Green Stormwater Infrastructure Vegetation Guide

Santa Clara Valley Urban Runoff Pollution Prevention Program

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Prepared for the
Santa Clara Valley Urban Runoff Pollution Prevention Program
by EOA, Inc.
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Table of Contents

Chapter 1: Introduction and Background

Intended Audience: The Green Stormwater Infrastructure Vegetation Guide (Guide) was created for professionals in the public and private sector who work with the plant communities specific to landscaped green stormwater infrastructure (GSI) measures. These professionals include those performing landscape maintenance and inspection.

Purpose: The purpose of the Guide is to assist with the care and maintenance of landscaped GSI measures and provide guidance and information for ensuring healthy and thriving vegetation with cost-effective and environmentally sensible practices. The first step in maintaining or designing any landscaped GSI measure is to be able to identify and understand the vegetation planted within GSI measures. The plants used in GSI measures are often different from plants in other types of landscapes and have different maintenance requirements.

Goal: The primary goal of the Guide is to ensure compliance with Bay Area stormwater regulations by maintaining functioning GSI measures with healthy, thriving plants. It is recommended that professionals use the information provided in the Guide to improve vegetation health and GSI measures' performance when performing maintenance and inspection activities. Another goal of the Guide is to reduce the use of pesticides, fertilizers, and other synthetic additives for improving plant health. Managing common pests, weeds, and other vegetation maintenance issues within GSI measures in an integrated and holistic manner involves understanding the plants that exist in these landscapes. Once the various vegetation species have been identified, the care of those plants and other aspects of the measure can be more properly assessed. While there are hundreds of plants that may be found or used in landscaped GSI measures, the Guide focuses on the maintenance and care of 12 of the more common species of plants used in Bay Area installations. The basic principles in the Guide are useful in the maintenance and utilization of other plant species as well.

Regulatory Background: Public agencies in the Bay Area are regulated by the San Francisco Bay Regional Water Quality Control Board (Water Board) via National Pollutant Discharge Elimination System (NPDES) permits issued to ensure compliance with the Federal Clean Water Act. In Santa Clara Valley, public agencies are required to comply with the Water Board's Municipal Regional Stormwater Permit (MRP). One aspect of these regulations involves the installation of vegetated GSI measures on development sites, roadways, and parking lots, to improve water quality in downstream rivers, creeks, and the Bay. The Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP) assists public agencies in Santa Clara Valley by creating guidance materials such as this Guide.

Complementary GSI Resources: The City of San José GSI Maintenance Field Guide (SJ MFG) has excellent information and guidance for maintaining GSI measures and vegetation care. To prevent repetition and duplication of effort,

the SJ MFG will be referenced when a particular subject is covered more in-depth. While the Guide does not cover trees, shrubs, or the specialized plants used in green roof measures, the SJ MFG does provide some information on those subject areas. Calscape's website provides detailed information on the California native plants in the Guide and is recommended for additional guidance. Calflora's website provides additional plant information. The U.C. Davis WUCOLS database is referenced for water use and other characteristics. The SCVURPPP GSI Handbook and SCVURPPP C.3 Stormwater Handbook have extensive guidance on the design of GSI measures and will also be referenced in appropriate sections.

Chapter 2: How the Guide is Organized

The Guide is organized into three main sections:

Chapter 3: The Guide's Approach to GSI Plant Maintenance

The Guide is introducing a new approach – identifying and grouping plants by their maintenance characteristics. These are the Guide's three plant maintenance groups:

1. Rushes
2. Grasses
3. Flowers

Chapter 3 describes the following aspects of each of the three plant maintenance groups:

- Identification and characteristics
- Basic pruning tips for general plant health

Chapter 4: Identification, Characteristics, and Care

Chapter 4 has photographs and information on each of the specific 12 plants, divided into the three plant maintenance groups. The general care practices of each plant maintenance group are summarized and shown on the last two pages of each group section.

Chapter 5: Additional Vegetation Information

Chapter 5 has information on the following general topics for all three plant maintenance groups:

- Quick tips for checking and diagnosing irrigation systems
- Tips for identifying the frequency of plant maintenance activities
- Identifying undesirable plants (i.e., weeds)
- Best practices for mulch use, application, and procurement
- Nursery information for plant replacement and ordering

Chapter 3: The Guide's Approach to GSI Plant Maintenance

One of the most common ways of treating stormwater is with biotreatment measures. Biotreatment measures are a type of green stormwater infrastructure (GSI) that uses plants, mulch, and soil to filter pollutants from urban runoff. There are different names for biotreatment measures depending on the type of vegetation and the location, such as Stormwater Planter, Rain Garden, Tree Well Filter, and Stormwater Curb Extension. For more information on biotreatment measures, see the SCVURPPP GSI Handbook and SCVURPPP C.3 Stormwater Handbook.

This Guide focuses on biotreatment measures with small plants on streets and in parking lots and parks, although it can be used when inspecting biotreatment measures on private property. Figure 3-1 below demonstrates the following features of a typical biotreatment measure indicated by the corresponding number:

1. The inlets where stormwater flows from the adjacent impervious area into the measure;
2. The ponding and planting area with vegetation, mulch, and soil that treats the stormwater;
3. The outlet structure where excess water is discharged during larger storm events.

Figure 3-2 shows other aspects of a typical biotreatment measure including the media layers and underground pipes. Biotreatment measures often have one planting zone (or hydrozone) with a flat bottom and vertical sides as shown in the Figure 3-2, however, when there is more space, the measure may have sloped sides with different planting zones as shown in Figure 3-3.

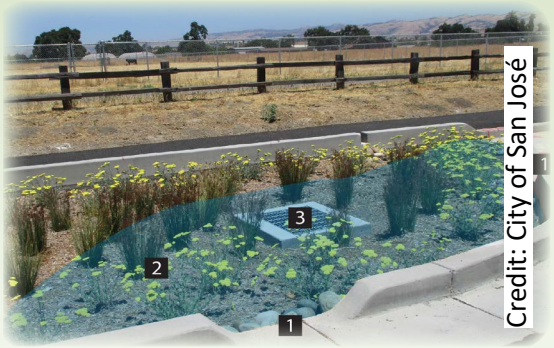


Figure 3-1

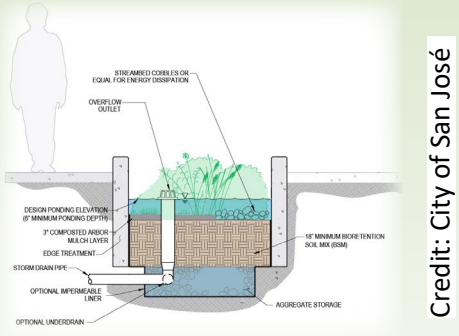


Figure 3-2

Figure 3-3

The plant list in this Guide is not intended to represent a list of recommended plants. Lists of recommended plant species can be found in design references such as Appendix D of the SCVURPPP C.3 Stormwater Handbook. The focus of this Guide is on maintenance – not design. The plants described here were chosen because they are commonly found in GSI measures and there appears to be a need for more information on best practices for their care. The Guide's purpose is to provide common-sense maintenance practices for these commonly found plants.

However, sometimes plants need to be replaced when they die or are not performing well. As experience grows, professionals around the Bay Area are learning that some plants used in the past may not be the best choice for new plantings. Plants native to California have not always been used in GSI measures, but for several reasons, the Guide recommends, whenever possible, the use of native plants that are appropriate for GSI measures in the Bay Area. Native plants provide benefits to native pollinators and native animals such as birds. Native plants are generally not invasive, nor do they generally harbor invasive diseases or pests from other regions of the world. That said, one challenge with some native plants is that they may not be as commonly found in Bay Area plant nurseries, but over time as the demand increases, the nurseries should respond with more inventory.

Some of the plants commonly found in GSI measures are difficult to distinguish from other species and are sometimes only identifiable by looking very closely at seeds, flowers, or other plant parts. In those cases, the Guide lists both types of plants and does not attempt to distinguish between them as long as the maintenance needs for both types of plants are similar.

There are two main groups of small plants found in GSI measures in the Bay Area: Perennial Grasses and Perennial Flowering Plants. Perennial species are used in GSI measures because they live more than two years (as compared to the short-lived annual plants), so they are less expensive to maintain and offer other benefits.

Grasses come in several types including many California natives. Bunch Grasses, Rushes, Sedges and Fescues can all be found in GSI measures. Several species of grasses from other regions around the world with Mediterranean climates are also used because they perform well in the Bay Area. One example of a non-native grass that is commonly planted is the Lomandra from Australia. Grasses are often selected for GSI measures because many are hardy, drought tolerant and pest-resistant.

Flowering plants (with flowers that are larger, more visible, and more colorful than on the grasses) come in many types and typically have broader leaves than grasses. They add variety and color to the biotreatment measure landscapes. Most of the Flowering plants mentioned in this guide are California natives.

The Guide's approach to maintaining GSI plants is to create an easier way to remember what types of care GSI plants typically need. Instead of trying to learn every type of plant in GSI measures, the Guide assists users by showing how plants that have similar maintenance needs can be grouped together. The Guide's 12 plants are similar in some ways and different in other ways – especially in their care practices – and are different from plants in other landscapes. Therefore, the Guide has developed three plant "maintenance groups" that each have similar care practices.

Rushes have specific and different maintenance and care practices, so they have been separated out from the larger Grasses family into their own maintenance group. The other two maintenance groups are Grasses and Flowers.

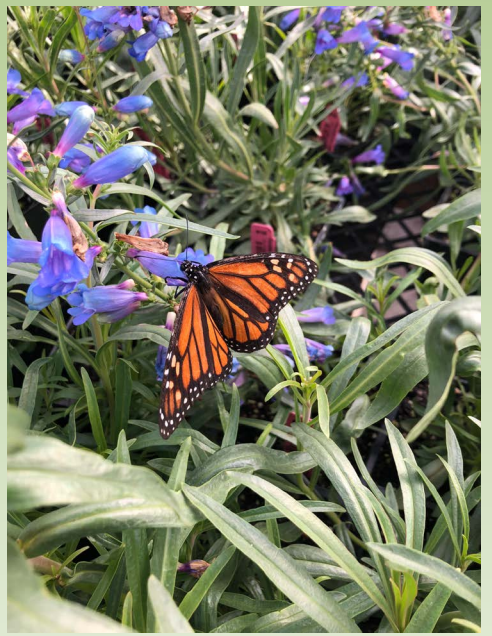
The Guide's three maintenance groups are:
Rushes, Grasses and Flowers[1]
(The Grasses group includes Sedges, Fescues and a Lomandra.)

To assist the user, the three plant maintenance groups are color coded consistently throughout the Guide:
Rushes are Highlighted in Blue, ***Grasses are Highlighted in Yellow***, and ***Flowers are Highlighted in Pink.***

Each plant maintenance group has a distinctive leaf (leaf or stem) shape:
Rushes are round, ***Grasses are flat***, and ***Flowers have broad leaves***, as demonstrated in these three photographs:

Rushes - Round

Grasses - Flat



Flowers - Broad Leaf

[1] Disclaimer: for the purposes of the Guide, the chosen plants have been separated into three groups that each have shared characteristics and care practices. While botanists may quibble with the terminology used for the three groups and may legitimately argue that there is significant overlap between them, the three groups are designed to assist the Guide user with the goals and purpose of the Guide and not necessarily to conform to the rules of botanical study or the Kingdom Plantae.

The 12 plants chosen for this guide were not chosen at random. They are commonly found in GSI measures in the San Francisco Bay Area. The Guide is meant to help professionals identify the plants that they may find and take care of them properly. The following three tables summarize the attributes and care practices for the 12 plants. The plant maintenance groups are shown by row and color. Table 3-1 provides a summary of the primary care and characteristics of each plant maintenance group, Table 3-2 covers more specific pruning practices, Table 3-3 describes other pertinent maintenance issues, and Table 3-4 summarizes practices that are similar for all groups.

Rushes

Grasses

Flowers

Table 3-1 provides a summary of typical and important characteristics for each of the three plant maintenance groups:

Table 3-1

PLANT GROUP	PLANT SHAPE	LEAF SEASON	LEAF SHAPE	FLOWERS	PRUNING PRACTICE
Rushes	• Upright and tall	• Year-round green	• Round stems – can be solid or hollow	• Very small on spikes, stems, or tips	• Prune dead and sprawling leaves only at base.
Grasses: • Sedges and Lomandra • Fescues and Bunch Grasses	• Bunches of various shapes or ground cover forms	• Some are browner in their winter or summer dormancy (non-growing) period, but many are green all year.	• Flat stems with edges	• Very small flowers on stems or spikes	• Varies – prune during dormancy for best results.
Flowers	• Varies	• Typically green year-round, but some have winter dormancy period.	• Broad leaves that vary in shape and size	• Larger, colorful flowers	• Prune out dead flowers and stems after flowering.

Table 3-2 provides an overview of pruning practices for each plant group.

Table 3-2

GROUP	SPECIES	GENERAL PRUNING TIPS	DEAD GROWTH PRUNING METHOD	DEAD GROWTH PRUNING SEASON	LIVE GROWTH PRUNING METHOD	LIVE GROWTH PRUNING SEASON
RUSHES	Gray Rush	• Avoid pruning in general. • Move plants that overhang pathways and sidewalks, to minimize need for pruning unnecessarily.	• Thin out dead leaves in center using a textured glove. • Prune dead or overhanging leaves around exterior at base of plant.	• Any time • Dormancy period (non-growing season): Late Summer to Fall	• If needed, prune selectively to thin dense clumps of leaves or stems. • Clip leaves or stems at the base of the plant.	• Prune live growth only during dormant season (August to October). Inspect plants for over-wintering beneficial insects (e.g., lady bugs) prior to any pruning.
	Cape Reed	• Same as Gray Rush	• Same as Gray Rush	• Any time • Dormancy period (non-growing season): Late Summer to Fall	• Remove clumps of leaves, stems or roots to thin very dense masses.	• Prune live growth only during dormant season.
GRASSES	Sedges and Lomandra	• Respond well to periodic removal of dead leaves and blooming stems with a severe pruning every few years.	• Thin out dead leaves and thatch in center of plant using textured gloves. • Prune out rigid, dead flower stems at base.	• Any time • Dormancy period (non-growing season): Summer	• Remove leaves or stems to base. • Be careful not to damage the crown (a few inches above the ground).	• Prune during cooler months. • Should be pruned down to the crown every few years depending on growth rate.
	Fescues and Bunch Grasses	• Respond well to pruning after blooming during dormancy • (non-growing season).	• Prune out flower stalks when they become messy and bent. • Thin leaves and thatch using textured gloves.	• After flowering during dormancy • Dormancy (non-growing season) period is: Late Summer to Fall	• Live plant growth should not be pruned.	• Do not prune live plant growth. • Should be thinned/ pruned every year during dormancy.

Table 3-2 cont.

GROUP	SPECIES	GENERAL PRUNING TIPS	DEAD GROWTH PRUNING METHOD	DEAD GROWTH PRUNING SEASON	LIVE GROWTH PRUNING METHOD	LIVE GROWTH PRUNING SEASON
Flowers	Woody (hard-stem) flowering plants	• Should be dead headed as needed after flowering and lightly pruned in natural shape if needed.	• Prune dead branches/ stems back to next live node using hand pruners or loppers. • Remove any fallen leaves and debris from within the plant.	• Remove dead material as needed. • Dormancy (non-growing season) period is: Late Summer to Fall	• Live growth should not be removed.	• Live plant growth should not be removed.
	Herbaceous (soft-stem) flowering plants	• Should be deadheaded after flowering and cut back after flowering during dormancy.	• Remove dead material entirely during dormancy.	• Remove dead material as needed. • Dormancy (non-growing season) period is: Late Summer to Fall	• Live growth should not be removed.	• Live plant growth should not be removed.

Table 3-3 provides information on various other group characteristics and care with hyperlinks to the Calscape websiteand associated page references in the SJ MFG:

Table 3-3

GROUP	SPECIES	LIFESPAN[2]	REPLANTING TIPS	CALSCAPE (NATIVE PLANTS)[3]	CALFLORA[4] or WUCOLS[5]	SJ MFG PAGE
Rushes	Gray Rush	Long	• May be periodically divided.	Gray Rush		43
	Cape Reed	Long	• Do not respond well to division.		Cape Reed	43
Grasses	Sedges and Lomandra	Moderate to Long	• Plants can be divided periodically during dormancy.	Berkeley Sedge (tumulicola)	Lomandra hystrix Berkeley Sedge (divulsa) Berkeley Sedge (divulsa)	43
	Fescues and Bunch Grasses	Short to Moderate	• Giant Wild Rye spreads by rhizomes and can be divided every few years during dormancy.	Giant Wild Rye Deer Grass Blue Fescue (idahoensis)	Blue Fescue (glauca) Blue Fescue (glauca) Hairy Awn Muhly	43-44, 47-48
Flowers	Woody flowering plants	Long	• Relocate during cooler months if needed due to improper spacing.	Creeping Wild Lilac Common Yarrow		43-44
	Herbaceous flowering plants	Moderate to Long	• Relocate during cooler months if needed due to improper spacing - Some may be divided.	California Fuchsia Foothill Beardtongue		43

[2] Lifespan is hard to calculate exactly for many species, so the Guide uses estimated ranges of 2-4 years for Short, 4-8 years for Moderate and over 8 years for Long.
[3] Calscape – California Native Plant Society plant database: https://calscape.org/
[4] Calflora – A non-profit database providing information on wild California plants: https://www.calflora.org/
[5] WUCOLS – Water Use Classification of Landscape Species database: https://ucanr.edu/sites/WUCOLS/

Table 3-4 provides information on characteristics and care that are the same for all the plant groups:

Table 3-4

GROUP	LOCATION	PLANT SITING	REPLANTING TIPS	PEST and WEED ISSUES	SJ MFG PAGE
All Groups	• Adjacent to sidewalks and drainage structures	• Plant at a minimum spacing of one half of the mature diameter of the plant.	• Plant at a minimum spacing of one half of the mature diameter of the plant.	• Use natural pest controls and limit chemical use by: ◦ Limiting excessive vegetative growth by only using compost or worm castings for fertilization; ◦ Using native plants to attract native insects and other beneficial animals to control pests; ◦ Maintaining three inches of mulch to prevent weed growth.	20: Plant Density 43-44: Plant Health 44: Fertilizing 45-46: Layout 47-48: Pruning 19, 41, 91-92: Weeds
	• General	• On center planting must be at a minimum spacing equal to the mature diameter of the plant.	• On center replanting must be at a minimum spacing equal to the mature diameter of the plant. • Tips for separating, thinning, and replanting layouts can be found in the SJ MFG. • Stagger rows and plant with the density of mature plants in mind. • Methods of plant reproduction include rhizomes, spreading, seeds, and bulbs.[6]		

[6] Add definitions for rhizome, spreading, etc.

Chapter 4: Identification, Characteristics, and Care of Plant Groups and Individuals

The 12 commonly found species of plants in the Guide are identified and described in more depth in Chapter 4. The plants are divided up into the three plant maintenance groups with two pages for each individual plant and photos of various aspects and stages of life for each plant. Then the care practices for that maintenance group are identified on the last two pages of that section. Each section has its own color to assist the user.

The Guide's 12 plants are summarized in Table 4-1 below with water usage per the WUCOLS database:

Table 4-1

Common Name	Latin Name (similar plants or multiple Latin names)	Water Usage per WUCOLS[7]
California Gray Rush	*Juncus patens*	Low
Cape Reed[8]	*Chondropetalum tectorum (or Chondropetalum elephantinum)*	Low (Low)
Berkeley Sedge[9]	*Carex tumulicola (or Carex divulsa)*	Low (Low)
Lomandra[10]	*Lomandra hystrix*	Unknown
Blue Fescue[11]	*Festuca idahoensis (or Festuca glauca)*	Very Low (Low)
Deer Grass	*Muhlenbergia rigens*	Low
Hairy Awn Muhly	*Muhlenbergia capillaris*	Low
Giant Wild Rye[12]	*Elymus condensatus (Leymus condensatus[13])*	Low
California Fuchsia	*Epilobium canum (Epilobium septentrionale[13])*	Low
Creeping Wild Lilac[14]	*Ceanothus thyrsiflorus (variety griseus)*	Low
Foothill Beardtongue	*Penstemon heterophyllus*	Unknown
Common Yarrow	*Achillea millefolium (or non-native hybrids)*	Low (Moderate)

[7] The WUCOLS rating for each species is based on Region 1 (for the San Jose area).
[8] In the SF Bay Area, two species of Cape Reed or Rush are planted - a regular size and a large size. They are often difficult to differentiate, so the Guide lists both here.
[9] The Guide uses the term "Berkeley Sedge" as it is a name often used interchangeably at nurseries for both the non-native European Gray Sedge (Carex divulsa) and the California native Foothill Sedge (Carex tumulicola). The Guide recommends the native Foothill Sedge (Carex tumulicola) for new and replacement plantings.
[10] The Lomandra is also known as the Creek Mat Rush, however as it is not a "true rush" and to avoid confusion, the Guide is using the Latin name for identification.
[11] The Guide uses the term "Blue Fescue" as it is a name often used interchangeably at nurseries for both the non-native Festuca glauca and the native Festuca idahoensis, which is also called the Idaho Fescue. The Guide recommends the native Festuca idahoensis for new and replacement plantings.
[12] Giant Wild Rye is also known as Canyon Prince.
[13] These plants and others can be described with different Latin names as genetic research continues to reclassify plant species.
[14] There are many species, varieties and cultivars of Ceanothus in California. The Guide recommends a low-growing (creeping) variety (var. griseus) for sightline issues.

RUSHES

California Gray Rush

Cape Reed

GRASSES

Berkeley Sedge

Lomandra

Blue Fescue

Deer Grass

Hairy Awn Muhly

Giant Wild Rye

FLOWERS

California Fuchsia

Creeping Wild Lilac

Foothill Beardtongue

Common Yarrow

The following tables explain the legends used to describe the characteristics of each plant and the care for each maintenance group in the plant and group care pages in this chapter.

Characteristic	Descriptor
Height:	Range of Height (feet) of Plant at Maturity
Width:	Range of Width (feet) of Plant at Maturity
Shape/Form:	Upright, Bunch, Low
Leaf/Blade Type:	Round, Flat, Broad
Sun Exposure:	Full, Partial
Summer Appearance:	Green, Blue-Green, Green with Water, Brownish, Brown
Water Need[15]:	Very Low, Low, Moderate
CA Native[16]:	Yes, No
Valley Water LRP Plant List[17]:	Yes, No
Life Span[18]:	Short, Moderate, Long
Flowering Season:	Spring, Summer, Fall, Winter
Growth Season:	Dry Season, Wet Season (Summer/Warm or Winter/Cool)

Group - Care Legend:

Characteristic	Descriptor
Live Growth Pruning Area:	None, Tops-only, Base, Flowers, Whole Plant down to Crown
Live Growth Pruning Method:	Textured Glove, Shears, Loppers
Live Growth Pruning Season:	Dry Season, Wet Season (Summer/Warm or Winter/Cool)
Dead Growth Pruning Area:	Tops-only, Base, Flowers, Whole Plant down to Crown
Dead Growth Pruning Method:	Textured Glove, Shears, Loppers
Dead Growth Pruning Season:	Dry Season, Wet Season (Summer/Warm or Winter/Cool)
Tolerates Division:	Yes or No
Reproduction Method:	Rhizome or Seed

[15] Source: WUCOLS
[16] Source: Calscape
[17] See Valley Water's website for more information. Low or Very Low (L or VL) water usage qualifies a plant for the Landscape Rebate Program (LRP).
[18] Life Spans are estimates and therefore ranges are used for approximations: Short: 2-4 Years, Moderate: 4-8 Years, Long: 8 or more years.

California Gray Rush

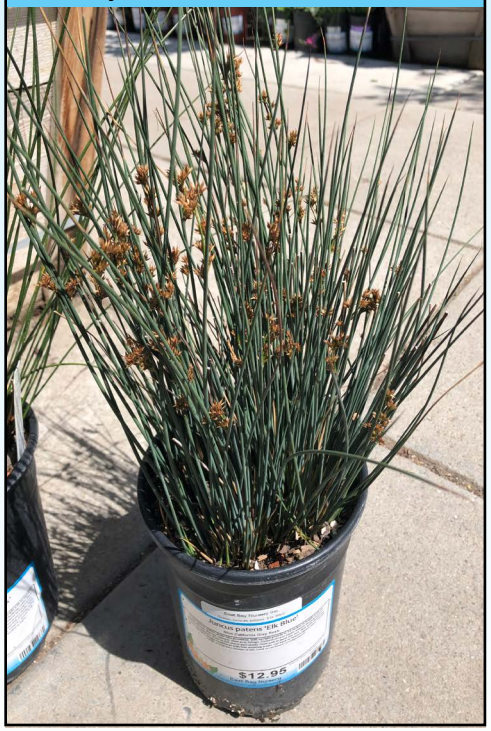
Juncus patens

Characteristics:

Height:	2-3 Feet
Width:	3-4 Feet
Shape/Form:	Upright
Leaf /BladeType:	Round
Sun Exposure:	Full or Partial
Water Need:	Low
CA Native:	Yes
VW List:	Yes
Life Span:	Long

Mature

Nursery



Immature

Declining

Dead

California Gray Rush

Juncus patens

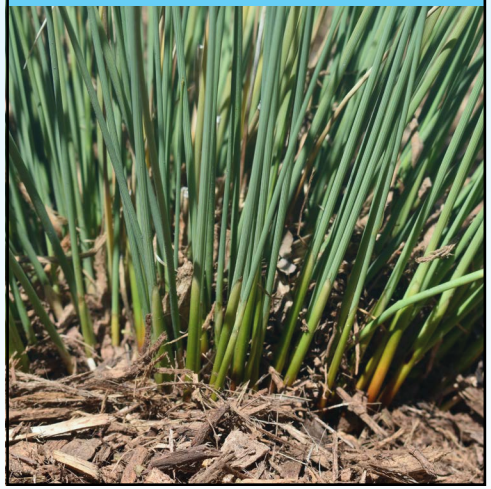
Characteristics:

Flowering Season:	Spring
Growth Season:	Winter
Summer Look:	Green

Healthy Group

Seeds

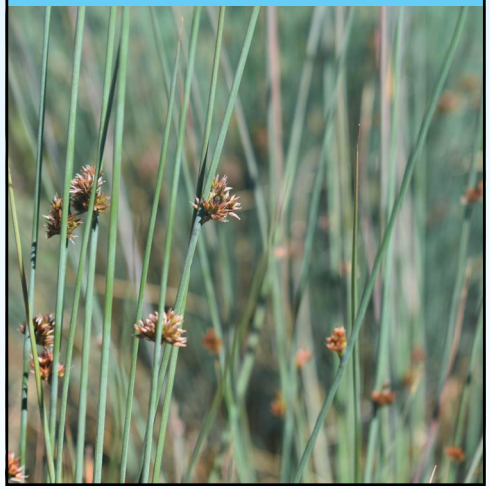
Base



Mature

Flowers

Stems



Cape Reed

Chondropetalum tectorum/ Chondropetalum elephantinum

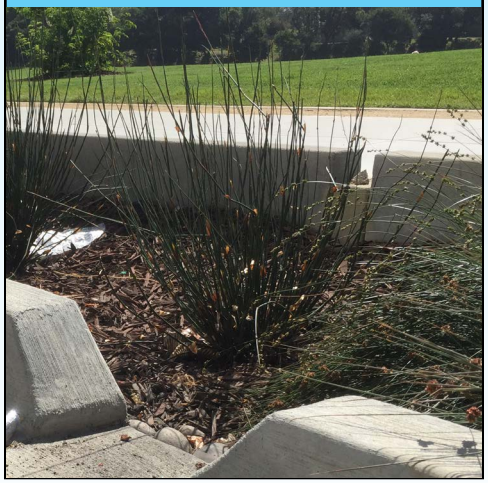
Characteristics:

Height:	3 Feet/6 Feet
Width:	3 Feet/6 Feet
Shape:	Upright
Leaf Type:	Round
Sun Exposure:	Full, Partial
Water Need:	Low
CA Native:	No/No
VW List:	Yes
Life Span:	Long

Mature

Nursery

Immature



Declining

Dead

Cape Reed

Chondropetalum tectorum/ Chondropetalum elephantinum

Characteristics:

Flowering Season:	Spring
Growth Season:	Winter
Summer Look:	Green

Chrondropetalum elephantinum

Seeds

Stems

Improperly Pruned

Stem Regrowth

Improperly Pruned Stems

CA Gray Rush (Page 4-6):

Live Growth Pruning	Area:	None, if possible, or base only
	Method:	Shears
	Season:	Any time
Live Growth Type:		Abnormal and older exterior
Dead Growth Pruning	Area:	Base (pull from base)
	Method:	Textured glove
	Season:	Any time
Tolerates Division:		Yes (every 3 years in winter)
Reproduction:		Seed or division

Cape Reed (Page 4-8):

Live Growth Pruning	Area:	None, if possible, or base only
	Method:	Shears
	Season:	Any time
Live Growth Type:		Abnormal and older exterior[19]
Dead Growth Pruning	Area:	Base
	Method:	Pruning shears – cut at base
	Season:	Any time
Tolerates Division:		No
Reproduction:		Seed

Properly Pruned

New Growth

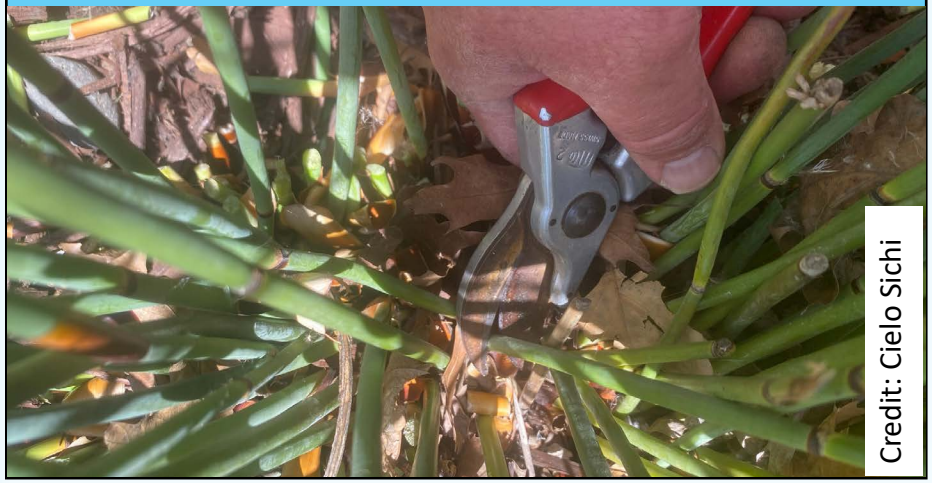
Dead Plant

Improper Pruning

Closeup of Improper Pruning

[19] Abnormal means a stem that sticks out and doesn't follow the rest of the plant's form. Older exterior stems are ones on the outside of the base of the plant that can be removed to prune the form into a desired shape, if necessary.

Step 1: Prune rushes at the base - as close as possible.



Credit: Cielo Sichi

Step 2: Remove dead matter.

Credit: Cielo Sichi

Step 3: Prune down any remaining nubs.

Credit: Cielo Sichi

Berkeley Sedge

Carex tumulicola/Carex divulsa

Characteristics:

Height:	2 Feet
Width:	2-3 Feet
Shape:	Bunch
Leaf Type:	Flat
Sun Exposure:	Full, Partial
Water Need:	Low
CA Native:	Yes/No
VW List:	Yes
Life Span:	Moderate

Mature

Nursery (C. tumulicola)

New

Declining From Overgrowth

Dead

Berkeley Sedge

Carex tumulicola/Carex divulsa

Characteristics:

Flowering Season: Spring

Growth Season: Winter

Summer Look: Green w/ Watering

Mature Group

Seeds

Stems

Flower Stalks

Healthy Group

Needs Pruning

Lomandra

Lomandra hystrix

Characteristics:

Height:	3 Feet
Width:	3 Feet
Shape:	Bunch
Leaf Type:	Flat
Sun Exposure:	Full, Partial
Water Needs:	Low
CA Native:	No
VW List:	No
Life Span:	Moderate to Long

Mature

Nursery

New

Declining

Dead

Lomandra

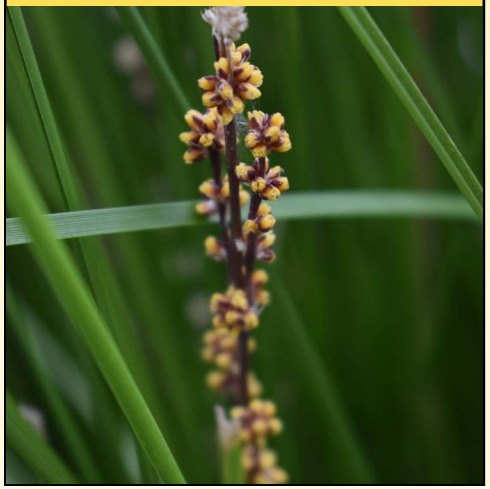
Lomandra hystrix

Characteristics:

Flower Season:	Winter
Growth Season:	Summer
Summer Look:	Green

Mature

Flowers



Stems/Blades

Seeds/Stalks

Plant with Stalks

Dormant

Blue Fescue

Festuca idahoensis/Festuca glauca

Characteristics:

Height:	1 Feet
Width:	1-2 Feet
Shape:	Bunch
Leaf Type:	Flat
Sun Exposure:	Full, Partial
Water Need:	Low
CA Native:	Yes/No
VW List:	Yes
Life Span:	Short to Moderate

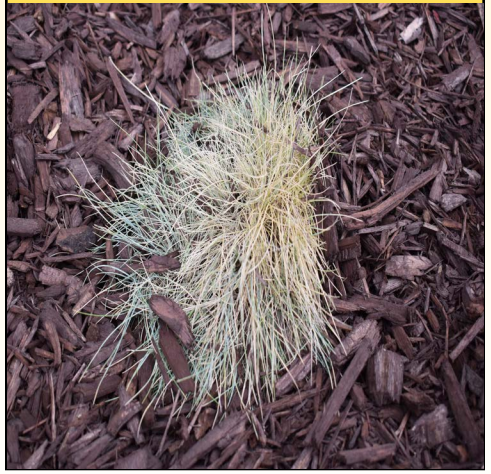
Mature

Nursery – Festuca glauca

New

Declining - Lack of Irrigation

Dead - Lack of Irrigation



Blue Fescue

Festuca idahoensis/Festuca glauca

Characteristics:

Flower Season: Spring

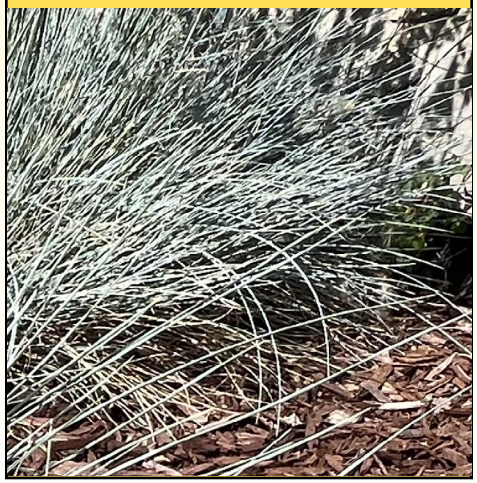
Growth Season: Winter

Summer Look: Blue-Green w/ Water

Nursery – F. idahoensis

Mature

Stems



Flowers

Flower Stalks

Healthy Group

Deer Grass

Muhlenbergia rigens

Characteristics:

Height:	4 Feet
Width:	4 Feet
Shape:	Bunch
Leaf Type:	Flat
Sun Exposure:	Full, Partial
Water Needs:	Low
CA Native:	Yes
VW List:	Yes
Life Span:	Moderate

Mature

Nursery

Immature

Declining

Dead

Deer Grass

Muhlenbergia rigens

Characteristics:

Flowering Season:	Spring
Growth Season:	Winter
Summer Look:	Brownish

Mature Group

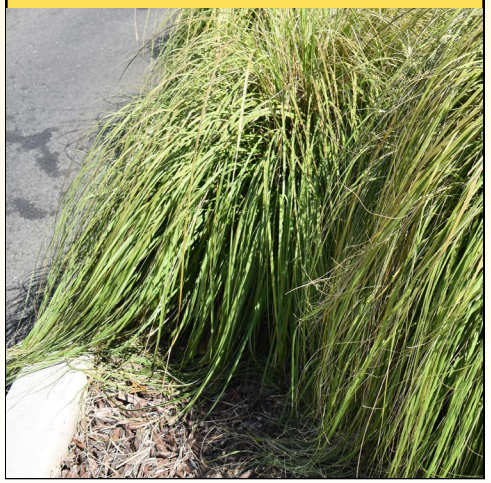
Flowers/Seeds

Stems

Row

Needs Pruning of Dead Growth

Needs Pruning of Live Growth



Hairy Awn Muhly

Muhlenbergia capillaris

Characteristics:

Height:	3 Feet
Width:	3 Feet
Shape:	Bunch
Leaf Type:	Flat
Sun Exposure:	Full, Partial
Water Needs:	Low
CA Native:	No
VW List:	Yes
Life Span:	Moderate

Mature

Nursery

New

Declining

Dead

Hairy Awn Muhly

Muhlenbergia capillaris

Characteristics:

Flowering Season:	Spring
Growth Season:	Winter
Summer Look:	Brownish

Improperly Pruned (dead growth in base not removed properly)

Flowers/Seeds (white cloud variety)

Credit: Saxon Holt

Pruned Stems and New Flower

Flowers

Dead

Group

Giant Wild Rye (var Canyon Prince) Grasses

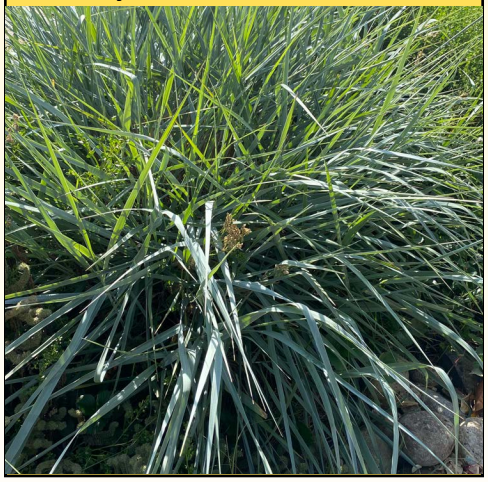
Elymus condensatus

Characteristics:	
Height:	2-3 Feet
Width:	2-3 Feet
Shape:	Bunch
Leaf Type:	Flat
Sun Exposure:	Full, Partial
Water Need:	Low
Planting Zone:	All
CA Native:	Yes
VW List:	Yes

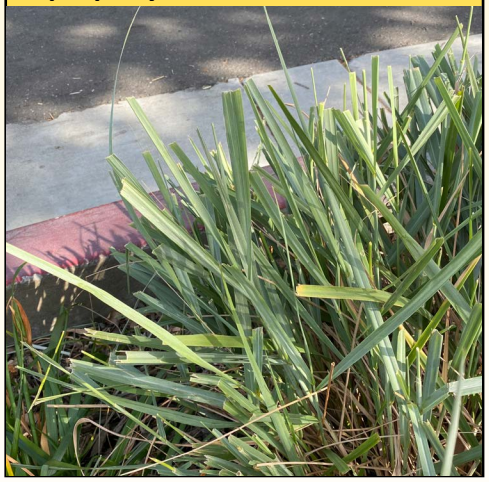
Mature

Nursery

Healthy



Improperly Pruned



Needs Pruning (dead growth)

Giant Wild Rye (var Canyon Prince) Grasses

Elymus condensatus

Characteristics:

Flowering Season: Spring

Growth Season: Winter

Summer Look: Blue-Green

Mature

Credit: Saxon Holt

Spreading by Rhizome

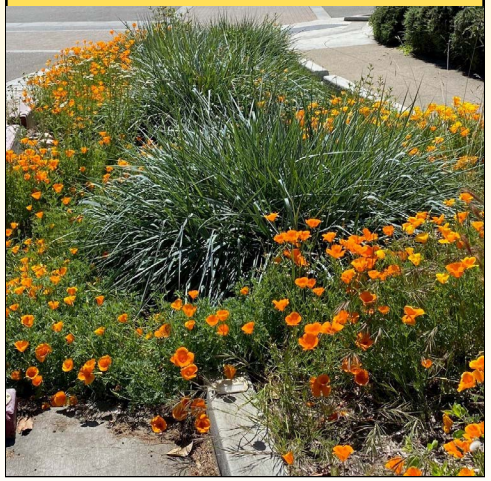
Leaves

One Year

Credit: City of Palo Alto

Dead Leaves at Base

Mature Group with Poppies



Berkeley Sedge and Lomandra (Pages 4-12 and 4-14):

Live Growth Pruning
- Area: To base of plant – approx. 2"-4" above grade
- Method: Shear to base and clean with textured gloves to remove remaining dead material
- Season: February-March (once every 3 years)

Dead Growth Pruning
- Area: To base of plant – approx. 2"-4" above grade
- Method: Shear to base or use textured gloves
- Season: As needed (once every 3 years)

Tolerates Division: Generally, yes, but species dependent

Reproduction: Division or seed

Blue Fescue, Deer Grass, Hairy Awn Muhly and Giant Wild Rye (Pages 4-16, 4-18, 4-20, and 4-22):

Live Growth Pruning
- Area: Do not prune live growth
- Method: Do not prune live growth
- Season: Do not prune live growth

Dead Growth Pruning
- Area: To base of plant. Approx. 2"-4" above grade
- Method: Shear to base and clean with textured gloves to remove remaining dead material

Dead Growth Pruning Season: February-March

Tolerates Division: Yes

Reproduction: Division or seed

Improper Pruning – Excess Dead Material in Base

Pruning Training

Dead Plant

Improper Pruning

Inadequate Pruning

Proper Pruning

Grasses

Step 1: Grab stems and look for dead growth at base

Credit: Cielo Sichi

Alternative Step 1: Shear plant down to crown height

Credit: San Marcos Growers

Step 2: Grab live growth bunch and prune tops

Credit: City of San José

California Fuchsia

Flowers

Epilobium canum

Characteristics:

Height:	2 Feet
Width:	3 Feet
Shape:	Upright
Leaf Type:	Broad
Sun Exposure:	Full
Water Need:	Low
CA Native:	Yes
VW List:	Yes
Life Span:	Moderate

Mature

Nursery

New

Declining

Dead Growth to be Pruned

California Fuchsia

Flowers

Epilobium canum

Characteristics:

Flowering Season:	Spring
Growth Season:	Winter
Summer Look:	Green

Healthy Group

Flowers

Stems

Leaves

Leaf Color Variety

Mature Individual

Creeping Wild Lilac

Flowers

Ceanothus thyrsiflorus var. griseus

Characteristics:

Height:	1-2 Feet
Width:	3-7 Feet
Shape:	Low
Leaf Type:	Broad
Sun Exposure:	Full, Partial
Water Needs:	Low
CA Native:	Yes
VW List:	Yes
Life Span:	Long

Mature

Nursery

New

Declining

Dead

Creeping Wild Lilac

Flowers

Ceanothus thyrsiflorus var. griseus

Characteristics:

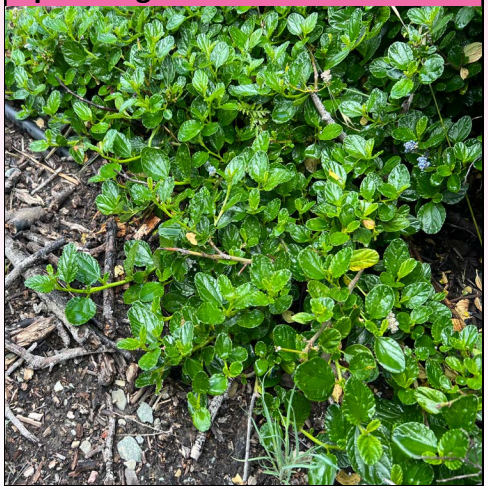
Flower Season:	Spring
Growth Season:	Winter
Summer Look:	Green

Large Mound

Flower Cluster (Dark Flower Variety)

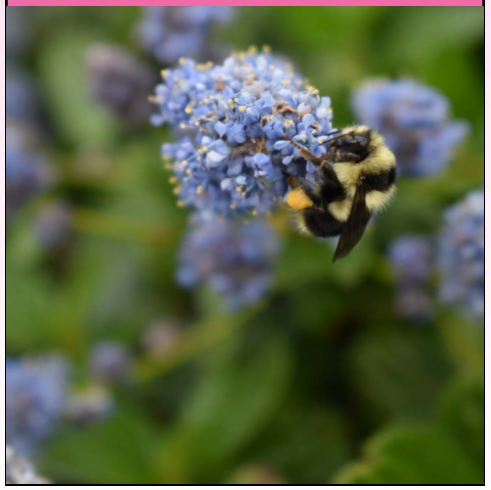
Stems

Spreading Growth



Flower Cluster

Pollinator



Foothill Beardtongue

Flowers

Penstemon heterophyllus

Characteristics:

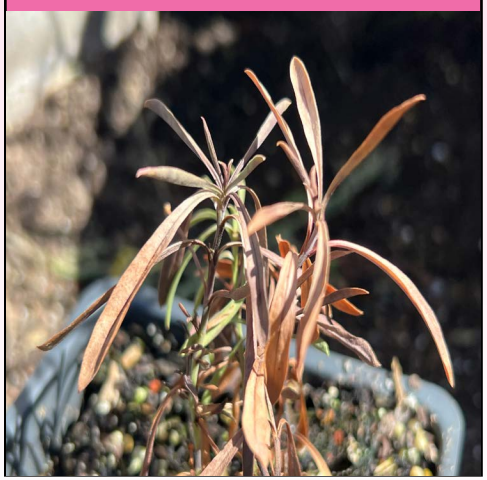
Height:	1-3 Feet
Width:	2-3 Feet
Shape:	Upright
Leaf Type:	Evergreen
Sun Exposure:	Full Sun
Water Needs:	Low
CA Native:	Yes
VW List:	Yes
Life Span:	Short

Mature

Nursery

New

Declining



Dead

Foothill Beardtongue

Flowers

Penstemon heterophyllus

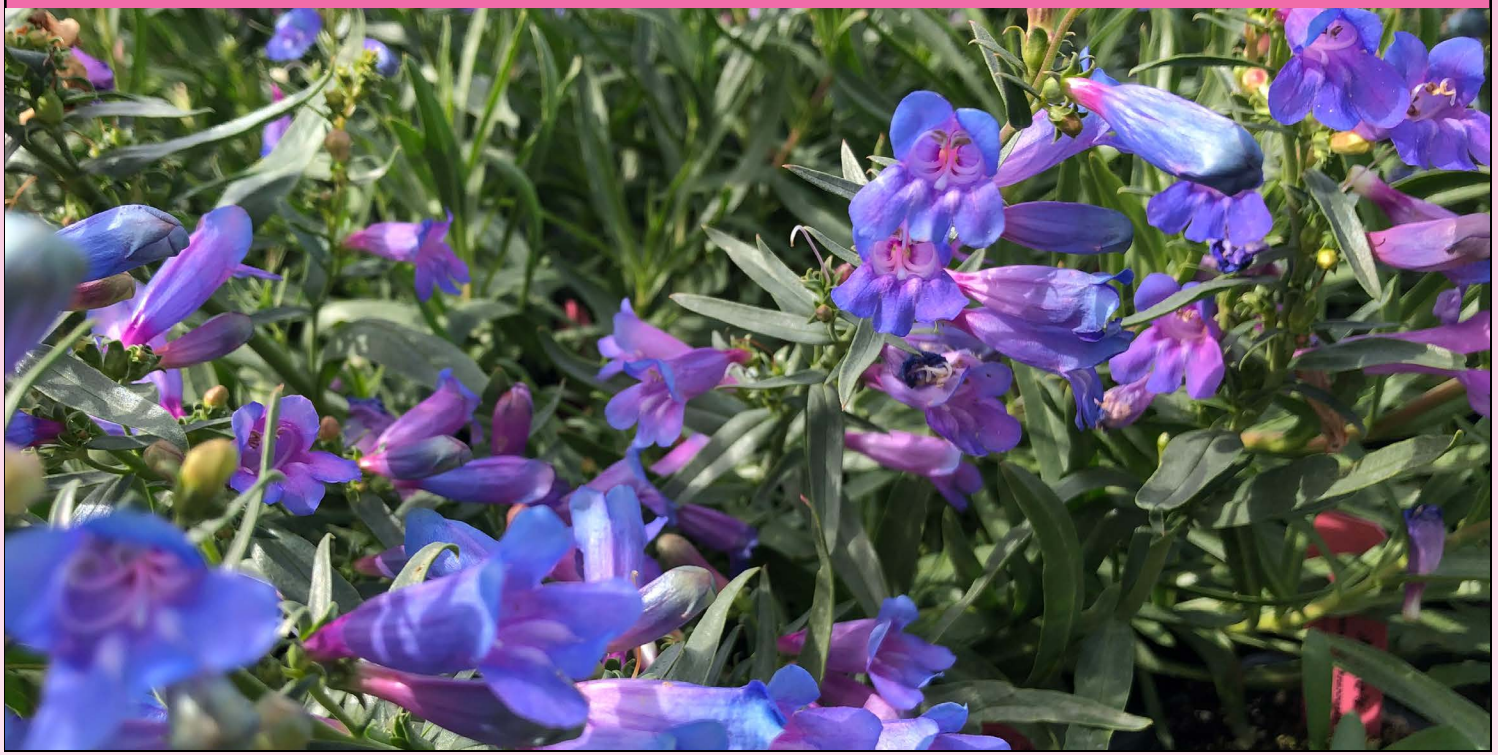
Characteristics:

Flower Season: Spring-Summer

Growth Season: Winter

Summer Look: Green with Water

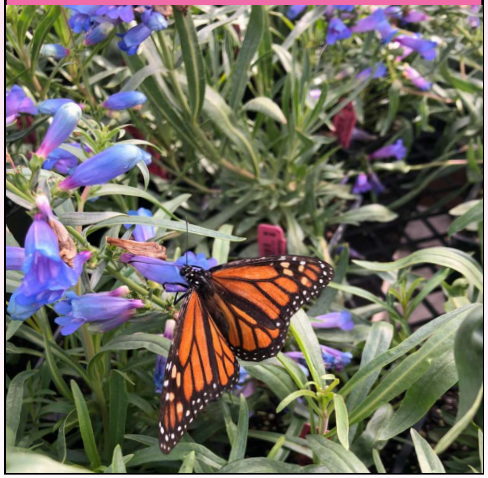
Healthy Individual



Flowers/Seeds

Stems

Flowers with Pollinator



Variety

Full Plant View

Common Yarrow

Achillea millefolium/Achillea tomentosa

Characteristics:

Height:	3 Feet
Width:	3 Feet
Shape:	Upright
Leaf Type:	Evergreen
Sun Exposure:	Full, Partial
Water Needs:	Low
CA Native:	Yes (White)
VW List:	Yes
Life Span:	Moderate

Mature (*A. tomentosa*)

Nursery

New

Ready for Pruning

Dead

Common Yarrow

Flowers

Achillea millefolium/Achillea tomentosa

Characteristics:

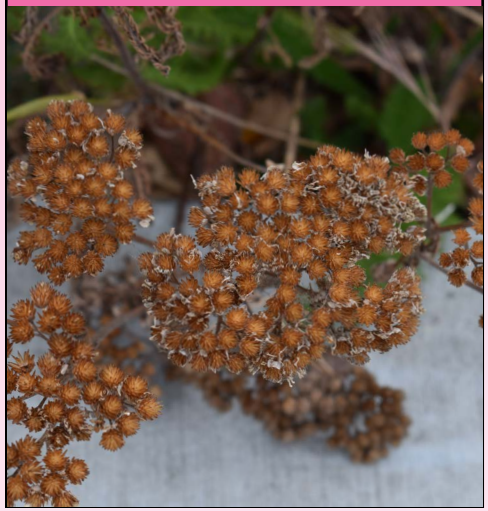
Flower Season: Spring

Growth Season: Winter

Summer Look: Green with Water

Blooming

Seeds/Flowers (*A. millefolium*)



Stems

Healthy Group

Individual Plant

Flowers (*A. millefolium*)

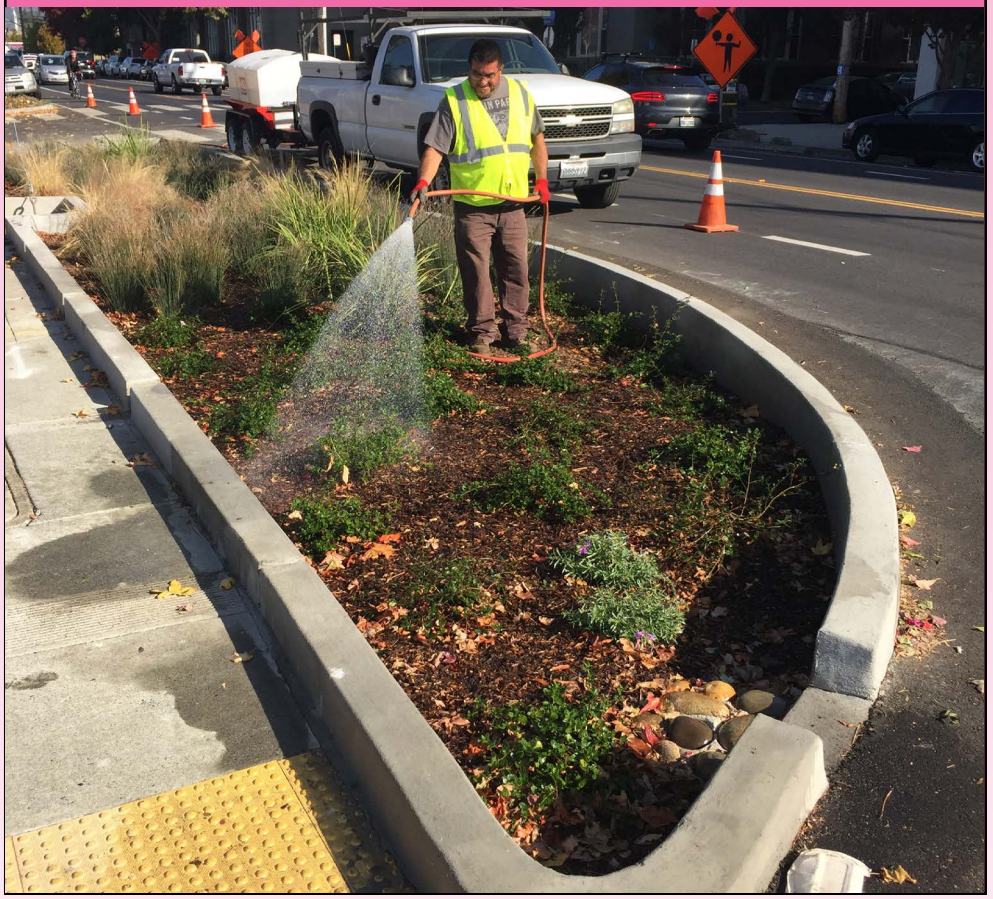
California Fuchsia and Common Yarrow (Pages 4-26 and 4-32):

Live Growth Pruning	Area: To base of plant – approx. 2"-4" above grade Method: Shear to base and clean with textured gloves to remove remaining dead material Season: August to September
Dead Growth Pruning	Area: To base of plant – approx. 2"-4" above grade Method: Complete removal to base using textured gloves or hand pruners Season: As needed

Ceanothus and Foothill Beardtongue (Pages 4-28 and 4-30):

Live Growth Pruning	Area: Do not prune live growth Method: Do not prune live growth Season: Do not prune live growth
Dead Growth Pruning	Area: To base of plant. Approx. 2"-4" above grade Method: Complete removal by shears followed by hand cleaning and removal of dead material at base Season: August to September
Dead Flowers: Anytime	

Proper Care: hand watering from truck during establishment period



New Growth

Some Dead Plants

Blooms Ready for Pruning

Needs Pruning Down to Crown

Step 1: Move aside stems and select one to prune

Step 2: Grab stem and prune down to base

Step 3: Repeat until whole plant down is down to crown height

Chapter 5: Additional Information on Irrigation, Maintenance, Weeds, and Nurseries

Tips for checking and diagnosing irrigation systems:

1 Inspect and run irrigation systems periodically to ensure proper operation. Check full system at end of Winter. Make repairs as needed and flush system.

2 Check for standing water or evidence of standing water, such as widespread plant decline. If singular plants are in decline, check the irrigation system adjacent to the plant to be sure that it is receiving irrigation. Biotreatment soil media drains water quickly and vertically, so place emitters close to root balls.

3 Install and use pressure indicators (red eco-indicator shown) to quickly identify that the irrigation system is operating properly.

4 Confirm that all drip lines are covered with 3” of mulch. Where drip lines rise above mulch, move mulch aside and reset drip lines onto soil. Stake the tubing into place at 24” on center and replace mulch layer.

Tips for determining the frequency of GSI measure maintenance activities:

1 Establishment Period

- During the establishment period, observe plant growth.
- Make corrections and adjust irrigation as needed.
- Remove trash and debris from the GSI measure.

2 High Visibility Sites

- Consider aesthetic issues at high visibility sites (e.g., City Hall)
- Check for trash more frequently
- Focus on removing weeds that may set seed soon.

3 Location and Design Issues

- Trash (high generating areas like food retail/schools/bus stops)
- Sediment (nearby construction activity & industrial businesses)
- Trees (leaf load in the fall and after windy weather)
- Dog-walkers in the area (kicking up mulch, plastic bags, poop)
- Vandalism (irrigation equipment, signage, pipes)
- Walk-through traffic (erosion, plant damage, soil compaction)

4 Seasonal Issues

Prior to rainy season - check:

- Inflow and outflow locations for operability
- Overflow inlet for any visible debris or damage
- For dead plants and replace.
- Mulch and replenish to 3” depth

During rainy season - check:

- For standing water (ponding two+ days after rain)
- Inflow and outflow locations – remove silt and repair any damage
- For soil erosion and displaced mulch

End of rainy season - check:

- Irrigation systems for operability and leaks
- For dead growth on Flowers (blooms), on Grasses or Rushes (stems)
- Mulch and replenish to 3” depth

Common weeds in GSI measures (courtesy of the City of San Jose MFG):

1 Bur Clover


Young


Mature

Description: Stems grow to 2 feet long and tend to trail along the ground but may grow upright. Leaves divide into three round leaflets, resembling those of a clover. Leaflets have serrated edges.
Removal: Grab at base and hand pull or use a trowel to get tap root completely (easy to remove, especially in soft soils).

2 Catchweed Bedstraw


Young


Mature

Description: Seed leaves are oblong with slightly notched tips. Mature bedstraw has 6-foot-long square stems. Forms dense mats that sprawl on the ground or over other vegetation. Leaves are whorled and have small hair-like structures. Small, four-parted, white or greenish-white flowers.
Removal: Pull gently from base if accessible to get entire root out (easy to remove, especially in soft soils).

3 Cutleaf Geranium


Young


Mature

Description: Remains prostrate in turf. Rosette with long-stalked leaves. Has a beak where flowers are growing.
Removal: Grab at base and hand pull or use a trowel to get tap root completely (easy to remove, especially in soft soils).

4 Dandelion


Young


Mature

Description: Seed leaves are oval and hairless. The first and next few leaves are football-shaped to oblong, taper at the base, and have weakly toothed edges.
Removal: Push leaves aside to get at base of plant, remove taproot completely (moderately easy to remove in soft soils but will regrow if any part of taproot remains).

Common weeds in GSI measures (courtesy of the City of San Jose MFG) cont.:

5 Field Bindweed


Young


Mature

Description: Mature plants have arrowhead-shaped leaves that can be 0.5-2 inches long. Leaves at the base of the stem are larger than the young leaves at the stem terminal. Flowers are trumpet-shaped, white to pink, and 1-1.5 inches wide.

Removal: Move vines away from base and dig deep for the whole taproot with a weed pick or flathead screwdriver (difficult to remove).

If larger infestations are present, see: http://ipm.ucanr.edu/PMG/PESTNOTES/pn7462.html

6 Little Mallow


Young


Mature

Description: Seed leaves are distinctly heart-shaped, hairless, and have long stalks.

Removal: When young, pull from base to get taproot. Older plants require a trenching or pointed shovel to dig out completely (difficult to remove).

7 Milk Thistle


Young


Mature

Description: Mature plants are stiff and have prickly, white-marked leaves. Stem branches are thick, hollow, sparsely hairy, lack wings or spines, and grow 2-6.5 feet tall.

Removal: Knock leaves aside with spade and dig deep under base of stem to get taproot completely (difficult to remove, use leather gloves and long pants/sleeves).

8 Redstem Filaree


Young


Mature

Description: Seed leaves and first true leaves are deeply lobed and occur on long petioles that are hairy (look like a carrot top).

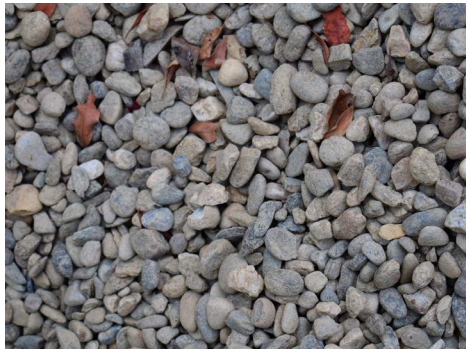
Removal: Grab at base and hand pull or use a trowel to get tap root completely (easy to remove, especially in soft soils).

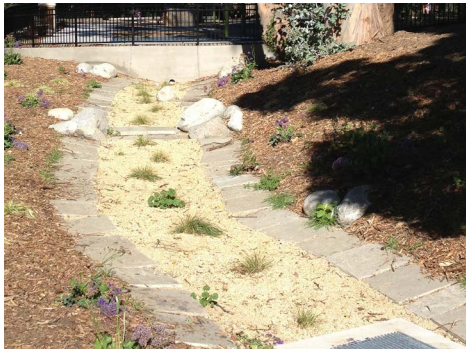
Mulch Tips:

1 Wood mulch

The composted mulch (left image) is recommended because it floats less (see regional biotreatment wood mulch specification). Un-composted wood mulch (right image) can also be used for oversized measures that won't be blown out in large storms and on sloped sides out of the flow line. Wood mulch also adds nutrients to the soil.

2 Rock mulch





Three inches of mulch over exposed soil areas is important to avoid erosion and to conserve water. A combination of rock mulch and wood mulch can be used. Rock mulch, such as gravel (left image), can be used in the flow line with wood mulch on the side slopes (right image).

3 Other mulch options

Install sheet mulching during construction to reduce weed growth (left image). Ensure mulch is not piled up against plant stems/trunks above the root crown. Adjust grade or mulch depth adjacent to plants as needed. Replenish mulch to maintain 3" layer yearly at a minimum. Jute netting can also be used (right image).

4 Design issues

The type of system can also influence the mulch choice. Undersized systems (left image) use rock mulch to avoid mulch blow-outs in large storms. But rock mulch can heat up soil in hotter climates harming plants and increasing irrigation demand. High-flow bypasses in the system design (right image) can allow wood mulch to be used.

Local Nursery Resources[20,21]:

Table 5-1

Nursery Name	City	Street Adress	Website	Retail/Wholesale	Phone #
Annie's Annuals	Richmond	740 Market Ave.	www.anniesannuals.com	Retail	(510) 215-3301
Capitol Wholesale Nursery	San Jose	2938 Everdale Dr.	www.CapitolWholesaleNursery.net	Wholesale	(408) 239-0589
CNPS SCV Nursery	Los Altos Hills	26870 Moody Rd.	https://california-native-plant-society-santa-clara-valley-chapter.square.site/	Retail	(650) 260-3450
Delta Bluegrass	Stockton	111 N Zuckerman Rd.	www.deltabluegrass.com	Wholesale	(800) 637-8873
Devil Mountain Nursery	Morgan Hill	1965 Tennant Ave.	www.devilmountainnursery.com	Wholesale	(669) 888-3738
East Bay Nursery	Berkeley	2332 San Pablo Ave.	www.eastbaynursery.com	Retail	(510) 845-6490
Flowerland Nursery	Albany	1330 Solano Ave.	www.flowerlandshop.com	Retail	(510) 526-3550
Grassroots Ecology Native Plant Nursery	Palo Alto	Foothills Park	www.grassrootsecology.org	Retail/Wholesale	(650) 949-3158
Linda Vista Native Nursery	Saratoga	PO Box 2031	www.lindavistanatives.com	Retail	(408) 216-3874
Middlebrook Gardens	San Jose	76 Race St.	www.middlebrook-gardens.com	Retail	(408) 292-9993
Oaktown Native Plant Nursery	Berkeley	702 Channing Way	https://oaktownnursery.com	Retail	(510) 387-9744
Our City Forest Nursery	San Jose	1000 Spring St.	https://www.ourcityforest.org/nursery/#community-nursery	Retail/Wholesle	(408) 785-2302
San Marcos Growers	Santa Barbara	125 South San Marcos Rd.	www.smgrowers.com	Wholesale	(805) 683-1561

[20] The Guide recommends sourcing clean-cultured plants (grown without root rot pathogens) per Nursery BMP's available here: https://www.suddenoakdeath.org/diagnosis-and-management/best-management-practices/

[21] The Guide recommends use of the ecotype or seed source originating closest to the planting site and avoid using a cultivar or distant ecotype when a local population of a species exists to reduce the possibility of hybridization. This footnote may apply to the following plants in the Guide that grow within Santa Clara County: Juncus patens, Muhlenbergia rigens, Epilobium, Ceanothus, Penstemon, Achillea, and Festuca.

Additional Plant Information and Availability at Local Nurseries:

Table 5-2

Common Name	Latin Name (and related species)	Cultivars (commonly planted)	Calscape Nursery Listing (CA Natives only)
California Gray Rush	*Juncus patens*	Elk Blue	Yes - Nursery List
Cape Reed	*Chondropetalum tectorum* *Chondropetalum elephantinum*	El Campo (Small Var.)	Non-native Non-native
Berkeley Sedge[22]	*Carex tumulicola* *Carex divulsa*		Yes- Nursery List Non-native
Lomandra[23]	*Lomandra hystrix*	Katie Belles or Breeze	Non-native
Blue Fescue[24]	*Festuca idahoensis* *Festuca glauca*	Siskiyou Blue Elijah Blue	Yes - Nursery List Non-native
Deer Grass	*Muhlenbergia rigens*		Yes - Nursery List
Hairy Awn Muhly	*Muhlenbergia capillaris*	Regal Mist White Cloud	Non-native No listing
Giant Wild Rye	*Elymus condensatus (Leymus condensatus[25])*	Canyon Prince	Yes - Nursery List
California Fuchsia	*Epilobium canum* *Epilobium septentrionale*	Everett's Choice	Yes - Nursery List
Creeping Wild Lilac	*Ceanothus thyrsiflorus (var. griseus)*	Yankee Blue	Yes - Nursery List
Foothill Beardtongue	*Penstemon heterophyllus*	Electric Blue Margarita Bop	Yes - Nursery List No listing
Common Yarrow	*Achillea millefolium* *Achillea tomentosa*	Sonoma Coast Moonshine	Yes - Nursery List Yes - Nursery List

[22] The Guide uses the term “Berkeley Sedge” as it is a name often used interchangeably at nurseries for both the non-native European Gray Sedge (Carex divulsa) and the California native Foothill Sedge (Carex tumulicola). The Guide recommends the native Foothill Sedge (Carex tumulicola) for new and replacement plantings.

[23] The Lomandra is also known as the Creek Mat Rush, however as it is not a “true rush” and to avoid confusion, the Guide is using the Latin name for identification.

[24] The Guide uses the term “Blue Fescue” as it is a name often used interchangeably at nurseries for both the non-native Festuca glauca and the native Festuca idahoensis. The Guide recommends the native Festuca idahoensis for new and replacement plantings.

[25] There are two Latin names used for this plant arising from recent genetic research.