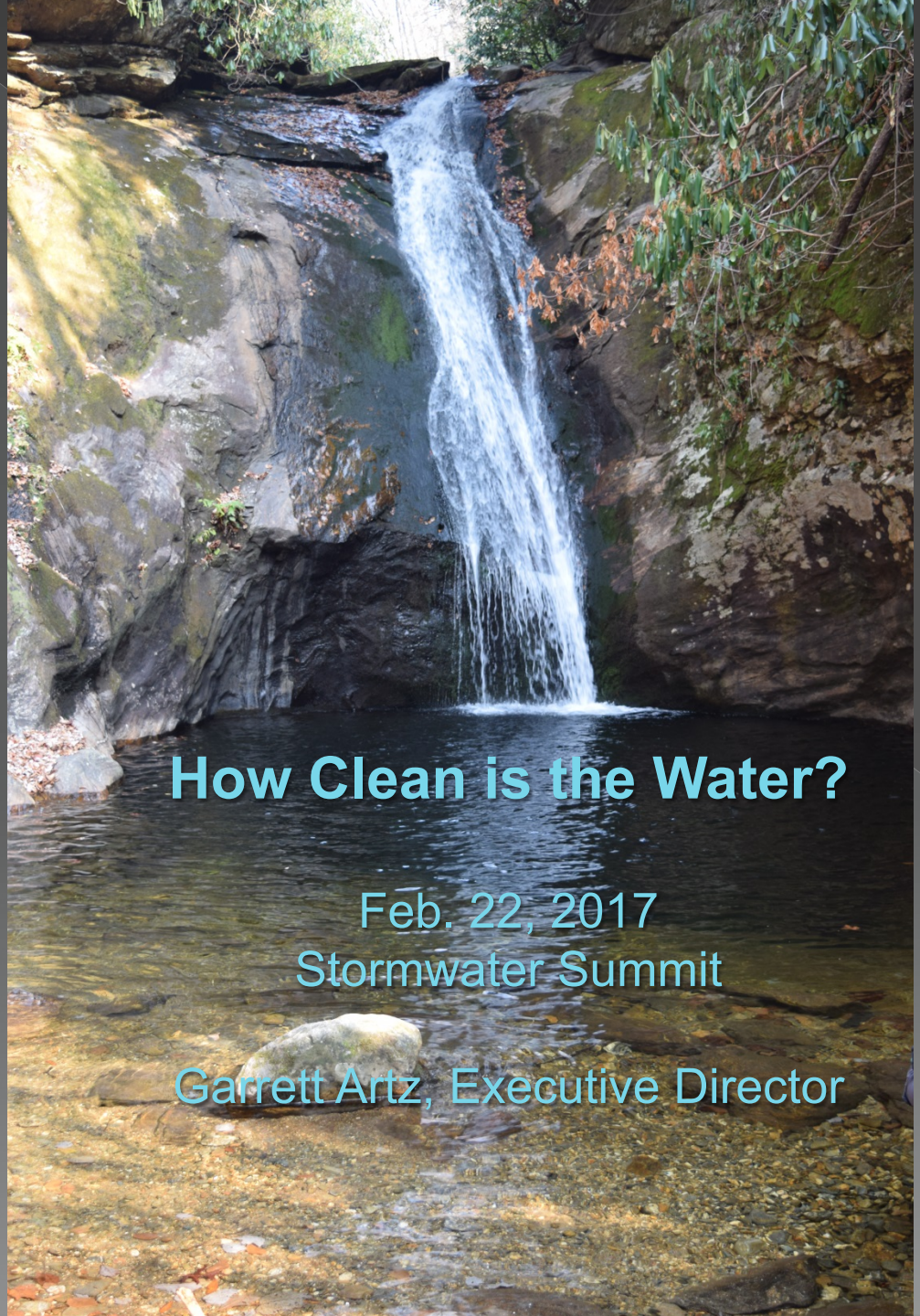

How Clean is the Water?

Feb. 22, 2017
Stormwater Summit

Garrett Artz, Executive Director

RIVER LINK

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RiverLink

est. 1987

RiverLink promotes the environmental and economic vitality of the French Broad River and its watershed as a place to live, learn, work, and play.

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Clean Water Drives Economic Success

Clean Water Drives Economic Success

- Vibrant Brewing Scene
- Nationally recognized destination
- More to come:
  - Tiger 6 and > $50M Invested
  - Bond Approvals – Woodfin
- High quality of life attracts business

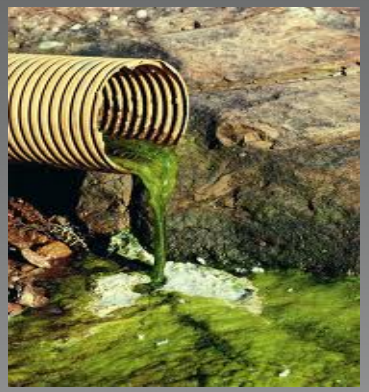
How did we get here?

- Bold Vision
- We planned – Wilma Dykeman Riverway Plan
- Community Participation
- Community/Political Buy In
- Execution – Where we are now

Is the Water Clean . . . enough to swim, etc.?

Point Source Pollution

A single identifiable source of pollution.



Nonpoint Source Pollution

Erosion, Land runoff, precipitation, atmospheric deposition, drainage, or seepage.

Where are we going & how to get there?

- Non-metrics answer – clear water after a storm
- Issues to address:
  - Stormwater
  - Point Source - Garbage
  - Agriculture
  - Construction and sediment
  - Stream Restoration

How to get there? Approaches?

- Collective Impact – abandon own agenda for collective one
- 5 elements
  - Common agenda
  - Measuring results consistently
  - Plan of action - mutually enforcing activities
  - Open and continuous Communication
  - Backbone organization(s) with dedicated staff

How to get there? Approaches?

- Collective Impact – See Stanford Social Innovation
- Existing collaborations:
  - Stormwater Summit
  - American Rivers Dam Removal Group
  - Blue Ridge Forever (Accredited Land Trusts)
- Upper French Broad River Partnership?

Don’t forget - Equity & Inclusion

- Communities of Color/Poverty
  - Town “Nasty” Branch
- Everybody’s Environment
- Rural Communities

Thank You
&
Please support us!

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Erosion Sediment Control & Steep Slopes

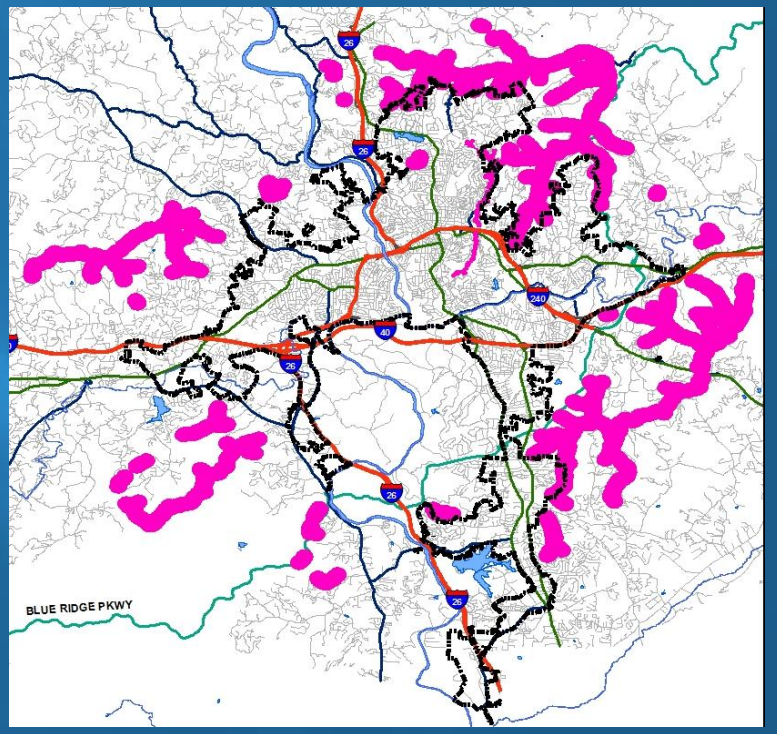
- Erosion & Sediment Control
  - Permitting & Design
  - Challenges
- Steep Slopes
  - Constructed Slopes UDO 7-12-2
  - Steep Slope Ordinance UDO 7-12-4

Erosion and Sediment Control

- Permitting:
  - 500 sq. ft. land disturbance
  - Formal Plan
    - 10,000 sq. ft. land disturbance
  - 3rd party Inspector
    - 25,000 sq. ft. land disturbance
  - Re-vegetation Bond
    - 5 acres land disturbance

Steep Slopes & Ridgeline

- Steep Slope-
  - Zone A: 2220′ to 2349′
  - Zone B: above 2350′
  - 15% existing grade
- Ridgeline-
  - Land within 100 vertical feet of ridgeline – designated on Ridge Top Map



Steep Slopes & Ridgeline

Limits of Disturbance Allowed

	Zone A (2220′-2349′)	Zone B (>2350′)
Existing Grade	Maximum % Site Graded	
15-19%	80%	45%
20-24%	70%	40%
25-29%	60%	35%
30-34%	45%	30%
35-39%	35%	25%
40+	20%	15%

- Steep Slopes:
  - Limits of Disturbance
  - Road Construction
  - Constructed Slopes
  - Structure Height and Depth
  - Tree & Vegetation Preservation
  - Density
- All Slopes:
  - Geo-technical report required
    - >36% slope requires
    - High-Moderate Hazzard on Buncombe County Slope Stability Index Map

Steep Slopes & Grading

Grading UDO 7-12-2

Slope	Spacing of 5′ benches
50% (2:1)	No more than 20 vertical feet
33% (3:1)	No more than 35 vertical feet
25% (4:1)	No more than 45 vertical feet

Steep Slopes UDO 7-12-4

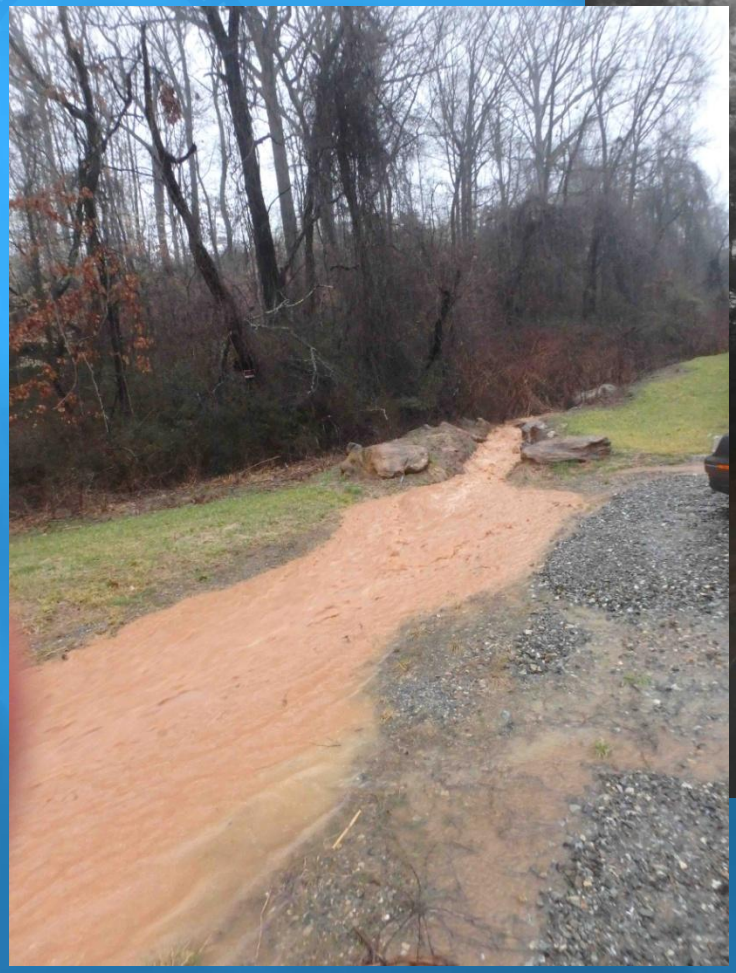
Slope Type	Maximum Slope	Maximum Vertical Height
Cut Slope	1.5:1	30 ft.
	2:1	40 ft.
	<2.5:1	30 ft.
Fill Slope	2:1	40 ft.
	<2.5:1	30 ft.

All slopes greater than 2:1 slope and 5′ vertical height requires a Geo-tech slope certification.

Erosion and Sediment Control

Erosion Sediment Control & Steep Slopes

Erosion and Sediment Control



Erosion Sediment Control & Steep Slopes

Stormwater & Localized Flooding

Erosion Sediment Control & Steep Slopes

Stormwater Control Measure Operations & Maintenance Facilitated Discussion

The Challenge: Fund, Design, Build…

MAINTAIN so that the SCM continues to operate as designed and hopefully built.

- Who ensures/enforces maintenance in your communities?
- Is O&M codified?
- Who performs the work?
- How often?
- What issues are being encountered? Over-Mowing, Invasives, Clogging, Improper Chemical Application, Structural/Mechanical Failure, …

GREEN INFRASTRUCTURE ON THE UNC ASHEVILLE CAMPUS

INTEGRATION OF ECOLOGICALLY CONNECTED SYSTEMS

Green Infrastructure

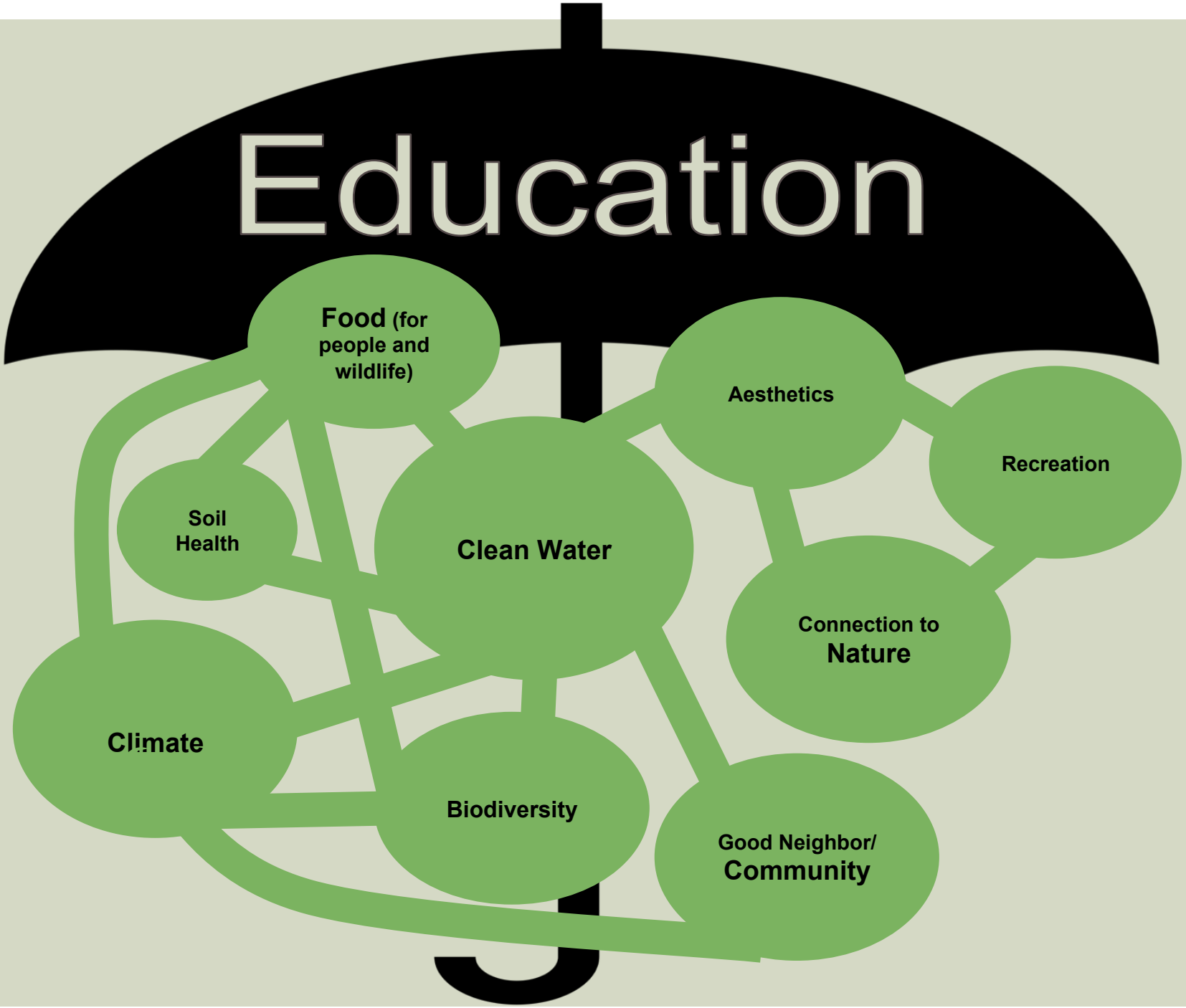
CAMPUS NATURAL SYSTEMS DIRECTLY SUPPORTING HUMAN HEALTH AND WELL BEING - BODY, MIND AND SPIRIT

- **PHYSICAL ACTIVITY- OPEN SPACE FOR RECREATION, TRAILS**
- **PEACE AND SERENITY- NOISE POLLUTION MITIGATION- ELECTRIC VEHICLES AND EQUIPMENT, PLACES DESIGNED FOR QUIET**
- **AESTHEICS, BEAUTY FOR BEAUTY'S SAKE**
- **THE CONNECTEDNESS OF ALL LIVING THINGS- WILDLIFE**

GREEN INFRASTRUCTURE

CAMPUS NATURAL SYSTEMS DIRECTLY SUPPORTING HUMAN AND PLANET SURVIVAL

- CLEAN AIR-DESIGN OF LANDSCAPES TO REDUCE USE OF SMALL ENGINES, ELECTRIC VEHICLES
- CLEAN WATER –STORMWATER MANAGEMENT, RAINWATER
- SOIL- CONSERVATION,RESTORATION, CARBON SINK
- OPEN SPACE/URBAN FORESTS
- BIODIVERSITY OF SPECIES AND HABITATS
- CLIMATE AND MICRO-CLIMATE
- FOOD- POLLINATORS, PERMACULTURE, EDIBLE LANDSCAPING


Education
Food (for people and wildlife)
Aesthetics
Recreation
Soil Health
Clean Water
Connection to Nature
Climate
Biodiversity
Good Neighbor/ Community

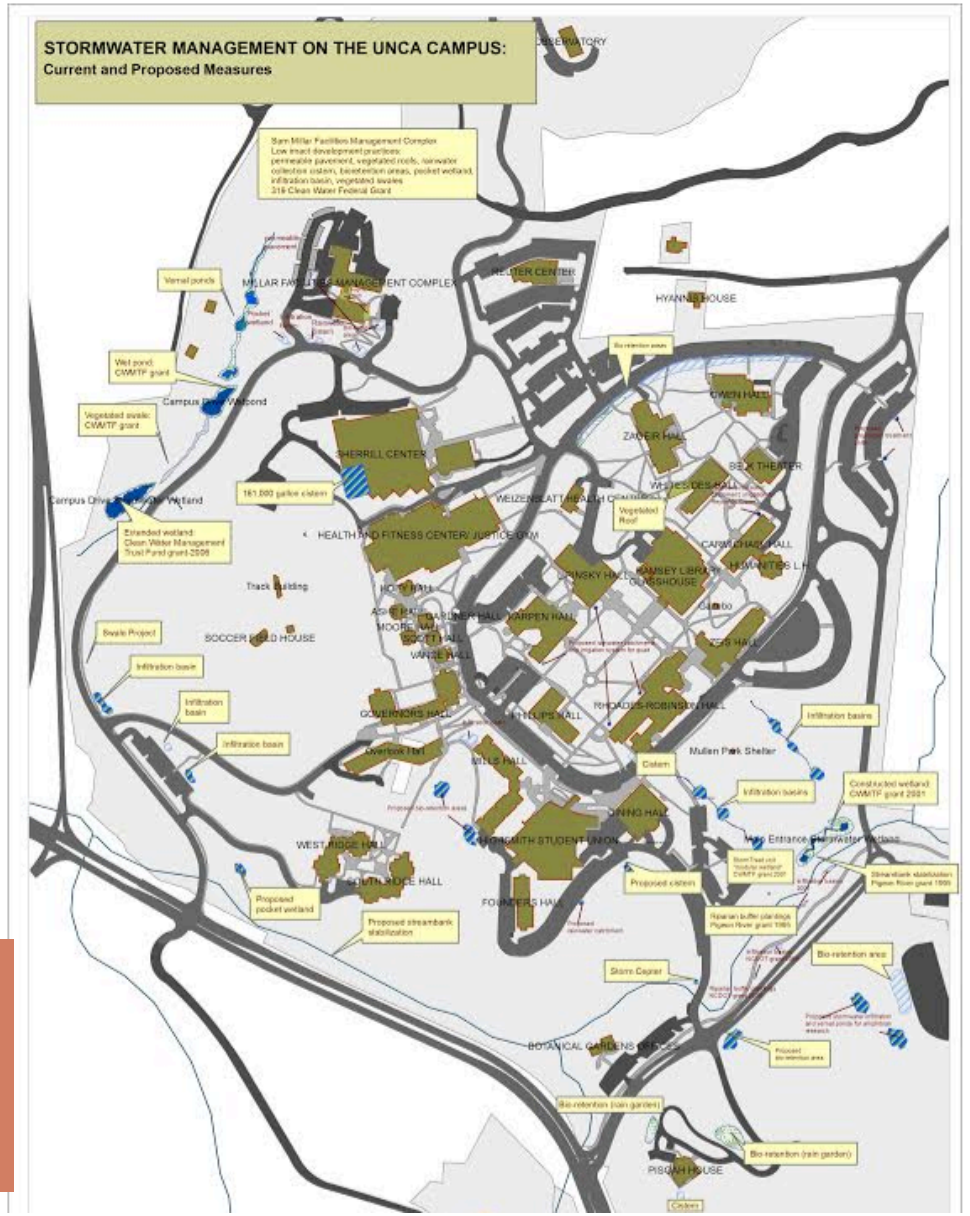
GREEN INFRASTRUCTURE

CAMPUS NATURAL SYSTEMS DIRECTLY SUPPORTING HUMAN AND PLANET SURVIVAL

2006

2016

INTEGRATED STORMWATER MANAGEMENT



OUR WATER QUALITY GOAL: NO UNTREATED RUNOFF FROM THE UNC ASHEVILLE CAMPUS WILL REACH THE FRENCH BROAD RIVER

INTEGRATED STORMWATER MANAGEMENT

2003 Clean Water Management Trust Fund

Main Entrance Constructed Wetland
33 acre Watershed

Micro-Watershed

INTEGRATED STORMWATER MANAGEMENT

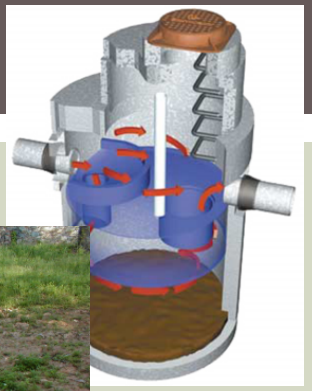
STREAMBANK STABILIZATION AND RIPARIAN BUFFER PLANTINGS

2014

Pigeon River Grants
1998-2013

INTEGRATED STORMWATER MANAGEMENT

VEGETATED INFILTRATION BASINS



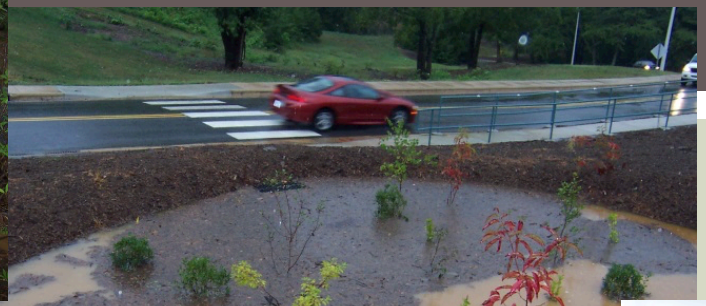
PROPRIETARY TREATMENT SYSTEMS

GREEN ROOFS

INTEGRATED STORMWATER MANAGEMENT

CONSTRUCTED WETLANDS AND WETPOND
CWMTF 2006-2007

INTEGRATED STORMWATER MANAGEMENT



BIORETENTION CELLS

NC 319 2006-2007

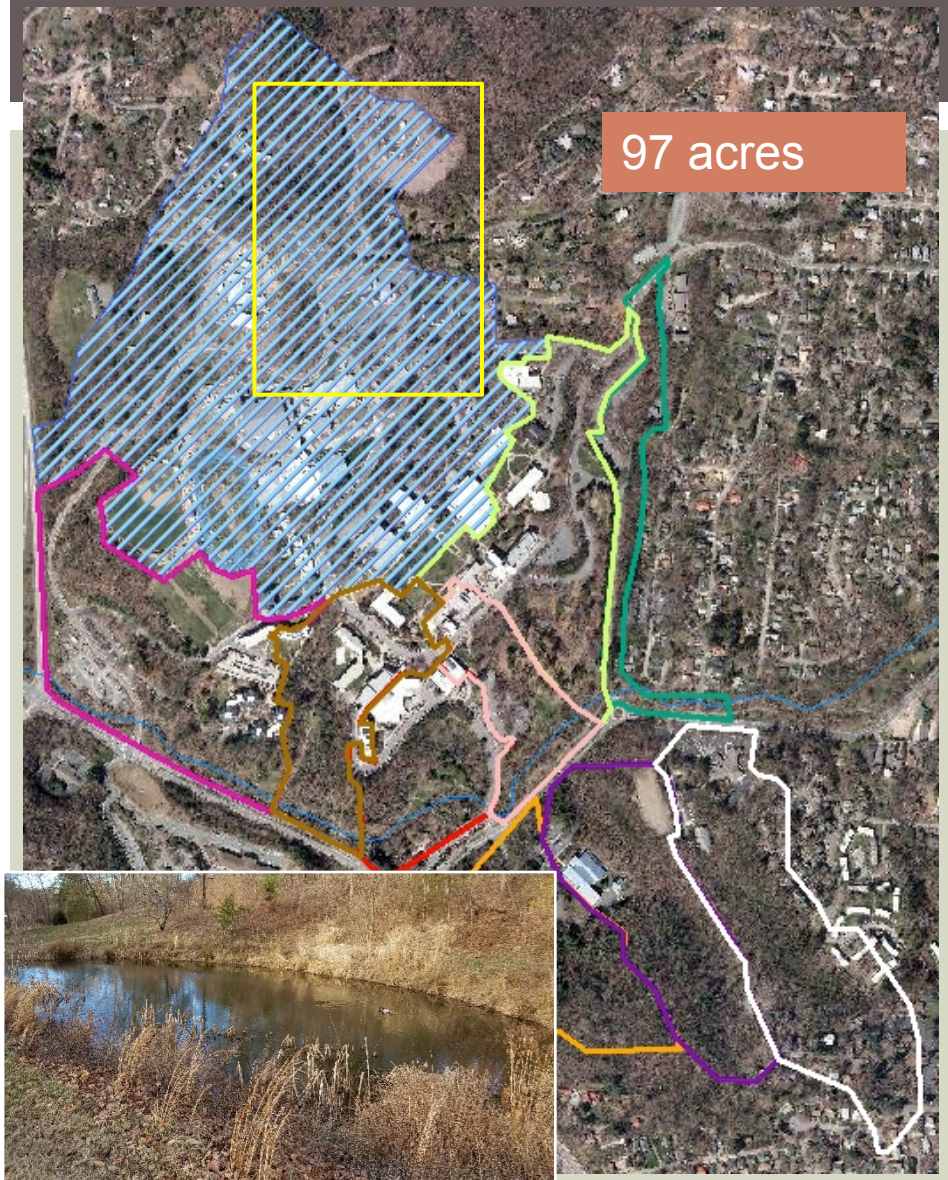
INTEGRATED STORMWATER MANAGEMENT

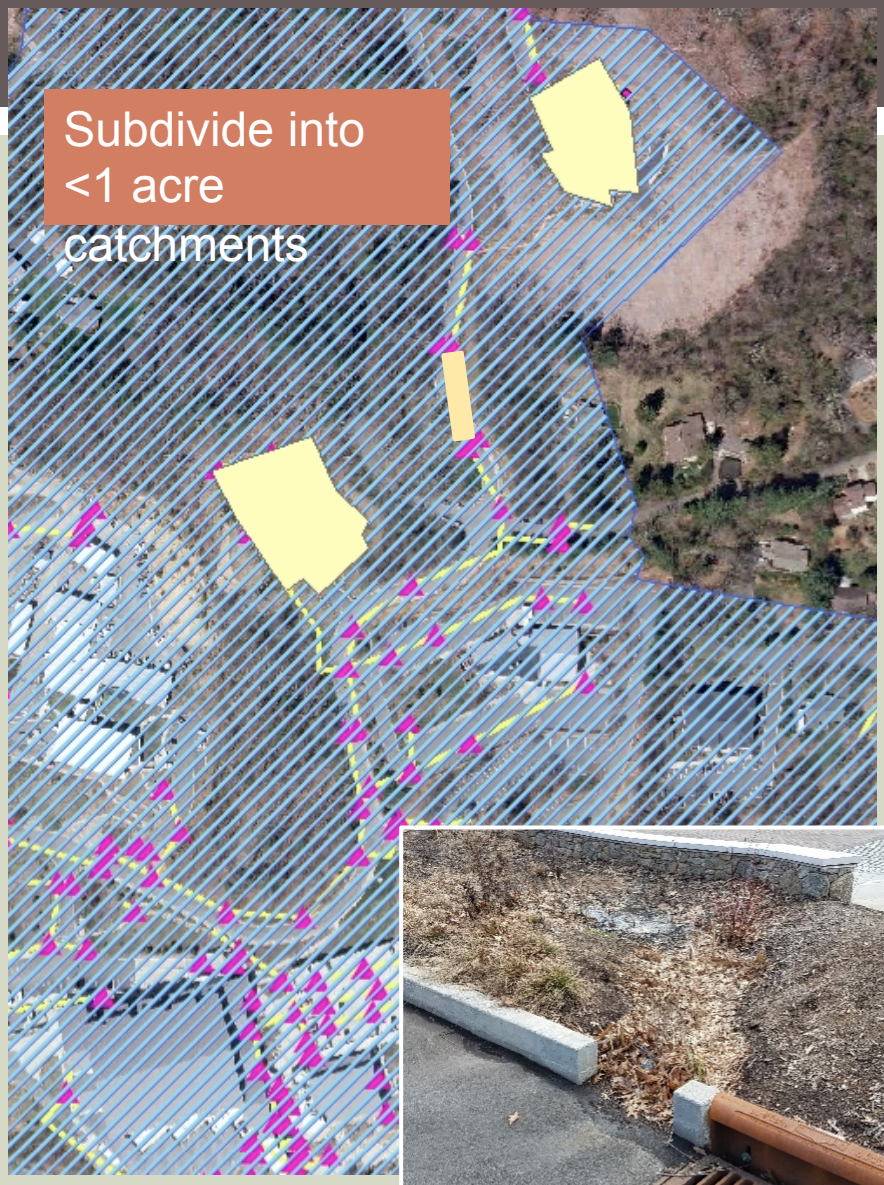
MILLER COMPLEX LOW IMPACT DEVELOPMENT

- Permeable Pavement
- Vegetated Roof
- Bioretention cells
- Vegetated Swale
- Infiltration Basin
- Rainwater Cistern
- Pocket Wetland
- Permaculture Swales
- Soil Restoration

NC 319 2006-2007

FUTURE DIRECTIONS: SMALLER SCALE



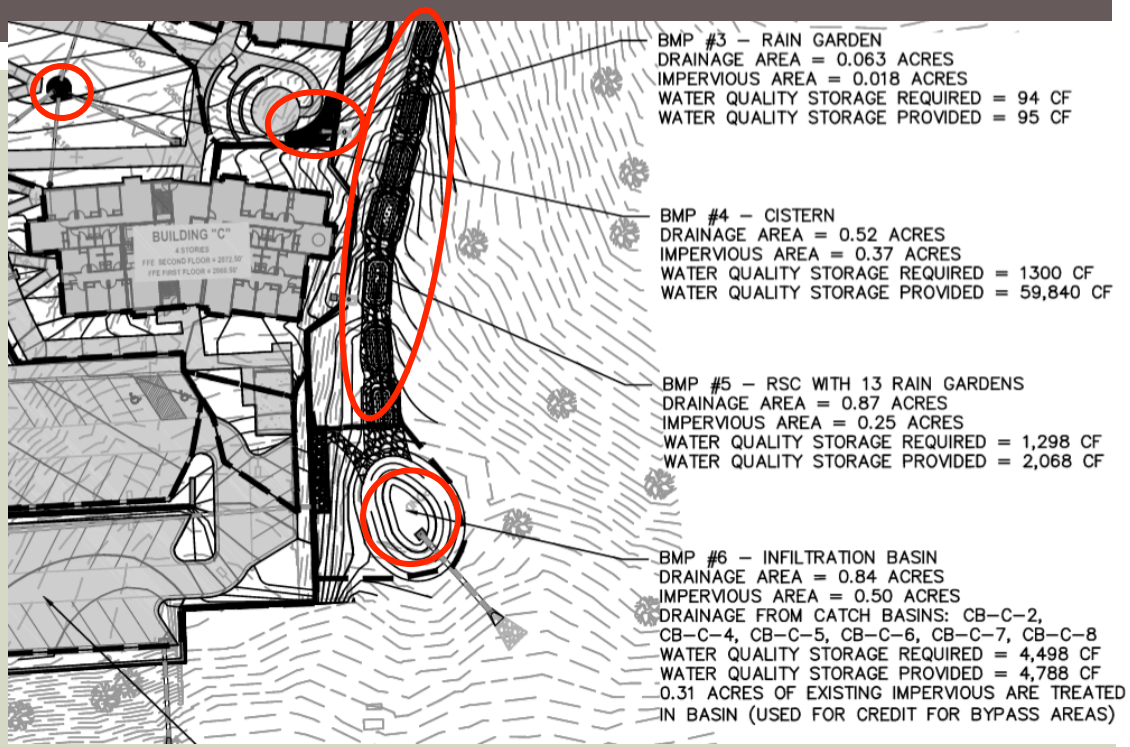


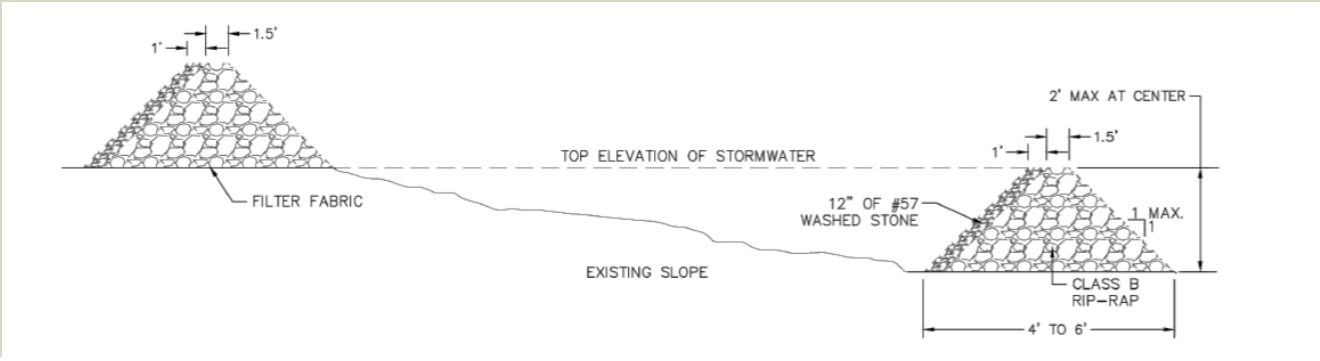
Current Project: OBSERVATORY WETLAND

FUTURE DIRECTIONS: NEW CONSTRUCTION PROJECTS

From UNCA Design and Construction Guidelines:

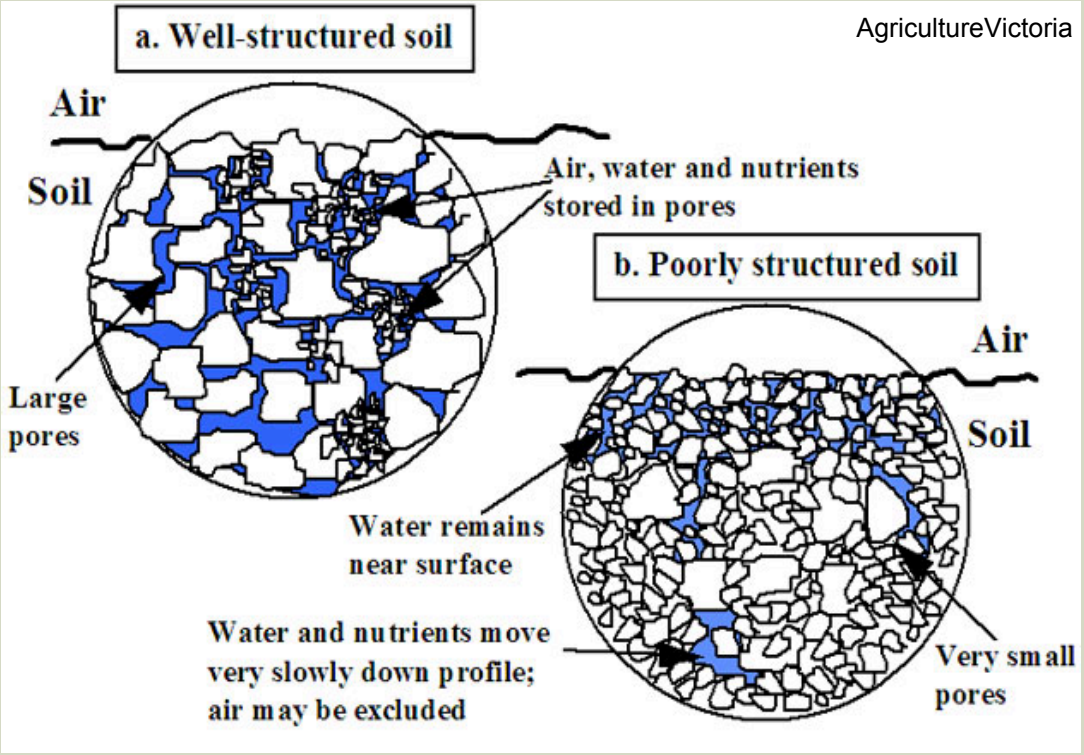
"Whenever practicable, collected rainwater should be re-used in toilet flushing or landscape irrigation. In addition, stormwater design strategies should give priority to infiltration of rainwater as close to the source as possible. "





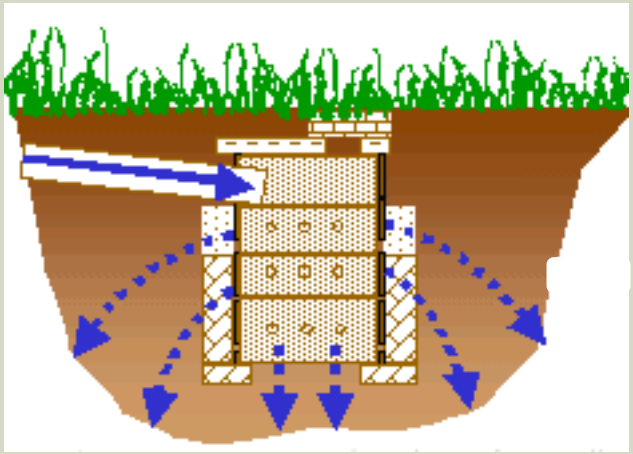
FUTURE DIRECTIONS: SOIL RESTORATION AS BMP

- Enhance compacted soils to improve porosity and nutrient retention
- Promotes root growth, microbial activity, and infiltration
- Can reduce runoff from 30-75%
- TSS:85%
- Undergraduate research opportunity



FUTURE DIRECTIONS: STORMWATER BOG

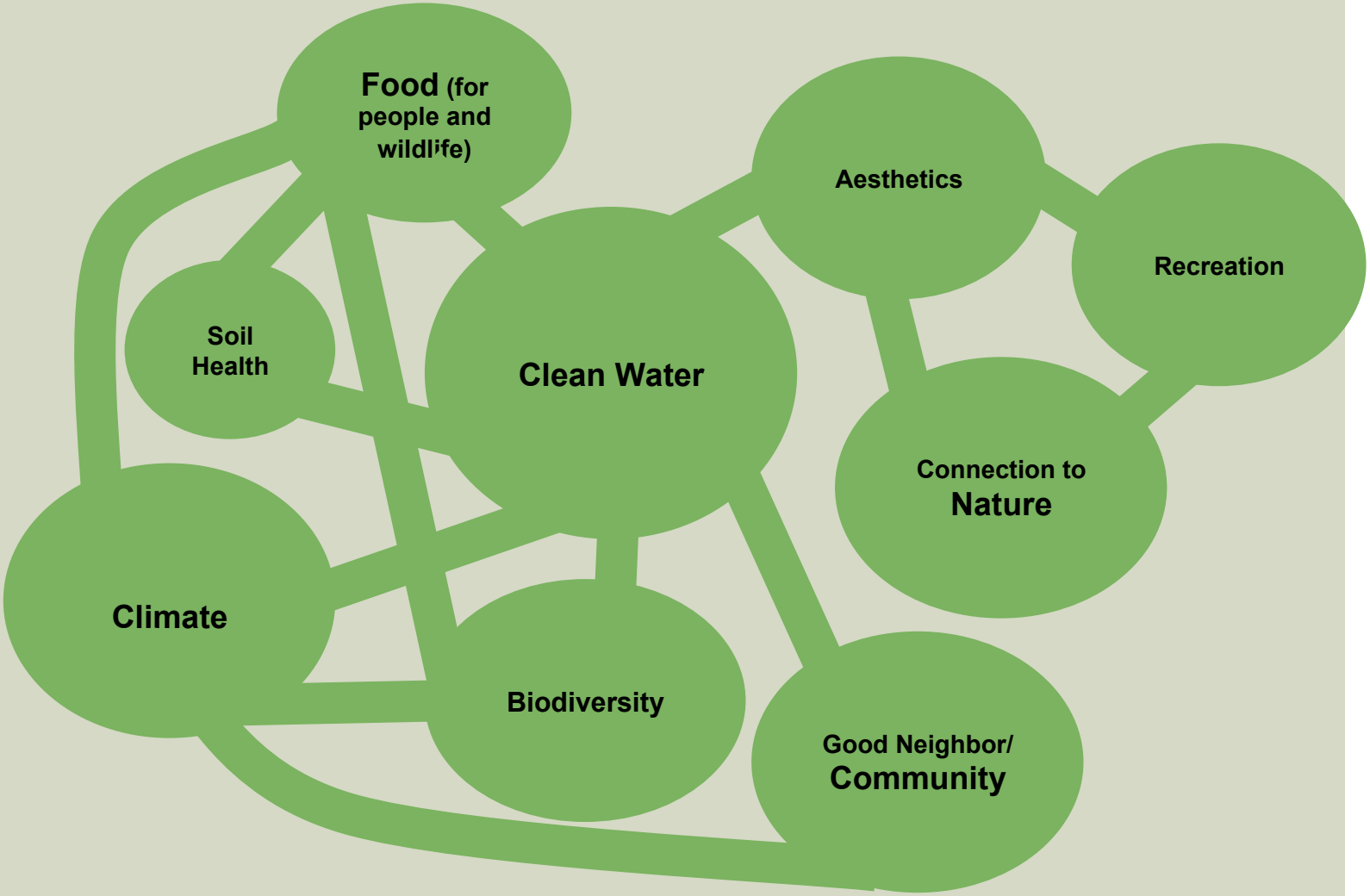
- Not typical site, stretching convention
- Simulate ground-fed fen/ bog
- Viewed as a re-use project
  - Serve as an outdoor laboratory for classes and research projects
  - Provide habitat for wildlife
  - Safeguard local genotypes
  - Grow plant material for research or reintroduction to natural habitats
  - Supplement geographically isolated natural habitats



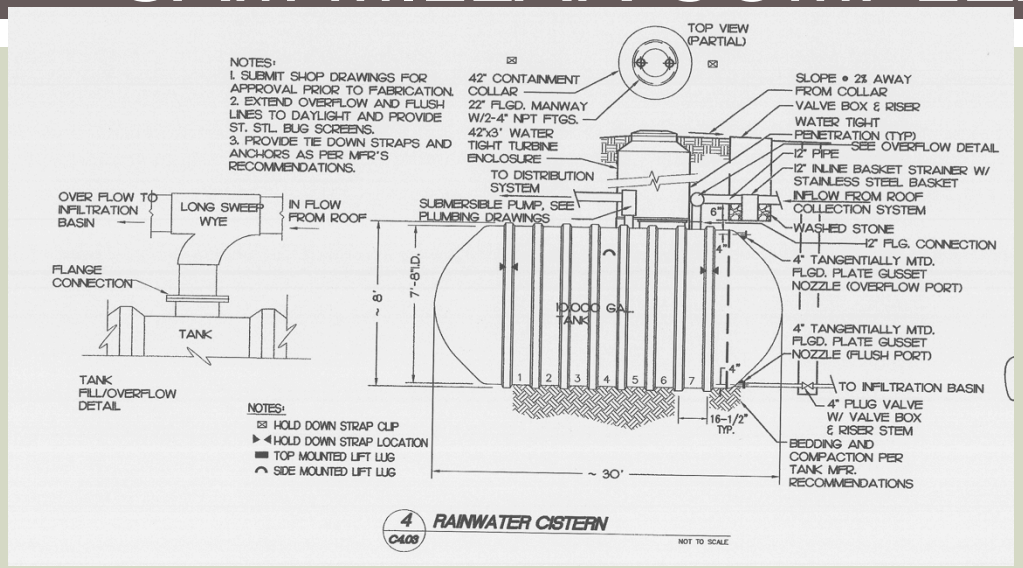
CHALLENGES

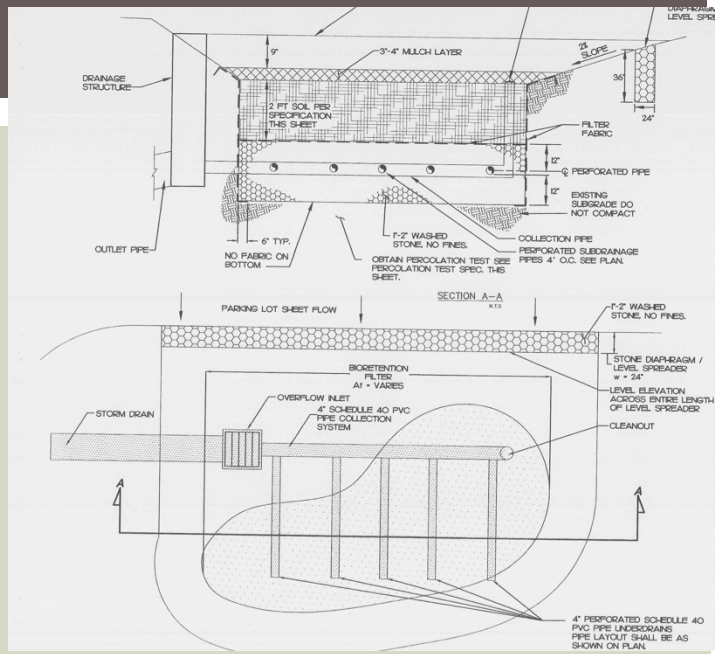

Questions?

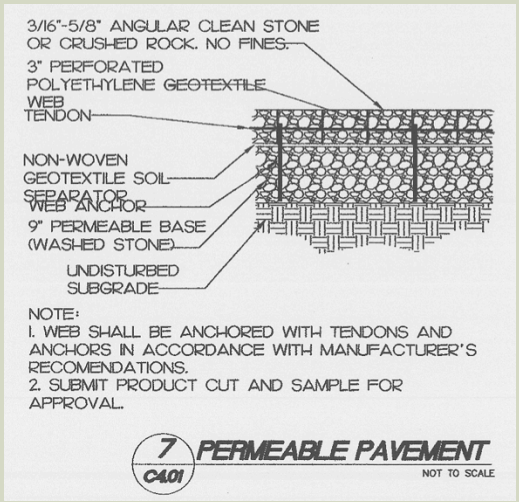

MILLAR FACILITIES
MANAGEMENT

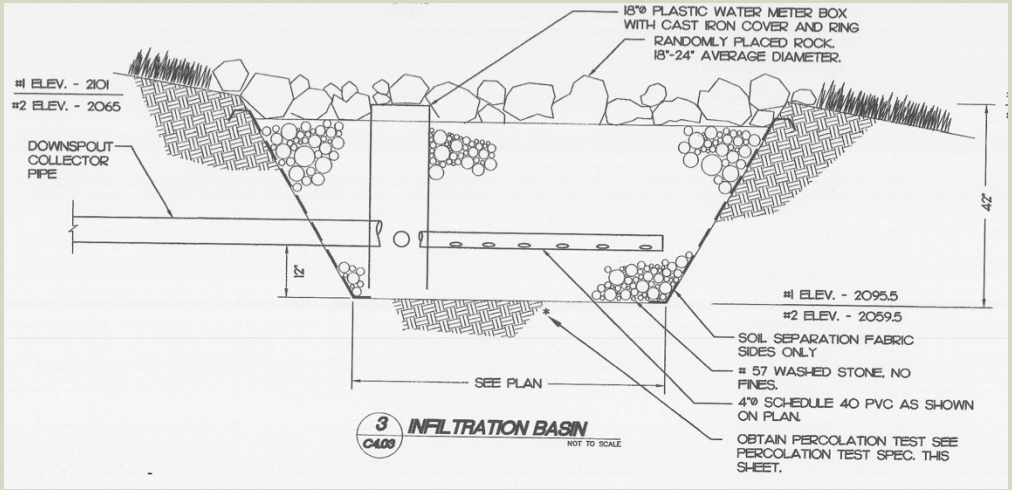

Food (for people and wildlife)
Aesthetics
Recreation
Soil Health
Clean Water
Connection to Nature
Climate
Biodiversity
Good Neighbor/ Community

LOW IMPACT DEVELOPMENT SAM MILLAR COMPLEX

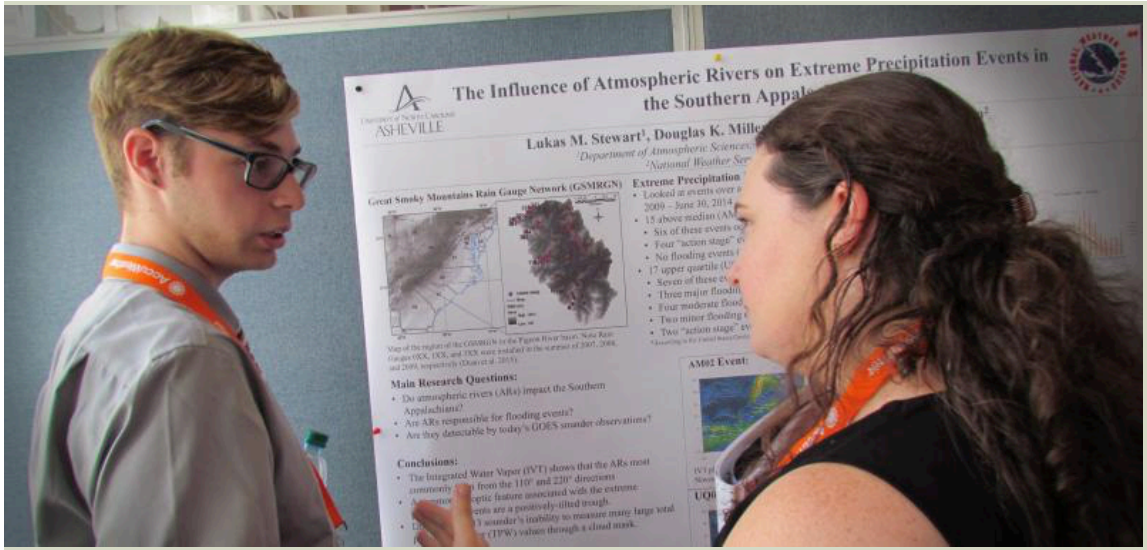








MULTI-USE SYSTEMS



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Bee Campus USA
One Campus At A Time

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