

ONE-PAGE PLACE ASSESSMENT: MOAB, UTAH

LOCATED IN THE UPPER COLORADO-KANE SPRINGS SUBWATERSHED WITHIN THE COLORADO RIVER WATERSHED

CLIMATE		AVERAGE HIGH & LOW TEMPERATURES ¹											1893-2005	
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
° F HIGH		42.0	51.8	61.9	71.9	82.3	93.1	99.1	96.5	87.3	74.4	58.3	45.1	72.0
° F LOW		18.0	25.5	34.2	41.9	50.1	57.5	64.1	62.8	52.8	40.8	30.6	21.4	41.6
° C HIGH		5.6	11.0	16.6	22.2	27.9	33.9	37.3	35.8	30.7	23.6	14.6	7.3	22.2
° C LOW		-7.8	-3.6	1.2	5.5	10.1	14.2	17.8	17.1	11.6	4.9	-0.8	-5.9	5.3
RECORD HIGH ²	114° F	45.6° C	July 7, 1989					RECORD LOW ²	-24° F	-31.1° C	January 22, 1930			

SUN		MAR 21 JUN 21 SEP 21 DEC 21					
LATITUDE	38.6°	DEGREES N or S of DUE EAST THE SUN RISES ³		0°	31°N	0°	30°S
		DEGREES N or S of DUE WEST THE SUN SETS ³		0°	31°N	0°	30°S
ELEVATION	4,021 FT 1,226 m	SOLAR-NOON ALTITUDE ANGLE (ABOVE HORIZON) ^{a,3,4}		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,3}		1 : 3.71	...AND AZIMUTH ^{c,3}		42°

WIND		PREVAILING WIND DIRECTION (FROM WHERE) ⁵ & AVERAGE SPEED ⁶											MAX SPEED ⁶			
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	MPH	km/h
		NW	W	W	W	W	SW	SE	E	W	W	W	NW	W	78	126
MPH		7	8	9	9	10	10	10	9	10	9	8	8	9		
km/h		11	13	14	14	16	16	16	14	16	14	13	13	14		

WATER		AVERAGE RAINFALL (GAIN) ¹											1893-2005	
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
INCHES		0.56	0.43	0.85	0.98	0.72	0.48	0.83	0.86	0.75	1.16	0.74	0.65	9.01
mm		14.2	10.9	21.6	24.9	18.3	12.2	21.1	21.8	19.1	29.5	18.8	16.5	228.9
		AVERAGE PAN EVAPORATION (POTENTIAL LOSS) ^{d,7}											1889-2005	
INCHES		0.00	0.00	4.19	7.29	10.41	12.03	12.72	10.75	7.66	4.25	2.26	0.00	71.56
mm		0.0	0.0	106.4	185.2	264.4	305.6	323.1	273.1	194.6	108.0	57.4	0.0	1,817.6
WETTEST YEAR'S RAIN ²	16.4 INCHES	417 mm	1983	DRIEST YEAR'S RAIN ²	4.3 INCHES	110 mm	1898	LONGEST PERIOD WITH NO MEASURABLE PRECIPITATION ⁸	112 DAYS: May 25 – September 15, 1954				RAINFALL INCOME ^e	347 GPCD
													1,315 lpcd	
AREA ^{f,9}	4.13 SQ MILES	10.7 km ²	POPULATION ^{f,9}	5,101	2011 est.	UTILITY-WATER USE ¹⁰	188 GPCD						712 lpcd	
HISTORICAL	0 FT	0.0 m	DEPTH TO GROUNDWATER ^{g,11}	0 FT	0.0 m	CURRENT								
CURRENT GROUNDWATER EXTRACTION			NATURAL GROUNDWATER RECHARGE ^{h,i,12,13}											

WATERGY		# OF UTAH HOMES THAT COULD BE POWERED w/ ENERGY USED TO MOVE & TREAT MOAB'S WATER ¹⁴

TOTEM SPECIES		FISH:	Humpback chub (<i>Gila cypha</i>) ¹⁵	MAMMAL:	Desert bighorn (<i>Ovis canadensis nelsoni</i>) ¹⁶
BIRD:		Willow flycatcher (<i>Empidonax traillii</i>) ¹⁵	PLANT:		Jones Cycladenia (<i>Cycladenia humilis jonesii</i>) ¹⁵
AMPHIBIAN:		Boreal toad (<i>Bufo boreas boreas</i>) ¹⁶	MEGAFUNA:	Mountain lion (<i>Puma concolor</i>) ¹⁶	REPTILE:

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.

MOAB 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 $x = 1 \div \tan(90 - (\text{latitude} + 23.44))$.
- 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. 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.
- h.
- i.

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

MOAB PLACE-ASSESSMENT REFERENCES

1. Per Laurel Hagen, Executive Director, Canyonlands Watershed Council, via email March 10, 2013
2. Moab station (#425733), wrcc.dri.edu, accessed 3/10/2013
3. Rainwater Harvesting for Drylands & Beyond, Vol 1, or esrl.noaa.gov/gmd/grad/solcalc, accessed 6/13/2010
4. RWHDB Vol 1, or Mar 21 = $90 - \text{latitude}$, Jun 21 = $90 - (\text{latitude} - 23.44)$, Sep 21 = $90 - \text{latitude}$, Dec 21 = $90 - (\text{latitude} + 23.44)$
5. Western Regional Climate Center, Prevailing Wind Direction, www.wrcc.dri.edu/htmlfiles/westwinddir.html, accessed 3/10/2013. WRCC's data varies slightly from observations of Laurel Hagen, Executive Director of Canyonlands Watershed Council, who described winter winds from the N/NW, April–June winds from the S/SW, and summer winds from the S, via email 3/10/2013.
6. MyForecast.com, Almanac: Historical Information, www.myforecast.com/bin/climate.m?city=31478, accessed 3/10/2013
7. Western Regional Climate Center, Monthly Average Pan Evaporation, www.wrcc.dri.edu/htmlfiles/westevap.final.html, accessed 3/10/2013
8. Michelle Breckner, Service Climatologist, Western Regional Climate Center, via phone 3/11/2013
9. Census.gov, accessed 3/10/2013
10. This statistic for Grand County *excluding* the City of Moab was found in Grand Water & Sewer Service Agency's 2011 Annual Report, downloaded on 3/10/2013 from www.grandwater.org/Documents/2011%20Annual%20Report.pdf. The City of Moab employee with whom we spoke via phone on 3/11/2013 said they are unable to provide gpcd data without submission of a records request form. The most recent gpcd for Moab we found online was for 1996, when it was 276 gpcd. The same report listed Grand County's 1996 usage as 224 gpcd. Report downloaded 3/10/2012 from Utah Division of Water Resources' website, at www.water.utah.gov/planning/swp/seastcol/swp_sc11.pdf. If Moab's usage is still 123% of Grand County's, then in 2011 it would have been 231 gpcd.
- 11.
- 12.
- 13.
- 14.
15. BLM.gov, Threatened & Endangered Species, www.blm.gov/ut/st/en/fo/moab/more/threatened_and_endangered.html, accessed 3/12/2013
16. Brad Lancaster, via email 3/13/2013
- 17.
- 18.