

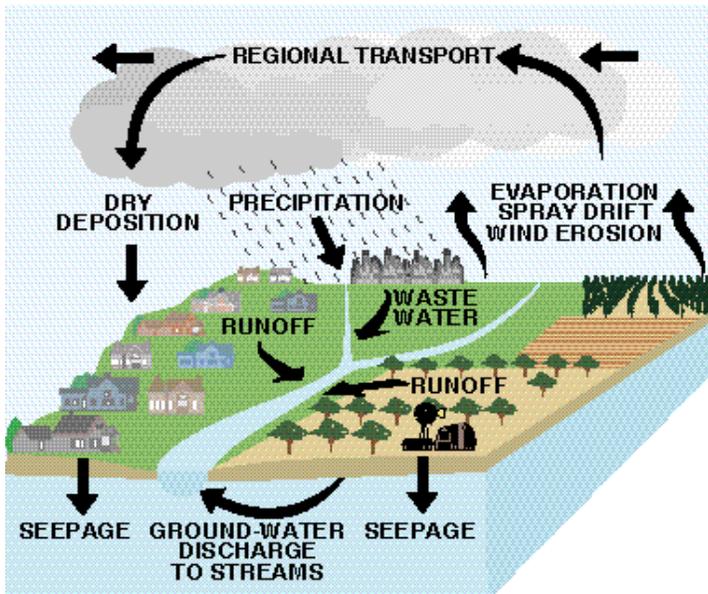
Key words: *Low Impact Development (LID), Best Management Practices (BMPs), Nonpoint Source (NPS) Pollution, Watersheds*

What's the problem with Stormwater?

Stormwater runoff is rain (or snowmelt) that flows off developed land such as roads, parking areas, rooftops and lawns, into nearby streams and rivers. Runoff enters these water bodies either directly or through drainage systems. Stormwater runoff poses a high risk to the health of our states waterways by causing two major problems.

1. Stormwater **transports a mixture of pollutants** such as petroleum products, heavy metals, animal waste and sediments from construction sites, roads, highways, parking lots, lawns and other developed lands, which has impacted virtually all urban water bodies in West Virginia.
2. During the spring and winter months, **high stormwater flows**, especially long-lasting high flows, can cause flooding, property damage and lead to loss of habitat for fish and wildlife by eroding stream banks, widening stream channels, depositing excessive sediment and altering natural streams and wetlands.

In addition, more impervious surface area means less water soaks into the ground. As a result, **drinking water supplies are not replenished and streams and wetlands are not recharged**. This can lead to water shortages for people and inadequate stream flows and water levels for aquatic organisms and other wildlife.



Hydrologic cycle

and lawns dominate the landscape, rainfall becomes stormwater runoff, carrying pollutants to nearby waters. Much less water infiltrates than is soaked up by plants, less evaporates back to the atmosphere, and much more (20-30 percent in a suburban neighborhood) becomes surface runoff or stormwater runoff. LID is typically carried out by implementing several BMPs resulting in a reduction or elimination of traditional stormwater infrastructure.

What is LID?

The goal of low impact development is to develop land and managing stormwater in a manner that **imitates the natural hydrology**. In a mature forest setting, nearly all the rainfall (or snowmelt) disperses along the forest floor, where it infiltrates into the ground. It is soaked up by the roots of plants and trees, or evaporates. Researchers estimate that about one percent becomes surface runoff.

When forests and natural open spaces are cleared, and buildings, roads, parking areas



What are the benefits of LID?

LID can help communities more efficiently and effectively manage stormwater, and protect their water resources.

- **LID can help protect the environment.** LID techniques remove pollutants from stormwater, reduce the overall volume of stormwater, manage high storm flows, and replenish streams and wetlands.
- **LID may reduce flooding and protect property.** Reducing impervious surfaces, increasing vegetation and dispersing and infiltrating stormwater results in less runoff. This reduces the likelihood of flooding from large rain events.
- **LID helps protect human health** by more effectively removing pollutants from stormwater. Untreated stormwater can be unsafe for drinking and swimming.
- **LID protects drinking water supplies** by ensuring that rainfall infiltrates and recharge aquifers, rather than being treated as a wastewater.
- **LID is good for the economy.** LID can help protect our natural resources, water quality and reduce sediment loads. This ensures that our resources remain clean and the surrounding Chesapeake Bay and Ohio River watersheds remain a great place to operate a business and attract employees. If our rivers and streams are clean, taxpayers don't have to bear the burden of expensive cleanup efforts for polluted waters.
- **LID provides cost-effective alternatives to systems upgrades.** Land developed prior to the 1990s usually provided little, if any, stormwater treatment. In many cases, LID systems are much less expensive than costly stormwater vaults or land-consuming stormwater ponds.
- **LID can increase the appearance and aesthetics of communities.** LID projects leave more trees and plants and have less impervious surfaces, which makes for greener developments and communities.
- **LID can increase public safety.** One of the hallmarks of LID is more narrow streets. Studies show that when vehicle traffic is slowed, there are fewer pedestrian accidents and fatalities.

What are BMPs?

BMPs are techniques used to control stormwater runoff, sediment control, and soil stabilization, as well as management decisions to prevent or reduce nonpoint source pollution. The EPA defines a BMP as a “technique, measure or structural control that is used for a given set of conditions to manage the quantity and improve the quality of stormwater runoff in the most cost-effective manner.”

Parking Lot Bioretention



Green Roof



Street Curb Bump-Out (Bioretention)





Background

The community of Creek Side, West Virginia needs you and your team to develop a plan that utilizes LID practices in order to reduce the use of traditional stormwater management practices. Your goal is to protect the local watershed by reducing nonpoint source pollution carried by stormwater runoff while improving the quality of life for the residents and promoting stewardship of the environment.

Using the community site plans provided, develop the most environmentally effective stormwater management plan possible. When planning, be sure to take into account how the different LID practices and other BMPs function, their operation and maintenance requirements, cost, and ability to offset traditional stormwater practices.

Scenario

Your team has been brought in to review the plans for the construction of a large housing community. The stream to the north of the property (Mary's Creek) has an impaired trout fishery and should be taken into consideration when planning LID practices. The developer has approved the plans and is ready to go forth with building as is; he has no experience in using LID practices. The current plan for managing stormwater is to build a system of ditches along the community's road system and pipe the runoff into storm drains near the south entrance by Team Ranch Road. There are also four conventional stormwater management practices planned for implementation (marked in **red** on aerial photo), two dry detention ponds and two wet ponds. The dry detention ponds are located in lots 45 off of Benet Court and lot A-10 off of Bella Terra Drive. Both are about $\frac{1}{2}$ acre in size and are wet in the spring and fall making the home owners back yards unusable. The first wet pond is located in lot 2 at end of Sagrada Park and measures approximately $\frac{1}{2}$ acre in size and the second is located in the center of Block 7 and takes up space on lots 4,5,6,10,11, and 12 with a total area of 1.3 acres.

You are restricted to using **only 10** separate LID practices. Choose your locations and practices carefully to allow for the best possible reduction in stormwater runoff. You also have permission to take up to three of the current lots to implement LID practices, if needed. If you decide to use a lot for stormwater management you must explain why you chose that lot.

- 1) Create a demonstration for the developer that explains the benefits of using LID practices.
 - a) This should highlight the LID practices you chose and why.
 - b) Identify the limitations with the current stormwater management plan and the effects it will have on the environment.
 - c) Explain how your plan will reduce NPS pollution.
- 2) Develop a strategy that incorporates the community and encourages them to be involved with their stormwater management plan.
 - a) Illustrate how LID is used to manage stormwater and explain the pros and cons.
 - b) Explain the impacts urban sprawl has on nonpoint source pollution and how LID can be used to manage and reduce NPS pollution.
 - c) Provide examples of what individuals and the community can do to implement LID practices at home.



Additional questions to consider

1. If you could have only chosen 3 LID practices to utilize what would they have been, where would you have implemented them and why?
2. What do you believe to be the main limiting factors that stray developers and designers away from utilizing LID practices?
3. Name the top five benefits of utilizing LID practices, explain your answers.
4. Explain the relationship between LID hydraulic controls (i.e. retention ponds, swales, etc.) and water quality benefits.
5. Define LID and give an example of where it has been successfully utilized to improve water quality in the United States.
6. What is your stance on the state proposing requirements that call for 50% of stormwater management practices for new construction to consist of LID practices? Would this improve LIDs perception by the public and developers?

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