Original Kite Aerial Photo by Cris Benton

BAXTER CREEK GATEWAY
RESTORATION PROJECT

MAINTENANCE & MANAGEMENT GUIDE

May 12, 2006

A Collaborative project by:

City of El Cerrito
Friends of Baxter Creek
The Watershed Project
Urban Creeks Council
Restoration Design Group

Funding provided by:

City of El Cerrito
California Coastal Conservancy
State Water Resources Control Board

the watershed project
Coastal Conservancy
Water Boards
THE CITY OF EL CERRITO

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INTRODUCTION

The *Baxter Creek Maintenance and Management Guide* is a working manual for ongoing landscape maintenance of the Baxter Creek urban stream restoration project at the Baxter Creek Gateway Park. The *Guide* was developed by the Maintenance & Management Working Group with assistance from the Restoration Design Group and the Urban Creeks Council. It reflects the views and concerns of a diverse set of individuals and agency representatives, and sets forth a cooperative approach to managing the restored landscape. This Guide will be updated and revised as lessons are learned over time.

Purpose

This *Guide* is intended for use by those involved in working to create healthy, safe, and attractive creek environments, including the City of El Cerrito Public Works Department, Friends of Baxter Creek, landscape contractors, and volunteer service groups. By incorporating current regulatory requirements, much of the principals described here also apply to maintenance and management of restored reaches throughout the city.

The purpose of the *Guide* is to provide a landscape management tool for coordinating individual maintenance efforts and creating a landscape setting for the creek and trail which promotes healthy habitat, requires minimal maintenance, is aesthetically pleasing, and upholds a sense of personal safety. The Guide also addresses how maintenance and management activities will evolve over time as the project matures.

How to Use This Guide

This manual is organized into three main sections: Management, Maintenance Schedule, and Resource Sheets.

The *Management Approach* describes the overall "philosophy", implementation strategy, and approach to maintenance and management of the Gateway site.

The *Maintenance Schedules* are year-by-year guides to specific tasks that should be undertaken at the project site each season. Maintenance managers may use the checklist to assign tasks to subcontractors and volunteer groups, track task completion, and record observations or issues over time. The *Checklists* are also seasonal guides that allow field crews, agency staff, contractors and volunteers know which tasks are most important during the different stages of the newly established restoration project.

The *Resource Sheets* provide managers and field crews with information needed to carry out the maintenance tasks listed in the checklists. These documents are intended for field use.

MANAGEMENT APPROACH

The "Natural Park" Concept

The concept of a "Natural Park" embodies the idea that landscapes can be managed and used in ways that balance public use, aesthetic preferences, and a resilient creek ecology that supports species habitat. Since its inception, the community has promoted a *Natural Park Concept* for the Gateway site. Many parks are manicured green spaces comprised of lawns, picnic areas, and playgrounds to support the active recreational needs of the human community. The Gateway site is designed and maintained to promote ecological values by providing diverse plant communities and wildlife habitat. In contrast to a typical urban park, this park will support passive recreation--emphasizing wildlife observation, interpretation, and responsible access.

This project is the result of several years of planning, and will serve as representative project for future endeavors toward natural park planning and restoration.

The site design for the park integrates the creek restoration, habitat, and environmental education goals of the project. Curvilinear features define the site's character—from the Ohlone Greenway Trail alignment to creek meanders, seat-walls, the creek access ramp, and site furnishings. Materials are simple and unadorned, including: board-formed concrete, asphalt, boulders, and crushed stone surfacing. Site grading supports this natural character aesthetic with flowing lines and subtle elevation changes, while integrating flood control by restoring the creek meanders and the floodplain. Revegetation will rely on riparian and upland natives, planted to establish a functional creek corridor ecosystem that evokes the historical setting of East Bay Area creek habitats.

The Baxter Creek Gateway site is designed to support two distinct native plant communities historically found in this region. The *Riparian Community* is associated with the moist, rich soils within Baxter Creek, its banks and floodplain. The other is the *Oak-Grassland Community*, which comprises the rest of the park and defines the Ohlone Greenway Trail landscape.

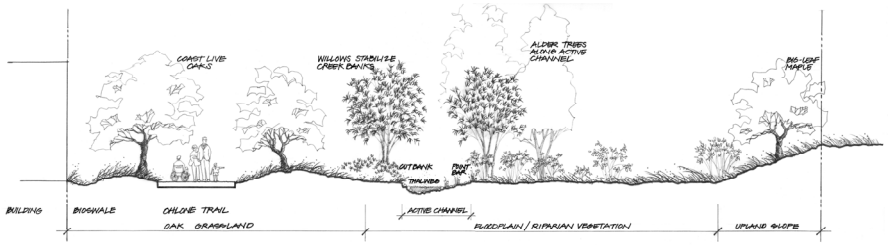
The *Riparian Community* consists of specialized plants that are adapted to creekside conditions. The deep, thirsty root systems of these species will stabilize the creek banks and reduce erosion. The canopy created by this vegetation shade the creek, cooling water temperatures and shading out invasive vegetation.

The *Oak-Grassland Community* evokes the upland landscapes of the Bay Area where oak trees grow among native grasses and wildflowers. This plant community is adapted to our climate's dry summers and winter rains.

The success of the Baxter Creek Gateway restoration is contingent on the implementation of this *Maintenance & Management Guide*, and the support of the *Natural Park Concept*. Maintenance and management of this site requires sensitivity to a variety of issues. The *Guide* strives to balance the multiple and often conflicting objectives of a *Natural Park* in an urban area:

- Riparian Habitat: Provide quality habitat for native amphibians, birds, and other species by creating a diverse native plant population along Baxter Creek.
- Recreation: Provide interesting and safe pedestrian and bicycle experience along the Ohlone Greenway Trail through the site as well as opportunities for people to access and explore the creek on foot trails.
- Water Quality: Improve water quality in the creek by creating a native vegetative buffer to filter stormwater pollution, reduce erosion, and stabilize creek banks. Protect water quality in the creek by applying Integrated Pest Management (IPM) techniques and avoid use of pesticides & herbicides.
- Public Safety/Access: Ensure sight lines through vegetation, and provide clear visual access throughout the site. Provide appropriate level of physical and universal access to the creek. Manage vegetation to minimize fire hazard.

- Aesthetics: Manage site resources to enhance and maintain a meaningful and attractive setting to encourage visitation and stewardship.
- Flood Damage Reduction: Improve channel capacity by restoring the channel and floodplain and managing in-stream and creek bank vegetation.
- Environmental Education: Create a setting which accommodates formal and informal environmental education and the exploration of native Riparian and Oak-Grassland plant communities.



Section illustrating the corridor following floodplain restoration. The creek channel and floodplain make up the riparian corridor.

Adaptive Management Approach

Because urban creek restoration projects are living, changing, unpredictable features, their unique attributes require an *Adaptive Management* approach to ensure that maintenance efforts are targeted where needed most. Adaptive Management is a process for continually improving management practices based on lessons learned over time.

At the Gateway Site, this will involve regular site visits to identify any problems and confirm maintenance tasks for implementation each season. Over time, adjustments to the initial management policies may be required. To achieve typical restoration goals and objectives it is necessary to monitor the effectiveness of maintenance activities as well as the overall health and conditions of the park. Monitoring leads to the evaluation of maintenance and management practices and encourages revisiting project objectives. The result is that practices and outcomes evolve and adapt over time to meet desired objective for the restoration.

At the Baxter Creek Gateway site, *Adaptive Management* will be implemented through a collaborative approach, including seasonal site visits by a team of professionals and local stakeholders to identify concerns and evaluate maintenance and management practices. The *Guide* recommends that an *ad hoc* Maintenance Advisory Committee be established to lead these site visits and to adapt maintenance goals, objectives, and procedures on a seasonal and year-to-year basis.

Maintenance Issues

In addition to maintenance issues encountered in typical urban parks, creek restoration sites face these specific concerns:

- General Site Management: Creek restoration sites often fall victim to more than their share of abuse. Litter, dumping, vandalism, encampments, off-leash dog use, and off-trail human access are common problems, and all degrade the resource. Other maintenance issues include lighting and irrigation systems, signage, site furnishings, and vector control.

- Vegetation Management: Proper plant selection and restoration design sets the stage for a successful vegetation restoration, but it is only part of the story. Plants will require on-going attention for the first three to five years until they establish the site on its way to achieving the project vegetation objectives. Temporary fencing and staking may be required to protect immature plants through the establishment period. The largest challenge will come from invasive species that strive to colonize the site and out compete native plants.
- Creek Channel Management: Maintenance of in-channel elements (riffle starters, coir bank protection, inlet headwalls, and creek access areas) require specialized skills and careful analysis of the evolving creek channel condition.

Implementation

Maintenance and management activities on Baxter Creek will be directed by the City of El Cerrito Public Works Department, yet successful restoration management will require the cooperation of many parties. Likely roles are outlined below.

- Public Works Department: Coordinate and track maintenance activities, oversee implementation by staff, contractors, and volunteer groups, and evaluate progress over time.
- Police and Fire Departments: Participate in regular site visits to help identify areas of concern and establish security sight lines through the property.
- Friends of Baxter Creek / Volunteers: Function as the "eyes and ears" for the creek and park. They will be requested to report problems to the City Public Works Department. These groups or individuals may adopt and maintain sensitive resource zones along the creek; assist in overall maintenance efforts; and participate in Maintenance Advisory Committee site visits.
- Landscape Contractors: Provide services under contract to Public Works Department, and participate in team site visits.

As described in the Adaptive Management section, seasonal Maintenance Advisory Committee site visits to the creek will be integral to determining the appropriate maintenance activities. The *ad hoc* Maintenance Advisory Committee should include representatives from key interest groups, including those parties listed above.

Training should be provided to City staff, contractors, and volunteer groups to ensure that maintenance tasks are carried out appropriately and in a coordinated manner.

Permitting requirements may change over time. City staff should communicate with permitting agencies on an annual basis to notify them of maintenance activities/plans and determine if restoration maintenance activities will trigger permit requirements.

Funding

Since its inception, this project was conceived as an opportunity to design and implement a public park with Baxter Creek and the Ohlone Greenway at its core. Project funding from agencies concerned with flood protection and environmental quality was sought and awarded. Community participation in the design process, similarly expressed a sincere desire to protect the creek, establish native vegetation, and create a "natural park" setting as discussed in previous chapters. The design and implementation of this project is only the beginning of the process of satisfying the vision of all of these stakeholders.

Fulfillment of the restoration goals for the Baxter Creek Gateway hinges on effective maintenance and management. Early financial investment in site maintenance will establish riparian vegetation that in turn will lower long-term maintenance efforts and costs. Critical to the restoration's ultimate success will be its ability to attract funding and maintenance staff from the City of El Cerrito's Public Works Department.

GENERAL SITE MANAGEMENT

In general, management of the Baxter Creek Gateway park follows standard public open space and park management procedures. However, there are some exceptions due to the unique character of restoration projects.

Litter & Debris

- Report any observed dumping to the dumping hotline (1-800-NO-DUMPING).
- Remove blockages and debris from the trash rack upstream of the culvert. This acts as a preventative measure against flooding.
- Immediately notify City of larger blockages that are too big to hand pull (e.g. appliances).
- Bag & label used motor oil filters, paint cans, automotive batteries, or any other hazardous materials for the City to dispose of properly or recycle. Do not pick up syringes, needles, or drug paraphernalia. Contact City staff for proper disposal.
- Leave large woody debris on site to act as a habitat feature unless it obstructs creek flow or act as a barrier to the culvert.
- Notify the City of large woody debris or downed trees that are obstructing creek flow or posing a threat. This material should be cut and removed from the channel to alleviate possible flooding and/or erosion.
- Properly dispose of dog waste in trash receptacles.

Irrigation

- Notify Public Works if the soil appears too dry or hard or if the ground seems over-saturated or spigots are gushing.
- If the irrigation system is failing to deliver water to any zones, hand watering may be needed until the system is repaired.
- Visit the site while the irrigation system is on to check irrigation coverage and overall performance
- Once the native plants are established (usually after irrigating for the first two years), it may be best to turn off the irrigation in these zones. The natural wet/dry seasonal cycles benefit native plants, while year-round soil moisture from irrigation gives opportunistic weeds an advantage.

Site Furnishings / Lighting / Signage / Fencing

- Site Furnishings will be subject to rough use, over-use, and vandal typical of public park settings. Repair and replace units damaged in a timely manner to remind would-be vandals that the site is a well-loved and supported community resource. Stewardship typically begets considerate use.
- Lighting systems for seating areas and trails are critical elements of the overall public safety program for the park. Ensure that fixtures and bulbs are replaced in kind to maintain the lighting design and engineering intent.
- Regularly check lighting system light levels and call boxes for working order.
- Railings must be maintained to meet code requirements.

Paving / Walls / Stairs / Pathways

- Check pavement integrity, especially decomposed granite paving affected by flood flows.
- Repair undercut pavements and walls

Public Use

- If an encampment is encountered, notify City Police and the Department of Public Works.

- Repair damages caused by vandalism immediately to prevent possible injury. Check for graffiti on a weekly basis and clean up promptly to discourage future acts.
- Off leash dogs lower water quality and habitat value for potential wildlife, especially birds. Notify the Parks Department regarding enforcement of local ordinances.
- Uncontrolled creek access or trampling of vegetation can cause erosion problems which worsen if left untreated. In general, these areas should be replanted to protect the soil. Depending on the location and degree of damage, boulders, signs, or fences may become necessary. However, if it appears that appropriate creek access for people is desired in that particular spot, it is usually best to provide controlled access that is safe and well-designed.

VEGETATION MANAGEMENT

Vegetation management for urban restoration projects begins with the careful analysis of a site's environmental conditions and the development of appropriate revegetation strategies throughout the design, construction, and maintenance phases. Once the initial revegetation work has been completed, Vegetation Management and Maintenance are necessary to keep invasive weeds in check and encourage establishment of a functioning, resilient riparian plant community.

Management and maintenance of restoration vegetation involves not only factors directly related to the health and viability of the new vegetation such as irrigation and weed control but also factors related to maintenance feasibility and practices, public safety, water quality, and aesthetics. The Vegetation Management section will discuss:

- Planting
- Pruning
- Watering
- Fertilizing
- Mulch
- Pest and disease control
- Invasive Plant Control
- Mowing

Planting

Project implementation relies on three primary modes of revegetation: vegetative reproduction (cuttings from live plants), seeding, and container plantings. It is important to understand each method to replace plants that die and need to be replaced.

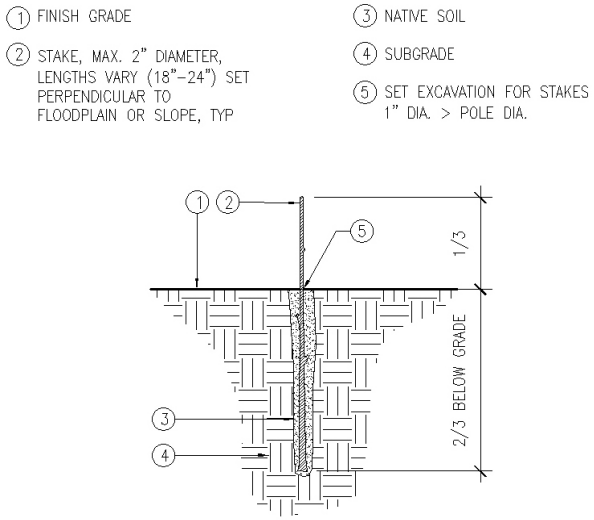
Vegetative Reproduction (Cuttings)

Regular maintenance and monitoring visits will undoubtedly reveal mortalities in the initial cuttings planted on site. Unless conditions in the first season are favorable, up to 50% of the cuttings might fail, however, this was considered in the initial planting density. If greater than 50% of the cuttings have not sprouted new growth by the second year, replacements may be necessary to prevent erosion on slopes. The following describes procedures for collecting and planting new cuttings to replace plants that do not succeed. If the cuttings have not sprouted new growth in spring, it can be assumed that they should be replaced.

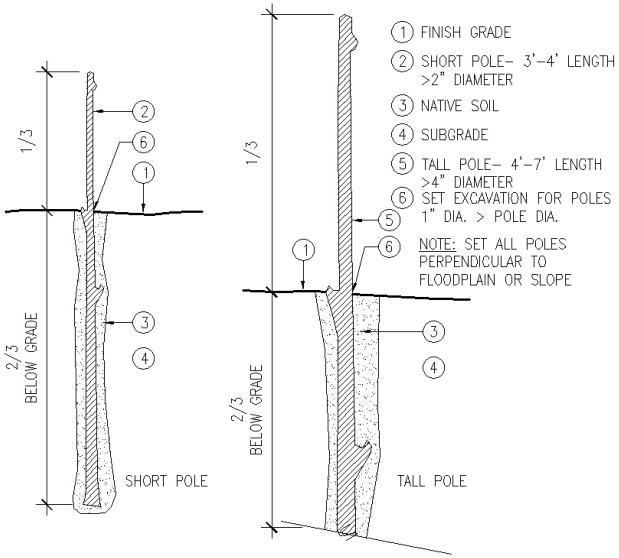
- The propagation of plants from cuttings is common where slopes need to be stabilized to prevent erosion, especially on the creek channel banks where the cutting will have access to the water table. Willow, cottonwood, dogwood, and ninebark are species typically planted as cuttings.
- Gather all cuttings from the lateral branches of healthy plants and wood.
- *Pole cuttings* should be straight, roughly two feet (2’0”) in length, and of a diameter of one (1”) to three (3”) inches. Pole cuttings are installed as a structural element for bank protection and revegetation.
- *Stakes* are live cuttings installed in masses for revegetation. In the initial project installation, cuttings may be used in addition to staples to anchor the erosion control (Coir) fabric).
- Cut the butt end of the cutting (that which is closest to the roots of the mother plant) at a sharp angle so it can be driven into the ground. A mallet may be used to drive pole cuttings into the

ground, but a whole must be prepared with a drive rod or small auger for the insertion of stakes. Cut the top end of the cutting (that which is closest to the terminal bud) flat.

- Remove all side branches and leaves from the cutting (using typical pruning techniques), creating a stake. The bark must remain on the cutting, undamaged.
- Keep cuttings moist and soak them for at least 24 hours prior to planting. Cuttings should be installed within 48 hours of collection.
- To install pole cuttings, drive them at least half of their length into the ground using a mallet. Make sure that the cutting is planted in the direction it was growing on the mother plant; the terminal bud must be above ground and the butt end (the angled end) should be driven into the ground where it will form roots.
- Backfill any open spaces between the soil and the cutting. The cutting will need moisture and soil contact to sprout viable roots into the surrounding soil.



Live stake cutting installation detail (above).



Live pole cutting installation detail (above).

Seeding

The importance of weed removal in the first few growing seasons cannot be overstated. Research indicates that exotic species have overrun California's native grasslands primarily due to increases in disturbance; reinforcing our understanding that most invasive exotics grow quicker above ground during the first few growing seasons and out-compete native species. If exotic species are not actively removed during the first few growing seasons, establishment of native species will be poor.

Additional research has begun to reveal that seed recruitment (the accumulation of viable seed) is one of the greatest obstacles for successful grassland restoration. According to these studies conducted in coastal and inland California, the continual introduction of native seed increases the number of native plants in test plots. *This suggests that adding additional seeding should be an integral part of the maintenance and management of Baxter Creek.*

Refer to the Annual Checklist section of this Guide for specific actions to be taken as native plants become established.

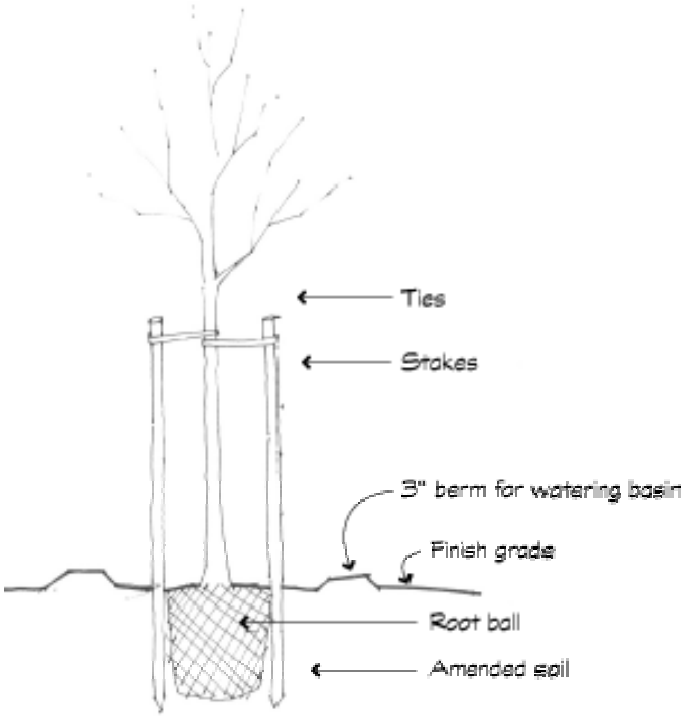
Container Plants

Some plant species are only available in container stock, and replacements should be planted as follows:

- Begin by digging a hole twice as large as the container, in both width and depth and filling the hole with water. Let the water drain out of the hole.
- Place soil amendments into the hole and a 4" layer of 50/50 native soil and organic mixture. The ground is now prepared for planting.
- Remove the plant from the container and break loose the root system. Loosen the roots so that they no longer hold the shape of the container.
- Place the plant in the prepared hole and fill halfway with planting mixture. Note that the crown of the plant should be slightly above grade.
- Tamp soil, water, and let drain.
- Then fill the remainder of the hole with soil leaving the plant's crown uncovered. Any extra soil can be used to create a water basin around the plant. Tamp soil and water thoroughly.

Tree Staking

Young trees may need to be supported by ties to wood or iron stakes. These stakes ensure the tree will grow vertically and be less affected by wind conditions and top-heaviness. While these stakes are initially helpful, these supports can eventually inhibit the trees from naturally developing trunk strength. Stake new trees according to the following detail.



Tree staking detail.

To promote stronger trees, remove stakes after the tree has become established in its new environment . Trees should not be staked for more then two years. Contact a qualified arborist to determine when to remove stakes based on the health and condition of the individual trees.

Pruning Native Plants

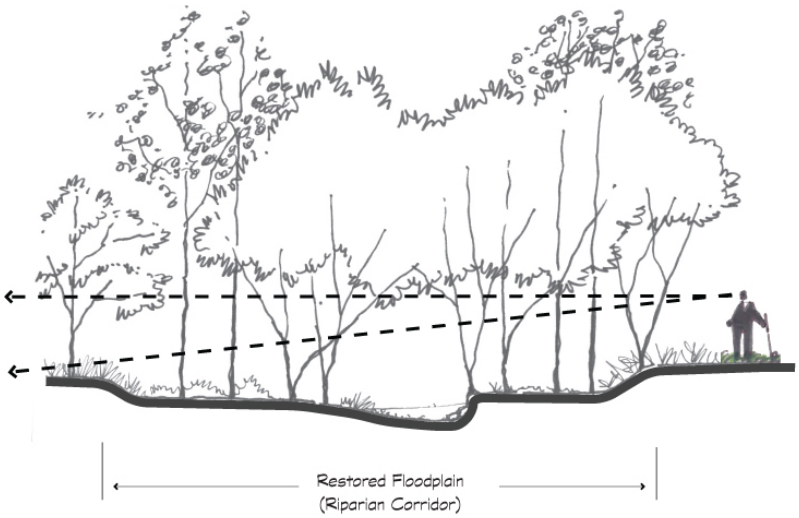
Generally, maintenance staff should monitor plants, ready to focus on preventative and corrective pruning. The goal is to coax the plant along in its natural form as the plant matures. The following points are described in detail in this pruning section.

- *Prune to maintain site lines and direct growth:*
  - After trees have reached 25' or more, they can be limbed up to 8' clearance if needed to maintain site lines.
  - Trees may be pruned to open the canopy, if deemed necessary by the advisory committee.
  - Keep groundcovers low (less than 3') to maintain site lines.
  - Prune shrub masses or thickets to maintain views between masses.
  - Prune to direct plant growth or to keep clear of overhead utilities (power lines).
  - Never "top" shrubs or trees, as it invigorates the plant, stimulating denser growth. It should not be necessary to prune plants because they have grown too large. Never use a hedge trimmer, especially to prune Dogwood or Ninebark shrubs.
- *Prune for plant health:*
  - Remove crossing branches.
  - If breakage occurs, prune branches for a clean cut.
  - Prune away infected parts of a plant to prevent the spread of disease. Prune to control mistletoe.
  - Prune for good branch attachment.
- *Prune to enhance the aesthetics of a plant.*
  - If the plant goes summer deciduous or experiences frost burn, prune. Don't fertilize or water, but do prune. Prune a little more than just the dead portions; up to 30% of the plant/year. Some of the genera like Quercus, Umbellularia, and Arctostaphylos are slow to recover from heavy pruning.
  - Seasonal grooming will keep perennial plants attractive all year.
- *Prune to rejuvenate plants.*
  - Prune to stimulate renewed vigor in shrubs that become leggy with age.
  - Prune flowering species if more flowers or fruits are desired (for habitat or aesthetics).

Why prune?

In the wild, plants in the forests and fields are pruned naturally by wind, weather, browsing animals, and competition for sunlight. The individual plant may suffer from infection that occurs when a limb is torn away, but the understory plants benefit from the additional light that is gained by an opening in the canopy. In this way, the entire collection of plants changes in a natural progression. However, a clear objective of the *Natural Park* concept is that pruning will not be left to the vagaries of nature, but instead the landscape as a whole will be carefully manipulated to create an aesthetic more appropriate for this urban context.

This section describes ways to prune plants in order to keep individual plants healthy, keep them from growing to large or obscuring lines of sight, make them more beautiful, and to rejuvenate them. While the riparian plants provide animal habitat, they must also serve to enhance the park setting. Park users want to experience a healthy, green environment that appears to have been lightly touched by the hand of man, but at the same time many people feel unsafe if distant views are obscured. For this reason, clear lines of sight must be maintained by pruning trees to create an open form and limbing them up (clearance to 8') and keeping groundcovers low. Understory shrubs must be maintained as masses, or groups of shrubs, such that park users can see between masses and across the site, but each mass or thicket is dense enough to be adequate for bird habitat. Individual shrubs within a mass do not need to be maintained in an open form.



Section illustrating the concept of site lines or visual access across the site or into the creek.

Prune for Plant Health

If you peer into an old, unpruned tree or shrub, you see a jumble of branches rubbing together, many of them dead or dying. The wood is weak from lack of light, which, along with poor air circulation, creates the dank conditions favored by disease-causing organisms. This can be seen in both woody and herbaceous plants. Pruning away some branches within the tangled mass of vegetation lets in light and air, inhibiting the growth of disease-producing organisms by allowing damp leaves, shoots, or fruits to dry more rapidly. Removing crossing limbs prevents wounds created when limbs rub together over time and create an entryway for disease.

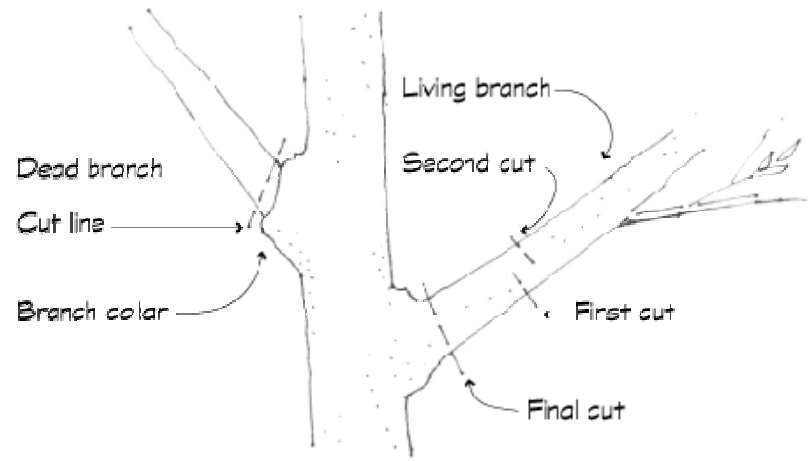
It is inevitable that sometimes natural causes such as wind will break branches, leaving a ragged break or large scar through which disease can gain a foothold. In such a case, prune the limb with a sharp saw to keep the plant healthy.

Generally, maintenance staff should monitor plants, ready to cut away portions attacked by disease or insects. Focus on preventative and

corrective pruning. On a dormant plant, look for problem areas where diseases spend the season. In summer, prune away stems whose leaves have been discolored by disease to prevent future infections.

Pruning also keeps trees healthy by directing growth while the tree is young so that limbs are firmly anchored to the trunk, and not apt to break in high winds or under their own weight. *Selectively pruning trees may be required to ensure good limb attachment.* It is important to perform these tasks correctly to protect the health of the trees and promote an aesthetically pleasing shape. Improperly executed or placed cuts can expose the tree to disease and/or dramatically alter the vertical growth of the tree.

Prune to ensure good branch attachment. Limbs should be cut just outside of the branch collar to ensure that the pruning wound heals properly. The branch collar is a connecting feature of the main limb that joins the branching limb to the tree. If the cut is made into the branch collar, the main limb will be open to disease. If the cut is made too far above the branch collar, a stub will result. Stubs are unattractive and detrimental to tree health as they disrupt plant metabolism. If a stub is created during pruning, it will die and make the tree susceptible to insect infestation and decay. When removing larger limbs, precautions must be taken to ensure that unnecessary damage to the tree does not occur. Preliminary cuts, as illustrated in the following figure, will prevent bark from tearing and wood from splitting. These two preliminary cuts allow the limb to be efficiently removed in such a manner that the tree can quickly heal.



Order of operations for cutting limbs of a tree.

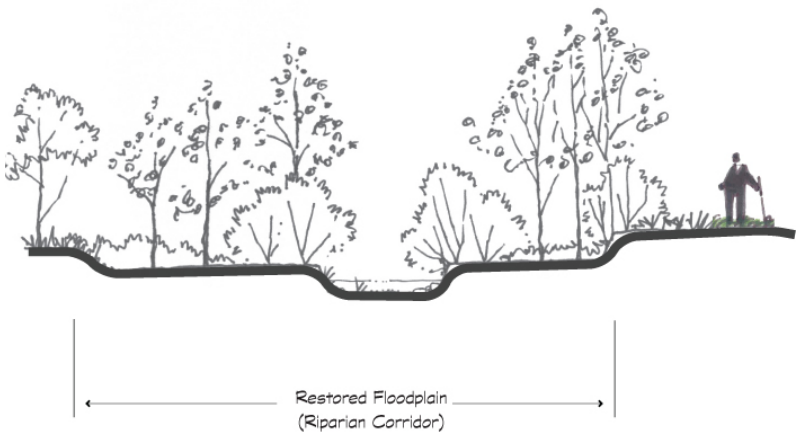
Pruning is essential in the control of mistletoe, a semiparasitic plant that can be a serious pest. Watch for mistletoe species attack on California Sycamore, Ash, Fremont Cottonwood, Oaks, Pines and other native plants. To curtail minor infestations of mistletoe, simply prune off any affected branches. When major limbs are infested, a more extensive treatment is recommended to preserve the structural and aesthetic integrity of the tree. In addition to pruning, paint the cut surface where the mistletoe stem was attached (carefully avoiding any surrounding tissues of the host plant) with Round-up or ethephon, and then cover it with plastic for up to two years. This should kill any mistletoe that may have penetrated the vascular tissue of the host tree, although subsequent treatments are sometimes necessary.

Prune to maintain site lines

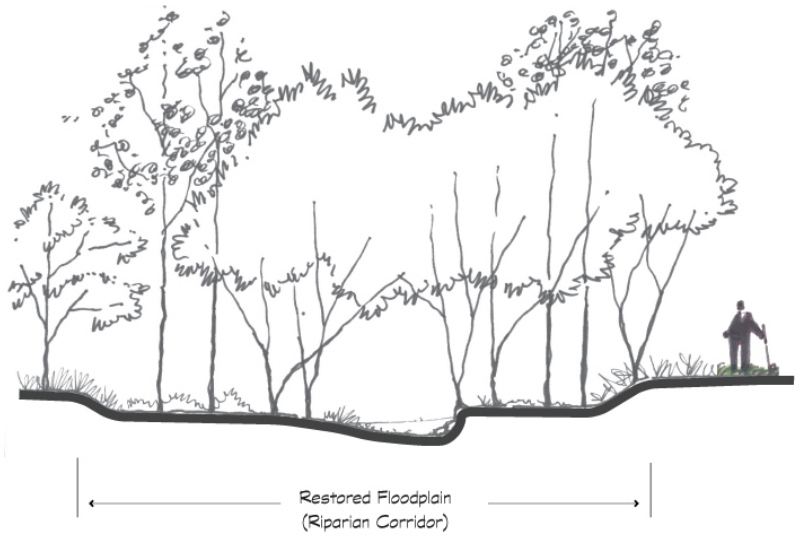
While in general trees should be encouraged to reach their full canopy height, there are a few exceptions in the urban park environment. Under power lines, trees must be pruned to direct growth away from the overhead utilities. Pruning dwarfs plants, and is thus a way to control their size. This does not mean wantonly hacking back branches, especially the leader, an act which stimulates the plant to

direct its vigor to lateral branches, resulting in a thicker, fuller plant that obstructs views across the site. Each cut must take into account the plant's needs as well as its response to various types of pruning cuts.

As a general rule, it is always easier to plant shrubs and trees with the desired form to suit the given situation rather than fighting its natural tendencies. During the first several years after project implementation, the new plants will luxuriate in the sunlight, moisture, and space. Expect an awkward, brushy appearance until these pioneering species start to compete for light and grow taller. *Wait*—in time these plants will open up naturally and grow tall to leave an open understory. As many cities have learned the hard way, "topping" these shrubs (especially willow), especially in the early years, will result in an undesirable form that must be constantly maintained. After the plants are established, careful pruning can shape the trees to create clear site lines into the creek and across the floodplain.



This section illustrates the dense vegetation typical of the early years as the riparian plants become established.



This section illustrates the mature canopy, when vegetation shades the creek but allows site lines across the site.

Prune for Aesthetics

When pruning is necessary, the goal is to coax a plant along in its natural form. Keep in mind that no matter how much a plant is pruned, it will attempt to resume its natural growth habit, and this habit will change as the plant matures. Young plants tend to grow more upright, with longer branches and larger leaves than older plants.

Some plants do benefit from seasonal grooming to remain attractive all year. In the garden, standard practices to enhance the plant's aesthetic appeal include removal of faded flowers, broken branches, and pest riddled or infested parts. In the large public landscape, such detailed pruning may not be practical, and therefore, maintenance should be focused on removing broken branches and pest infested parts of individual plants. For a more natural appearance, consider the aesthetics of shrub masses as a whole, rather than focusing on the sculptural qualities of individual shrubs.

Rejuvenation

A plant's appeal comes not only from its shape, but also from its size, mass of blooms, its leafy raiment, or its luscious fruits. Pruning can help to coax the best from a plant in these respects. Removing stems from a plant removes buds that would potentially have grown into shoots, so more energy gets channeled into the remaining buds and shoots. Vigorous new shoots stimulated by pruning are those that are most fiery red on the Red Twig Dogwood, for example. The more new growth you can stimulate on a woody plant that flowers only on new shoots, the greater the show of flowers the next season. Flowering Currant shrubs may be cut back to increase shoots, and therefore flowers and density, the next year, but it is not necessary to prune these shrubs for any other reason as they are naturally open in form. Drastically cutting back such plants in winter stimulates an abundance of new shoots and therefore future flowers.

As plants mature, they often lose their ability to produce vigorous new growth, resulting in an open, less compact appearance the reduced flower and fruit production. Periodic pruning can stimulate renewed vigor. This helps particularly with shrubs that become leggy with age such as Toyon, Western Redbud, and Coyote Brush. Certain plants respond well to basal pruning, or cutting the plant back to the ground, which simulates fire conditions experienced in California wildlands; refer the plant profiles which notes which species tolerate basal pruning. Basal pruning is *not* appropriate for some species, such as Manzanitas and Ceanothus.

Some of the buds lopped off during pruning are flower buds, and on some species, these flowers are future fruits. Fewer flowers result in fewer fruits, but those fruits that remain get an increased share of the plant's energy, resulting in larger, sweeter fruits.

Remember that animals such as birds and squirrels enjoy the flowers, fruits, and seeds of many native plants, and such attractions add to the quality of habitat provided by the park. The natural "pruning" and "re-planting" performed by such animals and insects is an important part of the ecosystem that this project aims to establish. And, coincidentally, it decreases the amount of maintenance necessary on the desired plants. Note that weedy species such as Glossy Privet, Firethorn, Cotoneaster, Thistle, etc. are also spread by animals which eat the seeds, and it is easiest to identify and remove these seedlings early.

Sunlight has a dramatic effect on plant performance, and by cutting off branches to change the form, you also affect the amount of light reaching the remaining branches.

Plant Responses to Pruning

It is important to understand how plants respond to pruning in order to make wise decisions before you cut. Unless you are only removing dead stems, pruning essentially dwarfs plants, causing them to grow less by cutting away leaves (where plants make food), stems (where food is stored), or roots (where water and minerals are taken up). Pruning a stem can strengthen it, induce flower buds, or cause branching, but the effect depends on the degree and timing of your cut.

Pinching

For the least pruning possible on a stem, pinch out the growing point of a shoot with your thumbnail. The tip of any stem releases a growth hormone, called auxin, that moves down that stem, inhibiting the growth of lower buds. Remove that stem tip, and you stop auxin flow, so lateral buds that were dormant are awakended into growth and existing side shoots now grow more vigorously. Pinching slows stem growth and encourages branching.

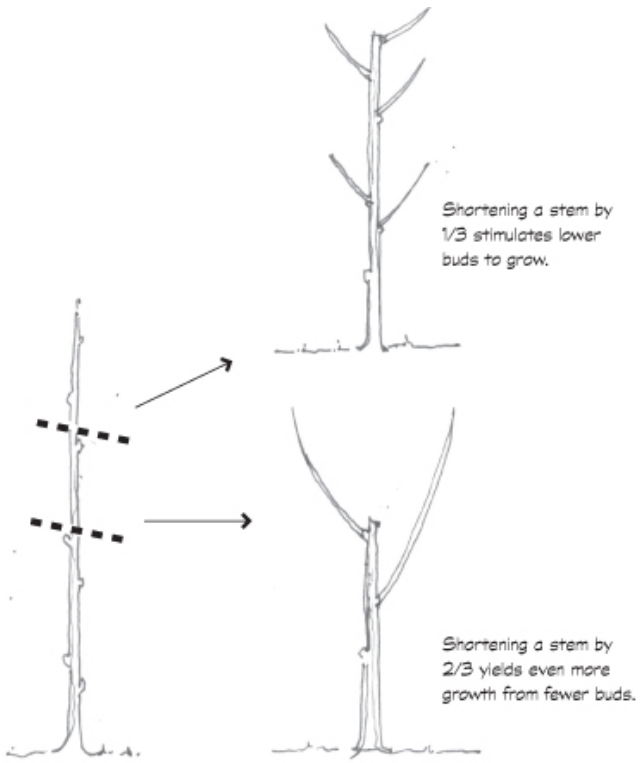
Heading

A "heading cut" refers to pruning of a stem by shortening it with pruning shears or a knife. *The response depends on the degree of heading, but basically, the plant is invigorated by this type of cut and the resulting form will be more densely branching.* Terminal buds are those found at the ends of all branches. By pruning a terminal bud, growth halts within that branch and plant resources/energy are reallocated to other terminal buds. So, if you cut a young stem back,

buds that have been dormant on remaining parts of the stem will be prompted to grow enthusiastically.

In most cases, t*he terminal bud of the tallest shoot should not be pruned.* Doing so "tops" the tree and causes the tree to grow outward, not upward. This results in a bushy appearance which is contrary to the goal of opening up the tree structure to maintain sight lines.

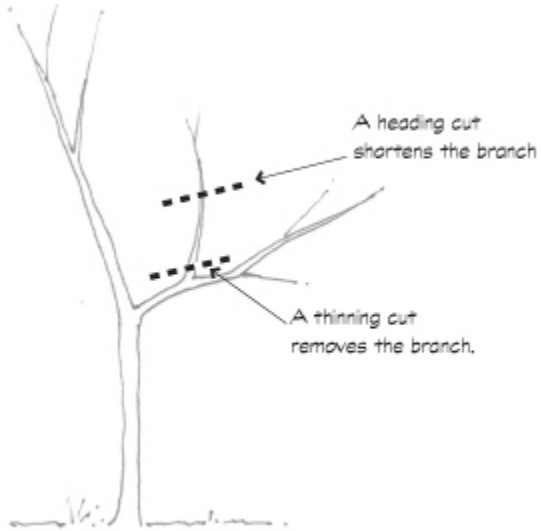
A heading cut is useful in the right situation, however, such as when vigorous growth or a fuller shrub is desired rather than a single trunk or few leggy stems. In some cases, a visual or physical barrier may be desired.



The illustration above shows a plant's responses to varying degrees of heading cuts.

Thinning

A "thinning cut" is a pruning cut which removes a stem completely, cutting back to a larger branch. Thinning cuts remove unwanted growth, such as the center of a tree or bush where growth is too dense. There is no plant response to this type of cut. Therefore, thinning is needed



The illustration above shows the different plant responses between heading cuts and thinning cuts.

When to Prune

How a plant responds to pruning depends not only on *how much* you cut off a stem by *when* you do it. Light to moderate pruning is ok for most native plants if they start to look bad or to maintain lines of sight. If stems turn brown, for example, trim off the bad-looking stems. Use pruning to revive an old shrub or untidy perennial. *Prune the least amount necessary.* Heavy pruning can kill most plants, particularly if it is already under stress.

As a general rule, the best pruning time is when foraging animals or the last frosts would naturally be "pruning" the landscape, in late summer and late winter when the onset of the rainy season will assist the plant in tolerating the stress of pruning. If a plant needs to be pruned heavily, do it in stages, over a period of years.

- ***Prune Winter-deciduous species (such as Western Redbud, Red Twig Dogwood, Maple species, and deciduous Oaks) during their dormant period, after the plant has dropped its leaves.*** It is also much easier to see structural problems such as crossing limbs and shape the plant at this time.
- ***Prune semi-evergreen species (such as Matilija poppy, shrubby monkeyflowers, goldenrods, irises and sages) when growth ceases completely, usually in early winter, or let the plants' appearance be your guide.*** Many native shrubs begin to look shaggy at the end of the dry season, so it may be desirable to prune them in the late fall.
- ***Evergreen, herbaceous perennials and shrubs (such as Coffeeberry, Toyon, Coyote Brush, Ceanothus, and Manzanitas) should be pruned for shaping right after they flower, unless fruits are desired for their wildlife or ornamental value. For rejuvenation, prune them in the fall.***
- ***Long-blooming plants (such Bush Poppy and Penstemons) which have multiple waves of flowers with summer irrigation should be pruned after the primary bloom cycle is over to stimulate a secondary flush.*** The degree of pruning is species-dependent. Note that the added moisture of summer watering often contributes to root rot.

Pruning late in fall will push new growth that can't harden off, and pruning in winter will do the same thing. Most natives have two 'dormant' periods (actually, in Mediterranean climates such as ours, they slow down rather than experience true dormancy): summer and again in mid-winter. They will push new growth in early winter, shut down, harden off and wait until their next push in spring. Most natives (not all) grow in small pulses, not fast growth. Some genera like *Ceanothus* grow very fast for 2-3 years, then slowly in small pulses.

Refer to the *Annual Checklists* in the Maintenance Section for a list of plant species, when to prune and how. Pruning and maintenance information is also included in the plant reference section.

Watering the Native California Landscape

It is an over-generalization to say that all California native species thrive without irrigation, because their watering needs are so extremely varied and relative to the landscape situation in which they occur naturally. However, irrigation regimes that work well for watering lawns, a typical component of many public park spaces, do not take into considerations the needs of summer-drought tolerant natives. The plants of the riparian corridor (the plants along the creek) are adapted to moist soils. Willows, for example, depend on thick fibrous root systems to draw in large amounts of water near the surface since they usually grow on creek banks or in the floodplain where they are frequently inundated with flood waters. In turn, these roots armor the banks with a strength greater than concrete, minimizing the erosive forces on the creek channel and providing habitat for aquatic animals.

Summer watering presents a challenge to native plant gardeners. Supplemental moisture in summer may be required to keep new plants alive or help established plants look their best. There are, however, potential negative effects of summer irrigation, including the activation of a variety of soil-borne fungal pathogens that will cause root rots and crown rots. These fungal pathogens flourish in warm, moist environments (conditions that are alien to the majority of our native flora) and their activity in the garden can be devastating and quick. During the warm season, it is preferable to water on cloudy or slightly cooler days and early in the morning or in the evening. Always avoid mid-day overhead irrigation, as much of the water will evaporate before the plants absorb it.

As a landscape of native plants matures, it usually requires less water overall. Once the plants become established, irrigate deeply but infrequently. The goal is to promote deep rooting, so allow enough time for the water to thoroughly soak the soil. Light, frequent waterings promote shallow root systems that are less resistant to drought conditions and more susceptible to root-rot fungi. A plant is generally considered “established” when it reaches three times the size it was when planted or after it has been planted for two or three summers, or both.

In the garden, drip irrigation or micro-irrigation is best for native plants. However, in large public landscapes, such systems are not practical as they are easily disturbed by animals chewing on the piping, vandalism, foot traffic, etc. resulting in greatly increased maintenance costs or dead plants.

Keep the following in mind when watering native plants:

- Check the soil; do not depend on a strict, automated schedule unless you have developed it through long, site-specific experience. Al watering must be adjusted seasonally and as plants mature.
- Do not water if the soil is already moist at root level. Sometimes the soil surface appears dry even though the soil is adequately moist where roots are growing.
- When in doubt, do not water—continue to carefully monitor the plants and soil until you are certain of its needs. It is much easier to add water to a plant than it is to dry out an over-watered specimen.
- Regularly check the moisture of the rootballs of newly installed plants and the soil around them. Rootballs should be moist, not wet, to encourage the roots to grow into the surrounding soil.
- If a plant is wilted, check the soil in the root zone. If the soil is dry, water. If the soil is moist, do not water, as this type of wilting often indicates that the plant suffers from root rot or has over-grown the capacity of its root system and needs to be cut back. Lush new growth will often wilt during the first warm spring days. If the plant perks back up in the late afternoon or evening, it is probably healthy. Such plants may require pinching or pruning as the hot weather intensifies.

- During droughts, it is imperative to water all your plants thoroughly during the normal rainy season, as this is when most species require water.
- After repeated cycles of watering and drying, soils with a high clay content will develop a thin, dense crust that greatly impedes water penetration. Shallow cultivation of the soil on a regular basis or applying mulch will prevent this layer from forming and allows water to reach the root zone of the plants.

Fertilizing

As a general rule, California natives thrive in nutrient-poor soils. It is not necessary to fertilize. Test soils if poor plant performance or appearance is observed. If, after careful consideration, fertilizer is used, the best time to fertilize natives is when plants are actively growing, typically from late fall to spring. In addition to being a waste of money, applying excess fertilizer can harm plants and pollute the environment by creating deleterious nutrient imbalances and contaminating water resources.

Organic compost is a source of fertilizer that improves soil structure. The most efficient, least expensive compost is that created on site using green waste that does not contain any weed seeds or vegetative parts that might regenerate.

Mulch

Mulch is a valuable resource that can significantly reduce moisture evaporation from the soil, thereby decreasing water demands and lowering costs. Mulch moderates extreme sol temperatures, reduces dust, decreases erosion, and suppresses weeds. Aesthetically, it provides, a neat, finished look to landscape areas. Leaf litter, wood chips, bark products, and other organic mulches add nutrients and improve soil structure as they decompose. Organic mulch is particularly appropriate in woodland gardens, whose natural counterparts are characterized by a constantly replenished layer of decaying leaves and branches.

- Woody stems and leaves of native plants may be chipped and used for mulch on site. Not only does this reduce the cost of removing plant debris, keeping this biomass on site suppresses weeds, protects the soil, conserves water, and improves the soil naturally.
- Maintain a two to four inch layer of mulch. However, carefully keep the crown area of plants free of mulch, as this zone is sensitive to crown rots caused by fungal and bacterial pathogens that are favored by excessive moisture, especially during warm weather.
- Do not remove fallen leaves, acorns or twigs from the area beneath the canopy of Oak trees.
- Separate out any seed heads or vegetative parts of weed species and carefully dispose of them off-site so as to avoid inadvertently spreading weeds to other parts of the site.

Pest and Disease Control

The concept of Integrated Pest Management, or IPM, is a multi-faceted approach that aims to reduce pests and diseases in an environmentally responsible manner, using chemical controls as a last resort. Long-term control is sought by monitoring pest and disease populations, employing a combination of horticultural, biological, and chemical methods, and evaluating the effectiveness of each treatment. The goal is to keep pests and disease levels acceptably low.

- Assess the problem, seeking professional help if needed.
- Is there sufficient damage to warrant treatment?
- Develop a plan of action.
- Evaluate the results and keep records of what worked well.

If chemical controls are deemed necessary, always try the least-toxic, environmentally safe products first, such as insecticidal soaps, baking soda, and horticultural oils. Many pests are more of a visual nuisance than a serious concern—modifying your aesthetic standards or removing afflicted plants may be preferable to using harsh chemicals.

Remember that if this project is successful, it will be teeming with life. Beneficial predators such as spiders are continually seeking food sources, including a variety of plant pests, but these natural allies will not stay if the landscape is devoid of all insects.

Invasive Plant Control

The importance of weed removal in the first few growing seasons cannot be overstated. Research indicates that exotic species have overrun California's native environs primarily due to increases in disturbance; reinforcing our understanding that most invasive exotics grow quicker above ground during the first few growing seasons and out-compete native species. Weeds compete with landscape plants for water, nutrients, sunlight and space, and they can also harbor pests and diseases. If exotic species are not actively removed during the first few growing seasons, establishment of native species will be poor.

These are all good reasons to strive for a weed-free park. Left unchecked, weeds can reach overwhelming levels within the park, downstream, in surrounding gardens, or in other open spaces. Integrated Pest Management (IPM) can be used to develop a weed management strategy.

Prevention of weed establishment is the first line of defense. Weed management will prove dramatically less costly and time consuming if measures are taken to remove all roots and aerial parts of the weeds before they grow, set seed, or form colonies that crowd out desired plants. Hand removal is recommended. Refer to the *Invasive Plants list* and *Weed Removal Calendar* in this *Guide* for identification, methods for removal and timing of the most commonly found weeds for this site.

As a last resort, if large colonies are forming which cause a downstream threat, the City may decide to apply herbicides. Tables are provided to guide maintenance staff by suggesting chemicals that are the least hazardous to sensitive water resources. The timing of application is an important aspect of safe usage in areas adjacent to the creek corridor.

Weed Management Tools

Use the appropriate pruning equipment (including various loppers and saws) for each cut. If a branch can not be easily pruned with loppers, use a saw. Exerting extra force with loppers will result in an unclean cut and will damage the tree. *Depending upon available equipment, loppers are sufficient for removing branches up to 1" in diameter. Use saws for the removal of larger branches to ensure a clean cut.*

Pulling

- Weed Wrench for tap-rooted shrubs and small trees.
- Pliers for seedlings, narrow stemmed plants.
- McLeod rake for vines.

Digging

- Round-point shovel
- Spade
- Transplanting spade
- Trowel for small plants
- Soil knife for small, tap-rooted plants
- Dandelion digger for small, tap-rooted plants
- Mattock for deep-rooted plants
- Pulaski
- Hand pick
- Digging bar
- Pry bar

Scraping

- McLeod, cultivator fork, tools with tines for mats of invasive perennials, including grasses.
- Pattern hoe for seedlings and small plants.
- Oscillating hoe for seedlings and small plants.

Cutting Woody Plants

- Pruners for woody stems less than 1/2" diameter.
- Loppers for woody stems less than 2" diameter including tree and shrub limbs and heavy stalks.
- Pruning saw woody stems less than 10" diameter.
- Hatchet, ax for large shrubs and small trees.
- Pulaski for large herbaceous plants, shrubs and small trees.
- Bow saw for woody stems less than 18" diameter.
- Limbing saw for woody stems less than 18" diameter.
- Chainsaw for woody stems.
- Brushcutter for woody stems less than 4" diameter.

Cutting Herbaceous Plants

- Weed Whip for small areas of grasses, herbaceous annuals or perennials.
- Brushcutter for grass or seedlings; use steel blades for vines or groundcovers.
- Mowers for grasses or herbs.
- Machete for almost anything.
- Scythe for grasses.
- Hand scythe to remove grass seed heads (flowers).
- Swedish brush ax for brush and small woody stems less than 4" diameter.
- Japanese sickle
- Pocket knife for shrubs and small trees.

Miscellaneous

- Flaming equipment for small seedlings, soon after germination.
- Landscape fabric and wire staples
- Wheelbarrow, bags, tarps
- Rake
- Push broom
- Hay fork
- Static kernmantle rope

CREEK CHANNEL MANAGEMENT

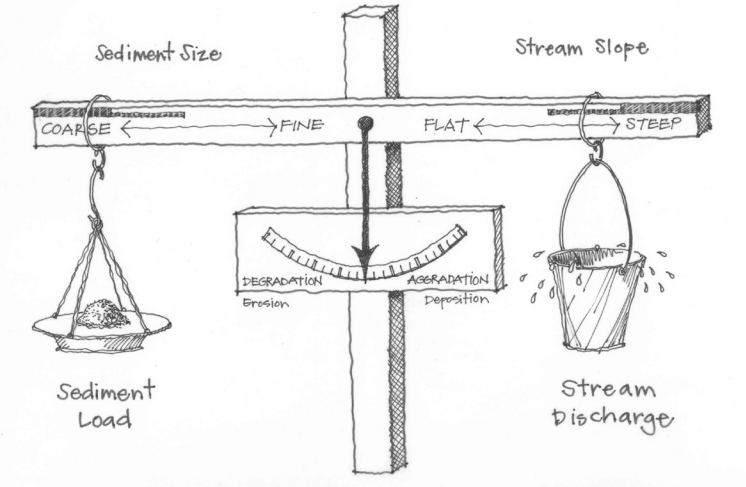
The Baxter Creek Gateway creek restoration project altered the channel dimensions, longitudinal slope, bank slopes, vegetation, and soil bioengineering in an effort to provide a stable stream channel condition. This stable condition is characteristic of a balanced creek hydrology. In other words, the channels' functions, including water and sediment transport, are in an equilibrium condition. This equilibrium is achieved when the creek can efficiently move both water and sediment through the system without excessive degradation (erosion, scouring) or aggradation (deposition, filling-in).

Variability in yearly rainfall and changes in the watershed will cause the stream structure to change over time. These natural changes are characteristic of a creek in dynamic equilibrium, and increase structural diversity and improve habitat quality. Dynamic equilibrium is the preferred condition of a creek, however, in urban areas, where infrastructure or park amenities arelocated in the floodplain or near the channel, there is often little space to allow a creek to naturally change over time. In these situations, management of the channel is required to protect the creek and adjacent areas.

In addition, riparian restoration sites are particularly sensitive to impacts prior to plant establishment, but as plants mature, the restored riparian zone becomes more stable as the plants mature and provide shade to reduce aquatic plant growth and work to further stabilize the creek banks.

Erosion/Degradation

Erosion and degradation occur when the creek geometry is not appropriate for flows; this can be due to upstream development sending increased flows, lack of plant root systems to anchor the soil, expose soil, a lack of roughness on banks, or bank erosion caused by people or animals accessing the creek.



Reference: Lane, 1953

- Photo document observed changes, especially undercut and scoured banks.
- Monitor and note any undercutting banks. Measure and track the amount of undercut which is occurring. Qualified professionals should be consulted to determine if erosion is excessive and requires treatment.
- In the first two seasons following project implementation, the channel will change as it strives to reach dynamic equilibrium. Some small-scale erosion should be expected.
- If severe erosion occurs, consult City Engineering staff and qualified professionals to determine if treatments are required and, if so, what treatments are most appropriate.

Reference: Conservation Corps Soil Bioengineering Manual

Prevent Erosion Problems:

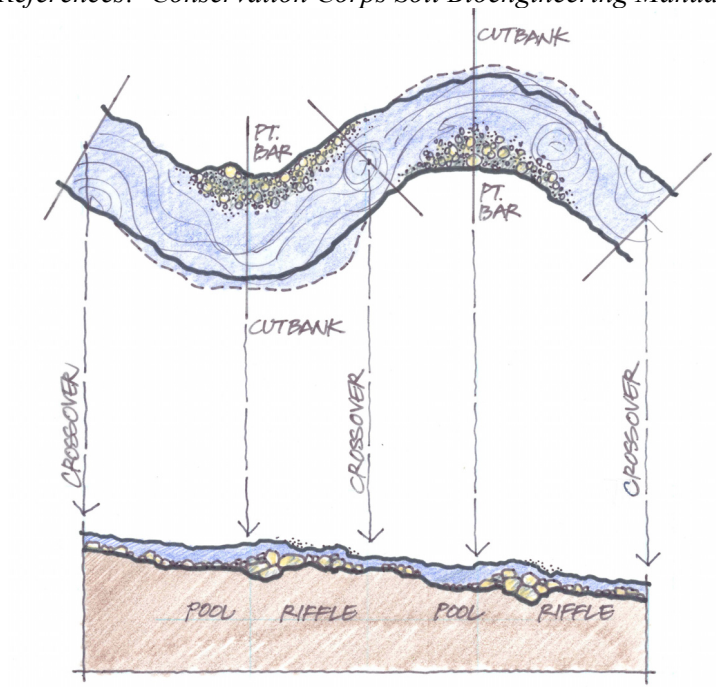
- ✓ **Preserve native creekside vegetation.** Native riparian plants growing within a creek corridor provide important habitat and help to stabilize banks. In times of flooding, a well-vegetated creek bank is protected.
- ✓ **Invasive non-native species can choke out native plants.** In some instances, these plants can actually impede creek flow and contribute to flooding. Invasive plants also have little or no habitat value for wildlife.
- ✓ **Yet mowing, clearing, or stripping away non-native vegetation can promote erosion.** Remove invasive species with care and replace with native vegetation as soon as possible.
- ✓ **Avoid removing natural debris. Removing branches, boulders, and dead vegetation from a creek can harm fish and wildlife.** Natural occurring debris provides food and cover for fish, aquatic insects and other animals.
- ✓ **If debris poses a serious flooding or erosion hazard, however, careful removal may be necessary.** Only remove large woody debris that is within 25' of a culvert.
- ✓ **Check for erosion regularly and correct problems promptly.**
- ✓ **When flowing water meets unprotected soil, erosion almost always results.** Barren slopes on any area of the site (not just creek banks) can lead to sedimentation problems in the creek. Too much sediment (soil, sand, and fine gravel) fills in the creek bed and reduces its ability to carry flood waters. Excessive sediment can also destroy pools, eliminate shelter and fish spawning habitat, and diminish food supplies for fish and aquatic insects.
- ✓ **A vegetated slope is the best defense against undercutting and slumping banks.** Replant barren slopes or disturbed soils as quickly as possible.
- ✓ **Stabilize banks using bioengineering techniques; putting tires or slabs of concrete over the bank will usually create more erosion, rather than lessen the problem.**

Deposition/Aggradation

Deposition and aggradation are caused by an increase in sediment supply or an over-wide channel decreasing stream power and efficiency, and backwaters caused by undersized culverts or blockages.

- Photo document observed changes.
- In the first two seasons post implementation, the channel will make changes as it needs to reach a dynamic equilibrium. Some sedimentation, on a small-scale, is expected. If sedimentation blocks the channel or interferes with the performance of downstream culverts, consult the City Engineer and qualified professionals.
- Assess whether sedimentation is altering the flow of the channel or interfering with passage into downstream culverts.

References: Conservation Corps Soil Bioengineering Manual



Weir Adjustments

Weirs are engineered structures composed of large boulders strategically placed in a V-shape within the channel. They act as grade control features and direct the main water flow through the center of the channel, diverting stress from the banks. Weirs are sometimes referred to as "riffle starters" due to the aerated "white" water they create.

- Monitor areas adjacent to constructed weirs. Look for erosion along the edges of the weir—not the center; bank erosion on adjacent banks; excessive scouring immediately downstream; and downstream movement of weir boulders. Pools should form just downstream of the weir.
- Photo document noticed adjustments.
- NOTE: In the first two seasons following implementation, the channel will make changes as it needs to reach a dynamic equilibrium. Minor adjustments in the areas adjacent to the weirs are expected and should not be a source of alarm. If the entire structure is removed or passed downstream, the City Engineer and qualified professionals should be consulted.

Flooding

Flooding is a naturally occurring event. In substantial storms the water will exceed the channel's bankfull limits and the floodplain will be inundated. Downstream culverts have not been improved to meet the improved capacity of the restoration reach. For this reason flooding along portions of San Pablo Avenue is possible in the future.

- Check for and remove any debris from the channel that may block the culvert and cause flooding.
- Monitor the site for changes and damage during and/or after large storm events if possible. Photo document any measurable situations and record storm date.
- Notify the City if flooding occurs.

Erosion Control Fabric

Coir fabric is a biodegradable, erosion control fabric constructed of coconut fibers. Coir is installed in areas prone to erosion to protect bare soil while plants are being established. In itself, coir is not a bank stabilization technique.

- Monitor coir, particularly in high traffic areas and following large storm events throughout the first winter of the implemented project. Look for coir flaps that have pulled loose and/or ripped.
- Re-staple coir that has been pulled loose as needed. Properly installed, coir fabric should be tight and stapled flush against the ground.
- If large sections of coir have been destroyed, new coir should be obtained and installed.
- If wooden stakes are used to secure coir fabric, hammer the staked flush to the ground after the first winter to reduce tripping hazards.
- Coir fabric is designed to degrade after the first two years, because its real value is controlling erosion immediately after grading operations and channel construction. At this point vegetation should be in place to adequately protect the banks.
- The project should expect coir fabric degradation along the creek banks. Consult with City regarding all coir fabric replacement.

Quick Glance: Signs of a Healthy Creek

Water quality and flow
- ✓ Cool, clear water free of contaminants, excess algae and sediment
- ✓ Varied flow cycles

Creek bed and banks
- ✓ Stable vegetated banks with minimal erosion
- ✓ Presence of both slow pools and fast water running over shallow, rocky stretches
- ✓ Rock and clean gravel of various sizes (critical for fish spawning)

Plants and wildlife
- ✓ Native tree canopy, which stabilizes banks, provides habitat for birds and small mammals, and keeps water temperature cool for fish populations
- ✓ Abundance of native vegetation, providing cover for wildlife and root systems which stabilize banks
- ✓ Presence of fish, amphibian, and aquatic insect populations
- ✓ Leaves, small branches, fallen logs and other natural vegetative debris within the stream bed and along banks, which support the aquatic food chain and provide hiding places for fish and invertebrates.

Quick Glance: Symptoms of an Ailing Creek

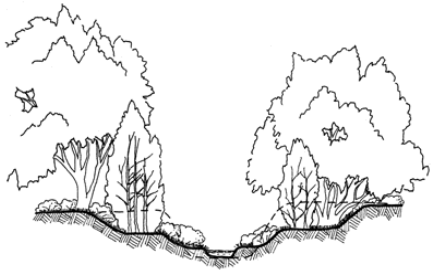
Water quality and flow
- ✓ Poor water quality, including problems such as excessive algae, suspended sediments, contamination from animal waste or sewage, or presence of metals or other toxics
- ✓ High water temperature
- ✓ Reduced water flow

Creek bed and banks
- ✓ Loss of natural creek channel
- ✓ Excessive erosion along creek banks or deeply incised stream bed and high rates of sedimentation impeding stream flow
- ✓ Still water, an absence of pools, riffles, or clean gravel (which may be covered by sediment)
- ✓ Litter, yard clippings, trash, and other dumped debris

Plants and wildlife
- ✓ Lack of diversity in flora and fauna
- ✓ Lack of shade
- ✓ Barren creek banks
- ✓ Invading non-native plants which compete with native species in the riparian corridor
- ✓ Diminished or non-existent fish, amphibian and aquatic insect populations

Quick Glance: Maintaining Channel Flow

- ✓ **The best way to accommodate flood waters is to avoid constructing improvements in the flood zone and maintain the area in its natural state.** Any structure built within reach of flood waters is subject to damage or loss and may decrease the creek's ability to accommodate flood flows safely.
- ✓ **Avoid diverting water or damming the creek.** Water diversions and dams significantly affect the life of a creek by reducing water flow.
- ✓ **Avoid taking water directly from creeks, especially during the dry season when natural flows are low.** Avoid altering the watercourse. Seek advice from the appropriate local agency and the California Department of Fish and Game.
- ✓ **Encourage infiltration.** Paved surfaces increase runoff during storms and peak flows in creeks, adding to flooding and erosion problems. Paving also results in lower creek flows during the dry season.
- ✓ **Practice water conservation.** Every drop of water you save, whether through landscaping with drought-tolerant plants, reducing personal consumption, installing drip irrigation, and avoiding other water-using activities, contributes to maintaining a healthy creek environment.



MAINTENANCE SCHEDULE

Using the Annual Maintenance Checklists

The maintenance checklists on the following pages have been designed to provide the City of El Cerrito, its contractors and volunteer service organizations with a guide to conducting ongoing maintenance and management for Baxter Creek. Maintenance and management activities vary based on the season and the age of the restoration project, therefore there is a maintenance sheet that is specific to each year and each season through year five of the project. After year five, maintenance will continue in perpetuity on an as-needed basis, adapting the strategies outlined in the maintenance checklists.

The City of El Cerrito Public Works Department will oversee maintenance activities, working closely with City Police and Fire departments, maintenance/management contractors, and volunteer service organizations. It is recommended that the City use these sheets to track and record all maintenance activities, and to communicate with contractors and volunteers on what activities will be undertaken by which groups. It is also recommended that contractors and volunteers use the checklists as a guide and record specific activities they complete in order to communicate completion of these activities to the City. Completed checklist sheets should be provided to the City of El Cerrito Public Works Department in a timely manner. The City will maintain a “master” copy of all checklists completed.

Years 1 & 2: Overview & Seasonal Checklists

Monitoring is very important during the plant establishment period. In the first year, the creek is not fully shaded and vegetation is dense--willow posts will be sprouting and grow up to 5 feet in height; container-grown trees are still supported with stakes; the mortality rate of restoration plantings may reach up to 20%. Monitor the site to remove invasive weed species early to ensure that they do not become established and hinder growth of native species. Monitor and repair creek channel problems such as blockage of culverts, damage to erosion control fabric, and bioengineering.

In the second year, vegetation growth at the site should be progressing well. If properly cared for, the willow posts should have substantial growth of up to 10 feet and riparian trees should be 10 to 15 feet tall. Smaller riparian bushes and groundcovers should have established themselves to the point that it will be clear where supplemental plantings are needed. These should be planted in late fall when the rains have begun, or should be well-irrigated. Invasive weeds should be aggressively removed by the roots and disposed of, as the most effective way of controlling them is to prevent their root systems from establishing. The creek will also have made adjustments to its morphology in the winter storms and may need to be re-surveyed or assessed for changes. Irrigation, Coir and bank stabilization areas should be carefully monitored for changes or damage and repaired as needed.

Clean-up / Vandalism / Public Safety

- Remove any garbage that may have been dumped or blown into the park.
- Inspect the park regularly for damage or graffiti, and make necessary repairs.
- Remove and dispose of dog waste.

Vegetation Management

- Monitor plant survival. In November, replace new container plants which have died or cuttings which have not sprouted.
- Protect newly-graded areas from foot traffic until plants have covered these areas.
- Carefully remove invasive species as specified in the list of invasive plants in this *Guide*.
- Expect sun-loving pioneer species such as Cattail and Tule grasses to thrive in the first years. These species will be shaded out over time.
- Remove fallen tree limbs and prune broken branches as necessary.
- Expect creek corridor vegetation to be dense and brushy in the first years. Cutting back this growth will only result in greater density. Let shrubs and trees to grow tall and open up to allow visual access into and across the creek corridor.
- Seeding should occur as follows:

Winter 2006/2007

Monthly:	Weed upland areas

Spring 2006/2007

Weekly:	Monitor site for weed flowering
Monthly:	Mow the site after flowering but before viable seeds are produced
Monthly:	Weed upland areas

Summer 2006/2007

Monthly:	Weed upland areas

Fall 2006/2007

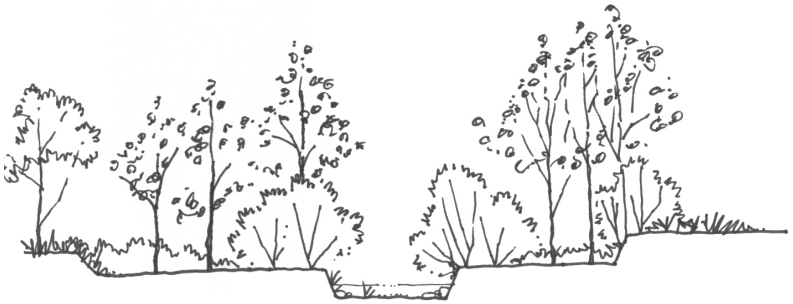
September:	Mow
Monthly:	Weed upland areas
November:	Overseed

Irrigation

- Notify Public Works if the soil appears too dry or hard or if the ground seems over-saturated or spigots are gushing.
- If the irrigation system is failing to deliver water to any zones, hand watering may be needed until the system is repaired.
- Visit the site while the irrigation system is on to check irrigation coverage and overall performance
- Once the native plants are established (usually after irrigating for the first two years), the irrigation in these areas is intended to be turned off. The natural wet/dry seasonal cycles benefit native plants, while year-round soil moisture from irrigation gives opportunistic weeds an advantage.
- Monitor the effects of the irrigation regime on the shrubs in the creek corridor. Many native plants prefer occasional, deep watering in summer and cannot tolerate over-watering. Is runoff from irrigated areas negatively affecting the adjacent native plants?

Creek Channel Maintenance:

- Some erosion and deposition is to be expected as the channel finds its natural equilibrium. Look for the formation of cut banks on the outside bends and point bars on the inside bends. Allow this sediment transport to continue. As they become established, plant's roots will stabilize the banks and begin to armor them against excessive erosion.
- Monitor areas adjacent to Riffle-Starters (Rock Weirs). Look for high velocities along the edges of the weirs, bank erosion on adjacent banks, excessive scouring immediately downstream, and downstream movement of weir boulders.
- Monitor Coir Fabric, particularly in high traffic areas and following large storm events throughout the first year of project construction. Fabric should be tight and stapled flush against the ground. Use biodegradable staples to tack down coir flaps that have pulled loose and/or ripped. Replace coir fabric if large sections have been destroyed. Coir fabric is designed to degrade after two years.
- Remove any debris from the channel that may block the culverts and cause water to back up. Monitor the site for changes and damage during and/or after large storm events. Photo document any measurable situations and record storm date.



Willow Growth Typical for Year 1

Annual Checklist for Year 1-2

EARLY SPRING

VEGETATION MANAGEMENT

Action	Responsible Party	Date(s) Task Completed
Prune to maintain site lines		
Note plant mortalities		
Replace container plants		
Replace failed cuttings (first winter only)		
Monitor for trampling		
Remove weeds		
Expect dense, vigorous growth from native pioneering species		

IRRIGATION EQUIPMENT CHECK

Action	Responsible Party	Date(s) Task Completed
Irrigation		
Check equipment		
Observe overall performance / coverage		
Review watering schedule		
Check soil for overwatering		
Hand water if needed		

SITE MANAGEMENT

Action	Responsible Party	Date(s) Task Completed
Clear pathways		
Empty trash receptacles		
Remove garbage, contaminants & dog waste		
Inspect for graffiti		
Repair damages		

CHANNEL MAINTENANCE

Action	Responsible Party	Date(s) Task Completed
Observe erosion/deposition		
Check for excessive erosion around rock weirs (a.k.a. riffle starters) or banks		
Check coir fabric; repair		
Remove culvert blockages		

PRUNING

Genus	Common Name	How To Prune	Notes
Adiantum	Maidenhair	clean up	
Agastache	Horse Mint	clean up	shuts down in late summer
Antirrhinum	Snapdragon	cleanup	
Aquilegia	Columbine	cleanup	
Arnica	Frog Flower	dead head	
Asclepias	Monarch	remove dead material if needed	goes winter deciduous
Aster		remove dead material if needed	
Atriplex	Saltbush	remove dead material if needed	deer loves and will prune for you
Baccharis		remove dead material if needed	can handle full butchering
Beloperone	Chuparosa	remove dead material if needed	
Brickellia		remove dead material if needed	
Camissonia	Beach Evening Primrose	remove dead material if needed	
Chrysothamnus		dead head	
Clematis		dead head, control	goes winter deciduous
Cowania	Cliff Rose	remove dead material if needed	
Crossosoma		remove dead material if needed	
Encelia	Bush sunflower	remove dead material if needed	

WEED REMOVAL

Genus	Common Name	Treatment Options	Follow-Up
Acacia sp.	Acacia	Pull sprouts and saplings by hand when soil is moist/loose. Cut larger trees and cover stump with black plastic to block-out light (stumps will sprout).	Return to the site to check for seedling growth and resprouts at least 2x year. Dig or cut out re-sprouts.
Agave attenuata	Agave	Hand pull or dig to remove all parts.	Check for re-sprouts.
Arundo donax	Giant Reed	(see winter removal notes)	Check for re-sprouts and new seedlings 4-6 times per year
Avena fatua	Wild Oat	(see winter removal notes)	Check for new sprouts.
Brassica nigra	Black Mustard	(see winter removal notes)	Hand pull new sprouts. Do not mow.
Brassica rapa	Field Mustard	(see winter removal notes)	
Conium maculatum	Poison Hemlock	Hand-pull when soils are moist to facilitate removal of the taproot. Mow in beginning of April, then every 3 months except during seeding. When removing poison hemlock wear protective gloves and clothing and take breaks from exposure.	Remove / hand-pull any new seedlings or regrowth by hand. Mow to height of 3" monthly (or at least every 3 months)
Cortaderia selloana	Pampas grass	Pull seedlings by hand. Cut stems and leaf blades near to the ground and remove all root mass (may need the use of machete or chainsaw). Cut all seed plumes (flowers) and carefully bag to dispose.	Check for seedlings. Cut all seed plumes (flowers) and carefully bag to dispose.
Cynara cardunculus	Artichoke Thistle	(see winter removal notes)	Best to mow monthly; Check Seasonally for new seedlings
Cynodon dactylon	Bermuda Grass	Hand-pull or dig out using a shovel, prior to plant establishment. Establishment of native vegetation will discourage Bermuda Grass	check for new sprouts
Cytisus scoparius	Scotch Broom	Hand-pull, dig, or use weed wrench to remove all parts, including tap root, while ground is soft but before plant goes to seed (in March). Seeds germinate in with early winter rains.	Prolific seeding--control plant seedlings as seeds sprout in the next 8 yrs after plant removal

Delairea odorata	Cape Ivy	Clear a strip around the infested area and work inward, peeling back the edges of the mat, and rolling the vegetation like a carpet. Hand-pull and rake soil surface to several inches deep to remove all root fragments, as roots will re-sprout. Work from upstream to downstream to prevent transport of fragments by water and recolonizing downstream.	Revegetate bare patches immediately to prevent erosion of exposed soils
Dipscacus sativus	Teasel	Hand pull wearing protective gloves.	check for new sprouts
Foeniculum vulgare	Fennel	Hand-pull or dig to remove all parts, including tap root while ground is soft/moist. Uproot seedlings with hand tools. Mow in beginning of April, then every 3 months except during seeding. (Do not mow during seed set--this would encourage seed spread.	Remove ripe seeds from site by brushcutting and bagging flower heads. Revegetate with native shrubs immediately to prevent re-establishment. Check for resprouts/ seedlings.
Genista monspessulana	French Broom	(see winter removal notes)	Prolific seeding--control plant seedlings as seeds sprout in the next 8 yrs after plant removal
Hedera canariensis	Algerian Ivy	Pull vines climbing into trees and along the ground by hand or with rakes and McLeods. Ivy can sometimes be rolled up like a carpet and piled or hauled off-site. Cut woody stems with pruners or loppers, and dig up the roots with a shovel to prevent re-sprouting.	Check for re-sprouts and new seedlings 3-4 times per year
Hedera helix	English Ivy	Pull vines climbing into trees and along the ground by hand or with rakes and McLeods. Ivy can sometimes be rolled up like a carpet and piled or hauled off-site. Cut woody stems with pruners or loppers, and dig up the roots with a shovel to prevent re-sprouting.	Check for re-sprouts and new seedlings 3-4 times per year
Lactuca serriola	Prickly Lettuce	Hand-pull wearing protective gloves.	
Pennisetum clandestinum	Kikuyu Grass	Hand-pull in early stages, removing root system. Do not hoe or mow--all cut pieces will root. Clean all equipment to prevent transporting grass to other sites.	
Raphanus sativus	Wild Radish	Hand-pull or cut plants prior to the formation of seed pods if possible. Because plants have a heavy taproot (resembling a radish), removal is easier when the ground is soft and wet. Check seasonally for re-growth.	
Rubus discolor	Himalayan Blackberry	Hand-pull or cut stems with loppers near ground; dig out roots with a Pulaski or shovel, and remove as much as possible, especially the main root ball and large lateral roots.	Revegetate immediately, return to site to remove seedlings or regrowth

Vinca major	Periwinkle	Pull up dense vegetation and underlying stolons by hand (if soil is loose) or use a McLeod. Pull roots from base of stems; grub to follow up root removal if necessary. All stems and root fragments will re-sprout.	Monitor every 3 months for re-sprouts
Spartium junceum	Spanish Broom	(see winter removal notes)	Remove new seedlings prior to flower/seed set.

LATE SPRING

PRUNING

Genus	Common Name	How To Prune	Notes
Abies	Fir	dead material only	
Ambrosia		cleanup	
Dryopteris	Wood Fern	remove dead material if needed	
Heteromeles	Toyon	remove dead material if needed	

WEED REMOVAL

Genus	Common Name	Treatment Options	Follow-Up
Arundo donax	Giant Reed	(see winter removal notes)	Check for re-sprouts and new seedlings 4-6 times per year
Centaurea solstitialis	Yellow Star Thistle	Hand-pull or dig to remove all parts, including root (if possible) May-June, when plants are bolting. Grasp the plant at the base and pull steadily, straight up. Mow monthly, 1-2" above the ground. If thistle is in flower, it is too late to mow, as seeds may be dispersed. Wear protective gloves and wash well after handling thistle.	In addition to mowing, continue to check for and pull out emerging plants through August.
Cirsium vulgare	Bull Thistle	Hand pull or dig to remove all parts, including tap root, before flowers open. If ground is hard, loosen with a pick first. Mow after thistle has bolted but before flowering. Cut and bag flower stems before they open, to reduce seed production. Clean all equipment to prevent spread of seeds.	Dig up rosettes each year or chop out 1-2 inches below ground. Replant with natives to discourage new thistles and shade them out.
Cynara cardunculus	Artichoke Thistle	(see winter removal notes)	Best to mow monthly; Check Seasonally for new seedlings
Picris echioides	Bristly Oxtongue	Hand pull wearing protective gloves prior to flowering to prevent seed dispersion (June).	Re-check seasonally. repeated mowing will be effective on larger stands.
Plantago lanceolata	Plantain	Hand-pull in early stages.	
Rubus discolor	Himalayan Blackberry	(see prior removal notes)	Remove seedlings or regrowth
Vinca major	Periwinkle	Pull up dense vegetation and underlying stolons by hand (if soil is loose) or use a McLeod. Pull roots from base of stems; grub to follow up root removal if necessary. All stems and root fragments will re-sprout.	Monitor every 3 months for re-sprouts

SUMMER

VEGETATION MANAGEMENT

Action	Responsible Party	Date(s) Task Completed
Note plant mortalities		
Monitor for trampling		
Remove weeds		

IRRIGATION EQUIPMENT CHECK

Action	Responsible Party	Date(s) Task Completed
Check equipment		
Observe overall performance / coverage		
Review watering schedule		
Check soil for overwatering		
Hand water if needed		

SITE MANAGEMENT

Action	Responsible Party	Date(s) Task Completed
Clear pathways		
Empty trash receptacles		
Remove garbage, contaminants & dog waste		
Inspect for graffiti		
Repair damages		

PRUNING

Genus	Common Name	How To Prune	Notes
Aesculus	Buckeye	open up and clean up	
Agave	Agave	control and clean up	
Castilleja	Indian Paint	remove dead material if needed	
Leptodactylon	Prickly Phlox	remove dead material if needed	
Libocedrus	Incense Cedar	remove dead material if needed	
Melica		remove dead material if needed	goes summer deciduous

LATE SUMMER

SITE MANAGEMENT

Action	Responsible Party	Date(s) Task Completed
Clear pathways		
Empty trash receptacles		
Remove garbage, contaminants & dog waste		
Inspect for graffiti		
Repair damages		

PRUNING

Genus	Common Name	How To Prune	Notes
Amorpha	Indigo Bush	cleanup	
Antirrhinum	Snapdragon	cleanup	
Aquilegia	Columbine	cleanup	
Arbutus	Madrone	VERY little, cleanup	
Arctostaphylos	Manzanita	VERY little, cleanup	
Artemisia	Sage brush	handles pruning well	
Asarum	Wild Ginger	can mow or remove foliage	
Campanula	California	remove dead material if needed	disappears in summer
Carex	Sedge	mow if needed	
Carpenteria	Bush Anemone	remove dead material if needed	
Ceanothus	Wild Lilac	remove dead material if needed, prune to control	
Cephalanthus	Button willow	remove dead material if needed	goes winter deciduous
Cercidium	Palo Verde	remove dead material if needed	
Cercis	Redbud	remove dead material if needed	goes winter deciduous
Cercocarpus	Mountain Mahogany	remove dead material if needed	deer love
Chlorogalum		dead head	goes summer deciduous
Cirsium		dead head	
Cneoridium		remove dead material if needed	
Comarostaphylos		remove dead material if needed	
Cornus	Dogwood	remove dead material if needed, can be heavily pruned	goes winter deciduous
Cupressus	Cypress	top, remove dead material if needed	
Delphinium		remove dead material if needed	goes summer deciduous

Diplacus	Monkey Flower	remove dead material if needed	
Dudleya	Liveforever	remove dead material if needed	
Elymus	Wildrye	remove dead material if needed, smaller forms can be mowed	
Erigeron	Fleabane	remove dead material if needed	
Eriodictyon	Yerba Santa	remove dead material if needed	
Eriogonum	Buckwheat	remove dead material if needed	
Eriophyllum		remove dead material if needed	
Erysimum		remove dead material if needed	
Eschscholzia	California	remove dead material if needed	goes summer deciduous
Fallugia	Apache Plume	remove dead material if needed	
Forestiera	Desert Olive	remove dead material if needed	
Fragaria	Strawberry	remove dead material if needed	
Frankenia		remove dead material if needed	
Fremontia	Flannel Bush	remove dead material if needed	
Galvezia		remove dead material if needed	
Garrya	Silk Tassal	remove dead material if needed	
Gaultheria	Salal	remove dead material if needed	
Geranium	Calif. Geranium	remove dead material if needed	
Grindella		remove dead material if needed	
Haplopappus	Golden Bush	remove dead material if needed	
Helenium	Owlsclaws	remove dead material if needed	
Helianthemum	Sun Rose	remove dead material if needed	
Helianthus	Sunflower	remove dead material if needed	
Heuchera	Alum Root	remove dead material if needed	
Holodiscus	Cream Bush	remove dead material if needed	
Hordeum	California	remove dead material if needed	
Horkellia	Star Turf	remove dead material if needed	
Hyptis	Desert	remove dead material if needed	
Iris		remove dead material if needed	looks unattractive in summer
Isomeris	Bladder Bod	remove dead material if needed	
Iva	Hayes iva	remove dead material if needed	
Jamesia	Cliffbush	remove dead material if needed	
Juncus	Rush	remove dead material if needed	
Juniperus		remove dead material if needed	
Keckiella	Bush Penstemon	remove dead material if needed	goes summer deciduous
Larrea	Creosote Bush	can be hedged	
Lathyrus		remove dead material if needed	
Lepechinia		remove dead material if needed	

Lepidium	Desert Alyssum	remove dead material if needed	
Leymus		remove dead material if needed	
Lilium	Lily	remove dead material if needed	goes summer deciduous
Lithocarpus	Tanbark Oak	remove dead material if needed	
Lobelia		remove dead material if needed	goes winter deciduous
Lonicera	Honeysuckle	control, remove dead material if needed	
Lotus	Deerweed	remove dead material if needed	
Ludwigia	Water Primrose	remove dead material if needed	
Lupinus	Silver Bush	remove dead material if needed	
Lyonothamnus	Catalina Ironwood	remove dead material if needed	
Mahonia	Oregon Grape	remove dead material if needed	
Malacothamnus	Bush Mallow	remove dead material if needed	
Maurandya	Snapdragon	remove dead material if needed	
Mimulus	Seep Flower	remove dead material if needed, mow if you need to	goes winter deciduous
Mirabilis	Four-O'clock	remove dead material if needed	
Monardella	Mint Bush	remove dead material if needed	
Muhlenbergia	Deer Grass	remove dead material if needed	
Myrica	Wax Myrtle	hedge if needed	
Oenothera	Evening	mow if needed	
Opuntia	Beavertail	remove dead material if needed	
Pellaea	Coffee Fern	remove dead material if needed	
Penstemon		remove dead material if needed	
Petrophytum	Rock Spiraea	remove dead material if needed	
Phacelia		remove dead material if needed	
Pluchea	Arrow Weed	remove dead material if needed	
Sisyrinchium	Eyed Grass	remove dead material if needed	ok to mow in late summer
Sporobolus	Alkali Sacaton	remove dead material if needed	ok to mow in late summer
Stachys	White Hedge	remove dead material if needed	ok to mow in late summer
Stanleya	Prince's Plume	remove dead material if needed	
Stipa		ok to mow in late summer	goes summer deciduous
Styrax		remove dead material if needed	goes winter deciduous
Symphoricarpos		remove dead material if needed	goes winter deciduous
Tellima	Fringcup	remove dead material if needed	goes summer deciduous
Thalictrum	Meadow Rue	remove dead material if needed	goes summer deciduous
Thuja	Canoe-Cedar	remove dead material if needed	
Trichostema	Woolly Blue-	remove dead material if needed	
Umbellularia	Bay Laurel	remove dead material if needed	
Vaccinium		remove dead material if needed	
Vancouveria	Inside-Out	remove dead material if needed	

Verbena	Pink Verbena	remove dead material if needed	
Viola	Violet	remove dead material if needed	disappears
Wyethia	Narrowleaf Mule Ears	remove dead material if needed	goes summer deciduous
Xylococcus		remove dead material if needed	
Xylorhiza	Orcutt's Aster	remove dead material if needed	

WEED REMOVAL

Genus	Common Name	Treatment Options	Follow-Up
Acacia sp.	Acacia	(see prior removal notes)	Return to the site to check for seedling growth and resprouts at least 2x year. Dig or cut out re-sprouts.
Agave attenuata	Agave	(see prior removal notes)	
Arundo donax	Giant Reed	(see winter removal notes)	Check for re-sprouts and new seedlings 4-6 times per year
Avena fatua	Wild Oat	(see winter removal notes)	Check for new sprouts.
Centaurea solstitialis	Yellow Star	(see prior removal notes)	In addition to mowing, continue to check for and pull out emerging plants through August.
Cirsium vulgare	Bull Thistle	(see prior removal notes)	Check for sprouts or seed/flower.
Conium maculatum	Poison Hemlock	(see prior removal notes)	Remove / hand-pull any new seedlings or regrowth by hand. Mow to height of 3" monthly (or at least every 3 months)
Cortaderia selloana	Pampas Grass	(see prior removal notes)	Check for seedlings. Cut all seed plumes (flowers) and carefully bag to dispose.
Cynodon dactylon	Bermuda Grass	(see prior removal notes)	check for new sprouts
Delairea odorata	Cape Ivy	(see prior removal notes)	Revegetate bare patches immediately to prevent erosion of exposed soils
Dipscacus sativus	Teasel	Hand pull wearing protective gloves.	
Hedera canariensis	Algerian Ivy	(see prior removal notes)	Check for re-sprouts and new seedlings 3-4 times per year
Hedera helix	English Ivy	(see prior removal notes)	Check for re-sprouts and new seedlings 3-4 times per year
Lactuca serriola	Prickly Lettuce	Hand-pull wearing protective gloves.	
Picris echioides	Bristly Oxtongue	(see prior removal notes)	Re-check seasonally. repeated mowing will be effective on larger stands.
Pennisetum clandestinum	Kikuyu Grass	(see prior removal notes)	Check for new sprouts.

Raphanus sativus	Wild Radish	(see prior removal notes)	Check for re-growth.
Rubus discolor	Himalayan Blackberry	(see prior removal notes)	Revegetate immediately, return to site to remove seedlings or regrowth
Spartium junceum	Spanish Broom	(see winter removal notes)	Remove new seedlings prior to flower/seed set.
Vinca major	Periwinkle	(see prior removal notes)	Monitor every 3 months for re-sprouts

EARLY WINTER

VEGETATION MANAGEMENT

Action	Responsible Party	Date(s) Task Completed
Prune to maintain site lines		
Note plant mortalities		
Replace container plants		
Replace failed cuttings		
Monitor for trampling		
Remove weeds		
Expect dense, vigorous growth from native pioneering species		

IRRIGATION EQUIPMENT CHECK

Action	Responsible Party	Date(s) Task Completed
Check equipment		
Observe overall performance / coverage		
Review watering schedule		
Check soil for overwatering		
Hand water if needed		

CHANNEL MAINTENANCE

Action	Responsible Party	Date(s) Task Completed
Observe erosion/deposition		
Check for excessive erosion around rock weirs (a.k.a. riffle starters) or banks		
Coir fabric should be desintegrating by now; do not repair		
Remove culvert blockages		

SITE MANAGEMENT

Action	Responsible Party	Date(s) Task Completed
Clear pathways		
Empty trash receptacles		
Remove garbage, contaminants & dog waste		
Inspect for graffiti		
Repair damages		

PRUNING

Genus	Common Name	How To Prune	Notes
Acer negundo	Box Elder	work to open it up, cleanup	
Alnus	Alder	remove suckers or top according to desired size	
Anemopsis	Yerba Mansa	mow	goes winter deciduous
Aristolochia	Dutchman's	manage/control the vines	goes winter deciduous
Betula	Birch	remove suckers to make tree, top to make shrub	goes winter deciduous
Bouteloua	Blue Gramma	mow	
Calycanthus	Spice Bush	remove dead material if needed	goes winter deciduous
Chilopsis	Desert Willow	prune to shape	goes winter deciduous
Corylus	Hazelnut	remove dead material if needed	goes winter deciduous
Cratagus	Hawthorn	remove dead material if needed	goes winter deciduous
Fraxinus	Ash	remove dead material if needed	goes winter deciduous
Juglans		remove dead material if needed	goes winter deciduous
Zauschneria	California fuchsia	remove dead material if needed	mow or hard prune
Oemleria	Oso Berry	remove dead material if needed	

WINTER

CHANNEL MAINTENANCE

Action	Responsible Party	Date(s) Task Completed
Observe erosion/deposition		
Check for excessive erosion around rock weirs (a.k.a. riffle starters) or banks		
Remove culvert blockages		

SITE MANAGEMENT

Action	Responsible Party	Date(s) Task Completed
Clear pathways		
Empty trash receptacles		
Remove garbage, contaminants & dog waste		
Inspect for graffiti		
Repair damages		

PRUNING

Genus	Common Name	How To Prune	Notes
Abronia	Sand verbena	dead material only	seasonal dieback common
Achillea	Yarrow	mow it	goes winter deciduous
Deschampsia		mow	
Elocharis	Creeping Spike Rush	mow	goes winter deciduous
Epipactis		mow	goes summer deciduous
Equisetum	Dwarf	mow	goes winter deciduous
Ericameria	Parish's	remove dead material if needed	
Heleocharis	Spike Rush	mow	goes winter deciduous
Mentha	Mint	mow if necessary	
Philadelphus	Wild Mock Orange	remove dead material if needed	goes winter deciduous
Physocarpus	Ninebark	remove dead material if needed	goes winter deciduous
Platanus	California Plane Tree	remove dead material if needed, if much dead, look for over or under watering	goes winter deciduous
Vitis	Grape vine	remove dead material if needed	goes winter deciduous

WEED REMOVAL

Genus	Common Name	Treatment Options	Follow-Up
Agave attenuata	Agave	Hand pull or dig to remove all parts.	
Arundo donax	Giant Reed	Cut stems with loppers, chainsaw, or brushcutter near the ground by May; dig out rhizomes to completely kill the root system. Perennial grass. Grows rapidly from cut stalks and root system. Keep all plant parts away from water.	Check for re-sprouts and new seedlings 4-6 times per year
Avena fatua	Wild Oat	Remove by hand or with hand tools. Mowing is also effective and should be done as soon as flowering begins. Remove in winter (January-April) and re-check seasonally.	
Brassica nigra	Black Mustard	Hand pull or use weed wrench to remove all parts, including tap root. (Mowing does NOT work.)	
Brassica rapa	Field Mustard	Remove plant and taproot by hand or with a weed wrench before seeds develop. (Mowing does NOT work.)	
Centaurea solstitialis	Yellow Star Thistle	(see prior removal notes)	In addition to mowing, continue to check for and pull out emerging plants through August.
Cirsium vulgare	Bull Thistle	(see prior removal notes)	Dig up rosettes each year or chop out 1-2 inches below ground. Replant with natives to discourage new thistles and shade them out.
Conium maculatum	Poison Hemlock	(see prior removal notes)	Remove / hand-pull any new seedlings or regrowth by hand. Mow to height of 3" monthly (or at least every 3 months)
Cortaderia selloana	Pampas Grass	(see prior removal notes)	Check for seedlings. Cut all seed plumes (flowers) and carefully bag to dispose.
Cynara cardunculus	Artichoke Thistle	Hand pull or dig to remove all parts, including tap root, when ground is moist. Mow monthly. Cut and bag flower stems before they open, to reduce seed production. Clean all equipment to prevent spread of seeds.	Best to mow monthly; Check Seasonally for new seedlings
Cynodon dactylon	Bermuda Grass	(see prior removal notes)	
Cytisus scoparius	Scotch Broom	(see prior removal notes)	Prolific seeding--control plant seedlings as seeds sprout in the next 8 yrs after plant removal
Delairea odorata	Cape Ivy	(see prior removal notes)	Revegetate bare patches immediately to prevent erosion of exposed soils
Dipscacus sativus	Teasel	(see prior removal notes)	

Foeniculum vulgare	Fennel	(see prior removal notes)	Remove ripe seeds from site by brushcutting and bagging flower heads. Revegetate with native shrubs immediately to prevent re-establishment. Check for resprouts/ seedlings.
Genista monspessulana	French Broom	Hand-pull, dig, or use weed wrench to remove all parts, including tap root, while ground is soft but before plant goes to seed (in March). Seeds germinate in with early winter rains.	Prolific seeding--control plant seedlings as seeds sprout in the next 8 yrs after plant removal
Hedera canariensis	Algerian Ivy	(see prior removal notes)	Check for re-sprouts and new seedlings 3-4 times per year
Hedera helix	English Ivy	(see prior removal notes)	Check for re-sprouts and new seedlings 3-4 times per year
Lactuca serriola	Prickly Lettuce	(see prior removal notes)	
Pennisetum clandestinum	Kikuyu Grass	(see prior removal notes)	
Picris echioides	Bristly Oxtongue	(see prior removal notes)	
Plantago lanceolata	Plantain	Hand-pull in early stages.	
Raphanus sativus	Wild Radish	(see prior removal notes)	
Rubus discolor	Himalayan Blackberry	(see prior removal notes)	Revegetate immediately, return to site to remove seedlings or regrowth
Spartium junceum	Spanish Broom	Hand-pull, dig, or use weed wrench to remove all parts, including tap root, while ground is soft but before plant goes to seed (in March). Seeds germinate in with early winter rains.	Prolific seeding--control plant seedlings as seeds sprout in the next 8 yrs after plant removal
Vinca major	Periwinkle	(see prior removal notes)	Monitor every 3 months for re-sprouts

ANY TIME

PRUNING

Genus	Common Name	How To Prune	Notes
Pinus	Pine	remove dead material if needed, most pines don't grow back, clean tools with disinfectant before using	
Acacia	Cat Claw, Wait-a-minute	very carefully, can handle at lot	A. Greggii is like pruning a wildcat
Brodiaea	Wild Hyacinth	na	disappears in summer
Calochortus	Mariposa Lilly	na	disappears in summer
Camassia	Camas	na	disappears in summer
Yucca		remove dead material if needed	if you have to prune, its dead
Poa	Pine bluegrass	mow if needed	
Polemonium	Western Sky	remove dead material if needed	
Populus	Cottonwood	prune up	goes winter deciduous
Potentilla	Cinquefoil	remove dead material if needed	
Prunus		remove dead material if needed	
Pseudotsuga		remove dead material if needed	
Psoralea	Indian Hemp	remove dead material if needed	goes summer deciduous
Purshia	Antelope	remove dead material if needed	
Quercus	Oak	remove dead material if needed	if much dieback, look at horticulture
Rhamnus		remove dead material if needed	if much dieback, look at horticulture
Rhus		remove dead material if needed	if much dieback, look at horticulture
Ribes	Currant/ Gooseberry	remove dead material if needed	goes winter deciduous
Rosa	Rose	remove dead material if needed, control suckers	goes winter deciduous
Rubus	Thimbleberry	remove dead material if needed, control suckers	
Salix	Willow	remove dead material if needed, control suckers, prune up to maintain sitelines below canopy, or prune into masses for views between thickets	goes winter deciduous
Salvia	Sage	remove dead material if needed	
Sambucus	Blue Elderberry	remove dead material if needed	goes winter deciduous
Sarcostemma	Hartweg's	remove dead material if needed	
Satureja		remove dead material if needed	
Scirpus	Bull Tule	control	goes winter deciduous
Scrophularia		remove dead material if needed	
Scutellaria		remove dead material if needed	ok to mow in late summer
Sedum	Stonecrop	remove dead material if needed	
Senecio		remove dead material if needed, control	

Shepherdia	Silver	remove dead material if needed	goes winter deciduous
Sidalcea	Checker Mallow	remove dead material if needed	goes summer deciduous
Solanum	Night Shade	remove dead material if needed	
Solidago	Golden Rod	remove dead material if needed	goes winter deciduous
Sphaeralcea	Desert Mallow	remove dead material if needed	
Spiraea	Mountain	remove dead material if needed	goes winter deciduous

Years 3-5: Overview & Seasonal Checklists

By the third year, the vegetation will have significant growth. Willow posts will be maturing rapidly and may need to be selectively thinned to form a taller, more treelike form. Container plants should continue to be supplemented at the beginning of each rainy season as needed. If trees have grown enough to provide adequate shade, second order species (creek plants that prefer shade) may be planted to replace the initial sun-tolerant pioneering species. Any major adjustments to the creek probably will have occurred by the second spring if there have been moderate storm flows, and by the third year the project is generally considered to be stable. In the third year, adequate watering, weeding, and upkeep are the main concerns.

Vegetation Management

- Monitor plant survival. In November, replace new plants which have died.
- Carefully remove invasive species as specified in the list of invasive plants in this *Guide*.
- Expect sun-loving pioneer species such as Cattail and Tule grasses to thrive in the first years.
- Remove fallen tree limbs and prune broken branches as necessary.
- Selectively thin dense thickets in the creek corridor. Topping or sheering these shrubs will only result in greater density. Let shrubs and trees to grow tall and prune inner branches to encourage an open, tree-like habit to allow visual access into and across the creek corridor.

Irrigation

- Once the native plants are established (usually after irrigating for the first two years), it may be best to turn off the irrigation. The natural wet/dry seasonal cycles benefit native plants, while year-round soil moisture from irrigation gives opportunistic weeds an advantage.
- If it is decided that the irrigation should be kept on, check equipment and coverage to ensure functionality. Notify Public Works if soil appears too dry or hard; or if ground seems over-saturated or spigots are gushing.
- Monitor the effects of the irrigation regime on the shrubs in the creek corridor. Many native plants prefer occasional, deep watering in summer and cannot tolerate over-watering.

Creek Channel Maintenance:

- The channel will have settled into it's natural state of equilibrium at this stage. Erosion and deposition should be minor.
- Watch for high velocities along the edges of the Riffle-Starters (Rock Weirs), bank erosion on adjacent banks, excessive scouring immediately downstream, and downstream movement of weir boulders.
- Coir fabric is designed to degrade at this stage. Vegetation should be in place to adequately protect the banks and prevent erosion.
- Remove any debris from the channel that may block the culverts and cause water to back up. Continue to monitor the site for changes and damage during and/or after large storm events. Photo document any measurable situations and record storm date.

Clean-up / Vandalism / Public Safety

- Remove any garbage that may have been dumped or blown into the park.
- Inspect the park regularly for damage or graffiti, and make necessary repairs.

- Seeding should occur as follows:

Winter 2008

Monthly:	Weed upland areas

Spring 2008

Monthly:	Weed upland areas
April:	Evaluate need to seed/mow
Monthly:	If necessary, mow site after flowering but before viable seeds are produced

Summer 2008

Monthly:	Weed upland areas

Fall 2008

September:	Mow
Monthly:	Weed upland areas
November:	Overseed

- Weed site once a month, taking special care to weed in spring before summer seed production begins.
- Overseed in the fall during years of high exotic plant coverage or poor native plant coverage. Mowing should be done during years of seed application; once in the fall prior to seeding and again in the spring before the exotics begin to flower. The maintenance interval for overseeding/mowing may be on the scale of every 2-4 years.

As a reminder, the target aesthetic is to maintain site lines across the site while creating a vegetative canopy to shade the creek. This canopy will naturally impede the development of a shrubby understory by blocking light.

Annual Checklist for Year 3-5

EARLY SPRING

VEGETATION MANAGEMENT

Action	Responsible Party	Date(s) Task Completed
Prune to maintain site lines		
Monitor for trampling		
Remove weeds		
Expect dense, vigorous growth from native pioneering species		

IRRIGATION EQUIPMENT CHECK

Action	Responsible Party	Date(s) Task Completed
Irrigation		
Check equipment		
Observe overall performance / coverage		
Review watering schedule		
Check soil for overwatering		
Hand water if needed		

SITE MANAGEMENT

Action	Responsible Party	Date(s) Task Completed
Clear pathways		
Empty trash receptacles		
Remove garbage, contaminants & dog waste		
Inspect for graffiti		
Repair damages		

PRUNING

Genus	Common Name	How To Prune	Notes
Adiantum	Maidenhair	clean up	
Agastache	Horse Mint	clean up	shuts down in late summer
Antirrhinum	Snapdragon	cleanup	
Aquilegia	Columbine	cleanup	
Arnica	Frog Flower	dead head	
Asclepias	Monarch	remove dead material if needed	goes winter deciduous
Aster		remove dead material if needed	
Atriplex	Saltbush	remove dead material if needed	deer loves and will prune for you
Baccharis		remove dead material if needed	can handle full butchering
Beloperone	Chuparosa	remove dead material if needed	
Brickellia		remove dead material if needed	
Camissonia	Beach Evening Primrose	remove dead material if needed	
Chrysothamnus		dead head	
Clematis		dead head, control	goes winter deciduous
Cowania	Cliff Rose	remove dead material if needed	
Crossosoma		remove dead material if needed	
Encelia	Bush sunflower	remove dead material if needed	

WEED REMOVAL

Genus	Common Name	Treatment Options	Follow-Up
Acacia sp.	Acacia	Pull sprouts and saplings by hand when soil is moist/loose. Cut larger trees and cover stump with black plastic to block-out light (stumps will sprout).	Return to the site to check for seedling growth and resprouts at least 2x year. Dig or cut out re-sprouts.
Agave attenuata	Agave	Hand pull or dig to remove all parts.	Check for re-sprouts.
Arundo donax	Giant Reed	(see winter removal notes)	Check for re-sprouts and new seedlings 4-6 times per year
Avena fatua	Wild Oat	(see winter removal notes)	Check for new sprouts.
Brassica nigra	Black Mustard	(see winter removal notes)	Hand pull new sprouts. Do not mow.
Brassica rapa	Field Mustard	(see winter removal notes)	
Conium maculatum	Poison Hemlock	Hand-pull when soils are moist to facilitate removal of the taproot. Mow in beginning of April, then every 3 months except during seeding. When removing poison hemlock wear protective gloves and clothing and take breaks from exposure.	Remove / hand-pull any new seedlings or regrowth by hand. Mow to height of 3" monthly (or at least every 3 months)
Cortaderia selloana	Pampas grass	Pull seedlings by hand. Cut stems and leaf blades near to the ground and remove all root mass (may need the use of machete or chainsaw). Cut all seed plumes (flowers) and carefully bag to dispose.	Check for seedlings. Cut all seed plumes (flowers) and carefully bag to dispose.
Cynara cardunculus	Artichoke Thistle	(see winter removal notes)	Best to mow monthly; Check Seasonally for new seedlings
Cynodon dactylon	Bermuda Grass	Hand-pull or dig out using a shovel, prior to plant establishment. Establishment of native vegetation will discourage Bermuda Grass	check for new sprouts
Cytisus scoparius	Scotch Broom	Hand-pull, dig, or use weed wrench to remove all parts, including tap root, while ground is soft but before plant goes to seed (in March). Seeds germinate in with early winter rains.	Prolific seeding--control plant seedlings as seeds sprout in the next 8 yrs after plant removal

Delairea odorata	Cape Ivy	Clear a strip around the infested area and work inward, peeling back the edges of the mat, and rolling the vegetation like a carpet. Hand-pull and rake soil surface to several inches deep to remove all root fragments, as roots will re-sprout. Work from upstream to downstream to prevent transport of fragments by water and recolonizing downstream.	Revegetate bare patches immediately to prevent erosion of exposed soils
Dipscacus sativus	Teasel	Hand pull wearing protective gloves.	check for new sprouts
Foeniculum vulgare	Fennel	Hand-pull or dig to remove all parts, including tap root while ground is soft/moist. Uproot seedlings with hand tools. Mow in beginning of April, then every 3 months except during seeding. (Do not mow during seed set--this would encourage seed spread.	Remove ripe seeds from site by brushcutting and bagging flower heads. Revegetate with native shrubs immediately to prevent re-establishment. Check for resprouts/ seedlings.
Genista monspessulana	French Broom	(see winter removal notes)	Prolific seeding--control plant seedlings as seeds sprout in the next 8 yrs after plant removal
Hedera canariensis	Algerian Ivy	Pull vines climbing into trees and along the ground by hand or with rakes and McLeods. Ivy can sometimes be rolled up like a carpet and piled or hauled off-site. Cut woody stems with pruners or loppers, and dig up the roots with a shovel to prevent re-sprouting.	Check for re-sprouts and new seedlings 3-4 times per year
Hedera helix	English Ivy	Pull vines climbing into trees and along the ground by hand or with rakes and McLeods. Ivy can sometimes be rolled up like a carpet and piled or hauled off-site. Cut woody stems with pruners or loppers, and dig up the roots with a shovel to prevent re-sprouting.	Check for re-sprouts and new seedlings 3-4 times per year
Lactuca serriola	Prickly Lettuce	Hand-pull wearing protective gloves.	
Pennisetum clandestinum	Kikuyu Grass	Hand-pull in early stages, removing root system. Do not hoe or mow--all cut pieces will root. Clean all equipment to prevent transporting grass to other sites.	
Raphanus sativus	Wild Radish	Hand-pull or cut plants prior to the formation of seed pods if possible. Because plants have a heavy taproot (resembling a radish), removal is easier when the ground is soft and wet. Check seasonally for re-growth.	
Rubus discolor	Himalayan Blackberry	Hand-pull or cut stems with loppers near ground; dig out roots with a Pulaski or shovel, and remove as much as possible, especially the main root ball and large lateral roots.	Revegetate immediately, return to site to remove seedlings or regrowth

Vinca major	Periwinkle	Pull up dense vegetation and underlying stolons by hand (if soil is loose) or use a McLeod. Pull roots from base of stems; grub to follow up root removal if necessary. All stems and root fragments will re-sprout.	Monitor every 3 months for re-sprouts
Spartium junceum	Spanish Broom	(see winter removal notes)	Remove new seedlings prior to flower/seed set.

LATE SPRING

PRUNING

Genus	Common Name	How To Prune	Notes
Abies	Fir	dead material only	
Ambrosia		cleanup	
Dryopteris	Wood Fern	remove dead material if needed	
Heteromeles	Toyon	remove dead material if needed	

WEED REMOVAL

Genus	Common Name	Treatment Options	Follow-Up
Arundo donax	Giant Reed	(see winter removal notes)	Check for re-sprouts and new seedlings 4-6 times per year
Centaurea solstitialis	Yellow Star Thistle	Hand-pull or dig to remove all parts, including root (if possible) May-June, when plants are bolting. Grasp the plant at the base and pull steadily, straight up. Mow monthly, 1-2" above the ground. If thistle is in flower, it is too late to mow, as seeds may be dispersed. Wear protective gloves and wash well after handling thistle.	In addition to mowing, continue to check for and pull out emerging plants through August.
Cirsium vulgare	Bull Thistle	Hand pull or dig to remove all parts, including tap root, before flowers open. If ground is hard, loosen with a pick first. Mow after thistle has bolted but before flowering. Cut and bag flower stems before they open, to reduce seed production. Clean all equipment to prevent spread of seeds.	Dig up rosettes each year or chop out 1-2 inches below ground. Replant with natives to discourage new thistles and shade them out.
Cynara cardunculus	Artichoke Thistle	(see winter removal notes)	Best to mow monthly; Check Seasonally for new seedlings
Picris echioides	Bristly Oxtongue	Hand pull wearing protective gloves prior to flowering to prevent seed dispersion (June).	Re-check seasonally. repeated mowing will be effective on larger stands.
Plantago lanceolata	Plantain	Hand-pull in early stages.	
Rubus discolor	Himalayan Blackberry	(see prior removal notes)	Remove seedlings or regrowth
Vinca major	Periwinkle	Pull up dense vegetation and underlying stolons by hand (if soil is loose) or use a McLeod. Pull roots from base of stems; grub to follow up root removal if necessary. All stems and root fragments will re-sprout.	Monitor every 3 months for re-sprouts

SUMMER

VEGETATION MANAGEMENT

Action	Responsible Party	Date(s) Task Completed
Monitor for trampling		
Remove weeds		

IRRIGATION EQUIPMENT CHECK

Action	Responsible Party	Date(s) Task Completed
Check equipment		
Review watering schedule		
Check soil for overwatering		
Hand water if needed		

SITE MANAGEMENT

Action	Responsible Party	Date(s) Task Completed
Clear pathways		
Empty trash receptacles		
Remove garbage, contaminants & dog waste		
Inspect for graffiti		
Repair damages		

PRUNING

Genus	Common Name	How To Prune	Notes
Aesculus	Buckeye	open up and clean up	
Agave	Agave	control and clean up	
Castilleja	Indian Paint	remove dead material if needed	
Leptodactylon	Prickly Phlox	remove dead material if needed	
Libocedrus	Incense Cedar	remove dead material if needed	
Melica		remove dead material if needed	goes summer deciduous

LATE SUMMER

SITE MANAGEMENT

Action	Responsible Party	Date(s) Task Completed
Clear pathways		
Empty trash receptacles		
Remove garbage, contaminants & dog waste		
Inspect for graffiti		
Repair damages		

PRUNING

Genus	Common Name	How To Prune	Notes
Amorpha		cleanup	
Antirrhinum		cleanup	
Aquilegia		cleanup	
Arbutus		VERY little, cleanup	
Arctostaphylos		VERY little, cleanup	
Artemisia		handles pruning well	
Asarum		can mow or remove foliage	
Campanula		remove dead material if needed	disappears in summer
Carex		mow if needed	
Carpenteria		remove dead material if needed	
Ceanothus		remove dead material if needed, prune to control	
Cephalanthus		remove dead material if needed	goes winter deciduous
Cercidium		remove dead material if needed	
Cercis		remove dead material if needed	goes winter deciduous
Cercocarpus		remove dead material if needed	deer love
Chlorogalum		dead head	goes summer deciduous
Cirsium		dead head	
Cneoridium		remove dead material if needed	
Comarostaphylos		remove dead material if needed	
Cornus		remove dead material if needed, can be heavily pruned	goes winter deciduous
Cupressus		top, remove dead material if needed	
Delphinium		remove dead material if needed	goes summer deciduous
Diplacus		remove dead material if needed	

Dudleya	remove dead material if needed	
Elymus	remove dead material if needed, smaller forms can be mowed	
Erigeron	remove dead material if needed	
Eriodictyon	remove dead material if needed	
Eriogonum	remove dead material if needed	
Eriophyllum	remove dead material if needed	
Erysimum	remove dead material if needed	
Eschscholzia	remove dead material if needed	goes summer deciduous
Fallugia	remove dead material if needed	
Forestiera	remove dead material if needed	
Fragaria	remove dead material if needed	
Frankenia	remove dead material if needed	
Fremontia	remove dead material if needed	
Galvezia	remove dead material if needed	
Garrya	remove dead material if needed	
Gaultheria	remove dead material if needed	
Geranium	remove dead material if needed	
Grindella	remove dead material if needed	
Haplopappus	remove dead material if needed	
Helenium	remove dead material if needed	
Helianthemum	remove dead material if needed	
Helianthus	remove dead material if needed	
Heuchera	remove dead material if needed	
Holodiscus	remove dead material if needed	
Hordeum	remove dead material if needed	
Horkellia	remove dead material if needed	
Hyptis	remove dead material if needed	
Iris	remove dead material if needed	looks unattractive in summer
Isomeris	remove dead material if needed	
Iva	remove dead material if needed	
Jamesia	remove dead material if needed	
Juncus	remove dead material if needed	
Juniperus	remove dead material if needed	
Keckiella	remove dead material if needed	goes summer deciduous
Larrea	can be hedged	
Lathyrus	remove dead material if needed	
Lepechinia	remove dead material if needed	
Lepidium	remove dead material if needed	

Leymus	remove dead material if needed	
Lilium	remove dead material if needed	goes summer deciduous
Lithocarpus	remove dead material if needed	
Lobelia	remove dead material if needed	goes winter deciduous
Lonicera	control, remove dead material if needed	
Lotus	remove dead material if needed	
Ludwigia	remove dead material if needed	
Lupinus	remove dead material if needed	
Lyonothamnus	remove dead material if needed	
Mahonia	remove dead material if needed	
Malacothamnus	remove dead material if needed	
Maurandya	remove dead material if needed	
Mimulus	remove dead material if needed, mow if you need to	goes winter deciduous
Mirabilis	remove dead material if needed	
Monardella	remove dead material if needed	
Muhlenbergia	remove dead material if needed	
Myrica	hedge if needed	
Oenothera	mow if needed	
Opuntia	remove dead material if needed	
Pellaea	remove dead material if needed	
Penstemon	remove dead material if needed	
Petrophytum	remove dead material if needed	
Phacelia	remove dead material if needed	
Pluchea	remove dead material if needed	
Sisyrinchium	remove dead material if needed	ok to mow in late summer
Sporobolus	remove dead material if needed	ok to mow in late summer
Stachys	remove dead material if needed	ok to mow in late summer
Stanleya	remove dead material if needed	
Stipa	ok to mow in late summer	goes summer deciduous
Styrax	remove dead material if needed	goes winter deciduous
Symphoricarpos	remove dead material if needed	goes winter deciduous
Tellima	remove dead material if needed	goes summer deciduous
Thalictrum	remove dead material if needed	goes summer deciduous
Thuja	remove dead material if needed	
Trichostema	remove dead material if needed	
Umbellularia	remove dead material if needed	
Vaccinium	remove dead material if needed	
Vancouveria	remove dead material if needed	
Verbena	remove dead material if needed	

Viola	remove dead material if needed	disappears
Wyethia	remove dead material if needed	goes summer deciduous
Xylococcus	remove dead material if needed	
Xylorhiza	remove dead material if needed	

WEED REMOVAL

Genus	Common Name	Treatment Options	Follow-Up
Acacia sp.	Acacia	(see prior removal notes)	Return to the site to check for seedling growth and resprouts at least 2x year. Dig or cut out re-sprouts.
Agave attenuata	Agave	(see prior removal notes)	
Arundo donax	Giant Reed	(see winter removal notes)	Check for re-sprouts and new seedlings 4-6 times per year
Avena fatua	Wild Oat	(see winter removal notes)	Check for new sprouts.
Centaurea solstitialis	Yellow Star	(see prior removal notes)	In addition to mowing, continue to check for and pull out emerging plants through August.
Cirsium vulgare	Bull Thistle	(see prior removal notes)	Check for sprouts or seed/flower.
Conium maculatum	Poison Hemlock	(see prior removal notes)	Remove / hand-pull any new seedlings or regrowth by hand. Mow to height of 3" monthly (or at least every 3 months)
Cortaderia selloana	Pampas Grass	(see prior removal notes)	Check for seedlings. Cut all seed plumes (flowers) and carefully bag to dispose.
Cynodon dactylon	Bermuda Grass	(see prior removal notes)	check for new sprouts
Delairea odorata	Cape Ivy	(see prior removal notes)	Revegetate bare patches immediately to prevent erosion of exposed soils
Dipscacus sativus	Teasel	Hand pull wearing protective gloves.	
Hedera canariensis	Algerian Ivy	(see prior removal notes)	Check for re-sprouts and new seedlings 3-4 times per year
Hedera helix	English Ivy	(see prior removal notes)	Check for re-sprouts and new seedlings 3-4 times per year
Lactuca serriola	Prickly Lettuce	Hand-pull wearing protective gloves.	
Picris echioides	Bristly Oxtongue	(see prior removal notes)	Re-check seasonally. repeated mowing will be effective on larger stands.
Pennisetum clandestinum	Kikuyu Grass	(see prior removal notes)	Check for new sprouts.

Raphanus sativus	Wild Radish	(see prior removal notes)	Check for re-growth.
Rubus discolor	Himalayan Blackberry	(see prior removal notes)	Revegetate immediately, return to site to remove seedlings or regrowth
Spartium junceum	Spanish Broom	(see winter removal notes)	Remove new seedlings prior to flower/seed set.
Vinca major	Periwinkle	(see prior removal notes)	Monitor every 3 months for re-sprouts

EARLY WINTER

VEGETATION MANAGEMENT

Action	Responsible Party	Date(s) Task Completed
Prune to maintain site lines		
Replace container plants		
Monitor for trampling		
Remove weeds		

CHANNEL MAINTENANCE

Action	Responsible Party	Date(s) Task Completed
Observe erosion/deposition		
Remove culvert blockages		

SITE MANAGEMENT

Action	Responsible Party	Date(s) Task Completed
Clear pathways		
Empty trash receptacles		
Remove garbage, contaminants & dog waste		
Inspect for graffiti		
Repair damages		

PRUNING

Genus	Common Name	How To Prune	Notes
Acer negundo	Box Elder	work to open it up, cleanup	
Alnus	Alder	remove suckers or top according to desired size	
Anemopsis	Yerba Mansa	mow	goes winter deciduous
Aristolochia	Dutchman's	manage/control the vines	goes winter deciduous
Betula	Birch	remove suckers to make tree, top to make shrub	goes winter deciduous
Bouteloua	Blue Gramma	mow	
Calycanthus	Spice Bush	remove dead material if needed	goes winter deciduous
Chilopsis	Desert Willow	prune to shape	goes winter deciduous
Corylus	Hazelnut	remove dead material if needed	goes winter deciduous
Cratagus	Hawthorn	remove dead material if needed	goes winter deciduous
Fraxinus	Ash	remove dead material if needed	goes winter deciduous
Juglans		remove dead material if needed	goes winter deciduous
Zauschneria	California fuchsia	remove dead material if needed	mow or hard prune
Oemleria	Oso Berry	remove dead material if needed	

WINTER

CHANNEL MAINTENANCE

Action		Responsible Party	Date(s) Task Completed
Observe erosion/deposition			
Remove culvert blockages			

SITE MANAGEMENT

Action		Responsible Party	Date(s) Task Completed
Clear pathways			
Empty trash receptacles			
Remove garbage, contaminants & dog waste			
Inspect for graffiti			
Repair damages			

PRUNING

Genus	Common Name	How To Prune	Notes
Abronia	Sand verbena	dead material only	seasonal dieback common
Achillea	Yarrow	mow it	goes winter deciduous
Deschampsia		mow	
Elocharis	Creeping Spike Rush	mow	goes winter deciduous
Epipactis		mow	goes summer deciduous
Equisetum	Dwarf	mow	goes winter deciduous
Ericameria	Parish's	remove dead material if needed	
Heleocharis	Spike Rush	mow	goes winter deciduous
Mentha	Mint	mow if necessary	
Philadelphus	Wild Mock Orange	remove dead material if needed	goes winter deciduous
Physocarpus	Ninebark	remove dead material if needed	goes winter deciduous
Platanus	California Plane Tree	remove dead material if needed, if much dead, look for over or under watering	goes winter deciduous
Vitis	Grape vine	remove dead material if needed	goes winter deciduous

WEED REMOVAL

Genus	Common Name	Treatment Options	Follow-Up
Agave attenuata	Agave	Hand pull or dig to remove all parts.	
Arundo donax	Giant Reed	Cut stems with loppers, chainsaw, or brushcutter near the ground by May; dig out rhizomes to completely kill the root system. Perennial grass. Grows rapidly from cut stalks and root system. Keep all plant parts away from water.	Check for re-sprouts and new seedlings 4-6 times per year
Avena fatua	Wild Oat	Remove by hand or with hand tools. Mowing is also effective and should be done as soon as flowering begins. Remove in winter (January-April) and re-check seasonally.	
Brassica nigra	Black Mustard	Hand pull or use weed wrench to remove all parts, including tap root. (Mowing does NOT work.)	
Brassica rapa	Field Mustard	Remove plant and taproot by hand or with a weed wrench before seeds develop. (Mowing does NOT work.)	
Centaurea solstitialis	Yellow Star Thistle	(see prior removal notes)	In addition to mowing, continue to check for and pull out emerging plants through August.
Cirsium vulgare	Bull Thistle	(see prior removal notes)	Dig up rosettes each year or chop out 1-2 inches below ground. Replant with natives to discourage new thistles and shade them out.
Conium maculatum	Poison Hemlock	(see prior removal notes)	Remove / hand-pull any new seedlings or regrowth by hand. Mow to height of 3" monthly (or at least every 3 months)
Cortaderia selloana	Pampas Grass	(see prior removal notes)	Check for seedlings. Cut all seed plumes (flowers) and carefully bag to dispose.
Cynara cardunculus	Artichoke Thistle	Hand pull or dig to remove all parts, including tap root, when ground is moist. Mow monthly. Cut and bag flower stems before they open, to reduce seed production. Clean all equipment to prevent spread of seeds.	Best to mow monthly; Check Seasonally for new seedlings
Cynodon dactylon	Bermuda Grass	(see prior removal notes)	
Cytisus scoparius	Scotch Broom	(see prior removal notes)	Prolific seeding--control plant seedlings as seeds sprout in the next 8 yrs after plant removal
Delairea odorata	Cape Ivy	(see prior removal notes)	Revegetate bare patches immediately to prevent erosion of exposed soils
Dipscacus sativus	Teasel	(see prior removal notes)	

Foeniculum vulgare	Fennel	(see prior removal notes)	Remove ripe seeds from site by brushcutting and bagging flower heads. Revegetate with native shrubs immediately to prevent re-establishment. Check for resprouts/ seedlings.
Genista monspessulana	French Broom	Hand-pull, dig, or use weed wrench to remove all parts, including tap root, while ground is soft but before plant goes to seed (in March). Seeds germinate in with early winter rains.	Prolific seeding--control plant seedlings as seeds sprout in the next 8 yrs after plant removal
Hedera canariensis	Algerian Ivy	(see prior removal notes)	Check for re-sprouts and new seedlings 3-4 times per year
Hedera helix	English Ivy	(see prior removal notes)	Check for re-sprouts and new seedlings 3-4 times per year
Lactuca serriola	Prickly Lettuce	(see prior removal notes)	
Pennisetum clandestinum	Kikuyu Grass	(see prior removal notes)	
Picris echioides	Bristly Oxtongue	(see prior removal notes)	
Plantago lanceolata	Plantain	Hand-pull in early stages.	
Raphanus sativus	Wild Radish	(see prior removal notes)	
Rubus discolor	Himalayan Blackberry	(see prior removal notes)	Revegetate immediately, return to site to remove seedlings or regrowth
Spartium junceum	Spanish Broom	Hand-pull, dig, or use weed wrench to remove all parts, including tap root, while ground is soft but before plant goes to seed (in March). Seeds germinate in with early winter rains.	Prolific seeding--control plant seedlings as seeds sprout in the next 8 yrs after plant removal
Vinca major	Periwinkle	(see prior removal notes)	Monitor every 3 months for re-sprouts

ANY TIME

PRUNING

Genus	Common Name	How To Prune	Notes
Pinus	Pine	remove dead material if needed, most pines don't grow back, clean tools with disinfectant before using	
Acacia	Cat Claw, Wait-a-minute	very carefully, can handle at lot	A. Greggii is like pruning a wildcat
Brodiaea	Wild Hyacinth	na	disappears in summer
Calochortus	Mariposa Lilly	na	disappears in summer
Camassia	Camas	na	disappears in summer
Yucca		remove dead material if needed	if you have to prune, its dead
Poa	Pine bluegrass	mow if needed	
Polemonium	Western Sky	remove dead material if needed	
Populus	Cottonwood	prune up	goes winter deciduous
Potentilla	Cinquefoil	remove dead material if needed	
Prunus		remove dead material if needed	
Pseudotsuga		remove dead material if needed	
Psoralea	Indian Hemp	remove dead material if needed	goes summer deciduous
Purshia	Antelope	remove dead material if needed	
Quercus	Oak	remove dead material if needed	if much dieback, look at horticulture
Rhamnus		remove dead material if needed	if much dieback, look at horticulture
Rhus		remove dead material if needed	if much dieback, look at horticulture
Ribes	Currant/ Gooseberry	remove dead material if needed	goes winter deciduous
Rosa	Rose	remove dead material if needed, control suckers	goes winter deciduous
Rubus	Thimbleberry	remove dead material if needed, control suckers	
Salix	Willow	remove dead material if needed, control suckers, prune up to maintain sitelines below canopy, or prune into masses for views between thickets	goes winter deciduous
Salvia	Sage	remove dead material if needed	
Sambucus	Blue Elderberry	remove dead material if needed	goes winter deciduous
Sarcostemma	Hartweg's	remove dead material if needed	
Satureja		remove dead material if needed	
Scirpus	Bull Tule	control	goes winter deciduous
Scrophularia		remove dead material if needed	
Scutellaria		remove dead material if needed	ok to mow in late summer
Sedum	Stonecrop	remove dead material if needed	
Senecio		remove dead material if needed, control	

Shepherdia	Silver	remove dead material if needed	goes winter deciduous
Sidalcea	Checker Mallow	remove dead material if needed	goes summer deciduous
Solanum	Night Shade	remove dead material if needed	
Solidago	Golden Rod	remove dead material if needed	goes winter deciduous
Sphaeralcea	Desert Mallow	remove dead material if needed	
Spiraea	Mountain	remove dead material if needed	goes winter deciduous

RESOURCE SHEETS

PROJECT PLANT LIST

Trees

Quercus agrifolia	Coast Live Oak
Populus fremontii	Fremont Poplar
Alnus rhombifolia	White Alder
Acer Macrophyllum	Big-Leaf Maple

Shrubs

Salix lasiopeis	Arroyo Willow
Salix lasiandra	Red Willow
Cornus stolonifera	Red-twig dogwood
Physocarpus capitatus	Ninebark
Rubus ursinus	Pacific Blackberry
Heteromeles arbutifolia	Toyon
Ribes menziesii	Flowering Currant
Ribes californicum	Hillside Gooseberry
Mimulus aurantiacus	Sticky Monkey Flower
Bacharis pillularis var. Consanguinea	Dwarf Coyote Bush
Artemisia californica	California Sage

Riparian Seed Mix

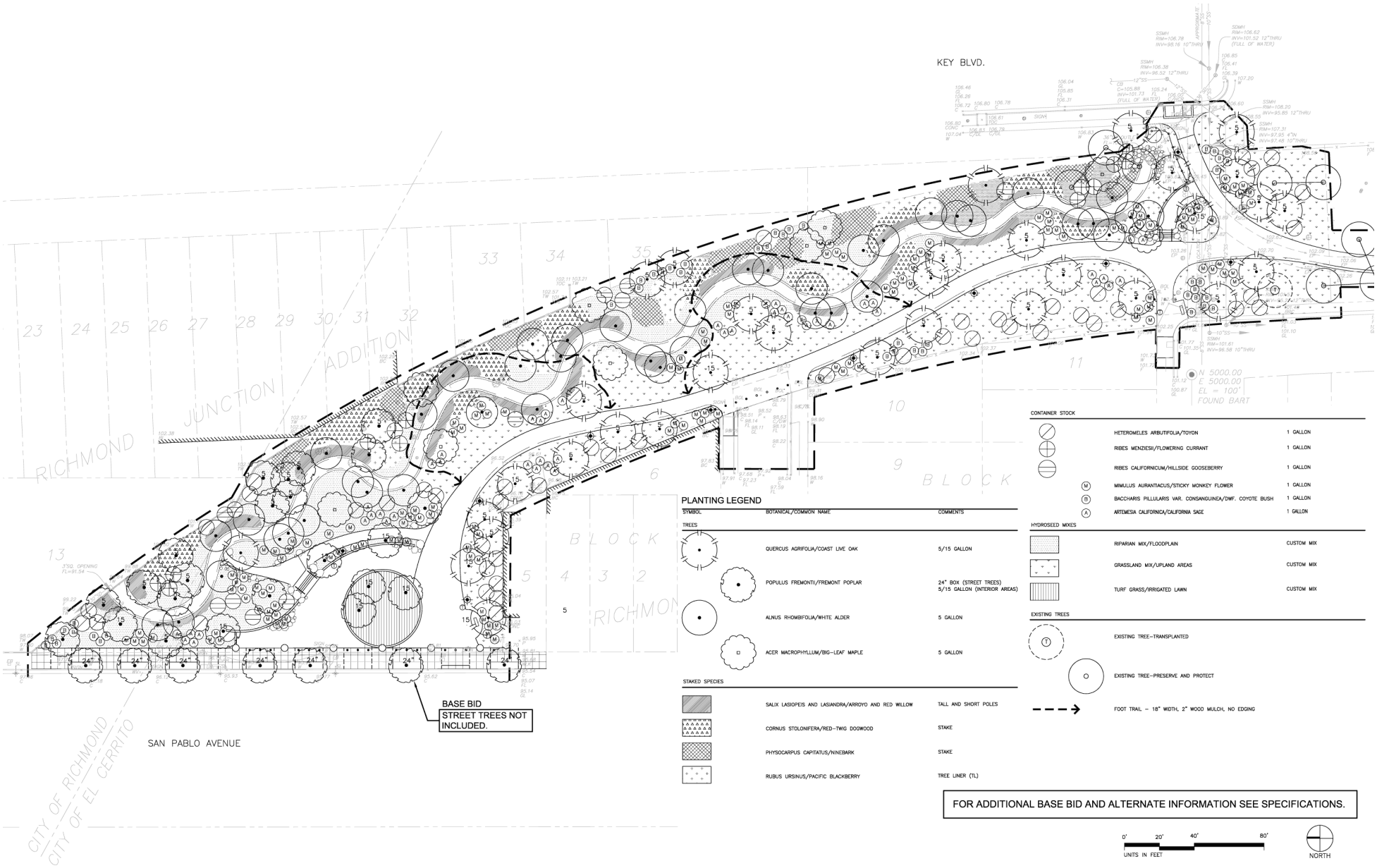
Artemisia douglasiana	Douglas mugwort
Aster chilensis	California aster
Bromus carinatus	California brome
Carex barbarae	Santa Barbara sedge
Euthamia occidentalis	western goldenrod
Hordeum rachyantherum	meadow barley
Juncus balticus	wire rush
Lasthenia glabrata	yellow-rayed lasthenia
Leymus triticoides Yolo	creeping wild rye
Trifolium obtusiflorum	creek clover
Ranunculus californicus	California buttercup
Scrophularia californica	bee plant
Collinsia heterophylla	Chinese houses

Grassland Seed Mix*

Achillea millefolium	yarrow
Clarkia rubicunda	Farewell to Spring
Elymus multisetus	big squirreltail
Elymus glaucus	blue wildrye
Eschscholzia californica	California poppy
Lupinus bicolor	annual lupine
Lupinus succulentus	succulent annual lupine
Melica californica	California melic
Nassella pulchra	purple needlegrass
Nemophila menziesii	baby blue eyes
Platystemon californicus	cream cups
Sisyrinchium bellum	California blue-eyed grass
Trifolium wildenovii	tomcat clover
Vulpia microstachys	three-weeks fescue
Ranunculus californicus	California buttercup
Perideridia kelloggii	Yampah
Castilleja ambigua	Owl's Clover

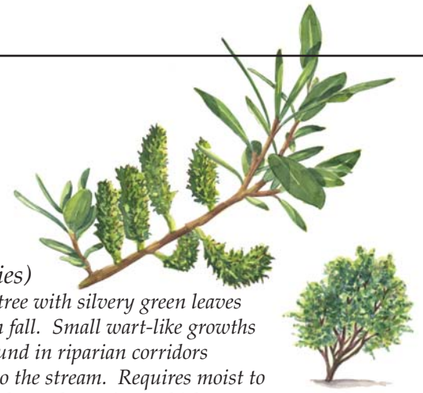
* This mix will be used for overseeding after the first year. In the first year, the grassland seed mix included: Elymus glaucus (Blue Wildrye); Vulpia microstachys (Three-weeks Fescue); Achillea millefolium (Yarrow); Eschsholzia californica (California Poppy); Lupinus bicolor (annual Lupine).

SITE REFERENCE MAP



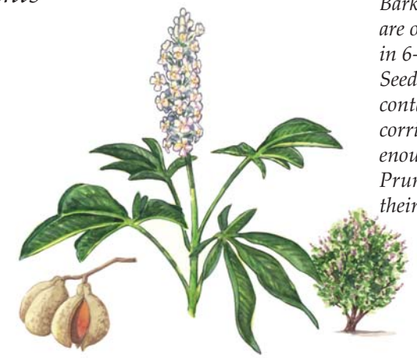
Native Plants

commonly used in the Restoration of East Bay Riparian Environments

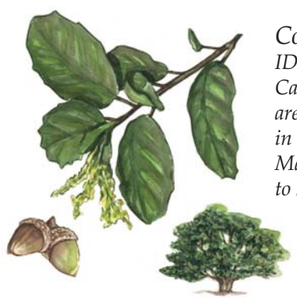


Willow (Salix species)
ID: Deciduous shrub/tree with silvery green leaves that yellow and shed in fall. Small wart-like growths visible along stem. Found in riparian corridors immediately adjacent to the stream. Requires moist to saturated soils. Planted as pole cuttings which will appear as sticks driven into the ground during the first years of growth. Maintenance: Do not prune during first two years, as this will top the trees and make them bushy. Supplement plantings if necessary using cuttings; take cuttings from established individuals during the winter while plant is dormant. No staking necessary.

Ninebark (Physocarpus capitatus)
ID: Deciduous shrub/tree. Leaves have 3-5 lobes and toothed edges. Planted as pole cuttings. Pole cuttings will appear as sticks driven into the ground during the first years of growth. Spreads by underground stems and rooting branches. Found in riparian corridors. Thrives in moist soils. Maintenance: Pruning is not typically required. No staking necessary. If pruning is necessary, prune near the base and do not hedge cut.



California Buckeye (Aesculus californica)
ID: Deciduous tree that grows to 20 feet tall with a spreading form. Bark is light gray. Leaves are compound with 5-7 leaflets. Leaflets are oblong in shape and slightly serrated. White flowers are arranged in 6-10 inch spikes during May-June. Trees lose their leaves in mid-summer. Seeds are large and encased in hard brown persistent husks. Planted from container stock. Found on dry slopes or along the top of bank in riparian corridors. Maintenance: Remove stakes when tree is sturdy (cambium stiff enough to keep tree from leaning or blowing over), after 1-2 years. Pruning of Buckeyes should only be conducted by professionals due to their slow growth and potential for unique morphology.



Coast Live Oak (Quercus agrifolia)
ID: Evergreen tree 30-75 feet in height with a beautiful spreading form. Canopy breadth can reach 100′. Oval leaves have prickly edges. Acorns are present in the fall. Planted from container stock. Found on hillsides in well-drained soil and along top of bank in riparian corridors. Maintenance: Remove stakes when tree is sturdy (cambium stiff enough to keep tree from leaning or blowing over), after 1-2 years.

Dogwood (Cornus stolonifera)
ID: Shrub with light green to dark reddish stems depending on age and season Planted as pole cuttings. Pole cuttings will appear as sticks driven into the ground during the first years of growth. Grows rapidly to 15 feet or more in height; spreads by underground stems and rooting branches. Found in moist soils and in riparian corridors. Maintenance: Prune only if necessary. Pruning should be conducted near the base of the plant and only at joints. Do not hedge cut Dogwood. No staking necessary.

Wild Lilac (Ceanothus spp.)
ID: Evergreen shrub/small tree. Leaves are small, bright green in color, and slightly serrated along the edges. White to deep blue flowers (depending on species) arranged to form cones. Planted from container stock. Found in well-drained soils. In a riparian corridor will be found along top of bank. Maintenance: Prune only dead or dying limbs.

Big Leaf Maple (Acer macrophyllum)
ID: Deciduous tree with greenish tan bark. Leaves are large (up to 12 inches in length) with 3-5 deeply cut lobes. Light yellow flowers bloom in clusters. Seed pods, helicopter or boomerang-shaped, are wind dispersed. Planted from container stock. Found along riparian corridors and thrives in moist soils Maintenance: Remove stakes when tree is sturdy (cambium stiff enough to keep tree from leaning or blowing over), after 1-2 years. Conduct training pruning, to ensure good limb s tructure and site line, in the second and third years.

Alder (Alnus rhombifolia)
ID: Deciduous tree with oval to pointed leaves with toothed edges. Found in riparian corridors immediately adjacent to the stream. Requires a lot of water. Planted from container stock. Maintenance: Remove stakes when tree is sturdy (cambium stiff enough to keep tree from leaning or blowing over); typically 1-2 years. Conduct training pruning to ensure good limb structure and site lines: typically in years 2 and 3.

Cottonwood (Populus fremontii)
ID: Deciduous tree. Yellow-green, simple leaves triangular in shape with toothed edges. Leaves turn yellow in the fall. Grows rapidly to 50 feet or more in height. Female trees bear cottony seeds; male trees grow easily from cuttings. Can be planted from container stock. Found along riparian corridors and in bottomlands. Maintenance: Requires moist/wet soil. Prune to train and for sight lines. Never top cut.

Native Plants Reference Section

Much of the success of this restoration project will depend on the healthy growth of desired plants throughout the project area. Native riparian, grassland, and Oak/Scrub communities (specifically adapted to our Mediterranean climate and soil types) are incorporated into the site planting plan. These plant communities require differing degrees of maintenance and management; however, each should become increasingly self-sustaining as they mature.

The species listed below provide specific plant names, identifying characteristics and some general and specific maintenance requirements.

Willow *(Salix species)*

- **ID:** Deciduous shrub/tree with silvery green leaves that yellow and shed in fall. Small wart-like growths visible along stem.
- Found in riparian corridor immediately adjacent to the stream where it finds moist to saturated soils.
- Planted as pole cuttings. Pole cuttings will appear as sticks driven into the ground during the first years of growth.
- **Habitat value:** shades creek, controls erosion, and provides food and cover for wildlife.
- **Maintenance:**
  - Do not prune during first two years—this will top the trees and make them bushy. Prune shrub masses with site lines between the masses until the willows reach 15' height. When they are at least that tall, prune to encourage an open structure with site lines below the canopy. This will naturally occur as the canopy closes and blocks sunlight to lower branches.
  - Supplement plantings if necessary using cuttings; take cuttings from established individuals during the winter while plant is dormant. Do not stake new plantings.

Alder *(Alnus rhombifolia)*

- **ID:** Deciduous tree with oval to pointed leaves with toothed edges. Catkins in early spring. Mature height 40'-60'.
- Found in riparian corridors immediately adjacent to the stream where ample water is available.
- Planted from container stock.
- **Habitat value:** Birds eat winged seeds. Shade lowers stream temperatures for aquatic wildlife.
- **Maintenance:**
  - Remove stakes when tree is sturdy (cambium stiff enough to keep tree from leaning or blowing over); typically 1-2 years.
  - Conduct training pruning to ensure good limb structure and site lines, typically in years 2 and 3.
- **IPM:** Possible pests include tent caterpillars, Alder borers, and mistletoe. BT (Bacillus thuringiensis) controls tent caterpillars effectively; proper cultural care prevents serious infestations of Alder borers, and removing infected branches manages mistletoe.

Big Leaf Maple *(Acer macrophyllum)*

- **ID:** Deciduous tree with greenish tan bark. Leaves are large (up to 12 inches in length) with 3-5 deeply cut lobes. Light yellow flowers bloom in clusters. Seed pods, helicopter or boomerang-shaped, are wind dispersed. Rounded canopy can reach 40'-80'.
- Planted from container stock.
- Found along riparian corridors and thrives in moist soils
- **Habitat value:** Shade for understory plants, shelter for wildlife, squirrels and chipmunks eat samaras (winged seeds).
- **Maintenance:**
  - Remove stakes when tree is sturdy (cambium stiff enough to keep tree from leaning or blowing over), after 1-2 years.
  - Conduct training pruning, to ensure good limb structure and site line, in the second and third years. Make pruning cuts to remove dead wood or crossing branches while trees are dormant.
- **IPM:** Susceptible to vermicillium wilt.

Dogwood

(Cornus stolonifera)

- **ID:** Shrub with light green to dark reddish stems in winter. Cream-white flowers in spring. Berry-like fruits.
- Planted as pole cuttings. Pole cuttings will appear as sticks driven into the ground during the first years of growth.
- Grows rapidly to 15 feet or more in height; spreads by underground stems and rooting branches, forming thickets.
- Found in moist soils and in riparian corridors.
- **Habitat value:** Thickets provide cover. Birds are attracted to the berry-like fruits.
- **Maintenance:**
  - Little maintenance required. Prune only if necessary to maintain site lines between masses.
  - Prune near the base of the plant and only at joints. Do not hedge cut Dogwood.
  - No staking necessary.
- **IPM:** Generally free of pests and diseases.

Ninebark

(Physocarpus capitatus)

- **ID:** Deciduous shrub/tree. Leaves have 3-5 lobes and toothed edges.
- Planted as pole cuttings. Pole cuttings will appear as sticks driven into the ground during the first years of growth.
- Spreads by underground stems and rooting branches.
- Found in riparian corridors. Thrives in moist soils.
- **Maintenance:** Pruning is not typically required.
- No staking necessary.
- If pruning is necessary, prune near the base and do not hedge cut.

Cottonwood

(Populus fremontii)

- **ID:** Deciduous tree. Yellow-green, simple leaves are triangular in shape with toothed edges. Leaves turn yellow in the fall.
- Grows rapidly to 50 feet or more in height.
- Female trees bear cottony seeds; male trees grow easily from cuttings.
- Can be planted from container stock.
- Found along riparian corridors and in bottomlands.
- **Habitat value:** Shade lowers stream temperatures for aquatic wildlife.
- **Maintenance:**
  - Requires moist/wet soil; roots may wander toward over-watered lawn areas.
  - Prune to improve form, counteract weak branching structure, and open up sight lines. Never top cut. Prune suckers.
- **IPM:** Possible pests include tent caterpillars and mistletoe. BT (Bacillus thuringiensis) controls tent caterpillars effectively and removing infected branches manages mistletoe.

Coast Live Oak *(Quercus agrifolia)*

- **ID:** Evergreen tree 30-75 feet in height with a beautiful spreading form. Canopy breadth can reach 100'. Oval leaves have prickly edges. Acorns appear in the fall.
- Planted from container stock.
- Found on hillsides with well-drained soil and along top of bank in riparian corridors.
- **Habitat value:** Acorns and leaves are the nutritional foundation of many oak-based ecological communities. The size and physical structure create a complexity and variety of opportunities for shelter.
- **Maintenance:**
  - Remove stakes when tree is sturdy (cambium stiff enough to keep tree from leaning or blowing over), after 1-2 years. If necessary to prune, do so in late summer or early fall.
  - Pruning should be minimal. Whether removing dead material or damaged limbs, controlling form, or opening the canopy, be sure only 15% of the tree's mass is removed at one time.
  - Never remove leaf litter from beneath the canopy of an Oak. It forms an important insulating layer.
- **IPM:** Possible pests include powdery mildew and oak moth.

Wild Lilac *(Ceanothus spp.)*

- **ID:** Evergreen shrub or groundcover. Leaves are small, bright green in color, and slightly serrated along the edges. White to deep blue flowers (depending on species) arranged to form cone shape.
- Planted from container stock.
- Found in well-drained soils. In a riparian corridor it will be found along top of bank. *Tolerates long periods of drought and is intolerant of wet summer environs.* Requires no fertilizer.
- **Habitat value:** Flowers attract bees and butterflies.
- **Maintenance:** It is only necessary to prune dead or dying limbs, however, annual pruning of new growth will improve appearance and maintain a smaller, more ompact form. Prune immediately after flowering, and only back to the new year's flush of growth. Pruning later in the year will cut off next year's flowers.
- **IPM:** Numerous fungal organisms (water molds and rots) attack plants in wet or poorly drained soils or with frequent summer irrigation. Allow soil to dry between waterings.

California Buckeye

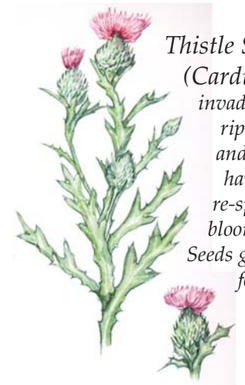
(Aesculus californica)

- **ID:** Deciduous tree that grows to 20 feet tall with a spreading form. Bark is light gray. Leaves are compound with 5-7 leaflets. Leaflets are oblong in shape and slightly serrated. White flowers are arranged in 6-10 inch spikes during May-June. Trees lose their leaves in mid-summer. Seeds are large and encased in hard brown persistent husks.
- Planted from container stock.
- Found on dry slopes or along the top of bank in riparian corridors.
- **Maintenance:** Remove stakes when tree is sturdy (cambium stiff enough to keep tree from leaning or blowing over), after 1-2 years. Pruning of Buckeyes should only be conducted by professionals due to their slow growth and potential for unique morphology.
- **IPM:** No serious pests or disease.
- *Note: Seeds are poisonous to humans and most mammals.*

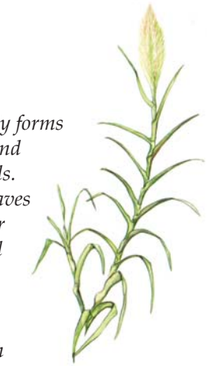
Invasive Plants

commonly found in East Bay Riparian Environments

Acacia species (Acacia melanoxylon), (Acacia decurrens)
Blackwood Acacia and Green Wattle Acacia are both typically found in disturbed areas and roadsides. Drought tolerant, but also grows well in moist soils. Blackwood Acacia reaches 20-40′ height, and has a single trunk with rough, grey bark, and forms a dense pyramidal canopy. Juvenile leaves are finely bipinnately compound, but the dull, dark green adult leaves are simple, measuring up to 4″ long. Leaves of Green Wattle Acacia are bipinnately compound, flattened and dark green. In winter, clusters of fragrant yellow pompon shaped flowers appear. Some Acacia species have allelopathic affects, altering soil chemistry and inhibiting germination of native plants. Being nitrogen fixers, Acacia is able to establish in nitrogen-poor soils. Acacias form densy, monotypic thickets and produce a thick accumulation of leaf litter. Reproduces from seed as well as root suckers and stump sprouting. Roots spread vigorously. High seed production from pods which dry and drop in the fall.



Thistle Species (Cynara cardunculus), (Cirsium vulgare), (Carduus pycnocephalus) *Perennial, biennial, or annual herb invades disturbed landscapes inlcuding chaparral, grassland, and riparian areas. Erect stems are thick, coated with downy hairs, and ribbed like celery. Prickly, wooly, silvery-grey-green leaves have spiny tips. Reproduces from abundant seed, but will also re-sprout vigorously from deep taproot if cut back. Flower heads bloom April-July in some species and June-September in others. Seeds germinate from first rains until July. Aggressively competes for soil nutrients and moisture then shades out other species' seedlings to form thick monoculture stands, inhibiting movement of wildlife.*



Giant Reed (Arundo donax)
A tall perennial grass that typically forms dense stands on disturbed sites, sand dunes, riparian areas, and wetlands. May reach 30′ tall. Grey-green leaves are alternate, up to 1′ long, slender and smooth, with coarsely serrated margins. Dry leaves are pale brown. Hardy stalks are hollow, about 1″ in diameter, similar to bamboo canes. The roots are tough and fibrous and form knotty, spreading mats that penetrate deep into the soil. Cream-colored florescence March-September. Reproduces vegetatively via underground rhizomes. Often spread downstream during floods, fire appears to stimulate new growth. Giant Reed threatens riparian ecosystems by outcompeting natives, such as willows, for water. Rapid growth leads to monocultural stands.

Fennel (Foeniculum vulgare)
Erect perennial herb found in open, disturbed areas. Grows 4-10′ tall and smells like licorice. Stout grey-green stems are jointed and sheathed by leaves at the nodes. Fine, feathery leaves are like dill leaves. Reproduces by seed or by regenerative root crowns if cut back. Small, yellow fowers in umbrella-shaped clusters bloom April-August. High seed production; seeds remain viable for several years. Aromatic seed appears in September. Seeds will germinate at almost any time of the year and are commonly spread by water, clothing, animals, machinery, or vehicles. Forms thick monospecific stands by competing with other species for nutients, light, and water. Fennel may also have an allelopathic effect on other species.

Himalayan Blackberry (Rubus discolor)
Perennial shrubby vine forms mounds up to 10′ tall with arching, trailing, thorny stems. Stems are green to deep purple, turning woody with age with hooked, curving thorns. Each of the 5 leaflets has toothed or serrated edges. Spreads vegetatively, from rhizomes or roots as well as from seeds in the berries. These long-lived seeds germinate in the spring.

Pampass Grass (Cortaderia selloana), (Cortaderia jubata)
Rapid-growing perennials that form large clumps, found in disturbed areas. 5-7′ tall at maturity, the dark green leaves of C. jubata and the grey-green leaves of C. selloana have sharply serrated margins. The inflorescence is a showy plume ranging from pink to creamy white that appears from July to September. Huge numbers of seeds are wind-dispersed from the parent plant to colonize new areas. Grasses can also spread vegetatively from fragments of a mature plant the root in the soil. Thrives in moist areas; keep pulled vegetation away from water.

Broom Species (Genista monspessulana), (Cytisus scoparius), (Spartium junceum)
These invasive shrubs quickly colonize disturbed areas, trailsides, and streambanks. Tolerates some shade, but prefers drier, sunny locations. Long-lived, flowering, evergreen shrubs grow 6-10′ tall. Deep taproot makes it difficult to remove. Yellow pea-flowers appear March-July. Fuzzy, inch-long seed pods appear June-July, drying out in late summer and popping open to propel thousands of tiny black seeds that are viable for up to 10 years. Seeds germinate with early winter rains, establishing new seedlings December-July.

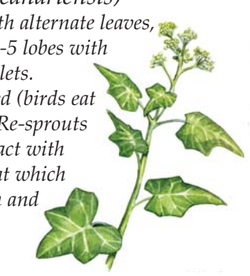
Cape Ivy (Delairea odorata) *Climbing perennial vine with succulent leaves, smooth and bright green with pointed lobes. Underground stolons are purple. Reproduces vegetatively from all parts except the leaf blade. Forms a dense mat which blankets desired vegetation. Thrives near moisture.*

Mustard Species (Brassica nigra), (Brassica rapa)
Annual or biennial herbs that can reach up to 6′ tall. Leaves are slightly hairy. Taproot is white and fleshy at maturity. March-June the bright yellow flower appears. The pods spring open when dry to release a profusion of small black seeds. Mustards grow profusely and reportedly produce allelopathic chemicals that inhibit germination of native plants. Mowing is an ineffective means of eradication.

Periwinkle (Vinca minor)
Spreading perennial vine. Leaves are opposite, 2-3 inches long, oval with pointed tip. Glossy, dark green leaves and purple flowers in March-July. Spreads vegetatively by arching stolons that root at the tips and underground growth of stolons. Also roots from fragments of stem. Forms a dense mat which prevents desired seedlings from succeeding and excludes native groundcover species. Grows rapidly.

Poison Hemlock (Conium maculatum)
Erect biennial, sometimes perennial, related to fennel, and often found in a wide variety of conditions, but grows best in rich, moist soil. Grows from seed, reaching 3-8′ in height. Leaves are opposite, pinnately compound, triangular, and bright green with an unpleasant odor when crushed. Reproduces by seed only, which are spread by birds, animals, water, vehicles, and machinery and germinate late summer to early spring. White flowers appear in umbels almost year round, but mostly in June-July. Handle with extreme care--Poison Hemlock is toxic to skin and respiratory system.

English Ivy (Hedera helix)
Algerian Ivy (Hedera canariensis)
Woody evergreen vines with alternate leaves, dark green and leathery. 3-5 lobes with white veins and aerial rootlets. Spreads by rhizomes or seed (birds eat the berries and disperse). Re-sprouts from cut roots left in contact with the soil. Forms a dense mat which blankets desired vegetation and open soil. Grows rapidly.



Invasive Plants Reference Section

Cape Ivy (Delairea odorata)

- **ID:** Vine with smooth, bright green leaves with pointed lobes. Grows quickly and can re-root from plant fragments.
- **Treatment:** Remove by hand-pulling and digging out shallow roots.
- **Disposal:** Bag and remove from site – do not compost.
- **Timing:** Check every 4-8 weeks.

English Ivy (*Hedera helix*)
Algerian Ivy (*Hedera canariensis)*

- **ID:** Ground cover or climbing vine, can become woody.
- **Treatment:** Hand-pull or rake small infestations. Roots will re-sprout; remove as much as possible.
- **Disposal:** Compost as green waste.
- **Timing:** Check 3-4 times per year.

Himalayan Blackberry (*Rubus discolor)*

- **ID:** Shrubby vine with hooked/curving thorns, 3-5 leaflets. (Native blackberry is similar but only has 3 leaflets and fine prickles, not hooked thorns.)
- **Treatment:** Hand pull/dig or cut stems with loppers near ground; dig out roots if possible.
- **Disposal:** Bag and remove from site.
- **Timing:** Check 3-4 times per year.

Periwinkle (*Vinca major)*

- **ID:** Spreading vine with purple flowers found in shaded areas. Re-sprouts from root fragments.
- **Treatment:** Hand pull or use McLeod to pull roots up from base of stems. Grub to remove root fragments.
- **Disposal:** Bag and remove from site.
- **Timing:** Check 3-4 times per year.

Broom Species:

French (*Genista monspessulana*)
Scotch (*Cytisus scoparius*)
Spanish (*Spartium junceum*)

- **ID:** Yellow flowers and fuzzy compound leaves similar to pea plants. Seed pods present in June-July.
- **Treatment:** Pull out plant and long tap root with weed wrench or digging.
- **Disposal:** Recycle as green waste.
- **Timing:** Pull while ground is soft but before plant goes to seed (January – May).

Thistle Species –
Artichoke thistle (*Cynara cardunculus)*
Bull thistle (*Cirsium vulgare*)
Yellow star thistle (*Centaurea solstitialis*)

- **ID:** Grayish-green leaves with white to gray underside. Spines. Purple to blue flowers. Yellow star thistle-spiny bud with yellow bloom on top. Leaves do not appear as normal thistle.
- **Treatment:** Pull or dig to remove plant and long taproot. Mow monthly.
- **Disposal:** Bag and remove from site especially the flowers/seeds and roots.
- **Timing:** Remove in April-June and re-check 3-4 times a year.

Fennel *(Foeniculum vulgare)*
Poison hemlock *(Conium maculatum)*

- **ID:** Jointed stalks with green feathery leaves. Fennel has yellow flowers in an umbrella shape while poison hemlock flowers' are white in a similar shape. Fennel plants have a licorice odor.
- **Treatment:** Hand pull making sure to remove fennel's taproot (poison hemlock's roots do not need to be entirely removed). Mow in beginning of April. When removing poison hemlock wear protective gloves and clothing and take breaks from exposure.
- **Disposal:** Fennel may be composted. Poison hemlock should be bagged and removed from site as wilting plants remain poisonous.
- **Timing:** Remove in early spring. Mow every 3 months but not during seeding.

Mustard –
Black mustard (*Brassica nigra*)
Field mustard (*Brassica rapa*)

- **ID:** Rigid stemmed weed, 2-6 feet in height. Green spade-like leaves which are slightly hairy. Yellow, 4-petal flowers March-June.
- **Treatment:** Remove plant and taproot by hand or with a weed wrench. (Mowing does NOT work.)
- **Disposal:** Bag and remove from site. May be composted as long as there are no seed pods.
- **Timing:** Best to remove when ground is moist.

Giant reed *(Arundo donax)*

- **ID:** Tall grass resembling bamboo. Long tapered leaves stem from a hollow stalk.
- **Treatment:** Cut stems as close to the ground as possible and dig up roots. Must remove extensive root system.
- **Disposal:** Chip and dispose of as green waste or use for mulch. Compost whole plants away from water.
- **Timing:** Perennial grass. Grows rapidly from cut stalks and root system. Check 4-5 times a year.

Pampas grass *(Cortaderia selloana)*

- **ID:** Large clumping grass with dark green to gray-green leaves. Showy, tall plume ranging from pink to golden white flowering in July-September.
- **Treatment:** Cut and remove all root mass (may need the use of machete or chainsaw). Cut all seed plumes and carefully dispose.
- **Disposal:** Bag and remove from site insuring all seed plumes and root masses are removed.
- **Timing:** Remove in winter, spring, and early summer. Check twice a year for re-growth.

Acacia ***(Acacia sp.)***

- **ID:** Grows into large evergreen tree. Dark green leaves are bi-pinnate and fern looking when young and simple when developed. Both leaf types can appear on the same tree.
- **Treatment:** Pull sprouts and saplings. Cut larger trees and cover stump with black plastic to block-out light, as stumps will sprout.
- **Disposal:** Dispose of young plants as green waste. Larger trees can be used as firewood.
- **Timing:** Check twice a year for re-growth.

Wild Oat ***(Avena fatua)***

- **ID:** Plants grow to be 1-5 feet tall with a distinguishing inflorescence and long "hairy" leaves. May flower as early as January and will dry out and brown during the summer.
- **Treatment:** Remove by hand or with hand tools. Mowing is also effective and should be done as soon as flowering begins.
- **Disposal:** Bag and remove from site.
- **Timing:** Remove in winter (January-April) and re-check seasonally.

Wild Radish *(Raphanus sativus)*

- **ID:** Plants grow to be 2-3 feet tall and branch within the upper portion giving a bushy appearance. Leaves have a large terminal lobe with paired leaflets along the stem and often have coarse hairs. Lavender, pink, or white flowers with 4 distinct, rounded petals. Long, dark green seed pods form in late summer/fall.
- **Treatment:** Hand pull or cut plants prior to the formation of seed pods if possible. Because plants have a heavy taproot (resembling a radish), removal is easier when the ground is soft and wet.
- **Disposal:** Bag and remove from site plants with seed. Plants without seeds can be used for compost.
- **Timing:** Best to remove when ground is moist. Check seasonally for re-growth.

Kikuyu Grass *(Pennisetum clandestinum)*

- **ID:** Stems are thick and fleshy with flat, light green leaves. This coarse-textured grass forms dense mats and can climb fences, tress, etc. May turn brown and be dormant in the winter months.
- **Treatment:** Hand pull in early stages removing root system. Hoeing or mowing of grass is not recommended as all cut pieces will root. If mowing equipment is used ensure that it is cleaned and all pieces of grass are removed to prevent transporting grass to other sites.
- **Disposal:** Bag and remove from site. Even the smallest piece left behind will take root.
- **Timing:** Check seasonally.

Prickly Lettuce *(Lactuca serriola)*

- **ID:** Bristly weed which stands erect and can grow to be 3.5 feet in height. Light green leaves are ovate and deeply lobed with bristles on the underside. The top of the plant is branching and produces many yellow flowers. Seeds are dispersed via wind similar to dandelions.
- **Treatment:** Hand pull wearing protective gloves.
- **Disposal:** Remove from site.
- **Timing:** Check seasonally.

Agave *(Agave attenuate)*

- ID**:** Large succulent plant, blue-green in color. Leaves can be up to 6 foot long and have spines along their edges. Flowers at the end of a long (15-40 foot) stalk.
- **Treatment:** Remove by hand or mechanically.
- **Disposal:** Remove from site.
- **Timing:** Check seasonally.

Bristly Oxtongue (Picris echioides)

- **ID:** Leaves are ovate with raised blisters (hence the name Oxtongue). Stems and leaves are covered with coarse bristles. May grow to be 2-3 feet tall. Stems bear yellow flowers that resemble dandelions and disperse seeds via wind.
- **Treatment:** Hand pull wearing protective gloves. Repeated mowing will be effective on larger stands.
- **Disposal:** Remove all materials from site and dispose of in approved facility.
- **Timing:** Remove prior to flowering to prevent seed dispersion (June). Re-check seasonally.

Bermuda Grass (Cynodon dactylon)

- **ID:** Gray-green grass that grows in dense mats with extremely deep roots. May grow to be 1.5 feet tall. Seed heads form at the ends of long spikes and are star-shaped in nature.
- **Treatment:** Hand pull in early stages. Once established this plant is very hard to remove, but may be dug out using a shovel. Establish-ment of native vegetation will prevent Bermuda grass
- **Disposal:** Bag and remove from site.
- **Timing:** Check seasonally.

Plantain *(Plantago lanceolata)*

- **ID:** Leaves up to 1-1/2 inches wide, 6 inches long. Commonly found in turf. Leaves ribbed with 5 veins. Leaves in rosette, flowers on short spike.
- **Treatment:** Hand pull in early stages.
- **Disposal:** Bag and remove from site.
- **Timing:** Check seasonally.

Teasel *(Dipscacus sativus)*

- **ID:** Simple leaves from basal rosette. Inflorescence 2-3 inches long; terminal with many flowers on a spherical head.
- **Treatment:** Hand pull wearing protective gloves.
- **Disposal:** Bag and remove from site.
- **Timing:** Check seasonally.

Contacts

California Invasive Plant Council 510.843.3902
The Watershed Project 510.231.5655
Green Waste Pick-up: Contact the City of El Cerrito 510.237.4321

References

Pete Holloran, Anouk Mackenzie, Sharon Farrell, Doug Johnson. *The Weed Workers' Handbook: A Guide to Techniques for Removing Bay Area Invasive Plants.* The Watershed Project and California Invasive Plant Council, 2004.

Carla C. Bossard, John M. Randall, and Marc C. Hoshovsky, eds. *Invasive Plants of California's Wildlands.* University of California Press, 2000.

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Invasive Plant

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Watercress ……
Cattails …….

APPENDIX A: GLOSSARY OF TERMS

Aggrade *v.* The raising of a stream-channel bed with time due to the deposition of sediment that was eroded and transported from the upstream watershed or the channel.

Allelopathy *n.* The influence or effect of one living plant upon another; refers to biochemical interaction between all types of plants and its effect depends on a chemical compound being added to the environment.

Bank *n.* The slope of land bordering the river. The margins of a channel. Lateral boundary of a stream, especially between low and high water marks.

Bankfull channel (Active channel) *n.* The stream channel that is formed by the dominant dischargewhich meanders across the floodplain as it forms pools, riffles, and point bars.

Bioengineering *n.* A branch of engineering in which live plants and plant parts are used as building material for erosion control and landscape restoration (this is in contrast to conventional engineering, in which only dead materials are used).

Channel stability *n.* Measure of the resistance of a stream to erosion that determines how well a stream will adjust to and recover from changes in flow or sediment transport.

Channel width *n.* The horizontal distance along a transect line from bank to bank at the high water marks, measured at right angles to the direction of flow. Multiple channel widths are summed to represent total channel width.

Channelization *n.* The straightening and/or deepening of a watercourse for purposes of storm-run-off control or ease of navigation. Channelization often includes lining of stream banks with a retaining material such as concrete or rock.

Cut bank *n.* The outside bank of a bend, often eroding opposite a point bar. *See figure A-1.*

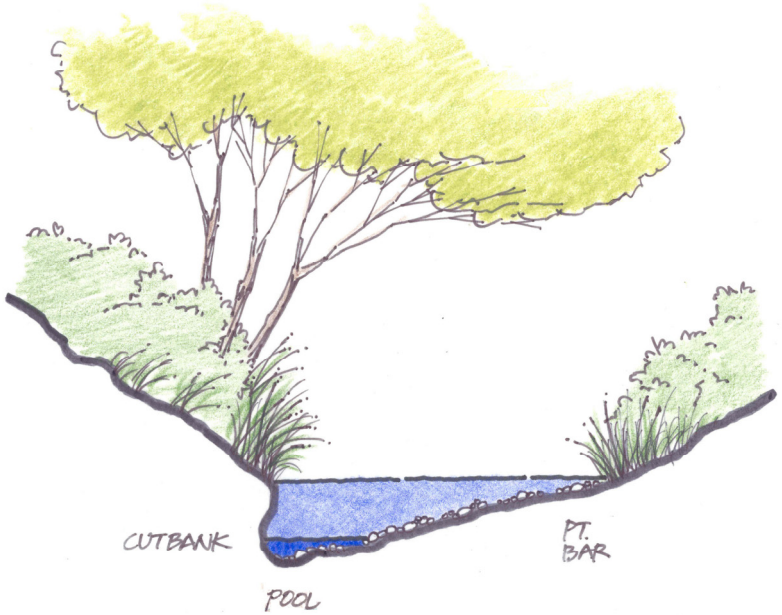


Figure A-1.

Dynamic equilibrium *n.* The natural channel condition where sediment deposition is balanced with erosion over time.

Erosion *n.* The wearing away of the earth's surface by natural forces, such as water, wind and ice. The loosening and transportation of rock and soil debris by wind, rain, or running water. Wearing away of land by physical and chemical action in moving water or air.

Flood Water flowing over normally dry land. Excess water in a river causes a river to overflow its banks. A high streamflow overtopping the natural or artificial banks in any reach of a stream. Any flow that exceeds the bankfull capacity of a stream or channel and flows out on the floodplain; greater than bankfull discharge.

Floodplain *n.* The land adjacent to a channel at the elevation of the bankfull discharge, which is inundated on the average of about two out of three years. The floor of stream valleys, which can be inundated by small to very large floods. *See figure A-2.*

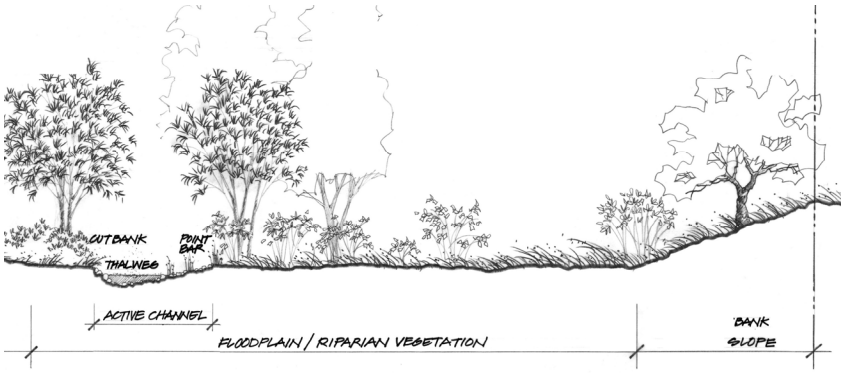


Figure A-2.

Meander *n.* The winding of a stream channel. Indirect or devious alignment of channels in erodible, alluvial valleys of a mature stream.

Myccorhiza *n.* A symbiotic relationship between plant root cells and fungi.

Point bar *n.* A bank on the inside of a meander bend that has built up due to sediment deposition opposite a pool. *See figure A-3.*

Pool *n.* A location in an active stream channel, usually on the outside bends of meanders, where the water is deepest and has reduced current velocities. *See figure A-3.*

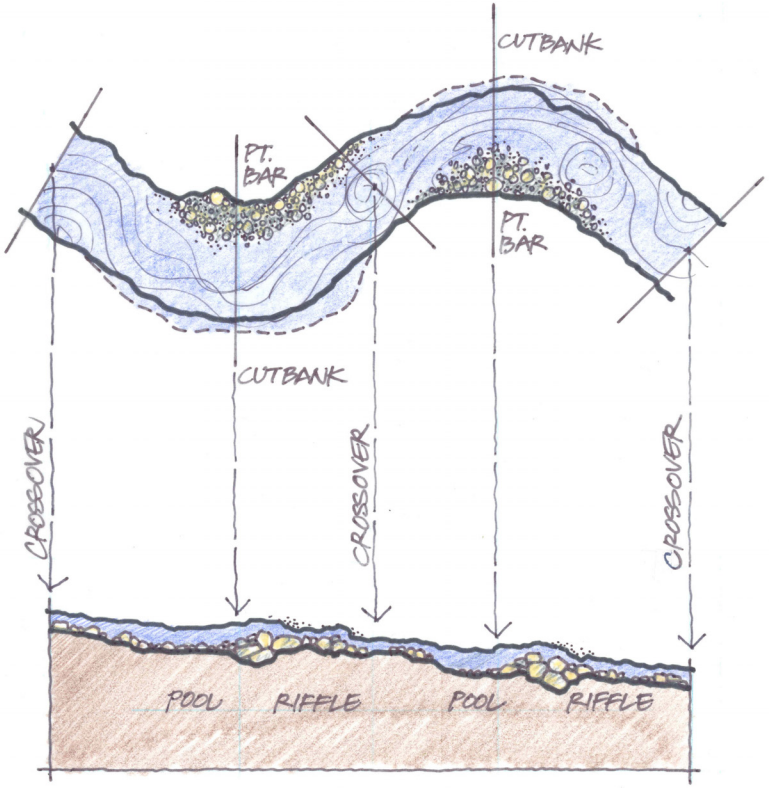


Figure A-3

Rhizome *n.* A horizontal underground stem which can send out both shoots and roots; rhizomes sometimes have thickened areas that store starch.

Riffle *n.* A shallow rapid, usually located at the crossover in a meander of the active channel. *See figure A-3.*

Riparian *adj* **:** On, or pertaining to, the banks of a stream. (As in riparian vegetation or riparian woodland.) Pertaining to the banks and other adjacent, terrestrial (as opposed to aquatic) environs of

freshwater bodies, watercourses, and surface-emergent aquifers (e.g., springs, seeps, oases), whose imported waters provide soil moisture significantly in excess of that otherwise available through local precipitation - soil moisture to potentially support a mesic vegetation distinguishable from that of the adjacent more xeric upland.

Riparian vegetation *n.* Vegetation which occurs in and/or adjacent to a watercourse. For the purpose of administering Fish and Game Code Section 1600, et seq., this should be expanded to include vegetation adjacent to lakes as well. Vegetation growing on or near the banks of a stream or other body of water on soils that exhibit some wetness characteristics during some portion of the growing season. Vegetation which occurs along watercourses, and is structurally or floristically distinct from nearby, non-streamside vegetation. Riparian vegetation is terrestrial vegetation that grows beside rivers, streams, and other freshwater bodies and that depends on these water sources for soil moisture greater than would otherwise be available from local precipitation.

Riparian corridor *n.* The area between a stream or other body of water and the adjacent upland identified by soil characteristics and distinctive vegetation. It includes wetlands and those portions of floodplains and valley bottoms that support riparian vegetation.

Riffle *n.* Shallow section of a stream or river with rapid current and a surface broken by gravel, rubble or boulders. (Compare glide; rapids; run.) A reach of stream in which the water flow is rapid and usually more shallow than the reaches above and below. Natural streams often consist of a succession of pools and riffles. (Sometimes incorrectly referred to as a "ripple.") *See figure A-3.*

Rock wier (riffle starter) *n.* Rock boulders placed across the active channel to prevent excessive downstream erosion. This is a grade control feature.

Roughness coefficient *n.* Designated by "N" in Manning's flow equation, the roughness coefficient is an expression of the resistance to flow of a surface such as the bed or bank of a stream.

Sediment *n.* Soil particles that have been transported from their natural location by wind or water action.

Swale *n.* Small depressions, natural or human-made, that carry water only after a rainfall. See *"bioswale" in figure A-4.*

Symbiotic *adj.* A type of organism-organism interaction where one organism lives in intimate association with another. The types of symbiotic relationships are mutualism, commensalism, parasitism, and amensalism.

Toe *n.* The break in slope at the foot of a stream bank where the bank meets the bed.

Top of bank *n.* The break in slope between the bank and surrounding terrain.

Watershed *n.* An area so sloped as to drain a river and all its tributaries to a single point or particular area. An area from which a river receives its water supply. The total area above a given point on a watercourse that contributes water to its flow; the entire region drained by a waterway or watercourse that drains into a lake or reservoir.

Weed *n.* Any plant that is growing in a place where a human wants a different kind of plant or no plants at all.

Wetlands *n.* Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.

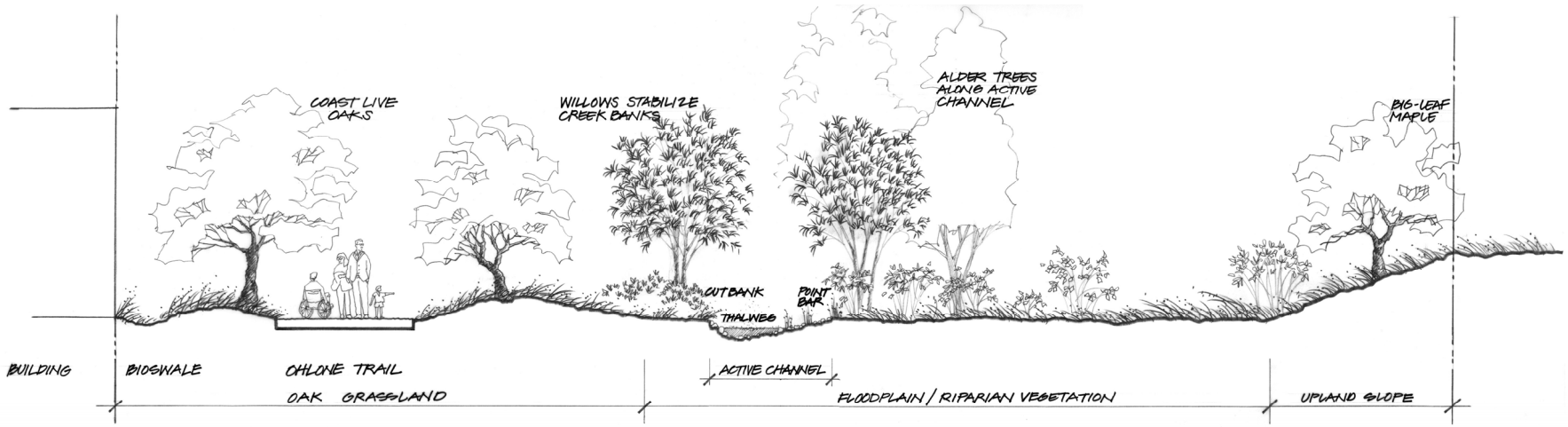

COAST LIVE OAKS
WILLOWS STABILIZE CREEK BANKS
ALDER TREES ALONG ACTIVE CHANNEL
BIG-LEAF MAPLE
CUTBANK
POINT BAR
THALWEG
BUILDING
BIOSWALE
OHLONE TRAIL
OAK GRASSLAND
ACTIVE CHANNEL
FLOODPLAIN / RIPARIAN VEGETATION
UPLAND SLOPE

Figure A-4.

APPENDIX B:

INTEGRATED PEST MANAGEMENT

Integrated pest management (IPM) is an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Pesticides are used only after monitoring indicates they are needed according to established guidelines, and treatments are made with the goal of removing only the target organism. Pest control materials are selected and applied in a manner that minimizes risks to human health, beneficial and non-target organisms, and the environment. *At this time the City does not approve of the use of pesticides and herbicides in the floodplain of the park.*

Cultural Control uses cultivation practices that limit weed populations. Techniques used to reduce pest problems include: choosing pest-resistant plants, choosing the right plants given the soil conditions and available water, and companion planting for mutually-beneficial species. In agriculture, practices such as grazing, burning, flooding, mowing, disking, and mulching.

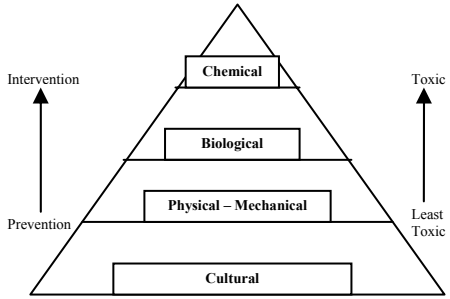
Mechanical Control utilizes simple hand tools to remove weeds such as simply pulling them by hand. This method is appropriate near creeks and other water bodies or when the weed species are intermixed with native plants. Mechanical control, especially if heavy equipment is used, can cause significant disturbance to soil and vegetation. It can also introduce weed propagules and pathogens, such as the one which causes Sudden Oak Death.

Biological Control involves methods such as the release of beneficial organisms such as ladybugs that can reduce insect pest populations or creating habitat attractive to beneficial organisms so that they can keep pest populations in check. Classical biological control refers to the importation of host-specific insect or pathogens from the native range of introduced pest plants. The lack of predation from such co-evolved species is one of the chief reasons that invasive plants can so effectively out-compete native plants. This approach requires research and testing before it is applied, but researchers at the USDA lab in Albany, California, are evaluating biocontrol agents for yellow starthistle, broom species and Cape Ivy.

Chemical Control includes the use of herbicides which kill plants or stunt their growth. Some herbicides are selective while others are more general. Herbicides can be used in a variety of ways at many scales. Permitting is usually required for using chemical controls near creeks or other water bodies.

Key Control Techniques include pulling, digging, scraping, cutting, and use of herbicides. Solarizing, flaming, mulching are less frequently used techniques.

The pyramid below illustrates the trade-offs for each control method. For example, a cultural approach may include steps not to introduce new species (i.e. ensure that mowing equipment is clean and not transporting seeds from another site) or to establish a native community to prevent colonizers. If cultural tactics do not prevent invasive vegetation, a physical/mechanical approach may include hand pulling weeds on a set schedule. The next step, biological, may include the introduction of parasites or competition to the site. Chemical means should be used only in extreme circumstances due to their compounding and detrimental nature. As one moves up the pyramid costs, toxicity, and environmental impacts increase while sustainability decreases.



The IPM pyramid

APPENDIX C: THE URBAN STREAM RESTORATION MOVEMENT

Why restore Creeks?

Baxter Creek is a valuable amenity. Both the City and park neighbors share responsibility for keeping the creek and its corridor healthy, both for people's enjoyment and for the wildlife that depends upon this fragile waterway.

In urban areas, a creek is an irreplaceable natural resource. Whether it flows year-round or seasonally, Baxter Creek provides water supply and groundwater recharge, wildlife habitat, a conduit for flood waters, and a host of aesthetic values. A creek is a part of the lives of all the people and animals who live within its watershed. The watershed is the land area which drains into the creek, including storm drain systems that carry rainwater and runoff from streets and adjacent properties to the creek.

Since so much creekside property in the Baxter Creek watershed is in private ownership, the responsibility for the health of the creek and the survival of creek-dependent wildlife is shared by the City and the area residents. While a property along a healthy creek has many benefits, a degraded creek causes problems for all its neighbors. This Guide is intended to facilitate appropriate treatment of the creek in all its reaches such that the health of the creek restoration within The park is not compromised.

Through proper care of stream banks and riparian vegetation, the value of public and private properties will be enhanced, erosion problems will be minimized, damage from flooding will be diminished, water quality will be improved, and the habitat value for wildlife will be improved.

Watershed Improvements Begin at Home

Many creeks in our cities and towns have been altered, channelized, or piped underground. Others have become victims of excessive sedimentation, sewage, reduced water flows, and dumped debris. While intact creek ecosystems continue to thrive in some places, few if any of California's urban creeks have survived in a pristine, natural state. Still, creeks are resilient. With care and stewardship, the health of a creek can rebound.

Of course, stream characteristics vary depending upon where you live. In many parts of California, a healthy creek may be an intermittent stream that does not flow year-round. Water flow and characteristics of the creek banks, stream bed, vegetation and wildlife also vary naturally along the length of each creek. A thriving creek ecosystem is a diverse habitat where you will encounter a range of conditions. Understand how a particular stretch of the creek and your property fit into the overall ecosystem.

Although neighbors play a key role in creek care, a creek's health is also affected by activities far beyond private property boundaries. Within the watershed, as natural surfaces are paved and developed, less rainfall percolates into the ground and more water flows directly into the creek system from streets and storm drains. Storm drains generally receive no wastewater treatment. Almost always, this urban runoff carries debris and pollutants that pose significant dangers to creeks. While individuals may have little control over the entire watershed, your diligence and cooperation with other creekside neighbors can prevent and reduce activities which harm your creek.

For more information, get a copy of Start at the Source, a design guidance manual for stormwater quality protection prepared by the Bay Area Stormwater Management Agencies Association (BASMAA).

APPENDIX D: CREEK CARE REMINDERS

As a first step, learn what products become pollutants when they enter a storm drain or creek. If proper disposal of a particular product is inconvenient, consider using an alternative product. Remember that storm drains flow into creeks, and in many places creeks flow to the bay and ocean with no wastewater treatment!

- ✓ **Even in low concentrations, automotive products are extremely toxic to aquatic wildlife.** Never dump gasoline, motor oil, antifreeze, battery acid, or other automotive fluids into a creek or storm drain. Place used motor oil or antifreeze in sturdy, sealed containers, caps taped down, and recycle through your local collection program or recycling depot.
- ✓ **Improperly disposed paint products also cause harm to fish, wildlife, and people.** Dispose of unusable paints and paint products at your local household hazardous waste facility. Do not clean brushes in a gutter or near a storm drain or creek. Paint thinners should be filtered and reused.
- ✓ **Use creek-friendly washing methods for vehicles and equipment.** Avoid hosing down paved surfaces or washing your car in the driveway or street. Even "biodegradable" soaps are toxic to fish and wildlife.
- ✓ **Clean up leaks, drips and other spills without water whenever possible. Keep pollutants off exposed surfaces.** Clean automotive spills using "dry" cleanup methods. Depending on the substance spilled, dispose of absorbent materials in the garbage can or at a hazardous waste collection site.
- ✓ **Control pet access to creeks and riparian vegetation.** People and pets trample vegetation within the creek corridor. Dog and cat feces add excessive nutrients and bacterial pollution to water, which decreases water quality, causes unpleasant odors, and can also cause human health problems.
- ✓ **Carefully remove trash, litter, and other dumped debris from the creek.** This debris can become a hazard during floods. It can also be a potential threat to groundwater quality and provide breeding places for rodents and mosquitoes. **Cover and maintain dumpsters.**
- ✓ **Label storm drain inlets so area neighbors do not dispose of waste there. Keep an eye on the creek and the storm drains in your neighborhood.** Report any spill or discharge other than rainwater to appropriate authorities for immediate cleanup.
- ✓ **Check your rain gutters and other pipes to see where they drain.** Make sure they do not carry water directly into the creek. Runoff from roof surfaces contributes to the decline of creek health.
- ✓ **Never pour oil or grease down a storm drain or sanitary sewer.** Fats, oils, grease, and food particles should be placed in sealed containers and recycled.
- ✓ **Never drain swimming pool or spa water to the street, gutter, or storm drain.** Chlorine and copper algicides are toxic to aquatic organisms and other wildlife.
- ✓ **Control parking lot and site drainage.** Strategic grading of parking lots and other outdoor spaces can prevent runoff from contacting potentially contaminated areas and reaching creeks and sensitive areas.

APPENDIX E: CREEK-FRIENDLY LANDSCAPING GUIDELINES

- ✓ Limit use of gardening chemicals. Avoid using chemicals entirely in wet weather. Pesticides, herbicides, and fertilizers can run off into the creek. Fertilizers add excess nutrients to natural waters that lead to algae blooms, bad odors, and even fish kills.
- ✓ Consider using compost and organic soil amendments instead of chemical fertilizers. Pull weeds before they flower to reduce the need for herbicides. Introduce natural predators such as frogs, spiders, garter snakes, and ladybugs, which reduce insect pests.
- ✓ Dispose of yard and lawn clippings properly. Never dispose of lawn clippings in a creek. Soil and lawn clippings disposed in creeks become unsightly, destroy aquatic habitats, and may also worsen flooding problems. While they are biodegradable, organic wastes use the oxygen that fish, aquatic insects, and native plants need for survival.
- ✓ Do not rake, sweep, or blow leaves or lawn clippings into the street or storm drain. Add them to a compost pile to make fertilizer for your property. If composting isn't possible, rake or sweep up clippings and dispose of at municipal composting programs or use curbside yard waste collection services. Require your gardener or landscape service to haul away pruning debris, leaves, lawn clippings, and other yard debris for composting.
- ✓ Landscape with native plant species. Native riparian vegetation is uniquely adapted to survive summer drought and winter flood conditions. Native plants provide erosion protection during high flows and generally recover quickly when flood waters subside. Native species also require less water and fewer chemicals than most exotic plants.
- ✓ Seek expert technical advice before revegetating a creek bank. Consult your local nursery, native plant organization, garden club, agricultural extension office, or a good reference book to find out which plants are best suited to your location and how to care for them. Some cities and counties have local creek ordinances which include landscaping requirements. Check with your local planning department.

APPENDIX F: STABILIZING CREEK BANKS

Creeks are constantly reshaping their channels through natural processes -- scouring outside curves and depositing sediment inside bends in the waterway. A stream's natural tendency to meander can be aggravated by human activities throughout the watershed. Increased volumes of stormwater runoff into creeks, removal of natural vegetation, and upstream alteration of the creek channel may lead to erosion problems on banks that were once stable. Unstable banks can lead to extensive bank failures and add large volumes of sediment to the creek, resulting in property loss.

Creeks are complex systems. Stabilizing banks requires knowledge and expertise. Actions taken to protect your bank may have unforeseen consequences downstream. You may unintentionally pass your erosion problem on to your neighbor.

If you have a serious erosion problem, consult with a qualified professional in bank stabilization and repair. Check with your local representative from the California Department of Fish and Game -- you may need to obtain a Stream Alteration Agreement. The U. S. Army Corps of Engineers also requires permits for work done in waters under their jurisdiction. Municipalities and local flood control agencies also have local creek ordinances with which you must comply.

Local, state and federal permit processes help ensure that riparian habitats and creek flows are protected and that property owners do not inadvertently worsen the situation. Remember, these agencies are there to assist you! Organizations and agencies with more information are listed on the back page of this booklet.

The Following are a few Bank Stabilization Considerations:

- ✓ Erosion control need not be costly.
- ✓ Consider low-tech, lower-cost, creek-friendly alternatives first.
- ✓ Be sure to seek professional advice before taking action.
- ✓ If the native riparian vegetation has been depleted or removed, but severe bank erosion has not yet occurred, you may be able to re-establish or augment the remaining vegetation on your own. Find out what types of native vegetation to use on your particular site and how to plant and care for them.
- ✓ Modify steep banks to shallow or moderate slopes and revegetate with native riparian species. (Live cuttings of willow driven into the bank or bundles of live cuttings secured to the banks can be effective stabilization techniques).
- ✓ Create terraces and plant with native species.
- ✓ Retrofit existing bank stabilization with planting collars.
- ✓ Stabilize the bottom of the slope with with bioengineering methods using native plant species, such as willow wattles.

APPENDIX G: LOCAL RESOURCES

In many cases, common sense -- as well as local guidelines and ordinances -- will help you care for your creek. Sound professional advice is always recommended. The agencies and organizations listed below may be able to assist you.

Local creek programs, regulations, ordinances, and permits:

- Call your local city or county public works department or planning department
- Call your local flood control agency

Reporting Spills and Illegal Discharges
(Call 800-852-7550 or 800-952-5400)

- Call your local city or county public works department or planning department
- Call your local Regional Water Quality Control Board
- Office of Emergency Services
- Fish and Game Cal Tips Hot Line

Bank Stabilization/Creek Restoration

- Call your local Resource Conservation District 707-944-5500
- California Department of Fish and Game 916-757-8200
- USDA Soil Conservation Service
- California Dept. of Water Resources - Urban Streams Restoration Program 916-323-9544
- Urban Creeks Council (non-profit organization) 510-540-6669

Plants and Landscaping

- Call your local city or county planning department
- California Native Plant Society
- Urban Creeks Council 510-540-6669
- Call your local city public works department

Recycling

- California Integrated Waste Management Board - Recycling Hot Line 800-553-2962
- California Department of Conservation, Recycling Hot Line 800-332-SAVE

More Information

- U.S. Fish and Wildlife Service 916-978-4613
- U.S. Army Corps of Engineers 415-744-3276
- National Park Service - Rivers, Trails and Conservation Assistance Program 415-744-3975