ONE-PAGE PLACE ASSESSMENT: SACRAMENTO, CALIFORNIA

LOCATED IN THE LOWER SACRAMENTO SUBWATERSHED WITHIN THE CALIFORNIA WATERSHED

CLIMATE ⚐1

AVERAGE HIGH & LOW TEMPERATURES[1] *1877 – 2015*

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
°F HIGH	53.5	59.7	64.9	71.1	78.3	85.9	91.7	90.6	86.3	76.7	64.1	54.1	73.1
°F LOW	39.6	43.1	45.7	48.4	52.5	56.9	59.2	58.7	57.0	51.6	44.5	39.9	49.8
°C HIGH	11.9	15.4	18.3	21.7	25.7	29.9	33.2	32.6	30.2	24.8	17.8	12.3	22.8
°C LOW	4.2	6.2	7.6	9.1	11.4	13.8	15.1	14.8	13.9	10.9	6.9	4.4	9.9

RECORD HIGH[1]: 114° F | 45.6° C | *July 17, 1925* — RECORD LOW[1]: 17° F | -8.3° C | *December 11, 1932*

SUN ⚐2

LATITUDE: 38.6°

ELEVATION: 27 FT / 8 m

	MAR 21	JUN 21	SEP 21	DEC 21
DEGREES N or S of DUE EAST THE SUN RISES[2]	0°	31°N	0°	30°S
DEGREES N or S of DUE WEST THE SUN SETS[2]	0°	31°N	0°	30°S
SOLAR-NOON ALTITUDE ANGLE (ABOVE HORIZON)[a,2,3]	51°	75°	51°	28°

SOLAR-NOON WINTER-SOLSTICE SHADOW RATIO[b]: 1 : 1.88 ...AND AZIMUTH[c]: 0°

9AM & 3PM WINTER-SOLSTICE SHADOW RATIO[b,2]: 1 : 3.71 ...AND AZIMUTH[c,2]: 42°

WIND ⚐3

MAX SPEED[5]: 56 MPH / 90 km/h

PREVAILING WIND DIRECTION (FROM WHERE) & AVERAGE SPEED[d,4]

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
	SE	SSE	S	SW	SW	SSW	SSW	SSW	SSW	S	NNW	SSE	S
MPH	5.9	6.8	7.7	8.0	8.4	8.8	8.3	7.8	6.7	5.9	5.2	5.8	7.1
km/h	9	11	12	13	14	14	13	13	11	9	8	9	11

WATER ⚐4

AVERAGE RAINFALL (GAIN)[1] *1877 – 2015*

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
INCHES	3.66	3.20	2.67	1.41	0.62	0.16	0.01	0.03	0.30	0.94	1.98	3.17	18.15
mm	93.0	81.3	67.8	35.8	15.7	4.1	0.3	0.8	7.6	23.9	50.3	80.5	461.0

AVERAGE PAN EVAPORATION (POTENTIAL LOSS)[e,6] *1917 – 2005*

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
INCHES	1.49	2.34	4.54	7.13	10.19	12.17	12.77	11.28	9.08	6.35	2.89	1.45	81.68
mm	37.8	59.4	115.3	181.1	258.8	309.1	324.4	286.5	230.6	161.3	73.4	36.8	2,074.7

WETTEST YEAR'S RAIN[1]: 37.62 INCHES | 956 mm | *1983* — DRIEST YEAR'S RAIN[1]: 6.67 INCHES | 169 mm | *1976*

LONGEST PERIOD WITH NO MEASURABLE PRECIPITATION[7]: 169 DAYS: *May 22 – November 7, 2002*

RAINFALL INCOME[f]: 174 GPCD / 660 lpcd

AREA[g,8]: 97.9 SQ MILES / 253.5 km²

POPULATION[g,8]: 485,199 *2014 est.*

UTILITY-WATER USE[9]: 179 GPCD / 678 lpcd

HISTORICAL: 14 FT | 4.3 m | *1953* — DEPTH TO GROUNDWATER[h,10]: 16 FT | 4.9 m | *2003* — CURRENT

CURRENT GROUNDWATER EXTRACTION: — NATURAL GROUNDWATER RECHARGE[i,11]: —

WATERGY ⚐5

% of CALIFORNIA'S ELECTRICITY USED FOR WATER-RELATED PURPOSES[j,12]: 20%

TOTEM SPECIES ⚐6

REPTILE: Giant Gartersnake (Thamnophis gigas) CRUSTACEAN: Vernal Pool Fairy Shrimp *(Branchinecta lynchi)*

FISH: Delta Smelt *(Hypomesus transpacificus)* BIRD: Least Bell's Vireo *(Vireo bellii pusillus)* MEGAFAUNA: Chinook Salmon *(Oncorhynchus tshawytscha)*

AMPHIBIAN: California Red-legged Frog *(Rana draytonii)* PLANT: Sacramento Orcutt Grass *(Orcuttia viscida)*

FOR MORE INFORMATION & HOW TO APPLY IT

1. For more CLIMATE information, see the introduction, chapters 1, 2, & 4, and appendix 5 of *Rainwater Harvesting for Drylands and Beyond (RWHDB), Volume 1, 2nd Edition*

2. For more SUN information, see chapters 2 & 4 and appendices 5 & 7

3. For more WIND information, see chapters 2 & 4 and appendices 5 & 9

4. For more WATER information, see the introduction, chapters 1–4, and appendices 1–5

5. For more WATERGY information, see chapters 2 & 4 and appendix 9

6. For more TOTEM SPECIES information: the ethics, principles, and strategies throughout *RWHDB* help us shift from a negative to a positive impact on these species and their habitats and ecosystems, on which our quality of life also depends.

SACRAMENTO PLACE-ASSESSMENT NOTES

a. The solar-noon altitude angle (a.k.a., solar-noon elevation angle) refers to the number of degrees the sun is located above the equator-facing horizon at solar noon on the given date. In the northern hemisphere, the equator-facing horizon is to the south. In the southern hemisphere, the equator-facing horizon is to the north.

b. The solar-noon winter-solstice shadow ratio is the object's height : length of object's shadow cast on December 21 at noon (the longest noontime shadow of the year). The ratio is 1 : x, where x = 1 ÷ tangent (90 - (latitude + 23.44)).

c. Azimuth is the angle formed between a reference direction (here, due south) to the point on the horizon directly below a given object. Solar noon is the time on any day when the sun's azimuth is 0°. The 9 am & 3 pm winter-solstice azimuth indicates the sun's deviation, in degrees, east/west of due south at those times (–/+ 3 hours from solar noon) on December 21.

d. In October and December, the second-most frequent prevailing wind direction is NNW (ref. 4).

e. Data used from Davis 1 WSW, the closest and most similar available location that maintains pan-evaporation data. An evaporation pan holds water whose depth is measured daily as water evaporates. These data allow us to determine evaporation rates at a given location. Compare average rainfall (water gain) to potential water loss via evaporation by looking up pan-evaporation rates for your area. According to one definition, if pan-evaporation rates exceed rainfall rates, you are in a dryland environment. Another definition states that drylands are "land areas where the mean annual precipitation is less than two thirds of potential evapotranspiration (potential evaporation from soil plus transpiration by plants), excluding polar regions and some high mountain areas which meet this criterion but have completely different ecological characteristics" (Greenfacts.org). The higher the ratio of potential evaporation to rainfall, the more important evaporation-reducing strategies such as mulch, windbreaks, shading, and covered water storage become.

f. Calculated in situ w/ average rainfall, area, & population

g. City proper

h. USGS well ID #383855121340401 009N004E08L001M, ~7 miles NW of midtown Sacramento at 38°38'55", -121°34'04". Well was chosen for its longest-available period of record among area wells.

i.

j. Water-related energy use in California consumes ~20% of the state's electricity & ~30% of the state's non-power plant natural gas.

CREDITS: Brad Lancaster, Resource concept | **Megan Hartman,** Resource creation, research

SACRAMENTO PLACE-ASSESSMENT REFERENCES

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5. Historical Climate Almanac for Sacramento, MyForecast.com, accessed 8/21/2015

6. Monthly Average Pan Evaporation, Davis (CA) 1 WSW, www.wrcc.dri.edu/htmlfiles/westevap.final.html, accessed 8/21/2015

7. Michelle Breckner, Service Climatologist, WRCC, via email 8/25/2015

8. Census.gov, accessed 8/21/2015

9. 2014 Water Savings, portal.cityofsacramento.org/city-manager/media-releases/best-water-conservation-savings, accessed 8/24/2015

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11.

12. Managing an Uncertain Future, State of California Department of Water Resources (2008), Climate Change Adaptation Strategie for California's Water, www.water.ca.gov/climatechange/docs/ClimateChangeWhitePaper.pdf, accessed 1/6/2015