

# Why are Stormwater Rain Gardens still landscaping curiosities

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Rain gardens and other stormwater Low Impact Development (LID) measures have been used in British Columbia for more than 10 years, and in other parts of North America for even longer. LID measures that provide infiltration and retention of rainwater or stormwater runoff have been identified as a critical part of reducing the impacts of development, and the destruction of our natural streams and waterways. But, why are they still pilot projects rather than part of mainstream development and infrastructure? Given the current emphasis on the protection of environmental values and green infrastructure, the slow implementation of stormwater management approaches seems strange for our province and for the region in general. A recent article<sup>1</sup> looked at this question from the perspective of the Pacific Northwestern United States, and asked similar questions about the progress of stormwater management. The following article looks at the issues and progress that we have seen for stormwater management in BC.

## Rain gardens utilize the natural hydrologic capacity of the landscape

A form of stormwater management called 'bio-retention,' a rain garden is a planted depression that captures and filters rainwater runoff from impervious urban areas such as roofs, driveways, walkways and parking lots, and allows it to infiltrate into the ground. A rain garden is a type of LID measure that uses storage of rainfall and runoff in soil and underground reservoirs, infiltration into the subsurface, and evapotranspiration from the soil and vegetation to mimic the natural landscape processes that handle water in an undeveloped environment. Also called stormwater best management practices (BMPs), and in the Lower Mainland area, stormwater Source Controls, the goal of LID measures is to make use of these natural hydrologic processes in a smaller footprint so that land development is balanced with protection of the downstream receiving watercourses. LID measures may also include infiltration trenches, green roofs and permeable pavements. Rain gardens are often seen as the poster child for

stormwater management LID measures because they take advantage of all the natural processes mentioned, while also providing surface storage to handle peak flows from impervious surfaces. Thus, they provide the most hydrologic performance per square metre of area taken up by the LID measures.

## Rain gardens balance development and protection of downstream water bodies

Development has been known to have adverse impacts on streams and receiving waters for some time. In the 1990s, a study in the Pacific Northwest determined that any watershed that has more than 10% of its area developed with impervious cover, such as buildings and pavement, will exhibit measurable increases in flow volumes, flow velocities and pollutant loads associated with the development. These lead to adverse impacts on the receiving water that include bank and streambed erosion, destruction of fish habitat, degraded water quality and reduction in baseflow. In BC, the streams and water bodies that are impacted by development are highly valued by the people who live in and visit the province. They are also important to fisheries as part of BC's cultural and economic heritage.

Stormwater LID measures, in association with techniques for LID planning and other rate control best management practices, are currently the best available method for mitigating the impacts of development on BC's watercourses and receiving waters. Pilot projects and performance monitoring over the last 10 years in the Lower Mainland and throughout the region have shown that properly sized, well-designed and constructed LID measures can work as designed, enhance the landscape and have reasonable longevity. They are necessary solutions for stormwater management, so why are they still rare and principally limited to pilot projects?

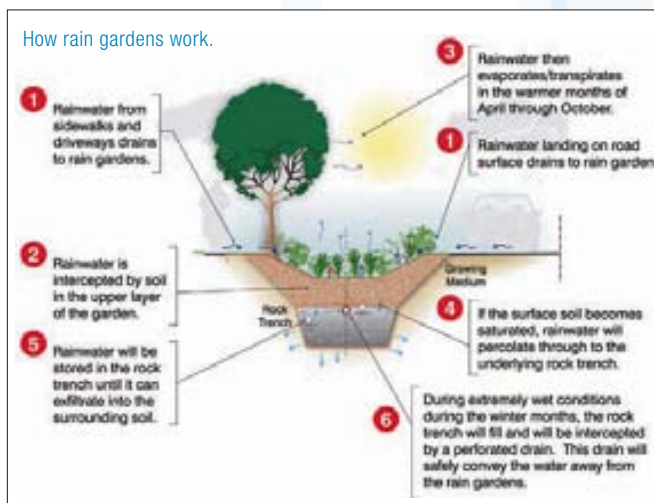
## Current barriers in BC and the status of overcoming them

There are many reasons why rain gardens are not more common in BC. Different issues may be more or less critical depending on the site location, type of development, the underlying soils and geology, and the topography. Specific issues that have restricted the use of stormwater LID measures and the progress in overcoming them are discussed below.

### Competition for lot space and land usability

While design sizing criteria for stormwater LID measures vary, the target values are generally larger in the Lower Mainland (30-70mm) and coastal areas than in drier interior climates, and more land is required to store and infiltrate that volume of rainwater. LID measures are seen as taking up too much valuable land area, particularly where there are poorly draining soils such that a greater surface area is required to meet the target. In addition, in urban areas there is a trend towards smaller lots, while houses and other building coverage are becoming larger, leaving scant room for on-lot surface LID measures. Urban rights-of-way are also getting narrower in support of density, but in many cases the pavement is not, which leaves little room for surface LID measures.

Some residents simply do not like the look of visible surface LID measures. They are sometimes described as 'messy,' and some prefer a traditional suburban lawn with a flat, grassed yard, and curb and gutter. Particularly in





Silver Ridge rain gardens in Maple Ridge, BC (2005).



Silver Ridge rain gardens seven years later and more beautiful than ever (2012).

residential cases, a requirement for surface stormwater facilities may be seen as an imposition on the owner's right to use his or her land as desired. On the other hand, some residents love these green solutions and feel they add to property values and the liveability of neighbourhoods.

**Improving awareness:** Improving awareness of stormwater LID measures and their purpose and function, both in the public realm and in municipal departments, has multiple benefits. Better awareness and understanding means less fear of 'new' technology and failure, and increased acceptance of rain gardens and other LID measures as parts of the drainage infrastructure system. As awareness and understanding increase, the aesthetic objections to LID measures should also decrease. As installations expand, LID measures may change the expectation of what 'urban' and 'residential' land use looks like. They could even become the new expectation for professionally-built developments.

Of course, actually promoting awareness and understanding is not trivial. The pilot projects that continue to be installed throughout BC are a significant boost on this front, particularly when they are visible and publicly accessible sites. Pilot projects also work as introductions for municipal staff in reviewing the infrastructure and design components of LID measures, and understanding the design concepts and construction requirements. They also help staff to develop familiarity with the look and process of the construction in order to incorporate reviews and inspections into standard municipal processes.

A sometimes overlooked component of pilot projects in BC is information explaining what the LID measure is, and why it is there. Whether the project is on private or public land, an informational sign or plaque installed for permanent use will serve as an educational tool for the public and passersby, as well as a reminder to landowners and maintenance crews that the rain garden or LID measure has a specific design and function, and is not simply a mistake that needs to be filled in.

### Design and reliability concerns

Although there are numerous pilot projects for stormwater LID measures around BC, and the Lower Mainland in particular, many land developers, consultants and municipal staff would prefer to continue with tried and true traditional servicing, and have not invested in the necessary planning for sizing, designing or constructing stormwater LID measures. Changing from traditional servicing is seen as a risk and is met with resistance. In addition, there appears to be a lack of faith that LID measures will work as designed, or are as reliable as long-term infrastructure installations. Additional design challenges are posed by difficult and sometimes inappropriate sites for engineered retention and/or infiltration facilities. Geotechnical investigation may be required where there is a risk of infiltrated water coming to the surface and impacting downslope properties or creating a geotechnical hazard due to saturated and unstable soils.

**Making design easier and better understood:** As more rain gardens and other LID measures have been designed and installed over the past few years, more has been learned about the critical elements of design and sizing for such facilities. Some municipalities in BC have developed municipal design standards (these may currently be in draft or preliminary form) for LID measures that can be used to design facilities for sites in those areas.

The *Metro Vancouver Stormwater Source Control Design Guidelines*<sup>2</sup> are a resource available on Metro Vancouver's website. Developed in 2005, these guidelines were updated in 2012 with additional engineering and design guidance, including step-by-step design examples and tools to make the design of stormwater LID measures easier. Simplified sizing using equations and charts are also included.

### Barriers within municipal departments

Even in municipalities where there is support – or even requirements for – the use of stormwater LID measures on developing lots, conflict can arise within the various city departments (engineering, planning development services, transportation, operations and inspection). While some departments understand the reasons why LID measures should be used, other departments do not. Everyone is busy and there is a strong desire to simply resist the 'extra work' and learning curve required to deal with a new and different type of infrastructure. Most municipalities have a sustainability charter or similar documents and find the idea of innovation appealing, but practically, the internal processes are not in place for approving and inspecting non-traditional types of facilities. Existing budgets and municipal staff are already stretched. Also in the mix are developers and landowners who have the ear of council and often argue against the use of surface LID measures.

Municipalities are also very concerned with the maintenance responsibilities and costs of LID measures. With budget cuts and other pressing municipal priorities, there is resistance to maintaining additional measures. However, rain gardens are designed to require minimal maintenance. In addition, the maintenance of the vegetation component of surface LID measures may be the responsibility of the landowner, as with tree, lawn and boulevard areas.

**Incorporating LID measures into municipal processes:** Municipalities are aware of their internal stumbling blocks and are working towards bridging the gaps by developing new internal processes and updated standards. Many municipal departments have encountered challenges related to LID measures and are working through the issues for assessing and approving emerging technologies. Each department has a different perspective on the relative benefits and challenges of this new infrastructure, which sometimes requires exceptions or unusual considerations compared to more traditional stormwater management practices.

Many municipalities are making efforts to identify these considerations and to incorporate new elements into existing policies and processes in order to deal with them. Municipal processes are changing and evolving further as technologies adjust and LID measures become more common and integrated into current designs. In general, as the uptake on rain gardens and stormwater LID measures increases and more projects are implemented, the level of comfort that municipal staff have with these types of facilities continues to rise.

In addition, many municipalities throughout BC have completed Integrated Stormwater Management Plans (ISMPs) and have consulted with multiple departments and made recommendations for managing development and protecting watershed health. Most ISMPs recommend some application of stormwater LID measures, as well as recommending implementation strategies specific to the municipality. Municipalities are beginning to adopt these recommendations as they look to promote and incorporate stormwater LID measures in development and redevelopment.

### Case study: Mountain Equipment Co-op, North Vancouver

The new Mountain Equipment Co-op store in North Vancouver, BC is an illustration of the gains that have been made in designing and implementing rain gardens and other stormwater LID measures in a project.

Roof leader to rain garden at the Mountain Equipment Co-op store.



The Mountain Equipment Co-op store rain garden in North Vancouver, BC.

When construction of the store was completed in July 2012, the finished half-hectare site did not have a drainage service connection to the municipal storm sewer because it did not require one. The site surrounding the new store acts like a sponge; it retains rainfall and runoff from frequently occurring storms and allows it to infiltrate into the ground and flow slowly into Lynn Creek.

This is achieved through a suite of stormwater LID measures including rain gardens, permeable pavers, an infiltration gallery under the parking lot, and manufactured stormwater storage chambers that allow for infiltration through the bottom. The major (larger than a 10-year storm) drainage system is provided by on-site vegetated swales that carry excess water directly to the creek.

The review and approval process for this site was smooth and expeditious. The progressive project owner had high environmental goals that exceeded standard requirements. Another benefit was that the stormwater design team was involved in the project from the beginning, allowing the stormwater management needs to influence the overall design from an early stage.

The contractors faced some challenges during construction and did not always understand the technical objectives of the stormwater management LID measures. For example, the rain garden's weirs were initially installed as decorative blocks that did not extend to the sides of the rain garden, so they did not hold water back to be infiltrated as intended, and water would just flow around them. This was quickly explained and fixed.

### Conclusion

We are slowly but surely overcoming the barriers that have delayed the widespread implementation of rain gardens and other stormwater LID measures. Time and experience have provided valuable lessons to designers, developers, municipal staff and contractors, and as with most things, we continue to learn as we move forward. There is significant progress toward the common use and application of stormwater LID measures and there appears to be increasing acceptance and momentum for these components of stormwater infrastructure. We, in the stormwater community, look forward to the day when development routinely incorporates stormwater LID measures and these practices are a standard part of the development infrastructure. 💧

### End notes

<sup>1</sup> [www.invw.org/article/lf-green-roofs-and-rain-g-1323](http://www.invw.org/article/lf-green-roofs-and-rain-g-1323)

<sup>2</sup> [www.metrovancouver.org/services/wastewater/sources/Pages/StormwaterManagement.aspx](http://www.metrovancouver.org/services/wastewater/sources/Pages/StormwaterManagement.aspx)

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