COLUSA COUNTY RESOURCE CONSERVATION DISTRICT

Colusa Basin Watershed *Management Plan*

December, 2012

Prepared by the Colusa County Resource Conservation District

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Colusa Basin Watershed
Management Plan

Counties of Colusa, Glenn and Yolo
State of California

December, 2012

Written by Mary Fahey, Colusa Basin Watershed Coordinator,
Colusa County Resource Conservation District,
in cooperation with stakeholders of the Colusa Basin Watershed

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The Colusa County Resource Conservation District is grateful for the time and expertise provided by all who shared their valuable input during the creation of this document.

Of special note are our partners at the Glenn County Resource Conservation District, the Yolo County Resource Conservation District and the Colusa County Natural Resources Conservation Service.

We are especially thankful for the insight provided by local stakeholders who generously shared their knowledge and insight regarding the history and function of the various landscapes in the Colusa Basin Watershed.

Photo above: Jack Alderson

Photos on front cover:
Aerial photo of watershed landscape: Jack Alderson
Field rows: Jack Alderson
Sunflower field: Mary Fahey
Irrigation ditch: Jack Alderson

Table of Contents

continued next page

Table of Contents *continued*

Executive Summary

The Colusa Basin Watershed is located in Northern California and lies mainly in Colusa County, with portions of the watershed spanning areas of Glenn and Yolo Counties. The watershed extends from the Stony Creek Watershed in the north to the Cache Creek Watershed in the south and from the Sacramento River westward to the ridge crest of the Inner Coast Range foothills. The watershed covers approximately 1,045,445 acres (1,634 square miles) and drains into the Sacramento River at Knights Landing via the Colusa Basin Drain. The landscape is dominated by agricultural and rangeland activities, with less than 1% of the land being urbanized.

The Colusa County Resource Conservation District's (CCRCD) Watershed Coordinator, working under a Watershed Coordinator grant from the California Department of Conservation, has prepared this Colusa Basin Watershed Management Plan (Plan) as part of an ongoing effort by the CCRCD to address natural resource concerns in the Colusa Basin Watershed. Although the CCRCD has always worked hard to protect, conserve and restore natural resources in the watershed, there has never been a plan in place to address these issues in an organized and comprehensive manner. This Plan will eliminate the "random acts of conservation" that have occurred in the past and provide a framework to promote projects that serve multiple benefits throughout the watershed. This Plan is a non-regulatory, community-driven guide which addresses the concerns of a variety of stakeholders. This Plan is meant to be a user-friendly, living document with a clear set of management goals, objectives and achievable programs and projects to sustain and enhance watershed functions.

The CCRCD chose to take an integrated approach to management planning for the Colusa Basin Watershed, coordinating our efforts with other planning activities in and around the watershed so as not to duplicate planning efforts. Collaboration among a variety of agencies, organizations, and landowners was key to the development of this Plan.

The CCRCD took the following steps in creating this Plan:

1. Identified and formed partnerships with stakeholders, including those identified in the *Colusa Basin Watershed Assessment*, and new interested parties (see appendix 5)
2. Characterized the watershed utilizing information from the *Colusa Basin Watershed Assessment* and other existing reports
3. Identified the major issues of concern in the watershed by referencing the *Colusa Basin Watershed Assessment* as a foundation, and updating those issues based on current stakeholder concerns
4. Set realistic goals and identified potential solutions, to meet current needs as identified through stakeholder and Technical Advisory Committee meetings, personal interviews and email feedback
5. Developed an implementation guide with action items that address the goals and objectives of this Plan

The Colusa Basin Watershed Assessment (Assessment) referenced above was completed in December, 2008 for the CCRCD by H.T. Harvey and Associates in collaboration with G. Mathias Kondolf, Geomorph and Blankinship & Associates. The Assessment served as an excellent foundation for identifying stakeholders and characterizing the watershed. Consultants utilized stakeholder input, historical records and current studies to create the Assessment. Following completion of the Assessment, the *Colusa Basin Watershed Limited Streambank Analysis* was prepared for the CCRCD by Geomorph with assistance from H.T. Harvey and Associates and G. Mathias Kondolf. This document contains detailed studies and mapping of 32 foothill streams in the Colusa Basin Watershed. The streams were mapped for erosion potential, invasive species, and riparian habitat, providing information to help identify future restoration projects, and address data gaps as identified in the Assessment.

While the Assessment and Streambank Analysis served as excellent references for this Plan, the Colusa Basin Watershed Coordinator was also able to gain valuable input from multiple sources through a series of stakeholder meetings, personal interviews and email correspondences throughout the planning process. Stakeholder participation was essential in creating the most comprehensive and locally-led Plan possible for the Colusa Basin Watershed. Major issues of concern were identified and the goals and objectives of this Plan were developed through this collaborative effort between the CCRCD, landowners, water experts, Tribal representatives and agencies.

This Plan focuses on the following eight goals as identified by stakeholders and the Technical Advisory Committee (TAC):

1. **Protect, maintain and improve water quality**
2. **Promote activities to ensure a dependable water supply for current and future needs**
3. **Preserve agricultural land and open space**
4. **Manage and reduce invasive plant populations**
5. **Reduce destructive flooding**
6. **Enhance soil quality and reduce erosion**
7. **Preserve and enhance native habitat**
8. **Address unknown future effects of climate change**

Based on these goals and their associated objectives, the Colusa Basin Watershed Coordinator has developed the Colusa Basin Watershed Management Plan as a guide for future watershed management. This Plan is considered a living document, to be updated as projects are completed and as changing conditions in the watershed require.

Colusa Basin Watershed Planning Timeline and Activities

December, 2008	Colusa Basin Watershed (CBW) Assessment Completed
February, 2010	CBW Limited Streambank Analysis Completed
April 27, 2010	CBW Management Plan community kick-off meeting: introduction to the Plan and planning process; received feedback on resource issues of concern
June 8, 2010	Stakeholder meeting #2 to determine Mission, Vision, Goals and Objectives
June, 2010	Mission, Vision defined
July, 2010	Goals, Objectives defined
October, 2010	Outline completed
August, 2010 - August, 2011	Stakeholder interviews conducted
June, 2011 – June, 2012	Defining Actions and writing Plan

Draft Sections of the Plan sent to stakeholders for review:

April, 2011	Introduction
August, 2011	Goal #4 Invasive Species
September, 2011	Goal #7: Habitat
October, 2011	Goal #3 Agriculture & Open Space
November, 2011	Goal #5: Flooding
November, 2011	Goal #6: Soil
January, 2012	Goal #8 Climate Change
February, 2012	Goal #1 Water Quality
April, 2012	Goal #2 Water Supply

June, 2012	First draft of CBW Management Plan sent to TAC and Stakeholders for review
July-October, 2012	Stakeholder comments from first draft review incorporated into draft
October, 2012	Second draft of CBW Management Plan sent to TAC and Stakeholders for review
November - December, 2012	Stakeholder comments from second draft review incorporated into draft
December, 2012	Final Colusa Basin Watershed Management Plan completed and released

The Vision Statement and Mission Statement
for the Colusa Basin Watershed Management Plan are as follows:

Vision

The vision of the Colusa Basin Watershed stakeholders is to promote a productive, healthy and sustainable watershed that balances human and natural resource needs.

Mission

To provide a practical, locally-led road map which will address the environmental, economic and social concerns of stakeholders in the Colusa Basin Watershed and provide stewardship guidance through well-planned, cooperative natural resource protection, conservation and restoration projects.

Please see Appendix 10 for larger versions of all maps

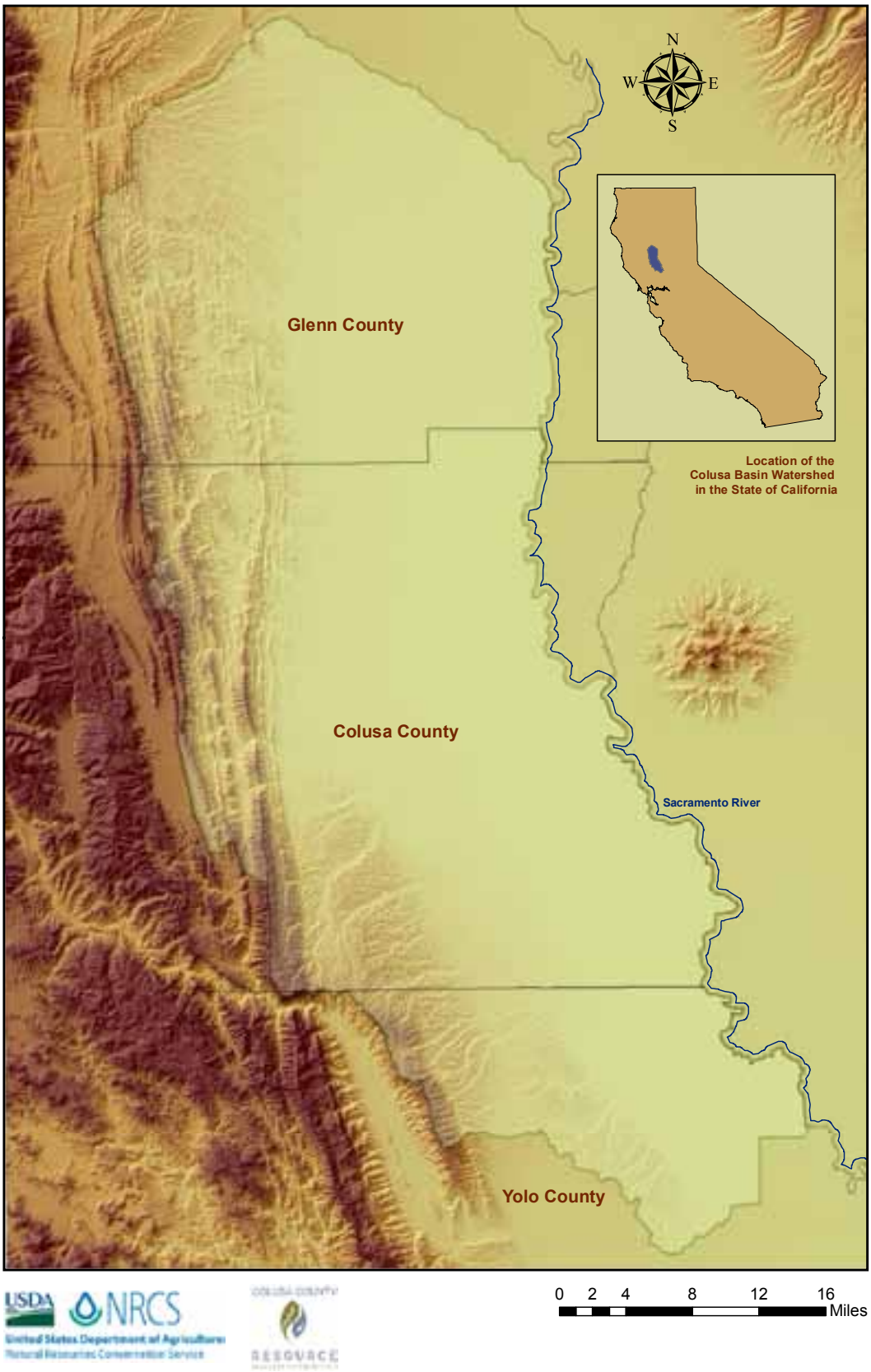


Figure 1: The Colusa Basin Watershed

Please see Appendix 10 for larger versions of all maps

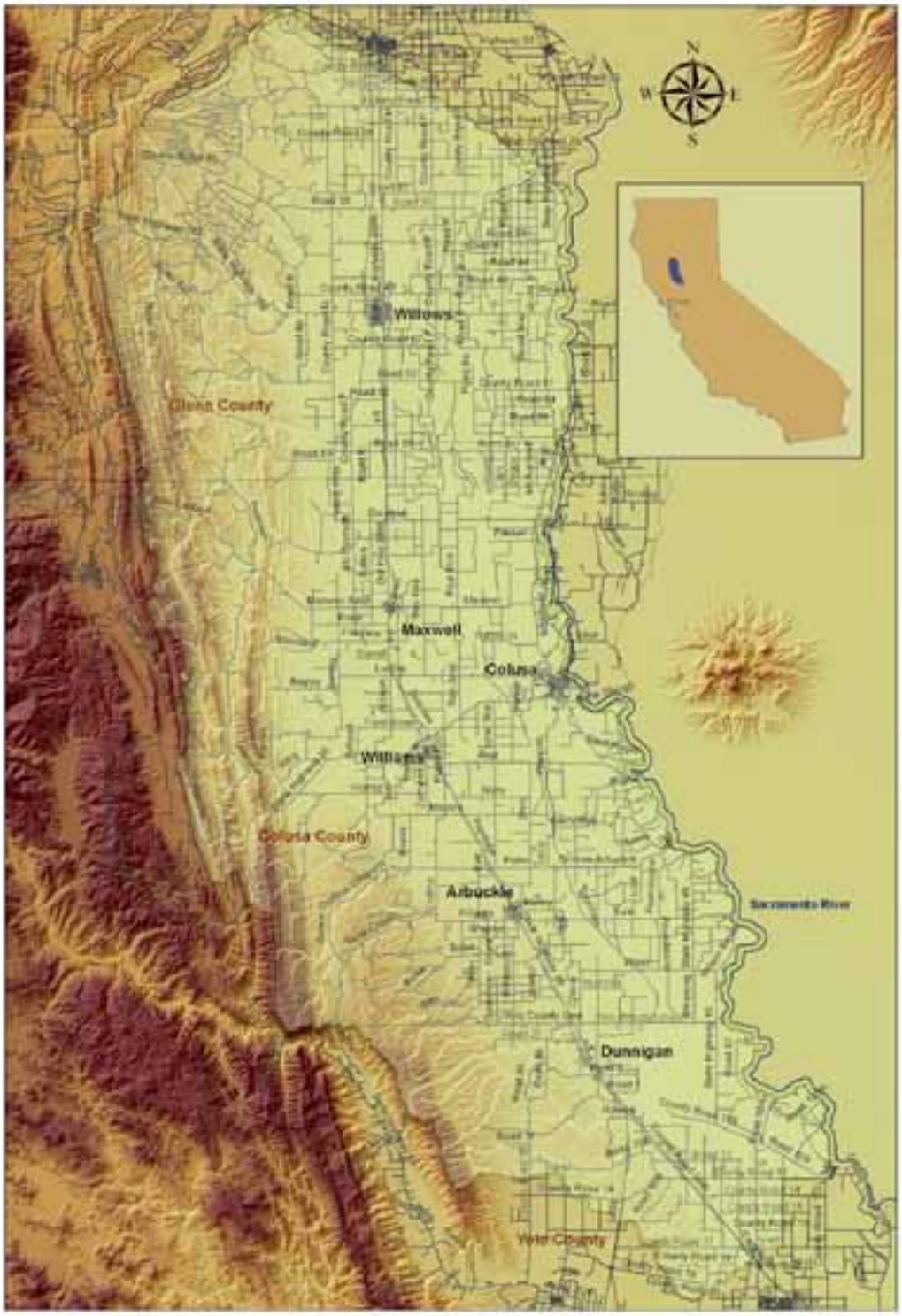


Figure 1.2: The Colusa Basin Watershed Showing Roads, Cities and Major Towns

1 Introduction

The health of our communities and natural resources is dependent upon the overall health of our watershed. Similarly, the health of our watershed is dependent upon the actions of those living within its boundaries. The Colusa County Resource Conservation District (CCRCD) Watershed Coordinator has created the Colusa Basin Watershed Management Plan (Plan) to function as a road map to watershed health by addressing the issues and concerns of stakeholders in the watershed and providing guidance in watershed stewardship through cooperative planning.

1.1 Purpose

The Colusa Basin Watershed spans 1,045,445 acres (1,634 square miles). A watershed of this size encompasses a wide variety of natural resource issues. The CCRCD has a successful history of assisting landowners with land stewardship projects throughout the Colusa Basin Watershed; however, there has never been a comprehensive planning effort in place for the entire watershed. This Plan attempts to fill that gap by providing a guide to address watershed-wide issues. The protection of private landowner rights and Tribal land rights is taken into consideration in this Plan.

1.2 Intended Use

Our intent in developing this Plan is to provide a user-friendly document to guide landowners in addressing natural resource issues of concern. This Plan is meant to be utilized by the people and communities in the Colusa Basin Watershed. This is a living document that should be updated as projects are completed, as watershed conditions change and as funding is available.

1.3 Planning Process

Work on this Plan began in April 2010. The approach in developing this Plan was to focus on the most pressing current environmental, economic and social concerns in the watershed as identified by stakeholders. This Plan is a culmination of a series of stakeholder meetings and interviews which served to identify local concerns and establish a clear set of management goals, objectives and voluntary actions to sustain and enhance healthy watershed functions. This Plan was developed through a collaborative process that

Stakeholder meeting to introduce the Plan and planning process (Photo: Patti Turner)

promotes watershed stewardship through community involvement, education and public awareness of watershed issues.

This Plan is based in part on findings from the *Colusa Basin Watershed Assessment* (Assessment), released in December 2008. The CCRCD worked with consultants from H.T. Harvey and Associates in collaboration with G. Mathias Kondolf, Geomorph and Blankinship & Associates, to complete the Assessment. The Assessment was the first step towards the creation of a comprehensive Watershed Management Plan. The CCRCD Watershed Coordinator utilized information in the Assessment as a starting point for this Plan and incorporated current stakeholder concerns and feedback.

Concerns identified in the Assessment included: water quality, soil erosion, flood control, preservation of agricultural land, invasive weeds, regulatory interface on projects, utilization of rice straw, and air quality. Since completion of the Assessment, some economic and regulatory changes have taken place in the Colusa Basin Watershed. Although some of the concerns from the Assessment are still relevant, the following eight goals were identified by stakeholders for the Colusa Basin Watershed Management Plan. These eight goals serve as the backbone for this Plan:

1. **Protect, maintain and improve water quality**
2. **Promote activities to ensure a dependable water supply for current and future needs**
3. **Preserve agricultural land and open spaces**
4. **Manage and reduce invasive plant populations**
5. **Reduce destructive flooding**
6. **Enhance soil quality and reduce erosion**
7. **Preserve and enhance native habitat**
8. **Address unknown future effects of climate change**

Looking west towards the coast range foothills, photo taken between Colusa and Grimes in Colusa County (Photo: Mary Fahey)

1.4 Participating Stakeholders

The CCRCD Watershed Coordinator made a concerted effort during the planning process to include a wide variety of stakeholders in order to create the most comprehensive Plan possible. The CCRCD was pleased to find a great deal of interest in this Plan from the community. Stakeholders included landowners, water experts, Tribal representatives and agencies. The CCRCD is very grateful for the input from these stakeholders, as their participation was crucial in Plan development. Please see Appendix 5 for a list of participating stakeholders.

2 Watershed Description

Much of the information presented in this section comes directly from the Colusa Basin Watershed Assessment (*H.T. Harvey and Associates with G. Mathias Kondolf, Geomorph, Blankinship & Associates, 2008*). The entire Assessment is available upon request from the CCRCD and can also be downloaded from our website at www.colusarcd.org.

2.1 Geography

The Colusa Basin Watershed is located in northern California and covers approximately 1,045,445 acres (1,634 square miles) encompassing a substantial portion of the west side of the Sacramento Valley (See map, Figure 1). The watershed extends from the Cache Creek Watershed in the south, to lower Stony Creek Watershed in the north and from the Sacramento River westward to the ridge crest of the Inner Coast Range foothills. Overall, the watershed is relatively flat but steeper slopes climb westward into the lower foothills of the Inner Coastal Range. Major landforms defining the watershed include the levees along the west side of the Sacramento River; the broad floodplains and basins of the valley floor; and the foothills, ridges, and valleys of the Inner Coast Range. A low trough of relatively flat basin lands runs parallel to the Sacramento River levees. Ephemeral streams draining winter rainfall from the Coast Range foothills coupled with overflow from the Sacramento River, have historically contributed to regular seasonal flooding of the Colusa Basin. The natural physical and biological conditions of the Colusa Basin Watershed have been dramatically altered over the past ~160 years through Euro-American settlement, the development of flood control and water supply projects, and the transformation of the Colusa Basin into a highly productive agricultural region. (*Harvey et al. 2008, p. 1*).

2.2 Characterization of the Colusa Basin Watershed

The cities in the Colusa Basin Watershed are Willows (population 6,166), Colusa (population 5,971), and Williams (population 5,123) *(U.S. Census Bureau 2010)*. Willows and Colusa are approximately 2-3 square miles in area, while Williams is 5.4 square miles (*U.S. Census Bureau 2010*). Numerous smaller communities exist within the unincorporated portions of the three counties. These include towns such as Maxwell, Arbuckle, Dunnigan, Knights Landing, Princeton, Grimes, and Artois. All of these cities and communities are located along one of the watershed's four principal roadways. Willows and Williams are located along Interstate 5, while Colusa is located at the

junction of Highways 45 and 20. Interstate 5 is the major north-south arterial, with Highways 45 and Old Highway 99W forming secondary north-south arterials. Highway 20 is the principal east-west arterial passing through Williams and Colusa in the center portion of the Colusa Basin Watershed. Highway 162 serves this function in the northern portion of the Colusa Basin Watershed as it passes through Willows.

A scene from the unincorporated town of Arbuckle, which is bisected by Old Highway 99 adjacent to Interstate 5 in southern Colusa County (Photo: Jack Alderson)

These four major transportation routes, along with county roads, serve to transport the majority of the Colusa Basin Watershed's agricultural and manufacturing products via truck, because river freight is no longer active, and railroad freight carries relatively little volume of local products *(Sedway Cooke Associates 1989)*. In addition to transporting commercial products into and out of the watershed, these four arterials also convey large amounts of commercial traffic through the watershed en route to further destinations. Colusa County contains 1,067 miles of roadways, half of which are local roads, mostly gravel or dirt surfaced (*Sedway Cooke Associates 1989*). Local roads convey much of this commercial traffic and consequently have maintenance requirements that exceed local financial resources for repairs. (*Sedway Cooke Associates 1989*). *(Harvey et al. 2008, pp. 32-33).*

The Colusa Basin Watershed spans three counties: Glenn, Colusa, and the northeastern portion of Yolo. Among these three counties, Yolo County is by far the most populous, followed by Glenn and Colusa, which have similar population densities. Yolo County has experienced the highest rates of population growth in the past ten years (19.1%), exceeding the statewide rate of growth (10%) during this period (2000-2010). Colusa County has also experienced growth exceeding the statewide rate (13.9%). Glenn County has experienced rates of growth lower than the statewide average (6.3%) *(U.S. Census Bureau 2010)*. The highest growth rate among cities within the Colusa Basin Watershed has occurred in Williams, which experienced 40% growth in the past seven years (*U.S. Census Bureau 2010*). The majority of the Colusa Basin Watershed is in private ownership with a small percentage in public ownership (primarily the Bureau of Land Management [BLM] and U.S. Fish and Wildlife Service [USFWS]). Agricultural production is the predominant industry in the region, and the vast majority of

the Colusa Basin Watershed is in rural-agricultural land use, which includes crop production, orchards and vineyards, and grazing land. The cities of Willows, Colusa, and Williams contain the largest proportion of the area's population. The remaining population lives on rural home sites and in numerous smaller communities within the unincorporated areas. Preservation of the aesthetic, economic, and environmental aspects of these pastoral communities is a primary value among residents of the region (*Colusa County 2030 General Plan 2012, Yolo County Community Development Agency 1983, Sedway Cooke Associates 1989, and QUAD Consultants 1993*). The rural character and requisite land and water resources that support these communities are threatened by population growth, attendant land conversion, urbanization, and changes and intensification in agricultural production. In the absence of comprehensive land use and watershed planning, these changes in community characteristics could potentially have adverse impacts on soil, water, and air resources through increased wind and water erosion, increased stormwater runoff, biological habitat loss/degradation, and transportation inefficiencies. (*Harvey et al. 2008, p. 33, with updated information from 2010 census*).

Demography and Economy Overview

Cultural and socioeconomic aspects of the Colusa Basin Watershed are a product of the settlement history and predominant industries of the Colusa Basin Watershed. 60-85% of the land is in agricultural use in Colusa and Yolo Counties. Although the average farm or ranch size is 748 ac, most (70%) farms are less than 500 acres and a small amount (8%) of ranches are very large, more than 2000 acres (*Sedway Cooke Associates 1989 as cited by Harvey et al. 2008 p. 33*).

Agriculture (including grazing and crops without timber revenue) accounts for $1.2 billion (2010) in goods from Colusa County and Glenn County; basin-wide totals would be much higher when one factors in that portion of the Yolo County agricultural economy ($443.5 million in 2010) that occurs within the watershed boundary *(Colusa County Department of Agriculture 2010, Glenn County Department of Agriculture 2010, Yolo County Department of Agriculture 2010)*. The Colusa Basin Watershed is the rice growing capital of the state with 242,209 ac in rice production in Colusa County and Glenn County in 2010 (*Colusa County Department of Agriculture 2010, Glenn County Department of Agriculture 2010*). Other important crops in Colusa and Glenn Counties include almonds,

Inspecting the Harvest. Agriculture is the main economic driver in the Colusa Basin Watershed (Photo: Phil Hogan)

walnuts and processing tomatoes. Processing tomatoes are Yolo County's leading commodity (*Yolo County Department of Agriculture 2010*). In Yolo County, education and social services are the largest employment sectors due to the presence of larger cities and schools in the southern half of the county, which are outside the watershed, yet affect County-level Census figures (*U.S. Census Bureau 2007*). The economic base and employment sectors of the northern half of Yolo County are probably comparable to the relative proportions shown for Glenn and Colusa counties. (*Harvey et al. 2008 pp. 33-34, with updated information from county Departments of Agriculture*).

2.2.1 Population

The average age of residents of the Colusa Basin Watershed is 35-40 years old, and proportions of people over the age of 65 are comparable to statewide averages (Colusa County: 11.9%; Glenn County: 13.4%; Yolo County: 10.2%). Most people over the age of 25 have completed high school (Colusa County: 70.5%; Glenn County: 73.9%; Yolo County: 84.3%), while numbers are lower for those that have completed bachelor's degrees or higher (Colusa County: 11.7%; Glenn County: 16.2%; Yolo County: 37.8%). *(Harvey et al. 2008 p.34, with updated information from U.S. Census Bureau).*

The majority of residents in the Colusa Basin Watershed are white, with persons of Hispanic or Latino origin making up the bulk of the balance. The U.S. Census states that "the concept of race is separate from the concept of Hispanic origin," therefore, the census numbers are a bit confusing on first glance because they add up to greater than 100%. The Census states that "Hispanics may be of any race, so also are included in applicable race categories." This is why the percentages of "white persons" are so high in the numbers presented below from the 2011 U.S. Census. Also of note is the larger Asian population in Yolo County, most likely due to the presence of the University of California in Davis, which is outside of the Colusa Basin Watershed.

Population QuickFacts *(U.S. Census Bureau 2011)*:

Colusa County:
- White persons: 97%
- Persons of Hispanic or Latino origin: 56.1%
- White persons, not Hispanic: 39%
- Other races in Colusa County make up 5.9% of the population

Glenn County:
- White persons: 90%
- Persons of Hispanic or Latino origin: 38.4%
- White persons, not Hispanic: 55%
- Other races in Glenn County make up 7.4% of the population

Yolo County:

- White persons: 75.6%
- Persons of Hispanic or Latino origin: 30.5%
- White persons, not Hispanic: 48.9%
- Asian: 14.1%
- Other races in Yolo County make up 5.5% of the population

2.2.2 Land Use

The vast majority of the watershed is rural, dominated by agricultural and rangeland activities. Less than 1% of the watershed is urbanized. The majority of the lands within the watershed's three counties (Yolo, Colusa, and Glenn) are mapped as "Important Farmland" by the U.S. Department of Agriculture and the State of California Department of Conservation. The preservation of agricultural land is among the highest priorities in the respective county general plans. The counties aim to achieve this goal by encouraging new development to occur within or adjacent to existing cities, communities, and major transportation corridors. (*Harvey et al. 2008, p. 3*).

Orchard and vineyard in the Dunnigan Hills in Yolo County (Photo: Phil Hogan)

Please see Appendix 10 for larger version of all maps

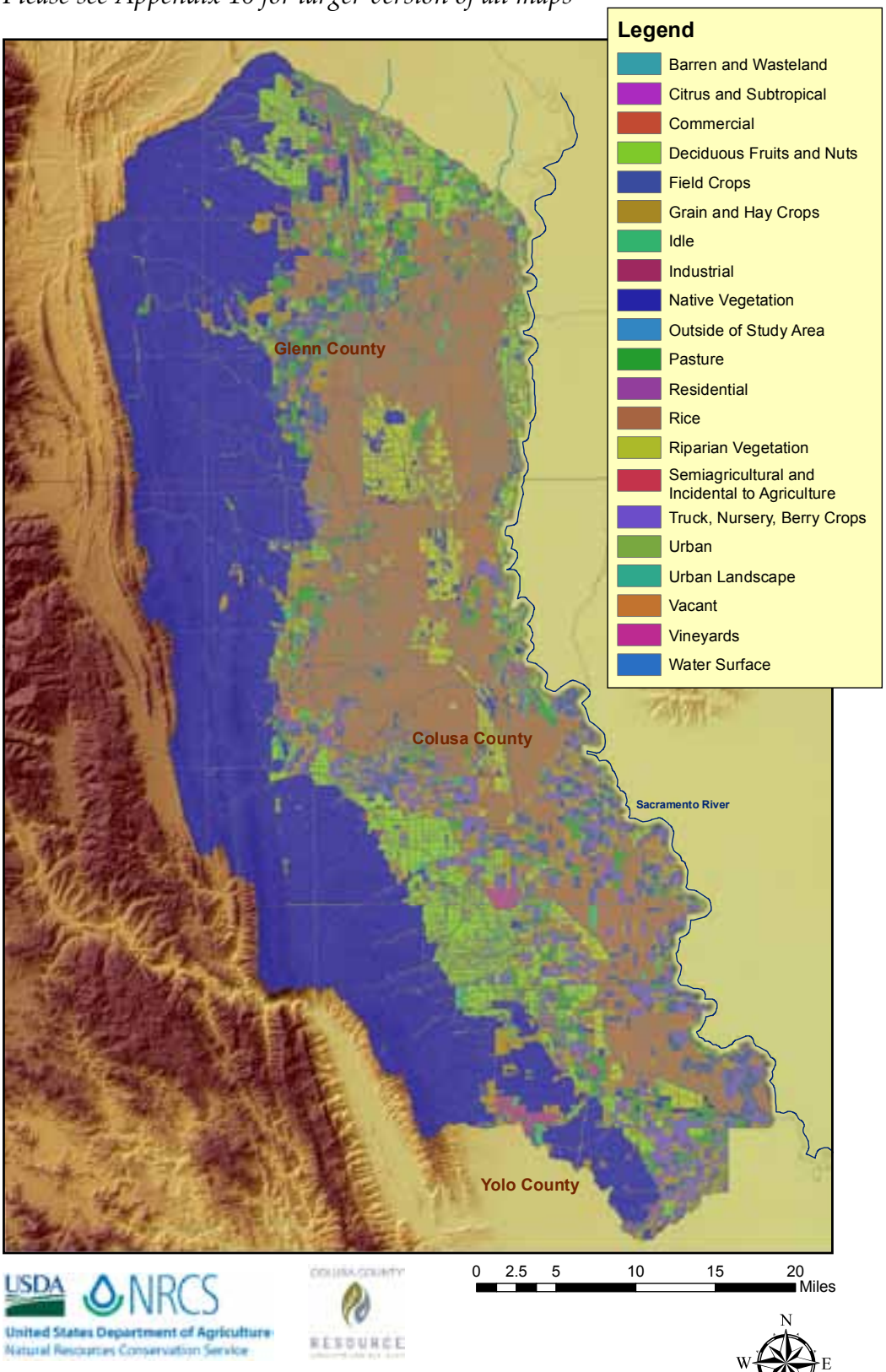


Figure 2: Colusa Basin Watershed Land Use Map

Land Use data was developed by the State of California, Department of Water Resources.

2.2.3 Geology

The Colusa Basin Watershed lies entirely within the Great Valley geologic province, an area that includes the Sacramento Valley bordered by the Coast Range, Klamath, Cascade, and Sierra Nevada mountains and its fringe of foothills underlain by the valley's older sedimentary bedrock. The bedrock formed when a Cretaceous sea filled the Sacramento Valley. Broad warping of the Cretaceous marine sedimentary bedrock layers uplifted and tilted them giving rise to the foothills along the western edge of the Watershed and lowered the rocks along the valley centerline where the aggrading floodplains of the ancestral Sacramento River created the valley flat. Erosional dissection of the uplifted foothills by Tertiary and Quaternary streams poured sediment into the sinking valley, forming a sequence of older semi-consolidated alluvial deposits that flank the foothills. These alluvial deposits in-turn have been uplifted and dissected by still younger streams. Holocene streams continue to dissect the Cretaceous bedrock foothills and the older alluvial deposits transporting sediments onto the valley floor. Holocene streams form contemporary alluvial fans that grade into the wide band of valley flat and basin lands – the Colusa Basin. The Colusa Basin is a complex of loamy floodplain deposits, slough channels, and frequently flooded basins formed by modern fluvial processes on the aggrading Sacramento River floodplain. (*Harvey et al. 2008, p. 3*).

2.2.4 Hydrology

Surface Water Hydrology

There are only three active stream flow gages in the watershed: The California Department of Water Resources (DWR) gages along the Colusa Basin Drain at Highway 20 and at the Knights Landing Outfall Gates, and the discontinued U. S. Geological Survey (USGS) station on South Fork Willow Creek near Fruto that DWR began operating after the 1998 flood. No foothill streams are currently gaged for stream flow, although historical records are available for Stone Corral Creek, South Fork Willow Creek, and Walker Creek at Artois.

(Photo: Jack Alderson)

Stone Corral Creek had zero or near-zero flow most of the year during normal and dry years with positive flow typically

occurring only as the result of individual rainstorms between November and April. South Fork Willow Creek near Fruto has a similar-sized drainage area as Stone Corral Creek with a similar pattern of mean annual precipitation as its upper watershed is adjacent to and within the same range of elevations, and it is underlain by similarly dissected Cretaceous bedrock. Gage records show that both streams had similarly timed and similarly sized peak flows resulting from individual winter rainstorms, with very few exceptions. Walker Creek at Artois has a drainage area approximately twice as large as for the Stone Corral Creek and Willow Creek gages. Walker Creek sustained a measurable winter base flow for a larger portion of the November to April rainy season, but at times had zero or near-zero streamflow between storms, especially during dry years but also during most normal rainfall years.

Annual average runoff at the Highway 20 gage on the Colusa Basin Drain for the period of record is much more than the natural amount of runoff from a watershed area with mean annual precipitation ranging generally from 17-27 inches, primarily reflecting the influence of irrigation water imports on the hydrology of the Colusa Basin Drain. It is generally understood that irrigation development substantially increased peak stormwater runoff to the Colusa Basin Drain but few data are available to quantify these historical effects. (*Harvey et al. 2008, p. 5*).

Groundwater Hydrology

Groundwater occurs in the alluvial deposits underlying the alluvial fans, low plains, and basin flats of the Colusa Basin Watershed. The Colusa Groundwater Subbasin comprises the part of the larger Sacramento Valley Groundwater Basin lying approximately under the Colusa Basin Watershed footprint, being "bounded on the east by the Sacramento River, on the west by the Coast Range and foothills, on the south by Cache Creek, and on the north by Stony Creek"*(DWR 1990)*. The base of the Tehama Formation is the base of groundwater-bearing alluvial deposits in the Colusa Groundwater Subbasin. The groundwater-bearing geologic formations in the subbasin include all of the alluvial deposits overlying the Cretaceous bedrock: the Tehama Formation of Tertiary age and the overlying Quaternary alluvial fan, flood basin, and alluvial deposits. (*Harvey et al. 2008, pp. 5-6*).

According to the California Department of Water Resources (DWR), groundwater levels in the Colusa Basin Watershed have remained historically steady, with declines occurring during drought years and recovering during subsequent normal rainfall years. Recent exceptions include the Yolo and Zamora areas which have seen 1 to 2 feet of land subsidence due to extensive groundwater extraction. The Arbuckle area in southern Colusa County is also seeing recent increases in groundwater extraction (*2009, DWR California Water Plan Update, Volume 3 Regional Report, p. SR-12*).

Sufficient groundwater data exist for monitoring changes in groundwater storage and to provide baseline data for evaluating future groundwater management efforts in

Please see Appendix 10 for larger version of all maps

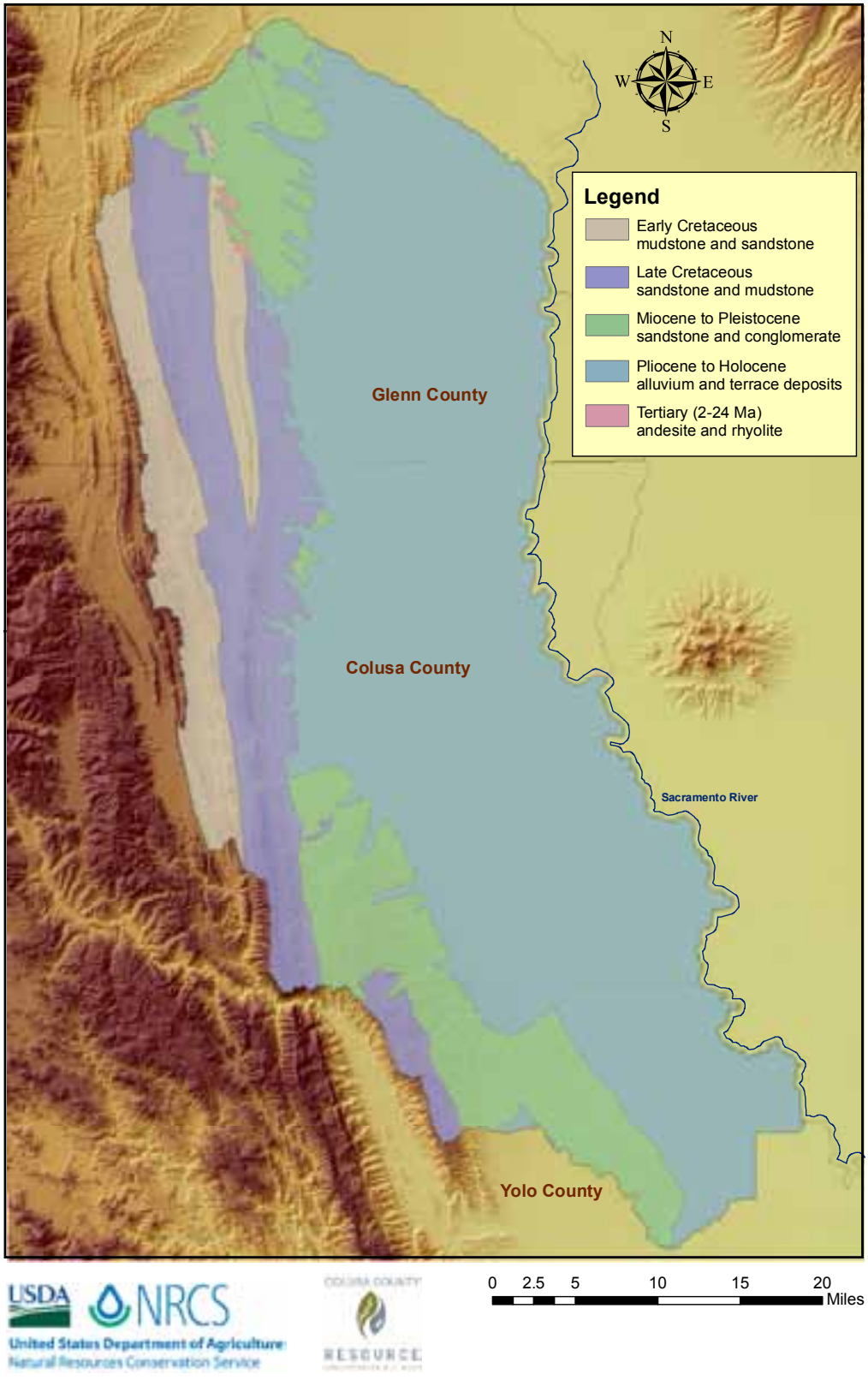


Figure 3: Geology of the Colusa Basin Watershed

Please see Appendix 10 for larger version of all maps

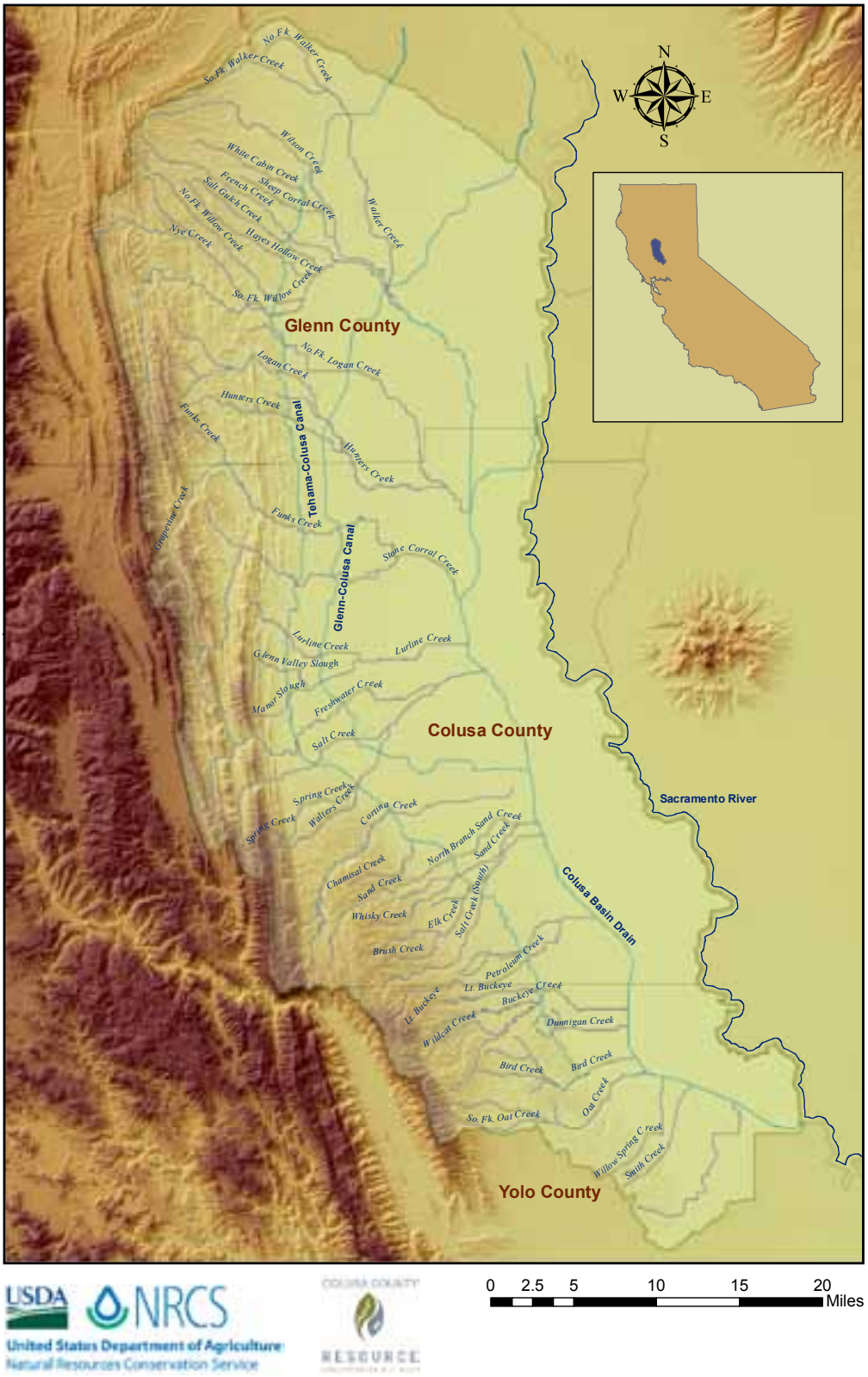


Figure 4: Colusa Basin Watershed Major Canals and Streams

the Valley portions of the watershed. Groundwater basins in the foothill areas are not monitored as extensively due to low supplies and use and difficulty accessing these areas. DWR currently monitors groundwater levels in 98 wells approximately semi-annually and maintains up-to-date published databases of the well data. On November 4, 2009 the State Legislature amended the Water Code with SBx7-6, which mandates a statewide groundwater elevation monitoring program to track seasonal and long-term trends in groundwater elevations in California's groundwater basins. To achieve that goal, the amendment requires collaboration between local monitoring entities and DWR to collect groundwater elevation data. (*DWR website: www.water.ca.gov/groundwater/casgem*).

In accordance with this amendment to the Water Code, DWR developed the California Statewide Groundwater Elevation Monitoring (CASGEM) program. The intent of the CASGEM program is to establish a permanent, locally-managed program of regular and systematic monitoring in all of California's alluvial groundwater basins. The CASGEM program will rely and build on the many, established local long-term groundwater monitoring and management programs. DWR's role is to coordinate the CASGEM program, to work cooperatively with local entities, and to maintain the collected elevation data in a readily and widely available public database. DWR will also continue its current network of groundwater monitoring as funding allows (*DWR website: www.water.ca.gov/groundwater/casgem*). The following entities have been identified as monitoring entities for Glenn, Colusa and Yolo Counties respectively: County of Glenn, Department of Agriculture; County of Colusa, Colusa County Resource Conservation District; and Yolo County Flood Control and Water Conservation District.

2.2.5 Soils

The types and patterns of soils on the Colusa Basin Watershed lands reflect its geology and geomorphology:

Upland Soils

Upland soils are generally shallow residual soils that occur in rolling, hilly to mountainous topography, mostly having been formed in place through decomposition and disintegration of the underlying parent bedrock. Low to moderate rainfall can support vegetation for grazing on upland soils. Upland soils cover the western third of the Colusa Basin Watershed area within the Inner Coast Range foothills.

Terrace Land Soils

Terrace land soils are formed in the older and younger valley fill alluvium occurring in the foothill valleys and on the alluvial fans sloping up from the edges of the valley and basin lands, usually at elevations of 5-300 ft. above the valley floor. Terrace land soils with dense subsoils exhibit poor drainage and are satisfactory for annual grasses and shallow-rooted crops. Terrace land soils with moderately dense subsoils usually have

brownish, neutral surface soils and occupy the lower elevation alluvial fan surfaces where younger alluvium is present, and covered with grass or woodland with a grass understory.

Valley Land Soils
In contrast to the relatively poorly drained terrace land soils, valley land soils are predominately well-drained alluvial soils formed in loamy alluvial fan and floodplain deposits. Valley land soils are generally brown in color and highly valued for irrigated crops. Some of these soils are slightly to moderately saline to alkali. They are located along the Sacramento River, in the streamside areas dissected in the Tehama Formation, and the oldest part of the relict Stony Creek alluvial fan lying northwest of Willows.

Valley Basin Soils
Valley basin soils occur in the lowest elevation parts of the watershed that are nearly flat and poorly drained. These soils are generally dark-colored and clayey, with a high water table. They are subject to frequent stormwater overflow and extended ponding and are primarily used for rice growing. Valley basin soils occur on the valley flat lying west of the Sacramento River floodplain deposits and east of the gently sloped alluvial fan deposits from the Coast Range foothills, comprising an area often referred to as a "low trough" extending from north of Willows to Knights Landing. The Colusa Basin comprises the southerly and lowest elevation part of the low trough on the valley flat. Valley basin soils also occur upslope from the rim of the Colusa Basin in the interfan basin area in the Maxwell vicinity. (*Harvey et al. 2008, pp. 4-5*).

Flooded rice fields (Photo: Jack Alderson)

Please see Appendix 10 for larger version of all maps

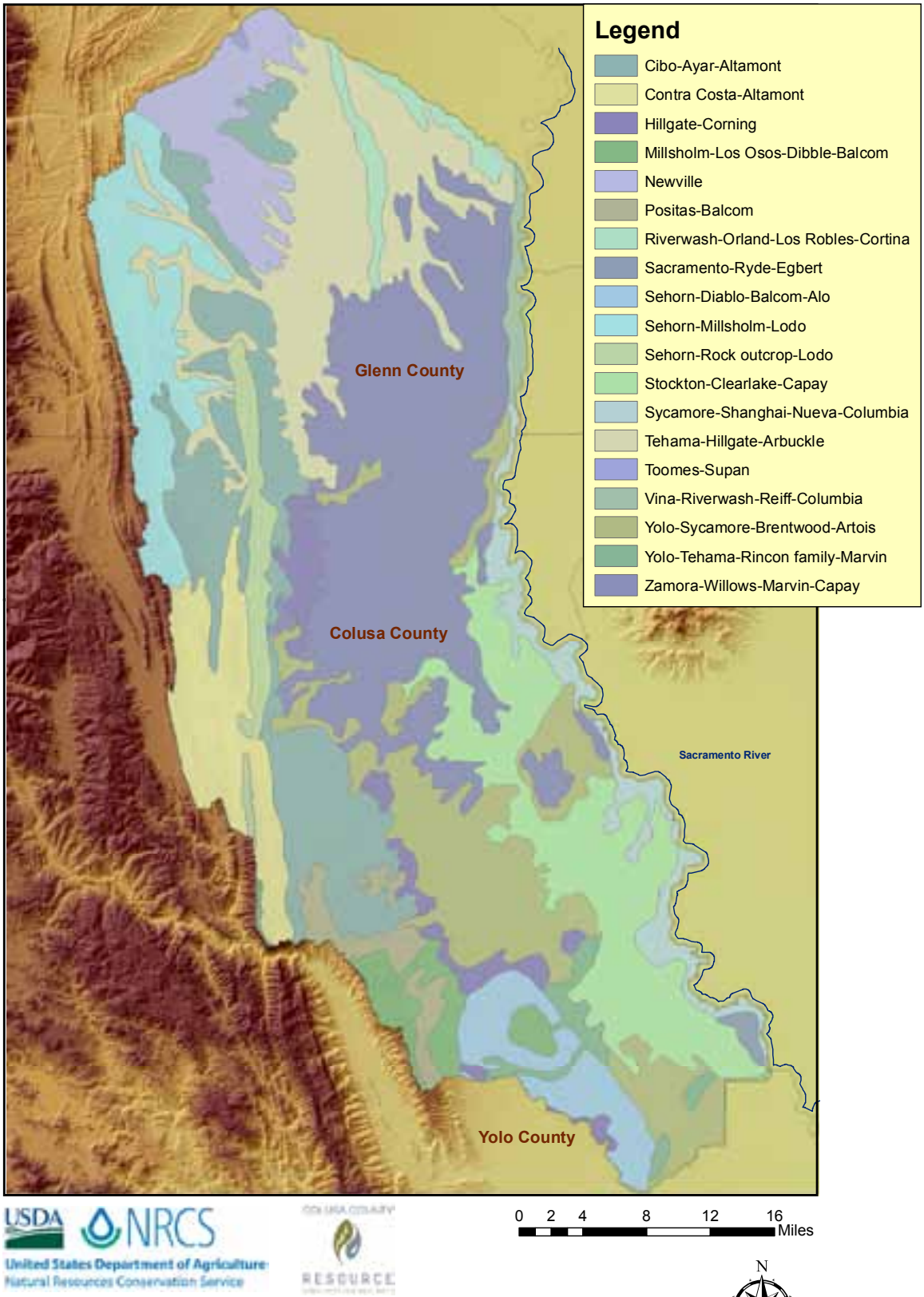


Figure 5: Colusa Basin Watershed Soils

2.2.6 Vegetation and Wildlife

Patterns of vegetation within the Colusa Basin Watershed generally correspond to the watershed's major topographic features and current land-use activity. The existing habitats of the Colusa Basin Watershed can be grouped broadly into the following seven types according to vegetation and landscape position: Cultivated (58%); Blue Oak/ Foothill Pine Woodlands (18%); Annual Grasslands (18%); Emergent Wetland (3%); Shrublands (2%); Riparian (0.5%); Developed/Urban (0.3%). (*Harvey et al. 2008, pp. 8-9*).

Special-status Wildlife

The Colusa Basin Watershed provides suitable habitat for numerous (~44) special-status wildlife species during certain times of year. The watershed provides suitable breeding habitat for nine federal or state listed threatened or endangered species; bank swallow, California tiger salamander, Conservancy fairy shrimp, giant garter snake, Swainson's hawk, western yellow-billed cuckoo, valley elderberry longhorn beetle, vernal pool fairy shrimp, and vernal pool tadpole shrimp. The watershed also provides suitable breeding habitat for 18 wildlife species considered by the state as species of special concern or protected species; Mountain Plover, Western spadefoot toad, Western pond turtle, White-fronted goose, Western Least Bittern, Golden Eagle, Black Tern, Northern Harrier, Merlin, Short-eared Owl, Long-eared owl, Burrowing Owl, Loggerhead Shrike, Yellow Warbler, Yellow-breasted Chat, Grasshopper Sparrow, Yellow-headed Blackbird, Tri-colored Blackbird. The majority of these species utilize freshwater emergent wetlands, vernal pools, and/or riparian habitat; habitats that have been dramatically reduced compared to their historic distribution. *(Harvey et al. 2008, pp. 9, 263-265).*

Special-status Plants

Twenty four special-status plant species are known to occur, while 33 species have the potential to occur within the Colusa Basin Watershed. Many (28) of these species are associated with vernal pool habitats. Seven of these species are listed as state and/or federally threatened or endangered and six of these threatened or endangered species are associated with vernal pool habitats. The known occurrences of the special-status plant species associated with vernal pools are located in the Colusa Basin between the Colusa Basin Drain and Interstate 5. Numerous occurrences are located within the Sacramento National Wildlife Refuge. (*Harvey et al. 2008, p.9*).

The California Tiger Salamander is both an endangered species and a threatened species (Photo: Yolo County RCD)

Please see Appendix 10 for larger version of all maps

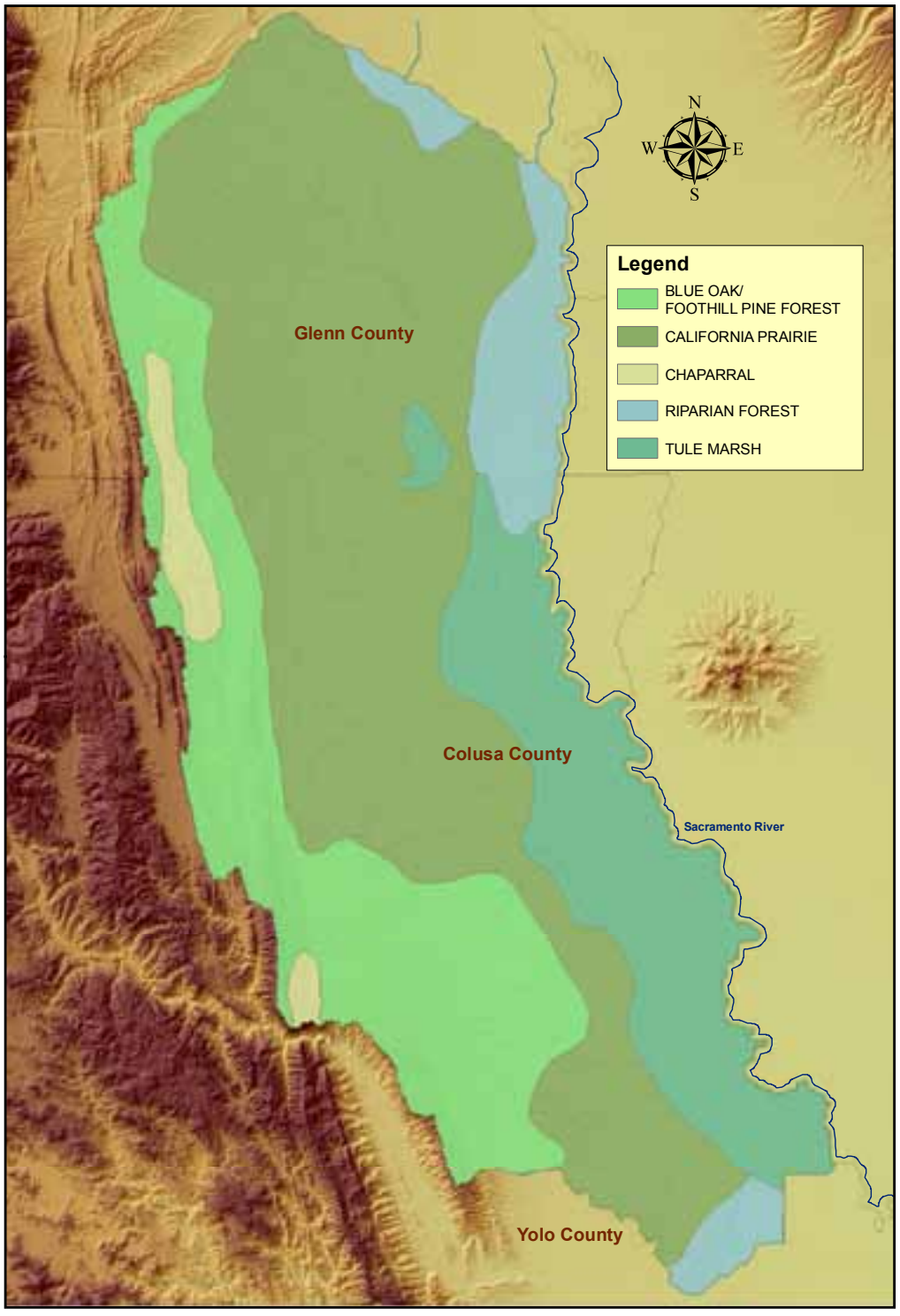


Figure 6: Potential Natural Plant Communities

Digital version of potential natural plant communites as compiled and published on "Map of the Natural Vegetation of California" by A. W. Kuchler, 1976

3 Goals, Objectives and Recommended Actions

Eight goals have been identified by stakeholders and the Technical Advisory Committee (TAC) as priority concerns in the Colusa Basin Watershed:

1. **Protect, maintain and improve water quality**
2. **Promote activities to ensure a dependable water supply for current and future needs**
3. **Preserve agricultural land and open space**
4. **Manage and reduce invasive plant populations**
5. **Reduce destructive flooding**
6. **Enhance soil quality and reduce erosion**
7. **Preserve and enhance native habitat**
8. **Address unknown future effects of climate change**

A set of objectives was then identified to address each listed goal. In this section, the eight goals, their associated objectives, and recommended actions to address these goals and objectives are presented. Many of the objectives and actions address multiple goals, illustrating the interrelated nature of the watershed's natural resources.

The recommended actions will be carried out through a combination of voluntary actions by landowners, incentive programs, technical assistance provided to landowners, and grant funding.

Public awareness and watershed education are incorporated throughout this Plan. Increased watershed knowledge throughout communities and schools, as well as awareness of local issues at the state and federal level, will ensure greater success and support for our efforts to improve and maintain the overall health of the Colusa Basin Watershed.

This section is organized as follows:

- **Goal:** a priority concern as identified by stakeholders
- **Current Status and Issues of Concern**: a discussion of current watershed conditions and issues related to the goal
- **Considerations**: issues to consider when discussing objectives and actions
- **Objectives and Actions**:
  - **Objective**: a means to reach the goal
  - **Action**: a project or activity necessary to address the objective and ultimately reach the goal
  - **Performance measure**: a measurable element for each action that will allow stakeholders to track progress in reaching the objective
  - **Entities Involved**: organizations, agencies and/or individuals that may participate in the action

3.1 Goal 1: Protect, maintain and improve water quality

Current Status and Issues of Concern

Water quality is a priority natural resource concern for stakeholders in the Colusa Basin Watershed. This is not surprising given the area's agriculturally-based economies. A clean water supply is essential for crop and livestock production, as well as healthy communities, ecosystems and recreational opportunities.

Sedimentation and erosion in a seasonal creek (Photo: Jack Alderson)

The following list outlines the major water quality concerns in the Colusa Basin Watershed as identified by stakeholders, the Colusa Basin Watershed Assessment, and other related reports:

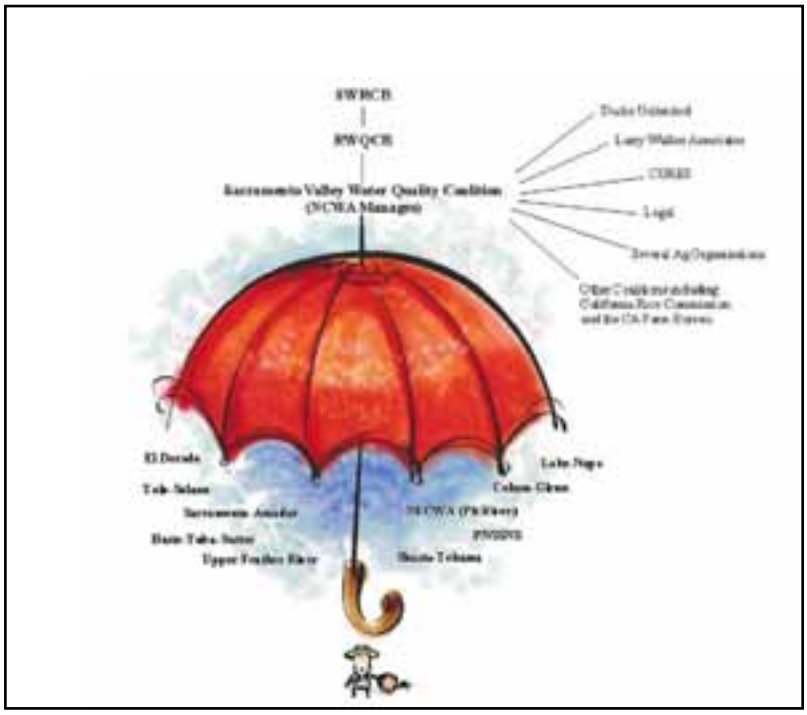
- ***Sedimentation and erosion*:** Seasonal flood flows cause land and channel erosion and disturbed channel beds, which lead to excessive turbidity in waterways. Although erosion is a natural process, it is commonly accelerated by such activities as redirecting channels, removing channel vegetation, livestock grazing and rural development. Runoff from irrigated cropland can also contribute to sedimentation in waterways.
- ***Urban stormwater runoff*:** Urban runoff carries contaminants and sediment to waterways.
- ***Pesticide and fertilizer discharge*:** Runoff from agricultural land and urban landscapes can carry pesticides and fertilizers to waterways. Pesticides can be toxic to aquatic organisms while fertilizers can promote excessive algal growth.
- ***Salinity*:** Excessive salinity buildup in local soils can decrease agricultural productivity. Lack of an adequate water supply increases the likelihood of high salinity levels in the soil and groundwater and can lead to unsafe drinking water.
- ***Dissolved Oxygen (DO)*:** Low flows and oxygen demanding substances can lead to low DO concentrations in waterways. Adequate DO is necessary for aquatic organisms to survive and for suppression of chemical reactions with toxic or noxious products.
- ***Nitrates*:** Nitrates can be discharged into local waterways from runoff of fertilizers and poorly functioning septic systems. High levels of nitrate in water can lead to excessive algal growth that clogs waterways and depletes DO.

Water quality issues in the upper watershed are primarily driven by soil erosion and sedimentation. Water quality in the basin is driven by agricultural field drainage and reuse of irrigation water. The majority of irrigation water is supplied to the Colusa Basin Watershed by a variety of water suppliers who pump from the Sacramento River. This water is considered of excellent quality *(CH2MHill 2003)*. Both drainage and reuse, however, cause increases in salt and sediment loading and in some cases, pesticide and fertilizer impacts.

The Central Valley Regional Water Quality Control Board (Regional Board) has adopted regulatory requirements for discharges from irrigated lands (tailwater, water from underground drains, and stormwater runoff) and managed wetlands to waters of the State under the Irrigated Lands Regulatory Program (ILRP). Under this program, all irrigated agricultural lands and managed wetlands must meet Regional Board requirements for waste waters running off of their land. These requirements can be met in two ways:

1. Landowners can get an individual permit from the Regional Board. This requires the permit holder to write a plan, perform water quality monitoring tests, and hire someone to write a report of the results. This can be time-consuming and expensive for an individual.

2. Landowners can join a Coalition to manage the program and share expenses with other landowners. This option is much more feasible for landowners. Led by the Northern California Water Association (NCWA), the Sacramento Valley Water Quality Coalition (Coalition) helps landowners subject to the ILRP meet the Regional Board's requirements. Under the Coalition, two local subwatersheds can be found within the Colusa Basin Watershed: the Colusa Glenn Subwatershed Program (Colusa and Glenn Counties), and the Yolo County Farm Bureau Education Corporations Subwatershed (Yolo County). Other Regional Board water quality programs include: the Rice program and the dairy program. In the near future, discharges to groundwater may also be regulated in the ILRP.



Entities involved in the Irrigated Lands Regulatory Program (Illustration provided by the Colusa Glenn Subwatershed Program)

Considerations

- Outreach, education and community awareness are essential to protecting water quality
- Actions should focus on multi-use and multi-benefit solutions
- Groundwater and surface water quality are equally important
- Best Management Practices (BMPs) should be encouraged
- Many regulatory issues exist in the realm of water quality

Objectives and Actions

Objective #1: Evaluate current conditions

Actions	Performance Measures	Entities Involved
RCDs coordinate with the local Subwatershed programs and regional IRWM groups to remain aware of sources of water quality impairments	RCDs receive quarterly water quality updates from the local Subwatershed programs and IRWM groups beginning in January 2013	• RCDs • Colusa Glenn Subwatershed program • Yolo County Farm Bureau Education Corporation Subwatershed program • NSV & Westside IRWM groups
RCDs coordinate with City and County agencies and Tribes to remain aware of local water quality issues	RCDs partner with City and County agencies involved with water quality and Tribes, and receive quarterly updates beginning in January 2014	• RCDs • City and County Public Works Departments • City and County Health departments • Tribes

Objective #2: Recommend water quality improvement measures

Actions	Performance Measures	• Entities Involved
RCDs create a Community Awareness Campaign to provide outreach and education on local water quality issues and causes of water quality impairment	Community Awareness Campaign is developed by June 2014 The RCDs working with local entities, disseminate information via website, 2 email blasts, 1 mailer and at 1 local event per year beginning in June 2014	• RCDs • Counties • Cities • Colusa Glenn Subwatershed program • Yolo County Farm Bureau Education Corporation Subwatershed program • Tribes

RCDs, working with the local subwatershed groups, promote voluntary actions to prevent pollution from such sources as: fertilizers, pesticides, motor oil, illegal dumping, soil erosion, hazardous waste, etc.	RCDs utilize Community Awareness Campaign (see above Action) to promote voluntary actions by landowners and homeowners beginning in June 2014 RCDs provide an information booth at a minimum of one local event per year beginning in 2014 Knowledge gained by stakeholders results in a measureable reduction in water pollutants in the watershed each year beginning in 2015	• RCDs • Colusa Glenn Subwatershed program • Yolo County Farm Bureau Education Corporation Subwatershed program • Homeowners • Landowners and land managers
RCDs work with partners (listed at right) to provide technical advice for implementing BMPs that enhance water quality on agricultural lands	RCDs, NRCS, U.C. Cooperative Extension and local subwatershed groups collaborate to facilitate a minimum of one educational workshop per year, beginning in 2014	• RCDs • NRCS • U.C.C.E. • Landowners and land managers • Colusa Glenn Subwatershed program • Yolo County Farm Bureau Education Corporation Subwatershed program

Field drainage entering Colusa Basin Drain (Photo: Colusa Glenn Subwatershed Program)

Objective #3: Encourage and implement measures to protect groundwater from contaminants

Actions	Performance Measures	Entities Involved
County Groundwater Commissions support implementation and updates of County Groundwater Management Plans (GMPs) and include areas not in the existing plans	Funding is secured by County Water Agencies to implement and/or update County GMPs by December 2014	• Boards of Supervisors • County Groundwater Commissions • IRWM Groups • Colusa Glenn Subwatershed program • Yolo County Farm Bureau Education Corporation Subwatershed program • County Water Agencies • Tribes
County Groundwater Commissions identify and protect existing recharge areas (also found under Goal #2, Objective #3)	County Groundwater Commissions acquire GIS mapping of important recharge areas in the watershed by December 2014 90% of landowners in important recharge areas are given information and sign a MOA by December 2016 to protect recharge areas identified on private lands	• RCDs • NRCS • Landowners and land managers • County Groundwater Commissions • IRWM Groups • County and City Departments of Planning and Building • Yolo Co. Flood Control and Water Conservation District

Water quality monitoring on Walker Creek in Glenn County (Photo: Colusa Glenn Subwatershed Program)

Objective #4: Recommend Best Management Practices (BMPs) for agricultural and rangeland areas to reduce soil erosion and associated sediment loading into drainages

Actions	Performance Measures	Entities Involved
RCDs work with NRCS and local subwatershed groups to promote erosion control efforts	RCDs disseminate information via website, 2 email blasts, and 1 local event per year beginning in 2014	• RCDs • NRCS • Colusa Glenn Subwatershed program • Yolo County Farm Bureau Education Corporation Subwatershed program
RCDs and NRCS encourage and assist in implementation of agricultural land BMPs related to erosion and sedimentation, including filter strips, grassed waterways and off-stream grazing	RCDs and NRCS Facilitate at least one landowner workshop per year to promote BMPs and Farm Bill programs beginning in 2013	• RCDs • NRCS • Landowners and land managers • Colusa Glenn Subwatershed program • Yolo County Farm Bureau Education Corporation Subwatershed program

Irrigation ditch (Photo: Mary Fahey)

3.2 Goal 2: Promote activities to ensure a dependable water supply for current and future needs

Irrigation efficiency testing in Glenn County by Tehama County RCD (Photo: Tehama County RCD)

Current Status and Issues of Concern

Water supply reliability in California is an issue with a rich history. Waterways throughout the state have been significantly manipulated in order to reduce flooding and to supply water to naturally drought-prone areas. Water supplies in the State are being threatened by an aging storage and delivery system, increasing populations, changes in climate patterns and lack of conservation efforts. In addition, water supplies vary from year to year due to fluctuations in precipitation, and water demands vary due to growing populations and shifts in agricultural cropping patterns. All of these factors combined make local planning for water supply reliability a difficult task.

A dependable water supply, much like a clean water supply, is essential for productive agriculture, healthy ecosystems and abundant recreational opportunities. The Colusa Basin Watershed is dominated by agriculture and rangeland activities; therefore, water supply concerns in the watershed tend to be focused on agricultural supplies. The U.S. Fish and Wildlife Service (USFWS) refuges, as well as private wetlands, also make up a significant portion of the landscape, and require dependable water supplies from irrigation districts. Agriculture drives the economy in the Colusa Basin Watershed and wildlife refuges and wetlands provide valuable resting, feeding and nesting habitat to waterfowl travelling along the Pacific Flyway. The refuges and wetlands, and some agricultural areas also provide recreational opportunities such as hunting, photography and bird watching.

Water Conservation

The Colusa Basin Watershed is experiencing a significant shift in cropping patterns from row crops to permanent orchard crops. Micro irrigation is replacing surface irrigation at a fast pace. Micro irrigation is an effective water conservation tool; however, in some circumstances replacing surface irrigation with micro irrigation can lead to reduced groundwater recharge and increased buildup of salts. Micro irrigation systems do not have the large volumes of water to infiltrate into the soil for recharge or to provide flushing of salts. Also, in some cases, growers may rely more on groundwater sources for their micro irrigation systems because surface sources require more filtering. These scenarios differ on different landscapes depending on soil type, aquifers and other factors. Long term effects of water use efficiency in the Colusa Basin Watershed remain to be seen.

Groundwater Resources

Groundwater is a crucial component of California's water supply and an important source of irrigation water and rural household water supplies. In the Colusa Basin Watershed, land subsidence due to groundwater extraction is documented east of Zamora in Yolo County. DWR reports 1 to 2 feet of land subsidence due to extensive groundwater extraction in the Yolo and Zamora areas *(2009, DWR California Water Plan Update, Volume 3 Regional Report, p. SR-12)*. The Yolo County Flood Control and Water Conservation District website reports subsidence between Zamora and Knights Landing to be nearly five feet *(http://www.ycfcwcd.org/wmpdistrictwatersystem.html)*. There are two extensometers installed in Yolo County, one of which is located east of Zamora. Between 2006 and 2008, two extensometers in Colusa County recorded seasonal elastic land subsidence of approximately .025 feet with no indication that any inelastic subsidence had occurred *(Colusa County Groundwater Management Plan)*. Glenn County has 3 extensometers with continuous monitoring, reporting about a half inch fluctuation annually.

Water supply issues stretch far beyond the local level, but through implementation of this Management Plan, we strive to support and implement beneficial programs, encourage wise water use and work to educate the public on current issues. The more educated our communities become regarding local and statewide water issues, the better our region can come together with a united voice to protect our water supplies and provide constructive participation in local and statewide water planning.

Considerations

- Promote strategies to diversify supplies – conservation, recycling, storage, etc.
- Engage in area and statewide water planning
- Recognize that changes in cropping and irrigation patterns are affecting water supplies and should be taken into consideration when planning for water supply reliability
- Recognize that some areas of the watershed lack adequate water supplies for growth or economic development

Photo: Jack Alderson

Objectives and Actions

Objective #1: Encourage wise use and management of surface and ground water

Actions	Performance Measure	Entities Involved
RCDs promote and encourage enrollment in programs that enhance water conservation and are integrated to the region and local environment	3 landowners per year implement water conserving practices through NRCS Farm Bill programs beginning in 2014	• RCDs • NRCS • Landowners and land managers
RCDs and NRCS encourage tailwater reuse and water recycling	RCDs disseminate information via website, 2 email blasts, and 1 local event per year beginning in 2014	• RCDs • NRCS • Irrigation Districts • Landowners and land managers
Landowners adopt practices to capture and manage stormwater runoff	2 new projects per year to capture and manage stormwater are implemented beginning in 2015	• Landowners and land managers
RCDs working with local water-related entities (listed at right) promote healthy conjunctive use programs (coordinated use of groundwater and surface water) where applicable	RCDs disseminate information via website and 2 email blasts per year beginning in 2014	• RCDs • NRCS • Irrigation Districts • County water agencies • County Groundwater Commissions • IRWM Groups • Landowners and land managers
Water related entities (listed at right) promote utilization of available surface water first, to avoid groundwater overdraft	Occurrences of groundwater overdraft in the CBW are reduced by 20% by December 2016	• Irrigation Districts • County water agencies • County Groundwater Commissions • IRWM Groups • Landowners and land managers

Water related entities (listed at right) support and promote development of sensible, well-planned water storage facilities	Water-related entities facilitate informative presentations 2 times per year beginning in January 2013	• Irrigation Districts • County water agencies • IRWM Groups • Local Governments • Landowners and land managers
Planning and Building Departments encourage water conserving building and development practices	Developers are required by County and City Planning Departments to incorporate water-wise landscaping and building practices in new developments by December 2016	• County and City Departments of Planning and Building • County and City Governments

Objective #2: Provide strategies to adjust to drought conditions

Actions	Performance Measure	Entities Involved
RCDs coordinate with local irrigation districts and urban water districts on measures taken during drought conditions	RCDs disseminate local drought preparedness information via website and email blasts during drought years	• RCDs • Irrigation Districts • Urban water districts • Tribes
RCDs work with NRCS and UCCE to promote water conservation techniques for agriculture, including: micro irrigation, practicing crop water monitoring, and diversifying production to create a strategy of flexibility during drought conditions	RCDs disseminate information via website and 2 email blasts per year, beginning in June 2013 A minimum of one educational workshop per year is facilitated beginning in 2014	• RCDs • NRCS • U.C. Cooperative Extension Offices • Landowners and land managers
RCDs and U.C. Master Gardeners promote water-wise landscaping emphasizing use of native plants	RCDs and Master Gardeners disseminate information via website, brochures and 4 email blasts per year, beginning in January 2013 A minimum of one educational workshop per year is facilitated beginning in 2014	• RCDs • U. C. Master Gardener Program

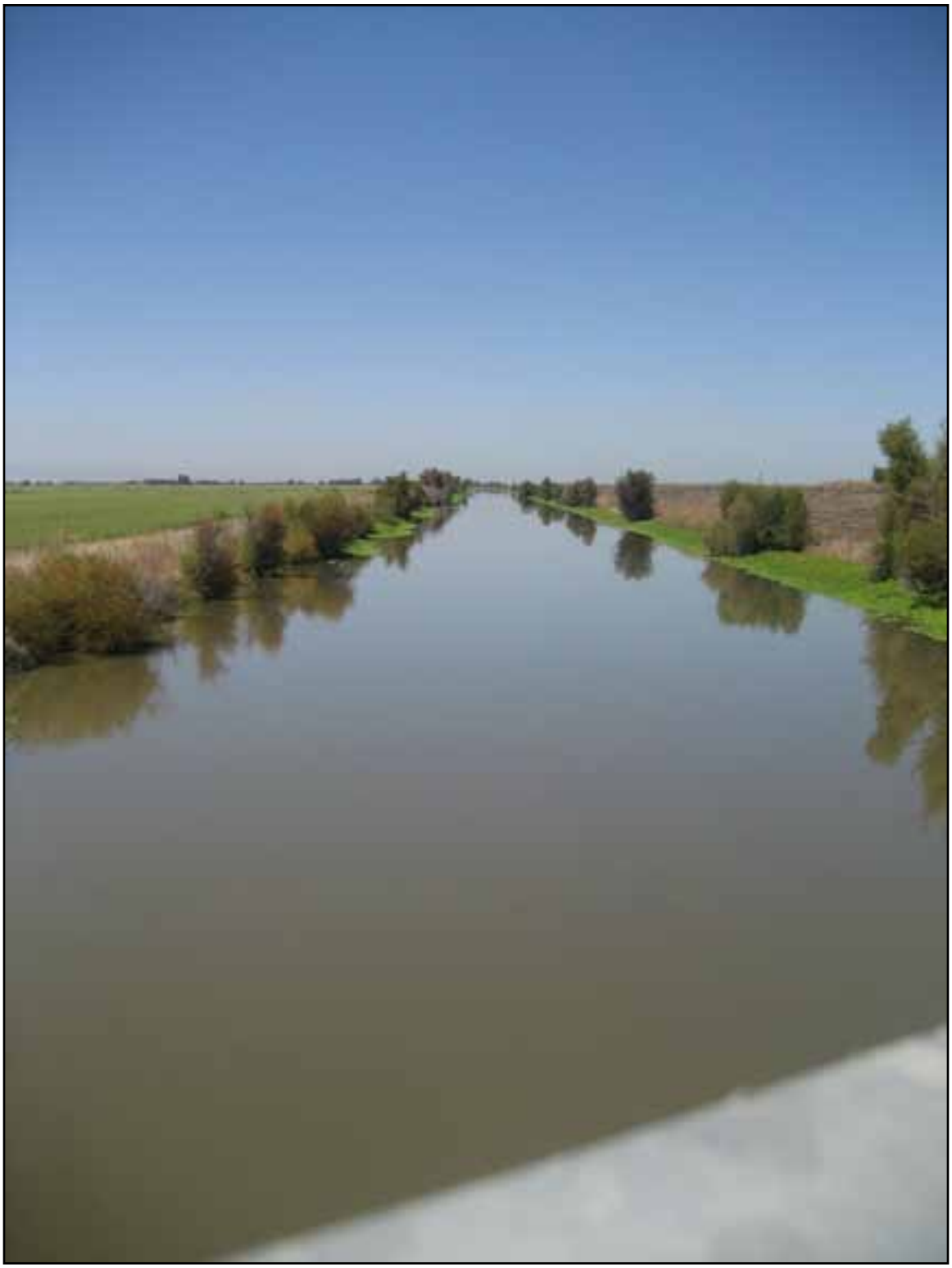
Objective #3: Investigate and implement practices that enhance groundwater recharge

Actions	Performance Measure	Entities Involved
RCDs and stakeholders coordinate with local entities to improve understanding of groundwater resources by participating in meetings, workshops and other informational endeavors	RCD staff attend a minimum of 2 Groundwater Commission meetings and 1 workshop per year beginning January 2013 RCDs disseminate information via website and 4 email blasts per year, beginning in June 2013	• RCDs • Local Governments • Tribes • Irrigation Districts • Groundwater Commissions • Landowners and land managers
Groundwater Commissions identify and protect areas that are optimal for groundwater recharge (also found under Goal #1, Objective #3)	County Groundwater Commissions acquire GIS mapping of important recharge areas in the watershed by December 2014 90% of landowners in important recharge areas are given information and sign a MOA by December 2016 to protect recharge areas identified on private lands	• RCDs • NRCS • Landowners and land managers • County Groundwater Commissions • IRWM Groups • County and City Departments of Planning and Building
RCDs and NRCS promote practices that are beneficial to groundwater recharge in agricultural settings, including: cover cropping, retention ponds, tailwater ponds, unlined canals and leveling fields to reduce runoff	3 landowners per year implement practices to enhance groundwater recharge through NRCS Farm Bill programs beginning in 2015	• RCDs • NRCS
Landowners manage flood water for short term retention and groundwater recharge where appropriate	Minimum 2 floodwater retention projects are implemented each year beginning in January 2014	• Landowners and land managers
City and County Planners minimize impervious surfaces to improve infiltration	Planning Departments require new development plans to address minimizing impervious surfaces by December 2016	• Planning and Building Departments

Objective #4: Provide current local and statewide water supply information to communities

Actions	Performance Measure	Entities Involved
RCDs gather and disseminate information regarding local and statewide water supply activities via newsletters, website, email blasts and meetings	RCDs attend a minimum of 2 meetings per year related to local, regional and statewide water issues beginning 2013 RCD staff subscribe to relevant listserves by June 2013 to receive email updates regarding local and regional water supply information RCDs disseminate water supply information quarterly via email blasts and newsletters beginning June 2013	• RCDs • Integrated Regional Water Management (IRWM) Groups
RCDs and stakeholders participate in water planning efforts such as IRWMPs, Bay Delta planning and California Water Plan	Minimum 2 meetings per year are attended by RCD staff and stakeholders beginning in 2013 Local entities including County staff and stakeholders sit on boards where appropriate	• RCDs • NRCS • Tribes • Landowners and land managers

Photo: Jack Alderson



Colusa Basin Drain at Knights Landing (Photo: Colusa Glenn Subwatershed Program)

3.3 Goal 3: Preserve agricultural land and open space

Current Status and Issues of Concern

As population growth and land development pressures remain ever-present in California, the Colusa Basin Watershed has remained a primarily agricultural region and is also home to thousands of acres of scenic open space. Preservation of these agricultural lands and open space areas is a priority for stakeholders.

Agriculture dominates the landscape in the watershed. 52% of the Colusa Basin Watershed is either prime farmland or farmland of statewide importance (545,960 ac). *(California Department of Conservation, Division of Land Resource Protection, Farmland Mapping and Monitoring Program)* Other farmland is principally grazing land in the western foothills (498,262 ac). These grazing lands, combined with over 21,000 acres of U.S. Fish and Wildlife Service (USFWS) National Wildlife Refuge lands provide scenic open space and valuable wildlife habitat. *(Harvey et al., 2008).*

Significant threats to agriculture in the Colusa Basin Watershed include uncertain future water supplies and an unknown future for the Williamson Act. Without a reliable source of water, farmers can't farm and USFWS Refuge wetlands and other water-dependent scenic open spaces cannot be sustained. As for the Williamson Act, it is unknown if funding for this program will ever be fully reinstated. If not, landowners will lose a critical financial incentive to keep their land in productive agriculture and out of development.

Poorly planned housing development poses another threat to agricultural lands and open space in the watershed, especially to farmland in the southern portion of the watershed. The watershed is bisected in a north-south direction by Interstate 5 and farmland adjacent to I-5 is particularly vulnerable. Development pressure has eased over the past few years (2007-20012) due to a severe economic downturn, but this threat to prime agricultural land is sure to re-emerge as the economy and housing markets improve.

Housing developments adjacent to agricultural land (Photo: Jack Alderson)

During stakeholder interviews, the subject of easements was brought up as both a benefit and a threat. Some stakeholders

felt that agricultural easements and conservation easements were vital to protecting these lands. Others expressed concern about conservation easements that take agricultural lands out of production. Similarly, some stakeholders voiced concern about conversion of agricultural lands to poorly managed habitat that can negatively affect neighboring farmland.

Field of winter wheat (Photo: Mary Fahey)

Perhaps one of the most frustrating threats to our agricultural and open space areas stems from a lack of understanding and appreciation of these lands among the general public. Farmland is often perceived as wasting water and contributing to pollution, while open space is viewed by some as a waste of space that could be better utilized for housing, industry or other development ventures. On the contrary, these lands and the people that work them provide food and fiber to the world, wildlife habitat, biodiversity and scenic beauty, as well as floodwater attenuation, groundwater recharge and many other benefits. The watershed's rural setting and location along the Pacific Flyway also provide tremendous opportunities for hunting, bird watching, wildlife viewing, photography and other forms of agritourism and ecotourism. There are efforts underway in California to highlight scenic places, local food and farmers. Similar marketing and public awareness efforts at the local level could help to preserve valuable agricultural and open space lands in the Colusa Basin Watershed.

Considerations

- Promote the value of agriculture by highlighting the importance of food and fiber production, land stewardship, habitat value and water conservation
- Promote the value of open space by highlighting the habitat value and opportunities for agritourism and ecotourism
- Ensure a dependable water supply (see Goal #2)
- Protect agricultural and open space resources, commodities and identity through support of smart urban planning centered around existing cities and towns
- Support funding for the Williamson Act and other programs that provide landowner incentives to keep land in agricultural production
- Ensure that conservation easements and habitat restoration projects are well planned and well managed
- Support a system of payments for ecosystem services

Objectives and Actions

Objective #1: Create public awareness of the benefits of agriculture and open space

Actions	Performance Measure	Entities Involved
RCDs and Farm Bureaus utilize social media to promote agriculture and open space in the watershed	RCDs and Farm Bureaus post information and/or photos promoting agriculture and open space on their social media sites weekly beginning June 2013	• RCDs • Farm Bureaus • Landowners and land managers
RCDs, Farm Bureaus and local governments promote agriculture and open space in the watershed on their websites	New information is posted monthly on pertinent websites beginning January 2013 Colusa County Grown website is maintained by the CCRCD and updated monthly beginning January 2013	• RCDs • Farm Bureaus • Local governments
RCDs and Farm Bureaus provide fact sheets for the general public that highlight the benefits of agriculture and open space	A minimum of two fact sheets are developed and disseminated per year beginning in 2013	• RCDs • Farm Bureaus • American Farmland Trust
Local entities (listed at right) promote agritourism activities such as wildlife-related activities, wildflower viewing, ranch stays and farm visits	Information is posted by local entities (listed at right) quarterly on their websites beginning January 2013 The RCDs disseminate information via website and 2 email blasts per year, beginning in January 2013	• RCDs • Landowners and land managers • Farm Bureaus • Chambers of Commerce • U.C. Davis Small Farm Program • U.S. Fish and Wildlife Service
RCDs work with partners (listed at right) to quantify the monetary benefits and benefits to society of agricultural and open space lands to counties from crop production, hunting, wildlife viewing and other agritourism and ecotourism opportunities	Funding is received by RCDs to facilitate this project by December 2014	• RCDs • County Governments • State and Federal Agricultural Economists • Chambers of Commerce • Business Owners

Objective #2: Preserve working agricultural lands and open space

Actions	Performance Measure	Entities Involved
RCDs advocate for preservation of the Williamson Act	RCDs gather and disseminate information via website and 2 email blasts per year beginning in 2013	• RCDs • County Governments • Landowners
RCDs support programs that provide payments for ecosystem services	RCDs identify existing programs by December 2014 RCDs publicize existing programs via websites, 2 email blasts, and 2 quarterly newsletter articles per year beginning in January 2015	• RCDs • NRCS • National Conservation Organizations • California Rice Commission • California Rangeland Conservation Coalition
RCDs, NRCS and other entities (listed at right) support development of agricultural easements and conservation easements that enhance the landscape	A 10% increase in acreage put into easements is implemented by December 2016, providing protection of agricultural lands and open spaces	• RCDs • NRCS • Land owners • USFWS • Land Trusts • Farm Bureaus
Agencies involved in habitat restoration promote responsible management of restoration projects	RCDs coordinate with habitat restoration agencies to gather/ produce guidelines for practical and effective habitat management by December 2014 RCDs disseminate guidelines to agencies and landowners beginning in 2015	• RCDs • NRCS • Agencies involved in restoration TBD • Landowners and land managers
Local governments promote business and industry conditions that maintain the economic viability of agriculture	Agriculture remains a strong and thriving industry in the watershed	• County Governments • City Governments
Cities and Counties limit urban development to surrounding incorporated areas and spheres of influence	County and City General Plans contain language limiting development to surrounding incorporated areas and spheres of influence by December 2016	• County Governments • City Governments • County and City Planning Departments

3.4 Goal 4: Manage and reduce invasive plant populations

Current Status and Issues of Concern

Invasive weeds are defined as plants that are non-native to the ecosystem and that cause or are likely to cause economic harm, environmental harm or harm to human health. According to the California Invasive Plant Council (www.cal-ipc.org), invasive weeds cost California $82 Million each year just for control efforts, monitoring and outreach. Estimates of actual impacts of invasive weeds reach into the billions of dollars. In the Colusa Basin Watershed, invasive weeds interfere with ranching, farming, recreation, habitat conservation and traditional gathering of native plants for Native American baskets and food. Effects of invasive weeds on our natural resources may include: increased wildfire potential, reduced water resources, accelerated soil erosion and flooding, threats to wildlife habitat and degraded range and crop land. Invasive weeds are able to thrive because they usually have no natural predators, are adapted to many environments, spread rapidly and proliferate, and out-compete native species. Some form of land disturbance is usually the trigger that facilitates invasion.

In the Colusa Basin Watershed, there are several invasive weed species of concern. Table 1 lists nine of the most troublesome weeds, as identified by stakeholders, and their associated impacts. Of these nine species, yellow starthistle is the most widespread. Barbed goat grass, purple starthistle and medusahead are particularly troublesome in rangeland areas. Giant reed and salt cedar, common along the many creeks and streams in the watershed, cause a multitude of problems including flooding, erosion, excessive use of groundwater, increase in risk of fire as a result of excessive fuel loads, and depletion of habitat. Water primrose clogs irrigation canals throughout the watershed. Tree of heaven alters native plant communities and its root systems can damage sewers and building foundations.

Yellow Starthistle is a troublesome invasive weed in many watersheds, including the CBW (Photo: Jack Alderson)

Perennial pepperweed has invaded a wide range of habitats including upland, riparian areas, wetlands, marshes and floodplains.

Resources to combat invasive weeds are limited in the watershed, mainly due to lack of funding, which has been drastically cut due to state budget shortfalls. There are two Weed Management Areas (WMAs) focusing on invasive weed eradication: the Colusa, Glenn and Tehama County WMA (coordinated by the Glenn County Department of Agriculture) and the Yolo County WMA (coordinated by the Yolo County Department of Agriculture and Yolo County RCD). The Weed Management Area program is facilitated by the California Department of Food and Agriculture. WMAs exist in each county in California and they are vital to protecting California landscapes from invasive plant species invasions.

TABLE 1 - Invasive plant species of concern in the Colusa Basin Watershed
(note: this list is not inclusive of all invasive species in the Watershed. Listed species were identified by stakeholders as highly problematic in the CBW)

Common Name	Species	Affected Habitats	Concerns*
Giant reed	Arundo donax	Riparian	E, F, FL, H, W
Salt cedar	Tamarix parviflora	Riparian	E, FL, H, W, WQ
Perennial pepperweed	Lepidium latifolium	Upland & Wetland	C, H, R
Yellow starthistle	Centaurea solstitialis	Upland	C, F, H, R
Purple starthistle	Centaurea calcitrapa	Upland	H, R
Medusahead	Taeniantherum caput-medusae	Upland	E, H, R
Barbed goatgrass	Aegilops triuncialis	Upland	C, H, R
Tree of heaven	Ailanthus altissima	Upland	H
Water primrose	Ludwigia: L. hexapetala (Uruguayan primrose-willow) L. peploides subsp. peploides (water primrose) L. peploides subsp. montevidensis (creeping water primrose)	Wetland	H, WQ

*C=Degrades Cropland; E= Promotes Erosion; F=Fire Danger; FL=Causes Flooding; H=Destroys Habitat; R=Degrades Rangeland; W=Water Hog; WQ=Degrades Water Quality

Table created by: Mary Fahey, CCRCD, 2011

Considerations:

- Early detection and quick action are key ingredients to an effective invasive weed management plan
- Preventive measures, such as weed seed inspections on vehicles, equipment, livestock feed, etc. should be considered
- Landowner participation in weed control efforts is vital
- Weed populations along waterways can spread from the foothill regions on the west side of the watershed downstream into the valley regions; therefore, control efforts along the streams should begin upstream
- To reduce the spread of weeds, control efforts should be concentrated on controlling outliers (small segregated weed populations) before they gain a foothold and expand to a larger infestation
- Control methods can include: chemical, physical, grazing (cattle, goats, sheep) and prescribed burning; integrated approaches, where two or more methods are used in combination will typically lead to more effective long-term control
- After control measures are taken, seeding and planting native grasses, shrubs and trees is recommended to restore native plants and discourage reestablishment of invasive species
- Inventory and mapping should be ongoing (the Colusa County Resource Conservation District has completed the Colusa Basin Watershed Limited Streambank Analysis *(Harvey et al. 2008)* in which 32 ephemeral streams were mapped for Arundo and Tamarisk as well as riparian habitat and soil erosion potential. The CCRCD has also created an initial GIS map containing locations of populations of nine important invasive weed species in the Colusa Basin Watershed. The map consists of a compilation of information gathered from a number of partners in the watershed along with field surveillance conducted by CCRCD staff. Shown in Figure 7, this map is meant to serve as a tool to monitor weed populations and plan control projects; it should be updated regularly as weeds spread to new areas, and as populations are controlled)
- Cooperative efforts to identify funding and resources for mapping, planning and implementing weed eradication projects are critical in the fight against invasive weeds

Objectives and Actions

Objective #1: Regularly identify invasive species concerns to facilitate early detection

Action	Performance Measure	Entities involved
RCDs maintain relationship with Colusa, Glenn and Tehama WMA, the Yolo WMA, and the Agricultural Commissioners' offices in Glenn, Colusa and Yolo counties	Quarterly updates are provided on each others' activities related to weed management beginning January 2013	• RCDs • Weed Management Areas • Agricultural Commissioners • Landowners and land managers
RCDs develop a Community Reporting System where landowners, land managers and agencies can report invasive weed infestations	RCDs create reporting system and put it to use by December 2014	• RCDs (create reporting system) • Weed Management Areas (assist to create reporting system) • Agencies (utilize reporting system) • Tribes (utilize reporting system) • Landowners and land managers (utilize reporting system)

Yellow starthistle
(Photo: Jack Alderson)

Objective #2: Maintain the Colusa Basin Watershed GIS weed map with current status of mapped species

Action	Performance Measure	Entities involved
Colusa County RCD monitors weed populations as time and funding allow	Colusa Basin Watershed GIS Invasive Weed Mapping project is updated at least yearly beginning in 2014	• Colusa County RCD
RCDs enlist landowner, land manager and agency input to help monitor invasive weed populations	RCDs train other entities to utilize community reporting system beginning January 2015	• RCDs • Landowners and land managers • Weed Management Areas • California Invasive Plant Council

Objective #3: Promote education and public awareness

Action	Performance Measure	Entities involved
RCDs facilitate education and outreach aimed at land managers (large and small acreage) and homeowners including weed identification and ecology, early detection, management and eradication actions.	RCDs disseminate information via website, 2 email blasts, and 2 quarterly newsletters per year beginning in 2014	• RCDs • County Departments of Agriculture • U.C. Cooperative Extension • Master Gardener Program
RCDs create an outreach plan including: articles, advertisements, PSA's, a series of workshops and development of a weed management manual	Outreach Plan is completed by December 2015	• RCDs • NRCS • California Invasive Plant Council
RCDs attend and support weed awareness functions such as "Day at the Capitol" to spread knowledge to stakeholders and government officials	RCD staff attend a minimum one Weed Awareness function per year beginning in 2013	• RCDs

RCDs utilize resources from California Invasive Plant Council (Cal-IPC) as educational tools	RCDs disseminate California Invasive Plant Council educational materials and demonstrate to landowners how to report invasive weeds with the Calflora Observer App at minimum one event per year beginning in 2015	• RCDs • Landowners and land managers

Objective #4: Develop tools to control invasive species of concern as they become known

Action	Performance Measure	Entities involved
Weed eradication agencies (listed at right) utilize existing information, such as the CCRCD GIS weed map and the Arundo and Tamarisk mapping from the Colusa Basin Watershed Limited Streambank Analysis, to identify problem areas and develop targeted control strategies	Grant funding is obtained to facilitate eradication projects by December 2014	• RCDs • Weed Management Areas • Public Works departments • County Departments of Agriculture
RCDs and WMAs create a "tool kit" that includes timely information about methods to identify and control noxious weeds	Tool kit is developed and disseminated to landowners and weed workers beginning in January 2015	• RCDs • Weed Management Areas

Water primrose invading a canal (Photo: Jack Alderson)

Objective #5: Promote BMPs for all types of invasive species management and abatement

Action	Performance Measures	Entities involved
RCDs, NRCS and WMAs promote projects that remove invasive plant species and replace them with native vegetation that provides improved erosion protection and wildlife habitat	Minimum 20 acres per year of invasive plants are removed and replaced with native vegetation beginning in 2015	• RCDs • NRCS • Weed Management Areas • Public Works Departments • Landowners and land managers
Agencies working on weed eradication target control efforts to upstream areas and outliers first	Part of the targeted control strategies mentioned in Objective #4 include focusing on upstream areas and outliers	• RCDs • Weed Management Areas • Public Works Departments • Landowners and land managers

This landscape is infested with Perennial pepperweed (Photo: Jack Alderson)

Objective #6: Acquire funding for collaborative weed eradication projects

Action	Performance Measure	Entities involved
RCDs and WMAs seek out and acquire grant funding for noxious weed eradication projects targeting priority areas	RCDs and WMAs acquire funding for a minimum one grant proposal per year for weed eradication projects beginning in 2015	• RCDs • Weed Management Areas
RCDs seek funding in collaboration and coordination with partners and landowners for noxious weed eradication projects	Spearheaded by RCDs, a minimum two collaborative grant proposals are written per year beginning 2013	• RCDs • Weed Management Areas • Landowners and land managers • Counties • Agencies • Others as appropriate

A work crew takes on the daunting task of removing an Arundo donax infestation in Glenn County (Photo: Glenn County RCD)

Please see Appendix 10 for a larger version of all maps

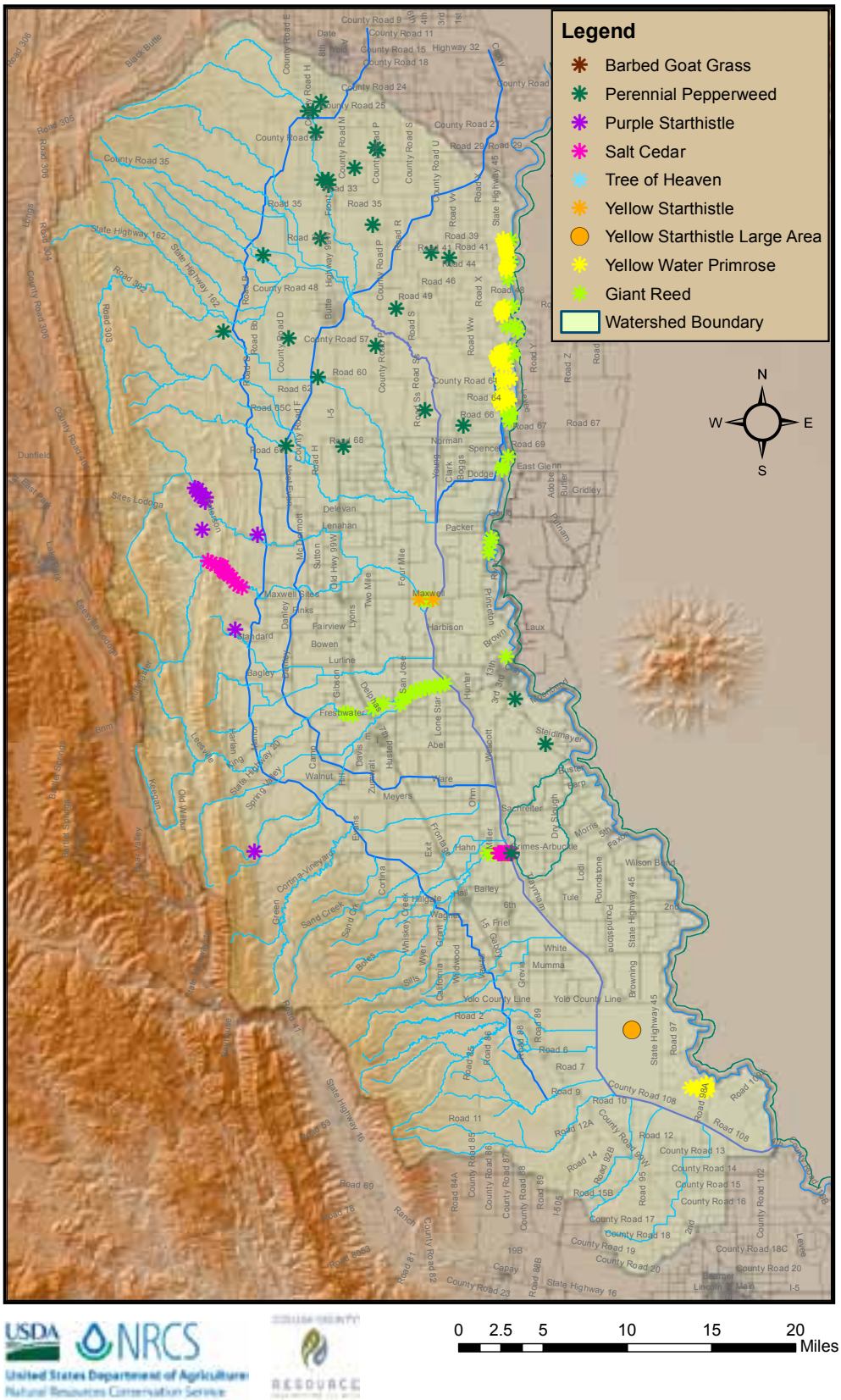


Figure 7: Colusa Basin Watershed Initial Map of Invasive Weed Populations

This map is the first step in the creation of comprehensive watershed-wide invasive weed mapping. Updates will be made as time and funding allow.

3.5 Goal 5: Reduce destructive flooding

Current Status and Issues of Concern

Flooding in the Colusa Basin Watershed is common during the wet season (October - April). The primary cause of flooding is inadequate conveyance capacities in the Colusa Basin Drain and in the many ephemeral streams throughout the watershed (*Navigant Consulting, Inc. 2002*).

Flooding in a walnut orchard near the Sacramento River, 2011 (Photo: Tim Hermansen)

The Colusa Basin Drain was not designed to carry the amount of stormwater runoff or irrigation runoff that it currently receives. Increasing the capacity of the Colusa Basin Drain, however, would only serve to redirect flooding problems to downstream areas. Flooding along the lower section of the Colusa Basin Drain is exacerbated when water levels in the Sacramento River and Yolo Bypass are high. In this case, water in the Colusa Basin Drain is not able to flow freely into the Sacramento River. This causes overflow that creates a "lake effect" in the Grimes area, and the Zamora to Knights Landing area, a problem that would increase if the Drain were to carry higher flows.

Flood flows from foothill streams are extremely flashy and drain swiftly into the valley causing flooding issues, especially along the Colusa Basin Drain. The capacity of upland rangeland soils to retain and store water has been greatly diminished as a result of native perennial grasses being replaced by annual grasses. Flood control efforts focused in the hills on the west side of the watershed may provide benefits by retaining more rainfall in the foothills, thereby slowing flood flows into the valley. Although no quantifiable studies have been published for the area, several ideas have been analyzed to accomplish flood flow retention in the foothill areas. These ideas include: increasing populations of deep-rooted perennial vegetation to improve soil structure and increase water infiltration, improving riparian habitats, allowing streams to reconnect to flood plains, and creating detention ponds. These methods would afford multiple natural resource benefits such as groundwater recharge, improved forage, enhanced habitat, reduced erosion and sedimentation and reduced pollutant loads.

Improving the available water holding capacity (AWHC) of foothill soils by planting deep rooted perennial grasses would be an excellent study in the Colusa Basin Watershed, providing increased organic matter and infiltration rate of soils while also providing more forage for grazing animals and a longer grazing season.

Considerations

- Use a watershed approach for analyzing flooding issues by considering the entire system
- Realize that in the right situations, flooding can be beneficial for groundwater recharge, habitat enhancement, and slowing stream flows
- Allow for stormwater overflow/flooding in low-risk (low damage) areas
- Promote measures that result in upstream stormwater retention and peak flow attenuation
- System-wide improvements should not redirect flood risk to other areas

Flooding adjacent to Freshwater Creek in Colusa County in 2003 (Photo: Jack Alderson)

Objectives and Actions

Objective #1: Assess the status and functionality of flood control infrastructure (e.g., drainage canals, ditches, canal banks, levees) and identify areas of risk

Actions	Performance Measure	Entities Involved
RCDs coordinate efforts with other entities (listed at right) involved in local flood control	Quarterly updates are provided on each others' activities related to flood control infrastructure beginning in 2013	• RCDs • Colusa Basin Drainage District • Public Works Departments • NSV IRWM group • Colusa Basin Drainage District • Mid Sacramento Regional work group
Local entities working on flood control (listed at right) support maintenance of flood control infrastructure and levees	Local governments and agencies sign MOU to support maintenance of flood control infrastructure and levees by January 2016	• RCDs • County Governments • City Governments • Reclamation Districts • Colusa Basin Drainage District • Mid Sacramento Regional work group
RCDs and NRCS identify where natural channels have been removed (through land leveling, etc.) and identify its effect upon storm runoff and localized flooding	Study is completed by RCDs and NRCS by December 2016	• RCDs • NRCS
RCDs and NRCS determine the cumulative effects of existing wetland and riparian restoration projects on flooding	Study is completed by RCDs and NRCS by December 2016	• RCDs • NRCS

Objective #2: Manage flood water for short-term retention and groundwater recharge where appropriate and promote recharge infrastructure

Actions	Performance Measure	Entities Involved
RCDs working with partners (listed at right) identify situations where flooding is beneficial	Mapping of these areas is completed by December 2014	• RCDs • Mid Sacramento Regional work group • Colusa Basin Drainage District • Landowners and land managers
RCDs and partners (listed at right) develop projects that utilize flood flows for managed groundwater recharge and habitat enhancement	RCDs, work with partners to implement minimum one project per year beginning in 2016	• RCDs • NRCS • Landowners and land managers • Planning Departments • Public Works Departments
RCDs and NRCS develop projects to improve groundwater infiltration in flood-prone areas	RCDs identify and map flood prone areas by December 2015 Funding is secured by RCDs to facilitate projects beginning in 2016	• RCDs • NRCS • Landowners and land managers
Agencies (listed at right) provide incentives for farmers and ranchers whose land is used for off stream storage	RCDs identify and create a list of willing landowners by December 2015 Incentive programs are identified and presented to landowners in 2016	• NRCS • California Rangeland Conservation Coalition • U.S. Fish and Wildlife Service • Department of Fish and Game

Objective #3: Develop and implement measures to control runoff in foothills and on agricultural lands

Actions	Performance Measure	Entities Involved
RCDs promote the use of native perennial vegetation to increase infiltration and slow flood flows in foothills (this is also under Goal #6, Objective #3)	Funding is secured by RCDs to facilitate one demonstration project for educational field days by January 2015	• RCDs • NRCS • Tribes • Landowners and land managers

Install and utilize tailwater ponds to control runoff on farmland	Land Managers install a minimum of three tailwater ponds per year with assistance as needed from RCDs and NRCS beginning in 2015	• RCDs • NRCS • Landowners and land managers
RCDs work with landowners to facilitate creating natural floodplains and detention ponds where appropriate	RCDs identify potential projects by December 2014 RCDs write minimum one proposal per year for project funding beginning in 2015	• RCDs • NRCS • Landowners and land managers • Colusa Basin Drainage District
Reestablish flood plains along streams, where feasible (this is also under Goal #6, Objective #1)	Funding is secured to facilitate one demonstration project by (this is also under Goal #6, Objective #4) December 2015	• RCDs • NRCS • Landowners and land managers

Stormwater draining out of the western foothills in Colusa County (Photo: Jennifer Masters)

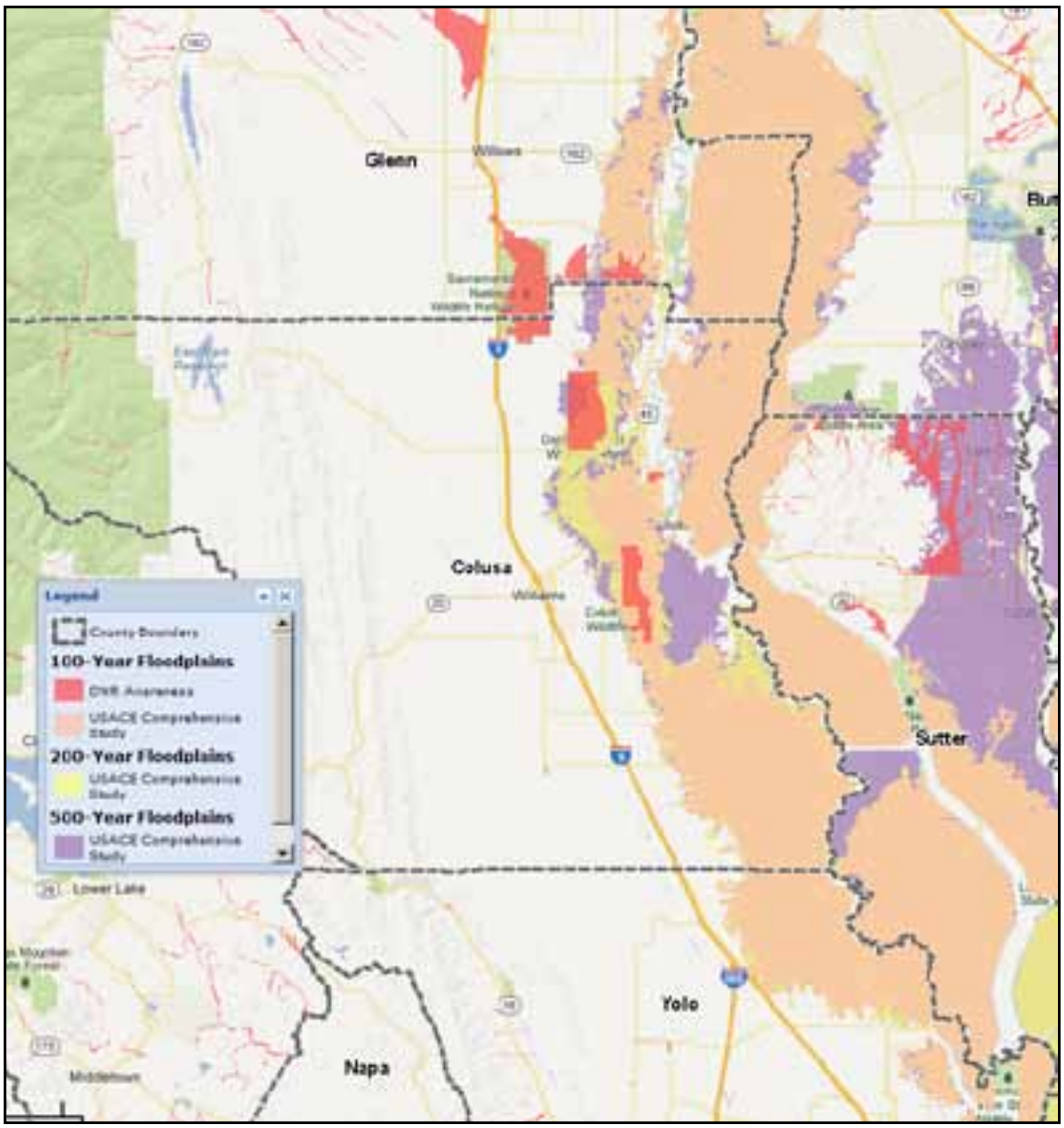


Figure 8.1: Flood Prone Areas, DWR and USACE
Map source: http://gis.bam.water.ca.gov/bam

(Note: This map not included in Appendix 10)

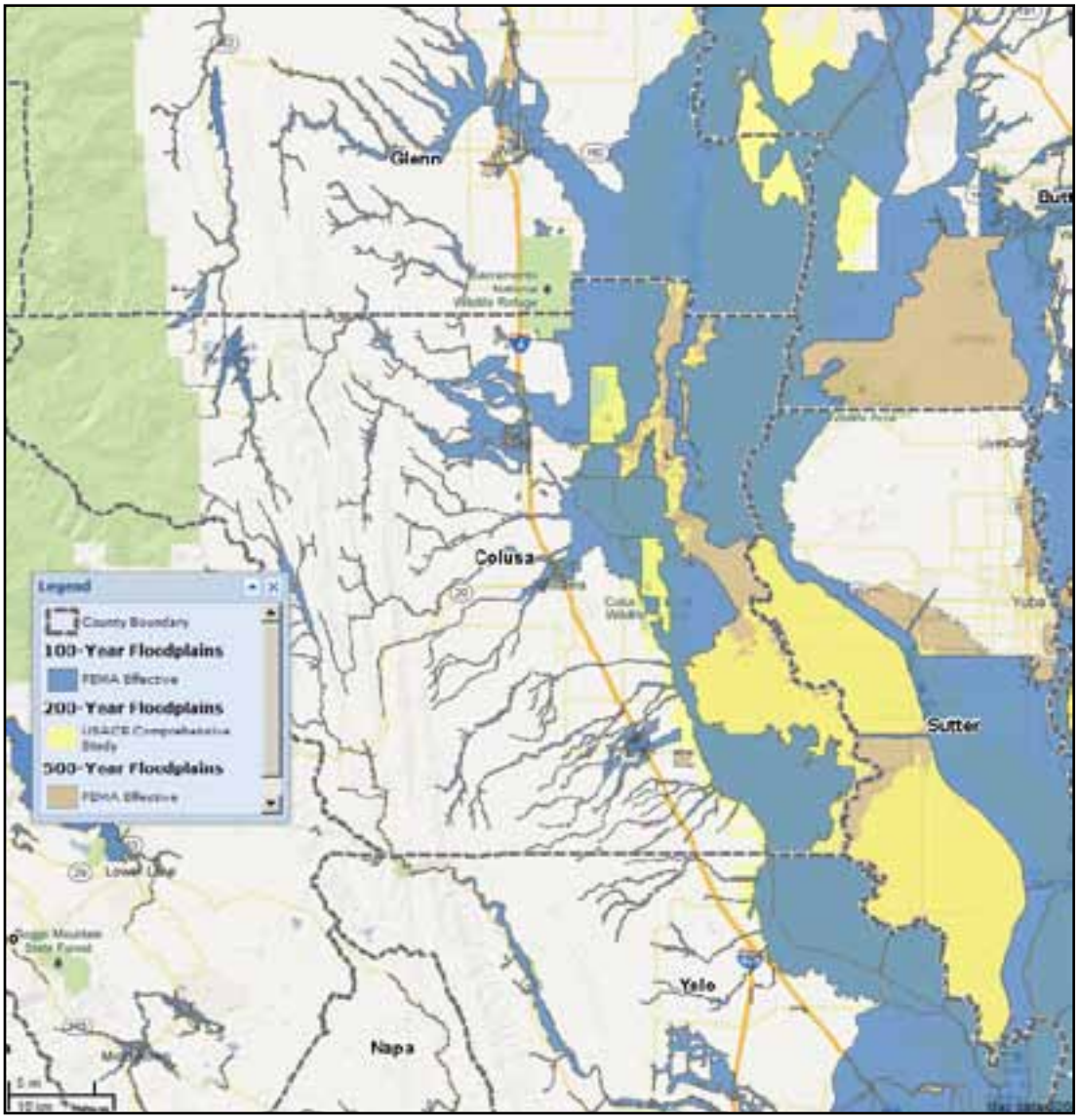


Figure 8.2: Flood Prone Areas from FEMA and USACE
Map source: http://gis.bam.water.ca.gov/bam

(Note: This map not included in Appendix 10)

3.6 Goal 6: Enhance soil quality and reduce erosion

Vegetation along this streambank would help stabilize the banks and filter runoff from the adjacent orchard (Photo: Jennifer Masters)

Current Status and Issues of Concern
Erosion is a natural process that can be exacerbated by human activities such as land leveling, building, road construction and eradication of natural vegetation. Erosion can lead to loss of valuable soil resources, degraded water quality and destructive sediment deposition. In the Colusa Basin Watershed, erosion typically occurs in the form of sheet and rill erosion, streambank erosion and gully erosion.

Sheet and rill erosion caused by rainfall runoff over exposed soils occurs throughout the watershed. Invasion of Mediterranean annual grasses and grazing impacts have had an effect on soil erosion in the upper watershed areas (*Harvey et al., 2008. p. 145*).

Streambank erosion is a major natural resource concern in the watershed. Causes of bank erosion include: channel alterations such as realignment and narrowing, lack of vegetation on and adjacent to channel banks, and flashy stream flows during the rainy season. There are many seasonal streams in the watershed that carry flood flows from the western foothills down to the valley floor.

Many of the strategies that can be used to reduce erosion and improve soil quality provide multiple benefits such as improved water quality, weed control, native habitat restoration and reduced flooding downstream.

Considerations

- Promote multi-benefit soil management measures that increase soil organic matter and promote healthy soil structure while also maintaining or improving crop/forage production, decreasing surface runoff, improving streambank stability, enhancing wildlife habitat, etc.
- Realize that erosion prevention projects will also benefit water quality
- Realize that vegetation protects the soil from erosion and utilize vegetative practices wherever possible
- Strive for greater permeability of the land to lessen runoff and erosion

Objectives and Actions

Objective #1: Reduce channel instability and stream bank erosion

Action	Performance Measure	Entities involved
RCDs and NRCS work to establish native vegetation buffers between channels and adjacent land	Minimum 2 miles of buffers are installed per year beginning in January 2015	• RCDs • NRCS • Subwatershed programs
RCDs utilize CCRCD Streambank Analysis mapping to identify areas that would benefit most from restoration	RCDs compile a list of potential restoration projects in each of their counties by December 2013	• RCDs
RCDs and NRCS promote fenced riparian areas on rangeland to limit livestock access	RCDs disseminate information via website, 2 email blasts, and 1 local event per year beginning in 2014	• RCD • NRCS • Landowners and land managers
RCDs and NRCS work with landowners to reestablish flood plains along streams, where feasible	Funding is received to facilitate one demonstration project (this is also under Goal #5, Objective #3) by December 2015	• RCDs • NRCS • Landowners and land managers
RCDs and NRCS work to reestablish native vegetation on bare or degraded streambanks	Minimum 2 miles of bare streambank per year are revegetated beginning January 2015	• RCDs • NRCS • Landowners and land managers

Objective #2: Advocate alternatives to non-vegetated streambanks and irrigation ditches

Action	Performance Measure	Entities involved
RCDs promote vegetative practices through articles on website, newsletter and newspaper	The RCDs disseminate information via website, quarterly newsletter, and minimum 1 newspaper article per year beginning in January 2013	• RCDs
RCDs, NRCS promote the use of native grass species to vegetate ditches and canals	RCDs and NRCS create one demonstration site by December 2014 RCDs facilitate minimum one workshop per year is beginning 2015	• RCDs • NRCS • Hedgerow Farms • Landowners and land managers

Examples of streambank erosion, typical in the Colusa Basin Watershed (Photos: Jack Alderson and Jennifer Masters)

Objective #3: Provide natural soil protection measures to reduce soil erosion and improve soil quality on farm land and range land

Action	Performance Measure	Entities involved
RCDs promote the use of cover crops to protect and enhance farmland soils	RCDs disseminate information via website, quarterly newsletter, and minimum 2 email blasts per year beginning in January 2013 RCDs establish minimum one demonstration site by December 2014 to be utilized for a minimum of one educational field day per year	• RCDs
RCDs and NRCS promote no-till farming practices	The RCDs disseminate information via website, quarterly newsletter, and minimum 2 email blasts per year beginning in January 2013 Colusa County RCD no-till drill rental demand increases by 10% per year beginning in 2014	• RCDs • NRCS
RCDs promote the use of native perennial vegetation to increase infiltration and slow flood flows in rangeland areas (this is also under Goal #5, Objective #3)	RCDs secure funding and work with partners (listed at right) to facilitate one demonstration project for educational field days by January 2015	• RCDs • NRCS • Tribes • Landowners and land managers
Land managers transition from "clean farming" to incorporate more vegetative cover	Long term shift in farming practices by land managers begins to be realized by 2016	• RCDs • NRCS • Landowners and land managers
Land managers utilize sediment traps to keep sediment on-farm	Land managers install a minimum of three new sediment traps per year beginning in 2016	• Landowners and land managers • RCDs • NRCS
NRCS works with landowners to establish vegetated filter strips at the tail end of irrigated farmlands and orchards	Minimum 3 filter strips per year are installed through NRCS Farm Bill programs beginning in 2016	• NRCS • Landowners and land managers

Objective #4: Assist land managers with soil erosion reduction measures and soil quality improvements

Action	Performance Measure	Entities involved
RCDs and NRCS increase land manager knowledge of erosion function	The RCDs disseminate information via website, 2 email blasts, and 1 local event per year beginning in 2014 RCDs and NRCS facilitate minimum of one educational workshop per year beginning in 2015	• RCDs • NRCS
RCDs establish demonstration sites and conduct site tours, workshops and trainings on strategies to improve soil health and stability	RCDs receive funding to facilitate one demonstration project in 2015 Minimum of two educational site tours facilitated per year beginning in 2016	• RCDs • Landowners and land managers

Deergrass lines the banks of this creek, stabilizing the banks and filtering orchard runoff (photo: Mary Fahey)

3.7 Goal 7: Preserve and enhance native habitat

A Barn Owl nest box placed among a variety of native plants on an unfarmed hillside adjacent to an almond orchard. The native plants control soil erosion, filter runoff from the orchard, and create habitat for pollinators, beneficial insects and wildlife. Attracting Barn Owls provides natural rodent control (photo: Mary Fahey)

Current Status and Issues of Concern

The Colusa Basin Watershed contains a variety of native habitats including riparian forest, upland, wetland, vernal pool, grassland and oak woodland (*Harvey et al. 2008. p.9*). These habitats are host to several endangered, threatened and at-risk species, as well as waterfowl and other migratory birds traveling along the Pacific Flyway whose numbers reach into the millions. Since the late 1800's and early 1900's, as the area began to be settled, these habitats have been greatly altered due to land use changes (urbanization, agriculture and flood control), and much of the native habitat in the watershed has been lost. Striking examples of this are the loss of vast riparian forests along the broad natural levees of the Sacramento River and hundreds of thousands of acres of wetlands in the adjacent floodplains.

Prior to the land use changes that began to occur in the late 1800's, grassland was perhaps the most extensive vegetative cover throughout the watershed (*Harvey et al. 2008. p.228*). The ephemeral streams draining the foothills supported less extensive riparian corridors than the perennial flows of the Sacramento River and adjacent sloughs, however this vegetation provided vital habitat and movement corridors for wildlife. Beyond the riparian corridors of these foothill streams, the landscape was rich with native grasslands, chamise chaparral, and blue oak woodlands which formed a mosaic of habitats along the western foothills *(Harvey et al. 2008. p.226)*.

Beginning in 1860 major flood control and irrigation development projects, drainage projects and agricultural expansion rapidly and dramatically altered hydrologic cycles and pathways in the watershed, which in turn eliminated or converted the vast majority of the riparian, wetland, and grassland habitats. Tree species were felled for firewood and construction, woodlands on natural levees were cleared for cropland, tule marshes were drained for agricultural use, and grasslands were tilled for crops (*Harvey et al. 2008, p.226*). Also, periodic burning by Tribes to promote wildlife habitat and native plant growth was eliminated, resulting in increased fuel loading, increased water use and changes in species diversity.

Existing Conditions

Table 2: The existing habitats of the Colusa Basin Watershed
Existing habitats can be grouped broadly into the following seven types according to vegetation and landscape position:

Habitat Type	Primary Landscape Position	Surface Area (acres)	Percent of Watershed Surface Area
Cultivated	Colusa Basin	606,737	58%
Blue Oak/Foothill Pine Woodlands	Western Foothills	189,068	18%
Annual Grasslands	Western Foothills	185,143	18%
Emergent Wetland including Vernal Pool	Colusa Basin	31,392	3%
Shrublands	Western Foothills	23,108	2%
Riparian	Sacramento River and Its Tributaries	4,715	0.5%
Developed/Urban	Colusa Basin	2,974	0.3%

Table: Harvey et al. 2008. p. 9

The U.S. Fish and Wildlife Service (USFWS) operates three National Wildlife Refuges in the watershed: Delevan, Colusa and Sacramento National Wildlife Refuges, which consist of 21,600 combined acres of wetland and upland habitat. Also within the watershed, the USFWS manages the Willow Creek-Lurline Wildlife Management Area which protects 5,795 acres of privately owned wetlands and uplands with perpetual conservation easements. The USFWS lands include: seasonal marshes, permanent ponds, riparian woodlands, water grasses, uplands and vernal pools (*USFWS website, www.fws.gov/sacramentovalleyrefuges/index.html*). These habitats serve as resting, feeding and breeding areas for millions of migratory birds, several threatened and endangered species and numerous other wildlife species. Also, the Natural Resources Conservation Service (NRCS) has restored and protects just over 10,000 acres of wetlands in the Colusa Basin Watershed through their Wetlands Reserve program (WRP).

Aside from the USFWS Refuges and easements and WRP wetlands, healthy stands of native habitat are few in the watershed. Habitat loss is a primary threat to natural biological communities and this loss has resulted in dramatically reduced and altered wildlife populations, increased erosion potential due to lack of vegetation, increased invasive species populations and loss of the natural biodiversity that is necessary for a healthy watershed system. Effective, informed and well-planned habitat restoration and project management are essential to enhancing the health of the landscape while sustaining the viability of current local land uses, especially agriculture which is the dominant industry in the watershed.

There is great potential for agricultural lands to provide habitat while remaining economically viable operations, and in many cases agricultural lands are currently serving habitat functions. For example, there are programs in place to manage post-harvest water levels in rice fields to mimic lost wetlands and provide valuable habitat for migratory birds. This practice also offers benefits to the farmer such as rice straw decomposition, opportunities for financial incentive programs and in some cases agritourism income through hunting. Conservation groups are currently looking into options for other cropping systems to utilize similar flooding patterns to create migratory bird habitat. Habitat can also be incorporated into farming systems by utilizing idle farm spaces to install native habitat plantings.

The ultimate goal is to encourage and implement restoration projects that reestablish stands of native habitat throughout the watershed in a way that compliments current land uses and provides healthy, functioning ecosystems that will benefit the land, the wildlife and the people for generations to come.

Considerations

- Plan restoration projects to be manageable for the land owner/manager
- Engage land owners and managers in the planning process to ensure projects will be manageable for short and long term success
- Plan projects to include practices that farmers, ranchers, land managers and small acreage landowners are familiar with such as water control, fencing, planting, fertilizing, etc.
- During the planning phases, incorporate the good neighbor policy by communicating with neighbors and taking into consideration adjacent land uses
- Plan riparian restoration projects to ensure that channel capacity and flood water conveyance are not compromised
- When possible, plan restoration projects that enhance existing habitat to create corridors and habitat connectivity
- Design projects that balance the needs of habitat, agriculture and other existing land use

- Quantify the benefits of habitat restoration projects to make them more appealing to the landowner: pollination services, rodent control (raptor nest boxes), reduced herbicide and labor managing weedy edges, reduction in loss of land to erosion, income opportunity through agritourism (hunting, bird watching), etc.
- Identify and protect areas of existing habitat that provide important ecosystem functions
- Create projects with multiple benefits (see Table 3)

Table 3: habitat restoration practices that create multiple benefits

	PRACTICES												
NATURAL RESOURCE CONCERNS	Grassed Waterway	Hedgerow	Riparian Plantings	Native grass plantings	Cover Crops	Tailwater pond	Detention pond	Fenced stock ponds	Fenced riparian areas	Establish wetland	Invasive species removal	Raptor nesting boxes	Map existing habitat
Native habitat	X	X	X	X	X	X	X	X	X	X	X	X	X
Pollinator/beneficial insect habitat	X	X	X	X	X								
Field erosion				X	X			X					X
Streambank erosion	X		X	X					X				X
Ag runoff water quality	X	X	X	X	X	X							X
Weedy areas	X	X	X	X	X						X		X
Invasive plants	X	X	X	X							X		X
Stock water quality								X	X				X
Flooding										X	X		X
Groundwater recharge					X	X	X	X	X	X			X
Pest Populations					X						X	X	

Table: Mary Fahey, CCRCD, 2011

Objectives and Actions

Objective #1: Encourage installation of on-farm habitat features

Actions	Performance Measure	Entities Involved
RCDs encourage habitat restoration projects on idle farm spaces, unproductive and/or frequently flooded farm land, and unused farm edges	RCDs disseminate information via website, quarterly newsletter, and minimum 2 email blasts per year beginning in January 2013 Minimum of one educational workshop facilitated per year beginning in 2014	• RCDs • Landowners and land managers
RCDs investigate incentive programs to assist project planners, landowners and land managers	RCDs develop list of incentive programs by December 2013	• RCDs • NRCS
Habitat restoration groups utilize past projects as models of success for tours and educational demonstrations and training	Minimum of one landowner field day per year is facilitated by RCDs beginning in 2014	• RCDs • NRCS • Audubon Landowner Stewardship Program (LSP) • Landowners and land managers
RCDs work with partners (listed at right) to provide restoration plans that are manageable for landowners and land managers	Restoration plans are developed that are manageable for landowners and land managers by December 2014	• RCDs • NRCS • Audubon LSP • Landowners and land managers
Agencies create a user-friendly permitting process for restoration projects	Yolo County RCD's Permit Coordination Program is being utilized by December 2014	• RCDs • County Government • State permitting agencies

RCDs and partners (listed at right) quantify restoration project benefits by demonstrating money/ labor saved over time and additional revenue generated	Initial report is created by December 2014	• RCDs • NRCS • Audubon LSP • Others involved in restoration TBD
RCDs work with partners (listed at right) to promote and enhance pollinator habitat	RCDs establish minimum of one pollinator habitat demonstration site by December 2014 RCDs and partners (listed at right) facilitate minimum one landowner field day/workshop per year beginning January 2015	• RCDs • NRCS • Xerces Society for Invertebrate Conservation • Hedgerow Farms

Objective #2: Improve or enhance freshwater wetland habitat, waterways and ponds

Actions	Performance Measure	Entities Involved
RCDs encourage participation in incentive programs that enhance wetland habitat	Freshwater wetland habitat acreage in the watershed increases yearly by 2% beginning in 2016	• RCDs • NRCS • U.S. Fish and Wildlife Service
RCDs and NRCS assist landowners to install ponds, settling basins, tail water return systems, wetland areas	Minimum 3 landowners per year implement practices through NRCS Farm Bill programs beginning in 2015	• RCDs • NRCS • Landowners and land managers
NRCS provides landowner incentives for rice field flooding during winter months to create waterfowl habitat	The Waterbird Habitat Enhancement Program continues to be funded yearly	• NRCS • Partners at Audubon, California Rice Commission, PRBO

This young hedgerow planting along a farm edge between two fields will provide habitat for beneficial insects and pollinators (Photo: Yolo County RCD)

Objective #3: Maintain existing native plant habitat and reestablish native habitat stands, emphasizing areas with greatest potential for connectivity

Actions	Performance Measure	Entities Involved
CCRCD utilizes Streambank Analysis mapping to identify areas that would benefit most from riparian restoration projects	Areas are identified by December 2013	• Colusa County RCD
CCRCD expands Streambank Analysis mapping area by identifying and mapping additional native plant stands throughout the watershed	Grant funding is received to facilitate this project by December 2014	• Colusa County RCD
RCDs and partners utilize past projects as a stepping stone to new projects (e.g.: Brush Creek, Elk Creek and other Colusa Almond Project sites)	Minimum two grant proposals are written per year to expand on existing projects throughout the watershed beginning in 2013	• RCDs • NRCS • Audubon Landowner Stewardship Program • Landowners and land managers

Objective #4: Promote healthy grassland/oak woodland habitat through managed livestock grazing

Actions	Performance Measure	Entities Involved
RCDs and NRCS encourage development of off-stream livestock watering systems	RCDs disseminate information via website and minimum 2 email blasts per year beginning in 2013 Minimum one grazing management workshop facilitated per year beginning in 2014 (includes all Actions under Objective #4)	• RCDs • NRCS • Landowners and land managers
RCDs and NRCS encourage fenced riparian areas, streams and ponds to manage livestock access	RCDs disseminate information via website and minimum 2 email blasts per year beginning in 2013 Grazing management workshops (see above)	• RCDs • NRCS • Landowners and land managers
RCDs and NRCS encourage rotational and seasonal grazing and establishment of native grasslands	RCDs disseminate information via website and minimum 2 email blasts per year beginning in 2013 Grazing management workshops (see above)	• RCDs • NRCS • Landowners and land managers
RCDs and NRCS encourage responsible residual dry matter (RDM) at end of grazing season	RCDs disseminate information via website and minimum 2 email blasts per year beginning in 2013 Grazing management workshops (see above)	• RCDs • NRCS • Landowners and land managers • Department of Fish & Game

Great White Egret (Photo: Mary Fahey)

Objective #5: Promote wise management of all watershed habitats utilizing a variety of proven tools and methods

Actions	Performance Measure	Entities Involved
RCDs ensure habitat enhancement projects are designed to be manageable and do not conflict with neighboring land uses	RCDs plan habitat projects to include "Good Neighbor" policies beginning January 2014	• RCDs • Landowners and land managers
RCDs and partners provide plans/guides to landowners for habitat enhancement project maintenance	Maintenance plans and guides are compiled and/or developed by June 2014	• RCDs • NRCS • Audubon California's Landowner Stewardship Program
RCDs provide information on available programs and contacts for technical assistance	List of resources is developed by June 2014	• RCDs

Objective #6: Encourage and promote the use of native plants throughout the watershed

Actions	Performance Measure	Entities Involved
RCDs provide outreach and education about the benefits of native plants via articles, presentations, field visits, website and newsletters	RCDs disseminate information via website and minimum 2 email blasts per year beginning in 2013 Minimum of one educational workshop facilitated per year beginning in 2014	• RCDs
RCDs and partners encourage homeowners to utilize native plants in their landscapes	RCDs disseminate information via website and minimum 2 email blasts per year beginning in 2013	• RCDs • U. C. Master Gardeners • Local chapters of the California Native Plant Society • Tribal Elders
RCDs work with groups such as the Master Gardeners to facilitate educational workshops about gardening with native plants	Minimum of one educational workshop facilitated per year beginning in 2014	• RCDs • U.C. Master Gardener Program

3.8 Goal 8: Address unknown future effects of climate change

Increased flooding is a predicted impact of Climate Change in the CBW (Photo: Jack Alderson)

Current Status and Issues of Concern

Climate change and global warming are often confused as being one in the same. Global warming is a specific type of climate change (higher temperatures), while climate change is a more general term that refers to a number of potential changes to the earth's climate. While there are many unknown factors related to the future climate effects on our watershed, some evidence of climate change is already being observed at the statewide level. The California Department of Water Resources (DWR) reports that the California coast has seen a sea level rise of seven inches in the last century *(DWR, U.S. EPA, Climate Change Handbook for Regional Water Planning. 2011. p. 2-7)*. There are also documented reports of a decrease in the annual Sierra Nevada snow pack over the last half century.

Scientific evidence suggests that changes in the Central Valley climate will impact natural resources and agriculture in the Colusa Basin Watershed. Each of the natural resource issues discussed previously in this Plan will potentially be affected by climate change, and our best defense will be to develop adaptation strategies based on our current understanding of the consequences of climate change, and adjust this Plan as more knowledge is gained.

In our area, it is predicted that warmer temperatures will cause precipitation to increasingly fall in the form of rain rather than snow, greatly decreasing the Sierra snowpack which is California's main source of water storage. Such a shift in precipitation form will cause increased flooding during the rainy season, and decreased

Table 4: Expected Impacts and Proposed Strategies Related to Climate Change in the Colusa Basin Watershed

	STRATEGIES TO ADDRESS POTENTIAL IMPACTS OF CLIMATE CHANGE															
POTENTIAL IMPACTS OF CLIMATE CHANGE	Water conservation	Water use efficiency	Water storage	Vegetation enhancement for erosion control and groundwater recharge	Native vegetation enhancement	Conservation tillage	Habitat restoration	Wetland enhancement	Spreading basins	Invasive weed early detection and eradication	Integrated pest management (IPM)	Brush control and fuels reduction	Crop rotation	Adjust cropping patterns	Levee protection	Increased soil organic matter
Decreased dry season water supply (surface & groundwater)	X	X	X	X				X	X	X						X
Decreased water quality	X			X						X						
Increased flooding			X	X				X	X						X	
Decreased hydropower			X													
Decreased ecosystem function	X	X		X	X	X	X	X		X	X					X
Impacts to agricultural production		X	X							X	X		X	X		
Increased risk of catastrophic wildfire												X				
Increased invasive plant infestations					X					X						
Increased pest pressures											X		X			
Increased erosion				X	X	X										X
Loss of native habitat					X		X	X		X						

Table: Mary Fahey, CCRCD, 2011

water supplies during the growing season when water demand is highest. This scenario will also affect water quality, flood management and ecosystem function. Other commonly predicted climatic changes in the Colusa Basin Watershed and surrounding area include: changes in precipitation patterns, increased temperatures, and longer drought periods. These changes could result in increased wildfires, reduced agricultural production, increased invasive species and pest pressures, increased soil erosion and loss of native habitat.

Although no one really knows what climate change will bring to the Colusa Basin Watershed, it is encouraging to note that most of the land use strategies promoted in this plan that have been practiced by good land stewards for decades serve the co-benefit of addressing predicted climate change outcomes. Table 4 summarizes some of the potential impacts of climate change, and strategies to address those impacts. Many of these strategies are more completely defined in the Objectives and Actions section.

Considerations

- Stay up to date with current science and understand the necessity of adaptive management as it relates to climate change issues
- Recognize, support and promote current land stewardship practices that also provide protections against effects of climate change
- Promote agricultural and the non-agricultural community's ability to adapt to changing water supply and availability and to utilize existing resources as efficiently as possible to allow for a healthy, functioning watershed

Objectives and Actions

Objective #1: Maintain a collaborative partnership with the research community to stay current on science related to climate change, and disseminate information gained

Action	Performance Measure	Entities involved
RCD staff attend workshops and conferences related to current climate change science	RCD staff attend a minimum 2 workshops and/or conferences per year beginning in 2014	• RCDs
RCDs work with partners and communities to build a Climate Change partnership to enhance information exchange	Network is developed by December 2014 Quarterly updates on each others' activities are provided beginning in 2015	• Climate change science community • Climate change organizations • RCDs • NRCS • Landowners and land managers

RCDs and partners provide education and outreach to both agricultural and non-agricultural entities on methods to address local effects of climate change	RCDs disseminate information via website and minimum 2 email blasts per year beginning in 2013	• RCDs • Climate change organizations • Tribes

Objective #2: Enhance biodiversity conservation and ecosystem services to promote sustainable natural ecosystems and human wellbeing

Action	Performance Measure	Entities involved
RCDs and NRCS recognize and promote land stewardship practices that will provide the co-benefit of mitigating effects of climate change	Information is compiled and disseminated to land managers via website, and minimum 2 email blasts beginning in 2013	• RCDs • NRCS • Landowners and land managers
NRCS and RCDs provide and promote natural resource conservation incentives for private landowners	RCDs disseminate information via website and minimum 2 email blasts per year beginning in 2013	• RCDs • NRCS • Department of Fish and Game • Other conservation organizations TBD
RCDs and WMA work with local entities to provide resources for invasive species control	Weed Management Areas are actively identifying a minimum 3 projects per year and work with partners to seek funding for implementation beginning January 2014	• RCDs • NRCS • Weed Management Areas • County Departments of Agriculture
Entities involved with groundwater promote activities that enhance groundwater recharge and storage	RCDs coordinate with partners (listed at right) and disseminate information via website and minimum 2 email blasts per year beginning in 2014	• RCDs • NRCS • IRWM groups • Groundwater Commissions
Restoration groups create connected corridors of habitat to facilitate wildlife movement	CCRCD utilizes Streambank Analysis maps to identify potential projects by June 2014 Funding is solicited to facilitate minimum one habitat connectivity project per year beginning in 2013	• RCDs • Audubon LSP • Landowners and land managers

RCDs and NRCS promote vegetation enhancement practices that utilize native species	RCDs disseminate information via website and minimum 2 quarterly newsletters per year beginning in 2013	• RCDs • NRCS • Landowners and land managers
RCDs work with partners (listed at right) to reduce fuel loads in forested areas resulting in decreased risk of catastrophic wildfire	RCDs solicit funding to facilitate projects beginning in 2014	• RCDs • Cal Fire • Bureau of Indian Affairs

Dry conditions in the Dunnigan Hills, Yolo County (Photo: Phil Hogan)

Objective #3: Support programs that promote carbon sequestration and greenhouse gas (GHG) reduction

Action	Performance Measures	Entities involved
RCDs and NRCS promote no-till and reduced-till practices	RCDs disseminate information via website and minimum 2 email blasts per year beginning in 2013	• RCDs • NRCS • Landowners and land managers
RCDs promote NRCS Wetlands Reserve Program (WRP) and other existing wetland enhancement programs	RCDs disseminate information via website and minimum 2 email blasts per year beginning in 2013	• RCDs • NRCS • U.S. Fish and Wildlife Service
RCDs promote vegetation enhancement including native habitat, native rangeland species, cover crops and hedgerows	RCDs disseminate information via website and minimum 2 quarterly newsletters per year beginning in 2013 Minimum of one landowner workshop facilitated per year beginning in 2015	• RCDs • NRCS
RCDs and NRCS promote and provide resources to increases on-farm fuel use efficiency, renewable and sustainable energy	RCDs disseminate information via website and minimum 2 email blasts per year beginning in 2014	• RCDs • NRCS • U.S. Department of Energy

4 Other Issues Affecting the Watershed

As noted in the introduction, several resource concerns were identified by stakeholders during the development of the Colusa Basin Watershed Assessment which was completed in 2008. Some of these concerns did not rise to the top of the priority list during development of this Plan. Other issues were brought to light during the development of this Plan, but were not considered high enough priority to be included in our list of goals. Although these resource concerns are not listed as goals in this Plan, some of them are worth mentioning for future planning purposes, and they are discussed below.

4.1 Fire prevention and fuels management

Prior to Euro-American settlement, wildfire was a naturally occurring event in the upper watershed where annual grasslands in the foothills transition to blue oak woodlands and blue oak-foothill pine woodlands at the higher elevations on the western edge of the watershed. These fires were quick burning and low in intensity and helped to maintain a healthy ecological balance on the landscape. With increased European settlement in and around forested lands, incidences of fires have been greatly reduced due to control efforts. This reduction in regular burning has resulted in higher fuel loads (denser vegetation, more dead trees), increased invasive weed populations, and degraded habitat. Proper fuels management in our forested areas would create a healthier landscape and reduce the risk of catastrophic wildfire events.

The California Department of Forestry and Fuels Management (CAL FIRE) has a Vegetation Management Program (VMP) which is a cost share program for public and private landowners to participate in wildland fuel reduction projects. Prescribed burning is the primary tool utilized in this program. Mechanical treatment of vegetation is also utilized. Acreages treated with prescribed burning through the VMP have declined in recent years due to increasing rural populations and air quality issues, but CAL FIRE considers it to be a cost effective tool to establish fuel breaks and eliminate heavy fuel loads, while also controlling invasive weeds and improving wildlife habitat.

Objectives under this topic might include:

- Provide community outreach and education
- Identify high-risk areas
- Develop a Community Wildfire Protection Plan
- Increase collaboration between landowners and agencies
- Ensure human safety
- Protect natural resources, including air quality, water quality, habitat and native vegetation

4.2 Air Quality

Dust and smoke from agricultural operations are the main air quality issues in the watershed. Local air pollution control districts are the primary mechanism for air quality management. These districts implement rules and regulations and provide enforcement for the attainment and maintenance of the California and national ambient air quality standards *(Colusa County Air Pollution Control District)*. Each County has an Air Pollution Control District whose goals are to protect public health and the environment while balancing economic and industry considerations. The following Districts are active in the Colusa Basin Watershed: Colusa County Air Pollution Control District, Glenn County Air Pollution Control District, and the Yolo-Solano Air Quality Management District.

Objectives under this topic might include:

- Provide public education and outreach
- Provide incentive programs to encourage landowners to reduce activities that contribute to air pollution

Agricultural burning (Photo: Jack Alderson)

4.3 Regulatory Agency Interface

In carrying out projects to meet the goals and objectives of a watershed management plan, it will be necessary at times to work with and coordinate with state and federal agencies. This can often be a long and daunting process. Enhanced coordination with these agencies, and taking a proactive approach would greatly improve efficiency in carrying out projects and programs in the Colusa Basin Watershed Management Plan.

Objectives under this topic might include:

- Improve cooperation between regulatory agencies to resolve conflicting input on projects
- Strike an effective balance between environmental and economic interests to maintain the economic viability for farmers and counties

4.4 Urban Encroachment

As previously noted, land use in the Colusa Basin Watershed is primarily agriculture and open space. County governments have been dedicated to maintaining the rural character of the watershed, which can be noted in each of the three counties' General Plans. County planners are working to ensure that urban growth is limited to areas around existing towns and spheres of influence. However, much of the farmland along the I-5 corridor is considered highly desirable to developers, especially in the southern portion of the watershed near Dunnigan and Arbuckle. It will take persistence and dedication by County officials and communities to keep poorly planned development from gaining a foothold in the watershed.

Objectives under this topic may include:

- Plan urban development in a manner that maintains healthy natural resources and viable agriculture
- Limit growth to existing cities, towns and spheres of influence, utilizing in-fill first

4.5 Funding Sources for Future Projects

Sustainable funding is an essential component to fulfilling the goals and objectives in this Plan. The economic challenges that our State and Nation are currently facing have led to severe cutbacks in available funding for watershed planning and project implementation. RCDs and watershed groups throughout the country are strategizing ways to diversify their options, turning to a variety of sources that go beyond State and Federal grant funding. Some options are: solicit Foundation funding, partner with other like-minded organizations, provide services to County governments, utilize volunteers, utilize in-kind services from landowners and partners.

Objectives under this topic may include:

- Educate the public, county government and state government about the value of watershed protection and management
- Foster relationships with funders
- Form strong partnerships with organizations that share the same mission

(Photo: Jack Alderson)

5 Conclusions

The Colusa Basin Watershed is large, spanning three counties and containing a variety of landscapes and natural resource conditions. This Plan takes into consideration the entire watershed, from the foothills to the orchard and row crop lands to the rice fields, wetlands and refuges, to the cities and towns. Included in this system is a variety of stakeholder concerns and interests. In an area of 1,634 square miles it is interesting to note that, with very few exceptions, feedback from watershed stakeholders was remarkably consistent:

- Stakeholders generally want to see healthy natural resources, especially water resources.
- Slowing stormwater runoff in the foothills was brought up often as a means to address a number of resource concerns including, water quality, water supply, flooding, erosion and groundwater recharge.
- Stakeholders are concerned about over-regulation and government intrusion in local issues.
- Stakeholders would like to see better planning and management of habitat restoration projects to ensure compatibility with agricultural operations.
- There was little to no support for putting effort into mitigating possible effects of climate change, noting that we do not know enough to be certain about climate change and that good land stewardship practices that are already taking place in the watershed will minimize the potential effects of climate change.
- Money, in the form of landowner incentives and project funding, is a crucial component to getting projects on the ground.
- Regulation of groundwater is an up-and-coming issue.
- Education and outreach, including demonstration projects, are critical to fostering effective natural resources management.

(Photo: Jack Alderson)

6 Next Steps

This Plan was written to be a user-friendly document that stakeholders can readily reference and utilize. This document is not meant to sit on a shelf. It is a guide for future RCD and partner projects and voluntary stewardship actions by landowners. The actions identified in this Plan are not presented in any particular order. Project implementation will take place wherever and whenever adequate resources exist (funding, willing landowners, knowledgeable staff). As a living document, this Plan is meant to be updated as projects are implemented and watershed conditions change. This Plan sets forth a path to achieving watershed-wide natural resources protection and enhancement.

The next step in the watershed management process is to implement the Colusa Basin Watershed Management Plan by developing specific projects that address the actions and meet the goals and objectives of the Plan. Some of the actions identified in this Plan can be carried out voluntarily by individual landowners that are willing to utilize their own resources. Other actions are more involved and expensive and will require a combination of funding, manpower and expertise. The RCDs and NRCS are available to help individual landowners develop projects and locate funding opportunities. The RCDs will also be developing projects and engaging partners to facilitate implementation of the Colusa Basin Watershed Management Plan.

The following steps should be taken during implementation of the Colusa Basin Watershed Management Plan:

- Foster greater community watershed stewardship through outreach and education
- Work with stakeholders to identify specific projects that meet the Goals and Objectives of the Plan
- Identify costs of project implementation as project ideas are defined
- Identify potential future funding sources
- Develop monitoring activities to track progress of projects towards reaching Plan goals
- Build on successful projects by utilizing them as demonstration sites for outreach and education
- Practice adaptive management by updating the Plan as projects are implemented and watershed conditions change

7 Appendices

7.1 Appendix 1: Acronyms and Abbreviations

- **Assessment**: The Colusa Basin Watershed Assessment
- **AWHC**: Available Water Holding Capacity
- **BIA**: Bureau of Indian Affairs
- **BLM**: Bureau of Land Management
- **BMP**: Best Management Practices
- **CASGEM**: California Statewide Groundwater Elevation Monitoring
- **CA-IPC**: California Invasive Plant Council
- **CAL FIRE**: California Department of Forestry and Fire Protection
- **CBDD**: Colusa Basin Drainage District
- **CCRCD**: Colusa County Resource Conservation District
- **CNPS**: California Native Plant Society
- **DFG**: California Department of Fish and Game (name changed to California Department of Fish and Wildlife on January 1, 2013)
- **DO**: Dissolved Oxygen
- **DOE**: Department of Energy
- **DOI**: Department of the Interior
- **DWR**: California Department of Water Resources
- **EC**: Electrical Conductivity
- **FEMA**: Federal Emergency Management Agency
- **FWA**: Family Water Alliance
- **GCRCD**: Glenn County Resource Conservation District
- **GMP**: Groundwater Management Plan
- **ILRP**: Irrigated Lands Regulatory Program
- **IPM**: Integrated Pest Management
- **IRWMP**: Integrated Regional Water Management Plan
- **MOA**: Memorandum of Agreement
- **NCWA**: Northern California Water Association
- **NRCS**: Natural Resources Conservation Service
- **Plan**: Colusa Basin Watershed Management Plan
- **RCD**: Resource Conservation District

- **RD**: Reclamation District
- **Streambank Analysis**: The Colusa Basin Watershed Streambank Analysis
- **TAC**: Technical Advisory Committee
- **UCCE**: University of California Cooperative Extension
- **US EPA**: U.S. Environmental Protection Agency
- **USACE**: U.S. Army Corps of Engineers
- **USFS**: U.S. Forest Service
- **USFWS**: U.S. Fish and Wildlife Service
- **VMP**: Vegetation Management Program (CAL FIRE)
- **WMA**: Weed Management Area
- **WRP**: Wetlands Reserve Program

7.2 Appendix 2: Definitions

- **Action**: a project or activity necessary to reach objectives and goals in this Plan
- **Agritourism**: the act of visiting a working farm or any agricultural, horticultural or agribusiness operation for the purpose of enjoyment, education, or active involvement in the activities of the farm or operation
- **Conjunctive Use**: utilizing both groundwater and surface water
- **Extensometer**: an instrument for measuring land subsidence
- **Goal**: a priority concern as identified by stakeholders in this Plan
- **Objective**: a means to reach the goals in this Plan
- **Outliers**: small populations of invasive weeds that lie outside of the main areas of infestation. These populations are more easily controlled than larger populations, and should be targeted before they spread.
- **Performance Measure**: a measurable element for each action in this Plan that will allow stakeholders to track progress in reaching our watershed management goals
- **Settling Pond**: a pond designed to slowly release runoff, allowing sediment to settle to the bottom and be detained
- **Sponge Effect**: A non-technical term referring to increased water infiltration ability in soils due to increased vegetative cover to facilitate a decrease in storm water runoff, especially in foothills
- **Spreading Basin**: an area, usually adjacent to a stream, where water is allowed to pool during rain events so it can percolate into the ground (vegetation enhancement helps facilitate this process as plant roots open up the soil and provide an avenue for water to move into the earth)
- **Stakeholder**: any person that holds an interest [a stake] in the watershed
- **Subsidence**: lowering of land surface due to excessive amounts of groundwater extraction
- **Tailwater**: runoff from agricultural irrigation

7.3 Appendix 3: List of Figures and Tables

Railroad tracks running parallel to Interstate 5 on left (Photo: Jack Alderson)

7.4 Appendix 4: References

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Interstate Highway 5 passes over Buckeye Creek in Yolo County (Photo: Phil Hogan)

7.5 Appendix 5: Participating Stakeholders

We are grateful for the participation of many local stakeholders during the formation of the Colusa Basin Watershed Management Plan. Local knowledge of the history and landscape in the watershed was invaluable. Stakeholder participation was solicited through meetings, email questionnaires and personal interviews. Many stakeholders also helped with editing during the writing of the Plan. The following entities participated in the creation of this Plan:

- Jack Alderson, Natural Resources Conservation Service, Colusa Field Office
- Bob Alvernaz, Landowner and Colusa County RCD Director
- Brandon Ash, Landowner and Colusa County RCD Director
- Mary Anne Azevedo, Colusa County Department of Agriculture
- Jim Bell, Colusa County Department of Public Works
- Chuck Bergson, City of Williams
- Josh Bush, Department of Fish and Game
- Denise Carter, Landowner and Colusa County Supervisor
- Katherine Chandler, Reclamation District 108
- James Cornelius, Sutter County RCD
- Miles DaPrato, Audubon, California Landowner Stewardship Program
- Fritz Durst, Landowner
- Jim Erdman, Landowner
- Ben Felt, Landowner and Colusa County RCD Director
- Roberta Fivorod, California Rice Commission
- Dan Frisk, U.S. Fish and Wildlife Service
- Kimberly Gallagher, Landowner and Colusa County RCD Director
- John Garner, Landowner
- Jay Dee Garr, Landowner and Colusa County RCD Director
- Donita Hendrix, Dunnigan Water District
- Tom Hickock, Landowner and Colusa County RCD Director
- Bruce Houdesheldt, Northern California Water Association
- Ashley Indrieri, Family Water Alliance
- Craig Isola, U.S. Fish and Wildlife Service
- Rodd Kelsey, Audubon, California
- Dale Klever, City of Colusa
- Larry Lloyd, Sutter County RCD
- Rachel Long, U.C. Cooperative Extension and Yolo County RCD Director
- Jeff Lynch, Cortina Rancheria, Kletsel DeHe Band of Wintun Indians
- Jerry Maltby, Landowner
- Kandi Manhart, Glenn County RCD
- Gene Massa, Colusa Basin Drainage District
- Brett Matzke, Cortina Rancheria, Kletsel DeHe Band of Wintun Indians

Continued

Participating Stakeholders, Continued

- Stephen McCord, McCord Environmental
- Lester Messina, Glenn County Department of Agriculture
- Jean Miller, Glenn County Department of Agriculture
- Dick Mudd, Landowner
- Beth Nall, Landowner and Colusa County RCD Director
- Heather Nichols-Crowell, Yolo County RCD
- Chris O'Sullivan, Landowner
- Gilbert Ramos, Landowner and Colusa County RCD Director
- Gillies Robertson, Yolo County RCD
- Lucinda Roth, NRCS, Climate Change Specialist
- Oscar Serrano, Colusa Indian Community
- Claudia Street, Glenn County RCD
- Craig Thomsen, U.C. Davis
- Patti Turner, Colusa County RCD
- Rob Vlach, Glenn County NRCS
- Blair Voelz, Landowner
- Jeanette Wrysinski, Yolo County RCD

7.6 Appendix 6: Overview of Stakeholder Feedback

The charts below summarize comments from Stakeholders during personal interviews and email responses to questions regarding the eight Plan goals. The columns on the left state the discussion topic and the columns on the right summarize Stakeholder input.

7.6.1 Goal #1: Protect, maintain and improve water quality	
What are the biggest water quality issues in the CBW?	Sedimentation
	Runoff
	Pesticides and fertilizer in groundwater
	Septic systems
	Domestic animals
	Low flows cause water quality issues (salts, etc.)
	Effects of water conservation on salinity
	D.O. - low oxygen content, stagnant water
	E. Coli
	Nitrates
	Stormwater runoff (Willows especially)
	Mosquito abatement & spraying canals for aquatic plants
	Colusa Basin Drain - Quality diminishes as you move down the canal
What are some possible Solutions/ projects to address water quality issues in the CBW?	Erosion control
	Flood control
	Avoid groundwater overdraft - utilize surface water first
	Create sponge effect in foothills
	Off-stream storage to ensure adequate supplies
	Retention basins in foothills
	BMPs for water infiltration in orchards
	Increase vegetative ground cover
	Sediment traps on every farm - cheap, easy & effective!
	Settling ponds in foothills
	It all starts in the hills
	Monitor - know what you quality is so you can figure out how to make improvements
	BMPs and IPM programs - USFWS has plans for refuges

What issues should be addressed in the Plan regarding groundwater as it relates to water quality	Support implementation of County Groundwater Management Plans
	Sponge effect - create springs that last through Aug/Sept
	Reservoirs or cattle ponds in hills
	Pesticide/fertilizer application management
	Domestic animal management and septic maintenance
	Retention ponds, or call them "wildlife enhancement areas"
	More testing of water
	Long term quantity/supplies
	Use surface water first
	Education/knowledge of resources through monitoring
	Groundwater issues at the Cortina Rancheria are serious and not included in current plans

(Photo: Jack Alderson)

7.6.2 Goal #2: Promote activities to ensure a dependable water supply for current and future needs	
Water conservation and drought preparedness	Promote healthy conjunctive use programs
	Keep permanent crops to a minimum in water deficient areas
	Coordinate with irrigation districts on measures taken during drought conditions
	Storage
	Storage/infrastructure modifications will be necessary to capture a greater amount of precipitation that falls in the form of rain if the snowpack decreases as predicted. These projects will take decades to plan/permit/complete
	Tax southern California for water - we need their money for our storage projects
	Fallow land
	Conservation is causing diminished groundwater recharge, minimizing our groundwater resources. Conservation is counter-productive to groundwater health
	Too much conservation on farmland equals lack of variation for habitat
	Know what your normal needs are so you can make adjustments
	Convert to drip/micro irrigation
	Cover crops to increase infiltration and increase water table
	In row crops utilize techniques such as: cross ripping furrows in winter, retention ponds, tailwater ponds to increase infiltration
	Diversify crop production to not rely entirely on permanent crops
	Crop water status monitoring
	Level fields to reduce runoff
	Desalinization - they are doing it overseas!
	Change irrigation strategies - timing of irrigations for best efficiency and less evaporations.
	Time flood up to best benefit bird populations
	Promote effective conservation programs that are integrated to the region and local environment
	Utilize and create new innovations such as a spray-on product that reduces evapotranspiration in crops
	Utilize NRCS incentives
	Education!!
	Education – both new and historic knowledge (Tribal Elders)

What is the role of groundwater related to water supply reliability?	Groundwater is a valuable resource and when managed properly can provide an adequate supply for domestic and irrigation uses
	Excessive well drilling, unpredictable surface supplies, unused surface supplies, minimal application of surface water in potential recharge areas and cropping patterns can contribute to local groundwater resource decline.
	Implement a good monitoring program for groundwater levels and quality
	Implement monitoring in foothills
	Groundwater recharge
	Maximize aquifer functions
	Storage
	Reservoir sustainability should be a consideration
	Quality testing - not enough is known
	Only use groundwater as a backup when supplies are low
	More people are drilling wells - this will increase on the west side as supplies decrease. We don't have the knowledge or resources to manage this (Colusa County)

7.6.3 Goal #3: Preserve agricultural land and open space	
What are the biggest threats to agriculture and open space?	Demand for water for urban uses
	Water supply issues could affect agricultural production
	Urban expansion from the most developed regions in the basin (Chico, Yuba City, Marysville, greater Sac areas)
	Urban development in South portion of the watershed
	Housing/development
	I-5 corridor, commercial development, residential expansion around towns
	Agricultural land converted to poorly managed habitat
	Loss of Williamson Act
	Inheritance tax - valuation of farm land should be on current production and ag valuation, not on future potential (golf course, development, etc.)
	Federal easements and land purchases are a threat
	Influx of people from other areas that don't understand the role of agriculture and open space
	Conversion to habitat that is restrictive to production

What actions can we take to protect ag land and open space?	Preserve the Williamson Act
	Assure dependable water supply
	Agricultural easements
	Conservation easements to ensure open space stays
	Comprehensive urban planning with a focus on preservation of valuable ag and other open space resources
	Education to landowners and public to see the value of agricultural land
	Emphasize the habitat that farmland provides
	Land trusts and life time easements
	Establish boundaries for cities
	Support California Rangeland Trust - they have hundreds of thousands of acres protected. Need to find stable funding resources for them
	Protect land that surrounds the wildlife refuges from development
	Better funding for easement programs
	Make sure the rules aren't used against farmers (endangered species act, etc.)
Views on Agritourism	Some opportunities exist but are hard to manage
	Maximize profits
	Threat - could it change the face of agriculture?
	Provide significant support for a well-funded program that provides payments for ecosystem services
	Website resources - Know a California Farmer, Social Media
	Agritourism is good, but proceed with caution. Regulations are a concern. Promoting agritourism in production agriculture is a waste of time for grower
	Possibility as long as private landowner issues can be addressed
	Yes - I think it's great. Tours, wildflower viewing, hunting. A lot of people are doing it.
	Get statistics to get an idea of the economic benefits
	Hunting on rice is a huge economic boost - benefits restaurants, hotels, gas stations, etc.
	Southfork Willow Creek Ranch would be a good place for educational agritourism
	Fishing on Sacramento River – economic boost
	Does not think Colusa County is a destination except for hunting and recreation

7.6.4 Goal #4: Manage and reduce invasive plant populations	
What weed species of greatest concern in the CBW?	Weeds with ratings of A, B, or C. Doesn't think we have any A rated weeds in CBW. B rated weeds include perennial pepperweed and purple starthistle. C rated include yellow starthistle. Jointed goatgrass and medusahead may also be C rated
	Aquatic weeds - a new one that is clogging waterways (can't remember name), Parrot feather, water hyacinth
	Starthistle, Bull thistle, Medusa head
	Starthistle, pepperweed, water primrose, willows in the flood zone
	Stinkwort is new and may become a threat
	Medusa head, goat grass, starthistle, arundo, smutgrass in irrigated land
	Big thistles not a problem - easily controlled
	Are we getting in the way of something that should happen? Look at the situation - is it really a problem?
Possible solutions to invasive weed problems	Chemical control for pepperweed and purple starthistle. Others are too widespread to control
	Work with U.C. Davis
	Press the chemical companies and research folks to keep improving their products
	Burn, spray or graze
	Replace noxious weeds with something you want
	Don't introduce new weeds
	Burn then seed with native grasses. Don't leave bare ground after fire.
	Early detection
	Work from top down(hills to valley)
	Restore native grasses
	Managed grazing
	CDF will do burning - their funds are limited but they will work with you
	Burn, herbicide, goats
	Non-chemical strategies
	Partners for Wildlife (USFWS) can help with restoration
What resources are available to help us combat invasive weeds?	Weed Management Areas
	U.C. Davis, NRCS
	Field men, chemical companies
	Josh Davy is doing trials - get info from him
	RCDs can provide education and outreach
	Education is very important - get the information out to landowners

Are you aware of existing weed mapping resources?	Check with water districts
	Aquatic resources - Lance Boyd, Lewis Bair, Maxwell Irrigation District
	They are not mapping weeds at the Refuges

Stormwater running off of the foothills (Photo: Jack Alderson)

7.6.5 Goal #5: Reduce destructive flooding	
What areas in the CBW are most affected by flooding?	Colusa Basin Drain
	Entire basin
	Mercury and residual DDT out of hills (DDT does not break down). Residual chemicals from foothills. We need to slow the water down (sponge effect). When soils erode, chemicals get stirred up and enter the waterways
	All areas - Willows, follow basin down to outfall. Delevan, Maxwell, Williams, Dunnigan
	Near Sac River and major streams out of foothills
	Points where flash flooding hits Buckeye Creek
	Where highways 505 and 5 intersect
	Where Highway 5 and Road 8 intersect
	Highway 20, new section, Mitchell Ranch has flooding
	Wildlife Refuge infrastructure - public access roads can get flooded
	Colusa Basin Drain at Highway 20
	Freshwater Creek, Williams
	Funks Slough, Maxwell
	All of the uncontrolled streams
	Are there issues at Knights Landing where the Drain dumps into the river?
	We have a good system that is working well
Existing resources for flooding information	Colusa Basin Drainage District (CBDD) pamphlets, info
	CBDD IRWM
	County Public Works and Roads departments
	National Weather Service
	DWR - Keith Swanson
	Central Valley Flood Control Board
	Look up 1955 flood in Sutter County/Yuba City
	Yolo Water Resources Agency (WRA)
	Old timers - they know where flooding has occurred
	Family Water Alliance Fish Screen Program
	Reclamation Districts
	Levee Districts
	Tribal Elders' knowledge
	Army Corps
	Central Valley Flood Protection Plan Existing Conditions Report

Possible actions to reduce flooding	Flooding is good in a natural system
	Clean the snags and dredge the river for greater capacity, less flood risk
	Better coordination between Shasta Dam and downstream users. Need more leniency to do what's best for the river - don't just open the gates because it's on the calendar - actually look at the conditions to make the decision
	Flooding is essential for recharge
	Huge releases from Shasta Dam this year caused blight and death in Walnuts. Smaller releases over a longer period would be better

Migrating birds utilizing flooded rice fields for resting and feeding (Photo: Jack Alderson)

7.6.6 Goal #6:Enhance soil quality and reduce erosion	
Are you aware of areas in the CBW with poor soil quality?	Best soils are by the river, worst are near the Colusa Basin Drain
	Rice is poor ground, orchard and row crops are on good ground
	Soils are poorer for ag production as you go further up the watershed
	Glenn County is not as bad. Sites Road, south the soil gets worse, rockier.
	Sac and Colusa refuges have alkali soils, Vernal pools contain alkali-loving species
	There is erosion in the foothills, but it works
Are you aware of areas with erosion issues?	Streams
	Buckeye Creek and Sand Creek
	Hills
Possible actions	Sponge effect in hills
	Create healthy riparian stands
	Increase infiltration
	Keep creeks and streams clear of blockage so water will stay inside of banks
	Transition away from clean farming, incorporate more vegetative cover
	Changing irrigation types, reducing speed of water at last exit point of farm, vegetated protection at lowest exit points, cover bare areas with vegetation, reduce runoff, winter soil surface protection (avoid pre-bedding)
	BMPs - cattle fencing, cover crops, filters
	Create a soil testing program, soil testing training

7.6.7 Goal #7: Preserve and enhance native habitat	
Do you know of areas in the CBW with existing stands of native riparian habitat?	In and around Arbuckle
	Wildlife Refuges
	College City along drain
	Lurline Creek
	Bear Creek (outside of watershed)
	Cortina Rancheria
	Along the river

What types of habitat restoration projects are most compatible with agriculture?	Any drainage, natural or man-made, can support a variety of native plant species and in turn a diversity of wildlife habitat
	Idle farm spaces and farm edges not in production can be left wild or planted to natives - borders, hedgerows, etc.
	Stock ponds and fencing in the rangeland
	Good neighbor policy is important
	Farm up to and into habitat area so mammals have a food source close to the habitat and will not be as likely to come further into the field to cause major crop damage
	Projects that don't conflict with present farming system
	Tules on the levees
	Vegetated streambanks for stabilization
	Managed willows in flood conveyance areas
	Insectary/pollinator hedgerows
	Water recirculation ponds vegetated for sediment capture and wildlife habitat
	Wetlands - tailwater recovery ponds which also create habitat
	Warming ponds
	Create smaller projects that landowners can manage
	Hunt clubs
	Flood rice fields for decomp
Considerations	Projects should be voluntary
	Large tracts should not be taken out of production
	Projects should be something farmers are used to and comfortable with such as water control, fencing, fertilization, planting
	Many farmers are reluctant because they are afraid of government coming on their land/regulations

Stone Corral Creek during the rainy season (Photo: Jennifer Masters)

What strategies can be implemented to give landowners an incentive to participate in habitat restoration projects?	CSP (NRCS program) and other annual payment programs
	Cite quantifiable benefits of pollination services, rodent control (Barn Owl boxes), reduced herbicide/labor managing weedy edges, reduced loss of land to erosion, etc.
	Monetary incentives
	Education
	Demonstration sites - show people successful projects
	Propose tried and proven projects
	Technical support
	Multi benefit projects
	Partner with other groups
	Keep it on a local level - don't get state or federal offices involved
	Farm bill and Partners for Fish and Wildlife Program (USFWS)
	Everyone has to work together
	Start with one person who implements a successful project, then talks to neighbors
	Have patience - long term engagement with landowners and development of trusting relationships
	Reduce regulatory burden, streamline permitting
Drawbacks to habitat restoration	Cost
	Space/land available for restoration
	None
	Affects neighbors
	Impact on flood control (backing up water)
	Lack of effective long term maintenance so that ecosystem function is maintained over time
	Lack of financial compensation for land taken out of production

7.6.8 Goal #8: Address unknown future affects of climate change	
Climate change issues that may affect the CBW	Increased risk of greater variability of water availability over the years
	Insect spectrum is changing, new diseases entering the watershed
	Predictability of food production, safe living spaces/places
	Water supply
	Water quality
	Flooding events
	Not aware of any issues unique to the Colusa Basin. On a broad scale, many reports suggest that there will be decreased water availability in the future due to climate change.
	Water resources - supply, surface and groundwater, groundwater overdraft
Opinions regarding climate change	Not worried about climate change because we are a speck of time in the grand scheme of things
	15 years ago we were talking about "global cooling"
	This project cannot solve climate change
	Believes that there is climate change but we are being exploited into spending billions of dollars on research. There are natural cycles and occurrences. Does not believe it is man-made when there are volcanoes and other natural processes. Thinks we are being duped by over-hype
	We are spending billions on multiple studies and plans when there are people starving and other issues where money could be better spent
	Had better see absolute proof of climate change
	Is it just a natural cycle?
	Naysayers should open their eyes and look at the scientific facts
	How does one degree make a difference?

Actions we can take to address climate change	Consider how actions already being promoted in this Management Plan have the co-benefit for addressing climate change. There are many ag activities that can contribute to reduction in atmospheric buildup of GHGs and save producers time and money while enhancing and improving the environment around them.
	Change expectations of 100% production on every field every year. Food production planning should account for the risk of variability which includes the potential for increased frequency of drought years as well as flood frequency and extent of flooded areas
	The climate is changing and there is nothing we can do about it - it will change whether we are here or not…not to say we shouldn't try to reduce pollutants
	Education
	Engage with research folks
	Don't know until climate change is observed for some period of time
	The RCD is already helping by trying to do all they can to protect natural resources and therefore, this Plan will help as well
	Develop water detention facilities
Resources for climate change information	PRBO summary
	http://soils.usda.gov/survey/global_climate_change.html
	The Carbon Management Online Tool for Voluntary Reporting (COMET-VR) is a decision support tool developed jointly by the NRCS and Colorado State University for calculating soil carbon stored or sequestered by changing land management practices. It can help us understand how activities promoted for other goals may address climate change: http://www.cometvr.colostate.edu/
	CalCAN Climate and AG network
	NOAA weather station
	Modeling at the local level
	U.C. Extension - Ag and Research arm
	USFWS landscape conservation cooperative - forming now
	http://www.climatescience.gov/Library/sap4-3/final-report/sap4-3-final-water.pdf

7.6.9 Other Comments	
What outcomes would you like to see from this Plan?	Would like to see that all cooperating entities are not duplicating tasks
	Hope the Plan will lay out a strategy for tackling resource issues affecting water quality and habitat loss across the watershed. Would encourage the RCD to build upon existing demonstration projects to protect critical reaches of stream across the watershed
	Coordinate with current water quality programs to avoid duplication of efforts and resources
	Have a timeline to address resource concerns
	"Sponge effect" in hills - start efforts uphill. This will cause a domino effect to benefit resources from hills to valley floor
	More outreach to the foothill and range areas, and to industry
	Ag Waiver/water quality folks will look uphill, so they (upstream landowners) need to get on board
	Would like to see groundwater addressed
	Would like to see water supply addressed - Sites and other off stream storage
	Promote BMPs and solutions for groundwater infiltration and upstream water retention
	Tribal water resources protected; protect farm land and agriculture; Protect water resources
	Would like to see all stakeholders engaged, especially landowners; sufficient demonstration projects for BMPs in place so that landowners throughout the watershed can observe and learn from them
	Would like to see a plan that is well layed out, citizen driven and usable and valuable to the landowners; focus upstream
	Better coordinated education and outreach over large rural land areas regarding exceedences based on water quality issues
	The Federal Government needs to stop buying up ground - they can't manage what they have now. Let local working groups lead locally
	Learn from what we do. There is room for everything - agriculture, habitat, etc.
	A smart, workable Plan that is based on sound science, not just a "feeling"; common sense; an easier system to establish baselines; Protect landowner rights; bridge gap between conservation and farmers - put together a workable plan
	Would like to see water quality and supply addressed; Habitat, open space and agricultural easement and USFWS Partners in Restoration program

Do you agree with the Goals of the Plan?	Yes, but would add "Promote a healthy economy through agriculture, recreation, etc.
	Don't spend a lot of time on climate change
	Add animal species to invasive species section
	Add groundwater
	Goal #5 - "limit" impacts of destructive flooding. Some environmentalists believe even destructive flooding is good, but we may want to change our goal to "limit" destructive flooding to make everyone happy.
	There are issues arising from agricultural land conversion to riparian habitat along the 2047 that are not being managed. There is a need to engage these land managers in the watershed planning process and to seek a more coordinated land management effort that benefits habitat, agriculture and the need for flood conveyance.
	Would rank soil quality and erosion higher; erosion and flooding should go together as one goal and can be lumped under water quality. He was flown over foothills during the 1999 flood and saw the damage and blown out creeks - clearly saw that the water needs to be slowed in the hills and that is where the focus should be for most of our goals - everything starts in the hills
	Landowner incentives for habitat enhancement
	Water marketing which may be an issue as supplies dwindle
	Water issues with climate change

What issues are likely to interfere with the success of this project?	Legislation and regulation
	Constricted water channels - limited in terms of capacity from a water transportation perspective and in terms of space available for active revegetation to occur in a way that does not compromise channel capacity
	Financial challenges to landowners to take land out of production for habitat/buffer areas. If ultimately the conservation project will protect resources - water, wildlife, air quality, etc. for all citizens, then more focus should be placed on creating financial incentives to make the transition easier for the landowner
	Complacency, lack of interest
	Make sure it doesn't sit on a shelf
	Resistance from landowners already in a regulatory water quality program - they may perceive your efforts as duplication of those programs
	Permits
	Funding
	Change is hard, economics is an issue, flood zone issues conflict with some habitat enhancement goals, single species regulations make potential habitat projects unpalatable or may make doing BMPs impossible
	Landowner barriers including: 1. Economics (ag viability, cost of projects, funding to support cost share on projects); 2. Agency and permit related issues = fear of unknown and 3. Local support of watershed stewardship concepts
	There are a lot of goals, a lot of information; getting cooperation from landowners
	Government getting in the way with over regulation, too complicated permits and restrictions, over regulation of EIS/EIR; Restriction on funding - prevailing wage will make projects too pricey when we have knowledgeable local folks that will do the work and do it well at a reasonable rate
	Money, getting the right projects, having the personnel, willing landowners
	Need to provide value to the landowner - talk in terms of monetary values to landowners
	Has to involve people/the right personalities. Few people will want to read or implement the Plan
	Understanding climate change will be a big issue

What would make your participation in the Management Planning process worthwhile?	Looking behind me and seeing that I have done something
	Involvement in anything relative to the rice industry
	One on one interaction
	A clear sense that the outcomes will be accomplished
	Confidence there will be results - can we stop erosion? Can we slow the water down?
	To see projects happen/get off the ground
	To see habitat happening on the ground, including agriculture as habitat
	Knowledge that the people involved are looking out for local interests; local folks need to be acknowledged for what they do, the risks they take, the good things they do; want to attract talent back to farming industry; need water and available land
	Bring ideas, work together - collaborations
Other watershed planning and/ or planning that applies to the CBW Plan goals, currently occurring in the CBW	Northern Sacramento Valley Integrated Regional Water Management Planning (NSV IRWMP)
	Whole farm conservation planning on the Davis Home Ranch through Audubon's Migratory Bird Program
	Regulations growers are facing for discharges from surface and (eventually) ground water
	Planning should be congruent with irrigation district goals and objectives
	Colusa Basin Drainage District IRWM
	IRWMP, FloodSAFE and other flood planning efforts, next phase of Irrigated Lands program (Central Valley Regional Board) which will include groundwater monitoring
	2009 CA Water Plan; Central Valley Flood Protection Plan
	USFWS Comprehensive Conservation Plan (CCP)
	GCID groundwater plan?

Other resources we should utilize	Industries (Cattlemen's, etc.)
	Ducks Unlimited, Nature Conservancy - involve them in the process
	Wildlife refuges
	Audubon is providing some funding as incentive to producers to adapt forage crop farming practices to coexist with nesting bird populations
	The NRCS may be able to provide stakeholder led planning processes with a professional facilitator if needed. Include some of the known conservation organizations as stakeholders: Ducks Unlimited, CWA California Waterfowl Association, The Nature Conservancy, Defenders of Wildlife, Wildlands, Inc,. River Partners. Brainstorm an exhaustive list of restoration/conservation businesses and then engage them in the watershed's ecosystem function
	Irrigated Lands Program, water districts - bring them in at the end after stakeholder/landowner input, for review
	USFWS programs - Private Lands programs, Partners for Fish & Wildlife, Purchased easements
Ideas to motivate landowners to participate	Some will engage because they care, but the majority will likely need an economic incentive to make it worth their while
	Coordination with local subwatershed groups within the Sacramento Valley Water Quality Coalition - you do not want to duplicate efforts already in place with the Irrigated Lands program
	Contact key leaders in the ag community - Farm Bureau, Cattlemen's, etc.
	Incentives

	Advertise in Ag Alert - make CCRCD the shining example of watershed planning
	Monetary/financial incentives
	Money, getting the right projects, having the personnel, willing landowners
	Funding - show landowners that it is going to benefit them; give them time to observe the ecosystem function; give them assurances that their opinions will be valued
	Show them the issues - water quality, water supply, groundwater overdraft; Show "before and after" - successfully implemented projects, show results
	Once landowners see their neighbors do the projects they might be more likely to sign on
	Financial assistance; assurance the Plan will be utilized and there will be benefits.
	Involvement by stakeholders and assurances they are being listened to and this is not just another plan that will sit on a shelf
	Money
	Demonstration sites
What is important for us to understand to facilitate this process effectively?	Old habits die hard - adaptive management is a key component to a Watershed Management Plan. The Plan is a living document subject to changes as needed. Farmers have serious economic challenges. Public support (money) is CRITICAL and should be supportive on a legislative level because ecosystem function benefits all watershed residents!
	Incentives/value to the landowner
	Flexible timeline
	Communicate with neighbors

7.7 Appendix 7: Other area Planning Efforts

The following local and regional planning efforts may affect and/or compliment elements contained in the Colusa Basin Watershed Management Plan:

- **Bay Delta Conservation Plan** (in progress)
- **Capay Valley Watershed Stewardship Plan** (November 2003)
- **Central Valley Flood Protection Plan** (June 2012)
- **Colusa Basin Drainage District Integrated Resources Management Program for Flood Control in The Colusa Basin** (May 2000)
- **Colusa County 2030 General Plan** (July 2012)
- **Colusa County Groundwater Management Plan** (October 2008)
- **DWR 2009 California Water Plan Update** (March 2010)
- **DWR 2013 California Water Plan Update** (in progress, due out March 2014)
- **Glenn County Community Wildfire Protection Plan** (July 2011)
- **Glenn County Groundwater Coordinated Resources Management Plan** (August 2012)
- **Hungry Hollow Watershed Management Plan** (December 2011)
- **Lower Stony Creek Watershed Restoration Plan** (February 2010)
- **Mid and Upper Sacramento Regional Flood Management Plan** (in progress)
- **Northern Sacramento Valley Integrated Regional Water Management Plan (IRWMP)** (in progress)
- **Westside Integrated Regional Water Management Plan (IRWMP)** (in progress)
- **Yolo County 2030 Countywide General Plan** (October, 2009)
- **Yolo County Groundwater Management Plan** (June 2006)

7.8 Appendix 8: Resources for technical assistance and project funding

Resource Conservation Districts

Colusa County
100 Sunrise Blvd., Suite B, Colusa, CA 95932
530.458.2931
www.colusarcd.org

Glenn County
132 North Enright Avenue, Suite B, Willow, CA 95988
530.934.4601 X5
www.glenncountyrcd.org

Yolo County
221 W. Court Street, Woodland, CA 95695
530.662.2037
www.yolorcd.org

Natural Resources Conservation Service

Colusa County
100 Sunrise Blvd., Suite B, Colusa CA 95932
530.458.2931

Glenn County
132 North Enright Avenue, Suite C, Willows, CA 95988
530.934.4601 X3

Yolo County
221 W. Court Street, Woodland, CA 95695
530.662.2037

Goal #1: Protect, maintain and improve water quality

California State Water Resources Control Board
www.swrcb.ca.gov

California Department of Water Resources
www.water.ca.gov

Colusa Glenn Subwatershed Program
530.934.8036
email: cgsubwatershed@sbcglobal.net

Environmental Protection Agency Region 9
www.epa.gov/aboutepa/region9.html

Indian Health Service, California
916.930.3945
www.ihs.gov/dsfc/index.cfm?module=staff_california

Regional Water Board Water Quality Programs
www.waterboards.ca.gov/centralvalley/water_issues

Yolo County Farm Bureau Education Corporation (YCFBEC) Subwatershed Program
530.662.6316
email: info@yolofarmbureau.org

U.C. Davis California Rangeland Watershed Laboratory
www.rangelandwatersheds.ucdavis.edu

County Departments of Environmental Health

Colusa County
124 East Webster Street, Colusa CA 95932
530.458.0395

Glenn County
257 North Villa Avenue, Willows, CA 95988
530.934.6102

Yolo County
137 N. Cottonwood Street, Woodland, CA 95695
530.666.8646

Goal #2: Promote activities to ensure a dependable water supply for current and future needs

California Department of Water Resources
www.water.ca.gov

Colusa County Department of Agriculture
100 Sunrise Blvd., Suite B, Colusa, CA 95932
530.458.0580

Glenn County Water Advisory Committee
720 North Colusa Street, Willows, CA 95988
530.934.6501

Water Resources Association of Yolo County
P.O. Box 8624, Woodland, CA 95776-8624
530.666.2733
www.yolowra.org

(Photo: Jack Alderson)

Goal #3: Preserve agricultural land and open space

American Farmland Trust
National Office
1200 18th Street, NW, Suite 800, Washington, DC 20036
800.886.5170

Farmland Information Center
800.370.4879
www.farmlandinfo.org
California Office
P.O. Box 73856, Davis, CA 95617
916.469.9412

California Rangeland Trust
1225 H Street, Sacramento, CA 95814
916.444.2096
www.rangelandtrust.org

U.C. Davis Small Farm Program
www.sfp.ucdavis.edu

U.S. Fish and Wildlife Service, Sacramento NWR
www.fws.gov/sacramentovalleyrefuges

Yolo Land Trust
P.O. Box 1196, Woodland, CA 95695
530.662.1110

Rice harvest in Yolo County
(Photo: Phil Hogan)

County Farm Bureaus

Colusa County
520 Market Street, Colusa, CA 95932
530.458.5130, www.colusa.cfbf.com

Glenn County
831 5th Street, Orland, CA 95963
530. 865.9636, www.glenn.cfbf.com

Yolo County
69 West Kentucky Avenue, Woodland, CA 95695
530.662.3616, www.yolofarmbureau.org

Goal #4: Manage and reduce invasive plant populations

California Invasive Plant Council:
www.cal-ipc.org

Calflora
www.calfora.org

PlantRight
www.plantright.org

U.C. Davis Statewide Integrated Pest Management Program
www.ipm.ucdavis.edu/PMG/PESTNOTES/pn74139.html

USFWS – Partners for Fish & Wildlife Program
(530) 934-2801

Weed Management Areas

Colusa, Glenn and Tehama County WMA
www.cal-ipc.org/WMAs/Colusa_Glenn_Tehama_WMA.php

Yolo County WMA
www.cal-ipc.org/WMAs/Yolo_WMA.php

Perrenial pepperweed (Photo: Mary Fahey)

Goal #5: Reduce Destructive Flooding

California Bureau of Reclamation
Northern California Area Office
16349 Shasta Dam Boulevard, Shasta Lake, CA 96019
530.275.1554
www.usbr.gov/mp/ncao

California Department of Water Resources
www.water.ca.gov

Central Valley Flood Protection Board
916.574.0609
www.cvfpb.ca.gov

U.S. Army Corps of Engineers, Sacramento Division
916.557.7490

Water Resources Association of Yolo County
P.O. Box 8624, Woodland, CA 95776-8624
530.666.2733
www.yolowra.org

County Departments of Agriculture

Colusa County
100 Sunrise Blvd., Suite B, Colusa, CA 95932
530.458.0580

Glenn County
720 North Colusa Street, Willows, CA 95988
530.934.6501

Yolo County
70 Cottonwood Street, Woodland, CA 95695
530.666.8140

County Departments of Public Works

Colusa County
1215 Market Street, Colusa, CA 95932
530.458.2035

Glenn County
530.934.6530

Yolo County
292 West Beamer Street, Woodland, CA 95695
530.666.8156

City Departments of Public Works

Colusa
425 Webster Street, Colusa, CA 95932
530.458.4740
www.cityofcolusa.com/departments/public_works

Williams
735 7th Street, Williams, CA 95987
530.473.2519
www.cityofwilliams.org/public-works/index.htm

Willows
201 N Lassen Street, Willows, CA 95988
530.934.7041
www.cityofwillows.org

Goal #6: Reduce Soil Erosion

Natural Resources Conservation Service

Colusa County
100 Sunrise Blvd., Suite B, Colusa CA 95932
530.458.2931

Glenn County
132 North Enright Avenue, Suite B, Willows, CA 95988
530.934.4601 X3

Yolo County
221 W. Court Street, Woodland, CA 95695
530.662.2037

Glenn County Rangeland (Photo: Glenn County RCD)

Goal #7: Preserve and enhance native habitat

Audubon California Landowner Stewardship Program
www.ca.audubon.org/lsp

California Department of Fish and Game, North Central Region
1701 Nimbus Road, Rancho Cordova, CA 95670
916.385.2900
www.dfg.ca.gov/regions/2

California Native Grasslands Association
www.cnga.org

California Native Plant Society
www.cnps.org

Cornflower Farms
www.cornflowerfarms.com

Floral Natives Nursery
www.floralnativesnurser.com

Hedgerow Farms
www.hedgerowfarms.com

U.C. Davis Rangeland Management
www.californiarangeland.ucdavis.edu/index.htm

U.S. Fish and Wildlife Service, Sacramento National Wildlife Refuge Complex
752 County Road 99W, Willows, CA 95988
530.934.2801
www.fws.gov/sacramentovalleyrefuges

U.S. Fish and Wildlife Service
Partners For Fish and Wildlife Program
www.fws.gov/sacramentovalleyrefuges/pl_partners.html

Wildlife Conservation Board
1807 13th Street, Sacramento, CA 95811
916.445.8448
www.wcb.ca.gov

Xerces Society
www.xerces.org

Yolo County Resource Conservation District, "Bring Farm Edges Back to Life" publication
www.yolorcd.org/nodes/resource/publications.htm

BIA Pacific Region, Sacramento
2800 Cottage Way, Sacramento, CA 95825
916.978.6000
www.bia.gov/WhoWeAre/RegionalOffices/Pacific/index.htm

Colusa Wildlife Refuge (Photo: Mary Fahey)

Goal #8: Address unknown future affects of climate change

California Climate and Agricultural Network (CalCAN)
www.calclimateag.org

California Department of Fish and Game Climate Science and Renewable Energy Branch
www.dfg.ca.gov/Climate_and_Energy

California Department of Water Resources
www.water.ca.gov

CalFire
www.fire.ca.gov

Flex Your Power
www.fypower.org

Global Green USA
www.globalgreen.org

National Center for Appropriate Technology
www.ncat.org

NRCS National Water and Climate Center
http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/nwcc

Pacific Gas and Electric Company
www.pge.com

Environmental Protection Agency Region 9
www.epa.gov/aboutepa/region9.html

Interstate 5 (Photo: Jack Alderson)

7.9 Appendix 9: Timetable to Accomplish Actions

This timetable was developed as a summary of Actions to be completed each year. Note, in the first year, 2013, most of the Actions involve information gathering and dissemination. As we get into 2014 and 2015, we begin to see more project implementation and Actions that involve measurable results. Please keep in mind that completion of these Actions, in most cases, is dependent upon availability of funding and willing landowners.

January 2013

Water Quality

- RCDs receive quarterly updates from the local Subwatershed programs and IRWM groups beginning in January 2013
- RCDs and NRCS Facilitate at least one landowner workshop per year to promote BMPs and Farm Bill programs related to erosion and sediment loading beginning in 2013

Water Supply

- Water-related entities facilitate informative presentations related to water storage 2 times per year beginning in January 2013
- The RCDs and Master Gardeners disseminate information via website, brochures and 4 email blasts per year, beginning in January 2013
- RCD staff attend a minimum of 2 Groundwater Commission meetings and 1 workshop per year beginning January 2013
- RCD staff attend a minimum of 2 meetings per year related to local, regional and statewide water issues beginning in 2013
- Minimum 2 meetings per year related to water planning are attended by RCD staff and stakeholders beginning in January 2013

Preserve Agriculture and Open Space

- New information is posted monthly on pertinent websites beginning January 2013
- Colusa County Grown website is maintained and updated monthly by CCRCD staff beginning January 2013
- Minimum two fact sheets are developed per year by RCDs and Farm Bureaus highlighting agriculture and open space and are disseminated beginning in 2013
- Information related to agritourism is posted quarterly on local websites beginning January 2013
- The RCDs disseminate information related to agritourism via website and 2 email blasts per year, beginning in January 2013
- RCDs gather and disseminate information regarding the Williamson Act via website and 4 email blasts per year beginning in 2013

Invasive weeds

- RCD staff attend a minimum of one Weed Awareness function per year beginning in 2013

- Minimum two collaborative grant proposals are written per year beginning in 2013
- Quarterly updates are provided by RCDs, WMAs, County Departments of Agriculture and lansowners on each others' activities related to weed management beginning January 2013

Flood

- Quarterly updates are provided by entities working on flood protection on each others' activities related to flood control infrastructure beginning in January 2013

Soil

- The RCDs disseminate information about vegetation enhancement via website, quarterly newsletter, and minimum 2 newspaper articles per year beginning in January 2013
- The RCDs disseminate information about cover crops via website, quarterly newsletter, and minimum 2 email blasts per year beginning in January 2013
- The RCDs disseminate information about no-till and reduced till practices via website, quarterly newsletter, and minimum 2 newspaper articles per year beginning in January 2013

Habitat

- The RCDs disseminate information about incorporating habitat plantings on idle farm spaces via website, quarterly newsletter, and minimum 2 email blasts per year beginning in January 2013
- Minimum two grant proposals are written by RCDs per year to expand on existing projects throughout the watershed beginning in 2013
- RCDs disseminate information about off stream livestock watering, etc. via website and minimum 2 email blasts per year beginning in 2013
- RCDs disseminate information about fenced riparian areas via website and minimum 2 email blasts per year beginning in 2013
- RCDs disseminate information about rotational grazing via website and minimum 2 email blasts per year beginning in 2013
- RCDs disseminate information about RDM via website and minimum 2 email blasts per year beginning in 2013
- RCDs disseminate information about native plants via website and minimum 2 email blasts per year beginning in 2013
- RCDs disseminate information to homeowners about landscaping with native plants via website and minimum 2 email blasts per year beginning in 2013

Climate Change

- RCDs disseminate information about ways to address climate change, via website and minimum 2 email blasts per year beginning in 2013
- Information about multi-benefit projects is compiled by RCDs and NRCS and disseminated via website, and minimum 2 email blasts beginning in 2013
- RCDs disseminate information about NRCS incentive programs, via website and minimum 2 email blasts per year beginning in 2013
- Funding is solicited by restoration groups to facilitate minimum one habitat connectivity project per year beginning in 2013

- RCDs disseminate information about vegetation enhancement with native plants, via website and minimum 2 email blasts per year beginning in 2013
- RCDs disseminate information about no-till drill practices, via website and minimum 2 email blasts per year beginning in 2013
- RCDs disseminate information about NRCS Wetlands Reserve Program, via website and minimum 2 email blasts per year beginning in 2013
- RCDs disseminate information about vegetation enhancement via website and minimum 2 quarterly newsletter per year beginning in 2013

June 2013

Water Supply

- RCD staff subscribes to relevant listserves by June 2013 to receive email updates on regional and statewide water supply news
- RCDs disseminate information about water conservation for agriculture, via website and 4 email blasts per year, beginning in June 2013
- RCDs disseminate information about groundwater, via website and 4 email blasts per year, beginning in June 2013
- RCDs disseminate water supply information quarterly via email blasts and newsletters beginning June 2013

Preserve Agriculture and Open Space

- RCDs and Farm Bureaus post information and/or photos promoting agriculture and open space on their social media sites weekly beginning June 2013

December 2013

Habitat

- CCRCD identifies priority areas for habitat restoration based on Streambank Analysis study by December 2013
- RCDs develop list of incentive programs by December 2013

January 2014

Water Quality

- RCDs partner with City and County agencies involved with water quality and Tribes, and receive quarterly water quality updates beginning in January 2014
- RCDs provide information booth at a minimum of one local event per year beginning in 2014
- RCDs, NRCS, UCCE and local subwatershed groups collaborate to facilitate a minimum of one educational workshop per year, beginning in 2014
- The RCDs disseminate information about erosion control via website, 4 email blasts, and 1 local event per year beginning in 2014

Water Supply

- RCDs and Master Gardeners facilitate a minimum of one educational workshop per year beginning in 2014
- RCDs disseminate information about tailwater reuse & recycling, via website, 4 email blasts, and 1 local event per year beginning in 2014
- RCDs work with local water-related entities to disseminate information about conjunctive use, via website, 2 email blasts, and 1 local event per year beginning in 2014
- RCDs facilitate a minimum of one educational workshop per year about water conservation in agriculture, beginning in 2014
- Minimum 2 flood water retention projects per year are implemented beginning in 2014
- Minimum 3 landowners per year implement agricultural water conservation practices through NRCS Farm Bill programs beginning in 2014

Invasive Weeds

- Colusa Basin Watershed GIS Invasive Weed Mapping project is updated at least yearly by RCD staff beginning in 2014
- RCDs disseminate information about weed I.D. ecology, etc., via website, 4 email blasts, and 1 local event per year beginning in 2014

Soil

- The RCDs disseminate information about fenced riparian areas via website, 4 email blasts, and 1 local event per year beginning in 2014
- Colusa County RCD no-till drill rental demand increases by 10% per year beginning in 2014
- RCDs disseminate information about erosion function via website, 2 email blasts and one local event per year beginning in 2014

Habitat

- RCDs facilitate minimum of one educational workshop about installing habitat plantings on idle farm areas per year beginning in 2014
- RCDs facilitate minimum of one landowner field day highlighting successful past habitat planting projects per year beginning in 2014
- RCDs plan habitat projects to include "Good Neighbor" policies beginning in January 2014
- Minimum one grazing management workshop facilitated per year by RCDs and NRCS, beginning in 2014 (includes all Actions under Objective #4)
- Minimum of one educational workshop on the benefits of native plants is facilitated per year by RCDs, beginning in 2014
- RCDs and Master Gardeners facilitate minimum of one educational workshop per year on gardening with native plants beginning in 2014

Climate Change

- RCD staff attends minimum 2 workshops and/or conferences related to climate change per year beginning in 2014
- RCDs solicit funding to facilitate forest health projects beginning in 2014
- Weed Management Areas are actively identifying a minimum 3 projects per year and work with partners to seek funding for implementation beginning 2014
- RCDs coordinate with partners and disseminate information about groundwater recharge and storage, via website and minimum 2 email blasts per year beginning in 2014
- RCDs disseminate information about on-farm fuel efficiency and renewable energy, via website and 2 email blasts per year beginning in 2014

June 2014

Water Quality

- RCDs working with local entities, disseminate water quality information via website, 2 email blasts, 1 mailer and at 1 local event per year beginning in June 2014
- RCDs develope Water Quality Community Awareness Campaign by June 2014
- Community Awareness Campaign is utilized by RCDs to promote voluntary actions beginning in June 2014

Habitat

- Maintenance plans and guides are compiled and/or developed by RCDs and partners by June 2014
- List of resources for available programs and technical assistance is developed by RCDs by June 2014

Climate Change

- CCRCD utilizes Streambank Analysis maps to identify potential projects by June 2014

December 2014

Water Quality

- Funding is secured by County Water Agencies to implement and/or update County GMPs by December 2014
- County Groundwater Commissions have GIS mapping of important recharge areas in the watershed by December 2014

Water Supply

- County Groundwater Commissions acquire GIS mapping of important recharge areas in the watershed by December 2014

Ag and Open Space

- Funding is received by RCDs to facilitate a project to quantify benefits of agricultural and open space lands by December 2014
- RCDs identify existing ecosystem services programs by December 2014
- RCDs coordinate with agencies to produce guidelines for effective habitat management by December 2014

Invasive Weeds
- Grant funding is obtained by weed management groups to facilitate eradication projects by December 2014
- Community reporting system is created by RCDs and in use by December 2014

Flood
- RCDs and partners identify and map areas where flooding could be beneficial by December 2014
- RCDs identify potential floodplain projects by December 2014

Soil
- RCDs and NRCS create one demonstration site by December 2014 – vegetated ditches and canals
- RCDs establish minimum one cover crop demonstration site by December 2014 to be utilized for a minimum of one educational field day per year

Habitat
- RCDs establish minimum one pollinator habitat demonstration site by December 2014
- RCDs work with partners and develop a list of options for restoration plans that make them manageable for landowners and land managers by December 2014
- Yolo County RCD's Permit Coordination Program is being utilized by December 2014
- RCDs and partnerns create initial report to quantify benefits of restoration projects by December 2014
- RCDs establish minimum of one pollinator habitat demonstration site by December 2014
- Grant funding is received by CCRCD to facilitate streambank mapping project by December 2014

Climate Change
- RCDs and partners develop Climate Change partnership by December 2014

<u>January 2015</u>

Water Quality
- Knowledge gained by stakeholders results in measurable reduction in water pollutants in the watershed each year beginning in 2015

Water Supply
- Minimum 2 new projects per year are implemented to capture and manage stormwater beginning January 2015
- Minimum 3 landowners per year implement practices to enhance groundwater recharge through NRCS Farm Bill programs beginning in 2015

Ag and Open Space
- RCDs work with other entities to publicize ecosystem services programs, via websites, 4 email blasts, and 1 local event per year beginning in January 2015
- RCDs disseminate habitat management guidelines beginning in 2015

Invasive Weeds

- RCDs disseminate California Invasive Plant Council educational materials and demonstrate how to report invasive weeds with the Calflora Observer App at minimum one event per year beginning in 2015
- RCDs and WMAs develop tool kit and disseminate to landowners and weed workers beginning in January 2015
- RCDs train other entities to use Community Reporting system beginning in January 2015
- RCDs and WMAs acquire funding for minimum 1 weed eradication project per year beginning in 2015
- Minimum 20 acres of invasive plants are removed and replaced with native vegetation per year beginning in 2015

Flood

- Funding is secured by RCDs to facilitate 1 demonstration project utilizing native perennial vegetation to increase infiltration and slow flood flows by January 2015 (This Action is also under the Soil goal)
- Land managers install minimum 3 tailwater ponds per year beginning in 2015
- RCDs write a minimum of 1 proposal per year to create natural floodplains and/or detention ponds beginning in 2015

Soil

- RCDs facilitate minimum one workshop per year about vegetated ditches beginning January 2015
- Minimum 2 miles of buffers installed per year beginning in January 2015
- Minimum 2 miles of bare streambank per year revegetated beginning January 2015
- RCDs and NRCS facilitate minimum 1 workshop per year on erosion function beginning in 2015
- RCDs receive funding for 1 demonstration project to utilize native vegetation to increase infiltration by 2015
- RCDs receive funding to facilitate one demonstration project to be utilized to conduct site tours, workshops and trainings on strategies to improve soil health and stability in 2015

Habitat

- Minimum 3 landowners implement habitat restoration practices through NRCS Farm Bill programs each year beginning in 2015
- Minimum one landowner field day/workshop about pollinator habitat is facilitated per year beginning January 2015

Climate Change

- RCDs and Climate Change partners provice quarterly updates on each others' activities beginning in 2015
- Minimum of one landowner workshop about vegetation enhancement is facilitated per year by RCDs beginning in 2015 – veg enhancement

December 2015

Invasive Weeds

- Outreach Plan is completed by RCDs by December 2015

Flood

- RCDs identify and map flood prone areas by December 2015
- RCDs identify and create a list of willing landowners for off stream storage projects by December 2015
- Funding is secured for RCDs and NRCS to facilitate one demonstration project to Reestablish flood plains along streams, where feasible (this is also under Goal #6, Objective #1 below) by December 2015

Soil

- Funding is secured for RCDs and NRCS to facilitate one demonstration project to Reestablish flood plains along streams, where feasible (this is also under Goal #5, Objective #3 above) by December 2015

2016

Water Quality

- Occurrences of groundwater overdraft in the CBW are reduced by 20% by December 2016
- Developers are required by County and City Planning departments to incorporate water-wise landscaping and building practices in new developments by December 2016
- Planning Departments require new development to minimize impervious surfaces by December 2016
- 90% of landowners in important recharge areas are given information and sign a MOA by December 2016 to protect recharge areas identified on private lands (also under Water Supply)

Water Supply

- 90% of landowners in important recharge areas are given information and sign a MOA by December 2016 to protect recharge areas identified on private lands (Also under Water Quality)

Ag & Open Space

- 10% increase in easements are implemented by December 2016, providing protection of agricultural lands and open spaces
- County and City General Plans contain language limiting development to surrounding incorporated areas and spheres of influence by December 2016

Flood

- Study of natural channel removal is completed by RCDs and NRCS by December 2016
- Study of the cumulative effects of existing wetland and riparian restoration projects on flooding is completed by RCDs and NRCS by December 2016
- Incentive programs for farmers and ranchers who use their land for off stream storage are identified by RCDs and presented to landowners in 2016

- RCDs, work with partners to implement minimum one project per year utilize flood flows for managed groundwater recharge and habitat enhancement beginning in 2016
- Funding is secured by RCDs to facilitate projects develop projects to improve groundwater infiltration in flood-prone areas beginning in 2016

Soil

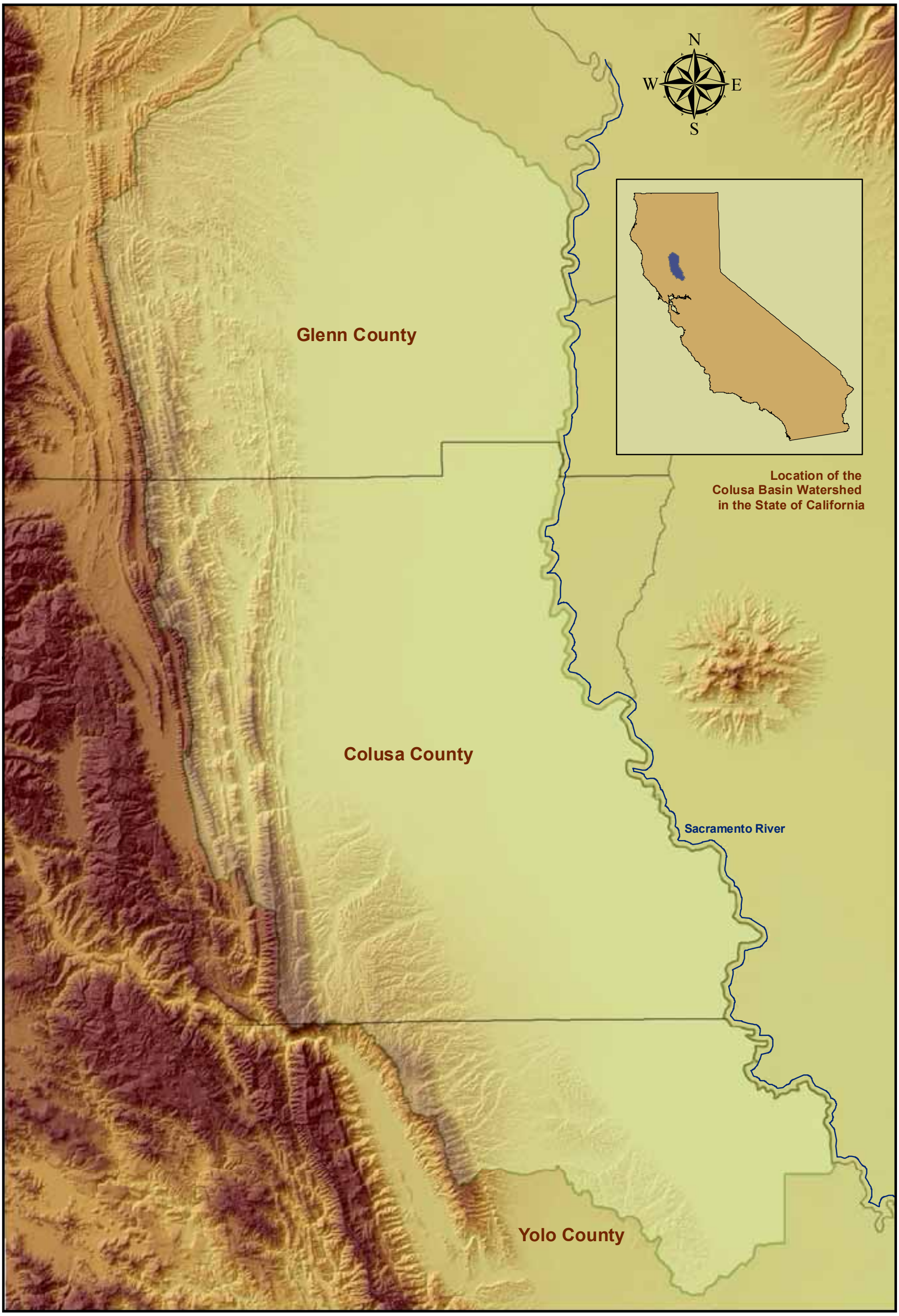
- Long term shift from clean farming practices begin to be realized beginning 2016
- Land Managers install minimum 3 new sediment traps per year beginning in 2016
- Minimum 3 filter strips per year installed through NRCS Farm Bill programs beginning in 2016
- Minimum 2 educational site tours related to soil health and stability are facilitated per year by RCDs beginning in 2016

Habitat

- Freshwater wetland habitat acreage increases by 2% per year beginning in 2016

7.10 Appendix 10: Maps, full size

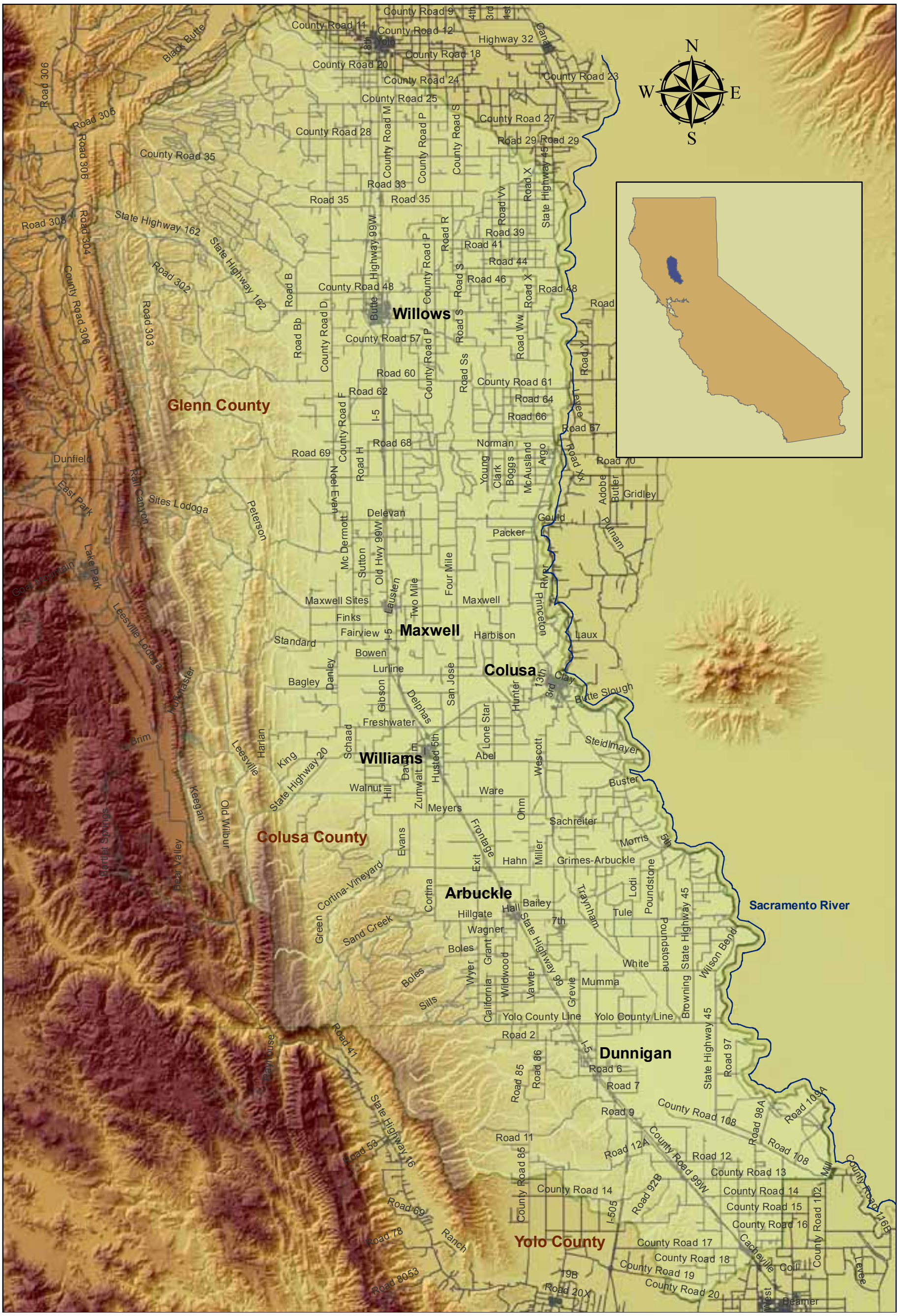
- **Figure 1**: Map - Colusa Basin Watershed
- **Figure 1.2**: Map - Colusa Basin Watershed Showing Roads, Cities and Major Towns
- **Figure 2**: Map - Land Use
- **Figure 3**: Map - Geology
- **Figure 4**: Map - Major Canals and Streams in the CBW
- **Figure 5**: Map - Soils
- **Figure 6**: Map - Potential Natural Plant Communities in the CBW
- **Figure 7**: Map - Initial Map of Invasive Weed Populations in the CBW



USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

COLUSA COUNTY RESOURCE

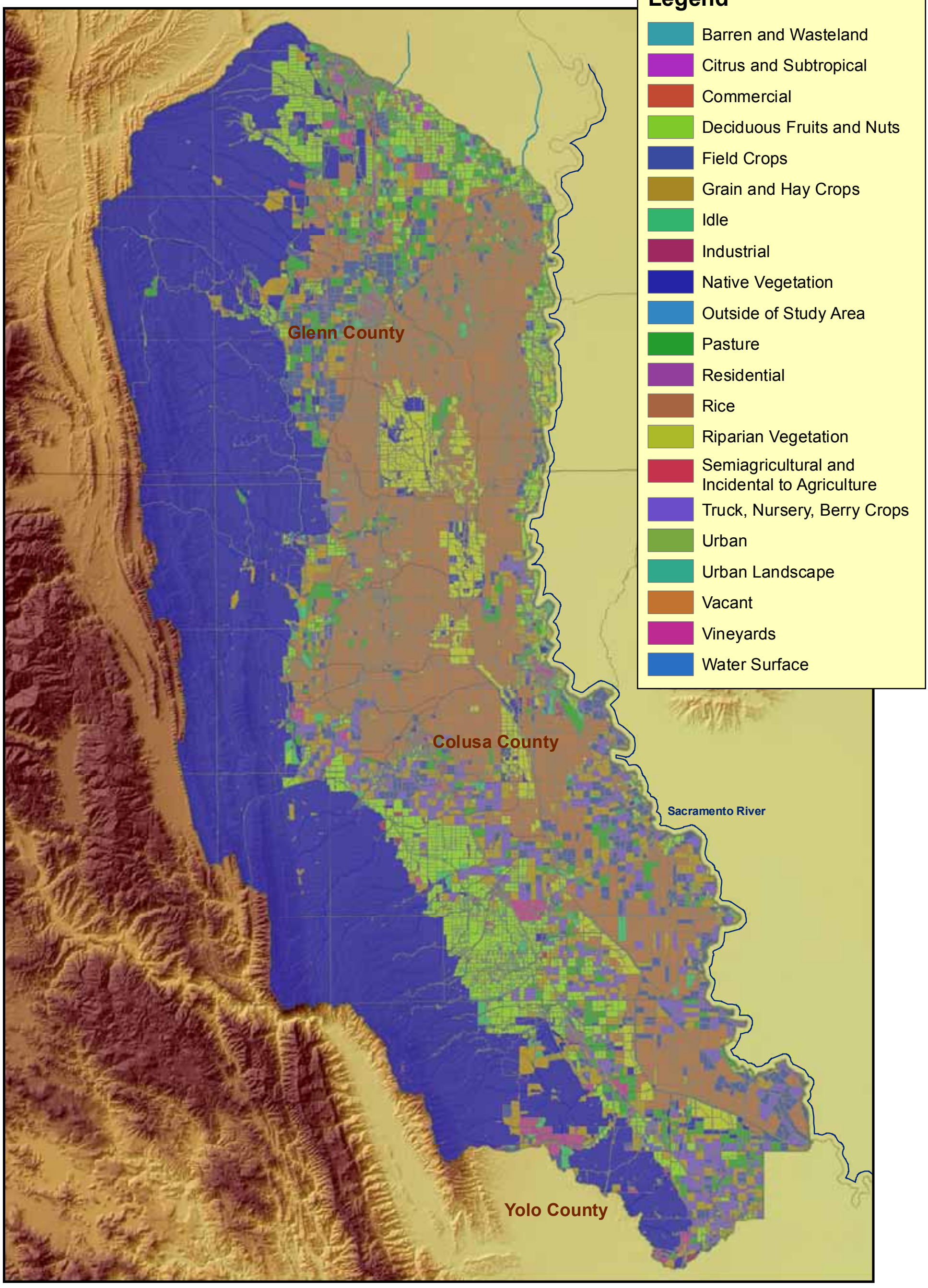
Figure 1: The Colusa Basin Watershed



USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

COLUSA COUNTY RESOURCE

Figure 1.2: The Colusa Basin Watershed Showing Roads, Cities and Major Towns

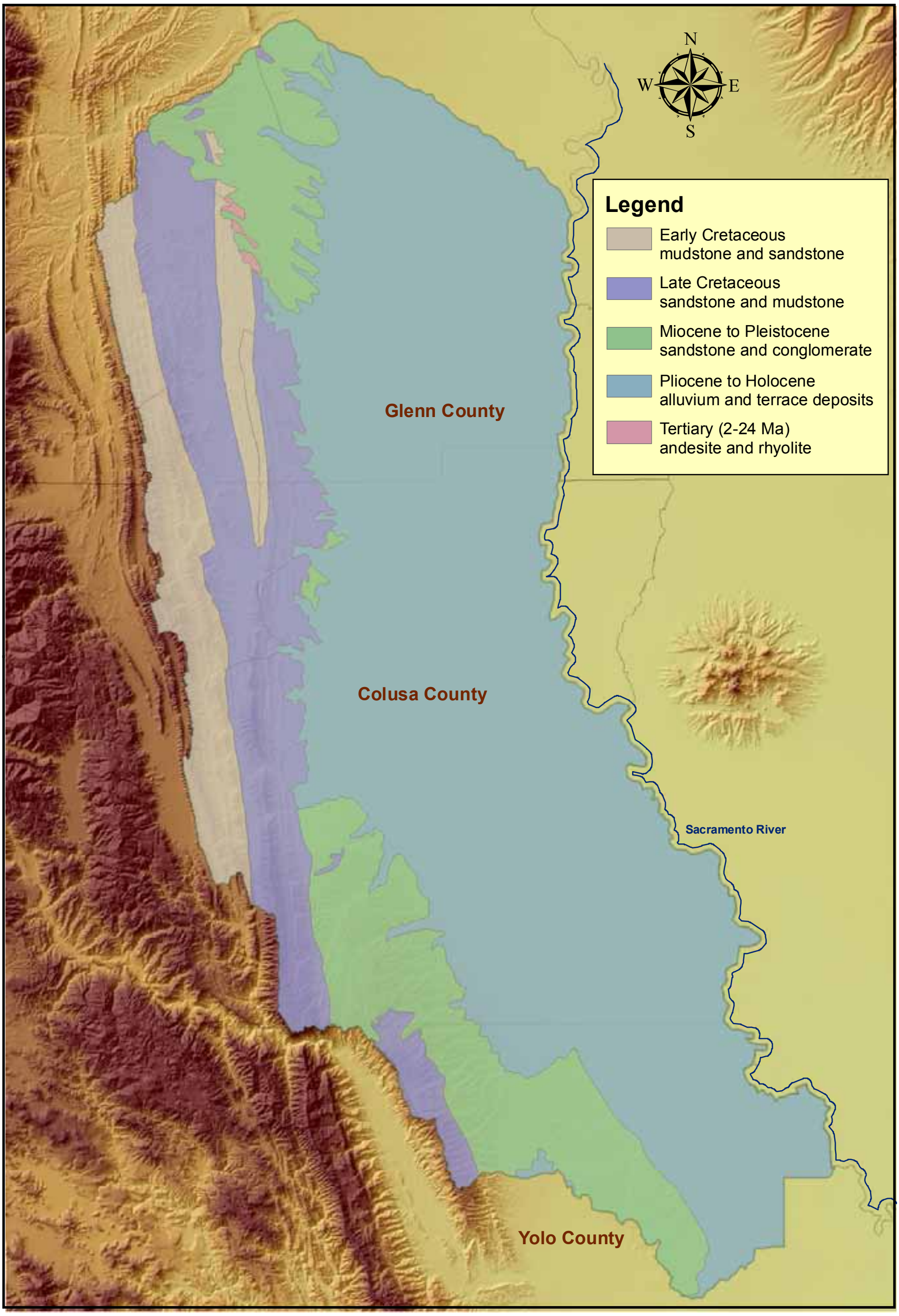


USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

COLUSA COUNTY RESOURCE

Figure 2: Colusa Basin Watershed Land Use Map

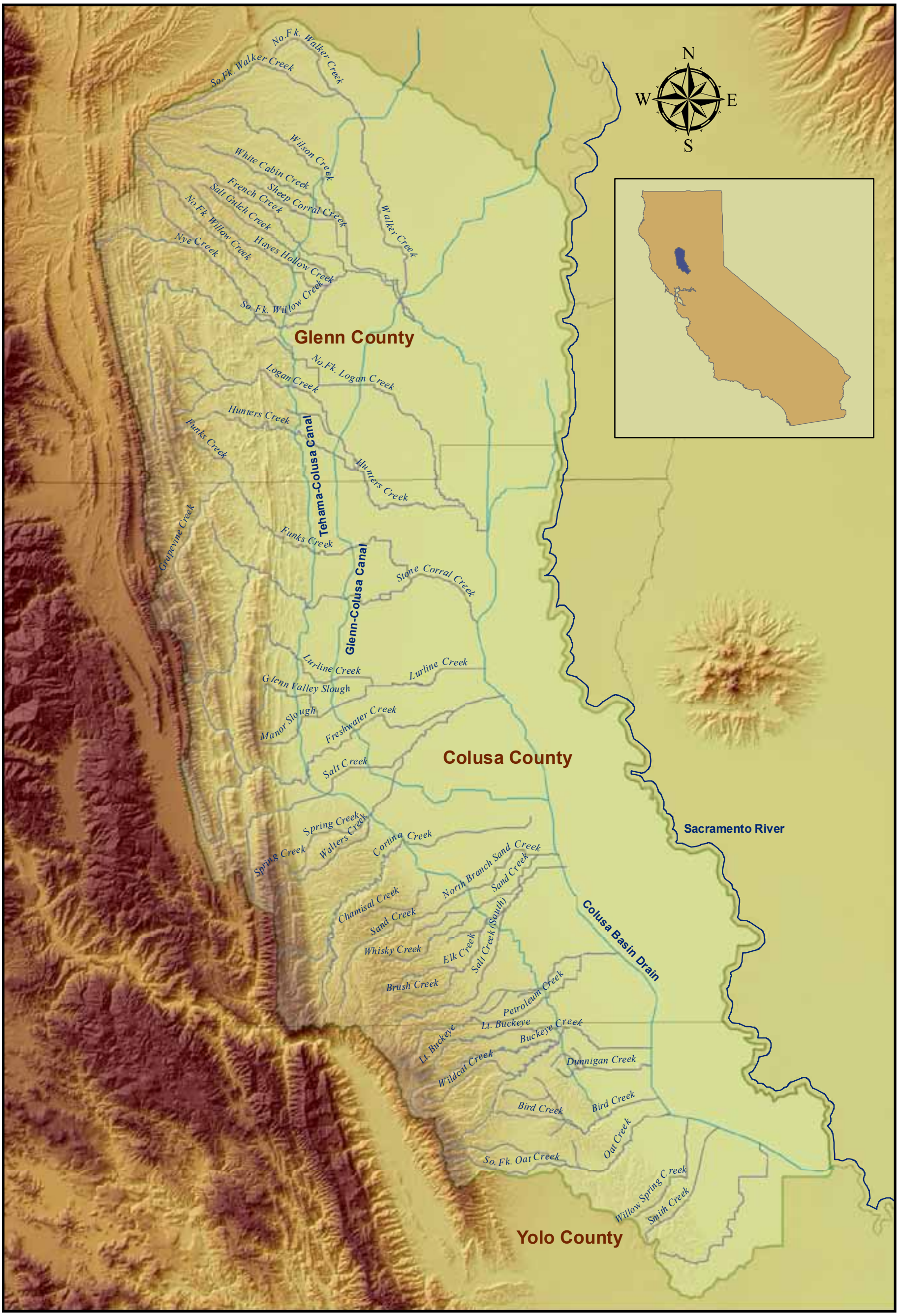
Land Use data was developed by the State of California, Department of Water Resources.



USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

COLUSA COUNTY RESOURCE

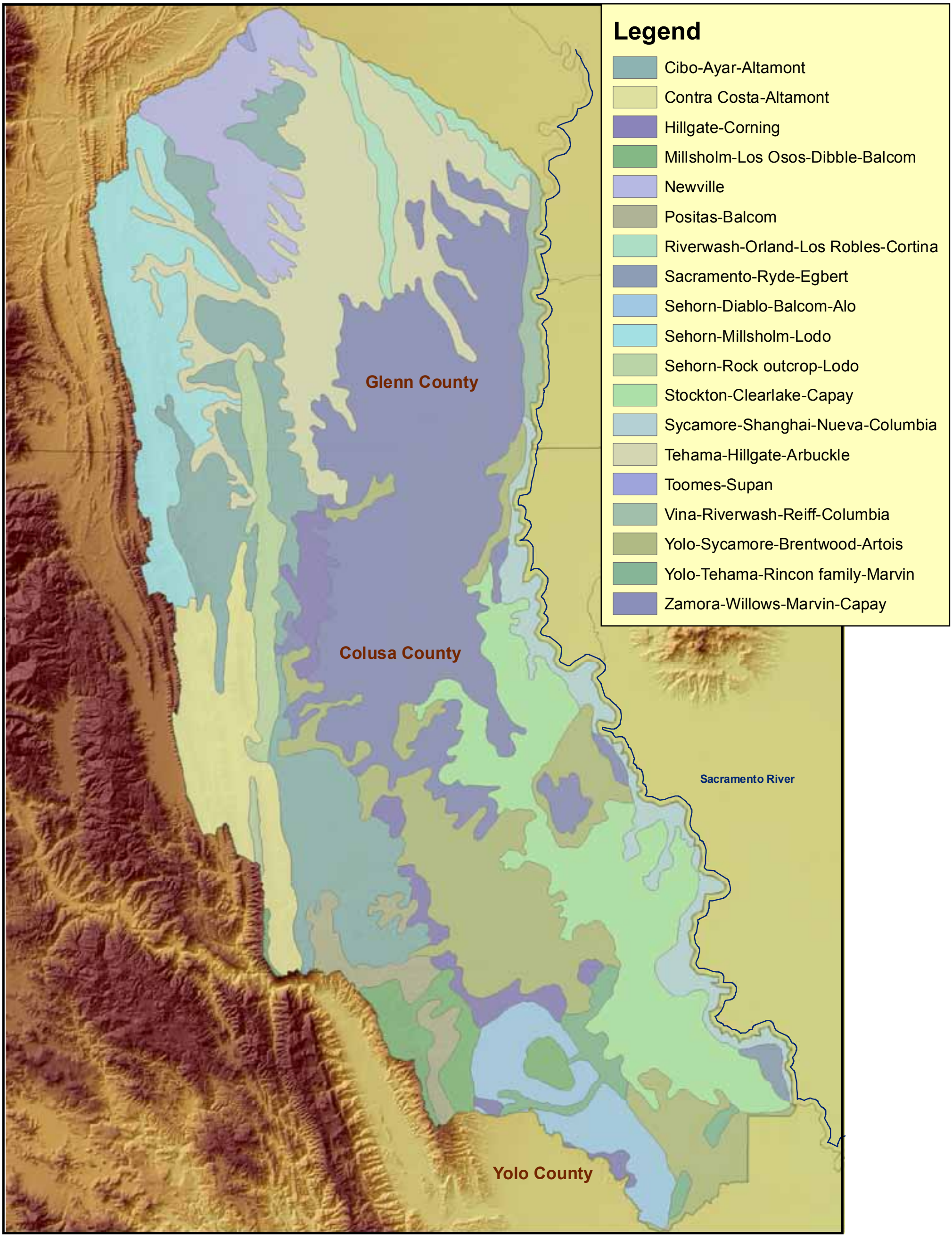
Figure 3: Geology of the Colusa Basin Watershed



USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

COLUSA COUNTY RESOURCE

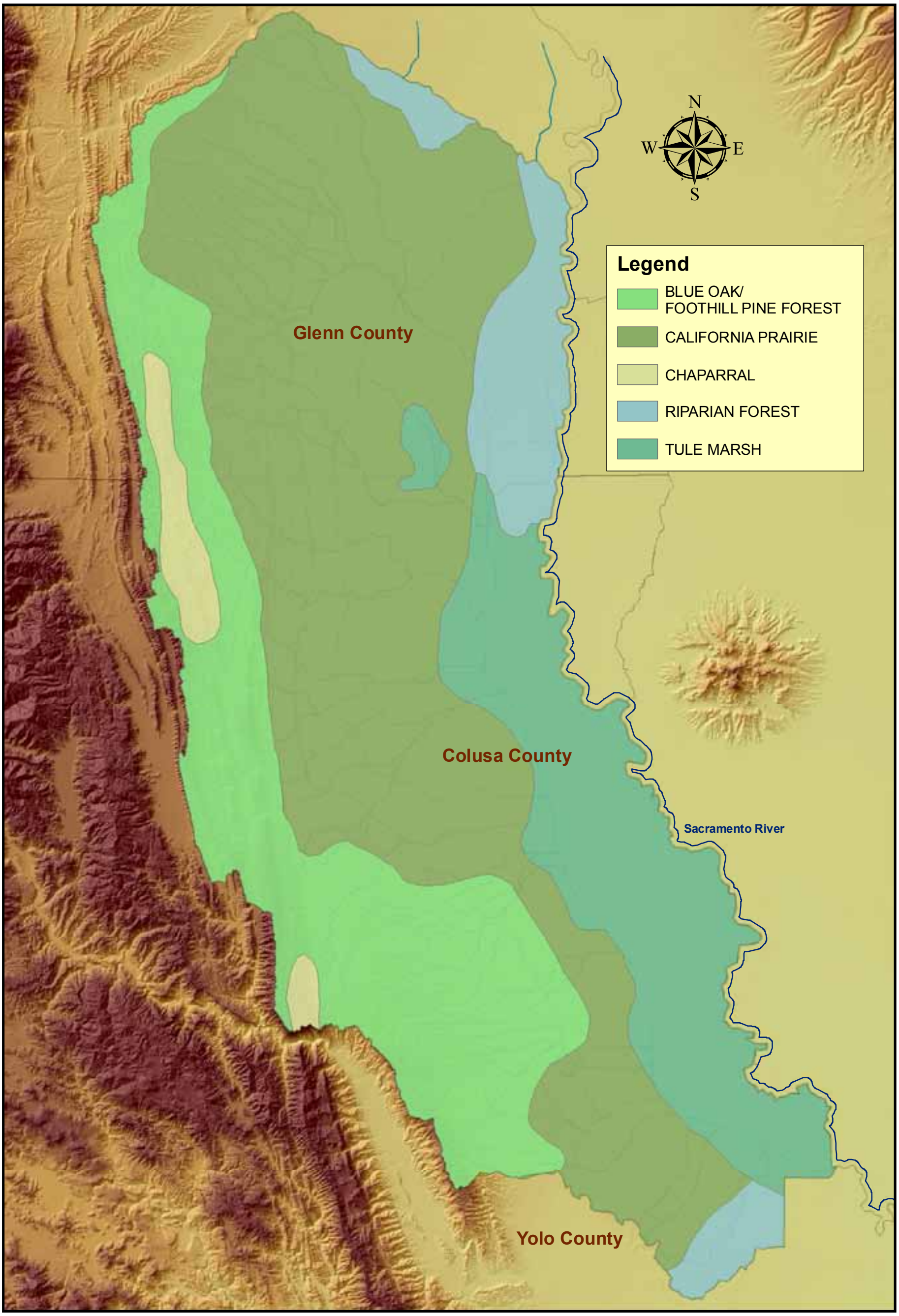
Figure 4: Colusa Basin Watershed Major Canals and Streams



USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

COLUSA COUNTY RESOURCE

Figure 5: Colusa Basin Watershed Soils



USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

COLUSA COUNTY RESOURCE

Figure 6: Potential Natural Plant Communities

Digital version of potential natural plant communites as compiled and published on "Map of the Natural Vegetation of California" by A. W. Kuchler, 1976

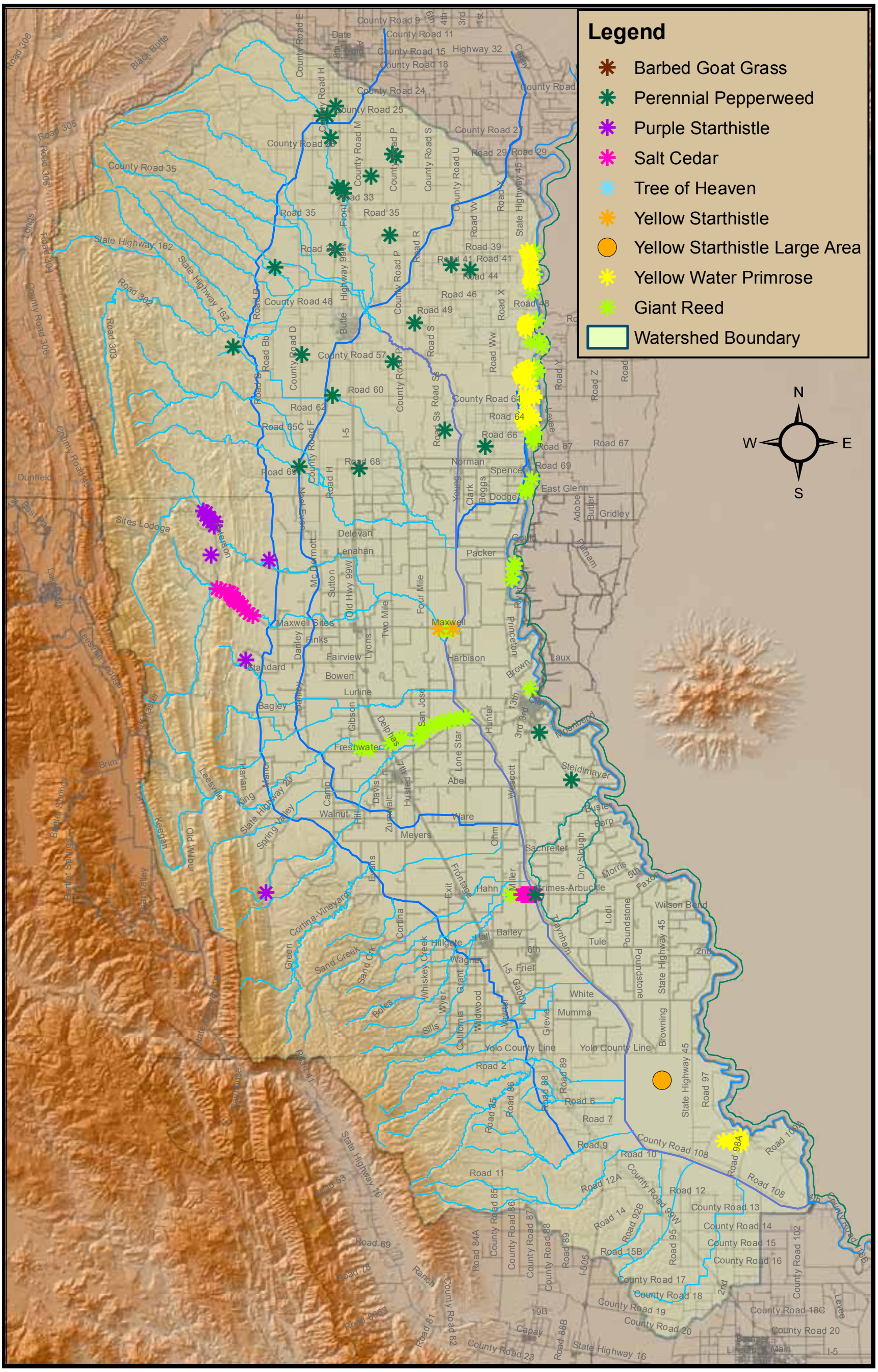


Figure 7: Colusa Basin Watershed Initial Map of Invasive Weed Populations

This map is the first step in the creation of comprehensive watershed-wide invasive weed mapping. Updates will be made as time and funding allow.