

# Regional Groundwater Modeling Results for Water Supply Planning in Northeast Illinois

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Illinois State Water Survey  
University of Illinois

*NE Illinois Regional Water Supply Planning Group  
December 16, 2008*



# Acknowledgments

Yu-Feng Lin, Ph.D., Center for Groundwater Science, ISWS

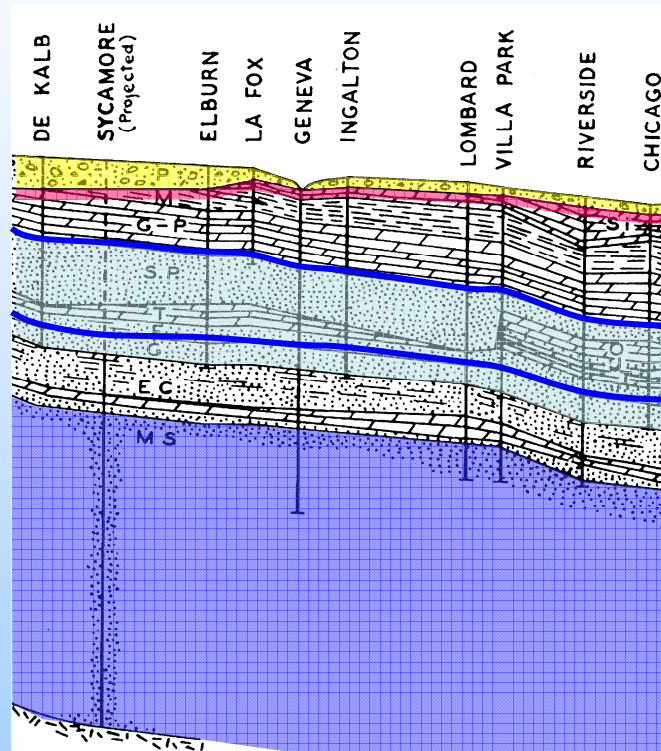
Jason Thomason, Ph.D., Geologic Mapping and Hydrogeology Center, ISGS



# Aquifers of Northeastern Illinois

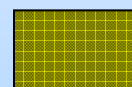
West

East

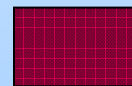


Top of Ancell (St. Peter ss)

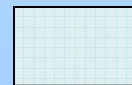
Top of Ironton-Galesville



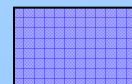
Unconsolidated Aquifer System



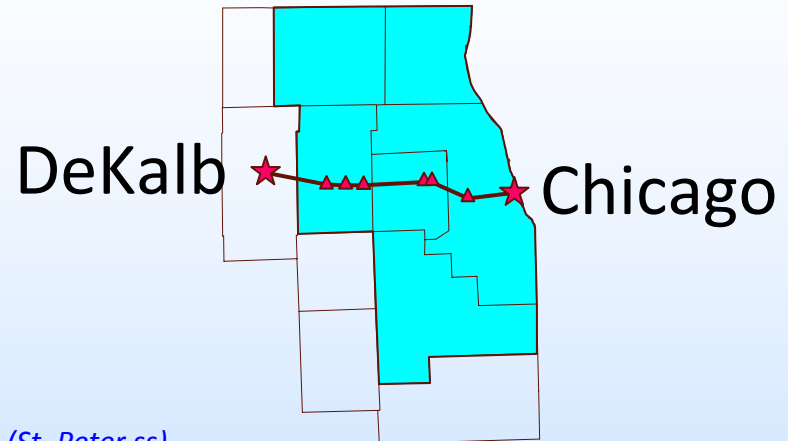
Shallow Bedrock Aquifer



Deep Bedrock Aquifer System  
(Ancell and Ironton-Galesville sandstones)



Elmhurst-Mt. Simon Aq. (saline?)



Cross-Section Modified from Bretz (1939)

## CAUTION! REMINDER!

Analysis of impacts, **not assessment of availability**

Using prescribed demand scenarios to evaluate impacts primarily in the form of drawdowns & critical water levels – **streamflows have not been assessed yet**

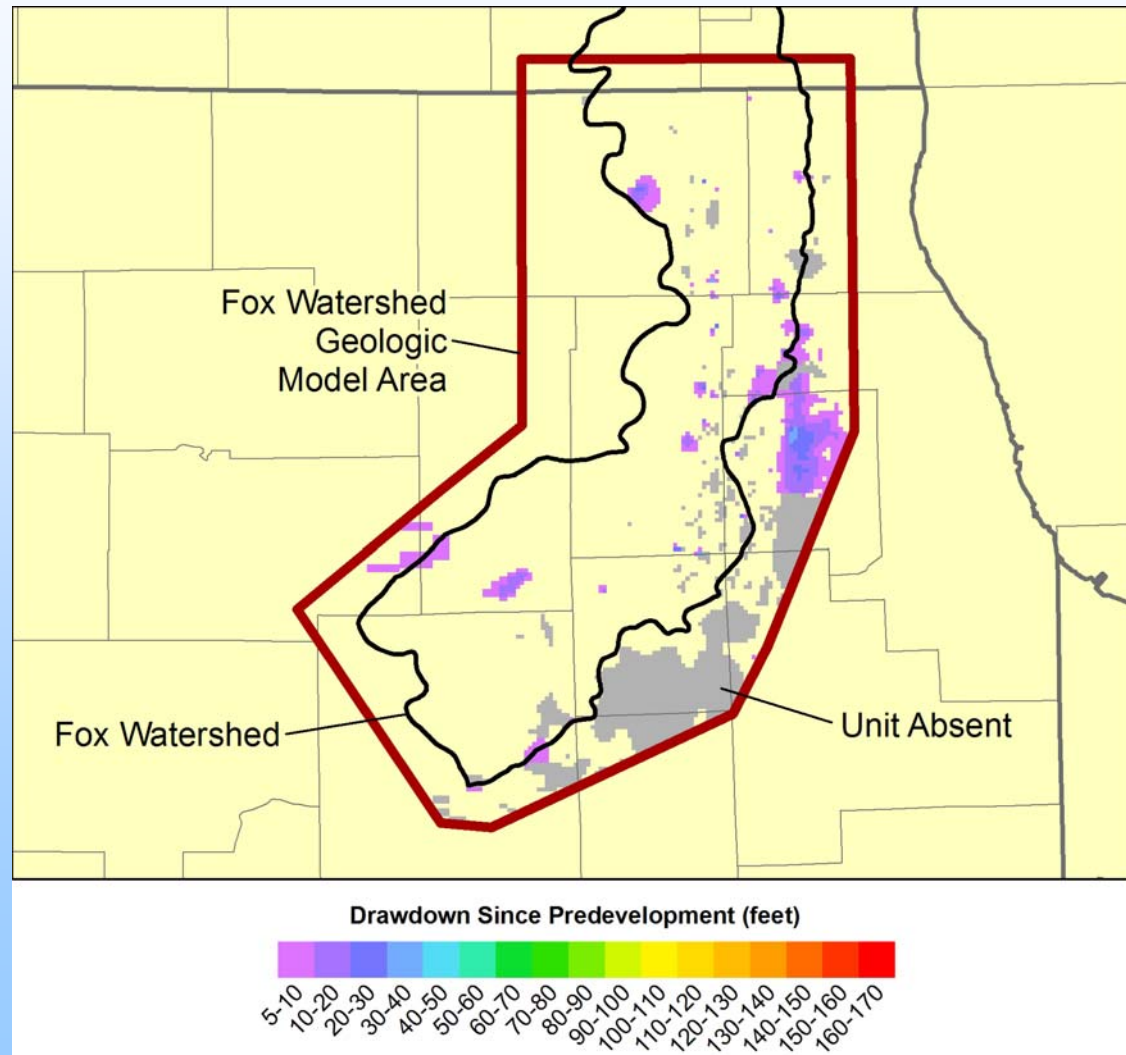
Model runs used pumping rates from the various aquifers based on the proportional split of the 2005 pumping rates – **sources were not shifted if a source ran out or levels went below a certain level**

Results from pumping shallow s/g wells outside the FRB are highly uncertain and not shown – **uncertainties also exist within the FRB**

We have not assessed the shallow bedrock yet or all wells that went “dry”

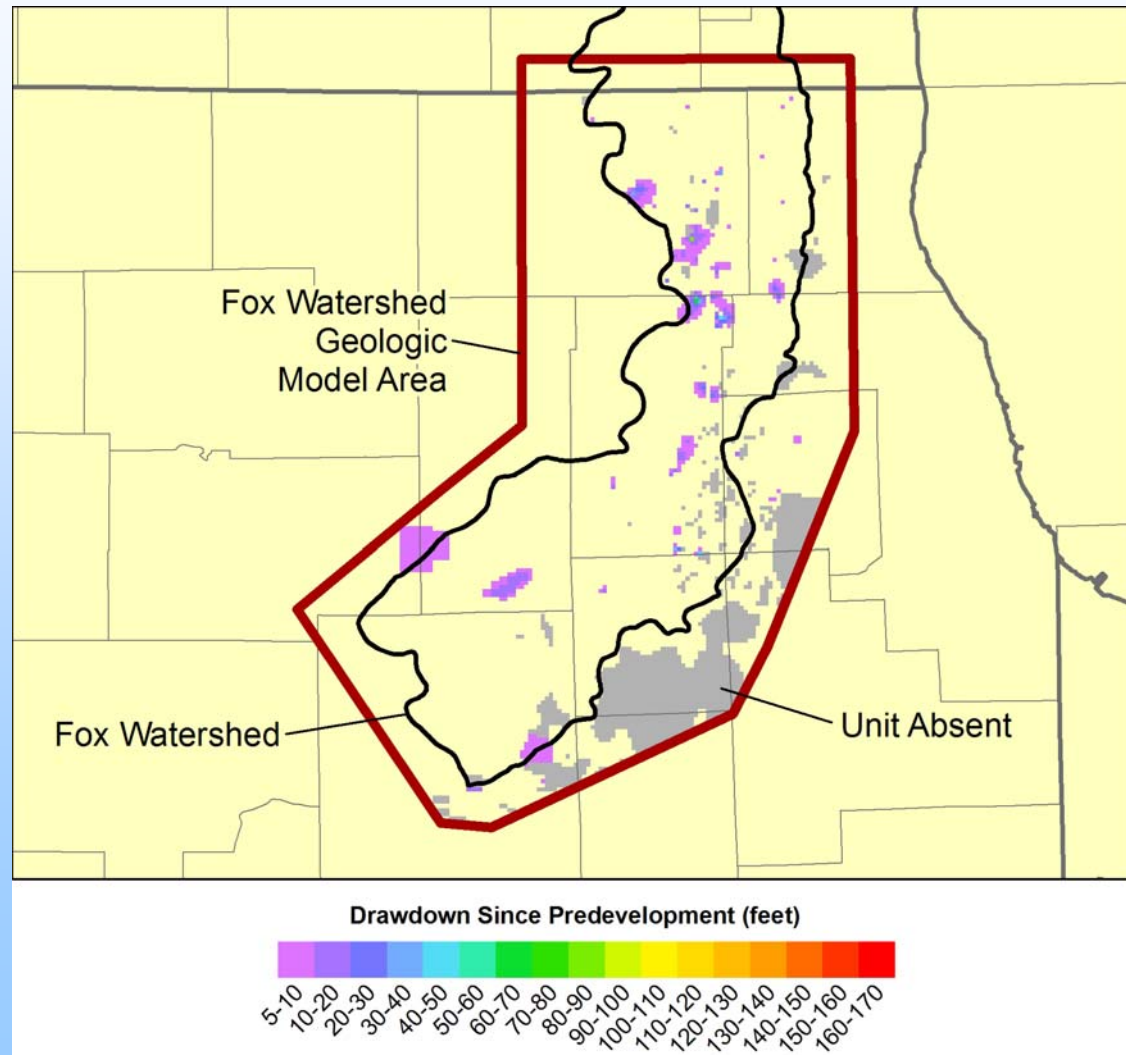
# Drawdown in Quaternary Coarse-Grained Unit 2

*End of Summer Irrigation Season, 1985*



# Drawdown in Quaternary Coarse-Grained Unit 2

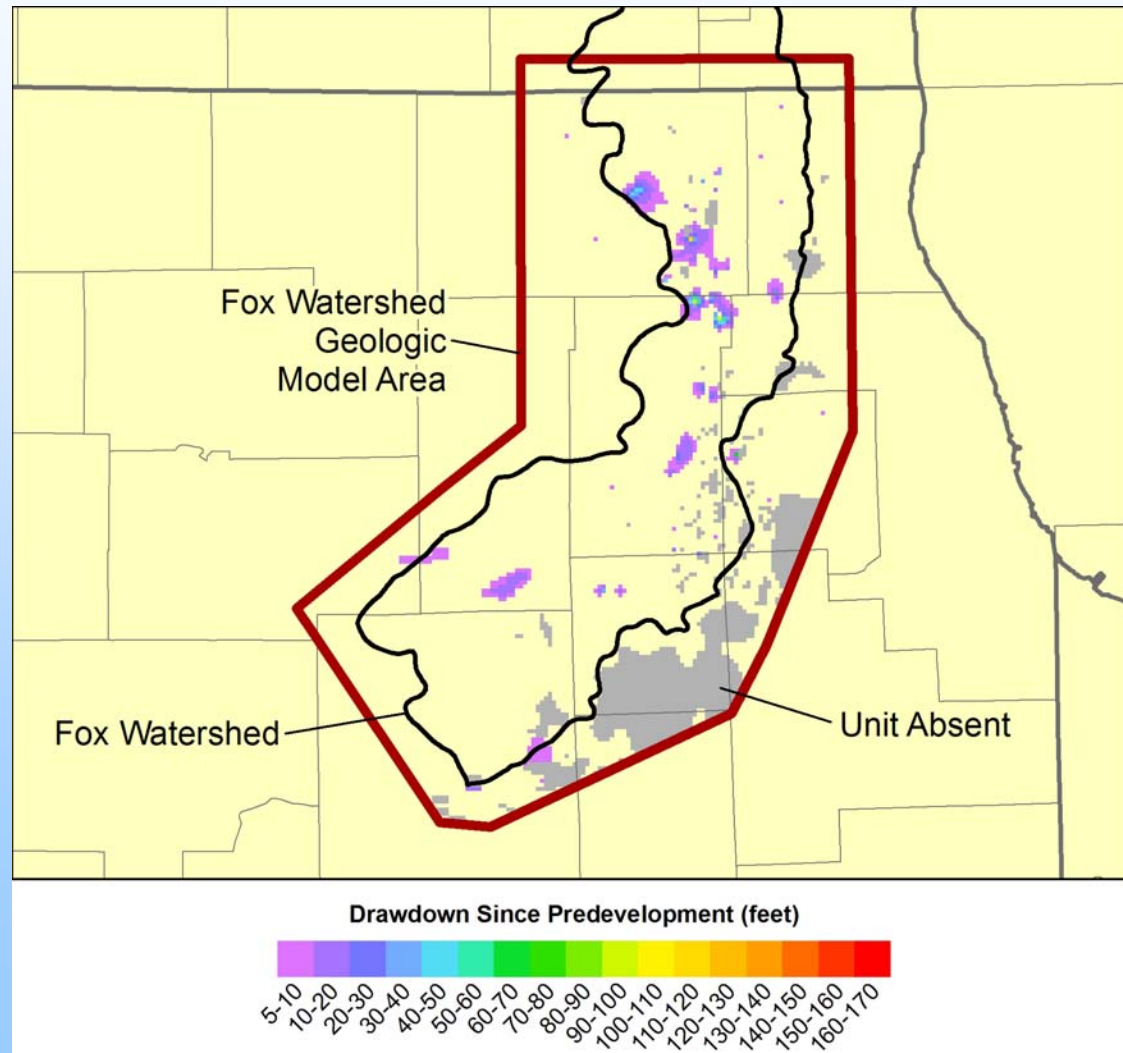
*End of Summer Irrigation Season, 2005*



# Drawdown in Quaternary Coarse-Grained Unit 2

*End of Summer Irrigation Season, 2025*

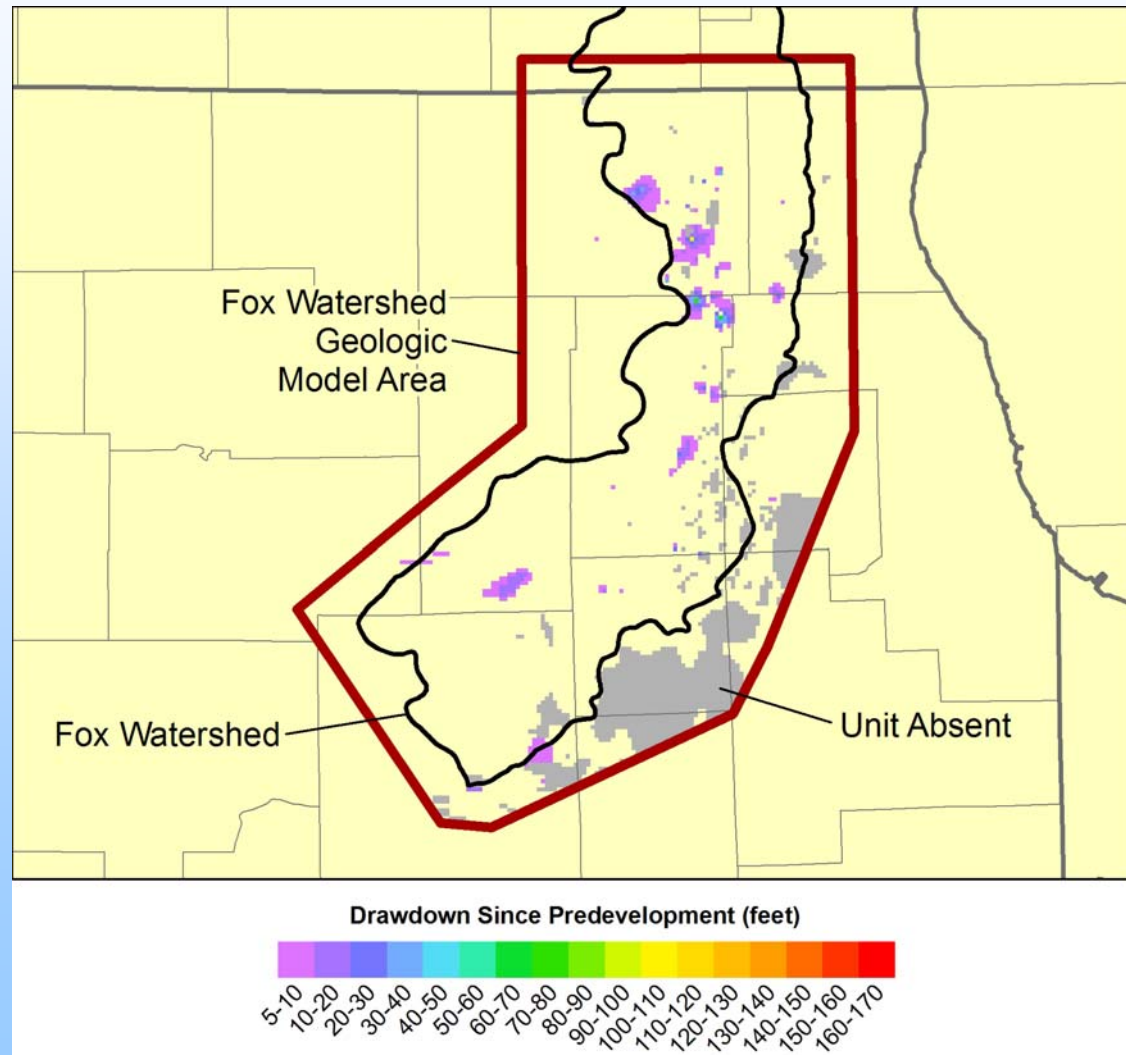
**Baseline Scenario**



# Drawdown in Quaternary Coarse-Grained Unit 2

*End of Summer Irrigation Season, 2025*

***Less Resource-Intensive Scenario***

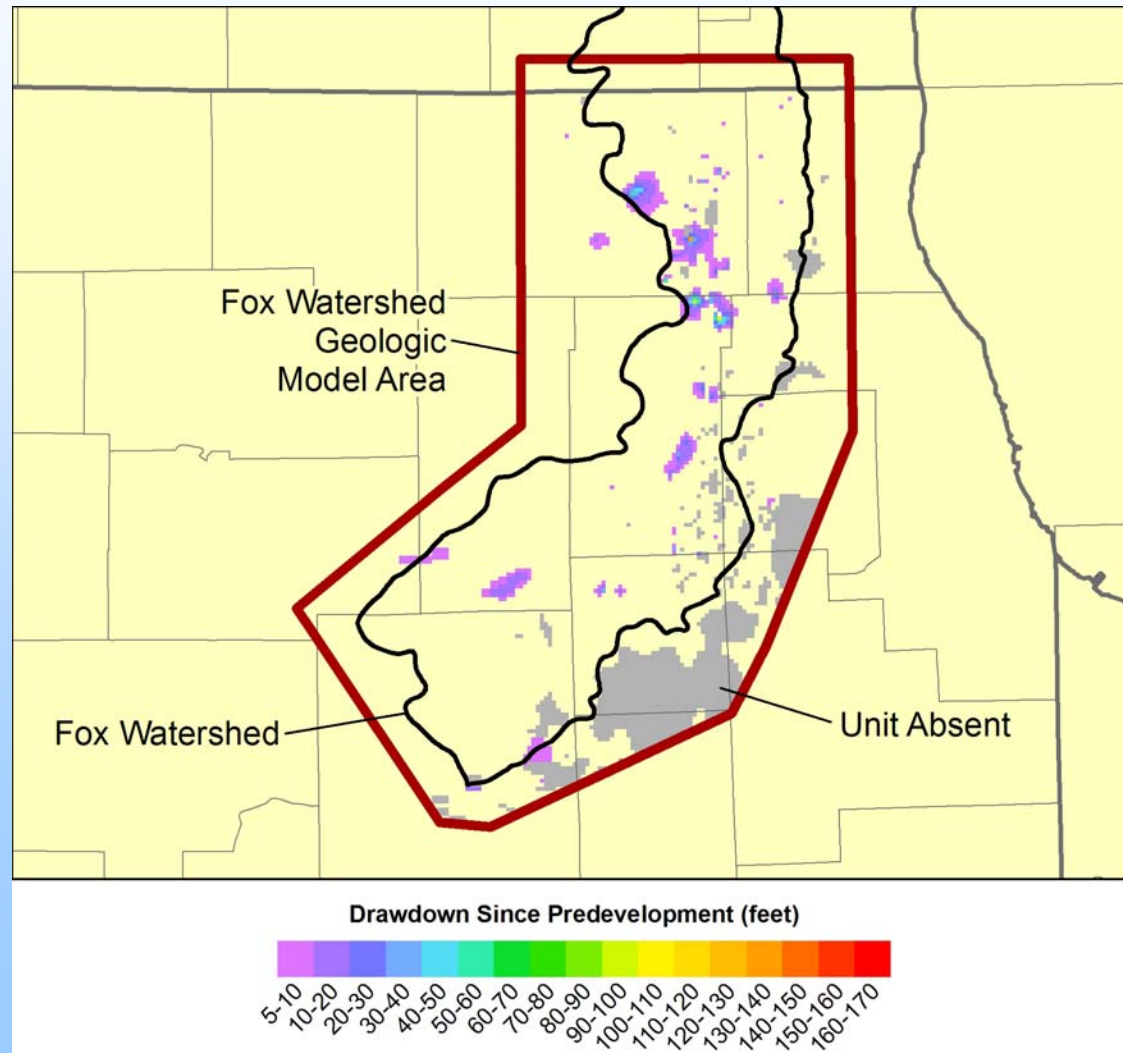




# Drawdown in Quaternary Coarse-Grained Unit 2

*End of Summer Irrigation Season, 2025*

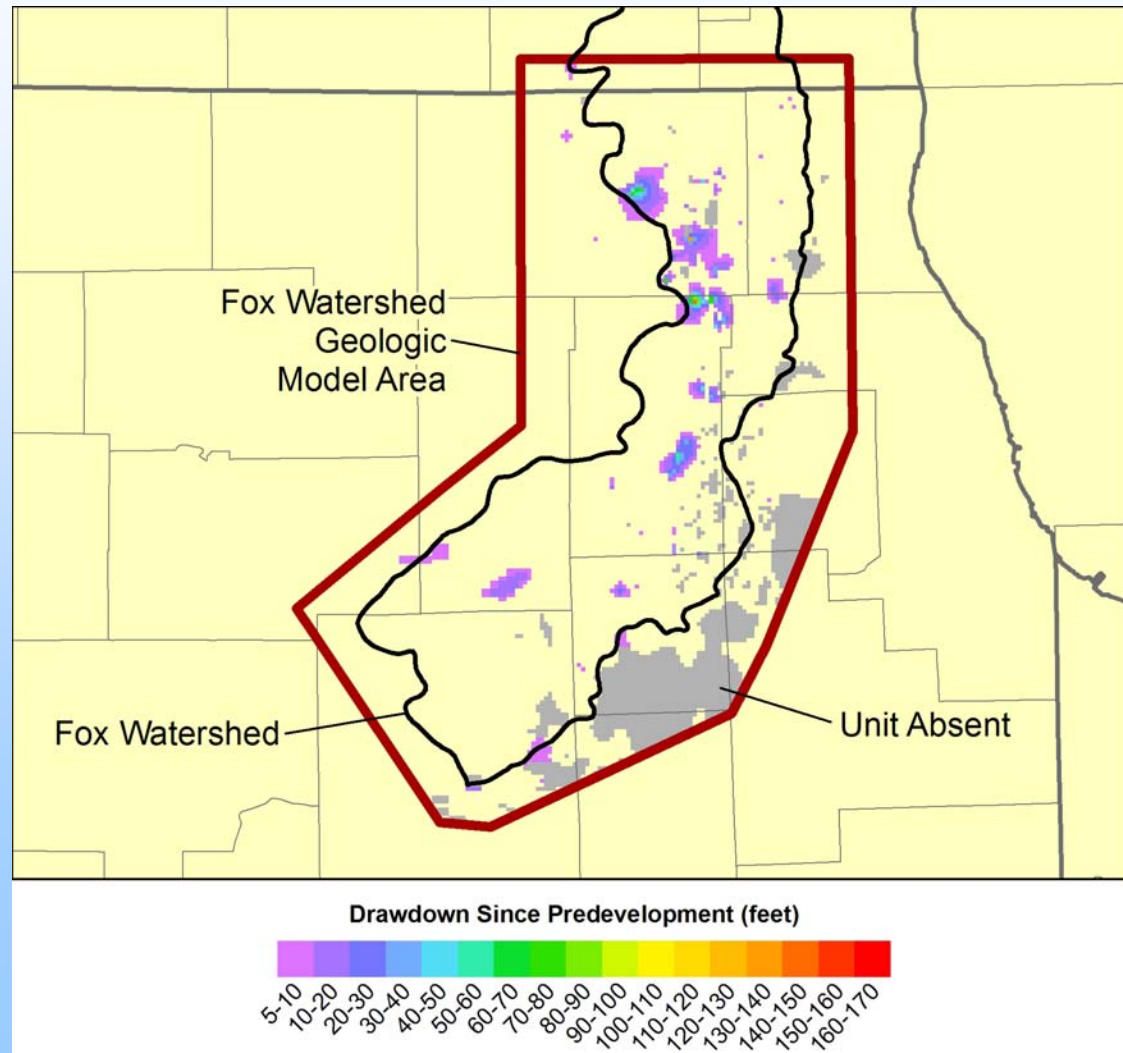
***More Resource-Intensive Scenario***



# Drawdown in Quaternary Coarse-Grained Unit 2

*End of Summer Irrigation Season, 2050*

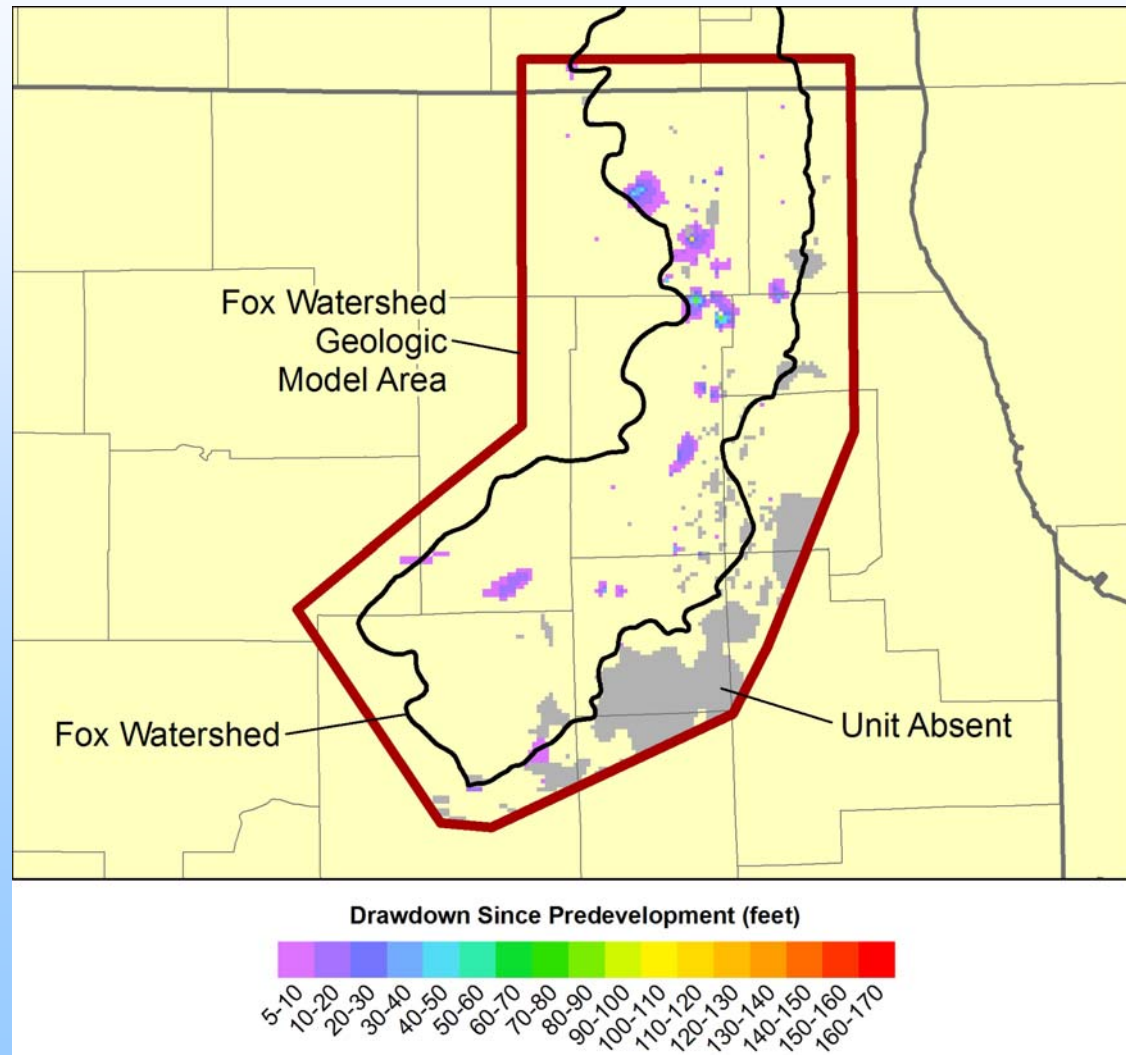
***Baseline Scenario***



# Drawdown in Quaternary Coarse-Grained Unit 2

*End of Summer Irrigation Season, 2050*

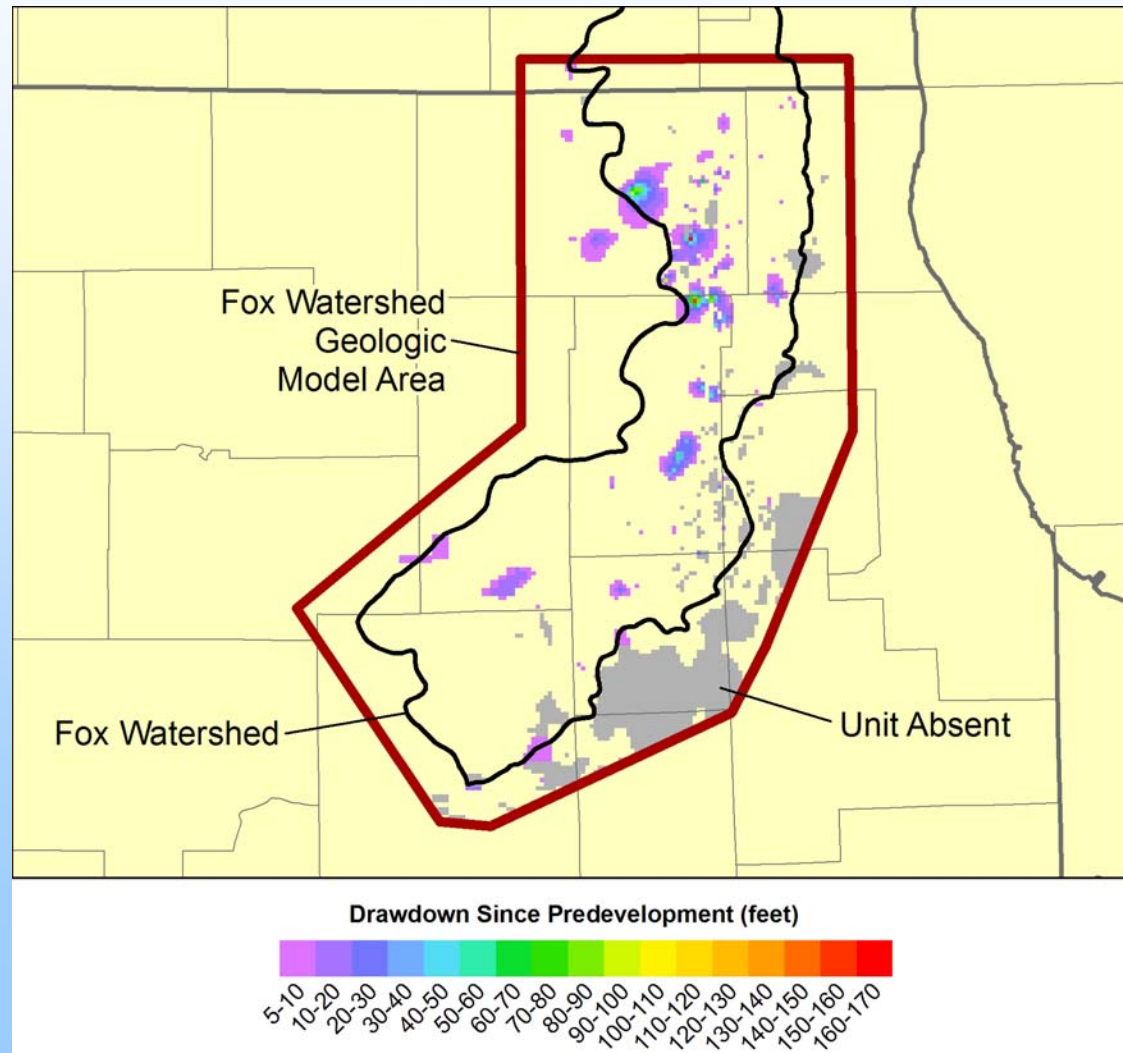
***Less Resource-Intensive Scenario***



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*End of Summer Irrigation Season, 2050*

***More Resource-Intensive Scenario***



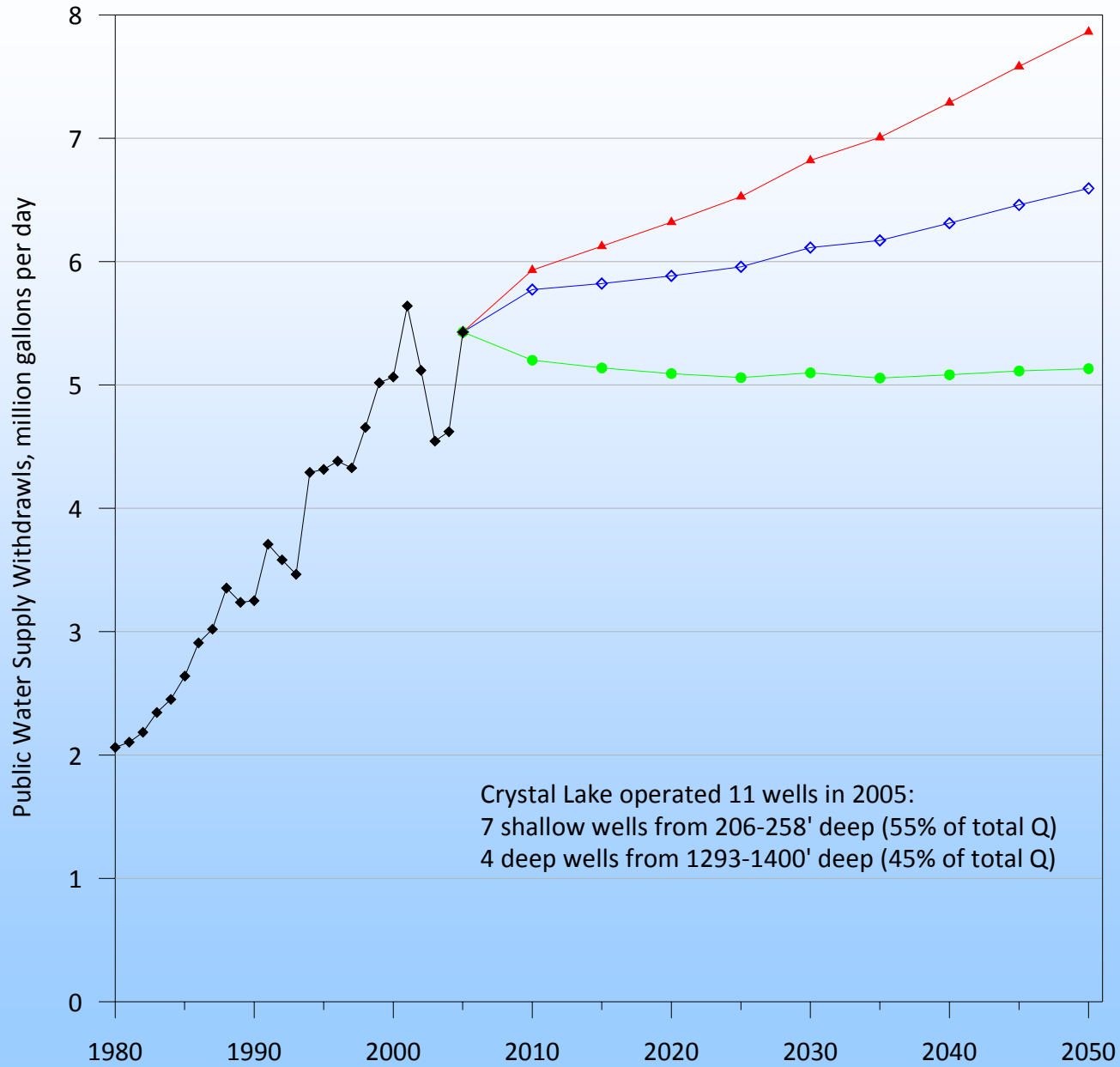
# Simulated Hydrograph Locations

- Coarse-Grained Unit 2 (Model Layer 5)
- “Deep” Bedrock Ancell & Ironton-Galesville Units (Model Layers 14 & 17)



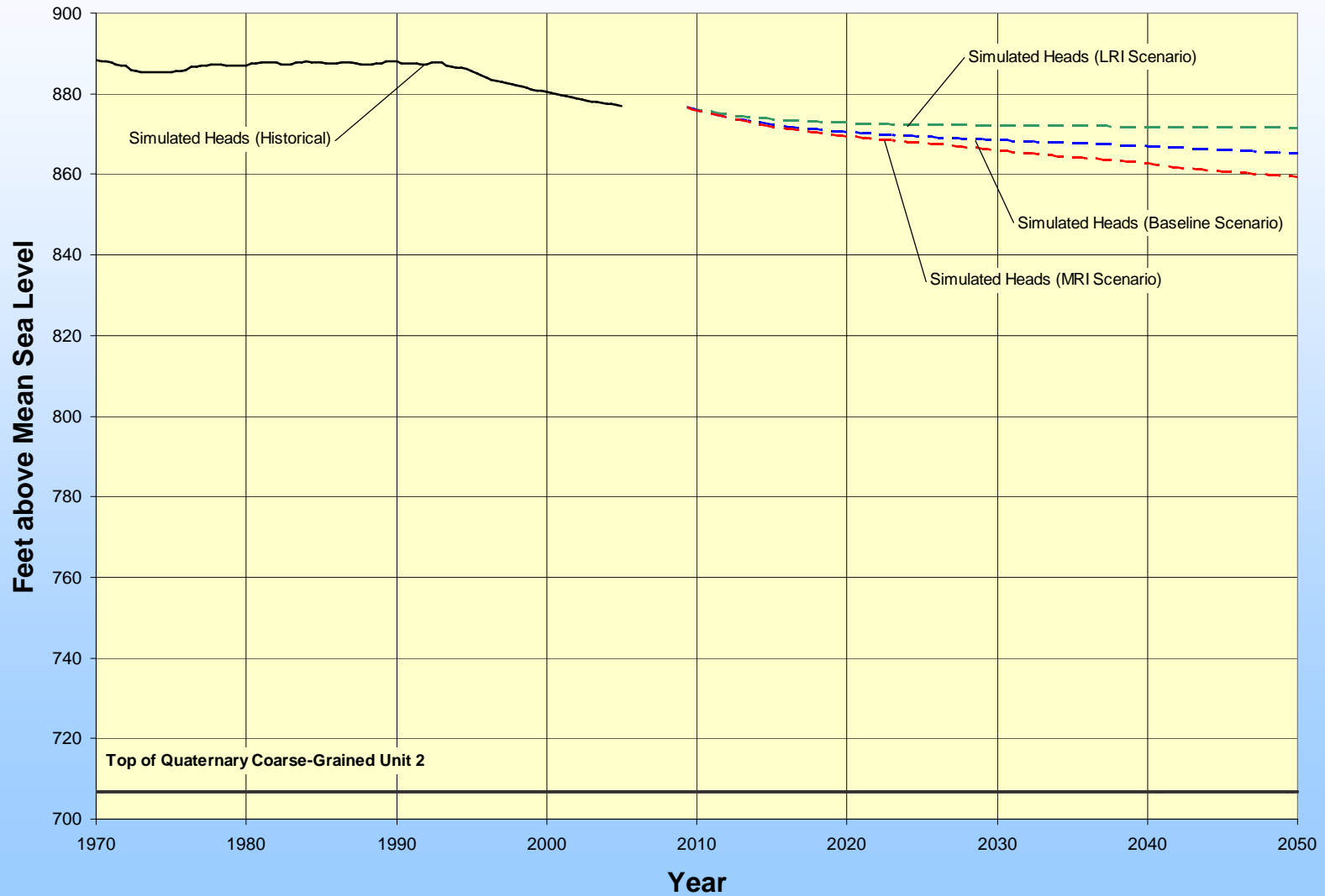
# Crystal Lake PWS Withdrawals

1980 - 2050



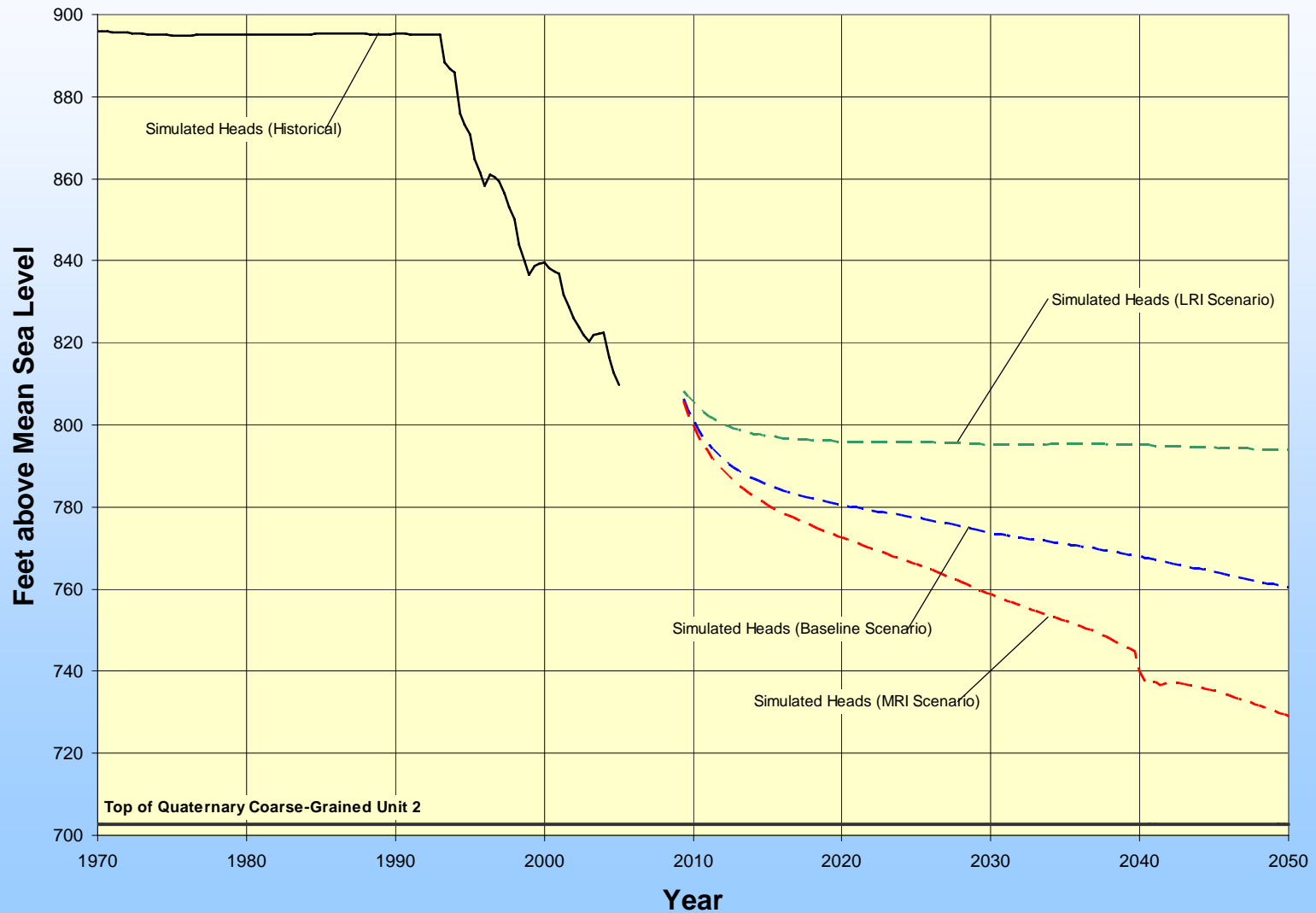
# Crystal Lake Area

## Quaternary Coarse-Grained Unit 2



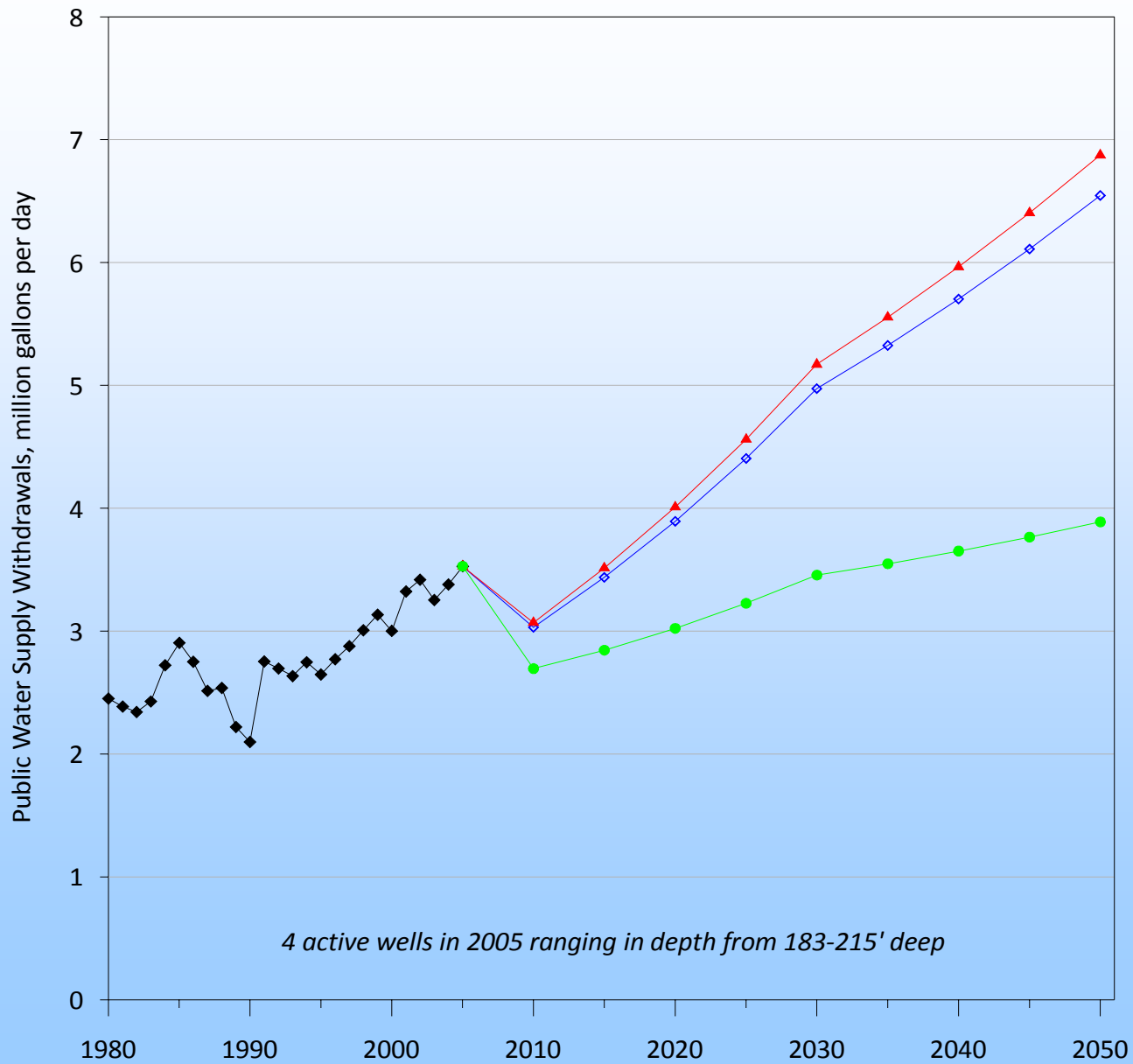
# Crystal Lake Cone Center

## Quaternary Coarse-Grained Unit 2



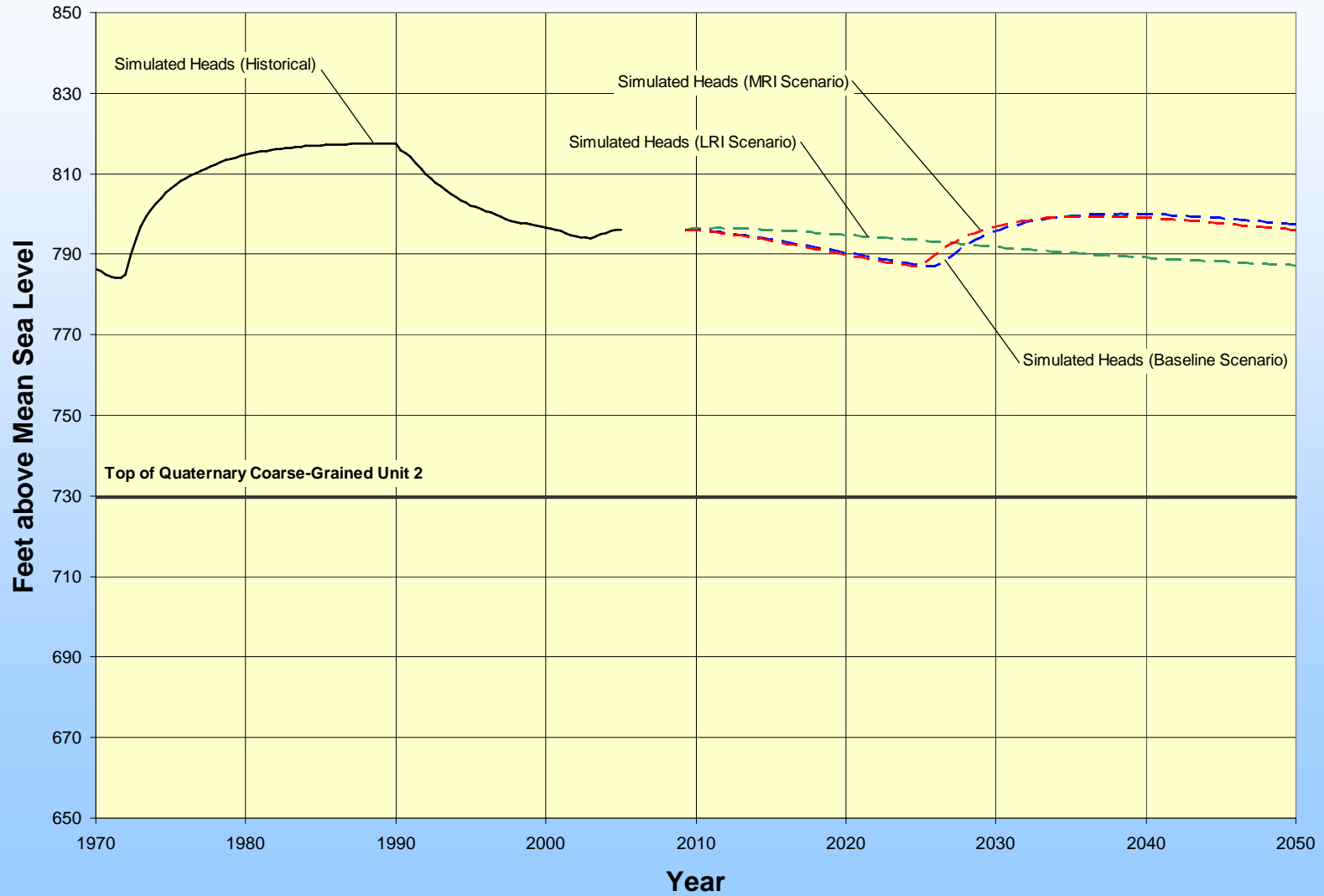


### Carpentersville PWS Withdrawals 1980 - 2050



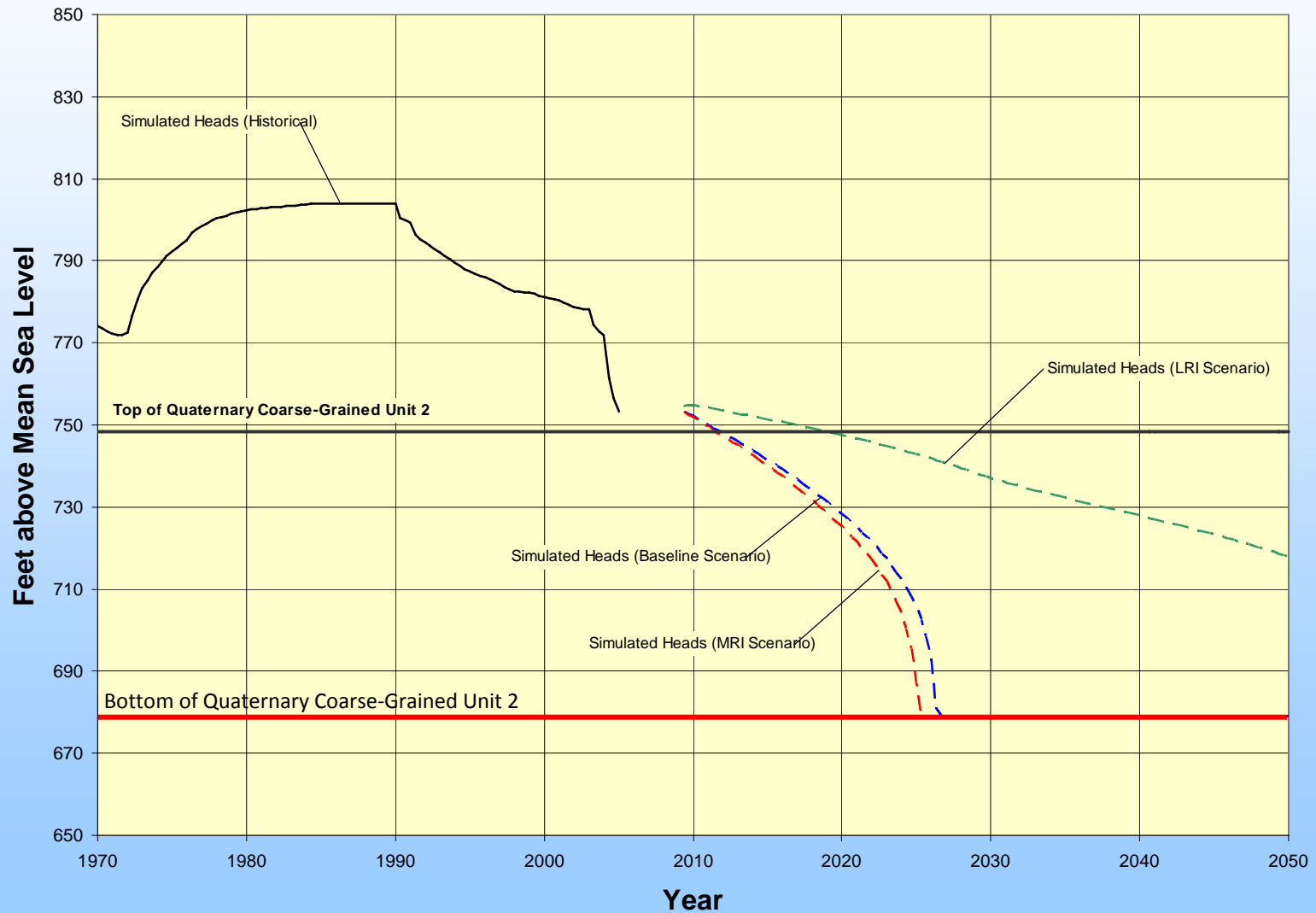
# Carpentersville

## Quaternary Coarse-Grained Unit 2

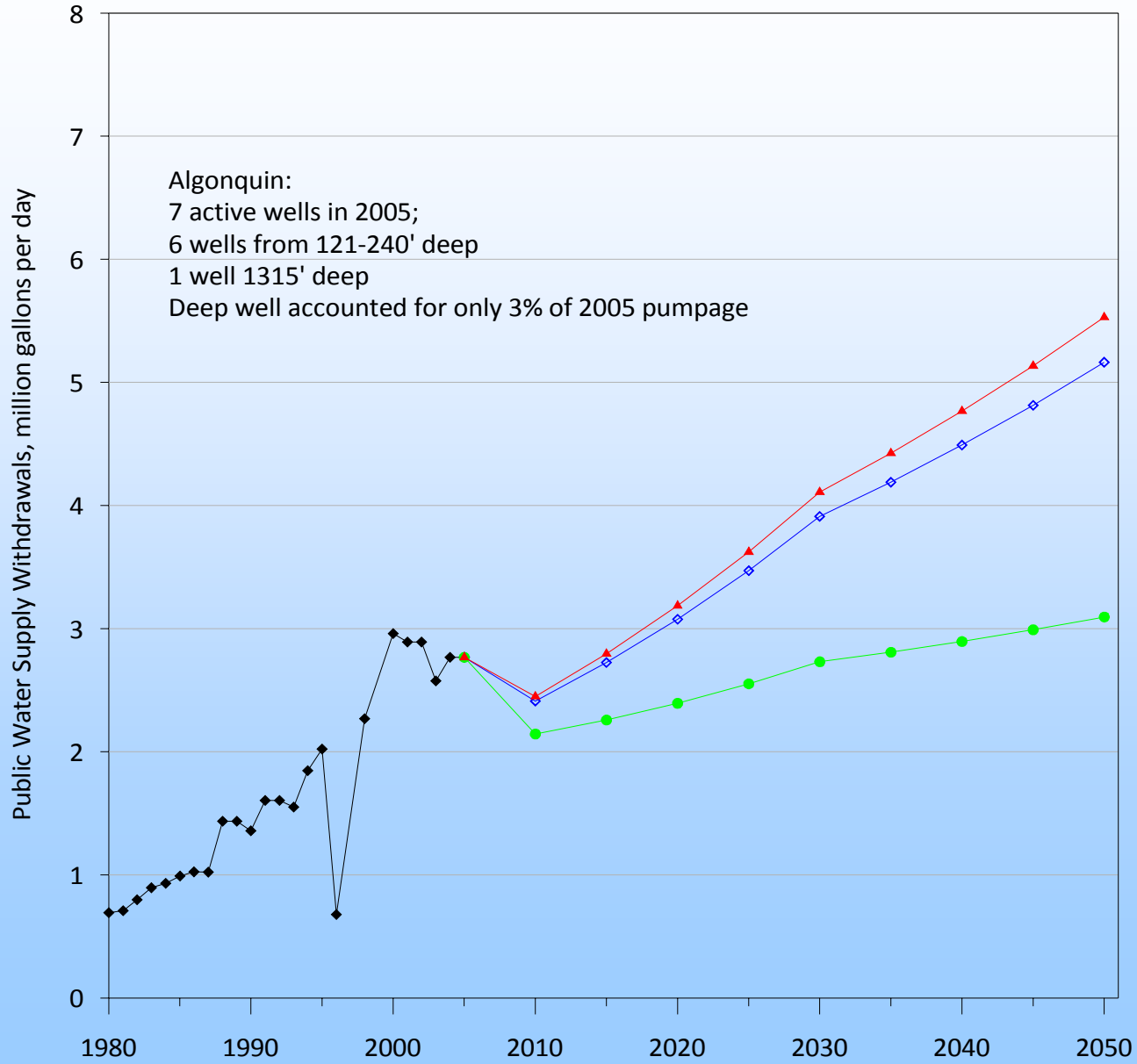


# Carpentersville Cone Center

## Quaternary Coarse-Grained Unit 2

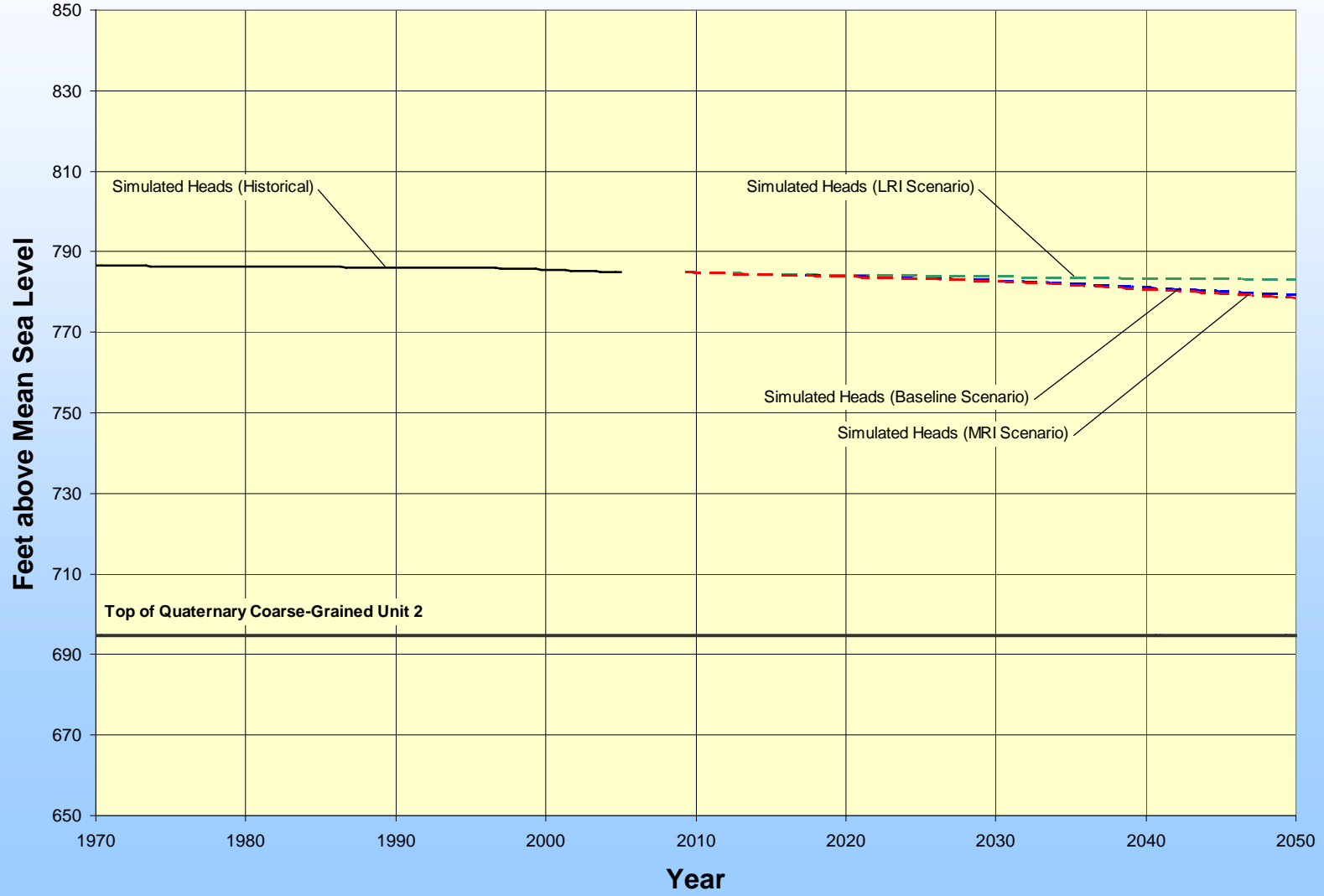


### Algonquin PWS Withdrawals 1980 - 2050



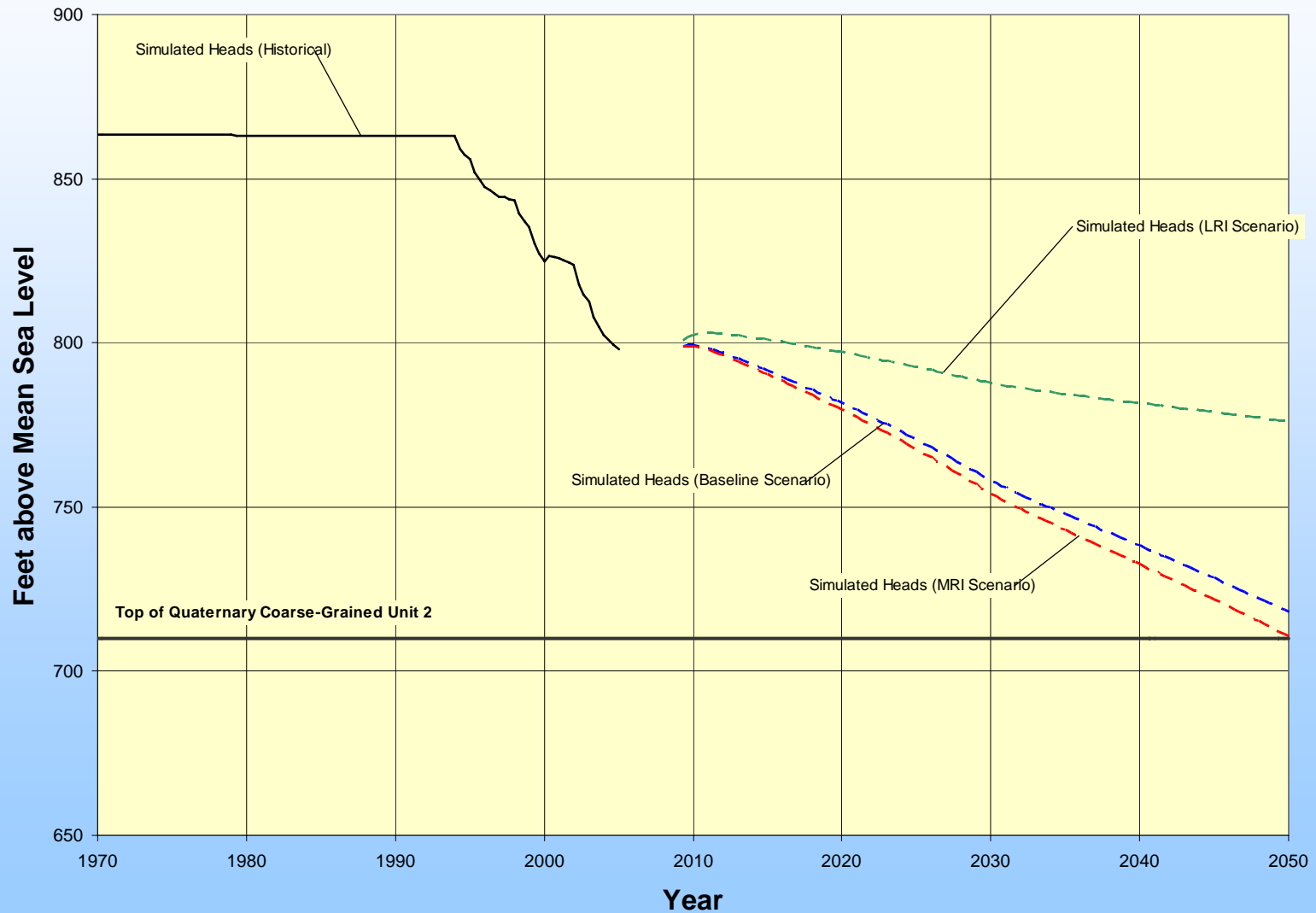
# Algonquin

## Quaternary Coarse-Grained Unit 2



# Algonquin Cone Center

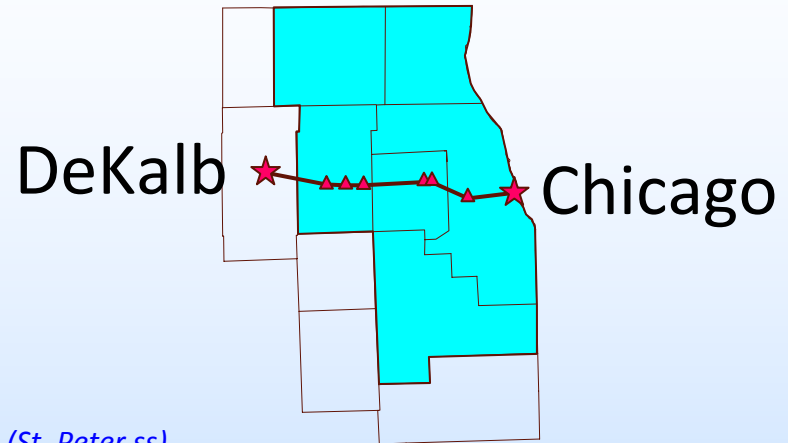
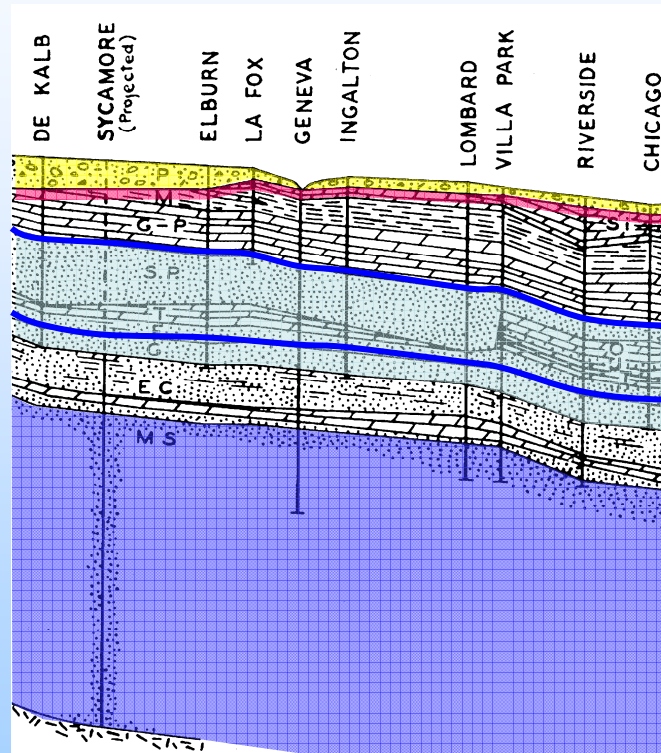
## Quaternary Coarse-Grained Unit 2



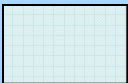
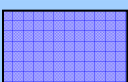


# Aquifers of Northeastern Illinois

West

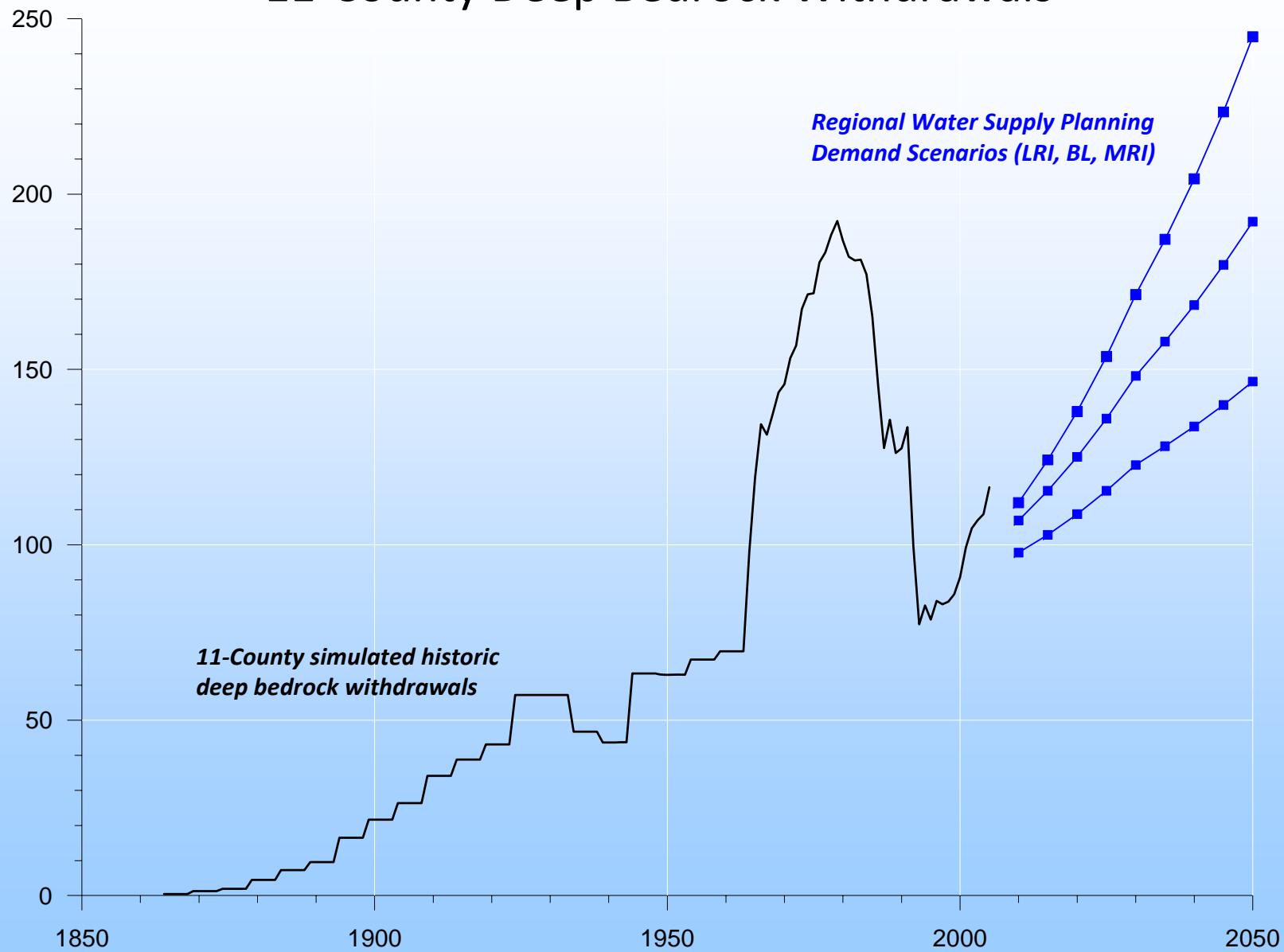
East



-  Unconsolidated Aquifer System
-  Shallow Bedrock Aquifer
-  Deep Bedrock Aquifer System  
(Ancell and Ironton-Galesville sandstones)
-  Elmhurst-Mt. Simon Aq. (saline?)

Cross-Section Modified from Bretz (1939)

# 11-County Deep Bedrock Withdrawals



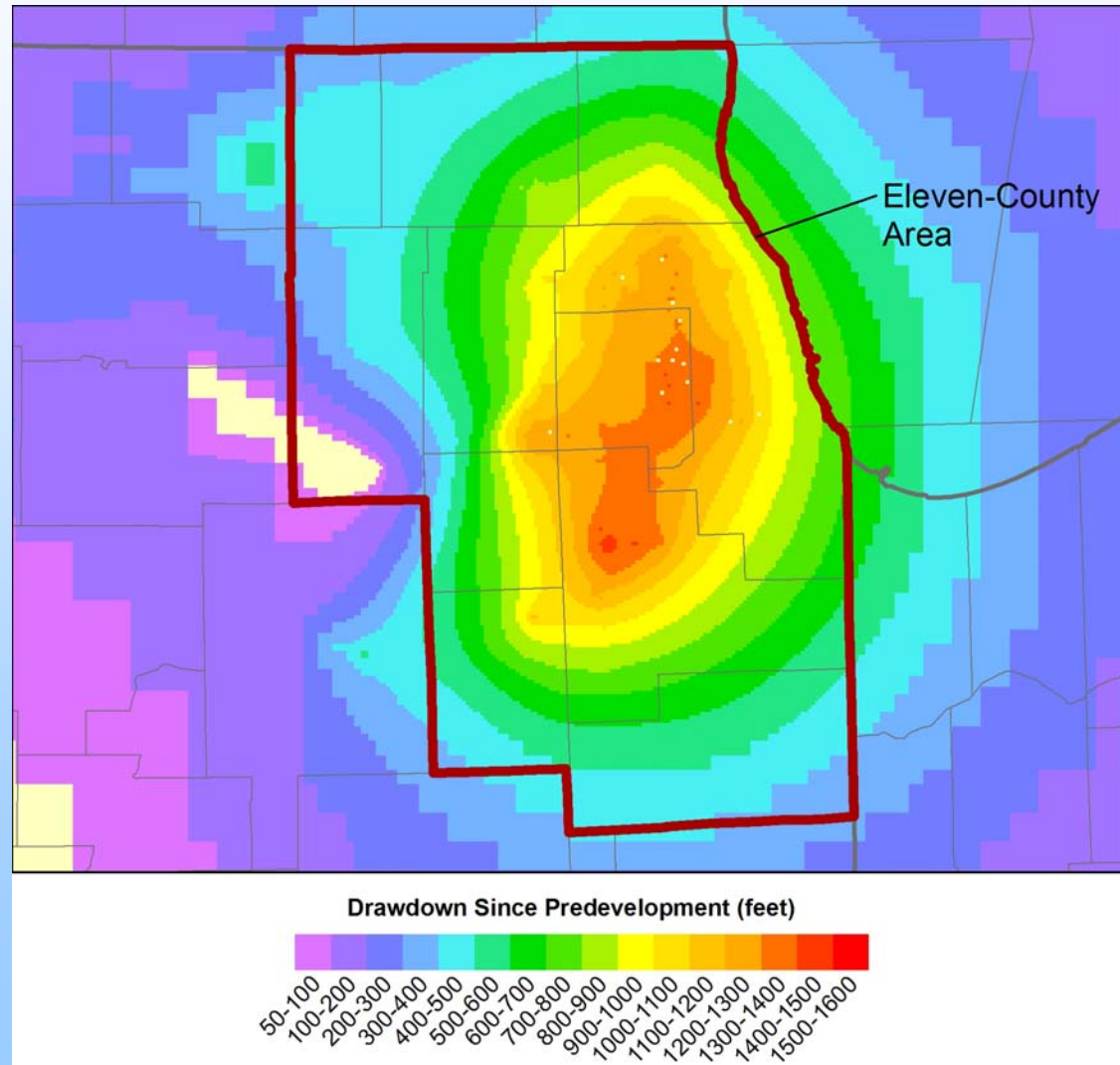
*11-County simulated historic deep bedrock withdrawals*

*Regional Water Supply Planning Demand Scenarios (LRI, BL, MRI)*



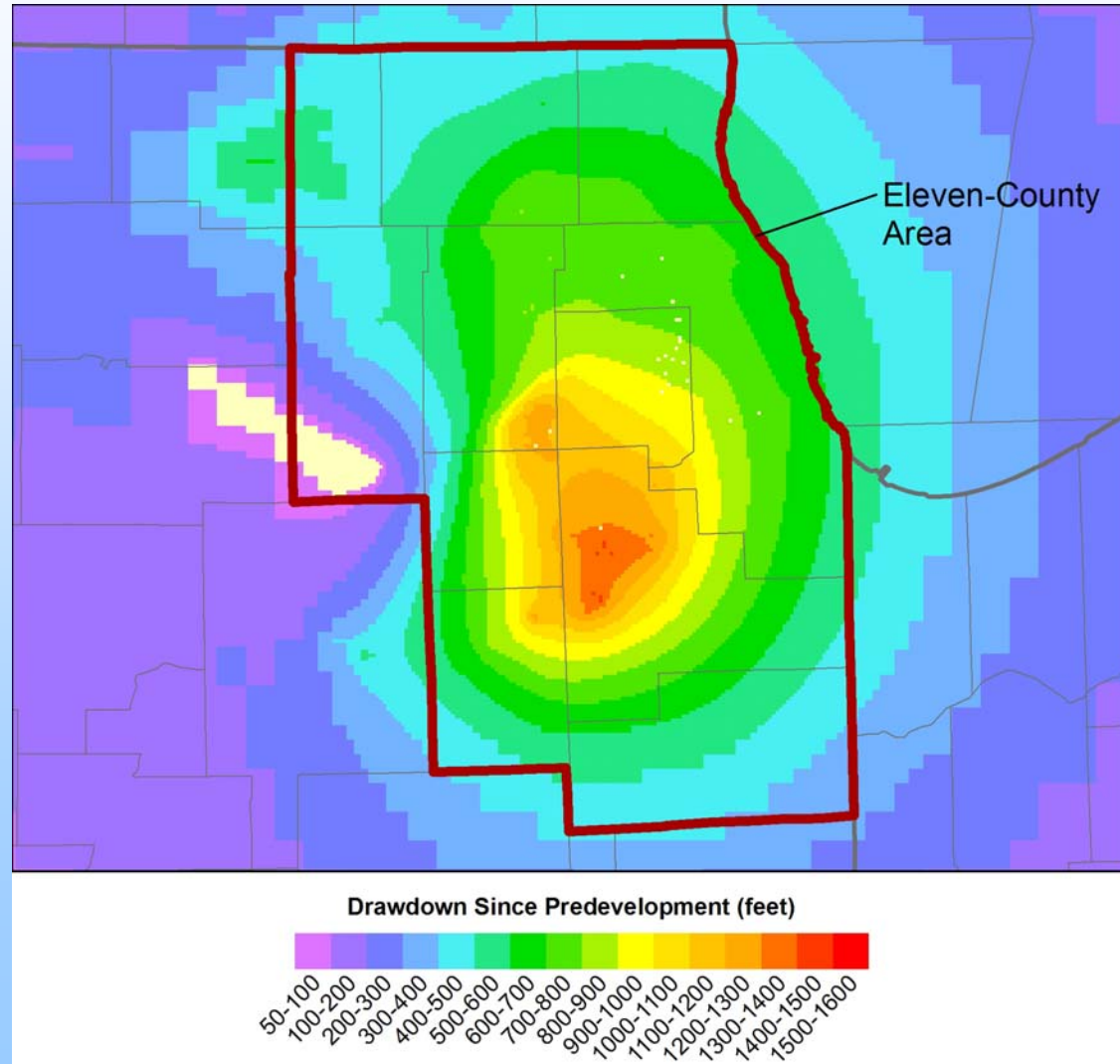
# Drawdown in the Ironton-Galesville Unit

*End of Summer Irrigation Season, 1985*



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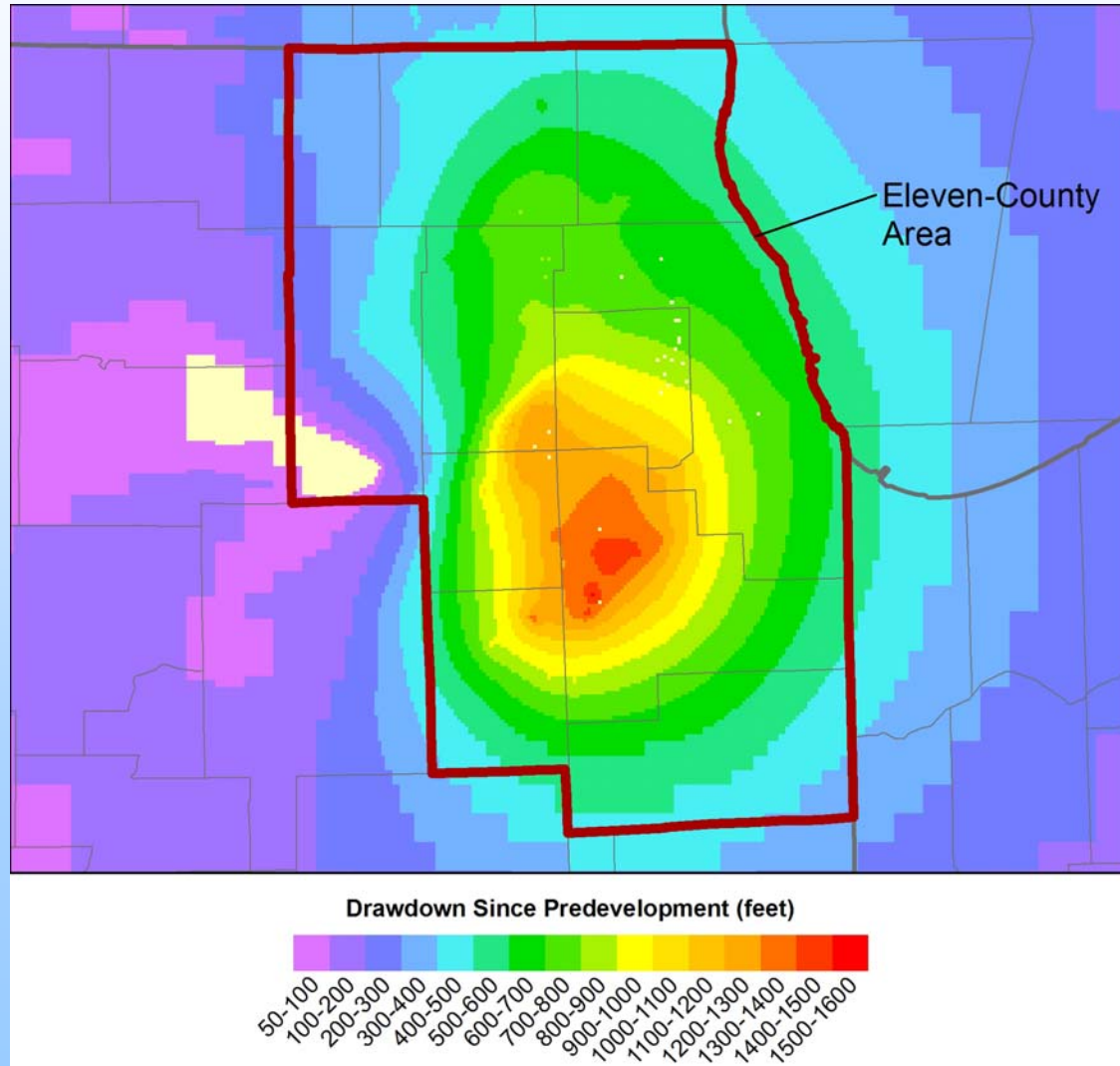
*End of Summer Irrigation Season, 2005*



# Drawdown in the Ironton-Galesville Unit

*End of Summer Irrigation Season, 2025*

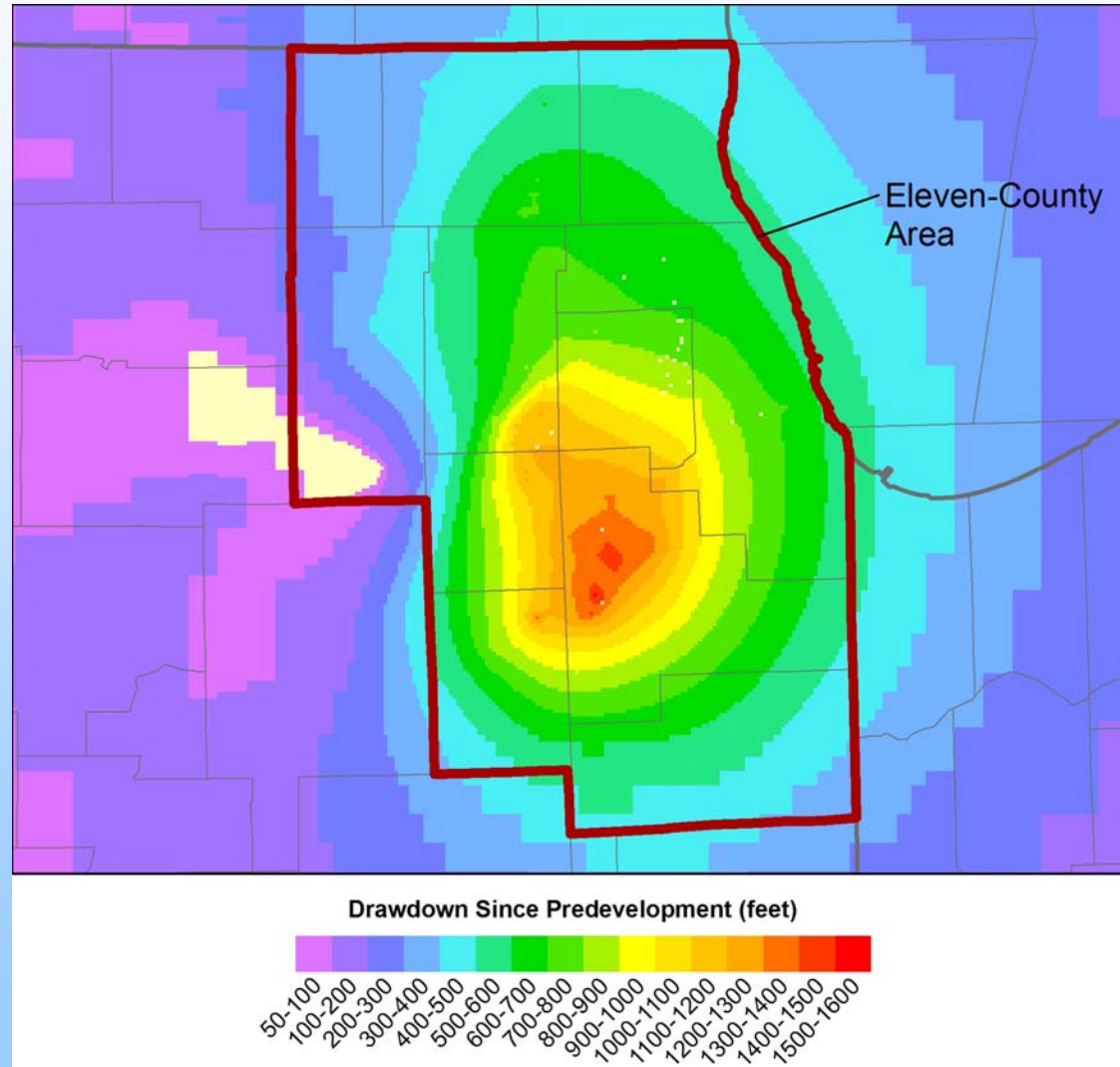
***Baseline Scenario***



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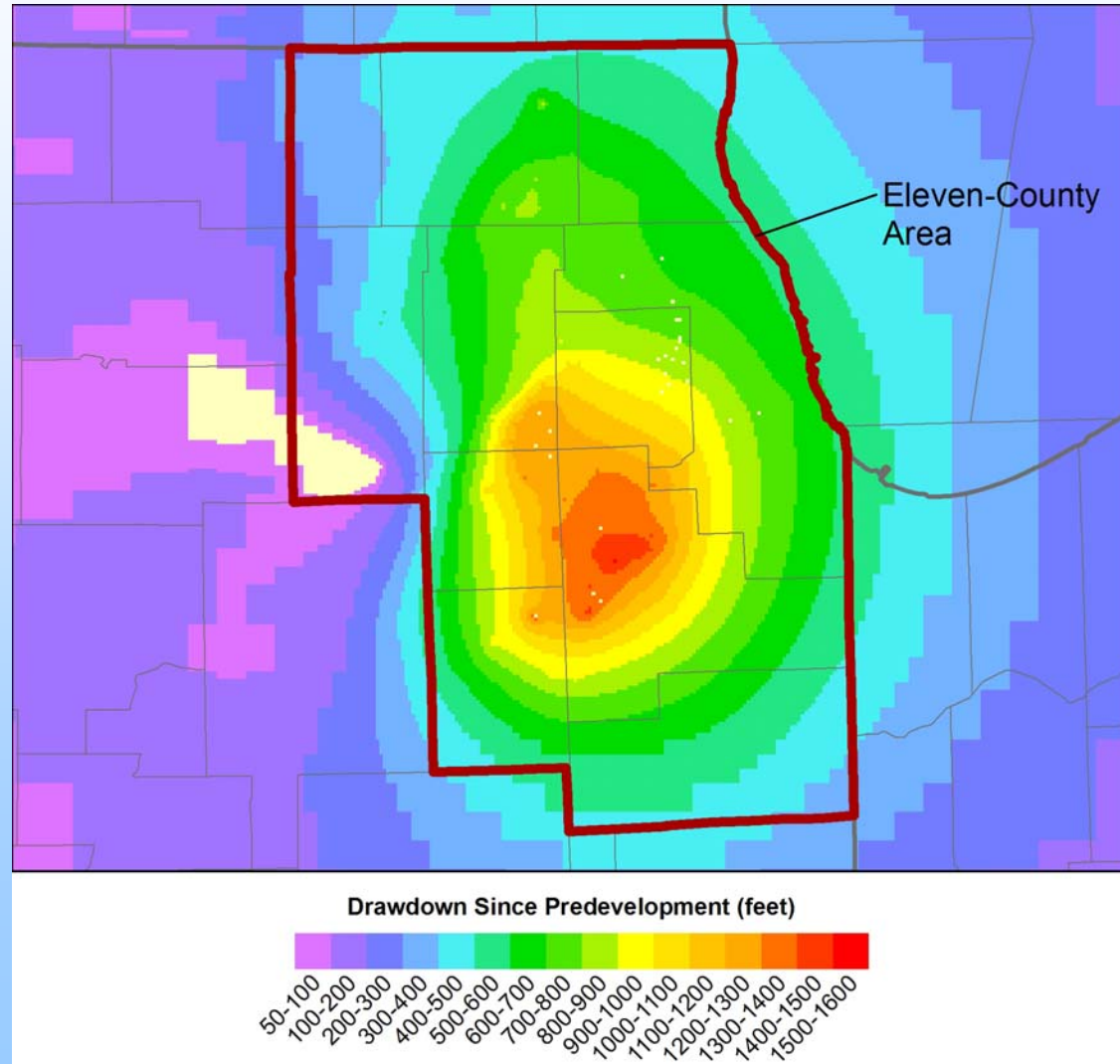
***Less Resource-Intensive Scenario***



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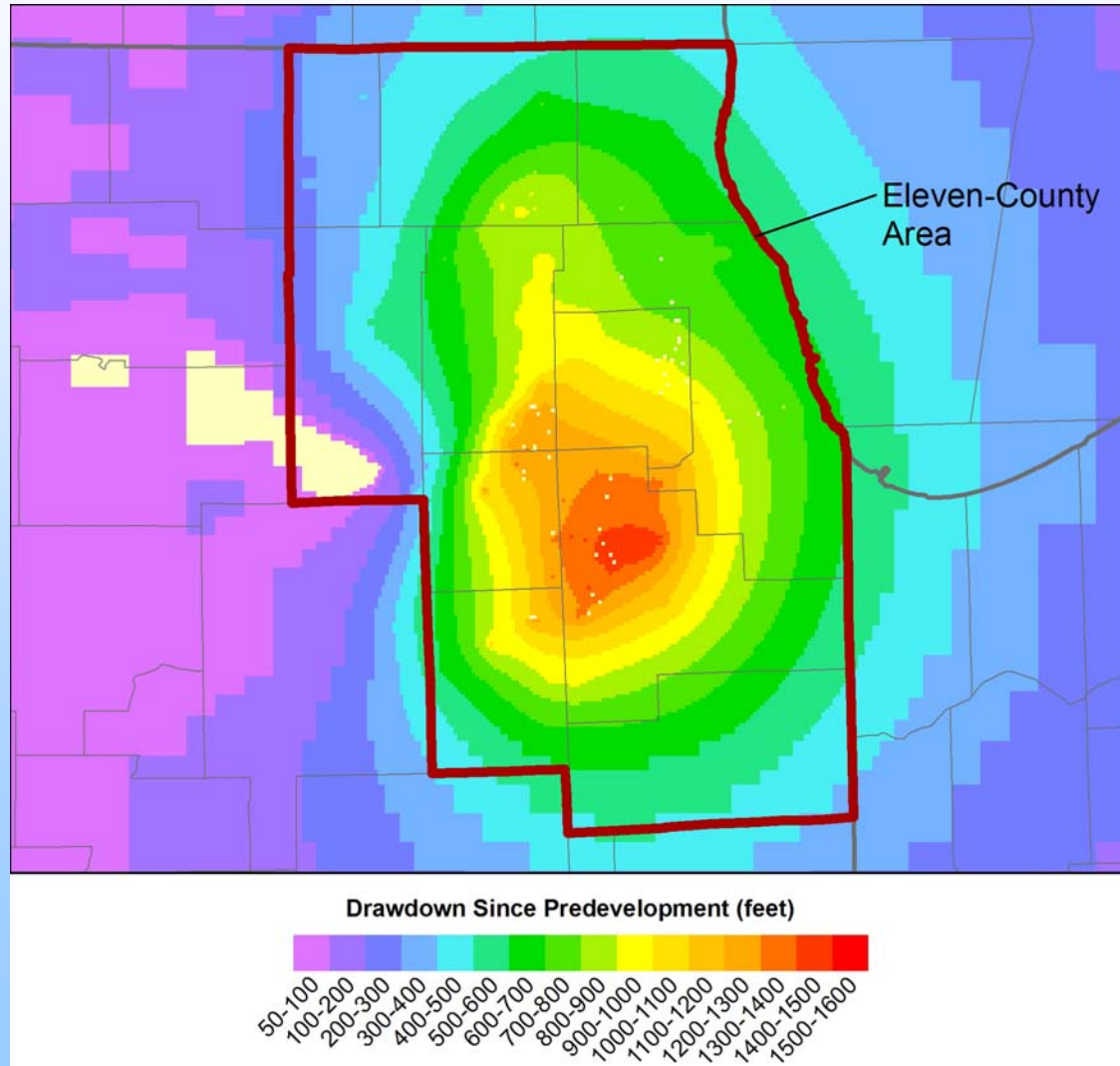
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# Drawdown in the Ironton-Galesville Unit

*End of Summer Irrigation Season, 2050*

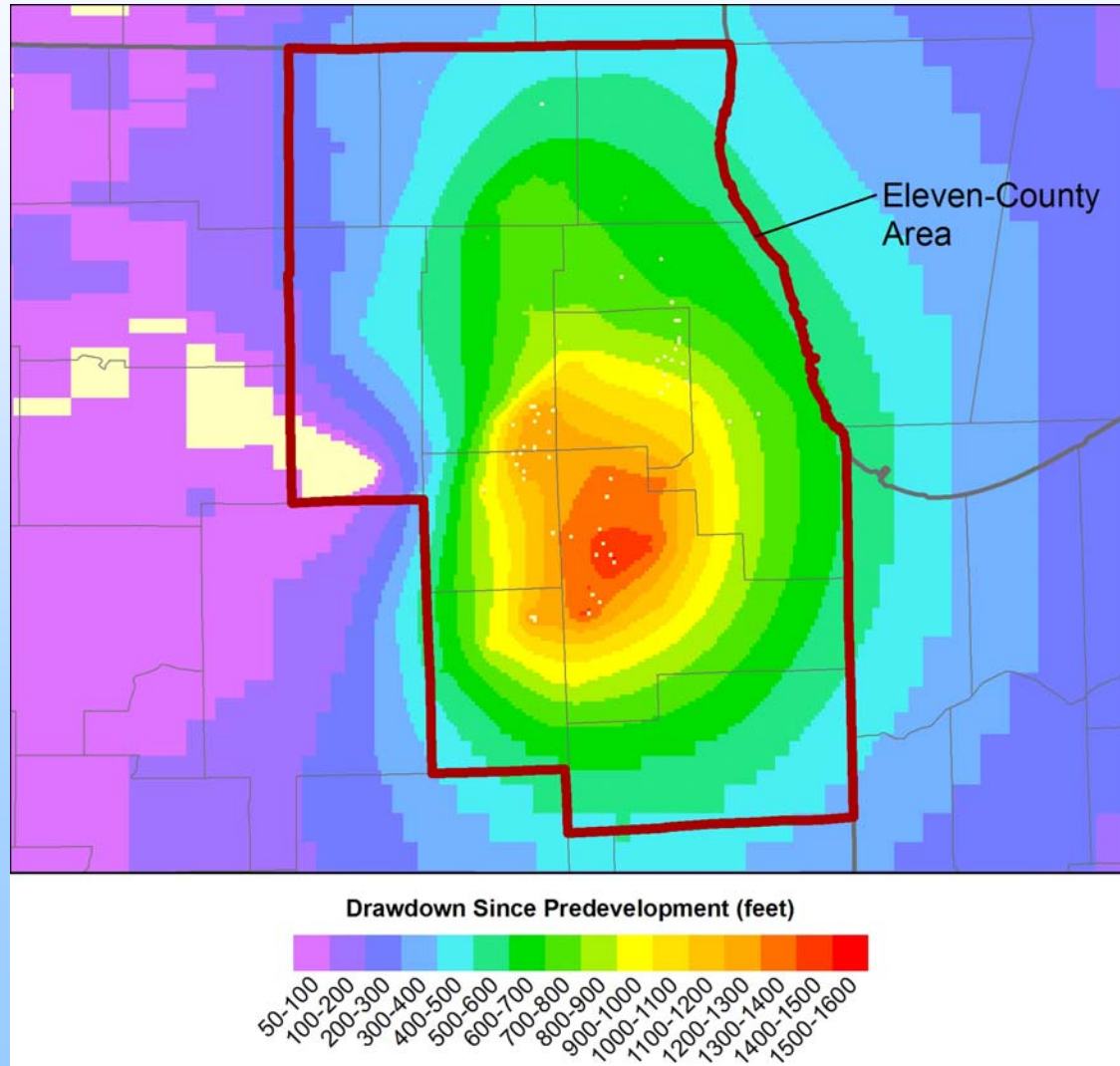
***Baseline Scenario***



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*End of Summer Irrigation Season, 2050*

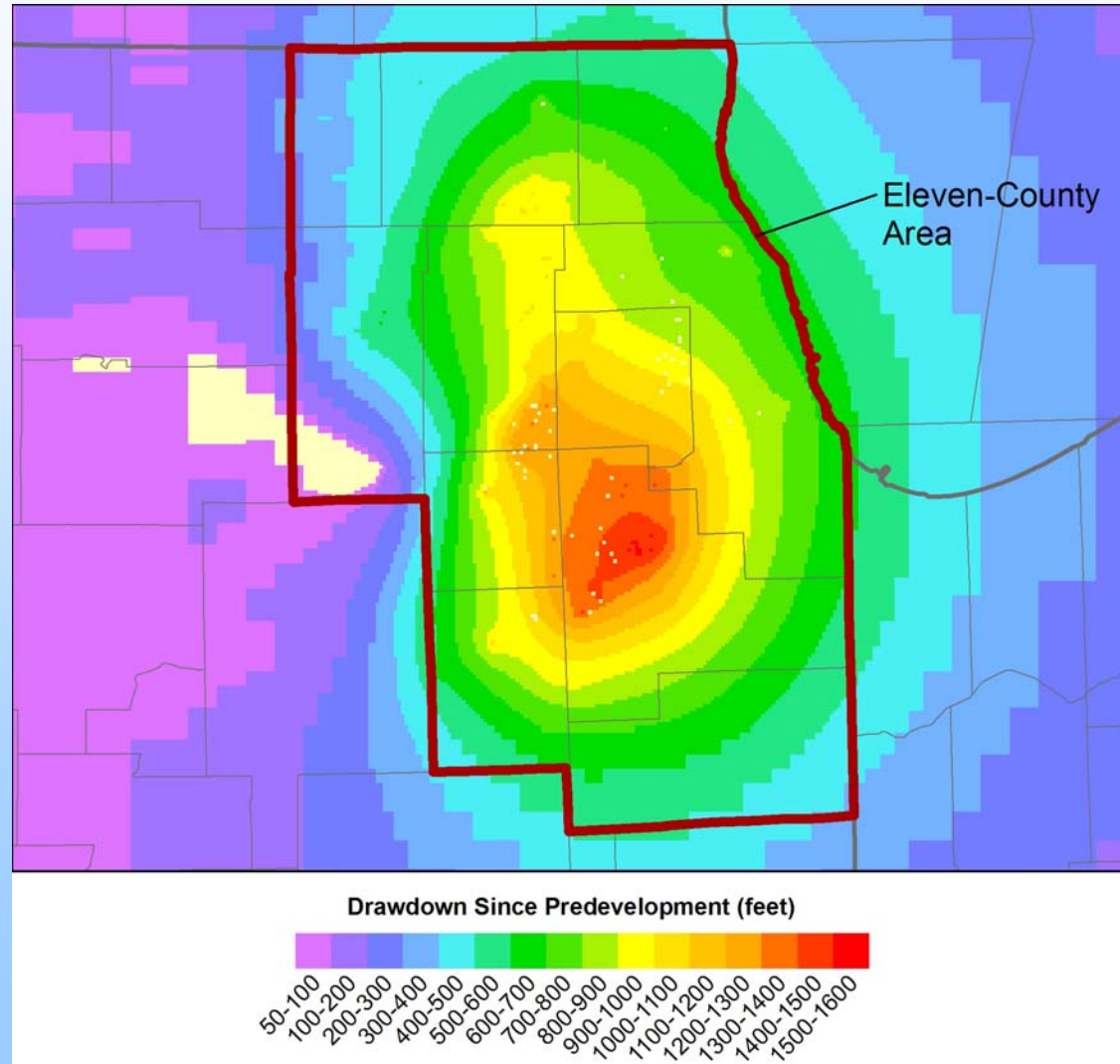
***Less Resource-Intensive Scenario***



# Drawdown in the Ironton-Galesville Unit

*End of Summer Irrigation Season, 2050*

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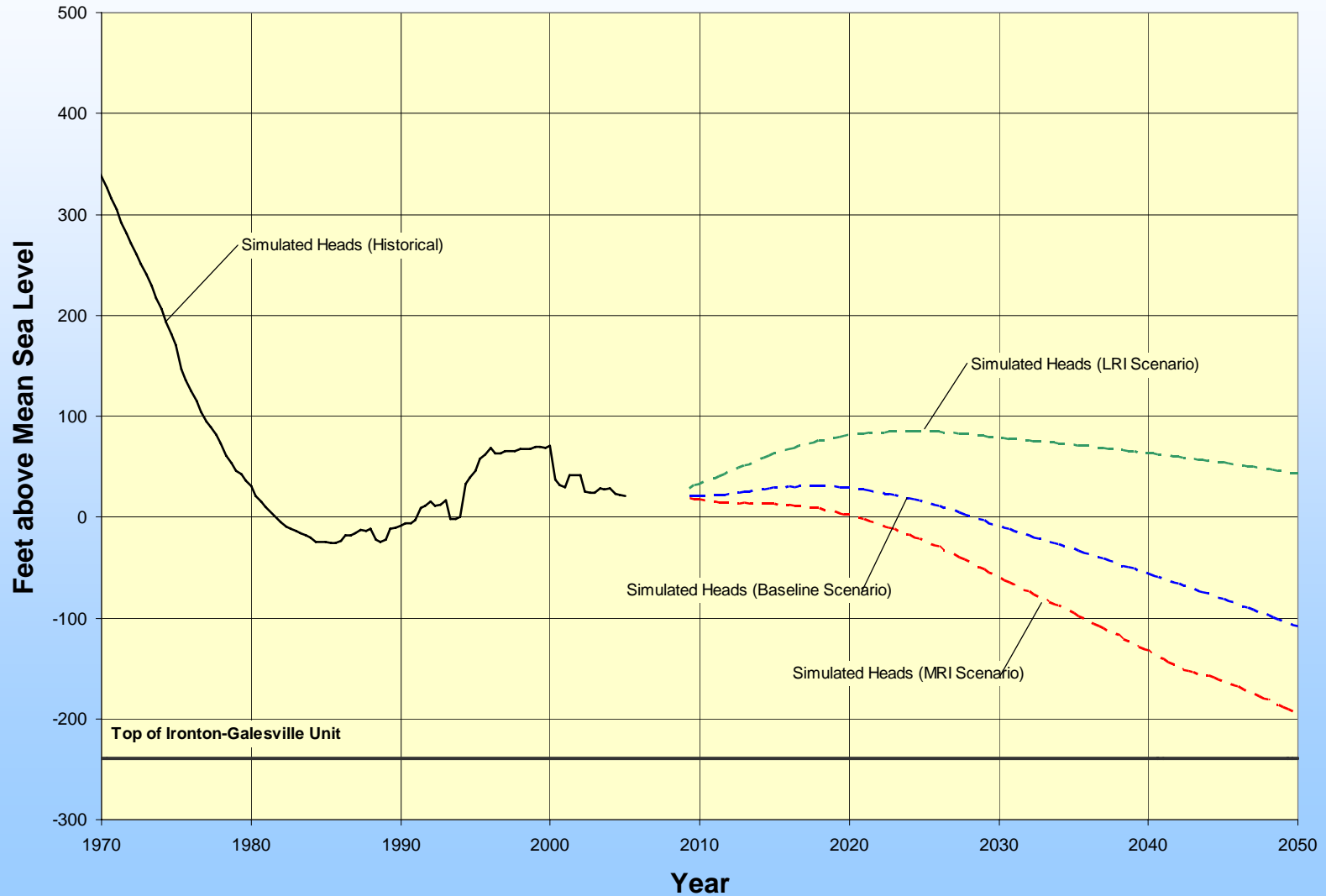
# Simulated Hydrograph Locations

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- “Deep” Bedrock Ironton-Galesville Unit (Model Layer 17)



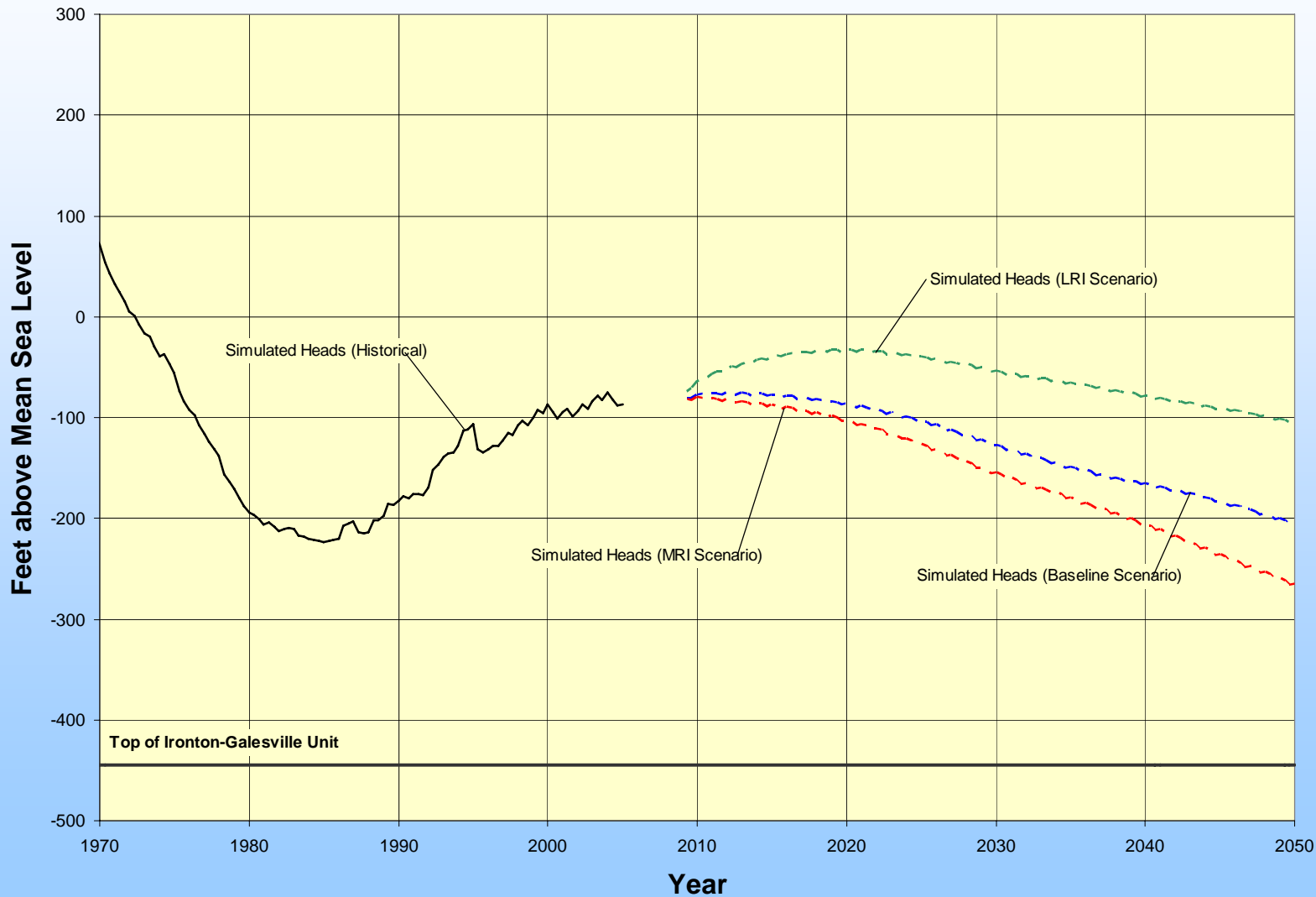
# Lake in the Hills

## Ironton-Galesville Unit



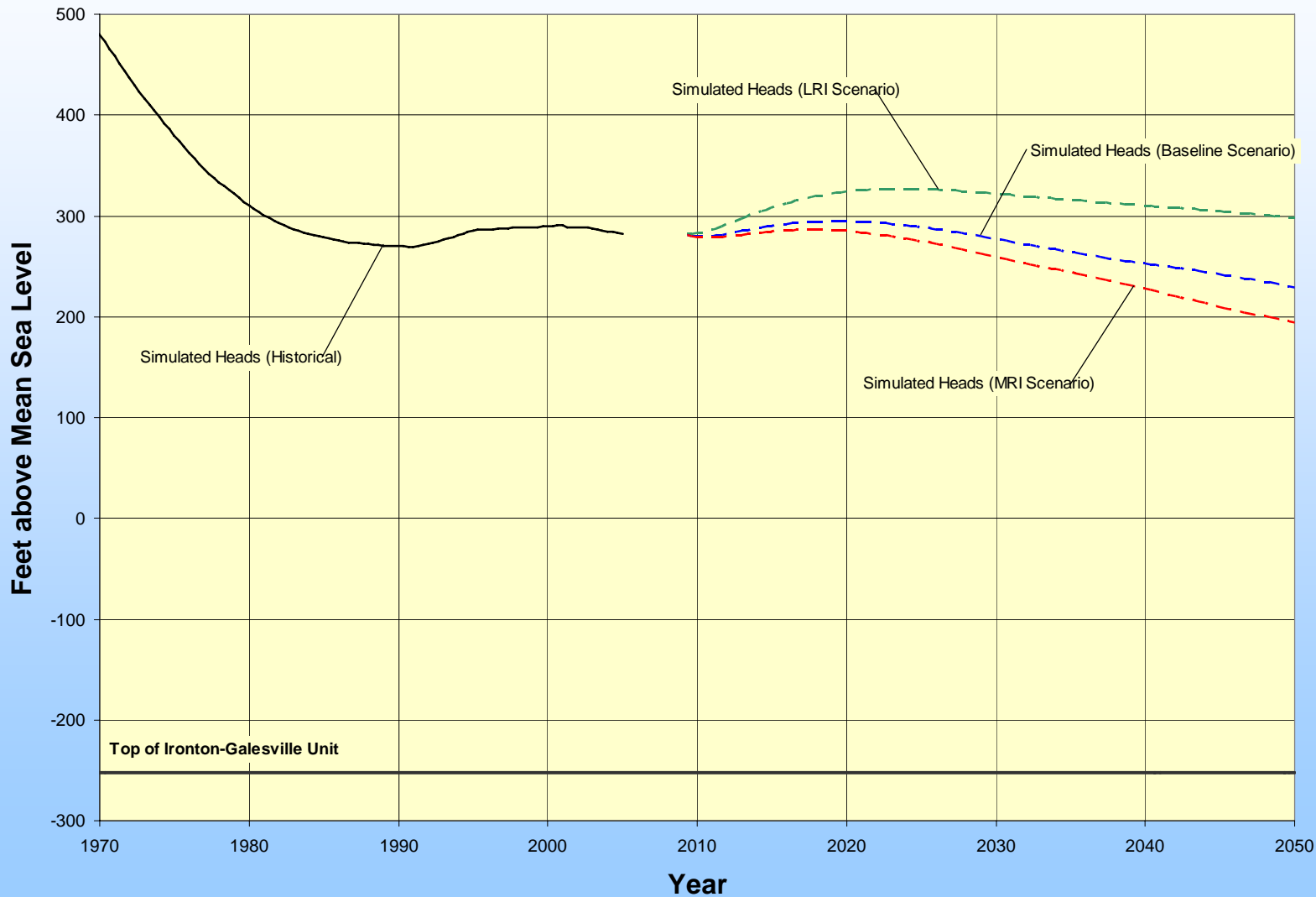
# St. Charles

## Ironton-Galesville Unit



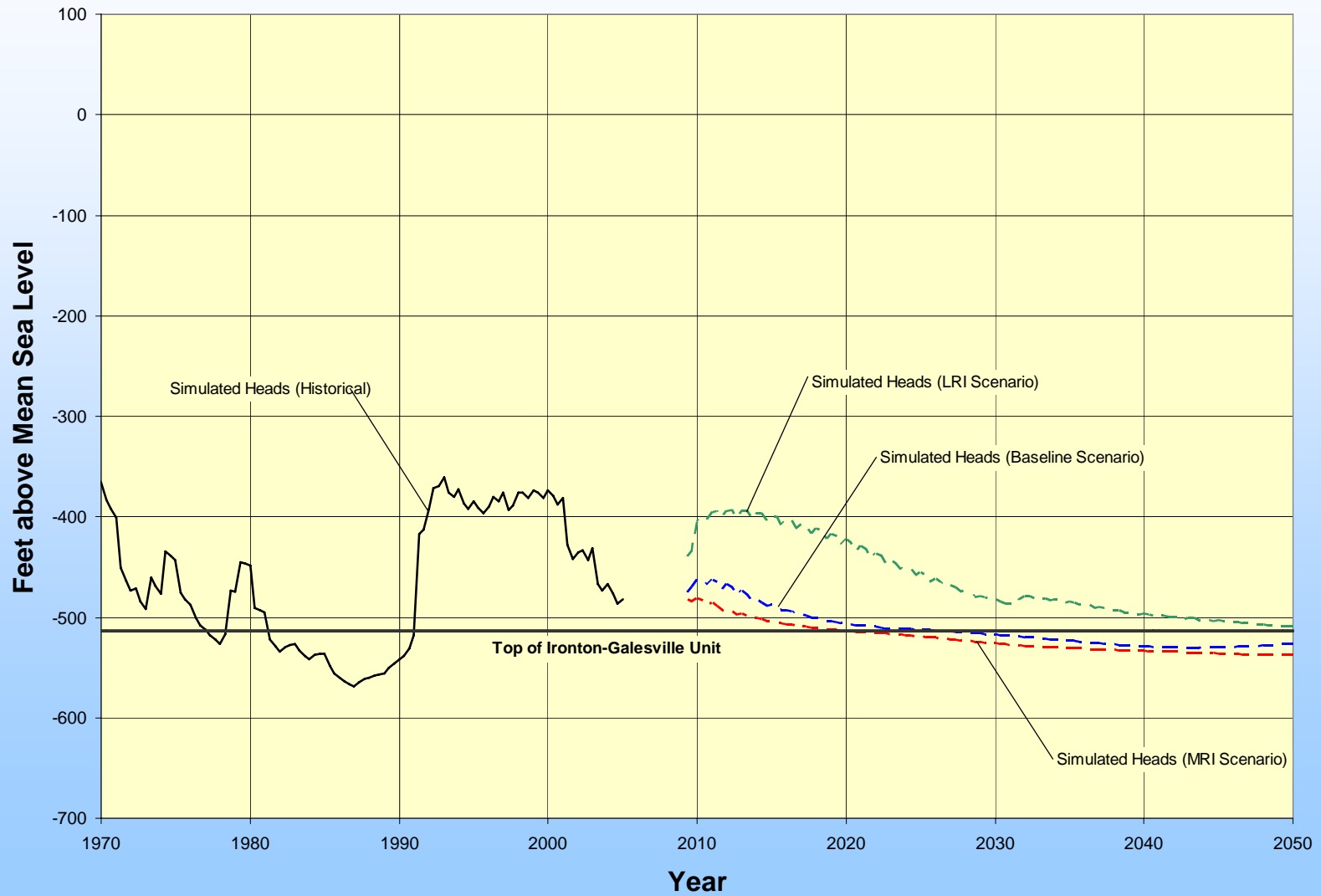
# Maple Park

## Ironton-Galesville Unit



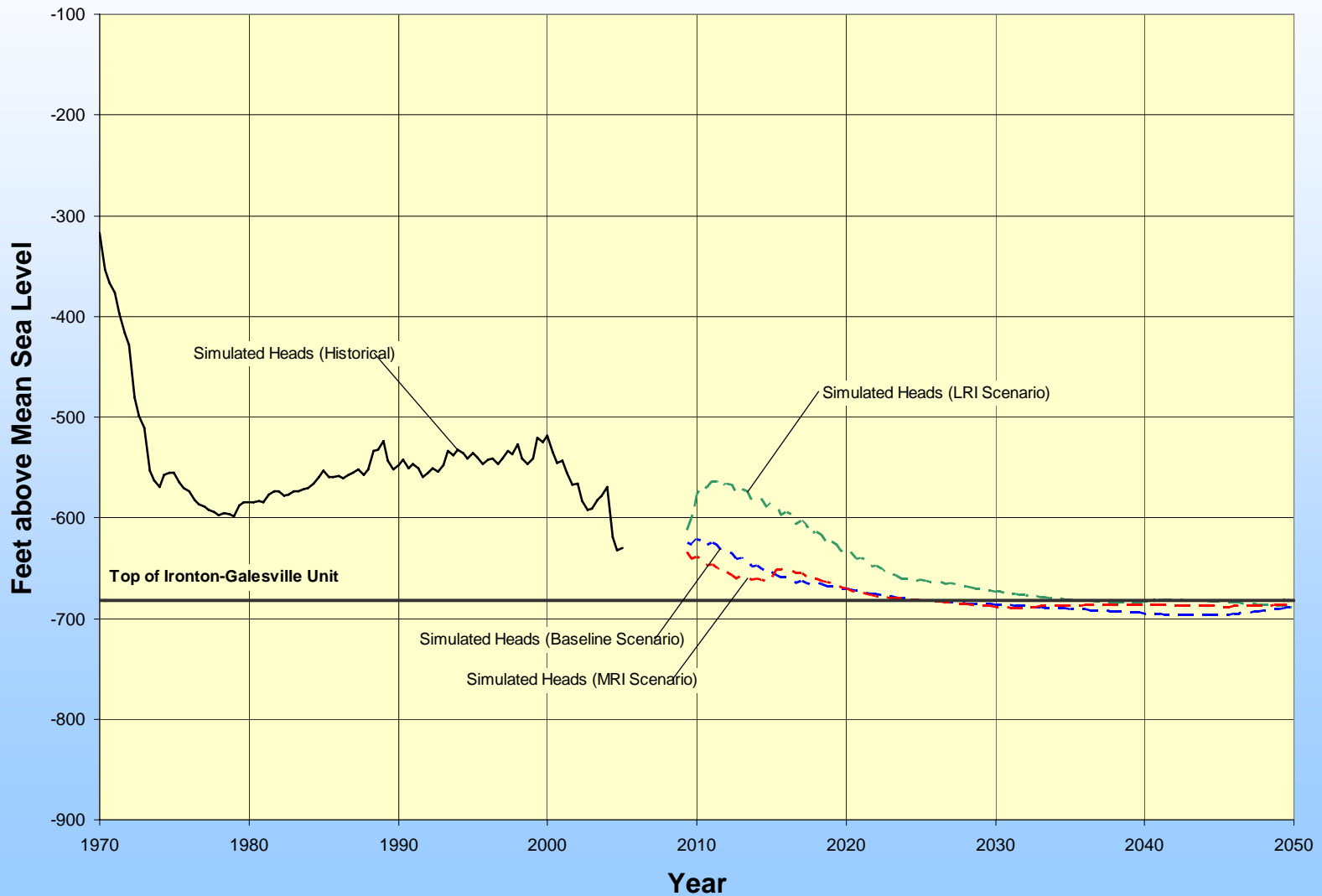
# Aurora

## Ironton-Galesville Unit



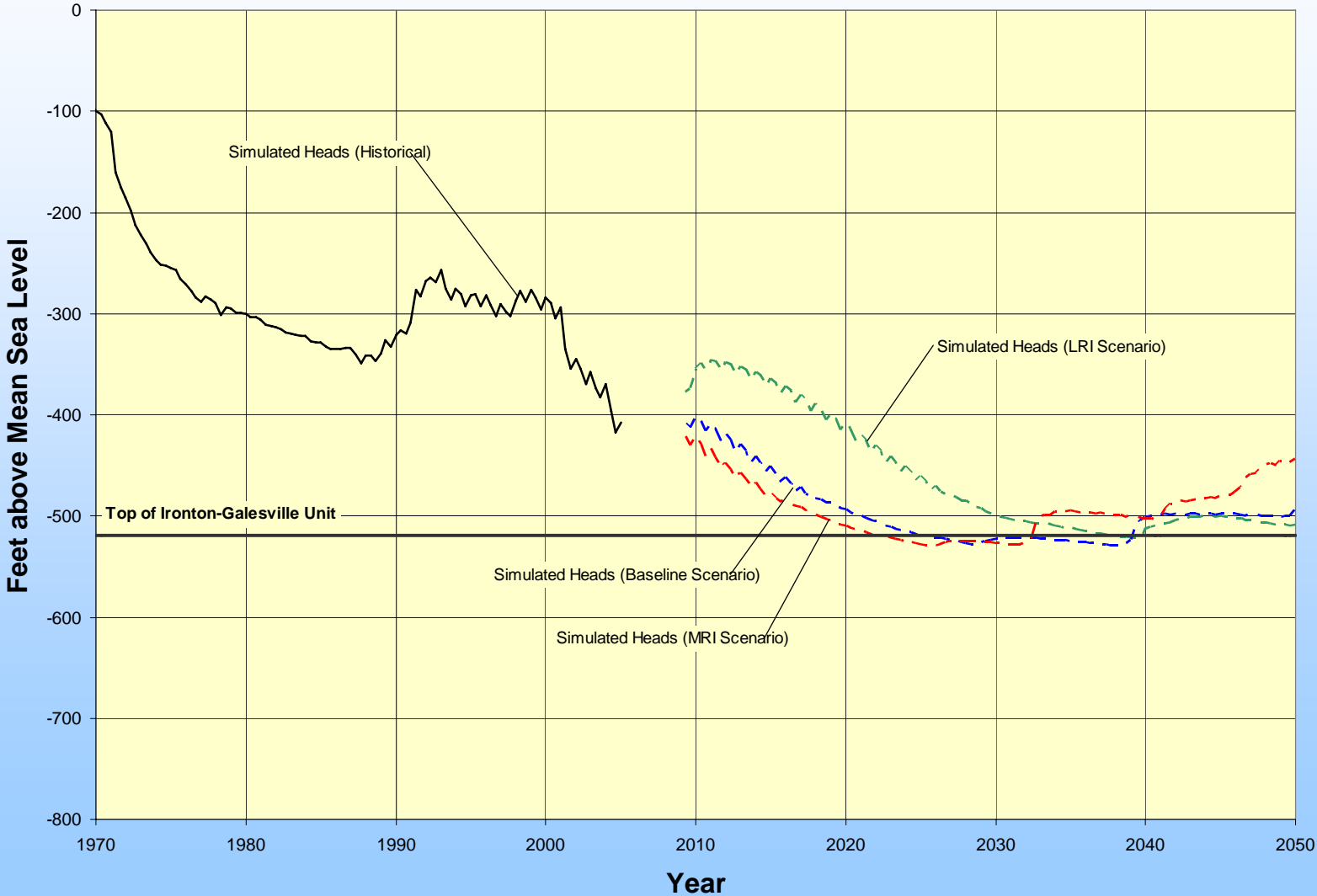
# Shorewood

## Ironton-Galesville Unit



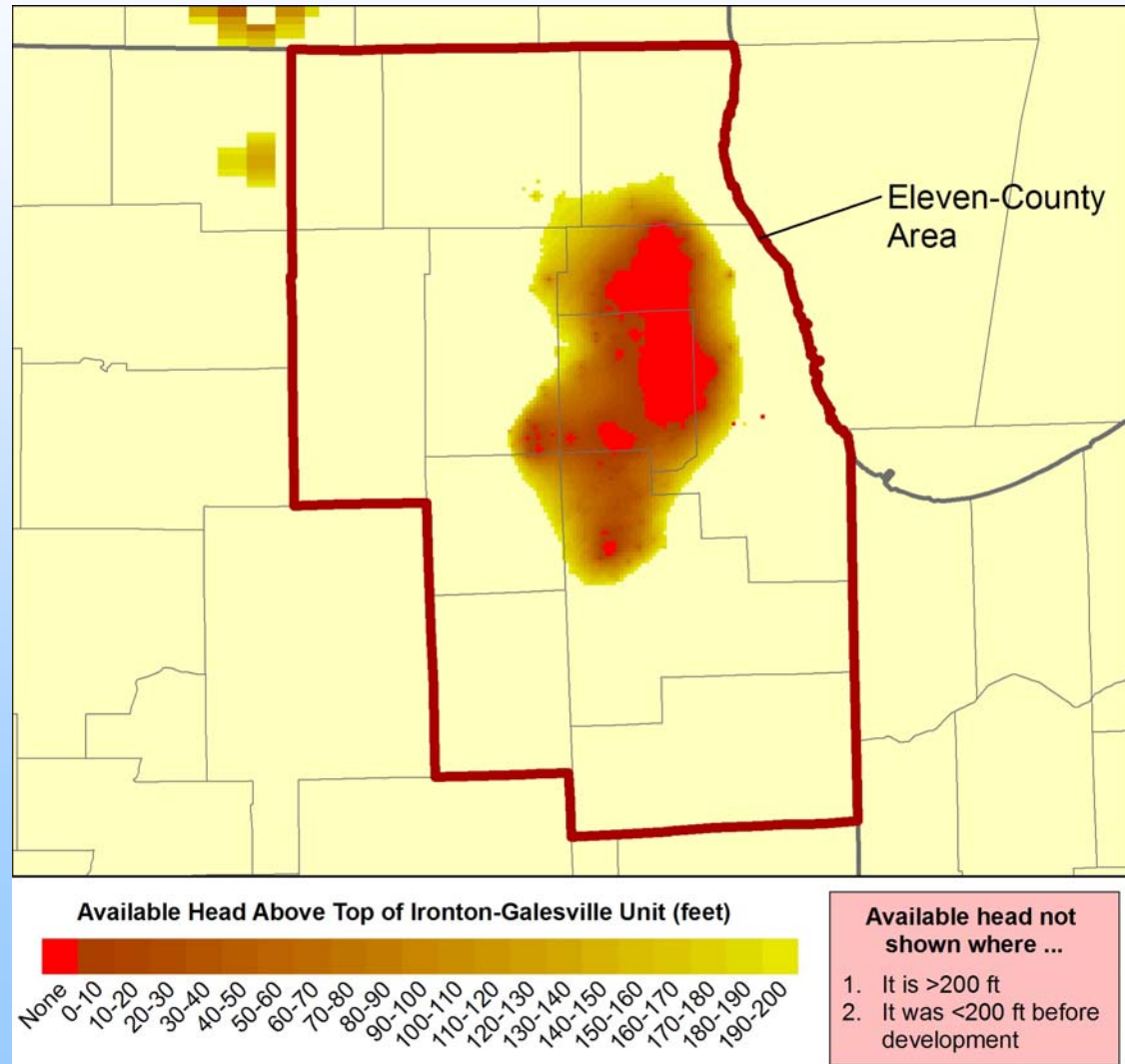
# Oswego

## Ironton-Galesville Unit



# Available Head Above Top of Ironton-Galesville

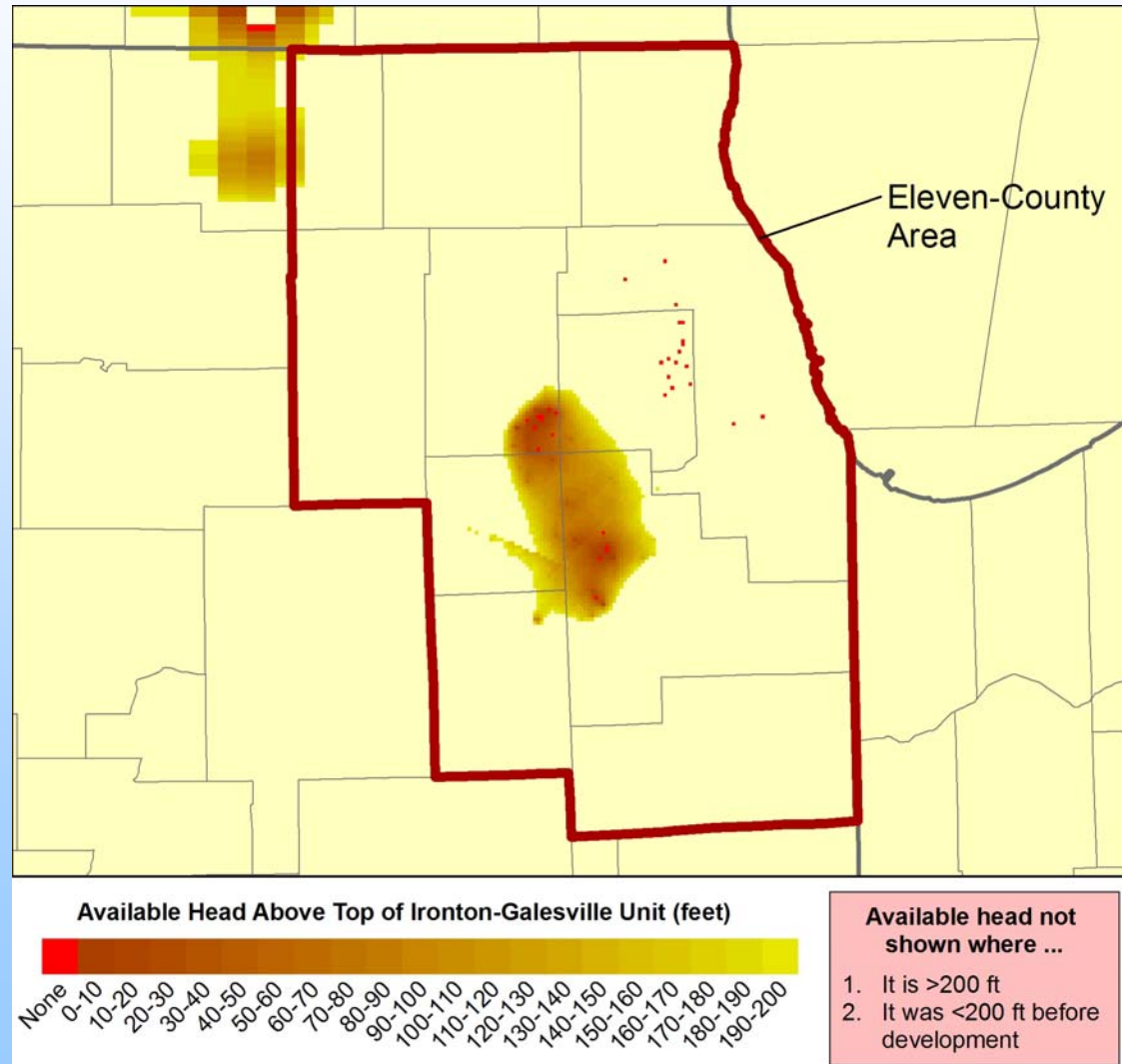
*End of Summer Irrigation Season, 1985*





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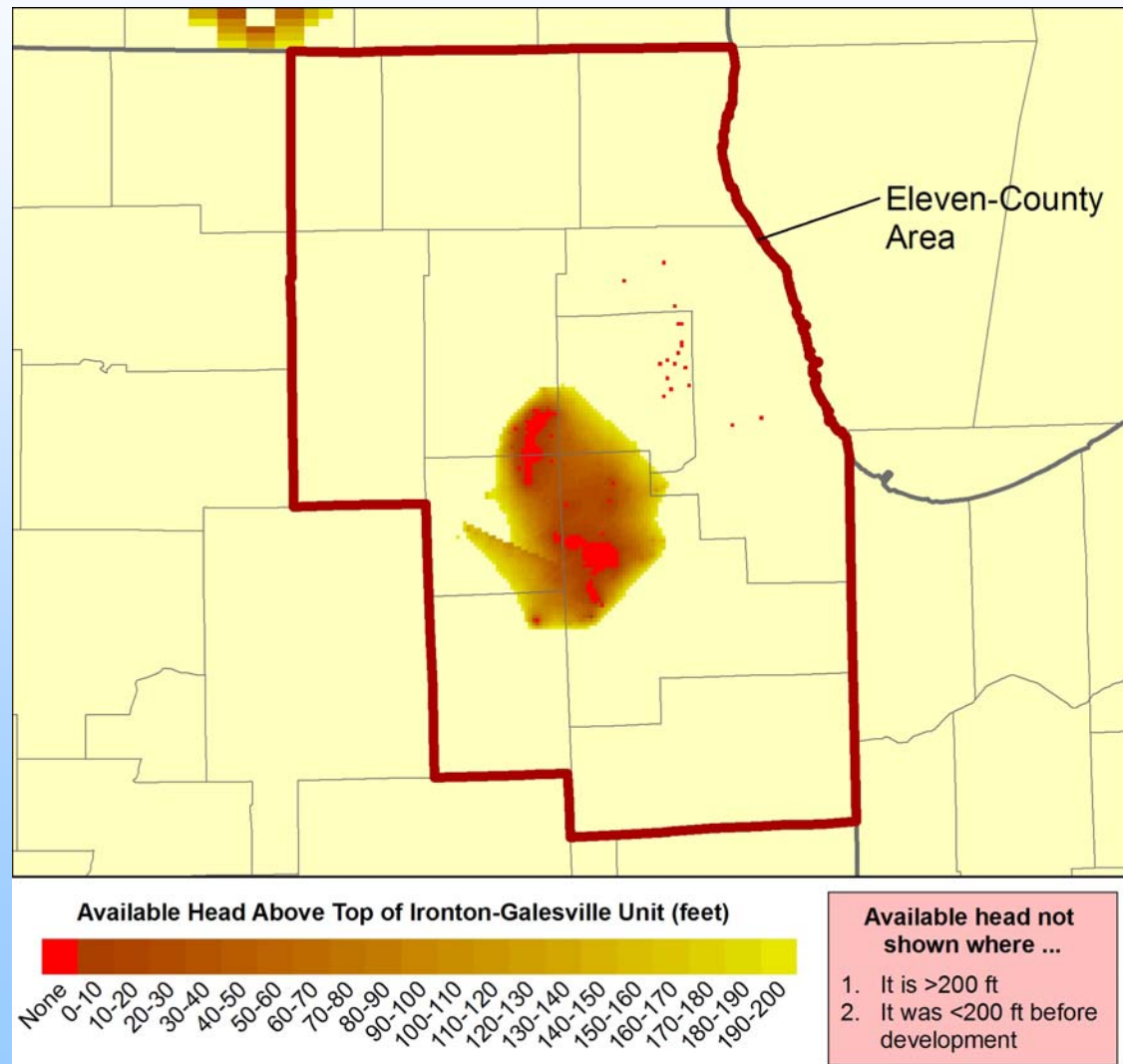
*End of Summer Irrigation Season, 2005*



# Available Head Above Top of Ironton-Galesville

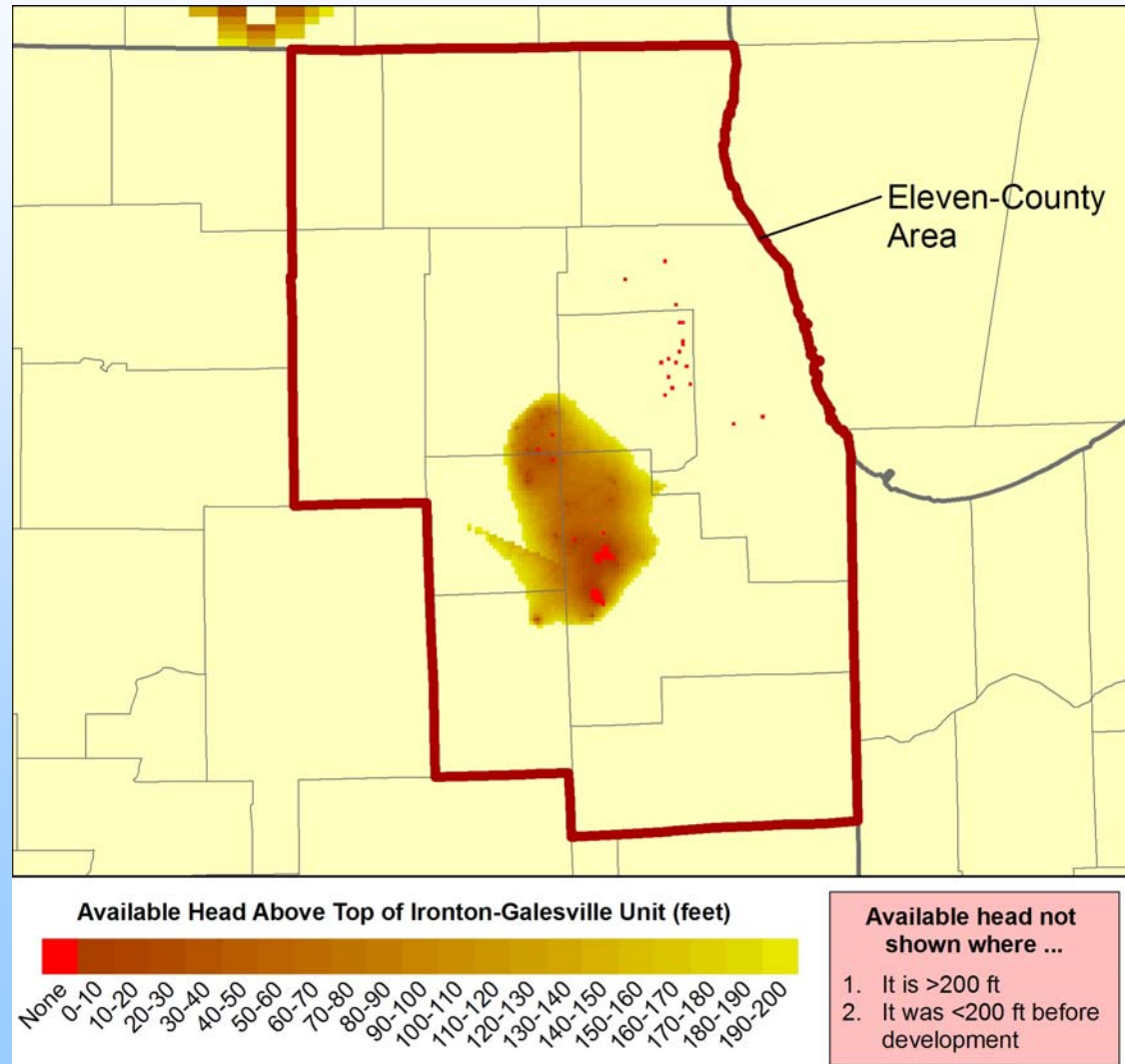
*End of Summer Irrigation Season, 2025*

**Baseline Scenario**



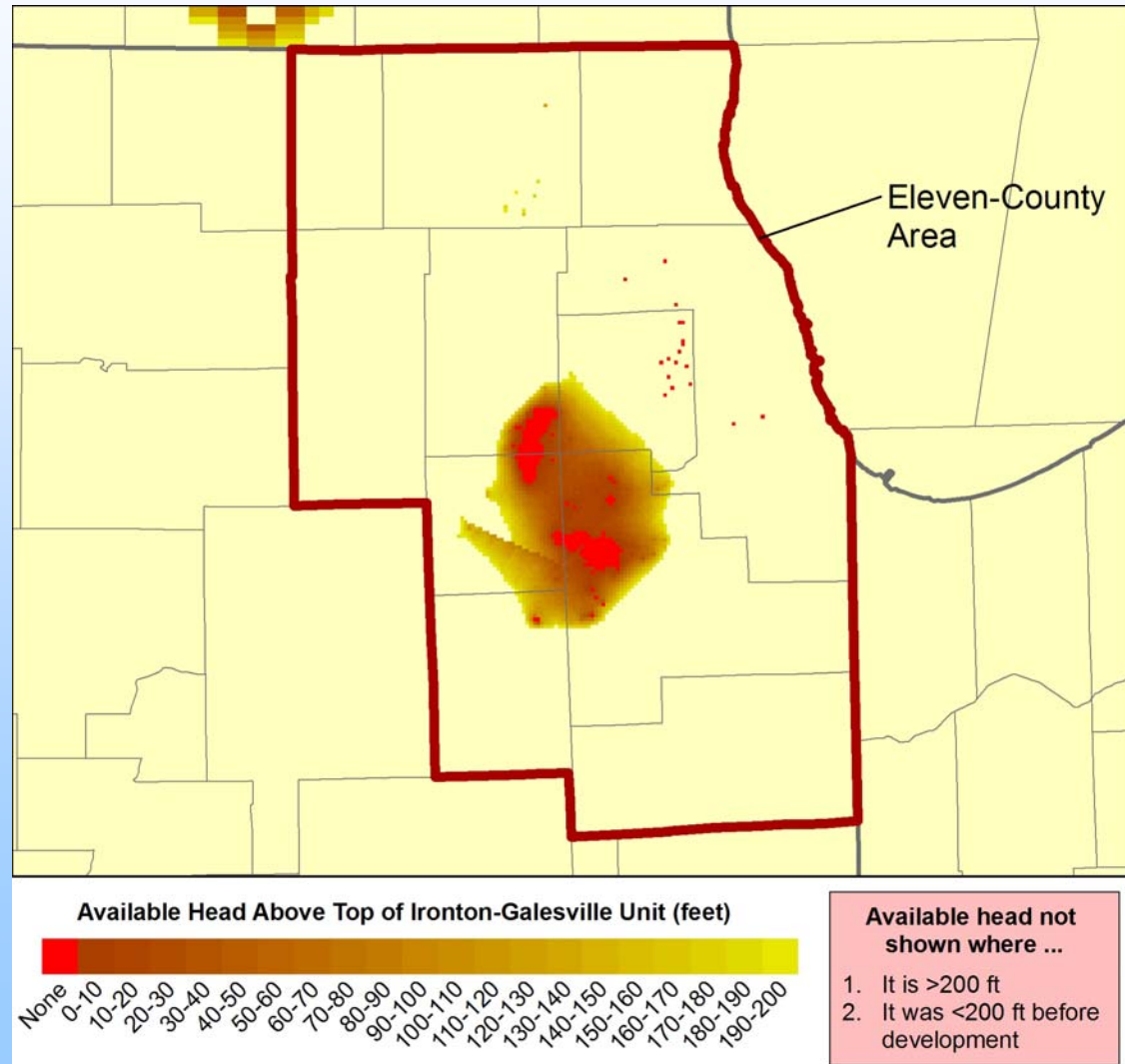
# Available Head Above Top of Ironton-Galesville

*End of Summer Irrigation Season, 2025*  
**Less Resource-Intensive Scenario**



# Available Head Above Top of Ironton-Galesville

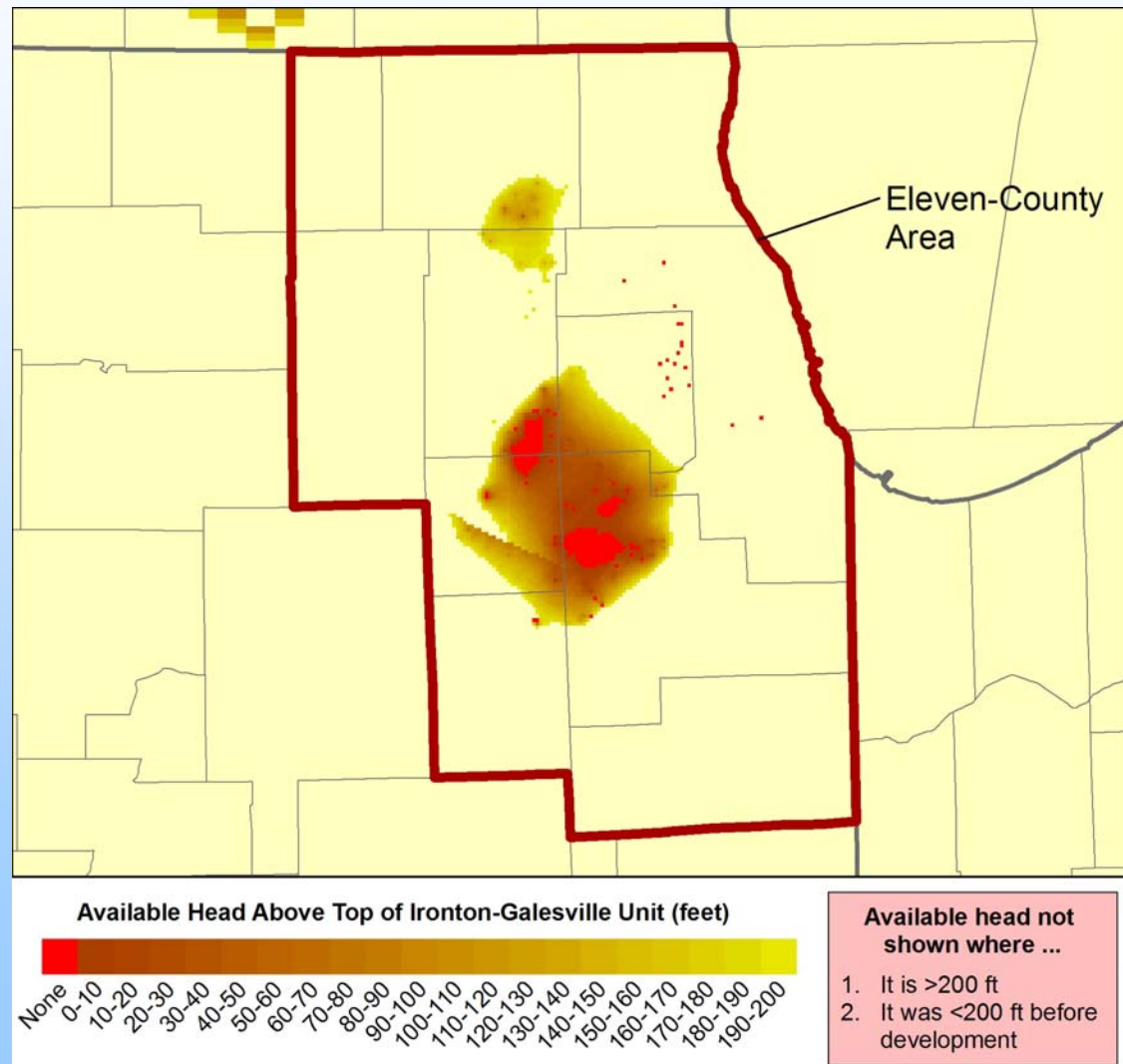
*End of Summer Irrigation Season, 2025*  
**More Resource-Intensive Scenario**



# Available Head Above Top of Ironton-Galesville

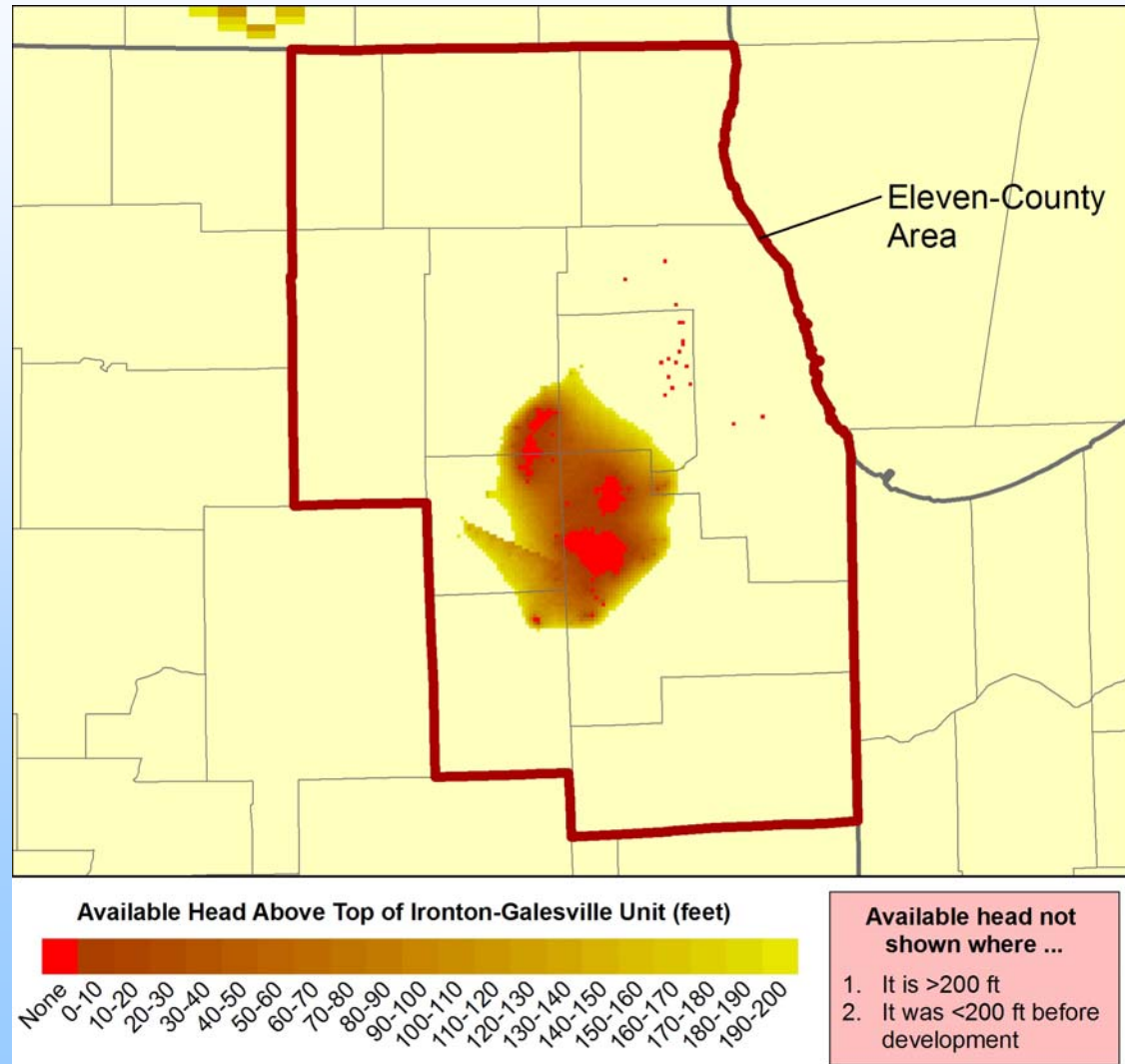
*End of Summer Irrigation Season, 2050*

**Baseline Scenario**



# Available Head Above Top of Ironton-Galesville

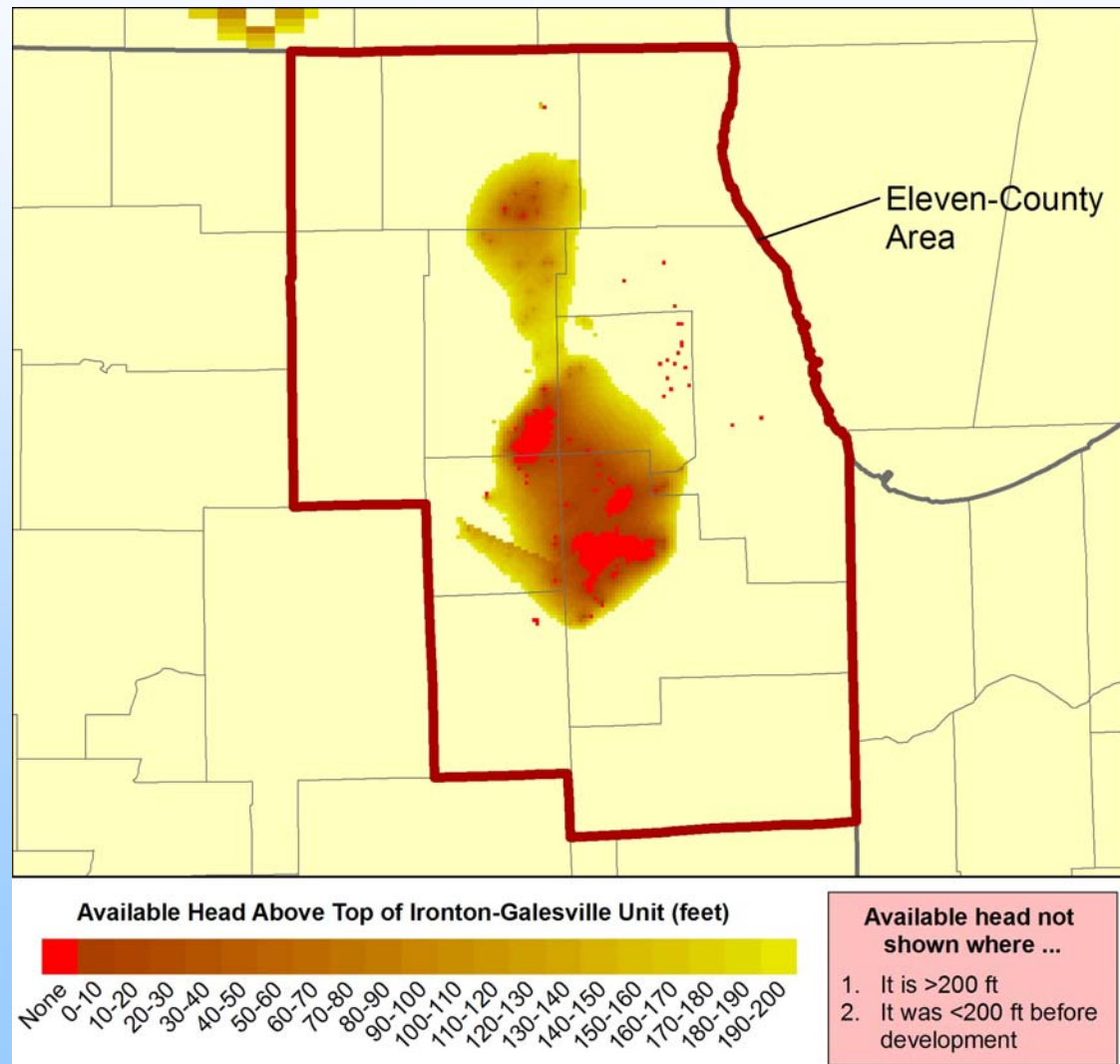
*End of Summer Irrigation Season, 2050*  
**Less Resource-Intensive Scenario**



# Available Head Above Top of Ironton-Galesville

*End of Summer Irrigation Season, 2050*

***More Resource-Intensive Scenario***



# Conclusions

- Regional groundwater flow model results have been produced for the 3 basic demand scenarios
- Results for shallow sand/gravel aquifers within the Fox River Basin were presented - cones of depression are evident in major pumping centers – some Carpentersville wells apparently went dry in the Baseline and MRI scenarios
- Stream flow impacts have not been examined yet – stream flow may be contributing significantly to sand/gravel wells
- Results for Ironton-Galesville were presented and some future demand scenarios show significant impacts, esp. in areas near Aurora and Joliet
- Model results suggest future demands can largely be met only *if* the impacts are deemed acceptable
- There is time to make model improvements and plan alternatives, but not time to waste



# To-Do List for 2009

- Evaluate model results to see if more wells went dry than just Carpentersville
- Model impacts of drought and climate change
- Assess impacts of all scenarios on streamflow
- Assess impacts on shallow bedrock aquifers



Happy Holidays!

See you next year...

