Stormwater Management: Why Do We Care?

Andrew Anderson, E.I.T. Extension Associate Engineer Biological & Agricultural Engineering NCSU





Meet the NCSU Stormwater Team.....

- <u>Campus -</u>
 - Teaching
 - Research
- <u>County -</u>
 Extension/Outreach:
 - Demonstration
 - Teaching



One Goal - Accelerate the Adoption of Solutions!!!









Land Conversion



Pittsboro, NC in 1700



Pittsboro, NC in 2014





Land Conversion



Lincoln, NE , 1850

Lincoln, NE , 2012





Changes associated with urban land development lead to increases in stormwater runoff <u>volumes</u> and <u>velocities</u>.





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Pre-vs Post-Development Hydrology





PRE-DEVELOPMENT HYDROLOGIC BUDGET



POST-URBANIZATION HYDROLOGIC BUDGET

Prince George's County, Maryland. 1999. "Low-impact Development Hydrologic Analysis". Department of Environmental Resources, Programs and Planning Division. Accessed at: www.epa.gov/owow/NPS/lid hydr.pdf.



Peak flow...viewed another way



Time, hours











What is NC's LID Hydrologic Target?







Coweeta Hydrologic Laboratory



One of the oldest continuous environmental studies in North America, Coweeta is a centerpiece of a long-term cooperation between the **University of** Georgia and the **USDA Forest** Service.



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For Example:

BIORETENTION HYDROLOGY:

Outflow (Drainage)	Infiltration	ET
50%	40%	10%

COWEETA (PRE-DEV.) HYDROLOGY:

Runoff	5%
Evapotranspiration	50%
Infiltration	45%
Shallow Interflow	43%
Deep Seepage	2%
	– Pittsboro Rain Ga

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What is Stormwater Runoff?

Rainwater that washes across yards, roads and parking lots, and flows into streams, creeks and other waterbodies.

Pollutants...

Erosion...

Flooding...



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The "First-Flush" Phenomenon



stormh2o.com

PHOTO: GORDON ENGLAND



lithocrete.com











Sediment





Nutrients, fertilizers, pesticides, yard waste





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Bacteria

When your pet goes on the lawn, remember it doesn't just go on the lawn.





Rai

Automobile oil deposits, brake pad dust, etc.



h2o.enr.state.nc.us



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Stormwater Effects: Temperature Impacts



Temperature Sensitivity to Runoff in Trout Waters (Brevard, NC)



CONSEQUENCES





NC STATE LINUVERSITY

ISITY

Algal blooms & Eutrophication





Pittsboro Rain C Octo







Eroding & degraded streams



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Chemistry **Physical Habitat** Streambed Sediments **Total Phosphorus** 58.3% 30% Southern Appalachians (315,242 mi) 30.4% 28.1% Biology 39.6% 13.3% Macroinvertebrate MMI 0.3% 16.5% **Total Nitrogen** In-stream Fish Habitat 18.2% 64.9% 72.7% 71.2% ⊨ 0 11.9% 17.6% 0 0.4% 16.8% 9.4% Fish MMI 36% 0.3% 16% Salinity **Riparian Vegetative Cover** 37.4% 17.8% 84.7% 49.2% 1.8% 12.9% 1 24.5% 1.5% **Periphyton MMI** 1 2.4% 26.2% 20.8% 9.9% - 68.3% Acidification **Riparian Disturbance** 0 0 30.8% 99.2% H 1.1% 43.3% 0 0.8% 25.9% Macroinvertebrate O/E 17.1% 37.1% 19.3% 26% 0.5% 0 20 40 60 80 100 0 20 40 60 80 100 0 20 40 60 80 100 MMI O/E Percent of Length ND > 50% Taxa Loss Good Fair Poor NA InsuffData 20-50% Taxa Loss NA 10-20% Taxa Loss Poor < 10% Taxa Loss Fair No Data

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Good

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NC STATE LINUVERSITY







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North Carolina's Response:







Who is responsible for regulating these challenges?

- Federal Level: U.S. Environmental Protection Agency
- State Level: NC Dept of Environment and Natural Resources
- Local Level: County and City Stormwater Divisions

ULTIMATELY WE ALL ARE RESPONSIBLE!





LOW IMPACT STREET

What can we do?

SCMs!









Low Impact Development ("LID")

- A development is considered LID when the volume of runoff leaving the site after development matches the volume of runoff before development.
- In addition, an LID project should maintain adequate flows to the streams and wetlands on the site rather than piping stormwater to a single low point.





Goals of Low Impact Development

- Reduce impervious surfaces
- Retain runoff on-site
- Promoting infiltration and evapotranspiration



• Replicating pre-development hydrologic conditions as closely as possible - Davis, 2005



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What We Will Cover Today

- **1.** Introduction to stormwater management
- 2. What is a rain garden
- 3. Site selection and design
- 4. Plants (yippee!)
- 5. Construction, alternative design, and maintenance
- 6. In-class design example





Questions?

Want PDFs of the slides seen today? Contact me!

Andrew Anderson arander5@ncsu.edu 919-515-8595





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