ONE-PAGE PLACE ASSESSMENT: HOT SPRINGS, ARKANSAS

LOCATED IN THE OUACHITA HEADWATERS SUBWATERSHED WITHIN THE LOWER MISSISSIPPI WATERSHED

CLIMATE ⚐1

AVERAGE HIGH & LOW TEMPERATURES[1] *1892 – 2015*

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
°F HIGH	52.6	57.4	65.8	75.3	81.9	89.7	94.0	93.8	87.2	76.8	63.7	53.9	74.3
°F LOW	31.8	34.4	41.5	50.7	58.7	66.6	70.5	69.4	62.5	51.7	41.5	33.9	51.1
°C HIGH	11.4	14.1	18.8	24.1	27.7	32.1	34.4	34.3	30.7	24.9	17.6	12.2	23.5
°C LOW	-0.1	1.3	5.3	10.4	14.8	19.2	21.4	20.8	16.9	10.9	5.3	1.1	10.6

RECORD HIGH[1] 115° F | 46.1° C | *August 10, 1936* — RECORD LOW[1] -11° F | -23.9° C | *February 18, 1910*

SUN ⚐2

LATITUDE 34.5°

ELEVATION 585 FT / 178 m

	MAR 21	JUN 21	SEP 21	DEC 21
DEGREES N or S of DUE EAST THE SUN RISES[2]	0°	32°N	0°	30°S
DEGREES N or S of DUE WEST THE SUN SETS[2]	0°	32°N	0°	30°S
SOLAR-NOON ALTITUDE ANGLE (ABOVE HORIZON)[a,2,3]	56°	79°	56°	32°

SOLAR-NOON WINTER-SOLSTICE SHADOW RATIO[b] 1 : 1.60 ...AND AZIMUTH[c] 0°

9AM & 3PM WINTER-SOLSTICE SHADOW RATIO[b,2] 1 : 3.06 ...AND AZIMUTH[c,2] 43°

WIND ⚐3

MAX SPEED[5] 63 MPH | 101 km/h

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

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
	E	E	E	E / S	E	S	E	E	E	E	E	E	E
MPH	6.5	6.8	7.5	7.3	6.4	5.7	5.3	5.2	5.4	5.3	5.9	6.1	6.1
km/h	10	11	12	12	10	9	9	8	9	9	9	10	10

WATER ⚐4

AVERAGE RAINFALL (GAIN)[1] *1892 – 2015*

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
INCHES	4.42	4.00	5.12	5.65	6.19	4.39	4.46	3.42	3.86	4.06	4.73	4.73	55.03
mm	112.3	101.6	130.0	143.5	157.2	111.5	113.3	86.9	98.0	103.1	120.1	120.1	1397.8

AVERAGE PAN EVAPORATION (POTENTIAL LOSS)[d,6] *1956 – 1979*

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
INCHES	1	2	3.18	4.37	5.53	5.99	6.63	5.98	4.22	3.28	2.09	1	45.27
mm	25.4	50.8	80.8	111.0	140.5	152.1	168.4	151.9	107.2	83.3	53.1	25.4	1,149.9

WETTEST YEAR'S RAIN[1] 84.92 INCHES | 2,157 mm | *1973* — DRIEST YEAR'S RAIN[1] 38.72 INCHES | 983 mm | *1916*

LONGEST PERIOD WITH NO MEASURABLE PRECIPITATION[7]: 45 DAYS: *December 4, 1955 – January 18, 1956*

RAINFALL INCOME[e] 2,572 GPCD | 9,736 lpcd

AREA[f,8] 35.0 SQ MILES | 90.7 km²

POPULATION[f,8] 35,673 *2014 est.*

UTILITY-WATER USE[g,9] 427 GPCD | 1,616 lpcd

HISTORICAL 117.3 FT | 35.8 m | *1991* — DEPTH TO GROUNDWATER[h,10] 117.06 FT | 35.7 m | *2015* CURRENT

CURRENT GROUNDWATER EXTRACTION ≈ NATURAL GROUNDWATER RECHARGE[i]

WATERGY ⚐5

% of HOT SPRINGS' MUNICIPAL ENERGY USED TO MOVE & TREAT WATER[j,11]: 50%

TOTEM SPECIES ⚐6

MOLLUSK: Ouachita Rock Pocketbook *(Arkansia wheeleri)* REPTILE:

FISH: MAMMAL: Northern Long-Eared Bat *(Myotis septentrionalis)* BIRD:

AMPHIBIAN: MEGAFAUNA:

Available online at HarvestingRainwater.com/one-page-place-assessments

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.

HOT SPRINGS 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. 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.

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

f. City proper

g. Usually we would cite the *residential* gpcd: the average gallons per capita per day used by residents at home (excluding industrial, commercial, institutional, municipal, agricultural use, etc). However, as Hot Springs does not track residential gpcd, the gpcd provided is the quotient of the annual gallons of total water production for *all purposes* (5,554,456,000 in 2014 (ref. 9)) ÷ the number of residents (35,673 (ref. 8)) ÷ 365 days in a year. This is often called the *virtual* gpcd.

h. This well, ID #USGS 343048093030401 02S19W33CBD1 Hot Springs Mountain Dr, located in the town of Hot Springs at 34°30'48.15", 93°03'04.11", was chosen for its longest-available period of record. Both years' readings are from February 13 (ref 10).

i. Based on depth-to-groundwater data reported from ref. 10.

j. The total municipal kWh used by Hot Springs in FY 2015–16 (8/1/2014–7/30/2015) was 29,470,726.5 kWh. Of this, 49.8% (14,670,346 kWh) was used to move & treat water: 22,686 kWh for water distribution; 1,226,000 kWh for Lakeside Pumping Station; 2,024,400 for Ouachita Pumping Station; and 11,419,946 kWh for Sewer-Lift (ref. 11).

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

HOT SPRINGS PLACE-ASSESSMENT REFERENCES

1. Hot Springs 1 NNE station (#033466), wrcc.dri.edu, accessed 8/26/2015
2. Rainwater Harvesting for Drylands & Beyond, Vol 1, or esrl.noaa.gov/gmd/grad/solcalc, accessed 8/25/2015
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. Custom Wind Rose Plots, Arkansas ASOS, Hot Springs station, mesonet.agron.iastate.edu/sites/locate.php, accessed 8/26/2015
5. Record Wind Speed; Hot Springs National Park, AR; Almanac: Historical Information, myforecast.com, accessed 8/27/2015
6. Mean Monthly, Seasonal, and Annual Pan Evaporation for the United States, NOAA Technical Report NWS 34, Blakely Mountain Dam (34°36', -93°11'; elev. 867 ft.), station #0764, www.nws.noaa.gov/oh/hdsc/PMP_related_studies/TR34.pdf, accessed 8/27/2015
7. Michelle Breckner, Service Climatologist, WRCC, via email 8/25/2015
8. Census.gov, accessed 8/26/2015
9. Production Report for 2014 (Excel file) provided by Max Sestili, Stormwater Manager, City of Hot Springs, via email 10/16/2015
10. Daily Data, Depth to water level, nwis.waterdata.usgs.gov/nwis/gwlevels, accessed 8/27/2015
11. Entergy Accounts (Excel file) provided by Jessica Johnson, Stormwater Coordinator, City of Hot Springs, via email 9/13/2015