

Riparian Watersheds

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What are riparian areas?

Riparian areas are the transition zones between land and water environments. They are narrow strips of land located along streams, lakes, potholes, springs, wooded draws, or anywhere water is plentiful. The abundance of water and plant communities which are different from their drier uplands sets riparian areas apart from their surroundings. Riparian areas are productive and a valuable resource providing numerous social, economic, and environmental benefits.



History of riparian use in California

Riparian areas have long held importance on the California landscape. For thousands of years, native people have depended on them for water, wood, shelter, food and medicinal plants. The extensive distribution of buckeye in San Mateo and Santa Cruz County stream corridors has been attributed to deliberate establishment by local Costanoan Indians, who depended heavily on buckeye as a food source. The first European activity to affect California riparian habitats undoubtedly was livestock grazing. The early vaqueros recognized that streams provided abundant water, palatable forage, and shade in an otherwise arid environment. Drought, heat, cold and wind made the well-watered, sheltered valleys especially desirable for early farmers and ranchers both in summer and winter. It should also be mentioned that waterways were important as transportation and trade routes.

Riparian areas today



In California and across the country, agriculture and human settlement have had a large impact on riparian areas. Because of their lush vegetation and our natural attraction to water, riparian areas often suffer from excessive use that can lead to their deterioration. Riparian areas have often been forgotten in management planning. They cover only a small percentage of the overall landscape, but their importance and influence extends well beyond the area they occupy. Riparian areas fill

the crucial position between land and water and regulate the movement of water, sediments, nutrients and energy.

California communities, landowners, ranchers, farmers, anglers, hunters, industry and others all have a role in the conservation and management of these areas. Maintaining healthy riparian zones is much easier and less expensive than restoring severely damaged and degraded ones. Fortunately, however, riparian areas are resilient and with good management, most of those which have been degraded can be restored.

Benefits of healthy riparian areas

- ***Streambank Protection and Development*** – Riparian vegetation protects shorelines from damaging erosion caused by heavy flows. Friction between the plants and water slows the streamflow reducing the water's potential to erode and carry sediments. A deep, binding root mass holds soil in place, stabilizing streambanks. Healthy riparian vegetation helps to slow the streamflow, allowing suspended sediments in the water to be deposited on the streambanks and floodplains. This aids in building up banks and ultimately creating narrow, deep, stream channels and fertile floodplains.
- ***Groundwater Recharge and Streamflow Regulation*** - As spring run-off moves through a well-vegetated, meandering stream, the speed at which water flows is reduced. The slower streamflow allows increased absorption of water into the soil, replenishing groundwater reserves and lowering the intensity of flooding in downstream areas. Highly permeable soils of well-vegetated areas aid in groundwater recharge and underground storage. Later in the year, water is released into the streams from seeps and springs, maintaining streamflow through the rest of the season.
- ***Sediment Trapping and Filtration*** - Riparian areas play an important role in keeping water clean, clear and safe. Water from adjacent fields can carry pesticide residues and fertilizers which adhere to soil particles or are dissolved in the water itself. Above ground vegetation acts as a filter to intercept sediments and pollutants found in run-off. The root systems intercept the underground translocation of pesticide and fertilizer residues from cultivated uplands. When riparian vegetation is destroyed, these substances are able to reach streams and wetlands. Erosion of streambanks and shorelines after vegetation has been reduced or removed also contributes to sediment levels in water. Sediments in streambeds and lakes reduce the quality of habitat for fish and other aquatic organisms.

Plants in riparian areas use nutrients contained in run-off, slowing their build up in water and reducing the occurrence of dense algae blooms. Some types of algae, such as blue-green algae, are toxic, and their presence in high concentration can kill livestock and pets which drink the water. Algae blooms can deplete dissolved oxygen in the water after they die and decay, sometimes leading to extensive losses of fish. Streambank vegetation provides shade which keeps water cooler in summer. Cooler water contains more oxygen, necessary for aquatic life.

- ***Wildlife and Fish Habitat*** - Because of the abundance of water, shelter and food, riparian areas are extremely important and attractive to all types of wildlife. Most animals and birds living in California make use of these areas during some stage of their life. In largely cultivated landscapes, riparian zones are often the only substantial wildlife habitat remaining. Damage to riparian area vegetation from clearing, cultivation and grazing can devastate local bird and animal populations.

The transition zones between different types of habitat typically produce abundant and diverse populations of wildlife. The presence of both aquatic and upland habitats in close proximity to riparian areas results in an especially rich variety of plants and animals. These areas provide refuge for many birds and animals, allowing survival during periods of extreme weather. These survivors are then able to spread and colonize surrounding areas when conditions become more favorable.

Riparian areas are also critical components of fish and aquatic life habitat. The suitability of a stream for some aquatic species can be determined by the condition of the riparian area. Human-caused changes to riparian and wetland areas threaten fish habitat in many parts of California. Stream blockage by dams, poorly constructed culverts and stream crossings can prevent fish populations from reaching spawning areas. Loss of riparian vegetation due to cultivation or overgrazing can increase erosion and smother streambeds with silt, reducing the quality of spawning habitat. Sediment contained in run-off originating on cultivated land is a major threat to fish habitat. The wide, shallow, unshaded streams that result from the destruction of riparian vegetation provide poor fish habitat. These streams are warmer in summer and contain low levels of oxygen.

Riparian vegetation

Vegetation is responsible for performing the majority of the functions carried out in riparian areas. Without vegetation, streams are little more than drainage ditches. Managing riparian areas involves maintaining and improving desirable riparian vegetation.

Because riparian areas are transition zones between uplands and wetlands, the areas beside the water have more moisture available than areas farther away. This often produces zones or belts of vegetation types that parallel the water.

At the waters edge, deep-rooted sedges and rushes stabilize the streambank. Slightly back, shrubs and moisture-loving grasses and forbs (broad-leaved plants) are found. In many regions, willows are probably the most common and important of the woody plant species, offering streambanks substantial resistance to erosion with their extensive roots while also building banks up by trapping sediment. On the upper, drier portions of riparian areas, vegetation may be a mix of riparian and upland species.

The vegetation you would expect to find at a particular site is determined by many factors, including local climate, topography, groundwater movement, and soil characteristics such as texture, type and salinity. Stream characteristics such as the steepness of the terrain, flooding frequency and duration and depth of floodwaters have an effect on the vegetation.

Because of the diversity of riparian areas, providing a detailed description of what the vegetation would be in different regions is difficult. However, except in the most highly disturbed landscapes, the blueprint for a healthy riparian area will likely exist nearby. Healthy, riparian plant communities that occur along the same stream can provide information about the potential vegetation of your site.

In some parts of California, native trees, shrubs and grasses are found only in riparian areas. Diverse stands of trees and shrubs commonly line rivers, lakes and wooded draws. Trees you might find include the common fig, California black walnut, red and white alder, box elder and buckeye. Common shrubs are willows, columbine, hazelnut, mugwort, gooseberry, Indian hemp and currants. Perennial herbs and grasses include lupine, cow parsnip, Indian rhubarb, deer and lady ferns, creeping wild-rye, deer grass and hair grass.

Agriculture and riparian areas

Healthy riparian zones provide many benefits to agriculture, and agricultural production can be compatible with the conservation of riparian areas. Riparian areas are often critical to forage production and water supply in pastures. Properly managed riparian areas provide valuable livestock grazing and are an asset to any livestock operation. Controlled, managed livestock grazing can maintain and improve forage yields and conserve riparian areas.

Many floodplains are highly fertile and have therefore been cultivated. In regions where most of the land is cultivated, the valleys along wetlands and streams that cannot be cultivated have often been viewed as wasteland. Sometimes they are fenced and grazed or simply used as dumping grounds for stones, old machinery and wastes. In any case their value is often overlooked and little effort is expended in managing them. Even if vegetation is not destroyed, cropping practices in adjacent areas can have serious effects on riparian areas and streams.

Effects of agricultural activities on riparian areas

- **OVERGRAZING** decreases plant vigor, inhibits reproduction of desirable plants, reduces productivity and allows weedy and exotic plants to invade.
- **EXCESSIVE TRAMPLING** by livestock can expose streambanks to erosion, compact the soil which reduces water infiltration and sheer the banks which can change the shape of the channel, increase sediments in the water and lower water tables.
- **EXCESSIVE BROWSING** of trees and shrubs by livestock can damage and eventually eliminate them from a riparian area.
- **LIVESTOCK MANURE** can contaminate water with bacteria and disease-causing organisms and promote excessive algae growth.
- **CULTIVATING** too close to the water's edge eliminates riparian vegetation.
- **EROSION** of large amounts of soil from nearby cultivated fields into streams affects fish habitat, reduces water depth and lowers the storage capacity of groundwater reservoirs.
- **FERTILIZERS AND PESTICIDE** residues can be carried into riparian areas with run-off during heavy rains.
- **DRAINING WETLANDS** and floodplains can lower a watertable and reduce streamflow.
- **SOIL SALINITY** may be increased after riparian vegetation has removed. Groundwater seepage and evaporation can deposit large quantities of soluble salts on the soil surface.

Develop a Riparian Area Management Plan

Now that you are familiar with the characteristics of healthy riparian areas, take a look at your own land and determine its condition. Are your current management practices promoting riparian health? Developing a management plan is the first step to good streambank stewardship.

Developing a riparian management plan involves answering four basic questions:

1. Why do you want to conserve your riparian area?
2. What condition is it in?
3. What do you need to do to improve it?
4. Is your plan working?

Preparing a management plan on paper lets you try out different scenarios and make changes before investing too much time and money. Will the plan meet desired goals and can it be accomplished with the available resources? Build flexibility in to your management plan and to make adjustments as required.

Step 1: Define values, goals and objectives

Before developing a management plan, take time to think about what you want to accomplish in your riparian area. What do you value about your riparian area? Is there something special that you wish to preserve? What are your expectations of the area? Are your land-use practices compatible with preserving riparian health?

Taking some time to clearly define what is important to you and what you hope to achieve is an important step. Don't forget the ultimate goal is keeping your riparian area healthy! Healthy riparian areas provide the framework for a variety of activities.

The objectives and reasons for managing riparian zones will vary greatly between landowners. Some common reasons are:

- to increase season-long forage production
- to provide fish and wildlife habitat
- to improve or maintain water quality
- to preserve special areas (scenic or nostalgic value)
- to protect cultural and heritage sites
- to sustain resources such as berries, fuelwood, timber
- to attract tourism
- to provide recreation

If you have several goals, it may be best to decide which take priority. While most management plans can accommodate a wide range of objectives, if resources are limited it is important to concentrate on your highest priorities. Secondary objectives may be achieved later.

What do you value about your riparian area?

1.
2.
3.

What are your management objectives?

1.
2.
3.

Step 2: Assess the condition of the riparian area

Take stock of your riparian resources. This will tell you if your riparian area is healthy and will identify any problems. Most people with some experience are able to estimate the general health of a riparian area. If you need help determining the health of your riparian area some of the agencies listed at the back of this guide can provide assistance.

When going out into the field to assess riparian condition you may wish to take along some plant identification books, an aerial photograph of your land, a measuring tape or yardstick, and a camera. However, the best tools will be your eyes and your feet. Become familiar with the characters on the checklist. Then get out and take a leisurely walk. Observe the plants and soil. Carefully examine the condition of streambanks.

When examining streambanks for erosion look at one full meander if possible. A meander consists of an S-shaped section of a stream. Also, if possible look at the riparian areas on both side of the stream. Headcutting and slumping are more active on the outside of a stream curve, looking only at these areas will cause you to overestimate the amount of erosion. By the same token, looking only at the inside curve means that the extent of erosion will likely be underestimated.

A number of indicators are used to estimate the condition of your riparian area. The presence of several signs of poorer health indicate that some adjustment of current management practices would be beneficial. A simple checklist of the telltale signs of deteriorating riparian area condition can indicate whether or not you have a problem.

Riparian Health Checklist

Streambanks and channel	Yes	No
Is stream channel downcutting occurring?		
Is erosion occurring on the outside of stream curves (small amounts OK)?		
Is the stream channel becoming wide and flat?		
Is only sandy or coarse textured soil available for plant establishment?		
Are streambanks poorly vegetated with areas of bare soil?		
Is there extensive hoof damage to streambanks?		
Are streambanks slumping?		
Does the stream overflow its banks only during severe floods?		

Vegetation	Yes	No
Is dead plant material or litter from previous years absent?		
Is plant vigor poor?		
Has grazing removed almost all of the palatable vegetation?		
Are desirable plants being replaced by unpalatable or undesirable types?		
Are noxious weeds present?		
Are wetland species being replaced by drought tolerant upland species?		
Do the palatable species shrubs and trees appear to be heavily browsed?		
Do willows have a mushroom-like appearance?		
Are all the trees old and of poor health (as opposed to being of all sizes and ages)?		
Do stands of trees have an open, 'park-like' appearance?		
Have trees and shrubs been eliminated from sites where they should be present?		
Is the buffer strip between the riparian area and cultivated lands less than 30 feet?		

Have you checked 'yes' to many of the items on the checklist? What are the areas of concern? Highlight some areas and take some photographs. These photos will be useful later for before-and-after management comparisons.

If the condition of your riparian area is less than desired, try to determine the causes. Is the area overstocked or are the animals poorly distributed? Is insufficient rest being provided to the vegetation after grazing? Are cultivated fields too close to the stream? Identifying the underlying reasons will help you find solutions. In addition to looking at the general health of your riparian area you may also wish to identify trouble spots which might be present. Changes to healthy riparian areas may still result in improvements in condition and productivity or rehabilitate problem areas.

An assessment of your riparian area should include looking at surrounding areas, as some problems originate away from the stream. Nearby cultivated fields and pastures can be the source of most of the water, sediments and pollutants flowing down streams and rivers. Upstream land uses can also have a major impact on your section of the stream.

Using aerial photos

Aerial photos can be a valuable tool when preparing a management plan. A birds-eye view of the landscape puts distances, vegetation types and topographical features into perspective. This is something that is difficult to do from the ground, especially in rough terrain. Aerial photos are available for most of the agricultural areas throughout the United States from the USDA Natural Resources Conservation Service or Farm Service Agency (see reference list at the back of this guide). Photocopied enlargements can be used to document features of your riparian area and explore different management scenarios. Important features that can be highlighted on your map are:

- wetlands and streams
- riparian areas
- vegetation types
- fences, trails, and roads
- land-uses such as cultivated or grazed areas
- topographical features like hills and valleys
- notes on upstream characteristics such as diversions or land uses
- problem areas and anything that may be of concern or special interest to you.

Step 3: Develop and implement a riparian action plan

Land-use practices that conserve the health of riparian areas involve sound soil, water and vegetation management principles. These practices are designed to maintain the vegetation of healthy riparian areas. When given the opportunity, many plant communities can heal themselves. The object is to minimize the sources of damage by managing our use of riparian areas.

A management plan can be developed based on the riparian condition, goals and objectives. Before you start, consider the resources you have at your disposal. Are enough resources available to adequately meet the goals and objectives? Resources can include:

- financial resources
- land, alternate grazing areas, available forage
- technical resources and information
- expertise
- plants, shrubs and seeds
- fencing and construction materials
- desire, time and commitment

Fencing, managing rotational grazing systems, or planting shrubs and trees all require money, knowledge and time to implement and maintain. Be realistic about what you can afford in light of the

expected benefits. If resources are limited, make the simplest and most cost-effective (or the most pressing) changes first. It might take several years to meet all of your objectives. It can be useful to set up your plan in a series of stages.

Management options for grazing in riparian areas

Riparian vegetation is normally very different than surrounding upland vegetation, and therefore has special management needs. Because riparian areas are usually only a small portion of the total grazing landbase, it is easy to forget that they might require a different approach. Healthy riparian areas are highly productive and provide a valuable source of forage. Restoring areas degraded by overgrazing will lead to increased forage production and animal gains.

Managing livestock grazing in riparian areas involves minimizing the negative impact of livestock and maintaining a healthy cover of desirable vegetation. Basic livestock and pasture management principles for uplands also apply to riparian areas, although the application can vary. Controlling animal distribution, providing rest from grazing and leaving sufficient carry-over is necessary to maintain or improve the health and productivity of riparian areas.

When planning a grazing system that includes riparian areas, consider these factors:

- upland and riparian area land-base
- range condition
- forage availability
- livestock behavior
- type and class of livestock
- present livestock utilization and distribution
- terrain
- availability of alternate water sources
- inherent productivity of the site
- problems identified in the assessment.

In light of these, what are the management options for grazing? Continuous season-long grazing is still the most common grazing strategy for most producers. However, continuous season-long grazing allows livestock to be highly selective when grazing. Desirable plants are constantly being grazed while less desirable ones are avoided. This usually results in riparian areas being overgrazed while other areas are under-utilized.

Improvements usually require adjusting the stocking rates and/or controlling animal distribution in the pasture. The bottom line is, proper livestock use of riparian areas will ultimately improve forage yields and return greater economic benefits. Good management doesn't cost, it pays!

Management tools

Setting stocking rates

Stocking rates should be set to balance forage production with livestock use while leaving sufficient plant material to maintain riparian functions. Overuse by livestock will quickly reduce forage yields, livestock gains and riparian health.

When determining stocking rates for pastures containing riparian areas, livestock distribution and utilization must be considered. If a stocking rate is based on an entire pasture but livestock are only using areas around the riparian zones, the riparian areas will be overused. Stocking rates must be based on the area of actual use.

While this is a step towards proper management, continual grazing pressure does not allow the vegetation any rest periods. At the same time, it may not be cost-effective to cut stocking rates to

adjust for highly uneven use across the pasture. Rather than reducing stocking rates, it may be wise to take measures to correct the distribution problem.

Controlling animal distribution

Riparian zones normally produce an abundance of palatable forage. This fact, along with the presence of water and shelter attracts livestock to these areas. Controlling when, where, and how long livestock graze is the cornerstone of a good riparian grazing plan.

Fences are the surest way to control animal movement. Dividing large pastures into paddocks allows the livestock producer to better regulate grazing distribution and builds flexibility into the grazing system. Creating riparian fields in a pasture system allows the producer to:

- control the season and intensity of grazing in the riparian areas
- remove cattle if unexpected damage is occurring to streambanks.

A riparian paddock should include some adjacent upland and not be a narrow corridor along the stream. This allows livestock a place to lounge and will reduce stock density in the riparian areas. Alternative methods of regulating livestock distribution, such as creating upland watering sites and putting saltlicks on the uplands, are useful but not as effective as fencing. Another point to consider is that cows with calves generally remain in one area of the pasture, more than likely the riparian areas, whereas yearlings tend to wander throughout the pasture.

Benefits of rotational grazing

Rotational grazing involves shifting grazing animals through a series of paddocks. Large pastures can be divided into a group of smaller paddocks and each grazed in accordance with an overall plan. Although there are numerous variations of this theme, there are some basic features and benefits common to all:

- Grazing activity is concentrated on a smaller land area at any given time, so animals are not permitted to be as selective as they could be in a continuous grazing system.
- All parts of the pasture are rested at some time during the growing season, permitting plants to build the energy reserves and rebuild root systems. This is vital in sustaining plant vigor, productivity, future growth and reproduction, especially of desirable plants.
- Because livestock occupy smaller areas, handling and checking is easier.

The length of the rest period depends on the season, availability of soil moisture, previous grazing intensity as well as management objectives. Absence of grazing during the dormant season does not constitute rest because plant growth is limited during this time of the year.

Dividing pastures into native and tame pastures or those that contain riparian areas can create a very effective grazing system. Each of these paddocks will have specific advantages and management needs, so separating them allows them to be used at the most appropriate times.

Although creating separate riparian paddocks can fit well within a rotational grazing system, dividing pastures in this fashion is not the only option. In fact, large pastures with riparian areas can be divided so that riparian areas are present in all fields. In these areas, fences generally run across creeks or streams and uplands are included with the riparian areas. This practice is common where the valley constitutes the entire pasture and the creation of a riparian field would result in a narrow corridor along the stream channel.

If the rotation is designed in this fashion, it is important that:

- the stocking rate is based on the area that the livestock actually use
- livestock are moved before all the vegetation has been removed in the riparian areas
- there is sufficient time for re-growth to occur after the grazing period, and
- carry-over exists along the riparian areas.

Excluding livestock

Fencing a narrow corridor along riparian areas and removing livestock completely can be useful in some situations. When the streambanks and channel are severely damaged, excluding livestock for a period of time may be the only practical way to promote recovery in a reasonable time span.

Corridors may also be desirable when streambanks are highly susceptible to damage because of soil texture, topography or continually saturated soils. However, there are several points to consider before erecting a corridor fence to exclude livestock. There are high construction and maintenance costs associated with corridor fences since they tend to follow the channel. Fences can be prone to damage during floods since they are close to the water. In addition, if adjacent pasture areas are not in good condition, the lush, green vegetation near the water will be very attractive to cattle and the fence may not be strong enough to keep livestock out and damage can still occur. One last consideration is that there will be excessive plant litter build up in areas where cattle are excluded and this will have an impact on new growth and may also create a fire risk.

Watering livestock

Direct access to the stream channel by livestock has been a standard method of watering on western rangelands. But here are some things to consider:

- Watering in streams usually brings with it heavy livestock traffic and the associated detrimental effects discussed earlier.
- Livestock manure can contaminate water sources with bacteria and parasites such as Giardia and Cryptosporidium that can cause disease in humans and livestock.
- Manure in the water increases nutrient availability and causes algae blooms of which some types are toxic to livestock. Dense algae growth can deplete oxygen and kill fish and other aquatic life.
- Cattle moving in the water disturb bottom sediments that can affect fish, interfering with normal gill functioning and suffocating them.
- Livestock may be reluctant to wade through muddy areas to water. Reducing the frequency of watering and the quantity consumed has a negative effect on livestock health. In fact, studies have shown that poor quality water contaminated with bacteria and parasites can reduce daily weight gains in livestock by up to 25 percent. To reduce these negative affects, livestock producers have several options:
- Develop additional watering sources in the form of dugouts or wells on the uplands. Water sources can be excluded from livestock and water pumped into troughs.
- Fence a stream and move water to troughs with solar, wind powered or electric pumps. Water can be transported through pipelines up to two miles away from the water source, depending on topography.

- Build access ramps with hard, compacted surfaces to streams. Livestock prefer to use the compacted access areas rather than wade through mud.
- If a riparian field has been constructed, an alleyway can be constructed from the upland fields to an access point on the creek.

Cultivation and riparian areas

Riparian areas surrounded by cultivated land also need attention. Producers attempting to increase their cultivated area sometimes drain wetlands, and the surrounding riparian vegetation is destroyed. Cultivating close to or through streams reduces the amount of the vegetation in riparian areas and impairs its ability to trap sediments, fertilizers and pesticides and protect streambanks from erosion. Wildlife habitat is lost and water quality suffers.

Surrounding croplands are the source of the sediments, pesticide residues and fertilizers that can impact riparian areas and water quality through erosion. It is recommended that buffer strips of grass, shrubs or trees are planted between the riparian area and the cultivated land. Grassing of gullies and runways in cultivated fields that drain towards creeks and streams will prevent erosion. In addition, streams will benefit from cropping practices that keep the soil covered.

To minimize or eliminate the effect of cultivation on riparian areas and water quality, producers of annual crops can:

- Maintain or seed strips of permanent vegetation (buffer strips) between the riparian and cultivated areas to trap sediments and agricultural pollutants. These should be at least 30 feet wide (preferably 100 feet). On steep slopes a wider strip is required. Because the watertable is often near the surface next to riparian areas large amounts of forage can be produced here. Buffer strips can also stop the development of saline soils along streams and provide valuable wildlife habitat.
- Prevent erosion on surrounding croplands by practicing conservation tillage.
- Replace annual crops with perennial hay and forage crops on soils susceptible to erosion.
- Plant water runways to grass to prevent gullying and erosion.
- Limit application of chemicals, fertilizers and manure on croplands adjacent to streams.
- Plant shrubs and trees in riparian zones to add stability to the soil and streambanks. Streambanks that are highly eroded can be stabilized with deadfall and untreated lumber prior to tree and shrub planting.

Step 4: Monitoring the effectiveness of your management plan

Monitoring the changes in and around your stream area is a very important step in the management process. Determine if your goals and objectives are being met. The following are examples of what kinds of questions might be asked when monitoring:

Riparian Health Checklist

Streambanks and channel	Yes	No
Is stream channel downcutting occurring?		
Is erosion occurring on the outside of stream curves (small amounts OK)?		
Is the stream channel becoming wide and flat?		
Is only sandy or coarse textured soil available for plant establishment?		
Are streambanks poorly vegetated with areas of bare soil?		
Is there extensive hoof damage to streambanks?		
Are streambanks slumping?		
Does the stream overflow its banks only during severe floods?		

Vegetation	Yes	No
Is dead plant material or litter from previous years absent?		
Is plant vigor poor?		
Has grazing removed almost all of the palatable vegetation?		
Are desirable plants being replaced by unpalatable or undesirable types?		
Are noxious weeds present?		
Are wetland species being replaced by drought tolerant upland species?		
Do the palatable species shrubs and trees appear to be heavily browsed?		
Do willows have a mushroom-like appearance?		
Are all the trees old and of poor health (as opposed to being of all sizes and ages)?		
Do stands of trees have an open, 'park-like' appearance?		
Have trees and shrubs been eliminated from sites where they should be present?		
Is the buffer strip between the riparian area and cultivated lands less than 30 feet?		

Because of the abundant water in riparian areas, vegetation can respond quickly to improved management. Greater plant vigor and forage yields may be visible in a few months, while changes to the shape of the streambanks and channel may take years. However, because the vegetation is responsible for many characteristics of a healthy riparian system, recovery of the plant portion is a positive signal that recovery of other components is on the way.

Take some more photographs of the areas that were highlighted at the start. These before-and-after photographs provide a dramatic way of documenting the effects of improved management. Finally, have a sense of personal satisfaction knowing that you are a streambank steward! Don't forget to share your successes with your neighbors. Cooperation among all the landowners in a watershed will hasten the recovery of riparian areas and improve the end result. We all benefit from improved riparian health!

Technical Assistance

The following briefly describes the general functions or missions of the agencies and organizations that could provide assistance.

Resource Conservation Districts

Providing technical assistance is one of the principle tools used by most Resource Conservation Districts (RCDs) to foster sensitive use of local natural resources. At a minimum, the structure of all RCDs provides for technical support from the Natural Resources Conservation Service specialists, but many RCDs have augmented this source of expertise with a large reservoir of technical knowledge from both private and public sources. With respect to riparian areas, RCDs can provide assistance in any number of ways, including: advice on which incentives programs or combination of programs might be best suited to the landowner's situation; connecting the landowner with the appropriate scientific expertise to address a special difficulty in integrating riparian restoration with agriculture production; establishing demonstration projects; and perhaps most important, providing an on-going local presence to which landowners can bring questions, concerns, and ideas.

Contact: Loma Prieta (Gilroy) 408-847-4171.
Monterey County (Salinas) 831-424-1036 ext. 124.
San Benito County (Hollister) 805-772-4398.
San Mateo County (Half Moon Bay) 650-712-8938.
Santa Cruz County (Capitola) 831-464-2950.
Upper Salinas-Las Tablas (Templeton) 805-434-0396.

University of California Cooperative Extension

The University of California Cooperative Extension (UCCE) was developed to apply the resources of the University to the needs of local communities. It serves every county in the state and can provide technical assistance on a wide array of conservation-related topics, including: enhancing wildlife on farm and forest lands; designing range systems that minimize effects on watersheds and protect riparian and other wet areas; and developing soil and water conservation practices and plans.

Contact: Monterey County (Salinas) 831-759-7350
San Benito County (Hollister) 831-637-5346
San Mateo County (Half Moon Bay) 650-726-9059
San Luis Obispo County (SLO) 805-781-5940
Santa Clara County (San Jose) 408-299-2635
Santa Cruz County (Watsonville) 831-763-8040

USDA Natural Resources Conservation Service

The USDA Natural Resources Conservation Service (NRCS) works with the RCDs on the local level to promote wise use and management of natural resources. NRCS specialists also provide technical expertise independent of the RCDs to address the practical difficulties of conservation land management, including integrating wildlife habitat with agriculture. Aerial photographs and topographic maps of your area can be found at your local NRCS or Farm Service Agency office.

Contact: Monterey County (Salinas) 831-424-1036
 San Benito and Santa Clara Counties (Hollister) 831-637-4360
 San Mateo and Santa Cruz Counties (Capitola) 831-475-1967
 San Luis Obispo County (Templeton) 805-434-0396

Central Coast Contacts

Coalition of Central Coast County Farm Bureaus.....	831/661-0344
Central Coast Vineyard Team.....	805/434-4854
Central Coast Resource Conservation & Development Council.....	805/772-5623
Central Coast Regional Water Quality Control Board.....	805/549-4646
Community Alliance with Family Farmers.....	831/722-5556
Monterey Bay National Marine Sanctuary.....	831/647-4219
Monterey County Water Resources Agency.....	831/755-4860
Pajaro Valley Water Management Agency.....	831/722-9292
Santa Clara Valley Water District.....	408/265-2600
California Fish & Game (Monterey Field Office).....	831/649-2893
Agricultural Commissioner’s Office (Monterey County).....	831/759-7325

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California State Coastal Conservancy. 1994. *Options for wetland conservation- a guide for California landowners*.