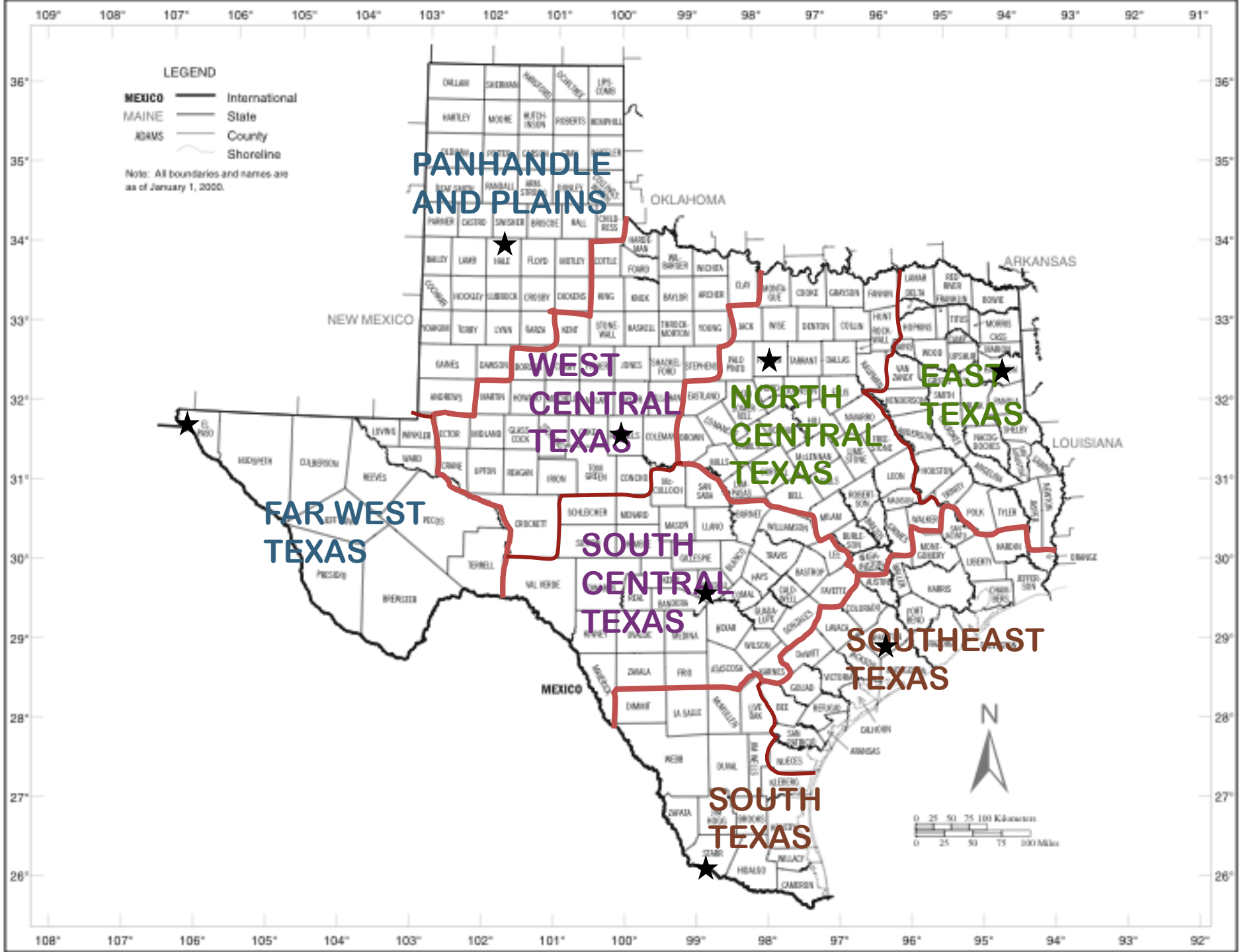
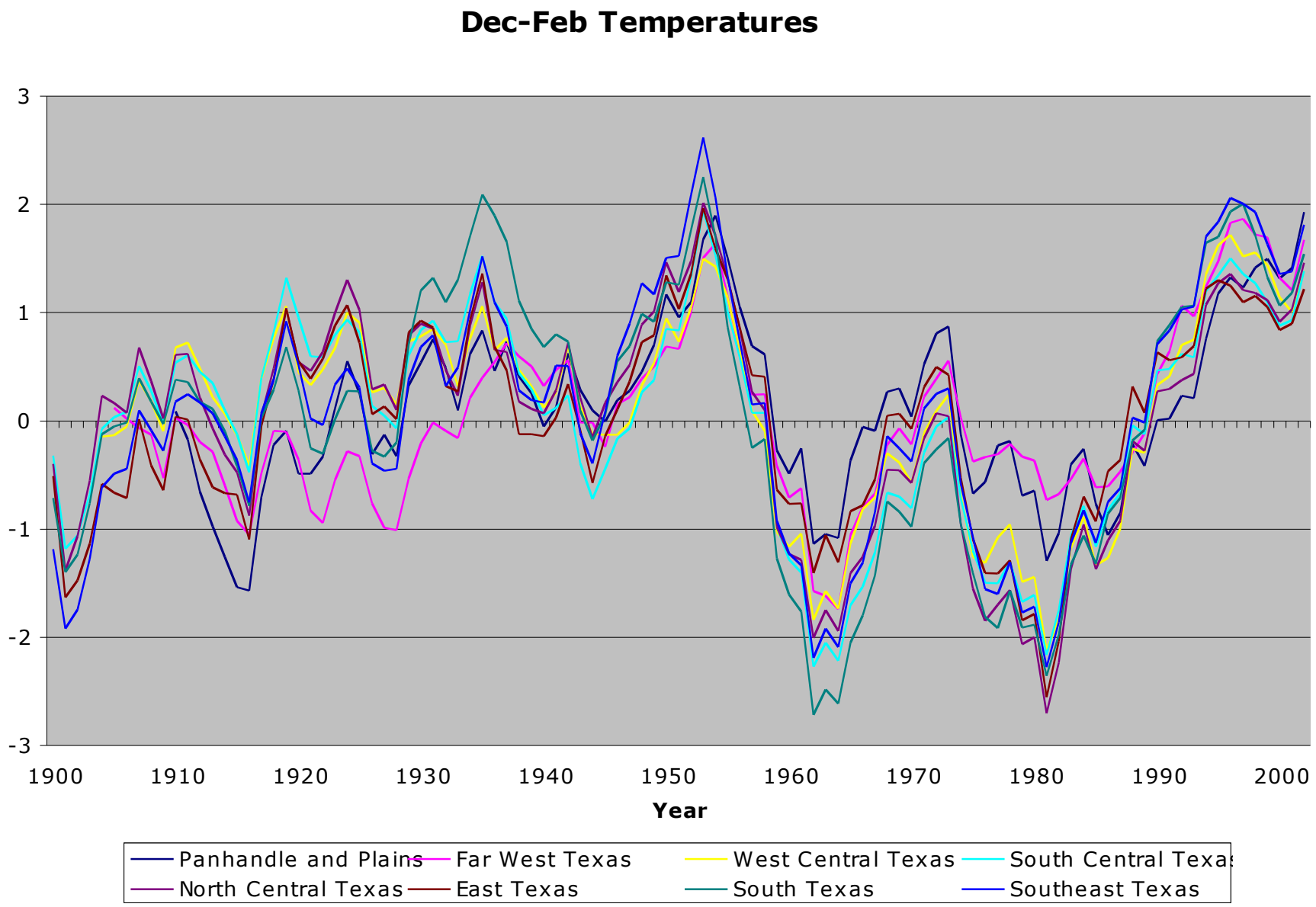
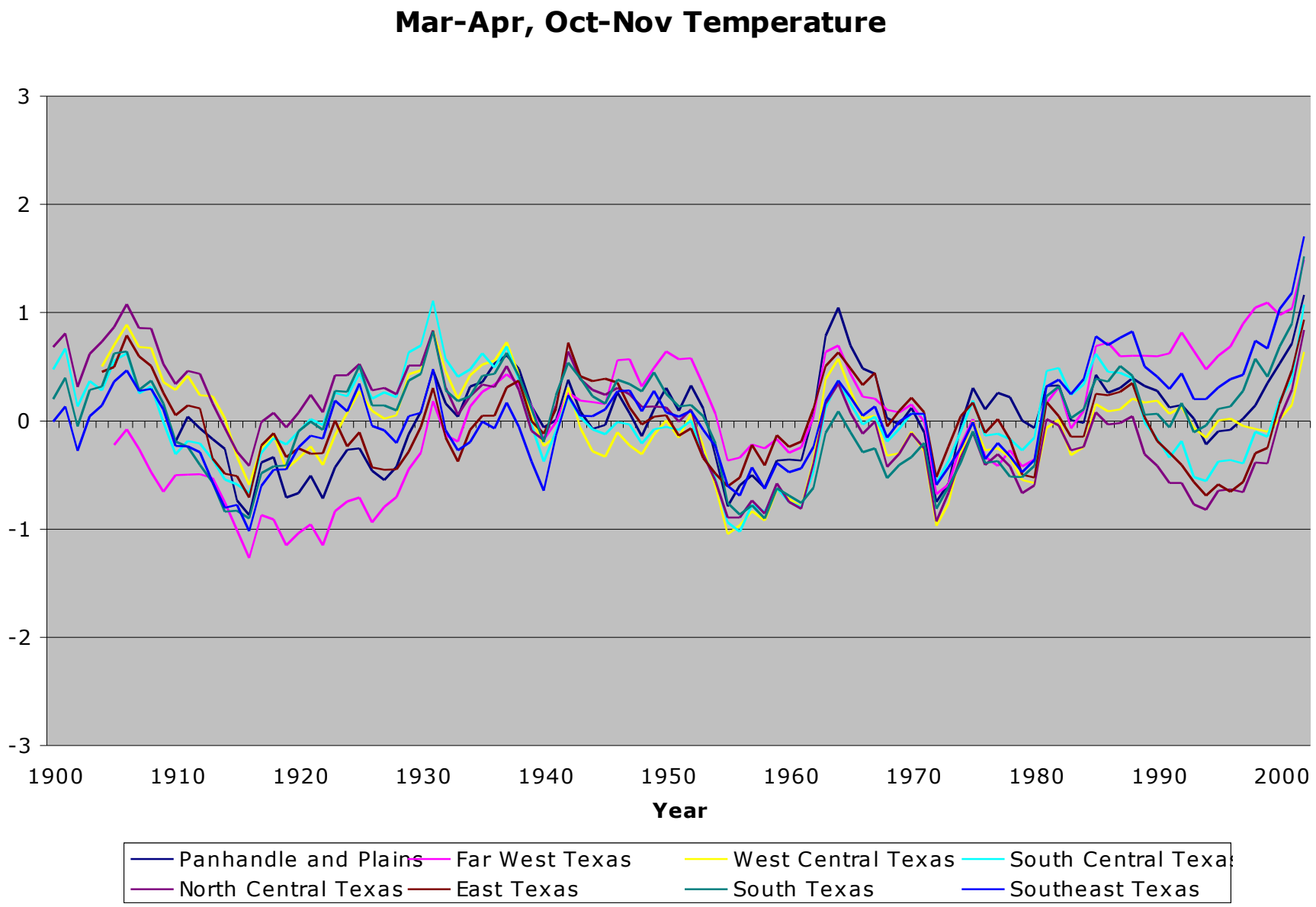
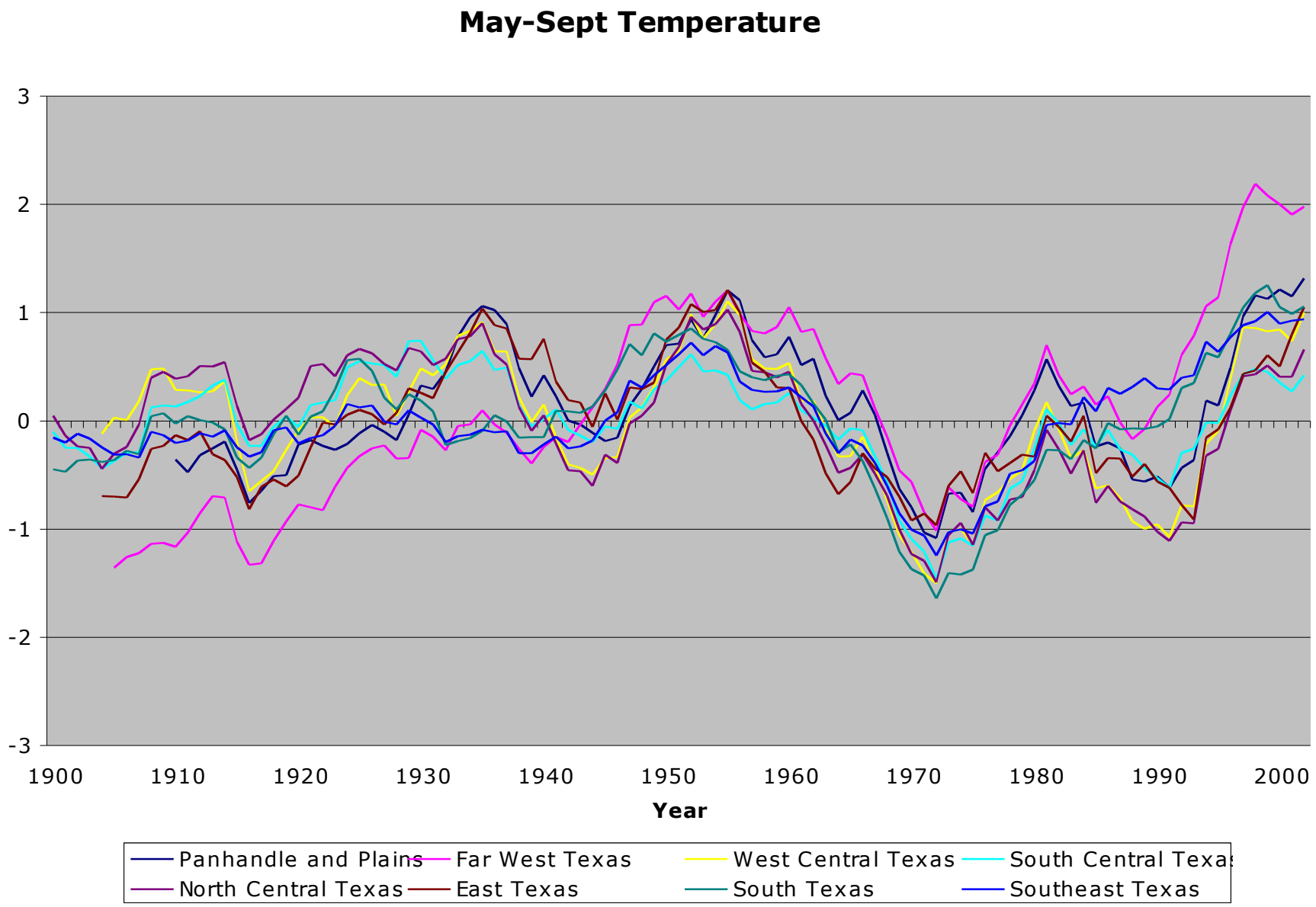
Climate Change and Drought in Texas: Past vs. Future

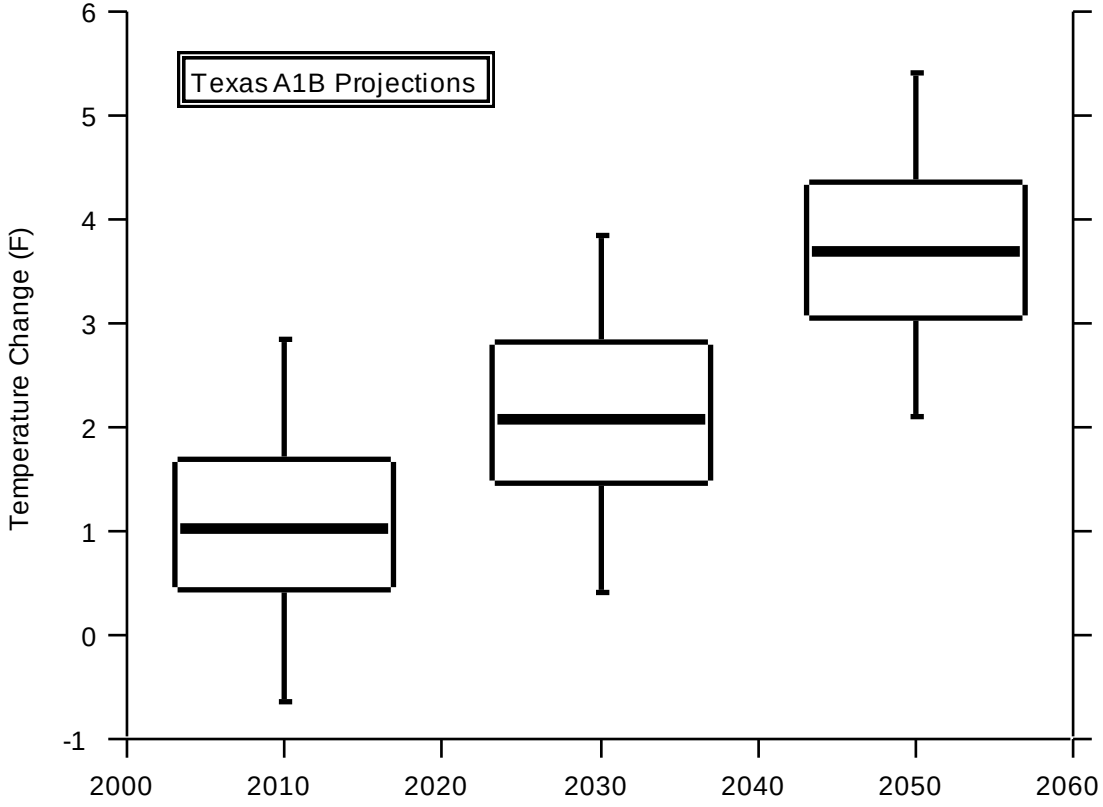
John Nielsen-Gammon
Texas State Climatologist
Texas A&M University


TEXAS - Counties
U.S. Census Bureau, Census 2000
LEGEND
MEXICO International
MAINE State
ADAMS County
Shoreline
Note: All boundaries and names are as of January 1, 2000.
PANHANDLE AND PLAINS
WEST CENTRAL TEXAS
NORTH CENTRAL TEXAS
EAST TEXAS
FAR WEST TEXAS
SOUTH CENTRAL TEXAS
SOUTHEAST TEXAS
SOUTH TEXAS
OKLAHOMA
ARKANSAS
NEW MEXICO
LOUISIANA
MEXICO
N


Dec-Feb Temperatures
3
2
1
0
-1
-2
-3
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
Year
Panhandle and Plains
Far West Texas
West Central Texas
South Central Texas
North Central Texas
East Texas
South Texas
Southeast Texas

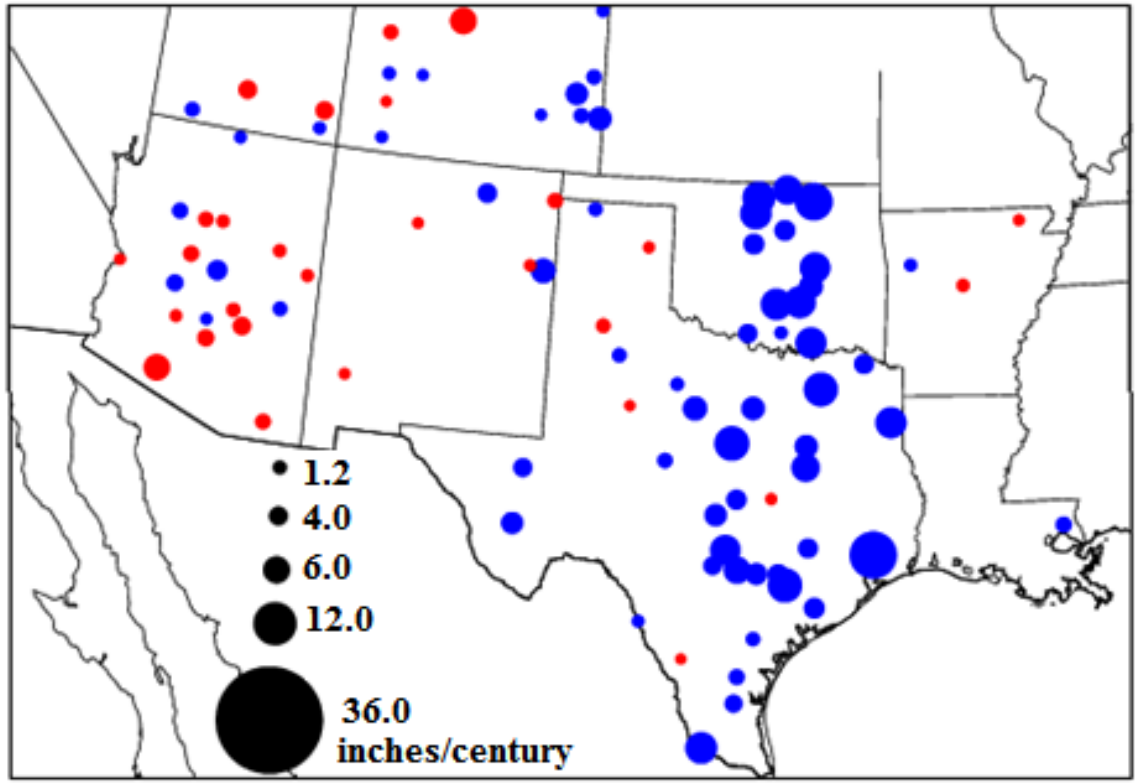

Mar-Apr, Oct-Nov Temperature
3
2
1
0
-1
-2
-3
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
Year
Panhandle and Plains
Far West Texas
West Central Texas
South Central Texas
North Central Texas
East Texas
South Texas
Southeast Texas


May-Sept Temperature
3
2
1
0
-1
-2
-3
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
Year
Panhandle and Plains
Far West Texas
West Central Texas
South Central Texas
North Central Texas
East Texas
South Texas
Southeast Texas



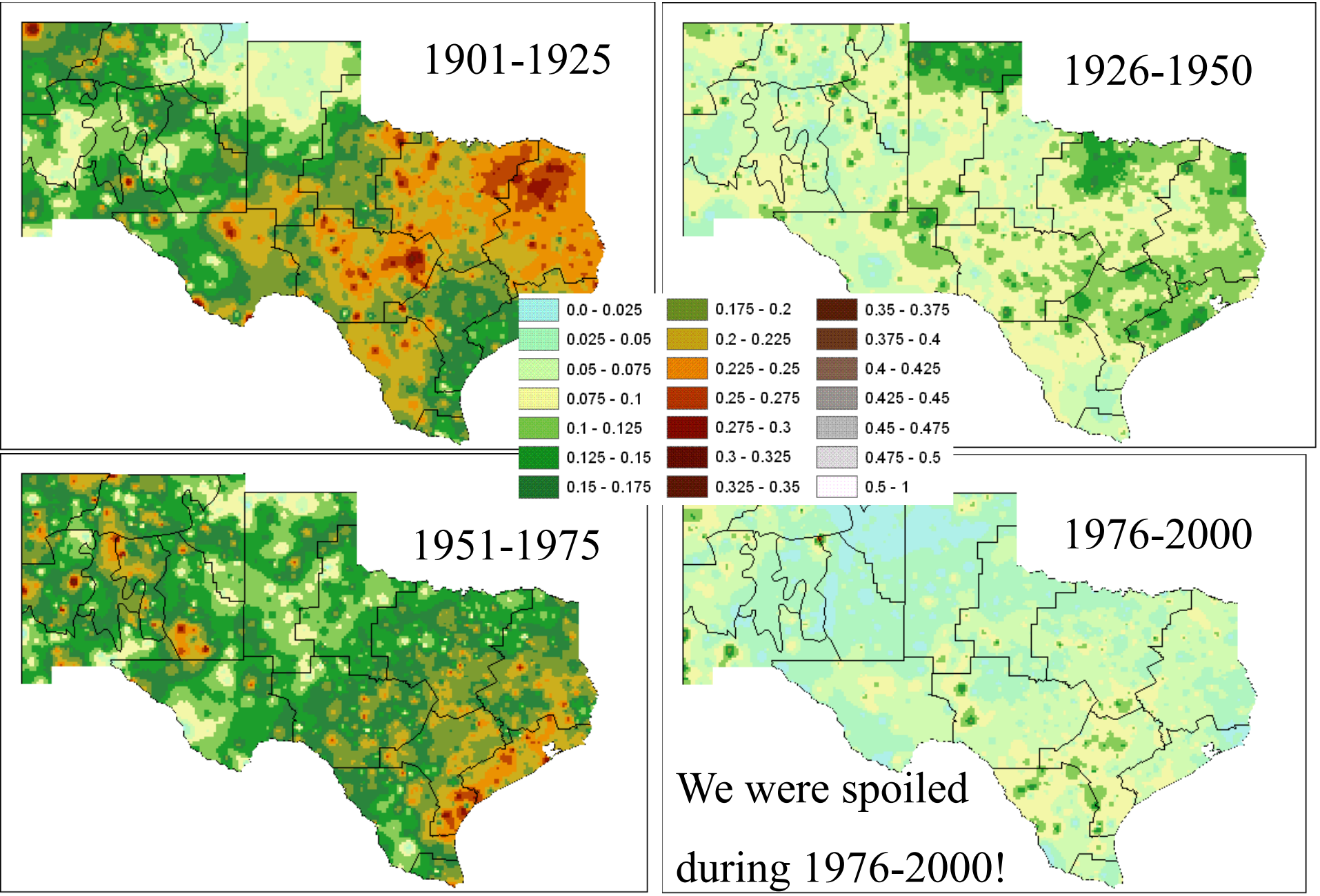
Climate model projections: + 2-4 ° F by 2050

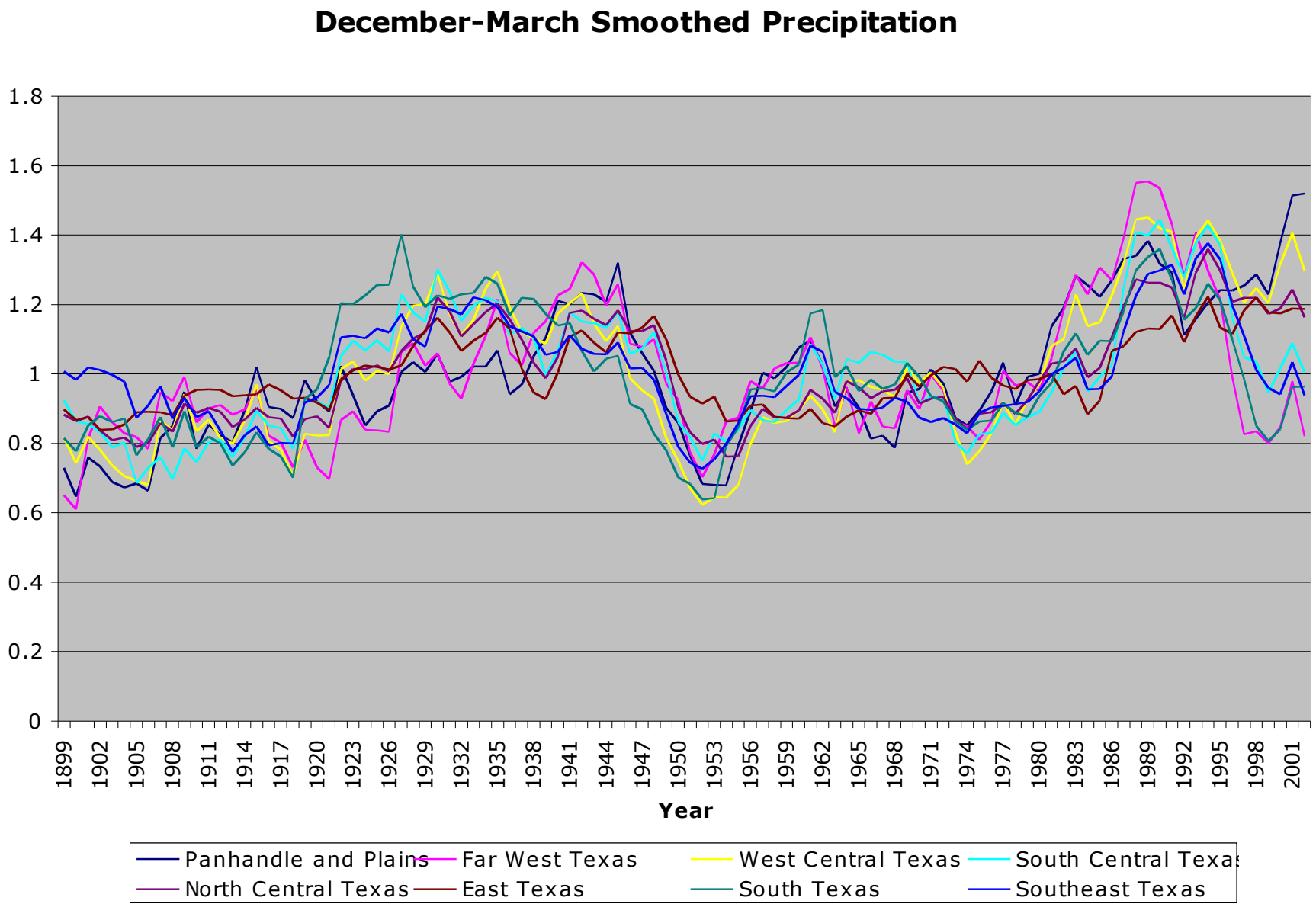
Precipitation trends at century-long USHCN stations



Blue: Increasing Precipitation
Red: Decreasing Precipitation

Fraction of months below 20th percentile of PDF, 12-month precip




December-March Smoothed Precipitation
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1899
1902
1905
1908
1911
1914
1917
1920
1923
1926
1929
1932
1935
1938
1941
1944
1947
1950
1953
1956
1959
1962
1965
1968
1971
1974
1977
1980
1983
1986
1989
1992
1995
1998
2001
Year
Panhandle and Plains
Far West Texas
West Central Texas
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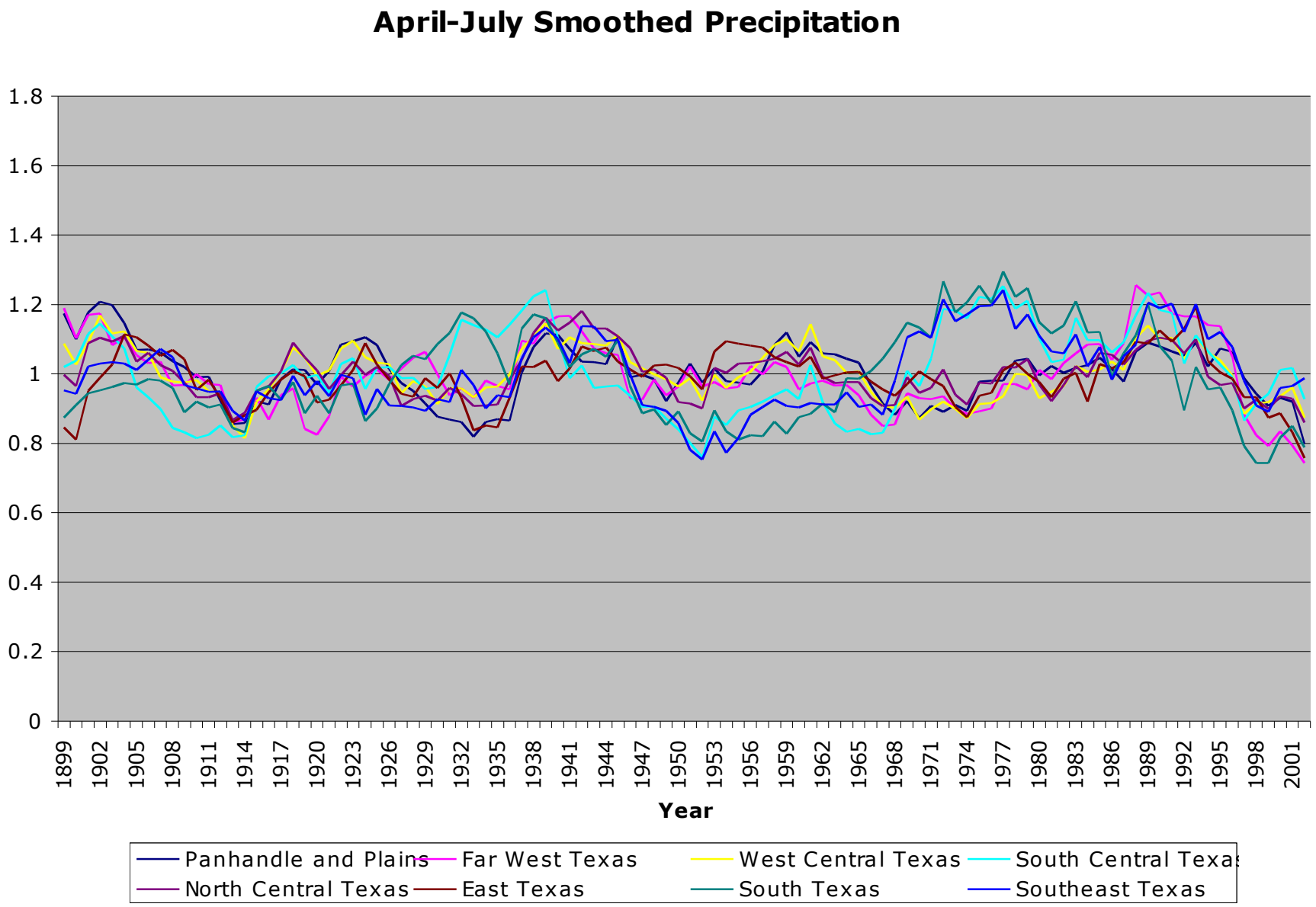
April-July Smoothed Precipitation
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1899
1902
1905
1908
1911
1914
1917
1920
1923
1926
1929
1932
1935
1938
1941
1944
1947
1950
1953
1956
1959
1962
1965
1968
1971
1974
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Year
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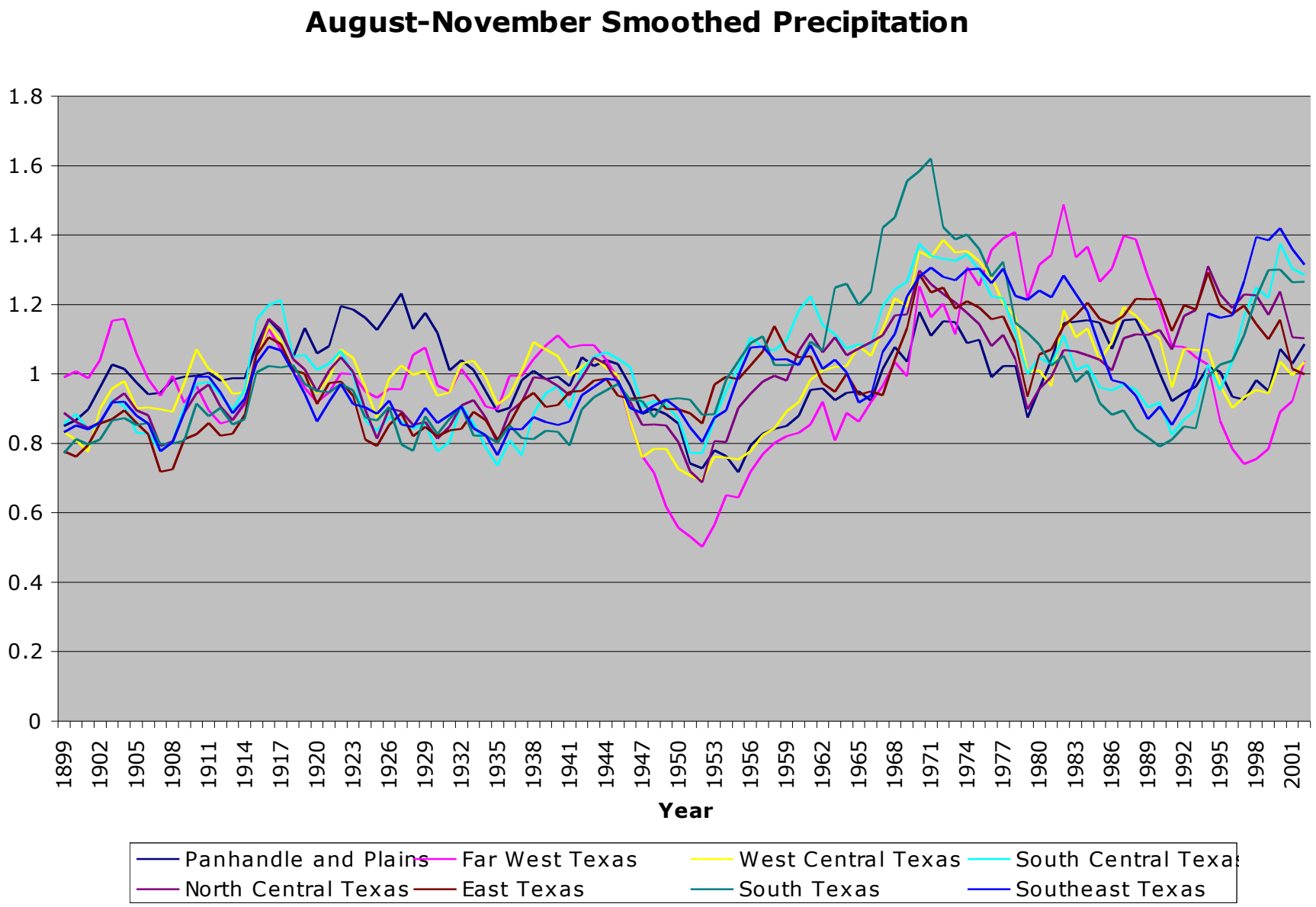
August-November Smoothed Precipitation
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1899
1902
1905
1908
1911
1914
1917
1920
1923
1926
1929
1932
1935
1938
1941
1944
1947
1950
1953
1956
1959
1962
1965
1968
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1974
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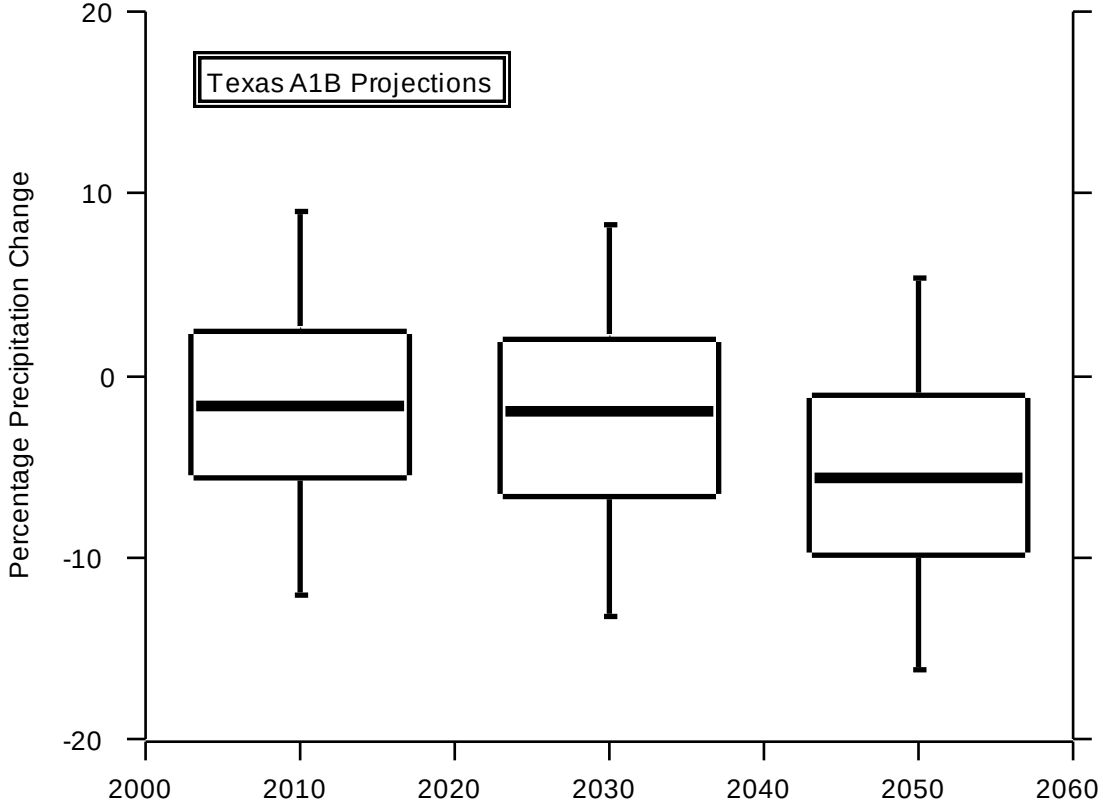
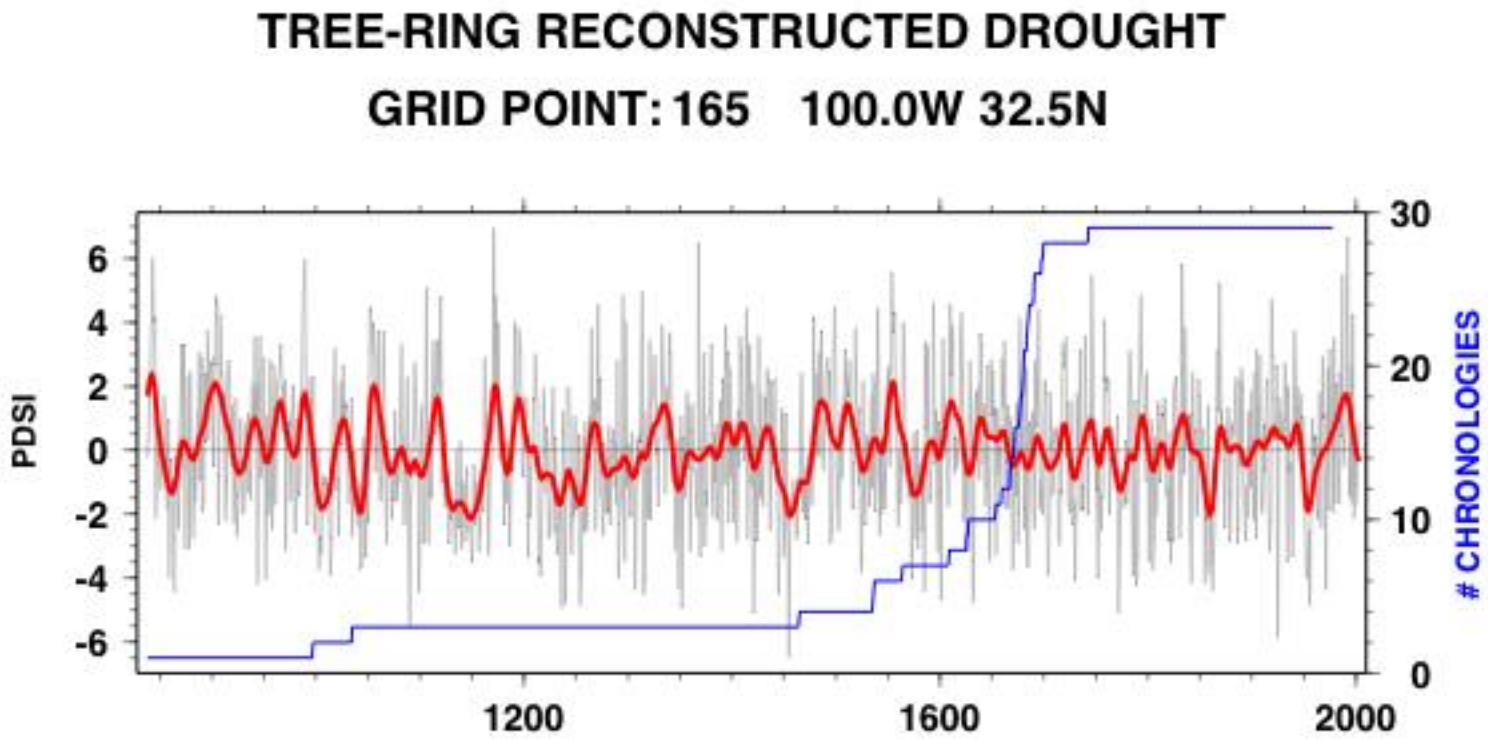


Climate model projections: probably drier by 2050



Gray: PDSI; Red: 20-yr average PDSI

Note: 1950s were bad, but so were 1850s, and the last part of the 20th century was probably the most drought-free period of the past millennium!

Source: North American Drought Atlas, IRI/Columbia

Climate Change Summary

- Certainly warmer, maybe less rain, definitely more evaporation
- That scenario could easily happen (and has) even without global warming
- Year-to-year changes strongly driven by nature
- The Impact of Global Warming in Texas: http://www.texasclimate.org/

Headline: Hundreds Attend Global Warming Protest

(courtesy Jan Null)

pipec.ru

Local Monitoring Tools

- Keetch-Byram Drought Index
- http://twc.tamu.edu/kbdi.aspx
- Just google “texas keetch-byram”
- Constructed from NWS radar-estimated precipitation

Keetch-Byram Drought Index (KBDI)

Keetch-Byram Drought Index (KBDI) is an index used to determining forest fire potential. The drought index is based on a daily water balance, where a drought factor is balanced with precipitation and soil moisture (assumed to have a maximum storage capacity of 8-inches) and is expressed in hundredths of an inch of soil moisture depletion.

The drought index ranges from 0 to 800, where a drought index of 0 represents no moisture depletion, and an index of 800 represents absolutely dry conditions. Presently, this index is derived from ground based estimates of temperature and precipitation derived from weather stations and interpolated manually by experts at the Texas Forest Service (TFS) for counties across the state. Researchers at Texas A&M University are working with the TFS to derive this index from AVHRR satellite data and NEXRAD radar rainfall within a GIS.

- **More details on KBDI**
- **View current interactive KBDI map**

View KBDI Maps

Select a date from the calendar, check the boxes next to the maps you would like to display, and click "Submit".

<		April 2008				>
Su	Mo	Tu	We	Th	Fr	Sa
30	31	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	1	2	3
4	5	6	7	8	9	10

- [x] Keetch-Byram Drought Index
- [ ] Keetch-Byram Drought Index 14 Day Forecast
- [ ] Keetch-Byram Drought Index County Average
- [ ] Keetch-Byram Drought Index County Average 14 Day Forecast
- [ ] Keetch-Byram Drought Index Summary
- [ ] Keetch-Byram Drought Index 14 Day Summary Forecast

You may need to disable your pop-up blocker before submitting (CTRL + click).

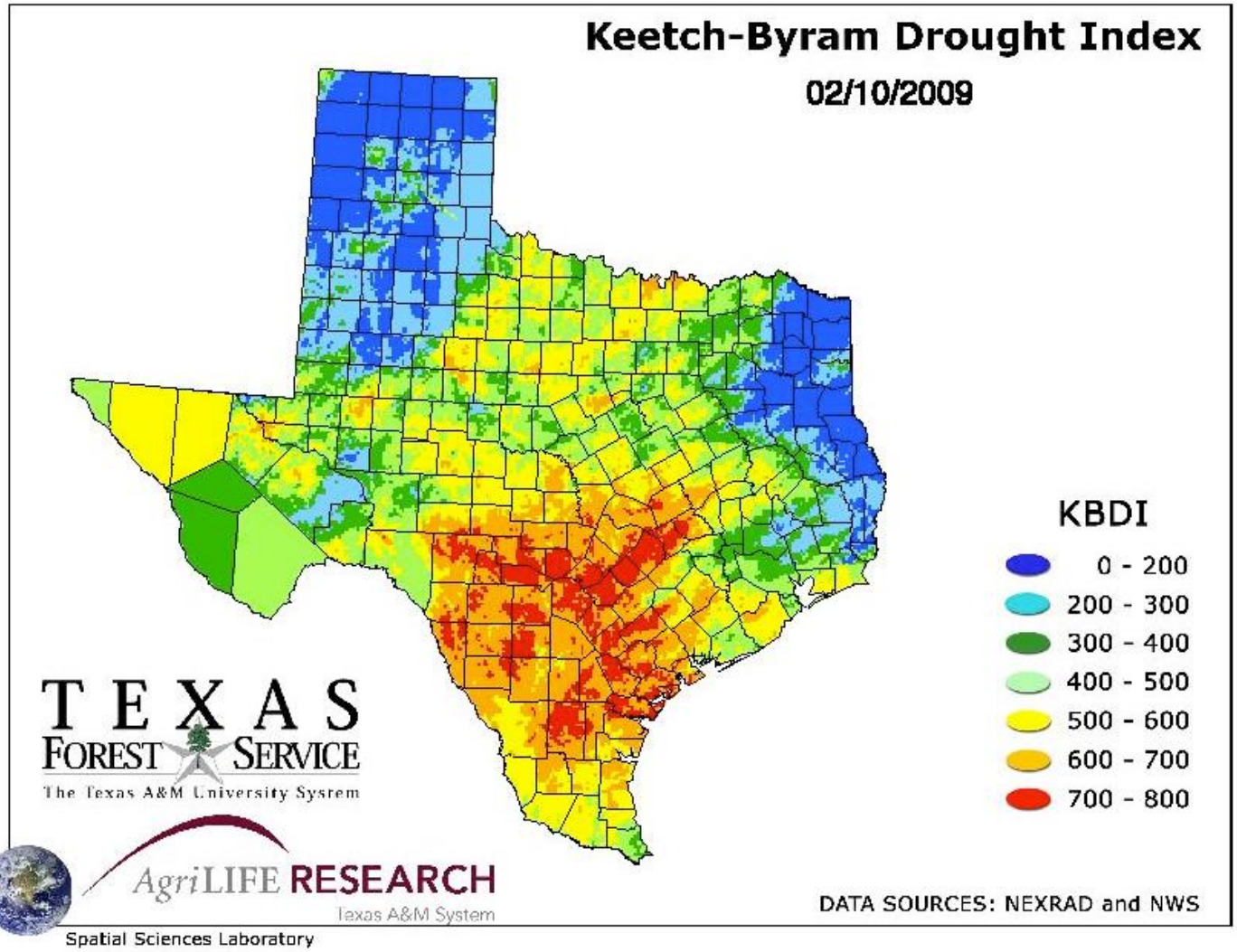
Submit

Query Results Texas Weather Connection

http://webgis.tamu.edu/imgdisplay.aspx

<< Previous Image | Next Image >> | Click to View All Images | Close This Window

Keetch-Byram Drought Index for 2/10/2009



Done

Local Monitoring Tools

- Community Collaborative Rain, Hail, and Snow Network (CoCoRaHS)
- http://www.cocorahs.org/
- Volunteer high-density rain gauge monitoring network
- More volunteers needed in west-central Texas!

Community Collaborative Rain, Hail & Snow Network

"Because every drop counts"

Home | States | View Data | Maps | My Data Entry | Login

Welcome to CoCoRaHS

Main Menu

- Home
- About Us
- Join Cocorahs
- Contact Us
- Donate

Resources

- FAQ / Help
- Education
- Training Slide-Show(6MB)

- Volunteer Coordinators
- Hail Pad Distribution/Drop-off
- Help Needed
- Printable Forms

- CoCoRaHS Store
- Calendar
- *The Catch*
- Message of the Day
- CoCoRaHS Blog

- Sponsors
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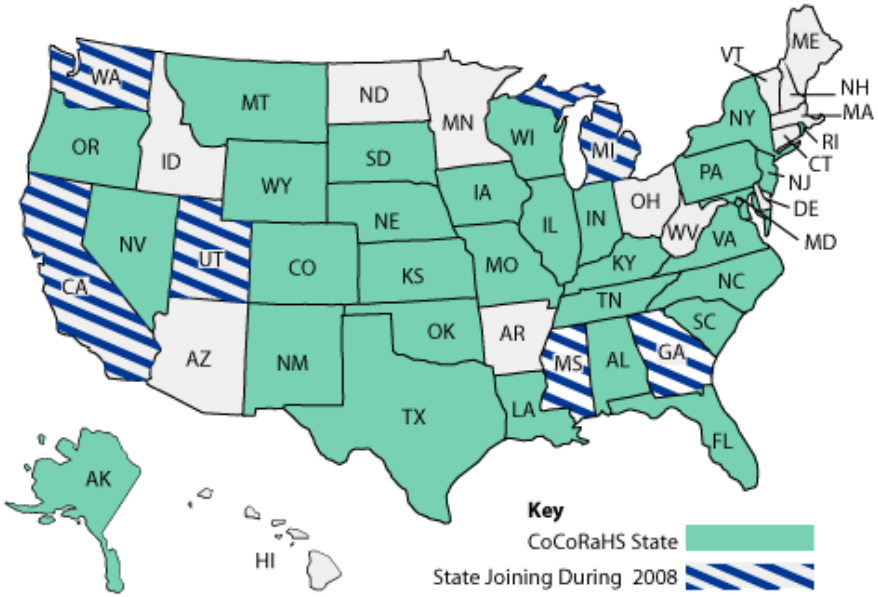
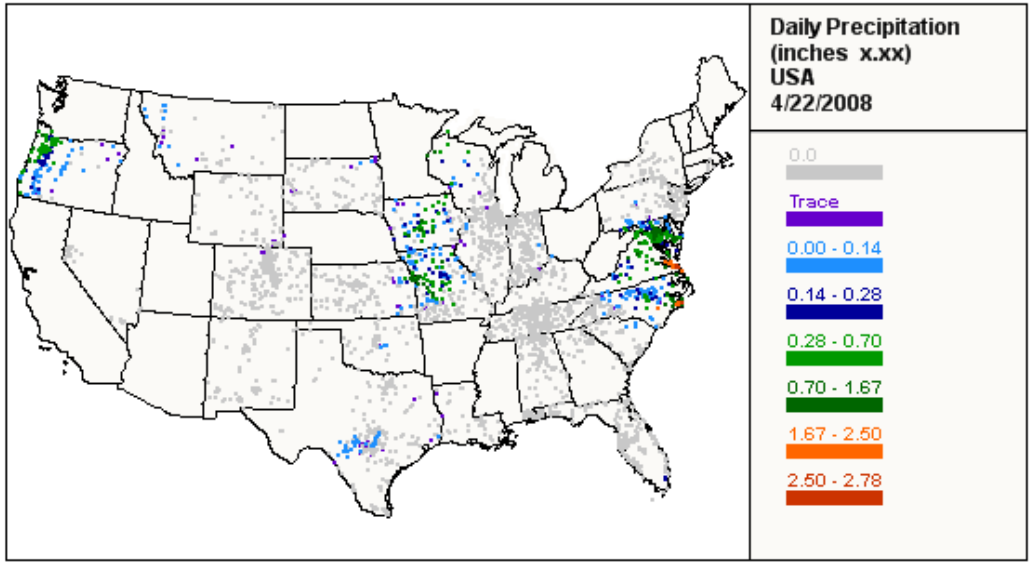
- Links





Join CoCoRaHS
Click Here

Things to know about...

Rain

Hail

Snow

weatherwise

Read the *"CoCoRaHS Article"* and find out more about Weatherwise Magazine

Maps : Daily Precipitation

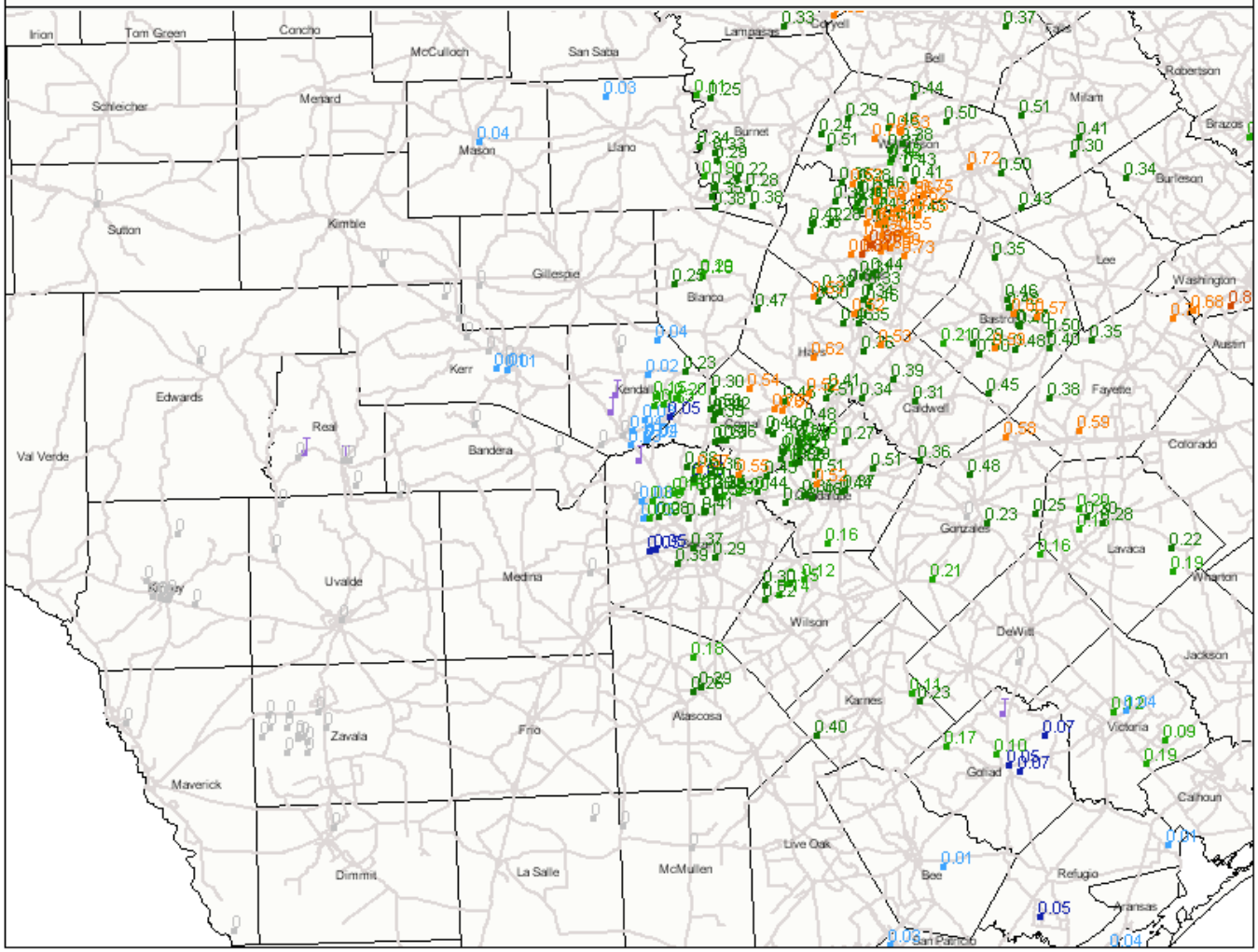
Map Type	Map Location	Date	Colors
Precipitation	Texas Austin/San Antonio/Del Rio Region	2/11/2009	Standard

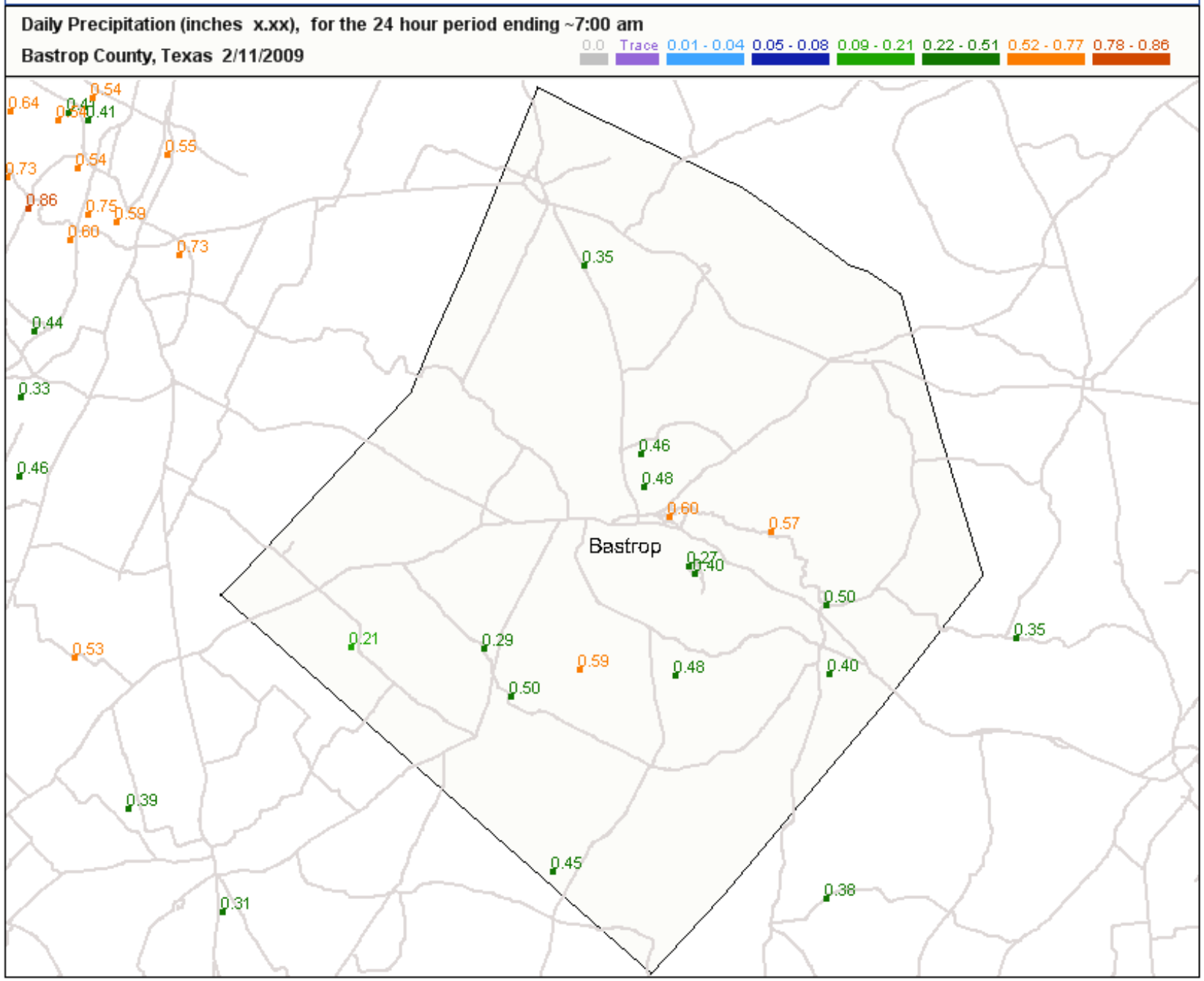
Get Map

Daily Precipitation (inches x.xx), for the 24 hour period ending ~7:00 am

Austin/San Antonio/Del Rio Region, Texas 2/11/2009

0.0 | Trace | 0.01 - 0.04 | 0.05 - 0.08 | 0.09 - 0.21 | 0.22 - 0.51 | 0.52 - 0.77 | 0.78 - 0.87

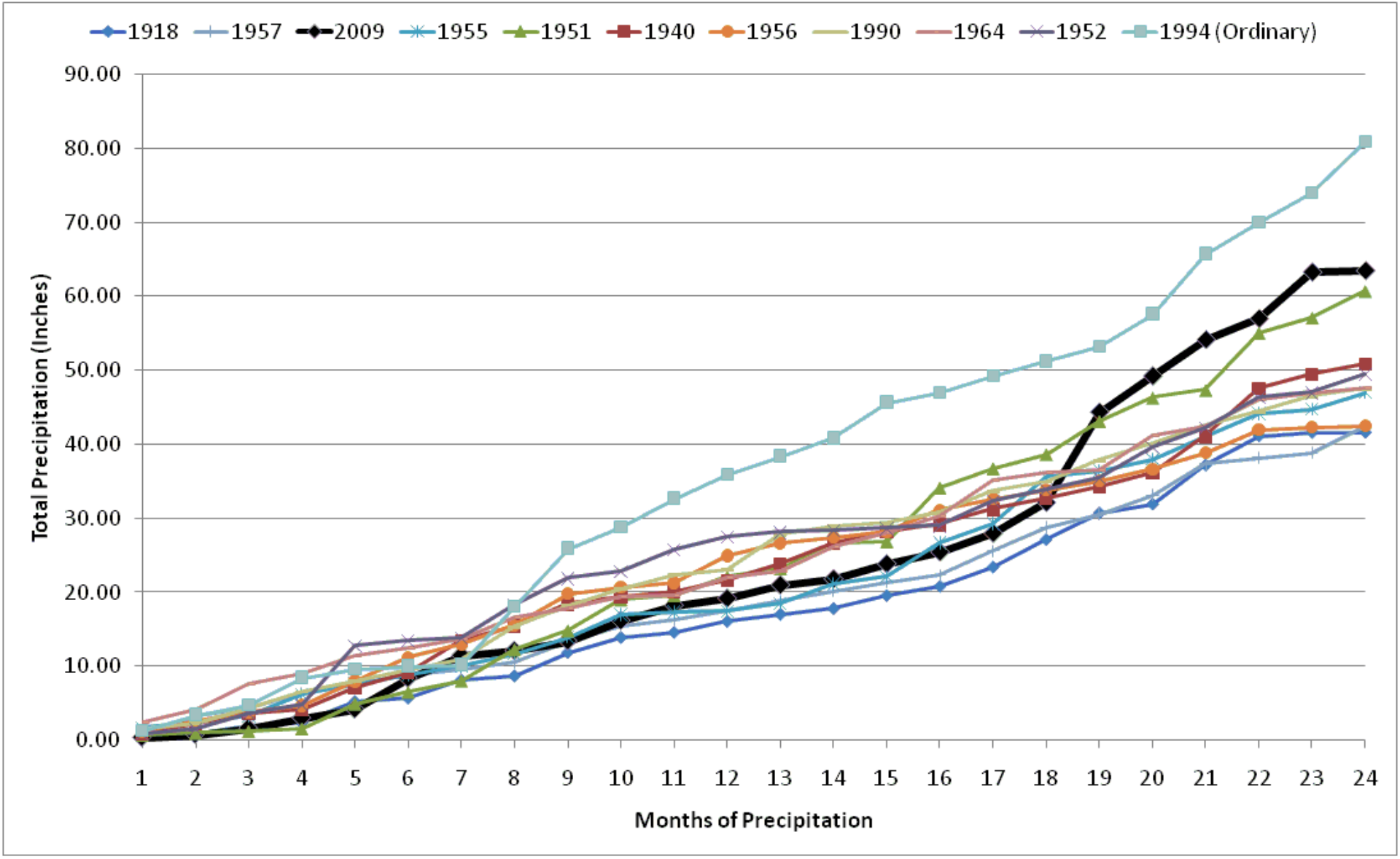




Sign up for once-a-day measurements at www.cocorahs.org

Local Monitoring Tools

- Office of the State Climatologist, Texas
- http://atmo.tamu.edu/osc
- Weekly/monthly climate reports
- Climate monitoring tools under development
- Steven Quiring (Geography) and Brent McRoberts (OSC)



Accumulated precipitation, south-central Texas

The End

- Contact Info:
  - John W. Nielsen-Gammon, Texas State Climatologist
  - n-g@tamu.edu
  - http://atmo.tamu.edu/osc
  - 979-862-2248