

# Climate Data Report Round 2

Keaton Kane

7 October 2017

ARCH 633

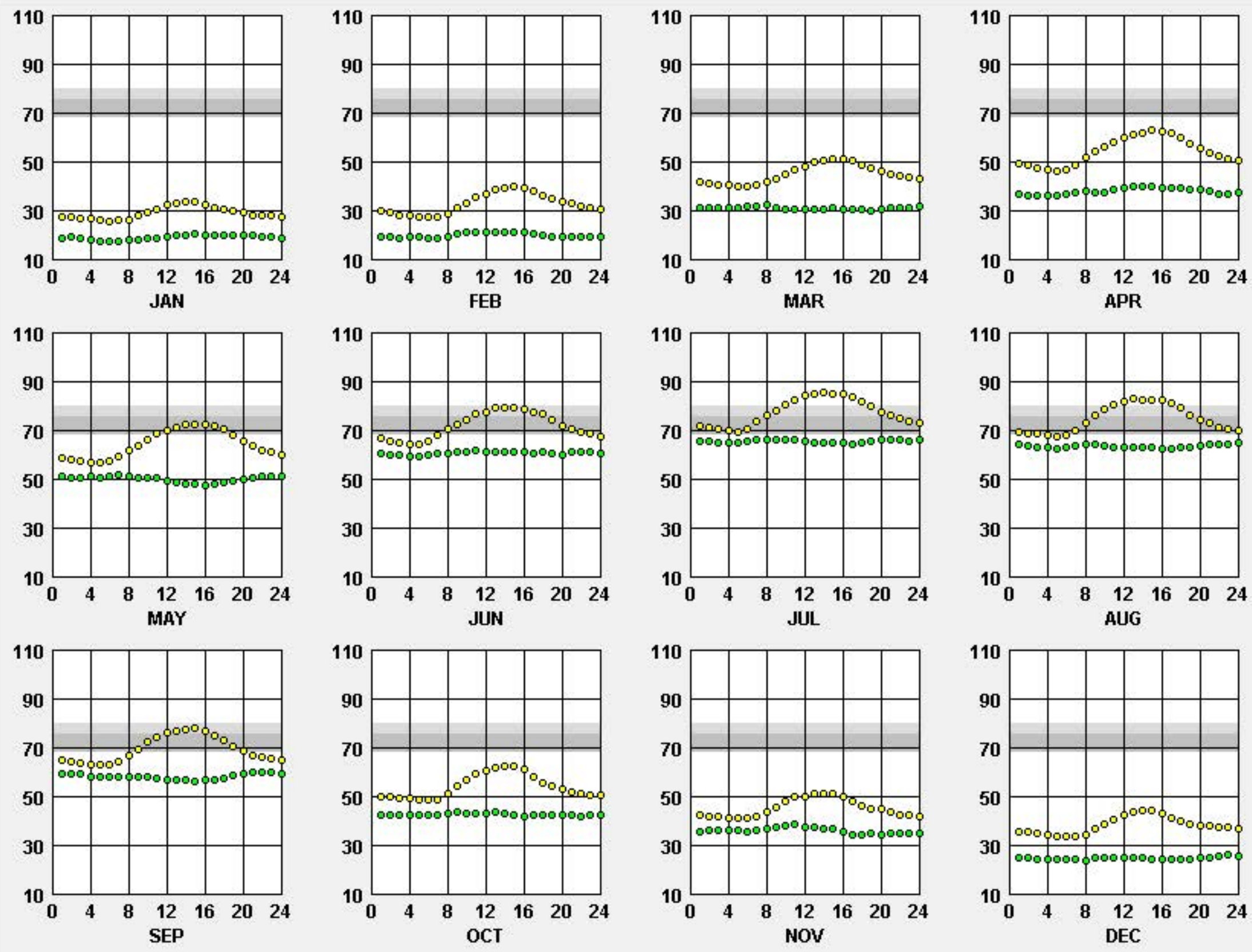
**DRY BULB X DEW POINT**  
**ASHRAE Standard 55-2004 using PMV**

**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

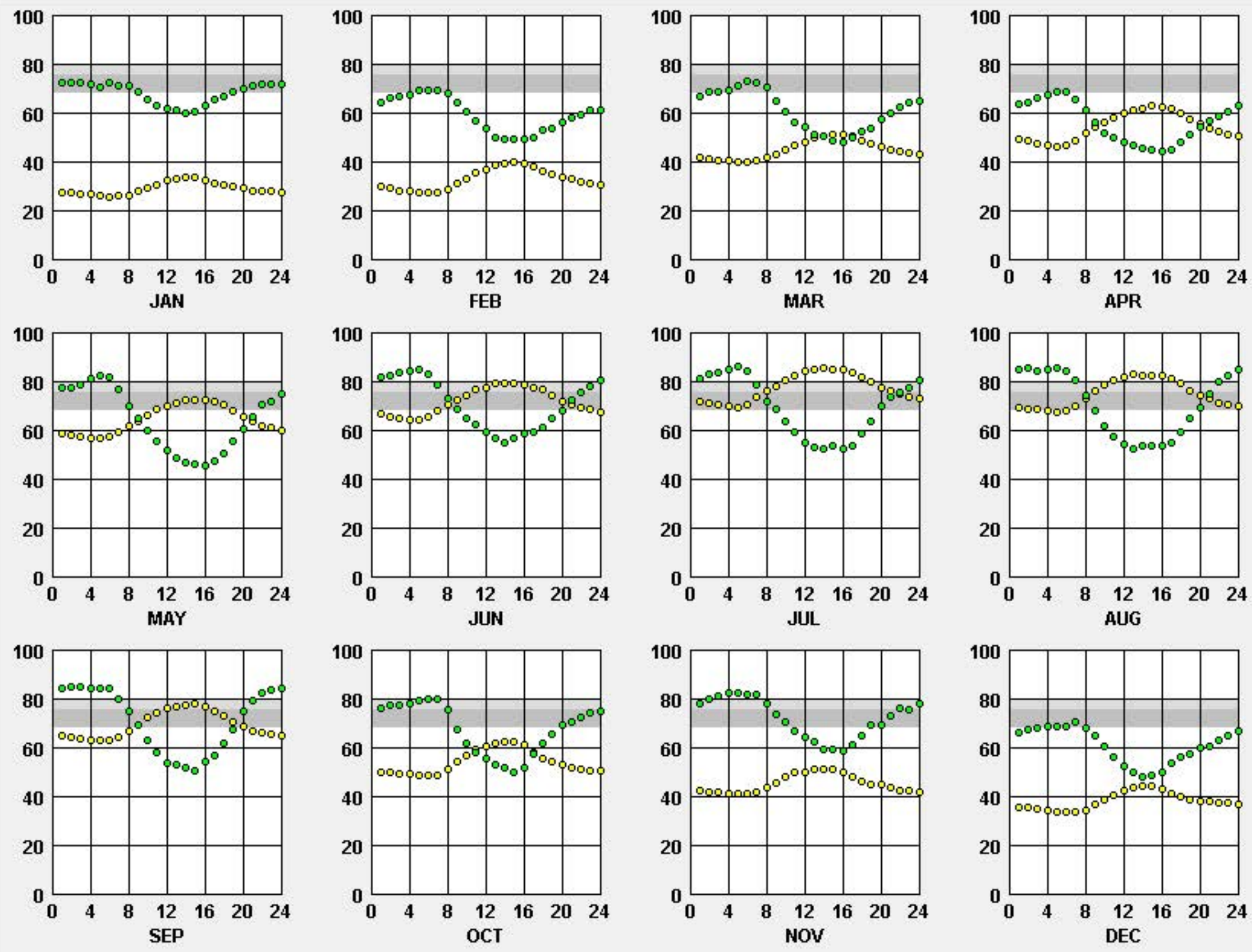
Humidity

Comfort Zone

Summer

Winter

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: TMY3 724080 WMO Station Number, Elevation 6 ft

LEGEND

DEPTH (feet)

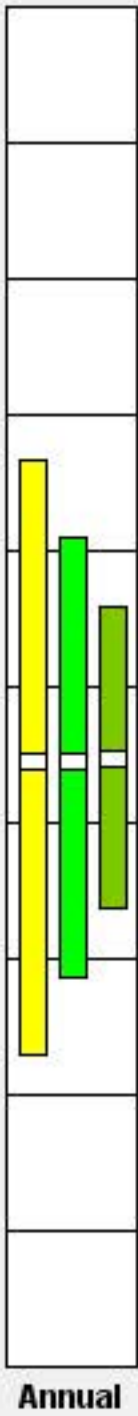
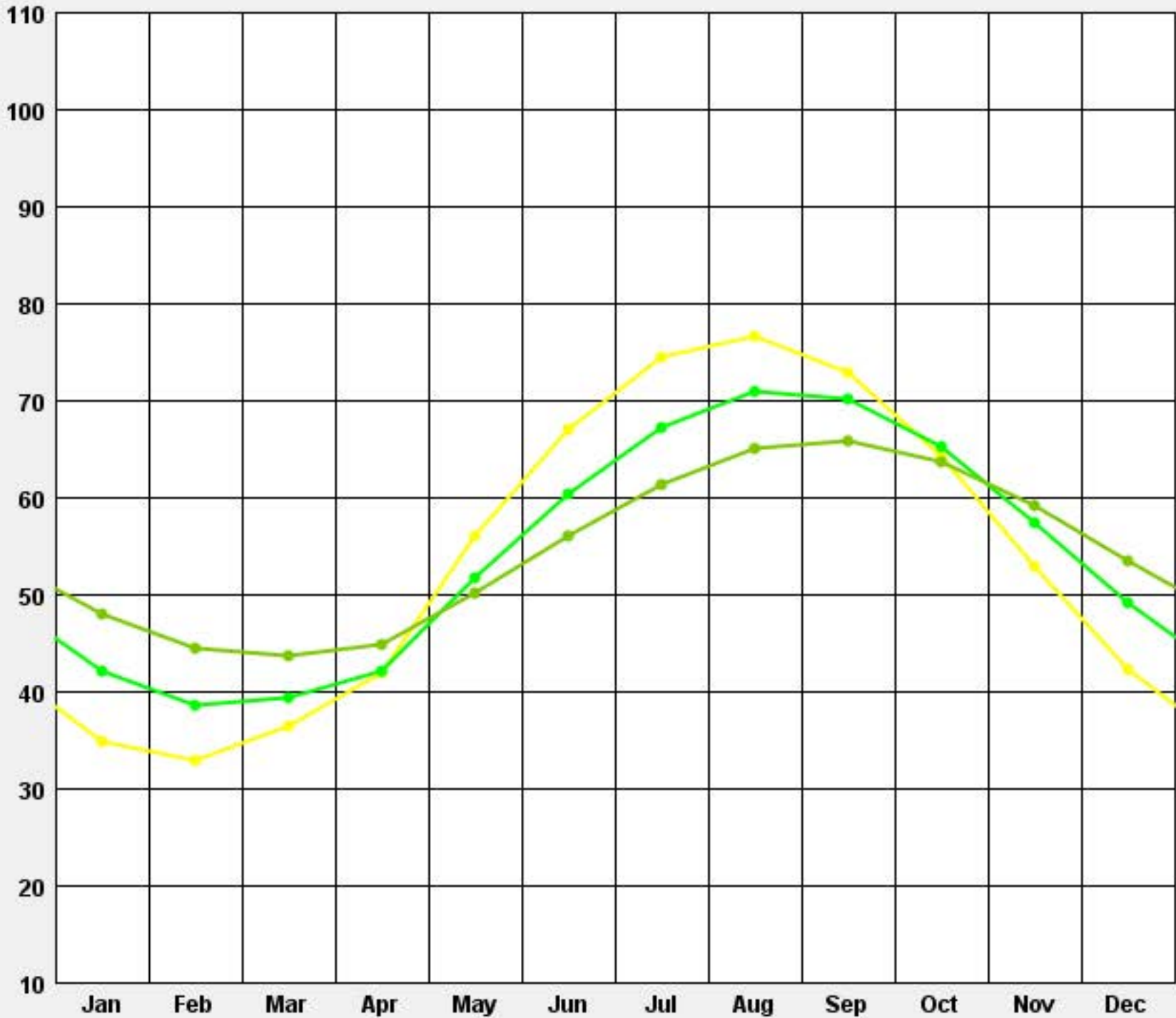
- 1.64
- 6.56
- 13.12

(Surface is freshly mown grass.)

TEMPERATURE RANGE:

☒ 10 to 110 °F

☐ Fit to Data










ILLUMINATION RANGE

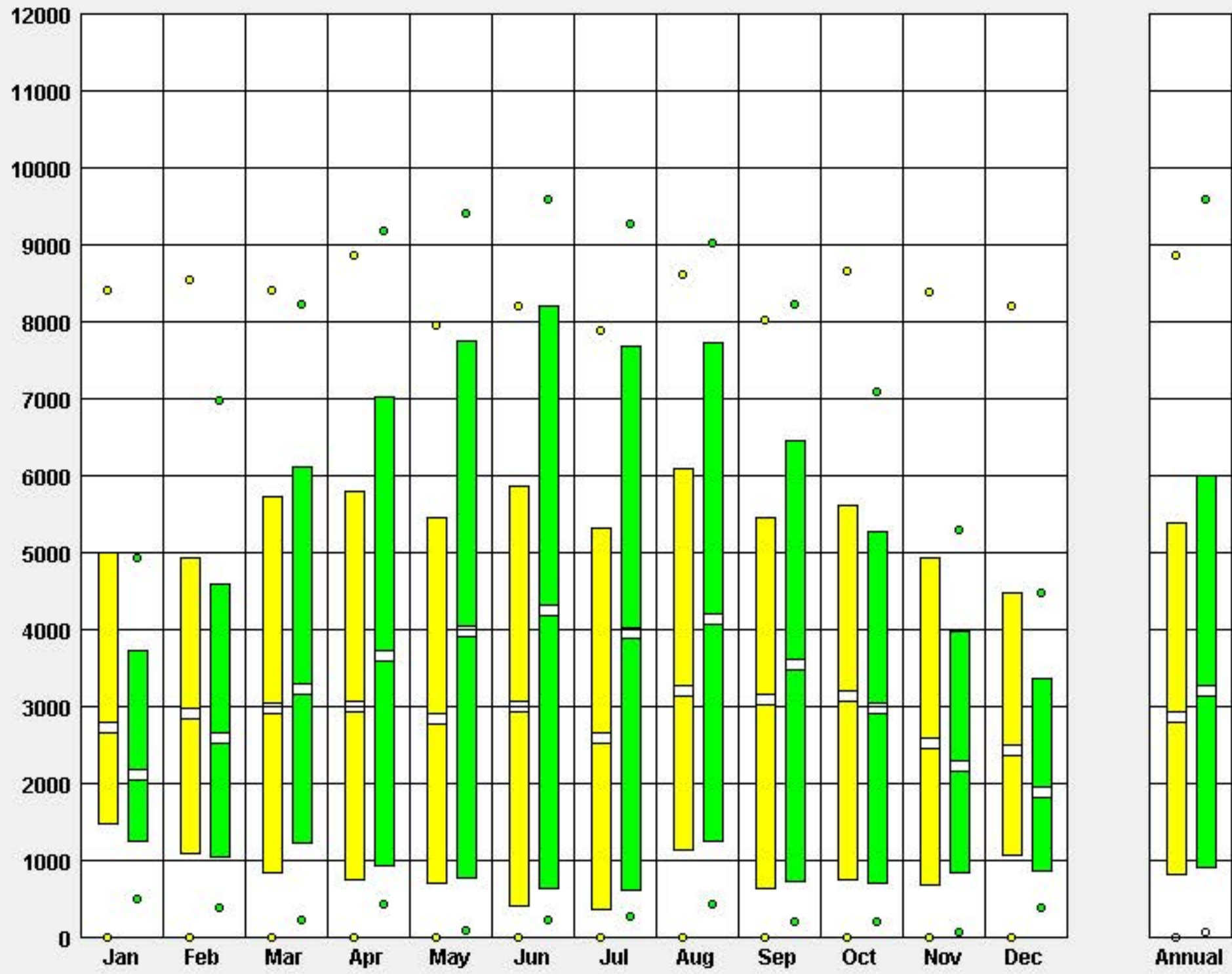
LOCATION: Philadelphia International Ap, PA, USA  
Latitude/Longitude: 39.87° North, 75.23° West, Time Zone from Greenwich -5  
Data Source: TMY3 724080 WMO Station Number, Elevation 6 ft

LEGEND

HOURLY ILLUMINATION  
DAYLIT HOURS ONLY

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

RECORDED:  
 DIRECT NORMAL  
 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)

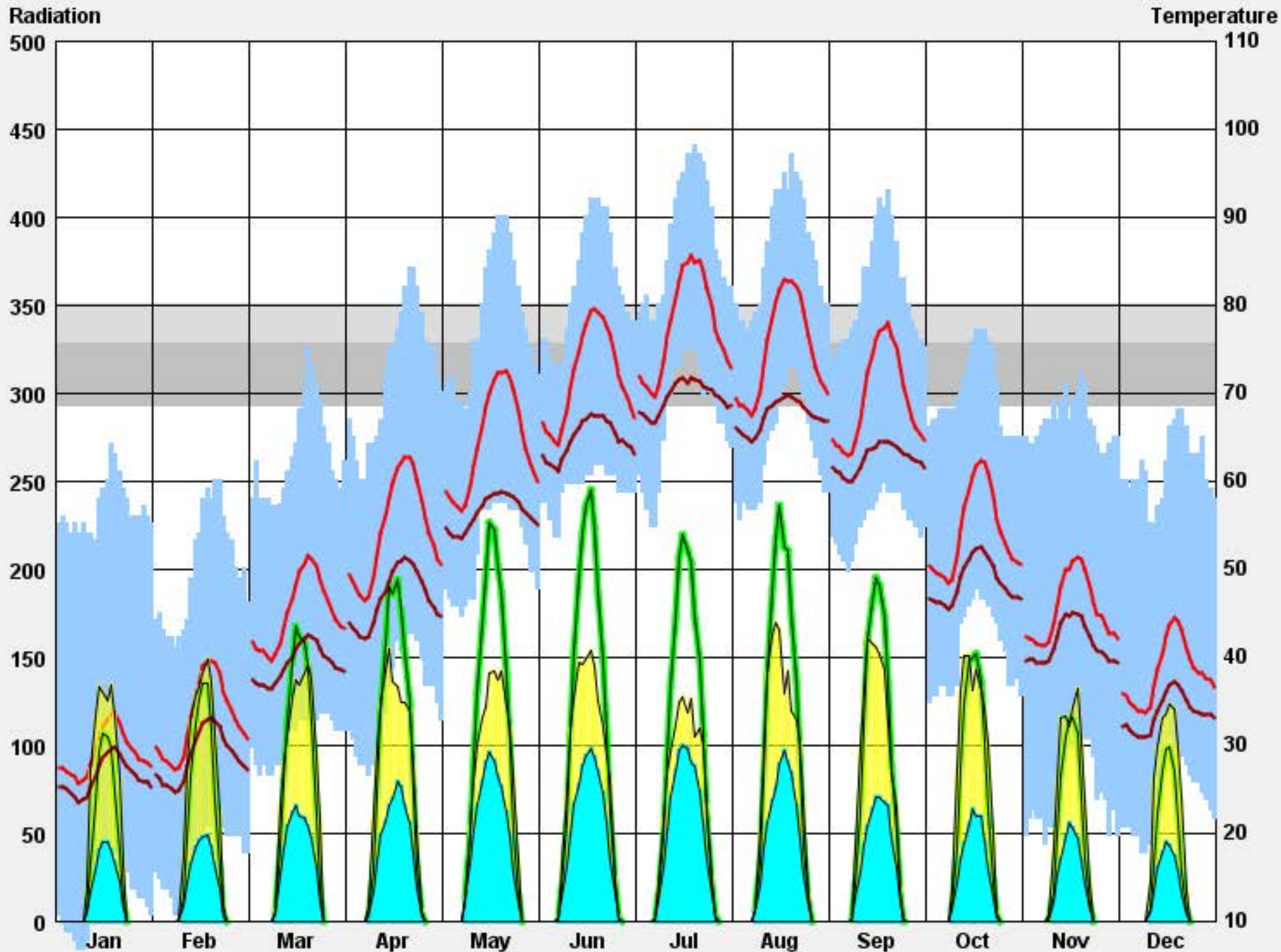
**RADIATION: (Btu/sq.ft)**

- GLOBAL HORIZ
- DIRECT NORMAL
- DIFFUSE

☒ Display Dry Bulb Temp  
(all hours)

**TEMPERATURE RANGE:**

- ☒ 10 to 110 °F
- ☐ Fit to Data



Back

Next



PSYCHROMETRIC CHART  
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

COMFORT INDOORS

100% COMFORTABLE  
0% NOT COMFORTABLE

PLOT: COMFORT INDOORS

Hourly Daily Min/Max

All Hours Select Hours

1 a.m. through 12 a.m.

All Months Select Months

JAN through DEC

1 Month JAN Next

1 Day 1 Next

1 Hour 1 a.m. Next

TEMPERATURE RANGE:

10 to 110 °F Fit to Data

Display Design Strategies

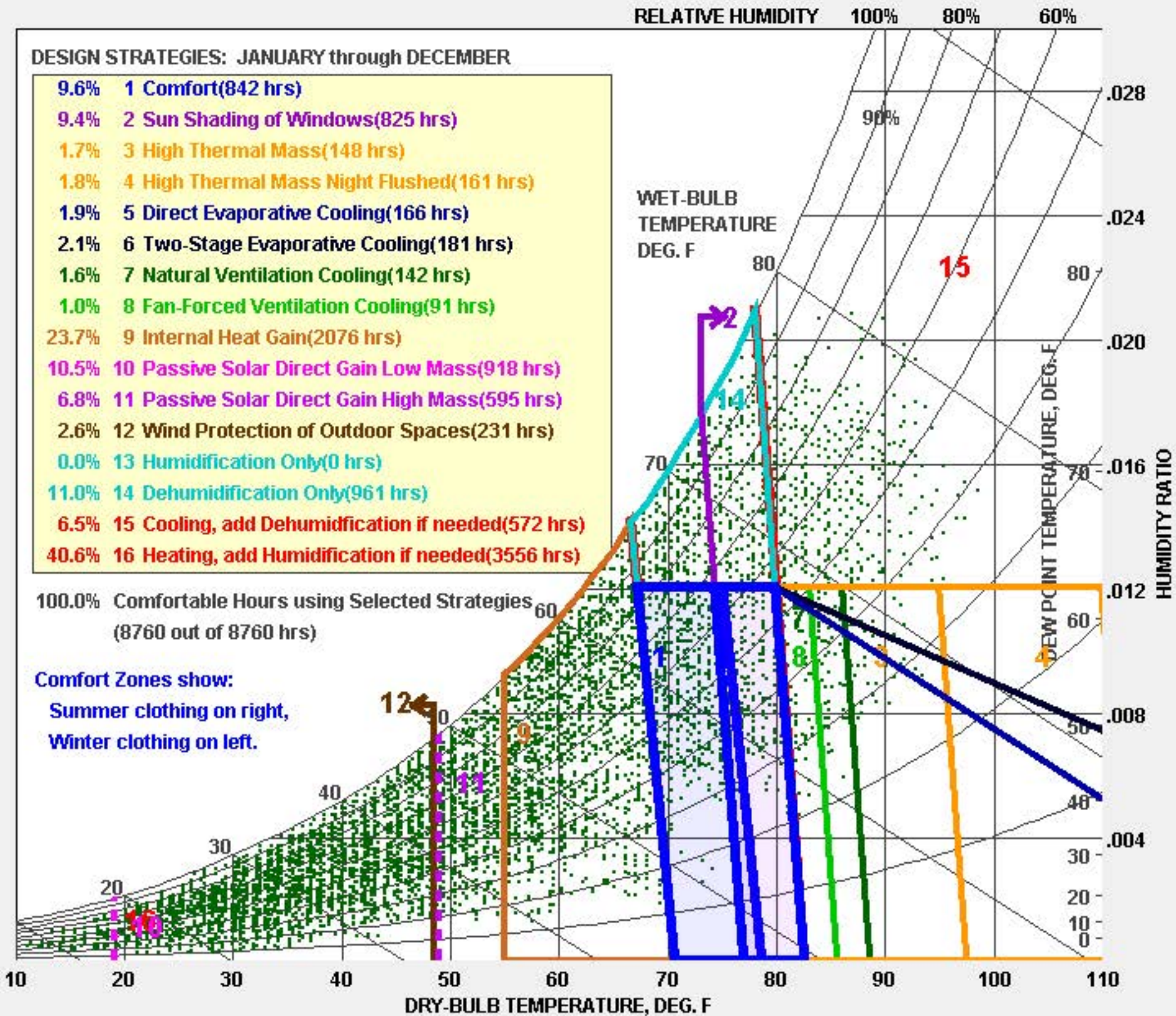
Show Best set of Design Strategies

DESIGN STRATEGIES: JANUARY through DECEMBER

- 9.6% 1 Comfort(842 hrs)
- 9.4% 2 Sun Shading of Windows(825 hrs)
- 1.7% 3 High Thermal Mass(148 hrs)
- 1.8% 4 High Thermal Mass Night Flushed(161 hrs)
- 1.9% 5 Direct Evaporative Cooling(166 hrs)
- 2.1% 6 Two-Stage Evaporative Cooling(181 hrs)
- 1.6% 7 Natural Ventilation Cooling(142 hrs)
- 1.0% 8 Fan-Forced Ventilation Cooling(91 hrs)
- 23.7% 9 Internal Heat Gain(2076 hrs)
- 10.5% 10 Passive Solar Direct Gain Low Mass(918 hrs)
- 6.8% 11 Passive Solar Direct Gain High Mass(595 hrs)
- 2.6% 12 Wind Protection of Outdoor Spaces(231 hrs)
- 0.0% 13 Humidification Only(0 hrs)
- 11.0% 14 Dehumidification Only(961 hrs)
- 6.5% 15 Cooling, add Dehumidification if needed(572 hrs)
- 40.6% 16 Heating, add Humidification if needed(3556 hrs)

100.0% Comfortable Hours using Selected Strategies  
(8760 out of 8760 hrs)

Comfort Zones show:  
Summer clothing on right,  
Winter clothing on left.



Click on Design Strategy to select or deselect.



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)

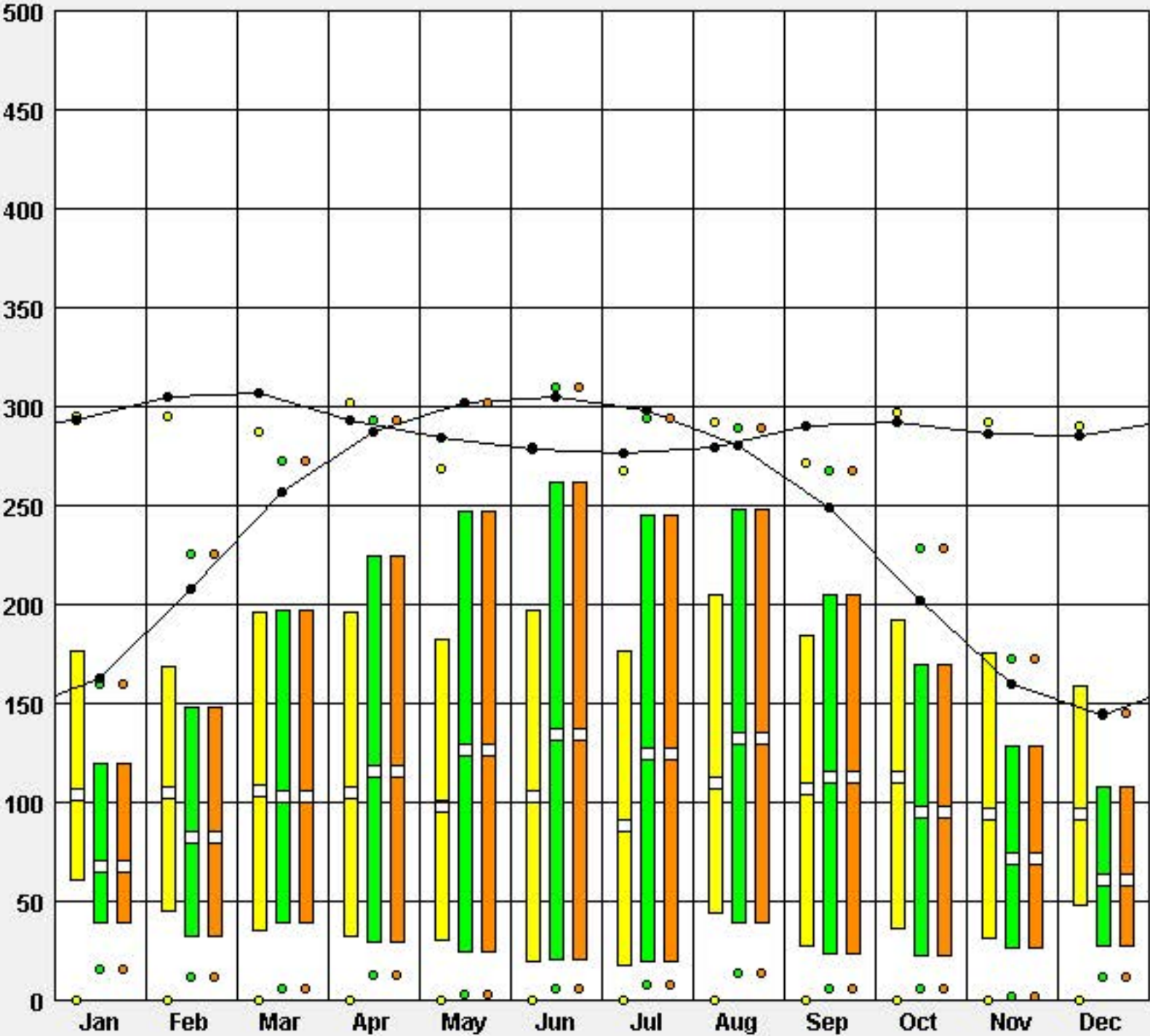
THEORETICAL:

Tilted Surface Radiation Input:

Tilt degrees from ...  
(Vertical = 90°)  
 Bearing degrees fr...  
(South = 0°, West ...  
 % Ground Reflecta...  
(20% = grass)

PLOT:

☒ Hourly Avg ☐ Daily Total



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

Back

Next





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 - 

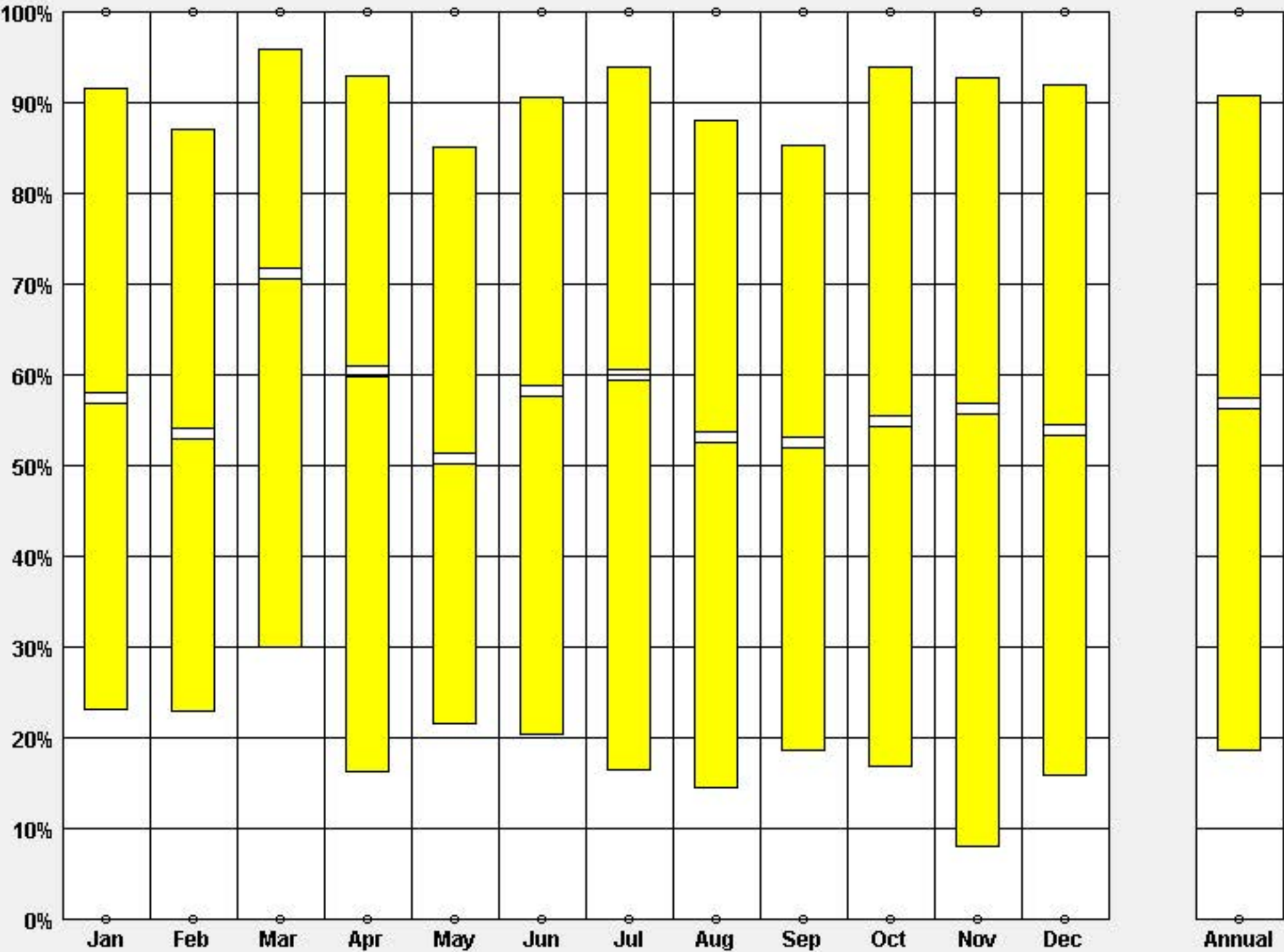
AVERAGE HIGH - 

MEAN - 

AVERAGE LOW - 

RECORDED LOW - 

Clear Skies 0



SUN CHART

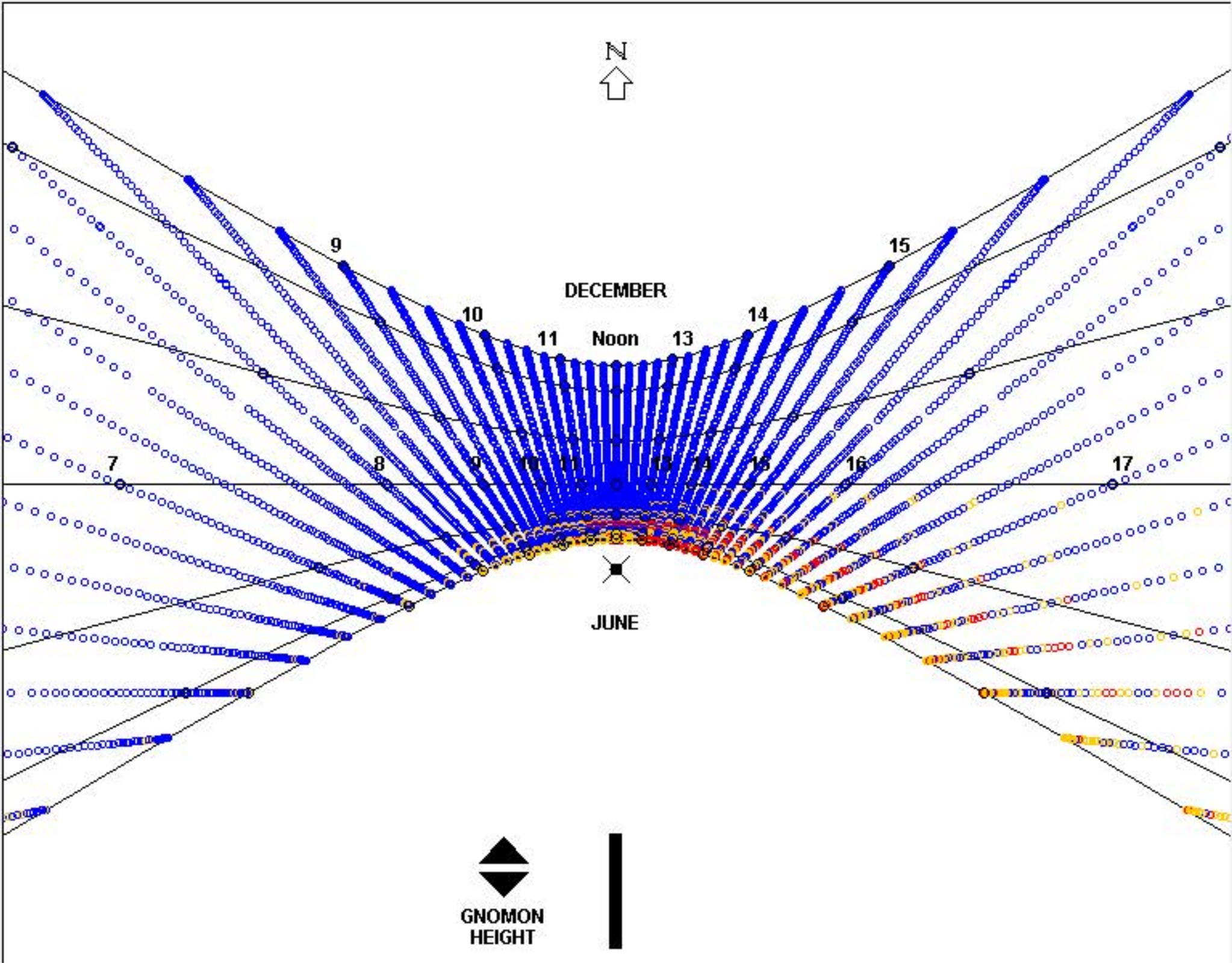
LOCATION: Philadelphia International Ap, PA, USA  
Latitude/Longitude: 39.87° North, 75.23° West, Time Zone from Greenwich -5  
Data Source: TMY3 724080 WMO Station Number, Elevation 6 ft

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.



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

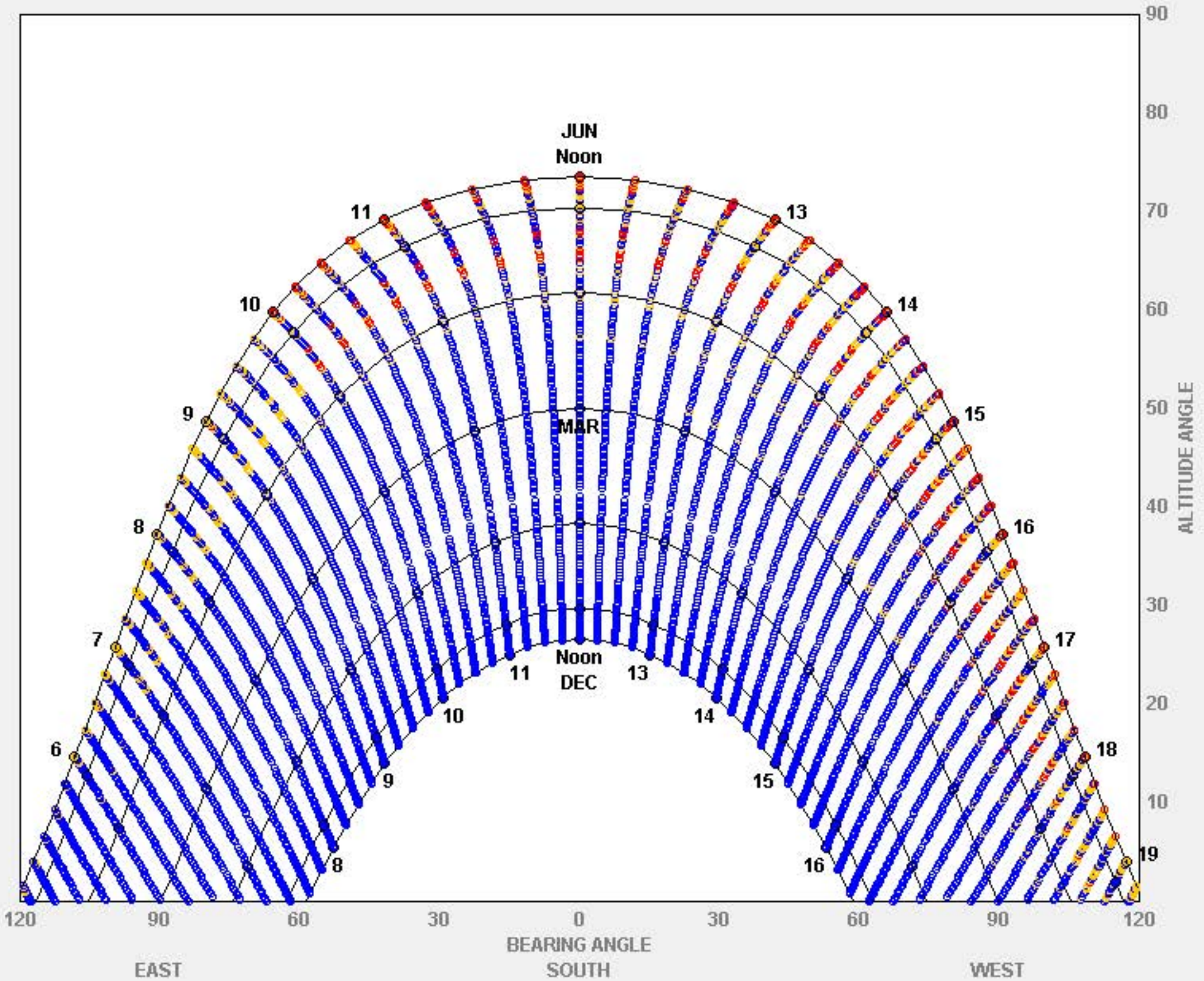
● December 21 to June 21

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

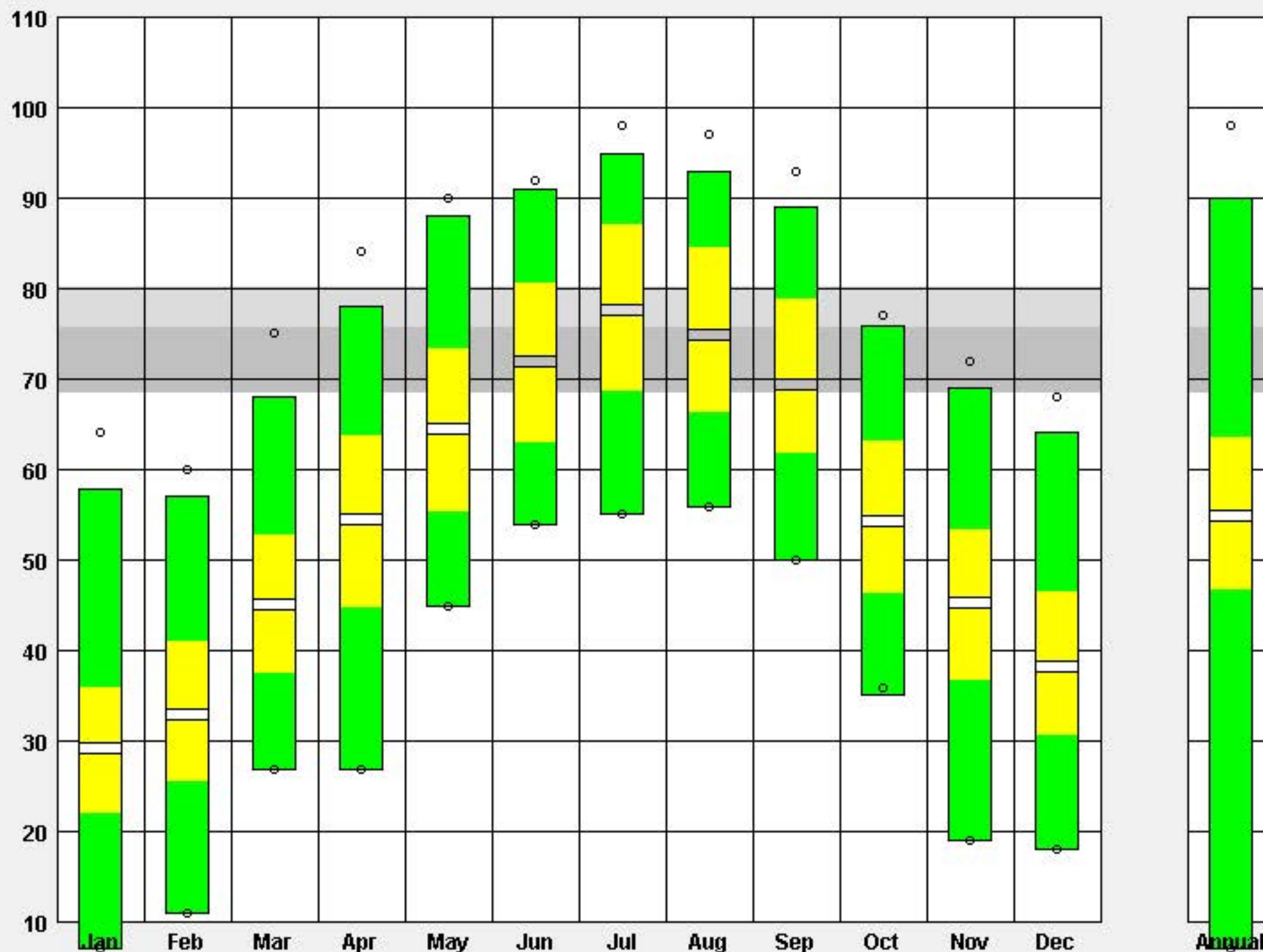
- ☒ 1% of Hours Above  
☐ .5% of Hours Above  
☐ 0% of Hours Above

DESIGN LOW: Residential

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

TEMPERATURE RANGE:

- ☒ 10 to 110 °F  
☐ Fit to Data





# 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

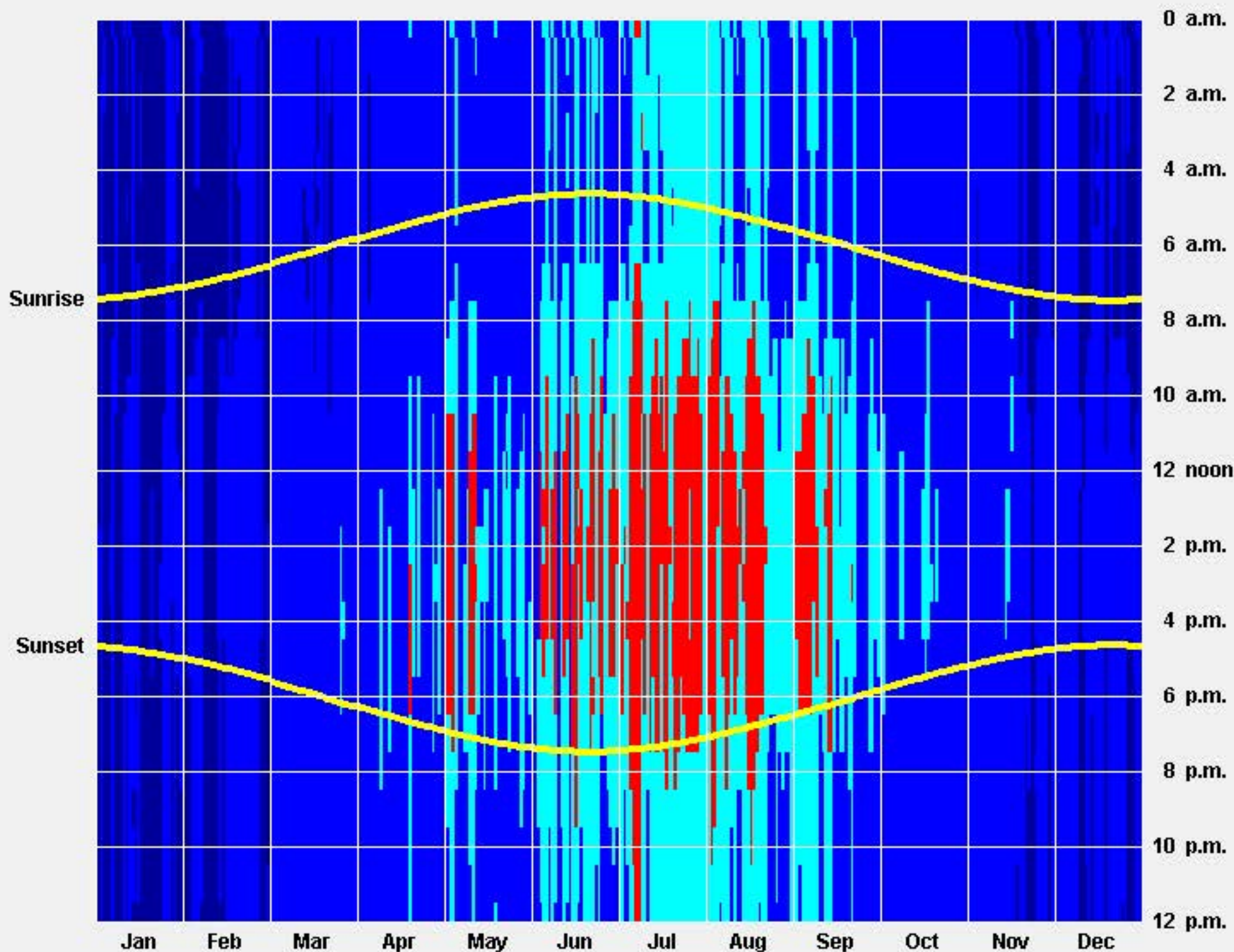
(degrees F)

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

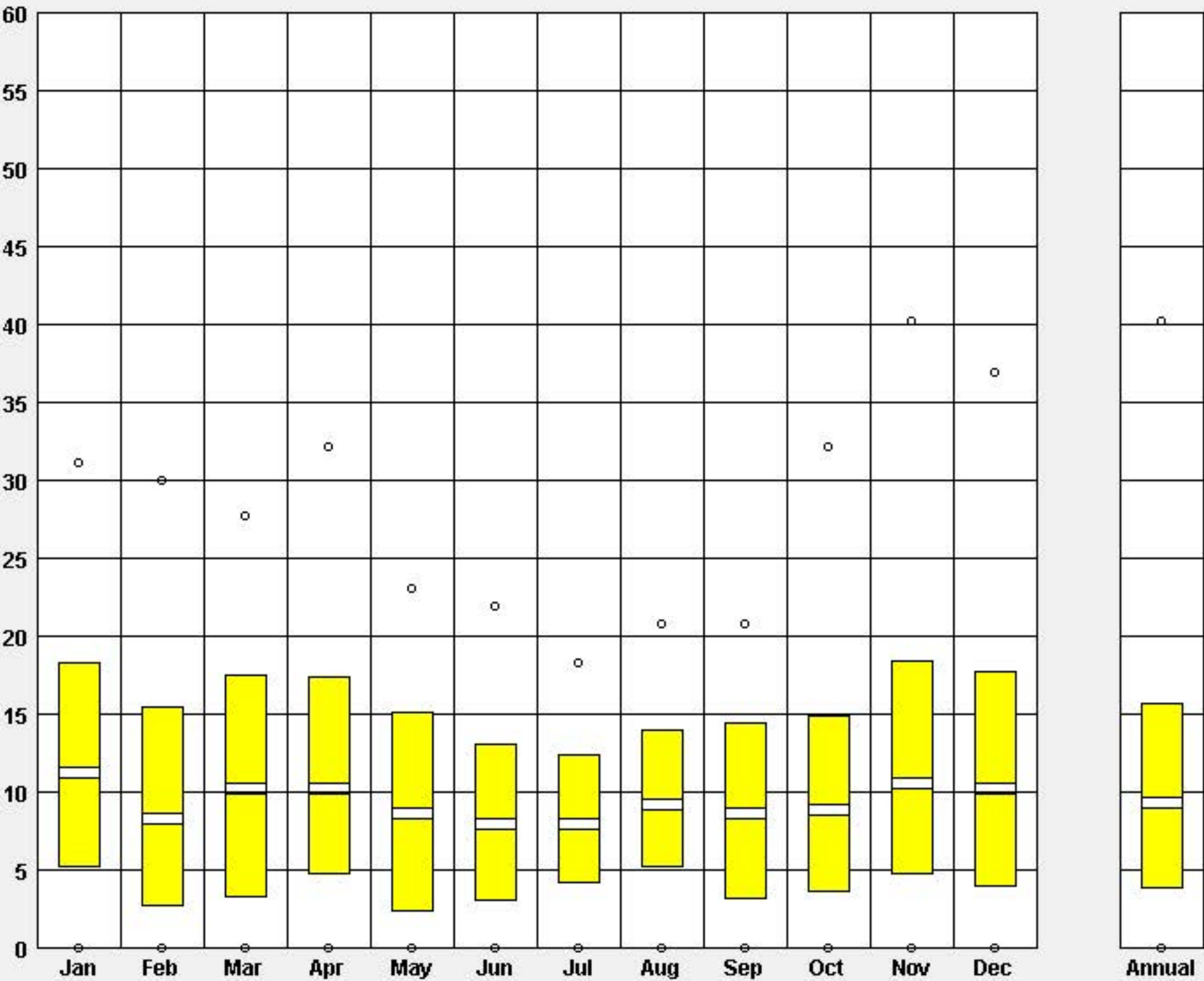
WIND VELOCITY:

●

 0 to 60 mph

○

 Fit to Data





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

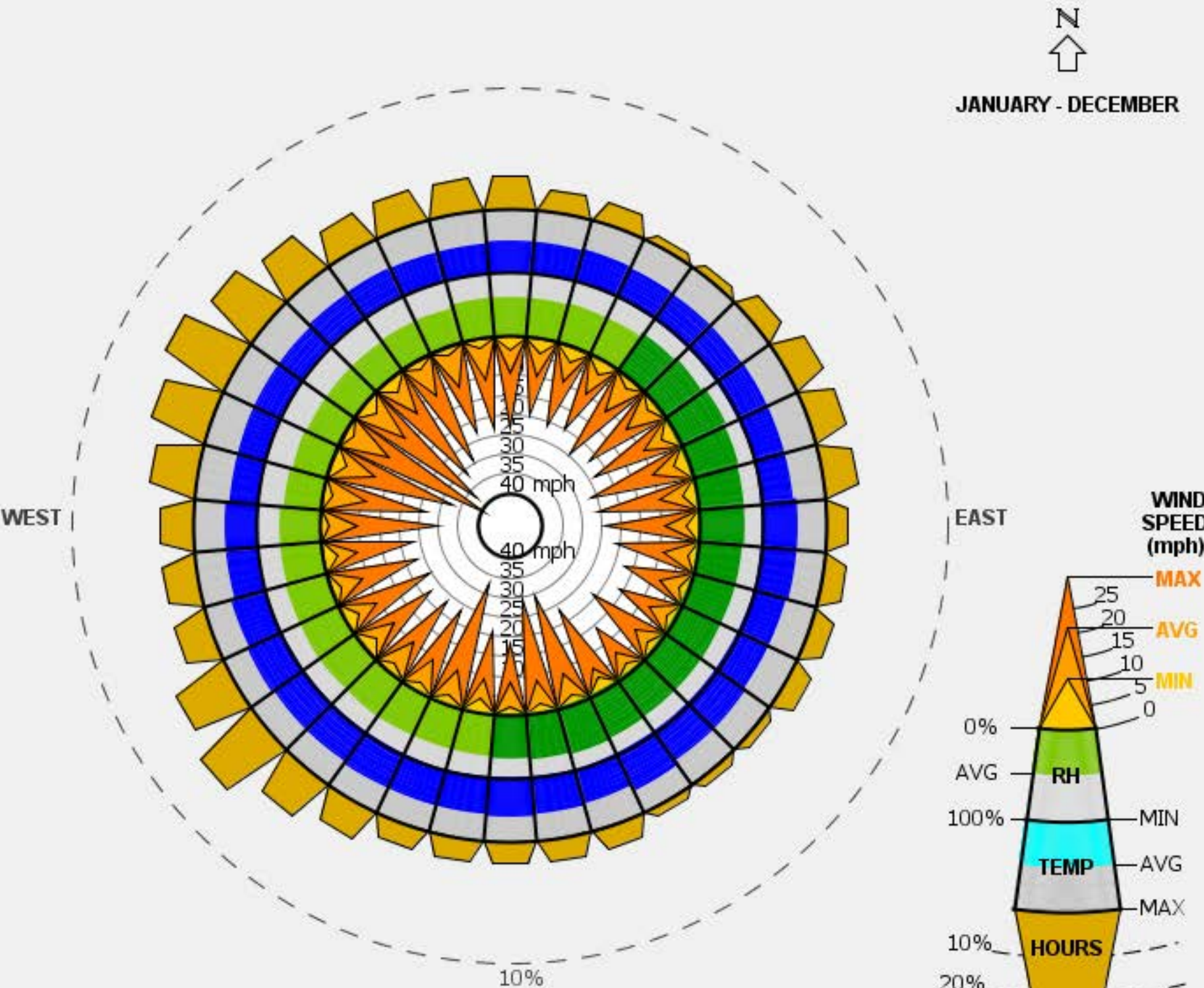
☐ Daily

☐ Hourly

Start

Pause

Stop



## Conclusions:

- 1) According to the Sun Shading Chart, shading systems need to block the summer sun from especially the South and West directions. Since the summer sun is higher in the sky than the winter sun, the shade can be constructed such that the sun is able to penetrate the outdoor space in the winter but not in the summer.
- 2) According to the Wind Wheel, the wind is most prevalent and strongest from the Northwest and Southwest directions. Any outdoor shade structures or pavilions should be designed to mitigate wind from these directions in order to maximize comfort.
- 3) As temperatures and radiation are higher during the summer, shade structures should be designed with natural ventilation in order to allow for heat to escape without allowing in disruptive wind.