

# Advancements in Managing Stormwater in New Jersey



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# What's the Fuss?...Its Only a Little Runoff!!





# Extreme Rain Events

# Headline!



**NEWS**

*Death Toll Tops 40 After Ida's Remnant Blindsides Northeast*





# But Its Not Just The Extreme Events

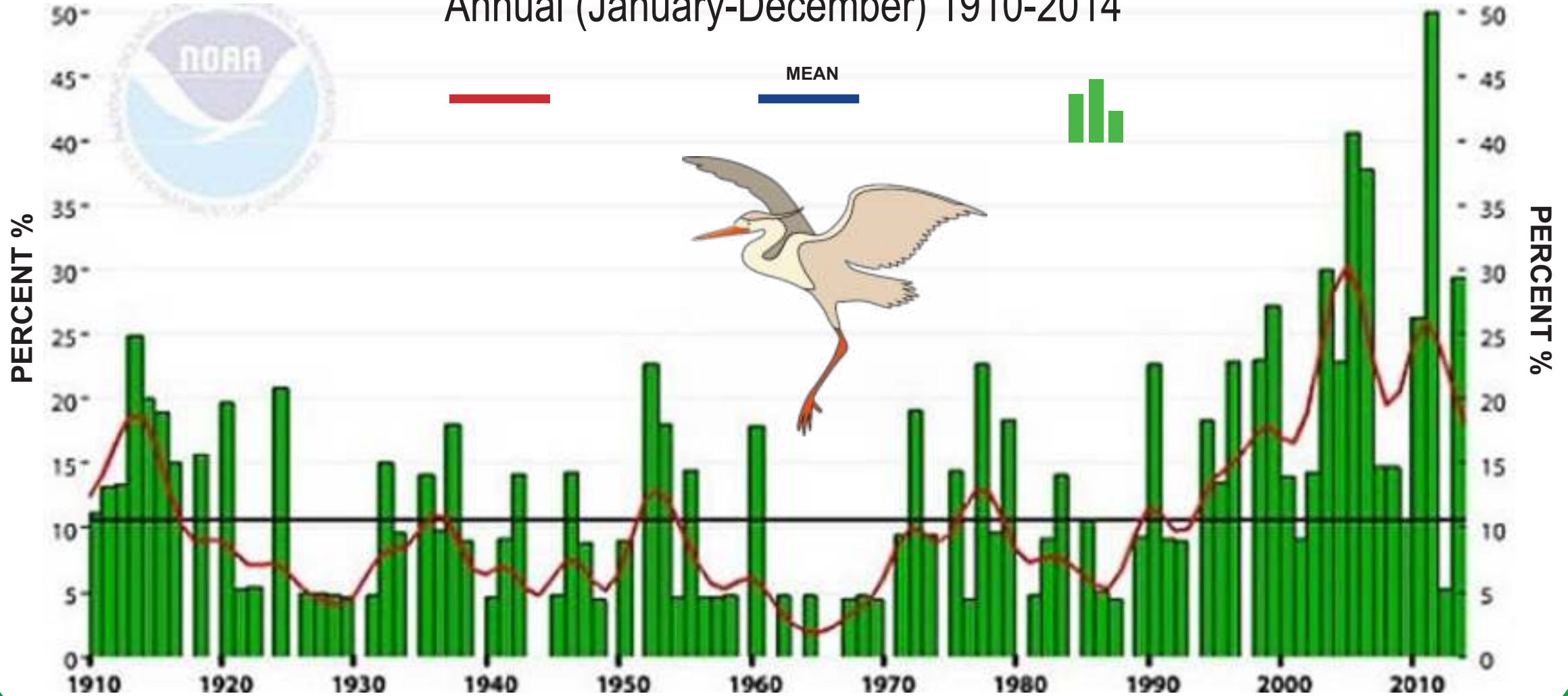


- “Smaller”, storms with greater return frequency (e.g., 0.5-yr, 1-yr and 2-yr events) now generate more rain and runoff.
- Increases frequency of localized nuisance floods.
- Exacerbates environmental stress.
- Results in chronic, repeating impacts.
- Although we need to properly manage all precipitation events, smaller events must be given greater emphasis and priority.



# Northeast Extremes in 1-Day Precipitation

Annual (January-December) 1910-2014



Source: Dr. Anthony Broccoli Rutgers University



# What's The Fuss About a Little Runoff?

- Flooding
- Increased volume and velocity
- Altered hydrology
- More non-point source pollution
- Degraded water quality
- Impaired aquatic ecosystems
- 





# Localized Nuisance Flooding



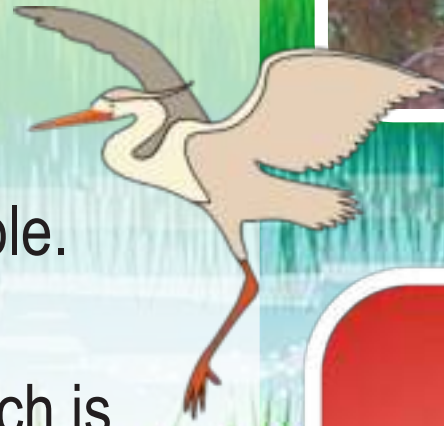
Caused by more common, frequently occurring rain fall events.  
(0.5, 1 and 2 yr. storms)





# Loss of Recharge

- More impervious cover decreases opportunity for precipitation to infiltrate.
- This decreases replenishment and maintenance of surficial groundwater table.
- Leads to less groundwater interflow, which is critical to maintaining stream baseflow.





# Loss of Recharge



**Incised Channel**



**Reduced Baseflow**

**Linked to lost recharge opportunities**





# Hydraulic Impacts



**Erosion**



**Bank Subsidence**



Linked to increased velocity and flow rates





# Floodplain / Riparian Degradation



Riparian buffers intact and stream banks stable



Riparian buffers disturbed and stream banks unstable

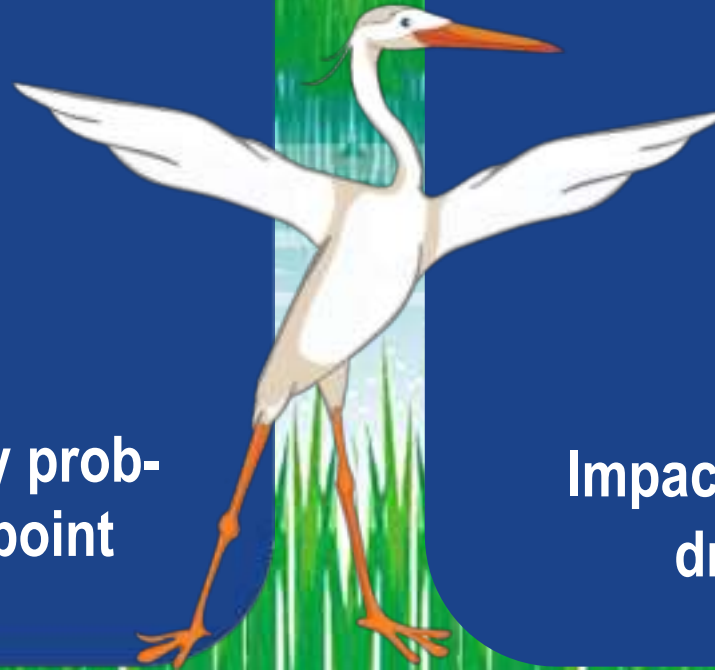




# Impacted/Impaired Water Quality



Over 70% of water quality problems in US due to non-point source pollution



Impacts recreation, aesthetics, drinking water quality.





# Altered/Compromised Ecological Services and Functions



Eutrophication



Fish Kills





# Let's Not Forget About HABs

**NEWS**

**2019 - HABs May Hit Lake Hopatcong Before Labor Day!**







## The High Cost of Algae Blooms in U.S. Waters: More Than \$1 Billion in 10 Years

By Anne Schechinger, Senior Analyst, Economics

WEDNESDAY, AUGUST 26, 2020

Source: <https://www.ewg.org/research/high-cost-of-algae-blooms>

Communities across the United States have spent more than \$1 billion since 2010 dealing with outbreaks of potentially toxic algae in lakes, rivers, bays and drinking water supplies, according to an analysis by the Environmental Working Group.

We identified 85 locations, mostly cities and towns, in 22 states that spent money to prevent or treat algae blooms in the past 10 years. The staggering price tag: about \$1,158,245,000. This is a first attempt to calculate the cost to communities.





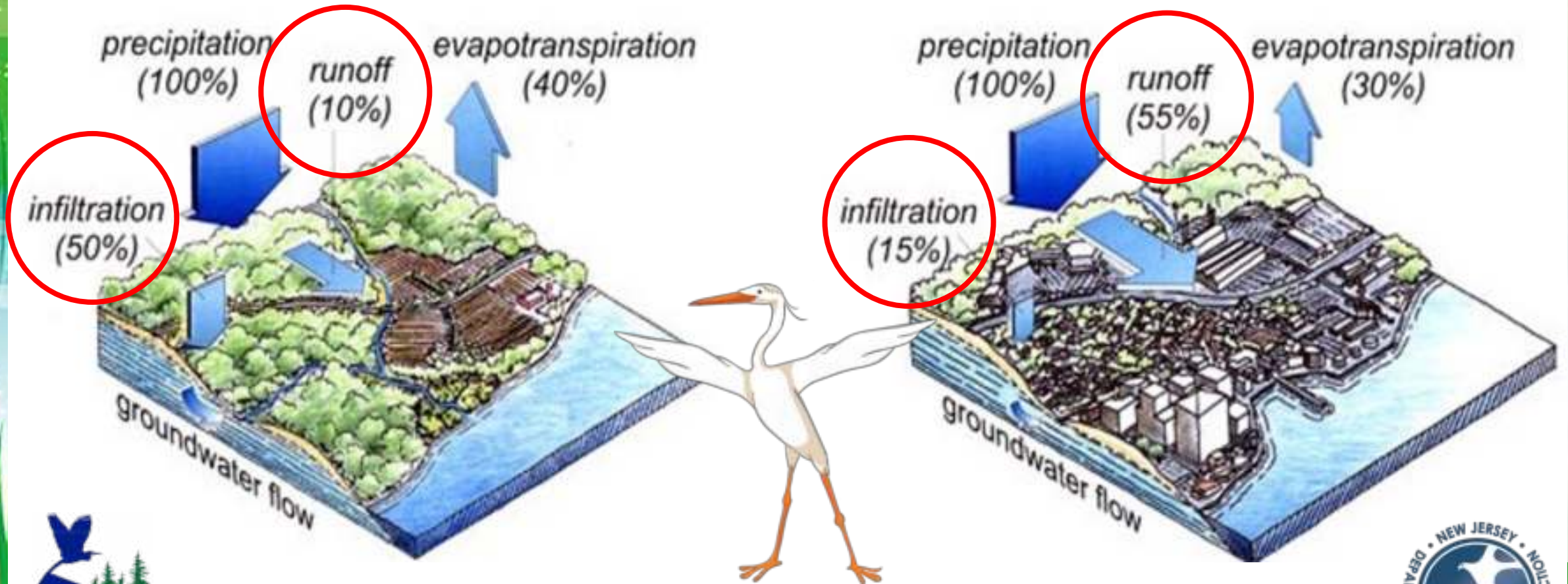
So Yes...

# A Little Runoff Can Cause A Lot of Problems





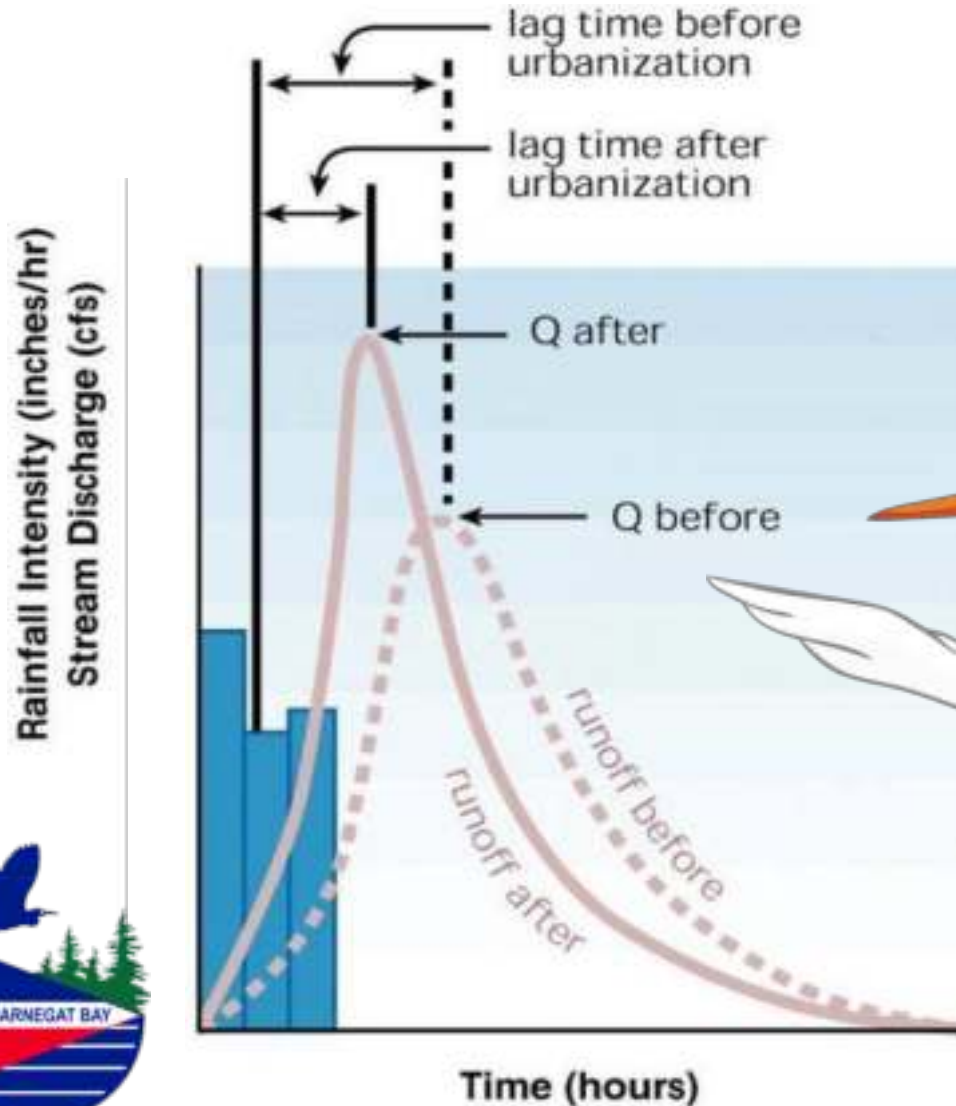
# Development Driven Hydrologic Change





Effect of...

# Watershed Urbanization On Storm Hydrograph

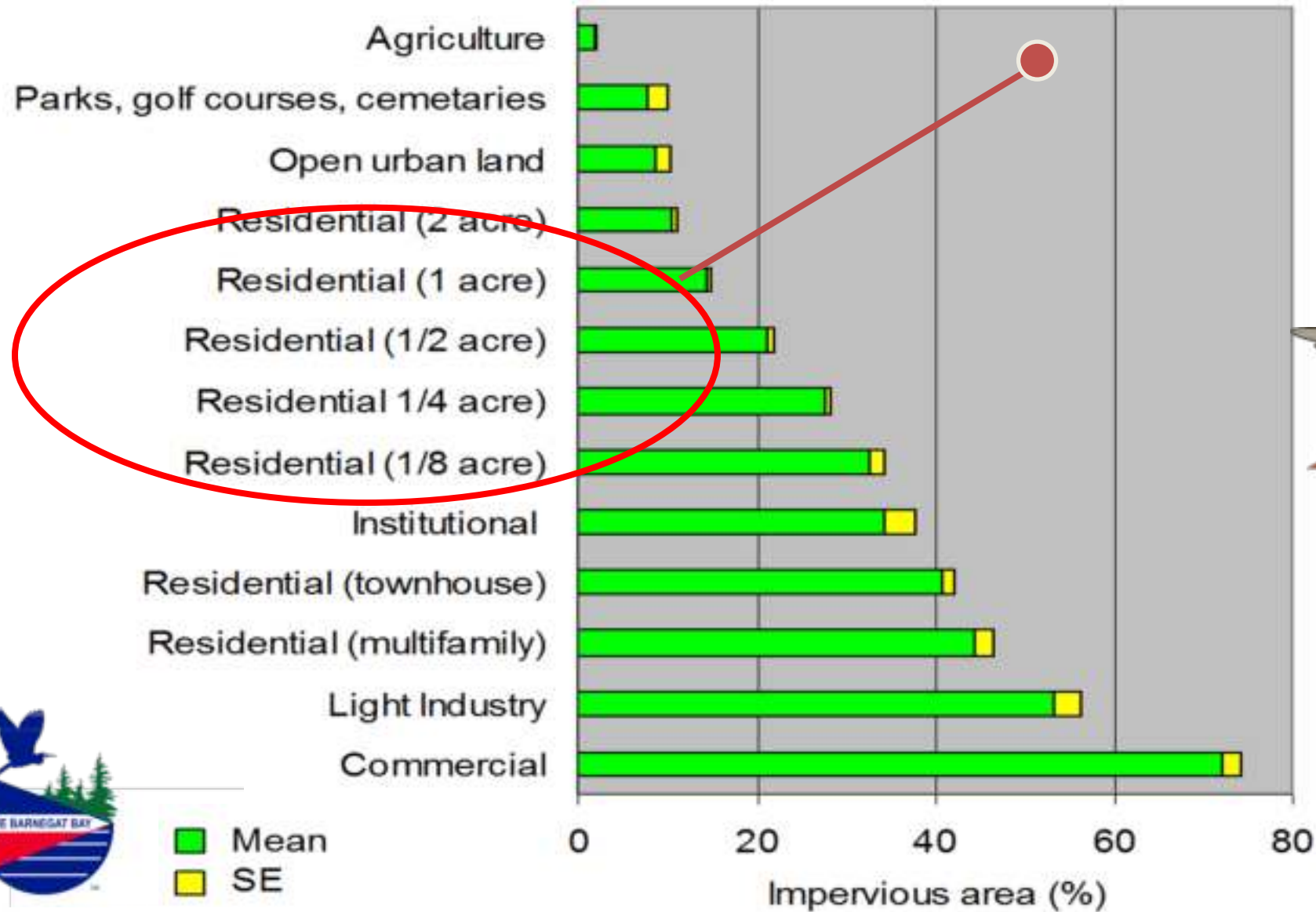


Source: USDA/NRCS – Stream Restoration Handbook





# It Doesn't Take a lot of Development to Trigger Runoff Problems.



Mean  
SE

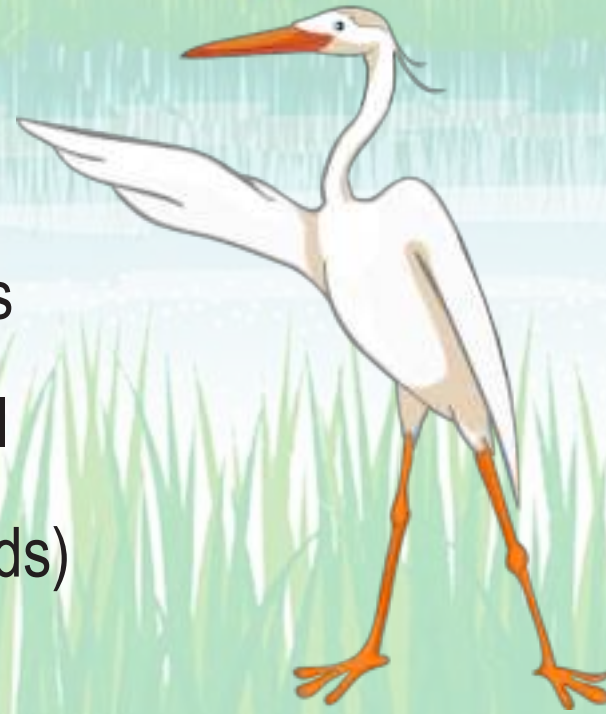


Source: Center for Watershed Protection 2003



# New Jersey's Stormwater Regulations

- Stormwater regulated under NJAC 7:8. But also addressed within:
- NJAC 7:13 Flood Hazard Rules
- NJAC 7:15 WQ Management Planning
- NJAC 7:9B NJ Water Quality Standards
- NJ Best Management Practices Manual
- RSIS (Residential Site Improvement Stds)
- Pinelands Comprehensive Plan





# Standard Approach To Runoff Management

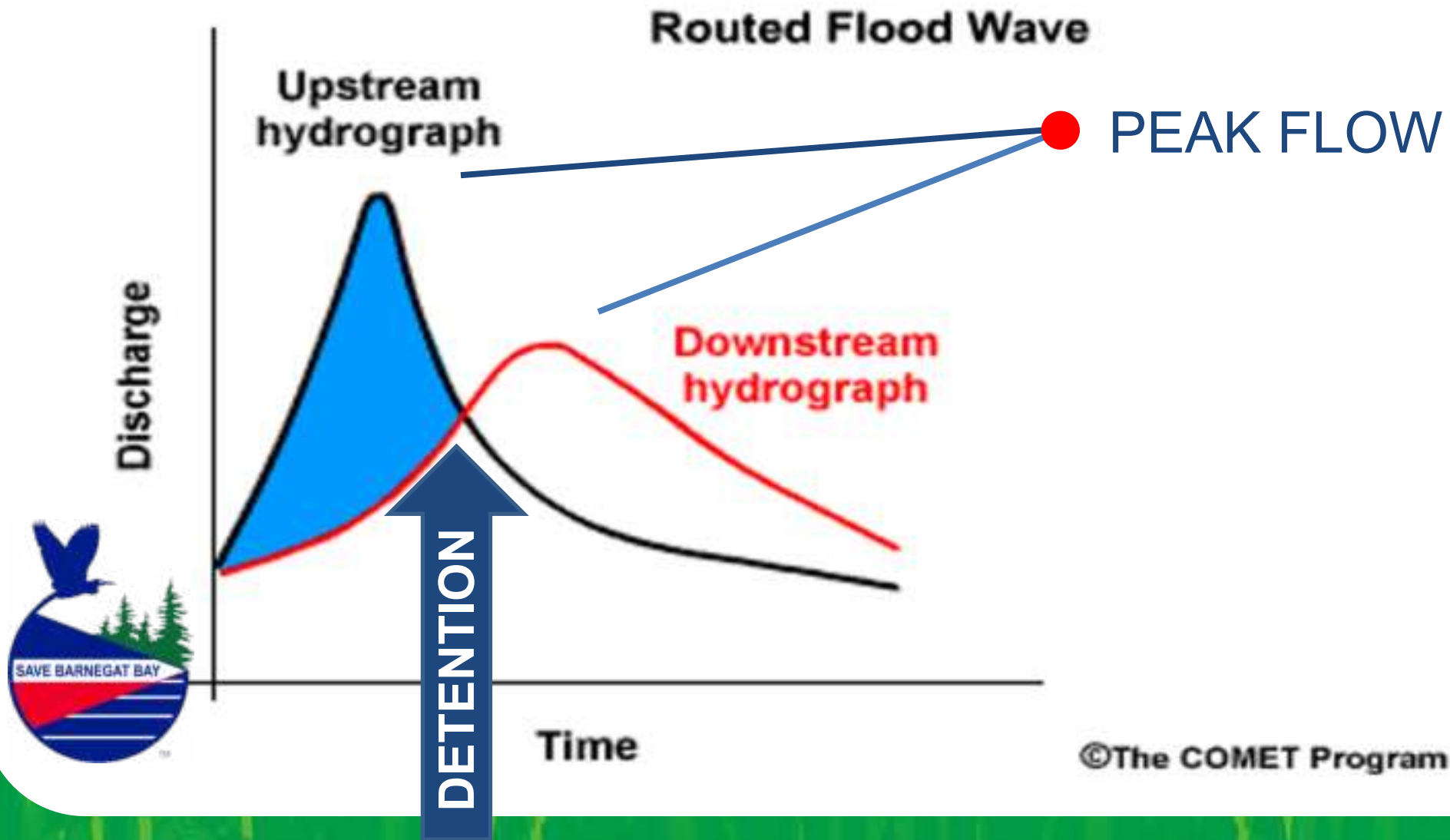


- Route runoff to centralized detention basin.
- Runoff stored and released at controlled rate.
- Peak flow decreased.
- Minimal volume reduction.
- Only 60% TSS removal.





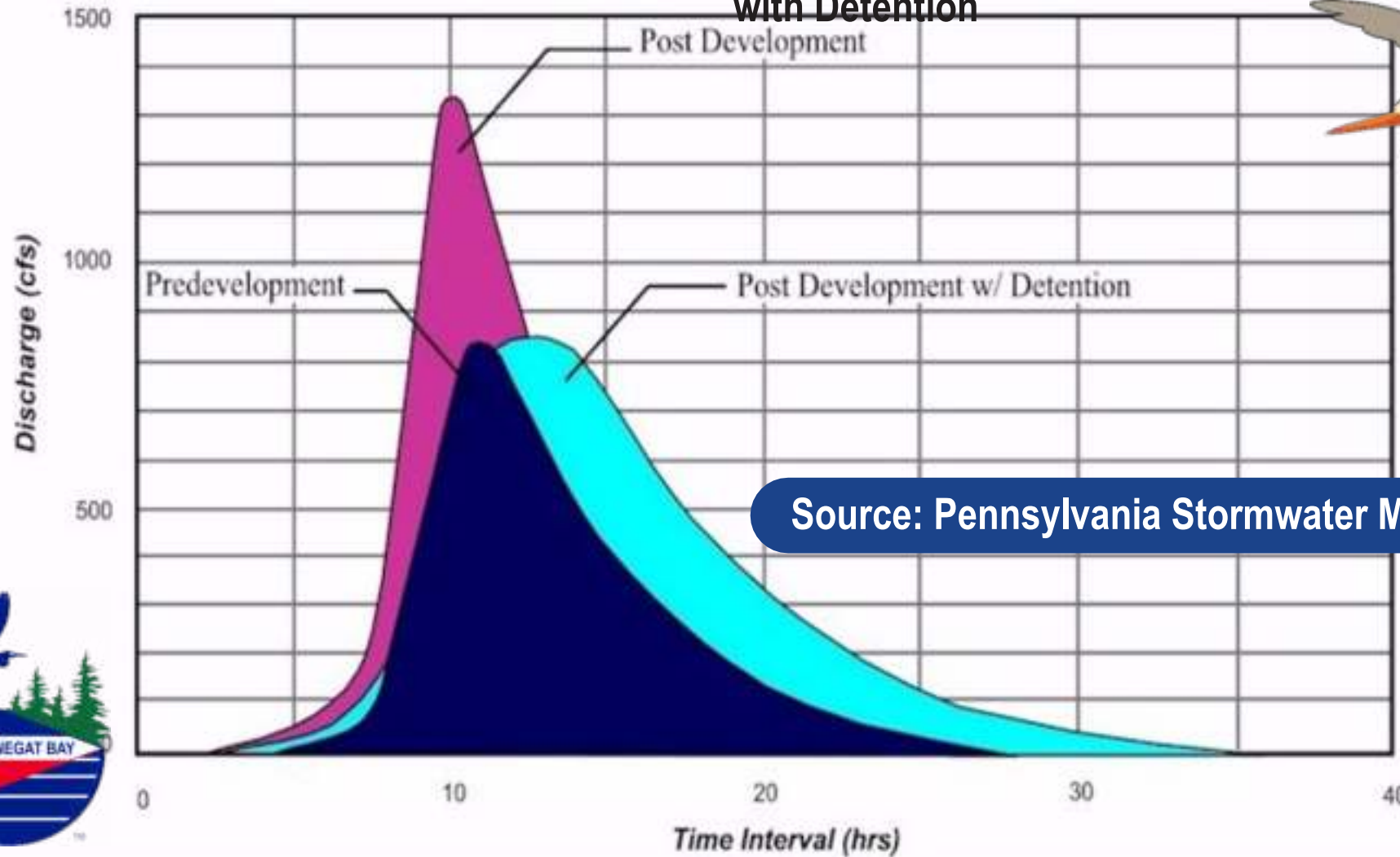
# What Detention Alone Accomplishes



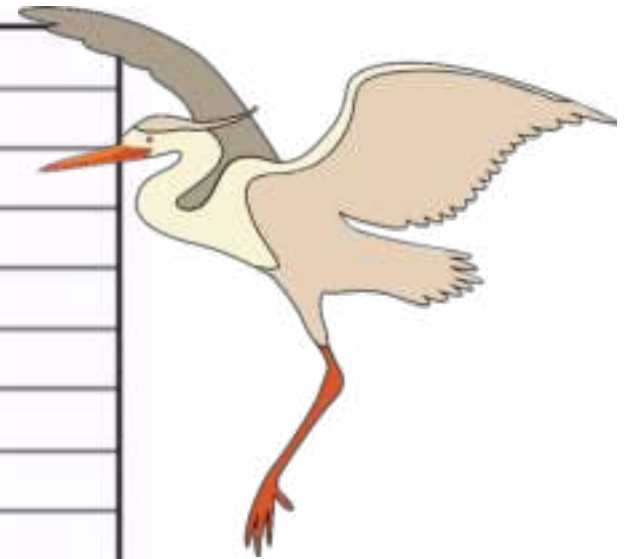


# Stormwater Runoff Hydrograph

with Detention



Source: Pennsylvania Stormwater Management Manual





# Stormwater Impacts Can't Be Solved By Only Managing Peak Flow... Also Need To:

- Reduce runoff volume.
- Recharge and maintain baseflow.
- Maintain or replicate existing hydrology.
- Remove and reduce pollutant loads...including nutrients (P and N).



**CAN'T BE ACCOMPLISHED USING ONLY DETENTION**





# USEPA's Definition of Green Infrastructure

- An adaptable term.
- Array of products, technologies, and practices that use natural systems or engineered systems that mimic natural processes.
- Stormwater management **systems that mimic nature by soaking up and storing water.**
- Use of vegetation, soils, and natural processes to infiltrate, evapo-transpirate, and/or recycle runoff.
- Create healthier environments.





# Turn Down The Volume!!!



- Most GI BMPs reduce volume of runoff generated from a site.
- Less runoff volume, peak flow mitigated, less offsite pollutant loading.
- Starts with proper site planning and site preparation.
- Accomplished through proper BMP selection and construction.





# NJDEP's Emphasis on Green Infrastructure

*Encourages thinking of stormwater as a resource.*

*GI stormwater management methods can result in:*

- Reduction in stormwater volume and flow
- Better SW infiltration
- Better SW treatment
- Beneficial reuse

Details on GI website (<https://www.nj.gov/dep/gi/>)  
and the NJ Stormwater BMP Manual ([https://www.njstormwater.org/bmp\\_manual2.htm](https://www.njstormwater.org/bmp_manual2.htm))





# NJDEP Expanded Recognition of Green Infrastructure

**RULE CHANGE TO NJAC 7:8 - ADOPTED MARCH 2020**

As per NJDEP the “groundbreaking amendments to the state’s stormwater management rules better protect water quality by **reducing polluted runoff** through implementation of green infrastructure technologies, which also helps to make NJ **more resilient to storm and flood impacts from climate change.**”

“**Engineering with nature** and focusing on green infrastructure strategies **can be more effective** at managing polluted runoff and reducing flooding when **compared to older stormwater collection systems and approaches**”.





# As of March 2021



## 7:8-5.3 Green Infrastructure Standards

**GI SHALL BE USED to meet GW and WQ quality requirements.**

### What does this mean?

Applies to all new, state-wide major development projects

- **Replace current requirement** that nonstructural stormwater management strategies be used to the “**maximum extent practicable**” with **requirement that green infrastructure be used to meet groundwater recharge standards, stormwater runoff quantity standards, and stormwater runoff quality standards.** ○



For details: [https://www.nj.gov/dep/rules/adoptions/adopt\\_20200302a.pdf](https://www.nj.gov/dep/rules/adoptions/adopt_20200302a.pdf)





# Keys to Making Green Infrastructure Successful

- 1 Treat stormwater as a resource
- 2 Don't make stormwater management an afterthought
- 3 Use nature as your model
- 4 Turn your watershed inside out
- 5 Sweat the big storms but focus on the small storms





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# Treat Runoff As A

## Resource

**STANDARD APPROACH:** Runoff is a “waste” therefore “get rid of it quickly”

**INSTEAD:**

○ Think of runoff as a  
V Valuable resource.



○ REUSE



○ RETAI  
N



○ RECHARGE





2

# Don't Make Stormwater Management An Afterthought



- Good design doesn't occur by chance, start design early in development process.
- Work with the site's environmental features
- Think form and function...Know how a GI BMP work is it consistent with site conditions?
- Don't force fit a BMP...avoid the "flavor of the month".





# 3

## Let Nature Be Your Model

GI BMPs can reduce volume, recharge stormwater, remove variety of pollutants and attenuate peak flows.



Plants, soil and hydrology working in concert.



“Natural BMPs”....Biodetention, Bioretention, Biofiltration,  
Environmental Landscaping.





# 4

## Turn Your Watershed Inside Out

Don't rely on "end of pipe", centralized SW management solutions.

Start close to where runoff generated.

Use multiple "small footprint" BMPs to capture, retain, infiltrate and reuse runoff.

Link opportunities to collect and treat runoff... Create "treatment trains".





# New Stormwater Management Paradigm



Small footprint,  
green infrastructure BMPs



Large, end of the pipe, centralized  
detention BMPs





# 5

## Focus on the Small Storms



Small, frequently occurring storms responsible for chronic water quality and environmental impacts

Retain on site as much of the runoff volume generated by 1 and 2-yr events as possible.

“Divide and conquer”... Work with small catchments.

Tame small “chunks” of runoff, deal with small volumes.





# In Summary...



Improperly managed stormwater results in environmental and ecological impacts.

Smaller, frequent storms cause chronic impacts.

Standard detention techniques can't provide correct solution.

Need to do more than just mitigate peak flow.

Need to decrease runoff volume.





# In Summary...

**Green Infrastructure** - more holistic way to manage storms and stormwater runoff.

**GI SWM** treats stormwater as a resource not as a waste.



Through **GI SWM** can achieve

- Peak flow mitigation
- Less runoff volume
- More Recharge
- Better pollutant removal





# In Summary...



GI SWM solutions treat runoff as a resource

Successful green infrastructure starts with knowledge of site conditions.

Look for opportunities to manage runoff as close to its point of generation as possible.

Divide and conquer...manage small “chunks” of runoff.

Link BMPs and create “treatment train”







**Green Infrastructure Takes the Bite Out of Stormwater Runoff!**



# Thank You!

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[www.nj.gov](http://www.nj.gov)