2 Watershed Condition and Management Strategy

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

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

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

Sediment deposit in an unnamed Tehama West creek
Management Strategy
TCRCD will support implementation of projects which have direct or indirect benefits in improved attainment of appropriate sediment budgets for:

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

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

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

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

Existing Condition and Assessment Conclusions

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

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

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

Enhancement of riparian vegetation, as recommended by USFWS, and centering on the improvement of potential salmon spawning habitat is the first movement towards restoring Chinook salmon to the tributaries of the TWW.
Tehama West riparian habitats have been tremendously altered during the past century and a half. These habitats are extremely valuable for wildlife but also play important stream stabilization, water quality, and fishery habitat roles. The location of existing riparian habitats is not well known but would be the first step in planning future restoration projects. Following the identification of existing riparian stands and their attributes, steps could be taken to protect the most important ones and then to re-connect scattered habitats.

Management Strategy
The TCRCD will support implementation of projects, studies, and public education which have direct or indirect benefits to riparian habitat. Priority projects/studies include:
- Determine historical riparian habitat trends in the watershed. Develop GIS mapping for the watershed in conjunction with this inventory effort.
- Analyze historical aerial photographs from CDF, Caltrans, NRCS, DWR, and other sources to determine the change in riparian resources over time.
- Promote restoration projects on public and private lands focused on improving riparian areas.
- Encourage the development of riparian buffer zones to maintain native riparian habitat, benefit fish and native plant species, provide buffering benefits, and reduce the potential for damage from floods.

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

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

During flood cycles, properly functioning riparian areas are a key factor in reducing downstream flooding. Riparian plants resist the flow and dissipate the flood's energy, increasing the delivery time of water and allowing it to infiltrate and be stored in the soil for use by plants and for later release for downstream use.

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

Existing Conditions and Assessment Conclusions

Riparian communities have been significantly changed over the last 50 years. Livestock grazing, introduction of non-native plants, and gravel mining have reduced original riparian areas.
It is likely that montane riparian habitats have been affected by fire suppression. These narrow corridors are comprised primarily of hardwoods that are regenerated by a disturbance, such as flood or fire. Because of fewer and wider spaced timing of wildfires, the opportunity to reproduce has been changed, leading to older trees along the streams. Forest management may have affected the riparian areas by removing the largest conifers and leaving smaller trees. This has become an issue in many areas due to the importance of riparian areas in providing large woody debris recruitment to streams and the importance of these large pieces to fisheries habitat. However, on Thomes Creek, below the confluence with Fish Creek, large woody debris plays a very limited role in channel development as more control is exerted by geomorphology.

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

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

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

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

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

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

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

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

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

Existing Conditions and Assessment Conclusions
Headwaters of the streams in the watershed have relatively little, if any, drainage area with significant snowpack. Therefore, in contrast to streams flowing from the high Sierra Nevada with relatively predictable and significant snow packs, snow melt and run-off play a minor role in the flow characteristics of the streams in the watershed. Watershed streams show rapid responses to storms, and flow levels fluctuate greatly between storm periods and intervening dry spells.

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

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

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

Existing Conditions and Assessment Conclusions
Early day flooding had serious impacts on transportation and the development of infrastructure within the Sacramento River Valley. Since flows over Shasta Dam have been regulated, the Sacramento River does not flood in the same pattern or with the same magnitude that it had previously. Currently, floods tend to be relatively infrequent and highly localized with damage occurring in well-known and expected locations. As the number and extent of the flooding has been reduced, development has extended into the areas where it was previously infeasible or impossible. One result from these changing land use patterns is that flood flow features, such as the natural levees and ox-bow lakes, are now often difficult to identify or have been modified. Hydraulically, the Reeds Creek drainage more closely resembles a circular basin because the three major tributaries, Liza, Reeds, and Pine Creeks are approximately equal in length and join Reeds Creek about 5 miles upstream from the mouth. Because of equivalent stream lengths, flood peaks meet at