



# Vegetated Waterways and Riparian Restoration: Oakdale Ranch

*By Juliet Christian-Smith*

## Introduction

The Capay Valley is a narrow alluvial valley located in northwestern Yolo County, California. It drains approximately 1,300 square miles of Lake, Yolo, and Colusa Counties, trending in a southeast direction from the Northern California Interior Coast Range to the Sacramento Valley. The primary landscapes are mountainous blue oak woodlands, chaparral, rangeland, and fertile valley floor agriculture (orchards and row crops). Several small rural communities are dispersed along State Highway 16, which runs the length of the Valley. The area has a primarily agriculture-based economy that includes a rapidly-growing organic farming sector (Yolo County RCD and Cache Creek Watershed Stakeholders Group 2003).

In 2003, the Yolo County Resource and Conservation District (RCD) and a group of local stakeholders released the Capay Valley Water Stewardship Plan, an effort to “deal comprehensively and thoughtfully with resource issues in Capay Valley” (Yolo County RCD and Cache Creek Watershed Stakeholders Group 2003). The report identified several major resource concerns, such as stream bank erosion, and goals and objectives to address them. Goal 1 was to manage watershed lands to minimize unnatural rates of erosion and sedimentation. Recommended voluntary actions to achieve this goal included:

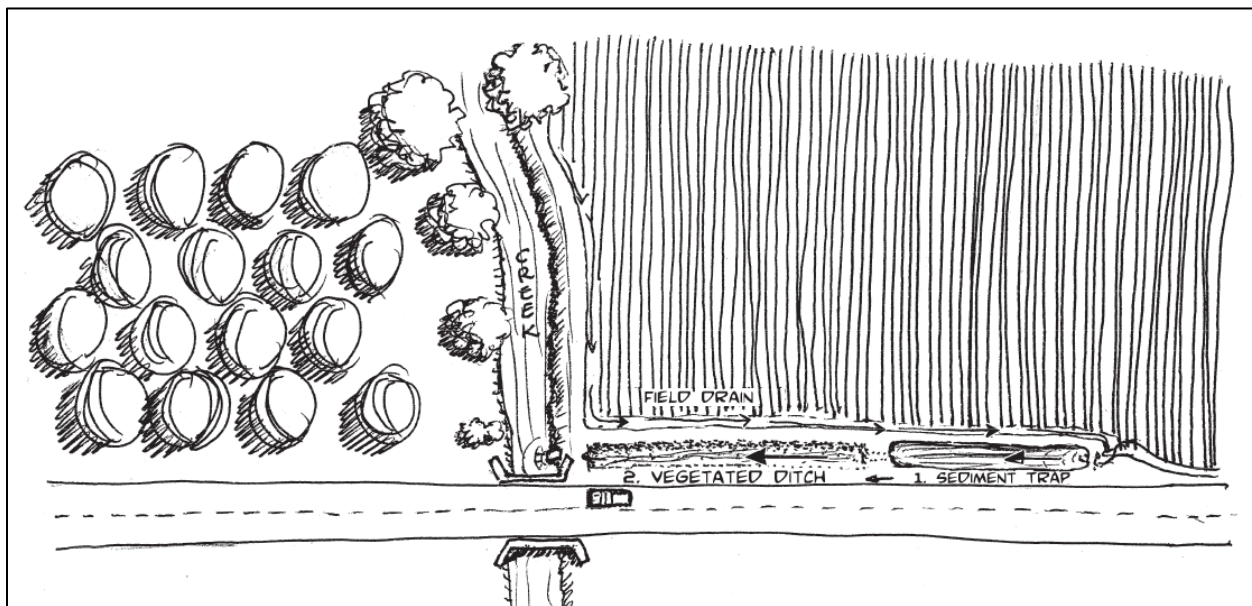
- Establishing riparian buffers between stream channels and adjacent land use,
- Vegetating stream banks with native vegetation to maintain bank stability,
- Removing and/or controlling non-native invasive vegetation in the stream channel and riparian areas,
- Establishing vegetated filter strips at the tail end of irrigated crop land and orchards,
- Establishing riparian strips using native vegetation between agricultural land and streams, and
- Vegetating irrigation ditches and canals with native perennial grasses.

The vast majority of land in Yolo County is privately owned and therefore much of this work would have to be undertaken by individual landowners, at their own expense. Around the same time, Audubon California was developing its Landowner Stewardship Program to work with private landowners on resource management projects. This case study describes how the Landowner Stewardship Program collaborated with one landowner in Yolo County to restore the riparian area around Willow Slough.

## Background

Vegetated waterways are intended to slow and filter the flow of runoff water, allowing suspended sediment to settle out and enabling runoff water and soluble pollutants to infiltrate the ground. The plants, decomposing vegetation, and associated microorganisms help trap sediments and take up dissolved nutrients and other chemicals. Vegetated drainage ditches have proven successful in the Midwest, reducing sediment and pesticide concentrations in agricultural drainage, especially water soluble pesticides (Bennett et al. 2005). Studies have documented that: “riparian VBS [vegetated buffer strips] can significantly reduce the concentrations of nitrate-N in shallow groundwater before its entry into a stream channel. The evidence also suggests that riparian forests are more efficient at removing nitrate-N in shallow subsurface water than are grass VBS” (Osborne and Kovacic 1993). According to the Solano and Yolo County RCDs, an appropriately designed vegetated drainage ditch can remove 38% – 98% of pesticides in and filter strips can remove 50% – 80% of pesticides and nutrients (Solano and Yolo County Resource Conservation Districts 2006a and 2006b).

Vegetated drainage ditches are typical agricultural drainage ditches planted with a selection of plants, which act as binding sites for pesticides and fertilizers that have run off fields during irrigation or storm events, reducing movement of agricultural chemicals from the field to the waterway. At sites with high concentrations of sediment in runoff water, it may be necessary to couple vegetated ditches with an upstream sediment trap to reduce sediment deposition that can smother the vegetation to prolong the useful life of the ditch (Figure 1).

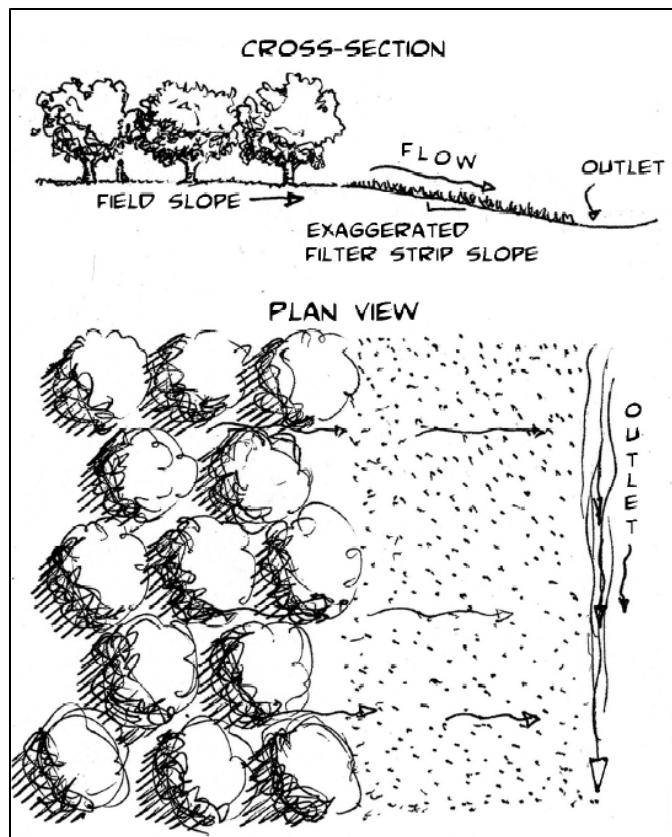


**Figure 1. A sediment trap and vegetated drainage ditch slow and filter water as it runs off an agricultural field to a nearby creek**

Source: Solano and Yolo County Resource Conservation Districts 2006a

Vegetated drainage ditches are eligible for Natural Resources Conservation Service (NRCS) funding through their Environmental Quality Incentive Program (EQIP). The EQIP specifications require the ditch to be constructed with sufficient capacity (width, length, depth, and grade) to discharge expected irrigation flows and surface water runoff from a 10-year event. The shape of the ditch must conform to either a U-shape or V-shape design. The ditch could contain a specified number of water control structures (such as flash board risers) to allow sufficient time for residues from application of pesticides and/or fertilizers to be utilized or adhere to ditch vegetation and reach their expected half-life before discharge into surface water bodies (NRCS 2008). More information is available from NRCS about the practice specifications (NRCS 2008).

Filter strips are areas of grass and other perennial (non-woody) vegetation that are established between agricultural fields and waterbodies. Filter strips can be established adjacent to drainage ditches, streams, lakes, ponds, seeps or other wetland habitats and have the potential to provide many benefits to onsite and offsite aquatic habitats (Figure 2). These improvements may include improved water quality, reduced soil erosion, stabilized stream banks, improved floodplain function, and recharge of groundwater aquifers (NRCS 2001). Properly designed and maintained filter strips potentially provide habitat for feeding, nesting, and resting wildlife. They also may serve as important travel corridors that allow animals to move safely between habitats. Filter strips are usually at least 12 feet wide but NRCS recommends a width of at least 36 feet if the filter strip is intended to be used as a habitat corridor, or at least 40 feet if it is intended for nesting and escape cover (NRCS 2001). In terms of water quality, wider strips provide more filtering benefits and filter strips work best if runoff flows across the strip as shallow sheet flow, rather than as concentrated flow (Solano and Yolo County Resource Conservation Districts 2006b).



**Figure 2. Cross-sectional and plan view of a vegetated filter strip**

Source: Solano and Yolo County Resource Conservation Districts 2006b

In the mid-west, where filter strips are most commonly used, experience with filter strips has shown that their effectiveness is related to several factors, including:

- The amount of sediment running into the filter strip (influenced by tillage, rain, steepness of surrounding terrain),
- The amount of water that is retained in the filter strip (influenced by the width of the strip and the type of and condition of the vegetation planted),
- The infiltration rate of the soil, and
- The uniformity of water flow through the filter strip (Iowa State University Extension 2000).

In the flat fields of California's Central Valley, the design of filter strips is still under experimentation. Gentle slopes may have to be created. One possible design is an asymmetrical "V" ditch at the field end, with a flatter slope being the 12–20 foot wide filter strip and a steep slope completing the "V" (Solano and Yolo County Resource Conservation Districts 2006b).

In summary, there are many benefits related to vegetated waterways, including:

- Preventing soil erosion and stabilizing field border soils,
- Competing with and protecting against invasion by weeds,
- Improving water quality,
- Enhancing habitat for wildlife and beneficial insects,
- Providing forage hay or bedding mulch, and
- Replacing an otherwise weedy maintenance problem with a non-weedy filter strip or vegetated ditch for farm run-off (Solano and Yolo County Resource Conservation Districts 2006a and 2006b).

However, vegetated waterways also require on-going maintenance, including:

- Mowing and harvesting,
- Controlling weeds,
- Supplemental seeding every 2 – 5 years and reseeded disturbed areas,
- Removing debris, repairing gullies, and removing sediment deposits,
- Periodically re-grading and re-establishing vegetation when sediment deposition jeopardizes its function, and
- Limiting the length of time a drainage ditch holds standing water for mosquito control (Solano and Yolo County Resource Conservation Districts 2006a and 2006b).

There are installation and maintenance costs associated with vegetated waterways. The cost for installation of a vegetated drainage ditch is estimated to be around \$1000 per acre or more. Costs will vary for each project, depending on the length of the ditch, the amount and type of seed used, the amount of excavation needed, and any irrigation required (Solano and Yolo County Resource Conservation Districts 2006a). The cost of a vegetated filter strip is determined by the price of perennial grass seed and any grading necessary due to field end topography. In 2006, average costs of installing a filter strip were around \$750 per acre, depending on seed choice and seeding rate (Solano and Yolo County Resource Conservation Districts 2006b). Yet, according to

Rachel Long, a UC Extension scientist and Yolo County farmer, maintenance costs can be higher for regular drainage ditches and weedy edges, costing around \$100 per year, while a hedgerow or filter strip costs around \$40 per year to maintain.

## Restoring Willow Slough on the Historic Oakdale Ranch

Audubon California's Landowner Stewardship Program works with private landowners to conserve and restore wildlife habitat on working farms and ranches. The program's long-term programmatic goals are to enhance and restore riparian, oak woodland and grassland habitats, improve forage quality, improve water quality, and reduce erosion. This is a particularly valuable program in places with limited public lands, such as Yolo County, which is 90% privately owned. Responsibility for protecting public resources typically falls on individual landowners, many of whom struggle to earn all or part of their living from agriculture and lack the time, money or technical expertise to restore and maintain wildlife habitat and natural resources (EDF 2005). The Landowner Stewardship Program, together with its extensive network of partners, helps provide funding, labor and technical assistance. At the same time, landowners can shape projects to meet their own goals and keep their land in production. Over the last ten years, the program has partnered with 75 farmers in Yolo, Solano, Colusa, and San Joaquin Counties, including a slough restoration project on Oakdale Ranch.

Oakdale Ranch is home to the second oldest working ranch in Yolo County to be owned and operated continuously by the same family. The 400 acre ranch is located on the outskirts of Esparto, California, at the gateway to the Capay Valley. The Stephens Family has owned and operated Oakdale Ranch since 1852. Today, John Stephens and his son grow walnuts on the property. Recently, the Stephens partnered with the California Audubon's Landowner Stewardship Program to restore a portion of Willow Slough, re-grading and re-vegetating the banks to filter runoff, convey drainage, absorb floods, and provide a habitat corridor for riparian species that the Stephens remember once inhabiting the area.

John Stephens originally approached Audubon California with the idea of restoring wildlife habitat on his land. Early on, all parties agreed that improving flood control and water conveyance along the one-mile stretch of Willow Slough where it crosses the ranch was also a priority. Each winter the incised slough flooded fields and a nearby highway and required reshaping with heavy machinery. The maintenance was costly for Stephens, the local water district and the neighboring town of Madison. Thus, the project was designed to achieve multiple benefits: improving wildlife habitat and also minimizing harmful flooding. In the project's second year, Willow Slough's banks were sloped back, rising gently above the channel, mimicking a natural floodplain and re-vegetated with native plants (EDF 2005). Stephens enthusiastically describes the teams of teenagers that came out to plant the native vegetation through the Student and Landowner Education and Watershed Stewardship program (SLEWS). SLEWS engages California high school students in habitat restoration projects that enhance classroom learning, develop leadership skills and result in real positive impact for the environment.

According to Stephens, the project has worked out well: “To my neighbors and fellow farmers, obviously they’ve been looking over the back fence watching what’s going on over here and I’ve started to get more and more questions – what do you think? Did it work? Is it working out for you? And I have nothing to say but positive [things] about the situation. I don’t think it cannot work. It helps the drainage, which most farmers are worried about draining off their property. Is it helping the water quality? Yes, we’re starting to see that already. And as far as wildlife, it’s going to take two or three years to see how they’ll come back and if we can go out on those pheasant hunts again.”



**Figure 3. Willow Slough on Oakdale Ranch before the project (left, an incised drainage ditch with steep banks covered in non-native vegetation) and after (right, more gently sloped banks provide a lower bench for high floods covered in native grasses and an upper bench with a maturing riparian forest).**

Source: EDF 2005

Nearly six years later, the project has developed into a well-established riparian forest. Mature elderberries loaded with fruit, 15-foot tall cottonwoods, a variety of willows, and mulefat line the waterway. An understory of native rose, coyote bush, and coffee berry provide year-round food for wildlife from both the fruit they produce as well as the insects attracted to their flowers. Extensive stands of native perennial grasses and sedges provide year-round ground cover and continue to spread, securing the banks of the waterway, and filtering runoff before it enters the slough. Stephens says that the restoration process has been adaptive and that the second phase of the project was designed a bit differently based on what they learned from the first phase: “This [second phase of planting] was designed to keep some of the trees up off the banks a little higher since we found out some of the trees were plugging off the stream... We have done some learning and the Audubon found some things out, which is really good, so some of the other projects that I hope they do in Yolo County can use this as a model” (Figure 4).

## Conclusion

Today, Stephens reports considerable improvements in Willow Slough's water quality. In addition, wildlife has gradually returned to the banks, including a beaver, quail and pheasants. Stephens is currently planning to expand the restoration project another half mile, in cooperation with CalTrans. Stephens notes the project requires on-going maintenance to ensure that non-native species do not return and that flood flows continue to be conveyed quickly downstream. "You have to be committed...The ongoing grants that we thought maybe would come from the government or the state are not there, so we more or less have to take it up ourselves," according to Stephens. But the payoff is considerable; Stephens hopes to soon introduce his grandchildren to the pheasant hunts that he so fondly remembers from his own childhood on the ranch. In the future, Stephens hopes that his riparian restoration project will be linked to other riparian projects that will create a riparian corridor along the length of Willow Slough. The availability of programs to help offset the costs of design installation and maintenance will be key.



**Figure 4. John Stephens showing the second phase of the Willow Slough restoration project on Oakdale Ranch**

Source: Rich Panter

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