



Tisbury CWMP Alternative Technologies

Water Resources Committee



Workshop Goals and Objectives

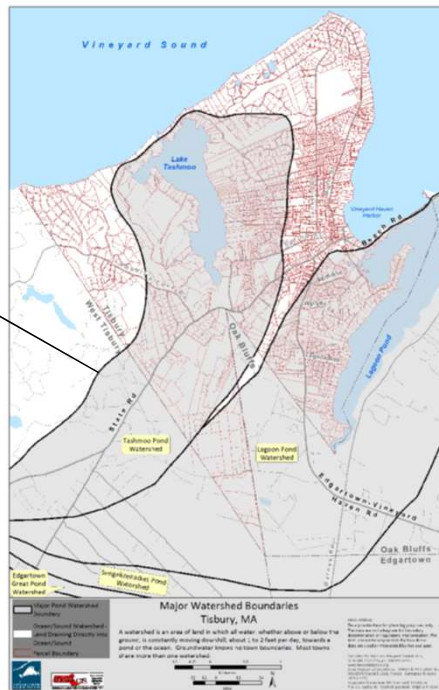
- Provide Technology Overview
- Review Evaluation Criteria
- Discuss Recommended Technologies by Watershed



Tisbury's Watersheds

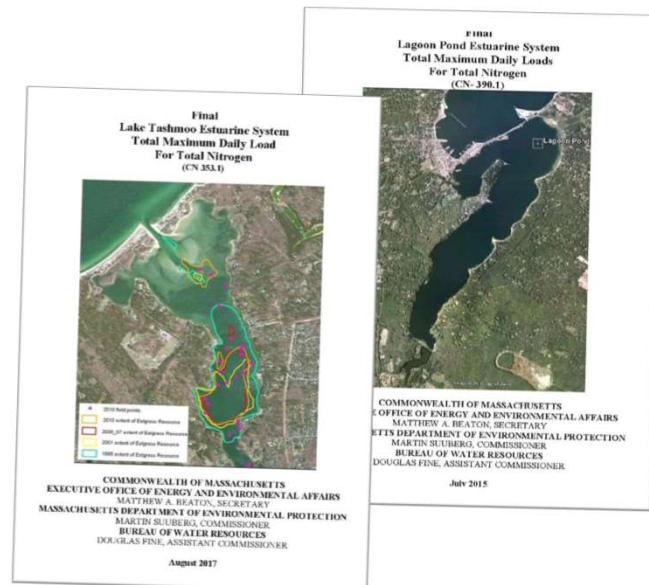
Lake
Tashmoo
Watershed

Lagoon Pond
Watershed



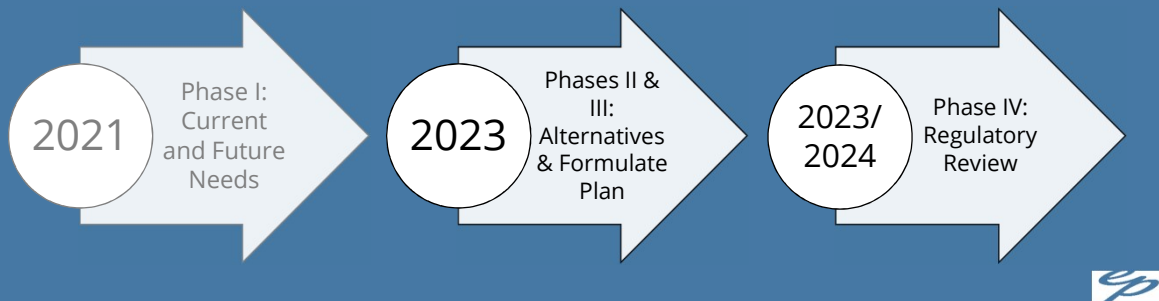
A Quick Recap

- Lagoon Pond Nitrogen Total Maximum Daily Load (TMDL) removal goals:
 - 13,000 pound per year
 - 34.6% / 50%
- Lake Tashmoo Nitrogen Total Maximum Daily Load (TMDL)
 - 6,500 pounds per year
 - 31.9% / 42.5%

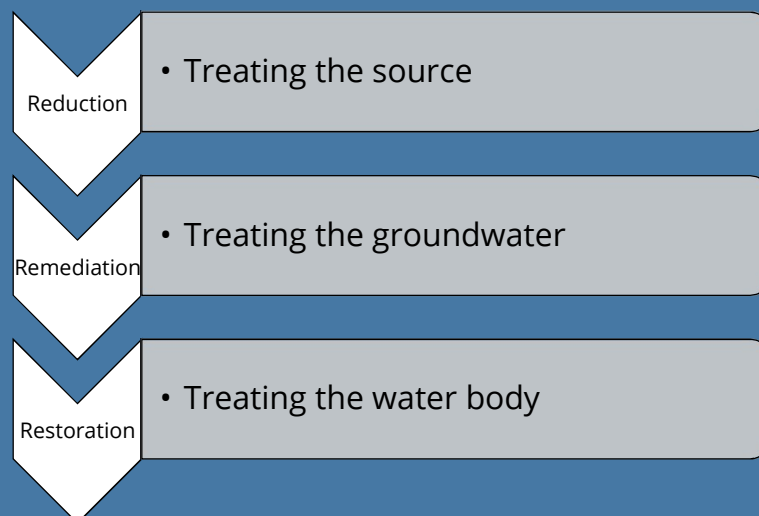


The CWMP Planning Process

- Plan of Study approved by Select Board
- Town-wide water quality assessment and solutions
- 20-year planning to meet water quality goals



Background & Information Sources

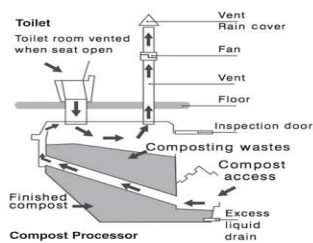
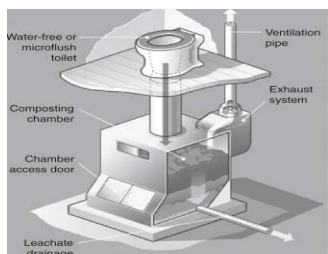


Source Reduction Technologies

Primary

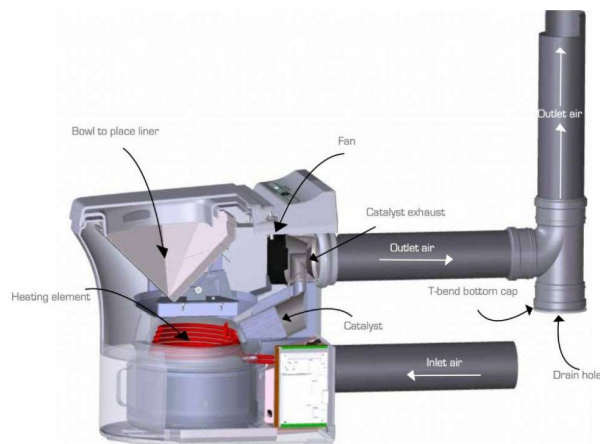
Waste Reduction Toilets

Composting Toilets



Source: Sam Kubba, Composting Toilets- Handbook of Green Building Design and Construction, 2017

Incinerating Toilets

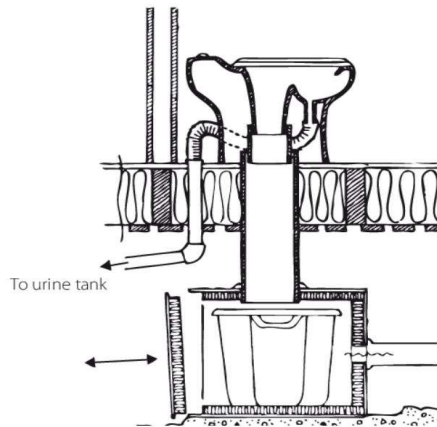


Source: Incinerating Toilets, Inc



Waste Reduction Toilets

Urine diversion

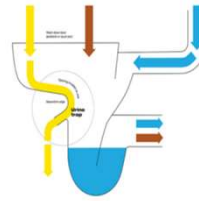


Source: Jönsson, Håkan et.al., "Urine diverting toilets in climates with cold winters : Technical considerations and the reuse of nutrients with a focus on legal and hygienic aspects." (2007).

Laufen SAVE! Toilet



Wostman EcoFlush

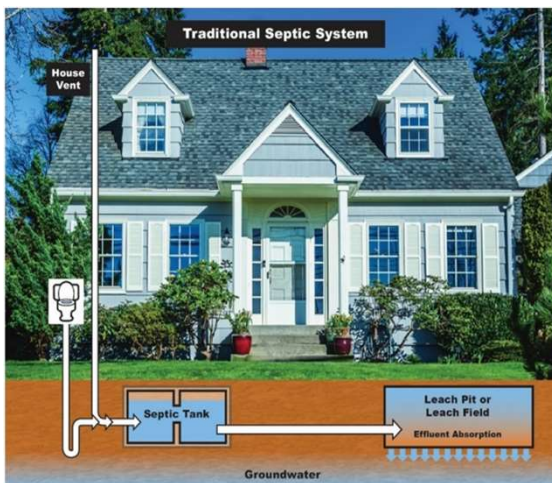


Source: Rich Earth Institute



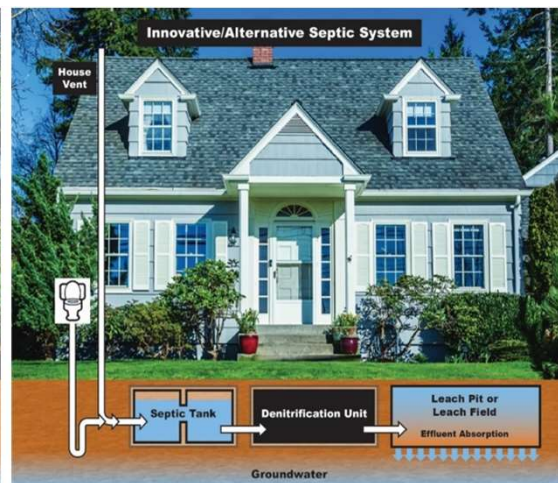
On-Site Systems

Title 5 Septic System Replacement



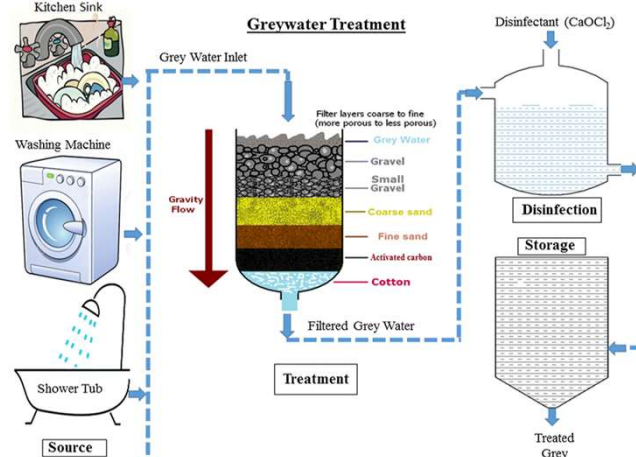
Source: EPA

I/A Systems



Decentralized Systems

On-site grey water treatment processes

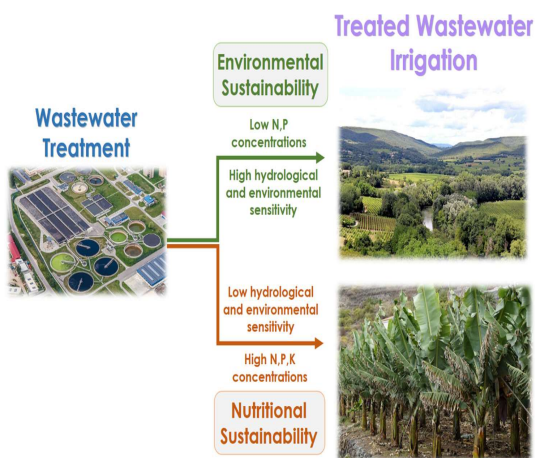


Source: Samayamanthula, D.R., et al., Treatment and effective utilization of greywater. *Appl Water Sci* (2019)



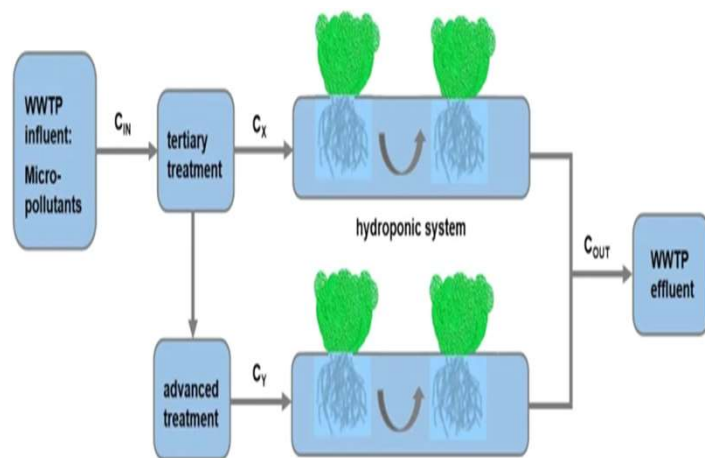
Green Infrastructure

Phyto Irrigation



Source: E. Shitull-Trauring, et al., NPK in treated wastewater irrigation, Science of the Total Environment

Hydroponic Treatment



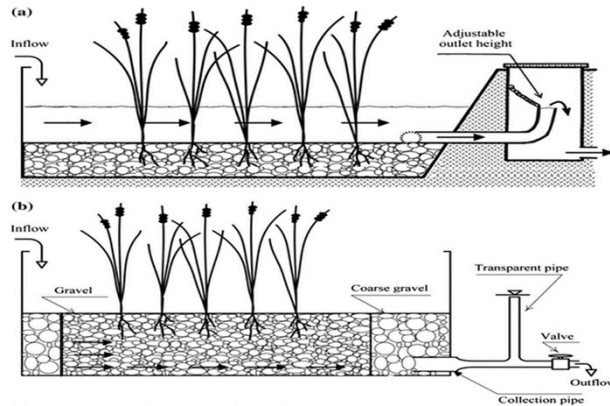
Source: Kreuzig, R. et al. Reclaimed water driven lettuce cultivation in a hydroponic system. *Environ Sci Pollution Research*



Green Infrastructure

Constructed Wetlands:

- Surface Flow and
- Subsurface Flow



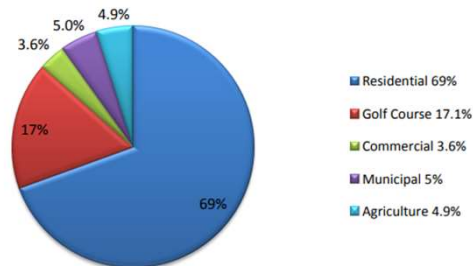
Source: Wang, Mo., et al. Application of constructed wetlands for treating agricultural runoff and agro-industrial wastewater: a review, *Hydrobiologia*, (2018)



Non- Structural Technologies

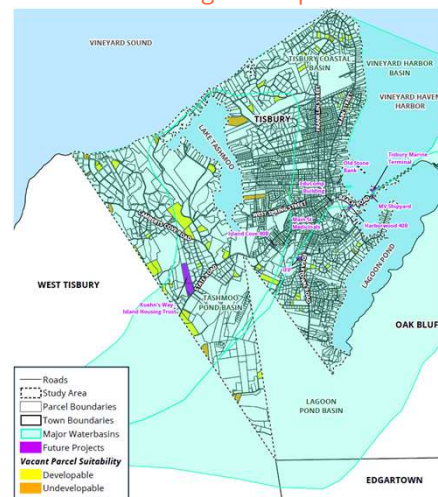
Fertilizer Management

- 57% of residential properties use an average of 49 lbs. of fertilizer annually



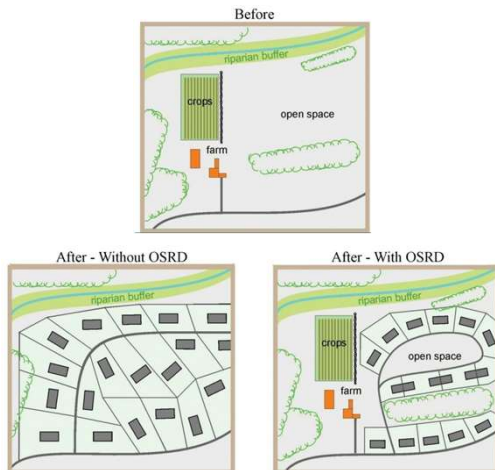
Cape Cod Pesticide and Fertilizer Use Inventory, Horsley Witten Group, Inc. April 2014.
https://www.capecodcommission.org/resource-library/file?url=/dept/commission/team/Website_Resources/waterresources/Cape_Cod_Pesticide_and_Fertilizer_Use_Inventory_Final_Report_April_2014.pdf

Remediation of Existing Development



Non- Structural Technologies

Compact Open Space Development



"An Introduction to the State's New Open Space Design/Natural Resource Protection Zoning Model Bylaw," Kurt Gaertner, Massachusetts EOEAA <https://www.mass.gov/smart-growth-smart-energy-toolkit-information-and-resources>

Transfer of Development Rights



Transfer of Development Rights Concept, Smart Growth/Smart Energy Toolkit, Massachusetts EOEAA <https://www.mass.gov/smart-growth-smart-energy-toolkit-information-and-resources>



Compact Open Space Development: Kuehn's Way

- 20 year-round apartments clustered into 10 duplexes
- IHT received a collective \$1.5 million in funding from all six towns' Community Preservation committees, with Tisbury being the biggest contributor.
- Utilizes I/A Technology for onsite wastewater treatment



Source: MCLA, Martha's Vineyard Magazine

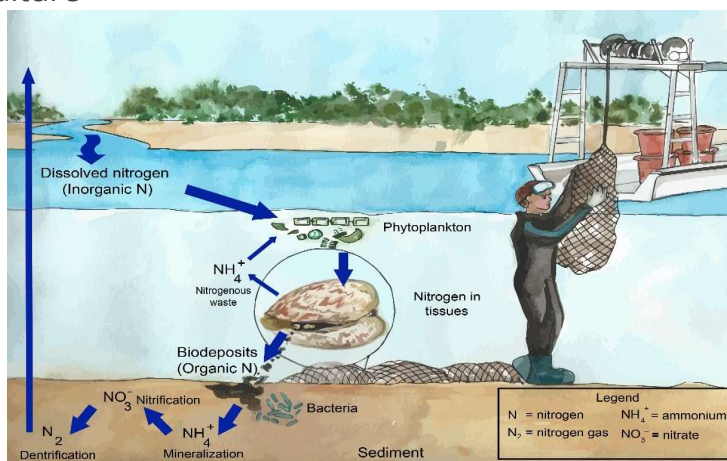


Restorative Technologies

Secondary

Innovative Resource Management Technologies

Aquaculture



Source: University of Florida- Shellfish Aquaculture



Innovative Resource Management Technologies

Fertigation Wells

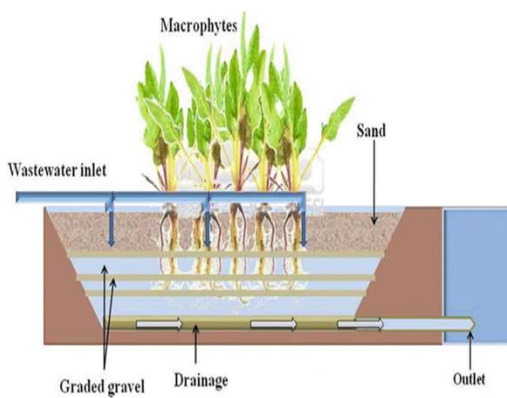


Source: Cape Cod Commission



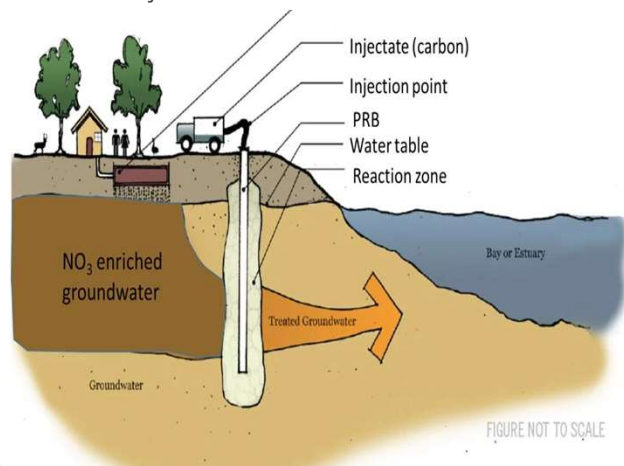
Innovative Resource Management Technologies

Phytoremediation



Source: Herath, I., et al. Phytoremediation in Constructed Wetlands. Springer (2015)

Permeable Reactive Barriers (PRBs): Trench & Injection Method



Source: Cape Cod Commission



PRB Injection Wells: Lagoon Pond Study

- Funded by EPA through Southeast New England Program (SNEP) Coastal Watershed Restoration grant (2018)
 - Administered by MVC and monitored by the Coastal Studies Program at UMass Dartmouth (School of Marine Science and Technology)
- Installed in 2020
 - 30 feet deep
 - Mix of soy-based solution and water (15,000 gallons)



Source: MV Times, 2020



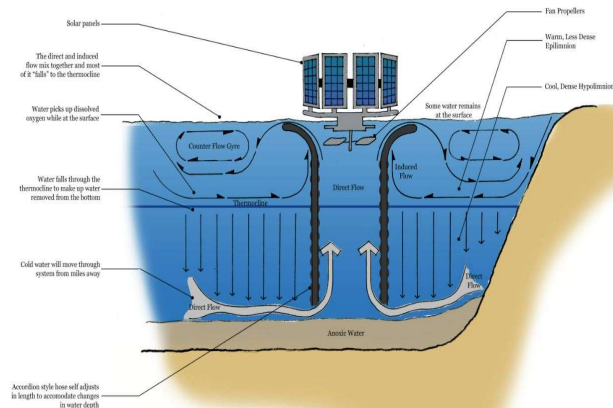
System Alterations

Floating Constructed Wetlands



Source: Midwest Floating Islands

Pond and Estuary Circulators & Dredging



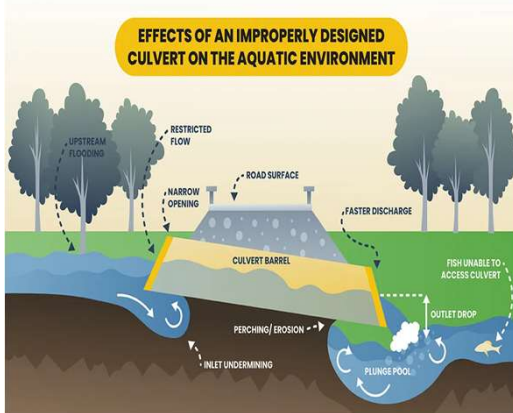
Source: Cape Cod Commission



System Alterations

Inlet/ Culvert Widening

Re-construction of bridge or culvert openings; increases tidal flux and decreases nutrient concentration



Source: Infrasteel-Permanent Culvert Rehabilitation Systems

Coastal Habitat Restoration

Includes establishing and/or enhancing estuary salt marshes, eel grass beds, as well as shellfish and oyster beds together as an ecosystem

Surface Water Remediation Wetlands

Surface water is pumped or allowed to flow naturally through treatment cells containing wetlands. They are often used in combination with groundwater recharge or potable water reuse systems

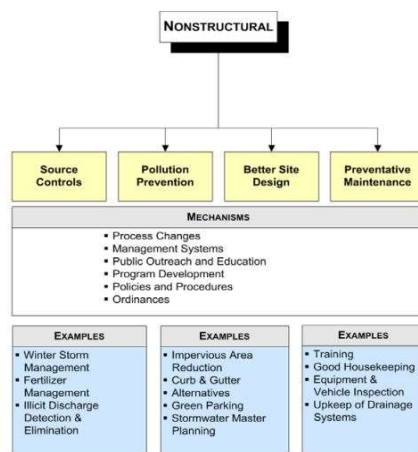
Chemical Treatment of Ponds

Alum is added to reduce Phosphorus amounts in pond sediments.

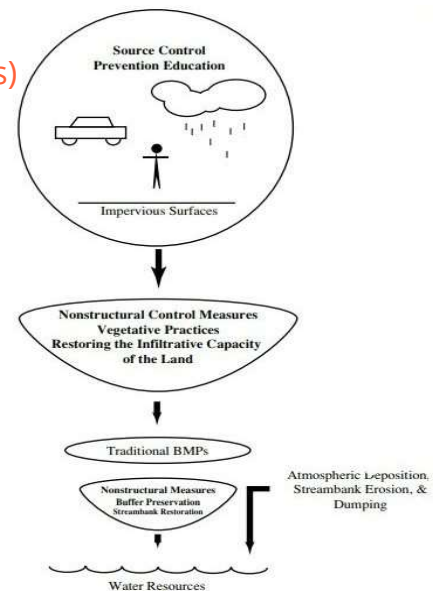


Non- Structural Technologies

Stormwater Best Management Practices (BMPs)



Source: Northern Virginia Regional Commission



Source: North Carolina DOT



Next Steps

Action Items and Schedule

Project Team

- Reflect on Reviewed Technologies and Evaluation Criteria
- Send feedback to Water Resources Committee Chair, Ben Robinson
- Public Meeting for Draft Feedback from the Community to be held in April/May



THANK YOU

