

Tehama East Watershed Management Plan

Prioritizing Management Actions to Improve Watershed Conditions



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Watershed Introduction

On landscape scales, 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 watershed approach to management became an important tool during the late 1980s, when interested individuals and agencies started to plan on a watershed delineated basis. Utilizing the expertise of stakeholders, actions were developed using rigorous science and suitable technology. Characterizing the watershed's existing conditions, identifying and prioritizing problems, and defining objectives, provides a process which is documented within a watershed management plan.

The Tehama East Watershed Management Plan is an action document resulting from the evaluation of the Tehama East Watershed Assessment (TEWA 2010), which provides the necessary background information on existing conditions within the watershed. The watershed assessment project was funded through a grant from the California Department of Water Resources through the CalFed Watershed Program. Many other contributions from state, federal, and private sources have made the assessment possible. The 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 and from additional interviews and written comments, conclusions and recommendations were reached concerning possible improvement activities. Further comments concerning this management plan will also provide input and implementation of projects in the future.

Guidance and assistance addressing the conclusions and recommendations were provided by the Technical Advisory Committee (TAC) members consisting of individuals from private industry and public agencies, together with 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, while 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

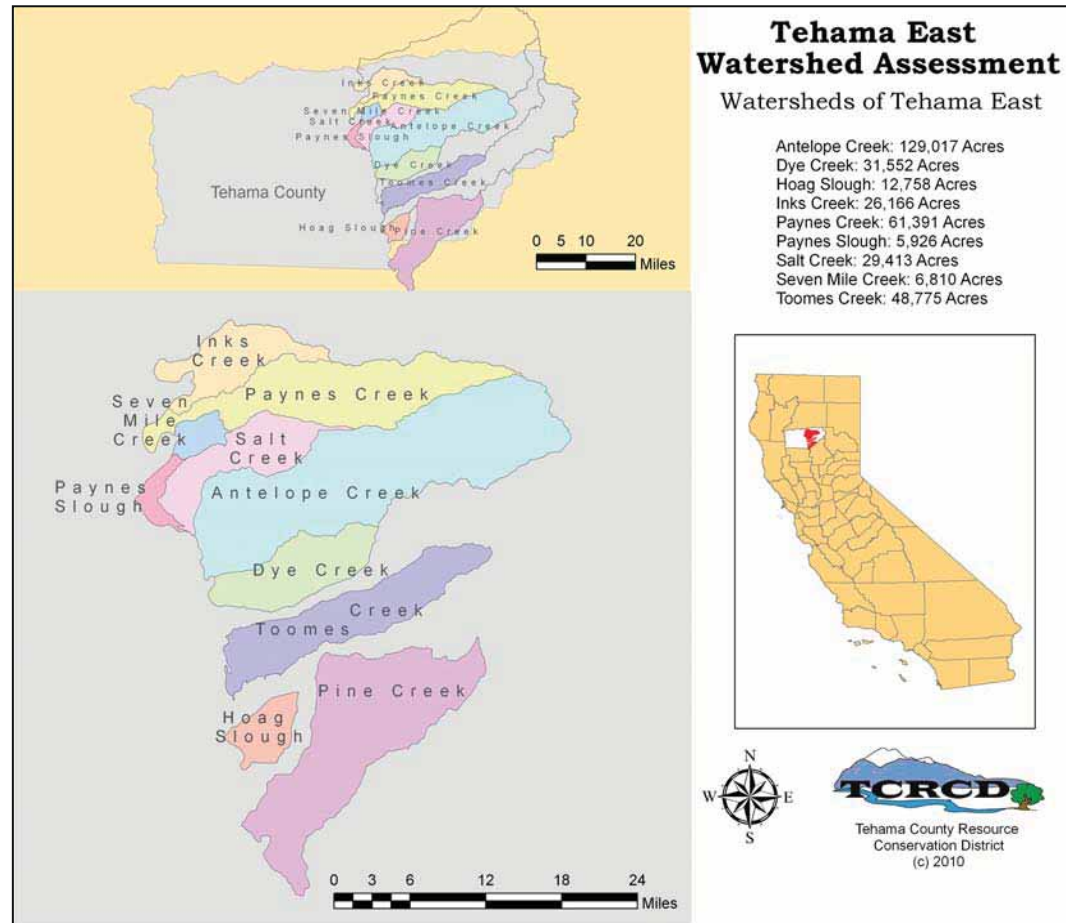
producers, and government agencies of Tehama County. These include:

- 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; and
- Providing education services, materials, and workshops for students, teachers, and adults throughout Tehama County.

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 nonvoting Associate Directors, appointed by the District's Board of Directors. The board members are all local landowners 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 TCRCD 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.



Map 1. Watersheds of Tehama East Watershed Assessment

Tehama East Watersheds

The Tehama East Watersheds are located in northern California along the eastern edge of the Sacramento Valley. To the north, they are bordered to the north by the Battle Creek watershed, by Butte County to the east and south, and by Plumas County to the east, while the Sacramento River to the west terminates the flow of these water courses associated with the Tehama East Watershed Assessment. The general acreage of the watersheds is shown in Table 1-1. The Tehama East Watersheds encompass 441,769 acres and are comprised of Antelope Creek watershed, Dye Creek watershed, Hoag Slough

watershed, Inks Creek watershed, Paynes Creek watershed, Paynes Slough watershed, Salt Creek watershed, Seven Mile Creek watershed, and Toomes Creek watershed (See Map 1, or the Tehama East Watershed Assessment Atlas). Not included in this survey are Battle Creek watershed, Deer Creek watershed, and Mill Creek watershed. The reason for this exclusion is that those watersheds have had extensive analysis in the past and are represented by organized interest groups, including the Battle Creek Watershed Conservancy, the Deer Creek Watershed Conservancy, and the Mill Creek Watershed Conservancy.

Table 1. Tehama East Watersheds

Watershed	Total Acres	% of Total
Antelope Creek	129,053	29.2
Dye Creek	31,591	7.2
Hoag Slough	12,764	2.9
Inks Creek	26,179	5.9
Paynes Creek	61,410	13.9
Paynes Slough	5,928	1.3
Pine Creek	89,788	20.3
Salt Creek	29,426	6.7
Seven Mile Creek	6,812	1.5
Toomes Creek	48,818	11.1
Total	441,769	100.0

Moving up the watersheds eastwardly, the topography of the Tehama East Watersheds ranges from relatively flat plains along the floor of the Sacramento Valley to the mountainous upper reaches.

Many of the watersheds of Tehama East are relatively low in elevation and therefore receive little precipitation in the form of snowfall. In fact, six of the ten watersheds are below 4,000 feet at their highest points. (See Snow Shed Map, page iii, Tehama East Watershed Assessment Atlas). This tends to create a situation where flows are flashy and brief, especially

for some of the smaller watersheds (Inks, Seven Mile, and Salt Creeks).

The rural population density of Tehama County is approximately nineteen persons per square mile overall, while the density of population for the study area watersheds is vastly smaller, perhaps two to four persons per square mile. The largest community in these watersheds is the eastern portion of Red Bluff (the Sacramento River bisects Red Bluff and Tehama County), with an overall current population of 14,025. Other communities in the watersheds include Dairyville, Dales, Paynes Creek, Vina, and Ponderosa Sky Ranch. Timber, ranching, and farming are the primary resource activities throughout these watersheds, with mineral resource extraction playing a minor role. Livestock utilizing pasture and range dominate the agricultural activities in the uplands, while orchards and pastures for livestock are most prominent in the lower parts of the watersheds.

Table 2. Land Ownership

	Acres	Percent
State	42,747	9.68
US Forest Service	44,923	10.17
Bureau of Land Management	16,056	3.63
US Fish & Wildlife Service	82	0.02
Private	337,961	76.5
Total	441,769	100

General ownership within the watersheds is shown in Table 2. Land ownership in the Tehama East

Watersheds is approximately 23.5 percent public and 76.5 percent private (California Resources Agency, 2004).

The average mean elevation of the watersheds is approximately 1,061 feet above mean sea level (msl). The lowest elevation of 115 feet msl occurs at the Sacramento River and the bottom of Pine Creek Watershed, climbing to 6,896 feet msl at the highest point of the Antelope Creek Watershed to the east. The major community with the highest elevation is Paynes Creek, at 1,850 feet msl (USGS, 1976).

Table 3. Elevation in feet: Min/Max/Average

Watershed	Min	Max	Average
Antelope Creek	210	6,896	2,463
Dye Creek	200	2,503	1,036
Hoag Slough	150	331	225
Inks Creek	285	2,940	689
Paynes Creek	256	5,850	1,952
Paynes Slough	230	761	282
Pine Creek	115	4,003	941
Salt Creek	230	2,411	938
Seven Mile Creek	253	1,785	731
Toomes Creek	171	4,104	1,348
Tehama East	115 - Low	6,896 - High	1,061

Interviews of long time residents of the watershed were conducted by TCRCD employees during 2008 to 2010. The interviews were also made available online

at www.tehamacountyrcdd.org from January 2010 to March 2010. The interviews attempted to develop a personal perspective of eastern Tehama County watersheds and to determine issues critical for residents of eastern Tehama County. These interviews were used to establish the issues of concern to the residents of the study area. The results are as follows:

Table 4. East Tehama Watershed Study Area Interviews

Issue	Responses n/28	Percent
Grazing	6	21
Stream bank Erosion	1	4
County General Plan	3	11
Conservation Easement	2	7
Surface Water & Ground Water	16	57
Roads in the Watershed	0	0
Stream & Riparian	11	39
Wildlife & Habitat	9	32
Fisheries	0	0
Agriculture	7	25
Land Use	16	57
Vegetation	5	18
Woodlands	2	7
Heirs	18	64
Fire & Fuels	8	29

Life Style: 3 Urban
 3 Rural, non-Ag
 21 Agriculture

The issues receiving the greatest response were:

- Surface Water & Ground Water – 57 percent listed this issue. This is a major issue in northern California, and it is not surprising that more than half the respondents showed concern over this issue.
- Land Use – 57 percent listed this issue. There are concerns as to how the land will be used into the future. This is similar to what was reported for the west side of Tehama County in a watershed assessment for that area.
- Heirs – 64 percent listed this issue. There are a number of interviewees who have offspring interested in continuing the current land use.

Issues of little concern to our respondents were:

- Streambank erosion – 4 percent listed this issue. Unlike western Tehama County, streambank erosion is not a major issue among the eastside residents.
- Roads in the watersheds – 0 percent listed this issue. The number of roads (of any surface type) is fewer in number on the east side compared to western Tehama County and is not a concern of those responding. See Roads Map, page 190, Tehama East Watershed Assessment Atlas.
- Fisheries – 0 percent listed this issue. The lack of concern over this issue is somewhat surprising considering that the Tehama East

Watersheds have current and potential habitat for threatened and/or endangered fish species.

From the results of the resident interviews, certain issues will be addressed in this watershed management plan. The issues fall into three main groups:

- 1) Water Quality and Quantity
 - Infrastructure within the watersheds
 - Groundwater Management
 - Influences from Climate Change
 - Streamflow Characteristics
 - Commercial/Residential Water Use
 - Agricultural Water Use
- 2) Vegetation Resources
 - Development
 - Grazing and Grasslands
 - Oak Woodlands
 - Vernal Pools
 - Agriculture
 - Riparian Communities
 - Invasive Plants
- 3) Fire and Fuels
 - Fire Management

Tehama East Watershed Study Area

For this management plan the region of concern encompasses delineated watersheds as reported in the Tehama East Watershed Assessment and Tehama East Watershed Assessment Atlas. Throughout the Tehama East Watershed Management Plan document, these watersheds will be described as the “Tehama East Watershed Study Area,” or simply “Study Area.”

Within the Study Area, there are two distinct regions, which will be referred to as the Uplands and Lowlands. The Uplands is the region of the Study Area above the escarpment that bisects Tehama County from north to south on the eastern side of the county. This escarpment is easily identified by vegetation, geology, and soil changes. (See Critical Habitat: Vegetation Map on page 115, Geology Map on page 66, and Soils: NRCS Soil Survey Map on page 231, Tehama East Watershed Assessment Atlas.) The Lowlands is the Study Area region west of the escarpment and consists of the Sacramento River Valley.

These two areas are in many ways very different. The scale at which development has taken place is markedly different, and so, too, the physiographic features. Throughout this document certain existing conditions and potential projects will vary greatly

within even the same watershed. While this document may not be specific concerning exact location, it will be specific concerning these two areas.

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.

➤ Infrastructure Within the Watersheds

On the most basic level, infrastructure consists of all transportation, communication, sewage, water, and electric systems within a community, region, state, or nation. When considering infrastructure, there are two distinct and separate areas for the Uplands and Lowlands of the Study Area. The contrast between the two is evident by the amount of roadways, power lines, and other basic infrastructure in the Lowlands. Further, certain infrastructure can have a considerable impact on water quality, and in turn on wildlife species dependent upon water resources. The mere existence of roads, and especially roads that cross streams, can greatly impact water quality and habitat condition.

Existing Conditions

Many of the streams within the Study Area are ephemeral or are low flowing. The sizing and condition of culverts or the armament of shallow

stream crossings may also affect water quality. Impediments to upstream and downstream fish migration should be remedied where they have been identified, and assessed in greater detail where information is lacking.

Management Strategy

TCRCD will support implementation of projects which have direct or indirect benefits of improving infrastructure passage over streamcourses for:

- Assessment of road crossings in the Uplands of Antelope, Dye, and Salt Creeks;
- Assessment of Antelope Creek's braided channel in the Lowlands; and
- Provision of educational opportunities to rural residents so that stream crossings are properly maintained.

➤ Groundwater Management

Groundwater is the water which occurs below the earth's surface between both macro and micro pores of rocks or sediment. A majority of California's accessible groundwater is found in alluvium—materials deposited by streams.

Managing California's water needs imparts new challenges and increases the importance of understanding groundwater resources.

Understanding the connection between surface and groundwater, the drawing of groundwater necessitates the need for monitoring and evaluation so that current and future needs are met. Proper management of California's groundwater is generally left to local agencies who may better understand constituent issues.

Existing Conditions

One-fourth of Californians rely completely on groundwater; half of California residents receive some groundwater through the tap. California has segmented its groundwater sources into 450 groundwater basins. Statewide, they hold a predicted 850 million acre feet, not all readily accessible or useable. Groundwater in Tehama County is an integral commodity. In the past, surface water supplemented a majority of water demand in Tehama County. Today almost two-thirds of all water in the county comes from groundwater. The cities of Red Bluff and Corning rely solely on groundwater to supply their residents with water. Groundwater contours of these areas show a spring to summer drawdown greater than any other areas in the county. In average years of precipitation, groundwater contours have shown increasing depth to groundwater. This decrease appears to be attributed to change in land use and/or conversion from surface water to

groundwater resources. Because of reliable stream flow of eastside tributaries, groundwater in these areas has been historically safe from overdraft.

Management Strategy

TCRCD will support implementation of projects which have direct or indirect benefits of understanding the groundwater issues concerning the Study Area by:

- Providing educational opportunities to Study Area residents concerning the importance of groundwater.

➤ Influences from Climate Change

Climate change refers to long-term changes in temperature, precipitation, wind patterns, and other elements of the earth's climate system brought on by certain influences, whether they occur naturally or possibly from anthropogenic effects. The concept of a changing climate and human evolvment continues to be argued, but changes have not gone unnoticed.

Existing Conditions

Evidenced in many studies indicating that global climate is changing, California and Tehama East

will surely be impacted. Recently, several climate projects have been undertaken through executive orders by California Governor Schwarzenegger (the 2006 and 2009 Scenarios Projects). The intentions of the project reports were to study impacts to the state through different greenhouse gas emissions scenarios. The 2006 report used three global climate models for three greenhouse gas emissions scenarios: a lower emission, a medium-high emission, and a higher emissions scenario. The 2009 report used six global climate models, run with two emissions scenarios, one with higher and one with lower emissions. Both reports focused on the impacted areas of water resources, public health, agriculture, forests, sea levels, and energy. In both reports, future temperatures had increases of at least two degrees and up to as much as nine degrees by the end of the century.

Management Strategy

TCRCD will support implementation of projects which have direct or indirect benefits of understanding the continuing narrative of climate change by:

- Providing educational opportunities to Study Area residents concerning the implications of climate change.

➤ Streamflow Characteristics

Streamflow constantly changes on a daily basis. The main influence on streamflow is precipitation and the runoff throughout a watershed. A river can rise even if it only rains high in the watershed, and the size of a river is highly dependent on the size of the watershed, its vegetation, the geology, and the elevation within the boundary of the watershed. These physiographic features are the characteristics of a watershed. These characteristics in turn affect streamflow and the duration of flow.

Existing Conditions

Antelope Creek originates at an elevation of 6,800 feet near the base of Turner Mountain, in the Lassen National Forest in Tehama County. At least 47 springs feed Antelope Creek and help sustain its flow through the summer months. Antelope Creek flows roughly 30 miles east to west and then takes a sharp turn south for 8 miles to its confluence with the Sacramento River. The North fork of Antelope Creek drops in elevation from 6,200 feet at the headwaters to 220 feet where it meets the Sacramento River.

Paynes Creek originates at an elevation of 5,400 feet in a series of small springs about six miles east

of the town of Mineral near Lyons Peak. Paynes Creek's main channel drops from an elevation of 5,100 feet to 320 feet during its journey to the Sacramento River.

Little is known about the characteristics of these streams and the influence on fish passage, water quality, or flow timing, quantification, or duration. Yet these are two very important streams providing water for wildlife, irrigation, and other desirable purposes.

Management Strategy

TCRCD will support implementation of projects which have direct or indirect benefits of understanding the stream flow characteristics of selected watersheds. Priority projects/studies include:

- Assess streamflow characteristics of Antelope and Paynes Creek and
- Collect stream flow data at the same time that water quality samples are collected during any future assessments of Study Area streams.

➤ 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

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). Currently, groundwater is the primary water supply in the Study Area; 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. It must also be considered that 70 percent of residential water use is outside the home, according to California Department of Water Resources.

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.

➤ Agricultural Water Use and Management

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

Existing Conditions

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 Study Area; 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. According to analysis of the data gathered by TCRCD's Mobile Irrigation Lab, conclusions that much of eastside irrigation systems which are quite efficient, mostly consisting of drip irrigation. The future of water

conservation lies in converting the last flood systems to micro and in improving scheduling on the micro systems.

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 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; and
- Mitigate irrigation discharge directly into watercourses, thereby reducing nutrients, bacteria, and increased water temperatures.

Vegetation Resources

Vegetation resources are an important component of a healthy watershed. In addition to providing habitat for wildlife, vegetation maintains soil stability, provides cooling shade for aquatic animal species, recycles gases in the atmosphere, gives aesthetic pleasure, is a sustainable resource, and can add economic value to our domiciles.

➤ Development

Development is important to rural communities in order to encourage job creation, improve schools, and provide stable infrastructure, safer neighborhoods, and housing that is affordable to all. Many federal, state, and local agencies work to assist rural communities such as those found in the Study Area. At the same time, however, county residents wish to maintain the quality of life which has attracted so many to this region.

Existing Condition

Development of roads, infrastructure, housing, commerce, and industry should be done in such a way as to minimize impacts to the watershed's vegetation resources. Inclusion of conservation and smart growth principles into development plans will aid in protecting sensitive plant species and

communities. The National Governors Association's Principles of Smart Growth encourages mixed land use, "walkable" communities with a range of public transportation options, environmental and historic preservation, and collaboration and participation among all stakeholders. The Best Management Practices formulated by the Sacramento River Watershed Program provides information on rural residential development strategies.

Management Strategy

TCRCD will support implementation of projects which have direct or indirect benefits to understanding rural development by:

- Providing educational opportunities for the public concerning the importance of prudent development;
- Promoting sustainable development and opportunities in utilizing local resources, both cultural and natural; and
- Assisting Tehama County Transportation Commission with its Blueprint Process Program utilizing Geographic Information Systems (GIS).

➤ Grazing and Grasslands

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

Existing Conditions

Livestock grazing provides economic benefits to people living in and around the Tehama East Watersheds and serves as a management tool for maintaining and restoring grasslands. Preserves within the watershed such as Dye Creek Ranch and Vina Plains are important research facilities for ranchers and scientists alike, who work cooperatively to develop grazing and burning prescriptions for maintaining native plant diversity and controlling non-native plant invasion.

Management Strategy

TCRCD will support implementation of projects which have direct or indirect benefits to grazing areas. Priority projects/studies include:

- Promote policies and practices in accordance with those laid out in the California Rangeland Conservation Coalition Programmatic Safe Harbor Agreement and Voluntary Local Program for Butte, Glenn, Shasta, and Tehama Counties and
- Take into account the interests of various stakeholders, such as the Cattlemen’s Association, private ranchers, conservationists, and landowners, when developing policies affecting grazing and grasslands within the watershed.

➤ Oak Woodlands

Land management measures should be taken to protect the valuable oak woodland habitat in the Tehama East Watershed. The Tehama County Voluntary Oak Woodland Management Plan was prepared in 2005. The purpose of this document was to establish protection guidelines for oaks and oak woodland habitat throughout Tehama County and to provide guidance for landowners, the county planning department, and local developers.

Existing Conditions

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.

Management Strategy

TCRCD will support implementation of projects which have direct or indirect benefits to oak woodlands. Priority projects/studies include:

- Encouraging voluntary education and protection programs that assist private landowners in the management of their productive oak woodlands;
- Promote economic studies on the value of alternative and sustainable rangeland products such as fee hunting, eco-tourism, wild herb production, and firewood production;
- Utilize the resources and expertise of the Tri County Economic Development

Corporation and the Tehama Local 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; and
- Request that the Tehama County Hardwood Advisory Committee periodically evaluates the state of oak woodlands using available data sources such as the California Department of Forestry and Fire Protection's FRAP (Fire and Resource Assessment Program) data.

➤ Vernal Pools

Vernal pools provide habitat for special status native plants, offer food sources for migrating waterfowl, and moderate seasonal flooding. They should be protected as important resources within the Study Area.

Existing Condition

Vernal pools provide habitat for numerous plant and animal species. Of the threatened and

endangered species of plants known to occur in eastern Tehama County, many occur only in vernal pools or are found in marshes and other wetlands. In other words, many rare plant species 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 Study Area.

Management Strategy

TCRCD will support implementation of projects which have direct or indirect benefits to vernal pool areas. Priority projects/studies include:

- Educate government and private employees, developers, and the general public working/living within the watershed about the importance of vernal pool ecosystems;
- Work collaboratively with land owners to address concerns associated with the presence of vernal pools on their property; and
- Implement management practices prescribed by scientists and ranchers who have developed appropriate grazing treatments to mimic historic disturbance regimes associated with vernal pools and surrounding vegetation.

➤ Agriculture

Agricultural lands contribute greatly to the economy of the Study Area. Efforts should be made to preserve as much prime agricultural land as is reasonably possible.

Existing Condition

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

TCRCD will support implementation of projects which have direct or indirect benefits to agricultural lands. Priority projects/studies include:

- As described in the Tehama County General Plan (PMC 2008), prepare a document with policies, standards, and guidelines for

agricultural buffer setbacks for the Tehama East Watersheds.

➤ Riparian Communities

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, groundwater 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. Groundwater 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 of water 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.

Riparian habitats in the Study Area 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

Riparian communities have been significantly changed over the last 50 years. Livestock grazing, introduction of nonnative 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, resulting in older trees along the streams. Forest management may also 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.

Overall, the existing condition of the Uplands is relatively intact. The Lowlands have been much

more affected by development, particularly for water use.

Management Strategies

TCRCD will support implementation of projects which have direct or indirect benefits to riparian areas. Priority projects/studies include:

- Encourage the protection, conservation, enhancement, and restoration of riparian vegetation within the Tehama East Watersheds;
- Conduct an analysis of historical aerial photography to determine historical alignments of creeks within the watershed, location of sensitive resources (e.g. vernal pools, wetlands, riparian), and how these have changed over time;
- Conduct a rapid assessment to map and characterize the functions and values of sensitive habitat areas (e.g., vernal pools, wetlands, riparian, oak woodland) within the Tehama East Watersheds;
- Conduct a large-scale assessment to characterize the existing condition of riparian vegetation and floodplain conductivity along each creek within the Tehama East Watersheds;
- Develop a ranking system to prioritize stream reaches within the Study Area

targeted for restoration based on the information from the assessment described above;

- Research potential funding mechanisms for restoration projects that conserve, enhance, or restore riparian communities or other sensitive habitat types;
- Implement restoration projects on priority reaches as funding is available; and
- Prepare a riparian corridor study with policies, standards, and guidelines for riparian habitat buffer setbacks for the Tehama East Watersheds.

➤ Invasive Plants

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.

Existing Conditions

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

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 Study Area. 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 species.

Management Strategy

The TCRCD 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 Study Area 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 Study Area and elsewhere in the county;
- Determining the cause as well as the effect of invasive plant populations and the efficacy of current treatments and management.

Fire and Fuels Management

Naturally occurring fire has played an important role in the ecology of the Tehama East Watersheds for thousands of years. Wildlife and native vegetation has adapted to the return of fire (e.g., species composition, nutrient cycling, seed viability), yet human activities have altered these natural processes. Expansion of urban areas into natural landscapes, along with the increased utilization of natural resources, requires the control of environmental interactions that have developed over millennia. As a result, natural processes can be pushed out of balance.

The hazard from wildfire exemplifies the dramatic effect that human occupation has had on the environment. In order to more intensively utilize landscapes and the resources they contain, wildfire has in the past been largely excluded from western landscapes. However, this control has impacted the equilibrium between fire and vegetation. It has also indirectly affected other natural systems such as hydrology and wildlife interactions. In many areas affected by human influence, stands of live and dead vegetation have developed to unnatural levels. Now, when wildfires occur, their intensity and the severity with which they affect landscapes are often extreme.

The Study Area contains significant resources and assets at risk from uncontrolled wildfire:

- Rural communities containing commercial services and utilities infrastructure;
- Lands used for commercial purposes (such as grazing, vineyards, crop production, and timber production);
- Important environmental resources (anadromous species habitats, critical habitat for fish and other species);
- Conservation easement lands;
- Potential and current nonnatal rearing habitat for juvenile Chinook salmon at the confluence of creeks with the Sacramento River;
- Sites of cultural and historical significance (ranches, home sites, and other areas of human occupation);
- Significant electrical, telephone, and gas transmission infrastructure; and
- Disbursed recreational facilities.

Management Strategies

In prioritizing project recommendations, the protection of residents and firefighters is of primary importance. Additionally, protection of development on public and private property and in the urban cores is also considered paramount. The protection of watershed plant and animal species and critical

habitat was also given special consideration in the process of project development. Projects protecting cultural and historical resources were considered as well. The following descriptions and discussions of projects and their protection goals reflect the prioritization values of the Study Area's stakeholders and project participants.

Roadside Thinning along Ponderosa Way

Roadside thinning along Ponderosa Way should be a top priority in developing fire protection infrastructure in the Study Area for several reasons. This major thoroughfare cuts across the Tehama East Watersheds from north to south roughly at the timberline, tying into areas that have existing fuel breaks and other types of fuels reduction projects. Ponderosa Way makes a useful anchor point for new projects due to the considerable break in vegetation created during its construction. Because the roadway is located at the transition zone between chaparral/oak woodland and timber lands, some portions of roadside thinning along Ponderosa Way would require little, if any, short term maintenance.

Lanes Valley Road Fuels Reduction and Shaded Fuel Break

Lanes Valley Road provides the most direct access from the Manton CalFire station to the town of Paynes Creek, in the Paynes Creek Watershed, and provides an alternate escape route for both the

Manton and Paynes Creek communities if Manton Road or Highway 36E were blocked by a fire or other emergency. Since the Inskip Grade conflagration of 1973, there have been no major wildfires in the vicinity of Lanes Valley Road. As a consequence, chaparral brush has grown very high on both sides of this county road, continuing up Inskip Hill towards the fire lookout and radio relay station and threatening these facilities. Significant fuels reduction work is recommended along Lanes Valley Road. Fuels work would include removal of brush along both sides of the roadway within 100 feet of the pavement. Work should continue further out on both sides of the road prism through a combination of prescribed burns and mechanical fuels treatments on lands owned by private individuals interested in conducting such work. It is also recommended that large prescribed burning projects be developed and conducted through CAL FIRE's Vegetation Management Program, which would provide fire management resources, technical expertise, project administration, and indemnification for damages in the event of an escape. Consequently, large prescribed burns are recommended to be conducted on the east slope of Inskip Hill near Lanes Valley Road in two phases. The initial phase would be conducted between Lanes Valley Road and the PG&E power line right of way. A second phase would be conducted between the power line right of way and the lookout facility on top of Inskip Hill. Finally, in

order to provide emergency access to the lookout facility, it is also recommended that significant brush removal occur along Inskip Road between the lookout facility and Lanes Valley Road, providing an east-west fuel break on the east side of Inskip Hill.

Mapping and Incorporation of Water Conveyance Infrastructure into Natural Fire Management Unit Database

Water conveyance infrastructure found in urban areas has the potential to provide an array of benefits to firefighters during a wildfire event. At the same time, these structures pose an obstacle to the ingress of firefighting personnel if their locations are unknown to firefighters coming from outside the area. A detailed map showing the location of existing water conveyance infrastructure is recommended so that this spatial information may be incorporated into a map of natural fire management units.

Canal Improvements

Canals, ditches, flumes, and other water conveyance infrastructure provides an array of linear features that could be of service in relation to fire control and fuels management. Water in such infrastructures could be made available for firefighting, and these linear features also provide a break in vegetation that could be developed as a fuel break through the thinning of small trees along the watercourse, thus protecting nearby homes, farms, and woodlots. One

recommendation for enhancing the use of this infrastructure for firefighting is the construction of small drafting ponds or water tanks where appropriate and convenient for tanker use.

Installation of Water Tanks with High Volume Fill Spout Fittings

During wildfire emergencies, drafting of water out of ditches and streams can be time consuming. In addition, roads adjacent to such infrastructure can become cut off from firefighting vehicles, limiting the number of water sources available for fire containment. Consequently, an important recommendation is that supplemental water sources be constructed for use in firefighting efforts at appropriate locations. Smaller such water tanks (e.g. 10,000 gallon) can be moved in order to maximize their utility as yearly fire conditions change or as fire threats change in the face of community development.

Formal Establishment of Fire Safety Zones

In the event of a large, fast moving fire, various routes out of a community may become blocked, preventing egress. In such an event, the creation of formal safety zones and emergency evacuation routes would be invaluable. Any existing landing strips may be maintained relatively free of vegetation so that the area could be utilized as a formal safety zone if a catastrophic wildfire threatened. Additionally,

irrigated grazing lands are possible locations for a formally designated safety area, providing protection to residents living nearby. Finally, if such areas were formally designated as Fire Safety Zones, it would be important to get these safety areas placed on evacuation maps prepared by CalFire personnel.

Paynes Creek Fuels Reduction and Shaded Fuel Break

The community of Paynes Creek contains an array of important urban assets and is surrounded by chaparral stands, oak woodlands, and grasslands on all four sides. It is recommended that a combination of prescribed burns, oak thinning, and shaded fuel breaks be developed and maintained around the urban core as well as along Highway 36. Specifically, recommended projects would entail the proposed work discussed in the following paragraphs.

Collaboration with CalTrans and PG&E. In order to expand current fuels reduction and thinning work along the portion of Highway 36 adjacent to the Paynes Creek community, any projects in this area should be coordinated with CalTrans and PG&E. Removal and processing of chaparral and small trees would extend approximately 200 feet from the highway right-of-way along a two mile stretch between the PG&E twin tower transmission line crossing to roughly one mile south of the junction of Highway 36, Lanes Valley Road, and Plum Creek

Road. The primary goals of this project would be to develop greater community protection and to maximize project cost efficiency by tying together newly developed fuels reduction work with work already being conducted on an ongoing basis by CalTrans within the state highway right-of-way and by PG&E along their power line right-of-way.

Fuels Reduction and Thinning Along Plum Creek Road. Similar fuels reduction and thinning would be conducted along Plum Creek Road between its junction with Highway 36 and the State of California facilities located approximately 1.5 miles south of the Paynes Creek community.

Shaded Fuel break at Paynes Creek School. A shaded fuel break would be developed and oaks would be trimmed along the south property line of the new Paynes Creek School property and facility. This portion of the project would protect the school facilities from fires originating in wildland areas to the south, and it would prevent the spread of fires that may develop within the Paynes Creek urban core.

Howell Ridge Fuels Reduction Project. Howell Ridge parallels Highway 36, beginning just south of Ponderosa Sky Ranch and ending just east of the Paynes Creek community. This major ridge borders Paynes Creek to the south along the stream's

ecologically significant riparian corridor. Howell Ridge also lies north of the property boundaries of the Paynes Creek Rod and Gun Club, Wilson Ranch, and the state facilities on Plum Creek Road. Both the north and south faces of Howell Ridge have very heavy accumulations of chaparral fuel that are at risk of ignition from sources of development along Ponderosa Way, Plum Creek Road, and an undeveloped ranch road on the ridgetop that connects these two more traveled routes. Numerous potential ignition sources are also found within the Ponderosa Sky Ranch and Paynes Creek urban areas. Fuels reduction work along the north side of Howell Ridge could be leveraged by fuels reduction efforts already completed at a pine plantation managed by Sierra Pacific Industries. In addition, the unpaved wildland road on the top of Howell Ridge could be utilized as a fire control line during initial prescribed burning activities and could then be developed into a larger, more developed, permanent fuel break. Opportunities may exist for shared project funding between private landowners and federal agencies holding nearby lands (i.e., Lassen National Forest and Bureau of Land Management), as these federally owned lands would be protected by this project. Financial contributions or in kind match of equipment and labor might also be provided by the California Department of Fish and Game, which manages lands within the nearby Tehama Wildlife Area.

Plum Creek Road/High Trestle Road Fuel Break. Just south of Howell Ridge, Plum Creek Road traverses the summit of Plum Creek Ridge which runs east to west separating the subwatersheds of Oak Creek and Plum Creek. Numerous fires have swept through this area including the very large Finley Fire of 1990. High Trestle Road traverses the south slope of Plum Creek Ridge connecting Plum Creek Road with Hogsback Road, a primitive yet highly used county road. If these linear features were more fully developed and maintained as formal fuel breaks, the state facilities at Plum Creek, the watersheds and riparian areas of Plum Creek, and the historical site on High Trestle Road could all be better protected from fires moving upslope from chaparral lands further to the west. If the road surface and vegetation were properly maintained, High Trestle Road would also allow escape on either Plum Creek Road or Hogsback Road if one of the other routes became cut off from a large, fast moving fire.

Ponderosa Sky Ranch Airport Fuels Reduction, Maintenance and Extension. Over the years, numerous attempts have been made to utilize the airstrip at Ponderosa Sky Ranch as fire protection infrastructure for that community. Chaparral species adjacent to this area continue to develop into heavy stands of flashy fuels that threaten the community from ignition sources along Highway 36. It is

recommended that the Ponderosa Sky Ranch community develop the means to permanently maintain the fuels within the airstrip area. It is also suggested that additional prescribed burning or other types of fuels reduction work be conducted between the community and Highway 36. Such project work would help to protect Ponderosa Sky Ranch and would also protect valuable aquatic and riparian habitats found along nearby Paynes Creek if it was extended several miles east to west along the state highway.

Power Line Right-Of-Way Maintenance Between Ponderosa Sky Ranch and Lyman Springs. The Lyman Springs area contains the historic site of a lumber mill that once operated at the turn of the 20th Century. At the present time, a small outpost of houses and recreational structures is located there. A wooden pole power line connects utility facilities at Ponderosa Sky Ranch with the Lyman Springs community. If more fully managed for vegetation, this power line could provide a fuel break extending roughly two miles between these two communities. If properly developed and maintained, the right-of-way area could be used for initial attack of chaparral fires moving upslope from chaparral lands to the west, or down slope from immediately adjacent timber stands. Such a linear fuel break would also provide partial protection to the Lyman Springs community and to the developing pine plantations managed by Sierra

Pacific Industries just east of the power line right of way.

Battle Creek Estates Fuel Project. On the north side of Highway 36 opposite Ponderosa Sky Ranch is a relatively new residential development called Battle Creek Estates. At the present time a few scattered homes have been constructed within the area's heavy stands of chaparral vegetation and oaks. It is recommended that a fuel break be developed around the perimeter of the estates area. It is also suggested that the developers of Battle Creek Estates fund the purchase of a chipper for use by the community's residents.

2007-2008 Panther Spring / Boonedocks Area Fuels Treatment

Recommended project work here consists of an additional 591 acres of mastication, hand thinning, piling, and prescribed burn treatments near the Panther Spring and Boonedocks communities.

2008-2012 Hogsback Road / Finley Lake Fuels Treatment

This 2,952-acre mastication and prescribed burning project continues earlier US Forest Service efforts that will be executed over multiple years at various sites along Hogsback Road.

Knass Spring Improvements

The Knass Spring recreational community is located just south of Panther Spring along Ponderosa Way. Within the area, a number of cabins, a road system, and a small pond have been developed. Many of the development features found in the area could, with some improvements, be developed into significant fire fighting and fire management infrastructure. The most significant linear feature in the area is Ponderosa Way, which lies less than a mile to the west of these communities. With some clearing and annual grading, Ponderosa Way would provide east-west fire protection and would also speed access to wildfires occurring in the immediate area and further south towards the Mill Creek and Deer Creek watersheds. In addition, it is recommended that funding be developed for roadside thinning of interior secondary roads throughout the Knass Spring area and along other rural roads surrounding the structures in the vicinity of Tail Holt Spring. Improvements to these roads would enhance their use as fuel breaks and would improve access to the north, south, and east sides of these communities. Finally, it is recommended that the pond located in the center of the inhabited area of Knass Spring be developed to increase its capacity and that water tanks be installed as a backup source for fire fighters in the event the pond goes dry.

Tramway Road Shaded Fuel Break

Tramway Road directly connects the Lyonsville–Lyman Springs urban area with Highway 36 and as a result has become a major escape route during wildfire events. In addition, if forest and chaparral fuels were reduced along the roadway, the ability of this linear feature to protect the southeast side of these communities would be dramatically increased.

Little Giant Mill Road Shaded Fuel Break.

Like Tramway Road, the Little Giant Mill Road directly connects the Lyonsville–Lyman Springs urban area with Highway 36 and is another major escape route. This road traverses similar vegetation as Tramway Road; consequently, if vegetative fuels were reduced, an additional level of protection would be provided to residents and visitors of the Lyonsville–Lyman Springs community, especially from fires approaching from the southwest.

Yellowjacket Road–Tamarack Road Shaded Fuel Break

If properly developed as a shaded fuel break, the parallel alignment of Yellowjacket Road with Ponderosa Way would make this linear feature an additional source of fire protection that could be used to defend against wildfires moving in an east or west direction. The road is located near the transition line between chaparral and timberland, making it particularly useful in defending valuable pine stands

from fires moving upslope out of the east. Tamarack Road could also be developed into an additional east-west fuel break if a significant volume of brush and forest fuels were removed.

High Trestle Road Fuels Reduction

High Trestle Road connects Plum Creek Road at the northerly end and Hogsback Road on the southerly end. If the road surface and vegetation were properly maintained, this road could be utilized as an east-west fuel break and would also allow escape on either Plum Creek Road or Hogsback Road if one of the other routes became cut off from a large, fast moving fire.

Installation of 50,000 Gallon Water Tank with High Volume Fill Spout Fittings at the Paynes Creek School

In the near future, a new elementary/middle school will be opened on the southeast side of the Paynes Creek community. Although the school grounds are cleared, the facility is located adjacent to a considerable amount of wildland fuels that have developed in adjacent oak woodlands and grasslands. Through the installation of a 50,000 gallon water tank on the school's property, a considerable volume of water is available for fires occurring within the community and at its urban fringe. This tank would also provide water for fires occurring further south in the vicinity of the Tehama Wildlife Area or on lands

adjacent to the Ishi Wilderness. By locating the tank in this highly visible area, vandalism could be kept to a minimum.

Installation of 50,000 Gallon Water Tank with High Volume Fill Spout Fittings in the Vicinity of Lyonsville/Lyman Springs

The combination of Plum Creek Road, Little Giant Mill Road, and Tramway Road provides primary access to the Lyonsville community from Highway 36. All of these roads are well maintained and can provide rapid access to the Lyonsville and Lyman Springs urban areas. Consequently, the installation of a 50,000 gallon water tank at either at the intersection of Plum Creek Road and Little Giant Mill Road or at the intersection of Tramway Road and Little Giant Mill Road would provide a water source that would benefit fire fighting needs in the immediate vicinity and would also be of considerable value to fire equipment traveling Highway 36 or to units fighting fire further south in the wildland areas of the Central-Cohasset Planning Unit.

Installation of 50,000 Gallon Water Tank with High Volume Fill Spout Fittings at Dales

The community of Dales is located at the major intersection of Manton Road and Highway 36. During very dry months when surface flows within Paynes Creek are lowest, drafting of water supplies can be time consuming. In addition, the heavy fuels and

high fire danger found along the Lanes Valley Road could result in a very large wildfire that would cut off the transport of water from the Paynes Creek area, resulting in lengthier travel from Red Bluff or Manton. The installation of a large water tank at this location would provide protection to the immediate Manton community and would make water readily available to firefighting crews working in this region.

Installation of 10,000 Gallon Water Tanks with High Volume Fill Spout Fittings throughout the Paynes and Antelope Creek Watersheds

Like other areas of eastern Tehama County, the Antelope and Paynes Creek watersheds have limited sources of water with which to refill tanker units. The Paynes Creek Volunteer Fire Department, CalFire staff, and members of the Paynes Creek community have recommended the following candidate sites for installation of medium size water tanks: (a) the intersection of Plum Creek Road and Hogsback Road, (b) the intersection of Plum Creek Road and Ponderosa Way, and (c) the intersection of Highway 36 and Lanes Valley Road.

Refurbishment of Ponderosa Sky Ranch Water Tank

At the present time, the water tank located in Ponderosa Sky Ranch stands unused and is in need of new quick fill fittings. If refurbished and maintained, this water supply infrastructure could

provide considerable fire fighting water to Ponderosa Sky Ranch, Battle Creek Estates, Lyonsville, and the Lyman Springs area further to the south.

Construction of Access Road from Ponderosa Way to Highway 36

Ponderosa Way forms the major access road into the community of Ponderosa Sky Ranch. During a wildfire event, residents would have to evacuate either east via the paved portion of Ponderosa Way and onto Highway 36 or by way of the rough, unpaved portion of Ponderosa Way to the south. Both routes could become congested if large numbers of residents attempted to evacuate at the same time using this road. It is recommended that a second access route be developed to the west by the construction of a connecting spur between Highway 36 and Ponderosa Way on the west side of the community.

Classification of Communities as Wildland Urban Interface Areas

An Intermix Community is described in the Federal definition of Wildland Urban Interface (WUI), as reported in the Federal Register of January 4, 2001. "The Intermix Community exists where structures are scattered throughout a wildland area. There is no clear line of demarcation; wildland fuels are continuous outside of and within the developed area. The development density in the intermix ranges from

structures very close together to one structure per 40 acres. Fire protection districts funded by various taxing authorities normally provide life and property fire protection and may also have wildland fire protection responsibilities. An alternative definition of intermix community emphasizes a population density of between 28-250 people per square mile.” It is recommended that the coordinator of the Tehama-Glenn Fire Safe Council initiate those processes required in order to have certain rural communities formally classified as a Wildland Urban Interface area, thus increasing the potential for local residents to receive technical assistance and startup funds for community fuels reduction efforts. These communities are described below.

Panther Spring, Boonedocks, Lyonsville, and Lyman Springs. The remote communities of Panther Spring and Boonedocks are located approximately ten miles south of Ponderosa Sky Ranch along Ponderosa Way. Although there are few permanent residents in the area, a significant number of private recreational structures are located in the vicinity that are in need of some form of organized public and private efforts to assure that adequate fire protection measures are accomplished. This area is surrounded by Lassen National Forest lands; chaparral and thick stands of small timber create significant ladder fuels. When these multiple sources of ignition are combined, the chance of a catastrophic wildfire is considerable.

The Lyman Springs–Lyonsville area faces a similar situation in that a number of inhabited structures are in close proximity to federal lands, have significant fuel accumulations, and are at a significant risk from roads and other sources of ignition. An evaluation of the risk factors used in establishing these interface areas—including fire behavior potential, values at risk, and infrastructure—indicate that the residents and urban development in the vicinity of Panther Spring, Boonedocks, Lyonsville, and Lyman Springs are at significant risk of wildfire.

Recommendations regarding Proposed WUI’s for Panther Spring, Boonedocks, Lyonsville, and Lyman Springs. It is recommended that the coordinator of the Tehama-Glenn Fire Safe Council initiate those processes required in order to have the communities described above formally classified as Wildland Urban Interface areas. This would also increase the potential for local residents to receive technical assistance and startup funds for community fuels reduction efforts.

Power Line Access Improvements within the Dye Creek Preserve

At the present time, power line access roads within the upper reaches of the Dye Creek Preserve are discontinuous, poorly maintained, and bisected by many stringers of live oak and other vegetation. A 2002 mastication project under power lines generated considerable dead fuel which could generate high fire

intensities when wildfire occurs. In addition, steep areas near canyon bottoms have not been cleared of either live or dead fuels. As a result, these utility access roads cannot be safely or effectively used for prescribed burning operations. In order to correct this situation, fuels reduction projects need to be undertaken that improve the ability of fire equipment to rapidly travel these electrical utility roads, that reduce previously generated dead fuels, and that remove both live and dead fuels in canyon bottoms.

The Nature Conservancy /Dye Creek Preserve Fire Ecology Projects

As is the case with much of the fire management work within the Study Area watersheds, fire planning efforts on lands managed by The Nature Conservancy (“TNC”) focus on ecological restoration and on land management practices that promote and sustain the natural fire ecology of the area. Few structures or developed features are found within TNC managed lands. As a result, with the exception of firefighter safety, the fire hazard to lives and property are not as significant on TNC lands as in areas near “at risk” communities and areas of Wildland Urban Interface. Throughout the Dye Creek Preserve, fire management has been identified as a key strategy and tool for managing an array of ecological threats to the grasslands and oak woodlands of the area. The use of prescribed burns has also been determined to be an important means of maintaining the environmental

health of these lands, once current threats have been minimized. Through the use of managed fire, TNC is attempting to alter the age and size structure of vegetation within the area’s chaparral and low elevation forests, as well as to alter the fire regimes throughout the preserve. In addition, through the use of carefully developed burning prescriptions, TNC is attempting to control invasive plant species which threaten native plant and animal communities found within this portion of Tehama County. To accomplish its environmental goals, TNC employees have developed a yearly program of prescribed burning to enhance the resources on conservation lands under TNC management rather than to simply reduce the threat of wildlife within the Wildland Urban Interface. During the 2007 burning season, TNC staff treated 662 acres of chaparral and grassland fuels in the Wildcat North Unit and another 470 acres in the Andreini Pasture Unit. Between 2008 and 2010, TNC staff in partnership with CalFire plan to treat 1073 acres of chaparral and grassland fuels in the Upper Parker Unit on Dye Creek Preserve and another 2231 acres of grassland in the Brown, Foor and Rowles Units on Vina Plains Preserve, representing treatment of approximately 1100 acres of TNC land annually. This project work will be planned, funded, and administered through the CalFire vegetation Management Program. At the present time it is expected that roughly 2,000 acres of grasslands, oak

woodlands, and chaparral lands will be burned per year.

Coordination of Vegetation Management Efforts Within the Tehama Wildlife Area

On occasion, prescribed burns and other vegetation management projects are conducted throughout the Tehama Wildlife Area managed by California Department of Fish and Game. While these projects are developed with wildlife habitat improvement in mind, if properly conducted, these projects can also be used to reduce fuels in strategic areas. It is recommended that Department of Fish and Game personnel managing these lands and developing improvement projects coordinate with CAL FIRE, the Tehama-Glenn Fire Safe Council, and the Lassen National Forest in order to develop multi-resource improvement projects throughout these state lands.

Improvements to Existing Ponds and Lakes

A number of ponds and small natural lakes throughout the Study Area would provide water during fire emergencies. If properly developed with pumping facilities and storage tanks, the time it takes to fill tankers and other firefighting equipment could be dramatically reduced. As a result of improvements, these existing water sources could provide one of the most significant firefighting infrastructures within the Study Area.

Installation of Water Tanks with High Volume Fill Spout Fittings

Given the remoteness of some portions of the Study Area watersheds, fires occurring within the Uplands are often accessed by air utilizing the CalFire helitack crew located near Vina. In addition, water tanks located in very remote locations face a significant risk of vandalism which could render them useless in the event of a fire emergency. Considering these limitations, the installation of a water tank is recommended near the ranch facilities at the Dye Creek Preserve headquarters.

Sacramento National Wildlife Refuge Complex (Sacramento NWRC)

The Sacramento River NWRC was established in 1989 under the Endangered Species Act and Emergency Wetlands Resources Act with the purpose of preserving, restoring, and enhancing riparian habitat for threatened and endangered species, neotropical and migratory birds, waterfowl, anadromous fish, resident wildlife, and plants. The Coleman National Fish Hatchery and the US Fish & Wildlife Service Red Bluff Field Office were established, in part, to facilitate the restoration of Pacific salmonids by providing mitigation, biological expertise, leadership, and assistance to partners protecting and enhancing ecosystems of the northern Central Valley. The Sacramento NWRC was established under Executive Order No. 75 62 and the Emergency Conservation

Act of 1933 to alleviate crop depredation and to provide wintering habitat for waterfowl. Fire management goals on all USFWS properties include the protection of life and property, reduction of hazardous fuels and non-native plants, and restoration of native habitats for fish and wildlife. In order to further these goals, it is recommended that partnerships be encouraged between Tehama County Resource Conservation District and the US Fish & Wildlife Service. For example, some riparian habitats have been significantly altered from historic conditions, and the presence of nonnative invasive plants such as yellow starthistle and medusa-head grass is a significant issue and has altered the fire regime/condition class. The Tehama East Community Wildfire Protection Plan contains details concerning recommended project work in partnership with US Fish & Wildlife Service.

Appendix

Tehama East Community Wildfire Protection Plan (2008) – Excerpt

Battle Creek-Manton Planning Unit

Priorities and Summary of Proposed Projects

The significant resources found within the Manton–Battle Creek

Planning Unit consist of:

- The community of Manton, which is the only developed area in the Manton–Battle Creek Planning Unit having an urban core containing commercial services and community utilities infrastructure
- Lands used for commercial purposes such as grazing, vineyards, crop production, and timber production
- Vast watershed areas containing an array of important environmental values, including:
 - The important anadromous species habitats provided by the north and south forks of Battle Creek
 - Other sensitive, threatened, and endangered plant and animal species, along with their critical habitat
 - Riparian habitats along watercourses
 - Properly functioning aquatic ecosystems
 - Unique landscapes such as The Nature Conservancy conservation easements
 - The north and south forks of Battle Creek, portions of which are considered streams of nationwide significance and whose resources warrant inclusion into the Nationwide Rivers Inventory Listing maintained by the National Park Service
 - Potential and current non-natal rearing habitat for juvenile Chinook salmon found at the mouth of Inks Creek
 - Sites of cultural and historical significance, including ranches, home sites, and other areas of human occupation

Introduction

In prioritizing project recommendations, the protection of residents and firefighters was of primary importance. Additionally, protection of development on public and private property and in the Manton community's urban core was considered paramount. Also of considerable concern was the Battle Creek watershed, as both the north and south forks are considered critical to the protection and maintenance of the system's anadromous fish stocks, which are of statewide importance. As was the case throughout the project area of the Tehama East Community Wildfire Protection Plan, the protection of watershed plant and animal species and critical habitat were also given special consideration in the process

of project development. Projects protecting cultural and historical resources were considered as well. The following descriptions and discussions of projects and their protection goals reflect the prioritization values of the planning area's stakeholders and project participants.

Development of Existing Roads as Fuel Breaks

The fire records and experience of Manton Volunteer Fire Department members indicate that the majority of wildfires impacting the Manton community occur during the months of August and September. Most of the ignitions related to these fires occur in dry grass and chaparral located at elevations between 1,800 and 2,400 feet. The normal wind direction in the Manton area is downhill in the morning and uphill in the afternoon, with stronger northerly or southerly winds occurring with the passage of high or low pressure systems. The behavior of past wildfires such as the very destructive Manton Fire of 2005 reveal that fuel breaks are most effective when there is light wind and when fire is moving at right angles to the fire break. These fire control mechanisms are less effective on steep slopes due to increased flame lengths associated with the "chimney" effect. Throughout the Manton–Battle Creek Planning Unit, preexisting features such as roads, streams, PG&E canals, power line rights of way, and other utility infrastructure could be expanded quickly and efficiently into fire breaks.

Using these observations, members of the Manton Volunteer Fire Department, the Manton Fire Safe Council, and the Battle Creek Watershed Conservancy have developed recommendations for various fuel breaks to be constructed in a north/south direction along relatively flat roads. Proposals for specific sites include the vegetation management program in Tehama and Shasta Counties and roadside thinning along Ponderosa Way.

Ponderosa Way

A majority of community members participating in the Manton Fire Safe Council agree that roadside thinning along Ponderosa Way should be top priority in developing fire protection infrastructure in this area for several reasons. This major thoroughfare ties into areas that have existing fuel breaks and other types of fuels reduction projects. Ponderosa Way makes a useful anchor point for new projects due to the considerable break in vegetation created during its construction. Because the roadway is located at the transition zone between chaparral/oak woodland and timber lands, some portions of roadside thinning along Ponderosa Way would require little, if any, short term maintenance. (*Refer to Figure VIII-1 at the end of this section.*)

Hazen Road Fuel Break

When originally completed, the Hazen Road fuel break provided considerable protection to homes and other structures located along its route. Several years have passed since the original project work was completed, and brush species are rapidly invading the initial treatment sites. It is recommended that the Manton Fire Safe Council, Tehama–Glenn Fire Safe Council, and Tehama County Resource Conservation District cooperate with the Tehama County Road Department in developing a collaborative funding program for the maintenance of this important fire protection infrastructure. Funding sources might be pursued from the Tehama County Road Department itself, through assessments to local landowners, or from CalFire or US Forest Service grants. A detailed maintenance program and treatment schedule along specific road segments would greatly assist in developing a budget and procuring funds for permanent upkeep of this fuel break infrastructure. *(Refer to #1 on Figure VIII-2 at the end of this section.)*

Thinning and Fuels Reduction along Other Shasta and Tehama County Roads

Other fuel break improvements and infrastructure development in the Tehama County portion of this planning unit include thinning and fuels reduction along South Powerhouse Road, Manton School Road, and Cedar Ridge Road. Within Shasta County, improvements were suggested along Woodcutters Way and along the portions of Wilson Hill Road and Battle Creek Bottom Road that border the airstrip to the northwest of Manton. *(Refer to #2, 3, and 4 on Figure VIII-2 at the end of this section.)*

Lanes Valley Road Fuels Reduction and Shaded Fuel Break

Lanes Valley Road provides the most direct access from the Manton CalFire station to Paynes Creek and provides an alternate escape route for both the Manton and Paynes Creek communities if Manton Road or Highway 36E were blocked by a fire or other emergency. Since the Inskip Grade conflagration of 1973, there have been no major wildfires in the vicinity of Lanes Valley Road. As a consequence, chaparral brush has grown very high on both sides of this county road, continuing up Inskip Hill towards the fire lookout and radio relay station and threatening these facilities. A recommendation was developed for significant fuels reduction along Lanes Valley Road. Fuels work would include removal of brush along both sides of the roadway within 100 feet of the pavement. Work would continue further out on both sides of the road prism through a combination of prescribed burns and mechanical fuels treatments on lands owned by private individuals interested in conducting such work. *(Refer to #5 on Figure VIII-3 at the end of this section.)* It was also recommended that large prescribed burning projects be developed and conducted through CAL FIRE's Vegetation Management Program, which would provide fire management resources, technical expertise, and project administration, and indemnification for damages in the event of an escape. Consequently, large prescribed burns were recommended to be conducted on the east slope of Inskip Hill near Lanes Valley Road in two phases. The initial phase

would be conducted between Lanes Valley Road and the PG&E power line right of way. A second phase would be conducted between the power line right of way and the lookout facility on top of Inskip Hill. (*Refer to #6 and #7 on Figure VIII-3 at the end of this section.*) Finally, in order to provide emergency access to the lookout facility, it was also recommended that significant brush removal occur along Inskip Road between the lookout facility and Lanes Valley Road, providing an east-west fuel break on the east side of Inskip Hill. (*Refer to #8 on Figure VIII-3 at the end of this section.*)

Vianet Lane and Little Inskip Hill Fuels Reduction Project

Vianet Lane traverses the east side of Little Inskip Hill through extremely heavy brush fields. Like the proposed Inskip Hill project, fuels reduction along Vianet Lane would result in a sizeable fuel break as protection against fires moving upslope. (*Refer to #9 on Figure VIII-3 at the end of this section.*)

Use of Water Conveyance Infrastructure

The water conveyance infrastructure found throughout the Manton area has the potential to provide an array of benefits to firefighters during a wildfire event. At the same time, these structures pose an obstacle to the ingress of firefighting personnel if their locations are unknown to firefighters coming from out of the area. The following paragraphs discuss specific recommendations.

Mapping and Incorporation of Water Conveyance Infrastructure into Natural Fire Management Unit Database

The recommendation was made to map in detail the location of water conveyance infrastructure, to plot this spatial information onto the map of natural fire management units, and to incorporate coordinates into the related database.

Canal Improvements

As described below, the array of canals, ditches, flumes, and other water conveyance infrastructure in the Manton area provide an array of linear features that could be of service in relation to fire control and fuels management.

Boole Ditch Improvements and Vegetation Management

The water in Boole Ditch could be made available for firefighting. This linear feature also provides a break in vegetation that could be developed as a fuel break through the thinning of small trees along the watercourse, thus protecting a number of homes, small farms, and woodlots within this portion of the Manton–Battle Creek Planning Unit. One

recommendation for enhancing the use of the ditch as a water source for firefighting was construction of a small drafting pond or water tank along Forward Road installed with fittings appropriate for tanker use.

Cross Country Canal Improvements

This water distribution structure could be developed as a significant fuel break through the removal and continued control of vegetation, protecting portions of the Manton community during wildfires moving from the east or west. In addition, by clearing vegetation along the canal, firefighters could move more quickly when conducting initial attacks on wildfires threatening the community and would have a substantial water supply immediately at hand. With additional maintenance, the penstocks connecting the Cross Country Canal with Grace Lake and Nora Lake could be used to continue the fire protection provided by this water distribution infrastructure. *(Refer to #10 on Figure VIII-4 at the end of this section.)*

Union Canal Improvements

This water transport structure runs south approximately four miles from the Cross Country Canal to the South Powerhouse and the Inskip Dam along Battle Creek's south fork. Through improvements similar to those recommended for the Cross Country Canal, this feature would extend the fire protection provided by the Cross Country Canal from the slopes of Shingletown Ridge to the South Fork of Battle Creek. *(Refer to #11 on Figure VIII-4 at the end of this section.)*

South Inskip Canal/Coleman Canal (Inskip Dam-Coleman Dam Segment)

The South Inskip Canal is located just upslope from Battle Creek's south fork and transports water westward from the area near the South Powerhouse to the Inskip Dam and then to the Coleman Dam, where it joins the Coleman Canal and continues northwest to the Darrah Springs Fish Hatchery. If this structure could be properly cleared and maintained, it would create a midslope fuel break and would allow firefighter access to Battle Creek's South Fork Canyon, which contains significant stands of riparian vegetation. *(Refer to #12 on Figure VIII-4 at the end of this section.)* The combined canal system that runs for approximately ten miles from Grace and Nora Lakes, along the Cross Country and Union Canals, and then along the South Inskip and Coleman Canals, offers an opportunity to create a significant and continuous fuel break in this area.

South Battle Creek Canal

Roughly four miles southeast of Manton, the South Battle Creek Canal moves water northwest from the Soap Creek/Devils Canyon/Initial Gulch area in order to join the Union Canal and Cross Country Canal south of Manton. Much like the South Inskip Canal, through the clearing of brush and small timber along this canal's right of way, fire protection could be provided in an east-west direction along a four mile path directly south of the Manton area. Considering that the canal is midslope from the South Fork of Battle Creek, vegetation removal would have to be fairly extensive (100 feet or more) on each side of the structure in order to be effective. Another consideration is that once vegetation clearing was completed, the South Battle Creek Canal route would allow firefighters access into steep portions of Battle Creek Canyon and would provide protection to the riparian and aquatic habitats found within this portion of the south fork's stream channel. *(Refer to #13 on Figure VIII-4 at the end of this section.)*

Installation of Water Tanks with High Volume Fill Spout Fittings

During wildfire emergencies, drafting of water out of ditches and streams can be time consuming. In addition, roads adjacent to such infrastructure can become cut off from firefighting vehicles, limiting the number of water sources available for fire containment. Consequently, an important recommendation is that supplemental water sources be constructed for use in firefighting efforts. *(Refer to Figure VIII-5 at the end of this section.)*

50,000 Gallon Water Tank at the Manton School

The Manton School is located along Forward Road, a main rural route in the area. In addition, the school has extensive clearance and would be accessible during almost all wildfire events. A recommendation was made to install a 50,000 gallon water tank on the school grounds which would be available for service to the Manton community and would also serve as fire protection infrastructure to the school itself.

10,000 Gallon Water Tanks throughout the Manton–Battle Creek Planning Unit

Portions of the Manton–Battle Creek Planning Unit have limited sources of firefighting water in the form of ponds, tanks, flumes, and close access to streams. In addition, such sources of water can be easily cut off from firefighting vehicles in the event of large, fast moving wildfires. Ten thousand gallon water tanks provide flexibility in staging firefighting resources, as they are relatively inexpensive and portable. Tanks of this size can be moved in order to maximize their utility as yearly fire conditions change or as fire threats change in the face of community development. Members of the Manton Fire Safe Council provided a list of locations considered to be candidate sites including:

Ponderosa Way

Rock Creek Road at Jack Tom Road

Forward Road at Ponderosa Way
Hazen Road at Rolling Hills Road
Manton Road at Lanes Valley Road
Lanes Valley Road at Inskip Road
Lanes Valley Road at Moulton Loop
Spring Branch Road at Manton Road
Spring Branch Road at Jellys Ferry Road

Formal Establishment of Fire Safety Zones

In the event of a large, fast moving fire in the Manton area, various routes out of the community may become blocked, preventing egress to other parts of Shasta and Tehama Counties. In such an event, the creation of formal safety zones and emergency evacuation routes would be invaluable. Just northwest of the Manton community within Sections 16 and 17 of T30N-R1E is an undeveloped landing strip which can be accessed along Wilson Hill Road. This landing strip area is relatively free of vegetation and could be utilized as a formal safety zone if a catastrophic wildfire threatened the community from the south. Another possible site for a safety zone is the CalFire station on the south side of Digger Creek just east of the Manton community's urban core.

This site could provide protection to residents in the event of a wildfire moving toward the community. Finally, irrigated grazing lands in the Forward Valley area are a third possible location for a formally designated safety area, providing protection to Forward Valley residents and those residents living along Forward Road, Forwards Mill Road, and Rock Creek Road who may become cut off from escape via Manton Road, Ponderosa Way, or Viola Mineral Road. If these areas were formally designated as Fire Safety Zones, it would be important to get these safety areas placed on evacuation maps prepared by CalFire personnel. (*Refer to Figure VIII-6 at the end of this section.*)

Bureau of Land Management Projects

Spring Branch Road Repair and Maintenance

Working in cooperation with the Tehama County Public Works Department, the Bureau of Land Management is in the process of making repairs to and graveling that portion of Spring Branch Road from the BLM parking lot at Jellys Ferry Road to the agency's shooting range further east. A significant portion of the Manton–Battle Creek Fire Planning Unit's west side can be accessed in an emergency using Spring Branch Road. In addition, the roadway could be developed into a more effective control feature for fast moving grass fires that occur within this area.

Consequently, it is recommended that similar road improvements be made to the entire length of Spring Branch Road from Jellys Ferry Road to Manton Road. (*Refer to #14 on Figure VIII-7 at the end of this section.*)

Bureau of Land Management Juniper Removal along Battle Creek

The Bureau of Land Management has initiated juniper removal on agency-managed lands along Highway 36 in the vicinity of Hog Lake. Additional stands of juniper are increasing on BLM lands located along Battle Creek's main stem about one half mile upstream from the Coleman Fish Hatchery near Spring Branch. These juniper stands have the potential of escalating low intensity grass fires into fast moving high intensity crown fires that can destroy mature blue oak woodlands as well as significant riparian habitat along Battle Creek.

Consequently, it is recommended that the Bureau of Land Management actively pursue treatment of those juniper stands located near important riparian areas and oak woodlands adjacent to Battle Creek's main stem. (*Refer to #15 on Figure VIII-7 at the end of this section.*)

Paynes Creek-Highway 36 Corridor

Priorities and Summary of Proposed Projects

The significant resources found within the Paynes Creek–Highway 36 Corridor

Planning Unit consist of:

- Rural communities
 - ..Dales
 - ..Paynes Creek
 - ..Ponderosa Sky Ranch
 - ..Battle Creek Estates
 - ..Lyman Springs
 - ..Lyonsville
 - ..Panther Spring
 - ..Knass Spring
 - ..Tail Holt Spring
- Lands used for commercial purposes such as range lands and timber production
- The watersheds of Paynes Creek, Plum Creek, the north and south forks of Antelope Creek, and Finley Lake, all containing an array of important

environmental values, including:

- Sensitive, threatened, and endangered plant and animal species along with their critical habitat
- Water quality and quantity
- Riparian habitats along major watercourses
- Properly functioning aquatic ecosystems
- Cultural and historical artifacts, including significant sites of human occupation
- Potential and current non-natal rearing habitat for juvenile Chinook salmon found at the mouths of Seven Mile Creek and Salt Creek
- Critical local roads, including:
 - Plum Creek Road
 - Ponderosa Way
 - Hogsback Road
- Significant electrical, telephone, and gas transmission infrastructure
- Disbursed recreational facilities such as the Paynes Creek Rod and Gun Club

Introduction

In terms of establishing the priority of recommended projects, the protection of lives and private property were of paramount importance. In recognition of the landscape scale interconnectedness of watershed components, those projects which provided landscape scale protection of animal and watershed resources were next in importance. Finally, projects that protected permanent cultural features in the area were given consideration. The following descriptions and discussions of projects to protect the resources within the Paynes Creek–Highway 36 Corridor Planning Unit have been prioritized based upon the values placed on the primary resources these projects would protect.

Paynes Creek Fuels Reduction and Shaded Fuel Break

The community of Paynes Creek contains an array of important urban assets and is surrounded by chaparral stands, oak woodlands, and grasslands on all four sides. Members of the community recommended that a combination of prescribed burns, oak thinning, and shaded fuel breaks be developed and maintained around the urban core as well as along Highway 36. Specifically, project work would entail the proposed work discussed in the following paragraphs.

Collaboration with CalTrans and PG&E.

In order to expand current fuels reduction and thinning work along the portion of Highway 36 adjacent to the Paynes Creek community, any projects in this area should be coordinated with CalTrans and PG&E. As tentatively envisioned, removal and processing of chaparral and small trees would extend approximately 200 feet from the highway right-of-way along a two mile stretch between the PG&E twin tower transmission line crossing to roughly one mile south of the junction of Highway 36, Lanes Valley Road, and Plum Creek Road. The primary goals of this project are to develop greater community protection and to maximize project cost efficiency by tying together newly developed fuels reduction work with work already being conducted on an ongoing basis by CalTrans within the state highway right-of-way and by PG&E along their power line right-of-way. *(Refer to #1 on Figure IX-2 at the end of this section.)*

Fuels Reduction and Thinning Along Plum Creek Road

Similar fuels reduction and thinning would be conducted along Plum Creek Road between its junction with Highway 36 and the State of California facilities located approximately 1.5 miles south of the Paynes Creek community. *(Refer to #2 on Figure IX-2 at the end of this section.)*

Shaded Fuel break at Paynes Creek School

A shaded fuel break would be developed and oaks would be trimmed along the south property line of the new Paynes Creek School property and facility. This portion of the project would protect the school facilities from fires originating in wildland areas to the south, and it would prevent the spread of fires that may develop within the Paynes Creek urban core. *(Refer to #3 on Figure IX-2 at the end of this section.)*

Howell Ridge Fuels Reduction Project

Howell Ridge parallels Highway 36, beginning just south of Ponderosa Sky Ranch and ending just east of the Paynes Creek community. This major ridge borders Paynes Creek to the south along the stream's ecologically significant riparian corridor. Howell Ridge also lies north of the property boundaries of the Paynes Creek Rod and Gun Club, Wilson Ranch, and the state facilities on Plum Creek Road. Both the north and south faces of Howell Ridge have very heavy accumulations of chaparral fuel that are at risk of ignition from sources of development along Ponderosa Way, Plum Creek Road, and an undeveloped ranch road on the ridgetop that connects these two more traveled routes. Numerous potential ignition sources are also found within the Ponderosa Sky Ranch and Paynes Creek urban areas. Fuels reduction work along the north side of Howell Ridge could be leveraged by fuels reduction efforts already completed at a pine plantation

managed by Sierra Pacific Industries. In addition, the unpaved wildland road on the top of Howell Ridge could be utilized as a fire control line during initial prescribed burning activities and could then be developed into a larger, more developed, permanent fuel break. Opportunities may exist for shared project funding between private landowners and federal agencies holding nearby lands (i.e., Lassen National Forest and Bureau of Land Management), as these federally owned lands would be protected by this project. Financial contributions or in kind match of equipment and labor might also be provided by the California Department of Fish and Game, which manages lands within the nearby Tehama Wildlife Area. *(Refer to #4 on Figure IX-2 at the end of this section.)*

Plum Creek Road/High Trestle Road Fuel Break

Just south of Howell Ridge, Plum Creek Road traverses the summit of Plum Creek Ridge which runs east to west separating the watersheds of Oak Creek and Plum Creek. Numerous fires have swept through this area including the very large Finley Fire of 1990. High Trestle Road traverses the south slope of Plum Creek Ridge connecting Plum Creek Road with Hogsback Road, a primitive yet highly used county road. If these linear features were more fully developed and maintained as formal fuel breaks, the state facilities at Plum Creek, the watersheds and riparian areas of Plum Creek, and the historical site on High Trestle Road could all be better protected from fires moving upslope from chaparral lands further to the west. If the road surface and vegetation were properly maintained, High Trestle Road would also allow escape on either Plum Creek Road or Hogsback Road if one of the other routes became cut off from a large, fast moving fire. *(Refer to #5 on Figure IX-2 at the end of this section.)*

Ponderosa Sky Ranch Airport Fuels Reduction, Maintenance and Extension

Over the years, numerous attempts have been made to utilize the airstrip at Ponderosa Sky Ranch as fire protection infrastructure for that community. Chaparral species adjacent to this area continue to develop into heavy stands of flashy fuels that threaten the community from ignition sources along Highway 36. A recommendation was made that the Ponderosa Sky Ranch community develop the means to permanently maintain the fuels within the airstrip area. *(Refer to #6 on Figure IX-2 at the end of this section.)* It was also suggested that additional prescribed burning or other types of fuels reduction work be conducted between the community and Highway 36. Such project work would help to protect Ponderosa Sky Ranch and would also protect valuable aquatic and riparian habitats found along nearby Paynes Creek if it was extended several miles east to west along the state highway. *(Refer to #7 on Figure IX-2 at the end of this section.)*

Power Line Right-Of-Way Maintenance Between Ponderosa Sky Ranch and Lyman Springs

The Lyman Springs area contains the historic site of a lumber mill that once operated at the turn of the 20th Century. At the present time, a small outpost of houses and recreational structures is located there. A wooden pole power line connects utility facilities at Ponderosa Sky Ranch with the Lyman Springs community. If more fully managed for vegetation, this power line could provide a fuel break extending roughly two miles between these two communities. If properly developed and maintained, the right-of-way area could be used for initial attack of chaparral fires moving upslope from chaparral lands to the west, or down slope from immediately adjacent timber stands. Such a linear fuel break would also provide partial protection to the Lyman Springs community and to the developing pine plantations managed by Sierra Pacific Industries just east of the power line right of way. *(Refer to #8 on Figure 2 at the end of this section.)*

Battle Creek Estates Fuel Project

On the north side of Highway 36 opposite Ponderosa Sky Ranch is a relatively new residential development called Battle Creek Estates. At the present time a few scattered homes have been constructed within the area's heavy stands of chaparral vegetation and oaks. It was recommended that a fuel break be developed around the perimeter of the estates area. It was also suggested that the developers of Battle Creek Estates fund the purchase of a chipper for use by the community's residents. *(Refer to #9 on Figure IX-2 at the end of this section.)*

2007-2008 Panther Spring / Boonedocks Area Fuels Treatment

Project work consists of an additional 591 acres of mastication, hand thinning, piling, and prescribed burn treatments near the Panther Spring / Boonedocks communities. *(Refer to Figure IX-3 at the end of this section.)*

2008-2012 Hogsback Road / Finley Lake Fuels Treatment

This 2,952-acre mastication and prescribed burning project continues earlier US Forest Service efforts that will be executed over multiple years at various sites along Hogsback Road. *(Refer to Figure IX-3 at the end of this section.)*

Knass Spring Improvements

The Knass Spring recreational community is located just south of Panther Spring along Ponderosa Way. Within the area, a number of cabins, a road system, and a small pond has been developed. Many of the development features found in the

area could, with some improvements, be developed into significant fire fighting and fire management infrastructure. The most significant linear feature in the area is Ponderosa Way, which lies less than a mile to the west of these communities. With some clearing and annual grading, Ponderosa Way would provide east-west fire protection and would also speed access to wildfires occurring in the immediate area and further south towards the Mill Creek and Deer Creek watersheds. In addition, it was recommended that funding be developed for roadside thinning of interior secondary roads throughout the

Knass Spring area and of other rural roads surrounding the structures in the vicinity of Tail Holt Spring. Improvements to these roads would enhance their use as fuel breaks and would improve access to the north, south, and east sides of these communities. Finally, it was recommended that the pond located in the center of the inhabited area of Knass Spring be developed to increase its capacity and that water tanks be installed as a backup source for fire fighters in the event the pond goes dry. *(Refer to Figure IX-3 at the end of this section.)*

Tramway Road Shaded Fuel Break

Tramway Road directly connects the Lyonsville–Lyman Springs urban area with Highway 36 and as a result has become a major escape route during wildfire events. In addition, if forest and chaparral fuels were reduced along the roadway, the ability of this linear feature to protect the southeast side of these communities would be dramatically increased. *(Refer to Figure IX-3 at the end of this section.)*

Little Giant Mill Road Shaded Fuel Break.

Like Tramway Road, the Little Giant Mill Road directly connects the Lyonsville–Lyman Springs urban area with Highway 36 and is another major escape route. This road traverses similar vegetation as Tramway Road; consequently, if vegetative fuels were reduced, an additional level of protection would be provided to residents and visitors of the Lyonsville–Lyman Springs community, especially from fires approaching from the southwest. *(Refer to Figure IX-3 at the end of this section.)*

Yellowjacket Road–Tamarack Road Shaded Fuel Break

If properly developed as a shaded fuel break, the parallel alignment of Yellowjacket Road with Ponderosa Way would make this linear feature an additional source of fire protection that could be used to defend against wildfires moving in an east or west direction. The road is located near the transition line between chaparral and timberland, making it particularly useful in defending valuable pine stands from fires moving upslope out of the east. Tamarack Road could also

be developed into an additional east-west fuel break if a significant volume of brush and forest fuels were removed. *(Refer to Figure IX-3 at the end of this section.)*

High Trestle Road Fuels Reduction

High Trestle Road connects Plum Creek Road at the northerly end and Hogsback Road on the southerly end. If the road surface and vegetation were properly maintained, this road could be utilized as an east-west fuel break and would also allow escape on either Plum Creek Road or Hogsback Road if one of the other routes became cut off from a large, fast moving fire.

Installation of 50,000 Gallon Water Tank with High Volume Fill Spout Fittings at the Paynes Creek School

In the near future, a new elementary/middle school will be opened on the southeast side of the Paynes Creek community. Although the school grounds are cleared, the facility is located adjacent to a considerable amount of wildland fuels that have developed in adjacent oak woodlands and grasslands. Through the installation of a 50,000 gallon water tank on the school's property, a considerable volume of water is available for fires occurring within the community and at its urban fringe. This tank would also provide water for fires occurring further south in the vicinity of the Tehama Wildlife Area or on lands adjacent to the Ishi Wilderness. By locating the tank in this highly visible area, vandalism could be kept to a minimum. *(Refer to Figure IX-4 at the end of this section.)*

Installation of 50,000 Gallon Water Tank with High Volume Fill Spout Fittings in the Vicinity of Lyonsville/Lyman Springs

The combination of Plum Creek Road, Little Giant Mill Road, and Tramway Road provides primary access to the Lyonsville community from Highway 36. All of these roads are well maintained and can provide rapid access to the Lyonsville and Lyman Springs urban areas. Consequently, the installation of a 50,000 gallon water tank at either at the intersection of Plum Creek Road and Little Giant Mill Road or at the intersection of Tramway Road and Little Giant Mill Road would provide a water source that would benefit fire fighting needs in the immediate vicinity and would also be of considerable value to fire equipment traveling Highway 36 or to units fighting fire further south in the wildland areas of the Central-Cohasset Planning Unit. *(Refer to Figure IX-4 at the end of this section.)*

Installation of 50,000 Gallon Water Tank with High Volume Fill Spout Fittings at Dales

The community of Dales is located at the major intersection of Manton Road and Highway 36. During very dry months when surface flows within Paynes Creek are lowest, drafting of water supplies can be time consuming. In addition, the heavy fuels and high fire danger found along the Lanes Valley Road could result in a very large wildfire that would cut off the transport of water from the Paynes Creek area, resulting in lengthier travel from Red Bluff or Manton. The installation of a large water tank at this location would provide protection to the immediate Manton community and would make water readily available to fire fighting crews working within the central and western portions of both the Battle Creek–Manton and the Paynes Creek– Highway 36 Corridor Planning Units. *(Refer to Figure IX-4 at the end of this section.)*

Installation of 10,000 Gallon Water Tanks with High Volume Fill Spout Fittings throughout the Paynes Creek–Highway 36 Corridor Planning Unit

Like other areas of eastern Tehama County, the Paynes Creek–Highway 36 Corridor Planning Unit has limited sources of water with which to refill tanker units. The Paynes Creek Volunteer Fire Department, the Manton Fire Safe Council, CalFire staff, and members of the Paynes Creek community have recommended candidate sites for installation of medium size water tanks:

Intersection of Plum Creek Road and Hogsback Road

Intersection of Plum Creek Road and Ponderosa Way

Intersection of Highway 36 and Lanes Valley Road

(Refer to Figure IX-4 at the end of this section.)

Refurbishment of Ponderosa Sky Ranch Water Tank

At the present time, the water tank located in Ponderosa Sky Ranch stands unused and is in need of new quick fill fittings. If refurbished and maintained, this water supply infrastructure could provide considerable fire fighting water to Ponderosa Sky Ranch, Battle Creek Estates, Lyonsville, and the Lyman Springs area further to the south. *(Refer to Figure IX-4 at the end of this section.)*

Construction of Access Road from Ponderosa Way to Highway 36

Ponderosa Way forms the major access road into the community of Ponderosa Sky Ranch. During a wildfire event, residents would have to evacuate either east via the paved portion of Ponderosa Way and onto Highway 36 or by way of the

rough, unpaved portion of Ponderosa Way to the south. Both routes could become congested if large numbers of residents attempted to evacuate at the same time using this road. It was recommended that a second access route be developed to the west by the construction of a connecting spur between Highway 36 and Ponderosa Way on the west side of the community.

Classification of Communities as Wildland Urban Interface Areas

An Intermix Community is described in the Federal definition of Wildland Urban Interface (WUI), as reported in the Federal Register of January 4, 2001.

“The Intermix Community exists where structures are scattered throughout a wildland area. There is no clear line of demarcation; wildland fuels are continuous outside of and within the developed area. The development density in the intermix ranges from structures very close together to one structure per 40 acres. Fire protection districts funded by various taxing authorities normally provide life and property fire protection and may also have wildland fire protection responsibilities. An alternative definition of intermix community emphasizes a population density of between 28-250 people per square mile.”

It is recommended that the coordinator of the Tehama-Glenn Fire Safe

Council initiate those processes required in order to have certain rural communities formally classified as a Wildland Urban Interface area, thus increasing the potential for local residents to receive technical assistance and startup funds for community fuels reduction efforts. These communities are described below. (*Refer to Figure IX-5 at the end of this section.*)

Panther Spring, Boonedocks, Lyonsville, and Lyman Springs

The remote communities of Panther Spring and Boonedocks are located approximately ten miles south of Ponderosa Sky Ranch along Ponderosa Way.

Although there are few permanent residents in the area, a significant number of private recreational structures are located in the vicinity that are in need of some form of organized public and private efforts to assure that adequate fire protection measures are accomplished. This area is surrounded by Lassen National Forest lands; chaparral and thick stands of small timber create significant ladder fuels. When these multiple sources of ignition are combined, the chance of a catastrophic wildfire is considerable.

The Lyman Springs–Lyonsville area faces a similar situation in that a number of inhabited structures are in close proximity to federal lands, have significant fuel accumulations, and are at a significant risk from roads and other sources of ignition. An evaluation of the risk factors used in establishing these interface areas—including fire behavior potential, values at risk, and infrastructure—indicate that the residents and urban development in the vicinity of Panther Spring, Boonedocks, Lyonsville, and Lyman Springs are at significant risk of wildfire.

Fire Behavior Potential: Steep slopes in the vicinity of Panther Spring can result in structures being threatened by fire that is rapidly advancing upslope. Steep topography also limits evacuation of residents out of the area and limits access by fire fighting personnel and equipment into the area. A significant portion of the fuels surrounding and within the community consist largely of chaparral and thick stands of small timber. Although the Lyonsville and Lyman Springs communities are located on relatively flat terrain, they also have thick stands of small diameter trees that can create ladder fuels for large crown fires. The vegetative fuels in all three communities can become extremely flashy during hot weather, especially during extremely dry years. As a result, wildland fires can spread quickly with only a minor amount of wind.

Values at Risk: Development within the Panther Spring, Boonedocks, Lyonsville and Lyman Springs communities includes scattered cabins, ranches, and other housing, as well as significant outbuildings that are in some instances less than a mile apart.

Recommendations regarding Proposed WUI's

It is recommended that the coordinator of the Tehama-Glenn Fire Safe Council initiate those processes required in order to have the communities described above formally classified as Wildland Urban Interface areas. This would also increase the potential for local residents to receive technical assistance and startup funds for community fuels reduction efforts.

Central-Cohasset Planning Unit

Priorities and Summary of Proposed Projects

The significant resources found within the Central–Cohasset Planning Unit consist of:

- Small rural communities (Campbellville and Cohasset)
- Sensitive, threatened, and endangered plant and animal species along with their critical habitat, particularly the vernal pool species found within the Vina Plains area
- Lands used for commercial purposes, such as range lands and timber lands

- Vast watershed areas containing an array of important environmental values such as:
 - Water quality and quantity
 - Riparian habitats along major stream courses
 - Properly functioning aquatic ecosystems
- Unique landscapes, including:
 - Tehama County Wildlife Area
 - Ishi Wilderness Area
 - Black Rock Campground
 - Devils Parade Ground
 - Dye Creek Preserve
 - Vina Plains Preserve
 - Deer Creek Area of Critical Environmental Concern
 - Burroughs Pinery
 - Beaver Creek
- Ponderosa Way
- Streams of nationwide significance whose resources warrant consideration for inclusion into the Nationwide Rivers Inventory Listing, i.e., portions of Mill Creek and Deer Creek
- Important anadromous fisheries along Mill Creek and Deer Creek, and their tributaries
- Potential and current non-natal rearing habitat for juvenile Chinook salmon found at the mouths of tributaries of the Sacramento, including Dye Creek, Pine Creek, and Toomes Creek
- Cultural and historical artifacts, including
- Historical rock walls
- Significant sites of human occupation

Introduction

In prioritizing project recommendations, the protection of residents and firefighters was of primary importance, as well as the protection of public and private property. In recognition of the landscape scale interconnectedness of watershed components, those projects which provided landscape scale protection of plants, animals, and other watershed resources found within the Central–Cohasset Planning Unit were next in importance. Finally, those efforts that protected permanent cultural features were given consideration. The following description and discussion of projects that would protect the

resources within the Central–Cohasset Planning Unit have been prioritized based upon the values placed on the primary resource these projects would protect.

C

old Springs Underburn 2006-2007 Phase

During 2004 and 2005, about 80 acres of pine/oak woodlands and mixed conifer stands were treated in the Cold Springs area of Lassen National Forest lying just east of Ponderosa Way. Project work entailed hand thinning, piling, and burning of woody debris in preparation for a larger shaded fuel break project to be completed in 2007 or 2008. A 265-acre prescribed fire project is planned for the Cold Springs area. The 2006-2007 phase of project work continues earlier efforts to underburn within pine stands, oak woodlands, and mixed conifer forests in order to create a shaded fuel break which will tie in with a similarly developed fuel break completed by Sierra Pacific Industries. *(Refer to #1 on Figure X-2 at the end of this section.)*

Public and Private Collaborative Improvements Along and Adjacent to Ponderosa Way

Lassen National Forest, Sierra Pacific Industries, and Collins Pine Company have identified a number of biomass thinning operations that could be conducted along ridgetop roads in the area between Barkley Mountain and The Narrows just south of McCarthy Point. In addition, similar thinning work could be conducted along the upper slopes of Dead Horse Creek. This proposed project includes a possible extension of thinning work along Ponderosa Way toward Mill Creek. If completed, this latter project would add a four mile long linear protection feature. *(Refer to #2 on Figure X-3 at the end of this section.)*

Power Line Access Improvements within the Dye Creek Preserve

At the present time, power line access roads within the upper reaches of the Dye Creek Preserve are discontinuous, poorly maintained, and bisected by many stringers of live oak and other vegetation. A 2002 mastication project under power lines generated considerable dead fuel which could generate high fire intensities when wildfire occurs. In addition, steep areas near canyon bottoms have not been cleared of either live or dead fuels. As a result, these utility access roads cannot be safely or effectively used for prescribed burning operations. In order to correct this situation, fuels reduction projects need to be undertaken that improve the ability of fire equipment to rapidly travel these electrical utility roads, that reduce previously generated dead fuels, and that remove both live and dead fuels in canyon bottoms. *(Refer to Figure X-4 at the end of this section.)*

The Nature Conservancy /Dye Creek Preserve Fire Ecology Projects

As is the case with much of the fire management work conducted within the Central–Cohasset Planning Unit, fire planning efforts on lands managed by The Nature Conservancy (“TNC”) focus on ecological restoration and on land management practices that promote and sustain the natural fire ecology of the area. Few structures or developed features are found within TNC managed lands. As a result, with the exception of firefighter safety, the fire hazard to lives and property are not as significant on TNC lands as in areas near “at risk” communities and areas of Wildland Urban Interface. Throughout the Dye Creek Preserve, fire management has been identified as a key strategy and tool for managing an array of ecological threats to the grasslands and oak woodlands of the area. The use of prescribed burns has also been determined to be an important means of maintaining the environmental health of these lands, once current threats have been minimized. Through the use of managed fire, TNC is attempting to alter the age and size structure of vegetation within the area’s chaparral and low elevation forests, as well as to alter the fire regimes throughout the preserve. In addition, through the use of carefully developed burning prescriptions, TNC is attempting to control invasive plant species which threaten native plant and animal communities found within this portion of Tehama County. To accomplish its environmental goals, TNC employees have developed a yearly program of prescribed burning to enhance the resources on conservation lands under TNC management rather than to simply reduce the threat of wildfire within the Wildland Urban Interface. During the 2007 burning season, TNC staff treated 662 acres of chaparral and grassland fuels in the Wildcat North Unit and another 470 acres in the Andreini Pasture Unit. Between 2008 and 2010, TNC staff in partnership with CalFire plan to treat 1073 acres of chaparral and grassland fuels in the Upper Parker Unit on Dye Creek Preserve and another 2231 acres of grassland in the Brown, Foor and Rowles Units on Vina Plains Preserve, representing treatment of approximately 1100 acres of TNC land annually. This project work will be planned, funded, and administered through the CalFire vegetation Management Program. At the present time it is expected that roughly 2,000 acres of grasslands, oak woodlands, and chaparral lands will be burned per year, focused on these areas:

Ridgetop Fuel Breaks Between Grass/Chaparral Lands and Timbered Areas

The Deer Creek Fire Management Framework mentions that fires within the lower portions of the Deer Creek watershed spread quickly through annual grasses. In these grasslands, fuel breaks and other fuels reduction projects are of limited effectiveness in controlling fire spread, and air resources are often directed to those areas that have greater population densities, thus exacerbating the rate of fire spread. It is recommended that the Deer Creek Watershed Conservancy in connection with the Tehama-Glenn Fire Safe Council and Sierra Pacific Industries collaborate on the development and

funding of fuel breaks and other fuels reduction efforts in areas outside of the Ponderosa Way road prism as a way to reduce the threat of wildfire on valuable timberlands.

Coordination of Vegetation Management Efforts Within the Tehama Wildlife Area

On occasion, prescribed burns and other vegetation management projects are conducted throughout the Tehama Wildlife Area managed by California Department of Fish and Game. While these projects are developed with wildlife habitat improvement in mind, if properly conducted, these projects can also be used to reduce fuels in strategic areas. It is recommended that Department of Fish and Game personnel managing these lands and developing improvement projects coordinate with CAL FIRE, the Tehama-Glenn Fire Safe Council, and the Lassen National Forest in order to develop multi-resource improvement projects throughout these state lands.

Improvements to Existing Ponds and Lakes

Throughout the Central–Cohasset Planning Unit, a number of ponds and small natural lakes would provide water during fire emergencies. If properly developed with pumping facilities and storage tanks, the time it takes to fill tankers and other firefighting equipment could be dramatically reduced. As a result of improvements, these existing water sources could provide one of the most significant firefighting infrastructures within this portion of the Tehama East Community Wildfire Protection Plan project area.

Installation of Water Tanks with High Volume Fill Spout Fittings Throughout the Central–Cohasset Planning Unit

Given the remoteness of the area and lack of roads, a large percentage of the fires occurring within the Central–Cohasset Planning Unit are accessed by air utilizing the CalFire helitack crew located near Vina. In addition, water tanks located in very remote locations face a significant risk of vandalism which could render them useless in the event of a fire emergency. Considering these limitations, sites suitable for the installation of water tanks were identified by members of the Tehama-Glenn Fire Safe Council, Lassen National Forest, CAL FIRE, The Nature Conservancy, and the Tehama County Resource Conservation District.

Installation of a 10,000 Gallon Water Tank

Installation of a 10,000 gallon water tank was recommended at the ranch facilities at the Dye Creek Preserve headquarters(Refer to #3 on Figure X-5 at the end of this section.)

Sacramento River Corridor Planning Unit

Priorities and Summary of Proposed Projects

The significant resources found within the Sacramento River Corridor Planning Unit consist of:

- Various small rural communities:
 - ..Bend
 - ..Red Bluff
 - ..Dairyville
 - ..Los Molinos
 - ..Vina
- Lands used for commercial purposes such as farming, ranching and timber management
- Vast watershed areas containing an array of important environmental values such as:
 - ..Sensitive, threatened, and endangered plant and animal species along with their critical habitat, particularly vernal pool species found within the BLM Bend ACEC area adjacent to the Sacramento River
 - ..Water quality and quantity
 - ..Riparian habitats along major watercourses
 - ..Properly functioning aquatic ecosystems, including the non-natal rearing habitats found at numerous stream mouths along the Sacramento River
- Areas of cultural and historical significance, including significant sites of human occupation

Introduction

In terms of ranking priority projects, the protection of lives and private property was of paramount importance. The recognition that landscape scale interconnectedness of watershed components resulted in those projects which provided landscape scale protection to plants, animals and other watershed resources second in importance. Finally, projects that protected permanent cultural features in the area were given consideration. The following descriptions and discussion of projects to protect the resources within the Sacramento River Corridor Fire Planning Unit have been prioritized based upon the values placed on the primary resource these projects would protect.

The Sacramento River Corridor Planning Unit includes that portion of the Sacramento River's floodplain located within Tehama County. The area contains both public and private lands. Major land management entities and other stakeholders in the planning area include the U.S. Fish & Wildlife Service, California Department of Fish and Game, The Nature Conservancy, Bureau of Land Management, and California Department of Parks and Recreation. The lands found within this planning unit are located along a portion of the river that is outside the Sacramento River Flood Control Project area and thus has no levee control. With the exception of Red Bluff, Tehama, Los Molinos, and Vina, the majority of the Sacramento River Corridor Planning Unit is rural in nature, having a low population and low housing density. In addition to a riparian corridor located immediately adjacent to the Sacramento River, the planning unit contains agricultural lands such as orchards, croplands, and a small amount of irrigated grazing land. Since the majority of the planning area's agricultural lands are irrigated, they pose a minimal risk from wildfire during the dry summer period. Wildfire is, however, a threat to the unit's wildland areas adjacent to the Sacramento River. The topography of the undeveloped portions of the riparian corridor is generally characterized by high and low terraces, an array of oxbow lakes, and sparsely vegetated gravel bars that are often only accessible by boat. Vegetation consists of dense riparian forests, upland grasslands, riparian shrub lands, wetlands, seasonal marshes, and vernal pools.

The typical high fire danger period within the planning unit is between May and early November as confirmed by information developed by CAL FIRE. Most of the fires occurring on these lands are reported to last no longer than one burning period (suppression before sunup or sundown). Fire causes are generally roadside ignitions, adjacent levee burning, power line, railway, and adjacent agricultural burning. Fire history within the area indicates that large and damaging fires can occur almost anywhere within the planning unit. This includes large, one-day fires in grass fuels; large fires (over 200 acres) in the foothills, which can be difficult to contain; and valley grassland fires, which can carry rapidly spreading, wind-driven fires with low to moderate resistance to control once attacked.

Results

Given the relatively limited amount of stakeholder interest and participation in the Sacramento River Corridor Planning process, community input was focused on government land management entities and watershed conservancies. This participation consisted of agency (U.S. Fish & Wildlife Service and the California Department of Fish and Game) membership and input into the core work group's efforts, input from members of the Tehama-Glenn Fire Safe Council, and focused outreach to various landowners, watershed representatives, and land managers regarding technical or location specific issues. The results of these efforts are summarized in this section. Also presented in this section are

assets at risk located within the planning unit, in place fire protection infrastructure, and proposed efforts to improve the protection of local at risk assets. Additional recommendations for fire safe activities are discussed.

United States Fish & Wildlife Service

The presence of the U.S. Fish & Wildlife Service (USFWS) within the Sacramento River Corridor Planning Unit includes that portion of the Sacramento National Wildlife Refuge Complex (Sacramento NWRC) located within Tehama County and the Red Bluff Field Office (Red Bluff FO), which oversees management of the Coleman National Fish Hatchery Complex (Coleman NFHC). The Sacramento River NWRC was established in 1989 under the Endangered Species Act and Emergency Wetlands Resources Act with the purpose of preserving, restoring, and enhancing riparian habitat for threatened and endangered species, neotropical and migratory birds, waterfowl, anadromous fish, resident wildlife, and plants. The Coleman NFHC and the Red Bluff FO were established in part, to facilitate the restoration of Pacific salmonids by providing mitigation, biological expertise, leadership, and assistance to partners protecting and enhancing ecosystems of the northern Central Valley. The Sacramento NWRC was established under Executive Order No. 75 62 and the Emergency Conservation Act of 1933 to alleviate crop depredation and to provide wintering habitat for waterfowl. Fire management goals on all USFWS properties include the protection of life and property, reduction of hazardous fuels and non-native plants, and restoration of native habitats for fish and wildlife.

Assets at Risk from Wildfire

Refuge and hatchery properties include a range of assets at risk from wildfire. Many refuge properties include threatened, endangered, and sensitive species which could be affected by unplanned and catastrophic wildfires, including those that start on adjacent public and private lands. These USFWS properties support neotropical migratory land birds and diverse flora and fauna, in addition to providing feeding and resting habitat for migrating and wintering waterfowl and other water birds. These sites also provide opportunities for public education and research related to wildlife ecology and human impacts on riparian environments. Various structures, facilities, high value fish and wildlife habitats, and cultural resources occur on these properties. Wildland urban interface issues on local USFWS lands are most prevalent in the vicinity of the Coleman NFHC and in scattered locations adjacent to the Sacramento River NWR. Adjacent to these properties are orchards, pastures, agricultural crops, private duck-hunting clubs (seasonal wetlands), and low density housing that are also at risk of wildfire. The Coleman NFHC has additional issues with recreational use and target shooting on adjacent lands. In addition, these areas have increased ignition probabilities attributable to urban interface development and have a high potential for public trespass.

In-Place Fire Protection Infrastructure and Proposed Efforts to Improve the Protection of Local At-Risk Assets

The USFWS has established a funding priority for fire and fuels management projects within Wildland Urban Interface areas which emphasizes those assets and values at risk that are identified collaboratively within a Community Wildfire Protection Plan. In some cases, habitat management goals would create and/or maintain vegetation (fuels) in a Fire Regime Condition Class II or III. Some of these habitats have been significantly altered from historic conditions, but the ecosystem is not at risk of collapse and may be managed with fire at a more frequent rate than would naturally occur. In areas being managed for native upland habitat, the presence of nonnative invasive plants such as yellow starthistle and medusa-head grass is a significant issue and has altered the fire regime/condition class.

USFWS Planning Policy

The Department of Interior (DOI) fire management policy requires that all burnable acres on USFWS lands have a Fire Management Plan (FMP) which details fire management guidelines for operational procedures and values to be protected and or enhanced. FMP's are tiered from larger programmatic-level resource management plans such as a refuge Comprehensive Conservation Plan (CCP) and associated Habitat Management Plan (HMP). Current FMP's within the Tehama-Glenn Fire Safe Council area of interest include the 2001 Coleman NFHC FMP (updating in 2006), the 2001 Red Bluff FO FMP, and the 2001 Sacramento NWRC FMP. These FMP's are designed to assist in the protection of individual site facilities, resources, employees, and adjacent communities at risk to wildfire.

Fire management programs are coordinated by the Zone fire management team and various resource staffs, although final management decisions are made by site or complex managers. Fire project planning and implementation are directly supervised by the Zone Fire Management Officer. The Sacramento Fire Zone maintains a fire staff consisting of a Fire Management Officer, Wildland Urban

Interface Coordinator, Fire Operations Supervisor, Engine Captain and crew.

Planning strategies and objectives are considered in the preparation of the Zone's Annual Work Plan and development of annual budget requests. Proposed actions, alternatives, and environmental analyses in compliance with the NEPA will be developed from annual strategies and will be used in the development of site-specific projects occurring on FWS properties. Annual work plans/project lists will be provided to the applicable CWPP representatives (CALFIRE Tehama-Glenn Unit Pre-Fire Engineer and TGFSC Coordinator) and other interested parties for review, prioritization, and amendment/adoption into the applicable CWPP(s).

Proposed WUI Projects

The USFWS North Central Valley Fire Management Zone submitted a proposed 2007 Wildland Urban Interface project, along with CWPP support information, to the Tehama-Glenn Fire Safe Council for review, comment, and adoption. This information was then forwarded to the Tehama County Resource Conservation District for incorporation into the Tehama East Community Wildfire Protection Plan. Initially, project proposals are general and aim for maintenance and projected project needs (out-year planning). Treatment areas have primarily been outlined within Fire Management Plans, Habitat Management Plans, and Comprehensive Conservation Plans, which provide the overlying management objectives. USFWS Wildland Urban Interface project areas/treatments may also be identified through CWPP efforts. Collaborative Wildland Urban Interface treatments identified within a CWPP will receive priority funding.

The majority of USFWS Wildland Urban Interface treatments are focused at reducing nonnative vegetation and hazardous fuels as well as managing habitat.

Mechanical fuel treatments may include hand thinning, chipping, mowing, disking, and grazing. Prescribed fire and grazing are often the preferred management tools (depending on habitat type), as they provide many habitat benefits as well as hazardous fuels reduction. The majority of prescribed fire activities on USFWS lands follow minimum impact strategies so as to reduce impacts to sensitive/protected plants, fish, and wildlife. The following are proposed fiscal year 2007 Wildland Urban Interface projects within the Tehama-Glenn CWPP unit area.

- 07-SAC-CNFH Piles—Proposed two acres of thinning around structures and pile burning at Coleman NFHC for approximately \$5,560
- 07-SAC-Sacramento Rx—Proposed 287 acres of prescribed burning at the Sacramento NWRC for hazardous fuels reduction and habitat management for approximately \$48,480
- 07-SAC-Sac Cmplx- CCC Project—Proposed 30 acres of mechanical work on USFWS and private lands in the WUI for approximately \$31,000
- 07-SAC Cmplx- Tribal & CSUC Fuel Reduction Projects—Proposed 50 acres of fuels reduction, vegetation management, and research (treatment options for native plant and cultural resource management) on USFWS and private lands for approximately \$50,000
- 07-SAC-Cmplx-RFD Partnership Defensible Space Projects—Proposed 30 acres of mechanical treatments on USFWS and private lands in the WUI for approximately \$30,000
- 07-SAC-Sac River Rx—Proposed 79 acres of prescribed burning on the Sacramento NWRC for hazardous fuels reduction and for fish and wildlife

habitat management for approximately \$13,720

· 07-SAC-Sac River WUI—Proposed 2,248 acres of mechanical fuel break maintenance (mowing, disking, and thinning) and grazing for approximately \$99,500

· 070SAC-RBFO-RX—Proposed 21 acres of prescribed burning around properties adjacent to roads, railroad, and facilities to reduce hazardous fuels for approximately \$6,740

Partner and community support for USFWS fire management projects enhances funding and implementation options for USFWS and project collaborators. Federal WUI funding is prioritized by several factors, with emphasis on collaboration. Both grant funding and agency project funding are enhanced as partnerships, and support, are leveraged.

Zone WUI Program Objectives

Within the WUI, fuels reduction projects will be designed to mitigate the risks to people, their communities, and adjacent resource values important to the social/economic stability of those communities from unwanted wildland fire. Although community protection is a WUI priority, USFWS has a general conservation mission and when and where possible will incorporate habitat objectives into WUI projects. To be effective in mitigating risks, in many cases projects cross over jurisdictional boundaries and address landscape level management strategies. USFWS-funded WUI projects emphasize the following criteria:

1. Be focused on communities at risk (CAR). In California, the CAR list is maintained by the California Fire Alliance and a process is in place for communities to be added or removed from that list. If the adjacent community meets the criteria of “at-risk” and is not identified on the CAR list, guidance and information will be offered to community organizations (fire safe councils, fire departments, city council, etc.) on the potential benefits of this listing status, and these community organizations will be directed to the CAR application.

2. Be adjacent or in close proximity to USFWS lands where there is risk of fire originating on those lands and threatening life and community values.

Additionally, other lands will be managed under the direction or guidance of USFWS to incorporate fire management and hazardous fuels reduction within the WUI. These projects may include conservation easement lands

and recovery implementation projects providing the mutual benefit of species recovery and fuels reduction.

3. Be identified or referenced within a CWPP which has or will be coordinated with the USFWS or is identified under a collaborative agency hazard mitigation plan which meets the intent of or is equivalent to a CWPP when all partners are not available.
4. Be designed to meet the objectives outlined in a CWPP (or other collaborative plan) and consistent with USFWS policy and management directives.

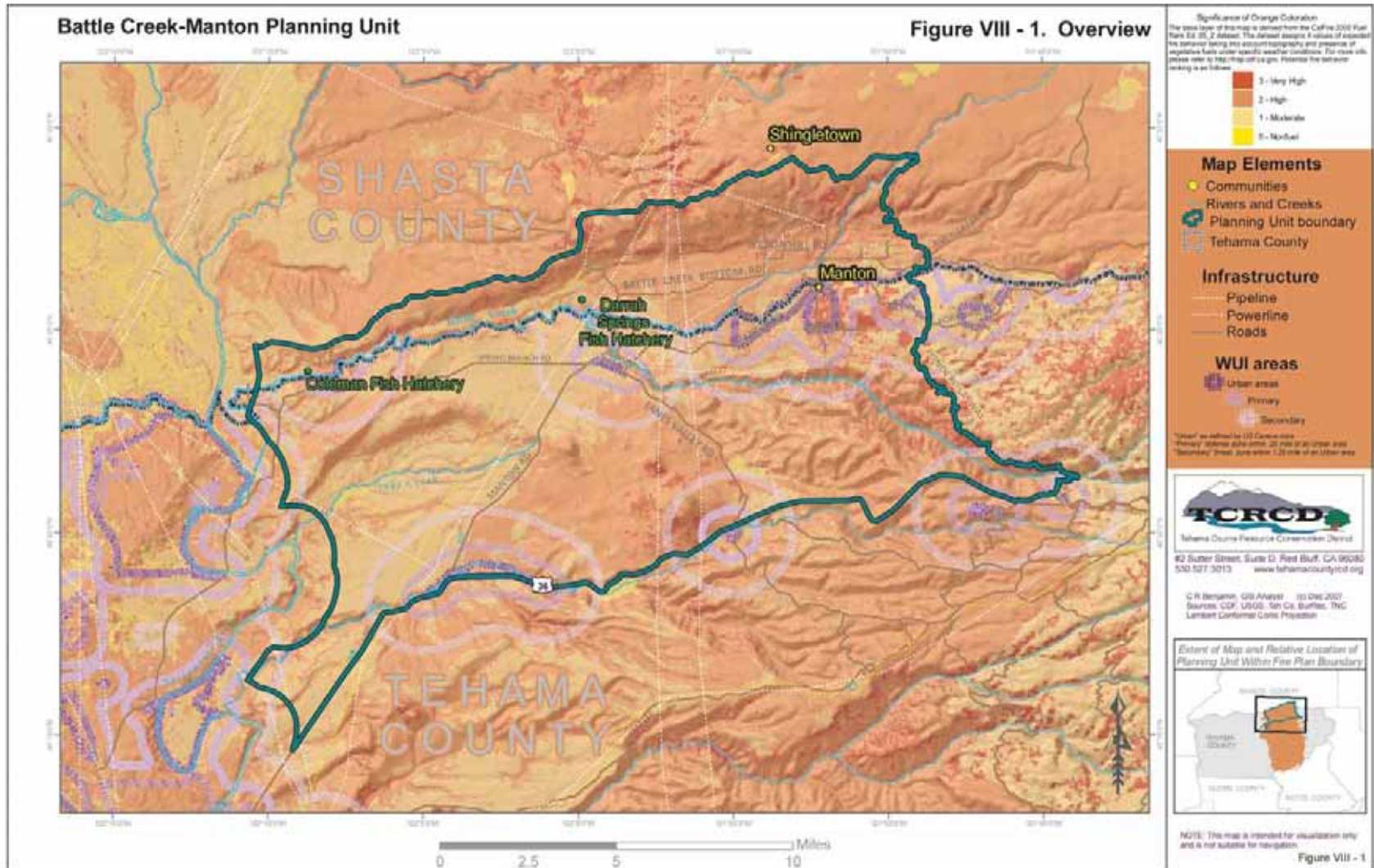
Priority objectives include (a) firefighter and public safety, protection of community values (including primary living and business structures, escape routes, watershed and ecosystem functions); (b) utilization of mechanical treatments which emphasize projects yielding biomass for off-site economic use (see guidance in the Apr 2004 DOI IM “Implementation of the Policy and Principles of Woody Biomass Utilization”); (c) partnerships providing matching or in-kind services demonstrating commitment to project objectives; (d) utilization of local contractors in support of rural community stability; and (e) provision of the mutual benefits of hazardous fuels reduction and ecosystem enhancement.

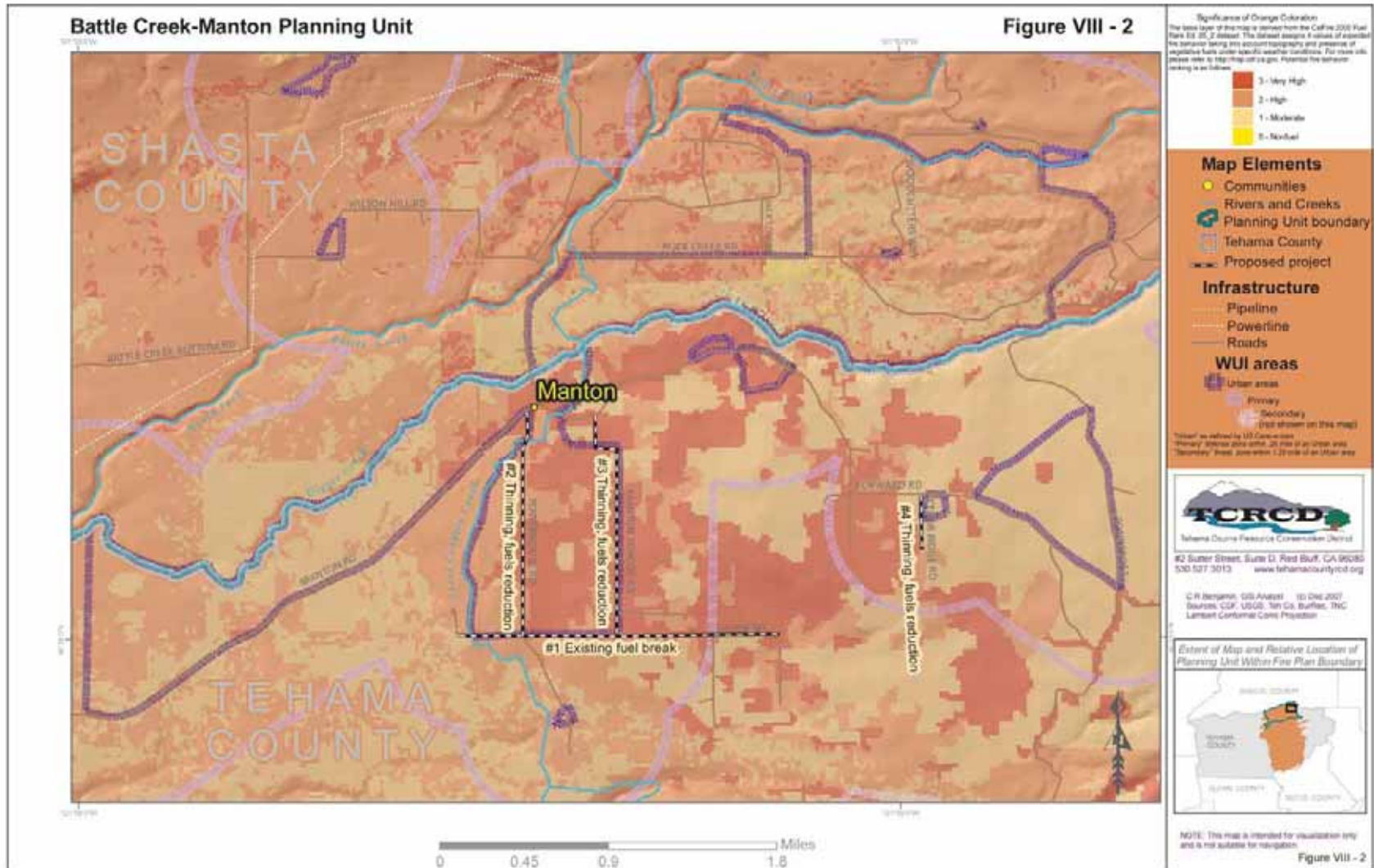
Zone CWPP Objectives

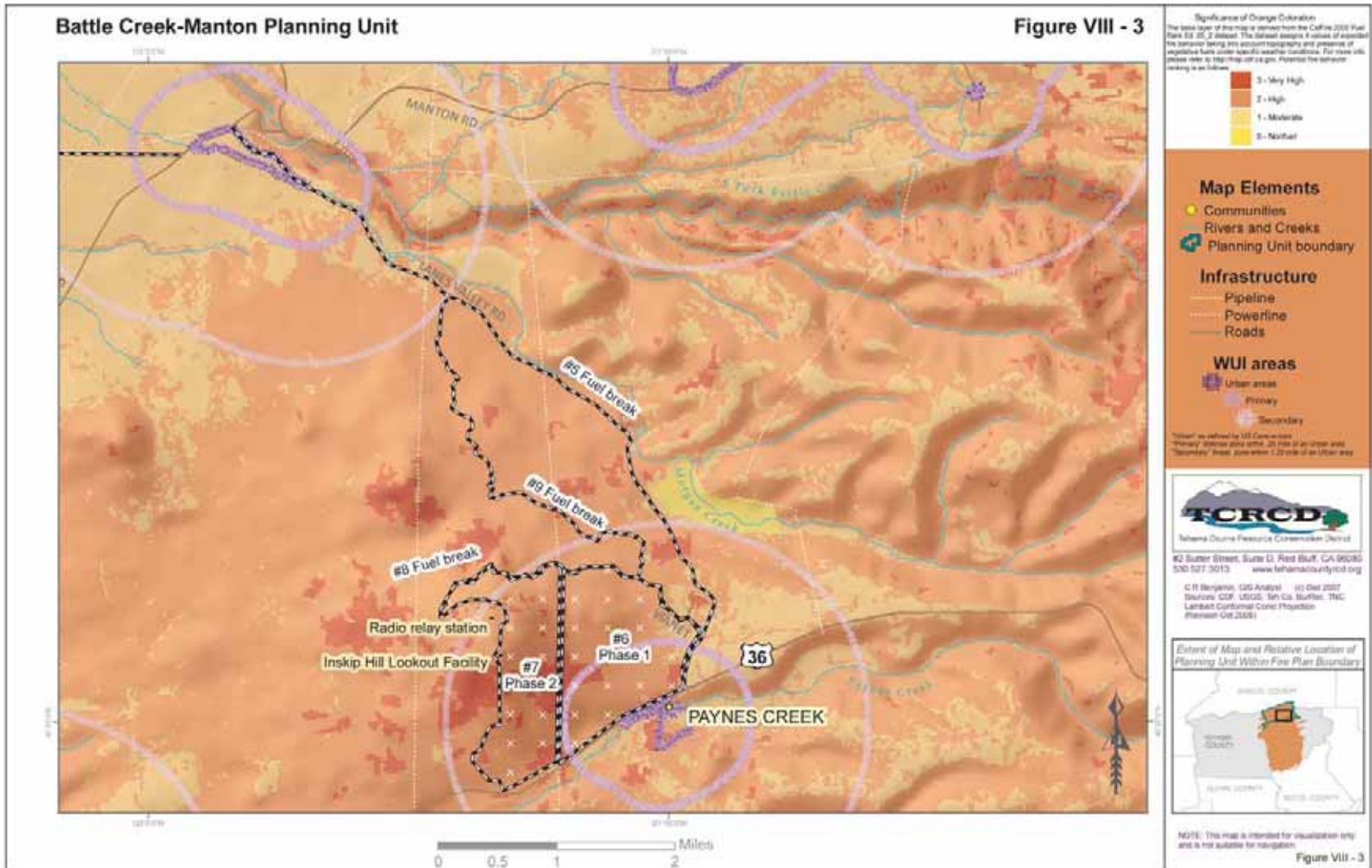
Education and outreach with interagency and local WUI partners will be the key to integration of USFWS fire management activities in a CWPP. Refuge CCPs, HMPs, and FMPs may need to be presented and/or interpreted to WUI partners in order to provide the information necessary for cooperative fire management efforts. Managers will review refuge documents to determine if WUI program objectives are clearly outlined and linked between plans. Many CCPs and HMPs may only identify fire as a habitat management tool and may not identify WUI program objectives. Under a CWPP, community values and objectives will be defined through a collaborative process. An attempt will be made to address and incorporate refuge habitat management objectives into a CWPP when considering USFWS-related WUI projects. Refuge FMPs will identify CWPP objectives, treatment areas and projects when and where applicable. The March 2003 Information Memorandum (IM) Service Fire Management Policy Clarification states that USFWS fire management policy and implementation guidance shall apply to all USFWS fire management activities regardless of land ownership. USFWS projects defined in a refuge FMP and CWPP or with the treatment area and treatment type identified in a CWPP will receive priority WUI funding.

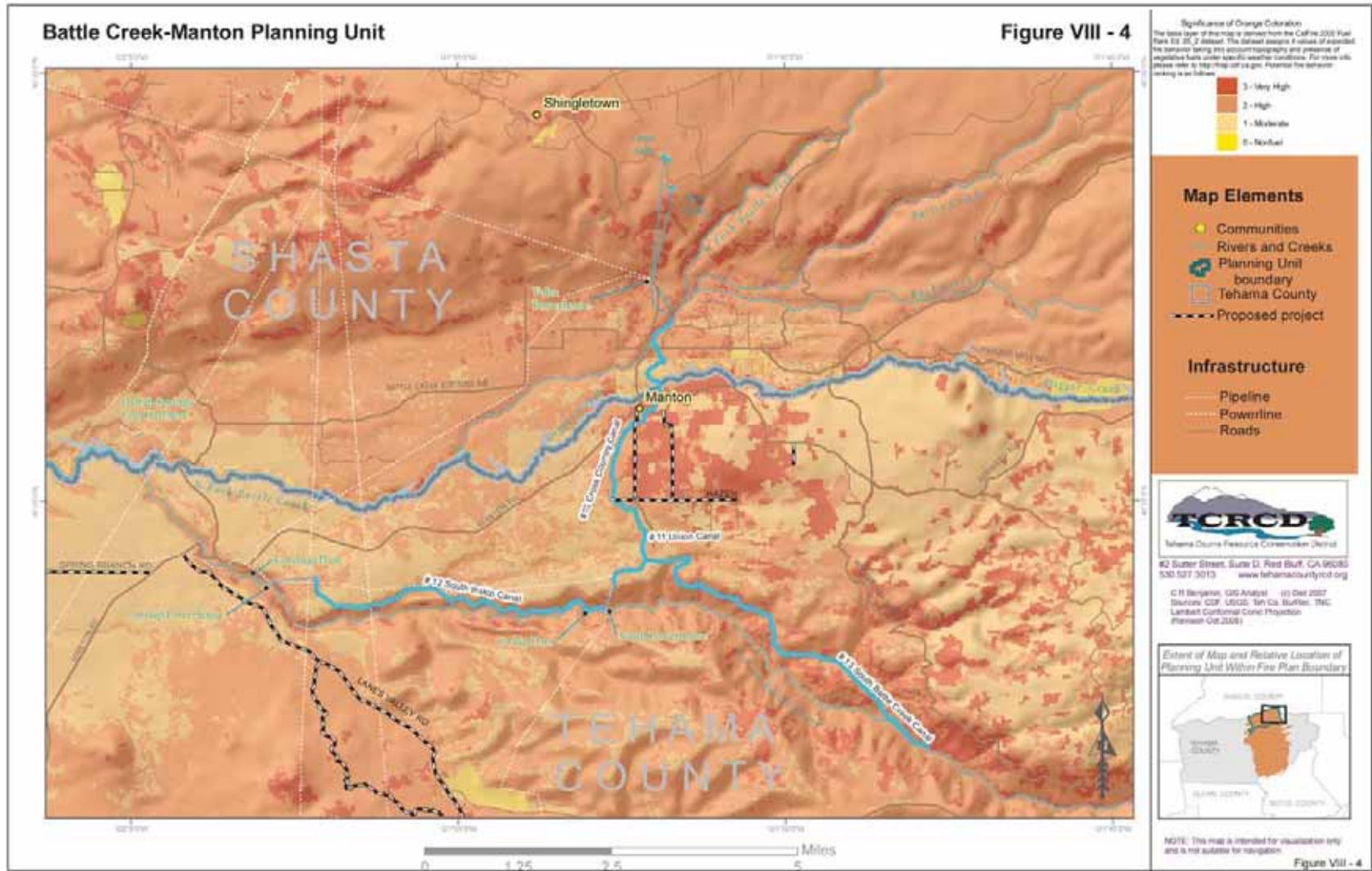
Where appropriate, a CWPP can be incorporated into a county plan or Disaster Mitigation Act/Multi-Hazard Mitigation Plan to help meet multiple planning and policy requirements. Project prioritization at a larger scale makes agency-funding strategies more effective while addressing local needs. The complexity of a CWPP will be dependent on local needs and opportunities, however the USFWS may be more strategic at coordinating at the county or watershed level or through integration with CalFire unit plans.

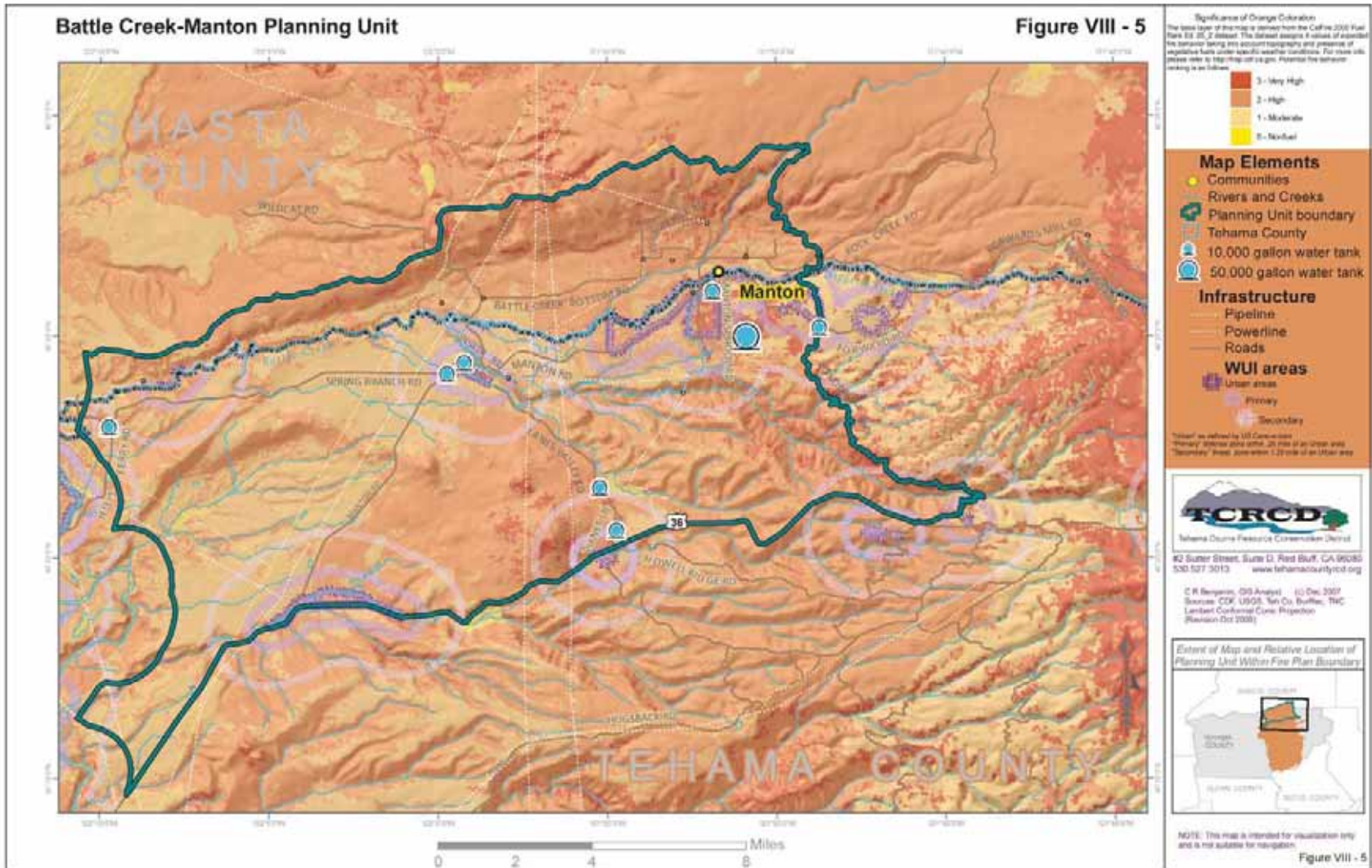
USFWS fire management directives state that a FMP will be reviewed and/or revised at a minimum of five year intervals or when a significant change in program management is proposed or land use changes occur adjacent to FWS lands. When a FMP is ready for revision or amendment, CWPP objectives and treatments will be incorporated into the plan, if and when applicable.

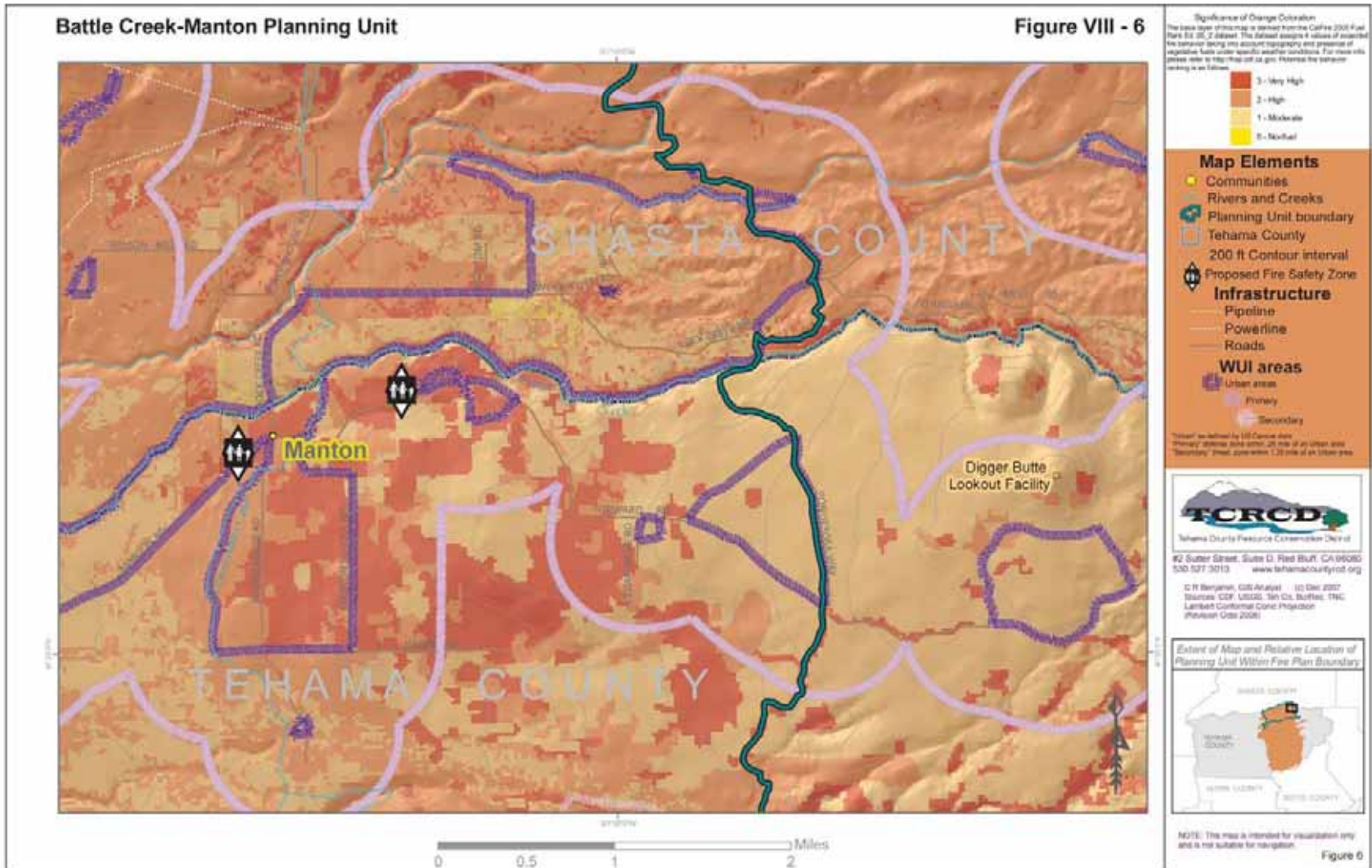


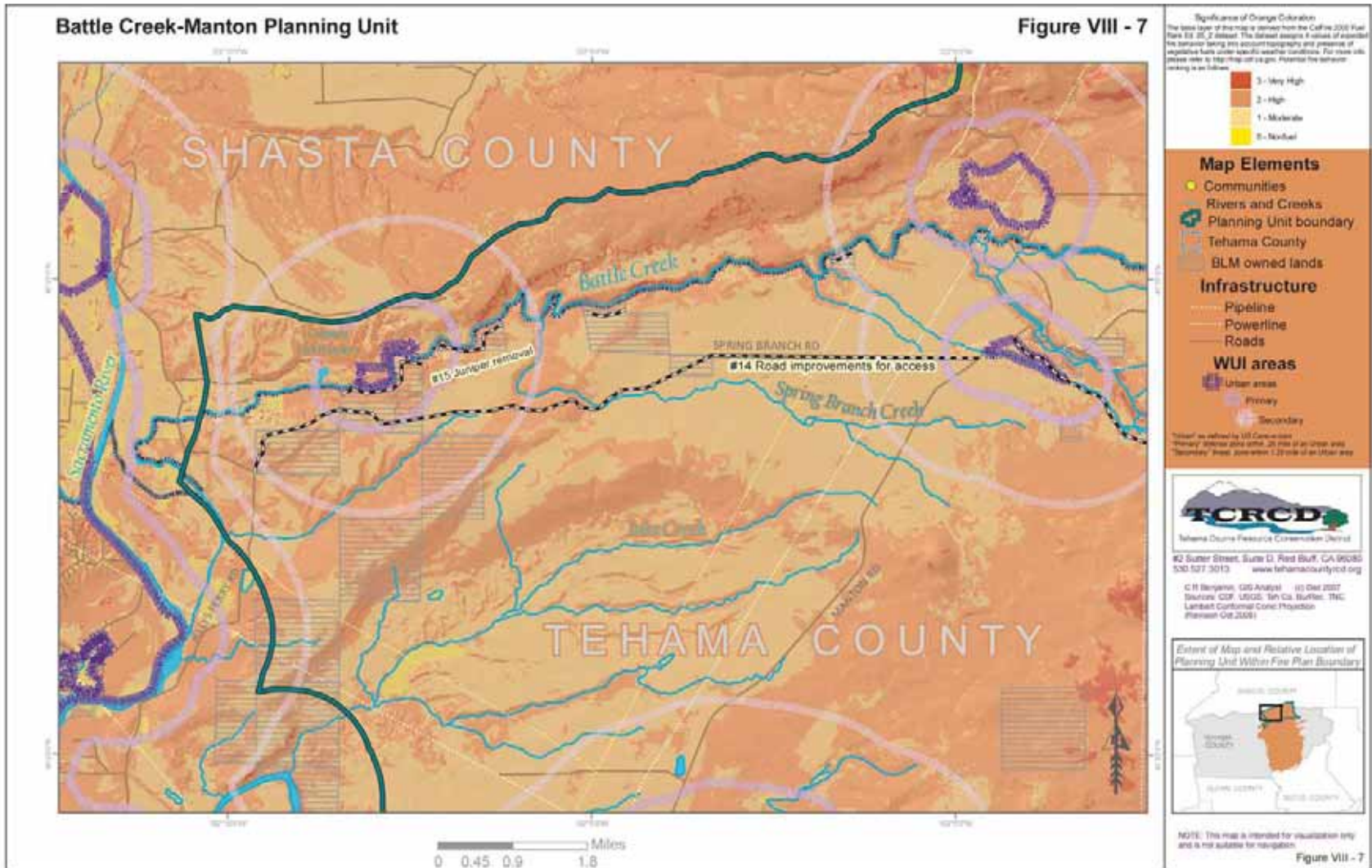


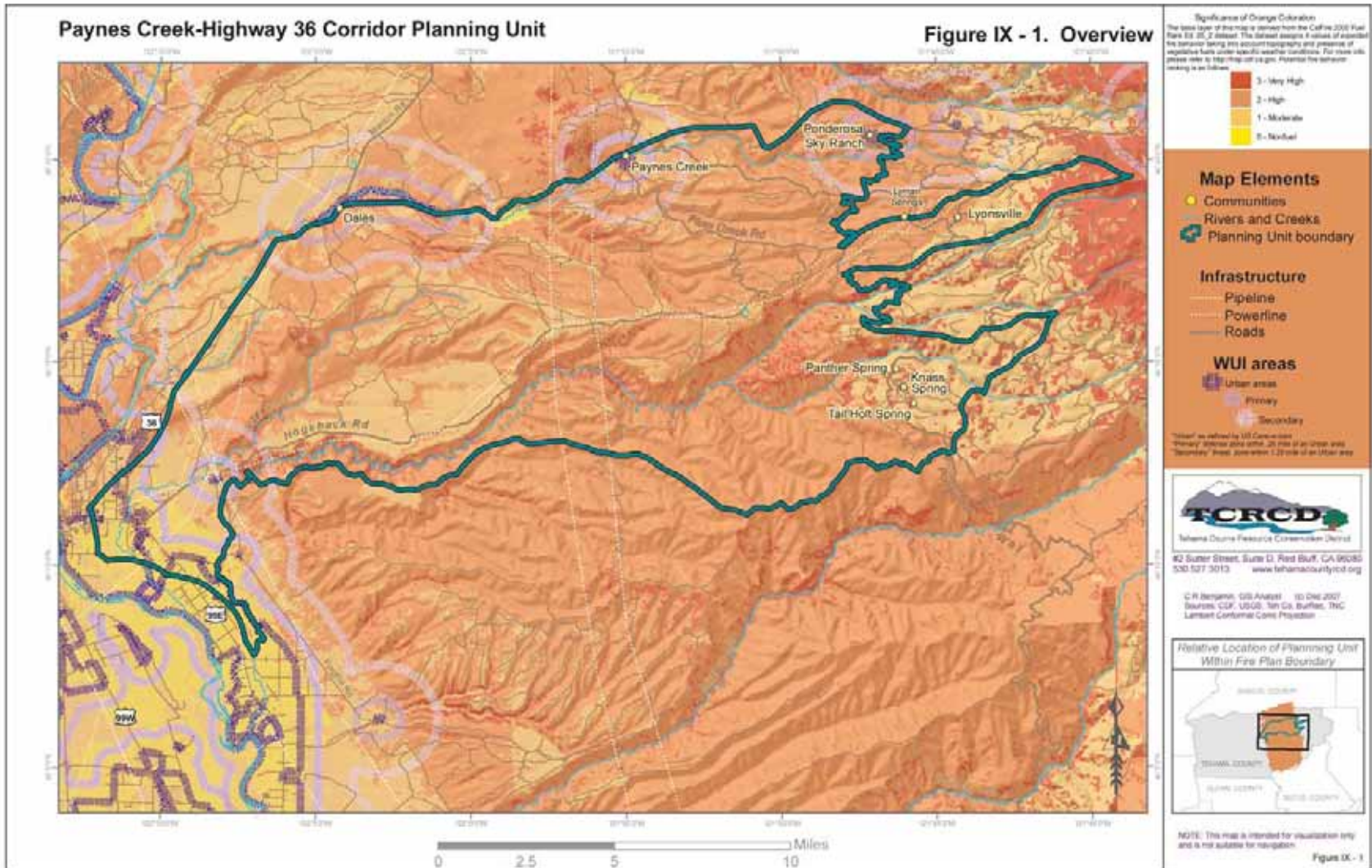


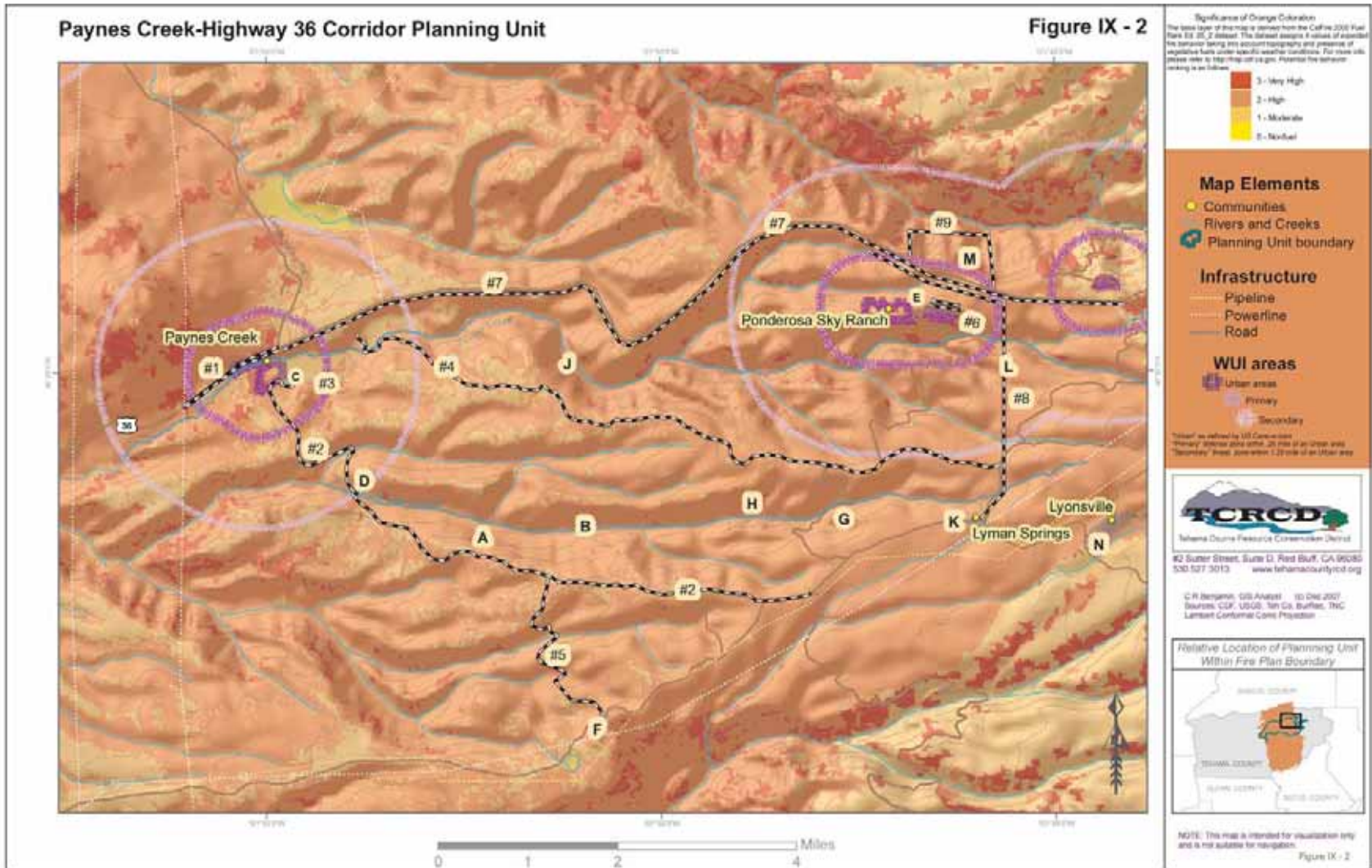


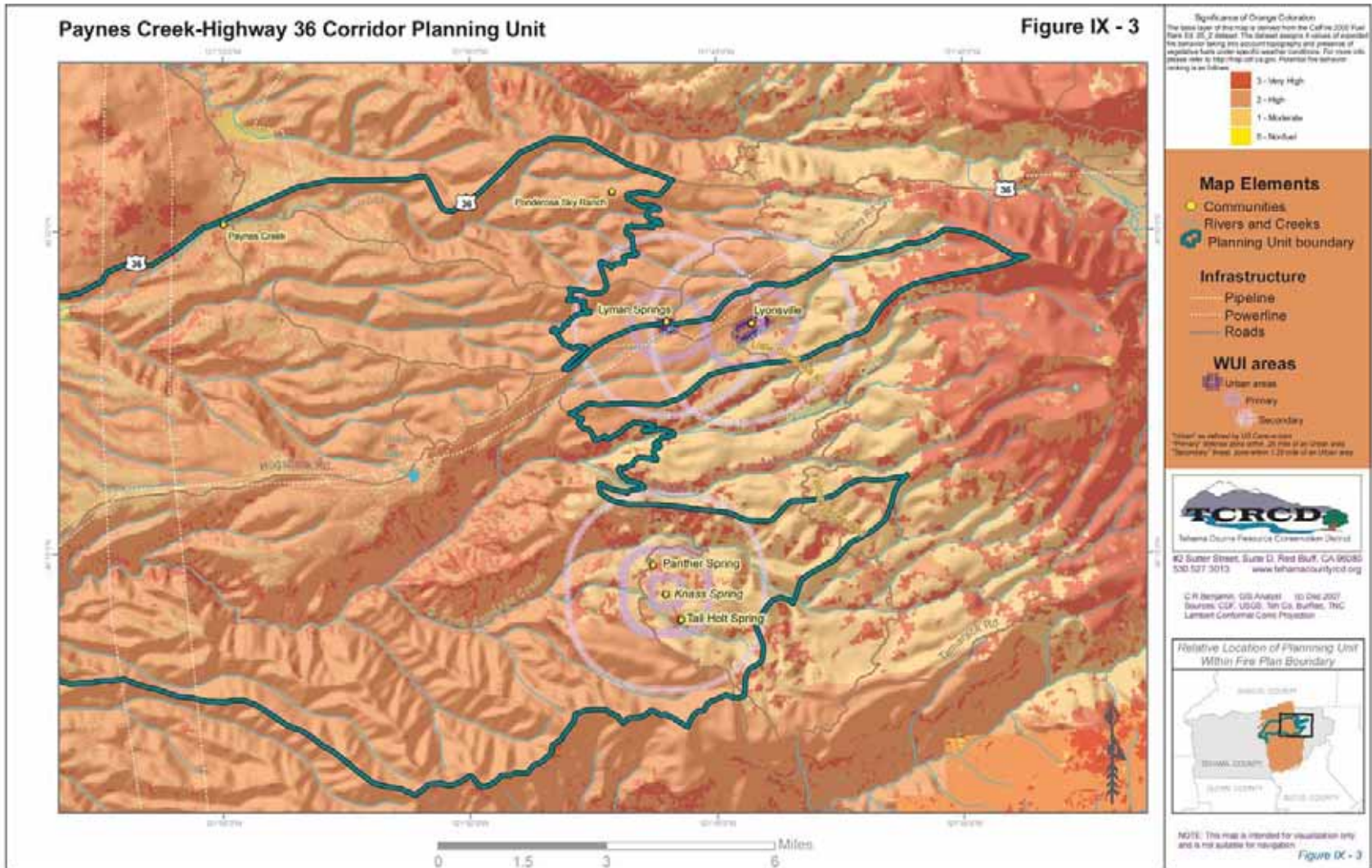


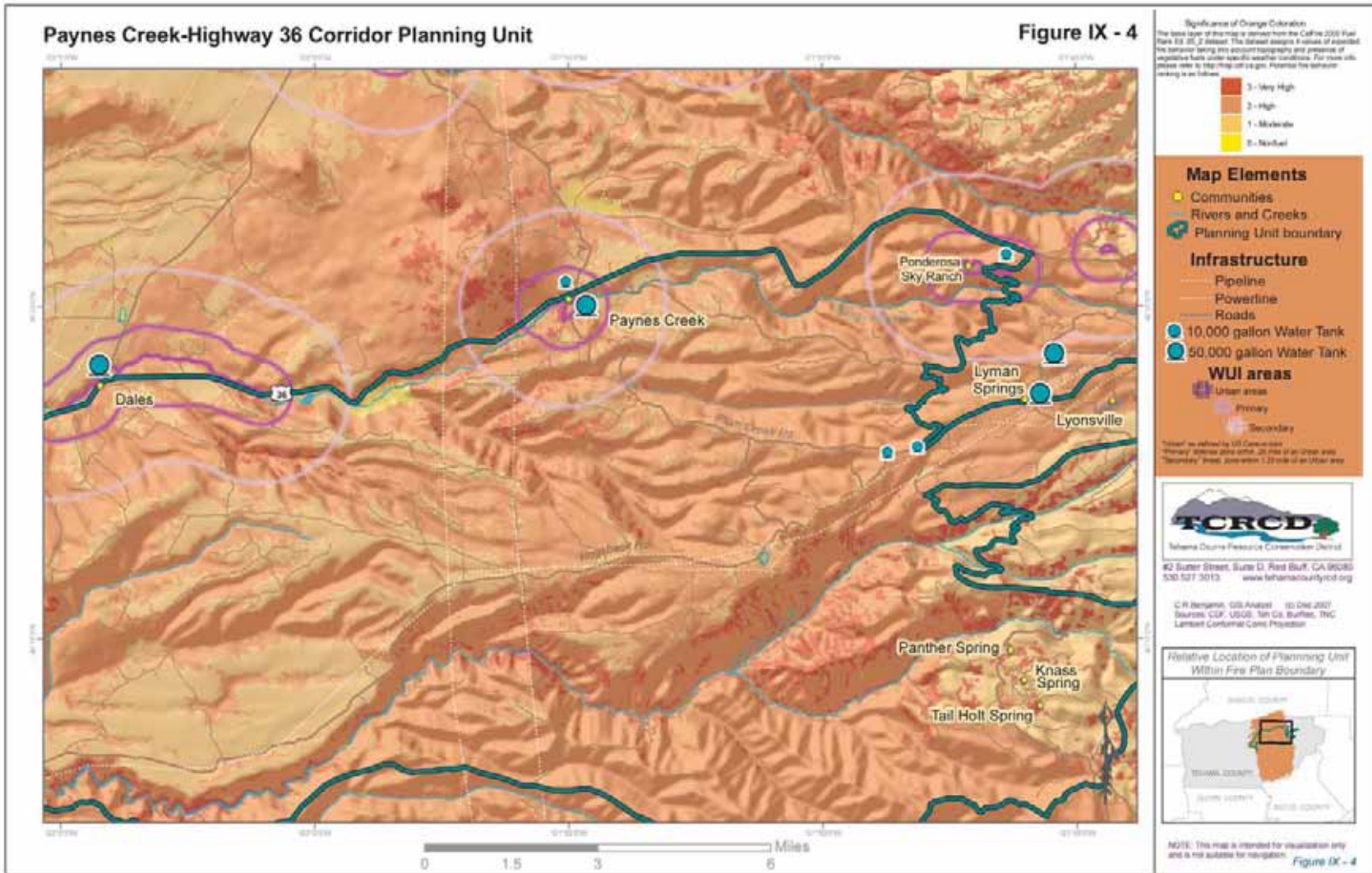


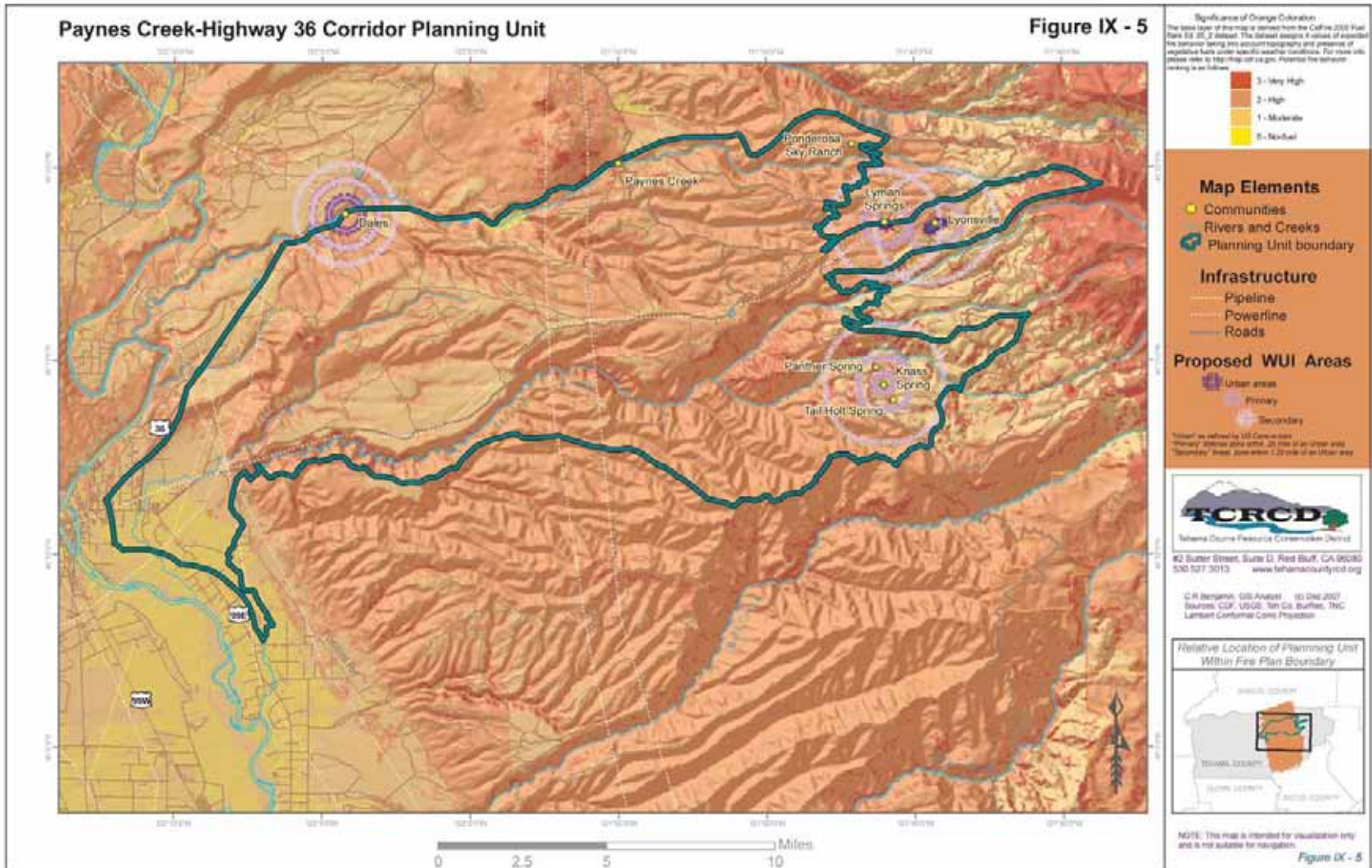


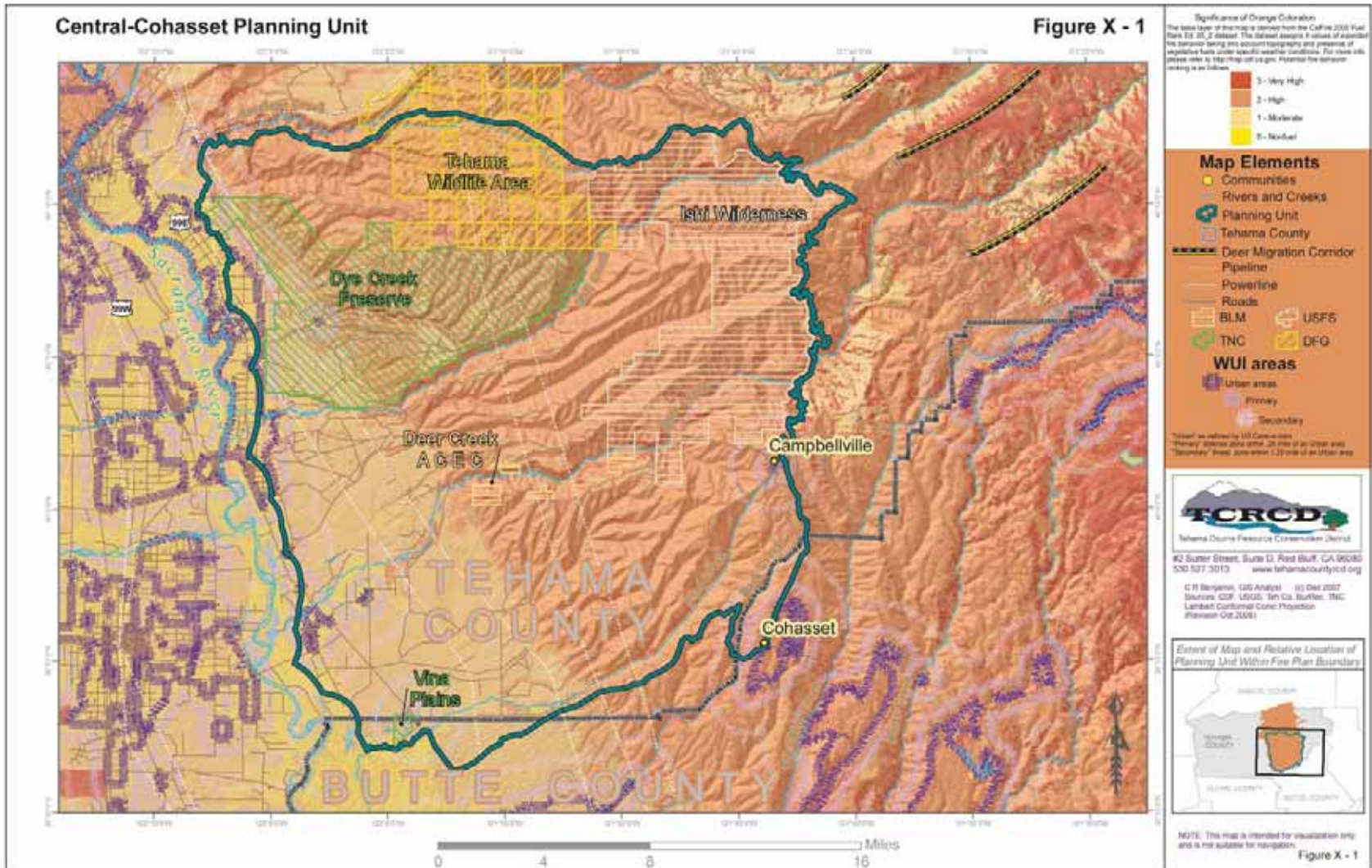


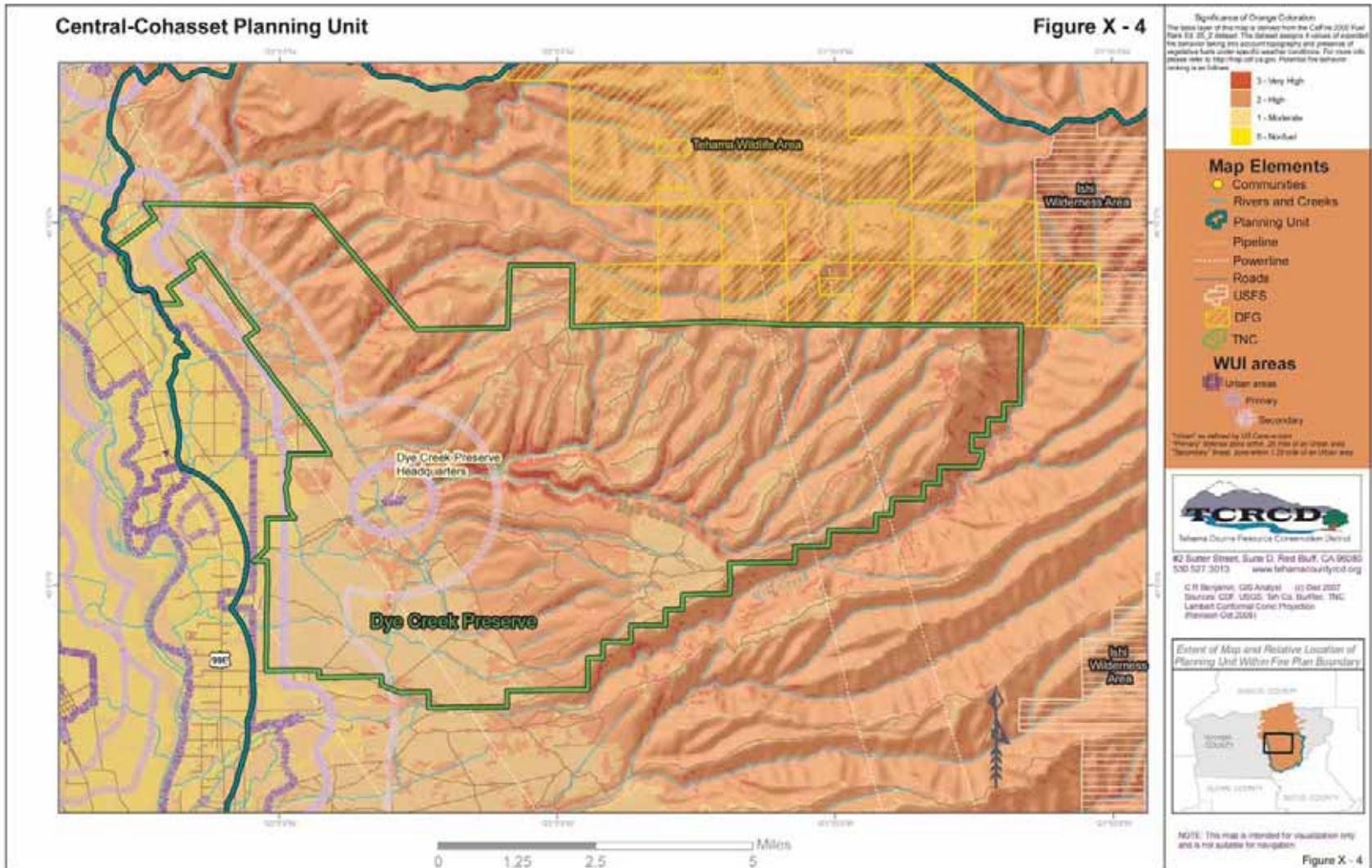


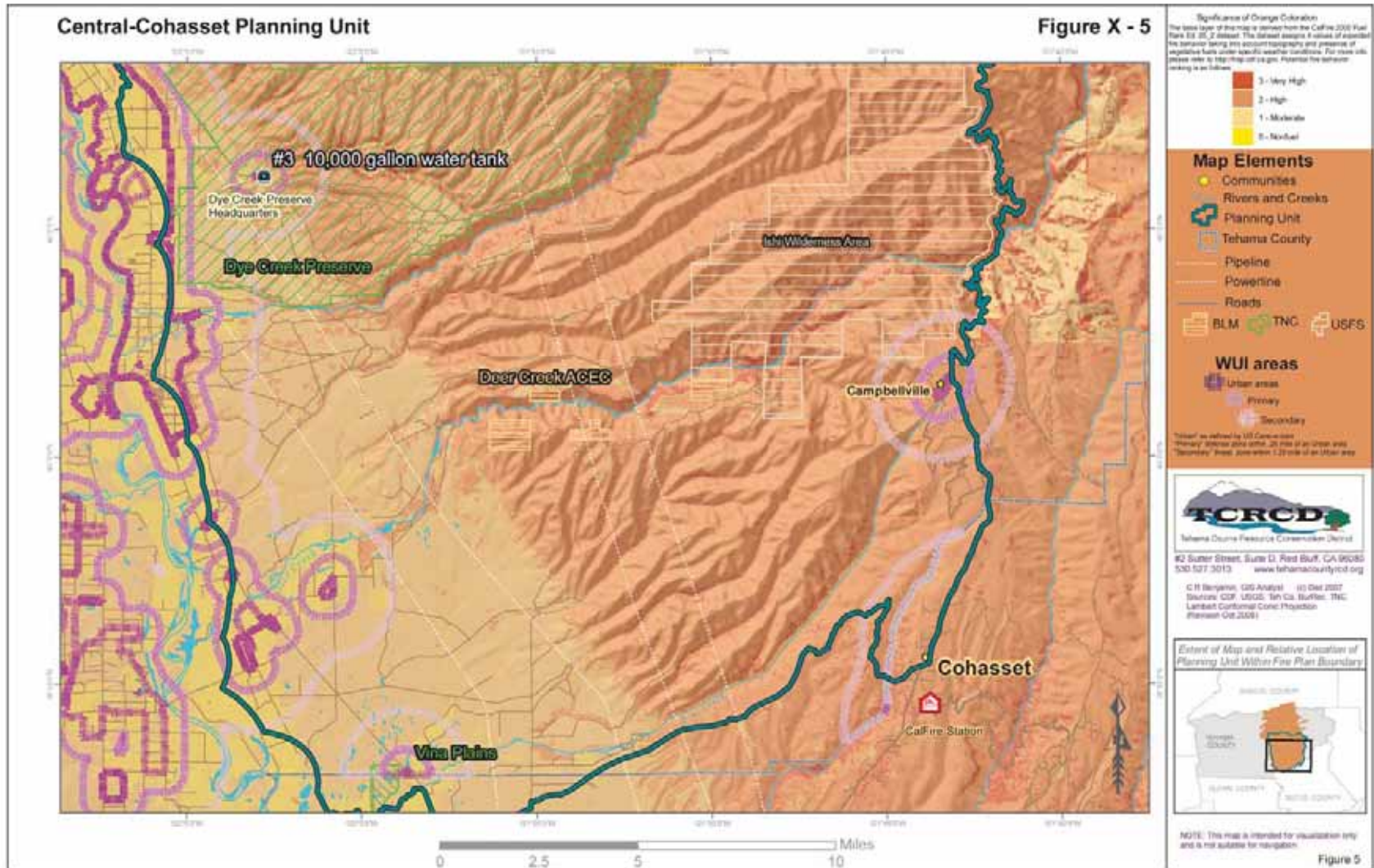


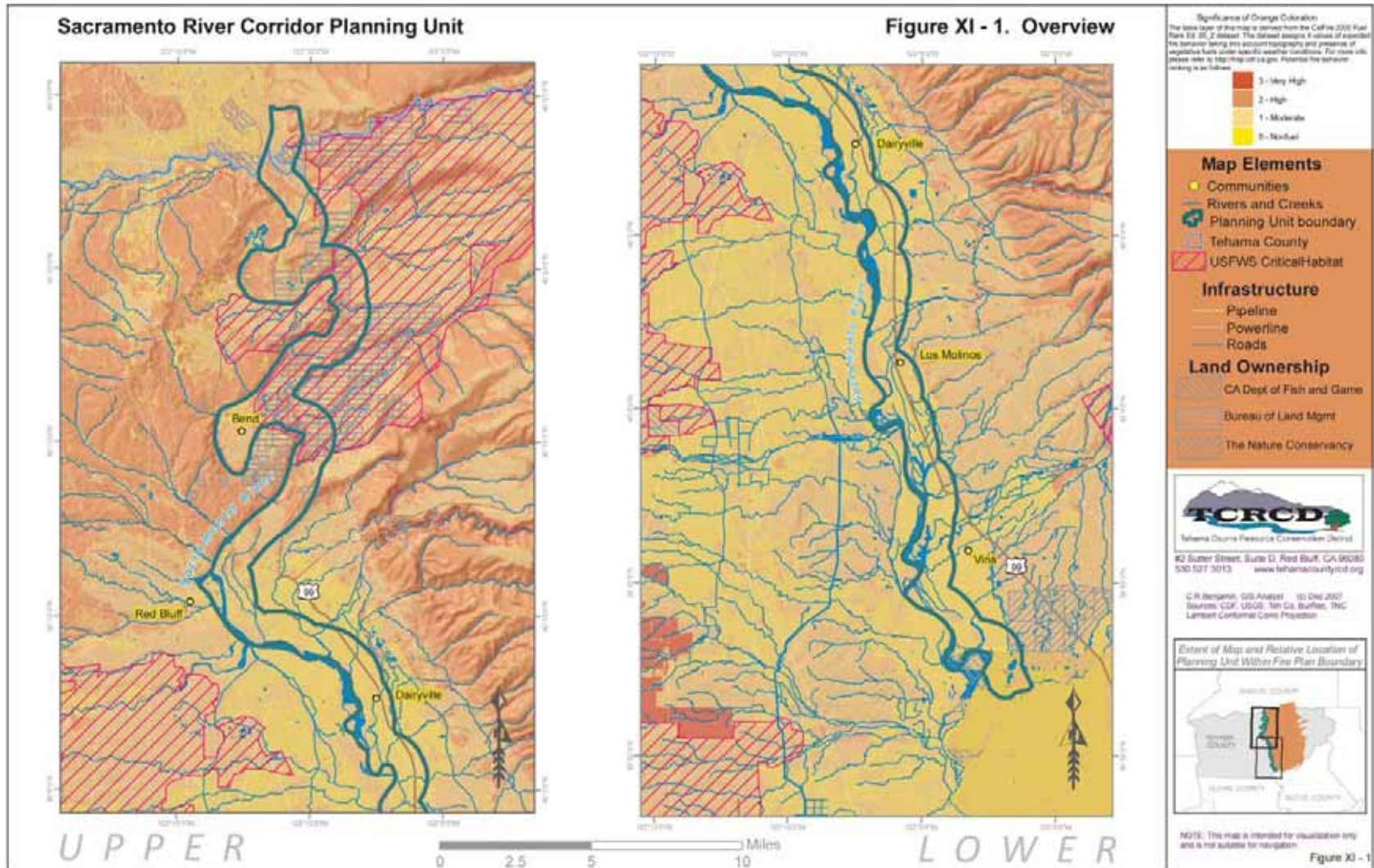












Tehama East Projects Completed

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.

Tuscan Headwaters Project

2008 - 2011

The Northern California Regional Land Trust (NCRLT) and Sierra Nevada Conservancy (SNC) signed a Grant Agreement for the "Tuscan Headwaters Project" (Project), a collaborative outreach campaign designed to increase stakeholder awareness and conserve land in the upper reaches of up to 10 watersheds within the Tuscan Land Formation in eastern Butte and Tehama counties.

Increasing demand for water in California threatens the watersheds and groundwater resources in the Tuscan region. The depletion of groundwater lowers surface water flows and drains wetlands, damaging riparian habitat and affecting water quality. Protecting Tuscan aquifer recharge areas will help ensure that wildlife habitat, agricultural lands and urban areas can continue to depend on sufficient water resources into the future. Building public support for watershed protection and generating interest among landowners for permanent land protection using conservation easements will help protect the Tuscan watersheds and aquifer from these threats.

The purpose and goals of this project are to facilitate coordinated outreach between the NCRLT and Tehama County Resource Conservation District with the intention of increasing stakeholder awareness, and land conservation and stewardship within the upper reaches of Paynes Creek and Antelope Creek in eastern Tehama County.

Tehama East Projects Completed

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.

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CARCD Cooperative Forest and Fire Technical Assistance and Outreach Grant

May 2009 – September 2009

This project made use of existing multimedia materials regarding creation of defensible space and presented these materials as well as providing on the ground demonstrations of these techniques for the rural residents of Tehama County. Presentations of these materials through workshops in various communities of Tehama County provided the opportunity to address critically important information to those residents. To better illustrate the information provided through the presentation workshops, 'hands-on' workshops showed the rural resident what that effectively looks like when put into practice.

The workplan consisted of determining the greatest opportunity to disperse information related to wildland fire and the interface with rural residents. Most of the rural residents within Tehama County are found within three to four communities, located in the foothills of the inner Coastal Range and Sierra Nevada/Cascade Ranges. Some of these communities have recently experienced wildland fires within or near their communities. Others have yet to experience first hand. While it may appear that holding a workshop concerning defensible space in communities that have experienced such events, there are always newcomers to these areas that often arrive from parts of the country that does not a familiarity with such occurrences and need to be informed.

Sierra Nevada Yard & Garden – Sierra Nevada Alliance

September 2008 – September 2010

The Yard & Garden program provides written information, on-site consultation and ongoing assistance to help homeowners adopt practices that protect their watershed. The program conducts site visits, makes recommendations, and leaves the homeowner will tools such as a site plan, resource list, and suggested next steps for their yard. These programs consider five elements of conservation landscaping: soil, water, vegetation, wildlife, and wildfire.

Sierra Nevada Yard & Garden Program promotes conservation landscaping integrating issues of water, soil, vegetation, wildlife, and wildfire. It is a strategy for creating a low impact, highly efficient yard design which accommodates the natural elements of a yard, integrating homeowner uses like recreation, meals and pets, living in harmony with wildlife, and creating a visually appealing space that is defensible against wildfire.

Department of Conservation Watershed Coordinator Program

2009 -2011

The goal of the Tehama County Resource Conservation District's Department of Conservation' 2008-2011 Watershed Coordinator Program is to build upon the knowledge and understanding of the County's watersheds that has developed over the past ten years.

The watershed assessments and management plans developed over the past five years identified an array of issues and opportunities within the County's Eastside and Westside watersheds. Under the current work program, these issues are being addressed through multiple projects and initiatives that restore and protect local watersheds. These efforts also help implement the TCRCD's other long range goals including improvement of upper watershed and riparian health, water quality and water quantity. Current efforts are increasing the District's financial independence by developing non-grant funding sources. Significant levels of traditional grant funding are also being developed to complete project work. Finally, accomplishment of these goals require extensive coordination with surrounding Resource Conservation Districts, watershed groups, resource agencies and other stakeholders located within and outside of Tehama County.

Tehama County Resource Advisory Committee East Sand Slough Invasives Management Project 2009 – 2010

The *East Sand Slough Invasives Management Project* entails GPS mapping of invasive plants throughout a city owned 25 acre parcel in order to determine the location and acreage of invasive Himalayan blackberry (*Rubus discolor*) and Tree of Heaven (*Ailanthus altissima*). Elderberry (*Sambucus nigra* L. ssp. *canadensis* (L.) R. Bolli) is being mapped utilizing GPS technology in order to locate and protect individual plants from damage during project operations. Reduction of Blackberry biomass is being completed using goats that intensively graze infestations on a short duration basis. With vegetative material from these invasive species reduced or removed, City of Red Bluff personnel or contractors will apply a suitable registered herbicide to treat remaining stems and root masses. Follow up herbicide treatments will be applied by City personnel as described in a vegetation management plan prepared by the Tehama County RCD, the City of Red Bluff and the Mendocino National Forest.

Once the upstream portion of the project area has been treated, work will continue down stream on a 488 acre parcel managed collaboratively by the Mendocino National Forest and the Sacramento River Discovery Center. Infestations of invasives along with elderberry plants will be mapped with GPS. Included in this effort will be the removal and chemical treatment of Andean Pampas Grass (*Cortaderia jubata* or *C. selloana*) infestations along Sale Lane. This portion of project work will entail reduction of vegetation using California Department of Conservation/Cal Fire Salt Creek Camp crews, who will cut, pile and later burn vegetative material. Once this has been completed, Mendocino National Forest personnel who are licensed applicators will treat Pampas Grass clumps with an appropriate herbicide licensed for use in aquatic environments. Scattered clumps of Giant Reed (*Arrundo Donax*), Tamarisk (*Tamarix parviflora*), Black Locust (*Robinia pseudoacacia* L), Eucalyptus (*Eucalyptus globules*) and Tree of Heaven will be cut and piled by Sacramento River Discovery Center students for later burning by Conservation Camp crews. The stumps of these invasive plants will later be chemically treated.

U.S. Fish and Wildlife Service Ponderosa Way Fuels and Road Assessment 2009 -2011

This survey and analysis project entails the development of a planning and strategy document that will assess the condition of both roadside fuels and roadbed conditions along Ponderosa Way. Much of this work is being conducted using remote sensing data (air photos etc.); GIS analysis, road maintenance records provided by the Tehama County Road Department and various landowners who maintain portions of the route. Landownership have been identified using Tehama County parcel data. With this information, specific project work scopes will be developed and recommendations made to land managers as to efforts that could improve the route as a shaded fuel break, egress route for firefighters and as an escape route for local communities. These developed areas include Lyonsville, Lyman Springs as well as those residences located in the extreme eastern portion of the Manton Community. Once recommended improvements have been made to Ponderosa Way, the Tehama County Road Department, firefighting agencies, owners of private timberlands and landowners could collaborate in developing permanent funding sources for road maintenance such as the Forest Service Cooperative Road Program.

U.S Fish and Wildlife Service Antelope Creek Geomorphology and Fish Passage Assessment 2009 - 2011

The goal of this project is to determine the location and causes of barriers that potentially affect access to 30 miles of anadromous salmonid habitat in Antelope Creek. Expected outcome of project work include the identification of opportunities, constraints and feasibility of providing fish passage improvements. Lower Antelope Creek is divided into multiple channels that in dry years become discontinuous and disconnected from the Sacramento River during low flow and are suspected of creating barriers to upstream and downstream fish passage. This multi-task project includes:

- The compilation of existing physical, biological, and resource management information into a spatial database
- Development of a stakeholder advisory group to coordinate and facilitate landowner participation
- Collection of data to characterize hydrogeomorphic functioning and habitats of lower Antelope Creek
- The evaluation of opportunities, constraints and feasible alternatives to improving fish passage.

Once the current phase of project work has been completed an evaluation of feasible potential actions along with the development of preferred and locally supported strategy for improving fish passage will be developed. This phase of the overall project will also entail preliminary consultation with agencies regarding the permitting process for implementing the strategy.

California Fire Safe Council TCRCD Chipper Program
2009 -2010

The Tehama County Resource Conservation District recently received funding to purchase a commercial sized chipper unit to be used in process wood vegetation generated in connection with various public and private fuels reduction and fuel break projects. The goal of the Chipper Program is to both provide equipment for fuels reduction work. More importantly, the program will generate income for the District that can be used to subsidize fuels reduction work on both public and private lands including the establishment of new fuel breaks and the maintenance of those already in place.

California Fire Safe Council Manton Fuel Break and Paynes Creek Community Fuel Break
2009 -2010

These roadside fuel break projects will utilize RCD Chipper Program equipment and staff in order to create approximately 20 miles of roadside fuel break along various routes within eastern Tehama County. Once complete, project work will provide significant protection from wildfire to various rural communities within the eastside areas wildland urban interface.