

CHICO LANDING-COLUSA REACH

Significant remnants of riparian forest remain between Chico Landing and Colusa. Their pattern upon the landscape reflects the meander scrolls left by former channels of the river.

This reach of the river marks the beginning of historical overflow into the Butte and Colusa Basins and the gradual downstream development of natural levees. It is also the beginning of the Sacramento River Flood Control Project, which controls and directs overflows into the Sutter Bypass through a system of setback levees, overflow areas, and weirs.

This reach extends from Chico Landing at the mouth of Big Chico Creek, past the Ord Ferry Bridge, the tiny towns of Ord, Glenn, and Butte City, and the Butte City Bridge. Downstream of Princeton and the Princeton Ferry, floodwaters are diverted out of the setback levee system into Butte Basin through the Moulton Weir. Just north of Colusa, the Colusa Weir diverts additional floodwater. The reach ends at Colusa Bridge in the City of Colusa (Figure 5-1 and Table 5-1).

In its 1989 Plan, the SB1086 Advisory Council recommended establishing a Conservation Area along the Sacramento River. In 2002, the boundary of the Conservation Area was determined to be the same as the inner river zone guideline within this reach. The Conservation Area defines the location where interested landowners may participate in voluntary riparian habitat programs administered or coordinated through the Sacramento River Conservation Area. The purpose of the inner river zone is to focus the preservation and reestablishment of a continuous riparian ecosystem on the 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.

Table 5-1. Features of the Chico Landing-Colusa Reach

River Mile	Feature	River Mile	Feature
194L	Chico Landing	169R	Mouth of Rasor Slough
194L	Mud Creek	169L	Butte City
193L	Mouth of Big Chico Creek	169R	Codora
193L	Bidwell River Park	167R	Packer Island
191R	Phelan Island	167R	Packer Lake
190R	Mouth of Stony Creek	164R	Princeton
190L	Mouth of Murphy Slough	164	Princeton Ferry
190L	Golden State Island	161L	Boggs Bend
184	Ord Ferry Bridge	160R	Stegeman
184	Ord Ferry Road	159L	Moulton Weir
184R	Ordbend	151L	Hamilton Bend
182L	The Lagoon	146L	Colusa Weir
181L	Perkins Lake	146L	Mouth of Colusa Bypass
180R	Jacinto	145R	Colusa Sacramento River State Recreation Area
178R	Mouth of Provident Irrigation Main Canal	144R	Colusa
176L	Eddy Lake	143	River Road
173L	Hartley Island		
171R	Hanson Island		

The inner river zone in this reach includes those areas along the river where aerial photography shows evidence of meander. The inner river zone should be the focus of efforts to preserve and restore river processes. By nature, the channel alignment in this area is transitory and subject to change. The criteria used to develop a guideline for the inner river zone include historical and projected future erosion (Chapter 2). The inner river zone guideline within Reach 3 consists of the 100-year meanderbelt combined with 50-year erosion projections, and does not compromise the structural integrity of the existing state or federally authorized flood control levees and structures or conflict with the operation and maintenance jurisdiction of local maintaining entities as designated by The Reclamation Board. The inner river zone does not include the weir or bypass areas.

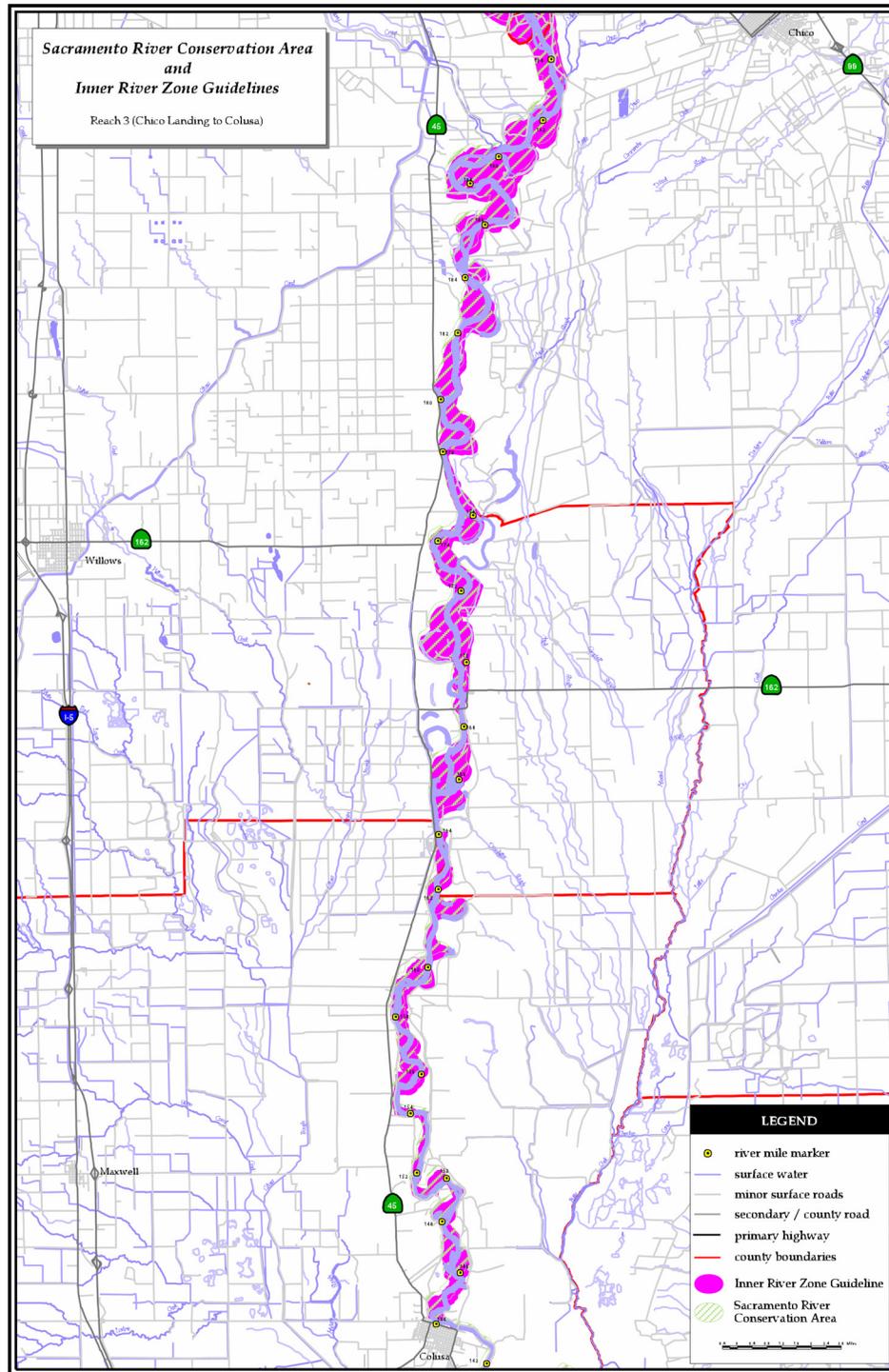


Figure 5-1. Sacramento River Conservation Area, Chico Landing to Colusa

PHYSICAL SETTING

Geology and Soils

Within the Chico Landing–Colusa Reach, the river no longer receives water from tributaries. With the exception of rare inflow from Butte Creek, Stony Creek is the furthest downstream of the tributaries. Historically, the river overflowed its banks on both sides of the river downstream of Stony Creek during floods (Thompson, 1961). This overflow arrived at the Delta through the sloughs and channels within the Butte, Sutter, Colusa, and Yolo Basins. Today, the Sacramento River Flood Control system mimics this system to a large degree. The various sloughs and distributaries that wound their way into tule-filled basins, however, have been replaced by a systematic network of overflow areas and weirs. Instead of vast inland marshes flanking the river for miles during the wet season, the weirs direct the floodwater into Butte Sink and the Sutter and Yolo Bypasses for more efficient drainage to the Delta (Kelly, 1989, Ch. 2).

The west side of the river corridor in this reach is bounded by the Modesto Formation, a terrace deposit of an older Sacramento River system. Along the east side of the main channel, in the vicinity of Angel Slough, the paleochannel deposits of a much older Sacramento River system lie between the modern day river channel and the basins.

A main feature of this reach is the gradual development of natural levees with distance downstream. These levees form gentle mounds on either side of the river, separating the main channel from overflow basins on either side. They are most easily seen when the river is flooding, when they form dry islands up either side of the river. A close examination of contour lines on a USGS quad will also reveal their presence. Soil texture also indicate their location; the natural levee soils tend to be loamy, in contrast to the basin soils which have a much larger clay component. The natural levees begin on the west side of the river as far north as Hamilton City, but are discontinuous for several miles south of Stony Creek (Brice, 1977).

The river becomes more sinuous in this reach, with less branching around islands (anabranching). While there are fewer islands than upstream, there are many oxbow lakes and scars of old meanders. The texture of the sediments in this reach is finer than in the Red Bluff–Chico Reach; the banks are composed of silts and sands, with little of the gravels that predominate upstream (WET, 1988).

The Sacramento River Flood Control Project

One of the most important factors affecting riparian habitat downstream of Chico Landing is the Sacramento River Flood Control Project, constructed by the USACE (Chapter 2). Along the Sacramento River the project consists of setback levees beginning near the town of Ord on the west side and just north of the Butte-Glenn County line on the east. Upstream of the setback levees, there are three low points on the east side of the river where floodwater flows away from the main river channel during high flows: the M&T, 3B's, and Goose Lake Flood Relief Structures (Figure 5-1). These structures are located at natural depressions in private levees. Downstream, this floodwater collects in the Butte Sink and is then diverted into the Sutter Bypass. Further downstream, along the leveed portion of the Sacramento River, floodwaters are released eastward into the Sutter Bypass through Moulton, Colusa, and Tisdale Weirs.

The setback levees of the Sacramento River Flood Control Project are generally built along the Modesto Formation along the west side of the river. On the east side, however, the levees lie well within the paleochannel deposits. There are meander scars visible outside of the levees just north of the Colusa Weir. A strip of natural levee deposits lies outside of the east side project levee for most of the reach.

The Reclamation Board is responsible for maintenance of the Sacramento River Flood Control Project, as well as the Sacramento River Bank Protection Project. The responsibility is passed on to the local reclamation and levee districts or to the California Department of Water Resources where no such district exists. The bank protection project consists of the rock revetment of about 160 miles of banks and levees, installed to ensure the security of the flood control system.

Channel Movement

The Chico Landing–Colusa Reach is a meandering river (Chapter 2). The combination of channel locations between 1896 and 1991, the “one-hundred year meanderbelt,” is approximately 9,200 acres. As in the Red Bluff–Chico Landing Reach, relatively stable, straight subreaches alternate with more sinuous, dynamic subreaches. This reach of the river has become less sinuous since 1896. This has been attributed to chute cutoffs promoted by the clearing of riparian forests and to natural variation over time (USGS, 1977; WET 1988). Two meander scars of unknown age (Eddy Lake, RM 176-177, and a meander scar at RM 167-168) indicate a high degree of sinuosity in at least portions of the channel in the recent past.

The subreach just upstream of the setback levees where floodwater flows away from the main channel through the flood relief structures is referred to as the Butte Basin Reach (RM 176-194). The USACE has been stabilizing the channel in this reach with a series of bank protection installations as part of its flood control responsibilities. Because changes in channel alignment in the Butte Basin Reach (particularly chute cut-offs of meander loops) could lower channel elevation, it was thought that this would result in less flow into Butte Sink via the flood relief structures, and more flow down the leveed river corridor. Too much water flowing down the leveed river corridor could compromise the effectiveness of the flood control system. Recent studies indicate however, that change in channel elevation is insignificant in altering the flow split between Butte Basin and the main channel of the Sacramento River at higher flows. These studies show that excessive flows are entering the leveed reach regardless of channel alignment (Ayres, 1997).

Land Use

Approximately 16% (about 1,946 acres) of the Conservation Area is used for agriculture (Table 5-2). Important crops include walnuts, prunes, wheat, almonds, and beans. There are several towns along this reach of the river, including Glenn, Princeton, Butte City, and Ord Ferry. Two bridges cross the river in this reach: the Ord Ferry Bridge (RM 184) and the Butte City Bridge (RM 168). The Princeton Ferry is at River Mile 164.

Table 5-2. Land use within the Conservation Area, Chico Landing-Colusa Reach

Land Use Category	Inner River Zone		Guideline Conservation Area	
	Acres	% of Land Surface Area	Acres	% of Land Surface Area
Agriculture	1,946	16%	1,946	16%
Riparian Vegetation	5,944	48%	5,944	48%
Upland Vegetation	1,374	11%	1,374	11%
Water Surface (excluding main channel)	275	2%	275	2%
Urban	1,371	11%	1,371	11%
Miscellaneous (includes barren wasteland)	1,583	13%	1,583	13%
Total Land Surface Area	12,493	101%	12,493	101%
Channel Surface Area	2,832		2,832	
Total	15,325		15,325	

*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.

The Princeton-Codora Glenn Irrigation District, Roberts Ditch Irrigation Company, and Reclamation District 2047 lie partially within the Conservation Area. The California Department of Fish and Game recorded 95 agricultural diversions along this reach of the river, ranging from small, portable units owned by private landowners to large plants providing water to large irrigation districts. Irrigation districts pumping water within this reach include Maxwell Irrigation District, R.D. 1004, Princeton-Codora-Glenn Irrigation District, and the Provident Irrigation District.

The California Department of Parks and Recreation lists approximately ten recreation sites along this reach of the river, including boat landings, day use areas, a wildlife area, and a scenic park.

RIPARIAN VEGETATION

Current Acreage

The summary of riparian and associated vegetation types within the inner river zone guidelines and Conservation Area (Table 5-3) is based on the Geographic Information Center's (California State University, Chico) 1999 riparian habitat mapping. While the project mapped most riparian habitat along the Sacramento River, it did not map the entire Conservation Area. The actual amount of riparian habitat within the Conservation Area may be somewhat higher. The Geographic Information Center at CSU, Chico, is currently updating riparian habitat acreages based on recent aerial photographs.

Table 5-3. Riparian and other native vegetation types and closely related classifications within the Conservation Area

Vegetation Type	Inner River Zone Guideline		Conservation Area	
	Acres	% of Land Surface Area	Acres	% of Land Surface Area
Riparian Forests	4,621	42%	4,621	42%
Riparian Scrub	3,276	30%	3,276	30%
Valley Oak Woodland	20	<1%	20	<1%
Marsh	83	<1%	83	<1%
Blackberry Scrub	11	<1%	11	<1%
Total Riparian Vegetation	8,011	72%	8,011	72%
Total Land Surface Area	11,072		11,072	
Channel Surface Area	2,832		2,832	
Total	13,904		13,904	

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

This reach is particularly rich in freshwater marsh habitat. These marshes are often associated with oxbow sloughs outside of the 100-year meander belt. An excellent example of this vegetation type is found at Murphy Slough (Figure 5-2). Sensitive species, such as rose mallow (California hibiscus) and pond turtles, are located in these areas of still or slowly moving waters. The Conservation Area also contains more than 1,000 acres of seasonal wetlands (most of which is managed waterfowl habitat) (DWR Butte, 1994; Glenn, 1993).

Excellent examples of mature riparian habitat, which supports federally or state listed species such as Swainson's hawk and western yellow billed cuckoo, are also found within this reach. DFG has identified several valley elderberry longhorn beetle (VELB) sites between RM 169 and 180 (DFG, 1996). The beetle's host plant, blue elderberry, can be found in a wide variety of vegetation types including mature riparian forest and open elderberry savannas on higher terraces along the river.



Figure 5-2. Murphy Slough

Current Extent of Habitat Types at the Water's Edge

The total bank length for this reach of the river (including sloughs, side channels, and islands) is approximately 133 miles (USACE, 1991). The main channel (excluding sloughs, side channels, and islands) has a bank length of approximately 105 miles. There are several types of banks and habitat types, including shaded riverine aquatic habitat, cut banks, sand and gravel bars, and revetted banks (Appendix D).

Bank Swallow Nesting Habitat

The U.S. Fish and Wildlife Service (USFWS) surveyed the river for bank swallow nesting habitat in 1989 (USFWS, 1990). Biologists measured 2.01 miles of active habitat and 8.97 miles of inactive habitat. Active sites had bank swallow burrows. Inactive sites did not have burrows, but had the suitable slope, bank height, and soil erodability. The total bank swallow habitat for this reach represents 8 percent of the total bank length and 10 percent of the main channel.

Shaded Riverine Aquatic Habitat

USFWS biologists measured 22.20 miles of shaded riverine aquatic habitat along the Chico Landing-Colusa Reach in 1991. This represents 17 percent of the total channel bank length.

Ownership

Approximately 67 percent (7,437 acres) of the Conservation Area is owned privately. Publicly owned parcels encompass approximately 32 percent (3,634 acres) of the area and are largely concentrated close to the main channel of the river. Table 5-4 shows the proportion of publicly held land within the Conservation Area.

The publicly owned land includes several units of the federal Sacramento River National Wildlife Refuge. State publicly owned land includes lands held by the California Department of Fish and Game (DFG) as part of the Sacramento River Wildlife Area, lands held by the State Lands Commission, and approximately 400 acres purchased by the Reclamation Board to preserve riparian vegetation and preserve stability of the river. These purchases include Murray, Burns, and Kienlen (MBK) sites (Chapter 7).

There are also approximately 19 conservation easements on private land in this reach encompassing 3,600 acres. These easements range greatly in size. Some are small areas between the waterside levee toe and the river on the waterside berm, purchased from willing sellers to mitigate for the second phase of the Sacramento River Bank Protection Project. The Reclamation Board holds these easements and DWR manages them. The Nature Conservancy and the USFWS hold the two largest easements at Llano Seco, owned by Parrot Investment Company, Inc. (near RM 176-183, right bank). DFG also administers conservation easements in this reach (Chapter 7).

Table 5-4. Ownership within the Conservation Area, Chico Landing–Colusa Reach

Ownership Category	Inner River Zone Guideline		Conservation Area	
	Acres	% of Land Surface Area	Acres	% of Land Surface Area
Private	7,437	67%	7,437	67%
Public				
Federal	1,092	10%	1,092	10%
State	2,523	23%	2,523	23%
Local District, City, County	20	<1%	20	<1%
Total (Land Surface Area):	11,072	100%	11,072	100%
Channel Surface Area	2,832		2,832	
Total	13,904		13,904	

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

Restoration Strategy

All restoration shall use 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 3 consists of the area of the 100-year meanderbelt combined with 50-year erosion projections. It does not compromise the structural integrity of the existing state or federally authorized flood control levees and structures 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 reach between Chico Landing and Colusa is divided into two distinct subreaches depending on the presence of flood control setback levees. The opportunities for restoration efforts will differ somewhat between these two reaches.

1. Preserve intact processes

The area between RM 176 and 144 is enclosed by setback levees, and encompasses the 100-year meanderbelt. Active river meander and associated successional riparian types

are present in a number of sites within this portion of the reach. Virtually all of the soils between these levees are floodplain deposits. *Purchase of these areas or landowner participation in voluntary programs within erosion-prone and flood-prone areas should receive the highest priority for the protection of a functional riparian ecosystem.* The majority of the setback levee reach is inundated by a 2-year flood event. Virtually 100 percent of that reach is inundated by a 4-year flood event (Figure 5-3). Plans have begun to monitor for “natural restoration” within a fallow orchard, within the northern portion of this reach which is flooded by a 2.5-year flood event. Monitoring of a similar 2-year and the 4-year event within the lower reach would also be useful in guiding restoration efforts.

2. Allow riparian forests to reach maturity

According to the 1987 DWR data, the 9,086 acres of riparian habitat present were dominated by large climax vegetation (3,992 acres). Early successional stages were also well represented (2,259 acres). *All areas of early successional stages should be allowed to mature to climax conditions, thus ensuring a wide variety of vegetation types.* Areas outside of active meander belts but within “natural restoration” areas should also be allowed to reach mature states.

3. Restore physical and successional processes

As previously discussed, channel movement above the setback levees (Butte Basin Reach) is limited by bank protection. If current studies by the USACE indicate that channel movement has no significant effect on riverbed levels, this portion of the river should be reviewed for restoration of physical processes. The river meander is restricted to the 100-year meanderbelt for the majority of the setback levee reach. Recent floodplain deposits, evidence of meanders older than the 100-year meander, as well as deposits that no longer show evidence of meander (due to changes with time or agricultural development) are present outside of the setback levees area (DWR, 1994).

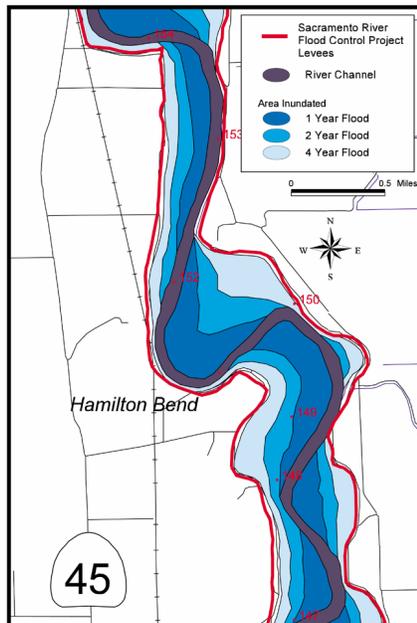


Figure 5-3. Areas inundated at various flood recurrence intervals within the Sacramento River Flood Control Project setback levees

4. Conduct reforestation activities

Areas outside of the levees in the setback reach, outside the frequently flooded areas (defined here as a 2.5 years interval occurrence), or in the areas above RM 176 which are “cut-off” from meandering or flooding, require active restoration. Because of the lack of a flooding regime on these areas, it would be inefficient to attempt to establish early successional or other species that would need a permanent artificial water source. Establishment of valley oak woodlands and elderberry savanna (possible valley elderberry longhorn beetle mitigation preserves) is recommended for such areas, because these species are able to withstand drought conditions. The exception would be areas of seepage adjacent to levees that may support wetland vegetation. *The establishment of a wide continuous riparian and valley oak woodland corridor should be the first option under the reforestation priority. Areas adjacent to the corridor should be considered for active restoration after a continuous corridor is established.*

The use of “natural restoration” may involve the control of invasive or weedy species. As previously mentioned, the establishment of monitoring programs within the frequently flooded areas will help define possible guidelines for the natural restoration within this reach. If native vegetation is out-competed by invasive species a mechanical/herbicide control program or active restoration plan may be necessary. Reforestation activities are restricted, or severely limited, in areas designated for floodwater overflow. Larger trees with no understory may be allowed to remain in the floodways; but because these are designated floodways, dense low growing vegetation is routinely treated with herbicide or removed by maintenance personnel.

