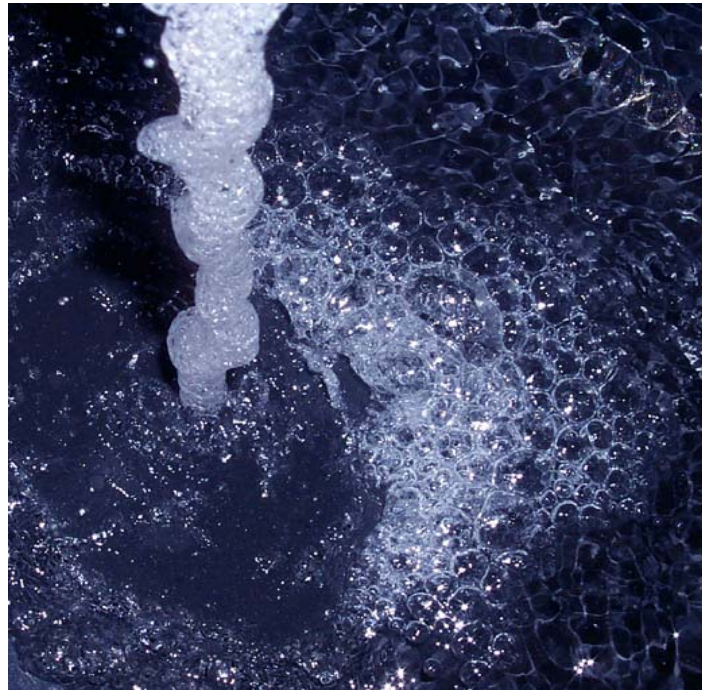


# UNCERTAINTIES AND CHALLENGES IN STATE AND REGIONAL WATER SUPPLY PLANNING

**Derek Winstanley, D.Phil.**

**Gary Clark, P.E.**



# CONTENT

- **Purpose of water supply planning**
- **Uncertain future and data and analytical limitations**
  - **drought and climate change**
  - **water withdrawals**
  - **geology**
  - **water demand**
  - **impacts of withdrawals**
  - **economics**
  - **social values**
- **Conclusions**

# **THE GOAL OF WATER SUPPLY PLANNING**

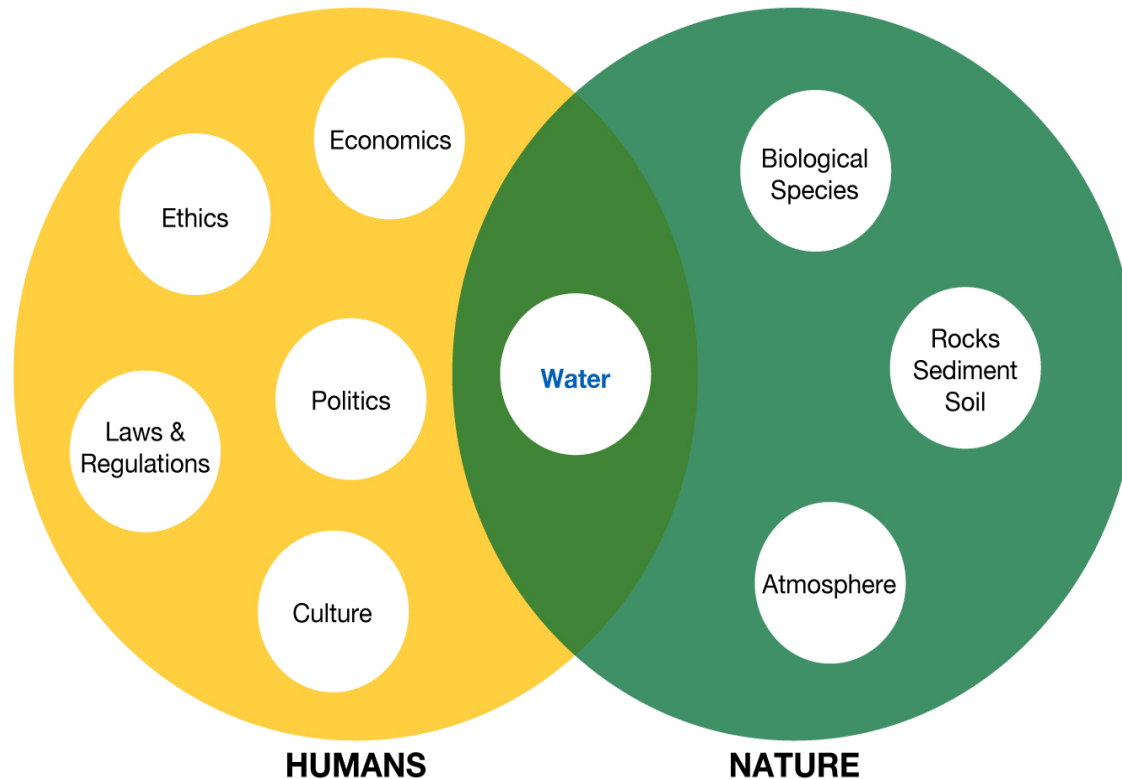
**TO ENSURE ADEQUATE SUPPLIES OF  
CLEAN WATER FOR ALL USERS  
AT REASONABLE COST**

**WATER WILL NOT CONTINUE  
TO FLOW FROM THE FAUCET  
WITHOUT ADEQUATE PLANNING**

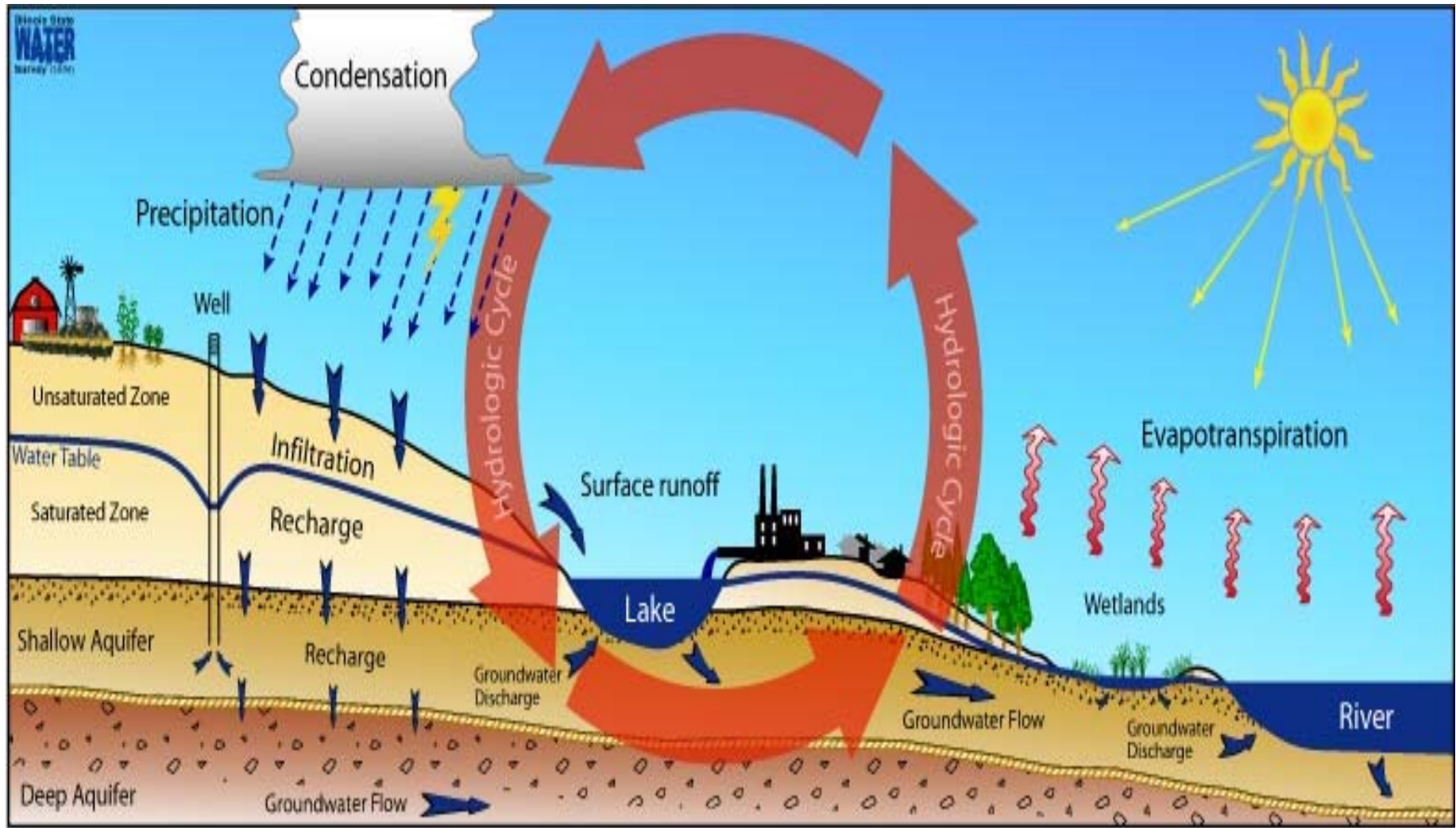
**Planning for an uncertain future entails  
risk assessment and risk management**

# WATER SUPPLY IS EMBEDDED IN ENVIRONMENTAL, ECONOMIC AND SOCIAL ISSUES

## Water Supply Planning and Management



# THE WATER CYCLE: CLIMATE, SURFACE WATER and GROUNDWATER ARE INTERCONNECTED

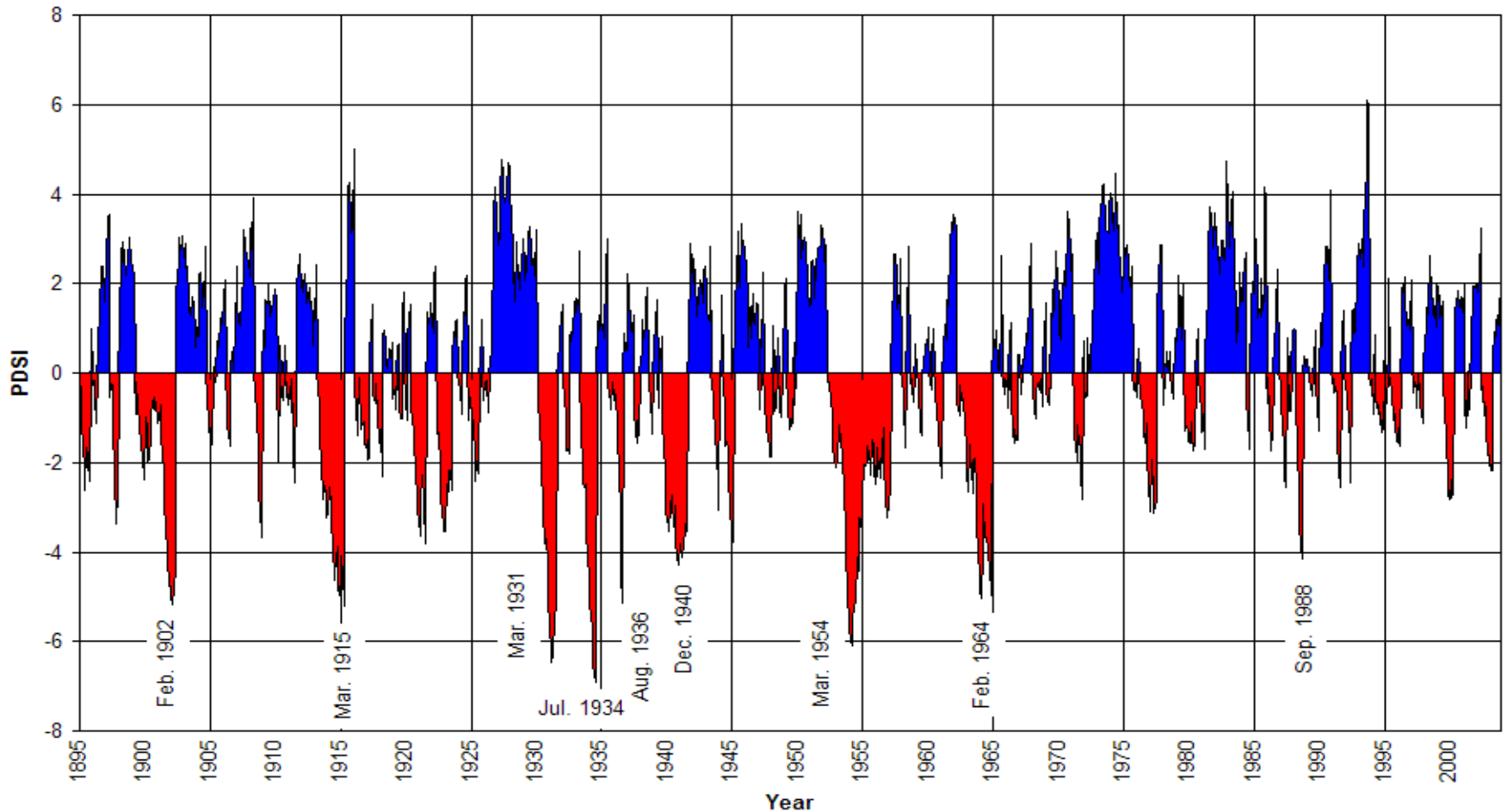


# DROUGHT

- **Severe multi-year droughts have occurred periodically in the past and will occur again in the future.**
- **Droughts reduce water availability, increase water use, and create water shortages.**
- **Droughts must be planned for and managed.**

# DROUGHT FREQUENCY AND MAGNITUDE IN ILLINOIS (M. Palecki, ISWS) LAST 40 YEARS RELATIVELY FREE FROM MAJOR MULTI-YEAR DROUGHTS (RED)

Palmer Drought Severity Index - Illinois





# **DROUGHT PLANNING AND MANAGEMENT**

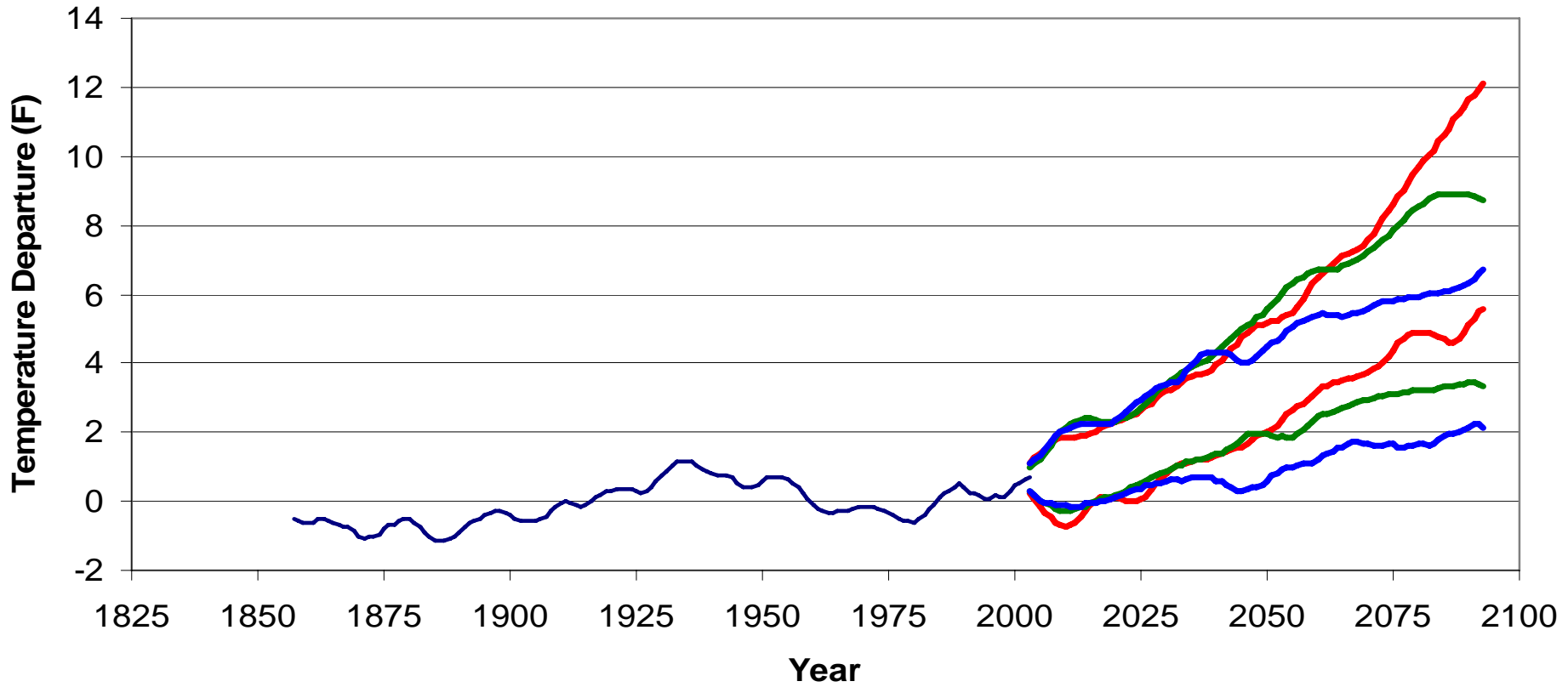
- **RISK ASSESSMENT & MANAGEMENT**
  - 1 in 50 year droughts?
  - 1 in 100 year droughts?
  - worst-case droughts?
- **DROUGHT PREPAREDNESS**
- **DROUGHT RESPONSE**

# CLIMATE CHANGE

- **Warmer – probably**
  - **higher temperature increases water demand and reduces water availability**
- **Wetter or drier – don't know**
  - **drier conditions, like drought, increase water demand and reduce water availability**

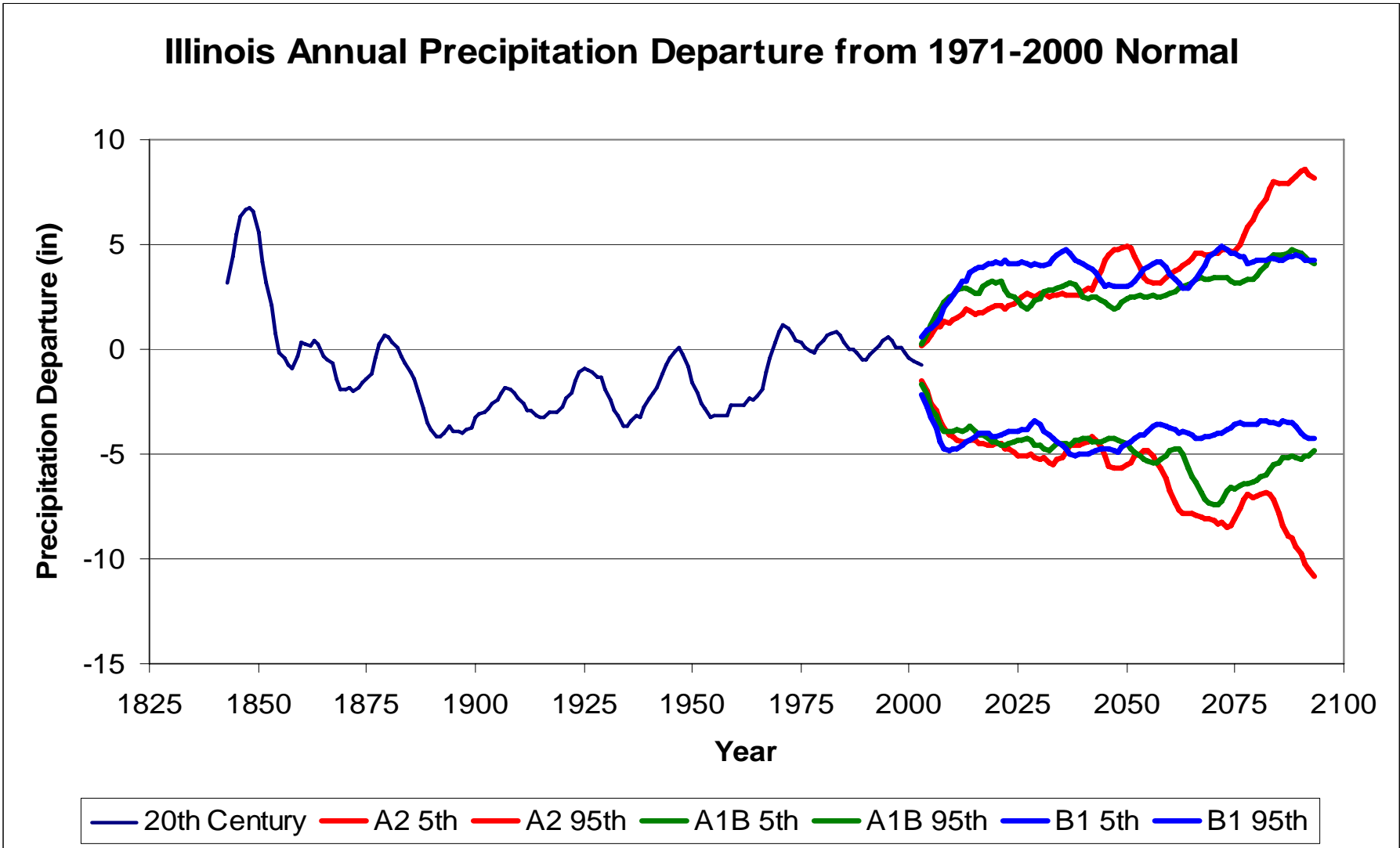
# RESULTS FROM 120 GLOBAL MODEL RUNS UNDER HIGH, MEDIUM and LOW EMISSIONS SCENARIOS (ASC/AWS). 5<sup>th</sup> and 95 percentiles shown.

## Illinois Annual Temperature Departure from 1971-2000 Normal

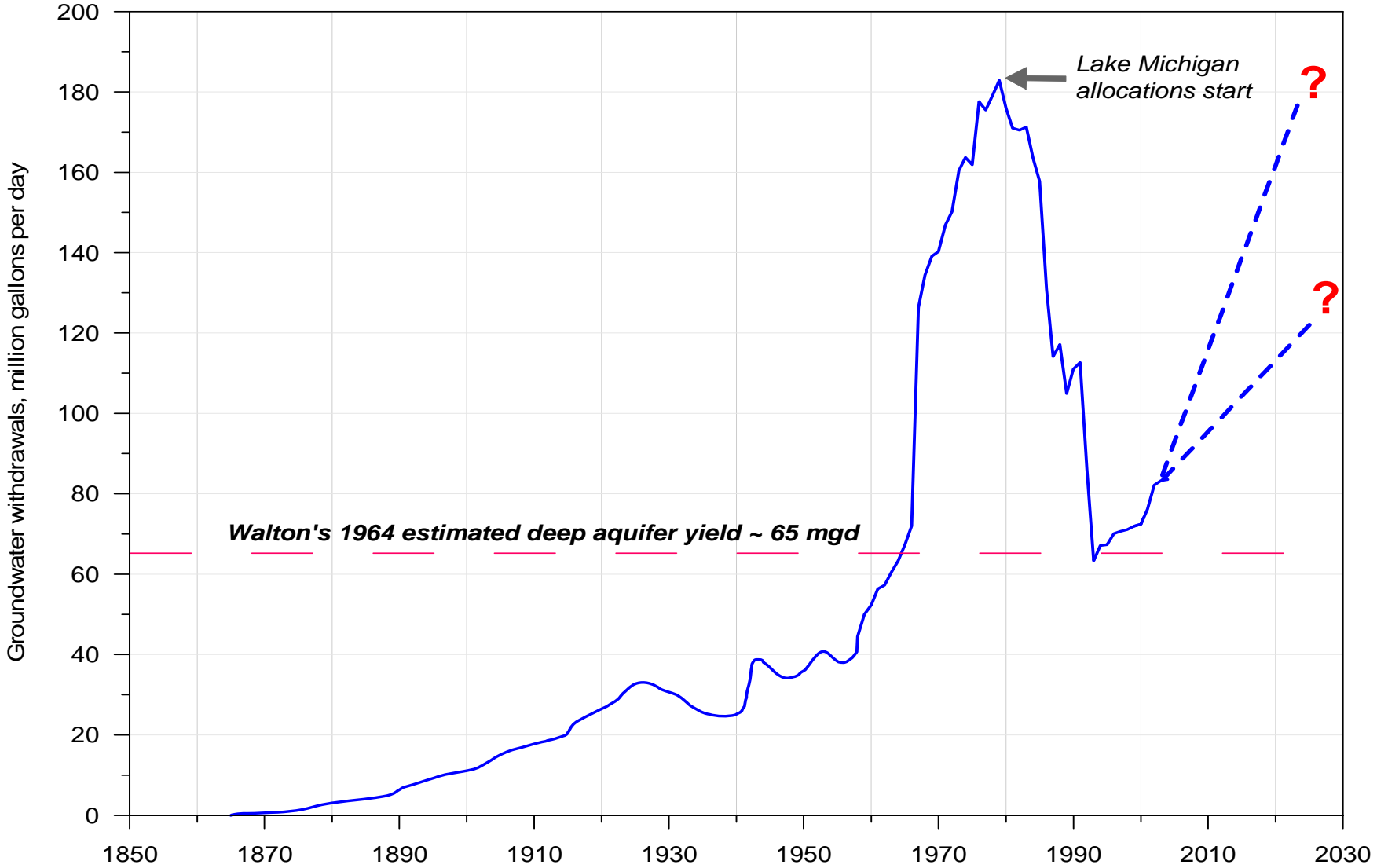


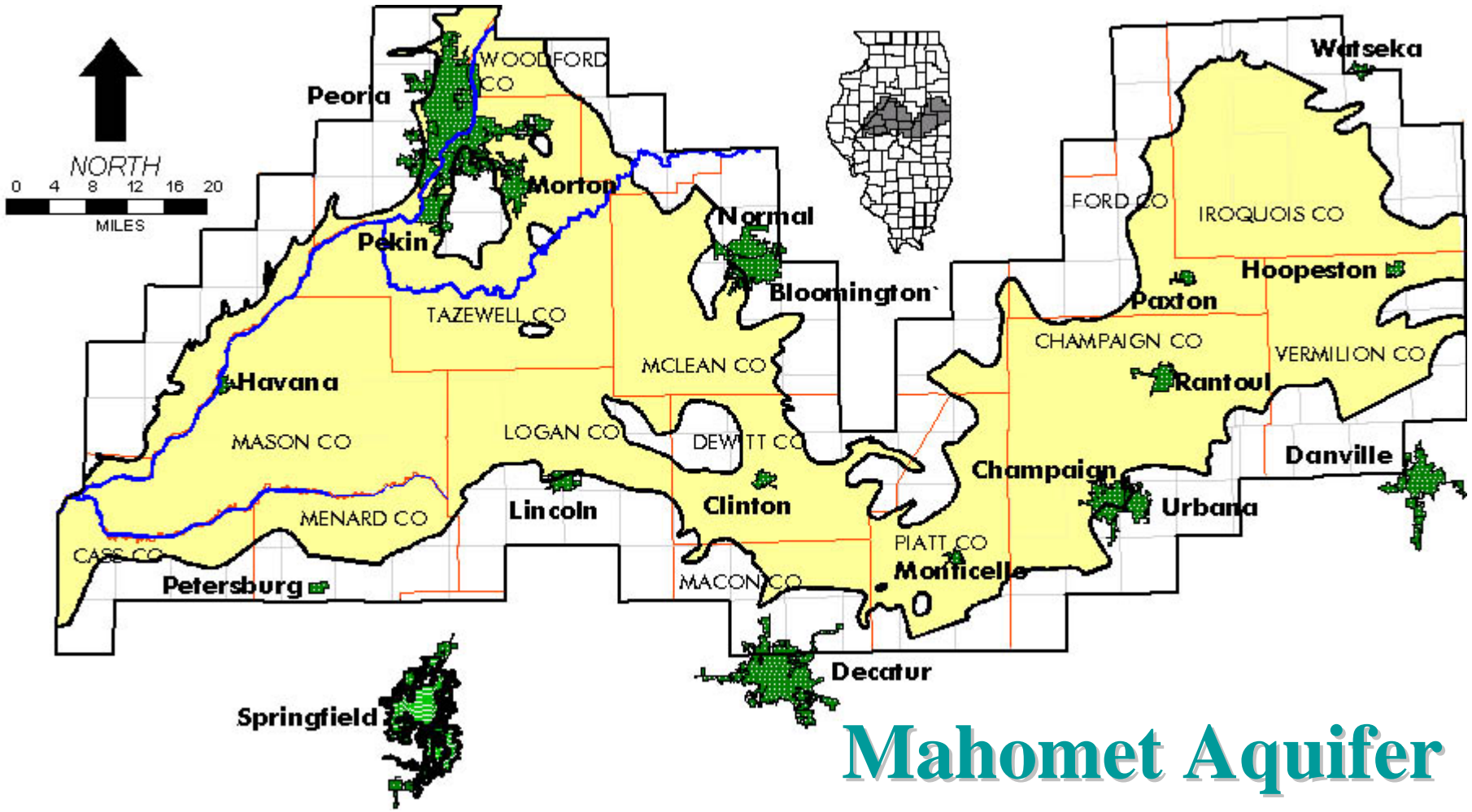
— 20th Century — A2 5th — A2 95th — A1B 5th — A1B 95th — B1 5th — B1 95th

# RESULTS FROM 120 GLOBAL MODEL RUNS UNDER HIGH, MEDIUM and LOW EMISSIONS SCENARIOS (ASC/AWS). 5<sup>th</sup> and 95 percentiles shown.



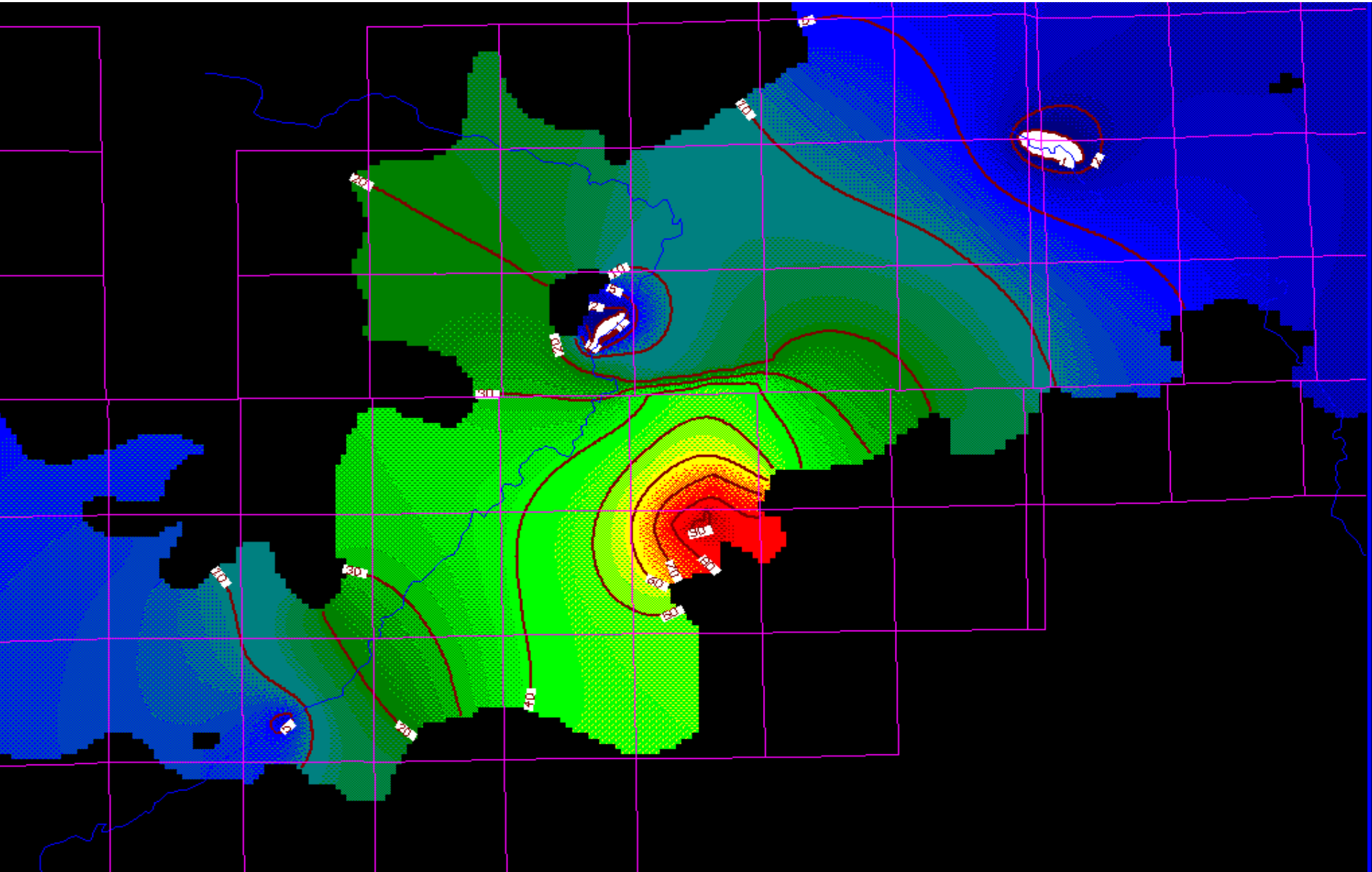
# How much more water can we withdraw from the deep aquifers of NE Illinois? (GSC/ISWS)





# Mahomet Aquifer

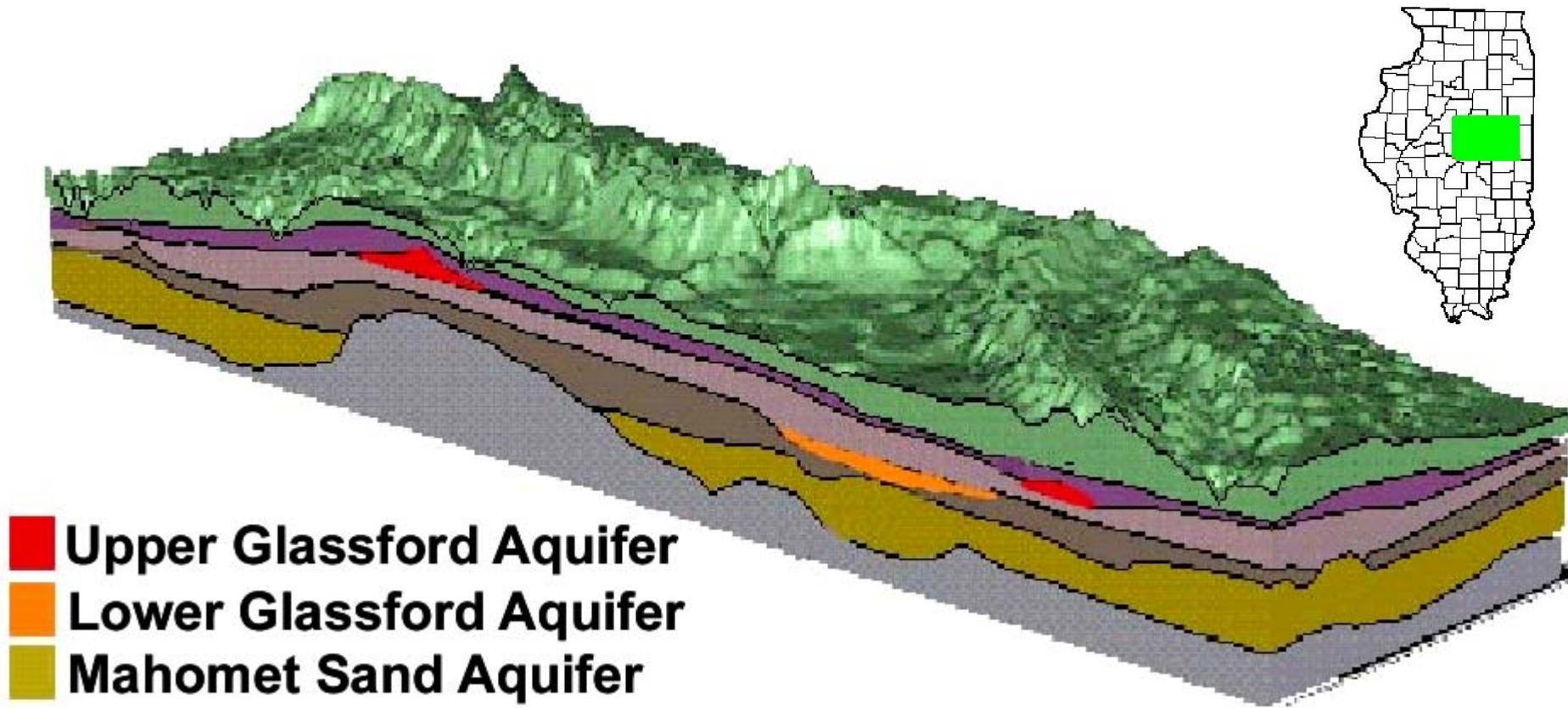
# Simulated Drawdown from IAWC Wellfield 2005 draft (George Roadcap, ISWS)



# MAHOMET AQUIFER

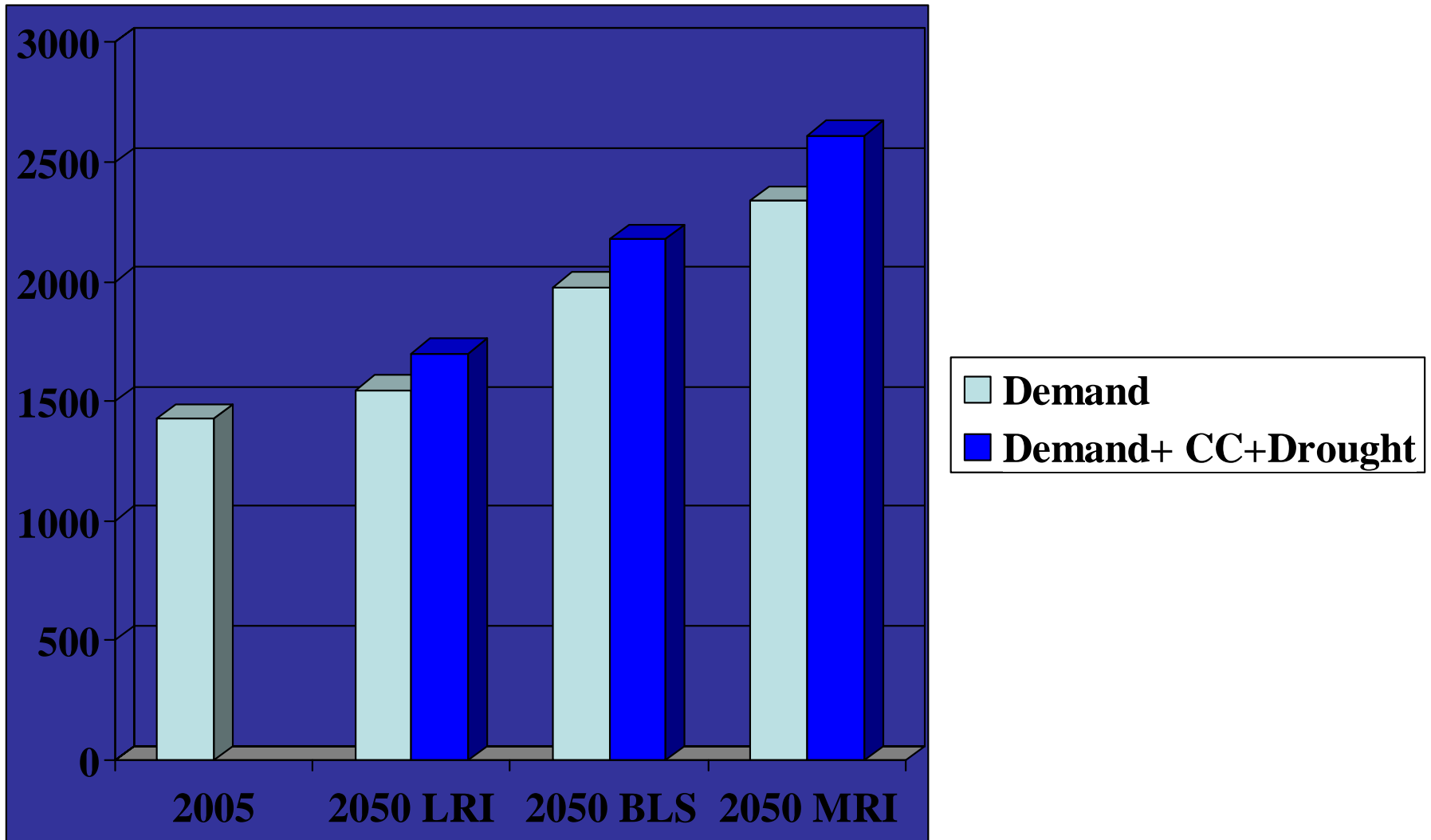
## Hydrogeology (ISGS)

*The need for good hydrogeological data to model*



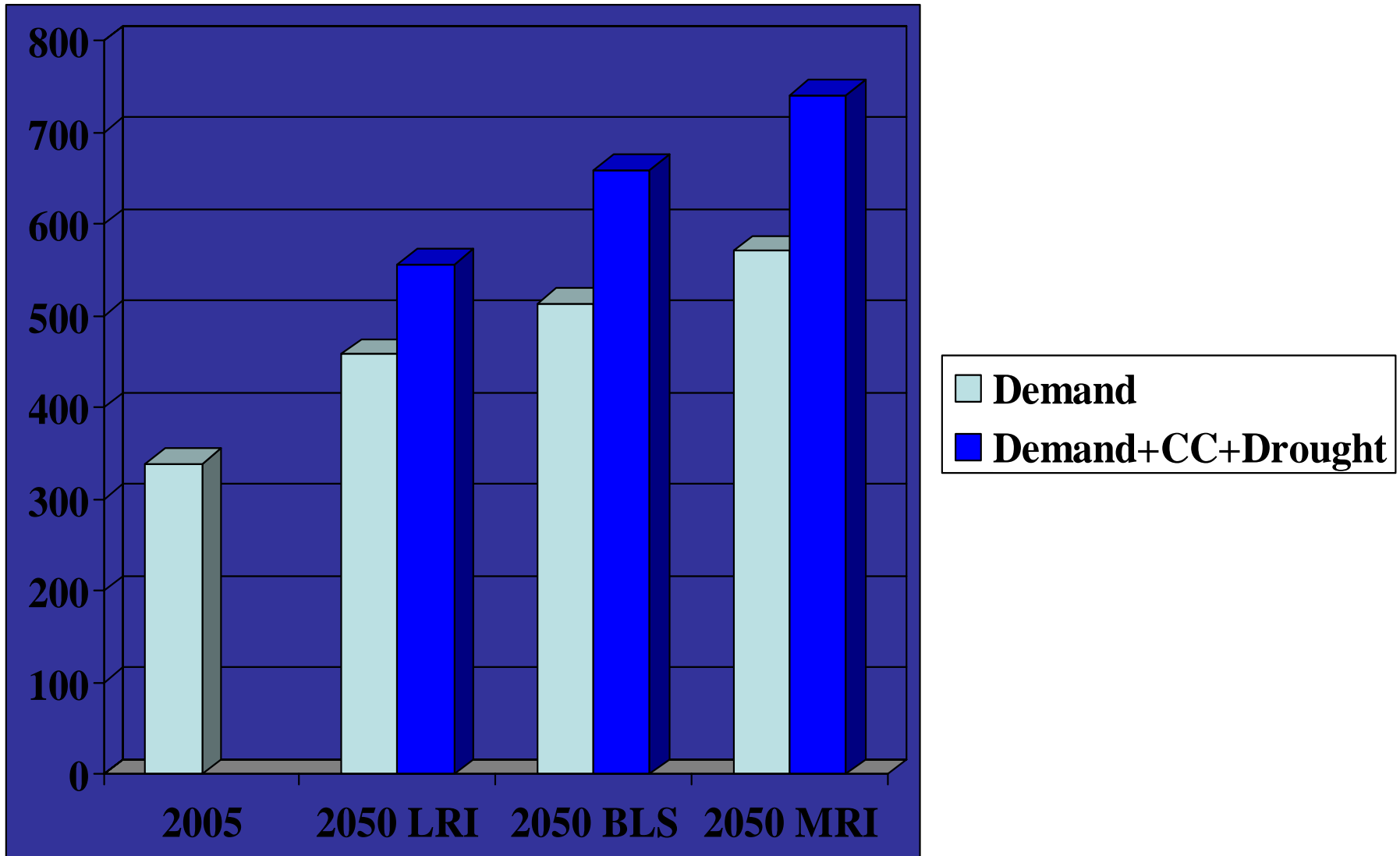


# WATER DEMAND TO 2050 (mgd): 11 COUNTIES NE ILLINOIS (data from Ben Dziegielewski, 2008)



# WATER DEMAND TO 2050 (mgd): 15 COUNTIES EAST-CENTRAL ILLINOIS

(data from Wittman Hydro Planning Associates, Inc, 2008)



# **WHAT IMPACTS AND COSTS ARE SOCIALLY ACCEPTABLE?**

- **Drawdown?**
- **Impacts on existing wells?**
- **Reduction in surface-water flows?**
- **Changes in regional groundwater flow?**
- **Dewatering an aquifer?**
- **Water quality?**
- **Desalinating water?**
- **Transporting water from the Mississippi?**

# **CONCLUSION: SOME KEY QUESTIONS**

- **How much more water can be allocated from the Lake Michigan Diversion?**
- **How much more water can be withdrawn safely from rivers and aquifers?**
- **What are sustainable yields?**
- **How much can the price of water be increased to reduce demand and increase supply?**
- **How much reduction in water demand can be achieved by water conservation and reuse?**
- **What magnitude and frequency of drought should we be prepared for?**
- **What risk of climate change should we be prepared for?**

# WE DO KNOW THAT ...

- **WITHOUT ADEQUATE PLANNING THERE WILL BE THREATS TO THE ENVIRONMENT, ECONOMIC DEVELOPMENT AND SOCIAL WELL BEING. COMPETITION AND CONFLICT.**
- **WE ARE ENGAGED IN 2 PILOT PROJECTS FOR REGIONAL WATER SUPPLY PLANNING AND MANAGEMENT.**
- **A PERMANENT STATEWIDE PROCESS MUST BE PUT IN PLACE AND FUNDED.**

**THE END**

**MORE INFORMATION**

**<http://www.sws.uiuc.edu/wsp>**