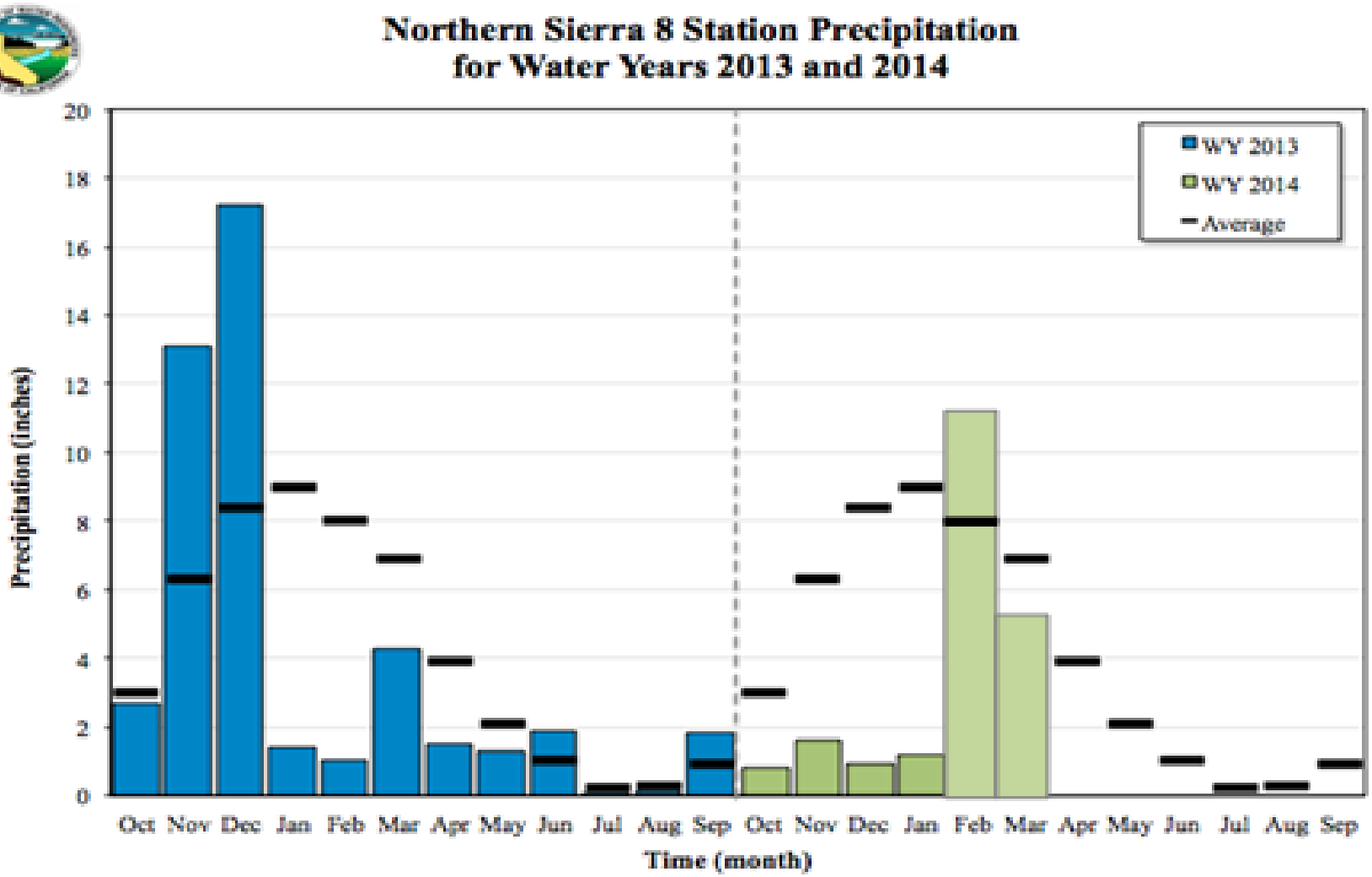
Climate Change and California Water

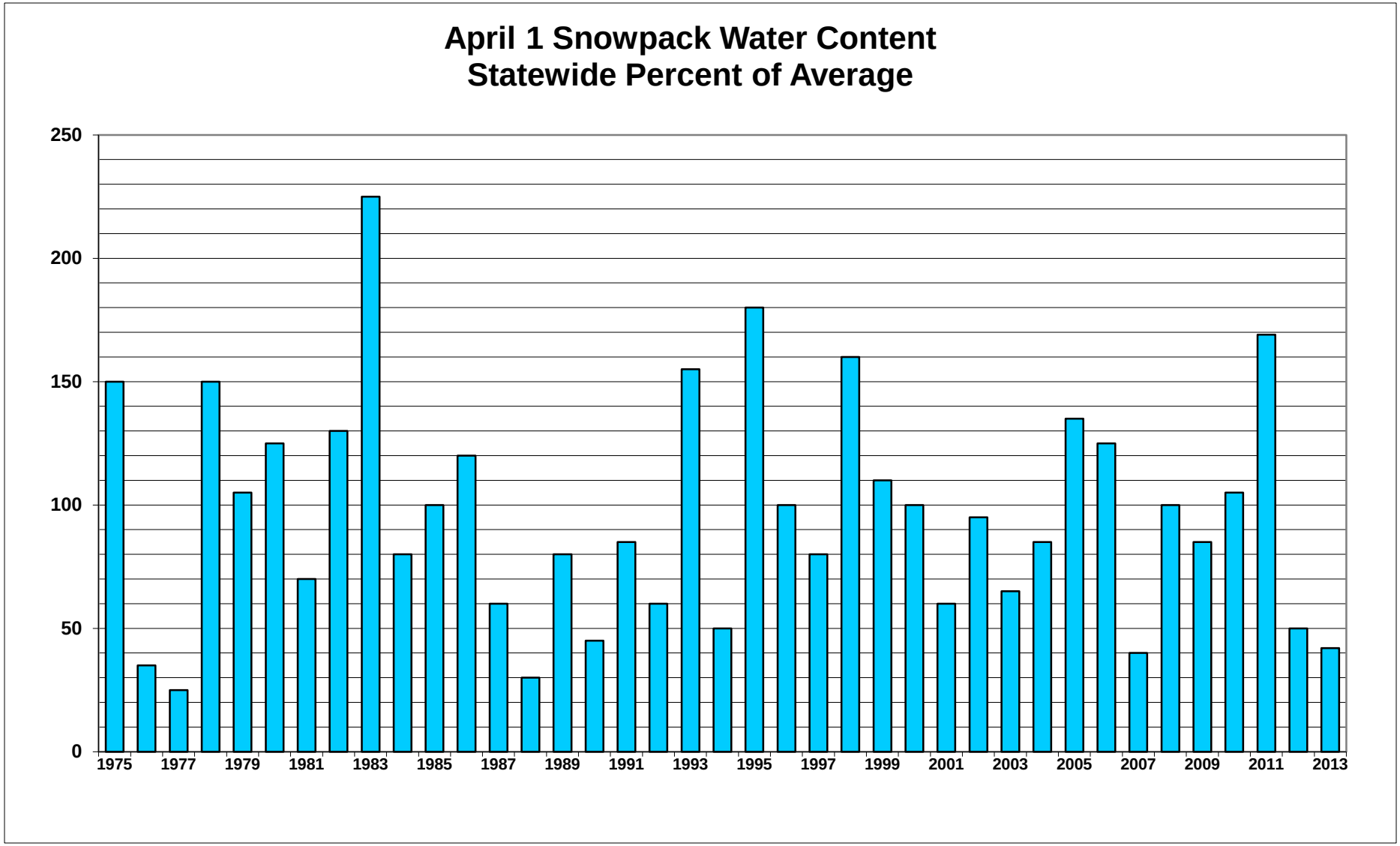
CCTAG

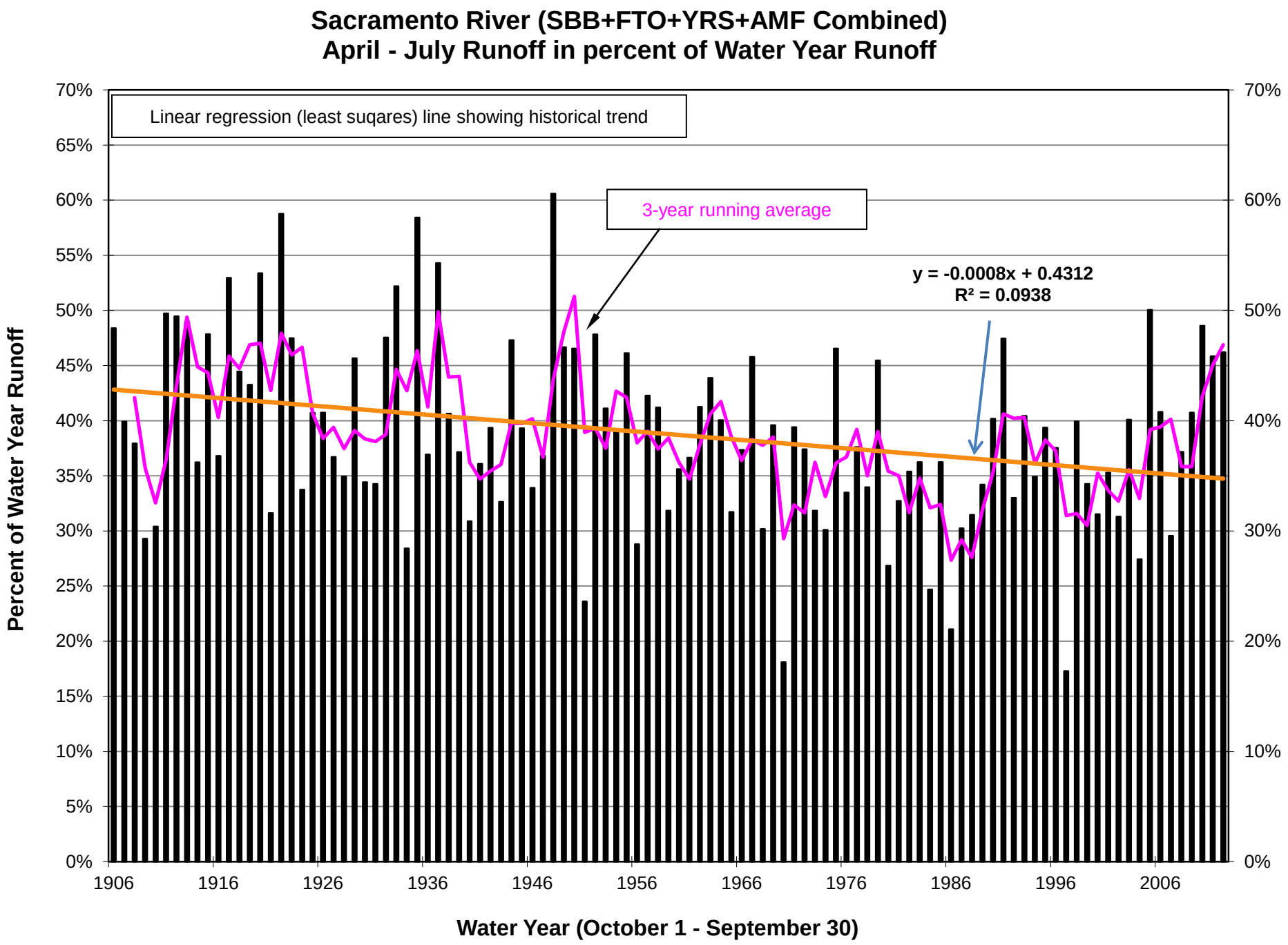
April 3, 2014

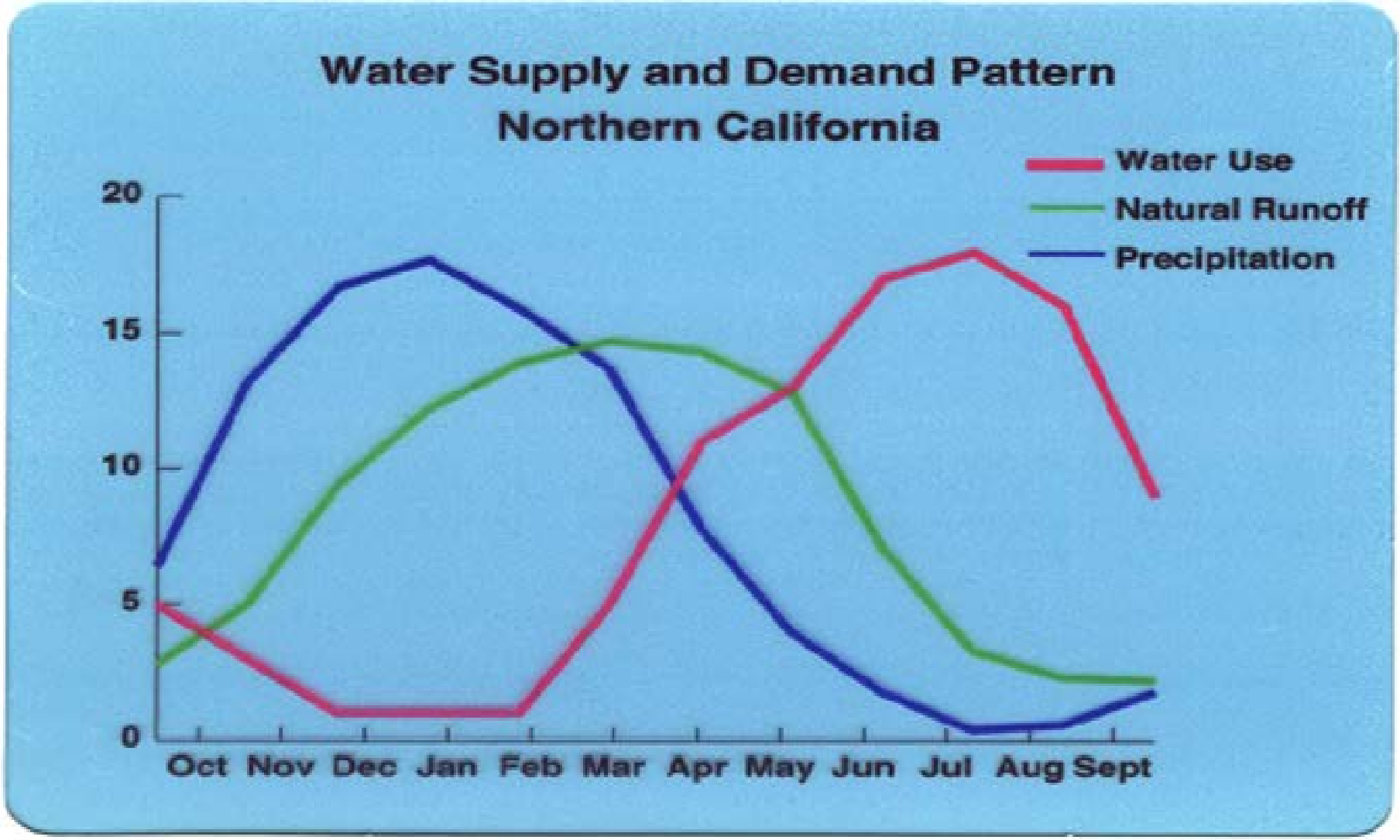
by Maury Roos

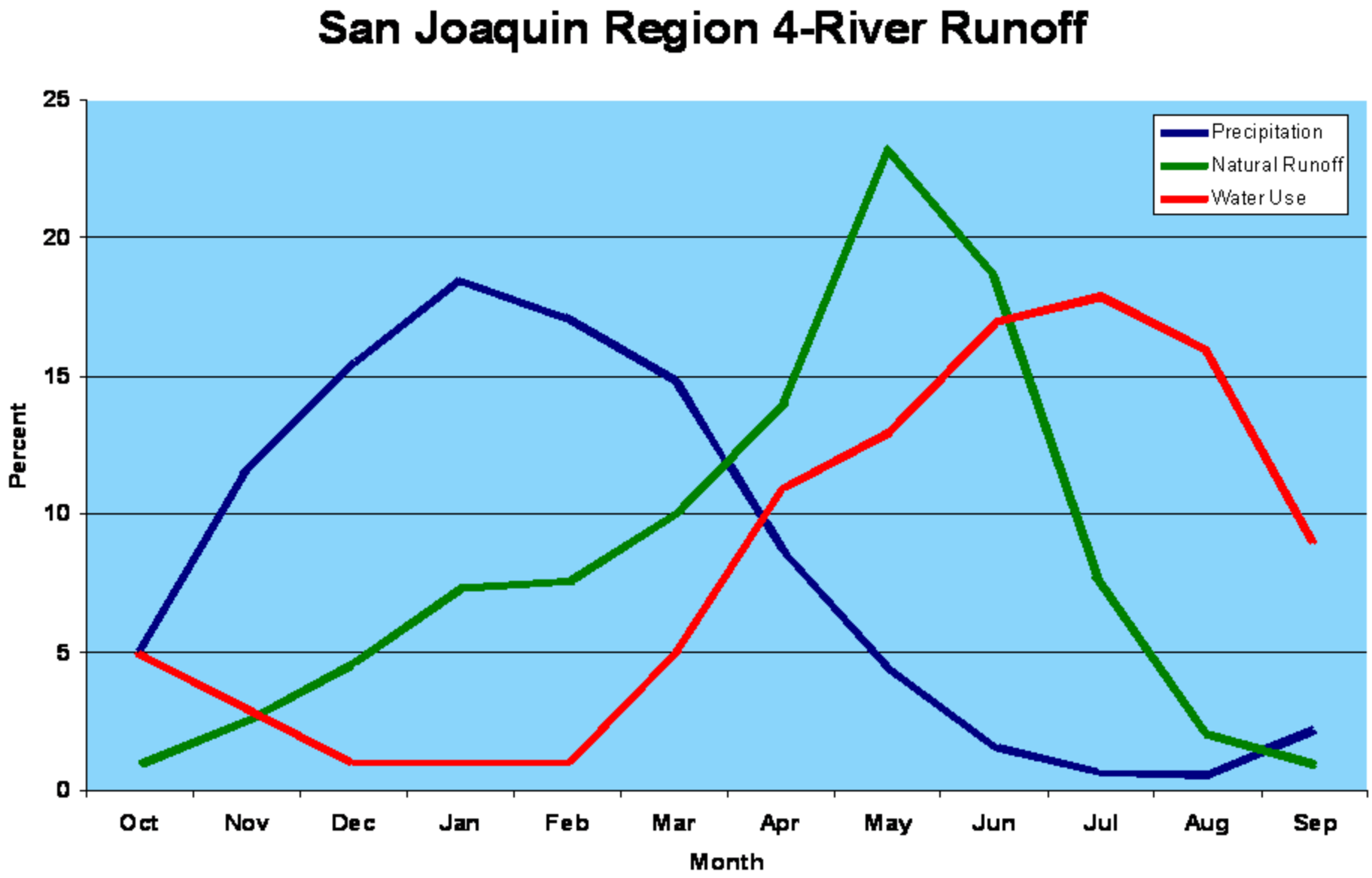
MONTHLY PRECIPITATION DISTRIBUTION


Northern Sierra 8 Station Precipitation
for Water Years 2013 and 2014
WY 2013
WY 2014
Average
Precipitation (inches)
0
2
4
6
8
10
12
14
16
18
20
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep
Time (month)

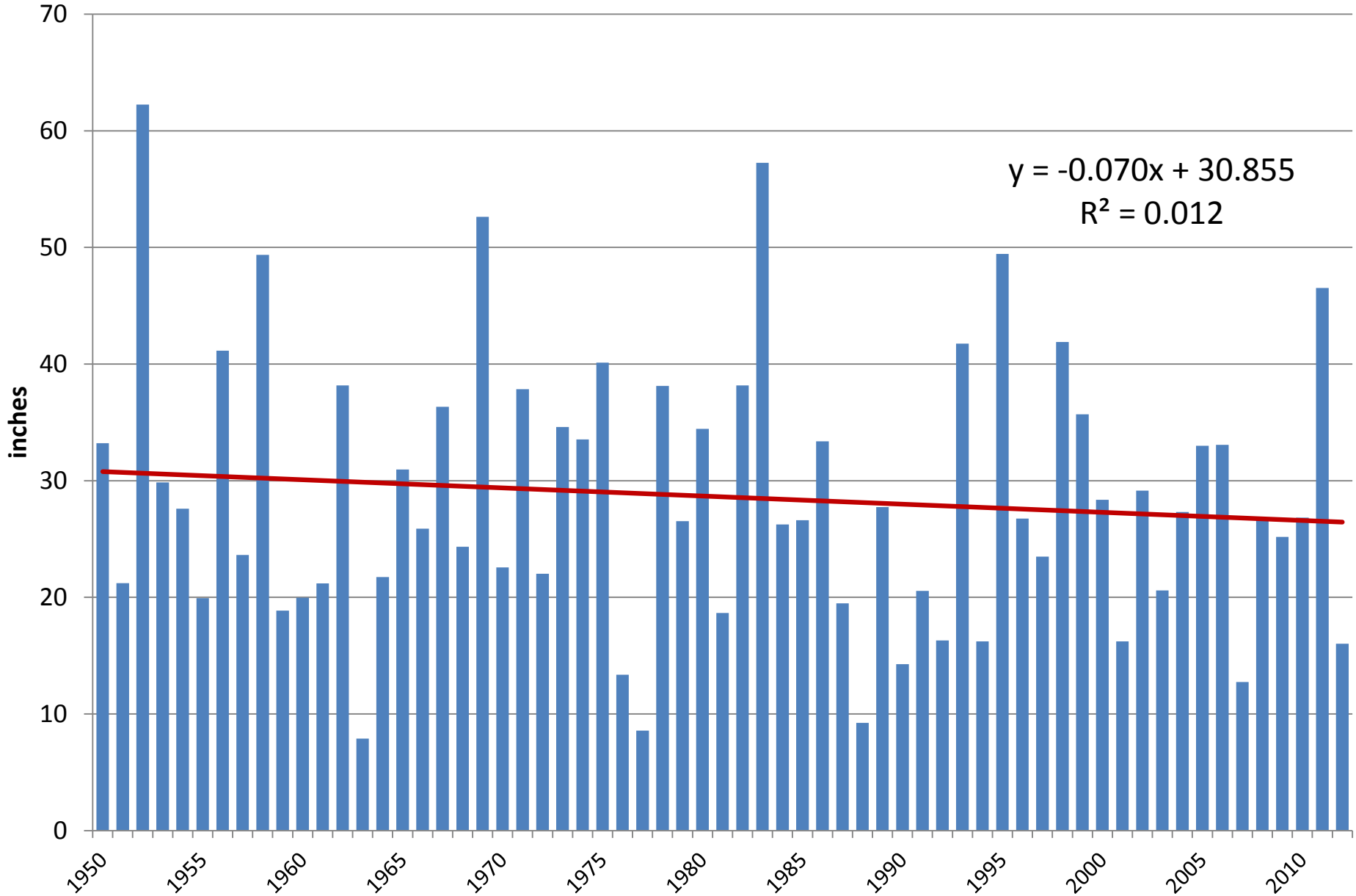

April 1 Snowpack Water Content
Statewide Percent of Average
250
200
150
100
50
0
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013


Sacramento River (SBB+FTO+YRS+AMF Combined)
April - July Runoff in percent of Water Year Runoff
Linear regression (least suqares) line showing historical trend
3-year running average
y = -0.0008x + 0.4312
R² = 0.0938
Percent of Water Year Runoff
Water Year (October 1 - September 30)
70%
65%
60%
55%
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
1906
1916
1926
1936
1946
1956
1966
1976
1986
1996
2006

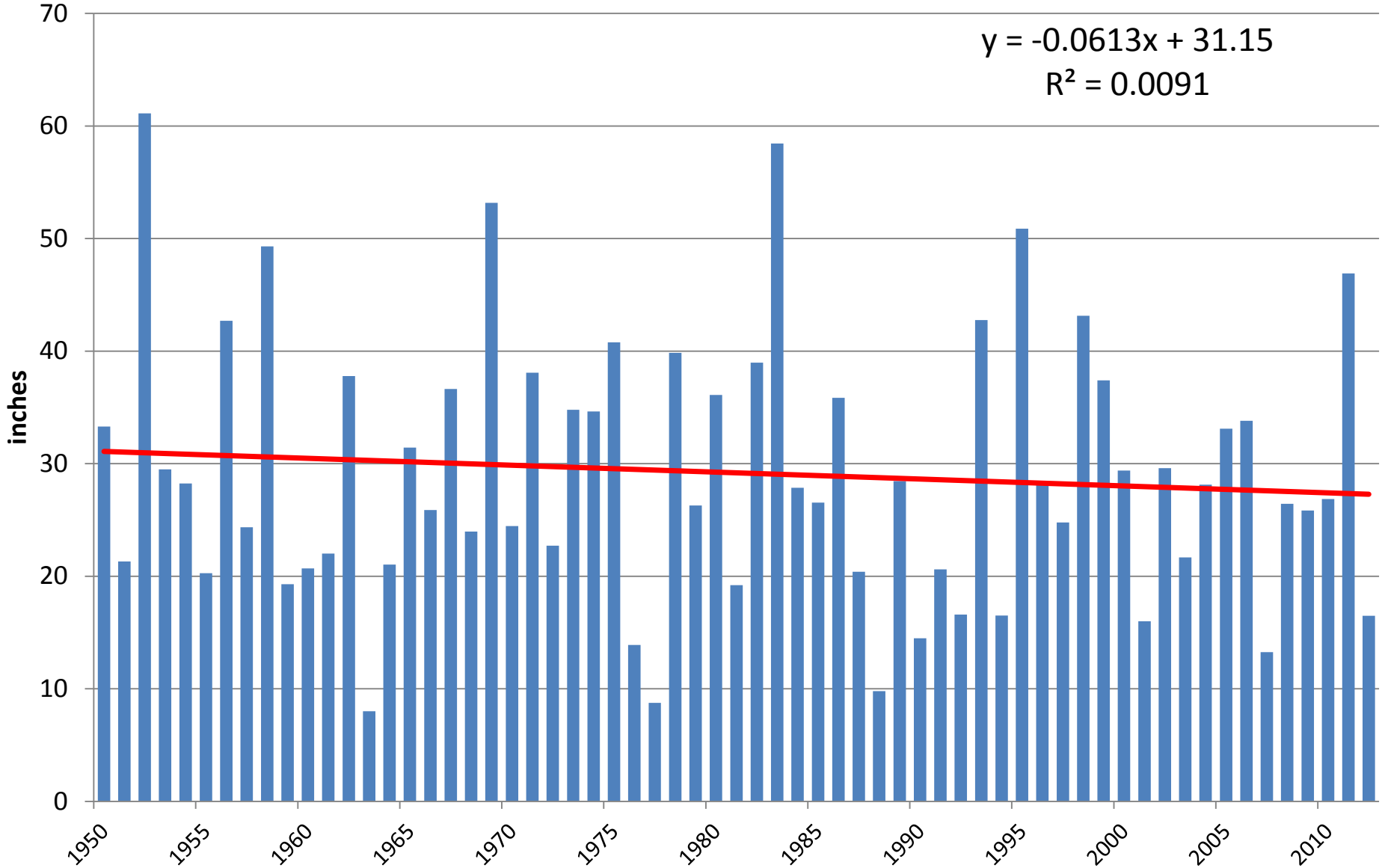

Water Supply and Demand Pattern
Northern California
Water Use
Natural Runoff
Precipitation
20
15
10
5
0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sept


San Joaquin Region 4-River Runoff
Precipitation
Natural Runoff
Water Use
Percent
25
20
15
10
5
0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Month

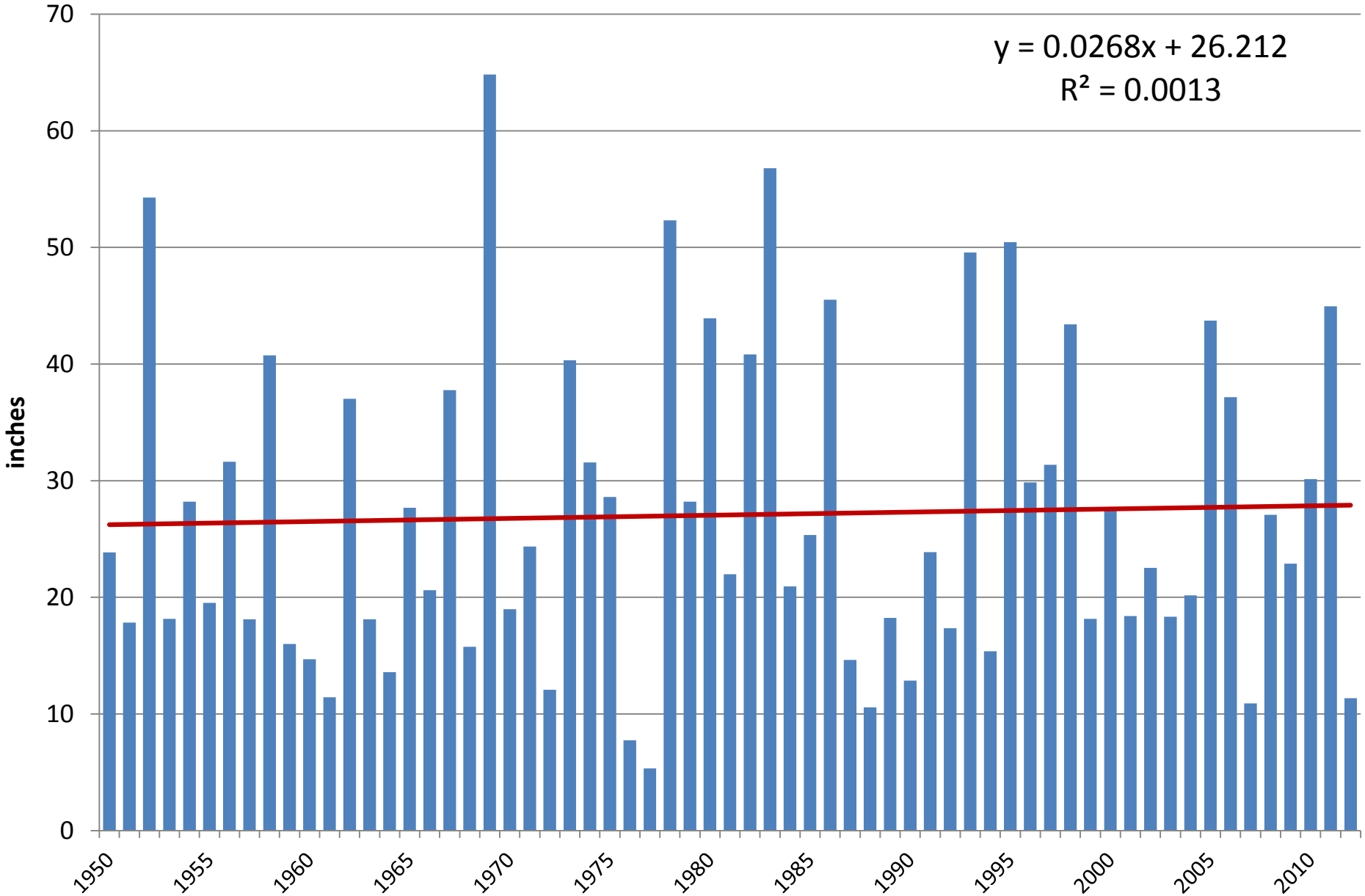
April 1 Snow-Water Content
13 Northern Sierra Nevada Snow Courses

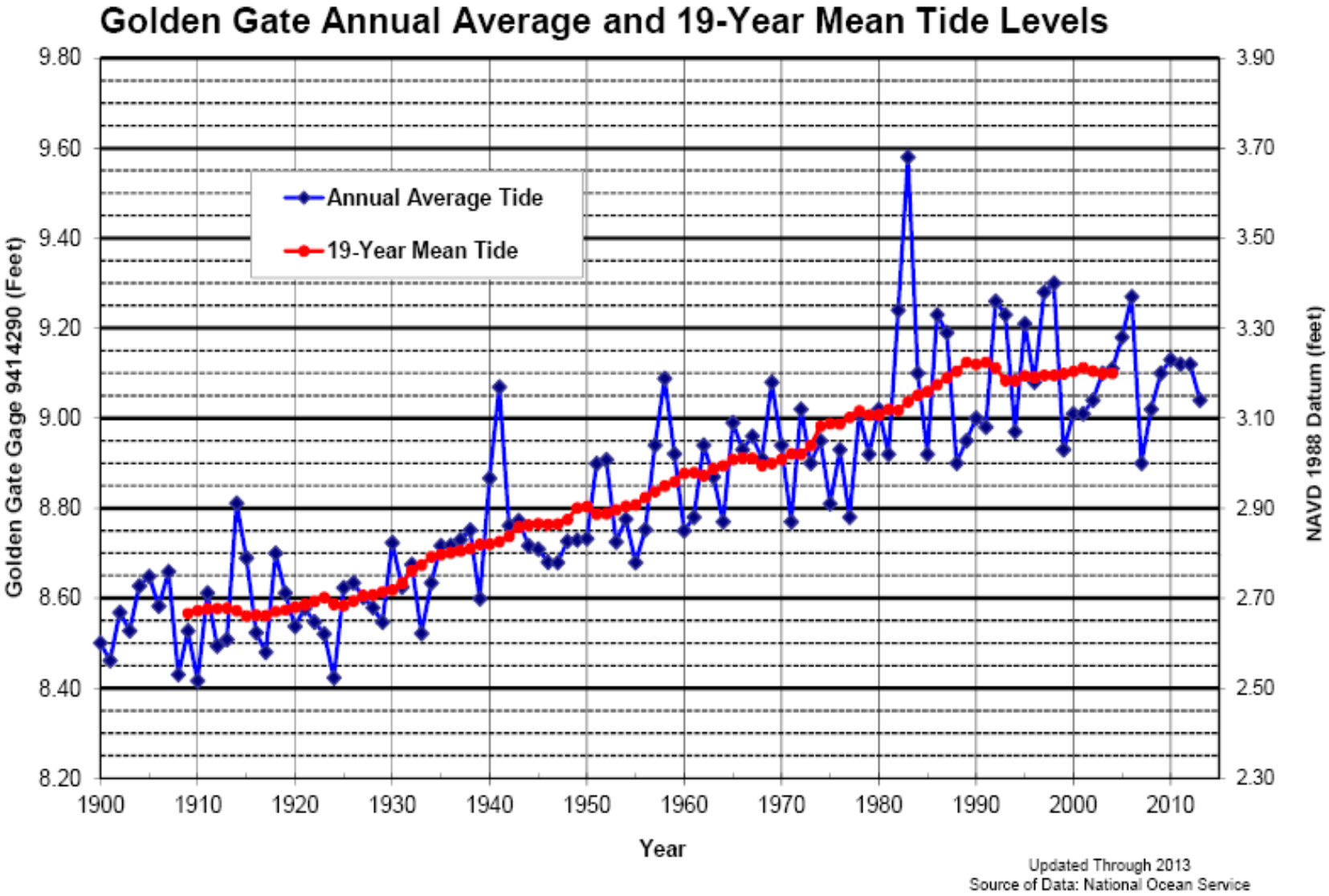


April 1 Snow Water Content
12 Northern Sierra Snow Courses
(Original 13 less Lake Spaulding)



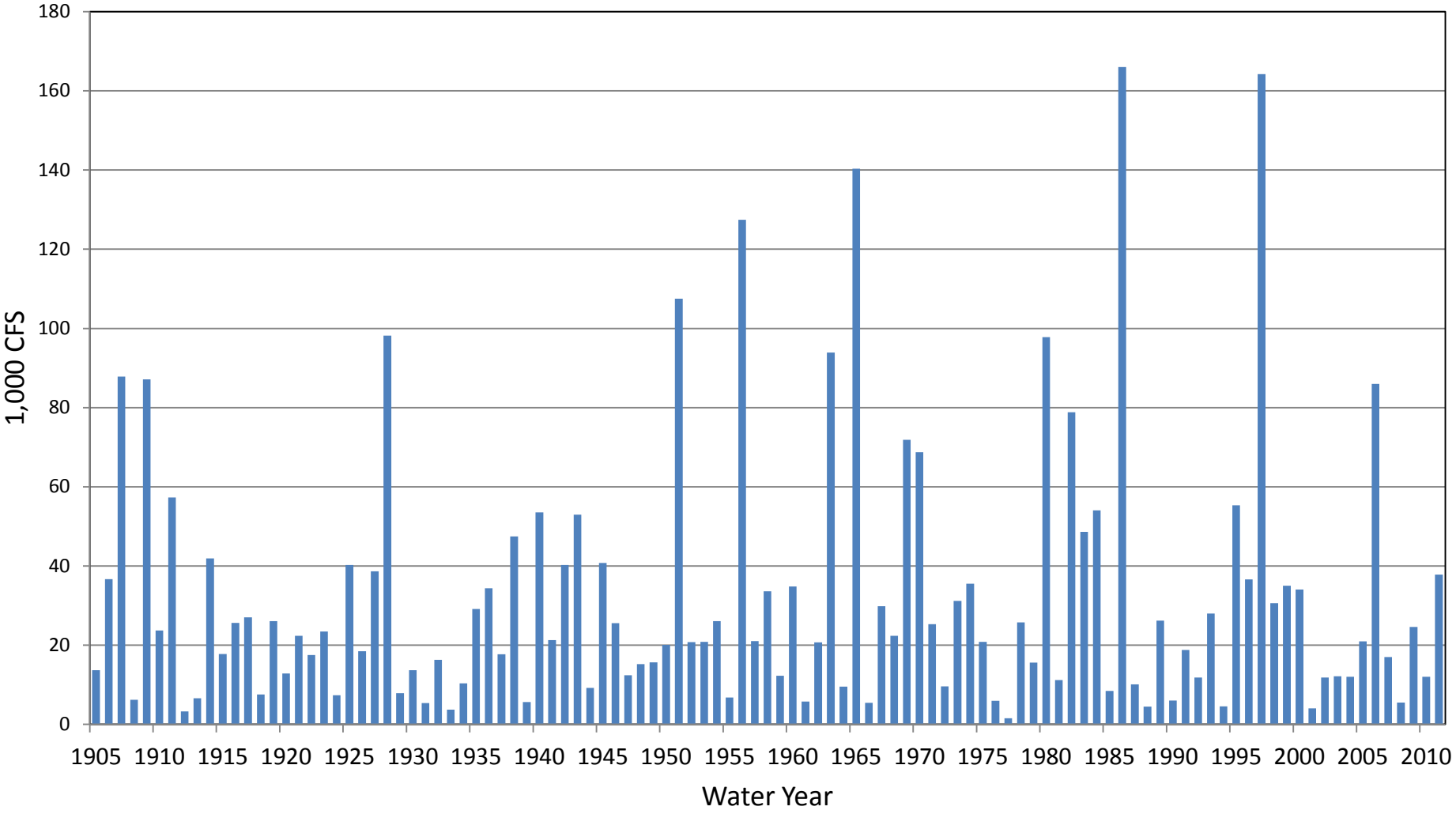
April 1 Snow-Water Content
13 Southern Sierra Nevada Snow Courses




Golden Gate Annual Average and 19-Year Mean Tide Levels
Annual Average Tide
19-Year Mean Tide
Golden Gate Gage 9414290 (Feet)
NAVD 1988 Datum (feet)
Year
9.80
9.60
9.40
9.20
9.00
8.80
8.60
8.40
8.20
3.90
3.70
3.50
3.30
3.10
2.90
2.70
2.50
2.30
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
Updated Through 2013
Source of Data: National Ocean Service

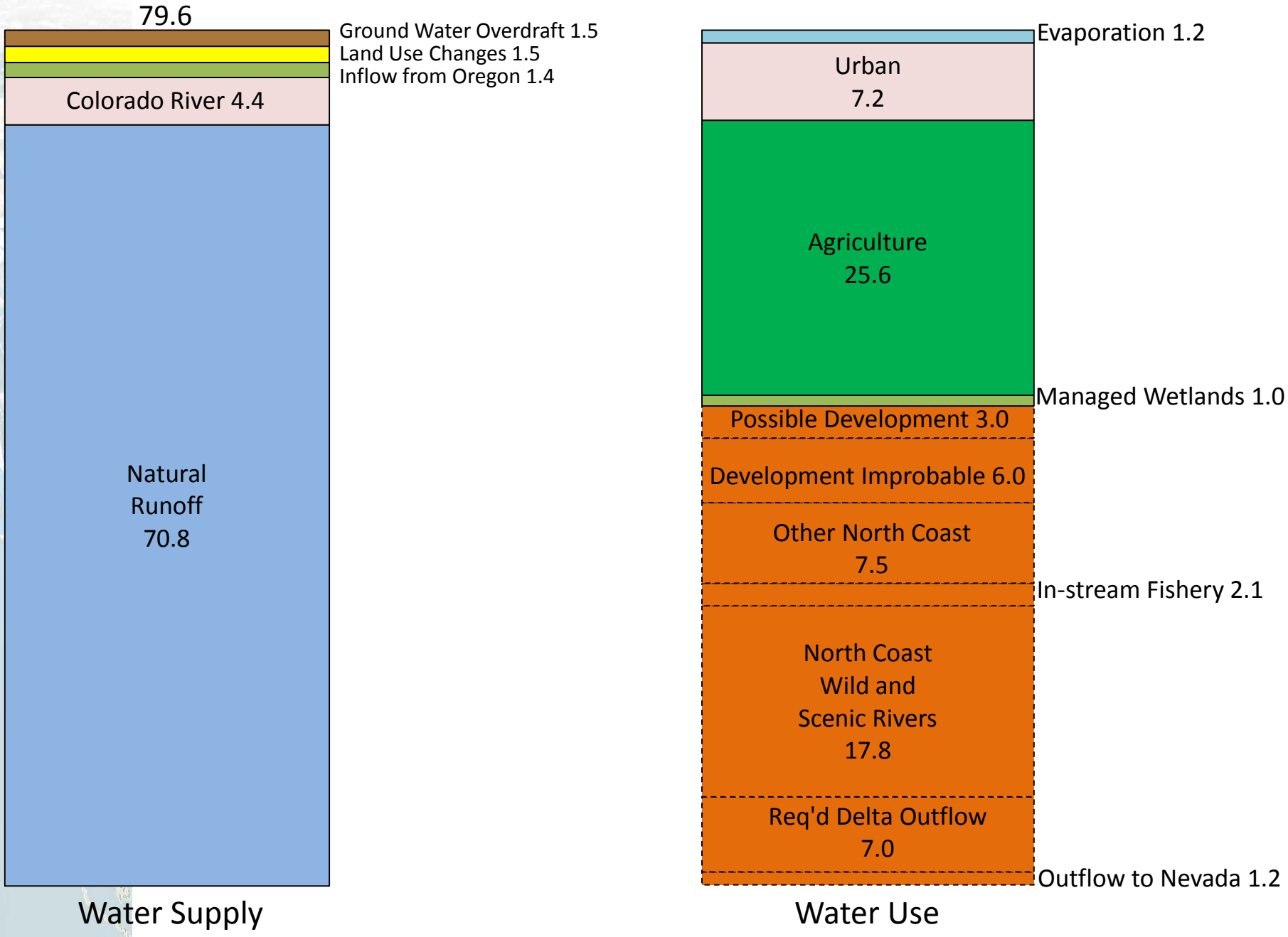
American River Runoff
Annual Maximum 3-Day Flow

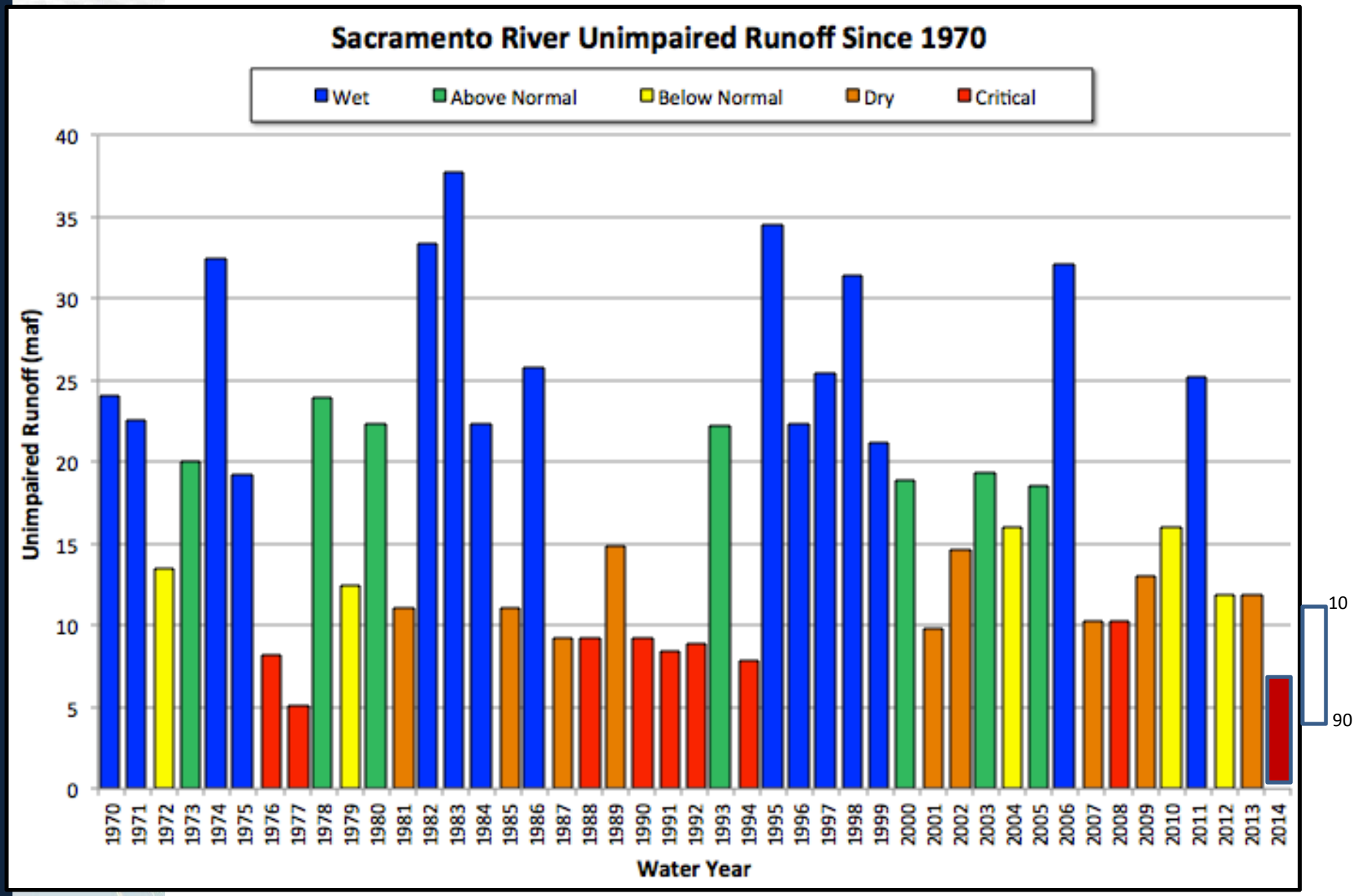
Unimpaired Runoff at Fair Oaks



Data from Corps of Engineers Sacramento District

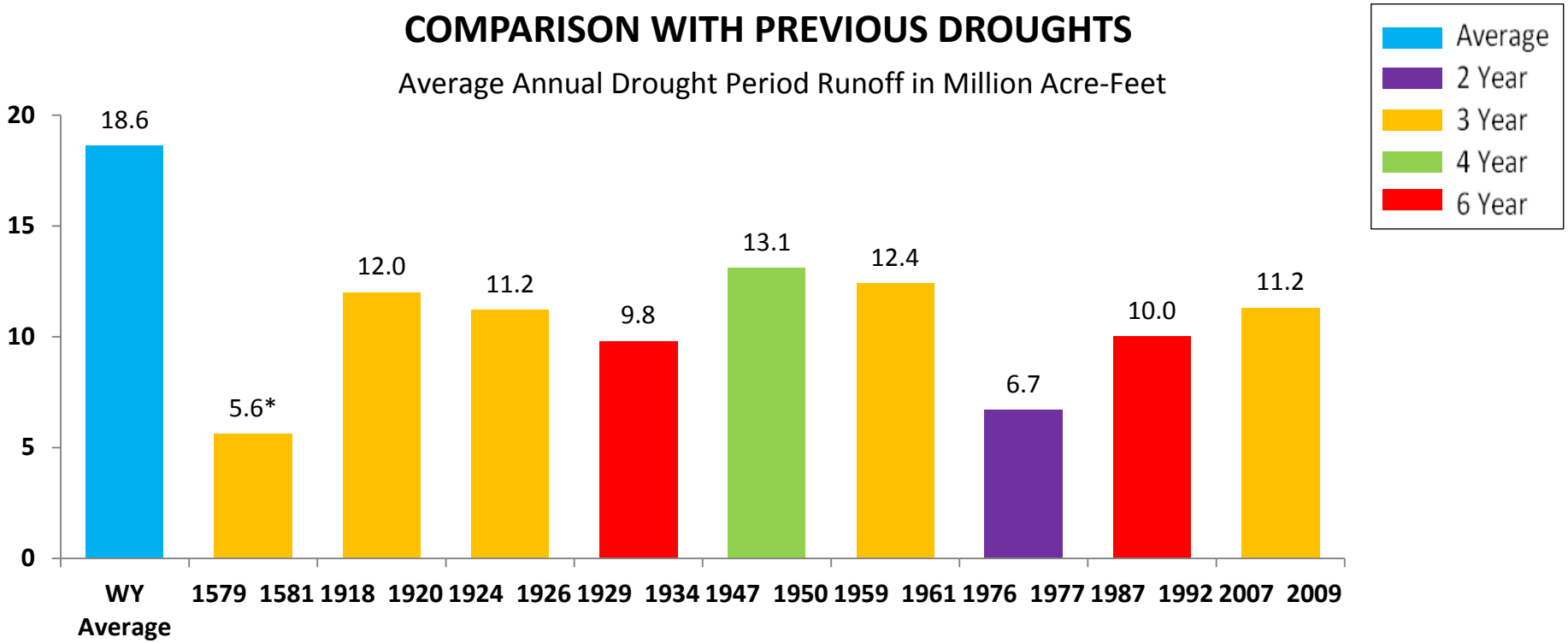
CA 2012 LEVEL WATER SUPPLY AND USE (Million Acre-Feet)




Sacramento River Unimpaired Runoff Since 1970
Wet
Above Normal
Below Normal
Dry
Critical
Unimpaired Runoff (maf)
0
5
10
15
20
25
30
35
40
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
Water Year
10
90

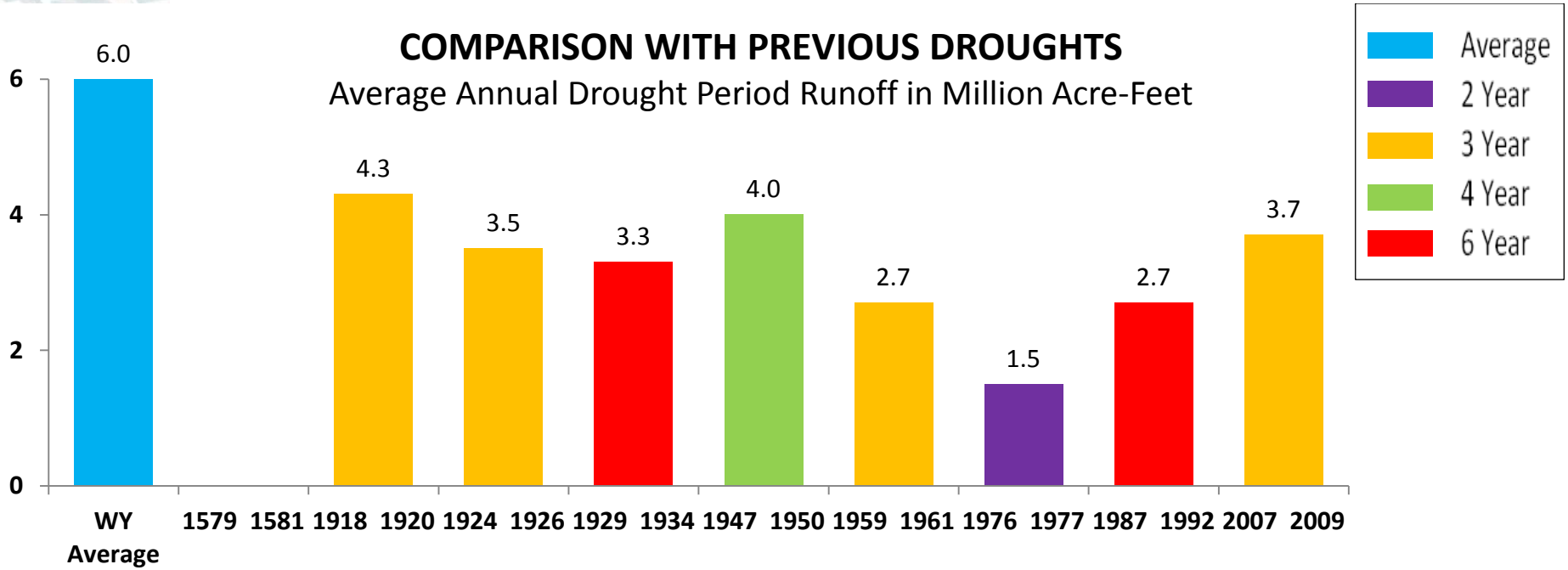
COMPARISON WITH PREVIOUS DROUGHTS

Average Annual Drought Period Runoff in Million Acre-Feet



SACRAMENTO FOUR RIVER RUNOFF

* from tree rings



SAN JOAQUIN FOUR RIVER RUNOFF