

ONE-PAGE PLACE ASSESSMENT: FORT MYERS, FLORIDA

LOCATED IN THE CALOOSAHATCHEE SUBWATERSHED WITHIN THE SOUTH ATLANTIC GULF WATERSHED

CLIMATE

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AVERAGE HIGH & LOW TEMPERATURES¹

1892 – 2016

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	
°F HIGH	74.4	75.9	79.8	84.1	88.2	90.0	90.6	90.8	89.3	85.1	79.6	75.4	83.6	
°F LOW	53.8	54.8	58.5	62.4	67.4	72.1	73.8	74.2	73.4	68.3	60.4	55.2	64.5	
°C HIGH	23.6	24.4	26.6	28.9	31.2	32.2	32.6	32.7	31.8	29.5	26.4	24.1	28.7	
°C LOW	12.1	12.7	14.7	16.9	19.7	22.3	23.2	23.4	23.0	20.2	15.8	12.9	18.1	
RECORD HIGH ¹	103° F		39.4° C		June 16, 1981			RECORD LOW ¹		24° F		-4.4° C		December 29, 1894

SUN

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MAR 21 JUN 21 SEP 21 DEC 21

LATITUDE	26.6°	DEGREES N or S of DUE EAST THE SUN RISES ²	0°	27°N	0°	26°S
		DEGREES N or S of DUE WEST THE SUN SETS ²	0°	27°N	0°	26°S
ELEVATION	10 FT 3 m	SOLAR-NOON ALTITUDE ANGLE (ABOVE HORIZON) ^{2,3}	63°	87°	63°	40°
		SOLAR-NOON WINTER-SOLSTICE SHADOW RATIO ³	1 : 1.19		...AND AZIMUTH ⁴	0°
		9AM & 3PM WINTER-SOLSTICE SHADOW RATIO ^{3,5}	1 : 2.28		...AND AZIMUTH ^{4,2}	45°

WIND

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MAX SPEED^{5,6}

48 77

PREVAILING WIND DIRECTION (FROM WHERE) & AVERAGE SPEED^{6,4}

MPH km/h

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
	E	E	E	E	E	E	E	E	E	ENE	NE	NE	E
MPH	7.6	8.0	8.6	8.3	7.6	6.6	5.8	6.0	6.7	7.7	7.7	7.3	7.3
km/h	12	13	14	13	12	11	9	10	11	12	12	12	12

WATER

☒⁴

AVERAGE RAINFALL (GAIN)¹

1892 – 2016

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
INCHES	1.75	2.01	2.48	2.02	3.67	9.30	8.70	8.78	8.31	3.66	1.44	1.56	53.68
mm	44.5	51.1	63.0	51.3	93.2	236.2	221.0	223.0	211.1	93.0	36.6	39.6	1363.5

AVERAGE PAN EVAPORATION (POTENTIAL LOSS)¹⁶

1951 – 1966

INCHES	3.19	3.91	5.65	6.76	7.84	7.39	6.77	6.14	5.42	4.90	3.77	3.05	64.79
mm	81.0	99.3	143.5	171.7	199.1	187.7	172.0	156.0	137.7	124.5	95.8	77.5	1,645.7

WETTEST YEAR'S RAIN¹ 80.17 INCHES 2036 mm 1947 DRIEST YEAR'S RAIN¹ 32.83 INCHES 834 mm 1964

LONGEST PERIOD WITH NO MEASURABLE PRECIPITATION⁷ 41 DAYS: February 19 – April 1, 1935 RAINFALL INCOME⁸ 1,380 GPCD
5,223 lpcd

AREA^{8,b} 39.96 SQ MILES 103.5 km² POPULATION^{8,s} 74,013 2015 est. UTILITY-WATER USE^{8,9} 82 GPCD
310 lpcd

HISTORICAL +36.9 FT +11.3 m 1987 WATER LEVEL ABOVE SPECIFIC VERTICAL DATUM¹⁰ -13.16 FT -4.0 m 2016 CURRENT

CURRENT GROUNDWATER EXTRACTION > NATURAL GROUNDWATER RECHARGE^{k,11}

WATERGY

☒⁵

% of FORT MYERS' MUNICIPAL kWh USED TO MOVE & TREAT WATER¹²

TOTEM SPECIES

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BIRD: Wood stork (*Mycteria americana*) MAMMAL: Florida panther (*Puma concolor coryi*)

FISH: Gulf sturgeon (*Acipenser oxyrinchus desotoi*) PLANT: Aboriginal prickly apple cactus (*Harrisia aboriginum*)

REPTILE: Eastern Indigo snake (*Drymarchon corais couperi*) MEGAFAUNA: Loggerhead sea turtle (*Caretta caretta*)

FOR MORE INFORMATION & HOW TO APPLY IT

- F1. 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
- F2. For more SUN information, see chapters 2 & 4 and appendices 5 & 7
- F3. For more WIND information, see chapters 2 & 4 and appendices 5 & 9
- F4. For more WATER information, see the introduction, chapters 1–4, and appendices 1–5
- F5. For more WATERGY information, see chapters 2 & 4 and appendix 9
- F6. 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.

FORT MYERS 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 $x = 1 \div \text{tangent}(90 - (\text{latitude} + 23.44))$.
- 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. Data from custom 16-bin wind rose. Changing the number of bins—more bins yield more-specific wind directions, fewer bins yield more-general directions—will often change the apparent prevailing wind direction. Choose the degree of specificity that best suits your context.
- e. Per Figure 1609B, Ultimate Design Wind Speeds for Risk Category III and IV Buildings and Other Structures, wind speeds as high as 185 mph at 10 m elevation should be planned for during hurricanes (cityftmyers.com/DocumentCenter/Home/View/491).
- f. 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. One definition says if pan-evaporation exceeds rainfall, you are in a dryland environment. Another says drylands are "land areas where mean annual precipitation is $< 2/3$ of potential evapotranspiration (potential evaporation from soil + transpiration by plants), excluding certain regions that meet this criterion but have completely different ecological characteristics" (Greenfacts.org). The higher the ratio of potential evaporation : rainfall, the more important evaporation-reducing strategies such as mulch, windbreaks, shading, & covered water storage become. The weather station whose data appear here is 105 miles N of Ft Myers, also on south FL's west coast. While Moore Haven Lock station is only 45 miles E of Ft Myers, its inland location likely means notably lower humidity & therefore higher pan-evaporation rates. Ft Myers' ratio of pan evaporation : rainfall is 1.2 : 1.
- g. Calculated in situ w/ average rainfall, area, & population
- h. City proper
- i. Uniform residential per-capita water use for the South Florida Water Management District (16 counties, including Lee) for fiscal year 2014–15 was reported as 82 gpcd. Uniform gross per-capita water use was reported as 125 gpcd (ref. 9).
- j. USGS Well ID # 263718081485003 L-2292, located at latitude $26^\circ 37' 20.8''$, longitude $81^\circ 48' 50.1''$, was chosen for its longest-available period of record. From 10/29/1981 to 10/31/2016, the groundwater level in this well dropped 50.06 feet (ref. 10).
- k. "Approximately 90% of the water used in homes and businesses comes from groundwater... The remaining 10% comes from surface waters such as lakes, community ponds and rivers. Both surface and groundwater supplies are primarily recharged by rainfall (ref. 11)." In this context, we infer that dropping groundwater levels reflect extraction rates greater than natural recharge.

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

FORT MYERS PLACE-ASSESSMENT REFERENCES

- 1. Fort Myers Page Field Airport station (#083186), wrcc.dri.edu, accessed 7/8/2016
- 2. Rainwater Harvesting for Drylands & Beyond, Vol 1, or esrl.noaa.gov/gmd/grad/solcalc, accessed 7/9/2016
- 3. RWHDB Vol 1, or Mar 21 = $90 - \text{latitude}$, Jun 21 = $90 - (\text{latitude} - 23.44)$, Sep 21 = $90 - \text{latitude}$, Dec 21 = $90 - (\text{latitude} + 23.44)$
- 4. Custom Wind Rose Plots, mesonet.agron.iastate.edu/sites/locate.php, Florida ASOS network, Fort Myers Page Field station, 1948–2016, accessed 7/9/2016
- 5. Almanac: Historical Information, www.myforecast.com/bin/almanac.m?city=KRSW, accessed 7/9/2016
- 6. Bay Lake station (#0520), $28^\circ 04' - 81^\circ 30'$, from "Mean Monthly, Seasonal, and Annual Pan Evaporation for the United States," www.nws.noaa.gov/oh/hdsc/Technical_reports/TR34.pdf, accessed 7/9/2016
- 7. Michelle Breckner, Service Climatologist, WRCC, via email 11/8/2016
- 8. Census.gov, accessed 7/8/2016
- 9. South Florida Water Management District (SFWMD)'s Tentative Budget Submission, August 2016, p. 159, www.sfwmd.gov/sites/default/files/documents/tentative_budget_submission_fiscal_year2016_17.pdf, accessed 11/7/2016
- 10. USGS National Water Information System, Groundwater Levels for the Nation, nwis.waterdata.usgs.gov/nwis/gwlevels, accessed 11/7/2016
- 11. Water Conservation, SFWMD website, www.sfwmd.gov/community-residents/water-conservation, accessed 11/7/2016
- 12.