THE NEW OKLAHOMA STATE UNIVERSITY LID PROGRAM: INfiltrating INTO THE STORMWATER COMMUNITY

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Workshop Objectives

- Share some successful programs that we have implemented in the first year and a half of our program
- Facilitate group discussion of successful university/community educational programs
Educational Programs for Engineers, Developers, and Homeowners

When working with engineers, developers, and homeowners, you need more than just talk…

- Work with local, state, and national partners, including both public and private entities
- Hands-on workshops
- Demonstration sites with monitoring data
- Readily available resources
A little background...

- New research and extension faculty position hired in December 2009 in stormwater management
- Program still developing, but is taking shape
- Working with a variety of entities including:
  - Communities
  - Extension educators
  - Homeowners
  - Other local, state, and national groups
What drives these partnerships?

- Regulations
- Flooding Issues
- Water Quality Concerns
- Relationships and Opportunity
The Storm Water Rules – Phase I and Phase II

- **Phase I (1992)**
  - cities over 100,000 population
  - construction sites 5 acres and larger.

- **Phase II (March 10, 2003)**
  - ‘urbanizing communities’ population over 10,000 and density 1,000 per sq mile.
    (45 entities in Oklahoma)
  - construction sites 1 acre and larger.
Municipal Separate Stormwater Sewer Systems (MS4s)

- The state designates MS4s, municipalities and other entities that control separate stormwater sewer systems in urbanizing areas.
- Some MS4s are designated because they discharge to sensitive waters.
- All MS4s must meet Phase II requirements.
Phase II Requirements

- Public Education and Outreach
- Public Participation/Involvement
- Illicit Discharge Detection and Elimination
- Construction Site Runoff Control
- Post-Construction Runoff Control
- Pollution Prevention/Good Housekeeping
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Low Impact Development

Comprehensive land planning and engineering design approach with a goal of maintaining and enhancing the pre-development hydrologic regime of urban and developing watersheds.

- Bioretention cells and rain gardens
Low Impact Development

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- Bioretention cells/rain gardens
- Pervious Pavement
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- Green Roofs
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- Rainfall Harvesting
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- Pervious Pavement
- Green Roofs
- Rainfall Harvesting
Educational Program Examples

- Oklahoma Low Impact Development web site ([lid.okstate.edu](http://lid.okstate.edu))
  - Updated almost daily with resources, news articles, and events of regional interest
  - Includes link to the National LID database from NEMO
  - Recently won a “Blue-Ribbon Award” in the web site category from the American Society of Agricultural and Biological Engineers (ASABE)
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**Readily Available Resources**

**Partnership with national experts**
For additional information...

lid.okstate.edu

On Facebook at “Oklahoma Stormwater and Low Impact Development”
Oklahoma LID Website Hits

Map Overlay

Visits
1 | 6,057

6,597 visits came from 91 countries/territories
Oklahoma LID Website Hits

led.okstate.edu
Country/Territory Detail:
United States

Mar 8, 2010 - Jul 4, 2011
Comparing to: Site

This country/territory sent 6,057 visits via 52 regions
Oklahoma LID Website Hits

State Detail:
Oklahoma

Mar 8, 2010 - Jul 4, 2011
Comparing to: Site

This state sent 3,363 visits via 72 cities
What are some examples of informative LID web sites that you are aware of?

Web pages discussed during the presentation:

• Aridlig.org
• Texaslid.org
• Center for Low Impact Development web site
• NC State/Maryland/Villanova consortium
Educational Program Examples

- **Stillwater Rain Garden Workshop**
  - Organized by Dr. Mike Smolen and Sharla Lovern on June 9, 2009
  - Morning webcast with extension educators as part of USDA Southern Region programming
  - Afternoon hands-on workshop with City of Stillwater to install a rain garden at the Stillwater Public Library
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Hands-on activities
Stillwater Rain Garden Workshop

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Readily Available Resources

- [Bioretention Cells and Rain Gardens](http://lid.okstate.edu/bioretention-cells-and-rain-gardens)
Educational Program Examples

- Specifying and Designing Pervious Concrete Workshop
  - Two-part workshop on April 21 and 28, 2010
  - 2-part webinar (2 hours each day) in collaboration with the National Ready-Mixed Concrete Association
  - Participants broke into 2-person teams
    - Created pervious concrete squares, plus toured pervious paver demonstration first week
    - Tested squares for infiltration capacity and void content (strength) second week
  - Follow-up segment on “Oklahoma Gardening”
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Demonstration Site
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Readily Available Resources

Demonstration Site
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Pervious Pavilion

Pervious concrete pavement is a unique and effective means to address important environmental issues and support green, sustainable growth. By capturing stormwater and allowing it to seep into the ground, pervious concrete is instrumental in recharging groundwater, reducing stormwater runoff, and meeting U.S. Environmental Protection Agency (EPA) stormwater regulations. In fact, the use of pervious concrete is among the Best Management Practices (BMPs) recommended by the EPA— and by other agencies and geotechnical engineers across the country—for the management of stormwater runoff on a regional and local basis. This pavement technology creates more retention ponds, swales, and other stormwater management devices. In doing so, pervious concrete has the ability to lower overall project costs on a first-cost basis. (from perviouspavement.org)

PERVIOUS PAVEMENT IN THE NEWS

Concrete In Focus Magazine: Assessment of Pervious Concrete Maintenance Techniques
Mason City Globe Gazette: Charles City completes permeable pavement project
Santa Monica Daily Press: Alleys set to get green treatment
Keeene Sentinel: ‘Blacktop’ gets greener
Gwinnett Daily Post: Duluth (GA) celebrates opening of greenway trail, overlook
Click here for older pervious pavement news stories...

FACT SHEETS

Pervious Concrete Pavement for Stormwater Management, University of New Hampshire
Pervious Paving, Sustainable Cities Institute
Permeable Pavement: Research Update and Design Implications, North Carolina State University
Pervious Asphalt: The Paveent that Cleans, Asphalt Institute
Pervious Concrete Options: Darcy Columns for Clay Soils, California Nevada Cement Association
Porous Pavement, EPA

http://lid.okstate.edu/pervious-pavement
Readily Available Resources

http://lid.okstate.edu/pervious-pavement
Pervious Concrete

From OklahomaGardening | Aug 26, 2010 | 373 views

Oklahoma Gardening's Kim Reike talks with OSU Extension stormwater specialist Jason Vogel about the differences between pervious and traditional concrete and learns how to correctly mix pervious concrete.

View comments, related videos, and more

http://www.youtube.com/oklahomagardening#p/a/u/1/56ne6SLYyUs
Readily Available Resources
"I build houses and it was a wonderful experience for me. After the workshop while I was standing at the concrete pour area, I felt guilty about not pouring the pervious concrete. I don’t know whether anybody is making these kind of concrete here in large scale. If they do, I would like to use them on all my houses, if the cost difference is not much. I already talked to several of my friends about this and they could not believe the volume of water passing through the concrete. Unless otherwise they see it themselves, I don’t think they will understand what we are talking about… Jason, it has a very bright future and I am thankful that you are working on these kind of very creative projects."

- Byju Sudhakaran, P.E., American Building Contractors and Developers, Oklahoma City, OK
Educational Program Examples

- Erosion Control Workshop
  - Held on March 24, 2011 by the City of Tulsa Stormwater Quality Division, the Homebuilders Association of Greater Tulsa, and the Oklahoma Department of Environmental Quality
  - Over 80 in attendance, including engineers, developers, homebuilders, and regulators
  - Very good dialogue between groups that don’t often communicate
  - Invited vendors to set up booths
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Partnership with local and state, public and private partners
What are some examples of successful university/community LID workshops that have been undertaken in your communities?

How has this cooperation facilitated between the University and Community?

Short course on LID in Texas being considered
San Antonio using 319 grant at library for demo, monitoring, education, and standards

Tuscon-Developers and homebuilders require LID to be in regulations;
stormwater construction seminar in Tuscon/southern Arizona

319 program can be a good funding source

2011 Continuing Education Seminar – Sustainable Central Texas, August 23 from 8-5
Educational Program Examples

- Small Community Stormwater Development Plan
  - Working with three communities (Weatherford, OK is the first one) across Oklahoma that are smaller than Phase II communities, but have approached Extension for help
  - Used as case studies for a general small community stormwater development guide
  - Includes baseline data collection, general and specific workshops, LID modeling class, and plan development, implementation, and followup
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Hands-on activities

Demonstration Site
Educational Program Examples

- Experimental Green Roof at the National Weather Center
  - Initially funded by ARRA; installed April 2010
  - Collaboration between University of Oklahoma, Oklahoma Conservation Commission, and Oklahoma State University
  - An estimated 50,000 visitors tour the National Weather Center each year
  - Currently installing monitoring equipment for water budget, energy budget, and glare studies
  - Video segment on nationally-syndicated “Oklahoma Horizon”
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- **Partnership with state agencies**
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Partnership with state agencies

Readily Available Resources
Experimental Green Roof

- [Link to More Information](http://lid.okstate.edu/green-roofs)
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Green Roofs

Green roofs are vegetated layers that sit on top of the conventional waterproofed roof surfaces of a building. Whilst green roofs come in many different forms and types, usually a distinction is made between extensive, intensive and biodiverse or wildlife roofs. These terms refer to the degree of maintenance the roofs require. Intensive green roofs are composed of relatively deep substrates (20cm+) and can therefore support a wide range of plant types: trees and shrubs as well as perennials, grasses and annuals. As a result they are generally heavy and require specific support from the building. Intensive green roofs (what most people think of as roof gardens) have in the past been rather traditional in their design, simply reproducing landscapes found on the ground, such as lawns, flower beds and water features. However, more contemporary intensive green roofs can be visually and environmentally exciting, integrating water management systems that process waste water from the building as well as storing surplus rainwater in constructed wetlands. Because of their larger plant material and horticultural diversity, intensive green roofs can require substantial input of resources – the usual pruning, clipping, watering and weeding as well as irrigation and fertilization.

Conversely, the green roofs that have received the greatest interest recently are extensive green roofs. They are composed of lightweight layers of free-draining material that support low-growing, hardy, drought-tolerant vegetation. Generally the depth of growing medium is from a few centimetres up to a maximum of around 10-15cm. These roof types have great potential for wide application because, being lightweight, they require little or no additional structural support from the building. Furthermore, because the vegetation is adapted to the extreme roof top environment (high winds, hot sun, drought, and winter cold), extensive green roofs require little in the way of maintenance and resource inputs. Extensive green roofs can be designed into new buildings, or 'retro-fitted' onto existing buildings.

Biodiverse or wildlife roof are becoming more popular, as people become more aware of biodiversity issues, and options for conservation. These are designed either to replicate specific habitat needs of a single or small number of species, or to create a range of

http://lid.okstate.edu/green-roofs
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- Trailwoods Project in Norman, Oklahoma
  - Collaboration between University of Oklahoma, Ideal Homes, Oklahoma Conservation Commission, and U.S. EPA under the direction of Dr. Reid Coffman, OU
  - 18 houses built with rain gardens
  - 18 houses built with curb and gutters
  - Monitoring to begin in 2011
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Demonstration Site with monitoring data

Partnership with developers and federal and state agencies
Trailwoods Project
What are some examples of successful and innovative university/community LID demonstrations that have been undertaken in your communities? How have these demonstrations been utilized?

Austin and the University of Texas have been working on quantifying the benefits of biofiltration
- Criteria manual available online, section 1.6.7 on city of Austin web site

Texas A&M Kingsville cooperating in Complete Stormwater Issue team; has website, environmental engineering

University of New Mexico Law School has a Greenroof demo with monitoring

University of Arizona is involved with LID; retrofitting parking lot with bioretention

Kansas City has implemented a 10,000 rain garden program
National LID Database

Demonstration Sites
Some Research Projects as well...

- Low Impact Development
  - Rainwater harvesting
  - Bioretention cells
  - Pervious Pavement
  - Greenroofs
- Sediment Control at Construction Sites
  - Passive system for liquid flocculant injection
- ‘Green Entrepreneurship’ with OSU School of Entrepreneurship
Take Home Message

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- Work with local, state, and national partners, including both public and private entities
- Hands-on workshops
- Demonstration sites with monitoring data
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