

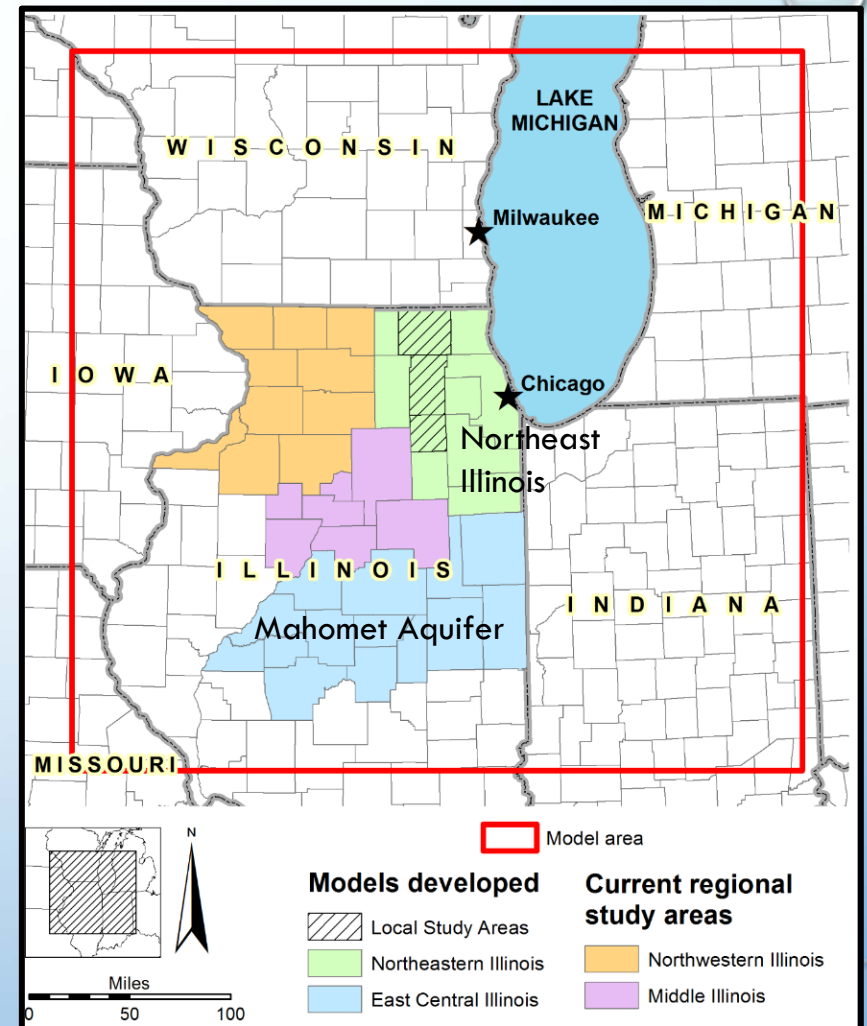
THE ILLINOIS GROUNDWATER FLOW MODEL FRAMEWORK

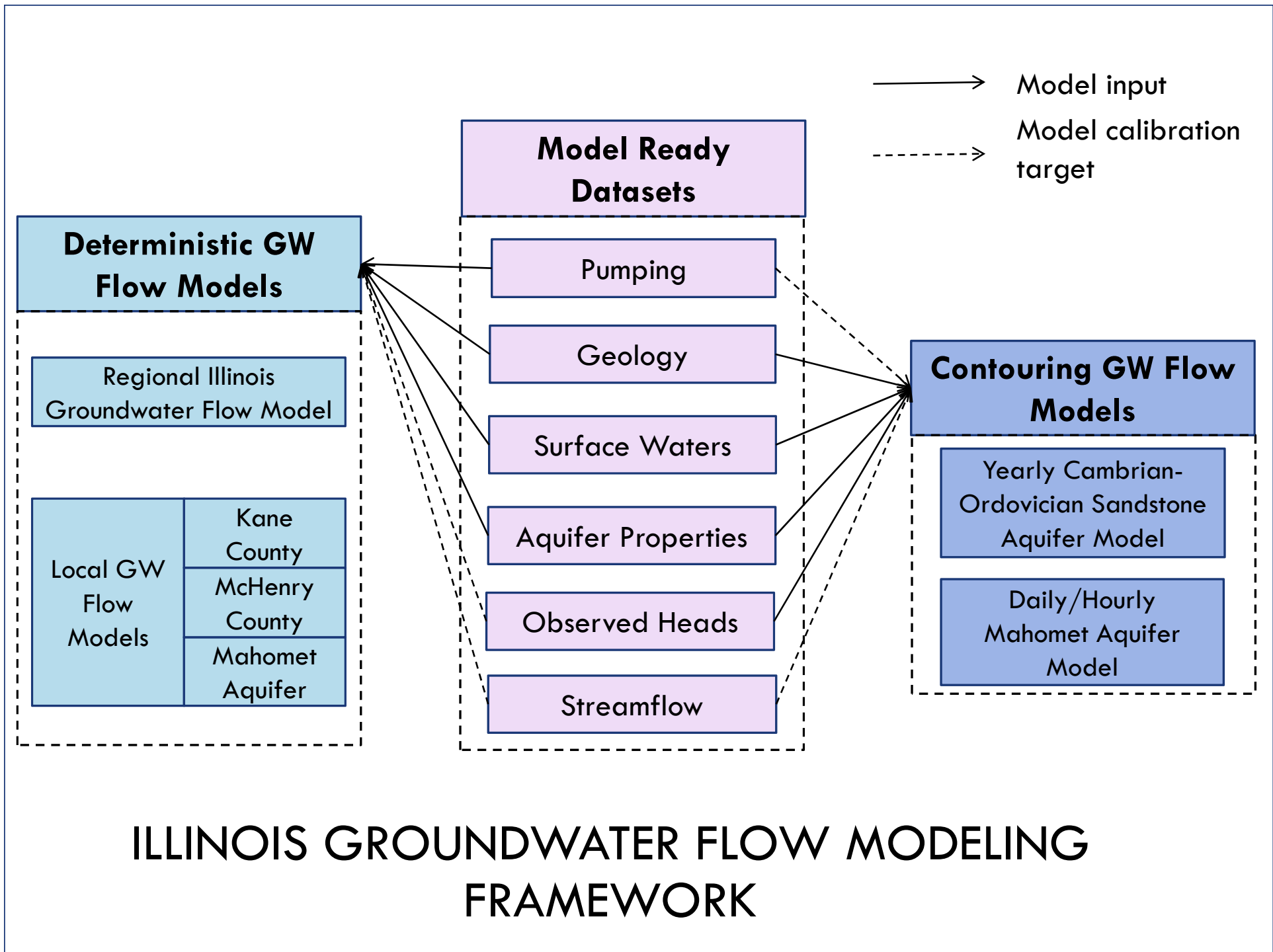
DANIEL ABRAMS



NEW ILLINOIS GROUNDWATER FLOW MODEL FRAMEWORK

- Water Supply Planning on the state, regional, and local scale
- Combine local and regional models into one modeling framework
- Common database and methodology
- Ability to zoom in on local problems
- **WHEN NEW INFORMATION IS AVAILABLE, ALL MODELS ARE IMMEDIATELY UPDATED**





ILLINOIS GROUNDWATER FLOW MODELING FRAMEWORK

DETERMINISTIC (SCENARIO) MODELS

- ASSIGN PUMPING, SIMULATE HEADS AND FLOWS
- ALLOW FOR SIMULATION OF FUTURE CONDITIONS

Regional scale

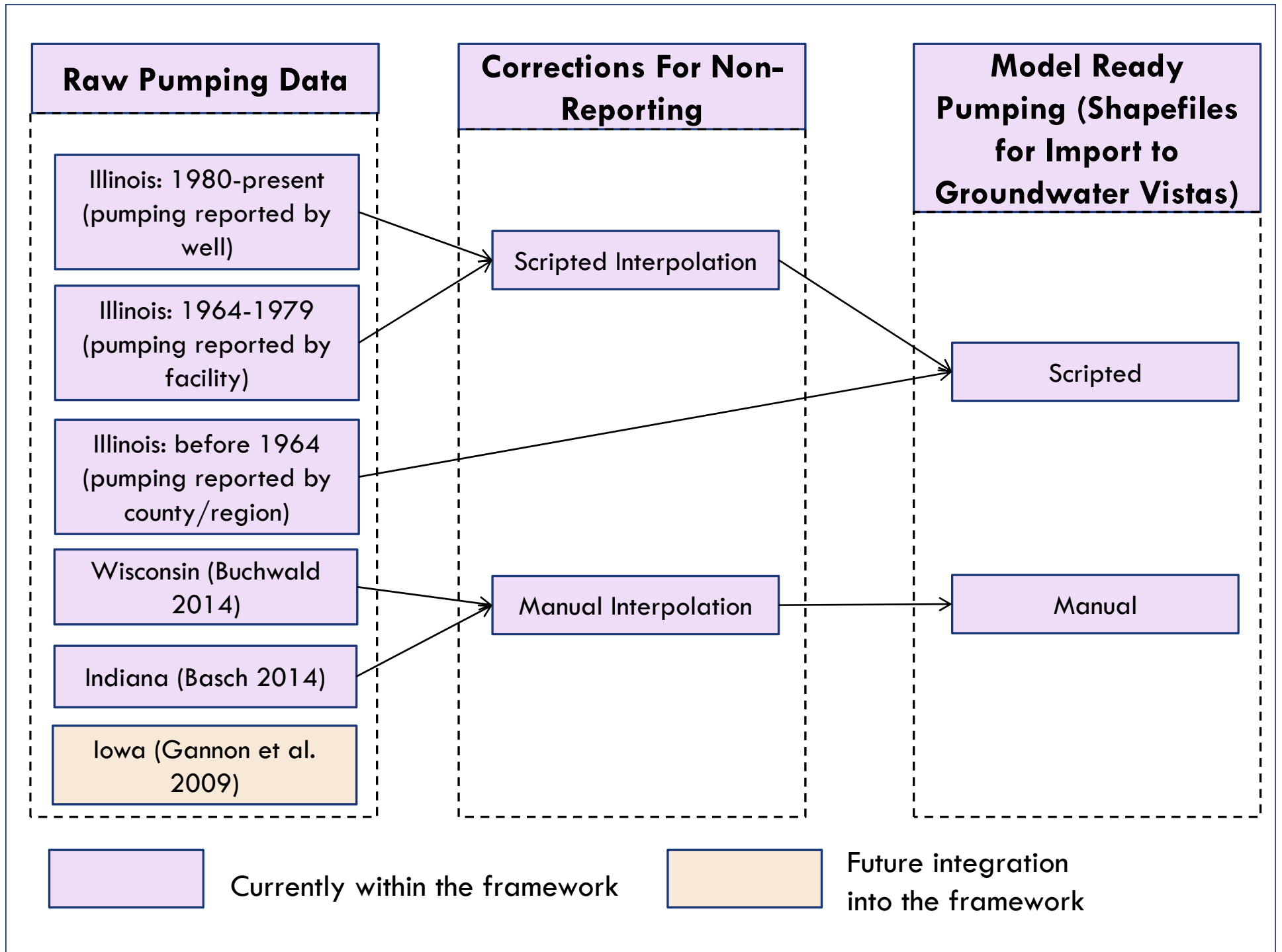
Local scale

CONTOURING MODELS

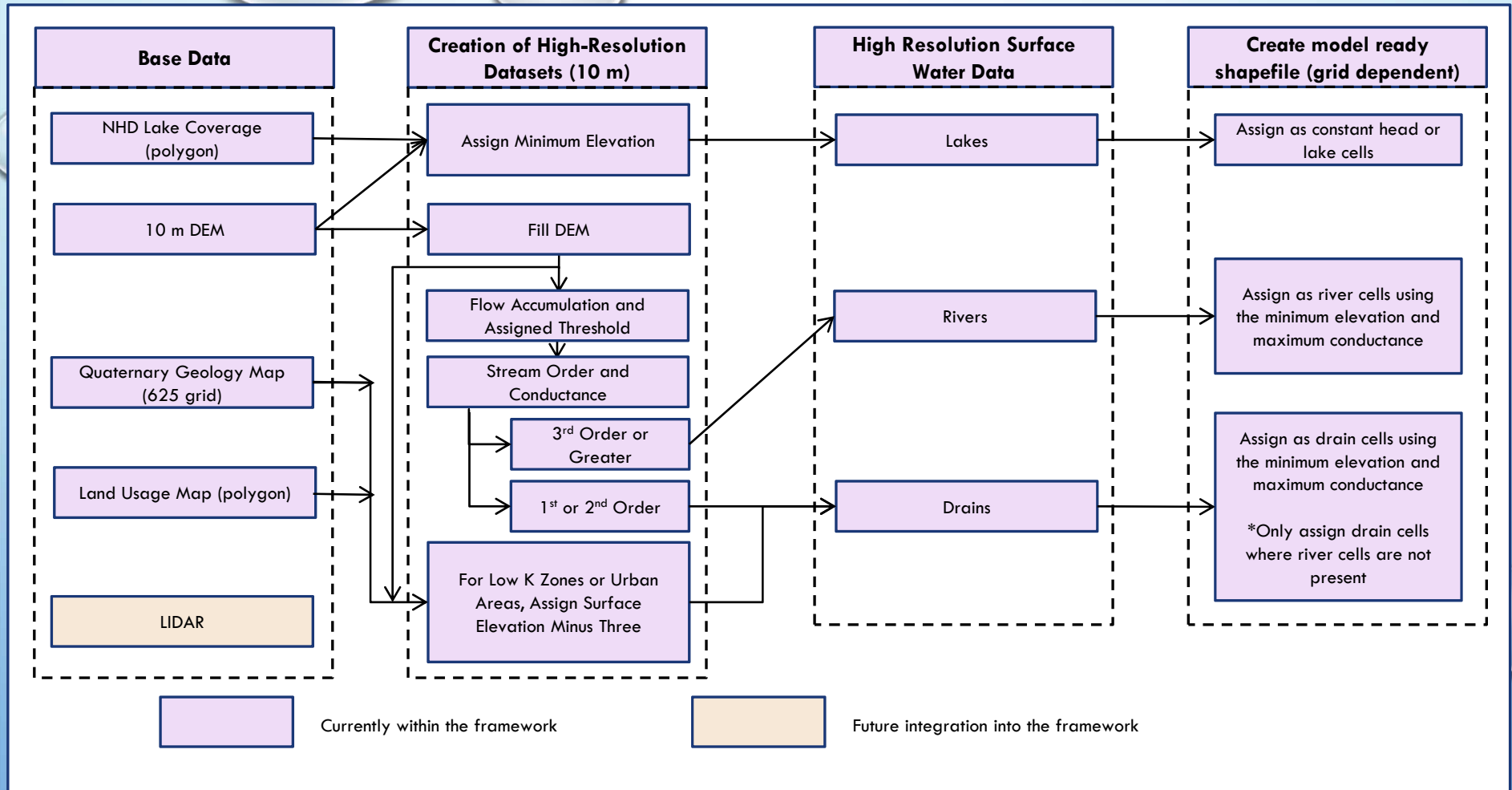
- PURELY DATA DRIVEN
- IMPROVE UNDERSTANDING OF HISTORICAL CHANGES

Seasonal changes

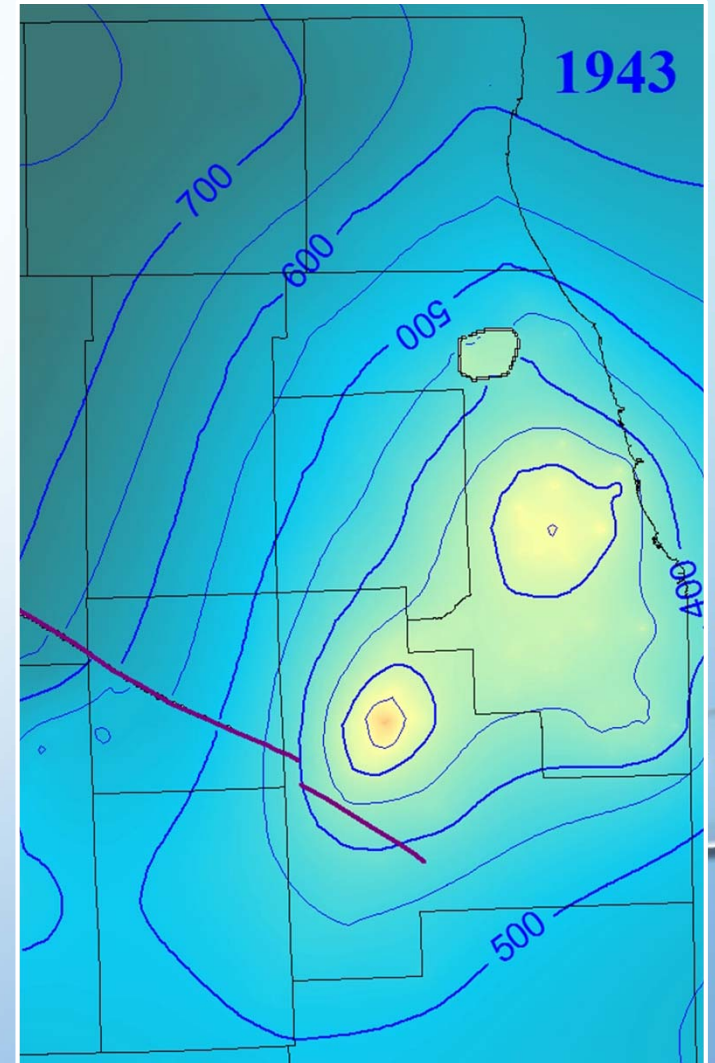
Long term changes



STREAM NETWORK



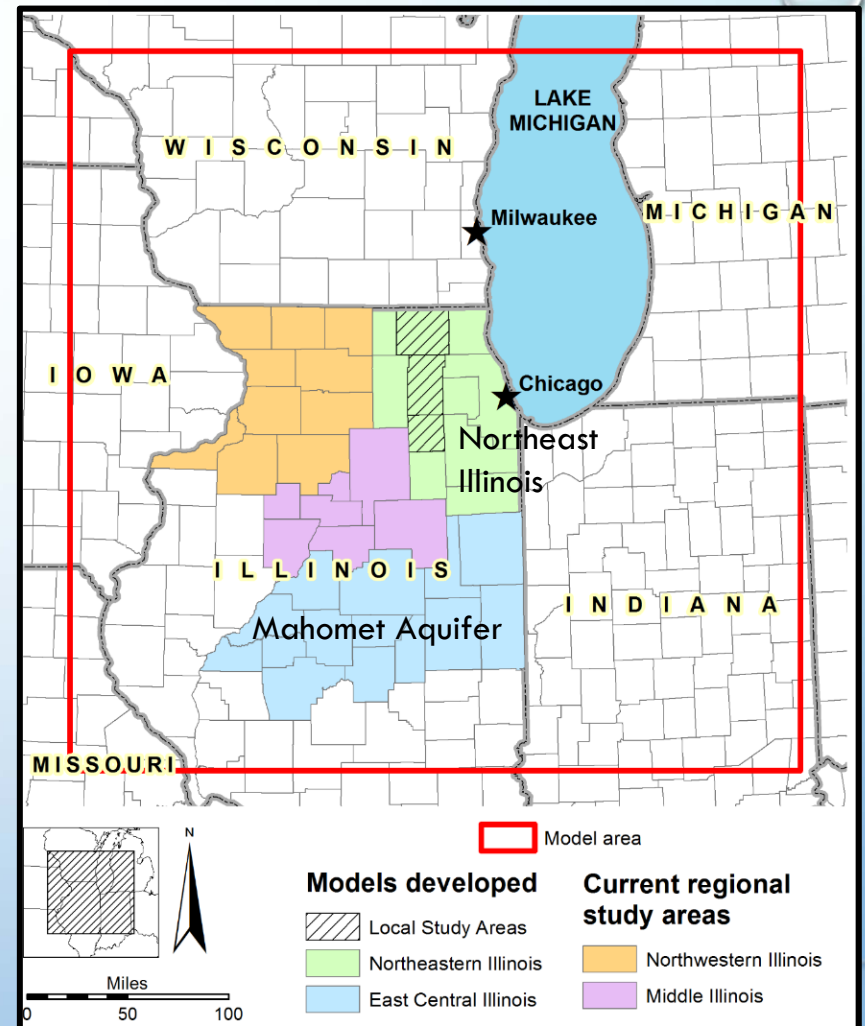
**CONTOURING MODEL: CHANGES
IN HEADS IN NE ILLINOIS
(SANDSTONE)**



REGIONAL NORTHERN ILLINOIS SCENARIO MODEL:

21 LAYERS

CREATES A SOLUTION FOR EVERY YEAR (1863 – PRESENT DAY)



- Bedrock Aquitard
- Major Aquifer
- Saline Water
- Geologic Contact

BEDROCK UNITS

- Sd Silurian Dolomite
- Mq Maquoketa Shale
- Gp Galena-Platteville Dolomite
- Sp St. Peter Sandstone
- Pdc Prairie du Chien Formation
- Ig Ironton-Galesville Sandstone
- Ec Eau Claire Formation
- Ms Mt. Simon Sandstone
- Pc Precambrian Granite

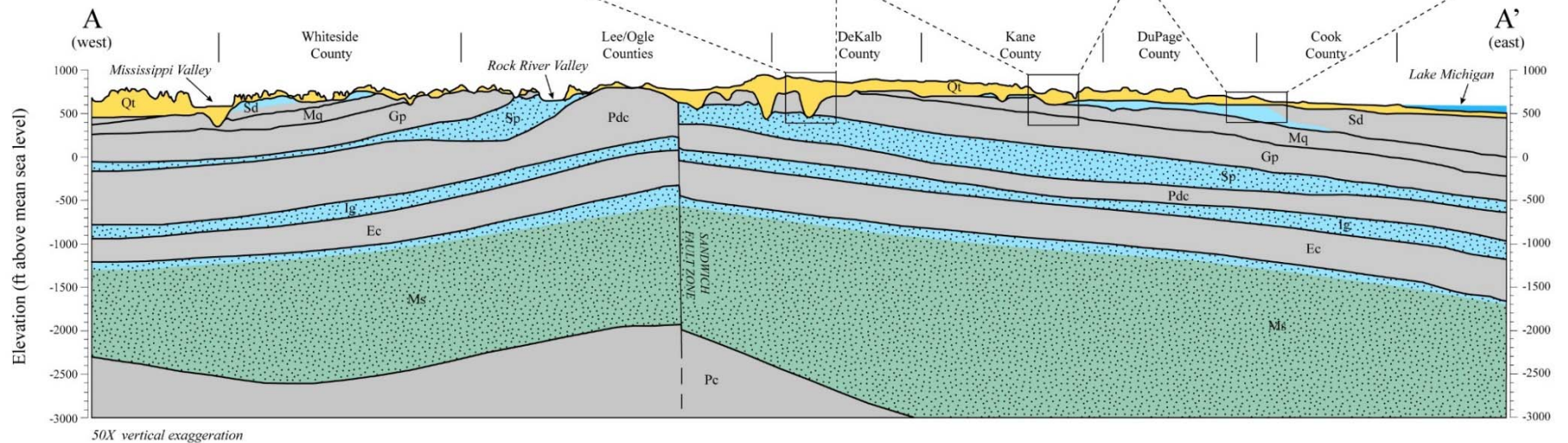
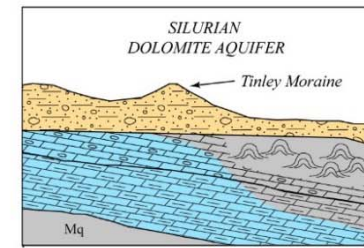
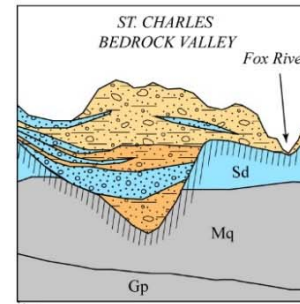
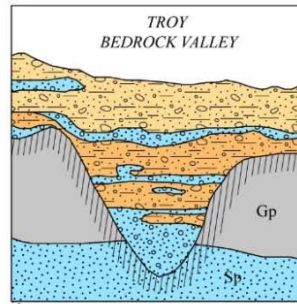
- Weathered Bedrock

QUATERNARY (Qt) SYSTEM

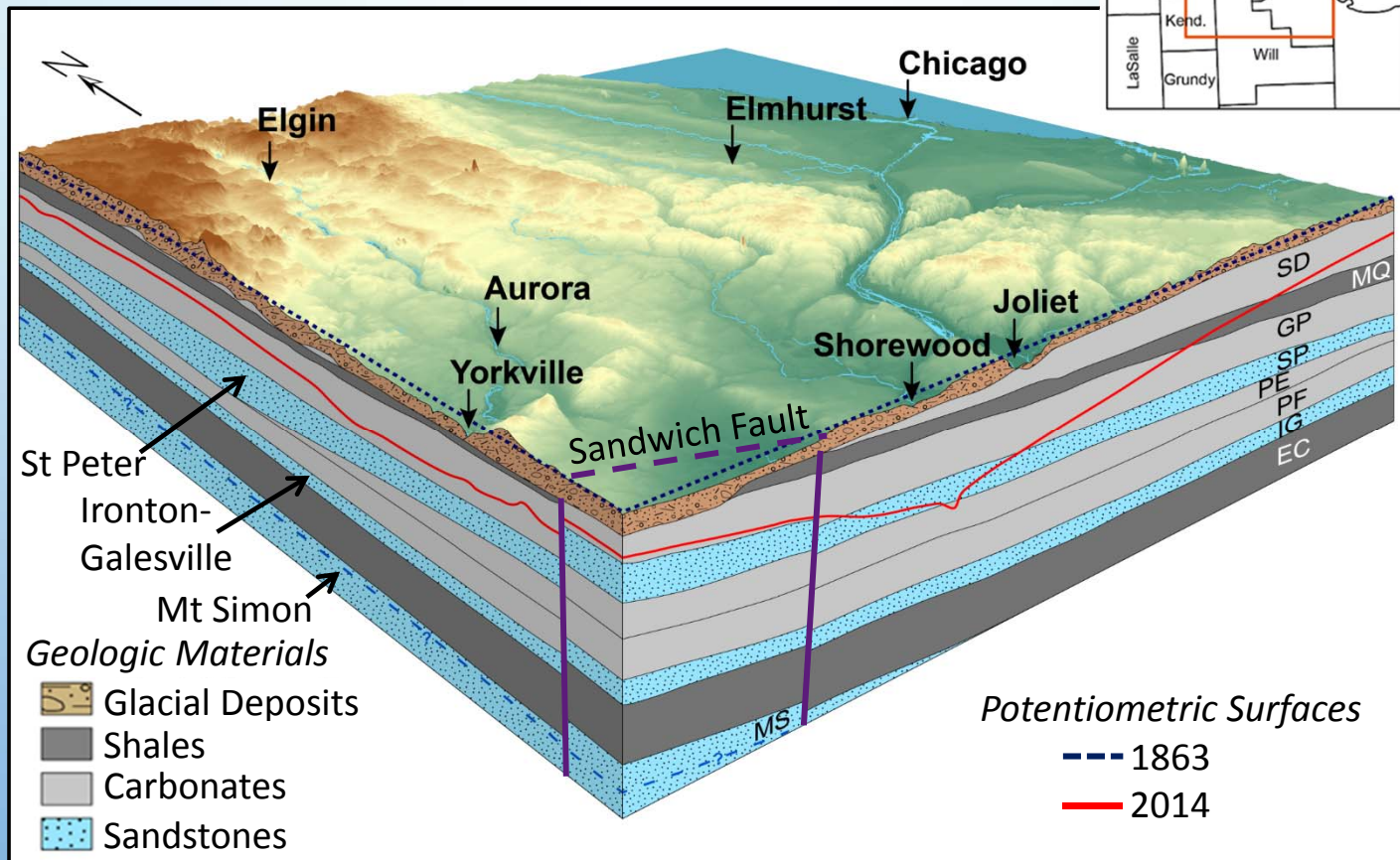
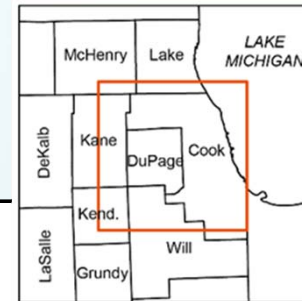
- Wedron Group
- Glasford Group
- Diamicton
- Sand and Gravel

SILURIAN SYSTEM

- Niagaran Series
- Alexandrian Series
- Reef Structures

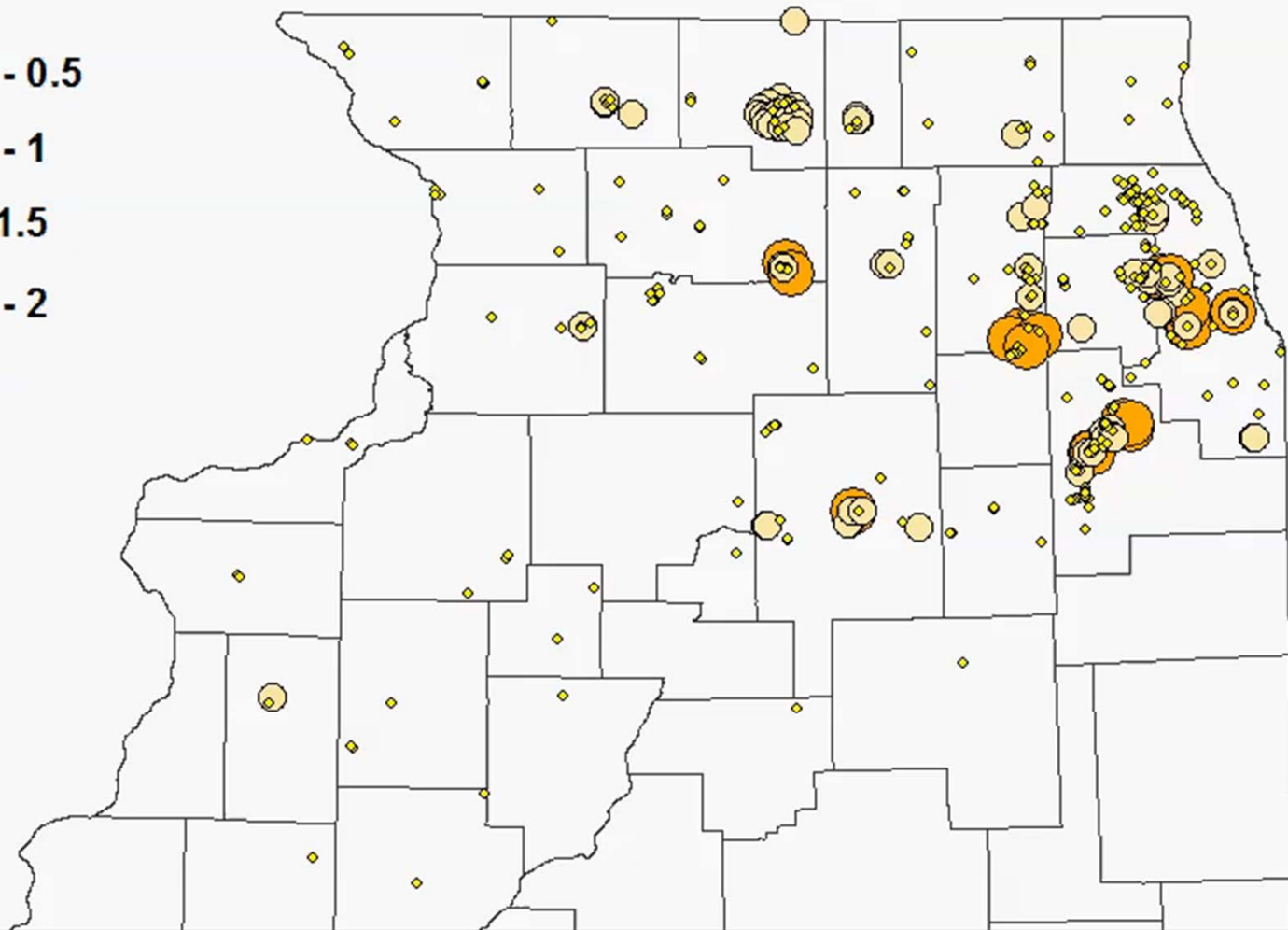


Regional Bedrock Geology

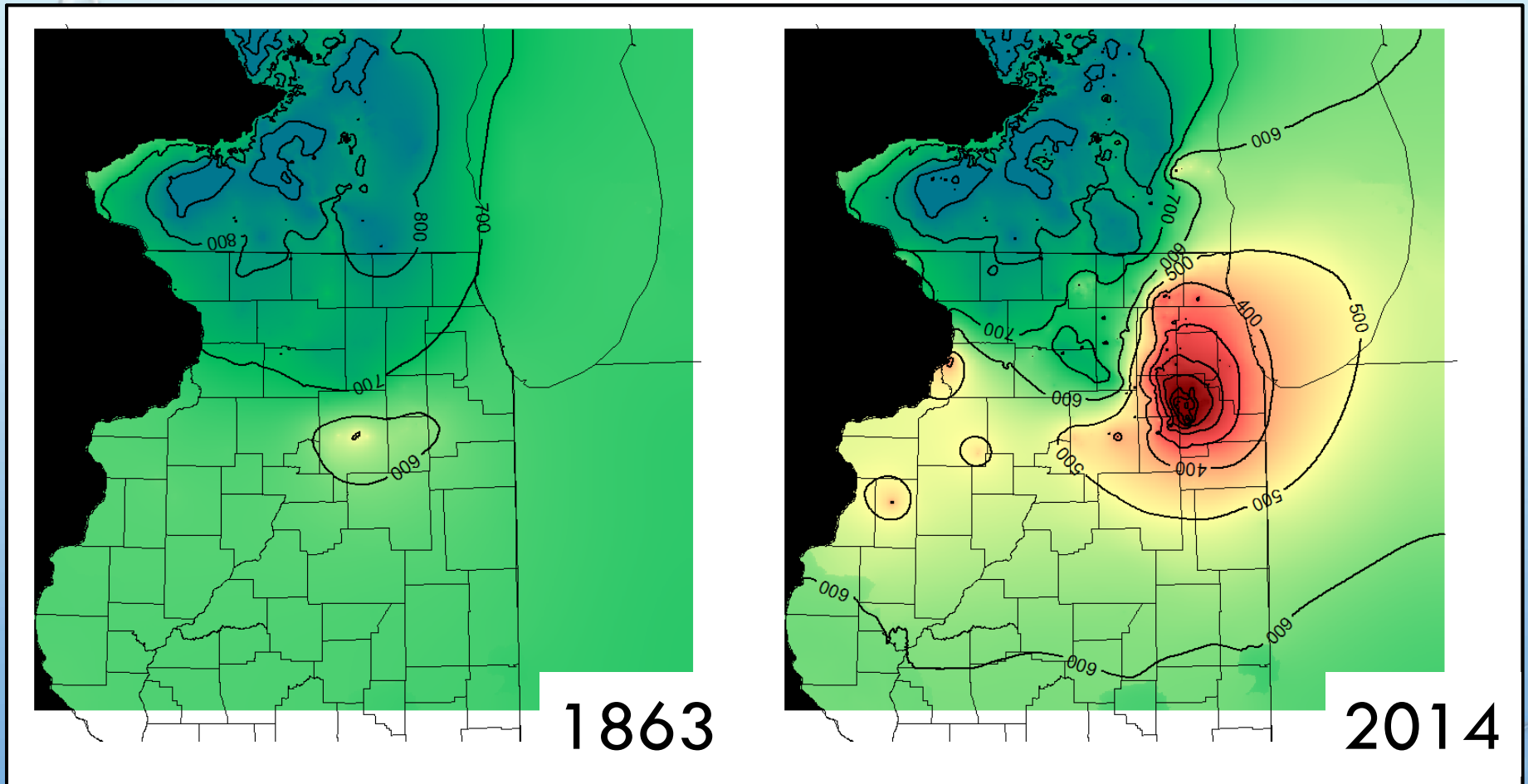


1963 Sandstone Aquifer Withdrawals

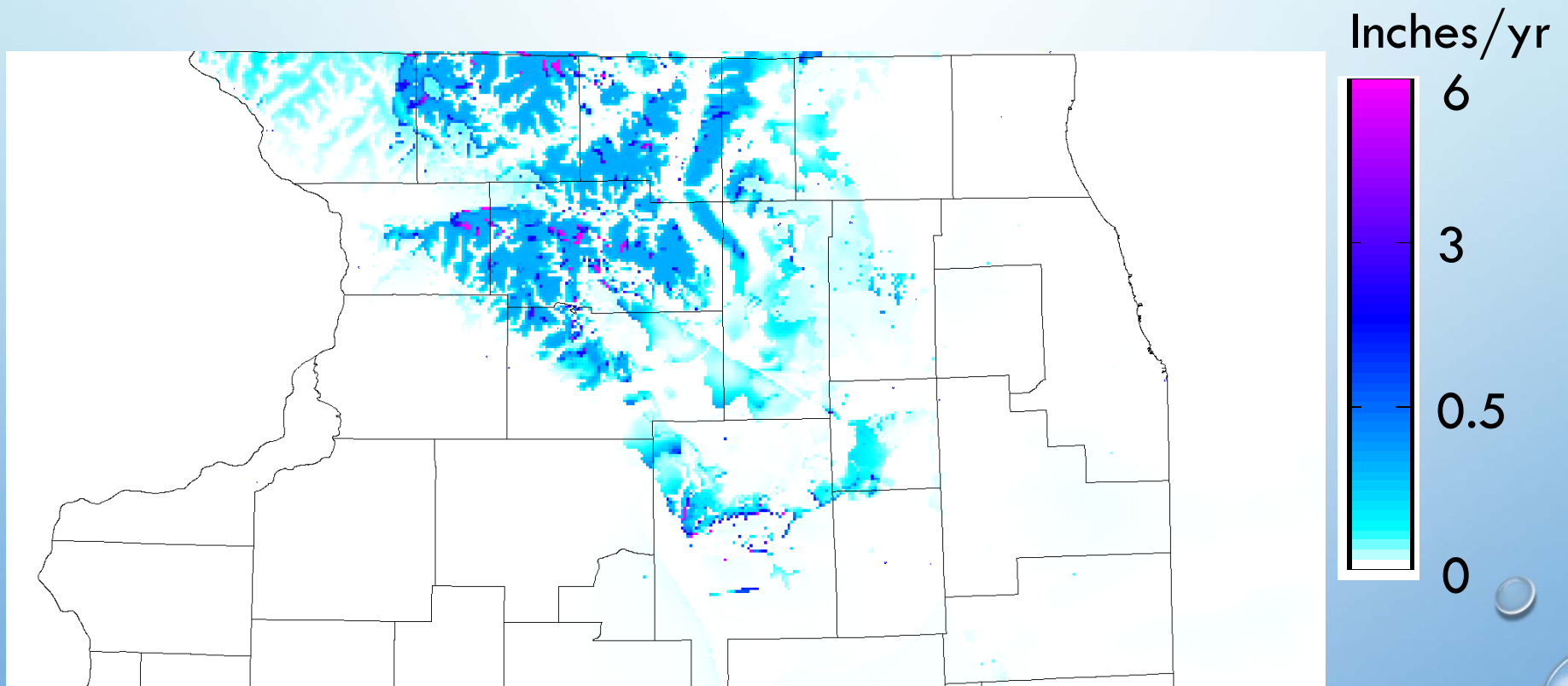
MGD



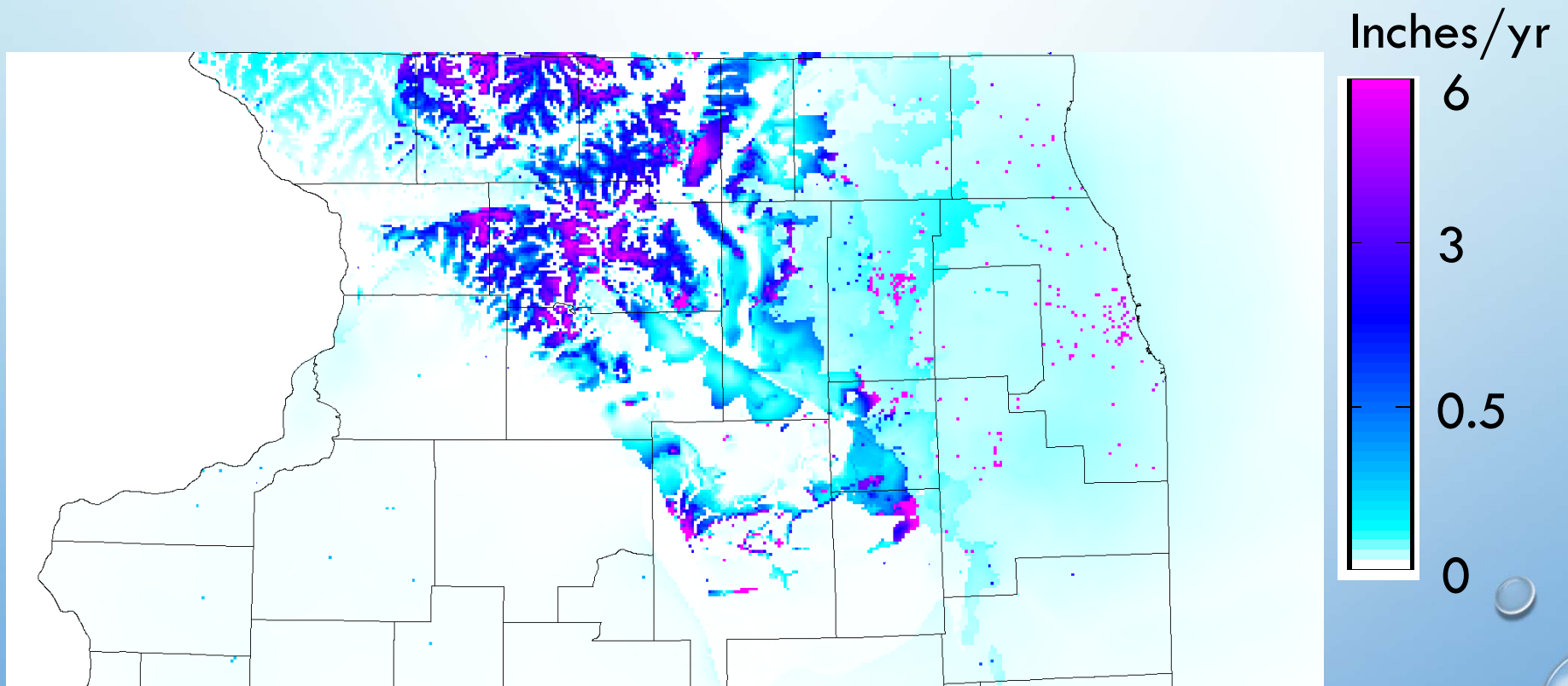
Regional sandstone heads



PREDEVELOPMENT WATER FLOWING INTO THE ST. PETER SANDSTONE



2014 WATER FLOWING INTO THE ST. PETER SANDSTONE



As pumping increases, flow into the sandstone increases

IMPACTS OF SANDSTONE WITHDRAWALS TO NATURAL GROUNDWATER DISCHARGE (PROVISIONAL)

- GROUNDWATER DISCHARGE TO THE ROCK RIVER
IN WINNEBAGO COUNTY

- 1863: 46 MGD

- 2014: 23 MGD

50% reduction

- GROUNDWATER DISCHARGE TO THE FOX RIVER
IN KANE AND KENDALL COUNTIES

- 1863: 125 MGD

- 2014: 75 MGD

40% reduction



- Bedrock Aquitard
- Major Aquifer
- Saline Water
- Geologic Contact

- BEDROCK UNITS**
- Sd Silurian Dolomite
 - Mq Maquoketa Shale
 - Gp Galena-Platteville Dolomite
 - Sp St. Peter Sandstone
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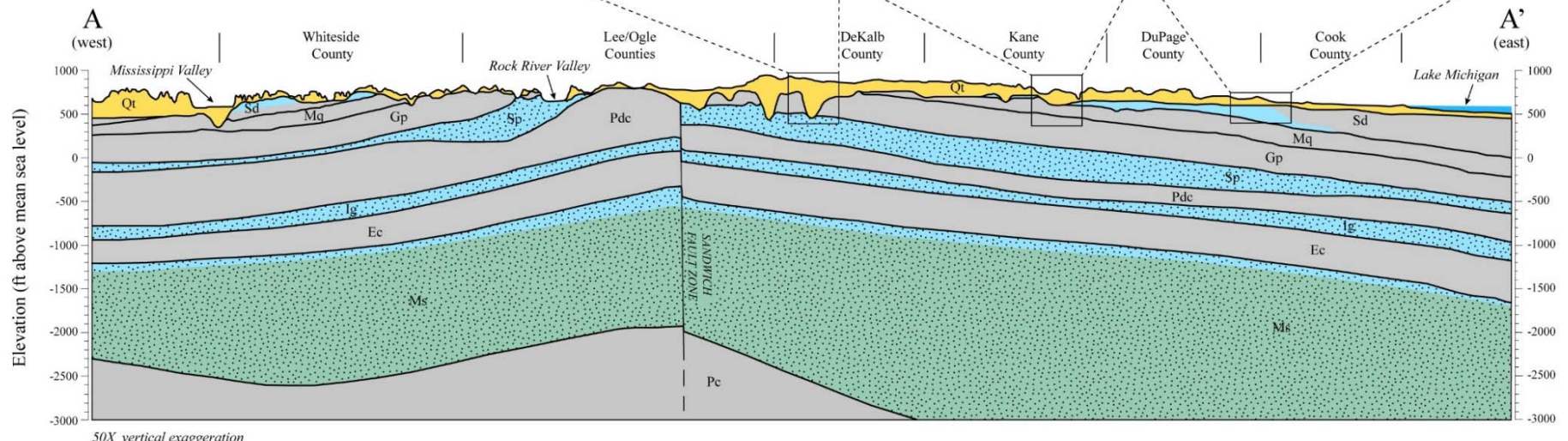
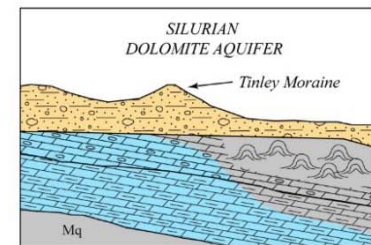
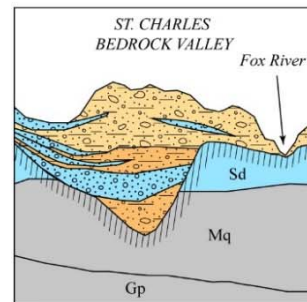
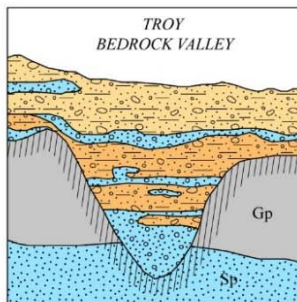


QUATERNARY (Qt) SYSTEM

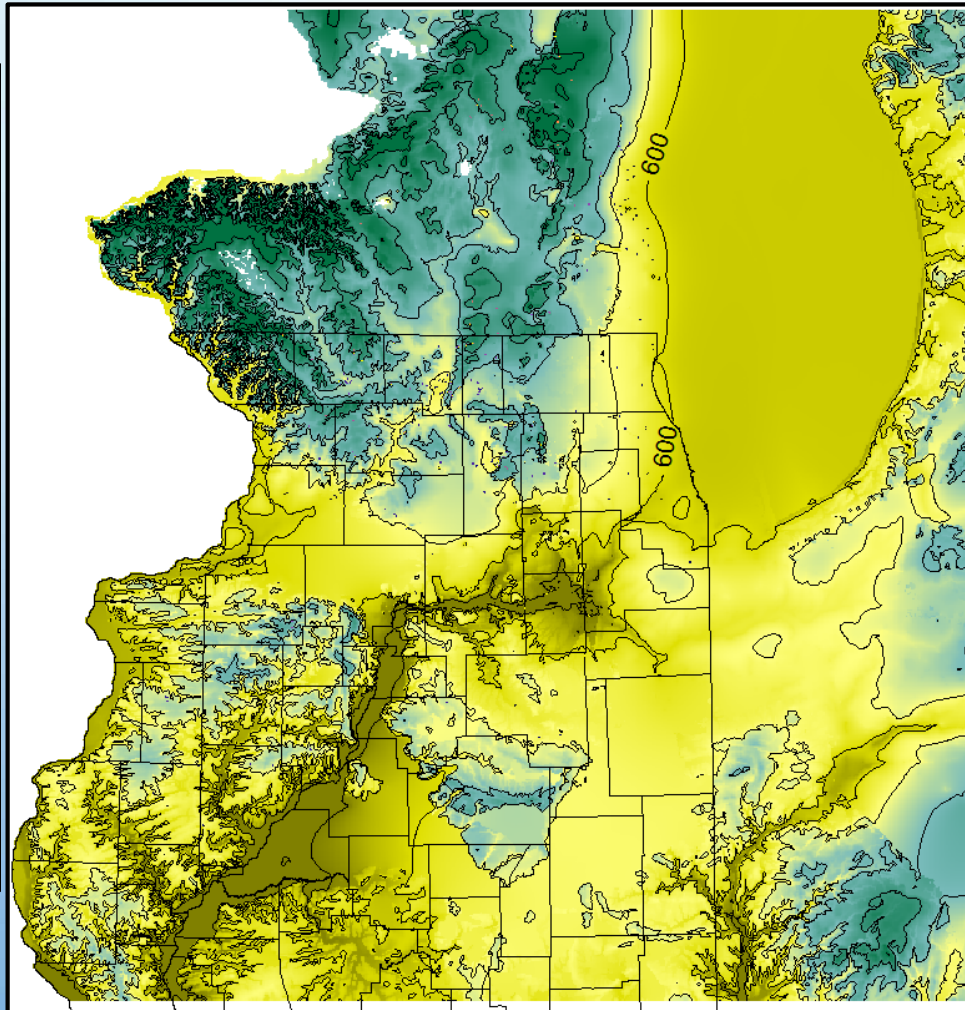
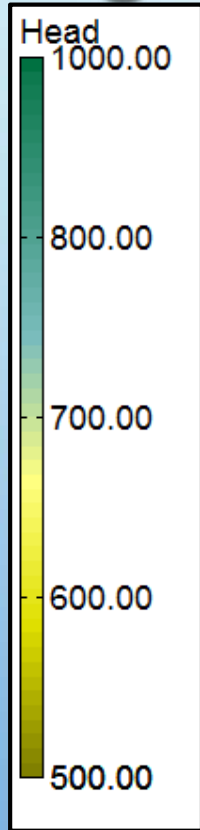
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SILURIAN SYSTEM

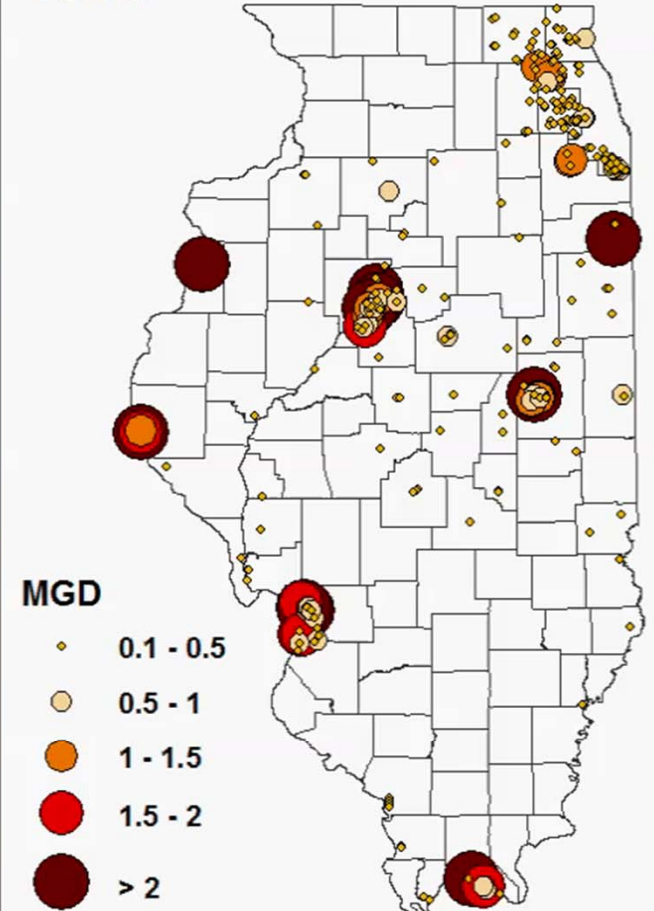
- Niagaran Series
- Alexandrian Series
- Reef Structures



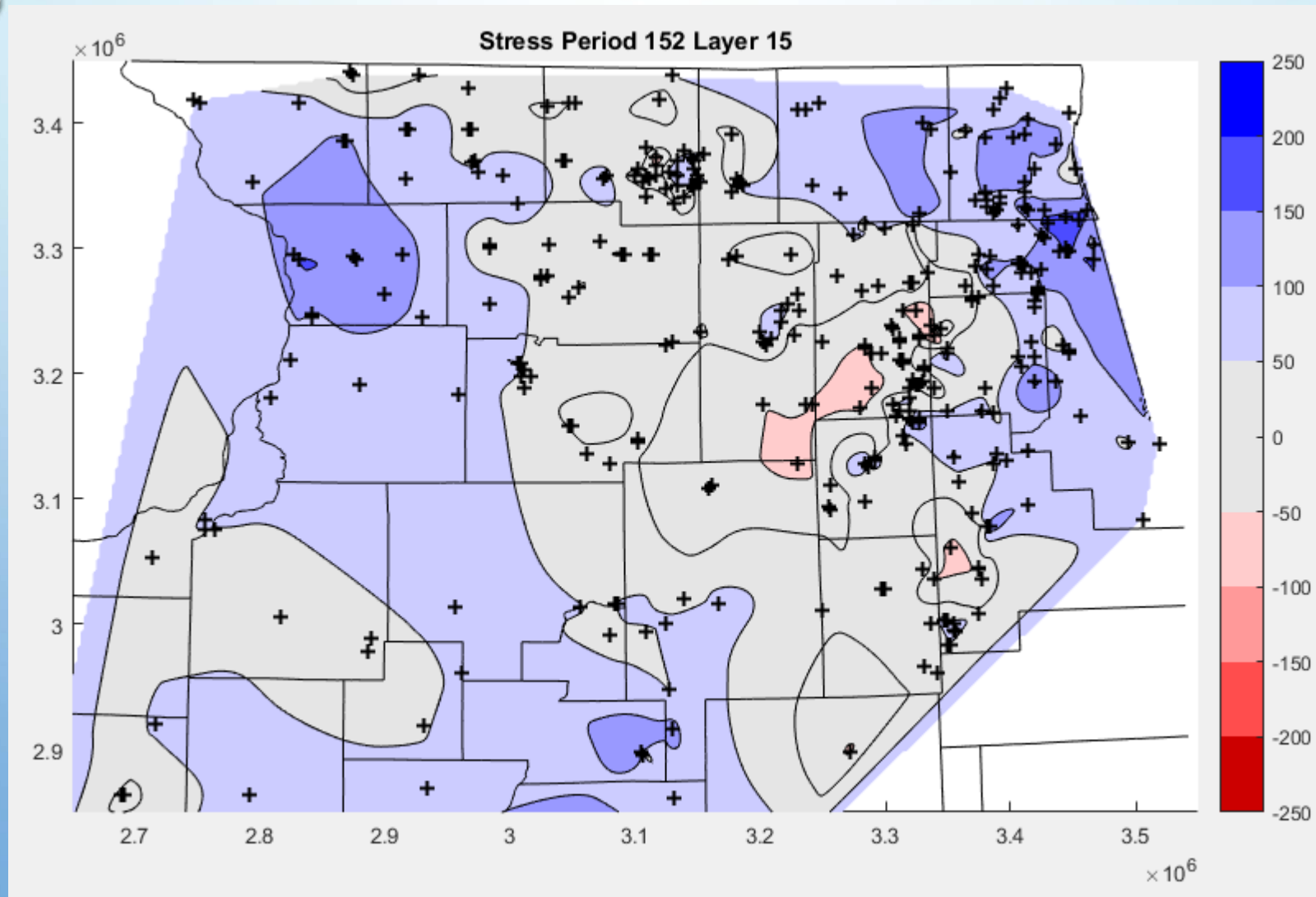
SIMULATED WEATHERED BEDROCK POTENTIOMETRIC SURFACE (PREDEVELOPMENT)



1963 Shallow Aquifer Withdrawals



MODEL CALIBRATION (ST. PETER IN 2014)



SUMMARY OF THE MODELING FRAMEWORK

CONTOURING MODELS

- OBSERVED HEADS AS AN INPUT
- PROVIDE INSIGHT INTO TRANSIENT CHANGES IN AN AQUIFER WITHOUT THE INFLUENCE OF CALIBRATION ERRORS
- NOT CAPABLE OF FUTURE SIMULATIONS

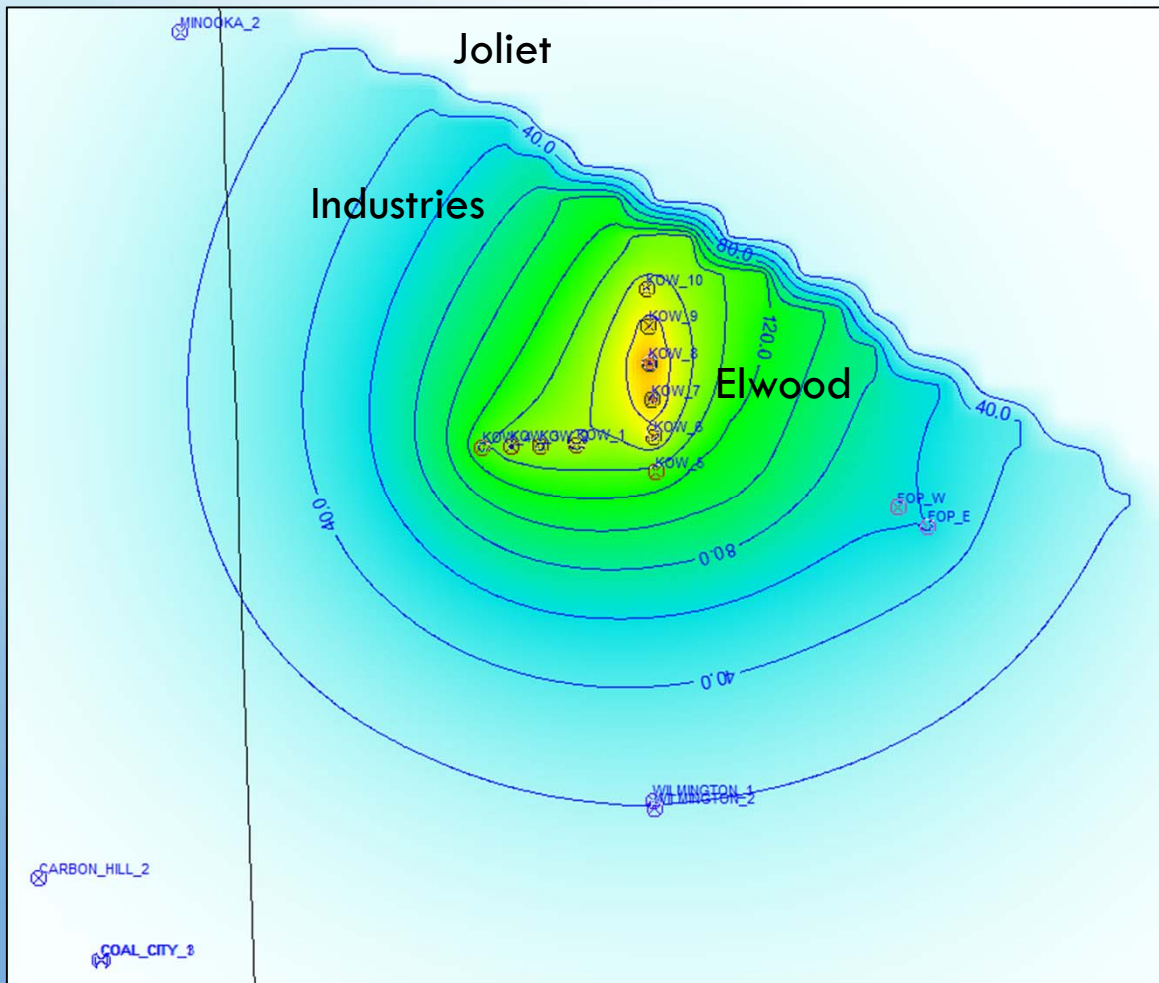
SCENARIO MODELS

- PUMPING DATA AS AN INPUT
- SUBJECT TO CALIBRATION ERRORS
- ALLOW DETAILED, 3D ANALYSES OF GROUNDWATER FLOW
- CAPABLE OF ROBUST FUTURE SIMULATIONS
- CAN BE REFINED TO SIMULATE LOCAL SCALE ISSUES

MULTIPLE STAKEHOLDERS

- LOCAL COMMUNITIES AND INDUSTRIES (LOCAL SCALE MODELS)
- REGIONAL PLANNING REGIONS (NORTHWEST WATER PLANNING ALLIANCE, MAHOMET AQUIFER CONSORTIUM)
- IDNR-LED WATER SUPPLY PLANNING STUDIES
- INTERSTATE COOPERATION BETWEEN WATER AND GEOLOGIC SURVEYS

ELWOOD PUMP TEST: 1942



Army Corp of Engineers
30 day pump test

Currently analyzing in
MODFLOW

ELWOOD PUMP TEST- PERMISSION TO REVISIT



OLD ARSENAL INTAKE





ILLINOIS STATE
WATER SURVEY
PRAIRIE RESEARCH INSTITUTE

THE ILLINOIS GROUNDWATER FLOW MODEL FRAMEWORK

DANIEL ABRAMS

GROUNDWATER FLOW MODELER

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