

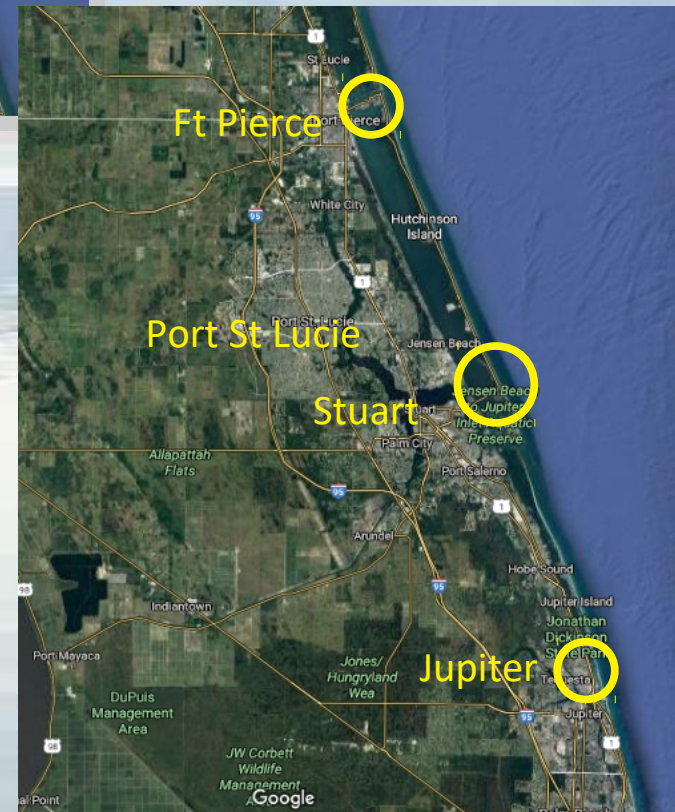
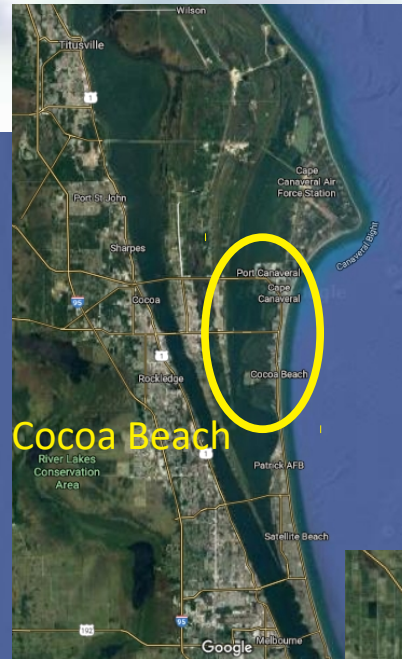
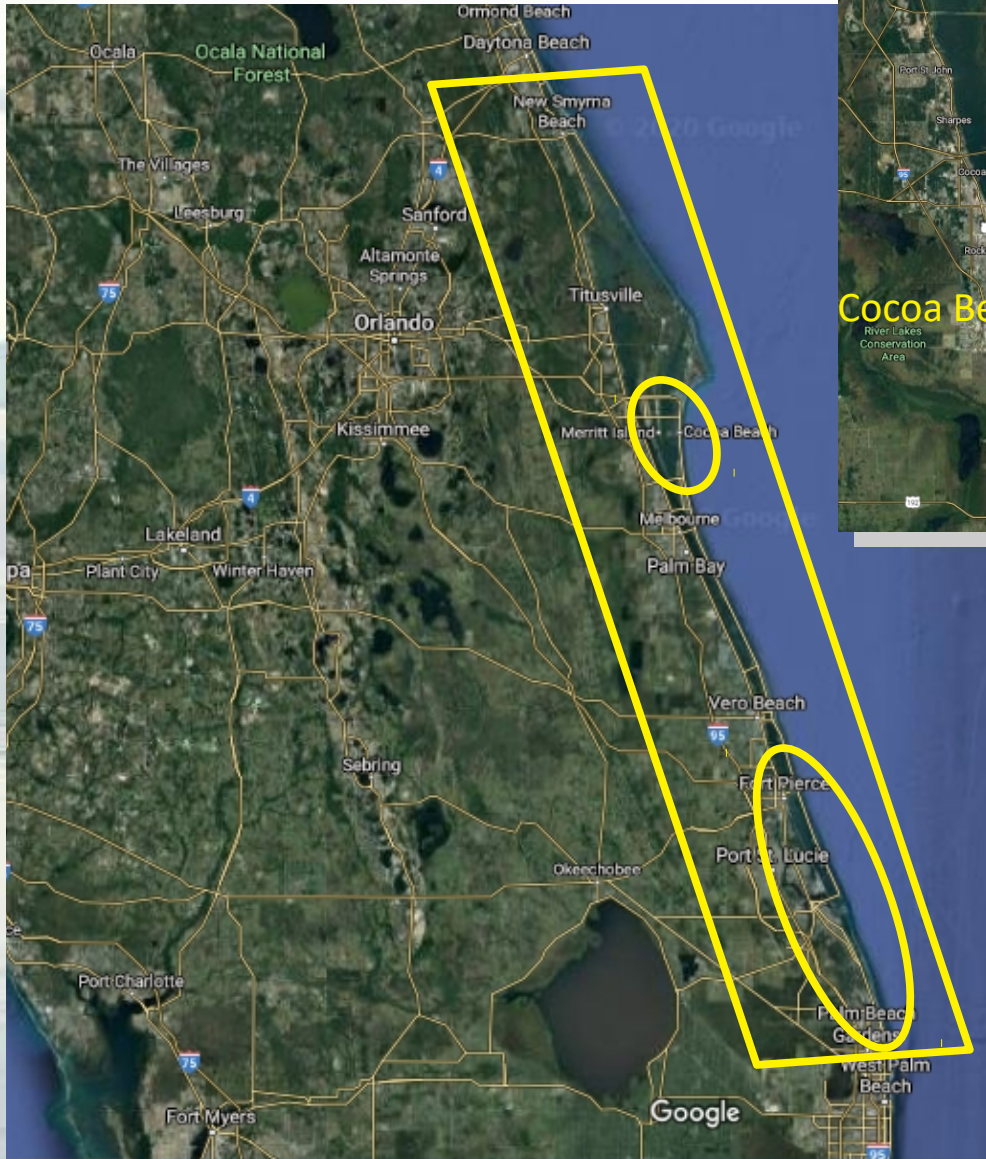
Restoring Rain's Natural Path



Low Impact Design

A Tool in the Restoration of the Indian River Lagoon

Our Indian River Lagoon (IRL)



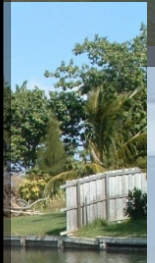
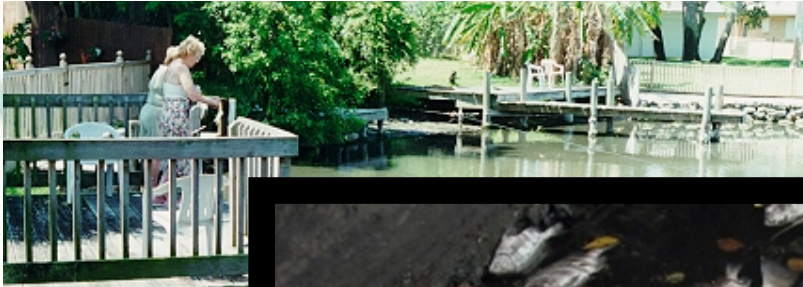
THE PROBLEM – Huge Stormwater Flows/Volumes



THE PROBLEM – Water Quality



THE PROBLEM – Loss of Habitat



THE PROBLEM - Muck



“How did the pavement hurt the fish?..”

**Pavement storm runoff contains a lot of hazardous pollutants
This runoff ends up in our lagoon & ocean
Our fish & marine life get sick and can die**

Planting trees can help!..

They capture rain before it hits the ground
They add oxygen to the air & remove pollutants

We can save the fish!..

Remove unnecessary pavement
Add green landscape areas

For more information & helpful tips please visit our website:
www.cityofcocoa.com/stormwater
THANKS FOR STOPPING BY! - CITY OF COCOA BEACH



“I remember a lot more fish here 40 years ago...”

“...Well, there was less pavement here 40 years ago!”

Building the Case for Low Impact Design – Impervious Creep



Cocoa Beach 1956



Cocoa Beach Today



Urbanization Infrastructure . . . Impervious Creep . . . green turns gray

Building the Case for Low Impact Design – Development Patterns



Cocoa Beach Land Use Breakdown

Private

2104.2 acres

97%

Public Roadways

55.1 acres

3%

Impervious & Redevelopment

Public Roadways are mostly impervious
with

very little green areas for runoff infiltration



**3% Public Roadways
cannot mitigate
97% Privately-Owned
Development
Storm Runoff**



Building the Case for Low Impact Design – Development Patterns

IMPERVIOUS SURFACES
can cause **FLOODING**
putting homes and properties
at **RISK.**

WATER QUALITY
FLOODING
RESILIENCE

Impervious & Redevelopment



Vast Amounts of
UPSTREAM IMPERVIOUS
causes
DOWNSTREAM FLOODING

Building the Case for Low Impact Design – Development Patterns

Conventional Stormwater System Deficiencies

many old systems are now filled in
algae producing systems



BEST pollutant removal
is the day its built.

Many are now 30-40 years old.

Sustainable Stormwater Management

Low Impact Design (LID) & Green Infrastructure

allowing rain to percolate as close to where it falls as possible

Conventional Stormwater Design



Low Impact Design/Green Infrastructure



Sustainable Stormwater Management

Low Impact Design (LID) & Green Infrastructure

allowing rain to percolate as close to where it falls as possible

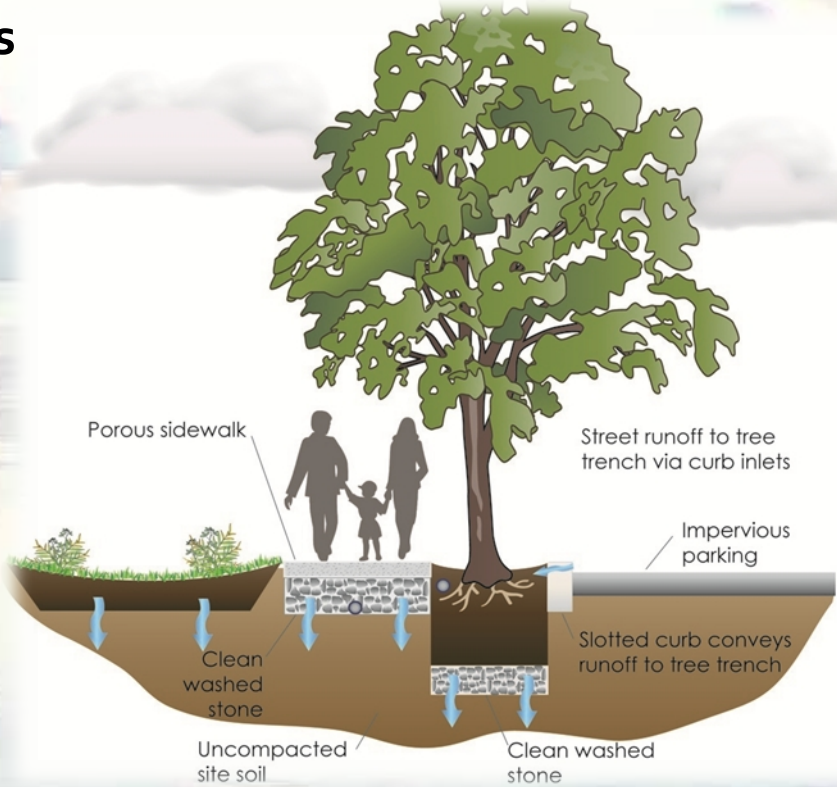
Tree Canopy/Urban Forest

Green Roofs/Walls

Permeable Pavements

Rain Harvesting

Rain Gardens



Underground Exfiltration

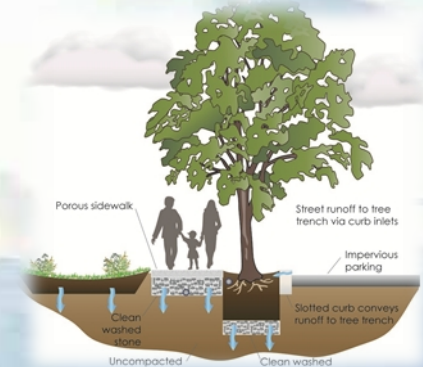
Sustainable Stormwater Management

Low Impact Design (LID) & Green Infrastructure

allowing rain to percolate as close to where it falls as possible

Why?

- Reduces Stormwater **VOLUME** to waterways
- Reduces Stormwater **POLLUTANTS** to waterways
- Reduces Stormwater **INTENSITY** at Storm Outfall
- Recharges Local **AQUIFER**
- Nourishes **SOIL BIOTA/MICROBES** – increases holding capacity
- Soil Biota/Microbes **REDUCE TN/TP** to **GROUNDWATER**
- Protects against **SALTWATER INTRUSION**
- Reduces **DOWNSTREAM FLOODING/KING TIDES**
- Promotes **GREEN SPACE & NATURAL RESOURCES**



Sustainable Stormwater Management

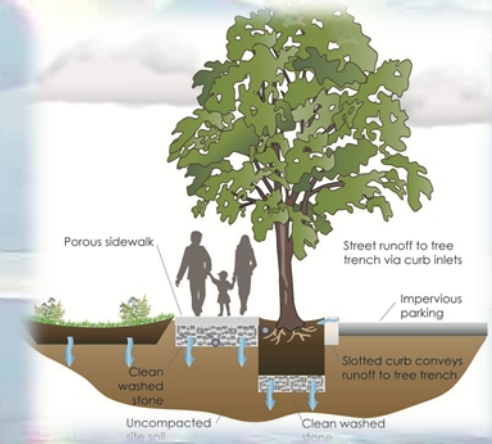
Low Impact Design (LID) & Green Infrastructure

allowing rain to percolate as close to where it falls as possible

HOW?

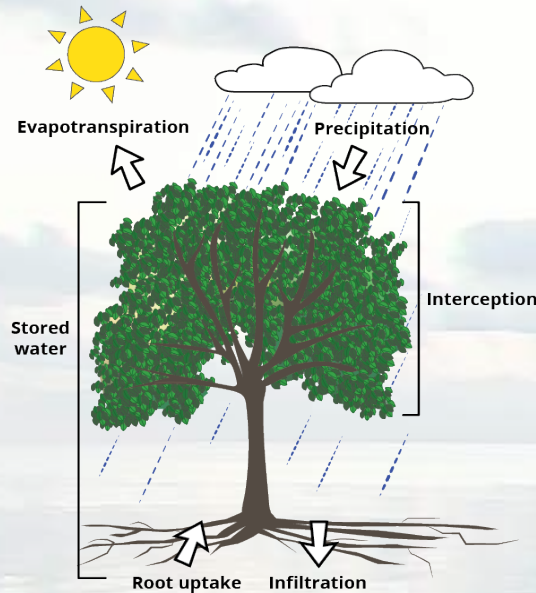
LID/Green Infrastructure Principles/BMPs

- Minimize Impervious Footprint
- Preserve Site Trees/Natural Areas
- Plant Tree Canopy
- All Green Areas recessed
- Pervious Pavement walkways and driveways
- Elevated Structures for buildings, decks and patios
- Underground Rain Storage/Rainwater Harvesting/Cisterns
- Explore Innovative BMPs – Green Roofs/Walls



Tree Canopy/Urban Forest

Trees are the premier stormwater BMP – they become more effective over time as they grow.
All other stormwater BMPs become less effective.



- capture & store rain
- slow down runoff
- moderate climate
- release oxygen
- cleanse air of pollutants
- provide habitat
- increase business & lower crime
- increase well being

This collage features several articles and a diagram. At the top right is the **University of Washington College of Forest Resources** logo. Below it is a large number '17' with the text 'HUMAN DIMENSIONS OF THE URBAN FOREST' and 'FACT SHEET #17'. The main article is titled **Trees on Main Street: Influences on Retail and Shopping Behavior**. It states: 'Trees make business districts more pleasant places! Yet long-term care and maintenance is needed to gain the most benefit from trees in downtown business centers. Are the returns worth the costs? Several scientific studies indicate that trees are good for business! A recent study tested the response of shoppers and visitors in smaller cities throughout the U.S. Three general findings were:

- Shoppers spend more time in tree-lined streets.
- Shoppers are more likely to visit businesses in tree-lined streets.
- Shoppers are more likely to purchase goods and services in tree-lined streets.

Below this is a diagram titled **Trees in the Small City Retail Business District: Comparing Resident and Visitor Perceptions** by Kathleen L. Wolf. The abstract reads: 'Many small cities and towns are located near resource lands, and their central business districts serve both residents and visitors. Such quasi-rural retail centers face competitive challenges from regional shopping malls, online purchasing, and big box discount retailers. District merchants must strategically enhance their market position to prevent outshopping. Streetview trees are a physical improvement that can be used to attract and welcome consumers. A national survey indicated that trees in retail settings, and consumer behavior is positively associated with the urban forest on multiple cognitive and behavioral dimensions. Forest amenities of both wildland and built environments can be used to strengthen local economies.'

Keywords: urban forestry, retail business, small city, public perception

The diagram also includes a section titled **Trees Mean Business: City Trees and the Retail Streetscape** by Kathleen L. Wolf, Ph.D., University of Washington. It discusses how trees in retail streetscapes can attract visitors and increase sales. A photo shows a busy street with many trees and people walking.

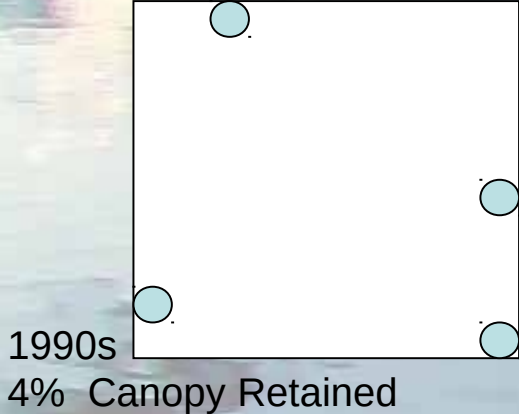
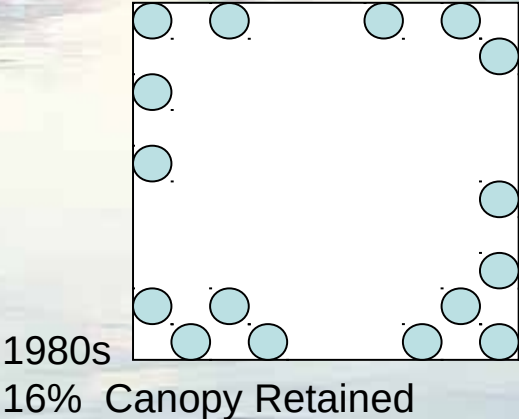
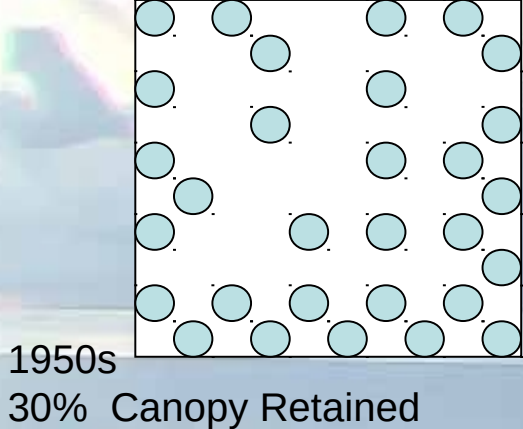
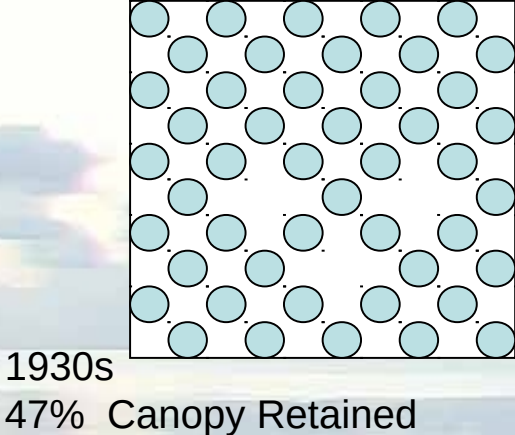
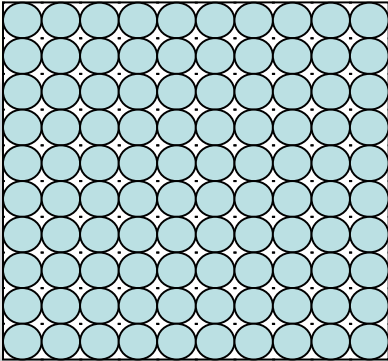
LID - Integrated Stormwater/Landscape Design

Sustainable Stormwater Management

Tree Canopy/Urban Forest

Subdivision Development Trends

Undeveloped Site



Data from Center for Urban Forest Research

Changing our Built Environment

allowing rain to percolate as close to where it falls as possible

TREE CANOPY *if rain doesn't hit the ground, its not stormwater runoff; can intercept 15-35% of annual rainfall*



RAIN GARDENS *creating stormwater recharge areas to intercept runoff; recharge groundwater & abate saltwater intrusion*



Changing our Built Environment

allowing rain to percolate as close to where it falls as possible

PERVIOUS PAVEMENTS & DECKING *not green infrastructure but allows rain to soak in*



Changing our Built Environment

allowing rain to percolate as close to where it falls as possible

ELEVATED STRUCTURES *minimizes building footprint, mitigates flooding & provides resilience*



Changing our Built Environment

allowing rain to percolate as close to where it falls as possible

Cisterns & Rain Water Harvesting *captures building footprint runoff for reuse/percolation & resiliency resource in storms*



Changing our Built Environment

allowing rain to percolate as close to where it falls as possible

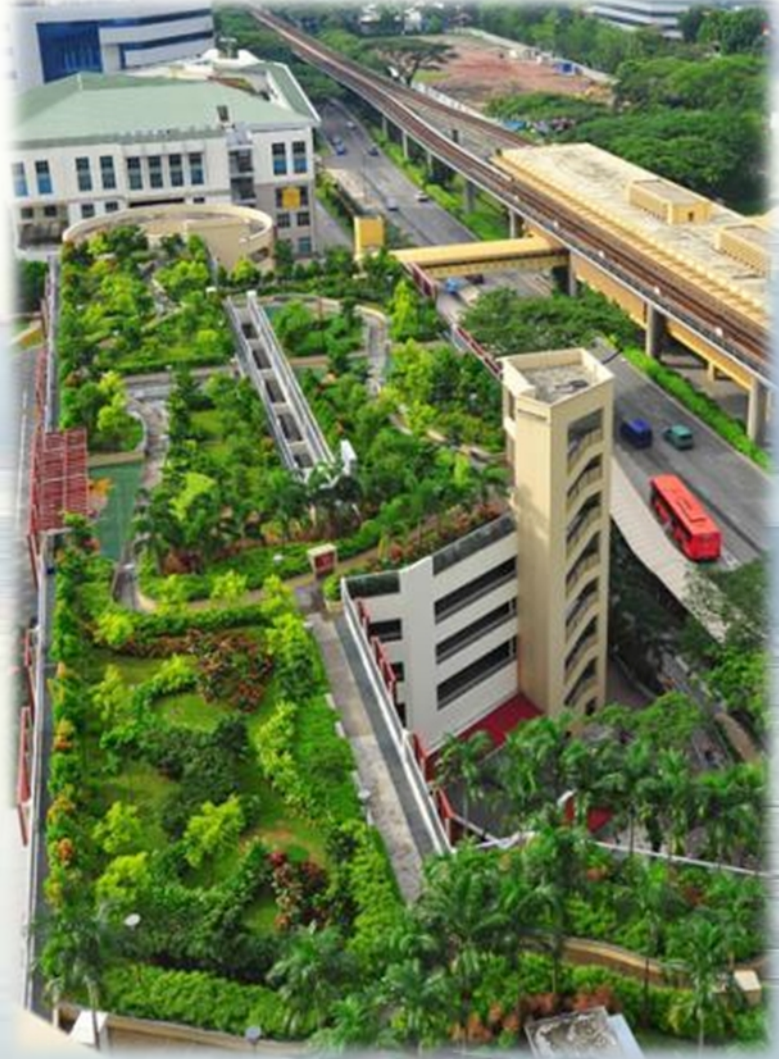
UNDERGROUND STORAGE/EXFILTRATION *not green infrastructure but recharges aquifer*



Changing our Built Environment

allowing rain to percolate as close to where it falls as possible

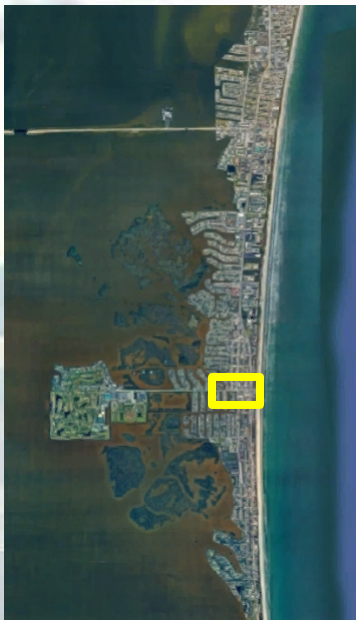
Green Roofs & Walls *minimizes building impervious footprint & provides air quality and cooling effect*



Changing our Built Environment

allowing rain to percolate as close to where it falls as possible

Minutemen Corridor Stormwater LID Streetscape - 5-block main street improvement, 23 acres



Tree Canopy



Pervious Pavers



Rain Gardens



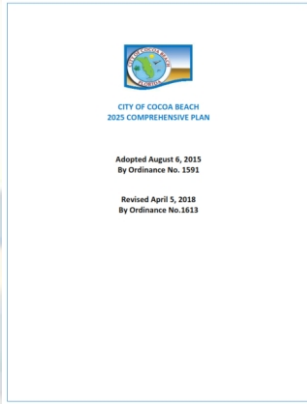
Tree Wells



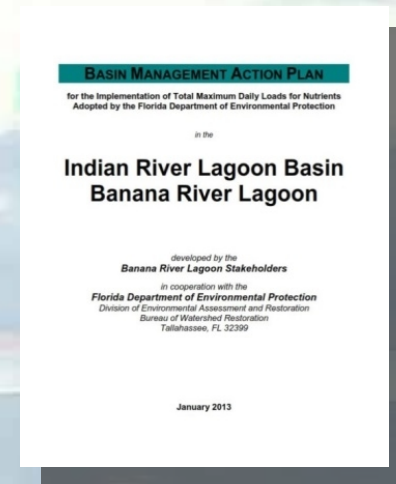
Challenges – Changing the Norm

... getting the barge to turn

Comprehensive Plan



IRL BMAP Indian River Lagoon BMAPs



Land Development Code



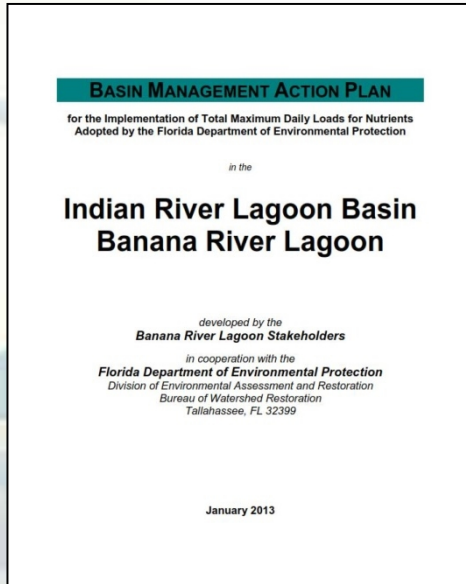
SW NPDES Permit

Code No.	Code Section	Description of BMP	Measure Number	Priority/Implementation Schedule	Responsible Party/Department
64	64	<p>ESC Code (Substance 100), LDC Exposure & Sediment Control (ESC) Code Compliance Enforcement Assurance</p> <p>LDC Chapter 10-10-10 requires that all new and existing development projects that are subject to the ESC Code shall implement and maintain the ESC Code requirements for all new and existing development projects that are subject to the ESC Code.</p>	Revised 8 Report any changes to LDC Chapter 10-10-10 Section 1.03	Year 1 - Year 3	Development Services
65	65	<p>ESC Code (Substance 100), LDC Exposure & Sediment Control (ESC) Code Quarterly BMP Requirements</p> <p>LDC Chapter 10-10-10 Section 1.03 requires that all new and existing development projects that are subject to the ESC Code shall implement and maintain the ESC Code requirements for all new and existing development projects that are subject to the ESC Code.</p>	Revised 8 Report any changes to LDC Chapter 10-10-10 Section 1.03	Year 1 - Year 3	Development Services
66	66	<p>Water Control on Construction Sites</p> <p>LDC Chapter 10-10-10 Section 1.03 requires that all new and existing development projects that are subject to the ESC Code shall implement and maintain the ESC Code requirements for all new and existing development projects that are subject to the ESC Code.</p>	Revised 8 Report any changes to LDC Chapter 10-10-10 Section 1.03	Year 1 - Year 3	Development Services

Challenges – Changing the Norm

... getting the barge to turn

Indian River Lagoon BMAP



1.5 FUTURE GROWTH IN THE BASIN

This BMAP does not include a specific allocation for new development because of ERP Program requirements. The ERP Program requires that new discharges into the basin cannot increase existing loads. All ERP applications must include documentation demonstrating compliance with state water quality standards, as well as showing that the project does not adversely affect the quality of receiving waters, resulting in water quality standards violations. Since the BRL is an impaired water that does not currently meet state water quality standards, new development in the basin cannot increase nutrient loads to the BRL.

Starting on July 1, 2012, developers have the option of obtaining a general permit for the construction of surface water management systems serving a project area of up to 10 acres, with less than 2 acres of impervious area and no wetlands impacts. This "10/2" general permit would be in lieu of an ERP for areas up to 10 acres. To obtain the general permit, the developer must demonstrate that the project does not cause adverse impacts, including violations of state water quality standards. This evaluation must be signed by a state of Florida registered professional; however, state agency review is not required. With this new rule in place, local governments cannot require that the developer obtain a permit from a state or federal agency as a condition of issuing a permit. In addition, efforts are under way to streamline the ERP process; however, the implications of this streamlining are unknown as of the date of this report.

Since the TMDL reductions are based on decreasing loads from past development, it is important that loads from new development are well controlled. Although future development may meet state stormwater standards, the development may still add a nutrient load to the lagoon. To ensure that future growth does not add to the degradation of the BRL, local governments must be proactive in controlling loads from future growth.

Options to address future loading include low-impact development (LID) standards and Florida-friendly landscaping to further minimize the impacts of existing development and new development through local development regulations. LID is an approach to development that conserve natural resources and is from future growth and future BMAP iterations. FDEP quantified for the use of LID

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Options to address future loading include low-impact development (LID) standards and Florida-friendly landscaping to further minimize the impacts of existing development and new development through local development regulations. LID is an approach to development that employs land planning, design practices, and technologies to conserve natural resources and reduce infrastructure costs. These activities could offset loads from future growth and, therefore, may reduce the reductions needed from the entities in future BMAP iterations. FDEP will continue to research how nutrient reduction credits could be quantified for the use of LID BMPs.



Outreach



Marine Resources Council
Turning Science into Action

3178 Doctor Philip N.E. Palm Bldg. FL 32908 (321) 718-7778 www.SaveTheIRL.org

SIGNERS

July 2, 2020

- 1000 Friends of Florida
- Sierra Club Florida Chapter
- Space Coast Association of REALTORS®
- Brevard IRL Coalition
- CCL Space Coast Chapter
- Space Coast Audubon Society
- Pelican Island Audubon Society
- St Lucie Audubon Society
- The Guardians of Martin County
- Martin County Conservation Alliance
- Indian Riverkeeper
- Conservation Alliance of St Lucie County
- Surfrider Sebastian Inlet Chapter
- Florida Native Plant Society Conradinga Chapter
- Keep Brevard Beautiful
- UCF Stormwater Management Academy
- Friends of the Thousand Islands Sanctuary
- Jim Swann
- Kids Digging Gardening
- Anglers for Conservation

LOW IMPACT DESIGN FOR THE INDIAN RIVER LAGOON

The Indian River Lagoon (IRL) is one of the most valuable wildlife habitats in Florida. It is an Estuary of National Significance and has been internationally featured as the most diverse estuary in North America. The lagoon is being badly damaged by human caused pollution which produces algae blooms that devastate its marine life. It is federally listed as an impaired waterbody. Local governments, acting in compliance with the Florida Department of Environmental Protection (FDEP) Indian River Lagoon Basin Management Action Plans (BMAPs), are attempting to repair the results of past development mistakes and reduce the pollutant loads in the lagoon. However, the future of the IRL is in peril. Outdated land use and stormwater regulations at state and local levels are enabling development to continue as before, making the same mistakes that got us where we are today. In too many cases, new development and redevelopment will add to the already excessive inflow of pollution to our lagoon.

Stormwater management remains a primary problem. Current stormwater management systems are, at best, only partially effective in reducing pollutants in runoff and groundwater. Stormwater must be controlled if we are to ensure the future of our Indian River Lagoon. Low Impact Design provides that control.

Low Impact Design (LID) is a globally proven concept of site design and development that minimizes impervious surfaces and retains stormwater onsite to recharge the aquifer and reduce discharges to the IRL. It treats rain water as an asset rather than a liability, prevents Lagoon habitat destruction and reduces flooding. It is a significant change from the old ways of development, but it can be less expensive, reducing development costs overall. LID reduces the need for costly stormwater infrastructure and land acquisition to build large retention ponds.

LID is well documented with detailed engineering information. It is endorsed by the US EPA and FDEP. Several Florida communities have adopted LID and have published detailed Best Management Practice (BMP) manuals. However, uncertainty with our outdated state regulations and permitting rules have hampered widespread acceptance even though many experts believe that LID will enhance our focus on resiliency and is essential to Florida's future.

We strongly recommend that local leaders act quickly to approve ordinances that will establish Low Impact Design as the new standard of development in the drainage basin of the Indian River Lagoon. The current pace of growth in the watershed demands that we act now for our Lagoon's future.

Sincerely,


Leeza Souto, Ph.D.
Executive Director

- Local Environmental Groups
- City/County Environmental/Sustainability Boards
- City/County Elected Officials
- City/County Manager & Land Permitting Depts
- FL Legislative Elected Officials
- FL State Env Agencies – FDEP, SFWMD, SJRWMD
- Development Industry
- Site Development Engineering Firms

We strongly recommend that local leaders act quickly to approve ordinances that will establish Low Impact Design as the new standard of development in the drainage basin of the Indian River Lagoon. The current pace of growth in the watershed demands that we act now for our Lagoon's future.

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Partners ... so far

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Martin County**

**Martin County
Conservation Alliance**

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**Space Coast
League of Women Voters**

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Surfrider

Sebastian Inlet Chapter

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Conradina Chapter**

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**UCF
Stormwater Management
Academy**

**Friends of the
Thousand Islands**

Jim Swann

“The world as we have created it is a process of our thinking. It cannot be changed without changing our thinking.”

— Albert Einstein

