ONE-PAGE PLACE ASSESSMENT: SEDONA, ARIZONA

LOCATED IN THE UPPER VERDE SUBWATERSHED WITHIN THE COLORADO RIVER WATERSHED

CLIMATE ⚐1

AVERAGE HIGH & LOW TEMPERATURES[1] *1943 – 2010*

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
°F HIGH	56.0	60.0	64.8	72.9	82.4	92.3	96.1	93.4	88.3	77.8	65.4	56.5	75.5
°F LOW	30.8	33.3	36.6	42.3	49.8	58.1	65.1	63.8	58.2	48.6	37.6	30.9	46.3
°C HIGH	13.3	15.6	18.2	22.7	28.0	33.5	35.6	34.1	31.3	25.4	18.6	13.6	24.2
°C LOW	-0.7	0.7	2.6	5.7	9.9	14.5	18.4	17.7	14.6	9.2	3.1	-0.6	7.9

RECORD HIGH[1] 110° F | 43.3° C | *June 25, 1981* RECORD LOW[1] 0° F | -17.8° C | *January 14, 1962*

SUN ⚐2

LATITUDE 34.9°

ELEVATION 4,354 FT / 1,327 m

	MAR 21	JUN 21	SEP 21	DEC 21
DEGREES N or S of DUE EAST THE SUN RISES[2]	0°	30°N	0°	28°S
DEGREES N or S of DUE WEST THE SUN SETS[2]	0°	30°N	0°	28°S
SOLAR-NOON ALTITUDE ANGLE (ABOVE HORIZON)[a,2,3]	55°	79°	55°	32°

SOLAR-NOON WINTER-SOLSTICE SHADOW RATIO[b] 1 : 1.62 ...AND AZIMUTH[c] 0°

9AM & 3PM WINTER-SOLSTICE SHADOW RATIO[b,2] 1 : 3.11 ...AND AZIMUTH[c,2] 43°

WIND ⚐3

MAX SPEED[4] 99 MPH | 159 km/h

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

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
	NE	NE	SW	SW	SW	SW	SW	SW	SW	NE	NE	NE	ANNUAL
MPH	7	8	10	10	11	10	8	8	10	7	8	8	8.8
km/h	11	13	16	16	18	16	13	13	16	11	13	13	14.2

WATER ⚐4

AVERAGE RAINFALL (GAIN)[1] *1943 – 2010*

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
INCHES	2.03	1.86	1.96	1.11	0.59	0.37	1.76	2.15	1.61	1.42	1.33	1.65	17.84
mm	51.6	47.2	49.8	28.2	15.0	9.4	44.7	54.6	40.9	36.1	33.8	41.9	453.1

AVERAGE PAN EVAPORATION (POTENTIAL LOSS)[d,5]

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
INCHES													58.00
mm													1,415.2

WETTEST YEAR'S RAIN[1] 33.16 INCHES | 842.3 mm | *1965* DRIEST YEAR'S RAIN[1] 7.79 INCHES | 197.9 mm | *1956*

LONGEST PERIOD WITH NO MEASURABLE PRECIPITATION[6]: 107 DAYS: *March 16 – July 1, 1996*

RAINFALL INCOME[e] 1,621 GPCD / 6,135 lpcd

AREA[f,7] 19.14 SQ MILES / 49.6 km²

POPULATION[f,7] 10,031 / *2010*

UTILITY-WATER USE[8] 188 GPCD / 712 lpcd

HISTORICAL | DEPTH TO GROUNDWATER[g,9] | CURRENT

CURRENT GROUNDWATER EXTRACTION | NATURAL GROUNDWATER RECHARGE[h,10]

WATERGY ⚐5

of AVG AZ HOMES THAT COULD BE POWERED W/ ENERGY USED TO MOVE & TREAT SEDONA'S WATER[i,11]

TOTEM SPECIES ⚐6

[12]PLANT: Arizona Cliff Rose *(Purshia subintegra)*
[12]AMPHIBIAN: Chiricahua Leopard Frog *(Lithobates chiricahuensis)*
[12]FISH: Gila Chub *(Gila intermedia)*
[12]BIRD: Yellow-Billed Cuckoo *(Coccyzus americanus)*
[12]REPTILE: Northern Mexican Garter Snake *(T. e. megalops)*
[12]MAMMAL: River Otter *(Lontra canadensis)*
[13]MEGAFAUNA: Grizzly Bear *(Ursus arctos)*
[12]INSECT: Redrock Stonefly *(Anacroneuria wipukupa)*

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.

SEDONA PLACE-ASSESSMENT NOTES

a. Altitude angle (a.k.a., elevation angle) refers to the number of degrees the sun is located above the horizon at a given time and date.

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 0º. 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. 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.

d. Lake evaporation refers to the evaporation occurring from a small natural open water-body having negligible heat storage and very little heat transfer at its bottom and sides. It represents the water loss from ponds and small reservoirs but not from lakes that have large heat storage capacities. Lake evaporation is calculated using the observed daily values of pan-evaporative water loss, the mean temperatures of the water in the pan and of the nearby air, and the total wind run over the pan. Lake normals for the 1971–2000 period were calculated as means of daily means for a given station rather than a measure of total monthly evaporation. To convert the lake evaporation values from daily means to monthly means, we multiplied the daily by the number of days in each month, as directed by the given source.[1]

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

f. City proper

g.

h.

i.

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

SEDONA PLACE-ASSESSMENT REFERENCES

1. Sedona Ranger Station (#027708), wrcc.dri.edu, accessed 10/1/2013

2. Rainwater Harvesting for Drylands & Beyond, Vol 1, or esrl.noaa.gov/gmd/grad/solcalc, accessed 10/1/2013

3. RWHDB Vol 1, or Mar 21 = 90–latitude, Jun 21 = 90–(latitude–23.44), Sep 21 = 90–latitude, Dec 21 = 90–(latitude+23.44)

4. My Forecast, www.myforecast.com/bin/climate.m?city=10927, accessed 10/1/2013

5. www.sedonaaz.gov/sedonacms/Modules/ShowDocument.aspx?documentid=18060, accessed 10/1/2013

6. Michelle Breckner, Service Climatologist, WRCC, via phone 3/20/2012

7. Census.gov, accessed 3/20/2012

8. Calculated with data provided by Ruth Greenhouse, Conservation Coordinator, AZ Dept of Water Resources, via email 10/3/2013. This gpcd includes water from multiple area providers for all uses (not the residential sector alone). All data are from 2012.

9.

10.

11.

12. Jeff Humphrey, Public Outreach Specialist, Fish & Wildlife Service, Phoenix AZ, via phone 3/20/2012. See fws.gov/southwest/es/arizona/Docs_Species.htm for more info.

13. Wikipedia, en.wikipedia.org/wiki/Grizzly_bear, accessed 10/2/2013