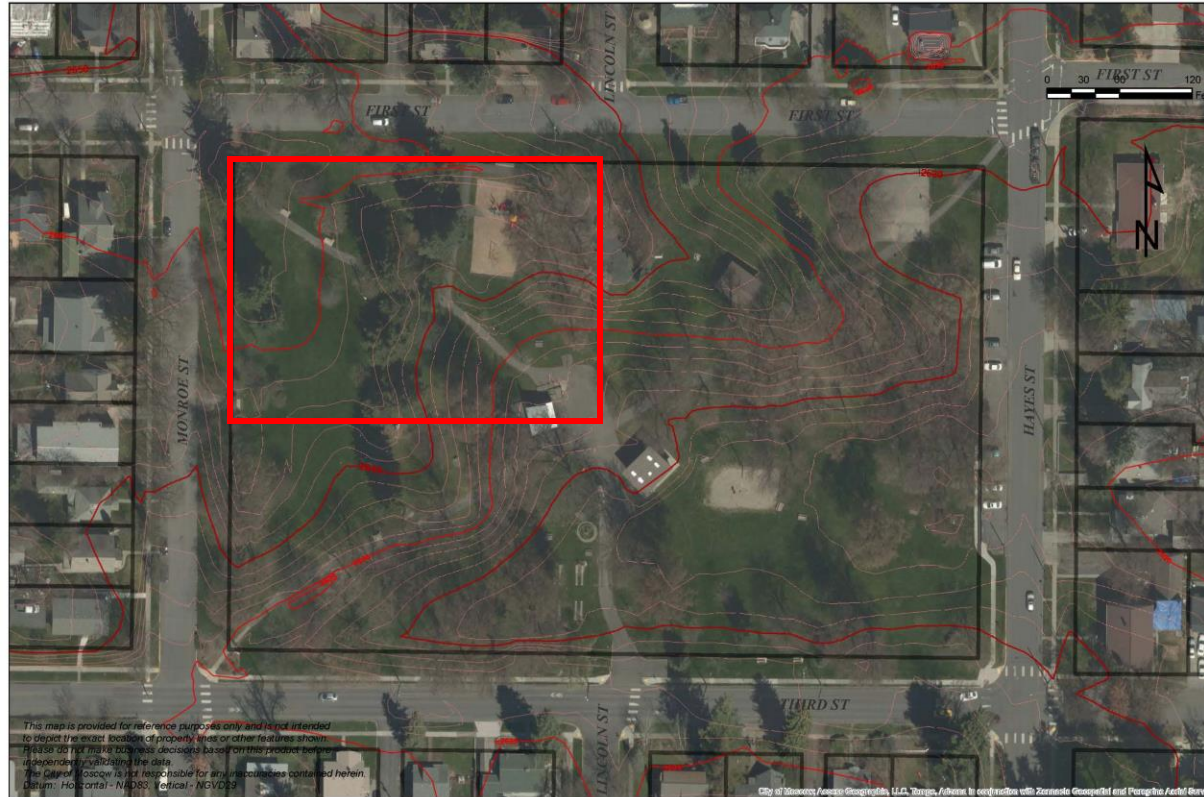


Lab Exercise 1



Discovering Precedent, Site, and Program
Boston, MA - Public Library
Site – East City Park NW Quadrant
Nate Henrie, Elizabeth Smythe, Amanda Eller

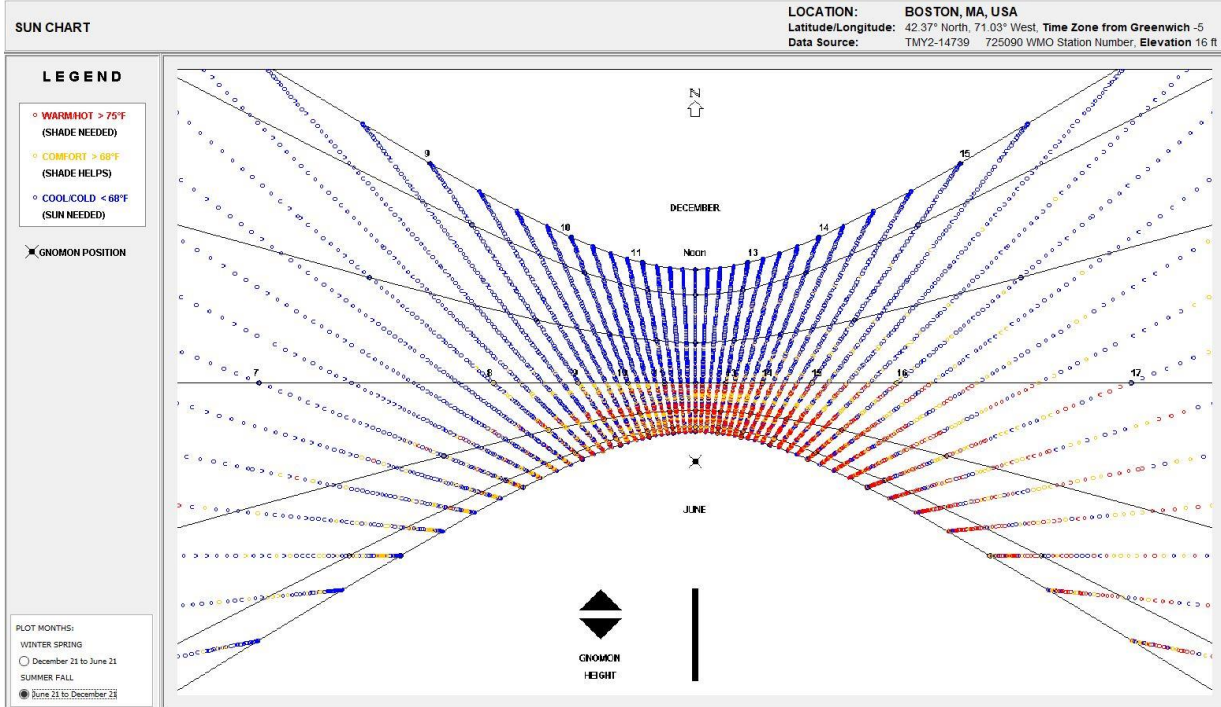
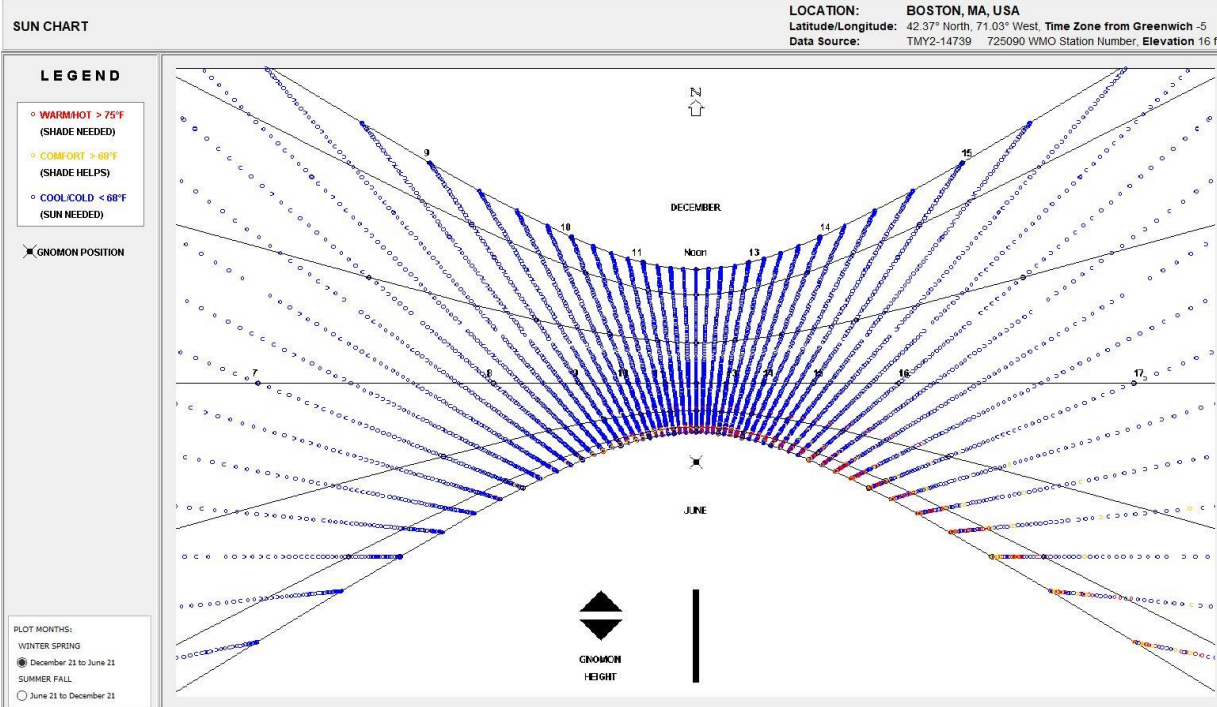
A: Climate Analysis – Sun Chart

Winter / Spring

- Mostly cold temperatures with some shade needed in late spring

Summer / Fall

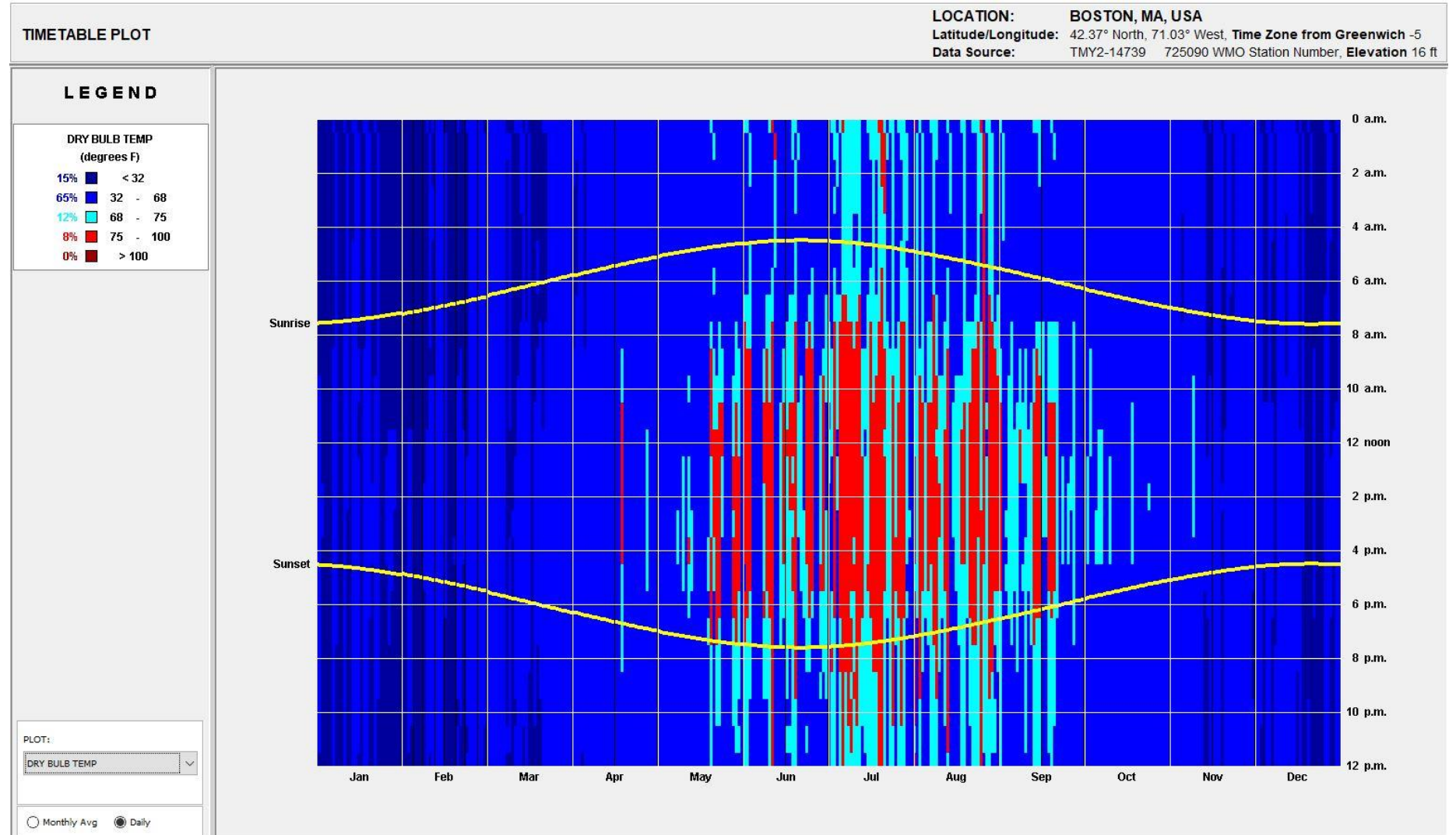
- Shade needed in Summer and early Fall



A: Climate Analysis – Timetable Plot

Heating
Months:
September –
May

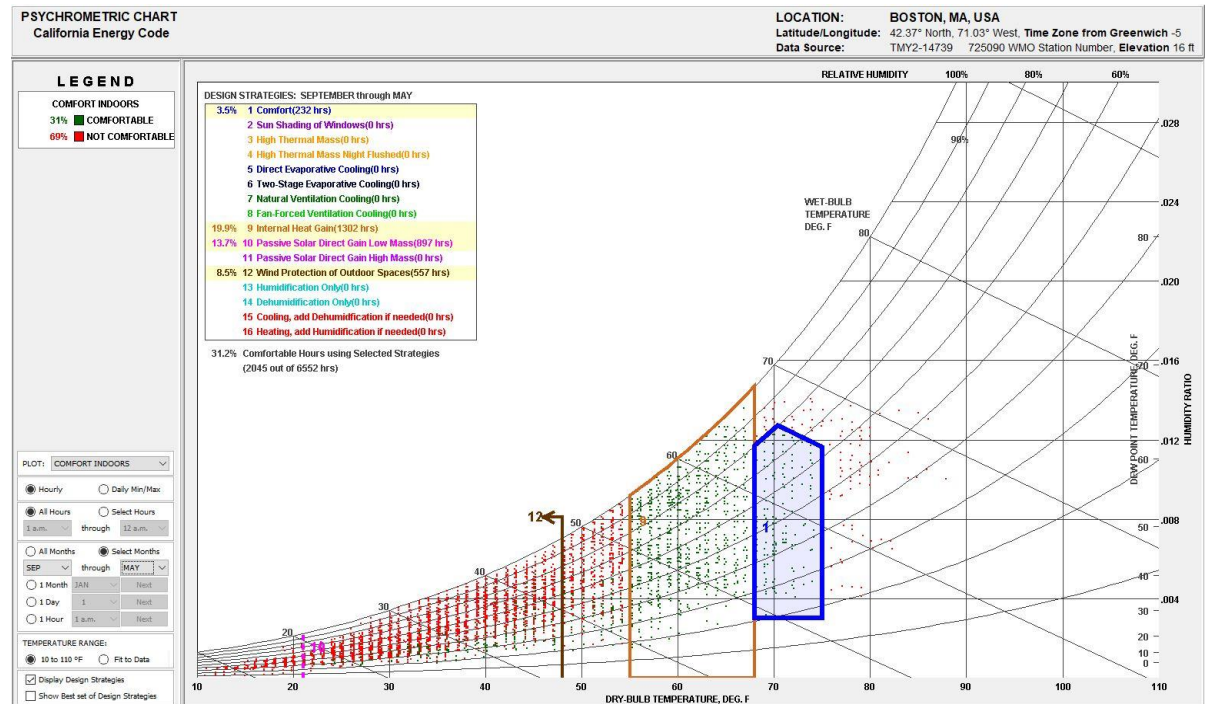
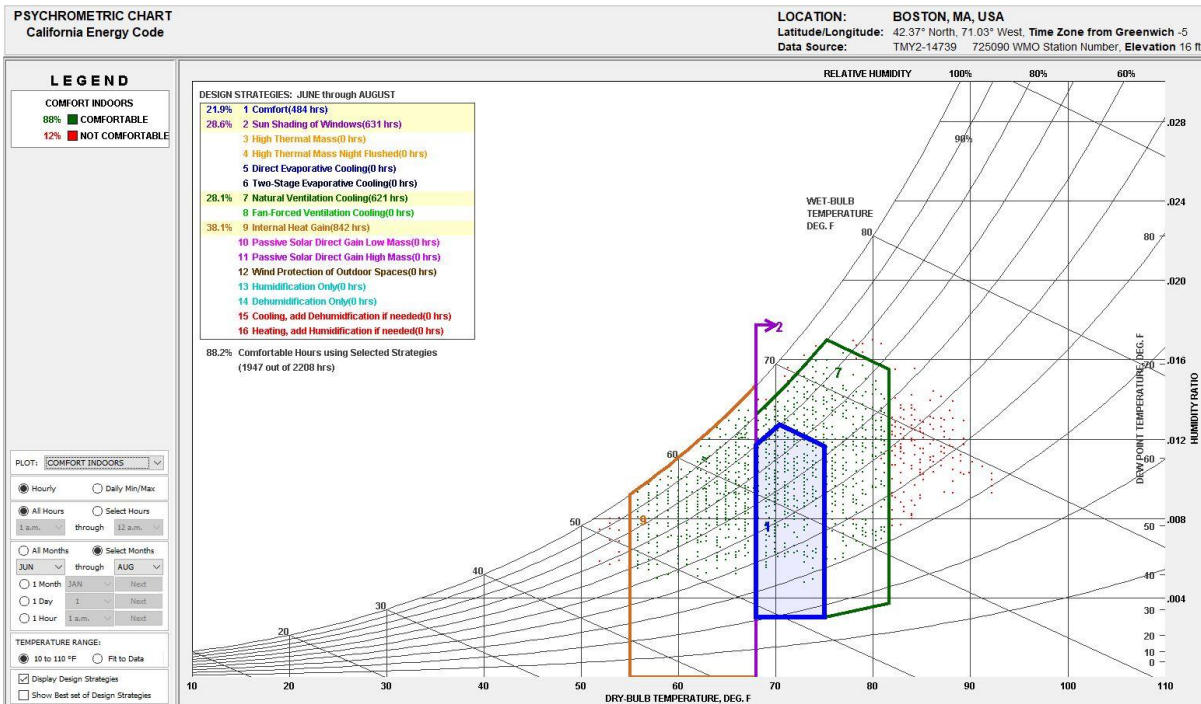
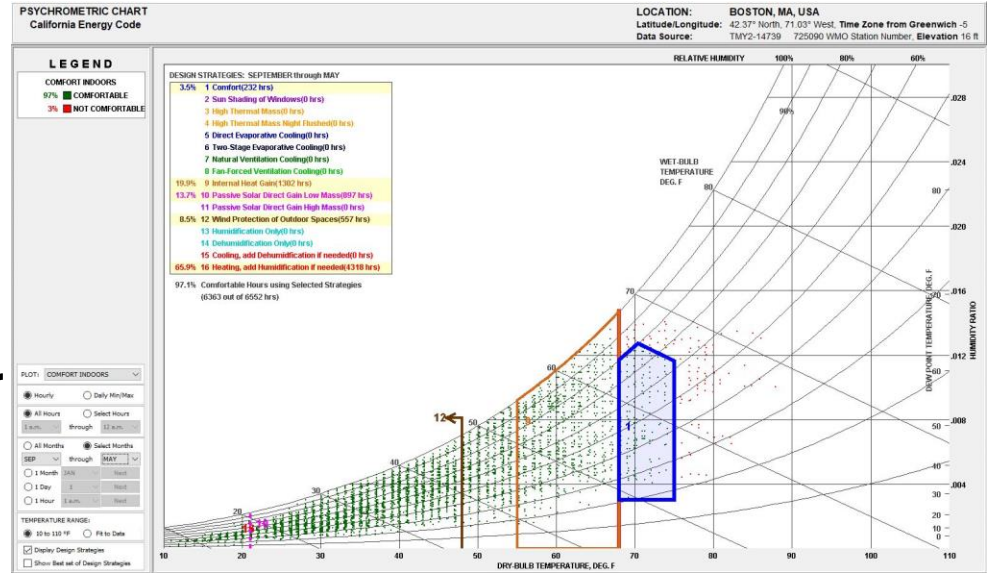
Cooling
Months: June
– August



A: Climate Analysis – Psychrometric Charts

Cooling Months: sun shading of windows, natural ventilation cooling, and internal heat gain

Heating Months: heating*, internal heat gain, passive solar direct gain low mass, and wind protection of outdoor spaces

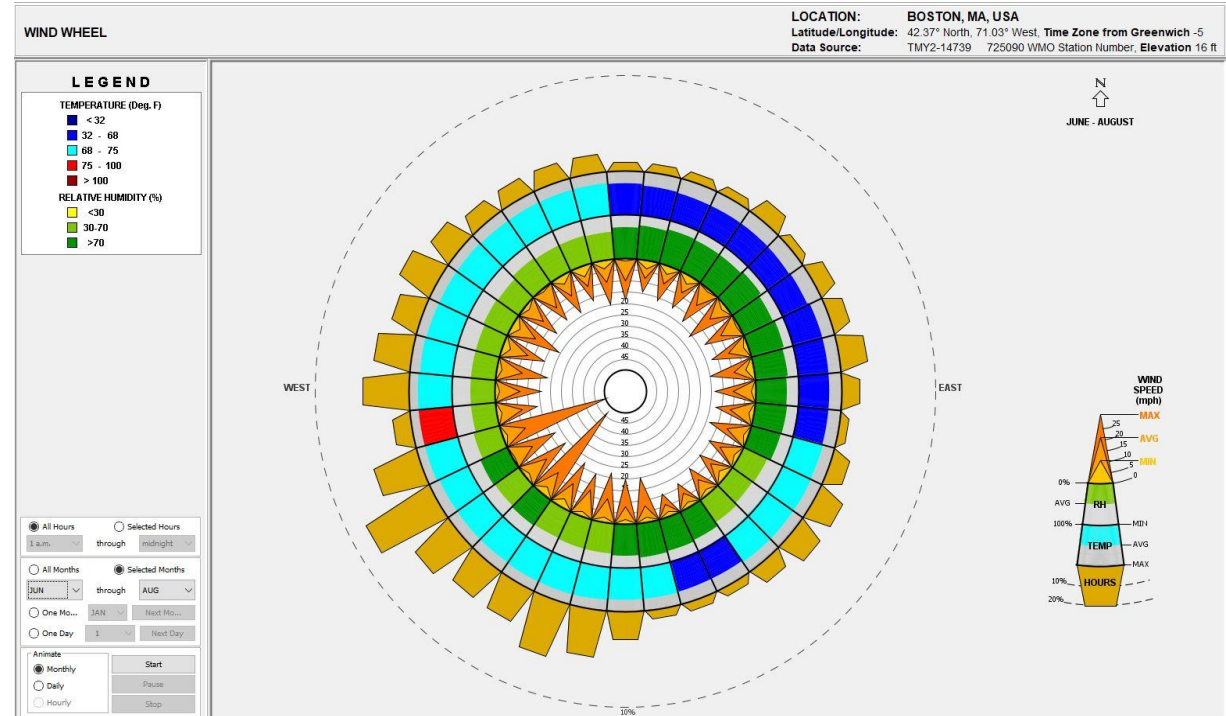
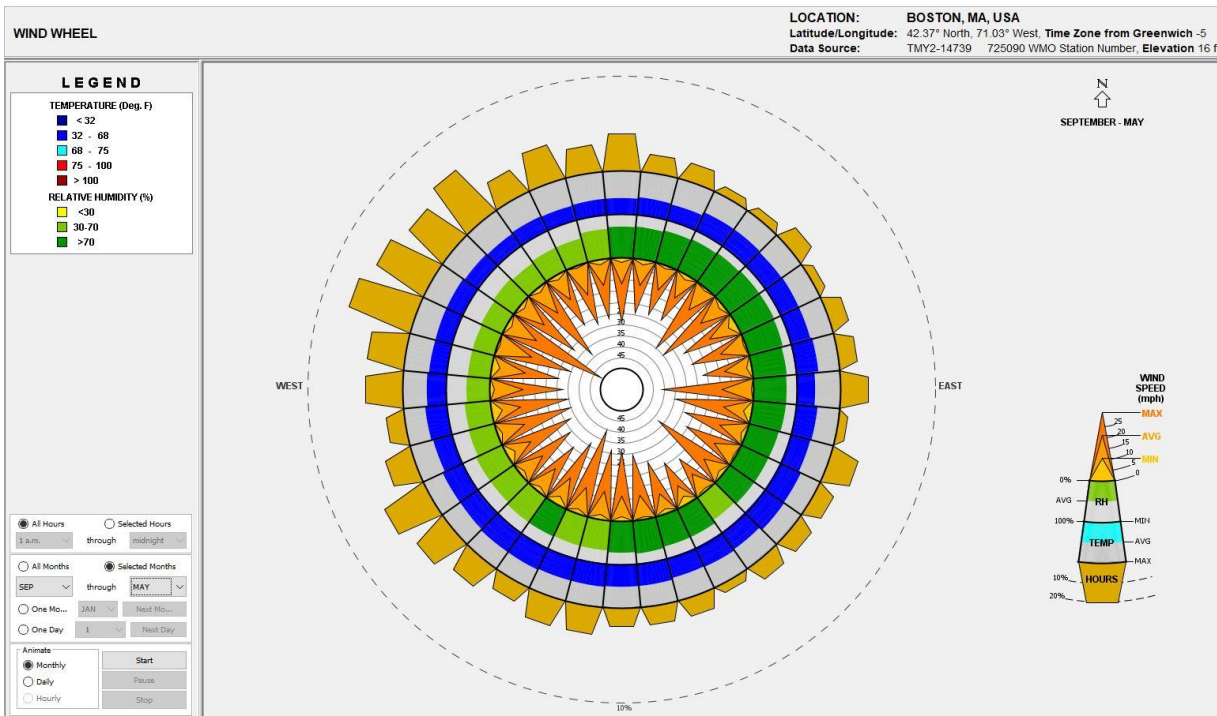


A: Climate Analysis – Wind Wheels

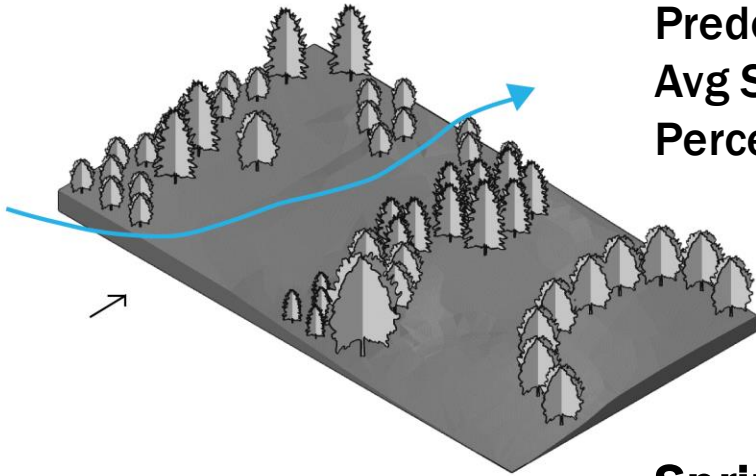
There is little change in daily wind speeds, but it changes direction often. Wind speeds are generally higher in Fall/Winter than in Spring/Summer. Humidity is consistently high and temperature is cool.

Heating Months: high winds – typically cool, humid air

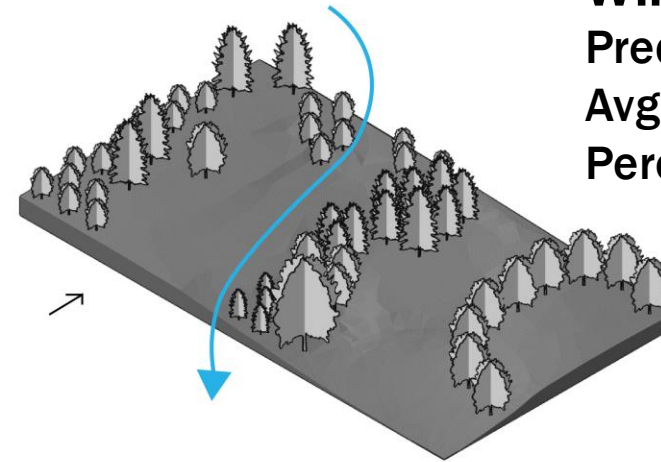
Cooling Months: lower wind speeds, typically mild, humid air



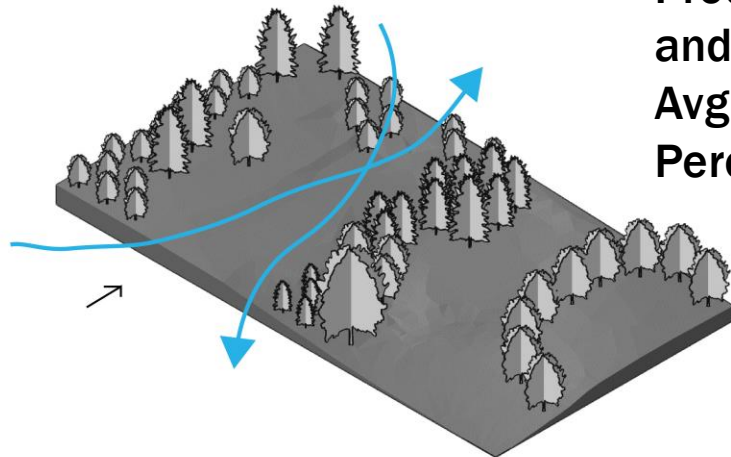
A: Climate Analysis – Wind Wheels



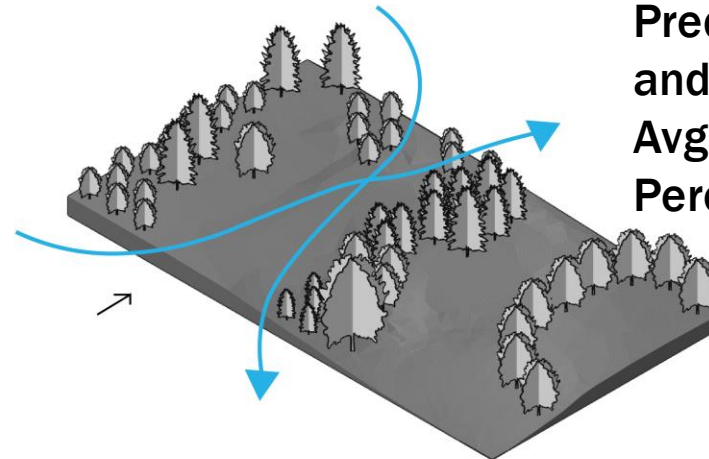
Summer Wind Flow
Predominately from SW
Avg Speed 10 mph
Percent Calm: 25%



Winter Wind Flow
Predominately from NW
Avg Speed 10 mph
Percent Calm: 42%

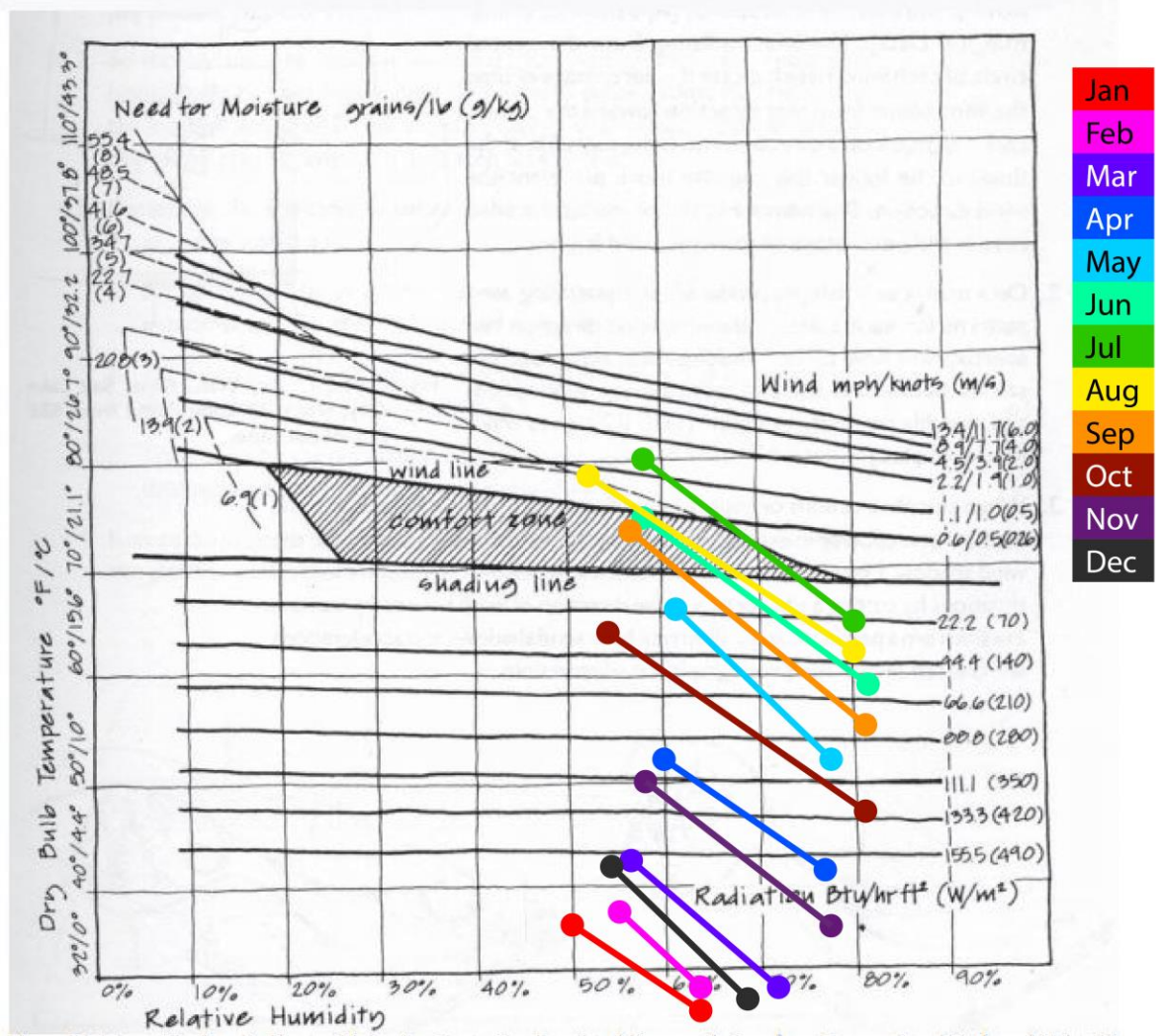
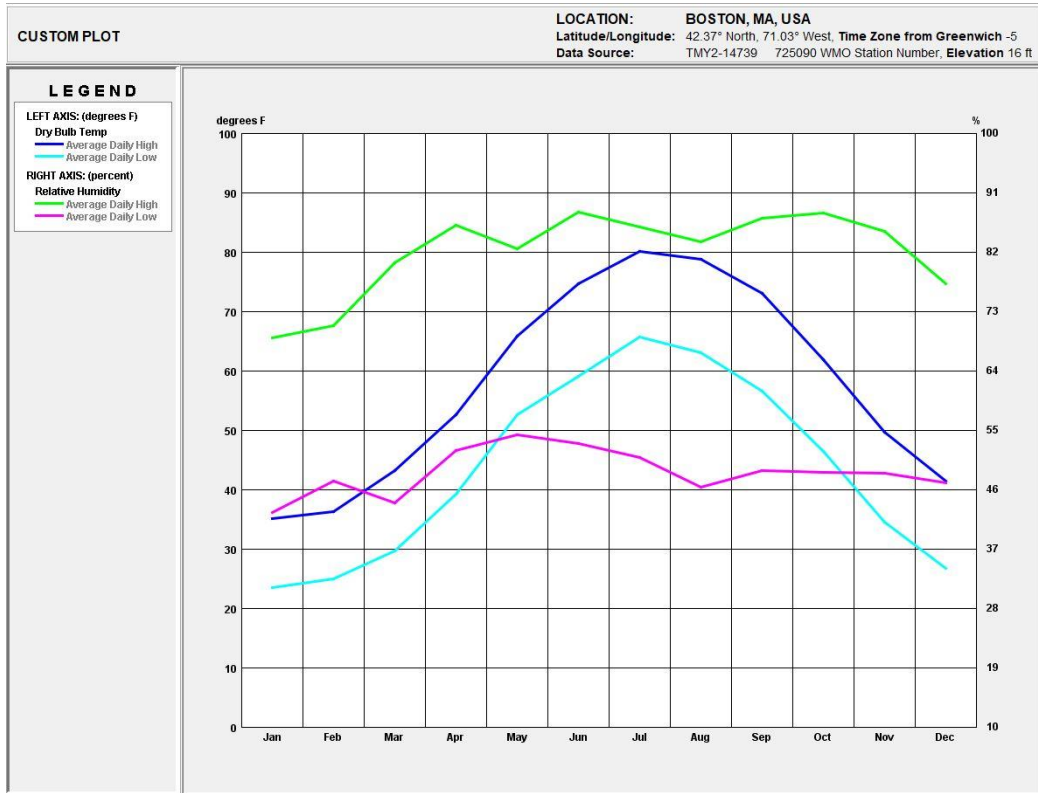


Spring Wind Flow
Predominately from NW
and SW
Avg Speed 15 mph
Percent Calm: 14%



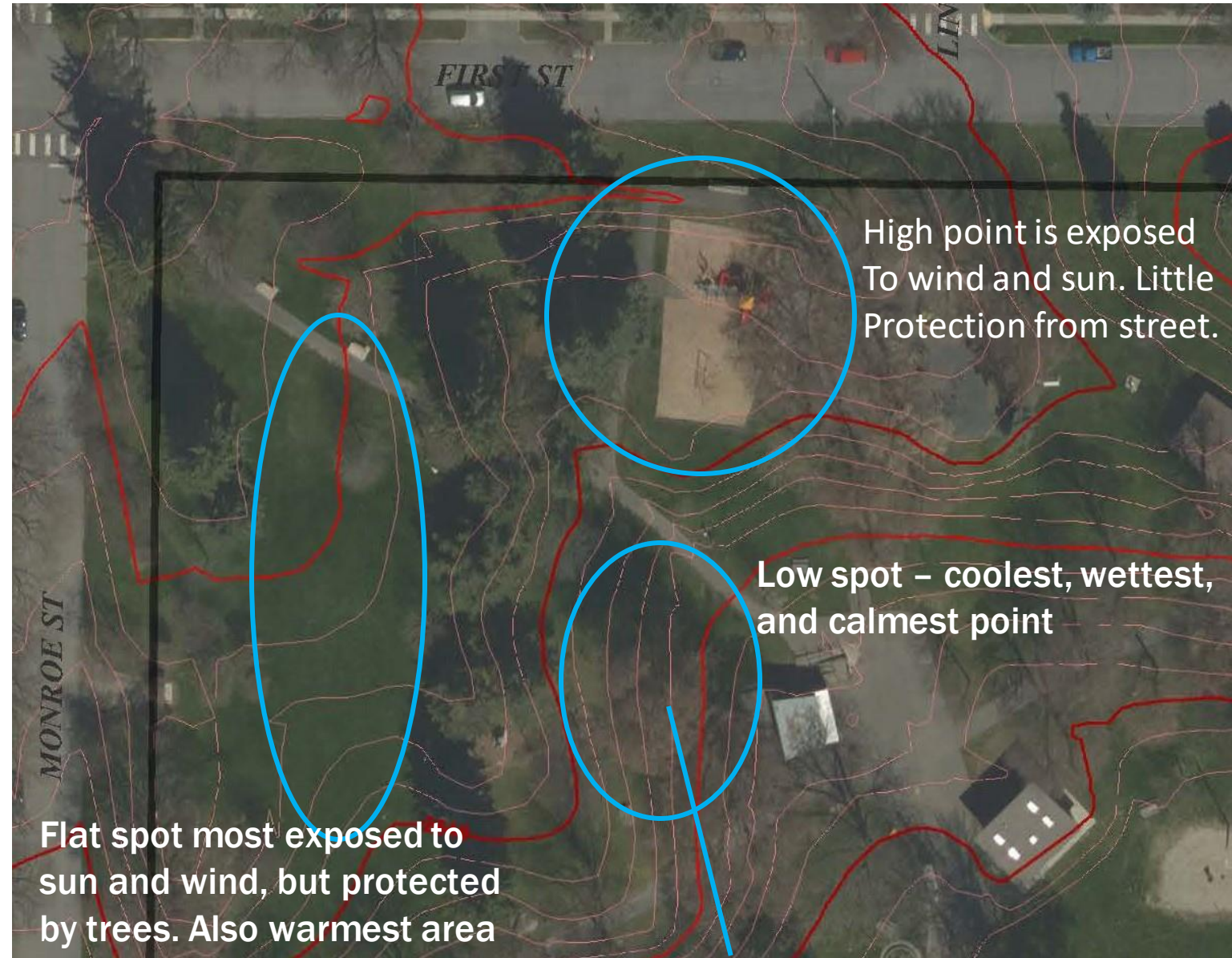
Fall Wind Flow
Predominately from NW
and SW
Avg Speed 10-15 mph
Percent Calm: 30%

A: Custom Plot 1



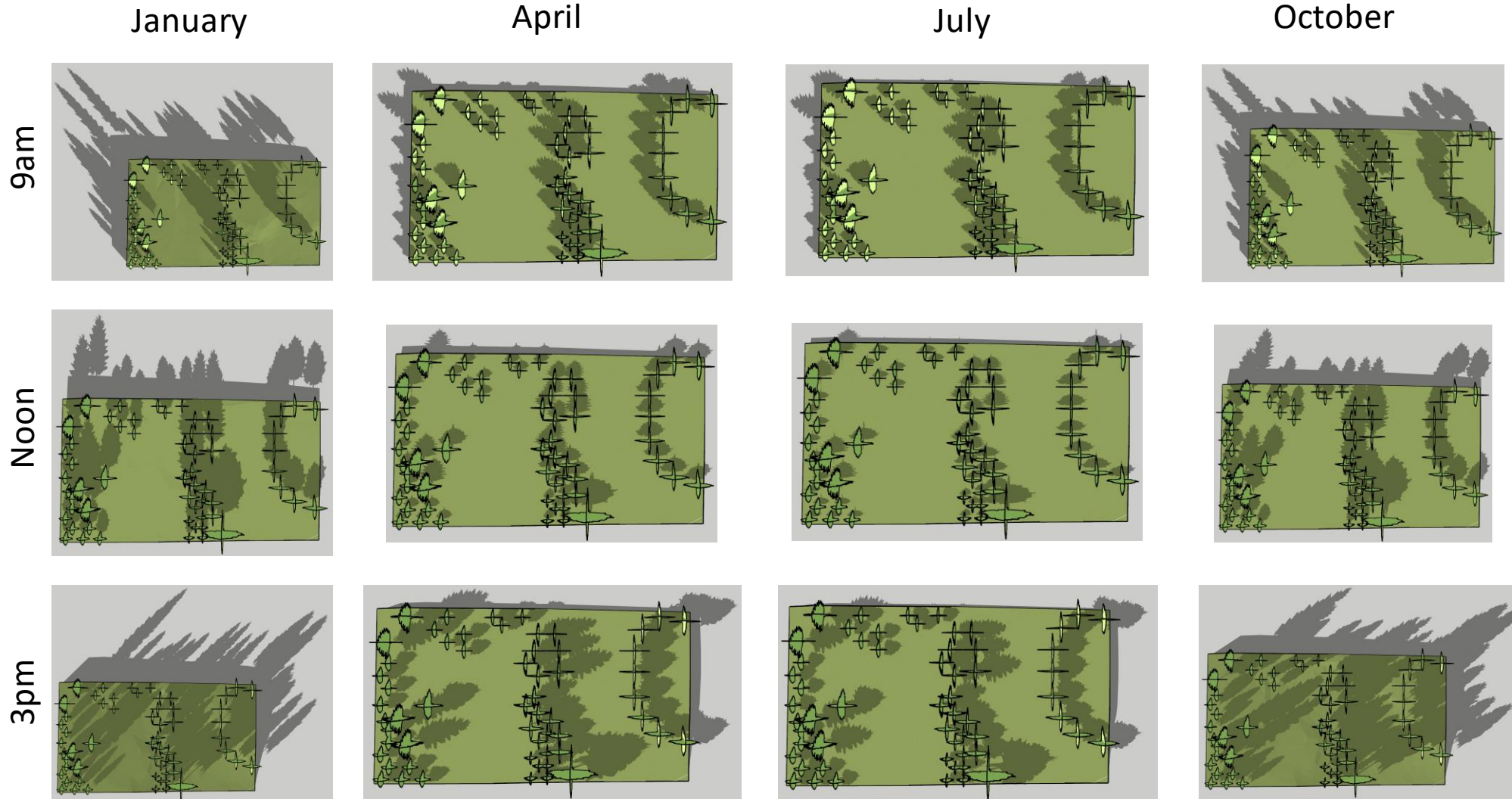
Record of Corresponding Average Monthly Temperature (°F) and Relative Humidity (%)																	
	Tem (HI)		RH (LO)		Tem (LO)		RH (HI)			Tem (HI)		RH (LO)		Tem (LO)		RH (HI)	
Jan	35°	50	24°	62	May	66°	61	53°	77	Sep	74°	57	56°	81			
Feb	37°	55	26°	62	Jun	75°	58	59°	82	Oct	63°	54	47°	81			
Mar	43°	56	30°	72	Jul	80°	58	66°	80	Nov	50°	59	35°	77			
Apr	53°	60	39°	76	Aug	79°	52	63°	80	Dec	42°	55	27°	68			

B1: Site Visit






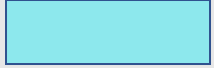
Hill is natural barrier - possibly build into it?

B2: Site Analysis – Shade Study



The largest shadows were cast in the afternoon the site, much larger than those cast in the morning, and covered most of the site. April/July has low shade until the afternoon which is helpful to heat the building as it is still chilly in Boston during those times of the year in the morning. The western clearing had the least amount of shadow throughout the day.

B3: Site Model - Sun-wind Matrix

KEY	Sun	Shade
Windward		
Leeward		

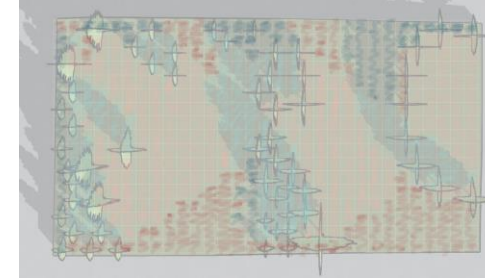
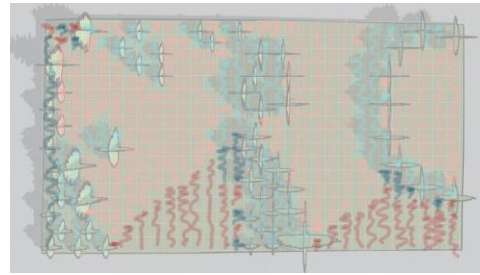
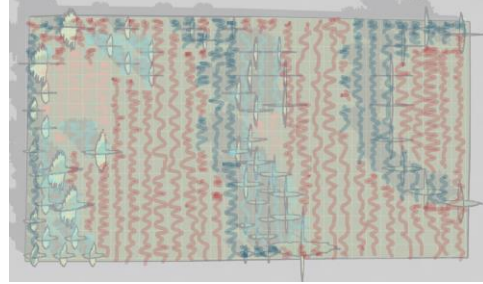
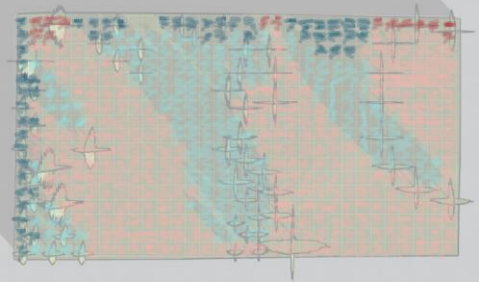
January

April

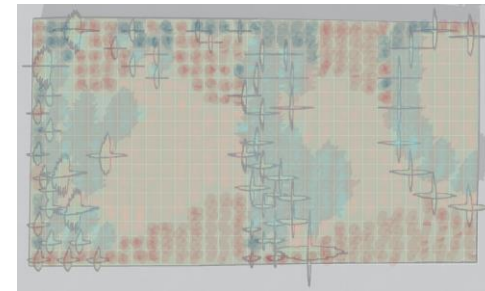
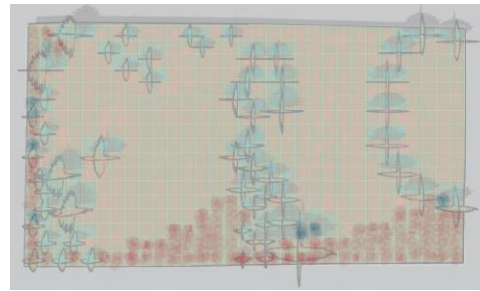
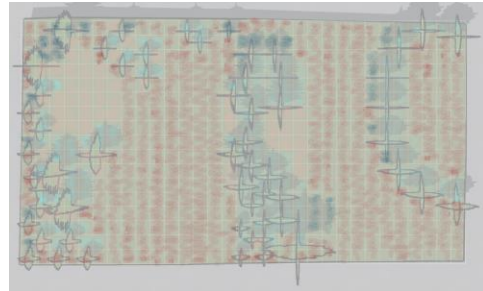
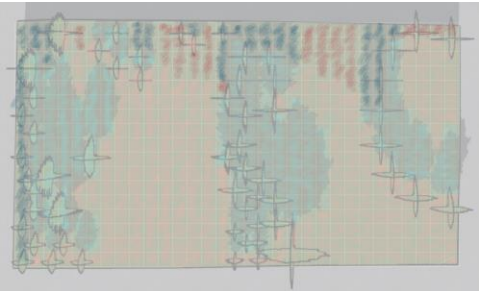
July

October

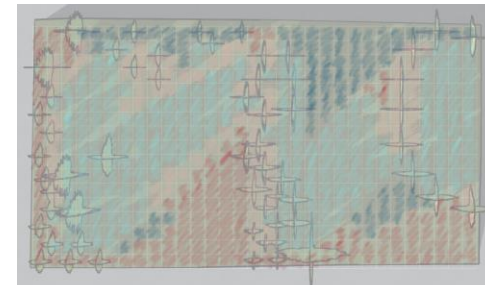
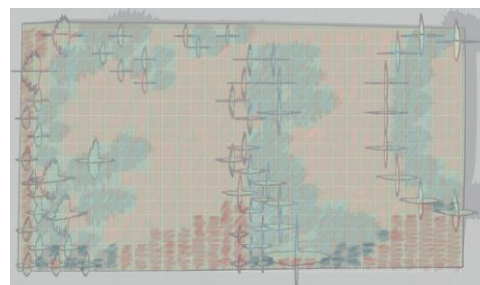
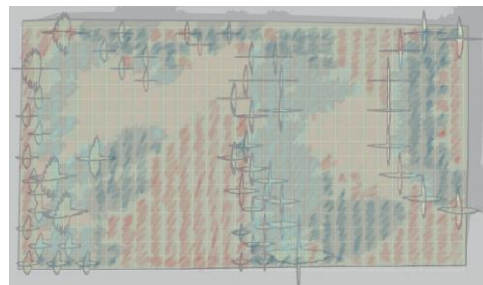
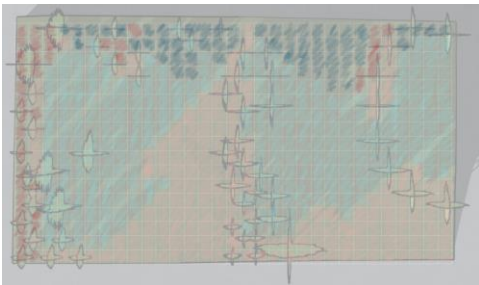
9am



Noon



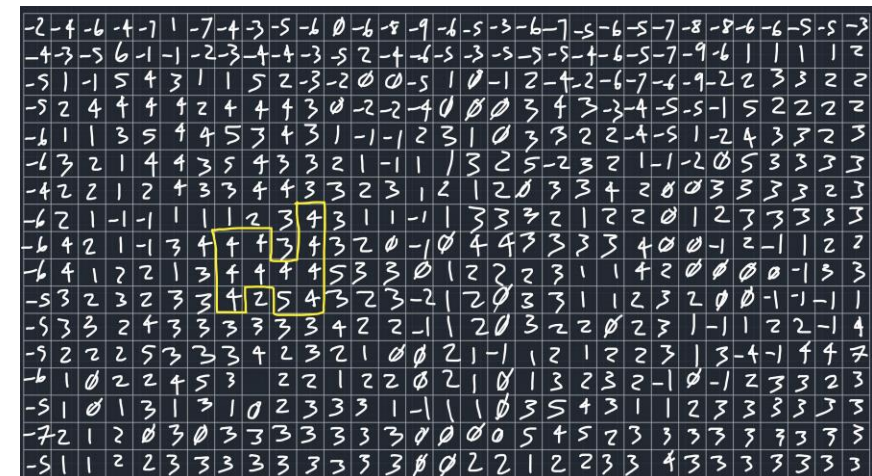
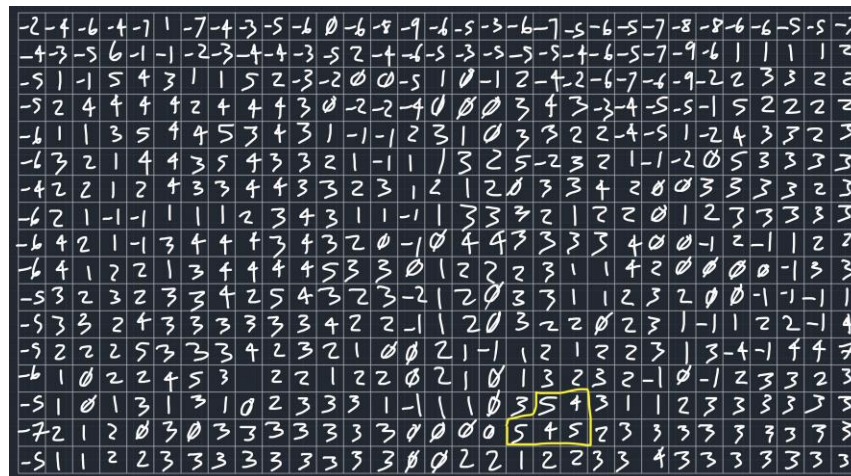
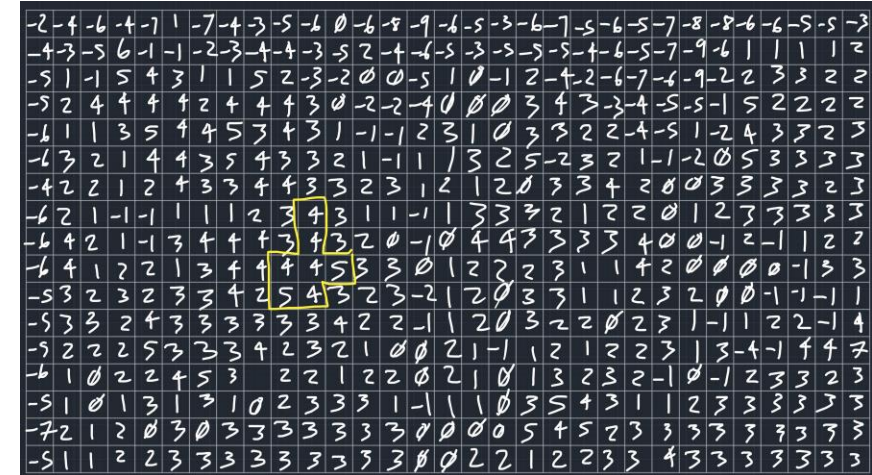
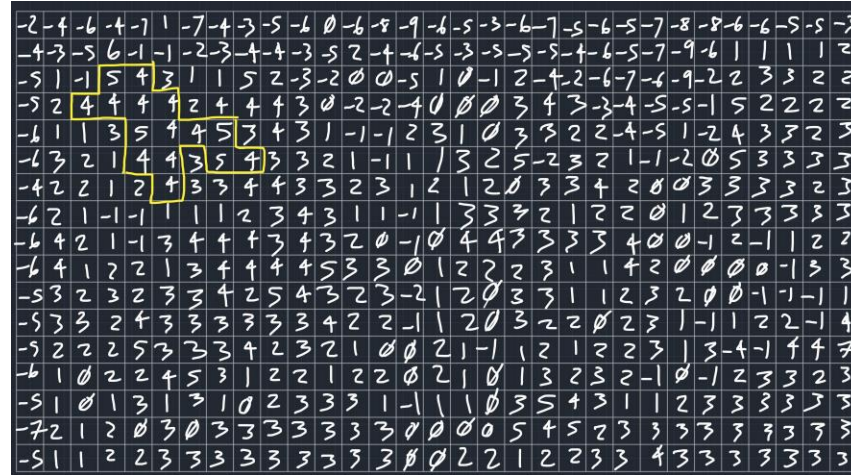
3pm



Utilized a 10'x10' grid as the site didn't lend itself to a 110'x110' grid. This also gave more exact zoning. Saw that the western clearing was well protected from the wind often, with a large amount of sun exposure, which are desirable site conditions for Boston, MA.

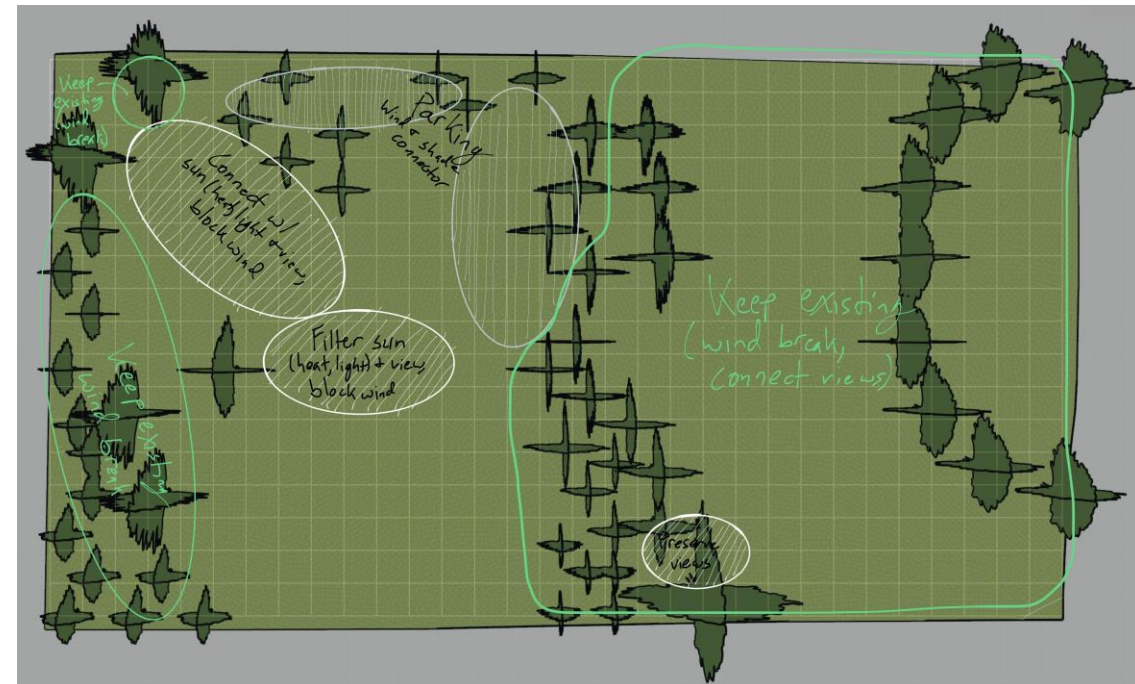
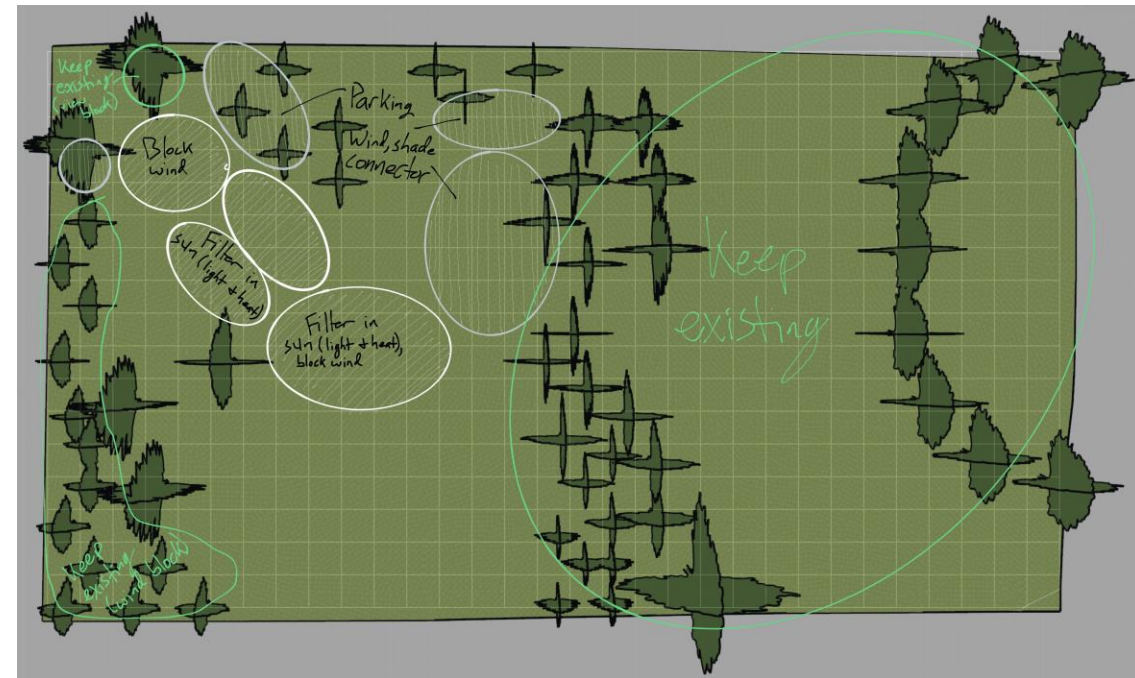
B3: Potential Site Placement

Grouped potential site locations based on having 5+ scores of 4 or more adjacent to each other. The four areas identified were in the western clearing, in the NW or central portion of that clearing. This makes sense is this area has good sun exposure, particularly in the morning and through midday, while not being subject to the winds that are common to Boston (see previous wind wheels).



C: Site Selection

Based off of the climate response matrix analyses on the previous slide, we determined the most successful building site for our program to be the western clearing, particularly the NW corner to the center. The trees on the western edge of the site act as natural barriers to the wind, while the southern end of the clearing will help the building gain natural light and heat from the sun. There are low thermal scores on the north side of the site, and the eastern edge of this clearing which is where we can have all the program parking located. One option is to also have part of the program located near the southern end of the central line of trees as this was also thermally favorable. It would be isolate and therefore more costly to heat/cool the space when that is needed. Finally, the eastern side of our site would remain largely how it is today. The existing large growth trees are good natural filters of the wind when it comes from the east, as well as providing relaxing views for the patrons of the library.



D1: Thermal Zones

After analyzing each space within the building, it became apparent on which spaces most complement each other. After they were zoned into three different groups, we had noticed that they almost line up programmatically as well. Zone A has the lowest occupancy and internal heat generation. Whereas Zone C has high occupancy which creates a large amount of internal heat gain.

Space	Area (ftsq)	Peak Hours	Off-Peak Hours	Occupants	Light Level	Equipment Use
Archives	1000	n/a			low	low
storage area	4000	n/a			low	low
2 bathrooms	500			4	low	high
	500			0	low	moderate
circulation desk	500			2	low	moderate
open plan office	1000	M-F: 10am-1pm, 3pm-7pm Sat: 10am-2pm			25 moderate	moderate
	1000		M-F: 1pm-3pm, 7pm-10pm Sat: 2pm-10pm		5 moderate	low
lecture room		M-F: 10am-1pm, 3pm-7pm Sat: 10am-2pm		50	moderate	low
			M-F: 1pm-3pm, 7pm-10pm Sat: 2pm-10pm		0 low	moderate
staff lounge	500	M-F: 1pm-3pm, 7pm-10pm Sat: 2pm-10pm			15 moderate	moderate
	500		M-F: 10am-1pm, 3pm-7pm Sat: 10am-2pm		5 low	low
controlled outdoor eating area		M-F: 10am-1pm, 3pm-7pm Sat: 10am-2pm			moderate	low
			M-F: 1pm-3pm, 7pm-10pm Sat: 2pm-10pm		moderate	low
Book bindery and workshop	1000	M-F: 10am-1pm, 3pm-7pm Sat: 10am-2pm		50	moderate	moderate
	1000		M-F: 1pm-3pm, 7pm-10pm Sat: 2pm-10pm		0 low	low
lecture room		M-F: 10am-1pm, 3pm-7pm Sat: 10am-2pm		50	moderate	low
			M-F: 1pm-3pm, 7pm-10pm Sat: 2pm-10pm		0 low	moderate
3 reading areas	600	M-F: 10am-1pm, 3pm-7pm Sat: 10am-2pm		120	moderate	low
	600		M-F: 1pm-3pm, 7pm-10pm Sat: 2pm-10pm		20 moderate	low
stack area	4000	M-F: 10am-1pm, 3pm-7pm Sat: 10am-2pm		267	moderate	low
	4000		M-F: 1pm-3pm, 7pm-10pm Sat: 2pm-10pm		20 moderate	low

Space	Area (ftsq)	Peak Hours	Off-Peak Hours	Occupants	Light Level	Equipment Use
Archives	1000	n/a			low	low
storage area	4000	n/a			low	low
2 bathrooms	500			4	low	high
	500			0	low	moderate
circulation desk	500			2	low	moderate
open plan office	1000	M-F: 10am-1pm, 3pm-7pm Sat: 10am-2pm			25 moderate	moderate
	1000		M-F: 1pm-3pm, 7pm-10pm Sat: 2pm-10pm		5 moderate	low
staff lounge	500	M-F: 1pm-3pm, 7pm-10pm Sat: 2pm-10pm			15 moderate	moderate
	500		M-F: 10am-1pm, 3pm-7pm Sat: 10am-2pm		5 low	low
controlled outdoor eating area		M-F: 10am-1pm, 3pm-7pm Sat: 10am-2pm			moderate	low
			M-F: 1pm-3pm, 7pm-10pm Sat: 2pm-10pm		moderate	low
Book bindery and workshop	1000	M-F: 10am-1pm, 3pm-7pm Sat: 10am-2pm		50	moderate	moderate
	1000		M-F: 1pm-3pm, 7pm-10pm Sat: 2pm-10pm		0 low	low
lecture room		M-F: 10am-1pm, 3pm-7pm Sat: 10am-2pm		50	moderate	low
			M-F: 1pm-3pm, 7pm-10pm Sat: 2pm-10pm		0 low	moderate
3 reading areas	600	M-F: 10am-1pm, 3pm-7pm Sat: 10am-2pm		120	moderate	low
	600		M-F: 1pm-3pm, 7pm-10pm Sat: 2pm-10pm		20 moderate	low
stack area	4000	M-F: 10am-1pm, 3pm-7pm Sat: 10am-2pm		267	moderate	low
	4000		M-F: 1pm-3pm, 7pm-10pm Sat: 2pm-10pm		20 moderate	low

D1: Design Layout

Zone A- Archives, storage, and bathrooms.

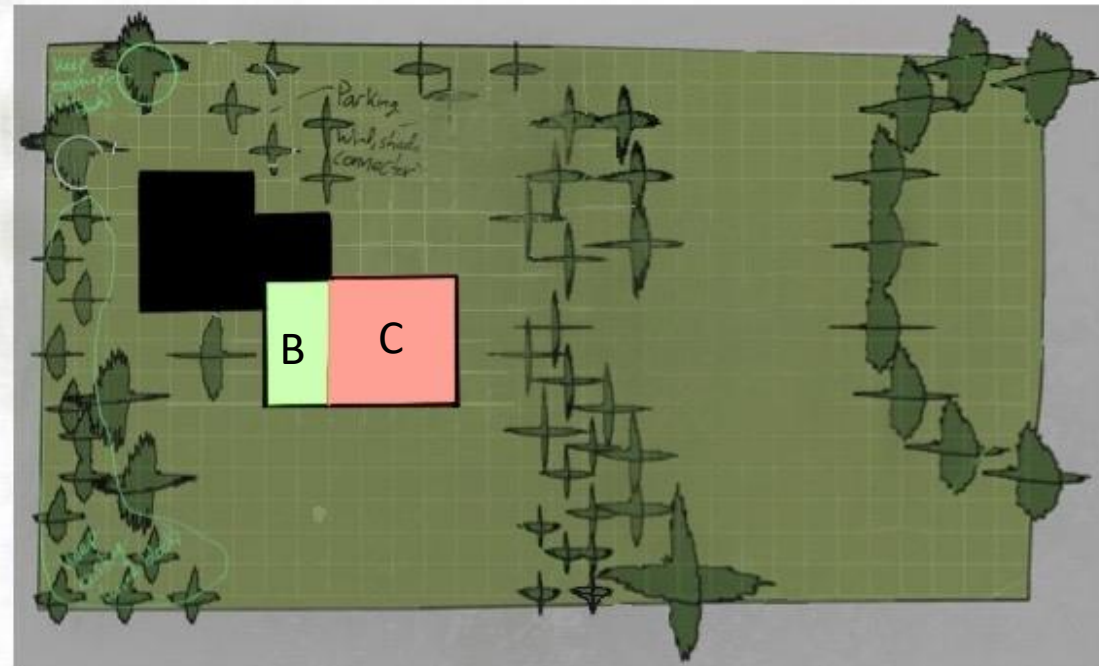
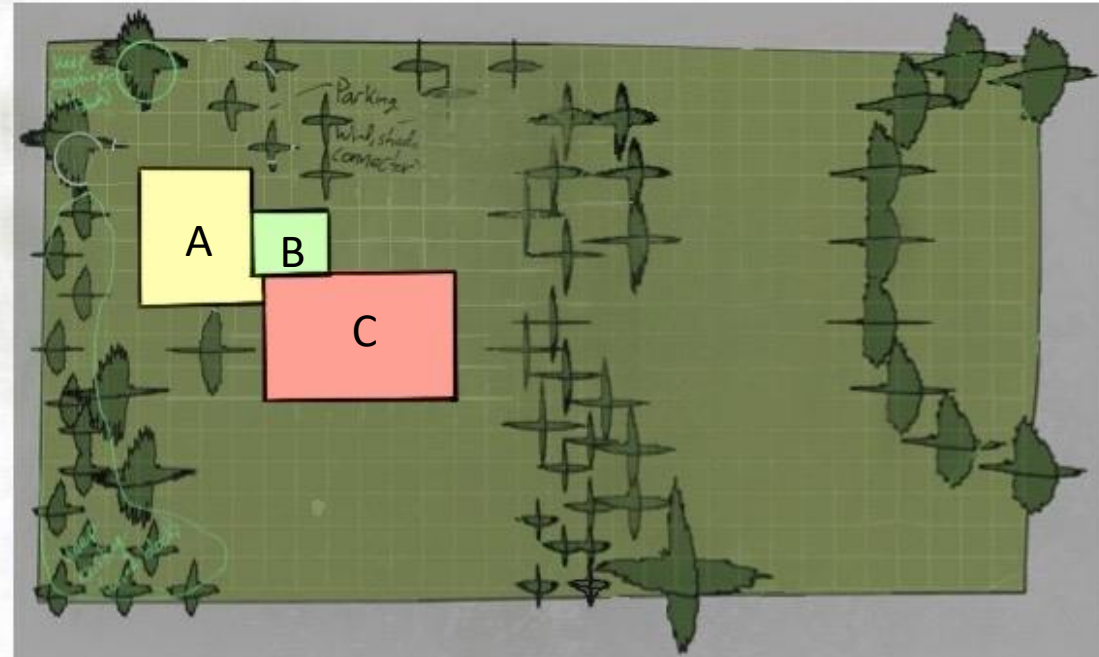
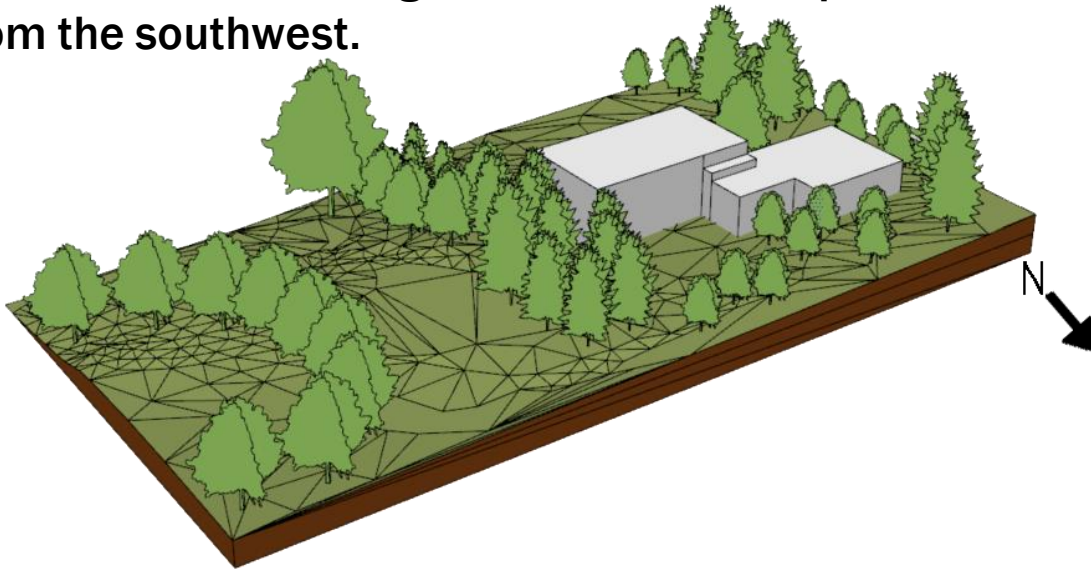
Zone B- Circulation desk, offices, staff lounge, and outdoor eating.

Zone C- Workshop, stacks, reading areas, and lecture room.

Energy conservation strategies

Zone A- Trees shield zone from wind.

Zone B & C- Gets a large amount of sun exposure from the southwest.

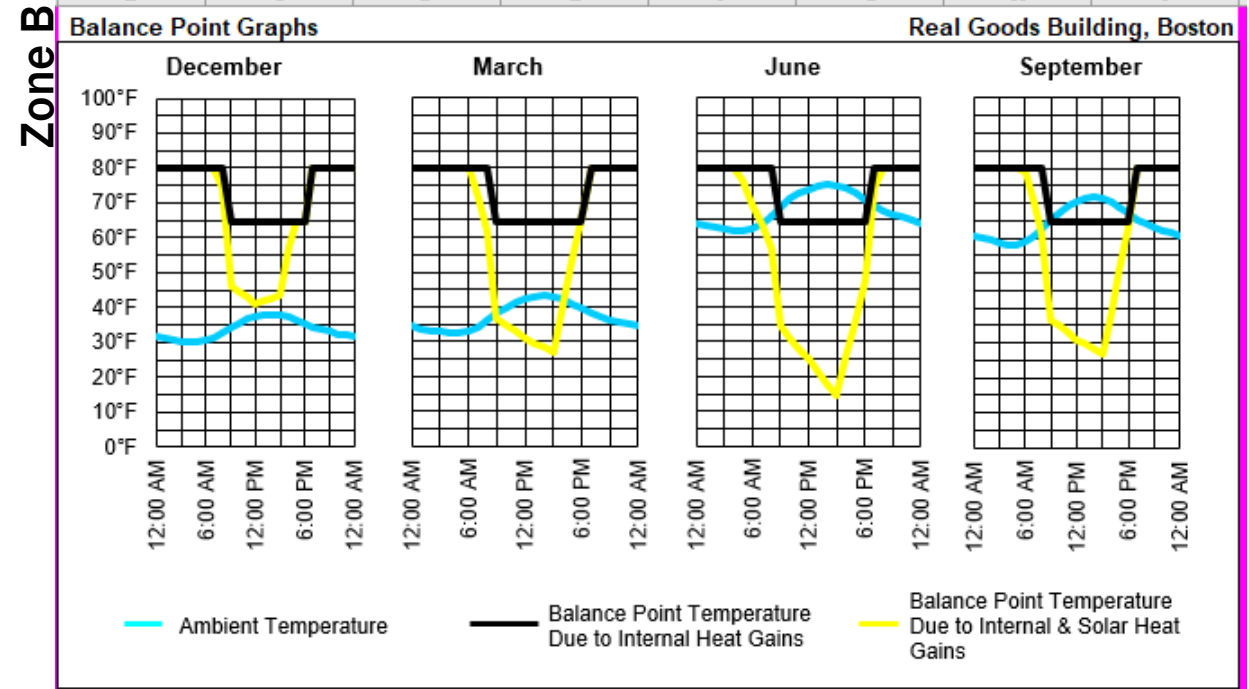
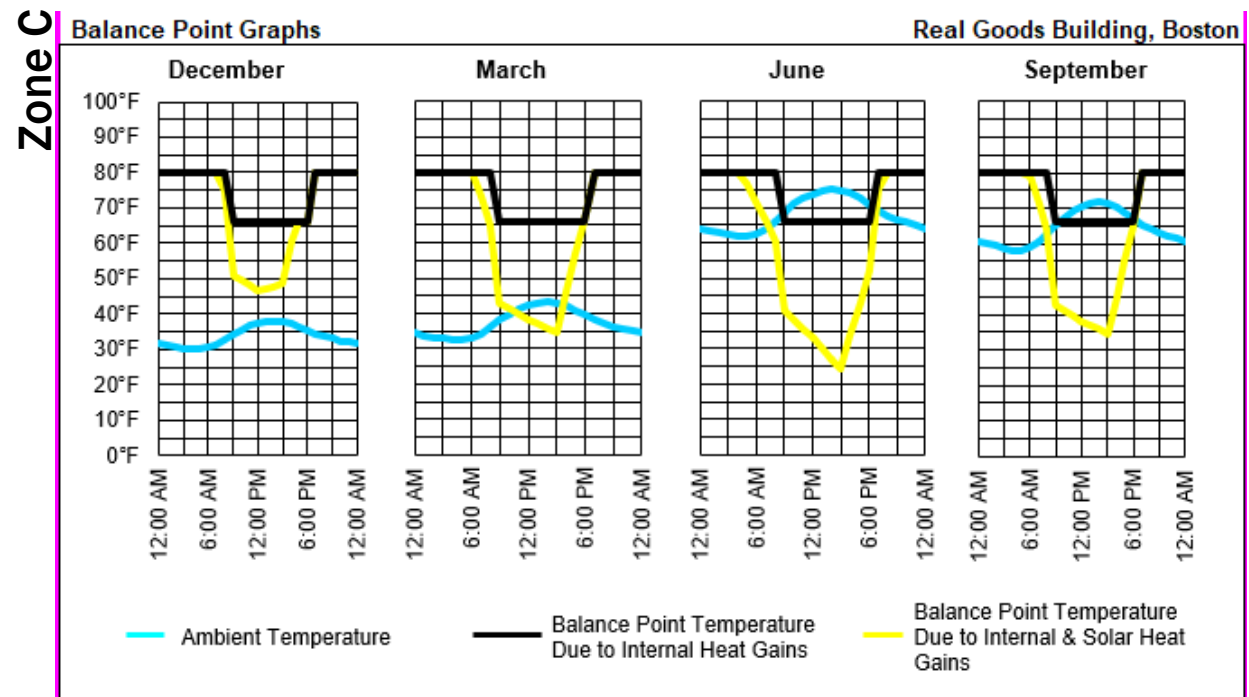
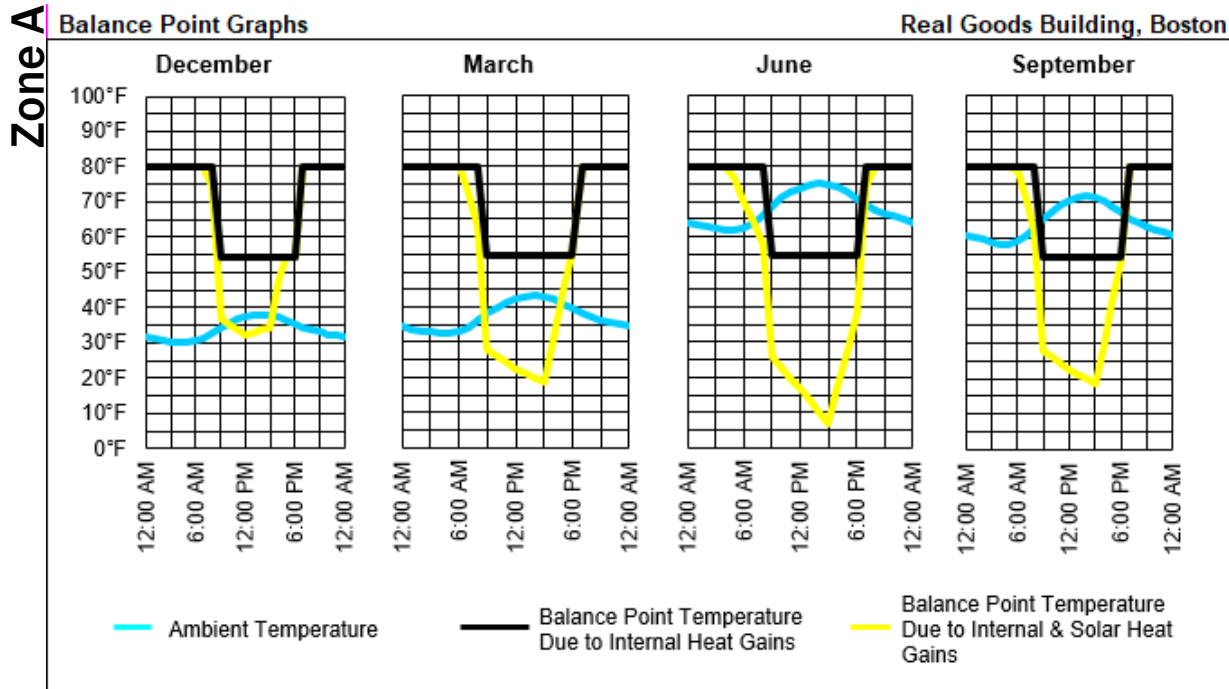


D2: Balance Point

Energy conservation strategies

Zone A- External dominated. NO heating required, only cooling.

Zone B & C- Internal dominated. Heating and cooling required. Heating only needed in December-January



Conclusion

- At the initial site visit, we noted the high, flat spot on the site as a good potential building site due to its capacity for sun exposure. The evidence gathered in our climate and site analyses supported this thought and confirmed that this would be a good spot for building placement. This site has maximum sun exposure, which will help to heat the building during Boston's long, cold winters. Despite being the highest and most exposed point on the site, it is surrounded by trees on all sides, which serve as a barrier to wind. This site allows for the implementation of passive strategies such as passive solar direct gain for heating in the winter.