



Figure S1: Monthly PDSI time series in the seven climate divisions with the identified drought periods (red shade) using threshold of PDSI = -2 (red dotted line).

Table S1: Summary of the drought events identified based on PDSI time series in the seven climate divisions in California

Climate Division	Start	End	Duration (month)	Mean PDSI
NORTH COAST DRNG.	Jan/1985	Sep/1985	8	-2.93
	Jun/1987	Mar/1989	21	-2.37
	Mar/2001	Nov/2002	20	-2.44
	Mar/2007	May/2009	26	-2.79
	Feb/2013	Dec/2015	34	-2.82
NORTHEAST INTER. BASINS	Dec/1986	Nov/1988	23	-3.00
	Jan/1992	Dec/1992	11	-3.53
	Dec/2000	Apr/2003	28	-3.48
	Mar/2004	Oct/2004	7	-2.86
	Sep/2006	Mar/2009	30	-3.62
	Jan/2012	May/2015	40	-3.36
CENTRAL COAST DRNG.	Dec/1986	Jul/1991	55	-2.71
	Jun/1992	Dec/1992	6	-2.45
	Mar/1997	Nov/1997	8	-3.63
	Jan/2007	Oct/2009	33	-3.46
	Feb/2013	Oct/2016	44	-4.55
SACRAMENTO DRNG.	Apr/1987	Mar/1989	23	-2.56
	May/2001	Nov/2002	18	-2.43
	Jan/2007	Feb/2009	25	-2.97
	Mar/2013	Dec/2015	33	-2.98
SOUTH COAST DRNG.	Apr/1987	Apr/1988	12	-2.52
	Mar/1989	Mar/1991	24	-4.18
	Feb/2002	Feb/2003	12	-4.82
	Mar/2004	Oct/2004	7	-3.69
	Dec/2006	Dec/2009	36	-4.25
	May/2012	Dec/2016	55	-5.79
SAN JOAQUIN DRNG.	Dec/1986	Dec/1992	72	-2.38
	Mar/1997	Nov/1997	8	-3.37
	Jan/2007	Oct/2009	33	-3.69
	Jan/2012	Oct/2016	57	-4.61
SOUTHEAST DESERT BASINS	Apr/1987	Oct/1987	6	-2.37
	Mar/1989	Mar/1991	24	-3.44
	Mar/1994	Nov/1994	8	-2.89
	Dec/1995	Sep/1997	21	-3.36
	Oct/1999	Feb/2001	16	-3.34
	Dec/2001	Oct/2004	34	-2.95
	May/2006	Dec/2009	43	-3.10
	Mar/2012	Dec/2016	57	-3.16

Table S2: Summary of abbreviations

Abbreviation	Long Name
DOR	degree of regulation
DSWE	dynamic surface water extent
E_{pw}	elasticity of FrcSA to P_w
E_{swe}	elasticity of FrcSA to SWE_m
FrcSA	fractional river extent
GSW	global surface water
MCRW	multi-temporal China river width
NLDAS	national land data assimilation system
P/PET	humidity index
PDSI	palmer drought severity index
PET	potential evapotranspiration
P_w	cumulative winter precipitation
R^2	coefficient of determination
SAR	synthetic aperture radars
SWE_m	annual maximum snow water equivalent
USGS	United States Geographical Survey
WO	water occurrence
WTD	water table depth