

Keynote Address: Building a Better Way

Martin P. Wanielista, PhD, PE, Professor Emeritus, College of
Engineering & Computer Science, University of Central Florida





Low Impact Development Conference

Building a Better Way – An Overview



Marty Wanielista
October 21, 2021



Motivation for and Outline of Presentation

Motivation:

Promote the use of Low Impact Development (LID) practices.

Hopeful Outcomes: An increase in the use of LID that enhances the water quality and uses of the Indian River Lagoon (IRL) as well as many benefits to our communities within the IRL watersheds.

Using my experience and the messages from the speakers, an outline is:

1. Introduce and discuss characteristics of LIDs.
2. Provide example LIDs and their benefits for use in the IRL watersheds.
3. Discuss challenges (opportunities) to implementation of LIDs.

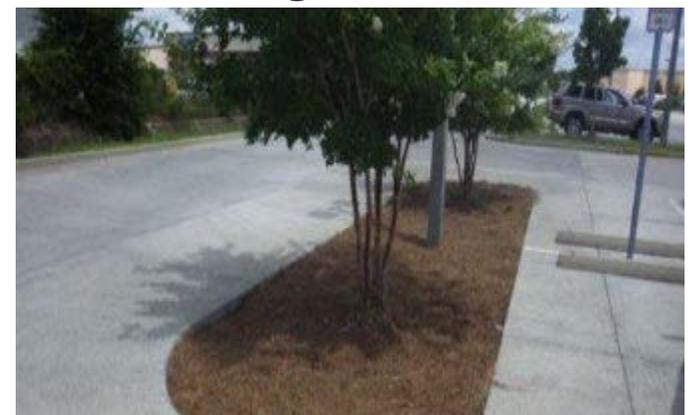
Characteristics of Low Impact Development - LID (a.k.a. Green Stormwater Infrastructure - GSI)

Those plans, practices and methods that are

1. Implemented with no additional land purchases (ex: used within business and home property, or within state and municipal owned land).
2. Designed and operated to bring water management into compliance with applicable state and local codes, comprehensive plans and regulations.
3. Built to mimic natural processes for water budgets and habitat protection.
4. Are used to accomplish a set of benefits to individuals and the public.

no additional land

and many Benefits



Some Benefits of LIDs – commonly used

1. Water Quality Improvement (mainly nutrients); but others to include those related to TMDL and BMAPs, ex. metals, pathogens, PFAS, sediment, etc.).
 2. Flood Control (peak discharges and volume storage).
 3. Minimize salt-water intrusion.
 4. Save Fresh Water (by stormwater harvesting): replaces potable water.
 5. Habitat Enhancement, ex.
Butterfly encounter at Wagner
 6. Increase coastal resilience, ex.
recovery time from floods.
- Others.



Wagner Park: Credit Zach Eichholz, USGBC

Other benefits classified as Triple Line (environmental, social, and financial)

Supported by the **Federal 2020 Water Resources Development Act** Requires an Evaluation of Nature Based Systems with economic and social value in B/C analyses. Ex.. USACOE required to use!

1. Environment; examples, minimize floods, increase water quality, protect and increase wildlife habitat, carbon reduction.
2. Social; examples, air quality, heat island, recreation in green space, aesthetics, green job creation, reduced flood insurance cost, increased water supply or reduced cost of potable water.
3. Financial; examples, avoided infrastructure capital cost, reduced operating cost from floods and for treatment, asset life extension, energy savings.

Some comments: Super storm Sandy: coastal wetlands saved \$625 Million dollars
From Census data: Overall 10% savings in property value with natural systems.

All benefits are not mutually exclusive.

Help to identify who pays; fraction to individuals, federal, state, local, developers.

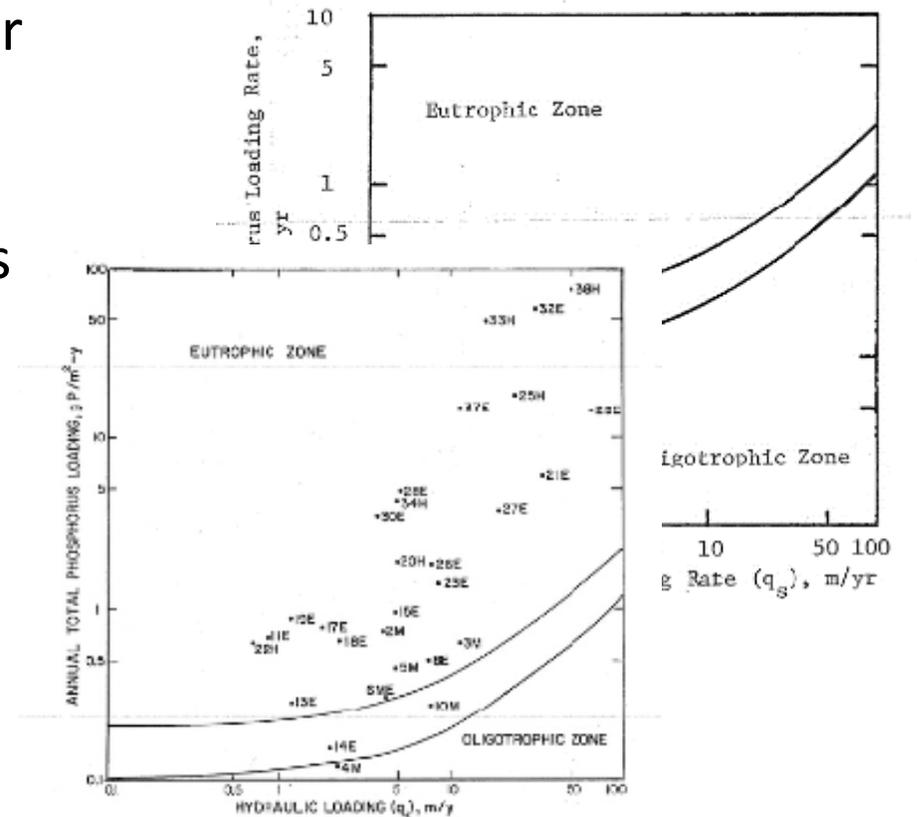
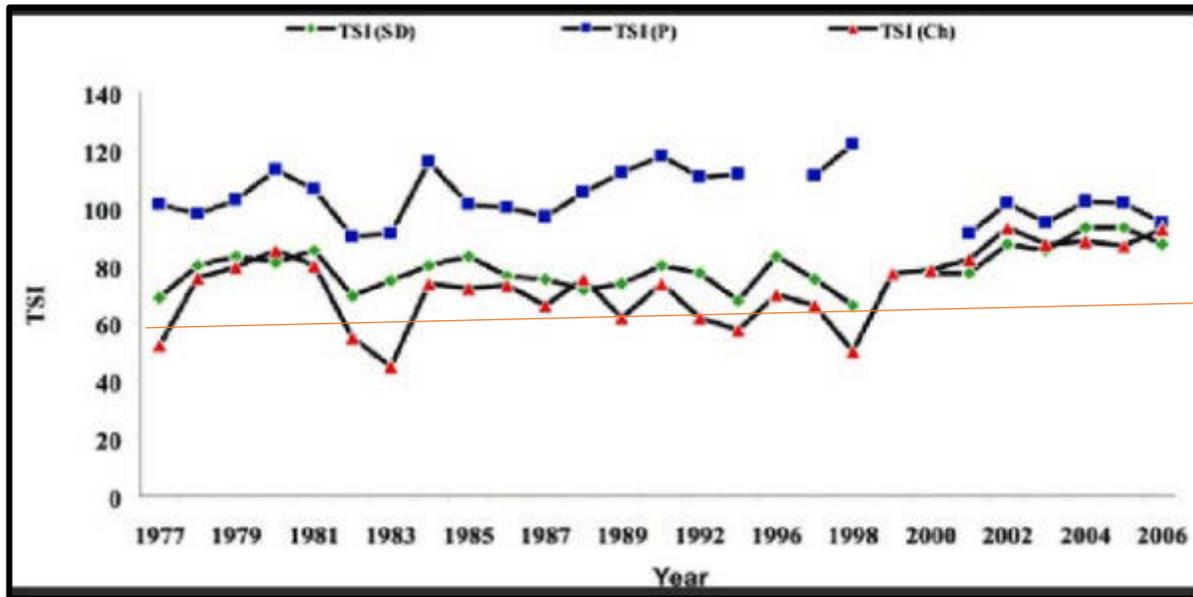
The early days: Why LID? Water Quality Improvement

More acceptable trophic state (nutrient enrichment) for
Lakes, Rivers and Estuaries (long residence times).

Related to nutrient mass load reduction per year.

Stormwater Quality Management related to mass loads

Mass Load = Concentration x Discharge Volume:



What can be done to control nutrients?
USE LID among other stormwater methods

Examples using LID Prevention Methods

Consistent with building codes, comp plans, and manuals of practice

Disconnect the roof drains or impervious areas. Building down drain into rain gardens.

Limit impervious area by lowering the streets width.

Trash pick up

Set minimum green space (include option to build and maintain LIDs)



LID usually results in more development space or additional land is not needed

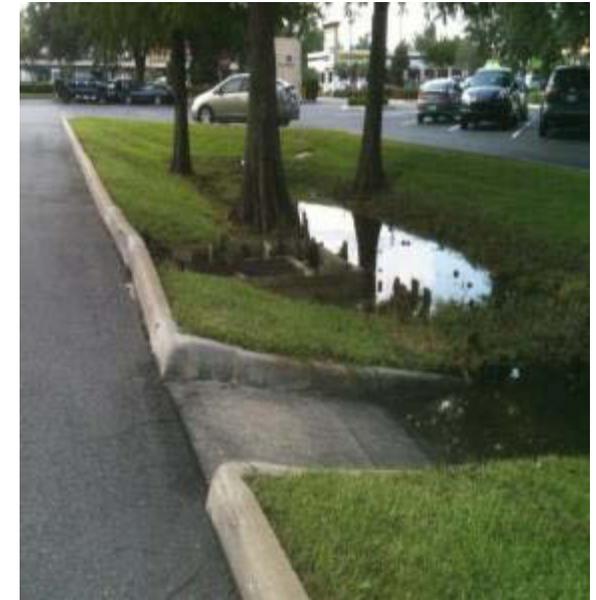
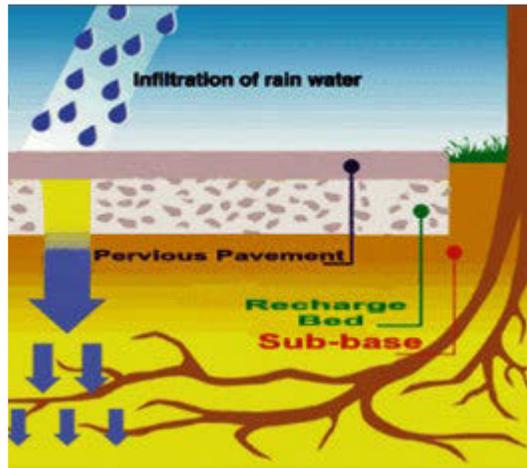
Early examples to Mitigate: Reduce TN and TP (1972-1978)

Retention basins in low water table areas>

Shopping center rain garden with select soils (rate ≥ 1 "/hr)

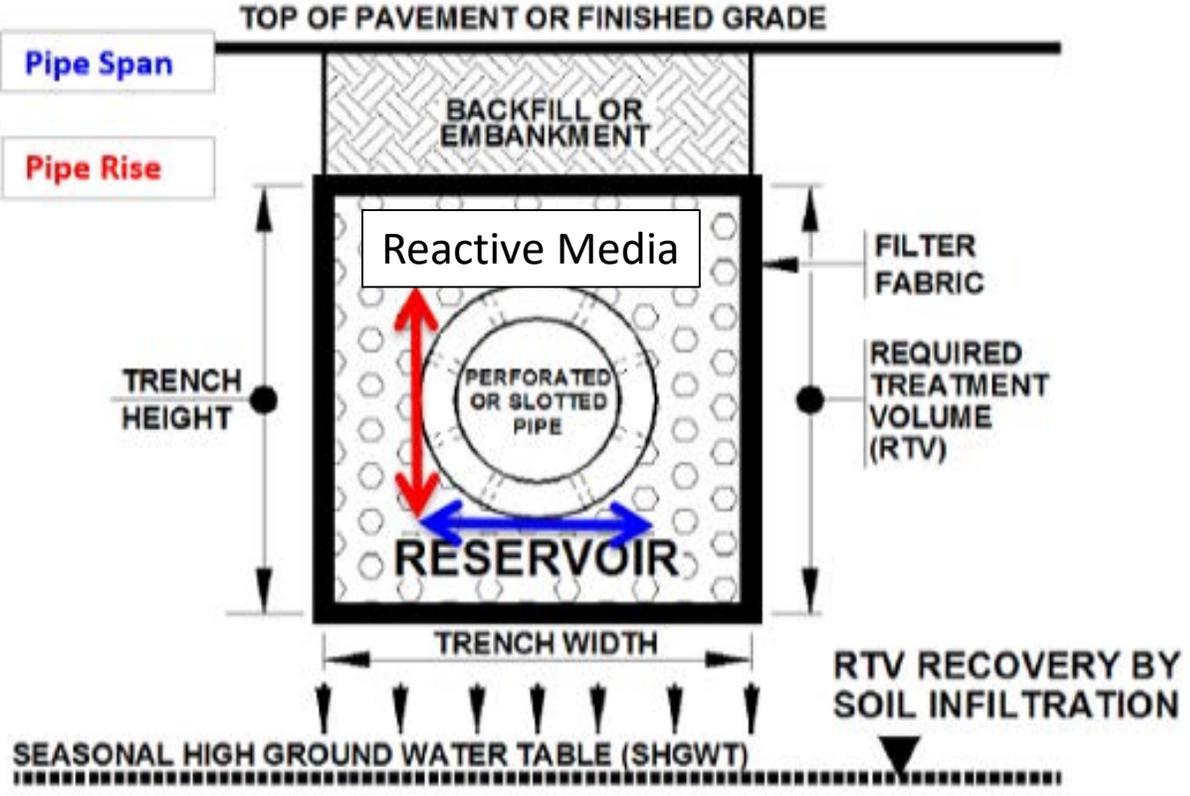
Motel "smart" off-line infiltration garden (recovery in 72 hrs)

Pervious concrete as retention (balance the budget)



Urban area used exfiltration, and filtration media (alum sludge)

Example of Exfiltration: An underground LID Within the IRL watersheds (no new land needed)



Protects groundwater quality

Treat: Nutrient Control Filter for street runoff water



United States
Environmental Protection
Agency

Research and Development

Municipal Environmental Research
Laboratory
Cincinnati OH 45268



EPA-600/S2-82-048 August 1982

Project Summary

Stormwater Management to Improve Lake Water Quality

Martin P. Wanielista, Yousef A. Yousef, and James S. Taylor



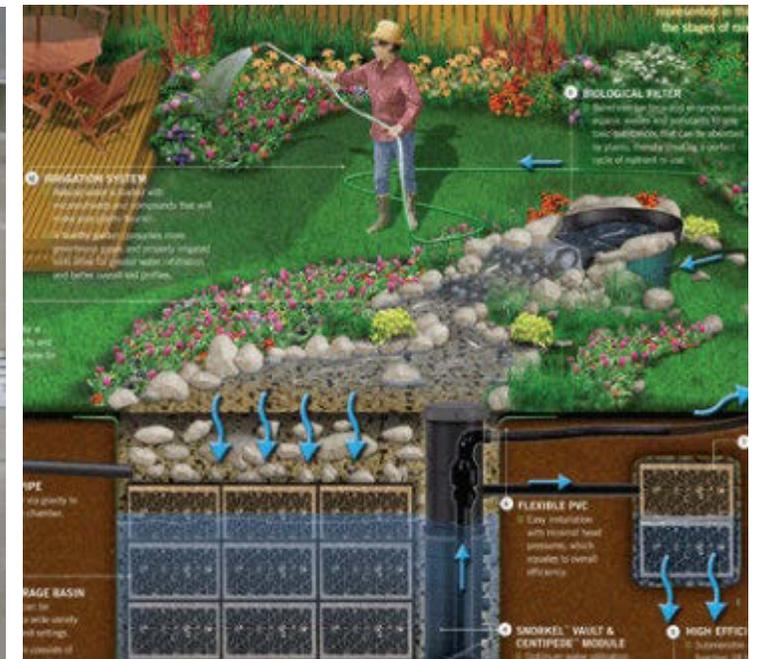
Constructed in 1979

October 2021



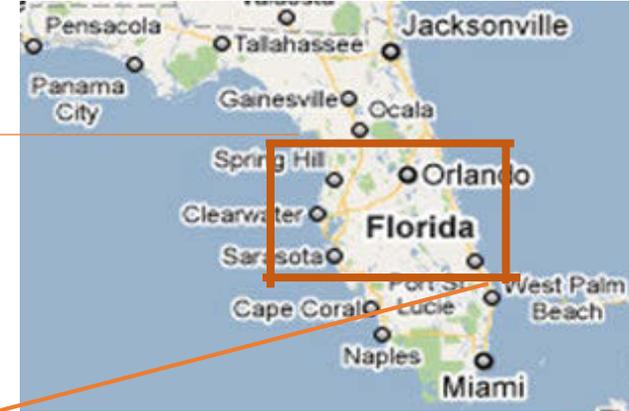
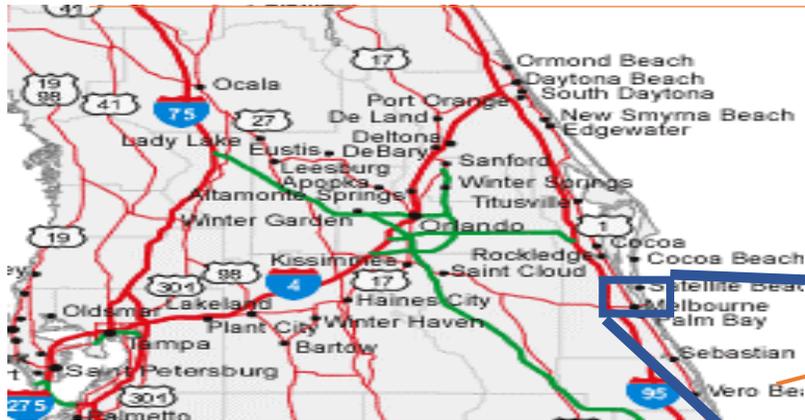
Stormwater Harvesting or Reuse (with no additional land) to reduce TN and TP Loads (1980-1990s) and add resiliency.

Stormwater Reuse: in SJRWMD Manual of Practice. Community and individual benefits: save potable water otherwise used for landscaping, vehicle washing, toilet flushing, make-up cooling water, etc.



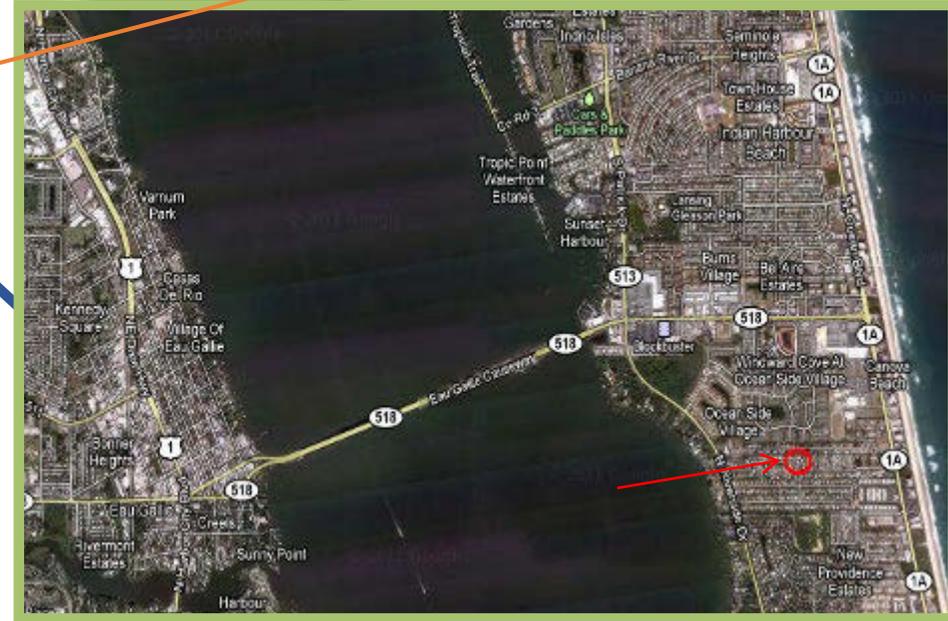
Florida's Showcase Green Envirohome (FSGE)

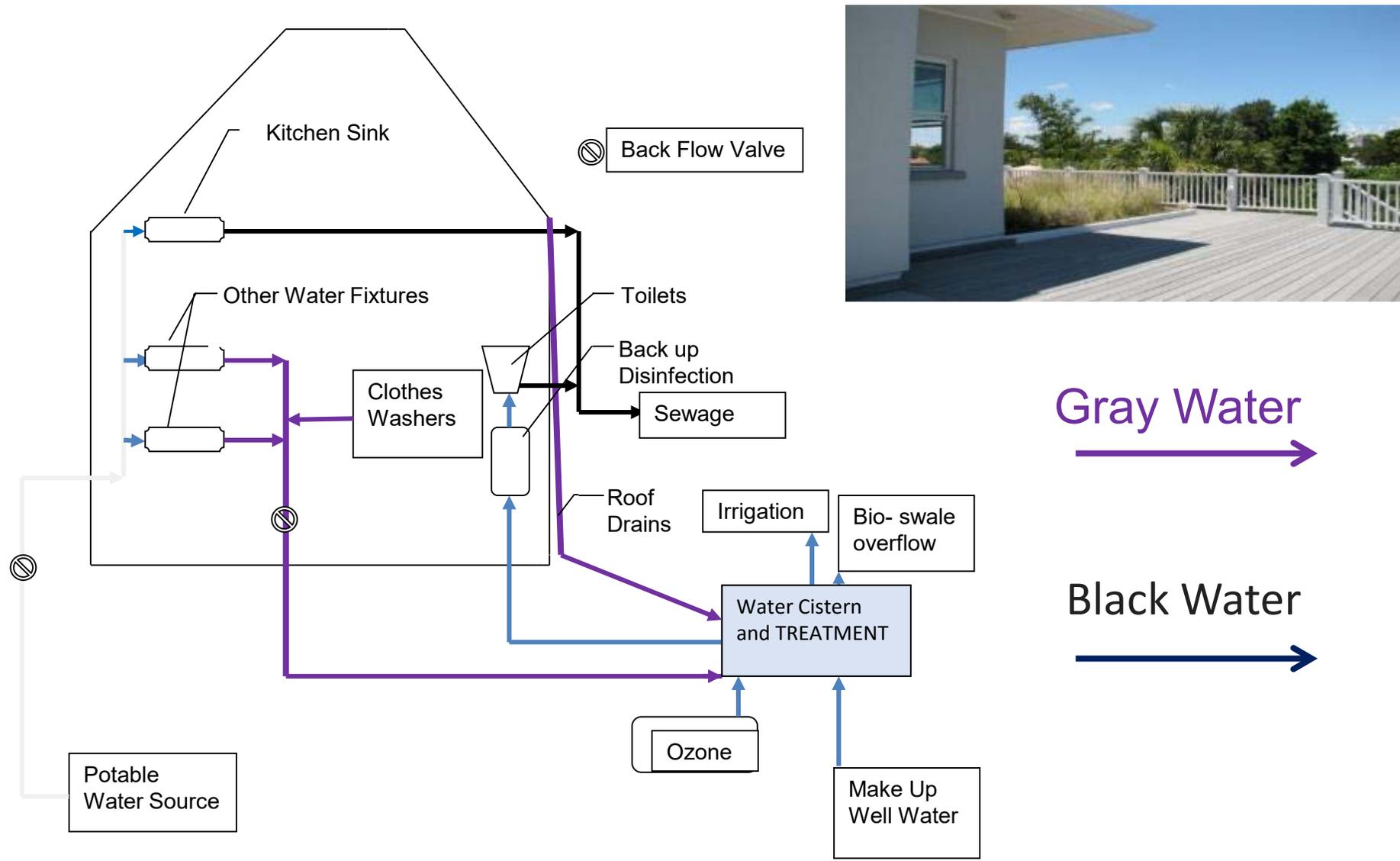
Individual and Community Benefits



Indianalantic, Florida
(IRL Estuary)
Mark and Nonnie

FSGE is one of the best examples
of LID design, operation and benefits
For residential application.





Gray Water



Black Water



Integrated Gray and Stormwater Harvesting Water Treatment for In-house Water Use



4500-gallon CISTERN

Based on a water budget



Green Roof with Cistern, Pervious Pavement and Rain Gardens



Photo credit to Baker and Crystal



1. Tropical Storm Faye: no discharge from 2 days of rain (about 25 inches measured at the home) note: mimic natural systems.
2. Potable Water Saving – Reduced Average Daily Flow (ADF) for FSGE:

Date	Volume Change (G)	Flow rate gpd	GPCD
4/4/11 to 8/3/11	10,727	88	29.3
National Average = 69.3			

3. Water pollution control, volume control, flood control, increased habitat areas, cost effective (vs other LIDs), aesthetics, coastal resilience, others.

Thus, many community and on-site benefits.



A Community Retro-Fit example of LIDs for public benefit and to reduce surface and ground water pollution

Example of limited land available for regional treatment and a need to preserve the business and residential area without taking any existing land.



Minutemen Streetscape - Brevard Av to Orlando Av

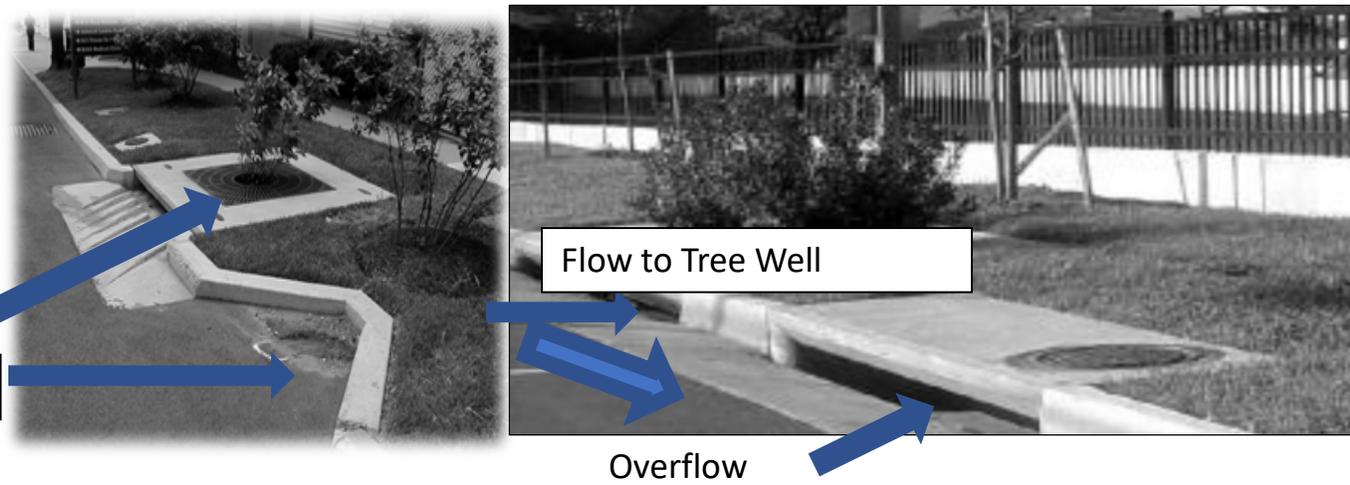
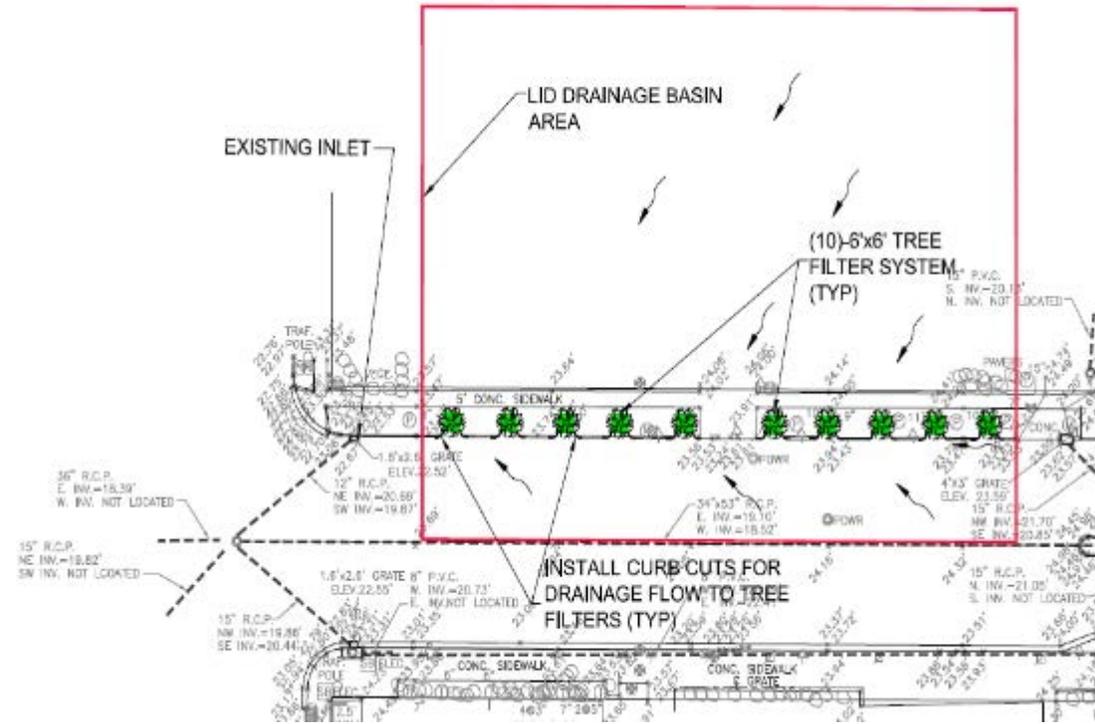
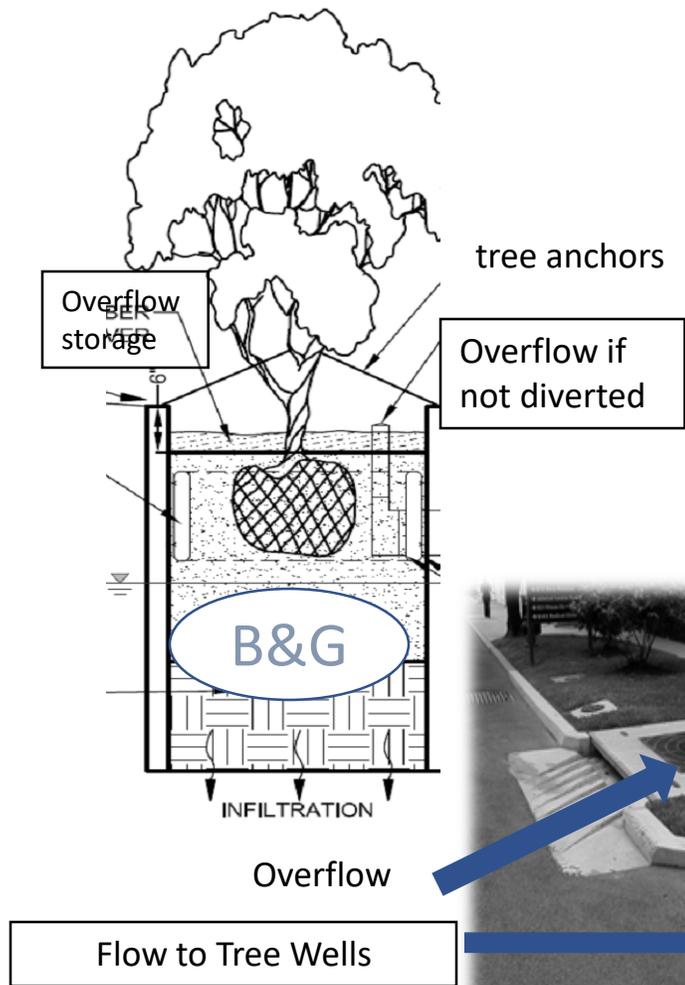


B&G in rain gardens, tree wells, pavers and exfiltration for estuary protection

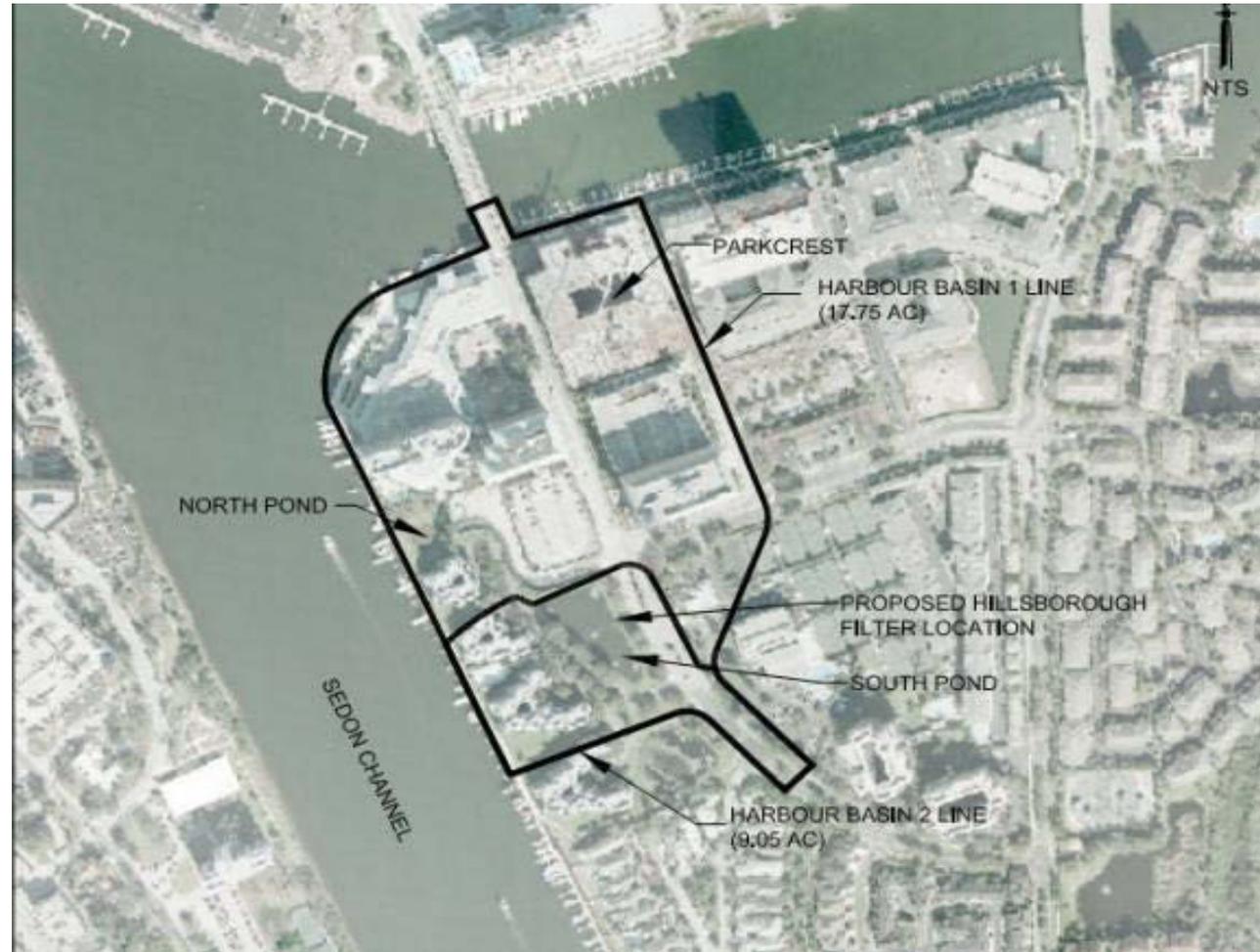
Water Quality sampling indicated that a fraction of the groundwater is protected. The removal was much greater than the current 10% more than existing target.

Project credit to Joanie Regan

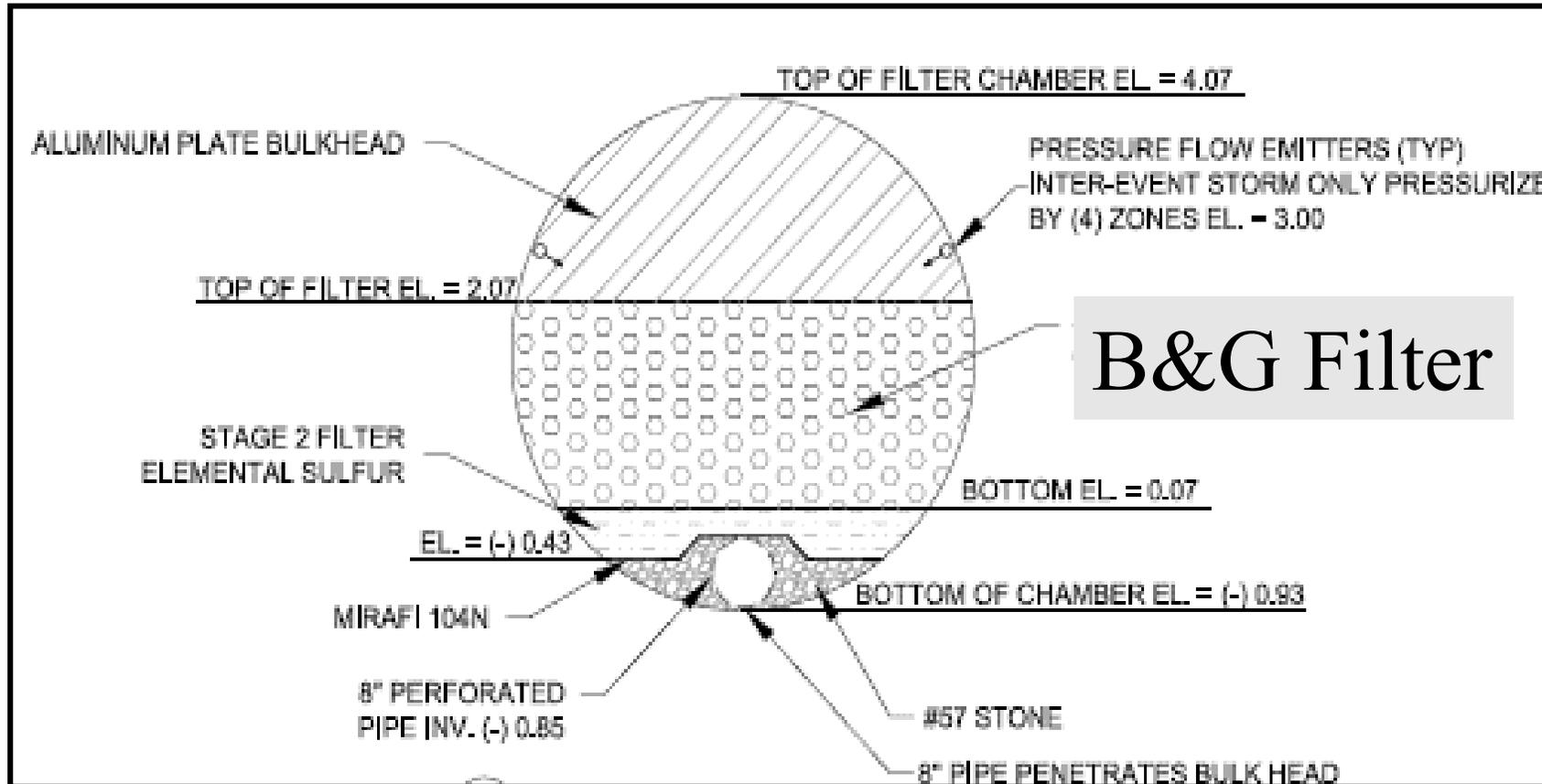
Tree Box Filter Retention Design



Pipe with media filter near an Estuary Area has minimum infiltration



Reactive Media Filter in a pipe (estuary protection)



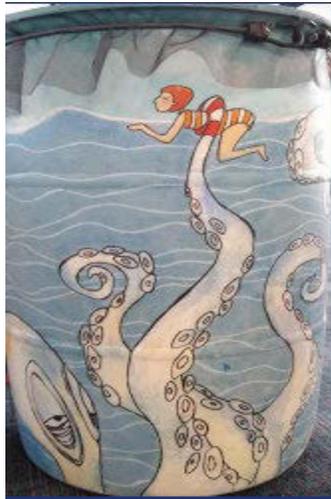
85% reduction of Nitrate, 76% reduction of TP

Credit Watermark Engineering

Challenges (Barriers) to implementing LIDs

Convert them to opportunities

1. Increase knowledge of options and B/C. Meetings like this ,USGBC, FSA, ASCE.
2. Host technical workshops to assist in design and maintenance. Also download reports and BMPTRAINS from: <https://stars.library.ucf.edu/bmptrains/>
3. Continue holding workshops for individuals like the MRC Rain Barrell Workshop.
4. Provide incentives, like credits on utility charges, design assistance, construction grants, permit ease, awards or recognition, etc.

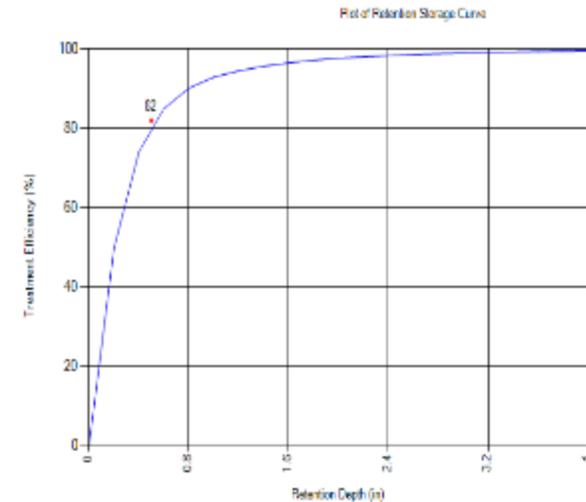


MRC Rain Barrel Workshops

Indian Harbor Beach, Melbourne, and Cocoa give \$50 Cash Rebate!!

Next workshop -
October 10, 2021
Bula Kava & Coffee House in Cocoa Beach

BMP Trains



Technical Support for LIDs used in Florida: Published Reports and Data

STARS Site & Stormwater Management Academy UCF, USGS, FDEP, WMD, IFAS,
FDOT, MRC, Universities, etc. Stormwater.ucf.edu. ~40,000 hits per year

Research Publications

Over 100,000 hits in two years at UCF sites

<https://stars.library.ucf.edu/bmptrains/>

[Click here for Archived Publications \(Pre-2010\)](#)

- [Filter Media for Nutrient Removal in Natural Systems and Built Environments: I – Previous Trends and Perspectives Environmental Engineering Sciences Journal, November 2010.](#)
- [Nitrogen Transport and Transformation Beneath Stormwater Retention Basins in Karst Areas – Final Report, FDEP, Tallahassee, October 2011.](#)
- [Soil Property Control of Biogeochemical Processes beneath Two Subtropical Stormwater Infiltration Basins – Biochemistry Journal, November 2011.](#)
- [Identifying biogeochemical processes beneath stormwater infiltration ponds in support of a new best management practice for groundwater protection – 7th international groundwater quality conference Zurich Swi, June 2010.](#)

How to understand and protect groundwater quality

But there are other challenges. How much \$\$ & who pays?

We must understand the monetary benefits and cost of methods that protect our IRL and benefit our communities. And who pays?

(the elephants in the watersheds... or big problems that we must solve)



Understand
the problem

Develop a
solution



Not all
solutions
will work.

LID will work

There is precedence for federal and state funding:

consider as examples: wastewater treatment grants and everglades funding.

The Federal 2020 Water Resources Development Act Requires an Evaluation of Nature Based Systems with economic and social value in B/C analyses.

LID Cost and Benefit Analysis Help (BMPTrains)

<https://stars.library.ucf.edu/bmptrains/>

BMP Type	Treatment Volume (ac-ft)	Land Cost (\$)	Expected Life (yr)	Fixed Cost (\$)	BMP Cost (\$/ac-ft)	Initial BMP Cost (\$)	BMP Maintenance (\$/yr)	Present Value/Life Cycle Cost (\$)	PV Cost per Pound N Removed (\$/lb)	PV Cost per Pound P Removed (\$/lb)
Exfiltration	0.07	0	30	2,000	165,000	13,401	800	27,235	106.88	642.42
Rain Garden	0.40	0	30	1,000	25,000	11,044	1,000	28,336	30.03	180.50
Tree Well	0.07	0	30	2,000	35,000	4,410	800	18,244	71.83	431.77
Multiple BMP	0.54	0	0	5,000	0	28,855	2,600	73,815	69.36	416.88

But we cannot fully fund until we have the means to implement.

We will lean about opportunities to develop and use codes and regulations to **enable funding**.

All will help protect our IRL and make our communities a better place to live, work and play.



Summary

1. Presented was an overview of the learning experiences that you will get from the stormwater professionals presenting in this conference.
2. The benefits LID have to the IRL as well as the community in watersheds “feeding” the IRL were discussed.
3. Some options to respond to needs and challenges (opportunities) for implementation were presented.
4. We must continue building a better way for the future of our communities and for the “health” of the IRL. LID will help!

By our attendance at this conference, We are functioning to use LID in our landscapes while also recreating the functions of our landscapes.



Low Impact Development Conference



**Building a Better Way – An Overview
Comments, Questions and Discussion**

marty@greensmarts.com or Martin.Wanielista@ucf.edu

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