University of California
Agriculture and Natural Resources

ANR Publication 8575 | June 2017
http://anrcatalog.ucanr.edu
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Restoration Manual for Annual Grassland Systems in California

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Grassland and rangeland habitat are some of the most economically, socially, and environmentally important habitats in California (fig. 1). Unfortunately, widespread development and massive degradation are quickly eroding the persistence and health of these systems (see Huenneke and Mooney 1989; Cameron et al. 2014), making them one of the most endangered ecosystems on the planet (Sampson and Knopf 1994; Peters and Noss 1995). Restoration of these systems encourages revegetation and soil recovery by encouraging natural successional processes that might otherwise take decades to occur in the absence of applied management (Beltran et al. 2014). In general, the restoration process for grasslands and rangelands involve

Figure 1. Plant-eye view of a typical California annual–dominated grassland habitat.

- late summer: preparing soil
- fall: wait for annual grass weeds to emerge approximately 7–14 days after the first fall rains, manage weeds
- mid fall, early winter: apply restoration species as seed or plugs
- late winter: broadleaf weed management (restoration species should have about four leaves per seedling)
- spring: grass weed management

To ensure widespread, effective deployment of restoration in California grasslands, practitioners should have access to general guidelines developed from field-tested, science-based studies. Current practical restoration guidelines for California habitats cover

- riparian habitat (Griggs 2009; Stark and Dettman 2010; Jackson et al. 2015)
- river and stream habitat (Kier 1995; Flosi et al. 1998; Carville 2000)
- dune habitat (Pickart and Sawyer 1998; Pickart 2008)
- mountain meadows (Stillwater Sciences 2012)

Although similar types of small documents exist for grassland systems (Anderson 2001; Yolo County Resource Conservation District 2002; Bornstein et al. 2011; Howard and Robbins 2002; Sheley et al. 2008), there is an absence of a relatively comprehensive ecological application guide for effective restoration in grassland and rangeland systems for California. Synthesizing both published and unpublished data, this guide was developed for practitioners of any experience level to inform grassland restoration design and application.

The techniques outlined in this publication follow a format that attempts to provide general direction to effectively improve grassland conditions in monetarily and logistically feasible ways. Although this publication provides an overview to many activities associated with California grassland and rangeland restoration, particular focus is paid to restoration species choice, because species identity can be the dominant driver of achieving a restoration goal. The techniques outlined here are the result of years of experience from research scientists and non-academic practitioners and provides general guidelines for effective grassland vegetation management.

Identify Restoration Goals

In order to design and deploy an effective restoration approach, restoration goals and desired outcomes must be clearly defined (see Barry et al. 2006; Vasey and Holl 2007). For example, is the goal of the revegetation effort to support grazing animals, cultivate native pollinators, enhance wildlife habitat, or protect against erosion? Is it some combination of these? Although multiple benefits can derive from single restoration strategies, species mixes and restoration techniques can be unique to each goal. Once a goal is identified, restoration approaches can be refined through considerations of site size, shape, and context. For example, restoration sites that are contiguous to agricultural fields might require different approaches than those that are contiguous to state parks. Further, small, rectangular sites might require dissimilar approaches to large, irregularly shaped sites. Generally, understanding restoration needs and priorities prior to designing an approach will likely lead to higher success at a lower cost. Although rarely recorded in the literature, restoration practitioners in California grasslands estimate that native-only restoration costs typically from $1,000 to $3,000 per acre. These costs can easily be higher if inputs are hard to get or particularly expensive. The following goals are often associated with grassland restoration.

Biodiversity: Enhancing Biodiversity of Native Plant Species

Fundamental to the development of principles of ecological restoration is the goal of increasing the number of native species (Brudvig 2010). Since biodiversity enhancements typically result in concomitant increases in a wide range of ecosystem services (see Benayas et al. 2009), restoring for biodiversity can allow practitioners to achieve multiple management goals. Seeding or planting a high diversity of plant species is an obvious technique to achieve this goal; however, practitioners should also consider how species included in a restoration mix can be leveraged to facilitate the survival and growth of other species. This might be particularly critical in arid habitats (Padilla and Pugnaire 2006).

Resources

Wright, J., et al. 2009. Restoring biodiversity and ecosystem function: Will an integrated approach improve results? In S. Naeem, et al., ed., Biodiversity, ecosystem functioning and human wellbeing. Oxford, UK: Oxford University Press. 167–177. http://www.lerf.esalq.usp.br/divulgacao/recomendados/outros/wright2009.pdf.

Invasive Plant Management: Reducing Invasive Plant Cover and Providing Invasion Resilience

Active restoration is a surprisingly uncommon weed management strategy, despite the research that highlights its utility (see James et al. 2015). Restoration can be a practical solution for achieving weed management goals because seeded species can decrease resource availability for invasives and cultivate soil microbial communities that are antagonistic to nonnatives (fig. 2). An effective restoration approach would include species that demonstrate functional similarity to targeted invasives, which enhances the competitive dominance of the natives (Funk et al. 2008).

Figure 2. Large patches of invasives such as medusahead (*Taeniatherum caput-medusae*) can be controlled with careful restoration strategies.

Resources

Blumenthal, D., et al. 2003. Weed control as a rationale for restoration. Ecology and Society 7(1): article 6. http://www.ecologyandsociety.org/vol7/iss1/art6/.

Harding, K. 2004. Controlling invasive species as part of restoration treatments. Working Papers in Southwestern Ponderosa Pine Forest Restoration no. 8. http://library.eri.nau.edu/gsdl/collect/erilibra/index/assoc/HASH01dd/f50a8b64.dir/doc.pdf.

James, J., et al. 2010. Ecological principles for invasive plant management. Burns, OR: Area-Wide EBIPM. http://oregonstate.edu/dept/eoarc/sites/default/files/675.pdf.

Tjarks, H. 2012. Using a native understory to control weeds in riparian restoration. Cal-IPC Newsletter. http://riverpartners.org/news-and-events/newsletters/201212_NativeUnderstory.html.

Pollinator Habitat: Providing Nectar and Breeding Habitat for Native Bees and Butterflies

Although revegetation efforts for pollinators can be one of the most expensive types of restoration goals (Miller and Hobbs 2007), pollinator habitat enhancement has been shown to benefit a multitude of other ecosystem services (see Morandin and Kremen 2013). Pollinators are generally benefited by plants that flower at different times during the growing season, which enhances resource availability (fig. 3).

Figure 3. Availability of nectar resources can enhance agricultural production.

Resources

Adamson, N., B. Borders, J. Cruz, et al. 2014. Pollinator plants: California. Portland, OR: Xerces Society. http://www.xerces.org/wp-content/uploads/2014/09/CaliforniaPlantList_web.pdf.

Black, S., M. Shepherd, et al. 2009. Pollinator conservation strategy. Portland, OR: The Xerces Society. http://www.xerces.org/wp-content/uploads/2010/01/yolo-nhp_pollinator-strategy_xerces.pdf.

Bumblebee Conservation Trust (Scotland). n.d. Grassland restoration and creation for bumblebees. Land Management Series Factsheet 4. http://bumblebeeconservation.org/images/uploads/Resources/BBCT_Land_Factsheet_4_Grassland_restoration.pdf.

California Native Plant Society. 2009. Perennial meadow garden. http://www.cnps.org/cnps/grownative/pdf/plan_yb2.

Earnsahw, S. 2004. Hedgerows for California agriculture. Davis: Community Alliance with Family Farmers. http://caff.org/wp-content/uploads/2010/07/Hedgerow_manual.pdf.

Mäder, E., B. Borders, and A. Minnerath. 2013. Establishing pollinator meadows from seed. Portland, OR: The Xerces Society for Invertebrate Conservation. http://www.xerces.org/wp-content/uploads/2013/12/EstablishingPollinatorMeadows.pdf.

Xerces Society. 2017. Pollinator conservation seed mixes. Portland, OR: The Xerces Society. http://www.xerces.org/pollinator-seed/.

Wildlife Habitat: Providing Food, Security, Nesting, Breeding Habitat, and Thermal Cover to Wildlife

Providing and enhancing wildlife habitat is one of the oldest motivations for restoration and revegetation efforts; often, resources are available through California agencies to help fund these efforts. Consult the enormous amount of literature devoted to highlighting effective techniques for the active cultivation of wildlife habitat for a more detailed description of techniques. In general, to effectively enhance grassland wildlife habitat, choose restoration species that provide diversity in canopy cover (e.g., low-lying and erect species as well as heterogeneous planting or seeding patterns). This can be accomplished by maximizing functional richness of species choice: no single species should make up more than 35% of the mixture (Monson et al. 2004). Topography can also be modified to achieve wildlife restoration goals in order to enhance habitat heterogeneity (Schlafmann and Morrison 2005).

Resources

California Native Plant Society. 2010. Habitat meadow garden. http://www.cnps.org/cnps/grownative/pdf/plan_habitat-meadow.pdf.

DiGaudio, K., K. Kreitinger, and T. Guardali. n.d. Bringing the birds back. California partners in flight. http://www.pointblue.org/uploads/assets/pacvalley/SacValleyHabitatEnhancement.pdf.

Eisenstein, B. 2015. Links to lists of plants that attract birds. Weeding Wild Suburbia website, http://weedingwildsuburbia.com/lists/ListofBirdLists.pdf.

Long, J., L. Quinn-Davidson. R. Goode, et al. 2015. Restoring California black oak to support tribal values and wildlife. In R. B. Stadiford and K. L. Purcell, ed., Proceedings of the Seventh California Oak Symposium. General Technical Report PSW-GTR-251. Albany, CA: USDA Forest Service Pacific Southwest Research Station. http://www.fs.fed.us/psw/publications/documents/psw_gtr251/psw_gtr251_113.pdf.

USDA Forest Service. n.d. Wildlife restoration and monitoring: Concepts and development. http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5150405.pdf.

Erosion Control: Protecting against the Loss of Topsoil and Cultivating Soil Formation

Protecting against the movement of sediment on hillsides and bare areas is often a top priority for restoration in order to sustain healthy soils (Gornish et al. 2016). If a site is relatively bare and erosion is likely, applying weed-free rice straw bales at a rate of approximately 40 bales per acre is a good approach (Barnett et al. 1967) just after seeding at about 60 pounds per acre can be helpful. Post-fire seedings should include forbs, which tend to do well after burns (Keeley and Keeley 1984). All erosion control seedings should contain species characterized by rapid growth for fast coverage and deep root systems that can restrict soil movement.

Resources

California Department of Transportation. 2010. Key concepts of sustainable erosion control: Technical guide. http://www.dot.ca.gov/hq/LandArch/16_la_design/guidance/ec_toolbox/Erosion_Control_Technical_Guide_v2.pdf.

Casale, R. 2008. Post fire restoration "do's" and "don'ts." Santa Cruz, CA: USDA Natural Resources Conservation Service. http://www.co.santa-cruz.ca.us/FIREDosDontsRESTORATION09.pdf.

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Shanks, L., D. Moore, and C. Sanders. 1998. Soil erosion. In C. Ingels, et al., ed., Cover cropping in vineyards. Oakland: University of California Division of Agriculture and Natural Resources Publication 3338. http://www.ucanr.org/sites/intvit/files/24454.pdf.

Primary Production: Providing Forage for Grazing Animals

Enhancing grassland and pasture resources can provide economic benefits to producers (fig. 4) as well as serving as a method for invasive plant control (e.g. Davy et al. 2015). The Utah State University Extension office estimated that perennial grasses and forbs can yield between 400 to 1000 lb of feed/acre! This is because native perennial grasses increase green forage availability for a longer period during the growing season (Menke 1992). In order to enhance productivity and cover, choosing species based on characteristics that confer resilience to grazing (but are still palatable) is critical. For example, native perennial forbs typically do not respond well to grazing, so less of this type of plant should be used to achieve grazing goals (Hayes and Holl 2003). Other characteristics to consider for restoration mixes to enhance forage production include low to no toxicity, rapid establishment and growth rate and high protein content (e.g. include a minimum of 20% legumes in the mix).

Resources

Kroeger, T., F. Casey, P. Alvarez, et al. 2010. An economic analysis of the benefits of habitat conservation on California rangelands. Washington, DC: Defenders of Wildlife. https://www.defenders.org/publications/an_economic_analysis_of_the_benefits_of_habitat_conservation_on_california_rangelands.pdf

Figure 4. Restoration is a powerful tool to enhance beef cattle production.

Carbon Storage/Nutrient Cycling: Enhancing Carbon Sequestration and Soil Nutrient Dynamics

Conversion to and maintenance of perennial grasslands is becoming a popular way to promote carbon sequestration and enhance nutrient cycling. There are also quite a few government cost-share programs that can help with financial investments associated with carbon sequestration efforts. To achieve this management goal, restoration mixes should be largely composed of perennial grasses, which cultivate the bacteria needed to sequester carbon. The employment of fertilizer should also be used to ensure that grasses are likely to dominate (Walker et al. 2015). The inclusion of legumes, such as species of Trifolium, Lupinus, or Castilleja is another good way to enhance carbon and nitrogen sequestration (fig. 5) (De Deyn et al. 2010).

Figure 5. Owls clover (*Castilleja exserta*).

Resources

Savory Institute. 2013. Restoring the climate through capture and storage of soil carbon through holistic planned grazing. http://savory.global/assets/docs/evidence-papers/restoring-the-climate.pdf,

University of California Cooperative Extension San Luis Obispo County. n.d. Carbon storage in rangelands. Ranching Sustainability Analysis Info Sheet. http://cesanluisobispo.ucanr.edu/files/136179.pdf.

Pre-Vegetation Techniques

Once restoration goals have been identified, management techniques must be designed and deployed. Many restoration practitioners posit that revegetation activities cannot occur before major problematic physical processes are solved (Tongway and Ludwig 2010). Therefore, prior to considerations of any biotic management, chronic abiotic disturbances must be acknowledged and mitigated: rectifying floods, rockslides, chemical contaminations, etc. of the site is the first priority. This section briefly outlines other major issues that must be addressed in grassland restoration prior to seeding or planting activities.

Invasive Species Management

Integral to any grassland restoration design is invasive species management. Native seed sown into fields dominated by invasive plants generally perform very poorly (see Cione et al. 2002) and in many cases fail to establish. Since applied invasive species management in California has been well described elsewhere (e.g., Lanini et al. 1996; DiTomaso et al. 2013; Kyser et al. 2014) , only an extremely brief overview of best practices will be presented here. Environmental variables (both previous and current-year) can be important drivers of weed management success. For example, Kimball et al. (2015) showed how weed management is much less important for mediating weed germination in dry years than in years of average or high precipitation. Alternatively, other papers have shown that weed management in drought years can be particularly effective because the density of invasives is already low (see Salo 2004).

In order to increase restoration success, perform weed management at least one season prior to seeding or replanting in order to kill existing plants and prevent existing plants from going to seed (Wrysinski 1999). Initiating weed management 2 years before revegetation activities is even more ideal, as this allows the practitioner to deplete the weed seed bank as well. However, initiating management this early is often logistically and financially infeasible. The type of weed management program chosen must consider both existing invasive plants as well as the types of species used for revegetation. Many of the conventional weed management strategies listed below suggest targeting a particular point in the life cycle of the plant (e.g., the seedling). Keep in mind that many populations of invasive plants do not enter life stages at the same time; for example, spraying a patch of seedings will likely not provide eradication because some of the plants will not yet be in the seedling stage. Multiple management events within a single season can address this obstacle.

Late-spring burning of annual grasslands has been shown to effectively reduce some important annual invasive plant species (Pollak and Kan 1998; Wirka 1999) (fig. 6), although these types

Figure 6. Burning can enhance desired plant cover.

of weeds can sometimes be replaced by invasive forbs after fire (Parsons and Stohlgren 1989). Burning for multiple years appears to be necessary for long-term control (see Swiecki and Bernhardt 2002) but may not always be feasible due to a lack of fuel to carry a fire in the second year. Additionally, the effectiveness of fire can be contingent upon the physical structure of dominant weeds. For example, the germination of certain invasive plant species, such as yellow starthistle (Centaurea solstitialis), has been shown to be encouraged by fire (Sheley et al. 1999; Kyser et al. 2013). Despite this, when included in an integrated management approach, prescribed fire over consecutive years has been shown to be a useful weed management approach (see DiTomaso et al. 1999). Keep in mind that, in most cases, a burn permit is required prior to the deployment of prescribed fire. Work closely with CAL FIRE (see http://www.fire.ca.gov/fire_protection/fire_protection_burnpermits) and your local air pollution control district (see http://www.arb.ca.gov/capcoa/roster.htm) to streamline the process of writing up and getting approval for a permit.

Figure 7. Mowing can provide effective reduction in exotic plant cover.

Herbicides, which can significantly reduce exotic plant populations (Cione et al. 2002), can be broadly separated into systemic (can be translocated throughout the plant) and contact (do not move from the point of contact) herbicides, as well as nonselective (control all plants) and selective (control, e.g., grasses without affecting broadleaf plants). Prioritizing weeds by distinguishing between grasses, herbaceous broadleaves, and woody species is critical to successful and effective chemical control. For example, in established or establishing sites, broadleaf herbicides that offer loosely selective preemergent control of primarily thistles (e.g., clopyralid and animopyralid) can be applied in late fall. In contrast, broad-spectrum broadleaf herbicides that do not provide residual control (e.g., 2,4-D) should be applied in February to mid-March, while other types of nonselective herbicides, (e.g., glyphosate) can used right after grass weed emergence but prior to native plant emergence in October or November (glyphosate is also effective on late-season annuals or perennials and can be applied after desirable plants disperse their seed and senesce). Weed identity is particularly important for herbicide choice. For example, a fall preemergent application of aminopyralid (typically used to control broadleaf weeds) is effective on medusahead (Taeniatherum caput-medusae) but not on barb goatgrass (Aegilops triuncialis) (G. Kyser, pers comm.). Moreover, if legumes and/or composites are to be used for reseeding, a fall application of clethodim or glyphosate would be most effective.

Identifying life stages of the target species that are susceptible to herbicides is also important. A spring application of a nonselective herbicide prior to seed maturation can mimic the use of a control burn in eliminating season-long plants and preventing seed production for the subsequent year. Similar to burning, a second application in the fall of the following season is required to obtain the high level of exotic annual grass suppression often required for native and perennial grass planting. Herbicide choice is also restricted by site land use and species. Be sure to consult the herbicide label to determine whether the herbicide is legal for use on a particular site.

Mowing (fig. 7) can be an effective invasive plant management technique when used at the correct time. Because many grasses (both native and invasive) respond well to mowing (depending on mower height), mowing should be done in the spring, when invasive annual grasses have started producing immature seed. Disrupting seed maturation is most effective in the milk stage of production (when mashing the seed between your fingers produces a milky substance). After this stage, mowing may not provide adequate management on mature seedheads. Sanitize all equipment before and after mowing activities to reduce the spread of invasives across sites.

Grazing is an effective strategy for targeting nontoxic weeds that can be extremely cost effective (Kimball et al. 2015), particularly if low-cost fencing is available. In addition to targeting weeds when they are vulnerable to grazing (boot stage), careful grazing can also enhance soil aeration and nutrient recycling. The type of animals used, the number of animals used, the duration of grazing, and the site location can affect the cover and identity of invasive species (Hayes and Holl 2003). On a large scale, grazing should be viewed as a long-term weed suppression strategy (Davy et al. 2015), but it requires adequate infrastructure such as water, fencing, and access.

Effective weed management is not a single action, but an activity that must be a continuous component of a restoration project. Weedy threats from the seedbank and reinvasion from edges necessitates active weed control before, during, and after revegetation (see Anderson and Long 1999). Considerations of herbicide-resistant weed presence, as well as the development of herbicide resistance in treated species, are also important (see Hanson et al. 2014). However, this risk is likely to be small in natural areas since the same herbicide is rarely used for consecutive years. In general, expect to pay about 10% of the direct restoration costs each year following seeding activities in site maintenance for weeds (Robins et al. 2001) and plan for at least 3 years of weed management.

Plant Materials

Choosing Species and Genotypes

Plants to include in a restoration mix should be based on management goals, and often, the species present at a reference site (mature, undisturbed areas). This reference site can take many forms, from a relatively uninvaded remnant to a documented historical community. Reference sites should be characterized by similar conditions to sites that are to be restored. These conditions can include soil type, slope, aspect, elevation, the presence of grazing, and climate. Reference sites can facilitate plant selection because they provide a plant community target. However, they can be difficult to use in restoration design because management goals might include, for example, rapid erosion control, which may not be quickly achieved using plants in the reference community. To achieve this goal, the reestablishment of early-successional species particularly suited for colonization and site improvement might be required, even if these plants are absent from a reference site.

A critical part of restoration planning should also involve a careful assessment of a site's existing plant species. Often, many native plants can be found hidden within even the most invaded annual grasslands or on the margins of a degraded area. These native species are a valuable source of information about species that might grow best at the site and may even be a source for locally adapted seed. Selecting appropriate plants for a restoration site also depends on careful consideration of local soil and climatic conditions. If you aren't sure what soil type you have, use the free UC Davis SoilWeb app (http://casoilresource.lawr.ucdavis.edu/soilweb-apps), which describes the reported soil type for most areas in the United States and is compatible with desktop computers, tablets, and smartphones. Similarly, the CalClim website (http//www.calclim.dri.edu/) provides easy assistance in determining a site's climate.

Figure 8. California natives *Lupinus bicolor* and *Stipa pulchra.*

Sourcing Seed and Plants

California native species (fig. 8) are the focus of restoration candidates in this guide. The cost of plant materials can be the largest consumer of restoration dollars in a project. Deciding on where to get plant material will be critical. Often, the easiest way to acquire locally adapted plant materials for restoration is from local or federal native nurseries and farms. You can check the California Native Plant Link Exchange (cnplx.info) for lists of seed and stock by county and producer or look into the native seed network for resources on the native seed industry by state (www.nativeseednetwork.org). Keep in mind that many nurseries develop or cultivate their own varieties with characteristics that can make a species more or less suitable for restoration in a particular area.

Alternatively, you can collect plants and seed from the field yourself. An advantage of this is that it ensures the use of locally adapted species and varieties for your project. If you gather seed from the field, collect them from locations in or around the restoration site to ensure local genotypes are used for the restoration project (see Borders et al. 2011). However, field seed collecting can sometimes require maneuvering through regulatory laws of collection permits; securing knowledgeable field crews is often needed to know how, when, and where to collect seed, and there can be added costs of subsequent seed cleaning and storage. Moreover, the environment in which the seed were produced can strongly affect germination, growth rate, seed production, and longevity (Goodwin and Doescher 1995; Bergum et al. 2010). Some agencies recommend that seed be collected within 30 miles of a restoration site, but the most important criteria are that climate and sometimes soils must be matched in the restoration and collection sites (McKay et al. 2005). Outcrossing species can be collected at a greater distance than selfing species, as the latter may form more locally adapted ecotypes (Rice and Knapp 2008).

For more information on field collection see Emery 1988 and Monsen et al. 2004; for more information on propagation, see McClaran 1981 and Amme 1985.

Once seed is collected, pretreatment may be required to ensure germination. For example, 19% of native annual plant species found in California have cold-cue seed germination (Mayfield et al. 2014). To overcome seed dormancy of field-collected seed in the absence of a laboratory, consider the biological needs of restoration species in your management techniques. For example, seeding species in the fall, preferably during or just before the autumn rains, can increase the exposure of seed to periods of cold temperatures, moisture, and late-season light, conditions that are often necessary for germination.

Seed Mixes

Regardless of your restoration goal, always use multiple species in seeding or planting. Using a diversity of restoration species, including a diversity of species that differ in traits (i.e., different functional groups) is important for two reasons. First, choosing species that provide a diversity of functional traits increases the likelihood of invasion resistance, which enhances community stability (Young et al. 2009; Aigner et al. 2011; Kimball et al. 2014). Second, individual species have been shown to maximize single ecosystem functions (see Sutton-Grier et al. 2012), so increasing species number in restoration mixes increases the likelihood of maximizing an array of ecosystem services in a restored habitat.

Restoration seed mixes should be comprised of functionally dissimilar species that match functional groups of vegetation at the restoration site (annuals and perennials, forbs and grasses). However, mixing annuals (which tend to grow quickly, bloom early, and have shallower roots) and perennials (which tend to grow slowly, bloom late, and have deep roots) in seed mixes can result in a significant decrease in emerging perennials (Young et al. 2014). Planting or seeding perennials earlier than annuals is a good way to encourage germination and root development of perennials in the absence of intense competitive pressure from annuals (Abraham et al. 2008; Young et al. 2014). This approach will likely be most effective when the invasive annual seed bank is depleted. Another approach includes incorporating native annuals such as small fescue (Festuca microstachys) that have been shown to facilitate the survival and growth of native perennials in the restoration seed mix. Finally, employ a multiyear approach where annuals are seeding sparsely in the first year to avoid competition with perennials seeded the following year.

How Much Seed Should You Use?

The amount of seed used depends on species identity, seed characteristics, and cost. For example, larger-seeded grasses are often more likely to germinate and emerge, but these types of seed are generally more expensive (Lulow et al. 2007), so using more seed is not always better (Porensky et al. 2012; Wilson 2015), particularly if germination rates are high. Saturating the soil with seed might also create a competitive environment for seed germination and seedling growth.

Although seeding rates are constantly being tested, follow these very general rules of thumb:

- 9 to 20 pounds of seed per acre for seed mixes (Rose 1998; Anderson 2001; Lulow et al. 2007). This includes approximately 3 to 7 pounds per acre of easily established, fast-growing species and 6 to 10 pounds per acre of slower-growing species (e.g., most perennial grasses).
- Broadcast large-seeded natives at more pounds of live seed (PLS) per acre than smaller-seeded natives.
- Plant forbs at higher rates than perennial grasses.
- Use much lower seeding rates for shrubs than for herbaceous species (see Cione et al. 2002; Montalvo et al. 2002).

Management for Arbuscular Mycorrhizal Fungi

Grasses and most grassland forbs form associations with vesicular-arbuscular mycorrhizal fungi (VAMF or AMF) that improve their growth by increasing nutrient and water uptake. Most cool-season grass species are facultatively mycorrhizal, meaning that they have relatively small responses to mycorrhizae and can survive for some time periods without mycorrhizae, especially in the absence of competition. For example, inoculation did not improve the ability of purple needlegrass (*Stipa pulchra*) to compete with slender oat (*Avena barbata*), the latter having intrinsically higher growth rates with or without inoculum (Nelson and Allen 1993). However, Eman 2016 found that preinoculation of *S. pulchra* plugs with local soil improved growth. Typically, unless the topsoil is removed or altered, natural levels of mycorrhizal inoculum are sufficient and inoculation is not required. If inoculum is used, it should be from local sources to reduce the unintended transport of nonbeneficial pathogens (Schwartz et al. 2006).

Revegetation Techniques

Timing

In California, most species should be seeded in the fall, preferably during or just before the autumn and winter rains. This exposure to periods of cold temperature, moisture, and late-season light are often necessary for seed to overcome dormancy and germinate. Moreover, cool and wet growing conditions in late winter and early spring will be critical to seedling growth and establishment.

Planting in the fall means that restoration success can depend on winter precipitation; unfortunately, no two years are the same in terms of precipitation timing and amount. Unless the restoration site can be irrigated, a very large investment in native seed planted before a drought may be a waste of money. Given a fixed project budget for a site, the chances for revegetation success may be improved by hedging your bets and planting smaller investments in seed over the course of several growing seasons. That way it will be more likely that at least one or two of the years will be good for seedling establishment.

Location

Seed can be applied to the entire area to be restored (which will likely reduce the density of seed and seedlings per acre) or to a subset of the area in strips or patches (which will concentrate seed). Seeding only a subset of the area has been shown to be an effective way to increase survival of emerging grass seedlings (Rayburn and Laca 2013) while minimizing seed and logistical costs. Subset seeding (commonly referred to as strip seeding or spatially patterned seeding) generally involves the application of seed in proximate but not necessarily contiguous strips or parcels. This encourages the in-filling of unseeded areas between seeded patches by desired plants as they mature. However, the in-filling of nonseeded sites can be faster for grass species than for perennial forbs (Jongepierova et al. 2007) and may be subject to reinvasion.

Even small restoration sites often include a range of spatial microenvironments and soil types that greatly affect plant growth. Different grasses are often found on south-facing slopes, for instance, than on flat ground under a valley oak. Seeding the same species across all sites may be a waste of seed if species in your mix do not tolerate the micro-environments present. Rather than sowing one seed mix throughout, consider making two or three seed mixes tailored to the unique conditions across the restoration area.

Application

Seed can be applied in many ways. The easiest way is by broadcast seeding by hand or by vehicle across sites. This can be an effective way to target seed onto disturbed soils. However, this approach can be difficult to successfully apply across large areas and can be one of the most costly seeding techniques (Kimball et al. 2015). A general rule of thumb suggests not to broadcast seed by hand when a site is greater than 2 acres. Aerial seeding (both fixed-wing and helicopter) can address these larger areas, but this approach is restricted to practitioners who have access to the variety of tools (e.g., vehicles, pilots, etc.) needed for this approach. Broadcast seeding can require from 20 to 80% more seed than is needed for other seeding approaches (Monsen et al. 2004; Stromberg et al. 2007; Anderson and Long 2010) and tends to not spread seed uniformly across target areas. This lack of uniformity, however, can increase space between seed, reducing competition between individuals in the seed mixture. Ultimately, this dynamic can actually lead to higher rates of native seedling establishment than with drill seeding (Kimball et al. 2014). If broadcast seeding is used, the soil should be disked approximately 1 to 2 inches deep prior to seeding to increase seed-soil contact and also to reduce the presence of small mammals (Stevens and Monsen 2004). Once seed is spread, ensuring the adhesion of seed to the soil can be accomplished by imprinting, which can involve pulling an imprinter over seeded areas, moving animals through a seeded area, or putting cardboard sheets on top of the seed and stepping on them.

Hydroseeding, which involves spraying a mixture of seed, mulch, and fertilizer in a water-based slurry to the soil surface, can also be used to prepare a seedbed (see Roberts and Bradshaw 1985). This method is less labor intensive than hand seeding, can be useful for seeding areas inaccessible to drills, and can quickly cover large areas. However, this approach is subject to high failure rates in plant establishment, is often costly, and requires access to machinery. Hydroseeding can be improved by scarifying the soil surface and hydromulching (Montalvo et al. 2002).

Finally, in drill seeding, (fig. 9<<F9>>) seed is dispensed from a seed hopper pulled by a tractor and placed in a furrow directly into the soil. This method can ensure that seed is deposited deeper in the soil profile, an environment that is typically characterized by more ideal conditions for germination than those found at the soil surface. For example, many grasses demonstrate best emergence when drill seeded 0.5 to 1.5 inches into the soil. Since seed is typically placed in conditions that facilitate germination using a seed drill, less seed is needed per acre, making it one of the more cost-effective techniques (Montalvo et al. 2002; Kimball et al. 2015). However, if desired vegetation already exists at the site, drill seeding might not be the best method for restoration, as it can uproot existing plants. Heavy drill machinery can also disturb the seed bed, limiting germination rates.

Figure 9. Drill rows in a Yolo County restoration project.

The seed application technique used in a restoration project depends on financial and logistical constraints as well as site conditions and plant species used. Site conditions are important because they can interact with the seeding approach. For example, heavy machinery used for drill seeding might compact soil in sites characterized by high clay content (Monsen et al. 2004), subsequently leading to puddling and reduced availability of moisture for plants. The use of heavy duty drilling equipment is also generally unfeasible in rough, rocky terrain. Drier areas might benefit more from hydroseeding approaches, which add moisture to the soil surface. However, since this approach requires significant water, hydroseeding during drought conditions might prove untenable.

The restoration species used can also impact seed application choice. As an obvious example, shrubs appear to do better with direct transplanting (see McAdoo et al. 2013). But seed characteristics are a less-apparent factor. Seed with long awns can get stuck in drills and often do better with hand seeding or by no-till drilling. If a competitively dominant native is included in a mixture, drill seeding is not ideal because it can cause seed to be placed in very close contact with one another in a furrow, facilitating a very competitive environment. Studies from other areas have demonstrated that broadcast seeding is more effective than drill seeding for the long-term success of native forbs (Wilson et al. 2004).

Direct Planting

Applying seed for restoration is often preferred to direct planting (plugs or plants) because it can be less expensive per area of

Figure 10. Established perennial bunchgrass restoration in Modoc County, CA.

coverage (Parmerlee and Young 2010), easier to deploy, and has less likelihood of inadvertently introducing plant pathogens. In cases where established plants are required immediately on smaller parcels of land, direct planting is a preferred method.

In grasslands, the presence of even a few established herbs, shrubs, and trees can enhance restoration practices (Stahlheber and D'Antonio 2014) and provide a variety of ecosystem services (fig. 10). These include erosion control, shade for grazing animals, increased landscape heterogeneity, and exotic plant reduction (see Belsky et al. 1989; Fritzke 1997). This is another example of why care should be taken to identify and preserve existing native plants on a site prior to restoration activities. Plugs (also referred to as container stock) can also have higher establishment rates than direct-seeded plants. However, because plugs are much more expensive than seeding (Pelmerlee and Young 2010), planting them is typically done only in relatively small areas. Using plugs for grassland restoration can require creative techniques to improve the survival and growth of transplanted materials. For example, lining plug holes with PVC piping can protect root damage by ground squirrels, which can decimate newly established plants, especially shrubs and trees. Using hand-held digging forks and shovels on small areas or tractors on larger areas can loosen soil to encourage root penetration of newly planted plugs.

Plugs should be installed between December and February to ensure that at least one winter rain event provides moisture to the growing plugs. If irrigation is possible, the season of plug planting becomes wider (e.g., September to April). Some practitioners actually install plugs even earlier (August) because late summer is most conducive to growth in that it allows for sufficient photosynthesis and carbon storage; this is advisable only if sufficient moisture is available (usually via irrigation). Whenever plants are transplanted, roots should always be kept moist and cool.

Transplanting induces plant stress, so to minimize this stress and increase the likelihood of restoration success transplants should be installed in areas free of existing plant competition and with adequate moisture. For example, planting plugs at a distance of 7 inches from existing vegetation can be sufficient to reduce competitive effects on plugs (Huddleston and Young 2004). Applying mulch prior to or immediately after planting is one relatively easy way to decrease invasive plant cover and increase soil moisture (Holl et al. 2014b). Mulch application is less important if the base of the plug is encased in a tube shelter (more common with tree seedlings and shrubs, e.g., Tubex tree shelters). This tube can also be useful for preventing rodent damage, and can serve as protection for water gel packets. Adding litter and soil from conspecific canopies can also increase survival and growth through the introduction of beneficial bacteria and fungi (Scott and Pratini 1997).

After plugs are installed, grazing should be removed from the area for at least one season to reduce soil compaction and direct plant damage. If grazing cannot be removed, fencing should be installed to protect plugs. This fencing can also serve to reduce small mammal herbivory (depending on fencing cell size). Fencing

Figure 11. Assessing restoration outcomes is critical.

is expensive, however; studies have found that planting in grazed areas can double planting costs (see Kraetsch 2001). For more information on restoration techniques for installing established plants, see McCreary and Tecklin 2005.

After Seeding or Planting

The establishment stage of seeded natives is extremely vulnerable to the competitive effects of invasive plants. Therefore, after the majority of seeding and planting has been conducted, maintain weed management to ensure adequate establishment and survival of seeded species. Knowing how to identify the native plants you seeded, extant native plants, and invasive weeds at the seedling and small plant stage will be critical for managing your plantings in the first year. This is also a reason to be very strategic with planting amounts and locations: a large investment in seed planted over an area that is too large to be weeded and maintained will go to waste. Weeding and other maintenance costs should always be factored into any seed investment. Fortunately, after a few growing seasons many California native grasses become established (i.e., native biomass approaches approximately 1 pound per yard) and can compete effectively with exotic species (Seabloom et al. 2003; Lulow 2006).

Resist the urge to pile on the fertilizer, which can enhance invasive growth more than natives and be detrimental to soil biota (Emam 2014). Follow-up management depends on both the identity of invasive species as well as seeded native species characteristics. The application of a nonselective weed control herbicide, such as glyphosate (1.25 pints per acre; Lulow et al. 2007) early in the season (January or February) is an effective way to treat initial weedy seedlings, but it must be done carefully in order to avoid desirable seedlings. In late spring of the first growing season, broadleaf herbicide (Transline or 2,4D) can be applied (Lulow 2006). Burning is another way to reduce weedy species, and it can also enhance native species diversity (see Young et al. 2015). Mowing has been shown to reduce invasives while favoring short-statured native species with big, thin leaves (Sandel et al. 2011).

Although inconsistently done (Kettenring and Adams 2011), assessment of restoration activities is important for the success of the project as well as for informing future project (fig. 11). Monitoring seeded or planted individuals will alert practitioners to encroaching weeds, herbivory damage, desiccation stress, and other controllable factors. At a minimum, assessment will require pre- and post-restoration surveys or comparison of restored and unrestored sites. The proxy used to measure success (density, cover, survival, etc.) can affect restoration outcome interpretations (Gomez-Aparcio 2009). For example, if restoration species demonstrate high density in very patchy populations, assessing density might suggest a successful project, while assessing overall cover might suggest an unsuccessful project. It is also important to consider the context-dependency of restoration success (Young et al. 2014). Techniques that prove effective at one site in one year might not demonstrate the same level of success the following year, especially since, in many cases, weather can be more important than applied management for modifying plant communities (see Cione et al.

2002; Swiecki and Bernhardt 2008). Additionally, site-specific factors such as topography, soil moisture, soil type, soil microbial composition, land-use history, and nitrogen deposition can directly and indirectly moderate restoration success. Since landscapes are heterogeneous, restoration practices that work at one site might not work at a nearby, seemingly similar site (Clewell and Rieger 1997), particularly if applied in different years or seasons.

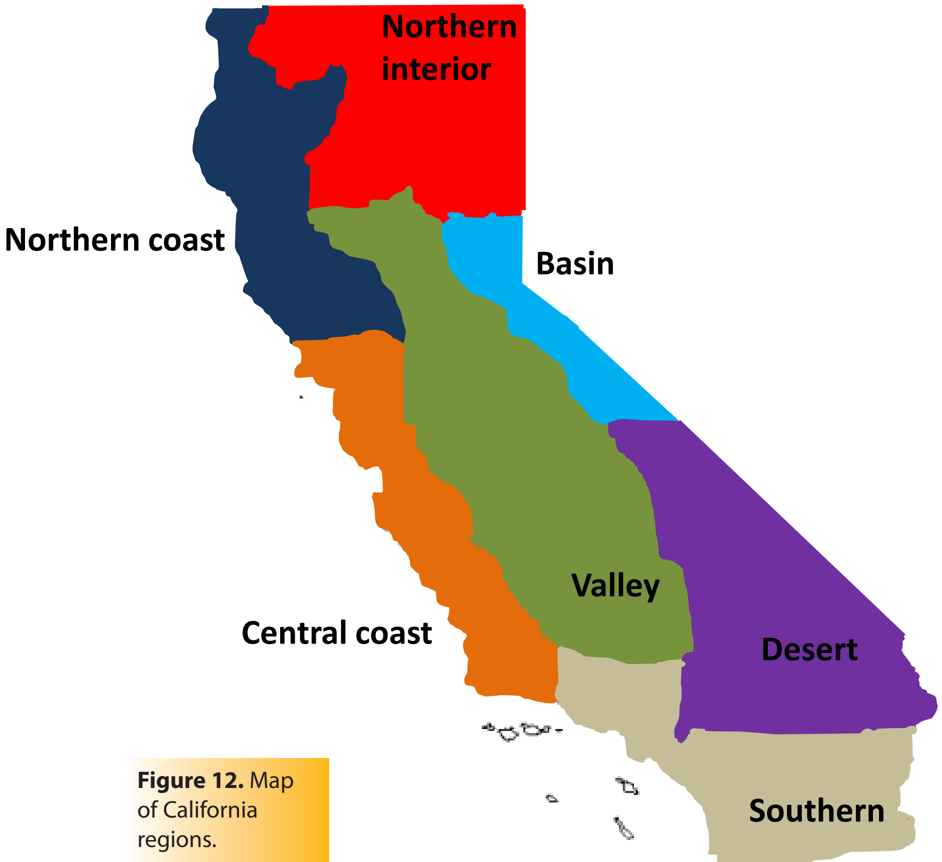

Figure 12. Map of California regions.

Species

Following are brief descriptions of native plant species that are typically used in restoration, based on available literature and practitioner knowledge. All listed species are suggestions, and practitioners are strongly suggested to review species ranges and habitat preferences at calflora.org. Appendix A at the end of this publication lists species by region (for a map of regions, see fig. 12) and restoration goal. The number of pounds per acre to seed denotes the range of values found in the literature when the species is included in a mix. Contrary information is sometimes listed, as disparate sources provide dissimilar observations.

Yarrow (*Achillea millefolium*)

Perennial forb that prefers well-drained soils in full sun. Found in virtually all non-desert systems in California. Has been shown to be enhanced by the application of mulch. Seed approximately 0.03 to 2 pounds per acre.

Pro: Improves soil quality, good for erosion control, salt tolerant, good pollinator plant, drought tolerant, relatively high germination, relatively high establishment success, disturbance tolerant.

Con: Grazing intolerant, generally found at low density, flood intolerant, can become weedy.

Citations: Kaye 1997; Hallock et al. 2003; Pywell et al. 2003; Dewey et al. 2006; Sheley and Half 2006; Hyvonen 2007; Long and Anderson 2010; Sandel et al. 2011; Adams 2012; Holl et al. 2014a.

Spanish lotus (*Acmispon americanus*)

Cosmopolitan, late-season blooming annual forb. Does well early in the restoration process, then demonstrates low density in subsequent years. Seed approximately 1.2 to 2 PLS per acre.

Pro: Tolerant of most soil types, good for erosion control, heavy metal tolerant, nitrogen fixer, disturbance tolerant, relatively drought tolerant, fire resistant, provides butterfly habitat, responds well to grazing.

Con: Can become weedy.

Citations: Wilkerson et al. 2014; Kimball et al. 2015.

Deerweed (*Acmispon glaber*)

Perennial subshrub largely found on the coast and in the foothills. Pioneer species that tends to prefer sandy soils.

Pro: Tolerant of serpentine soils, tolerant of slightly saline soils, nitrogen fixer, drought tolerant, establishes well after fire, fire tolerant, good for wildlife, good pollinator plant.

Con: Short lived, does not compete well with shrubs of later successional stages.

Citations: Keeley and Keeley 1984.

Spike bentgrass (*Agrostis exarata*)

Perennial grass found almost everywhere except California deserts. Seed approximately 1 to 5 pounds per acre.

Pro: Good for erosion control, disturbance tolerant, good for wildlife, good forage species, good competitor to Phalaris arundinacea.

Fiddleneck (*Amsinckia menziesii*)

Annual forb found mostly in coastal and Central Valley areas in California, often in undisced soil. Requires full sun. Seed approximately 1 to 2 pounds per acre.

Pro: Tolerant of most soil types, drought tolerant, disturbance tolerant, establishes well after fire, good pollinator plant, has been shown to reduce seed output of Bromus tectorum.

Con: Toxic to livestock, can become weedy, relatively low germination.

Citations: Davidson and Fox 1974; Whitson et al. 2000; Gillespie and Allen 2008; Forbis 2010; Borders et al. 2011; Leger et al. 2014.

Coulter snapdragon (*Antirrhinum coulterianum*)

Annual forb confined to the southern part of California. It is especially common in areas that have recently burned (early successional). Seed approximately 1.12 pounds per acre.

Pro: Drought tolerant, establishes well after fire.

Sixweeks three awn (*Aristida adscensionis*)

Annual grass localized in southern California.

Pro: Good for erosion control, disturbance tolerant, relatively drought tolerant, tolerant of wasteland habitat, good forage species when immature.

Con: Can become weedy, can have an allelopathic effects on Rhizobium spp.

Citations: Murthy and Nagodra 1977.

Purple three awn (*Aristida purpurea*)

Warm-season perennial grass localized in southern California in desert, coastal, and mountain habitats. Dry, coarse, or sandy soils in desert valleys and foothills are ideal. Seed approximately 4 PLS per acre.

Pro: good for erosion control, disturbance tolerant, drought tolerant, good pollinator plant, wildlife habitat, deer resistant, forage species when green (but not favored in presence of other bunchgrasses).

Con: Can become weedy, requires two or more seasons to establish before grazing can be introduced, seedhead awns can become lodged in soft tissue of livestock.

Citations: Ogle et al. 2011; Ogle et al. 2014.

California sagebrush, California mugwort (*Artemisia californica*)

Evergreen shrub that is generally confined to coastal areas south of Point Reyes below 2,625 feet. Seed approximately 2 to 5 pounds per acre.

Pro: Tolerant of most soil types, tolerant of sandy soils, tolerant of alkaline soils, good for erosion control, wildlife habitat, moderately adapted to fire, will establish on slope, drought tolerant, facilitates blue oak (Quercus douglasii) and coast live oak (Q. agrifolia) seedling establishment.

Con: Seed might require exposure to wildfire for germination, allelopathy likely reduces native plant neighbors, short seed shelf life, unpalatable to livestock (except domestic goats).

Citations: Keeley and Keeley 1987; Callaway and D'Antonio 1991; Callaway 1992; Hickman 1993; Hauser 2006; Kimball et al. 2015.

Mugwort (*Artemisia douglasiana*)

Cosmopolitan perennial shade-tolerant herb. Seed approximately 7 to 8 pounds per acre.

Pro: Tolerant of most soil types, good for erosion control, deer resistant, good pollinator plant, provides wildlife habitat, disturbance tolerant, drought tolerant, rapid growth rate.

Con: Flood intolerant, short seed shelf life, can become weedy, relatively low survival of planted seedlings.

Citations: Bornstein et al. 2005; Long and Anderson 2010; McClain et al. 2011; Moore et al. 2011.

Narrow leaf milkweed (*Asclepias fascicularis*)

Perennial herb with a relatively cosmopolitan distribution around the state. Easier to maintain transplants than to establish from seed.

Pro: Tolerant of clay soils, tolerant of saline soil, good pollinator plant, host plant for monarch butterflies, deer resistant, drought tolerant.

Con: Flood intolerant, can be poisonous to livestock due to alkaloids.

Citations: Long and Anderson 2010.

Blue grama (*Bouteloua gracilis*)

Perennial grass found in southern California and infrequently in the Central Valley. Drought dormant. Seed approximately 1 to 3 PLS per acre for drill seeding (increase 50 to 100% for broadcast seeding.

Pro: Found in a large range of soils, good for erosion control, extremely drought tolerant, tolerant of low-nutrient soils, good forage species, attracts birds and butterflies.

Con: Flooding intolerant, shade intolerant, intolerant of acidic soil.

Citations: USDA Forest Service 1937, Wilson et al. 1976.

California bromegrass (*Bromus carinatus*)

Perennial grass found in virtually all nondesert systems in California that prefers clay and loam soils. Seed approximately 1 to 4 pounds per acre.

Pro: Good for erosion control, rapid establishment, establishes well after fire, good forage species for cattle and wildlife, cover for small mammals and birds, relatively high germination, can establish on slopes, high survival of established individuals, soil stabilization and infiltration, tolerant of periodic drought, good competitor with exotic weeds.

Con: Becomes weedy, short longevity, since it is easily spread should not be used near crops.

Citations: Bugg et al. 1997; Stromberg and Kephart 1997; Chiaramonte et al. 2003; Hallock et al. 2003; Seabloom et al. 2003; Adams 2012; Holl et al. 2014a.

Redmaids (*Calandrinia menziesii*)

An annual forb that prefers well-drained soils. Establishes well after fire. Found in almost every county in California. Does not transplant well. Seed approximately 0.07 to 0.56 pounds per acre.

Pro: Can grow in nutrient-poor soils, drought tolerant, good for wildlife, good forage species for cattle, fire resistant, establishes well after fire.

Con: Can be a minor weed in agricultural areas, difficult to establish.

Citations: Hayes and Holl 2011; Porensky et al. 2012; Kimball et al. 2014.

California sun cup (*Camissoniopsis bistorta*)

Annual forb confined to the southern California. Seed approximately 0.22 pounds per acre.

Pro: Disturbance tolerant.

Owl's clover (*Castilleja exserta*)

Annual forb that is found in most of the coast and central part of California. Seed approximately 1 pound per acre.

Pro: Tolerant of sandy and clay soils, good pollinator plant, larval plant for the endangered Quino checkerspot butterfly.

Con: Difficult to establish, can need a perennial host plant (hemiparasitic).

Citations: Hayes and Holl 2011; Kimball et al. 2015; Marushia and Allen 2011.

Spikeweed (*Centromadia fitchii*)

Annual forb found mostly in grassland and wetland/vernal pool habitats in the Central Valley. Seed approximately 2 pounds per acre.

Pro: Disturbance tolerant, good pollinator plant, early germination, good competitor to invasive annuals.

Con: Can become weedy, avoided by livestock.

Cobweb thistle (*Cirsium occidentale*)

This endemic, cosmopolitan perennial/biennial forb is found throughout California outside of the Central Valley. Prefers well-drained soils. Seed approximately 1.5 PLS per acre.

Pro: Good pollinator plant, nesting material for native bees, deer resistant, drought tolerant.

Citation: Kimball et al. 2015.

Davy's clarkia (*Clarkia davyi*)

Endemic annual forb found mainly on California coastal prairies.

Pro: High survival.

Con: Low cover.

Citations: Hektner and Foin 1977; Adams 2012; Holl et al. 2014a.

Purple clarkia (*Clarkia purpurea*)

Annual forb found across systems in California.

Pro: Tolerant of most soil types, relatively unaffected by competition, drought tolerant, good pollinator plant.

Con: Does not compete well with weedy species.

Citations: Espeland 2013.

Elegant clarkia (*Clarkia unguiculata*)

Endemic annual forb found around the Central Valley and the southern coast.

Pro: Drought tolerant, good pollinator plant, larval host for Clark's sphinx moth, tolerant of most soil types and habitat types, high germination, establishes well after fire.

Con: Intolerant of heavy clay soil.

Citations: Travers 1999.

Turkey mullein (*Croton setiger*)

Cosmopolitan summer annual forb that grows in open, dry areas.

Pro: Good for wildlife, drought tolerant, quickly colonizes disturbed areas.

Con: Can be weedy in agricultural areas, toxic to livestock.

Citations: Kingsburg 1964.

Popcorn flower (*Cryptantha intermedia*)

Annual forb that is found mostly in dry, sandy soils in southern California. Can be enhanced by fire. Seed approximately 1 pound per acre.

Pro: Relatively drought tolerant, good pollinator plant.

Con: Relatively low germination, poor establishment.

Citations: Keeley and Keeley 1987; Beyers and Wakeman 1997; Dickens and Allen 2014; Bell et al. 2016.

California oatgrass (*Danthonia californica*)

Perennial grass found on the periphery of the Central Valley. Seeding alone is recommended. Seed approximately 10 to 20 PLS per acre.

Pro: Tolerant of most soil types, some populations tolerant of serpentine soils, good forage species for livestock and wildlife, stays green year long with adequate soil moisture, tolerant of heavy grazing, good pollinator plant, good for erosion control, fire resistant, potential high seed dormancy.

Con: Host for blind seed disease (Gloeotinia temulenta), which harms ryegrass seed, slow seedling development, low establishment, not a good competitor against invasive species until established.

Citations: Hatch et al. 1999; Bartolome et al. 2004; Suttle and Thomsen 2007, Amme and Miallef 2008, Hayes and Holl 2011

Clustered tarweed (*Deinandra fasciculata*)

Annual forb is found mostly in coastal southern California. Seed approximately 1 PLS per acre.

Pro: Clay soils tolerant, alkaline soil tolerant, drought tolerant, disturbance tolerant, good for wildlife, good pollinator plant.

Con: Can become weedy, outcompeted by invasive annuals, deters grazing.

Citations: Allen et al. 1998; Kimball et al. 2015.

California hairgrass (*Deschampsia cespitosa*)

Perennial grass largely found on the periphery of the Central Valley. Prefers well drained-soil. Seed approximately 2 to 3 PLS per acre.

Pro: Tolerant of saline soils, heavy metal tolerant, good for wildlife, good forage species for livestock, good pollinator plant, shade tolerant.

Con: Drought intolerant.

Citations: Cox and Hutchinson 1980.

Saltgrass (*Distichlis spicata*)

Warm-season, sod-forming perennial grass. Cosmopolitan, but tends to be found in wetlands. Prefers sandy soils.

Pro: Tolerant of saline soils, alkaline soils, and clay soils; disturbance tolerant, excellent for erosion control, high survival after transplanting, responds well after a burn, good forage species for wildlife.

Con: Alternate host plant to red rust (Puccinia aristidae) that infect spinach, can become weedy.

Citations: Hansen et al. 1976.

Giant wildrye (*Elymus condensatus*)

Perennial grass found largely on the coast. Seed approximately 2.5 PLS per acre.

Pro: Tolerant of most soil types, drought tolerant, green all season long, grazing tolerant.

Con: Easily hybridizes with other Elymus species.

Citation: Kimball et al. 2015.

Bottlebrush squirreltail (*Elymus elymoides*)

Perennial grass found across California. Early successional species. Seed approximately 7 PLS per acre.

Pro: Outcompetes invasive annuals weeds after fire or disturbance, disturbance tolerant, good competitor with cheatgrass and medusahead, fire resistant, good for erosion control, fair forage species for livestock and wildlife before seedhead development.

Con: Short lived, hybridizes easily, seedhead harmful to livestock, susceptible to rust.

Citations: Clausnitzer et al. 1999.

Blue wildrye (*Elymus glaucus*)

Perennial grass found on the coast and around the Central Valley. This species best used as an early seral species and performs well on well-drained upland sites. Seed approximately 5 to 7 pounds per acre.

Pro: Tolerant of alkaline soils, tolerant of clay and sandy soils, can do well as an understory species, drought tolerant, good at resisting invasion from yellow starthistle, high establishment success, can establish on slopes, high germination, fast growing, remains green for most of the growing season, disturbance tolerant, fire tolerant, habitat for wildlife, new growth is palatable to livestock.

Con: Intolerant of continuous grazing, intolerant of shallow soils, takes at least two years to mature in ideal conditions, can be hard to establish, can become weedy, flood intolerant.

Citations: Sampson et al. 1951; Bugg et al. 1997; Stromberg and Kephart 1996; Rose et al. 1998; Hallock et al. 2003; Deering and Young 2006; Lulow 2006; Suttle and Thomsen 2007; Lulow 2008; Young et al. 2009; Long and Anderson 2010; Porensky et al. 2012; Holl et al. 2014b.

Thickspike wheatgrass (*Elymus lanceolatus*)

Perennial grass found in a variety of habitats, but does best on well-drained soils. Seed approximately 1 to 11 PLS acre.

Pro: Good for erosion control, disturbance tolerant, drought resistant, fire tolerant, good for livestock and wildlife, does not get weedy, good for resisting invasion by knapweed, strong seedling vigor, can maintain high cover long-term, quick establishment.

Con: Does not compete well with aggressive invasives during establishment.

Citations: Scher 2002; Pantel et al. 2011; Wilson 2015.

Big squirreltail (*Elymus multisetus*)

Perennial grass found throughout California, preferring well drained soils, but can tolerate clay soils. Seed approximately 4 to 15 pounds per acre.

Pro: Drought tolerant, good for erosion control, relatively competitive against common invasive plants once established, high establishment success, good forage species in the spring, tolerant of a variety of habitats.

Con: Low fire tolerance, does not do well as an understory species, takes at least two years to mature in ideal conditions, does not persist, hybridizes easily.

Citations: Bugg et al. 1997; Dukes 2002; Lulow et al. 2007; Suttle and Thomsen 2007; Rowe and Leger 2011; Goergen and Chambers 2012.

Slender wheatgrass (*Elymus trachycaulus*)

Perennial grass found mostly in the foothills. Seed approximately 1 to 4 pounds per acre.

Pro: Tolerant of saline soils, good for erosion control, can establish on slopes, tolerant of a variety of habitats, excellent forage species, good for wildlife, high establishment success, rapid germination, fast growing, flood tolerant.

Con: Can be weedy, short lived, hybridizes easily.

Citations: Bugg et al. 1997; Lulow 2006; Deering and Young 2006; Long and Anderson 2010.

Creeping wildrye (*Elymus triticoides*)

Water loving long-lived cool season perennial grass that uniquely produces long, robust rhizomes. Can survive in the sun or shade. Seed approximately 0.5 to 4 pounds per acre.

Pro: Tolerant of most soil types, tolerant of saline soils, flood tolerant, fast growing once established, good for erosion control, grazing tolerant, wildlife habitat, rapid growth once established.

Con: Slow germination, does not establish well, can become weedy, fire intolerant.

Citations: Bugg et al. 1997; Lulow 2006; Long and Anderson 2010.

Brittlebush (*Encelia farinosa*)

Perennial shrub found in sandy soils in the southern coast and deserts of California.

Pro: Good for erosion control, good pollinator plant, good for wildlife, easy to propagate, drought tolerant, disturbance tolerant.

Con: Poor forage value, allelopathic, not fire resilient, relatively low germination.

Citations: Ludwig et al. 1988; Padgett et al. 1999.

California fuchsia (*Epilobium canum*)

Perennial forb found on the periphery of the Central Valley and on the coast.

Pro: Tolerant of most soil types, relatively drought tolerant, excellent pollinator plant, deer tolerant.

California buckwheat (*Eriogonum fasciculatum*)

Perennial evergreen shrub found mostly south of San Francisco. Seed approximately 4 to 11 pounds per acre.

Pro: Tolerant of most soil types, tolerant of serpentine soils, and acidic soils, good for erosion control, good for wildlife, excellent pollinator plant, drought tolerant, effective at colonizing disturbed sites, good seed producer (300 pounds per acre/yr).

Con: Poor establishment, can become weedy.

Citations: Stylinski and Allen 2001; Bell et al. 2016.

St. Catherine's lace (*Eriogonum giganteum*)

Endemic perennial shrub that is restricted to the coast. Endemic to the Channel Islands. Should not be planted in high traffic areas. Full sun. Needs good soil drainage.

Pro: Good for wildlife, drought tolerant, tolerant of clay soils, grows fast once established.

Con: Brittle plant is easily damaged.

California poppy (*Escholzia californica*)

Annual or perennial herb found almost everywhere in California. Does well with hydroseeding, but does not mix well with Avena fatua or Lolium perenne. Does well early in the restoration process and then demonstrates low density in subsequent years. Seed approximately 3 to 4 pounds per acre.

Pro: Good for erosion control, very adaptable to different soil and climate conditions, excellent pollinator plant, drought tolerant, disturbance tolerant, high germination, cost effective.

Con: May be toxic to livestock, can become weedy in some areas, low emergence, poor competitor for light and water.

Citations: Chiaramonte et al. 2003; Hallock et al. 2003; Funk et al. 2015; Wilkerson et al. 2014; Kimball et al. 2015.

Goldenrod (*Euthamia occidentalis*)

Perennial forb found in coastal and inland areas in California. Often found in wet meadows, wetlands, and along stream banks. Full sun or partial shade.

Pro: Tolerant of clay, tolerant of saline soils, good for erosion control, pollinator plant for native bees, facultative wetland species.

Con: Flood intolerant.

Citations: Long and Anderson 2010.

Idaho fescue (*Festuca idahoensis*)

One of the most common and widely distributed perennial grasses in the western US. Found mostly north of San Francisco. It is a late seral species that should be used in secondary seeding efforts. Seed approximately 8 to20 pounds per acre.

Pro: Good for erosion control, good forage species, can grow as an understory species, good wildlife species, deer resistant, resists cheatgrass invasion, high survival once established.

Con: Slow to establish, requires adequate soil moisture, can not compete with invasives, flood intolerant.

Citation: USDA Forest Service 1937; Bugg et al. 1997; Huddleston and Young 2004.

Small fescue (*Festuca microstachys*)

Cool-season annual grass found throughout the state that prefers sandy soils. Seed approximately 1PLS per acre.

Pro: Tolerant of low-nutrient soils, some ecotypes tolerant of serpentine soil, drought tolerant, disturbance tolerant, good for erosion control, fast growing.

Con: Low productivity, can be used as forage but has a short lifespan, does not compete well with cheatgrass.

Citations: Hallock et al. 2003.

Sixweeks grass (*Festuca octoflora*)

Annual grass found all over California. It is most common in open and disturbed areas. It prefers coarse-textured soils, but can tolerate a wide range of soils. Seed approximately 8 PLS per acre.

Pro: Highly drought tolerant, low nitrogen tolerant, does well in disturbed areas.

Con: Low coverage, slow growing, shade intolerant, unpalatable to livestock.

Citations: Lonard and Gould 1974.

Red fescue (*Festuca rubra*)

Perennial grass that is located in both coastal and upland areas. Prefers well drained (sandy loam) soils. Seed approximately 6 to 20 pounds per acre.

Pro: Can establish on slopes, good for erosion control, salt tolerant, grazing tolerant, relatively drought tolerant, wildlife habitat, fire resistant, can facilitate establishment of other species, high recruitment once established.

Con: Relatively poor at establishment, not palatable to livestock, can restrict forb growth.

Citations: Bugg et al. 1997; Walker et al. 2015.

Gumplant (*Grindelia camporum*)

Endemic, late season blooming perennial forb that is found on the coast and within the Central Valley. It is found along stream banks and occasionally in wetlands. Seed approximately 0.08 to3 pounds per acre.

Pro: Tolerant of both clay and sandy soils, salt tolerant, grows readily, disturbance tolerant, drought tolerant, good for wildlife habitat, high germination, cost effective, excellent pollinator plant, deer tolerant.

Con: Can be toxic to livestock, can become weedy in crop areas, can be slow to establish, flood intolerant.

Citations: Long and Anderson 2010; Porensky et al. 2012; Wilkerson et al. 2014; Kimball et al. 2015.

Hayfield tarweed (*Hemizonia congesta*)

Summer active annual forb found mostly west of the Central Valley. Seed approximately 2 pounds per acre.

Pro: Tolerant of most soil types, excellent pollinator plant, good for wildlife, drought tolerant, can be tolerant of invasives, early germination, long-lasting seed bank.

Con: Tends to hybridize with related species, does not respond well to fertilizer application.

Citations: Chiariello and Field 1996; Dukes 2002.

Meadow barley (*Hordeum brachyantherum*)

Perennial grass found throughout California. Does best on fine textured soils. Seed approximately 1

5 pounds per acre.

Pro: Tolerant of most soil types, high establishment success, fast growth rate, high survival once established, high value for deer forage in Spring, tolerant of low fertility soils and prescribed fire, does relatively well in the first year of seeding, shade tolerant, flood tolerant, can establish on slopes and in ditches, relatively high germination, good for erosion control.

Con: Low to moderate forage value for livestock, can be weedy, not a good understory species, generally does not last past the first year, relatively non-resistant to invasion, low and slow germination; low establishment, can hybridize with some Hordeum and Elymus species.

Citations: Bugg et al. 1997; Lulow 2006; Deering and Young 2006; Long and Anderson 2010; Adams 2015; Holl et al. 2014a; Holl et al. 2014b.

Foxtail barley (*Hordeum jubatum*)

Perennial grass found across California.

Pro: Tolerant of saline soils, tolerant of most soil types, drought tolerant, disturbance tolerant, good for erosion control.

Con: Can be weedy, poor forage species (once mature), fire intolerant, poor competitor, poor for wildlife.

Common rush (*Juncus patens*)

Perennial grasslike forb found mostly on coastal areas but not confined to wetlands. Seed approximately 1 to 2 pounds per acre.

Pro: Tolerant of sandy and clay soils, drought tolerant once established, attracts birds, nesting material for birds, easily grown from seed, tolerant of low soil drainage.

Con: Low cover.

Citations: Adams 2012; Holl et al. 2014a.

June grass (*Koeleria macrantha*)

Perennial grass widespread in California except for the Central Valley and the southern deserts. This species can grow in both full sun and partial shade.

Pro: Relatively drought tolerant, grazing tolerant, fast growing, fire tolerant, good for erosion control, salt tolerant.

Con: Cannot tolerate clay soils, negatively affected by nitrogen addition, can be difficult to establish.

Citation: Lulow 2008.

Goldfields (Lasthenia californica)

Annual forb that is found throughout California, although less so in the Central Valley.

Pro: Tolerant of most soil types, good pollinator plant, relatively drought tolerant, fire resistant, establishes to high cover.

Coastal tidytips (*Layia platyglossa*)

Annual forb found at low elevations, mostly in coastal areas on clay soils. Seed approximately 0.56 pounds per acre.

Pro: Good pollinator plant, attracts wildlife, drought tolerant, salt tolerant, nitrogen fixing.

Con: Short seed shelf life.

Annual lupine (*Lupinus bicolor*)

Annual forb found in a diverse array of open sandy habitats in almost every county in California. Has been shown to respond well to mulch. Seed approximately 0.3 pounds per acre.

Pro: Does well in disturbed soils, good pollinator plant, drought tolerant, fire resistant, nitrogen fixer, high cover.

Con: Low natural cover, does not compete well with perennials, vulnerable to small rodent herbivory.

Citations: Fitch and Bentley 1949; Heady 1956; Eviner 2004; Potthoff et al. 2005; Cox and Allen 2008; Young et al. 2011.

Summer lupine (*Lupinus formosus*)

Perennial forb found mostly on coastal areas with clay soils. Seed approximately 8.1 PLS per acre.

Pro: Good for wildlife, drought tolerant, shade tolerant, good pollinator plant, host plant of endangered Mission blue butterfly, deer resistant.

Con: Toxic to livestock (crooked calf disease), expensive, can take over a year to increase in density.

Citations: Wilkerson et al. 2014.

Chick lupine (*Lupinus microcarpus*)

Abundant annual forb found in most areas in California. Seed approximately 1.5 to 6.7 pounds per acre.

Pro: Alkaline soil tolerant, tolerant of most soil types, arsenic tolerant, drought tolerant, disturbance tolerant, excellent pollinator plant, high survival through time, good wildlife habitat, nitrogen fixer, easy to establish.

Con: Can be toxic to livestock, high variation in seedling establishment.

Citations: Brown and Bugg 2001; Parks Canada Agency 2011; Wilkerson et al. 2014; Kimball et al. 2015; Diaz et al. 2016.

Sky lupine (*Lupinus nanus*)

Annual forb found in the Central Valley and central and north coasts.

Pro: Disturbance tolerant, tolerant of many soil types, nitrogen fixer, good pollinator plant, drought tolerant, fire resistant.

Con: Low germination.

Citations: Moore 2009.

Arroyo lupine (*Lupinus succulentus*)

Annual forb that is almost endemic to California. Prefers moist clay or heavy soils on the coast in full sun. Higher growth rate in high-nitrogen soils. Does well early in the restoration process and demonstrates low density in subsequent years. Seed approximately 2.5 to 4 PLS per acre.

Pro: Good for erosion and soil stabilization, tolerant of clay soils, excellent pollinator plant, deer resistant, drought tolerant, establishes well after fire, nitrogen fixer.

Con: Low germination.

Citations: Johnson et al. 1987; Chiaramonte et al. 2003; Hallock et al. 2003; Wilkerson et al. 2014; Kimball et al. 2015.

Cliff aster (*Malacothrix saxatilis*)

Endemic perennial forb found in the southern coast. Seed approximately 1 to 2 pounds per acre.

Pro: Drought tolerant.

Citations: Kimball et al. 2015.

California melicgrass (*Melica californica*)

Endemic cool-season rhizomatous perennial grass. Prefers full sun or partial shade in well-drained upland locations. Seed approximately 20 pounds per acre.

Pro: Good for erosion control and slope stabilization, tolerant of most soil types, tolerant of serpentine soil, deer resistant, drought tolerant, fast growth rate, fire resistant, robust to invasion, forage plant for wildlife, does well under oaks, good for livestock.

Con: Requires good drainage, weak rhizomatous growth, slow growing–can take up to 4 years to mature.

Citations: Stebbins 1999; Bugg et al. 1997; Lulow 2006; Lulow 2006; Long and Anderson 2010; Porensky et al. 2012.

California melic (*Melica imperfecta*)

Perennial grass found mostly outside of the Central Valley. Does best with partial shade. Seed approximately 10 pounds per acre.

Pro: Good for erosion control, grazing tolerant for deer and elk, drought tolerant, fire resistant.

Con: Irregular germination.

Citation: Bugg et al. 1997.

Douglas' microseris (*Microseris douglasii*)

Annual forb found in the Central Valley and on the coast.

Pro: Tolerant of clay soils, tolerant of serpentine soils.

Con: Responds poorly to grazing.

Citations: Funk et al. 2015.

Orange monkey flower (*Mimulus aurantiacus*)

Almost endemic perennial showy shrub that is an important host plant for checkerspot butterfly larvae. Does best on well drained soils.

Pro: Tolerant of most soil types, tolerant of serpentine soils, drought tolerant, pollinator plant for hummingbirds, host plant for buckeye and checkerspot butterflies, deer resistant.

Annual muhly (*Muhlenbergia microsperma*)

Annual grass found across habitat types in the south of California.

Pro: Disturbance tolerant, drought tolerant, fire resistant.

Deergrass (*Muhlenbergia rigens*)

Warm-season perennial bunchgrass found in the Central Valley and along the southern coast, favored in sandy or well-drained soils. Seed approximately 4 PLS per acre.

Pro: Flood tolerant, salt tolerant, drought tolerant, good wildlife habitat, good for erosion control, relatively fast growing, fire tolerant.

Con: Mature plants are poor for grazing, can reduce growth of other native plants.

Citations: Long and Anderson 2010.

Baby blue eyes (*Nemophila menziesii*)

Annual forb found throughout the western and central part of California, less so in the valley. Seed approximately 3 to 6 pounds per acre.

Pro: Tolerant of most soil types and habitat types, good pollinator plant, drought tolerant, fire resistant.

Con: Intolerant of saline conditions.

Bunchleaf penstemon (*Penstemon heterophyllus*)

Endemic perennial forb found on the periphery of the Central Valley and on the coast.

Pro: Drought tolerant, good for wildlife, good pollinator plant, tolerant of many habitats, tolerant of a variety of well-drained soils, rapid growth rate.

California phacelia (*Phacelia californica*)

Endemic perennial forb mostly found in low elevations on the coast in well drained soils. Seed approximately 0.25 to1.5 pounds per acre.

Pro: Drought tolerant, good wildlife habitat, good pollinator plant, grazing tolerant, creates copious seed.

Con: Flood intolerant.

Citation: Long and Anderson 2010; Wilkerson et al. 2014.

Caterpillar phacelia (*Phacelia cicutaria*)

Annual forb found along the foothills and the southern coast in frequently burned areas (charate-induced germination). Seed approximately 0.5 PLS per acre.

Pro: Drought tolerant, pollinator plant for native bees.

Citation: Kimball et al. 2015.

Common phacelia (*Phacelia distans*)

Annual forb that is found mostly south of San Francisco. Seed approximately 1.27 pounds per acre.

Pro: Tolerant of most habitats, drought tolerant.

Lacy phacelia (*Phacelia tanacetifolia*)

Annual forb found mostly south of the Central Valley. Seed approximately 2 pounds per acre.

Pro: Tolerant of most soil types, drought tolerant, good pollinator plant, attracts beneficial insects, reduces soil nitrates and calcium, high establishment success.

Con: Can become weedy.

California plantain (*Plantago erecta*)

Annual forb found mostly on low elevation shallow soils on the coast and foothills in California. Particularly valuable restoration species because it provides food for the endangered Checkerspot butterfly. Seed approximately 1 to 5.6 PLS per acre.

Pro: Good pollinator plant, pollinator plant for endangered Checkerspot butterfly, good for erosion control, quick establishment, relatively high germination.

Con: Not particularly drought tolerant, flood intolerant, poor competitor with invasive annuals.

Citation: Kimball et al. 2015.

Sandberg bluegrass (*Poa secunda*)

Perennial grass with cosmopolitan distribution that does well on well-drained upland sites. Seed approximately 30 pounds per acre or 3 PLS per acre.

Pro: Tolerant of most soil types, drought tolerant, can establish on slopes, favored by fire, good early forage species for livestock and wildlife, can compete with cheatgrass and other invasives.

Con: Drought intolerant, flood intolerant, low density, slow and low germination.

Citations: USDA Forest Service 1937; Champlin and Winward 1979; Bugg et al. 1997; Deering and Young 2006; Long and Anderson 2010; Funk et al. 2015; Nafus et al. 2015.

Chia (*Salvia columbariae*)

Annual forb found in areas with well-drained soils on the Central Coast and everywhere in southern California. Seed approximately 1.12 pounds per acre.

Pro: Tolerant of most soil types, good wildlife habitat, good pollinator plant, drought tolerant, disturbance tolerant, fire tolerant.

Con: Tends to be avoided by herbivores.

Alkali sacaton (*Sporobolus airoides*)

Warm-season perennial grass found in the Central Valley as well as throughout the southern part of the state. Requires full sunlight. Seed approximately 2 PLS per acre.

Pro: Tolerant of most soil types, salt tolerant, drought tolerant, accumulates heavy metals, flooding tolerant, good for wildlife, good forage species, grazing tolerant, good for erosion control, relatively fast growing, can suppress invasive thistles.

Con: Does not reseed well.

Citations: Herbel and Nelson 1966; Dreesen and Marple 1979; Winter et al. 1982; Marcum 2006; Ferrero-Serrano et al. 2008.

Nodding needlegrass (*Stipa cernua*)

Cool-season perennial bunchgrass that does not like heavy soil and needs full sun or partial shade. Seed approximately 11 pounds per acre.

Pro: Deer resistant, drought tolerant, good for erosion control.

Con: Fire intolerant, flood intolerant, hybridizes easily with Stipa pulchra.

Citations: Love 1954; Bugg et al. 1997; Monsen et al. 2004; Long and Anderson 2010.

Foothill needlegrass (*Stipa lepida*)

This mostly coastal cool-season perennial bunchgrass dislikes heavy (class 2) soil and tends to occur with buckwheats and yarrows. Seed approximately 2.5 pounds per acre.

Pro: Good pollinator plant, grazing tolerant (but does better without grazing), drought tolerant, fire resistant, good for erosion control, long-lived.

Con: Fire intolerant.

Citations: Hallock et al. 2003; Bartolome et al. 2004; Monsen et al. 2004.

Purple needle grass (*Stipa pulchra*)

Cool-season perennial bunchgrass. One of the most common clone-forming native grass species in California. Likes sandy loam soils, soils with high clay content, and well-drained upland sites. Does better in the absence of grazing and after topsoil has been removed. Seed drilling better than hydroseeding. Seed approximately 1 to 10 PLS per acre.

Pro: Tolerant of poor-nutrient and low-moisture soils, tolerant of alkaline soil, tolerant of serpentine soils, tolerant of clay soils, strong root systems, good for erosion control, pollinator plant for native bees, great forage species, will grow well in dense patches of filaree, very high survival once established, high germination, long lived.

Con: Very low emergence rate, low establishment in presence of annuals, slow germination and growth rate (takes about 3 to 4 years to reach maturity), fire intolerant, flood intolerant, susceptible to competition from invasives when establishing, awns can injure livestock.

Citations: Crampton 1974; Hull and Muller 1977; Bartolome and Gemmill 1981; Bishop 1996; Dyer et al. 1996; Bugg et al. 1997; Stromberg and Kephart 1997; Hatch et al. 1999; Bartolome et al. 2004; Monsen et al. 2004; Deering and Young 2006; Lulow et al. 2007; Buisson et al. 2008; Long and Anderson 2010; Adams 2012; Porensky et al. 2012; Holl et al. 2014; Young and Veblen 2015; Kimball et al. 2015.

California aster (*Symphyotrichum chilense*)

An almost endemic perennial forb with a mostly coastal distribution. Tends to do better with shallow seeding and no mowing. Seed approximately 0.75 to 1 pound per acre.

Pro: Tolerant of clay soils, good pollinator plant, good for wildlife habitat, drought tolerant, excellent for erosion control.

Con: Flood intolerant, low germination, low survival.

Citation: Dewey et al. 2006; Hybner et al. 2009; Long and Anderson 2010; Holl et al. 2014a.

Indian clover (*Trifolium albopurpureum*)

Annual forb often found in clay and loamy soil in the Central Valley and the coast.

Pro: Responds well to grazing, well adapted to a variety of habitats, disturbance tolerant, drought tolerant, good for wildlife, good pollinator plant, blooms long into summer, nitrogen fixer.

Con: Low cover.

Citation: Franklin 2010; Funk et al. 2015.

Pinole clover (*Trifolium bifidum*)

Annual forb that is largely found in the north and central coast of California and requires full sunlight.

Pro: Tolerant of most soil types, nitrogen fixer, high establishment success.

Citation: Lulow 2008; Porensky et al. 2012.

Bull clover (*Trifolium fucatum*)

Annual forb found on the coast and near the Central Valley. Does well early in the restoration process and then demonstrates low density in subsequent years. Prefers well drained soils. Seed approximately 2.43 PLS per acre.

Pro: Tolerant of most soil types, good pollinator plant, good forage species, nitrogen fixer.

Con: Can become weedy, drought intolerant.

Citations: Wilkerson et al. 2014.

Clammy clover (*Trifolium obtusiflorum*)

Annual forb found in moist, gravelly soil on the periphery of the Central Valley. Does well early in the restoration process and then demonstrates low density in subsequent years. Seed approximately 1.2 PLS per acre.

Pro: Disturbance tolerant, nitrogen fixer, good for erosion control, good pollinator plant.

Con: Low long-term establishment.

Citations: Graham 1941; Gorelick 1969; Wilkerson et al. 2014.

Tomcat clover (*Trifolium willdenovii*)

Low-elevation annual forb that is found in both coastal and inland areas along almost the entire length of the state. Prefers heavy soils in full sun. Seed approximately 0.32 pounds per acre.

Pro: Drought tolerant, disturbance tolerant, good pollinator plant, relatively high establishment success, fast growing, nitrogen fixer.

Con: Can become weedy, low cover, low recovery after grazing.

Citations: Lulow 2008; Adams 2012; Porensky et al. 2012.

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Appendix A: Species Listed by Region and Restoration Goal

Geographic region: *Southern*
Restoration goal: *Forage production*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood tolerant *Sporobolus airoides*	Flood tolerant *Elymus trachycaulus* *Elymus triticoides* *Sporobolus airoides*	Flood tolerant *Koeleria macrantha* *Sporobolus airoides*	Flood tolerant *Elymus trachycaulus* *Elymus triticoides* *Distichlis spicata* *Koeleria macrantha* *Sporobolus airoides*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Elymus condensatus* *Elymus multisetus* *Sporobolus airoides* Flood intolerant *Bouteloua gracilis* *Poa secunda* *Stipa pulchra*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Elymus triticoides* *Elymus condensatus* *Elymus multisetus* *Sporobolus airoides* Flood intolerant *Bouteloua gracilis* *Poa secunda* *Stipa pulchra*	Flood tolerant *Elymus condensatus* *Elymus lanceolatus* *Elymus multisetus* *Festuca microstachys* *Hordeum brachyantherum* *Koeleria macrantha* *Sporobolus airoides* Flood intolerant *Bouteloua gracilis* *Poa secunda* *Stipa pulchra*	Flood tolerant *Calandrinia menziesii* *Distichlis spicata* *Elymus trachycaulus* *Elymus triticoides* *Elymus condensatus* *Elymus lanceolatus* *Elymus multisetus* *Festuca microstachys* *Hordeum brachyantherum* *Koeleria macrantha* *Sporobolus airoides* Flood intolerant *Bouteloua gracilis* *Elymus glaucus* *Poa secunda* *Stipa pulchra*

Geographic region: *Southern*

Restoration goal: *Invasive plant management*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood tolerant *Sporobolus airoides*	Flood tolerant *Muhlenbergia rigens* *Sporobolus airoides*	Flood tolerant *Sporobolus airoides*	Flood tolerant *Elymus trachycaulus* *Muhlenbergia rigens* *Sporobolus airoides* Flood intolerant *Achillea millefolium*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Elymus multisetus* *Sporobolus airoides* Flood intolerant *Poa secunda*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Elymus multisetus* *Lupinus microcarpus* *Sporobolus airoides* Flood intolerant *Poa secunda*	Flood tolerant *Elymus elymoides* *Elymus multisetus* *Muhlenbergia rigens* *Sporobolus airoides* Flood intolerant *Poa secunda*	Flood tolerant *Aristida adscensionis* *Aristida purpurea* *Elymus elymoides* *Elymus multisetus* *Elymus trachycaulus* *Lupinus microcarpus* *Muhlenbergia rigens* *Sporobolus airoides* Flood intolerant *Achillea millefolium* *Elymus glaucus* *Poa secunda*

Geographic region: *Southern*
Restoration goal: *Enhance biodiversity*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood tolerant *Juncus patens* *Lasthenia californica* *Layia platyglossa* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Juncus patens* *Lasthenia californica* *Layia platyglossa* Flood intolerant *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Festuca rubra* *Juncus patens* *Koeleria macrantha* *Lasthenia californica* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Festuca rubra* *Juncus patens* *Koeleria macrantha* *Lasthenia californica* Flood intolerant *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Agrostis exarata* *Castilleja exserta* *Clarkia purpurea* *Elymus condensatus* *Elymus multisetus* *Epilobium canum* *Eriogonum giganteum* *Festuca octoflora* *Juncus patens* *Lasthenia californica* *Layia platyglossa* *Lupinus succulentus* *Malacothrix saxatilis* *Melica imperfecta* *Microseris douglasii* *Nemophila menziesii* *Phacelia cicutaria* *Phacelia distans* *Salvia columbariae* *Sporobolus airoides* Flood intolerant *Bouteloua gracilis* *Euthamia occidentalis* *Plantago erecta* *Poa secunda* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Castilleja exserta* *Clarkia purpurea* *Elymus condensatus* *Elymus multisetus* *Epilobium canum* *Eriogonum giganteum* *Escholzia californica* *Festuca octoflora* *Juncus patens* *Lasthenia californica* *Layia platyglossa* *Lupinus formosus* *Lupinus microcarpus* *Lupinus succulentus* *Malacothrix saxatilis* *Melica imperfecta* *Microseris douglasii* *Muhlenbergia microsperma* *Nemophila menziesii* *Phacelia cicutaria* *Phacelia distans* *Salvia columbariae* *Sporobolus airoides* *Trifolium albopurpureum* Flood intolerant *Asclepias fascicularis* *Bouteloua gracilis* *Euthamia occidentalis* *Grindelia camporum* *Plantago erecta* *Poa secunda* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Acmispon glaber* *Acmispon strigosus* *Antirrhinum coulterianum* *Camissoniopsis bistorta* *Castilleja exserta* *Cirsium occidentale* *Clarkia purpurea* *Clarkia unguiculata* *Cryptantha intermedia* *Elymus condensatus* *Elymus elymoides* *Elymus lanceolatus* *Elymus multisetus* *Epilobium canum* *Eriogonum giganteum* *Festuca microstachys* *Festuca octoflora* *Festuca rubra* *Juncus patens* *Koeleria macrantha* *Lasthenia californica* *Lupinus bicolor* *Trifolium obtusiflorum* *Malacothrix saxatilis* *Melica imperfecta* *Mimulus aurantiacus* *Nemophila menziesii* *Penstemon heterophyllus* *Phacelia cicutaria* *Salvia columbariae* *Sporobolus airoides* *Stipa lepida* *Trifolium albopurpureum* Flood intolerant *Bouteloua gracilis* *Euthamia occidentalis* *Plantago erecta* *Poa secunda* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Acmispon glaber* *Antirrhinum coulterianum* *Camissoniopsis bistorta* *Castilleja exserta* *Cirsium occidentale* *Clarkia purpurea* *Clarkia unguiculata* *Cryptantha intermedia* *Elymus condensatus* *Elymus elymoides* *Elymus lanceolatus* *Elymus multisetus* *Epilobium canum* *Eriogonum giganteum* *Escholzia californica* *Festuca microstachys* *Festuca octoflora* *Festuca rubra* *Juncus patens* *Koeleria macrantha* *Lasthenia californica* *Lupinus bicolor* *Lupinus formosus* *Lupinus microcarpus* *Malacothrix saxatilis* *Melica imperfecta* *Mimulus aurantiacus* *Muhlenbergia microsperma* *Nemophila menziesii* *Penstemon heterophyllus* *Phacelia cicutaria* *Phacelia distans* *Salvia columbariae* *Sporobolus airoides* *Stipa lepida* *Trifolium obtusiflorum* Flood intolerant *Asclepias fascicularis* *Bouteloua gracilis* *Euthamia occidentalis* *Grindelia camporum* *Plantago erecta* *Poa secunda* *Stipa pulchra* *Symphyotrichum chilense*

Geographic region: *Southern*
Restoration goal: *Enhance pollinators*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood tolerant *Lasthenia californica* *Layia platyglossa* *Sporobolus airoides* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Lasthenia californica* *Layia platyglossa* *Sporobolus airoides* Flood intolerant *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Lasthenia californica* *Sporobolus airoides* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Lasthenia californica* *Sporobolus airoides* Flood intolerant *Achillea millefolium* *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Castilleja exserta* *Clarkia purpurea* *Epilobium canum* *Eriogonum giganteum* *Lasthenia californica* *Layia platyglossa* *Lupinus succulentus* *Malacothrix saxatilis* *Microseris douglasii* *Nemophila menziesii* *Phacelia cicutaria* *Phacelia distans* *Salvia columbariae* *Sporobolus airoides* Flood intolerant *Bouteloua gracilis* *Euthamia occidentalis* *Plantago erecta* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Acmispon americanus* *Amsinckia menziesii* *Castilleja exserta* *Clarkia purpurea* *Deinandra fasciculata* *Epilobium canum* *Eriogonum fasciculatum* *Eriogonum giganteum* *Escholzia californica* *Lasthenia californica* *Layia platyglossa* *Lupinus formosus* *Lupinus microcarpus* *Lupinus succulentus* *Malacothrix saxatilis* *Microseris douglasii* *Nemophila menziesii* *Phacelia cicutaria* *Phacelia distans* *Phacelia tanacetifolia* *Salvia columbariae* *Trifolium albopurpureum* *Trifolium willdenowii* Flood intolerant *Artemisia douglasiana* *Asclepias fascicularis* *Bouteloua gracilis* *Euthamia occidentalis* *Grindelia camporum* *Plantago erecta* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Acmispon glaber* *Acmispon strigosus* *Antirrhinum coulterianum* *Castilleja exserta* *Cirsium occidentale* *Clarkia purpurea* *Clarkia unguiculata* *Cryptantha intermedia* *Epilobium canum* *Eriogonum giganteum* *Lasthenia californica* *Lupinus bicolor* *Malacothrix saxatilis* *Mimulus aurantiacus* *Nemophila menziesii* *Penstemon heterophyllus* *Phacelia cicutaria* *Phacelia distans* *Salvia columbariae* *Trifolium albopurpureum* *Trifolium obtusiflorum* Flood intolerant *Bouteloua gracilis* *Euthamia occidentalis* *Plantago erecta* *Stipa cernua* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Acmispon americanus* *Acmispon glaber* *Amsinckia menziesii* *Antirrhinum coulterianum* *Aristida purpurea* *Calandrinia menziesii* *Camissoniopsis bistorta* *Castilleja exserta* *Cirsium occidentale* *Clarkia purpurea* *Clarkia unguiculata* *Cryptantha intermedia* *Deinandra fasciculata* *Epilobium canum* *Eriogonum fasciculatum* *Eriogonum giganteum* *Escholzia californica* *Lasthenia californica* *Lupinus bicolor* *Lupinus formosus* *Lupinus microcarpus* *Malacothrix saxatilis* *Mimulus aurantiacus* *Nemophila menziesii* *Penstemon heterophyllus* *Phacelia cicutaria* *Phacelia distans* *Phacelia tanacetifolia* *Salvia columbariae* *Trifolium obtusiflorum* Flood intolerant *Achillea millefolium* *Artemisia douglasiana* *Asclepias fascicularis* *Bouteloua gracilis* *Euthamia occidentalis* *Grindelia camporum* *Plantago erecta* *Stipa cernua* *Stipa pulchra* *Symphyotrichum chilense*

Geographic region: *Southern*

Restoration goal: *Enhance wildlife*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood tolerant *Lasthenia californica* *Layia platyglossa* *Sporobolus airoides*	Flood tolerant *Lasthenia californica* *Layia platyglossa* *Sporobolus airoides*	Flood tolerant *Deschampsia cespitosa* *Lasthenia californica* *Muhlenbergi rigens* *Sporobolus airoides*	Flood tolerant *Deschampsia cespitosa* *Lasthenia californica* *Muhlenbergia rigens* *Sporobolus airoides*	Flood tolerant *Agrostis exarata* *Clarkia purpurea* *Lasthenia californica* *Layia platyglossa* *Lupinus succulentus* *Melica imperfecta* *Salvia columbariae* *Sporobolus airoides* *Trifolium albopurpureum* Flood intolerant *Poa secunda* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Clarkia purpurea* *Lasthenia californica* *Layia platyglossa* *Lupinus formosus* *Lupinus microcarpus* *Lupinus succulentus* *Melica imperfecta* *Salvia columbariae* *Sporobolus airoides* *Trifolium albopurpureum* Flood intolerant *Poa secunda* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Acmispon glaber* *Clarkia purpurea* *Deschampsia cespitosa* *Lasthenia californica* *Lupinus bicolor* *Melica imperfecta* *Muhlenbergia rigens* *Penstemon heterophyllus* *Sporobolus airoides* *Stipa lepida* Flood intolerant *Poa secunda* *Stipa cernua* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Acmispon glaber* *Clarkia purpurea* *Deschampsia cespitosa* *Lasthenia californica* *Lupinus bicolor* *Lupinus formosus* *Lupinus microcarpus* *Melica imperfecta* *Muhlenbergia rigens* *Penstemon heterophyllus* *Salvia columbariae* *Sporobolus airoides* *Stipa lepida* Flood intolerant *Poa secunda* *Stipa cernua* *Stipa pulchra* *Symphyotrichum chilense*

Geographic region: *Southern*

Restoration goal: *Enhance soil health*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood tolerant *Layia platyglossa*	Flood tolerant *Layia platyglossa*			Flood tolerant *Layia platyglossa* *Lupinus succulentus* *Trifolium albopurpureum*	Flood tolerant *Bromus carinatus* *Layia platyglossa* *Lupinus formosus* *Lupinus microcarpus* *Lupinus succulentus* *Phacelia tanacetifolia* *Trifolium albopurpureum* *Trifolium willdenowii*	Flood tolerant *Acmispon glaber* *Acmispon strigosus* *Lupinus bicolor* *Trifolium obtusiflorum*	Flood tolerant *Acmispon glaber* *Lupinus bicolor* *Lupinus formosus* *Lupinus microcarpus* *Phacelia tanacetifolia* *Trifolium obtusiflorum*

Geographic region: *Southern*

Restoration goal: *Erosion control*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood tolerant *Sporobolus airoides*	Flood tolerant *Sporobolus airoides*	Flood tolerant *Koeleria macrantha* *Muhlenbergia rigens* *Sporobolus airoides*	Flood tolerant *Distichlis spicata* *Koeleria macrantha* *Muhlenbergia rigens* *Sporobolus airoides*	Flood tolerant *Agrostis exarata* *Lupinus succulentus* *Melica imperfecta* *Sporobolus airoides* Flood intolerant *Plantago erecta* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Lupinus microcarpus* *Lupinus succulentus* *Melica imperfecta* *Sporobolus airoides* Flood intolerant *Plantago erecta* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Koeleria macrantha* *Lupinus bicolor* *Melica imperfecta* *Muhlenbergia microsperma* *Muhlenbergia rigens* *Sporobolus airoides* *Stipa lepida* *Trifolium obtusiflorum* Flood intolerant *Plantago erecta* *Stipa cernua* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Distichlis spicata* *Koeleria macrantha* *Lupinus bicolor* *Lupinus microcarpus* *Melica imperfecta* *Muhlenbergia microsperma* *Muhlenbergia rigens* *Sporobolus airoides* *Stipa lepida* *Trifolium obtusiflorum* Flood intolerant *Plantago erecta* *Stipa cernua* *Stipa pulchra* *Symphyotrichum chilense*

Geographic region: *Desert*

Restoration goal: *Forage production*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood tolerant *Sporobolus airoides*	Flood tolerant *Sporobolus airoides*	Flood tolerant *Koeleria macrantha* *Sporobolus airoides*	Flood tolerant *Distichlis spicata* *Koeleria macrantha* *Sporobolus airoides*	Flood tolerant *Sporobolus airoides* Flood intolerant *Bouteloua gracilis* *Poa secunda*	Flood tolerant *Sporobolus airoides* Flood intolerant *Bouteloua gracilis* *Poa secunda*	Flood tolerant *Festuca microstachys* *Koeleria macrantha* *Sporobolus airoides* Flood intolerant *Bouteloua gracilis* *Poa secunda*	Flood tolerant *Distichlis spicata* *Festuca microstachys* *Koeleria macrantha* *Sporobolus airoides* Flood intolerant *Bouteloua gracilis* *Poa secunda*

Geographic region: *Desert*
Restoration goal: *Invasive plant management*

Saline soil?	What best describes soil?	Is site on or near agricultural fields or rangeland?	Species
YES	CLAY	YES	Flood tolerant *Sporobolus airoides*
YES	CLAY	NO	Flood tolerant *Sporobolus airoides*
YES	SANDY	YES	Flood tolerant *Sporobolus airoides*
YES	SANDY	NO	Flood tolerant *Sporobolus airoides*
NO	CLAY	YES	Flood tolerant *Sporobolus airoides* Flood intolerant *Poa secunda*
NO	CLAY	NO	Flood tolerant *Lupinus microcarpus* *Sporobolus airoides* Flood intolerant *Poa secunda*
NO	SANDY	YES	Flood tolerant *Elymus elymoides* *Muhlenbergia rigens* *Sporobolus airoides* Flood intolerant *Poa secunda*
NO	SANDY	NO	Flood tolerant *Aristida adscensionis* *Aristida purpurea* *Elymus elymoides* *Lupinus microcarpus* *Muhlenbergia rigens* *Sporobolus airoides* Flood intolerant *Poa secunda*

Geographic region: *Desert*

Restoration goal: *Enhance biodiversity*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood tolerant *Sporobolus airoides*	Flood tolerant *Sporobolus airoides*	Flood tolerant *Koeleria macrantha* *Sporobolus airoides*	Flood tolerant *Koeleria macrantha* *Sporobolus airoides*	Flood tolerant *Festuca octoflora* *Phacelia distans* *Salvia columbariae* *Sporobolus airoides* Flood intolerant *Bouteloua gracilis* *Poa secunda*	Flood tolerant *Eriogonum fasciculatum* *Festuca octoflora* *Lupinus microcarpus* *Phacelia distans* *Salvia columbariae* *Sporobolus airoides* Flood intolerant *Bouteloua gracilis* *Poa secunda*	Flood tolerant *Acmispon strigosus* *Camissoniopsis bistorta* *Elymus elymoides* *Festuca microstachys* *Festuca octoflora* *Koeleria macrantha* *Muhlenbergia microsperma* *Phacelia distans* *Salvia columbariae* *Sporobolus airoides* Flood intolerant *Bouteloua gracilis* *Poa secunda*	Flood tolerant *Camissoniopsis bistorta* *Elymus elymoides* *Eriogonum fasciculatum* *Festuca microstachys* *Festuca octoflora* *Koeleria macrantha* *Lupinus microcarpus* *Muhlenbergia microsperma* *Phacelia distans* *Salvia columbariae* *Sporobolus airoides* Flood intolerant *Bouteloua gracilis* *Poa secunda*

Geographic region: *Desert*

Restoration goal: *Enhance pollinators*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
					Flood tolerant *Phacelia distans* *Salvia columbariae* Flood intolerant *Bouteloua gracilis*	Flood tolerant *Acmispon americanus* *Eriogonum fasciculatum* *Lupinus microcarpus* *Phacelia distans* *Phacelia tanacetifolia* *Salvia columbariae* Flood intolerant *Bouteloua gracilis*	Flood tolerant *Acmispon strigosus* *Camissoniopsis bistorta* *Phacelia distans* *Salvia columbariae* Flood intolerant *Bouteloua gracilis*	Flood tolerant *Acmispon americanus* *Aristida purpurea* *Camissoniopsis bistorta* *Erigonum fasiculatum* *Lupinus microcarpus* *Phacelia distans* *Phacelia tanacetifolia* *Salvia columbariae* Flood intolerant *Bouteloua gracilis*

Geographic region: *Desert*

Restoration goal: *Enhance wildlife*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood tolerant *Sporobolus airoides*	Flood tolerant *Sporobolus airoides*	Flood tolerant *Muhlenbergia rigens* *Sporobolus airoides*	Flood tolerant *Muhlenbergia rigens* *Sporobolus airoides*	Flood tolerant *Salvia columbariae* *Sporobolus airoides* Flood intolerant *Bouteloua gracilis* *Poa secunda*	Flood tolerant *Croton setiger* *Erigonum fasciculatum* *Lupinus microcarpus* *Salvia columbariae* *Sporobolus airoides* Flood intolerant *Bouteloua gracilis* *Poa secunda*	Flood tolerant *Camissoniopsis bistorta* *Festuca microstachys* *Muhlenbergia microsperma* *Muhlenbergia rigens* *Salvia columbariae* *Sporobolus airoides* Flood intolerant *Bouteloua gracilis* *Poa secunda*	Flood tolerant *Aristida purpurea* *Camissoniopsis bistorta* *Croton setiger* *Erigonum fasciculatum* *Festuca microstachys* *Lupinus microcarpus* *Muhlenbergia microsperma* *Muhlenbergia rigens* *Salvia columbariae* *Sporobolus airoides* Flood intolerant *Bouteloua gracilis* *Poa secunda*

Geographic region: *Desert*

Restoration goal: *Enhance soil health*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
						Flood tolerant *Acmispon americanus* *Lupinus microcarpus* *Phacelia tanacetifolia*	Flood tolerant *Acmispon strigosus*	Flood tolerant *Acmispon americanus* *Lupinus microcarpus* *Phacelia tanacetifolia*

Geographic region: *Desert*

Restoration goal: *Erosion control*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood tolerant *Sporobolus airoides*	Flood tolerant *Sporobolus airoides*	Flood tolerant *Koeleria macrantha* *Muhlenbergia rigens* *Sporobolus airoides*	Flood tolerant *Koeleria macrantha* *Muhlenbergia rigens* *Sporobolus airoides*	Flood tolerant *Distichlis spicata* *Festuca octoflora* *Sporobolus airoides* Flood intolerant *Bouteloua gracilis*	Flood tolerant *Acmispon americanus* *Croton setiger* *Erigonum fasciculatum* *Festuca octoflora* *Lupinus microcarpus* *Sporobolus airoides* Flood intolerant *Bouteloua gracilis*	Flood tolerant *Elymus elymoides* *Festuca microstachys* *Festuca octoflora* *Koeleria macrantha* *Muhlenbergia microsperma* *Muhlenbergia rigens* *Sporobolus airoides* Flood intolerant *Bouteloua gracilis*	Flood tolerant *Acmispon americanus* *Aristida adscensionis* *Aristida purpurea* *Croton setiger* *Distichlis spicata* *Elymus elymoides* *Erigonum fasciculatum* *Festuca microstachys* *Festuca octoflora* *Koeleria macrantha* *Lupinus microcarpus* *Muhlenbergia microsperma* *Muhlenbergia rigens* *Sporobolus airoides* Flood intolerant *Bouteloua gracilis*

Geographic region: *Central coast*
Restoration goal: *Forage production*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood tolerant *Sporobolus airoides*	Flood tolerant *Sporobolus airoides*	Flood tolerant *Deschampsia cespitosa* *Koeleria macrantha* *Sporobolus airoides*	Flood tolerant *Deschampsia cespitosa* *Distichlis spicata* *Elymus trachycaulus* *Elymus triticoides* *Koeleria macrantha* *Sporobolus airoides*	Flood tolerant species *Agrostis exarata* *Bromus carinatus* *Danthonia californica* *Elymus condensatus* *Elymus multisetus* *Melica californica* *Sporobolus airoides* Flood intolerant *Poa secunda* *Stipa pulchra*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Danthonia californica* *Elymus condensatus* *Elymus multisetus* *Elymus triticoides* *Hordeum brachyantherum* *Melica californica* *Sporobolus airoides* Flood intolerant *Poa secunda* *Stipa pulchra*	Flood tolerant *Danthonia californica* *Deschampsia cespitosa* *Elymus condensatus* *Elymus multisetus* *Festuca microstachys* *Koeleria macrantha* *Melica californica* *Sporobolus airoides* Flood intolerant *Poa secunda* *Stipa pulchra*	Flood tolerant *Calandrinia menziesii* *Danthonia californica* *Deschampsia cespitosa* *Distichlis spicata* *Elymus condensatus* *Elymus multisetus* *Elymus trachycaulus* *Elymus triticoides* *Festuca microstachys* *Hordeum brachyantherum* *Koeleria macrantha* *Melica californica* *Sporobolus airoides* *Trifolium fucatum* Flood intolerant *Elymus glaucus* *Poa secunda* *Stipa pulchra*

Geographic region: *Central coast*

Restoration goal: *Invasive plant management*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
			Flood tolerant *Muhlenbergia rigens*	Flood tolerant *Elymus trachycaulus* *Muhlenbergia rigens* Flood intolerant *Achillea millefolium*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Elymus multisetus* *Hemizonia congesta* *Melica californica* Flood intolerant *Poa secunda*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Centromadia fitchii* *Elymus multisetus* *Hemizonia congesta* *Lupinus microcarpus* *Melica californica* Flood intolerant *Poa secunda*	Flood tolerant *Elymus multisetus* *Hemizonia congesta* *Melica californica* *Muhlenbergia rigens* Flood intolerant *Poa secunda*	Flood tolerant *Centromadia fitchii* *Elymus multisetus* *Elymus trachycaulus* *Hemizonia congesta* *Lupinus microcarpus* *Melica californica* *Muhlenbergia rigens* Flood intolerant *Achillea millefolium* *Elymus glaucus* *Poa secunda*

Geographic region: *Central coast*

Restoration goal: *Enhance biodiversity*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood tolerant *Juncus patens* *Lasthenia californica* *Layia platyglossa* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Juncus patens* *Lasthenia californica* *Layia platyglossa* Flood intolerant *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Deschampsia cespitosa* *Festuca rubra* *Juncus patens* *Koeleria macrantha* *Lasthenia californica* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Deschampsia cespitosa* *Festuca rubra* *Juncus patens* *Koeleria macrantha* *Lasthenia californica* Flood intolerant *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Agrostis exarata* *Castilleja exserta* *Clarkia davyi* *Clarkia purpurea* *Danthonia californica* *Elymus condensatus* *Elymus multisetus* *Epilobium canum* *Eriogonum giganteum* *Festuca octoflora* *Hemizonia congesta* *Juncus patens* *Lasthenia californica* *Layia platyglossa* *Lupinus nanus* *Lupinus succulentus* *Malacothrix saxatilis* *Melica californica* *Melica imperfecta* *Microseris douglasii* *Nemophila menziesii* *Phacelia distans* *Salvia columbariae* *Trifolium albopurpureum* *Trifolium bifidum* Flood intolerant *Euthamia occidentalis* *Plantago erecta* *Poa secunda* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Castilleja exserta* *Clarkia davyi* *Clarkia purpurea* *Danthonia californica* *Elymus condensatus* *Elymus multisetus* *Epilobium canum* *Eriogonum giganteum* *Escholzia californica* *Festuca octoflora* *Hemizonia congesta* *Juncus patens* *Lasthenia californica* *Layia platyglossa* *Lupinus formosus* *Lupinus microcarpus* *Lupinus nanus* *Lupinus succulentus* *Malacothrix saxatilis* *Melica californica* *Melica imperfecta* *Microseris douglasii* *Nemophila menziesii* *Phacelia distans* *Salvia columbariae* *Trifolium albopurpureum* *Trifolium bifidum* Flood intolerant *Asclepias fascicularis* *Euthamia occidentalis* *Grindelia camporum* *Plantago erecta* *Poa secunda* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Acmispon glaber* *Castilleja exserta* *Cirsium occidentale* *Clarkia davyi* *Clarkia unguiculata* *Cryptantha intermedia* *Clarkia purpurea* *Danthonia californica* *Deschampsia cespitosa* *Elymus condensatus* *Elymus multisetus* *Epilobium canum* *Eriogonum giganteum* *Festuca microstachys* *Festuca octoflora* *Festuca rubra* *Hemizonia congesta* *Juncus patens* *Koeleria macrantha* *Lasthenia californica* *Lupinus bicolor* *Lupinus nanus* *Malacothrix saxatilis* *Melica californica* *Melica imperfecta* *Mimulus aurantiacus* *Nemophila menziesii* *Penstemon heterophyllus* *Phacelia distans* *Salvia columbariae* *Stipa lepida* *Trifolium bifidum* *Trifolium obtusiflorum* Flood intolerant *Euthamia occidentalis* *Phacelia californica* *Plantago erecta* *Poa secunda* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Acmispon glaber* *Castilleja exserta* *Cirsium occidentale* *Clarkia davyi* *Clarkia unguiculata* *Clarkia purpurea* *Cryptantha intermedia* *Danthonia californica* *Deschampsia cespitosa* *Eriogonum giganteum* *Escholzia californica* *Elymus condensatus* *Elymus multisetus* *Epilobium canum* *Festuca microstachys* *Festuca octoflora* *Festuca rubra* *Hemizonia congesta* *Juncus patens* *Koeleria macrantha* *Lasthenia californica* *Lupinus bicolor* *Lupinus formosus* *Lupinus microcarpus* *Lupinus nanus* *Malacothrix saxatilis* *Melica californica* *Melica imperfecta* *Mimulus aurantiacus* *Nemophila menziesii* *Penstemon heterophyllus* *Phacelia distans* *Salvia columbariae* *Stipa lepida* *Trifolium bifidum* *Trifolium obtusiflorum* Flood intolerant *Asclepias fascicularis* *Euthamia occidentalis* *Grindelia camporum* *Phacelia californica* *Plantago erecta* *Poa secunda* *Stipa pulchra* *Symphyotrichum chilense*

Geographic region: *Central coast*

Restoration goal: *Enhance pollinators*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood tolerant *Lasthenia californica* *Layia platyglossa* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Lasthenia californica* *Layia platyglossa* Flood intolerant *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Deschampsia cespitosa* *Lasthenia californica* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Deschampsia cespitosa* *Lasthenia californica* Flood intolerant *Achillea millefolium* *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Castilleja exserta* *Clarkia davyi* *Clarkia purpurea* *Danthonia californica* *Epilobium canum* *Eriogonum giganteum* *Hemizonia congesta* *Lasthenia californica* *Layia platyglossa* *Lupinus nanus* *Lupinus succulentus* *Malacothrix saxatilis* *Microseris douglasii* *Nemophila menziesii* *Phacelia distans* *Salvia columbariae* *Trifolium albopurpureum* *Trifolium bifidum* Flood intolerant *Euthamia occidentalis* *Plantago erecta* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Acmispon americanus* *Amsinckia menziesii* *Castilleja exserta* *Centromadia fitchii* *Clarkia davyi* *Clarkia purpurea* *Cryptantha intermedia* *Danthonia californica* *Epilobium canum* *Eriogonum giganteum* *Escholzia californica* *Hemizonia congesta* *Lasthenia californica* *Layia platyglossa* *Lupinus formosus* *Lupinus microcarpus* *Lupinus nanus* *Lupinus succulentus* *Malacothrix saxatilis* *Microseris douglasii* *Nemophila menziesii* *Phacelia distans* *Phacelia tanacetifolia* *Salvia columbariae* *Trifolium albopurpureum* *Trifolium bifidum* *Trifolium willdenowii* Flood intolerant *Artemisia douglasiana* *Asclepias fascicularis* *Grindelia camporum* *Plantago erecta* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Acmispon glaber* *Acmispon strigosus* *Castilleja exserta* *Cirsium occidentale* *Clarkia davyi* *Clarkia purpurea* *Clarkia unguiculata* *Danthonia californica* *Deschampsia cespitosa* *Epilobium canum* *Eriogonum giganteum* *Hemizonia congesta* *Lasthenia californica* *Lupinus bicolor* *Lupinus nanus* *Malacothrix saxatilis* *Mimulus aurantiacus* *Nemophila menziesii* *Penstemon heterophyllus* *Phacelia distans* *Salvia columbariae* *Trifolium bifidum* *Trifolium obtusiflorum* Flood intolerant *Euthamia occidentalis* *Grindelia camporum* *Phacelia californica* *Plantago erecta* *Stipa cernua* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Acmispon americanus* *Acmispon glaber* *Amsinckia menziesii* *Calandrinia menziesii* *Castilleja exserta* *Centromadia fitchii* *Cirsium occidentale* *Clarkia davyi* *Clarkia purpurea* *Clarkia unguiculata* *Cryptantha intermedia* *Danthonia californica* *Deschampsia cespitosa* *Epilobium canum* *Eriogonum giganteum* *Escholzia californica* *Hemizonia congesta* *Lasthenia californica* *Lupinus bicolor* *Lupinus formosus* *Lupinus microcarpus* *Lupinus nanus* *Malacothrix saxatilis* *Mimulus aurantiacus* *Nemophila menziesii* *Penstemon heterophyllus* *Phacelia distans* *Phacelia tanacetifolia* *Salvia columbariae* *Trifolium bifidum* *Trifolium fucatum* *Trifolium obtusiflorum* Flood intolerant *Achillea millefolium* *Asclepias fascicularis* *Artemisia douglasiana* *Euthamia occidentalis* *Grindelia camporum* *Phacelia californica* *Plantago erecta* *Stipa cernua* *Stipa pulchra* *Symphyotrichum chilense*

Geographic region: *Central coast*

Restoration goal: *Enhance wildlife*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood tolerant *Lasthenia californica* *Layia platyglossa* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Lasthenia californica* *Layia platyglossa* Flood intolerant *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Deschampsia cespitosa* *Festuca rubra* *Koeleria macrantha* *Lasthenia californica* *Muhlenbergia rigens* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Deschampsia cespitosa* *Elymus trachycaulus* *Elymus triticoides* *Festuca rubra* *Koeleria macrantha* *Lasthenia californica* *Muhlenbergia rigens* Flood intolerant *Achillea millefolium* *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Agrostis exarata* *Clarkia purpurea* *Danthonia californica* *Epilobium canum* *Eriogonum giganteum* *Hemizonia congesta* *Lasthenia californica* *Layia platyglossa* *Lupinus succulentus* *Melica californica* *Melica imperfecta* *Salvia columbariae* *Trifolium albopurpureum* Flood intolerant *Euthamia occidentalis* *Poa secunda* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Agrostis exarata* *Artemisia californica* *Bromus carinatus* *Clarkia purpurea* *Croton setiger* *Danthonia californica* *Elymus triticoides* *Epilobium canum* *Eriogonum giganteum* *Escholzia californica* *Hemizonia congesta* *Hordeum brachyantherum* *Lasthenia californica* *Layia platyglossa* *Lupinus formosus* *Lupinus microcarpus* *Lupinus succulentus* *Melica californica* *Melica imperfecta* *Salvia columbariae* *Trifolium albopurpureum* Flood intolerant *Artemisia douglasiana* *Asclepias fascicularis* *Euthamia occidentalis* *Grindelia camporum* *Poa secunda* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Acmispon glaber* *Cirsium occidentale* *Clarkia purpurea* *Danthonia californica* *Deschampsia cespitosa* *Epilobium canum* *Eriogonum giganteum* *Festuca microstachys* *Festuca rubra* *Hemizonia congesta* *Koeleria macrantha* *Lasthenia californica* *Lupinus bicolor* *Melica californica* *Melica imperfecta* *Muhlenbergia rigens* *Penstemon heterophyllus* *Salvia columbariae* *Stipa lepida* Flood intolerant *Euthamia occidentalis* *Phacelia californica* *Poa secunda* *Stipa cernua* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Artemisia californica* *Acmispon glaber* *Calandrinia menziesii* *Cirsium occidentale* *Clarkia purpurea* *Croton setiger* *Danthonia californica* *Deschampsia cespitosa* *Elymus trachycaulus* *Elymus triticoides* *Epilobium canum* *Eriogonum giganteum* *Escholzia californica* *Festuca microstachys* *Festuca rubra* *Hemizonia congesta* *Hordeum brachyantherum* *Koeleria macrantha* *Lasthenia californica* *Lupinus bicolor* *Lupinus formosus* *Lupinus microcarpus* *Melica californica* *Melica imperfecta* *Muhlenbergia rigens* *Penstemon heterophyllus* *Salvia columbariae* *Stipa lepida* Flood intolerant *Achillea millefolium* *Artemisia douglasiana* *Asclepias fascicularis* *Elymus glaucus* *Euthamia occidentalis* *Grindelia camporum* *Phacelia californica* *Poa secunda* *Stipa cernua* *Stipa pulchra* *Symphyotrichum chilense*

Geographic region: *Central coast*

Restoration goal: *Enhance soil health*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood tolerant *Layia platyglossa*	Flood tolerant *Layia platyglossa*			Flood tolerant *Layia platyglossa* *Lupinus nanus* *Lupinus succulentus* *Trifolium albopurpureum* *Trifolium bifidum*	Flood tolerant *Acmispon americanus* *Bromus carinatus* *Layia platyglossa* *Lupinus formosus* *Lupinus microcarpus* *Lupinus nanus* *Lupinus succulentus* *Phacelia tanacetifolia* *Trifolium albopurpureum* *Trifolium bifidum* *Trifolium willdenowii*	Flood tolerant *Acmispon glaber* *Acmispon strigosus* *Lupinus bicolor* *Lupinus nanus* *Trifolium bifidum* *Trifolium obtusiflorum*	Flood tolerant *Acmispon americanus* *Acmispon glaber* *Lupinus bicolor* *Lupinus formosus* *Lupinus microcarpus* *Lupinus nanus* *Phacelia tanacetifolia* *Trifolium bifidum* *Trifolium fucatum* *Trifolium obtusiflorum*

Geographic region: *Central coast*
Restoration goal: *Erosion control*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood tolerant *Juncus patens* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Hordeum jubatum* *Juncus patens* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Festuca rubra* *Juncus patens* *Koeleria macrantha* *Muhlenbergia rigens* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Distichlis spicata* *Elymus trachycaulus* *Elymus triticoides* *Festuca rubra* *Hordeum jubatum* *Juncus patens* *Koeleria macrantha* *Muhlenbergia rigens* Flood intolerant *Achillea millefolium* *Euthamia occidentalis*	Flood tolerant *Agrostis exarata* *Danthonia californica* *Elymus condensatus* *Elymus multisetus* *Festuca octoflora* *Juncus patens* *Lupinus succulentus* *Melica californica* *Melica imperfecta* Flood intolerant *Euthamia occidentalis* *Plantago erecta* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Agrostis exarata* *Acmispon americanus* *Artemisia californica* *Bromus carinatus* *Croton setiger* *Danthonia californica* *Elymus condensatus* *Elymus multisetus* *Elymus triticoides* *Escholzia californica* *Festuca octoflora* *Hordeum brachyantherum* *Hordeum jubatum* *Juncus patens* *Lupinus microcarpus* *Lupinus succulentus* *Melica californica* *Melica imperfecta* Flood intolerant *Artemisia douglasiana* *Euthamia occidentalis* *Plantago erecta* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Danthonia californica* *Elymus condensatus* *Elymus multisetus* *Festuca microstachys* *Festuca octoflora* *Festuca rubra* *Juncus patens* *Koeleria macrantha* *Lupinus bicolor* *Melica californica* *Melica imperfecta* *Muhlenbergia rigens* *Stipa lepida* *Trifolium obtusiflorum* Flood intolerant *Euthamia occidentalis* *Plantago erecta* *Stipa cernua* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Acmispon americanus* *Artemisia californica* *Croton setiger* *Danthonia californica* *Distichlis spicata* *Elymus condensatus* *Elymus multisetus* *Elymus trachycaulus* *Elymus triticoides* *Escholzia californica* *Festuca octoflora* *Festuca microstachys* *Festuca rubra* *Hordeum brachyantherum* *Hordeum jubatum* *Juncus patens* *Koeleria macrantha* *Lupinus bicolor* *Lupinus microcarpus* *Melica californica* *Melica imperfecta* *Muhlenbergia rigens* *Stipa lepida* *Trifolium obtusiflorum* Flood intolerant *Achillea millefolium* *Artemisia douglasiana* *Euthamia occidentalis* *Plantago erecta* *Stipa cernua* *Stipa pulchra* *Symphyotrichum chilense*

Geographic region: *Valley*

Restoration goal: *Forage production*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
			Flood tolerant *Deschampsia cespitosa*	Flood tolerant *Deschampsia cespitosa* *Distichlis spicata* *Elymus trachycaulus* *Elymus triticoides*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Elymus multisetus* *Lupinus succulentus* *Melica californica* Flood intolerant *Poa secunda* *Stipa pulchra*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Elymus multisetus* *Elymus triticoides* *Hordeum brachyantherum* *Lupinus succulentus* *Melica californica* Flood intolerant *Poa secunda* *Stipa pulchra*	Flood tolerant *Deschampsia cespitosa* *Elymus multisetus* *Festuca microstachys* *Melica californica* Flood intolerant *Poa secunda* *Stipa pulchra*	Flood tolerant *Calandrinia menziesii* *Deschampsia cespitosa* *Distichlis spicata* *Elymus multisetus* *Elymus trachycaulus* *Elymus triticoides* *Festuca microstachys* *Hordeum brachyantherum* *Melica californica* *Trifolium fucatum* Flood intolerant *Elymus glaucus* *Poa secunda* *Stipa pulchra*

Geographic region: *Valley*
Restoration goal: *Invasive plant management*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
			Flood tolerant *Muhlenbergia rigens*	Flood tolerant *Elymus trachycaulus* *Muhlenbergia rigens* Flood intolerant *Achillea millefolium*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Elymus multisetus* *Hemizonia congesta* *Lupinus succulentus* *Melica californica* Flood intolerant *Poa secunda*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Centromadia fitchii* *Elymus multisetus* *Hemizonia congesta* *Lupinus microcarpus* *Lupinus succulentus* *Melica californica* Flood intolerant *Poa secunda*	Flood tolerant *Elymus multisetus* *Hemizonia congesta* *Melica californica* *Muhlenbergia rigens* Flood intolerant *Poa secunda*	Flood tolerant *Centromadia fitchii* *Elymus multisetus* *Elymus trachycaulus* *Hemizonia congesta* *Lupinus microcarpus* *Melica californica* *Muhlenbergia rigens* Flood intolerant *Achillea millefolium* *Elymus glaucus* *Poa secunda*

Geographic region: *Valley*
Restoration goal: *Enhance biodiversity*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood tolerant *Lasthenia californica* *Layia platyglossa* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Lasthenia californica* *Layia platyglossa* Flood intolerant *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Deschampsia cespitosa* *Festuca rubra* *Lasthenia californica* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Deschampsia cespitosa* *Festuca rubra* *Lasthenia californica* Flood intolerant *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Agrostis exarata* *Castilleja exserta* *Clarkia purpurea* *Elymus multisetus* *Epilobium canum* *Festuca octoflora* *Hemizonia congesta* *Lasthenia californica* *Layia platyglossa* *Lupinus nanus* *Lupinus succulentus* *Melica californica* *Microseris douglasii* *Nemophila menziesii* *Phacelia distans* *Salvia columbariae* *Trifolium albopurpureum* *Trifolium bifidum* Flood intolerant *Euthamia occidentalis* *Plantago erecta* *Poa secunda* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Agrostis exarata* *Castilleja exserta* *Clarkia purpurea* *Elymus multisetus* *Epilobium canum* *Escholzia californica* *Festuca octoflora* *Hemizonia congesta* *Hordeum brachyantherum* *Lasthenia californica* *Layia platyglossa* *Lupinus formosus* *Lupinus microcarpus* *Lupinus nanus* *Lupinus succulentus* *Melica californica* *Microseris douglasii* *Nemophila menziesii* *Phacelia distans* *Salvia columbariae* *Trifolium albopurpureum* *Trifolium bifidum* Flood intolerant *Asclepias fascicularis* *Euthamia occidentalis* *Grindelia camporum* *Plantago erecta* *Poa secunda* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Acmispon glaber* *Castilleja exserta* *Clarkia purpurea* *Deschampsia cespitosa* *Elymus multisetus* *Epilobium canum* *Festuca microstachys* *Festuca octoflora* *Festuca rubra* *Hemizonia congesta* *Lasthenia californica* *Lupinus bicolor* *Lupinus nanus* *Melica californica* *Mimulus aurantiacus* *Nemophila menziesii* *Penstemon heterophyllus* *Phacelia distans* *Salvia columbariae* *Stipa lepida* *Trifolium bifidum* *Trifolium obtusiflorum* Flood intolerant *Euthamia occidentalis* *Plantago erecta* *Poa secunda* *Stipa cernua* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Acmispon glaber* *Castilleja exserta* *Clarkia purpurea* *Deschampsia cespitosa* *Elymus multisetus* *Epilobium canum* *Escholzia californica* *Festuca microstachys* *Festuca octoflora* *Festuca rubra* *Hemizonia congesta* *Hordeum brachyantherum* *Lasthenia californica* *Lupinus bicolor* *Lupinus formosus* *Lupinus microcarpus* *Lupinus nanus* *Melica californica* *Mimulus aurantiacus* *Nemophila menziesii* *Penstemon heterophyllus* *Phacelia distans* *Salvia columbariae* *Stipa lepida* *Trifolium bifidum* *Trifolium obtusiflorum* Flood intolerant *Asclepias fascicularis* *Euthamia occidentalis* *Grindelia camporum* *Plantago erecta* *Poa secunda* *Stipa cernua* *Stipa pulchra* *Symphyotrichum chilense*

Geographic region: *Valley*
Restoration goal: *Enhance pollinators*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood tolerant *Lasthenia californica* *Layia platyglossa* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Lasthenia californica* *Layia platyglossa* Flood intolerant Asclepias fascicularis Euthamia occidentalis	Flood tolerant *Deschampsia cespitosa* *Lasthenia californica* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Deschampsia cespitosa* *Lasthenia californica* Flood intolerant *Achillea millefolium* *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Castilleja exserta* *Clarkia purpurea* *Epilobium canum* *Hemizonia congesta* *Lasthenia californica* *Layia platyglossa* *Lupinus nanus* *Lupinus succulentus* *Microseris douglasii* *Nemophila menziesii* *Phacelia distans* *Salvia columbariae* *Trifolium albopurpureum* *Trifolium bifidum* Flood intolerant *Euthamia occidentalis* *Plantago erecta* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Acmispon americanus* *Amsinckia menziesii* *Castilleja exserta* *Centromadia fitchii* *Clarkia purpurea* *Epilobium canum* *Escholzia californica* *Hemizonia congesta* *Lasthenia californica* *Layia platyglossa* *Lupinus formosus* *Lupinus microcarpus* *Lupinus nanus* *Lupinus succulentus* *Microseris douglasii* *Nemophila menziesii* *Phacelia distans* *Phacelia tanacetifolia* *Salvia columbariae* *Trifolium albopurpureum* *Trifolium bifidum* *Trifolium willdenowii* Flood intolerant *Artemisia douglasiana* *Asclepias fascicularis* *Euthamia occidentalis* *Grindelia camporum* *Plantago erecta* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Acmispon glaber* *Castilleja exserta* *Clarkia purpurea* *Deschampsia cespitosa* *Epilobium canum* *Hemizonia congesta* *Lasthenia californica* *Lupinus bicolor* *Lupinus nanus* *Mimulus aurantiacus* *Nemophila menziesii* *Penstemon heterophyllus* *Phacelia distans* *Salvia columbariae* *Trifolium bifidum* *Trifolium obtusiflorum* Flood intolerant *Euthamia occidentalis* *Plantago erecta* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Acmispon americanus* *Acmispon glaber* *Amsinckia menziesii* *Calandrinia menziesii* *Castilleja exserta* *Centromadia fitchii* *Clarkia purpurea* *Deschampsia cespitosa* *Epilobium canum* *Escholzia californica* *Hemizonia congesta* *Lasthenia californica* *Lupinus bicolor* *Lupinus formosus* *Lupinus microcarpus* *Lupinus nanus* *Mimulus aurantiacus* *Nemophila menziesii* *Penstemon heterophyllus* *Phacelia distans* *Phacelia tanacetifolia* *Salvia columbariae* *Trifolium bifidum* *Trifolium fucatum* *Trifolium obtusiflorum* Flood intolerant *Achillea millefolium* *Artemisia douglasiana* *Asclepias fascicularis* *Euthamia occidentalis* *Grindelia camporum* *Plantago erecta* *Stipa pulchra* *Symphyotrichum chilense*

Geographic region: *Valley*
Restoration goal: *Enhance wildlife*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood tolerant *Lasthenia californica* *Layia platyglossa* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Lasthenia californica* *Layia platyglossa* Flood intolerant *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Deschampsia cespitosa* *Festuca rubra* *Lasthenia californica* *Muhlenbergia rigens* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Deschampsia cespitosa* *Elymus trachycaulus* *Elymus triticoides* *Festuca rubra* *Lasthenia californica* *Muhlenbergia rigens* Flood intolerant *Achillea millefolium* *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Agrostis exarata* *Clarkia purpurea* *Epilobium canum* *Hemizonia congesta* *Lasthenia californica* *Layia platyglossa* *Lupinus succulentus* *Melica californica* *Salvia columbariae* *Trifolium albopurpureum* Flood intolerant *Euthamia occidentalis* *Poa secunda* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Croton setiger* *Clarkia purpurea* *Elymus triticoides* *Epilobium canum* *Escholzia californica* *Festuca microstachys* *Hemizonia congesta* *Hordeum brachyantherum* *Lasthenia californica* *Layia platyglossa* *Lupinus formosus* *Lupinus microcarpus* *Lupinus succulentus* *Melica californica* *Salvia columbariae* *Trifolium albopurpureum* Flood intolerant *Artemisia douglasiana* *Asclepias fascicularis* *Euthamia occidentalis* *Grindelia camporum* *Poa secunda* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Acmispon glaber* *Clarkia purpurea* *Deschampsia cespitosa* *Epilobium canum* *Festuca rubra* *Hemizonia congesta* *Lasthenia californica* *Lupinus bicolor* *Melica californica* *Mimulus aurantiacus* *Muhlenbergia rigens* *Penstemon heterophyllus* *Salvia columbariae* *Stipa lepida* Flood intolerant *Euthamia occidentalis* *Poa secunda* *Stipa cernua* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Acmispon glaber* *Calandrinia menziesii* *Clarkia purpurea* *Croton setiger* *Deschampsia cespitosa* *Elymus trachycaulus* *Elymus triticoides* *Epilobium canum* *Escholzia californica* *Festuca microstachys* *Festuca rubra* *Hemizonia congesta* *Hordeum brachyantherum* *Lasthenia californica* *Lupinus bicolor* *Lupinus formosus* *Lupinus microcarpus* *Melica californica* *Mimulus aurantiacus* *Muhlenbergia rigens* *Penstemon heterophyllus* *Salvia columbariae* *Stipa lepida* Flood intolerant *Achillea millefolium* *Artemisia douglasiana* *Asclepias fascicularis* *Elymus glaucus* *Euthamia occidentalis* *Grindelia camporum* *Poa secunda* *Stipa cernua* *Stipa pulchra* *Symphyotrichum chilense*

Geographic region: *Valley*

Restoration goal: *Enhance soil health*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood tolerant *Layia platyglossa*	Flood tolerant *Layia platyglossa*			Flood tolerant *Layia platyglossa* *Lupinus nanus* *Lupinus succulentus* *Trifolium albopurpureum* *Trifolium bifidum*	Flood tolerant *Acmispon americanus* *Bromus carinatus* *Layia platyglossa* *Lupinus formosus* *Lupinus microcarpus* *Lupinus nanus* *Lupinus succulentus* *Phacelia tanacetifolia* *Trifolium albopurpureum* *Trifolium bifidum* *Trifolium willdenowii*	Flood tolerant *Acmispon glaber* *Calandrinia menziesii* *Lupinus bicolor* *Lupinus nanus* *Trifolium bifidum* *Trifolium obtusiflorum*	Flood tolerant *Acmispon americanus* *Acmispon glaber* *Lupinus bicolor* *Lupinus formosus* *Lupinus microcarpus* *Lupinus nanus* *Phacelia tanacetifolia* *Trifolium bifidum* *Trifolium fucatum* *Trifolium obtusiflorum*

Geographic region: *Valley*

Restoration goal: *Erosion control*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood intolerant *Euthamia occidentalis*	Flood tolerant *Hordeum jubatum* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Festuca rubra* *Muhlenbergia rigens* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Distichlis spicata* *Elymus triticoides* *Elymus trachycaulus* *Festuca rubra* *Hordeum jubatum* *Muhlenbergia rigens* Flood intolerant *Achillea millefolium* *Euthamia occidentalis*	Flood tolerant *Agrostis exarata* *Elymus multisetus* *Festuca octoflora* *Lupinus succulentus* *Melica californica* Flood intolerant Euthamia occidentalis *Plantago erecta* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Acmispon americanus* *Agrostis exarata* *Bromus carinatus* *Croton setiger* *Elymus multisetus* *Elymus triticoides* *Escholzia californica* *Festuca octoflora* *Hordeum brachyantherum* *Hordeum jubatum* *Lupinus microcarpus* *Lupinus succulentus* *Melica californica* Flood intolerant *Artemisia douglasiana* *Euthamia occidentalis* *Plantago erecta* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Elymus multisetus* *Festuca microstachys* *Festuca octoflora* *Festuca rubra* *Lupinus bicolor* *Melica californica* *Muhlenbergia rigens* *Stipa lepida* *Trifolium obtusiflorum* Flood intolerant *Euthamia occidentalis* *Plantago erecta* *Stipa cernua* *Stipa pulchra* *Symphyotrichum chilense*	Flood tolerant *Acmispon americanus* *Croton setiger* *Distichlis spicata* *Elymus multisetus* *Elymus trachycaulus* *Elymus triticoides* *Escholzia californica* *Festuca microstachys* *Festuca octoflora* *Festuca rubra* *Hordeum brachyantherum* *Hordeum jubatum* *Lupinus bicolor* *Lupinus microcarpus* *Melica californica* *Muhlenbergia rigens* *Stipa lepida* *Trifolium obtusiflorum* Flood intolerant *Achillea millefolium* *Artemisia douglasiana* *Euthamia occidentalis* *Plantago erecta* *Stipa cernua* *Stipa pulchra* *Symphyotrichum chilense*

Geographic region: *Northern coast*

Restoration goal: *Forage production*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
			Flood tolerant *Deschampsia cespitosa* *Koeleria macrantha*	Flood tolerant *Deschampsia cespitosa* *Distichlis spicata* *Elymus trachycaulus* *Elymus triticoides* *Koeleria macrantha*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Danthonia californica* *Elymus multisetus* *Melica californica* Flood intolerant *Poa secunda*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Danthonia californica* *Elymus multisetus* *Elymus triticoides* *Hordeum brachyantherum* *Melica californica* Flood intolerant *Poa secunda*	Flood tolerant *Danthonia californica* *Deschampsia cespitosa* *Elymus multisetus* *Festuca microstachys* *Koeleria macrantha* *Melica californica* Flood intolerant *Festuca idahoensis* *Poa secunda*	Flood tolerant *Calandrinia menziesii* *Danthonia californica* *Deschampsia cespitosa* *Distichlis spicata* *Elymus multisetus* *Elymus trachycaulus* *Elymus triticoides* *Festuca microstachys* *Hordeum brachyantherum* *Koeleria macrantha* *Melica californica* *Trifolium fucatum* Flood intolerant *Elymus glaucus* *Festuca idahoensis* *Poa secunda*

Geographic region: *Northern coast*

Restoration goal: *Invasive plant management*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
				Flood tolerant *Elymus trachycaulus* Flood intolerant *Achillea millefolium*	Flood tolerant *Agrostis exarata* *Elymus multisetus* *Hemizonia congesta* *Melica californica* Flood intolerant *Poa secunda*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Elymus multisetus* *Hemizonia congesta* *Melica californica* Flood intolerant *Poa secunda*	Flood tolerant *Elymus multisetus* *Hemizonia congesta* *Melica californica* Flood intolerant *Poa secunda*	Flood tolerant *Elymus multisetus* *Elymus trachycaulus* *Hemizonia congesta* *Melica californica* Flood intolerant *Achillea millefolium* *Elymus glaucus* *Poa secunda*

Geographic region: *Northern coast*

Restoration goal: *Enhance biodiversity*

Saline soil?	What best describes soil?	Is site on or near agricultural fields or rangeland?	Flood tolerant	Flood intolerant
YES	CLAY	YES	*Lasthenia californica*, *Juncus patens*	*Euthamia occidentalis*
YES	CLAY	NO	*Juncus patens*, *Lasthenia californica*	*Asclepias fascicularis*, *Euthamia occidentalis*
YES	SANDY	YES	*Deschampsia cespitosa*, *Festuca rubra*, *Koeleria macrantha*, *Lasthenia californica*, *Juncus patens*	*Euthamia occidentalis*
YES	SANDY	NO	*Deschampsia cespitosa*, *Festuca rubra*, *Juncus patens*, *Koeleria macrantha*, *Lasthenia californica*	*Asclepias fascicularis*, *Euthamia occidentalis*
NO	CLAY	YES	*Agrostis exarata*, *Clarkia davyi*, *Clarkia purpurea*, *Danthonia californica*, *Elymus multisetus*, *Epilobium canum*, *Hemizonia congesta*, *Juncus patens*, *Lasthenia californica*, *Melica californica*, *Nemophila menziesii*, *Trifolium bifidum*	*Euthamia occidentalis*, *Plantago erecta*, *Poa secunda*, *Symphyotrichum chilense*
NO	CLAY	NO	*Agrostis exarata*, *Clarkia davyi*, *Clarkia purpurea*, *Danthonia californica*, *Elymus multisetus*, *Epilobium canum*, *Escholzia californica*, *Hemizonia congesta*, *Juncus patens*, *Lasthenia californica*, *Lupinus formosus*, *Lupinus nanus*, *Melica californica*, *Nemophila menziesii*, *Trifolium bifidum*	*Asclepias fascicularis*, *Euthamia occidentalis*, *Grindelia camporum*, *Plantago erecta*, *Poa secunda*, *Symphyotrichum chilense*
NO	SANDY	YES	*Cirsium occidentale*, *Clarkia davyi*, *Clarkia purpurea*, *Clarkia unguiculata*, *Danthonia californica*, *Deschampsia cespitosa*, *Elymus multisetus*, *Epilobium canum*, *Festuca microstachys*, *Festuca rubra*, *Hemizonia congesta*, *Juncus patens*, *Koeleria macrantha*, *Lasthenia californica*, *Lupinus bicolor*, *Lupinus nanus*, *Melica californica*, *Mimulus aurantiacus*, *Nemophila menziesii*, *Penstemon heterophyllus*, *Stipa lepida*, *Trifolium bifidum*, *Trifolium obtusiflorum*	*Euthamia occidentalis*, *Festuca idahoensis*, *Phacelia californica*, *Plantago erecta*, *Poa secunda*, *Symphyotrichum chilense*
NO	SANDY	NO	*Cirsium occidentale*, *Clarkia davyi*, *Clarkia purpurea*, *Clarkia unguiculata*, *Danthonia californica*, *Deschampsia cespitosa*, *Elymus multisetus*, *Epilobium canum*, *Escholzia californica*, *Festuca microstachys*, *Festuca rubra*, *Hemizonia congesta*, *Juncus patens*, *Koeleria macrantha*, *Lasthenia californica*, *Lupinus bicolor*, *Lupinus formosus*, *Lupinus nanus*, *Melica californica*, *Mimulus aurantiacus*, *Nemophila menziesii*, *Penstemon heterophyllus*, *Stipa lepida*, *Trifolium bifidum*, *Trifolium fucatum*, *Trifolium obtusiflorum*	*Asclepias fascicularis*, *Euthamia occidentalis*, *Festuca idahoensis*, *Grindelia camporum*, *Phacelia californica*, *Plantago erecta*, *Poa secunda*, *Symphyotrichum chilense*

Geographic region: *Northern coast*

Restoration goal: *Enhance pollinators*

Saline soil?	What best describes soil?	Is site on or near agricultural fields or rangeland?	Flood tolerant	Flood intolerant
YES	CLAY	YES	*Lasthenia californica*	*Euthamia occidentalis*
YES	CLAY	NO	*Lasthenia californica*	*Asclepias fascicularis* *Euthamia occidentalis*
YES	SANDY	YES	*Deschampsia cespitosa* *Lasthenia californica*	*Euthamia occidentalis*
YES	SANDY	NO	*Deschampsia cespitosa* *Lasthenia californica*	*Achillea millefolium* *Asclepias fascicularis* *Euthamia occidentalis*
NO	CLAY	YES	*Clarkia davyi* *Clarkia purpurea* *Danthonia californica* *Epilobium canum* *Hemizonia congesta* *Lasthenia californica* *Lupinus nanus* *Nemophila menziesii* *Trifolium bifidum*	*Euthamia occidentalis* *Grindelia camporum* *Plantago erecta* *Symphyotrichum chilense*
NO	CLAY	NO	*Acmispon americanus* *Amsinckia menziesii* *Clarkia davyi* *Clarkia purpurea* *Danthonia californica* *Epilobium canum* *Escholzia californica* *Hemizonia congesta* *Lasthenia californica* *Lupinus formosus* *Lupinus nanus* *Nemophila menziesii* *Trifolium bifidum* *Trifolium willdenowii*	*Artemisia douglasiana* *Asclepias fascicularis* *Euthamia occidentalis* *Plantago erecta* *Symphyotrichum chilense*
NO	SANDY	YES	*Cirsium occidentale* *Clarkia davyi* *Clarkia purpurea* *Clarkia unguiculata* *Danthonia californica* *Deschampsia cespitosa* *Epilobium canum* *Hemizonia congesta* *Lasthenia californica* *Lupinus bicolor* *Lupinus nanus* *Nemophila menziesii* *Penstemon heterophyllus* *Trifolium bifidum* *Trifolium obtusiflorum*	*Euthamia occidentalis* *Phacelia californica* *Plantago erecta* *Symphyotrichum chilense*
NO	SANDY	NO	*Acmispon americanus* *Amsinckia menziesii* *Calandrinia menziesii* *Clarkia davyi* *Clarkia purpurea* *Cirsium occidentale* *Clarkia unguiculata* *Danthonia californica* *Deschampsia cespitosa* *Epilobium canum* *Escholzia californica* *Hemizonia congesta* *Lasthenia californica* *Lupinus bicolor* *Lupinus formosus* *Lupinus nanus* *Nemophila menziesii* *Penstemon heterophyllus* *Trifolium bifidum* *Trifolium fucatum* *Trifolium obtusiflorum*	*Achillea millefolium* *Artemisia douglasiana* Asclepias fascicularis *Euthamia occidentalis* *Grindelia camporum* *Phacelia californica* *Plantago erecta* *Symphyotrichum chilense*

Geographic region: *Northern coast*

Restoration goal: *Enhance wildlife*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood tolerant *Lasthenia californica*	Flood tolerant *Lasthenia californica* Flood intolerant *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Deschampsia cespitosa* *Lasthenia californica* *Festuca rubra* *Koeleria macrantha* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Deschampsia cespitosa* *Elymus trachycaulus* *Elymus triticoides* *Festuca rubra* *Koeleria macrantha* *Lasthenia californica* Flood intolerant *Achillea millefolium* *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Agrostis exarata* *Clarkia purpurea* *Danthonia californica* *Epilobium canum* *Hemizonia congesta* *Lasthenia californica* *Melica californica* Flood intolerant *Euthamia occidentalis* *Poa secunda* *Symphyotrichum chilense*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Clarkia purpurea* *Croton setiger* *Danthonia californica* *Elymus triticoides* *Epilobium canum* *Escholzia californica* *Grindelia camporum* *Hemizonia congesta* *Hordeum brachyantherum* *Lasthenia californica* *Lupinus formosus* *Melica californica* Flood intolerant *Artemisia douglasiana* *Asclepias fascicularis* *Euthamia occidentalis* *Poa secunda* *Symphyotrichum chilense*	Flood tolerant *Cirsium occidentale* *Clarkia purpurea* *Danthonia californica* *Deschampsia cespitosa* *Epilobium canum* *Festuca microstachys* *Festuca rubra* *Hemizonia congesta* *Koeleria macrantha* *Lasthenia californica* *Lupinus bicolor* *Melica californica* *Penstemon heterophyllus* *Stipa lepida* Flood intolerant *Euthamia occidentalis* *Festuca idahoensis* *Phacelia californica* *Poa secunda* *Symphyotrichum chilense*	Flood tolerant *Calandrinia menziesii* *Clarkia purpurea* *Cirsium occidentale* *Croton setiger* *Danthonia californica* *Deschampsia cespitosa* *Elymus trachycaulus* *Elymus triticoides* *Epilobium canum* *Escholzia californica* *Festuca microstachys* *Festuca rubra* *Hemizonia congesta* *Hordeum brachyantherum* *Koeleria macrantha* *Lasthenia californica* *Lupinus bicolor* *Lupinus formosus* *Melica californica* *Penstemon heterophyllus* *Stipa lepida* Flood intolerant *Achillea millefolium* *Artemisia douglasii* *Asclepias fascicularis* *Elymus glaucus* *Euthamia occidentalis* *Festuca idahoensis* *Grindelia camporum* *Phacelia californica* *Poa secunda* *Symphyotrichum chilense*

Geographic region: *Northern coast*
Restoration goal: *Enhance soil health*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO

			Flood tolerant *Lupinus nanus* *Trifolium bifidum*	Flood tolerant *Acmispon americanus* *Bromus carinatus* *Lupinus formosus* *Lupinus nanus* *Trifolium bifidum* *Trifolium willdenowii*	Flood tolerant *Lupinus bicolor* *Lupinus nanus* *Trifolium bifidum* *Trifolium obtusiflorum*	Flood tolerant *Acmispon americanus* *Lupinus bicolor* *Lupinus formosus* *Lupinus nanus* *Trifolium bifidum* *Trifolium fucatum* *Trifolium obtusiflorum*

Geographic region: *Northern coast*

Restoration goal: *Erosion control*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood tolerant *Juncus patens* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Hordeum jubatum* *Juncus patens* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Festuca rubra* *Juncus patens* *Koeleria macrantha* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Distichlis spicata* *Elymus trachycaulus* *Elymus triticoides* *Festuca rubra* *Hordeum jubatum* *Juncus patens* *Koeleria macrantha* Flood intolerant *Achillea millefolium* *Euthamia occidentalis*	Flood tolerant *Agrostis exarata* *Danthonia californica* *Elymus multisetus* *Juncus patens* *Melica californica* Flood intolerant *Euthamia occidentalis* *Plantago erecta* *Symphyotrichum chilense*	Flood tolerant *Agrostis exarata* *Acmispon americanus* *Bromus carinatus* *Croton setiger* *Danthonia californica* *Elymus multisetus* *Elymus triticoides* *Escholzia californica* *Hordeum brachyantherum* *Hordeum jubatum* *Juncus patens* *Melica californica* Flood intolerant *Artemisia douglasii* *Euthamia occidentalis* *Plantago erecta* *Symphyotrichum chilense*	Flood tolerant *Danthonia californica* *Elymus multisetus* *Festuca microstachys* *Festuca rubra* *Juncus patens* *Koeleria macrantha* *Lupinus bicolor* *Melica californica* *Stipa lepida* *Trifolium obtusiflorum* Flood intolerant *Euthamia occidentalis* *Festuca idahoensis* *Plantago erecta* *Symphyotrichum chilense*	Flood tolerant *Acmispon americanus* *Croton setiger* *Danthonia californica* *Distichlis spicata* *Elymus multisetus* *Elymus trachycaulus* *Elymus triticoides* *Escholzia californica* *Festuca microstachys* *Festuca rubra* *Hordeum brachyantherum* *Hordeum jubatum* *Juncus patens* *Koeleria macrantha* *Lupinus bicolor* *Melica californica* *Stipa lepida* *Trifolium obtusiflorum* Flood intolerant *Achillea millefolium* *Artemisia douglasii* *Euthamia occidentalis* *Festuca idahoensis* *Plantago erecta* *Symphyotrichum chilense*

Geographic region: *Northern interior*

Restoration goal: *Forage production*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
			Flood tolerant *Deschampsia cespitosa* *Koeleria macrantha*	Flood tolerant *Deschampsia cespitosa* *Distichlis spicata* *Elymus trachycaulus* *Elymus triticoides* *Koeleria macrantha*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Danthonia californica* *Elymus condensatus* *Elymus multisetus* Flood intolerant *Poa secunda*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Danthonia californica* *Elymus condensatus* *Elymus multisetus* *Elymus triticoides* *Hordeum brachyantherum* Flood intolerant *Poa secunda*	Flood tolerant *Danthonia californica* *Deschampsia cespitosa* *Elymus condensatus* *Elymus lanceolatus* *Elymus multisetus* *Festuca microstachys* *Koeleria macrantha* Flood intolerant *Festuca idahoensis* *Poa secunda*	Flood tolerant *Calandrinia menziesii* *Danthonia californica* *Deschampsia cespitosa* *Distichlis spicata* *Elymus condensatus* *Elymus lanceolatus* *Elymus multisetus* *Elymus trachycaulus* *Elymus triticoides* *Festuca microstachys* *Hordeum brachyantherum* *Koeleria macrantha* Flood intolerant *Elymus glaucus* *Festuca idahoensis* *Poa secunda*

Geographic region: *Northern interior*

Restoration goal: *Invasive plant management*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
				Flood tolerant *Elymus trachycaulus* Flood intolerant *Achillea millefolium*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Elymus multisetus* *Melica californica* Flood intolerant *Poa secunda*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Elymus multisetus* *Lupinus microcarpus* *Melica californica* Flood intolerant *Poa secunda*	Flood tolerant *Elymus elymoides* *Elymus multisetus* *Melica californica* Flood intolerant *Poa secunda*	Flood tolerant *Elymus elymoides* *Elymus multisetus* *Elymus trachycaulus* *Lupinus microcarpus* *Melica californica* Flood intolerant *Achillea millefolium* *Elymus glaucus* *Poa secunda*

Geographic region: *Northern interior*

Restoration goal: *Enhance biodiversity*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood intolerant *Euthamia occidentalis*	Flood intolerant *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Festuca rubra* *Koeleria macrantha* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Festuca rubra* *Koeleria macrantha* Flood intolerant *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Agrostis exarata* *Clarkia purpurea* *Danthonia californica* *Elymus condensatus* *Elymus multisetus* Flood intolerant *Euthamia occidentalis* *Poa secunda*	Flood tolerant *Agrostis exarata* *Clarkia purpurea* *Danthonia californica* *Elymus condensatus* *Elymus multisetus* *Escholzia californica* *Lupinus microcarpus* Flood intolerant *Asclepias fascicularis* *Euthamia occidentalis* *Poa secunda*	Flood tolerant *Cirsium occidentale* *Clarkia purpurea* *Cryptantha intermedia* *Danthonia californica* *Elymus condensatus* *Elymus elymoides* *Elymus lanceolatus* *Elymus multisetus* *Festuca microstachys* *Festuca rubra* *Koeleria macrantha* *Lupinus bicolor* Flood intolerant *Euthamia occidentalis* *Festuca idahoensis* *Poa secunda*	Flood tolerant *Cirsium occidentale* *Clarkia purpurea* *Cryptantha intermedia* *Danthonia californica* *Elymus condensatus* *Elymus elymoides* *Elymus lanceolatus* *Elymus multisetus* *Escholzia californica* *Festuca microstachys* *Festuca rubra* *Koeleria macrantha* *Lupinus bicolor* *Lupinus microcarpus* Flood intolerant *Asclepias fascicularis* *Euthamia occidentalis* *Festuca idahoensis* *Poa secunda*

Geographic region: *Northern interior*

Restoration goal: *Enhance pollinators*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood intolerant *Euthamia occidentalis*	Flood intolerant *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Deschampsia cespitosa* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Deschampsia cespitosa* Flood intolerant *Achillea millefolium* *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Clarkia purpurea* *Danthonia californica* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Acmispon americanus* *Clarkia purpurea* *Danthonia californica* *Escholzia californica* *Lupinus microcarpus* *Trifolium willdenowii* Flood intolerant *Artemisia douglasiana* *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Cirsium occidentale* *Cryptantha intermedia* *Clarkia purpurea* *Danthonia californica* *Deschampsia cespitosa* *Lupinus bicolor* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Acmispon americanus* *Calandrinia menziesii* *Cirsium occidentale* *Clarkia purpurea* *Cryptantha intermedia* *Danthonia californica* *Deschampsia cespitosa* *Escholzia californica* *Lupinus bicolor* *Lupinus microcarpus* Flood intolerant Achillea millefolium Artemisia douglasiana Asclepias fascicularis *Euthamia occidentalis*

Geographic region: *Northern interior*
Restoration goal: *Enhance wildlife*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood intolerant *Euthamia occidentalis*	Flood intolerant *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Deschampsia cespitosa* *Festuca rubra* *Koeleria macrantha* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Deschampsia cespitosa* *Elymus trachycaulus* *Elymus triticoides* *Festuca rubra* *Koeleria macrantha* Flood intolerant *Achillea millefolium* *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Agrostis exarata* *Clarkia purpurea* *Danthonia californica* Flood intolerant *Euthamia occidentalis* *Poa secunda*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Clarkia purpurea* *Croton setiger* *Danthonia californica* *Elymus triticoides* *Escholzia californica* *Hordeum brachyantherum* *Lupinus microcarpus* Flood intolerant *Artemisia douglasiana* *Asclepias fascicularis* *Euthamia occidentalis* *Poa secunda*	Flood tolerant *Cirsium occidentale* *Clarkia purpurea* *Danthonia californica* *Deschampsia cespitosa* *Elymus lanceolatus* *Festuca microstachys* *Festuca rubra* *Koeleria macrantha* *Lupinus bicolor* Flood intolerant *Euthamia occidentalis* *Festuca idahoensis* *Poa secunda*	Flood tolerant *Calandrinia menziesii* *Cirsium occidentale* *Clarkia purpurea* *Croton setiger* *Danthonia californica* *Deschampsia cespitosa* *Elymus lanceolatus* *Elymus trachycaulus* *Elymus triticoides* *Escholzia californica* *Festuca rubra* *Festuca microstachys* *Hordeum brachyantherum* *Koeleria macrantha* *Lupinus bicolor* *Lupinus microcarpus* Flood intolerant *Achillea millefolium* *Artemisia douglasiana* *Asclepias fascicularis* *Elymus glaucus* *Euthamia occidentalis* *Festuca idahoensis* *Poa secunda*

Geographic region: *Northern interior*

Restoration goal: *Enhance soil health*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
						Flood tolerant *Acmispon americanus* *Bromus carinatus* *Lupinus microcarpus* *Trifolium willdenowii*	Flood tolerant *Lupinus bicolor*	Flood tolerant *Acmispon americanus* *Lupinus bicolor* *Lupinus microcarpus*

Geographic region: *Northern interior*
Restoration goal: *Erosion control*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood intolerant *Euthamia occidentalis*	Flood tolerant *Hordeum jubatum* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Festuca rubra* *Koeleria macrantha* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Distichlis spicata* *Elymus triticoides* *Elymus trachycaulus* *Festuca rubra* *Hordeum jubatum* *Koeleria macrantha* Flood intolerant *Achillea millefolium* *Euthamia occidentalis*	Flood tolerant *Agrostis exarata* *Danthonia californica* *Elymus condensatus* *Elymus multisetus* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Agrostis exarata* *Acmispon americanus* *Bromus carinatus* *Croton setiger* *Danthonia californica* *Elymus condensatus* *Elymus multisetus* *Elymus triticoides* *Escholzia californica* *Hordeum brachyantherum* *Hordeum jubatum* *Lupinus microcarpus* Flood intolerant *Artemisia californica* *Euthamia occidentalis*	Flood tolerant *Danthonia californica* *Elymus condensatus* *Elymus elymoides* *Elymus lanceolatus* *Elymus multisetus* *Festuca microstachys* *Festuca rubra* *Koeleria macrantha* *Lupinus bicolor* Flood intolerant Euthamia occidentalis Festuca idahoensis	Flood tolerant *Acmispon americanus* *Croton setiger* *Danthonia californica* *Distichlis spicata* *Elymus condensatus* *Elymus elymoides* *Elymus lanceolatus* *Elymus multisetus* *Elymus trachycaulus* *Elymus triticoides* *Escholzia californica* *Festuca microstachys* *Festuca rubra* *Hordeum brachyantherum* *Hordeum jubatum* *Koeleria macrantha* *Lupinus bicolor* *Lupinus microcarpus* Flood intolerant *Achillea millefolium* *Artemisia dougasiana* *Euthamia occidentalis* *Festuca idahoensis*

Geographic region: *Basin*

Restoration goal: *Forage production*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
			Flood tolerant *Deschampsia cespitosa*	Flood tolerant *Deschampsia cespitosa* *Distichlis spicata* *Elymus trachycaulus* *Elymus triticoides*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Danthonia californica* *Elymus multisetus* Flood intolerant *Poa secunda*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Danthonia californica* *Elymus multisetus* *Elymus triticoides* *Hordeum brachyantherum* Flood intolerant *Poa secunda*	Flood tolerant *Danthonia californica* *Deschampsia cespitosa* *Elymus lanceolatus* *Elymus multisetus* *Festuca microstachys* Flood intolerant *Poa secunda* *Festuca idahoensis*	Flood tolerant *Calandrinia menziesii* *Danthonia californica* *Deschampsia cespitosa* *Distichlis spicata* *Elymus lanceolatus* *Elymus multisetus* *Elymus trachycaulus* *Elymus triticoides* *Festuca microstachys* *Hordeum brachyantherum* Flood intolerant *Elymus glaucus* *Festuca idahoensis* *Poa secunda*

Geographic region: *Basin*

Restoration goal: *Invasive plant management*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
				Flood tolerant *Elymus trachycaulus* Flood intolerant *Achillea millefolium*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Elymus multisetus* Flood intolerant *Poa secunda*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Elymus multisetus* Flood intolerant *Poa secunda*	Flood tolerant *Elymus elymoides* *Elymus multisetus* Flood intolerant *Poa secunda*	Flood tolerant *Elymus elymoides* *Elymus multisetus* *Elymus trachycaulus* Flood intolerant *Achillea millefolium* *Elymus glaucus* *Poa secunda*

Geographic region: *Basin*

Restoration goal: *Enhance biodiversity*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood intolerant *Euthamia occidentalis*	Flood intolerant *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Deschampsia cespitosa* *Festuca rubra* *Koeleria macrantha* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Deschampsia cespitosa* *Festuca rubra* *Koeleria macrantha* Flood intolerant *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Agrostis exarata* *Danthonia californica* *Elymus multisetus* *Epilobium canum* Flood intolerant *Poa secunda* *Euthamia occidentalis*	Flood tolerant *Agrostis exarata* *Danthonia californica* *Elymus multisetus* *Epilobium canum* *Escholzia californica* *Lupinus formosus* Flood intolerant *Asclepias fascicularis* *Euthamia occidentalis* *Poa secunda*	Flood tolerant *Cirsium occidentale* *Clarkia unguiculata* *Danthonia californica* *Deschampsia cespitosa* *Elymus elymoides* *Elymus lanceolatus* *Elymus multisetus* *Epilobium canum* *Festuca microstachys* *Festuca rubra* *Koeleria macrantha* Flood intolerant *Euthamia occidentalis* *Festuca idahoensis* *Grindelia camporum* *Poa secunda*	Flood tolerant *Calandrinia menziesii* *Cirsium occidentale* *Clarkia unguiculata* *Danthonia californica* *Deschampsia cespitosa* *Elymus elymoides* *Elymus lanceolatus* *Elymus multisetus* *Epilobium canum* *Escholzia californica* *Festuca microstachys* *Festuca rubra* *Koeleria macrantha* *Lupinus formosus* Flood intolerant *Asclepias fascicularis* *Euthamia occidentalis* *Festuca idahoensis* *Grindelia camporum* *Poa secunda*

Geographic region: *Basin*

Restoration goal: *Enhance pollinators*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood intolerant *Euthamia occidentalis*	Flood intolerant *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Deschampsia cespitosa* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Deschampsia cespitosa* Flood intolerant *Achillea millefolium* *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Danthonia californica* *Epilobium canum* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Acmispon americanus* *Danthonia californica* *Epilobium canum* *Escholzia californica* *Lupinus formosus* *Trifolium willdenowii* Flood intolerant *Artemisia douglasiana* *Asclepias fascicularis* *Euthamia occidentalis* *Grindelia camporum*	Flood tolerant *Cirsium occidentale* *Clarkia unguiculata* *Danthonia californica* *Deschampsia cespitosa* *Epilobium canum* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Acmispon americanus* *Calandrinia menziesii* *Clarkia unguiculata* *Cirsium occidentale* *Danthonia californica* *Deschampsia cespitosa* *Epilobium canum* *Escholzia californica* *Lupinus formosus* Flood intolerant *Achillea millefolium* Artemisia douglasiana *Asclepias fascicularis* *Euthamia occidentalis* *Grindelia camporum*

Geographic region: *Basin*

Restoration goal: *Enhance wildlife*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood intolerant *Euthamia occidentalis*	Flood intolerant *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Deschampsia cespitosa* *Festuca rubra* *Koeleria macrantha* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Deschampsia cespitosa* *Elymus trachycaulus* *Elymus triticoides* *Festuca rubra* *Koeleria macrantha* Flood intolerant *Achillea millefolium* *Asclepias fascicularis* *Euthamia occidentalis*	Flood tolerant *Agrostis exarata* *Danthonia californica* *Epilobium canum* Flood intolerant *Euthamia occidentalis* *Festuca idahoensis* *Poa secunda*	Flood tolerant *Agrostis exarata* *Bromus carinatus* *Croton setiger* *Danthonia californica* *Elymus triticoides* *Epilobium canum* *Escholzia cailfornica* *Hordeum brachyantherum* *Lupinus formosus* Flood intolerant *Artemesia douglasiana* *Asclepias fascicularis* *Euthamia occidentalis* *Festuca idahoensis* *Grindelia camporum* *Poa secunda*	Flood tolerant *Cirsium occidentale* *Danthonia californica* *Deschampsia cespitosa* *Elymus lanceolatus* *Epilobium canum* *Festuca microstachys* *Festuca rubra* *Koeleria macrantha* Flood intolerant *Euthamia occidentalis* *Festuca idahoensis* *Poa secunda*	Flood tolerant *Calandrinia menziesii* *Cirsium occidentale* *Croton setiger* *Danthonia californica* *Deschampsia cespitosa* *Elymus lanceolatus* *Elymus trachycaulus* *Elymus triticoides* *Epilobium canum* *Escholzia californica* *Festuca microstachys* *Festuca rubra* *Hordeum brachyantherum* *Koeleria macrantha* *Lupinus formosus* Flood intolerant *Achillea millefolium* *Artemisia douglasiana* *Asclepias fascicularis* *Elymus glaucus* *Euthamia occidentalis* *Festuca idahoensis* *Grindelia camporum* *Poa secunda*

Geographic region: *Basin*
Restoration goal: *Enhance soil health*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
						Flood tolerant *Acmispon americanus* *Bromus carinatus* *Lupinus formosus* *Trifolium willdenowii*		Flood tolerant *Acmispon americanus* *Lupinus formosus*

Geographic region: *Basin*
Restoration goal: *Erosion control*

Saline soil?	YES				NO			
What best describes soil?	CLAY		SANDY		CLAY		SANDY	
Is site on or near agricultural fields or rangeland?	YES	NO	YES	NO	YES	NO	YES	NO
	Flood intolerant *Euthamia occidentalis*	Flood tolerant *Hordeum jubatum* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Festuca rubra* *Koeleria macrantha* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Distichlis spicata* *Elymus trachycaulus* *Elymus triticoides* *Festuca rubra* *Hordeum jubatum* *Koeleria macrantha* Flood intolerant *Achillea millefolium* *Euthamia occidentalis*	Flood tolerant *Agrostis exarata* *Danthonia californica* *Elymus multisetus* Flood intolerant *Euthamia occidentalis*	Flood tolerant *Acmispon americanus* *Agrostis exarata* *Bromus carinatus* *Croton setiger* *Danthonia californica* *Elymus multisetus* *Elymus triticoides* *Escholzia californica* *Hordeum brachyantherum* *Hordeum jubatum* Flood intolerant *Artemisia douglasiana* *Euthamia occidentalis*	Flood tolerant *Danthonia californica* *Elymus elymoides* *Elymus lanceolatus* *Elymus multisetus* *Festuca microstachys* *Festuca rubra* *Koeleria macrantha* Flood intolerant Euthamia occidentalis Festuca idahoensis	Flood tolerant *Acmispon americanus* *Croton setiger* *Danthonia californica* *Distichlis spicata* *Elymus elymoides* *Elymus lanceolatus* *Elymus multisetus* *Elymus trachycaulus* *Elymus triticoides* *Escholzia californica* *Festuca microstachys* *Festuca rubra* *Hordeum brachyantherum* *Hordeum jubatum* *Koeleria macrantha* Flood intolerant *Achillea millefolium* *Artemisia douglasiana* *Euthamia occidentalis* *Festuca idahoensis*

Acknowledgments

We are grateful to the many individuals who provided thoughtful comments on this document. This includes Edith Allen, University of California Cooperative Extension; Travis Bean, University of California Cooperative Extension; Josh Davy, University of California Cooperative Extension; Joe DiTomaso, University of California Cooperative Extension; D. J. Eastburn, University of California, Davis; Taraneh Emam, ECORP Consulting, Inc.; Andy Kleinhesselink, Utah State University; Kara Moore-O'Leary, U.S. Fish and Wildlife Service; Leslie Roche, University of California Cooperative Extension; Richard Smith, University of California, Cooperative Extension; and Kristina Wolf, University of California, Davis). All photos by E. Gornish.

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Publication 8575
ISBN-13: 978-1-60107-984-8

An electronic copy of this publication can be found at the ANR Communication Services catalog website, http://anrcatalog.ucanr.edu/.

<pr logo>This publication has been anonymously peer reviewed for technical accuracy by University of California scientists and other qualified professionals. This review process was managed by ANR Associate Editor for Natural, Marine, and Freshwater Resources William Stewart.

web-6/17-SB/CR