LID Plant Guidance

Marine West Coast Climate

Low Impact Development (LID) aims to reduce the impact of human development on a site's hydrologic system. Strategies used include infiltration and evapotranspiration which work to slow runoff in order to prevent flooding and use native vegetation to reduce urban pollutants. In wet regions, LID is used to limit how much water goes into large, conventional end-of-pipe stormwater infrastructure, while in dry regions, LID can store water aiding in overall water savings.

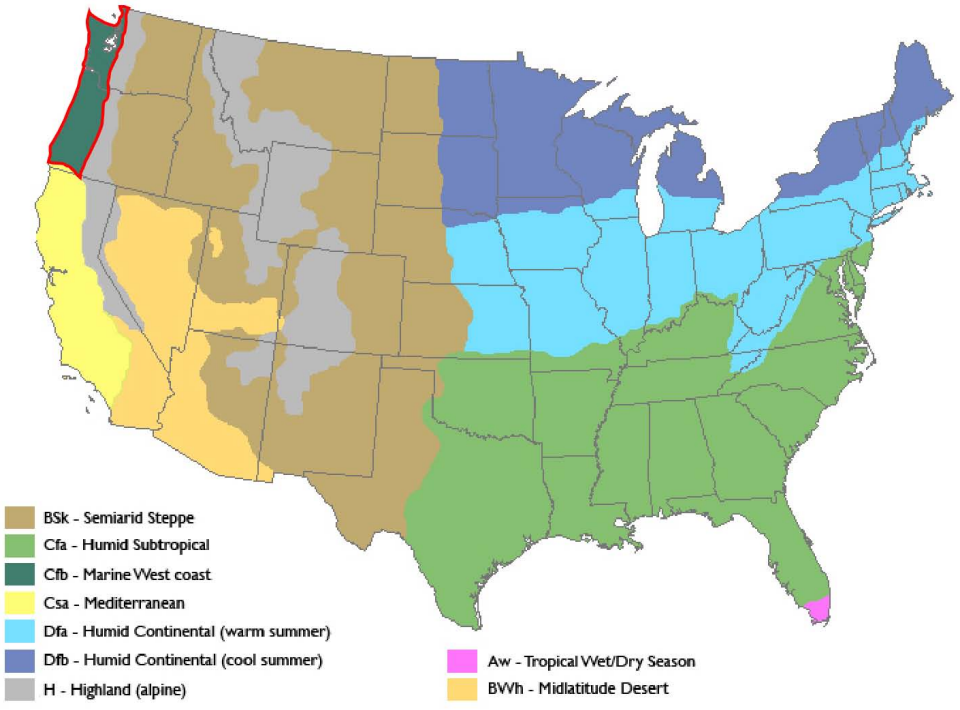
LID designs can natural resource area conservation, incorporate reduction of the development envelope, and minimization of impervious surfaces. LID Best Management Practices (BMP) are landscape and infrastructure controls for stormwater management. The selection of drought tolerant, native plantings is critical to enhance BMP functions and efficiencies. Because LID BMPs are designed to accommodate rain events, the vegetation used in LID systems needs to be adapted to both dry periods and flooding. To perform effectively, LID BMPs must be planned and maintained properly to provide pollutant removal and protection of predevelopment hydrological functions. This factsheet can be used by engineers, landscape architects, planners, landscapers, and developers in selecting appropriate vegetation in the development and implementation of LID BMPs for individual climatic regions.

Key Concepts

- Cost-effective
- Easy to maintain
- Aesthetic
- Maintain runoff near site
- Pollution removal
- Species management
- Noise and dust abatement
- Reduce heat islands

Marine West Coast Climate

The Köppen Climate system divides the United States into nine zones. The Marine West Coast climate zone extends along the pacific northwest coastline from southern Oregon to northern Washington. This climate type is characterized by mild temperatures and frequent precipitation in the autumn, winter, and spring with slightly drier summers. Because this climate borders the ocean, there are small fluctuations in temperature from winter lows to summer highs. Vegetation used for LID BMPs within this climate zone must be able to endure prolonged saturation and intermittent dry periods, as well as periodic freezes in the winter. Using locally adapted native plants will result in higher success rates, and less overall maintenance inputs than non-native ornamentals.



Army Low Impact Development Technical User Guide. Washington, DC: U.S. Army Corps of Engineers, 4 January 2013.

US EPA. "Managing Wet Weather with Green Infrastructure." 2008.

LID BMPs

According to the Army Low Impact Development Technical User Guide (2013), there are seven primary types of structural LID BMPs. Of those seven types, there are three that require extensive planting designs to function properly: bioretention, vegetated swales, and vegetated filter strips. Selecting the right vegetation for the BMP ensures overall plant success as well as maximizing the benefits gained from the LID system.

Bioretention

- ✓ *Holds stormwater to prevent flooding*
- ✓ *Allows water to infiltrate soil/ underdrain*
- ✓ *Filters out pollutants and sediments*

Courtesy of US Dept. of Housing and Urban Development

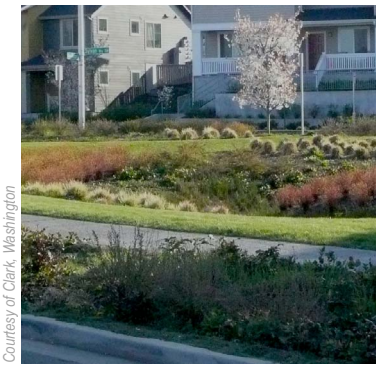
Bioretention collects and holds stormwater runoff in flat-bottomed, shallow depressions or basins. The basins are vegetated and designed to filter pollutants as stormwater infiltrates into soil/ underlying drain.

Bioretention cells are designed for water infiltration, filtration, or a combination of both. Cells make use of the physical properties of water, soils, and vegetation to reduce or remove pollution from stormwater runoff (U.S. Army Corps of Engineers 2013, 2-26).

Since bioretention areas have flat bottoms, most of the plants used need to tolerate heavy saturation for the times when it is at full capacity. Bioretention is critical in the Marine West Coast where an estimated 40 percent of rainfall is intercepted by foliage and evaporated during rainy season (Puget Sound Partnership 2012, 1). Due to the extremely wet conditions in the cooler seasons, saturated soils are common and low lying soils are frequently inundated. Care should be taken to ensure adequate drainage and retention volumes.

Vegetated Swales

- ✓ *Allows water to infiltrate soil/ underdrain*
- ✓ *Filters out pollutants and sediments*
- ✓ *Slows runoff*



Courtesy of Clark, Washington

Vegetated swales are broad, shallow channels that direct stormwater surface runoff to a waterbody or stormwater system. Swales are densely planted with grasses, shrubs, and trees to slow and filter stormwater while enabling transpiration and infiltration.

The natural rate which interflow moves from wet areas to streams in this particular climate is very slow, possibly taking up to weeks to complete the process. To best simulate those natural conditions, deep subsurface soils should be planted with lush vegetation to slow and intercept concentrated runoff during seasonal rains.

Vegetated Filter Strips

- ✓ *Filters out pollutants and sediments*
- ✓ *Slows runoff*

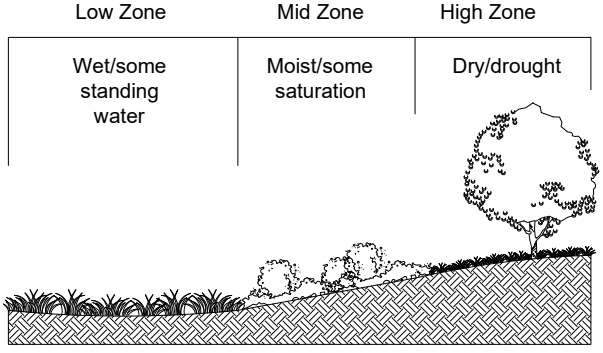
Courtesy of Clark, Washington

Vegetated filter strips are heavily planted, narrow depressions that collect sheetflow runoff from adjacent impervious areas. Vegetated filter strips can connect to other LID BMPs, vegetated areas, or receiving waterbodies as well as effectively treating runoff from isolated impervious areas such as roofs and parking lots (USACE 2013, 2-33).

Vegetated filter strips are not meant to retain water, so they require plants that can endure dry periods.

LID Planting Considerations

Because LID BMPs are strategically designed to slow and infiltrate runoff, plants selected for use must be able to accommodate periodic flooding as well as prolonged dry conditions. Selecting low maintenance, native vegetation ensures that a LID BMP will work within the Marine West Coast climate and be more efficient and use less resources. Shrubs, grasses, perennials, and groundcovers should be used strategically to stabilize slopes, slow and absorb runoff, and filter pollutant loads. The layering of vegetation canopies is important in this climate to achieve the highest rate of precipitation interception and detention on plant surfaces. Understanding how LID BMP vegetation functions is important to the overall functioning of the stormwater system. The depressions of LID BMPs can be divided into three general moisture zones: low, mid, and high. The lowest sections collect and hold water for the longest amount of time. Vegetation in the lowest zone must be able to accommodate prolonged saturated periods as well occasional dry conditions between rainfalls, especially in summer months. Mid zone plantings should provide slope stabilization and be able to withstand potentially high runoff volumes while saturated. Plants selected for the highest zone of a Marine West Coast BMP still require some tolerance of wet conditions, but must also be able to survive with less water between rainfalls.



References / More Information

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Special Considerations for the Marine West Coast Zone

Because of the wet conditions of this region, most selected plants need to be able to thrive in moist conditions. Emergent plants can be incorporated to aid in overall pollutant removal places frequently ponded with water. Although the growing season is shorter and cooler than other climates, the vegetation in this region is typically lush and can become established quickly. Care should be taken to ensure drought tolerance in areas of increased drainage where the LID BMP may be drier than surrounding areas for prolonged periods of time. Tree cover is also an important consideration because are adapted to a forest system and do not need full sun. Below are some suggested vegetation species applicable for the Marine West Coast climate. Proposed LID designs include but are not limited to suggested plant species shown below. Coordination with local plant nurseries and natural resource services is essential to successful LID planning. Proposed LID plantings and planting locations shall be in accordance with applicable AT/FP (Anti-terrorism/Force Protection) guidelines and UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings.

LID Plant Suggestions	Form	Height	Width	High Zone	Mid Zone	Low Zone	Sun	Part Sun	Shade	Hardiness	Notes / Maintenance
Western Yarrow *Achillea millefolium*	Forb	1-3'	1-2'	X	X		X			2-9	Very drought tolerant, can spread very quickly
Blackeyed Susan *Rudbeckia hirta*	Forb	3'	1-2'	X	X		X	X		2-9	Clump forming forb with minimal maintenance
Showy Milkweed *Asclepias speciosa*	Forb	2-4'	1'	X	X	X	X	X		2-8	Highly beneficial, very drought tolerant
Pacific Bleeding Heart *Dicentra formosa*	Forb	1'	1-3'		X			X	X	2-9	Spreading ground cover, drought tolerant
LID Plant Suggestions	**Form**	**Height**	**Width**	**High Zone**	**Mid Zone**	**Low Zone**	**Sun**	**Part Sun**	**Shade**	**Hardiness**	**Notes / Maintenance**
Dunegrass *Elymus mollis*	Grass	3-4'	1-2'	X	X		X			3-7	Will not toerlate soggy soils
Muhly Grass *Muhlenbergia capillaris*	Grass	2-5'	2'	X	X		X	X		4-8	Muhly is common native grass which is well adapted to periods of saturation to drought
Dewey's Sedge *Carex deweyana*	Grass	1-3'	1-2'	X	X	X	X	X		4-7	Clump forming, tolerates dry to moist soils
Slough Sedge *Carex obnupta*	Grass	1-3'	1-3'		X	X	X	X		6-9	Tolerates salt water, fast growing, good for slope stablization
LID Plant Suggestions	**Form**	**Height**	**Width**	**High Zone**	**Mid Zone**	**Low Zone**	**Sun**	**Part Sun**	**Shade**	**Hardiness**	**Notes / Maintenance**
Pacific Stonecrop *Sedum spathulifolium*	Ground Cover	< 1'	1-2'	X			X			3-9	Spreading ground cover
Oregon Stonecrop *Sedum oreganum*	Ground Cover	< 1'	1-3'		X	X	X	X		5-8	Likes moist soil but tolerates drought well, does well in rocky and sandy soils, spreading
Bunchberry *Cornus unalaschkensis*	Ground Cover	1'	2'		X	X		X	X	2-7	Spreading ground cover

LID Plant Suggestions	Form	Height	Width	High Zone	Mid Zone	Low Zone	Sun	Part Sun	Shade	Hardiness	Notes / Maintenance
Snowberry *Symphoricarpos albus*	Shrub	3-6'	2-4'	X	X		X	X		4-10	Prune in early spring
Wild Mock Orange *Philadelphus lewisii*	Shrub	4-6'	6-8'	X	X		X	X		4-10	Prefer moist, well-drained soil
Western Serviceberry *Amelanchier alnifolia*	Shrub	6-10'	6-10'	X	X			X		3-10	Requires bi-annual pruning to control suckers
Evergreen Huckleberry *Vaccinium ovatum*	Shrub	5-8'	4-6'	X	X	X		X	X	4-7	Beautiful landscape shrub
Black Gooseberry *Ribes lacustre*	Shrub	3-5'	3-5'		X	X	X	X		4-8	Spreads easily by runners
Stink Currant *Ribes bracteosum*	Shrub	5'	3-6'		X	X	X	X	X	6-9	Grows well along streams in moist soils
Salmonberry *Rubus spectabilis*	Shrub	5-10'	5-10'		X	X	X	X	X	4-8	Can tolerate dry summer conditions
Rose Spirea *Spiraea douglasii*	Shrub	6-10'	4-8'		X	X	X	X		4-8	Prune in early spring
Blue Elderberry *Sambucus caerulea*	Shrub	25'	10'		X	X	X			4-8	Prefer well-drained soil, good for pollinators
LID Plant Suggestions	**Form**	**Height**	**Width**	**High Zone**	**Mid Zone**	**Low Zone**	**Sun**	**Part Sun**	**Shade**	**Hardiness**	**Notes / Maintenance**
Oregon White Oak *Quercus garryana*	Tree	50-90'	50'	X			X	X		6-8	Tap root, drought tolerant
Hairy Manzanita *Arctostaphylos columbiana*	Tree	10-12'	10-15'	X	X		X			4-8	Does well in sand to clay soils
White Alder *Alnus rhombifolia*	Tree	50'	30'	X	X	X	X	X	X	4-7	Improves soil through nitrogen fixation
Indian Plum *Oemleria cerasiformis*	Tree	10-15'	12'		X	X		X	X	5-9	Tolerant of polluted soils
Pacific Ninebark *Physocarpus capitatus*	Tree	13-15'	13-15'		X	X	X	X	X	4-10	Prefers moist soils, good for pollinators
Bigleaf Maple *Acer macrophyllum*	Tree	50-90'	50'		X	X	X			5-9	Tolerates poor soil conditions, low salt tolerance