

Assignment 1

Keaton Kane

1 September 2017

ARCH 633

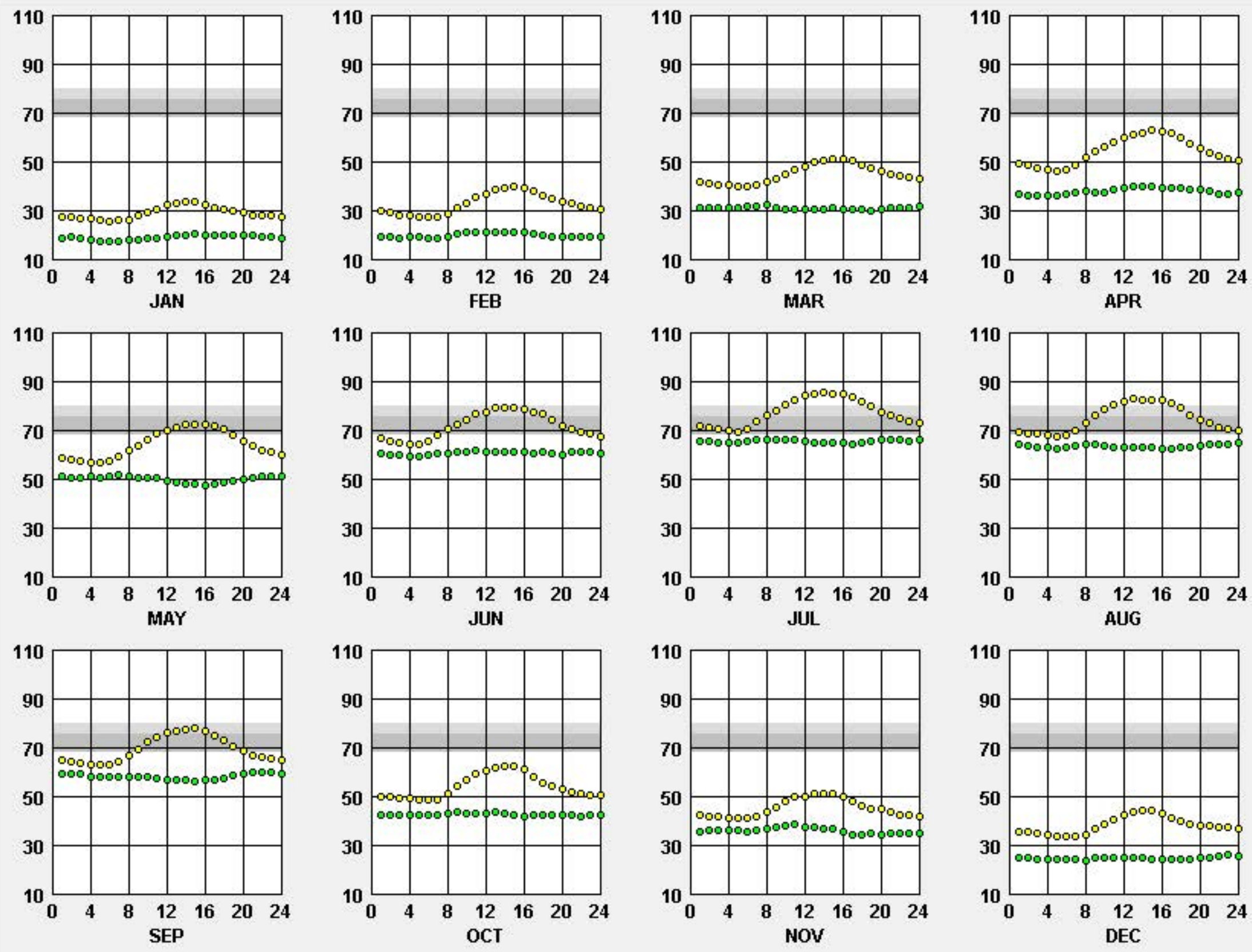
DRY BULB X DEW POINT
ASHRAE Standard 55-2004 using PMV

LOCATION: Philadelphia International Ap, PA, USA
Latitude/Longitude: 39.87° North, 75.23° West, **Time Zone from Greenwich** -5
Data Source: TMY3 724080 WMO Station Number, **Elevation** 6 ft

LEGEND

- Dry Bulb
- Dew Point
- Comfort Zone
- Summer
- Winter
- At 50%
Relative Humidity

- TEMPERATURE RANGE:**
- ☒ 10 to 110 °F
 - ☐ Fit to Data

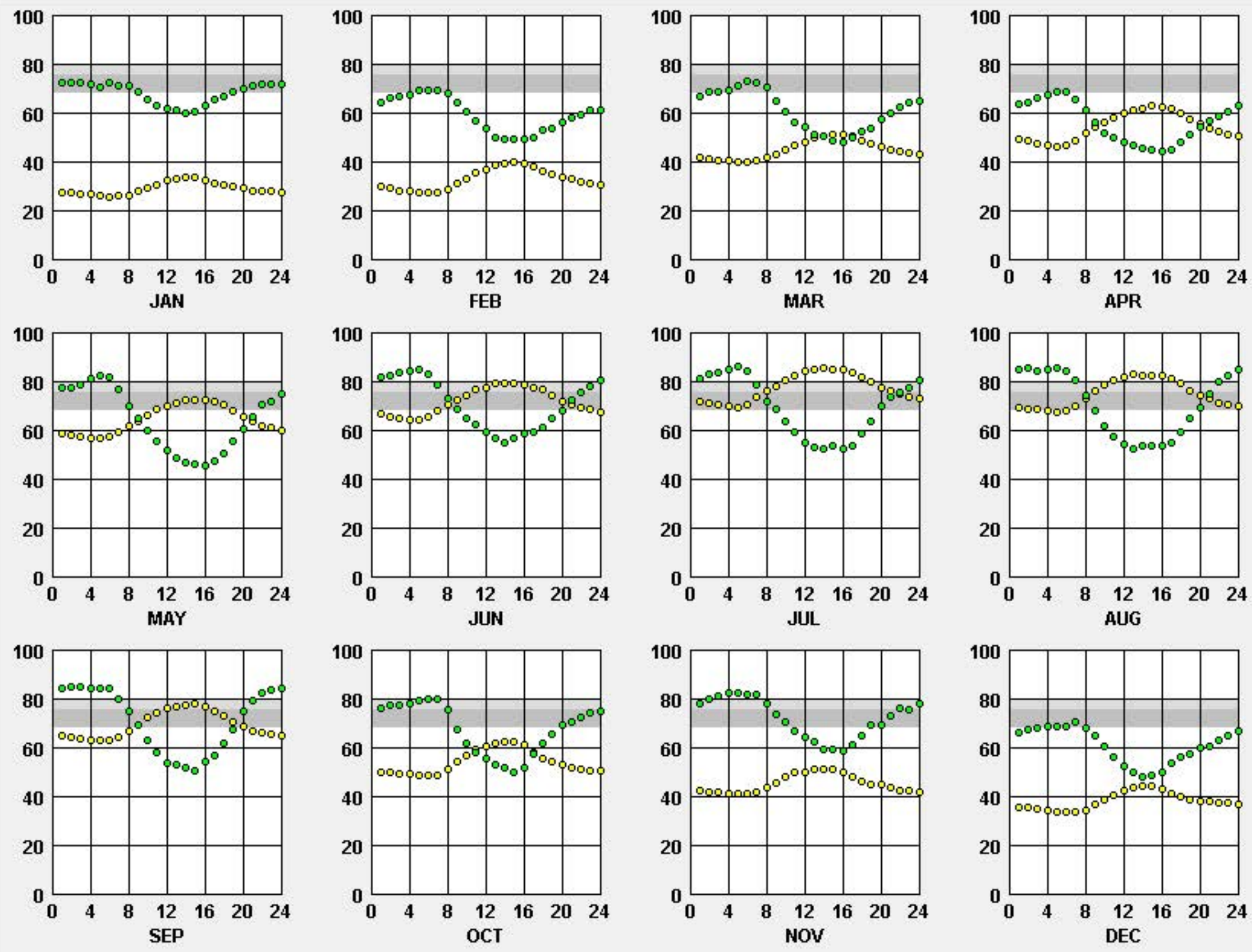


DRY BULB X RELATIVE HUMIDITY
ASHRAE Standard 55-2004 using PMV

LOCATION: Philadelphia International Ap, PA, USA
Latitude/Longitude: 39.87° North, 75.23° West, **Time Zone from Greenwich** -5
Data Source: TMY3 724080 WMO Station Number, **Elevation** 6 ft

LEGEND

- Dry Bulb ●
- Humidity ●
- Comfort Zone
- Summer [light gray box]
- Winter [dark gray box]
- At 50%
Relative Humidity



GROUND TEMPERATURE (MONTHLY AVERAGE)

LOCATION:Philadelphia International Ap, PA, USA

Latitude/Longitude:39.87° North, 75.23° West, Time Zone from Greenwich -5

Data Source:TMY3724080 WMO Station Number, Elevation 6 ft

LEGEND

DEPTH
(feet)

1.64

6.56

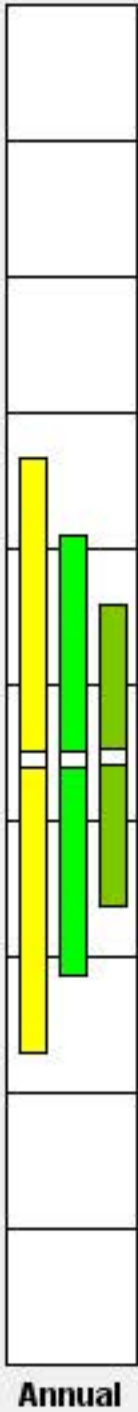
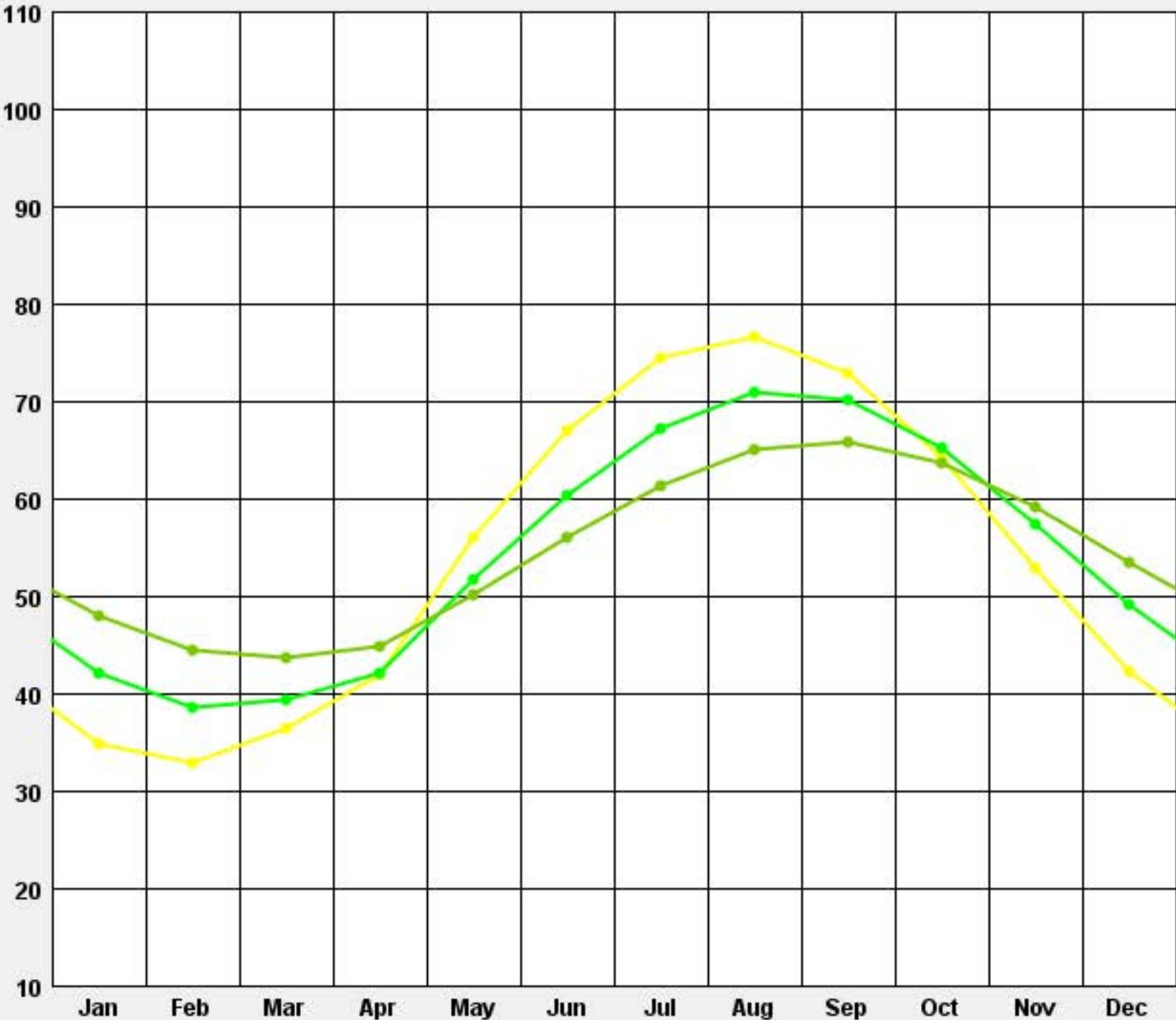
13.12

(Surface is freshly
mown grass.)

TEMPERATURE RANGE:

☒ 10 to 110 °F

☐ Fit to Data



ILLUMINATION RANGE

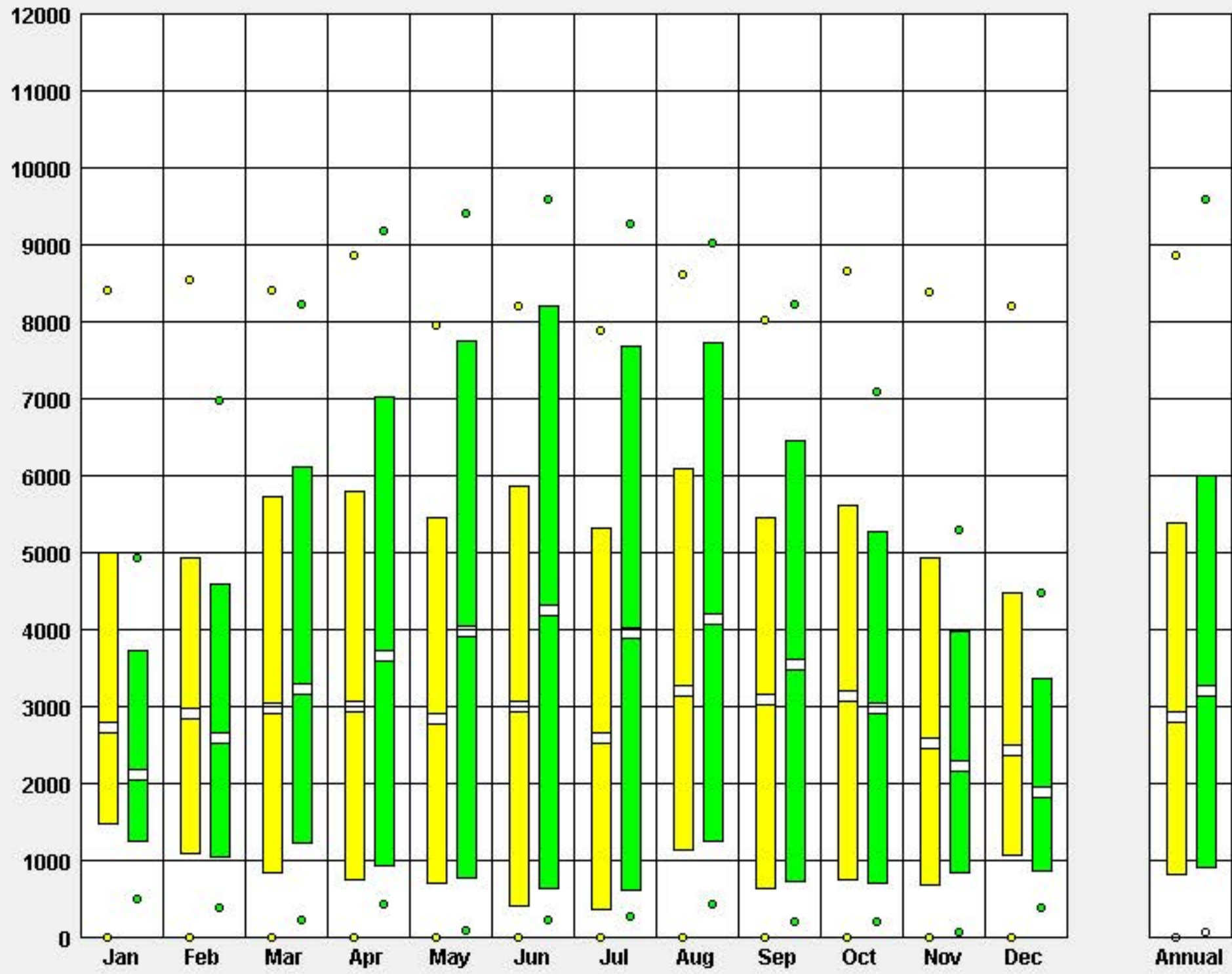
LOCATION: Philadelphia International Ap, PA, USA
Latitude/Longitude: 39.87° North, 75.23° West, Time Zone from Greenwich -5
Data Source: TMY3 724080 WMO Station Number, Elevation 6 ft

LEGEND

HOURLY ILLUMINATION
DAYLIT HOURS ONLY

- RECORDED HIGH - ○
- AVERAGE HIGH - [yellow bar]
- MEAN - [white bar]
- AVERAGE LOW - [yellow bar]
- RECORDED LOW - ○

- RECORDED:
- [yellow bar] DIRECT NORMAL
 - [green bar] GLOBAL HORIZONTAL
(footcandles)



MONTHLY DIURNAL AVERAGES
ASHRAE Standard 55-2004 using PMV

LOCATION: Philadelphia International Ap, PA, USA
Latitude/Longitude: 39.87° North, 75.23° West, **Time Zone from Greenwich** -5
Data Source: TMY3 724080 WMO Station Number, **Elevation** 6 ft

LEGEND

HOURLY AVERAGES

TEMPERATURE: (degrees F)

- DRY BULB MEAN
- WET BULB MEAN
- DRY BULB (all hours)

COMFORT ZONE

- SUMMER
- WINTER

(At 50% Relative Humidity)

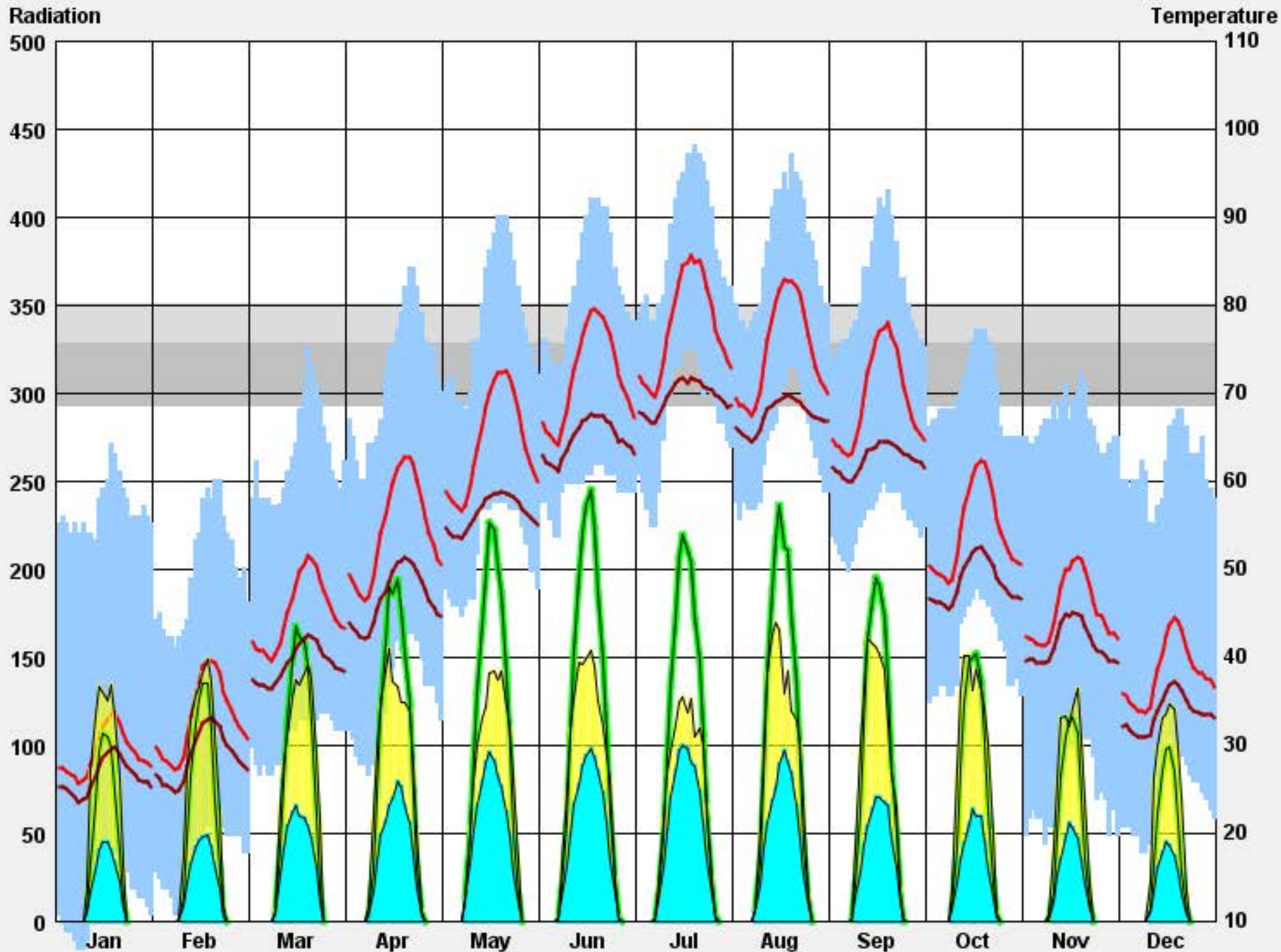
RADIATION: (Btu/sq.ft)

- GLOBAL HORIZ
- DIRECT NORMAL
- DIFFUSE

☒ Display Dry Bulb Temp
(all hours)

TEMPERATURE RANGE:

- ☒ 10 to 110 °F
- ☐ Fit to Data



Back

Next

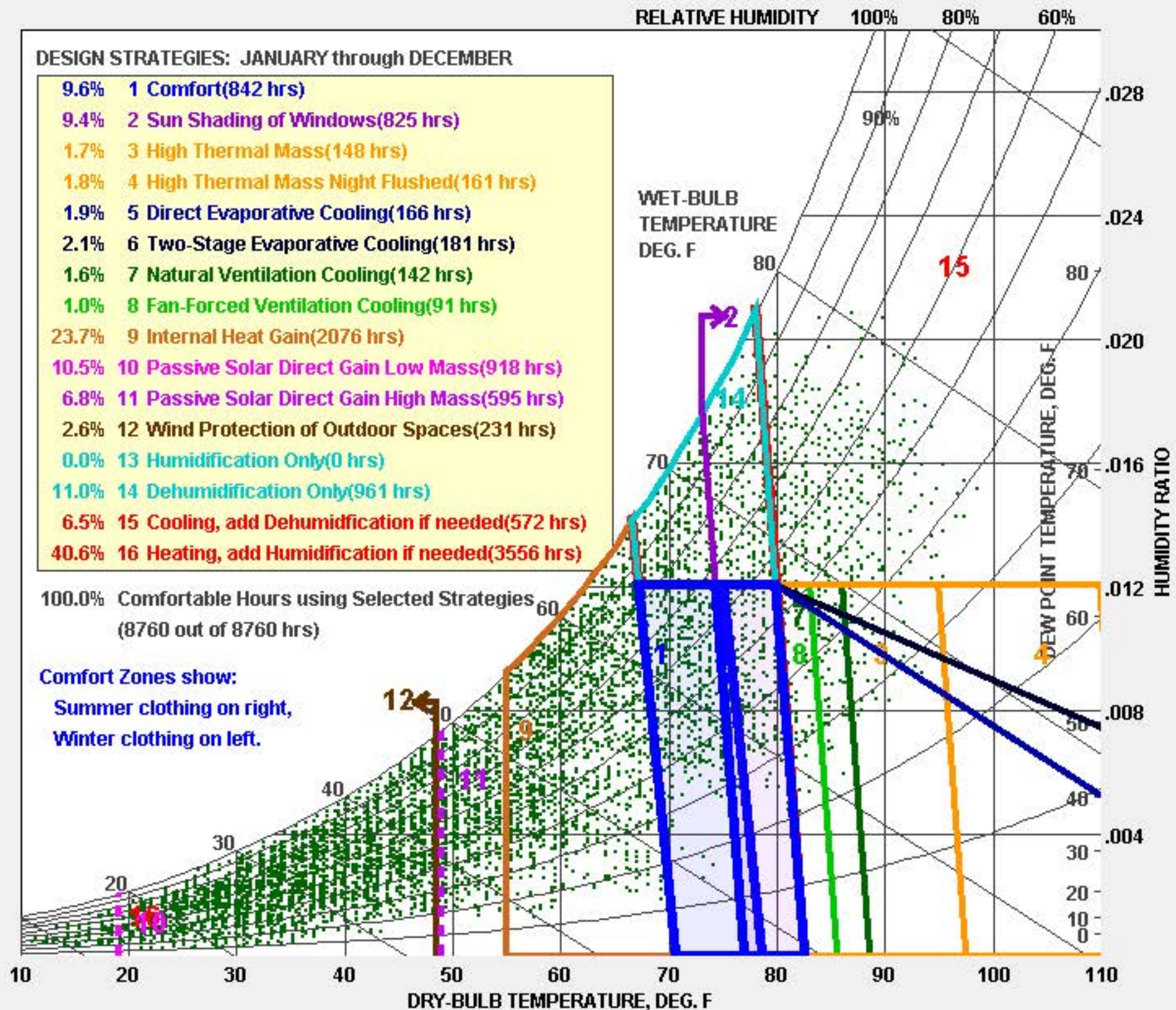
LOCATION:	Philadelphia International Ap, PA, USA
Latitude/Longitude:	39.87° North, 75.23° West, Time Zone from Greenwich -5
Data Source:	TMY3 724080 WMO Station Number, Elevation 6 ft

100% COMFORTABLE
0% NOT COMFORTABLE

○ 1 Hour 1 a.m. Next

☐ Show Best set of Design Strategies

Summer clothing on right,
Winter clothing on left.



Next

RADIATION RANGE

LOCATION: Philadelphia International Ap, PA, USA
Latitude/Longitude: 39.87° North, 75.23° West, Time Zone from Greenwich -5
Data Source: TMY3 724080 WMO Station Number, Elevation 6 ft

LEGEND

HOURLY AVERAGES
DAYLIT HOURS ONLY

RECORDED HIGH -

AVERAGE HIGH -

MEAN -

AVERAGE LOW -

RECORDED LOW -

RECORDED:

DIRECT NORMAL

GLOBAL HORIZONTAL

TOTAL SURFACE

(Btu/sq.ft per hour)

THEORETICAL:

Tilted Surface Radiation Input:

0.0

Tilt degrees from ...

(Vertical = 90°)

0.0

Bearing degrees fr...

(South = 0°, West ...

20.0

% Ground Reflecta...

(20% = grass)

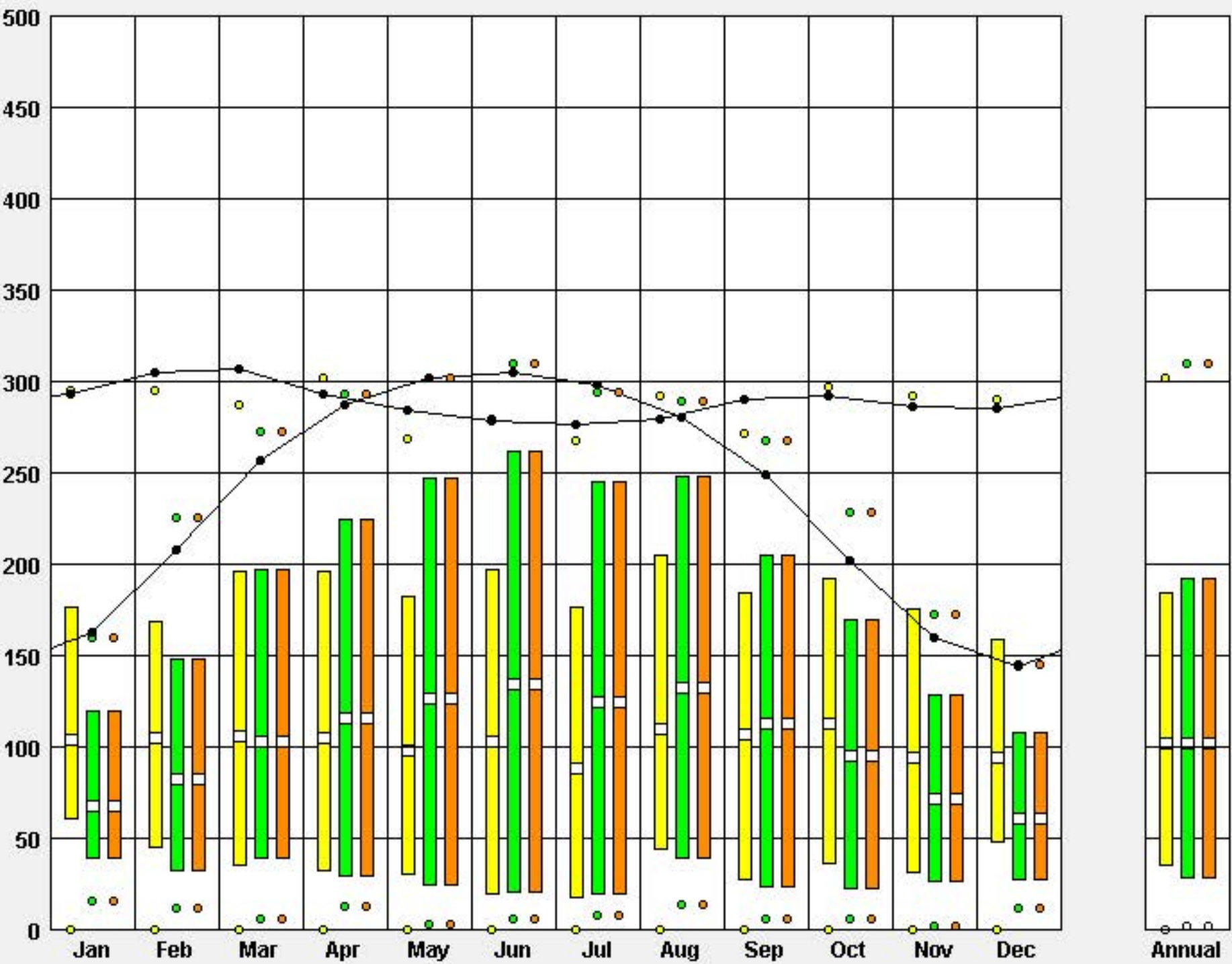
PLOT:

☒

 Hourly Avg

☐

 Daily Total




Hit ENTER to replot if you change Tilted Surface Radiation parameters.


SKY COVER RANGE


LOCATION: Philadelphia International Ap, PA, USA
Latitude/Longitude: 39.87° North, 75.23° West, Time Zone from Greenwich -5
Data Source: TMY3 724080 WMO Station Number, Elevation 6 ft


LEGEND


Total Cloud Cover 100%

RECORDED HIGH - 

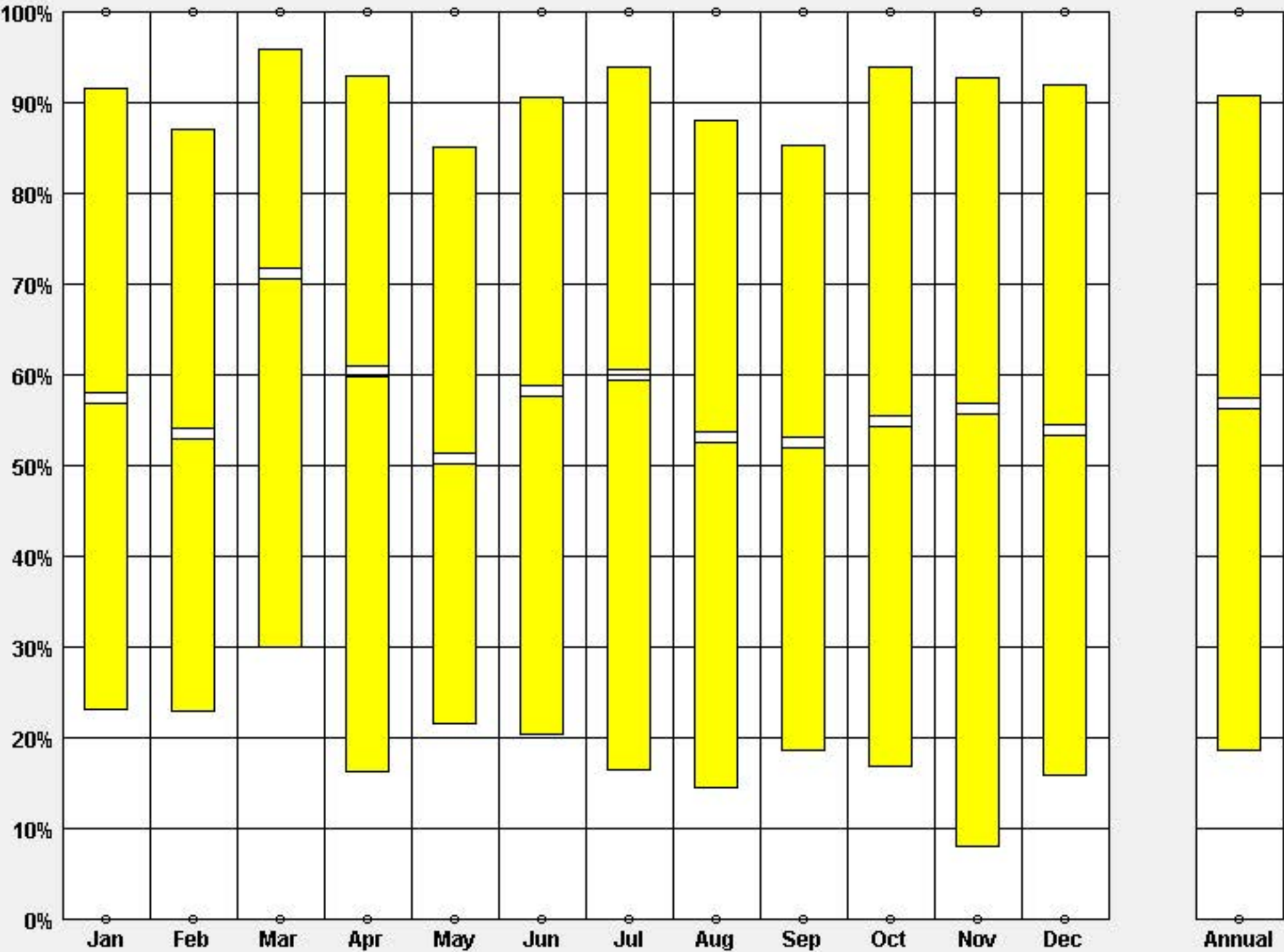
AVERAGE HIGH - 

MEAN - 

AVERAGE LOW - 

RECORDED LOW - 

Clear Skies 0



SUN CHART

LOCATION:	Philadelphia International Ap, PA, USA
Latitude/Longitude:	39.87° North, 75.23° West, Time Zone from Greenwich -5
Data Source:	TMY3 724080 WMO Station Number, Elevation 6 ft

LEGEND

- **WARM/HOT > 80°F**
(SHADE NEEDED)
- **COMFORT > 68°F**
(SHADE HELPS)
- **COOL/COLD < 68°F**
(SUN NEEDED)

 GNOMON POSITION

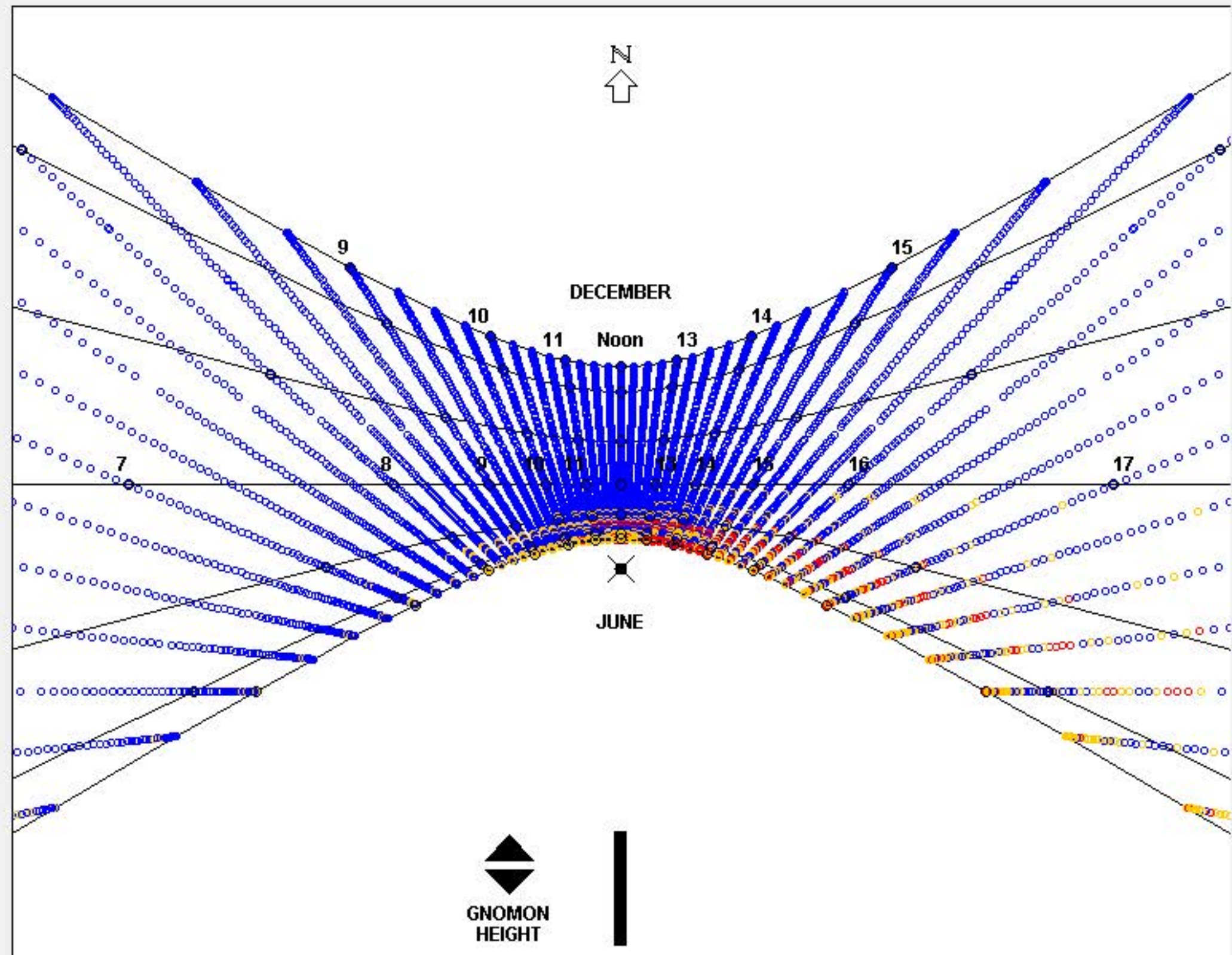
PLOT MONTHS:

WINTER SPRING

● December 21 to June 21

SUMMER FALL

☐ June 21 to December 21



Click on arrows to increase or decrease gnomon height.

[Back](#)

Next

SUN SHADING CHART

LOCATION: Philadelphia International Ap, PA, USA
Latitude/Longitude: 39.87° North, 75.23° West, Time Zone from Greenwich -5
Data Source: TMY3 724080 WMO Station Number, Elevation 6 ft

LEGEND

- WARM/HOT > 80°F
(SHADE NEEDED)
163 Hours Exposed
0 Hours Shaded
- COMFORT > 68°F
(SHADE HELPS)
433 Hours Exposed
0 Hours Shaded
- COOL/COLD < 68°F
(SUN NEEDED)
1914 Hours Exposed
0 Hours Shaded

PLOT MONTHS:

WINTER SPRING

● December 21 to June 21

SUMMER FALL

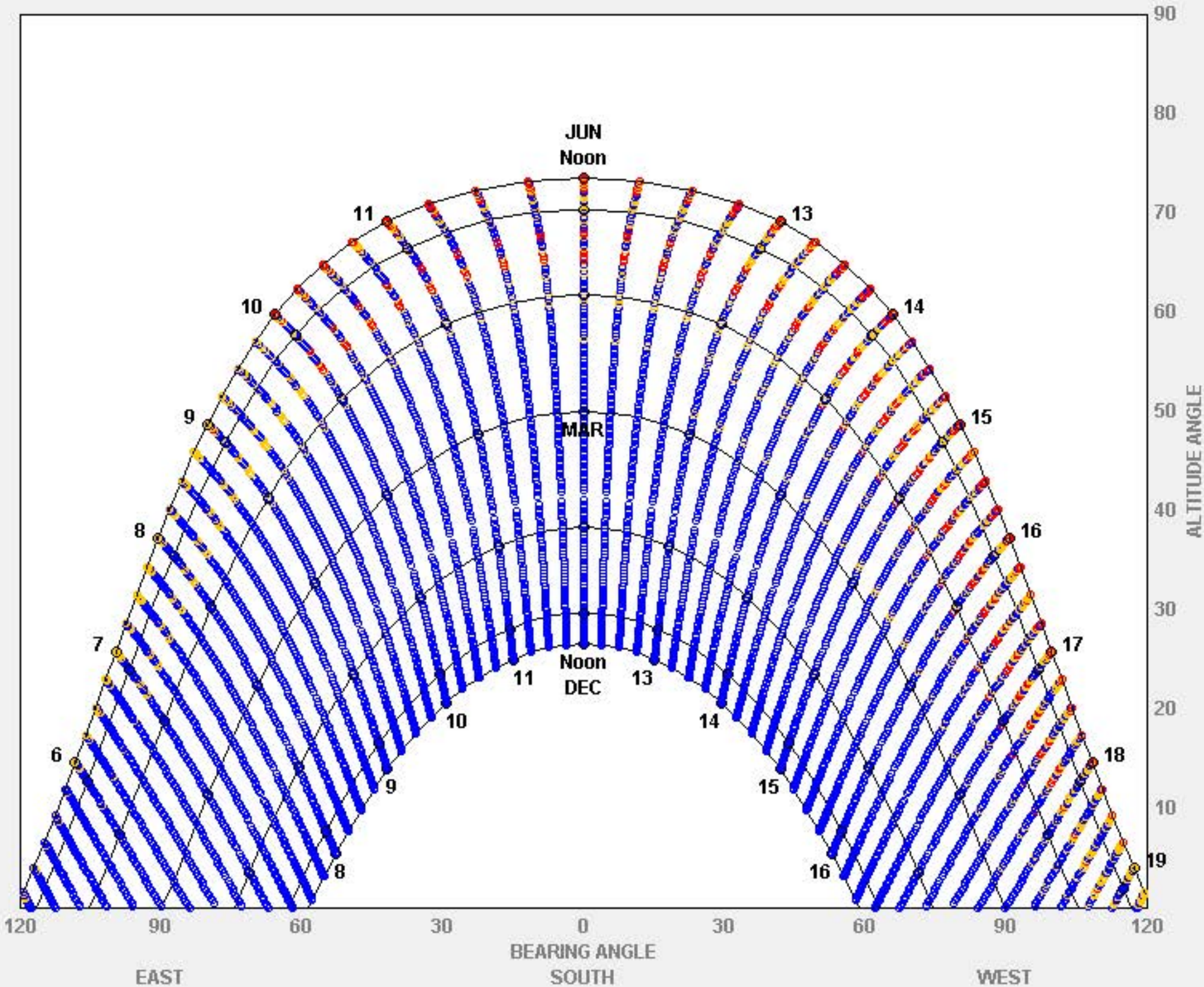
○ June 21 to December 21

☐ Display Grid

☐ Display Shading Calculator

☐ Display Obstruction Elevation



Input Obstructions



TEMPERATURE RANGE
ASHRAE Standard 55-2004 using PMV

LOCATION: Philadelphia International Ap, PA, USA
Latitude/Longitude: 39.87° North, 75.23° West, **Time Zone from Greenwich** -5
Data Source: TMY3 724080 WMO Station Number, **Elevation** 6 ft

LEGEND

RECORDED HIGH - 
DESIGN HIGH - 
AVERAGE HIGH - 
MEAN - 
AVERAGE LOW - 
DESIGN LOW - 
RECORDED LOW - 

COMFORT ZONE
SUMMER 
WINTER 
(At 50% Relative Humidity)

DESIGN HIGH: Residential

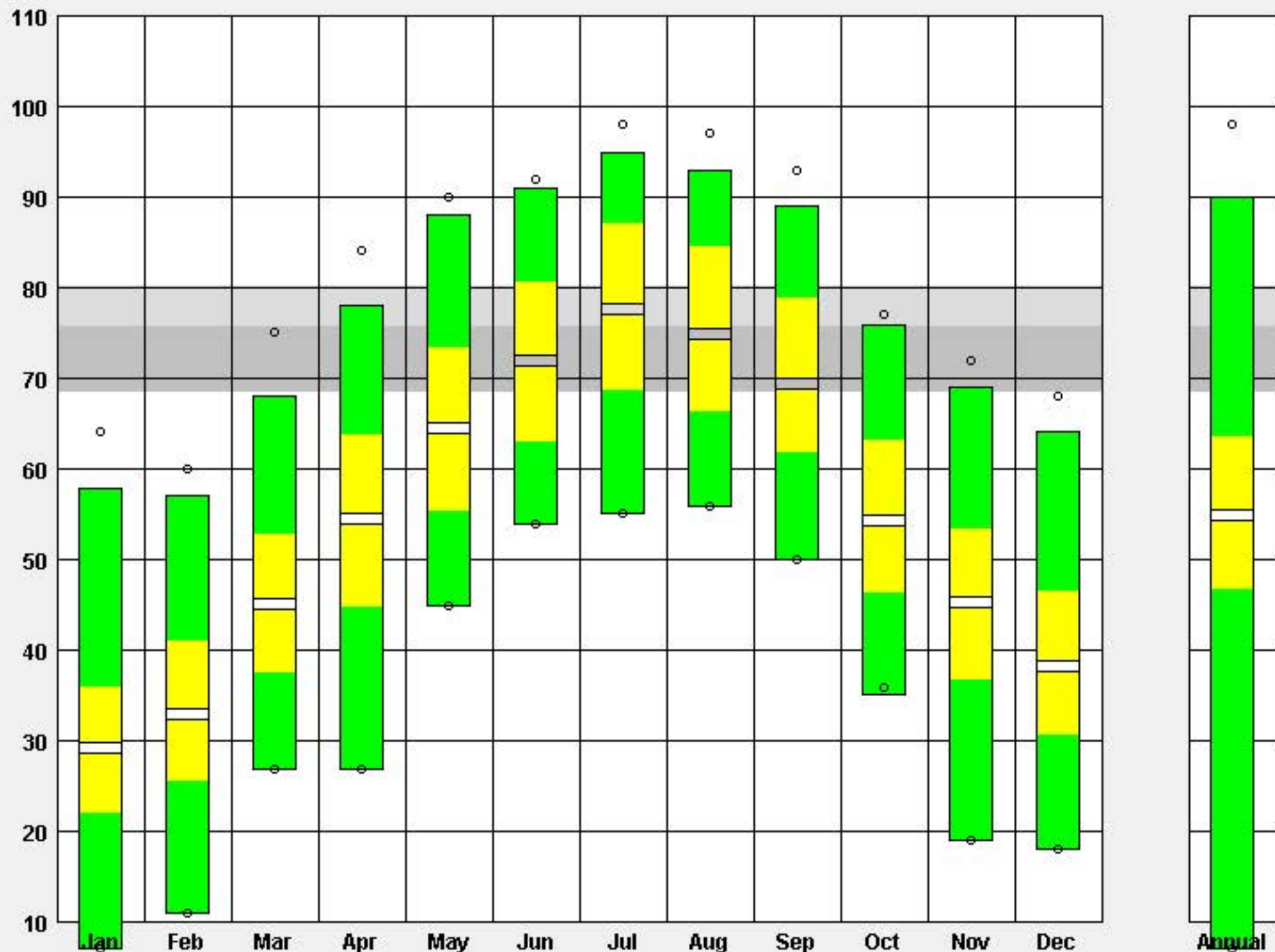
- ☒ 1% of Hours Above
☐ .5% of Hours Above
☐ 0% of Hours Above

DESIGN LOW: Residential

- ☐ 1% of Hours Below
☐ .5% of Hours Below
☒ 0% of Hours Below

TEMPERATURE RANGE:

- ☒ 10 to 110 °F
☐ Fit to Data



Back

Next

TIMETABLE PLOT

LOCATION:

Philadelphia International Ap, PA, USA

Latitude/Longitude: 39.87° North, 75.23° West, Time Zone from Greenwich -5

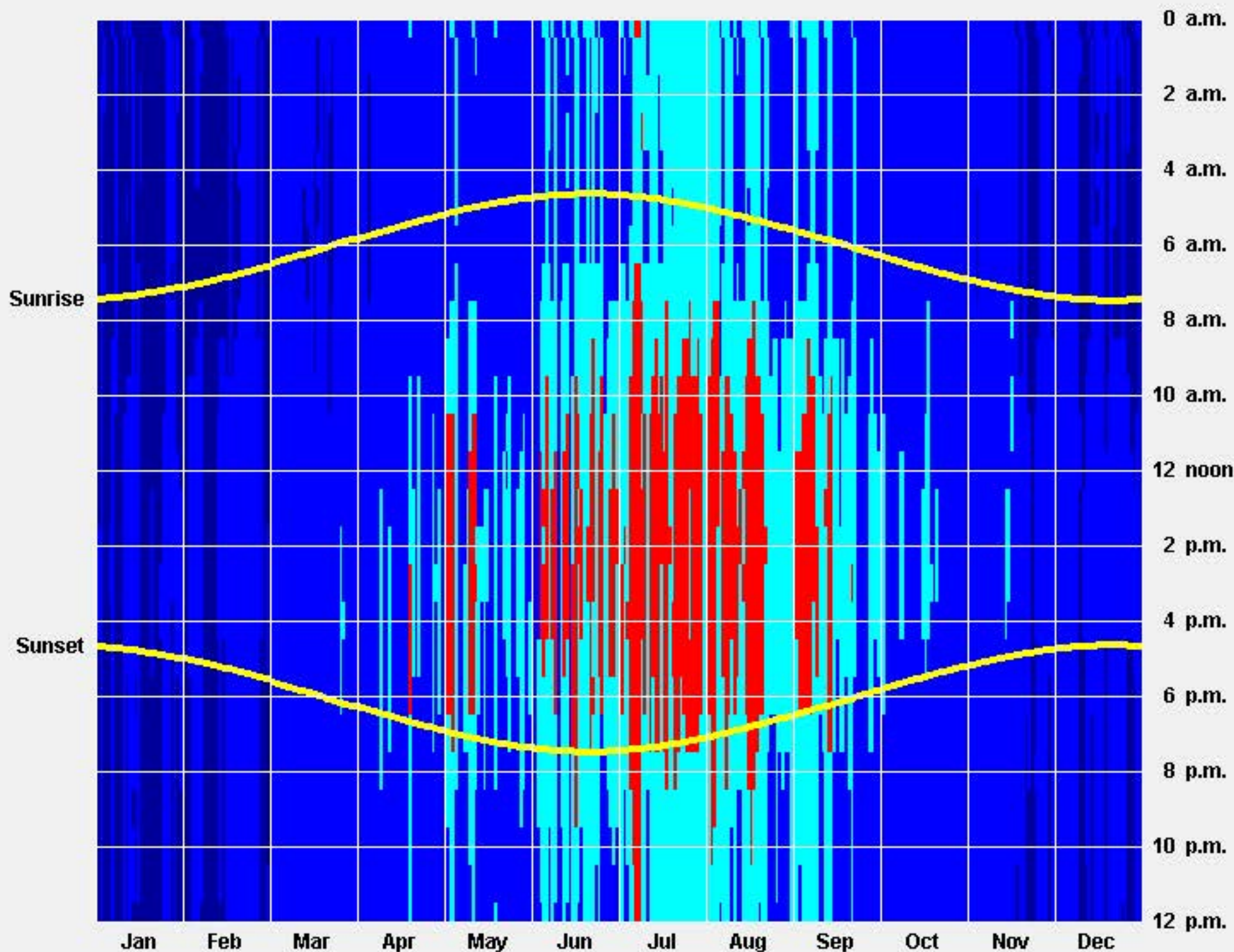
Data Source: TMY3 724080 WMO Station Number, Elevation 6 ft

LEGEND

DRY BULB TEMP

(degrees F)

12%	■	< 32
60%	■	32 - 69
20%	■	69 - 81
8%	■	81 - 100
0%	■	> 100



PLOT:

DRY BULB TEMP

☐ Monthly Avg ☒ Daily

Select colored squares on LEGEND to change plot colors (see Help).






Back

Next

WIND VELOCITY RANGE

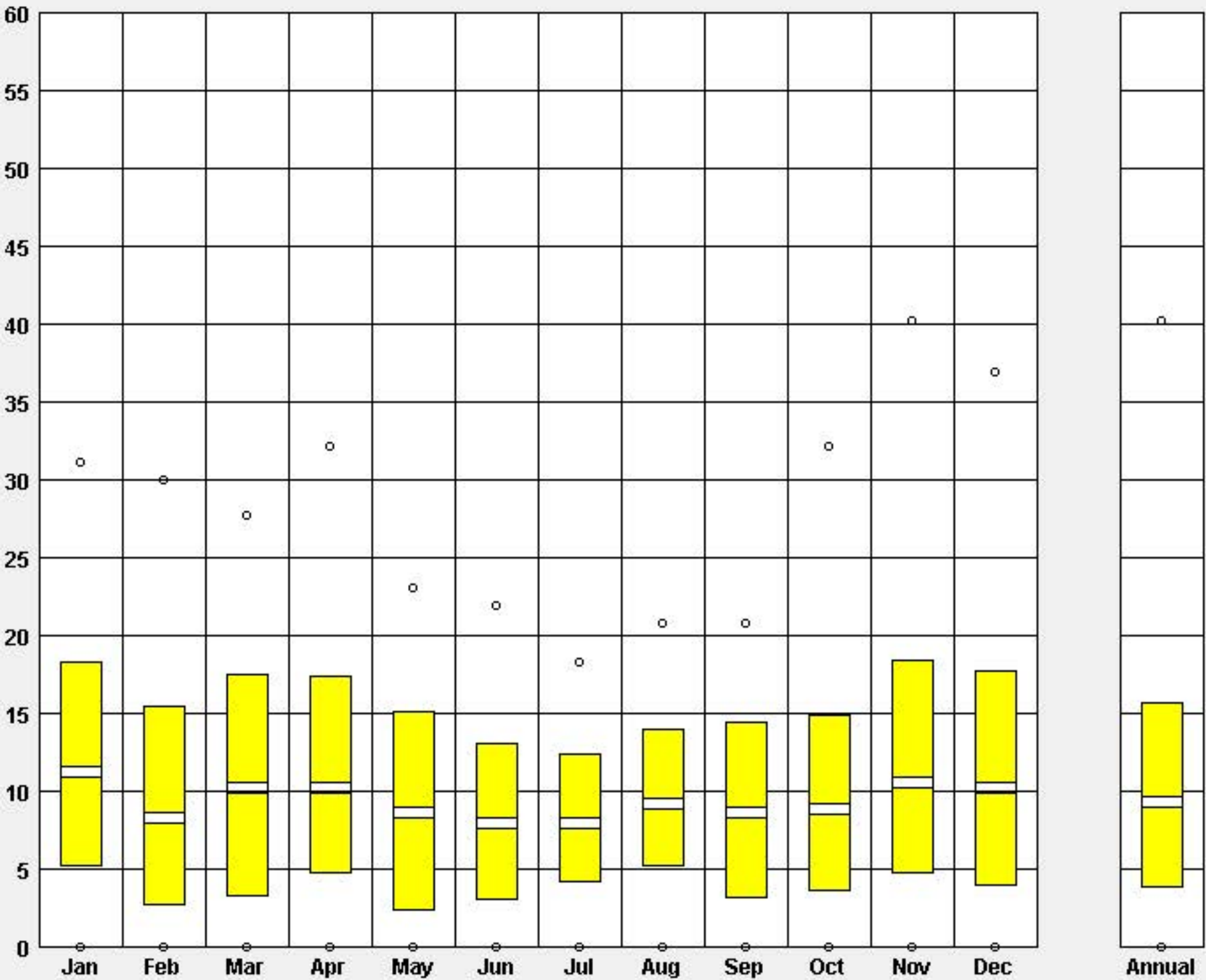
LOCATION: Philadelphia International Ap, PA, USA
Latitude/Longitude: 39.87° North, 75.23° West, Time Zone from Greenwich -5
Data Source: TMY3 724080 WMO Station Number, Elevation 6 ft

LEGEND

RECORDED HIGH - 
AVERAGE HIGH - 
MEAN - 
AVERAGE LOW - 
RECORDED LOW - 
(mph)

PLOT:
☒ mph ☐ fpm

WIND VELOCITY:
☒ 0 to 60 mph
☐ Fit to Data



Back

Next

WIND WHEEL

LOCATION: Philadelphia International Ap, PA, USA

Latitude/Longitude: 39.87° North, 75.23° West, Time Zone from Greenwich -5

Data Source: TMY3 724080 WMO Station Number, Elevation 6 ft

LEGEND

TEMPERATURE (Deg. F)

- < 32
- 32 - 69
- 69 - 81
- 81 - 100
- > 100

RELATIVE HUMIDITY (%)

- <30
- 30-70
- >70

☒ All Hours

☐ Selected Hours

1 a.m.

through

midnight

☒ All Months

☐ Selected Months

JAN

through

DEC

☐ One Month

JAN

Next Month

☐ One Day

1

Next Day

Animate

☒ Monthly

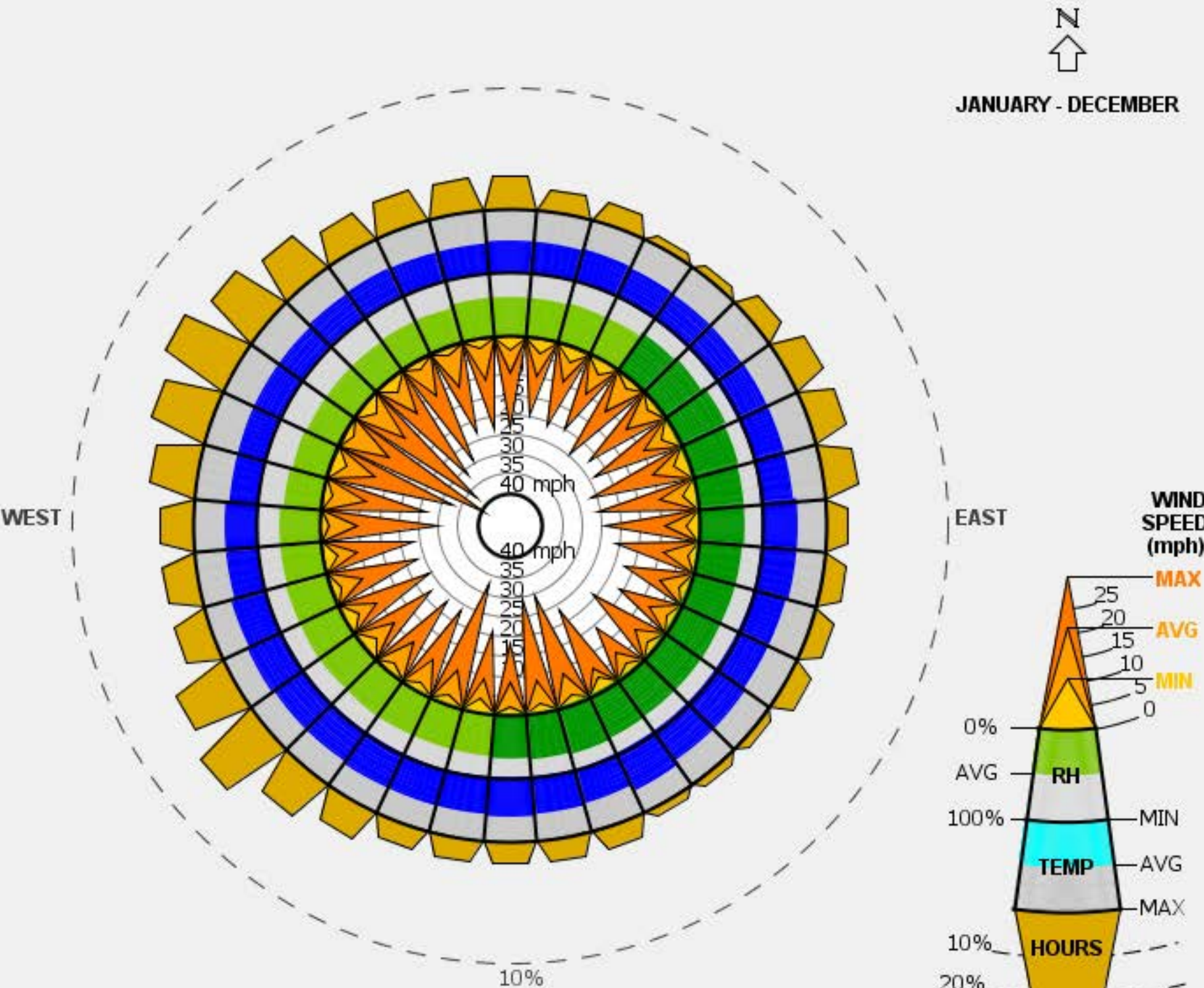
☐ Daily

☐ Hourly

Start

Pause

Stop



Start "Animation" to see monthly plots or select the "One Month" option and cycle through months by clicking "Next Month".

Conclusions:

- 1) According to the Sun Chart, buildings should face South in order to gain the necessary levels of heat gain from the sun, especially during the winter months when heat gain is at a minimum. During the summer months when heat gain is much higher, moveable shades should be employed to reduce direct sun exposure.
- 2) As per the Wind Velocity chart, average wind speeds in Philadelphia are too high (avg. 8-12 mph) to allow for a comfortable natural ventilation. As such, incoming wind must be tempered to comfortably ventilate the interior of the building.
- 3) The humidity in Philadelphia is relatively high year-round (50-90%) according to the Relative Humidity Chart and as such buildings must be designed to deter water from accumulating and causing your structure to become a “sick building.” A design priority must be ensuring that the façade is designed to expel water from its surface. Additionally, adequate air flow must be allowed inside in order to prevent excessive humidity and condensation.