



The Water Supply and Demand Quandary

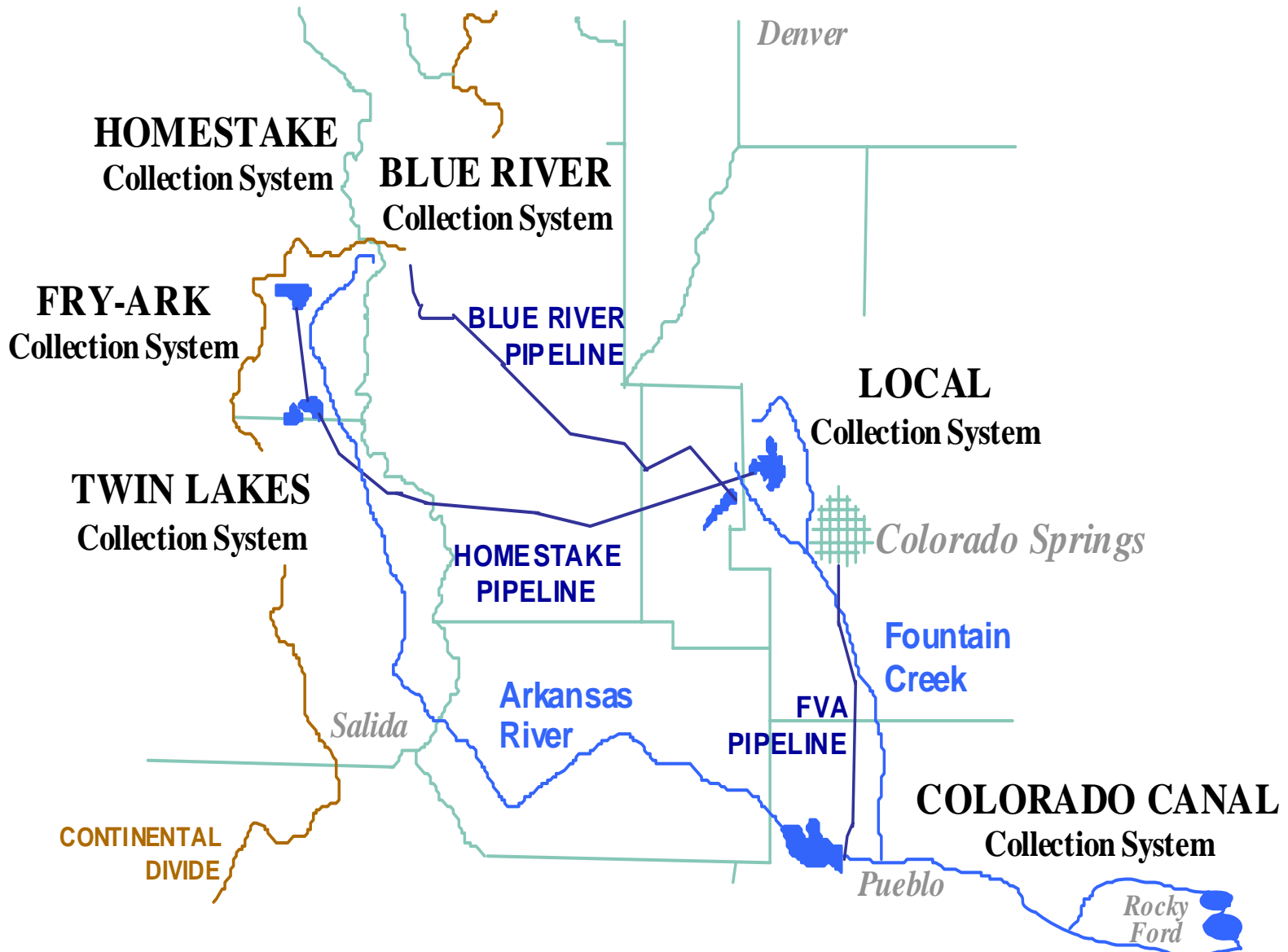
JANUARY 2005
James C. McGrady



Topics

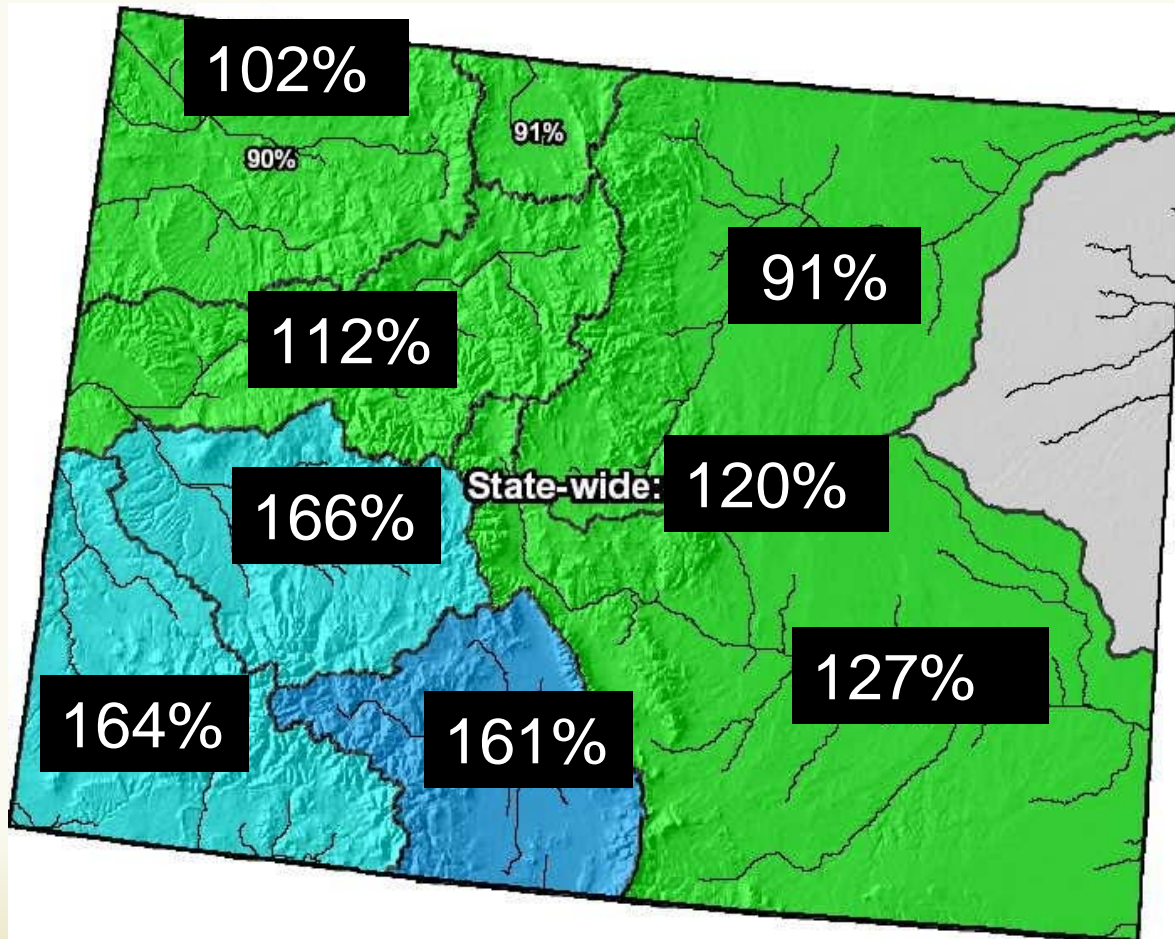
- ❖ Colorado Springs Water Collection System
- ❖ The Need for Accurate Forecasts
- ❖ Development of Supply Side Relationships
- ❖ Demand Side Relationships

Raw Water Collection Systems





Colorado Snow Water Equivalent looks quite good for mid-January!



Water Outlook

January 2005

- ❖ **Reservoir Levels**
(as of December 31, 2004)
 - **Pikes Peak**
58% (normally 60%)
 - **Rampart**
75% (normally 69%)
 - **Local Total**
69% (normally 66%)
 - **System Total**
56% (normally 74%)



Rampart Reservoir



The Supply and Demand Quandary

- ❖ Should we spend \$5,000,000 leasing water only to have it spill?
- ❖ Should we spend \$3,000,000 on conservation messages?
- ❖ Should we reduce or eliminate many large Capital Expenditures due to reduced revenues?
- ❖ Should we purchase additional temporary storage space at a cost of \$270,000



Answer: We really don't know without an insight into the impacts of climate on supply, yield and demand!!



The Need to Forecast

- ❖ Establish a leasing strategy and be able to commit to leasing water.
- ❖ Purchase of temporary storage accounts
- ❖ Setting Conservation Targets
- ❖ Setting Watering Restrictions
- ❖ Development of Customer Communication Plans
- ❖ Managing Reservoir Storage Volumes



Climate and Weather

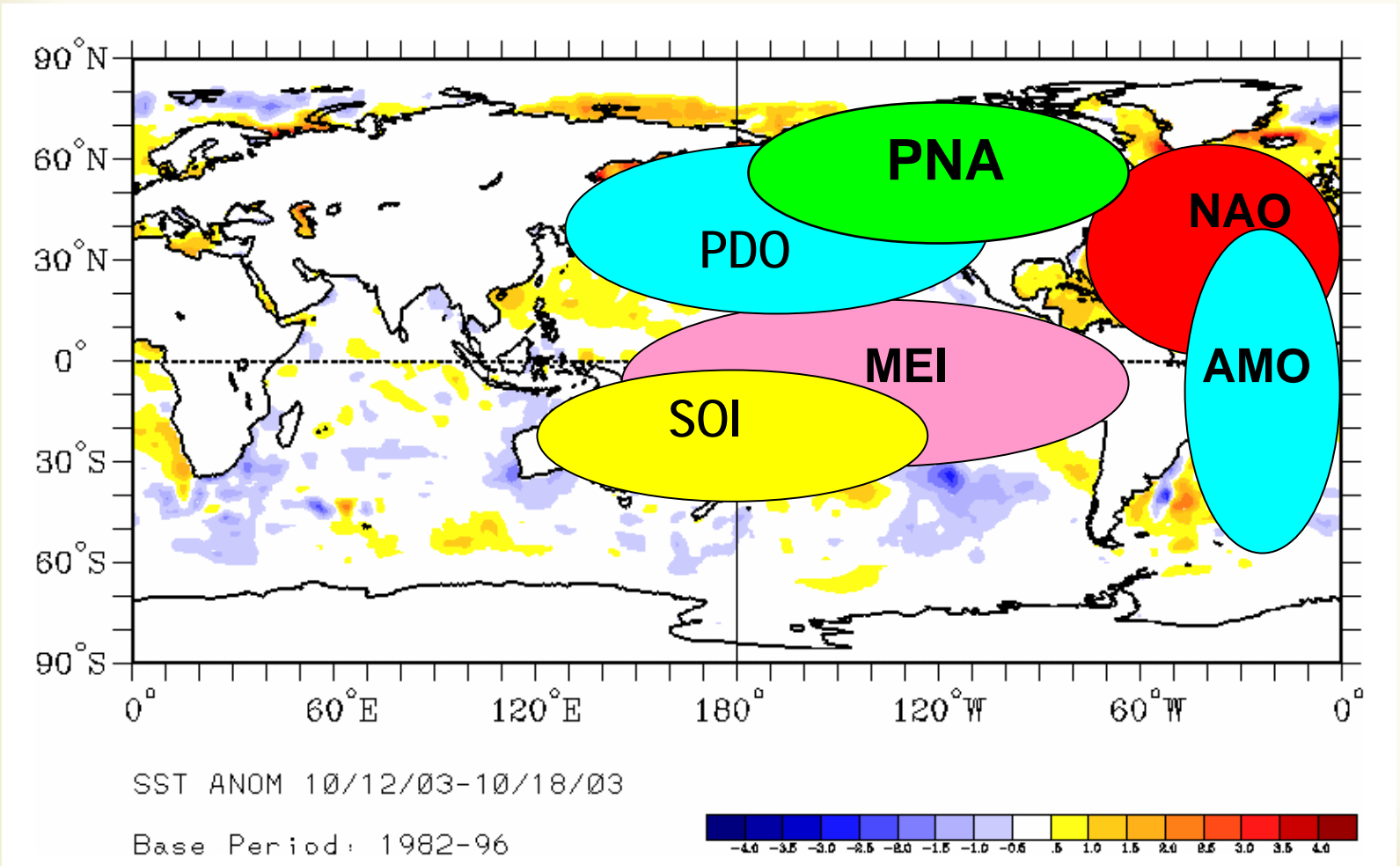
- ❖ **Climatology** deals with the observed geographic and temporal distribution meteorological parameters over long periods of time
- ❖ **Weather** is the dynamic realization of the current state of the earth's atmosphere in short timescales on the order of hours or days.



Six Hydro Climate Indices will be evaluated:

- ❖ **Multi-Variate ENSO Index (MEI)**
- ❖ **Southern Oscillation Index (SOI)**
- ❖ **Pacific Decadal Oscillation (PDO)**
- ❖ **Pacific North American Index (PNA)**
- ❖ **North Atlantic Oscillation Index (NAO)**
- ❖ **Atlantic Multi-Decadal Oscillation Index (AMO)**

Where the CSU Hydro-Climate Indices Operate





Primary Purpose of the Hydro-Climate Analysis

- ❖ Identify definable Quantitative Relationships between basin precipitation and the influence of large scale climatic regimes in the key regions of Springs Utilities Water Supply System
- ❖ Develop a series of **basin** outlooks for the Water Year months of October to March



Primary Purpose of the Hydro-Climate Analysis

- ❖ Develop Outlooks for the period April through September that will assist predicting spring/summer demands on Springs Utilities water service area.
- ❖ Primarily will focus on Precipitation and temperature. Specifically the number of days above 90 degrees.



What is the Supply Component in the CSU Service Area?

Comparison of leading Climate Indices to the following:

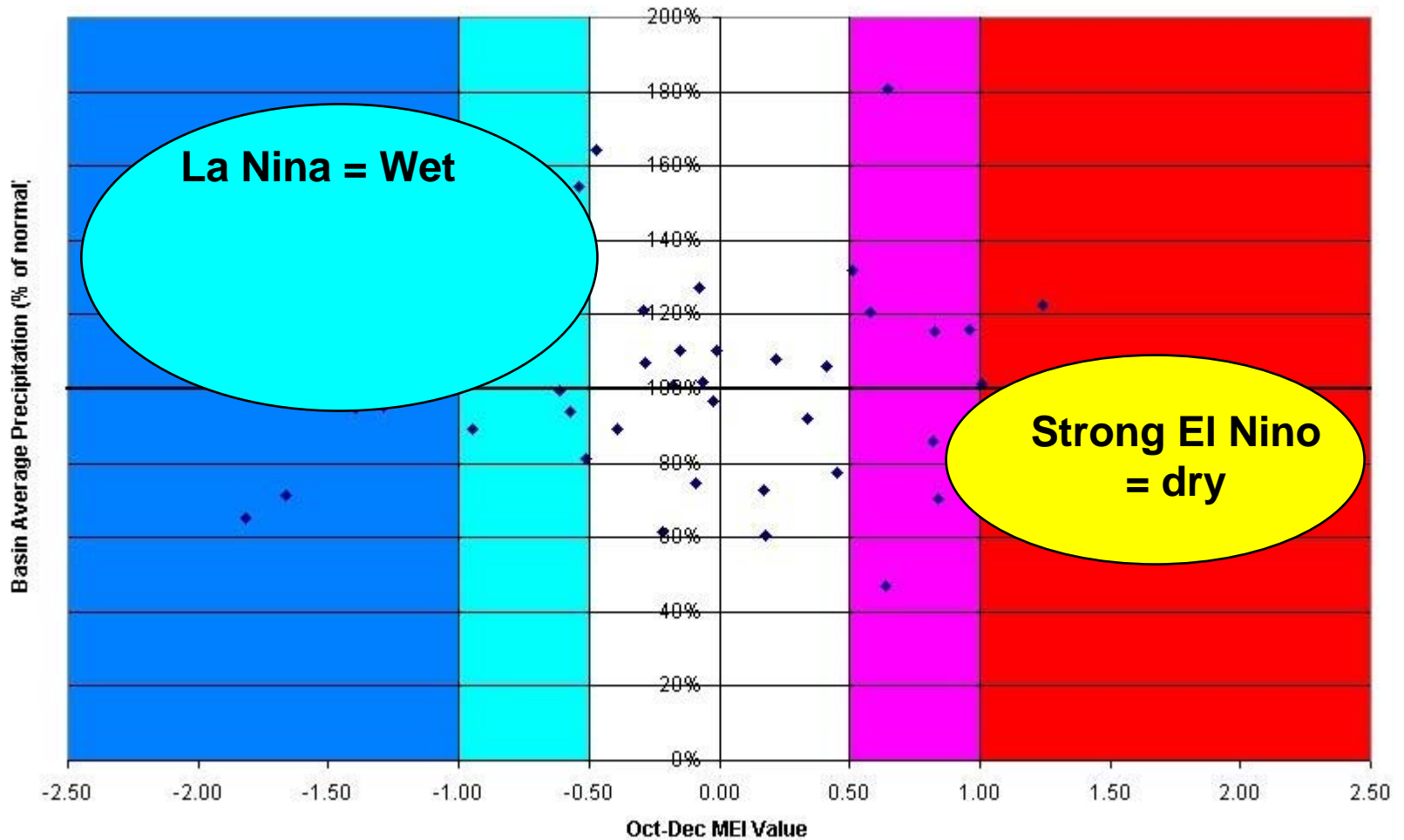
- 1) Seasonal precipitation and/or snow water equivalent
- 2) Seasonal runoff at critical basin/sub-basin locations



An example of supply

side relationships

October-December MEI vs.
Arkansas Headwaters: Oct. - Mar. Basin Avg. Precip. (% of normal)





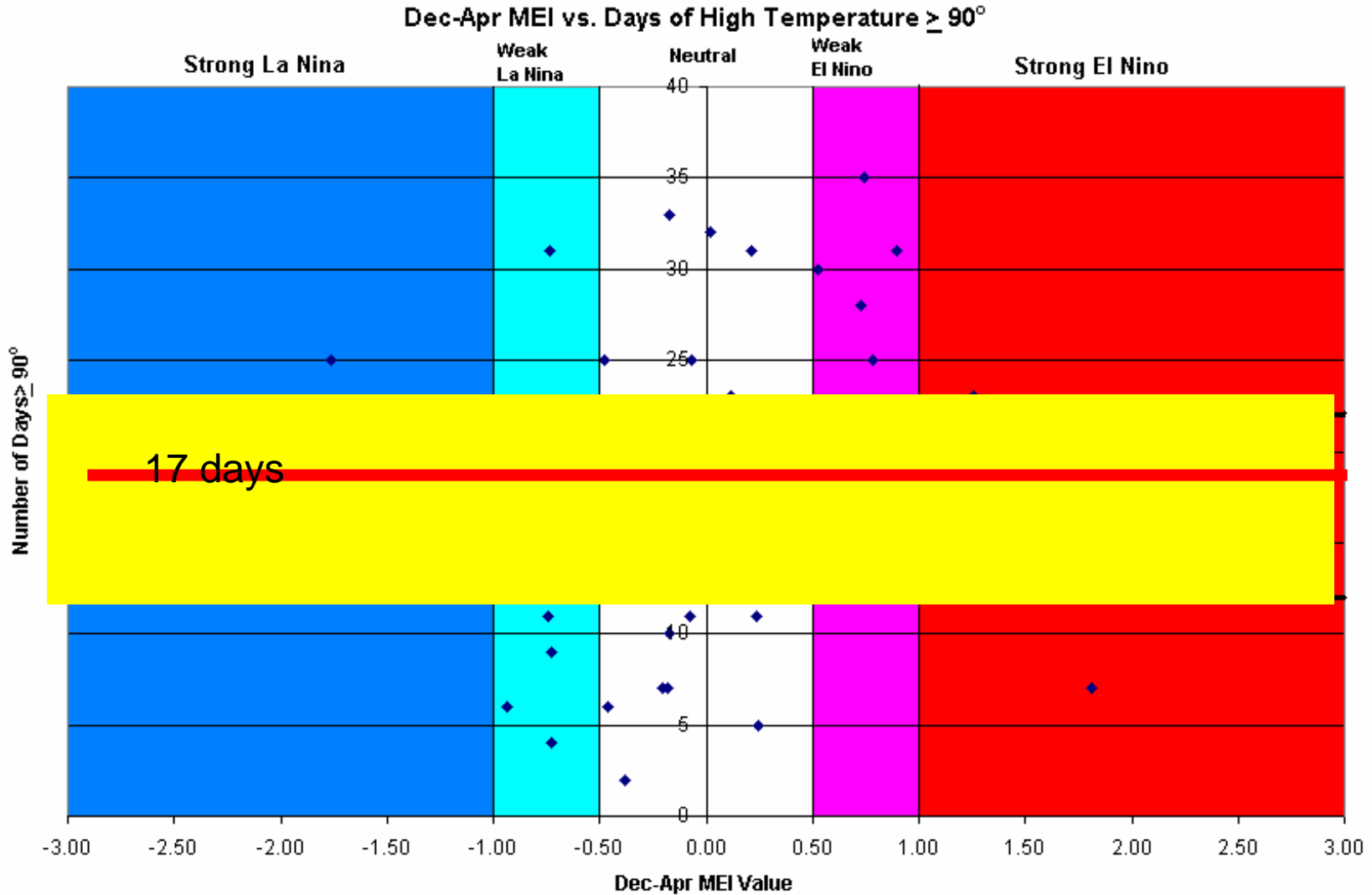
What is the Demand Component in the CSU Service Area?

Comparison of leading Climate Indices to the following:

- 1) Days where the Daily Maximum Temperatures $\geq 90^{\circ}$ F (seasonal and monthly basis) at Colorado Springs
- 2) Days where Daily Precipitation exceeds 0.10" at Colorado Springs

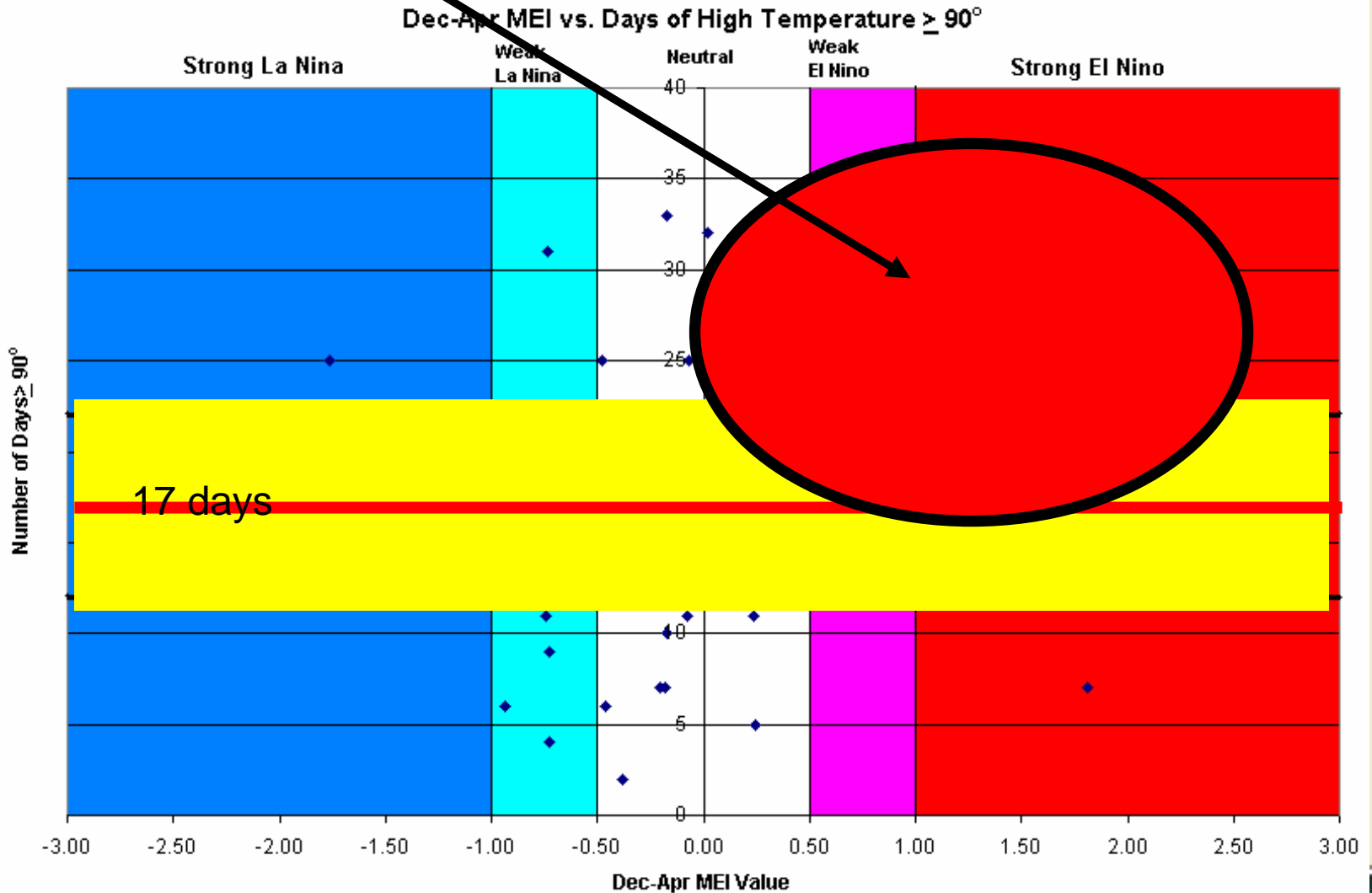


Demand: Days (May-Sept) Max.Temp. $\geq 90^{\circ}$ F (Yellow – Normal) vs. MEI (Dec-Apr) – an example



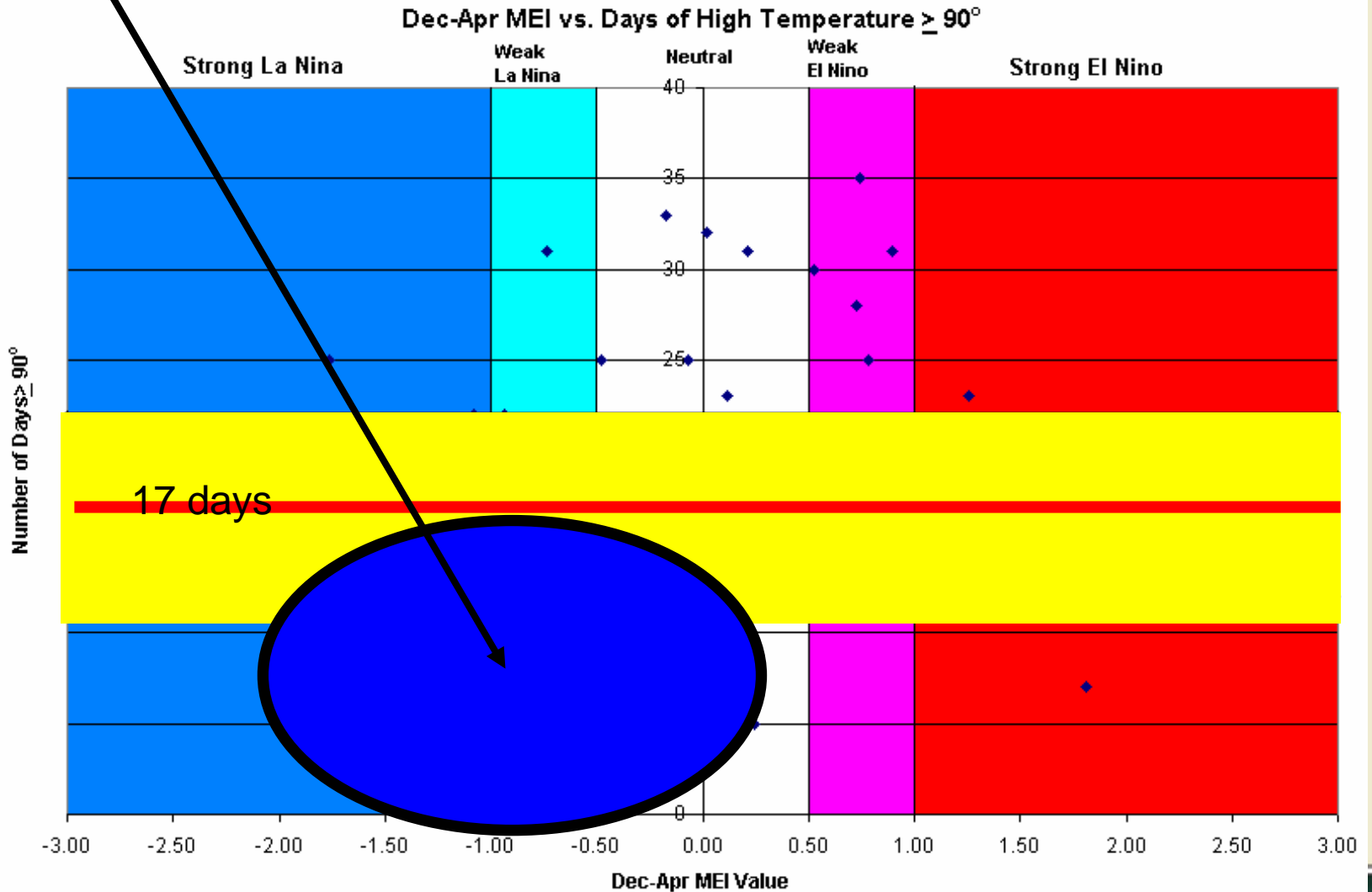


Demand: More days > 90F tend to favor El Nino or warm neutral summers.





Demand: Fewer Days >90F favor La Nina or Cool Neutral Summers

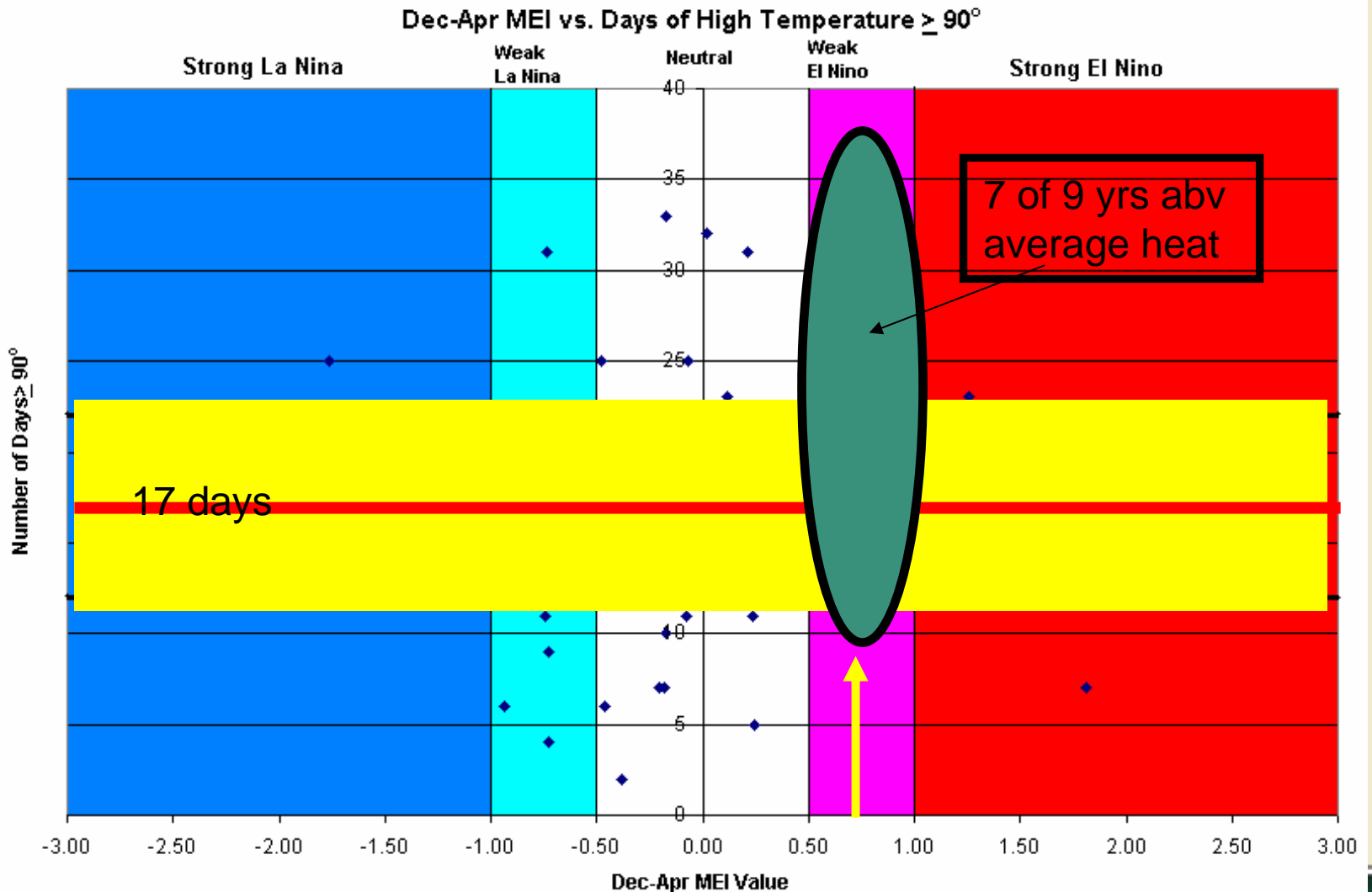




CSU Demand:

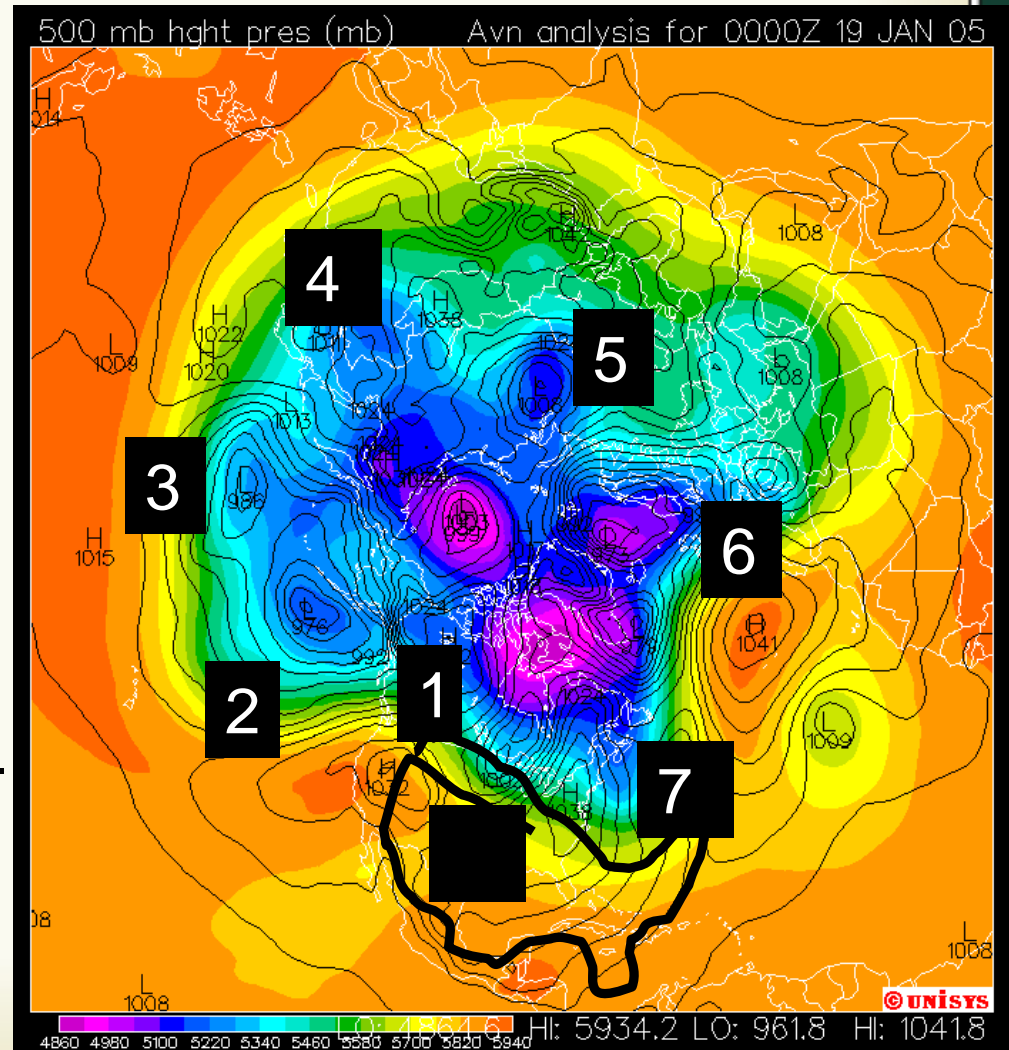
Current: MEI = 0.680

Summer 2005 seems to favor an above average number of days > 90F



*Seven Pacific storms
to the west support a
wet three months
ahead and a wet spring!*

- ❖ 7 Pacific “storms”
- ❖ 3 for late Jan/Feb
- ❖ 2 for Mar; then some dry
- ❖ 2 for 1-15 Apr
- ❖ Storms 1, 2 3 look potent;
too early to tell for the others.
- ❖ Looks wet ahead to
mid-May!





Water Outlook

Snow Pack January 18 2005

Basin	Percent of Normal	1 April Fcst SWE
❖ Arkansas River	130%	100%
❖ Colorado River	112%	110%
❖ Gunnison River	169%	120%
❖ North Platte River	113%	110%
❖ South Platte River	93%	115%
❖ Yampa River	100%	100%