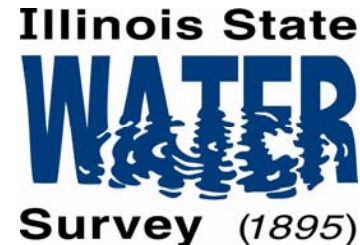


2007 IAFSM ANNUAL CONFERENCE STORMS and FLOODS

WHAT MOTHER NATURE IS DOING?

**Derek Winstanley
Chief
Illinois State Water Survey**



TOPICS

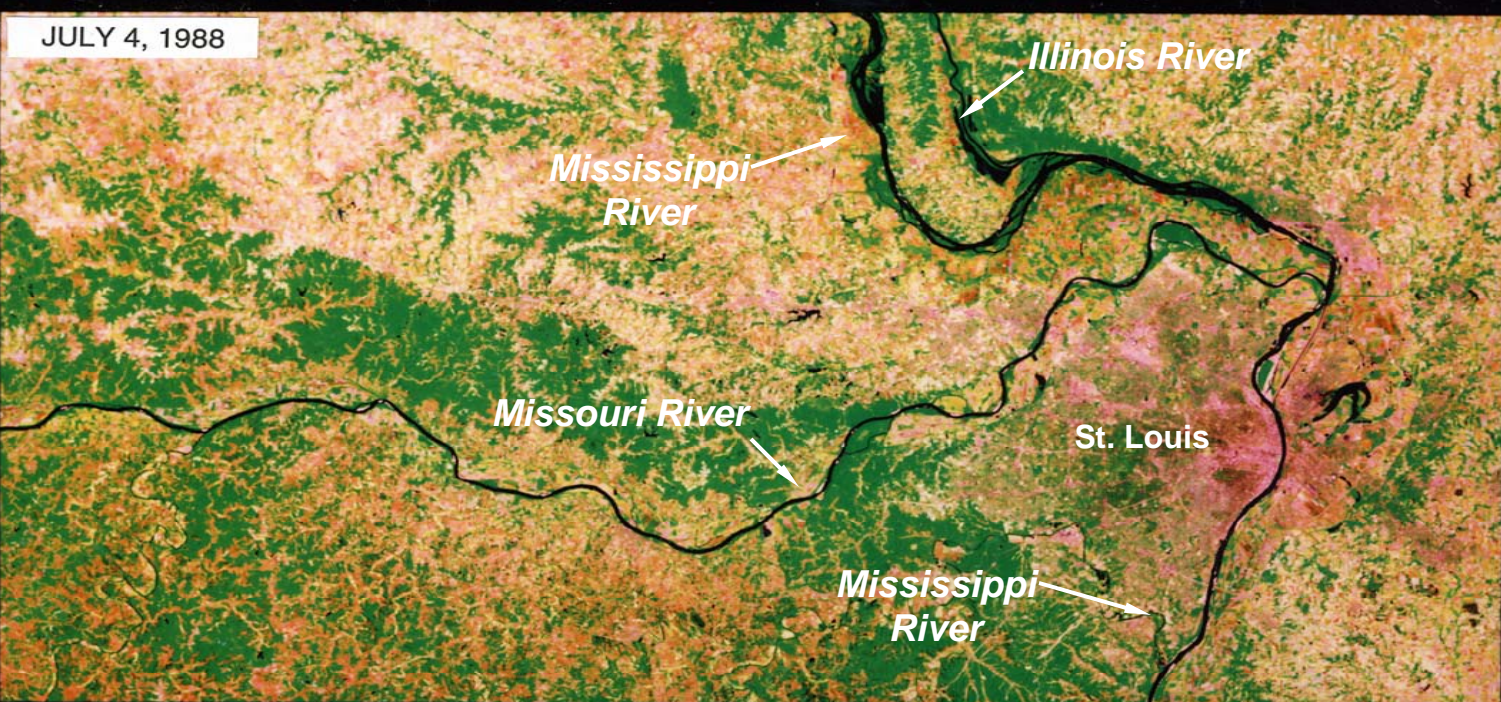
- **climate variability and change**
- **streamflow changes**
- **what does the future hold?**

CLIMATE VARIABILITY AND CHANGE

NFIP rates assume a stationary climate

2. Climate Change - The climate for the period of record, 1940-1998, is assumed to be stationary; i.e., not significantly changing. The analysis by the Corps of Engineers' Institute for Water Resources (IWR) showed possible trends for some stations but no clear climate change trend for this period. IWR's recommendation was to assume that the period of record was stationary given the difficulty in distinguishing a climatic trend from overall climatic variability. Consequently, standard flood frequency statistical analysis will be used to capture the overall variability in the flood record.

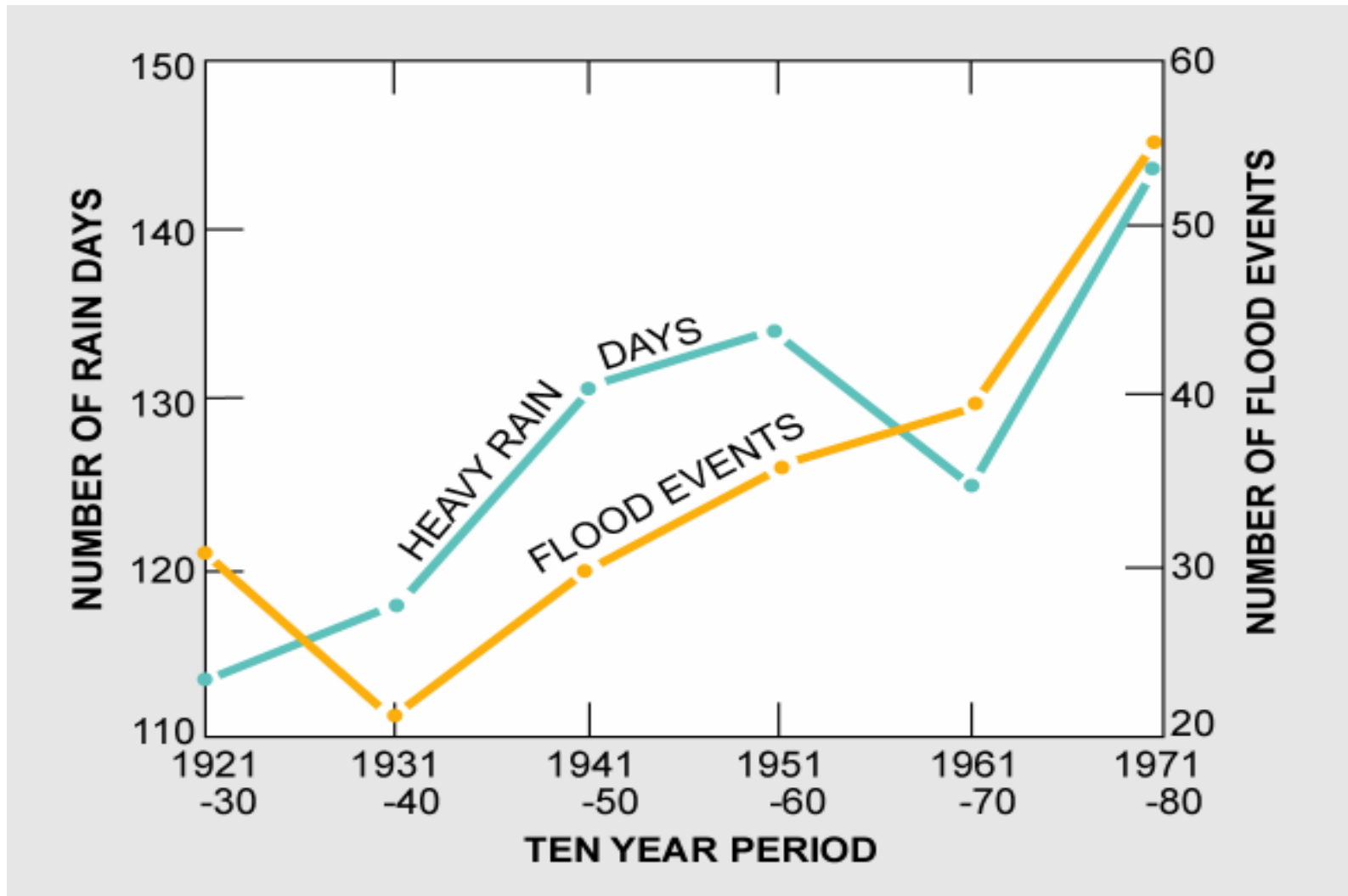
JULY 4, 1988

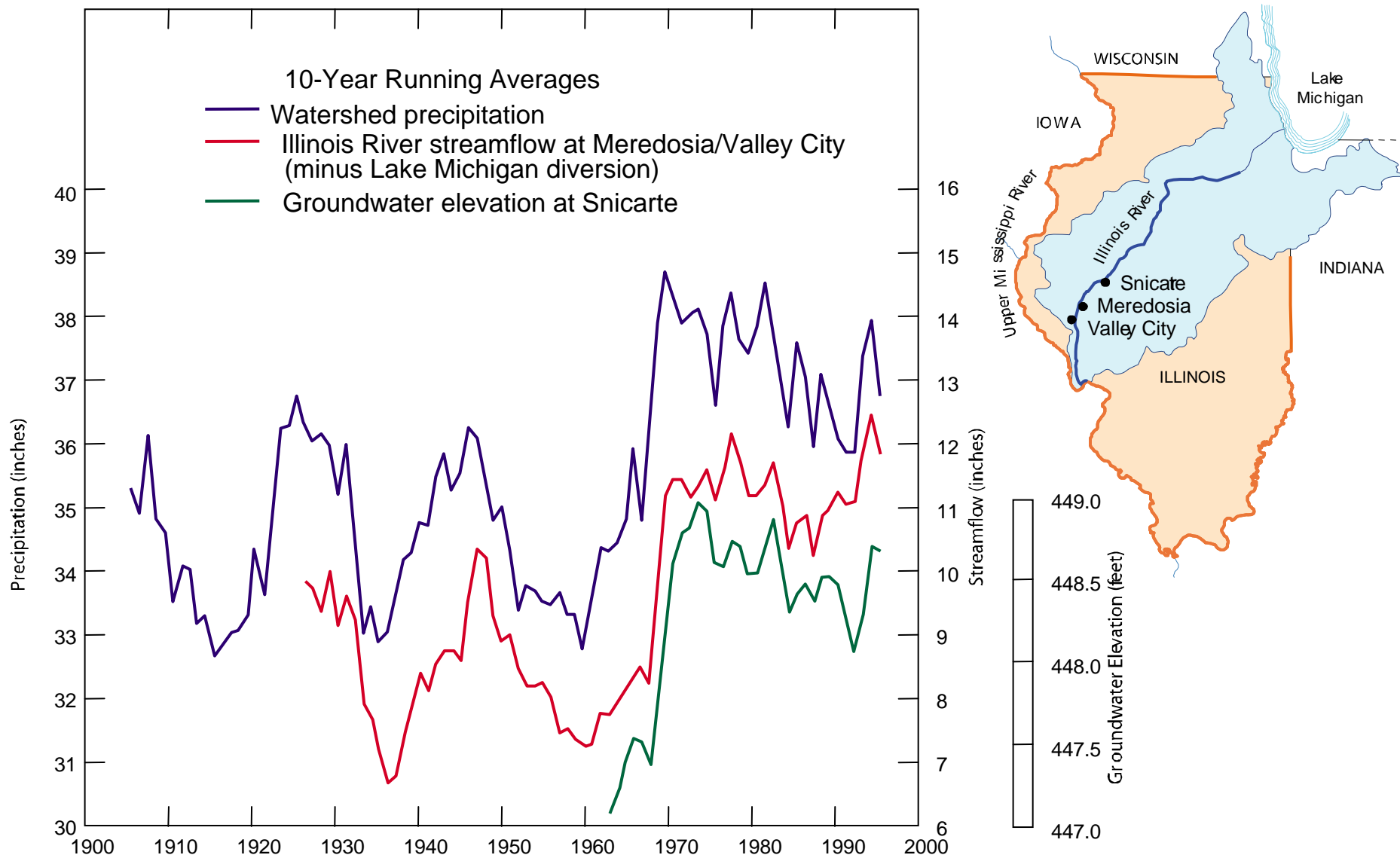


JULY 18, 1993

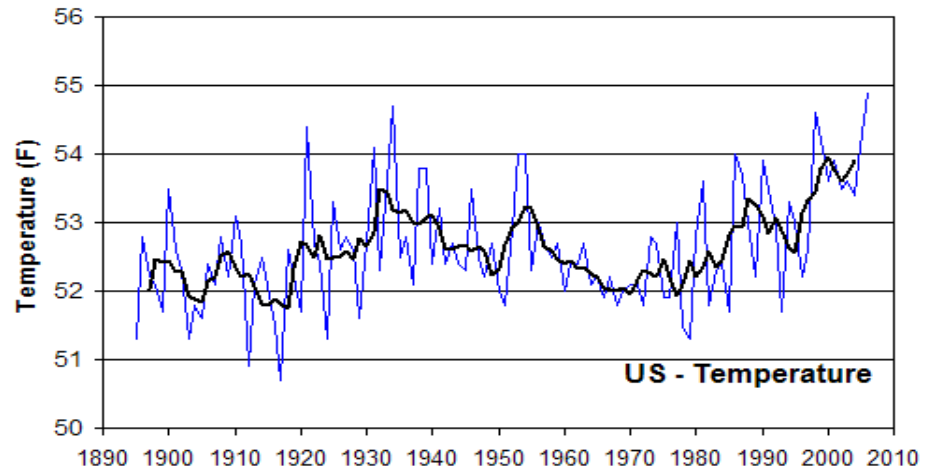


Decadal Frequency of Summer Heavy Rains and Floods in Illinois

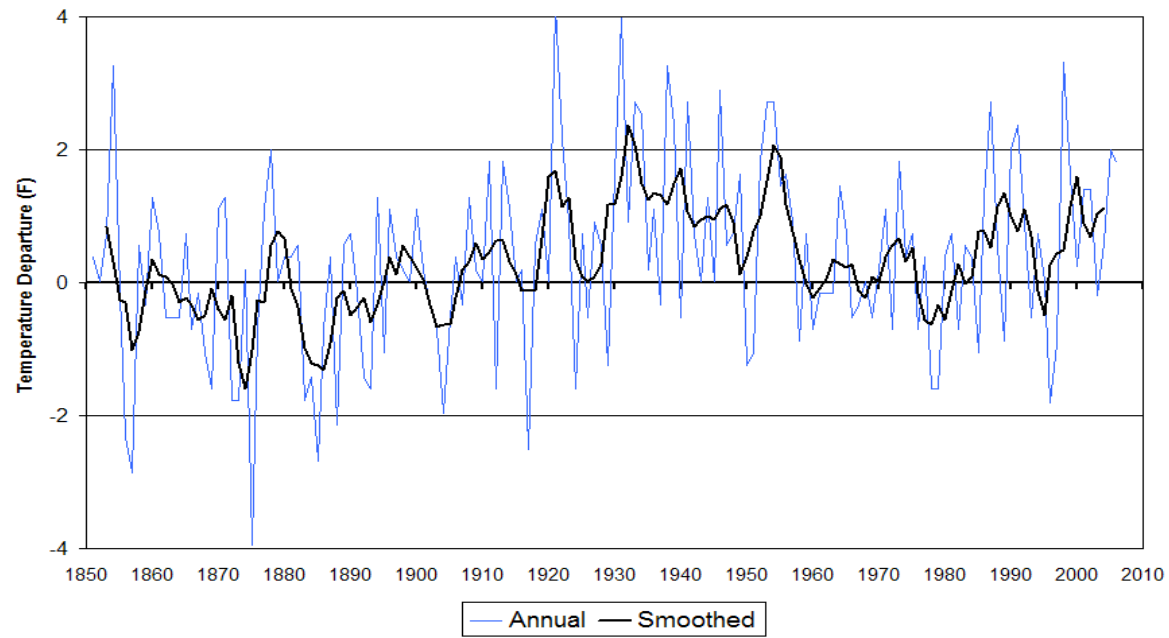




10-year running averages of Illinois River watershed precipitation, streamflow (minus Lake Michigan diversion), and groundwater elevation.



Annual Temperature - Illinois



ANNUAL TEMPERATURE TRENDS

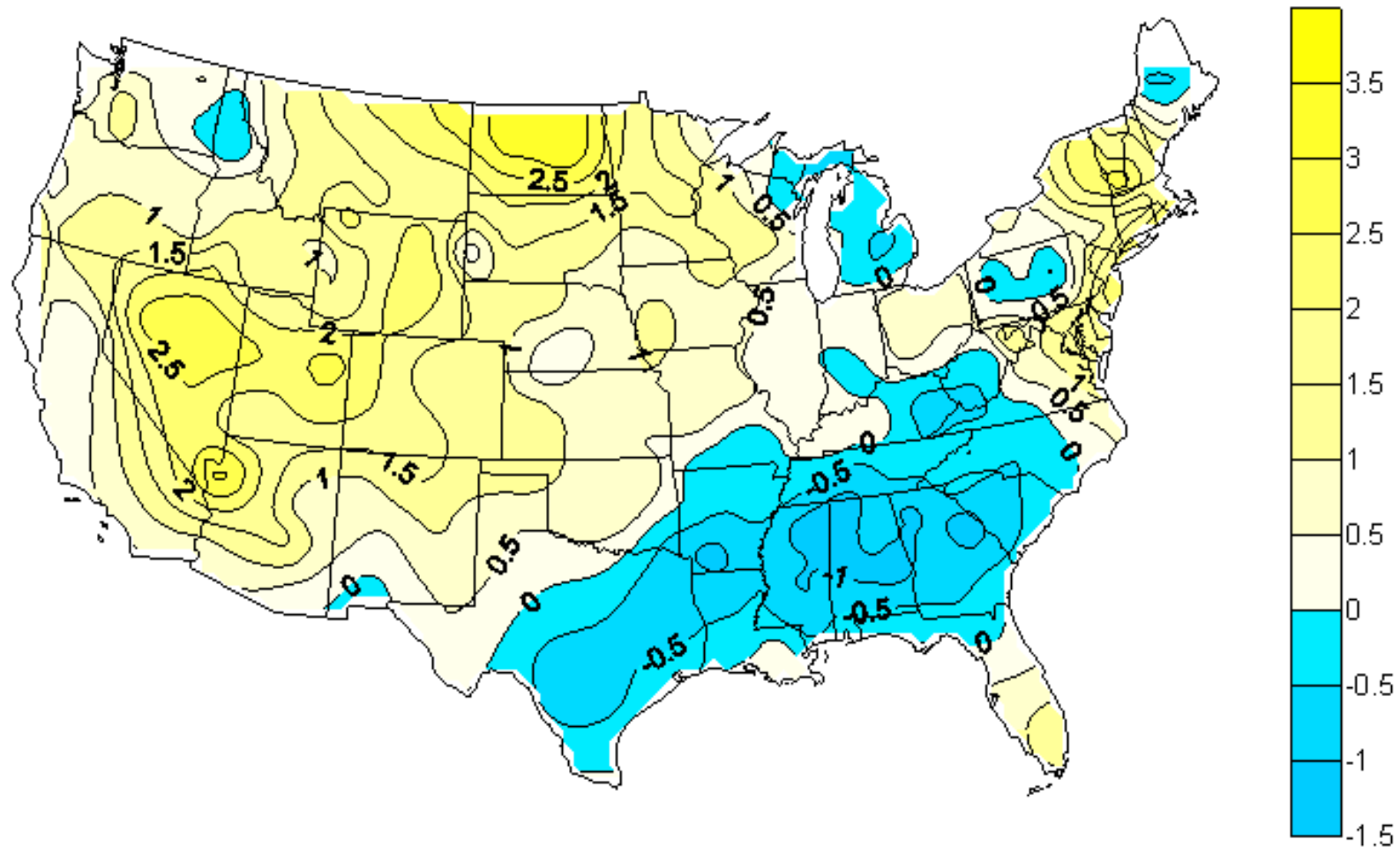
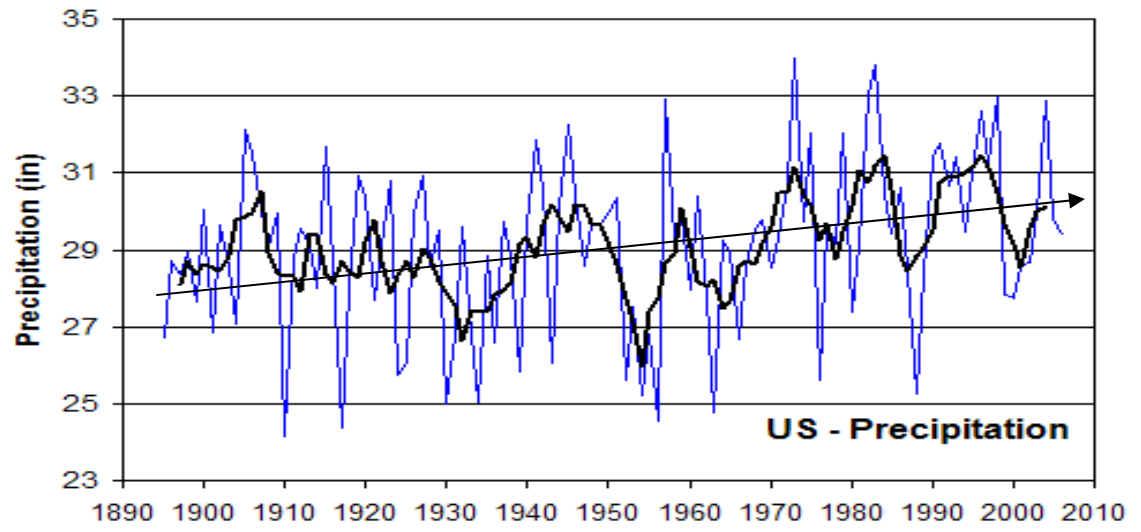
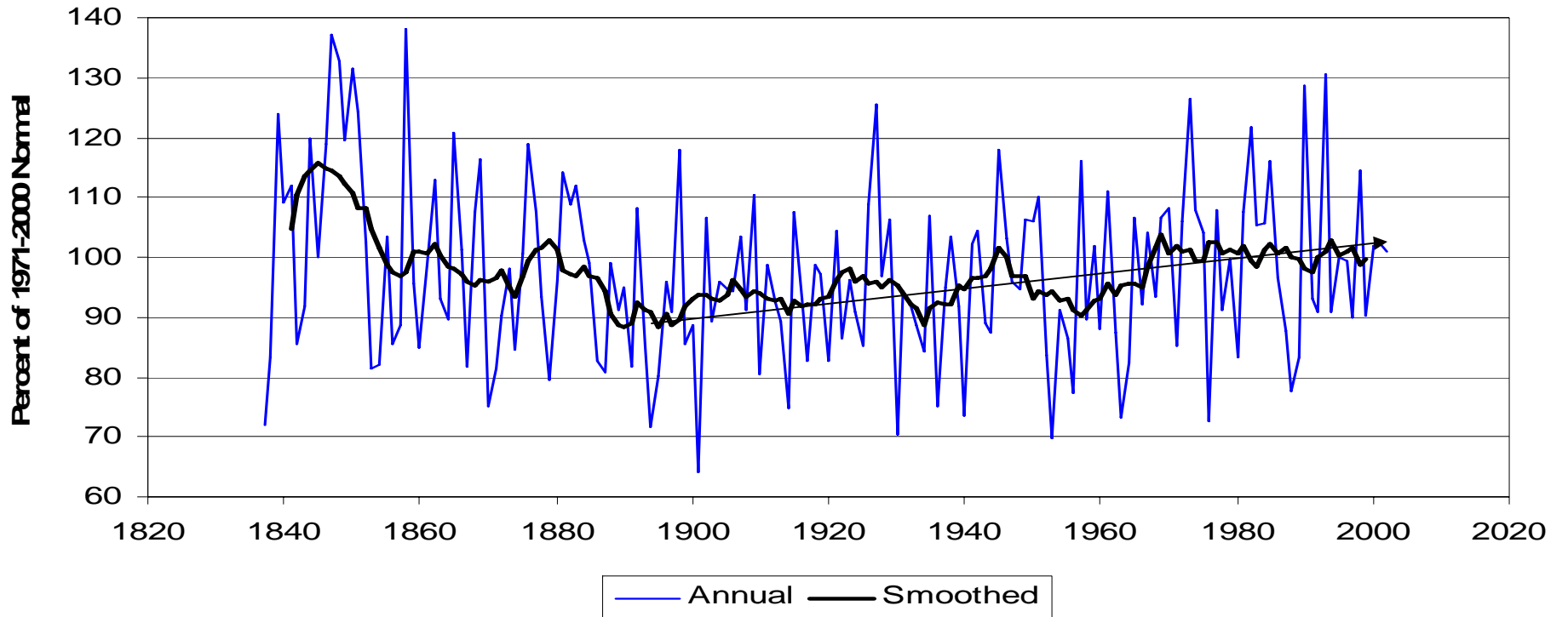


Figure 1. Temperature trends for the U.S. in degrees Fahrenheit, expressed as the change over the period 1895-2003, as derived from climate division data.



Annual Precipitation for Illinois



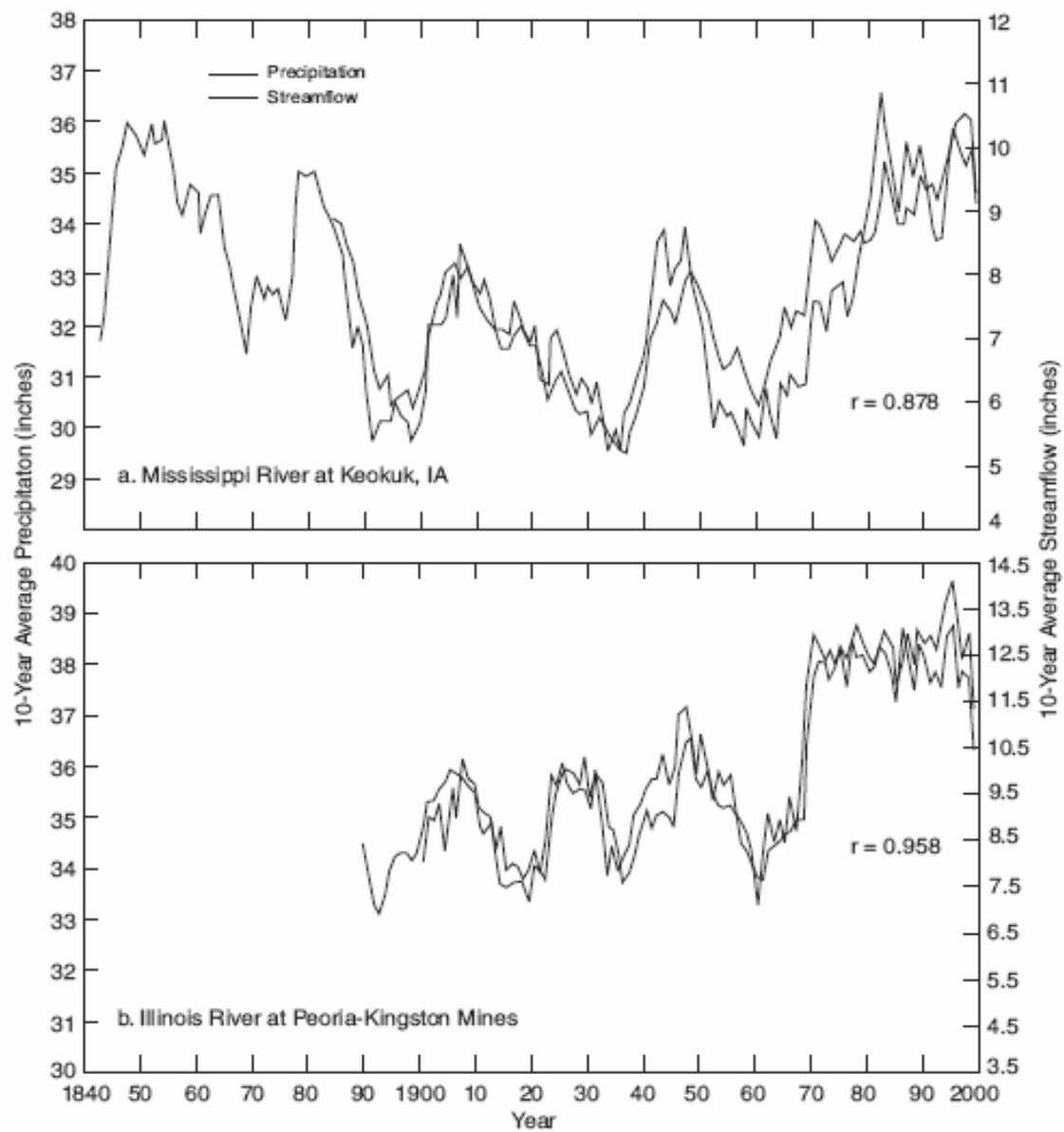
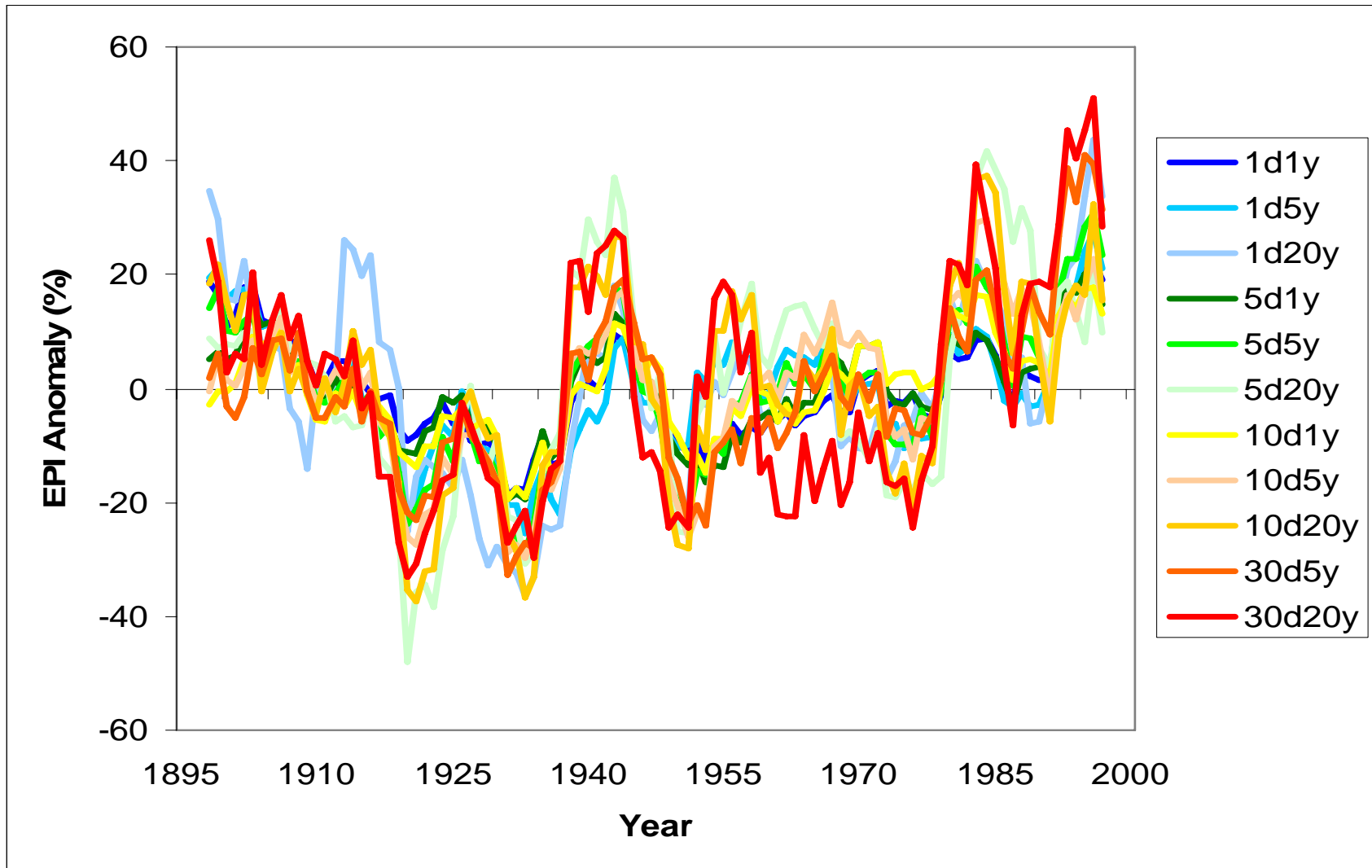


Figure A-16. Comparison of 10-Year Moving Averages of Watershed Precipitation and Streamflow for a) Mississippi River at Keokuk, Iowa, 1837-2002, Using 3 Precipitation Gages, and b) Illinois River at Peoria-Kingston Mines, 1870-2002, Using Data from 4 Climate Divisions (from Knapp, 2004).

FREQUENCY OF SEVERE PRECIPITATION EVENTS IN USA (Kunkel et al. 2003)



Major causes of loss trends related to weather and climate extremes are societal factors (Changnon, 2003)

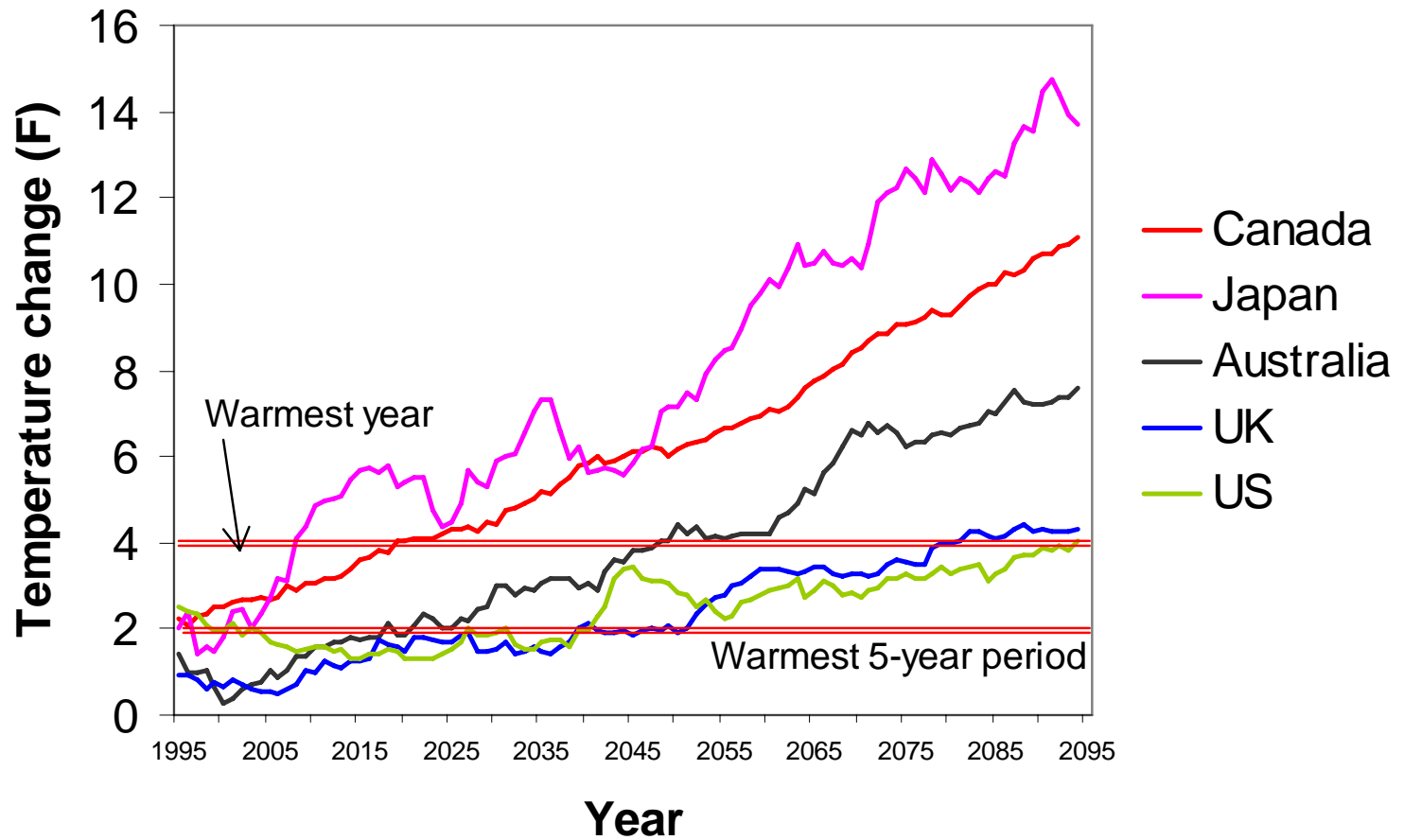
- **Increased wealth and property value**
- **Increased density of property**
- **Shifts to coastal areas**
- **Aging infrastructure and inadequate building codes**

Increasing vulnerability to weather and climate extremes (Kunreuther, 1998)

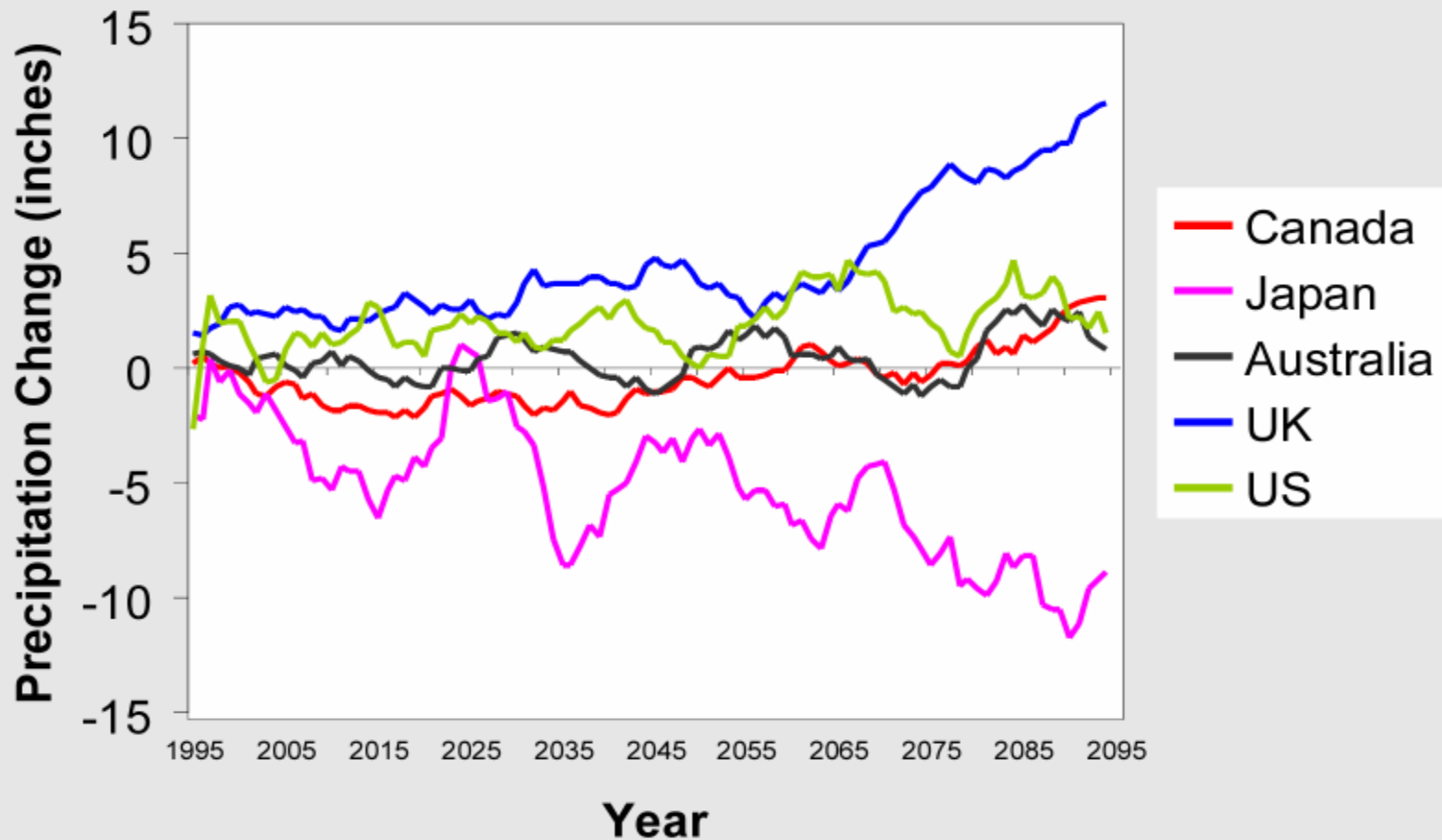
EXCESS PRECIPITATION IS THE FUNDAMENTAL CAUSE OF FLOODS (Changnon, 2004)

- **Over last century there has been:-**
 - **an increase in precipitation**
 - **an increase in the frequency of heavy precipitation**
 - **an increase in streamflow**
 - **an increase in flood-related damages**
 - **inconclusive about roles of physical and societal factors in causing increased impacts**

Global Climate Model Projections Annual Temperatures - Illinois

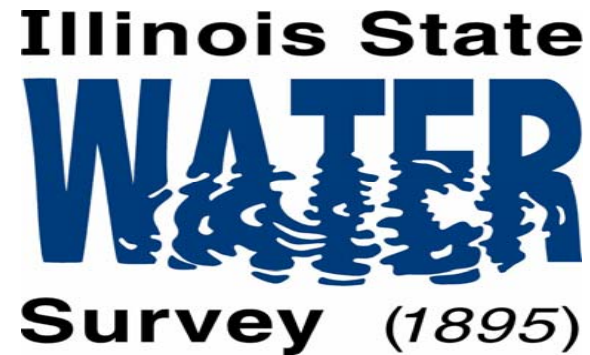


Global Climate Model Projections Annual Precipitation - Illinois



CONCLUSIONS

- Precipitation and floods have increased over last 100 years. Increased greenhouse effect?
- Higher precipitation (and floods?) in 1800s
-natural variability.
- No warming in Illinois over last 80 years.
- Future – climate effects on streamflows highly uncertain
 - wide envelope of risks
- When does climate become non-stationary?



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