DROUGHT IN ILLINOIS: IMPACTS TO WATER SUPPLY

11th Biennial Governor's Conference on the Management of the Illinois River System
October 3, 2007

Peoria

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Chief

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Illinois State WATER Survey (1895)

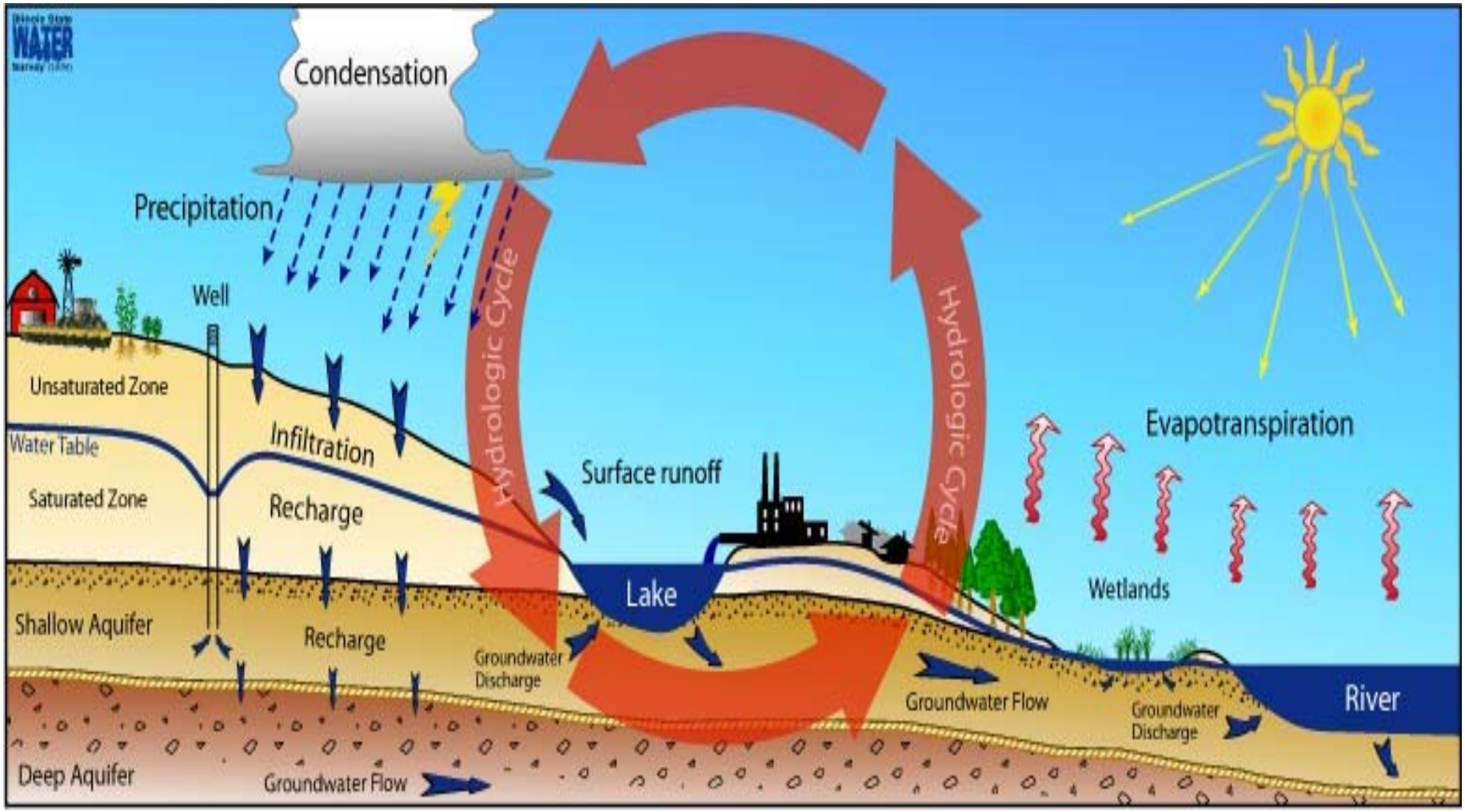
ILLINOIS

Fresh water use in Illinois: 16 billion gallons per day





THE WATER CYCLE: CLIMATE, SURFACE WATER, and GROUNDWATER ARE ALL LINKED



LOW RAINFALL CAN CREATE BOTH DROUGHTS AND FLOODS

- **Life adapts to a range of “normal” climatic conditions**
- **Arizona 10 ins rain**
- **Illinois 38 ins rain**
- **25 ins rain causes floods in Arizona and drought in Illinois**

CAUSES OF DROUGHT: NATURAL AND MAN MADE

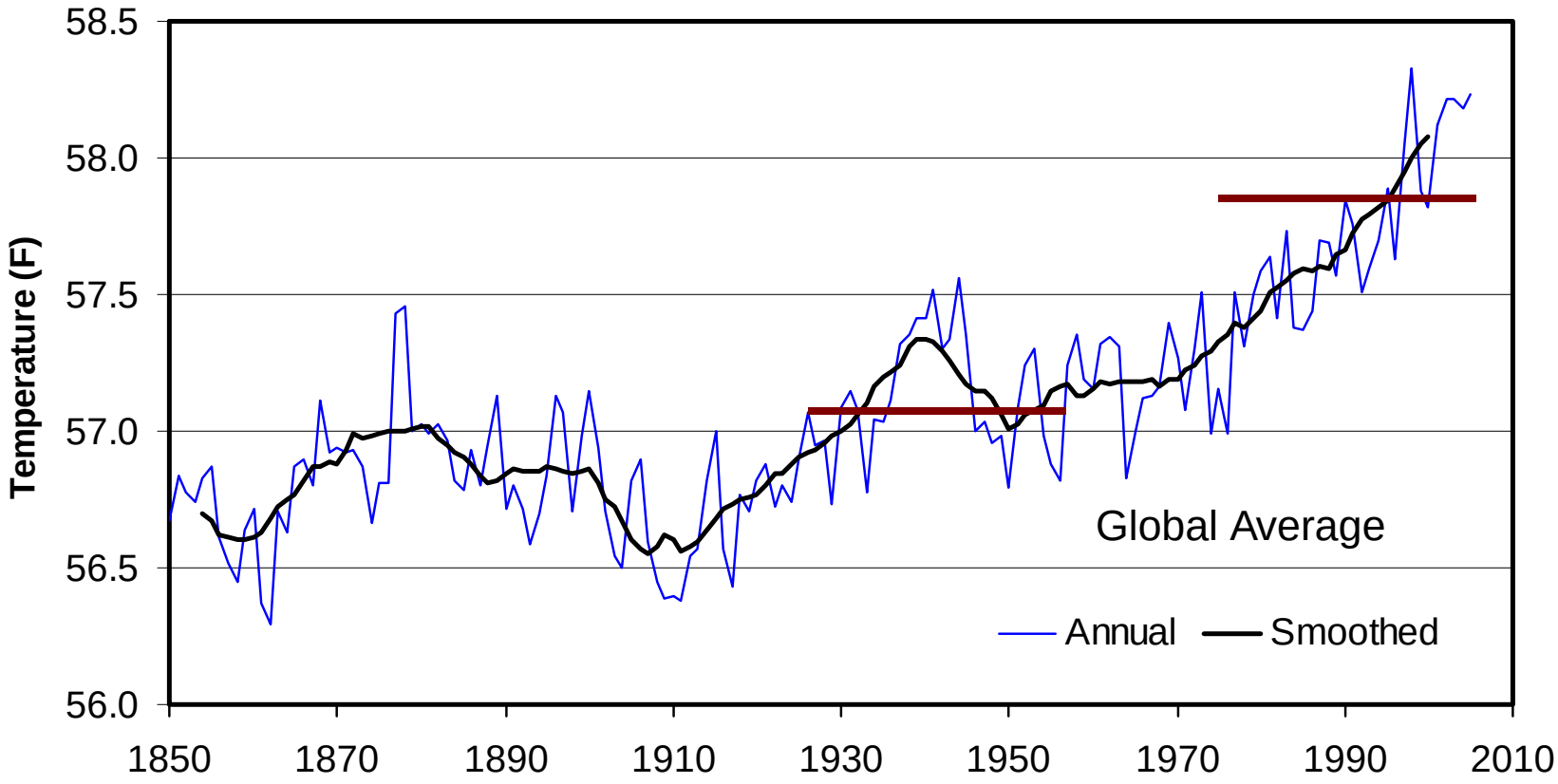
- **BELOW NORMAL PRECIPITATION**
- **HIGH TEMPERATURES**
- **HIGH WATER WITHDRAWALS**
- **LAND USE CHANGES**
- **SEDIMENTATION**

CLIMATE

Temperature and Precipitation

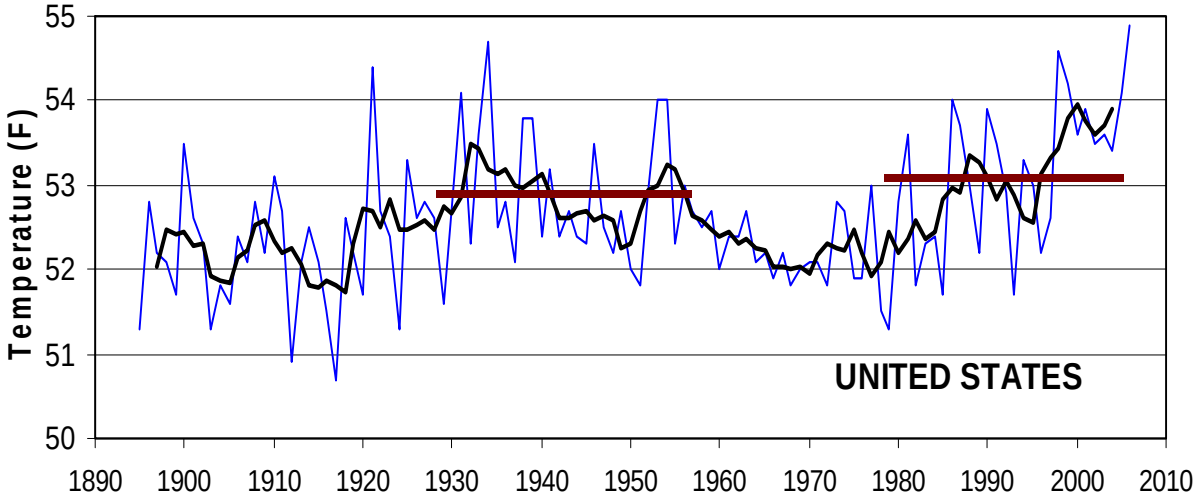
Global Warming

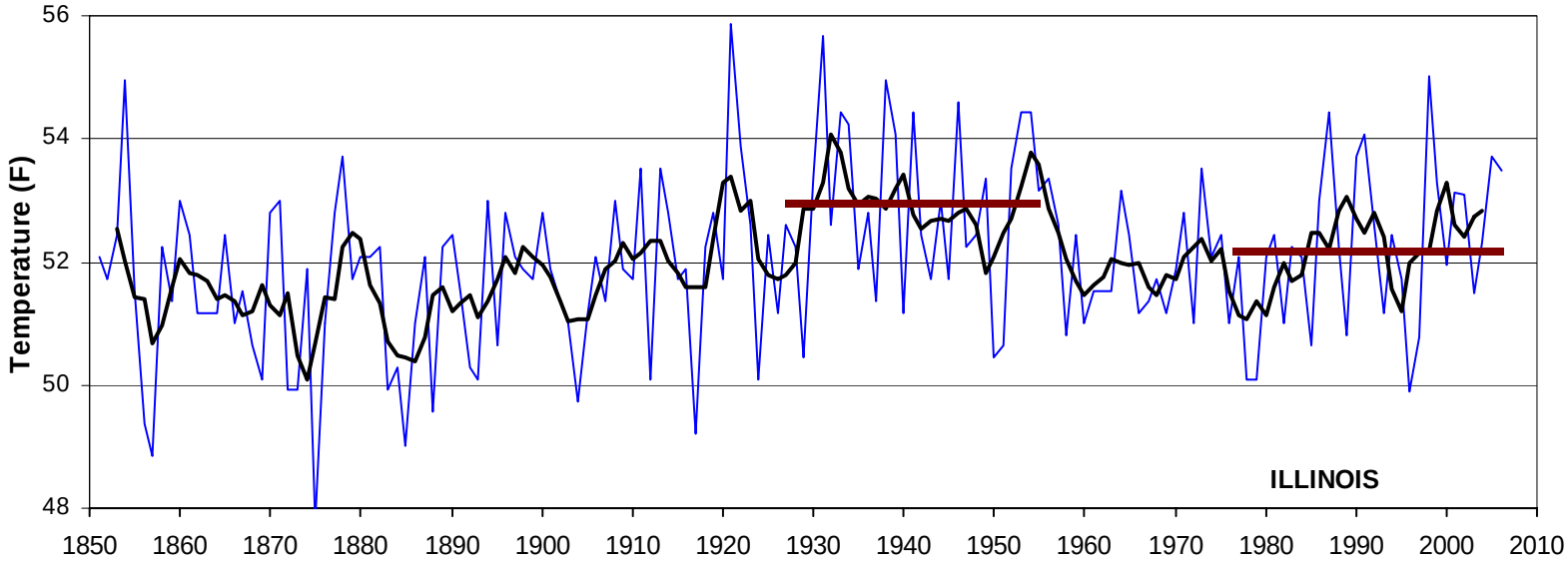
Source: Hadley Centre, UK



Temperature – Annual – Smoothed

Source: Jim Angel, Illinois State Water Survey





ANNUAL TEMPERATURE TRENDS

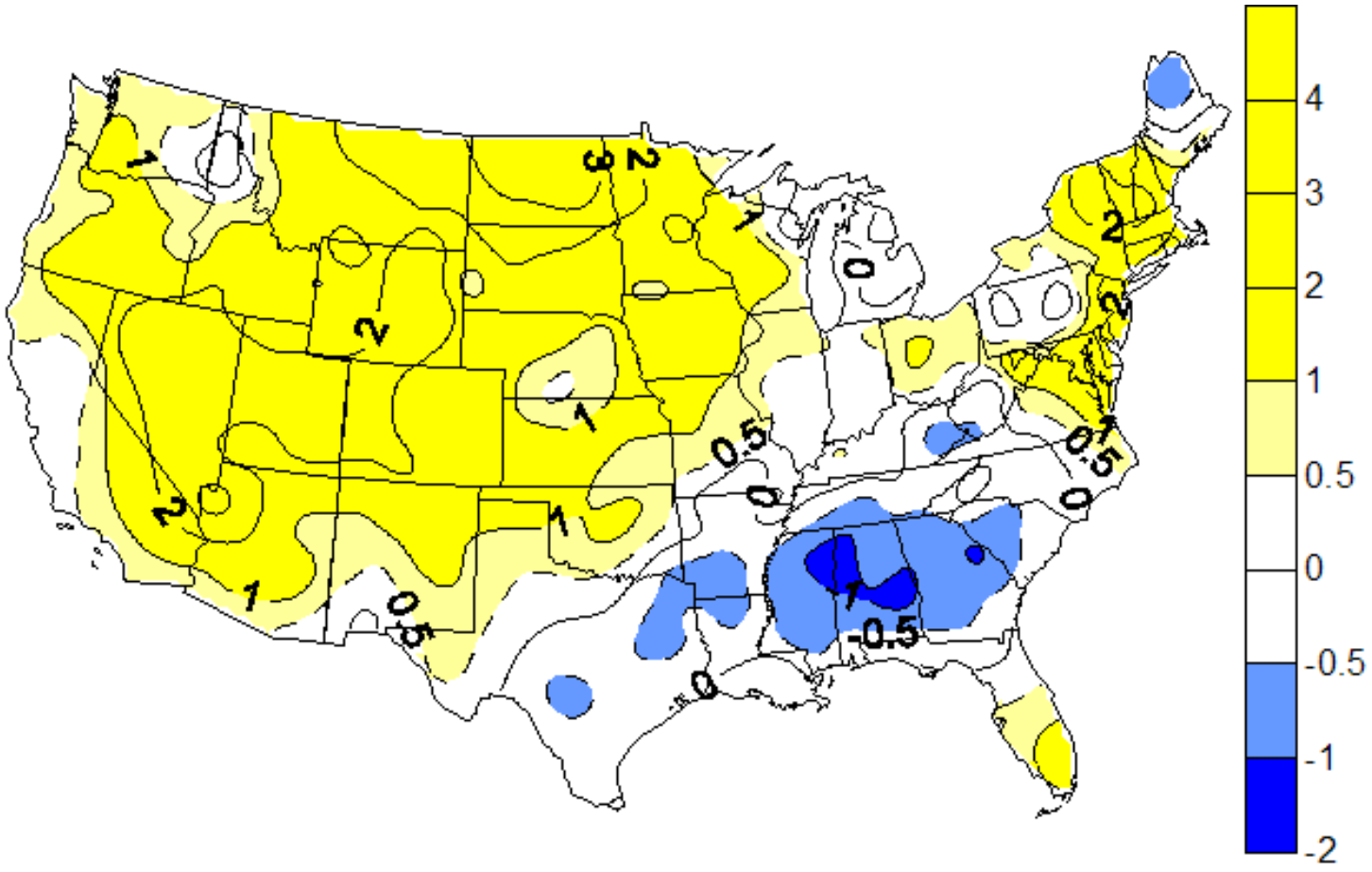
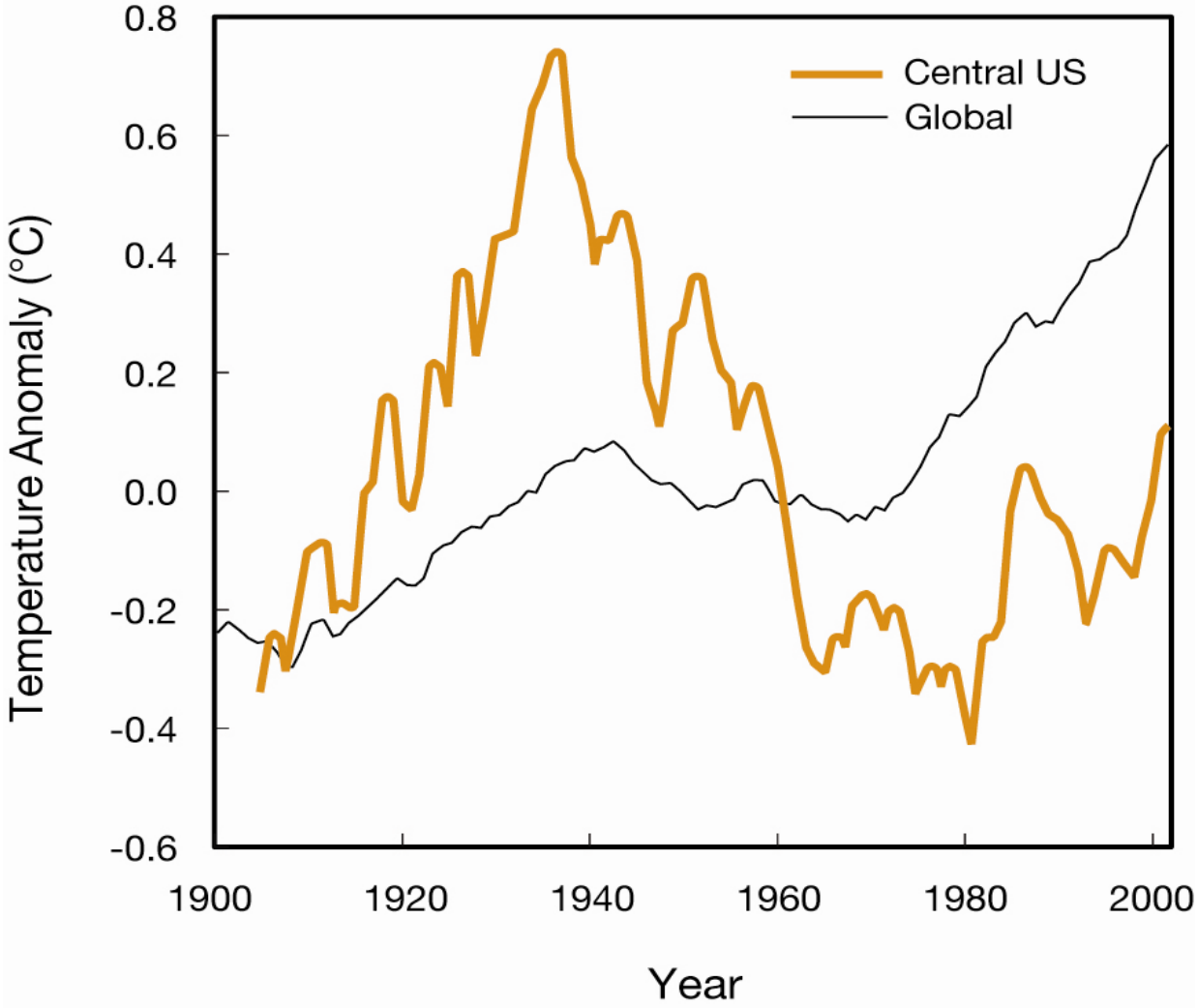


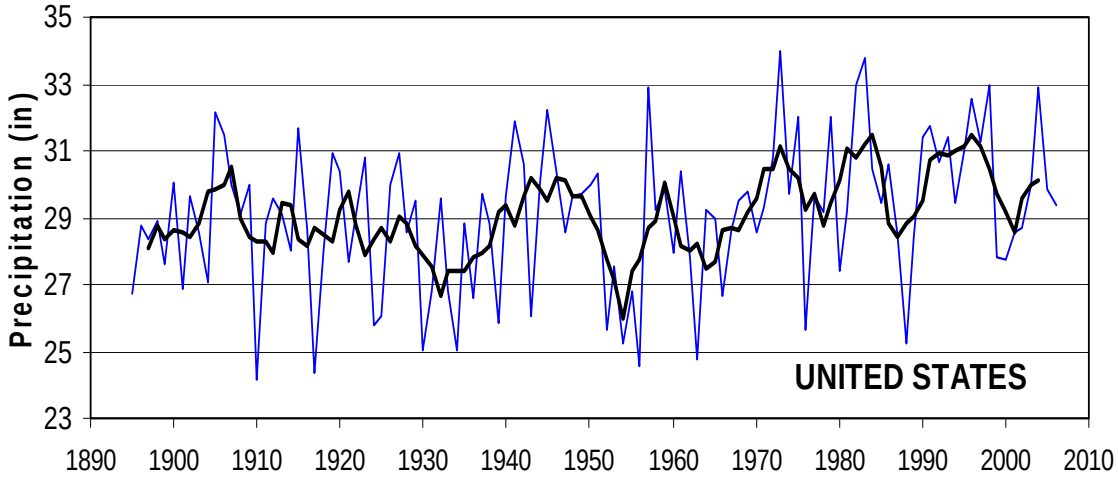
Figure 1. ANNUAL temperature trends in the U.S. expressed as the total change over the period 1895-2006 in degrees F and derived from climate division data. Copyright 2007. Illinois State Water Survey.

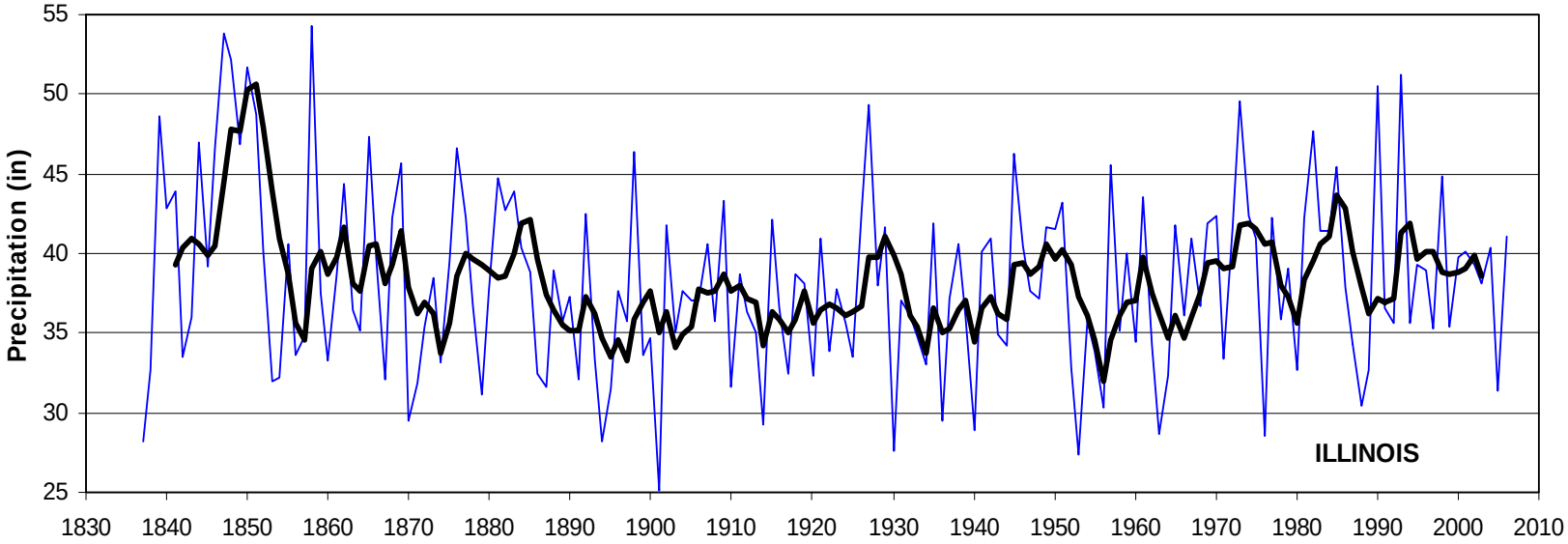
TEMPERATURE TRENDS IN CENTRAL USA ARE NOT THE SAME AS GLOBAL AVERAGE TEMPERATURE TRENDS (Kunkel et al.)



PRECIPITATION – Annual –Smoothed

Source: Jim Angel, Illinois State Water Survey





ILLINOIS' LOWEST ANNUAL PRECIPITATION RECORDED (ins)

[Note: different period of record at each site]

Lowest state-wide total 26.3 ins in 1901

- Rantoul 13.1 (1964)
- Keithsburg 16.6 (1956)
- Mount Pulaski 18.1 (1988)
- Urbana 18.3 (1894)
- Danville 18.9 (1901)
- Galena 18.9 (1988)

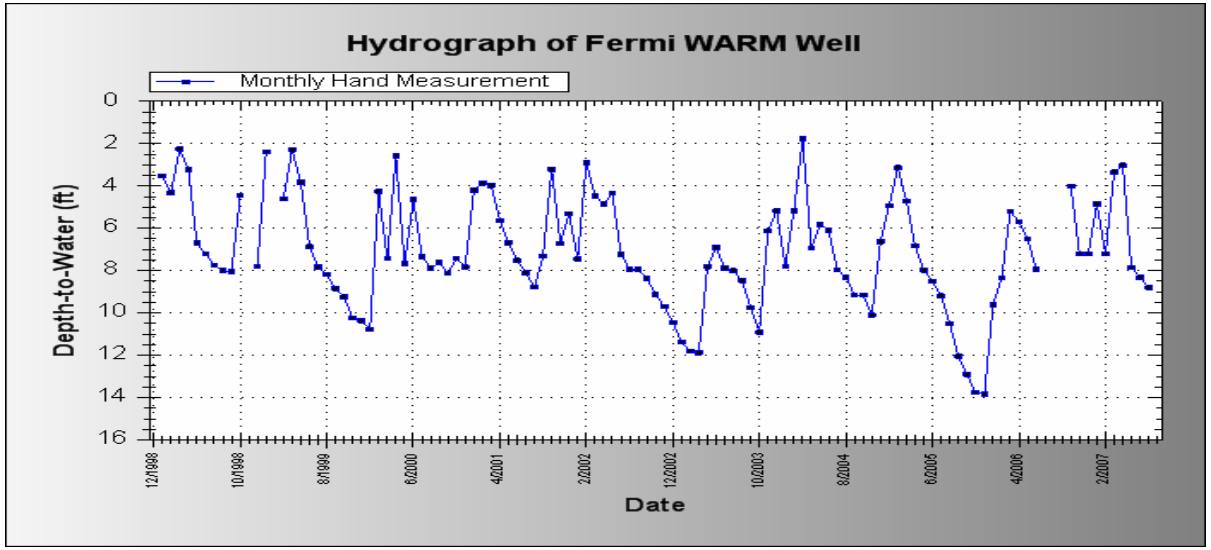
CLIMATE STATISTICS

Expected Precipitation (ins) Across Illinois (mean annual precipitation 38 ins)

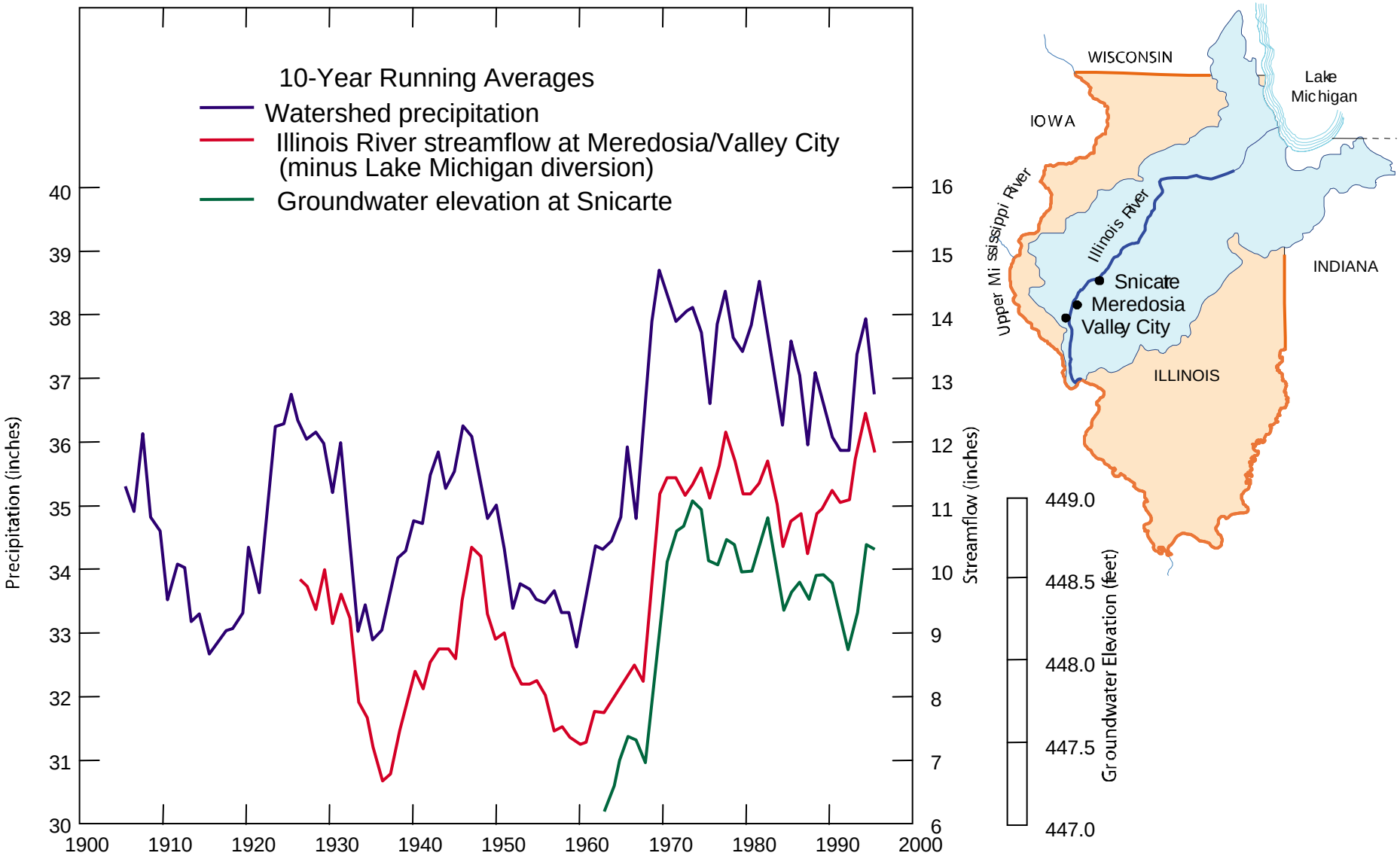
Drought duration	50-year return period	200-year return period
12 months	20	17
24 months	25	21
60 months	30	26

DROUGHT IMPACTS

- **Decreases water levels in shallow wells**

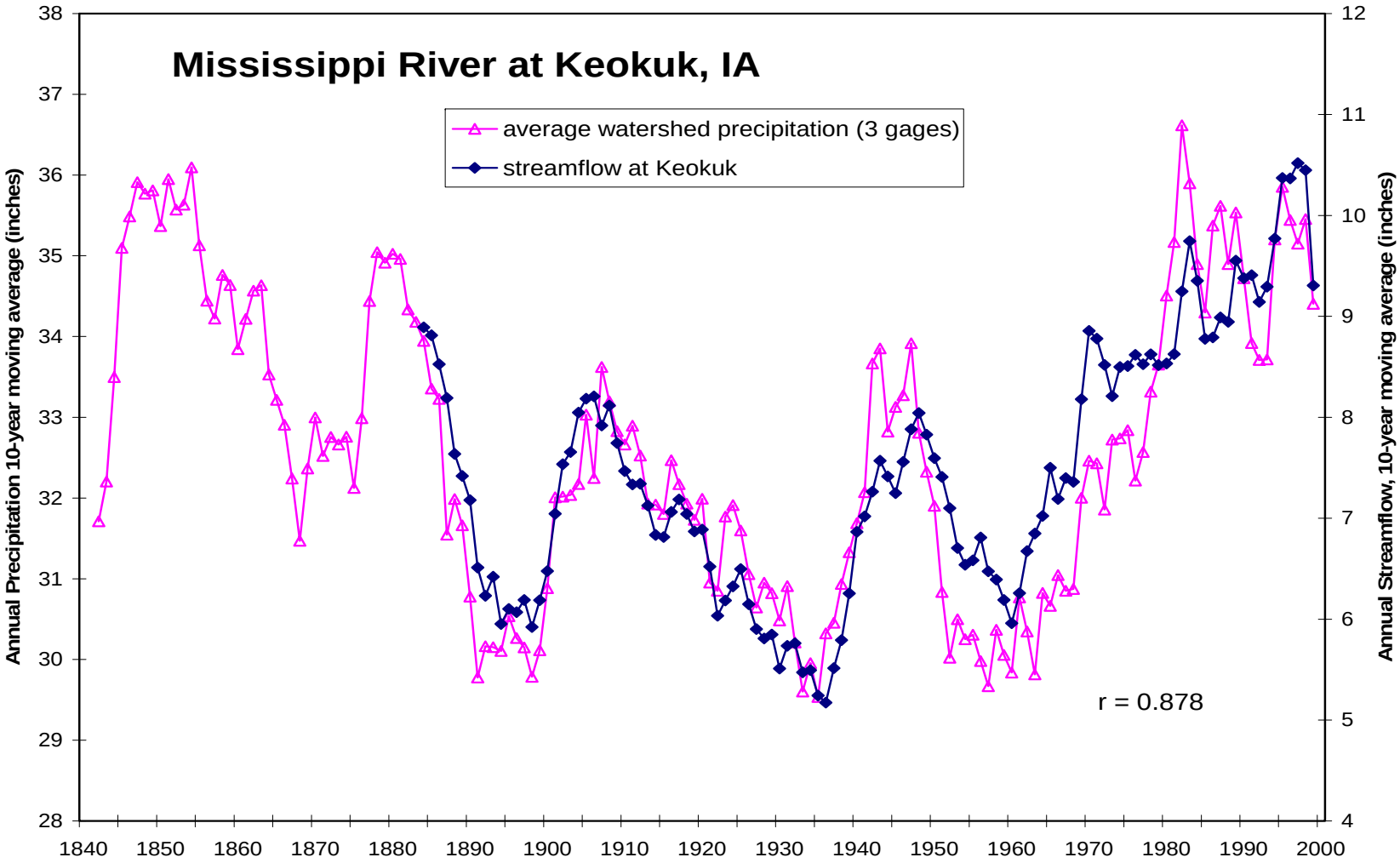


- **Deep aquifers are buffered from drought but could be impacted by long-term climate change.**
- **Reduces streamflow (10% precipitation decline typically results in a 20-50% streamflow reduction).**
- **Increases peak water demand up to 50-60%.**



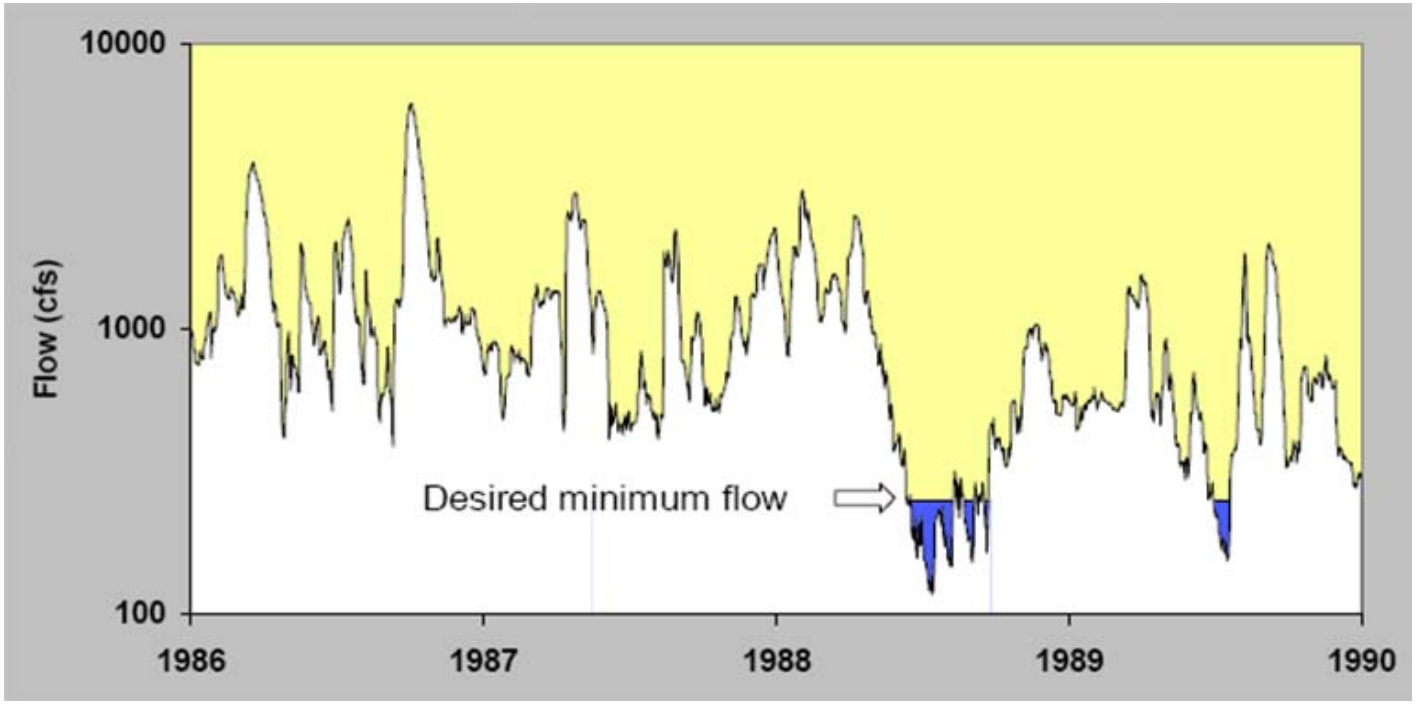
10-year precipitation; streamflow (minus Lake Michigan diversion); and groundwater level (Winstanley et al., 2006)

Precipitation and Streamflow in the Upper Mississippi (Vern Knapp, ISWS)



Protecting Instream Flows

Streamflow is usually abundant and its use for water supply is not a concern in most years. But during low flows, instream flow uses become a priority issue.



Vern Knapp (ISWS)

FUTURE CLIMATE

1. **Climate statistics: past as a guide to the future**

2. **Climate modeling: simulate natural and anthropogenic changes**

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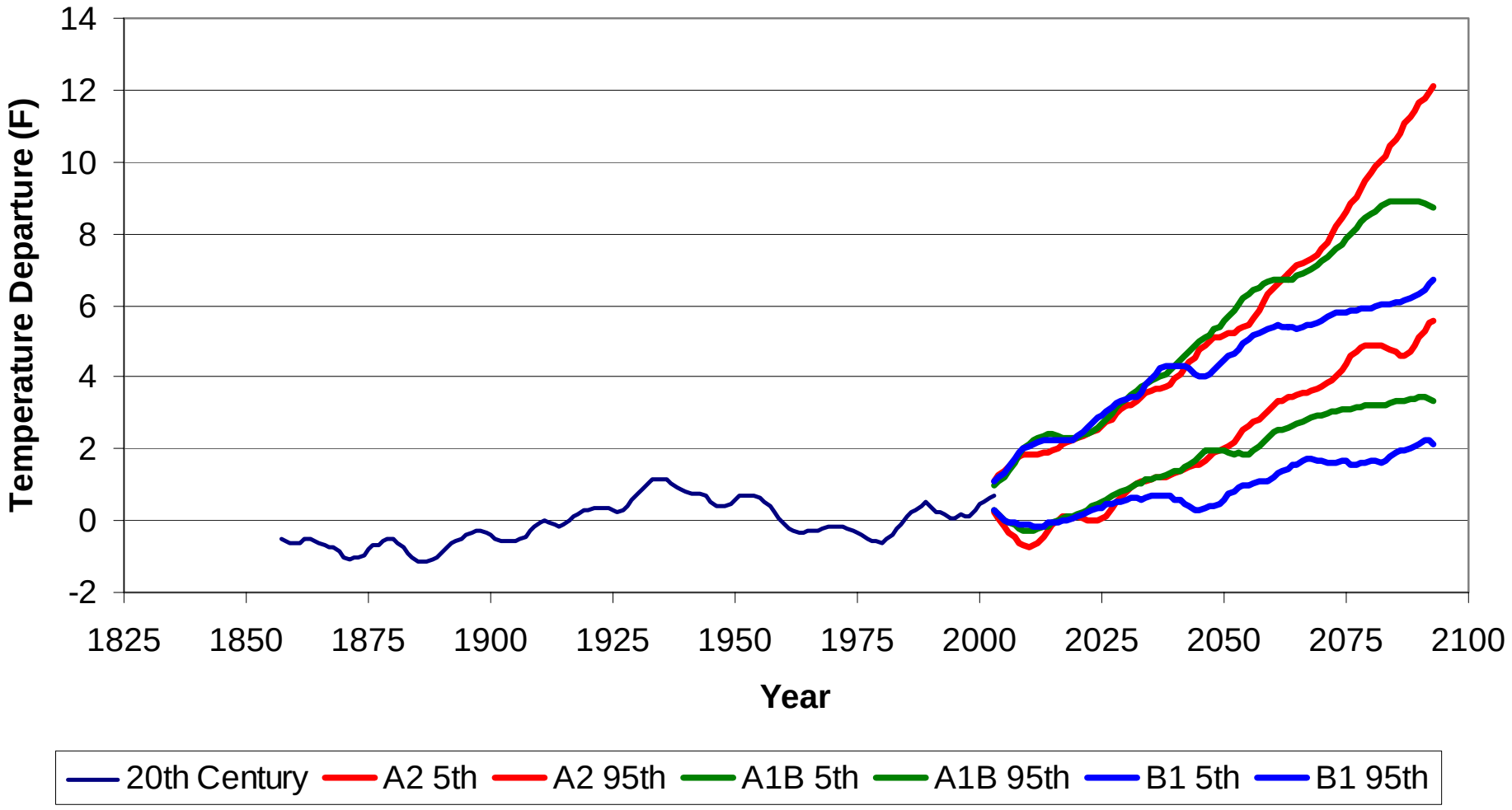
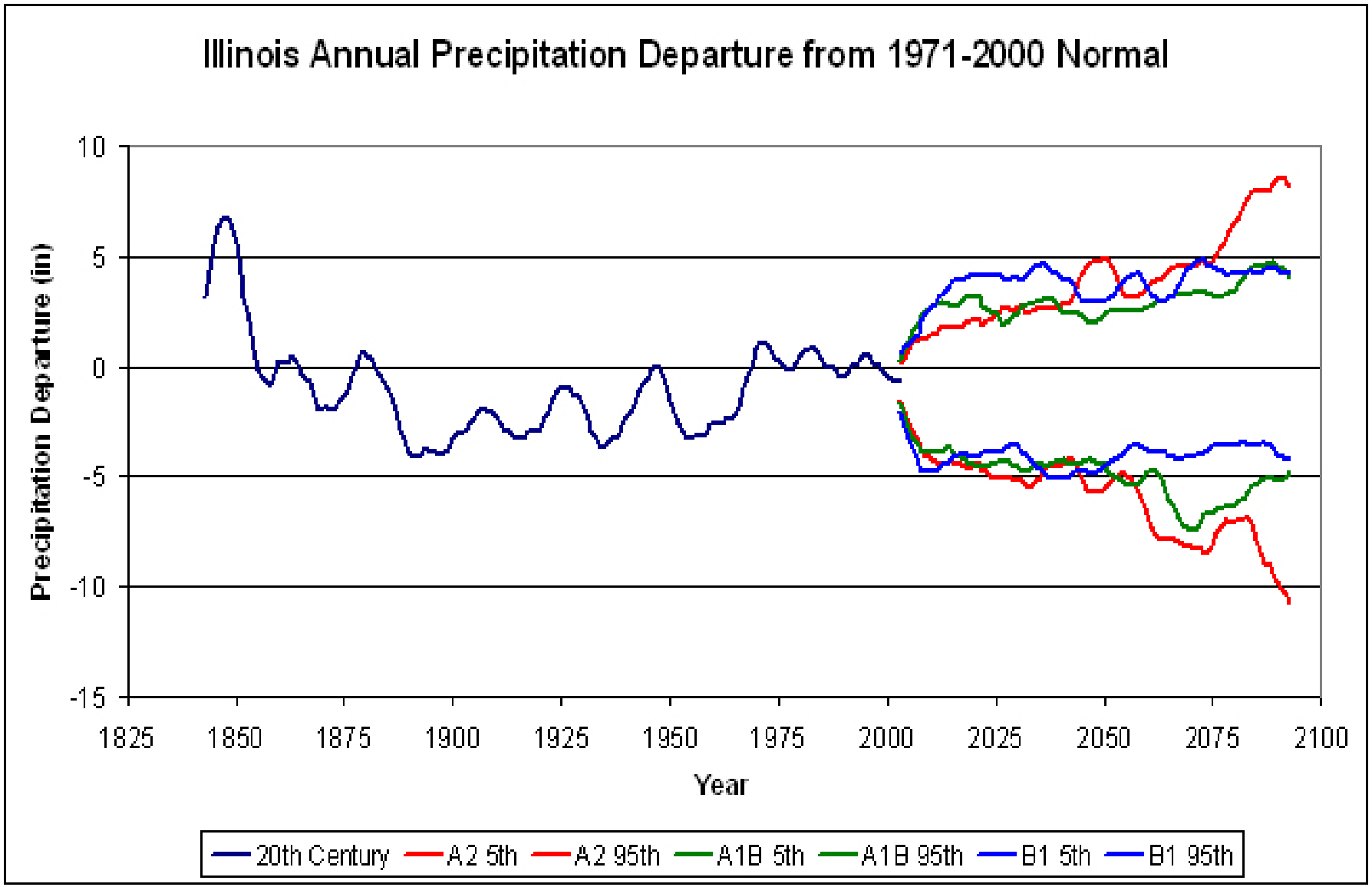
Illinois Annual Temperature Departure from 1971-2000 Normal



http://www.sws.uiuc.edu/wsp/climate/ClimateTom_scenariosmap2.asp



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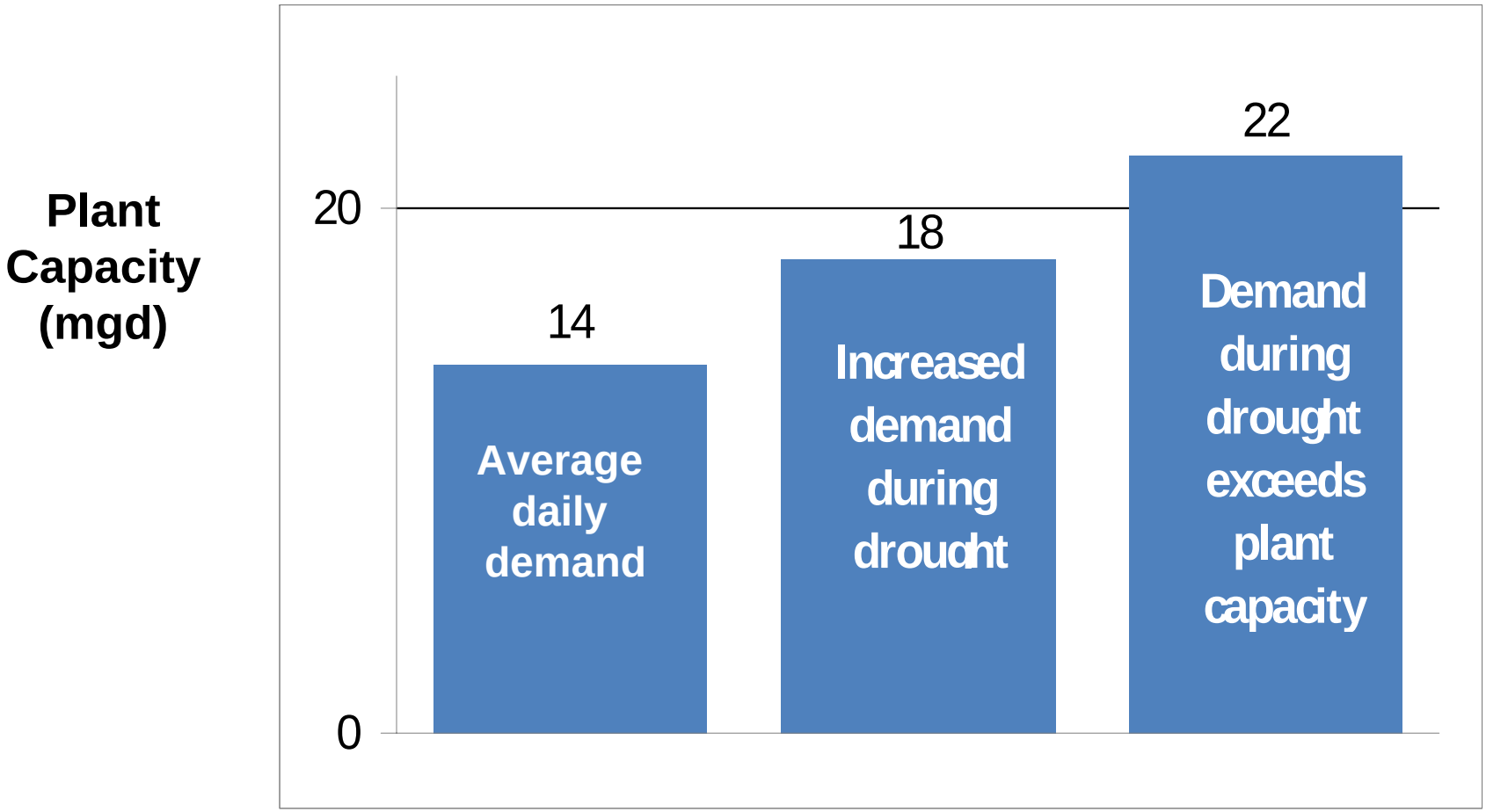
DROUGHT RISK AND MANAGEMENT

Relationship of Increased Water Demand to Plant Capacity



SEVERE DROUGHTS: PAY NOW FOR PROTECTION OR PAY LATER FOR DAMAGES?

- **IL (average 38 ins rain)**
  - **plan for 25 ins? 20 ins? 15 ins?**
  - **acceptable level of damage?**
  - **acceptable cost of protection?**
- **Science can provide data for risk assessment**
- **Resource managers must make decisions on risk management**

REGIONAL WATER SUPPLY PLANNING

GOVERNOR

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

MAHOMET AQUIFER CONSORTIUM

CMAP Chicago Metropolitan Agency for Planning

East Central Illinois Regional Water Supply Planning Committee

Northeastern Illinois Regional Water Supply Planning Group

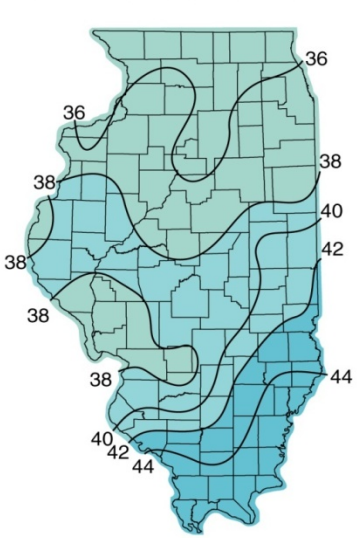
1 in 200 Year Drought

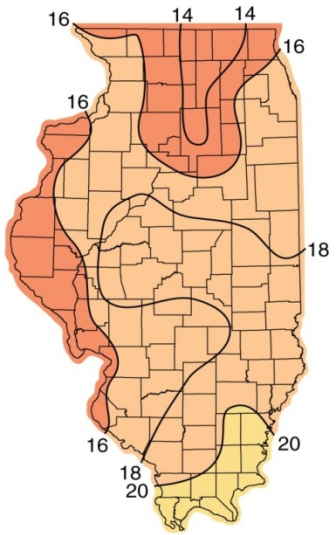
(ISWS Informational/Educational Materials 2006-02)

The Water Cycle and Water Budgets in Illinois:
A Framework for Drought and Water-Supply Planning

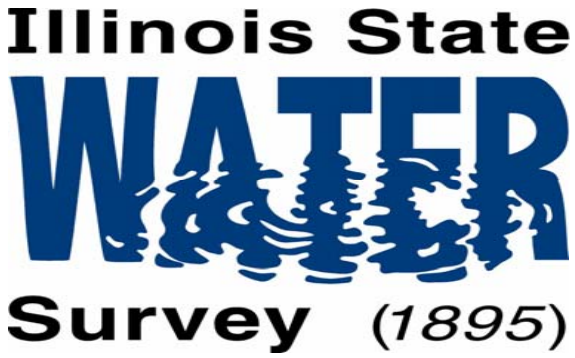
Derek Winstanley, James R. Angel, Stanley A. Changnon, H. Vernon Knapp,
Kenneth E. Kunkel, Michael A. Palecki, Robert W. Scott, and H. Allen Wehrmann

ARE WE PREPARED...





...FOR SEVERE DROUGHT?



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