



Stormwater Ponds in Coastal South Carolina

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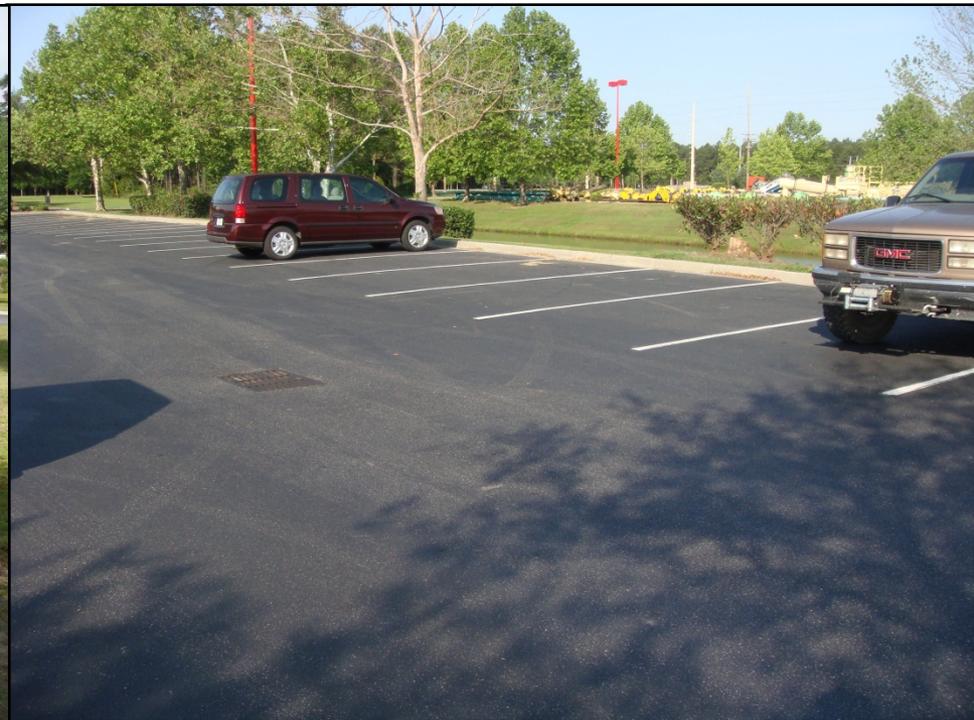
Outline

- Stormwater runoff
- Why ponds?
- Considerations
- What can you do?



Coastal Development

- Decreases the number of trees
- Increases the amount of impervious surfaces
 - Roofs, driveways, roads and parking lots

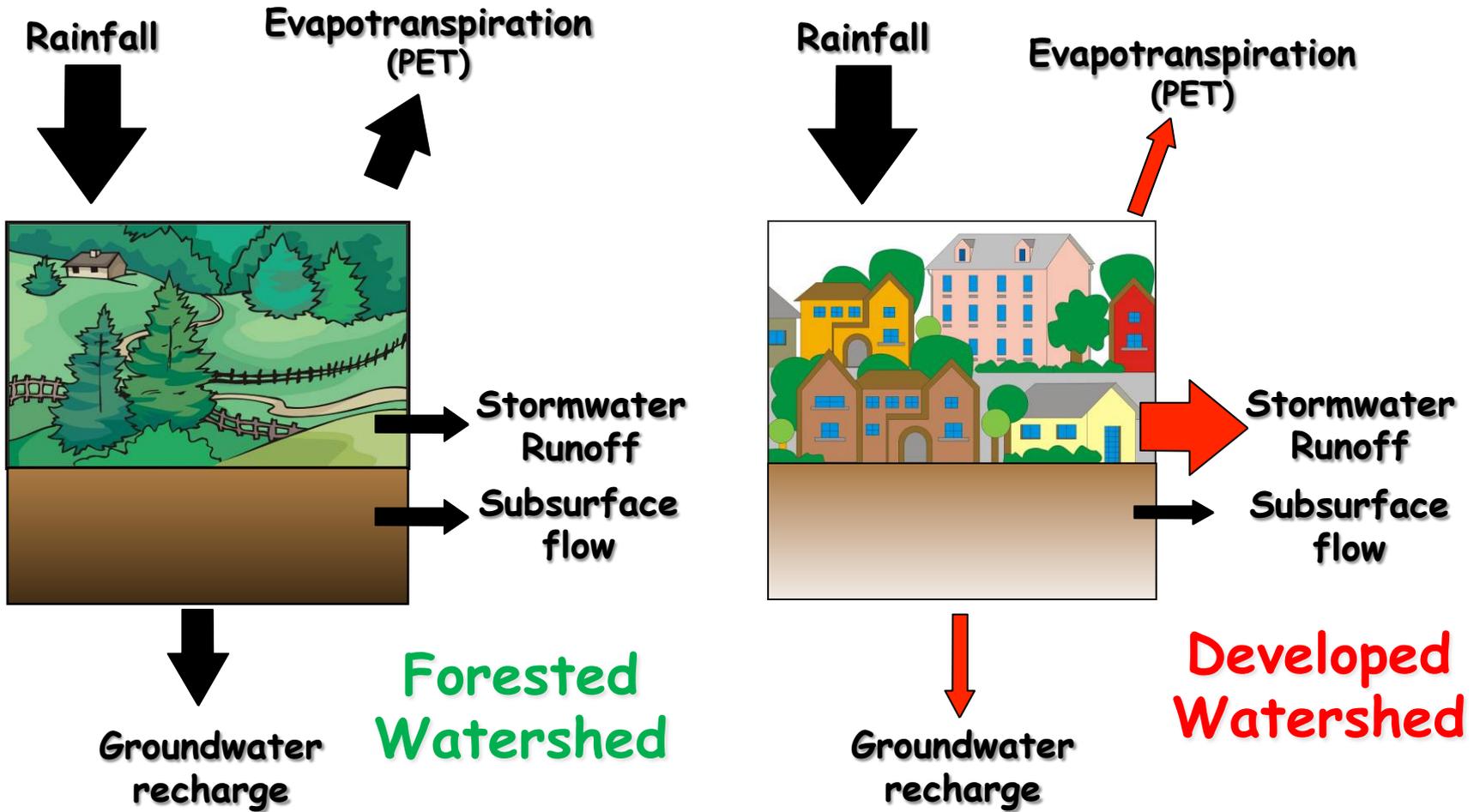


Stormwater Runoff

- Impervious surfaces restrict the movement of water into the ground and results in surface runoff or stormwater runoff.



Water Budgets



Source: Holland and Sanger 2008

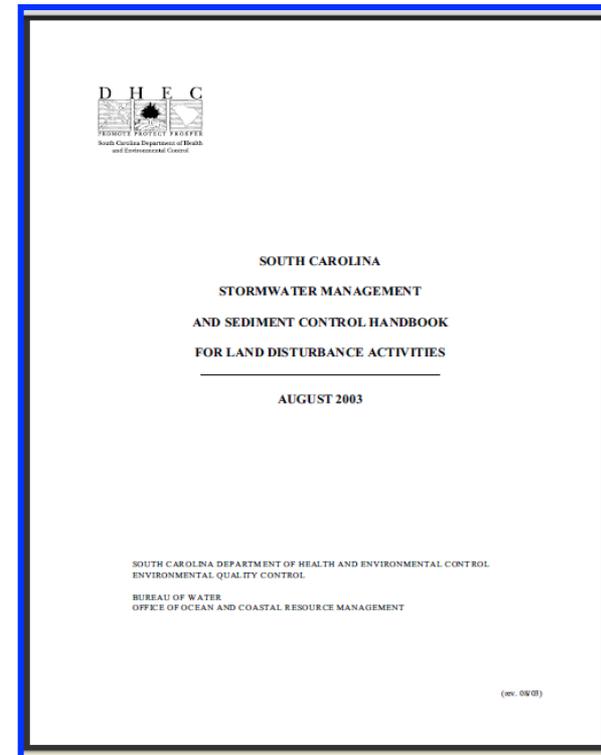
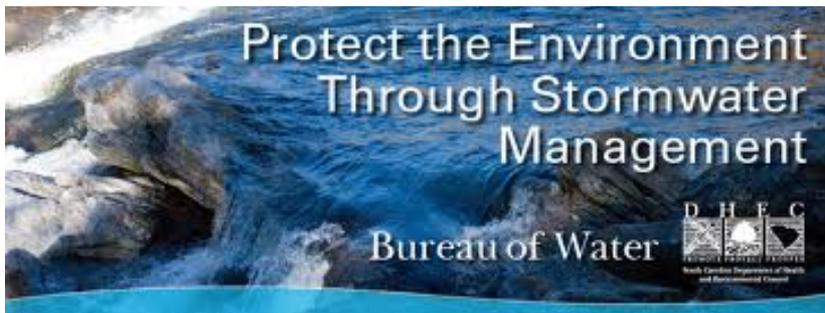
Coastal Development

- Increases the pollutant loadings
 - Fertilizers (nutrients), pesticides/herbicides, metals, fossil fuels, bacteria, sediment



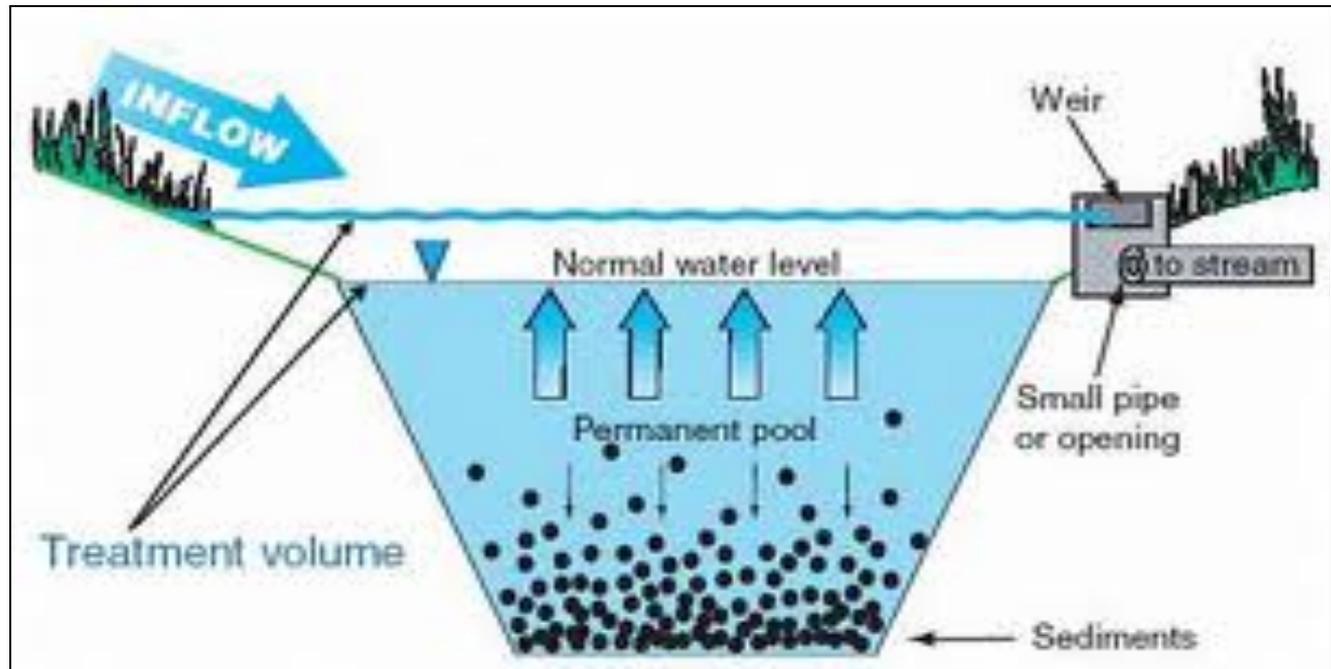
Regulations

- South Carolina regulations require stormwater best management practices (BMPs) to mitigate the impacts of disturbing the land.

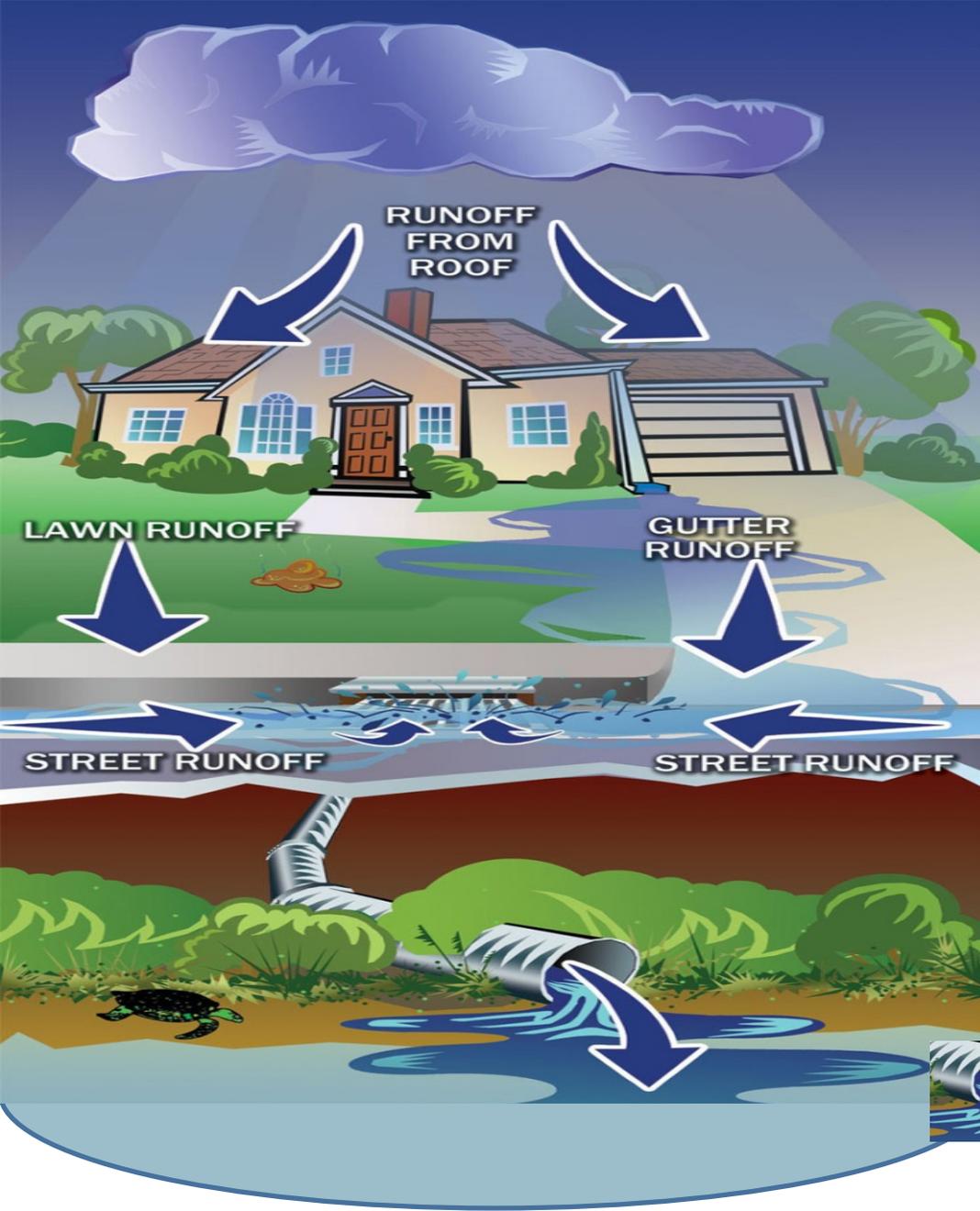


Types of BMPs

- Rain Gardens, Bioswales, Pervious Pavers, etc.
- Constructed Wetlands
- Pre-Fabricated Control Devices
- Stormwater Ponds (wet or dry) - most commonly used BMP in coastal SC - detain runoff for a period of time.



Source: Crane et al. 2010



Coastal SC
Approximately
52 in/yr

STORMWATER RUNOFF
ENDS UP IN LOCAL
STREAMS, CREEKS,
RIVERS AND LAKES.

Courtesy NCDENR

Source: Modified from NCDENR

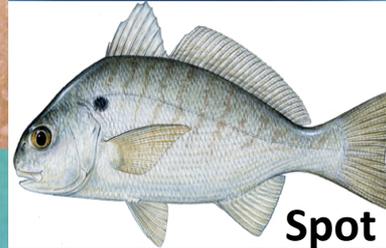
Outfalls to Tidal Creeks/Salt Marshes



Nurseries & Refuges



Flounder



Spot

Atlantic silversides



Sheepshead



Red drum



Black seabass



Blue crab



White shrimp

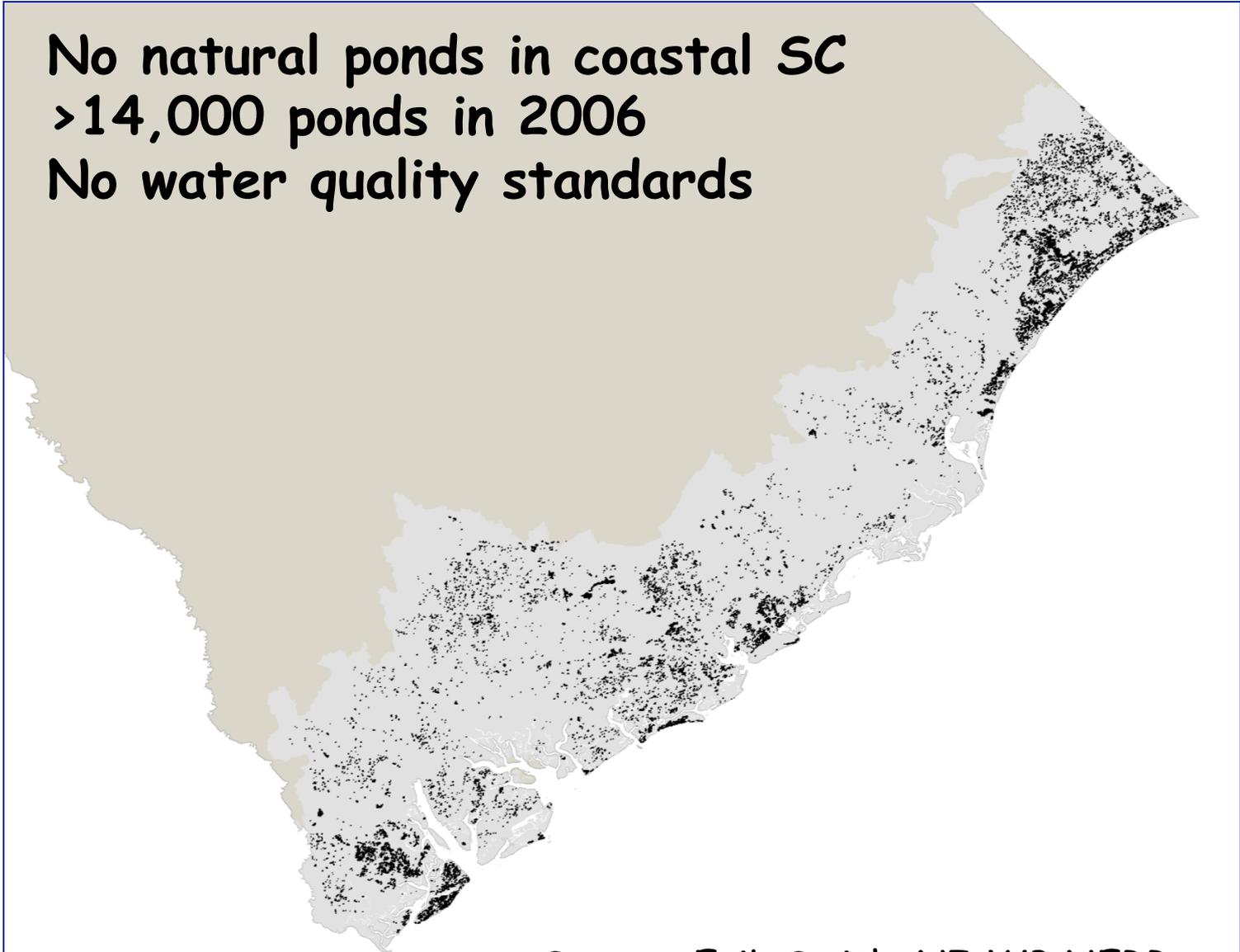
Why Ponds?

- Intended
 - Meet stormwater regulation requirements
 - Provide fill for development
 - Amenity
- Unintended
 - Habitat



Created Open-Water Ponds

No natural ponds in coastal SC
>14,000 ponds in 2006
No water quality standards



Source: Erik Smith, NI-WB NERR

1994

Daniel Island, Charleston, SC 29492, USA

4859 ft

Image U.S. Geological Survey

Google earth

Imagery Date: 2/13/1994

32°50'51.00" N 79°55'31.98" W elev 0 ft

Eye alt 22280 ft

2007

Daniel Island, Charleston, SC 29492, USA

Image © 2012 DigitalGlobe

Google earth

4859 ft

32°50'51.00" N 79°55'31.98" W elev 0 ft

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1994

Daniel Island, Charleston, SC 29492, USA



Image U.S. Geological Survey

Google earth



Imagery Date: 2/13/1994

32°51'26.94" N 79°55'01.97" W elev 0 ft

Eye alt 7779 ft

2007

Daniel Island, Charleston, SC 29492, USA

Count: ~25 ponds

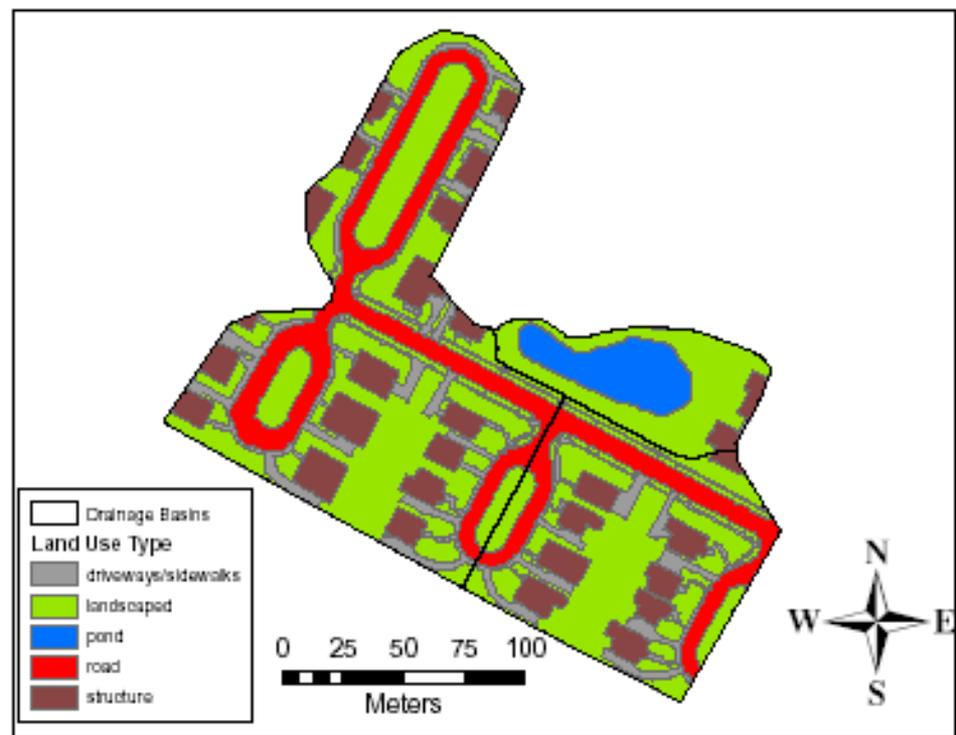


Image © 2012 DigitalGlobe

Google earth

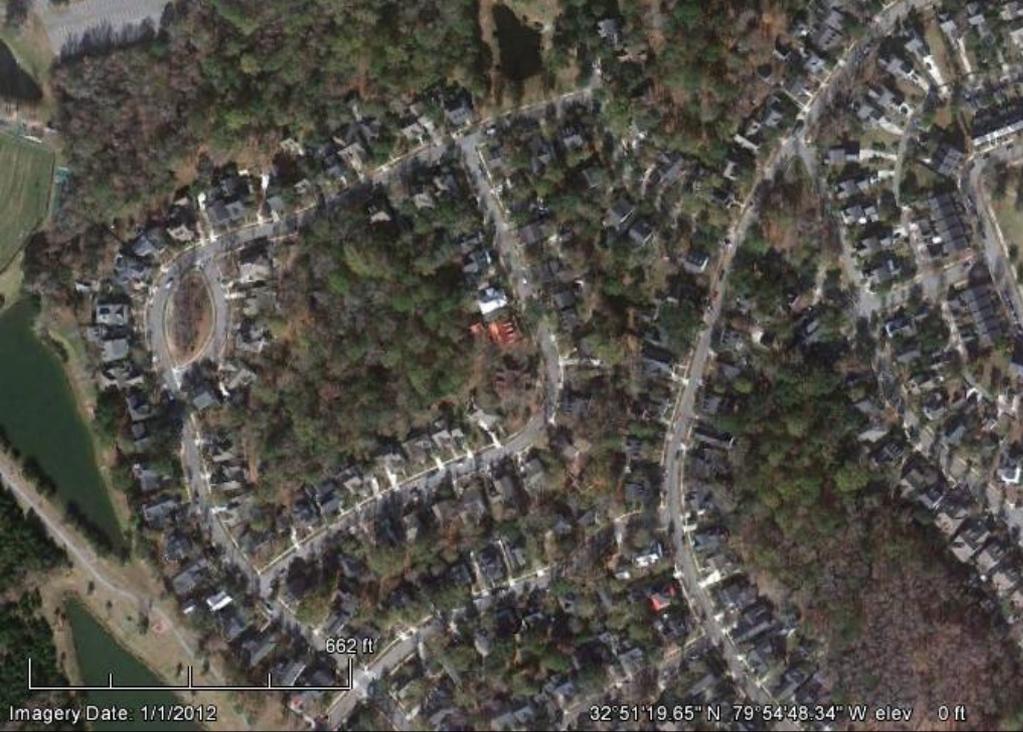
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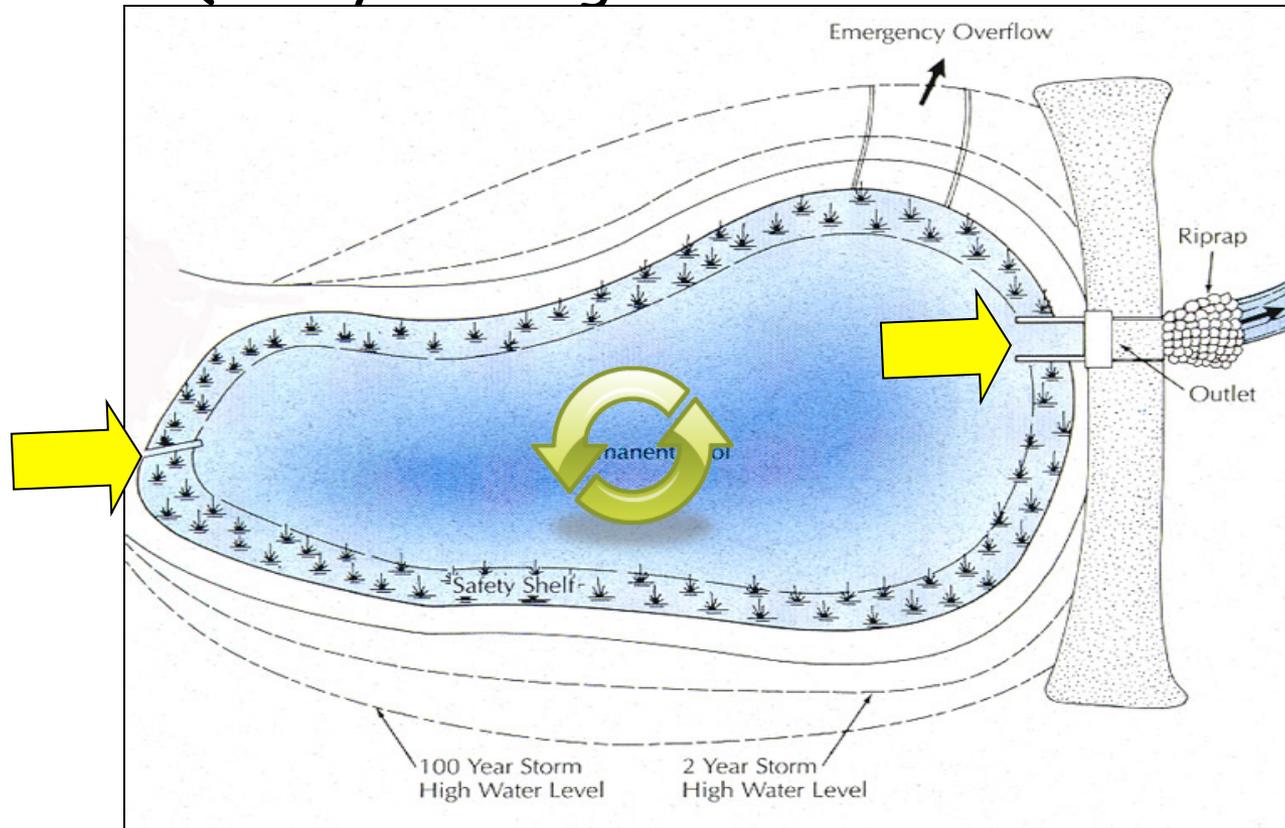
Source: Messersmith 2007

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Considerations

- Water Quality/Quantity of Runoff Into Pond
- Water Quality Within Pond
- Water Quality Exiting the Pond



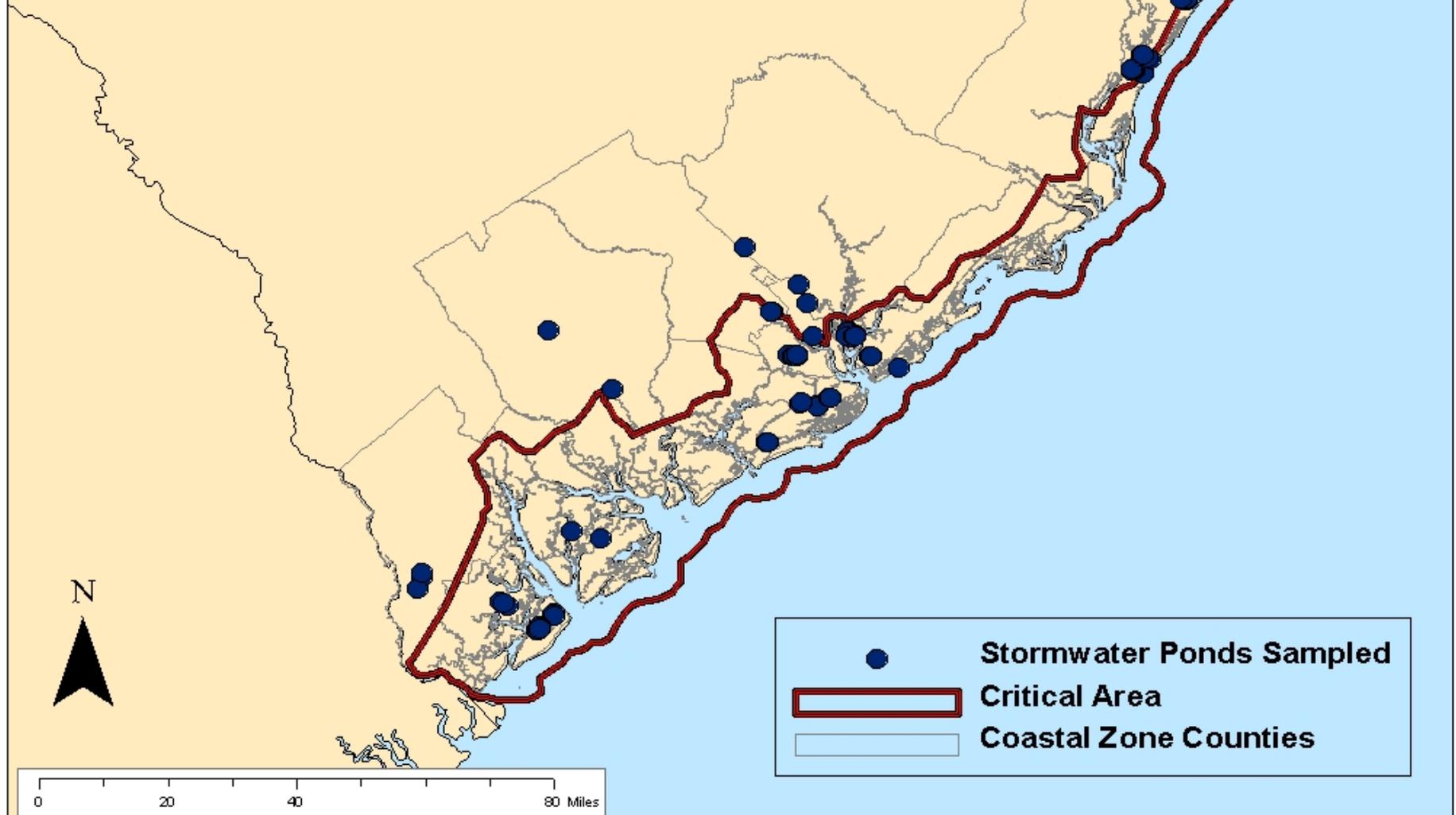
Considerations

- Quantity
 - Rate
 - Volume
- Quality
 - Nutrients
 - Chemicals
 - Pesticides
 - Sediments
 - FC Bacteria
 - Algae



Source: <http://apwsm.org/raingarden>

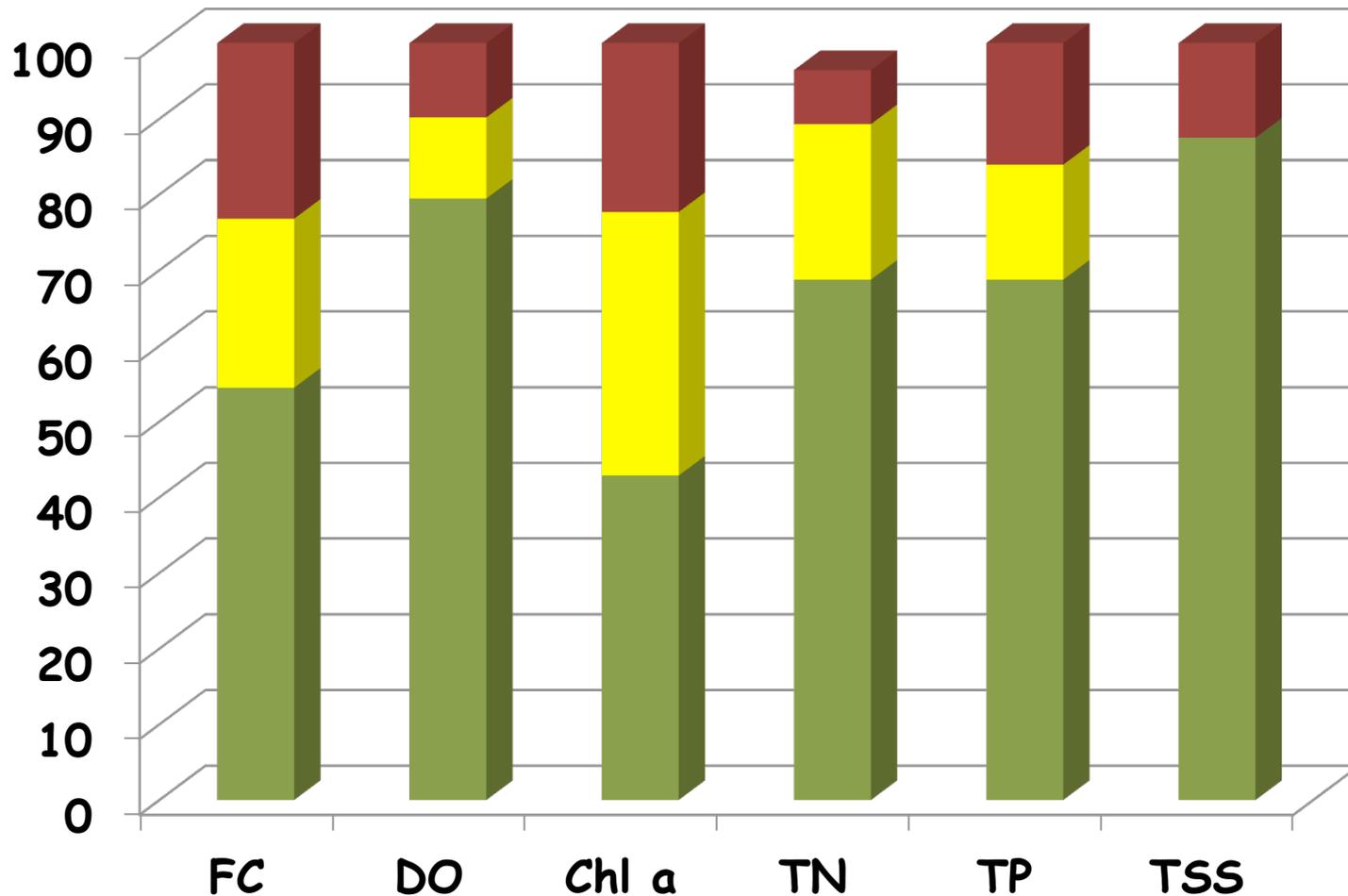
SCDHEC-OCRM Stormwater Pond Baseline Study (n=112)



Water Quality

Half of all the ponds had at least one poor rating

■ good ■ moderate ■ poor



Source: Drescher et al. 2011

Pollutant Removal Efficiency

Pollutant	Single Pond	Multiple Pond
Fecal Coliform Bacteria	14%	55%
Total Suspended Solids	19%	88%
Total Nitrogen	-2.5%	39%
Total Phosphorus	-6%	71%

Source: Messersmith 2007

What Can Homeowner Associations Do?

- Education
- Maintenance
- Supplement



Educate Homeowners

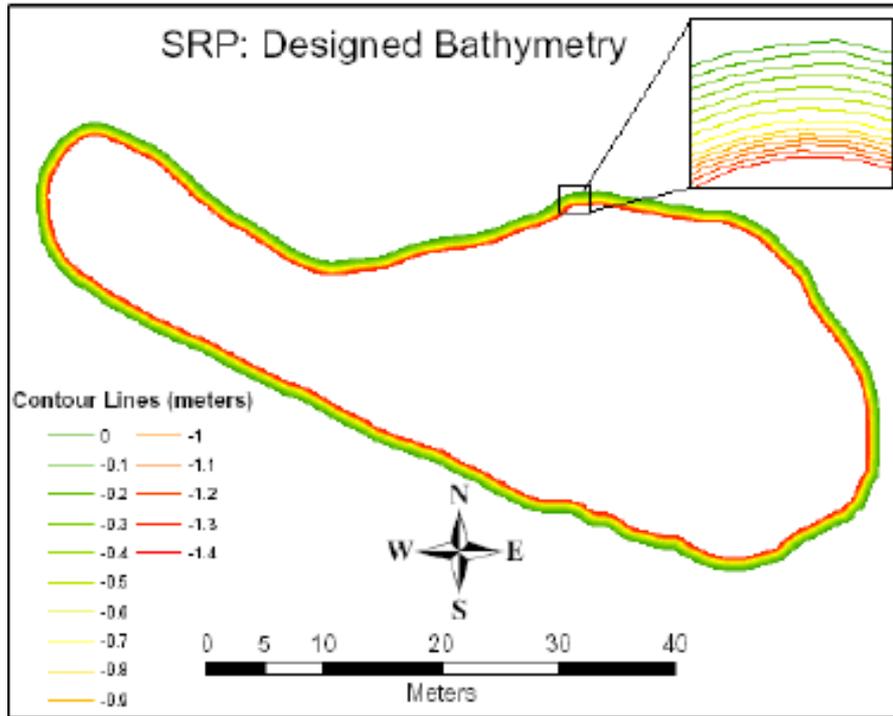
- Purpose of the lake/lagoon in their backyard
- Apply fertilizers and pesticides according to directions, sparingly, and not before it rains
- Reduce bacteria - pet waste, septic systems
- Wash car on lawn
- Dispose of lawn clippings in compost
- Clean up spilled brake fluid, oil, etc. and do not dump in ground or in a storm drain
- Harvest rain water
- Preserve mature trees

Maintenance

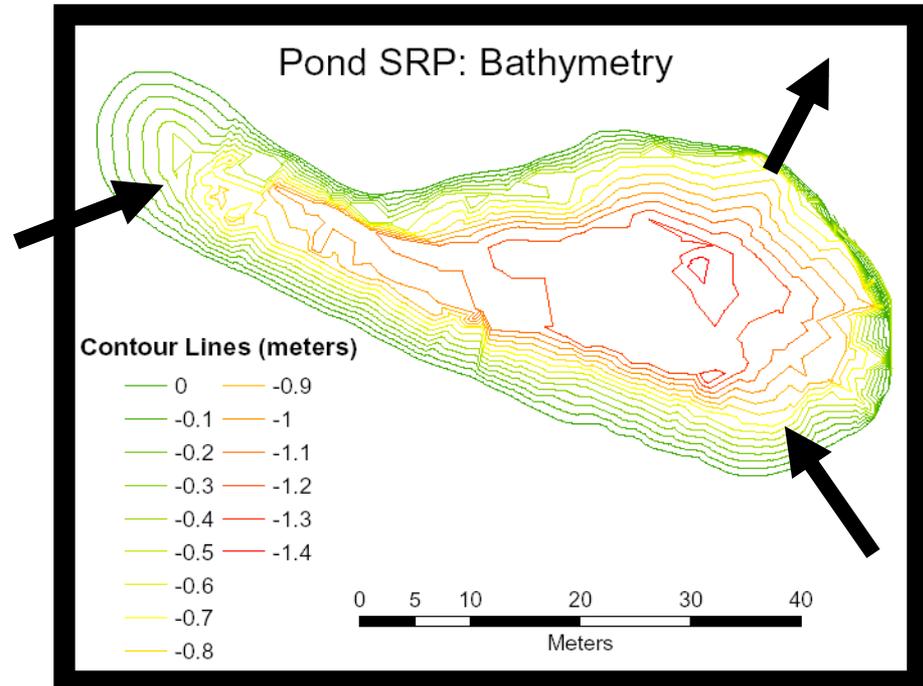
- Inspections - guides available online
 - Inlet and outlet pipes
 - Debris
 - Erosion
- Dredging
- “Weed” Control - mechanical, biological, and chemical



Dredging



36% loss in storage capacity - after 5-7 years



“Weed” Control

- Mechanical
- Biological
- Chemical



Supplement

Add vegetation in the pond and along the pond edge



Take Home Message

- Stormwater pond issues are complex - one size does not fit all.
- Most stormwater ponds are not operating at maximal benefit.
 - Education
 - Maintenance
 - Supplements

