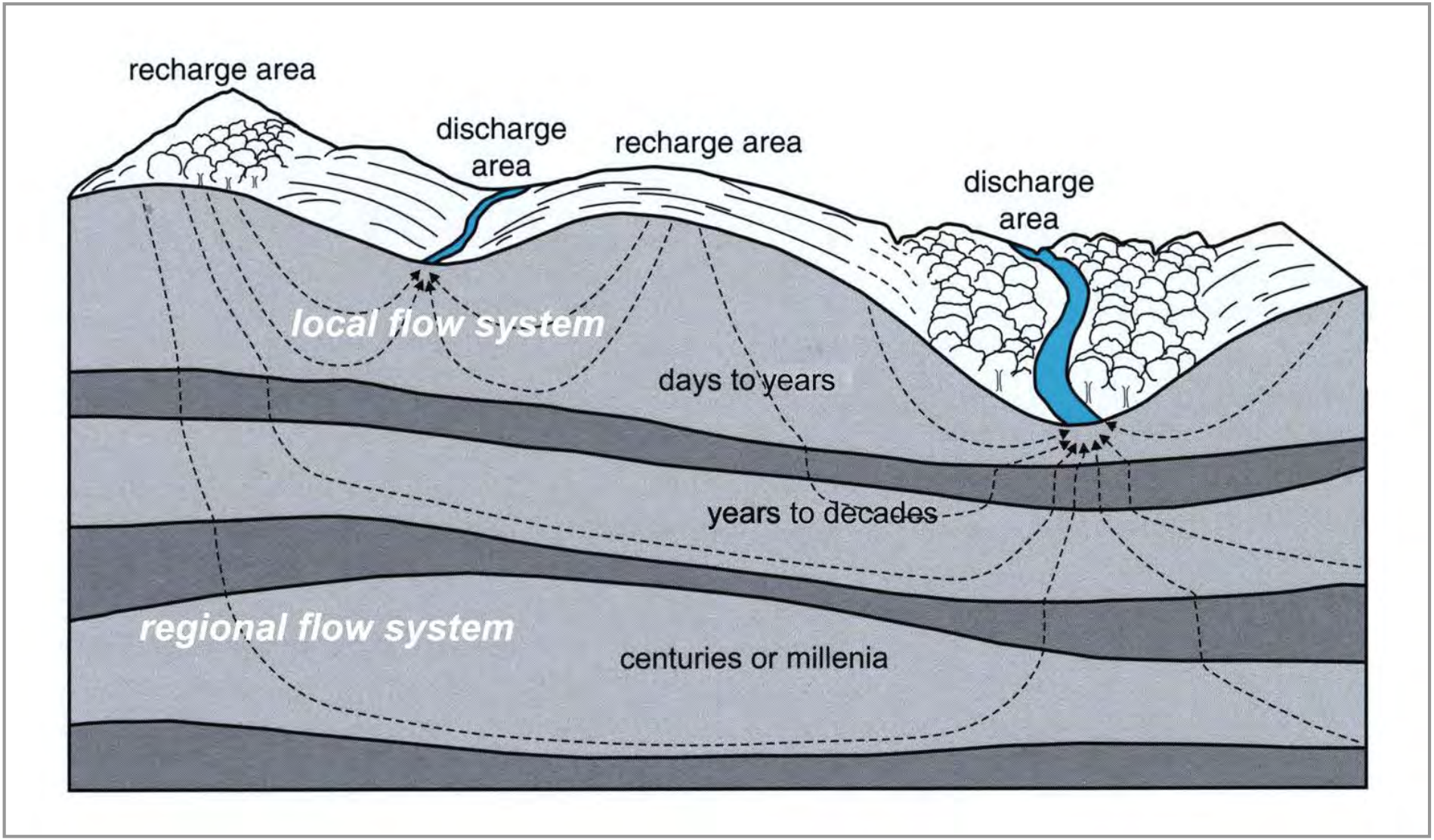
Outline

- Geology and water resources
  - Bedrock aquifers
  - Sand/gravel aquifers
  - Groundwater concepts/water use
- Models of McHenry County
  - Geologic models
  - Groundwater flow models and predictions
- Data sharing and online tools/viewers

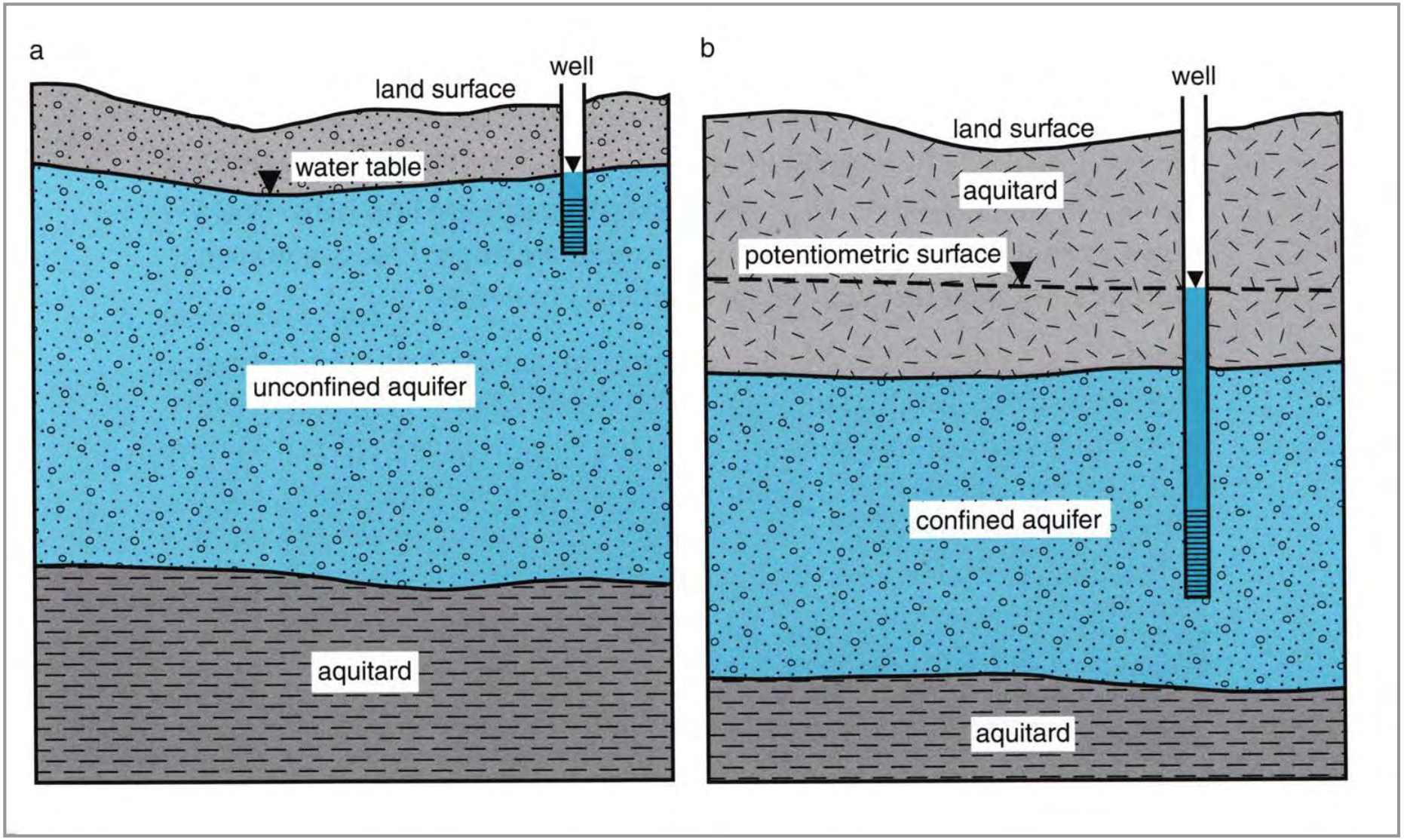
Groundwater and the Hydrologic Cycle

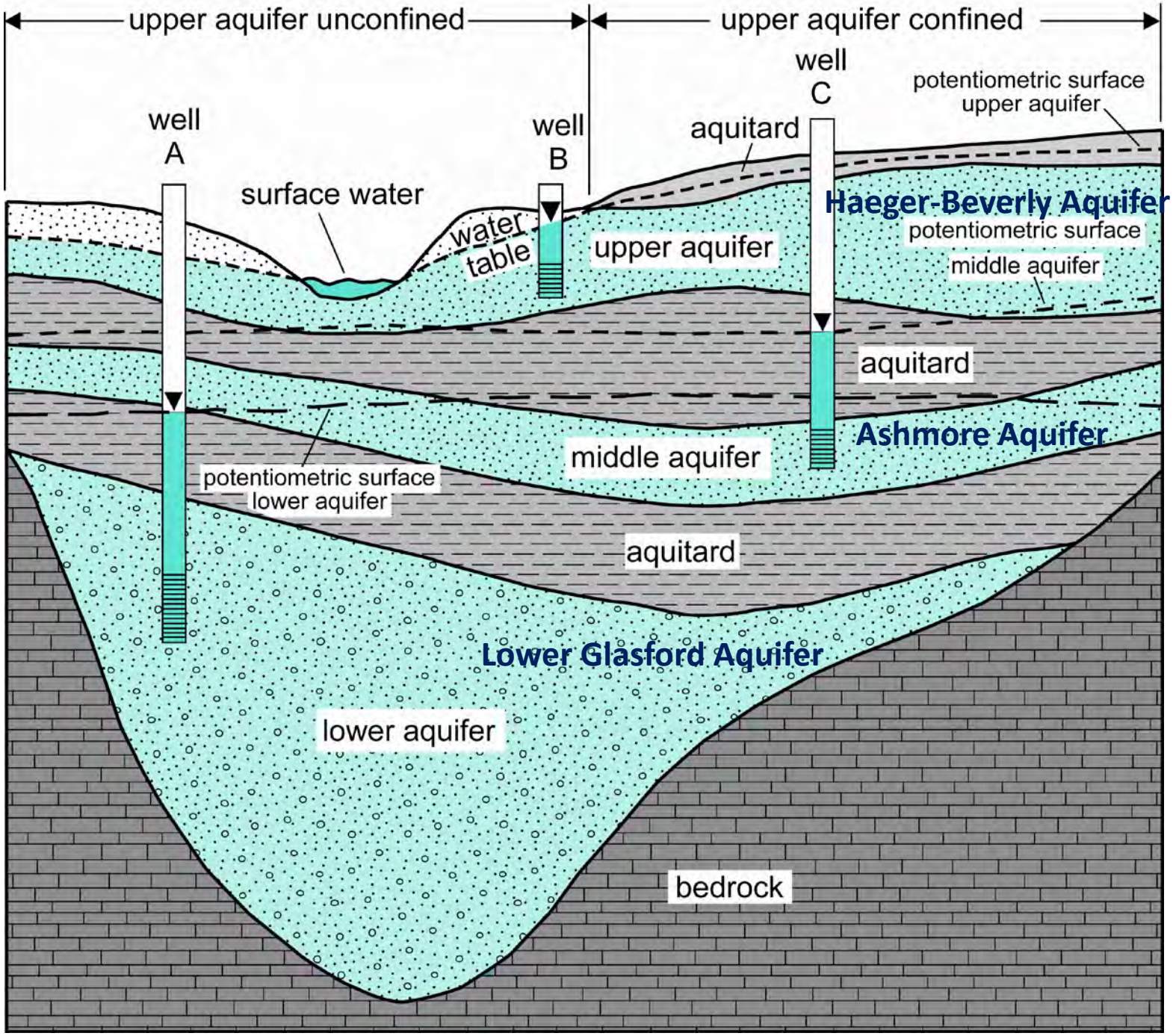


Groundwater flow paths

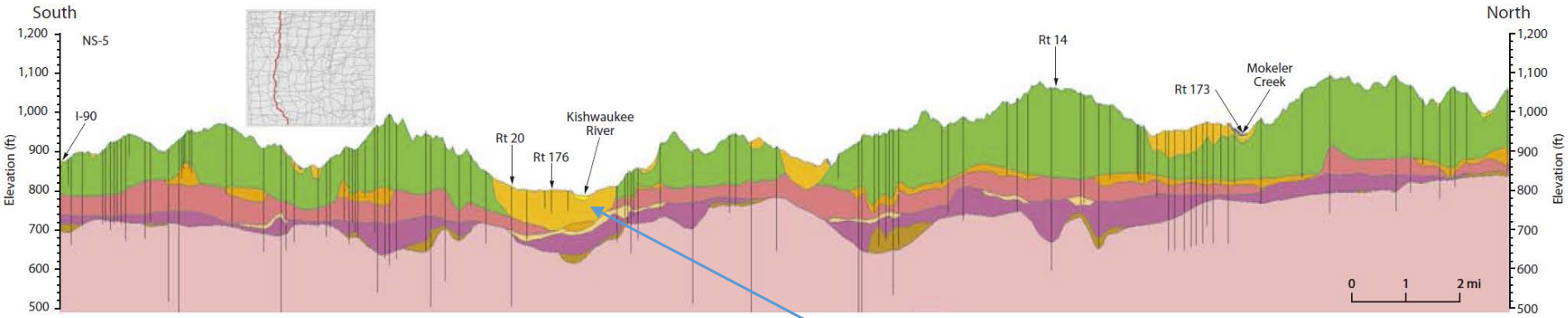


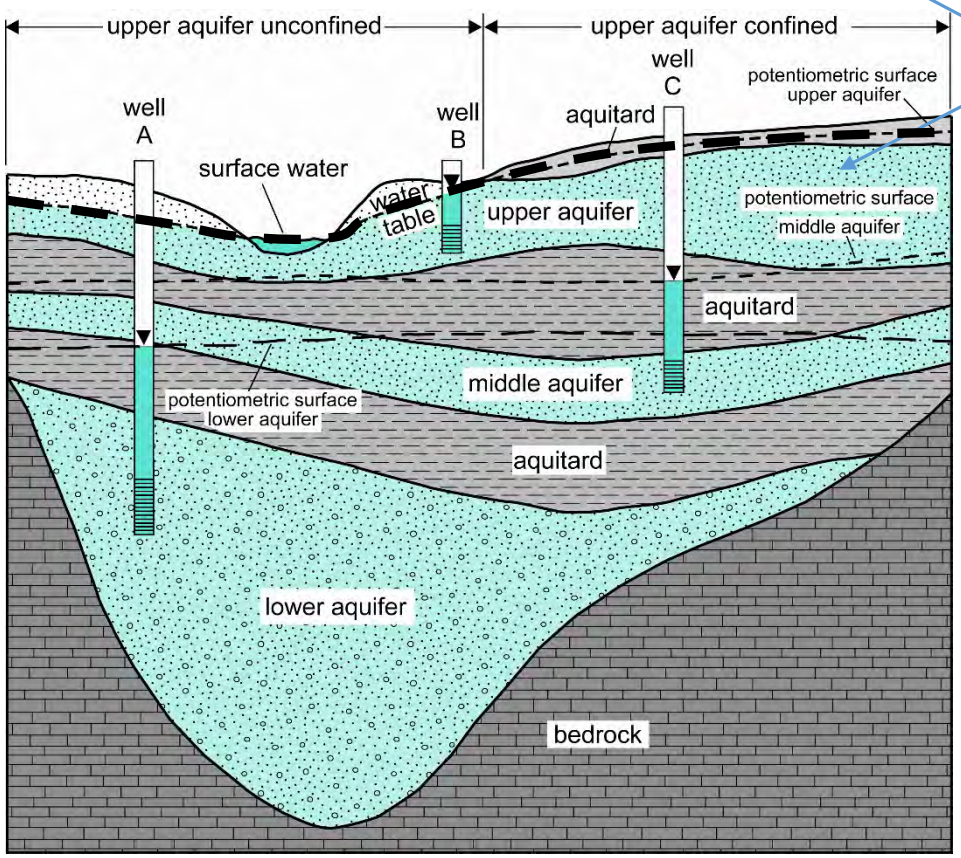
Two types of aquifers

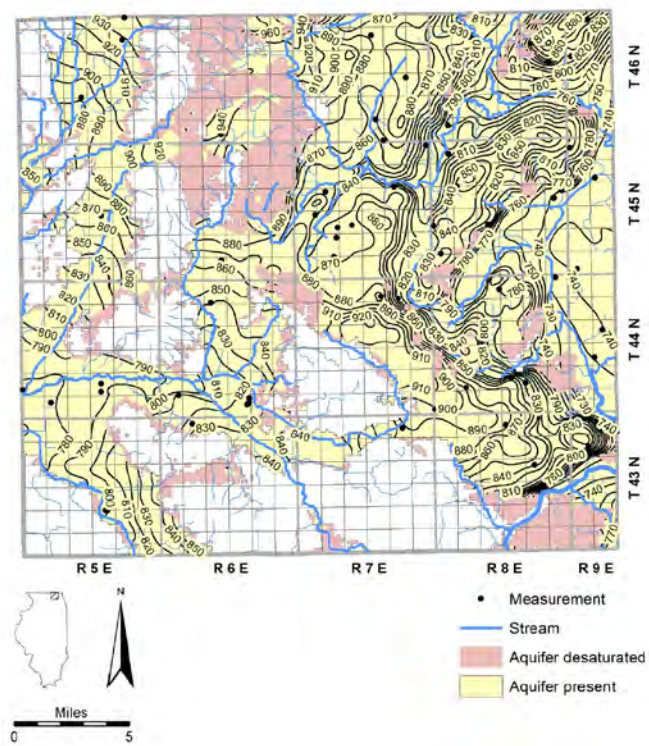


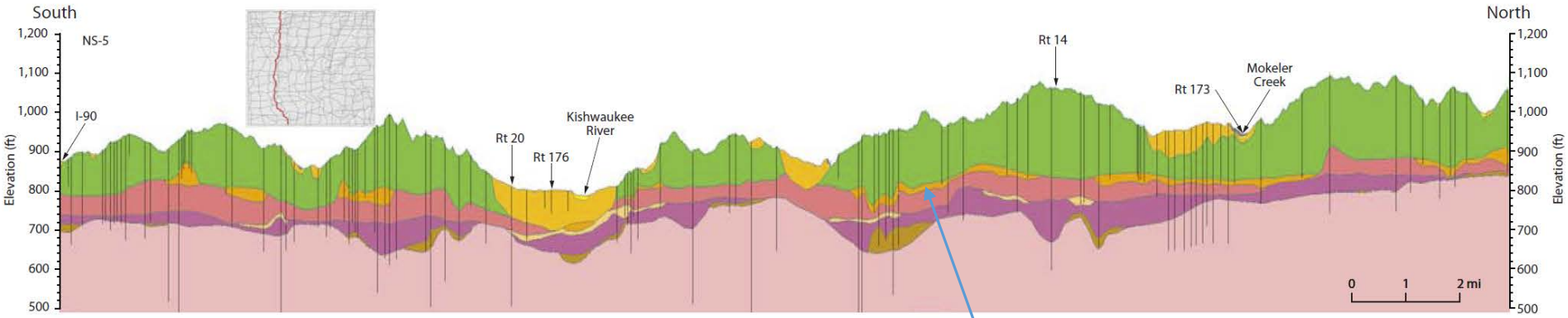

upper aquifer unconfined
upper aquifer confined
well A
well B
well C
surface water
water table
upper aquifer
aquitard
potentiometric surface upper aquifer
Haeger-Beverly Aquifer
potentiometric surface
middle aquifer
aquitard
Ashmore Aquifer
middle aquifer
potentiometric surface lower aquifer
aquitard
Lower Glasford Aquifer
lower aquifer
bedrock

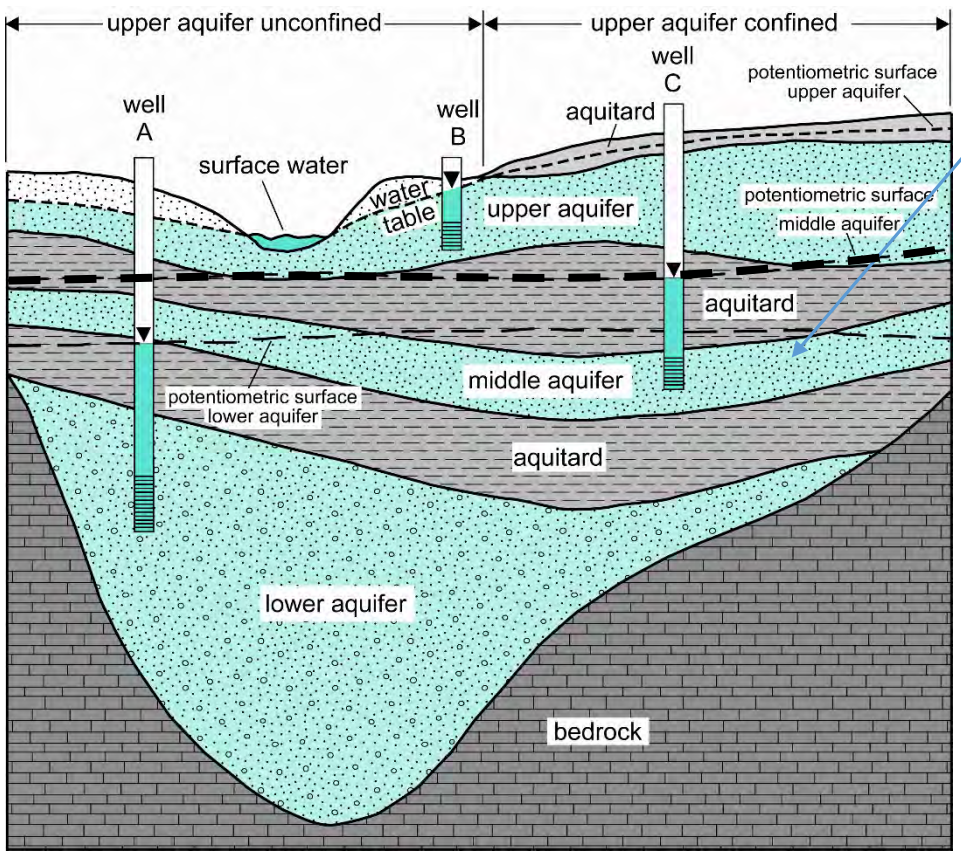
Haeger-Beverly Aquifer





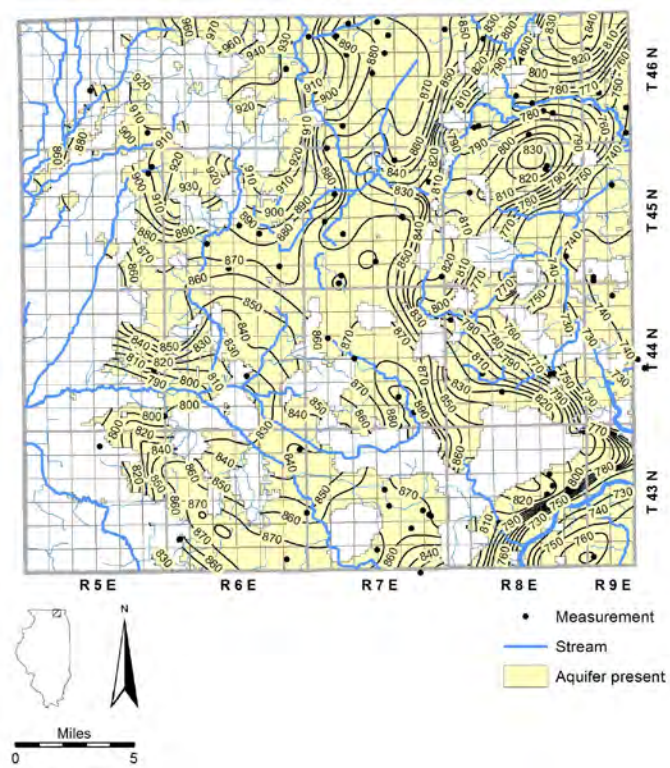


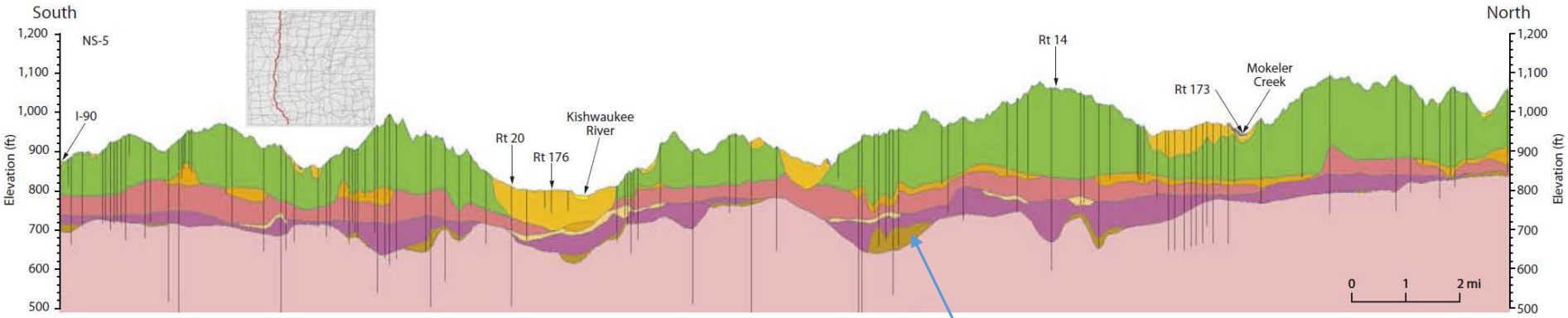




Haeger-Beverly Aquifer

Ashmore Aquifer

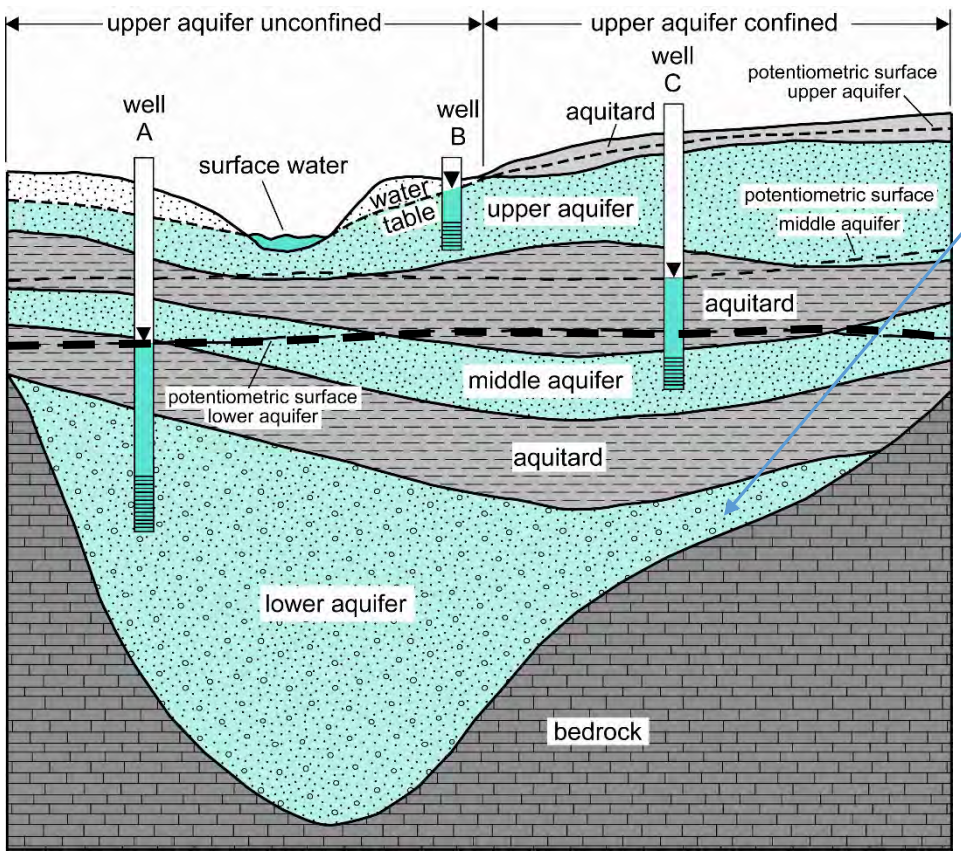


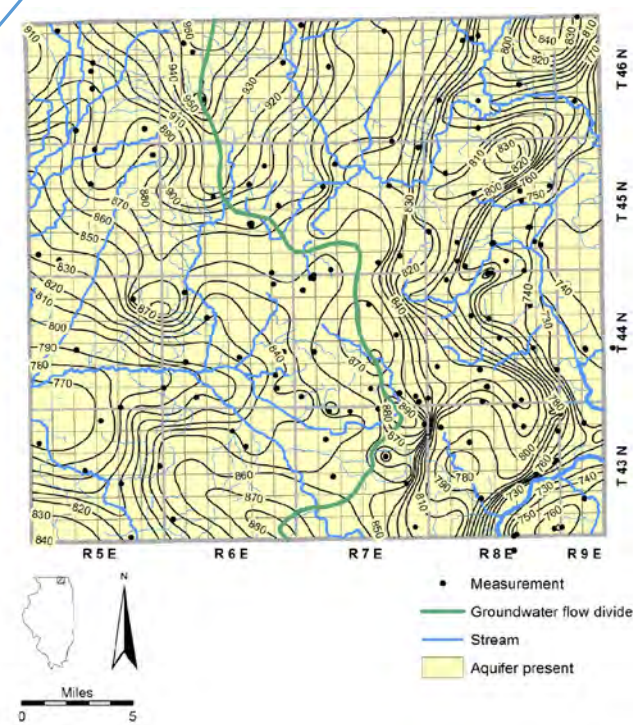


Haeger-Beverly Aquifer (upper)

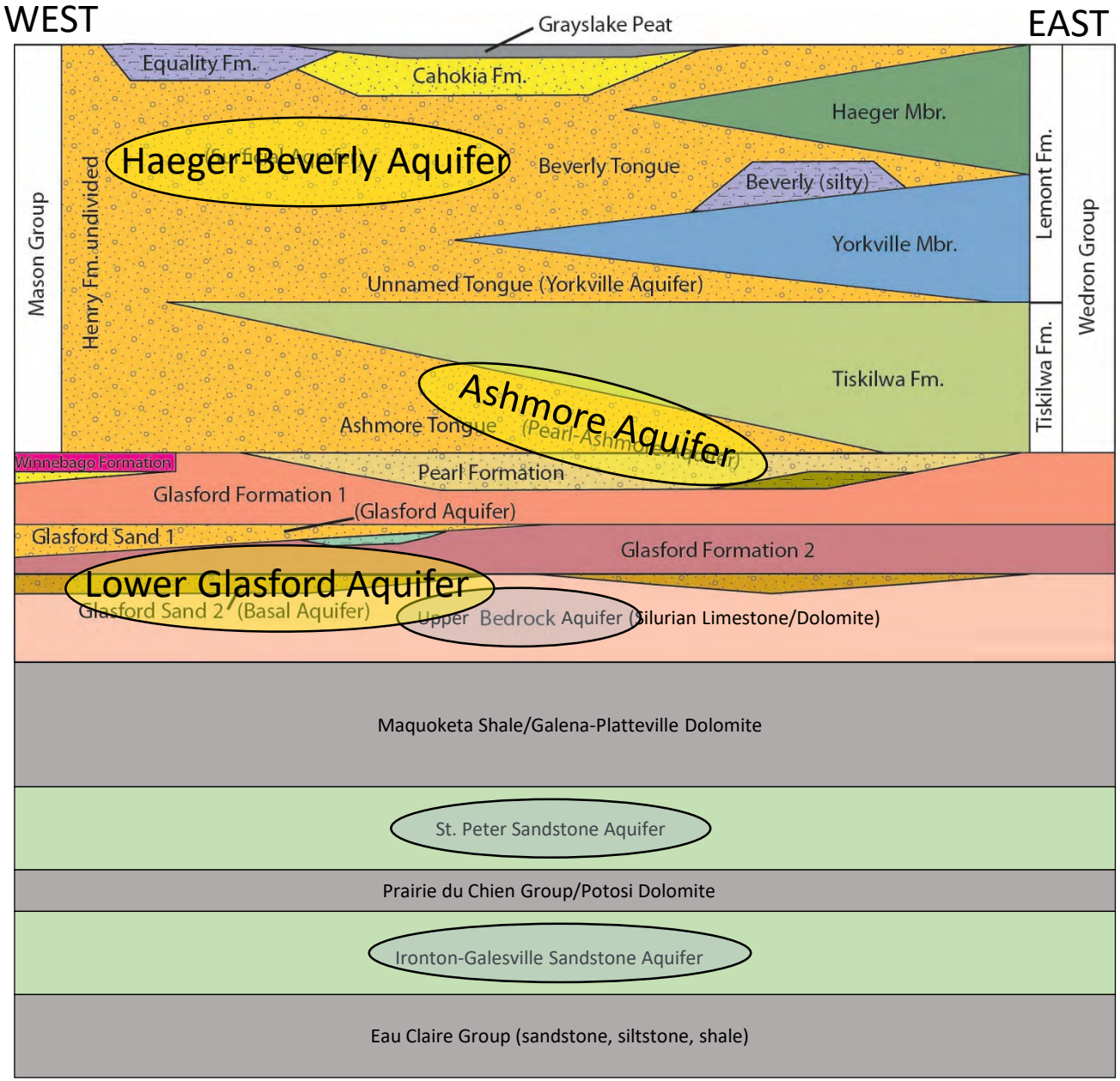
Ashmore Aquifer (middle)

Lower Glasford Aquifer (lower)





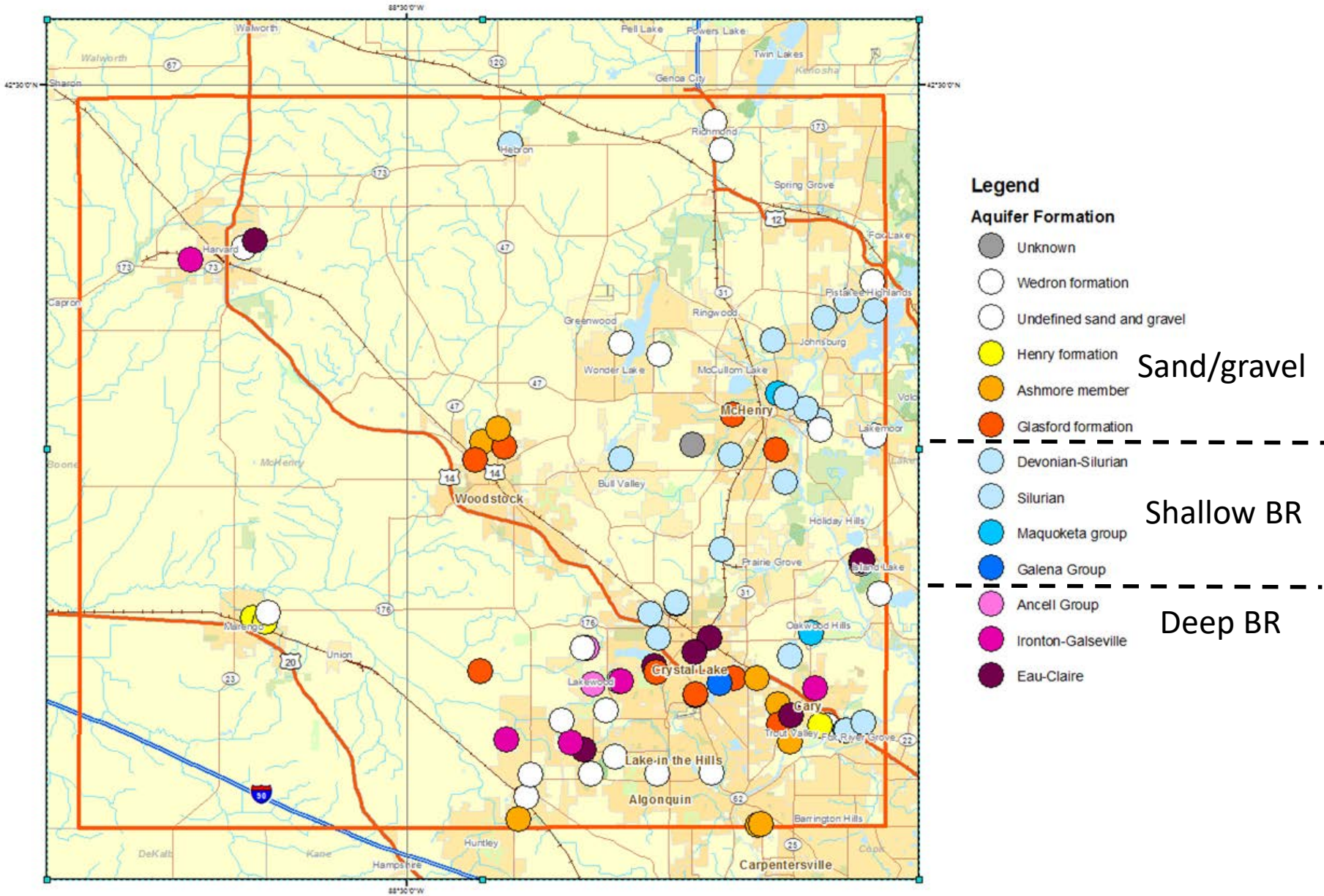
Conceptual Geologic Framework



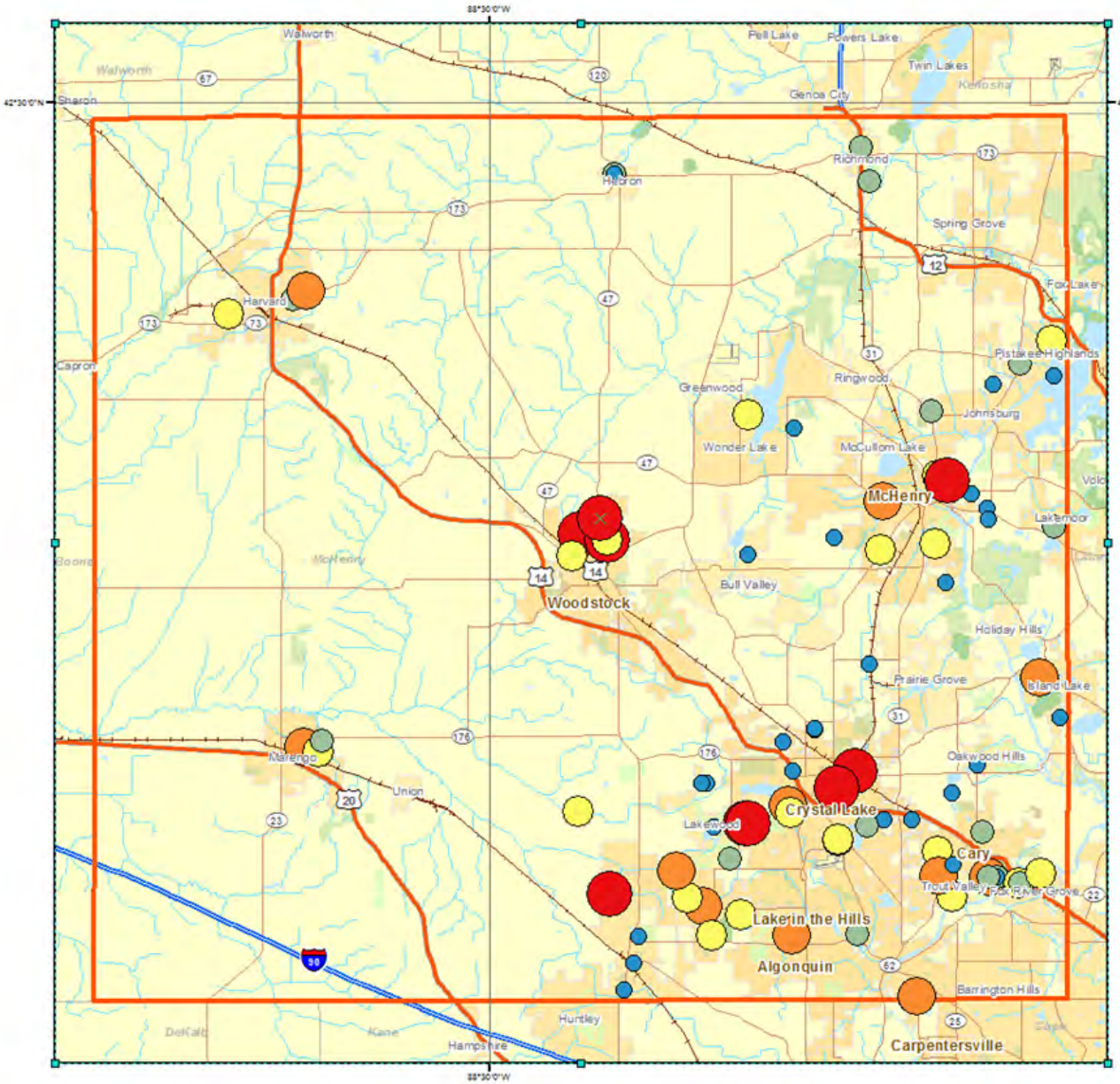
Shallow Sand and Gravel Aquifers 0-300 ft deep

Bedrock Aquifers 100-1200 ft deep

Municipal withdrawals and geologic formations 2013-2018



Municipal withdrawals and locations 2013-2018



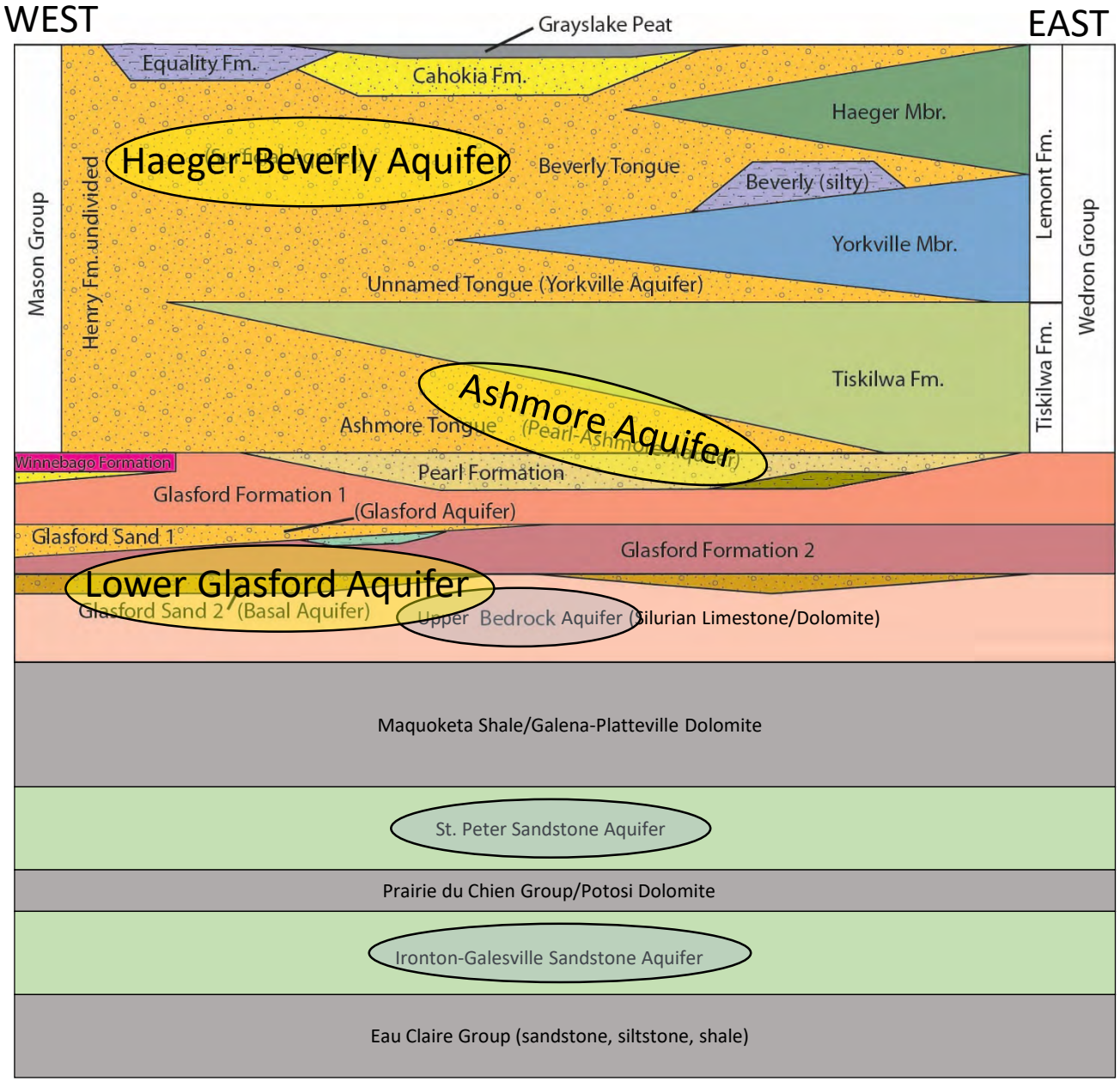
Total Municipal
2013-2018
18.6 million gallons/day

Legend

Last Usage Reported 2013-2018

0-20 M gpy	0-54 K gpd
20-55 M gpy	54-150 K gpd
55-95 M gpy	150-260 K gpd
95-140 M gpy	260-380 K gpd
140-283 M gpy	380-775 K gpd

Municipal Water Supplies- Total 18.6 MGD



10 MGD

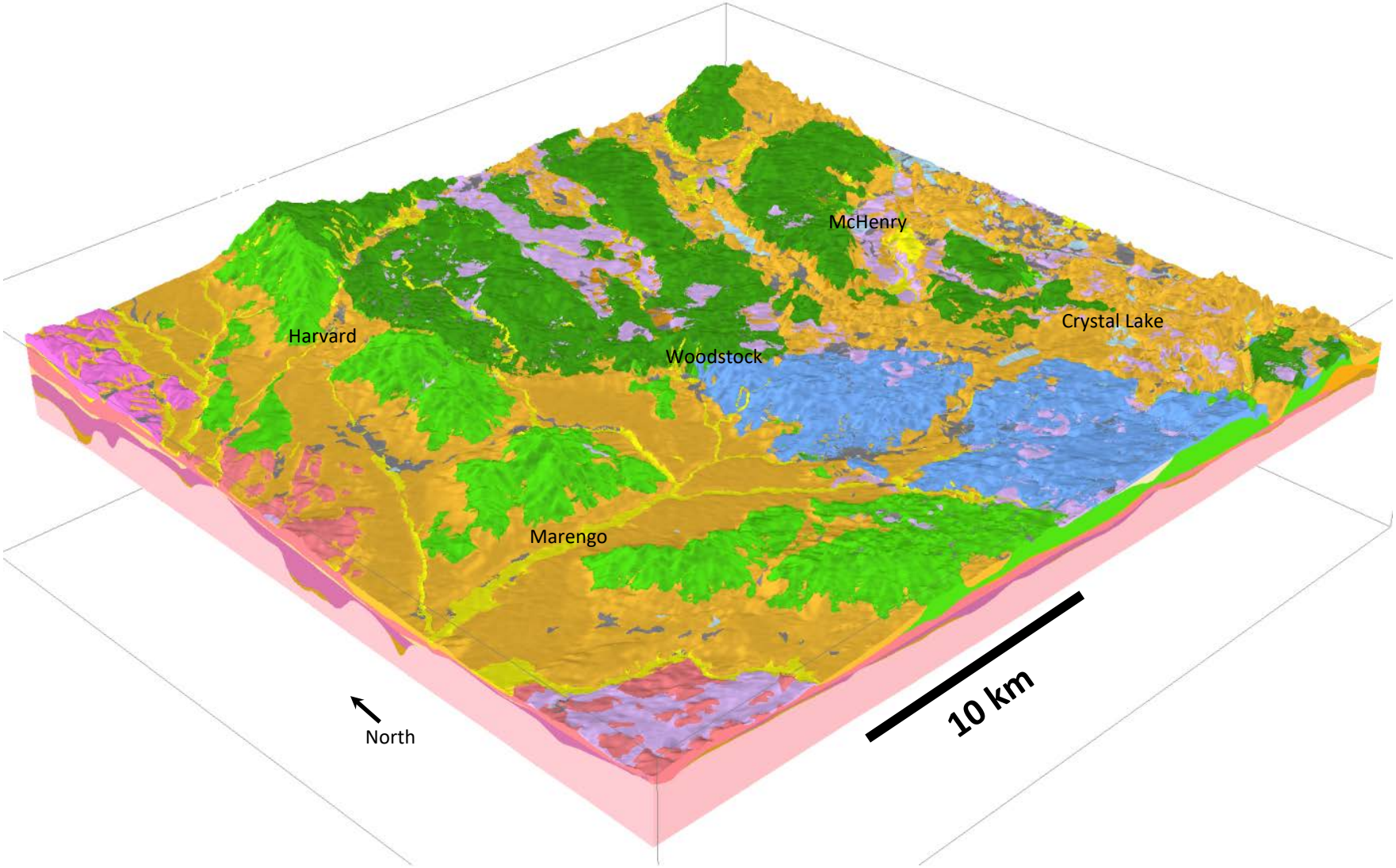
2.7 MGD

5.9 MGD

Outline

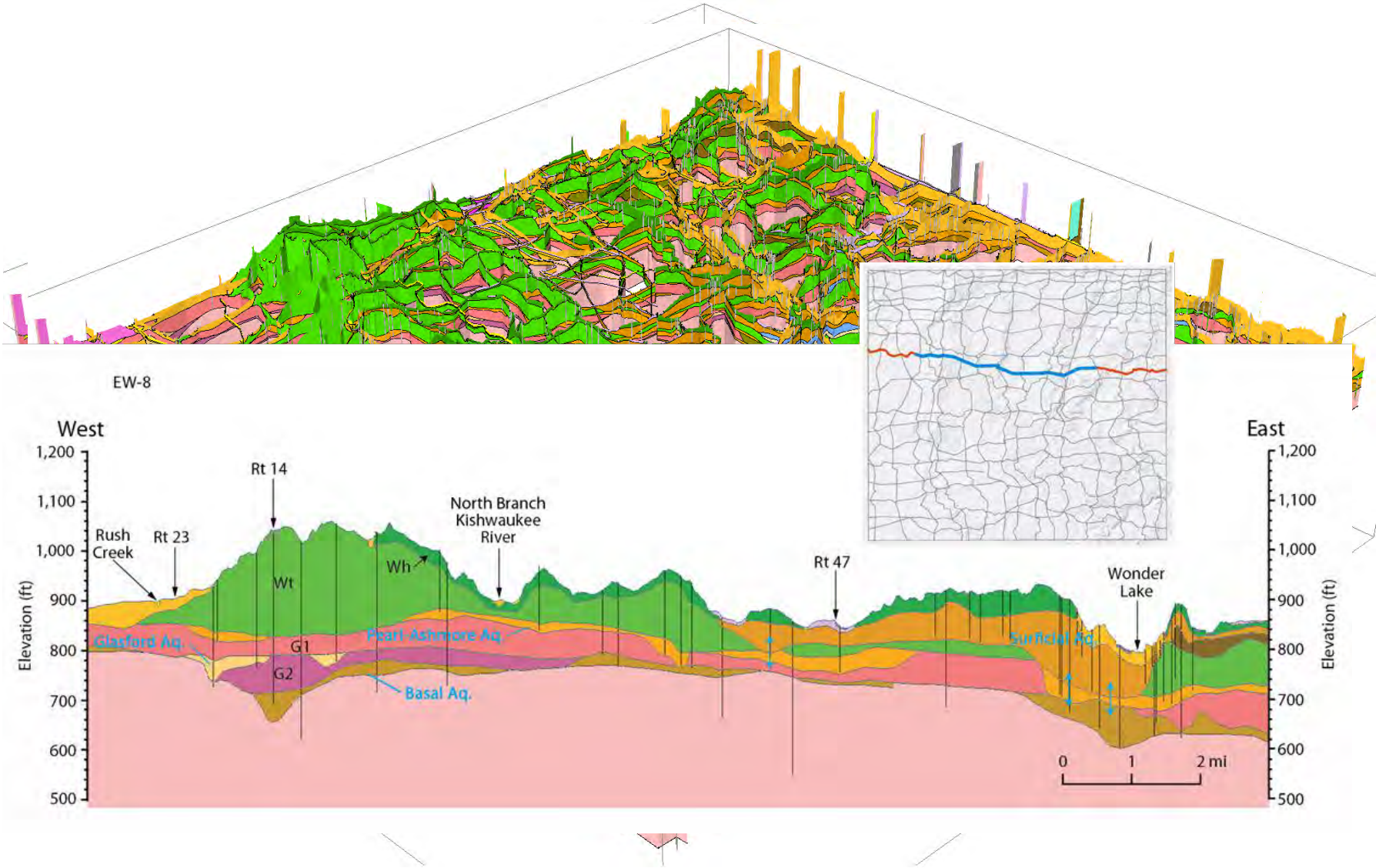
- Geology and water resources
  - Bedrock aquifers
  - Sand/gravel aquifers
  - Groundwater concepts
- Models of McHenry County
  - Geologic models
  - Groundwater flow models and predictions
- How do we learn more?
  - Airborne surveys
  - Auto-mapping aquifers
  - Detailed landform/landscape mapping
  - Geohazard assessments

McHenry County 3D Geologic Mapping



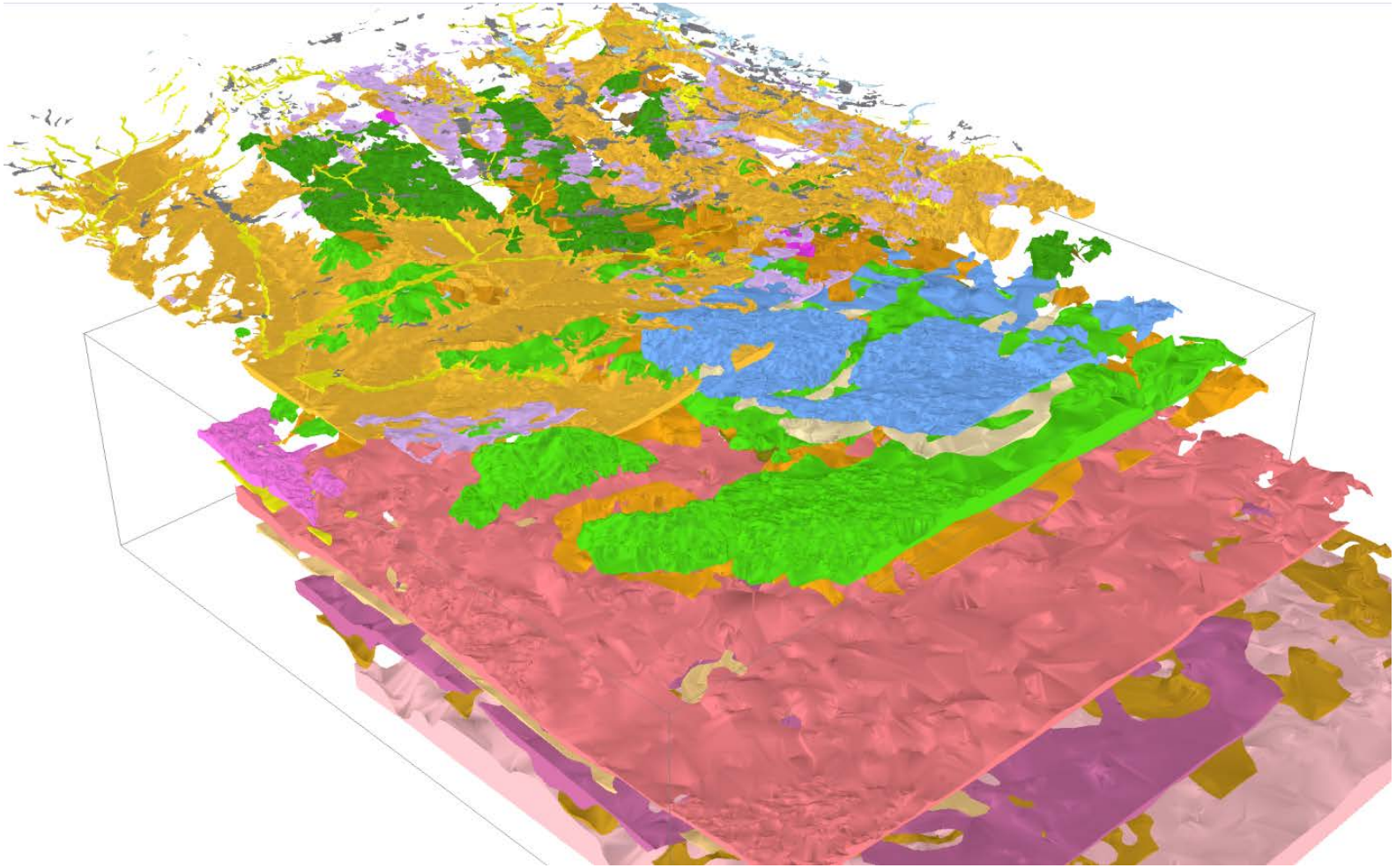
3D Geologic Map-Cross Section Network

Viewed from Southwest



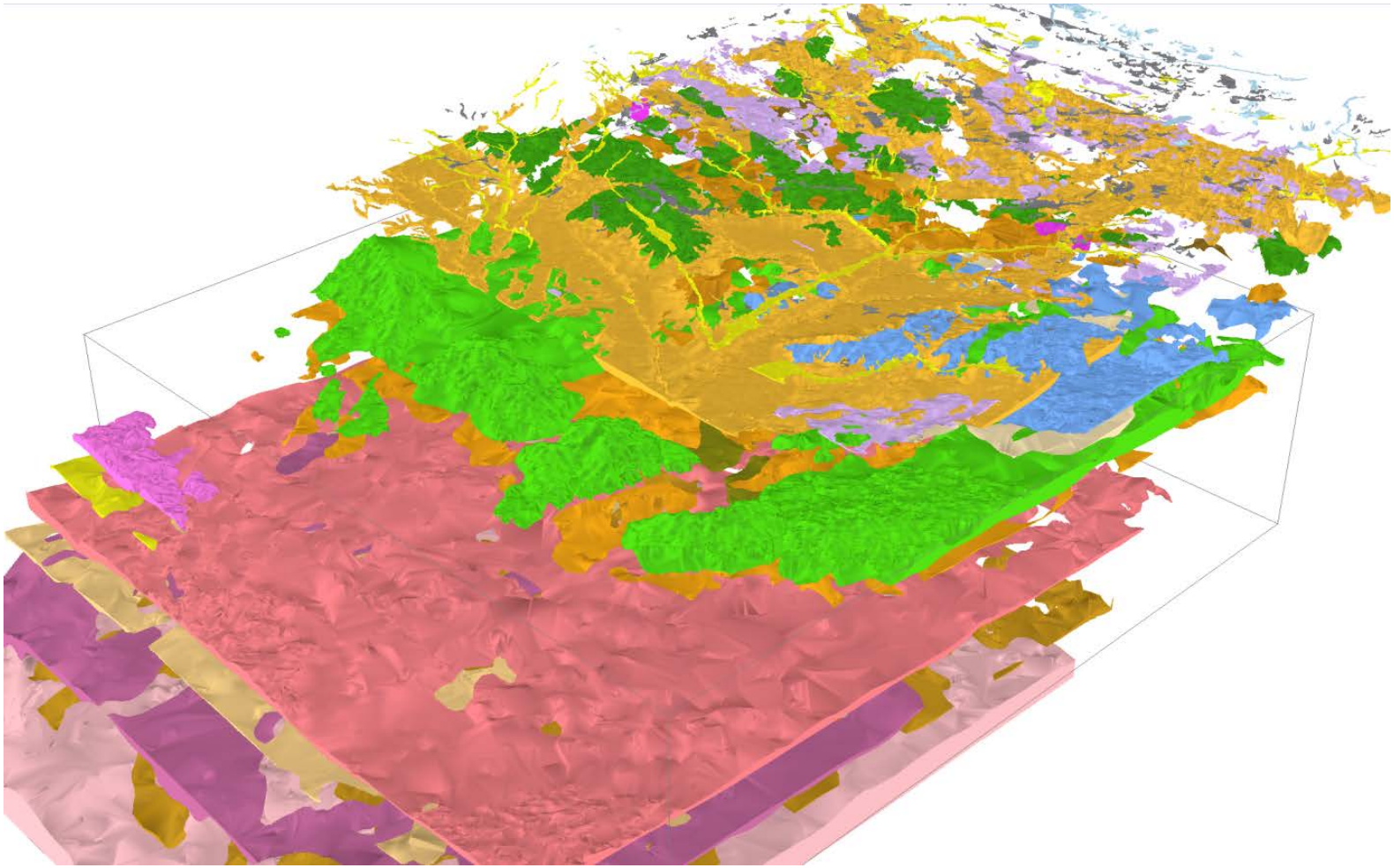
3D Geologic “Pull-Apart” Map

Viewed from Southwest

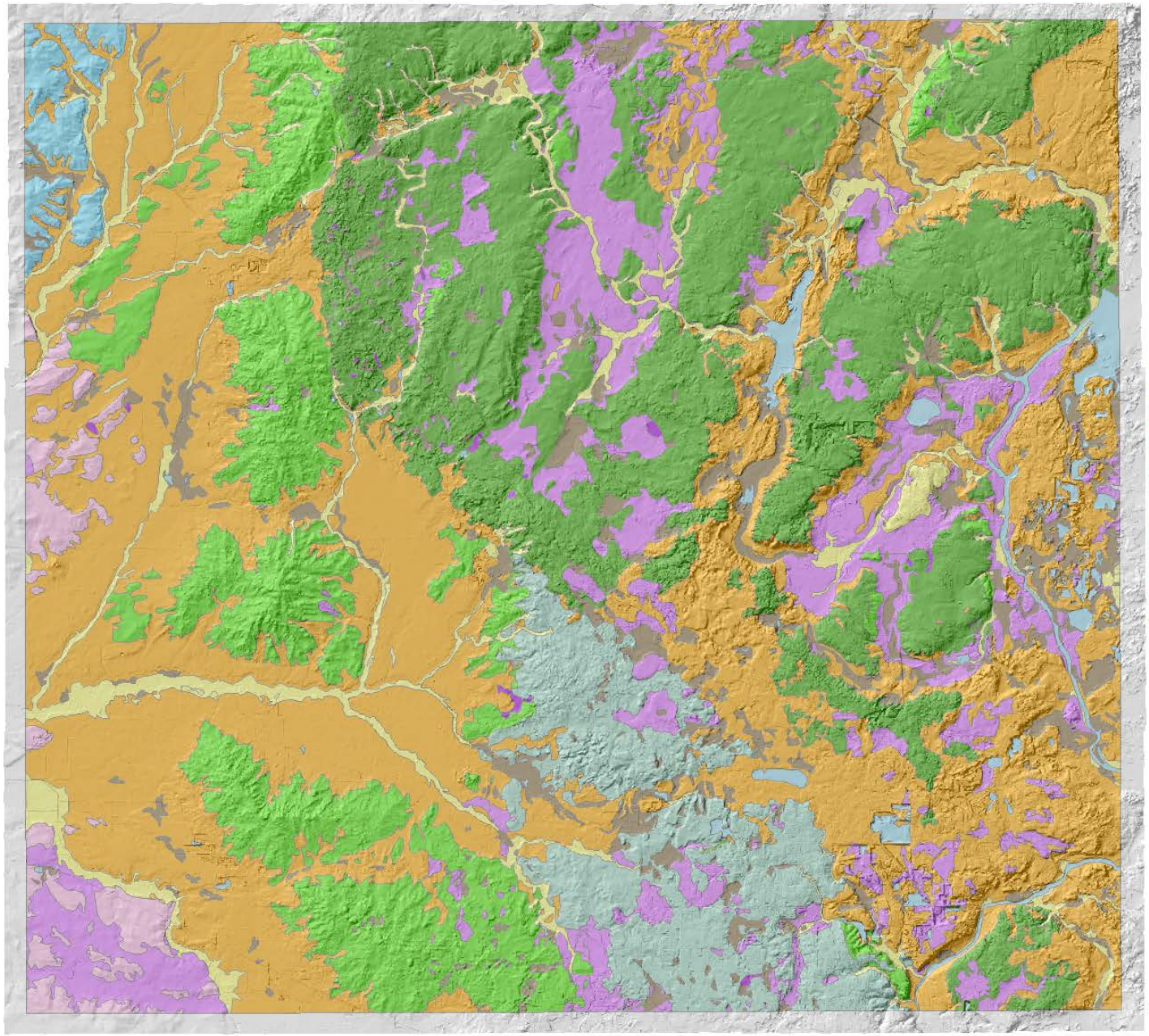


3D Geologic “Pull-Apart” Map

Viewed from Southwest



Geologic Map of McHenry County, IL



Legend

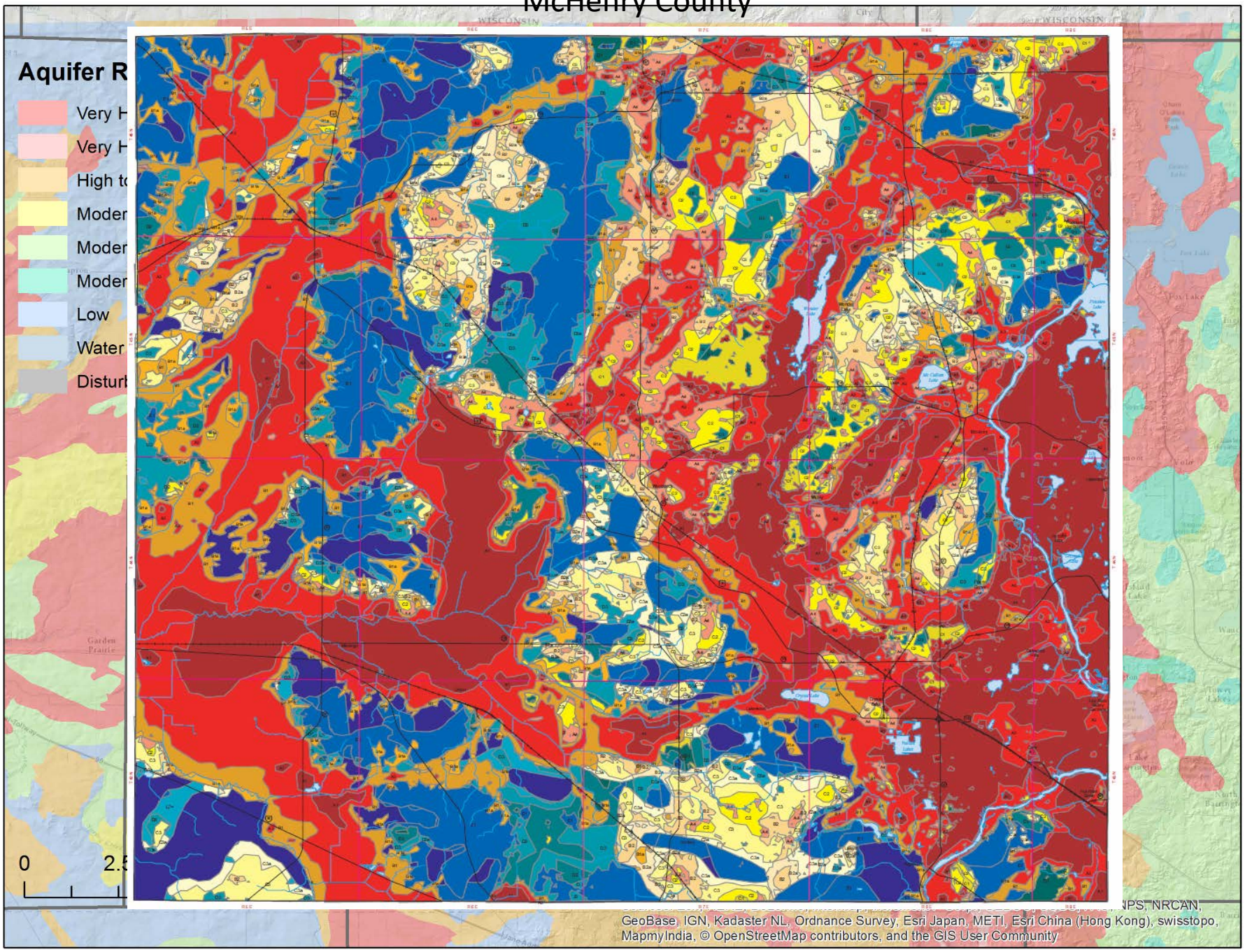
Geologic Materi

- Water Body
- Grayslake peat (bog)
- Peyton Formation (landslides)
- Equality (lake sediments)
- Cahokia Fm (river sediments)
- Henry Fm (glacial meltwater sediments)
- Haeger (till)
- Yorkville (till)
- Tiskilwa (till)
- Winnebago Fm (till)
- Glasford Fm (till)

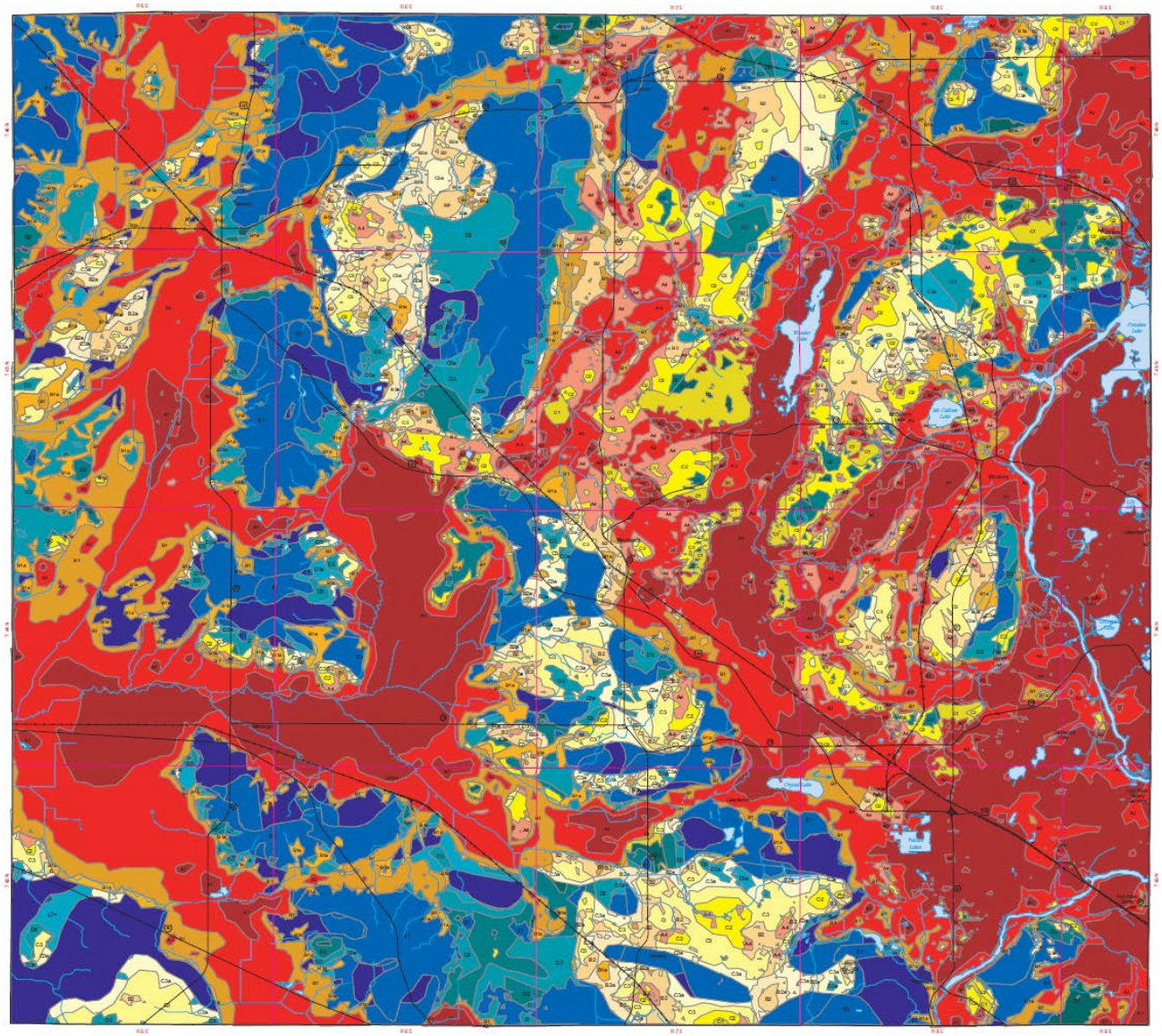
N
W E
S

0 0.5 1 2 3 4 Miles

McHenry County



Aquifer Sensitivity/Recharge Potential Map



Burial depth

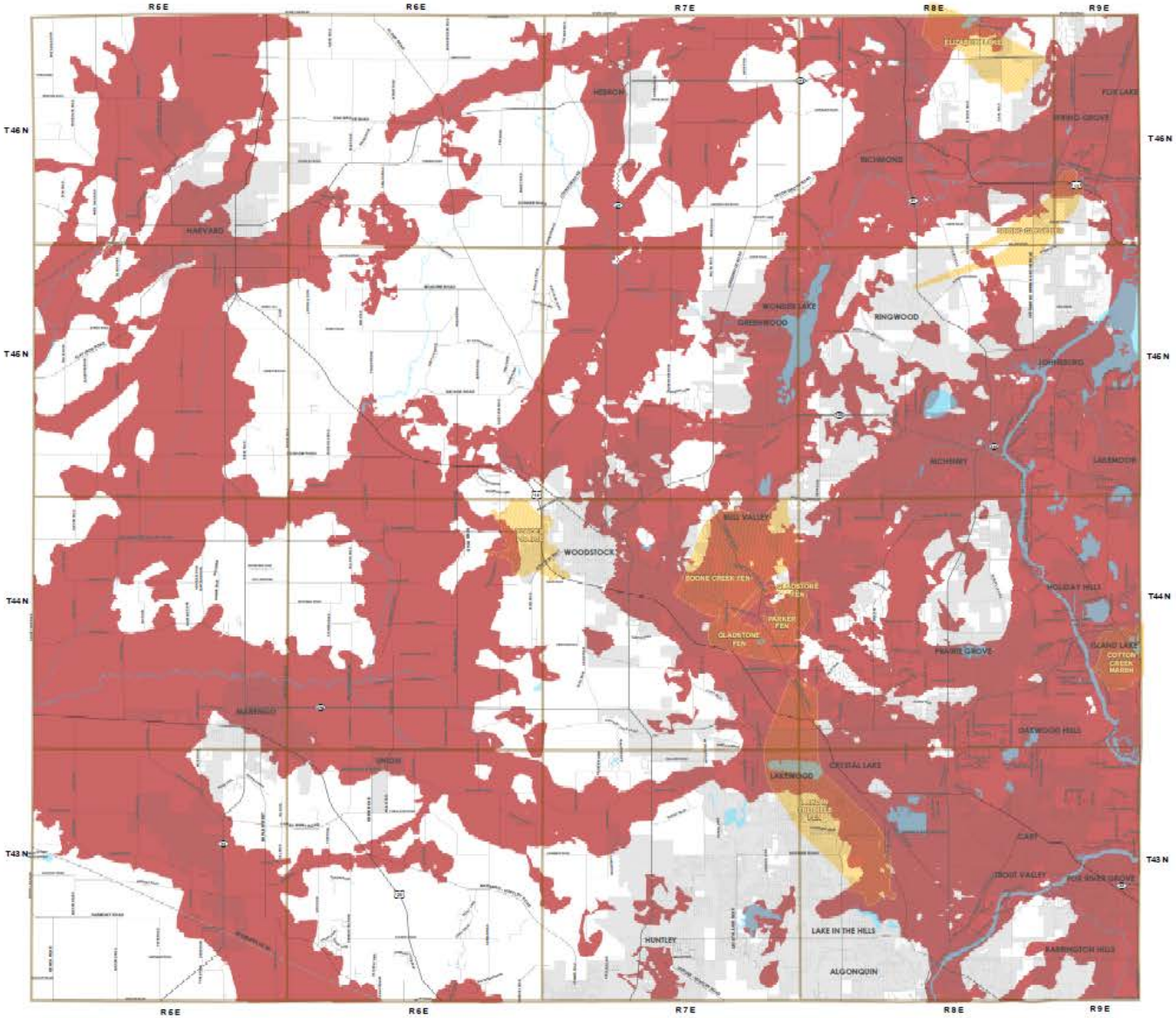
Less Sensitive

More Sensitive

Thickness

More Sensitive

Less Sensitive



McHENRY COUNTY SENSITIVE AQUIFER RECHARGE AREAS (SARA) MAP

TOWNSHIPS

CHEMUNG	ALDEN	HEBRON	RICHMOND	BURTON
DUNHAM	HARTLAND	GREENWOOD	MCHENRY	
MARENGO	SENECA	DORR	NUNDA	
RILEY	CORAL	GRAFTON	ALGONQUIN	

SENSITIVE AQUIFER RECHARGE AREAS

CLASS III GROUNDWATER AREAS

CORPORATE BOUNDARY

LAKES, RIVERS, STREAMS

This map is for reference purposes only. This map may contain inaccuracies and or typographical errors. This information may be changed and or updated without notice. Information on this map is provided "as-is" without warranty of any kind, either expressed or implied. In no event shall McHenry County be liable to you or any third party for any damages or lost profit resulting from any use or misuse of the information contained on this map. The information contained on this map should not be used in place of an on the ground survey or legal documents. Do not scale distances on this map.

N
W E
S

DATA SOURCES:
Base map compiled by Illinois State Geological Survey from digital data (2009 TIGER / Line shapefiles) provided by the United States Census Bureau. Hillshade from USGS National Elevation Dataset. Transverse Mercator Projection, North American Datum of 1983. Map data compiled by Thomason, J.F. Illinois State Geological Survey, as contracted by McHenry County for 3-D Geologic Mapping, November, 2013. Compiled information extracted and formatted by Edward Amoo, McHenry County GIS Dept. The 3-D Geologic Map Layers used on this Sensitive Aquifer Recharge Areas (SARA) map include areas identified as High Potential for Aquifer Contamination (A1, A2, A3, A4), and Moderately High Potential for Aquifer Contamination (B1, B2).

SARA_2018.mxd
Prepared by CTRB, CNW, Jan 2019

2013 Geologic and Hydrogeologic Modeling

Three-dimensional Geologic Mapping for McHenry County

Jason F. Thomason and Donald A. Keefer

Illinois State Geological Survey
Prairie Research Institute
University of Illinois at Urbana-Champaign

November, 2013

ILLINOIS STATE WATER SURVEY
PRAIRIE RESEARCH INSTITUTE

Contract Report 2013-06

Groundwater Simulation Modeling and Potentiometric Surface Mapping, McHenry County, Illinois

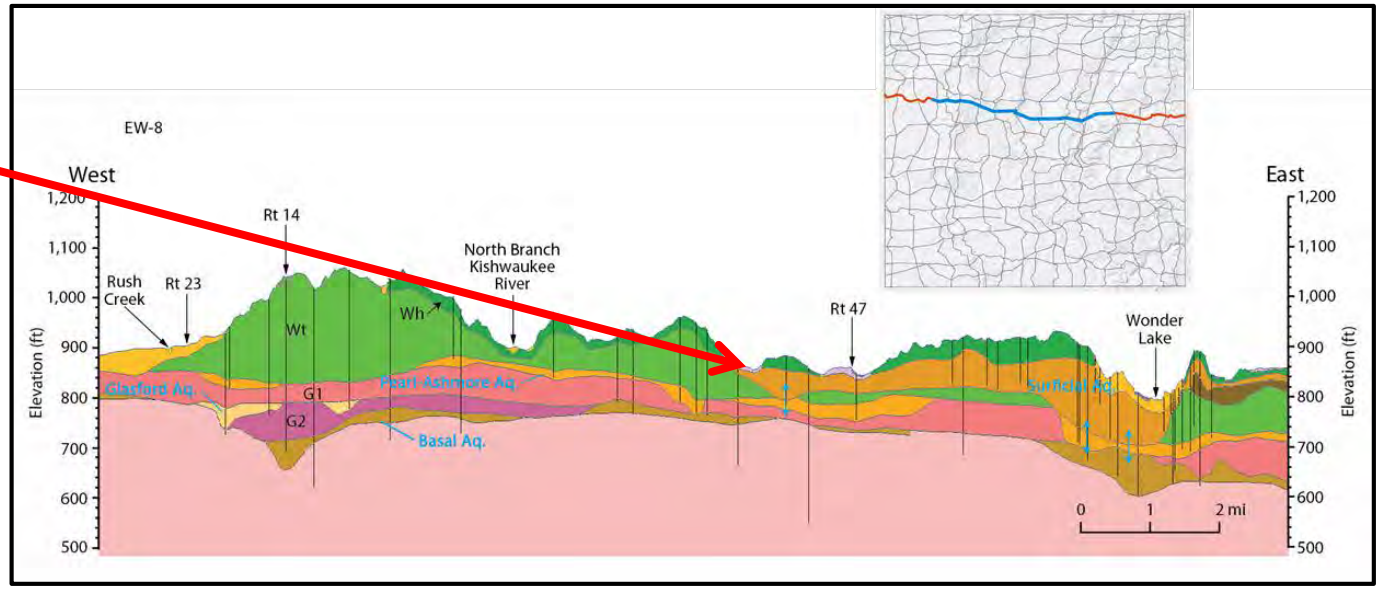
Scott C. Meyer, Yu-Feng Lin, Daniel B. Abrams, George S. Roadcap

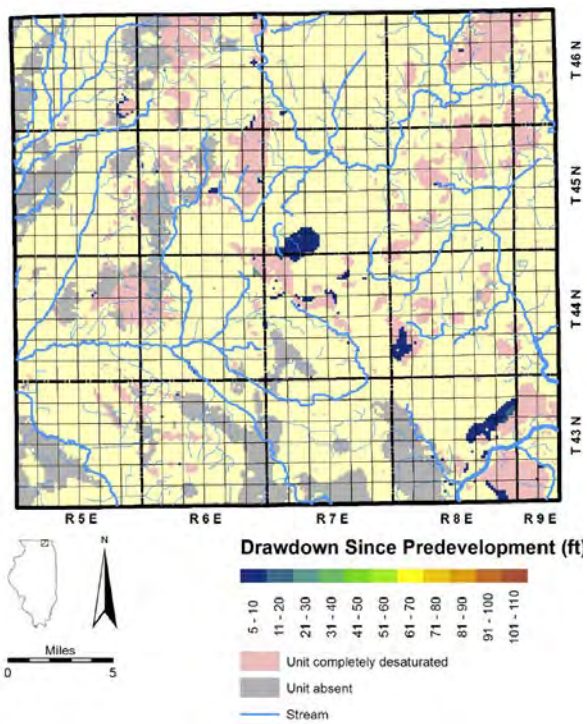
ILLINOIS

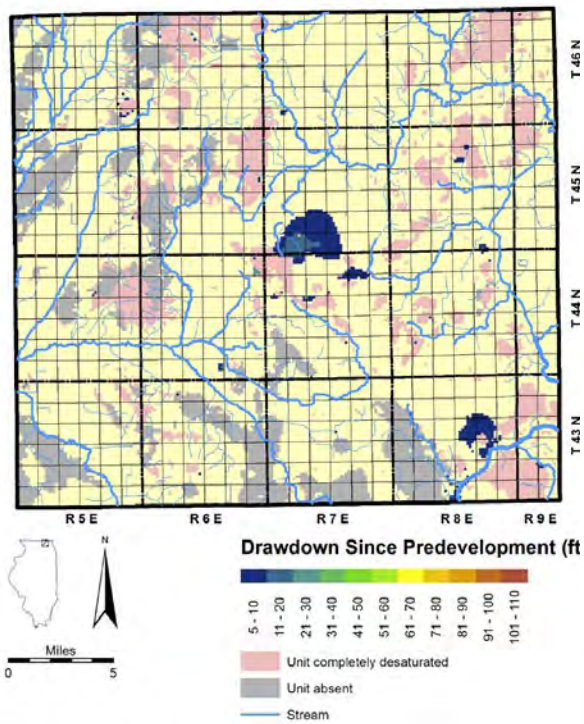
Haeger-Beverly Aquifer

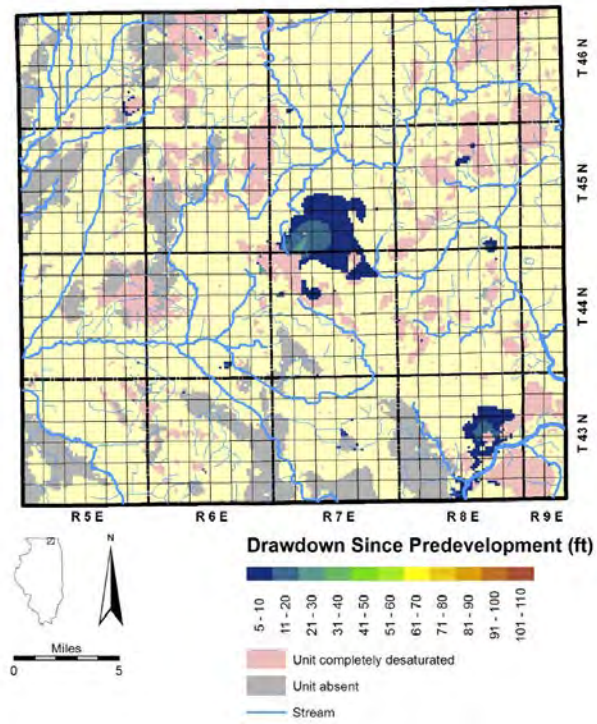
Simulated Drawdown 2009, 2030, & 2050

Illinois State Water Survey Meyer, et al., 2013





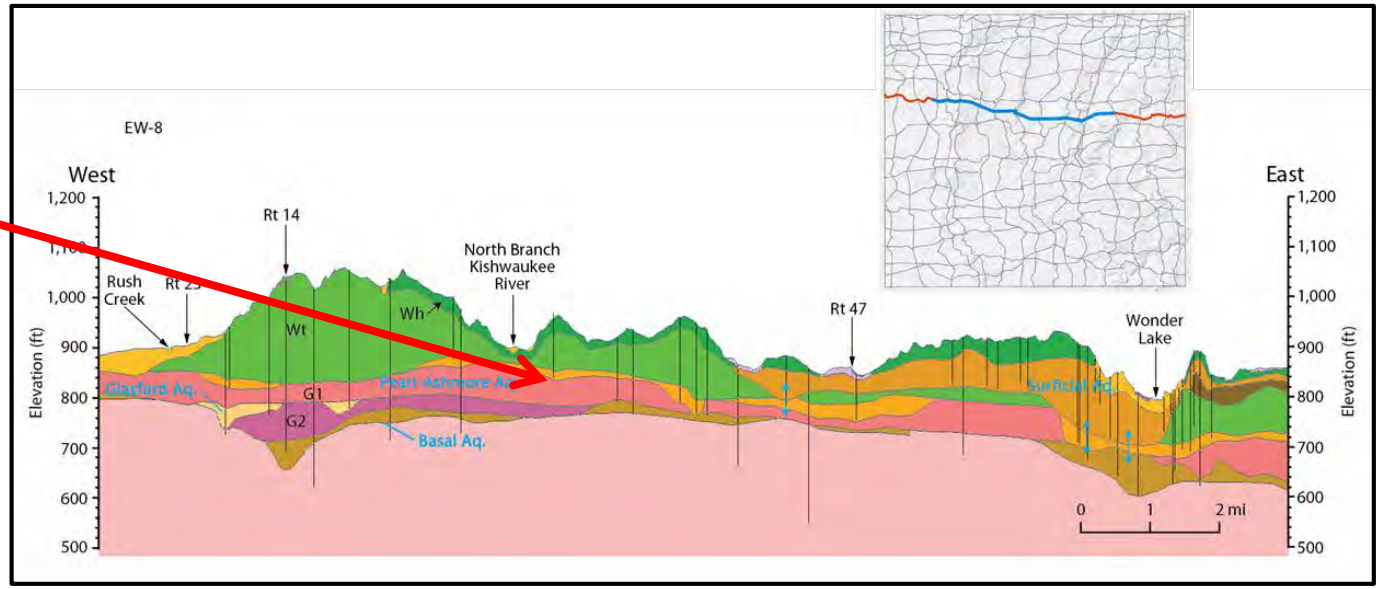


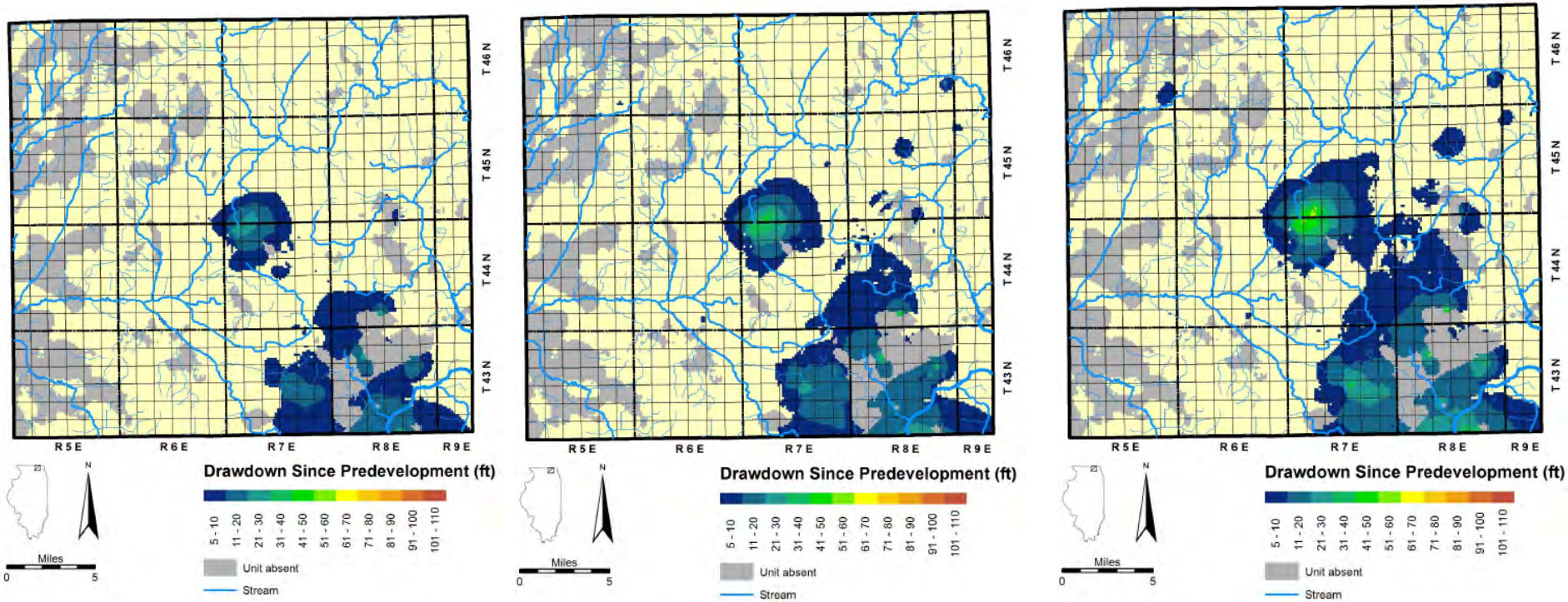


Ashmore Aquifer

Simulated Drawdown 2009, 2030, & 2050

Illinois State Water Survey Meyer, et al., 2013

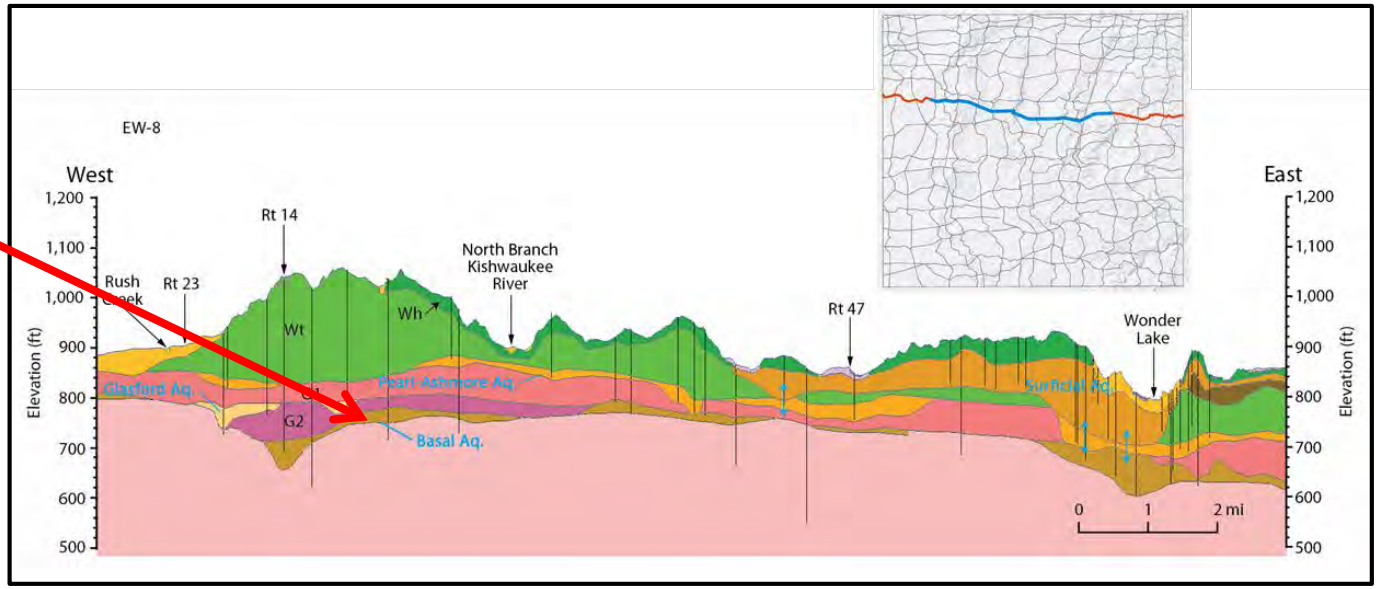


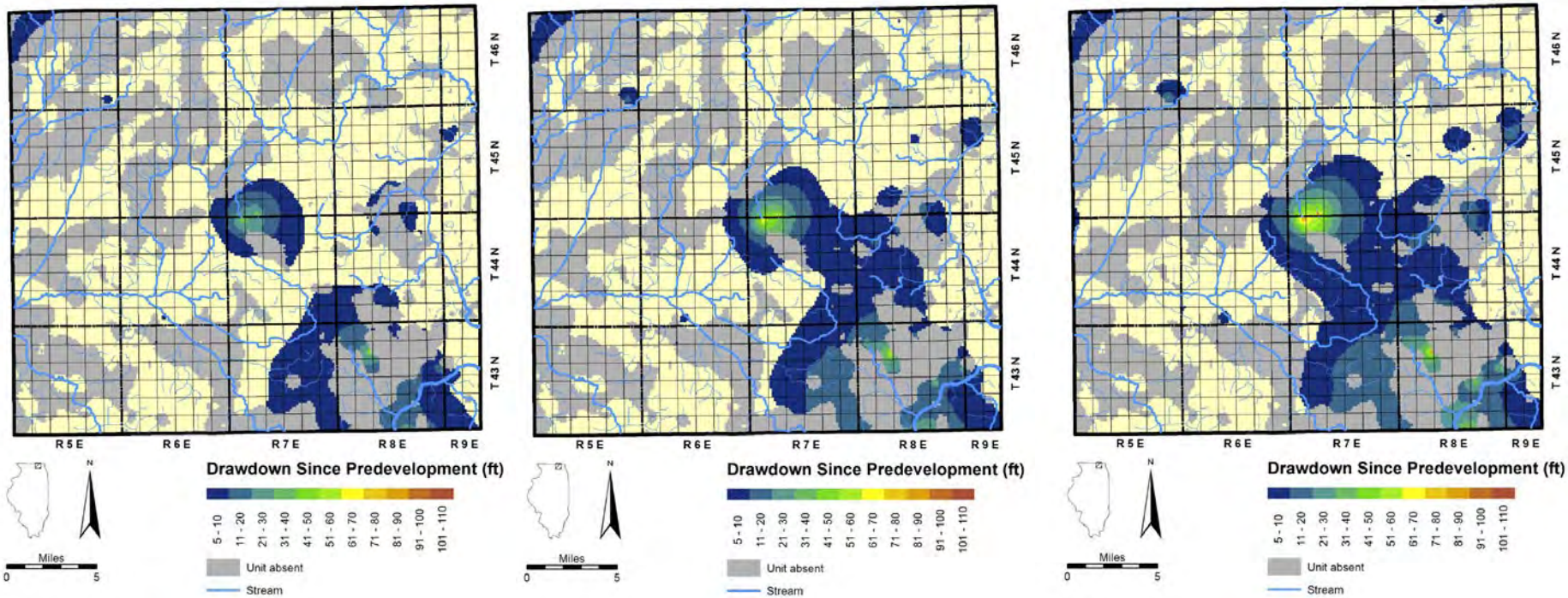


Lower Glasford Aquifer

Simulated Drawdown 2009, 2030, & 2050

Illinois State Water Survey Meyer, et al., 2013



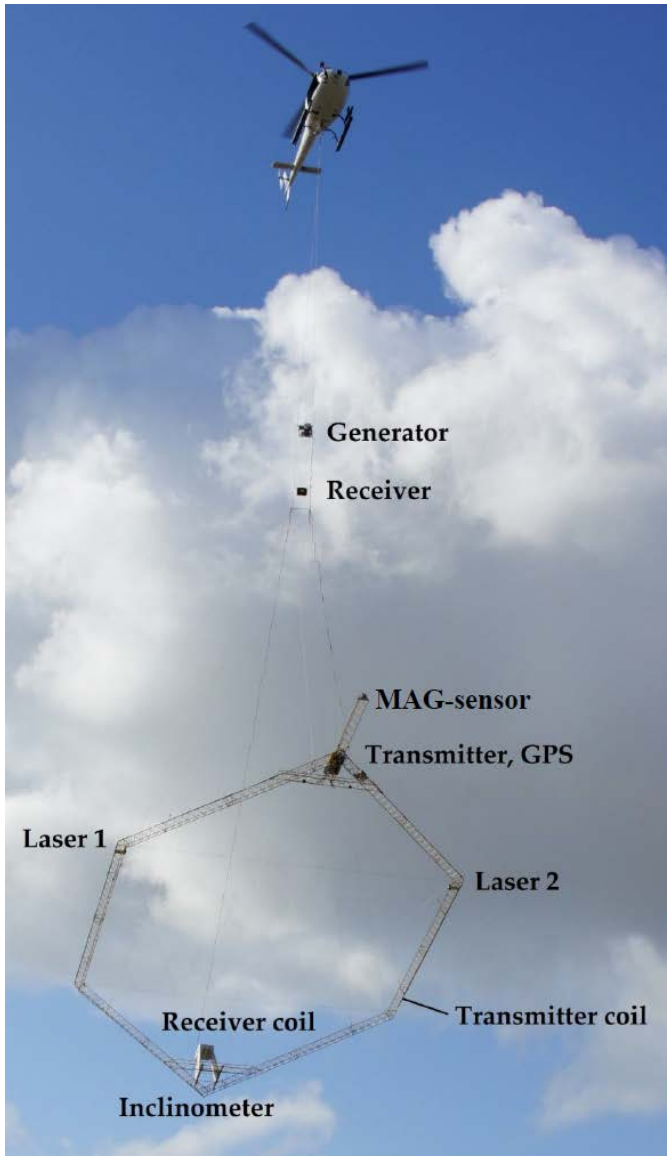


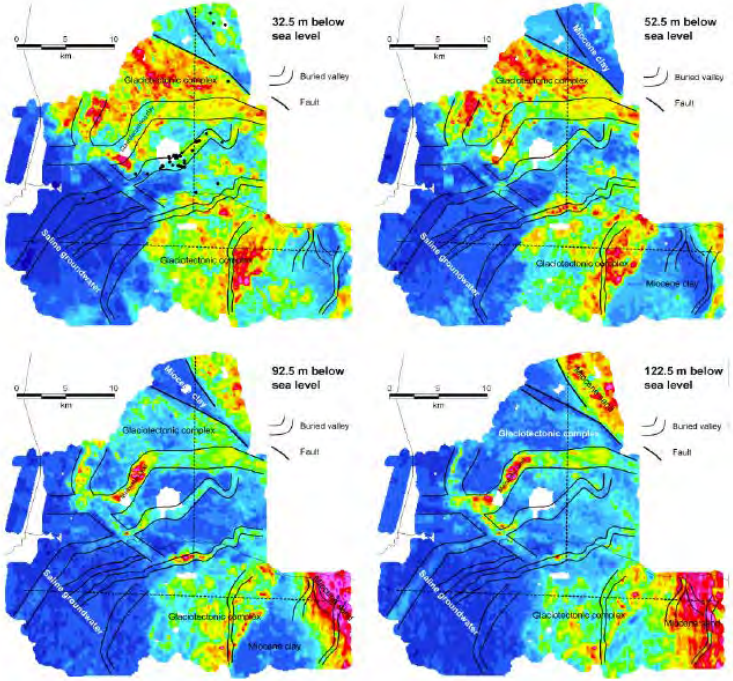
Outline

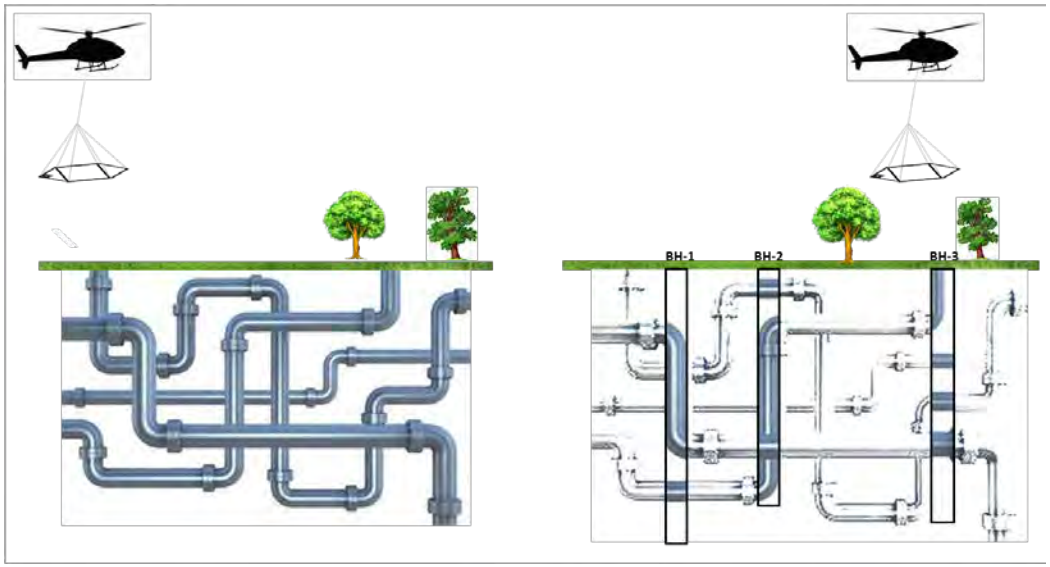
- Geology and water resources
  - Bedrock aquifers
  - Sand/gravel aquifers
  - Groundwater concepts
- Models of McHenry County
  - Geologic models
  - Groundwater flow models and predictions
- How do we learn more?
  - Airborne surveys
  - Auto-mapping aquifers
  - Detailed landform/landscape mapping
  - Geohazard assessments

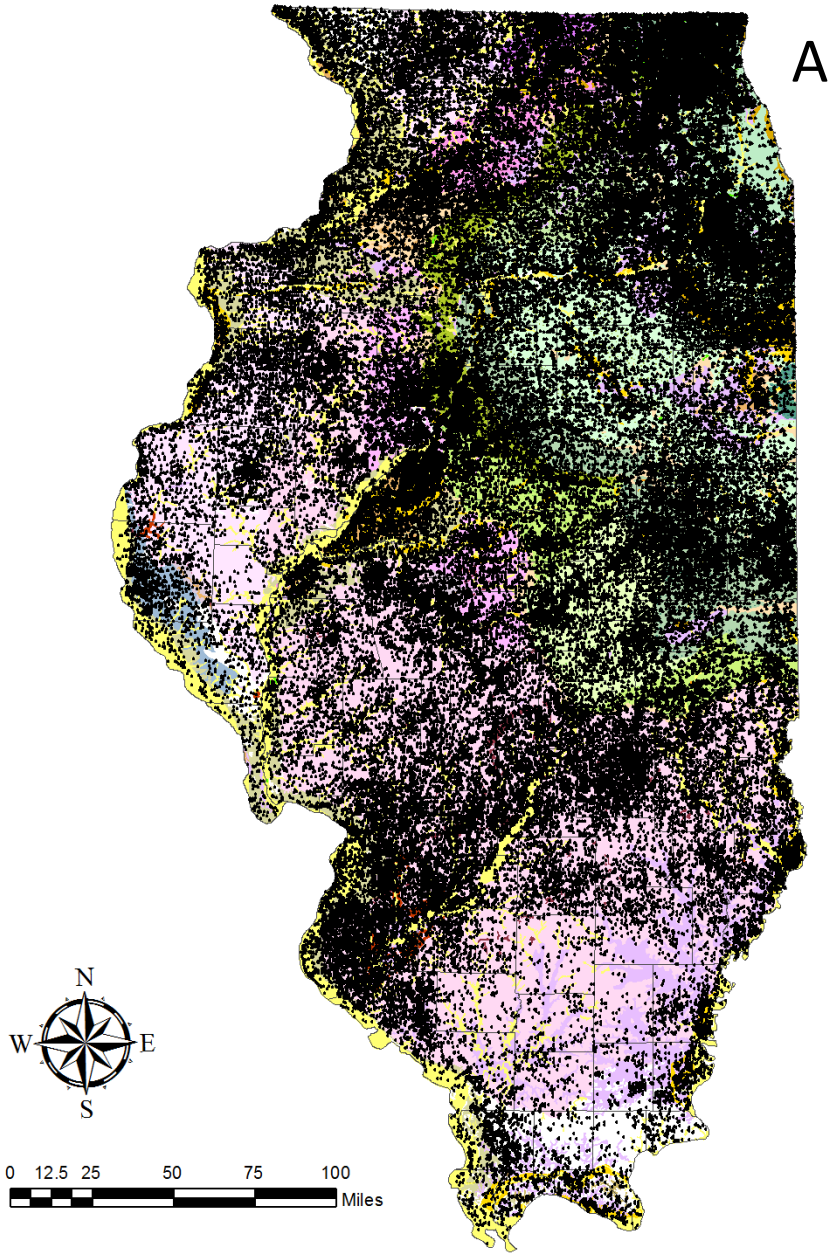
Airborne Electromagnetics

Kisa Mwakanyamale, ISGS







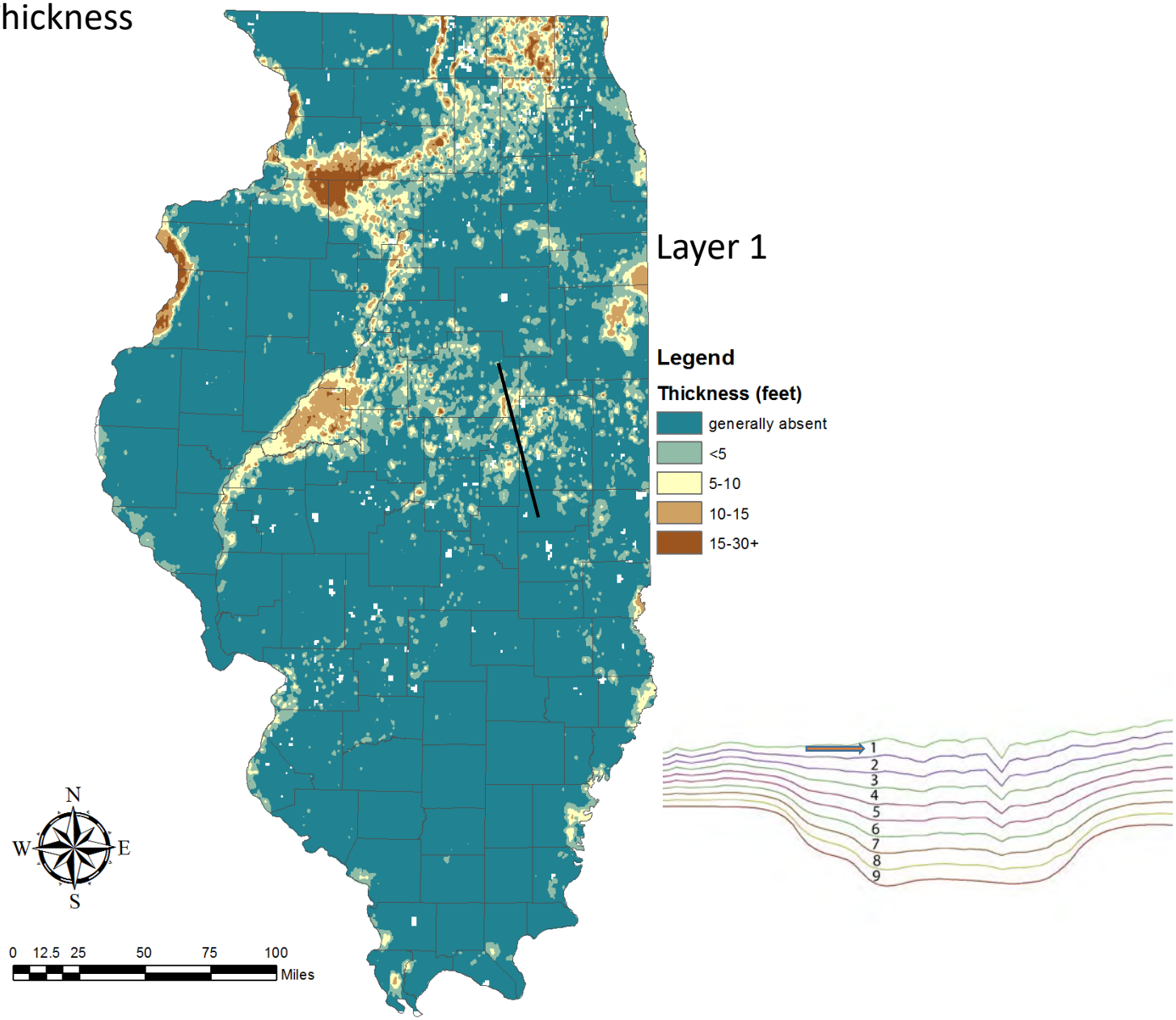


Automated Mapping

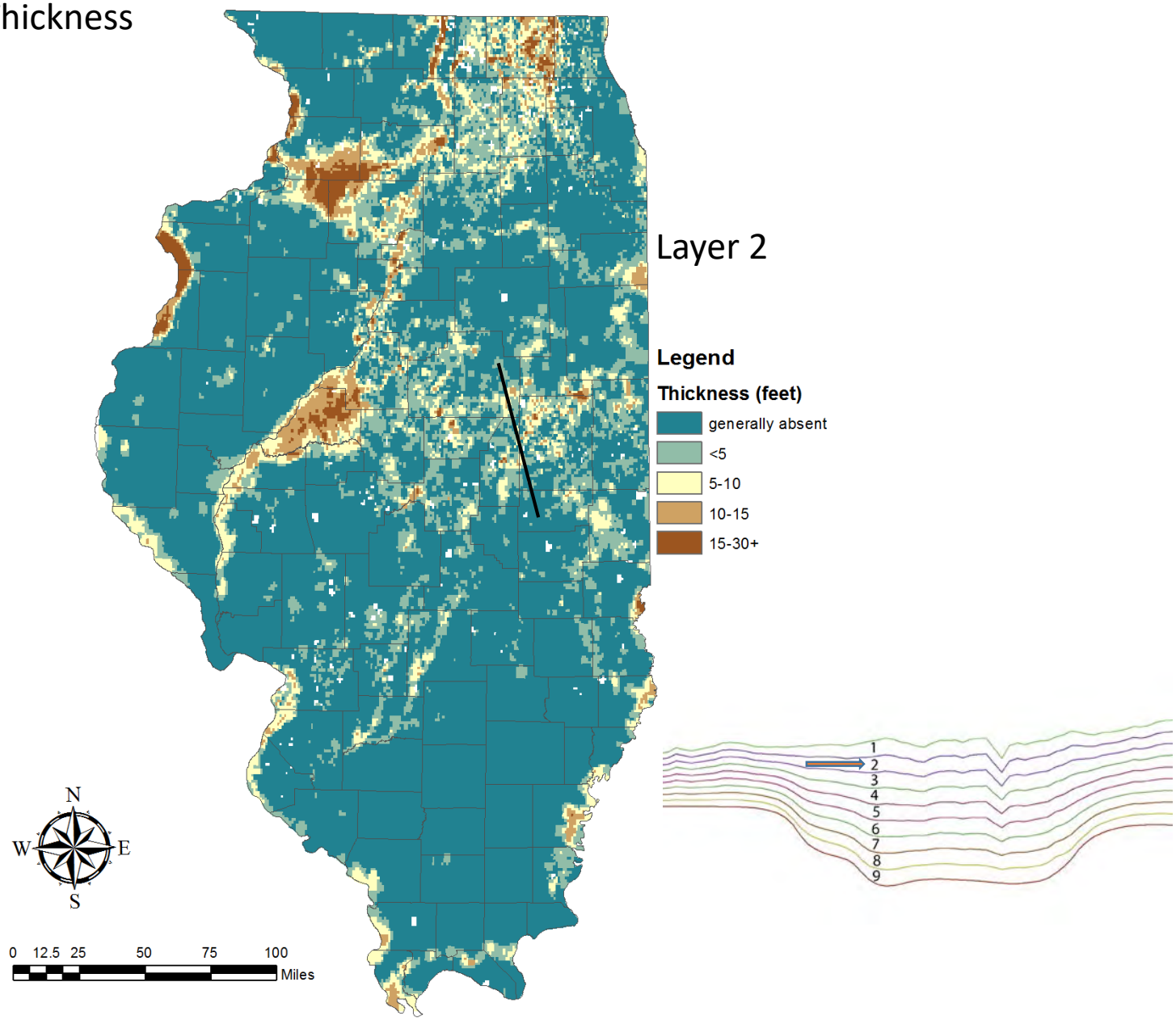
- Geologic Database
  - Water well records, engineering, stratigraphic
- 239,888 records
- QA/QC
  - Location (e.g. still many duplicates)
  - Descriptions (generalized)
- 90% database QA/QC, 10% Map work
- Fits framework for groundwater flow modeling (625 ft X 625 ft)
- Riley Balikian, ISGS

- Ron Klass, ISGS

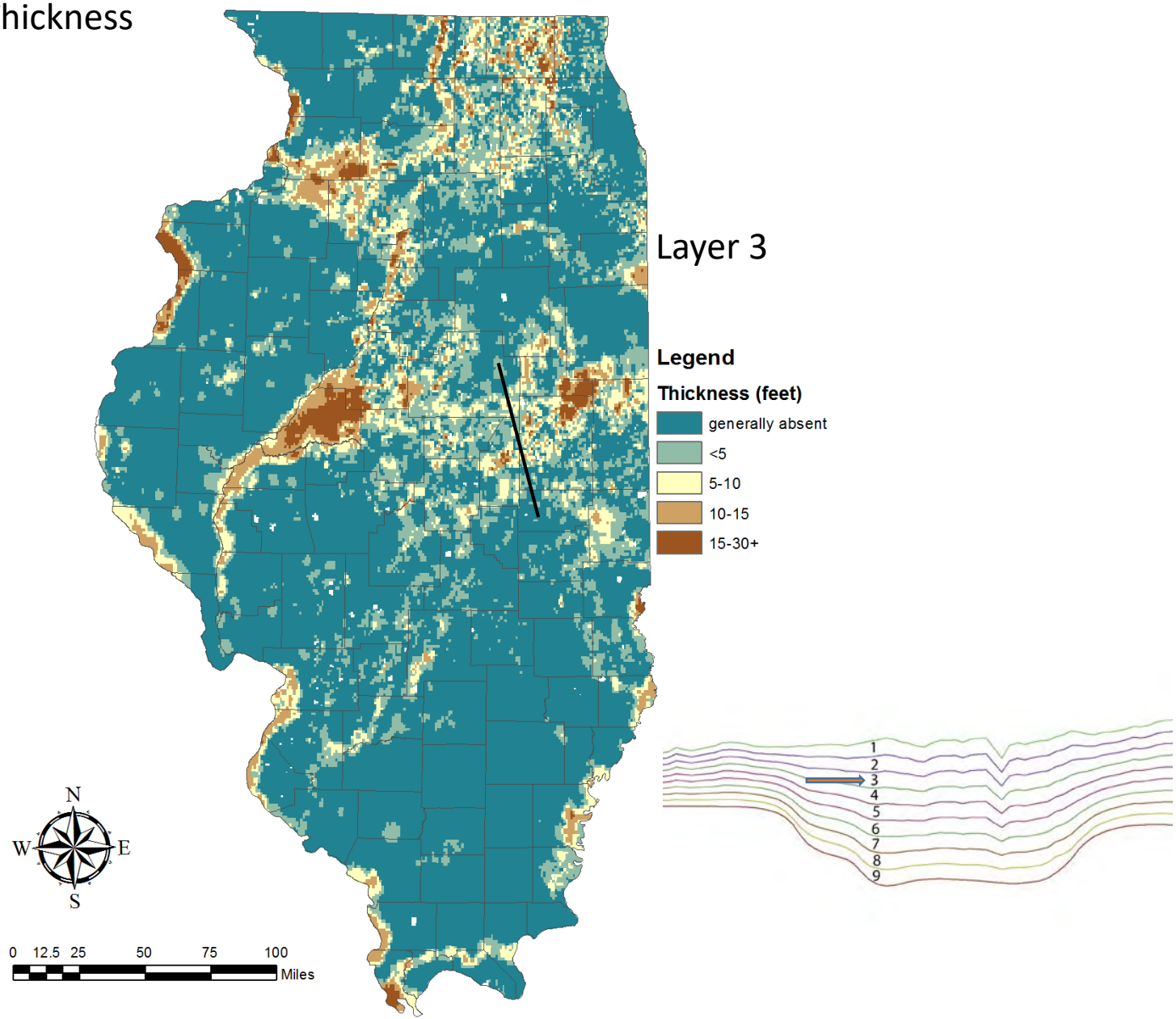
Sand and Gravel Thickness



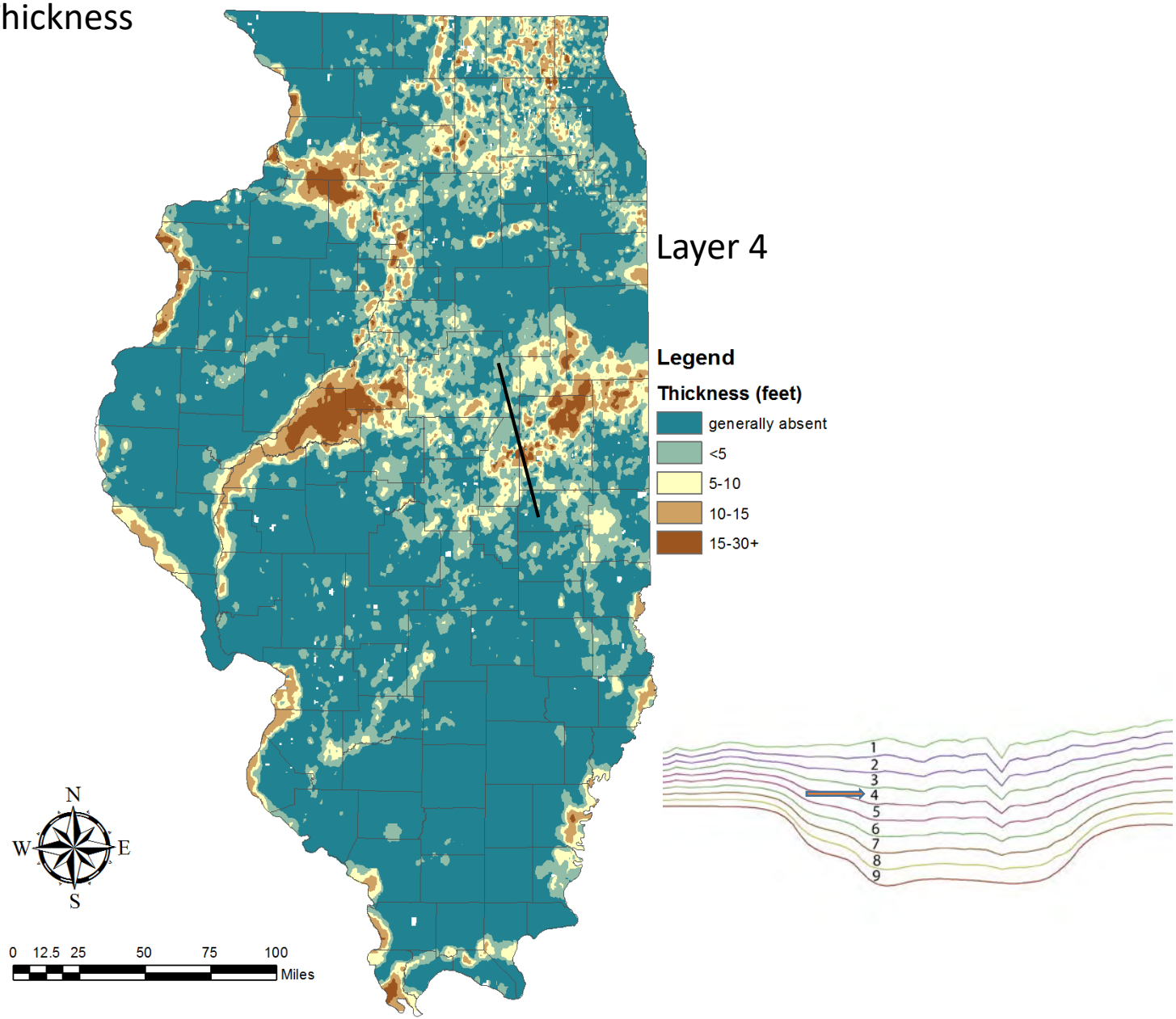
Sand and Gravel Thickness



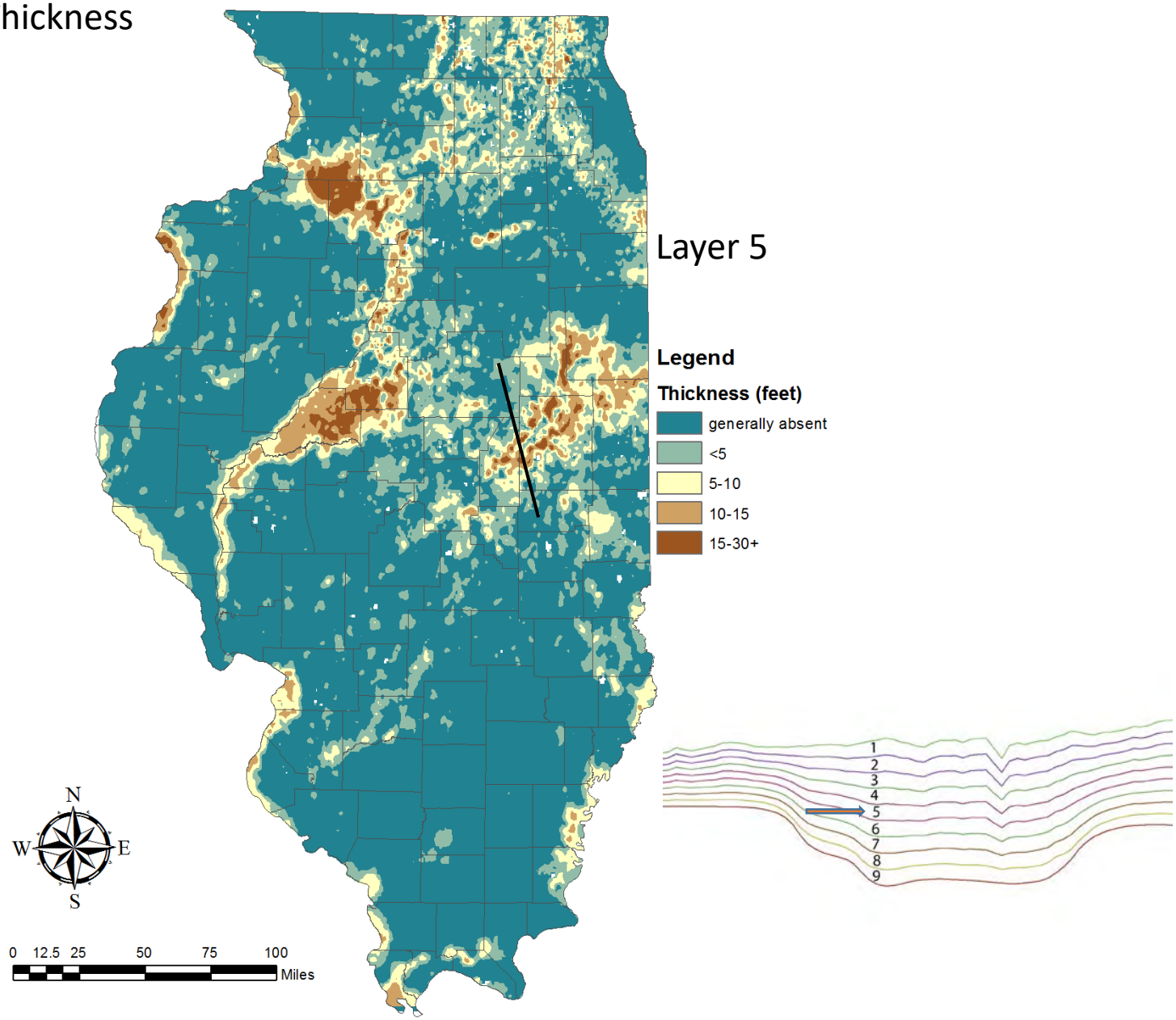
Sand and Gravel Thickness



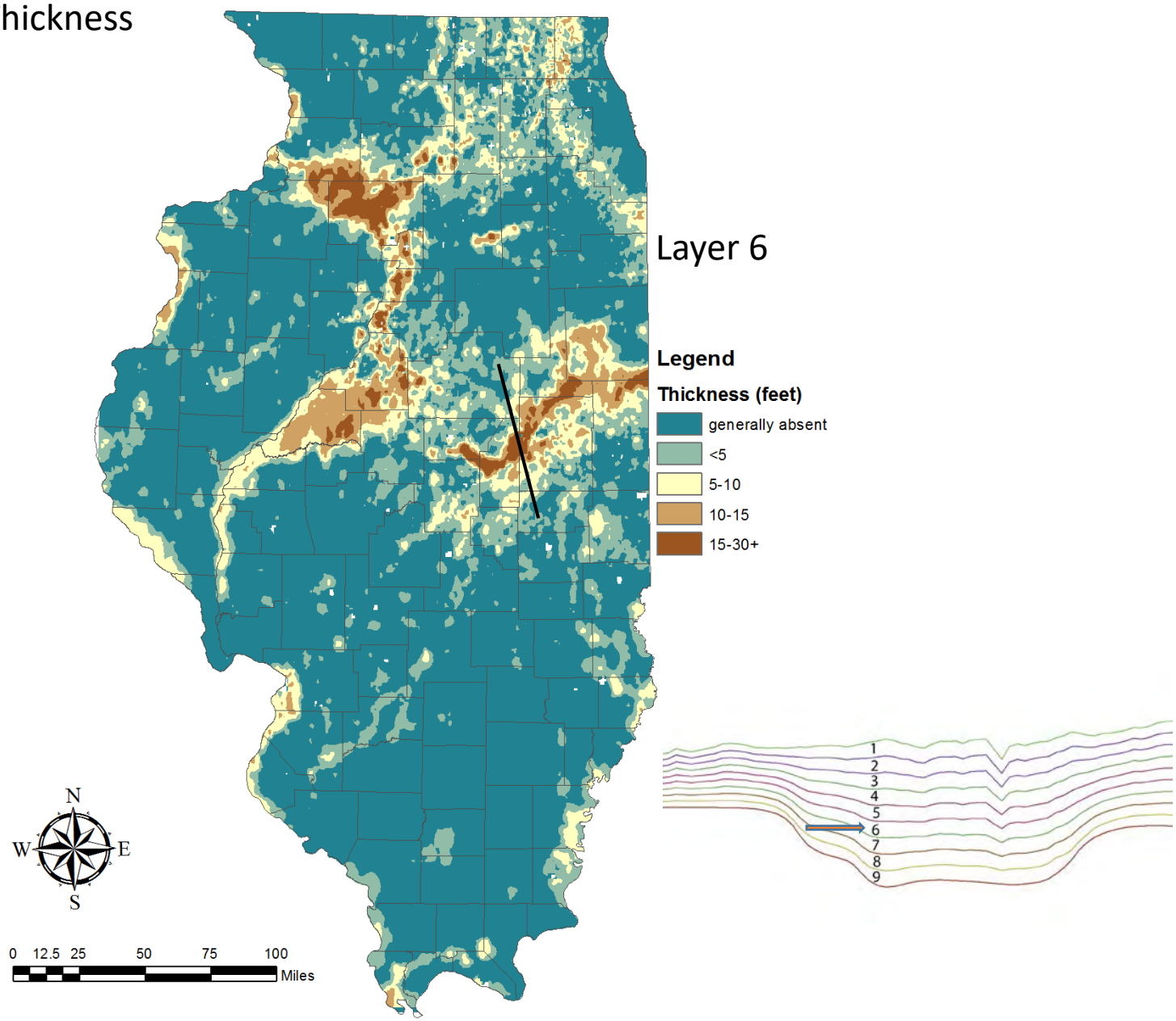
Sand and Gravel Thickness



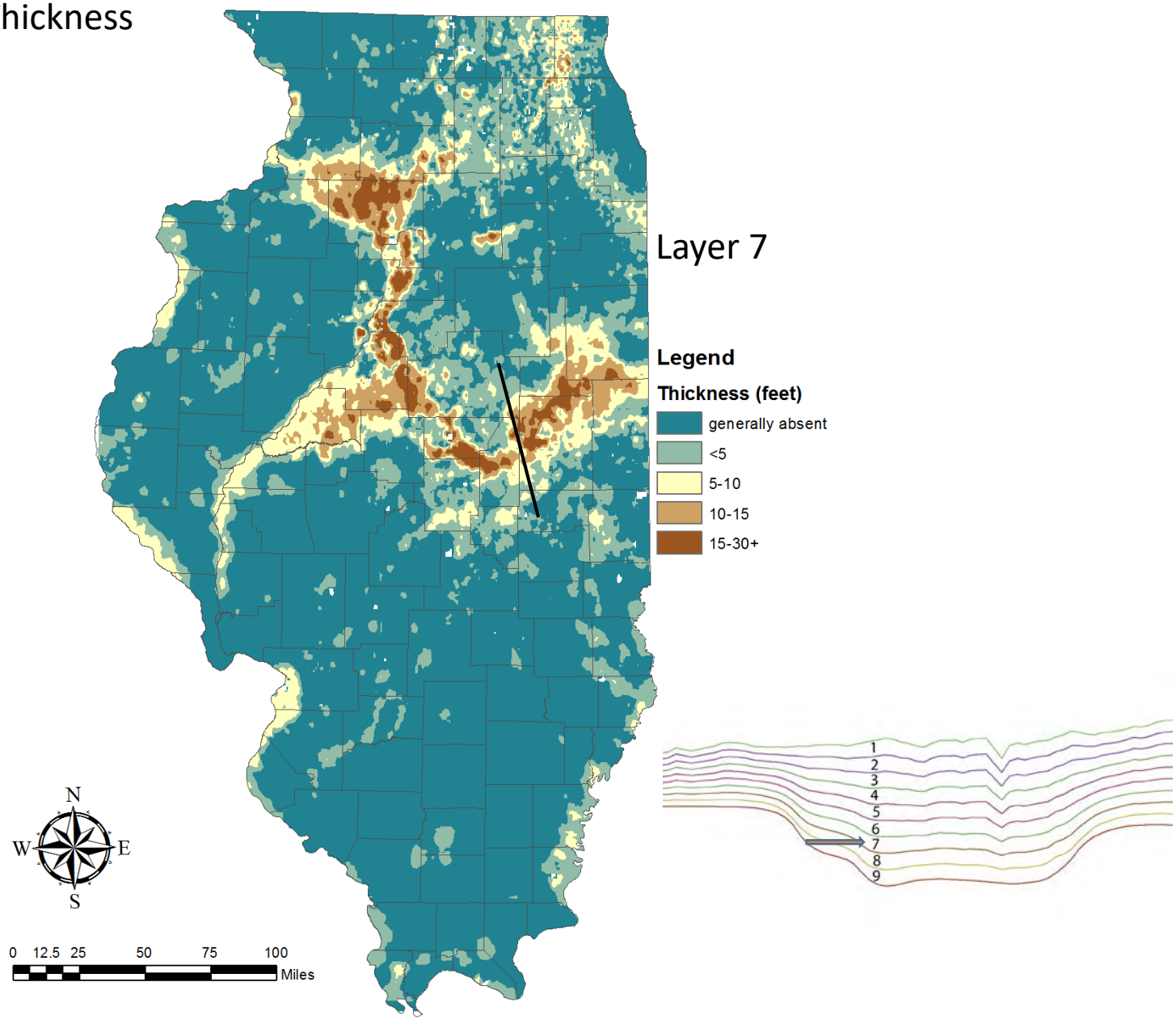
Sand and Gravel Thickness



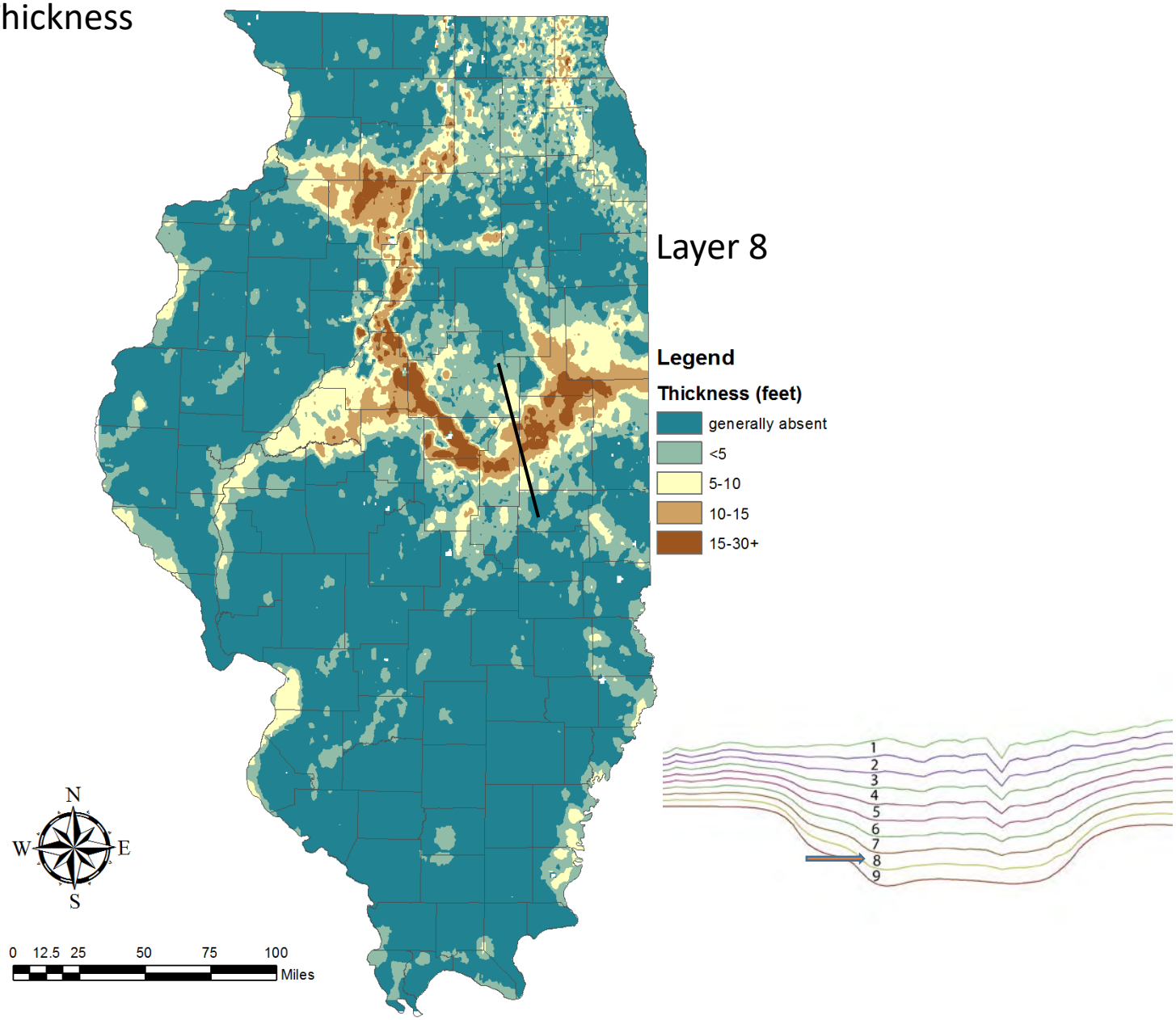
Sand and Gravel Thickness



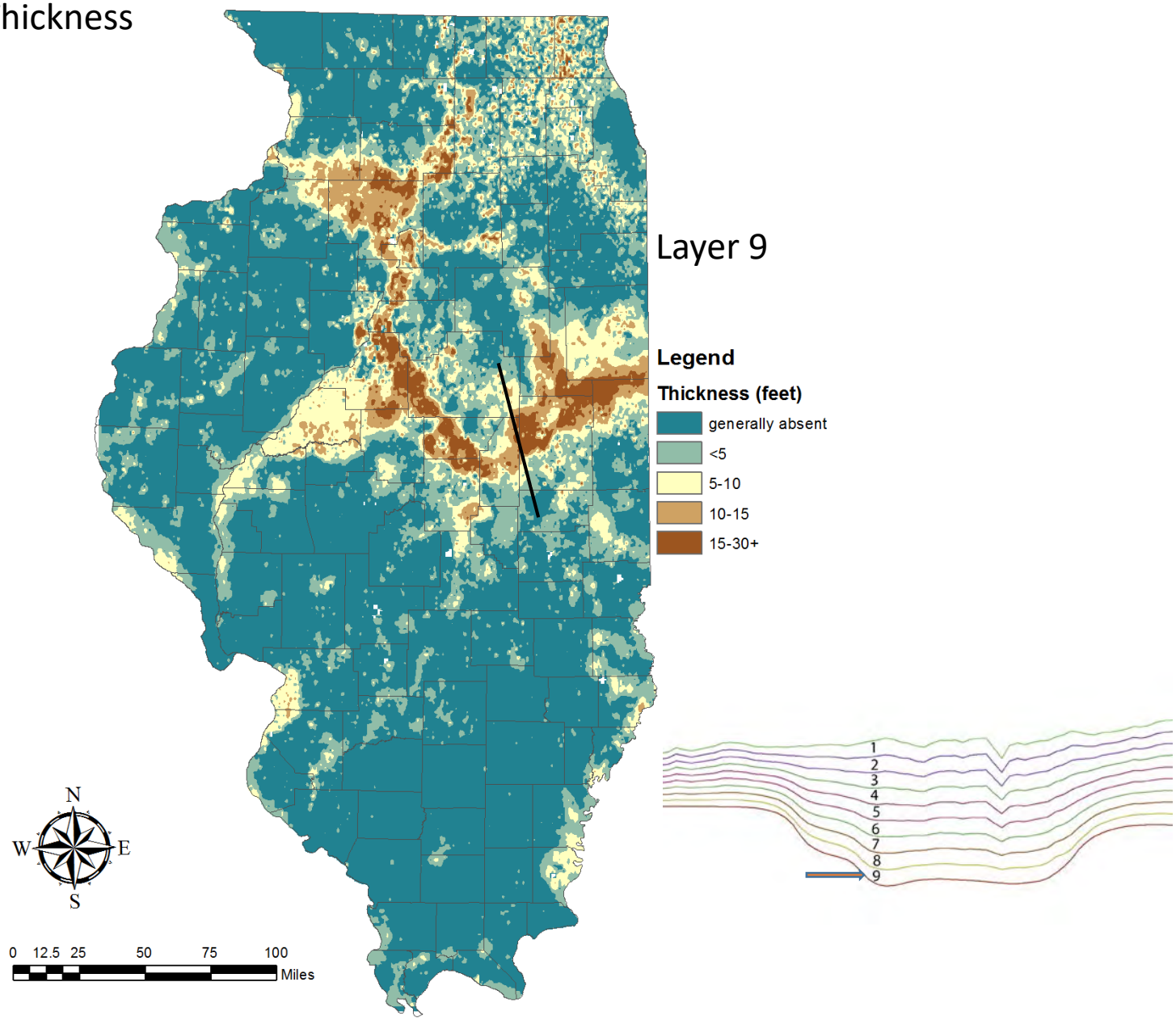
Sand and Gravel Thickness



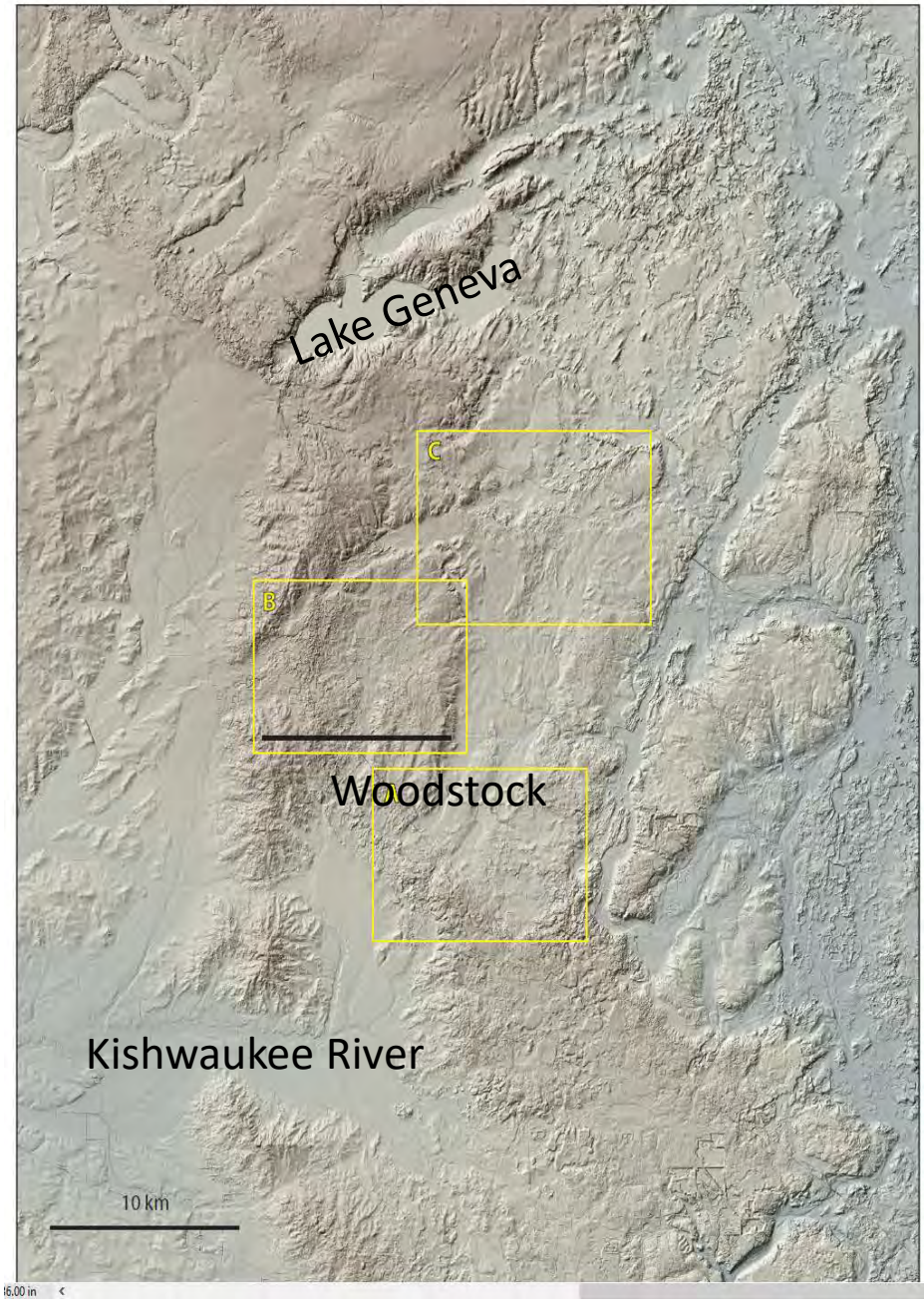
Sand and Gravel Thickness



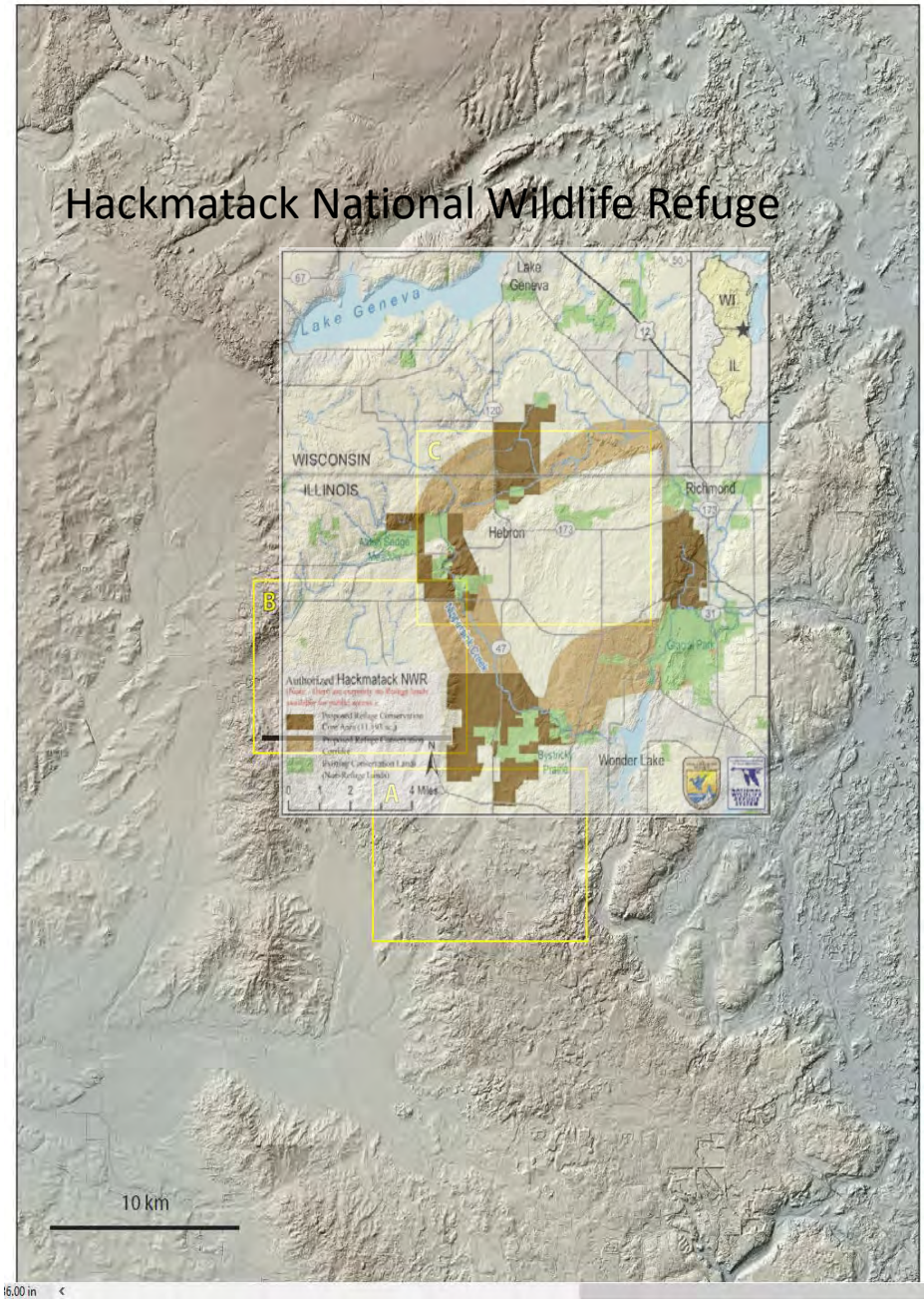
Sand and Gravel Thickness



Mapping Detailed Landforms and Landscapes



Mapping Landforms and Landscapes



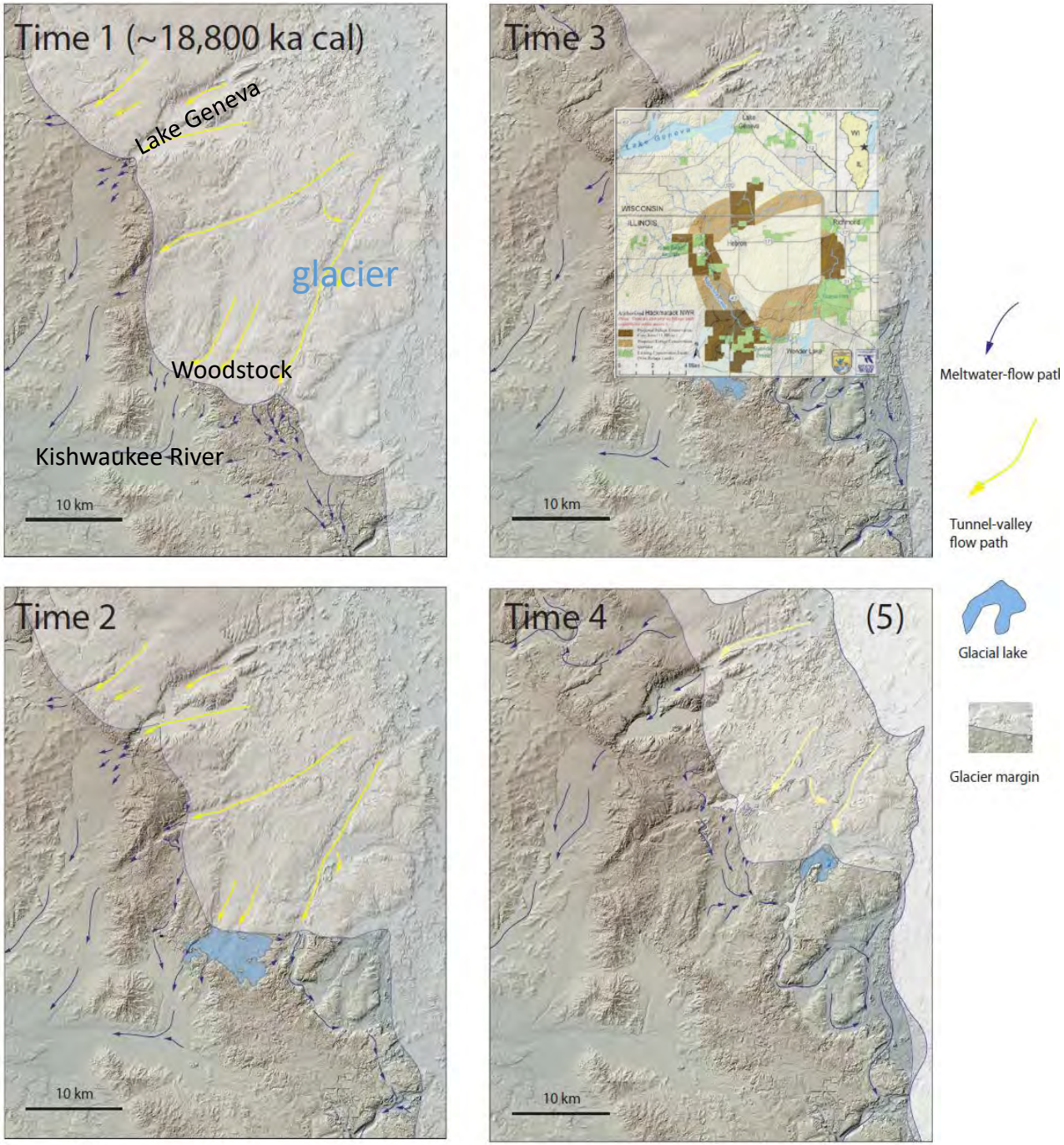
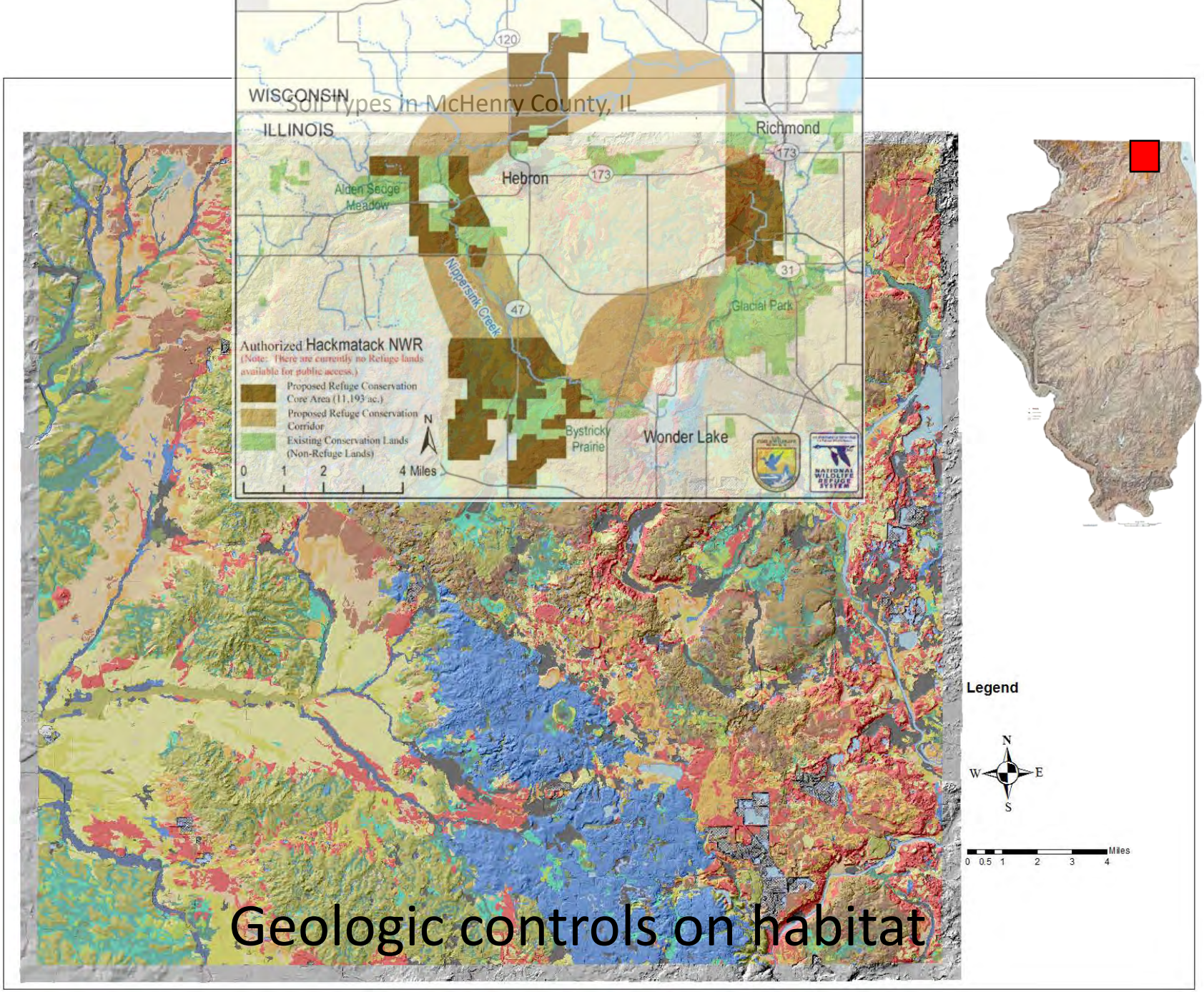


Figure 6. Retreat of the Woodstock Phase of the Lake Michigan Lobe interpreted from mapped ice-margin positions and former meltwater drainage paths.



Geologic controls on habitat

Outline

- Geology and water resources
  - Bedrock aquifers
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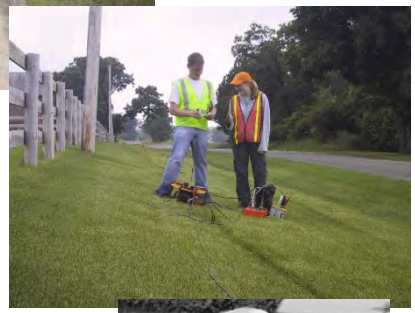
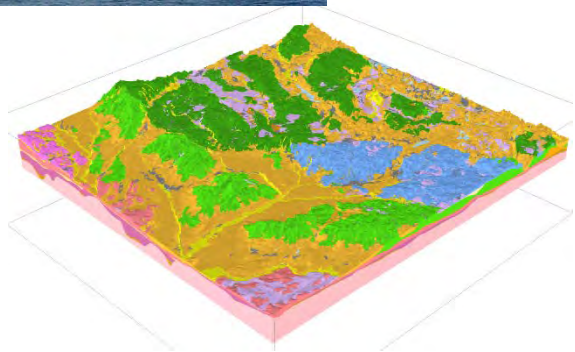
  - Groundwater flow models and predictions
- How do we learn more?
  - Airborne surveys
  - Auto-mapping aquifers
  - Detailed landform/landscape mapping
  - Geohazard assessments that include groundwater
  - Geothermal studies, engineering data

Thank you!





Capture zone modeling of irrigation wells

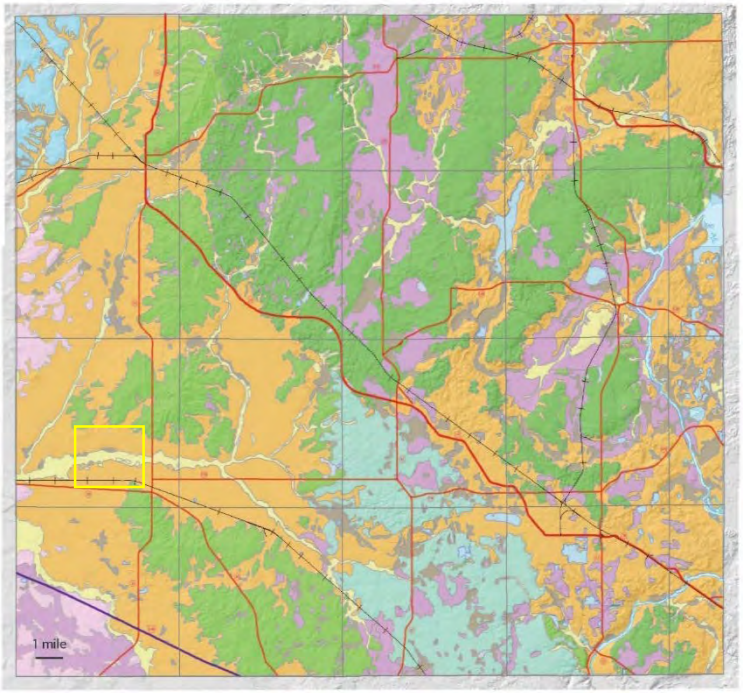
Journal of Geoscience and Environment Protection, 2016, 4, 43-53
Published Online May 2016 in SciRes. http://www.scirp.org/journal/gep
http://dx.doi.org/10.4236/gep.2016.45005

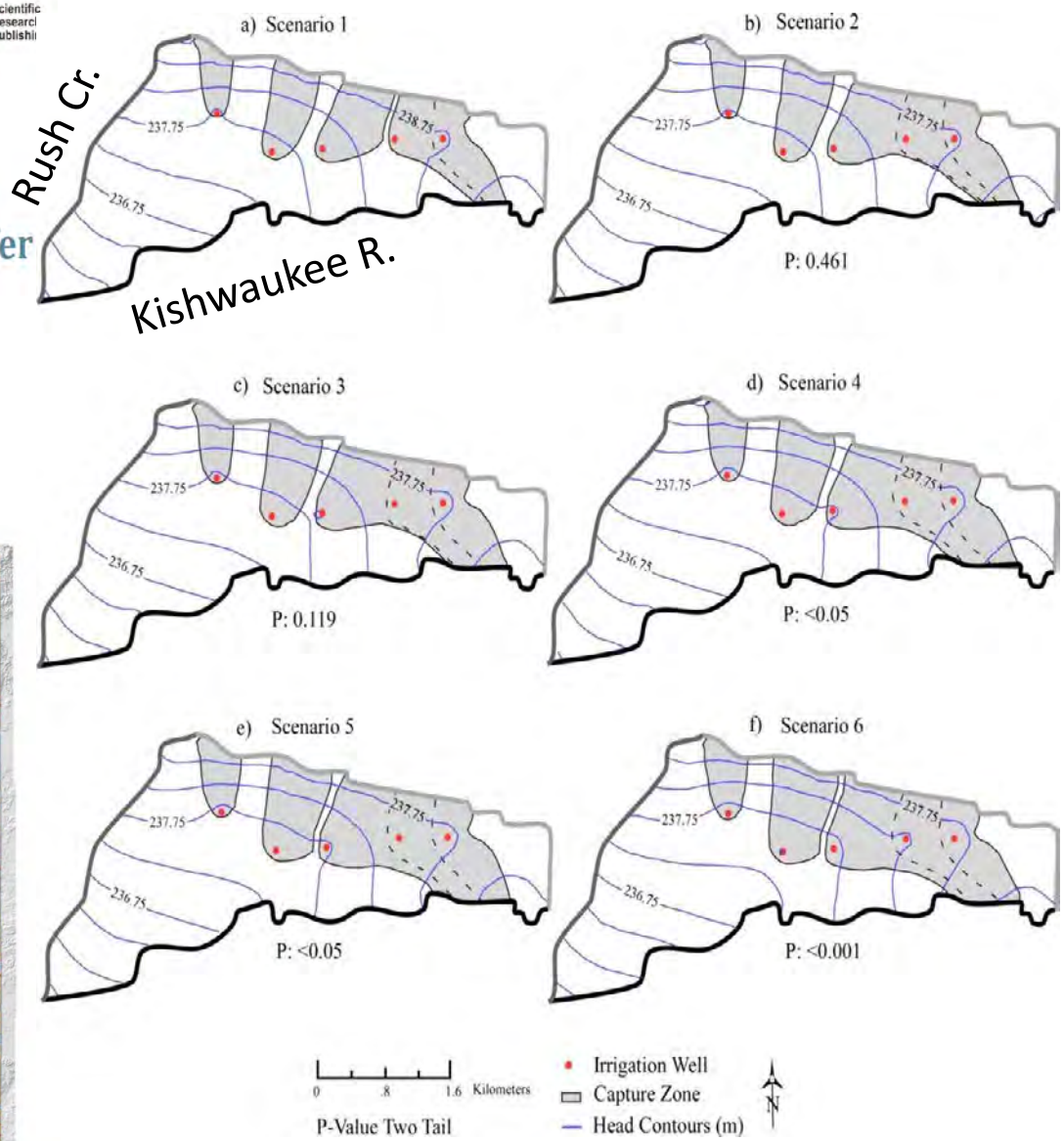
Role of Multiple High-Capacity Irrigation Wells on a Surficial Sand and Gravel Aquifer

Logan C. Seipel[1,2], Eric W. Peterson[2*], David H. Malone[2], Jason F. Thomason[3]

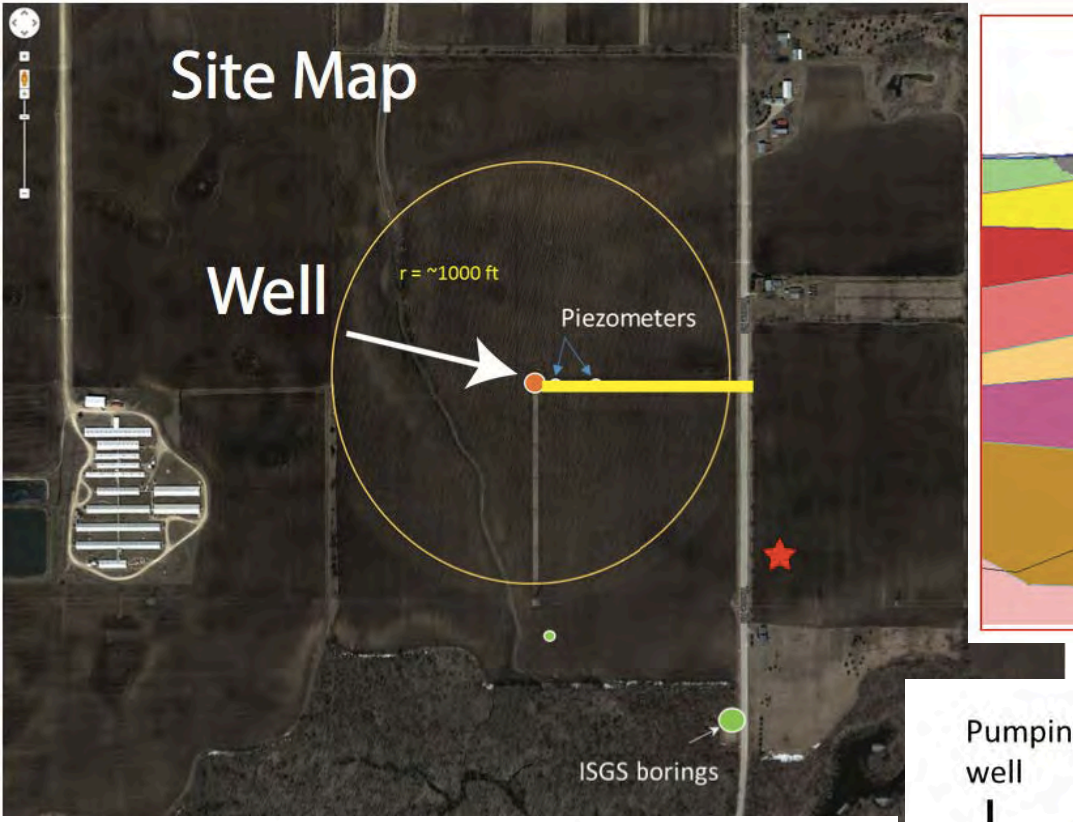
[1]Braun Intertec Corporation, Minneapolis, MN, USA
[2]Department Geography-Geology, Illinois State University, Normal, IL, USA
[3]Illinois State Geological Survey, Champaign, IL, USA
Email: *ewpeter@ilstu.edu

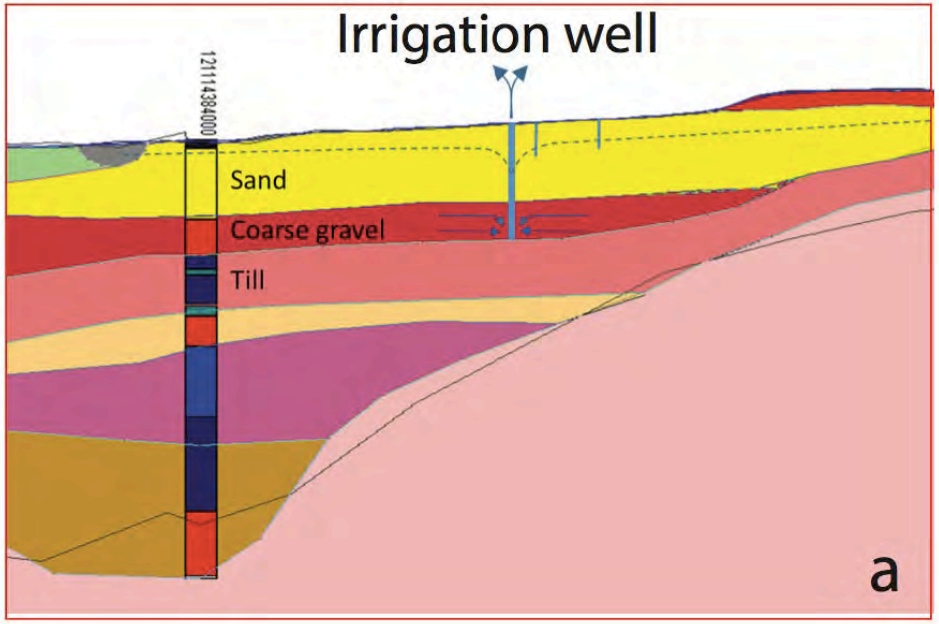
Received 1 April 2016; accepted 3 May 2016; published 6 May 2016



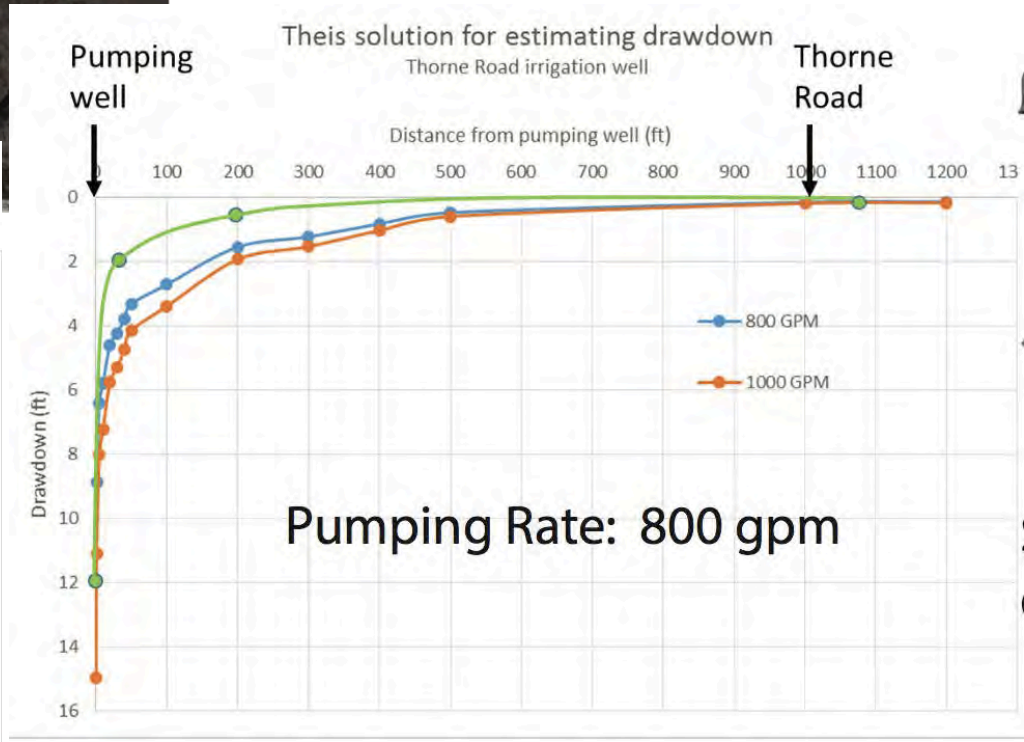


l et al., 2016, Journal of Geoscience and Environmental Protection





Drawdown during pumping



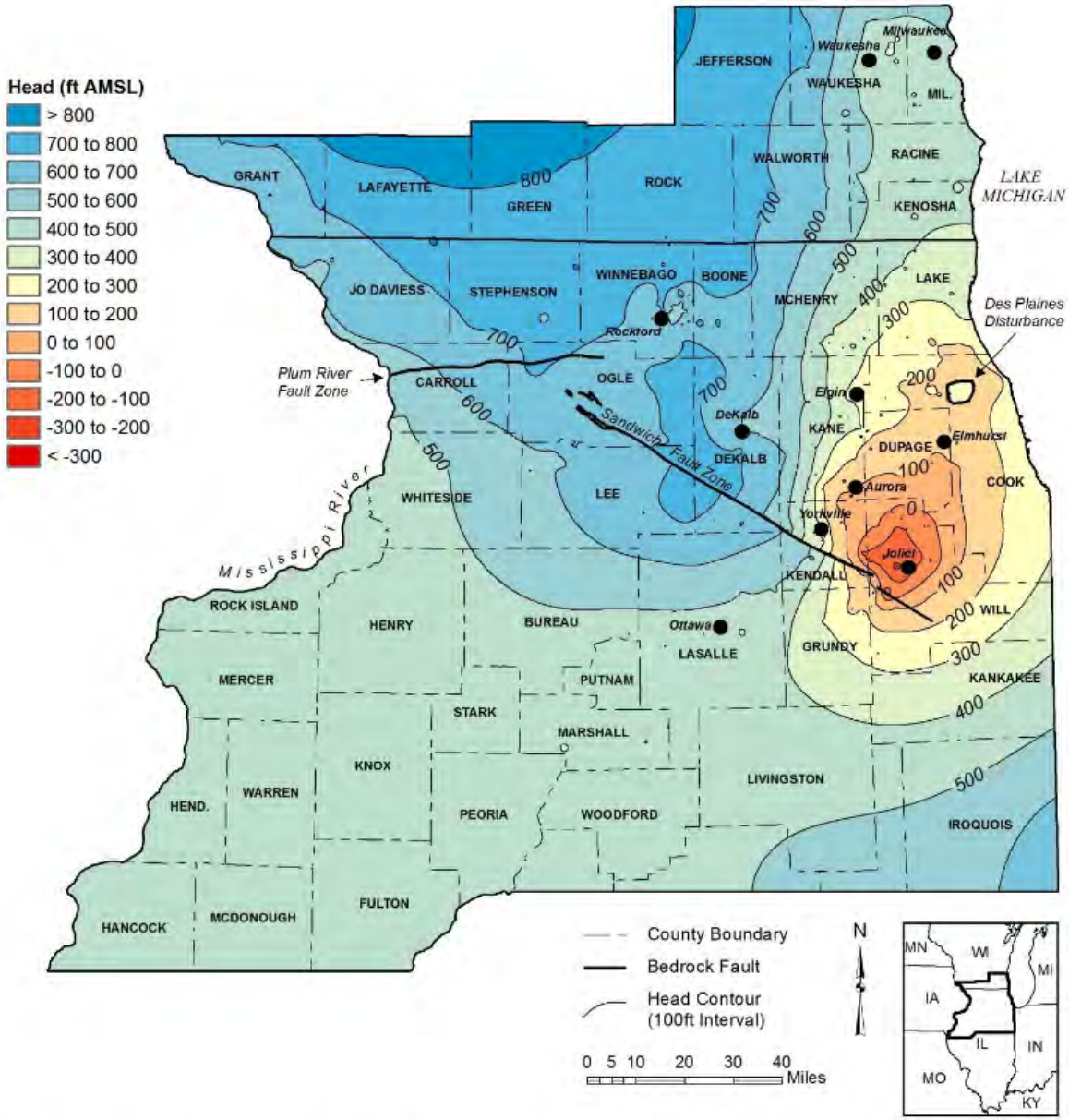


Figure 14: Potentiometric surface of the Cambrian-Ordovician sandstone aquifers in 2014 (100 ft contour).

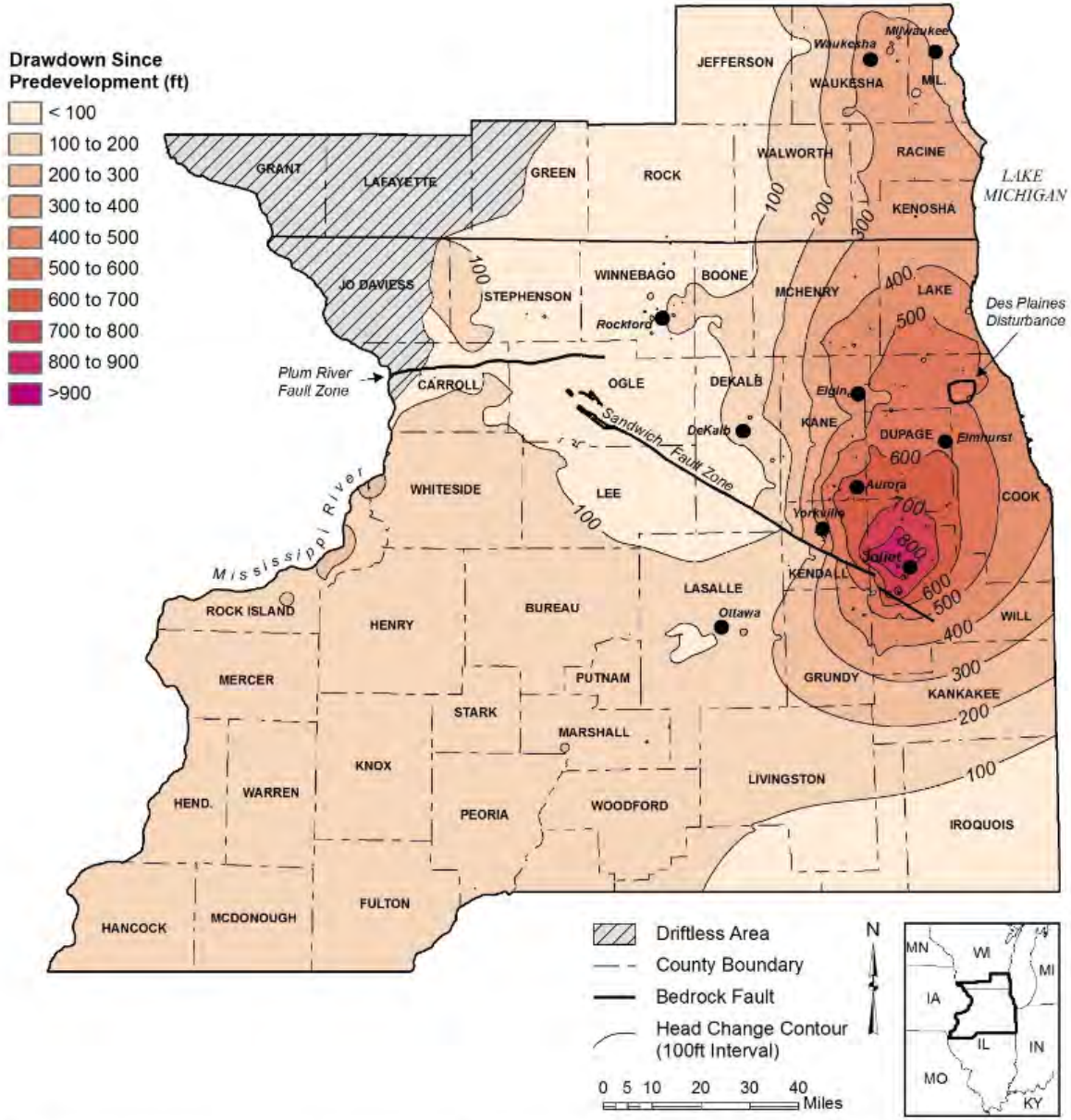
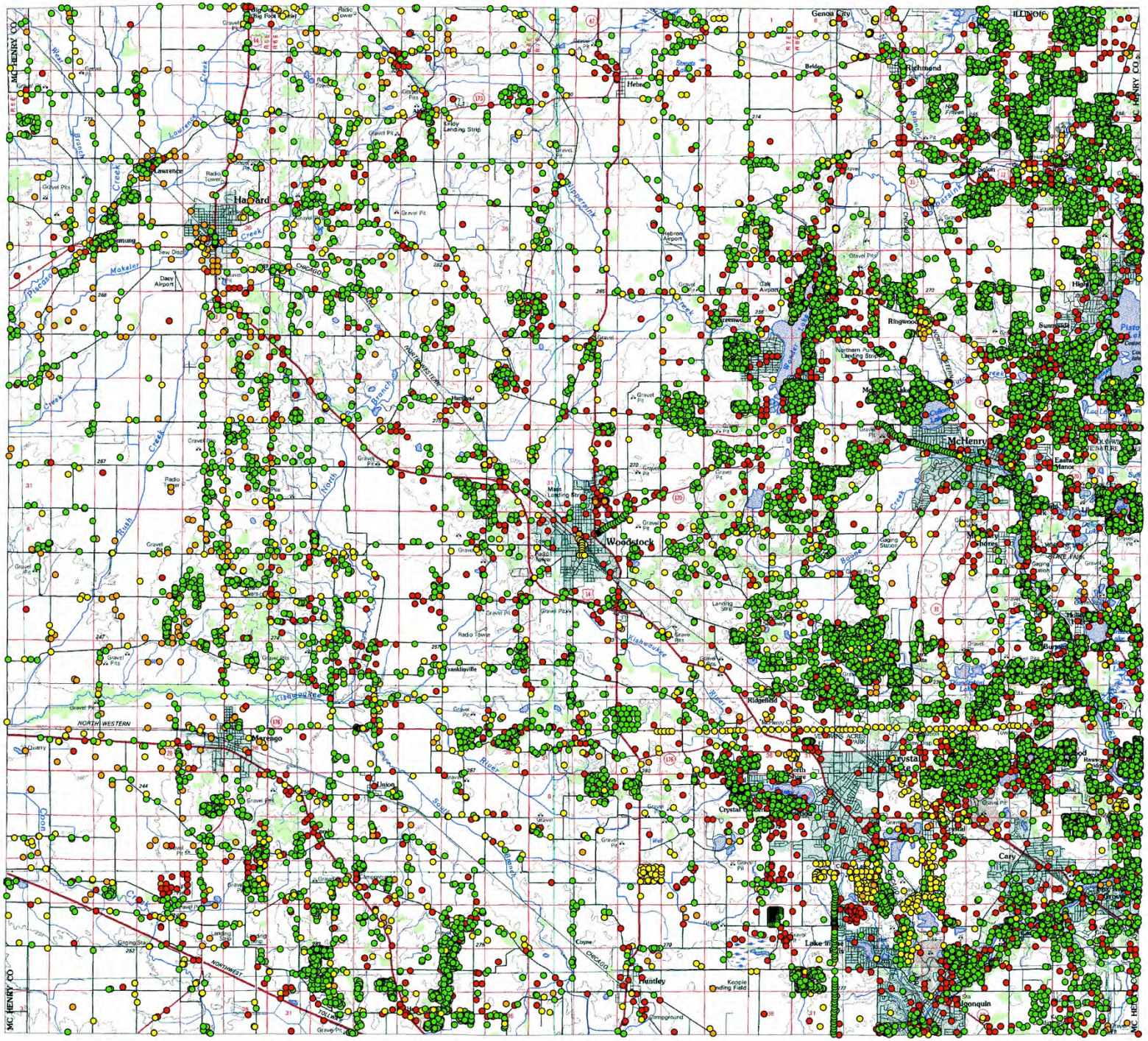


Figure 16: Drawdown of heads in the Cambrian-Ordovician sandstone aquifers from predevelopment to 2014.


MC HENRY CO
Big Pond
Genoa City
ILLINOIS
Richmond
Belden
Hebron
Kelly Landing Strip
Lawrence
Radio Tower
Harvard
Gravel Pit
Hebron Airport
Oak Airport
Ringwood
Northern Airport Landing Strip
Sunnyside
Hunt
McHenry
Eastlake
Lake Shores
Burgess
Woodstock
Mass Landing Strip
Franklinville
Ridgefield
Marengo
Union
Crystal Lake
North Crystal Lake
Cary
Coyne
Huntley
Keeple Landing Field
Algonquin
Campground
Sewer Disp
Dacy Airport
Gaging Station
Quarry
Landing Strip
Well
Pleasant
Makeler
Lawrence
Creek
Branch
Flippenpink
Chicago
Northwestern
Nippersink
Kishwaukee
Boone
Rush
Coon
Fox
Blackberry
Tollway
Norfolk
Southern
Rt 31
Rt 47
Rt 176
Rt 120
Rt 14
Rt 173
Rt 12
Rt 22
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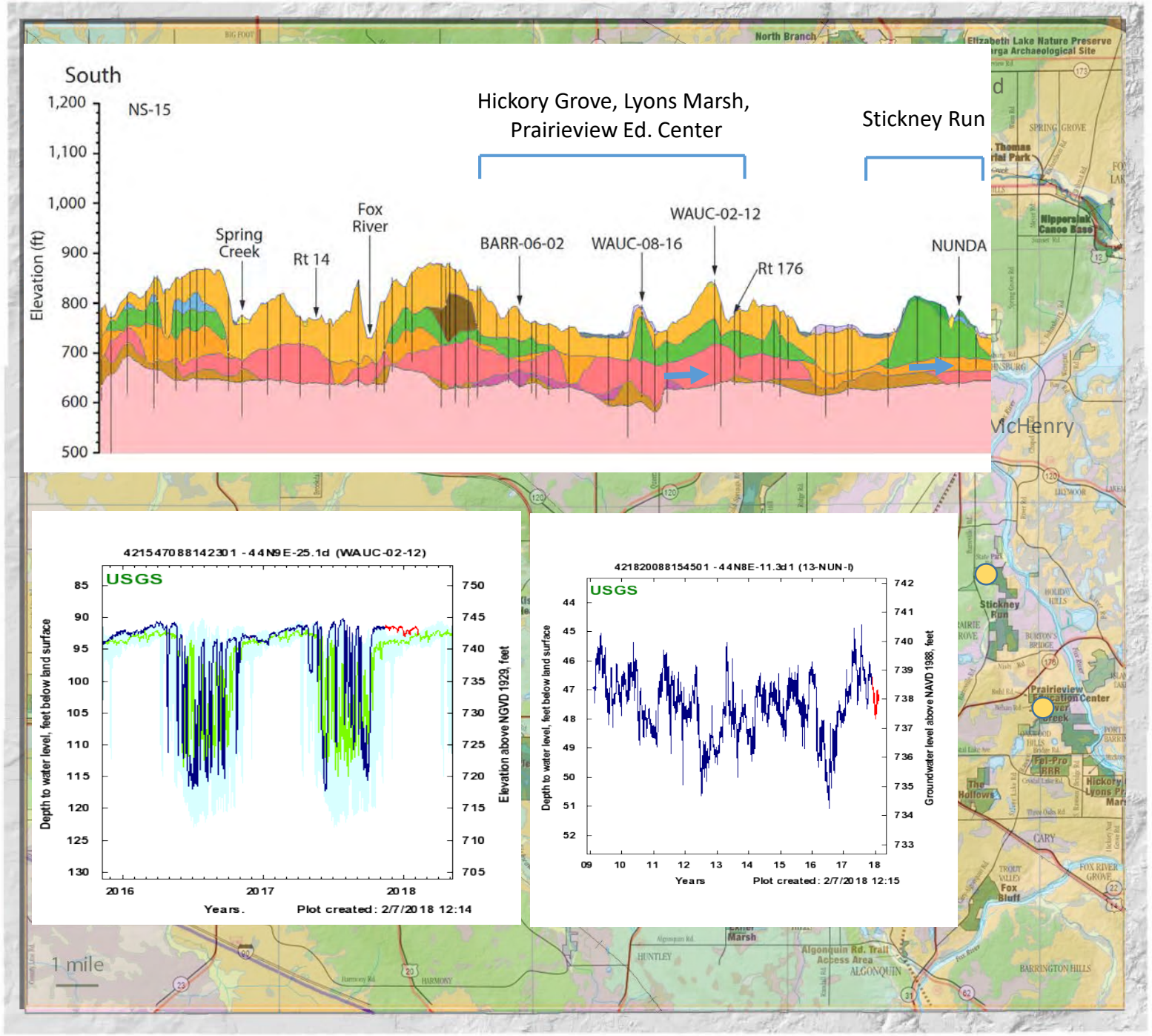
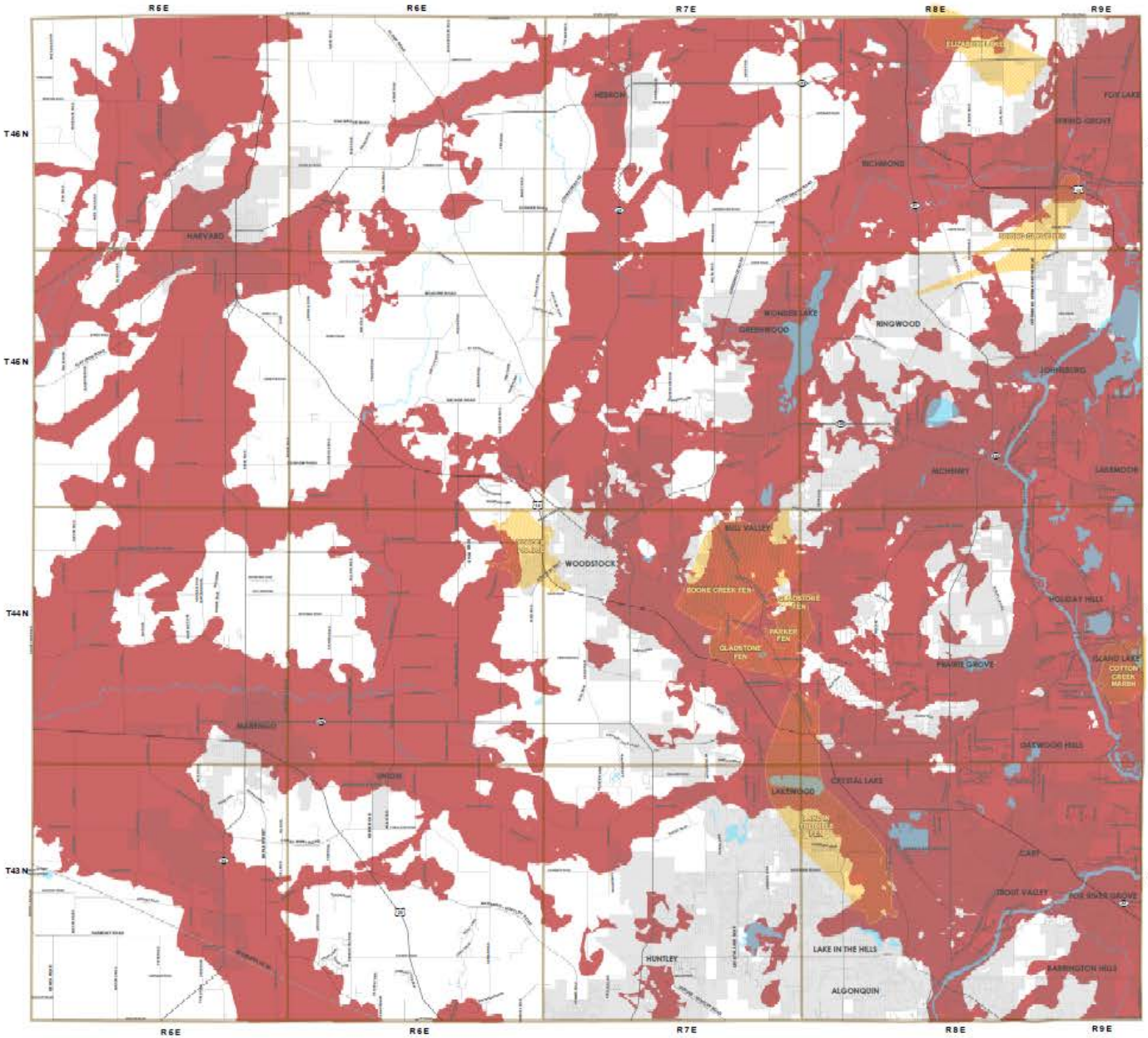
Rt 12
Rt 22
Rt 126
Rt 14


South
NS-15
Elevation (ft)
1,200
1,100
1,000
900
800
700
600
500
Spring Creek
Rt 14
Fox River
BARR-06-02
WAUC-08-16
WAUC-02-12
Rt 176
NUNDA
Hickory Grove, Lyons Marsh, Prairieview Ed. Center
Stickney Run
421547088142301 - 44N9E-25.1d (WAUC-02-12)
USGS
Depth to water level, feet below land surface
Elevation above NGVD 1929, feet
Years
Plot created: 2/7/2018 12:14
421820088154501 - 44N8E-11.3d1 (13-NUN-I)
USGS
Depth to water level, feet below land surface
Groundwater level above NAVD 1988, feet
Years
Plot created: 2/7/2018 12:15
1 mile

Implications

- What does this mean?
  - Geology controls mechanisms

- Groundwater flow in McHenry County
  - How does it happen?
  - Why does geology matter?
- How do we learn more about geology



DATA SOURCES:
Base map compiled by Illinois State Geological Survey from digital data (2009 TIGER / Line shapefiles) provided by the United States Census Bureau. Hillshade from USGS National Elevation Dataset. Transverse Mercator Projection, North American Datum of 1983. Map data compiled by Thompson, J.F. Illinois State Geological Survey, as contracted by McHenry County for 3-D Geologic Mapping, November, 2013. Compiled information extracted and formatted by Edward Arnold, McHenry County GIS Dept. The 3-D Geologic Map Layers used on this Sensitive Aquifer Recharge Areas (SARA) map include areas identified as High Potential for Aquifer Contamination (A1, A2, A3, A4), and Moderately High Potential for Aquifer Contamination (B1, B2).

M
SENSITIVE

T

CHEMUNG	A
DUNHAM	HA
MARENGO	S
RILEY	C

SENSIT

CLASS

CORPO

LAKES

This map is for refere
inaccuracies and or ty
changed and or update
provided "as-is" witho
implied. In no event sh
third party for any dam
misuse of the informa
contained on this ma
ground survey or lega
map.

Study Area and Background

Figure 1. Regional map of study location. Local study area indicated in blue. Last-glacial maximum boundary indicated in red and sublobes of the Laurentide Ice Sheet are indicated (JL-James Lobe; DL-DesMoines Lobe; SL-Superior Lobe; CL- Chippewa Lobe; GBL- Green Bay Lobe; LML-Lake Michigan Lobe; SG-Saginaw Lobe; HE- Huron-Erie Lobe.

Figure 3. Regional landscape of SE Wisconsin and NE Illinois, which includes areas of the former Green Bay Lobe and Lake Michigan Lobe (modified from Schneider, 1983 and Curry et al., 2004). This study re-examines the glacial record of the Delavan and Harvard sublobes as indicated by moraines and other ice-margin positions and indicators.

Figure 4. Regional geologic map of Quaternary deposits (from Lineback et al., 1983). Geologic map compilationsby D. Mickelson and J. Lineback. Legend terminology adopted from Curry et al., 2013.

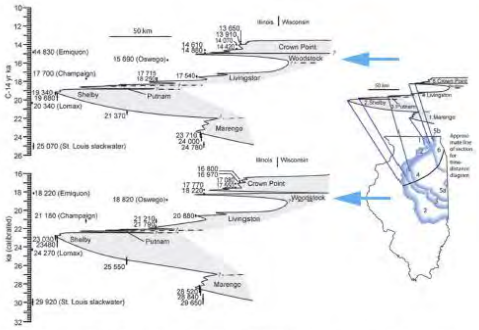
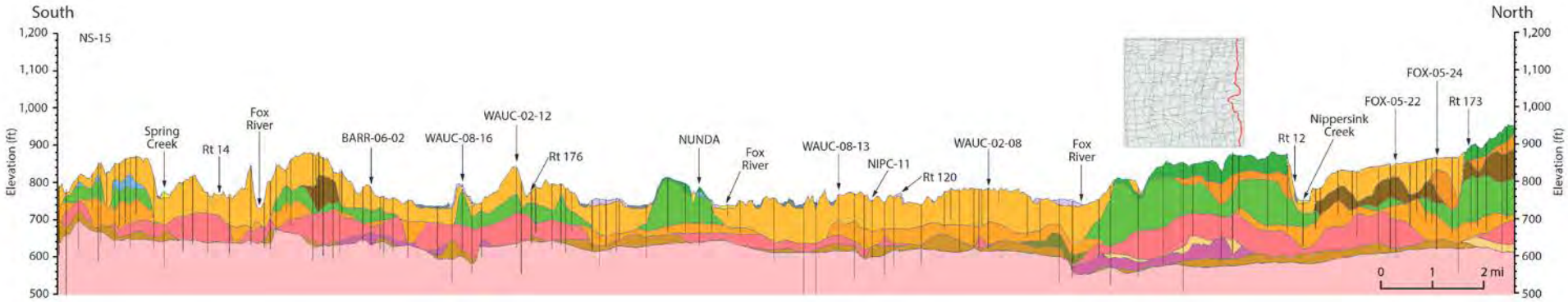
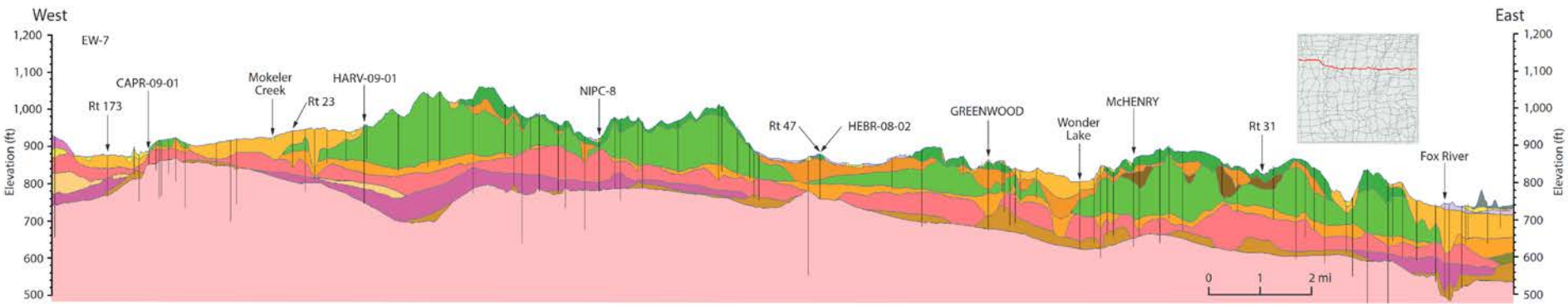


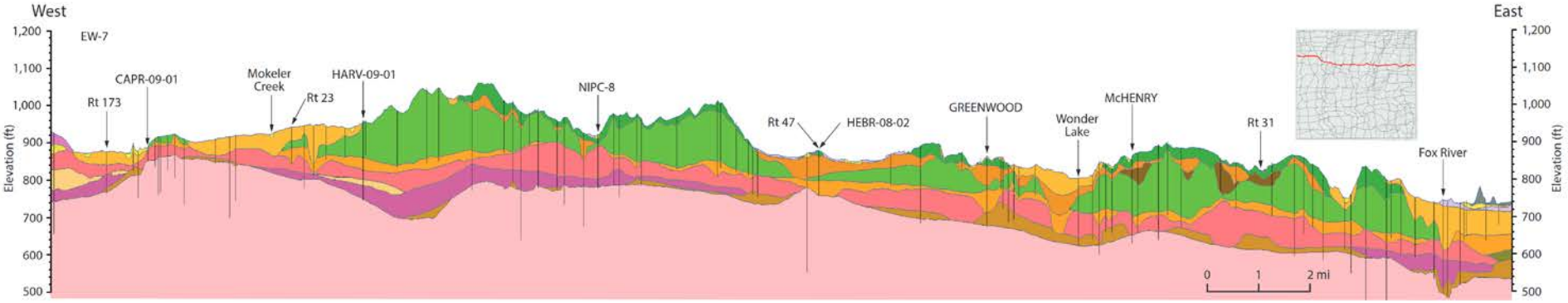
Figure 3. Time-distance diagram (from Curry et al., 2013) of Wisconsinan glacial advances in Illinois. This study examines the extent and recession of the Woodstock Phase (~18ka calibrated) in NE Illinois and SE Wisconsin.

Research Questions

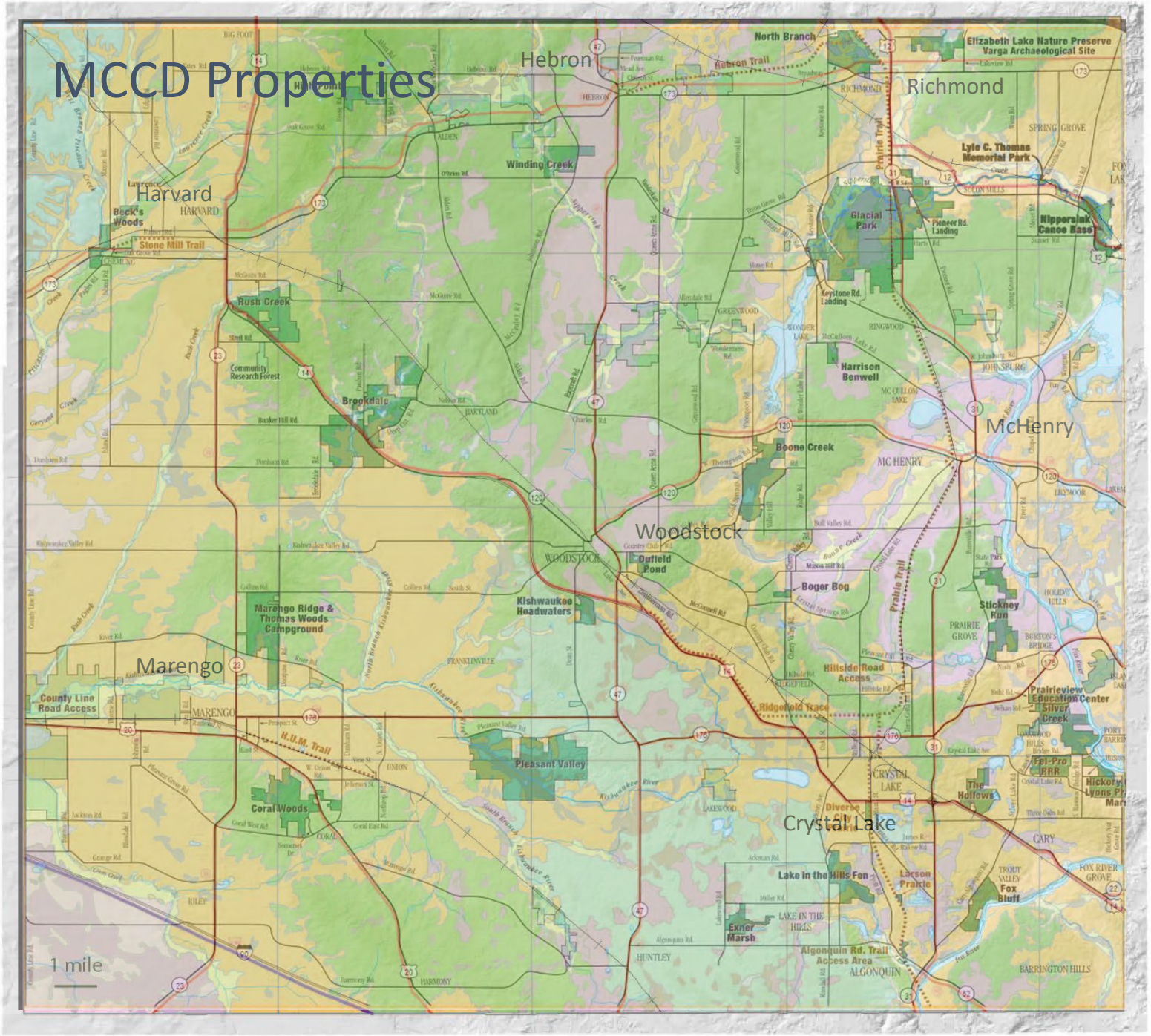
- What is the relationship between the Delavan and Harvard Sublobes?


South
North
NS-15
Elevation (ft)
1,200
1,100
1,000
900
800
700
600
500
Spring Creek
Rt 14
Fox River
BARR-06-02
WAUC-08-16
WAUC-02-12
Rt 176
NUNDA
Fox River
WAUC-08-13
NIPC-11
Rt 120
WAUC-02-08
Fox River
Rt 12
Nippersink Creek
FOX-05-22
FOX-05-24
Rt 173
0
1
2 mi

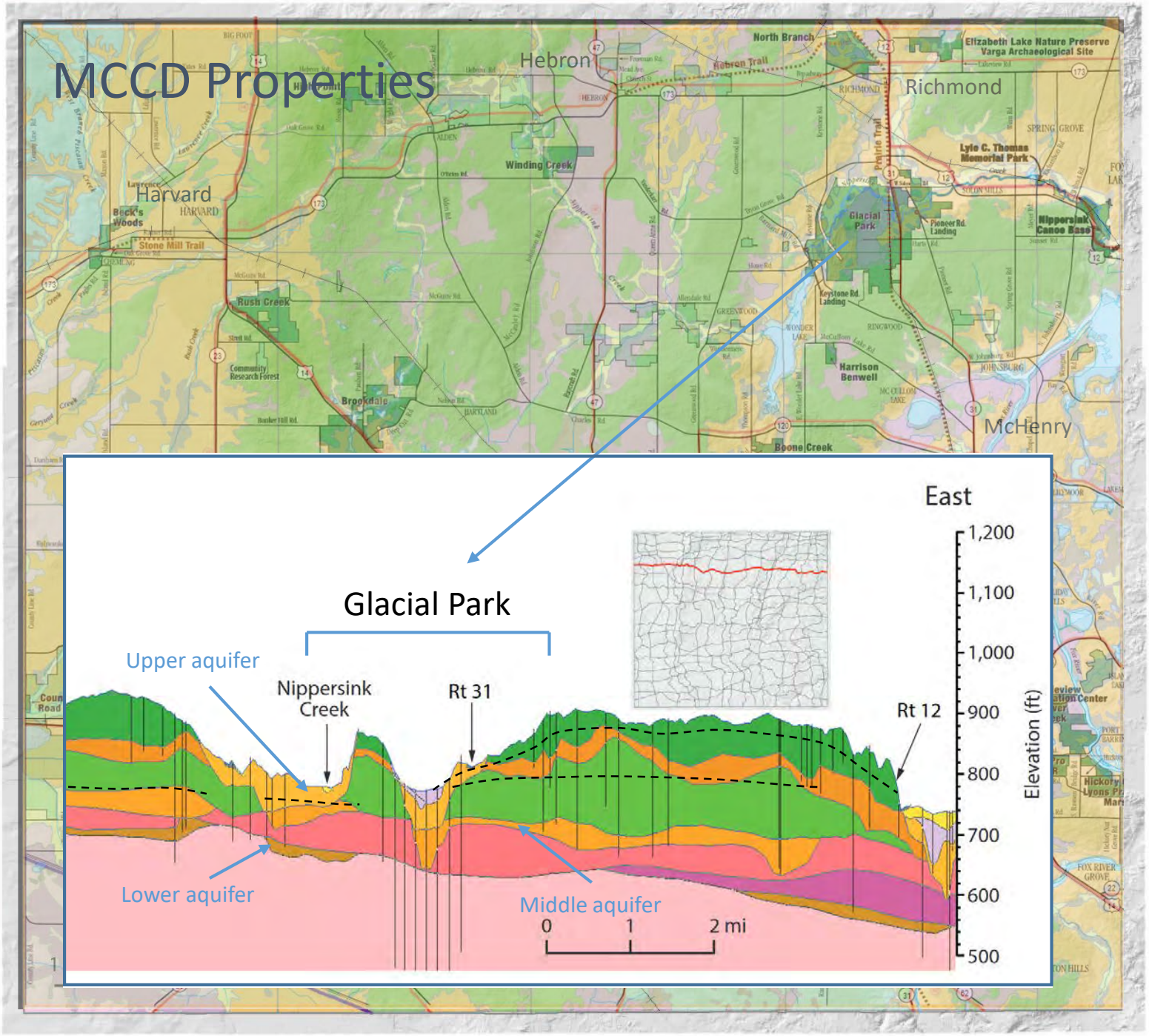

West
East
EW-7
Elevation (ft)
1,200
1,100
1,000
900
800
700
600
500
Rt 173
CAPR-09-01
Mokeler Creek
Rt 23
HARV-09-01
NIPC-8
Rt 47
HEBR-08-02
GREENWOOD
Wonder Lake
McHENRY
Rt 31
Fox River
0
1
2 mi


West
East
EW-7
Elevation (ft)
1,200
1,100
1,000
900
800
700
600
500
Rt 173
CAPR-09-01
Mokeler Creek
Rt 23
HARV-09-01
NIPC-8
Rt 47
HEBR-08-02
GREENWOOD
Wonder Lake
McHENRY
Rt 31
Fox River
0
1
2 mi

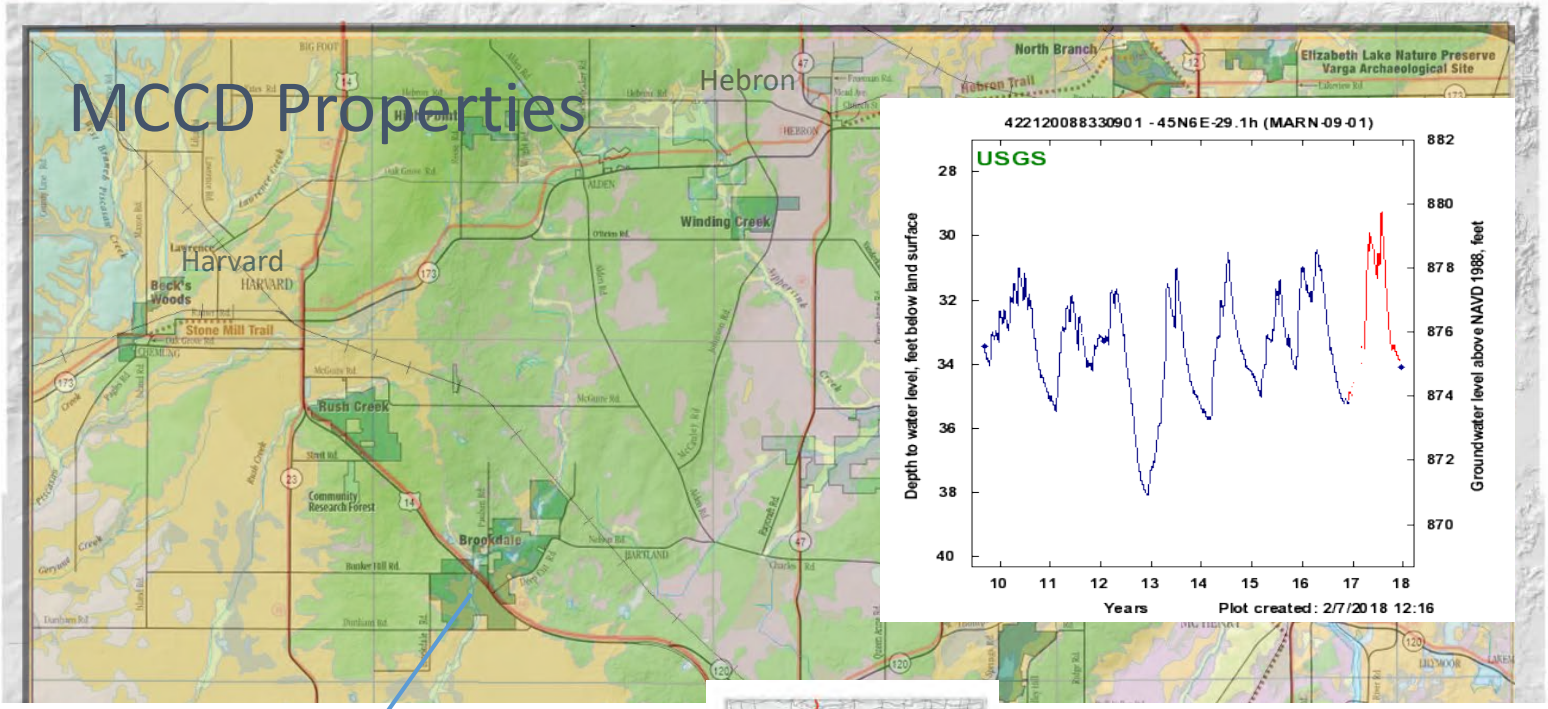
MCCD Properties

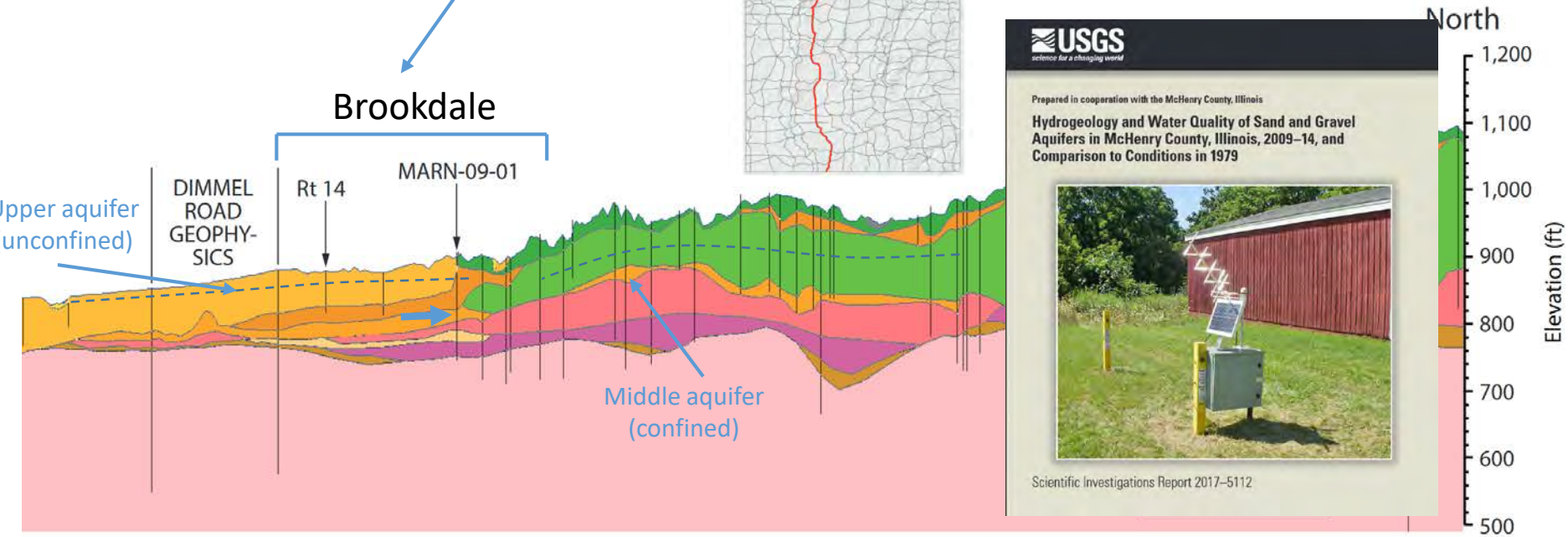


MCCD Properties

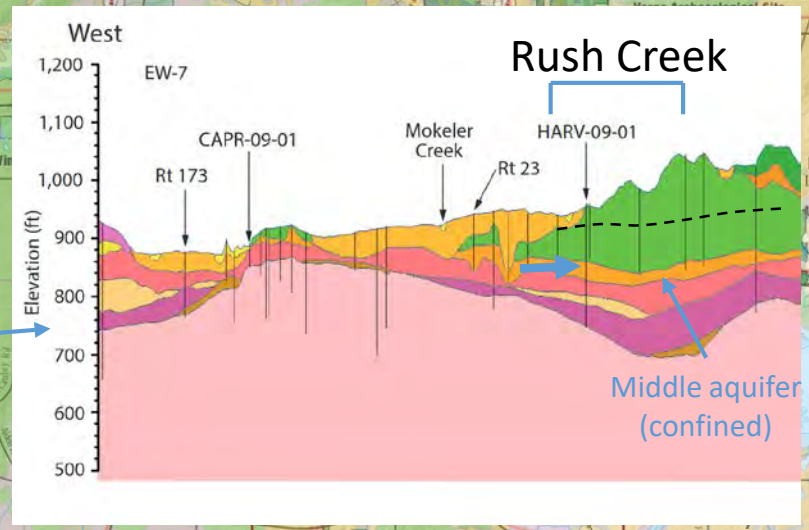


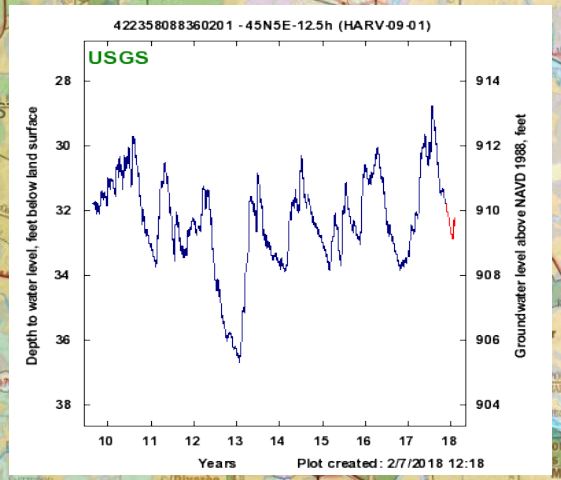
MCCD Properties

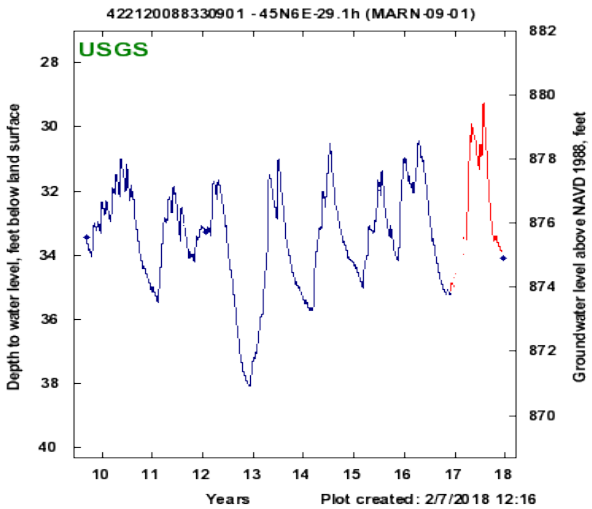


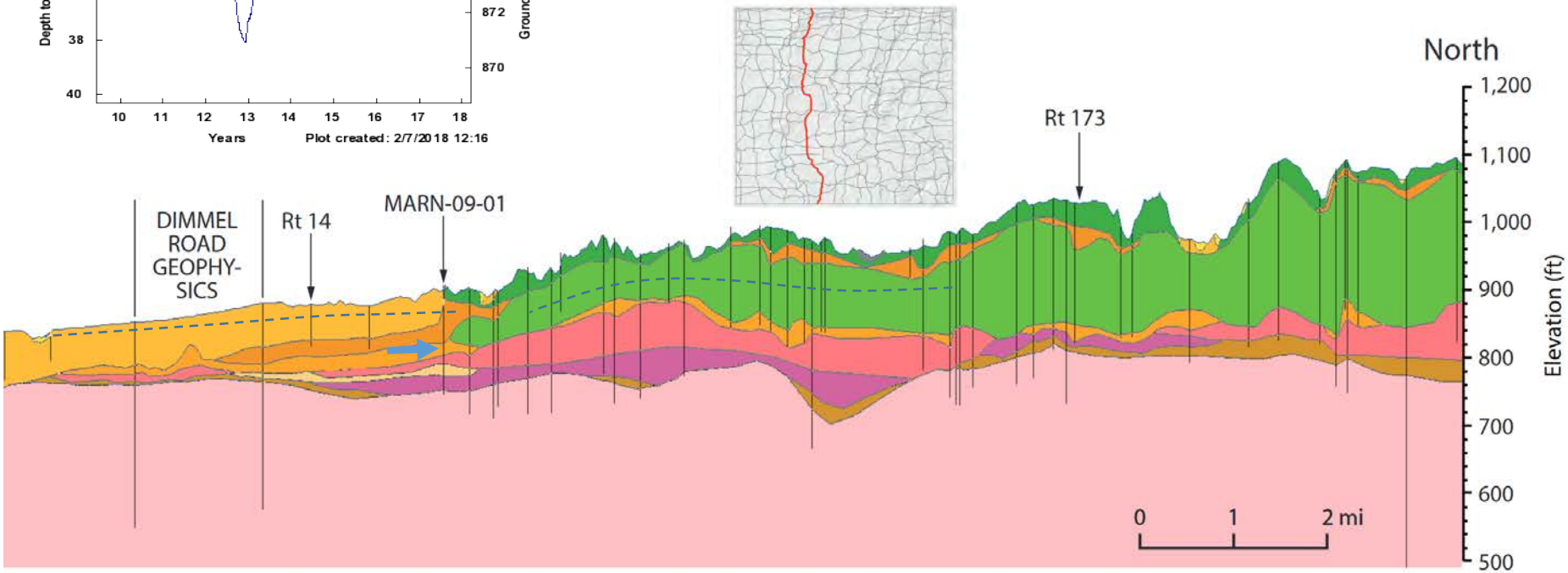


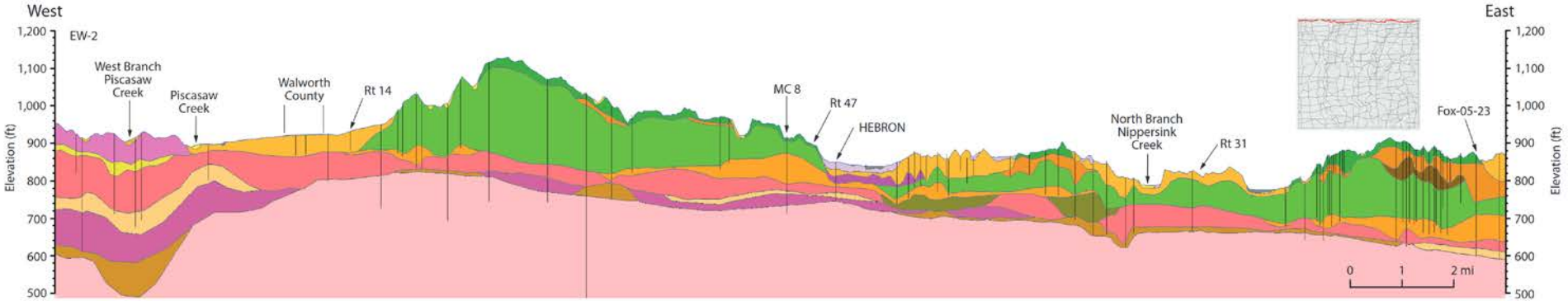
MCCD Properties






422120088330901 - 45N6E-29.1h (MARN-09-01)
USGS
Depth to water level, feet below land surface
Groundwater level above NAVD 1988, feet
28
30
32
34
36
38
40
882
880
878
876
874
872
870
10
11
12
13
14
15
16
17
18
Years
Plot created: 2/7/2018 12:16


North
DIMMEL ROAD GEOPHY-SICS
Rt 14
MARN-09-01
Rt 173
1,200
1,100
1,000
900
800
700
600
500
Elevation (ft)
0
1
2 mi


West
East
EW-2
1,200
1,100
1,000
900
800
700
600
500
Elevation (ft)
West Branch Piscasaw Creek
Piscasaw Creek
Walworth County
Rt 14
MC 8
Rt 47
HEBRON
North Branch Nippersink Creek
Rt 31
Fox-05-23
0
1
2 mi

maps.isgs.illinois.edu/vxs/mchenry/

ed weskerna mchenry c

McHenry County Geology

ILLINOIS STATE GEOLOGICAL SURVEY
PRAIRIE RESEARCH INSTITUTE

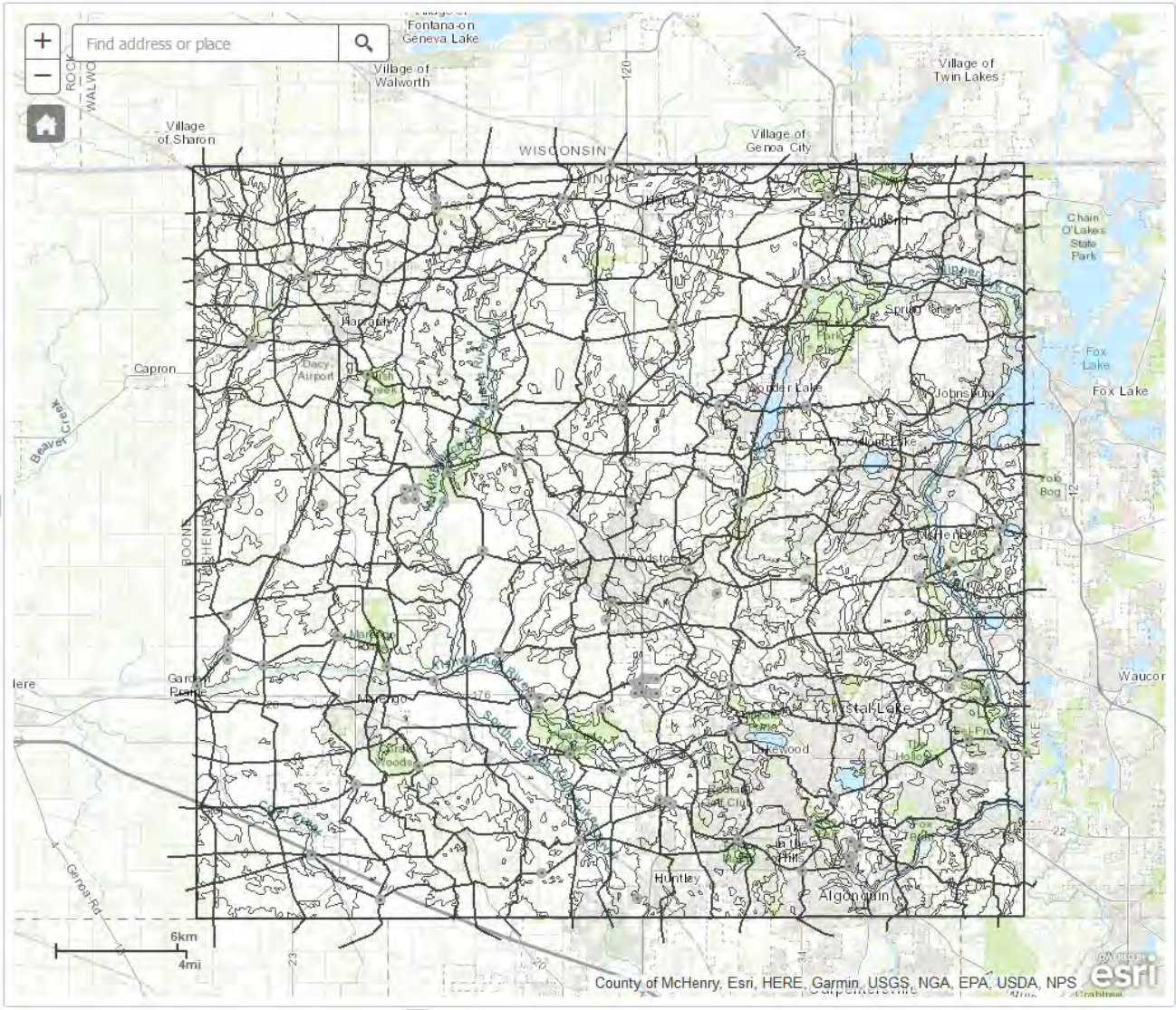
Draw a line anywhere in McHenry County to generate a cross section on-the-fly from the 3D model.

Layers

- [x] Surficial Geology

Sublayers | Legend | Opacity

- [x] Borings
- [x] Cross Sections
- [x] Geologic Contacts
- [ ] Geologic Units

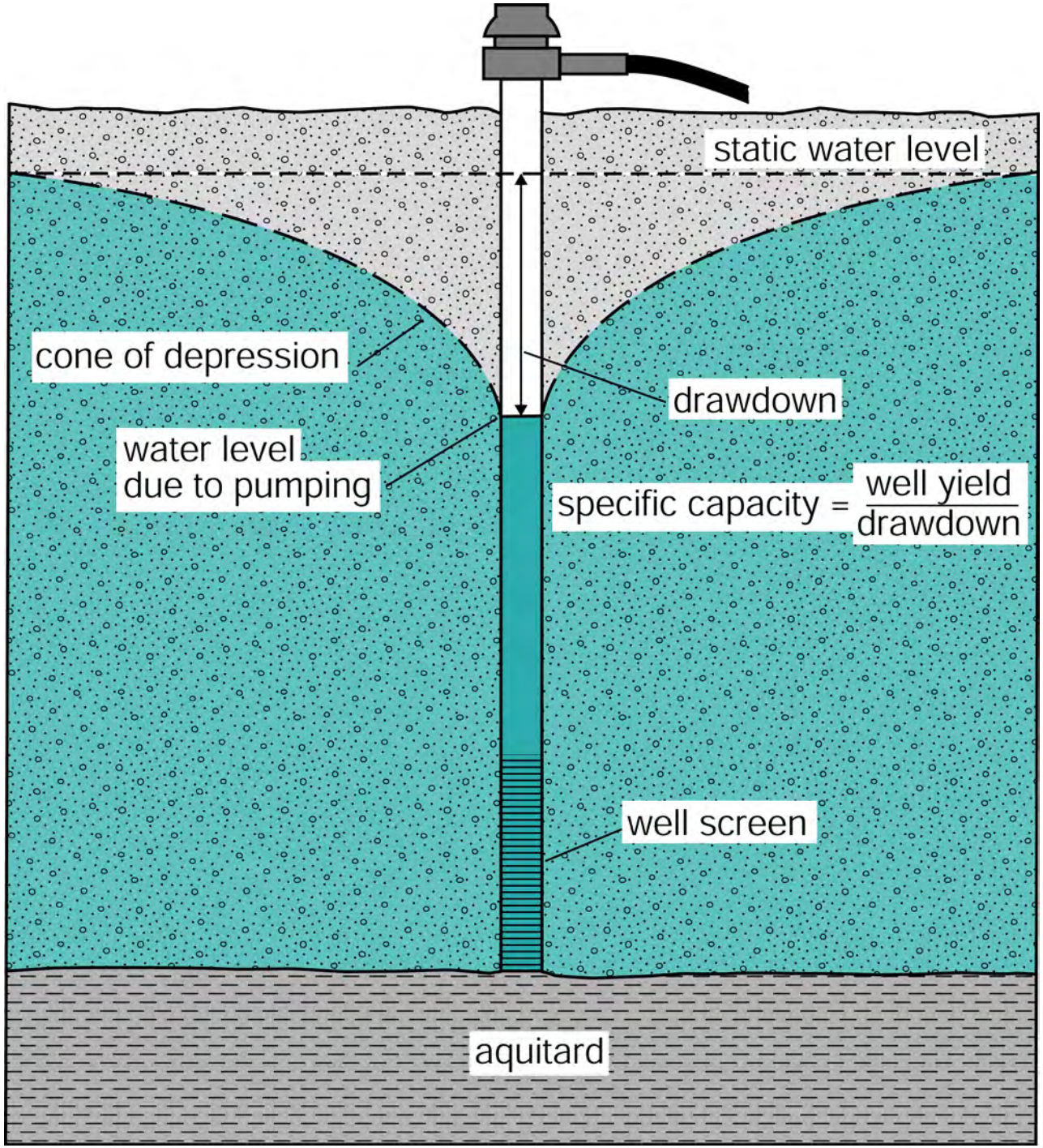


Outline

- Geology and water resources
  - Bedrock aquifers
  - Sand/gravel glacial aquifers
  - Groundwater concepts
- Models of McHenry County
  - Geologic models
  - Groundwater flow models and predictions
- Data sharing and online tools/viewers

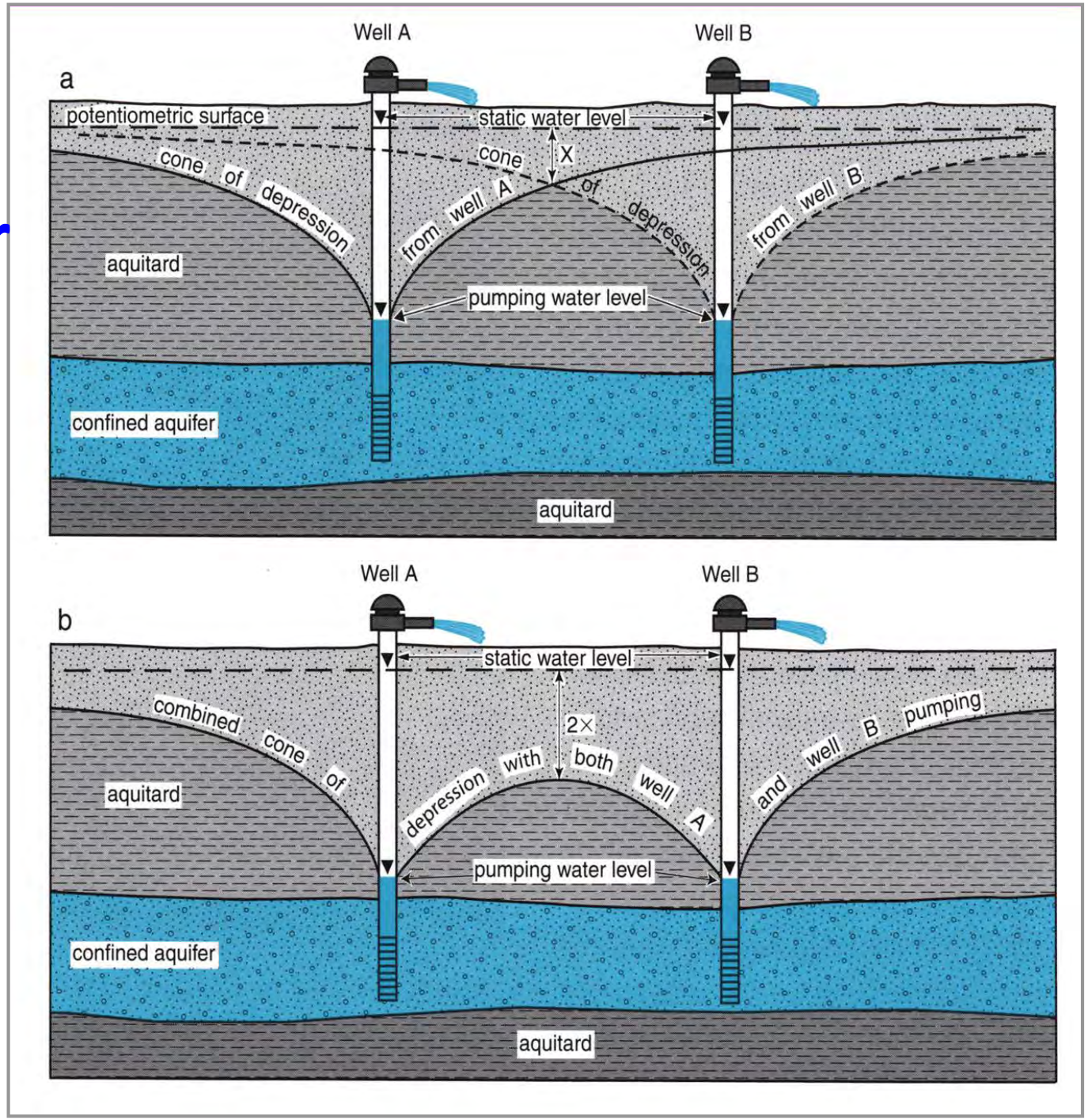
Groundwater and Wells

Unconfined Aquifer



Groundwater and Wells

Confined Aquifer



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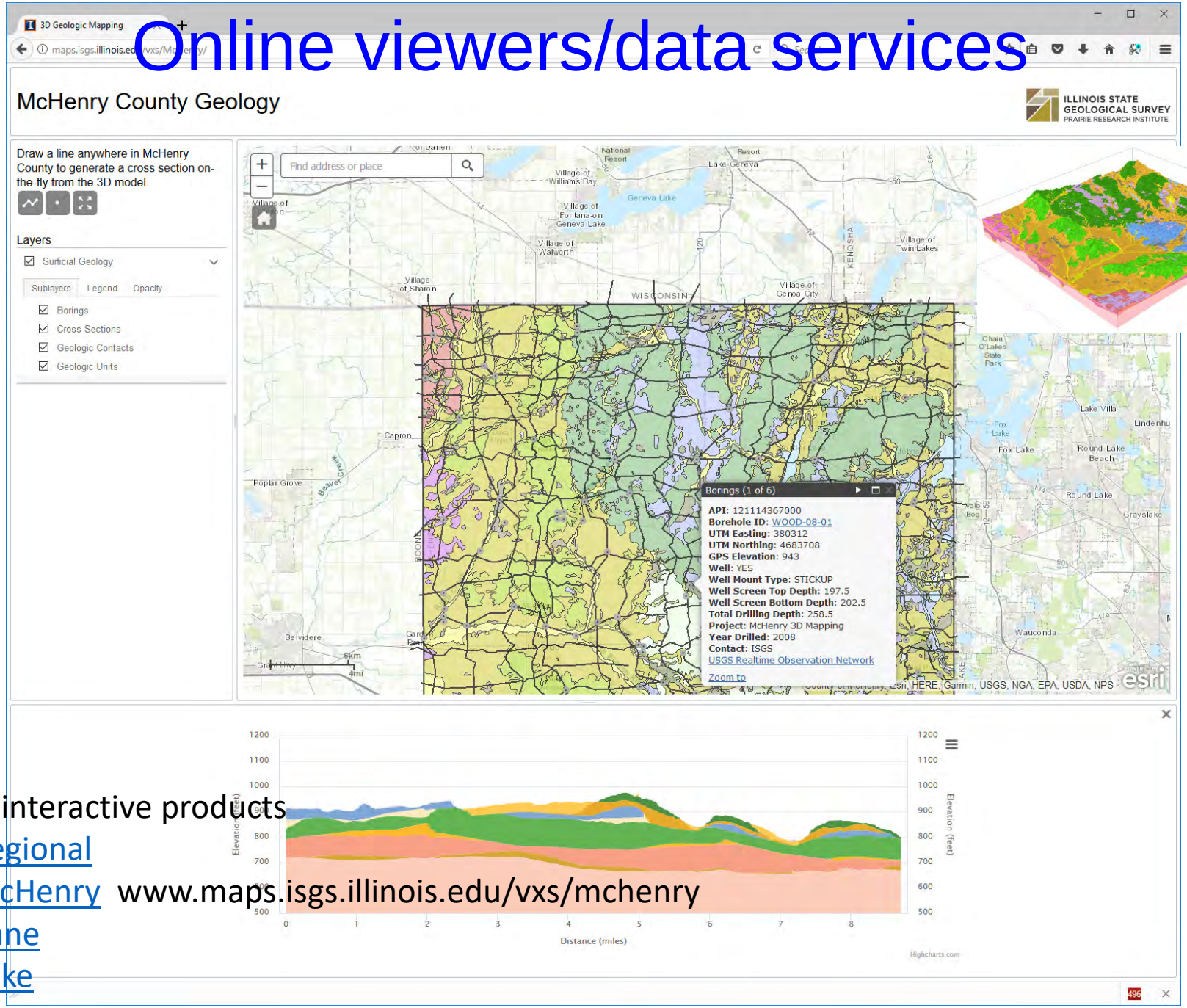
Online viewers/data services



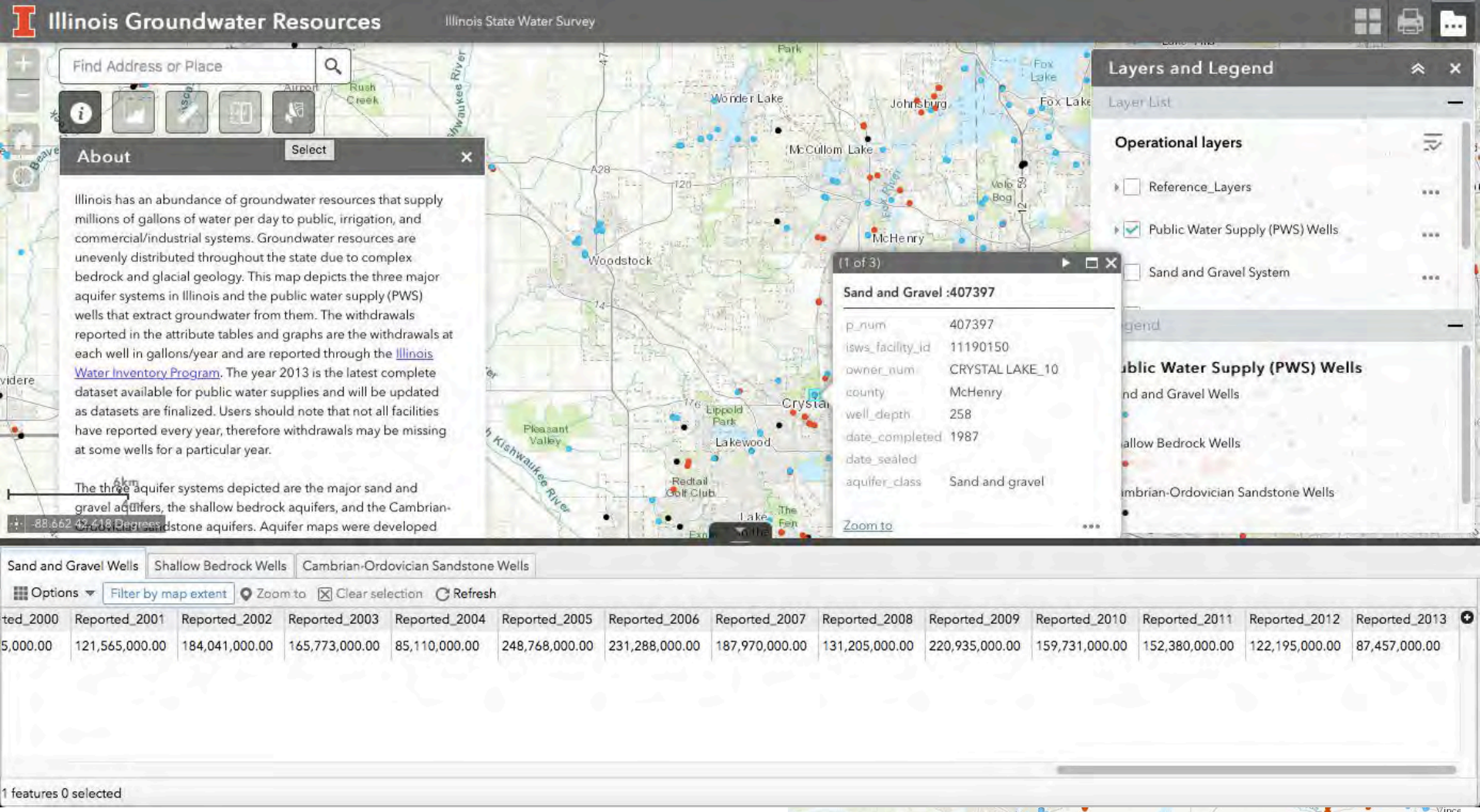
Online interactive products

[Regional](#)

[McHenry](#) www.maps.isgs.illinois.edu/vxs/mchenry

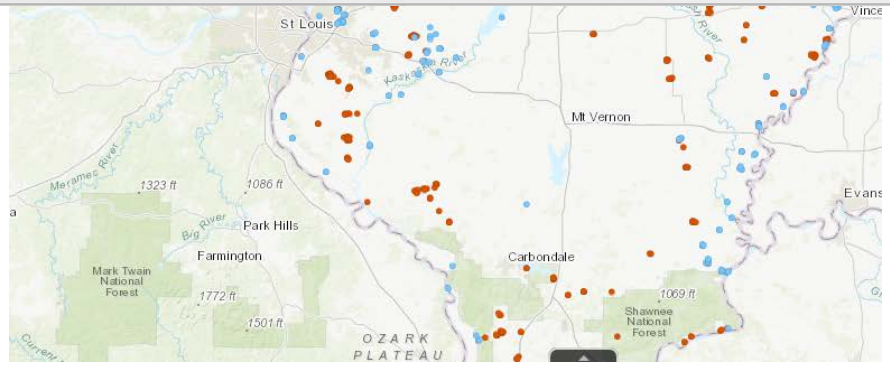
[Kane](#)

[Lake](#)



Online interactive products
Illinois State Water Survey
Groundwater Science

[Illinois Public Water Supply Data]
[Illinois Water Network and Purchase]



The city also drilled two shallow wells in 1913 so that the deep wells are not used now so extensively as formerly. In September, 1914, the water level in the 1,000±-foot well at rest was 50 feet below the surface when the other two wells were idle; the effects of pumping were not known. There has been some recession of the water level, but records have not been kept.

The deep wells are reported to yield from 75 to 160 gallons per minute each; the sizes are not exactly known, but they are probably not over 5 inches in diameter at the bottom.

The two shallow wells belonging to the city are situated in a separate pumping station over a mile distant from the old plant. The land around this No. 2 station is low lying and nearly flat. The wells are 85 feet deep and are each cased with 10-inch pipe to the top of an 18-foot Cook deep-well strainer. Although the wells are only about 15 feet apart they are able nevertheless to deliver 200 gallons each per minute when operating together. The water level at rest is 23 feet below the surface; the operating level is not known.

The Oliver Typewriter Company has two deep wells, one of which is 1,211 feet deep, but the depth of the other is not known, although it is probably about the same. The 1,211-foot well is completely cased from the surface to 980 feet, or to the bottom of the red shale that underlies the St. Peter sandstone; the diameter is 8 inches at the surface, and approximately 5 inches at the bottom. The water level is about 60 feet at rest and about 90 feet when pumping at the rate of 120 gallons per minute.

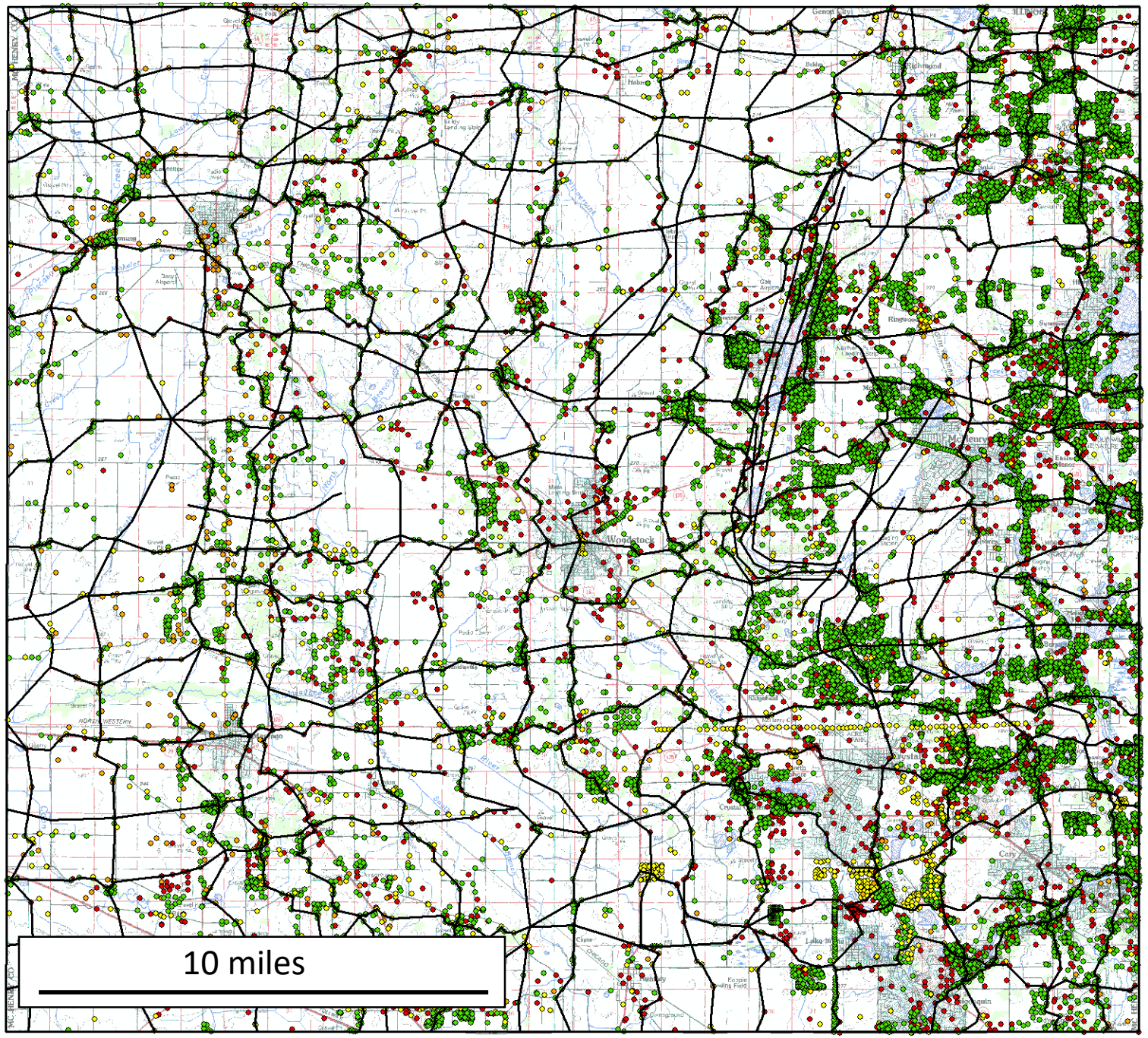
The analyses of the water from the 1,000±-foot well at the municipal water plant and from the 1,211-foot well at the Oliver Typewriter Company are very similar. Although the water contains a notable amount of mineral matter, it is not too hard to be used for boiler purposes. The shallow-well water is also very similar; carbonates of calcium and magnesium being the predominant salts.

WILL COUNTY

Physiography

Will County adjoins Dupage and Cook counties on the south; the eastern boundary is the Indiana state line. The total area is 844 square miles.

The Valparaiso morainic system crosses the northeastern and easttern portions and the elevations along its crest are the highest in the county. Altitudes somewhat greater than 800 feet are found around Monee, although the average elevations along the ridge are from 750

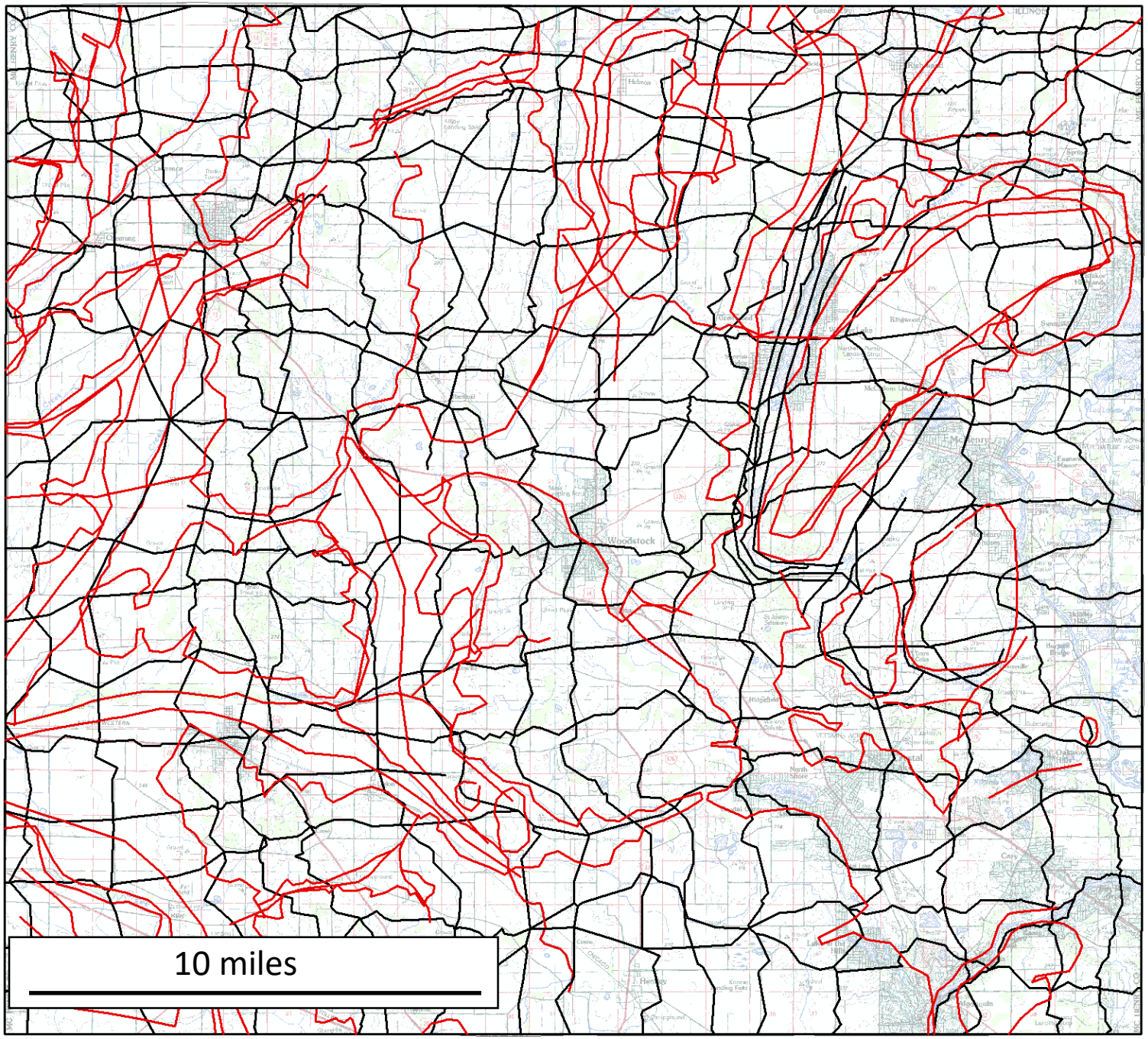


Data, map scale, resolution

~11,000 records used to interpret geology

Data distribution clustered

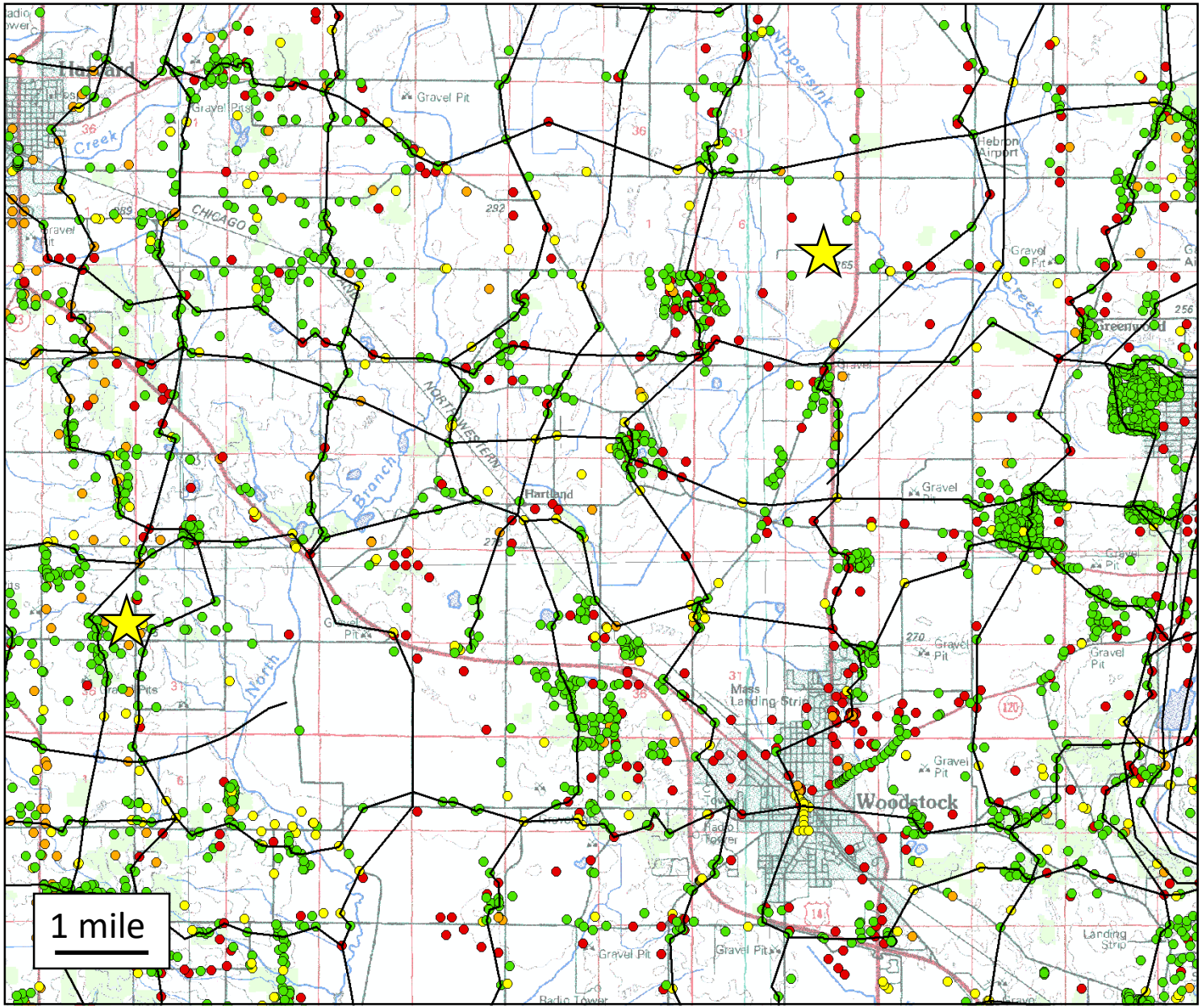
Key cross section every ~1-2 miles



Data, map scale, resolution

40 KEY sections

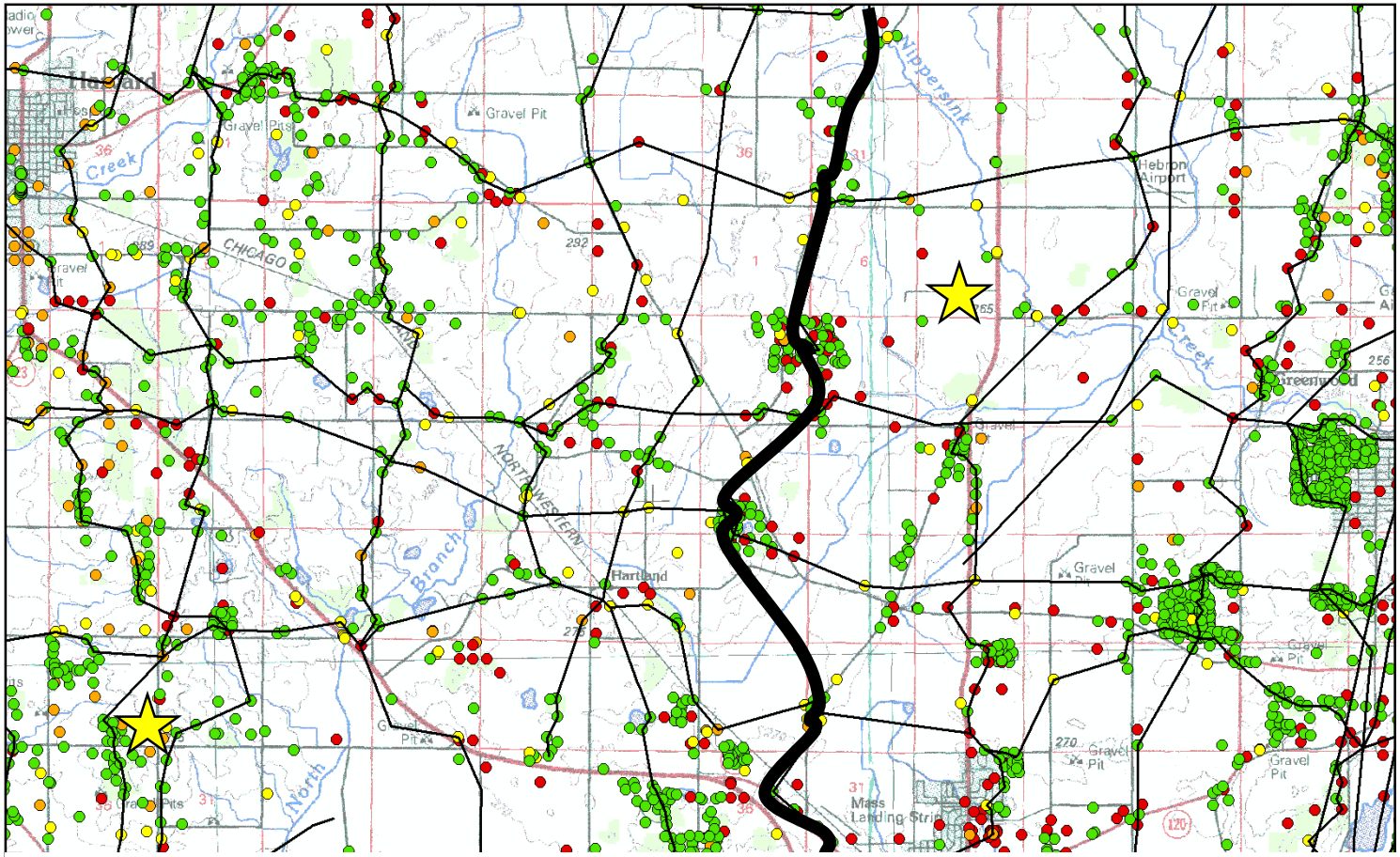
60 “helper” sections



Data, map scale, resolution

Sections intersect clusters

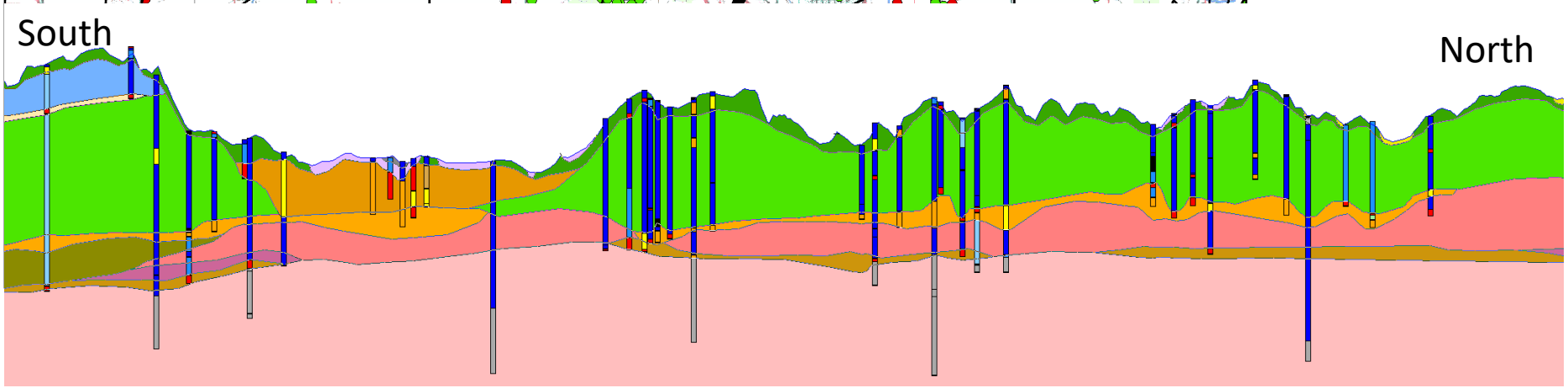
At most, any location within ~1 mile from section



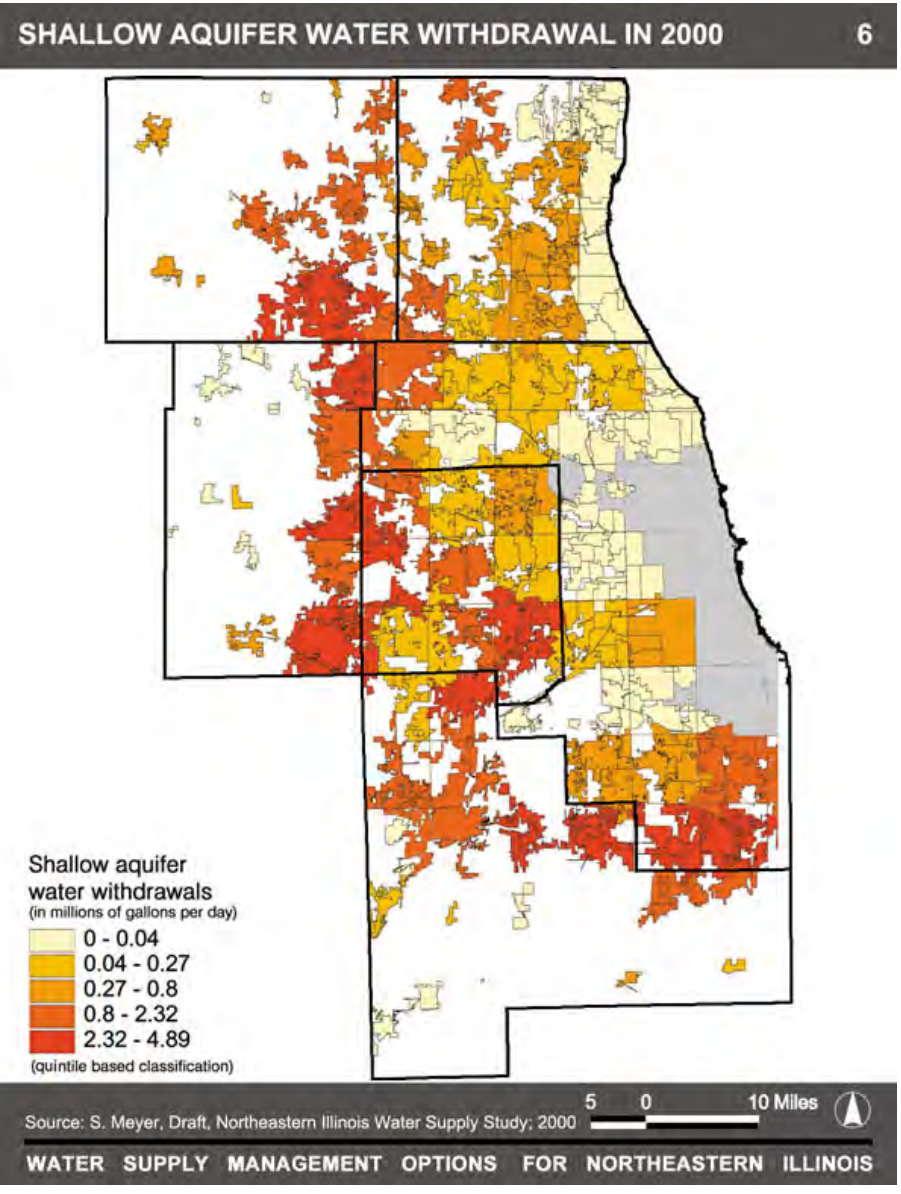
Data, map scale, resolution

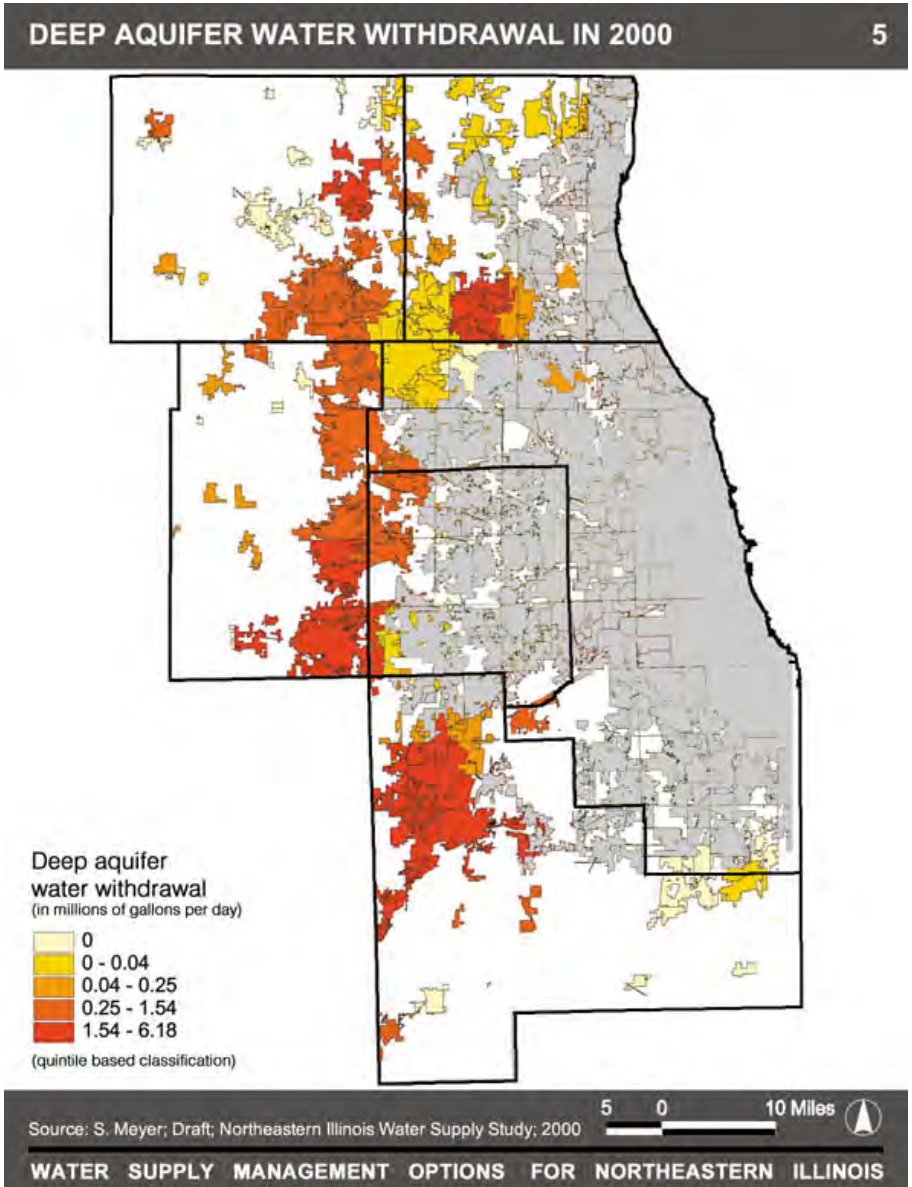
Sections intersect clusters

At most, any location within ~1 mile from section



Northeastern Illinois Aquifers

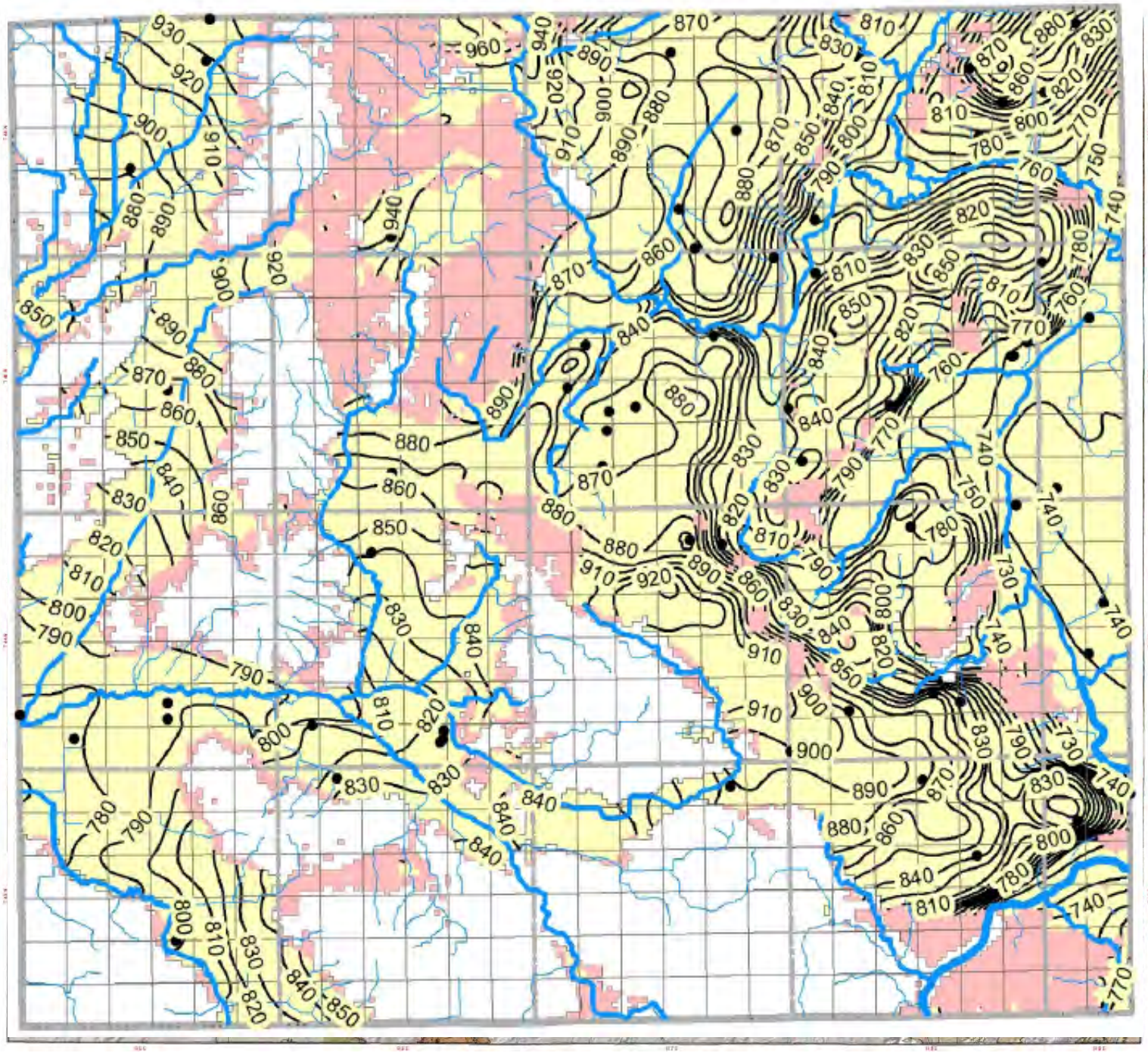




Haeger-Beverly Aquifer

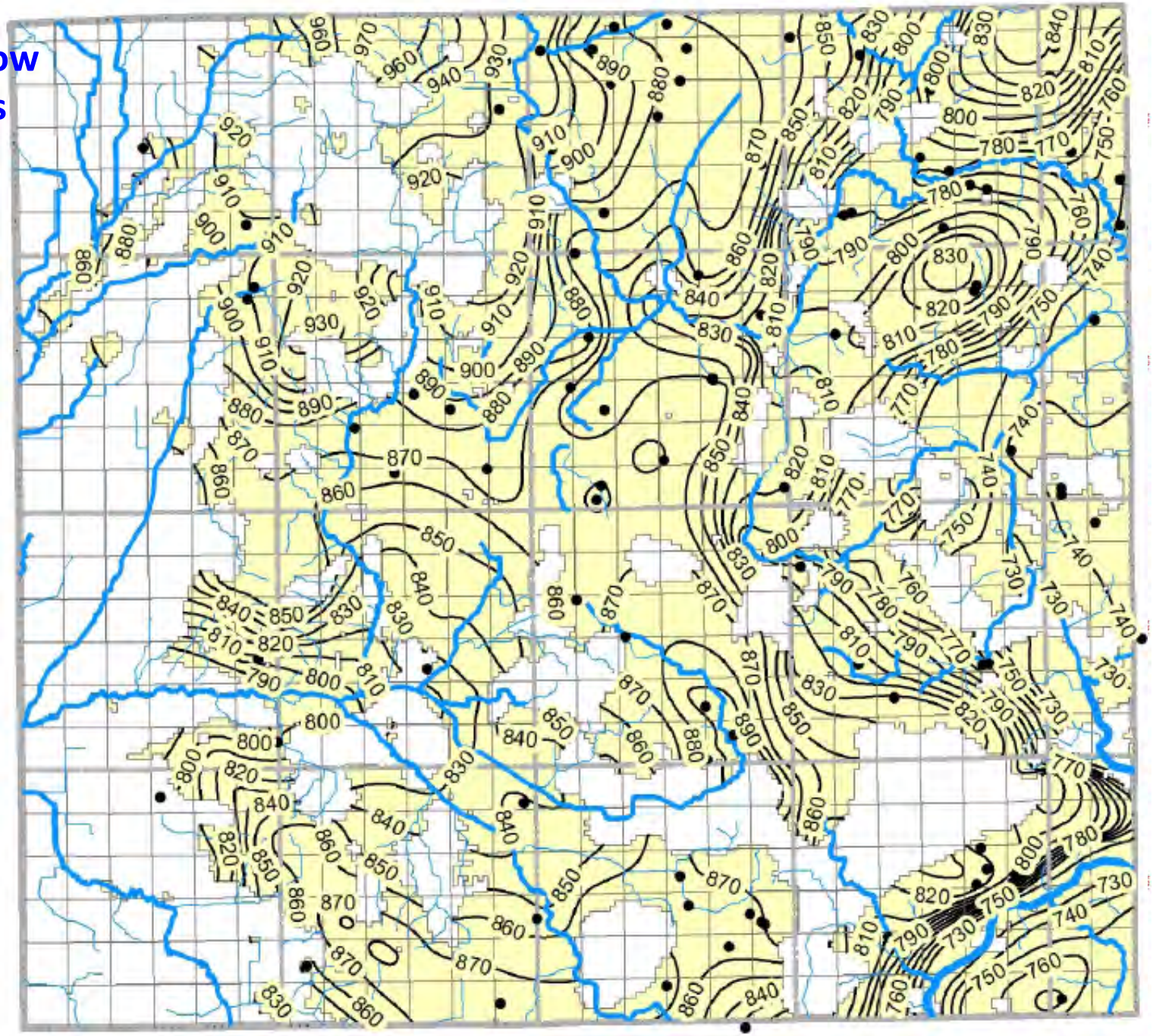
Flow-modeling results

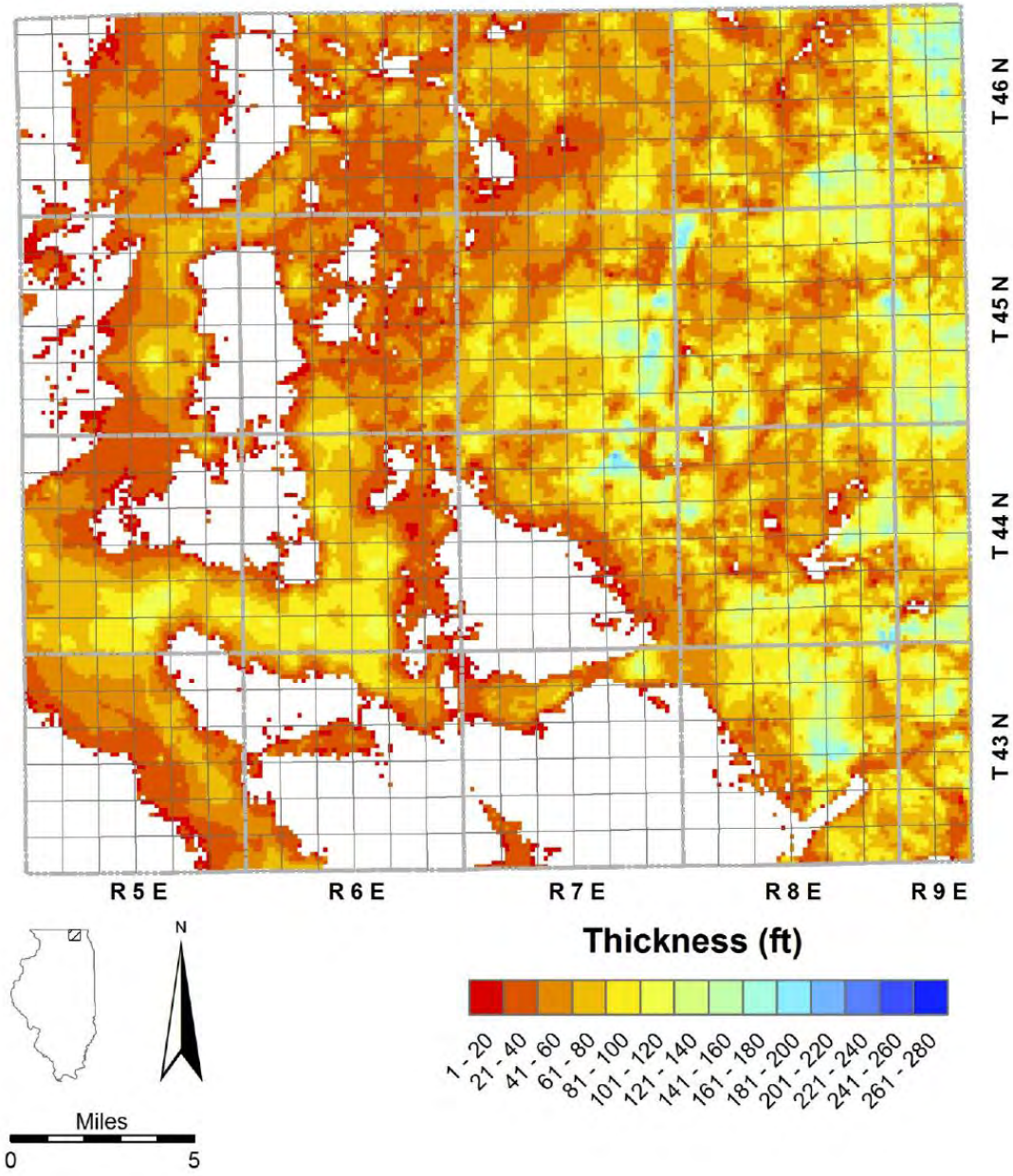
ISWS 2013

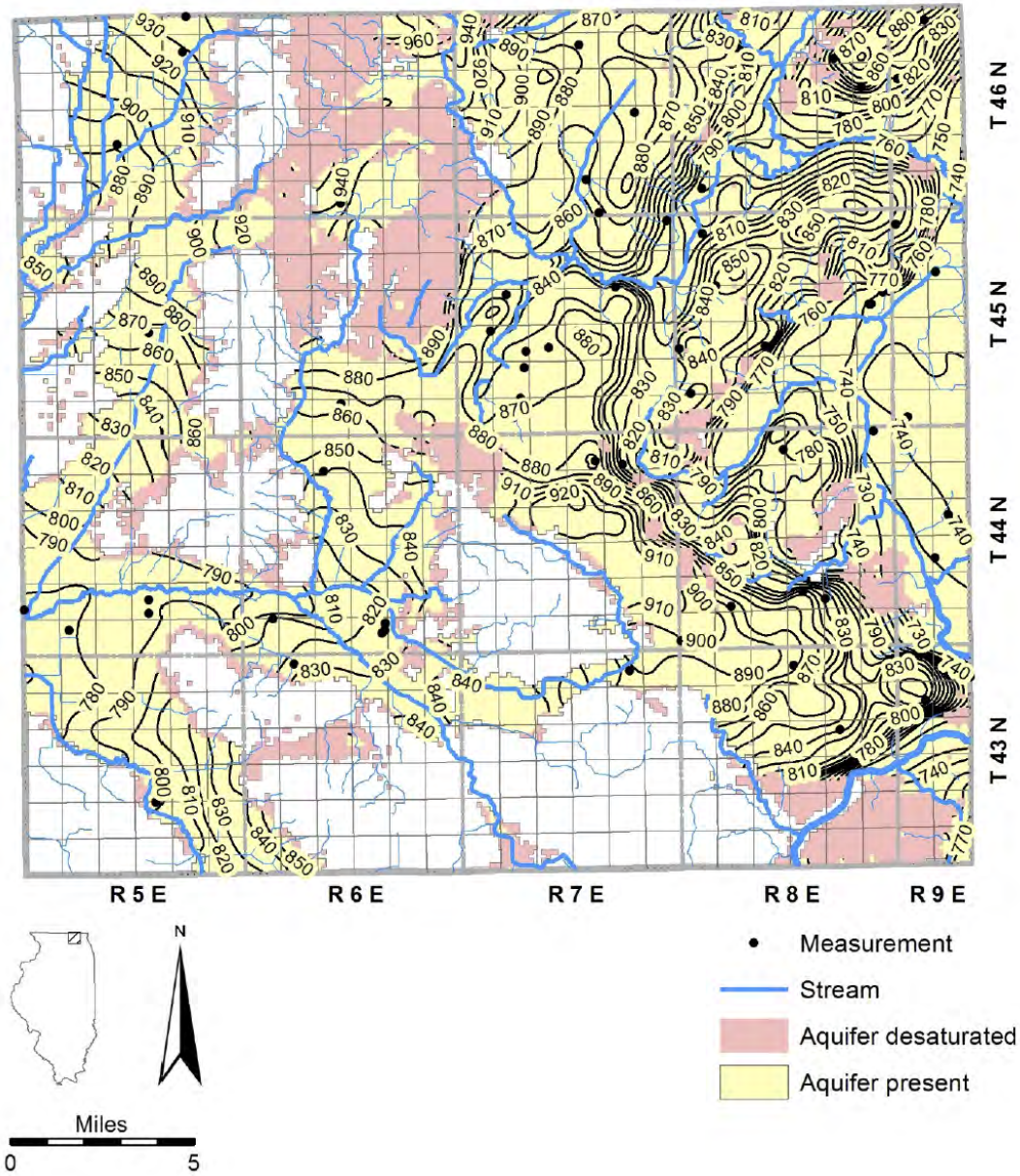


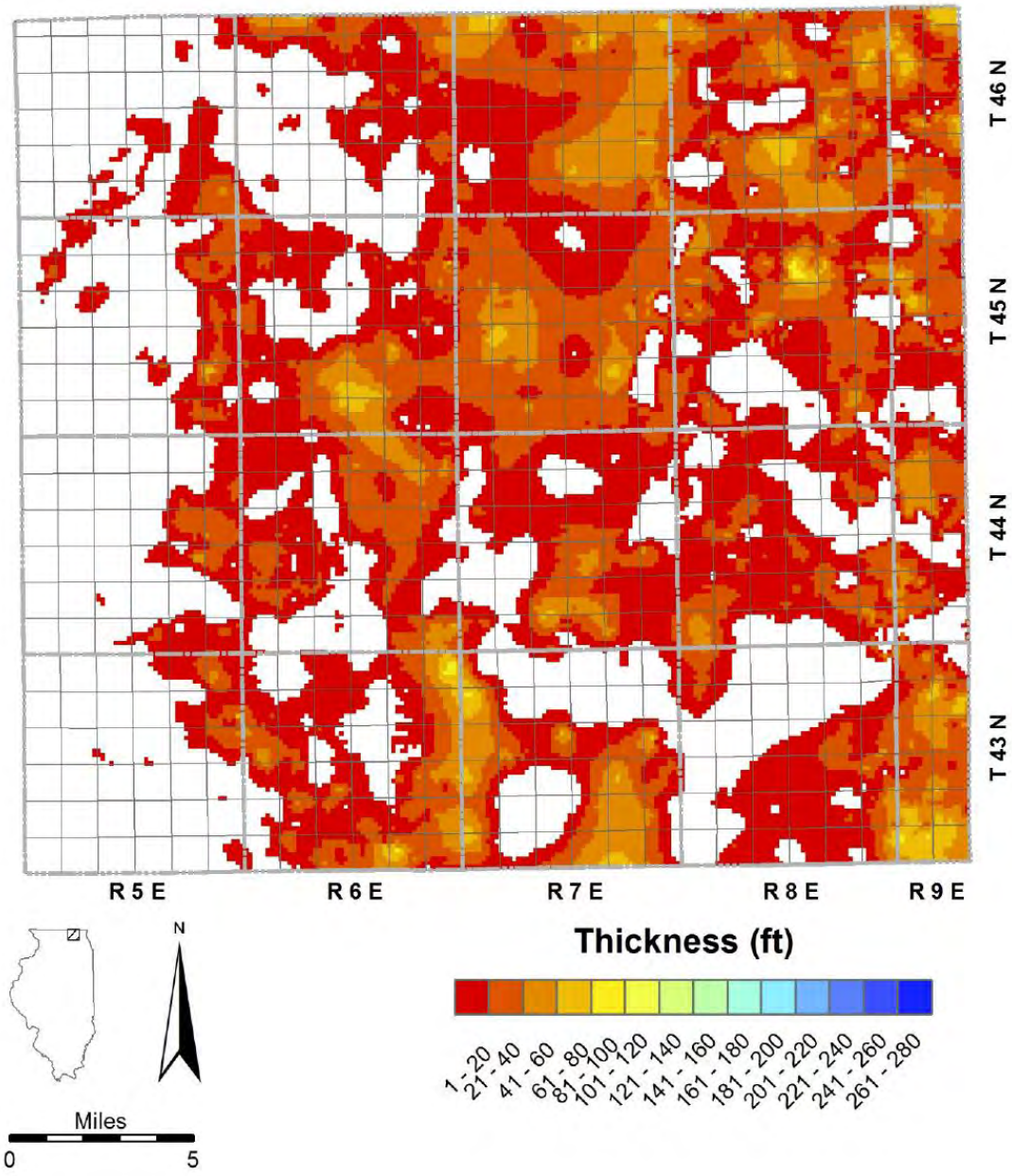
Groundwater-flow modeling results

Illinois State Water Survey




T 46 N
T 45 N
T 44 N
T 43 N
R 5 E
R 6 E
R 7 E
R 8 E
R 9 E
N
Miles
0
5
Thickness (ft)
1 - 20
21 - 40
41 - 60
61 - 80
81 - 100
101 - 120
121 - 140
141 - 160
161 - 180
181 - 200
201 - 220
221 - 240
241 - 260
261 - 280


T 46 N
T 45 N
T 44 N
T 43 N
R 5 E
R 6 E
R 7 E
R 8 E
R 9 E
N
Miles
0
5
Measurement
Stream
Aquifer desaturated
Aquifer present


T 46 N
T 45 N
T 44 N
T 43 N
R 5 E
R 6 E
R 7 E
R 8 E
R 9 E
N
Miles
0
5
Thickness (ft)
1 - 20
21 - 40
41 - 60
61 - 80
81 - 100
101 - 120
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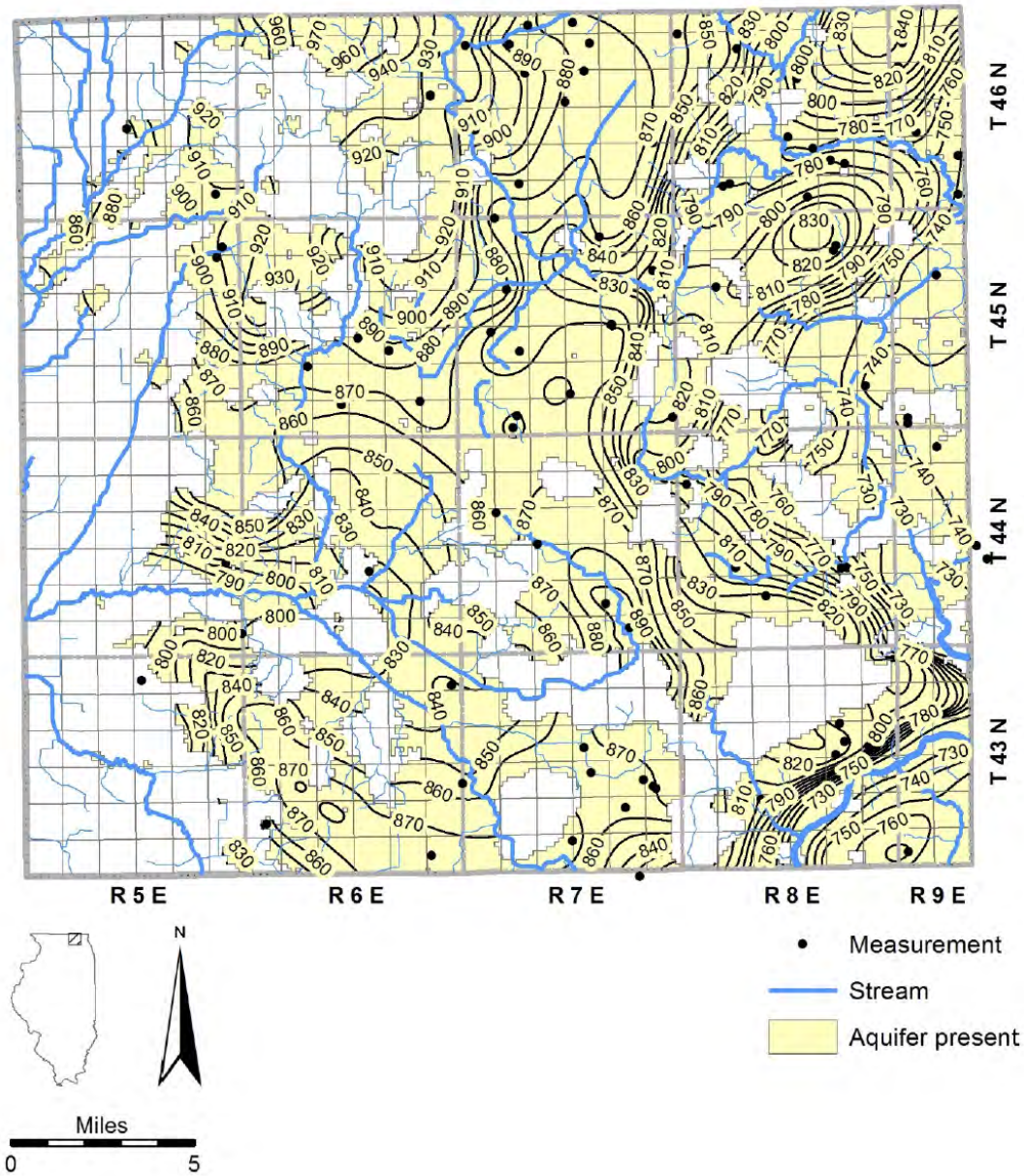
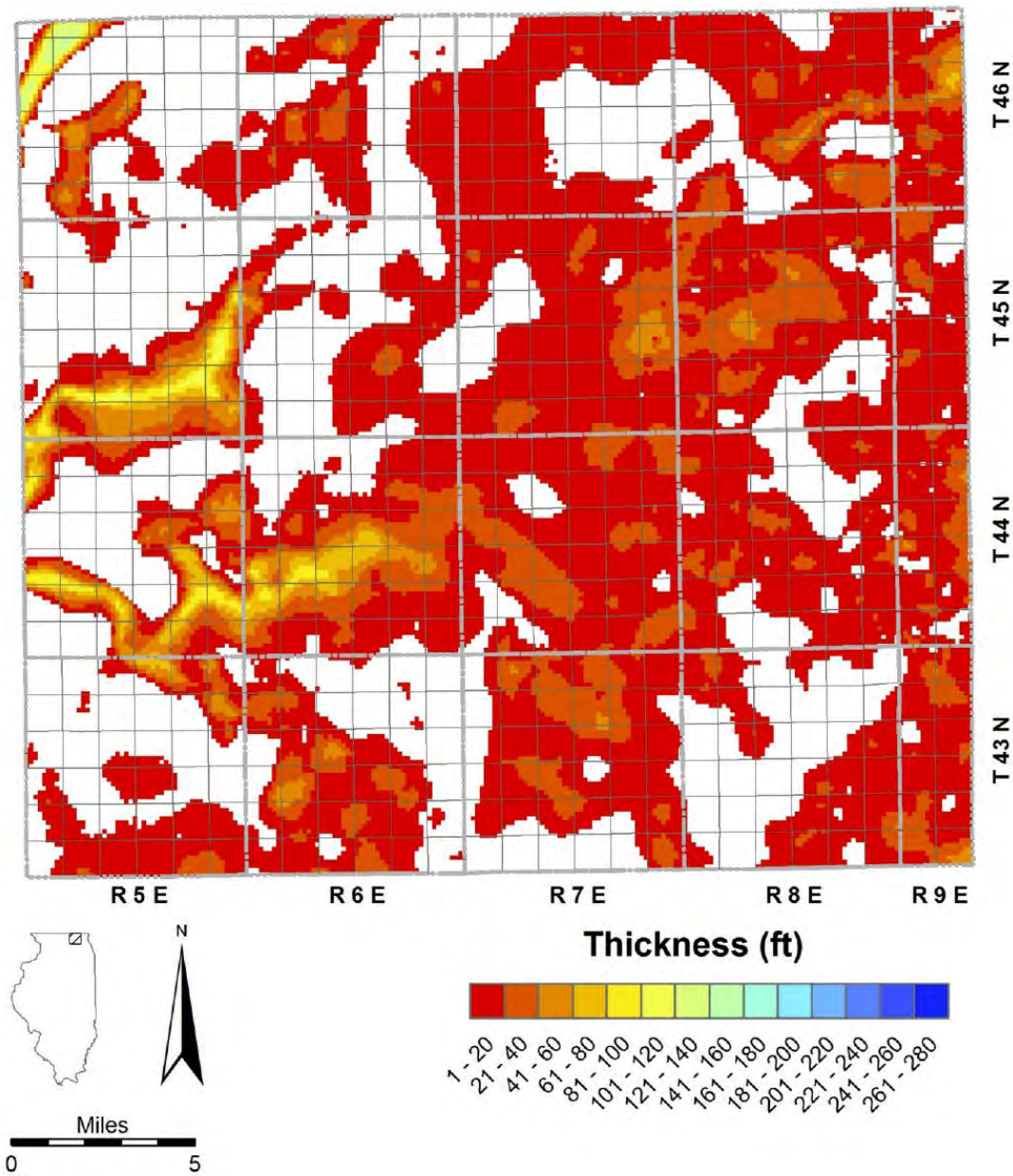
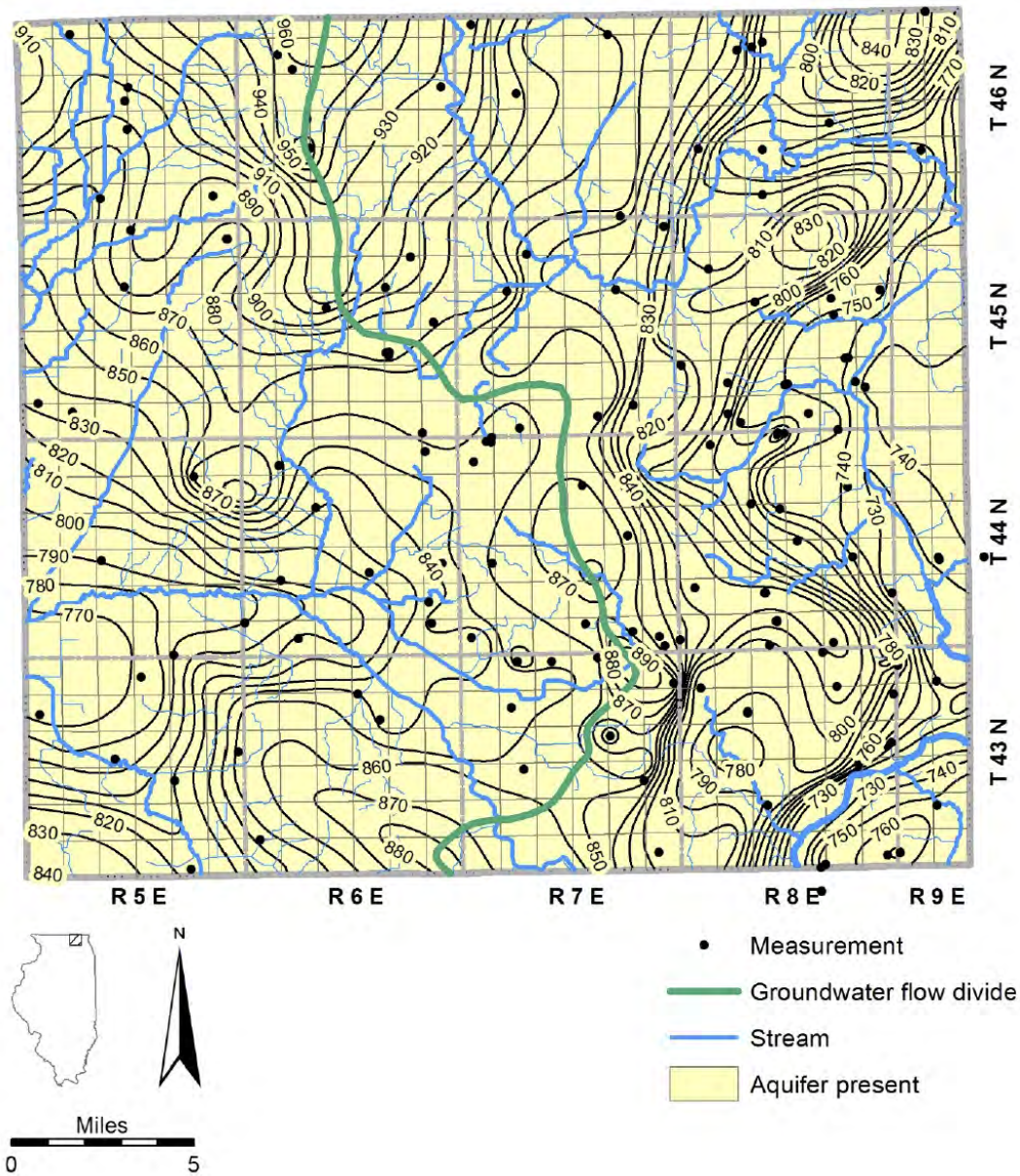
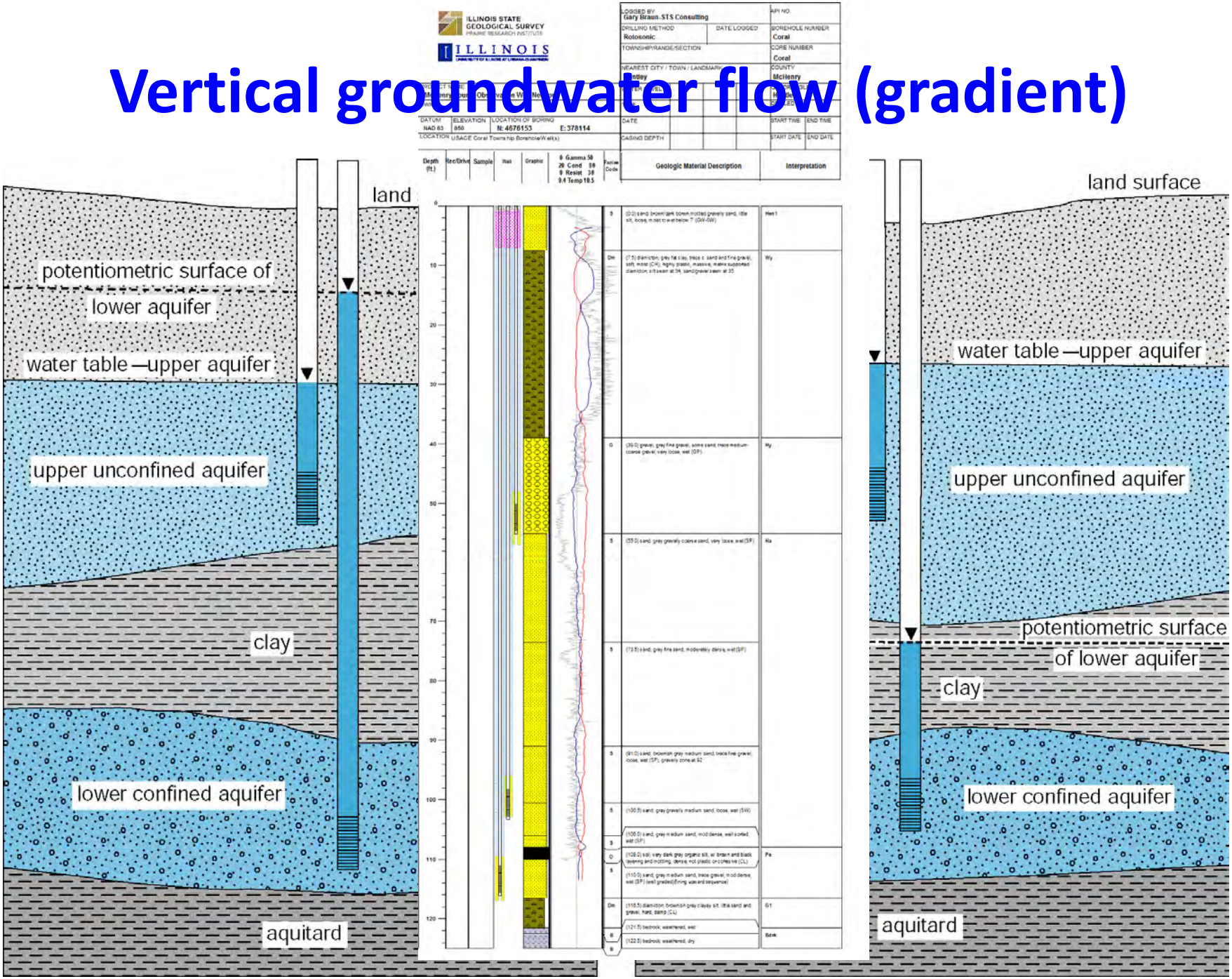
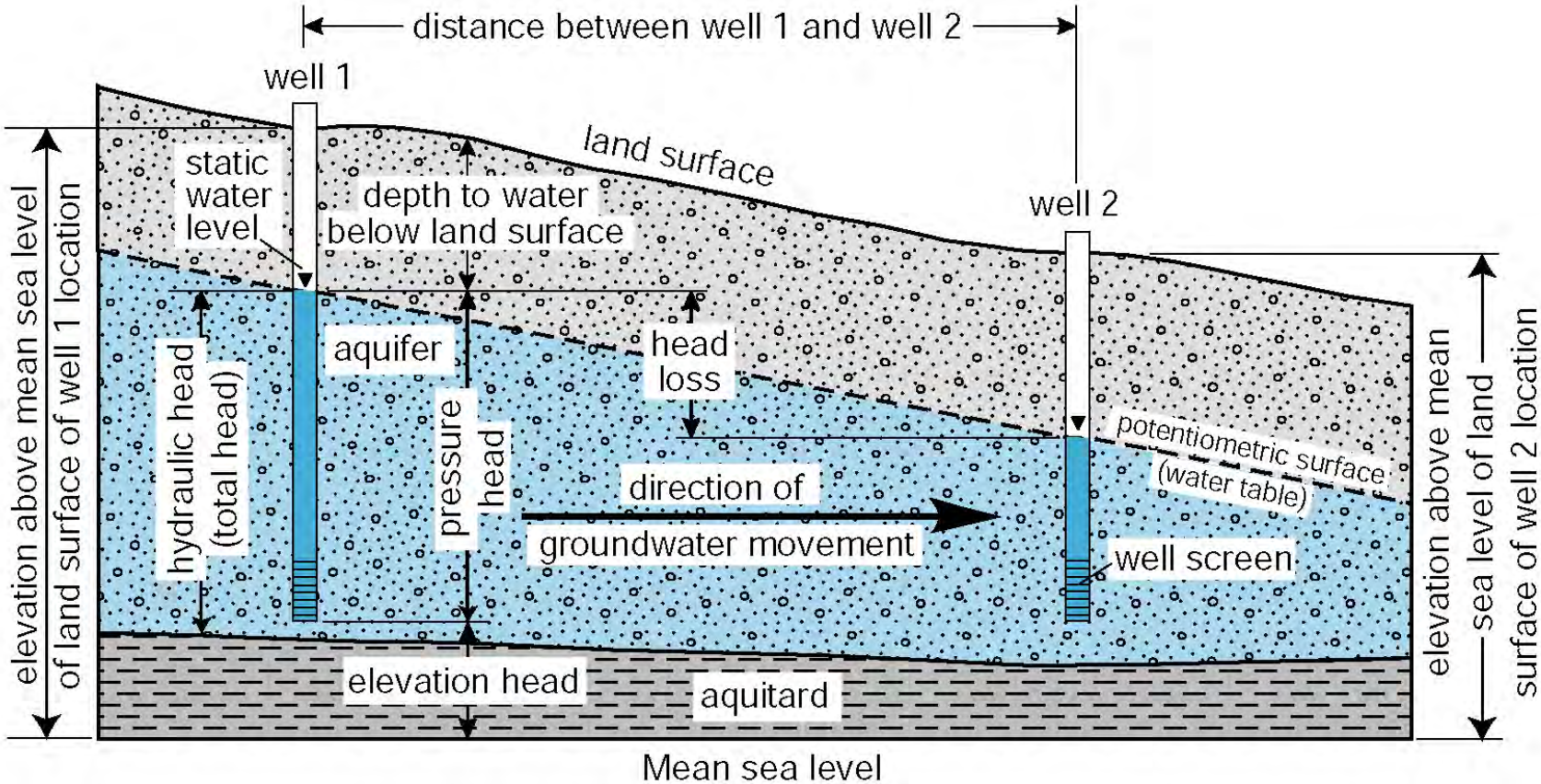
141 - 160
161 - 180
181 - 200
201 - 220
221 - 240
241 - 260
261 - 280


T 46 N
T 45 N
T 44 N
T 43 N
R 5 E
R 6 E
R 7 E
R 8 E
R 9 E
N
Miles
0
5
Measurement
Stream
Aquifer present


T 46 N
T 45 N
T 44 N
T 43 N
R 5 E
R 6 E
R 7 E
R 8 E
R 9 E
N
Miles
0
5
Thickness (ft)
1 - 20
21 - 40
41 - 60
61 - 80
81 - 100
101 - 120
121 - 140
141 - 160
161 - 180
181 - 200
201 - 220
221 - 240
241 - 260
261 - 280


T 46 N
T 45 N
T 44 N
T 43 N
R 5 E
R 6 E
R 7 E
R 8 E
R 9 E
N
Miles
0
5
Measurement
Groundwater flow divide
Stream
Aquifer present

Vertical groundwater flow (gradient)



Horizontal groundwater flow (gradient)