0 Intro to Low Impact Development

What is Low Impact Development?

Low Impact Development (LID) is a collection of methods (aka Best Management Practices or BMPs) that preserve natural resources and collect and clean stormwater runoff to protect and improve water quality and availability. One of the main principles is to simulate natural drainage patterns and incorporate vegetation and natural materials into stormwater facilities. The Puget Sound Partnership defines LID as "a stormwater and land use management strategy that strives to mimic pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation and transpiration by emphasizing conservation, use of on-site natural features, site planning, and distributed stormwater management practices that are integrated into a project design." LID may also be referred to as Green Infrastructure, Green Development Practices, or Alternative Storm Water Management Systems.

There are over 200 best management practices (BMPs) that may be used to improve watershed health[1]. BMPs may fall into two categories:

Non-structural BMPs

These are restoration and protection practices often employed during the early planning phase, but may also appear during other project phases. This includes choosing low impact techniques over conventional ones and also selecting natural approaches over ones that require more physical structures.

- Relative Effectiveness: High
- Relative Cost: Low

Figure 1 Choose good materials and avoid polluting ones (like this copper downspout).

Figure 2 This berm, made of compost instead of ordinary loose soil, is highly effective at reducing sediment transport off-site and can be installed by hand or machine.

Figure 3 Compost amended soils restore compacted soils and can be used to reduce water demand in gardens or lawns.

[1] For a checklist of best management practices, visit http://www.greengirlpdx.com/Publications.htm#c

Structural BMPs

These are mitigation strategies or facilities designed to reduce impact from either past or future development.

- Relative Effectiveness: Low to Moderate
- Relative Cost: High

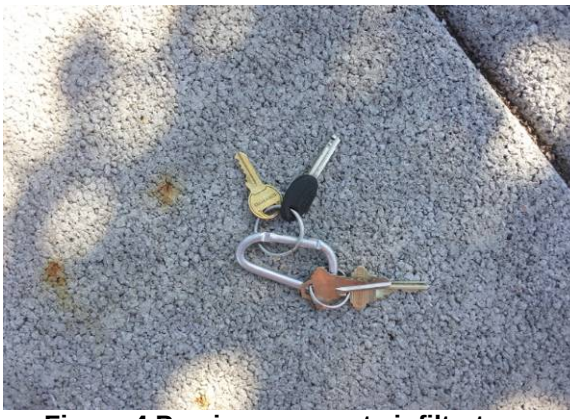

Figure 4 Pervious concrete infiltrates rainfall at the source.

Figure 5 Contained planters intercept, then evaporate, rainfall and are a cost-effective way to beautify anyplace.

Figure 6 Ecoroofs intercept & evaporate rainfall and greatly extend roof life.

Figure 7 Rain gardens are great alternative to mange runoff when it can't be prevented.

Why Use Low Impact Development?

In undeveloped areas, very little rainwater or snowmelt runs off the land like it does in urbanized towns and cities. Trees, plants, and soil capture much of the precipitation, and some of it evaporates back into the air. Most of the precipitation that doesn't evaporate or get captured by vegetation soaks into the ground where soil and microbes remove pollutants naturally. The water slowly recharges streams, wetlands and groundwater. Very little runs off, except in very large storms. The natural terrain acts like a sponge.

This natural hydrologic cycle is radically altered when land is developed and the way it has been for decades is changed. Typical development clears the land of vegetation and covers it with hard surfaces such as roads,

Figure 8. Water quality is important to the life that lives in streams; but humans, too rely on clean water for drinking and recreation.

Figure 9. As long as excess runoff volume is piped to streams, erosion from streambank scouring will continue to impair water quality.

parking lots, and rooftops. Construction and foot traffic compact soils, so that even landscaped areas can generate unnaturally high runoff volumes. Storm drains are installed to get water out of the way by sending it into local streams or injecting it underground without treatment. Development dramatically increases runoff volumes. Even when controlled by detention basins, this causes flooding, damages fish and wildlife habitat, and delivers pollutants such as oils and pesticides to local waterways. The decreased infiltration results in: less cool, clean groundwater to recharge streams in the dry summer months; and in a reduction in water availability throughout the watershed.

LID practices may be incorporated into existing as well as newly built developments in a community. They increase groundwater supplies and reduce the negative water quality impacts to streams and fish habitat, flooding, and in many cases, the cost of stormwater treatment and infrastructure. They are aesthetically pleasing and have been shown to increase real estate values.

Which BMPs Should I Use & How?

The 5C Program offers technical guidance on a number of different practices. (See *"Navigating the 5C Program's Stormwater Management Guidance".)* The reason for a particular design element in this guidance may not be apparent immediately; but, it's "that way" because it supports long-term water quality and watershed restoration[2]. In order for them to work properly, stormwater BMPs must be installed and maintained according to the design specifications. So to avoid unintended consequences, the project team, which might include the owner, designer(s), contractor(s)/construction crew, maintenance staff and others as appropriate, all need to do their part in properly implementing the practices you choose. The table below shows the types of practices that are generally applicable to different stormwater runoff sources. Each BMP has additional applicability criteria

[2] For additional information on how changes to facility designs are likely to impact function, see pdfs under the column heading "Additional sustainability & design considerations for modifying details" under each set of facility detail design at http://extension.oregonstate.edu/stormwater/swamp-lid-details

related to slopes, soils, setbacks, and geometry and is included in the guidance documents provided by the 5C Program.

Applicability

The following table illustrates which types of stormwater runoff thatseveral BMPs can manage:

	BMPs	Stormwater Runoff Surface Types			
		Rooftops	Roadways	Sidewalks	Compacted & Semi-pervious Landscape Areas
Structural BMP	Rain Gardens	X	X	X	X
	Vegetated Filter Strips	X	X	X	X
	Pervious Concrete		X	X	
	Rainwater Harvesting	X			
	Convey Stormwater without a Pipe	X	X	X	
Non-structural BMP	Minimize Impervious Area	X	X	X	
	Runoff Area Disconnection		X	X	
	Tree Preservation & Planting		X	X	X
	Restore Soil				X
	Native Plants				X

Combining Practices

Numerous practices may be combined into endless combinations depending on natural conditions on-site, stakeholder and designer preferences, and budget. As you can see, some practices can be applied to runoff from an array of surfaces while others only manage one or two kinds of surfaces. So combining practices is probably the best and most cost-effective way to manage stormwater on your site.

Figure 10 A daylit stream, a rain garden, porous pavement, and native plants all work together to protect water resources on and off site.

Figure 11 Even a single practice like this rain garden will need additional BMPs implemented (erosion control) to be really effective long-term.