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Plant List and Planting Guidance for Landscape- Based Stormwater Measures

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D.1 Introduction

The purpose of the Plant List for Stormwater Measures is to provide guidance on the planting techniques and selection of appropriate plant materials for implementing stormwater measures. Other appropriate plant species may be selected by a landscape architect or landscape designer with approval by the permitting jurisdiction. In selecting plant materials, it is important to consider factors that provide ecological benefits and influence plant establishment and success, such as microclimate, type of soil, water availability, pollinator and bird habitat, native/non-native and/or invasive species, proximity to saltwater, and exposure to sun. The list has integrated specifications for each plant to improve the use and function of the list. The list has also been cross-referenced with the Santa Clara Valley Water District's *Approved Plant*

List which identifies low water use plants that qualify for their Landscape Rebate Program¹. The list identifies water needs for plants using the Water Use Classifications of Landscape Species (WUCOLS) in Region # 1 for the North Central Coast of California.

SCVURPPP has created the GSI Vegetation Guide to assist maintenance and inspection staff with the identification and care of plants that are commonly found in bioretention areas. The vegetation guide complements the City of San Jose's GSI Maintenance Field Guide.

In addition, the function of the individual stormwater measure should be carefully considered when selecting plant materials. Factors to be considered include inundation period, expected flow of water, and access and maintenance requirements.

Numerous resources are available to assist in selecting appropriate plant species in Santa Clara County, including Sunset's *Western Garden Book*, the Santa Clara Valley Water District's *Approved Plant List*, the East Bay Municipal Utility District (EBMUD) *Landscapes for Summer-Dry Climates of the San Francisco Bay Region and the regenerative landscaping practices of ReScape*² (formerly the *Bay-Friendly Landscaping Coalition*).³ There is also a list near the end of this document from the California Native Plant Society of local nurseries that offer native plants.

D.2 General Recommendations

Avoid the use of invasive species. In selecting plants for stormwater measures, the use of invasive species should be avoided. A complete list of invasive plants can be found at <http://www.cal-ipc.org/paf/>, the California Invasive Plant Council's Invasive Plant Inventory.

Minimize or eliminate the use of irrigated turf. Irrigated turf is no longer allowed in some landscapes per State law. Effort should be made to minimize the use of irrigated turf, which has higher maintenance requirements, energy and water use, and greater potential for polluted runoff and air.

Select drought tolerant California native plants whenever possible. Planting appropriate, drought tolerant California native plants provides habitat for native pollinators and birds, reduces water consumption for irrigation, and reduces mowing, fertilizing, and spraying. When native plants are not available or feasible, non-invasive Mediterranean-climate plant species are recommended. For the purposes of the plant list on the following pages, "drought tolerant" refers to plants that meet the following criteria:

- Are identified as drought tolerant as follows: *California Native Plants for the Garden* (Borstein, et al.).
- Are identified as requiring occasional or infrequent irrigation in Borstein, et al., or *Plants and Landscapes for Summer Dry Climates* (EBMUD).
- Are identified as requiring no summer water in EBMUD.
- Are identified as requiring little or no water in the *Sunset Western Garden Book*.

¹ For more information, see: www.valleywater.org/Programs/LandscapeRebateProgram.aspx

² For more information, see: www.rescapeca.org

³ Please note that the plants identified as requiring no summer water in EBMUD and requiring little or no water in the *Sunset Western Garden Book* do not take biotreatment soil texture or extended periods of drought into account.

- Are identified as requiring low or very low irrigation in the *Guide to Estimating Irrigation Water Needs of Landscape Plantings in California* (University of California Cooperative Extension).

Plants not listed in any of the above references will require that the design professional base selection upon successful experience with species on previous projects under similar horticultural conditions. Design professionals should include plant locations (basins, banks, upland, etc.) within the planting legend for reviewer clarity.

SITE-SPECIFIC FACTORS

Given Santa Clara County spans several Sunset climate zones, with variable humidity, heat, frost, and wind factors, as well as varying soil characteristics, plants need to be selected with an understanding of specific climate and microclimate conditions, and grouped in appropriate hydrozones.

SUPPLEMENTAL WATERING NEEDS

Many plants listed as drought tolerant per the above references may require more supplemental watering in fast-draining, engineered soils. Adapt water use calculations with specified biotreatment soil media, which will remain dryer than native amended soils.

D.3 Plants for Stormwater Measures

Plants play an important role in the function of landscape-based stormwater treatment measures:

- Infiltration and evapotranspiration. Plants aid in the reduction of stormwater runoff by both increasing infiltration, and by returning water to the atmosphere through evapotranspiration.
- Pollutant trapping. Vegetation helps to prevent the resuspension of pollutants associated with sediment particles. It is essential that pollutants removed during small storms are not remobilized during large storms.
- Phytoremediation. Plants for stormwater treatment measures are important for their role in phytoremediation, the uptake of nutrients and the ability to neutralize pollutants. Forbs (herbaceous perennials) and graminoids (grasses) offer optimal opportunity for pollutant capture.
- Soil stabilization. As in any landscaped area, established plantings help control soil erosion. This is important both to keep sediment out of stormwater and to retain the surface soils, which help to remove pollutants from infiltrated runoff.
- Aesthetic benefits. Plants within or adjacent to stormwater facilities provide an aesthetic benefit.

Plants suitable for use in stormwater treatment measures are organized according to the following categories:

- **Grasses** refer to those species that are monocotyledonous plants with slender-leaved herbage found in the in the Family Poaceae.

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- **Perennials** and **groundcovers** are typically herbaceous plants with soft upper growth rather than woody growth. Some species will die back to the roots at the end of the growing season and grow again at the start of the next season.
- **Shrub** is a horticultural distinction that refers to those species of woody plants which are distinguished from trees by their multiple stems and lower height. A large number of plants can be either shrubs or trees, depending on the growing conditions they experience.
- **Tree** refers to those species of woody plants with one main trunk and a rather distinct and elevated head.

The SCVURPPP GSI Vegetation Guide has more details on plant identification and care. Plants suitable for use in stormwater treatment measures in the Santa Clara Valley are listed in Table D-1, below, which lists the plants in alphabetical order by Latin name, in the categories described above. The columns in the table indicate stormwater treatment measures for which each plant species may be suitable.

INVASIVE SPECIES

Under no circumstances shall any plants listed as invasive by the California Invasive Plant Council's Invasive Plant Inventory be specified (<http://www.cal-ipc.org/paf/>).

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TREES		DESCRIPTION					PLANTING & MAINTENANCE					LANDSCAPE INTEREST/USES	TREATMENT TYPES			COMMENTS
Scientific Name	Common Name	Evergreen (E) or Deciduous (D)	Height (feet)	Spread (feet)	Shape: Round (R), Pyramidal (P), Broad (B), Oval (O), Upright (U)	Growth Rate: Fast (F), Moderate (M), Slow (S)	Water Needs: Very Low (VL), Low (L), Moderate (M)	Solar Needs: Full-Sun (FS), Part-Shade (PS), Shade (S)	Maintenance Needs: Low (L), Moderate (M)	CA Native	SCVMD Plant List		Bioretention Planter	Flow-Through Planter	Tree Well Filter	
<i>Acer circinatum</i>	Vine Maple	D	15	15-20	R	f	M	PS	M	●		Understory small tree from Pacific NW, avoid direct hot sun, orange-red fall color; adaptable to clay, rocky soils; tolerates moisture, drought tolerant when established.	●	●	●	Best in Sunset Zone 17 in part sunny areas.
<i>Acer macrophyllum</i>	Big Leaf Maple	D	40 to 80	30 to 50	B	F	M	PS	M	●		Striking fast growing native maple with bright yellow fall color.	●			Best in Sunset Zone 17 in part sunny areas.
<i>Arbutus 'Marina'</i>	Strawberry Tree	E	20	15	R	M	L	FS to PS	M	●	●	Red-brown trunks and large branches of mature trees become twisted and gnarled in appearance; can be messy. Clay-tolerant; acid to neutral soil.	●	●	●	<i>Arbutus unedo</i> in District List
<i>Carpinus betulus</i>	Fastigate European Hornbeam	D	30 - 40	20 - 30	U	S-M	M	FS to PS	L			Upright, dense form; long lived. Tolerates moisture in well-drained soils.	●			Best in Sunset Zone 17 in part sunny areas.
<i>Celtis reticulata</i>	Western Hackberry	D	30-60	30-60	R	M	L	FS to PS	L	●		Spreading tree canopy. Tolerates poor soils.	●			
<i>Cercis canadensis</i>	Eastern Redbud	D	25-35	25-35	R	F	L-M	FS to PS	L			Deep pink early spring bloom; glossy, heat resistant leaves; short lived	●	●	●	Part sun in hotter microclimates
<i>Cercis occidentalis</i>	Western Redbud	D	10-18	10-18	R	S	L	FS	M	●	●	Deep pink early spring bloom; Use multi-trunk where possible; short lived. Clay-tolerant.	●	●	●	
<i>Geijera parviflora</i>	Australian Willow	E	40	30	O	S	M	FS to PS	L			Low, early pruning; train prune longer due to slow growth; long lived. Clay-tolerant.	●			
<i>Ginkgo biloba 'Autumn Gold'</i>	Autumn Gold Maidenhair Tree	D	40	30	O	S	M	FS to PS	L			Low, early pruning; train prune longer due to slow growth; long lived. Clay-tolerant. Prefers moist, well-drained soils. Golden fall color.	●			Best in Sunset Zone 17 in part sunny areas.
<i>Ginkgo biloba 'Fairmount'</i>	Fairmount Maidenhair Tree	D	50	20	P	F	M	FS to PS	L			Faster growing than other Ginkgos; erect pyramidal form; long lived. Clay-tolerant. Prefers moist, well-drained soils. Golden fall color.	●			Best in Sunset Zone 17 in part sunny areas.
<i>Ginkgo biloba 'Fastigiata'</i>	Columnar Ginkgo	D	30-50	10-15	U	S	M	FS to PS	L			Columnar. Clay-tolerant. Prefers moist, well-drained soils. Golden fall color.	●			Best in Sunset Zone 17 in part sunny areas.
<i>Ginkgo biloba 'Magyar'</i>	Magyar Ginkgo	D	50	15	U	M	M	FS to PS	L			Clay-tolerant. Prefers moist, well-drained soils. Golden fall color. Tol. urban conditions.	●			Best in Sunset Zone 17 in part sunny areas.
<i>Ginkgo biloba 'Princeton Sentry'</i>	Princeton Sentry Maidenhair Tree	D	40	15	P	S	M	FS to PS	L			Erect, pyramidal form; long lived. Clay tolerant. Prefers moist, well-drained soils. Heat tolerant. Golden yellow fall color.	●			Best in Sunset Zone 17 in part sunny areas.
<i>Koelreuteria bipinnata</i>	Chinese Flame Tree	D	30	30	R	M	M	FS	L			Summer orange, red, or salmon bloom. Clay-tolerant.	●			Best in Sunset Zone 17 in part sunny areas.
<i>Koelreuteria paniculata 'Fastigiata'</i>	Goldenrain Tree	D	20-25	20-25	R	S	M	FS	L			Yellow bloom; upright habit. Adaptable.	●			Best in Sunset Zone 17 in part sunny areas.
<i>Lagerstroemia indica (cultivars)</i>	Crape Myrtle	D	15-25	8 to 15	R	S	L	FS	M		●	Attractive peeling cinnamon bark, excellent winter feature; spec cultivars: 'Muskogee', 'Natchez', 'Osage', 'Tuscarora'. Tolerates most soils; well-drained.	●		●	

TREES		DESCRIPTION					PLANTING & MAINTENANCE					LANDSCAPE INTEREST/USES	TREATMENT TYPES			COMMENTS
Scientific Name	Common Name	Evergreen (E) or Deciduous (D)	Height (feet)	Spread (feet)	Shape: Round (R), Pyramidal (P), Broad (B), Oval (O), Upright (U)	Growth Rate: Fast (F), Moderate (M), Slow (S)	Water Needs: Very Low (VL), Low (L), Moderate (M)	Solar Needs: Full-Sun (FS), Part-Shade (PS), Shade (S)	Maintenance Needs: Low (L), Moderate (M)	CA Native	SCVMD Plant List		Bioretention Planter	Flow-Through Planter	Tree Well Filter	
<i>Laurus nobilis</i> 'Saratoga'	Saratoga Bay Laurel	E	12-40	12-40	O	S	L	FS to PS	L			Tolerates many soils and climate conditions. Prefers moist, fast-draining soils.	●	●	●	
<i>Platanus x acerfolia</i> 'Bloodgood'	Bloodgood London Plane Tree	D	70-100	60	B	M/F	L/M	FS	M			Withstands high pH, and pollution and grime of cities. Prefers deep, rich, moist, well-drained soils.	●			
<i>Platanus x acerfolia</i> 'Liberty'	Liberty London Plane Tree	D	70-100	70	B	M/F	L-M	FS	M			Allergy concern; long lived; mildew resistant. Tolerates most soils.	●			
<i>Platanus x acerfolia</i> 'Yarwood'	Yarwood London Plane Tree	D	40-80	30-40	B	M/F	L-M	FS	M			Allergy concern; long lived; mildew resistant; 'Yarwood' foliage holds up better than most plane trees in late summer; yellow fall color. Tolerates most soils.	●			
<i>Platanus x acerfolia</i> 'Columbia'	Columbia London Plane Tree	D	45	40		M-F	L-M	FS	M			Allergy concern; long lived. Tolerates most soils.	●			
<i>Prunus ilicifolia</i>	Holley leaf Cherry	E	15	15	O	M	L	FS	L	●	●	Skinny branches with large leaves and cherry looking fruit; can be trained into a small tree. Adaptable to most soils.	●	●	●	
<i>Prunus ilicifolia</i> spp. <i>Lyonii</i>	Catalina Cherry Laurel	E	10	15	O	M	L	FS	L	●	●	Shiny green leaves with small white flowers. Adaptable to most soils.	●	●	●	
<i>Quercus agrifolia</i>	Coast Live Oak	E	20-70	70	O	M	VL	FS	L	●		Long-lived; attractive bark; attracts birds and butterflies; deer resistant; drought resilient. Prefers a deep loam. Use only where sufficient room for roots.	●			Provide sufficient room for deep and wide root structure
<i>Quercus coccinea</i>	Scarlet Oak	D	70-80	40-50	R	M	L/M	FS	L			Foliage is a glossy green in summer turning to scarlet in fall.	●			
<i>Quercus ilex</i>	Holly Oak	E	30-60	30-60	R	S	L	FS	L			Tolerates water. Adaptable.	●			
<i>Quercus suber</i>	Cork Oak	E	40-70	35-40	R	M	L	FS	L			High VOC absorption and CO2 sequestration; long lived; ornamental cork bark. Acidic, dry to medium, well-drained loams.	●			
<i>Quercus wislizenii</i>	Interior Live Oak	E	25-40	25-40	O	F	VL	FS	L	●		Attractive bark; attractive birds and butterflies; deer resistant; very tough, adaptable tree. Dry, well-drained, loams, clay and gravelly loams.	●			
<i>Robina x ambigua</i> 'Purple Robe'	Purple Robe Locust	D	30-35	20-25	O	F	L	FS	M			Purplish bronze new foliage, showy violet purple flowers. Tolerate poor soils, heat, low water when established.	●			Brittle in high winds
<i>Tristania laurina</i> 'Elegant'	Elegant Water Gum	E	45	35	O	M	M	FS to PS	M			Profuse fragrant yellow flowers April-June. Tolerates damp well-drained soils, drought tolerant, cold tolerant to 28 degrees.	●		●	

Notes:

Plant selection shall be based upon site-specific conditions.

Consider subsurface infrastructure and provide sufficient growth for root area for larger trees.

Plants requiring moderate water should be planted in part sun and avoid late afternoon sun exposure on the root crowns.

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SHRUBS		DESCRIPTION						PLANTING & MAINTENANCE						LANDSCAPE INTEREST/USES	PLANTING ZONES			TREATMENT TYPES			COMMENTS
Scientific Name	Common Name	Flower Color	Height (feet)	Spread (feet)	Shape: Mounding (M), Spreading (S), Upright (U), Round (R)	Growth Rate: Fast (F), Moderate (M), Slow (S)	Water Needs: Very Low (VL), Low (L), Moderate (M)	Solar Needs: Full-Sun (FS), Part-Shade (PS), Shade (S)	Maintenance Needs	CA Native	SCVWD Plant List		Basin	Banks	Upland	Bio-retention	Flow-Through Planter	Tree Well Filter			
<i>Arctostaphylos densiflora</i> 'McMinn'	Mazanita 'McMinn'	white	5-6	7	M	M	L	FS to PS	L	●	●		●	●	●	●		Will not tolerate wet roots Listed as <i>Arctostaphylos</i> spp.			
<i>Arctostaphylos hookeri</i>	Hooker's Manzanita	white	2-8	3-12	M	M	L	FS to PS	L	●			●	●	●	●		Will not tolerate wet roots			
<i>Callistemon viminalis</i> 'Little John'	Dwarf Bottlebrush	blood red	3-4	4-8	R	M	L/M	FS	L		●		●	●	●	●		Can be pruned up to small trees; heat tolerant. Clay tolerant.			
<i>Cistus</i> spp.	Rockrose	varies	varies 3-5	x 3-5	R	L	L	FS	M		●		●	●	●	●		neat, compact shrub with showy white, pink or rose-purple blooms. Adaptable.			
<i>Cotinus coggygria</i>	Smoke Tree	purple	12-15	up to 25	U	M	L	FS	L		●		●	●	●	●		Deciduous small tree/large shrub; flowers form smoke-like look around the plant; slow growing. Well-drained soils. Cold and heat tolerant.			
<i>Garrya elliptica</i>	Silk Tassel	white	10-20	10-20	R	M	L	FS to PS	L	●	●		●	●	●	●		Interesting flowers hang in tassels; large shrub/small tree. Well-drained soil.			
<i>Grevillea</i> spp.	Grevillea	varies				M	L	FS to PS	L		●			●	●	●	●		Very heat tolerant; attracts hummingbirds. Tolerant of poor soils.		
<i>Heteromeles arbutifolia</i>	Tayon	white	6-15	15-20	R	F	VL	FS to PS	M	●	●		●	●	●	●		Large shrub/small tree; red berries; green leaves with white flowers; takes pruning well, but flowers only on second year growth. Adaptable.			
<i>Mahonia aquifolium</i> 'Compacta'	Oregon Grape	yellow	1.5-2	3-4	S	S	L	PS	L	●			●	●	●	●		Yellow flowers in spring. Berries attract birds. Well-drained soil.			
<i>Mahonia aquifolium</i> var. <i>repens</i>	Creeping Barberry	yellow	2-3	3-4	S	S	L	PS	L	●			●	●	●	●		Yellow flowers in spring. Berries attract birds. Well-drained soil.			
<i>Mahonia nevinii</i>	Nevin Mahonia	yellow	6-10	6-12	U	M	L	PS	L	●	●		●	●	●	●		Rigid branches covered with gray-blue foliage. Adaptable; tolerates clay and alkaline			
<i>Mahonia pinnata</i>	California Holly Grape	yellow	4-5	4-5	U	M	L	PS	L	●	●		●	●	●	●		Reddish orange new growth.			
<i>Nerium oleander</i>	Oleander	red/ pink/ white	varies		R	M	L	FS	L		●			●			●	Size varies with varieties; Standard form for tree well filters. Can develop mildew in Zone 17 - prefers moisture only at root zone.			
<i>Photinia x fraseri</i>	Fraser Photinia	white	8-12	8-10	R	F	M	FS	L									Standard form for tree well filters; bright red-bronze spring foliage			
<i>Pittosporum tenuifolium</i>	Tawhiwhi	purple	15-25	10-15	U	F	M	FS - PS	L									Standard form for tree well filters; bright red-bronze spring foliage			
<i>Rhamnus californica</i> 'Little Sur'	Little Sur Coffeeberry	inconspicuous	3-4	3-4	R	M	L/M	FS-PS	M	●	●			●	●	●		Partial shade inland			
<i>Ribes sanguineum</i> (incl cultivars)	Red-Flowering Currant	pink	6	6	U	F	L	PS	M	●	●		●	●	●	●		Red-pink showy flower clusters. Adaptable.			
<i>Symphoricarpos albus</i>	Snowberry	white	6	8	S	M	L/M	PS	M	●	●		●	●	●	●		Large white berries in the fall; berries are not edible. Adaptable.			

Notes:
 Plant selection shall be based upon site-specific conditions.
 Taller shrubs and perennials with more substantial roots systems can be grown on green roofs with 18" growing medium.
 Plants requiring moderate water should be planted in part sun and avoid late afternoon sun exposure on the root crowns.
 Trees/Tall shrubs planted in tree well filters shall provide sufficient vertical clearance for the location.

GRASSES		DESCRIPTION						PLANTING & MAINTENANCE					LANDSCAPE INTEREST/USES	PLANTING ZONES			TREATMENT TYPES			COMMENTS
Scientific Name	Common Name	Flower Color	Height (feet)	Spread (feet)	Shape: Mounding (M), Spreading (S), Upright (U), Round (R)	Growth Rate: Fast (F), Moderate (M), Slow (S)	Water Needs: Very Low (VL), Low (L), Moderate (M)	Solar Needs: Full-Sun (FS), Part-Shade (PS), Shade (S)	Maintenance Needs	CA Native	SCVMD Plant List		Basin	Banks	Upland	Bioretention	Flow-Through Planter	Tree Well Filter	Green Roof	
<i>Aristida purpurea</i>	Purple Three-Awn	white	2-3	2	U	F	VL	FS	L	●	●		●	●	●	●				Purple seed heads that wave gracefully in the wind; recommended for erosion control on slopes, hillsides, and in canyons. Well-drained soil.
<i>Bouteloua gracilis</i> 'Blonde Ambition'	Blonde Ambition Blue Grama	chartreuse turning to blonde	1.5-2	1	M	M	L	FS	L	●	●		●	●	●	●				Can be grown from seed; no irrigation needed once established. Adaptable to many soils, prefers well-draining. Showy flowers last summer through winter.
<i>Calamagrostis x acutiflora</i> 'Karl Foerster'	Feather Reed Grass	light tan	2-3	2-3	U	F	L	PS	L	●	●			●	●	●				Background plant. Well-draining.
<i>Carex barbarae</i>	Santa Barbara Sedge		1-3	1	M	M	L/M	FS	L				●	●	●	●				Rich green leaves; good for erosion control; little or no summer water. Tolerates damp soil.
<i>Carex divulsa</i> (C. tumulicola)	Berkeley Sedge		2	2	U	F	L	FS to PS	L	●	●		●	●	●	●				Greenish flowers age to brown in winter and spring. Clay-tolerant; tolerates damp, well-drained soil.
<i>Carex pansa</i>	Dune Sedge		1	1	M	F	L/M	FS to PS	L	●	●		●	●	●	●				Creeping meadow sedge, good on slopes. Tolerates variety of soil and climate conditions.
<i>Chondropetalum elephantinum</i>	Large Cape Rush	brown	3-5	4-6	U	M	L/M	FS to PS	L		●		●	●	●	●				Tolerates wet well-draining soils and drought. Large striking upright form.
<i>Chondropetalum tectorum</i>	Small Cape Rush	brown	2-3	3-4	U	M	L	FS	L		●		●	●	●	●				Small, unique plant forms broad clumps of thin erect jointed stems; evergreen; good for erosion control. Accepts both dry and wet conditions
<i>Deschampsia caespitosa</i>	Tufted Hairgrass	creamy white	1-2	2 (flr stalk to 3')	U	M	L	FS to PS	L	●			●	●	●	●				green to greenish gold, turning straw color in the winter; they generally maintain good color through the summer, but won't grow much when it is hot. tolerates most soils
<i>Deschampsia caespitosa</i> ssp. <i>Halciformis</i>	Pacific Hairgrass		1-2	2	U	M	L	FS to PS	L	●			●	●	●	●				dense dark green foliage; good choice for erosion control near constant moisture such as marsh, vernal pool or seeps. tolerates most soils
<i>Festuca californica</i>	California Fescue		2	2	U	M	L	FS to PS	L	●	●		●	●	●	●				Cool season bunchgrass with flower stalks that reach 5 ft. tall and create fountain-like clumps. Beneficial insect plant.
<i>Festuca glauca</i> 'Elijah Blue'	Blue Fescue		>1	>1	R	F	L	PS	L		●		●	●	●	●				Forms clumps of silver-blue leaves; long lived; use as edging, well-drained
<i>Festuca idahoensis</i>	Blue Bunchgrass		1	1	R	F	L	FS to PS	L		●		●	●	●	●	●			Well-drained
<i>Helictotrichon sempervirens</i>	Blue Oat Grass	light blue	1-2	1-2	U	M	L	PS	L		●		●	●	●	●				Attractive symmetrical form and blue color with straw-colored flower. well-drained
<i>Juncus patens</i>	Californian Grey Rush	brown	2	1	U	M	L	FS to PS	L	●	●		●	●	●	●				Accepts both dry and wet conditions
<i>Muhlenbergia rigens</i>	Deer Grass	yellow	4	4-6	R	M	L	FS	L	●	●		●	●	●	●				Clean, dependable form; very rugged. Adaptable.
<i>Muhlenbergia capillaris</i>	Pink Muhly Grass	pink	4	3-4	R	M	L	PS	L		●		●	●	●	●				Showy pink panicles in late summer. well-drained
<i>Sisyrinchium bellum</i>	Blue-Eyed Grass	blue, yellow	1-1.5	0.5	U	F	VL/L	FS to PS	L	●	●		●	●	●	●		●		Dies back in summer; use as a small accent plant; long green leaves with blue and purple flowers with yellow center; goes dormant in summer. Adaptable
<i>Stipa arundinacea</i>	New Zealand Wind Grass	NA	3	3	M	F	M*	S to FS	L				●	●	●	●				Arching olive, amber & gold foliage; cut to 12" in winter. *Some sources state low water req/mt. adaptable.
<i>Stipa pulchra</i>	Purple Needlegrass		4-6	4-6	U	F	L	FS	L		●		●	●	●	●				Long-lived native bunch grass. Adaptable.

Notes:
 Plant selection shall be based upon site-specific conditions.
 *Greenroof plants require a minimum of 4" growing medium and automatic irrigation with inline drip unless otherwise noted.
 Plants requiring moderate water should be planted in part sun and avoid late afternoon sun exposure on the root crowns.

SANTA CLARA VALLEY URBAN RUNOFF POLLUTION PREVENTION PROGRAM

GROUNDCOVERS & TURF ALTERNATIVES		DESCRIPTION						PLANTING & MAINTENANCE						LANDSCAPE INTEREST/USES	PLANTING ZONES			TREATMENT TYPES				COMMENTS
Scientific Name	Common Name	Flower Color	Height (feet)	Spread (feet)	Shape: Mounding (M), Spreading (S), Upright (U), Round (R)	Growth Rate: Fast (F), Moderate (M), Slow (S)	Water Needs: Very Low (VL), Low (L), Moderate (M)	Solar Needs: Full-Sun (FS), Part-Shade (PS), Shade (S)	Maintenance Needs	CA Native	SCVWD Plant List		Basin	Banks	Upland	Bioretention	Flow-Through Planter	Tree Well Filter	Green Roof	Turf Block Pavers		
GROUNDCOVERS																						
<i>Arctostaphylos 'Emerald Carpet'</i>	Emerald Carpet Manzanita	white	1-1.5	3-6	S	M	L	FS	L	●			●	●	●	●				Spreads best with even moisture		
<i>Arctostaphylos uva-ursi</i>	Bearberry, Kinnikinnick	blood red	3-12	4-9	S	M	Low	FS	L	●			●	●	●	●						
<i>Baccharis pilularis 'Twin Peaks'</i>	Dwarf Coyote Brush	white	1-2	6-10	S	F	L/M	FS	M	●			●	●	●	●						
<i>Fragaria chiloensis</i>	Beach Strawberry	white	6-12"	1-2'	S	F	M	FS to PS	L	●			●	●	●	●			●	Prefers 6" growing medium and additional moisture on greenroofs		
<i>Fragaria vesca</i>	Mountain Strawberry; Woodland Strawberry	white	6-12"	1-2'	S	F	M	FS to PS	L	●			●	●	●	●			●	Prefers 6" growing medium and additional moisture on greenroofs		
<i>Grindelia stricta platyphylla</i>	Coastal Gum Plant	yellow	6"	3'	S	M	L	FS	L	●			●	●	●	●				Prefers 6" growing medium and additional moisture on greenroofs		
<i>Mahonia repens</i>	Creeping Oregon Grape	yellow	2.5'	3-5'	S	M	L/M	PS	M	●	●		●	●	●	●						
<i>Salvia sonomensis</i>	Creeping Sage	purple	2	6-8	S	M	L	FS	M	●			●	●	●	●			●	Prefers 6" growing medium		
<i>Verbena peruviana</i>	Peruvian Verbena	scarlet, white	>1	2-3	S	M	L	FS	M	●			●	●	●	●						
TURF ALTERNATIVES																						
<i>Bouteloua gracilis</i>	Blue Gramma Grass		1.5-2	1	S	F	L	FS	L	●			●	●	●	●			●	●	irrigate to 1ft to establish; after established needs no irrigation; nice as border planting; okay to mow down to 1.5in	
<i>Buchloe dactyloides</i>	Buffalograss		<1	<1	S	F	VL	FS	L				●	●	●	●				●	requires little or no mowing; grows to 4" tall; start from sod or plugs. Adaptable to soil types.	
<i>Festuca rubra 'molate'</i>	Molate Fescue		1	-	S	F	M/L	FS/PS	M						●	●			●	●	Prefers part shade, regular water in hot areas, lawn alternative.	
<i>Dymondia margaritae</i>	Dymondia, Silver Carpet	yellow	1-3"	1-2'	S	M	M/L	FS	L	●			●	●	●	●				●	Tight ground-hugging groundcover good as turf substitute in small areas. Tolerates heat, sun and cold to 28 degrees.	
<i>Lippia nodiflora</i>	Kurapia	white	1"-3"	-	S	M	L	FS/PS	L				●	●	●	●			●	●	Spreading groundcover from Japan. Tolerates periodic inundation. Flowers can attract bees.	
NA	Biofiltration Sod		<1	<1	S	F	M	FS	L				●		●	●					Tolerates periodic inundation.	
NA	Native, No-Mow Sod		<1	<1	S	S	M/L	FS/PS	L	●	●		●	●	●	●			●	●	Slow growing, narrow leafed grass with blades that are very lax and flexuous. Provides soil stabilization for sloped areas. Can be mowed as turf lawn, or left unmowed.	

Notes:
 Plant selection shall be based upon site-specific conditions.
 *Greenroof plants require a minimum of 4" growing medium and automatic irrigation with inline drip unless otherwise noted.
 Plants requiring moderate water should be planted in part sun and avoid late afternoon sun exposure on the root crowns.

PERENNIALS		DESCRIPTION										PLANTING & MAINTENANCE				LANDSCAPE INTEREST/USES	PLANTING ZONES			TREATMENT TYPES			COMMENTS
Scientific Name	Common Name	Flower Color	Height (Feet)	Spread (Feet)	Shape: Mounding (M), Spreading (S), Upright (U), Round (R)	Growth Rate: Fast (F), Moderate (M), Slow (S)	Water Needs: Very Low (VL), Low (L), Moderate (M)	Soil Needs: Full-Sun (FS), Part-Shade (PS), Shade (S)	Maintenance Needs	CA Native	SCVWD Plant List		Basin	Banks	Upland	Bioretention	Flow-Through Planter	Green Roof*					
<i>Achillea millefolium</i>	Common Yarrow	white	3	2	S	F	L	FS	L	●	●		●	●	●	●	●		Maintenance challenges; longevity issues				
<i>Achillea filipendulina</i>	Fern-Leaf Yarrow	golden	3-4	2-3	U	M	L	FS	M		●		●	●	●	●	●						
<i>Armeria maritima</i>	Sea Pink	pink	1	1	M	S	L-M	FS	L		●		●	●	●	●	●		Maintenance challenges; longevity issues				
<i>Anigraonthus spp.</i>	Kangaroo Paw	red, purple, green, yellow	to 6	to 3	U	F	L	FS	L				●	●	●	●	●		Unattractive if subject to freezing or standing water				
<i>Coreopsis grandiflora</i>	Coreopsis	purple-blue	1.5-2.5	2-3	S	M	L	FS	L		●		●	●	●	●	●						
<i>Diets iridioides</i>	Fortnight Lily	pale yellow; light blue; white	up to 3	1-1.5	U	M	L	FS	L		●		●	●	●	●	●		Disruptive to planting/soil when pulled up and divided every 5 years				
<i>Echeveria spp.</i>	Hens and Chicks	pink	varies			M	L/VL	FS	L				●	●	●	●	●						
<i>Epilobium bowman</i>	Bowman California Fuchsia	orange	varies	1.5-3	S	F	L	FS	L	●			●	●	●	●	●						
<i>Epilobium canum</i>	California Fuchsia	orange-red	varies	1.5-3	S	F	L	FS	L	●			●	●	●	●	●						
<i>Erigeron glaucus</i> <i>'Wayne Roderick'</i>	Wayne Roderick Daisy	lavender	1	3	M	M	M	FS to PS	L	●			●	●	●	●	●						
<i>Erigeron karvinskianus</i>	Santa Barbara Daisy	white with pink tinge	10-18"	2-3'	M	F	L-M	FS to PS	L	●			●	●	●	●	●		Reseeds				
<i>Eriogonum grande</i> var. <i>rubescens</i>	Red-Flowered Buckwheat	rosy red	1-2'	1-2'	S	F	L	FS to PS	L	●			●	●	●	●	●		Reseeds				
<i>Eriogonum latifolium</i>	Coast Buckwheat	pink, white	6	6	S	F	Low	FS	Low	●			●	●	●	●	●						
<i>Eschscholzia californica</i>	California Poppy	orange	1.5	1.5-2	S	F	VL	FS	L	●	●		●	●	●	●	●		Maintenance challenges; longevity issues				
<i>Gaillardia grandiflora</i>	Blanket Flower	varies	2-3	1-2	U	M	L	FS	L		●		●	●	●	●	●		Prefers 6" planting medium				
<i>Gaura lindheimeri</i>	Gaura	white	2.5-4	2-3	U	M	L/M	FS	M				●	●	●	●	●		More drought tolerant in Zone 17; Can self-sow				
<i>Heuchera maxima</i>	Island Alum Root	white, pink	1-2	3-4	S	M	L	PS	L	●			●	●	●	●	●						
<i>Iris douglasiana</i>	Douglas Iris	varies	1.5	1.5	S	M	L	PS	L	●			●	●	●	●	●		Maintenance challenges; longevity issues				
<i>Mimulus aurantiacus</i>	Sticky Monkey Flower	varies	3-4	3-4	M	M	L	FS to PS	L	●			●	●	●	●	●		Can be short-lived, 3 years; Maintenance challenges; longevity issues				
<i>Mimulus aurantiacus</i> var. <i>puniceus</i>	Red Monkey Flower	red	3-4	3-4	M	M	L	FS to PS	L	●			●	●	●	●	●		Can be short-lived, 3 years; Maintenance challenges; longevity issues				
<i>Monardella villosa</i>	Coyote Mint	light purple	2	2	M	F	VL	FS to PS	L	●	●		●	●	●	●	●		Prefers 6" growing medium; Maintenance challenges; longevity issues				
<i>Penstemon heterophyllus</i> 'Blue Springs'	Foothill Penstemon	Iridescent blue-purple	1-2	2	M	F	L	FS	M	●			●	●	●	●	●		Prefers 6" planting medium				
<i>Sedum sp. (many)</i>	Stone Crop	varies	varies			S	M	L	FS	L	●			●	●	●	●		Varied succulent species. Prefer well-drained soils. Many heat adapted and thrive in dry gardens, green roofs.				
<i>Tulbaghia violacea</i>	Society Garlic	pink	2	1	M	F	L	FS	L	●			●	●	●	●	●		Very dependable grass-like plant with pink flower atop 2' stalks. Distinctive garlic odor. Tolerates most soils.				
<i>Verbena lilacina</i>	De La Mina Lilac	purple	3	3	S	M	L	S to PS	L				●	●	●	●	●		Low, mounding perennial, attracts bees and butterflies.				

Notes:
 Plant selection shall be based upon site-specific conditions.
 *Greenroof plants require a minimum of 4" growing medium and automatic irrigation with inline drip unless otherwise noted.
 Taller shrubs and perennials with more substantial roots systems can be grown on green roofs with 18" growing medium.

D.4 Stormwater Measures

For each of the stormwater measures offered in the Plant List for Stormwater Measures there is a brief description of each, including the key factors that should influence planting techniques and plant selection.

BIORETENTION AREA

Bioretention areas are intended to act as filters with plants. Plants in bioretention areas help with phytoremediation and infiltration. Therefore, nutrient uptake and the ability to neutralize pollutants are priorities for species selection. Plants for these areas should be able to withstand periods of inundation as well as extended periods of drought. Emergent, grass and herbaceous species can be planted in the bioretention area, while shrub and tree species should be concentrated on the outer edges. Grasses can also be planted along the exterior to slow the velocity of flow and allow the sedimentation of coarse solids, which helps minimize clogging of the bioretention area. Supplemental irrigation will be necessary to maintain emergent species during extremely dry conditions. If trees are going to be planted in a bioretention area, see the tree guidance in the Tree Well Filter section below.

FLOW-THROUGH PLANTER

Plant species for flow-through planters will depend on the size of the planter. Shrubs and small trees should be only placed in planters when there is sufficient space and adequate soil depth and volume. Recommended minimum soil depth for shrubs is 18", and for small trees is 36". Plant species should be adapted to well-drained soils. Irrigation is typically required, but selecting plants adapted to extended dry periods can reduce irrigation requirements.

TREE WELL FILTER

Trees and shrubs planted in tree well filters should be an appropriate size for the space provided. Plant roots are confined to the container, and therefore it is recommended that small trees and shrubs with shallow, fibrous roots be planted in the tree well filter. Provided that site conditions allow, it may be possible to work with the manufacturer to design a container that would allow for the planting of larger trees or shrubs. Plants for tree well filters should be tolerant of frequent, but temporary periods of inundation as well as adapted to extremely well-drained soils. Species with the ability to neutralize contaminants are preferred. Trees should be provided soil volumes that correspond to the size of the tree species at maturity. Larger trees require more soil volume for their roots than smaller trees. It is recommended that the following minimum soil volumes be provided corresponding to the tree species size at maturity: small – 600 cubic feet, medium – 900 cubic feet, and large – 1,200 cubic feet of soil volume. For additional guidance on tree selection and required soil volumes, contact the local jurisdiction's arborist.

GREEN ROOF

A green roof is intended to capture precipitation and roof runoff. Green roofs utilize a lightweight, porous soil media. The depth and composition of this soil media is extremely important in determining types of plants that will be successful as part of a green roof system. Intensive green roofs, which can have up to 48" of soil media, can support a wider variety of plant types. Look for plants with check marks in the Green Roof sections of the list. *Extensive* green roofs, which have a depth of 3" to 7" of soil media, are suitable for a limited number of grass and herbaceous species. These roofs generally require little maintenance and should be

designed to succeed with minimal irrigation. In addition to the species listed, pre-vegetated mats can be utilized on extensive green roofs.

TURF BLOCK PAVERS

Some grid pavement systems can be planted with grass or herbaceous species in order to assist with erosion prevention as well as promote infiltration and pollutant uptake. However, this is not as common in California due to the water needs of the plants. Plant species should be tolerant of compaction and should not interfere with maintenance and use of the paved surface. Most plant species cannot tolerate frequent vehicular compaction. Therefore, turf block pavers are best suited for areas requiring infrequent access, such as emergency vehicle access routes. The paver manufacturer should be consulted regarding recommended and acceptable plant species.

D.5 Planting Specifications

Planting plans and specifications must be prepared by a qualified professional and coordinated with other site development details and specifications including earthwork, soil preparation and irrigation (if used). Plans indicating a planting layout, with species composition and density, should be prepared on a site-specific basis. Reference the Rescape Eight Principles for Regenerative Landscapes (available at www.rescapeca.org), which outline principles and practices to minimize waste, protect air and water quality, conserve energy and water, and protect natural ecosystems, including:

- Evaluate site and assess the soil;
- Consider potential for fire;
- Select plants for appropriate size upon maturity, do not over-plant;
- Irrigation, if required, should be designed as a high efficiency, water conserving system; and
- Utilize compost and composted wood mulch to build healthy soils and increase the water holding capacity of the soil.

PROPAGATION AND PLANTING METHODS

The propagation methods for different species will vary, depending upon the type of plant and stormwater adaptation. Container stock, transplants (plugs), pole cuttings, and seeds can be utilized for planting in treatment measures.

CONTAINER STOCK. Plant spacing should be determined on a site-specific basis. When planting, the root collar and base of the stem should be 1" above the adjacent biotreatment soil surface. Soils should be backfilled and tamped down to assure contact with the roots. The planting should be watered-in promptly to promote the settling of soil. Ensure that supplemental water has direct contact with the root ball of plant. Trees should be staked or guyed per local arborist guidelines to provide interim support until established.

TRANSPLANTS (PLUGS). Transplanted plant divisions, referred to here as "plugs", should be planted during the fall dormant period, preferably between October 1 and November 15 after first soaking rain. Temporary supplemental irrigation may be necessary to withstand dry periods until the plants are established. Plugs should be collected from a suitable collection site

in the vicinity of the constructed basins. Plugs are clumps of plant roots, rhizomes or tubers combined with associated soil that can be manually removed or salvaged with an excavator or backhoe. The maximum recommended size is 1 foot x 1 foot. Whole plants or plant divisions can be utilized. The plugs should be from healthy specimens free of insects, weeds and disease. The plugs should be spaced according to the size of the plant species at maturity. Smaller plugs can be planted at the minimum distance to promote faster spreading and cover. Larger plugs from cattail and bulrush species should be planted at larger intervals. Do not over-excavate the hole depth or the plant will settle below grade. A shovel could be used to create the planting hole. Manual planting with a spade is recommended for wet soils. Power augers can be used for creating holes in dry soils. To plant a plug with an established root system, the base of the stem and top of the root collar should be level with the ground surface. Tubers should be secured to prevent floating. Rhizomes should be placed in the soil with a slight upward angle. The hole or trench containing the plug(s) should be backfilled with soil and the soil tamped down to assure good soil contact and secure the plug. The vegetative portion of the plant should be cut back to prevent water loss and wilting and encourage the growth of roots and new shoots. Plugs of wetland plants should be grown in saturated soil. The soil should not be allowed to dry out after planting. Plugs should be planted immediately, when possible. When necessary, plugs can be stored in a cool, moist, shaded location for a maximum of one day. Plants must be thoroughly watered. See "Water Level Management and Irrigation for Plant Establishment" section below for more information.

POLE CUTTINGS. Pole cuttings should be collected from the 1-year old wood of dormant trees and have a minimum of 5 viable nodes. The parent material should be healthy and free of diseases. The basal area of the pole cutting should be a minimum of one to two inches in diameter; however, the diameter at the base should not exceed 2 inches. The optimum diameter width of the base is 1 inch. The length of the cutting should be a minimum of 2 feet and should not exceed a maximum of 4 feet in length. Generally, 75 percent of the length of the cutting should be planted beneath the soil surface.

Pole cuttings should be collected no more than 2 days prior to planting. Cuttings should be placed in cool water to promote swelling of the nodes. Water should be kept fresh by aeration and/or by daily replacement. The pole cuttings should be placed in a hole approximately 3 feet deep (as determined by the length of the cutting) and backfilled with native soil, or a rich organic medium mixed with native soil. Soil should be tamped down to remove air pockets and assure soil contact with the cutting.

SEEDING. Seeding should be conducted after plugs, container stock and pole cuttings are installed. Hydroseeding or broadcast method should be utilized as appropriate for the size and accessibility of the area. The soil surface should be scarified prior to seeding. Do not damage previously planted vegetation. The seeds should be planted in fall, ideally in October. Temporary supplemental irrigation may be necessary to assist germination until rain events occur and/or until plant material is established. See "Water Level Management and Irrigation for Plant Establishment" section below for more information. Seeds should be broadcast or hydroseeded over the specified planting area. With broadcast seeding, the seed should be applied with hand-held spreaders to scarified soil. The soil surface should then be raked to cover the seeds with about one-eighth to one-quarter inch of soil to discourage predation, and tamped or rolled to firm soil surface. Seeds should be planted at the ratios and rates specified by the supplier. The seed should be free of weeds and diseases. The certified germination percentage should be provided by the supplier.

MULCH

Regular application of mulch in bioretention areas, flow-through planters, and tree well filters is important and useful for the following reasons:

- Controlling weed growth;
- Cooling soil and reducing plant stress;
- Reducing plant water consumption and irrigation demand;
- Inoculation of soil with beneficial organisms from the composting process; and
- Providing soil with nutrients from the slow decomposition of the mulch.

Use of composted wood mulch, consistent with the regional Biotreatment Wood Mulch (BWM) specification⁴ (developed in 2021), in areas between plantings is recommended. Compared to uncomposted wood mulch, composted wood mulch does not float as much, can be less flammable, and can have fewer pathogens.

The BWM specification is included at the end of Appendix D and available on the SCVURPPP website⁵. Installing and maintaining a 3-inch layer of BWM is consistent with the State of California's Model Water Efficient Landscape Ordinance. BWM can be obtained through soil suppliers, compost processors, or commercial landscape companies.

Rock mulch, such as cobble or gravel, should be used sparingly and only where necessary, as this type of mulch does not provide most of the benefits described above for wood mulch and can heat up soil, which reduces some of those benefits. However, rock mulch may be helpful in some on-line bioretention areas where high flows could blow out wood mulch. Mulches that are not recommended include "Micro-bark", and "gorilla hair" mulch, as well as chipped wood mulch from recycled pallets and dimensional lumber.

WATER LEVEL MANAGEMENT AND IRRIGATION FOR PLANT ESTABLISHMENT

All newly planted material will need careful attention to watering requirements to ensure proper establishment. As mentioned in the introduction, it is important to select plants based on specific site conditions, which will affect the availability of water for plant use. In addition, grouping plants with similar water requirements can help reduce irrigation needs. The specific approach will vary for irrigated and non-irrigated conditions, and for each stormwater application. In most cases, stormwater applications will require a permanent irrigation system which should be designed to maximize water conservation. Irrigation specifications and design plans should be provided.

Plants such as shrubs and trees grown in naturalized areas that are not saturated to the surface or inundated should be irrigated with drip irrigation or low volume bubblers. The irrigation system should remain in place for a minimum of three years, and should continue until it is demonstrated that the plantings can survive on annual rainfall and/or groundwater.

⁴ <https://scvurppp.org/wp-content/uploads/2021/08/Biotreatment-Area-Wood-Mulch-Spec-8-1-21-Final.pdf>

⁵ <https://scvurppp.org/2021/07/01/biotreatment-soil-media-supplier-list/>

Seeded areas do not need irrigation in years of normal rainfall. If a period of drought occurs after seeding, supplemental watering may be needed for germination in the first year.

The plants on the bottom and edge of the constructed basins should be allowed to become established for one growing season prior to the onset of significant flooding that will inundate the plantings for extended periods. The types of plants recommended for these locations are rushes, sedges, grasses and herbaceous species. Initially, saturated soils are required for the bioretention areas and extended detention basins during the establishment period of the plantings. After the plants have become established, inundation with a surface depth of 1 cm to 2 cm alternating with short dry periods is recommended for the basins during the first year. Periodic shallow flooding of these basins can slow the growth of non-native weedy terrestrial species in the wetland system; however, the water depth should not be greater than the height of the plants. This initial irrigation regime will prevent plant mortality from dry periods or excessive flooding in the first year, and reduce the growth of non-native weedy species. Emergent species should be planted in saturated soil so the plants will become established. For emergent species, the water level in the first year should be maintained to allow for soil saturation or shallow inundation around the base of the plants. Significant flooding and inundation of stems and leaves of the plants should be avoided the first year. Tall plugs and plantings can tolerate greater depths of inundation if a significant portion of the stems and leaves of the plantings remain above the water surface.

D.6 Monitoring and Maintenance

GENERAL REQUIREMENTS

All planted areas should be monitored and maintained as required to ensure proper establishment by a Contractor with a valid California C-27 contractor's license. Frequency of site visits and required maintenance practices will vary depending upon the stormwater measure and plant selection. Maintenance should include watering, cultivation, weeding and pruning as necessary to maintain optimum growth conditions and, as appropriate to the specific stormwater measure, to keep the planted areas neat and attractive in appearance. In all instances, controlling weeds and unwanted growth with chemical applications is prohibited.

The contractor should be familiar with the design and function of the specific stormwater measure(s) to ensure that the plantings are maintained appropriately and do not interfere with the efficient runoff drainage and filtration. Treatment systems and inlets should be devoid of sediment, trash, debris, or any blockages prior to rain events to ensure positive flow.

Ongoing management of invasive weed species will be required in all applications. Monthly hand weeding will allow the naturalized vegetation to take hold, and will ultimately be less costly than less frequent, and more intensive clearing. Replenishing mulch on a regular basis will assist with weed control. It is recommended to apply 1" to 2" of composted mulch, once a year, preferably in June following weeding to maintain the required 3" depth of mulch.

EROSION CONTROL

Particularly with landscapes that are not fully established, contractors will need to monitor and evaluate potential for erosion and sediment accumulation in the runoff, which will influence irrigation scheduling and as well as determine the need for additional erosion control measures. Soil can be protected from erosion by a number of methods including:

- During construction:
 - Block inlets to the treatment system by using compost socks, straw wattles, or gravel bags
 - Until the final plant material and final mulch are installed, prevent erosion of BSM by covering any bare soil areas with temporary erosion controls such as tarps, wood mulch, jute nets, straw mats, bonded fiber matrix etc.
- During plant establishment
 - If needed, slow water runoff inside the system at inlets and/or slopes by using compost socks, straw wattles, or gravel bags;
 - Keep bare soil areas to a minimum - plant with vegetation (at least 90% coverage for established systems recommended);
 - Cover bare soil with a minimum of 3 inches of composted wood mulch per mulch guidance above;
 - Minimize the use of blowers in planting beds and on turf;
 - On slopes use mulch that is not prone to washing into storms drains; and
 - Store leaf litter to create mulch in planting beds as appropriate.

IRRIGATION SYSTEMS

Where irrigation systems have been installed for temporary or permanent irrigation, the contractor should maintain the irrigation system for optimum performance, as per manufacturer's specifications. The contractor should inspect the entire system on an ongoing basis, including cleaning and adjusting all sprinkler and bubbler heads, drip emitters and valves for proper coverage. The contractor should monitor the irrigation system while operating to identify and correct problems with water runoff or standing water.

Monitor soil moisture within plant root zones using a soil probe or shovel and adjust irrigation schedules accordingly if a soil moisture sensor is not being utilized to signal the irrigation controller. If a Weather-Based Irrigation Controller (WBIC), otherwise known as a "Smart" Controller is not utilized on the project, irrigation should be scheduled using a water budget approach, basing irrigation frequency on evapotranspiration data (ET) to avoid over-irrigation of plant material. Adjust irrigation frequency within each hydrozone area a minimum of every four weeks to respond to expected adjustments in ET data. Refer to California State's Model Water Efficient Landscape Ordinance (MWELO) for guidance on irrigation systems⁶. Irrigation systems that include features providing visual confirmation of an operating pressurized system, such as pop-up "eco-indicators", are recommended.

Bioretention sod products are available in different varieties including a no-mow blend. If a standard turf mix is used in lieu of a no-mow variety, implement grasscycling, where appropriate to the stormwater treatment measure. Grass clippings should not be carried into the drainage structures. Refer to *A Landscaper's Guide to Grasscycling* available at StopWaste.org.

⁶ For more information, see the UC Davis WUCOLS database: <https://ccuh.ucdavis.edu/wucols>

BIORETENTION WEEDING

In bioretention areas non-native invasive plant species should be carefully monitored and controlled to reduce competition with the native plantings and to assure the success of the revegetation activities. The establishment of weeds and invasive species can be partially controlled during the establishment period by implementing the watering schedule of initial saturation followed by alternating periods of shallow inundation and dry soil. Manual methods of weed removal should be conducted on the bottom, edge and side of the areas during dry soil periods.

Weeding should be conducted regularly the first two years to prevent the growth, flowering, and seed set of non-native weeds and invasive species. After the first two years, weeding frequency will be determined on a site-specific basis as determined by the type of weeds and seasonal growth cycle of the weed species. In general, weeding once a month will be necessary to avoid more extensive and costly eradication in the future.

Long-term maintenance tasks include continued control of nonnative weeds and invasive plants, and control of erosion. Erosion could include gullies, rills and sheet erosion. Actions to control erosion should include redirecting or dissipating the water source. Recontouring and subsequent mulching and/or replanting may be required in bare areas. In the event of extensive die-off of the desired plant species, the bare areas should be replanted. Where the event that caused plant mortality was not a natural catastrophic occurrence, the site condition that resulted in the die-off should be investigated and remedial action to correct the problem should be undertaken prior to replanting.

D.7 ReScape Regenerative Landscapes Principles and Integrated Pest Management (IPM)

This section provides a summary of ReScape's Eight Principles for Regenerative Landscapes (available at www.rescapeca.org) and integrated pest management techniques.

EIGHT PRINCIPLES FOR REGENERATIVE LANDSCAPES

ReScape advances a whole systems watershed approach to earthscaping that works in harmony with the natural environment. Their landscaping practices address the fact that one input affects the whole. They are based on eight core principles which foster soil health, conserve water, sequester carbon and protect valuable resources while reducing waste and preventing pollution.

Project sponsors are encouraged to use landscape professionals who are familiar with and committed to implementing sustainable landscaping practices from the initial plant selection through the long-term maintenance of the site. This section summarizes landscaping practices that may be implemented information that project sponsors need about how these practices can benefit water quality of the Bay and its tributaries.

ReScape's 8 principles encompass the following practices:

- Act Local
- Reduce Waste
- Nurture the Soil

- Sequester Carbon
- Conserve Water
- Conserve Energy
- Protect Water and Air Quality
- Create and Protect Wildlife Habitat

INTEGRATED PEST MANAGEMENT

All creeks in the San Francisco Bay Area exceed water quality toxicity limits, primarily due to the pesticide Diazinon entering urban runoff. Although the residential use of Diazinon is currently being phased out, the use of a group of highly toxic chemicals, called pyrethroids, is increasing. Because all pesticides are toxins, an integrated pest management (IPM) places a priority on avoiding their use. IPM is a holistic approach to mitigating insects, plant diseases, weeds, and other pests. Each agency has a Source Control Measures List that includes provisions for using IPM in the landscaping plans of development projects. Contact the local agency to learn about the IPM requirements that may apply to your projects. Remember that avoiding pesticides and quick release synthetic fertilizers are particularly important in your project's stormwater treatment measures, to protect water quality.

IPM encourages the use of many strategies for first preventing, and then controlling, but not eliminating, pests. It places a priority on fostering a healthy environment in which plants have the strength to resist diseases and insect infestations, and out-compete weeds. Using IPM requires an understanding of the life cycles of pests and beneficial organisms, as well as regular monitoring of their populations. When pest problems are identified, IPM considers all viable solutions and uses a combination of strategies to control pests, rather than relying on pesticides alone. The least toxic pesticides are used only as a last resort.

IPM features the following practices:

- Prevent Pest Problems
- Watch for and Monitor Problems
- Use Physical and Mechanical Controls
- Use Biological Controls
- Least Toxic Pesticides are a Last Resort

D.8 Nursery Sources for Native Plants

It is recommended that the native plants used in treatment controls be grown by a qualified nursery. Seed collection should be conducted by a qualified botanist and/or nursery staff. Seed should be collected locally from selected sites to maintain the genetic integrity of the native plant species. The seeds should be propagated by the nursery for planting during the fall dormant season. The appropriate container size for each species should be used by the nursery.

The Santa Clara Valley Chapter of the California Native Plant Society maintains a native plant nursery on the grounds of Hidden Villa Ranch in Los Altos Hills. Volunteers propagate native plants throughout the year for the chapter's [native plant sales](#). Proceeds from plant sales are the major source of funding for all chapter activities. Inventory is updated once a month before the plant sale. Go to the following chapter webpage for more details:

www.cnps-scv.org/index.php/gardening/cnps-nursery

The following website lists local nurseries that the California Native Plant Society acknowledges as locations to buy native plants:

<http://www.cnps-scv.org/index.php/gardening/39-gardening-with-natives/356-where-to-buy-native-plants>

The Bay Area Eco Gardens website also includes useful information on resources for ecogarden design, plant selection, construction and maintenance:

www.bayareaecogardens.org/Garden-Resources/

Phytophthora Plant Pathogens in California Native Plant Nurseries⁷

Over the past several years, numerous Phytophthora (pronounced Fie-TOF-ther-uh) plant pathogens have been detected in California native plant nurseries and habitat restoration sites. Phytophthora, which means “plant destroyer”, is a genus of microscopic water molds, fungal-like organisms that are most closely related to diatoms and brown algae and can cause moderate to severe root and crown rot, and death in highly infected plants. The genus Phytophthora is large, with over 100 described species, including the sudden oak death

⁷ *Adapted in part from "In Brief... Phytophthora plant pathogens in California native plant nurseries and habitats. Why the Concern?" from the Working Group on Phytophthoras in Native Plant Habitats, May 2015.

pathogen and other destructive pathogens of agricultural, ornamental, and forest plants. Preliminary investigations have identified more than 15 Phytophthora species in native plant nurseries. Inadvertent planting of Phytophthora-infected nursery stock into or adjacent to native habitats has the potential to introduce these pathogens into wildlands. Furthermore, many of these Phytophthora species appear to have wide host ranges, capable of causing disease on plants across many families.

Obtaining nursery stock from local plant nurseries for implementation of green infrastructure and low impact development projects has the potential to spread Phytophthora plant pathogens into wildlands (e.g., adjacent or nearby creeks) or to cause mortality of new plantings. Valley Water has developed nursery contract specifications for plant pathogen prevention, and is working with specific native plant nurseries to implement techniques or practices that prevent nursery stock from being infected with plant pathogens. For more information, contact the Valley Water Environmental Mitigation and Monitoring Unit at 408-265-2600 or Phytosphere Research at phytosphere@phytosphere.com or 707-452-8735.

D.9 References

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A Landscaper's Guide to Grasscycling and A Landscaper's Guide to Mulch, StopWaste, www.stopwaste.org

Sunset Magazine, www.sunset.com/garden/climate-zones

The Weed Worker's Handbook, A Guide to Techniques for Removing Bay Area Invasive Plants, The Watershed Council (510) 231-5655 and the California Invasive Plant Council (510) 843-3902.

University of California Cooperative Extension, Guide to Estimating Irrigation Water Needs of Landscape Plantings in CA.

D.10 Credits

The plant list included in Section D.3 was prepared by Placeworks specifically for the Santa Clara Valley Urban Runoff Pollution Prevention Program to identify species appropriate for local climate conditions in Santa Clara Valley.

D.11 Biotreatment Wood Mulch Specification

The Composted Wood Mulch Specification for Stormwater Biotreatment Areas, also known as the Biotreatment Wood Mulch (BWM) specification, is provided on the following page and is recommended for use in bioretention areas, flow-through planters, and tree well filters. Installing and maintaining a 3-inch layer of BWM is consistent with the State of California's Model Water Efficient Landscape Ordinance. BWM can be obtained through soil suppliers, compost processors, or commercial landscape companies.

COMPOSTED WOOD MULCH SPECIFICATION FOR STORMWATER BIOTREATMENT AREAS

Overview: This specification for composted wood-based mulch was developed for use in engineered stormwater biotreatment areas. The specification provides for a consistent mulch product that enhances water quality; improves water retention and plant health; has been treated to reduce any potential pathogens, insects or invasive weed seeds; and has reduced floating and migration potential. There are three parts of the specification: feedstocks, processing and testing.

A. Feedstocks: This mulch shall be derived from plant debris with at least 90% consisting of clean (minimal trash) woody vegetation such as “Arbor Mulch” (i.e., tree trunks, branches, stumps, and brush). Up to 10% by volume may be derived from other clean source-separated feed stocks, such food scraps, and/or other woody materials, such as clean uncoated lumber.¹

B. Processing: These feedstock materials shall be: 1) composted; 2) meet the PFRP (Process to Further Reduce Pathogens) standard to reduce weed seeds, pathogens, and deleterious materials under 14 CA Code of Regs §17868.3 (i.e., reaching the required minimum temperature of 55 degrees Celsius for the required length of time²); and 3) screened to meet the specifications in Table 1 below³. No dyes or gorilla hair (fiber mulch) shall be used in the finished mulch product.

C. Testing and laboratory-related requirements: All testing of the mulch product shall be completed within 120 days prior to delivery to the site by an STA Program-approved laboratory⁴. A 3- to 4-gallon sample of the mulch product shall be submitted to the laboratory for testing, to provide enough fines from the product to complete the specific testing procedures.

Table 1: Specifications for Composted Wood Mulch for Stormwater Biotreatment Areas

Property	Test Method/Units ⁵		Requirement	
1. pH	TMECC 04.11-A	Elastomeric pH 1:5 slurry method (pH units)	6.0 – 8.5	
2. Soluble salts	TMECC 04.10-A	Electrical conductivity 1:5 slurry method (dS/m or mmhos/cm)	≤ 6.0	
3. Moisture Content	TMECC 03/09-A	Total solids & moisture at 70±5 °C (% wet weight basis)	30-55%	
4. Organic matter content	TMECC 05.07-A	Loss-on-ignition organic matter method (% dry weight basis)	≥ 65	
5. Maturity	TMECC 05.05-A	Germination and vigor (% relative to positive control)	--	
		Seed emergence	≥ 80	
		Seedling vigor	≥ 80	
6. Stability	TMECC 05.08-B	Carbon dioxide evolution rate (mg CO ₂ -C/g OM per day)	≤ 5	
7. Pathogen	TMECC 07.01-B	Salmonella (MPN per 4 grams, dry weight basis)	< 3	
8. Pathogen	TMECC 07.01-B	Fecal coliform bacteria (MPN per gram, dry weight basis)	< 1,000	
9. Physical contaminants	TMECC 02.02-C	Human-made inert removal and classification: plastic, glass, and metal (% > 4 mm fraction)	combined total: < 0.5%	
10. Physical contaminants	TMECC 02.02-C	Film plastic: (% > 4 mm fraction)	< 0.1%	
11. Sizing	TMECC 02.02-B	Sample sieving for aggregate size classification (% dry weight basis)	Min	Max
		Pass 3-inch sieve	100%	--
		Pass 2-inch sieve	90%	--
		Pass 3/8-inch sieve	20%	40%

¹ Unacceptable feedstocks: dyed mulches, plywood, laminated wood products, glued laminated timber (Glulam), oriented strand board (OSB), painted wood, stained wood, pressure-treated wood or other treated wood waste (TWW), or any other manufactured wood products with non-wood ingredients, such as adhesives, or wood treated with chemicals of any kind. Metal concentrations in compost must not exceed the maximum listed in 14 CA Code of Regs §17868.2.

² <https://govt.westlaw.com/calregs> (§17868.3. Pathogen Reduction)

³ Based on the Caltrans specification for “Coarse Compost” with modifications for use in biotreatment systems.

⁴ List of approved testing laboratories: www.compostingcouncil.org/page/CertifiedLabs

⁵ TMECC refers to “Test Methods for the Examination of Composting and Compost,” published by the United States Department of Agriculture and the United States Compost Council (USCC).