

Colorado's Climate - Then and Now

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Atmospheric Science Department

Presented to Channel 7News, Colorado Climate
Change Seminar, April 12, 2006, Denver, CO

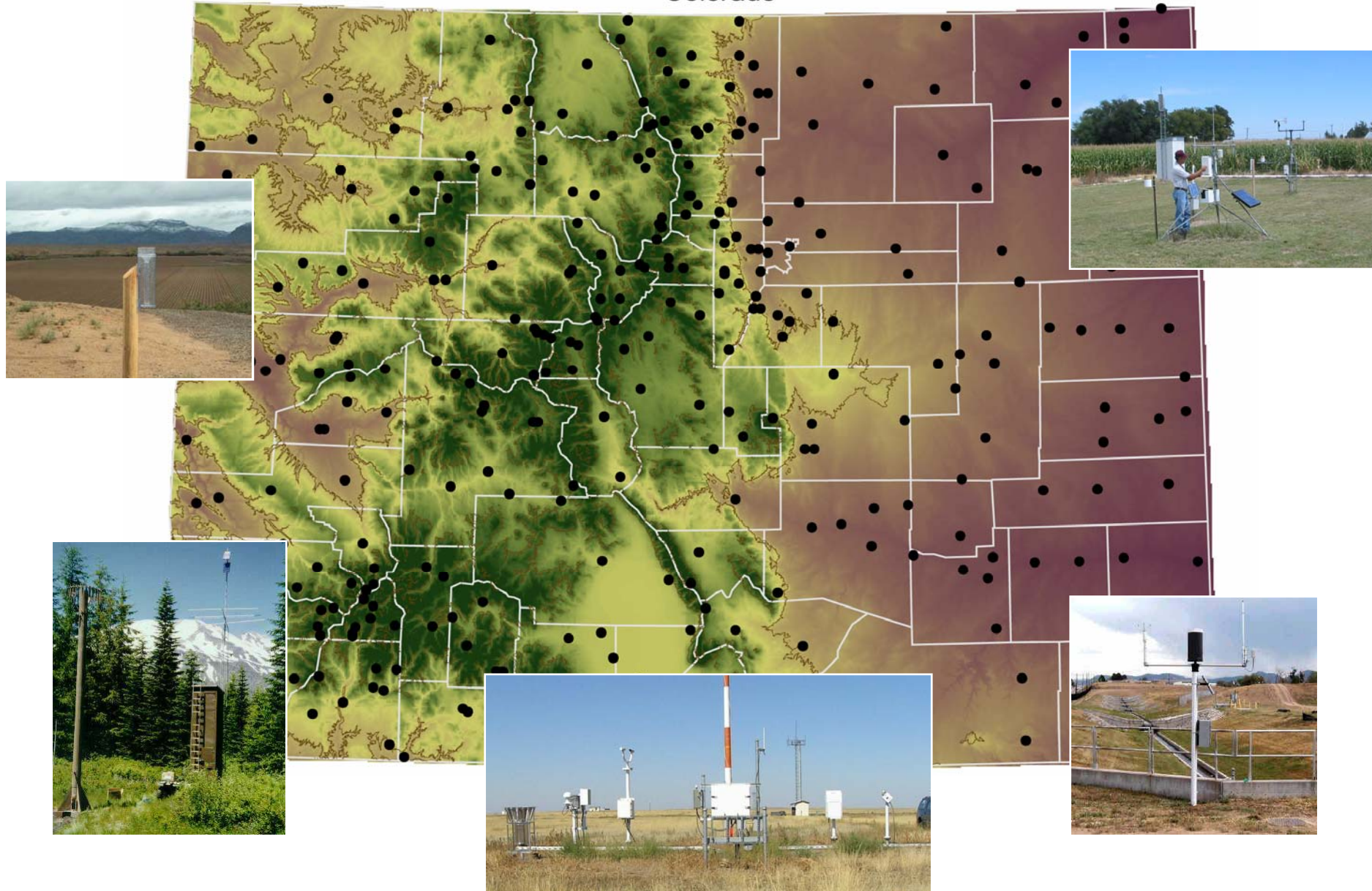


Perspectives on Colorado's Climate



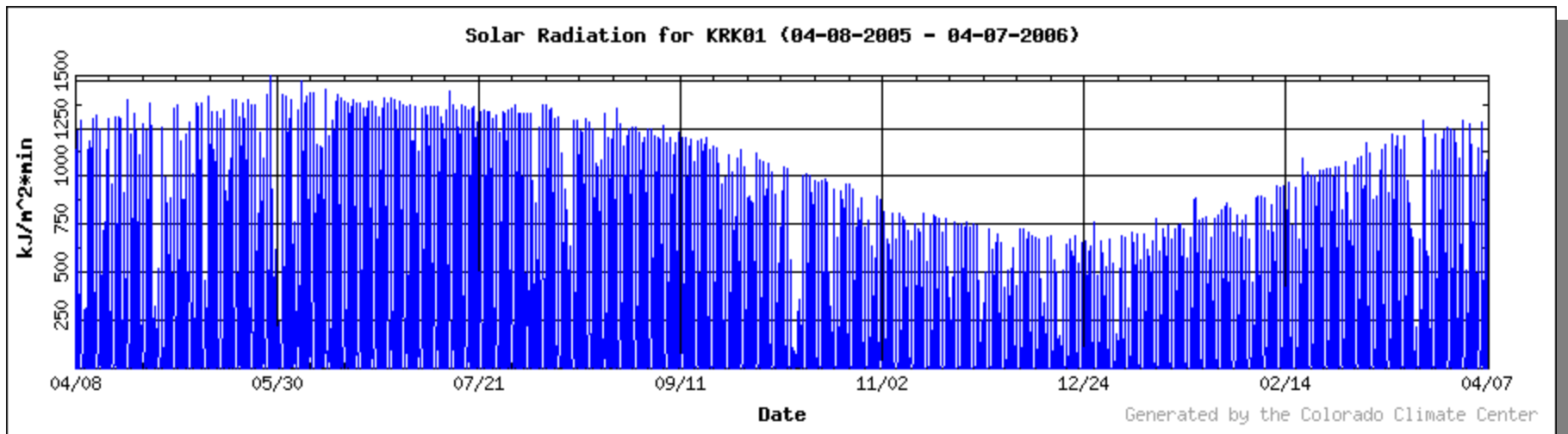
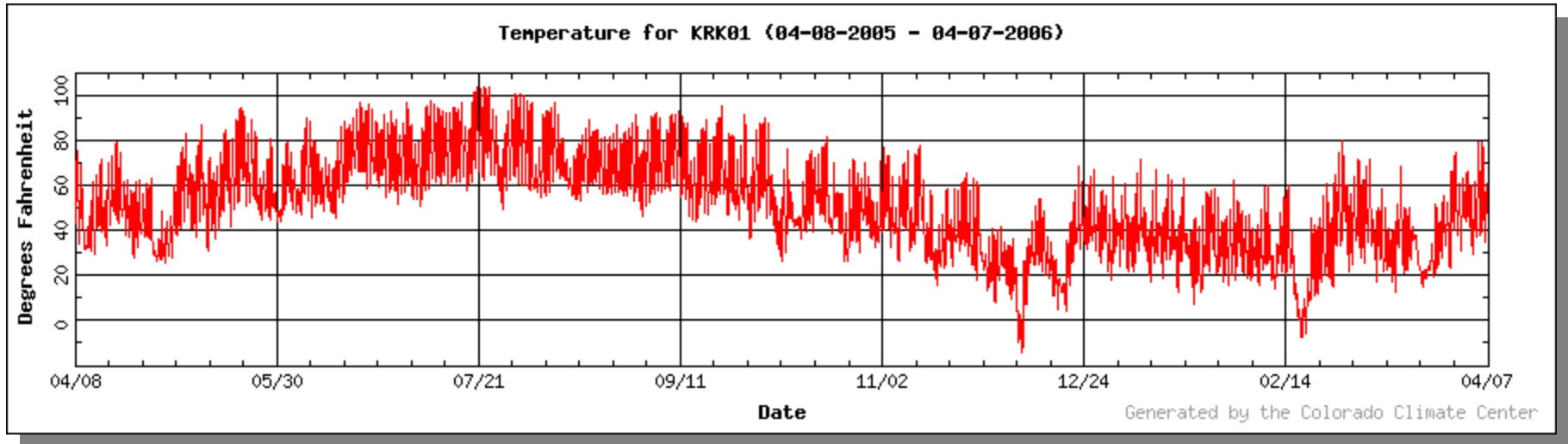
We have a lot of weather data!

Colorado

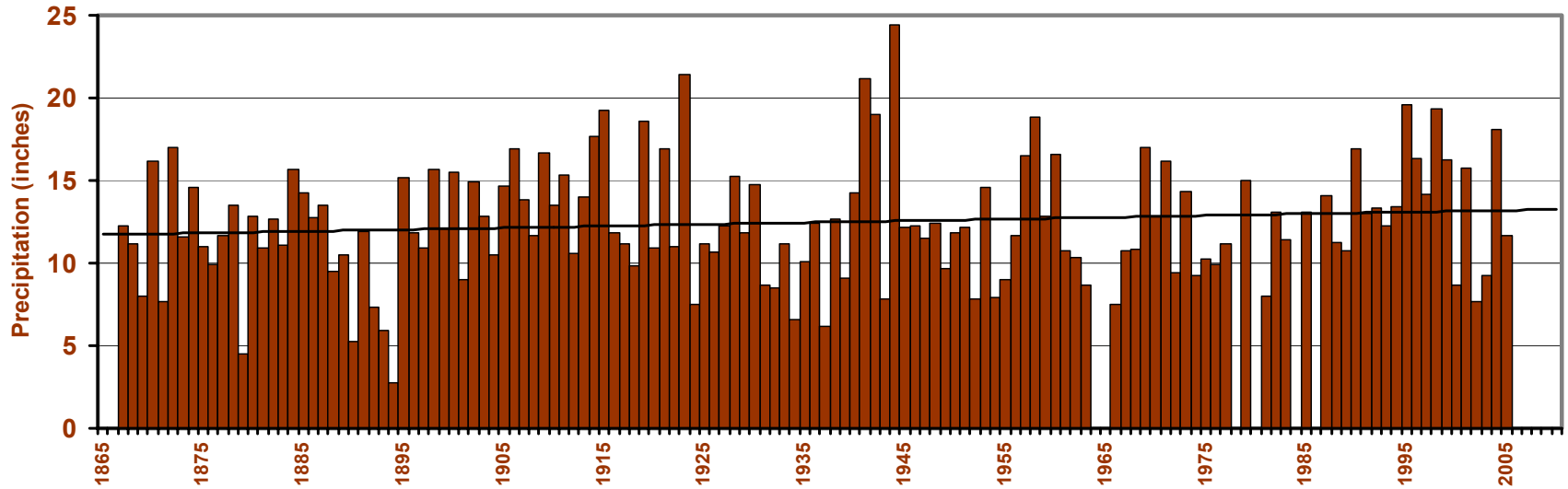


Kirk, Colo, CSU CoAgMet weather

April 2005-2006



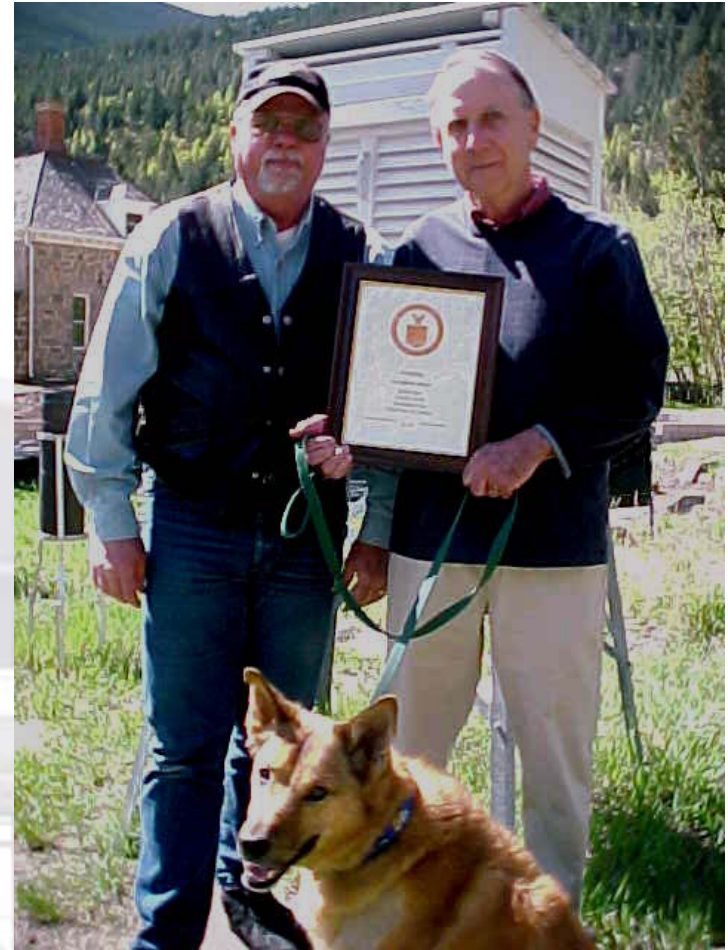
Las Animas Annual Precipitation (1867-2005)



**Instrumental weather observations
date back to the late 1800s**

We are indebted to NWS for maintaining long-term weather stations

- ❑ Army Signal Service (began 1870-1891)
- ❑ Weather Bureau (1890-1969)
- ❑ National Weather Service (1970-present)



Climate is variable

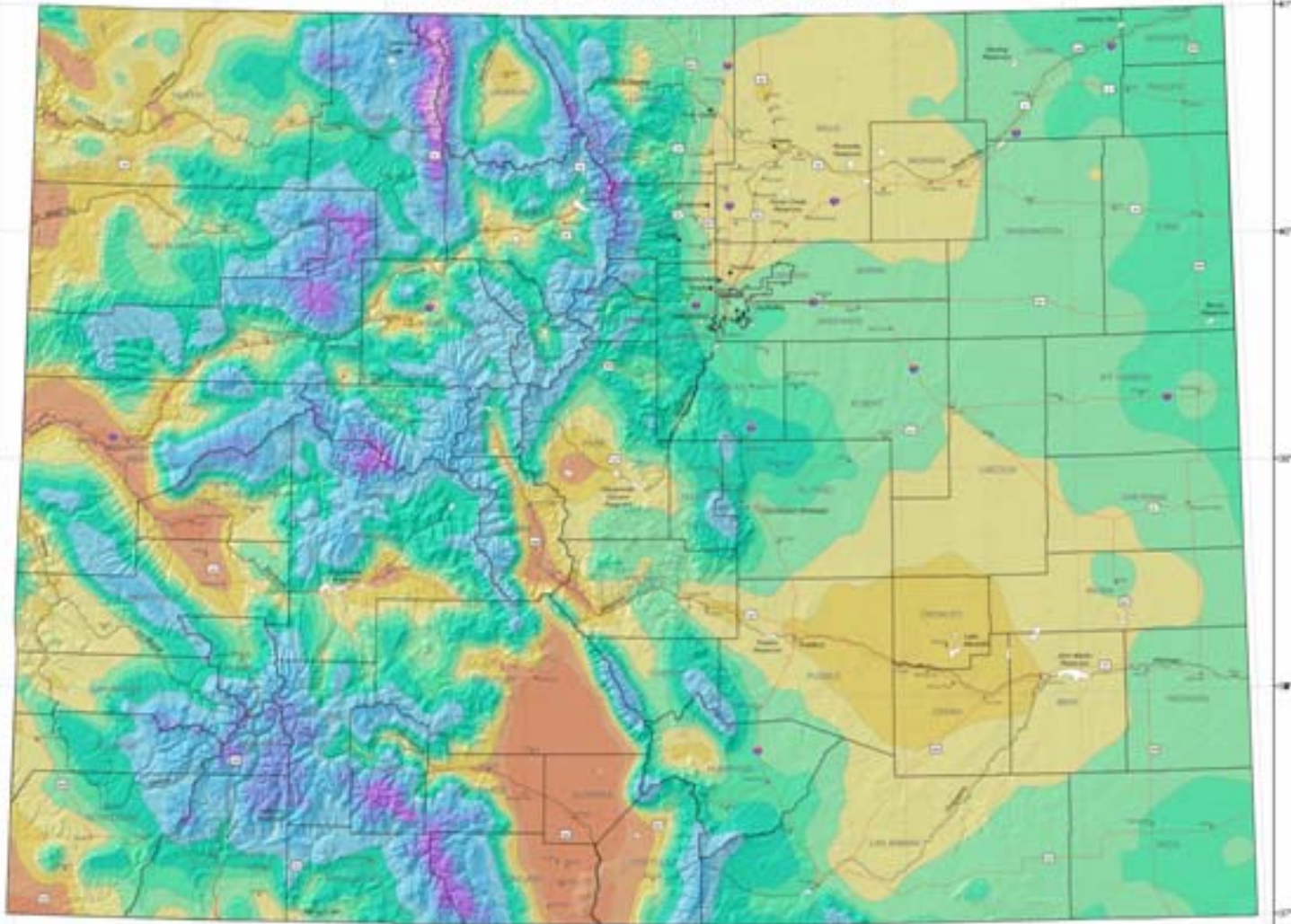


John Haynes Cheyenne Wells, CO 2002

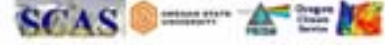


Colorado Average Annual Precipitation

COLORADO
PRISM 1971 - 2000 Mean Annual Precipitation

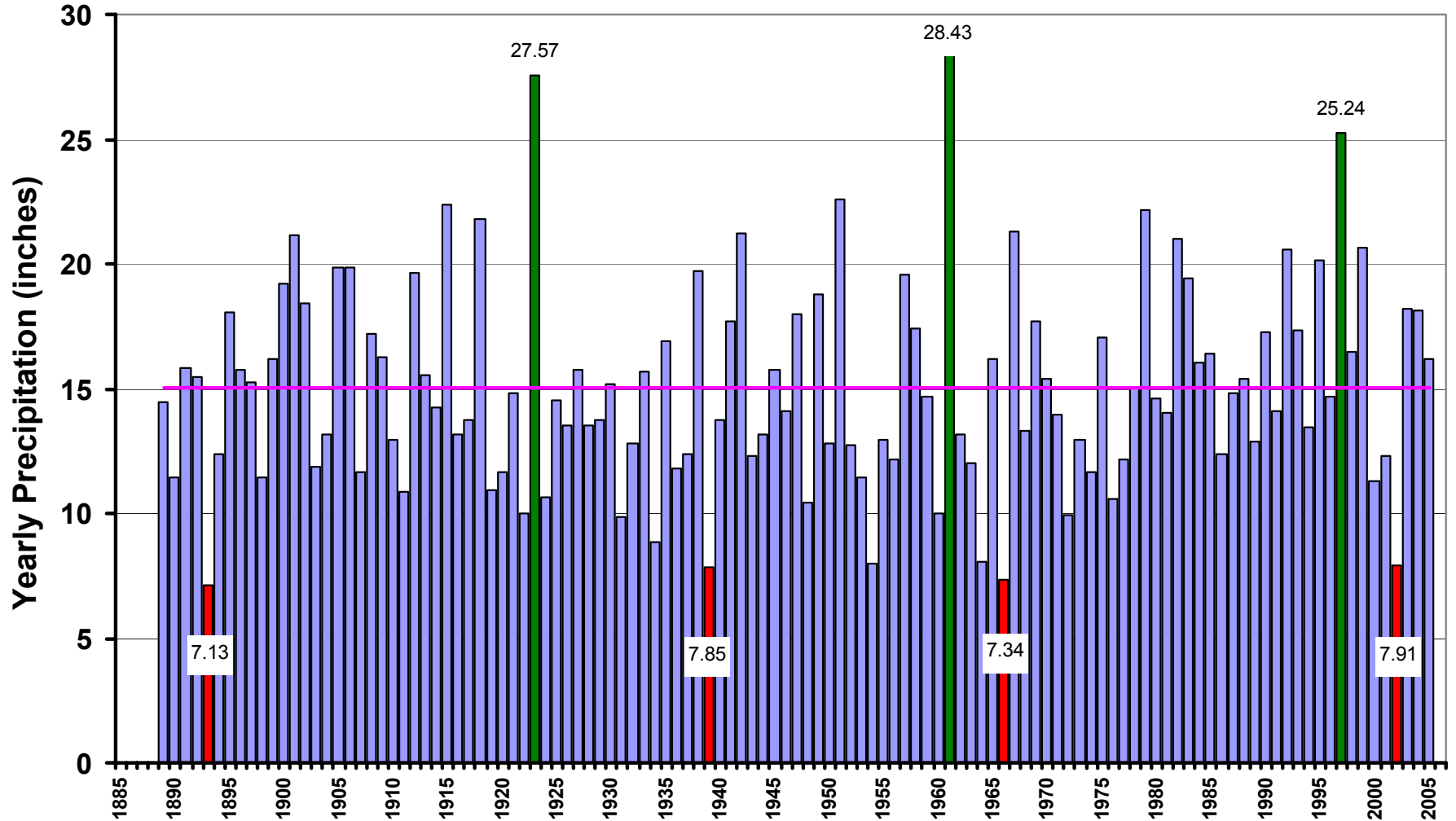


Map prepared with the PRISM climate modeling system by the Spatial Climate Analysis Service, Oregon State University.
<http://www.scas.oregonstate.edu/> Copyright © 2004, OSU SCAS

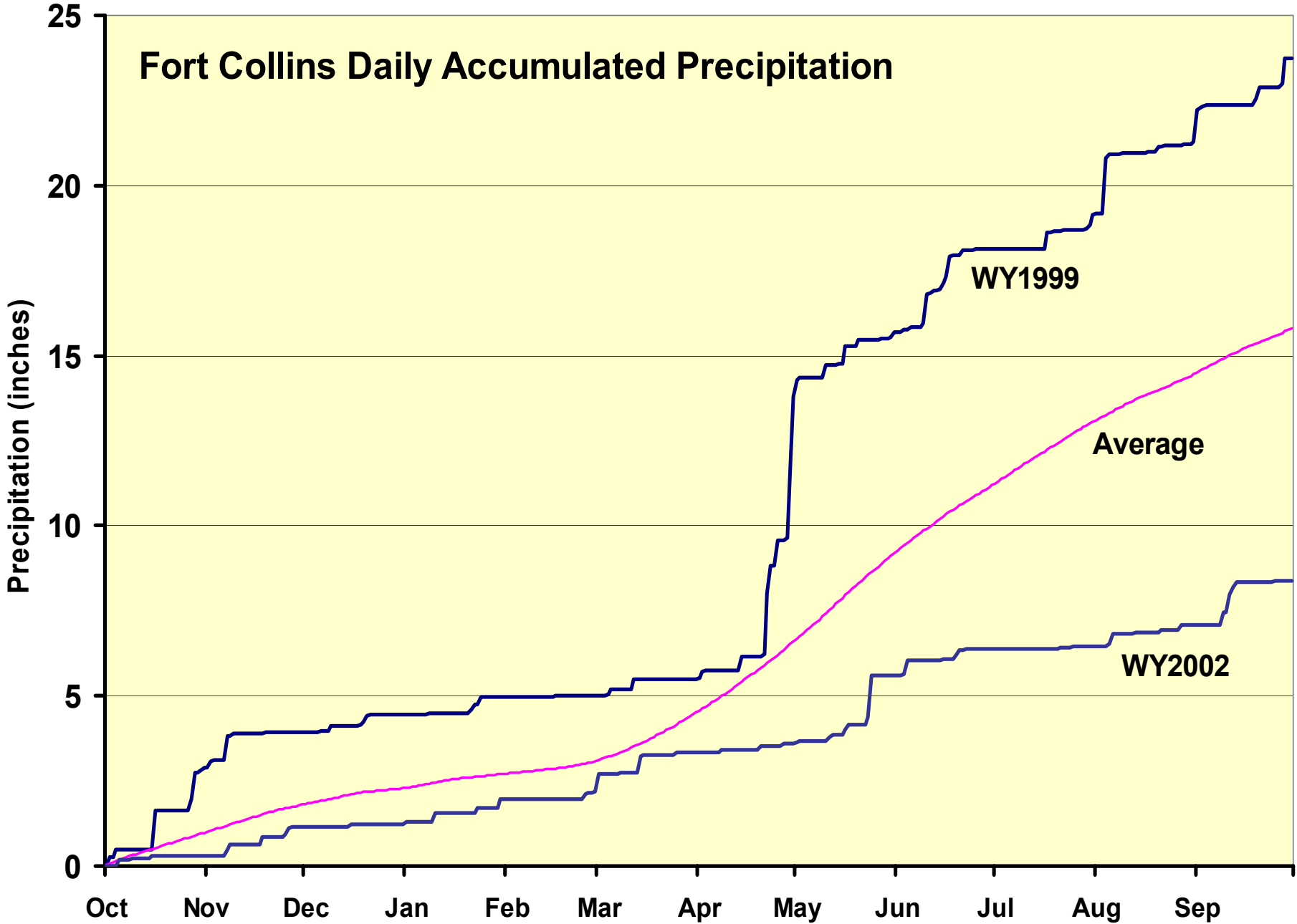


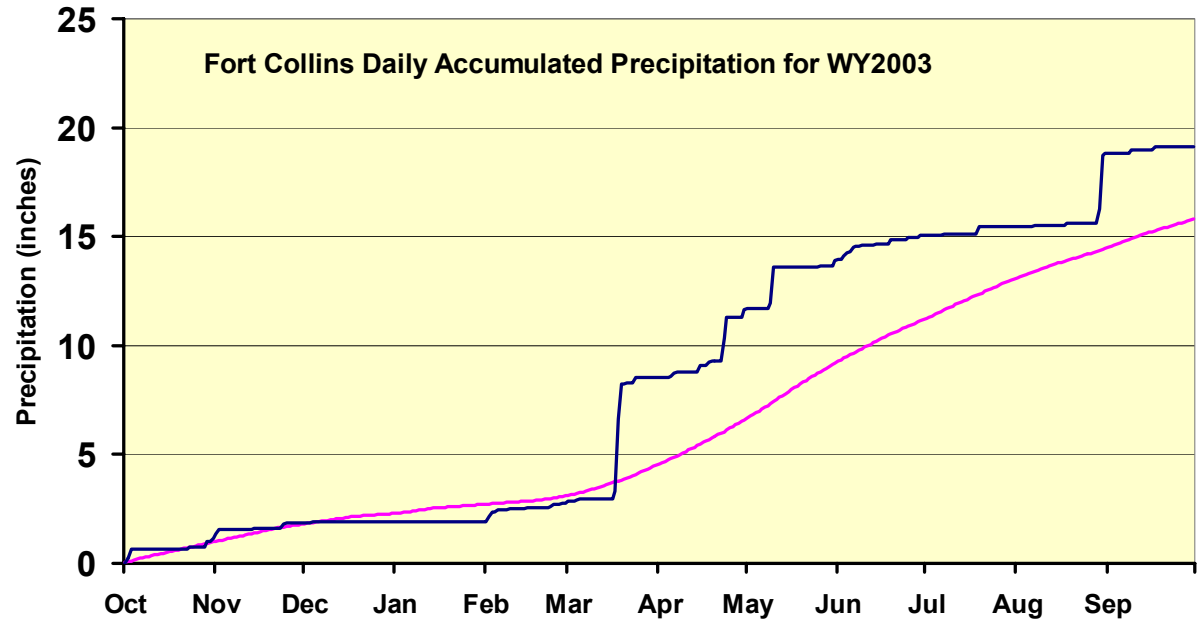
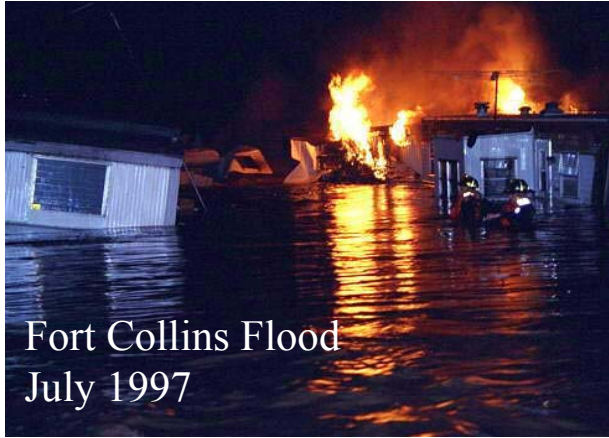
Fort Collins Historic Weather Station – Continuous observations from 1889 to present

Fort Collins Yearly Precipitation



Fort Collins Daily Accumulated Precipitation



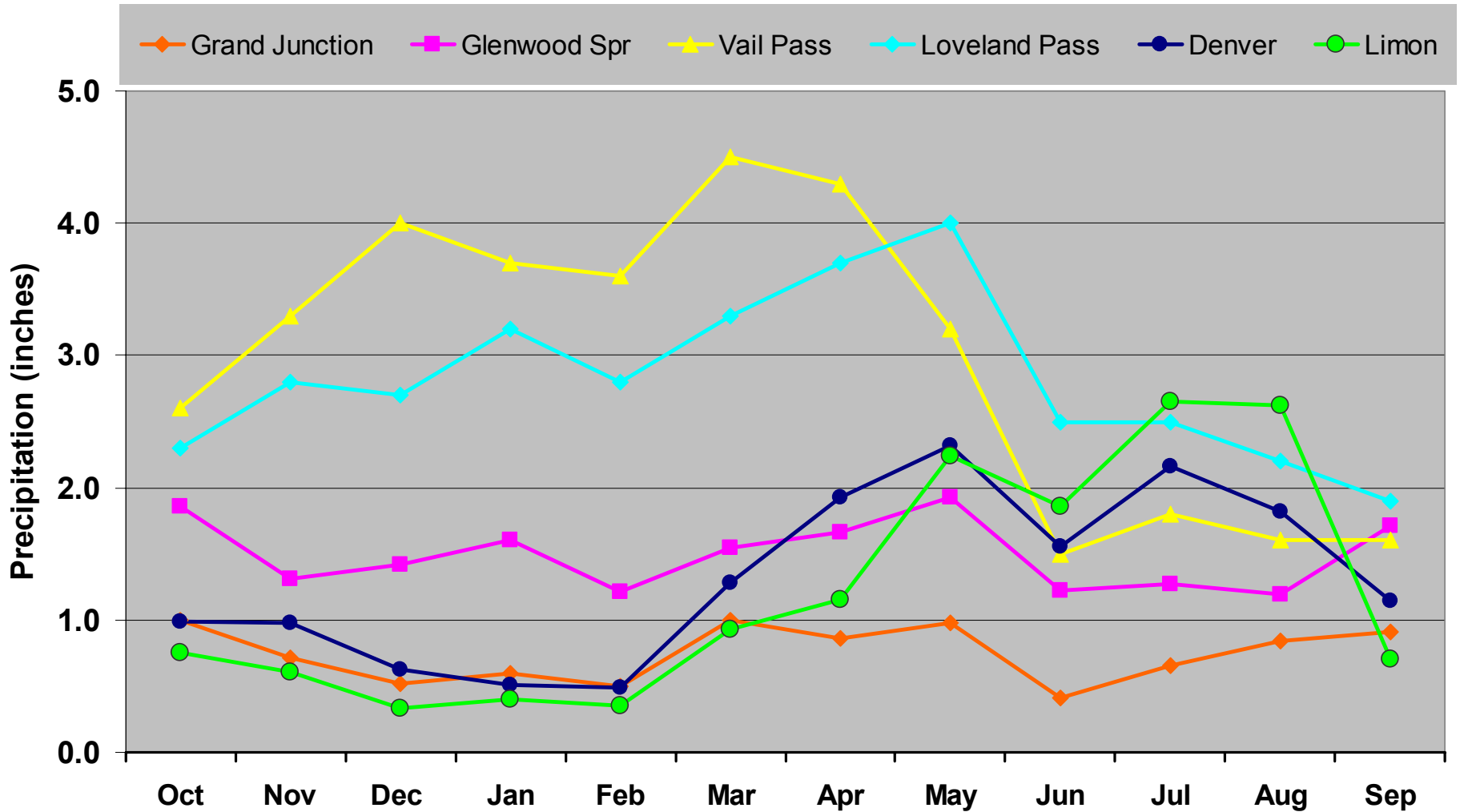


A few storms contribute a large fraction of our precipitation



Precipitation varies with the seasons

Water Year Average (1971-2000) Precipitation for Selected Stations



Quiz!

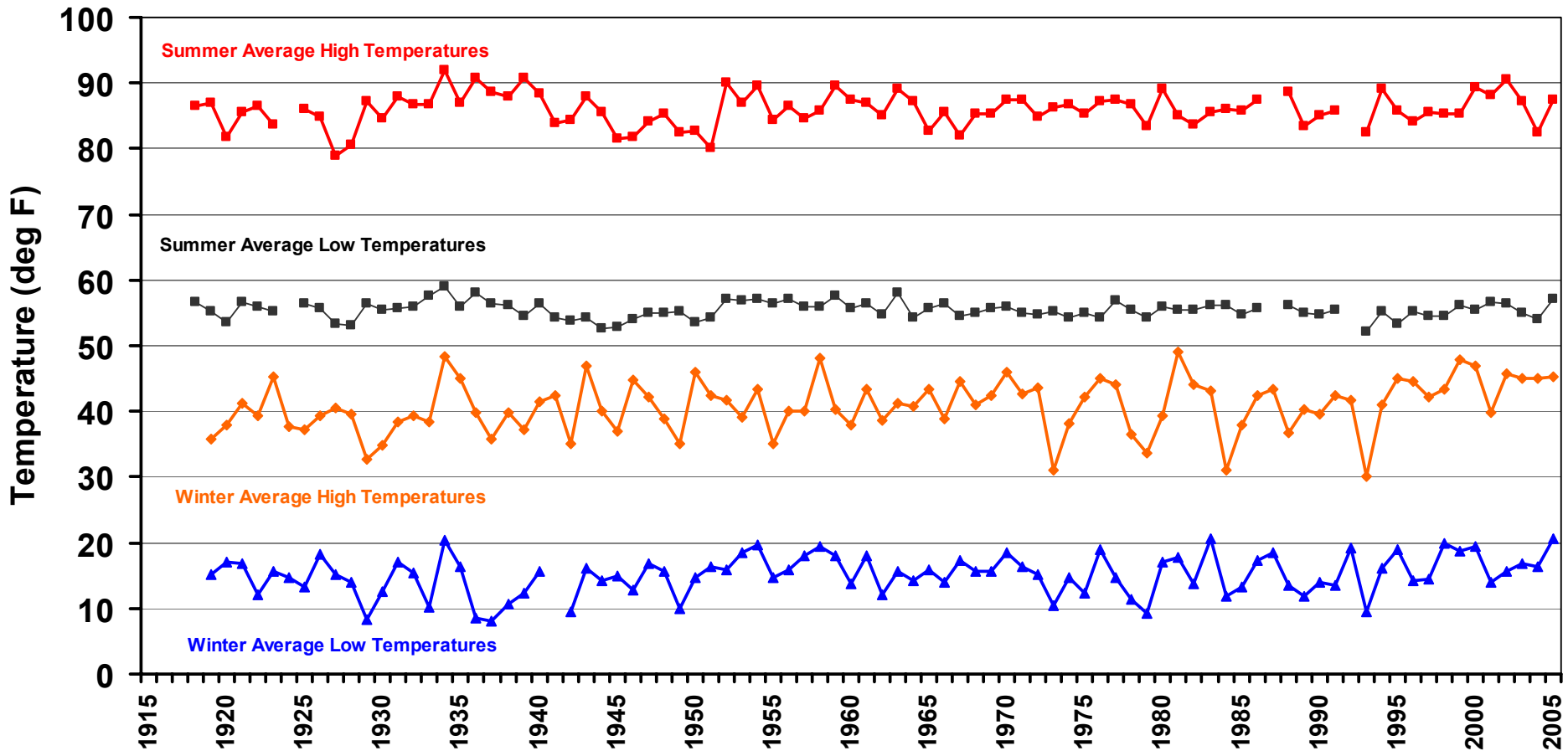
What month is the wettest month of the year (on average) for northeastern Colorado AND the driest month of the year for southwestern Colorado?



Photo by Henry Reges

Some climate elements are more consistent than others

Akron 4E Temperature

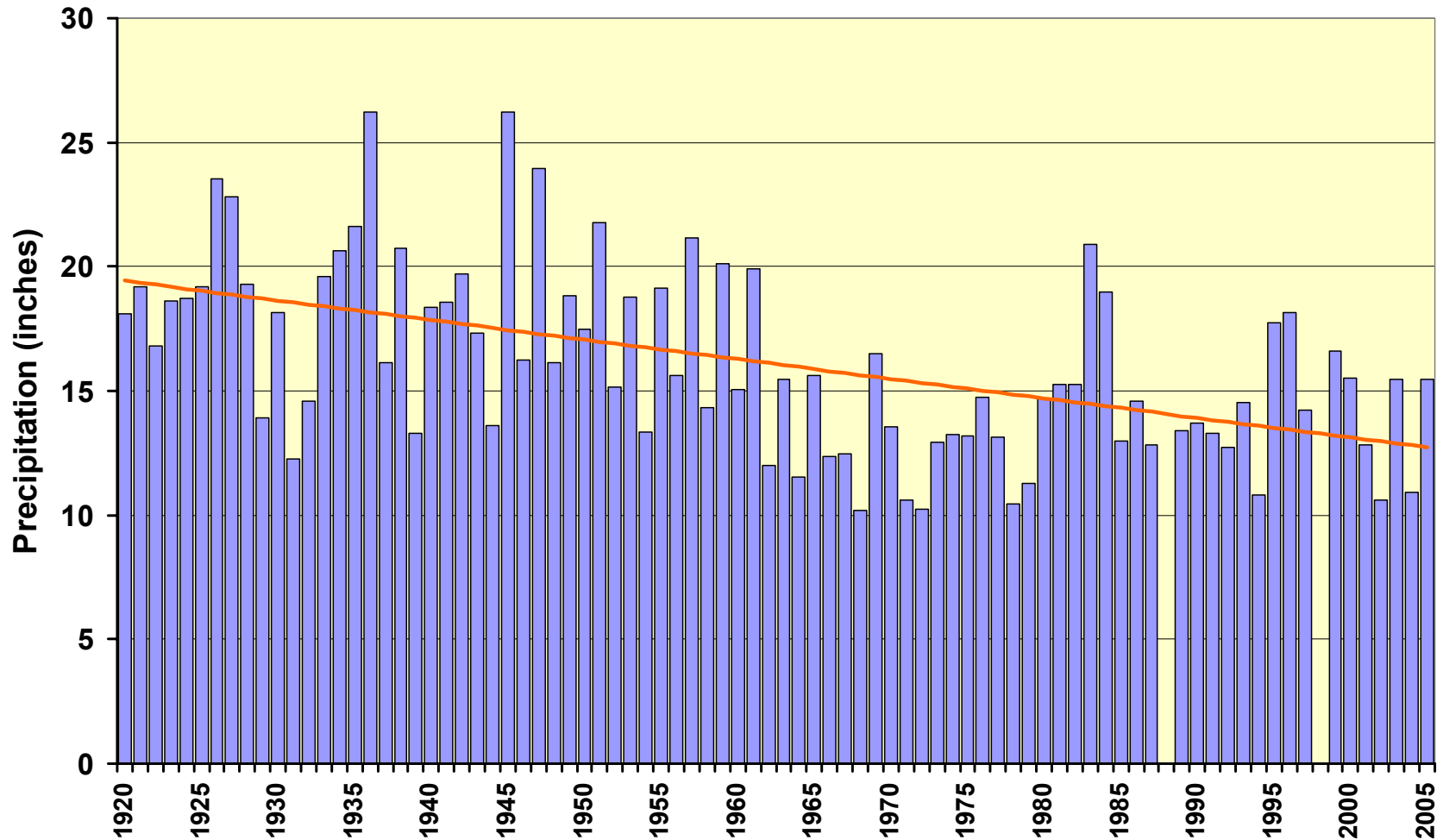


And one more thing to know, the data are good but not great....

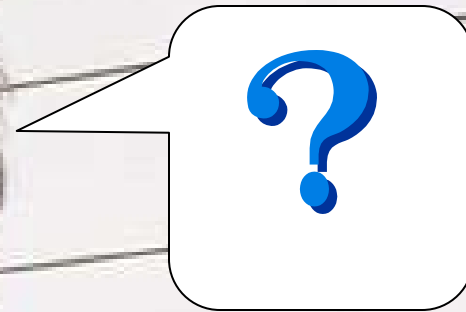


This is quickly revealed when we try to explore long-term changes

Dillon Annual (Jan-Dec) Precipitation Totals

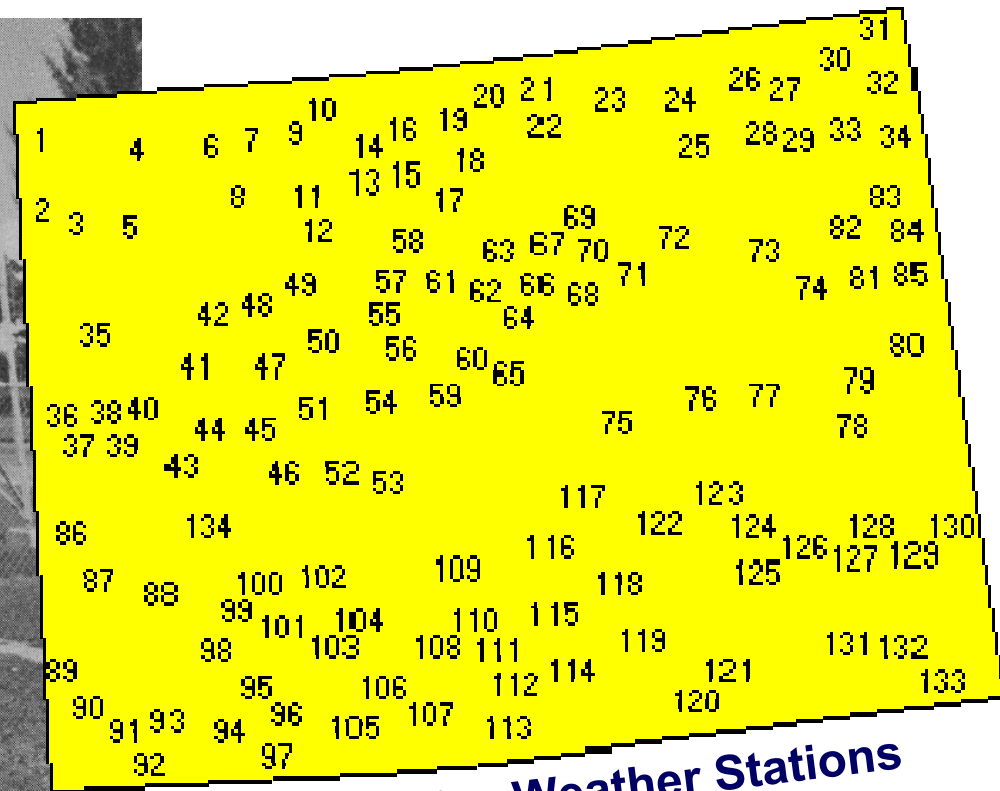
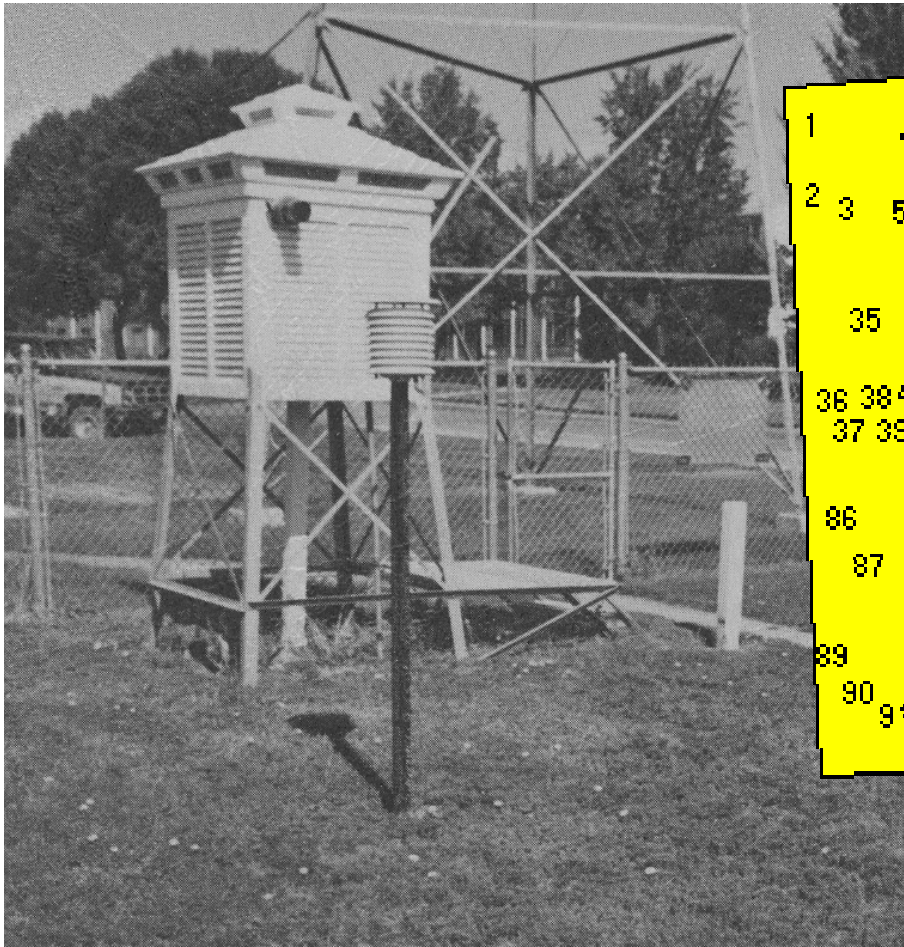


So! Based on our available data, can we tell if our climate is changing?



First, let's look at temperatures

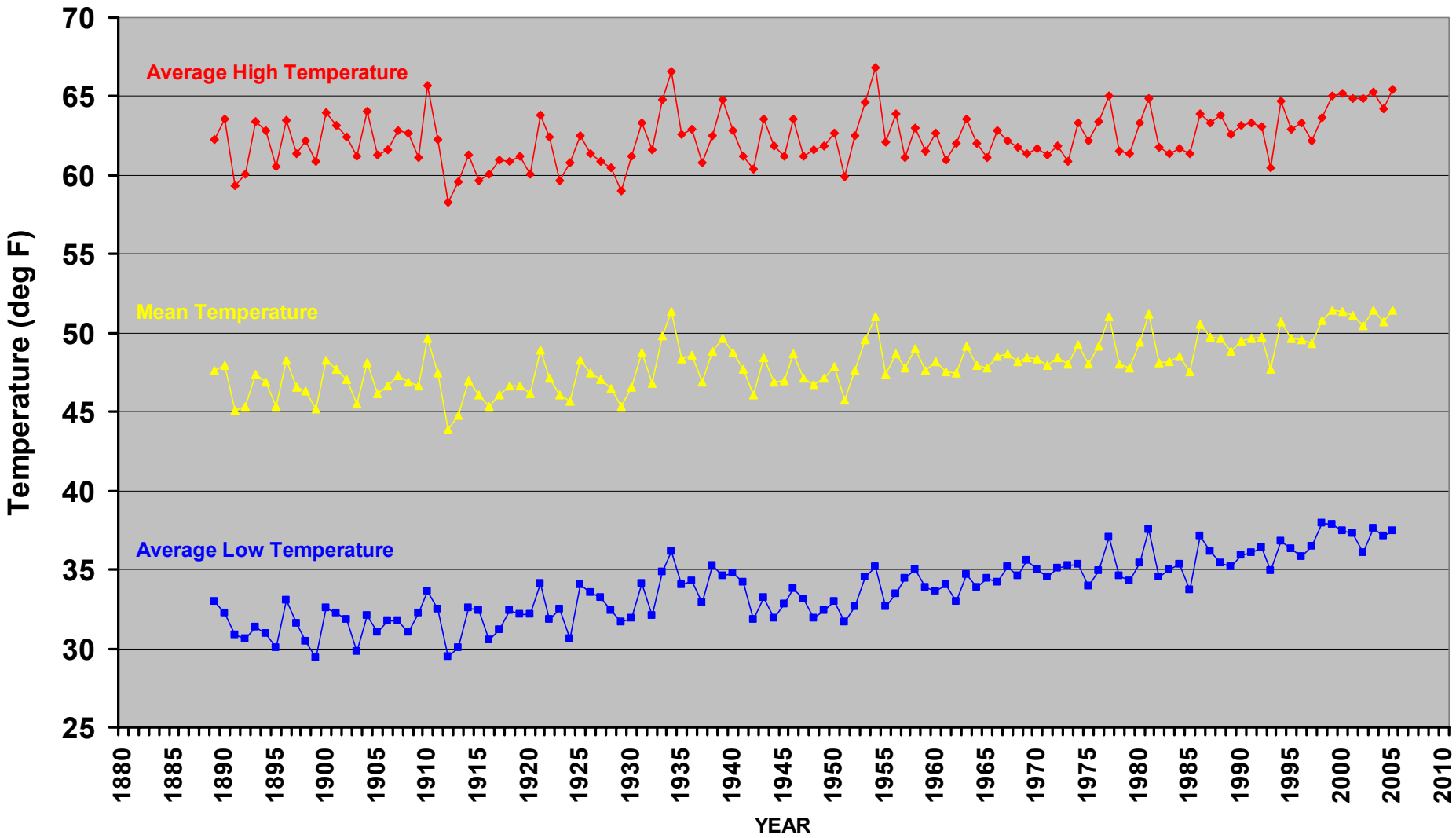
- Of all the state's long-term weather stations, very few have uninterrupted, consistent data for analyzing climate trends.



**Cooperative Weather Stations
in Colorado**

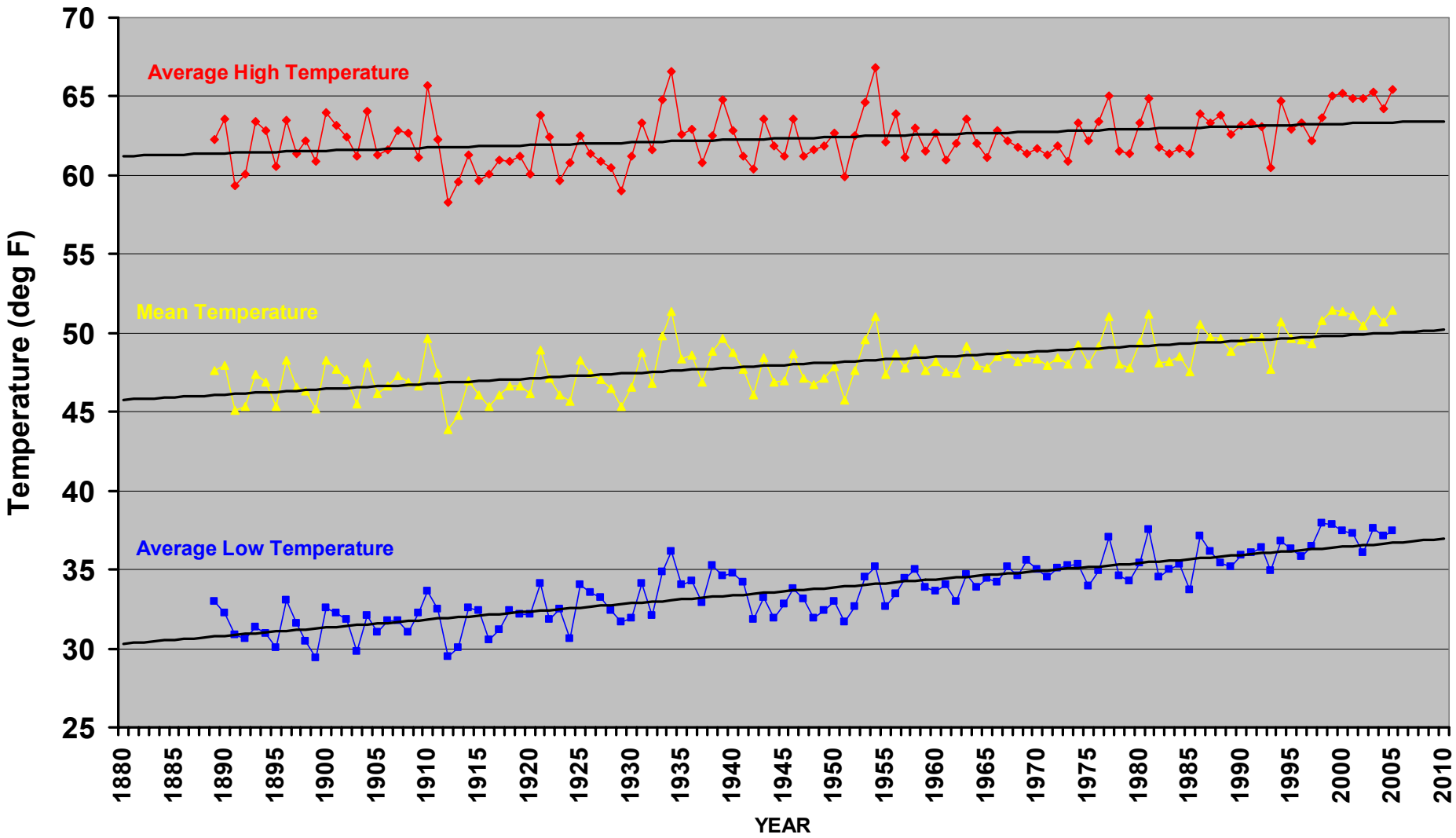
Fort Collins Temperatures

Fort Collins Average Temperatures from 1889 to 2005



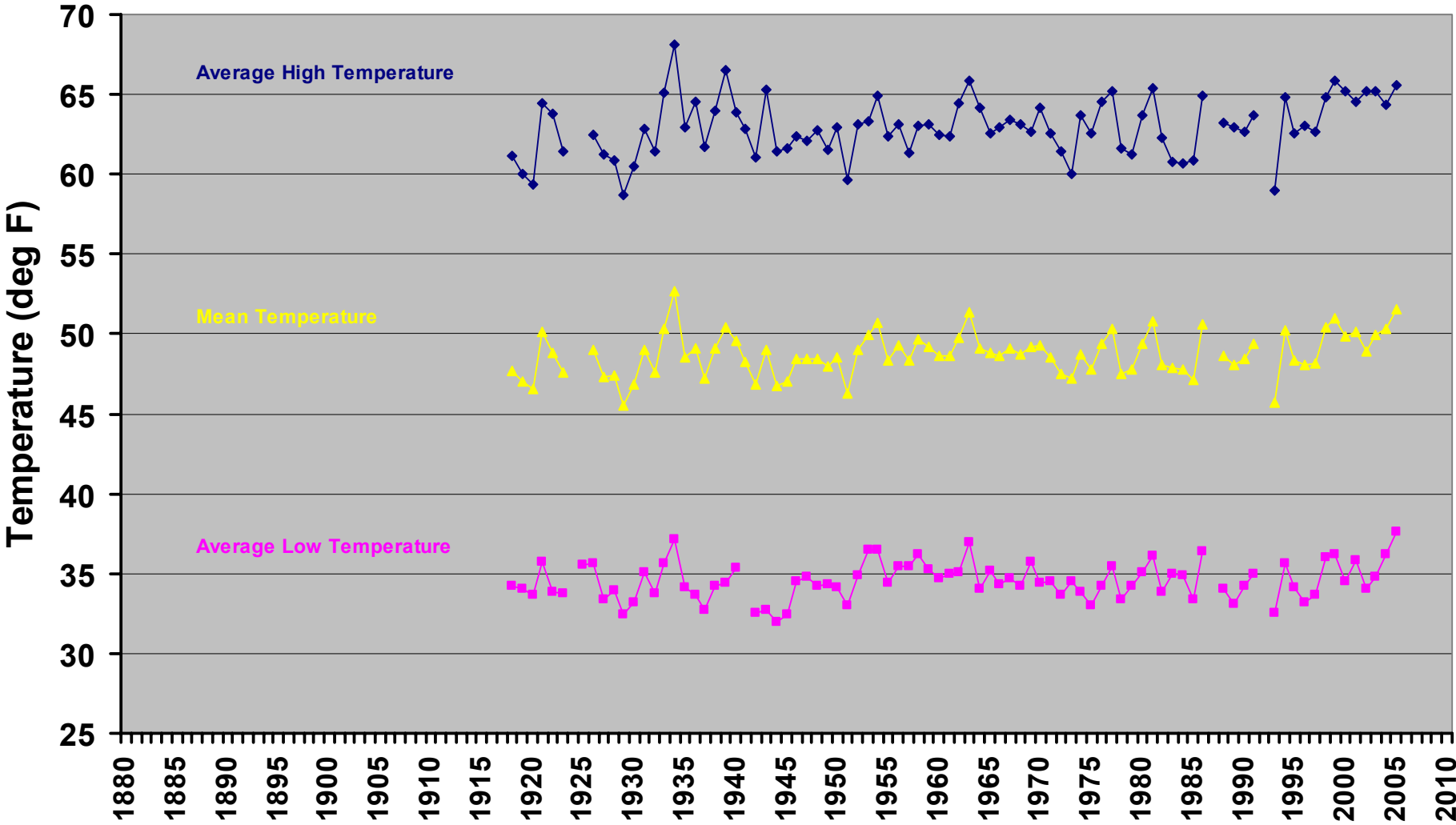
Fort Collins Temperatures

Fort Collins Average Temperatures from 1889 to 2005



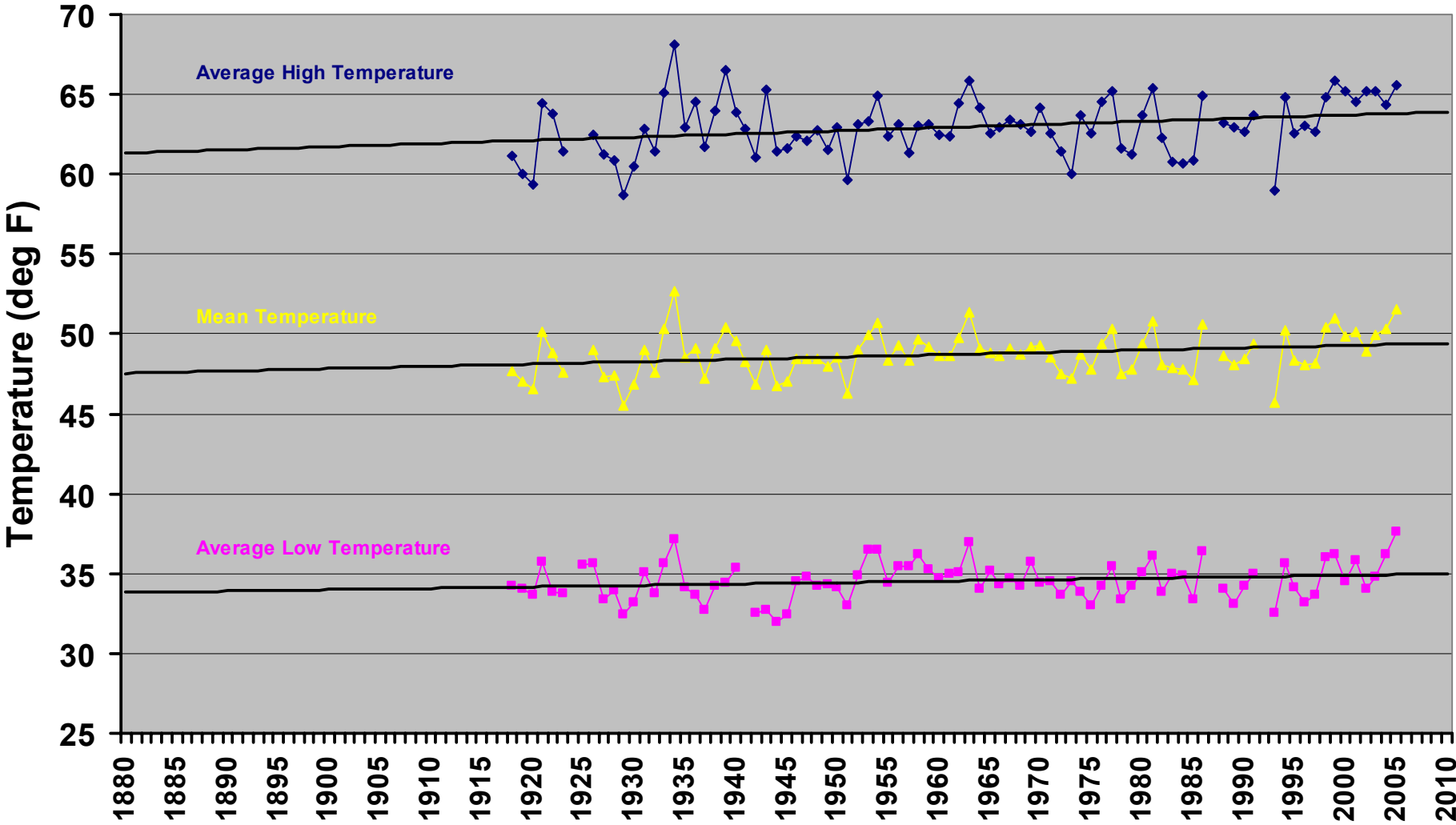
Akron Temperatures

Akron Average Temperatures (from 1918-2005)



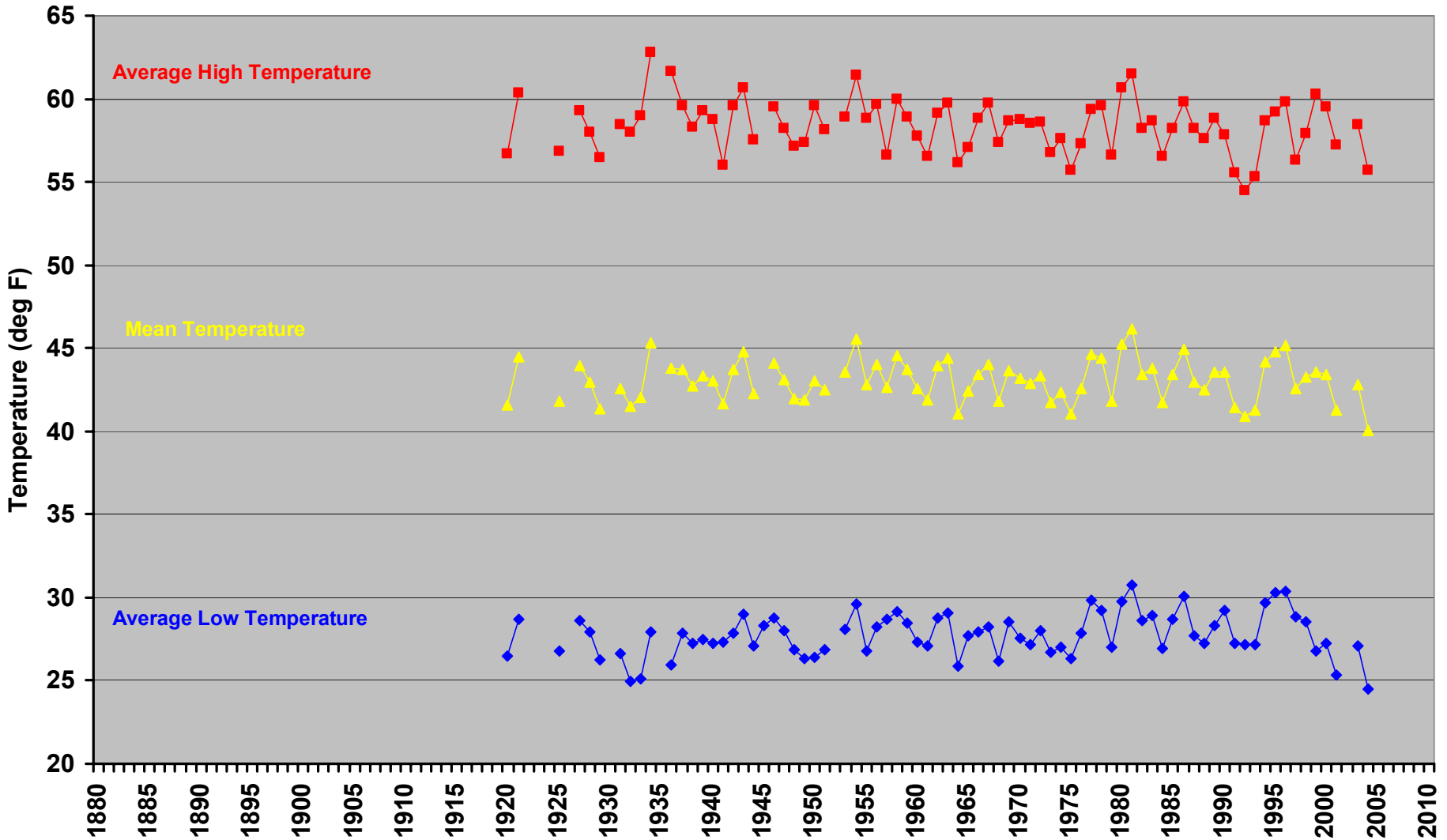
Akron Temperatures

Akron Average Temperatures (from 1918-2005)



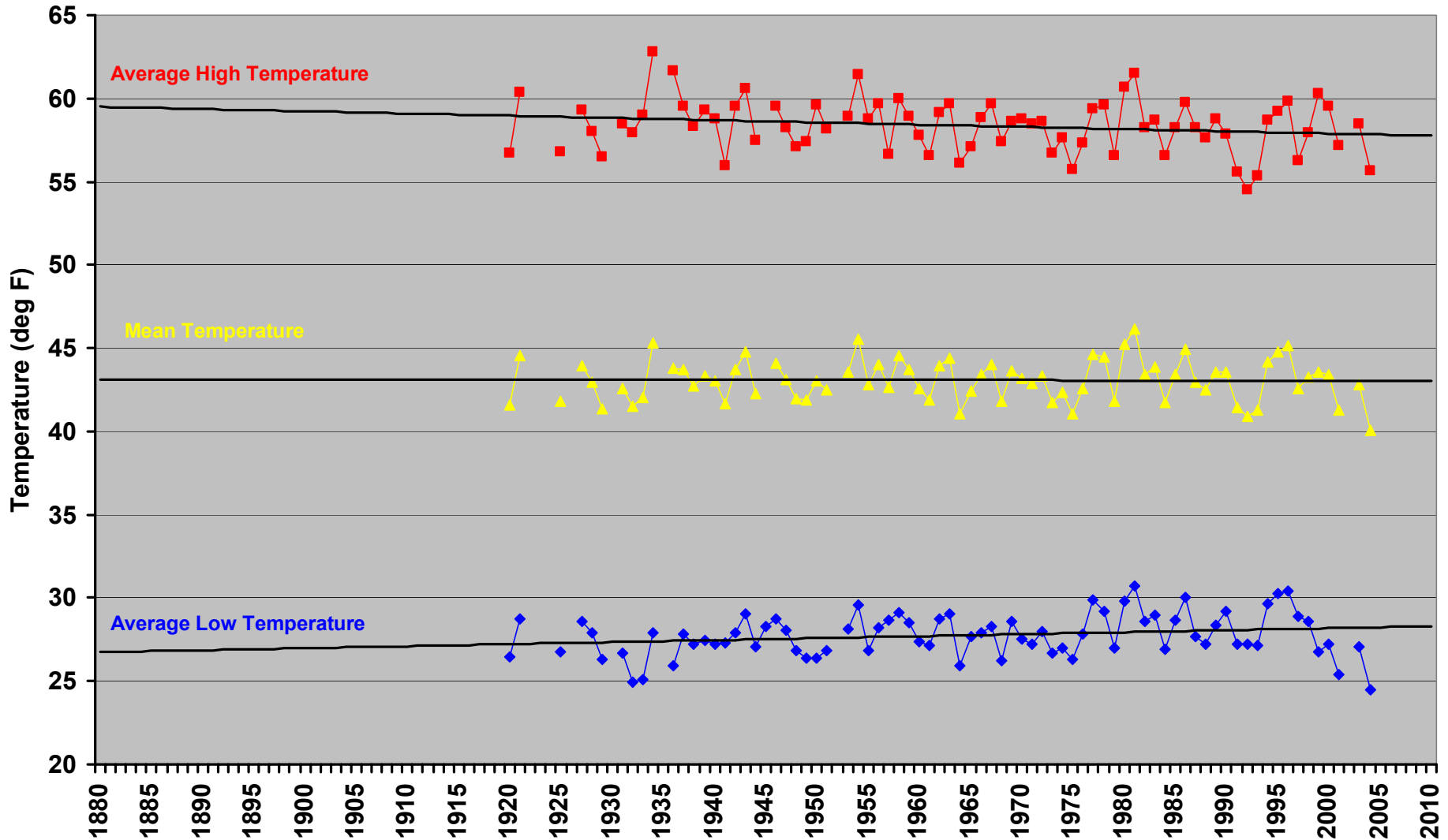
Del Norte Temperatures

Del Norte Monthly Average Temperatures (1920-2005)



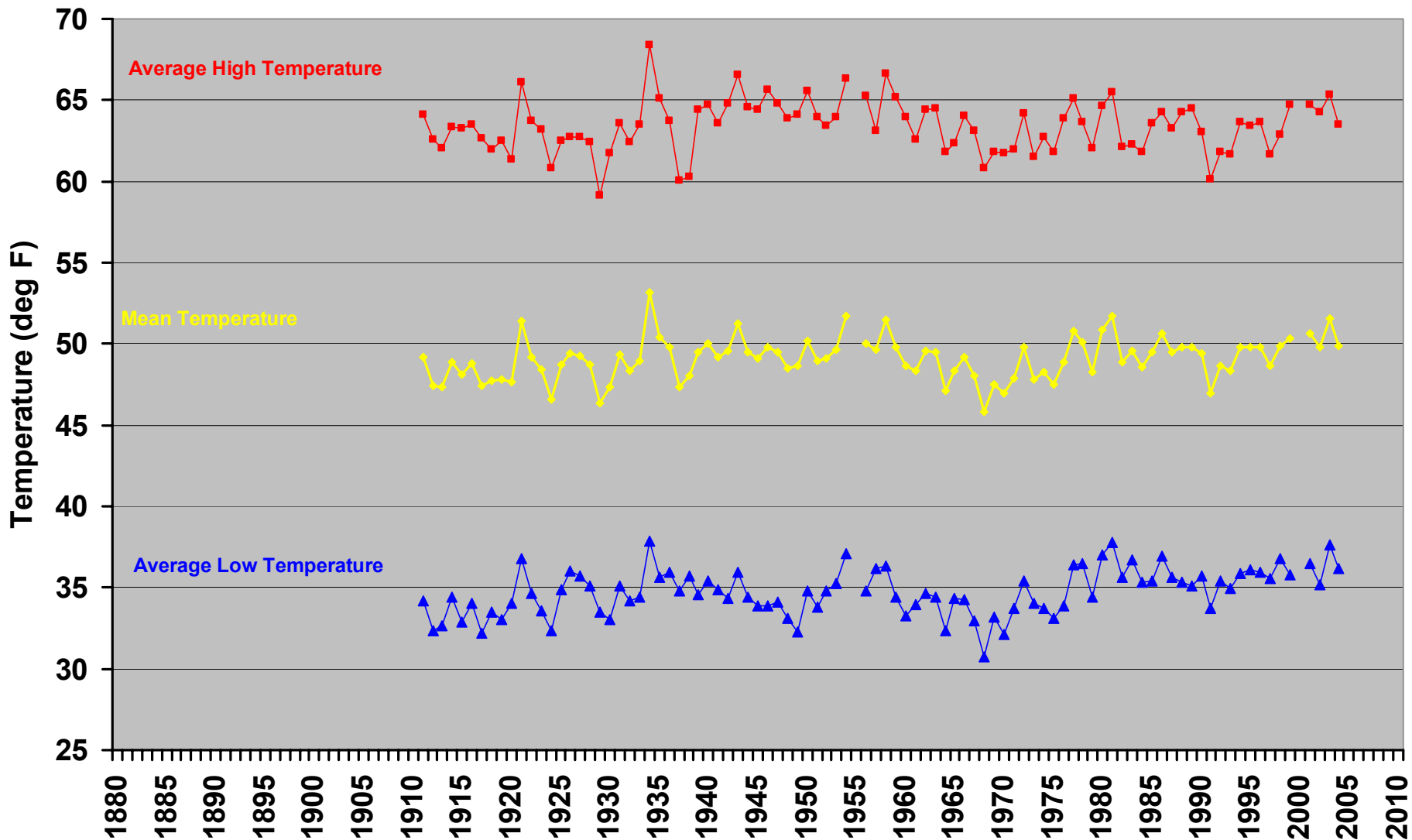
Del Norte Temperatures

Del Norte Monthly Average Temperatures (1920-2005)



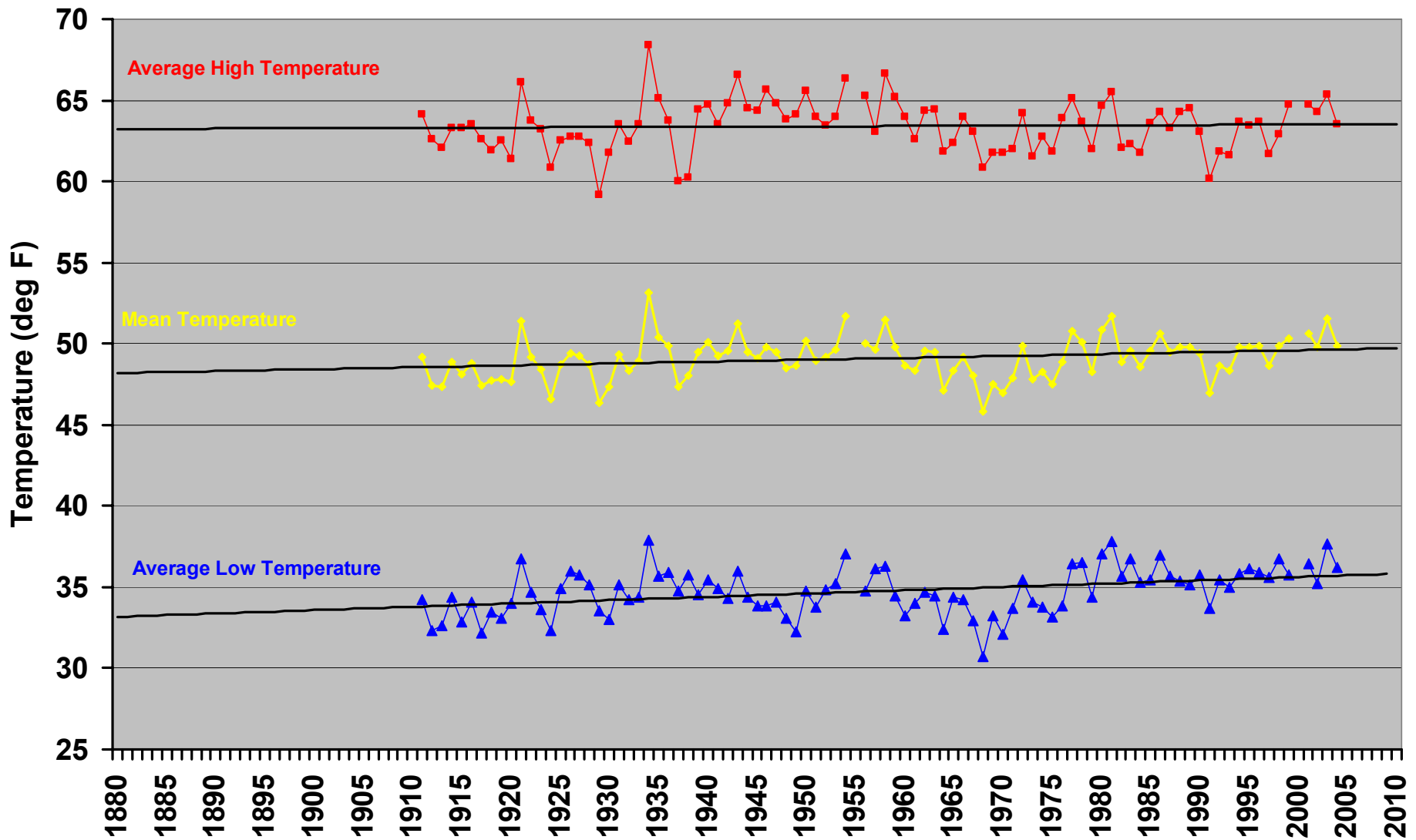
Montrose Temperatures

Montrose 2 Average Monthly Temperatures (1911-2005)



Montrose Temperatures

Montrose 2 Average Monthly Temperatures (1911-2005)



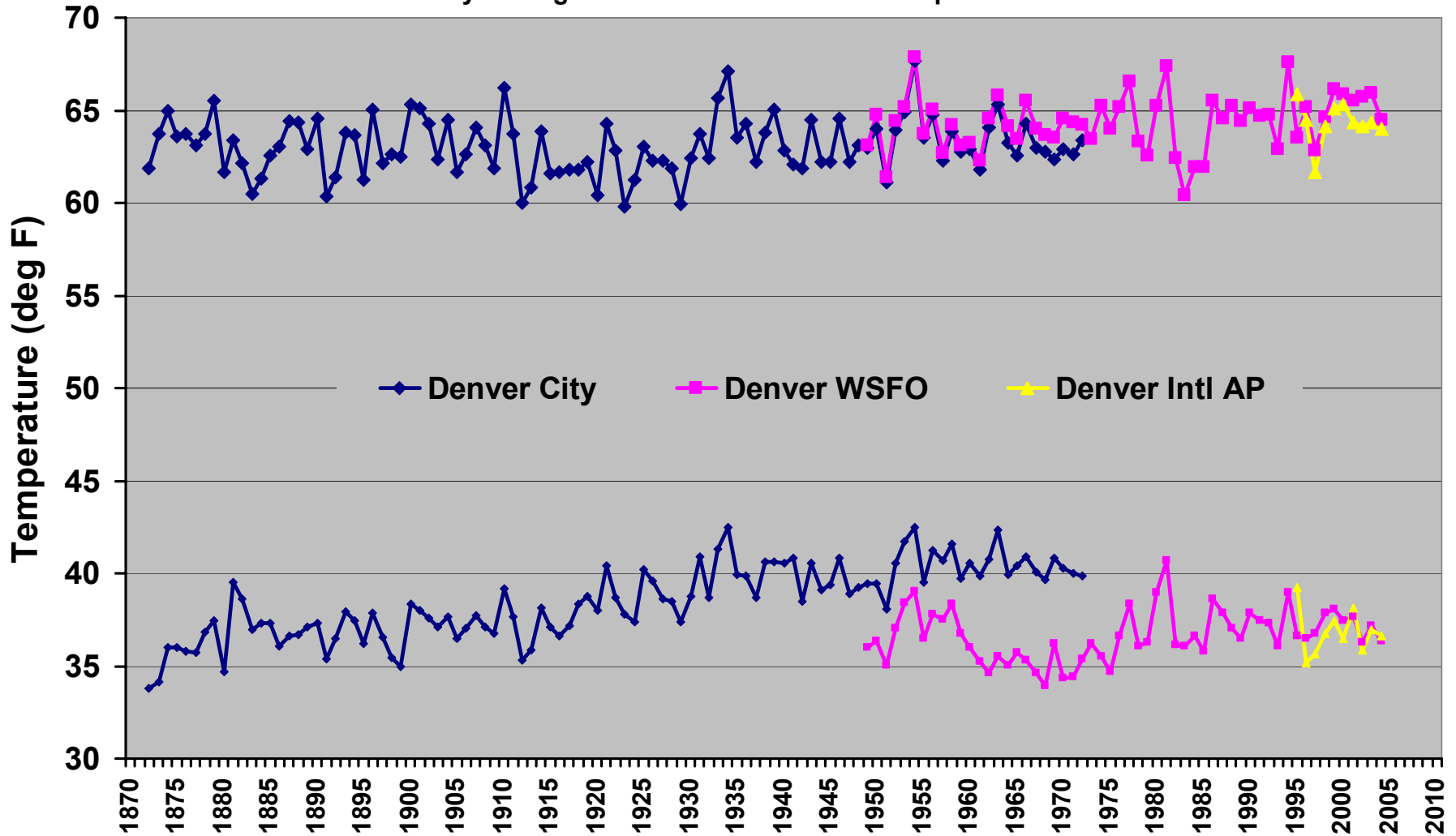
What about Denver?!?



Denver (combined)

Denver (all 3 stations)

Monthly Average Maximum and Minimum Temperatures

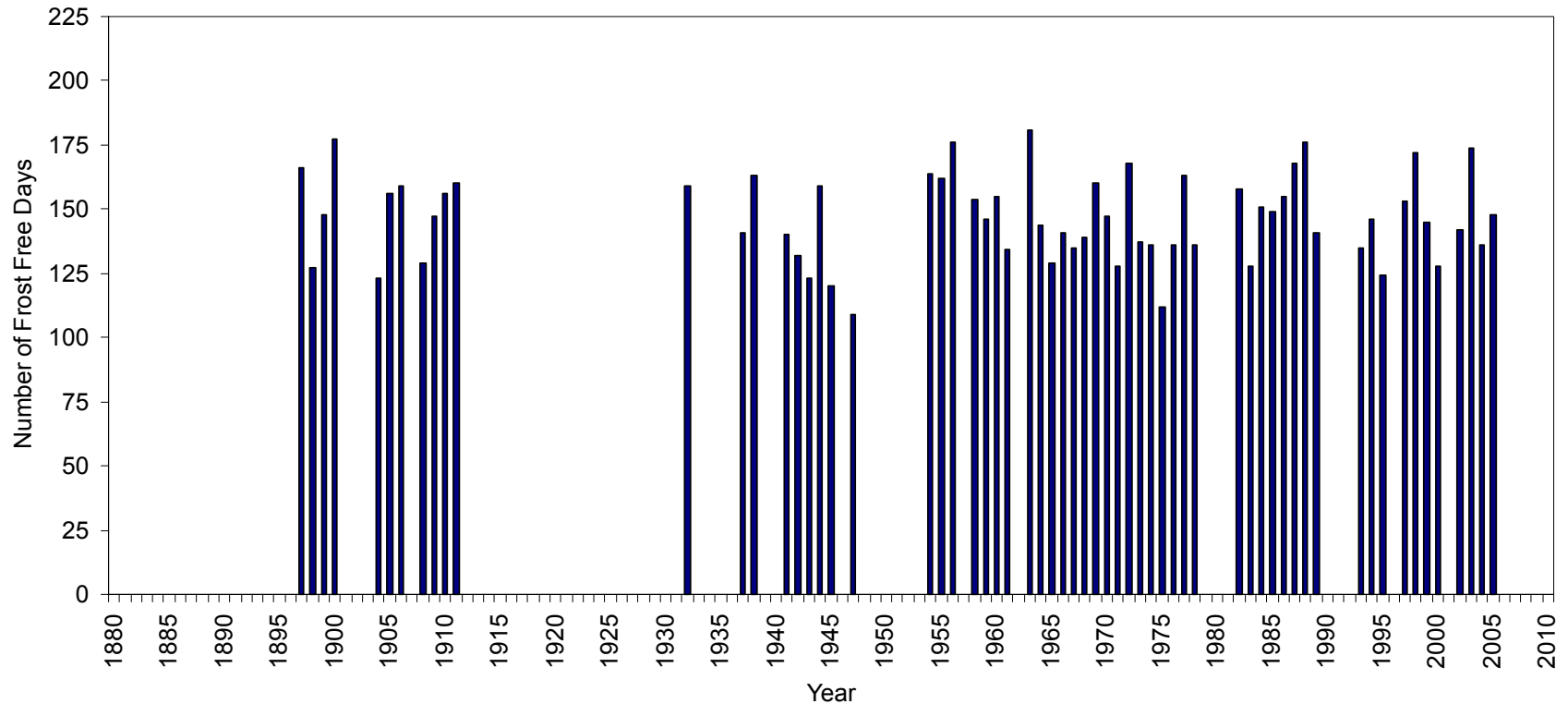


Frost Free Days (Growing Season)



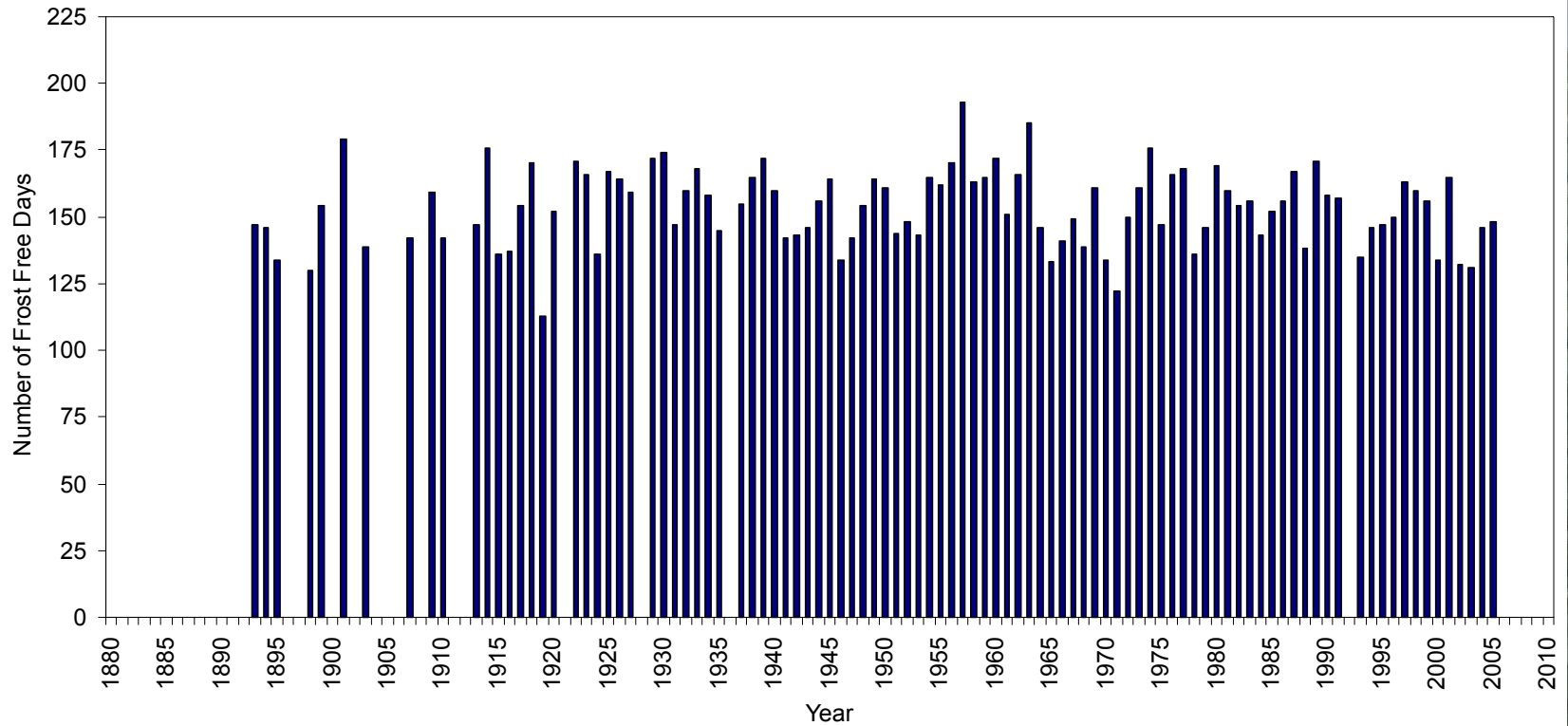
Cheyenne Wells Frost Free Days

Cheyenne Wells, CO Length of Frost Free Period Based on 32 F Threshold



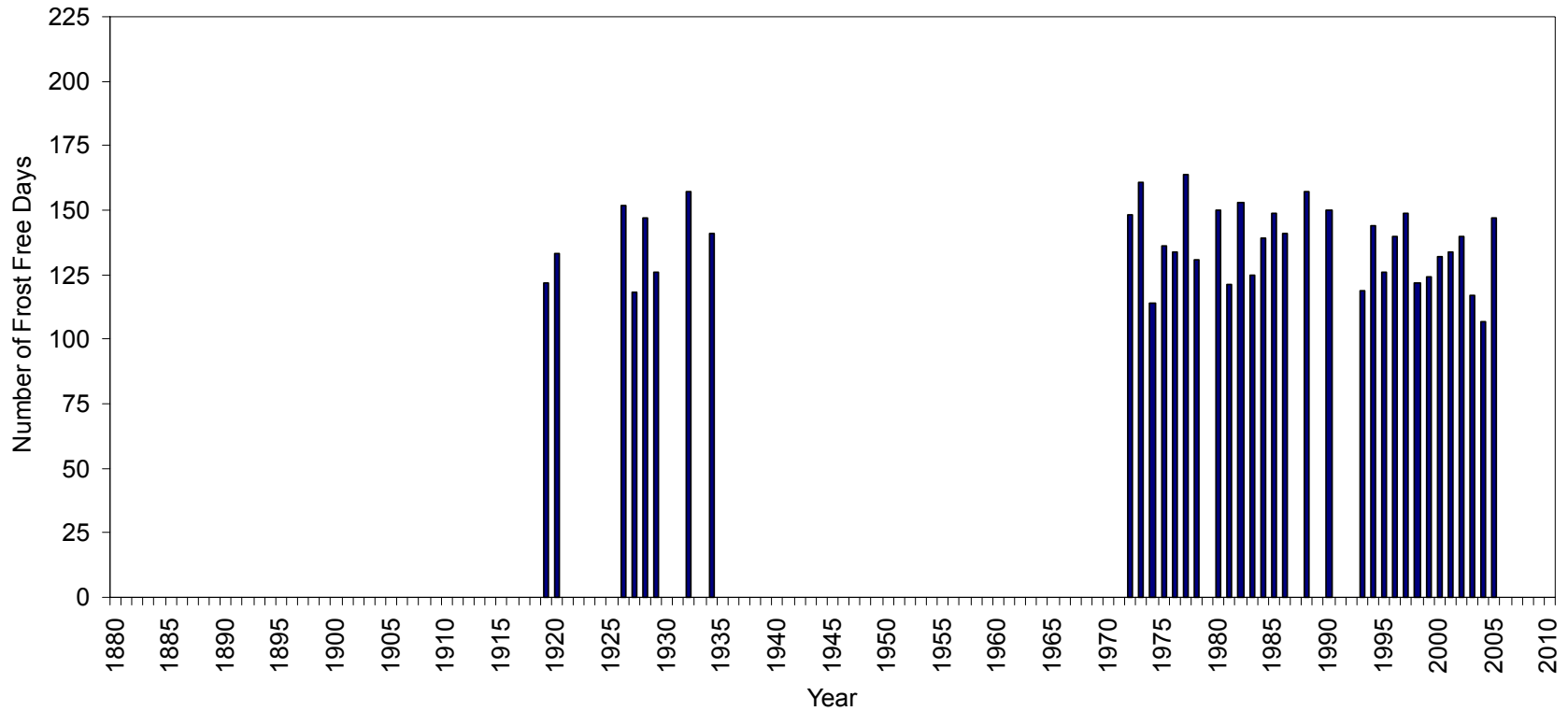
Rocky Ford Frost Free Days

Rocky Ford 2SE Length of Frost Free Period Based on 32 F Threshold



Akron Frost Free Days

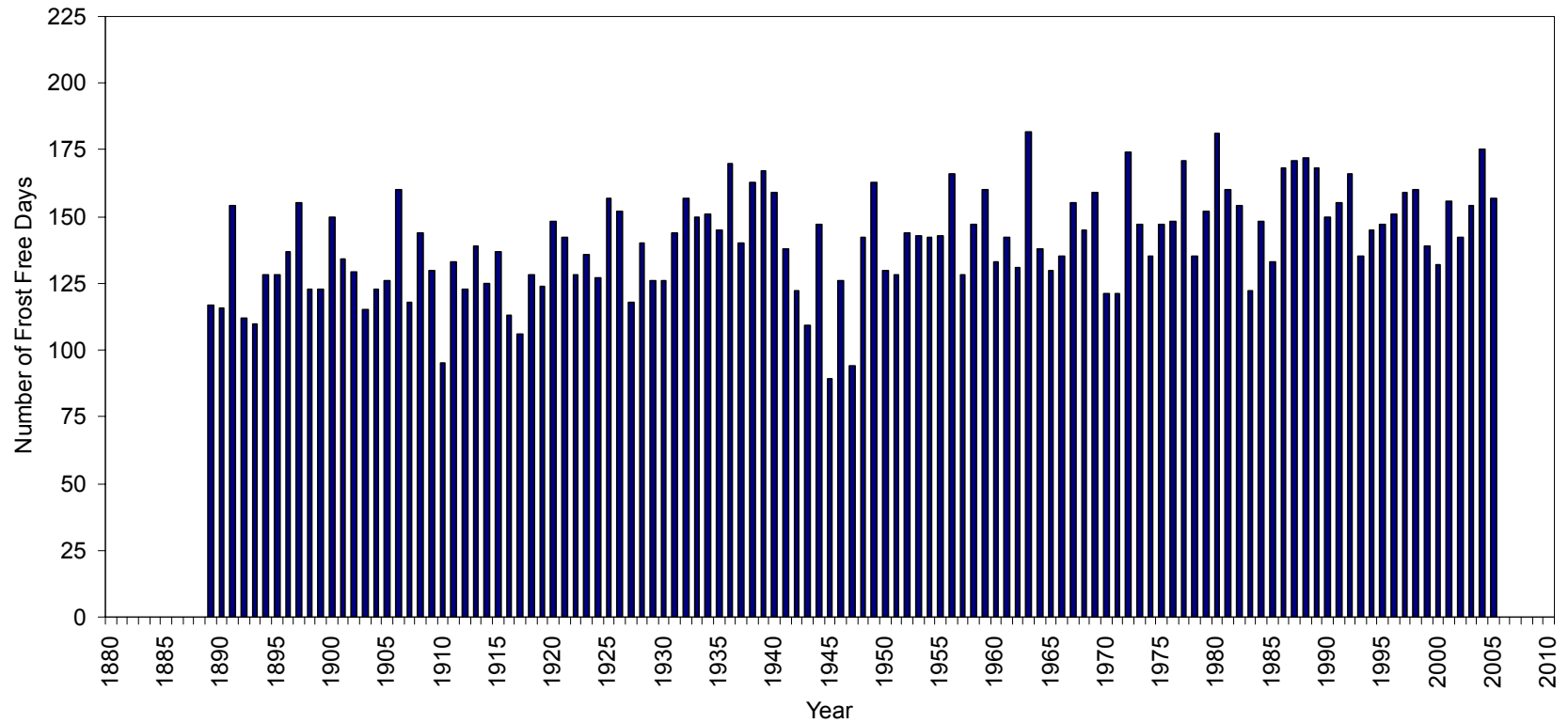
Akron 4E Length of Frost Free Period Based on 32 F Threshold



Fort Collins

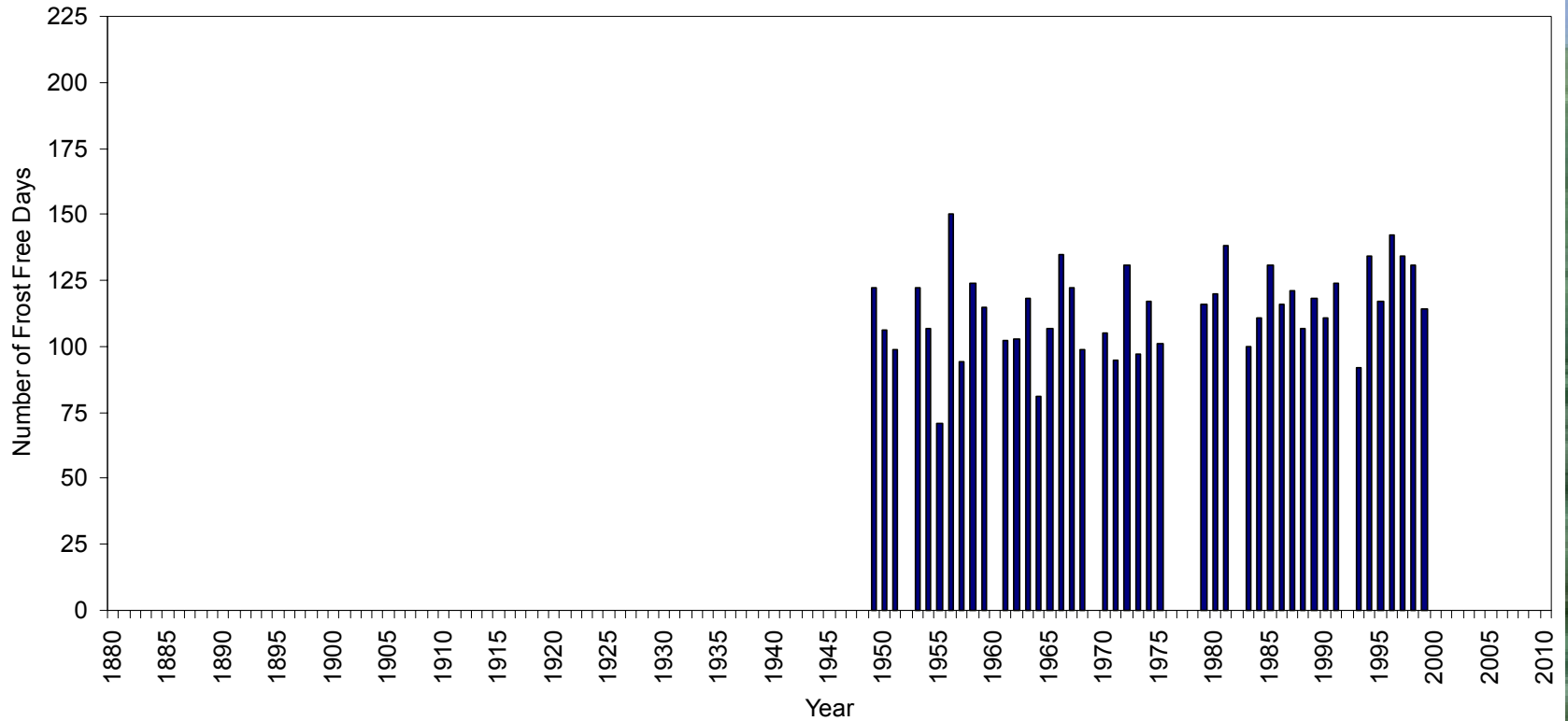
Frost Free Days

Fort Collins, CO Length of Frost Free Period Based on 32 F Threshold



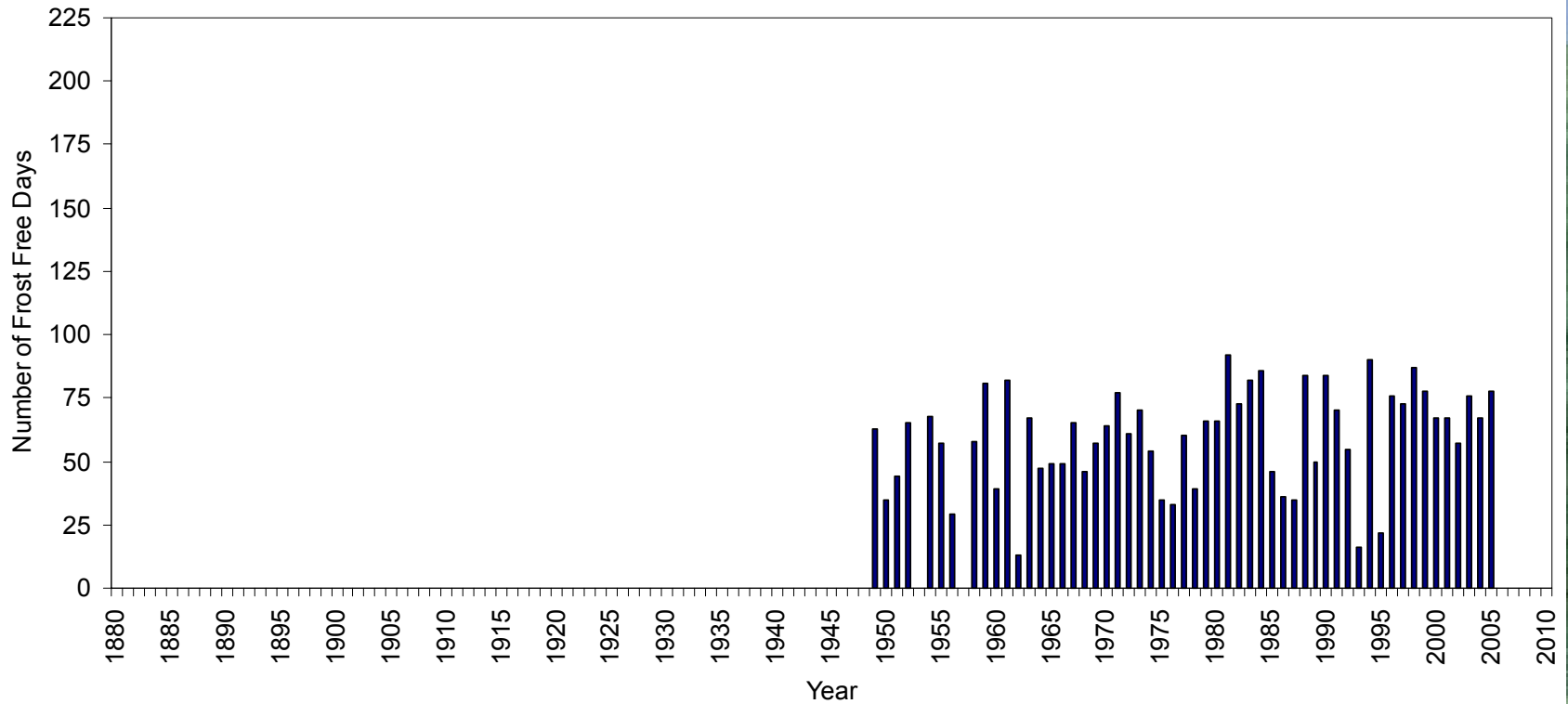
Del Norte Frost Free Days

Del Norte Length of Frost Free Period Based on 32 F Threshold



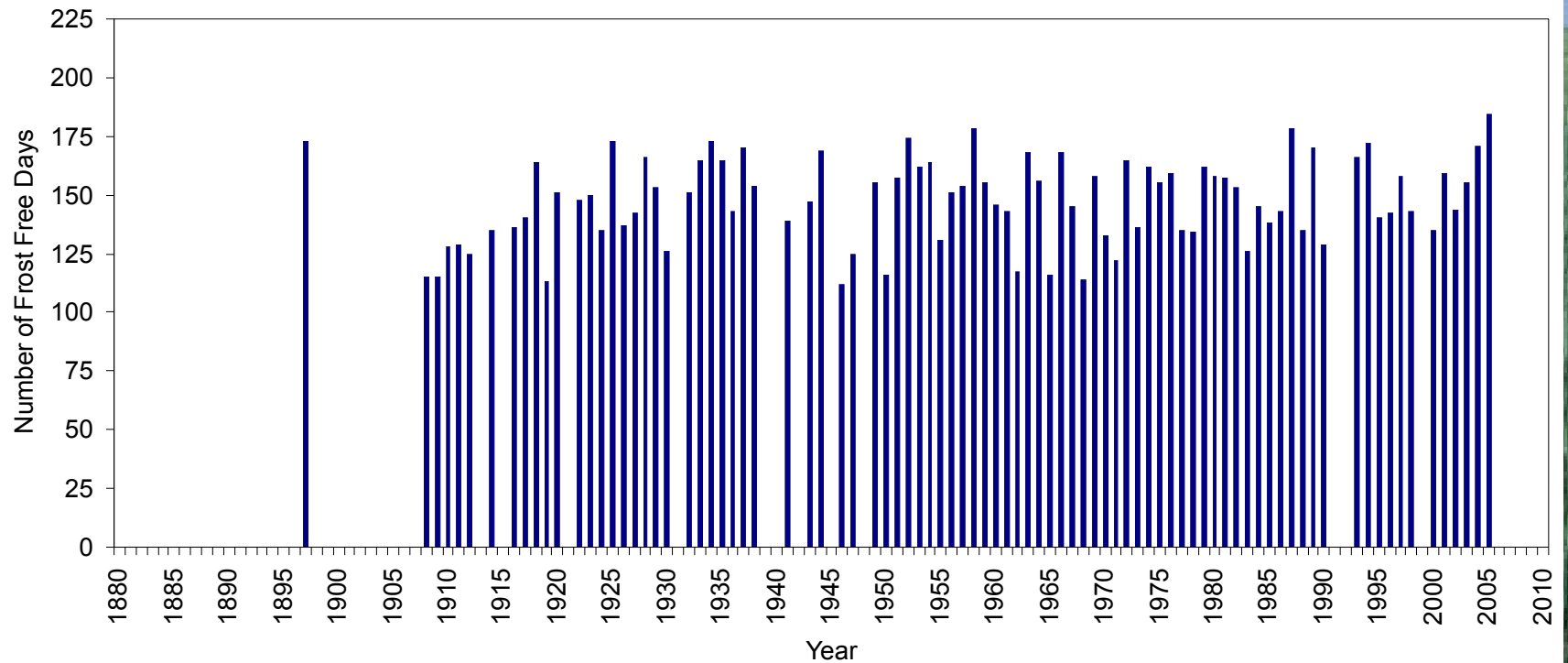
Cochetopa Creek Frost Free Days

Cochetopa Creek, CO Length of Frost Free Period Based on 32 F Threshold



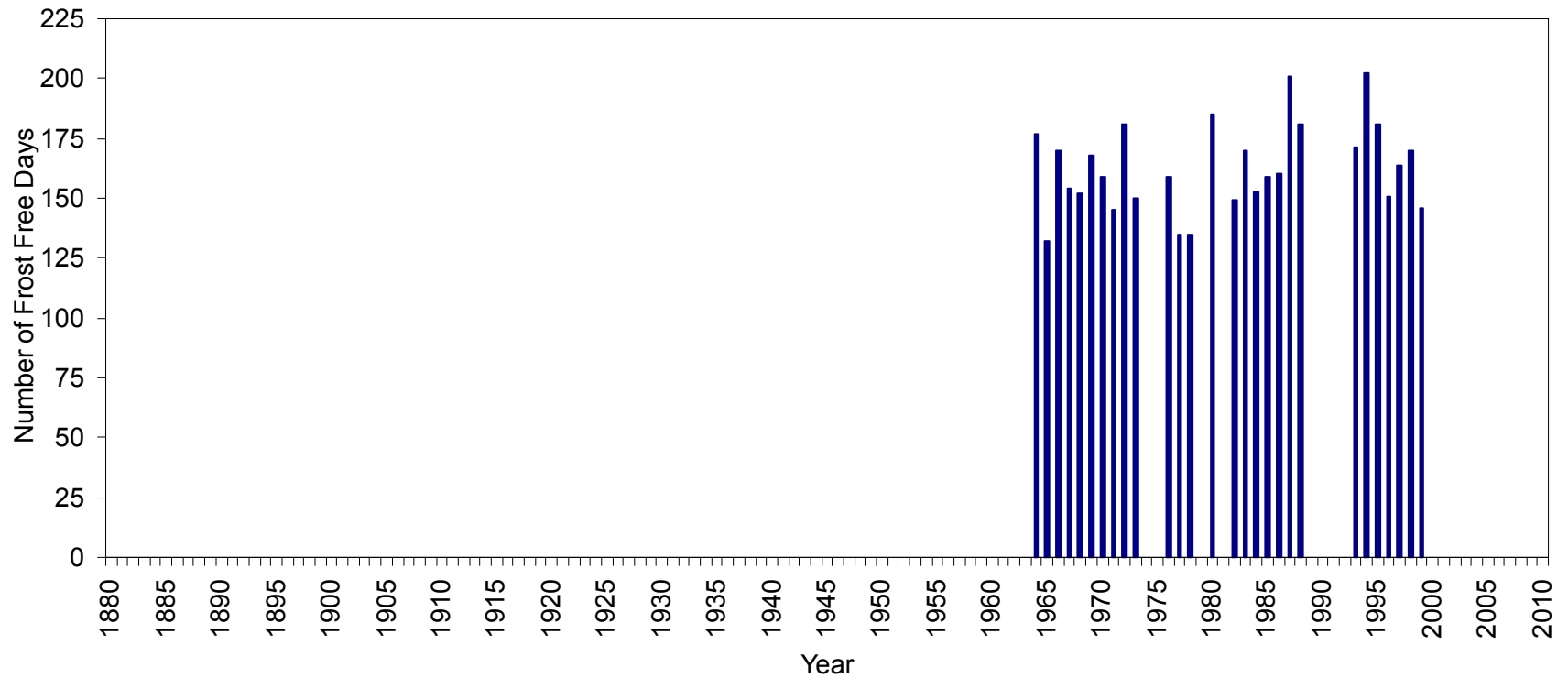
Montrose Frost Free Days

Montrose #2 Length of Frost Free Period Based on 32 F Threshold



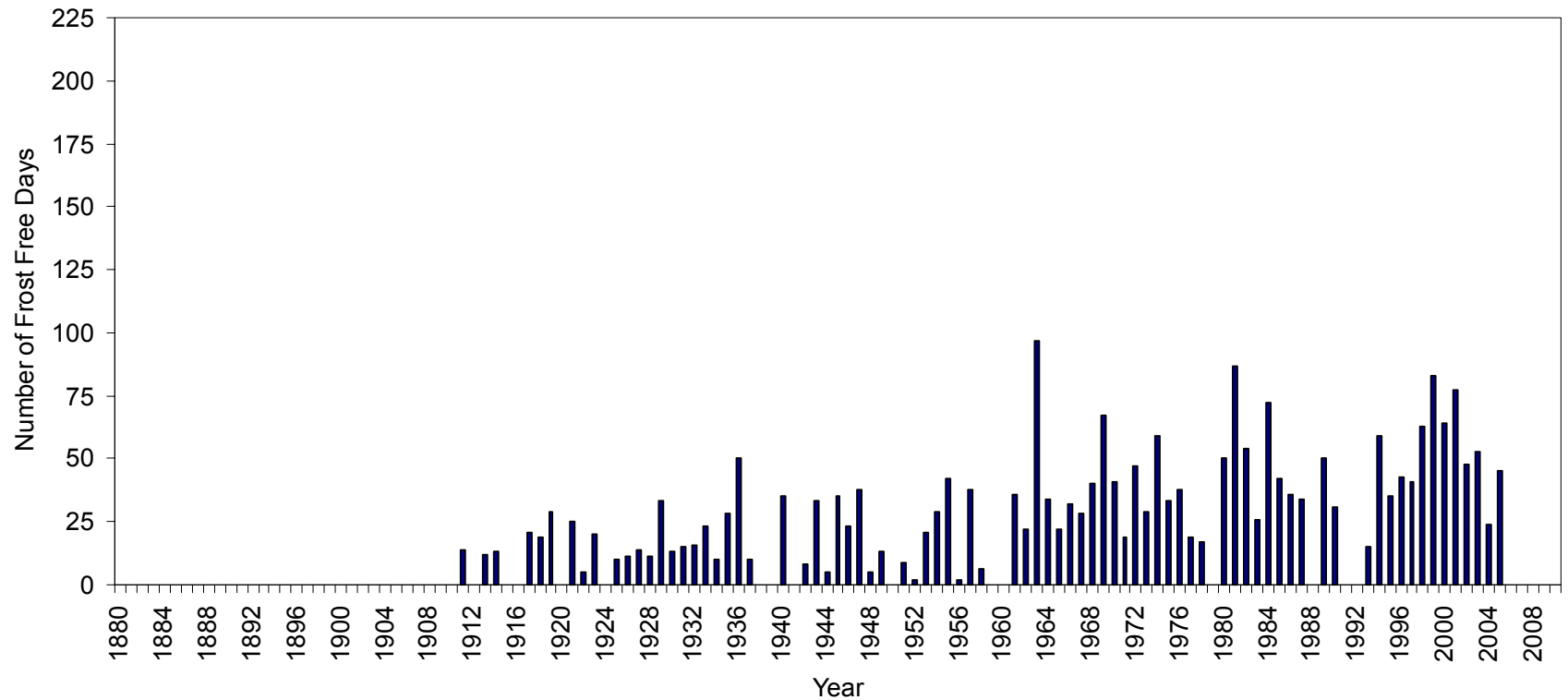
Grand Junction 6ESE Frost Free Days

Grand Junction 6ESE Length of Frost Free Period Based on 32 F Threshold



Dillon Frost Free Days

Dillon 1E Length of Frost Free Period Based on 32 F Threshold

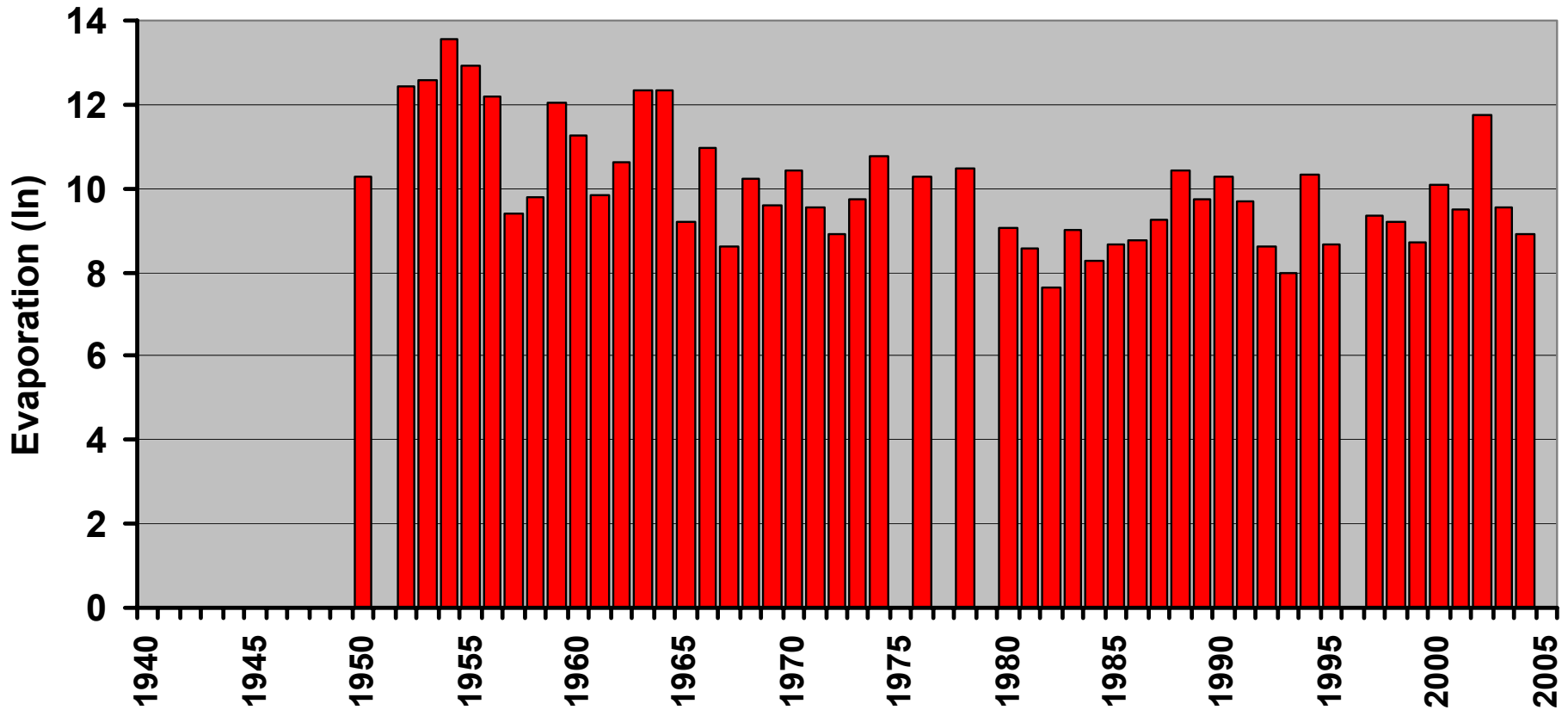




Evaporation

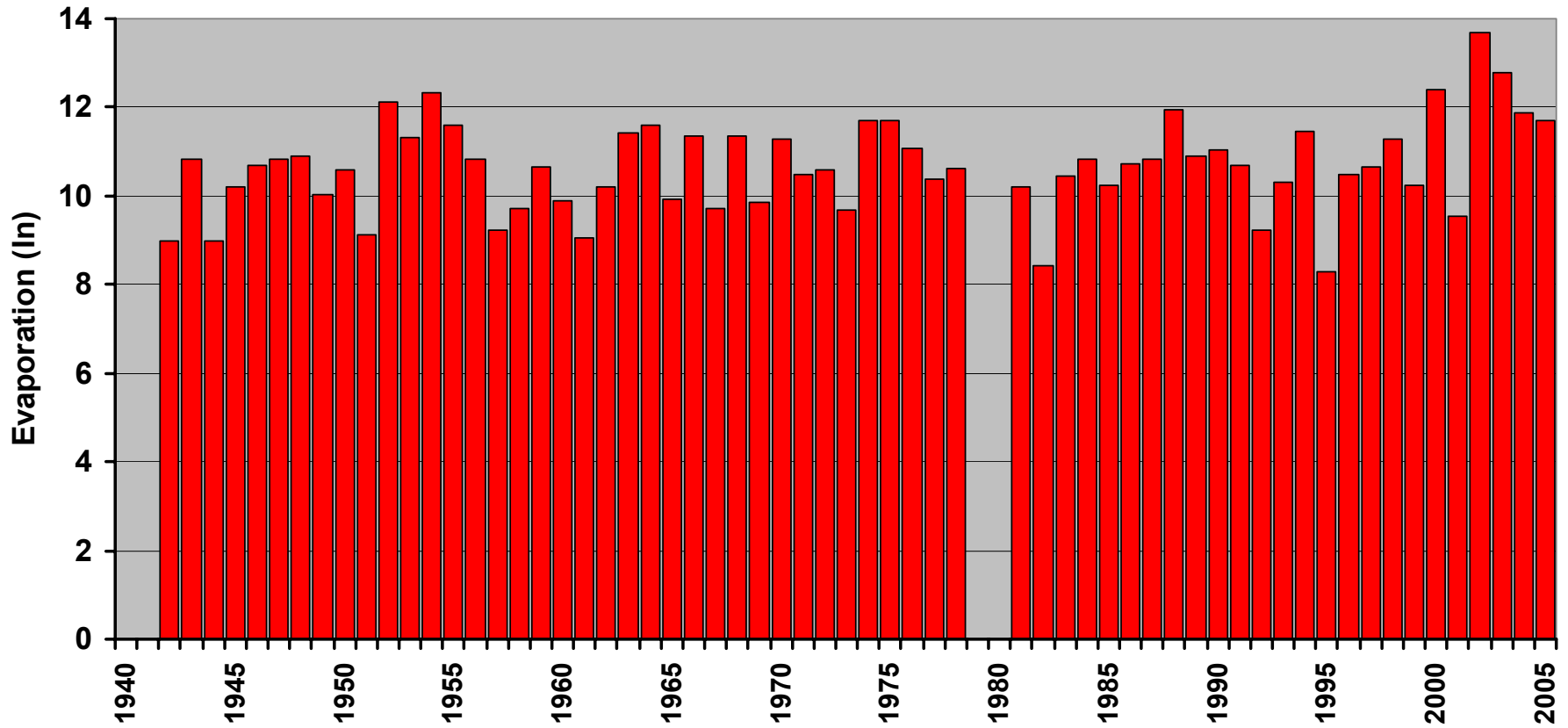
Bonny Dam Evaporation

Bonny Dam
May through Sept Pan Evaporation



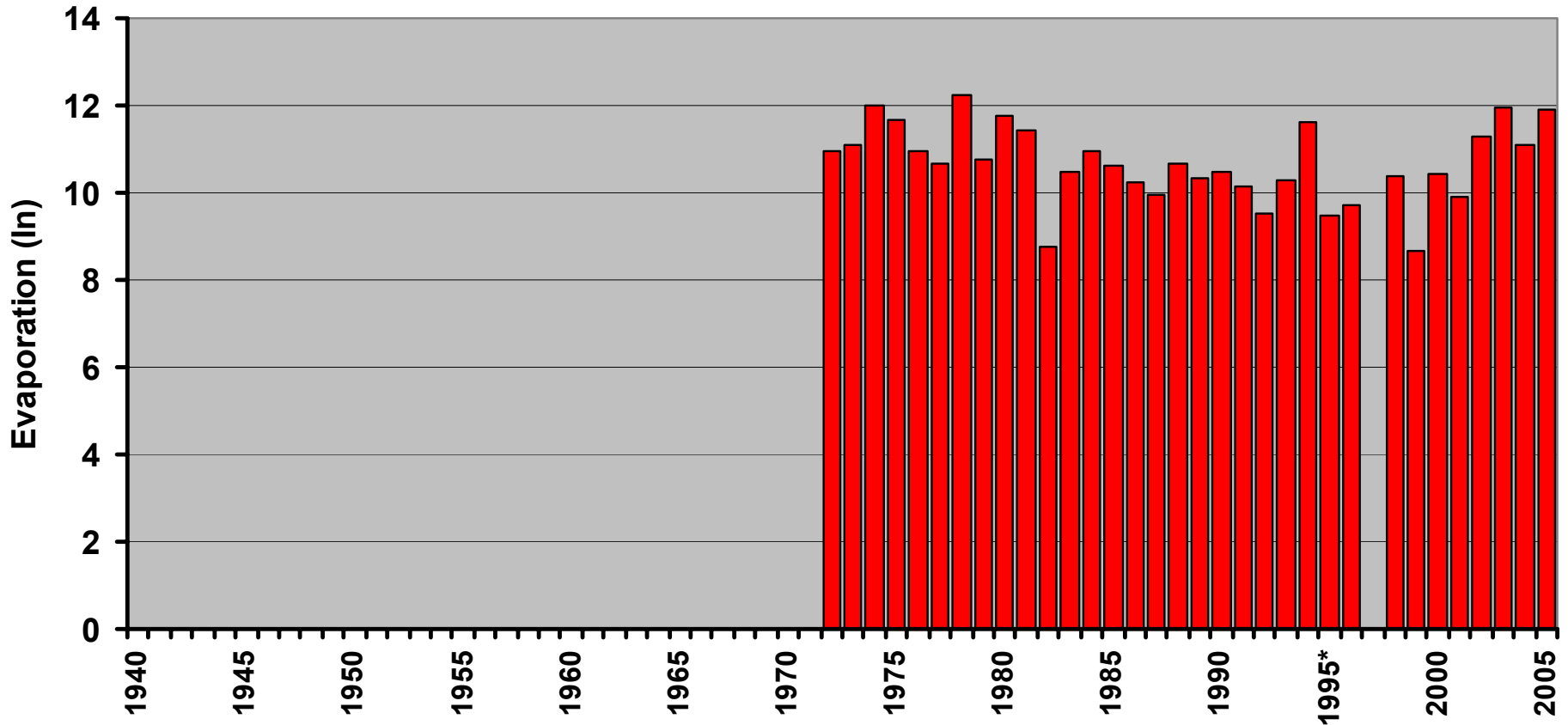
John Martin Dam Evaporation

John Martin Dam
May through Sept Pan Evaporation



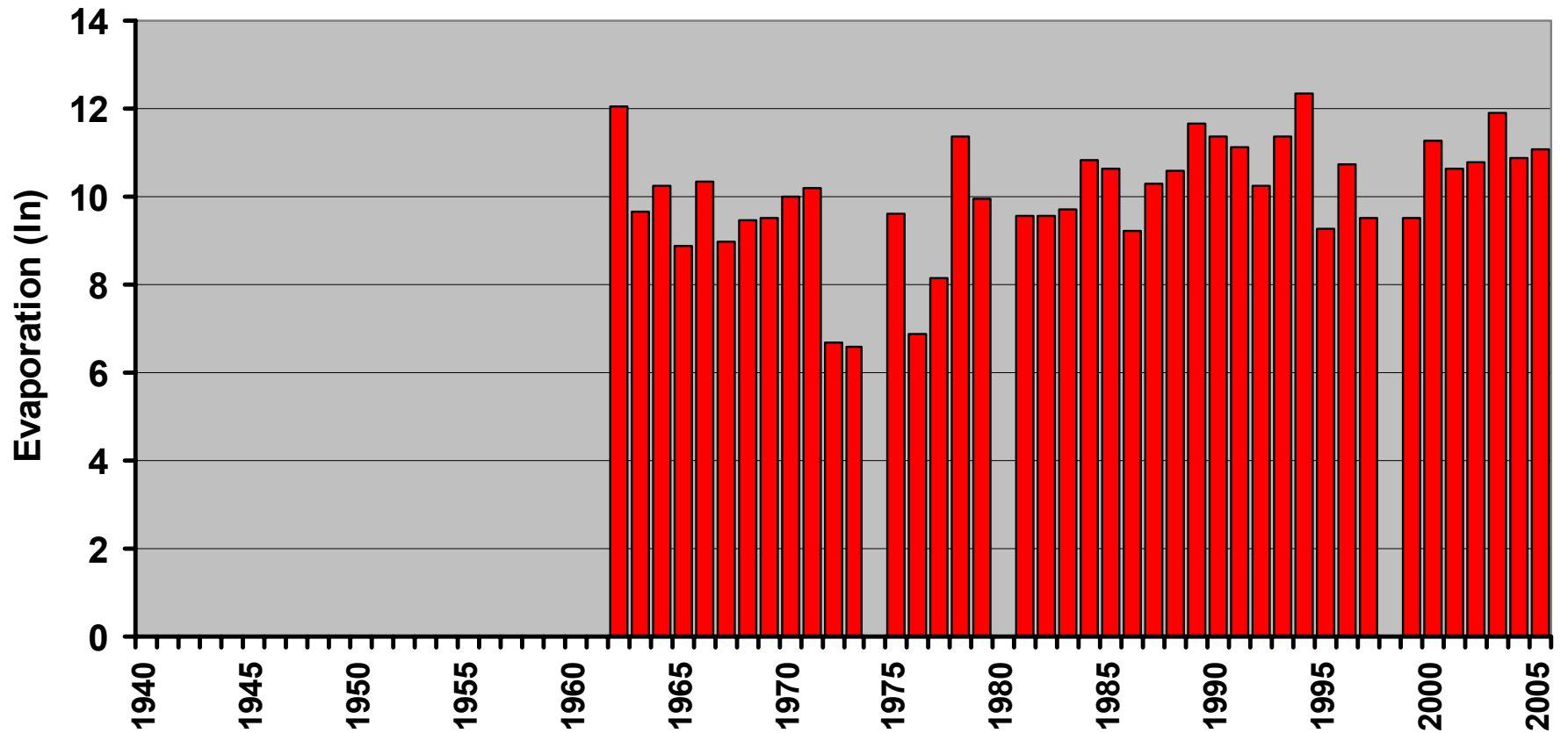
Pueblo Evaporation

Pueblo WSO
May through Sept Pan Evaporation



Grand Junction

Grand Junction
May through Sept Pan Evaporation



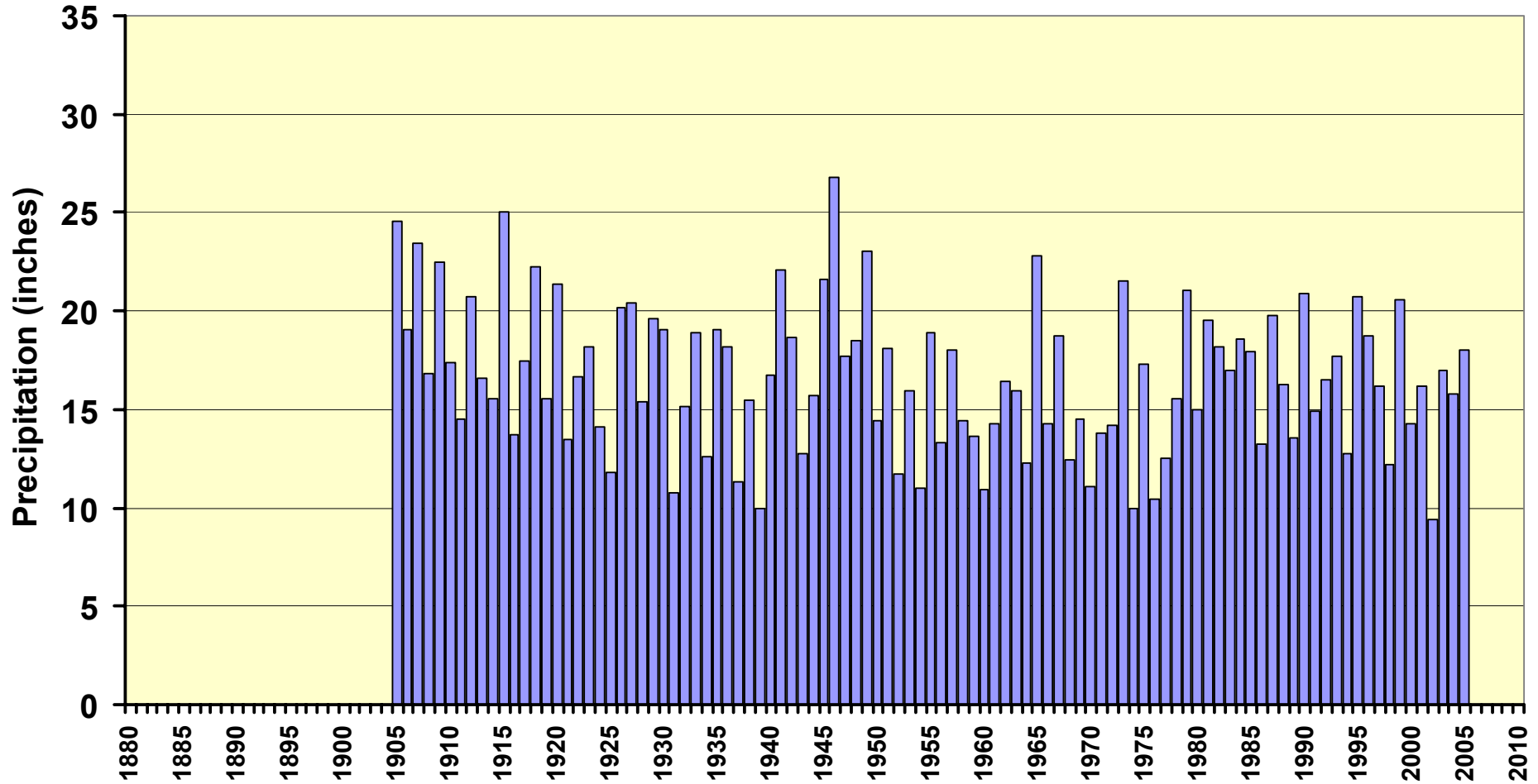


Precipitation

Photo by Wendy Ryan

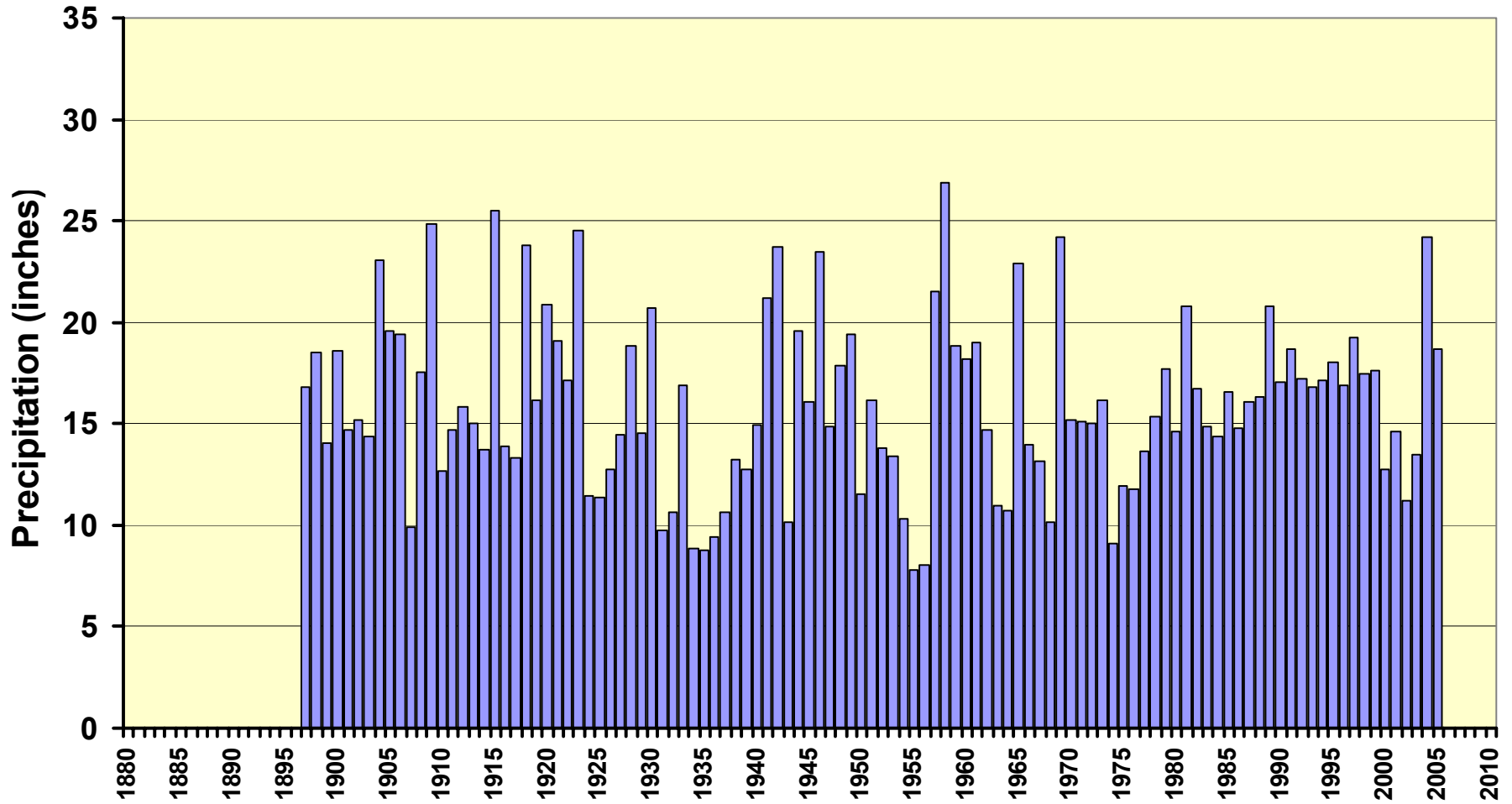
Akron Precipitation

Akron 4E Annual (Jan-Dec) Precipitation



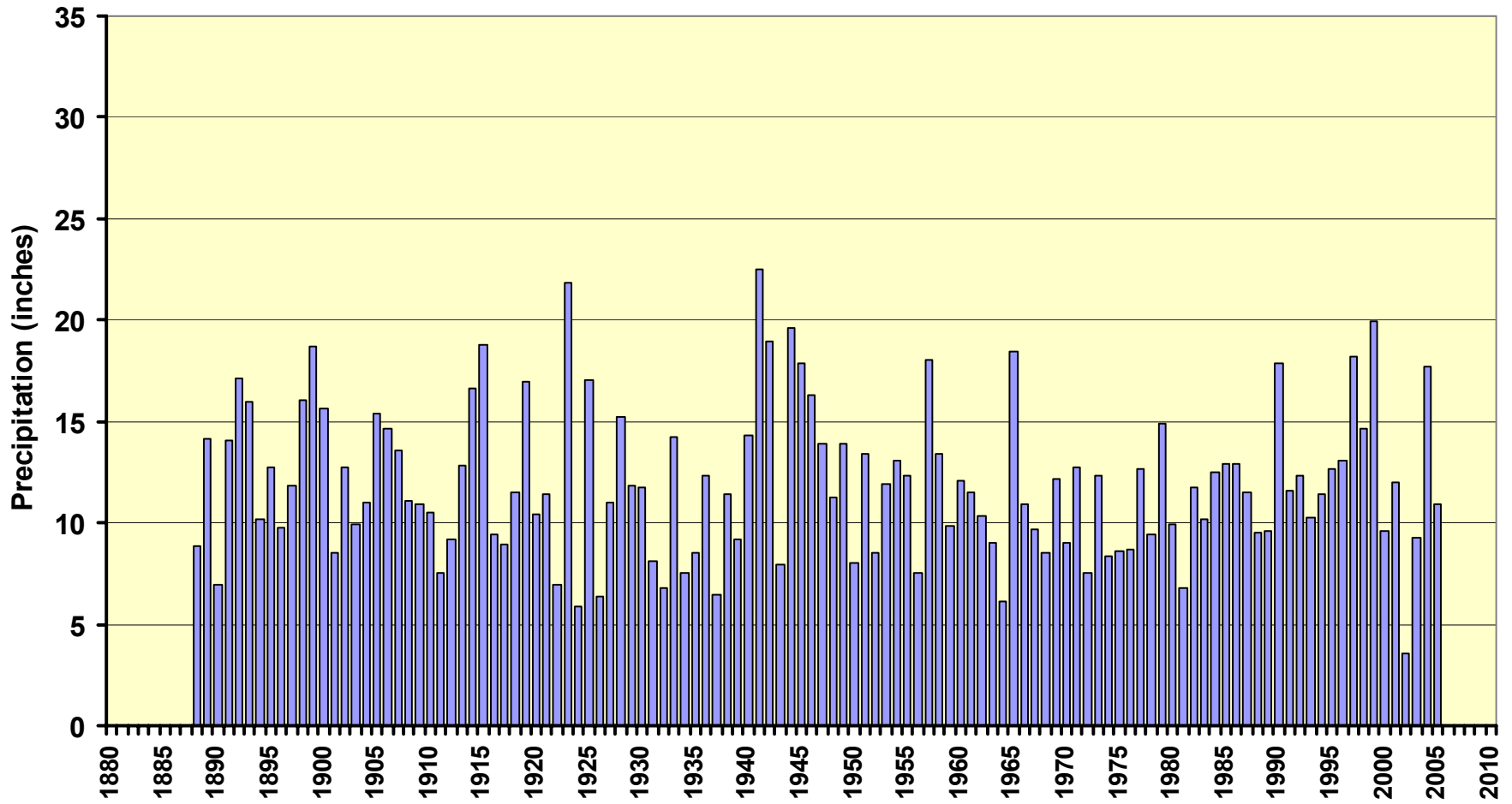
Cheyenne Wells Precipitation

Cheyenne Wells Annual Precip



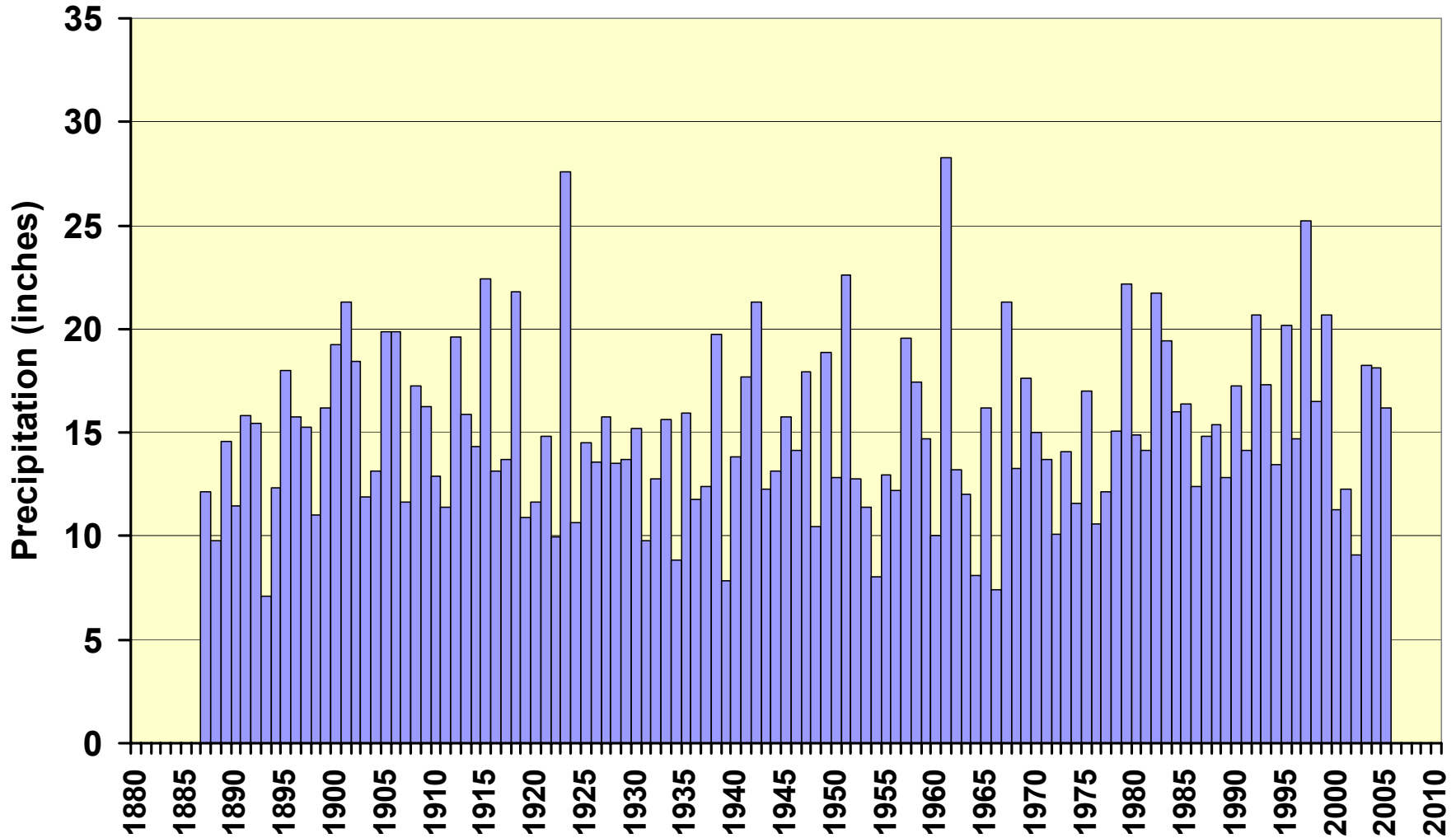
Rocky Ford Precipitation

Rocky Ford Annual Precipitation



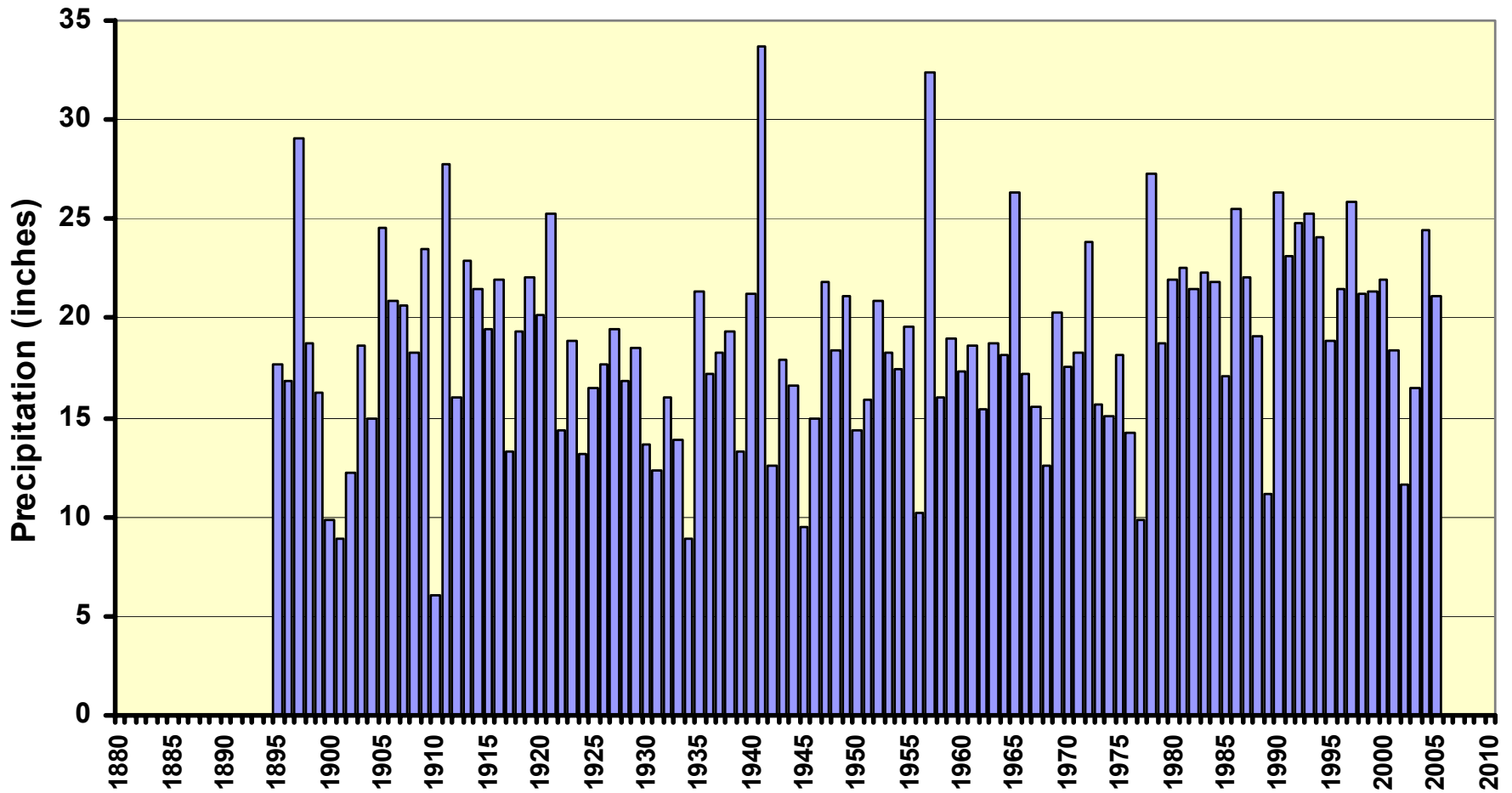
Fort Collins Precipitation

Fort Collins Annual Precipitation



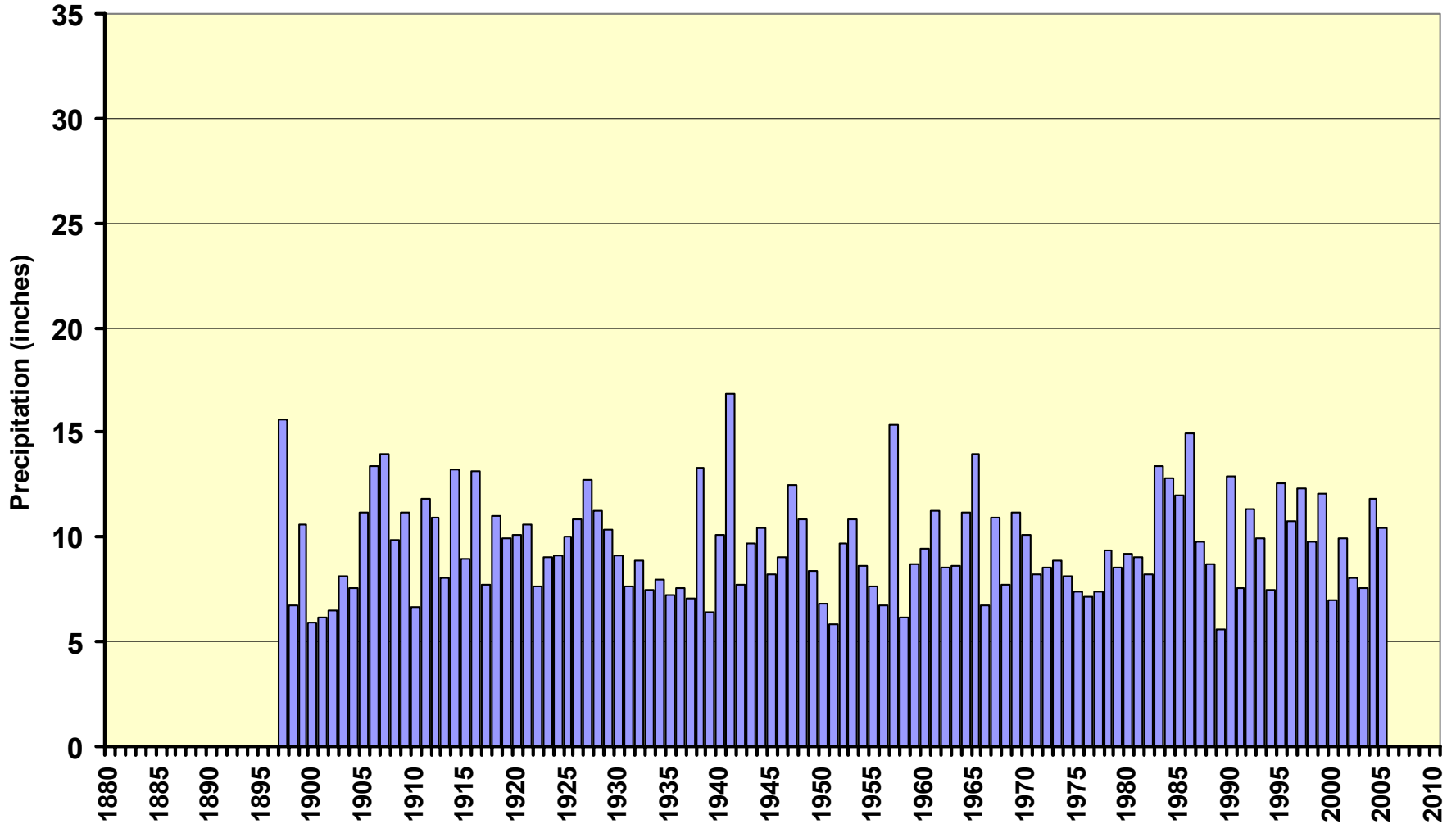
Durango Precipitation

Durango Annual Precipitation



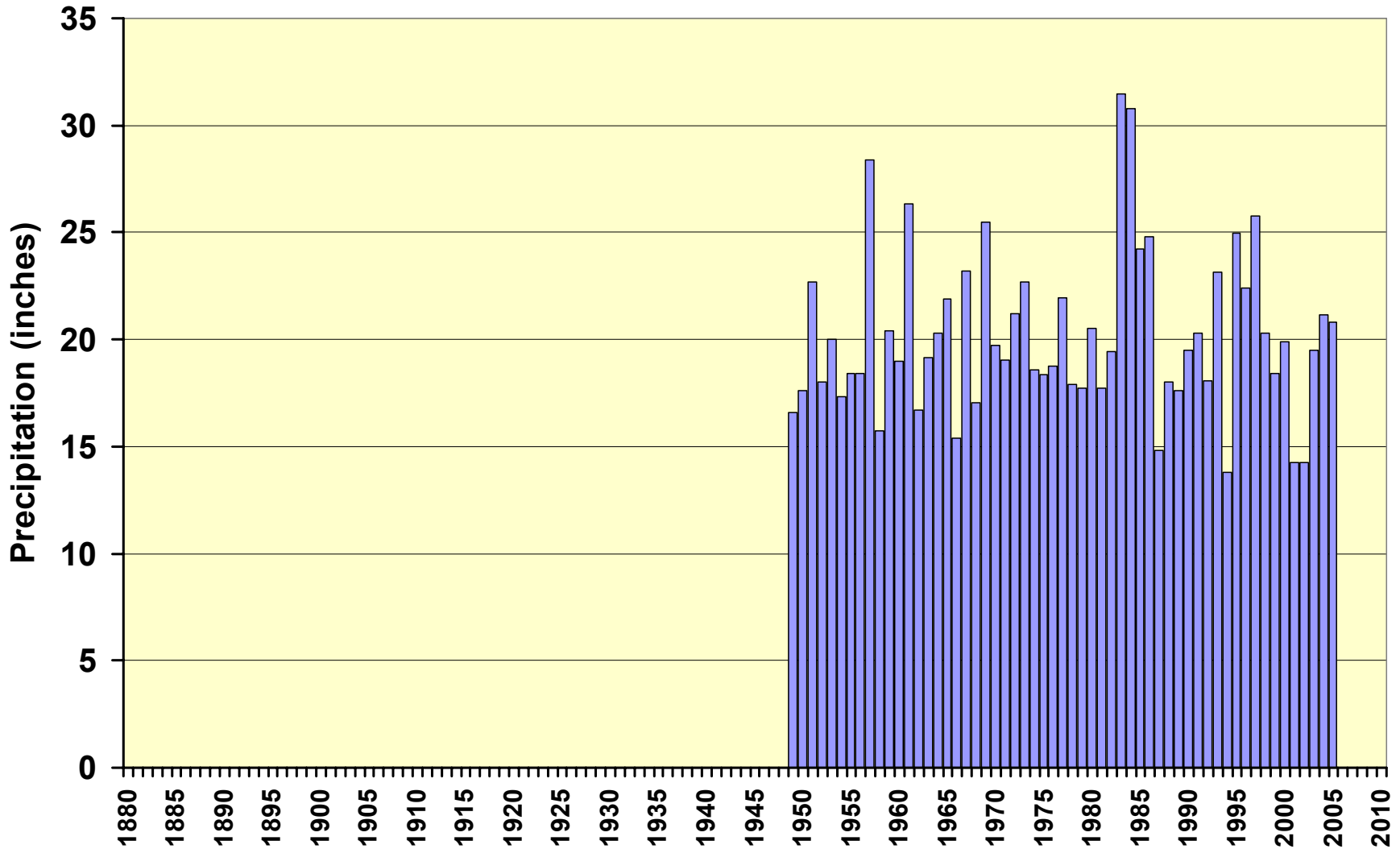
Montrose Precipitation

Montrose Annual Precipitation



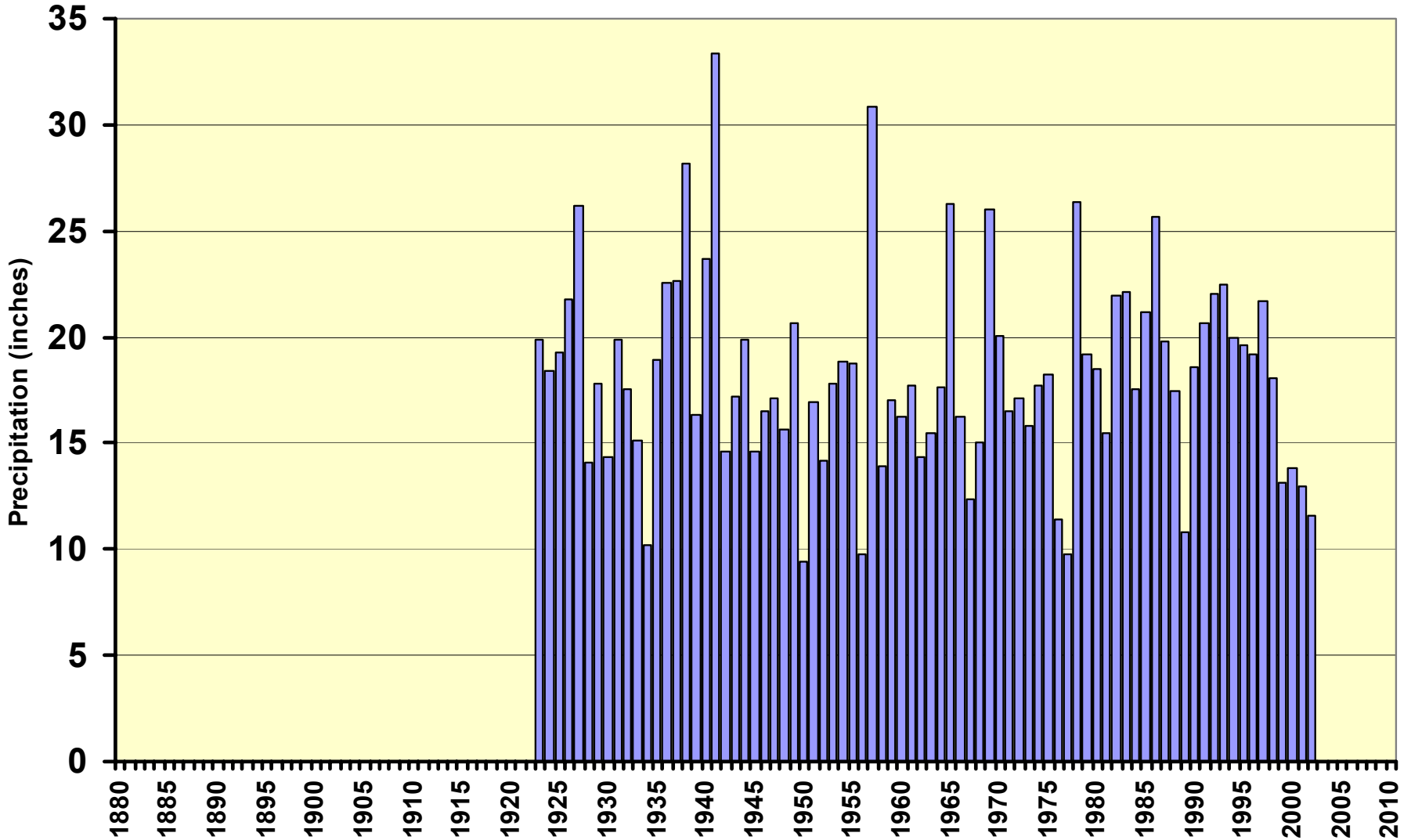
Grand Lake 1N Precipitation

Grand Lake 1N Annual Precipitation



Mesa Verde Precipitation

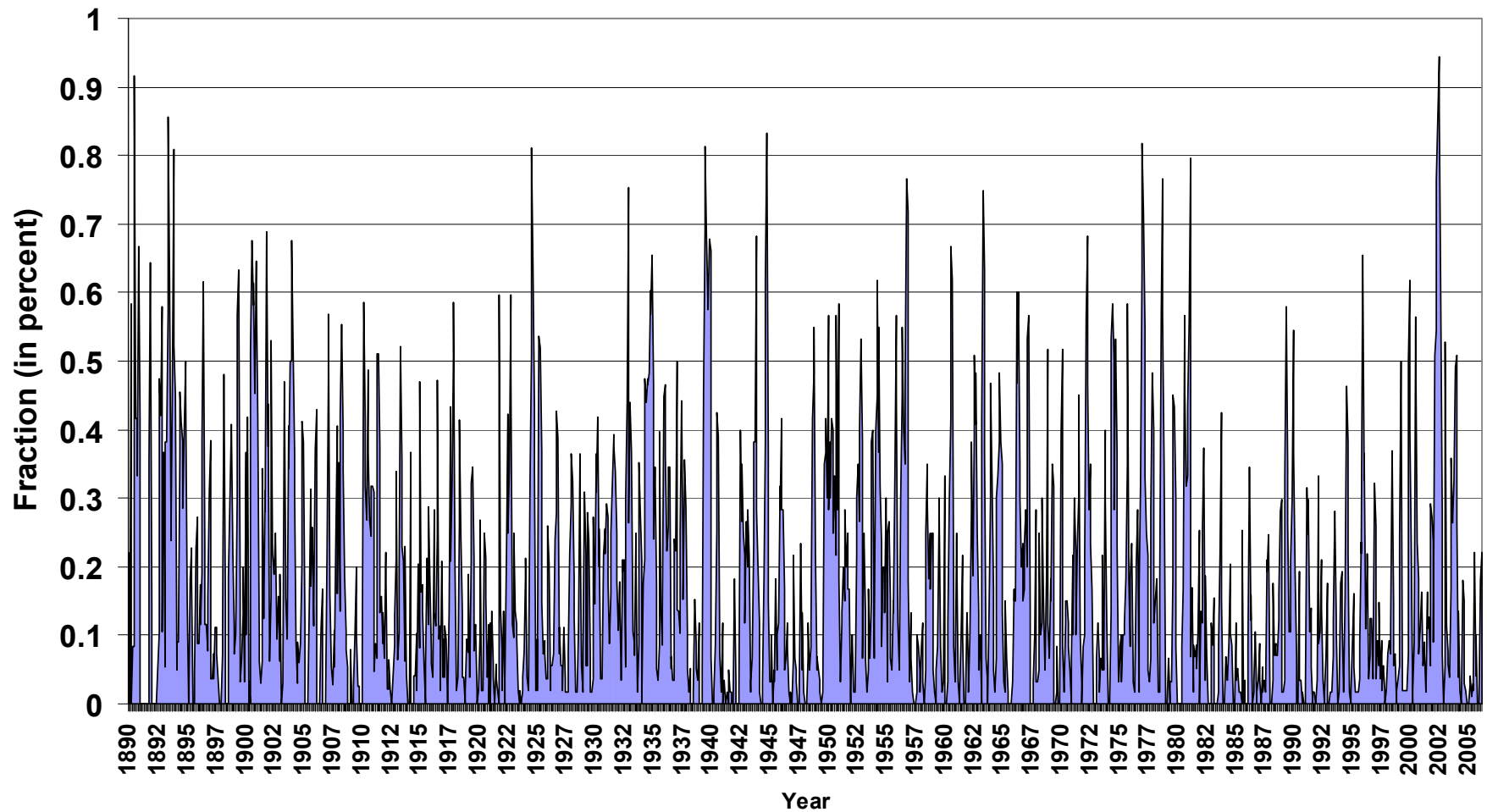
Mesa Verde Annual Precipitation



Standardized Precipitation Index 3 Month

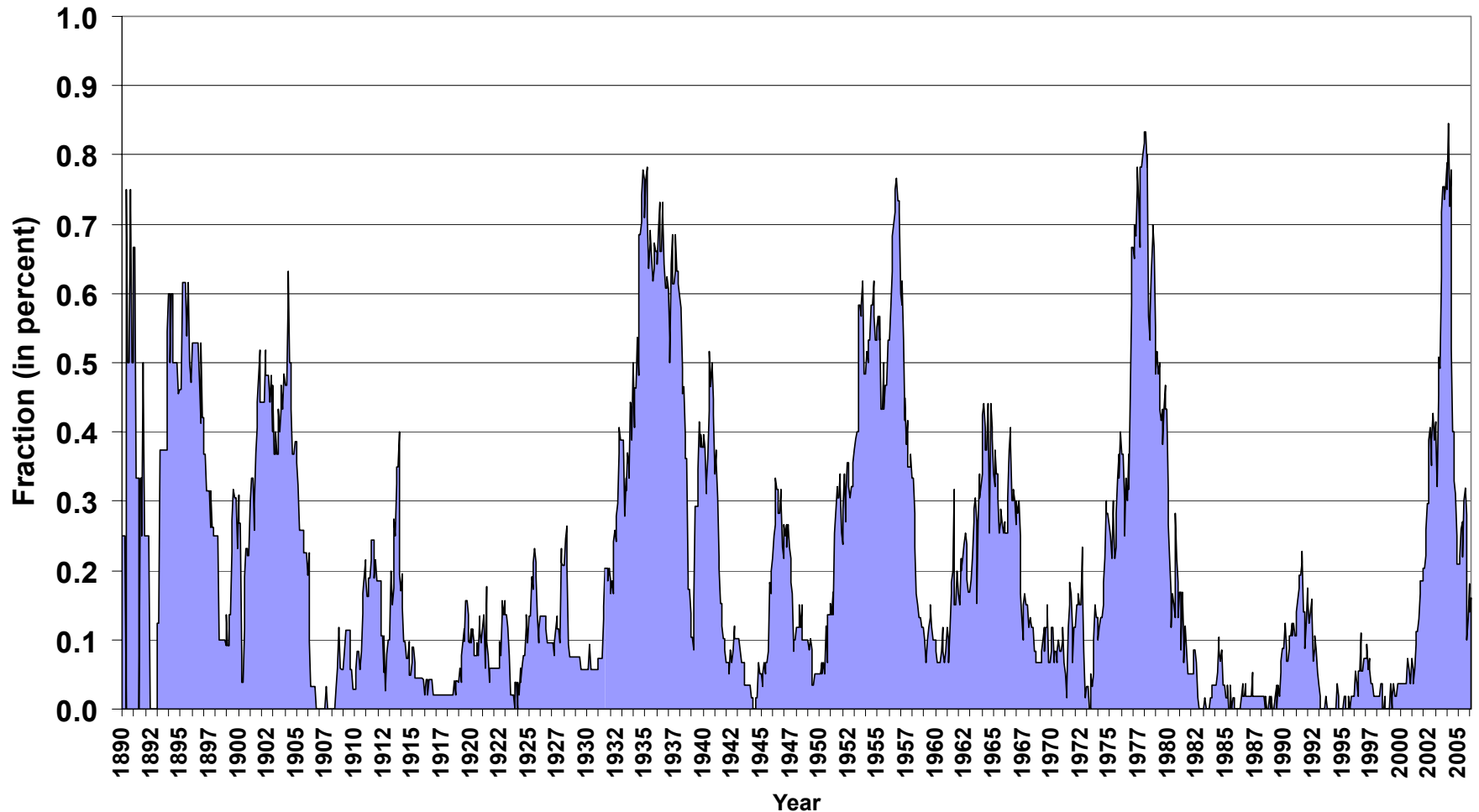
Fraction of Colorado in Drought Based on 3 month SPI

(1890 - February 2006)



Standardized Precipitation Index 48 month

Fraction of Colorado in Drought Based on 48 month SPI (1890 - February 2006)



Fort Collins

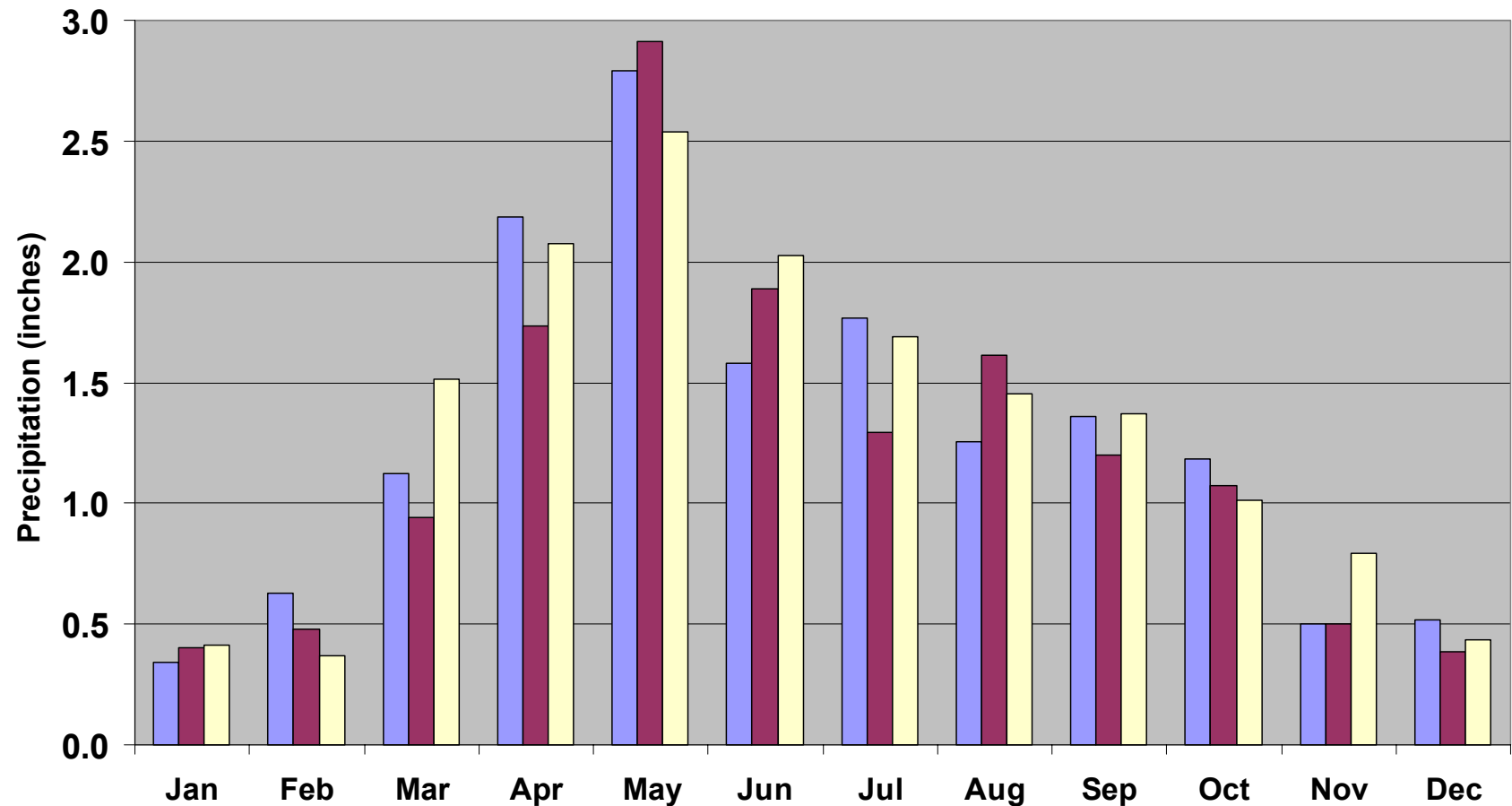
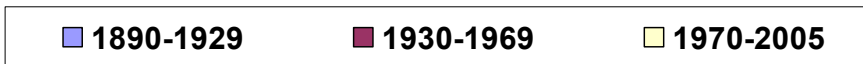
Seasonal Patterns of Precipitation

Fort Collins Comparison of Monthly Averages

1890-1929 = 15.23 inches

1930-1969 = 14.42

1970-2005 = 15.69



Akron

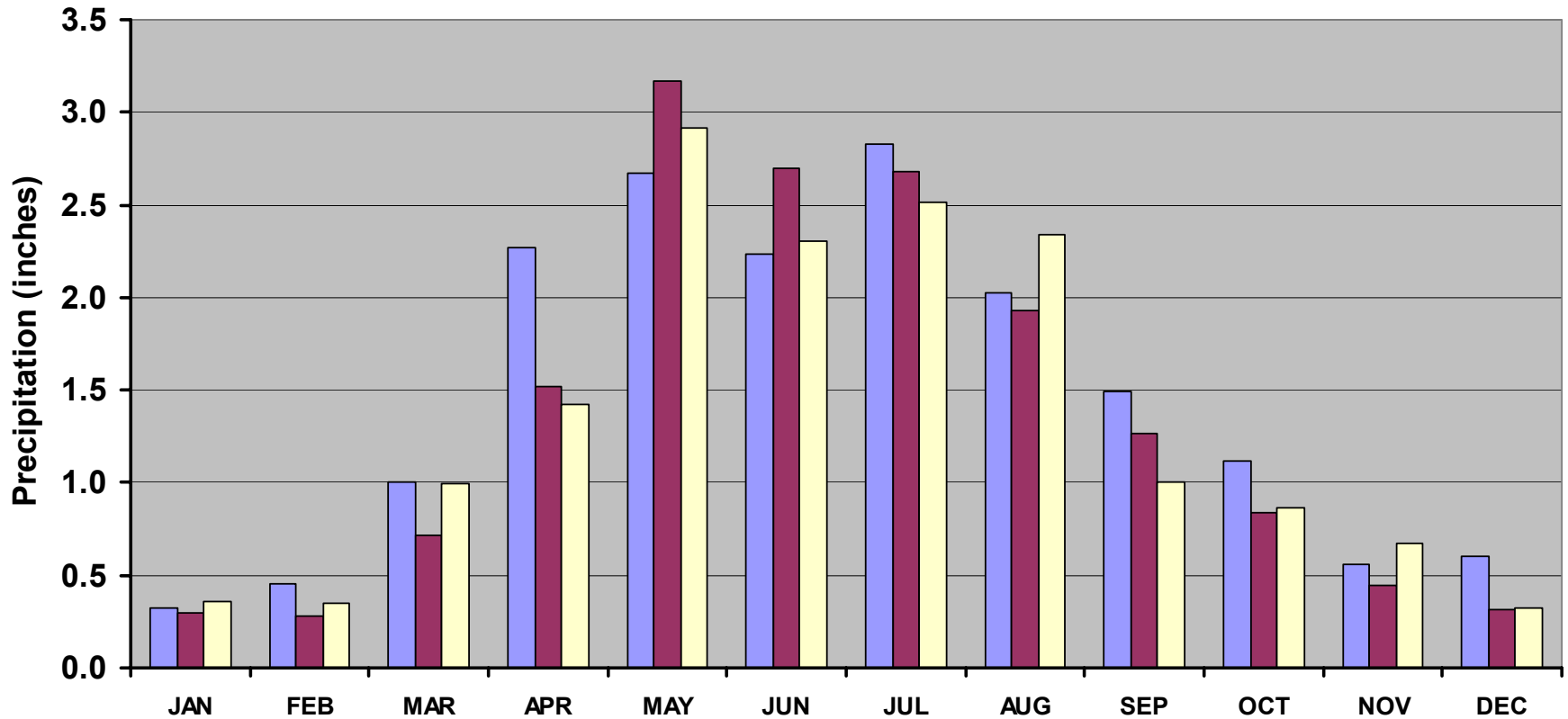
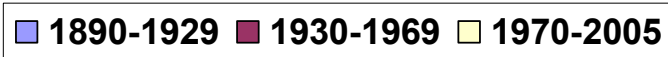
Seasonal Patterns of Precipitation

Akron 4E Monthly Precipitation Averages

1905-1929 = 17.58 inches

1930-1969 = 16.16

1970-2005 = 16.06



Rocky Ford

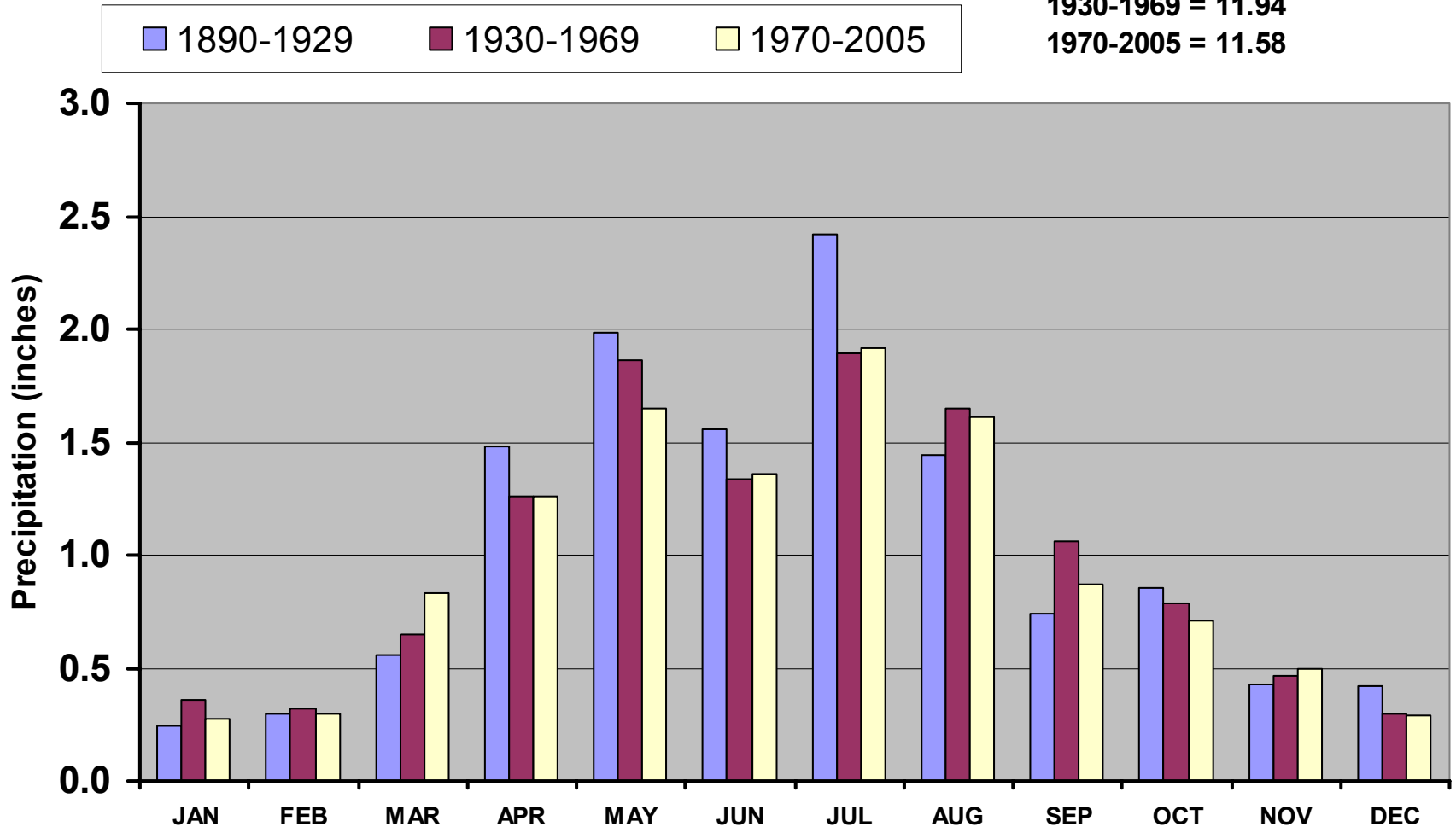
Seasonal Patterns of Precipitation

Rocky Ford Seasonal Precipitation Patterns

1890-1929 = 12.43 inches

1930-1969 = 11.94

1970-2005 = 11.58



Montrose

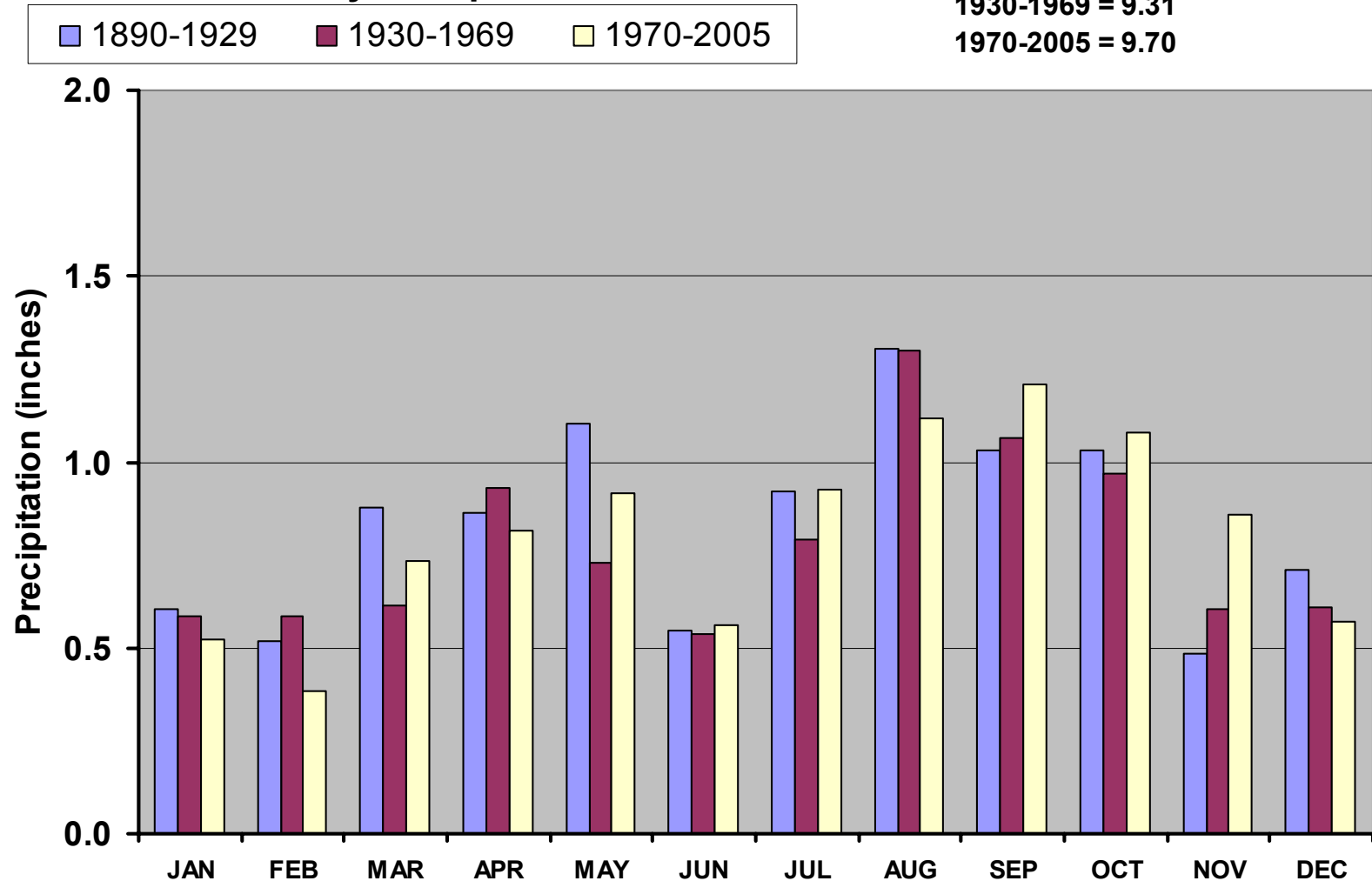
Seasonal Patterns of Precipitation

Montrose Monthly Precipitation Patterns

1897-1929 = 10.0 inches

1930-1969 = 9.31

1970-2005 = 9.70



Mountain Snow!

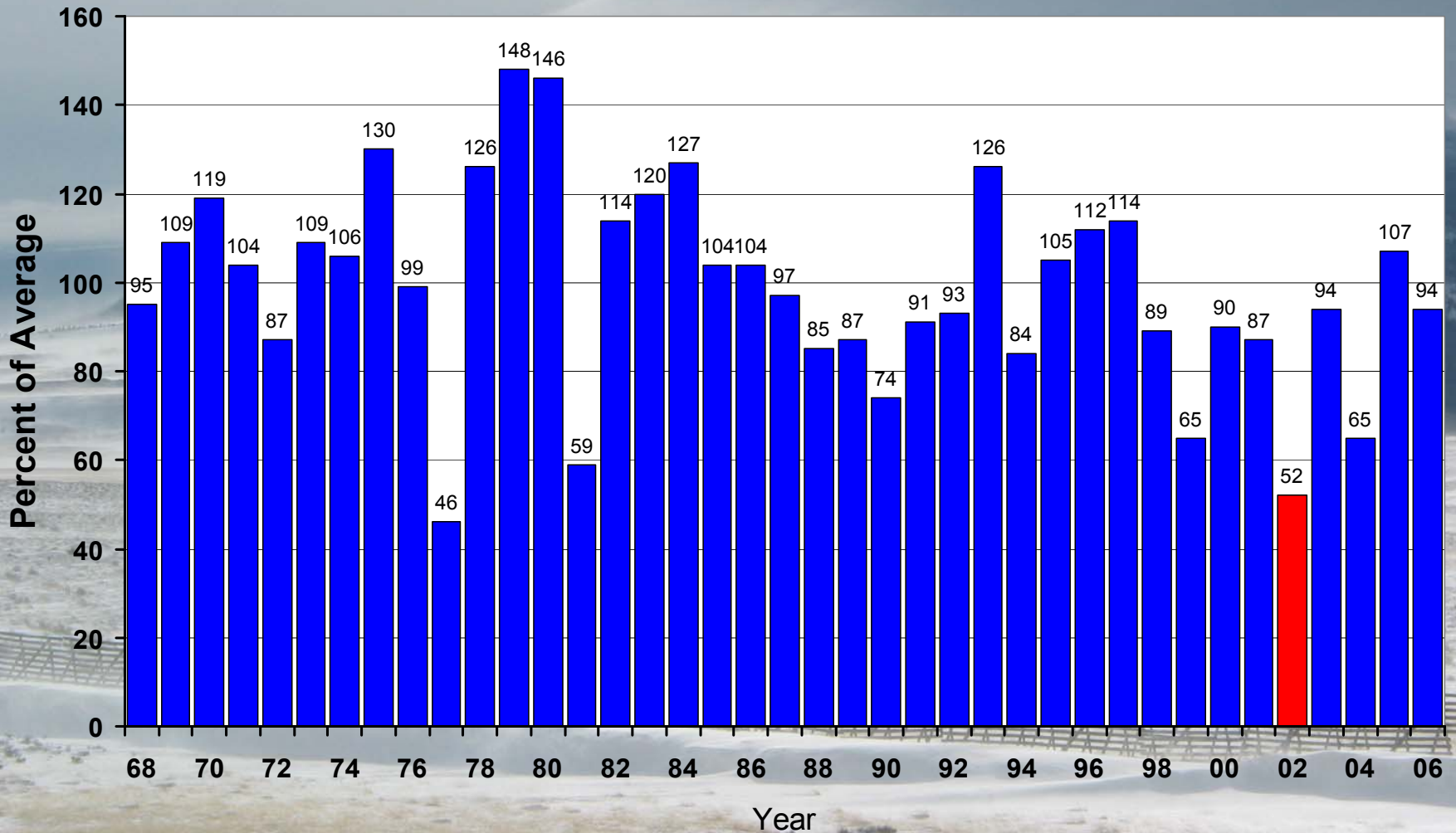


Photo by Wendy Ryan



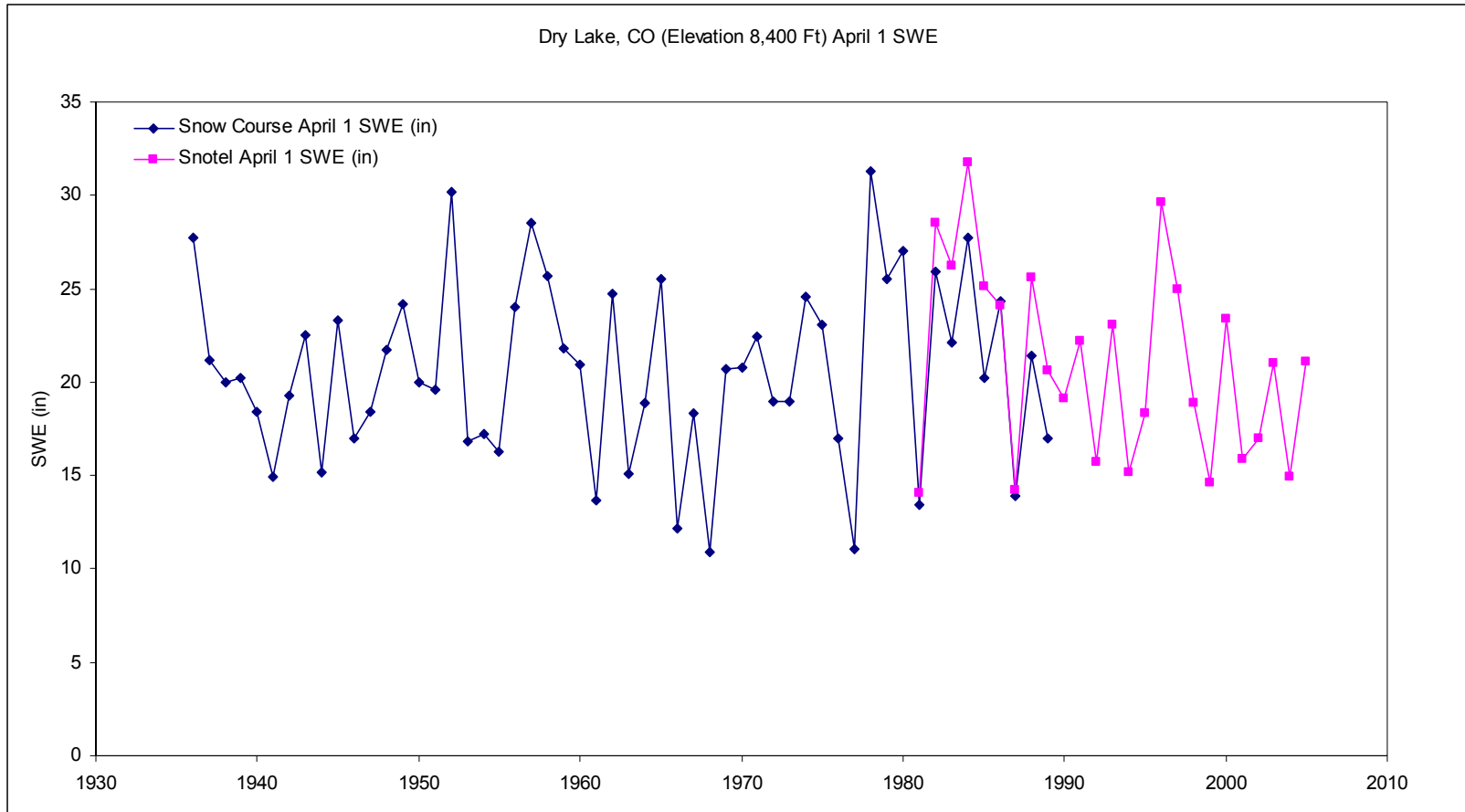
April 1 Colorado Snowpack

APRIL 1 SNOWPACK COLORADO STATEWIDE



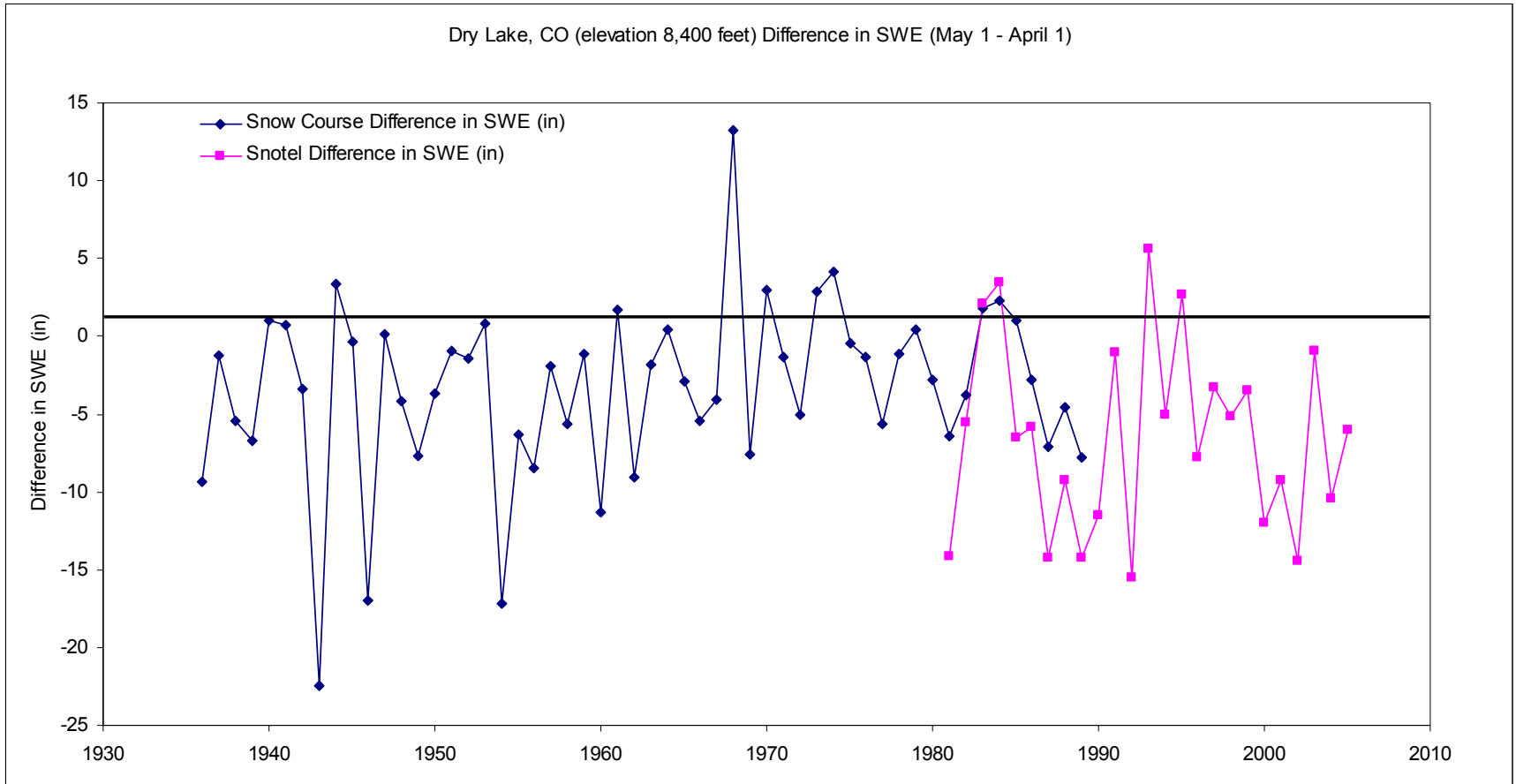
Dry Lake

April 1 Snow Course and Snotel



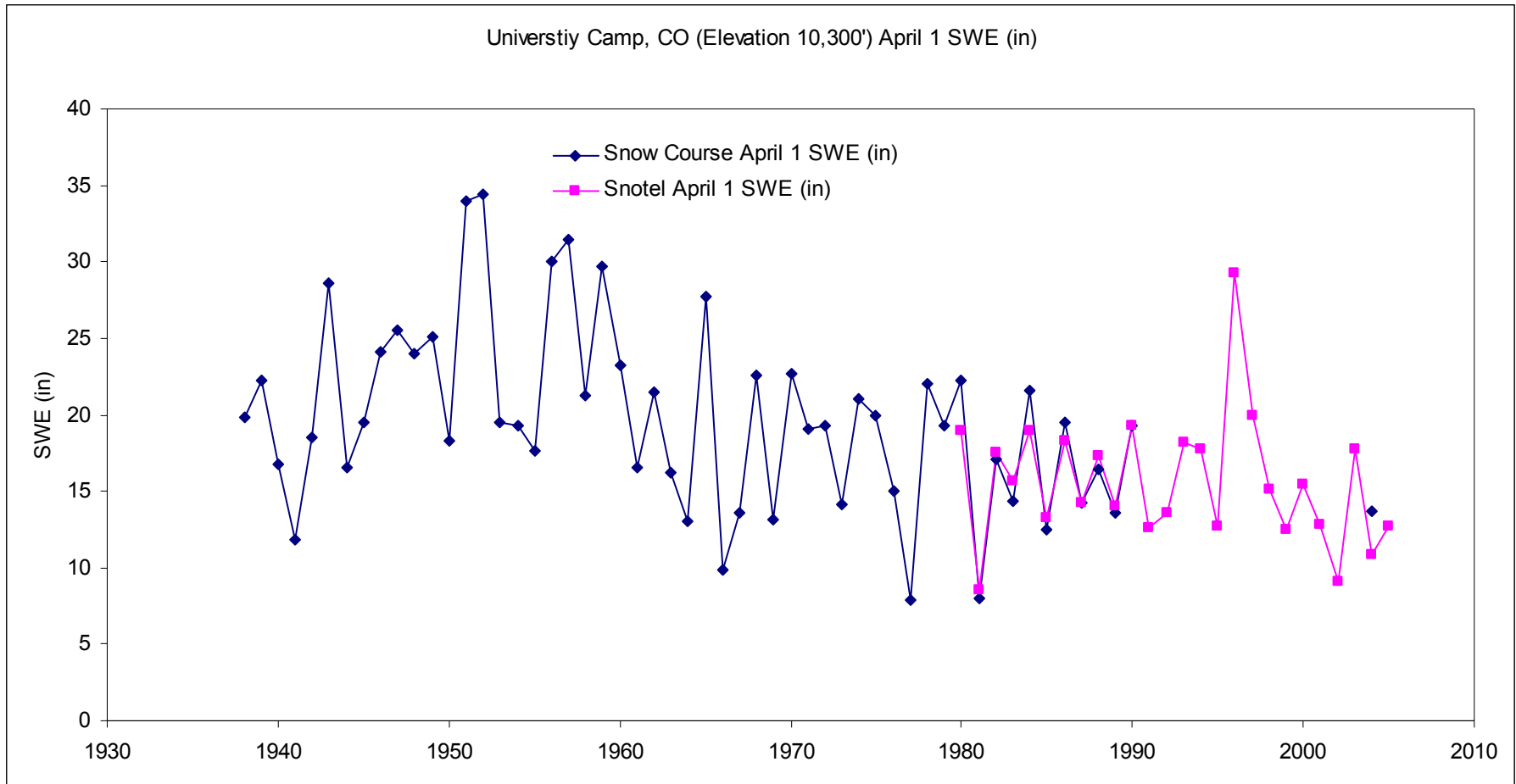
Dry Lake

May 1 – April 1 SWE Difference



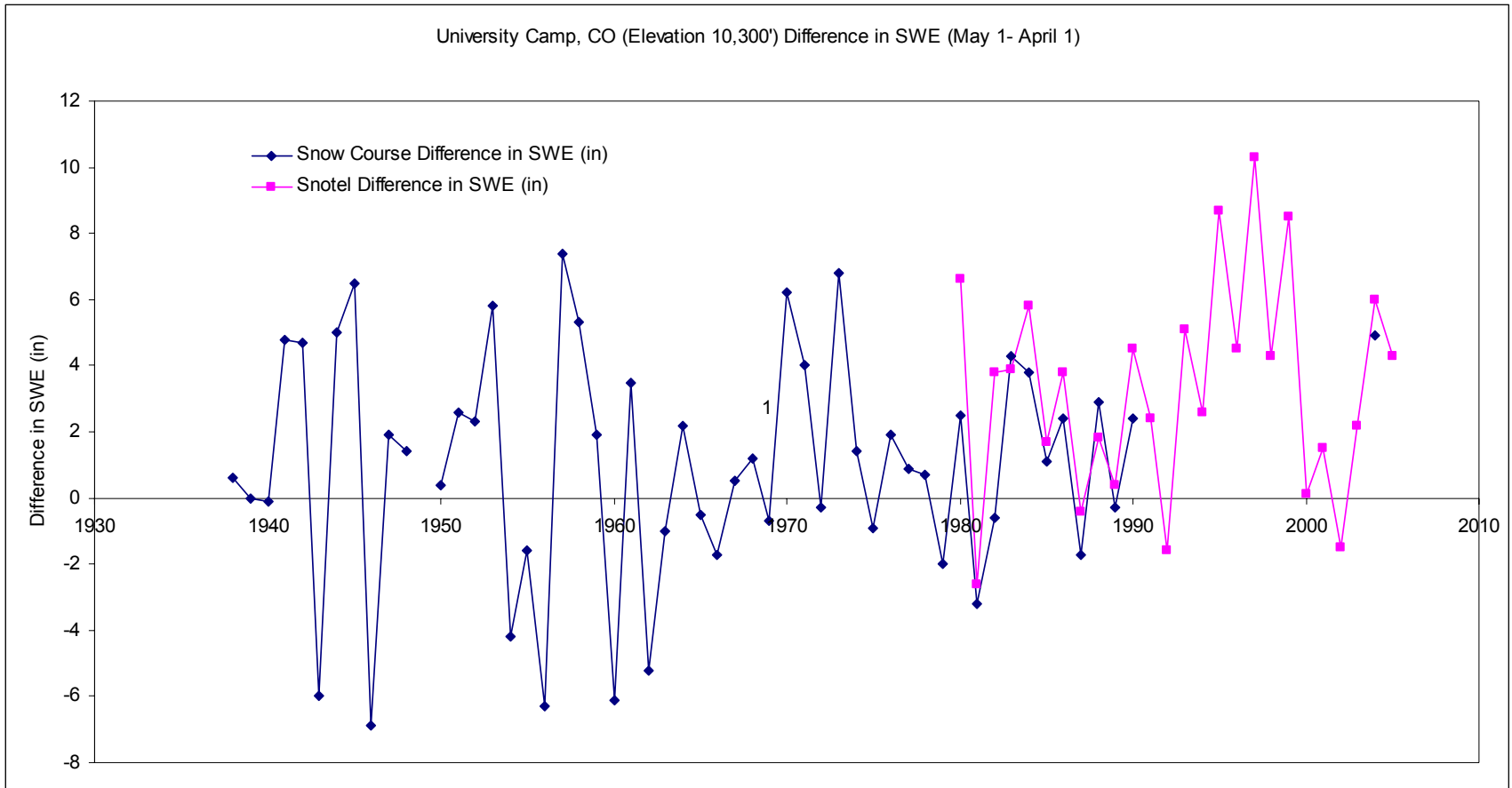
University Camp

April 1 Snow Course and Snotel



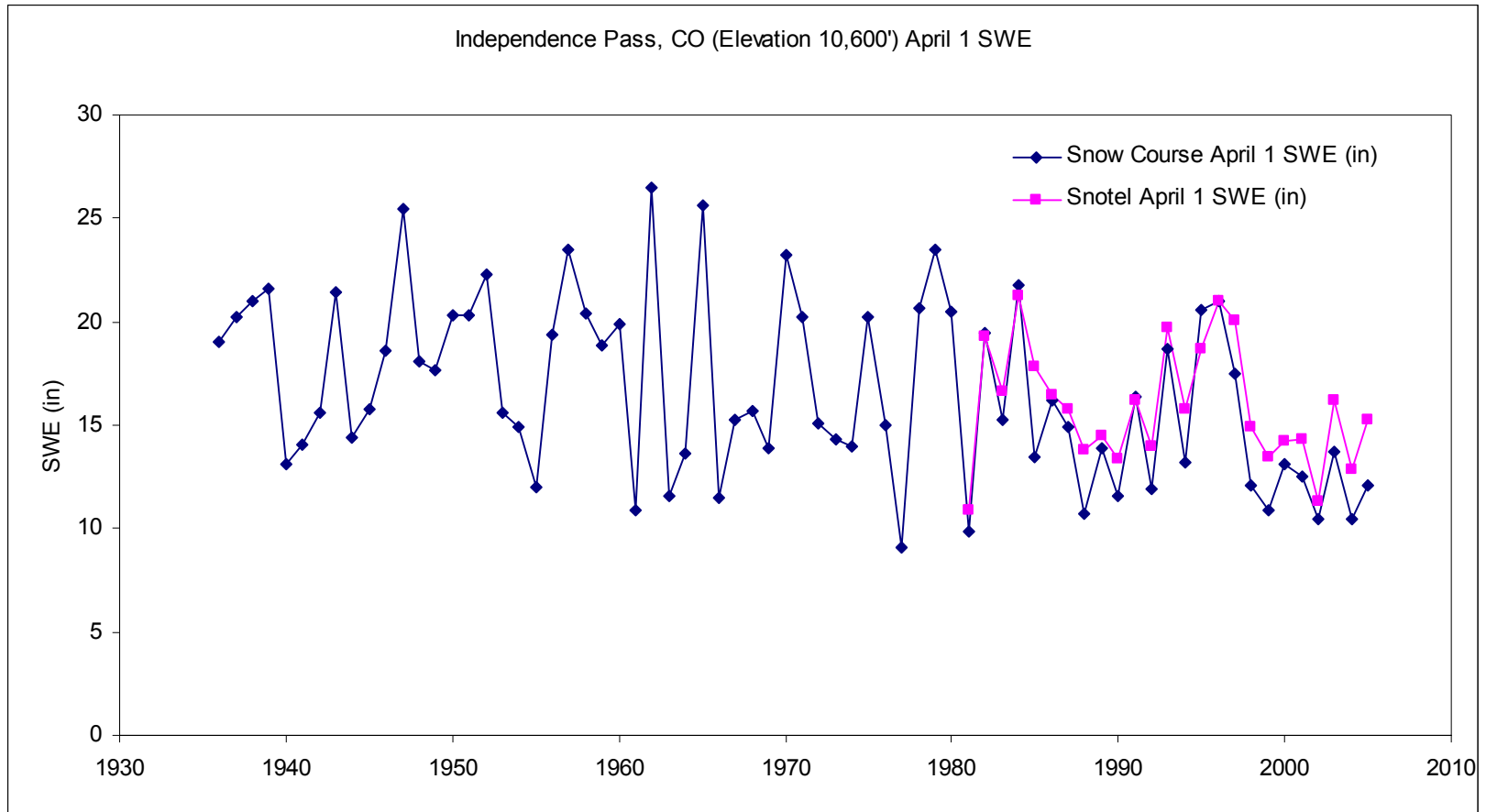
University Camp

May 1 – April 1 SWE Difference



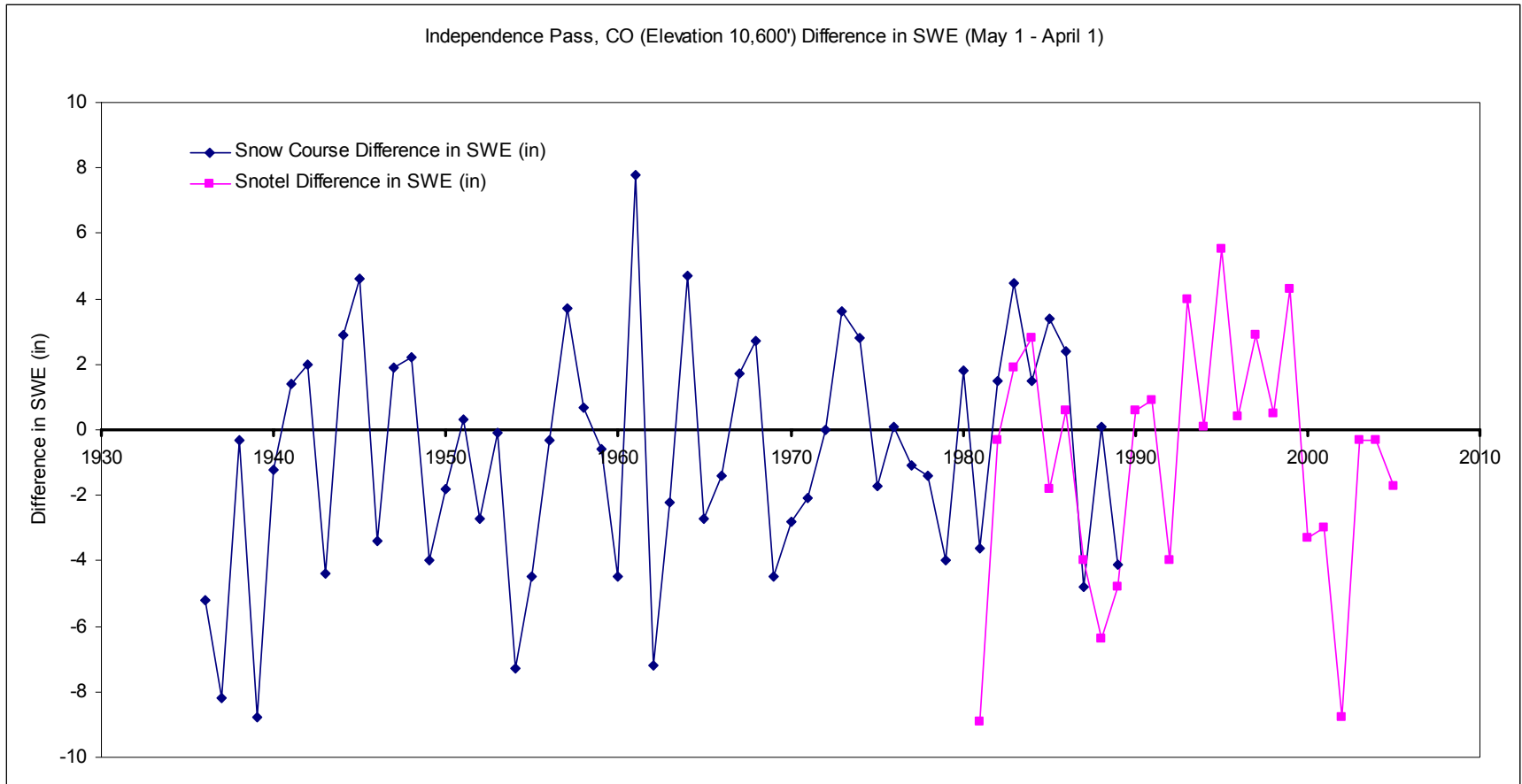
Independence Pass

April 1 Snow Course and Snotel



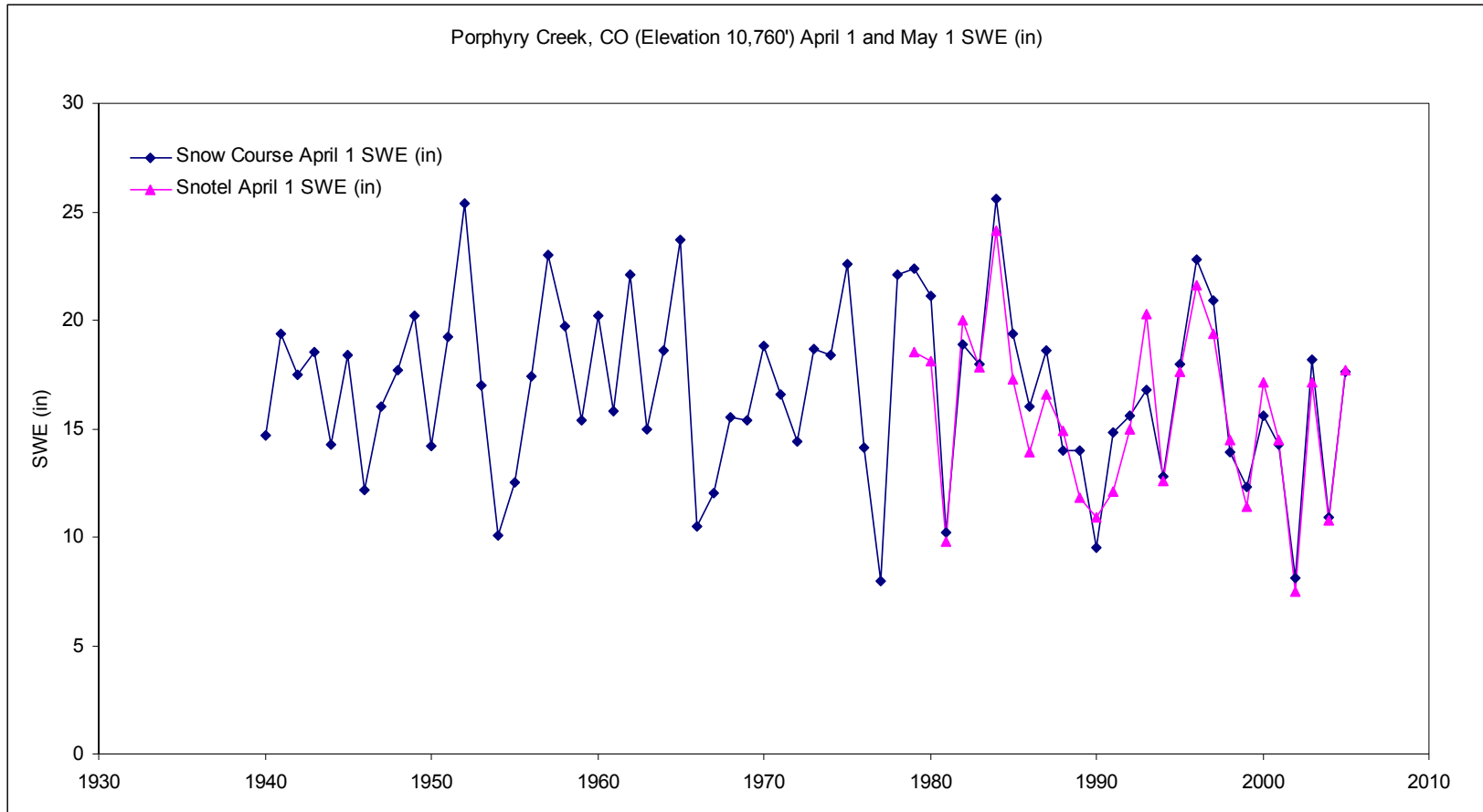
Independence Pass

May 1 – April 1 SWE Difference



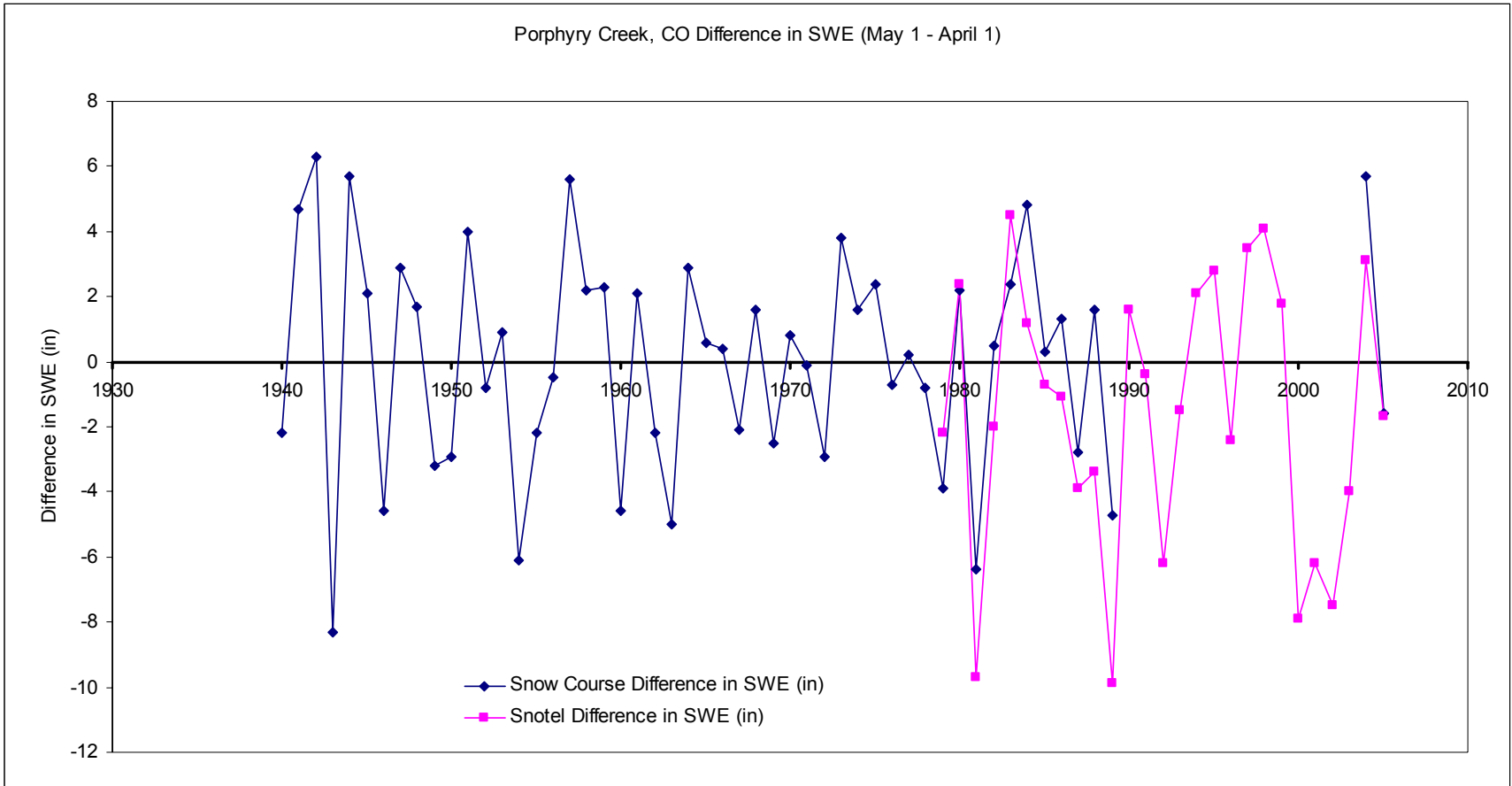
Porphyry Creek

April 1 Snow Course and Snotel



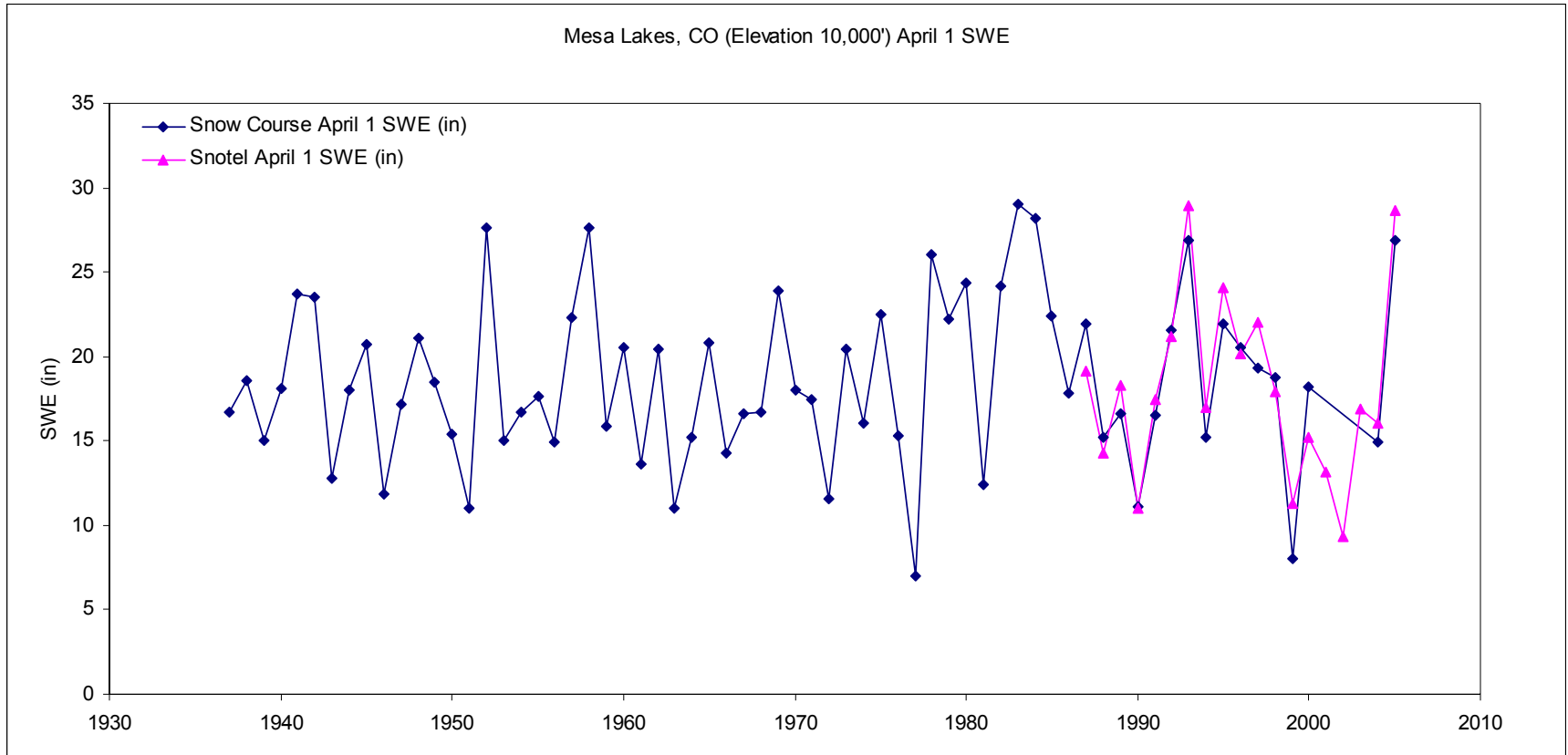
Porphyry Creek

May 1 – April 1 SWE Difference



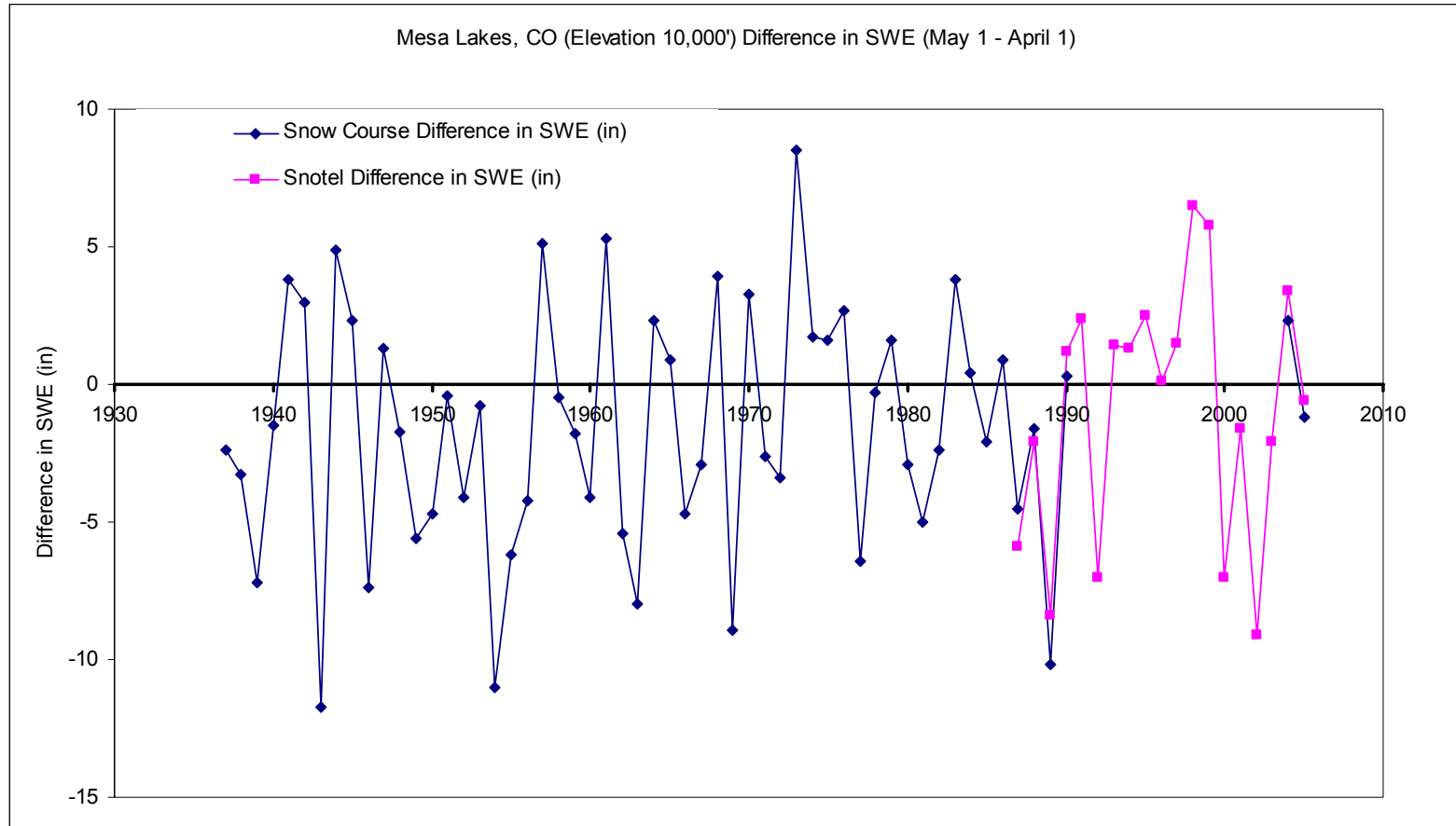
Mesa Lakes

April 1 Snow Course and Snotel



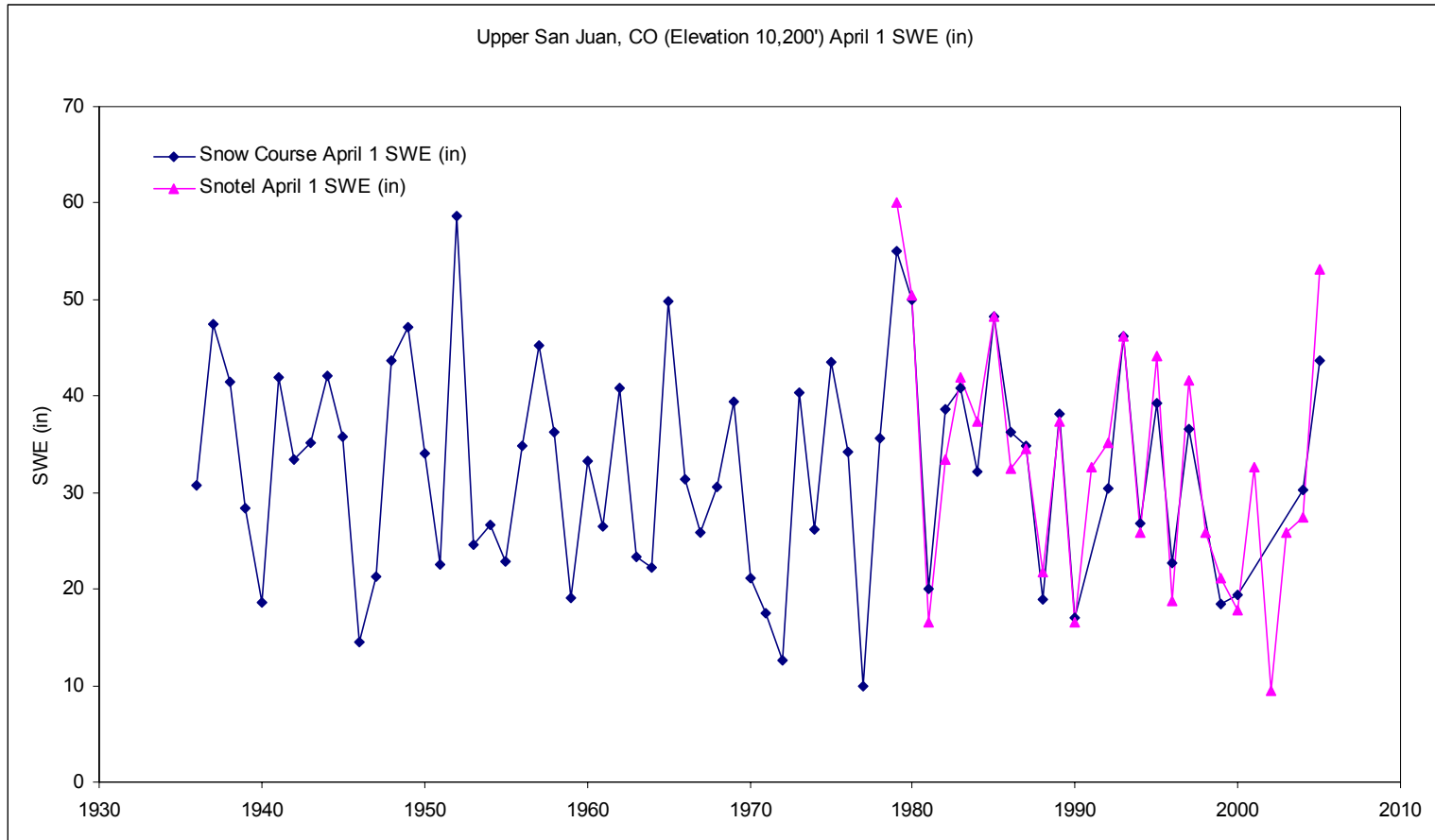
Mesa Lakes

May 1 – April 1 SWE Difference



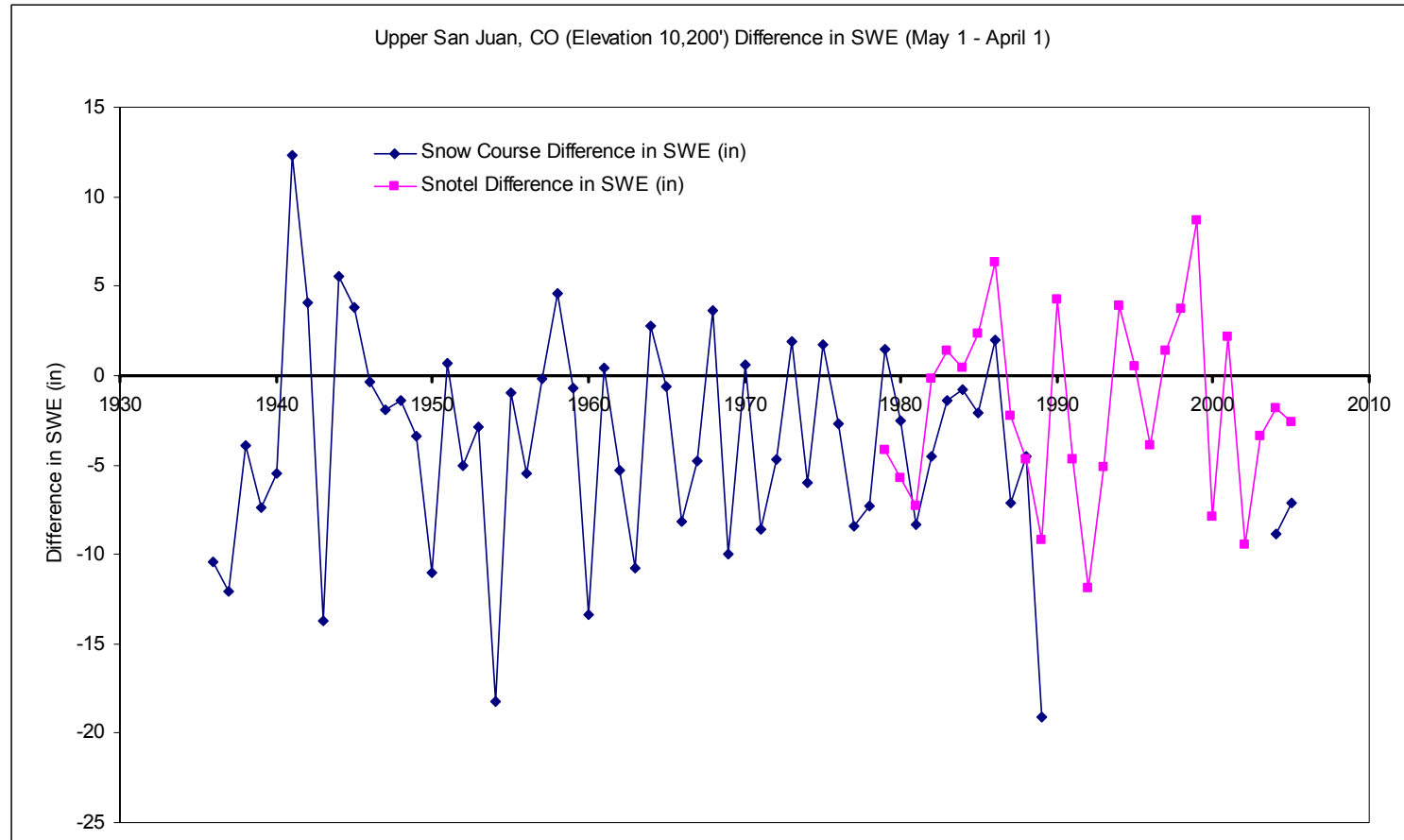
Upper San Juan

April 1 Snow Course and Snotel



Upper San Juan

May 1 – April 1 SWE Difference





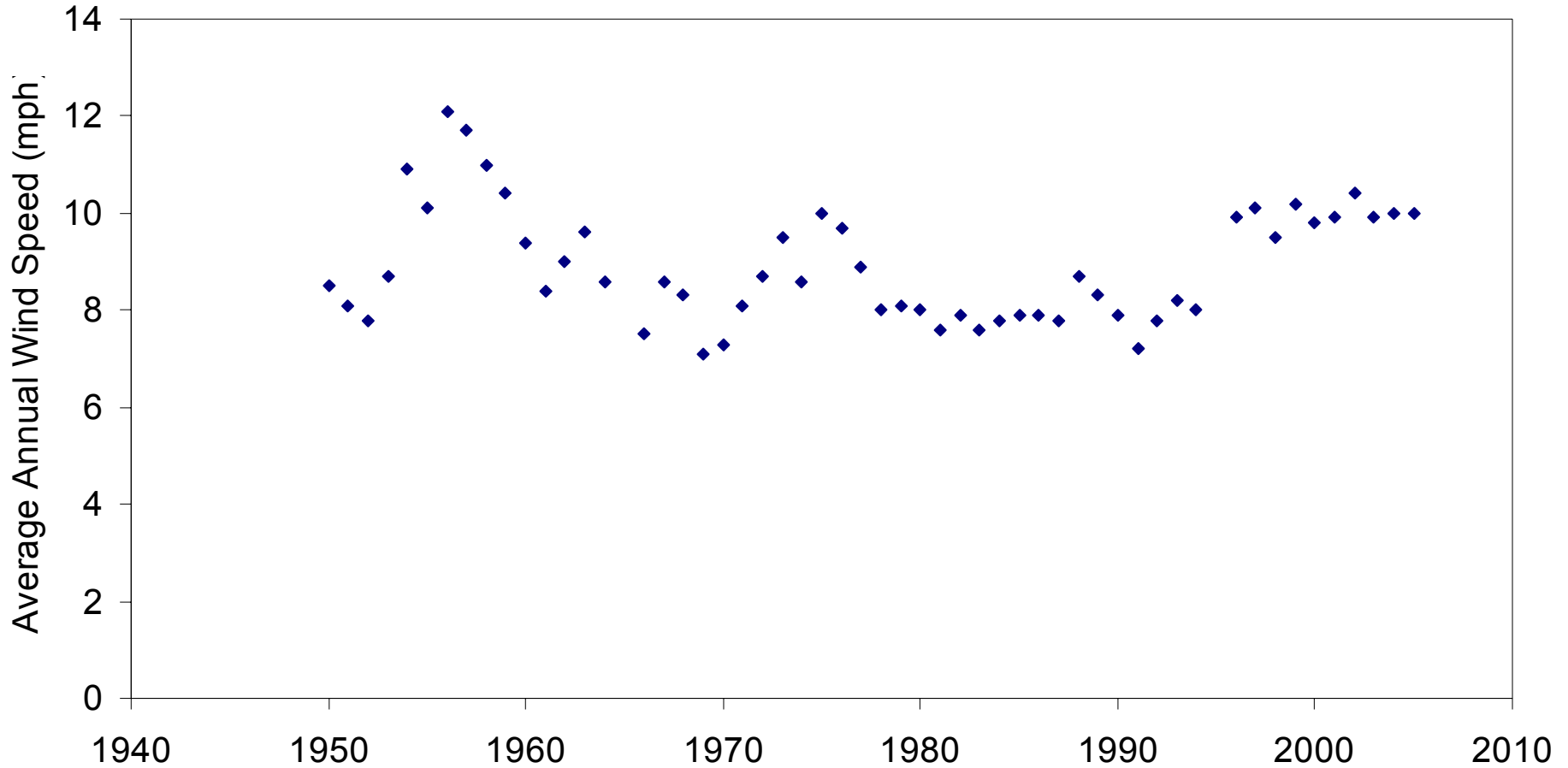
Wind!!



<http://www.state.co.us/oemc/programs/renewable/anemometer.htm>

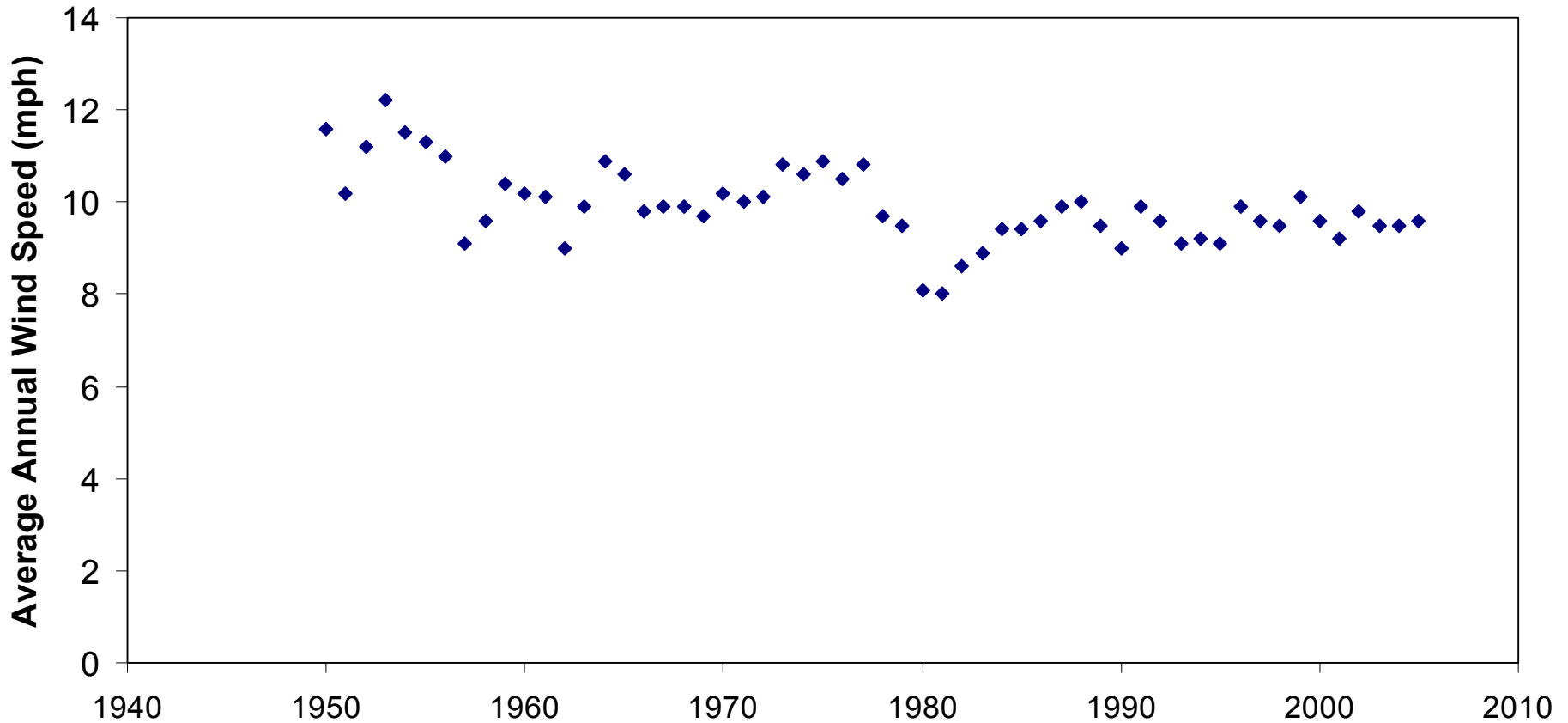
Denver Average Annual Wind Speed

Denver/Stapleton International Airport (DIA as of 1996) Average Annual Wind Speed



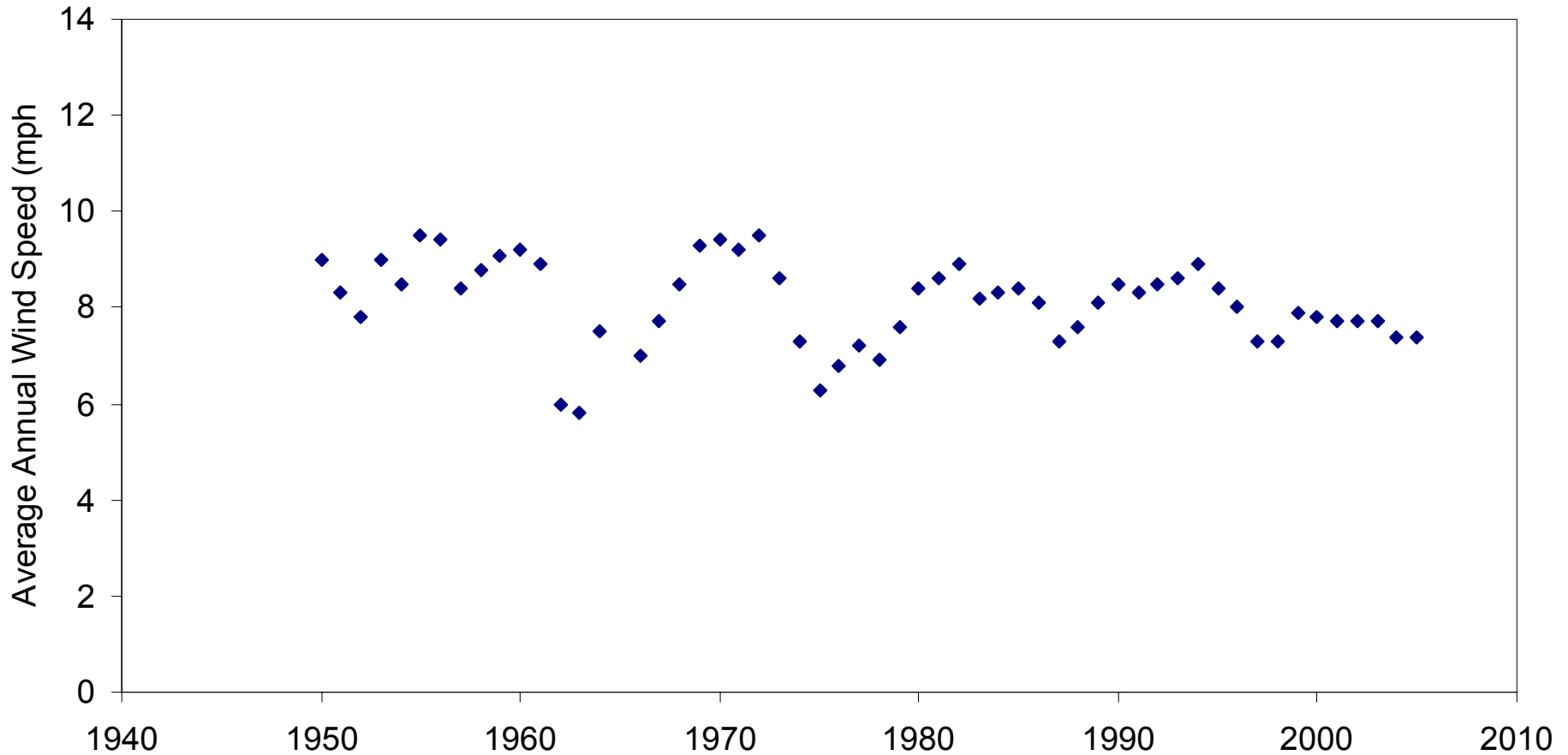
Colorado Springs Average Annual Wind Speed

Colorado Springs Airport Average Annual Wind Speed (mph)



Grand Junction Average Annual Wind Speed

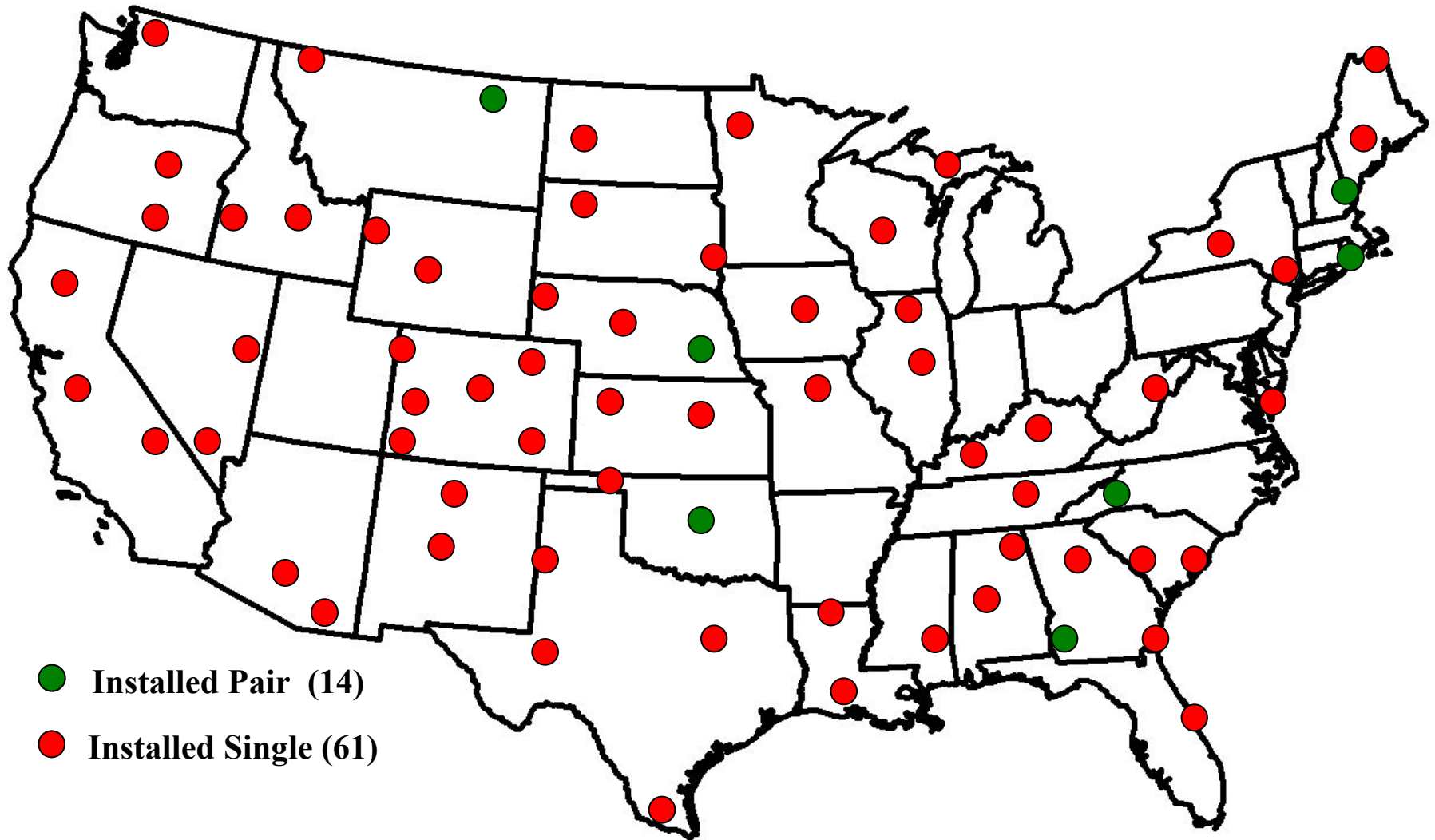
Grand Junction Airport Average Annual Wind Speed



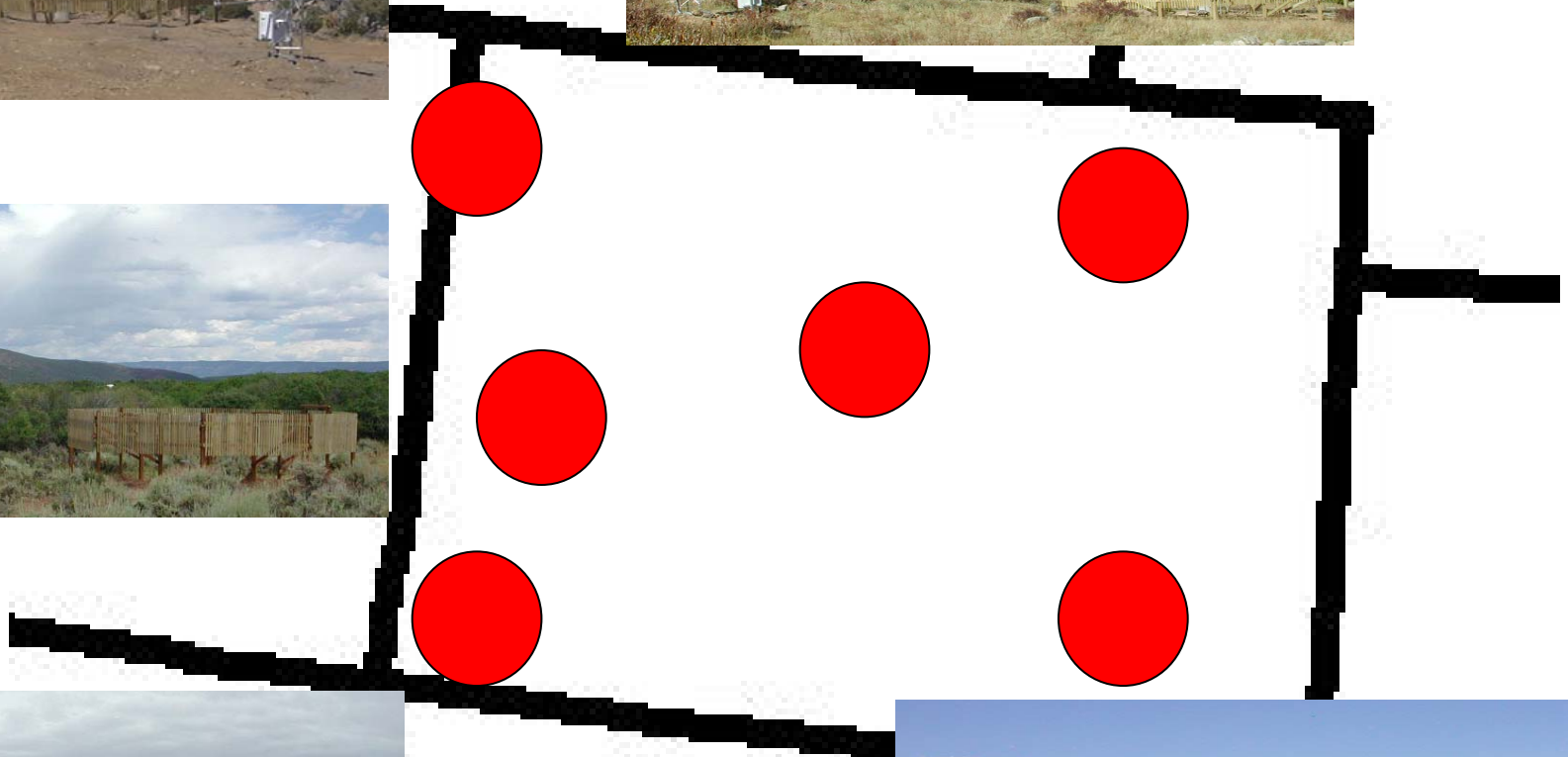
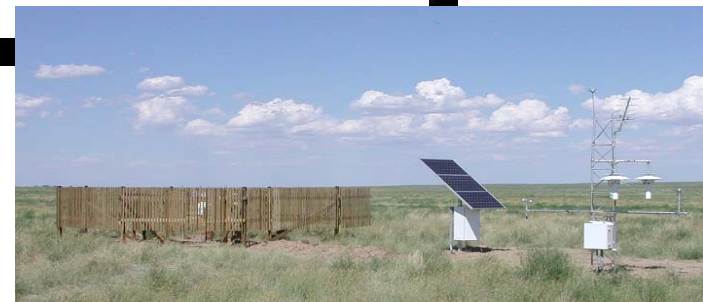


Conclusions!

Climate Reference Network (CRN)



Climate Reference Network (CRN)



So, what should I do?

- Join CoCoRaHS!



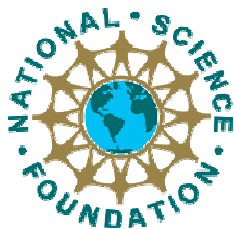
Community Collaborative Rain, Hail and Snow Network



For More Information,
Visit the CoCoRaHS Web Site



<http://www.cocorahs.org>



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Colorado Climate Center

Data and Power Point Presentations available for downloading

<http://ccc.atmos.colostate.edu>

- click on “Drought”
- then click on “Presentations”

