

Initial

COLUSA SUBREACH BACKGROUND REPORT



Prepared by
The Nature Conservancy
Northern Central Valley Office
in Partnership with the
Sacramento River Conservation Area Forum



August 1, 2005

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COLUSA SUBREACH PLANNING

Advisory Workgroup

Mission Statement

Adopted November 3, 2004

To cooperatively determine practical strategies for conservation and restoration of wildlife habitat within the Colusa Subreach that minimize adverse economic impacts, are compatible with agriculture and local community needs, integrate with recreation needs and protect the integrity of the flood control system.

Representation	Individual	Background
<i>Steering Committee</i>		
SRCAF - Glenn Co. - Landowner	Don Anderson	Glenn County Farmer
SRCAF - Glenn Co. - Public Interest	Denny Bungarz	Glenn County Supervisor
SRCAF - Colusa Co. - Landowner	Ben Carter	Colusa County Farmer
SRCAF Manager	Burt Bundy	SRCAF Manager, Farmer
SRCAF - Public Agency	Armand Gonzales	DFG Manager
SRCAF - Colusa Co. - Public Interest	Gary Evans	Colusa County Supervisor
The Nature Conservancy	Dawit Zeleke	TNC Project Director
<i>Interest Representatives</i>		
Irrigation and Reclamation Districts	John Garner	PCGID Board Member, Farmer
Environmental Interests	Jay Dee Garr	Local Wildlife Consultant
Inner Levee Private Property Owners	Francis Hickel	Colusa County Farmer
Recreation Interests	Pat Kittle	Kittle's Outdoor
Business Interests	Ray Krause	Ray's Bike Shop
Glenn County Government	Dan Obermeyer	County Plng & Pub. Works Director
City of Colusa	John Rogers	Mayor, Farmer
Agriculture Interests	Jeff Sutton	FWA Executive Director
Colusa County Government	Jon Wrysinski	County Public Works Director
<i>Agency Representatives</i>		
CA Department of Water Resources	Annalena Bronson	Flood Management
CA Department of Parks and Rec.	Mike Fehling	Supervising Ranger
California Bay Delta Authority	Rebecca Fris	CBDA staff
US Fish and Wildlife Service	Kelly Moroney	Asst. Refuge Manager
CA Department of Fish and Game	Paul Raquel	Supervising Biologist

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I. INTRODUCTION

Colusa Subreach Planning (CSP) will develop a strategy for restoration of the ecosystem along the Sacramento River between the community of Princeton and the City of Colusa in Northern California. Figure 1 depicts the regional location of the area which is referred to as the Colusa Subreach. The objective of this ecosystem restoration is to restore the ability of the environment to support viable populations of native wildlife including those listed under State and Federal Endangered Species Acts. This strategy will be integrated with the flood control system, agriculture and other existing land uses. The Nature Conservancy (TNC) and the Sacramento River Conservation Area Forum (SRCAF) have formed a partnership to conduct the planning program. Funding is provided by the California Bay Delta Authority, commonly referred to as CALFED.

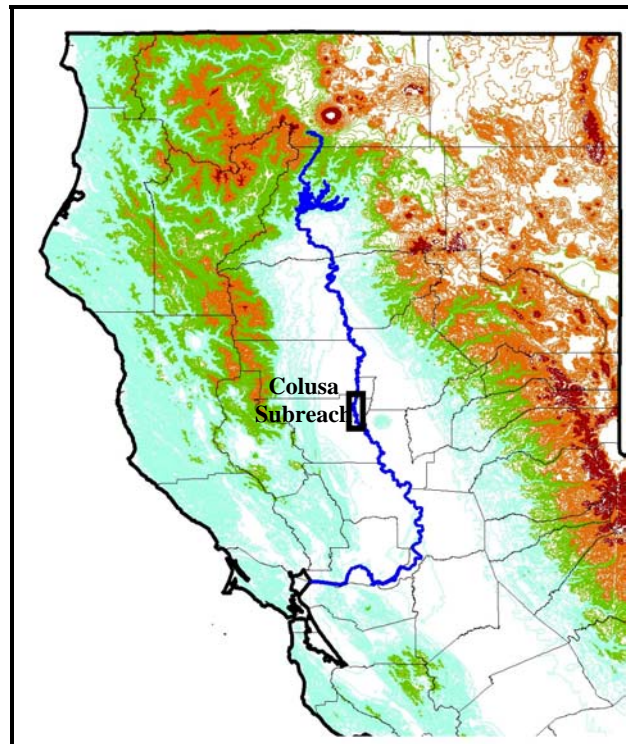


Figure 1. Colusa Subreach Location

The Primary Goal of Colusa Subreach Planning is to:

Increase citizen stakeholder involvement in determining realistic conservation strategies and projects for protecting and restoring riparian vegetation along the Sacramento River, between River Miles 143.5 and 164.5, compatible with the flood control system and other economic and environmental uses of the floodplain

This Goal is specified in Recipient Agreement ERP-02-P27, which is the contract for the CALFED grant that supports CSP. Colusa Subreach Planning is grounded in the belief that, through good communication, information sharing and collaborative design, many of the existing concerns regarding the restoration of the riparian ecosystem along the Sacramento River can be resolved.

The Objectives of the planning effort are to:

- a) Ensure an open and inclusive planning process consistent with the SRCAF principles and guidelines with multiple opportunities for input by local stakeholders, agencies and private interest groups.
- b) Collect baseline data and analyze existing data to inform floodplain management and compliment long-term monitoring programs.
- c) Build and calibrate tools (including models) to evaluate the effects of restoration on land management alternatives and flood control infrastructure specific to the Princeton – Colusa Subreach.
- d) Develop design alternatives and identified implementation projects, incorporating ecosystem restoration and related compatible flood protection, recreation and other land use benefits.
- e) Address stakeholder concerns and research priority questions.

A. Purpose of the Report

This Colusa Subreach Background Report is a basic information source for the subreach planning process. It provides a broad baseline information context for the consideration of the economic, social and ecosystem needs of the subreach. It is intended to be a resource for the Advisory Workgroup and other stakeholders involved in the planning process including local landowners, governments and organizations, recreation and conservation interests and agencies involved in the management of wildlife habitat and the flood control system. It is also intended to be used by SRCAF and TNC staff as a reference work and repository of information regarding the Colusa Subreach Planning Area. Some of the information may also be adapted as part of the Subreach Planning Report, a document that will summarize the planning process and products at the end of the CSP term. This Report is designed to focus on information that will help the Advisory Workgroup and other stakeholders understand and evaluate subsequent plans for the restoration of riparian habitat and other plans and reports that will be developed through CSP.

The Report includes six different types of information. Chapter I provides an overview of Colusa Subreach Planning, the funding source and the project partners. Chapter II describes the entire subreach in terms of land use, ownership and land use controls. Information is drawn from a Geographic Information system (GIS) database that has been developed to support CSP. Chapters III and IV describe the Sacramento River and the ecosystem within the Colusa Subreach. Information is principally drawn from the *Sacramento River Conservation Area Forum Handbook (Handbook)* to tell the story of the river processes, the adaptive responses of plant and animal species and how wildlife has been impacted by changes in the area. A description of the flood control system is also included. Chapter V provides an overview of the local communities and economy as well as a summary of the local concerns that have been identified in regard to habitat conservation. Chapter VI summarizes existing strategies to restore the Sacramento River ecosystem. Finally, Chapter VII describes the tracts that have been identified for potential riparian

habitat restoration in the Subreach. This Subreach Background Report is not intended to reach conclusions or determinations. It is a compilation of information, some preexisting and some newly-developed, that is intended to stimulate thought, discussion and ultimately understanding of ecosystem restoration in the Colusa Subreach.

B. Colusa Subreach Planning Overview

Colusa Subreach Planning addresses a twenty-one mile section of the Sacramento River lying between the unincorporated community of Princeton and the City of Colusa. The subject area is located entirely inside of the flood control levees from River Mile 164.5 on the north, downstream to RM 143.5 on the south. The north boundary is the site of the former Princeton Ferry and the south boundary is the Colusa Bridge. The terms "Planning Area" and "Colusa Subreach" are used interchangeably in this Report to describe the area. It includes approximately 5,466 acres of land with approximately 5094 acres in Colusa County and 372 acres in Glenn County. Figure 2 depicts the Colusa Subreach Planning Area on a 1999 aerial photo.

The Colusa Subreach is an important section of the Sacramento River corridor. The corridor is a rich mosaic of aquatic habitat, oxbow lakes, sloughs, seasonal wetlands and riparian forests within the most diverse and extensive river ecosystem in the State of California. It supports a wide range of wildlife including numerous rare and declining species, critical breeding areas for neo-tropical migrant birds as well as the largest remaining populations of anadromous fish in California. It also supports a vibrant agricultural economy and provides important recreational opportunities to local residents and visitors from other parts of the State and the nation. The Sacramento River is the largest source of water in the State of California and a healthy waterway is essential to the economic and social wellbeing of the entire State.

The Sacramento River has been greatly altered through water supply and flood control activities. Less than ten percent of the natural riparian habitat adjoining the river remains. These changes have contributed to the elimination of some wildlife species and the listing of other species as Threatened, Endangered and of Special Concern under state and federal Endangered Species Acts. At present, these special status species include 43 different anadromous fish, raptors, songbirds and other animals. In response, a wide range of private interests and public agencies have joined together in the effort to restore the riparian ecosystem to a healthy state and provide for stable populations of fish and wildlife.

Over 90 percent of the original riparian habitat area, which averaged about five miles in width, has been converted to agricultural use over the past 150 years. The area nearest the river is primarily planted to orchards and row crops, while rice is the dominant crop in the outer portions of the area. The agricultural lands along the river are an important part of the local agricultural economy, which is the mainstay of both Colusa and Glenn Counties. The communities of Colusa and Princeton and the Sacramento River Flood Control System, composed of levees and two major weirs for flood flow diversion to the Butte Basin, have also been developed within this area. The flood control system is essential to the existing social and economic fabric of Colusa and Glenn Counties. Therefore, it is recognized that reclamation and flood control have had substantial social and economic benefits.

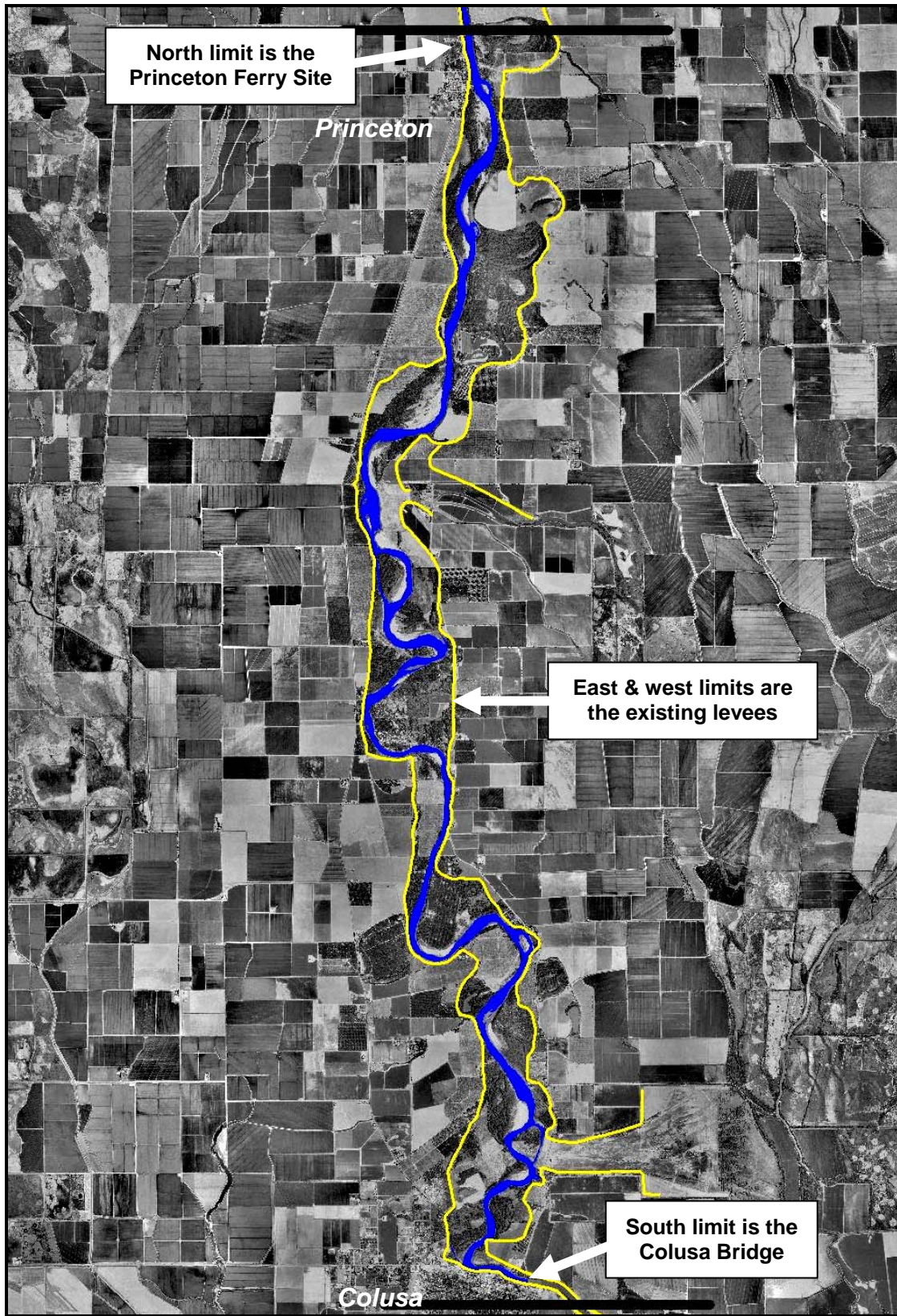


Figure 2. Colusa Subreach Planning Area

A frequent comment along the river has been that landowners and other stakeholders should be involved in the planning of ecosystem restoration projects at the beginning of the process and that their concerns should be incorporated into land use decisions. Speakers at CSP public outreach activities and other forums have asked that conservation projects address the range of concerns that are summarized in Chapter V. Accordingly, Colusa Subreach Planning focuses on early involvement of the wide range of stakeholders in order to address these concerns. For the purposes of CSP, “Stakeholders” are defined as groups or individuals that can affect or will be affected by conservation activities within the floodway of the Sacramento River. This includes landowners in the Subreach as well as other persons outside of the Subreach that are affected by the flood control system, infrastructure within the Subreach and the local economy.

CSP will develop strategies for the restoration of riparian habitat and related flood control and land use considerations. There are seven established Tasks within CSP as summarized below:

Task 1 – Coordination and Outreach

SRCAF and TNC will manage an extensive and open public engagement effort that will focus on the following groups:

- A **Steering Committee** composed of SRCAF and TNC representatives that will direct the public engagement process on behalf of SRCAF and TNC.
- An **Advisory Workgroup** composed of the Steering Committee, local stakeholders and representatives of public agencies that manage property along the river. The Workgroup will identify issues and develop understanding of and solutions to those concerns as part of developing plans for restoration and related uses. The Workgroup will also review technical reports and products, proposed plans for restoration and related land uses for consistency with the Goal and Principles of the Sacramento River Conservation Area Handbook.
- **Technical Subgroups** of the Advisory Workgroup will be constituted as needed for various projects to help advise the scientific and technical aspects of CSP.

An experienced, professional facilitator was chosen, from the Common Ground Center for Cooperative Solutions at U. C. Davis, to help plan the public engagement and to directly facilitate meetings of the Advisory Workgroup and other public meetings.

CSP will also reach out to a wide range of stakeholders that may be affected by ecosystem restoration in the Colusa Subreach. The Institute for Social Research at Sacramento State University has also been retained to develop and conduct an initial and final survey of landowners in the Subreach to determine their perceptions and concerns in regard to the restoration of riparian habitat. Outreach to landowners and other stakeholders will also include public meetings, workshops, information presentations to local organizations and newsletters. Additionally, a CSP website has been established within the SRCAF website at www.sacramentoriver.ca.gov. It features CSP information, documents and announcements regarding all public engagement events.

Task 2 – Baseline Assessments

Baseline Assessments will be conducted to compile and analyze the information base required to support planning of the restoration of riparian habitat, integrated land use and resource planning. It will also help inform the discussion of landowner questions as part of Task 5 through four components:

- This Subreach Background Report to characterize the entire Planning Area and establish Geographic Information System (GIS) base for CSP.
- Baseline Assessment Reports prepared to support restoration planning of specific tracts that are owned by public agencies and TNC.
- Tract Specific Baseline Assessment Reports to characterize soils, vegetation, inundation factors, etc. and develop preliminary restoration recommendations.
- A Small Mammals Report to develop information that may be used to help predict changes in small mammal distribution and abundance that may occur as a result of restoration.
- A Cultural Resources Assessment Report to identify cultural resources on these restoration tracts that should be protected.
- Detailed topographic mapping of the entire Subreach using Light Detection and Ranging (LIDAR) technology to support the design and future evaluation of future projects in the Colusa Subreach.

Task 3 – Modeling

Modeling of the hydraulic impacts of proposed restoration actions will be performed by Ayres Associates in order to determine the potential affect of restoration activities on the integrity of the flood protection system. Peer review at the scoping and results stages is proposed to assist the process.

Task 4 – Focal Area Planning

Restoration plans will be developed for review by the Advisory Workgroup. Other plans related to compatible land uses and flood control will also be developed. This Task has been intentionally left broad to permit flexibility in the identification of planning topics so that the stakeholder input can help give direction to CSP.

Task 5 – Landowner Questions

The facilitator will assist the Advisory Workgroup to identify questions and issues that can be researched to generate information to help reduce uncertainty regarding future restoration activities and/or identify actions that could help resolve issues. Key components of this Task include:

- Determination, by the Advisory Workgroup, of major landowner questions for which research is needed.
- Development of scopes of work for this research (to be reviewed by the Advisory Workgroup) to address these concerns.
- Contracted research projects to address these identified landowner questions.

Task 6 and 7 – Project Management, Administration and Closure

CSP will involve requisite accounting and record keeping, subcontracts management, preparation of quarterly, annual and final reports. A key component of this Task will be a Subreach Planning Report, which will synthesize the results of CSP and identify a strategy for future restoration and related actions. The Advisory Workgroup will help to determine the scope of this

Report and review the draft for consistency with the Goal and Principles of the *Sacramento River Conservation Area Handbook*.

Colusa Subreach Planning is funded through the Ecosystem Restoration Program of the CALFED Bay-Delta Program pursuant to Recipient Agreement No. ERP-02-P27. Total funding authorization is \$1,488,009 and the source of the funds is Proposition 204 which was approved by the voters of California on November 5, 1996. As a contractor and subcontractor, TNC and SRCAF are responsible to the California Bay-Delta Authority for management of CSP.

CSP is scheduled per the CALFED grant to occur over a three-year term, ending in April of 2007. The Advisory Workgroup will meet and other public outreach efforts will occur during each of the three years. Highlights of the CSP schedule are:

Year 1 (April 2004 to April 2005)

- Plan the public engagement activities
- Initiate Baseline Assessment studies
- Prepare the Subreach Background Report
- Convene Advisory Workgroup and identify landowner questions and research
- Conduct initial landowner survey, public meeting, workshop, presentations

Year 2 (April 2005 to April 2006)

- Initiate landowner question research
- Initiate focal area planning projects
- Prepare and review draft restoration plans
- Initiate hydraulic analysis of draft restoration plans
- Conduct midterm public meeting, workshop and presentations

Year 3 (April 2006 to April 2007)

- Review and complete land owner question research
- Review and complete focal area planning
- Review and complete hydraulic analysis
- Review and complete restoration plans
- Conduct final landowner survey, public meeting, workshop, presentations
- Prepare the Subreach Planning Report

C. California Bay Delta Program

The CALFED Bay-Delta Program was established to be a balanced, comprehensive approach to reduce conflicts over limited water supplies and to address the Program's four objectives of Water Supply Reliability, Water Quality, Levee System Integrity and Ecosystem Restoration through 11 major program elements, as depicted on Figure 3. The California Bay Delta Authority manages the joint state and federal program commonly known as "CALFED". The California Bay-Delta Authority oversees the 23 state and federal agencies working cooperatively through the CALFED program to improve the quality and reliability of California's water supplies while restoring the Bay-Delta ecosystem. The California Bay-Delta Act of 2003 established the Authority as the new governance structure and charged it with providing accountability, ensuring balanced implementation, tracking and assessing Program progress, using sound science, assuring public involvement and outreach, and coordinating and integrating related government programs. Additional information is available online at the California Bay Delta Authority website at www.calwater.ca.gov.

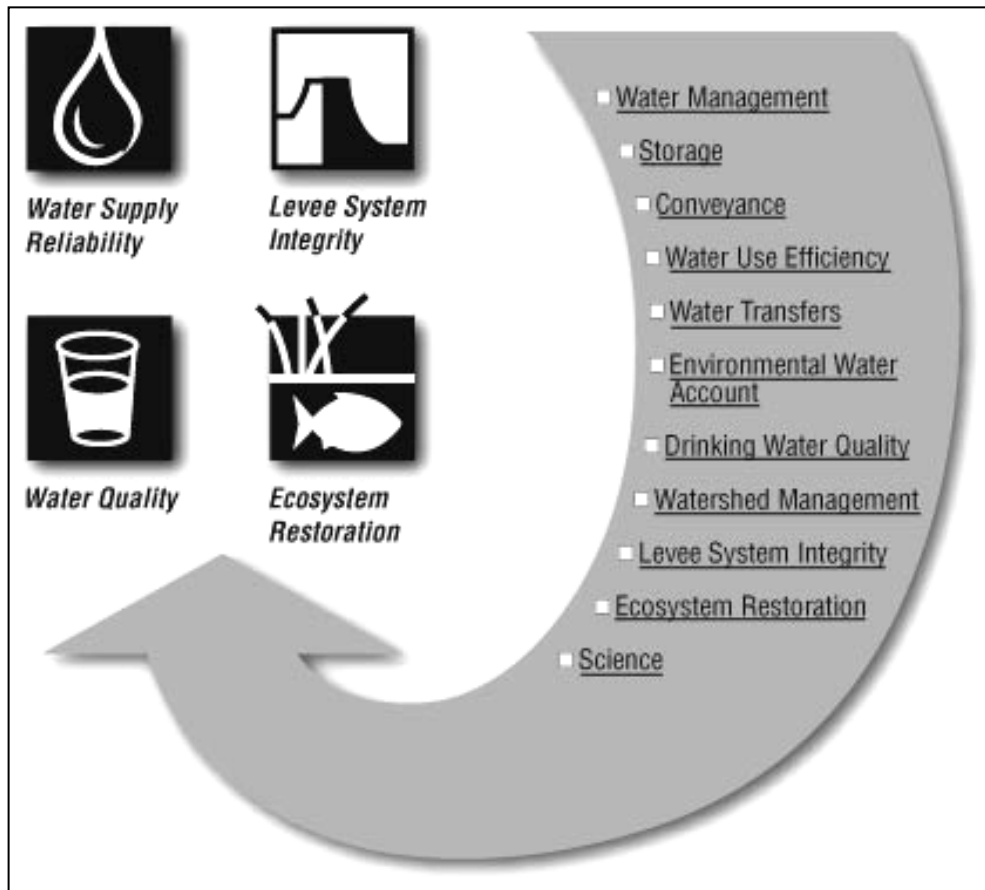


Figure 3. Resource Management Objectives of the Bay – Delta Program

Illustration from the California Bay-Delta Authority website.

In August 2000, the Bay-Delta Program issued a Record of Decision that set forth a 30-year plan to address ecosystem health and water supply reliability problems in the Bay-Delta watershed. The document laid out specific actions and investments over the first seven years (Stage 1) to meet Program goals. It also described a strategy for implementing the plan and identified complementary actions to be pursued by the Bay-Delta agencies. Included within that strategy are plans to restore the ecosystem of the Sacramento River. The *Ecosystem Restoration Program Plan Volume II Ecosystem Management Zone Visions*, which is available online in the CALFED website, details the actions that have been identified to achieve ecosystem restoration for the Sacramento River including the Colusa Subreach.

D. Sacramento River Conservation Area Forum

The Sacramento River Conservation Area Forum is a nonprofit corporation that adopted the following mission statement in 2004:

The Sacramento River Conservation Area Forum brings communities, individuals, organizations and agencies together along the Sacramento River from Keswick to Verona to make resource management and restoration efforts more effective and sensitive to the needs of local communities. The Forum supports restoration done well, and serves as a forum for sharing, a facilitator of solutions, and a partner for projects that protect both the natural values of the Sacramento River and the communities it runs through.

The Sacramento River Conservation Area (SRCA) extends along 222 miles of the Sacramento River, from its confluence with the Feather River near Verona to Keswick Dam just north of Redding. The SRCA includes land in Shasta, Tehama, Butte, Glenn, Colusa, Sutter and Yolo Counties. The Colusa Subreach lies in the lower half of the SRCA and it includes land in both Colusa and Glenn Counties.

The SRCA is a product of the effort initiated through State Senate Bill 1086 in 1986. That legislation created an Advisory Council that completed the *Upper Sacramento River Fisheries and Riparian Habitat Management Plan* in 1989. The Riparian Habitat Committee of the Advisory Council also conducted an extensive public process that resulted in the completion of the *Sacramento River Conservation Area Handbook* in 1999. The *Handbook* established a Goal and the Basic Principles and Management Guidelines for the SRCAF. The *Handbook* was developed as the basis for interagency cooperation and agreement on programs within the SRCA. The *Sacramento River Conservation Area Handbook Forum*, as updated in 2003, specifies the following overall Goal for the SCRAF:

Preserve remaining riparian habitat and reestablish a continuous riparian ecosystem along the Sacramento River between Redding and Chico and reestablish riparian vegetation along the river from Chico to Verona.

This Goal is supported by a set of Principles, Actions and Management Guidelines that detail a process to reach the Goal. Figure 4 depicts the structure of the SCRAF in a diagram from the *Handbook*. The *Handbook* also provides a detailed discussion of the dynamic river processes and the resulting habitat communities. The *Handbook* is available online at the SRCAF website (www.sacramentoriver.ca.gov) and it should be consulted for additional information regarding the SRCAF. Consistency with the Goal and Principles of the *Handbook* was also chosen as the review standard for products of the Colusa Subreach Planning when the project was first conceived in 2001.

E. The Nature Conservancy

The Nature Conservancy is a nonprofit corporation that has been active in conservation activities in California and along the Sacramento River for many years. The Mission of The Nature Conservancy is:

To preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive.

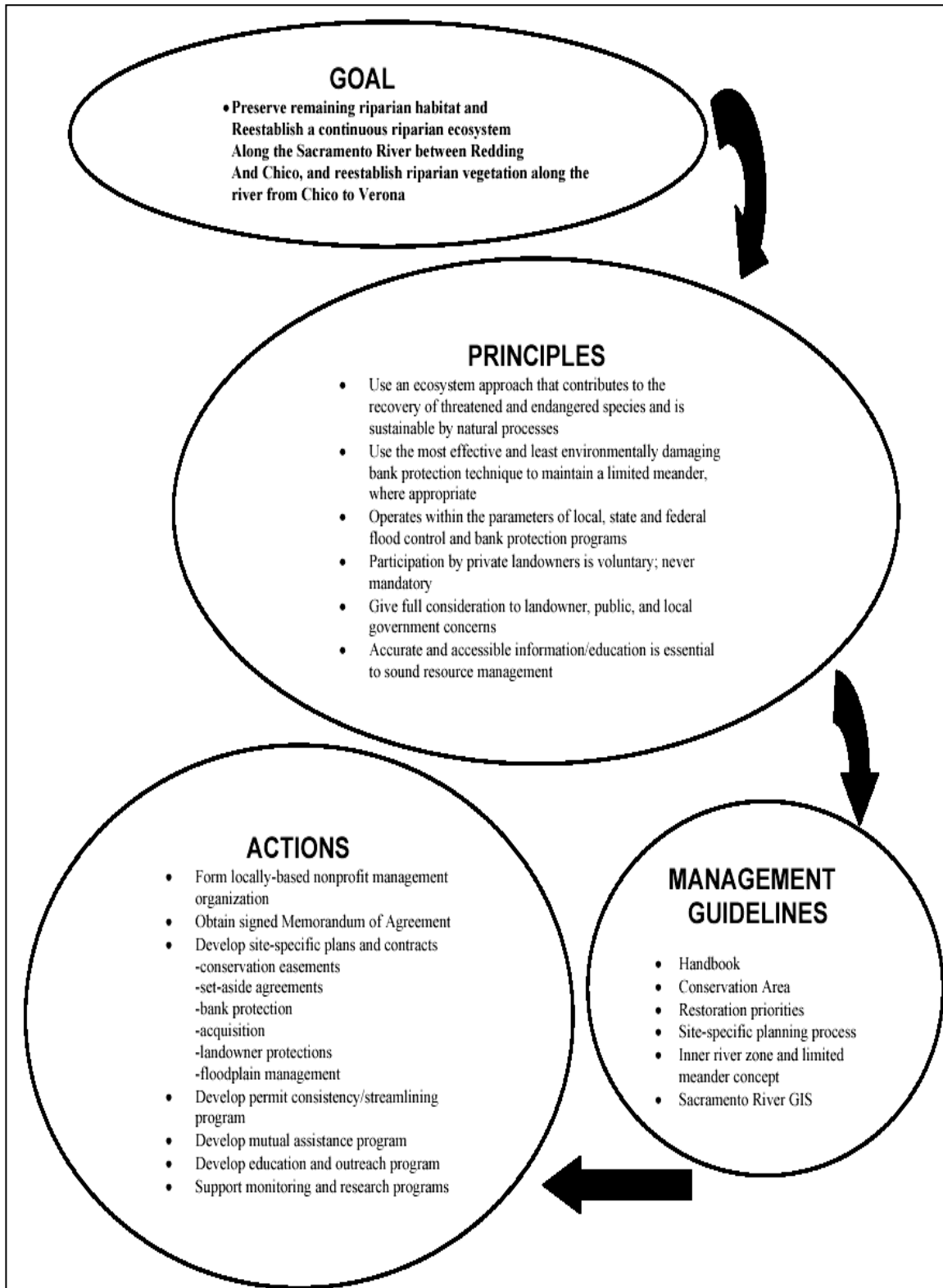


Figure 4. The Structure of the Sacramento River Conservation Area Program
Illustration from the Sacramento River Conservation Area Forum Handbook.

The Sacramento River corridor has been identified by TNC as well as many other private, academic and public entities as an unusually diverse ecosystem; a priority for plants and animals, including humans. TNC's approach to conservation along the Sacramento River is designed to accommodate both the human uses of the river (such as agriculture, flood control and recreation) and the natural resource benefits provided by the river.

The Nature Conservancy is one of many organizations and agencies working to restore the Sacramento River ecosystem. TNC works in partnership with landowners, the SRCAF, other local organizations and local, state and federal government agencies to implement practical conservation strategies in several key ways:

- Developing the best available scientific information to help guide conservation
- Planning for habitat management and restoration in concert with stakeholders
- Acquiring land for conservation; only from willing sellers
- Restoring native riparian habitat utilizing local agricultural contractors

Working with the SRCAF, TNC has developed subreach planning as a tool to involve local interests and other stakeholders in the planning of conservation actions along the Sacramento River. The overall Colusa Subreach Planning effort is managed from the TNC office at 500 Main Street in Chico, California. Further information regarding TNC is available online at www.tnc.org.

E. Public Engagement Plan

TNC and SRCAF initially agreed to form a partnership to conduct Colusa Subreach Planning in the summer of 2001 when the application for project funding was first prepared. Both entities recognized that there were concerns with habitat restoration that required open and cooperative interaction with all stakeholders. This joint agreement was further detailed the *Memorandum of Agreement Between the Sacramento River Conservation Area Forum and the Nature Conservancy Regarding the Colusa Subreach Planning Project (Memorandum of Agreement)*, in June of 2004. The *Memorandum of Agreement*, contained in Appendix A, specifies the shared commitments of both entities related to:

- The Goal and Objectives of CSP
- The responsibilities of both SRCAF and TNC
- Provision for a Steering Committee to direct the public outreach
- Provision for an Advisory Workgroup to provide representative stakeholder input

The *Public Engagement Plan for Colusa Subreach Planning*, contained in Appendix B, details plans for the various components of public outreach that will be a part of CSP. The Plan was developed with the project facilitator and approved by the Steering Committee. It is a blueprint to "Increase stakeholder involvement in realistic conservation strategies..." as stated in the CSP Goal. It describes multiple strategies and tools to engage a wide range of stakeholders in the planning process.

The central focus of the *Plan* is the Advisory Workgroup. The Workgroup includes representatives of local government, organizations and interest groups as well as representatives of the SRCAF and public agencies that are involved with conservation and flood control along the river. The membership of the Advisory Workgroup is noted on the inside cover of this Report. The following mission statement was adopted by the Workgroup at their initial meeting, on November 3, 2004.

To cooperatively determine practical strategies for conservation and restoration of wildlife habitat within the Colusa Subreach that minimize adverse economic impacts, are compatible with agriculture and local community needs, integrate with recreation needs and protect the integrity of the flood control system.

Other stakeholders will be engaged in Colusa Subreach Planning through landowner surveys, a website, public presentations, public meetings, workshops and newsletters as depicted in Figure 5.

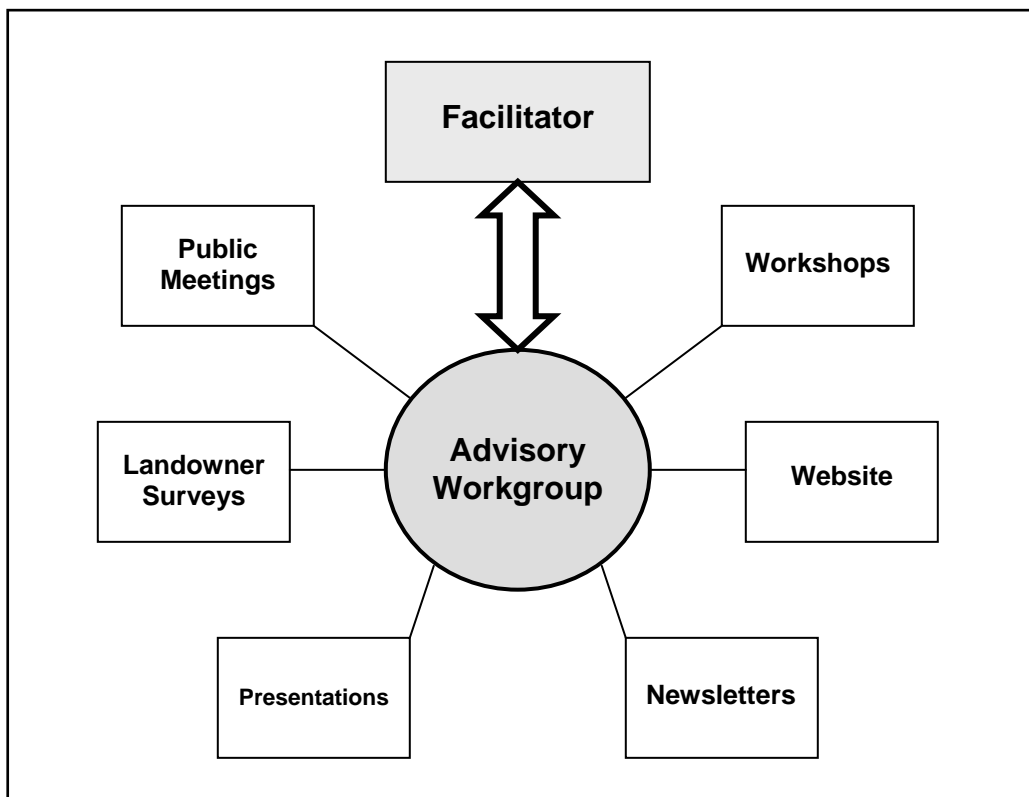


Figure 5. CSP Public Engagement Program

In conjunction with the initial commitment of TNC and SRCAF to the establishment of the partnership in 2001, TNC additionally committed to delay all habitat restoration activity within the Subreach until it could be planned as part of CSP. The intent was that all the restoration projects that were proposed at that time would be planned and considered comprehensively as part of the Colusa Subreach Planning process. It was anticipated that the ecosystem restoration strategy to be developed as part of CSP would also provide direction for other public access or habitat conservation projects that, while not planned at this time, might occur in the future.

II. EXISTING LAND USE PATTERNS

The Colusa Subreach was originally part of a riparian forest that was approximately five miles in width and extended along the floodplain of the Sacramento River. Within this landscape, the river continually meandered and constantly changed its channel location. It annually flooded during the rainy season and overflowed into the nearby Colusa and Butte Basins. The area supported a large and diverse population of wildlife including resident and migratory land animals and birds as well as resident and anadromous fish. The area was populated by Native Americans in a relatively dense pattern though their culture caused minimal impact on the area.

With Euro-American settlement, land use in the Subreach began to change. Over 90 percent of the original riparian forest was cleared, initially for steamboat fuel and lumber and later for agriculture (Golet et al, 2003). The current levee system was constructed in the early 1900's and the existing overflow weirs were added in the early 1940's. The resulting improvement in flood protection stimulated an expansion of agriculture outside of the levees and the riparian forest was soon reduced to the area inside of the levees. With the regulation of the flows afforded by Shasta Dam, additional area inside the levees was cleared for agriculture, resulting in the present pattern of land use in the Subreach.

The conversion of native vegetation to agriculture in Colusa and Glenn Counties resulted in substantial economic and social benefits to the area. The expansion of agricultural activity fueled the growth of towns such as Colusa and Princeton. The development of reliable irrigation systems also increased the range and yield of crops, adding to the prosperity of the area. The local economies in Colusa and Glenn Counties are based upon their agriculture production. The economic impact of these agricultural economies is further described in Chapter V.

The Colusa Subreach extends from levee to levee, from the Princeton Ferry site in the north to the Colusa Bridge in the south. The Planning Area includes approximately 5466 acres of land as well as the Sacramento River, which flows through the Subreach and provides its most dominate feature. More than half of this land is in natural riparian habitat although this is less than ten percent of the larger habitat corridor that originally existed along the river. The majority of the remainder of the Subreach is in agricultural use. There are no urban uses and there is no expectation that the area will be converted to urban use in the foreseeable future. This Chapter summarizes the mapping and analysis of existing land use patterns that was conducted to help provide a technical basis for subreach planning.

A. Existing Land Use

Land use in the Planning Area was determined through interpretation of aerial photography from the *1999 Sacramento River Aerial Atlas* with supplemental analysis from other available sources and field observation. Data was analyzed as part of a geographic information system (GIS) database. Figure 6 depicts the existing land uses in the Subreach and the estimated historical extent of riparian

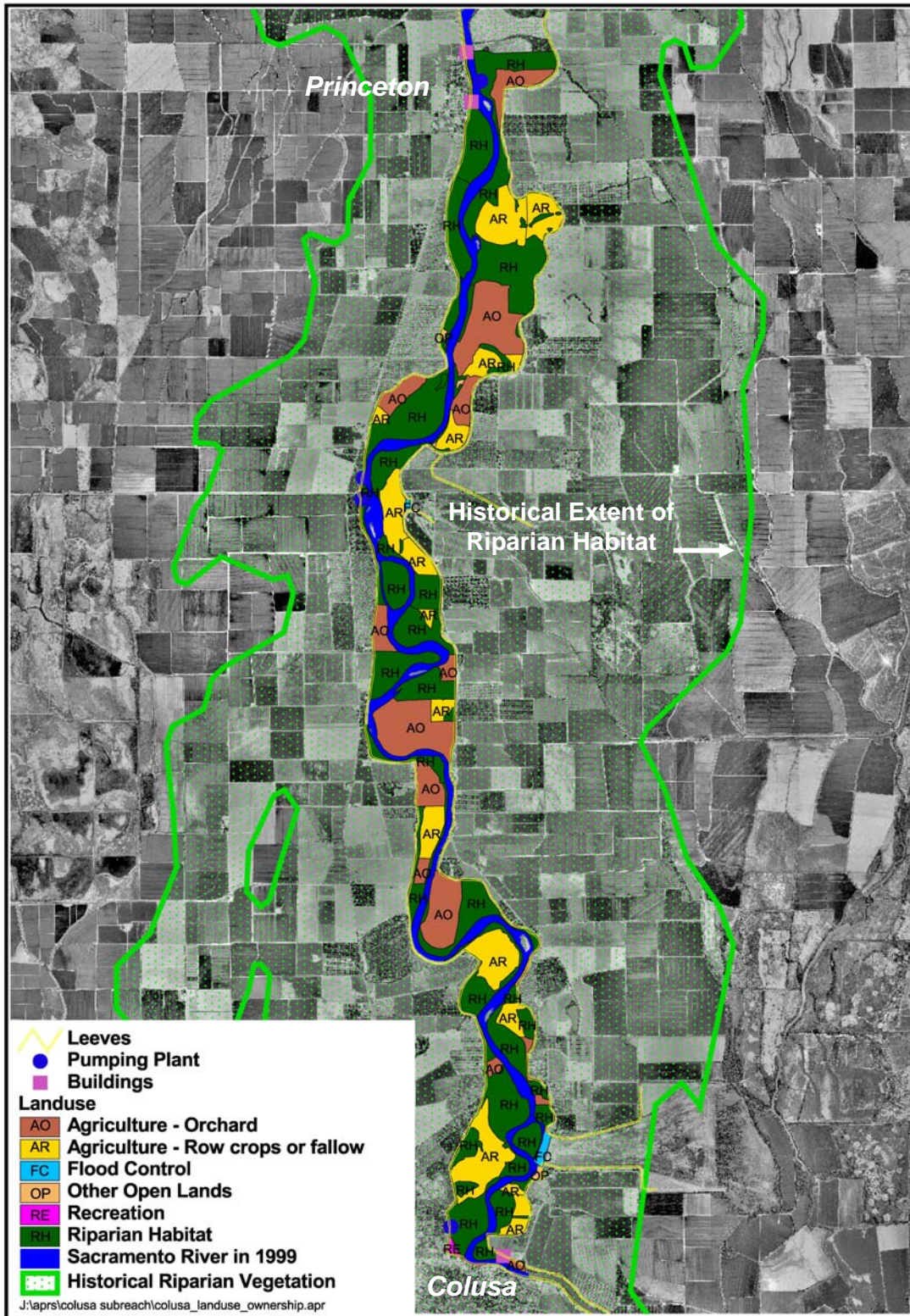


Figure 6. Land Use in the Colusa Subreach

Source: The Nature Conservancy & Greco, 1999

vegetation. The extent of the original area of riparian habitat was determined on the basis of soils characteristics by Steven Greco of UC Davis in 1999. Table 1 describes the existing land uses in the Subreach.

Table 1. Land Use in the Colusa Subreach

Land Use Category	Acres	Percent of Total Area
Agriculture – Orchard	1204	22%
Agriculture – Row Crops or Fallow	1163	21%
Other Open Area	23	0.4%
Riparian Habitat	3031	55%
Flood Control	25	0.5%
Water Supply	5	0.1%
Recreation	14	0.3%
Residential	1	0.1%
Total	5466	

Source: The Nature Conservancy

The following land use categories were used to describe the Colusa Subreach:

Agriculture-Orchard	Land planted to orchard crops
Agriculture-Row Crops & Fallow.....	Land planted to row crops or fallow, open crop land
Other Open Lands.....	Land that is open and not visibly in agriculture, habitat or other use
Riparian Habitat.....	Land that is devoted to riparian vegetation including gravel bars
Flood Control.....	Land devoted to weir structures and open, approaches to weirs
Water Supply.....	Land devoted to irrigation pumping and diversion facilities serving multiple properties
Recreation.....	Land improved for active recreation activities
Residential.....	Land devoted to residential dwellings

All land area figures in this Chapter, and this Report in general, should be considered as approximate because they are not based on a field survey of the Planning Area. They do, however, reflect relatively accurate figures that were derived through GIS analysis of aerial photography. The land areas were measured from the inside edge of the levees and do not include portions of properties that lie under the levees or outside of the levees. The figures also exclude the river surface at the flow rate of approximately 8,000 cubic feet per second, which occurred on the May 24, 1999, the date when the aerial photos for the 1999 *Sacramento River Aerial Atlas* were taken. For these reasons, property areas may not precisely match figures derived from County Assessor's maps or other record sources.

The two principal land uses in the Subreach are riparian habitat and agriculture. Together these two uses represent approximately 98% of the land area in the Subreach. Small portions of the Planning Area, totaling less than two percent of the area, are devoted to flood control water supply, recreation and miscellaneous open areas. Riparian habitat areas occupy about 3031 acres, or 55% of the Colusa Subreach. This compares to 44% habitat in the portion of the Sacramento River Conservation Area (SRCA) between Red Bluff and Colusa (SRCAF 2003). Habitat areas tend to be on lower elevation property that may have been less attractive, or

more expensive to utilize, for agriculture. Habitat areas are commonly in locations that have been within the meandering river channel during the past century.

Agricultural areas are divided into orchard (1204 acres or 22% of the total Subreach area) and row crops (1163 acres and 21% of the area). The percentage of the land devoted to agriculture, 43%, equals the figure for the portion of the SRCA that lies between Red Bluff and Colusa (SRCAF 2003). The orchards are almost entirely composed of English walnuts and prunes. The row crop areas are annually planted to a mix of crops including beans, safflower, wheat and other vegetables and grains.

Approximately 25 acres are devoted to flood control purposes at the Mouton and Colusa Weirs and 14 acres are devoted to water supply purposes at four pumping plants that each provide irrigation water from the river to multiple properties outside of the Planning Area. Approximately 14 acres are improved for recreation use at the Colusa-Sacramento River State Recreation Area and at the Colusa Levee Park, downstream of the Recreation Area. Two residential dwellings also lie along the crest of the levee with small yard areas extending inside the levee. The only building in the Planning Area, other than the small structures at the Colusa State Recreation Area, is a metal storage building that is across the river from Colusa.

B. Land Ownership

Land ownership in the Planning Area was determined through the review of the 2004 Colusa and Glen County Assessor's rolls and Assessor's Parcel Maps. The information was then transferred to aerial photography coverage from the 1999 *Sacramento River Aerial Atlas*. Data was incorporated into and analyzed using the Sacramento River Geographic Information System. Table 2 describes the land ownership in the Subreach and Figure 7 depicts the location of those uses. As noted previously, all acreage figures are unsurveyed and therefore approximate.

Table 2. Land Ownership in the Colusa Subreach

Ownership Category	Acres	Percent of Total Area
Private - Agriculture	2183	40%
Private -Habitat	1696	31%
Private - Other	5	0.1%
Private Conservation-Agriculture	184	3%
Private Conservation-Habitat	185	3%
Public - Habitat	1150	21%
Public - Other	63	1%
Total	5466	

Source: Colusa and Glen County Assessor's Office records

The land use categories were utilized to describe the Colusa Subreach:

- Private-Agriculture..... Land owned by private entities in agricultural use
- Private-Habitat..... Land owned by private entities in riparian habitat
- Private-Other..... Privately-owner land not in either agriculture or riparian habitat
- Private Conservation-Ag..... Land owner by a private conservation organization and devoted to agriculture
- Private Conservation-Habitat.. Land owner by a private conservation organization and in riparian habitat

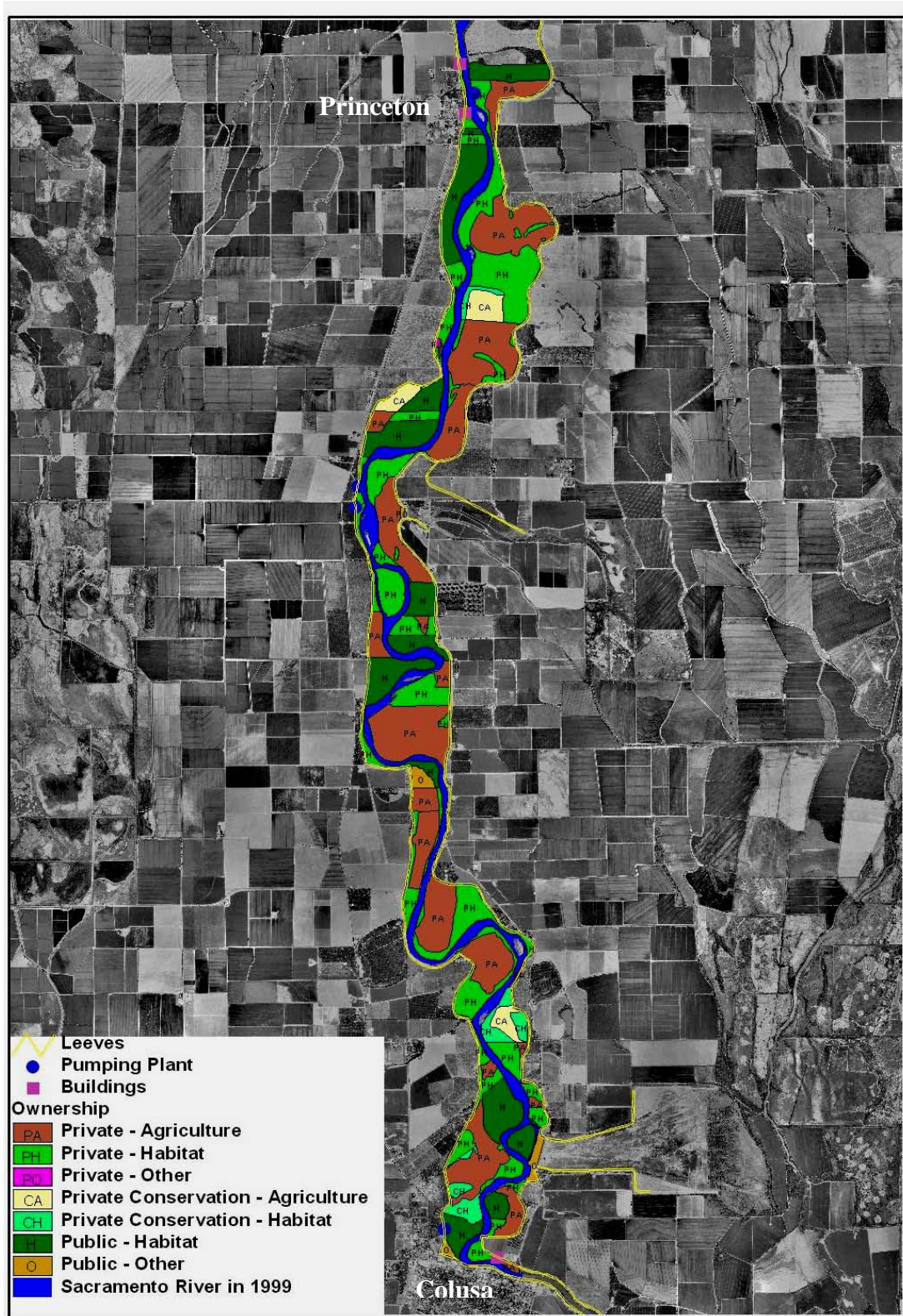


Figure 7. Land Ownership in the Colusa Subreach
 Source: Colusa and Glen County Assessor's Office records

Public-Habitat..... Land owned by a public agency in riparian habitat
 Public-Other..... Land owned by a public agency that is not in
 riparian habitat.

Approximately 78% of the land in the Colusa Subreach is in private ownership and about 22% of the land is in public ownership. The percentage of private ownership is slightly greater than that in the Red Bluff to Colusa portion of the SRCA where approximately 72% is privately owned and 28% is publicly owned (SRCAF 2003). The Private ownership category includes 3,884 acres owned by 78 different owners, of which, 56% is devoted to agriculture, 44% is in riparian habitat and less than one percent is in other miscellaneous uses. A second category of private ownership is Private Conservation, which represents the 369 acres owned by The Nature Conservancy. This land is evenly divided between habitat and agriculture.

Public ownership totals 1,213 acres and it is composed of 95% habitat and 5% other uses including recreation, water supply and flood control. Public agencies managing land within the Subreach include four local agencies, three State agencies and one federal agency. Table 3 list the area the public lands by managing agency and Figure 8 depicts the location of the public lands in the Colusa Subreach. Acreage figures in Table 3 are rounded to the nearest whole number.

Table 3. Public Lands in the Colusa Subreach

Public Agency	Number of Sites	Acres
City of Colusa	1	<1
County of Colusa	2	11
Rec. District 1004	1	4
Maxwell Irrigation. District	1	<1
CA Dept. of Fish and Game	7	905
CA Dept. of Parks and /Recreation	1	95
Sac. & San Joaquin Drainage Dist.	1	161
US Bureau of Indian Affairs	1	37
Totals	15	1213

Source: Colusa and Glenn County Assessor's Offices and The Nature Conservancy

The State of California also holds three conservation easements in the Subreach ,which total 188 acres, that are administered by the Department of Fish and Game. These easements apply to privately-owned property and do not include the right of public access. One of the three sites is entirely in riparian habitat and the easement provides for permanent maintenance of the habitat. The other two easements apply to property that is partially in riparian habitat and these easements include the potential of converting the remaining land to wildlife habitat. Consistent with the Department's policy, these conservation easements are not mapped or located in this Report in order to help protect the property rights of the landowners.

The three conservation easements were purchased in the 1990's from willing sellers for the fair market value of the property rights that were transferred on the basis of competent appraisals. Conservation easements involve the transfer of certain, specified property rights. The landowner retains fee title ownership of the property and all the property rights that are not sold as part of the transaction. The provisions of conservation easements can vary depending on the objectives of the transaction parties. Generally, conservation easements commit the landowner to maintain the

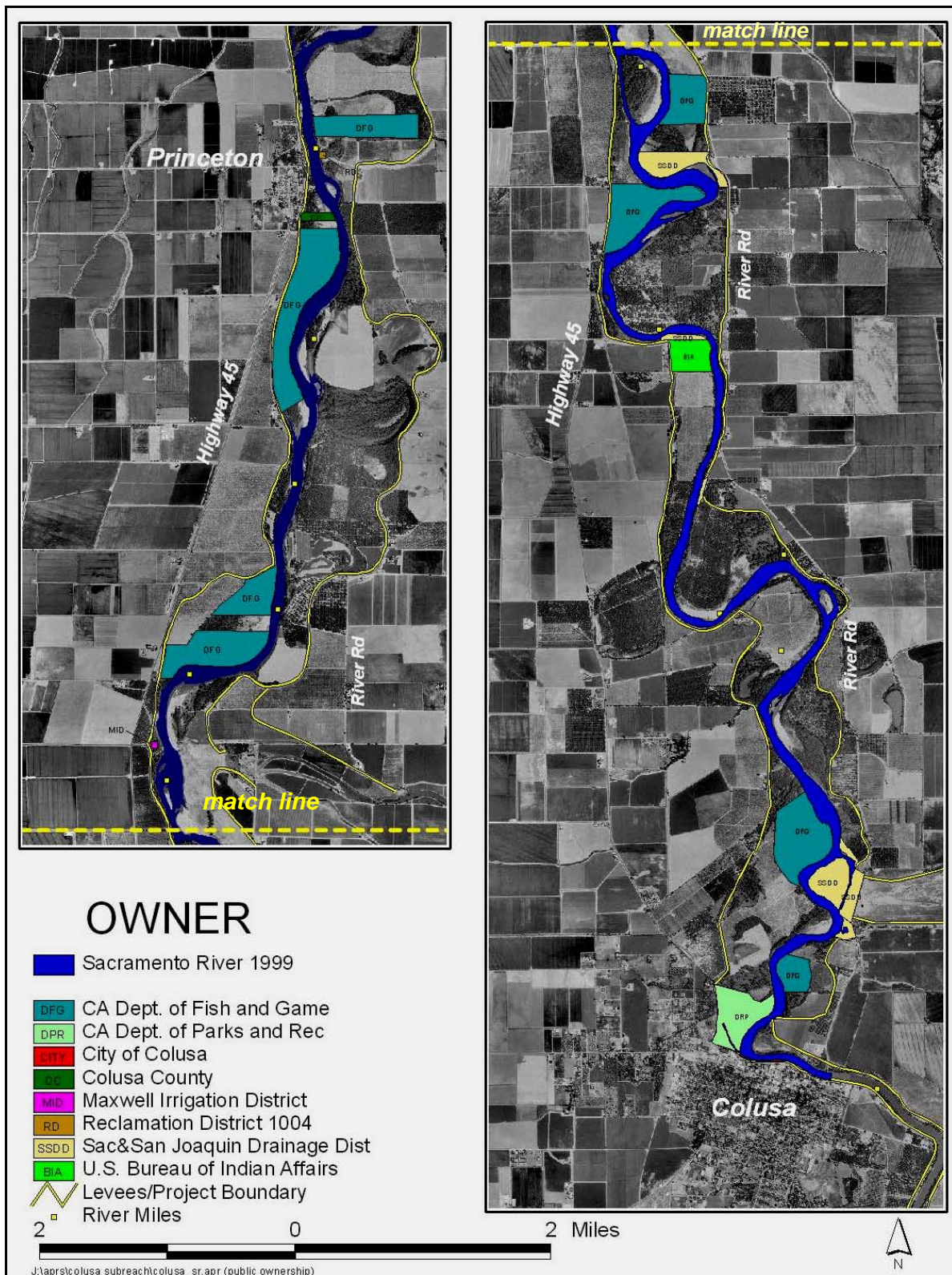


Figure 8. Public Lands in the Colusa Subreach
 Source: Colusa and Glen County Assessor's Office records

habitat value of the subject property. For example, a property that is in riparian habitat would typically be kept in that habitat under a conservation easement. Such easements may also permit continuation of agricultural use, commonly subject to the provision that the land not be developed for more intensive use with a lower habitat value. All transferred rights, which become permanent binding limitations on the fee title ownership, are specified in the easement deed. The holder of the easement is normally given the right to access the property and verify that the easement provisions are being met.

C. Recreation Use and Facilities

Recreation is a common secondary use of the riparian habitat and, to a lesser degree, agricultural areas. The most common recreation uses are hunting and fishing although birding, hiking, camping, boating, photography, beach activities and environmental education occur frequently. Recreation use of private land is subject to the owner's permission and the use of public land is dependant on the use and regulations established by the managing agency. One private property owner near Princeton does reportedly permit public use such as boat launching on a fee basis.

The majority of the public land is specifically open to public use by State law or agency regulations. This includes the approximate 1000 acres managed by the California Department of Fish and Game (CDFG) and Department of Parks and Recreation (CDPR). The small, City-owned Colusa Levee Park is also open to the public. The CDPR land, the Colusa-Sacramento River State Recreation Area, is accessible from public roads and from the river. One of the CDFG sites, the Princeton-East Unit of the Sacramento River Wildlife Area, has public road access. The other six Wildlife Area sites do not have public access rights-of-way and they are accessible only from the river. The remaining six public properties are not specifically managed for public access.

The only substantive recreation improvements in the Colusa Subreach are adjoining the City of Colusa at the Colusa-Sacramento River State Recreation Area. Improvements include a boat ramp, parking, restrooms and a campground. The boat ramp is located on a side channel about fifteen hundred feet away from the main river channel. The channel between the boat ramp and the river is subject to siltation and requires frequent and expensive dredging to be kept open. During low flow periods the channel is often closed and the boat ramp is not usable. A local committee, supported by the City of Colusa, investigated this problem. Desired characteristics of a boat ramp site were that it not require complete new support facilities, be in close proximity to local businesses and not be seriously impacted by future channel meander. The State Department of Water Resources assisted this effort with an analysis of the hydraulic and geomorphologic characteristics of the area.

The City of Colusa City Council recently selected a site for a new boat ramp. It is located on City property that adjoins the river, at the mouth of the channel that connects to the current boar ramp. It is anticipated that construction funding will be requested in the future from either the California Department of Boating and Waterways or the Wildlife Conservation Board. It is also anticipated that the California Department of Parks and Recreation will maintain the relocated boat ramp facility.

D. Local Land Use Standards

The Colusa Subreach includes land within both Colusa and Glenn Counties. The portion of the Planning Area from RM 162 to 164.5 on the east side of the river is in Glenn County and the remaining majority of the Subreach is in Colusa County. All of the Glenn County area is unincorporated. Only a very small portion of the Colusa County area, a small strip, along the base of the levee, is within the City of Colusa. The remaining area in Colusa County, including the community of Princeton, is unincorporated area. For all practical purposes, the two counties administer the local land use controls within the Colusa Subreach.

Glenn and Colusa Counties have both adopted general plans and zoning ordinances to maintain basic land use controls. The Glenn County General Plan designates its respective portion of the Planning Area as "Intensive Agriculture" and the zoning district applied to the area is "AE-40" which establishes a minimum parcel size of forty acres. The Colusa County General Plan designates the majority of the Planning Area as "Designated Floodway" with the "Floodway" zoning district applied to the area. A small portion of the Planning Area, which includes the existing State Recreation Area and the Colusa Levee Park, are designated "Parks and Recreation" on the County General Plan. The existing general plan designations and the zoning preclude urban development within the Planning Area. The existing uses within the Planning Area (agriculture, habitat, flood control, water supply and recreation) appear to be consistent with the existing, local land use controls.

The Planning Area is also located entirely within the mapped area of the 100-year flood as established by the Federal Emergency Management Agency (FEMA). This FEMA designation is implemented through local floodplain management ordinances. These ordinances essentially preclude urban or otherwise intensive development inside of the flood control levees. This status is further strengthened by the jurisdiction of the State Reclamation Board, which has authority to review all substantive development within the flood control levees.

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III. THE SACRAMENTO RIVER

The Sacramento River is the largest river in California. It drains a watershed of over 24,000 square miles, most of which lies above the Colusa Subreach. The river receives annual runoff of over twenty-two million acre feet of water and contributes 80% of the fresh water that flows to the Sacramento-San Joaquin Delta. It provides water to farmers in Northern and Central California and cities in Northern, Central and Southern California. Its water sustains the agricultural economy of the Sacramento Valley and it is vitally important to the communities in the Colusa Subreach.

The River also sustains the riparian ecosystem that includes the riparian plant communities, the animals that have adapted to those communities and the animals that utilize the aquatic habitats the river provides. The river is the single greatest source of salmon caught off the California coast. It also sustains public recreation activities, such as hunting, fishing, birding and boating that are enjoyed by thousands of people each year. In short, the Sacramento River is many things to many people and important to all of California.

A. Hydrology and Geomorphology

Stream flow is the primary controlling variable affecting the riverine (related to or formed by the river) environment in the Colusa Subreach. The natural disturbance regime of the river, the intra and inter-annual variability in the flow patterns and all of its associated physical processes are the factors largely responsible for the mosaic of riparian vegetation communities along the river. In the Colusa Subreach, and along the river in general, the preservation and restoration of these physical processes has been identified as the key to successful long-term restoration and maintenance of the riparian ecosystem.

Channel Movement - The processes of channel meander and avulsion are the dominant process that shape the floodplain and associated natural communities along an alluvial river such as the Sacramento River. Meandering involves the river channel migrating laterally through the floodplain, eroding materials on the outside (concave side) of a bend in the channel creating nearly vertical cut banks, while at the same time depositing materials on the inside (convex side) of a bend creating point bars. This combination of erosion on the outside of bends and deposition on the inside results in the familiar meander form when seen on a map or aerial photo. Figure 9 depicts a typical bend on the river. Over time, this continual process of erosion and deposition creates new floodplain area and provides a variety of ecosystem niches for the associated riparian species.

Channel avulsion also creates a dynamic variety of landforms that sustain natural communities along the river. Although channel avulsion is a complex process, it can be described simply as the channel cutting off a bend that has become too tight to maintain. When a meander bend becomes too tight of a turn for the river to maintain, the river will create a straighter path for itself.

Recent analysis has identified at least a third of the riparian communities on the Sacramento River result from this process (Greco, 2000).

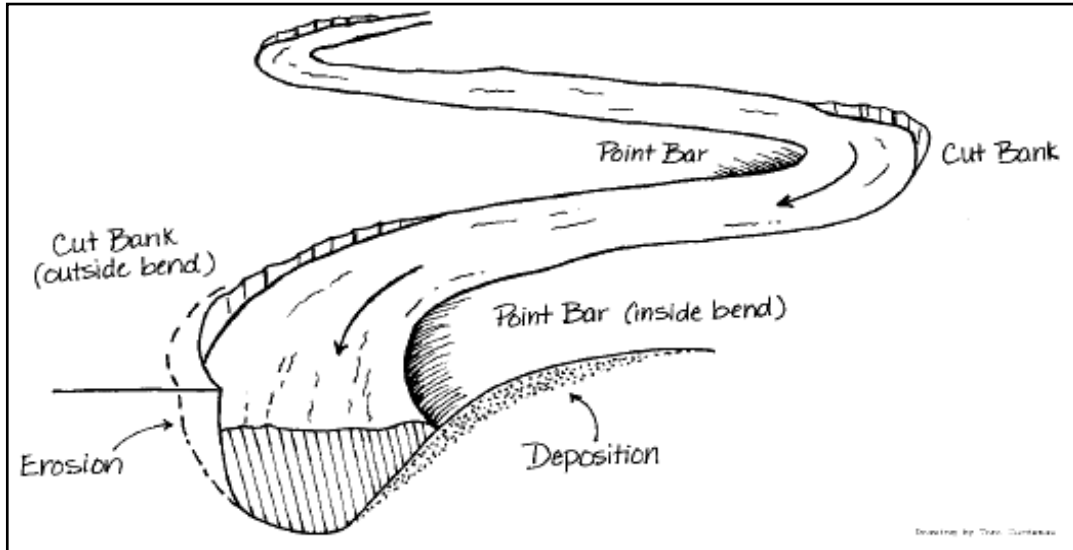


Figure 9. Typical Bend on the Sacramento River

Illustration from the Sacramento River Conservation Area Handbook.

This process leaves evidence on the floodplain in the form of oxbow lakes and sloughs. A slough results from a relatively recent avulsion, where the channel has filled one end in with sediment, generally the upstream end, leaving the bottom or downstream end connected to the river. As more time passes, this bottom end eventually fills in as the river channel moves away from it creating an oxbow lake.

Within the meander belt of the river, the constant movement of the channel can greatly change the configuration of property. Figure 10 depicts the change that has occurred at RM 183 just south of the Ord Bend Bridge. The main river channel moved approximately one mile to the west between 1896 and 1908 as the result of avulsion. An oxbow lake, known as "The Lagoon," resulted from this sudden shift in the channel location. Since that time, the river has moved progressively east, eroding and redepositing the land in that area. Similar, substantial changes in the river channel location and the resulting reconfiguration of the adjoining land areas have occurred throughout the Colusa Subreach.

This constant changing of the channel can, however, result in impacts to flood control and infrastructure improvements within the Subreach and to the agricultural use of the adjoining land. Movement of the channel can render costly improvements such as pumping plants ineffective if the river moves away from the intake location. A related problem is that channel movement can result in changes to the velocity of the flow, which can impact the effective operation of some fish screen systems. Major changes in channel location can also impact the utility of bridges and boat ramps. Likewise, channel meander can result in

the loss of agricultural cropland as the river erodes into orchards or row crop land located on the outside of bends.

A 150 year meander belt has been described and mapped by the Department of Water Resources for the Sacramento River. This meander belt includes the location that the river channel has occupied in the last 100 years (moving both through meander and avulsion), and where it is projected to occupy in the next 50 years. Channel movement can be either incremental or more sudden and this is controlled by the interaction of many complex physical factors. Therefore, the 50-year projections while approximate are still of great value for large-scale planning. Within the Colusa Subreach, the 150 year meander belt is entirely located within the flood control levees and, therefore, within the Planning Area.

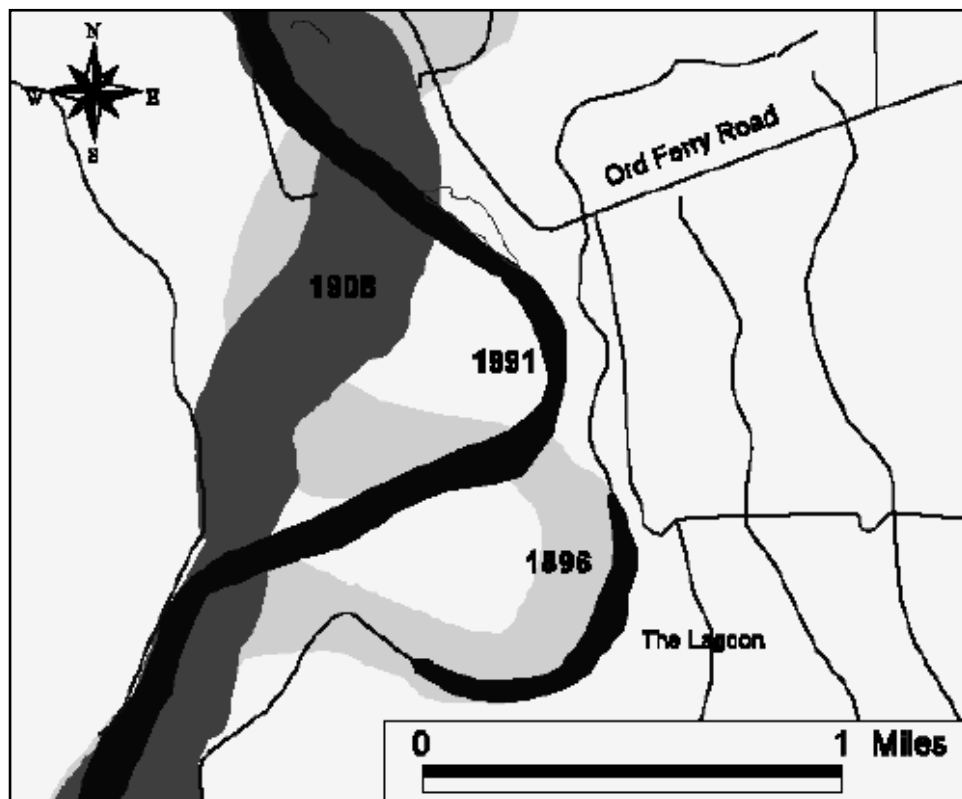


Figure 10. River Channel Movement at RM 183

Illustration from the Sacramento River Conservation Area Handbook.

This combination of gradual meander and sudden avulsion occurs differentially within the Subreach and the river corridor in general. Different soils along the river offer differing resistance to channel movement and, as a result, the river channel is actively moving in some areas and relatively static in other areas. Soils that are highly resistive to channel movement are referred to as geologic control. The presence of these geologic controls results a differential pattern of channel movement. Figure 11 depicts the historical movement of the river channel in the Colusa Subreach. Channel locations from 1896, 1937, 1960, 1976 and 1999 are shown to demonstrate the range of channel movement that

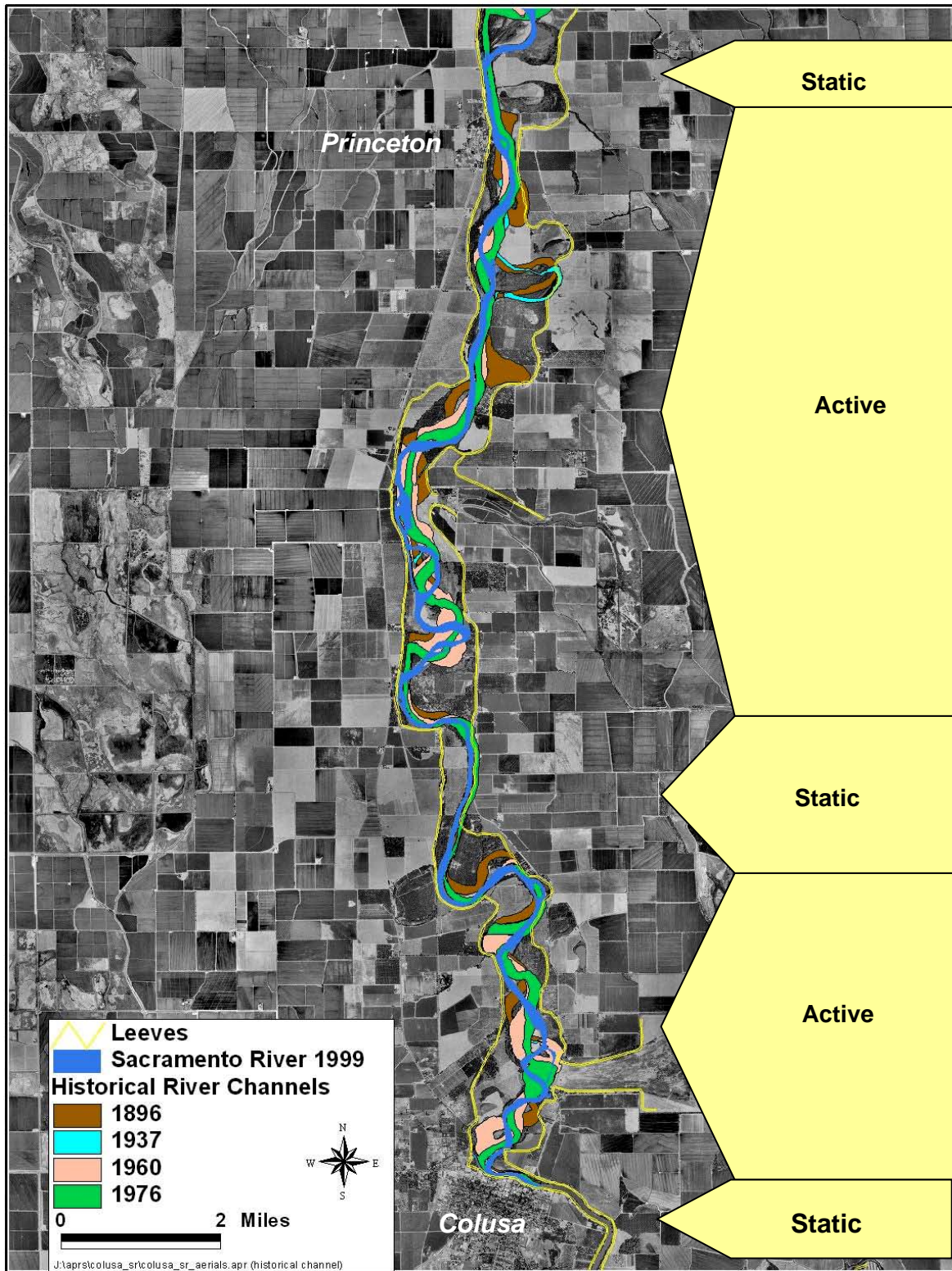


Figure 11. Historic Channel Movement
 Source: Sacramento River Geographic Information System

has occurred. Figure 11 also generalizes this channel movement to differentiate where the channel has been historically active and static during the 20th Century.

Bank Protection – As noted previously, the natural movement of the channel can be disruptive to adjacent improvements and land uses. Land areas on one side of the river can be reduced and land areas on the opposite side of the channel can be increased. In response to this natural process, revetment, which is often referred to as bank protection or armoring, has been installed along portions of the middle Sacramento River in an effort to protect substantial investments such as levees, pumping plants, fish screens, buildings, orchards, bridges, other public improvements and adjacent land uses. Within the Colusa Subreach, revetment has been installed along approximately 20% of the river bank in an attempt to limit erosion and the resultant movement of the river channel. Almost all of this revetment has been installed to limit erosion where the river is adjacent to the levee system. Figure 12 depicts the location of revetment within the Subreach as mapped by the California Department of Water Resources. This revetment was primarily installed through state and federal projects.

Bank protection typically involves stripping away existing vegetation and replacing it with riprap, a covering of large rocks or concrete rubble, set at a relatively steep angle to the channel. This alters the rate of channel movement both upstream and downstream. It often, however, relocates and modifies patterns of erosion, but does not completely halt erosion. When the channel migration process is frozen in place at one bend by bank protection, the bend downstream or across the river may erode more rapidly than it would have otherwise (Sacramento River Conservation Area Forum, 2002). Agencies such as the Army Corps of Engineers are attempting to develop analysis that will take offsite impacts into consideration when formulating new bank protection projects and the related mitigation actions that are required. In the past, however, the full offsite and ecological impacts of revetment were generally not considered.

Bank protection has also been shown to have substantial, negative impacts on wildlife, especially fish species. Site-level impacts occur that are directly related to the loss of vegetation and habitat where the bank protection is installed. An example is the loss of the cut banks that are required for bank swallow nesting. Substantial, reach-level impacts also occur. Bank protection halts the formation of new riparian forest and alters the sediment transport regime, a primary driving force in the overall ecological balance of the riverine ecosystem. Another major impact is the loss of large woody debris, a key component of fishery habitat, in the river downstream of the riprap (U.S. Fish and Wildlife Service, 2000). Because of these negative impacts, the placement of new revetment often involves a requirement to appropriately mitigate the negative impact on special-status species such as bank swallows and anadromous fish.

Revetment, which is intended to fix the river in a relatively permanent location, involves a conflict of societal values. The need to protect levees from erosion is a priority given the great importance of the flood control system. Also, given the high cost of infrastructure along the river, there is a

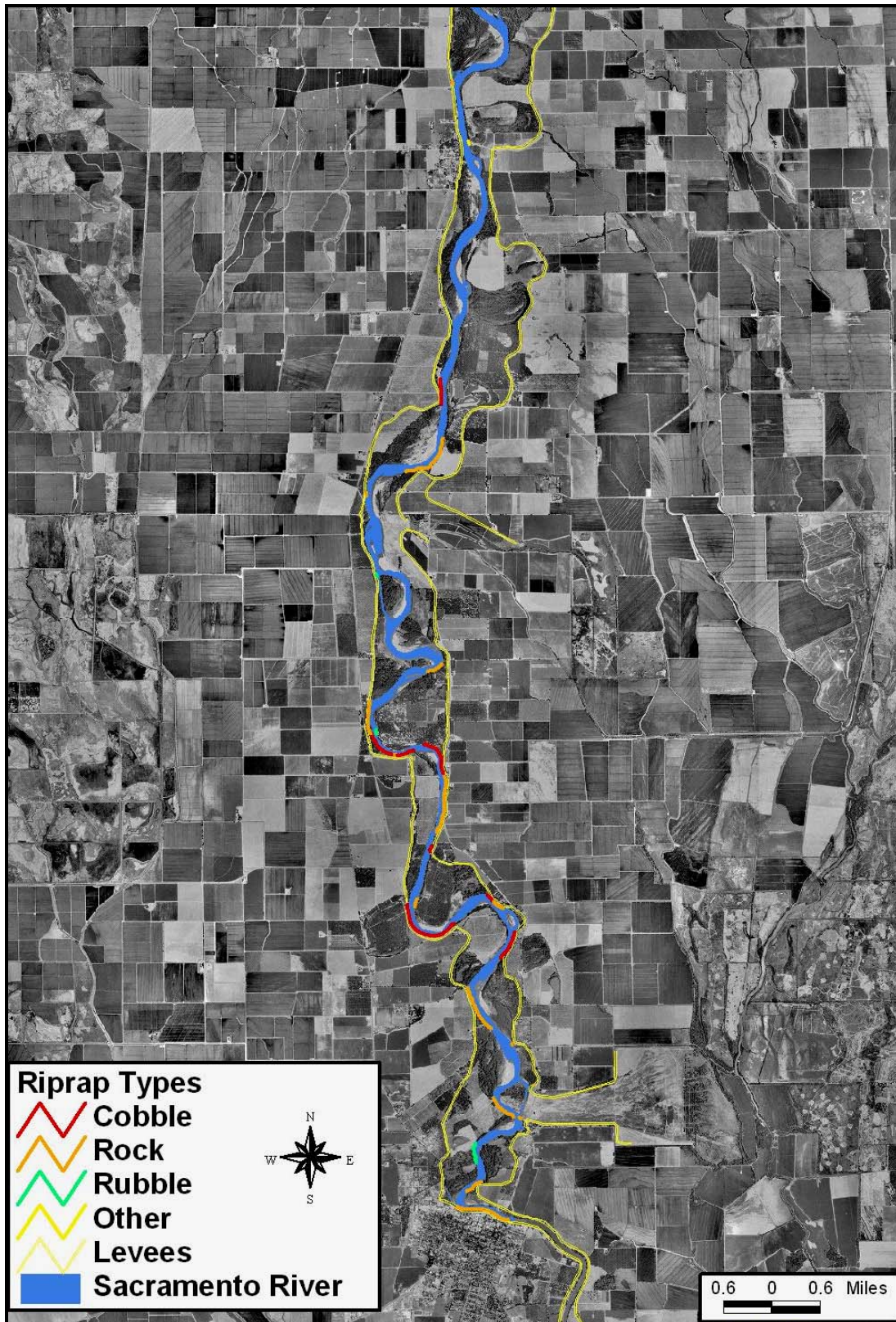


Figure 12. Location of Bank Protection in the Colusa Subreach

Source: California Department of Water Resources

need to maximize the utility and service life of public and private investments. On the other hand, there is a large body of scientific research that documents that the covering of river banks with rock and the stalling of channel meander is very disruptive to the natural systems and directly contributes to the loss of animal species including several Threatened and Endangered Species. In recent years, the general response to this dilemma has been to limit new revetment to locations that are required to protect the flood control system or protect major public infrastructure investment.

Sediment Transport – Sediment transport is the process that supplies the source of materials for land and habitat building. The river works as a conveyor of sediment, transporting materials eroded from upper reaches and depositing them in lower ones. Material transported by the river includes various sizes of rock material, soil, fine vegetative matter and large woody debris. This material is generally deposited on the inside of meander bends, but it is deposited over a larger area of the floodplain in conjunction with flood flows.

The construction of Shasta Dam in the mid 1940's reduced the contribution of sediment from the upper portion of the watershed and modified the natural sediment transport regime. The exact status of the river in terms of sediment transport and balance is a matter of some scientific uncertainty, and additional research and information is needed before management conclusions can be drawn.

Flow Variation and Flooding – The flow regime of the Sacramento River has been substantially changed from the natural situation. Naturally, the river had a pattern of high flows during the winter, rainy season and during the spring when a combination of rain and snowmelt from the higher portions of the watershed generated heavy runoff. Extreme flood flows occurred during these portions of the year. During the summer and early fall, flows diminished to annual, low levels. Upstream regulation, principally by Shasta Dam, has modified the flow regime by greatly reducing the wet season flows and greatly increasing the summer flow levels. High flows during the wet season are stored at Shasta Dam and released during the summer to meet water supply demands for agriculture and municipal uses.

Most of the Planning Area is a low-lying portion of the floodplain that is inundated every year or two on average. For example, most if not all of the Subreach was inundated by the flows that occurred on February 18, 2004. All of the Subreach experiences flooding at least every five years. Figure 13 depicts the frequency of flooding in the Colusa Subreach, as detailed in the Sacramento River GIS. It is important to note, however, that the one and two year inundation designations are based on modeling, which does not incorporate minor elevation differences. Therefore, the diagram should be taken as illustrative of overall flooding patterns, but not as a precise delineation of inundation frequency for specific sites.

Flooding and flow variation are important factors in the creation and maintenance of riparian habitat. While Shasta Dam has substantially regulated the flow regime of the river from its natural conditions, the river still retains some

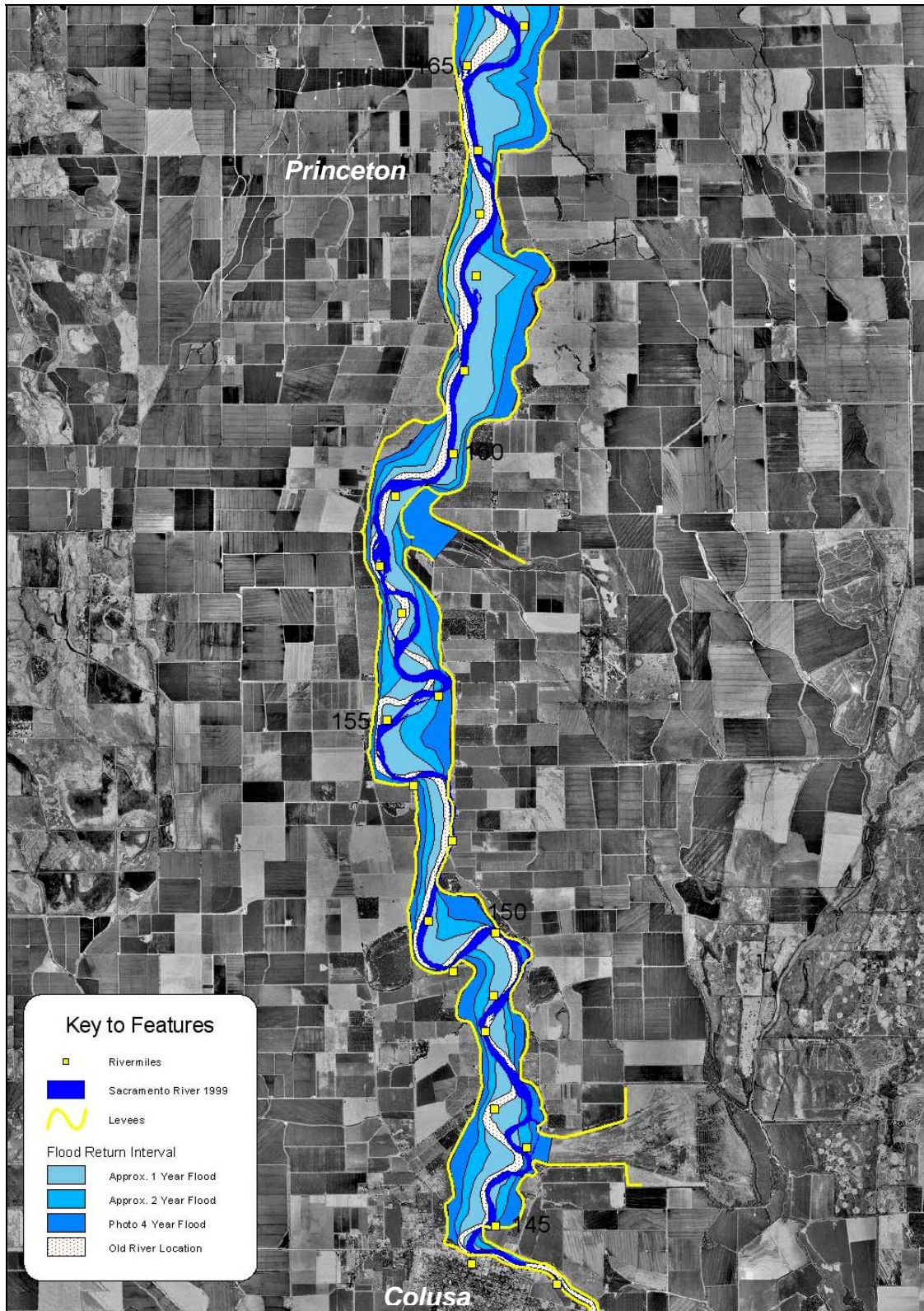


Figure 13. Inundation Frequency in the Colusa Subreach

Source: Sacramento River Geographic Information System



Flooding of the Boggs Bend Area on February 18, 2004

degree of natural flow variability. There are substantial unregulated tributaries below the Dam, which significantly contribute to the present-day flooding and flow regime patterns. Although many aspects of the flow regime have been altered (such as the frequency, magnitude, duration, timing and rate of change) flooding as an important natural change agent has not been eliminated within the levee system. In part, it is this level of natural process and the resulting ecological function that makes the Colusa Subreach important for ecosystem restoration.

Flood flows within the Subreach deposit sediment over the portion of the floodplain that is inundated, building up the level of the land. The sediment also provides mineral and vegetative matter to create and enrich the soil that sustains riparian vegetation. The plants that form the mosaic of riparian habitat have selectively adapted to and depend on this flood regime. Flooding also carries essential nutrients and organic matter to the river and in so doing benefits fish and other aquatic species. Higher flood flows can also impact the floodplain through erosion. This occurs along the outer edge of channel meanders and through the scouring of the area between meanders. The rate and intensity of this erosion is variable and it is affected by the several factors including soil characteristics, vegetative cover and the velocity of the flow.

Concurrent with the evaluation of future water storage and supply options in the Sacramento River watershed, there are studies ongoing that are intended to identify flow regime options that can better support plant and animal life along the river. The intent is to foster flow regimes that support both the river's ecosystem and the demands for irrigation and municipal water supply. A point raised during the CSP public outreach was that some local interests are concerned that flow regime changes could effect flood control water supply considerations.

B. Sacramento River Flood Control Project

All uses in the Colusa Subreach must be considered in the context of the Sacramento River Flood Control Project. The Army Corps of Engineers completed the Project in 1968 and system maintenance is under the jurisdiction of the Reclamation Board with the funding and maintenance provided by a combination of the State Department of Water Resources and local districts. The *Sacramento River Conservation Area Forum Handbook*, Chapter 2, contains an overview of the Sacramento River Flood Control Project. Material within this section is adapted from the *Handbook*, from *Battling the Inland Sea*, by Robert Kelly, a historical account of flood control in the Sacramento Valley, and other available sources.

History - The Colusa Subreach flooded annually as flows generated by upstream rain and snowmelt exceed the capacity of the river channel. This pattern resulted in the channel and the adjoining land being built up higher than the lands to the east and west. Flood flows spilled from the river to these lower lands, the Butte Basin on the east and the Colusa Basin on the west, through distributaries channels such as Cheney and Drumheller Sloughs. These basins held water into the summer until a combination of drainage release to the south and evaporation dried the areas. The majority of the flood flows left the river channel north of Colusa and as a result, the river channel downriver from Colusa had a substantially reduced flow capacity.

Initial levees in the Subreach were constructed in the 1870's by local Reclamation Districts. For the next forty years, individual districts in the Subreach and throughout the Sacramento Valley attempted to control annual flooding by constructing ever-higher levees in the hope of limiting flood flows to the river channel and precluding outflow into the basins. These levee systems were not coordinated and often levees on one side of the river resulted in increased flooding across the river or upstream. Ultimately, a series of disastrous floods made it clear that a comprehensive flood control system that included restoration of outflow into the adjoining basins was required. In 1917 the US Congress authorized the Sacramento River Flood Control Project. The project was constructed in increments that included the rebuilding and heightening of some locally-built levees and managed overflow from the main river channel. In the early 1930's, the Moulton and Colusa Weirs were opened to permit major diversion of flood flows from the Subreach into the Butte Basin. By the mid 1940's the Project was able to regularly provide regular flood protection to the lands outside of the levees and the planned overflow areas.

The Existing System - The Sacramento River Flood Control Project was designed to provide flood damage reduction for 800,000 acres of agricultural land as well as the urban areas located in the floodplain. The system was also designed to increase the sediment transport capacity of the river in order to flush out large quantities of debris resulting from gold mining activities in the surrounding mountains. Overall, the Flood Control Project mimics the spatial patterns of natural historic flood flows with a complex system of levees, weirs for diversion of floodwaters, off-stream floodways and channel modifications. The Flood Control Project levees begin in the vicinity of the Ord Ferry Bridge (RM 184) and extend downstream to the mouth of the river.

The Flood Control Project is assisted by the regulation of flood flows that is afforded by Shasta Dam on the Sacramento River and, to a lesser degree, by Black Butte Dam on Stony Creek. Shasta Dam has storage capacity of 4.5 million acre feet, of which 1.3 million acre feet are dedicated to flood control. Shasta controls the runoff from the upper 6,420 square miles of the watershed and it substantially limits flood flow contribution from the upper watershed. The river, however, receives unregulated flows from major tributaries below Shasta Dam that drain the east and west sides of the Sacramento Valley. These flows, as well as occasional high releases from Shasta Dam, result in flows in the Colusa Subreach that still exceed the capacity of the channel on an annual basis.

Within the Colusa Subreach, the Flood Control Project is designed to limit river-related flood damage by restricting design flows to the area inside the levees. Figure 14 depicts the key features of the Flood Control Project in the Colusa Subreach. The channel in the northern portion of the Subreach has design flow of 150,000 cubic feet per second (cfs). The levees north of Colusa are often set back several thousand feet, on one or both sides of the river, such that the total levee-to-levee width of the floodway is over a mile in several sections of the Subreach. This total floodway width, however, varies greatly and in three locations the width is reduced to less than 2000 feet. At its narrowest point, about RM 153, the floodway is only about 1,250 feet wide.

The Project utilizes three natural overflows north of the Subreach (M&T, Three B's and Goose Lake) as well as two major overflow structures in the Subreach (Moulton Weir and Colusa Weir). Together these five diversions are designed to transfer about 70% of the river's flood flow east to the Butte Basin. The Moulton Weir has a design flow of 40,000 cfs and the Colusa Weir has a design flow of 60,000 cfs, equaling a total diversion of 100,000 cfs from the river. This diversion is designed to accommodate the reduction in the floodway width and capacity that occurs from the City of Colusa southward. The levees from Colusa southward are generally adjacent to the river bank and the design flow for the channel is reduced to 65,000 cfs. All flow figures in this section are taken from the *Handbook*, Figure 2-14.

System Maintenance – The flood control system is maintained by multiple entities. These include the U.S. Bureau of Reclamation which operates Shasta Dam and the U.S. Army Corps of Engineers (USACE) which operates Black Butte Dam. The levee system is maintained by a combination of local and state agencies with annual funding coming from both local and state sources. The California Department of Water Resources (CDWR) is responsible for maintenance of the weirs and bypass channels.

Within the Colusa County portion of the Subreach, levee maintenance is performed by CDWR. Funding for maintenance on the west side of the river comes from local assessments that are collected by Colusa County pursuant to a Maintenance Area. Funding for the east side of the river comes from the State General Fund. The portion of the Subreach within Glenn County has levee maintenance performed by Levee District No. 3, an independent local district funded by property tax.

Levee maintenance generally includes vegetation and rodent management on the levees, minor levee repair and limited vegetation and debris removal inside

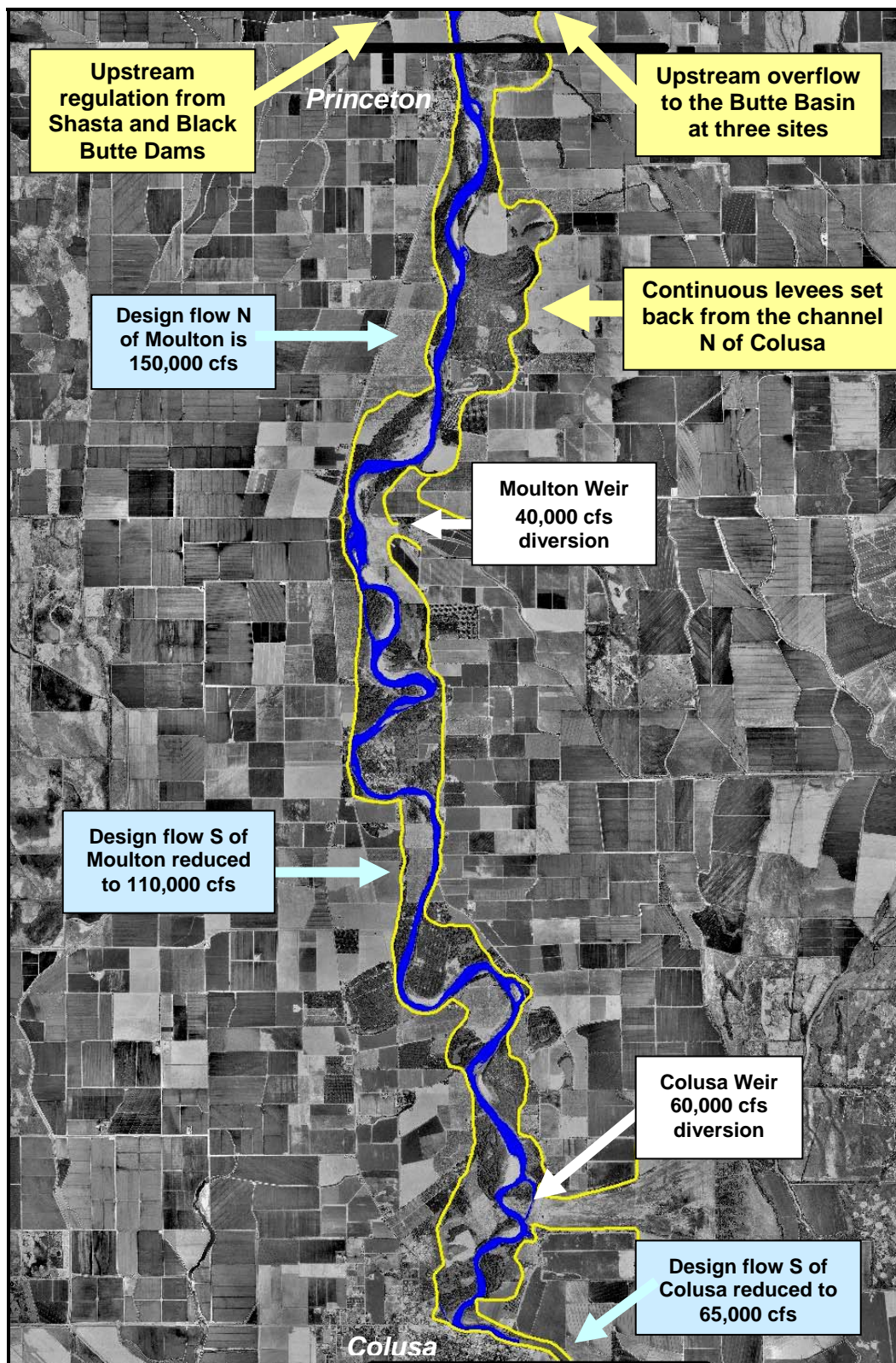


Figure 14. Sacramento River Flood Control Project Features

Source: Design Flow data from the SRCAF Handbook, Figure 2-14

of the levees. Activities do not generally include the channel area. Basic maintenance budgets are not adequate to fund larger levee repair projects and those more expensive projects require other state or federal funding sources that are not always available. Maintenance activities do not include reconstruction or retrofit of levees for increased integrity. In locations where system integrity is at risk, work is usually done by the ACOE and State Reclamation Board under the emergency authority of the PL-84-99 Program.

CDWR activities that relate to weirs and bypass areas include limited annual debris removal, scour hole repair and vegetation management. In weir and bypass areas below the Colusa Subreach, such as the Tisdale Weir, sedimentation is a problem that is not addressed on a regular basis. Overall maintenance resources have been reduced in recent years due to the State's budget deficit. Between 2000 and 2004 the budget for the Flood management division of DWR was reduced by 74% (Leavenworth, 2004). Maintenance funding does not come from a dedicated source and it must compete with other legislative priorities as part of the annual State budget process. Local interests have often been critical of the overall maintenance effort related to the Sacramento River Flood Control Project. A recent report issued by CDWR, *Flood Warnings: Responding to California's Flood Crisis*, concludes that additional local and State funding sources are required to support adequate levels of maintenance.

The US Army Corps of Engineers and the California Department of Water Resources conduct an annual field inspection of the levee system to identify and monitor erosion of the levees. A report is subsequently prepared which serves as a guide to future repair activities. The most recent publicly available report, *2003 Field Reconnaissance Report of Bank Erosion Sites-Sacramento River Flood Control Levees and Tributaries* was prepared by Ayres Associates, the hydraulic analysis subcontractor for Colusa Subreach Planning. Ayres prepared a subsequent report in 2004 that has not been released by the ACOE. The 2003 report noted 101 erosion sites on Sacramento River levees that were being monitored, with 20 of those sites categorized as, "Critical." Six of the monitored erosion sites were within the Colusa Subreach at the following River Mile locations: 149.8L, 154.5R, 163L, 164R, 164.3R, 164.4R. One site at River Mile 164R was categorized as "Critical." In the 2004 report, the site at River Mile 149.8L was deleted and an additional site at RM 157.7 was added.

Public input received as part of CSP indicates that many local residents are concerned about the current adequacy of the flood control system. This leads to their further concerns that restoration of wildlife habitat within the Colusa Subreach may reduce flood protection for the area outside of the levees. Comments have included a shared perception that the flood control system is not adequately maintained and that the ability of the system to carry the design flows has been compromised. Perceptions that are cited in conjunction with this perspective include:

- Past maintenance activities included dredging and debris removal within the channel that kept the channel more open.
- Buildup of large woody debris has resulted in sediment build-up within the channel.
- There is increased pressure on the levees and inadequate maintenance is provided.

- There is a critical need to clean out weirs and bypasses.
- Environmental review and mitigation requirements have increased maintenance costs and delayed implementation of projects.

Hydraulic analysis that will be conducted as part of CSP will directly address channel capacity to carry design flows with and without restoration projects. It is also anticipated that the Advisory Workgroup will identify research projects that will provide information to help evaluate other questions related to the flood control system.

System Effects – The construction of the flood control system made significant expansion of the local agricultural economy possible by virtually eliminating the annual occurrence of flooding from the Sacramento River for the area outside of the levees. As such, the ongoing maintenance of this system facilities and system capacities are of paramount importance to residents of the entire Sacramento Valley. Local public input received as part of CSP has stressed that protecting the integrity of the Sacramento River Flood Control Project is a critical part of any ecosystem restoration strategy.

The Flood Control Project affects the natural river process in various ways depending on the location. The Project levees through much of the Subreach are setback from the channel, accommodating continued channel meander where bank protection has not been installed. Though upstream regulation has reduced the annual occurrence and intensity of flooding, within the levee system annual flooding still occurs. This flooding helps sustain some limited natural river process, which, in turn, helps to sustain the ecosystem. South of the Colusa Subreach, the flood control levees, and often bank protection, are directly adjacent to the river channel, effectively limiting channel meander and the natural process of habitat formation and maintenance. The Sacramento River Flood Control Project serves a large area and flood damage reduction is an important State and local priority. Therefore, the interrelationship between the flood damage reduction system, the riparian habitat and other uses of the floodway must be considered as part of planning for ecosystem restoration in the Colusa Subreach.

Regulation - The State Reclamation Board is charged with the responsibility of maintaining the integrity of the Sacramento River Flood Control Project. The Reclamation Board reviews proposals for physical change within the "Designated Floodway" to ensure that such projects will not cause new flooding problems. For the Colusa Subreach, the Designated Floodway is the area inside of the levees. This jurisdiction is applicable to most substantive improvements within the Subreach such as levees, bridges, planting to restore riparian habitat, etc. Accordingly, habitat restoration plans that are developed as a part of CSP will be subject to hydraulic modeling and analysis to ensure that they do not diminish the integrity of the Flood Control Project per the standards of the Reclamation Board. Prior to the planting of native vegetation restoration plans will also be subject to review and permit approval by the Reclamation Board per its established jurisdiction.

C. Sacramento River Bank Protection Project

To support the objectives of the Sacramento River Flood Control Project, the Sacramento River Bank Protection Project was authorized by the U.S. congress in 1960 and a second phase was authorized in 1973. The purpose of the Project was to reduce the need for emergency levee repair, periodic dredging, and loss of land area due to channel meander. This was to be accomplished by revetment that typically involved stripping away existing vegetation and replacing it with rock riprap.

In addition to the revetment that was installed as part of the Sacramento River Bank Protection Project portions of river bank have also been modified through state projects and private landowner projects. Concrete rubble has sometimes been dumped over eroding banks and other materials such as cobbles and car bodies were occasionally utilized in the past. Generally, the private projects have occurred without required review or permits from the Reclamation Board and the U.S. Army Corps of Engineers.

Eventually, the ecosystem impacts of bank protection became an issue and all of the authorized bank protection sites were not completed. Recreation and conservation interests objected strongly to the losses of fish, wildlife and aesthetic resources that occurred from revetment. State and federal agencies also determined that bank protection constituted a further threat to Threatened and Endangered Species, such as bank swallows and fish. Additionally, there were concerns that bank protection could act to transfer erosive impacts to different properties.

Direct ecosystem impacts occur to relatively small-scale areas when native vegetation is removed from the project levee or riverbank and replaced with rock. More importantly, long-term and much larger scale impacts to the overall ecosystem result from halting the process of river channel meander. As described previously in this Chapter, this meander is one of the fundamental processes that creates and maintains the diverse mosaic of riparian communities.

Nonetheless, it is recognized that bank protection has an important purpose in protecting levees from erosion in order to maintain the flood control system and the benefits that it provides. It is also recognized that major public investments, like bridges and pumping plants, may require protection from erosion. The *Handbook* incorporates the concept of "limited meander." This concept acknowledges that some revetment is required to maintain the flood control levees and key infrastructure features. Review of each individual revetment project is dictated by current regulations in order to evaluate the effect on the environment and on neighboring properties. There remains, however, strong interest in developing a more comprehensive program, which will not only protect the levee system, but that will also preserve riparian environmental attributes (Sacramento River Conservation Area Forum, 2003). The conflicting objectives, of channel stabilization through bank protection and the protection of wildlife habitat and special-status species are recognized, but not yet resolved.

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IV. RIPARIAN HABITATS AND WILDLIFE

The Sacramento River has meandered across the Valley for thousands of years, transforming the landscape and supporting a unique riparian ecosystem within its floodplain. The dynamic riverine processes reviewed in Chapter III have created and maintained this ecosystem. The plants in these riparian communities have adapted to and become dependent upon these natural processes. In turn, many species of fish and wildlife that inhabit the riparian corridor have adapted exclusively to these habitat communities. As a result, threats to the viability and connectivity of this habitat are threats to the viability of those species.

The wildlife and fishery resources of the Sacramento River riparian ecosystem are of great natural and economic importance. The river corridor supports a great variety of resident and migratory species. Waterfowl and songbirds are attracted by the diversity and richness of the riparian habitat. Many neotropical songbirds breed in the riparian communities along the river and winter in Central and South America while other species prosper in the moist and lush environment all year long. The river supports four distinct runs of Chinook salmon, which are the greatest source of supply for the commercial salmon fishery off the California coast. It also supports runs of other anadromous game fish including steelhead trout, striped bass, shad and sturgeon, which combine to generate substantial local economic activity.

This Chapter reviews the adaptation of plants to the dynamic riverine environment and the related adaptations of animals to the resulting habitats. It also identifies key impacts to these habitats that threatened wildlife in the Colusa Subreach. This Chapter also identifies special status species, which are species that are listed as Threatened, Endangered or of Special Concern under state and federal Endangered Species Acts.

This review of the natural environment must, however, be considered in the context of the existing pattern of land uses and the changes that have occurred over the past 150 years. The modification of the river's flow regime and the removal of most of the native vegetation on the floodplain have contributed to the development of an agricultural economy that is the mainstay of the Sacramento Valley and a social fabric that has developed over many generations. Colusa Subreach Planning is intended to develop a strategy for ecosystem improvements that is reasonably integrated with these existing patterns of economic and social activity.

A. Existing Habitat Communities and Plants

The Colusa Subreach is part of a rich riparian ecosystem that supports a wide variety of wildlife and fish on a seasonal and year-round basis. Within this ecosystem, riparian habitat provides the food, water, and shelter necessary for the reproduction and survival of many native and nonnative species of wildlife. The habitat includes various forms of vegetation, wetlands, banks, sand and gravel bars along the river. The *Sacramento River Conservation Area Handbook*, Chapter 2, contains a description of the habitats in the river corridor. Much of the material in this Chapter is adapted from the *Handbook*. Relevant material is also adapted from *Comprehensive Management Plan for the Sacramento River Wildlife Area*, which was prepared by the California Department of Fish and Game in 2003.

Ecological Adaptation – The riparian vegetation along the Sacramento River has evolved in an environment maintained by the natural disturbance regime of the river. This regime is primarily composed of flooding and substrate erosion and deposition. The majority of the species are phreatophytes, which must have their roots in contact with a stable water supply during long periods of the year. Most of the trees within the riparian corridor are broadleaved and deciduous during the winter months. Broad leaves enable trees to maximize sun exposure, thus maximizing growth. Early colonizing species such as willows and cottonwood exhibit rapid growth of foliage and roots, characteristics necessary for surviving during the hot, dry summers on a substrate composed of alluvial sands or gravels with available subsurface water. Other adaptations that plants have made to thrive in the riparian corridor include:

- seed dispersal mechanisms to ensure successful recruitment such as seeds which float and are resistant to rotting
- adventitious roots (roots that bud from buried stems) which form after sediments are deposited over plants during flood events
- ability to tolerate low levels of oxygen in soil in flooding events
- ability to form suckers and roots after mechanical damage

These adaptations help to ensure species survival in the portions of the Subreach that are subject to frequent riverine disturbances. Individual plants may not always survive following disturbances at particular sites, however, the species readily colonize other newly disturbed or deposited areas and the cycle will be repeated.

As silt accumulates under the initial willow-cottonwood scrub, other trees such as box elder and ash are able to germinate in the spring after flooding has ended. Because the existing trees have slowed the flood flows, the materials deposited in these areas tend to have a higher percentage of fine material such as silt. This finer material builds soils that are able to retain moisture longer than sand and gravel substrates and thus additional species can thrive. Species such as box elder and ash can tolerate some deposition, but not to the same extent as the early- colonizing cottonwood and willow species. On higher areas of the floodplain where the disturbance regime is more muted and deposited soils are deeper, species such as valley oak and sycamore are typically dominant.

Flood events can also result in channel cutoffs, which can bring about major physical change in a short period of time. The Boggs Bend area on the east side of the river, approximately two miles south of Princeton, was the site of such a sudden change in the river channel that resulted in a profound impact on the habitat characteristics of the immediate area. A new river channel was formed through an avulsion or channel cutoff that occurred in the early 1930's. This new channel quickly became the active channel, resulting in the creation of an oxbow lake within the former channel area. Such oxbow areas benefit from the adaptations of the native plant species and the river's steady deposition of sediment. Working in tandem, these forces can develop "optimal" riparian habitat for special status species such as the yellow-billed cuckoo, within as few as 12 years (Greco, 1999).

Successional Stages – From a distance, the riparian communities of the Colusa Subreach appear to be a uniform blanket of lush, green growth. A closer view, however, reveals that there are distinct bands of vegetation that are differentiated by plant species composition, forest structure and wildlife usage. These areas of vegetation are, in turn, differentiated by the magnitude in which

they are affected by the disturbance regimes and by their position on the floodplain. The Subreach is located on the river where the natural disturbance regime results in an environment of continual physical change. The riparian communities and their associated vegetation species have adapted to colonize and establish themselves in successional stages as these areas are physically changed over time. Figure 15 illustrates the typical succession pattern for these communities in relation to river hydrology and channel movement.

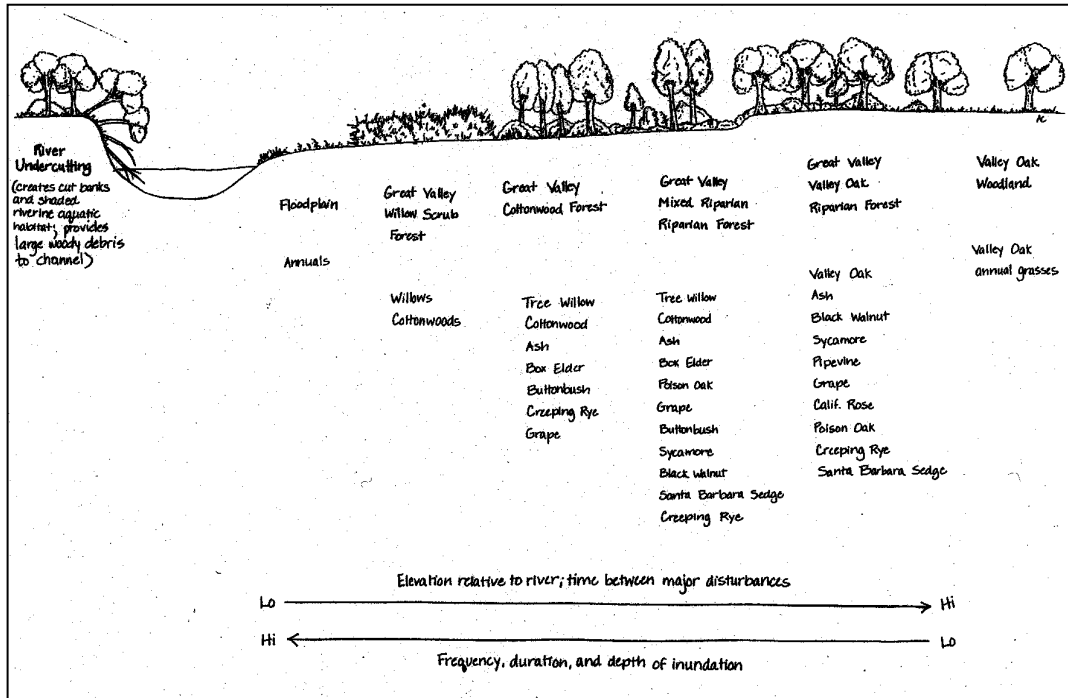


Figure 15. Typical Plant Communities and Successional Stages

Illustration from the Sacramento River Conservation Area Handbook

The successional stages of the riparian communities that occur in the Subreach can be classified into several distinct plant communities for overview purposes. In the field, however, the pattern of riparian communities is far more complex. Any one species of tree, shrub or vine can occur in more than one natural community. There is an intergrading between communities and there is rarely an abrupt edge between them. Figure 15 incorporates a fifth riparian community, the Valley Oak Woodland, which exists in some upland areas outside of the levees. It should be noted that the clearing of riparian forest for other uses, the presence of large project levees and the loss of natural riverine process often interrupts the typical, natural successional pattern reflected on the diagram. The riverine process also creates other aquatic and marsh habitats that are not reflected in this simplified description of typical succession stages.

The California Natural Diversity Database (NDDDB/Holland) classification system was chosen for the primary description of habitat in this Report for consistency with the *Handbook*. This system is also best known by the public in reference to the Subreach. The descriptions of the habitat communities relate to the typical situation and do not reflect variations related to the loss of some natural riverine process in the Subreach. It is important to note that this loss can result in

interference with the typical successional patterns and lead to the grouping of plant species that differ substantially from those listed below.

Great Valley Riparian Forest – The Great Valley Riparian Forest communities, classified by NDDDB/Holland, are the dominant communities in the remaining riparian areas along the river. They are uniquely adapted to the natural processes of the river and the resulting natural environment. Also prominently represented in the Subreach are the Coastal and Valley Freshwater Marsh and the Great Valley Willow Scrub communities. While these communities do not specifically fall within the Great Valley Riparian Forest series in NDDDB/Holland, they are serial stage communities that often succeed to the Great Valley Cottonwood Forest. For the purposes of this Plan, these communities are treated as components of the Great Valley Riparian Forest series.

The Great Valley Riparian Forest communities are a biologically rich habitat. The cottonwood-willow areas support more breeding avian species than any other comparable, broad California habitat type (Gaines, 1977). Riparian forests along the Sacramento River have several characteristics which enable them to support an abundance and diversity of wildlife. Abundant resources, high structure and habitat diversity (maintained over time by flooding and channel movement) and linear continuity all contribute to the diversity of species in the Subreach.

Proximity to water, a variety of soils and periodic influx of nutrient-rich sediment from flooding all contribute to the abundance of resources in the riparian forest system. This abundance continues through the summer months, in contrast with much of California which is hot and dry, such that many plant species outside of the riparian corridor die or go dormant. The riparian forests attract a vast array of terrestrial and aquatic insects, which in turn attract many species of birds, fish and mammals.

- ◆ **Coastal and Valley Freshwater Marsh** occurs commonly in the Subreach on the lowland periphery of the side channels, sloughs and oxbow lakes that are formed by the natural riverine processes. These areas are seasonally inundated to a substantial depth by floodwaters. The plant community is typically dominated by monocots up to two meters in height. These include cattails, bulrush, sedges, spike rushes and watercress. Rooted aquatic species with floating stems and leaves may also be present, including water primrose, water smartweed and pondweed. Black willow and button brush are also common at the edges of the water. The Coastal and Valley Freshwater Marsh areas may succeed to the Great Valley Willow Scrub community, if deposition raises the level of the land above the permanent water level and these areas can rapidly move to the Great Valley Cottonwood Riparian Forest community when deposition rates are substantial. This community is especially important for many species of migratory birds and fish.



Coastal and Valley Freshwater Marsh

- ◆ **Great Valley Willow Scrub** is the most common pioneering community found on depositional areas (typically point bars) on the river's edge. The community will tend to survive along a band that meets the substrate, texture and moisture requirements of germinating seeds. The young plants are adapted to a coarse substrate such as sand or gravel. The rapidly growing root systems must stay in contact with water as it recedes to summer levels. If the right conditions exist, the narrow band of cottonwoods in this community will become the riparian forests of the future. Common species in this community are the sandbar willow, other willow species (black, red, yellow and arroyo willows) and Fremont cottonwood. Openings within the willow scrub may be covered by annual and perennial grasses and forbs. As vegetation slows the velocity of flood flows, deposition increases, reducing the frequency and duration of inundation. As this occurs, California sycamore, box elder and Oregon ash may become established. This community intergrades with and generally succeeds to the Great Valley Cottonwood Riparian Forest.

The initial colonization and long-term survival of these species is directly related to the river's flow regime. If the flow level drops too fast, the roots of young plants cannot reach groundwater levels and the plants die. Research indicates that manipulation of the flow regime on the river can interfere with the colonization of cottonwoods on recently deposited areas (Roberts et al., 2002).

Great Valley Cottonwood Riparian Forest is typically the successor community to the Great Valley Willow Scrub. As the river meanders away frequency of flooding is diminished. This community is dominated by



Great Valley Willow Scrub

Fremont cottonwood, which sometimes constitutes the entire upper canopy. A second tall tree, the black willow, is often a significant member of the community. This community has a total canopy coverage of greater than 80%. Many species are able to germinate under the dense canopy cover, including berries, California rose, wild grape and poison oak, and many smaller tree species. These species combine to develop into a dense understory. Trees such as box elder and ash may become established in the understory, but do not typically become significant canopy species until the land surface is built up and flooding becomes less frequent.



Great Valley Cottonwood Riparian Forest

The tall form of the cottonwood trees is visible from a great distance. It is a common indicator of the river when crossing the featureless areas of the Sacramento Valley. This community intergrades with and generally succeeds to the Great Valley Mixed Riparian Forest away from the river.

Great Valley Mixed Riparian Forest is typically the successor to the Great Valley Cottonwood Forest, as the land area is further raised through deposition of sediment, and flooding frequently continues to diminish. This community has a diverse, often dense, mixture of tall cottonwoods and willows in combination with sycamores, box elders, black walnuts and alders at greater than 80% canopy coverage. Shrubs, such as buttonbrush, blackberries and poison oak, are often covered by an assortment of vines (clematis, wild grape and pipevine) which extend up into the overstory trees. Perennial grasses, such as creeping wild rye and Santa Barbara sedge, may form dense pockets in the understory. Openings in this community may also contain elderberry savanna. This community intergrades with the Great Valley Cottonwood Riparian Forest in lower lying areas and the Great Valley Valley Oak Riparian Forest in higher areas.

This community may be a substantial distance from the active channel, but still experiences relatively frequent flooding. This brings additional deposition, but not necessarily the damaging flows and subsequent erosion. As the community becomes drier (i.e. further above the water table), species such as the valley oaks are able to germinate and become established. Over an extensive period of time, valley oaks become dominant and the community develops into the most mature of the riparian vegetation types, the Great Valley Valley Oak Riparian Forest.

- ♦ **Great Valley Valley Oak Riparian Forest** is dominated by tall, mature valley oaks with significant numbers of sycamores, black walnuts and ash. The canopy is typically less dense than the Great Valley Cottonwood or Mixed Riparian Forest at less than 60% canopy coverage. The understory may be dense, with vines and shrub species typical in the Mixed Riparian Forest, shrub species from drier sites and often stands of perennial grasses and sedges. Often present with this community type are very old specimens of elderberry plants, which are the host of the valley elderberry longhorn beetle.

This community is subject to periodic flooding, but of a lesser frequency and duration than the preceding communities. This brings additional deposition and, as a site rises further above the water table, it can develop into a Valley Oak Woodland. Within the Subreach, inside of the levees, the Valley Oak Woodland does not currently exist.

Habitat Types at the Water's Edge – In addition to creating a mosaic of riparian forest communities, the natural disturbance regime creates other critical habitats and habitat elements. Channel meander, flooding and aggradation create sloughs and side channels, sand and gravel bars, bare cut banks and shaded banks with vegetation and woody debris extending into the water. All of these features and the vegetation that they support play an integral role in the functioning of the riparian ecosystem.

- ♦ **The Open River Channel** is a key part of the riparian ecosystem. The river channel is the migratory route for the annual runs of multiple species of anadromous fish and it sustains the activities of many avian, reptilian,

amphibian and mammalian species. The river channel provides great variation for the species that utilize this habitat. These variations include depth, velocity, cover and riverbed material. Important natural breaks in the consistency of the channel are often formed by vegetative materials that originate in the adjoining river corridor. Large woody debris, often composed of cottonwood or English walnut trees from eroding banks, has been identified as essential components of the habitat that supports fish species including the anadromous species. Concurrently, however, large woody debris has been noted as a concern by local interests who question its impact on boating, infrastructure and the flow capacity of the floodway.

- ◆ **Shaded Riverine Aquatic Habitat** is an important component of the Sacramento River ecosystem that is created as the river erodes into a bank supporting riparian forests. This is where “the adjacent bank is composed of natural, eroding substrate supporting riparian vegetation that overhangs or protrudes into the water” (U.S. Fish and Wildlife Service, 1992). It is characterized by “variable amounts of woody debris, such as leaves, logs, branches and roots, as well as variable depths, velocities and currents.” Shaded riverine habitats with large woody debris provide feeding and cover for aquatic species, such as salmon, and vital nutrients to help maintain the overall health of the ecosystem. They also play an important role in regulating water temperature (Triska and Cromack, 1980).



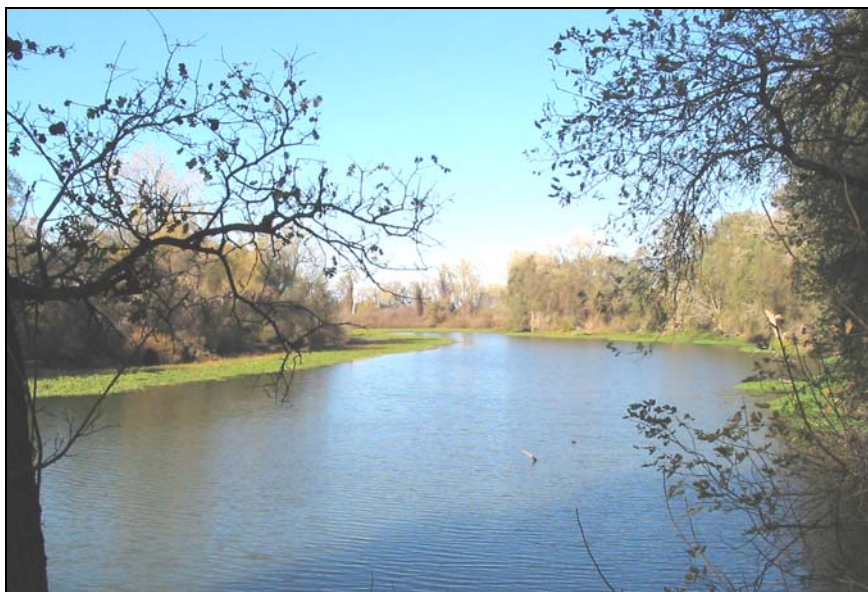
Shaded Riverine Aquatic Habitat

- ◆ **Cut Banks** are another important component of the riparian ecosystem. These nearly vertical banks, substantially free of plant cover, are found on the outside of meander bends where the river is actively eroding high terraces. Cut banks support the majority of California's bank swallow colonies. The bank swallow is a migratory species that winters in Central and South America. It nests in the spring, mostly in freshly eroded earthen banks.

Sloughs, Side Channels and Oxbow Lakes are created by channel movements and contribute substantially to the richness of the riparian ecosystem. They provide shelter from the fast currents of the main channel, creating habitat for many species such as beavers, river otters and northwestern pond turtles. They provide important spawning and rearing areas for fish species, notably chinook salmon, steelhead rainbow trout, and sturgeon and Sacramento splittail (Limm and Marchetti, 2003). Sloughs and side channels often have shaded riverine aquatic habitat along their banks. Most heron rookeries are located in tall vegetation surrounding sloughs oxbow lakes and on mid channel islands.



Cut Bank



Oxbow Lake

B. Existing Wildlife Species

Riparian habitats exhibit great diversity of animal species as compared to many other California terrestrial habitats. Most species are permanent residents, but several species of fish and many avian species are migratory. Overviews of the wildlife and fish populations contained in this section were adapted from the *Comprehensive Conservation Plan for the Sacramento River National Wildlife Refuge* and the *Comprehensive Management Plan for the Sacramento River Wildlife Area*.

Though substantially fragmented, the existing riparian habitat provides an important migration corridor plus an equally important wintering and breeding habitat for migratory birds. The high value of riparian habitats for neotropical migrants has been identified by both the Partners in Flight and the Riparian Habitat Joint Venture programs. Riparian vegetation is also home to a variety of mammals, such as the ringtail, which might not occur in the Sacramento Valley if these habitats were absent.

Riverine and lacustrine (related to the edge of a lake) habitats support a diversity of fish, amphibian, reptilian, avian and mammalian species. The aquatic habitats are especially important to anadromous fish species that utilize these habitats for migratory passage and rearing of young. Riparian vegetation that overhangs the river channel, sloughs and side channels in the Shaded Riverine Aquatic habitat is critically important for salmon.

Mammals – Most mammals (with the exception of bats) are year-round residents of the Subreach. Beaver, muskrat, mink and river otter are found in close proximity to the river channel, sloughs, side channels, oxbow lakes and other wetland areas. Several species of bats are common, including the red bat and Yuma myotis. Upland species in the riparian forests include rodents such as gray squirrel, deer mouse, ground squirrel, rat, shrew, pocket gopher, California vole and porcupine. Other mammals include the mule deer, black-tailed jackrabbit, desert cottontail, spotted and striped skunk, opossum, raccoon, river otter and ringtail. Carnivores include bobcat, the red fox, gray fox and coyote.

Birds - Avian species are a major component of the wildlife resource in the riparian habitat. The Subreach supports a wide variety of permanent resident and migratory species.

- ♦ **Waterfowl** use the wetland habitats of the Subreach primarily for wintering during the months of August through March. Peak wintering populations occur in December to January and a small portion remains through the spring and summer months to nest. Common wintering duck species include northern pintail, wigeon, green-winged teal, gadwall, northern shoveler, wood duck, ring-necked duck, canvasback, redhead and ruddy duck. The most common wintering goose species is the Canada goose. Mallard, cinnamon teal, gadwall, wood duck and lesser numbers of pintail and redhead ducks stay through the spring and summer to nest.
- ♦ **Shore birds** use the Subreach in great numbers during their fall and spring migrations with peak populations in April. Common fall and spring migrants include western and least sandpipers, dunlin, dowitcher, black-necked stilt, American avocet, black-bellied and semi-palmated plovers, greater and lesser yellowlegs, long-billed curlew and whimbrel.

- ♦ **Wading and diving birds** use the Subreach year-round, utilizing wetland and riparian habitats for foraging, roosting and nesting. Species include great blue heron, green heron, black-crowned night heron, great, snowy and cattle egrets, American bittern, white-faced ibis, Virginia rail, sora, moorhen, American coot, pied-billed and western grebes and the double-crested cormorant. Other waterbirds that use the Subreach during various times of the year include western and eared grebe and American white pelican.
- ♦ **Gulls and terns** occupy the Subreach seasonally. Ring-billed and herring gulls are common from the fall into the spring. The Caspian tern is a rare visitor to the river. Forster's terns occur infrequently, but are often seen in small numbers along the river during spring and fall migrations.
- ♦ **Raptors** are a very visible component of the avian population and they are often seen perching along the riparian corridor. Populations are greatest during the winter when the prey base is the greatest. The most abundant wintering species are red-tailed hawk and northern harrier, but bald and golden eagle, white-tailed kite, sharp-shinned hawk, rough-legged hawk, Cooper's hawk, peregrine falcon and short-eared owl occur regularly. The red-shouldered hawk is a resident species and turkey vulture, red-tailed hawk, osprey, bald eagle, white-tailed kite, northern harrier, American kestrel, barn owl and great-horned owl are breeding species. Swainson's hawk is common during the spring and summer when they are nesting in riparian areas.
- ♦ **Game birds** inhabit the Subreach year round. Common species include mourning doves, California quail and ring-necked pheasant. Wild turkey populations are also increasing.
- ♦ **Landbirds** inhabit the Subreach in great diversity and abundance. Both resident and migratory species are found. Common year-round wetland residents include marsh wren, Brewer's blackbird and black phoebe. Resident species that can be found in riparian forests include belted kingfisher, Anna's hummingbird, downy woodpecker, hairy woodpeckers, Nuttall's woodpecker, acorn woodpecker, northern flicker, California towhee, scrub jay, American crow, bushtit, Bewick's wren, mockingbird, loggerhead shrike, starling, western meadowlark and house finch. Additional breeding species supported by these habitats include yellow-billed cuckoo, western wood pewee, ash-throated flycatcher, western kingbird, house wren, American robin, black-headed grosbeaks, titmouse and tree, violet-green, bank, barn and Northern rough-winged swallows, which are found in riparian and adjoining upland areas during the nesting season. Wintering species include ruby-crowned kinglet, yellow-rumped warbler, lark sparrow, golden-crowned sparrow, white-crowned sparrow and lesser and American goldfinches, which may be found in wetland, riparian or upland areas during the winter. Other common migrants include olive-sided flycatcher, horned lark, Wilson's warbler, song sparrow and Lincoln's sparrow.

Reptiles - Common reptile species in riparian areas include the common garter snake, gopher snake, common kingsnake, western fence lizard and alligator lizard. The western rattlesnake also occurs. The northwestern pond turtle and the red-eared slider are found in aquatic and wetland habitats and venture into upland habitats for nesting.

Amphibians - Amphibian species are limited in the Subreach. Common species are the bullfrog, western toad and pacific tree frog.

Fish - Fish are found in the sloughs, side channels and oxbow lakes of the riparian habitat as well as in the channel of the Sacramento River. During periods of high water, species that are normally confined to the river channel occur within the flooded portions of the Subreach. Resident species in these aquatic habitats include hardhead, roach, pike minnow, Sacramento sucker, river lamprey, bluegill, carp, channel catfish, green sunfish, mosquitofish, smallmouth bass and largemouth bass. Anadromous fish include American shad, chinook salmon, striped bass, Sacramento splittail, green and white sturgeon, and steelhead rainbow trout. Four distinct runs of salmon use the river for access to upstream spawning areas, spawning and the rearing of young.

Invertebrates – Invertebrates are found in the greatest abundance and diversity in the aquatic habitats. They provide an important food base for many avian and fish species. Common aquatic invertebrates include waterfleas, snails, clams, dragonflies and damselflies, waterboatmen, backswimmers, beetles, midges, mosquito larva, crayfish and worms. Terrestrial invertebrates such as grasshoppers, beetles, butterflies (including the pipevine swallowtail) moths, midges and ants are an important food base for bats, neotropical migrant birds and waterfowl. The Valley Longhorn Elderberry Beetle nests exclusively within cavities of elderberry plants.

C. Impacts on Habitats and Wildlife

Many changes have occurred along the Sacramento River since the mid 1800's. These changes have resulted in a strong agricultural economy and a reliable water supply for the State of California. At the same time, they have greatly impacted the riparian habitat and the fish and wildlife of the area. Colusa Subreach Planning will not eliminate all these impacts but it is important that they be identified as part of a review of existing conditions. An understanding of these impacts is necessary to help make practical determinations regarding wildlife habitat conservation and restoration in the Colusa Subreach. It is recognized that the clock will not be turned back to the 1800's. Many changes that have taken place along the river have had important positive effects and that the ultimate resolution of these impacts on habitats and wildlife will involve consideration of tradeoffs and diverse opinions.

Loss of Natural Riverine Processes - Natural processes of the Sacramento River have been greatly modified as discussed in Chapter II. The natural processes of erosion, deposition and seasonal flooding historically enriched the riparian areas, creating and sustaining habitat. These changes have substantially interfered with this self-perpetuating system. The regulation of river for water supply, flood control and other purposes has changed the annual flow regime and bank protection has stalled channel meander. As a result, the Sacramento River in the Colusa Subreach has lost some capability to maintain existing habitats and create new areas of habitat.

The regulation of flows for water supply and flood control, which is provided by Shasta Dam, has resulted in many public benefits but it has had a substantial impact on the riparian habitat. The flood flows are reduced in the winter and spring, such that the frequency and duration of inundation are reduced. As a result, the natural distribution of sediment, seeds and other materials that helped to create and maintain habitat is altered. The rate of flow is greatly increased in the summer season and varied in response to water demand, especially those from south of the Delta. This flow regime contradicts the natural regime to which

plants are adapted. This operational control has been found to have negative impacts on the establishment of certain types of riparian vegetation (Roberts et al., 2003). Rapid reduction in flow levels can leave seedlings without adequate moisture so that they cannot continue to survive and become established.

Bank protection can stall the meander function, and with it the creation of habitat. Meander features such as sloughs, side channels and oxbow lakes are not developed, and a comparatively sterile environment can result. The natural variations in channel depth, velocity and vegetative matter are diminished. Areas of shaded riverine aquatic habitat are lost, and the contribution of large woody debris to help sustain the downstream fishery is greatly reduced. These substantial impacts on the wildlife and fishery resources affect both the area where bank protection is applied, and a substantial downstream reach (U.S. Fish and Wildlife Service, 2000).

Habitat Loss and Fragmentation - The substantial reduction and disruption of the riparian habitat has had major negative impacts on the wildlife and fish populations of the Sacramento River riparian corridor. Research indicates that only about 10% of the combined Valley Oak Woodland and Great Valley Riparian Forest in the river corridor, between Colusa and Red Bluff, remains (Golet et al., 2003). In addition, the majority of the associated wetland basins, that are located east and west of the river, have been converted to agricultural and urban uses. The net effect is a huge reduction in the overall area of the habitats that once supported healthy and diverse populations of fish and wildlife.

A serious ramification of this habitat loss along the riparian corridor is habitat fragmentation. Habitat fragmentation occurs when large and contiguous tracts of natural vegetation are converted to other uses, such that only fragments of the original habitat types remain. This fragmentation affects wildlife in various ways that include direct loss of habitat, increased edge effect and isolation effects. The species most affected are those with large home range requirements, species with narrow or very specific habitat needs and species that lack the ability to disperse and adapt. Habitat fragmentation also disrupts migration corridors along the river and connecting tributaries.

Each species requires a specific arrangement of food, water and cover to meet its biological needs. In addition, each species requires a minimum amount of suitable habitat area. For example, the western yellow-billed cuckoo requires dense deciduous forest with dense understory cover near slow-moving water. The species generally selects these habitats for nesting, only if they are in contiguous stands of at least 25 acres in area and at least 300 feet in width (Gaines, 1974). Smaller and narrower sites are seldom used. When species minimum home range sizes are greater than the available fragment sizes, they are frequently eliminated. Therefore, a consequence of habitat fragmentation is a reduction in richness and diversity of species, with the greatest impact being observed in small or linear-shaped fragments.

For area-sensitive species like cuckoos, edge effects further reduce the viability of otherwise suitable habitat areas. Where one habitat type borders another, edge effect can be negative for species that require large blocks of contiguous habitat. The fragmentation of habitat tends to increase the amount of the edge relative to the amount of the interior space. to the adverse impacts of edge effects documented for birds in the riparian forest; include increased nest predation, interspecific competition and reduced pairing and nesting success.

Edge effects have been documented to extend 150 to 1800 feet into the interior of fragmented forest habitats (Paton, 1994).

Isolation effects lessen a species ability to move between fragments of habitat. Isolated fragments may support lower densities of species than similar sized areas of contiguous habitat and that the long-term persistence of species may be lower in these areas. Birds and bats generally have excellent dispersal capabilities, while small mammals and some species of reptiles and amphibians typically have significantly poorer capability to disperse. The habitat in the Colusa Subreach has been substantially reduced in area and greatly fragmented.

Nonnative, Invasive Plant Species - Nonnative, invasive plant species that were not present prior to Euro American settlement have become established in the Colusa Subreach. Some were imported for a variety of purposes that included erosion control, food crops, animal fodder and garden stock and accidental introduction. In some cases, these plants displace or preclude the establishment of native plant communities. They also provide relatively low habitat value for the wildlife species that have adapted to the native species. Some "successful" invasive species feature adaptations, such as the production of large amounts of seeds, fast growth, and the ability to reproduce from small pieces of the plant. Adding to this advantage is the frequent lack of natural herbivores, parasites, diseases and a release from the competitive pressure of plants from their native environment.

An example of such a species is giant reed (*Arundo donax*), a large bamboo-like plant. It is able to reroot from small pieces that are distributed by flood events. It is well adapted to alluvial deposits and often proliferates in the same locations that historically support willow scrub communities. It grows extremely fast (3½ inches per day under optimal conditions) and manual attempts to remove the plant often result in pieces floating downstream to form new stands. It burns easily, but will resprout vigorously after a fire.

Other invasive species such as tree of heaven (*Ailanthus altissima*) appear to "fit" into the riparian environment, but provide poor habitat because they provide less cover value or structure than the native species they replace, or the seeds that they produce are of low nutritional value. Some plants, such as edible fig and black walnut, have the ability to produce chemicals (phytotoxins) that inhibit the germination of competing plant species. Nonnative invasive species, that have particularly serious disruptive impacts to the riparian habitat, include:

<i>Ailanthus altissima</i>	tree of heaven
<i>Apocynaceae</i>	vinca major and minor
<i>Arundo donax</i>	giant reed
<i>Centaurea solstitialis</i>	yellow starthistle
<i>Cynodon dactylon</i>	Bermuda grass
<i>Ficus carica</i>	edible fig
<i>Juglans spp.</i>	black walnut
<i>Rubus discolor</i>	Himalayan blackberry
<i>Sorghum halepense</i>	Johnson grass
<i>Tamarix chinensis</i>	salt cedar
<i>Lepidium latifolium</i>	perennial pepperweed

Some areas along the river, especially on higher elevation locations where flooding is now less frequent, have become dominated by nonnative invasive species such as Johnson grass and yellow starthistle. These exotic communities are acting to preclude the establishment of natural riparian

vegetation, such that, in some cases, the natural succession process of habitat communities has been effectively stalled. The Comprehensive Management Plan for the Sacramento River Wildlife Area documented this situation at the Merrill's Landing, Dicus Slough and Wilson Landing Units (California Department of Fish and Game, 2004). These three sites are located outside of the Colusa Subreach but they are examples of the situation that exists in the Subreach and throughout the Sacramento River Conservation Area.

Fire – The potential for wildfires to substantially impact the riparian habitat is a possible, serious threat to the both the habitat and the related fish and wildlife species. Research has suggested that the lack of a natural flooding regime, that formerly washed out vegetative materials from the riparian areas, can result in increased fire fuel. This greater fuel load might then support more intense fires, which could impact the composition and structure of habitat communities (Ellis 2001). Given the existing impairment of the natural riverine processes, that historically created and renewed riparian habitat, the concern has been raised that future fires could severely damage natural riparian vegetation that lack the natural means of regeneration. This situation could be worsened, if nonnative species invade and proliferate in riparian areas following a fire.

The magnitude of this additional threat is not known. It is known that fire has impacted riparian habitat in the past, although some impacts have been considered positive, and some plants are adapted to respond positively to fire events. The riparian forest is a relatively moist environment compared to upland habitats. Further monitoring and research is required to determine if the threat from wildfire is substantial. Recent habitat management plans, prepared by the Department of Fish and Game and the US Fish and Wildlife Service, recommend a fire protection strategy should be kept current for the protection of both the habitat resource and the adjoining property.

D. Special-Status Species

The Impacts noted in Section C of this Chapter, in conjunction with other wide-scale environmental changes, have resulted in a substantial decrease in the abundance and diversity of wildlife species in the Colusa Subreach and along the entire Sacramento River. Table 4 lists 43 special status species known or thought to occur in the Subreach, their state and federal listing status and a description of the habitat that they utilize. Also included are five plants that are listed as "rare, threatened and endangered" by the California Native Plant Society.

Adaptation to the riparian habitat has occurred over an extended period of time and each of the species in the Subreach depends on different habitat types and components of the riparian ecosystem. As the habitat area has been reduced, fragmented and degraded, some species have been extirpated and others are in danger of being extirpated (no longer existing in the area) State or becoming extinct (no longer existing in the state or country). The least Bell's vireo was considered the most numerous songbird along the river in the 1940's, but it was completely absent by the early 1960's. The vireo depended upon the willow scrub riparian community created by river meander. It is thought that the willow scrub habitat declined, following flood control projects, increasing the vireo's vulnerability to cowbird parasitism which eventually caused its elimination (Frauzreb, 1990).

The bank swallow is another example of a species that depends entirely upon a specific habitat situation created by the dynamics of the river processes. The bank swallows make their nests in the eroding cut banks, which result from the

Table 4. Special-Status Species Known or with Potential to occur in the Colusa Subreach

Species	Status			Habitat
	CNPS	State	Federal	
Fish				
Chinook salmon, Cen Val Sp.-run <i>Oncorhynchus tshawytscha</i>	-	ST	FT	Sacramento River and its tributaries for spawning and rearing
Chinook salmon, Sac River W-run <i>Oncorhynchus tshawytscha</i>	-	SE	FE	Sacramento River and its tributaries for spawning and rearing
Chinook salmon, Cen Val F/late F-run <i>Oncorhynchus tshawytscha</i>	-	SC (2)	FC	Sacramento River and its tributaries for spawning and rearing
Central Valley steelhead <i>Oncorhynchus mykiss</i>	-	-	FT	Sacramento River and its tributaries for spawning and rearing
Green sturgeon <i>Acipenser</i>	-	SC (1)	FC	Sacramento River for spawning and rearing
Hardhead <i>Mylopharadon conocephalus</i>	-	SC (3)	-	Sacramento River and its tributaries for spawning and rearing
River lamprey <i>Lampreta ayresi</i>	-	SC (3)	-	Sacramento River and its tributaries for spawning and rearing
Sacramento perch <i>Archoplites interruptus</i>	-	SC (2)	-	Sacramento River and its tributaries for spawning and rearing
Sacramento splittail <i>Pogonichthys macrolepidotus</i>	-	SC (1)	-	Shallow backwater areas for foraging and rearing
Wildlife				
Valley elderberry longhorn beetle <i>Desmocerus californicus dimorphus</i>	-	-	FT	Elderberries are the sole host plant for nesting
Giant garter snake <i>Thamnophis gigas</i>	-	ST	FT	Backwater areas and marshes with suitable prey, high ground for protection from floods
Northwestern pond turtle <i>Clemmys marmoratta marmoratta</i>	-	SC (2)	FC	Backwater areas and oxbow lakes with aquatic vegetation
Least bittern <i>Ixobrychus exilis</i>	-	SC (3)	FC	Marshes along ponds with tules, cattails and rushes
Bald eagle <i>Haliaeetus leucecephalus</i>	-	SFP	FT	Tall trees for nesting, protected sites with abundant populations of fish
Golden eagle <i>Aquila chrysaetos</i>	-	SC (3)	PR	Tall trees and protected sites with plentiful small/medium -sized mammals for prey
Osprey Pabdion haliaetus	-	SC (2)	-	Tall trees for nesting, protected sites with abundant populations of fish
Northern harrier Circus cyaneus	-	SC (2)	-	Grasslands, meadows and marshes providing tall cover
Cooper's Hawk <i>Accipiter cooperii</i>	-	SC (2)	-	Nests in riparian forests and forages in open woodlands
American Peregrine Falcon <i>Falco peregrinus anatum</i>		SFP		Forages along rivers and wetlands
Merlin <i>Falco columbarius</i>	-	SC (1)	-	Forages along open grasslands, savannas and woodlands
Sharp-shinned hawk <i>Accipiter striatus</i>	-	SC (3)	-	Dense forest and riparian habitats
Swainson's hawk <i>Buteo swainsoni</i>	-	ST	-	Tall trees for nesting and near by open areas for foraging
Short-eared owl <i>Asio flammeus</i>	-	SC (2)	-	Freshwater marsh, lowland meadows with dense tules or grass for nesting and roosts

Species	Status			Habitat
	CNPS	State	Federal	
Long-eared owl <i>Asio otus</i>	-	SC (2)	-	Dense stands of cottonwoods and willows with adjacent open areas for foraging
American white pelican <i>Pelecanus erythrorhynchos</i>	-	SC (1)	-	Sloughs and side channels with a prey base of small fish and amphibians
Double-crested cormorant <i>Phalacrocorax auritus</i>	-	SC (2)	-	Open water for foraging, nests in riparian forest or protected islands
Western yellow-billed cuckoo <i>Coccyzus americanus occidentalis</i>	-	SE	FC	Dense riparian forests with a thick understory of willows for nesting and cottonwood overstory for foraging
Willow flycatcher <i>Empidonax traillii</i>	-	SE	FC	Riparian areas with abundant willows for breeding
Bank swallow <i>Riparia riparia</i>	-	ST	-	Cut banks with sandy or sandy loam soil for nesting
Loggerhead shrike <i>Lanius ludovicianus</i>	-	SC (na)	FC	Open habitats with scattered shrubs, trees and other perches
Yellow warbler <i>Dendroica petechia bewersterii</i>	-	SC (2)	-	Riparian areas with willows, cottonwoods, sycamores or alders for nesting
Yellow-breasted chat <i>Icteria virens</i>	-	SC (2)	-	Riparian areas dominated by willows, alders, Oregon ash, tall weeds blackberry and grape for nesting
Tricolored blackbird <i>Agelaius tricolor</i>	-	SC (na)	-	Nests in dense colonies in emergent marsh vegetation, nesting habitat must be Large enough to support 50 pairs
Fringed Myotis <i>Myotis thysanodes</i>	-	SC	FC	Habitat includes riparian forests
Long-eared Myotis <i>Myotis evotis</i>	-	-	FC	Forages in heavily vegetated habitats
Long-legged Myotis <i>Myotis volans</i>	-	SC	FC	Habitat includes riparian forests
Pallid bat <i>Antrozous pallidus</i>	-	SC	-	Habitat includes riparian forests and oak savanna
Western red bat <i>Lasiurus blossevillei</i>	-	SC	-	Roosts under overhanging leaves of large trees in forest interiors, forages in open air
Small-fotted Myotis <i>Myotis ciliolabrum</i>	-	-	FC	Habitat includes riparian forests
Townsend's big-eared bat <i>Corynorhinus townsendii pallescens</i>	-	SC (2)	FC	Forages along edges of riparian habitats, ,
Western mastiff bat <i>Eumops perotis</i>	-	SC	FC	Forages over open meadows, grasslands, forests and open water.
Yuma Myotis <i>Myotis yumanensis</i>	-	-	FC	Riparian habitats, feeds over water and roosts in cavities in trees
Ringtail <i>Bassariscus astutus</i>	-	SFP	-	Riparian forest habitats
Plants				
Columbian watermeal <i>Wolffia brasiliensis</i>	CNPS 2	-	-	Marsh habitats
Four-angled spikerush <i>Eleocharis quadrangulata</i>	CNPS 2	-	-	Marsh habitats
Fox sedge <i>Carex vulpinoidea</i>	CNPS 2	-	-	Marsh and riparian habitats

Species	Status			Habitat
	CNPS	State	Federal	
Rose mallow <i>Hibiscus lasiocarpus</i>	CNPS 2	-	-	Wet banks, marshes and riparian habitats
Wright's trichocoronis <i>Trichocoronis wrightii</i>	CNPS 2	-	-	Marsh and riparian habitats

Status Key	California	
	SE	State-listed, Endangered
	ST	State-listed, Threatened
	SC	State Species of Special Concern
	SFP	State Fully Protected
	Federal	
	FE	Federally-listed, Endangered
	FT	Federally-listed, Threatened
	FC	Federal Species of Concern
	PR	Protected under Golden Eagle Protection Act
	California Native Plant Society	
	CSP 1	Plants rare, threatened, or endangered in California and elsewhere
	CSP 2	Plants rare, threatened, or endangered in California but more common elsewhere

Sources: US Fish and Wildlife Service, California Department of Fish and Game, California Native Plant Society, PRBO Conservation Science

meandering of the river channel and the river corridor has the greatest concentration of bank swallows in California. Unfortunately, this habitat is the location where landowners and governmental agencies have installed bank protection to prevent river meander. The placing of riprap on cut banks eliminates these vital nesting sites, and this once common species has disappeared throughout much of its historic range (Schlorff, 1977). The Colusa Subreach contains multiple sites where remaining cut banks support nesting populations of bank swallows.

Federally-listed species include species that are listed as “Endangered” and “Threatened” pursuant to the federal Endangered Species Act, as well as species that are fully protected under federal law. Federal “Species of Concern”, as identified by the USFWS, are also noted. State-listed species likewise include species that are listed as “Endangered” and “Threatened” pursuant to the California Endangered Species Act, as well as species that are fully protected under state law. Also included are “Species of Special Concern” as determined by the Department of Fish and Game. These are species that are not state listed as Endangered or Threatened but, nonetheless, are either declining at a rate that could result in listing, or historically occurred in low numbers and known threats to their persistence currently exist.

Table 4 incorporates the special-status species listings, as of this point in time. It is expected that these listings will change over time as new species are listed and others are delisted as the result of successful conservation efforts. Consistent with the policies of CALFED and the SRCAF, Colusa Subreach Planning will address the recovery of special-status species, and the support of other native and game species through an ecosystem approach to habitat management.

V. LANDOWNER CONCERNS

A key element of Colusa Subreach Planning is the identification and resolution of landowner concerns that relate to wildlife habitat conservation in general and habitat restoration in particular. This Chapter provides a summary of the principal concerns based upon input received as part of the CSP process. These concerns most frequently relate to potential effects of habitat restoration activities on the flood control system, the local economy and neighboring landowners. In order to provide a context for understanding these concerns, this Chapter begins with an overview of the local setting and economy.

Colusa Subreach Planning involves the engagement of local landowners, organizations and agencies in the planning of an ecosystem restoration strategy for the Colusa Subreach. With the identification of landowner concerns, CSP will proceed to address these concerns as part of the planning process. This will occur in conjunction with the planning of wildlife habitat restoration on specific properties in the Subreach and through planning and research projects that are specifically directed toward the identified concerns. The Advisory Workgroup will be closely involved in these planning and research projects and project results will be made available to all interested stakeholders.

A. Local Setting

The Colusa Subreach is a 5466-acre (8.54 square miles) portion of Colusa and Glenn Counties. Colusa County lies on the south side of Glenn County and both counties extend from Sacramento River and Butte Creek on the east to roughly the crest of the Coast Range on the west. Colusa County has a total area of approximately 736,450 acres (1,151 square miles) and an estimated population of 20,880 persons as of January 1, 2005. Glenn County has an area of approximately 841,470 acres (1,315 square miles) and a population estimated to be 28,197 persons. Between 2004 and 2005 Colusa County increased at a rate of 2.7% and Glenn County increased at a rate of 1.3%. The population estimates cited in this paragraph are from the California Department of Finance, Demographics Research Unit.

Agricultural Economy – The combination of agriculture and agriculture-related business is the principal economic activity in both Colusa and Glenn Counties. In Colusa County, approximately 45% of the land is in agricultural crops and in Glenn County approximately 32% of the land is in crops. The majority of the land that is not in crops is in the mountainous, western portion of the two counties, where soils and slopes are not suitable for cropland. A substantial portion of that area, however, is utilized for livestock raising. Table 5 describes the land within each County that is devoted to agricultural crops.

The vast majority of the crop value is produced on irrigated land. In Colusa County, approximately 88% of the cropland was irrigated and in Glenn County approximately 86% was irrigated in 2002. A comparison between the 1997 and 2002 USDA Census of Agriculture indicates that acreage of irrigated cropland

increased in both Counties over that period. The increase was approximately 3% in each County; 9,700 acres in Colusa County and 6,900 acres in Glenn County. This increase was a continuation of a fifteen-year trend. The largest source of water for irrigation of this area is the Sacramento River.

Table 5. Cropland in Colusa and Glenn Counties

Data Category	Colusa County	Glenn County
Total Acres	736,450	841,420
Acres in Farms	485,392	506,372
Cropland Acres	331,843	271,470
Irrigated Acres	290,861	233,127
Number of Farms	821	1,283

Source: USDA 2002 Census of Agriculture

In 2003, both counties produced a record total value of crops. Compared to the total value ten years earlier, this represented a 27% increase for Colusa County and a 23% increase for Glenn County. For each County, the highest value crop was rice followed by almonds. Table 6 lists the highest value crops for each County in 2003. All figures cited in this paragraph are taken from the 2003 annual reports prepared by the County Agriculture Departments for each of the two Counties. It is important to note that these available figures represent gross receipts and that they do not represent net income. Additionally, these figures are not adjusted to reflect inflation.

Table 6. 2003 Crop Value in Colusa and Glenn Counties

Product	Colusa County		Glenn County	
	Value	Rank	Value	Rank
Rice	\$106,669,000	1	\$160,971,000	1
Almonds	\$73,206,000	2	\$53,060,000	2
Processing Tomatoes	\$32,318,000	3	na	na
Cattle and Calves	\$11,628,000	4	\$17,639,000	4
Rice Seed	\$9,485,000	5	\$2,487,000	na
Dairy Products	na	na	\$48,539,000	3
Walnuts	\$6,466,000	6	\$15,182,000	5
Total of all Crops	\$361,573,000		\$317,387,000	

*Source: 2003 Crop Report, Colusa County Department of Agriculture
2003 Crop and Livestock Report, Glenn County Department of Agriculture*

All of the cropland in Glenn and Colusa counties was in native vegetation prior to the mid 1800's. This area included grasslands, seasonal marshes and riparian forests. The conversion of this land to agriculture over the last 150 years permitted the growth of the local agricultural economy and the related services and activity that it supports. Local concerns about potential impact of restoration activities on the flood control system and on agriculture within and adjoining the Colusa Subreach relate to public safety and to the ongoing viability of the local economy and the social interactions that it supports.

B. Principal Landowner Concerns

Landowner concerns were identified as part of the initial phase of CSP. Records from past public input programs were reviewed and a public input meeting was held on February 17, 2005, which was specifically focused on the identification of landowner concerns. A telephone survey of landowners within the Colusa Subreach and on the adjoining properties was also conducted by the Institute for Social Research at California State University, Sacramento. Finally, the Advisory Workgroup held several discussions that addressed overall concerns and concerns that related to the eight proposed habitat restoration sites. A summary of the most commonly mentioned concerns is provided below.

The Advisory Workgroup has identified planning and research projects that could be pursued as part of CSP to better understand or possibly resolve these concerns. The Workgroup will evaluate and prioritize these projects and recommend a mix of projects that fits within the CSP budget parameters and “Gets the most bang for the buck” in terms of resolving landowner concerns. Planning and research projects that have been proposed by the Advisory Workgroup are noted for information only. They are not specifically cited as resolutions to the identified concerns. The inclusion of these potential projects is intended only to inform the reader about the type of planning and research activities that may be pursued as part of CSP.

Although actions have been taken in response, there remains a feeling on the part of many local interests that their concerns have not been adequately heard or resolved. As noted previously, Colusa Subreach Planning is intended to provide a new forum to clarify, better inform and address these concerns as they relate to specific habitat restoration projects in the Colusa Subreach.

Effects on Flood Control and Water Supply – Because the Sacramento River Flood Control Project is key to the safety and ongoing economic welfare of Colusa and Glenn Counties, stakeholders are concerned that habitat restoration could reduce the protection afforded by the system. Stakeholders have expressed concerns include that restoration activities may lead to:

- Higher flood flow levels due to increased vegetation cover
- Increased levee seepage due to increased flood flow levels
- Reduction in flood flow capacity due to increased deposition of sediment caused by increased vegetation cover
- Floodway capacity limitations (and navigation hazards) related to increased amounts of large wood debris
- Future flow regime changes related to ecosystem restoration
- Erosion of hard points that protect infrastructure investments

Potential effects on flood control and water supply ranked as the highest priority concern among local interests and the Advisory Workgroup. For this reason, concerns related to flood flows under existing conditions and with proposed restoration projects will be addressed through hydraulic modeling as part of CSP. Other related questions may be addressed through Landowner Question research projects as determined with the Advisory Workgroup.

Fiscal and Economic Effects – The transfer of land from private to public ownership for habitat conservation, flood control and recreation purposes can result in a decrease in tax revenues to local government agencies in Colusa and Glenn Counties. This is primarily because the state and federal government are not subject to local taxes. The state and federal governments each provide

some payments in lieu of taxes (PILT) but these payments do not apply to all properties and they do not equal the local revenues that would otherwise be generated. Additionally, there can be a loss of tax revenue and local economic activity that relates to the loss of the value of the crops grown on lands that are converted from agriculture. An analysis of this effect is planned as a Landowner Question research project. It is recognized, however, that any change to the existing taxation or PILT system will require legislative action at the state and/or federal levels.

Public Recreation Access - The concern has been expressed that public ownership of land for habitat conservation may preclude the public from using those lands for recreation activities such as hunting, fishing, birding, etc. This concern has often been raised in regard to the Sacramento National Wildlife Refuge, which is managed by the US Fish and Wildlife Service. Prior to the adoption of the Comprehensive Conservation Plan (CCP) for the Refuge, public access was not permitted on most of the Refuge lands. This specific issue was largely resolved, however, with the adoption of the CCP in April of 2005 which provided for approximately 79% of the refuge land to be open to public use.

All the fee title lands managed by CDFG and CDPR are open to the public use. Concerns are expressed, however, that regulations could change and the current, open access might be eliminated in the future. There is also a concern that many of the publicly-owned sites do not have access available from the land; they are only accessible from the river, by boat. It is felt that this lack of convenient access precludes use by many persons. The development of a public recreation and access plan for the Colusa Subreach and a combination restoration and recreation plan for the Ward Tract are anticipated as a Focal Area Planning project in response to this concern.

Public Access Effects – Concerns have also been expressed regarding potential problems that could be caused by public access to publicly-owned land. Concerns include increased trespassing onto adjoining private land and vandalism of adjoining, private property. A common comment is that neither the state and federal agencies nor the County Sheriff's Departments have sufficient resources to adequately patrol the areas adjacent to the river. The development of a public recreation and access plan for the Colusa Subreach is planned as a Focal Area Planning project that will help to address this concern.

Increased Regulation – There is a concern that increased public ownership of land and increased areas of publicly-owned wildlife habitat may result in increased regulation of other properties in the Subreach by state and federal agencies. These concerns primarily relate to regulations that pertain to special status species and water and air pollution standards. Concerns have been expressed related to the following regulatory possibilities:

- Increase limitations related to state and federal Endangered Species Acts
- Additional mitigation requirements related to impacts on the environment or special status species
- Additional requirements or increased enforcement of agricultural chemical application regulations
- Additional requirements or increased enforcement of agricultural runoff water quality requirements

Two CSP projects have been discussed to address aspects of this regulatory concern. A project to develop a Programmatic Safe Harbor Agreement for the Valley Elderberry Longhorn Beetle (VELB) has been proposed as part of CSP to preclude additional regulatory limits related to the VELB. Research to identify the existing Endangered Species Act's effects on agriculture and any anticipated future effects is planned as part of a Landowner Question research project.

Crop Damage from Wildlife- Local landowners are concerned that increasing the area of wildlife habitat through restoration of native vegetation may result in an increase in crop depredation from increased agricultural pest populations. Pests of concern include insects, rodents, deer and other animals. Local interests have also indicated that they need to be consulted when habitat restoration projects are being designed so that potential problems can be mitigated in project design. CSP will include multiple consultations with each neighbor adjoining proposed restoration projects and development of a written agreement to clarify the determinations of these meetings. Additionally, a landowner question research project is planned to better define this potential effect and help identify appropriate mitigations.

Increased Mosquito Populations and Increased Incidence of West Nile Virus – Local interests have expressed a concern that the restoration of natural vegetation may lead to increased populations of mosquitoes and increased incidence of West Nile Virus (a disease transmitted by mosquitoes). While no new wetland areas are proposed as part of CSP, the application of Central Valley Joint Venture Best Management Practices and coordination with local mosquito abatement agencies are proposed as part of CSP to help limit mosquito populations and resolve this concern.

Landowner Assurances – The term “Landowners Assurances” has been used to refer to procedures that can provide assurances to neighboring landowners that habitat conservation will not lead to negative impacts on their land and their agricultural operations. Concerns center around two principal issues. First, a standardized grievance process is desired that can provide quick and inexpensive resolution of issues and disputes between private and conservation agency landowners. Second, a process to provide timely compensation for impacts to private landowners from habitat conservation lands is desired. The Landowners Assurances Committee of the SRCAF has attempted to define and resolve these but to date, no resolution has resulted. The lack of resolution is partially related to existing state and federal laws which specify the responsibilities of public agencies and the procedures for dispersal of public funds. Local interests indicate that this lack of resolution is a matter of considerable frustration. The Advisory Workgroup has recognized that these concerns are important but, are beyond the scope of CSP and must be resolved in other venues involving the SRCAF and appropriate state and federal agencies.

Self-Mitigating Area – Landowner interests have indicated that they believe that the Sacramento River Conservation Area should be a “Self Mitigating Area” where the benefits that have accrued to the ecosystem through the various habitat conservation projects should be determined to be mitigation for the impacts of future projects related to flood control, water supply, recreation, agriculture etc. This objective has also been pursued through the Landowners Assurances Committee of the SRCAF, though it is as yet unresolved.

Additionally, the SRCAF continues to address this issue through a LEGACI grant from the Great Valley Center. As with Landowners Assurances, there are numerous regulatory questions to be resolved and this lack of resolution is a matter of frustration to local interests. The Advisory Workgroup has recognized that this concern is important but, it is also beyond the scope of CSP and must be resolved in other venues involving the SRCAF and appropriate state and federal agencies.

VI. RESTORING THE ECOSYSTEM

Since the Euro-American settlement of the Sacramento Valley, the natural ecosystem along the Sacramento River has been greatly changed. The flow regime of the river has been greatly altered and over ninety percent of the riparian forest has been removed. Nonnative, invasive plant and animal species now compete for limited space and resources. Agriculture has become the dominant land use in the use in the entire Sacramento Valley and development in the watershed has modified the quality and quantity of runoff.

These changes have substantially impacted the habitats and animal species of the Colusa Subreach. Numerous animal species have been extirpated from the area and numerous species are now listed as “Endangered”, “Threatened” or of “Special Concern” through state and federal Endangered Species Acts. This situation has led to strong statements of public concern and responses through legislation and funding initiatives. Political responses to these concerns have included SB 1086, which was the precursor of the SRCAF, the Central Valley Public Improvement Act and the CALFED Bay-Delta Program.

In California, voters have authorized substantial amounts of funding for water supply, water quality, recreation, wildlife habitat conservation and related programs through ballot initiatives in recent years. It has been noted that, while these initiatives have passed statewide, the majority of the voters in Colusa and Glenn Counties voted against these initiatives by substantial margins. To clarify that point, Table 7 is provided below. It details the results of four initiative propositions that have provided funding for a wide range of activities that included wildlife habitat conservation in recent years.

Table 7. California Ballot Initiative Results

Initiative	Year	Colusa County		Glenn County		Statewide	
		Yes	No	Yes	No	Yes	No
Proposition 12	2000	38%	62%	36%	64%	63%	37%
Proposition 13	2000	47%	53%	44%	56%	65%	35%
Proposition 40	2002	31%	69%	24%	76%	57%	43%
Proposition 50	2002	26%	74%	23%	77%	55%	44%

Source: California Secretary of State, Elections Division

This Chapter reviews the ecosystem restoration policy that has been adopted for the larger Sacramento River corridor from Red Bluff to Colusa. This information is intended to provide a context for determining a restoration strategy for the Colusa Subreach. CSP is based on the concept that a broad ecosystem restoration strategy that is integrated with agriculture, public recreation, flood control and other uses of the Subreach will best serve all interests: the local community, the entire state and the wildlife resource. It is recognized that a balance between ecosystem

health and economic health is a necessary element of an effective ecosystem restoration strategy.

A. CALFED Ecosystem Restoration Goals

The CALFED Bay-Delta Program addresses the entire Sacramento – San Joaquin Delta watershed which includes the Colusa Subreach. It focuses on the four objectives of Water Supply Reliability, Water Quality, Levee System Integrity and Ecosystem Restoration. Ecosystem Restoration is also one of the eleven Program Elements of the CALFED Program. The Ecosystem Restoration Program Element is oriented to achieve six Goals for the entire Bay-Delta system:

1. Recover 19 at-risk native species and contribute to the recovery of 25 additional species.
2. Rehabilitate natural processes related to hydrology, stream channels, sediment, floodplains and ecosystem water quality.
3. Maintain and enhance fish populations critical to commercial, sport and recreational fisheries.
4. Protect and restore functional habitats, including aquatic, upland and riparian, to allow species to thrive.
5. Reduce the negative impacts of invasive species and prevent additional introductions that compete with and destroy native species.
6. Improve and maintain water and sediment quality to better support ecosystem health and allow species to flourish.

Colusa Subreach Planning was funded as part of the Ecosystem Restoration Program to help meet these Goals. Involving stakeholders and addressing landowner concerns through targeted planning and research projects was established as an important element of the planning process, consistent with CALFED policy.

B. SRCAF Restoration Priorities

The *Sacramento River Conservation Area Handbook* specifies four priorities for habitat restoration that are consistent with the Goal and Guiding Principles of the SRCAF. These priorities are drawn from the body of scientific knowledge that is summarized in the *Handbook*. The *Handbook* also provides specific directives for the Chico Landing–Colusa Reach which includes the Colusa Subreach in Chapter 5. Ecosystem restoration in the Sacramento River Conservation Area, including the Colusa Subreach, is expected to address four priorities. In the following discussion, each priority is evaluated in regard to the Colusa Subreach, in light of the most current information.

- **Protect physical processes where still intact** – A key consideration is whether a project protects existing processes of erosion, deposition and flooding. There is recognition within the *Handbook* that these natural riverine processes are what creates and replenishes riparian habitat and sustains the succession of plant communities. Therefore, a restoration project consistent with the *Handbook* would normally not include provisions

such as new levees that would divert floodwater or revetment that would eliminate or stall channel meander. The *Handbook* provides the following specific guidance regarding this priority for the Colusa Subreach :

Purchase of these areas (inside of the levees) or landowner participation in voluntary programs should receive the highest priority for protection of a functional riparian ecosystem. *Note that clarification is added in brackets*

- **Allow riparian forests to reach maturity** – Projects which protect areas of existing riparian habitat from conversion to other uses are supported by the *Handbook*. This priority relates to both public and private land. The *Handbook* provides the following specific guidance regarding this priority:

All areas of early successional stages should be allowed to mature to climax conditions, thus ensuring a wide variety of vegetation types.

- **Restore physical and successional processes** – Projects which restore natural riverine processes can help to reestablish habitat by restoring connectivity to the floodplain and facilitating the reworking of land through channel meander. The *Handbook* does not provide definitive guidance regarding this priority for the Colusa Subreach and no projects addressing this priority have been identified to date.
- **Conduct Reforestation activities** – The *Handbook* indicates that horticultural replanting of riparian plants should be a last resort. Where possible, the natural recruitment and reestablishment of native vegetation is preferred. This means replanting of riparian habitat is appropriate only where the natural processes are not sufficient to naturally restore riparian habitat in a reasonable period of time. The *Handbook* provides the following specific guidance regarding this priority:

The establishment of a wide continuous riparian and valley oak woodland corridor should be the first option under the reforestation priority.

In some low-lying areas there is adequate flooding, erosion and deposition so that native vegetation can be recruited naturally. On many higher sites, however, the combination of three key factors effectively frustrates effective natural recruitment of riparian vegetation. These key factors are:

1. Changes to the flow and flooding regime have reduced the natural capability to recruit riparian vegetation.
2. Levees and revetment have limited the meander of the river and the resultant creation of new habitat areas.
3. Competition from nonnative, invasive vegetation has severely limited the establishment of riparian plants.

Over the past ten years much scientific research has been directed to the restoration of riparian habitat along the Sacramento River. As a result, the scientific basis of habitat restoration has been greatly advanced. The use of detailed soils evaluation, inundation patterns and other baseline data has made the determination of the most appropriate vegetation community and structure much more precise and accurate. The rate of planting success is now relatively high. Additionally, advances in planting and maintenance

techniques have greatly reduced the average cost of restoration. Restoration costs today are generally in a range of from \$2,500 to \$5,000 per acre, including a three-year maintenance period. The range in cost is due to variations in site-specific costs including weed control, discontinuation of existing uses, planting design, irrigation, etc. These cost figures are based upon TNC's recent experience as part of several restoration projects along the Sacramento River.

C. Ecosystem Approach to Habitat Management

The SRCAF, TNC and the CALFED Program all support an ecosystem approach to the restoration and management of riparian habitat along the Sacramento River. This is the concept of achieving species management objectives by sustaining and enhancing the fundamental ecological structures and processes that contribute to the well being of the communities and species that comprise the ecosystem. The basic objective is to restore and rehabilitate, where feasible, the natural processes that create and sustain the important elements of the ecosystem structure. The ecosystem approach differs fundamentally from the more traditional approach of single-species management, which seeks to manipulate specific environmental factors thought to limit target species populations at levels below management objectives. An example of single-species management would be the direct removal of predators from an environment to reduce predation levels on a target species. In the context of the Colusa Subreach and the entire Sacramento River Conservation Area, the ecosystem approach seeks to restore and support natural riverine processes and resolve impediments to restoration through the application of the best available scientific information and adaptive management of the habitat. The expectation is that restoration of the natural ecosystem will benefit the broadest range of wildlife including special-status species, other native species and game species.

D. Potential Ecosystem Restoration Strategy Components

Under the ecosystem approach various strategies have been implemented by the agencies involved in ecosystem restoration along the Sacramento River. Some common elements of these strategies are reviewed below to facilitate their evaluation and consideration as part of Colusa Subreach Planning. The strategy components that are summarized in this Chapter are not strictly limited to habitat improvement but rather include related public involvement, accessory use and process streamlining concepts. It should be recognized, however, that the components reviewed in this Chapter do not represent the whole of the strategy elements that are currently apply to the Colusa Subreach.

The following review of strategies is presented for information and not as a recommendation for adoption. It is anticipated that through the CSP process, these and additional strategies will be raised and considered by the Advisory Workgroup. Ultimately, this will result in the identification of the most appropriate ecosystem restoration strategy for the Colusa Subreach.

Restoration of Natural Riverine Processes – Restoration of natural riverine processes is the most important component of the ecosystem approach. This includes actions that permit the river to meander and create habitat through the natural processes of erosion and deposition. This involves permitting the river to

erode within most areas of the Subreach and not placing artificial constraints in the way of that process. The *Handbook* recognizes, however, that there are some situations where revetment is required to protect the levee system, existing uses and investments such as buildings, pumping plants, bridges, etc. It is also understood that offsite ramifications of bank protection must be considered.

Reestablishment of the Habitat Corridor – In order to recover wildlife along the Sacramento River, a habitat corridor of adequate size and condition must be reestablished. This involves a combination of preserving existing riparian habitat and infilling with habitat restoration, through either natural recruitment or horticultural planting. Acquisition of land in fee title and conservation easement by public agencies and private conservation organizations from willing sellers is included in the SRCAF program. This permits direct management of the habitat resource and can facilitate the restoration of riverine process.

Within the Colusa Subreach 62% of the existing habitat is privately-owned. This is a major resource and how to best maintain this resource is an important consideration. The restoration of key areas of wildlife habitat on private land could also be part of a successful reestablishment effort. It is recognized, however, that significant economic incentives for private landowners to preserve or restore wildlife habitat are not apparent. Concerns regarding regulatory requirements that might follow restoration activities may also be a limiting factor. Preservation and management of habitat by private landowners is, however, vital to the success of the overall habitat reestablishment effort and the identification of incentives for the private conservation of habitat would be of great value.

The Colusa Subreach and the river corridor, in general, have experienced substantial habitat loss and fragmentation. To help deal with the effects of habitat loss and fragmentation, the preservation and restoration of habitat should be directed to sites which are of the greatest value. The *Comprehensive Management Plan for the Sacramento River Wildlife Area* in 2003 incorporated the following three locational priorities for habitat corridor restoration that appear to be relevant to the Colusa Subreach.

1. The assembly of large, contiguous areas, with high interior to edge ratios.
2. The preservation and restoration of sites which fill gaps and expand corridors of protected habitat.
3. The preservation of sites with significant existing habitat value.

An additional priority that should be considered is, “The acquisition of sites that provide or increase the opportunity for the restoration of natural riverine process.” It is reasonable to expect that these priorities could result in the greatest ecosystem benefit for the resources expended.

Control of Nonnative, Invasive Plant Species – The control of nonnative, invasive plant species is an important element of the maintenance and restoration of riparian habitat. Where allowed to proliferate, invasive species can come to dominate a site and preclude the recruitment of native riparian vegetation. In so doing they may greatly diminish the habitat value for wildlife. Due to the prevalence of invasive species in the other areas of the river corridor and the interconnections that exist through flood flows, the control of invasive species management is a difficult challenge that requires a coordinated approach.

Eradication activities such as those taking place on US Fish and Wildlife Service lands higher in the watershed are desirable, as part of the maintenance of the

habitat in the Colusa Subreach. Controls may involve mechanical removal, chemical control, burning or other methods. Control or eradication of invasive species should also continue to be a standard part of any future restoration planting projects.

Restoration Planting – The replanting of riparian vegetation will likely be required to restore some portions of the Colusa Subreach to native riparian habitat. The preferred method of restoration is to permit natural processes to restore the riparian habitat. In portions of the Subreach, such as low lying locations that are frequently inundated, successful natural recruitment of riparian vegetation continues to occur. The river is still actively reworking these areas and creating new habitat. Unfortunately, natural recruitment will not restore all sites in the foreseeable future to help recover wildlife species

Recent analysis has identified certain high terrace sites along the Sacramento River that have not recruited substantial native riparian vegetation even though they have been open and unfarmed for over 25 years (California Department of Fish and Game, 2003). In these cases, nonnative plants such as yellow starthistle and Johnson grass with low habitat value have dominated the sites and precluded meaningful recruitment of native plants. For these types of higher sites there is no reasonable expectation that the remaining natural processes will generate prime riparian habitat communities in the foreseeable future.

Horticultural planting of native vegetation is required in these situations so that the quantity and quality of habitat can be increased in the near future. The objective of both the state and federal Endangered Species Acts is to foster positive steps that will result in viable populations of special-status species in the foreseeable future so that species can be recovered and delisted. Restored habitat has been shown to support substantial populations of indicator species such as songbirds and Valley Elderberry Longhorn Beetles in relatively short periods of time. For these higher sites where the reduced natural processes (erosion, deposition and flooding) cannot support natural regeneration of riparian habitat horticultural planting of riparian vegetation is necessary to help recover special-status species.

Over 4000 acres of riparian habitat have been restored along the Sacramento River between Red Bluff and Colusa. Only a small portion of this total restoration, 124 acres, has occurred within the Colusa Subreach. Restoration has taken place at three tracts within the Sacramento River Wildlife Area, which is managed by the California Department of Fish and Game. These three tracts are described on Table 8 and depicted on Figure 16.

Table 8. Existing Habitat Restoration Tracts

Property	River Mile	Year	Acres
Princeton- East Subunit	164 L	1992	44
Princeton - South Subunit	162.5 R	2001	34
Moulton – North Subunit	156.5 L	2001	46
Total	-		124 acres

Source: Comprehensive Management Plan for the Sacramento River Wildlife Area

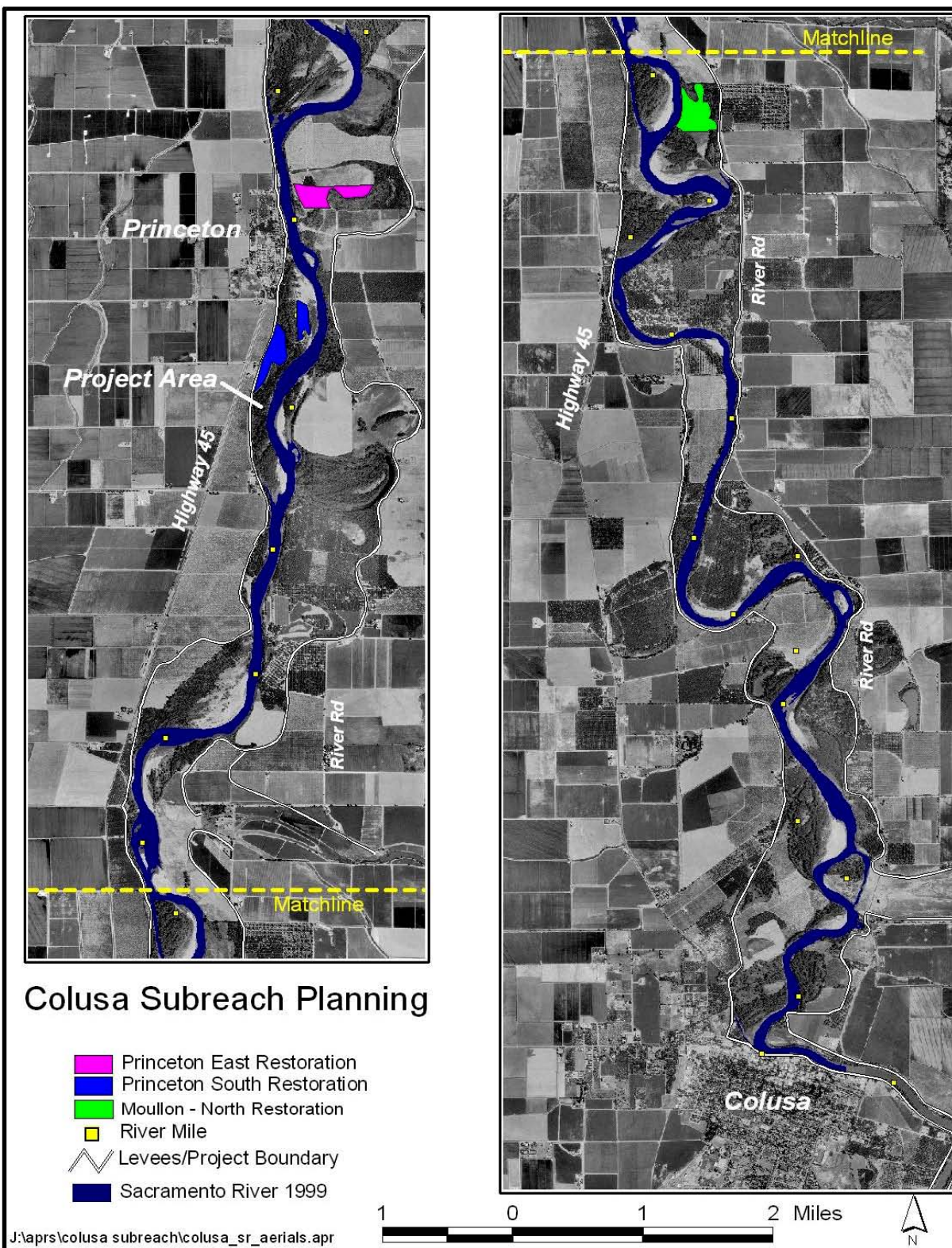


Figure 16. Existing Habitat Restoration Tracts

Source: California Department of Fish and Game

On each site it was determined that natural processes alone would not restore the area to riparian habitat of sufficient value in the near term. Restoration planting followed a detailed baseline analysis of the site characteristics and the development of a plan for the planting and initial maintenance of the area. The planting was limited to native species in a design that responded to existing site characteristics that included soils, drainage, inundation frequency and surrounding land uses. Irrigation was provided for a three-year establishment period. After three years the irrigation was discontinued because the root systems were adequately established to draw necessary moisture from groundwater (Alpert et. al., 1999).

Public Involvement in Habitat Management Planning – In recent years public agencies have expanded their efforts to involve the public in general and local interests specifically in planning for the management of the properties. This outreach is strongly encouraged by the SRCAF. Both the California Department of Fish and Game and the US Fish and Wildlife Service consulted local interests and held multiple public input meetings in the vicinity of the Colusa Subreach as part of their planning processes. While the California Department of Parks and Recreation has not conducted recent planning in this Subreach, it did include a substantial public input process as part of its development of a new general plan for the Bidwell-Sacramento River State Park near Hamilton City. Colusa Subreach Planning will take public involvement in restoration planning to a new level bringing public agencies, the SRCAF and TNC together with many local interests.

The recent experiences of each of these agencies suggest that a range of stakeholder perspectives can be expected in regard to habitat management. This range of input will reflect the variety of interests in the local area and California in general. Some inputs will likely conflict with others but some common themes can be expected to be heard that can help direct the future planning of habitat management.

Coordination with Other Area Landowners – Landowner coordination is stressed by the SRCAF and is an important provision in the habitat management plans prepared by the Department of Fish and Game, the Department of Parks and Recreation and the Fish and Wildlife Service. This coordination normally involves consultation as part of the planning of habitat restoration projects and communication as part of ongoing management of properties. There is a realization that activities on land managed for habitat may affect adjoining land and that the reverse is true.

The SRCAF facilitates the coordination of activities with neighbors as well as the public review of plans and projects related to ecosystem restoration. It has developed specific provisions for communication with neighboring owners and local governments as well as review through its Technical Advisory Committee (TAC) and Board of Directors. A Good Neighbor Policy was initially adopted by the SRCAF Board of Directors but remaining sections related to incidental take, grievance procedure and a self-mitigating area are unresolved. As noted in Chapter V, this lack of resolution is a matter of frustration to some local interests.

Planning for Compatible Public Recreation – Riparian habitat has been and will continue to be attractive for recreation uses that appeal to a substantial segment of both the local and regional population. The public ownership of land for ecosystem restoration offers the potential for increased public access and utilization of this recreation resource. Public input also indicates that such recreation is considered

to be a visible and tangible return on the taxpayer investment directed toward habitat conservation along the Sacramento River.

Planning for public recreation by been an important focus of activity within the Sacramento River Conservation Area over the past three years. Chico Landing Subreach Planning included the *Sacramento River Public Recreation Access Study* that developed an information base for subsequent planning efforts. Both the Department of Fish and Game and the Fish and Wildlife Service identified recreation uses that are compatible with their wildlife habitat conservation missions and identified policies and improvements that they would pursue, in order to better support public recreation use of the properties that they manage. The recent general plan for the Bidwell-Sacramento River State Park had public recreation as a central focus. All these processes identified the fact that the increased populations of fish and wildlife, that will result from habitat conservation, will support more and better public recreation opportunities on the more than 13,400 acres of land that will be available for public use along the middle Sacramento River.

Colusa Subreach Planning offers the potential to draw from these previous planning programs, obtain specific public input and target recreation needs that can be coordinated with habitat conservation. In this way compatible public recreation use could be integrated into the overall ecosystem restoration strategy that will be developed for the Subreach. The planning of specific restoration tracts additionally offers the potential to plan for public access and use (trails, parking areas, etc.) that will permit the public to directly experience the benefits of habitat conservation. For example, areas could be reserved for future public parking. Also, primitive roads for the initial maintenance of restoration plantings could be located so that they could serve as trails to desirable public use areas such as gravel bars in the future.

Regulatory Streamlining – The concept of streamlining regulations is a key consideration within the *Handbook*. The Sacramento River corridor is a rich but fragile ecosystem that is affected by numerous local, state and federal regulations designed to protect air quality, water quality and wildlife. These standards are administered by many different agencies; and meeting these various regulations can be complex, time consuming and expensive. These compliance costs impact agriculture, flood control, infrastructure, recreation and ecosystem restoration.

The *Handbook* proposes a regulatory consistency/streamlining program that should include the following elements:

- Mitigation requirements
- Interagency consistency
- Consolidation of application forms
- Mitigation banking

This interest in streamlining is applicable to the entire Sacramento River Conservation Area and efforts are underway to address these concerns, principally through the Landowner Assurances Committee of the SRCAF. While it is not practical or desirable for CSP to duplicate or replace these efforts, there may be the opportunity to address subreach-specific concerns or develop demonstration projects as part of CSP. The Landowner Assurances Committee of the SRCAF has been investigating concepts for regulatory streamlining supported by a Legaci grant from the Great Valley Center. This effort involves top managers of public conservation agencies, such as the State Department of Fish and game and the US Fish and Wildlife Service, as well as some members of the Advisory Workgroup.

Specific details of a streamlining proposal have not yet been finalized but it has been suggested that the Colusa Subreach might provide a real world opportunity to take a streamlining concept from the theoretical to reality.

One such opportunity that is proposed as part of CSP is the development of a Programmatic Safe Harbor Agreement (PSHA) related to the Valley Elderberry Longhorn Beetle (VELB). The proposed agreement could permit the planting of elderberry plants within Colusa Subreach restoration areas to expand the existing baseline of elderberry plants. This would expand the habitat available to the VELB. A PSHA could then permit flood control agencies, or any other public or private entity who wanted to join the Safe Harbor Agreement, to remove elderberry plants as part of their normal activities. Flood control agencies have indicated that this “incidental take” ability would improve their maintenance of the levee system by reducing cost and saving time.

Other Strategies – Additional concepts and new ideas are expected to be suggested, discussed and evaluated as part of Colusa Subreach Planning that may be reflected in the final ecosystem restoration strategy for the Colusa Subreach.

VII. PROPOSED RESTORATION TRACTS

Colusa Subreach Planning includes the development of habitat restoration plans for eight tracts, which are owned by a public agency, owned by TNC or optioned to TNC at this time. They include a total of 413 acres that have been converted to agriculture in the past. The restoration plans will identify the restoration opportunities at each tract and the site-specific techniques to be employed to restore riparian habitats. The plans will identify the species to be planted and the arrangement of planting at each site. They will be based on extensive baseline analysis, information generated through other CSP studies and input from the public engagement process. They will be of a sufficient detail that funding applications can be pursued for each tract in the future. No other private property will be planned for restoration.

Through the CSP public engagement process the restoration plans will be publicly discussed and reviewed. Initial restoration recommendations will be developed as part of the Tract-Specific Baseline Assessment. Meetings will be held with adjoining landowners and restoration recommendations will be reviewed by the Advisory Workgroup. Draft plans will undergo hydraulic analysis to determine the impact on the flood control system and any appropriate adjustments will be made to ensure that no substantive impacts to the integrity of the flood control system result from the proposed restoration. Actual restoration of these tracts will be dependant on the availability of funding for the restoration in the future.

A. Baseline Assessments

Baseline Assessments will be prepared for the eight restoration tracts in order to characterize each site and provide the necessary technical basis for the design of restoration plans. The eight tracts are described in Table 9 below and depicted in Figure 17. Each tract contains an area that is a potential candidate for restoration of native habitat. The Baseline Assessments will be prepared through two subcontracts: the Tract-Specific Baseline Assessment and the Cultural Resources Assessment.

Table 9. Proposed Restoration Tracts

Tract	Total Area	Restoration Area	River Mile	Existing Land Use	Owner
Womble	307	58	RM 162L	Agriculture-annual row crops	Under option
Jensen	105	83	RM 161L	Agriculture-walnut orchard	TNC
1000-acre Ranch	60	50	RM 160R	Agriculture-prune orchard	TNC
Stegeman	69	10	RM 160R	Fallow-former orchard	State / DFG
Boeger	129	55	RM 148L	Agriculture-annual row crops	TNC
Colusa-North	118	5	RM 147R	Fallow-former orchard	State / DFG
Ward	238	143	RM 145.5R	Agriculture-annual row crops	TNC
Cruise n'Tarry	10	9	RM 145.5L	Fallow-former orchard/marina	State/ DWR
Total Areas	1036	413			

Source: The Nature Conservancy

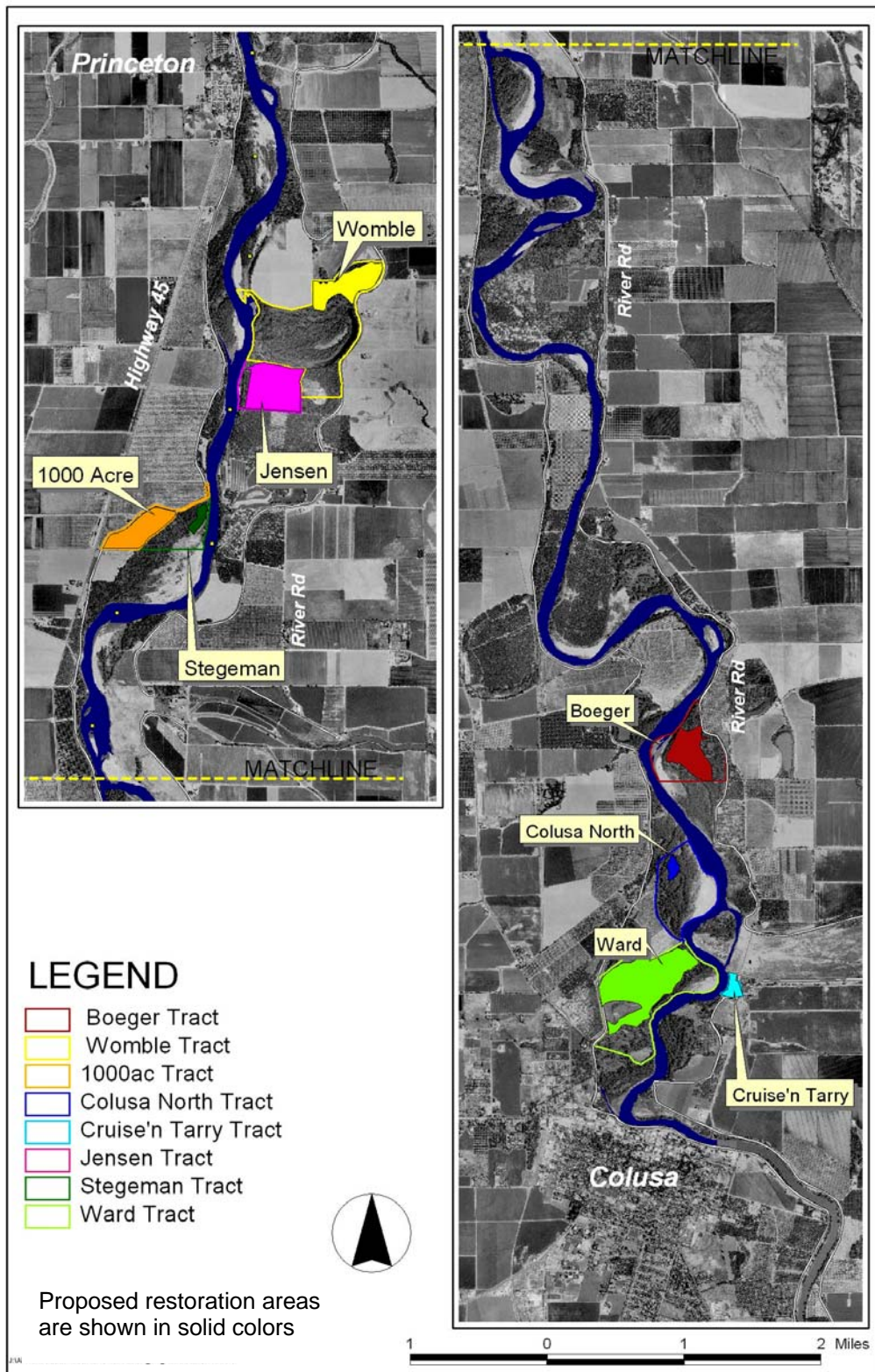


Figure 17. Proposed Habitat Restoration Tracts

Source: The Nature Conservancy

Tract-Specific Baseline Assessment – Researchers from the Department of Biology at CSU Chico will prepare the Tract-Specific Baseline Assessment under subcontract to TNC. Work on this subcontract was initiated in the summer of 2004 because of the need to begin this work early and have it completed in time to support the subsequent phases of CSP. This effort will result in two components, the Tract-Specific Baseline Data component and the Small Mammals component.

The Tract-Specific Baseline Data component will include research and analysis of existing vegetation, soils, inundation frequency and wildlife in order to develop the basic scientific information that is required for the planning of habitat restoration. It will also include description of adjacent land use patterns. This information will permit a determination as to whether a tract is likely to recruit adequate natural vegetation to restore the habitat, without a horticultural planting program. If planting is judged to be necessary, preliminary restoration planting recommendations will be developed. Such restoration recommendations will include specifications as to the appropriate mix and distribution of plant species for each site. The planting design will be developed to replicate the vegetation that would cover the tract under natural conditions. A separate report will be provided for each of the eight restoration sites, to facilitate future funding proposals. These reports are scheduled to be completed in the late summer of 2005.

The Small Mammals component will characterize the differences in distribution and abundance of small mammals (ground squirrels, pocket gophers, voles, etc.), in different habitat types. This will help to evaluate changes that may occur with habitat restoration. Sampling will include small animal trapping and analysis of owl pellets at established nest boxes. Data collection will occur during the dry and wet seasons of 2004-5 and 2005-6. A single report is scheduled to be completed by November of 2006, to convey the findings of this component.

Cultural Resources Assessment – The Archaeological Research Program at CSU Chico performed the Cultural Resources Assessment under subcontract to TNC. The intent of the Assessment was to document any significant cultural resources on the restoration tracts and to ensure that any subsequent restoration plans are designed so that they do not impact such cultural resources. The Assessment built upon the *Cultural Resources Overview and Management Plan, Sacramento River Conservation Area, Tehama, Butte, Glenn and Colusa Counties, California* that was prepared in 2003 as part of Chico Landing Subreach Planning.

The Assessment included review of existing archaeological records for the entire area of the restoration tracts, field survey of the restoration areas of these tracts and preparation of a report summarizing the findings of the study. The report also specified appropriate protections for any identified cultural resources. The Ward Tract was included in the *Cultural Resources Overview and Management Plan*, as referenced above, in 2003. Cultural resources information regarding the Ward Tract was, however, updated and incorporated in the Cultural Resources Assessment Report.

The report was completed in January of 2005 and presented to the Advisory Workgroup for review. It is available at the CSP website and at local libraries. One potentially significant archaeological site was identified and mitigation measures to protect the site were recommended. These measures will be incorporated in future plans for the subject tract. The specific location of these potentially important cultural resources was kept confidential to protect the resources.

B. Proposed Restoration Tracts

Eight tracts were chosen for restoration evaluation and planning within the subreach. Each site appears to have the potential to support native vegetation that would provide high value habitat for wildlife. As previously noted, the eight tracts are owned (or are planned to be owned in the case of the Womble Tract) by the public or by TNC. They are all located adjoining or in close proximity to the river and are inside of the levees. On two of the tracts, the agricultural use has been abandoned. The remaining six tracts retain some agricultural use.

Womble Tract is an approximate 307-acre site located about one mile south of Princeton, on the east side of the river. Figure 18 depicts the site on a 1999 aerial photo. The majority of the tract is in riparian habitat, which includes a large oxbow lake. The oxbow lake was formed after the river channel was cut across Boggs Bend about 1930. About 51 acres of the northeast corner of the tract has been cleared and is used for annual row crops. The row crop area is inundated in most years, and the portion of the area adjacent to the levee, ponds water annually because it is lower than the property to the west. Ponded water, in this area, has commonly been pumped out in the late spring or early summer to permit planting. The tract is under option to TNC, and the trustee has given permission to include the land in the Baseline Assessment. The Womble Tract adjoins the Jensen Tract to the southwest. The site has access from River Road on the east.

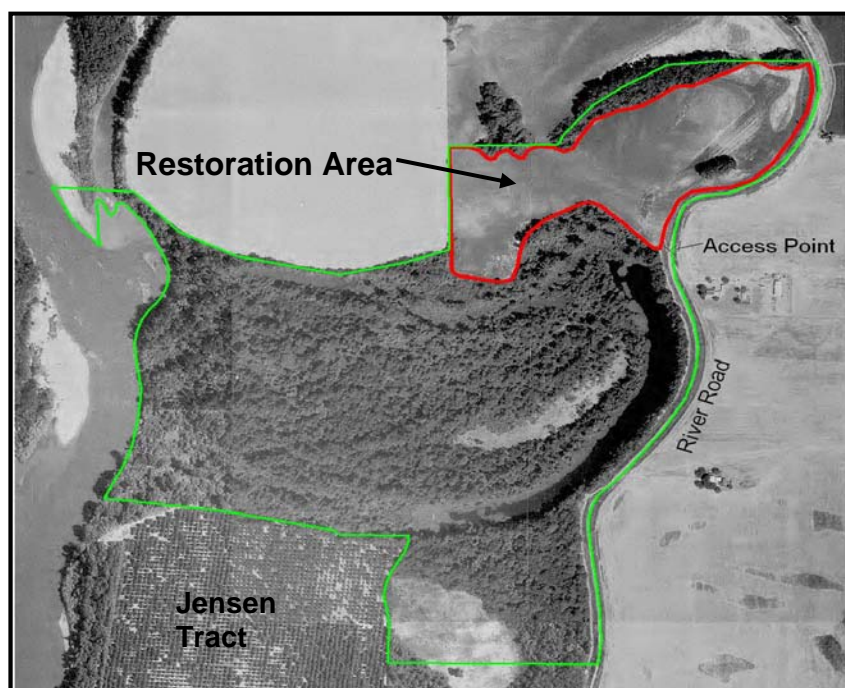


Figure 18. The Womble Tract

The existing row crop area will be evaluated for potential conversion to riparian habitat. This area adjoins the levee on its east boundary. It abuts row crops and riparian vegetation to the north and row crops the west. Irrigation water is pumped from the onsite oxbow lake. Restoration of the tract would increase the local area of

contiguous riparian vegetation from approximately 260 to 270 acres, or 394 acres, if the Jensen Tract is also restored.

Jensen Tract is an approximate 105-acre site located about 1.75 miles south of Princeton on the east side of the river. Figure 19 depicts the site on a 1999 aerial photo. About 83 acres of the tract is a walnut orchard and 22 acres are in riparian vegetation. The tract floods approximately every one to two years. The tract was purchased by TNC in 2000. The Jensen Tract adjoins the river on the west, and riparian portions of the Womble Tract on the north and along the north half of the east boundary. Access to the site is across a private easement from River Road.



Figure 19. The Jensen Tract

The existing orchard area will be evaluated for potential conversion to riparian habitat. The orchard area abuts onsite riparian area to the west. It abuts a walnut orchard, with a single owner on the south; and a riparian area, with a single owner along the south half of the east boundary. The orchard area is leveled and irrigation is supplied from an onsite well. Restoration of the tract would increase the local area of contiguous riparian vegetation, from approximately 260 to 343 acres, or 394 acres, if the Womble Tract is also restored.

1000-Acre Ranch Tract is an approximate 60-acre site located on the west side of the river about 2.75 miles south of Princeton. Figure 20 depicts the site in on a 1999 aerial photo. Fifty acres of the tract is an older prune orchard and the remaining ten acres are covered by the levee and the adjacent access area, which abuts the site to the northwest. The tract is estimated to be inundated about every two to four years. The tract was purchased by TNC in 2003. The 1000-Acre Ranch Tract adjoins the Stegeman Tract on the east. Access to the site is across a private easement from Highway 45.

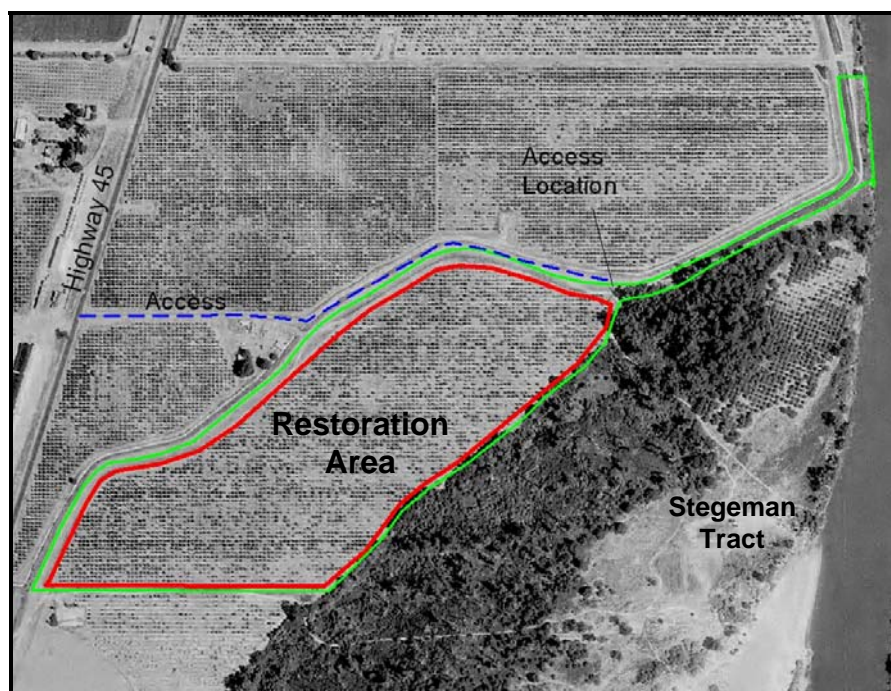


Figure 20. The 1000-Acre Ranch Tract

The existing orchard area will be reviewed for potential conversion to riparian habitat. The tract area abuts a young walnut orchard to the south, which is under the same ownership as the adjoining riparian habitat to the east. The restoration area has been leveled and irrigation is supplied from an offsite well. Restoration of the tract would increase the local area of contiguous riparian vegetation, from approximately 240 to 290 acres, or 300 acres if the Stegeman Tract is also restored.

Stegeman Tract is an approximate 69-acre site located, on the west side of the river, about 2.85 miles south of Princeton. Figure 21 depicts the site on a 1999 aerial photo. About 59 acres of the tract is in riparian habitat. Approximately ten acres is occupied by a walnut orchard that has been abandoned for over 14 years. The tract is flooded about every one to four years depending on elevation. It was purchased by the State of California in 1990 and it is the northerly parcel of the Stegeman Unit of DFG's Sacramento River Wildlife Area. The tract adjoins the 1000-Acre Ranch Tract on the west. Access to the site is across a private easement from Highway 45.

The abandoned orchard area will be evaluated for potential conversion to riparian habitat. The abandoned orchard area is entirely surrounded by onsite riparian habitat but the walnut trees have effectively precluded natural conversion to riparian over the last 14+ years. The orchard area is generally level and no irrigation infrastructure exists. Restoration of the tract would increase the local area of contiguous riparian vegetation from approximately 240 to 250 acres, or 300 acres if the 1000-Acre Ranch Tract is also restored.

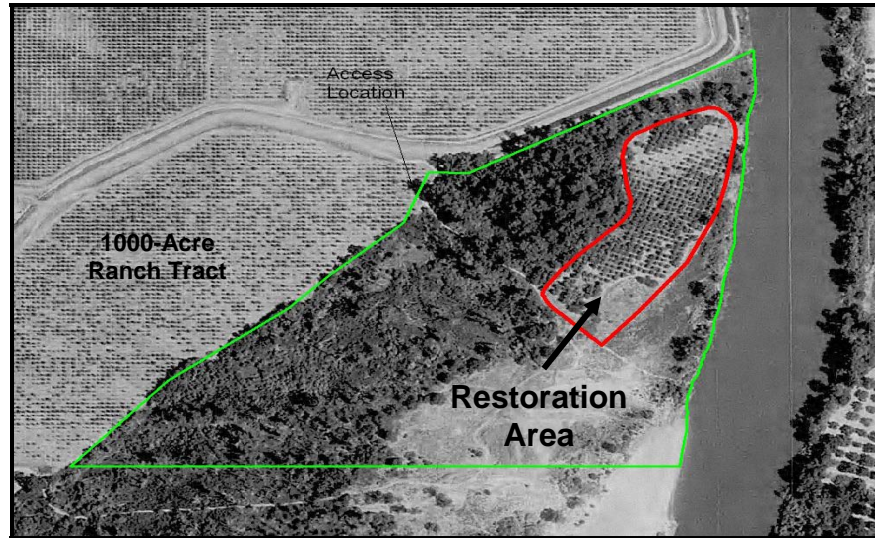


Figure 21. The Stegeman Tract

Boeger Tract is an approximate 129-acre site located about 2.5 miles north of Colusa on the east side of the river. Figure 22 depicts the site on a 1999 aerial photo. About 74 acres are in riparian habitat and 55 acres are now in row crops. The tract is flooded about every one to four years, depending on elevation, and it was purchased by TNC in 2002. The Boeger Tract adjoins the river, on the west and north. It abuts the levee on the east and private riparian habitat on the south. Access to the site is across a private easement from River Road.

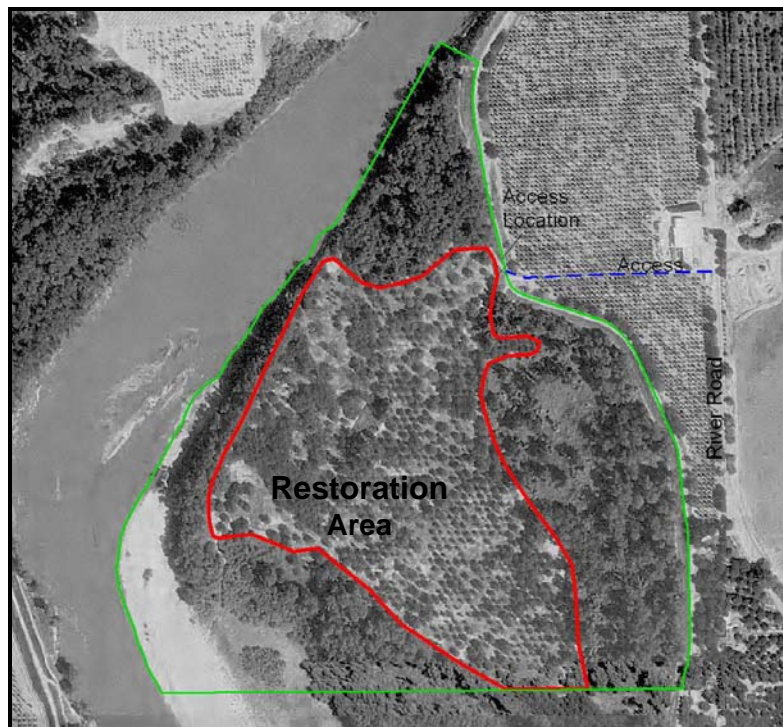


Figure 22. The Boeger Tract

The existing row crop area will be evaluated for potential conversion to riparian habitat. The row crop area is surrounded by onsite riparian, the adjoining private riparian property to the south and the levee on the east. The row crop area is leveled, and irrigation is supplied from an onsite well. Restoration of the tract would increase the local area of contiguous riparian vegetation, from approximately 140 to 195 acres.

Colusa-North Tract is an approximate 118-acre site located on the west side of the river, about 2 miles north of Colusa. Figure 23 depicts the site on a 1999 aerial photo. About 113 acres of the tract is in riparian habitat. Approximately five acres is occupied by a walnut orchard that has been abandoned for over 11 years. The tract floods about every one to two years, depending on elevation. It was purchased by the State of California in 1994 and comprises the northerly subunit of the Colusa Unit of DFG's Sacramento River Wildlife Area. The tract is north of the Ward Tract, with an intervening private property, where the owner has indicated a desire to restore natural habitat. Access to the site is across private easements.

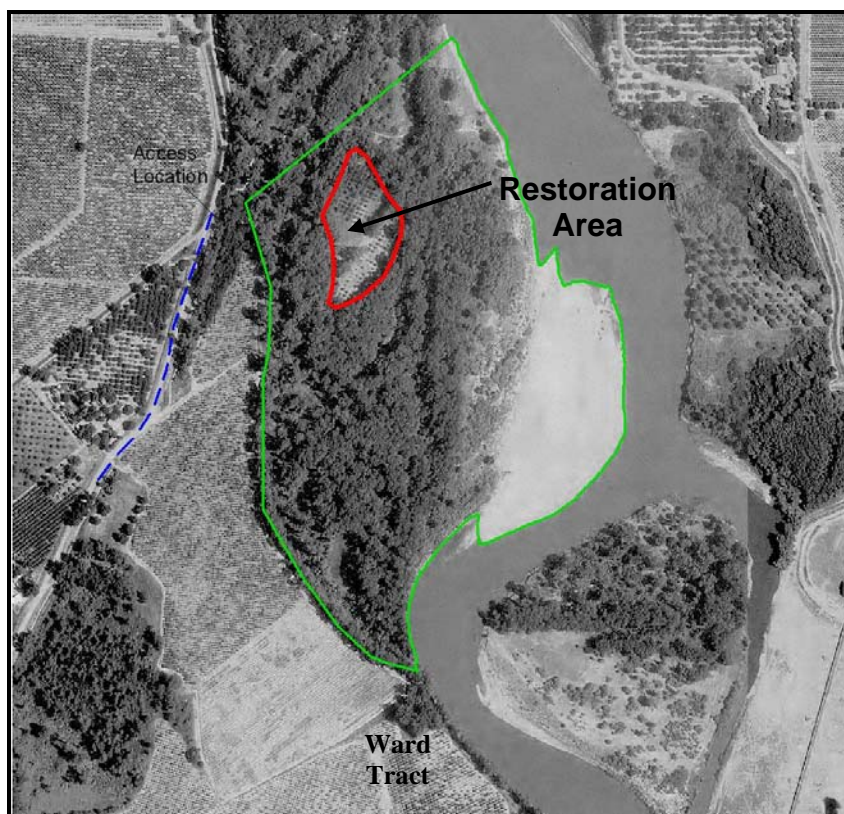


Figure 23. The Colusa-North Tract

The abandoned orchard area will be evaluated for potential conversion to riparian habitat. The abandoned orchard area is entirely surrounded by onsite riparian habitat, but the walnuts have effectively precluded natural conversion to riparian habitat over the last 10+ years. The orchard area is generally level and no irrigation infrastructure exists. Restoration of the tract would increase the local area of

contiguous riparian vegetation, from approximately 375 to 380 acres, or 523 acres, if the Ward Tract is also restored.

Ward Tract –The Ward Tract is an approximate 238-acre site located about one mile north of Colusa, on the west side of the river. Figure 24 depicts the site on a 1999 aerial photo. About 95 acres of the tract are in riparian habitat and approximately 143 acres are in row crops. An orchard was removed subsequent to the aerial photo. The tract is flooded about every one to four years, depending on elevation. It was purchased by TNC in 2001. The Ward Tract adjoins the river on the east, and the riparian portion of the Colusa-Sacramento River State Recreation Area on the south. It abuts the levee on the west and privately-owned riparian and row crop land on the north. Access to the site is across a private easement.

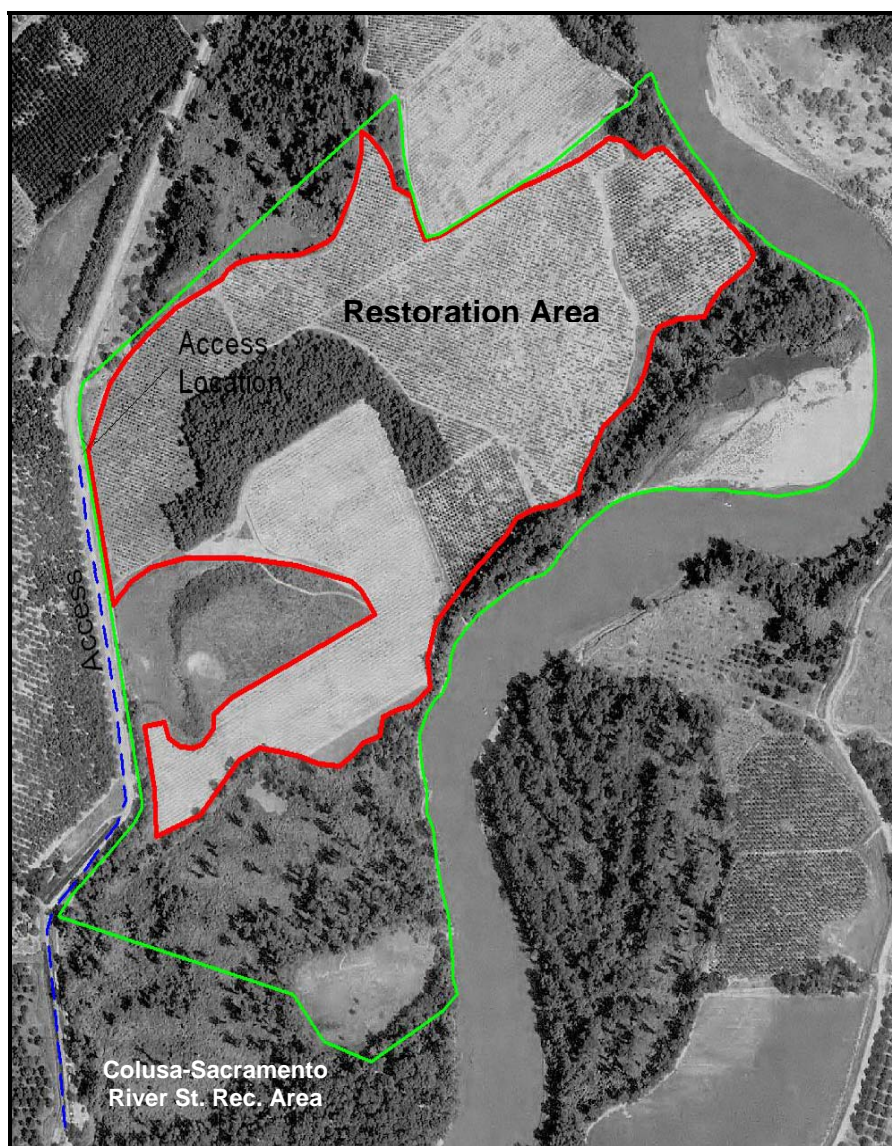


Figure 24. The Ward Tract

The row crop area will be evaluated for conversion to riparian habitat. The row crop area is surrounded, by onsite riparian, the levee and the river, on three sides. The owner of the adjoining row crop land, to the north, has indicated a desire to restore the adjoining area to habitat. The area has been leveled and irrigation is supplied from the river. Restoration of the tract would increase the local area of contiguous riparian habitat from approximately 375 to 518 acres, or 523 acres, if the Colusa-North Tract is also restored.

Cruise n'Tarry Tract - The Cruise n'Tarry Tract is an approximate 10 acre site located about one mile north of Colusa, on the east side of the river. Figure 25 depicts the site in an aerial photo. It is the site of a former marina and it was leased to Colusa County in the past. The tract is a mixture of open area, abandoned orchard and riparian habitat. It is flooded about every one to four years, depending on elevation and it was purchased by the State in 1989. The tract adjoins the river on the west, the Colusa Weir on the north and the levee on the east and south. The Ward Tract is located across the River to the west. Access to the site is from River Road. Access to the site is from River Road.

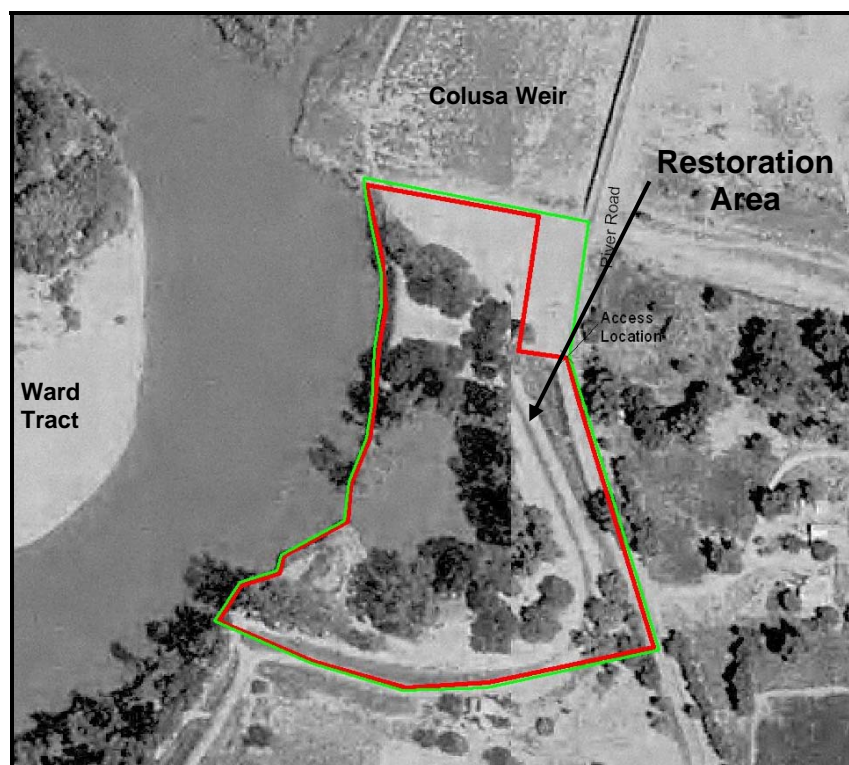


Figure 25. The Cruise n'Tarry Tract

Nine acres will be evaluated for potential conversion to riparian habitat and one acre will continue to be reserved for short-term storage materials cleared from the adjoining Colusa weir. The tract has a permanent pool in the center that is approximately the level of the river surface. A residence is located on the adjacent property, to the south, across the levee. Restoration of the tract could increase the local area of contiguous riparian vegetation from approximately 10 to 19 acres.

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APPENDIX A

Memorandum of Agreement between the Sacramento River Conservation Area Forum and The Nature Conservancy regarding the Colusa Subreach Planning Project

The Memorandum of Agreement was adopted by the Steering Committee on June 17, 2004 to help guide Colusa Subreach Planning. The full text of the Memorandum is incorporated in this Appendix.

**MEMORANDUM OF AGREEMENT
BETWEEN THE SACRAMENTO RIVER CONSERVATION AREA FORUM
AND THE NATURE CONSERVANCY REGARDING THE COLUSA
SUBREACH PLANNING PROJECT**

I. Preamble

The Nature Conservancy ("TNC") has been awarded a grant from the California Bay Delta Authority ("CBDA") referred to as ERP-01-P27 to conduct a three-year subreach planning project along the Sacramento River (the "Project"). The Project will focus on the land inside of the Sacramento River Flood Control Project levees between the Princeton Ferry site and the Colusa Bridge (the "Project Area"). The Project will involve a comprehensive approach to restoration planning that includes a high level of stakeholder involvement to develop conceptual restoration plans and analyze potential benefits to, and impacts of, restoration implementation on surrounding landowners and land uses. This planning process will develop the tools and information needed to make informed land use decisions regarding the effects of restoration actions that are uniquely designed to correspond to local conditions. TNC entered into a Recipient Agreement on April 21, 2004 with GCAP, the contract manager for CBDA, to implement the Project.

In October of 2001, TNC submitted a proposal to CBDA for funding of the Project (the "Proposal"). The Sacramento River Conservation Area Forum ("SRCAF") assisted in the development of the Proposal, supported the Proposal and was named in the Proposal as a partner in the Project. The principal role of SRCAF in the Project application was to collaboratively manage, with TNC, a public outreach process that would involve a wide range of stakeholders in planning the use of the floodplain and the restoration of riparian habitat within the Project Area. As set forth in the Proposal, TNC plans to enter into a subcontract with the CSU Chico Foundation, the contracting agent for SRCAF, to provide funding for certain staff services to be provided by SRCAF related to the public outreach aspects of the Project.

II. Purpose of the Memorandum of Agreement

The purpose of this Memorandum of Agreement ("MOA") is to set forth the agreement between SRCAF and TNC in regard to the implementation of the Project and to document and detail the collaborative partnership between the parties.

III. Commitment to the Goal and Objectives the Project

Shared Commitment to the Project Goal

SRCAF and TNC jointly commit to the following Goal of the Project:

Increase citizen stakeholder involvement in determining realistic conservation strategies and projects for protecting and restoring a riparian corridor along the Sacramento River in the Project Area that address flood control and economic and environmental uses of the floodplain.

Shared Commitment to the Project Objectives

SRCAF and TNC jointly commit to the following Objectives of the Project:

1. Ensure an open and inclusive planning process consistent with the SRCAF principles and guidelines with multiple opportunities for input by local stakeholders, agencies and private interest groups.
2. Collect baseline data and analyze existing data to inform floodplain management and compliment long-term monitoring programs.
3. Build and calibrate tools to evaluate the effects of restoration, land management alternatives and flood control infrastructure specific to the Princeton – Colusa Subreach.
4. Develop design alternatives and build support among stakeholders for identified implementation projects, incorporating ecosystem restoration and related compatible flood protection, recreation and other land use benefits.
5. Address stakeholder concerns and research priority questions.

IV. Responsibilities of SRCAF

SRCAF commits to discharge the following responsibilities pursuant to this MOA:

1. Act as a partner with TNC to jointly manage the public outreach portion of the Project to be consistent with the goal and principles of the SRCAF Handbook.
2. Assist TNC in selecting a project facilitator, as specified in the Recipient Agreement (“Facilitator”).
3. Select the Advisory Workgroup in coordination with TNC, consistent with Section VII of this MOA.
4. Coordinate and distribute, in conjunction with the Facilitator and TNC, agendas and information for the Advisory Workgroup.
5. Communicate with local governments and conservation agencies regarding the Project in coordination with TNC.
6. Utilize the SRCAF Board, Technical Advisory Committee and other appropriate SRCAF committees to review and comment on Project reports, studies and plans.

V. Responsibilities of TNC

TNC commits to discharge the following responsibilities pursuant to this MOA:

1. Manage the Project activities under the Recipient Agreement to be consistent with the goal and principles of the SRCAF Handbook, with reporting responsibility to CBDA.
2. Act as a partner with SRCAF to jointly manage the public outreach portion of the project to be consistent with the goal and principles of the SRCAF Handbook.
3. Coordinate with SRCAF in recruiting the Facilitator.
4. Assist SRCAF in selecting the Advisory Workgroup, consistent with Section VII of this MOA.
5. Assist SRCAF and the Facilitator to coordinate and distribute agendas and information for the Advisory Workgroup.
6. Communicate with local governments and conservation agencies regarding the Project.
7. Manage the preparation of reports and studies that are part of the Project.
8. Develop land use and restoration alternatives for land owned by those who choose to participate, including public agencies, TNC and other private landowners, with input from the Advisory Workgroup.
9. Consider input from the Advisory Workgroup and make Project

determinations consistent with the goal and principles of the SRCAF Handbook per CBDA requirements.

VI. The Steering Committee

The Steering Committee will serve as a coordinating body to guide the public outreach process and oversee the implementation of the Project. The Steering Committee will be members of the Advisory Workgroup and a member of the Steering Committee, selected by the Steering Committee, will serve as the chair of the Advisory Workgroup. The Steering Committee shall be composed of seven members as follows:

- SRCAF
 - Board members from
 - Colusa County – public interest representative
 - landowner representative
 - Glenn County – public interest representative
 - landowner representative
 - SRCAF Manager
- Public Conservation Agency representative selected by the SRCAF Board
- TNC representative – Project Director

VII. The Advisory Workgroup

Function

The Advisory Workgroup will serve to provide input representative of stakeholders to the planning of restoration and related land uses along the river and to studies developed through the Project. Members of the Advisory Workgroup will be expected to commit to become informed in regard to restoration and flood management issues, regularly attend meetings throughout the term of the Project and review Project reports and studies. An Advisory Workgroup Role Description will be developed by SRCAF staff and TNC in conjunction with the Facilitator that will detail the duties and expectations of the Advisory Workgroup. The Advisory Workgroup Role Description will be approved by SRCAF and TNC prior to the selection of the Advisory Workgroup.

Selection

The Advisory Workgroup will be selected by the SRCAF with the input of TNC. The composition of the Advisory Workgroup will be as specified on Attachment “A”.

Consistency with the Sacramento River Conservation Area Forum Handbook

The Advisory Workgroup will review reports, studies and plans to ensure consistency with the goal and principles of the SRCAF Handbook.

Science Subgroup

A Science Subgroup will be selected by the Steering Committee from the membership of the Advisory Workgroup to review technical aspects of the Project and related technical reports in order to permit the Advisory Workgroup to focus on substantive policy issues.

VIII. Amendment

This MOA may be supplemented, amended or modified by the written agreement of SRCAF and TNC.

IX. Approval

This MOA shall be effective as of June 17, 2004 and shall extend through April 15, 2007.

_____ (original signed by) _____
Lynnel Pollock, Board of Directors Chair
Sacramento River Conservation Area Forum

_____ (original signed by) _____
Mike Sweeney, Chief Operating Officer
The Nature Conservancy

Attachment “A”*

**This is subject to further refinement by the Steering Committee*

Composition of the Advisory Workgroup

Steering Committee members (7)

- ◆ SRCAF Board Member– Colusa County, landowner
- ◆ SRCAF Board Member – Colusa County, public interest
- ◆ SRCAF Board Member - Glenn County, landowner
- ◆ SRCAF Board Member - Glenn County, public interest
- ◆ SRCAF - Public Conservation Agency representative
- ◆ SRCAF Manager
- ◆ TNC Project Director

Interest Representatives (8):

- ◆ Inner Levee Private Property Owner
- ◆ Local Irrigation or Reclamation District
- ◆ City of Colusa
- ◆ Colusa County government
- ◆ Glenn County government
- ◆ Recreation Interest
- ◆ Business Interest
- ◆ Environmental Interest

Agency Property Owner Representatives (5):

- ◆ State Department of Fish and Game
- ◆ State Department of Parks and Recreation
- ◆ State Department of Water Resources
- ◆ US Fish and Wildlife Service
- ◆ California Bay Delta Authority

APPENDIX B

Colusa Subreach Planning Public Engagement Plan

The Public Engagement Plan was adopted by the Steering Committee on October 1, 2004 to help guide Colusa Subreach Planning. The full text of the Plan is incorporated in this Appendix.



COLUSA SUBREACH PLANNING

Public Engagement Plan



1. Purpose of the Public Engagement Plan

The Public Engagement Plan is intended to outline a process that will provide stakeholders with the opportunity to become informed about the Colusa Subreach Planning Project and to participate in the planning process. It is also intended to provide for a planning process is efficient and contributes to achieving the Project Goal and Objectives.

2. Overview of the Project

The Colusa Sub-reach Planning Project is a collaborative effort among landowners, other local interests and resources agencies to develop a conservation strategy along the twenty-one mile stretch of the Sacramento River from Princeton to Colusa. Planning will focus on identifying the concerns of area landowners and addressing them through research projects. It will include an emphasis on the restoration of riparian habitat on public lands and lands purchased for habitat conservation that are inside the Sacramento River Flood Control Project levees. Private properties will not be accessed without permission and private property rights will be respected. The Project will occur over a three-year period and it is funded by the California Bay-Delta Program, which is commonly known as CALFED.

The Colusa Subreach Planning Project will be substantially driven by the issues and opportunities that are identified as part of the public engagement process. The Project will include the preparation of detailed, baseline assessments for potential restoration sites and hydraulic analysis of draft restoration proposals to ensure the continuing integrity of the flood control system. Research projects will also be initiated to address key landowner questions and concerns identified by the Advisory Workgroup. The overall intent of the Project is to plan for identified habitat restoration activities and related uses that are compatible with agriculture and the flood control system.

3. TNC and SRCAF Partnership

The Sacramento River Conservation Area Forum (SRCAF) and The Nature Conservancy (TNC) initially agreed to form a partnership to conduct the Colusa Subreach Planning Project in the summer of 2001, when the application for project funding was first prepared. Both entities recognized that there were concerns with habitat restoration that required open and cooperative interaction with all stakeholders. This joint agreement was further detailed in the *Memorandum of Agreement between the Sacramento River Conservation Area Forum and the Nature Conservancy Regarding the Colusa Subreach Planning Project* in June of 2004. The *Memorandum of Agreement* specifies the shared commitments of both entities related to:

- The Goal and Objectives of the Project
- The responsibilities of both SRCAF and TNC

- Provision for a Steering Committee to direct the public outreach
- Provision for an Advisory Workgroup to provide representative stakeholder input

TNC is responsible to the California Bay-Delta Authority for the completion of all Project tasks. SRCAF partners with TNC to manage the public outreach effort and provides staff services to help support the effort pursuant a subcontract to TNC.

4. Key Targets for Public Engagement

- Landowners in and adjoining the Project Area (between the levees)
- Local government (Colusa and Glenn Counties, City of Colusa, local special districts)
- Local organizations (Farm Bureaus, Chambers of Commerce, etc.)
- Agricultural interests
- Water supply interests
- Recreation interests
- Conservation interests
- Other community opinion leaders
- Federal and State agencies with key jurisdiction in the Project Area
 - US Fish and Wildlife Service
 - US Army Corps of Engineers
 - California Department of Fish and Game
 - California Department of Parks and Recreation
 - California Department of Water Resource
 - California Reclamation Board
 - California Bay-Delta Authority

5. Key Information Needs for Key Contacts

Key Information To Contacts	Key Information From Contacts
Description of Project - Overview	Ways in Which Project is Attractive
Description of Project - Key Players	Ways in Which Project Raises Concerns
Description of Project - Timeline	Who Else Should Be Contacted
Description of Ways to Stay Informed	Familiarity with Restoration Issues
Purpose of Survey	Particular Issues or Areas of Concern
How Survey Results Will Be Used	Potential Solutions
How to Get Copy of Products	Information Needs
	Process Concerns

6. Public Engagement Tools

A wide range of techniques will be utilized to engage the stakeholders in the planning process:

- **Project Facilitator** - To provide professional guidance of the public meeting process (Advisory Workgroup, public meetings and workshops) over the term of the Project the services of a professional facilitator will be utilized. This will help ensure openness, transparency, representative participation and efficiency in the process.
- **Advisory Workgroup** - To provide primary stakeholder input throughout the process an Advisory Workgroup will be formed. The Advisory Workgroup is

intended to be representative of the range of stakeholders concerned with habitat restoration in the Subreach. The Advisory Workgroup tasks include:

- Identification of landowner concerns for research
 - Identification of locations for focal area planning
 - Review of studies and reports for consistency with the Goal and Principals of the SRCAF
 - Review of restoration plans for consistency with the Goal and Principals of the SRCAF
- **Landowner Survey** – To gain direct input from landowners within and adjoining the Project Area landowner surveys will be conducted. Two surveys will be taken; one during the initial stage of the Project and one at the end of the Project. The surveys will address the following questions:
 - General attitudes regarding habitat conservation and restoration
 - Concerns regarding habitat conservation and restoration
 - Input regarding the desired planning process (initial survey)
 - Feedback regarding success of the process (final survey)
 - **Public Meetings** - To provide an opportunity for all interested parties to provide direct input to the process and receive information regarding the status of the Project. Three such meetings are planned.
 - **Newsletters** - To provide landowners and other stakeholders with written information regarding the status of the Project and to publicize Project activities and events a newsletter will be distributed to stakeholders. Three newsletters are planned.
 - **Workshops** - To provide an opportunity to gain greater information and understanding of the technical factors involved in ecosystem restoration in an informal format and provide for field visits workshops will be held. Workshop participants will be the Advisory Workgroup and other interested persons. Three workshops are planned.
 - **Information Presentations** - To provide direct communication to SRCAF Board of Directors, local government, local organizations and state and federal agencies regarding the project and to receive direct input from these organizations information presentations will be made. Information presentations are planned during the initial stage and as otherwise appropriate,
 - **Project Website** – To provide an information posting location on the internet to provide interested persons with information about the Project, provide meeting information, post reports and plans a Project website will be established. A posting site connected to the SRCAF website is planned.
 - **Local Media Contacts** - To help inform interested parties about the status of the Project and publicize Project activities and events contacts with local media will be made and news releases will be provided. Local media contacts will be made throughout the project to help publicize key activities.
 - **Individual Stakeholder Meetings** – To help inform key stakeholders Project staff will meet informally with selected key stakeholders to introduce the Project, initiate working relationships, solicit input and address issues that arise in the process.
 - **Outreach Materials** – Various outreach materials to introduce the Project to stakeholders in detail appropriate to the anticipated interests of stakeholder groups, will be developed. These materials will include a project handout, PowerPoint presentations and materials in the Project webpage.