ONE-PAGE PLACE ASSESSMENT: PHOENIX, ARIZONA

LOCATED IN THE LOWER SALT SUBWATERSHED WITHIN THE COLORADO RIVER WATERSHED

CLIMATE ⚐1

AVERAGE HIGH & LOW TEMPERATURES[1] *1933–2013*

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
HIGH (F)	66.2°	70.0°	76.0°	84.5°	93.7°	103.0°	105.7°	103.6°	99.1°	88.3°	75.3°	66.5°	86.0°
LOW (F)	41.7°	44.5°	49.2°	55.9°	64.3°	72.9°	80.6°	79.4°	73.1°	61.0°	48.5°	41.8°	59.4°
HIGH (C)	19.0°	21.1°	24.4°	29.2°	34.3°	39.4°	40.9°	39.8°	37.3°	31.3°	24.1°	19.2°	30.0°
LOW (C)	5.4°	6.9°	9.6°	13.3°	17.9°	22.7°	27.0°	26.3°	22.8°	16.1°	9.2°	5.4°	15.2°

RECORD HIGH[1] 122° F | 50.0° C | *June 26, 1990*

RECORD LOW[1] 17° F | -8.3° C | *January 5, 1950*

SUN ⚐2

LATITUDE 33.4°

ELEVATION 1,088 FT / 332 m

	MAR 21	JUN 21	SEP 21	DEC 21
DEGREES N or S of DUE EAST THE SUN RISES[2]	0°	29° N	0°	28° S
DEGREES N or S of DUE WEST THE SUN SETS[2]	0°	29° N	0°	28° S
SOLAR-NOON ALTITUDE ANGLE (ABOVE HORIZON)[a,2,3]	57°	80°	57°	33°

SOLAR-NOON WINTER-SOLSTICE SHADOW RATIO[b] 1 : 1.53 ...AND AZIMUTH[c] 0°

9AM & 3PM WINTER-SOLSTICE SHADOW RATIO[b,2] 1 : 2.92 ...AND AZIMUTH[c,2] 43°

WIND ⚐3

MAX SPEED[4] 86 MPH | 138 km/h

PREVAILING WIND DIRECTION (FROM WHERE)[5] & AVERAGE SPEED[6]

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
	E	W	WSW	WSW	W	WSW	ESE	ESE	E	ESE	ENE	W	ANNUAL
MPH	4.9	5.6	6.4	7.6	7.3	7.6	7.6	7.2	6.4	5.7	5.1	4.6	6.3
km/h	8	9	10	12	12	12	12	12	10	9	8	7	10

WATER ⚐4

AVERAGE RAINFALL (GAIN)[1] *1933–2013*

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
INCHES	0.78	0.76	0.84	0.28	0.13	0.09	0.86	1.02	0.68	0.57	0.55	0.90	7.46
mm	19.8	19.3	21.3	7.1	3.3	2.3	21.8	25.9	17.3	14.5	14.0	22.9	189.5

AVERAGE PAN EVAPORATION (POTENTIAL LOSS)[d,7] *1896–2005*

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
INCHES	3.03	4.02	6.11	8.64	11.33	12.67	13.10	11.87	9.69	6.81	4.15	2.96	94.38
mm	77.0	102.1	155.2	219.5	287.8	321.8	332.7	301.5	246.1	173.0	105.4	75.2	2,397.3

WETTEST YEAR'S RAIN[1] 15.37 INCHES | 390 mm | *1941*

DRIEST YEAR'S RAIN[1] 2.82 INCHES | 72 mm | *1956*

LONGEST PERIOD WITH NO MEASURABLE PRECIPITATION[8]
160 DAYS: *December 30, 1971 – June 7, 1972*

RAINFALL INCOME[e] 125 GPCD / 473 lpcd

AREA[f,9] 516.7 SQ MILES / 1,338 km²

POPULATION[f,9] 1,469,471 *2011 estimate*

UTILITY-WATER USE[10] 186 GPCD / 704 lpcd

DEPTH TO GROUNDWATER[g,11]: HISTORICAL 450 FT | 137 m | *1983* — CURRENT 550 FT | 168 m | *2013*

CURRENT GROUNDWATER EXTRACTION > NATURAL GROUNDWATER RECHARGE[12]

WATERGY ⚐5

of AVG AZ HOMES THAT COULD BE POWERED w/ENERGY USED TO MOVE & TREAT PHOENIX WATER[13] 12,229

TOTEM SPECIES ⚐6

PLANT: Cottonwood Tree *(Populus fremontii)*

MAMMAL: Lesser Long-Nosed Bat *(Leptonycteris yerbabuenae)*[15]

FISH: Gila Top Minnow *(Poeciliopsis occidentalis)*[14]

BIRD: Yuma Clapper Rail *(Rallus longirostris yumanensis)*[14]

AMPHIBIAN: Lowland Leopard Frog *(Rana yavapaiensis)*[15]

REPTILE: Northern Mexican Gartersnake *(Thamnophis eques)*[15]

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.

PHOENIX 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. If pan-evaporation rates exceed rainfall rates, you are in a dryland environment, where evaporation-reducing strategies such as mulch, windbreaks, shading, and covered water storage are very important.

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

f. City proper

g. Depths to groundwater vary widely—the given levels are intended to be generally representative of local conditions in Phoenix.

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

PHOENIX PLACE-ASSESSMENT REFERENCES

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2. Rainwater Harvesting for Drylands & Beyond, Vol 1, or esrl.noaa.gov/gmd/grad/solcalc, accessed 4/9/2013
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. www.myforecast.com/bin/climate.m?city=10899, accessed 4/9/2013
5. ftp-fc.sc.egov.usda.gov/AZ/NRI/prevailing_winds.pdf, accessed 2/6/2012
6. Phoenix Sky Harbor (1996–2006), www.wrcc.dri.edu/climatedata/climtables/westwind/#ARIZONA, accessed 4/9/2013
7. Mesa (1896–2005), www.wrcc.dri.edu/htmlfiles/westevap.final.html, accessed 4/9/2013
8. Michelle Breckner, Service Climatologist, Western Regional Climate Center, via telephone 4/17/2013
9. Census.gov, accessed 4/9/2013
10. Estimate for 2011, per Mary Lu Nunley, Public Information Specialist, Phoenix Water Conservation Office, via email 4/9/2013
11. For well at Dysart & Cave Creek Roads, per Gary Gin, Phoenix City Hydrologist, via 4/11/2013 email from Mary Lu Nunley
12. Per Gary Gin, Phoenix City Hydrologist, via 4/11/2013 email from Mary Lu Nunley
13. 160,688,765 kWh used to pump & treat water in FY2011–12, per Andy Terrey, City of Phoenix Water Services Dept, via email 4/11/2013. 1,095 kWh/month used by average Arizona household (per www.eia.gov/cneaf/electricity/esr/table5.html, accessed 4/11/2013) x 12 months/year = 13,140 kWh/year/household. 160,688,765 kWh/year ÷ 13,140 kWh/year/household = 12,229 households.
14. Cathy Wise, Audubon Arizona Educational Director, via telephone 4/12/2013
15. Jeff Humphreys, Public Outreach Specialist, U.S. Fish & Wildlife Service, via telephone 4/15/2013

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