

## COLUSA-VERONA REACH

The character of the Sacramento River changes considerably near Colusa. This was as true before the completion of the Sacramento Valley Flood Control Project as it is today.

Downstream of Colusa the gradient of the river decreases, the channel becomes narrower and deeper, its capacity smaller, and its bed material finer. The natural levees, discontinuous further north, are now continuous along both sides of the channel to its confluence with the Feather River. These levees are not pronounced, but are broad surfaces that slope gradually away from the river.

In its *1989 Plan*, the SB1086 Advisory Council recommended establishing a Conservation Area along the Sacramento River. The Conservation Area in reach 4 is contiguous with an inner river zone that defines the locations where interested landowners may participate in voluntary riparian habitat programs administered or coordinated through the Sacramento River Conservation Area Forum. Inner river zone guidelines for this reach have been developed (Chapter 2, pages 2-20 through 2-23), and should be incorporated into site-specific planning. The purpose of the inner river zone is to focus the preservation and reestablishment of a continuous riparian ecosystem on erosion- and flood-prone areas along the Sacramento River in a manner that follows the six guiding principles:

- Uses an ecosystem approach that contributes to recovery of threatened and endangered species and is sustainable by natural processes;
- Uses the most effective and least environmentally damaging bank protection techniques to maintain a limited meander where appropriate;
- Operates within the parameters of local, state, and federal flood control and bank protection programs;
- Participation by private landowners and affected local entities is voluntary, never mandatory;
- Gives full consideration to landowner, public, and local government concerns; and
- Provides for the accurate and accessible information and education that is essential to sound resource management.

The Conservation Area for this reach is centered on the river's main channel from Colusa to the confluence with the Feather River at Verona. Although the natural levees and associated loamy soils extend up to 15 miles beyond the main channel of the river, the Conservation Area only includes those areas within the levees.

## PHYSICAL SETTING

### Soils

The natural levees generally consist of floodplain materials deposited over clays. They tend to be composed of loams and sandy loams, with some silt loams and clay loams. The levee soils tend to be well-drained, although some have a high water table. Typical soils series along these levees are the Colombia and Sycamore soils, which are often planted in orchards. Closest to the river these floodplain loams are deepest, becoming shallower with distance. Before the advent of the flood control project, these natural levees were about 5-20 feet higher than the flood basins on either side of the river. They range in width from one to ten miles. Prior to reclamation, the natural levees formed corridors of relatively dry land up either side of the river channel as the basins on either sides turned in to vast marshlands during the fall, winter, and spring.

Historically, these “natural levees” also formed along the sloughs that drained floodwater into the basins, as well as along the river channel itself. The Knights Landing Ridge, for example, which separates Yolo and Colusa Basins, is the pair of natural levees alongside the historical course of Cache Creek. The location of some of these former sloughs can be seen in the pattern of alluvial soils in the valley.

Because the natural levees prevented some tributary streams (such as Butte Creek) from joining the main river, particularly during lower flows, they would drain to the basins into “an intricate plexus of sloughs which meander through the tule-land bordering the main river” (Thompson, 1961). Prior to reclamation, runoff from surrounding areas tended to concentrate in Butte, Colusa, Sutter, and Yolo Basins.

*Table 6-1. Features of the Colusa–Verona Reach*

<b>River Mile</b>	<b>Feature</b>	<b>River Mile</b>	<b>Feature</b>
143	Colusa Bridge	104R	China Bend
141L	Butte Slough	103L	Collins Eddy
138L	Butte Slough Outfall Gates	102R	Tyndall Landing
137L	Woods Lake	102L	Mystic Lake
134L	Meridian	102L	Horseshoe Lake
132R	Former mouth of Sycamore Slough	102R	Beaver Lake
127R	Cecil Lake	99L	Eldorado Bend
125L	Sills Lake	97L	Missouri Bend
125R	Grimes	94L	Sutter Recreation Area
119L	Tisdale Weir	90R	Knights Landing Outfall Structure
119L	Mouth of Tisdale Bypass	90R	Mouth of Colusa Canal Basin Drainage
118R	Mouth of Wilkins Slough	90R	Knights Landing
116R	Steiner Bend	88R	Portuguese Bend
115L	Cranmore	87L	Mary Lake
112R	Millers Landing	86L	Horseshoe Lake
111L	Boyers Bend	82R	Fremont Weir
105L	Kirkville	80L	Mouth of Sacramento Slough
104L	Hiatt Lake	80L	Mouth of Feather River
		80L	Verona

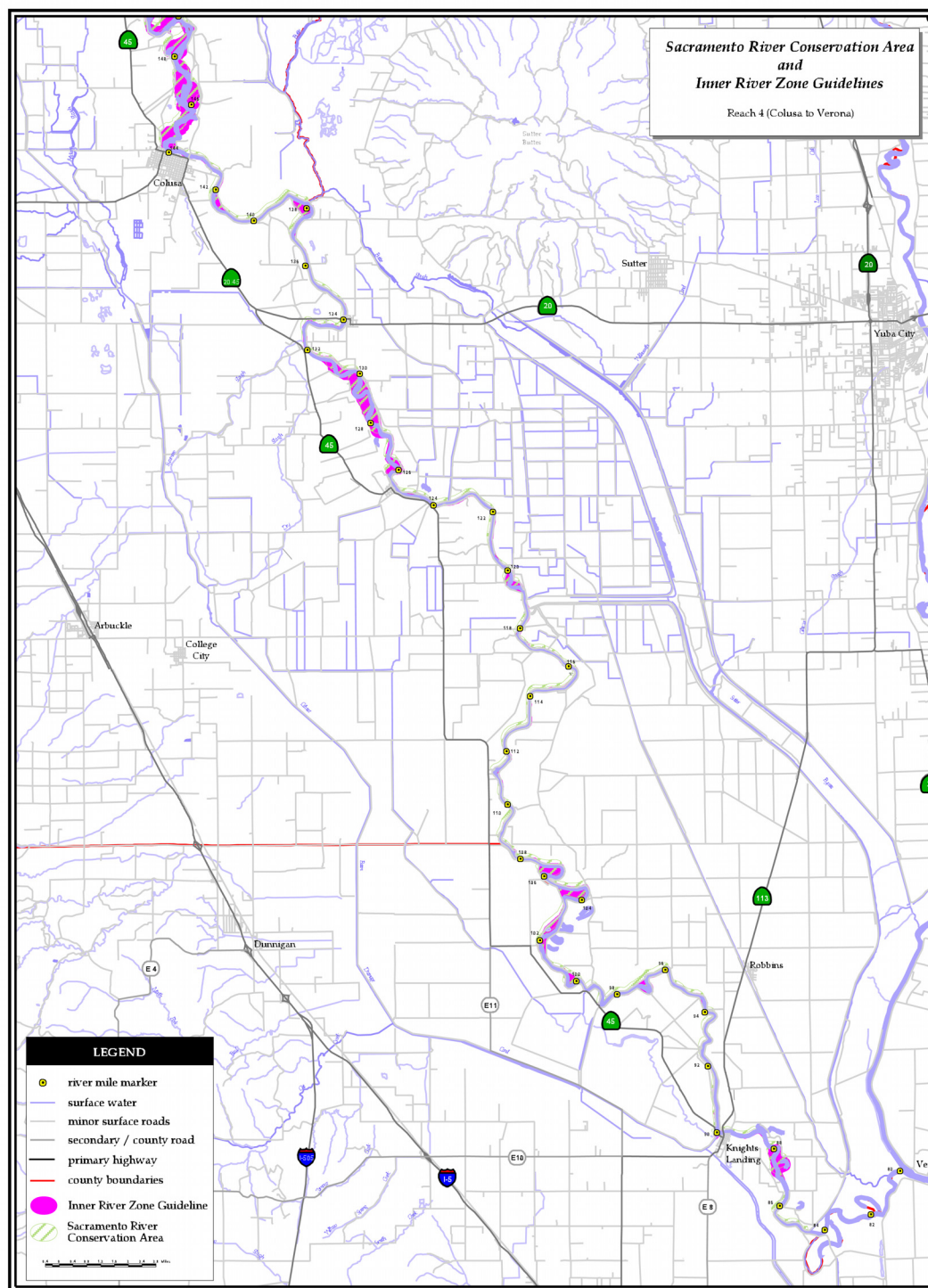


Figure 6-1. Sacramento River Conservation Area, Colusa to Verona Reach

## Historical Channel Movement

The landscape shows evidence of historical meandering in this reach. This tendency is strongest in three areas: RM 126-130 near Grimes, RM 96-107 near Kirkville, and RM 81-89 near Knights Landing. This meandering has been linked to the presence of major distributaries along the pre-reclamation river. As a distributary channel drains off floodflows, the remaining water in the channel has less energy and drops some of its sediment load. In theory, this deposition will cause the channel to become more sinuous. At the area near Knights Landing, it is surmised that Cache Creek (which historically entered the river near the Knights Landing Outfall Structure) contributed much sediment but relatively little flow, resulting in the same effect (Priestaf, 1983). Another factor that has affected the sinuosity is that some portions of the channel were probably straightened as an aid to navigation.

The meander process probably occurred more slowly in this reach. The gradient of the river is lower than upstream and the size of the sediment is finer. This means the erosion rates were probably lower. Therefore, the mosaic of riparian habitat types may have been considerably different than upstream.

Estimates of the historical extent of riparian vegetation in this reach have relied on historical soil surveys. More than 100,000 acres of alluvial soils probably supported both riparian plant communities and valley oak woodland. Cottonwood, willow, and other riparian species grew where there was a sufficiently high water table, such as along the channel itself, in the shallower loams at the basin margins, and along the networks of sloughs and tributaries. The highest portions of the natural levees, corresponding with the deepest alluvial soils, probably supported valley oak woodland.

## Flood Control and Reclamation

Reclamation districts in this reach were formed as early as the 1870s. The early attempts at reclaiming the flood-prone lands alongside the river consisted of closing off sloughs and building low levees along the main channel. These efforts were not coordinated; levees on the east side would force more floodwater to the west, and vice versa. Likewise, the damming of overflow into sloughs no doubt had consequences downstream. Problems in this reach were compounded by massive volumes of hydraulic mining debris moving down the Feather River, creating an underwater dam and backing up flood flows as far north as Colusa.

After many years, a federal and state cooperative effort, the Sacramento Valley Flood Control Project, replaced this uncoordinated effort at flood control. The project consists of a system of levees, overflow weirs, outfall gates, pumping plants, bypass floodways, and overbank floodway areas. Much of the project design was based on the fact that the magnitude of Sacramento River floods far exceed main channel's capacity. The floodwater that once flowed into the basins through a myriad of sloughs is now diverted into Colusa, Moulton, and Tisdale Weirs, and into the Sutter Bypass. The Sutter Bypass then drains the floodwater southward to Fremont Weir, where it crosses the main channel of the Sacramento River and flows via Yolo Bypass into the Delta.

Because most of the floodwaters overflowed upstream of Colusa, the historical channel capacity was smaller in this reach of the river. This is reflected in today's design



capacity of the channel in this reach which is only 30,000 cfs below Tisdale Weir as compared with an estimated 260,000 cfs in the Red Bluff to Chico Reach.

Several reclamation districts still exist, surrounded by levees. On the east side of the river, Reclamation Districts 70, 1660, and 1500 extend between the main channel of the river and the Sutter Bypass. The Sutter Mutual Water Company covers much of the same acreage as R.D. 1500. On the west side, Reclamation Districts 108, 787, and 730 cover the area between the river channel and the Colusa Basin Drain. Their responsibilities include the maintenance of both district and Project levees, and drainage of lands within the districts. RD 108 and The Water Company also provide and maintain a water supply for irrigation. They work closely with the Reclamation Board to ensure that their activities are consistent with the operation of the Sacramento River Flood Control Project. These latter districts are included within the Sacramento River West Side Levee District which maintains the west side levees from Colusa to Knights Landing. Drainage activities are most critical during fall, winter and spring, when a combination of seepage from the main channel of the Sacramento River and precipitation require pumping water out of the districts into the river and bypass system.

## Land Use

Land use acreage for this reach was determined using DWR land use surveys for Colusa, Sutter, and Yolo Counties (DWR 1993; 1990; 1989). Agricultural land use accounts for 23 percent of the area, riparian vegetation accounts for 40 percent, other native vegetation types about 21 percent, and 15 percent is classified urban or industrial. (Table 6-2)

*Table 6-2. Land Use within the Conservation Area, Colusa–Verona Reach*

Land Use Category	Inner River Zone Guideline		Conservation Area	
	Acres	% of Land Surface Area	Acres	% of Land Surface Area
Agriculture	645	23%	645	23%
Riparian Vegetation	1,113	40%	1,113	40%
Upland Vegetation	589	21%	589	21%
Urban	411	15%	411	15%
Water Surface (excluding main channel)	3	<1%	3	<1%
Miscellaneous (includes barren wasteland)	3	<1%	3	< 1%
<b>Total Land Surface Area</b>	<b>2,764</b>	<b>100%</b>	<b>2,764</b>	<b>100%</b>
Channel Surface Area	1,891		1,891	
<b>Total</b>	<b>4,655</b>		<b>4,655</b>	

\*The purpose of DWR land use surveys is to map agricultural crops. Refer to Appendix D, Part 2, for more accurate riparian vegetation data. Land use data based on DWR agricultural land use surveys of Shasta, Tehama, Butte, Glenn, Colusa, Sutter, and Yolo Counties (see References). Percentages may not be equal to 100 due to rounding

Reclamation has enabled agriculture to become the predominant land use within the Conservation Area in this reach. The main crops are those suited to the deep loamy soils of the natural levees, including walnuts, peaches, prunes, tomatoes, beans, sugar beets, safflower, and corn.

The Sacramento River provides the chief water supply; diversions are made directly from the river or from adjacent wells. The water table tends to be higher in the southern end of this reach, which is reflected in a greater percentage of row crops.

Of the four reaches, the Colusa to Verona Reach probably has the smallest population. Towns in this area include Meridian, Grimes, and Knights Landing. Boating and fishing are the most common recreational uses of the river. There are at least seven private marinas and fishing lodges and three official public access points. (Table 6-3; DPR, 1994).

The California Department of Fish and Game has recorded 205 water diversions in this reach. (Some diverters have more than one pump). The largest diversions are owned and operated by the Sutter Mutual Water Company and Reclamation District 108 (DFG, 1994).

*Table 6-3. Public and Private River Access Spots, Colusa–Verona Reach*

RIVER MILE	ACCESS TYPE	FACILITY NAME
142.7 L	Private	Ralph’s Steelhead Lodge
138.2 L	Private	Ward’s Boat Landing
137.0 L	Private	Bob and Pat’s Landing
124.4 R	Private	Grimes Boat Landing
119.5 L	Public	Tisdale Weir Fishing Access
96.6 R	Private	Missouri Bend River Access
92.8 L	Private	Fourmile Bend River Access
89.9 R	Public	Knights Landing County Park
89.9 L	Private	Knights Landing Marina
83.5 R	Public	Fremont Weir River Access
79.6 L	Private	Verona Marina

## RIPARIAN VEGETATION

### Current Acreage

The acreage estimates of riparian areas within the inner river zone are based on GIC (1997; 2000) data and a recent estimate for “stringer vegetation”. All stands of riparian trees that were not identified in DWR maps were estimated for width and shoreline length. There are 1,335 acres of riparian vegetation types within the inner river zone guidelines (Table 6-4).

Much of the riparian habitat in this reach exists as narrow stringers along levees and levee berms (Figure 6-2). In some areas levees are set back from the water edge, affording opportunity for larger areas of riparian habitat. Local Reclamation Districts maintain many of these areas. Examples of high quality mature riparian habitat and SRA (shaded, riverine aquatic) exist within the set back levees. Figure 6-3 (Moon’s Bend) and Figure 6-4 (Downstream of Colusa Bridge) show examples of such habitat. Limited areas of restricted meandering of the river channel occur between RM 126 and 130, resulting in bands of successional stages. Other areas contain little riparian vegetation (Figure 6-5).

Table 6-4. Riparian and closely related vegetation within the Conservation Area

**Colusa-Verona Reach**

VEGETATION TYPE	INNER RIVER ZONE GUIDELINE		CONSERVATION AREA	
	Acres	% of Land Surface Area	Acres	% of Land Surface Area
Riparian Forests	1,149	41%	1,149	41%
Riparian Scrub	176	6%	176	6%
Valley Oak Woodland	0	0%	0	0%
Marsh	6	<1%	6	<1%
Blackberry Scrub	4	<1%	4	<1%
Total Riparian Vegetation	1,335	47%	1,335	47%
<b>Total Land Surface Area</b>	<b>2,816</b>		<b>2,816</b>	
Channel Surface Area	1,891		1,891	
<b>Total</b>	<b>4,707</b>		<b>4,707</b>	

GIC (1997; 2000). Percentages may not total due to rounding

**Ownership**

Public ownership accounts for less than 2 percent of the conservation area in this reach and at least 98 percent of the area (2,754 acres) is privately owned (Table 6-5). The state owns approximately 200 acres at the Beaver Lake/Collins Eddy and Mary Lake areas. The Knights Landing County Park is also a publicly owned parcel in this reach. There are 16 Sacramento River Bank Protection Project mitigation conservation easements (Chapter 7) in this reach, about 180 acres.



Figure 6-2. Narrow “stringer” of riparian vegetation, Colusa–Verona Reach



*Figure 6-3. Riparian vegetation near Moon's Bend (RM 138)*



*Figure 6-4. Riparian vegetation on waterside berm, downstream of Colusa Bridge*





Figure 6-5. Area with little riparian vegetation, Colusa–Verona Reach

Table 6-5. Land ownership within the Conservation Area, Colusa–Verona Reach

OWNERSHIP CATEGORY	INNER RIVER ZONE GUIDELINE		CONSERVATION AREA	
	Acres	% of Land Surface Area	Acres	% of Land Surface Area
Private	2,754	98%	2,754	98%
Public				
Federal	0	0%	0	0%
State	53	2%	53	2%
Local District, City, County	9	<1%	74	<1%
<b>Total (Land Surface Area):</b>	<b>2,816</b>	<b>100%</b>	<b>2,816</b>	<b>100%</b>
Channel Surface Area	1,891		1,891	
<b>Total</b>	<b>4,707</b>		<b>4,707</b>	

DWR Sacramento River GIS (May 2000); DPR (1994)

### Restoration Strategy

As narrow as the existing band of riparian habitat corridor is within this reach, it can be excellent wildlife habitat, particularly where stands are contiguous, providing an important wildlife corridor. The SB1086 goal in this area is to restore and maintain a contiguous band of riparian vegetation within the Inner River Zone in a manner that follows the six guiding principles:

- Uses an ecosystem approach that contributes to recovery of threatened and endangered species and is sustainable by natural processes;

- Uses the most effective and least environmentally damaging bank protection techniques to maintain a limited meander where appropriate;
- Operates within the parameters of local, state, and federal flood control and bank protection programs;
- Participation by private landowners and affected local entities is voluntary, never mandatory;
- Gives full consideration to landowner, public, and local government concerns; and
- Provides for the accurate and accessible information and education that is essential to sound resource management.

### **Inner River Zone Guideline**

The inner river zone guideline within Reach 4 consists of the floodway within the existing federally authorized flood control levees, and does not compromise the integrity of the levee structure or conflict with the operation and maintenance jurisdiction of local maintaining entities as designated by the Reclamation Board. The inner river zone guideline does not include the weir or bypass areas.

The Sacramento River Flood Control Project determines channel configuration in this reach. In addition, the natural channel dynamics are much different than upstream. A thorough geomorphological, engineering, and environmental examination of this reach would be necessary to determine the soundest method of riparian habitat restoration. Projects in this reach should be evaluated according to the restoration priorities in Chapter 1.

#### **1. Preserve intact processes**

The ability of the river to meander in this reach is limited by the levee system. The area between RM 126 and 130 contains the banded appearance of various successional stages, which are typical of riparian vegetation with active channel movement. Several significant riparian stands exist within the leveed areas (Table 6-6). *Purchase of such areas or landowner participation in voluntary programs within these areas should receive the highest priority for the protection of riparian habitat.*

Approximately 1,200 acres between the levees are in agricultural crops or support grasses and herbs. A recent review of 1995 aerial photos, taken during a four-year recurrence interval flood event, suggests that all of these surfaces are covered by water on a fairly frequent basis. These areas could support early successional stages if left undisturbed.

#### **2. Allow riparian forests to reach maturity**

The DWR 1987 data suggest that the majority of the riparian vegetation within and adjacent to the levees is largely climax vegetation. Only 565 of the 1,928 acres of riparian habitat within the levees is subclimax or young vegetation. This may indicate that early stages are being removed through maintenance activities. All stages of riparian vegetation are important for the survival of a diverse assemblage of wildlife species. Management of existing and newly established vegetation should be done with a goal of increasing the diversity of riparian types.

Table 6-6. Significant areas of native vegetation and potential “natural restoration” areas between levees

RIVER MILE	NAME OF AREA
138	Moon’s Bend
130 – 126	Ogden Bend to Girdner Bend
120 – 119	North of Tisdale weir
111	Boyer’s Bend
106	Poker Bend
105.5 – 103.5	China Bend
103-101	Tyndel Landing
101-99	Upstream of Eldorado Bend. Outside of levee also
97	Missouri Bend
96	Victor Bend
94	Upstream and Downstream of Railroad Bend
88-87	Portuguese Bend/Mary Lake

### 3. Restore physical and successional processes

Any activities to restore physical or successional processes within the inner river zone (as adopted in 2002 revision) shall be investigated from a flood management perspective and be consistent with the guiding principles.

### 4. Conduct reforestation activities

*Restoration of the area between levees through “natural” restoration should receive the highest priority.* Active restoration should be conducted in areas of high terraces and berms that do not receive an adequate flooding regime for the establishment of riparian vegetation.

The effect of riparian restoration on river stage, velocity, and sediment transport should be evaluated before implementing projects. *The protection and restoration of a contiguous riparian strip down the rivers edge should also receive the highest priority.* Restoration throughout the inner river zone (as adopted in 2002 revision) should be evaluated and coordinated with those areas contiguous to the inner river zone with the objective of establishing linkage to other existing blocks of riparian or valley oak woodland habitat, as well as proximity to the main channel or sloughs and tributaries.

