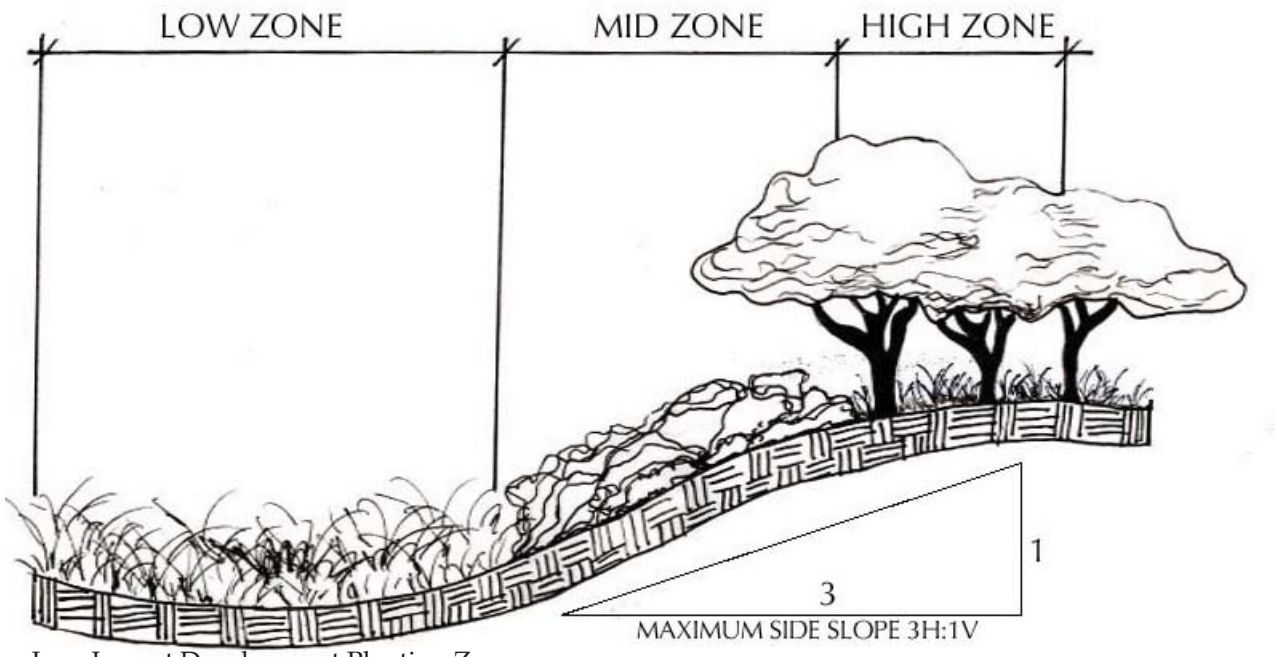
Appendix G

LID Planting Zones and Plant List

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 since they are adapted to the Cenral Coast climate and generally require less water and fertilization. Non-native invasive plant species are discouraged as water can quickly spread their occurrence and alter downstream habitats. Likewise turf grasses are discouraged for LID drainage features since 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**	Small planting Strips (< 5' wide)	Large planting areas (> 5'wide)	Green Roofs	Tolerates Prolonged Saturation	Tolerates Periodic Flooding	Tolerates Prolonged Dry Periods	Requires Good Drainage	Tolerates Mowing	Wind Tolerant	Notes
TREES														
Acer cercinatum	Vine maple		X	X	X	X			X	X				Needs some shade
Acer macrophyllum	Big-leaf maple		X	X		X		X	X				X	Clay tolerant
Aesculus californica	Buckeye			X		X		X	X	X			X	Clay tolerant
Alnus rhombifolia	White alder		X	X		X		X	X					Keep protected from prevailing winds
Alnus rubra	Red alder		X	X		X		X	X					
Cercis occidentalis	Western redbud		X	X	X	X			X	X	X			
Fraxinus latifolia	Oregon ash		X	X		X			X					
Juglans californica var. hindsii	Black walnut			X		X		X	X	X				
Populus fremontii	Western cottonwood			X		X		X					X	Water loving, aggressive roots, fast growing
Prunus lyonii	Catalina cherry			X	X	X		X	X	X			X	Clay tolerant
Pseudotsuga menziesii ssp menziesii	Coast Douglas fir			X		X			X	X			X	
Salix coulteri	Coulter willow	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	Elderberry		X	X	X	X		X	X	X			X	Clay tolerant
Umbellularia californica	California bay laurel			X		X		X	X				X	Needs large scale planting area
SHRUBS														
Baccharis douglasii	Marsh baccharis	X	X	X	X	X		X	X	X				
Baccharis pilularis	Coyotebrush			X	X	X			X	X			X	
Bachharis salicifolia	Mulefat		X	X		X		X	X	X			X	
Cornus stolonifera	Red-twig dogwood	X	X	X	X	X		X	X				X	Clay tolerant
Fremontodendron californica	Flannelbush			X		X					X	X		High zone, needs to dry between waterings
Garrya elliptica	Silk tassle			X	X	X				X				Clay tolerant with drainage
Gaultheria shallon	Salal				X	X			X					Prefers shade
Mimulus aurantiacus	Stickey monkey flower		X		X	X	X			X				
Mimulus cardinalis	Scarlet monkey flower	X	X		X	X	X	X	X				X	Clay tolerant
Rhamnus californica	Coffeeberry		X	X		X	X			X	X		X	Low water requirements
Ribes sanguineum	Pink-flowering currant		X	X	X	X		X	X	X			X	Clay tolerant
Ribes speciosum	Fuchsia-flowering gooseberry		X		X			X	X				X	Clay tolerant, prefers shade
Ribes viburnifolium	Catalina perfume		X	X	X	X		X	X	X			X	Extremely drought tolerant in clay soils
Rosa californica	California wild rose		X	X		X		X	X	X				Can be invasive, likes moisture
Rubus parvifolius	Thimbleberry					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

Low Impact Development (LID) Plant List

Developed for the City of Salinas, California

Botanical Name	Common Name	Low Zone**	Mid Zone**	High Zone**	Small planting Strips (< 5' wide)	Large planting areas (> 5'wide)	Green Roofs	Tolerates Prolonged Saturation	Tolerates Periodic Flooding	Tolerates Prolonged Dry Periods	Requires Good Drainage	Tolerates Mowing	Wind Tolerant	Notes
GRASSES, GROUNDCOVERS, FERNS, & BULBS														
Achillea millefolium	Yarrow		X	X	X	X	X				X		X	Clay tolerant
Aquilegia formosa	Western coulmbine	X			X	X		X	X	X				Clay tolerant with drainage and organic matter
Bromus carinatus	California brome		X	X	X		X			X				
Calamagrostis Karl Foerster	Feather reed grass	X	X		X	X		X	X	X			X	
Calamagrostis nutkentensis	Calamagrostis nutkaensis		X		X	X	X		X	X			X	
Calochortus albus	Globe lilies		X		X	X			X	X			X	
Carex globosa	Globe sedge	X	X		X	X	X	X	X				X	
Carex obnupta	Slough sedge	X	X		X			X	X				X	Needs moisture
Carex pansa	Sand dune sedge	X	X		X	X	X		X		X		X	Needs sandy soil
Carex tumulicola/ Carex divulsa	Berkeley sedge/ Gray sedge	X	X	X	X	X	X	X	X	X		X	X	Clay tolerant
Castilleja miniata	Indian paintbrush		X	X	X	X	X			X	X		X	
Deschampsia caespitosa	Tufted hair grass		X		X	X	X		X	X	X		X	Needs irrigation
Dudleya caespitosa	Dudleya		X	X	X		X			X	X		X	
Eleocharis macrostachya	Common spike rush	X	X		X	X	X	X	X				X	Sand to clay tolerant
Eschscholzia californica	California poppy		X	X	X	X	X			X	X		X	
Festuca californica	California fescue		X	X	X	X	X		X	X			X	Do not plant in low zone
Festuca idahoensis	Western 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	
Heuchera micrantha	Coral bells		X	X	X	X	X		X	X	X		X	
Iris douglasiana	Douglas iris		X		X	X	X		X		X		X	
Juncus effusus	Common rush	X	X		X	X		X	X	X			X	
Juncus patens	California grey rush	X	X		X	X		X	X	X			X	
Leymus triticoides	Creeping wildrye	X	X		X	X	X		X	X		X	X	Fast spreading, clay tolerant
Melica imperfecta	California melic		X	X	X		X		X				X	
Mulhenbergia rigens	Deer grass		X	X	X	X	X		X	X			X	Clay tolerant
Polystichum minutum	Sword fern		X		X	X			X					Prefers shade or part shade
Salvia ssp.	Sage		X	X	X	X	X		X	X			X	Higher zones, predominantly dry zones
Scirpus cernuus	Fiber optic grass	X	X		X	X	X	X	X	X			X	Prefers sandy soil
Sedum ssp.	Stonecrop		X		X		X			X	X		X	
Sisyrinchium bellum	Blue-eyed grass		X	X	X	X	X			X		X	X	
Satureja douglasii	Yerba buena	X	X		X		X		X				X	Clay tolerant, part shade
Vines														
Clematis ligusticifolia	Clematis	X	X		X	X		X	X	X	X			
Lonicera involucrata	Twinberry honeysuckle		X	X	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 as 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
- California native or easily naturalized plant species are preferred
- 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.

Gabbion for Energy Dispersion (i.e. erosion control)

PLANT LAYOUT

The following shall 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.

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Low Impact Development Planting Guidelines

SOIL TESTING

A soils report shall be prepared prior to planting . The report shall be prepared by a qualified soils specialist or laboratory. The report shall 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. Since surface soils are highly variable in the alluvial plain of the Salinas Valley, a sufficient number of soils samples shall 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 shall be added as described in the soils report. A copy of the soils report shall be attached to the irrigation schedule provided to the owner and/or operator of the project.

MULCH

After planting, exposed soils shall be covered with mulch to discourage erosion. Mulch should only be maintained until plant growth has covered the majority of the exposed soil. Biodegradable erosion control mats and materials may also be used to provide same function as mulch.

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 shall 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

"Gorilla Hair" (shredded redwood bark) will not be permitted by the City of Salinas as 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 shall be cleaned out periodically.

Bioretention basin along an urban roadway.

Prepared by Joni L. Janecki & Associates, Inc

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 form spreading and invading those habitats. Documents and conversations with and documents from 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 towards successful implementation, operations and maintenance of LID drainage features.

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