

Green Roof Service LLC presents:

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Projects	Services	Modern Green Roof Technology	Living Architecture	Resources	About Us
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Green Roof Plant of the Month:



Brush up on your green roof plant knowledge with a new plant every month! Only on our Green Roof Plant Blog!



Rooftop Farming, An Environmental Nightmare

Companies spend millions of dollars on creating rooftop farms to demonstrate how “green” they are. There is no doubt advertising with living green is a good idea because it makes the customers believe that the company practices environmental leadership. However, the reality looks very differently.



Green Roof Performance

Plants on a green roof, whether they were intentionally planted or not, are an indicator for the performance of any green roof system. If any extensive green roof system becomes high maintenance, requiring irrigation or extra nutrients, the whole purpose of the green roof is defeated. Understanding these complex synergetic effects takes decades of experience in the field, the patience of gardeners and common sense.



Irrigation on Green Roofs Revisited

Jörg’s blog regarding irrigation on extensive green roofs has recently been published on greenroofs.com. An extended version of the original, Jörg goes more in depth on why irrigation on green roofs should not be necessary.



Green Roofs and Stormwater Fees

The stormwater fee is upon us in Maryland. Those wishing to lessen their stormwater fee can reduce the impervious surface area on their property through smart design and management practices.



Rooftop Farming: An Environmental Nightmare

Companies spend millions of dollars on creating rooftop farms to demonstrate how “green” they are. There is no doubt advertising with living green is a good idea because it makes the customers believe that the company practices environmental leadership. However, the reality looks very differently.

Recently a food company started a huge campaign promoting their rooftop farm (and their green leadership) by opening a 17,000 square foot

rooftop farm on the East Coast. They were optimistic that they could grow 10,000 pounds of produce during the short growing season. This is approximately 25% over the average vegetable and berry crop yields estimated for New England on the ground during a good year, based on traditional irrigated farmland.

Since environmental conditions on rooftops are more extreme, achieving this goal seems ambitious and will require higher amounts of water and fertilizer. With more moisture in green roof soil the main benefit of green roofs (stormwater retention) is sacrificed and the run-off will most likely now contain more nutrients than in the run-off from traditional farms. Nutrients are already the number one pollutant in our waterways.

Based on these harsh environmental conditions growing crops on rooftops will be more labor intensive.

A 17,000 square foot rooftop farm requires approximately 300 tons of engineered growing media (soil) or 672,000 pounds in order to grow an average of 8,000 pounds of produce a year. In other words, it takes more than 80 years to grow the equivalent crop weight that was transported up onto the roof in the first place. This does not include the tons of water, fertilizer or structural support for the building that has to be shipped to the city and hoisted up on to the roof to start and maintain the garden.

Roof top farms ultimately increase the shipping (costs) of goods into cities. Shipping produce from a farm located on the ground is cheaper and more efficient because everything necessary to sustain the farm is already at hand. The food from rooftop farms is being transported a shorter distance creating a false sense of environmental responsibility. When in reality, the amount of materials essential to implement and maintain a rooftop farm outweighs the good in this situation.

Consider this: every person consumes 200-400 pounds of produce in a year (Profiling Food Consumption in America in 2000, Agricultural Fact Book) and an average of 8,000 pounds feeds around 20-40 people and requires at least one full-time, skilled farmer.

On a traditional field, one farmer can easily manage a 10-20 times larger area with a higher yield per acre using organic principals, which are not even discussed with most roof top farms.

Buyers of food from companies with rooftop farms are misled by advertising and are paying more for their goods while supporting a trend known as Greenwashing.

Jörg Breuning welcomes people who want to learn from decades of green roof experience - askjorg@greenrooftechnology.com



Green Roof Performance



Extensive green roofs are a thin layer of high performance components that allow a wide range of plants to grow on them. These plants have adapted over thousands of years to extremely harsh environments and are typically found in alpine regions, on natural rock debris (scree), deserts or tundra. Besides the extreme climate conditions in these areas, there is a very inconsistent supply of water or lack of water retention because of missing components in the soil (no fines, no organic).

In other words, these are typically locations where plants have to be very specialized. Once they have adapted, they are awarded by less competition of other plants - plants that require deeper, richer soils with a fine granular distribution line or high organic content.

Plants from these extreme conditions have not learned to compete with plants that we typically prefer for our gardens or our farms. Experienced horticulturists and plant collectors understand very well what it takes to grow these survivors, in locations other than their natural habitat. These experts are able to create an environment that supports these plants to prosper. These man-made environments are an example of modern green roof technology via extensive green roofs. Natural coarse, porous aggregates (pumice, lava rock) prove to be the most successful way to accomplish a proper environment. The porosity of the materials allows high water retention with simultaneously high air content. Also, this can be done very inexpensively and on a large scale. Modern green roof technology is engineered to ensure that every raindrop will penetrate the this soil layer immediately - soils with high organic content take too long for water to penetrate, resulting in standing water and consequently erosion.

Some people may try to get around some of nature's principals, essentially reinventing the wheel in regards of extensive green roofs. They may also try and maximize other potential benefits (including personal profits), but end up sacrificing something else and in the worst case plants will suffer and possibly die.

The plants, whether they were intentionally planted or not, are an indicator for the performance of any green roof system. If any extensive green roof system becomes high maintenance, requiring irrigation or extra nutrients, the whole purpose of the green roof is defeated. Understanding these complex synergetic effects don't take a PhD, green roof professional training, or the internet - it takes decades of experience in the field, the patience of gardeners and common sense.

Modern green roof technology - as described in the FLL guideline - combines all these decades of experiences and makes things as simple as possible for novice green roof applicators - but it sure doesn't try to simplify the process. Einstein had some good advice on the subject, "Make things as simple as possible, but not simpler."



Irrigation on Green Roofs Revisited

The main purpose of an extensive green roof is stormwater retention and delaying stormwater runoff amongst many other added values.

In the last decade, I've seen many green roofs where the intended plants never really flourished. I estimate that in the US at least 50% of the green roofs are not performing to their fullest potential. This can be observed by simply looking at the most obvious of indicators, the plants themselves, regardless if they were planted on purpose or somehow found the space to take root. Most of these less healthy extensive green roofs are pre-planted boxes, or commonly known as modular systems. Not only are these systems much more costly, in my opinion the mid to long term results are often far below systems that are assembled in place and at the time of installation.

I know that the transition from being a common nursery-grown plant (including pre-planted boxes) to the extreme environment of a rooftop poses severe challenges. Green roof plant nurseries typically have "great"

advice and recommend the installation of temporary or, more often, permanent irrigation systems. This advice is defeating the purpose of an extensive green roof and shows that asking self-appointed experts can cause a spiral of failures. Since many green roof installers lack the proper horticultural knowledge, they may not be able to identify problems by simply looking at the indicators. This could cause the problem to gain momentum.

In addition, the false conclusion that technology (Google search, Apps, synthetic growth media or sophisticated soil moisture control devices) can fix the problem supports my theory of less experienced or misinformed green roof professionals. They rely heavily on technology to fix any issue and miss the big picture.

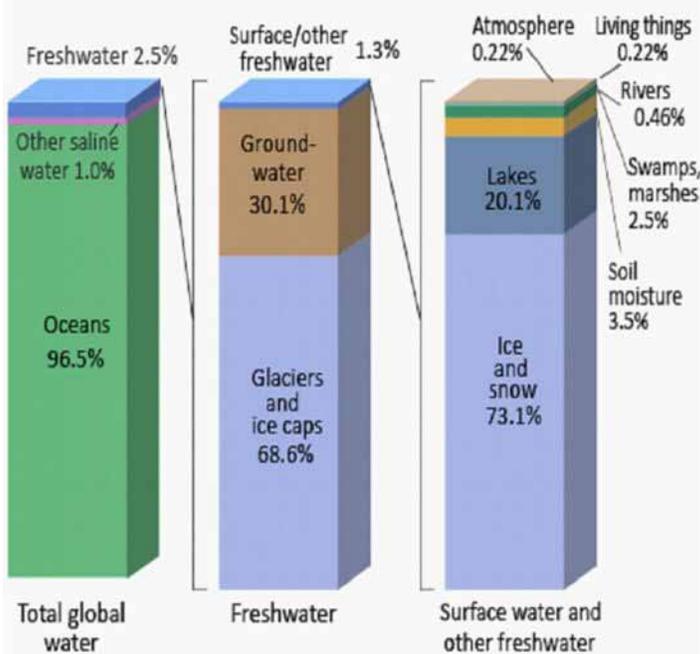
Only 1.73% of all water on earth is usable fresh water (Wikipedia); 70% of this little water is used for irrigation in agricultural/horticultural and it is distributed very unequally on Earth. At this point, it does not matter whether it is a rooftop farm, organic food farm, a conventional farm on the ground, landscaped area or a green roof. Getting the water from the source to irrigation system requires gigantic efforts like super powered pumps, endless piping,

canals, dams and sophisticated logistic and politics. The consequences of irrigation can spread from irreparable ecological damages (artificial lakes destroy natural habitat), wars, high carbon footprint and consistently lowering ground water tables (more irrigation is required).

Another major problem of irrigating agricultural/horticultural land is the tremendous impact on the natural water retention of soil: An irrigated area has higher moisture content and consequently less ability to retain water. For example, the runoff from agricultural/horticultural land is the leading source of impairments to surveyed



Where is Earth's Water?



Source: Igor Shiklomanov's chapter "World fresh water resources" in Peter H. Gleick (editor), 1993, *Water in Crisis: A Guide to the World's Fresh Water Resources*. (Numbers are rounded).





This is evidence enough that commercial growers (farmers –especially for bio-fuels, nurseries), LEED™ experts or green roof professionals who utilize irrigation might not have the right approach to farming, landscape design or modern green roof technology for extensive green roofs.

Rain-fed farms or so called dry farms can reduce water consumption on the commercial grower side but green roof designers also need to understand that any commercial production of a crop is done with the intention of selling it in the shortest time as possible.

An owner of an extensive green roof, however, wants to keep his “crop” as long as possible

– actually never wants to sell it, investing the least maintenance with it. What a conflict of interest and all the experts and academics in the North American green roof industry haven’t that found out yet. Vice versa if you ask them for advice - you might not get the answer you are looking for.

Green roof designers and green roof professionals must understand that less technology is often more when it comes to extensive green roofs and that no building owner wants to irrigate the roof in short, mid or long terms. In my opinion, there is no need to make a green roof more complicated (and water needy) by using multiple synthetic or plastic layers. LEED™ certification supports using gray (recycled) water for green roof irrigation or recycled components that are not needed; they missed the point of an extensive green roof system retaining as much stormwater as possible.

Common sense is understanding the main purpose of extensive green roofs, the problems that come with irrigation, and environmental awareness combined with extensive horticultural experience. These are the only things that will aid in planning the perfect green roof.

Implementing irrigation on an extensive green roof is a clear sign of not understanding the basic principles of horticultural techniques or the laws of nature. Irrigation reduces the water retention, increases the nutrient pollution in runoff and requires higher fertilization application. Irrigated extensive green roofs are not environmentally friendly, not economically feasible and have hardly any payback for the building owner if the true costs of water are considered.



I tell my clients if they have an offer or design for an extensive green roof that includes irrigation - be cautious!

*Farm Runoff in Mississippi River
Floodwater Fuels Dead Zone
in the Gulf of Mexico; via pbs.org.*

Green Roofs and Stormwater Fees

By: Rebecca Gullott

Not many Marylanders are happy about paying the new stormwater fee or “rain tax” as it has come to be known. The county imposed fee is based on the amount of impervious surface such as rooftops and driveways on each property (cost-by-cause principle). In Howard County alone there are over 19,000 acres of impervious surfaces that contribute to pollution of local streams and the Chesapeake Bay. 19,000 acres are almost 30 sq miles or 11% of the county's size- more than double the size of all water ways in the county! No wonder that Stormwater runoff is responsible for over 20% of pollution into the bay.



Those wishing to lessen their stormwater fee can reduce the impervious surface area on their property through smart design and management practices. Howard County is providing instruction and incentives for citizens to do just that. Howard County Stormwater Management Division has partnered with several organizations including the University of Maryland Extension to help citizens take control of their environmental impact. Rainscaping workshops will be offered this summer to show residents how to plant and maintain rain gardens and native species; as well as compost waste and use rain barrels to collect roof runoff for use in lawn and garden irrigation or car washing. Howard County is offering free rain barrels at the Alpha Ridge Landfill select Saturdays April through September. Other Maryland Counties have similar programs so check your county's website to see what offerings are available.

Property owners can receive credits for on-site improvements that reduce impervious surfaces. Whether it's establishing a rain garden in the yard or incorporating planted areas or green roofs into the company's parking lot, these incentives may encourage citizens to take control of their environmental impacts. These changes may help to reduce the need for future stormwater fee increases and promote a healthier Chesapeake for years to come.



The positive impact for the environment by implementing cost-by-cause fees is very effective in many other counties and States in the US and over decades in Europe.