Past Climate Change in Illinois

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ILLINOIS STATE WATER SURVEY
PRAIRIE RESEARCH INSTITUTE

Diary of the Weather, Fort Armstrong, Rock Island.

July 1820

Date 1820	Thermometer 7 A.M.	2 P.M.	9 P.M.	Course of the Winds	Weather	Remarks.
July 1	80	96	80	S. E.	Fair R2	I arrived at Fort Armstrong on the
2	78	90	86	Do	Do 24.	9th of the Present Month; from the
3	80	80	70	Do	Cloudy 5	commencement till my arrival the
4	66	80	72	S. W.	Do	Diary was kept by Maj: Marston
5	70	82	78	Do	Fair	Commanding Officer.
6	71	84	76	So.	Do	
7	77	90	82	S & S W	Cloudy	
8	77	92	82	S S W & W	Fair	
9	79	96	80	S W & S W	Do	
✓ 10	78	96	84	E. S W	Do	
11	81	84	81	W S W.	Cloudy	
12	80	90	71	N W & W	Do	
✓ 13	58	78	67	N W & N	Fair	74.16 — 06.77 — 75.50
14	58	78	68	N N W	Do	
15	68	90	70	E & S E	Do	2691
16	71	86	72	S E	Do	78.84
17	76	90	82	S E & E	Do	
18	78	90	73	S E	Do	
19	76	88	74	S W	Do	
20	72	90	78	W b S	Rain, P.M.	
21	78	80	72	W S W	Do Do	A violent hurricane on the 21st.
22	70	88	66	S E	Fair	

Peoria 1856-present

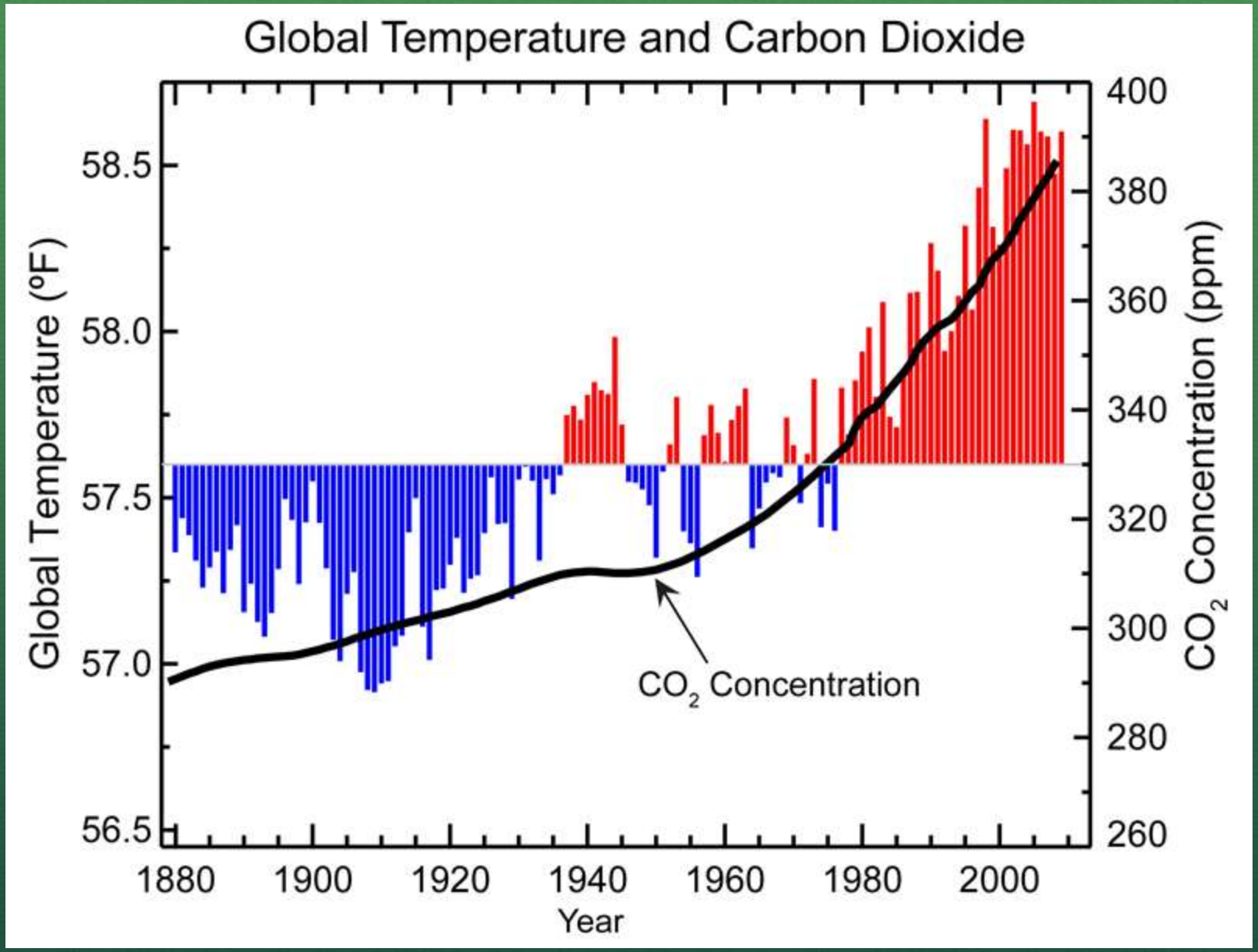
Climate Change and Variability

- Climate change – sustained over several decades or longer (ice ages, global warming)

- Climate variability – year to year changes in the climate system (El Niño, La Niña, 1993 flood, and 1988 drought)

Reasons for Climate Change

- Natural Change
  - Cycles, sun, volcanoes, ocean
- Human Change
  - Greenhouse gasses
  - Aerosols (small particles and dust)
  - Land Use


Global Temperature and Carbon Dioxide
Global Temperature (°F)
58.5
58.0
57.5
57.0
56.5
400
380
360
340
320
300
280
260
CO2 Concentration (ppm)
CO2 Concentration
1880
1900
1920
1940
1960
1980
2000
Year

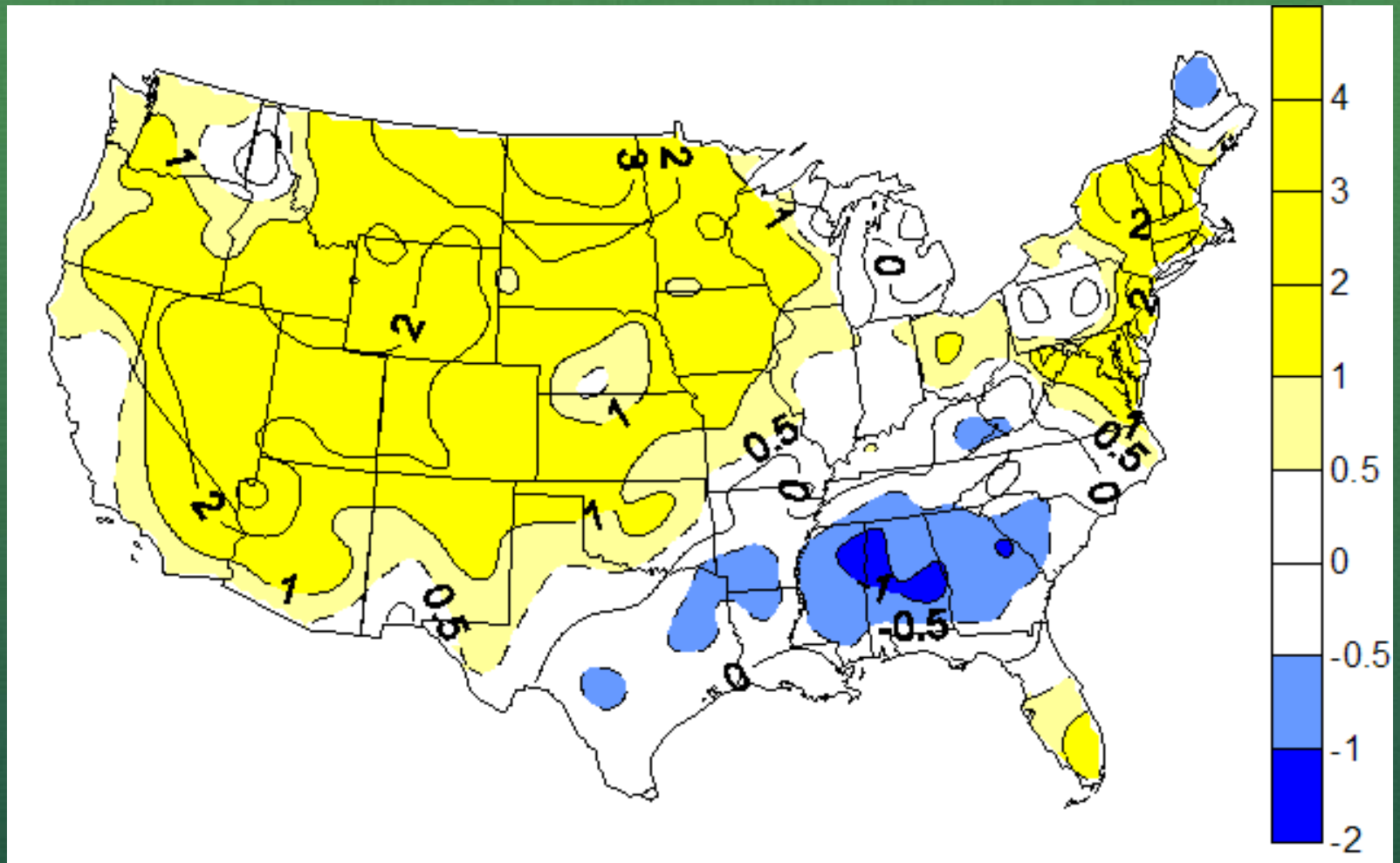
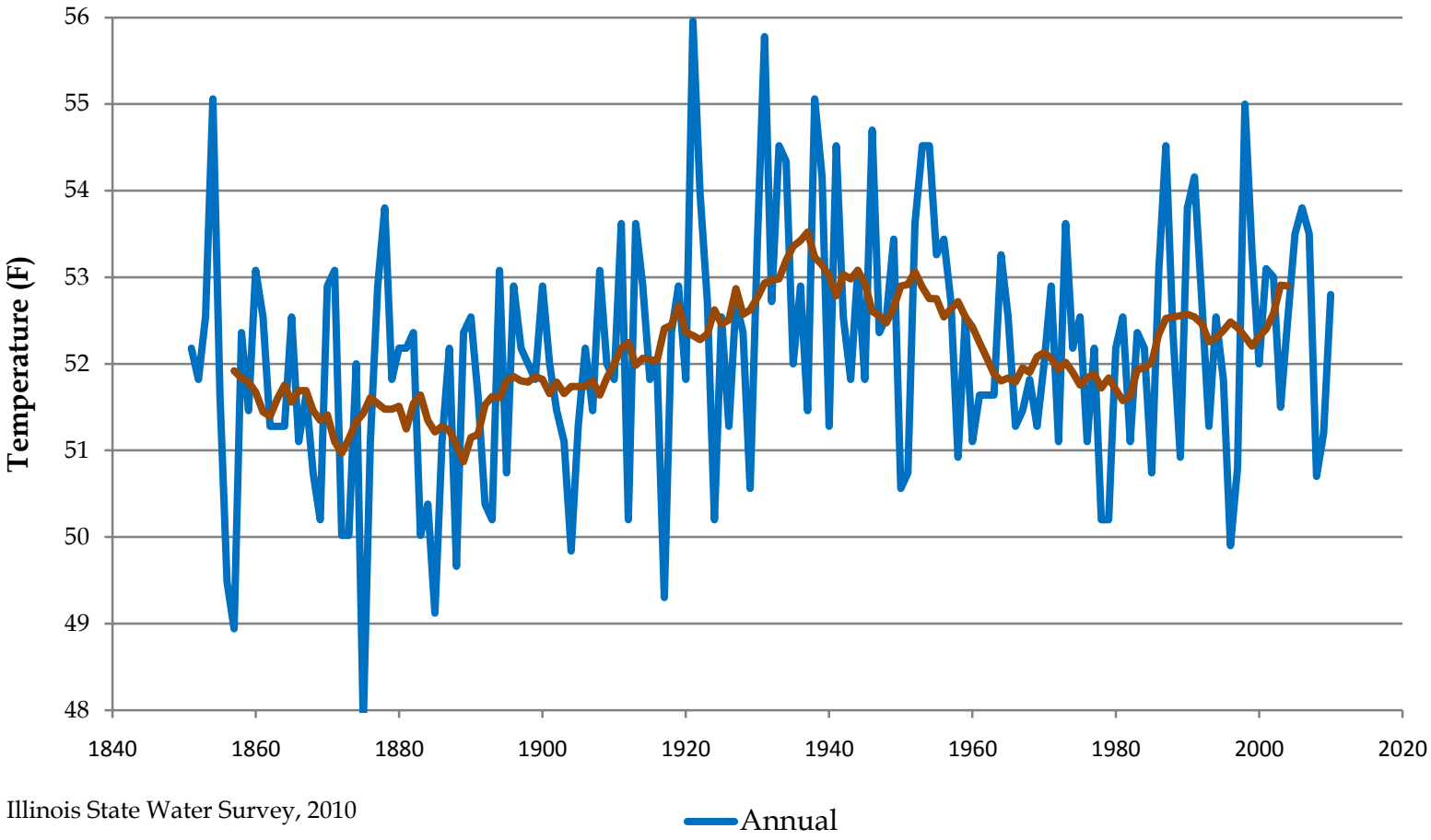
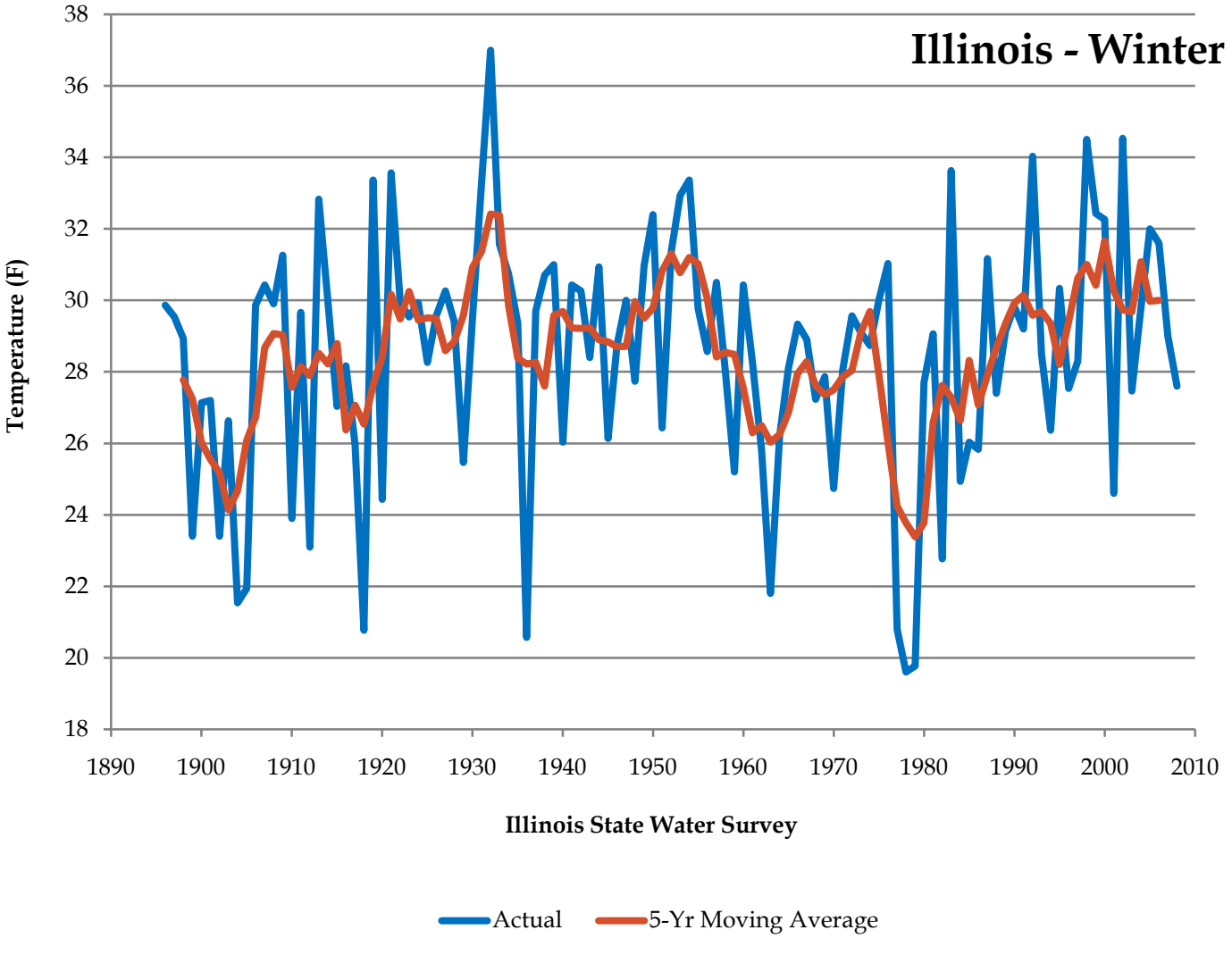


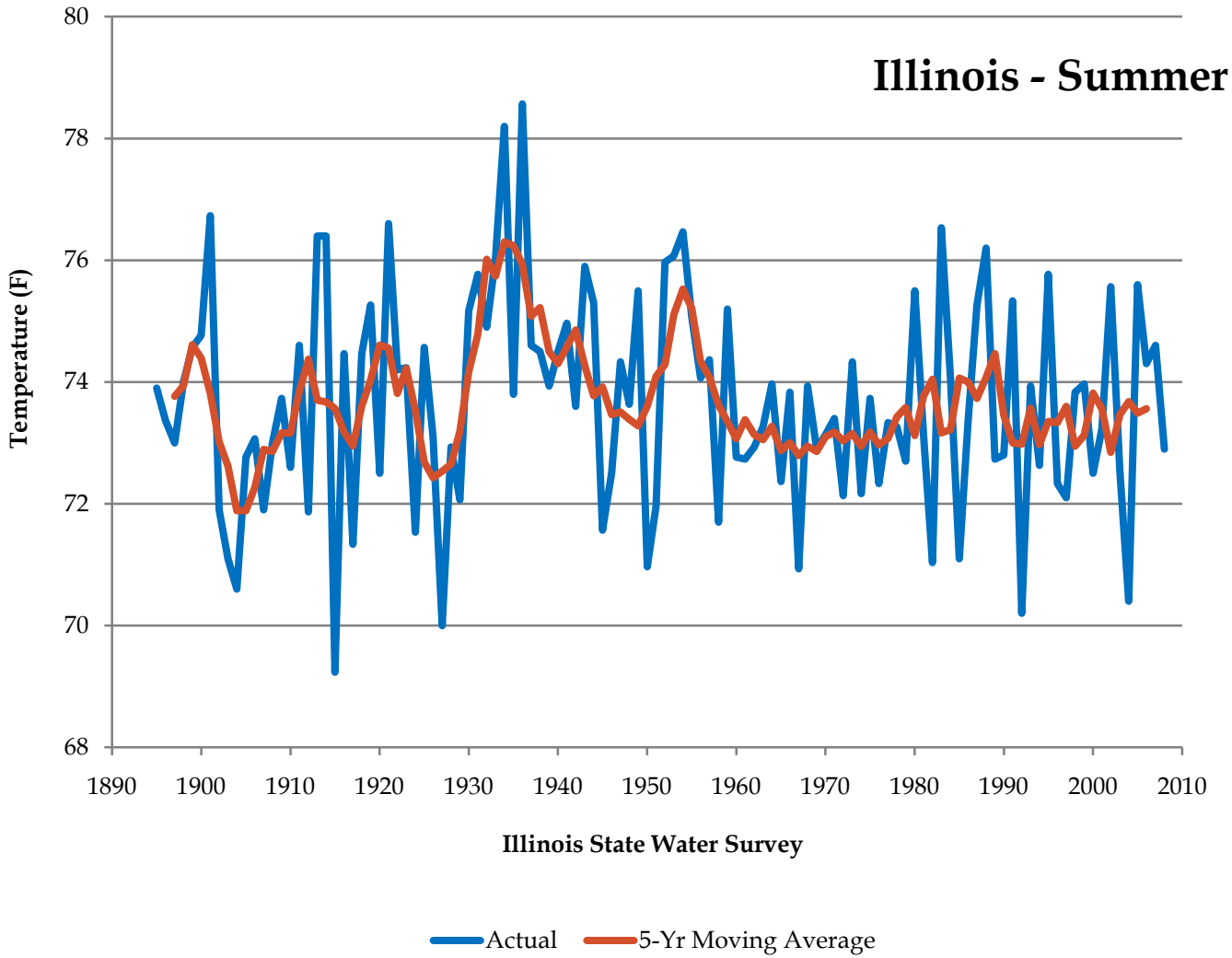
Figure 1. ANNUAL temperature trends in the U.S. expressed as the total change over the period 1895-2006 in degrees F and derived from climate division data. Copyright 2007. Illinois State Water Survey.

Annual Temperature for Illinois



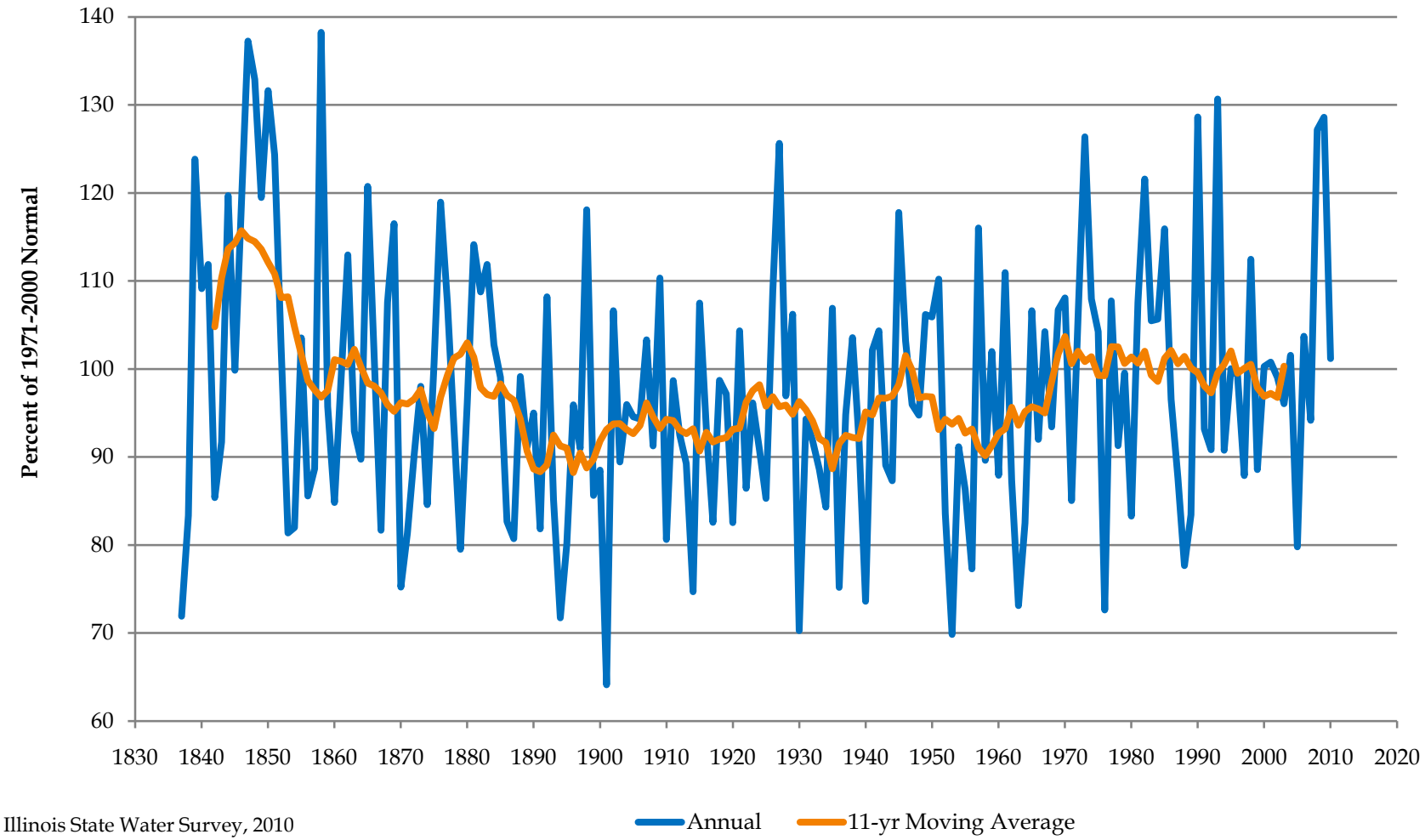
Illinois State Water Survey, 2010


Illinois - Winter
Temperature (F)
38
36
34
32
30
28
26
24
22
20
18
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
Illinois State Water Survey
Actual
5-Yr Moving Average


Illinois - Summer
Temperature (F)
80
78
76
74
72
70
68
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
Illinois State Water Survey
Actual
5-Yr Moving Average

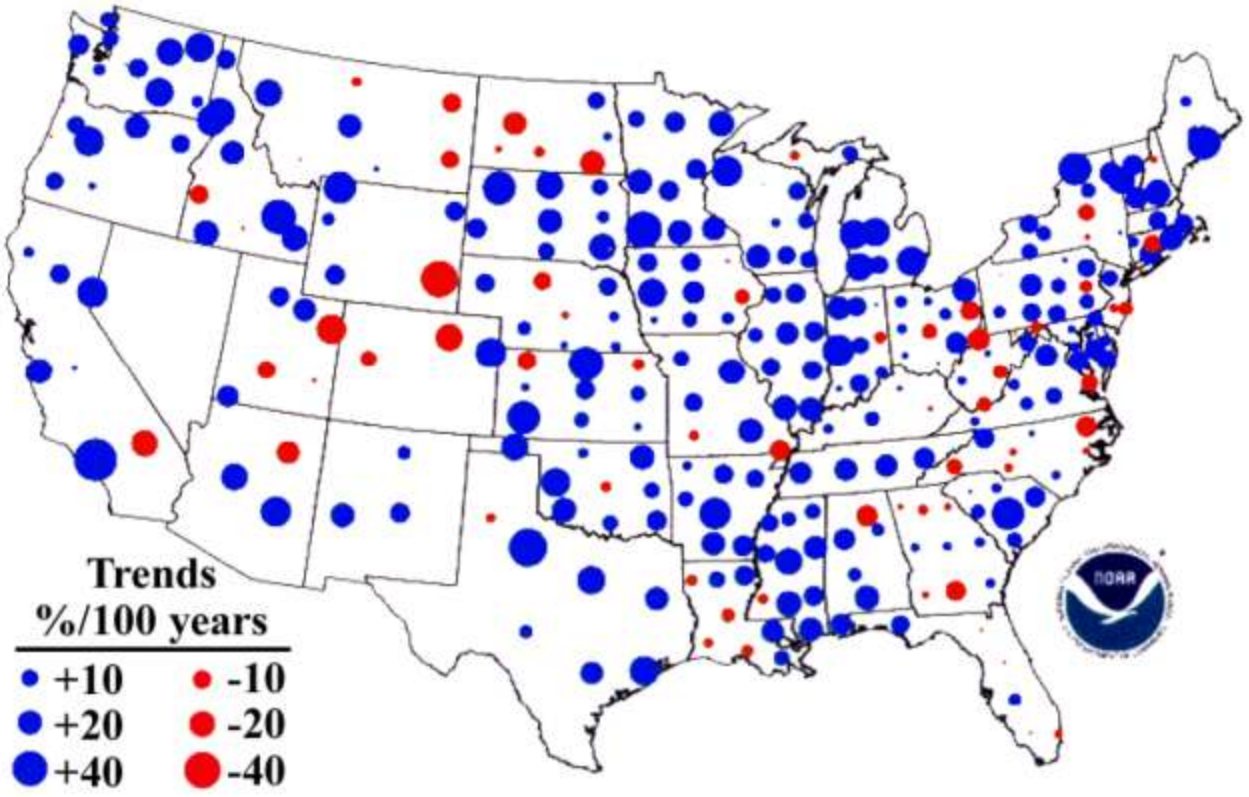
Precipitation

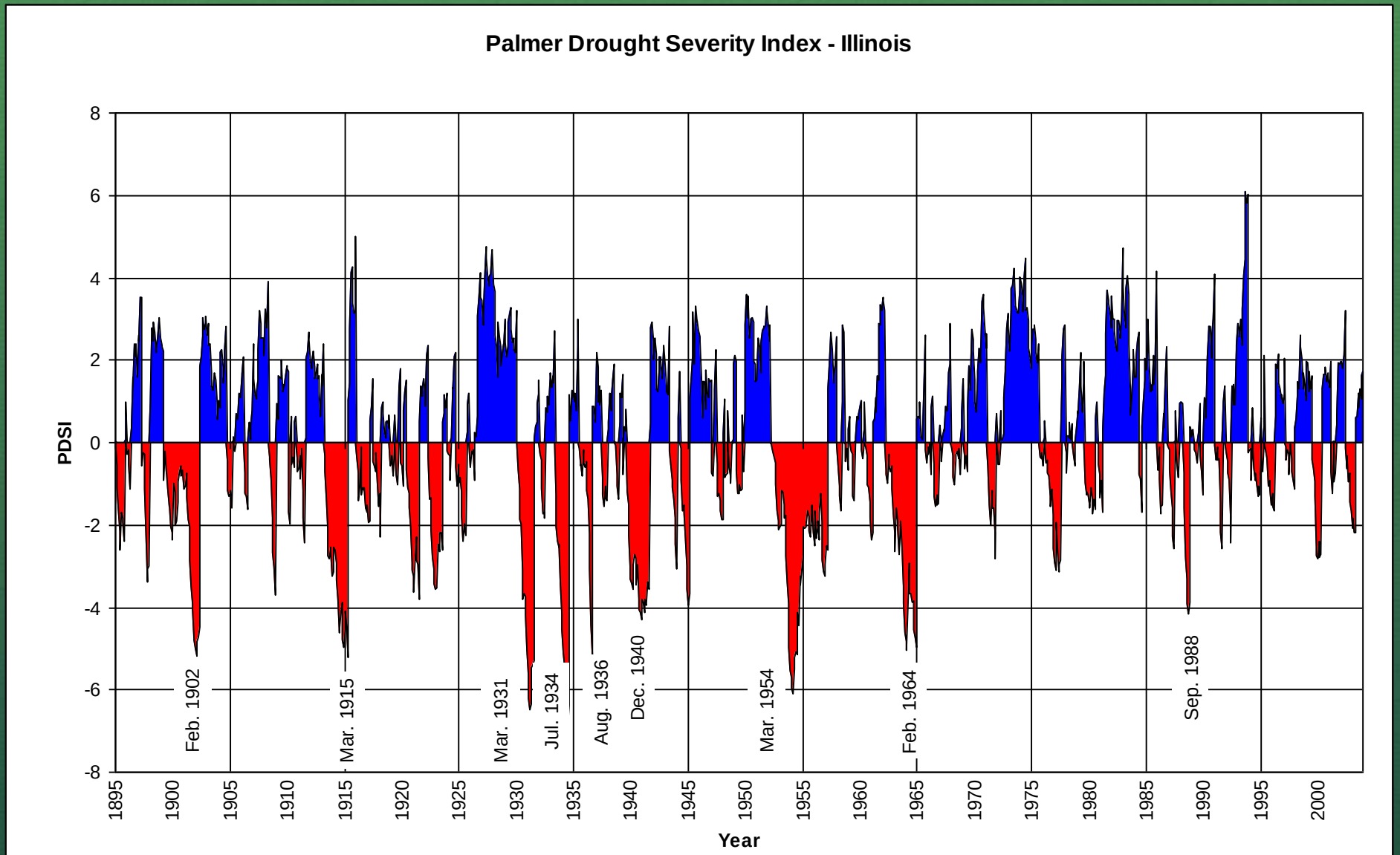
Annual Precipitation - Illinois



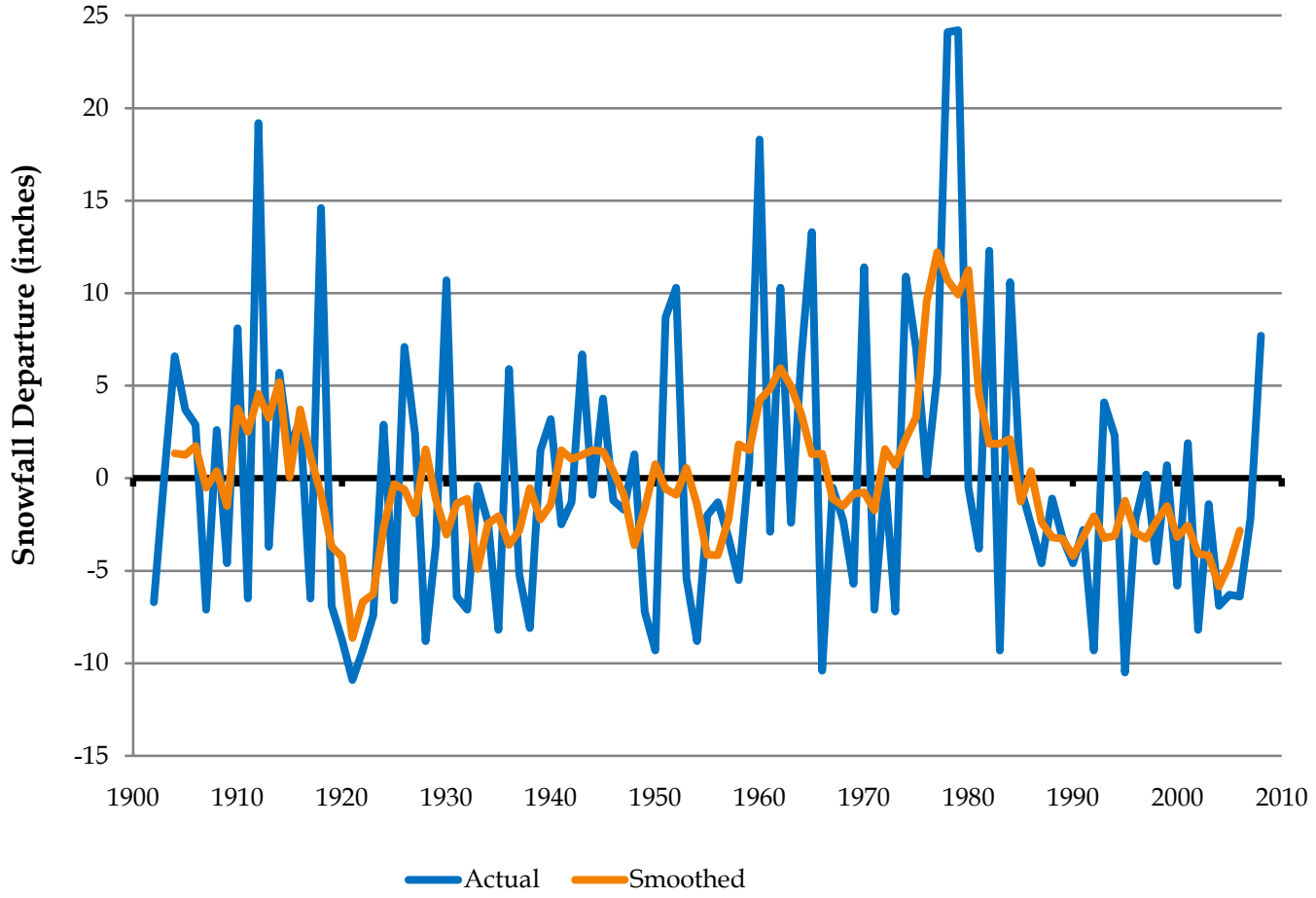
Illinois State Water Survey, 2010

USA 20th CENTURY PRECIPITATION TRENDS



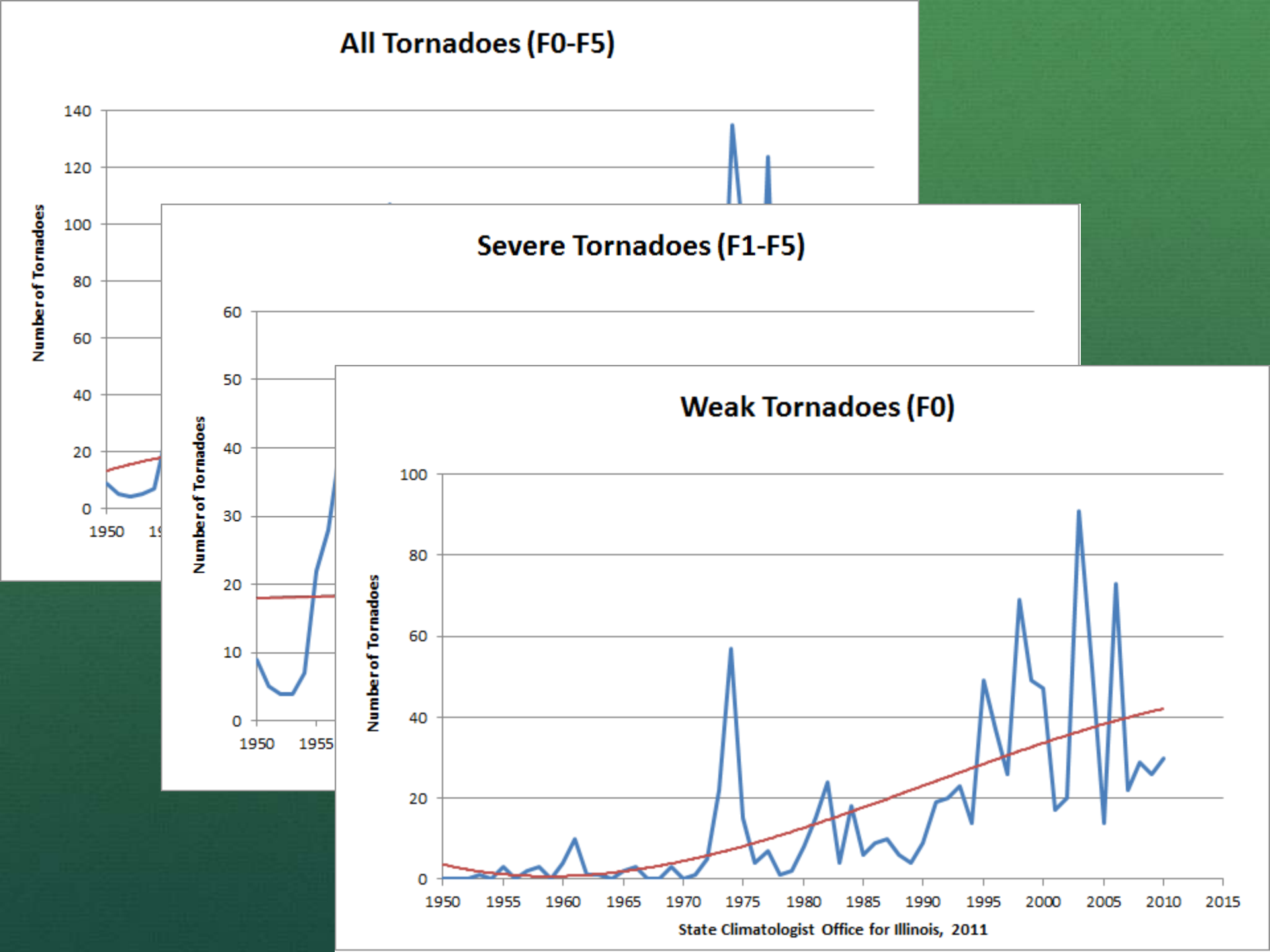

Palmer Drought Severity Index - Illinois
PDSI
8
6
4
2
0
-2
-4
-6
-8
1895
1900
1905
1910
1915
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
Year
Feb. 1902
Mar. 1915
Mar. 1931
Jul. 1934
Aug. 1936
Dec. 1940
Mar. 1954
Feb. 1964
Sep. 1988

Average Snowfall for Illinois

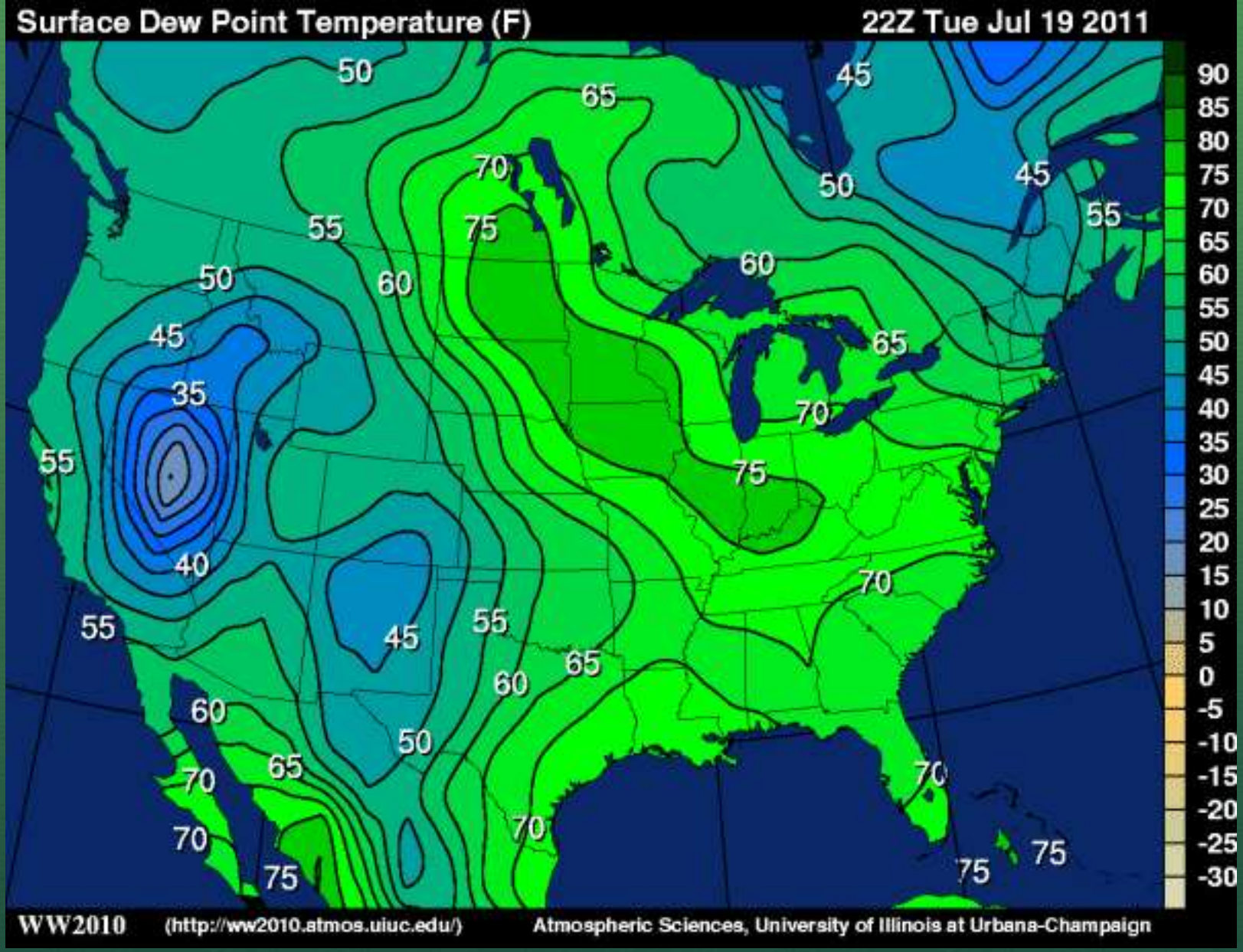


Climate Trend or Not

- Most of our observation systems are not designed for monitoring climate change
  - Change in sites
  - Changes in procedures
  - Changes in observers
  - Changes in equipment


All Tornadoes (F0-F5)
Number of Tornadoes
140
120
100
80
60
40
20
0
1950
Severe Tornadoes (F1-F5)
Number of Tornadoes
60
50
40
30
20
10
0
1950
1955
Weak Tornadoes (F0)
Number of Tornadoes
100
80
60
40
20
0
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
State Climatologist Office for Illinois, 2011

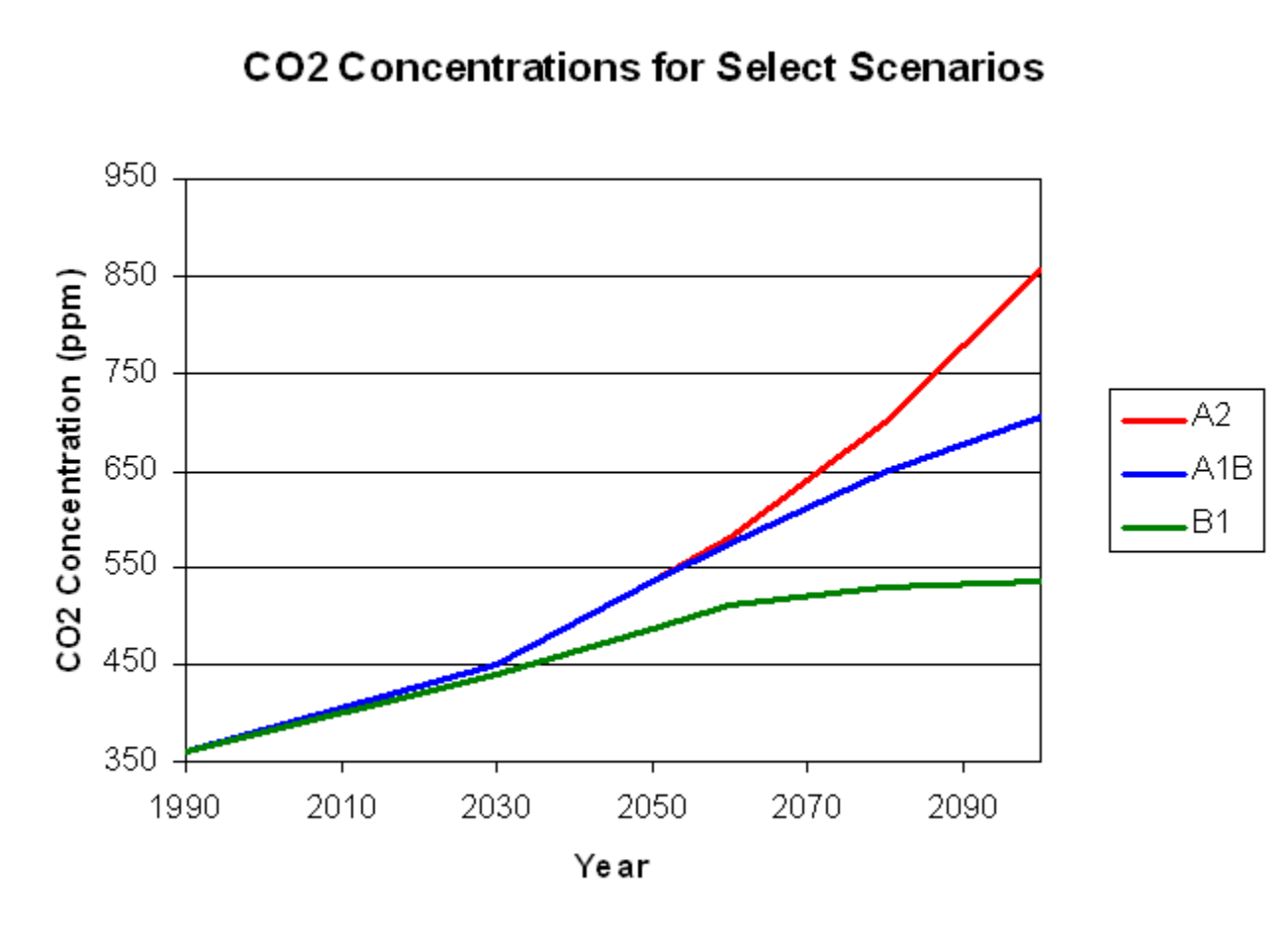
Land Use Changes



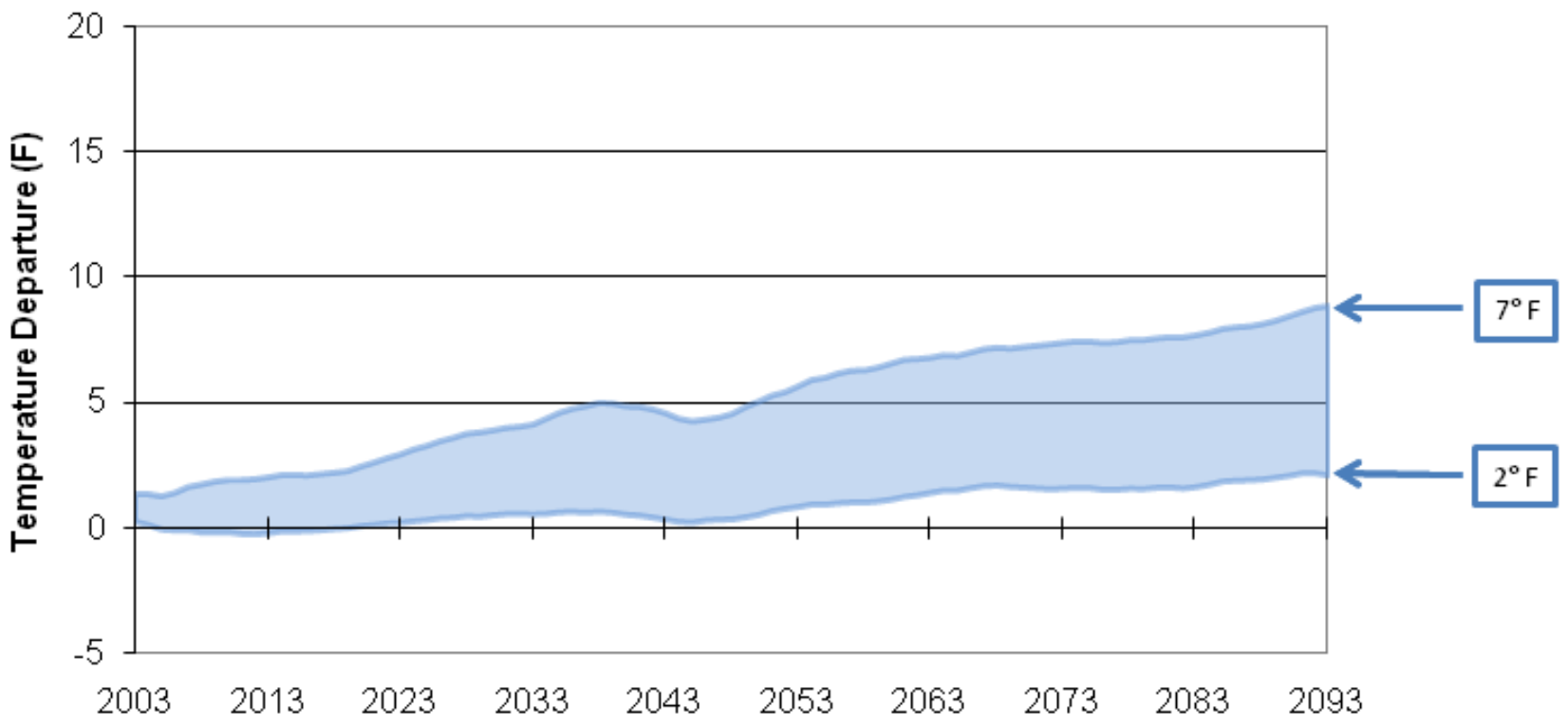
High dew point temperatures over the corn belt

Potential Future Climate Change

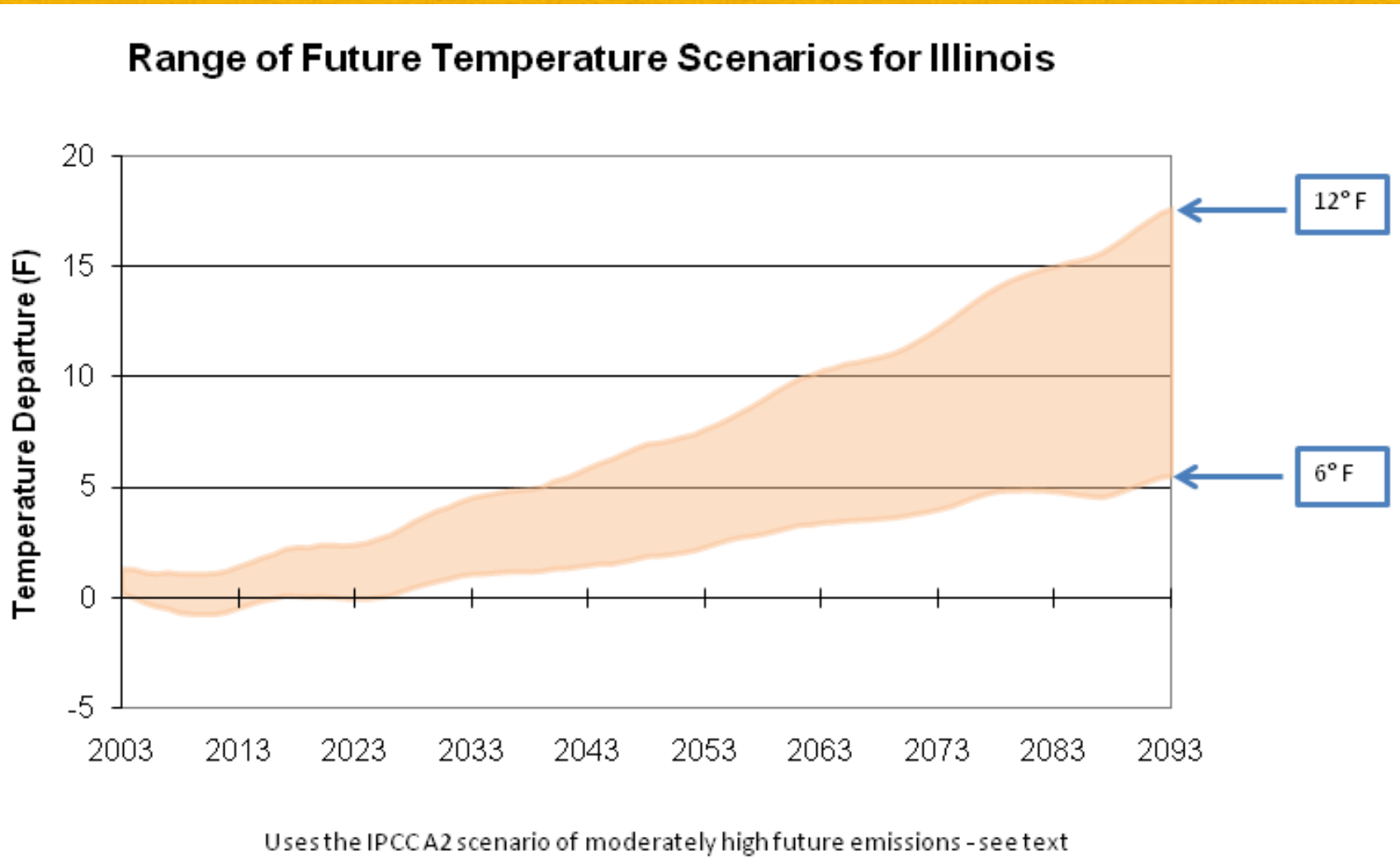
Three scenarios used



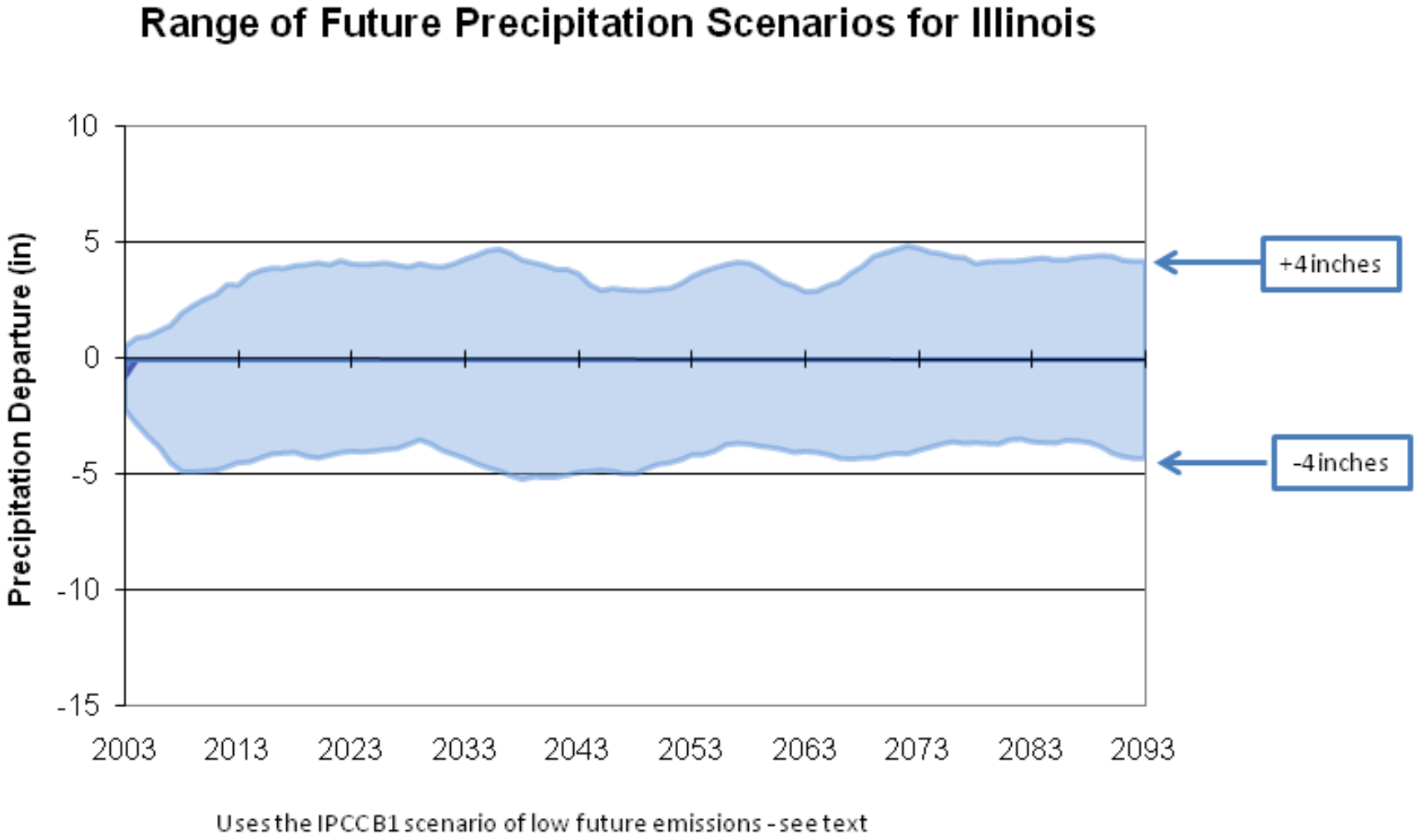
Low Emission Scenario



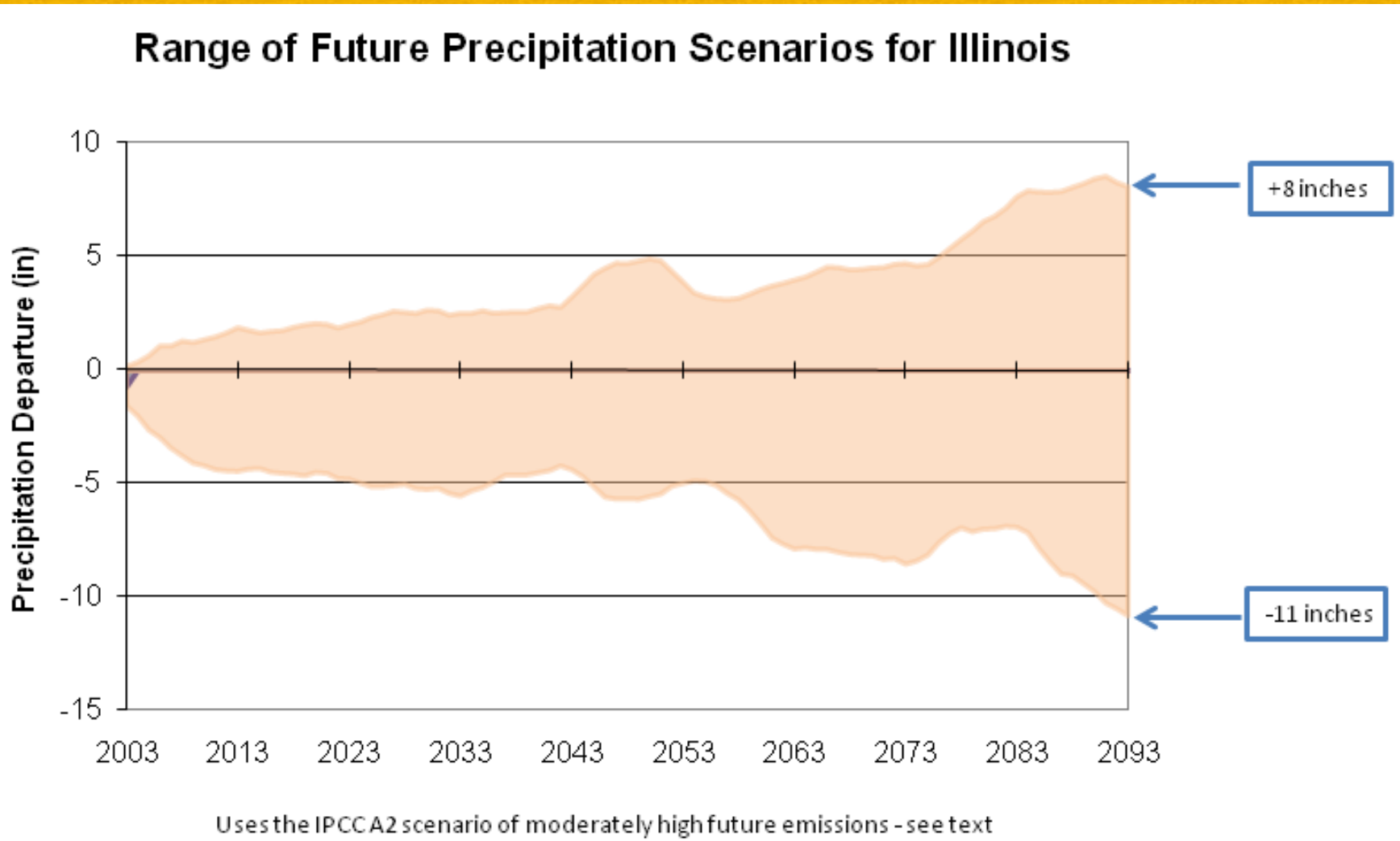
High Emission Scenario



Low Emission Scenario



High Emission Scenario



Summary

- Temperature trends are not clear-cut
- Precipitation is clearly increasing
- Historical climate is a challenge to reconstruct
- Helps us understand past and current climate change in Illinois
- Provides perspective on future climate change