Low Impact Development

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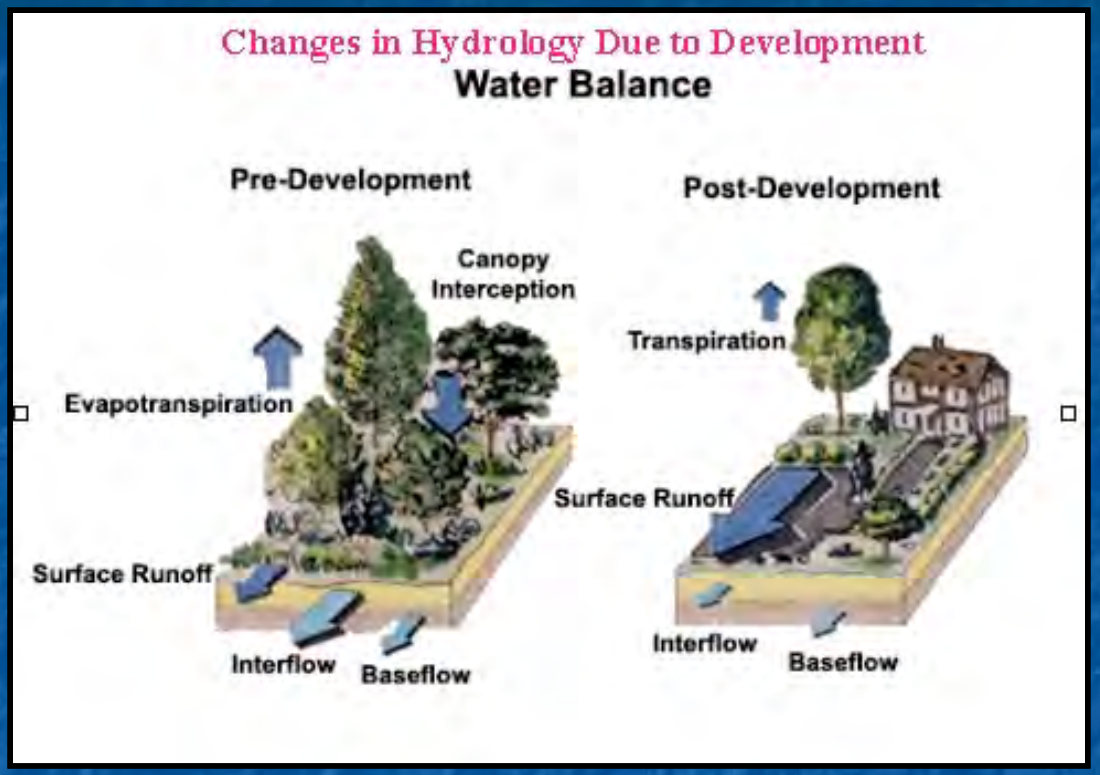
What is Low Impact Development?



Infiltrate Filter Store Evaporate Detain

"An innovative stormwater management system approach with a basic principle that is modeled after nature."

Low Impact Development Center

Key Distinctions of LID

- Stormwater management at a local scale to minimize impact of development on the local watershed
- Ecosystem based – design what you are building as a functioning part of the ecosystem, not apart from it
- Relies on advanced technologies more than conservation and growth management ... LID should be a part of smart growth plans

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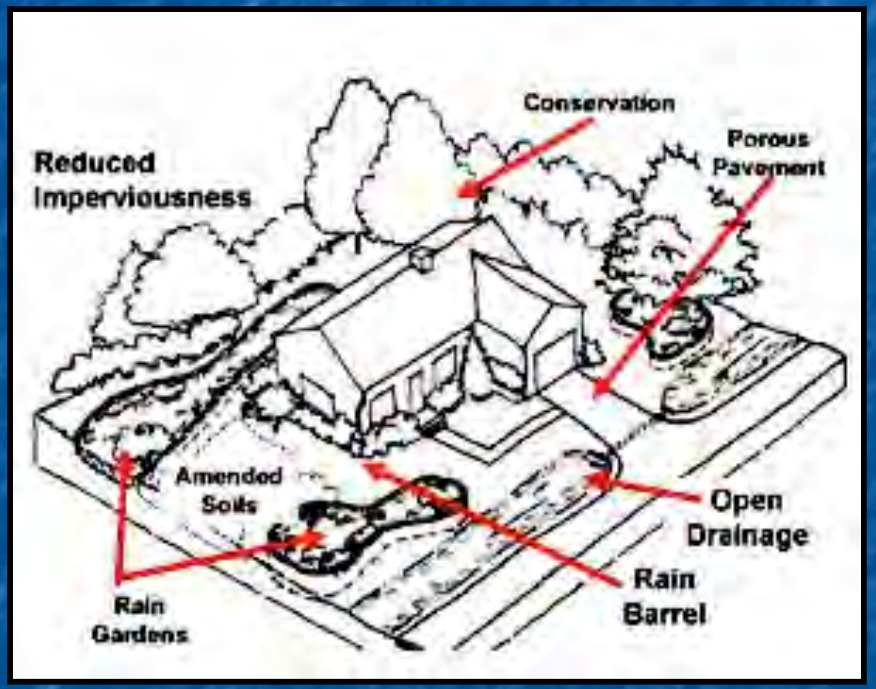
Creating a Hydrologically Functional Lot

- LID addresses stormwater through small, cost-effective landscape features located at the lot level
- Integrated Management Practices (IMPs)

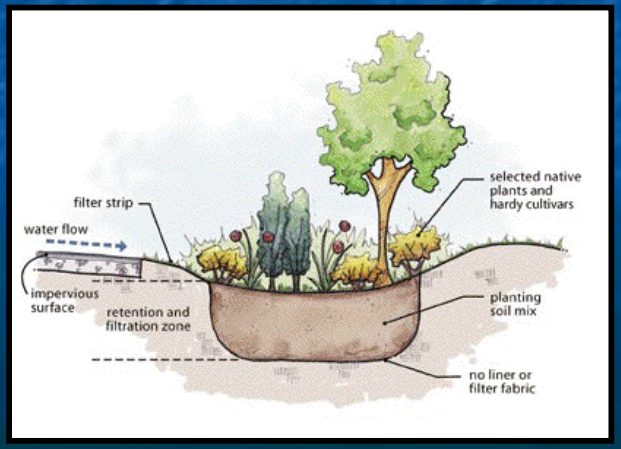


Rain Gardens/ Conservation/ Porous Pavement/ Reduced Impervious/Amended Soils/ Open Drainage/ Rain Barrel

Integrated Management Practices (IMPs)

- The term IMP is used because controls are integrated throughout the project and provide a landscape amenity

Rain Gardens/ Conservation/ Porous Pavement/ Reduced Impervious/Amended Soils/ Open Drainage/ Rain Barrel



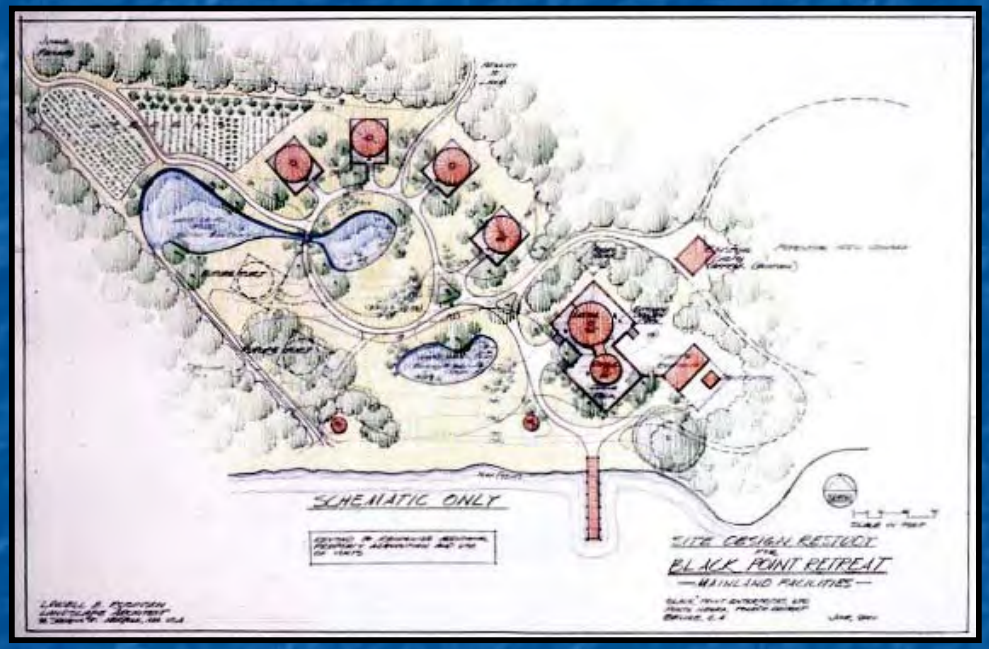
BMPs May Be IMPs

BMPs frequently used in LID development:

- Rain Gardens
- Constructed Wetlands
- Permeable Parking
- Green Roofs

Where can I use LID?

- New developments
- Urban retrofits
- Redevelopment / Revitalization

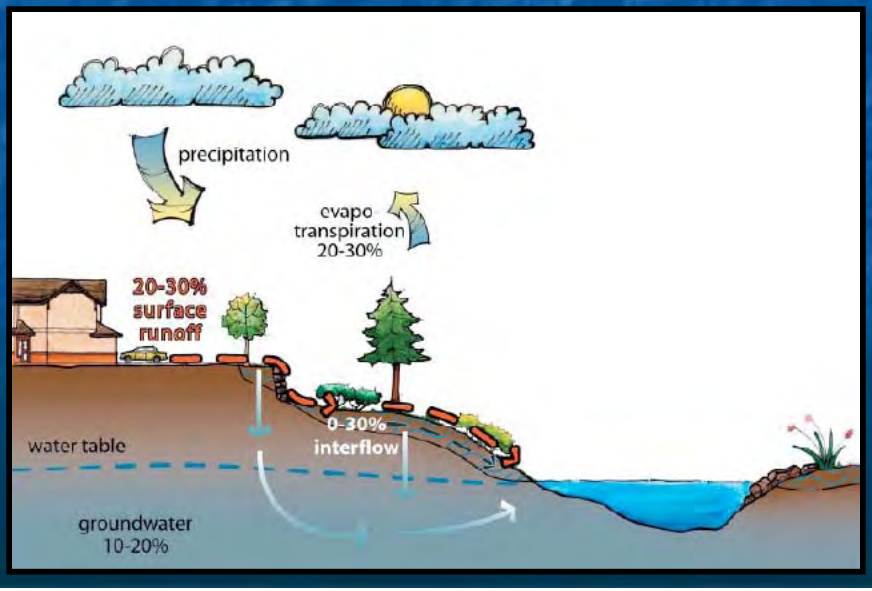


History of LID

- Introduction of bioretention technology in Prince Georges County, Maryland in mid-1980's

Key Elements of LID

- Conservation
  - Preserves native trees, vegetation and soils
  - Maintains natural drainage patterns
- Small Scale Controls
  - Mimics natural hydrology and processes

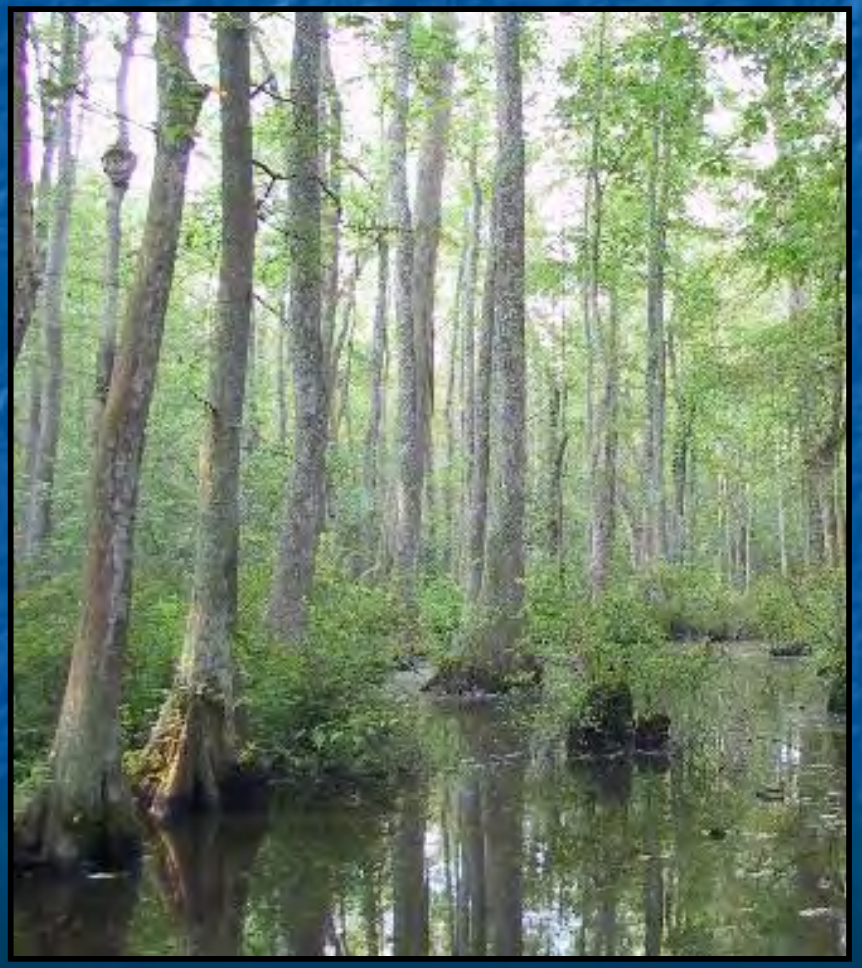


Key Elements of LID

- Customized Site Design
  - Ensures each site helps protect the entire watershed
- Maintenance Pollution Prevention and Education
  - Reduces pollutant loads and increases efficiency and longevity
  - Educates and involves the public

Key Elements of LID

- Directing runoff to natural areas
  - Effective ground water recharge areas
  - LID plans retain as much of the stormwater on site as possible



Why use LID?

- Enhances local environment
- Protects public health
- Improves community livability
- Saves developers and local governments money

LID provides the key in its emphasis on controlling or at least minimizing the changes to the local hydrologic cycle or regime.

Low Impact Development Center

Economics of LID

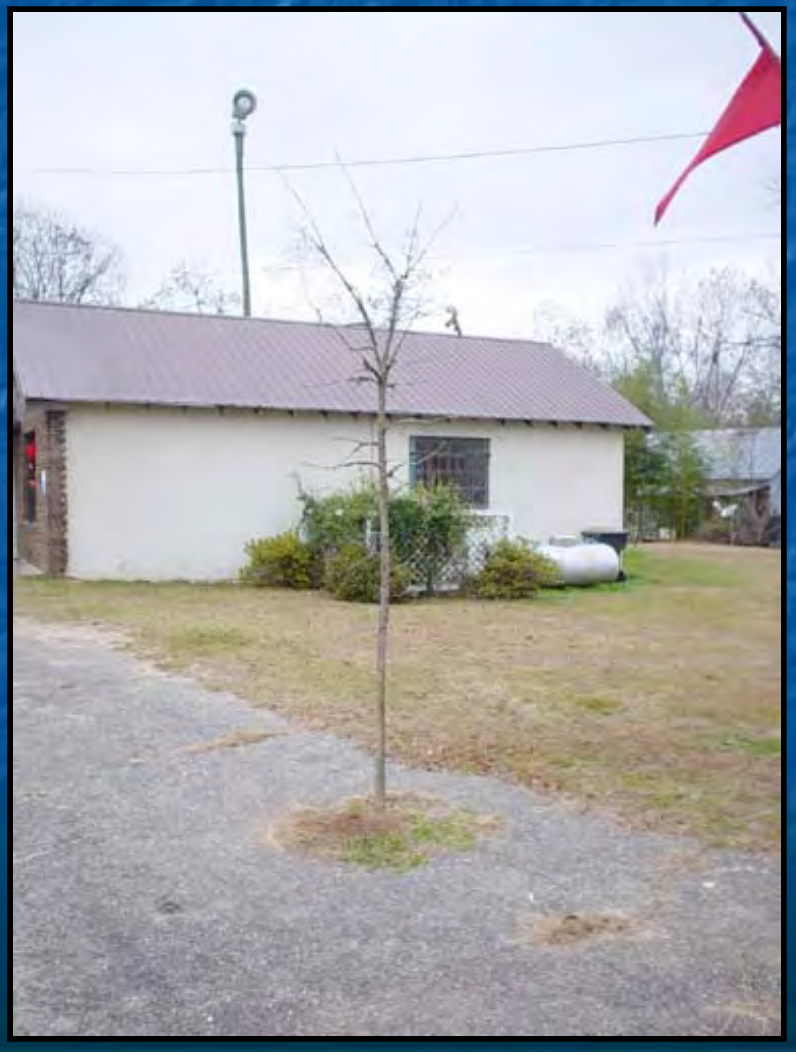
At least a 25-30% reduction in costs associated with site development, stormwater fees, and maintenance for residential developments that use LID techniques (Low Impact Development Center, Inc.)

Developers may save over 50% of stormwater construction costs (Low Impact Development (LID): A Literature Review, EPA)

How? Reductions in clearing, grading, pipes, ponds, inlets, curbs and paving

LID Practices – Where do I apply them?

- Open space
- Roof tops
- Streetscapes
- Parking lots
- Sidewalks
- Medians



Typical LID Design Components

- ***Vegetation***
  - Remove water through evapotranspiration
  - Pollutant removal through nutrient cycling

Typical LID Design Components

- *Vegetation*
- ***Pervious surfaces***
  - Allow stormwater to infiltrate into underlying soils
  - Promotes groundwater recharge and pollutant processing
  - Reduces volume of rainfall runoff

Typical LID Design Components

- *Vegetation*
- *Pervious pavements*
- ***Bioretention Systems***
  - Detain water long enough for infiltration and pollution removal to occur
  - Buffer strips, rain gardens, stormwater wetlands, grass swales

Green Roofs

Help to lessen the effects of urbanization on water quality by filtering, absorbing or detaining rainfall

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Pervious Pavement

- Allows water to infiltrate through the construction material back into the ground

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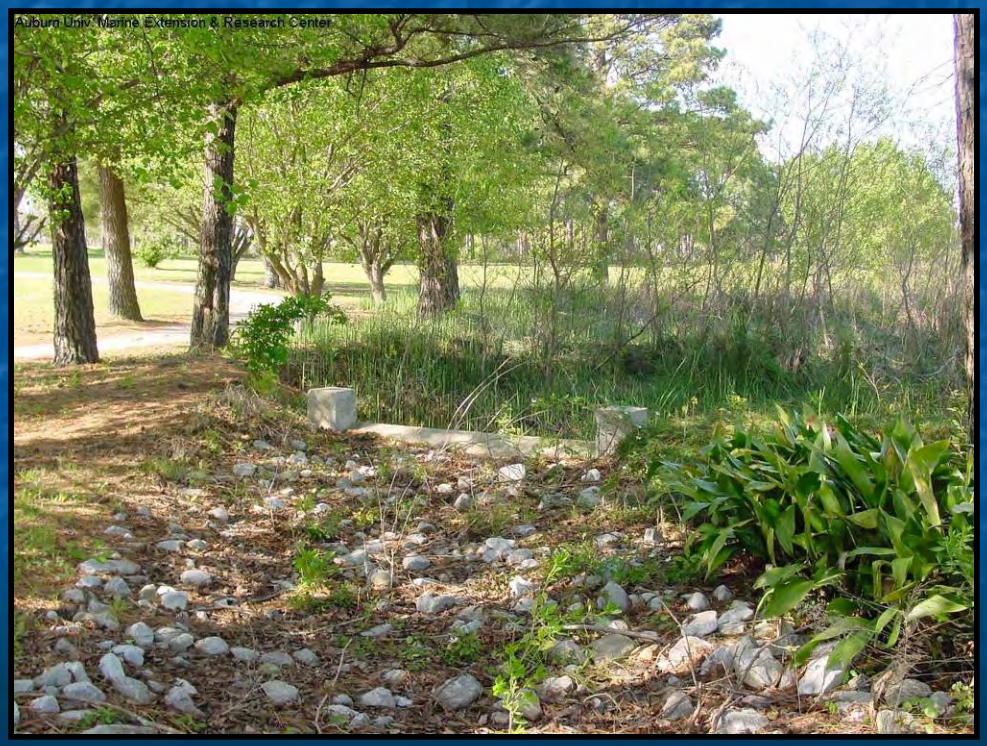
Good candidates for permeable parking areas …

- Sports complexes
- Small office parking lots
- Churches
- Museums
- Overflow parking areas

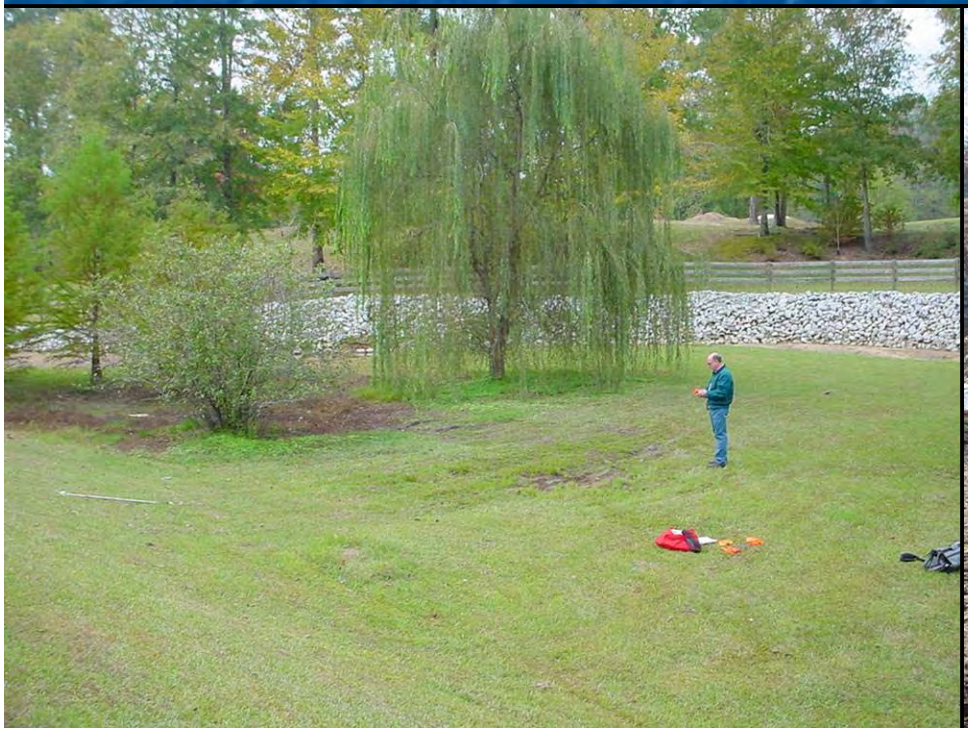
STORMWATER WETLANDS

TREAT STORMWATER RUNOFF BY SLOWING STORMWATER WHICH TRAPS POLLUTANTS



Stormwater Wetlands

- Depth to groundwater most important factor – intersect groundwater



Filter Strips

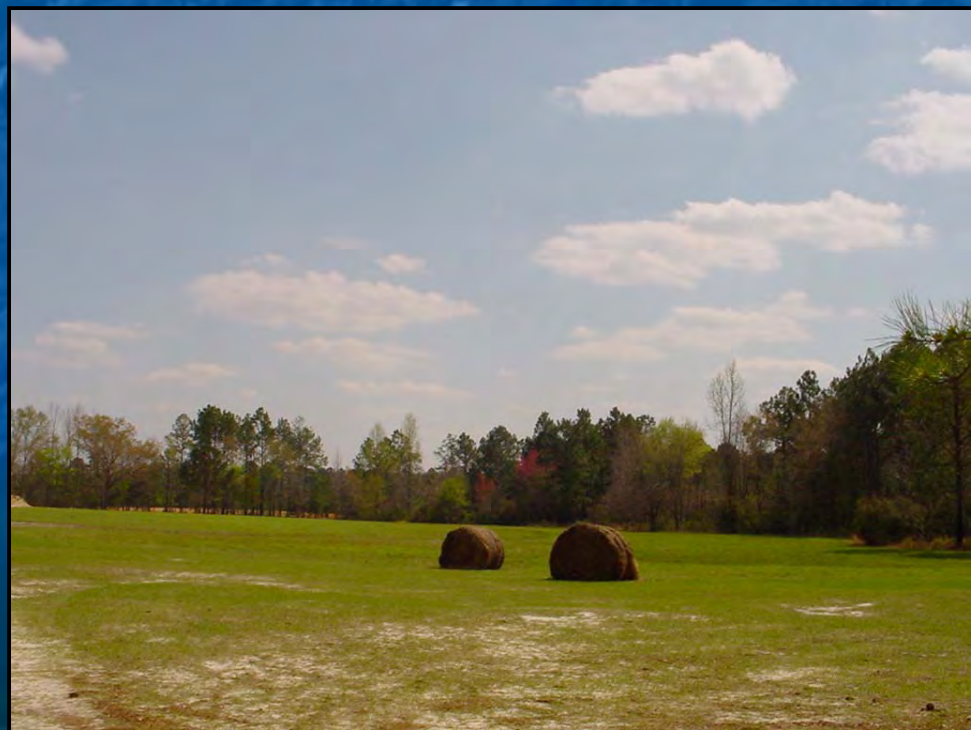
- **Can be designed as landscape features within parking lots or other areas to collect flow from large impervious surfaces**

Grass Swales

- **Uses grass or other vegetation to reduce runoff velocity and allow filtration, while high volume flows are channeled away safely**
- **Function as alternatives to curb and gutter systems**

Open Space

- Parks
- Recreational fields
- Land cover that allows stormwater to soak into the ground



CISTERNS AND RAIN BARRELS

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STORES ROOFTOP RUNOFF

Narrow Streets

Reduce the amount of impervious surfaces, thereby reducing flooding and pollution from stormwater runoff

NO CURB AND GUTTER

Avoiding the standard curb and gutter road design allows water to flow off the road and not accumulate in any one spot

Reduce or Shared Driveway

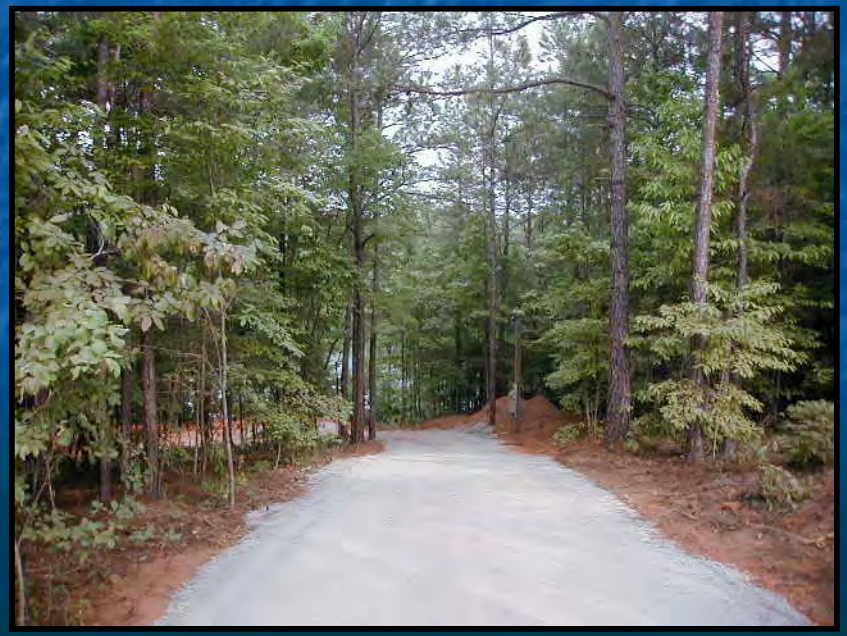
Minimizing house setbacks from streets and narrowing driveways reduces impervious surfaces

That’s a Great Idea ...

but is anyone doing it?

Residential LID

- Murphy Lake, Dadeville, AL
- New development
- 12% slope to driveway, conventional crush & run was not working



Residential LID—Lake Martin

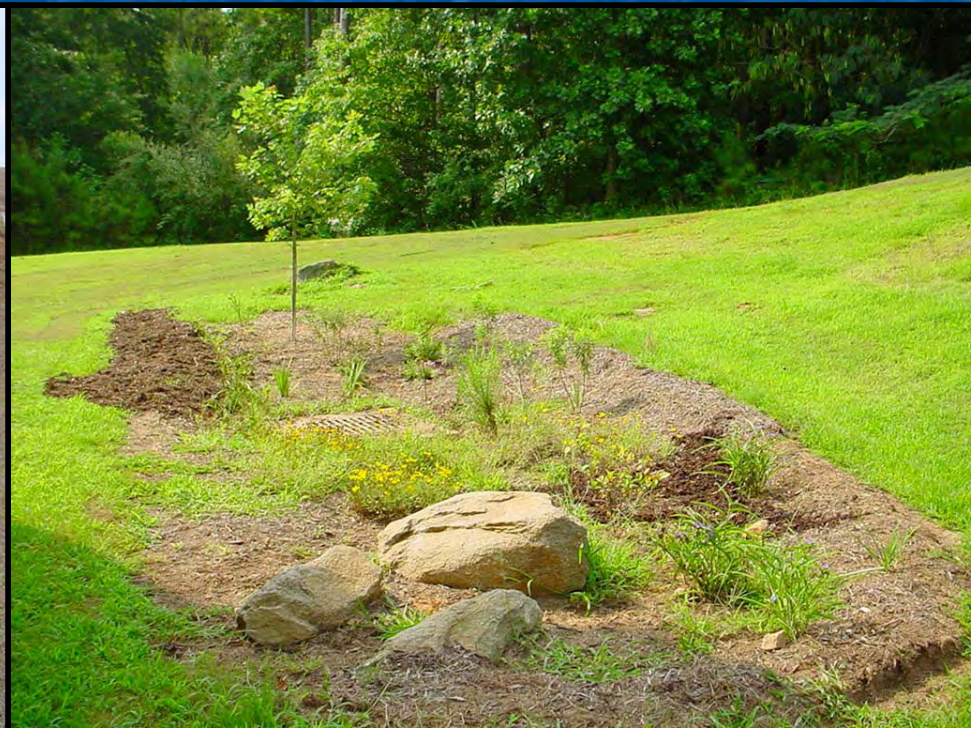
- Plastic hexagonal turf block using pea gravel for fill
  - base is #57 stone – 75% gravel, 25% sand
- 60-80% of the cost of a standard drive

City of Alexander City, AL

- 4 Raingardens installed, 1 wetland
- Demonstration Projects – improve stormwater runoff while educating public

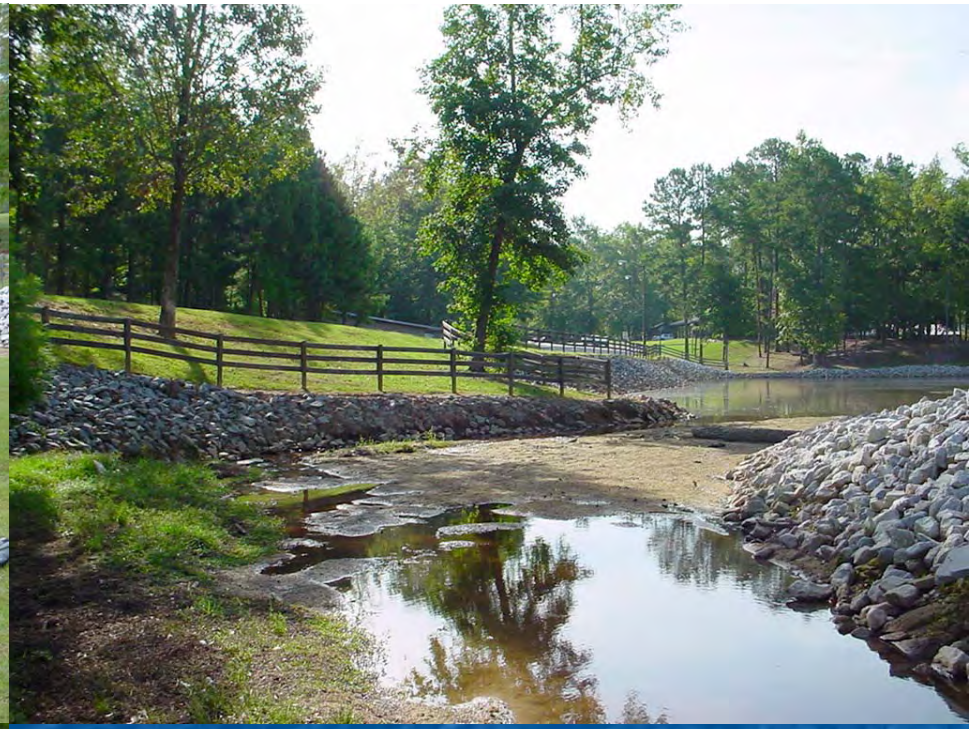
Radney Middle School, Alexander City , AL

- Radney Middle School



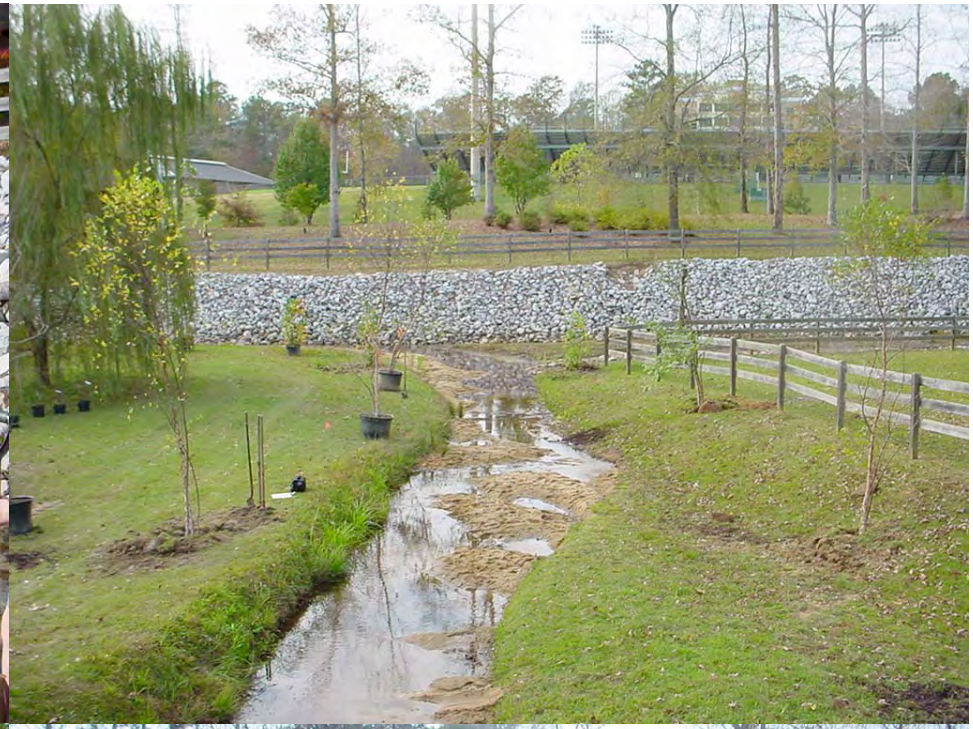
Alexander City , AL

- Benjamin Russell High School



SportPlex wetland and stream planting

September 2005



November 2005

Urban LID

- City of Fairhope, AL, City of Cullman, AL, Auburn University, AL
- Pervious Concrete
- Demonstration and Education Project

Fair Hope, AL

Auburn, AL

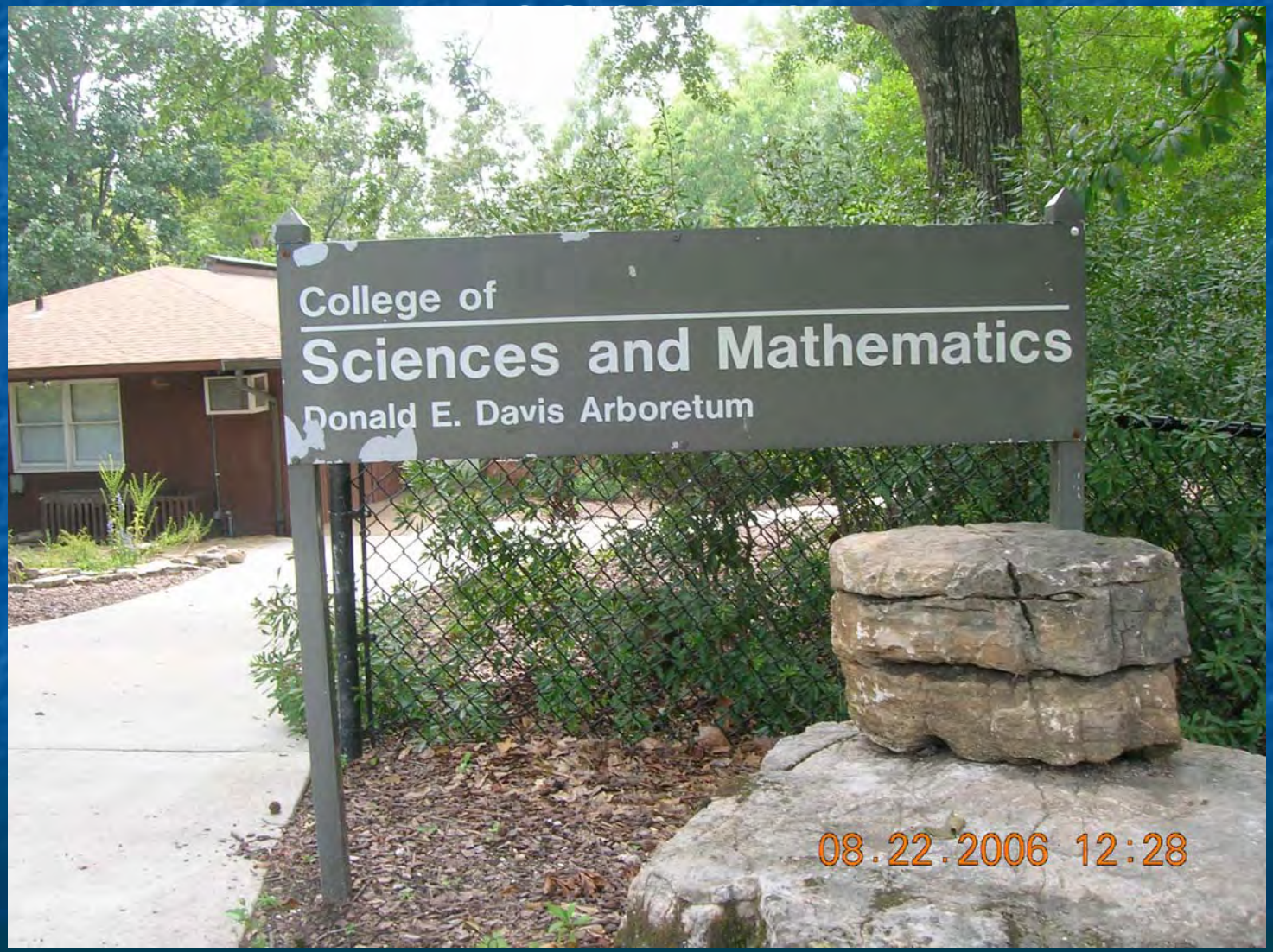
Cullman, AL

Evaluating bioretention nutrient removal in a rain garden with an internal water storage (IWS) layer

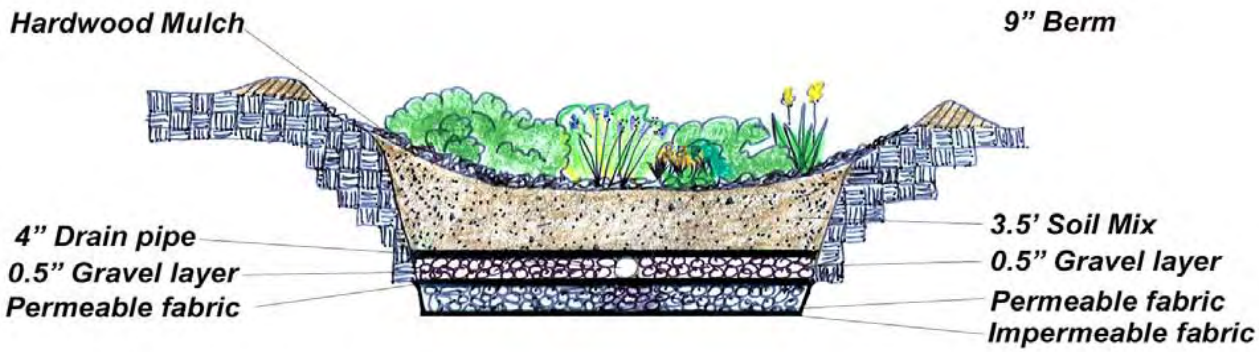
Mark Dougherty, Biosystems Engineering
Charlene LeBleu, School of Architecture
Christy Francis, Curator, Davis Arboretum
Eve Brantley, Coop. Ext., Agronomy & Soils

AUBURN UNIVERSITY

This raingarden study can be visited daily at Auburn University



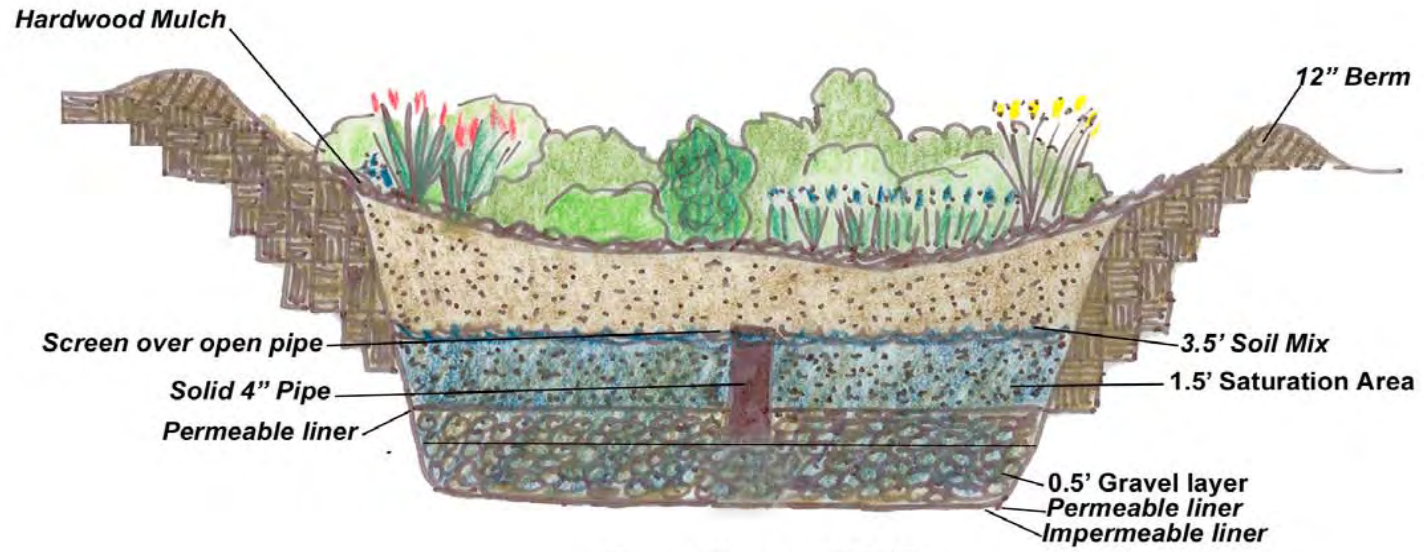
Conventional Rain Garden



Section--Conventional Rain Garden

No Scale

Internal Water Storage (IWS) Rain Garden



Section--IWS

Raingarden construction

Raingarden construction

Raingarden charging

Flowers in bloom

Results: other chemical trends

Decreasing concentrations: Fe, N

Increasing concentrations: Ca, K, Mg, Mn, Na

Zero concentrations found: Al, Cu, Pb, Zn

Summary

- Raingarden drain times were found similar to literature – approx. 2-3 days
- Flow hydrographs followed typical patterns
- Data indicate Part P and TP mass load reduction in conventional rain garden
- Data indicate N, P and TP reduction in IWS rain garden
- Average Part P mass removal rate = 22.6%
- Most water quality indicators increased:
  pH, color, TKN, NH_4, OX-N, and TN conc.
- Conc. increases likely a result of installation.

New Research

- LID Subdivision
  - LID subdivision vs. Traditional subdivision
  - Paired Watershed Study
  - Site is approximately 41 acres adjacent to Saugahatchee Creek
  - Approximately 30 lots
  - Will monitor pre and post development hydrologic flow

ADEM, EPA, City of Auburn, AL, Auburn University, Haley-Redd Construction, Ross Land Design

Summary - Benefits of LID

- Provides high level of water quality treatment – LID tends to control volume of the first flush (first ½ inch) runoff
- Is cost effective for developers and local governments
- Is aesthetically pleasing
- Increases quality of water in local streams, rivers, lakes or bays

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Want more information?

Visit the AL Cooperative Extension System's Water Quality (ACES)

www.aces.edu/waterquality/nemo/lid.htm

www.lowimpactdevelopment.org/

www.lid-stormwater.net/

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