

Guide to Native and Invasive Streamside Plants



Sespe Creek

**Restoring Riparian Habitats in Ventura County &
along the Santa Clara River in Los Angeles County**



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Produced by the County of Ventura, Planning Division

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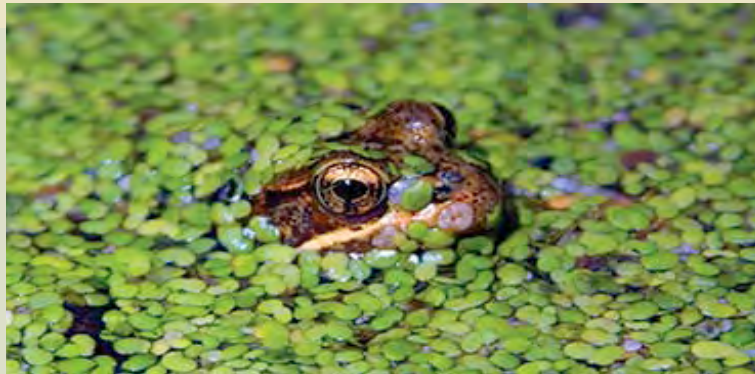
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California Red-Legged Frog

Other Wetland Guides Available from the Planning Division

Wetland Project Permitting Guide

**Permitting Stream and Wetland Projects in Ventura County
& along the Santa Clara River in Los Angeles County**

Guide to Stream and Wetland Project Funding

in Ventura County & along the Santa Clara River in Los Angeles County

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In this Guide

In the *Guide to Native and Invasive Streamside Plants* we provide information to help protect one of the most valuable elements of a living stream—riparian vegetation. Using this guide, you can help restore and enhance one of California's most vital and endangered resources: the living stream environment.

The “Native Riparian Habitats: A Conservation Bargain” section summarizes the many ways in which riparian habitats provide us with valuable services and protections.

The “Invasives” section explains the reasons invasive plants are so detrimental, covers the basic methods used to remove them and provides profiles of some of the area's worst invasive riparian plants.

The “Natives” section outlines the key elements of a native plant community, offers basic instruction in techniques for revegetating a riparian habitat and provides profiles of some of our most important native riparian plants. This section includes a Native Plant Summary Guide for easy reference.

And the “Resources” section provides many sources of additional information, such as where to get information about permits that may be required, where to buy native plants and a list of local organizations that can provide assistance or aid to restoration projects.

If any of the terms used here are new to you, see the [Glossary](#).



*A gallery of Ventura County riparian habitats. Top to bottom:
 Santa Clara River in the backcountry
 Dry seasonal stream
 Ventura River storm flow
 Santa Ana wash in spring
 Sycamore Creek after a rain*



Portrero Valley Creek

Introduction



The stream corridor, including the vegetation along the bank, is known as riparian habitat.

“Riparian” means next to streams or other water bodies. These habitats serve as the transition between aquatic habitats and upland, or dry, habitats.

Ventura and Los Angeles Counties have a Mediterranean climate, which means we have hot, dry summers and short winters during which most of our rain falls. Floods and extended periods of drought occur regularly here and our riparian habitats are ever changing: sometimes swamped, sometimes damp and often completely dry.

Riparian habitats, where water collects and plants thrive, are especially precious in this semi-arid climate. Eighty percent of our wildlife species depend on these areas for their survival.

Riparian habitats also provide very important “services” for us—from groundwater recharge to water treatment, erosion control and flood protection. Cities are even finding that protecting and expanding these natural habitats can sometimes be more economical than building and maintaining engineered facilities, such as flood-control structures and water treatment facilities.

Healthy riparian habitats rely on a community of native plant species naturally adapted to thrive there. Unfortunately, our riparian habitats and the services they provide are rapidly diminishing because of an onslaught of invasive plants.

Because most of the local riparian land is privately owned in this region, the stewardship of these important habitats depends in large part on individual landowners. We invite landowners, and others interested in riparian habitat protection, to use this guide to help identify riparian plants—native and invasive—on your property or project site, and to help with the restoration of our vital riparian habitats.

Native Riparian Habitats: A Conservation Bargain



Santa Clara River

Native riparian habitats, although they typically make up only a tiny fraction of the landscape in our area, perform many important ecological functions. These functions have direct economic and social value as well as environmental value. Because they provide so many services, riparian habitats can be thought of as a “conservation bargain”—a small investment that yields large returns.

Soil Protection

Perhaps one of the most important functions of riparian vegetation is its ability to control soil erosion. Erosion is a natural process. Our local mountains are composed of very erosive materials, naturally causing streams and rivers to be muddy brown after heavy rains (in fact, our beaches depend on these sediments or they themselves will erode). However, human alteration of the environment results in excessive erosion. Stream channelization (the straightening and concrete lining of streams) increases the water flow in our streams because the water cannot soak into the ground. With the natural stream curves straightened and no plants to slow it down, water also flows faster. This increased water volume and velocity intensifies erosive flood flows.

Today, sediment is the most significant pollutant in many local streams and rivers. In our altered streams, the sediment “load” continues for much longer after rain events than in unaltered systems. This excess sediment clouds water and silts over stream habitat, smothering aquatic plants, invertebrates and fish eggs and scouring fish gills.

Beyond the environmental damage it causes, streambank erosion is a major problem for landowners in this region, many of whom have lost streamside property to heavy flood flows through the years.

In a stream surrounded by native riparian habitat, with a variety of large and small plants, sediment pollution is controlled and streambank erosion reduced. Riparian plants have extensive root systems that help to stabilize streambanks and hold soil in place. Additionally, riparian plants help to remove sediment by slowing down runoff from the surrounding area, allowing the sediment to settle out before entering the streams.

Enhanced Water Quality

Streams can be contaminated by a range of materials from adjacent land, including sediment, nutrients, salts, metals, plant material from crops, pesticides, animal wastes and chemicals. In the Santa Clara River, salt (chloride) has become a serious water-quality problem that now threatens the ability to grow crops historically irrigated with river water. These salts originate from natural and artificial sources (such as water softeners).

The quality of the water in our streams and aquifers can be directly tied to the presence of riparian habitat, also called riparian “buffers,” along the length of the stream; where there is no riparian habitat, water quality is degraded. Riparian plants help slow the overland movement of water, causing sediment and pollutants to be deposited on the land before they can reach the stream, and they play an important role in taking up and filtering out nutrients before water enters groundwater aquifers. Metals, pesticides and biological pathogens can also be trapped by riparian habitats, and in some cases changed into less harmful forms.

Flood Protection

Impervious surfaces, such as roads, parking lots and rooftops, increase runoff by preventing water from soaking into the soil. As the amount of runoff increases, so does the threat of flooding. Like sponges, riparian soils soak up and slowly release floodwaters. This lowers flood heights and slows the flow of water down rivers and streams. The wider the riparian “buffer” the greater the protection.

Enhanced Water Supply

By slowing floodwaters, as well as the overland movement of water, riparian plant communities allow more water to seep into the ground. Water that could have been quickly lost to the ocean is instead held by the soil. This water recharges underground aquifers and also slowly releases into streams, supplying the base-flow waters that feed streams long into the dry season.

“Saltwater intrusion,” where ocean water intrudes into underground aquifers, has been a serious threat to local freshwater supplies for many years. Anything that enhances storage of runoff water into these aquifers helps to resist this saltwater intrusion. Vegetated riparian habitats do just that.



San Antonio Creek



San Antonio Creek



Great Blue Heron

A diverse riparian native plant community protects our environment and property better than do many invasive infestations through:

- Lower water usage
- Lower fire risk
- Creating habitat for native wildlife & beneficial insects
- Stabilizing streambanks
- Providing flood control
- Improving water quality

Critical Wildlife Habitat

Riparian habitats provide an important transition zone between water (aquatic) and land (terrestrial) habitats. Because riparian habitats contain both aquatic and terrestrial plant and animal species, they have unusually high species diversity. Riparian areas provide essential breeding, nesting, feeding and refuge habitats for many forms of waterfowl, other birds, mammals and reptiles.

Continuous riparian buffers also provide important wildlife migration corridors, which are critical “movement highways” for terrestrial species such as coyotes as well as for water-dependent species such as frogs and waterfowl.

According to the U.S. Fish & Wildlife Service, California has lost 90 percent or more of its historical wetlands, which includes riparian habitats. Yet riparian habitats in the Western states, such as California, provide habitat for up to 80 percent of wildlife species. Many of the animals and plants designated as threatened or endangered depend on wetland/riparian habitats.

Streamside vegetation plays an important role in creating the conditions required to support such a wide variety of plant and animal species. Riparian plants contribute organic matter such as leaves and fallen wood, which provide food and shelter for many animal species. Shade from these plants keeps water temperatures low, which is very important for fish and other aquatic species.

Other Values

Riparian habitats serve as recreation sites for fishing, hunting and observing wildlife. They provide educational opportunities for local residents and tourists alike.

In addition, property values benefit from protected stream corridors. An attractive riparian zone lush with native plants can improve the appearance of streamside property.

Preserving a relatively narrow strip of land along streams and rivers—land that is frequently less suitable for other uses—can help to maintain good water quality, provide habitat for wildlife, protect people and buildings against flood waters and extend the life of reservoirs by protecting them from siltation.



The Invasives

Invasive plants are decreasing the ability of riparian habitats to absorb floodwaters, increasing fire hazards and erosion damage along our rivers and consuming precious water.

Non-native plant species have been introduced to habitats all over the world, but not all of these species pose a serious threat to native plant communities. The term “invasive” is used for those non-native species that invade natural landscapes and establish self-sustaining populations that significantly degrade the value of native ecosystems.

Invasive plants alter the natural processes of an ecosystem so as to exclude other plants. They can alter soil and water chemistry, change fire patterns, alter hydrology and crowd out native plants. Native plants, which are not adapted to the changed environmental conditions brought about by invasive plants, start to disappear along with the animals that depend on the native plants for food and shelter.

Invasive plants are widely diverse in shape and size, but they all share certain characteristics that contribute to their destructive spread across our riparian habitats:

- They reproduce quickly, by producing large quantities of seed, resprouting from roots or spreading by stem fragments.
- Invasive plants often have no local competitors, predators or diseases. Without these limitations, they can spread unchecked across a landscape, often resulting in an area dominated by a single weedy species. Some invasives produce chemicals that inhibit the growth of other plants. A number of them are also poisonous to humans and animals.
- They establish quickly, dominating a disturbed site before native plants have a chance to re-establish.
- The thick monocultures formed by invasives, such as *Arundo*, can prevent the formation of the absorbent organic matter layer on the soil surface that is found in a mixed native plant community and serves to capture and filter water runoff.



Arundo resprouts more quickly than most natives after a burn, which increases its dominance in an area.

Once an invasive plant is established, it is extremely difficult to remove and nearly impossible to eradicate.



Arundo's shallow roots get undercut in floods, ripping out large clumps of vegetation, which flow downstream, damaging bridges and clogging flood-control channels.



- They reduce biodiversity by overtaking the native plants that provide superior shelter, nest sites and food for native animals. This disrupts and degrades the ecosystem and decreases the biodiversity, or species richness, of an area.
- They are often more flammable than natives and recover more quickly after a fire. Historically, riparian corridors, green with native vegetation, did not burn as easily as adjacent uplands and served as effective firebreaks. Today, however, highly flammable species such as Arundo and Blue Gum Eucalyptus have invaded many riparian areas, allowing fires to spread throughout these areas.
- They often consume considerably more water than native plants, which reduces water availability for native plants, wildlife and people. This can be significant, given our semi-arid climate and limited water reserves. Invasive riparian plants such as Arundo and Tamarisk can consume so much water, potentially double that of natives, that they lower the water table, harming native plants, crops and well-dependent land owners.
- They are hard to remove, requiring regular monitoring and treatment. A few of the invasives are so successful at reestablishing from the smallest fragment that eradication is extremely difficult.

Invasive plants have become so widespread that their control will not be achieved easily. The removal of invasive plants and the protection of the many important functions of our native riparian habitats will take considerable effort and cooperation. Assistance is needed from streamside property owners, government agencies and nonprofit groups.

The following section, "Invasive Plant Removal: The Basics," outlines common techniques used to remove invasive plant infestations. If you plan to undertake a large-scale removal project, there is much more to know than what is provided here. The work can involve use of heavy equipment and herbicides and possibly regulatory permitting and must be approached with considerable planning and care. Please see the "Resources" section for referrals to sources of more detailed information.

The "Invasive Plant Descriptions" section provides photos and descriptions of 19 of the worst invasive riparian plants in Ventura County and along the Santa Clara River in Los Angeles County, including how they spread and suggestions for removal.

Given that less than 5 percent of Southern California's historic riparian habitat remains, the spread of invasive plants is a serious threat.

Invasive Plant Removal: The Basics

The traits that make invasive plants successful colonizers of our landscapes also make removal very challenging. Here's a step-by-step overview of a removal process that will improve your chances of success:

1. Map & Inventory Existing Plants

The first step in invasive plant removal is to identify which invasive plants you have on your property or project site. This inventory helps you understand the scope of the problem, which will suggest the best removal techniques as well as whether any permits might be needed. Create a map with the locations of plants, their names, size and other factors important to their removal. It is also a good idea to try to figure out the source of the invasive plant infestation. Are plants coming from upstream? Are seeds being blown in by the wind? If the neighboring property is full of invasive plants, this will affect your removal efforts.

2. Select Removal Techniques

Many factors will help determine the removal techniques most appropriate in a given situation. More often than not, successful control of invasives requires a combination of several techniques. It is beyond the scope of this guide to provide detailed information on all the various options and appropriate uses for each situation. The section "Invasive Plant Removal: Tips and Techniques" offers some general guidelines about removal techniques. The reader should also consult one of the many excellent Internet resources on this topic. See the "Resources" section for a list of Web sites or for information on organizations that may be able to provide additional information.

3. Determine If Permits Are Required

Moving earth, working around protected species, or placing any material in a stream may require one or more permits. Obtaining permits may require you to communicate your plans in detail and then wait up to several months before proceeding. You may want to avoid activities that require permits. See the "Permits" section for more information.

4. Remove Plants

Scheduling plant removal will depend upon many factors, such as the type of plant and whether there are nesting birds or other sensitive species in the area. Here are some general points to keep in mind when scheduling plant removal:

Avoid disturbing wildlife. Vegetation removal during July through October minimizes disturbance to birds and other wildlife, which breed and rear young earlier in the spring and summer.

Work during the dry season. Fall is also a good time to schedule removal because the ground is firm and dry and rainfall that may interrupt work is less likely to occur.

Work in spring to get plants before seed heads form or for soft soil. For some plants, removing them before they form viable seeds is critical, so waiting until fall is too late. Spring, when the soil is still moist, may also be the preferred time if plants will be removed by pulling.

Minimize soil disturbance. Invasives thrive in disturbed soils. Tree trunks and roots should be retained whenever possible to prevent bank disturbances. Use of solarization or herbicides on tree trunks and roots can reduce resprouting.

Anticipate erosion problems. If you are taking out a lot of plant cover, you will want to prevent the exposed soil from eroding either by replacing the plants by sowing a fast-growing native grass seed or by mulching generously. Erosion-control fabrics can also be used.

5. Dispose of Plant Debris Appropriately

It is critical to dispose of invasive plant materials in a manner that will prevent further infestation. The best method will depend upon how the plant spreads. Speak with your local weed management agency to get disposal recommendations for specific plant species. You'll find some general guidelines in the following section.



Invasive Plant Removal: Tips & Techniques

PULL — If You CAN Easily Get the Roots Out

For many plants, the best way to ensure the plant is killed and will not resprout is to remove the entire plant, including roots. This is especially important when herbicides will not be used. This technique can work well for annual plants, immature plants, or for small infestations. Pulling is not as effective on plants with deep or easily broken roots.

Pulling can be done by hand, or with the aid of trowels, Weed Wrenches, Root Talons, McLeods, shovels, hand picks, soil knives, long pry bars, mowers and many other tools. The Weed Wrench is a favored tool



among experienced workers. It has a set of jaws that clamp tightly onto the stem, providing a strong lever action and allowing fairly large plants to be pulled from the ground.

Digging can cause considerable soil disturbance and soil disturbance invites weeds and invasives to take over. We suggest minimizing soil disturbance as much as possible and visiting the site on a regular basis (sometimes monthly) to remove new weeds.

If pulling plants involves significant soil disturbance, the need for permits could be triggered. See the “Permits” section for more information.

CUT — If You CAN'T Easily Get the Roots Out

For an infestation of any significant size, it is likely that the plants will need to be cut. For some plants, cutting them off at or near ground level is the best way to kill them. For others, cutting is just the first step in the removal effort. Some plants resprout vigorously when cut, replacing one or a few stems with many that can quickly flower and set seed. Be sure to research the biology of the plant before cutting.

An advantage of cutting, over pulling, is that it avoids soil disturbance.

There are lots of different cutting tools that can be used, including machetes, bow saws, pruners, loppers, pruning saws, mowers, brush cutters, weed whips with blade attachments and chain saws.

Methods of preventing resprouting after cutting:

- Grind the stump in place with a stump-grinding machine.
- Cut deep, crisscross grooves in the surface of the stump with a chain saw.
- Use solarization (see “Other Useful Techniques” section below).
- Treat the cut-stump immediately with herbicide (see the “Herbicides” section below).
- Combine several of the above methods.

Arundo is easily ripped out in storms, transported in rivers to the ocean, leaving masses of debris on local beaches.



Herbicides

With enough labor and vigilance, pulling and cutting can keep up with an invasive infestation, but often this kind of labor isn't available. Hence, herbicides are commonly used in an invasives removal project of any significant size.

Using herbicide involves a certain amount of risk to the area where the material is applied, particularly in riparian areas where water flows. The person applying the herbicide must also take care to minimize personal exposure.

In California, pesticide use, disposal and storage are governed by laws in the California Food and Agriculture Code (FAC) and regulations in Title 3 of the California Code of Regulations. Many herbicides are restricted from use in riparian areas because of their potential danger to fish and amphibians. Except for residential uses, you must contact your local agricultural commissioner's office to obtain an Operator ID number before purchasing or applying herbicide. There is no fee for this. When purchasing herbicides rated for aquatic use, you may be asked for this Operator ID number. In addition herbicides that are painted on cut surfaces or applied in a foliar application to woody plants are often "restricted materials" in California because they contain chemicals that could seriously harm nontarget plants or contaminate adjacent soil or water sources. Using these herbicides requires a Restricted Materials Permit, also issued by the Agricultural Commissioner. Furthermore, the application of herbicides into streams or onto aquatic plants growing in streams requires a National Pollutant Discharge Elimination System (NPDES) permit from the Regional Water Quality Control Board. More information is available at: www.waterboards.ca.gov/npdes/aquatic.html.

BE SURE TO CHECK THAT THE CHEMICAL YOU INTEND TO APPLY IS SAFE FOR RIPARIAN USE (VERY FEW ARE)

**READ THE ENTIRE PESTICIDE LABEL CAREFULLY
FOLLOW ALL MIXING AND APPLICATION INSTRUCTIONS**

The Agricultural Commissioner's office can provide information on applicable laws and safe handling and use of pesticides. Licensed Pest Control Advisors and Pesticide Control Operators can be contracted to apply herbicides (look

in phone book or visit www.cdpr.ca.gov/docs/license/currlic.htm). Local weed management agencies can be contacted for information about types of herbicides or herbicide treatments that work better on specific plant species. See the "Resources" section for Web sites that provide more detailed information on precautions and techniques for herbicide application.

Common Herbicide Application Techniques:

Cut-Stump. Herbicide concentrate or herbicide-water mixture applied immediately (within 3 minutes) to freshly cut-stumps (outer circumference) or stems (entire top surface) with a backpack sprayer, spray bottle, wick, paintbrush or sponge.

Basal Bark. Herbicide-oil-penetrant mixture sprayed or daubed in a 6- to 12-inch band onto the lower portion of woody stems, usually applied with a backpack sprayer or wick applicator. Works best on young trees with smooth bark. Usually not effective against older plants with thick, corky bark.

Foliar Spray. Herbicide-water solutions aimed at plant foliage to cover all leaves and usually applied with a backpack sprayer (use low pressure, drift retardants and spray shields to avoid drift). Tends to be ineffective on plants that have leaves with thick, waxy cuticles. Easier to use on small plants. Herbicide spray drift can cause damage to nontarget plants.

Hack and Squirt, and Stem Injection. Herbicide concentrate or herbicide-water mixtures applied into incisions spaced around woody stems made by an ax, hatchet, machete, brush ax or tree injector. Used on woody species with large, thick trunks.

Other Useful Removal Techniques

Solarizing

Plastic is used to cover and essentially “bake” plants and plant seeds to death. Some people advocate use of a heavy-duty black plastic and others a clear plastic that lets in sunlight. If the soil can be moistened first, this aids in killing seeds. Ensure that the plastic is held securely in place on all sides. Solarization may take up to a year or more and works best in really hot weather. It does not work as well in foggy coastal areas. Solarizing can be used on stumps after cutting as an alternative to herbicide application. Make sure the plastic extends along the ground 3 feet out from the base of the cut plant.

Flaming

A propane torch is used to kill young plants. Flaming avoids ground disturbance, can be precisely applied to target plants and does not introduce herbicides into the ecosystem. The young plants are not actually burned, but rather heated to the point at which the water boils which ruptures the plant cells. Flaming should be used only when it is raining or immediately thereafter and never when there is any risk of fire.

Steaming

Hot water or steam is applied to the plants using specialized equipment. Heat kills the plants without some of the dangers inherent in flaming. This method works best for young plants or small herbs and grasses.

Mulching

Mulching can be effective for smothering infestations of herbaceous weeds. Many different materials can be used, including leaves, compost, grass clippings, weed-free



Solarizing weeds.

straw, wood chips or shavings, or even gravel. A thick layer of mulch is needed to successfully inhibit weeds. Laying down a thick layer of newspaper or cardboard on the soil surface and then covering with 4 to 6 inches of mulch can achieve greater success. In addition to smothering weeds, mulching improves the tilth of the soil, which helps native plants compete with weeds.

Girdling

Girdling involves cutting away a strip of bark 1-2 inches wide all the way around the trunk. The removed strip must be cut deep enough into the trunk to remove the cambium, or thin layer in between the bark and wood (similar to what beavers do). Sometimes herbicides are applied to the cut.

Heavy Equipment

Sometimes bulldozers, excavators and other heavy equipment must be used to push trees out of the soil or knock over large stands of vegetation. Permits may be needed for these activities.

***Wear gloves, a long-sleeve shirt and long pants.
Many invasive plants are poisonous or cause skin irritation.***

Biological control agents (good bugs) are sometimes successful at controlling targeted invasive plant species.

These agents have been released in many states to control Tamarisk, for example, and they are successfully defoliating vast acreages of Tamarisk in the West. Researchers are working to introduce these biological control agents for Tamarisk control in Southern California.

Invasive Plant Debris: Safe Disposal Tips



Chipping Arundo into mulch.

Choosing the correct disposal method is critical to prevent invasive plant material from reseeding or resprouting and undoing all your hard work. Your local weed management agency is a good source of disposal recommendations for specific plant species. Here are some possible alternatives:

Chipping

Certain plants can be chipped, such as in a tree chipper, and used as mulch. Some people advocate this for *Arundo* canes, as long as no rhizomes get mixed in. The danger with chipping is that seeds can still sprout and rhizomes take root. Piles of chipped material can also be a fire hazard. Ensure that chipped material is spread out as mulch, no more than 12 inches high. Keep chipping activities and mulch well away from the stream.

Composting

Compost piles, where microbes decompose vegetation into a humus-like material, cannot be counted on to thoroughly destroy plant stems or seeds. Composting works well for leaves, wood chips and seedless vegetation that does not spread by rhizomes. Keep compost piles well away from the stream. Large composting operations require permits.

Solarizing

Leaving vegetation covered with plastic for an extended period of time is a good way to ensure that plant stems and seeds are thoroughly killed. This can take over a year and works best in really hot weather. Thoroughly dead vegetation can be left in place, or chipped for mulch or composting.

Landfill Disposal

This method ensures the plant material (except what you may drop on the ground getting it to the truck/bin) will not re-infest the site. However, landfill disposal can be very expensive, and the value of the vegetation's organic matter is lost from the ecosystem. Do not dispose of invasive plant material in green waste recycling programs.

Burning

Burning can be an ideal way of disposing of invasive plant debris but because of safety and air quality issues it may be difficult to do. Plant material must be dry. You must wait for an officially declared "burn day" and comply with regulations of the local fire district and air quality control agency.

Invasive Plant Descriptions

This section contains profiles of some of the worst invasive riparian plants in Ventura County and along the Santa Clara River in Los Angeles County. These particular species were chosen (in 2006) based on the experience of local biologists, weed experts and others involved in stream habitat restoration work. Almost all the plants listed were intentionally introduced into California; many are ornamental landscape plants that escaped into California's natural areas. They have spread unchecked by any of the limiting factors—local competitors, predators or diseases—present in their place of origin. This list is not complete, and new invasive species are introduced and spread each year. Unfortunately, many of these invasive, non-native species continue to be sold at local nurseries.

Invasive plants are commonly found in a variety of disturbed areas, often those that have been graded but also sometimes naturally disturbed. Because seasonal storms often disturb riparian areas, ripping out plants and turning over soil, these areas are particularly vulnerable to aggressive takeover by invasive plants.



Arundo, our biggest invasive plant challenge.

Mexican Fan Palm

Scientific Name: *Washingtonia robusta*

Origin: Northern Mexico (Baja California and Sonora)



Unfortunately, nothing says “Southern California” like a Mexican Fan Palm; it’s a popular landscape tree you’ll see lining streets in our area. However, Palm trees are not native to coastal Southern California.

Description: This Palm, which can grow up to 100 feet tall, has a slender trunk topped with a crown of large fan-shaped evergreen fronds. Dead fronds hang vertically and form a persistent skirt around the trunk. Arching clusters of tiny, tubular cream-colored flowers bloom in June. During the fall, large clusters of small, hard fruit hang from the tree. Because they lack deep roots, Mexican Fan Palms can grow only where water is near the surface.

How It Spreads: Spreads by seed, often dispersed by birds.

Ecological Damage: Because it produces large numbers of seeds that sprout readily and grow quickly in moist areas (established trees can grow up to 2 feet a year), the Mexican Fan Palm can form dense, monoculture groves in riparian areas that crowd out natives, consume large amounts of water and divert or impede stream flow. Although the trees themselves are fire-resistant, the dead fronds are a fire hazard.

Removal: Pull or dig up small plants. Cut large trees at the base below the growing tip. Herbicide stem injection can also be effective.

Peruvian Pepper Tree

Scientific Name: *Schinus molle*

Origin: Peru



WARNING:

Peruvian Pepper fruit is used for producing red pepper but can be toxic if eaten in large quantities.

Description: Peruvian Pepper (often called California Pepper Tree) is an invasive tree that has spread into riparian areas, as well as upland habitats, from backyards, street tree plantings and abandoned fields. Fast growing, it can reach 15 to 30 feet tall. A graceful tree with slender, weeping branches, its bright green leaves are divided into many narrow leaflets and have a spicy aromatic smell. The trunks of older trees are often gnarled with knots and burls. Peruvian Pepper tree has prolific, feathery, yellowish-white flowers in drooping clusters that bloom in spring and summer. In the winter, the tree bears abundant small, red, berry-like fruits that have a strong peppery scent.

How It Spreads: Spreads by bird-dispersed seed.

Ecological Damage: Because the tree drops abundant litter and inhibits understory plants, Peruvian Pepper can out-compete native plants. Peruvian Pepper and other species of *Schinus* have been known to cause hay fever, asthma and dermatitis. It is in the same family as poison oak.

Removal: Pull small saplings by hand or with a Weed Wrench. Larger trees can be treated with herbicide with the hack and squirt or cut-stump treatments. Solarization can be used on the cut stump to prevent resprouts.

Tamarisk

Scientific Name: *Tamarix ramosissima*

Origin: North Africa, the Mediterranean and the Middle East



Tamarisk and Arundo have been referred to as the “Deadly Duo.”

They often occur in the same habitats, compete for similar resources, and either species will fill empty niches if one is controlled while the other is ignored.

Description: Tamarisk, also called Salt Cedar, is a feathery-looking deciduous tree. It grows quickly and forms dense thickets. Although it can grow up to 25 feet high, in our local watersheds it is also found in its shrub form at about 6 to 10 feet high. Tamarisk can increase the surrounding soil salinity by absorbing deep soil salt and concentrating it near the surface when its leaves fall. The narrow, cedar-like leaves are $\frac{1}{16}$ inch long on wispy stems. Fuzzy, pink flowers appear in masses on 2-inch-long spikes at the end of branches. Blooms almost year-round locally, though most abundantly from April to August.

How It Spreads: Primarily through seed dispersal, although also through root and trunk shoots.

Ecological Damage: Very hardy and tolerant of extreme conditions, fast-spreading and fast-growing (it can grow as much as 1 foot a month in the spring). This plant easily displaces natives. It is fire-adapted, with more efficient post-fire recovery mechanisms than most native species. Stands can alter stream channels and increase flooding, and the vegetation is highly flammable. A long taproot allows it to access deep water tables.

Removal: Pull small plants by hand or with a Weed Wrench. Foliar sprays and basal bark and cut-stump treatments can be effective. To prevent resprouting without herbicides, dig down around the base and cut off the main stem below the crown or use solarization.

Tasmanian Blue Gum

Scientific Name: *Eucalyptus globulus* var. *globulus*

Origin: Southeast Australia



Blue Gum is the most commonly cultivated and naturalized *Eucalyptus* species in California.

Description: Distinguished by a tall growth habit, the Tasmanian Blue Gum tree, commonly called Blue Gum, grows 45 to 75 feet in height, but can reach nearly 180 feet under ideal conditions. The straight trunk can grow to a diameter of 7 feet or more. It has thin, peeling bark and long, drooping blue-grey leaves. The yellow flowers have a feathery starburst pattern. Blooms December to May. The large solitary fruits are woody and ribbed.

How It Spreads: Reproduces by seeds, which germinate readily. Also resprouts from roots and stumps.

Ecological Damage: Blue Gum can form dense monoculture stands by out-competing other plants for soil moisture and by smothering understory plants through prolific dropping of leaf, bark strips and branches. This plant spreads fast and has a vigorous root system that can cause damage to buildings and underground pipes. With its abundant leaf litter, peeling bark and oily leaves, Blue Gum is extremely flammable.

Removal: Pull small saplings by hand or with a Weed Wrench. Cut larger trees as close to the base as possible. To prevent resprouts, either apply herbicide using the cut-stump treatment or use solarization.



Tree-of-Heaven

Scientific Name: *Ailanthus altissima*

Origin: China



Look Closely!

Tree-of-Heaven may be confused with the native California Walnut (*Juglans californica*), because the leaves are similar. However, the leaflets of California Walnut have serrated edges and the leaflets of Tree-of-Heaven are mostly smooth.

Description: Tree-of-Heaven, named for its dramatic height, is a multitrunked deciduous tree that can grow to 80 feet. Stems are smooth with pale gray bark. Large compound leaves, 1 to 4 feet in length, are composed of 11 to 25 smaller leaflets that alternate along the stems. Clusters of small, yellow-green flowers appear in May and June. All parts of the tree, especially the flowers, have a strong (offensive) odor. Tree-of-Heaven is tolerant of urban conditions including compacted, poor soils and polluted air and is common in dusty, smoggy places where most other trees fail to grow.

How It Spreads: Spreads by seed and by secondary sprouting from lateral roots.

Ecological Damage: Fast-spreading Tree-of-Heaven can quickly overrun native vegetation. It produces toxins that inhibit natives, and can quickly take over forest openings.

Removal: Pull seedlings before deep taproot is established, usually in the first 3 months. Cutting alone is usually counterproductive because the tree responds by producing large numbers of stump sprouts and root suckers. For smaller infestations, repeated cutting of sprouts over time (years) can exhaust the tree's energy reserves. Cut trees before flowering and at the end of the growing season. Girdling, basal bark and cut-stump herbicide treatments can be used to kill the tree. Solarization can be used to prevent resprouts.



Arundo

Scientific Name: *Arundo donax*

Origin: India



Considered the largest threat to riparian habitats in Southern California, millions of dollars have been spent over the past 10 years in attempts to remove Arundo from river systems and estuaries in the state.

Description: Also referred to as Giant Reed, Arundo is a bamboo-like perennial grass that grows extremely fast; up to 2 inches a day, reaching 25 feet in height or more. Arundo thrives in permanently saturated conditions, though once established can survive in dry soil. It is found at elevations less than 1,600 feet. Arundo has a thick, persistent underground stem system that looks like giant pieces of ginger. Flower stalks are silky and purplish. Blooms September to December.

How It Spreads: Just like Bermuda grass, Arundo grows by sending out underground vegetative shoots (rhizomes) that take root and send up new stalks. It spreads when pieces of rhizome break off, travel downstream and take root in moist soil. Its seeds appear to be almost always sterile in California.

Ecological Damage: Arundo is one of the fastest-growing land plants in the world! It forms massive thickets of vegetation that can cover several acres, virtually eliminating all other plant species along with the rich biodiversity, structural diversity and wildlife habitat of riparian ecosystems.

Arundo is highly flammable, even when green, creating a significant fire threat to the environment and landowners. Fires increase the dominance of Arundo in riparian ecosystems because it recovers more quickly than most natives after a burn. Large Arundo infestations can alter stream flows by redirecting water against streambanks, undercutting them and accelerating erosion that causes property damage. Of particular concern is the amount of water Arundo consumes—up to twice as much as native vegetation. Arundo can actually reduce groundwater availability and the base flow of streams.

Arundo Removal: The following four techniques are commonly used to remove Arundo locally. In addition, solarization is also being tried with some success. Techniques that utilize herbicides are more effective when done in the fall, when plants are moving energy from their leaves to their roots prior to going semi-dormant over the winter. Always stockpile canes out of the streambed.

Cut-Stump

Cut canes close to the ground using hand-held equipment (e.g., loppers, chain saws or weed whips with blade attachments). If the canes are dense, make two cuts, the first at 5 feet above the ground to facilitate access and the second within 6 inches of the ground (make horizontal cuts to prevent sharp points. Avoid multiple, shorter cuts that produce small pieces of Arundo. Immediately (within 3 minutes) after the final cut, apply herbicide (glyphosate at 50-100% concentration). Use a sponge or brush to maximize herbicide contact with the cut edge of the stalk and prevent herbicide contact with soil and adjacent vegetation. Regular follow-up with a foliar spray, or use of solarization, will be necessary to control resprouting. **Pros:** If herbicide is applied correctly, reduces the labor necessary for follow-up treatments. **Cons:** Requires considerable initial labor as both plant removal and herbicide application happen at the same time. Can present safety hazards with herbicide applicators working directly with those removing the canes.

Foliar Spray

Apply herbicide (glyphosate) to the entire plant, with the goal of "spray-to-wet without runoff." Spray from the ground when the stands are less than 8 feet tall and there is little risk of overspray to nontarget plants. Spray taller stands from above using a hydraulic lift with an extension boom or an agricultural ladder. The canes can also be bent over first before spraying. Effects should be visible within 2 to 3 weeks of application and the entire plant should appear affected within about 6 weeks. Regular follow-up with a foliar spray, or use of solarization, will be necessary to control resprouting. **Pros:** Requires small labor crew initially for spraying, with labor for dead plant removal occurring later. Use of herbicide at low concentration rates may be preferable in some instances. **Cons:** Greater potential to harm nontarget plants. Larger stands of dead Arundo can become fire and flood hazards. Care should be taken to reduce these hazards. See the "Dispose of Plant Debris" section.

Cut-Apply Herbicide to Resprouts

Cut the stalks or canes and remove the plant material as in the cut-stump treatment. When the resprouts reach a height of 2-4 feet, spray with herbicide as in the foliar spray method. Regular follow-up with a foliar spray, or use of solarization, will be necessary to control resprouting. **Pros:** Requires a smaller labor crew initially for plant removal, with labor for herbicide application occurring later. **Cons:** More herbicide treatments and longer herbicide retreatment schedules are necessary than with other methods.

Cut Canes-Dig Roots-No Herbicide

Cut and dig with hand-held equipment such as loppers, chain saws, weed-whips with blade attachments, shovels, picks and digging bars. Hand-held pneumatic air-hammers and heavy equipment such as bulldozers can assist with root removal. Permits and restrictions may apply to use of this equipment. **Pros:** No herbicide application occurs. **Cons:** Expensive as requires large labor crews to remove root/rhizome systems by hand. Potential erosion and sediment problems may occur due to soil disturbing activities. Removal and/or disturbance of soil may trigger the need for additional permits.

Arundo rhizomes can dry out for over 6 months and still start growing vigorously when they come in contact with moisture.

Local Arundo Removal Efforts

Controlling Arundo requires cooperation throughout the entire watershed where it occurs. Because its rhizomes break off and resprout downstream, efforts to control Arundo infestations should ideally start at the headwaters, or top of the watershed, and work down.

Considerable effort is going into controlling Arundo locally. Removal projects are being implemented for various reasons including flood control, reduction of wildfire fuels, habitat restoration, and protection of water quality and quantity. Regulatory agencies have determined that the impacts of Arundo establishment are so great that they allow Arundo removal to be used as mitigation for other project impacts.

The Ventura County Resource Conservation District (VCRCD), as coordinator for the Ventura County Arundo Task Force and Weed Management Area, is working on watershed-wide Arundo removal efforts along the Santa Clara River. Their initial focus is on the upper part of the river, in Los Angeles County. VCRCD has mapped Arundo infestations along the river there and has completed a removal plan and Programmatic Environmental Impact Report (EIR). This EIR can cover multiple future removal projects. A streamlined permitting process is also being developed for this project area. The Antelope Valley Resource Conservation District will join VCRCD in removal work in Los Angeles County. VCRCD has similar strategies planned for the Ventura County side of the Santa Clara River as well as other watersheds in Ventura County.

Several other agencies, nonprofit groups and private landowners are actively removing Arundo. These organizations include the Ventura County Watershed Protection District, Friends of the Santa Clara River, the Matilija Coalition, the Ojai Valley Land Conservancy, the Nature Conservancy, the California Coastal Conservancy, Newhall Ranch and Farming and other private landowners.



Castor Bean

Scientific Name: *Ricinus communis*

Origin: Ethiopian region of tropical east Africa



WARNING:

Castor bean seeds contain a lethal, powerful poison. Ingesting a single castor bean seed can kill a child; two seeds can kill an adult.

The leaves are also toxic and may irritate skin and eyes.

Wear gloves, long sleeves, trousers and eye protection when handling this plant!

Description: Castor Bean is a common sight along streambanks, riverbeds and bottomlands. Typically 3 to 6 feet tall, Castor Bean can grow up to 15 feet; larger specimens of this vigorous shrub often look more like small trees. Large, dark green-purple palmate leaves give this plant a tropical look. Male flowers are small and greenish; female flowers are red and without petals. Male and female flowers appear on the same plant. Blooms March to May. Castor Bean produces spiny fruit capsules containing shiny, mottled "bean-like" seeds. Thrives in full sun in disturbed areas, fields and roadsides at elevations below 980 feet.

How It Spreads: Castor Bean reproduces through exploding seedpods; each releases three flat seeds. It is also capable of resprouting from the root crown if cut.

Ecological Damage: Fast-growing plants crowd out natives and form dense monoculture stands, with seeds that sprout more quickly after a fire than native seeds. All the plant parts are somewhat toxic; ingestion of seeds and their pods can be fatal to people and animals, and leaves can cause skin and eye irritation.

Removal: Pull small plants by hand or with a Weed Wrench. Herbicide application, using either foliar spray or cut-stump treatment, can be used when plants break off during pulling, or to kill mature plants. Solarization can be used to prevent resprouts. Wear gloves when handling this plant!



Myoporum

Scientific Name: *Myoporum laetum*

Origin: New Zealand



Description: Myoporum is a shrub (or small tree) that grows up to 30 feet tall. It is fast growing with many stout, spreading branches forming a broad crown. Leaves are bright green, shiny and finely toothed. Flowers are white spotted with purple. Blooms in the summer months. Fruits are red, oblong and fleshy. Like many other invasive plants, Myoporum is another runaway ornamental shrub that has become common in neglected urban areas and naturalized in coastal riparian areas at elevations below 700 feet.

How It Spreads: Spread by seeds that are attractive to birds.

Ecological Damage: Fast-growing shrub forms dense monoculture stands that crowd out natives. Because the interior of large plants contains a dense accumulation of dead branches, Myoporum is highly flammable. Leaves and fruit contain a toxin that may be fatal to livestock.

Removal: Pull small plants by hand or with a Weed Wrench. Myoporum has long, strong taproots and if the root is left in the ground it can resprout with vigor. Herbicide application using the cut-stump treatment can be used when plants break off during pulling, or to kill mature plants. As an alternative to herbicides, solarization can be used to prevent resprouts.

Pampas Grass

Scientific Name: *Cortaderia jubata* and *Cortaderia selloana*

Origin: Mountainous western South America



Description: Pampas Grass is a large, fast-growing, invasive perennial that can reach 7 feet in height. Common in disturbed sites, it occurs in habitats such as coastal scrub and dunes, rock outcrops and riparian areas at elevations below 2,600 feet. Forms large dense clumps with pink- or purple-tinged, plume-like groupings of flowers and sharp-edged, serrated, narrow leaves. Flowers appear July to September.

How It Spreads: Pampas Grass can spread by seed or from fragments of a mature plant that root in moist soil. Seeds remain viable for about a year. Seeds are tiny, wind-dispersed and can be carried up to 20 miles. Pampas Grass can readily establish itself in disturbed areas including landslides, road cuts and cliff faces.

Ecological Damage: Pampas Grass is turning our natural areas into silk-tasseled grass deserts. Fast-spreading and very flammable. The massive size of each Pampas Grass plant with its accumulated litter reduces wildlife habitat and creates fire and flood hazards. Recovers more quickly than natives following a fire.

Removal: Dig out small plants. Root crowns are shallow and can be “popped out” by placing the shovel blade just beneath a small plant. Cut larger plants to the ground, remove the root mass and chop it into smaller pieces. Herbicide can be used on the leaves during the growing period or on the stems immediately after cutting. As an alternative to herbicides, solarization can be used to prevent resprouts. Be careful to keep the seed-bearing plumes from reseeding.

Poison Hemlock

Scientific Name: *Conium maculatum*

Origin: Europe, western Asia and North Africa



Common Yellowthroat

You can easily identify this very poisonous plant by the reddish-purple spots on its stems.

Description: Poison Hemlock is a biennial herb that grows up to 10 feet high. Related to Sweet Fennel (both are in the carrot family), its ribbed, hollow stalks are topped with white flowers in an umbrella-shaped arrangement. Bright green, lacy leaves are musty smelling when crushed. Blooms April to September. It thrives in rich soils in moist, disturbed places as well as in native scrub, riparian and wetland habitats at elevations below 3,300 feet.

How It Spreads: Poison Hemlock reproduces by seed, with each plant producing roughly 1,000 seeds. They are spread by birds, animals, water and machinery. Seeds remain viable for up to 5 years.

Ecological Damage: Fast-spreading; crowds out natives; toxic to wildlife, livestock and humans if ingested or inhaled.

Removal: Poison Hemlock can be pulled out by hand or with a shovel. Cutting the plant at or just below soil level is also effective. Large stands can be reduced through regular mowing starting in March.

Repeat annually. Herbicide can be used on the leaves during the growing period or on the stems immediately after cutting. As an alternative to herbicides, solarization can be used to prevent resprouts. Be sure to wear protective gear, including gloves and mask, when removing this plant!

WARNING:

This plant and its seeds are poisonous if eaten and may cause skin irritation, nausea and headaches if touched or inhaled during cutting or mowing! Wear protective gear during mowing.

Spanish Broom

Scientific Name: *Spartium junceum*

Origin: Mediterranean and Canary Islands region



WARNING:

This plant is poisonous if eaten!
Causes skin and eye irritation.

Description: A shrub that grows up to 10 feet high, Spanish Broom sheds its leaves at the start of the hot season and remains leafless throughout the dry summer. Flowers are bright yellow, pea-like and pleasantly fragrant. Blooms April to June. Individual shrubs have been known to live up to 17 years. Common in disturbed areas and along roadsides at elevations below 2,000 feet. Scotch Broom is another non-native broom species in the area, but it is not as invasive as Spanish Broom.

How It Spreads: Spanish Broom reproduces quickly; seedpods burst open and propel seeds up to 12 feet away. The flowers produce thousands of seeds that build up in the soil over time, remaining viable for over 5 years.

Ecological Damage: This fast-spreading shrub provides poor forage for wildlife, increases fire hazard, crowds out natives and forms dense stands in hard-to-reach, hilly areas. All parts of the plant are poisonous if eaten and may cause skin and eye irritation if touched or handled.

Removal: Spanish Broom has a deep taproot that resprouts when cut. Pull or dig out smaller shrubs by hand. Herbicide can be used on the leaves during the growing period or on the stems immediately after cutting. Resprouting shoots can be cut, weed-whipped or treated with herbicide or solarization. Seedbank is long-lived and revisiting the site to treat seedlings will be needed.

Sweet Fennel

Scientific Name: *Foeniculum vulgare*

Origin: Southern Europe



Description: Sweet Fennel is a perennial herb that grows 4 to 10 feet tall. Related to Poison Hemlock, its stout, branching stalks are topped with yellow flowers in an umbrella-shaped arrangement. Gray-green, feathery leaves smell like licorice when crushed. Blooms May to September. Common along roadsides and in disturbed places. Occurs at elevations below 1,100 feet. Sweet Fennel is a nonpalatable version of the edible fennel, which is not invasive.

How It Spreads: Sweet Fennel reproduces readily by seed and from regenerative root crowns. Within 2 years, one plant can produce over 100,000 seeds. Seeds are commonly spread by water or by coming into contact with clothing, animals, vehicles and machinery. Seeds will germinate at almost any time of the year and remain viable in the soil for several years.

Ecological Damage: Crowds out native vegetation. Forms dense, monoculture stands. May release chemicals harmful to other plants.

Removal: Dig out or pull small plants, being careful to remove the bulb. Removal may also be accomplished by mowing, although less effectively because the plant will regrow quickly from the bulb. To address this regrowth, mow four times a year beginning in March. Do not mow when seeds are present. Herbicide can also be used on the plant or its resprouts. Solarization can also be used to prevent resprouts.

Tree Tobacco

Scientific Name: *Nicotiana glauca*

Origin: Bolivian and Argentinean area



WARNING:

This plant is poisonous to humans and animals!

Description: A straggling shrub or small tree (typically with one main trunk) that grows 18 feet high. Evergreen with tubular, deep-yellow flowers and large, grayish-green leaves. Blooms April to August. Occurs at elevations below 3,600 feet.

How It Spreads: Propagates by seed.

Ecological Damage: Fast-spreading plant crowds out natives; all parts of the plant contain toxic alkaloids (chemicals) that are harmful both to livestock and humans.

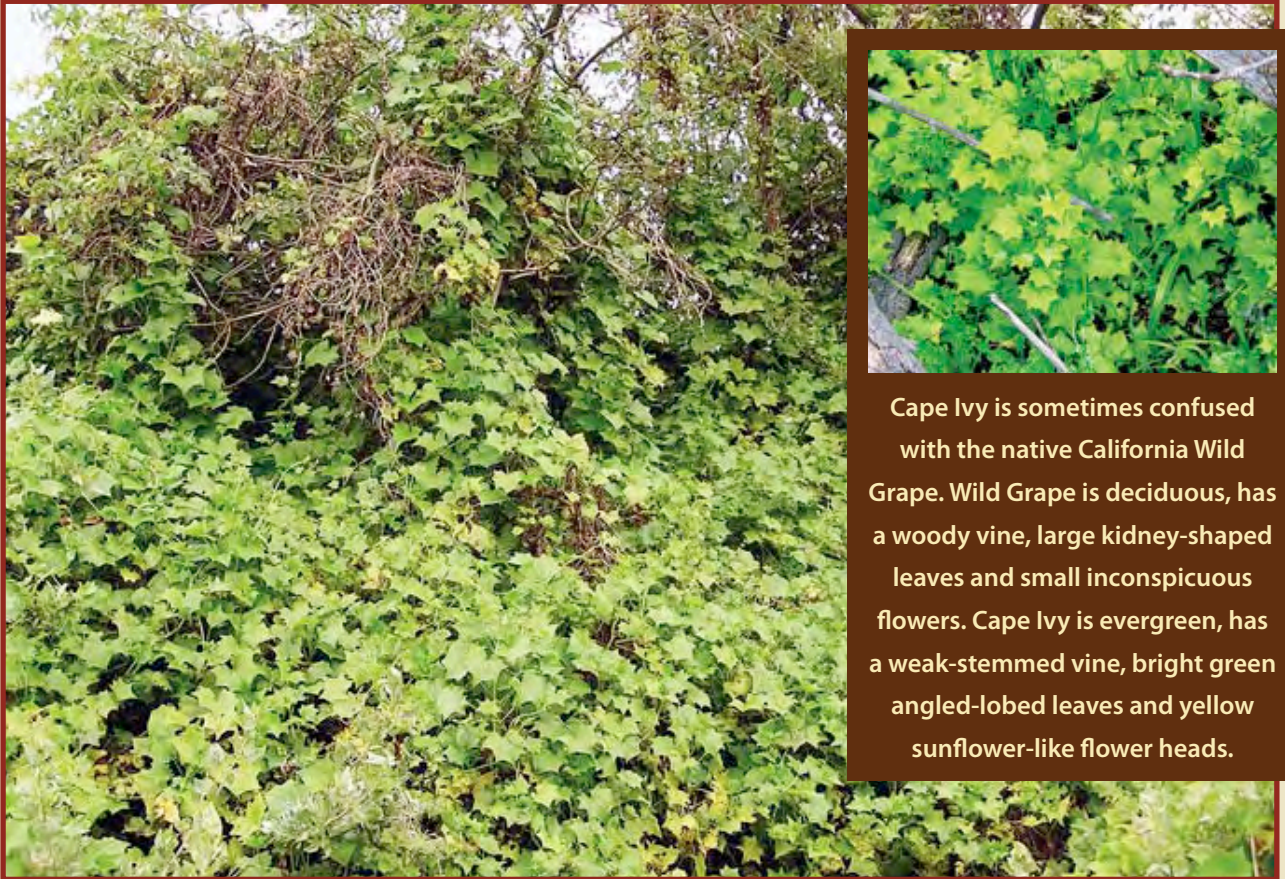
Removal: Pull small plants by hand or with a Weed Wrench. Foliar sprays and cut-stump treatments can be effective. Solarization can be used to prevent resprouts.



Cape Ivy

Scientific Name: *Delairea odorata* and *Senecio mikanioides*

Origin: Cape of South Africa



Cape Ivy is sometimes confused with the native California Wild Grape. Wild Grape is deciduous, has a woody vine, large kidney-shaped leaves and small inconspicuous flowers. Cape Ivy is evergreen, has a weak-stemmed vine, bright green angled-lobed leaves and yellow sunflower-like flower heads.

Description: Cape Ivy is a fleshy, climbing perennial vine with six-pointed bright green leaves and small yellow flowers. Blooms December to April. Both the leaves and stems store water, making the plant drought-tolerant. It is commonly confused with Wild Cucumber, a native vine with similar leaves. Cape Ivy has shallow roots that grow only 4 inches deep. Usually found invading the ground and shrub layer of shady areas and on disturbed moist sites at elevations below 800 feet.

How It Spreads: Cape Ivy spreads vigorously by sending runners in all directions. Reproduces by rooting from the stem or any other part of the plant that touches the ground. It usually produces no viable seed.

Ecological Damage: Fast-spreading and fast-growing, Cape Ivy climbs over vegetation in dense mats that block sunlight and smother plants. Native plants and animals can be virtually eliminated. Infestations can increase soil erosion and flooding. Contains chemicals that are harmful to animals, including fish.

Removal: Complete eradication requires extraordinary diligence as it requires that ALL stems and stem fragments be treated or removed. To prevent further spread, cut a containment line, creating a 1-yard-wide bare strip around the infested area. For manual removal, tease the roots out of the ground using a mini-rake. Where Cape Ivy is growing like a mat, roll it up like a carpet. Treat resprouts with herbicides, dig them out or use solarization. Herbicides can be applied as a foliar spray or wick application, but great care must be taken not to kill underlying native plants.

Greater Periwinkle

Scientific Name: *Vinca major*

Origin: Southern Switzerland to the Mediterranean basin, from Portugal to Turkey and across much of North Africa



Description: Greater Periwinkle is a sprawling perennial vine with trailing stems bearing opposite, dark green, oval leaves with pointed tips. Flowering stems rise to 1.5 feet high, ending in attractive, blue-lavender flowers. Blooms March to July. Thrives in sheltered places, especially along streams and at elevations below 700 feet. Grows most vigorously in moist soil with partial sun, but it will grow in complete shade, even in poor soil. Often found in dense patches around tree bases or over drainages.

How It Spreads: This aggressive grower has trailing stems that root wherever they touch the soil. Broken stem fragments, transported by water, resprout readily. Usually produces no viable seed.

Ecological Damage: Spreads rapidly in shady creeks and drainages, forming a dense carpet of both above-ground vegetation and matted underground roots that smothers the native plant community and reduces species diversity.

Removal: Small patches can be pulled by hand, while larger patches may require tools such as a McLeod. Vines can be brush-cut close to the ground and either immediately sprayed with an herbicide or solarized to prevent resprouts. Because of its waxy leaves, herbicide is more effective if the tissue is cut first to expose sensitive tissue. Because Greater Periwinkle can resprout from stem fragments, it's important to treat or remove all stems and stem fragments to prevent re-infestation.



Italian Thistle

Scientific Name: *Carduus pycnocephalus*

Origin: Mediterranean (western and southern Europe)



Description: Italian Thistle is an annual/biennial herb with spiny-winged stems, gray-green spiny leaves and pink-purple flowers. Blooms April through July. Grows 1 to 6 feet tall. Occupies roadsides, pastures and waste areas, physically disturbed riparian areas, Coastal Sage Scrub and Coast Live Oak Woodlands at elevations below 3,300 feet.

How It Spreads: Italian Thistle reproduces by seed. Thistle seed production is plentiful; the seeds have a high germination rate and can persist in the soil for up to 10 years. The seeds have a gummy coating that allows them to attach to animals and machinery. Drought-stressed, overgrazed and frequently disturbed sites are more vulnerable.

Ecological Damage: Fast-spreading plant crowds out natives.

Removal: Pull by hand (using gloves because of the spines). Removing the root will minimize regrowth. Alternately, cut or mow the stems as close to the ground as possible. This method requires follow-up mowing or cutting, but can be effective. Be sure to mow after the Thistles have grown tall but not flowered. Herbicides can be effective in controlling Italian Thistle. Solarization can be used to prevent resprouts.

It is very important to minimize the soil disturbance that favors infestation of Italian Thistle, and prevents establishment of desirable native species.

Perennial Pepperweed

Scientific Name: *Lepidium latifolium*

Origin: Europe and southwestern Asia



Description: Perennial Pepperweed is a highly invasive perennial herb. Multiple stalks bearing pointed leaves grow in stiffly erect masses up to 5 feet tall. Stems and leaves are dull gray-green and waxy. Small white 4-petaled flowers form dense clusters near the stem tips. Blooms May to July. Grows in a wide variety of habitats, including fresh and saltwater wetlands, in and around agricultural fields and even on stony slopes, from sea level to above 10,000 feet. Tolerates highly saline soils.

How It Spreads: Produces a large quantity of viable seed, but appears to spread primarily by propagating from its brittle rhizome-like roots. Root fragments exposed by washouts and land disturbances start new infestations downstream. New plants quickly regenerate from pieces of rootstock—even pieces under 1 inch. Roots fragmented by tilling or disking of soil increase infestation densities and facilitate spread.

Ecological Damage: Aggressive invader of coastal and interior wetlands throughout California and the Western states. It forms dense monoculture stands that out-compete the native plant community, reducing species diversity. The root-mat is fairly shallow, so that along riverbanks one often sees where the banks have been undercut and the Pepperweed above then slumps into the water.

Removal: Tilling the soil can actually spread Perennial Pepperweed; root fragments left in the soil resprout and produce a thicker stand. Carefully timed herbicide application can be effective, and uptake can be enhanced by first mowing to expose more sensitive tissue to spray. Solarization can be used to prevent resprouts. Perennial Pepperweed may be intolerant of lengthy periods of flooding during the growing season.



Summer Mustard

Scientific Name: *Hirschfeldia incana* [*Erucastrum incanum*]

Origin: The Mediterranean region



Description: Summer Mustard is an erect, perennial herb that grows on a branched stem topped with multiple terminal heads of four-petaled yellow flowers. Grows about 3 feet tall in disturbed areas, fields, along roadsides and in creek bottoms, grasslands and scrub communities at elevations below 1,000 feet. Like Sweet Fennel, Summer Mustard was introduced by European settlers.

How It Spreads: Spreads by seeds.

Ecological Damage: Fast-spreading plant that forms dense stands, exhausting soil water earlier in the season. Dried seed stalks can increase fire danger.

Removal: Mowing is not effective for the removal of Mustard species. Instead, pull or cut the plants before seed pods develop. Herbicide can also be used on the plant or its resprouts. Solarization can also be used to prevent resprouts.

Tocalote

Scientific Name: *Centaurea melitensis*

Origin: Southern Europe



Description: Tocalote is a spiny, thistle-like, annual herb. Its flowering heads are studded with purplish spines and topped with small yellow flowers. Blooms May to June. Grows to about 2 feet. Colonizes disturbed fields, riparian habitats, grassland, Coastal Sage Scrub, Chaparral and Coast Live Oak Woodland at elevations below 7,000 feet.

How It Spreads: Spreads by seeds. Seeds can be inadvertently mixed in and spread with crop seed or hay.

Ecological Damage: Forms dense, impenetrable, monoculture stands; crowds out natives; and consumes large amounts of water.

Removal: Proper timing of the eradication operation is critical to your success in eliminating Tocalote. Mowing can be an effective control, but mow too early and Tocalote will produce replacement seed heads. Mowing is most effective when done after bolting but before flower opening; Tocalote will have a harder time reflowering after having spent its energy to flower initially. Repeated shallow tilling of the soil during the germination period and before seed production can control an infestation. Monitoring may be required indefinitely to prevent re-infestation. Herbicides can also be effective in eliminating Tocalote. Solarization can also be used to prevent resprouts.

The Natives

Native plants form the base of the food web upon which local insects, birds, fish and other wildlife species depend.



Native plants are those that occur naturally in a specific geographic area without having been introduced by humans. This means that not only do the plants do well under the environmental conditions of the area—such as amount of sun, length of seasons, rainfall, temperatures, nutrient levels, and soil type—but also that the plants fit into a specific community, or ecosystem, of plants and animals.

The dynamic web of relationships between plants and animals keeps an ecosystem functioning properly and evolves gradually over time. Some federally protected birds like the Southwestern Willow Flycatcher and Least Bell's Vireo have evolved with a preference for nesting in shrubby natives like the Arroyo Willow that grows in riparian habitats. Native plant communities are full of similar relationships and dependencies.

Undisturbed vegetation communities tend to have a great diversity of native species because each plant has specialized over time to better partition and share resources.

The following section, "Native Plant Revegetation: The Basics," provides guidelines for replanting a riparian habitat. If you are undertaking such a project, you will likely need to seek out more detailed information. There is so much to know about how to make cuttings grow or how to select plants—we just touch the surface here. Please see the "Resources" section for referrals to sources of more detailed information.

The "Native Plant Descriptions" section provides photos and descriptions of 22 native plants common to riparian habitats in Ventura County and along the Santa Clara River in Los Angeles County. Plants are featured from all three riparian zones with a variety of trees, shrubs and ground-layer plants representing the multidimensional heights and textures found in a natural riparian plant community.

Native Plant Revegetation: The Basics

Successfully re-establishing a native plant community where invasive plants have taken root requires strategic planning as well as persistence—but it can be done. This section offers a roadmap you can use to plan your native riparian vegetation restoration project.

1. Study Existing Conditions & Identify Your Goals

If native plants already exist on the site, determine what species they are. This tells you what types of native plants grow naturally there and guides your selection of plants for revegetation. It can help to make a map of your site that indicates the locations of plants, their names and sizes.

Before designing your project, it is wise to study existing conditions, either on site or at a nearby natural stream habitat. The more your revegetation project resembles intact local native vegetation, the greater your chances of success and the lower your costs will likely be.

There is a lot known about the environmental conditions that promote native plant establishment. An ecologist or restoration specialist can provide an assessment of the potential for natural recovery based on water flow patterns, availability of seed, soil moisture and other conditions they will need to establish.

Designing a healthy riparian habitat involves:

- Establishing a diverse and multi-leveled structure of native plants, including trees, shrubs and ground cover.
- Quickly establishing shady canopy cover to reduce weed growth and cool stream water to enhance fish habitat.
- Establishing a wide riparian habitat. The wider the riparian habitat, the greater the benefits for animals as well as processes from water filtration to flood control. 25 feet is good. 200 feet (if available within the floodplain) is better.

Other goals of native revegetation might include:

- Attracting beneficial insects. See the “Attractive to Beneficial Insects” section below.
- Providing wildlife habitat. It is important to plant a variety of trees and shrubs rather than just one or two types, to provide diverse shelter and feeding sites for wildlife.
- Maximizing water filtration and sediment removal. Dense vegetation can more successfully trap contaminants and improve stream and groundwater quality.



Natural Colonization

Given the right conditions, revegetation can be achieved without active replanting. By continually removing invasives, native plants will likely recover—given enough time. Try leaving the site alone for one or two rainy seasons to see how well this works. Success will depend on water availability, especially consistent soil moisture, as well as a nearby native seed source.

2. Prepare the Site

Remove Weeds

The success, and cost, of many revegetation projects hinges on how well weeds are removed in advance of planting. It is highly recommended that you follow this weed-removal program before planting:



1. After initial removal of invasive plants, water the site thoroughly (or wait for rain) and allow time for new shoots to emerge.
2. Pull, solarize or otherwise kill the new weeds immediately.
3. Repeat this process until the last remnants of weeds are gone. Be patient; this could take months. Some projects have even spanned years to complete this pre-planting weed removal. Sometimes the soil is tilled or cultivated between irrigations to purposefully stir up buried weed seeds in order to deplete the seedbank.

Then Leave the Soil Alone

Once the above weed removal process is finished, don't till, disturb or amend the soil—unless absolutely necessary. This only encourages weed seeds to sprout. In addition, native plants are adapted to natural, local soil conditions. Modifying the existing soil, such as by adding soil amendment or compost, is usually unnecessary. If you are installing a plant species in the proper riparian zone, the existing soil should be adequate. In cases of degraded soil, or where recontouring of the site has changed the soil composition or structure, it may be necessary to have the soil tested before planting to see if amendments are necessary.

It is important to know what kind of soil is on site—whether it is predominantly sandy, loamy or clayey, or a mixture of these—because this will affect the need for supplemental irrigation (discussed below).

Budget & Plan for Ongoing Weed Control

Experienced restoration specialists all say the same thing: The number one cause of failure in restoration projects is that people do not anticipate the need for, and especially budget for, ongoing weed control. If your budget is spent the first season, you might be wasting your money. Ensure that follow-up weed control is in the plan.



*Weed competition
is the
major reason for
failure to
establish natives.*





Plan for Irrigation

Establishment of root systems is essential for riparian plant success. Root systems of most riparian species in this region develop naturally during the wet winter months and grow toward the receding soil moisture or shallow groundwater as conditions dry in the spring and summer. If adequate and consistent soil moisture is available on site throughout the growing season, supplemental irrigation may not be required. Because rainfall varies significantly each year, irrigation may be necessary in dry years but not in years with high rainfall. Whether irrigation is needed or not will depend on many variables, such as plant species, soil moisture in the rooting zone (upper 1-2 feet of soil), distance to surface or groundwater and sun/shade conditions. The most important variable that controls soil moisture retention is soil type; sandy soils will likely require initial irrigation, clayey soils may not.

The goal of irrigation, if required, is simply to help establish the native plants so they can thrive under existing conditions. This should take no more than 2 to 3 years.



Drip irrigation is recommended to ensure water supports only desired plants and not undesired weeds. Water only occasionally and deeply to stimulate the development of extensive root systems that help plants survive dry summer months. Remember that irrigation equipment in riparian areas can be lost to floods; go with simple, inexpensive methods whenever possible.

3. Select Plants Thoughtfully

Plant selection should consider the design goals addressed above plus the following considerations.

- Select plants that are locally native.
- Select plants appropriate for the specific riparian zone. Appropriate soil moisture is very important for riparian plants.
- Consider each plant's size, its height and spread at maturity. (See the "Native Plant Summary Guide.")
- Select plants appropriate for the site's soil type and sun exposure. (See the "Native Plant Summary Guide.")

Appropriate for the Riparian Zone

Different plants grow in different positions along the stream, according to their tolerance of flooding and drought. The stream corridor can be divided into three different zones: the frequently flooded zone, the occasionally flooded zone and the infrequently flooded zone. These areas can often be identified on successively higher "terraces" above the active stream channel. It is important, when selecting riparian plants, to understand the zone in which you are planting. The native plants listed in this guide have zone numbers indicating where in the riparian zone they'll grow best. Understand that these zone classifications provide a very simplified view of real plant communities. The three zones may be compressed in some habitats, such as on steep gradients, and there is considerable overlap between zones.

Riparian Zones



Zone 1

Zone 1, the frequently flooded zone, is the area immediately adjacent to the stream edge. This is the wettest nonsubmerged zone. Some native plants are uniquely adapted to growing in the streamside conditions of saturated soils and frequent flood disturbance.

Plants:

Arroyo Willow
Common Spike-rush
Creeping Wild Rye
Mulefat
Narrowleaf Willow
Red Willow
Rough Sedge
Shining Willow
White Alder
Yerba Mansa

Zone 2

Zone 2, the occasionally flooded zone, is upslope from and slightly drier than Zone 1. Groundwater is still readily available to plants here. Plants that occur in this zone are usually larger and more dense than in Zone 1, partly because they are less subject to scouring floods.

Plants:

Arroyo Willow
Blue Elderberry
California Blackberry
California Wild Rose
Creeping Wild Rye
Mugwort
Mulefat
Narrowleaf Willow
Red Willow
Scalebroom
Shining Willow

Zone 3

Zone 3, the infrequently flooded zone, lies beyond Zone 2. This area is often located on land terraces higher above the stream and is home to plants that require less water or have roots that penetrate deeper to obtain water. This zone contains both riparian species and species more typical of upland (dry) habitats.

Plants:

Black Cottonwood
Blue Elderberry
California Blackberry
California Flowering Ash
California Sycamore
California Wild Rose
Coast Live Oak
Fremont Cottonwood
Mugwort
Red Willow





Attractive to Beneficial Insects

Beneficial insects, such as lady beetles, lacewings and parasitic wasps, eat such pests as aphids, mites and caterpillars, and can be a safe and effective alternative to chemical pesticides. Controlling pests with beneficial insects is an ancient practice.

In addition to prey, many beneficial insects also forage on flowers. Pollen (protein and fat) and nectar (carbohydrates) not only provide this energy but also serve as an alternative food when pests are scarce. Growing flowering plants to provide these food sources helps attract and keep beneficials around.

Plants with small, open flowers and flat, horizontal flower clusters are most accessible to beneficial insects. Such flowers are provided by plants such as Blue Elderberry, Yarrow, Mulefat, California Buckwheat and Willow. Certain members of the Carrot, Gooseberry, Sumac and Sunflower families are also good “insectary” plants. In addition to nectar from flowers, insects feed on nectar exuded from leaves and stems of some plants (extra-floral nectaries).

In addition to flowers, riparian plants also enhance beneficial insect habitat by providing alternate prey or overwintering sites. Designing a beneficial insect planting, or insectary, entails providing beneficial insects with a year-round habitat that includes food (pollen, nectar and/or prey) and overwintering sites. Predatory mites that attack pest mites and thrips feed on pollen produced by wind-pollinated trees, such as Oaks, Cottonwoods and Walnuts, after it is deposited on the leaves of crop plants. As well, riparian zones provide habitat for hunting spiders and ground beetles that migrate from wooded areas into crops to forage on crop pests.

Riparian zones also provide habitat for native bees, which are important pollinators for many native plants and crops such as Melons. Native bees nest in the ground and within the hollow stems of trees, shrubs and herbaceous plants. They forage on the flowers of native plants such as Willows, Sages, Wild Roses and Lupines. Because native bees thrive in native vegetation, maintaining native vegetation in proximity to crops has been shown to enhance fruit-set levels in California.

Blooming Period of Beneficial Insect-Attracting Native Plants

The **highlighted** plants are those known to be particularly attractive to beneficial insects

Native Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Arroyo Willow												
California Blackberry												
Black Cottonwood												
California Sycamore												
Fleshy Lupine												
Fremont Cottonwood												
Coast Live Oak												
White Alder												
Blue Elderberry												
Yerba Mansa												
Deerweed												
Rough Sedge												
California Poppy												
Narrowleaf Willow												
Red Willow												
Shining Willow												
California Flowering Ash												
Purple Needlegrass												
Mulefat												
Common Spike-rush												
So. California Black Walnut												
California Wild Rose												
Black Sage												
California White Yarrow												
Purple Sage												
Leafy California Buckwheat												
Creeping Wild Rye												
Mugwort												
California Sagebrush												
Scalebroom												

It is ideal to always have flowers blooming and available to beneficial insects.
Choose a variety of plants so that you have blooms in all seasons.

Locally Native

Using locally collected native plant material is best for restoration projects. Local plant material is more likely to be adapted to local site conditions. For example, while all varieties of California Black Walnut (*Juglans californica*) are considered native to California, Southern California Black Walnut (*Juglans californica* var. *californica*) is the subspecies that is found in the Ventura County area. The local variety may be more drought-tolerant than the northern species and therefore more likely to successfully establish. Using locally native plants also preserves the genetic integrity of the area.

Propagating Plants from Cuttings or Seeds

While trees, shrubs and perennials can be introduced as container plants, sometimes it is challenging to find a source for them. Few commercial plant nurseries deal with native plants and if they do, the stock may not be from plants locally native to your site. For this reason, many riparian planting projects propagate their own plants.

Propagation is simply the growing of a new plant from the seeds or cuttings of an existing plant. Propagating native plants is an inexpensive way to generate the plants needed for a restoration project and is a great way to ensure you are getting the correct local variety. See the “Resources” section for Internet resources offering detailed information on propagation techniques.

Coast Live Oak acorns, Willow cuttings



Seeds

Seeding is a good way to establish native grasses or annual plants that are important for protecting the soil surface while other, slower-growing native plants become established. Seeds are the way nature designed plants to propagate, and if conditions are right, plants established through natural, on-site germination often fare better relative to other propagation methods. Getting the right conditions is the key, though, with high soil moisture usually being the determining factor.

Starting plants from seeds in containers, common with larger plants that have larger seeds, such as Oaks, has the benefit of protecting the seed from predation and competition from other plants.

Cuttings

Use of cuttings is a common propagation technique for riparian replanting projects. Cuttings yield a usable plant more quickly than those grown from seed. Cuttings must be collected from the parent plant during the winter months (December through February), but can often be stored in water for several weeks.

The plants that are most successfully propagated through cuttings locally are Willows, Mulefat and Cottonwoods.



4. Install Plants & Seeds

Planting schedules should take into consideration which riparian zone you are working in. If you are planting in Zone 1, right next to the stream, in an area that has a high likelihood of being flooded in winter rains, then planting should be scheduled later in the season after the threat of such flooding. The best time of year to plant is in winter, when the soil is moist. The more you can take advantage of natural soil moisture, the better your chances of plant survival and the less you will need to irrigate. In winter, most native plants are dormant (few to no leaves, not in flower). By planting at this time of year, you allow the plants to establish extensive root systems that help the plant survive the summer months.

Give plants plenty of room to grow. As a rough guide, place your planting holes as far apart as the plant's width at maturity.

If planting seeds, a “no till seed drill” may be a good choice for getting the seeds into the soil while minimizing disturbance to the soil (and dormant weed seeds).

Be careful to protect existing native plants during the planting process. Never disturb, compact or modify the soil beneath the drip-line (from the trunk to the edge of vegetation canopy) of existing plants.

5. Cover Bare Soil

Until your trees and shrubs grow larger, there will likely be considerable bare soil on the site. Exposed soil is not only vulnerable to erosion, it is also very fertile ground for invasive plants to become re-established. Covering the soil after planting can be done in various ways.

- Seeding with annual, native grasses and herbaceous plants
- Using landscape fabric, which blocks sunlight but allows water to soak through. Landscape fabric can be laid over a large area and natives planted through holes cut in the fabric.
- Using mulch, including leaves, compost, grass clippings, weed-free straw, wood chips or shavings, or even gravel. A thick layer of mulch (5 to 12 inches) on top of the soil is needed to successfully inhibit weeds. Greater success can be achieved by laying down a thick layer of newspaper or a layer of cardboard on the soil surface and then covering with 4 to 6 inches of mulch. Keep mulches several inches away from the stems of the plants to prevent root or crown rot. Do not mix uncomposted mulch into the soil—keep it on top!



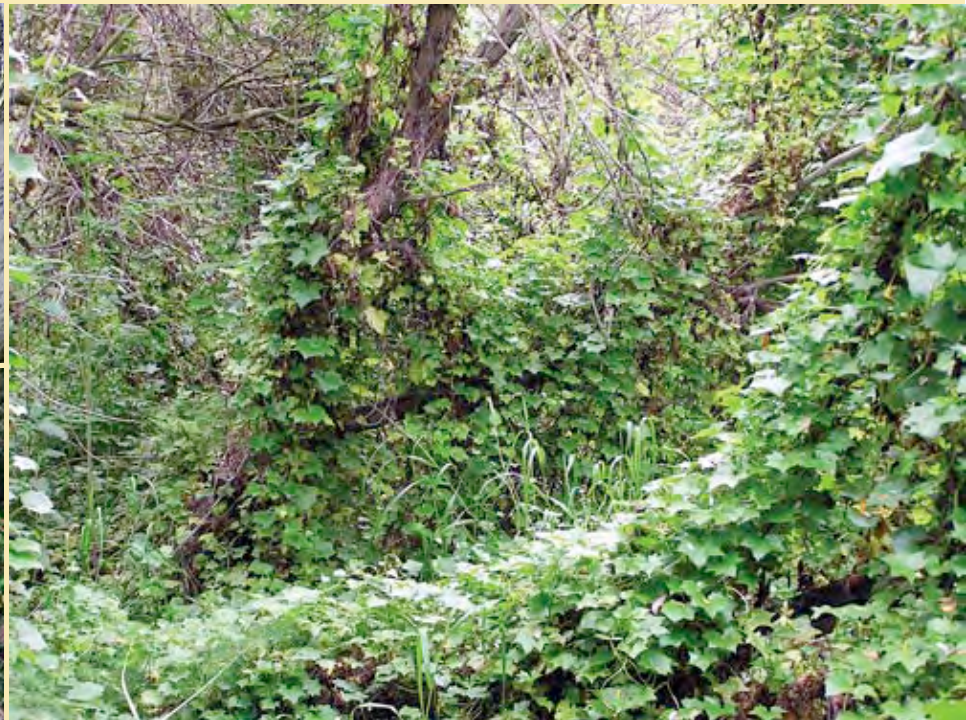
From top: Planting Oak seedlings at Ojai Meadows Preserve; restoration at Hedrick Ranch Nature Area, on the Santa Clara River; Willow cuttings at stream restoration site, landscape fabric for weed control.

6. Weed, Weed & Weed Again

The success of all your efforts hinges on weeding. Some helpful suggestions for weed management:

- Don't till the soil. If you till or cultivate, especially the upper layers, you encourage buried seeds to sprout.
- Mark your native plants. Pin-flags, stakes and tree tubes are good ways to mark intentional plantings while controlling weeds.
- Prevent weed-seed formation. Uproot and dispose of weeds before they set seed.
- Keep weeds clear within a 1- to 2-foot radius of each native plant during the maintenance period.
- Weed frequently.

Once your native plants are established and have grown for several seasons, they will help shade out undesirable weeds, eliminating the need for such aggressive weeding.



Local experts on Arundo removal and native revegetation advise that any invasive-removal project be followed with an aggressive replanting effort to more quickly establish an understory of vegetation.

These Native Plants Are Welcome Too

The following plants, though not strictly riparian, may show up and thrive in your riparian habitat. Don't pull them as weeds! They are native and belong where they can thrive. Many are also considered desirable because they are attractive to beneficial insects. All can be grown from seed.



Leafy California Buckwheat
Eriogonum fasciculatum var.
foliolosum



California White Yarrow
Achillea millefolium var.
californica



California Poppy
Eschscholzia californica ssp.
californica



Fleshy Lupine
Lupinus succulentus



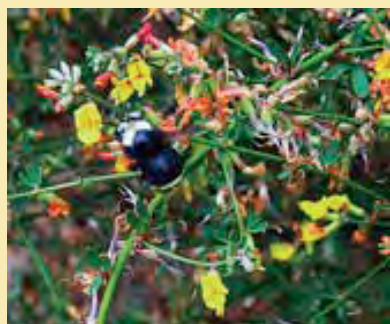
California Sagebrush
Artemisia californica



Purple Sage
Salvia leucophylla



Black Sage
Salvia mellifera



Deerweed
Lotus scoparius var. *scoparius*



Purple Needlegrass
Nassella pulchra

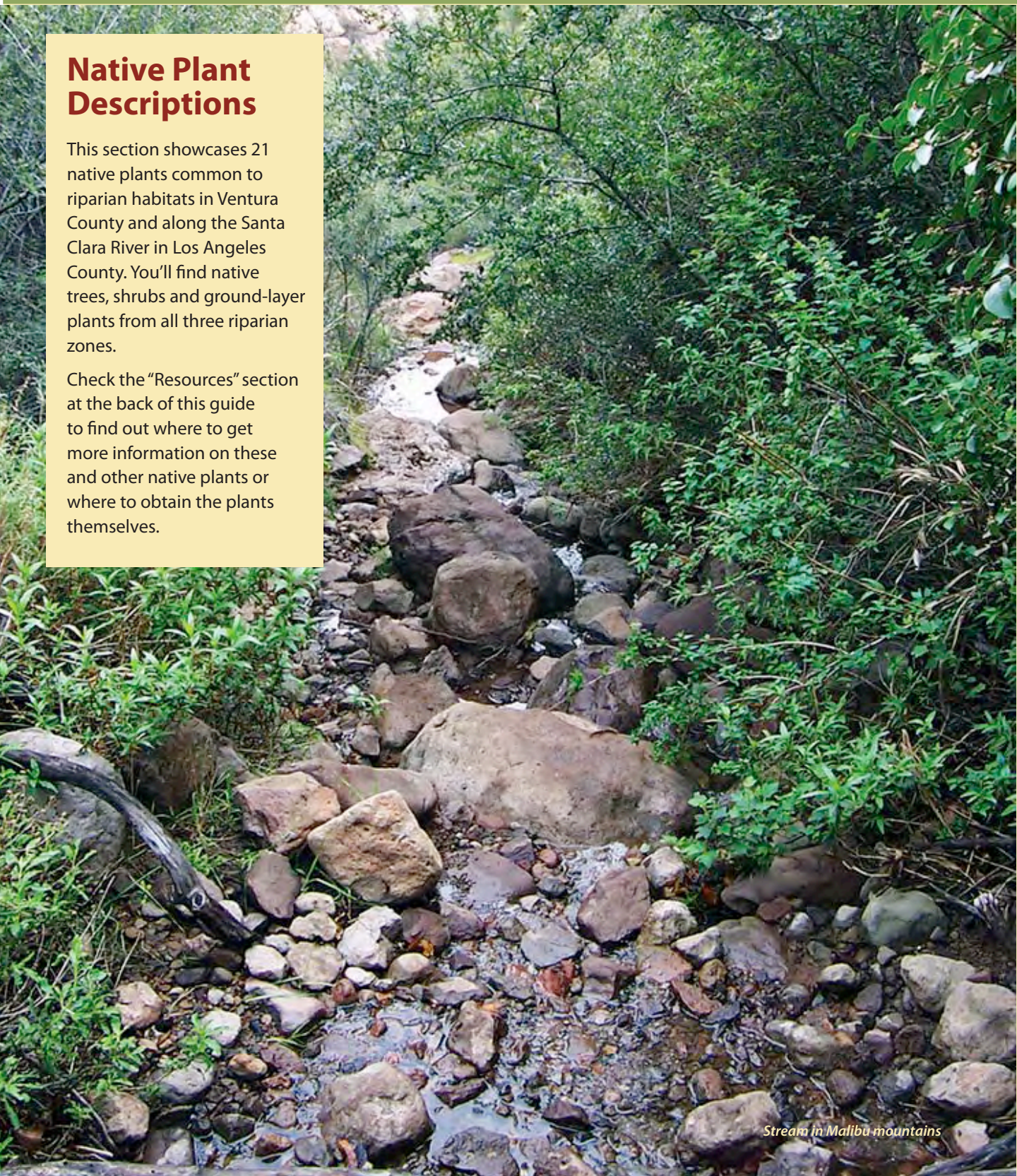


Southern Steelhead Trout

Native Plant Descriptions

This section showcases 21 native plants common to riparian habitats in Ventura County and along the Santa Clara River in Los Angeles County. You'll find native trees, shrubs and ground-layer plants from all three riparian zones.

Check the "Resources" section at the back of this guide to find out where to get more information on these and other native plants or where to obtain the plants themselves.



California Flowering Ash

Scientific Name: *Fraxinus dipetala*



Description: California Flowering Ash is a small, deciduous, shrubby tree that grows 6 to 20 feet tall. Multiple small leaflets—dark green on the upper surface but pale underneath—make up its compound leaves. Clusters of fragrant, two-petaled, white flowers bloom April to May. Moderate growth rate.

Riparian Zone: 3

Habitat: The California Flowering Ash occurs in canyons and on slopes in chaparral, riparian and woodland habitats at elevations up to 4,200 feet. Commonly an upland tree, it is also found on streambanks, floodplains, canyons and terraces. Tolerates intermittently flooded soils, but prefers clays. Full to partial sun.

Method of Propagation: Cuttings and seeds.

California Sycamore

Scientific Name: *Platanus racemosa* var. *racemosa*



Description: California Sycamore is a signature tree of some of our local stream corridors and an important habitat and food source for local birds and butterflies. A fast-growing deciduous tree that grows 50 to 115 feet tall, the high, arching growth habit and large leaves shade streamside habitats in the summer. Graceful trunks have thin, white-colored, peeling bark; fuzzy twigs; and large, lobed, hairy leaves that fade to orange in the fall. Some people are sensitive to the hairs of California Sycamore. Tiny flowers ripen into spiny fruit balls. Blooms February to April. Roots are deep and spreading.

Riparian Zone: 3. Requires permanently wet soils at depth.

Habitat: California Sycamore is common along rivers and streams and in moist rocky canyons, springs, seeps and floodplains at elevations below 6,500 feet. Tolerates full or partial sun. Requires open cobbled rocky soils with sand and/or clay. The roots must reach the water table for healthy growth. Tolerates wind and heat, but, like most riparian natives, is not drought-tolerant until fully established. Can tolerate weeks of flooding provided the water is aerated.

Propagation: Cuttings and seeds.

Coast Live Oak

Scientific Name: *Quercus agrifolia* ssp. *agrifolia*



Description: Coast Live Oak is one of the most widely distributed California evergreen Oak, capable of achieving large size and great age. Oaks produce a cornucopia of food for wildlife (acorns, leaves, twigs, sap, roots and pollen), forming the basis of an elaborate food web with herbivores eating oak products and carnivores eating herbivores. Provides significant habitat, food and cover for many species, especially birds; very fire-tolerant due to thick bark. Grows 30 to 80 feet tall. Strong branches can support a wide, spreading growth habit. Checkered, dark gray trunk bark and oval, cupped, spine-toothed, dark green leaves. Inconspicuous greenish-tan flowers in little tassels. Blooms in March. Acorns drop from September to October. Roots generally shallow, but spread beyond the tree canopy. Growth rate slow, though relatively fast when young.

Riparian Zone: 3

Habitat: Common in valleys, along dry slopes and in moderately moist canyons, but is also typical at the edge of riparian woodlands and on raised streambanks at elevations below 4,600 feet. Contributes to woodland, grassland and chaparral communities. Prefers full sun but can tolerate partial shade; requires sandstone or shale-derived soils. Low flood tolerance.

Method of Propagation: Seeds (acorns). Seeds are only viable for 3 to 4 months.

The Coast Live Oak is in decline statewide, due in part to sudden oak death. It is difficult for oak seedlings to find the understory shading they need to grow properly.

Protecting Our Coast Live Oaks

The Coast Live Oak lies at the heart of California's natural history. Native insect, plant, animal and human inhabitants rely on this long-lived tree for food and shelter. The Live Oak's position as the keystone species of its habitat extends below ground as well; its roots form a complex relationship with native mycorrhizal fungi creating soil conditions that support the Oak's health.

The health of our local ecosystems depends on a healthy Coast Live Oak population, so it's important to protect our living Oaks and to replant and encourage young Oaks. An acorn you plant today may live to serve California for hundreds of years.



Fossilized Oak leaves indicate the Live Oak has lived in California for 10 million years.

Maintain a Healthy Live Oak

The rule of thumb for keeping a Live Oak healthy also applies to most native plants: preserve (or recreate) natural conditions as much as possible, and the plant will take care of itself.

Here are the basics:

Respect the drip

line. The single most important thing you can do to protect a Live Oak is to maintain natural conditions under the Oak canopy. In the wild, moisture from fog and dew collects on Oak leaves and drips slowly off the edges of the tree canopy (the drip line), providing life-sustaining water during the long dry season. Don't plant anything that requires summer irrigation near the trunk; Live Oaks cannot tolerate wet soil within 4 feet of the trunk during the dry season.



Don't disturb the soil. Leave the soil under the canopy as undisturbed as possible and never pile soil up against the trunk.

Control invasive weed infestations under the canopy.

Recent research suggests that even 30% weed coverage under its canopy area can cause an Oak to decline. A layer of healthy Oak litter (free of invasive weeds) is the best ground condition to maintain a healthy Oak tree.

Keep pruning to a minimum. Declining branches are also part of the nutrient system for the Live Oak and its community. Keep trimming to the minimum required for safety.

Planting Oaks

Preserving (or re-creating) natural conditions is also helpful when you're trying to re-establish oaks.

Here are a few tips:

Planting acorns is the best way to start a new Live Oak tree. Acorns planted directly into the ground can best develop the long taproot necessary for surviving the dry season.

Use local acorns. Collect acorns for your replanting project as close as possible to your project location; locally adapted acorns have the highest chance of survival.

Plant saplings if weed and herbivore competition is heavy. A larger tree may be better able to survive heavy deer browsing.

Plant in December. The best time to plant acorns is December. The sprouting tree will benefit from the cool temperatures and the moisture of winter and spring rains.

Plant in the shelter of companion shrubs. Wild Live Oak seedlings do best when they sprout under the shelter of a native shrub. Ceanothus species, Purple Sage or Sagebrush are all good choices. If you can't provide native shrub cover, make a small open shade structure to protect the seedling for the first year or two.

Baby your baby Oaks. You can help your seedling Oaks survive by weeding competitors and providing occasional summer water and protection against herbivores and acorn predators until the young tree can fend for itself.

Cottonwood, Black

Scientific Name: *Populus balsamifera ssp. trichocarpa*



Description: Black Cottonwood is a cold-hardy, deciduous tree that can grow up to 100 feet—one of the tallest trees in our riparian areas. Also found as small as 40 feet. Handsome, upright growth with a broad, open crown and fast-growing when sufficient water is available, Black Cottonwood makes a good choice for a windbreak tree. Shimmering heart-shaped, dark-green leaves with silver undersides, turn golden in the fall. In winter, bare white branches are studded with large, fuzzy fragrant buds. Inconspicuous flowers bloom from February to April, followed by cottony wind-dispersed seeds, which give the plant its name. Roots are deep and spreading, allowing this plant to persist on high riparian terraces forming mature riparian forests.

Riparian Zone: 3, where shallow groundwater is available all year, but actual flooding is intermittent.

Habitat: Found scattered along floodplains and abundant along river terraces habitats at elevations below 9,000 feet. Requires full to partial sun, access to groundwater and occasional flooding to germinate seeds. Prefers sandy, cobbled or rocky river-wash soils. More common near the coast and in the upper reaches of Ventura County's watersheds. It is replaced further inland in more arid conditions by Fremont Cottonwood. If considering planting it, look around first to see if it occurs in the area. **Avoid planting Cottonwoods where the branches might arch over structures; the branches tend to break off more easily than other trees.**

Method of Propagation: Cuttings. Seeds are only viable for a short time and require newly deposited sediment and constant, high soil moisture for successful seedling germination and establishment.

Cottonwood, Fremont

Scientific Name: *Populus fremontii* ssp. *fremontii*



Fremont Cottonwood is considered by local ecologists to be one of our key riparian habitat plants for restoration projects. It grows well in many situations.

Description: Fremont Cottonwood is a fast-growing deciduous tree (a member of the Willow family) that reaches to a height of 40 to 65 feet. Closely related to Black Cottonwood and several other Willow species. Its wide canopy provides nesting habitat for many bird species. Fremont Cottonwood can be differentiated from Black Cottonwood by its yellow-green, heart-shaped leaves that are much broader and have scalloped edges. Inconspicuous flowers bloom March to April and develop into seeds attached to cotton-like structures that are readily wind dispersed. Shallow to deep roots, depending on water availability.

Riparian Zone: 3

Habitat: Occurs in bottomlands on streambanks and river floodplains predominantly well inland, where it forms large forests. Fremont Cottonwood appears in several Southern California riparian plant communities including Riparian Woodland, at elevations below 6,500 feet. This tree prefers full to partial sun, well-drained soils and periodic flooding.

Method of Propagation: Cuttings. Seeds are only viable for a short time.

Native Americans ate the inner bark of Fremont Cottonwood trees to prevent and treat scurvy, a vitamin C deficiency. The bark and leaves were used to relieve swelling, treat cuts, cure headaches and wash broken limbs.

Southern California Black Walnut

Scientific Name: *Jugans californica var. californica*



Look closely!

Sometimes the native Southern California Black Walnut is mistaken for the invasive Tree-of-Heaven.

Description: Southern California Black Walnut is a deciduous tree that grows 15 to 50 feet high. This species is locally common within Ventura County, but is very uncommon elsewhere in coastal Southern California. It has one to five trunks with gray-brown bark and light green compound leaves that turn brilliant yellow in the fall. Inconspicuous flowers. Blooms April to May. Produces small, round, strong-smelling walnuts. A fast-growing tree in its native habitat, the Black Walnut can live 125 to 150 years. Produces a deep taproot and is intolerant of root disturbance.

Riparian Zone: 3

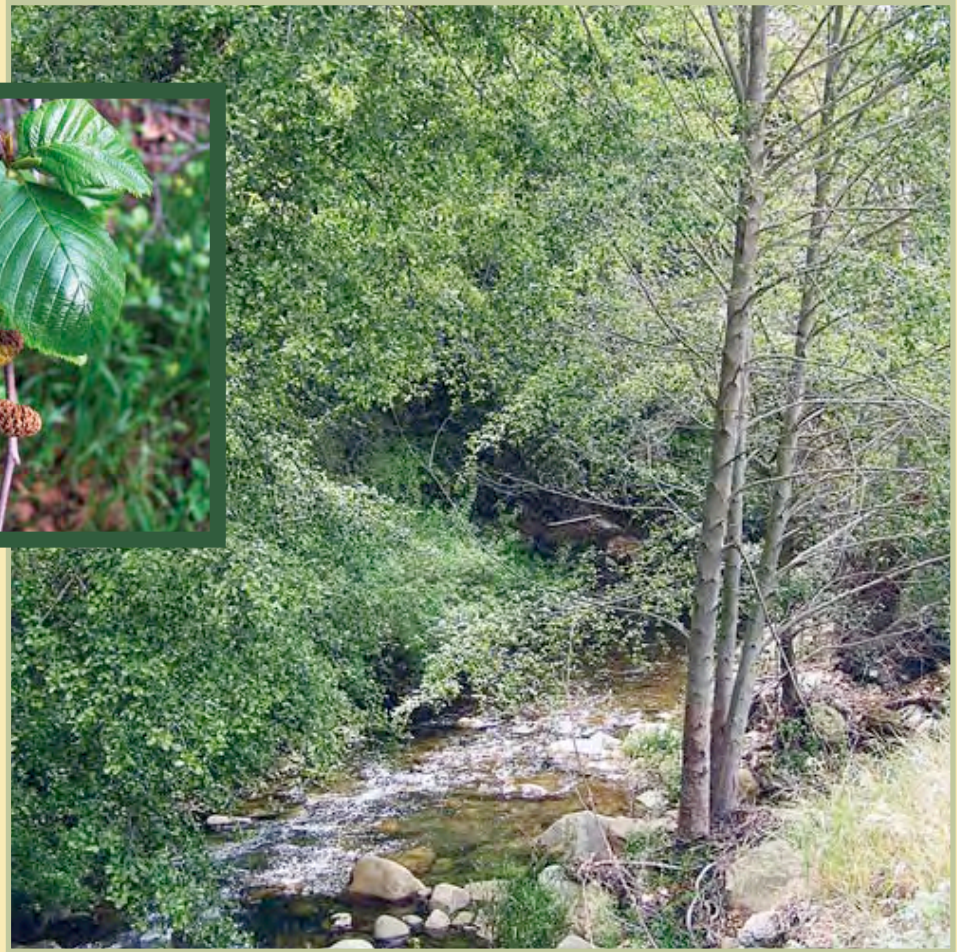
Habitat: Typically occurs on upland slopes and in valleys and canyons. Although it is often found inhabiting upland sites, it is also found on streambanks, floodplains and floodplain terraces. Tolerates intermittently flooded to wet soils. Requires full to partial sun and deep shale-derived soils and occurs at elevations from 165 to 3,000 feet.

Method of Propagation: Seeds (walnuts)

The Southern California Black Walnut is declining throughout its range. Hybridization with horticultural walnut trees, overgrazing and grading of steep slopes as habitat becomes urbanized are growing threats to aging Black Walnut populations.

White Alder

Scientific Name: *Alnus rhombifolia*



Description: White Alder is a very fast growing deciduous tree, reaching 15 to 115 feet high. A handsome tree with drooping catkins of pollen-producing male flowers, White Alder has smooth gray-brown bark, red-gray twigs and thick, serrated leaves. A member of the Birch family, it has inconspicuous wind-pollinated flowers. Blooms in March. The female flowers develop into tiny, woody, cone-like fruit that stays on the tree, opening to release tiny, winged nutlets that are very attractive to birds. Roots are shallow and fibrous and support nitrogen-forming bacteria.

Riparian Zone: 1

Habitat: Usually found along creeks with year-round surface or subsurface water. Also found on open rocky banks of steeper perennial streams; on slopes adjacent to streams, floodplains and narrow canyons; at seeps; and on low terraces at elevations from 300 to 7,000 feet. Requires full to partial sun, fresh water and intermittent to frequent flooding. Prefers rocky or sandy soil and is not drought-tolerant. This tree will grow in the streambed with the water flowing around it, but can also survive farther away from the streambed in areas where groundwater is close to the surface. This species is more common in the upper reaches of Ventura County's watersheds. If considering planting it, look around first to see if it occurs in the area.

Method of Propagation: Cuttings

Willow, Arroyo

Scientific Name: *Salix lasiolepis* var. *lasiolepis*



Willows make up the backbone of the riparian system and are excellent riparian natives to plant.

Description: Arroyo Willow a fast-growing, shrubby, deciduous tree that can reach 30 feet in height. It has shiny, dark-green leaves that are dull gray underneath and inconspicuous flowers. Blooms January to April. Male and female flowers are different; female flowers develop into fruit commonly known as “pussy willows.” It provides quality habitat for a variety of birds, wildlife and beneficial insect species, contributes to the structural diversity of streamside habitats and provides bank stabilization. Arroyo Willow withstands moderate disturbance.

Riparian Zone: 1 and 2

Habitat: Arroyo Willow is a very common species of Willow in our area, found most often in drier sites and along streams near the coast, at elevations below 9,000 feet. Prefers seasonally flooded to saturated riparian habitats. Tolerates full to partial sun. Arroyo Willow stands typically form a continuous shrub-to-tree canopy with a variety of low-growing plants making up the ground layer. Often found growing with other species of Willow. Can sprout from branches that make contact with damp ground.

Method of Propagation: Because seeds are only viable for a short time (as little as 3 to 5 days), cuttings are most successful. Cuttings of mature branches of the current year’s growth can be planted November to February in a sheltered outdoor bed, or planted straight into their permanent position and given a good weed-suppressing mulch. See the “How to Harvest and Plant Willow Cuttings” section.

The “Best of the Best” Award for Local Riparian Native Plants

The “Best of the Best” award for a local riparian native goes to the Arroyo Willow. In fact, any of the Willows in this guide are excellent choices to use for bank stabilization, habitat creation, flood control and water quality improvement.

Revegetating with Arroyo Willow is an easy and inexpensive way to establish woody vegetation on a denuded streambank. Willows need only sunshine and a year-round water supply; even if surface flows evaporate, groundwater may be close enough to the surface to support Willows. Willows spread easily and respond well to heavy pruning.

How to Harvest and Plant Willow Cuttings

1. Branches from mature Willow plants should be cut in the late fall/early winter as soon as the plant has stopped growing for the season (leaves will be dropping to the ground). The soil should be soft and wet. It is critical to plant Willows as early as possible to give them a chance to develop good root systems before they sprout leaves in the spring. Planting too late in the spring is the most common cause of failure.
2. Willow cuttings should be $\frac{3}{4}$ to 2 inches in diameter (bigger is better) and approximately 3 feet long. All branches and leaves should be stripped from the cutting. Also, all buds should be removed from the top one-third of the cutting length.
3. Plant cuttings by pushing (or pounding) the larger end into soft soil. In more compacted or drier soils, make a hole just slightly larger than the Willow cutting. A hand-held electric drill with an auger bit or a larger gas-powered auger can be used if soil is difficult to penetrate to 2 feet. Compress soil tightly around the cuttings. To give plenty of area for root growth, bury at least two-thirds of the length of the cutting (portion of cutting with buds). If planted in the active floodplain, angle cuttings slightly downstream to prevent them from being undermined by storm flows.
4. Plant Willows low enough on the bank to ensure adequate soil moisture during the summer. Even if streams or gullies have year-round water, Willows that are planted too high are likely to dry out and die. Cuttings should not need water if they are planted in an appropriate area.

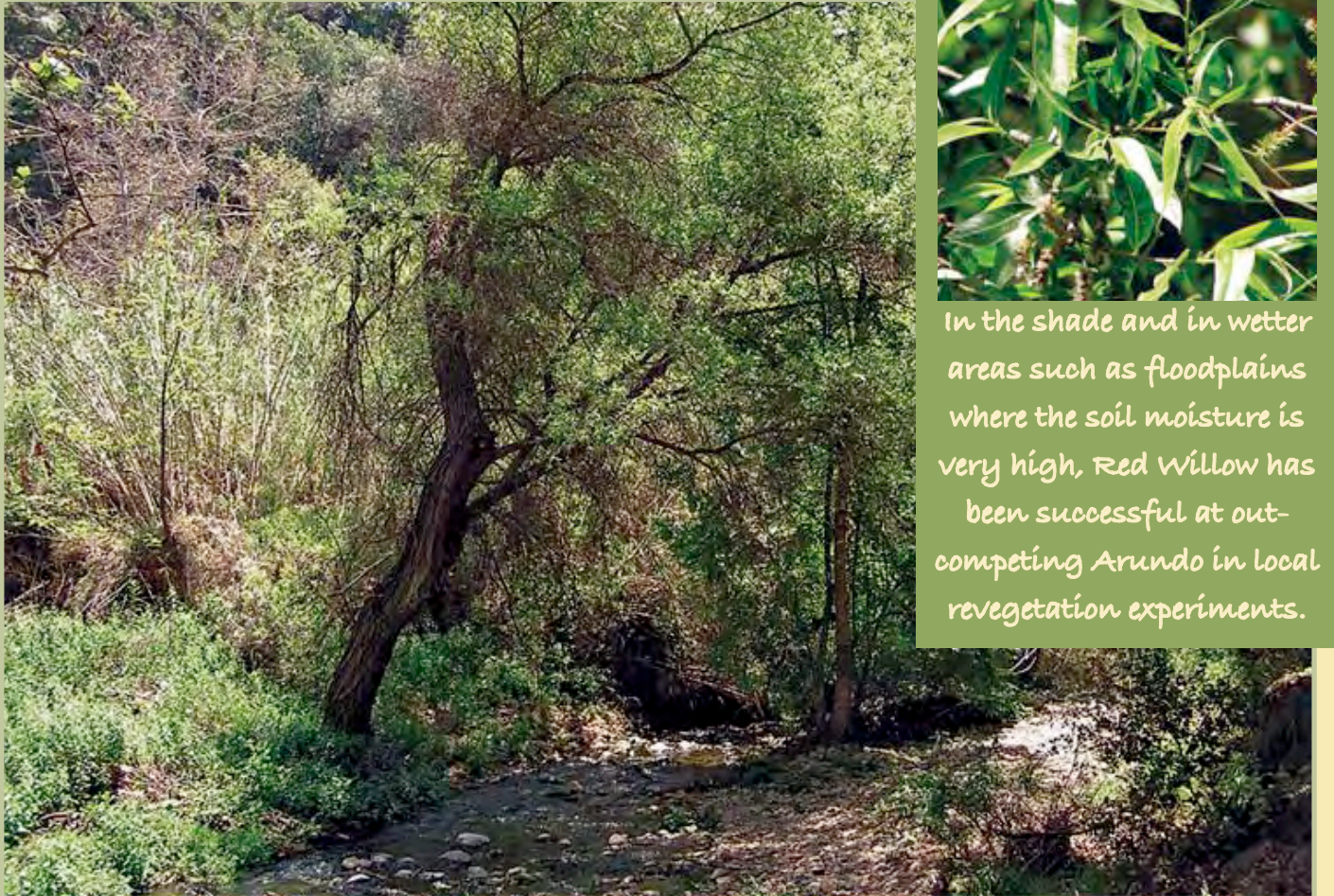
Willow Species Comparison

All of the Willows in this guide are excellent for bank stabilization, habitat, flood control and water quality improvement.

SPECIES	HEIGHT	LEAVES	RIPARIAN ZONE/ WATER NEEDS	OTHER CHARACTERISTICS
Arroyo	30'	Dark green above, gray below; fatter above the middle	Zones 1 & 2; doesn't need to be right next to the water	Good for streambank stabilization; has large, bulbous red galls
Narrowleaf	9'-21'	Long and slender; grey	Zone 1 & 2	Prefers sandy soil
Red	50'	More sharply pointed, thinner leaves, shiny green above, white below	Zones 1, 2 & 3	Good for streambank stabilization; thinner branches with a more reddish tint, and deeply furrowed bark on mature trees. Galls are always very small and numerous.
Shining	30'	Larger, long, pointed, shiny green	Zone 1 & 2	

Willow, Red

Scientific Name: *Salix laevigata*



In the shade and in wetter areas such as floodplains where the soil moisture is very high, Red Willow has been successful at out-competing *Arundo* in local revegetation experiments.

Description: Red willow is a large deciduous tree that grows to 50 feet tall, but may also be found as a smaller tree. Young branches are hairy and red to yellowish-brown; narrow leaves are green and shiny above with dull white undersides. Flowers are inconspicuous, blooming March to May. This species is excellent for streambed stabilization because roots are deep and spreading. Rapid growth rate. Attracts lady beetles, hoverflies and wasps. Red Willows are easily confused with Arroyo Willow; see the table on the previous page for distinguishing characteristics.

Riparian Zone: 1, 2 and 3

Habitat: Red Willow is the most common tree Willow species along major rivers in Ventura County and vicinity. Common at elevations below 5,000 feet. Requires full sun and seasonally flooded to permanently wet sandy soils.

Method of Propagation: Because seeds are only viable for a short time (as little as 3 to 5 days), cuttings are most successful. Cuttings of mature branches of the current year's growth can be planted November to February in a sheltered outdoor bed, or planted straight into their permanent position and given a good weed-suppressing mulch. See the "How to Harvest and Plant Willow Cuttings" section.

Willow, Shining

Scientific Name: *Salix lucida ssp. lasiandra*

Willows host the larvae of the Western Tiger Swallowtail and the Lorquin's Admiral butterflies.



Description: Shining Willow is a shrubby tree that grows up to 30 feet tall. Has hairy brown twigs with shiny green, long-pointed leaves. Flowers are inconspicuous. Blooms March to May, producing seeds attached to cotton-like structures called catkins that are readily dispersed by the wind. Root depth dependent on water availability. Moderate to rapid growth rate.

Riparian Zone: 1 and 2

Habitat: Common in wet places such as meadows, shores and seeps; floodplains; and depositional areas along rivers and streams. This species occurs at elevations below 8,000 feet and requires full to partial sun and seasonally flooded to permanently saturated sandy soils.

Method of Propagation: Because seeds are only viable for a short time (as little as 3 to 5 days), cuttings are most successful. Cuttings of mature branches of the current year's growth can be planted November to February in a sheltered outdoor bed, or planted straight into their permanent position and given a good weed-suppressing mulch. See the "How to Harvest and Plant Willow Cuttings" section.

Blue Elderberry

Scientific Name: *Sambucus Mexicana*

The Chumash called the Blue Elderberry the "tree of music" and used the hollow branches for flutes.



Description: Blue Elderberry is a multitrunked, shrub-like tree. Average height is 10 feet tall; can reach up to 25 feet. A member of the Honeysuckle family, it has compound leaves (meaning several leaflets to each leaf) and upright, flat-topped clusters of creamy white flowers that attract butterflies and hummingbirds. Blooms March to September. Clusters of waxy, blue berries are attractive to many species of birds and other wildlife. Roots are wide-spreading. Has moderate to fast growth. Attracts hoverflies and wasps.

Riparian Zone: 2 and 3

Habitat: Occurs along intermittent or ephemeral streambanks, on riparian terraces and transitional areas at elevations below 9,800 feet. Sandy or rocky, well-drained soils are preferred. Can grow in moist to semi-dry soils.

Method of Propagation: Propagates readily by direct seeding. Also cuttings.

California Wild Rose

Scientific Name: *Rosa californica*



Description: California Wild Rose is a native member of the Rose family. A prickly shrub that can grow to 8 feet high. Often forming thickets, it can also assume a vine-like growth habit. Fragrant pink flowers bloom from May to August followed by bright reddish-orange fruits known as Rose hips. Grows at a moderate to rapid rate; spreads by rhizomes.

Riparian Zone: 2 and 3

Habitat: Generally occurs in moist areas, especially streambanks and riparian terraces, at elevations below 4,800 feet. The California Wild Rose prefers open locations with full to partial sun. Does not require wet soils. Can tolerate some drought, but has a low flood tolerance. Rose hips become somewhat sweet when ripe in November and are very high in Vitamins C and E, making for a good tea.

Method of Propagation: Seeds and cuttings.

Mulefat

Scientific Name: *Baccharis salicifolia*



Mulefat, along with Arroyo Willow and Cottonwood, are often the backbone plants of local riparian habitat restoration projects.

Mulefat is a good nectar source for Monarch butterflies.



Description: Mulefat is one of our most vigorous and common riparian plants. An erect, scraggly looking semi-deciduous shrub that can grow to a height of 13 feet. Toothed leaves are long, narrow and dark green (*salicifolia* means Willow-leaved). Flowers consist of heads of small pinkish-white flowers. Blooms April to October although some plants may bloom year round. Seed heads appear as puffy cotton balls that are prolific during the late winter and early spring. Roots may be shallow to deep, depending on water availability. Grows quickly in good conditions. Once established, withstands moderate disturbance.

Riparian Zone: 1 and 2

Habitat: Grows readily anywhere there is moisture. Common in canyon bottoms, along moist streambanks and wherever water flows regularly. This hearty native shrub often forms thickets and is commonly associated with other riparian plant communities at elevations below 4,100 feet. Mulefat requires full to partial sun and seasonally flooded to wet soils, sandy or loamy. It is a substantial food source for deer and attracts hoverflies and lady beetles.

Method of Propagation: Cuttings. It is easy to start roots by putting cuttings in a bucket of water for a while. Mulefat cuttings have a very high survivor rate. However, care must be taken when planting not to break off any roots that have formed. Seeds are only viable for 3 to 4 months.

Narrowleaf Willow

Scientific Name: *Salix exigua*



Willow species create wonderful bird habitat, providing shelter, food and nesting material.



Description: Narrowleaf Willow (also called Sandbar Willow) is a shrub that grows 9 feet tall, occasionally reaching 21 feet. This member of the Willow family develops thickets of long, slender stems bearing narrow, silvery or gray leaves. Inconspicuous flowers. Blooms March to May, producing seeds attached to cotton-like structures called catkins that are readily dispersed by the wind. Also spreads by root sprouting. Fruit is small (only 1/4 inch across) and looks like long-pointed capsules in long, narrow clusters; each capsule contains numerous small, fuzzy seeds. Growth rate is very fast.

Riparian Zone: 1 and 2

Habitat: Common along streamsides, floodplains, deposition areas along rivers, marshes and wet ditches at elevations below 8,900 feet. Requires full sun and prefers sandy to loamy soils. Very high flood tolerance, requires regular inundation or soil saturation.

Method of Propagation: Because seeds are only viable for a short time (as little as 3 to 5 days), cuttings are most successful. Cuttings of mature branches of the current year's growth can be planted November to February in a sheltered outdoor bed, or planted straight into their permanent position and given a good weed-suppressing mulch. See the "How to Harvest and Plant Willow Cuttings" section.

Scalebroom

Scientific Name: *Lepidospartum squamatum*



Description: Scalebroom (also called California Broomsage) is a many-branched shrub that grows up to 10 feet high, but more typically at 5 feet. A member of the Sunflower family, this native slightly resembles but is not related to the invasive Spanish Broom. Scalebroom gets its name from its small leaves that form a scale-like skin, looking like part of the green stems. Small yellow flowers are arranged in heads. Blooms August to October. Root depth depends on water availability and will sometimes extend to the shallow water table. Moderate growth rate.

Riparian Zone: 2

Habitat: Typically found in sandy or gravelly washes, banks and bars along streams and on stream terraces in the inland, more arid portions of Ventura County. Especially prevalent on the Santa Clara River east of Fillmore and in smaller ephemeral streams throughout the Calleguas Creek watershed and major tributaries of the Santa Clara River, such as Sespe Creek; occurs at elevations below 5,500 feet. Can form relatively dense stands; common as part of Mulefat Scrub communities, but also considered a unique plant community of its own. Prefers full sun exposure, well-drained, sandy soils, and infrequent flooding.

Method of Propagation: Seeds and cuttings.

California Blackberry

Scientific Name: *Rubus ursinus*



Beware of confusing this species with the invasive Himalayan Blackberry!

California Blackberry has a thinner, waxy-gray stem with smaller thorns that are fairly flexible, whereas Himalayan Blackberry has much larger thorns similar to the domestic Rose. Himalayan Blackberry usually has leaves with five leaflets, and stouter spines. California Blackberry usually has leaves with three leaflets and less stout spines.



Description: California Blackberry is a prickly perennial mounding vine that grows to 10 feet long. It has large dark green trifoliate leaves. Its small white flowers develop into edible blackberries—a favorite food for many wildlife species as well as for people. Blooms March to July. California Blackberry makes a good ground cover and slope stabilizer in shady areas. This species forms large mounds of intertwined stems and can be quite impenetrable. Has shallow spreading roots and grows very quickly.

Riparian Zone: 2 and 3

Habitat: Occurs in many plant communities in moist and shaded places: shrublands, streamsides and canyons at elevations below 5,000 feet. Requires sandy to loamy soils that are seasonally flooded or saturated.

Method of Propagation: This plant roots at the stem nodes. Stake the stems to the ground and they will root-producing healthy new plants. Cuttings and root divisions.

Common Spike-rush

Scientific Name: *Eleocharis macrostachya*



Description: Common Spike-rush is a mat-forming, perennial sedge that grows to a height of 3 feet. It looks like a miniature rush. Its slender, round, deep green stems and leaves are topped with clusters of tiny brownish flowers at the stem tips. Grows singly or in clumps with creeping rhizomes. Blooms April to November. Underground rhizomes are shallow and spreading. Moderate growth rate.

Riparian Zone: 1

Habitat: Commonly found inhabiting fresh, brackish or alkaline wetland habitats (marked by permanently wet soils), including marshes, pond margins, rivers, streams, vernal pools and ditches at elevations below 8,200 feet. Prefers full sun and saturated sandy to clay loam soils. Reasonably high flood tolerance; suitable habitat anywhere from semi-permanently flooded to seasonally wet.

Method of Propagation: Root divisions and seeds.

Creeping Wild Rye

Scientific Name: *Leymus triticoides*



Description: Creeping Wild Rye is a perennial mat-forming grass with blue-green leaves and upright seed head spikes. Grows to a height of 4 feet. Inconspicuous yellow flowers. Blooms June to July. Most leaves lean away from the main stem, forming a complex of stems and seeds. The plant spreads by rhizomes, has a high resistance to fire, a high tolerance for low oxygen conditions and a rapid growth rate.

Riparian Zone: 1 and 2

Habitat: Commonly found in riparian forests, valley bottoms and wet meadows. Requires full to partial sun and soils ranging from loam to gravel, though prefers loamy soil. Tolerates permanently saturated soils and some degree of salinity.

Method of Propagation: Propagates readily by direct seeding. Plants are also successfully propagated by root divisions.

Mugwort

Scientific Name: *Artemisia douglasiana*



Description: Mugwort is a deciduous perennial herb, with aromatic gray-green foliage. Distinctive leaves are dark green on top and light color underneath. Mugwort grows to 8 feet tall. Inconspicuous cream-colored flowers in tight clusters. Blooms July to August. Has a very strong Sagebrush smell and is closely related to California Sagebrush (*Artemisia californica*). Tolerates infrequent flooding and can thrive in somewhat sandy soils. Common in wetter areas near seeps and creeks. Rapid growth rate.

Riparian Zone: 2 and 3

Habitat: Mugwort is the most common native riparian herbaceous species in Ventura County and vicinity. Grows on ditch banks, road cuts and disturbed areas in Chaparral, Coastal Sage Scrub, Marsh and Mixed Riparian Woodlands. Often in the understory of Cottonwoods and Willows. Commonly found growing in large patches of up to 100 plants, all of which may be connected by underground stems (rhizomes).

Method of Propagation: Propagates readily by direct seeding. Root divisions can also work.

Rough Sedge

Scientific Name: *Carex senta*



Description: Rough Sedge is a perennial grass-like plant that grows in clumps 4 to 16 inches high. Leaves are shorter than the stems and the long, gray leaf blades are flat and arching. Roots are clumped and fibrous. Dark flowering stalks produce inconspicuous flowers. Blooms March to June. Moderate growth rate.

Riparian Zone: 1

Habitat: Occurs in freshwater habitats including streambanks, marshy areas, lakes, ponds, rivers, depressions and seeps at elevations below 9,000 feet. Prefers full to partial sun and tolerates semi-permanently flooded to seasonally wet sandy or loamy soils.

Method of Propagation: Seeds and root divisions.

Yerba Mansa

Scientific Name: *Anemopsis californica*



Description: Yerba Mansa is a hardy, low-growing perennial herb. This plant has above-ground creeping stems that root and often form extensive mats of vegetation. Can grow to 2 feet high. Stems rise from a base of large pale green leaves and are topped with large white cone-like flowers. Spent flowers turn purplish-red. Cone-shaped dead flower heads are brown and persist on the plants. Long blooming, from March to September. Moderate to rapid growth rate.

Riparian Zone: 1



































Habitat: Can be found growing in freshwater marshes and other wetlands, coastal salt marshes and at the mouth of rivers, creeks and ditches at elevations from sea level to 6,500 feet. This species requires partial shade and prefers permanently wet fresh to slightly saline habitats with peaty soils.

Method of Propagation: Seeds and root divisions.



Sisar Creek

Native Plant Summary Guide

Plant	Sun	Riparian Zone	Flood Tolerance	Flower	Growth Rate
Tree layer					
California Flowering Ash		3	low	white	
California Sycamore		3	high	inconspicuous	
Coast Live Oak		3	low	inconspicuous	
Cottonwood, Black		3	moderate	inconspicuous	
Cottonwood, Fremont		3	high	inconspicuous	
Southern California Black Walnut		3	low	inconspicuous	
White Alder		1	high	inconspicuous	
Willow, Arroyo		1 & 2	high	female "pussy willows"	
Willow, Red		1, 2 & 3	moderate	inconspicuous	
Willow, Shining		1 & 2	high	inconspicuous	
Shrub layer					
Blue Elderberry		2 & 3	moderate	creamy white	
California Wild Rose		2 & 3	low	rose pink	
Mulefat		1 & 2	moderate	pinkish white	
Narrowleaf Willow		1 & 2	high	inconspicuous	
Scalebroom		2	high	yellow	
Ground layer					
California Blackberry		2 & 3	moderate to high	white	
Common Spike-rush		1	moderate to high	dark brown	
Creeping Wild Rye		2	high	yellow	
Mugwort		2 & 3	moderate	inconspicuous	
Rough Sedge		1	moderate to high	inconspicuous	
Yerba Mansa		1	high	white	

Sun needs:  Full  Partial Shade  Shade

Growth Rate:  Slow  Moderate  Moderate to Fast  Fast



	Bloom	Plant Type	Max. Height	Primary Method of Propagation
	April-May	Deciduous	6-20'	cuttings, seeds
	Feb-Apr	Deciduous	50-115'	cuttings, seeds
	March	Evergreen	30'-80'	seeds
	Feb-Apr	Deciduous	40'-180'	cuttings
	Mar-Apr	Deciduous	40'-65'	cuttings
	Apr-May	Deciduous	15'-50'	seeds
	March	Deciduous	50'-115'	cuttings
	Jan-Apr	Deciduous	30'	cuttings
	Mar-May	Deciduous	50'	cuttings
	Mar-May	Deciduous	30'	cuttings
	Mar-Sep	Deciduous	4'-25'	cuttings, seeds
	May-Aug	Deciduous	8'	cuttings, seeds
	April-Oct	Evergreen	13'	cuttings
	Mar-May	Deciduous	9'-21'	cuttings
	Aug-Oct	Evergreen	5'-10'	cuttings, seeds
	Mar-July	Perennial	10' long	cuttings, root divisions
	Apr-Nov	Perennial	3'	seeds, root divisions
	Jun-Jul	Perennial	2'-4'	seeds, root divisions
	Jul-Aug	Perennial	2'-8'	seeds, root divisions
	Mar-Jun	Perennial	1.5'	seeds, root divisions
	Mar-Sep	Perennial	2'	seeds, root divisions

From top: female Arroyo Willow "pussy willows," California Sycamore tree leaves, Blue Elderberry berries.

RESOURCES

Permits

Any project that might alter streams or habitats adjacent to them may trigger the need for one or more permits.

Even projects aimed at improving the quality of habitats can use methods that damage plants, animals or water quality, which is why permits are sometimes required. Federal, state and local agencies have regulatory jurisdiction in riparian areas. Although not all projects require permits, it is very important that you check with the agencies for confirmation before work begins.

The key agencies are listed below, but there are others.

U.S. Army Corps of Engineers

Ventura Field Office, (805) 585-2140

District Office, (213) 452-3333

California Department of Fish and Game

South Coast Region 5, (858) 467-4201

Regional Water Quality Control Board

Board representing Los Angeles County and most of Ventura County:

Los Angeles Regional Water Quality Control District, (213) 576-6600

Board representing northwest Ventura County (Rincon Creek watershed):

Central Coast Regional Water Quality Control District, (805) 549-3147

Agricultural Commissioner's Office

If herbicides will be used for nonresidential projects, an Operator ID Number will be required from the Agricultural Commissioner's Office.

Ventura County

815 E. Santa Barbara St., Santa Paula

(805) 933-3165

www.ventura.org/agcommissioner/

Los Angeles County

12300 Lower Azusa Rd., Arcadia

(626) 575-5471

<http://acwm.co.la.ca.us>

Invasive removal and revegetation projects can reduce the permitting requirements by avoiding or minimizing soil disturbance and scheduling invasive plant removal during the dry season to avoid impacts to flowing water and associated wildlife species.

In addition, the application of herbicides into streams or onto aquatic plants growing in streams requires a National Pollutant Discharge Elimination System (NPDES) permit from the Regional Water Quality Control Board. More information is available at: www.waterboards.ca.gov/npdes/aquatic.html

Consult the following publication for detailed information on stream and wetland project permitting.

Wetland Project Permitting Guide

*Permitting Stream and Wetland Projects in Ventura County
& along the Santa Clara River in Los Angeles County*

Available at www.ventura.org/planning/programs_services/bio_resources/bio_resources.htm

Sources for Native Plants

The following nurseries specialize in native plants of local origin. These and other nurseries can provide you with assistance on what plants are best for your area.

Native Plant Sales

California Native Plant Society, Channel Islands Chapter

Holds sales in March/April and October/November in Plaza Park (downtown Ventura, opposite Post Office on Santa Clara Avenue). Check Web site for dates.

www.cnpsci.org

California Native Plant Society, Los Angeles Chapter

Holds an annual sale in the fall. Check Web site for dates.

plantsale@lacnps.org and www.lacnps.org

Rancho Santa Ana Botanical Garden

Holds periodic sales. Contact the garden for information.

1500 N College Ave., Claremont

(909) 652-8767

rsabg.org

Santa Barbara Botanic Garden

Besides the on-site nursery, holds big plant sales twice a year. See contact info in "Gardens" section below.

Native Plant Nurseries & Seeds

Albright Seed Co. (a division of S&S Seeds)

Specializing in native seeds for landscaping, low water use and erosion control.

(805) 684-0436

www.albrightseed.com

Cornflower Farms

Natives nursery, Sacramento area. Open to the public some Saturdays.

Check Web site for available times. Some stock on hand.

Custom collection & propagation.

P.O. Box 896, Elk Grove

(916) 689-1015

www.cornflowerfarms.com

Greenlee Nursery

Wholesale & retail. Some natives. Mail order.

301 E. Franklin Ave., Pomona

(909) 629-9045

www.greenleenursery.com

Growing Grounds Farm

Nonprofit wholesale nursery; provides vocational training and employment to people with mental illness. Grows a variety of native plants.

3740 Orcutt Rd., San Luis Obispo

(805) 543-6071

www.growinggroundsfarm.org

Growing Solutions

Custom collection and propagation for restoration projects.

P.O. Box 30081, Santa Barbara

(805) 452-7561

www.growingsolutions.org

Hedgerow Farms

Wholesale and retail nursery. Custom collection & propagation. Revegetation and restoration.

21740 County Rd. 88, Winters

(530) 662-6847

www.hedgerowfarms.com

Las Pilitas Nursery

Wholesale nursery, retail by appointment. Seed and container plants. Custom collection and propagation.

3232 Las Pilitas Rd., Santa Margarita and 8331 Nelson Way, Escondido

www.laspilitas.com

Matilija Nursery

Retail and wholesale nursery specializing in native plants of Ventura County and the Southwestern region. Custom collection and propagation.

8225 Waters Rd., Moorpark

(805) 523-8604

www.matilijanursery.com

Native Sons

Wholesale. Mediterranean plants as well as natives.

379 West El Campo Rd., Arroyo Grande

(805) 481-5996

www.nativeson.com

Rincon-Vitova Beneficial Insectaries

Supplies a beneficial insect habitat seed mix, along with beneficial insects and organisms that safely control pests.

(805) 643-5407

108 Orchard Dr., Ventura

<http://rinconvitova.com/index.htm>

San Marcos Growers

Wholesale supplier of native plants. Not open to the public.
125 S. San Marcos Rd., Santa Barbara
(805) 683-1561
www.sanmarcosgrowers.com

Santa Barbara Botanic Garden

Has a retail nursery on site. Open Mon.-Fri., 10 a.m. to 3 p.m.
Volunteers are on hand to assist with questions.
1212 Mission Canyon Rd., Santa Barbara
(805) 682-4726
www.sbbg.org/

Theodore Payne Foundation

A nonprofit, retail nursery that sells native plants, seeds and educational materials
10459 Tuxford St., Sun Valley
(818) 768-1802
www.theodorepayne.org

Tree of Life Nursery

The largest native plant supplier in the state. Wholesale and retail container plants. Custom collection and propagation.
33201 Ortega Hwy., San Juan Capistrano
(949) 728-0685
www.treeoflifenuresry.com

Gardens & Riparian Habitats You Can Visit

Placerita Canyon Nature Center

A 350-acre natural park with hiking trails to riparian habitats, a natural history museum and live animal exhibits.
19152 Placerita Canyon Rd., Newhall
(661) 259-7721
http://parks.co.la.ca.us/placerita_narea.html

Rancho Santa Ana Botanical Garden

The largest garden in California dedicated to native plants. Provides educational programs.
1500 N College Ave., Claremont
(909) 652-8767
rsabg.org

Santa Barbara Botanic Garden

Displays of native California plants, books and publications, classes and tours.
1212 Mission Canyon Rd, Santa Barbara
(805) 683-4726
www.sbbg.org

Santa Clara River Estuary / McGrath State Beach

Public viewing of estuary, pristine dunes, plants and wildlife. Exceptional bird watching. Nature trail leads to Santa Clara Estuary Natural Preserve.
Access: 5 miles south of Ventura off Highway 101 via Harbor Boulevard.
Hours: dawn-dusk, year-round
Parking: day-use fee
www.parks.ca.gov/?page_id=607

Santa Clara River Estuary / Surfer's Knoll Viewing Area

Public viewing area for estuary habitat, plants and wildlife.
Access: In Ventura Harbor near Channel Islands National
Hours: 7 a.m. to dusk
Park Visitors Center at end of Spinnaker Drive
Parking: Free in Surfer's Knoll parking lot; walk toward river mouth

Ventura River Estuary / Emma Wood Group Camp

Riverside trail and bike lane through Emma Wood State Beach with views of estuary habitat, plants and wildlife
Access: At the west end of Main Street in Ventura
Hours: dawn-dusk; Oct. 1-March 31, park open Fri.-Sun.
Parking: day-use fee
www.parks.ca.gov/?page_id=604

Ventura River Estuary / Harbor Wetlands Ecological Reserve

Public viewing area for estuary habitat, plants and wildlife. Exceptional bird watching.
Accessible from a pedestrian walkway at Angler Court off Spinnaker Drive in Ventura Harbor
Hours: 8 a.m. to 5 p.m. Mon. to Fri.
Parking: Free, on Angler Court; volunteer sign-in at entrance

Assistance Organizations

California Conservation Corps

Corps members are available for hire to assist with conservation projects, including fish habitat and watershed restoration, invasive plant removal and restoration of native plants.

1878 South Lewis Rd., Unit 60, Camarillo
(805) 484-4345

www.ccc.ca.gov/DISTRICT/CAMARILO/camarilo.htm

California Native Plant Society (CNPS)

Local CNPS chapters have educational speaker programs, hikes, plant identification workshops, plant sales and restoration projects to involve members and the public in the protection of native plants.

Channel Islands Chapter (Ventura County area)

www.cnpsci.org

Los Angeles Chapter, www.lacnps.org

CREW (Concerned Resource Environmental Workers)

Nonprofit youth leadership organization involved in invasive plant species removal and restoration projects; contact Walter McCall, executive director.

Ojai
(805) 646-5085

Friends of the Santa Clara River

A nonprofit public interest organization dedicated to the protection, enhancement and management of the resources of the Santa Clara River.

(805) 498-4323

www.fscr.org

Los Angeles & San Gabriel Rivers Watershed Council

A consortium of community members, government agencies and academic institutions whose mission is to solve problems within the watershed. The council's Plant Profiler Web site provides information regarding native plants for the Los Angeles area.

700 N. Alameda St., Los Angeles
(213) 229-9945

www.lasgrwc.org

Los Angeles Weed Management Area

Provides information on weed management

12300 Lower Azusa Rd., Arcadia

(626) 575-5471

http://acwm.co.la.ca.us/scripts/wma_2.htm

Resource Conservation District (RCD)

The RCD is a local nonregulating, not-for-profit public entity whose mission is to help people protect, conserve and restore natural resources through information, education and technical assistance programs. Provides information on non-native plant removal, habitat restoration, permitting and funding.

Ventura County RCD

3380 Somis Rd., Somis

(805) 386-4685

www.vcrccd.org

Santa Monica Mountains RCD

122 N. Topanga Canyon Blvd.,

Topanga

(310) 455-1030

www.rcdsmm.org

UC Cooperative Extension

Master Gardener program, offering free gardening and landscaping information to the public.

Farm Advisors, provide information on horticulture, erosion control, pests and diseases, soils and irrigation.

Los Angeles Office

4800 Cesar Chavez Ave.

(323) 260-2267

celosangeles.ucdavis.edu

Ventura Office

669 County Square Dr., Suite 100

(805) 645-1455

ceventura.ucdavis.edu

Natural Resources Conservation Service

A nonregulatory federal agency offering soils and vegetation information, conservation planning, erosion control, technical and financial assistance programs. All services are free.

Somis Office

3380 Somis Rd.

(805) 386-4489

Lancaster Office

44811 Date Ave.

(661) 945-2604

The Nature Conservancy (TNC)

Nonprofit conservation organization. Its LA-Ventura project includes the entire Santa Clara River watershed and other wild areas in the region. The project's goal is to conserve the Santa Clara River and its tributaries as a healthy, functioning system. TNC has conserved many miles of the river and thousands of acres in the watershed.

3639 Harbor Blvd., Suite 201, Ventura
(805) 642-0345

www.nature.org

Ventura County Arundo Task Force

Undertaking Arundo eradication efforts throughout Ventura County and the upper Santa Clara River Watershed. Provides information on eradication techniques, biology and grant information.

c/o Ventura County Resource Conservation District
(805) 386-4685

www.arundotaskforce.org

Ventura County Weed Management Area

New organization formed to address weed control in Ventura County

c/o Ventura County Resource Conservation District
(805) 386-4685

Herbicide Information

Agricultural Commissioners' Offices

Regulates herbicide use. Provides information on how to obtain certification or licenses. Also provides Operator Identification Numbers and safety materials for application of nonrestricted materials.

Ventura County

815 E. Santa Barbara St., Santa Paula
(805) 933-3165

www.ventura.org/agcommissioner/

Los Angeles County

12300 Lower Azusa Rd., Arcadia
(626) 575-5471

<http://acwm.co.la.ca.us>

Glyphosate Herbicide Information

www.fs.fed.us/r6/nr/fid/pubsweb/gly.pdf

Guidelines for Herbicide Use

<http://tncweeds.ucdavis.edu/handbook.html>

List of Persons and Businesses with Valid Department of Pesticide Regulation License

www.cdpr.ca.gov/docs/license/currlic.htm

Regional Water Quality Control Board

Information regarding NPDES permits for aquatic herbicide use.

www.waterboards.ca.gov/npdes/aquatic.html

Web Sites

Invasive Plant Information

Arundo: A Landowners Handbook

Information for landowners about Arundo and techniques for its eradication.

<http://teamarundo.org/education/index.html>

California Invasive Plant Council (Cal-IPC)

Provides information on all aspects of invasive plants biology, ecology, control and management.

(510) 843-3902

www.cal-ipc.org/

National Invasive Species Information Center

Gateway site for the federal government invasive species programs.

www.invasivespeciesinfo.gov/

Natural Resources Conservation Service, Invasive Plants

Plant information about invasive species.

http://plants.nrcs.usda.gov/cgi_bin/topics.cgi?earl=noxious.cgi

Santa Barbara County Weed Management Area

www.countyofsb.org/agcomm/wma/index.htm

Team Arundo del Norte

Provides information on eradication techniques, biology, grant information and regional eradication coordination. (707) 996-0712

<http://ceres.ca.gov/tadn/>

The Nature Conservancy Wildland Invasive Species Program

Management notes on selected noxious weeds, including Yellow Starthistle, weed-control methods handbook, weed tool review, wick applicator schematic, up-to-date schedule of events.

<http://tncweeds.ucdavis.edu/>

University of California Davis Weed Research & Information Center

<http://wric.ucdavis.edu/>

University of California Integrated Pest Management Program

www.ipm.ucdavis.edu/

Weeds & Invasive Plants of Ventura County

UC Cooperative Extension, Ventura County

http://ceventura.ucdavis.edu/Weed_Science/

Weed Control Methods Handbook: Tools and Techniques for Use in Natural Areas

<http://tncweeds.ucdavis.edu/handbook.html>

Weed Workers' Handbook

Although written for the San Francisco Bay Area, this book, available by download, provides 1) a simple, strategic approach to dealing with weeds, 2) guidelines for leading volunteer weed-control projects, 3) descriptions of techniques used to control weeds, 4) tool illustrations and a chart explaining how each tool can be used, 5) illustrations, detailed descriptions and explanations of the best ways to control the Bay Area's worst weeds (some of which are similar for Ventura and Los Angeles Counties).

www.cal-ipc.org/ip/management/wwh/index.php

Native Plant Information

Bring Farm Edges Back to Life!

This comprehensive publication outlines methods for establishing farm hedgerows planted with native grasses, shrubs and trees for treating water runoff, stabilizing soil and attracting beneficial insects.

Yolo County Resource Conservation District

www.yolorcd.org/education/farm%20edges%20v5.pdf

CalFlora

CalFlora provides information on California wild plants for use in conservation, education and appreciation.

www.calflora.org

California Native Plant Society

Notices, articles, projects, membership on all aspects of native plants promotion; also information on non-native invasives.

www.cnps.org/

Hedgerows for California Agriculture

www.caff.org/programs/farmscaping/hedgerow-man.shtml

Know Your Natives: A Pictorial Guide to California Native Grasses

www.yolorcd.org/education/index.shtml

Las Pilitas Nursery

Lots of how-to information on planting, irrigation, soil amendments, attracting wildlife.

www.laspilitas.com/easy/easy.html

Native Plants in the Santa Clara River

Santa Clarita Organization for Planning the Environment. Written by Eileen Anderson.

www.scope.org/nativeplants/index.html

Propagation from Cuttings

<http://plant-materials.nrcs.usda.gov/pubs/wapmctn290195.pdf>

<http://projects.geosyntec.com/NPSManual/Fact%20Sheets/Live%20Stakes.pdf>

www.oaklandnet.com/wildfirePrevention/Plants-forStabilization.pdf

Glossary

Adapted: Possesses characteristics that improve an organism's ability to survive and reproduce in a particular environment.

Annual: A plant that completes its life cycle in one year, from seed to foliage, flower to fruit.

Aquifer: An underground bed or layer of earth, gravel or porous stone that yields water.

Banks: The side slopes of a stream or channel between which water flow is normally confined.

Bed (or Streambed): The bottom of a stream or channel bounded by banks.

Biennial: A plant that lives for 2 years before seeding, typically flowering during its second year.

Biodiversity (Biological Diversity): The magnitude of different plant, animal and microbial (bacterial, protozoan and fungal) species residing within a given area.

Biological Control Agents: Living organisms such as predators, parasites or pathogens that are used to control or reduce the abundance of pest species.

Bolting: When a plant sends up its flower stalk.

Channel: The low-flow part of the streambed, or the part where water is flowing at some portion of the year. The channel may cover the entire bed or a portion of the bed. Many local streams have "braided channels" within the streambed.

Cambium: The inner bark, or the thin layer of living tissue that moves sugars and other carbohydrates between areas of production (leaves), storage (roots) and growing points of a plant.

Compound Leaves: Leaves made up of more than one blade, or leaflets.

Crown: Where the plant stem meets the roots, usually at the soil level.

Culvert: An artificially made structure of concrete or steel that encloses a flowing body of water, typically under or beside roadways.

Cut-Stump: Application of a herbicide to a freshly created wound that has exposed the vascular tissue of a tree allowing rapid uptake of the applied chemical.

Deciduous: A plant that loses its leaves in the fall or winter.

Defoliating: The removal of leaves from a tree.

Ecosystem: A collection of organisms and their physical environment (habitat) that function together.

Endemic: Native or restricted to certain geographical areas.

Ephemeral Stream: A stream that flows for only a short time during and after rainfall.

Erosion Control Fabric: Fabric or blanket made from straw, synthetic or other material and enveloped in plastic or biodegradable netting. Used to stabilize disturbed or highly erosive soils while vegetation is established.

Estuarine: Related to or present in an estuary; a coastal body of water where freshwater at the mouth of a stream mixes with salt water from the ocean.

Foliar Spray: A spray applied to the leaves (foliage) of a plant.

Floodplain: The land area adjacent to a river, stream, watercourse, ocean, bay or lake that is likely to be flooded.

Germination: The process of beginning to grow or develop, such as from a seed.

Glyphosate: A systemic broad-spectrum herbicide used to control floating-leaved plants and shoreline plants such as Arundo. It is generally applied as a liquid to the leaves. Glyphosate does not work on underwater plants. (Trade names for aquatic products with glyphosate as the active ingredient include Rodeo®, AquaMaster® and AquaPro®.)

Grading: Any human activity using heavy machinery to clear vegetation and move soil prior to development.

Habitat: The area or environment where a plant or animal or ecological community naturally or normally lives and grows.

Hack and Squirt: An herbicide application method in which a hatchet or similar cutting tool is used to make cuts through the bark to expose the cambium at intervals around the stem of a tree, and herbicide is applied into each fresh cut.

Herbaceous: Plant type that lacks wood and which dies back into the ground every year.

Herbicide: A chemical substance used to destroy plants or to slow their growth.

Intermittent Stream: A stream that flows seasonally and when groundwater provides water for stream flow. During summer months and droughts, intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water for stream flow.

Invasive Plant: A non-native plant species that invades natural landscapes and establishes self-sustaining populations that significantly degrade the value of native ecosystems. Invasive plants alter the natural processes of an ecosystem so as to exclude other plants.

Invertebrate: Animal species, such as insects, that lack a spinal column. Aquatic invertebrates are a major source of food for birds, mammals, amphibians, reptiles, fish and other invertebrates in both aquatic and terrestrial habitats.

Landscape Fabric: A garden fabric that one lays down to prevent weeds and hold in moisture. It allows water to soak into the ground, but deters weeds from growing up through it.

Lateral Roots: Numerous smaller roots stemming from the taproot.

Loam: Soil type that falls between clays (finest particles) and sands (thickest particles) in texture.

Monoculture: The cultivation of a large area with a single species.

Mulch: A material, often organic matter such as leaves or wood chips, used on top of the soil to suppress weeds, conserve moisture, reduce erosion and build soil organic matter.

Native Plant: Plants that occur naturally in a specific geographic area without having been introduced by humans.

Naturalized: Plants that become established as a part of a plant community that is not their plant community of origin.

Nontarget: Animals or plants other than those that a pesticide is intended to kill.

Perennial Plant: Plant that lives for at least 3 years and flowers repeatedly.

Pioneer Plants: Plants that are the first to grow in disturbed sites and make it easier for succeeding plant species to populate an area.

Propagation: The reproduction of plants.

Restricted material: Pesticides listed in Section 6400 of the California Code of Regulations that can only be applied under the supervision of a certified applicator. The person may be certified by the state of California or by the County Agricultural Commissioner if they are applying pesticides to their own property. A list of California Restricted materials is available from the Department of Pesticide Regulation at www.cdpr.ca.gov.

Rhizomes: Root-like stems that grow horizontally below the ground surface.

Riparian: Adjacent to a river, stream, lake or other body of water. Riparian habitats are transitional zones between wetland and upland habitats.

Saturated: Continually and thoroughly wet.

Streambank Stabilization: Using vegetation or structural techniques to stabilize and protect banks of streams, lakes, estuaries or excavated channels against scour and erosion.

Streambed (or Bed): The bottom of a stream or channel bounded by banks.

Successional: Referring to changes that occur in an ecological community, such as the different types of plants that grow there over time.

Suckers: Stem sprouts that grow from the base of a tree or shrub.

Terrace: An old floodplain that is now abandoned because the stream channel or waterbody is at a lower elevation.

Transitional: In ecology, areas where one community type meets another and characteristics of both are present.

Trifoliolate: Having leaves in groups of three.

Understory: The area below the tree canopy (tree tops), or plants other than trees.

Upland Habitat: Any land area that does not qualify as a stream, wetland or riparian habitat.

Watershed: A geographic area of land that drains water to a common destination (e.g., stream, lake, ocean). Also called a drainage basin.

Wetland: Different agencies define “wetland” differently, but all variations involve these three elements: 1) Wetland hydrology: The presence of water at or above the soil surface for a sufficient period of the year to significantly influence the plant types and soil chemistry; 2) Hydric soil: Soil that is wet long enough during the growing season to develop low-oxygen conditions; 3) Hydrophytic plants: Plants adapted to saturated soil conditions.

Woody: A plant type characterized by bark and a stem that increases its girth every year and remains above ground during the winter.

References

The following documents and Web sites were used in developing this publication:

Arundo: Streamside Invader, Arundo Eradication Program, Sonoma Ecology Center

Santa Ana Integrated Watershed Plan Environmental and Wetlands Component

Santa Margarita–San Luis Rey Weed Management Area Web site

<http://smslrwma.org/nativeplanting/RiparianRestoration.html>

Protecting Stream and River Corridors: Creating Effective Local Riparian Buffer Ordinances by Seth J. Wenger and Laurie Fowler. A Public Policy Research Series, Carl Vinson Institute of Government, University of Georgia

County of Santa Clara, Planning Office, June 5, 2003

Streamside Planting Guide for San Mateo and Santa Clara County Streams, San Francisquito Creek Watershed Coordinated Resource Management and Planning Process

Native Plants in the Santa Clara River, www.scope.org/nativeplants/index.html. Santa Clarita Organization for Planning the Environment. By Eileen Anderson

Cornflower Farms Catalog, Cornflower Farms, Inc. (916) 689-1968

Informational Manual: Riparian Vegetation Management for Pierce's Disease in North Coast California Vineyards, 2000. The Pierce's Disease/Riparian Habitat Workgroup

Santa Cruz County Stream Care Guide, 2003. County of Santa Cruz Planning Department. www3.csc.noaa.gov/salmonid/html/manage/images/scc_care.pdf

Arundo: A Landowner Handbook, 1999. Sonoma Ecology Center and California State University, Sacramento, Media Services. <http://teamarundo.org/education/index.html#handbook>

Weed Workers Handbook

www.cal-ipc.org/ip/management/wwh/index.php

Herbicide information

www.ecy.wa.gov/programs/wq/plants/management/aqua028.html

Yellow Flowered Starthistle Fact Sheet

http://wric.ucdavis.edu/yst/biology/yst_fact_sheet.pdf