

Tehama West Watershed Management Plan

Prioritizing Management Actions to Improve Watershed Conditions



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Elder Creek Watershed John Bedford

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1.0 Introduction

Watersheds

A watershed is the most basic natural unit of delineation and contains within its geographic boundaries an array of natural and cultural resources. The maintenance of these resources is important to physiological and fiscal health of the watershed inhabitants.

The Tehama West Watershed Management Plan is the action document resulting from the evaluation of the Tehama West Watershed Assessment (TWWA 2006), which provides the necessary background information on existing conditions within the watershed. Funded through a grant from the State Water Resources Control Board as part of the CALFED Watershed Program, this community-based process provided the opportunity for public input through public meetings that were held in various locations within the assessment area. From those meetings, plus additional interviews and written comments, conclusions and recommendations were reached concerning possible improvement activities.

Guidance and assistance addressing the conclusions and recommendations were provided by the Technical Advisory Committee (TAC) members consisting of individuals from private industry, public agencies, and other stakeholders, including private landowners.

Many of the activities and projects found in this document will require new funding through public/private grants or other sources in order for those projects to reach fruition. Some activities may require nothing more than a prescription or strategy implementation, and other conclusions and recommendations may require further investigation before management activities can be described.

The Tehama County Resource Conservation District (TCRCD) is a non-regulatory public agency whose mission is "to assist citizens with managing, conserving, and improving the natural resources of Tehama County." TCRCD provides a number of services for the residents, landowners, agricultural producers, and government agencies of Tehama County. These include:

- Funding cost-share projects for landowners and agricultural producers

- Financial management and oversight of projects related to natural resource conservation, protection, and improvement
- Development and execution of noxious weed mapping and eradication projects
- Development and execution of resource surveys and analyses
- Development and preparation of wildfire plans, conservation plans, and resource assessments
- Providing technical assistance to landowners and agricultural producers for evaluating irrigation systems through the Mobile Irrigation Lab Program
- Providing education services, materials, and workshops for students, teachers, and adults throughout Tehama County.



Red Bank Creek Kristin Cooper-Carter

The Tehama County Resource Conservation District is a legal subdivision of the State of California, governed by Division 9 of the Public Resources Code. TCRCD's responsibility is conservation of the natural resources within its borders. It is governed by five Directors, appointed by the Tehama County Board of Supervisors, and non-voting Associate Directors, appointed by the District's Board of Directors. The board members are all local landowners

Tehama West Watershed Assessment Area



who volunteer their time to represent the land users in the district, thus insuring a local voice in natural resource issues. The District is wholly funded by grants, donations and contracts. It receives no general tax revenues.

By means of a Memorandum of Understanding with the Natural Resources Conservation Service, the District receives assistance carrying out its mandated responsibilities. Working together and as needed with other agencies and groups, a coordinated effort is made to conserve and improve the natural resources of Tehama County.

On May 26, 1987 the Tehama County Resource Conservation District was officially formed from the consolidation of the Corning (formed July 1945), Lassen View (formed May 1961) and Cottonwood (formed April 1956) RCDs. At the time of the consolidation, any parts of the Cottonwood or Corning RCDs that were in Shasta or Glenn Counties were detached from the new Tehama County Resource Conservation District. In September 2005, the Tehama County RCD merged with the Vina Resource Conservation District, located in the southeastern corner of the County. At the time of the merger, the small section of the Vina RCD that was in Butte County was detached, and the Tehama County RCD became a county-wide district.

Location

The Tehama West Watershed, consisting of over 1,000 square miles and more than 300 miles of perennial and ephemeral streams (Table 1), is located on the west side of Tehama County in northern California. The study area is bounded on the northern edge by the Cottonwood Creek Watershed, Mendocino County to the west, roughly follows the Glenn County boundary to the south, and down to the Sacramento River on the eastern edge. The Cottonwood Creek Sub-basin, completing western Tehama County to the north, was excluded from the assessment, as was a portion of the Stony Creek Sub-basin to the south. The aforementioned sub-basins already have assessments and existing condition reports completed.

**Table 1 Tehama West Watershed
Characteristic Assessment**

Watershed Area	1,044 sq.mi.
Highest Elevation	8,094 feet
Average Elevation	≈ 1,000 feet
Average Precipitation	≈ 22.9" (Red Bluff)
	≈ 24.3" (Paskenta)
Total Length of Major Tributaries	≈ 358 miles

Sub-Unit Watersheds

Made up of 11 sub-unit watersheds (Table 2) and encompassing over 668,000 acres, the Tehama West Watershed contains 11 major tributaries to the Sacramento River. Of the eleven sub-units, only Elder, Red Bank, and Thomes Creek contain perennial flows along some portion of their reaches.

Land Ownership

Land ownership within the Tehama West Watershed consists mostly of private lands, with the rest of the ownership in the hands of the federal government and less than 1 percent held by non-governmental organizations (NGO) and the State of California (Table 3).

Human Population

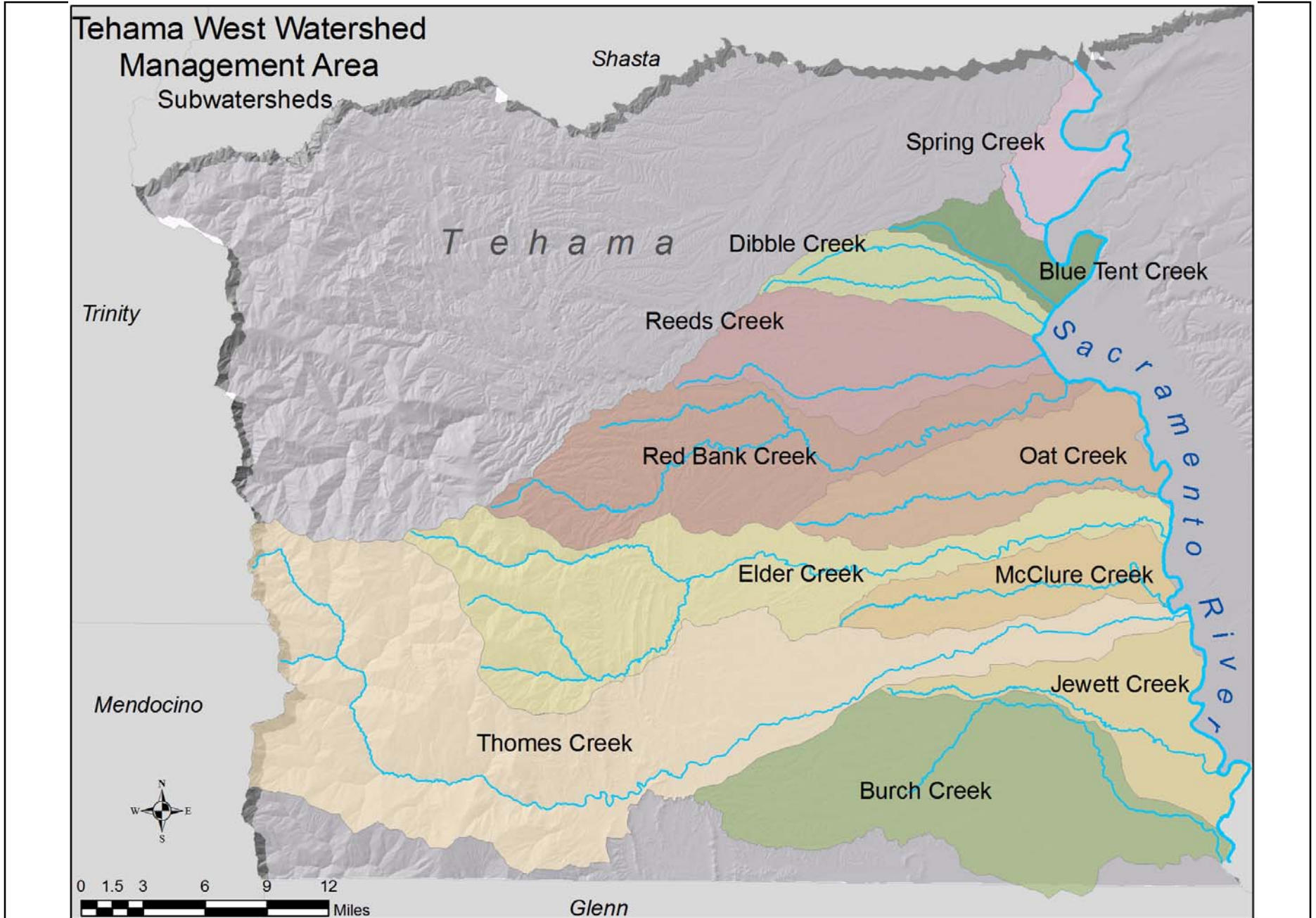
Tehama County's total population is estimated to be 61,686 persons (2006), with a majority of the population located west of the Sacramento River and mostly along the Interstate 5 (I-5) corridor. Few large communities are found outside of this freeway thoroughfare and the west side is . The larger communities on the west side are found in proximity of I-5 consist of Corning, Gerber, Proberta, Richfield, Tehama, and western Red Bluff. Outside of the I-5 corridor, the small communities of Paskenta and Rancho Tehama Reserve are found in the middle reaches of the watershed.

Table 2 Watershed Sub-Units

Sub-Unit	Length Miles	Total Acres	Percent Watershed
Blue Tent Creek	10.0	15,142.0	2.3%
Burch Creek	24.1	94,199.0	14.1%
Dibble Creek	33.9	21,327.0	3.2%
Elder Creek	72.1	96,350.0	14.4%
Jewett Creek	21.4	35,902.0	5.4%
McClure Creek	22.4	29,761.0	4.5%
Oat Creek	22.4	44,612.0	6.7%
Red Bank Creek	56.2	74,450.0	11.1%
Reeds Creek	20.9	48,814.0	7.3%
Spring Creek	4.5	14,494.0	2.2%
Thomes Creek	70.0	193,117.0	28.9%
Total	358	668,168	100%

Table 3 Land Ownership

Owner	Acres	Percent Watershed
Federal	101,365	15%
State	1,430	≤1%
NGO	250	≤1%
Sub Total	103,045	16%
Private Timber	56,531	8%
Other Private	508,592	76%
Total	668,168	100%



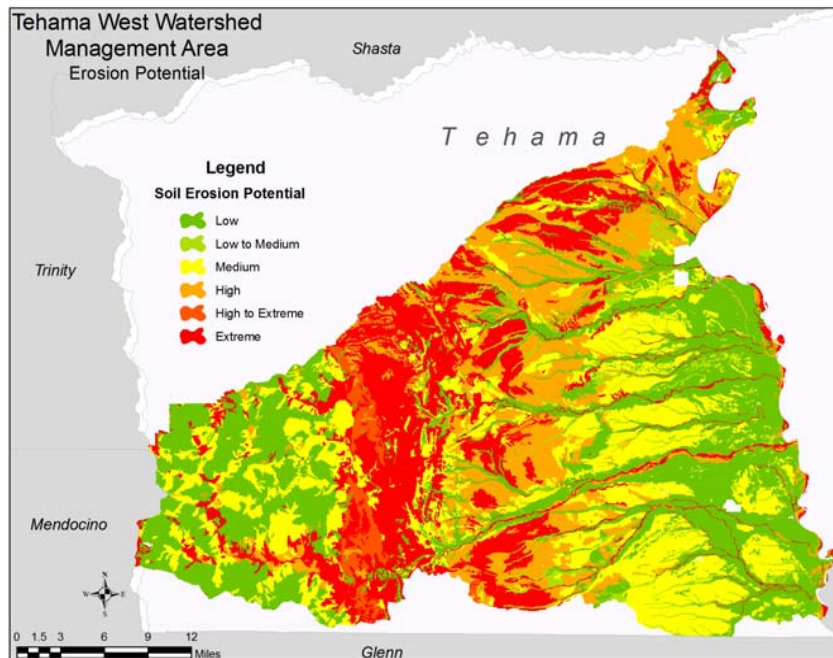
2 Watershed Condition and Management Strategy

2.1 Water Quality and Quantity

Water quality is an important component of a healthy watershed ecosystem. Water quantity is equally important, providing the water needs for all organisms residing within the watershed.

2.1.1 Erosion and Sediment Transport

A sediment budget is a description of the sources and deposition of sediment as it moves from the point of origin until it exits from a drainage basin. It accounts for rates and processes of erosion and sediment transport within the watershed and in the streams. A sediment budget also accounts for temporary placement of sediment in bars and other parts of the stream channel. There are certain manmade and natural activities that results in an increase in the sediment budget of stream courses.



Existing Condition and Assessment Conclusions

The watershed is characterized by low elevations, low precipitation, relatively gentle topography, low erosion potential, and potentially a significant groundwater reservoir. The western portion of the watershed is characterized by high elevations, high rainfall, and steep slopes with high erosion potential. Over time the transport of material from these rugged upland areas to the valley floor has resulted in the deposition of large alluvial fans and gravel reserves along the lower foothills. Sediment loading in Thomes Creek continues to be a problem as well as other in the Tehama West watersheds. Studies conducted by CSUC and DWR attribute sediment loading to landslides and remobilization of sediment.



Sediment deposit in an unnamed Tehama West creek

Management Strategy

TCRCD will support implementation of projects which have direct or indirect benefits in improved attainment of appropriate sediment budgets for:

- Red Bank Creek, Elder Creek, Blue Tent Creek, Dibble Creek, and Reeds Creek

Projects, based on priority, may consist of the following:

- Stabilizing stream courses subjected to erosion, which will reduce sediment discharge, turbidity, and deposition.

TCRCD will seek funding to produce sediment budgets for the creeks listed. These studies will provide information needed for further projects.

2.1.2 Riparian Vegetation/Fisheries

Riparian vegetation forms an important part of a properly functioning watercourse including various benefits for fish. The benefits include:

- shade and shelter development, maintaining temperatures and producing habitat for fish;
- depositing of fine organic materials, providing food for invertebrates and fish;
- stabilization of streambeds and banks, reducing erosion; and
- acting as a filter for sediments and other pollutants, improving the quality of water entering water courses.

Enhancement of riparian vegetation, as recommended by USFWS, and centering on the improvement of potential salmon spawning habitat is the first movement towards restoring Chinook salmon to the tributaries of the TWW.



Red Bank Creek Kristin Cooper-Carter

Existing Condition and Assessment Conclusions

Riparian communities have been significantly changed over the last 150 years. Riparian forests near the Sacramento River have declined to just 2 to 3 percent of the original area. During the early to mid 1900s, reservoir and levee projects to assist with flood control resulted in additional reductions in floodplain riparian zones. Loss of riparian habitats likely affected the associated streams and the quality of fish habitat.

At the same time, large multipurpose reservoirs and diversion dams impounded the Sacramento River. These structures stopped the upstream migration of anadromous fish into tributaries where spawning and rearing historically occurred. The Central Valley Project contributes to the alteration of the Sacramento River's natural flow regime, sediment transport capabilities, and riparian and riverine habitats.

In the lower reaches of the Tehama West streams, bedload materials are deposited, creating high gravel bars. Plants have difficulty colonizing these bars, and lateral scouring occurs, which widens the channel and disrupts riparian vegetation. Livestock grazing, introduction of non-native plants, and gravel mining have reduced original riparian areas.



Tehama West riparian habitats have been tremendously altered during the past century and a half. These habitats are extremely valuable for wildlife but also play important stream stabilization, water quality, and fishery habitat roles. The location of existing riparian habitats is not well known but would be the first step in planning future restoration projects. Following the identification of existing riparian stands and their attributes, steps could be taken to protect the most important ones and then to re-connect scattered habitats.

Management Strategy

The TCRCD will support implementation of projects, studies, and public education which have direct or indirect benefits to riparian habitat. Priority projects/studies include:

- Determine historical riparian habitat trends in the watershed. Develop GIS mapping for the watershed in conjunction with this inventory effort.
- Analyze historical aerial photographs from CDF, Caltrans, NRCS, DWR, and other sources to determine the change in riparian resources over time.
- Promote restoration projects on public and private lands focused on improving riparian areas.
- Encourage the development of riparian buffer zones to maintain native riparian habitat, benefit fish and native plant species, provide buffering benefits, and reduce the potential for damage from floods.

2.1.3 Riparian Vegetation/Function

Water flowing over the landscape shapes the extent of vegetation and soil development in a number of ways. First, since riparian areas occupy low depressions in the landscape, ground water is closer to the surface. In addition, sediments associated with connected flood plains are capable of retaining large amounts of water and provide nutrient rich systems. Ground water and sediments combine to create conditions that produce healthy and diverse plant communities.

Properly functioning riparian areas are associated with plant communities that are generally adjusted to the flood and dry cycles of riparian areas and have based their survivability upon those events.

During flood cycles, properly functioning riparian areas are a key factor in reducing downstream flooding. Riparian plants resist the flow and dissipate

the flood's energy, increasing the delivery time of water and allowing it to infiltrate and be stored in the soil for use by plants and for later release for downstream use.

TWW riparian habitats have undergone modification, mostly from human disturbance. In order to better manage existing riparian habitat, an inventory is necessary before restoration and protection can take place.

Existing Conditions and Assessment Conclusions



Deer grass on Elder Creek TCRCD Staff Riparian communities have been significantly changed over the last 50 years. Livestock grazing, introduction of non-native plants, and gravel mining have reduced original riparian areas.

It is likely that montane riparian habitats have been affected by fire suppression. These narrow corridors are comprised primarily of hardwoods that are regenerated by a disturbance, such as flood or fire. Because of fewer and wider spaced timing of wildfires, the opportunity to reproduce has been changed, leading to older trees along the streams. Forest management may have affected the riparian areas by removing the largest conifers and leaving smaller trees. This has become an issue in many areas due to the importance of riparian areas in providing large woody debris recruitment to streams and the importance of these large pieces to fisheries habitat. However, on Thomes Creek, below the confluence with Fish Creek, large woody debris plays a very limited role in channel development as more control is exerted by geomorphology.

Management Strategy

The TCRCD will support implementation of projects, studies, and public education which have direct or indirect benefits to riparian habitat. Priority projects/studies include:

- Assess riparian vegetation necessary for properly functioning systems which improve streamside vegetation and shading to benefit water temperature,
- Continue to provide technical and financial assistance to landowners who seek to address accelerated streambank erosion through TCRCD or NRCS and their various sources, and
- Promote the use of low cost, low maintenance schemes to restore natural functioning conditions of the streamcourses.

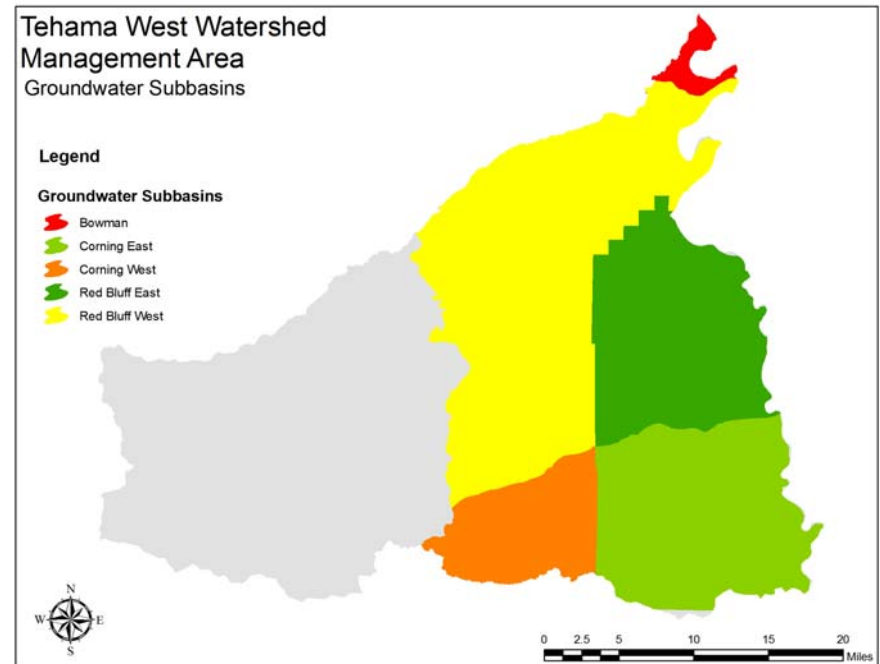
2.1.4 Groundwater Recharge and Associated Landscape Health

Recharge is the process by which precipitation is transmitted downward to an aquifer. Most recharge areas allow a certain amount of water to transverse to the water table, but these areas vary in the amount and time needed for this to occur. Water infiltration depends greatly on soil composition, vegetation type, and slope of the ground, as well as other factors which promote or retard groundwater recharge. Groundwater is the primary water supply for TWW, and continued availability is vital to maintain existing uses. To maintain and promote water capturing, additional methods to capture water need to be developed.

Existing Conditions and Assessment Conclusions

In general, the lower elevations within the watershed work as a significant groundwater reservoir. In 1993, USGS evaluated the general water quality of the Redding Groundwater Basin. Approximately one-third of the Tehama West Watershed is located within this basin. The report concluded that for the majority of the basin groundwater quality was considered good to excellent for most uses. Areas of poor water quality are largely limited to the margins of the basin.

Municipal runoff from roads, parking facilities, sidewalks, buildings, rooftops, and other impervious surfaces can transport trash, debris, metals, hydrocarbons, and fecal matter that pollute receiving streams. Lawns and other landscaped areas may also contaminate runoff with nutrients, fertilizers, and suspended solids. Agricultural runoff may carry nutrients, animal wastes, sediment, salts, pesticides, fertilizers, and other ingredients that may be harmful in high concentrations. Groundwater is susceptible to contamination from all these sources. Contamination of groundwater tends



to occur gradually because contaminants percolate downward through the soil at slow rates.

The transition between the Great Valley Geomorphic Province and Coast Range Geomorphic Province, both generally trending north-south, serves as the western boundary of the Sacramento Groundwater Basin. Significant groundwater recharge occurs in the alluvial deposits associated with this transition zone. Natural recharge of aquifers occurs where mountain ranges intersect with a groundwater basin, where streams pass over permeable geologic formations, and where precipitation infiltrates through permeable soil and the underlying formations. In some cases, recharge occurs from infiltration from drainage ditches. Percolation of surface water bodies where there are cross-permeable formations is considered to represent a significant portion of the natural recharge to aquifers in Tehama County.

Management Strategy

The TCRCD will support implementation of projects, studies, and public education which have direct or indirect benefits to groundwater recharge and riparian-wetland health. Priority projects/studies include:

- Evaluate the watershed for possible groundwater recharge zones;
- Seek opportunities to assist landowners with proper management opportunities;
- Provide education to the public concerning the connection between surface water and groundwater, particularly the importance of riparian areas and wetlands as to their water filtering capabilities; and
- Improve natural stream and floodplain function culminating in improved water retention during the wet season and slower release during the dry season.

2.1.5 Gaging Stations

Gaging stations that are situated on a streamcourse allow periodic observations of water level or discharge during the year. From these records hydrologists can make predictions and decisions concerning water level, flood activity, and control.

Existing Conditions and Assessment Conclusions

Headwaters of the streams in the watershed have relatively little, if any, drainage area with significant snowpack. Therefore, in contrast to streams flowing from the high Sierra Nevada with relatively predictable and

significant snow packs, snow melt and run-off play a minor role in the flow characteristics of the streams in the watershed. Watershed streams show rapid responses to storms, and flow levels fluctuate greatly between storm periods and intervening dry spells.

Management Strategy

The TCRCD will support implementation of projects, studies, and public education which have direct or indirect benefits to assist in accumulating information on stream flows on priority streams.

- Support funding to install water gaging stations on at least the major streams in the watershed, particularly those that can provide information for other streams that may not have gaging stations.

2.1.6 Creek Habitat and Flooding

While floods are very destructive to human infrastructure, flooding is a natural and is a very constructive process for stream habitats. The many positive effects of floods include scouring and deepening of pools, improved rearing habitat, the cleaning and sorting of gravels used for spawning, introduction of woody debris as structural material, and distribution of fine sediment, nutrients and seeds on the floodplain. Native plants, fish, and other organisms are adapted to these flooding events and provide long-term benefits for riparian habitats.

Existing Conditions and Assessment Conclusions

Early day flooding had serious impacts on transportation and the development of infrastructure within the Sacramento River Valley. Since flows over Shasta Dam have been regulated, the Sacramento River does not flood in the same pattern or with the same magnitude that it had previously. Currently, floods tend to be relatively infrequent and highly localized with damage occurring in well-known and expected locations. As the number and extent of the flooding has been reduced, development has extended into the areas where it was previously infeasible or impossible. One result from these changing land use patterns is that flood flow features, such as the natural levees and ox-bow lakes, are now often difficult to identify or have been modified.

Hydraulically, the Reeds Creek drainage more closely resembles a circular basin because the three major tributaries, Liza, Reeds, and Pine Creeks are approximately equal in length and join Reeds Creek about 5 miles upstream from the mouth. Because of equivalent stream lengths, flood peaks meet at

the same time and have caused serious flooding in the lower 5 miles of stream. The creek habitats of TWWA are greatly impacted by land use patterns, from expanding demographics to resource extraction.



Red Bank Creek TCRCD Staff

Management Strategy

TCRCD will support implementation of projects, studies, and public education which have direct or indirect benefits to improve creek habitat that would reduce the rapid runoff and associated flooding. Priority projects, studies, and public education include:

- Promote watershed projects that augment stream flows in the foothills by storage and retain winter flood flows to moderate the hydrograph.
- Establish baseline information on geomorphology of the streams including slope, basic channel types, extent and type of riparian vegetation, and gravel counts. Future planning and assessment strategies could include:

- Stream prioritization of major streams based on a variety of criteria including water quality, biological value, and need and opportunities for restoration;
- Stream classification according to Rosgen Stream Classification System to develop basic quantitative and qualitative knowledge of natural channel conditions; and
- Site specific geomorphic assessments including site reconnaissance, cross section surveys, sediment sampling, and determination of important geomorphic parameters, including bankfull-discharge channel geometry and flows, and sediment transport characteristics.

2.1.7 Hardwood and Conifer Forests

Forests are vital to watershed health and wildlife needs. The vast majority of the nation's threatened and endangered species have some or part of their habitat in forests. Freshwater supplies depend greatly on forested



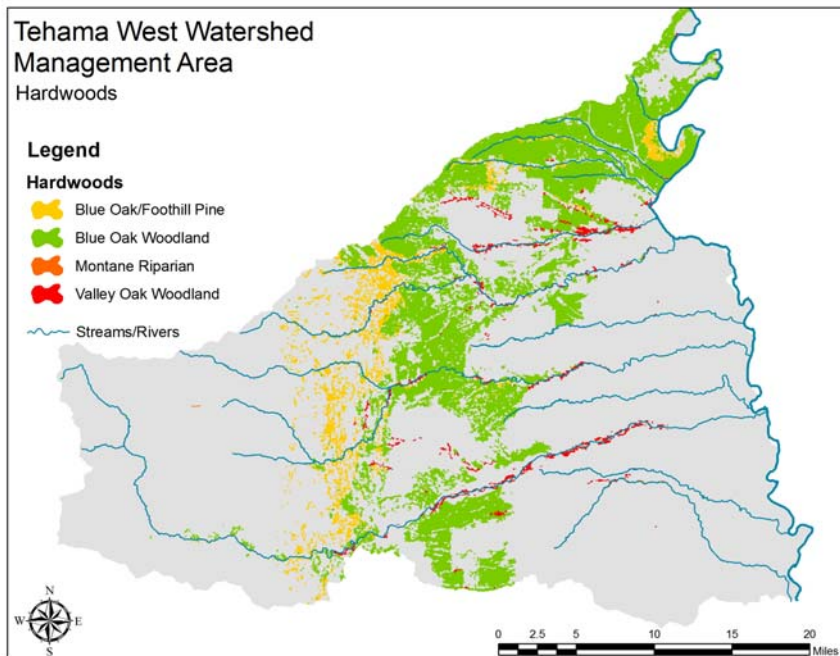
Oak habitat after oak harvest in Tehama West Watershed

landscapes to continue delivering fresh, clean, and abundant water.

Existing Conditions and Assessment Conclusions

For conifer forests, wildfire suppression and commercial timber management have caused changes in the composition, density, and mean tree size in the Tehama West Watersheds as well as the entire American West. The extent or degree of change has not been well-quantified because there is little data on forest stands prior to the period when fire suppression was well established.

Hardwood forests have been harvested for firewood, range improvement, and subdivision development, which has affected large acreage within the watershed and resulted in reduced habitat area. This has caused a reduction in the number of acres covered by oak species and a reduction in the amount of canopy cover of associated woodlands. There has also been concern regarding whether blue oaks are adequately regenerating to



replace dying trees. Failure to regenerate may also be influenced by changes in climate since 1850.

Tehama County has produced the *Tehama County Oak Woodland Management Plan* to help in management of its oak resources. Guidelines presented in the 2004 Draft pertain to fuel wood and range management projects. Some specific practices include:

- Retain at least 30 percent canopy cover in a variety of sizes and species originally present;
- Educate landowners regarding the economic benefits of maintaining oaks;
- Retain old trees with hollow limbs and boles for wildlife habitat;
- Seek management assistance from U.C. Extension and other local experts;
- Protect oaks during construction and avoid summertime watering; and
- Cluster housing to preserve wildlife corridors and habitats.

Management Strategy

The TCRCD will support implementation of projects, studies, and public education which have direct or indirect benefits to hardwood and conifer forests that would maintain the benefits that healthy forests provide. Priority projects, studies, and public education include:

- Encourage voluntary education and protection programs that assist private landowners in the management of their productive oak woodlands by promoting economic studies on the value of alternative and sustainable rangeland products, such as fee hunting, ecotourism, wild herb production, and firewood production;
- Use the resources and expertise of the Tehama County Economic Development Corporation in order to promote non-traditional, low intensity business ventures within the oak woodlands of Tehama County;
- Educate county landowners on the economic benefits of maintaining and restoring oak woodlands;
- When building within the oak woodland, encourage landowners to consider the impact of development practices on the longterm management of oaks found on their property;
- Inform private landowners regarding the value of well-managed oak woodlands;
- Educate landowners about potential threats to this resource and seek

funding that supports outreach to private landowners through the Tehama County RCD, NRCS, UC cooperative Extension, Wildlife Conservation Board, and others;

- Encourage landowners to protect oak woodlands for future generations by conserving large working landscapes with significant oak woodlands;
- Recognize sites according to landscape variables (size, shape, and connectivity to other habitats such as riparian) that support rich sustainable wildlife populations;
- Establish a monitoring program to evaluate conservation efforts;
- Encourage the Hardwood Advisory Committee to conduct biennial evaluations of the County's oak woodlands, utilizing FRAP and other appropriate data sources;
- Increase communication between land managers, ranchers, and scientists regarding the protection and management of oak woodlands;
- Encourage research on oak woodland habitats;
- Encourage studies that evaluate oak regeneration in Tehama County;
- Encourage studies that evaluate the effects of changing land uses on oak woodland's current values (wildlife, ranching, water, economics, etc.); and
- Encourage studies that provide Tehama County ranchers the ability to manage oak woodlands in a sustainable manner.

2.1.8 Fires and Fuels

Fire has long been a natural component of California ecosystems and is a critical component of a healthy and stable system. On the other hand, catastrophic wildfires can remove all vegetation, including organic materials and seeds from the soil and can create unhealthy conditions in the watershed, generating hazardous situations for those residing within the apportioned area. Fire suppression and timber/rangeland management has created changes in species composition and density. Projects designed to reduce the threat of catastrophic wildfires are a priority for watershed stability, with projects considered through fuel reduction or vegetation management.

Existing Conditions and Assessment Conclusions

Fire frequency, and its subsequent management, has had a significant effect on the landscape of ecosystems in the Tehama West Watershed. Throughout California, including the Tehama West Watershed, early Native Americans, sheepherders, and cattlemen used fire as a tool to manage

natural landscapes. Since fire suppression in the 1920s, much ground that was once open is now over-dense with brush or timber.

Forests today have undergone significant changes in species composition and structure. They now contain multi-level stands with a ladder fuel structure. Fires that occur are carried into the tree crowns by the ladder fuels. Once in the tree crowns, the fires move quickly with greater intensity. In general, the trend in fire size and severity within the watershed has increased. Recognizing fire's natural role in and effects on different vegetation types is imperative to understanding not only the different fire



management practices and policies that are implemented within the watershed, but also the potential effects to the ecosystem of total fire exclusion.

The Tehama West Watershed faces the growing problem of expansion of residential development into increasingly remote and historically fire prone areas. This area is known as the urban interface areas. These areas usually fall outside the boundaries of local fire districts and in State Responsibility Areas (SRA) that are handled by

CalFire. This adds a new complication to standard wildland firefighting tactics are shifted to include the need to protect human life and property. As such, CalFire has recognized the need to educate residents in the suburban interface areas on topics such as fuel management, proper clearance around structures, and responsible, fire safe behavior during fire seasons.

Management Strategy

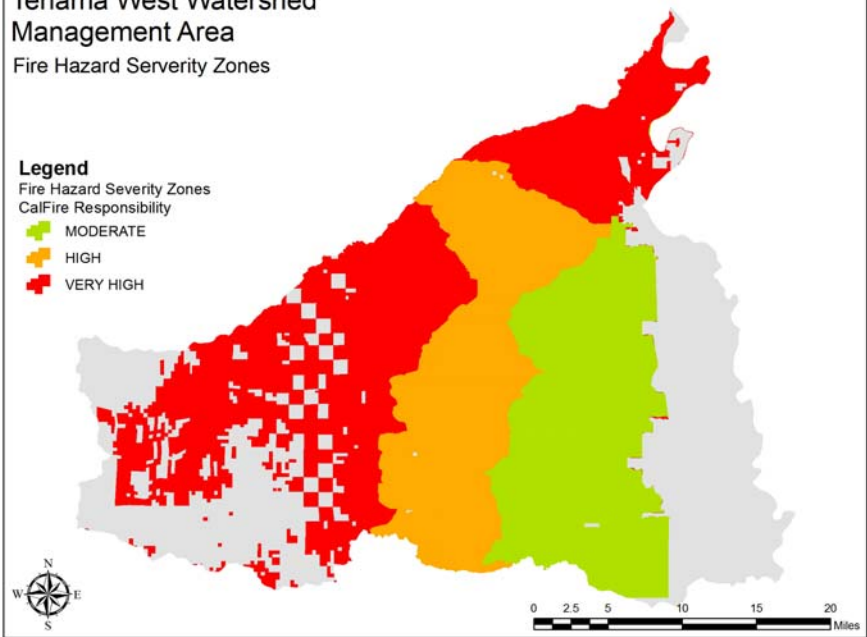
The TCRCO will support implementation of projects, studies, and public education which have direct or indirect benefits to management of the landscape concerning fire and fuels. Priority projects, studies, and public education include:

- Implement Tehama West Fire and Fuels Management Plan by
 - Supporting fuel treatment and forest health,
 - Reducing hazardous fuel loads within the Wildland Urban Interface,
 - Reducing fuel loads and improving wildlife habitat, and
 - Encouraging and supporting inter-boundary projects between private

Tehama West Watershed Management Area

Fire Hazard Severity Zones

- Legend**
 Fire Hazard Severity Zones
 CalFire Responsibility
- MODERATE
 - HIGH
 - VERY HIGH



- and public entities;
- Identify projects that result in the protection of residents and firefighters, and public and private properties;
- Public outreach; and
- Tehama County and adjoining county fire plans.



Elder Creek Watershed after a fire TCRCO Staff

2.1.9 Wetlands and Vernal Pools

Vernal pools are seasonal wetlands found on the West Coast of the United States. These shallow depressions, ranging in size from small puddles to several acres, are covered by water for short variable periods, usually from winter to spring, and usually become completely dry at some point during the year. Wetland and vernal pool habitats provide a variety of biologically diverse areas and are habitat for numerous rare and at-risk species. They provide forage for resident waterfowl and resting places for migratory waterfowl. Wetlands also are important refuges for native California plant and animal species. An inventory of wetlands and vernal pools, including the condition of these resources, would help produce a management plan encouraging the protection of these productive sites.



Vernal pool at Coyote Creek Conservation Area, Coyote Creek Watershed
TCRCD Staff

Existing Conditions and Assessment Conclusions

An example of sensitive wetlands in the TWW is the hardpan vernal pool complex found in a band from Red Bluff in the north to the Glenn County line in the south. Numerous studies have been conducted on vernal pool habitats in California by The Nature Conservancy (TNC), California Department of Fish and Game (CDFG), Natural Resources Conservation Service (NRCS) and others showing that grazing can help reduce the cover of invasive non-native species. Researchers concluded that grazing should be considered a potentially positive force for the maintenance of biodiversity in some situations. On the other hand, improperly managed grazing can negatively impact vernal pools. Disturbance can include the compaction of soils, particularly when they are wet, and excessive loss of native vegetation. In planning for grazing livestock, managers should consider the effects of grazing different livestock, season of grazing, and grazing intensity.

Vernal pools provide habitat for numerous plant and animal species. Of the 28 species of threatened and endangered plants known to occur in western Tehama County, 11 species (39 percent) are known to be strongly associated with serpentine soils, 6 species (21 percent) occur only in vernal pools, and two species (7 percent) are found in marshes and other wetlands. In other words, 19 of 28 rare plant species (68 percent) exist in habitats that are represented in only a very small percent of the watershed's lands, and, in the case of wetlands and marshes, in habitats that have been greatly reduced through historical development.

Development of commercial and residential properties, roads, utilities, and other infrastructure is likely to occur in or near existing communities and along the Interstate 5 corridor. In some cases, sensitive botanical resources lie in the path of this development. These resources include riparian plant communities, oak woodlands, vernal pool landscapes, and prime agricultural lands.

The nature and intensity of the grazing that occurred in vernal pool landscapes prior to the arrival of Europeans and domesticated livestock is unknown. The threat to vernal pool landscapes from development and other changes in land use is one of the largest threats to the Tehama West Watershed.

Management Strategy

The TCRCD will support implementation of projects, studies, and public education which have direct or indirect benefits to management of the landscape concerning wetlands and vernal pools. A discussion of priority projects, studies, and public education follows:

- Policies should be developed, and practices encouraged, that preserve and protect sufficient areas of these sensitive botanical resources so that they can continue to thrive and provide ecologic diversity in the landscape.
- Policies and practices should be developed that promote and encourage the continuation of livestock ranching in a sustainable manner. This may be achieved in part by research, education, and demonstrations that provide practical examples of livestock management that build soil fertility and diverse plant communities over time.
- Landscape management plans should be developed to meet these goals and to utilize the existing conditions of non-native vegetation and

grazing intensity that may be afforded by domestic livestock.

- Monitoring of success in meeting the landscape management goals can be used to revise and fine tune management strategies, including the timing and intensity of grazing and fire.
- Additional research should be conducted on the benefits of balanced grazing on vernal pool landscapes. Additional information on vernal pools with soils and climatic conditions similar to those found in western Tehama County would be most useful.
- Ranchers and land managers should be encouraged to develop range management plans that protect and enhance vernal pool resources. This may include educational efforts by the Tehama County Resource Conservation District, cost sharing for fencing or watering troughs from the Natural Resources Conservation Service, and other programs.
- Projects which increase capacity for wet season storage and dry season release of stored water via the hydrologic system should be encouraged.

2.1.10 Water Quality Monitoring

The chemical, physical, and biological health of water is important enough to be covered by federal legislation and state legislation. Human interaction with their environment can have a direct effect on water quality. Introduction of contaminants such as human waste or increased sediment loading have the greatest impact upon the water within a watershed. In order to determine the level and the trend of water quality, continued and expanded monitoring is needed in the TWW.

Existing Conditions and Assessment Conclusions

Demographics and land use can have a pronounced effect on water quality, not only through the addition of contaminants to surface and ground water, but also through the use and management of soil and the potential increase in sediment and nutrient loading over background levels.

California Department of Water Resources Northern District monitored nine stations on four streams within the TWW: Elder, Red Bank, Reeds, and Thomes Creeks. USGS monitored seven additional stations on three streams including Red Bank, Elder, and Thomes Creeks at different periods from 1958 to 2000.



Macroinvertebrate sampling in Thomes Creek TCRCD Staff

DWR and USGS monitoring have reported analytes that have exceeded their limits on Elder, Red Bank, Reeds, and Thomes Creeks for dissolved aluminum, dissolved iron, pH, total dissolved solids, water temperature, turbidity, specific conductance, and chloride. However, overall water quality in the watershed is good. It is recommended that further expanded studies be conducted to monitor surface and groundwater quality.

Management Strategy

The TCRCD will support implementation of projects, studies, and public education which have direct or indirect benefits to management of water quality within the watershed. Priority projects, studies, and public education include:

- Encouraging voluntary landowner participation in educational opportunities such as water quality short courses, field demonstrations, participation in citizen monitoring program activities, and distribution of water quality "fact sheets."
- Expansion of the TCRCD monitoring program;
- Collaborate with and support other water quality monitoring programs.



Algae in Red Bank Creek TCRCD Staff



Heneleyville-High Flat TCRCD Staff

2.2 Land Use

2.2.1 Invasive Species

According to the USDA's National Invasive Species Information Center, invasive species are defined as: "1) non-native (or alien) to the ecosystem under consideration; and 2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health." Invasive species are considered by some to be a serious threat to global biodiversity. Assessing the type and amount of invasive species within the watershed is critical for determining appropriate action and the components of that action. Components of appropriate action could include eradication, education, legislation, and ordinances.



Overgrown star thistle TCRC Staff

Existing Conditions and Assessment Conclusions

A group of technical experts called the California Invasive Plant Council has developed a list of plant pests specific to California wildlands. The "CalIPC" list is based on information submitted by land managers, botanists, and researchers throughout the state and published sources. The list highlights non-native plants that pose serious problems in wildlands (i.e., natural areas that support native ecosystems, including national, state, and local parks, ecological reserves, wildlife areas, national forests, BLM lands, etcetera). Plants found mainly in disturbed areas, such as roadsides and agricultural

fields, and plants that establish sparingly and have minimal impact on natural habitats are not included on the list.

In 2002 stream restoration projects for Reeds Creek and Red Bank Creek were initiated through a partnership with the TCRC, CSU Chico, Chico's Non-Native Eradication Team, and the Tehama County Agriculture Department. During the first season, 12 acres of Red Bank Creek and 8 acres of Reeds Creek were treated with the EPA aquatically approved herbicide, Rodeo™. This project has been successful, involving over 100 landowners.

Once established, invasive plants are extremely costly and difficult to remove. The control of tamarisk (*Tamarix spp.*) and arundo (*Arundo donax*) should be a priority for the watershed. The research and tools that have been developed to deal with these and other noxious weeds should be included in programs to detect and eradicate newly introduced invasive



Tamarisk in Red Bank Creek TCRC Staff species.

Management Strategy

The TCRCO will support implementation of projects, studies, and public education which have direct or indirect benefits to management of invasive species within the watershed. Priority projects, studies, and public education include:

- Mapping the extent and type of noxious weeds in the watershed and working cooperatively with adjacent watersheds in the eradication of these species;
- Educating the public, nurseries, and the landscaping industry concerning the issues surrounding the use of appropriate plantings within the watershed and county; and
- Determining the cause as well as the effect of invasive plant populations and the efficacy of current treatments and management.

2.2.2 Barriers to Fish Migration

Most fish use their habitat in many different ways, migrating seasonally within the main channel or utilizing other channels. They may migrate in order to reproduce, for nutrition and growth needs, to overwinter, or to evade predators. Barriers to fish migration consist of many factors, some of which are subject to human influence. Determining possible management strategies requires an inventory of sites to facilitate mediation of such human influences.

Existing Conditions and Assessment Conclusions

The Red Bluff Diversion Dam is the only partial barrier for fish on the Sacramento River in Tehama County. When the dam gates are lowered from mid-May to mid-September, upstream fish passage is provided by fish ladders on the east and west sides and middle portion of the dam. Some fish species (e.g., sturgeon, shad) do not utilize the fish ladders during that period and are blocked during a portion of their upstream migration period.

Inventories of human-caused physical barriers for fish in the west-side tributaries have been conducted and the California Department of Water Resources has identified three priority projects on Thomes Creek. These include: unnamed gravel mines, the Henleyville Diversion Dam, and the Paskenta Diversion Dam.

In recent years, streambed degradation downstream of the Tehama Colusa

Canal siphon crossing has caused a partial barrier to salmon that may attempt to spawn in Thomes Creek. The erosion is caused by downstream gravel mining that is removing gravel faster than can be naturally replaced. In addition, flood control levees and bank protection projects have significantly altered the lower reach of Thomes Creek.

In addition, the Corning Canal siphon crosses Elder Creek just west of Interstate 5, approximately 4 miles from its mouth, and creates a barrier to migrating Chinook salmon attempting to spawn in that tributary during low to moderate flow conditions. The blocking of adult fall-run Chinook salmon by the Corning Canal siphon has been observed on several occasions since 1970.

Field collaboration between the CDFG and Crane Mills has identified an anadromous fish barrier on Thomes Creek, approximately 10 miles upstream from Paskenta. It is not known if natural barriers in other streams in the assessment area have been identified.

Road crossings and infrastructure features frequently block fish migration. The effects of diversions, gravel mining, and obstructions for fish have not been quantified, but the USFWS's Anadromous Fish Restoration Program has an ongoing program to prioritize and screen Central Valley diversions to protect fish.

Given the characteristics of the Tehama West drainages and their limited historical fishery values, it is likely that any efforts toward salmonid habitat restoration will be considerably lower in priority than for many other streams in the Sacramento River drainage. Regardless, NOAA Fisheries has stated that the lower reaches of the Tehama West drainages are critical habitat for Chinook salmon and steelhead, and efforts should be made to improve the stream's habitat potential.

Management Strategy

The TCRCO will support implementation of projects, studies, and public education which have direct or indirect benefits to management of fisheries habitat concerning barriers to migration within the watershed. Priority projects, studies, and public education include:

- Inventory physical barriers, aggregate mining, and unscreened agricultural diversions as possible barriers to fish passage, particularly in Thomes Creek and Elder Creek.

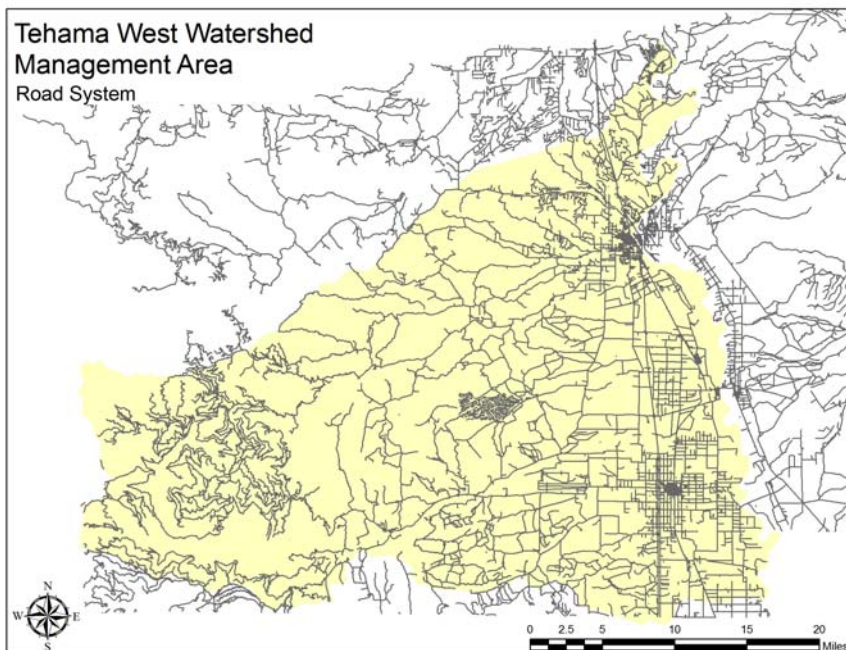
2.2.3 Builtup Land—Road Evaluation

Built-up lands consist of housing, roads, mines and quarries, and any other facilities related to human activities, and are generally impervious features on the landscape.

A healthy watershed that is allowed to function properly is important to water quantity and quality. The use of roadways and trail systems, whether authorized or unauthorized, can affect the proper functioning of any watershed. An inventory of roadways and trails, particularly those with soil or gravel surfaces, is necessary to determine their contribution to the function of the watershed.

Existing Conditions and Assessment Conclusions

Roads remain major contributors of sediments in the watershed. Roads can also create significant watershed perturbations by channel impingement and increased sediment supply, leading to bank instability and sedimentation (i.e., sediment deposition and reduction of dominant substrate sizes within the channel). Failure of road crossings, particularly culverts, can cause



disturbances including bed and bank erosion and change in channel course. Ungated roads may also promote erosion by allowing vehicles into areas that should be closed seasonally because of sensitive conditions.

Grassy fuels found along roadways at lower elevations can present a fire threat within this zone. These fuels are often located where the threat of human caused ignition is greatest, such as in developed areas and along major roads. Activity along roads (e.g. equipment use, vehicle exhaust, and smoking) has been the leading cause of vegetation fires from 1994 to 2004.

Management Strategy

The TCRCD will support implementation of projects, studies, and public education which have direct or indirect benefits to proper development and maintenance of roads, paved and unpaved, within the watershed. Priority projects, studies, and public education include:

- Assess the effects of storm water runoff and non-point source pollution, especially along roads in developed areas;
- Conduct a road evaluation, particularly of dirt and gravel surfaces, as a contributor to soil erosion, particularly unauthorized OHV roads/trails; and
- Work with the County concerning road construction on private property and construction/maintenance performed by Tehama County Public Works.

2.2.4 Rangelands

Rangelands are diverse ecosystems that produce an equally diverse array of tangible and intangible benefits. Tangible products include forage for grazing and browsing animals, wildlife habitat, and water quantity and quality, which are important economic goods. Intangible benefits consist of public trust issues such as open spaces and quality of life improvements derived from those uncrowded places.

Existing Conditions and Assessment Conclusions

Within the watershed boundaries, the most important industries are related to agriculture and grazing. With over half of the watershed covered by grasslands and oak woodlands, this is an area historically devoted to rangeland. Fires in this type of vegetation can move quickly and cover large areas. As the population of Tehama County grows, urban areas are being stretched and pushed outward into these traditional rangelands.



Livestock in Tehama West Watershed TCRC Staff

The effects of early-day, unrestrained livestock use of rangelands led to increased federal actions to address the problems. Many range improvement programs were initiated during the period from 1934 to 1944. Additional water sources were developed in dry areas, which allowed greater dispersal of livestock. Livestock grazing has likely affected hardwood regeneration, and aggressive, non-native weeds have been introduced that have likely reduced the extent of many of the oak woodland habitats.

How grazing is managed can affect watershed systems in various ways. In many cases grazing contributes to open space and the maintenance of annual grassland and vernal pool landscapes. Grazing of livestock can be done in a manner that provides long term protection of Tehama County's soils, vegetation, and other sensitive resources such as vernal pools.

Management Strategy

The TCRC will support implementation of projects, studies, and public education which have direct or indirect benefits to proper management of the rangelands within the watershed. Priority projects, studies, and public

education include:

- Develop policies and practices that promote and encourage the continuation of livestock ranching in a sustainable manner, which might be achieved in part by research, education, and demonstrations that provide practical examples of livestock management that build soil fertility and diverse plant communities over time;
- Evaluate the effectiveness of TNC Lassen Foothills Vina Grassbank project to determine if a similar project would assist Westside landowners in improving grassland ecosystem;
- Inventory non-native grassland impacts and develop techniques for re-establishment of healthy grasslands—specifically, develop control strategies for cheatgrass and medusahead and provide funding support for control efforts;
- Evaluate additional opportunities to provide off-stream water sources for livestock and to provide fencing for protection of sensitive riparian areas to improve water quality;
- Offer livestock and small animal operators increased opportunities to participate in voluntary cooperative water quality short courses to help livestock operators understand the possible sources of livestock impacts to water quality; and
- Continue to partner with agencies and landowners to improve vegetation conditions concerning habitat quality and quantity through invasive species control and grazing management.



Off stream livestock water development on Brannin Creek Ben Myrhe

2.2.5 Vegetation Monitoring—Health

The vegetation of the Tehama West Watershed has changed significantly since the arrival of the first European settlers. Change is mostly reflected in the alteration of plant species composition, diversity, and density. There are three major factors that may have contributed to the current condition: the introduction of non-native plant species, intensive grazing by imported livestock (especially during the early history), and radical alteration of the pre-existing fire regime. To a lesser degree, timber management, water management, and agricultural and urban development have also resulted in change.

Existing Conditions and Assessment Conclusions

Development of commercial and residential properties, roads, utilities, and other infrastructure is likely to occur in and near existing communities and

HABITAT TYPES AND NUMBER OF SPECIES IN THE WATERSHED

Type	Total Number of Species
Vernal Pools	12
Serpentine Soils	31
Chaparral (nonserpentine soils)	15
Conifer Forests	12
Mesic (bogs, riparian areas, meadows, etc, but not vernal pools)	23
Grasslands	6
Miscellaneous (rock outcrops, rocky streams, etc)	6

along the Interstate 5 corridor. In some cases, sensitive botanical resources lie in the path of this development. These resources include riparian plant communities, oak woodlands, vernal pool landscapes, and prime agricultural lands.

Management Strategy

The TCRCDD will support implementation of projects, studies, and public education which have direct or indirect benefits to proper management of habitat for native vegetation and especially those species listed as listed

threatened or endangered on either the State of California or Federal endangered/threatened plant list. Priority projects, studies, and public education include:

- Work to preserve rural and open space within the Tehama West watersheds, which will contribute to the preservation and enhancement of threatened or endangered species.

2.2.6 Commercial/Residential Water Use

Water is a significant and critical natural resource. Demand for water continues to grow from within and outside the watershed, from various users, including agricultural, commercial, and residential, with the greatest increase coming from residential users. In order to provide for continued increases in demand for water, various conservation measures should be investigated.

Existing Conditions and Assessment Conclusions

Water use history in the watershed has a direct correspondence to population and economic growth, development of regional water storage and supply projects, and water supply pricing and reliability.

A Water Inventory and Analysis of water use in Tehama County was conducted by the Tehama County Flood Control and Water Conservation District in 2003 (CDM 2003). In this analysis, the county was divided into numerous inventory units. The inventory units encompassing the Tehama West Watershed include all of the Red Bluff East and Red Bluff West inventory units, and portions of the Corning East, Corning West, Bowman, and Mountain Region West inventory units.

Currently, groundwater is the primary water supply in the Tehama West Watershed, and because surface water supplies are unpredictable and limited, future growth in the region and water demand during drought conditions will depend on the continued availability of groundwater. Recognizing the importance of groundwater in the county, the Tehama County Flood Control and Water Conservation District has been authorized as a groundwater management agency to develop a comprehensive groundwater management plan. The overall purpose of the plan is to: 1) prevent long-term overdraft of groundwater, 2) provide a reliable long-term water supply, and 3) protect groundwater quality.

Management Strategy

The TCRCD will support implementation of projects, studies, and public education which have direct or indirect benefits to proper management of the water resources, related to surface and ground water. Priority projects, studies, and public education include:

- Educate the public, private water users, and nursery and landscape professionals concerning water conservation issues through various means such as a Green Gardener Program and performance of water audits.

2.2.7 Agricultural Water Use and Management

Efficient use of water is crucial, no matter what segment of land use is being utilized. In agriculture, proper use of water reduces waste and runoff, thereby decreasing the need for counter measures against tail-end irrigation tail water problems.

Existing Conditions and Assessment Conclusions

The history of agricultural development in Tehama County has documented gradual changes in the source of irrigation water. In the early days of European settlement, surface water was primarily used to irrigate fields in Tehama County. In the 1970s two-thirds of irrigation water used in the county came from surface sources. Currently, groundwater is the primary water supply in the Tehama West Watershed, and because surface water supplies are unpredictable and limited, future growth in the region and water demand during drought conditions will depend on the continued availability of groundwater. Recognizing the importance of groundwater in the county, the Tehama County Flood Control and Water Conservation District has been authorized as a groundwater management agency to develop a comprehensive groundwater management plan. The overall purpose of the plan is to: 1) prevent long-term overdraft of groundwater, 2) provide a reliable long-term water supply, and 3) protect groundwater quality. Unfortunately, the majority of the groundwater used in the county is extracted by independent users, not organized districts, for agricultural purposes.

RWQCB Irrigation Discharge Requirement

The Regional Water Quality Control Board (RWQCB) requires landowners/operators discharging irrigation tailwater into waterways to apply for a waste discharge permit or seek coverage as part of a watershed wide

coalition. For the Tehama West Watershed, the Sacramento Valley Water Quality Coalition (SVWQC) was organized to ensure compliance in meeting the requirements of the RWQCB.

Management Strategy

The TCRCD will support implementation of projects, studies, and public education which have direct or indirect benefits to proper management of the rangelands within the watershed. Priority projects, studies, and public education include:

- Provide mobile irrigation lab assessments for county farmers and ranchers who would benefit from determining appropriate irrigation practices;
- Increase irrigation use efficiency and dedicate water savings to instream flow purposes;
- Mitigate irrigation discharge directly into watercourses, thereby reducing nutrients, bacteria, and increased water temperatures; and
- Encourage local participation in the California RWQCB Irrigated Lands Regulatory Program, with minimal cost to irrigators and with compliance through one program addressing all possible farm/ranch water quality concerns.

2.2.8 Land Conversion

Land use conversion affects both the amount and spatial pattern of affected habitat, which in turn can alter the ecological function and future development of remaining lands. Fragmentation of habitat and migration corridors also results from land use conversion, making these areas inhospitable for wildlife. Beyond the ecological and management effects, these changes can also lead to social conflict. Even as Tehama County revises its General Plan, agricultural lands and rangelands will continue to remain under development pressure. Landowners need options and agricultural commodities that will help them maintain their economic vitality in order to withstand expansion pressures brought on by urbanization.

Existing Conditions and Assessment Conclusions

In 1980, the California Department of Conservation, Division of Land Resource Protection, began work to supplement the Soil Conservation Service (SCS) conservation programs through a Farmland Mapping and Monitoring Program (CDC, 2001). This program, designed to inventory important farm and grazing lands in the form of important

Farmland Series maps, became California Law in 1982. Its purpose is to monitor conversion of the state's agricultural land to and from agricultural use and to report concerns to the Legislature, local government, and the public.

Farmland and rangeland are precious commodities in Tehama County. Temporary and permanent programs help provide landowners with incentives to keep their agricultural lands in production and prevent conversion to urban uses. Temporary programs, such as the Williamson Act, help provide property tax reductions to landowners with enrolled properties. Permanent protection can be found through conservation easements. An agricultural conservation easement maintains a property's agricultural focus by restricting residential or commercial development.

Management Strategy

The TCRCDD will support implementation of projects, studies, and public education which have direct or indirect benefits to proper management of the rangelands within the watershed. Priority projects, studies, and public education include:

- Promote and focus on land conversion concerns, looking at economic opportunities such as conservation easements of agricultural and rangelands;
- Promote the open space and agricultural nature of the landscape, with emphasis on habitat quality and quantity;
- Promote the TCRCDD as the "go-to" organization for technical assistance concerning natural resource issues; and
- Assist with creation, development, and implementation of legislation and local ordinances.

2.2.9 Carbon Sequestration & Alternative Energy Sources

Global climate change caused by greenhouse gases is headline news at this time. Whether agreement concerning climate change is human caused or not may never be settled in the near future. What can be stated is that there is continued increase in atmospheric carbon dioxide. There are also other opportunities to use agricultural waste and other natural resources of Tehama County. Considering this, an opportunity arises for land owners to grow plants that act as carbon sequestrators, removing carbon dioxide from the atmosphere and storing the carbon in the plant material. Using agricultural waste and other natural resources as alternative energy sources, may possibly improve the air quality of the county, too.

Existing Conditions and Assessment Conclusions

Vegetation patterns are shaped by the ecological forces at work in a region. Climate, topography, soil, and the frequency of natural disturbance such as fire, and human management are all driving factors that affect how vegetation is distributed on the landscape. Unfortunately, patterns in nature are rarely an unchanging picture. Individual trees grow and die. Fires and other natural calamities periodically result in instantaneous change to entire forests. In this sense, the mosaic of vegetation types (e.g., conifer forest, sagebrush, aspen, etc.) constantly changes with time. To give an example, a mere 12,000 years ago, glacial ice covered great portions of California. On a time scale closer to one in which we live, we can use ecology to describe the range of variability in vegetation patterns, and the trend of change in a place. Tree ring and glacial records show that as recently as 1760 to 1820, California experienced an extensive period of drought unparalleled anywhere in the past 2,000 years.

Plants tend to grow in areas where climate and soil are favorable to their these habitats have been greatly reduced and fragmented. On the other hand, wildlife species that require habitats that have not significantly changed during the past 150 years probably have not been seriously affected.

The restoration of degraded wildlife habitat is important, as well as the protection of existing high quality or unique habitats. With the information available at this time, a statement regarding which habitats have been degraded and their degree of degradation cannot be made, other than to say that riparian habitats certainly have been severely affected by development and agriculture. In addition, given the available information about existing habitats, the location and status of high quality or value habitats can only be identified in a general manner. Identification of unique or uncommon habitats in the Tehama West area can be done reasonably well with GIS because of the ability to classify all vegetation using satellite imagery. The wildlife inventory has shown that habitats known to harbor a large diversity of wildlife species, including wetlands and riparian habitats, are very uncommon within the drainage and those that still exist likely harbor many rare or at-risk species.

The Tehama West Watershed would benefit from an inventory of the most valuable habitats and habitat features in the county. These include habitats specific needs. There are often a wide number of plants that have similar

preferences or requirements and consequently are often found together. This mixture of species commonly existing together is known as a plant community. Existing plant communities within the Tehama West Watershed have been classified by CALVEG and linked to Wildlife Habitat Relationship (WHR) habitat types. Although numerous vegetation mapping systems exist, the CALVEG system was selected for this watershed assessment because of the level of detail that it provides, its correlation to databases available with coverage on a statewide basis, and because of the relationship between these vegetation types and wildlife habitat functions.

Management Strategy

The TCRCDD will support implementation of projects, studies, and public education which have direct or indirect benefits to proper management of the rangelands within the watershed. Priority projects, studies, and public education include:

- that support a high diversity of species, are uncommon or widely scattered, or are at risk of degradation. Until more is known about the wildlife in the watershed, these likely will include oak woodlands and riparian areas, vernal pool landscapes, caves, and cliffs.

Those vegetation communities and localized habitats that are rare or uncommon and which contribute disproportionately to the watershed's habitat values should be identified wherever possible so that if opportunities arise, they can be acquired by the state or federal government or can be protected by conservation easements. Collecting data regarding the current conditions will allow a future determination regarding changes that occur over time and regarding habitat quality trends.

- Develop a carbon sequestration plan and assist landowners in attaining outside support.
- Support the redirection of agricultural waste to co-generation plants instead of burning onsite.

2.2.10 Wildlife Habitat Appraisal

Wildlife requires contiguous tracts of land as buffers and wildlife corridors. An inventory of wildlife occurring in the TWW and the habitats required for sustainability of their populations is needed to properly manage land use and consider appropriate, acceptable changes.

Existing Conditions and Assessment Conclusions

The overall history of the watershed and the known or suspected historical changes to vegetation communities have altered the patterns of the landscape in providing wildlife habitat. Wildlife populations are particularly dependant upon changes to the vegetation. The historical changes to vegetation have undoubtedly affected wildlife populations in the Tehama West Watershed.

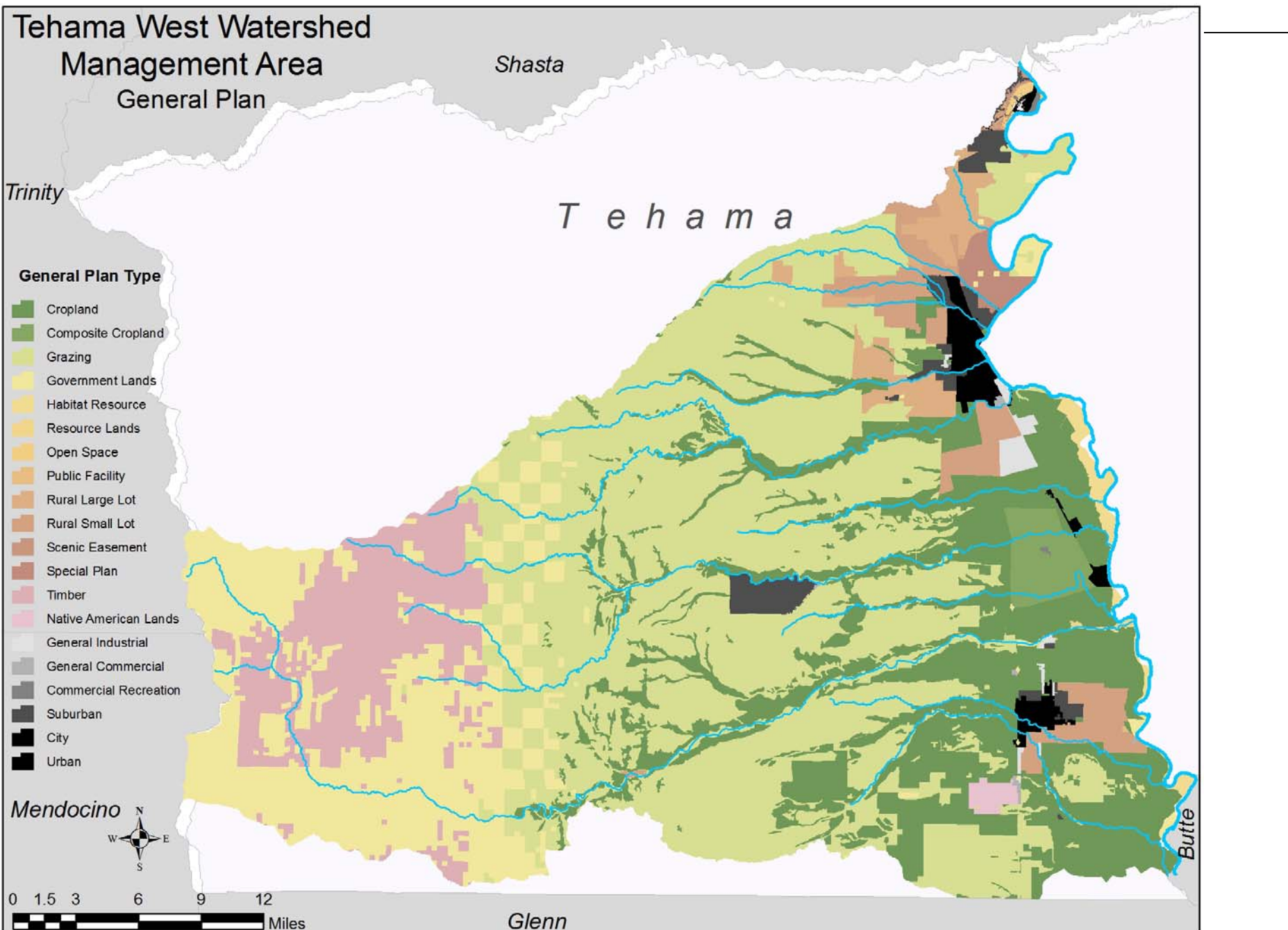
In general, the greatest historical impacts have been to wildlife species that require specialized habitats ("niches") that have been altered. Examples are the wildlife species requiring vernal pool, valley oak, or riparian habitats, as GIS can be used to analyze habitat characteristics in a manner and at a speed that no other technology can match. Habitat edge, while considered by biologists to be very valuable for many wildlife species, is rarely quantified or evaluated over time. For some species, it is suspected that habitat fragmentation, a process that increases edge, may be detrimental. It is possible to use habitat inventories and existing habitat mapping data to determine edge or habitat continuity metrics and to periodically re-assess and determine trends. This could be incorporated with wildlife surveys geared toward answering the question of how habitat fragmentation affects various wildlife species.

While a comprehensive inventory of wildlife species throughout the watershed is probably not possible, it can be done for a variety of high-value habitats. As in the case of a habitat inventory, these data should help planners understand future trends and help prioritize habitat protection and restoration efforts.

Management Strategy

The TCRCDD will support implementation of projects, studies, and public education which have direct or indirect benefits to proper management of the rangelands within the watershed. Priority projects, studies, and public education include:

- Appraise habitat in the watersheds, particularly across watershed boundaries, by addressing wildlife requirements for large home range needs, by assessing wildlife needs, and by surveying animal numbers.
- Promote Farm Bill programs such as WRP, CRP, CSP and EQIP through technical and financial assistance, community education, and outreach. Activities will emphasize habitat values and provide options for habitat enhancement and preservation.



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Appendix

Tehama West Projects Completed

319(h) Grant

1998 – 2002

Funded by: State Water Resources Control Board

The 319 contract of the Tehama County Resource Conservation District (TCRCD) has been a very productive project. All tasks, and more, have been completed. We have built a base of landowner participation through stakeholder meetings, workshops and demonstration projects. Instead of forming a landowner based watershed group, the landowners have been content to have TCRCD represent their concerns. This indicates that the watershed residents view TCRCD itself as a landowner-based group, and trust that the projects TCRCD will pursue in the future will be of benefit to them and the resource base. TCRCD plans to continue to hold stakeholder meetings on their own in the watersheds until receiving further funding. One of the most positive outcomes of this contract is that it has provided the opportunity for TCRCD to apply for and receive a number of additional project grants. This has allowed the RCD to increase its capacity and to develop a presence in the county, through offering 14 stakeholder meetings were held, more than the required number.

The demonstration projects were very rewarding. Seven projects were completed when three were required. All of the projects will be useful demonstrations of low-cost techniques that other land managers can use. All of the landowners are enthusiastic about their projects and are very willing to have people view them. The youth education project was installed at Reeds Creek School, a very small school of less than 100 students in grades K-8, with a correspondingly small staff. They installed a greenhouse and fenced off a demonstration planting area. To incorporate the use of these structures into their science curriculum will take time. TCRCD will continue to work with them to make the best use of their new outdoor areas.

Prop 204 Grant

2000 - 2003

Funded by: State Water Resources Control Board

The Tehama County Resource Conservation District (TCRCD) Proposition 204 Contract No. 9-167-250-0, "TCRCD Landowner Assistance Program," where the Watershed Coordinator was assigned to the project, made numerous presentations, developed educational materials, and wrote newspaper articles about Tehama County watershed related issues. The Watershed Coordinator also was able to assist several landowners in conservation planning and monitoring their land, host meetings and workshops and attend meetings of local watershed groups. One of the most valuable outcomes of this project however, is the grant funding that was received during the execution of the contract. These grants helped not only TCRCD in meeting its goals and objectives, but will also bring much needed project funding to the southwestern watersheds of Tehama County. These watersheds have heretofore been neglected by funding agencies, but they have potentially serious water quality issues in need of attention.

Citizen's Monitoring

2001 - 2003

Funded by: State Water Resources Control Board

This project involved landowners in assessing watershed conditions of Reeds and Red Bank Creek.

Feasibility Study

2001 - 2003

Funded by: US Forest Service

This project studied the feasibility of using small diameter poles (waste wood material) for recreation play structures. Titled "Feasibility Study for Recreation Structures: Small Wood Utilization," this report provides opportunities for material that would either go to waste or remain in the forest as a fuel hazard. Small roundwood is a significant contributor to fuel loading in over-stocked coniferous timber stands. The specific product size constraints were stump diameter ranges from 4 to 8 inches. The study demonstrates an opportunity to use this material in the construction of recreational and garden landscape structures. Within the report, a description of product design, manufacturing, and marketing aspects were developed. The intent of the report was to provide a planning document to entrepreneurs that would lead to the establishment of a small business, converting wood waste away from a fire hazard into a commercially viable product.

Conservation Easement

2002 - 2003

Funded by: Trust for Public Land

The Trust for Public Lands provided funding for the Tehama County Resource Conservation District (TCRCD) to develop a conservation strategy for an area around the Coyote Creek Conservation Area (CCCA) in western Tehama County, a region with many vernal pools. TCRCD partnered with local staff from The Nature Conservancy (TNC) and the Geographical Information Center (GIC), a subsidiary organization of the California State University, Chico Research Foundation and the Natural Resources Conservation Service (NRCS) to carry out the project.

The CCCA was set aside under an enforcement case brought by USEPA against Simpson Timber Company for unauthorized deep ripping of a 10,000-acre vernal pool landscape when the company was establishing a eucalyptus plantation south of the CCCA. USEPA is interested in protection of an approximate 10,000-acre area surrounding the 2,895-acre CCCA. The scope of this project included: identifying and mapping key properties with GIS, developing a conservation strategy for the area which will include a strategy for contacting landowners with possible interest in selling conservation easements on their property, working with local landowners to further their interest in conservation and their potential participation in conservation actions.

Mobile Irrigation Lab

2002 - Continuing

Funded by: Bureau of Reclamation/California Department of Water Resources

This project provides irrigation water management assistance to growers in Tehama County through a mobile irrigation lab. Knowing when and how much water needs to be applied is a major component of water management on the farm or ranch. Successful irrigation scheduling and application depends on the performance of the irrigation system. Based upon distribution uniformity, the mobile irrigation lab measures how well the water is being applied across the field. Once the farmer/rancher has the knowledge of the system's performance, he can then plan accordingly.

The Northern Sacramento Valley Mobile Irrigation Lab (NSVMIL), operated by Tehama County Resource Conservation District, provides this service, free of charge to anyone in Butte, Glenn, Shasta or Tehama County. So far, the NSVMIL has conducted over 200 evaluations, covering over 7,500 acres. These evaluations have been performed on everything from residential landscapes to walnuts, prunes, grapes, olives, figs, blueberries, and pasture.

CCCA Monitoring

2002 - Continuing

Funded by: Red Bluff Farms

The project provides for the monitoring of residual dry matter (RDM) after grazing season, as well as monitoring of vernal pool species composition and condition.

Tehama West Fire Plan

2003 - 2005

Funded by: US Forest Service

Project prepared a fire plan for the watersheds of Western Tehama County. The plan identified fire risks, assessed at risk of fire as well as mitigation measures that reduces the threat of catastrophic wildfire. In order to make a fire safe community, the needs of fire management require the identification, prioritization, modification, and improvement of the perceived hazards concerning wildland fires. The product to accomplish this task included a planning document and Geographic Information Systems analysis describing the public and private assets at risk. Through the planning process, fire safety, fire management, and fuels modification projects currently in place were identified, described and cataloged. Gaps in protective measures were also identified, along with additional project work proposals.

Based upon the objectives of the study, a priority list of projects were identified using the following criteria: 1) projects that provide immediate and direct impact on the threat and intensity of wildfires such as fuel breaks and fuel reduction projects; 2) projects that result in improvements to fire fighting and fire protection infrastructure including access for fire fighting forces, safe conduit for residents, water storage facilities and water delivery systems and up-grades; 3) projects that involve regulatory matters such as changes in laws, ordinances, and codes that relate to fire safety and fire management; 4) projects that formally classify a number of small communities as officially recognized communities at risk and identify these communities' Wildland Urban Interface areas; and 5) projects that entail planning, such as development of a fire plan for western Glenn County along with large scale fire plans for various local communities.

319(h) Grant

2003 - 2006

Funded by: State Water Resources Control Board

The specific water quality problems addressed by this project are the high sediment load being delivered to the Sacramento River by the tributaries on the west side of Tehama County, and the severely degraded conditions occurring in these tributaries. However, the larger problems addressed by this project are the lack of landowner and resource agency involvement in, and the lack of information about these sub-watersheds. These watersheds do not contribute significant anadromous fish habitat, and as such have received little attention from resource agencies or from residents. There are no active landowner groups in these sub-watersheds and there are no comprehensive assessments of them, and yet they have significant water quality problems, and therefore have a considerable negative impact on the Sacramento River.

The goal of the project is to engage landowners and other stakeholders in topics and activities that have the potential to increase the health and functioning of the watersheds through stakeholder meetings, workshops and demonstration projects. Through the efforts of the Tehama County Resource Conservation District (TCRCD), with the assistance of funding from this project, education about the topics and activities in the watersheds have been provided to 305 people at stakeholder meetings and 908 people at workshops; education about watersheds has been presented to over 2,000 students through involvement with Reeds Creek School and the Students and Landowners Watershed Stewardship (SLEWS) program and through TCRCD's involvement with 2 years of "Farm Day", "Education Day" and "Career Day" at the Tehama County Fairgrounds; 12 demonstration projects have been funded with private landowners in the watersheds, and 627 acres and 16.7 km of stream channel of *Tamarix* and *Arundo* have been treated in Reeds and Red Bank Creeks.

In addition, TCRCD staff has been successful in seeking funding from other sources to expand on the work of the Westside Watershed Enhancement Program. To date, TCRCD has completed the Tehama West Watershed Assessment and the Tehama West Fire Plan and has begun a contract to complete a Tehama West Watershed Management Plan. Along with funding for a part-time watershed coordinator, the funds for these additional Tehama West projects total nearly \$650,000.

containing the proposed project area are currently in the process of attaining mitigation banking rights for vernal pools. Once approved, this allowed land use will be continued into the foreseeable future. Conversely, the property surrounding the project site and its associated land is characterized by an extreme lack of diversity. The 16,000 acres surrounding the project area are planted with a monoculture forest of *Eucalyptus*. Thus, the project area will become an oasis of naturally occurring flora and fauna, where minimal alteration of the landscape will occur.

Tehama West Watershed Assessment 2004 - 2006

Funded by: State Water Resources Control Board

The project prepared a watershed assessment for western Tehama County, which identified the physical, biological, and human processes and features found within the assessment study area. The assessment process also involved the development of Geographic Information Systems (GIS) data layers which allow for the visualization of environmental conditions as well as a database of written and statistical information pertaining to the watershed.

The mission of the Tehama West Watershed Assessment was to gather and integrate existing information on the physical, cultural, and demographic variables that characterize the section of Tehama County west of the Sacramento River (excluding the Cottonwood Creek Watershed). This includes both the past and present information available. It is therefore primarily an existing conditions report, to be used as an educational tool to help guide residents and stakeholders in prioritizing future watershed projects. The assessment is considered to be the first step in accumulating known knowledge of existing conditions within the watershed ecosystem.

American Forests Oak Planting 2007 - 2008

The Tehama West portion of the American Forests project provided an opportunity to continue certain work already completed but where objectives had not been completely met. Located approximately six miles due west of the City of Corning, the project site is approximately 20 acres of riparian and associated uplands of an active cattle ranch with Brannin Creek running through the site. The riparian area was fenced by the owner/operator with financial assistance from TCRCD through one of its 319(h) projects and now excludes livestock from accessing the creek.

Together with the assistance of the landowner/manager, local students and adult volunteers contributed their time and expertise to this project. In the fall of 2007, over 1,000 acorns were planted. Protection of oak seedlings was provided by the use of BLUE-X Treeshelters. When used at the seedling stage, field studies of Treeshelters have documented increased growth rates averaging 100-150%, with certain species exceeding 500%. In addition, newspaper was placed over the tree tube to act as a weed mat to reduce competition for moisture.

Additional factors adding to the benefits of this planting opportunity relate to the land use of the surrounding property. The owners of the property containing the proposed project area are currently in the process of attaining mitigation banking rights for vernal pools. Once approved, this allowed land use will be continued into the foreseeable future. Conversely, the property surrounding the project site and its associated land is characterized by an extreme lack of diversity. The 16,000 acres surrounding the project area are planted with a monoculture forest of *Eucalyptus*. Thus, the project area will become an oasis of naturally occurring flora and fauna, where minimal alteration of the landscape will occur.





The Tehama West Watershed TCRCD Staff

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