

LID Plant Guidance

Humid Subtropical 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.

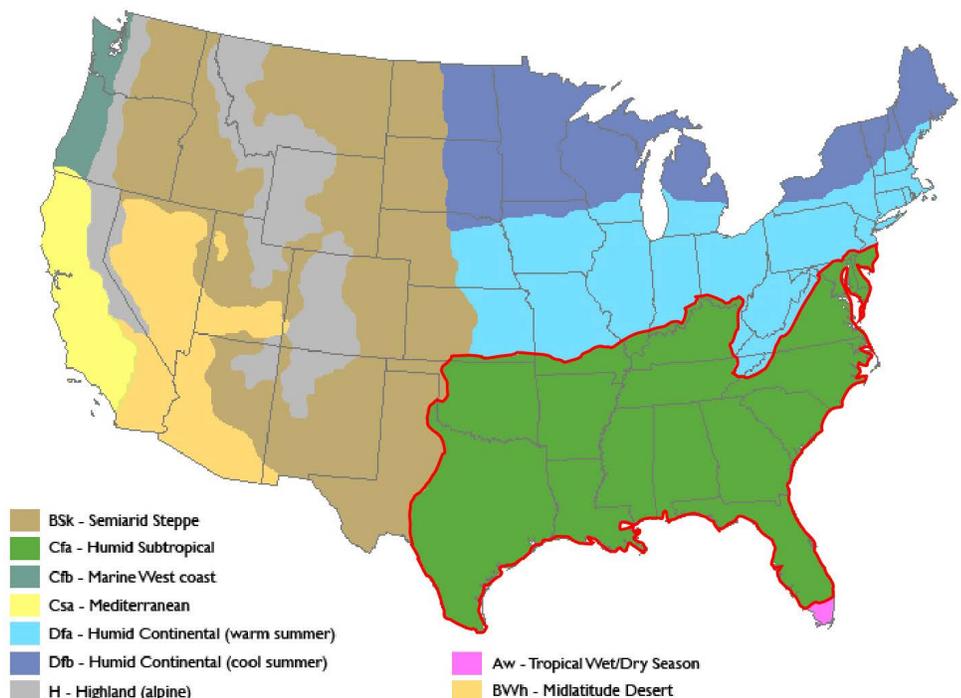
Key Concepts

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

Humid Subtropical Climate

The Köppen Climate system divides the United States into nine zones. The Humid Subtropical climate zone encompasses the southeast United States. This climate zone is characterized by fairly even precipitation throughout the year. Summers are hot and humid while winters are mild. Northern parts of this zone may endure below-freezing temperatures. Due to the location and weather patterns surrounding this climate zone, hurricanes and strong storms are common.

Vegetation used for LID BMPs must adapt to the temperature differences between seasons in this climate, as well as intense storms. Using locally adapted native plants for the region's soils and climate 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

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. There are many plants in this region that are wetland plants and therefore would be well-suited for this purpose. Saturated clay and silt



soils, with high water tables may require innovative engineering of bioretention units. Adjacent mini-retention and micro depressions connected to larger bioretention area maximize detention and retention volumes. The zone's severe summer storms and close proximity to the ocean will benefit from LIDs that stabilize underlying soils and removes pollutants from runoff.

Vegetated Swales

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

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). Vegetated swales greatly reduce pollutant loads when placed between roadways and waterbodies such as streams, rivers, wetlands, lakes, and oceans.

Courtesy of US Army, Fort Hood, Texas



Swales can be especially useful in this zone for mitigation of "first flush" occurrences where natural waterbodies are most vulnerable to stormwater pollution. Choosing grasses, sedges, and other wetland plants will assist in the bioremediation process.

Vegetated Filter Strips

- ✓ Filters out pollutants and sediments
- ✓ Slows runoff

Vegetated filter strips are heavily planted, narrow depressions that collect sheet flow runoff from adjacent impervious areas. Vegetated filter strips can connect to other LID, 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 should work to slow the flow of water in order to reduce pollutant loads as much as possible before discharge into nearby wetlands

USACE 2016

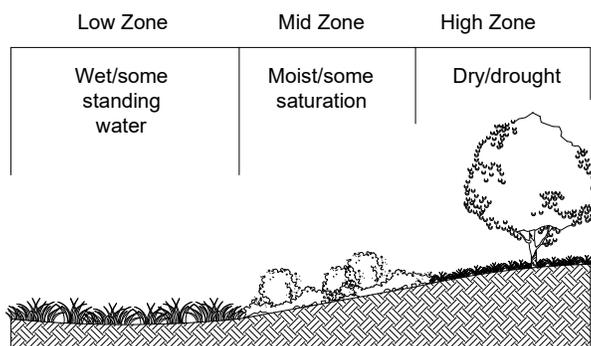


and water bodies. Vegetation for this LID should tolerate both saturation and dry periods between rainfall. Lowlands and wetlands are common in this region, and adequate retention and treatment capacity should be considered.

LID Planting Considerations

Because LID BMPs are strategically designed to slow and infiltrate runoff, plants selected for use must be able to accommodate flooding, which in this region, may be a constant factor. Selecting low maintenance, native vegetation ensures that a LID BMP will work within the Humid Subtropical 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. In the flat and low-lying areas present in many areas of this region, utilizing micro topography and maximizing opportunities for detention will assist LID BMP success. Understanding how a 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 as the occasional dry conditions. Mid zone plantings should provide slope stabilization and be able to withstand potentially high runoff volumes. Plants selected for the highest zone of a Humid Subtropical BMP may require less tolerance to wet conditions. Water-loving plants are ideal in most areas where drainage is slow and in the lowlands. Plants grow rapidly because of the moisture and consistent, warmer temperatures. Choosing slower-growing plants and shrubs with non-competing canopy heights can assist in minimizing maintenance requirements.



References / More Information

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

Missouri Botanical Garden. <http://www.missouribotanicalgarden.org/>

Encyclopædia Britannica Online, s. v. "Humid subtropical climate". <http://www.britannica.com/science/humid-subtropical-climate>

Alabama Department of Environmental Management, Alabama Cooperative Extension System & Auburn University, n.d. *Low Impact Development Handbook for the State of Alabama*. <http://www.aces.edu/natural-resources>

Special Considerations for the Humid Subtropical Zone

In addition to the use of native plants, LID BMPs in the Humid Subtropic zone benefit from slower-growing plants and shrubs with non-competing canopy heights to minimize maintenance requirements. Incorporation of mulch and “no-mow” groundcovers in lieu of traditional plantings is also a useful strategy. Significant maintenance, including regular mowing, could be problematic in areas of rapid growth due to the region’s optimal growing conditions. Although mulch also incurs a yearly maintenance cost, strategic incorporation can equate to less time, money, and energy expended. Adding sand as a soil amendment also assists in opening up drainage in clay and silty soils, while at the same time providing for higher volumes of underground water storage capacity. Standing surface water can attract unwanted wildlife, such as mosquitos, and LID BMPs should be designed to maximize infiltration and subsurface capture of stormwater. To prevent mosquitos from breeding, all LIDs should be designed to drain within three days of a regular storm event. Below are some suggested vegetation species applicable for the Humid Subtropical climate zone. 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
Poverty Oatgrass <i>Danthonia spicata</i>	Grass	1-3'	1-2'	X			X	X	X	2-8	Does well in rocky soils
Pennsylvania Sedge <i>Carex pensylvanica</i>	Grass	1'	1'	X	X			X	X	3-8	Spreading, can be used as a ground cover
Little Bluestem <i>Schizachyrium scoparium</i>	Grass	2-4'	1-2'	X	X		X				Deer resistant
Bitter Switchgrass <i>Panicum amarum</i>	Grass	3-4'	2-3'	X	X		X	X		2-9	Drought tolerant, can survive near black walnut trees
Indian Grass <i>Sorghastrum nutans</i>	Grass	3-5'	1-2'	X	X		X			4-9	Drought tolerant, good for native wildlife
Big Bluestem <i>Andropogon gerardii</i>	Grass	4-6'	2-3'	X	X		X			3-9	Needs some shade from direct afternoon sun, deer resistant
Virginia Wildrye <i>Elymus virginicus</i>	Grass	2-4'	1-2'		X			X		3-9	Good for pollinators
Eastern Gamagrass <i>Tripsacum dactyloides</i>	Grass	3-4'	1-2'		X			X		5-8	Can tolerate short periods of saturation
Tussock Sedge <i>Carex stricta</i>	Grass	1-3'	1-2'		X	X	X	X		3-8	Good for pollinators, deer resistant
Woolgrass Bulrush <i>Scirpus cyperinus</i>	Grass	6'	3-5'		X	X	X	X		4-8	Clump forming, spreading, good for native wildlife
Switch Grass <i>Panicum virgatum</i>	Grass	3-6'	2-3'			X	X	X		5-9	Drought tolerant
Canada Rush <i>Juncus canadensis</i>	Grass	1-2'	1'			X	X			3-9	Salt tolerant
Long Hair Sedge <i>Carex comosa</i>	Grass	2-3'	1-2'			X	X	X			Drought tolerant, prefers well-drained soils
Sallow Sedge <i>Carex lurida</i>	Grass	2-3'	1-2'			X	X	X	X	3-8	Tolerates long periods of saturation, deer resistant
Soft Rush <i>Juncus effusus</i>	Grass	2-4'	2-4'			X	X			4-9	Requires constant saturation
Rice Cutgrass <i>Leersia oryzoides</i>	Grass	2-4'	1-2'			X	X	X	X	3-9	Good for native wildlife and stabilizing slopes
American Burreed <i>Sparganium americanum</i>	Grass	4-7'	1-3'			X		X		3-9	Cut back in winter

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Yellow stonecrop <i>Sedum nuttallianum</i>	Groundcover	< 1'	< 1'	X	X		X			5-8	Annual and mat-forming
Stonecrop sedum <i>Sedum tematum</i>	Groundcover	< 1'	1'	X	X		X	X		4-8	Wide range of varieties, full ground coverage, tolerates moisture better than most sedums, highly drought tolerant, but takes several seasons to fill in
Mistflower <i>Eupatorium coelestinum</i>	Forb	2'	2'	X	X	X	X	X		6-9	Good for pollinators, drought tolerant once established
Blue Wild Indigo <i>Baptisia australis</i>	Forb	4'	3'	X	X	X	X			6-9	Good for pollinators
Marsh marigold <i>Caltha palustris</i>	Forb	1-2'	1'		X	X	X	X		6-9	Drought tolerant, but look better when watered during dry periods
Copper Iris <i>Iris fulva</i>	Forb	2-4'	1-2'		X	X	X	X		6-9	Good for pollinators
LID Plant Suggestions	Form	Height	Width	High Zone	Mid Zone	Low Zone	Sun	Part Sun	Shade	Hardiness	Notes / Maintenance
Black Huckleberry <i>Galussacia baccata</i>	Shrub	1-3'	1-3'	X	X	X	X	X	X	3-7	Prefers sandy or rocky soils
Spicebush <i>Lindera benzoin</i>	Shrub	6-12'	6-12'	X	X		X	X		4-9	Drought tolerant
Mountain Laurel <i>Kalmia latifolia</i>	Shrub	5-15'	5-15'	X	X			X		4-9	Prefers moist, well-drained soils
Oakleaf Hydrangea <i>Hydrangea quercifolia</i>	Shrub	6-8'	6-8'		X		X	X		5-9	Prune in the fall as much as desired, can be cut back all the way to the ground (full cutback will result in no flowers the next season)
Arrowwood Viburnum <i>Viburnum dentatum</i>	Shrub	6-10'	6-10'		X		X	X		2-8	Prune suckers yearly
Swamp Azalea <i>Rhododendron viscosum</i>	Shrub	4-6'	12'		X	X		X		4-9	Prefers moist, acidic soils
Sweet Pepperbush <i>Clethra alnifolia</i>	Shrub	3-8'	4-6'		X	X	X	X		3-9	Adaptable to many soils types but prefers well-drained soils, good for pollinators
Red Chokeberry <i>Aronia arbutifolia</i>	Shrub	6-8'	3-4'		X	X	X	X		4-9	Prefers moist, well-drained soil, prune suckers yearly
Winterberry <i>Ilex verticillata</i>	Shrub	3-12'	3-12'		X	X	X	X		3-9	Drought tolerant, prefers well-drained soils
Common Buttonbush <i>Cephalanthus occidentalis</i>	Shrub	5-12'	4-8'		X	X	X	X		5-9	Good for stabilizing slopes, good for pollinators
American Elderberry <i>Sambucus canadensis</i>	Shrub	5-12'	5-12'		X	X	X	X		3-9	Require watering during periods of drought, prune in early spring
Silky Dogwood <i>Cornus amomum</i>	Shrub	6-12'	6-12'		X	X	X	X		5-8	Water regularly until well-established
Southern Wax Myrtle <i>Myrica cerifera</i>	Shrub	6-12'	6'		X	X	X	X		7-9	Prefers moist, well-drained soils
Highbush Blueberry <i>Vaccinium corymbosum</i>	Shrub	6-12'	8-12'		X	X	X	X		5-8	Prefers acidic soils, requires some pruning
LID Plant Suggestions	Form	Height	Width	High Zone	Mid Zone	Low Zone	Sun	Part Sun	Shade	Hardiness	Notes / Maintenance
Corkwood <i>Leitneria floridana</i>	Tree	6-20'	4-12'		X	X	X	X		5-9	Good for erosion control
Common Witch Hazel <i>Hamamelis virginiana</i>	Tree	15-20'	15-20'		X	X	X	X		3-8	Prefers moist, well-drained soils, does not do well in compacted soils, moderately deer resistant