Joint City-County Planning Commission of Nelson County

Planning Matters

Volume 5, Issue 2 **Spring 2009**

Managing Stormwater Runoff: A Green Infrastructure Approach

by Lynn Richards, Acting Director for the U.S. Environmental Protection Agency's Development, Community, and Environment Division. Abby Hall, a Policy Analyst with the EPA, also contributed to this article.

This article was published in the Winter 2009 (Number 73) of the Planning Commissioner's Journal, the nation's leading publication for citizen planners, and is reprinted with permission from the Champlain Planning Press, Inc. For more information about the Journal, visit their Web site at: www.plannersweb.com.

Increasingly, communities are looking for ways to maximize the opportunities and benefits associated with growth while minimizing and managing its negative environmental impacts, especially of stormwater runoff. In many places, however, stormwater management is still primarily addressed at the site development level using "endofpipe" practices, such as detention ponds, or conveyance systems, such as sewer systems or culverts. These practices, however, fail to address cumulative water quality impacts from the excessive amounts of impervious cover associated with land development.

While conventional stormwater approaches work to drain each site, the continued spread of development in many areas has resulted in too much water, carrying too much pollution, running into drains and receiving water bodies. This can reduce water quality, especially at drain outlets, and lead to a dramatic drop in the refill rate of aquifers and streams.[1]

Today, the practice of stormwater management is evolving beyond engineered approaches applied at the site level to a multi-scale approach that looks at managing stormwater through more natural techniques. These "green infrastructure" approaches can be better for the environment *and* cost-effective. Green infrastructure strategies reduce and manage stormwater through *infiltration* (water soaking into the ground), *capture and reuse* (water being stored in a rain barrel or cistern for later use in watering plants or flushing toilets), and *evapotranspiration* (water being used by trees and plants).

A comprehensive green infrastructure approach to stormwater management seeks to:

- *Preserve* and enhance natural features, such as undisturbed forests, meadows, wetlands, regional and neighborhood greenways, trails, and other natural areas.
- *Recycle* land by directing new development to already degraded land, such as parking lots, vacant buildings, and abandoned malls.

continued on page 2

Bioswales

Bioswales are linear, vegetated depressions where runoff is slowed and managed through infiltration and uptake by native plants, including grasses, shrubs, and trees. Bioswales typically use amended soils and bioretention media underground so that these landscape features function beyond simple conveyance by infiltrating, retaining, and treating stormwater runoff. Swales can be used to reduce the impervious surfaces in parking lots or along the edge of streets, sidewalks, and residential or commercial lots.

Bioswales are an integral part of Oak Terrace Preserve, a 55-acre sustainable redevelopment project in North Charleston, South Carolina. When completed, it will include some 300 single-family homes and 74 town homes. The project is being implemented through a public-private partnership with the City of North Charleston as owner and the Noisette Company, LLC providing turnkey development management. The project employs an innovative stormwater management system, an extensive tree preservation program, and mandatory sustainable home building certification.

Photos (left): Completed bioswale and one under construction in North Charleston.

- *Reduce* land consumption and development footprint by using land more efficiently.
- *Reuse* stormwater by directing it back into the ground through infiltration, evapotranspiration, or through capture and reuse techniques.

While traditional approaches to stormwater management have focused at site-level techniques, green infrastructure takes into account the wide range of development-related issues at the regional, neighborhood, *and* site-level that affect impervious cover and stormwater runoff.

Where We Choose to Grow

Decisions about where and how our towns, cities, and regions grow are the first, and perhaps most important, development decisions related to water quality. Using land more efficiently reduces and better manages stormwater runoff by reducing total impervious area. The single most effective strategy for efficient land use is redeveloping already degraded sites such as abandoned shopping centers or underutilized parking lots rather than paving greenfield sites.

By redeveloping an underused site that is already paved, the net increase in runoff from development would likely be zero – or it might even decrease, depending on the on-site infiltration practices used. Indeed, if improved on-site infiltration practices are incorporated into redevelopment projects, runoff levels can even decrease.

By directing and concentrating new development in areas specifically targeted for growth, communities can reduce development pressure on undeveloped parcels and protect sensitive natural lands and recharge areas important for maintaining water quality. In addition, if denser development is allowed, less land may need to be converted overall, resulting in less impervious cover than would otherwise be created.

In conjunction with the stormwater benefits just described, a green infrastructure approach supports an interconnected network of open spaces

continued on page 3

The High Point Redevelopment

The High Point Redevelopment in Seattle, Washington demonstrates the superior environmental performance that can come from integrating stormwater design solutions at several different scales. High Point is a redevelopment project that includes 1,600 mixed-income housing units (that replaced 716 subsidized units) on 120 acres in a West Seattle neighborhood. The site's previous infrastructure directed polluted street, sidewalk, parking area, and building runoff through a series of underground pipes into a creek, damaging the ecosystem and reducing local salmon populations.

- Viewed at a regional scale, High Point redeveloped an underused site rather than creating new impervious cover across a previously undisturbed Greenfield site.
- The development also increased the site's density, allowing the space to accommodate more people without consuming additional land.
- The project's site design reduced stormwater runoff. In place of curbs and gutters, swales and check dams were constructed. These wide, landscaped swales slow, filter, and direct runoff into a detention pond that doubles as a park area.
- Parking areas in the project were built using pervious gravel cover, and sidewalks with porous pavement.

Together, these features create a comprehensive system to manage and reduce stormwater runoff from all 120 acres of the site.

Photo (left): In addition to managing runoff from the parking lot, this bioswale provides an attractive landscaping feature appreciated by pedestrians. Photo (top): High Point received a National Award for Smart Growth Achievement in 2007 from the EPA.

and natural areas (such as forested areas, greenways, floodplains, and wetlands). This will improve water quality by increasing infiltration and groundwater recharge, while also providing neighborhoods with access to open space for recreational purposes.

In Our Neighborhoods

Neighborhood-level green infrastructure approaches can include a range of planning and design strategies that seek to integrate the natural and the built environment. These include:

- Incorporating natural landscape features and functions into a neighborhood's street and road network, buildings, and other developed areas;
- Narrowing streets and roads;
- Reducing parking requirements or establishing parking minimums;
- Connecting open space and recreation areas; and

Photos (above): Creating a green street. The rendering shows how a major thoroughfare could be retrofitted to create stormwater management benefits, and a pedestrian buffer.

- Co-locating a range of land uses (such as retail, residential, civic, and schools) to minimize impervious cover.

These approaches can dramatically reduce pollution, decrease stormwater runoff volume and temperature, and protect aquatic habitat. At the same time, they can result in more interesting places to walk, ride, drive, or visit.

Just how much difference in stormwater runoff can a more compact development pattern make? That was the question examined during an intensive charrette conducted in the Town of Mount Pleasant, South Carolina, located in the Charleston metro area. Participants at the charrette included town and county officials and planners, private sector engineers, and researchers from the J.W. Jones Ecological Research Center, among others. Their task was to assess the water quality impacts of two very different development alternatives for a 583-acre site.

Complex water quality models were used to examine the potential water quality related impacts of two site designs. The conventional development design included large lots, wide roads, and separation of land uses. The compact, mixed-use design incorporated higher densities, mixed uses, and narrower roads. In each scenario, the overall number of homes and the square feet of commercial and retail space were held constant.

The results found that the conventional design consumed eight times more open space and generated 43 percent more runoff and three to four times more sediment, nitrogen, and phosphorous than the alternative design.[2]

Besides looking at broader development patterns as described so far, a green infrastructure approach also includes site-specific practices aimed at maintaining natural hydrologic functions by absorbing and infiltrating precipitation where it falls. This allows for local infiltration, groundwater recharge, and filtering of pollutants.

It also decreases the amount of stormwater that enters the sewer system, thereby reducing the risk of overflows that impact streams and other outfalls through scouring and the addition of nutrients and pollutants.

Techniques such as the use of rain gardens, green streets, bio-swales, and infiltration naturally treat runoff on-site, while helping reduce the amount of impervious cover. See the boxed material in this article for more on these techniques.

Engaging on Stormwater Management

What role can planning commissions play in implementing a green infrastructure approach to stormwater management? One important way is by closely examining the community's zoning code, subdivision regulations, and other land development ordinances for provisions that can lead to unnecessary impervious cover. For example:

- *Intensity of Use.* Zoning ordinances typically specify the type of land uses and intensity of those uses that are allowed on any given parcel. A zoning ordinance can dictate single-use, low-density zoning, which spreads development and can create considerable excess impervious surface, or it can facilitate more compact, higher density development, which uses land more efficiently.
- *Incentives.* What policies or incentives can a local government put in place to foster redevelopment? Some municipalities have successfully used density bonuses, infrastructure upgrades, and streamlined permitting as a way to direct redevelopment in specific areas.
- *Street Standards or Road Design Guidelines* dictate the width of roads, turning radii, intersection design, and other criteria. Are street and road widths sized appropriately for neighborhood use? Overly wide

continued on page 4

Managing Stormwater (continued from page 3)

- streets will not only create excess impervious cover, but will also encourage faster vehicle speeds. Can streets accommodate bike lanes? Sidewalks? Reducing vehicle miles traveled will reduce the amount of hydrocarbons washed into streams and reduce air deposition of some water pollutants.
- *Parking Requirements* in many communities set the minimum, not the maximum, number of parking spaces required for retail and office parking and residential housing. Setting minimums can lead to parking lots designed for peak demand periods, creating acres of unused pavement during the rest of the year.
- *Minimum Setback Requirements* can spread development out by leading to longer driveways and larger lots. Establishing maximum setback lines for both residential and retail development will bring buildings closer to the street, reducing impervious cover associated with long driveways, walkways, and parking lots.
- *Site Coverage & Height Limits*, when set too low, can disperse development and push each parcel further from its neighbor. This leads to more streets and roads than might otherwise be needed, increasing total impervious cover. Similarly, limiting height can spread development out if square footage cannot be met by vertical density.
- *Landscaping/Tree Preservation* provisions can help reduce runoff by limiting the amount of impervious surface. Are large trees preserved during construction? If not, will they be replaced? Are all landscaping elements also designed to manage stormwater? For example, sidewalk planter boxes can manage stormwater from the road, sidewalk, or rooftop depending on where they are placed. As most new developments have some type of landscaping, it should be designed to serve multiple functions.

Better aligning stormwater goals with other community goals can also help stretch local tax dollars. Think of it this way: your public works department could spend $1 million dollars installing a big tank or pipe underground to hold stormwater until it can be released. That money will serve just one community objective: managing stormwater. However, the same $1 million could be spent retrofitting streets to install green features.[3] These features could handle the same amount, or likely more, stormwater, while also creating more attractive – and safer – pedestrian environments.

Rain Gardens

Rain gardens are small vegetated areas used to temporarily detain, filter, and evapotranspirate stormwater from rooftops, driveways, parking lots, or other impervious areas. Rain gardens are planted with water-tolerant, native plants and can be implemented in a range of settings, from residential yards to commercial parking lots. Rain gardens are considered one of the most low-cost green infrastructure practices because of they are relatively simple to design, construct and maintain.

The City of Burnsville, Minnesota installed an experimental rain garden system and conducted a study comparing two residential areas, one with rain gardens and one without. The watershed retrofitted with rain gardens saw a 90 percent reduction in runoff volumes.

Infiltration

Infiltration refers to any green infrastructure practice that manages stormwater runoff from nearby "hardscapes" while also serving to reduce overall site imperviousness. For example, downspouts are often disconnected from the storm sewer system and directed into infiltration areas to manage roof runoff on site. Infiltration practices help to reduce flooding, replenish groundwater resources, and buffer against droughts. They also add community amenities that can be both functional and visually attractive.

Summing Up:

A green infrastructure approach to stormwater management can provide benefits for all stakeholders: the municipality has more effective and efficient stormwater management, residents have more attractive neighborhoods, and developers have more choices on how to manage runoff. Moreover, it can change how we think – and plan – for stormwater. With green infrastructure, stormwater is viewed not as a headache, but as an impetus for better, more environmentally-oriented communities.

Footnotes

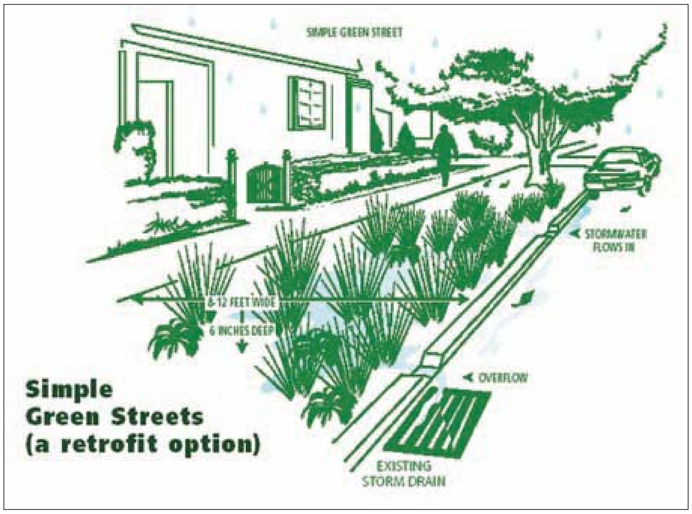
1 One study has reported that the 20 regions in the country that developed the most land over the period 1982 to 1997 now lose between 300 and 690 billion gallons of water annually that would otherwise have filtered through the earth and been captured as groundwater. "Paving Our Way to Water Shortages: How Sprawl Aggravates the Effects of Drought" (American Rivers, NRDC, and Smart Growth America, 2002). Available at: www.smartgrowthamerica.org/DroughtSprawlReport09.pdf .

2 More details on the Mount Pleasant, S.C., charrette, led by Dover, Kohl, and Partners, can be found online. Google search: Belle Hall charrette.

3 The City of Portland, Oregon, just completed a study, *From Grey to Green*, which found the city could either spend $83 million dollars installing a wide range of green infrastructure projects throughout the city, or spend $142 million on larger pipes to manage the same amount of stormwater as the green, more natural approaches.

continued on page 5

Managing Stormwater (continued from page 4)



Green Streets

Green Streets are those public rights of way that have been built or retrofitted to include landscape areas that increase stormwater infiltration, reduce runoff, and use biofiltration to remove pollutants and slow the rate of runoff. Green streets also replace traditionally impervious surfaces like roadways and sidewalks with pervious materials such as pavers and pervious concrete or asphalt. Portland, Oregon, has set up an excellent green streets program.

Some Environmental Benefits of Green Infrastructure

- **Reduced and Delayed Stormwater Runoff Volumes.** Green infrastructure reduces stormwater runoff volumes and peak flows by utilizing the natural retention and absorption capabilities of vegetation and soils.
- **Enhanced Groundwater Recharge.** Green infrastructure increases the amount of water that is filtered through the earth and captured as groundwater.
- **Heat Impacts Reduced.** As paved surfaces gather solar radiation, the heat is transferred to runoff, which can significantly increase the temperature of a creek or pond and disrupt aquatic ecosystems. Green infrastructure can reduce these heat impacts.
- **Reduced Sewer Overflow Events.** Green infrastructure limits the frequency of sewer overflow events by reducing runoff volumes and by delaying stormwater discharges.
- **Improved Air Quality.** Trees and other forms of vegetation that manage stormwater runoff can also help to improve air quality, especially in urban areas.
- **Wildlife Habitat and Recreational Space.** Greenways, parks, urban forests, wetlands, and vegetated swales are all forms of

Making Use of Site Plan Review

by Thomas J. DiPietro, Jr., Superintendent, South Burlington Stormwater Utility

Site plan review often can provide the best opportunity to makes changes to a project that will help protect water quality. Even if your zoning regulations are good, there are things to look for during site plan review that can make a difference. Here are a few examples:

- *Snow Storage.* During spring snowmelt, everyone has seen the blackened piles of melting snow that contain trash, sediment, and other pollutants. These pollutants will end up in lakes and streams if attention is not paid to snow storage locations. Plowed snow should not be stored in stream buffers or stormwater management facilities. Instead, it should be stored either in an area that will allow the melted snow to flow into a stormwater treatment facility, or in a grassed area that will allow the snowmelt to infiltrate.
- *Location of Dumpsters*. Keep dumpsters away from streams and storm drains. If dumpsters are left uncovered, rain can collect in them, come into contact with trash, and leak out of holes in the bottom of the container. Dumpsters should always be covered to prevent rainwater from contacting the trash inside.
- *Stream Buffer.* If your town has a stream buffer ordinance, does that mean your stream's water quality is protected? Not necessarily. Landscaping requirements within buffers are often needed to ensure that the buffer provides its intended functions. Existing vegetation should not be cleared during construction and the area should not be converted into lawn. In addition, items can end up within stream buffers that aren't shown on the site plan. Examples include walking paths, picnic tables, compost bins, and dumpsters. It is a good idea to specify that stream buffers are to remain in their natural condition and that modification and clearing is prohibited.
- *Composting.* Compost bins have a habit of ending up near streams, especially in residentiala reas. Due to their odor and tendency to attract animals, people often place compost piles or bins away from their homes, towards the rear of a property. In some cases, this will result in the compost pile being within the flood plain and only a few yards from the stream. Obviously, this practice should be avoided.
- *Vehicle washing.* In reviewing commercial operations, it is always good to ask where vehicles will be washed and where trucks will be cleaned out. Vehicle washing should never be conducted in the stream buffer or near storm drains.
- *Outdoor Materials Storage.* What kind of materials will be used at the facility and where will they be stored? If materials are not stored under cover, will they pose a contamination risk to stormwater?

Keep in mind the opportunities you have during site plan review to avoid future water quality and runoff problems.

Zoning Compliance Permit Analysis January - March 2009						
	City of Bardstown		Nelson County		Total	
	Permits	*Est. Cost ($)*	*Permits*	*Est. Cost ($)*	*Permits*	*Est. Cost ($)*
Agricultural Structures	0	$0	13	$90,400	13	$90,400
Agricultural Additions	0	$0	0	$0	0	$0
Agricultural Subtotal	***0***	***$0***	***13***	***$90,400***	***13***	***$90,400***
Accessory Additions	0	$0	1	$1,800	1	$1,800
Accessory Structures	13	$17,200	31	$219,674	44	$236,874
Demolitions	1	$0	1	$0	2	$0
Duplexes (0 units)	0	$0	0	$0	0	$0
Manufactured Homes, double-wide	0	$0	1	$108,350	1	$108,350
Manufactured Homes, single-wide	0	$0	4	$64,002	4	$64,002
Single-Family Additions	2	$13,600	15	$338,358	17	$351,958
Single-Family Dwellings	8	$689,000	21	$2,641,000	29	$3,330,000
Single-Family Alteration/Remodeling	5	$140,000	6	$92,000	11	$232,000
Townhouses/Condominiums (2 units)	1	$120,000	0	$0	1	$120,000
Residential Subtotal	***30***	***$979,800***	***80***	***$3,465,184***	***110***	***$4,444,984***
Commercial Alteration/Remodels	3	$414,500	3	$7,000	6	$421,500
Commercial Structures	2	$22,000	1	$300,000	3	$322,000
Commercial Tenant Fit-Ups	1	$12,000	0	$0	1	$12,000
Commercial Subtotal	***6***	***$448,500***	***4***	***$307,000***	***10***	***$755,500***
Industrial Accessory	2	$105,000	0	$0	2	$105,000
Industrial Additions	1	$200,000	0	$0	1	$200,000
Industrial Alterations/Remodels	0	$0	1	$100,000	1	$100,000
Industrial Structures	3	$270,000	0	$0	3	$270,000
Industrial Subtotal	***6***	***$575,000***	***1***	***$100,000***	***7***	***$675,000***
Telecommunication Acc. Structures	0	$0	1	$15,000	1	$15,000
Public Subtotal	***0***	***$0***	***1***	***$15,000***	***1***	***$15,000***
Total Permits Issued	***42***	***$2,003,300***	***99***	***$3,977,584***	***141***	***$5,980,884***

Joint City-County Planning Commission of Nelson County

One Court Square
Old Courthouse Building, 2nd Floor
P.O. Box 402
Bardstown, Kentucky 40004

Telephone: (502) 348-1805
Fax: (502) 348-1818
Email: ncpz@bardstowncable.net
Website: www.ncpz.com

Serving the Cities of Bardstown, Bloomfield, Fairfield, & New Haven & Nelson County

Planning Commission

Kenneth Brown, City of Bloomfield
Theresa Cammack, Nelson County (#3)
Wayne Colvin, Nelson County (#5)
Andy Hall, City of New Haven
Fred Hagan, City of Bardstown
Todd Johnson, City of Bardstown
Mary Ellen Marquess, City of Fairfield
Mark Mathis (Secretary/Treasurer), Bardstown
Carolyn Welch, Nelson County (#4)
Linda Wells (Vice-Chair), Nelson County (#2)
Mike Zoeller (Chair), Nelson County (#1)

# denotes Magisterial District

Planning Commission Staff

Janet Johnston, AICP, Director
Cindy Pile, Administrative Assistant
Phyllis Horne, Receptionist/Clerk
David Hall, Preservation Administrator
Pen Bogert, Preservation Administrator
Mike Coen, Legal Counsel
Alicia Brown, Court Reporter

News

Mr. Nathan Kiser has resigned from the Fairfield Board of Adjustment. Nathan was appointed in January 2004 to serve an unexpired 2-year term and was reappointed in February 2006 to serve a 4-year term. Fairfield City Commission will appoint a new BOA member to serve Nathan's unexpired term through the end of January 2010. Thanks Nathan for your service on the Fairfield BOA.