

Some Hydrometeorological Effects of Climate Change for the North Fork Feather River Headwater Drainage with Focus on the Lake Almanor and the East Branch Subbasins

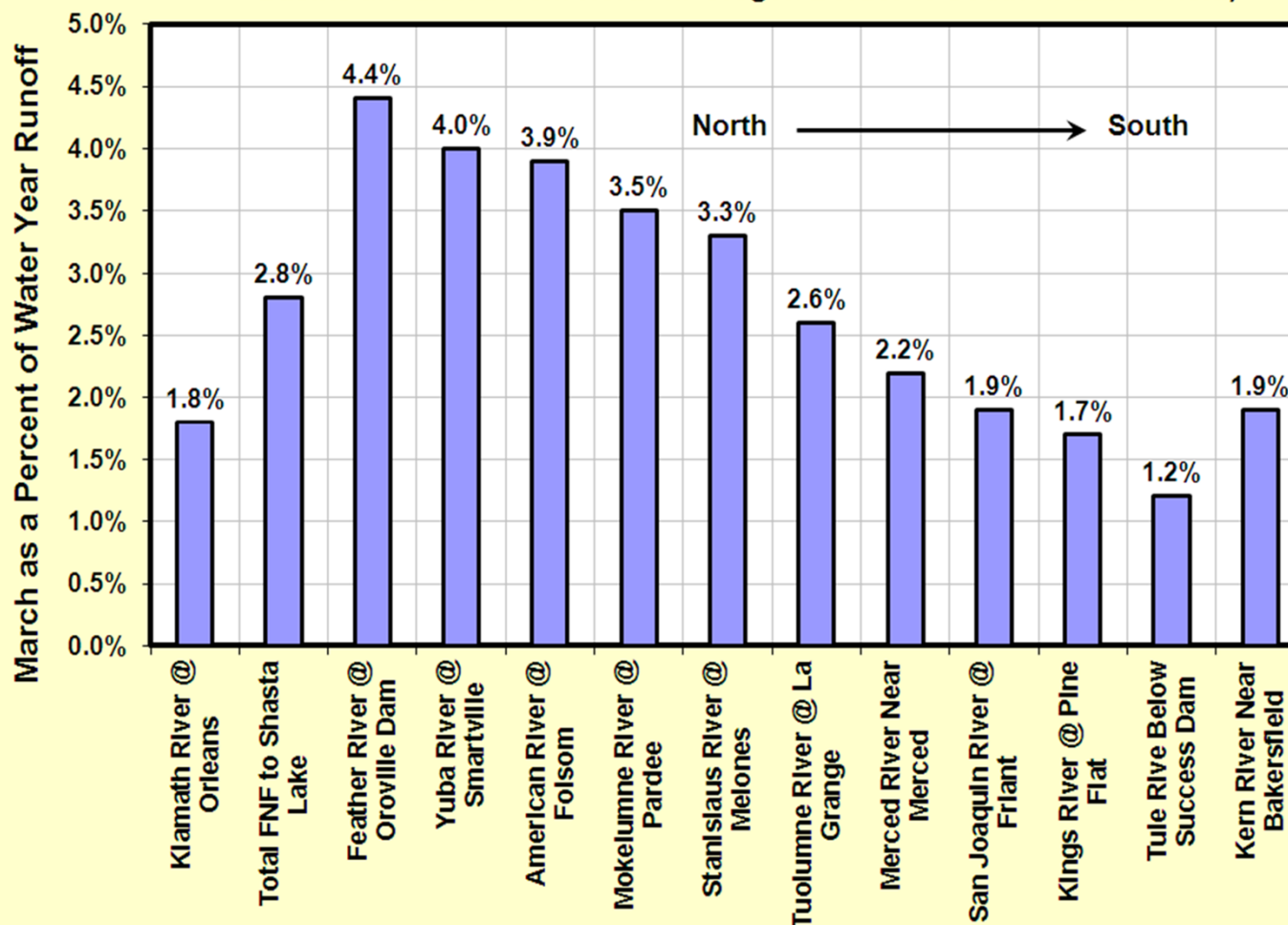
May 6, 2014



Compared Statewide an Analysis of Snowmelt Runoff Shows the Feather River to Have the Largest Shift towards an Earlier Snowmelt in March

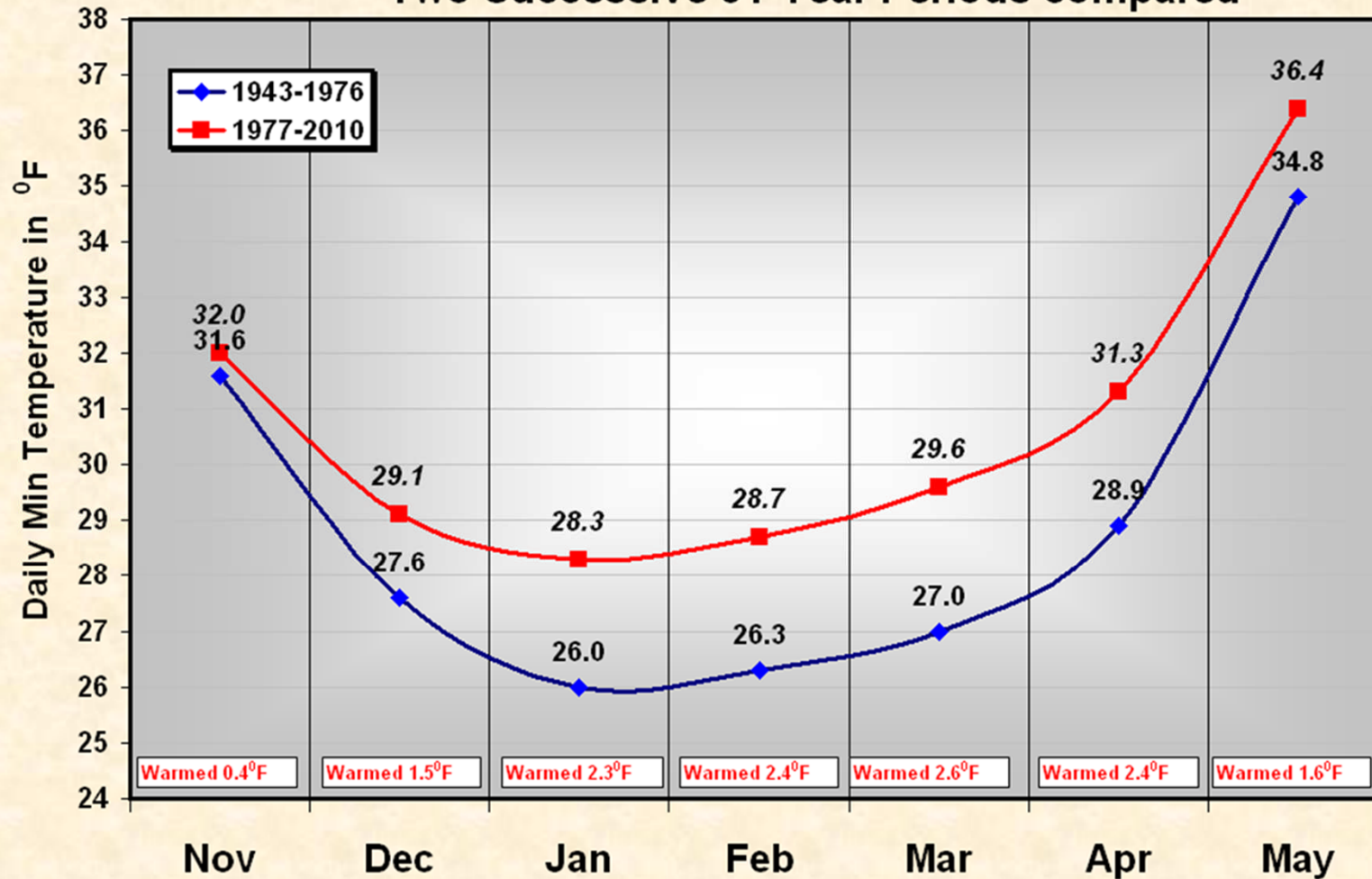


March Runoff Divided by Water Year Runoff
Basins are Listed from North nr Oregon Border to South nr Bakersfield)



Storms are Warmer in Recent Years Bringing Rainfall to Higher Elevations Compared with Years Prior to mid -1970's

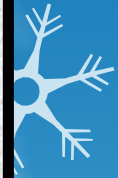
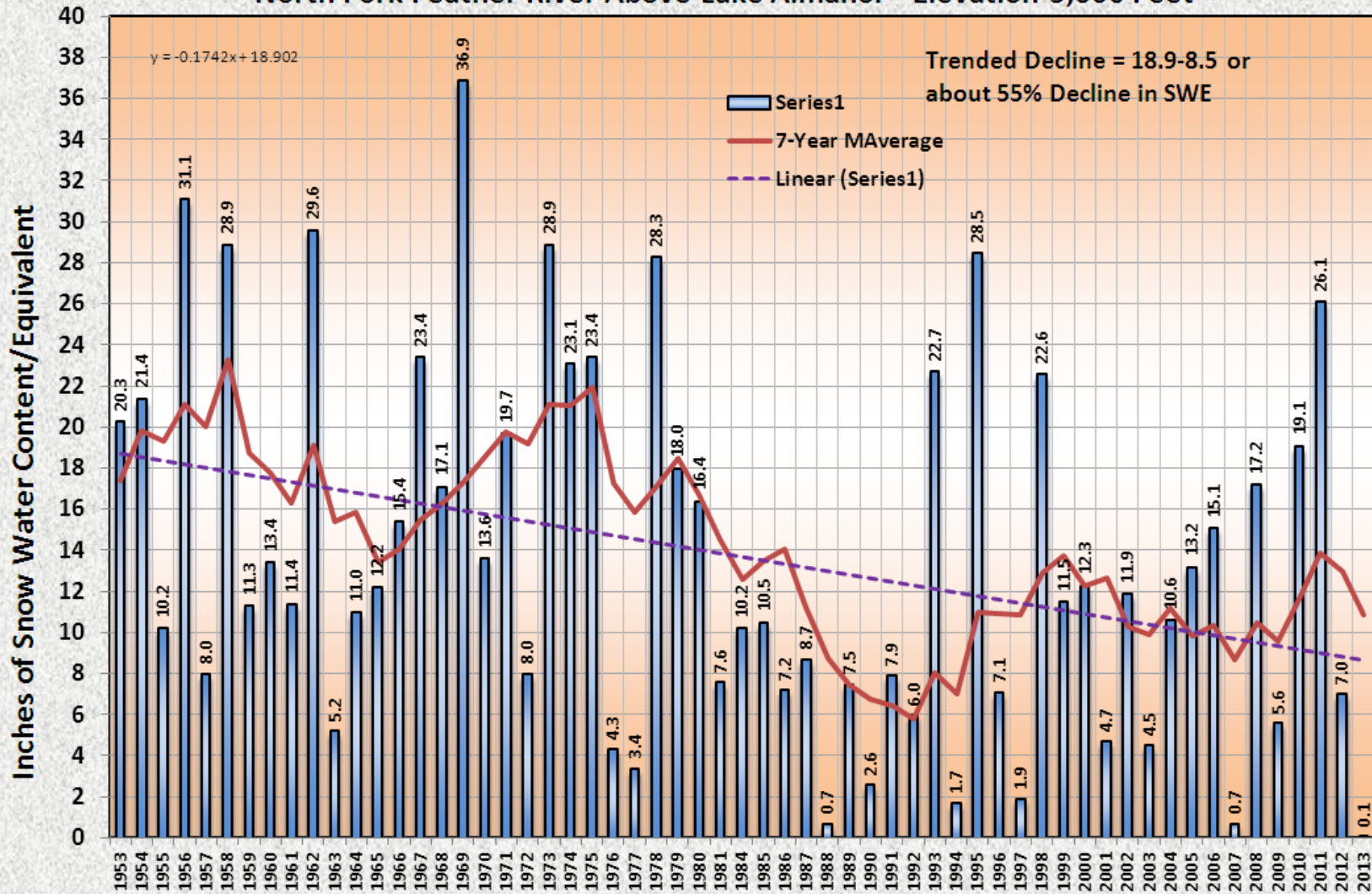
Canyon Dam Averaged Daily Minimum Temperatures
only on days with Precipitation
Two Successive 34-Year Periods compared



An Example of a Trending Decline In Lake Almanor's Snowpack



Historical April 1 SWE/Water Contents for Mt. Stover Snow Course #55
North Fork Feather River Above Lake Almanor Elevation 5,600 Feet

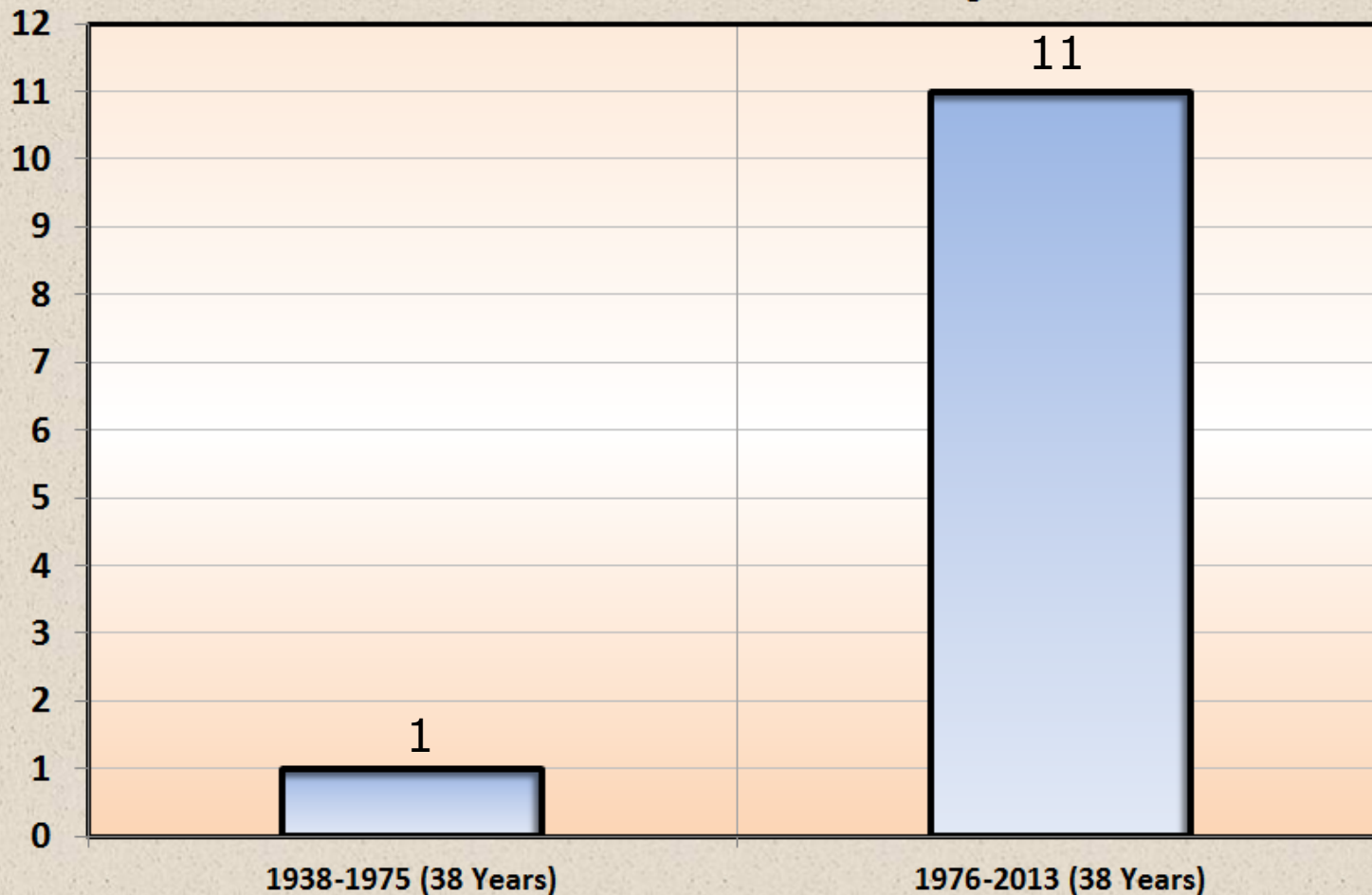


Recent Years Reveal an Increase in Number of Dry Water Years for North Fork Feather River



Comparison of Number of Dry Water Years Equal to or Less than 1,200 TAF (Unimpaired Runoff*) For Two Equal Length Successive 38-Year Periods (1938-1975 and 1976-2013) for North Fork Feather River @ Pulga

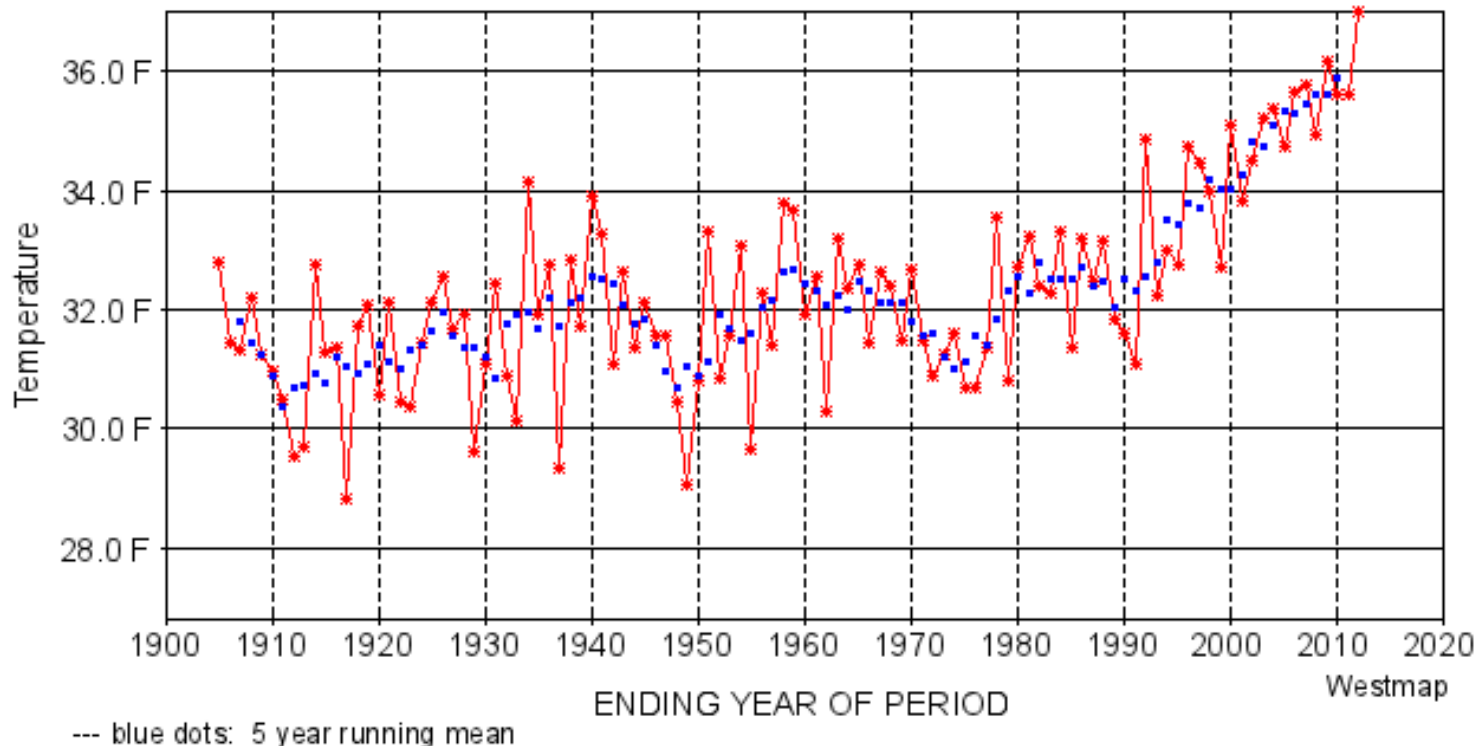
Number of Water Years Equal to or Less than 1,200 TAF



*Not corrected for Lake Almanor or Mtn Meadows surface evaporation



Mean Minimum Temperature for California – Plumas County
12 month period ending in August

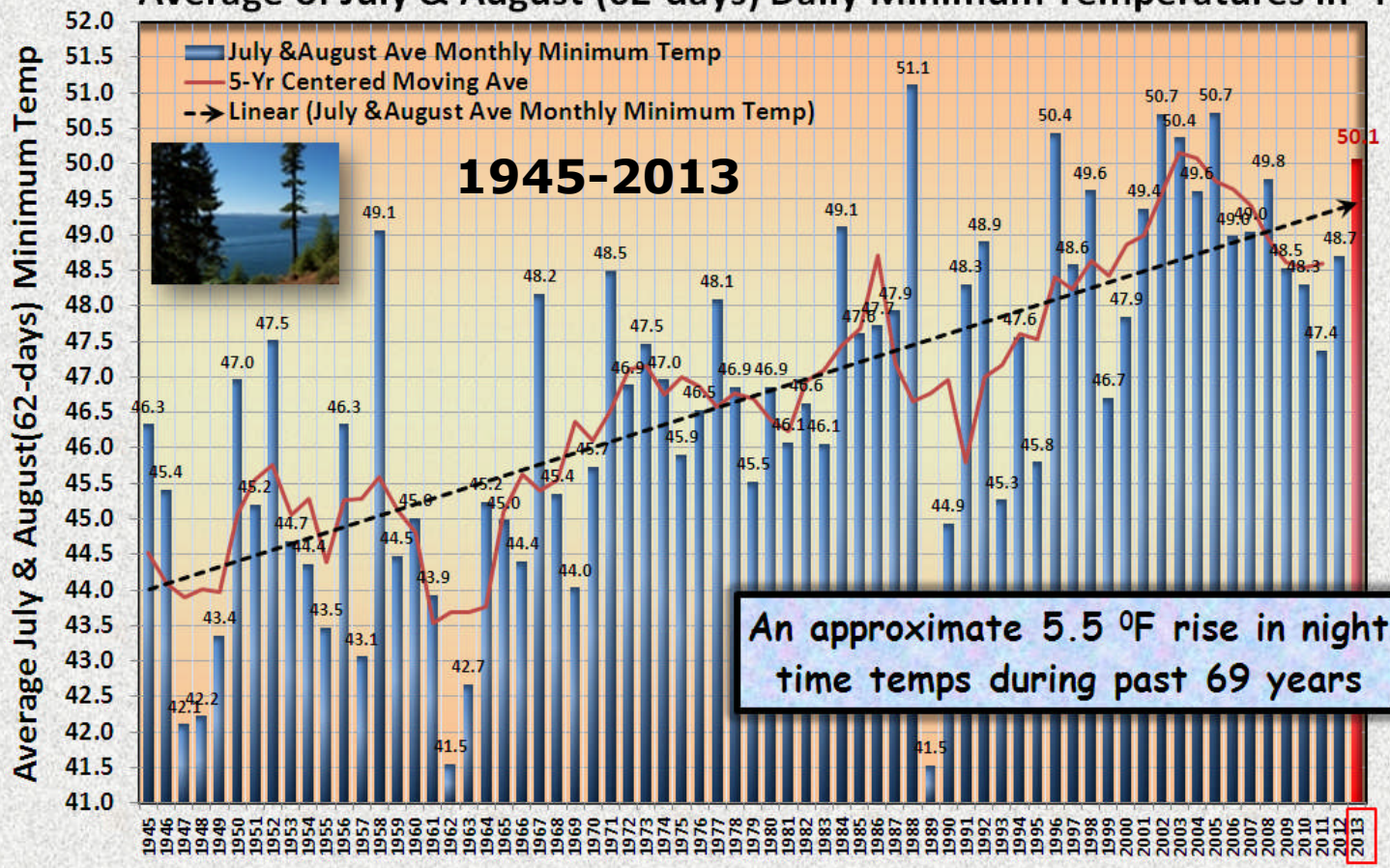


1990	31.6
1991	31.1
1992	34.9
1993	32.3
1994	33.0
1995	32.7
1996	34.7
1997	34.5
1998	34.0
1999	32.7
2000	35.1
2001	33.8
2002	34.5
2003	35.2
2004	35.4
2005	34.7
2006	35.7
2007	35.8
2008	34.9
2009	36.2
2010	35.6
2011	35.6
2012	37.0

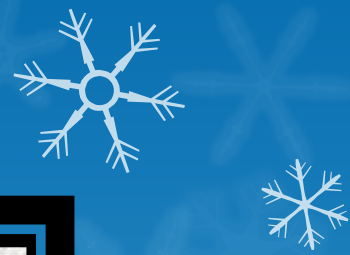
**Warming Trend of Nighttime
Temperatures in Plumas County
beginning about 1990 likely being
caused by an increase in greenhouse
gases 'trapping' daytime heating energy.**

12-Month Period Ending in August
AVERAGE 32.303
MEDIAN 32.138
MINIMUM 28.817
MAXIMUM 37.050
SKEWNESS 0.562
COEFF OF VAR 0.049
SIGMA (RMS) 32.345
NUMBER OBS 108.000

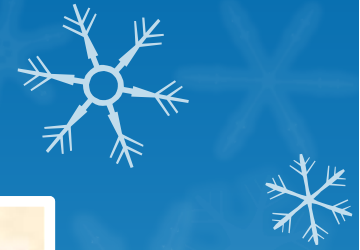
**Canyon Dam (Lake Almanor) Upper North Fork Feather River Elev. 4,560'
Average of July & August (62-days) Daily Minimum Temperatures in °F**



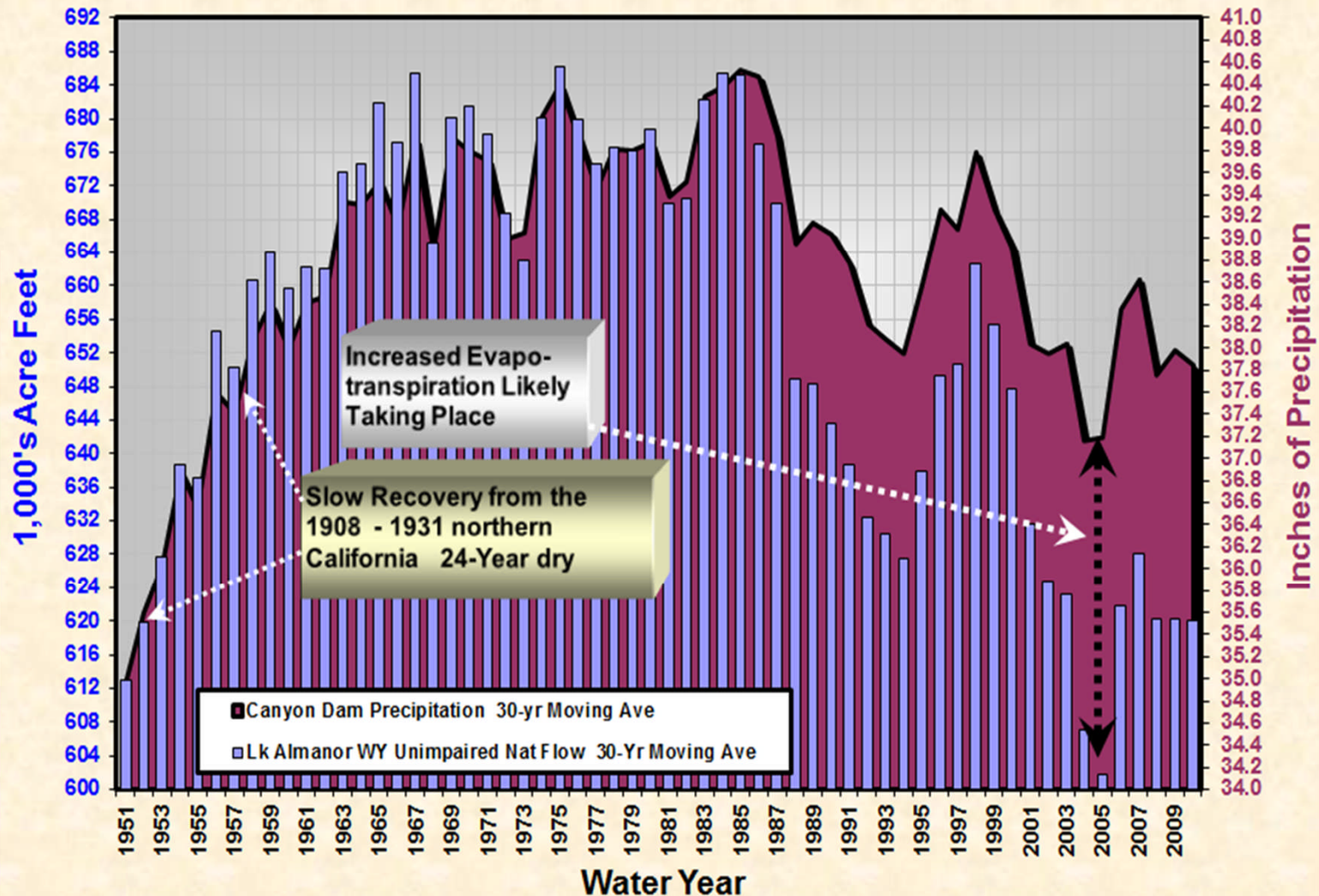
An approximate 5.5 °F rise in night time temps during past 69 years



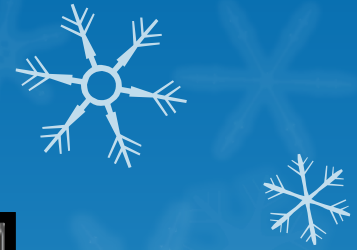
A Graphical Comparison of Canyon Dam Precipitation Compared With Runoff Utilized to Identify Increased Evapotranspiration which Started in the mid 1980's



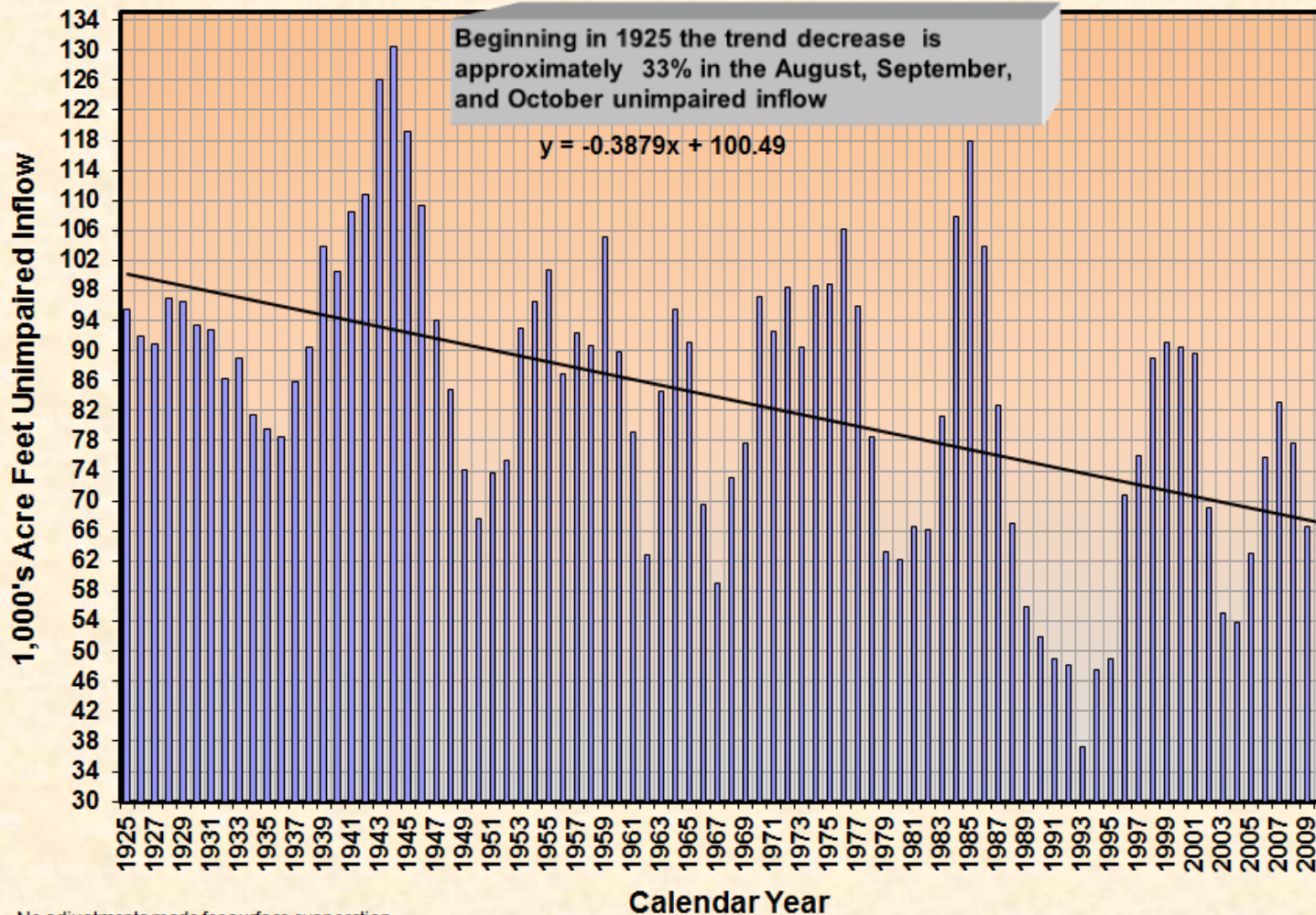
Lake Almanor Unimpaired Natural Flow & Canyon Dam Precipitation
30-Year Moving Average utilizing data starting 1922



For the Upper North Fork Feather @ Lake Almanor Late Summer and Fall Base Flows (Aquifer Outflow) Show a Declining Trend in Recent Years



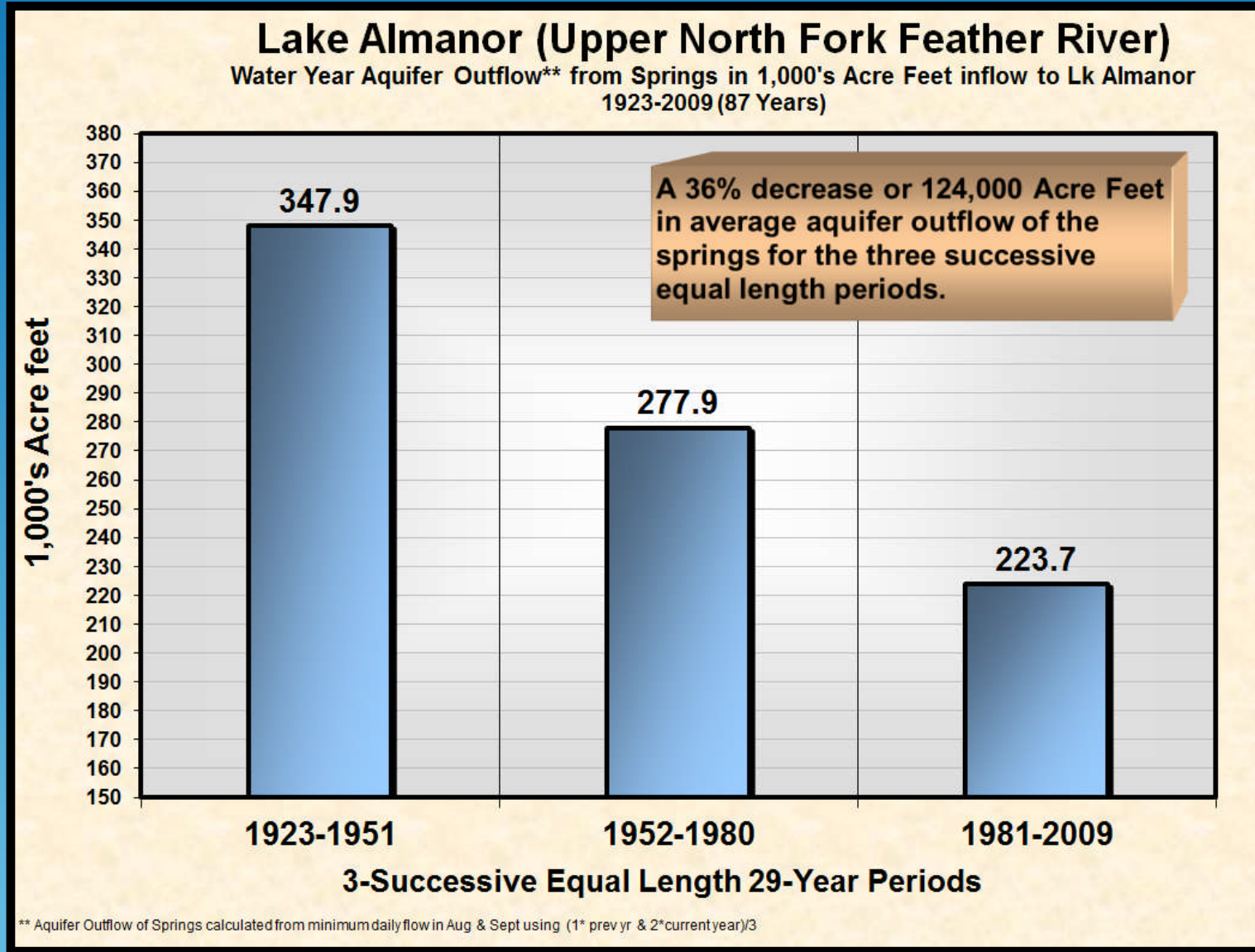
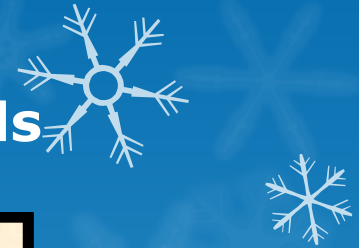
Lake Almanor, North Fork Feather River
August, September, and October Unimpaired Inflows (3-Year Moving Averages)



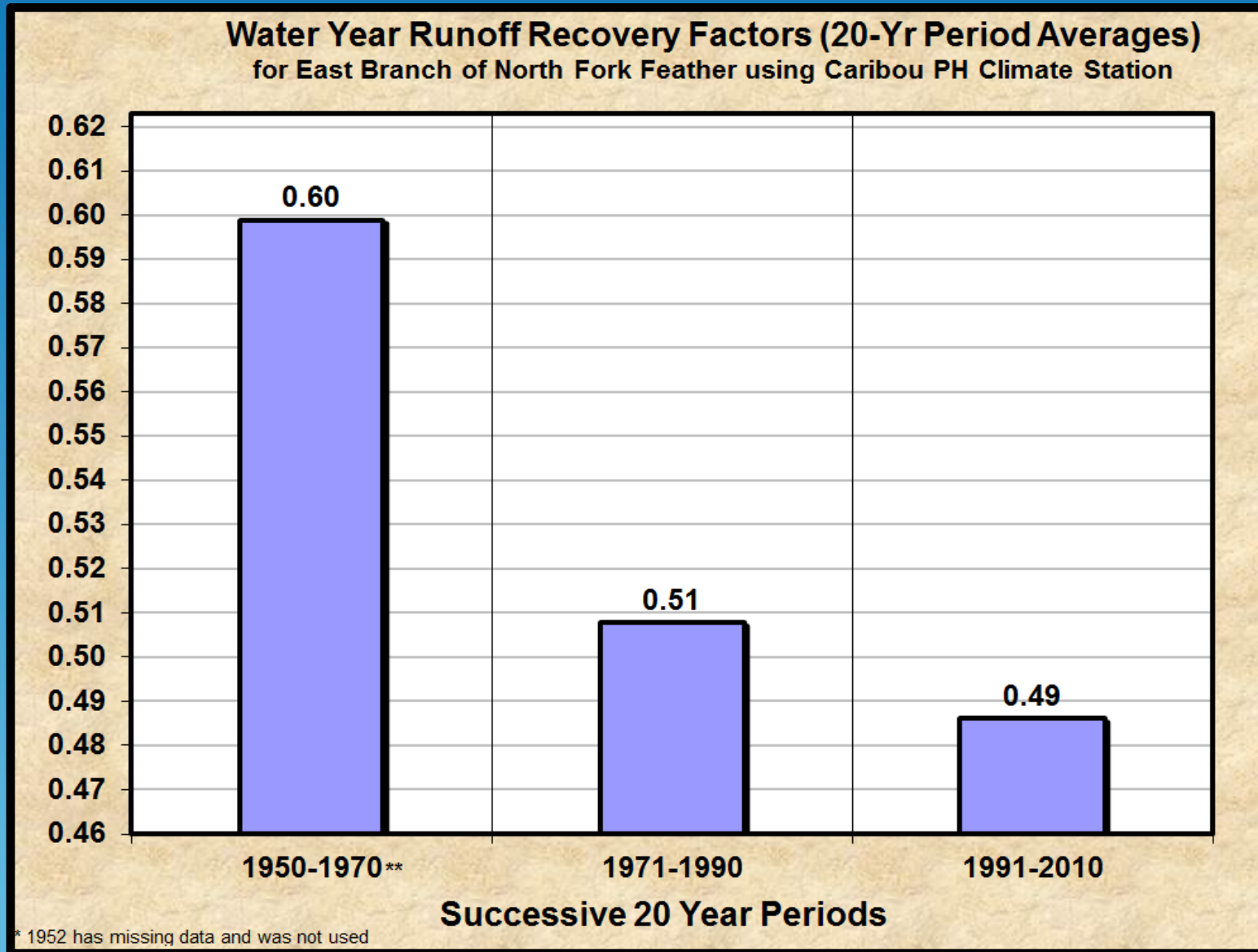
No adjustments made for surface evaporation



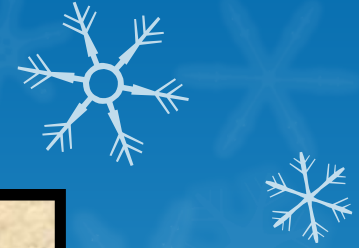
The Decline in Aquifer Outflow of the Springs Shown as Successive Equal Length 29-Year Periods



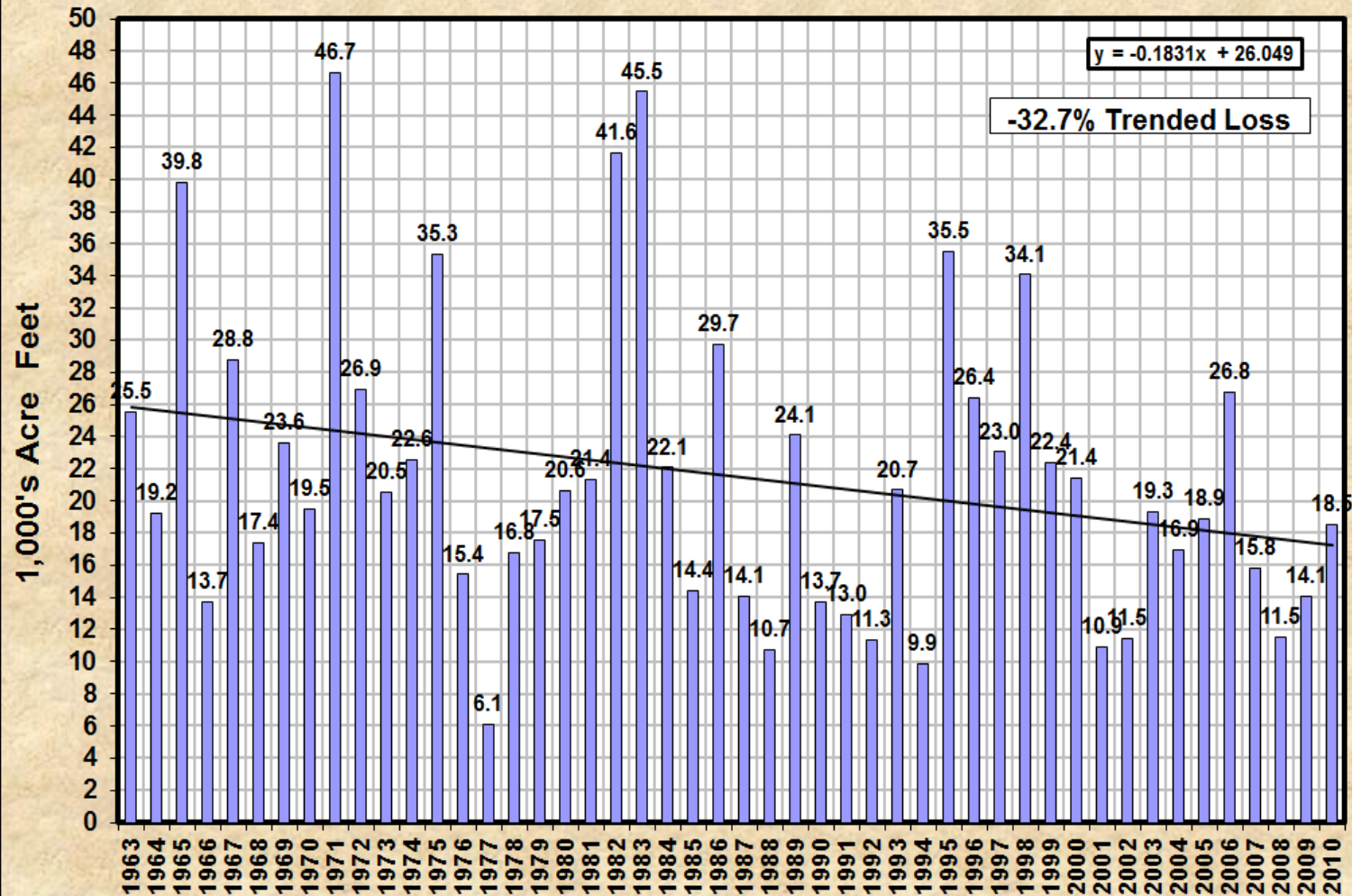
Revealing A Loss of Surface Runoff Starting in the 1970's Due Mostly to Increased Evapotranspiration



Decline in Late Summer and Fall Base Flows for East Branch of the North Fork Feather River



East Branch of North Fork Feather River
Sum of August, September, and October Flows 1964-2010



The Successive Decline in Water Year Runoff from The East Branch of the North Fk Feather River along w/Increase in Evapotranspiration

