

Low-Impact Development Planting Zones

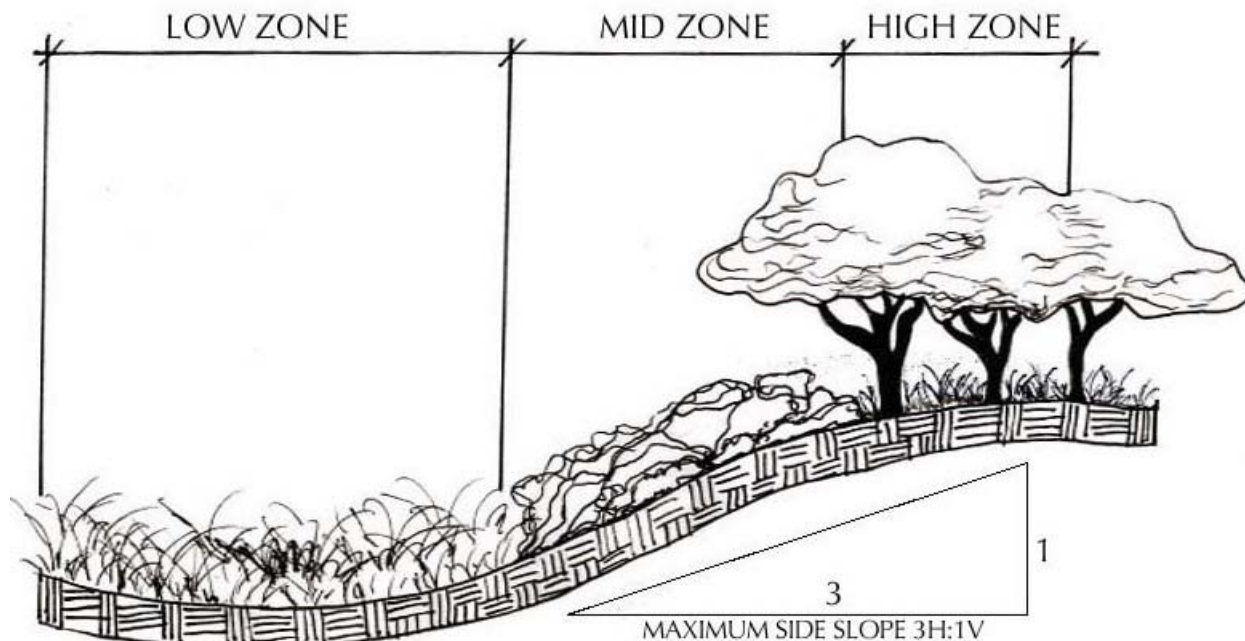
Planting zones refer to the planted areas in drainage features of low impact development (LID) practices and flood control detention basins. LID practices include vegetated swales and bioretention basins. Plants are an integral element of their function.

The plants in these zones facilitate natural infiltration of surface runoff, increase evapotranspiration, reduce the heat-island effect of urbanized areas, and reduce the rate, volume, and pollutant loading of urban runoff that ultimately ends up in local streams, rivers, estuaries, and the Monterey Bay.

For the drainage features to function optimally, numerous plant characteristics have been considered in indicating the appropriate plant species for the three plant zones, such as water requirements, tolerance for inundation, root and leaf structure, and a species' ability to filter pollutants. The plant zone guidelines and planting list can also be utilized for the revegetation, restoration, and bank stabilization of local streams, rivers, and estuaries.

In all instances, native plant species are recommended because they are adapted to the Central Coast climate and generally require less water and fertilization.

Non-native invasive plant species are discouraged because water can quickly spread their occurrence and alter downstream habitats. Likewise, turf grasses are discouraged for LID drainage features because they require large amounts of supplemental water, fertilizers, and regular maintenance.



Low Impact Development Planting Zones

LOW ZONE – The low zone is an area where runoff temporarily ponds in response to a rain event or dry weather flows such as upgradient washing or irrigation activities. The low zone should be designed to drain and not hold standing water for more than 72 hours. However, it may be inundated for extended periods of time during the rainy season.

Water-tolerant plants with dense root structure and/or vegetative cover provide maximum pollutant filtration, discourage erosion, and slow water runoff velocities (in drainage features that cross-drain, such as bioswales). Native grasses and groundcovers are recommended for these areas.

MID ZONE – The mid zone is an area that slows the storm water runoff as it flows into the drainage feature. Water passes through and saturates this area but will not stand there for extended periods of time during typical storm events. The plants for this zone must tolerate periods without water *and* periodic inundation. The plants in the mid zone should provide a root structure to prevent erosion of the side slope.

HIGH ZONE – The high zone is an area that creates the top of the bank of the drainage facility. Water will not stand in this zone. Deep roots give natural base structure to the edge of the drainage facility. These plants must be tolerant of extended periods without water and occasional saturation.

Low Impact Development (LID) Plant List

Developed for the City of Salinas, California

| Botanical Name | Common Name | Low Zone** | Mid Zone** | High Zone** | Swale or Filter Strip | Planting Strips (< | Large Planting Areas (> | Large Detention Basins | Green Roof | Tolerates Prolonged Saturation | Tolerates Periodic Flooding | Tolerates Prolonged Dry Periods | Requires Good Drainage | Tolerates Mowing | Wind Tolerant | Notes |
|----------------------------------|----------------------------------|------------|------------|-------------|-----------------------|--------------------|-------------------------|------------------------|------------|--------------------------------|-----------------------------|---------------------------------|------------------------|------------------|---------------|--|
| TREES | | | | | | | | | | | | | | | | |
| Acer circinatum | vine maple | | X | X | X | X | X | | | | X | X | | | | Needs some shade |
| Acer macrophyllum | big-leaf maple | | X | X | | | X | X | | X | X | | | | X | |
| Aesculus californica | California buckeye | | | X | | | X | X | | X | X | X | | | X | |
| Alnus rhombifolia | white alder | | X | X | | | X | X | | X | X | | | | | Keep protected from prevailing winds |
| Alnus rubra | red alder | | X | X | | | X | X | | X | X | | | | | |
| Cercis occidentalis | Western redbud | | X | X | | X | X | | | | X | X | X | | | |
| Fraxinus latifolia | Oregon Ash | | X | X | | | X | X | | | X | | | | | |
| Juglans californica var. hindsii | Northern California black walnut | | | X | | X | X | | | X | X | X | | | | |
| Populus fremontii | Fremont cottonwood | | | X | | | X | X | | X | | | | | X | Water loving, aggressive roots, "fast growing" |
| Prunus lyonii | Catalina cherry | | | X | | X | X | | | X | X | X | | | X | |
| Pseudotsuga menziesii | Douglas-fir | | | X | | | X | | | | X | X | | | X | |
| Salix coulteri | Coulter willow | X | X | X | | | X | X | | X | X | | | | X | |
| Salix laevigata | red willow | X | X | X | | | X | X | | X | X | | | | X | |
| Salix lasiolepis | arroyo willow | X | X | X | | | X | X | | X | X | | | | X | |
| Sambucus mexicana | blue elderberry | | X | X | | X | X | | | X | X | X | | | X | |
| Umbellularia californica | California bay | | | X | | | X | | | X | X | | | | X | |
| SHRUBS | | | | | | | | | | | | | | | | |
| Baccharis douglasii | marsh baccharis | X | X | X | | X | X | X | | X | X | X | | | | |
| Baccharis pilularis | coyote brush | | | | | X | X | | | | X | | | | X | |
| Baccharis salicifolia | mule fat | | X | X | | | X | X | | | X | X | | | | |
| Cornus stolonifera | red twig dogwood | X | X | X | | X | X | | | X | X | | | | X | |
| Fremontodendron californicum | flannelbush | | | X | | | X | | | | | | X | | | High zone, needs to dry between waterings |
| Garrya elliptica | coast silk tassel | | | X | | X | X | | | | | X | | | | |
| Gaultheria shallon | salal | | | | | X | X | | | | X | | | | | Prefers shade |
| Mimulus aurantiacus | sticky monkeyflower | | X | | X | X | | | X | | | X | | | | |
| Mimulus cardinalis | scarlet monkeyflower | X | X | | X | X | | X | X | X | X | | | | X | |
| Rhamnus californica | California coffeeberry | | X | X | | | X | X | | | | X | X | | X | Low water requirements |
| Ribes sanguineum | red flowering currant | | X | | | X | X | X | | X | | | | | X | |
| Ribes speciosum | fuchsia-flowered gooseberry | | X | | | X | | X | | X | X | | | | X | |
| Ribes viburnifolium | evergreen currant | | X | X | | | X | | | X | X | X | | | X | |
| Rosa californica | California rose | | X | X | | X | X | | | X | X | X | | | | Can be invasive |
| Rubus parviflorus | thimbleberry | | | | | X | X | X | | | X | X | | | X | |

* Plant species are considered native to California. California native selections are suggested to limit impact on native habitats downstream.

**Refer section drawing for planting zones.

Prepared by Joni L. Janecki & Associates, Inc.

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Developed for the City of Salinas, California

| Botanical Name | Common Name | Low Zone** | Mid Zone** | High Zone** | Swale or Filter Strip | Planting Strips (< 5') | Large Planting Areas (> 5') | Large Detention Basins | Green Roofs | Tolerates Prolonged Saturation | Tolerates Periodic Flooding | Tolerates Prolonged Dry Periods | Requires Good Drainage | Tolerates Mowing | Wind Tolerant | Notes |
|-------------------------------------|----------------------------|------------|------------|-------------|-----------------------|------------------------|-----------------------------|------------------------|-------------|--------------------------------|-----------------------------|---------------------------------|------------------------|------------------|---------------|--|
| GRASSES, GROUNDCOVERS, FERNS | | | | | | | | | | | | | | | | |
| Achillea millefolium | yarrow | | X | X | X | X | X | X | X | | | | X | | X | |
| Aquilegia formosa | Western columbine | X | | | X | X | X | | | X | X | X | | | | |
| Bromus carinatus | California brome | | X | X | X | X | | | X | | | X | | | | |
| Calamagrostis nutkaensis | Pacific reed grass | | X | | | X | X | | X | | X | X | | | X | |
| Calochortus albus | white globe lily | | X | | X | X | X | X | | | X | X | | | X | |
| Carex globosa | globe sedge | X | X | | X | X | X | X | X | X | X | | | | X | |
| Carex obnupta | slough sedge | X | X | | | | | X | | X | X | | | | X | |
| Carex pansa | California meadow sedge | X | X | | X | | X | X | X | | X | | X | | X | |
| Carex tumulicola/ Carex divulsa | Berkeley sedge/ gray sedge | X | X | X | X | X | X | X | X | X | X | X | | X | X | |
| Castilleja miniata | Indian paintbrush | | X | X | | X | X | | X | | | X | X | | X | |
| Deschampsia cespitosa | tufted hairgrass | | X | | X | | X | X | X | | X | X | X | | X | Needs irrigation |
| Dudleya caespitosa | dudleya | | X | | | | | | | | | | | | | |
| Eleocharis macrostachya | common spikerush | X | X | | X | X | | X | X | X | X | | | | X | |
| Eschscholzia californica | California poppy | | X | X | X | X | X | | X | | | X | X | | X | |
| Festuca californica | California fescue | | X | X | X | X | | | | | X | X | | | X | Do not plant in low zone |
| Festuca idahoensis | Idaho fescue | | X | X | X | X | X | | X | | X | X | | | X | Do not plant in low zone |
| Festuca rubra | red fescue | X | X | | X | X | X | X | X | X | X | | | X | X | Needs irrigation |
| Fragaria chiloensis | beach strawberry | | X | | X | X | | X | X | | X | X | X | | X | |
| Heuchera micrantha | alum root | | X | X | X | X | X | | X | | X | X | X | | | |
| Iris douglasiana | Douglas iris | | X | | | X | X | | | | X | | X | | X | |
| Juncus effusus | common rush | X | X | | X | X | X | X | | X | X | | | | X | |
| Juncus patens | California gray rush | X | X | | X | X | X | X | | X | X | | | | X | |
| Leymus triticoides | Creeping wild rye | | X | | X | X | X | X | X | | X | X | | | X | Fast spreading |
| Melica imperfecta | melic, onion grass | | X | X | X | X | | | X | | X | | | | X | |
| Muhlenbergia rigens | deergrass | | | | | X | X | | X | | X | X | | | X | |
| Polystichum munitum | Western sword fern | | | | X | X | X | | | | X | | | | | Prefers shade |
| Rhamnus californica | California coffeeberry | | | | | | | | | | | | | | | |
| Salvia ssp. | sage(s) | | | | | | | | | | | | | | | High zone, predominantly dry zones |
| Scirpus cernuus | fiber optic grass | X | | | X | X | X | X | X | X | X | X | | | X | |
| Sedum | stonecrop | | X | | | | | | X | | | | | | | |
| Sisyrinchium idahoense bellum | blue-eyed grass | | X | X | X | | | | X | | | | | | | |
| Satureja douglasii | Yerba buena | X | X | | X | X | | | | | | | | | | |
| VINES | | | | | | | | | | | | | | | | |
| Clematis ligusticifolia | virgin's bower | X | X | | | | X | | | | X | X | | | | |
| Lonicera involucrata | twinberry honeysuckle | | X | X | | X | | | | | X | | | | | |
| Vitis californica | California wild grape | X | X | X | | X | X | | | | X | X | X | | X | Needs partial sun, do not plant at low point |

* Plant species are considered native to California. California native selections are suggested to limit impact on native habitats downstream.
**Refer section drawing for planting zones.

Prepared by Joni L. Janecki & Associates, Inc.

Low Impact Development Planting Guidelines

DESIGN CRITERIA

There are numerous conditions to consider when choosing plant species to be used in LID drainage features. Many of the criteria are found in species that tolerate the various and (sometimes) disparate conditions in their native habitats. For example, the plant species need to tolerate periods of flooding, as well as extended dry periods without supplemental irrigation. California native plant species are highly recommended because they are best adapted to the local climate.

The LID plant palette is intended to serve as a baseline for plant species selection for LID drainage features. Other plant species may be proposed for use in LID drainage features; the City will have the right to permit or deny their use. The following planting criteria and characteristics are to be considered when proposing other species for LID drainage features:

- The planting zones where the plant species are to be planted (Low, Mid, High; see Planting Zones)
- The size of the planting area and the size of the plant species at maturity
- Preference for California native or easily naturalized plant species
- Non-native invasive species should not be used
- Drought-tolerant/low-supplemental irrigation requirements
- Tolerant of season flooding/inundation
- Low maintenance requirements
- Adaptability

As an element of a drainage feature, LID plant selections should aim to control erosion and wick water from soils. Accordingly, groundcovers and grasses that quickly cover exposed soils are the best choices for the low zone (see Planting Zones). Trees and large shrubs are best planted in the high zone where their roots can absorb the infiltration. Low shrubs, grasses, and groundcovers may be used in the mid zone, depending on the slope, soil type, and drainage patterns (sheet flow vs. concentrated flow, or flooding).

If a planted LID drainage feature receives a concentrated flow, energy dispersion devices will be required at the entry point to deter damage or erosion to the planted areas. Examples of erosion protection/energy dissipation designs include cobblestones, gabions, small hardscaped areas, or other approved devices.



Gabion for Energy Dispersion (i.e., erosion control)

PLANTING AND LAYOUT

The following should be considered when planting LID drainage features:

- The smallest practical area of land should be exposed at any one-time during development. Mulching or other protective erosion control measures should be used temporarily to protect exposed areas.
- Vegetation should be installed as soon as possible in the development after the land is exposed.
- Plants should be planted in staggered rows to ensure that plants grow together for maximum soil coverage.

Soils for bioretention area must meet the following objectives:

- Be sufficiently permeable to infiltrate runoff at a minimum of 5" per hour during the life of the facility;
- Have sufficient moisture retention to support healthy vegetation;
- Be a mixture of fine sand and compost measured on a volume basis:
 - 60 - 70% clean sand
 - 30 - 40% certified compost
 - Sand shall be clean washed ASTM-33 fine sand free of deleterious material.
 - Recycled wash water from concrete ready-mix operations and other sources shall not be used to wash the sand because it typically has a high pH
 - Organic matter content 35-75% by dry weight
 - C:N < 25.1 **and** C:N > 15.1
 - pH shall be between 6.5 and 8.2

For further information:

https://www.casqa.org/sites/default/files/downloads/basma_bioretention_soil_mix.pdf

Low Impact Development Planting Guidelines

SOIL TESTING

A soils report must be prepared prior to planting. The report will be prepared by a qualified soils specialist or laboratory. The report will be submitted to the City as part of the landscape and irrigation plans for final approval. Soil samples should be collected after grading operations are complete. Because surface soils are highly variable in the alluvial plain of the Salinas Valley, a sufficient number of soils samples must be collected to account for variations that may be present in the areas to be planted. The report should include:

- Native soil composition
- Infiltration rates
- A texture test
- Cation exchange capacity
- An agricultural suitability analysis
- Recommended amendments for planted species to thrive

The following list includes some qualified soil testing laboratories in the region:

Perry Soil Laboratory, 424 Airport Blvd., Watsonville, CA 95076, T: (831) 722-7606

Soil and Plant Laboratory, Inc., 352 Matthew Street, Santa Clara, CA 95052, T: (408) 727-0330

AMENDMENTS

Prior to planting, the recommended amendments must be added, as described in the soils report. A copy of the soils report should be attached to the irrigation schedule provided to the owner and/or operator of the project.

MULCH

After planting, exposed soils must be covered with non-floatable mulch to discourage erosion. Mulch should be maintained only until plant growth has covered the majority of the exposed soil. Biodegradable erosion control blankets may also be used to provide protection from erosion.

Mulch should be large enough in size to be easily cleaned away from drain inlets and not fit through the openings of drain grates. Mulch should be free of sticks and other debris. Always hold mulch away from root crown. Acceptable mulch types include:

- Nitrogen fortified bark (1" to 2" diameter)
- Redwood bark (1" to 2" diameter)
- Chipped gravel, crushed stone, or cobbles (1/2" – 2 1/2" diameter)
- 50/50 blend of top-soil and aged compost

HYDROSEEDING

Hydroseeding is to be used on slopes and areas that have not already been landscaped.

The hydroseed blend to be used is:

- 35% Annual Ryegrass
- 15% Blando Brome
- 15% Rose Clover
- 15% Crimson Clover
- 20% Gala Brome
- 1 oz per 1000 sf of California wildflower mix (poppies and lupins)

The mix should be applied at a minimum of 30 lbs/ac.

“Gorilla Hair” (shredded redwood bark) will not be permitted by the City of Salinas because it causes an impervious layer that encourages mold growth in Salinas’s soils.

MAINTENANCE

Native plant species naturally reduce the need for maintenance. These species will minimize pests and disease problems, require less fertilizer, reduce the need for excessive pruning, and conserve water. Woody plants require less maintenance once established, while perennials adjust to their new environment quickly but may require more care over the long run.

Care requirements should be considered when choosing plant species for LID drainage features. Trash and debris should be cleaned out of LID planting areas periodically, especially after large storm events. Drain inlets should be cleaned out periodically.



Bioretention basin along an urban roadway

Low-Impact Development Plant List Development

PROCESS

The LID plant list was developed through a research process. Characteristics of LID drainage features such as bioswales, bioretention basins, rain gardens, and tree filters were considered. Key local factors such as the climate, soils, and biodiversity of Salinas, California, provided further parameters for development of appropriate plants. Preference was given to plants native to the Central Coast region for their compatibility with sensitive downstream habitats and to keep exotics from spreading and invading those habitats.

Documents and conversations with other municipalities such as the Cities of Livermore, Oakland, and Santa Monica, California, the City of Seattle, Washington, and the City of Portland, Oregon, provided valuable guidance and insight toward successful implementation, operations, and maintenance of LID drainage features.

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