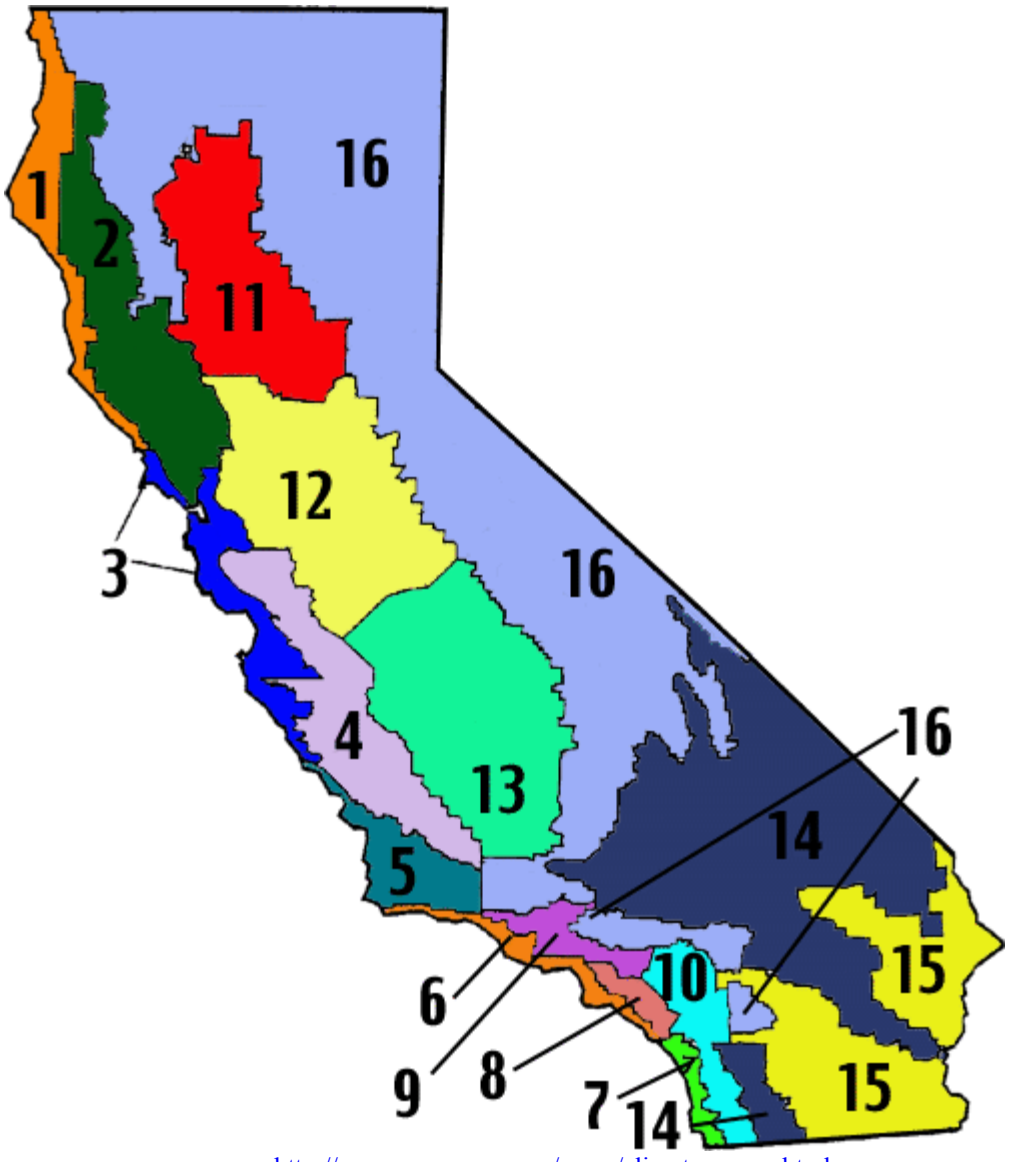
The Pacific Energy Center's Guide to:

California Climate Zones



http://www.energy.ca.gov/maps/climate_zones.html

and Bioclimatic Design

October 2006

PEC's Guide to California Climate Zones

This document of climate data was made for designers to inform energy-conscious design decisions. The information for 16 California Climate Zones is summarized and suggestions are given for passive design strategies appropriate to each climate.

Weather data is given for a reference city typical of each zone. Each zone contains a summary of the following types of data:

Basic Climate Conditions: Summer Temperature Range, Record High and Low Temperature
Design Day Data: Percentage of time dry bulb temperature in given season is *above* the stated value. Mean Coincident Wet-bulb Temperatures, and Relative Humidity also given for the summer.
Climate Design Priorities: Suggestions of design strategies to use in this zone for winter and summer seasons for a more energy passive design.
Title 24 Requirements: California's residential building energy code requires minimum ceiling and wall insulation values specific to different zones. Window U-values and maximum total area is also given. The complete document of requirements can be found on the California Energy Commission's website www.energy.ca.gov.
Climate Description: An overview of the general characteristics of the climate zone, such as geographical influence, typical patterns of weather and seasons, and precipitation.
HDD (Heating Degree Days) and CDD (Cooling Degree Days): Given for four cities in each zone. HDD value is the summation of degrees of the average temperature per day below 65F for the year. CDD is the summation of degrees of the average temperature per day above 80F for the year.

Charts and Graphs

Bioclimatic Chart: Defines dry bulb temperature and humidity levels for occupant thermal comfort and passive design strategies. The average minimum relative humidity and maximum temperature is plotted with the maximum relative humidity and minimum temperature for each month on the Bioclimatic chart. The chart is broken up into zones corresponding to design strategies for thermal comfort appropriate for that particular combination of temperature and humidity ranges. The best passive design strategies for each location are identifiable from the plotted data.

Zones and Strategies for the Bioclimatic Chart:

Comfort Zone: Humans are comfortable within a relatively small range of temperature and humidity conditions, roughly between 68-80 F (20-26.7 C) and 20-80% relative humidity (RH).
Passive Solar Heating: If 1700 BTU-day/sf from the sun comes into a given space, then occupants will feel comfortable inside if it is between 45-68 outside. This range can be lowered with better the insulation and more effective solar heat collected in thermal mass.
Natural Ventilation: Passive cooling strategies for natural ventilation are effective for temperatures in the range 68F to 90F. Cooling effectiveness decreases with higher humidity. In conditions below 20% RH natural ventilation may seem too dry.
Evaporative Cooling: Below 80% RH, evaporative cooling can be an effective passive cooling strategy. Adding moisture to the air can effectively cool temperatures up to 105F.
High Thermal Mass: Thermal Mass dampens and delays temperature swings to make it cool during the warm day, and warm during cool nights. It is most effective for places with large diurnal temperature changes. Thermal Mass is effective for temperatures up to 95F, with decreasing effectiveness in higher humidity.
High Thermal Mass with Night Ventilation: Thermal mass absorbs heat during the day and releases heat at night. By opening the building at night, cool air flushes out the hot air and cools down the thermal mass. This strategy is effective for average high temperatures up to 110F. This strategy requires occupant intervention.

California Climate

Zone 7

Reference City: San Diego
Latitude: 32.73 N
Longitude: 117.17 W
Elevation: 10 ft

Basic Climate Conditions

	(F)
Summer Temperature Range	14
Record High Temperature (1963)	111
Record Low Temperature (1949)	29

Design Day Data

Winter	99%	42		
	97.5%	44		
Summer				
	1%:	83	MCWB	69
	2.5%:	80	MCWB	69

Climatic Design Priorities

Winter: Insulate
Reduce Infiltration
Passive Solar
Summer: Shade
Allow natural ventilation
Distribute Thermal Mass

Title 24 Requirements

Package	*C*	*D*
Ceiling Insulation	R38	R30
Wood Frame Walls	R21	R13
Glazing U-Value	0.38	0.67
Maximum Total Area	14%	20%

Climate

Climate Zone 7 is the southernmost coastal region of California. The warm ocean water and latitude make this climate very mild. The temperature of the ocean water affects the air temperature over it, and this in turn moderates temperatures over the coastal strip.

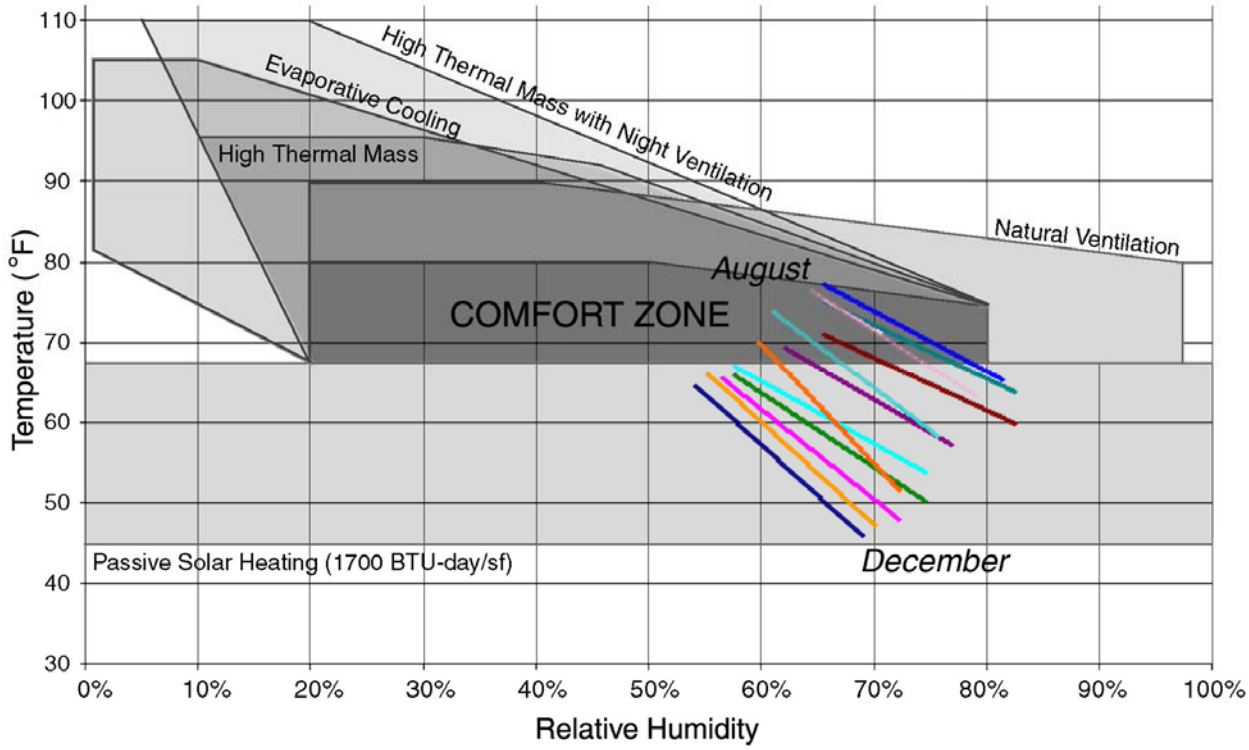
The ocean influences the weather most of the time, however the wind changes sometimes, bringing in the hot and extremely drying Santa Ana winds. The weather in the summer is warm and comfortable, and hot enough that cooling is necessary on some days.

	Oceanside	*Chula Vista*	*San Diego*	*La Mesa*
HDD	2009	1321	1256	1400
CDD	505	862	984	1110

HDD = Heating Degree Days (base 65F)
CDD = Cooling Degree Days

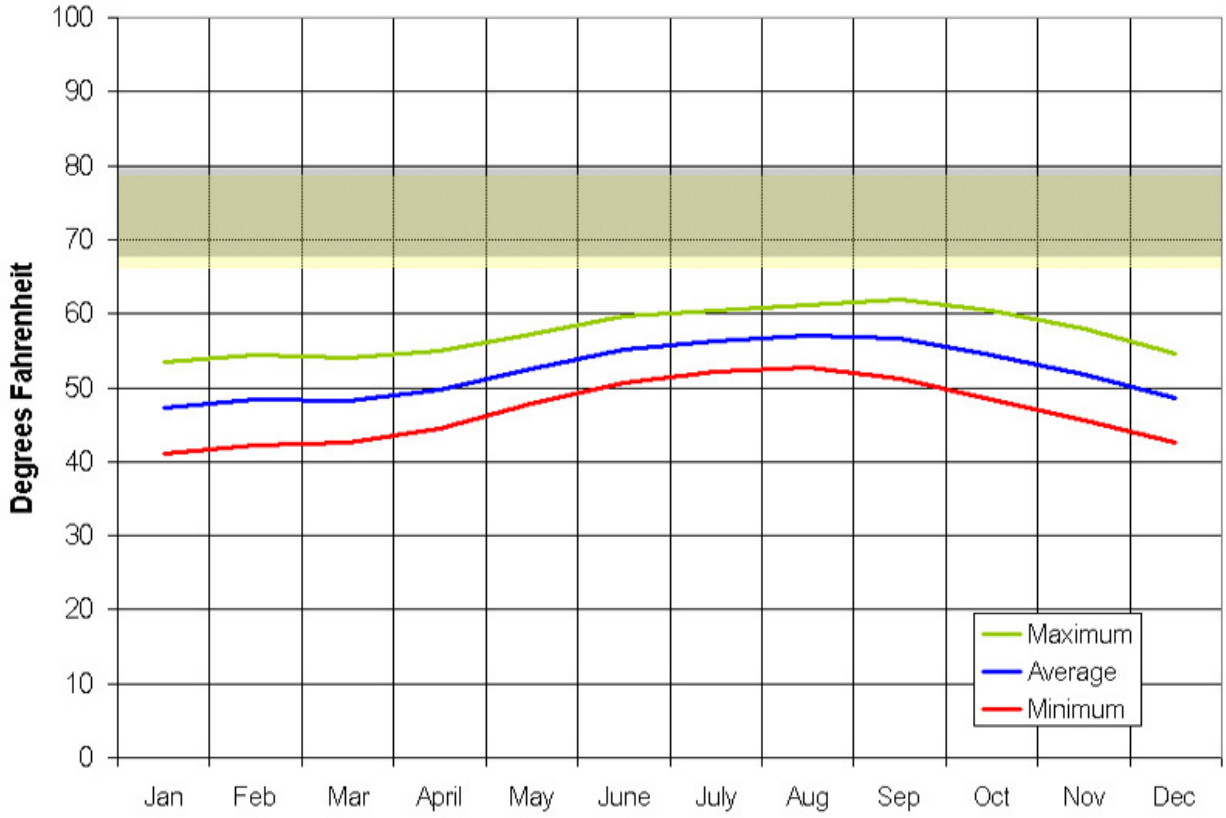
However, daily high fogs naturally cool the area at night. The winters are cool and heating is necessary sometimes. The weather and comfort standards in this region are in concurrence as shown by the low consumption of energy use.

Bioclimatic Chart

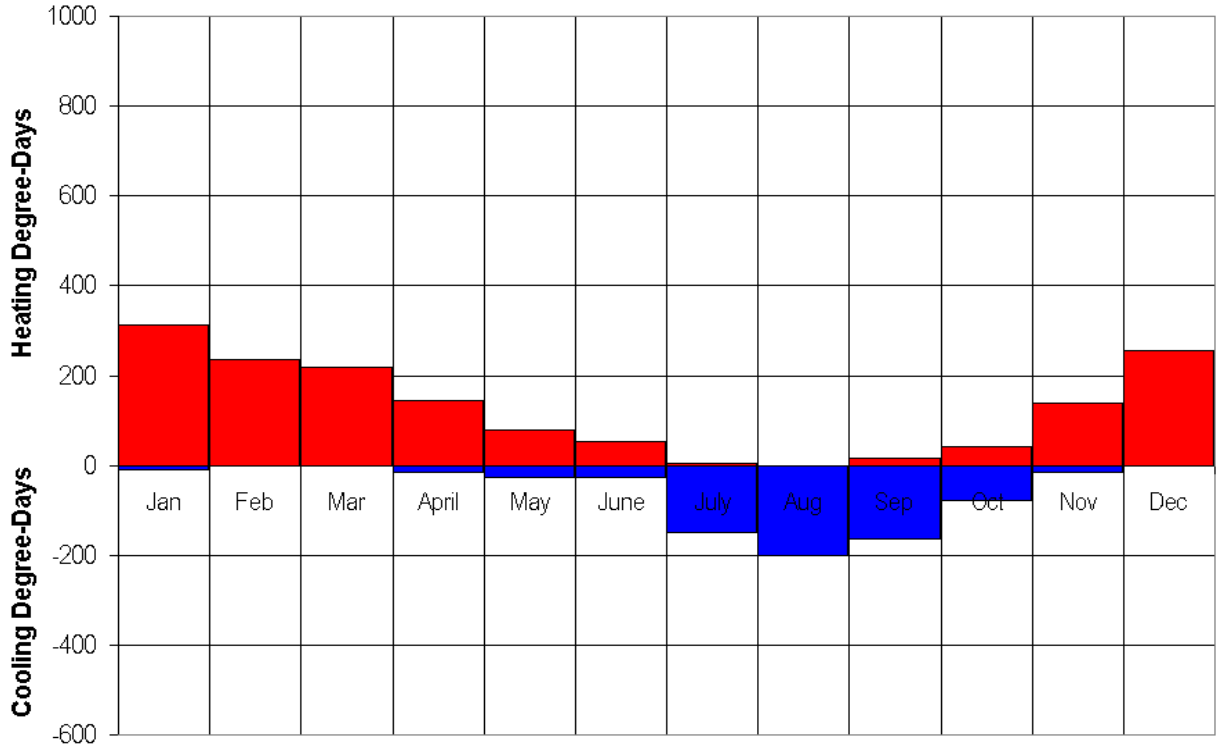


Temperature

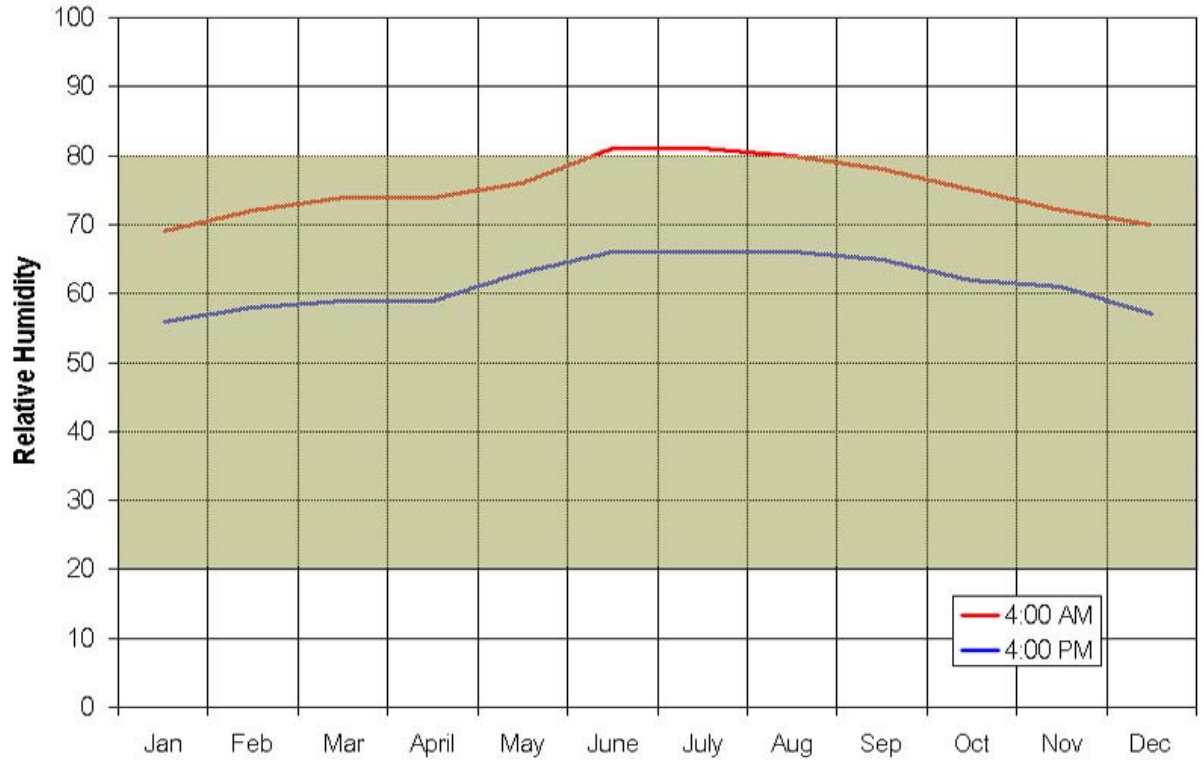
(Typical Comfort Zone: 68-80°F)



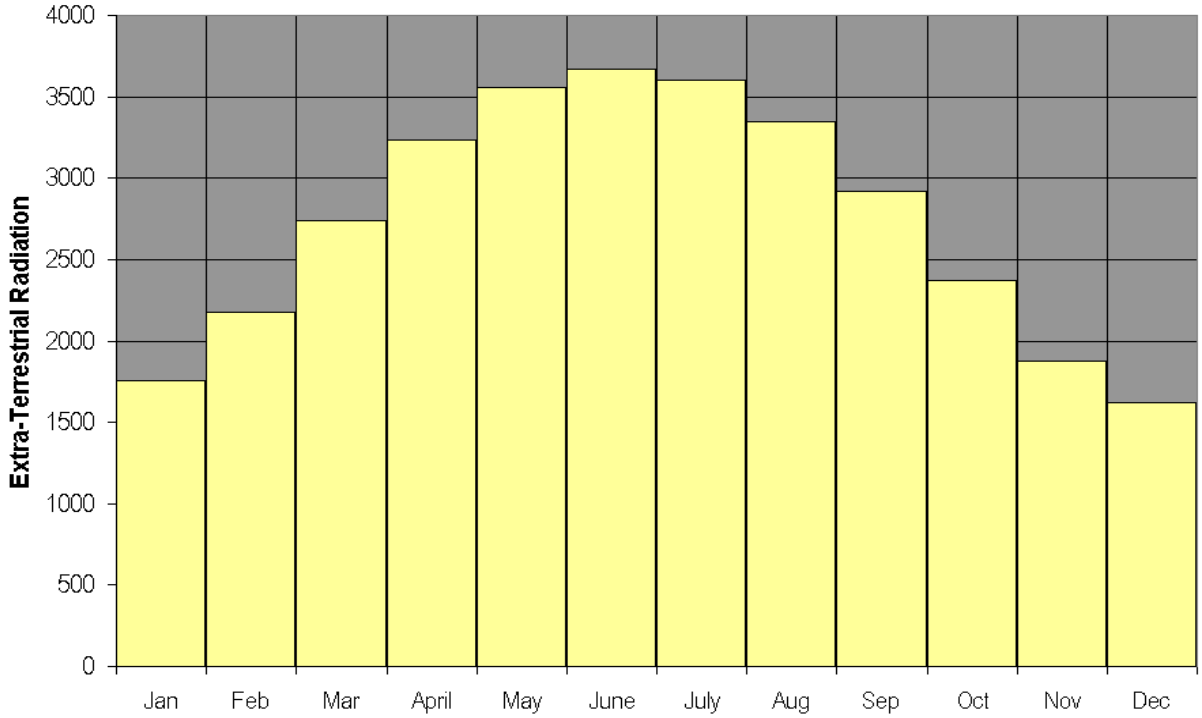
Degree Day
(Base 65°)



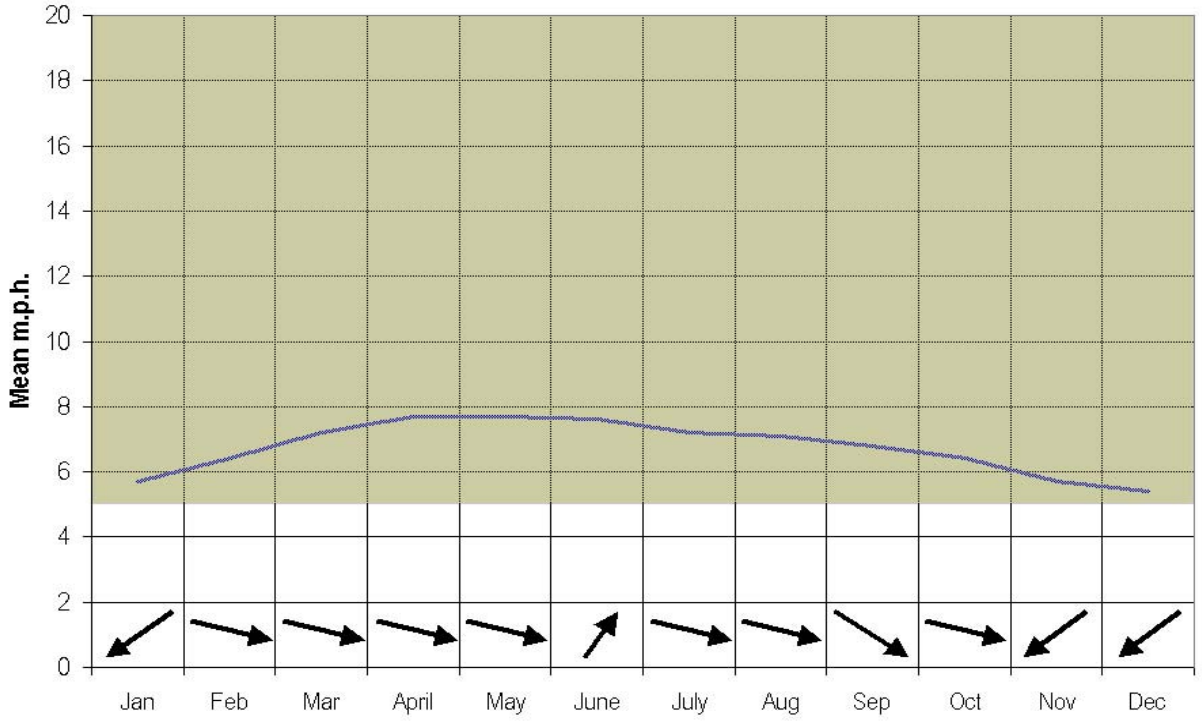
Relative Humidity
(Typical Comfort Zone: 20-80%)



Extra-Terrestrial Radiation Daily Mean ETR: 2739



Wind Speed



Prevailing Wind Direction
Summer: WNW
Winter: NE

Natural Ventilation is most effective when wind speed is 5 mph or greater.