LID Plant Guidance

Mediterranean 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.

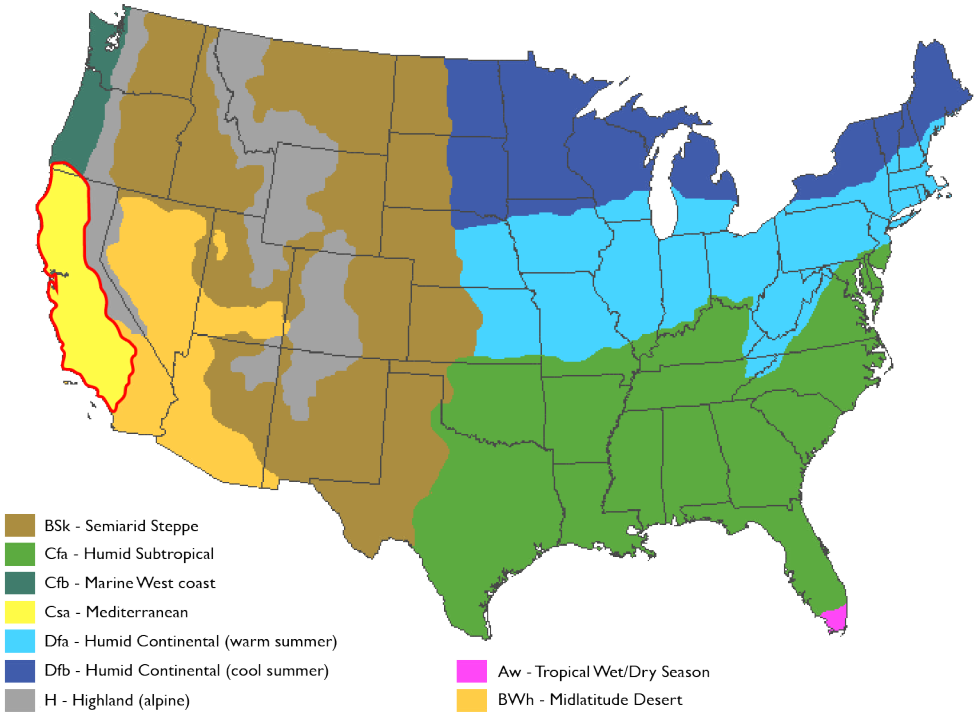
LID designs can natural resource area conservation, incorporate reduction of the development envelope, and minimization of impervious surfaces. LID Best Management Practices (BMP) are landscape and infrastructure controls for stormwater management. The selection of drought tolerant, native plantings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

Mediterranean Climate

The Köppen Climate system divides the United States into nine zones. The Mediterranean climate zone encompasses much of California and the southern tip of Oregon. The Mediterranean climate is characterized by hot, dry summers and winter rains. This climate cycle is exaggerated when El Nino-Southern Oscillation occurs. In this region, precipitation is limited during the summer months. Mediterranean climates occur near large bodies of water, which cause comparatively small ranges in temperature fluctuations from winter lows to summer highs. Vegetation used for LID BMPs must adapt to the Mediterranean climate's hot summer droughts and its mild, rainy winters. Attention must be paid to the local soils and subsoils, due to the high variability of content and depth, as well as depth to water table and water quality. 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*

Courtesy of California Water Boards

Bioretention collects and holds stormwater runoff in flat-bottomed, shallow depressions or basins. Vegetated basins are designed to filter pollutants as stormwater infiltrates into soil or underdrain.
Bioretention cells are designed for water infiltration, filtration, or a combination of both making 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).
California's rapid growth has caused significant expansion in total urbanized area. New impervious surfaces have increase stormwater runoff, and subsequent pollutant loads, within urban streams. Bioretention is a cost efficient way to reduce pollutants, slow peak discharges, and encourage groundwater recharge. In urban areas, smaller-scale bioretention cells vegetated with shrubs and trees reduce stormwater volumes, as well as reduce the urban heat island effect.

Vegetated Swales

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

Courtesy of Santa Cruz, California

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. There are three types of vegetated swales: grass, wet, and bio-swales (USACE 2013, 2-30).
Slowing of swales not only slows heavy winter rains, but also helps to filter, infiltrate, and replenish groundwater for use during long, dry summer months. Areas near the coast will benefit from high infiltration rates while inland soils may contain more clay and require some soil amendment. Swale design should accommodate periodic heavy inundations and large water volumes from intense seasonal storms.

Vegetated Filter Strips

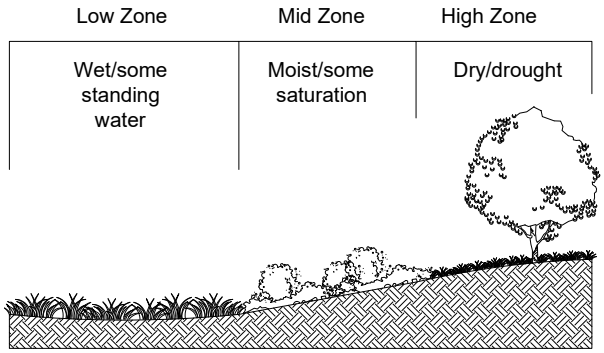
- ✓ *Filters out pollutants and sediments*
- ✓ *Slows runoff*

Courtesy of Santa Cruz, California

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 do not retain water, so they will require plants that can endure long dry periods, especially in the summer, as well as periods of drought.

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 and hot conditions. Selecting low maintenance, native vegetation ensures that a LID BMP will work within the Mediterranean 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. 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 drought conditions of the Mediterranean climate's summers. Mid zone plantings should provide slope stabilization, erosion control in poorer soils, and be able to withstand potentially high runoff volumes and peak runoff rates. Plants selected for the highest zone of a Mediterranean zone BMP require less tolerance to extreme wet conditions, but must still be able to survive with limited water; deep rooted vegetation will fare better in this zone.

References / More Information

UCRangelands Research & Education Archive. *Mediterranean Climate*. http://californiarangeland.ucdavis.edu/Mediterranean_Climate/.

Southern California Stormwater Monitoring Coalition & State Water Resources Control Board (2010). *Low Impact Development Manual for Southern California: Technical Guidance and Site Planning Strategies*. https://www.casqa.org/sites/default/files/downloads/socallid-manual-final-040910.pdf

Special Considerations for the Mediterranean Zone

This zone includes a large coastal area. Saline intrusion in coastal as well as central areas of the region is common, as is high levels of salts in the soils. Salt tolerant plants are recommended, and in certain cases soil amendments may be necessary to ensure long-term plant health. Water table height, soil type, and slopes range greatly throughout this climate zone. Considering soil chemistry, subsoils, and subdrainage in vegetation selection is just as important as accommodating climate features. Selecting heat, as well as fire tolerant vegetation is equally important. Coordination with local plant nurseries and natural resource services will be essential to successful LID planning. Below are some suggested plant species applicable for the Mediterranean 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.

Note: Because of its proximity to the ocean and its topography, California experiences a greater range of climate changes. Many of plants below are cataloged according to the Sunset 24 zone system, which factors in summer highs, lengths of growing seasons, humidity, rainfall patterns, and winter temperatures. Plants catagorized with this system begin with "Calif" in the hardiness zone column. More information about these zones can be referenced at:
http://www.sunset.com/garden/climate-zones/climate-zone-map-california-nevada

LID Plant Suggestions	Form	Height	Width	High Zone	Mid Zone	Low Zone	Sun	Part Sun	Shade	Hardiness	Notes / Maintenance
California Brome *Bromus carinatus*	Grass	1-5'	1'	X			X			Calif. All except 1A-3A, 8-9	Moderate salt tolerance, spreading, works well as a ground cover, good for soil stabilization
California Gray Rush *Juncus patens*	Rush	1-2'	1-2'	X	X		X	X	X	7-9	Tolerates poor drainage, seasonal drought, and shade
Pacific Reed Grass *Calamagrostis nutkaensis*	Grass	3-4'	2-3'	X	X		X	X		7-10	Spreading, clump-forming, drought tolerant, good for filtering pollutants
Mexican Rush *Juncus mexicanus*	Rush	1-3'	1-2'		X	X	X	X	X	Calif. 7, 9, 14-17	Spreading, moderate salt tolerance, prefers constant moisture
Soft Rush *Juncus effusus*	Rush	2-3'	2-3'		X	X	X	X		Calif. All	Tolerates poor drainage and heavy soils
LID Plant Suggestions	**Form**	**Height**	**Width**	**High Zone**	**Mid Zone**	**Low Zone**	**Sun**	**Part Sun**	**Shade**	**Hardiness**	**Notes / Maintenance**
Blue-Eyed Grass *Sisyrinchium bellum*	Forb	1'		X	X		X			Calif. All except 1A-3A	Tolerates sand, clay soils; tolerates wet soils
California Poppy *Eschscholzia californica*	Forb	1-2'	2'	X	X		X			6-10	Requires well-drained soil; is a perennial in mild climates and an annual where temperatures dip below freezing
Indian Paintbrush *Castilleja*	Forb	1-3'	1'	X	X		X	X		4-8	Requires watering the first year, do not allow soil to get over-saturated
Common Yarrow *Achillea millefolium*	Forb	1-3'	1-2'	X	X		X	X		Calif. All	Tolerates alkaline soil, sand and clay; seasonal wet conditions
Douglas Iris *Iris douglasiana*	Forb	1-3'	2-4'	X	X		X	X		Calif. All except 1A-3A	Tolerates sand and clay soils; seasonal inundation; spreads
Hummingbird sage *Salvia spathacea*	Forb	1-3'	3-5'	X	X		X	X	X	Calif. All; but 1A-3A	Tolerates clay, winter wet, summer drought

LID Plant Suggestions	Form	Height	Width	High Zone	Mid Zone	Low Zone	Sun	Part Sun	Shade	Hardiness	Notes / Maintenance
Ashleaf Buckwheat *Eriogonum cinereum*	Shrub	3-4'	4-6'	X	X		X	X		Calif. 15-17	Drought tolerant but looks better when watered during dry periods
Red Flowering Currant *Ribes sanguineum*	Shrub	8-10'	5'	X	X		X			5-9	Can be cut back if necessary
Thimbleberry *Rubus parviflorus*	Shrub	8-10'	8-10'	X	X		X	X		Calif. 7, 9, 14-15	May spread, can be trimmed back
Coyote Brush *Baccharis pilularis*	Shrub	8-10'	6-10'	X	X	X	X	X		Calif. 1A, 14-17	Has a dwarf cultivar that can be used as a groundcover
Red Twigged Dogwood *Cornus sericea*	Shrub	6-8'	4-6'		X	X	X	X		4-8	Can be cut back to the ground if needed
Mule Fat *Baccharis salicifolia*	Shrub	4-10'	8'			X	X	X		Calif. All except 1A-3A, 8-9	Requires fresh water, can be cut back as necessary
LID Plant Suggestions	**Form**	**Height**	**Width**	**High Zone**	**Mid Zone**	**Low Zone**	**Sun**	**Part Sun**	**Shade**	**Hardiness**	**Notes / Maintenance**
Coast Silk Tassel *Garrya elliptica*	Tree	5-10'	8-10'	X	X		X	X		Calif. 15, 17	Drought tolerant but looks better when watered during dry periods, requires well-drained soil, can grow up to 20' tall in ideal conditions
California Buckeye *Aesculus californica*	Tree	15-35'	15-30'	X	X		X	X		6-8	Requires watering during periods of drought
California Laurel *Umbellularia californica*	Shrub	60-80'	70-100'	X	X		X	X	X	7-10	Drought tolerant, stands up well in wind, good for stabilizing slopes
Red Willow *Salix laevigata*	Tree	15-45'	10-45'			X	X			7-10	Broad, spreading roots - plant at least 25' from pipes, buildings, and sidewalks