



# Green Roofs at WPI.

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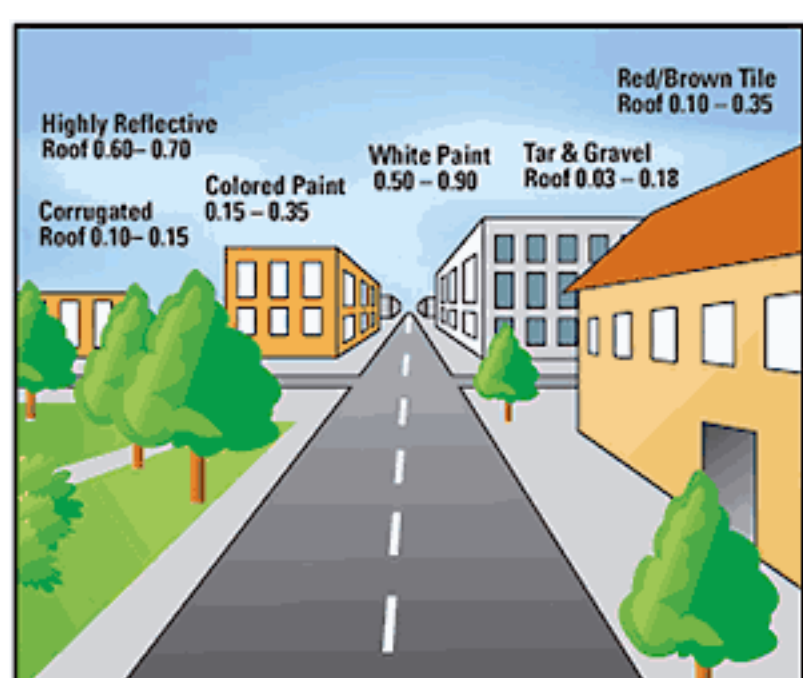
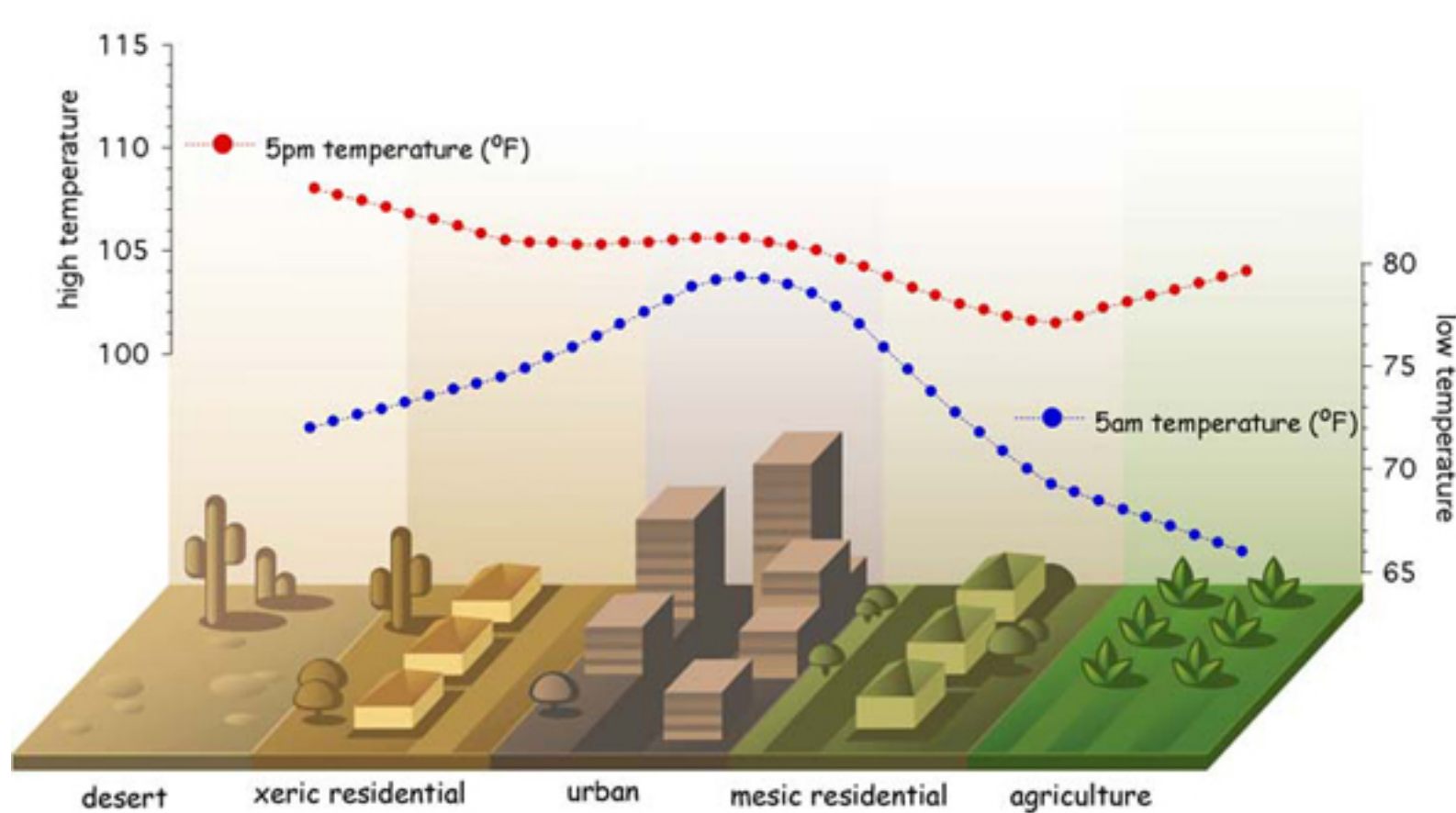
## Abstract

Global climate change is ravaging our world. There are many possible solutions, but one practical method is to start constructing more sustainable buildings. One key aspect to sustainable buildings is green roofing. With the construction of the new recreational center on campus beginning soon, we hope to have WPI set an example as an institution committed to sustainability and place a living roof on top of the new building.

## Background

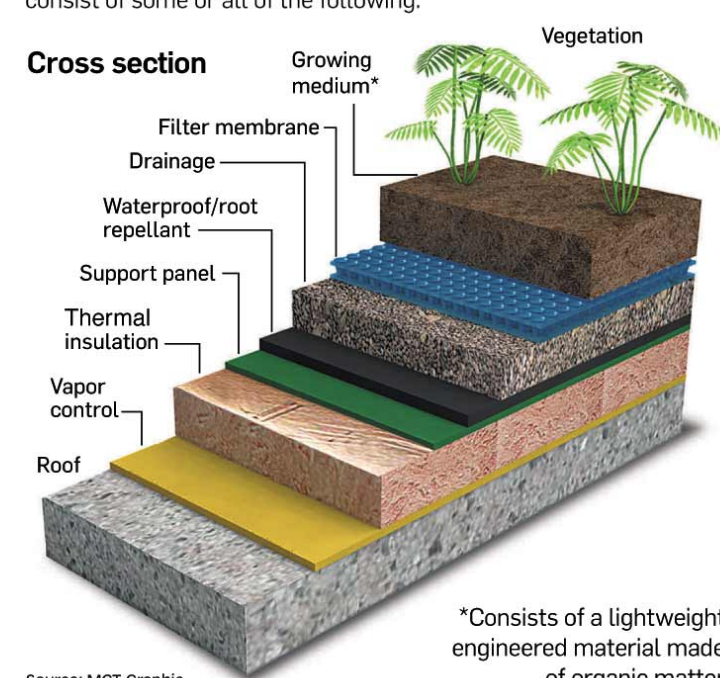
In a world where temperature is on the rise, fossil fuels are in limited supply, expansion space is limited, and many nations are beginning to undergo industrial revolutions, a movement towards sustainability has emerged. Within this "green" movement, many solutions to previous wasteful, inefficient practices based around the natural world have risen, though thus far, their adoption has been limited

Traditional blacktop roofing contributes to the urban heat island effect, toxic runoff into the public's water supply, and is rather unsightly. A green roof, which is defined as "simply [a roof] bearing vegetation that may take different forms," seeks to solve these problems (Cantor 14). Green roofs also provide additional benefits which make them on the whole, superior to traditional roofing.



### Roofs that really hold water

Green roofs vary in plant types used, size and shape, but may consist of some or all of the following:



\*Consists of a lightweight engineered material made of organic matter

Green roofing offers numerous advantages including energy savings (which can lead to reduced emissions from power plants, reducing their impact on the global climate), increased roof membrane lifespan, and improved storm water control.



Bartlett Center, WPI's first green building.

## Cost Benefit Analysis

The cost benefits of a green roof can be somewhat tricky to figure out because of the variability in size, materials, and labor costs. A green roof is more expensive to install than a traditional roof. Those initial higher costs make up the majority of the cost that needs to be recouped over the course of many years. For the new recreational center the estimated roof size is about 28000 square feet. Thus, we analyzed three different potential sizes for the green roof: five-thousand, seven-thousand-five-hundred and ten-thousand square feet.

Roof Size	Low Cost per square foot	High Cost Per Square foot	Total Cost (Low)	Total Cost (High)
5000 ft <sup>2</sup>	\$12.18	\$28.15	\$60,900	\$140,750
7500 ft <sup>2</sup>	\$12.18	\$28.15	\$91,350	\$211,125
10000 ft <sup>2</sup>	\$12.18	\$28.15	\$121,800	\$281,500

Due to the waterproof membrane's protection by the plant layer, a green roof lasts much longer than a traditional one. This means over the course of forty years, the cost of a traditional roof may be about \$8,000 more than the cost of what a green roof would be.

Runoff is another factor that lends it self to long-term economic and social benefits. Green roofing can control runoff, as the soil layer can take in, store, and slowly release water during rainstorms, releasing the same amount of water over a longer amount of time. Runoff can damage campus features like roads, landscaping, and fields. Since sewer systems will be less inclined to overflow, it is less likely for things such as waste to escape during a heavy event.

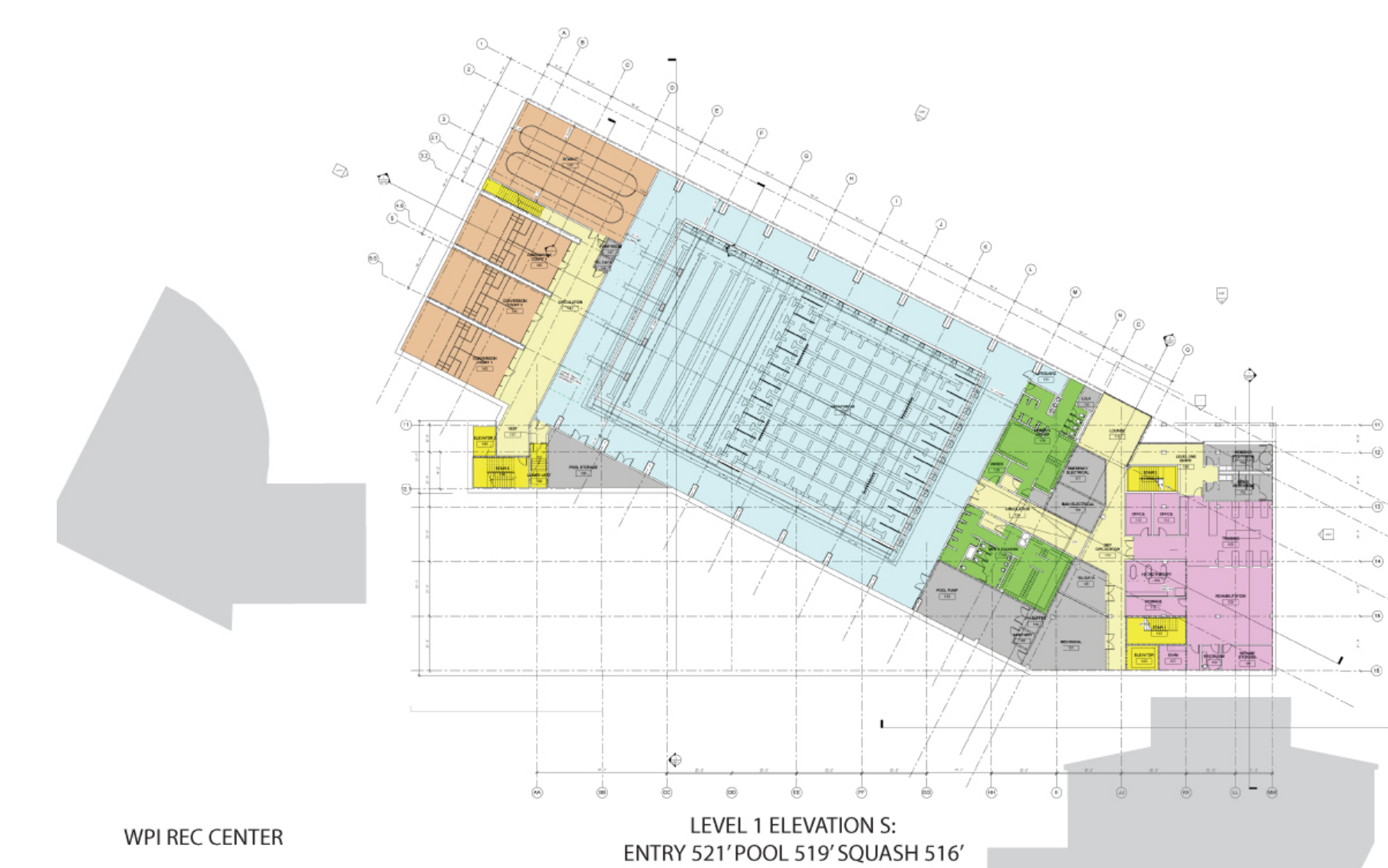
Green Roof Size	Cost of Trad. Roof	Cost of Green roof (Low)	Cost of special white roofing	Cost of Green Roof (High)	Cost Difference between Trad. Roof and Green Roof Low	Cost Difference between Trad. Roof and Green Roof High
5000 sq. ft.	\$39,900	\$60,900	\$75,000	\$140,750	\$22,000	\$100,850
7500 sq. ft.	\$88,350	\$91,350	\$112,500	\$211,125	\$33,000	\$152,775
10000 sq. ft.	\$77,800	\$121,800	\$150,000	\$281,500	\$44,000	\$203,700

Economic Benefits	Social Benefits
<ul style="list-style-type: none"> <li>•Reduced Storm water runoff</li> <li>•Doubled life of roof membrane</li> <li>•Heating Costs</li> </ul>	<ul style="list-style-type: none"> <li>•Aesthetically pleasing</li> <li>•No Toxic Runoff</li> <li>•Reduced Urban Heat Island Effect</li> <li>•Urban Habitat</li> </ul>



## Conclusions/Recommendations

We feel that this investment in a green roof is worth the extra cost. Not will the cost of the roof be regained over time, but a green roof will also provide many benefits to the surrounding community where it is built. With the installation of another green roof, WPI will continue to be the undisputed leader in sustainability in the area, as it has already shown to be through its commitment to sustainability illustrated by the two existing green buildings on campus. By committing to building a green roof on such a large and important building, WPI will inspire others to do the same.



WPI REC CENTER

LEVEL 1 ELEVATION S:  
ENTRY 521 POOL 519 SQUASH 516

## Project Goals/Objectives

- Spread understanding of the benefits of green roofs.
- Determine the possibility of installing a green roof on the new recreation center.
- If a green roof is beneficial for the new recreation center then promote the idea to the proper administrators to make it possible.

## Acknowledgments

Thanks to our Advisor Dr. Diran Apelian, Janet Richardson, and our PLA, Matthew Connolly

## WPI Buildings



East Hall, Worcester's first green roof



New Recreation Center

## References

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