



Introduction to Low Impact Development & Green Stormwater Infrastructure

May 12, 2023

FOR THE

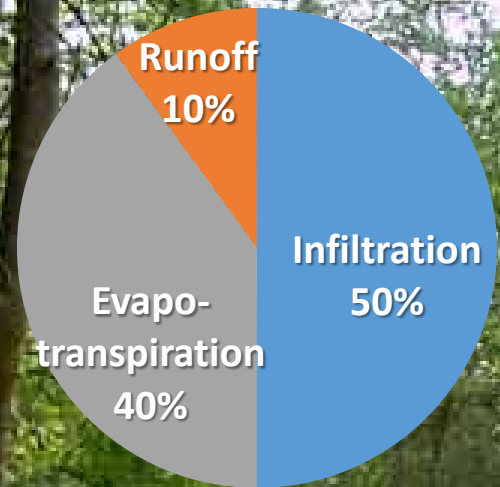
#GATORGOOD

Eban Z. Bean, PhD, PE

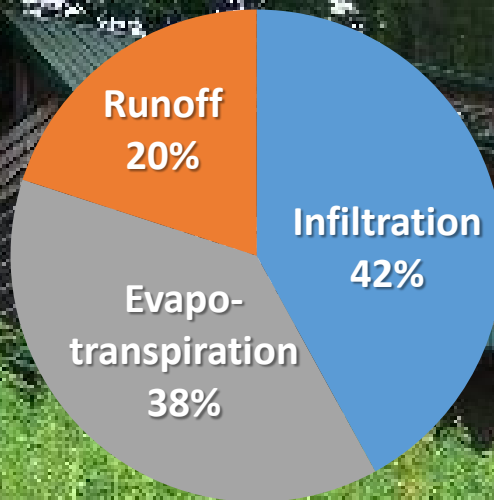
Asst. Professor & Ext. Specialist

Urban Water Resources Engineering

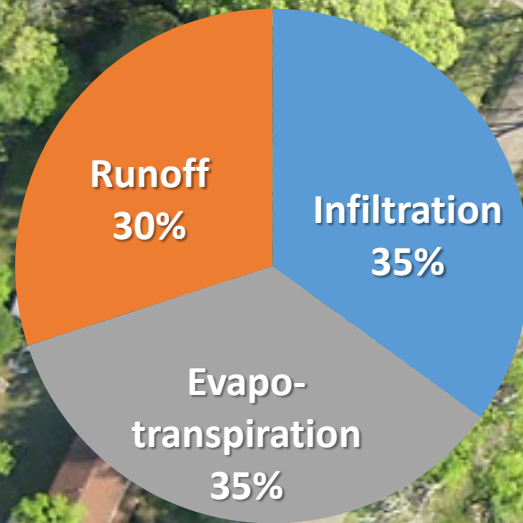
Agricultural & Biological Engineering, UF|IFAS



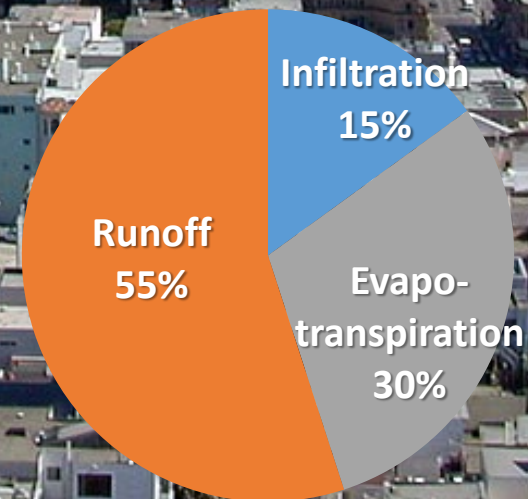
Natural Ground Cover
0% Impervious



10-20% Impervious



30-50% Impervious



75-100% Impervious

Typical Urban Drainage



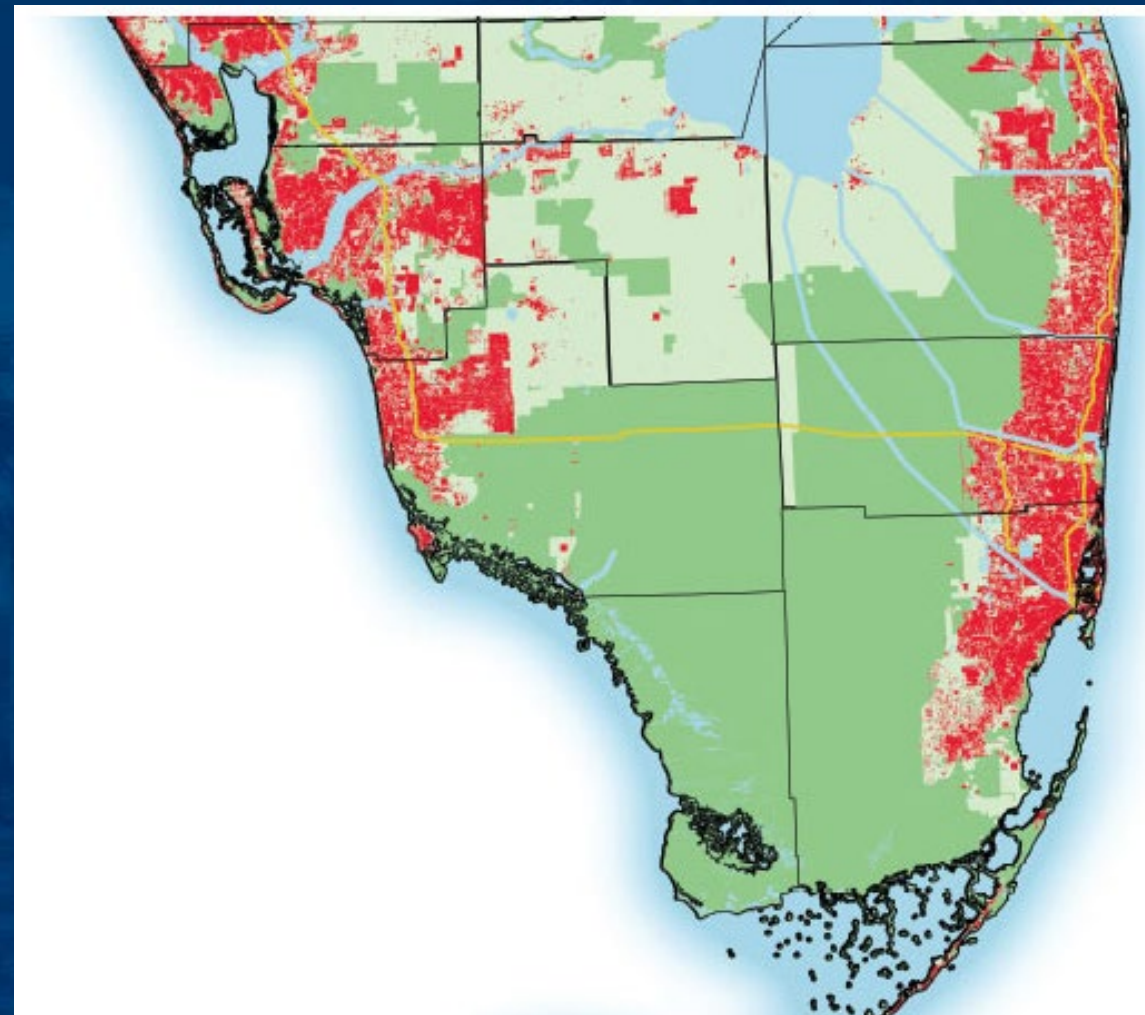




WATER QUALITY ADVISORY
DUE TO STORM WATER RUN-OFF
FROM RECENT RAINS, BACTERIA
LEVELS IN THE WATER HERE
EXCEED STATE WATER QUALITY
STANDARDS.
FULL BODY CONTACT IS NOT
RECOMMENDED.



Impaired Water Bodies Follow Urbanization



STORMWATER LEGACY

Conventional Approach



Lot & Street
Level Runoff



Stormwater Collection System

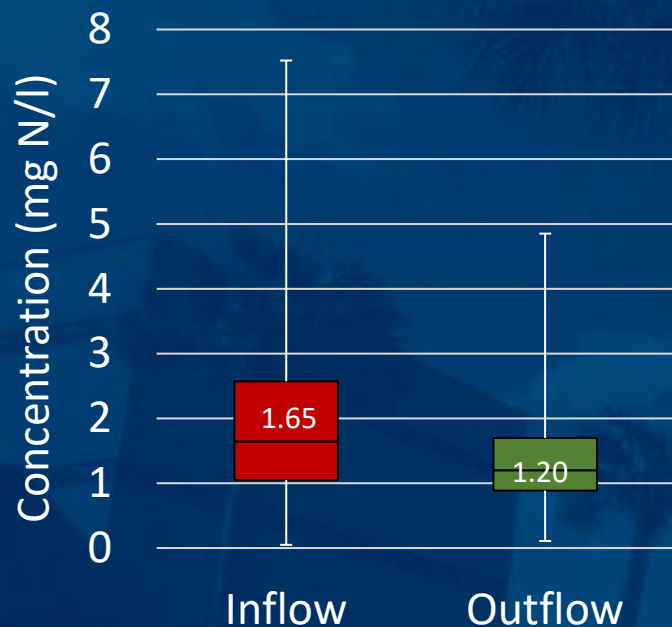
Stormwater Pond Meets:
Flood Control
Flow Rate
Water Quality Volume



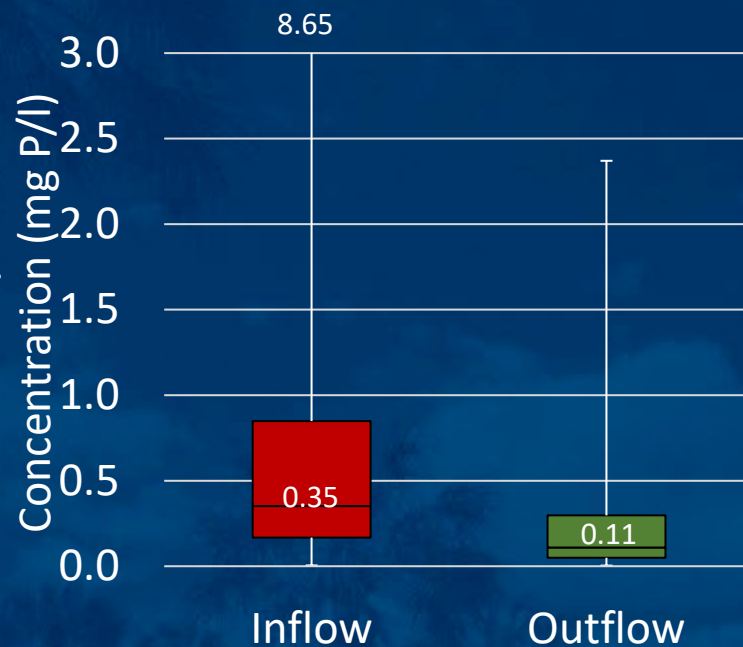
Overflow

Discharge

Total Nitrogen

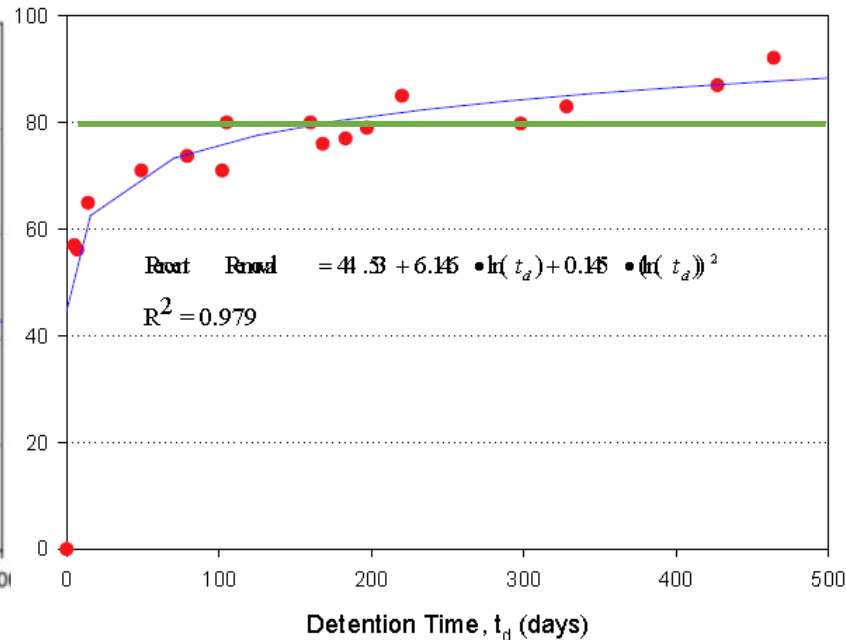
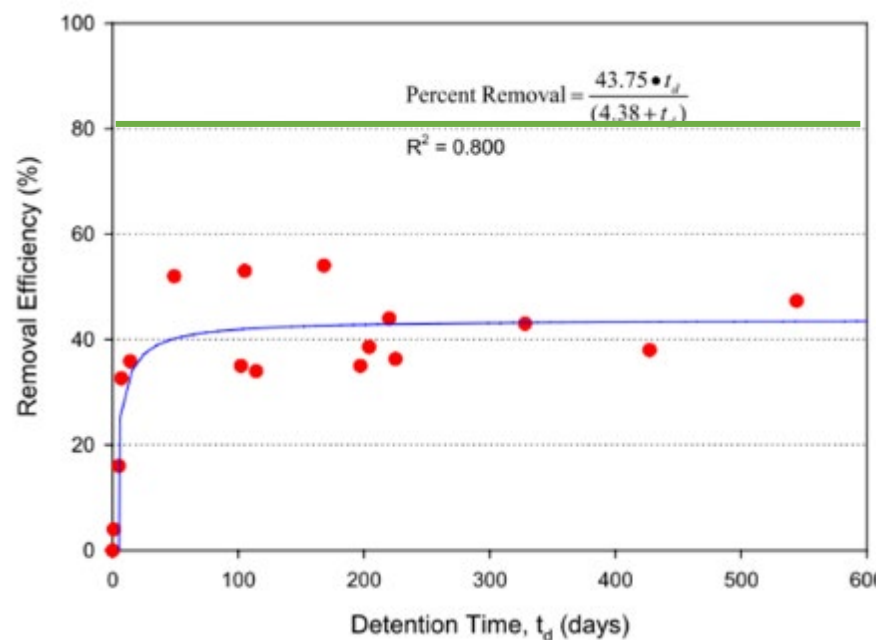


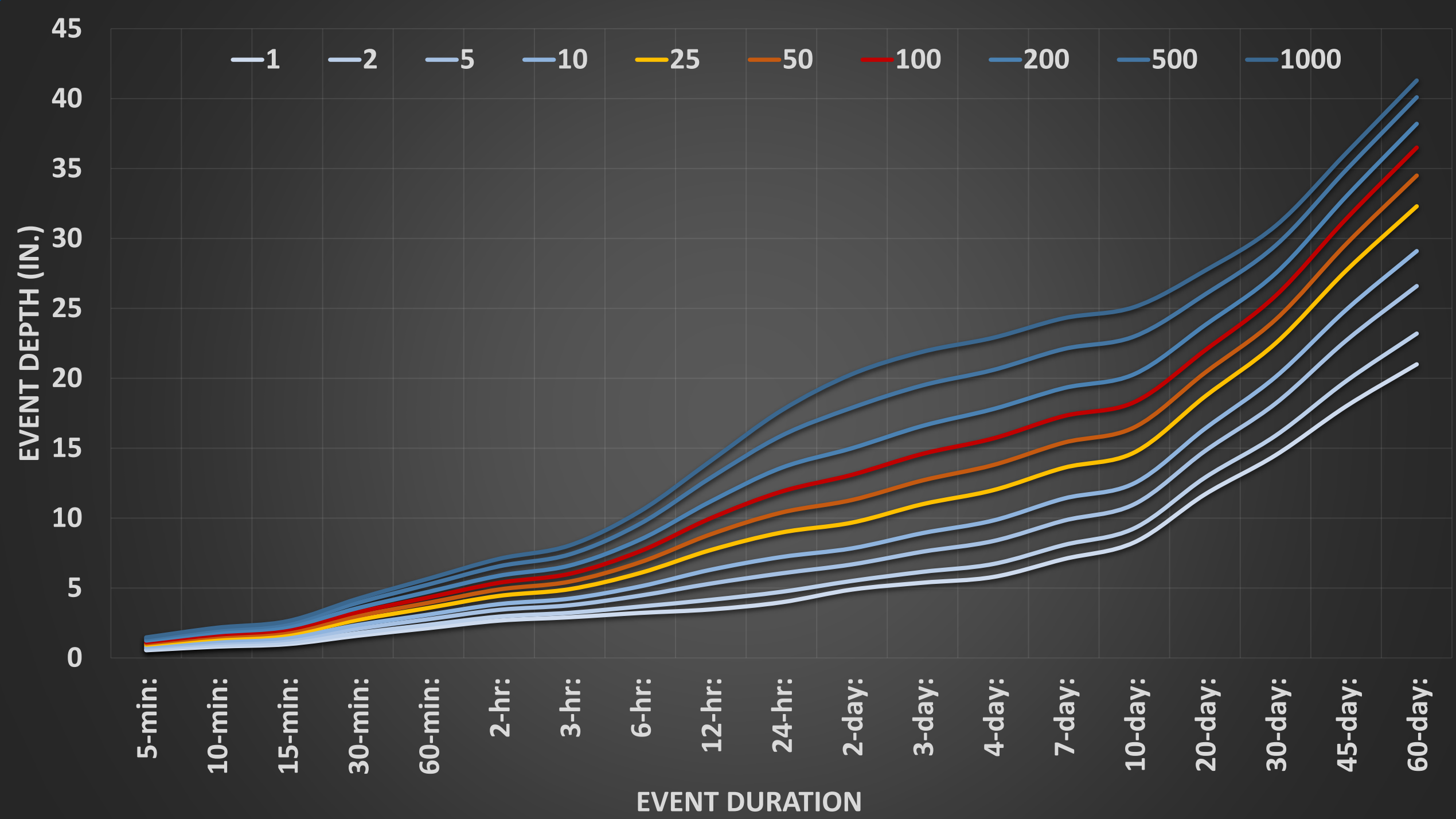
Total Phosphorus

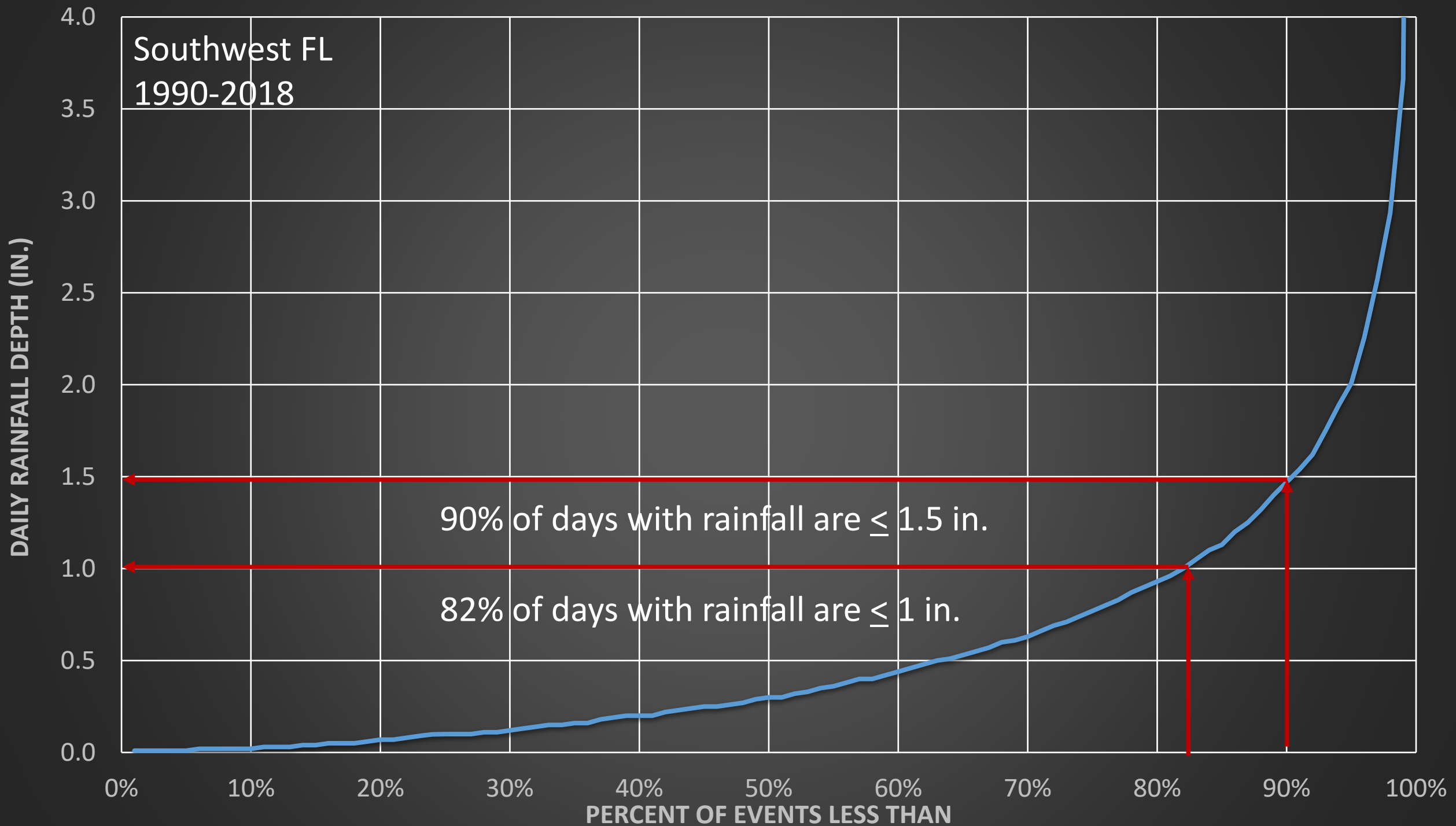


Ponds Not Making the Cut

- Assumed Performance – 80%
- Legacy Effects
- Impairment







Definition of LID+GSI

*LID: (Low Impact Development) a comprehensive site planning and design strategy for ***maintaining the predevelopment hydrologic regime*** (peak discharge rate, timing, and volume) and mitigating pollutant loads from land development using ***distributed structural and non-structural design techniques***. The goals of LID are to avoid and minimize additional runoff produced from site development.*

*GSI: (green stormwater infrastructure) includes the range of ***structural and non-structural retention and detention measures*** that infiltrate, evaporate, detain, filter, or store stormwater runoff closer to the source. The goal of GSI is to mitigate the runoff produced from site development.*

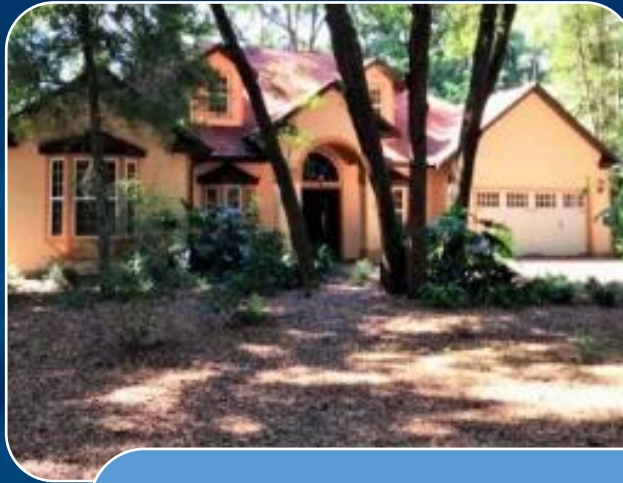
Together, these are referred to as “**LID+GSI**”

LID vs. GSI: Development Process



Avoidance (LID)

- Map natural infrastructure
- **Preserve open spaces, natural areas, trees and native soils**
- **Retain natural hydrologic and topographic features in site plan**



Minimization (LID)

- **Limit and disconnect impervious surfaces**
- Mimic and maximize pre-development hydrologic processes
- Integrate practices that provide co-benefits and multifunctional areas



Mitigation (GSI)

- Implement runoff source control measures
- Employ natural processes to treat and retain stormwater
- Provide treatment and attenuation in multiple areas across the site

LID Site Planning

Traditional Development



cluster housing

Low Impact Development





Disconnecting Impervious

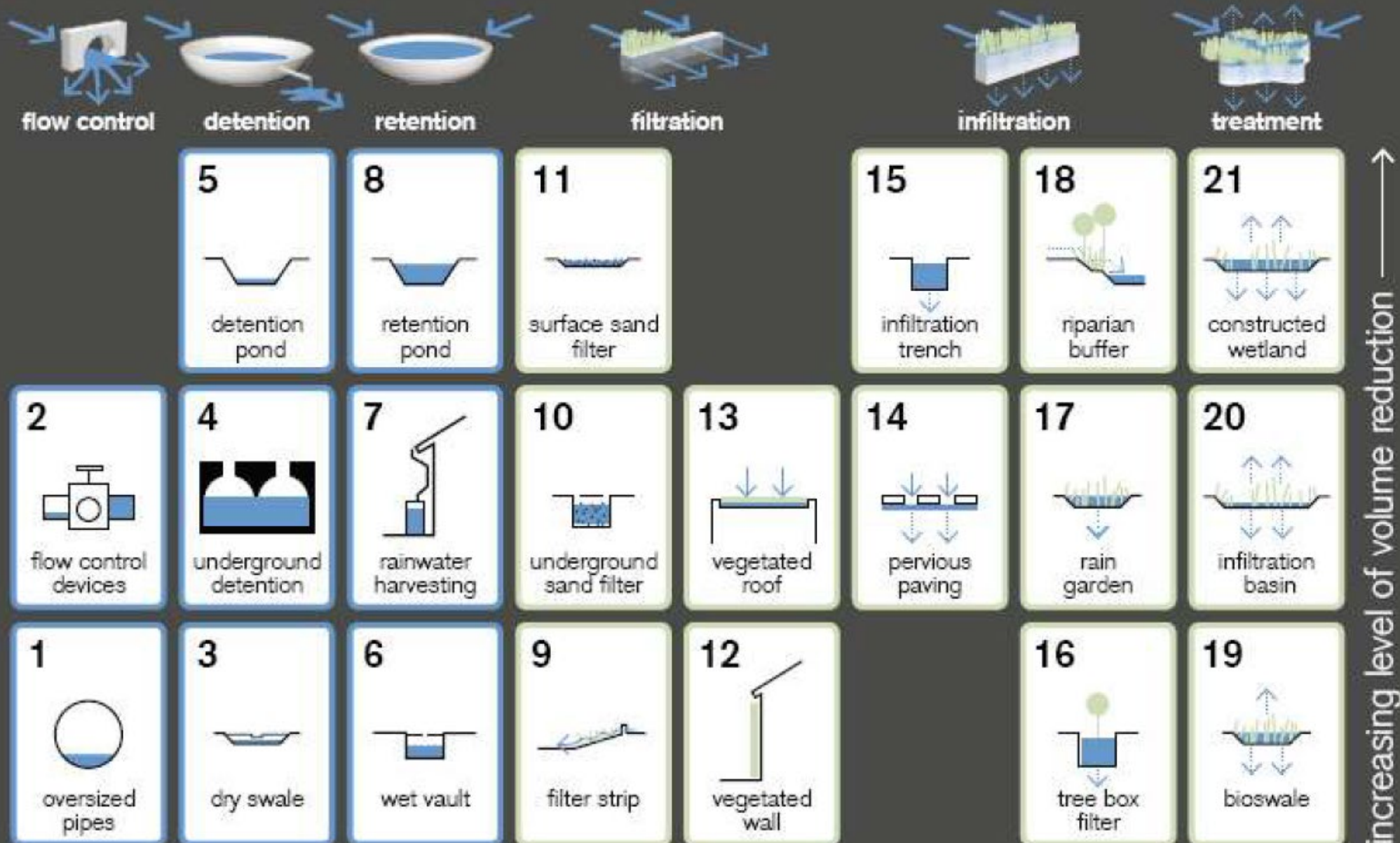
Traffic Islands & Medians



Green Stormwater Infrastructure

MITIGATE Impacts - Select GSI practices that fit the site

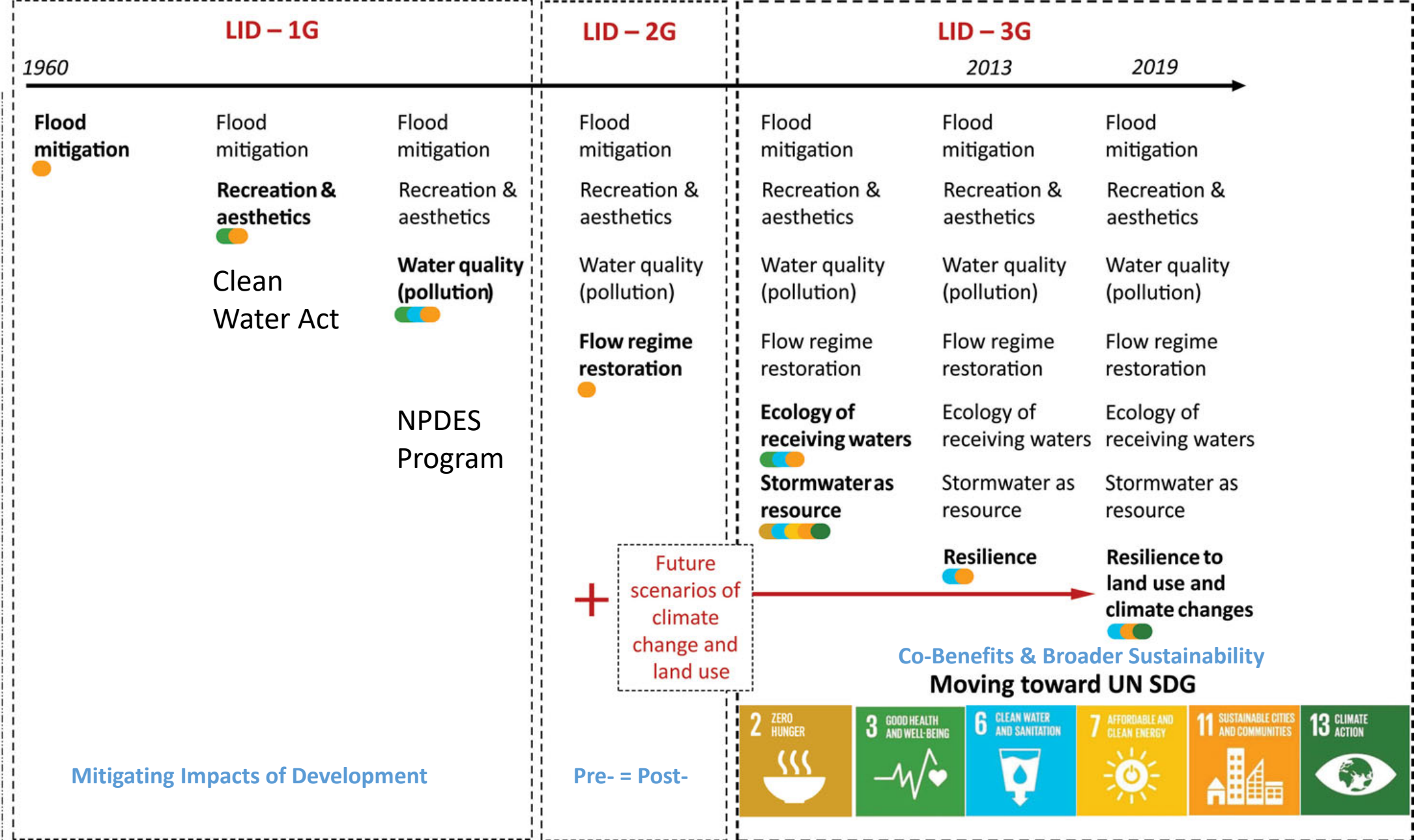
- Green Roof
- Pervious Paving
- Rain Gardens (Bioretention)
- Infiltration Trench
- Constructed Wetland
- Wet Retention Pond
- Rainwater Harvesting
- Tree Filters/Tree Wells
- Swale/Bioswale
- Infiltration Basin
- Dry Detention Pond
- Flow Control Devices



increasing level of volume reduction ↑

from mechanical —————> to biological





Interdisciplinarity
Complexity degree

Policy typically trails behind science

LID+GSI Summary

- LID Starts from the Beginning
- Avoid and Minimize Stormwater Increases
- Disconnect Impervious Cover
- Compact Design to Reduce Project Footprint and Area of Disturbance
- Fit the Project to the Site (instead of site to the project)

Questions?

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