Terminology of Low Impact Development

Distinguishing LID from other Techniques that Address Community Growth Issues

LID Barrier Busters Fact Sheet Series

What Is Low Impact Development (LID)?

The U.S. Environmental Protection Agency (EPA) considers LID to be a management approach and set of practices that can reduce runoff and pollutant loadings by managing runoff as close to its source(s) as possible. LID includes overall site design approaches (holistic LID, or LID integrated management practices) and individual small-scale stormwater management practices (isolated LID practices) that promote the use of natural systems for infiltration, evapotranspiration and the harvesting and use of rainwater. Although both holistic LID and isolated LID practices can remove pollutants and reduce damaging stormwater flows (volume and velocity), holistic approaches maximize these benefits. Note that LID is not the same as "no (or zero) impact development" which may represent an unattainable ideal. For more information on LID, see **www.epa.gov/nps/lid**.

A rain barrel captures and stores roof runoff for later use. A planter incorporated as the top of the rain barrel provides camouflage.

Communities' Efforts to Reduce the Impacts of Development Are Expanding — How Does LID Fit?

LID is one of many strategies and techniques used to counteract the impact of development. Many of the strategies have things in common and a few of the terms have been used interchangeably, but each may have a different frame that sets it apart from the others. The following explanations are offered to help clarify concepts that can often arise when discussing these terms.

- **Green Infrastructure (GI)** has been used in different ways by different entities. GI has been used outside of a stormwater context to describe the creation and networking of natural ecosystems and greenway corridors (e.g., forests and floodplains). This provides ecological services and benefits ranging from filtering air pollutants, reducing energy demands, mitigating urban heat islands, sequestering and storing carbon, enhancing aesthetics and property values, and preserving and creating natural habitat functions. In this context, the term may also be known as natural infrastructure (see **www.epa.gov/greenkit/natural_infrastructure.htm**). In the context of stormwater, GI refers to engineered-as-natural ecosystems such as green roofs, porous pavement, swales and rain gardens (which are also LID practices) that largely rely on using soil and vegetation to infiltrate, evapotranspirate, and/or harvest stormwater runoff and reduce flows to drainage collection systems. In this context, it is often used interchangeably with Green Stormwater Infrastructure or Wet Weather Green Infrastructure. Considered collectively, GI is an integrated system of natural elements and LID practices that provide broad environmental benefits. For many, GI is becoming an umbrella term under which other terms, such as LID, fit.
- **Green Stormwater Infrastructure or Wet Weather Green Infrastructure** emphasizes approaches that rely on natural or engineered-as-natural ecosystems to specifically control and manage stormwater runoff, often with the primary goal to reduce the occurrence and magnitude of combined sewer overflows (CSOs). See **www.epa.gov/greeninfrastructure** for more information.

A rain garden collects and treats runoff from a residential lot in Stafford County, Virginia.

A green roof, such as this one at Sidwell Friends School in Washington, D.C., absorbs rain water, reduces energy costs, and provides green space and wildlife benefits in an urban area.

- **Sustainable Stormwater Management** provides stormwater drainage solutions that minimize both stormwater impacts from development and the need for ongoing or long-term maintenance. Since sustainable stormwater management focuses on natural solutions to restore or maintain a predevelopment water balance and minimize long-term costs for stormwater drainage and treatment, holistic LID generally represents the current state of the art for accomplishing this goal.

- **Better Site Design** applies to an approach to new residential and commercial development that focuses on reducing pollutant loads, conserving natural areas, saving money and increasing property values. Key principles of this approach include reducing impervious cover, increasing the amount of natural lands set aside for conservation, and better integrating stormwater treatment systems on-site. The term Better Site Design was coined by the Center for Watershed Protection. It has many elements in common with nonstructural LID practices, conservation design and natural resources planning.

- **Conservation Design** seeks to protect the natural environment of an area by controlling growth and applying land use with an eye toward sustainability. Open space landscapes and vistas are intentionally preserved, along with high quality wildlife habitats and existing farmland and rural communities. In some regions, conservation design is used to explicitly protect water quality. It is related to "preservation development," which is more narrowly focused on preserving farmland.

- **Smart Growth** refers to a range of development and conservation strategies intended to preserve and protect the natural environment while simultaneously making communities more attractive, economically stronger and more socially diverse. Smart growth relies on ten key principles, such as taking advantage of compact building design and increasing density to prevent sprawl and preserve more undisturbed natural areas, mixing land uses to reduce transportation needs and improve quality of life, creating walkable neighborhoods, providing a variety of transportation choices. For more information on smart growth, see **www.epa.gov/smartgrowth**.

- **New Urbanism** is closely related to Smart Growth and for many can be used interchangeably. It focuses on traditional neighborhood design, provides improved connectivity through traditional street grids, promotes a strong sense of place and local identity, and minimizes dependency on cars.

- **Light Imprint Design** is a term that grew out of the New Urbanist movement that seeks to integrate Low Impact Development with New Urbanism. It encourages sustainable, compact, mixed-use community development and walkable communities. Placement of stormwater and other green practices strive to encourage interaction between people and the environment, not block it. For example, communities not only preserve natural areas, but also include access paths. Note that although Light Imprint Design purposefully uses the same acronym as Low Impact Development (which is the older term), EPA uses LID to refer to Low Impact Development, but in any case strives to define the acronym before using it.

A roadside swale built in a public right-of-way provides aesthetic benefits and collects and filters road runoff in Olympia, Washington.

An open space next to a school in Philadelphia was transformed into an outdoor learning lab, recreation area and stormwater management system (rain garden) that captures and filters parking lot runoff.

The roof of this Washington, D.C. parking garage doubles as a school athletic field, reducing runoff and offering usable open space.

United States Environmental Protection Agency • Office of Wetlands, Oceans, and Watersheds
1200 Pennsylvania Avenue, NW, Washington, DC 20460
EPA 841-N-12-003B • March 2012

Benefits of Low Impact Development

How LID Can Protect Your Community's Resources

LID Barrier Busters Fact Sheet Series

What Is Low Impact Development (LID)?

LID includes a variety of practices that mimic or preserve natural drainage processes to manage stormwater. LID practices typically retain rain water and encourage it to soak into the ground rather than allowing it to run off into ditches and storm drains where it would otherwise contribute to flooding and pollution problems (see **www.epa.gov/nps/lid**).

A green roof absorbs rainwater, reduces energy costs and offers wildlife habitat in urban Portland, Oregon.

Why Should My Community Adopt LID?

LID Reduces Stormwater Runoff by Emphasizing Infiltration

As a community grows, so does the amount of surface area covered by parking lots, roads and rooftops (Figure 1). Rainfall cannot soak through these hard surfaces; instead, the rain water flows quickly across them—picking up pollutants along the way—and enters ditches or storm drains, which usually empty directly and without treatment into local waterways. Local streams in urban areas are overwhelmed by frequent urban flash flooding and stream habitats are smothered by sediments carried by the excessive flows.

Contrast this to an undeveloped watershed, where vegetation-covered soil soaks up rainfall rather than allowing it to run off the land (Figure 2). Water filters through the soil before reaching the groundwater table or being released slowly into streams. An undeveloped watershed provides clean, safe water.

Fortunately, by adding LID solutions, communities can help their watersheds act more like undeveloped watersheds—despite the ever-expanding numbers of roads and rooftops. LID practices such as natural or man-made swales, depressions and vegetated areas capture and retain water onsite, allowing time for water to soak into the soil where it is naturally filtered.

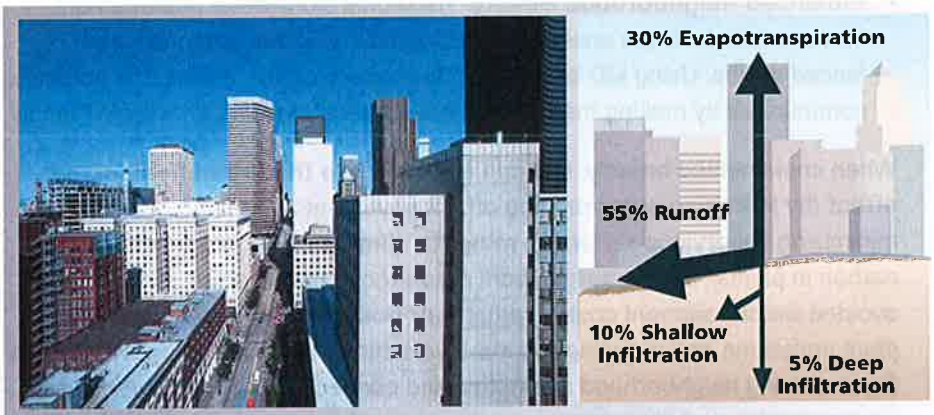

Figure 1. When roads, rooftops and parking lots cover much of the land, more than half of the rainfall runs off and flows directly into surface waters. In highly developed areas, such as in Seattle, Washington (above left), only 15 percent of rain water has the opportunity to soak into the ground.

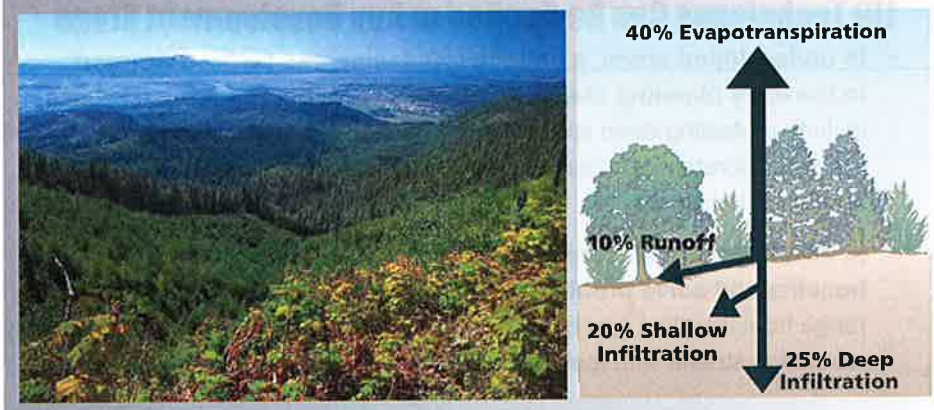

Figure 2. When vegetation and natural areas cover most of the land, such as in Oregon's Upper Tillamook Bay watershed (above left), very little water (only 10 percent) runs off into surface waters. Nearly half of the rainfall soaks into the soil. The remaining water evaporates or is released into the air by vegetation.

LID Provides Many Environmental and Economic Benefits

- **Improved Water Quality**. Stormwater runoff can pick up pollutants such as oil, bacteria, sediments, metals, hydrocarbons and some nutrients from impervious surfaces and discharge these to surface waters. Using LID practices will reduce pollutant-laden stormwater reaching local waters. Better water quality increases property values and lowers government clean-up costs.
- **Reduced Number of Costly Flooding Events.** In communities that rely on ditches and drains to divert runoff to local waterways, flooding can occur when large volumes of stormwater enter surface waters very quickly. Holistically incorporating LID practices reduces the volume and speed of stormwater runoff and decreases costly flooding and property damage.
- **Restored Aquatic Habitat.** Rapidly moving stormwater erodes stream banks and scours stream channels, obliterating habitat for fish and other aquatic life. Using LID practices reduces the amount of stormwater reaching a surface water system and helps to maintain natural stream channel functions and habitat.
- **Improved Groundwater Recharge**. Runoff that is quickly shunted through ditches and drains into surface waters cannot soak into the ground. LID practices retain more rainfall on-site, allowing it to enter the ground and be filtered by soil as it seeps down to the water table.
- **Enhanced Neighborhood Beauty**. Traditional stormwater management infrastructure includes unsightly pipes, outfalls, concrete channels and fenced basins. Using LID broadly can increase property values and enhance communities by making them more beautiful, sustainable and wildlife friendly.

When implemented broadly, LID can also **mitigate the urban heat island effect** (by infiltrating water running off hot pavements and shading and minimizing impervious surfaces), **mitigate climate change** (by sequestering carbon in plants), **save energy** (from green roofs, tree shading, and reduced/avoided water treatment costs), **reduce air pollution** (by avoiding power plant emissions and reducing ground-level ozone), **increase property values** (by improving neighborhood aesthetics and connecting the built and natural environments), and **increase groundwater recharge**, potentially slowing or reversing land and well field subsidence.

LID Techniques Can Be Applied at Any Development Stage

- **In undeveloped areas, a holistic LID design can be incorporated in the early planning stages**. Typical new construction LID techniques include protecting open spaces and natural areas such as wetlands, installing bioretention areas (vegetated depressions) and reducing the amount of pavement.
- **In developed areas, communities can add LID practices to provide benefits and solve problems**. Typical post-development LID practices range from directing roof drainage to an attractive rain garden to completely retrofitting streets with features that capture and infiltrate rainwater.

A landscaped curb extension calms traffic and captures and infiltrates street runoff in Portland, Oregon.

Rainfall soaks through permeable pavement and into the ground below in this parking area in west Des Moines, Iowa.

Street runoff collects in stormwater planters in Portland, Oregon.

United States Environmental Protection Agency • Office of Wetlands, Oceans, and Watersheds
1200 Pennsylvania Avenue, NW, Washington, DC 20460
EPA 841-N-12-003A • March 2012