INDIANA LAKE MICHIGAN COASTAL PROGRAM

DNR Indiana Department of Natural Resources

Low Impact Development

Economic and Community Benefits of LID

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Inside

Introduction

Low Impact Development (LID) is an approach to storm water management and site development that is increasingly being incorporated into government programs and ordinances. Its attractiveness lies in the use of natural features, such as rain gardens and swales, as an alternative or supplement to traditional "grey" infrastructure. Grey infrastructure including underground piping, curbs, and gutters can be costly to construct and maintain and often provide little or no water quality benefit. Alternatively, LID features can lessen storm water impacts, such as flooding and water pollution, and create a sense of community pride as attractive landscapes replace typical hard structures. Additionally, with a focus on keeping rainwater where it falls, LID features can reduce the need to construct costly infrastructure for storm water management. While the LID approach is not practical in every situation, the development of a process or program to determine when and where to install them is a good way to prepare for potential funding opportunities and start your community on a path toward sustainability.

The True Cost of Traditional Storm water Infrastructure

Traditionally, the goal of storm water management has been to move large amounts of water offsite as quickly as possible. To accomplish this governments have constructed a complex system of above and below ground structures such as curbs, gutters, and piping that often dump storm water directly into our waterways. This practice results in significant environmental and societal impacts such as flooding, pollution, degraded riverbanks, and poor habitat.

Many communities are facing unexpected costs as a result of these storm water impacts. Costs associated with flood prevention, natural area restoration, and pollution abatement represents the "true" cost of development. That is, when we install storm water structures that fail to reduce both the quantity and quality of water entering our waterways, the damage that will likely occur may have to be mitigated at some point in the future. The cost to "fix" the future damage essentially adds to the cost of the original storm water structures.

An example may help clarify this point. Let's say a traditional storm water practice is recommended for a new parking lot at a cost of $100,000. This practice transports water directly into a nearby stream and contributes to erosion as the riverbank expands to the increased flow. Years later the community would like to provide fishing access to the stream, but steeply eroded streambanks prevent such access. The community now has to pay $75,000 to restore the streambank before access can be achieved. Financially, it would have made more sense to utilize storm water practices that prevent the streambank damage from occurring in the first place.

Development that contributes to flooding also results in significant future costs. Communities often construct expensive flood prevention structures rather than focusing on the actual issue, large quantities of water entering our stream from urban areas. By installing storm water practices that reduce the amount of runoff, we can limit the need to construct expensive levees. These examples are oversimplified, but they illustrate an important point. Communities can minimize the future cost of storm water damage by being proactive in preventing its runoff into our waterways.

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Natural Assets

Storm water runoff is largely a man-made phenomenon. According to the U.S. Environmental Protection Agency, storm water has been identified as one of the leading sources of pollution to water bodies in the United States (1). Development leading to the removal of vegetation, soil compaction, and the addition of hard surfaces, such as asphalt, has altered the natural course of water and increased its volume and velocity in our waterways. Without vegetation to filter and slow runoff, natural and man-made pollutants are allowed to enter our waterways unimpeded. Consequently, flooding, erosion, and pollution are a significant issue throughout the United States and Northwest Indiana.

Communities have two types of storm water management assets - natural (wetlands, forests, etc) and structural (pipes, curbs etc). Natural landscapes, such as wetlands, slow surface runoff and filter pollutants resulting in reduced flooding and cleaner water. Additionally, woodlands provide a buffer to development resulting in the protection of our soil and lands adjacent to waterways. When these natural assets are reduced, we often create man-made structures to perform similar functions, but at a much higher cost and with reduced capability. For example, a significant loss in wetlands could result in a need for additional water treatment facilities, thus raising the cost of water. By viewing natural landscapes as a network of storm water management structures, we can better understand the value of conserving and recreating such features to function for us. The comprehensive planning process is a great opportunity to identify your community's natural assets. Free GIS tools exist to aid in your search such as www.Indianamap.org.

What is Low-Impact Development?

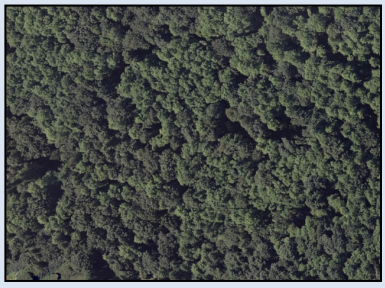
The Environmental Protection Agency defines LID as "an approach to land development (or re-development) that works with nature to manage storm water as close to its source as possible."(2). Washington State University has defined LID as, "a storm water management strategy that emphasizes conservation and the use of existing natural site features integrated with distributed, small-scale storm water controls to more closely mimic natural hydrologic patterns in residential, commercial and industrial settings." (3).

As discussed previously, before humans disrupted water's natural path (called the water cycle) rain water was filtered and regulated naturally with the help of soil and plants. The purpose of LID is to promote development practices that mimic these conditions by preserving natural features onsite, recreating natural landscapes, and minimizing impervious surfaces such as oversized parking areas. LID achieves four broad resource protection goals - flood control, channel protection, ground water recharge, and pollutant removal.

The terms low-impact development and green infrastructure are often used interchangeably because their themes overlap. In general, LID focuses on water management issues and specific practices to abate the effects of storm water. Green infrastructure, on the other hand, can be used to tackle other issues besides storm water management, such as air pollution, urban heat island effects, wildlife conservation and recreational needs.

One way we can distinguish green infrastructure from LID is in terms of scale. Green infrastructure can be viewed as a network of natural areas that provides habitat, flood protection, and clean air and water in addition to site specific practices such as those suggested by the LID approach. Because of its broad scale, the green infrastructure concept can be useful during the planning phase. LID, on the other hand, is more applicable when we're discussing a management practice at the site or neighborhood scale and is therefore used in conjunction with plan implementation. In the end, the installation of LID features will add to your larger green infrastructure network.

The point of LID is to make this…



function more like this.

Local Low-Impact Development Examples

Bioswale - The Village at Burns Harbor: Picture by Save the Dunes

Porter County Visitor Center Rain Garden: Picture by Save the Dunes

Green Roof – Coffee Creek, Chesterton: Picture by Steve Barker.

Bioswale – Calumet Ave. Valparaiso: Picture by Save the Dunes.

Rain Barrels are being distributed by agencies throughout NWI: Picture by Indiana DNR.

Porous Pavement –Valparaiso: Picture by Save the Dunes.

Green Roof – Imagination Glen Park, Portage: Picture by Save the Dunes.

Rain Garden – Forest Park Golf Course, Valparaiso: Picture by Save the Dunes.

Stream Daylighting – Dunes State Park: Picture by Indiana DNR.

Integrating Low-Impact Development in Your Community

Many communities are incorporating LID principals into their city-wide development strategies, planning documents, and ordinances. Consider four steps when developing your LID program:

1. **Assess** the condition and location of your storm water infrastructure and natural resources.
2. **Plan** for the development of future LID projects
3. **Integrate** LID practices and principals into your standard operating procedures for government activities and in ordinances.
4. **Implement** an LID program to include preservation and restoration projects.

Implementation Strategies

As part of its LID for Communities and Officials program, NC State University has developed the following helpful strategies for creating your program.

Minimize impact. Development that conserves native vegetation reduces grading and clearing, and decreases impervious surfaces.

Optimize water infiltration. Slow runoff and encourage more infiltration and contact time with the landscape by retaining natural drainage patterns, reducing channelization, using vegetative swales, lengthening flow paths and flattening slopes.

Create areas for local storage and treatment. Use small-scale best management practices (BMPs) such as rain gardens and swales which allow for collection, retention, storage, infiltration, and filtering on-site.

Conserve resources. At the watershed, subdivision, project, and individual lot level, retain natural resources (trees, water, wetlands), drainage patterns, topography and soils whenever possible.

Build capacity for maintenance of LID systems: Develop reliable, long term maintenance programs with clear and enforceable guidelines. Educate homeowners, lawn care companies, and local government staff on the operation and maintenance of all practices, and about protecting water quality.

Incentives to Encourage Low-Impact Development

Incentives offered by local governments to encourage the use of LID can be based on credit or bonus systems that encourage developers, designers, and builders to implement better site design and locate new development to areas that limit impacts to natural resources. The Northwestern Indiana Regional Planning Commission has outlined the following incentives to encourage LID in your community.

More Predictable Approval Process. One of the best incentives for developers is to increase the predictability of the approval process. A community may wish to create a list of design standards that, if included, will automatically be approved.

Special Designations. A community may provide incentives for which only conservation designs can qualify, such as eligibility for Special Service Area (SSA) designation, if allowable by law.

Density Bonuses. One example of density bonuses is if open space is dedicated to public use including, but not limited to, trails, parks, and other active recreation facilities, the developer may be eligible for a density bonus of up to a specific percentage allowed by law.

Impact Fee Reduction. "Impact fees" are financial contributions (i.e., money, land, etc.) imposed by communities on developers or builders to pay for capital improvements within the community which are necessary to service/accommodate the new development. To the extent that conservation design reduces development impact, the municipality may consider reducing relevant impact fees.

Given that reduced and/or improved storm water runoff can reduce water treatment costs and lessen the need to expand gray infrastructure, it might be appropriate to institute an incentive program whereby developers that install LID practices receive some financial incentive, such as reduced fees or speedy permitting. Additionally, LID practices that reduce site development costs – such as grading and clearing to maximize infiltration onsite – might be sufficient to offset costs associated with other site development requirements.

Economic Benefits of Low-Impact Development

While economic research on LID is still in its infancy, the results so far are very promising. Research suggests that most communities come out ahead when installing LID practices over traditional storm water infrastructure. Findings from several studies are presented below.

Local Government Benefits

- Bioretention such as rain gardens instead of piped storm water and sand filters saved $250,000 along Ancacostia river in Wahsington, DC.(4)
- Protecting water quality helps protect real estate values, which protects tax revenues.
- A wetland outside Columbia, SC is a natural water quality improvement facility. Replacing this with man-made infrastructure was found to cost $6.7 million. (5)
- Reduced regulatory costs associated with achieving water quality goals because LID practices can be more efficient at removing pollution than grey infrastructure.
- A reduction in occurrences of combined sewer overflows.
- Reduced costs associated with flooding, stream erosion, and pollutant loading and the programs and practices required to mitigate these problems.

Homeowner Benefits

- Reduced storm water fees if local government charges based on impervious surface area.
- A significant improvement in water quality can increase property values by as much as 15% for homes bordering the water body. (6)
- Reduced pavement and increased natural vegetation may reduce home energy bills by 33 – 50%. (7)
- Onsite storm water management reduces downstream flooding. A marginal reduction in flooding increases floodplain property values by up to 5%. (8)
- Homebuyers' willingness to pay for amenity values such as landscaped yards in Apex NC, added $5000 to the price of 40 homes adjacent to the regional greenway. (9)

Developer Benefits

- Initial savings from LID are usually accomplished through less conventional storm water infrastructure, less paving, and lower site preparation costs.
- Pilot project estimates suggest LID projects can be completed at a cost reduction of 25-30% over conventionally developed projects. (10)
- Replacing curb, gutter, and storm sewers with roadside swales saved one developer $70,000 per mile, or $800 per residence. (11)
- Reducing the need for storm water retention ponds may result in more lots available for home sites.
- New residential development using LID storm water controls saved $3500 - $4500 per lot compared to new development with conventional storm water controls.(12)
- A subdivision in Wisconsin preserved 40% of the site as open space and saved $761,396. (13)
- In one development, open space was increased from 1.5 acres to 23.5 acres and lots sold for $3000 more and cost $4,800 less to develop, resulting in $2.2 million additional profit. (14)
- A subdivision in Wisconsin preserved 59 % of the site as open space, incorporating LID and conservation subdivision design saving over $600,000 compared to conventional subdivision design. (15)
- Recent research at Duke University shows that it is cheaper to build conservation developments than conventional developments in western North Carolina.(16)

U.S. Environmental Protection Agency, LID Cost Comparison Study Results

Project	Conventional Development Cost	LID Cost	Cost Difference[b]	Percent Difference[b]
2nd Avenue SEA Street	$868,803	$651,548	$217,255	25%
Auburn Hills	$2,360,385	$1,598,989	$761,396	32%
Bellingham City Hall	$27,600	$5,600	$22,000	80%
Bellingham Bloedel Donovan Park	$52,800	$12,800	$40,000	76%
Gap Creek	$4,620,600	$3,942,100	$678,500	15%
Garden Valley	$324,400	$260,700	$63,700	20%
Kensington Estates	$765,700	$1,502,900	–$737,200	-96%
Laurel Springs	$1,654,021	$1,149,552	$504,469	30%
Mill Creek[c]	$12,510	$9,099	$3,411	27%
Prairie Glen	$1,004,848	$599,536	$405,312	40%
Somerset	$2,456,843	$1,671,461	$785,382	32%
Tellabs Corporate Campus	$3,162,160	$2,700,650	$461,510	15%

Source: U.S. Environmental Protection Agency. Reducing Storm water Costs through Low Impact Development Strategies and Practices. EPA Doc. 841-F-07-006. 2007. Note: Case studies on each project are presented in the referenced document.

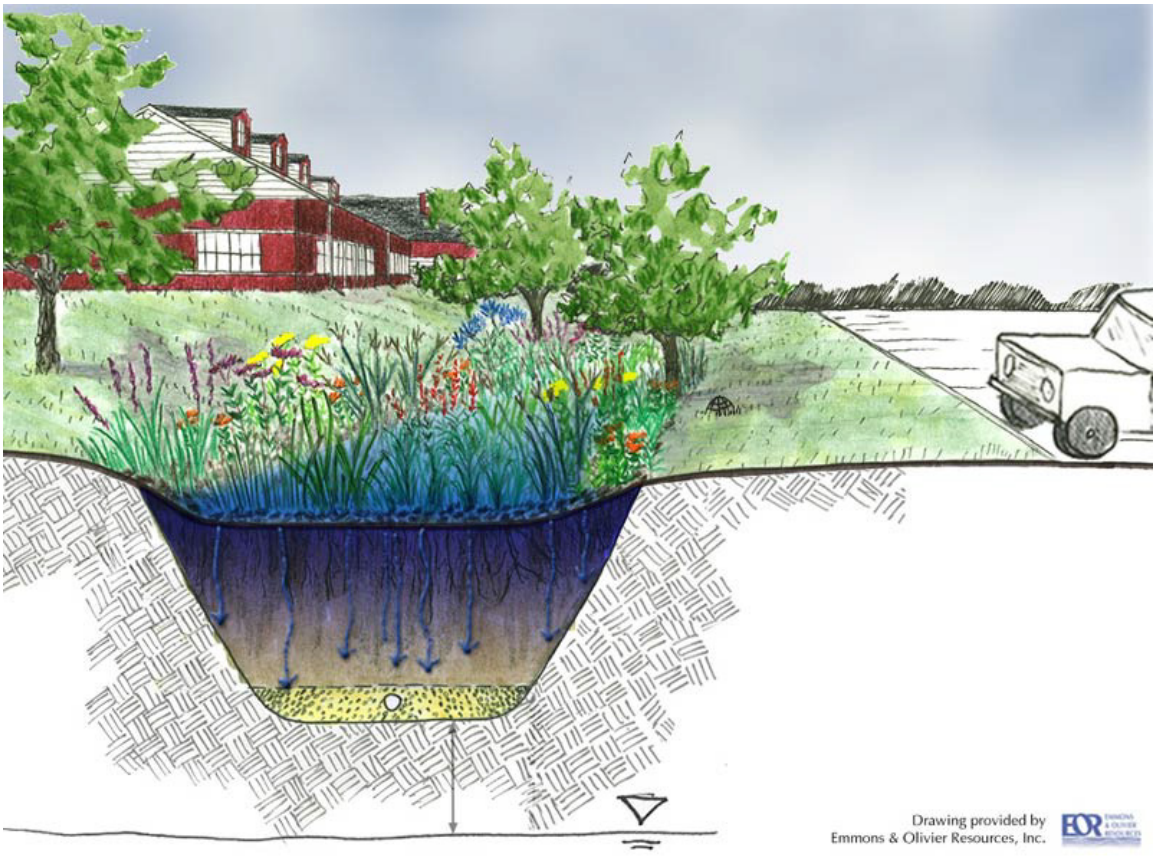


Figure 1: Rain Garden: Graphic by Emmons and Olivier, 2007.

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