You Can Do It!! Stormwater Management for Lake Communities

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Stormwater and Lake Restoration

- Lake eutrophication directly linked to nutrient loading
  - More loading greater potential for weed and algae problems
- Phosphorus is a component of stormwater runoff
  - Dissolved, particulate, organic and inorganic
- Proper management of runoff leads to less phosphorus loading = less eutrophic lake
- Stormwater management therefore must be an intrinsic part of any comprehensive long-term lake restoration and management plan

TOXIC ALGAE

AVOID ALL CONTACT WITH THIS WATER AND SURFACE SCUM

For more information contact the Pennsylvania Department of Environmental Protection (PADEP) at 814-332-6839 or go to: www.seagrant.psu.edu

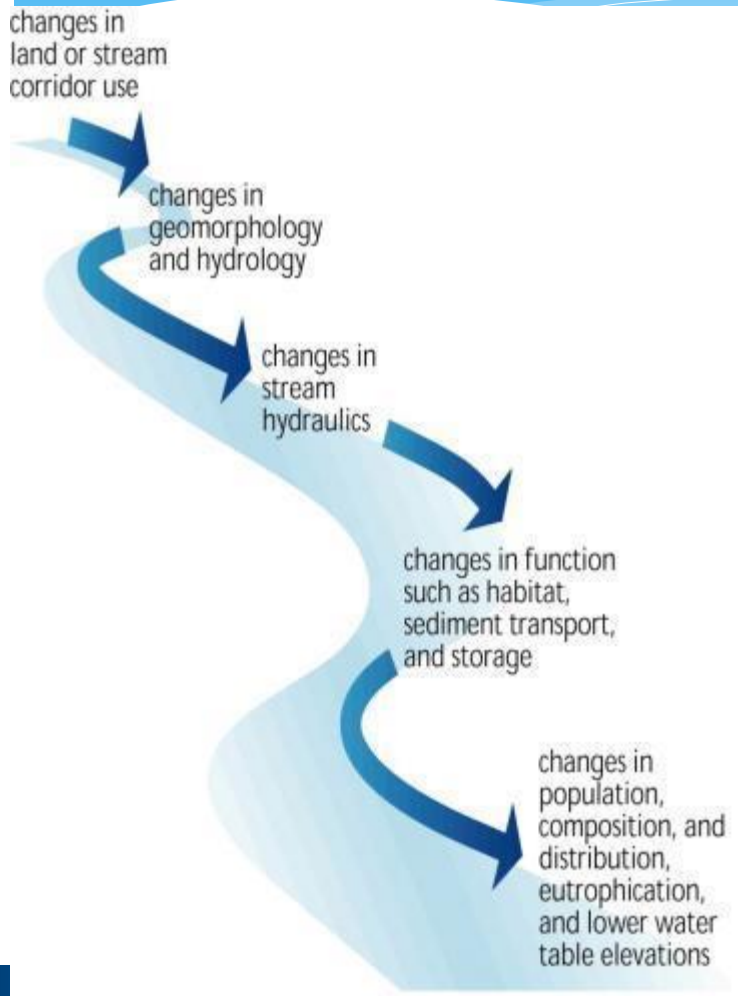
Sea Grant
Pennsylvania

Stormwater and Lake Restoration

Stormwater impacts lakes in additional ways

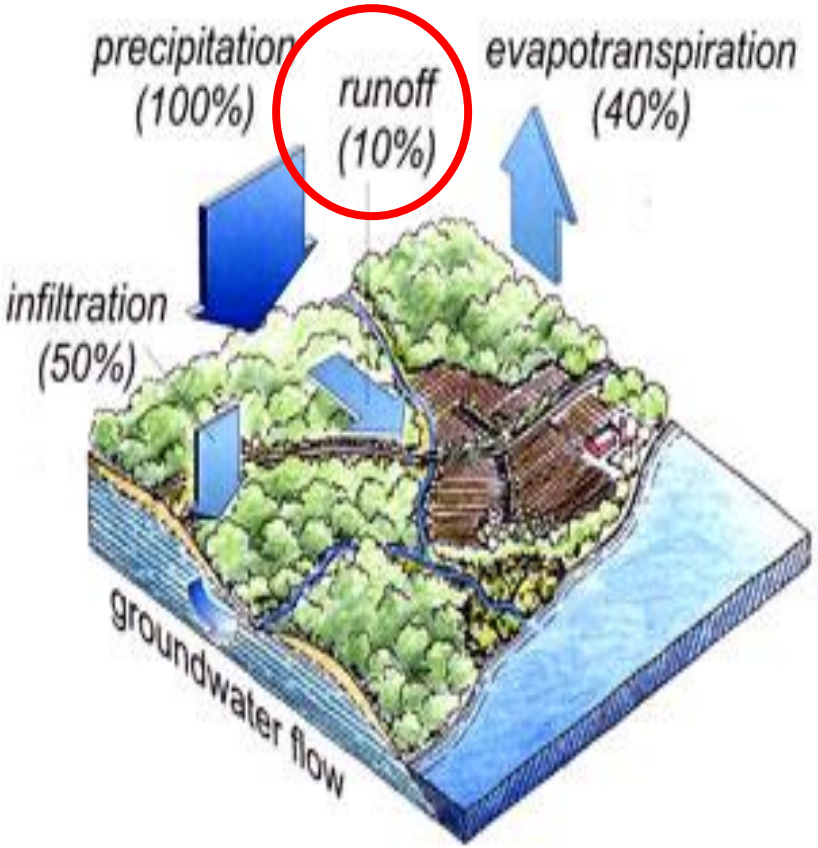
- Flooding
- Erosion
- Alteration of habitat
- Sedimentation and in-filling

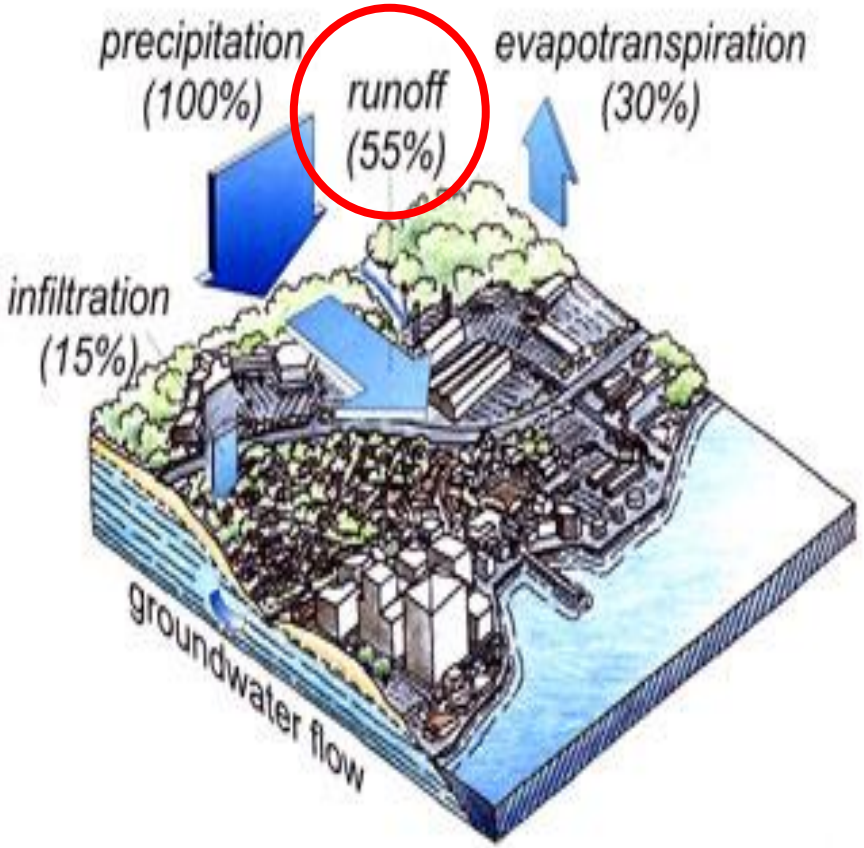
The "Cascading" Effects of Watershed Development



- Change in land use
- Changes hydrology
- Changes hydraulics
- Increases pollutants
- Impacts lake ecology
- Decreases lake use
- Decreases aesthetics
- Management cost

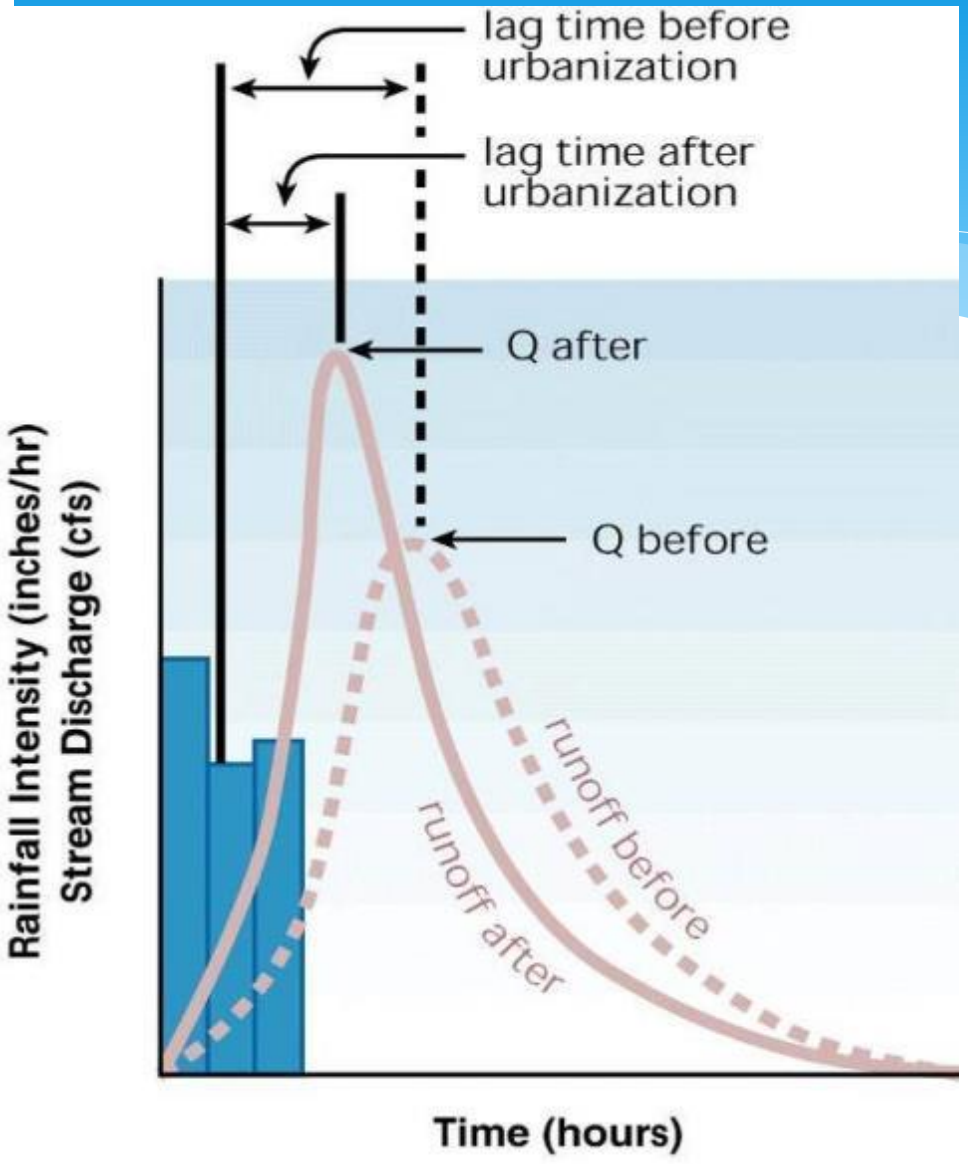
Development Driven Hydrologic Changes





www.mass.gov

Effect of Watershed Urbanization On Storm Hydrograph



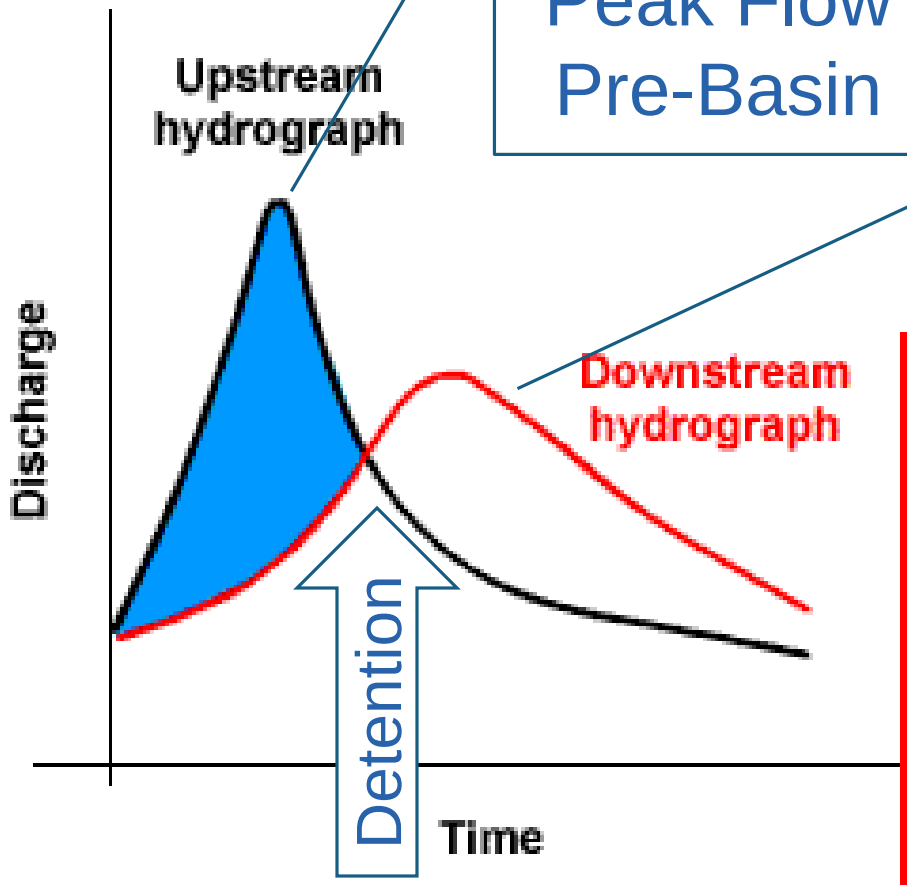
- Peak flow is greater
- Peak comes sooner
- Total volume is greater.
- Elevated flows persist for a longer amount of time…leads to stream erosion.
- 10% impervious enough to cause major impacts.

In the "Good Old Days"

- Move it from away from structures quickly.
- Route it to big centralized basin at the lowest point on site.
- Emphasis on "peak flow control".
- No consideration given to volume or nutrient reduction.

Standard Solution
Route Runoff Into A Detention Basin

Effects of Detention



Peak Flow Pre-Basin

Peak Flow Post-Basin

Although the peak flow released from the basin is reduced, the volume released remains the same....

No change in volume means more downstream flooding and no decrease in pollutant loading...

PROBLEM NOT SOLVED

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Fallacy of Detention

Managing only peak flow control does not solve SW problems

We need to….

- Reduce runoff volume
- Maintain or replicate existing hydrology and flow paths
- Maintain baseflow
- Remove or reduce pollutant loads

What Can We Do Differently?
Think Prevention First, Mitigation Second

As stated in NYS BMP Manual…

- First, prevent or minimize stormwater problems through comprehensive planning and development techniques, and
- Second, mitigate potential problems by employing structural and non-structural BMPs.
- Use integrated stormwater management approach.
- "Doing it better, Doing it smarter."

CAN'T BE ACCOMPLISHED USING ONLY DETENTION

Turn Down The Volume!

- Increased volume is prime destructive attribute of stormwater
- If you decrease off-site runoff volume you also reduce erosive flows and decrease pollutant loading.
- Calls for techniques that go beyond peak flow control.
- Stormwater harvesting, retainage, reuse and recharge decreases the volume of stormwater runoff

Turn Down The Volume!

- Focus on containing the full volume of the 1-year event (~2.75”/24 hrs) on site.
- 1-year event = water quality event
- Storms ≤ the 1-year event have the HIGHEST concentration of pollutants (first flush).
- Retaining the volume of storm events of this size and smaller can annually reduce the volume of runoff discharged off site by as much as 93%.
- “Thinking small leads to big results”

The Stormwater Management Paradigm for Lake Communities

Treat Runoff As A Resource Not As A Waste

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Green Infrastructure

As per the USEPA…

- Green infrastructure uses vegetation, soils, and natural processes to manage water and create healthier urban environments.
- At the neighborhood scale, green infrastructure techniques are stormwater management measures that mimic nature … soak up and store runoff… more than just detention.

Stormwater Management for Lake Communities

SOURCE CONTROL

- Start at the "home base"
  - Alternative groundcover and landscaping
  - Careful use of fertilizers and pesticides
  - Create/maintain vegetated shoreline buffers

DELIVERY CONTROL

- Collect and reuse
- Small catchment systems – turn the watershed inside out
- Emphasize biotreatment – use nature as a model
- Retrofit when possible – correct past problems

Lake Front Buffers

Colonial Lake and Deal Lake Vegetated Shoreline Buffers

Coir Fiber Log Used to Restore and Stabilize Shoreline

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Pro-Active Source Control

Canada Geese

- 4 geese produce as much phosphorus in 1 day as a single septic system
- Average goose defecates 28 times per day producing 2lbs of feces per day
- Generate over 2 million E.coli /day along with a variety of parasite, viruses and other waterborne diseases
- Trample and destroy lake side vegetation

Reuse and Recycle Runoff

Rain Barrels

- Decreases total volume of runoff
- Less runoff entering lake = less pollutants entering lake
- Reduces on-lot erosion
- Beneficial reuse of collected rainfall decreases water consumption

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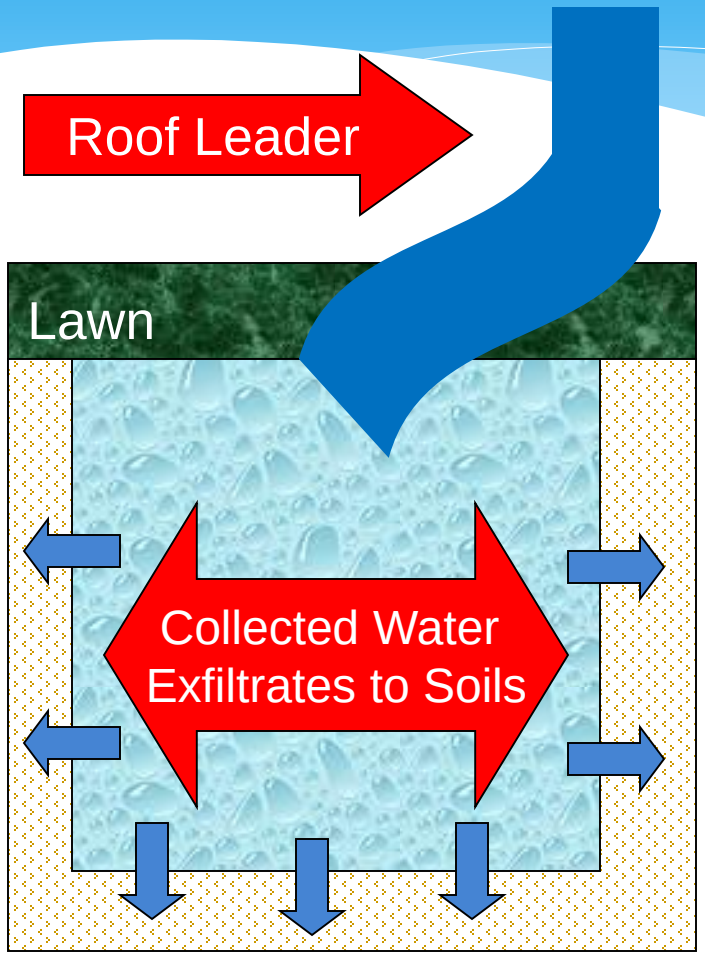
On-Lot Recharge Systems



Rain Gardens Perfect Start

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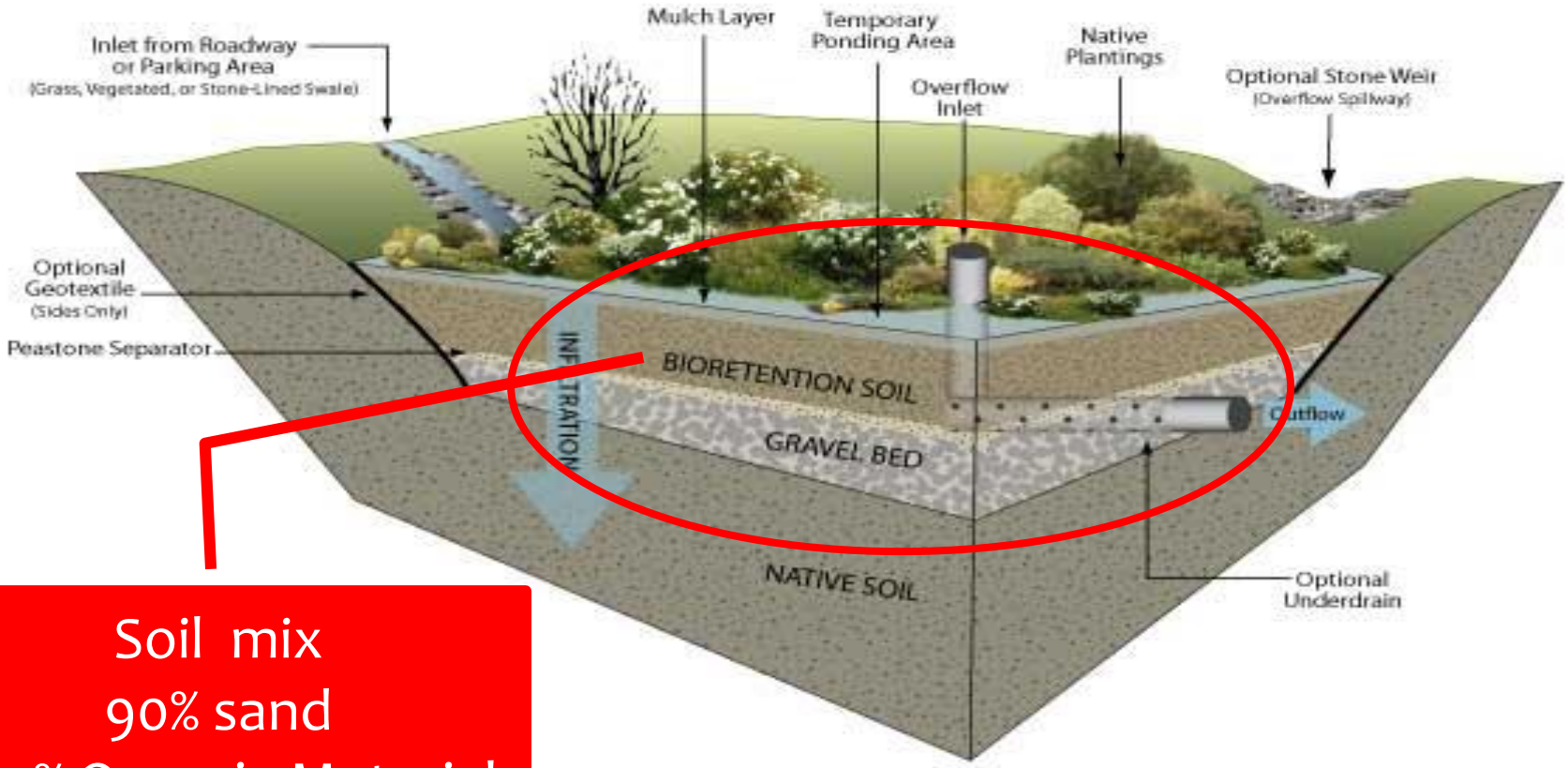
Rain Garden Planting Bed…



Soil mix
90% sand
5-15% Organic Material
NSDEC BMP Manual
for specification

Sources of Information

- Rutgers - http://water.rutgers.edu/Rain_Gardens/RGWebsite/rginfo.html
- NYSDEC - https://www.dec.ny.gov/public/44330.html
- www.familyhandyman.com/garden/how-to-build-a-rain-garden-in-your-yard/
- http://www.raingardennetwork.com/how-to-build-a-rain-garden-ten-steps/
- https://www.thisoldhouse.com/how-to/how-to-build-rain-garden-to-filter-run

THERE'S EVEN AN APP FOR THIS! - UCONN Rain Garden App

Curbside Rain Garden

Curbside Rain Garden

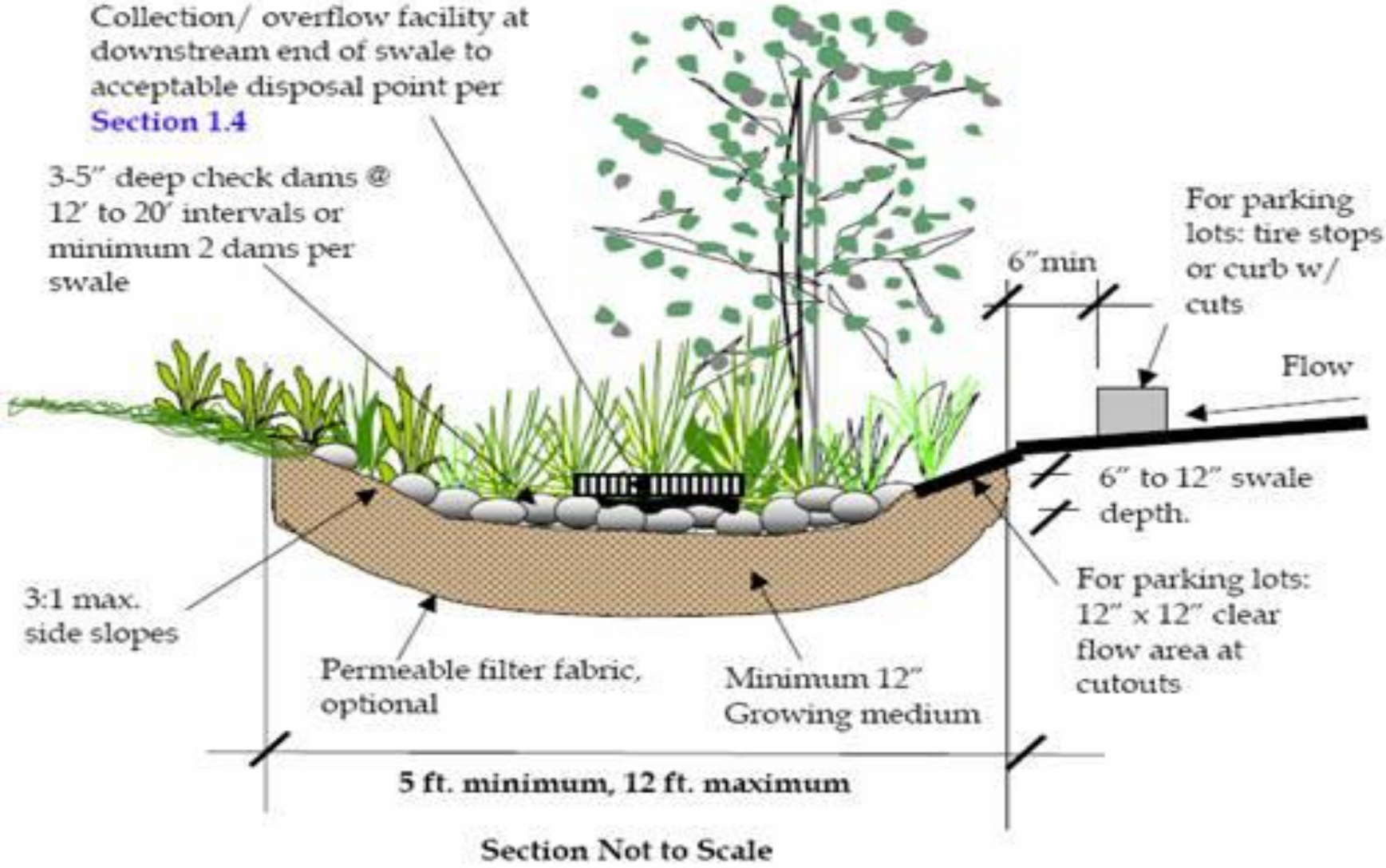
Curbside Rain Garden

NYC Environmental Protection

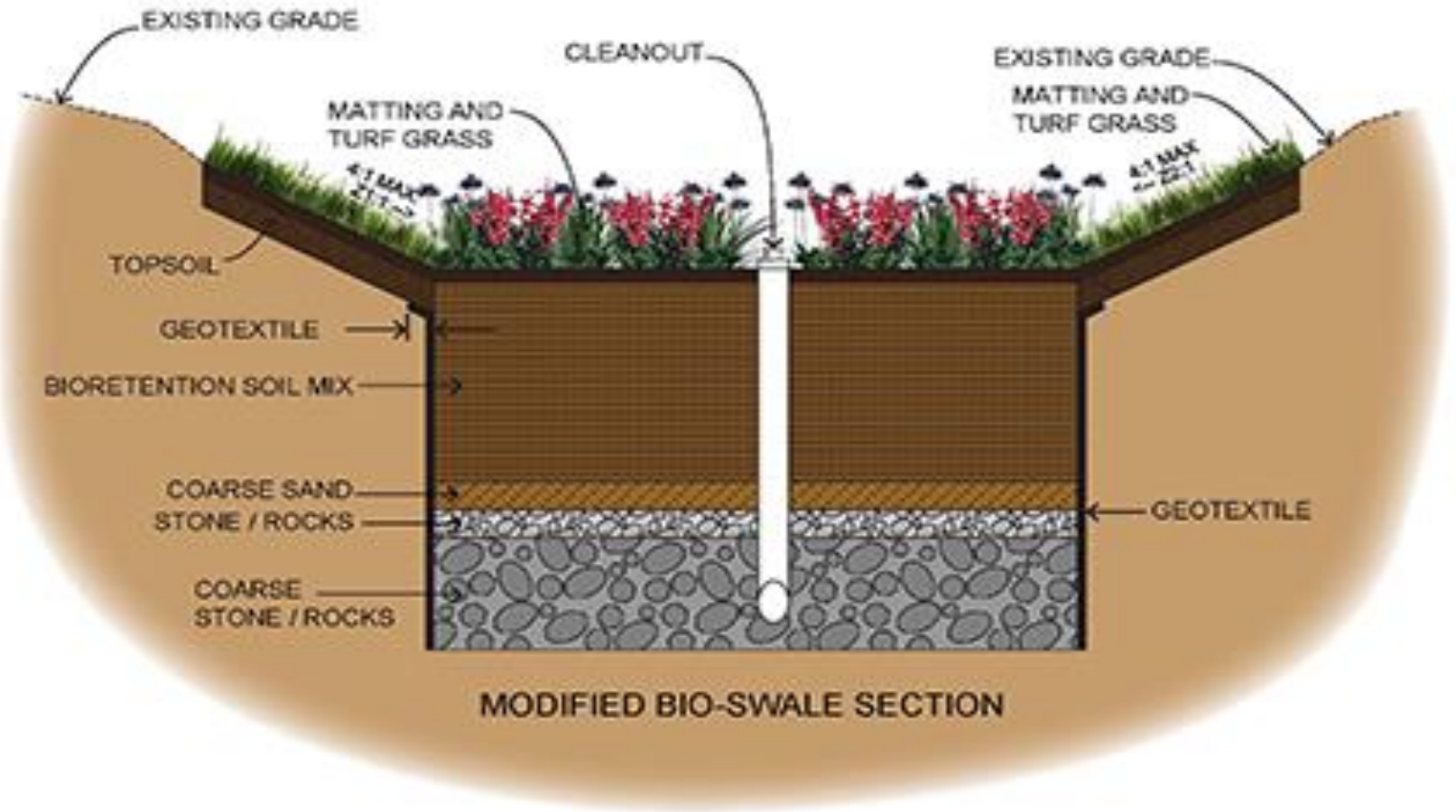
Bill de Blasio
Mayor

Vincent Sapienza, P.E.
Acting Commissioner

Bioretention Swales



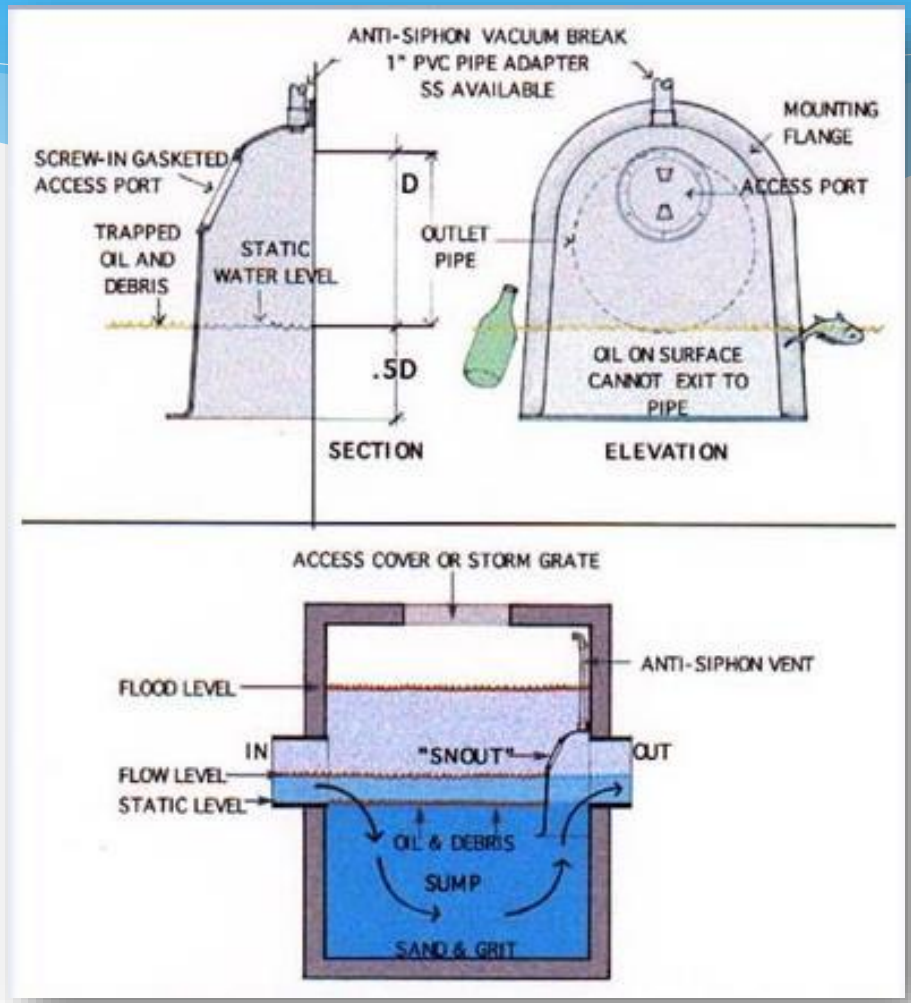
Bioretention Swales



Retrofitting Existing Infrastructure

- Standard SW infrastructure can often be easily retrofitted to increase treatment capabilities, increase recharge and decrease runoff volume
- Can convert conventional detention basins into bioretention, infiltration or wetland systems.

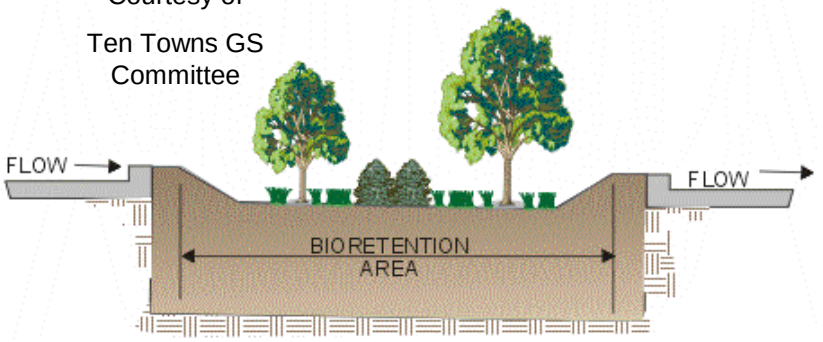
Lake Hopatcong – Catch Basin Retrofit



Manalapan Lake – Bioretention Parking Lot Swale

Courtesy of

Ten Towns GS Committee



In Summary…
The New Stormwater Paradigm

- NPS pollution responsible for majority of lake quality, aesthetic, and use impacts…including HABs!
- Lake communities can reduce NPS loading using on-lot and community-based scale green infrastructure techniques that go far beyond standard collection and detention..

In Summary…
The New Stormwater Paradigm

- Start with SOURCE CONTROL
- Less pollutants and less runoff = less required management
  - Fertilizer use
  - Pet waste
  - Septic management
  - Geese
  - Buffers

In Summary…
The New Stormwater Paradigm

- Treat runoff as a resource.
- Manage runoff in small "chucks", close to its source using techniques that mimic nature.
- Overall goal is to reduce the volume of runoff.
- By generating less runoff volume you can better control the rate, amount and quality of stormwater discharged offsite.

Yes You Can

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Take the Bite Out of Stormwater!

Thank You… Questions

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