

## It Ain't Easy Being Green

When I was 12, I was visiting Michigan with my family. We visited the Ford factory and saw the usual— trucks parts, assembly lines, and old cars. What struck me as the most interesting part of the tour, however, was their green roof. I found it fascinating how much green roofs helped the environment. Rainwater runoff into Lake Erie, was reduced by 28% by having the green roof. Later that year, friends and I entered the Future City Engineering competition. I was adamant that we integrate green roofs into our solutions. The problem concentrated on energy but, I convinced my peers how green roofs could significantly reduce energy cost. As a scout, I went to the National Jamboree and was one of the first to do work on the Sustainability Merit Badge. I had to draw a design for a sustainable community. Again, I went back to green roof engineering. As citizens in Austin look towards solar energy as an energy source, it doesn't address the other issues that central Texas faces. Austinites needs to look at environmental solutions that provide multiple benefits for its citizens. Green roofs solve many problems and would significantly help central Texans.

What isn't desert in a Texas is a well-developed community. One good rain storm can cause havoc. Considering the runoff coefficient of rooftops is essential. Green roofs absorbs more water, reducing flooding and groundwater pollution. On a metal roof, the runoff coefficient is .95. Which means that if you have 1,000 gallons of water fall onto a metal roof, 950 gallons will run-off the roof into surface water or groundwater. This means that almost all the water that falls on that roof will end up as runoff. I live on Barton Creek. I have seen creek go from being dry one year to raging class 3 rapids in one storm. I've found fish in trees and crawdads on the trail after these devastating floods. A green roof can help by reducing the amount of runoff. The highest runoff coefficient for a green roof is .65. So, when a 1,000 gallons of water falls on a green roof, only 650 gallons runs off— 300 gallons less. Having 3 roofs with just a sedum over metal would save 900 gallons of water for every 1,000 gallons that fell on each roof. This is the equivalent of what one cedar tree drinks in a month. Assuming 3.5 inches of rain per hour fell on a 1,000 ft metal roof, 34.25 US gallons per minute would fall from that roofline! The same size rainfall and the same square footage would only yield 23.44 US gallons per minute from a green roof.

The runoff from green roofs are also cleaner than traditional runoff. This means fewer pollutants end up in our groundwater and water supply. Groundwater is what is we humans use in our daily lives. Green roof absorb hydrocarbons in the air along with dioxide and monoxide. While saving water, green roofs would also clean the atmosphere. Keeping CO<sub>2</sub> out of groundwater would help improve public health. The most common hydrocarbon is oil; these are dangerous in water. The problem is that they are not soluble in water and many of them have varying densities, meaning some will float and some will sink. These become especially problematic when the oils seep out of the groundwater supply and into the surface water. If plants and animals digest these they die. Greens roofs help remove these compounds, preventing this indirect pollution of the groundwater. Reducing CO<sub>2</sub> would also help reduce vapor pressure pockets in the ground. Since the ground doesn't have to hold air pockets, there is even more

room for it to hold water. Green roofs can reduce pollutants in the air, in the runoff, and in our direct water supplies, while helping the earth to store more water.

In Michigan, the green roof were made of sedum; this might not be the best option for Texas. Michigan, gets a slow, constant easy streams of rain. Texas gets too much rain all at one time. For Texas, better plants would be a hybrid type of grass. Texas should research more about hybrid grass/sedum roofs. Sedum is great at drought resistance while grasses are better for larger amounts of rain. Grasses would also be more useful because they have larger roots, to help establish a denser, thus stronger, roof. Grass also needs a thicker base, which means it would absorb more water than a sedum roof-- and have a lower runoff coefficient. A grass roof would reduce runoff 20% more than a sedum roof. During dry parts of the year, runoff would be almost nonexistent because the dirt would be less saturated, and allow the green roof to soak up more water. If people had multiple rooflines they could have rooftop gardens, even adding small trees, herbs and shrubbery, reducing runoff even more. Think of having a rooftop garden with rosemary, lime trees and radishes. Food growing while also improving our water system. The roof would be enjoyable to look at as well as functional. A green roof can solve many issues facing our modern city.

Of course, some wonder what would be done in times where Texas experiences multi-year droughts. What would we do with a green roof? Would it be a fire hazard? Although most green roofs are not irrigated, it would be worth looking into how irrigation could be done inexpensively. What if gray water from a house could be used to irrigate a green roof when needed? When it did finally rain, a dry green roof would greatly reduce flooding. Flooding causes destruction, but also drastically affects our water supplies. Floods carry several pollutants into surface water supplies, which eventually end up in our groundwater.

I've been given a hard time for years about being a "greener" or "environmentalist." I drove my grandma crazy when I was 3 and had to pick up litter--everywhere. I was born with the sentiment that I needed to take care of the Earth. I lived in Seattle and then Vancouver, BC where water was abundant and everywhere. I moved to Texas when I was 7. That year was a record year of rainfall. After that we had droughts. I saw the creek I swam in, reduced to nothing. I watched green fields turn tan. I found coyotes drinking in the neighbor's water fountain because it was the only water around. I get it now. Water is gold. When I was surrounded in rain for 90 days straight, I didn't see it's value. Moving to Texas has changed that. Traveling to Michigan, gave me a solution for how Texas could make the most of its rainfall.

I am planning on majoring in engineering. I am an Eagle scout who takes the idea of "leave no trace" very seriously. We are taught to leave the environment better than we found it and hopefully improve it. This is my goal. I see a way for green roofs to improve our quality of lives and better our environment. We have to start embracing solutions for society's problems that contribute to a cycle-- like the water cycle does with water or the carbon cycle does with carbon.

We need to find holistic solutions. A windmill or a solar panel doesn't do anything to solve problem with surface water or groundwater. Carbon dioxide level are constantly on the rise and are detrimental to our Ozone. We need to reduce carbon dioxide back to healthy levels. Cities need green beauty! As a scout, I've experienced how being outdoors surrounded by nature reduces tension and stress. Green roofs can help with energy conservation, air pollution, and city aesthetics-- while also helping us protect our water supplies. Adopting green roofs won't be easy. It is different. However, we need different to take us into the the future. It won't be easy being green, but it will definitely be worth it!

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