Cahaba River Society

INFORMATION RESOURCES: LOW IMPACT DEVELOPMENT DESIGN

This list of weblinks will aid research by engineers, landscape architects, and city officials who are exploring Low Impact Development practices for streets and commercial, institutional, and residential development. Some are specific to southeastern and Alabama examples. CRS thanks the Alabama Cooperative Extension System, which is currently developing a post-construction stormwater and LID BMP Handbook for Alabama, and Macknally Land Design, award-winning designers of many LID projects in Alabama, for sharing their recommended informational resources.

I. PORTALS FOR RESEARCHING LID PRACTICES

1. **NC State University Stormwater Engineering Group** - NC State is a leader in tailoring LID approaches to the southeast and documenting outcomes. This website is a portal to research and training materials about Low Impact Development (LID), bioretention, green roofs, stormwater wetlands, permeable pavements, water harvesting systems, maintenance of stormwater systems, watershed and economic impacts of stormwater practices, temperature impacts, and mosquito control. These links are to the home page and publications list.
http://www.bae.ncsu.edu/stormwater/

http://www.bae.ncsu.edu/stormwater/pubs.htm

2. **Low Impact Development Center** – non-profit organization dedicated to the advancement of Low Impact Development technology. Fact sheets, publications, variety of design manuals, project case studies.
http://www.lowimpactdevelopment.org/publications.htm#LID_Design_Manuals_Reports

3. **The International Stormwater Best Management Practices (BMP) Database** project website features a database of over 530 BMP studies, performance analysis results, tools for use in BMP performance studies, monitoring guidance and other study-related publications.
http://www.bmpdatabase.org/

4. **EPA toolboxes and report hubs for post-construction stormwater management and for LID:**

http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=min_measure&min_measure_id=5

http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=124

http://water.epa.gov/infrastructure/greeninfrastructure/index.cfm

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5. **Urban Design Tools for Low Impact Development** – select the LID practice and the urban development type (e.g. low density residential, high density residential), and go to case studies, photos, some designs and specifications, research data.

http://www.lid-stormwater.net/index.html

6. **Stormwater Manager's Resource Center** – gateway to library of publications, ordinances, and a toolbox for building a stormwater practice design manual - including model construction specifications for LID practices.

http://www.stormwatercenter.net

II. LID ~ DESIGN MANUALS AND GUIDEBOOKS

1. **Alabama LID Guidebook** - Alabama Cooperative Extension System. The Guidebook is serving as the stepping stone for a statewide LID Manual that is currently being developed. Also links to best practices LID design manuals from Arkansas and North Carolina.

http://www.aces.edu/waterquality/LID/resources.php

2. **North Carolina design manuals** - For technical design information, see North Carolina Department of Environmental Resources:

http://portal.ncdenr.org/web/wq/ws/su/bmp-manual

The NC LID Handbook has user-friendly suggestions:

http://www.ces.ncsu.edu/depts/agecon/WECO/lid/documents/NC_LID_Guidebook.pdf

3. **LID guide for Tualatin River Basin, Oregon:**
http://www.cleanwaterservices.org/content/Documents/Permit/LIDA%20Handbook.pdf

III. ECONOMIC VALUE & COST SAVINGS OF LID & GREEN INFRASTRUCTURE

1. **American Society of Landscape Architects Stormwater Case Studies,** 2011 - ASLA collected 479 case studies from 43 states, the District of Columbia, and Canada on projects that successfully and sustainably manage stormwater. These projects demonstrate that green infrastructure and low-impact development (LID) approaches, which are less costly than traditional grey infrastructure projects, can save communities millions of dollars each year and improve the quality of our nation's water supply. Each case study is summarized and cost factors are reported. Combined results found that green infrastructure practices **reduced costs in 44.1% of cases, did not influence costs in 31.4% of cases,** and increased costs in 24.5% of cases.

http://www.asla.org/ContentDetail.aspx?id=31301

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2. **Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices -** December 2007 - EPA 841-F-07-006. EPA LID case studies comparing LID with conventional stormwater infrastructure, proving that LID usually saves money.
http://water.epa.gov/polwaste/green/upload/2008_01_02_NPS_lid_costs07uments_reducingstormwatercosts-2.pdf

3. **The Value of Green Infrastructure: A Guide to Recognizing its Economic, Environmental and Social Benefits** - Center for Neighborhood Technology and American Rivers, Inc. 2010
A cumulative assessment of the multiple benefits of LID and GI as a municipal or private investment. Since methods and tools for assessing benefits have been lacking, municipalities more easily can assess gray infrastructure cost-benefits and favor those solutions. This guide provides simplified ways to assess the full benefits of LID and GI to aid decision-makers in evaluating options for water management.
http://www.cnt.org/repository/gi-values-guide.pdf

4. **Integrating Valuation Methods to Recognize Green Infrastructure's Multiple Benefits**
Center for Neighborhood Technology (lead author), 2010 - This research paper reviews methods, tools and case studies of valuation of the economic and social benefits produced by green infrastructure practices, particularly in urban settings. It begins to define a framework for assessing the economic benefits of LID practices at the site and community scale.
http://www.cnt.org/resources/integrating-valuation-methods-to-recognize-green-infrastructures-multiple-benefits/

5. **National Green Values™ Calculator -** Center for Neighborhood Technology
The National Green Values™ Calculator is a tool for quickly comparing the performance, costs, and benefits of Green Infrastructure, or Low Impact Development (LID), to conventional stormwater practices. The GVC is designed to take you step-by-step through a process of determining the average precipitation at your site, choosing a stormwater runoff volume reduction goal, defining the impervious areas of your site under a conventional development scheme, and then choosing from a range of Green Infrastructure Best Management Practices (BMPs) to find the combination that meets the necessary runoff volume reduction goal in a cost-effective way.
http://greenvalues.cnt.org/national/calculator.php

6. **Economic, Water Quality, and Water Supply Benefits of Sustainable Real Estate Development in Middle Tennessee: Final Report for Morgan Park Place**
J. Gowdy Consulting for Cumberland River Compact and World Wildlife Fund, 2007
The Cumberland River Compact and World Wildlife Fund commissioned a study of one of their "Building Outside the Box" demonstration sites, at the Morgan Park Place development in Nashville, Tennessee. This report demonstrates the economic and ecological benefits of sustainable real estate development in the middle Tennessee region, including low-impact features. A copy of the report can be obtained from the Cumberland River Compact
http://cumberlandrivercompact.org/

7. **The Economics of Low-Impact Development: A Literature Review -** ECONorthwest, November 2007
http://www.econw.com/reports/ECONorthwest_Low-Impact-Development-Economics-Literature-Review.pdf or www.econw.com

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IV. LID / GREEN STREETS CASE STUDIES & TOOLBOXES

1. Lundy Chase development case study - This Auburn, AL residential project received 319 funds to combine LID practices with water quality remediation for an adjacent creek. At the bottom of this webpage is the link to download the final report to ADEM (19MB). Included are cost estimates from the contractor / developer on the cost of the BMP's utilized.
http://www.aces.edu/waterquality/lundychase/progress.php

2. **Takoma Park, MD project** – Use of LID as alternative to traditional residential street stormwater infrastructure. Poster with engineering design details and construction photos, for use of pervious paving with understreet storage and an adjacent bioswale to solve a flooding problem. LID was preferred solution over installing conventional storm drains.
https://s3.amazonaws.com/publicworks-takomapark/public/stormwater/the-use-of-LID-as-an-alternative-to-traditional-stormwater-management-practices-in-takoma-park-maryland.pdf

3. **Seattle's pilot Street Edge Alternatives Project (SEA Streets)** retrofitted a conventional suburban neighborhood with LID along streets. It has been extremely successful, reducing total volume of runoff leaving the site by 99%, adding value to properties, and receiving support and maintenance by homeowners. Several other green stormwater projects are accessible from this link also.
http://www.seattle.gov/util/MyServices/DrainageSewer/Projects/GreenStormwaterInfrastructure/CompletedGSIProjects/StreetEdgeAlternatives/index.htm

Resources related to **swales, driveways, and utilities:** Staff with the City of Seattle Public Works are willing to talk about lessons learned and recommendations for project success. Summary document at:
http://www.seattle.gov/util/groups/public/@spu/@usm/documents/webcontent/spu02_019984.pdf

4. **Low Impact Development Center – Green Streets** – case studies, designs. Website highlights significant Green Highways and Green Streets programs that the Center and other project partners have been involved in as examples and guidance for communities and institutions that are developing green infrastructure strategies for water resource protection, community development, and to address climate change through greening roads and communities.
http://www.lowimpactdevelopment.org/greenstreets/

5. **Manufacturers or their professional groups** – contact for recommendations on pervious paving and special products. As an example, the Interlocking Concrete Pavement Institute:
http://www.icpi.org

Contech provides LID stormwater products and can aid in meeting needs for a special type of product. May have approaches for dealing with driveway / swale conflicts.
http://www.conteches.com/

6. **Nannie Helen Burroughs - Great Street Project** - 1.5 mile long minor arterial and multi-modal corridor parallel to Watts Branch, the largest tributary to the Anacostia River. DDOT plans to redesign the Corridor as a model of innovative practices. Proposed improvements include street trees, rain gardens, permeable pavement, a "road diet" reduction of impervious asphalt, bioretention cells, multi-chamber catch basins and other Stormwater / Best Management Practices
http://www.lowimpactdevelopment.org/nhb/

7. **GHP U Blog** - The Green Highways Partnership "U" Blog reports on green highways technologies, with contributions from key researchers. Blog entries discuss the state of the art in green highways technology. GHP is administered by EPA Region 3. The LID Center, a partner in the GHP, is contracted by EPA to develop the GHP "U" Blog.
http://ghpublog.org/

8. **Narrower Residential Streets ~ Better Site Design Fact Sheets** – at www.stormwatercenter.net - list of narrow street standards in many cities (outdated perhaps?), with design considerations.
http://www.stormwatercenter.net/Assorted%20Fact%20Sheets/Tool4_Site_Design/narrow_streets.htm

V. OTHER RESIDENTIAL MODELS FOR IMPLEMENTING LID

1. ***Managing Rainwater – Healthy Homes for a Healthy Environment*** – detailed guide to Seattle homeowners on various LID and landscaping practices to manage rain falling on their property.
http://www.seattle.gov/util/groups/public/@spu/@usm/documents/webcontent/01_012405.pdf

2. **City of Fitchburg, WI Creek Supporter Pledge Form** – lists various actions homeowners can take to protect water resources. Possible model for homeowner information booklet.
http://www.city.fitchburg.wi.us/departments/cityHall/publicWorks/documents/SWUCreekSupporter01-29-08.pdf

3. **Missouri Botanical Garden online rainscaping guide for homeowners** – extensive online resources to help identify the drainage and natural characteristics of a site, determine best approaches, and guide installation. Wide range of LID and landscaping options for various needs and conditions.
http://www.missouribotanicalgarden.org/sustainability-conservation/sustainable-living/at-home/rainscaping-guide.aspx

VI. LID & WATER EFFICIENCY MODELS FOR AFFORDABLE HOUSING

1. Incremental Cost, Measurable Savings: Enterprise Green Communities Criteria
Enterprise Green Communities
2010 Report by Dana L. Bourland:
http://www.enterprisecommunity.com/resources/ResourceDetails?ID=67299.pdf
2012 Update by Davis Langdon:
http://www.enterprisecommunity.com/resources/ResourceDetails?ID=67812.pdf

The original 2010 report evaluates 27 affordable housing developments in the United States that meet the Enterprise Green Communities Criteria and found that the estimated lifetime savings exceed the initial costs of incorporating the "green" criteria. The 2012 update expands the analysis to 52 affordable housing developments.

2. Designed for Habitat: Collaborations with Habitat for Humanity - David Hinson and Justin Miller - This book, created in part by David Hinson, Head of Auburn University's School of Architecture, Planning, & Landscape Architecture, profiles thirteen projects where architects have collaborated with Habitat for Humanity across the nation to generate innovate approaches to affordable housing solutions. Available from Amazon and other online booksellers.