LID Plant Guidance

Midlatitude Desert 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.

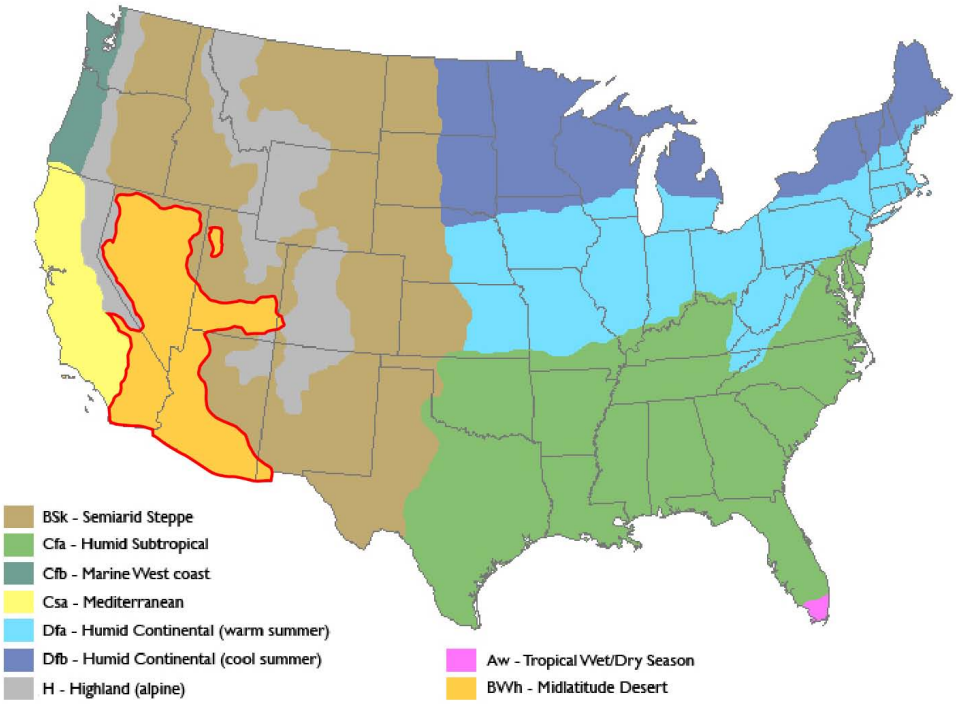
LID designs can natural resource area conservation, incorporate reduction of the development envelope, and minimization of impervious surfaces. LID Best Management Practices (BMP) are landscape and infrastructure controls for stormwater management. The selection of drought tolerant, native plantings 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

Midlatitude Desert Climate

The Köppen Climate system divides the United States into nine zones. The Midlatitude Desert climate zone is a located in the southwest United States. It is characterized by infrequent rainfall events throughout the year and extremely variable temperatures, both yearly and daily. Vegetation used for LID BMPs must adapt to drought-like conditions, especially in the extremely hot summers. Lack of rainfall will require vegetation that depends upon very little water but is also resilient to dramatic temperature changes from day to night and summer to winter. Using locally adapted native plants for the region's soils and climate will result in higher success rates, and less overall maintenance inputs than nonnative ornamentals. Water and soil conservation is especially important within this climate zone where water resources both above and below ground are limited.



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. Low rainfall and generally well-draining soils in this region mean that the primary function of LID BMPs will be pollutant removal. Any LID BMP will need to slow stormwater to acheive adequate detention time.

Bioretention

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

Courtesy of San Diego, CA

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 the soil or 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.

In this climate, bioretention cells will likely be dry; however, soils with high clay content and/or in low lying areas may drain slowly. This requires vegetation tolerant to inundation.

Additionally, some areas within the Midlatitude Desert zone contain saline soils. Perform proper soil analysis before plant selection to ensure appropriate plantings and use of soil amendments if required.

Vegetated Swales

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

Courtesy of San Diego, CA

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 and snowmelt while enabling transpiration and infiltration.

There are three types of vegetated swales: grass, wet, and bio-swales (USACE 2013, 2-30). Wet swales are unlikely for this region. Xeric plants that can handle periodic inundation or moist condtions are ideal for this BMP.

Dry soils in high clay areas can cause flash flood like conditions during rains. Swales can provide added detention and transport volume to manage flash runoff events.

Vegetated Filter Strips

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

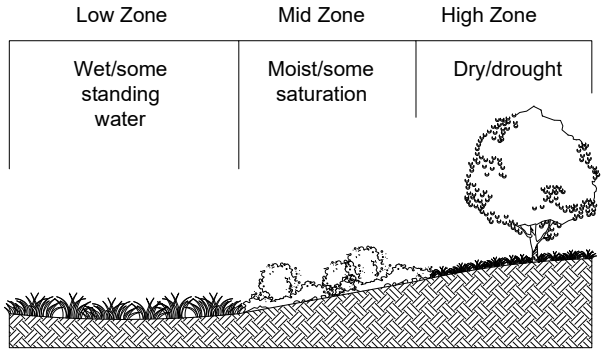
Courtesy of Encinitas, CA

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).

VFS must be able to handle short periods of high water flow and volume, although drainage time is likely to be quick except in areas with clay soils.Vegetated filter strips are not meant to hold water for long, so they will require plants that can endure long periods of drought, especially in the summer.

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 native vegetation will assist in this climate, as survival requires compatibility to potentially saline soils and drought conditions. Shrubs, grasses, perennials, and groundcovers should be used strategically to stabilize slopes, slow and absorb runoff, and filter pollutant loads. Understanding how LID BMP vegetation functions is important to the overall success 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. As soils in this regions are generally well-draining, vegetation in the lowest zone need to both handle inundation and be drought tolerant. Mid zone plantings should provide slope stabilization and be able to withstand potentially high runoff volumes. Plants selected for the highest zone of a Midlatitude Desert LID still require some moisture tolerance, but must also be able to survive in drought conditions between rainfalls. Layering vegetation canopies will assist in slowing down the erosive potential of precipitation and assisting in stormwater detention.

References / More Information

US Department of Agriculture. *Plants Database*. http://www.plants.usda.gov

Encyclopædia Britannica Online, s. v. "Mid-latitude steppe and desert climate". http://www.britannica.com/science/mid-latitude-steppe-and-desert-climate

University of Texas at Austin (2016). Lady Bird Johnson Wildflower Center. https://www.wildflower.org/plants/

City of Reno. "Truckee Meadows Stormwater Quality Management Program". http://www.reno.gov/government/departments/public-works/regional-stormwater-quality-management-program

Special Considerations for the Midlatitude Desert Zone

Because of the dry conditions of this region, most selected plants need to be drought tolerant. The majority of soil in this region is sandy/loamy and well-draining. Because of this, and since rainfall is infrequent, even plants located in the low zone will need to be drought tolerant. With the quick draining soils, the LID system will primarily function as a mechanism for pollutant removal. LID capture depth required for flood management will be minimal. Below are some suggested vegetation species applicable for the Midlatitude Desert climate. Proposed LID designs include but are not limited to suggested plant species shown below. 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
Desert Needlegrass *Stipa speciosa*	Grass	1-3'	1-2'	X			X			5-8	Drought tolerant once established, tolerates most soil types
Indian Ricegrass *Achnatherum hymenoides*	Grass	1-2'	1'	X	X		X			3-9	Spreads by seeding, good for a larger area where the seeds will be able to grow where they fall
Switch Grass *Panicum virgatum*	Grass	3-6'	2-3'			X	X	X		5-9	Drought tolerant, tolerates sandy soils, can be cut back to 2 in tall in the winter for better appearance
LID Plant Suggestions	**Form**	**Height**	**Width**	**High Zone**	**Mid Zone**	**Low Zone**	**Sun**	**Part Sun**	**Shade**	**Hardiness**	**Notes / Maintenance**
Pink Plains Penstemon *Penstemon ambiguus*	Forb	1-3'	1-2'	X	X			X		5-9	Drought tolerant, good for filtering out pollutants
Scabland Penstemon *Penstemon deustus*	Forb	1-2'	1-2'	X	X		X			4-8	Drought tolerant, tolerates rocky soils
Pearly Everlasting *Anaphalis margaritacea*	Forb	1-2'	1-2'	X	X		X			4-8	Drought tolerant but will look better with occasional waterings
Sand Verbena *Abronia fragrans*	Forb	1-3'	1-3'	X	X		X	X		7-10	Drought tolerant, does well in sandy soils
Colorado Four O'Clock *Mirabilis multiflora*	Forb	1-2'	3'	X	X			X		5-10	Drought tolerant, fast-growing ground cover, can be mowed over in October
Great Basin Sagebrush *Artemisia tridentata*	Forb	3-4'	3-4'	X	X		X			4-10	Drought tolerant, does well in rocky soils
Utah Sweetvetch *Hedysarum boreale*	Forb	1-2'	2'		X	X		X		3-7	Drought tolerant, grows on well-drained loams as well as soils with clay and sand, generally grows at elevations between 4,000 and 8,000 ft
Western Columbine *Aquilegia formosa*	Forb	2-3'	2'		X	X	X	X		4-8	Can tolerate some saturation

LID Plant Suggestions	Form	Height	Width	High Zone	Mid Zone	Low Zone	Sun	Part Sun	Shade	Hardiness	Notes / Maintenance
Black Sagebrush *Artemisia nova*	Shrub	1'	2-3'	X			X			3-7	Low spreading shrub, drought tolerant
Bitterbrush *Purshia tridentata*	Shrub	4-8'	3-4'	X			X			3-9	Does well in gravelly or sandy soils, drought tolerant
Kinnikinnik *Arctostaphylos uva-ursi*	Shrub	> 1'	3'	X	X		X	X	X	4-8	Drought tolerant, does well in rocky soils, spreading ground cover
Sulphur Flower *Eriogonum umbellatum*	Shrub	1-3'	3'	X	X		X	X		4-9	Drought tolerant, water during dry times in first year, does well in gravelly soils, good slope stabilizer
Mormon Tea *Ephedra viridis*	Shrub	3-5'	3-5'	X	X		X			6-11	Drought tolerant, good for stabilizing slopes, does well in rocky soil
Apache Plume *Fallugia paradoxa*	Shrub	2-6'	2-6'	X	X			X		4-10	Does well in sandy or rocky soils, cut back if necessary
Antelope Bitterbrush *Purshia tridentata*	Shrub	6-10'	4-8'	X	X		X			4-8	Good for stabilizing slopes
Silver Buffaloberry *Shepherdia argentea*	Shrub	10-20'	10-15'	X	X		X			3-9	Drought tolerant, does well in sandy or rocky soils
Fringed Sage *Artemisia frigida*	Shrub	1-3'	2-3'	X	X	X	X			4-8	Drought tolerant
Shadscale Saltbush *Atriplex confertifolia*	Shrub	1-3'	2-3'	X	X	X	X			4-8	Moderately fire resistant
Four-Wing Saltbush *Atriplex canescens*	Shrub	3-6'	4-8'	X	X	X		X		3-11	Salt tolerant, can tolerate both drought and soil saturation
Utah Serviceberry *Amelanchier utahensis*	Shrub	5-15'	5-15'	X	X	X	X			5-8	Grows well in heavy clay soils, prune annually in late winter/early spring
Wax Currant *Ribes cereum*	Shrub	3-5'	3-5'		X	X	X	X		4-8	Drought tolerant once established, does well in sandy or rocky soils
Mallow Ninebark *Physocarpus malvaceus*	Shrub	2-6'	3-5'		X	X	X	X		4-8	Drought tolerant, tolerates sandy soils
Snowbrush *Ceanothus velutinus*	Shrub	3-10'	3-8'		X	X	X	X		4-8	May require watering during long periods without rain, good for stabilizing slopes
LID Plant Suggestions	**Form**	**Height**	**Width**	**High Zone**	**Mid Zone**	**Low Zone**	**Sun**	**Part Sun**	**Shade**	**Hardiness**	**Notes / Maintenance**
Curl-Leaf Mountain Mahogany *Cercocarpus ledifolius*	Tree	8-20'	6-15'	X	X			X		6-9	Good for stabilizing slopes, drought tolerant