



GREEN CITY
RESOURCES

Rose Seeger

greencityresources@gmail.com

Sean Mullarkey

sean@tristatewaterworks.com



Doing The Most With Your Rain

Green Infrastructure

- An array of products, technologies, and practices that use natural systems – or engineered systems that mimic natural processes – to enhance overall environmental quality and provide utility services.
- As a general principal, Green Infrastructure techniques use soils and vegetation to infiltrate, evapotranspire and/or recycle stormwater runoff.



Green Infrastructure Practices

- Vegetated roofs
- Porous pavement
- Rain gardens
- Rainwater harvesting
- Vegetated swales

All can produce a variety of environmental benefits.

Additional Benefits

- Retain and infiltrating rainfall
- Filter air pollutants
- Reduce energy demands
- Mitigate urban heat islands
- Sequester carbon

All while providing the community with aesthetic and natural resource benefits.

2008 Final EPA Construction General Permit

- The EPA Construction General Permit (CGP) is a National Pollutant Discharge Elimination System (NPDES) permit issued under the authority of the Clean Water Act and associated regulations.
- For more information on the Campus RainWorks Challenge: http://water.epa.gov/infrastructure/greeninfrastructure/crw_challenge.cfm

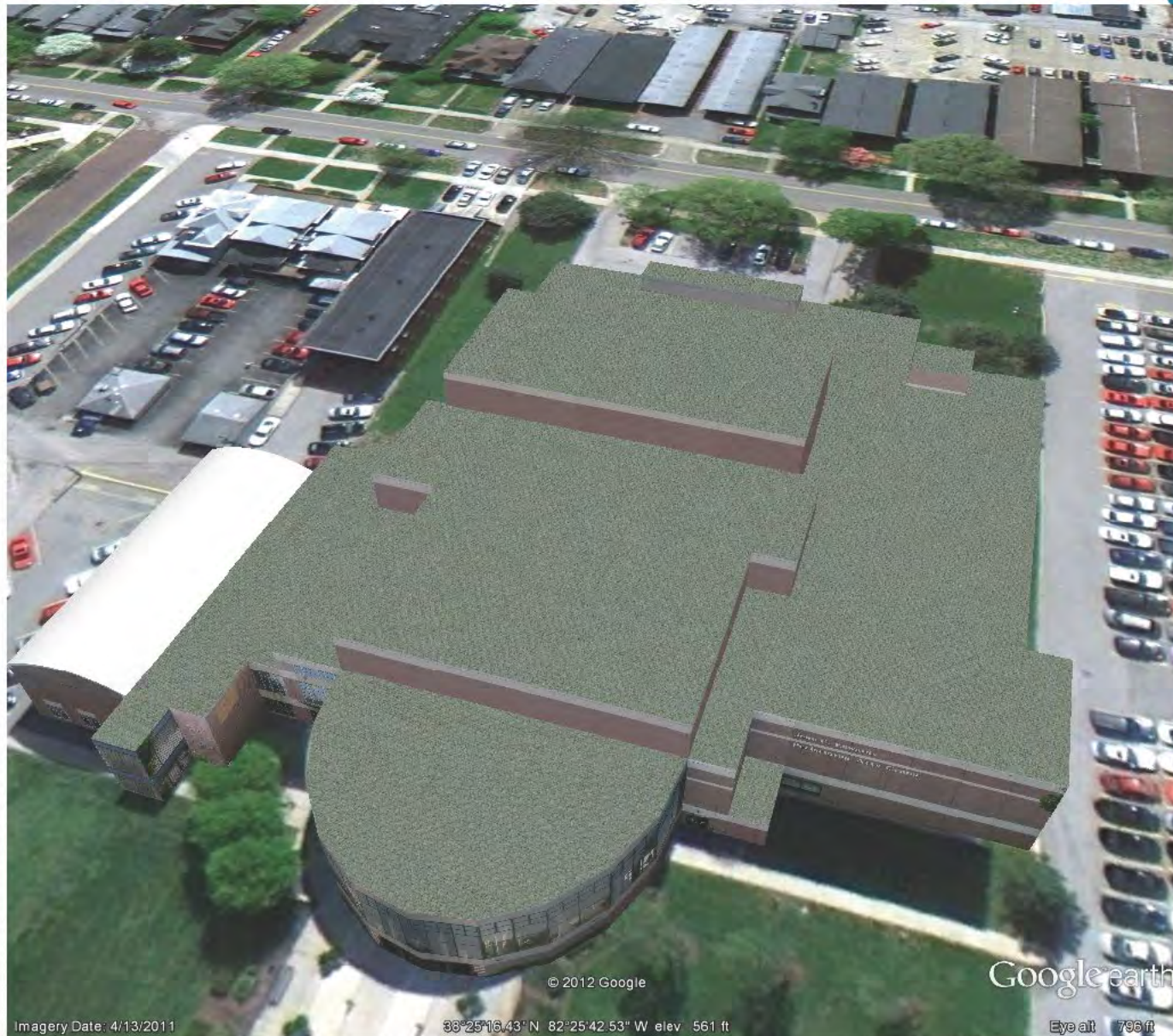
Green Roofs Add Biodiversity to

- Green or Vegetative Roofs



- As impermeable surfaces like buildings and pavement replace open space and vegetation, green roofs can play an increasingly important role in storm water management.
- During rainstorms, green roofs act as a sponge, absorbing much of the water that would otherwise run off. Researchers estimate that three to five inches of soil or growing medium absorbs 85-90% of rain events that are one inch or less. Green roofs also filter pollution from rainwater.

Joan C Edwards Performing



Thursday, July 19, 12

Green Roof

- 60,000 sf roof space

$60,000 \times .623 = 37,380$ gallons in a 1" rainfall

$37,380 \times 42 = 1,569,960$ gallons per year of runoff

A green roof would retain = 1,412,964 gallons

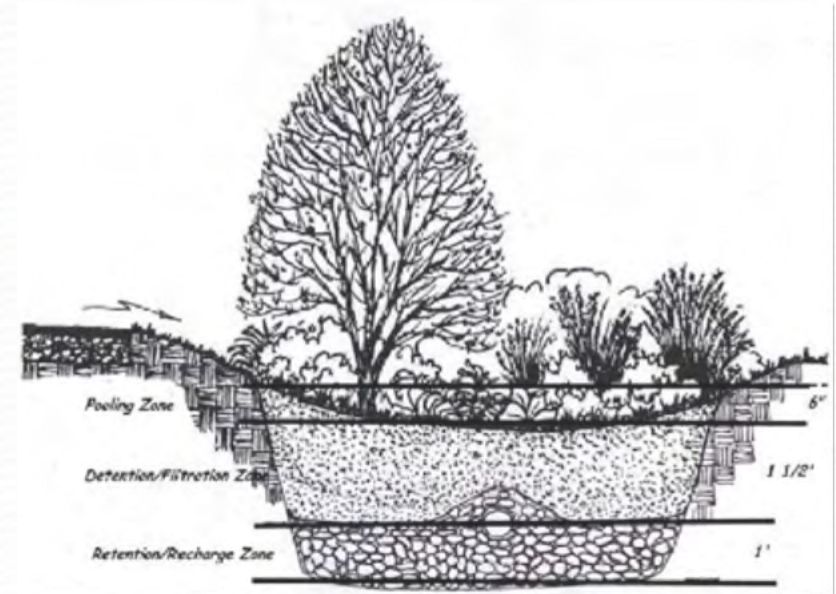
Leaving = 156,996 gallons of runoff per year







- Rain Garden size should be about 20% of the sq ft. of the impervious surfaces that are shedding into it.



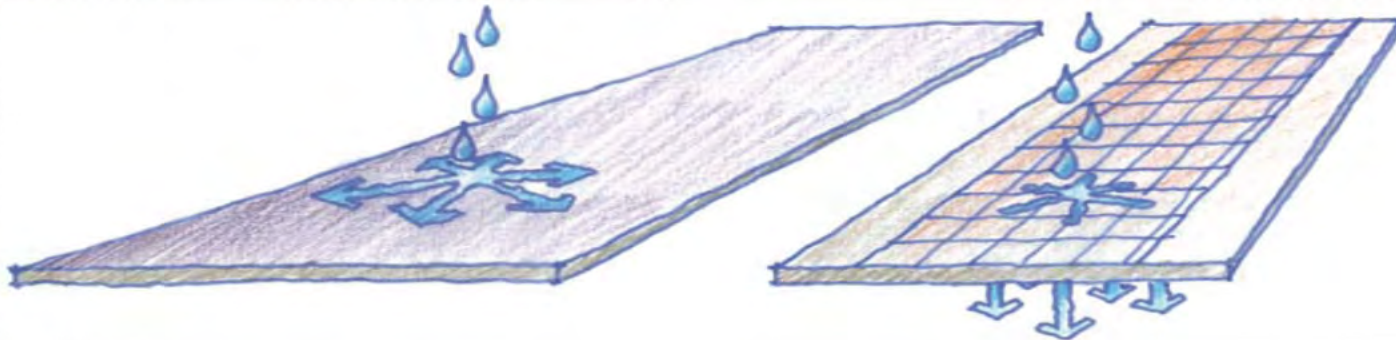
Rain Gardens





Thursday, July 19, 12

Green Infrastructure





Thursday, July 19, 12

Green Infrastructure



There are two classes of

- Systems which collect rainwater for personal use.
 - Flushing Toilets, Drinking, Washing Cloths and Cars, Topping off Pools, Fire Protection, Livestock, etc.
- Systems which are used for catchment to provide supplemental irrigation water.

Huntington Rain Fall Amounts

- Huntington on average gets about 42 inches of rainfall a year, that rainfall is not evenly spread out by month.
- On the high side you should plan to store at least three months worth of water for your needs. On the low side about six weeks of water storage.

Huntington Weather

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rain	3.21	3.09	3.80	3.30	4.40	3.88	4.46	3.88	2.80	2.73	3.32	3.37
ET	0.62	1.12	2.17	3.60	5.27	6.30	6.51	5.90	4.20	2.79	1.20	0.62

Average Precipitation in Huntington	42.31
Average Evapotranspiration in Huntington	40.3

What is Effective Rainfall vs. Actual Rainfall?

Water Balance and Sizing

- The basic rule for sizing any rainwater harvesting system is that the volume of water that can be captured and stored (the supply) must be balanced with the volume of water used (the demand).
- In theory, approximately 0.623 gallons per square foot of collection surface per inch of rainfall can be collected. In practice, however, some rainwater is lost for various reasons.
- The budget for the project is often the deciding factor.

- Roofs
 - Least amount of pollutants
 - Elevation of gutter allows directing to tank without pump
 - Easy to pre-filter and provide first flush
 - Low cost of conversion
- Pavement
 - Dirt and pollutants are more abundant
 - May need pumps to move water to storage area
 - Can be expensive to convert for collecting Rain, more cost effective if done during construction

How to figure the Sq. Ft. of a roof



Collectable Water

- A = (catchment area of building)
- R = (inches of rain)
- 0.623 (conversion factor for 1" rainfall to gallons of water/ sq ft.)
- G = (total amount of collected rainwater)

So if you have a roof that is 200' x 300' = 60,000 sq ft (A)

You have 1" of rainfall (R)

You would multiply 60,000 sq ft x 0.623 = 37,380 gal of water off that area in a 1" rain.

What are we going to water?

- What are we going to use the water for
- When will we need it.
- Where will it be located



Using the Rain Water

- Most Rainwater Harvesting System are best utilized watering landscape plantings not turf because of the limited size of storage units
- If you have a large storage area such as a lake all planted areas can be watered with the stored rainwater
- Most systems will need some sort of pump to distribute the water through a pipe network

Amount of water needed per 100 Sq. Ft. per month

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Gal/ 100SF	27	49	95	157	230	275	284	257	183	122	52	27

Catch It!







Cisterns-above ground



Large Underground Tank

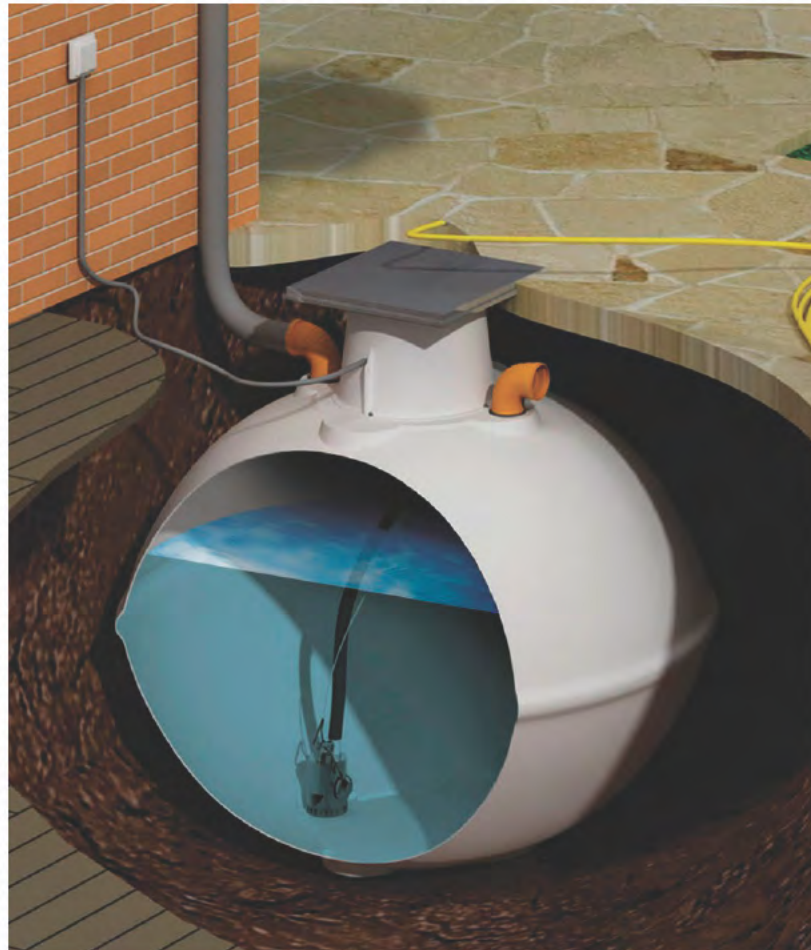




Rain Water Storage



Rain Water Storage



Concrete Formed Tanks



Storage Tank Cost

MATERIAL	COST, Small System	COST, Large system
galvanized steel	\$225 for 200 gallons	\$950 for 2000 gallons
polyethylene	\$160 for 165 gallons	\$1100 for 1800 gallons
fiberglass	\$660 for 350 gallons	\$10,000 for 10,000 gallons
ferro-cement	Price variable upon location	Price variable upon location
fiberglass/steel composite	\$300 for 300 gallons	\$10,000 for 5000 gallons
aluminum	Cost prohibitive for water use	Cost prohibitive for water use

http://www.lid-stormwater.net/raincist_cost.htm





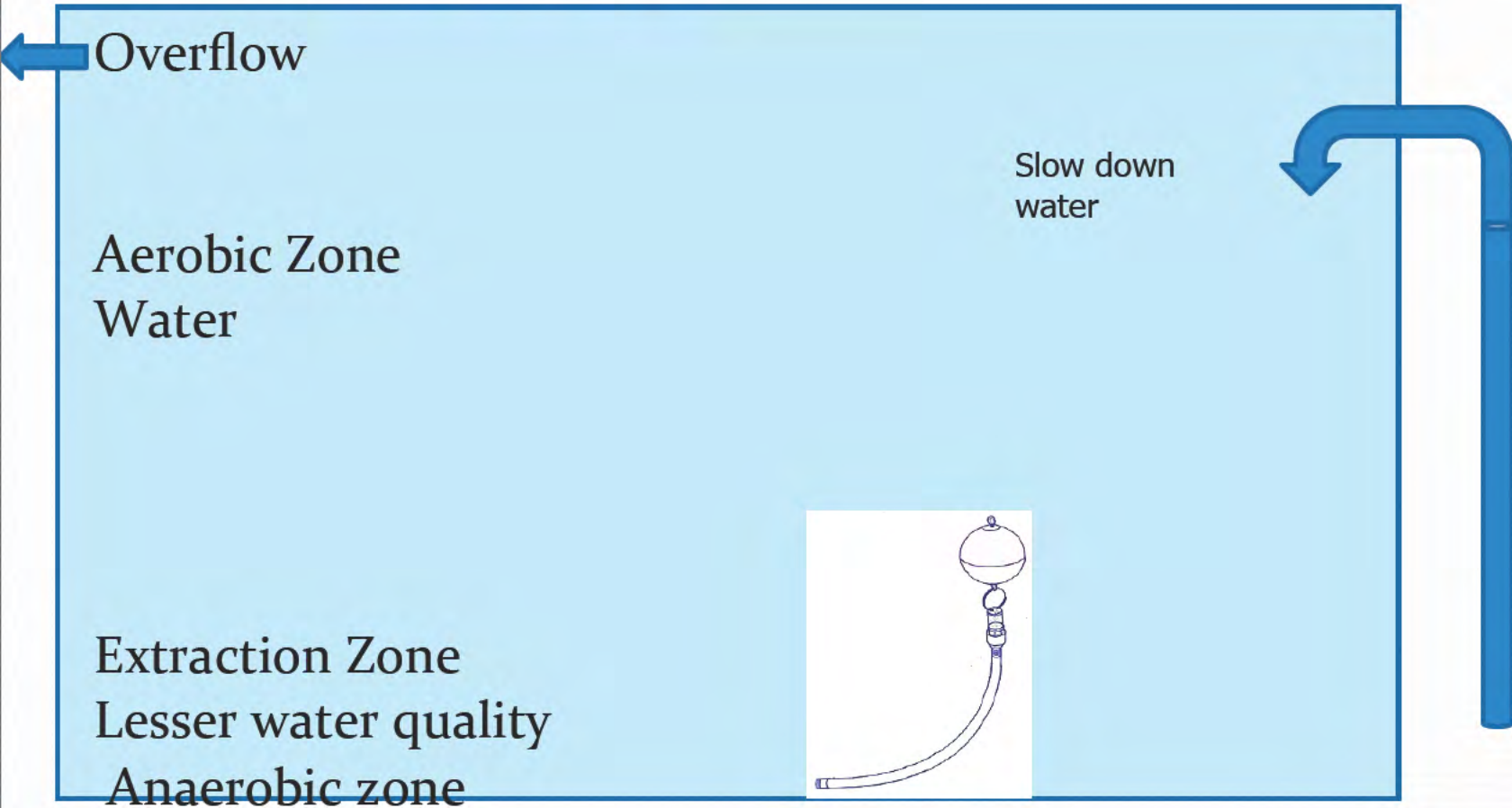


Bladders-under your deck





Aerobic zone



Best types of irrigation for

Drip and low volume irrigation

Most cost effective in the long term, utilizes the ever more precious resource of water better than any method, will get you LEED points , very flexible to change, can be unsightly if not installed properly.



Questions ?



GREEN CITY
RESOURCES

Rose Seeger

Sean Mullarkey

TRISTATE 
WATER WORKS