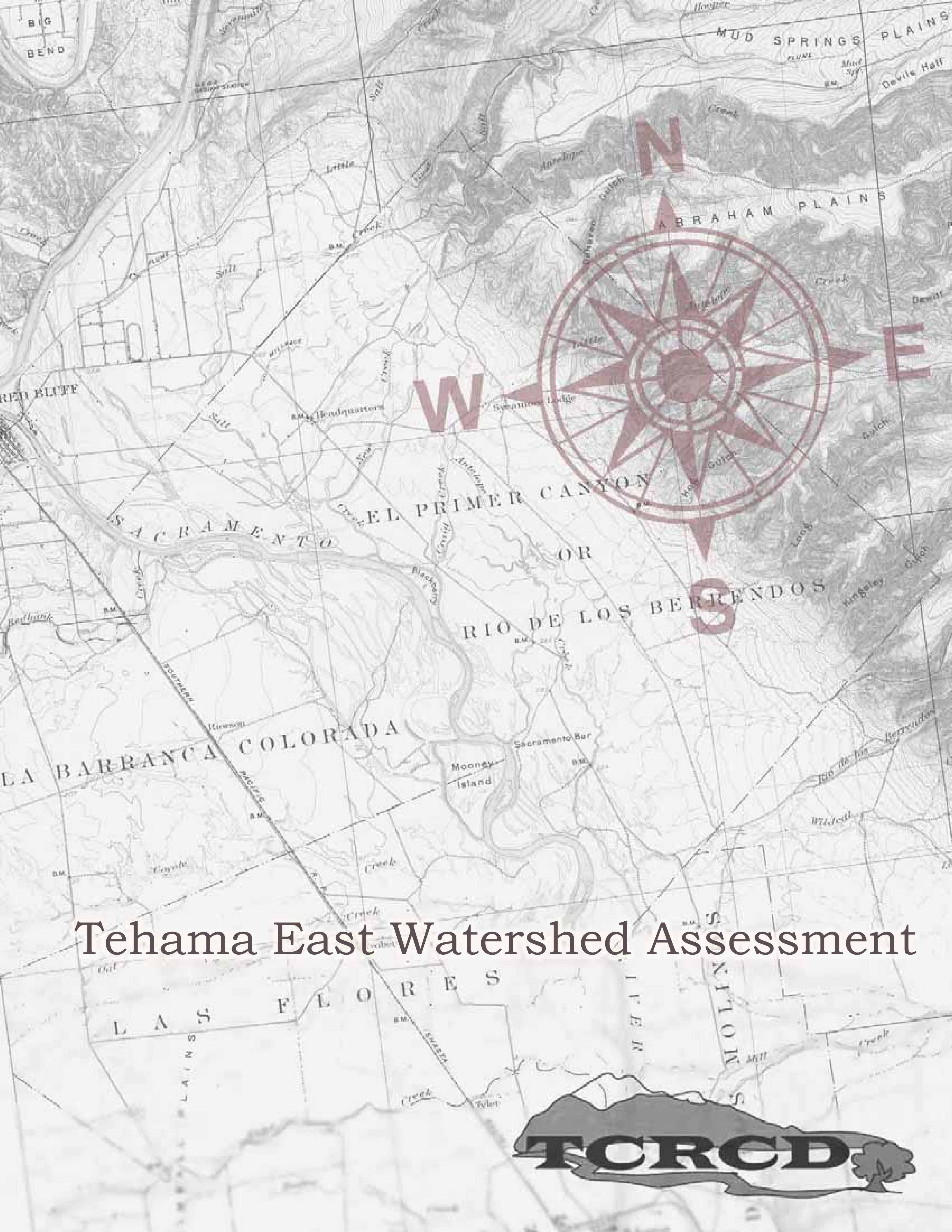

Tehama East Watershed Assessment

TCRCD

Title: Tehama East Watershed Assessment

Prepared: April 2010 under grant funding from Cal-Fed Bay Delta Program

By: Tehama County Resource Conservation District
#2 Sutter Street, Suite D, Red Bluff, CA 96080
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Front Cover illustration created by C R Benjamin
USGS 1:62500 Tehama topographic quadrangle, edition of Jan. 1905

Foreword

This document was created by the Tehama County Resource Conservation District with funding from the California Department of Water Resources under the Water Security and Clean Drinking Water, Coastal and Beach Protection Act of 2002.

A Resource Conservation District (RCD) is a non-regulatory public agency that is a subdivision of the State of California. RCD board members are volunteers, and all of the services they provide are voluntary. RCDs work in partnership with federal, state, and local agencies and organizations to provide assistance and education to the local community.

The Tehama County Resource Conservation District (TCRCD) is governed by five Directors appointed by the Tehama County Board of Supervisors and is assisted by non-voting Associate Directors appointed by the District's Board of Directors.

TCRCD has long served its community by providing educational opportunities through grants and cooperation with local schools and various state and federal agencies, fulfilling its mission "to assist people to manage, conserve, and improve the natural resources of Tehama County."

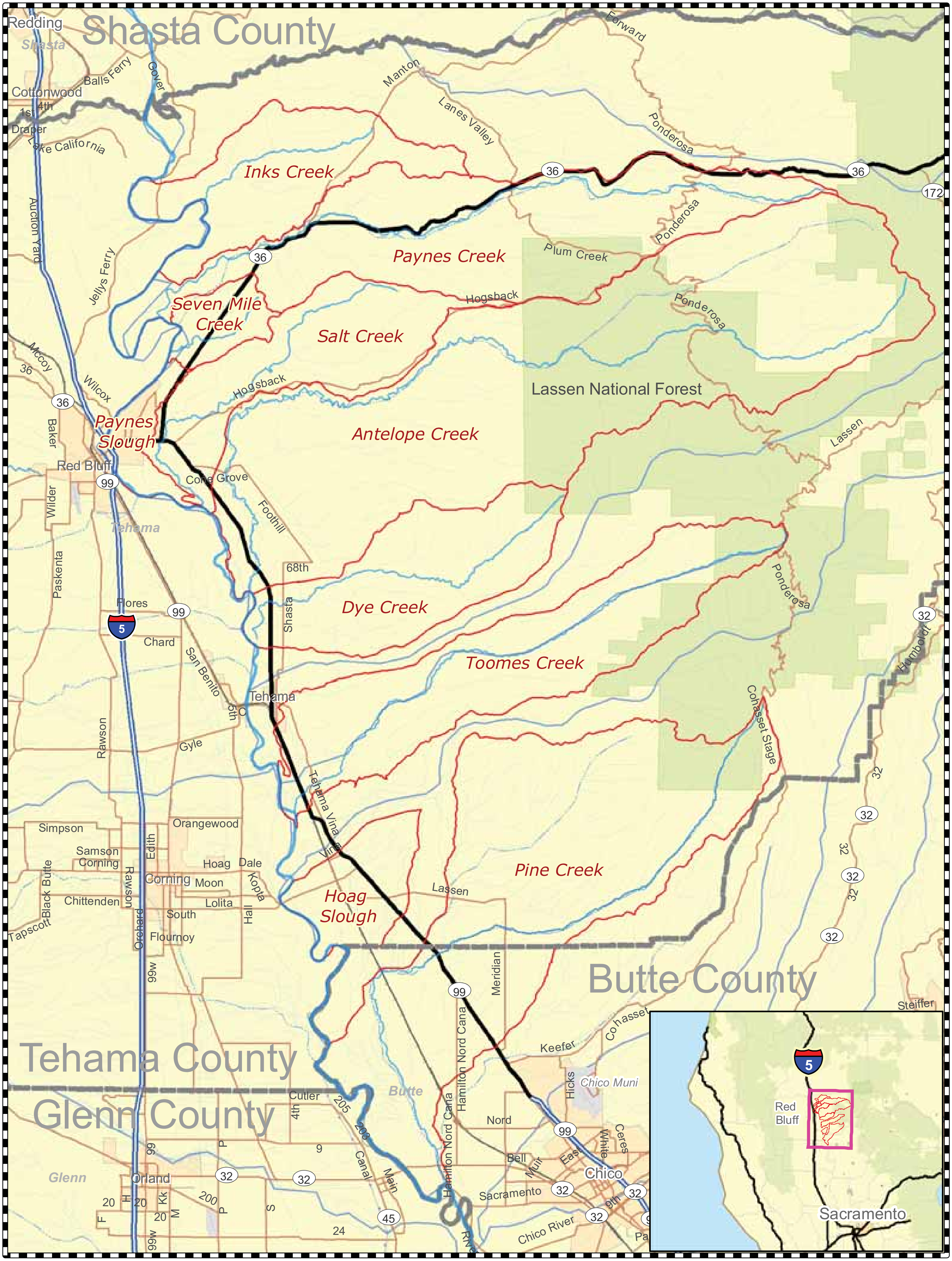
At the time the Tehama County Resource Conservation District conceived of the idea for the Tehama East Watershed Assessment project, we had high hopes for producing a document that would be a new style of watershed assessment. Since that time, the state of California, the funder for this project, has had to come to grips with some new economic realities. State and local governments have had to make difficult decisions. We at Tehama County Resource Conservation District have not been immune. We have struggled with funding for this project during the past year, going through start and stop cycles during the past two years.

Those who have helped us with this effort have also felt the effects. We appreciate their efforts as we worked through this demanding time. The funding challenges have left their mark on the final product. We have made our best efforts to create a product that can be used by the general public and other individuals. We hope you find it useful and informative.

Development of this document has been a true team effort. The Tehama County RCD board and Vicky Dawley, District Manager, gratefully acknowledge the important contributions of several people and organizations. Fraser Sime as Contract Manager with the California Department of Water Resources, the members of the Technical Advisory Committee, and the outside consulting firms that assisted with several of the chapters all provided invaluable assistance to the completion of this Watershed Assessment.

Randy Cousineau, Project Manager

Tehama County Resource Conservation District
Board of Directors:
Ernest White, President
Jack Bramhall, Vice President
Anne Read, Secretary
Ryan Sale, Treasurer
Shirley Davis, Board Member


Shasta County
Tehama County
Glenn County
Butte County
Inks Creek
Paynes Creek
Seven Mile Creek
Salt Creek
Paynes Slough
Antelope Creek
Dye Creek
Toomes Creek
Pine Creek
Hoag Slough
Lassen National Forest
Redding
Cottonwood
Red Bluff
Tehama
Corning
Orland
Chico
Chico Muni
Sacramento

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Prepared by TCRCD staff

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with assistance from TCRCD Staff**

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Section 1

Section 1

Introduction

TABLES

INTRODUCTION

SOURCES OF DATA

The data used in the Tehama East Watershed Assessment comes from federal, state, and local sources, including those collected by Tehama County Resource Conservation District (TCRCD). Most of the data sources are from printed material; however, efforts were made to obtain previously unavailable data.

Data Gaps

Throughout the various chapters, there are information gaps in the data available. These data gaps are bothersome in the respect that without the needed information, analysis is difficult to perform. On the other hand, data gaps provide an opportunity for those who may have an interest in filling that information gap. Such opportunities will not go unnoticed by TCRCD.

Various agencies responsible for providing available data include but are not limited to:

- United States Forest Service (USFS)
- United States Department of Agriculture (USDA)
- United States Geological Survey (USGS)
- Department of Transportation (DOT)
- Department of Water Resources (DWR)
- California State Water Resources Control Board (SWRCB)
- Bureau of Land Management (BLM)

- United States Geological Survey (USGS)
- National Oceanic and Atmospheric Administration (NOAA)
- California Department of Fish and Game (CDFG)
- Natural Resources Conservation Service (NRCS)
- CalFire (California Department of Forestry and Fire Protection, CDF)

OBJECTIVES

The objective of the Tehama East Watershed Assessment is to gather and assimilate existing information on the physical, cultural, and demographic characteristics of the Tehama East watersheds as they exist today. While this primarily is a report on existing conditions of the watershed, it is an opportunity to educate ourselves and residents of Tehama County to prioritize future projects. In other words, this is the first step to guide interested parties toward developing improvements where needed within the watersheds of eastern Tehama County.

SCOPE

The scope of this watershed assessment is intended to assist the efforts of the TCRCD in developing a means for assessing and implementing projects throughout the studied watersheds, with the support of interested groups or individuals, in part through use of the interviews performed.

The approach to assimilate and organize the data collection can be described in five basic actions:

1) Description of characteristics of the watersheds;
2) Description of conditions, both in a historic and current context;
3) Description of reference (historical) conditions;
4) Synthesis of information; and
5) Conclusions and recommendations.

FUNDING SOURCES

The watershed assessment project is 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 this assessment possible.

TECHNICAL ADVISORY COMMITTEE (TAC) MEMBERS

The TAC members are comprised of TCRCD staff and specialists from cooperating agencies. TAC members providing information and technical review for this project include:

Patricia Bratcher – California Department of Fish and Game
Larry Branham – United States Department of Agriculture
Guy Chetelat – Regional Water Quality Control Board, Central Valley Region
Andrea Craig – Dye Creek Preserve, The Nature Conservancy
Vicky Dawley – Tehama County Resource Conservation District
Eda Eggeman – California Department of Fish and Game
Jeff Galang – The Nature Conservancy
Dennis Heiman – State Water Resources Control Board

Tom McCubbins – Tehama County Resource Conservation District, Project Manager
Ernie Ohlin - Tehama County Flood Control & Water Conservation District
Brenda Olson – United States Fish and Wildlife Service
Chuck Schoendienst – CalFire (CDF)
Fraser Sime – California Department of Water Resources

WATERSHED INTRODUCTION

The Tehama East Watersheds are located in northern California along the eastern edge of the Sacramento Valley. To the north, they are bordered by the Battle Creek watershed, Butte County to the east and south, and Plumas County to the east, while the Sacramento River to the east terminates the flow of these water courses associated with the Tehama East Watersheds. 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. 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 1-1. 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

The topography of the Tehama East Watersheds ranges from relatively flat plains along the floor of the Sacramento Valley to the mountainous upper reaches moving up the watersheds eastwardly. 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, especially for some of the smaller watersheds (Inks, Seven Mile, and Salt Creeks) are flashy and brief.

The rural population density of Tehama County is approximately nineteen persons per square mile overall, while the density of population for these watersheds is vastly smaller, perhaps two to four persons per square mile. The largest community in the selected 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 selected 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.

Tehama East Watersheds

The Tehama East Watershed Assessment is comprised of 10 individual watersheds. Those watersheds are summarized in Table 1-1. The individual watersheds were delineated using USGS 1:24,000 topographic Maps, digitized at 1:1,000. These watersheds vary from the standard Calwater units available digitially as the latter includes different parameters for delineation. Table 1-1 shows the watersheds along with acreage and percent of the watershed.

Ownership

General ownership within the watershed is shown in Figure 1-4. Land ownership in the Tehama East Watershed is approximately 23.5 percent public and 76.5 percent private (California Resources Agency, 2004). The number of acres in each ownership classification is shown in Tables 1-2 through 1-6.

Table 1-2. Ownership - State of California

Watershed	Total Acres	State Acres	% of Total
Antelope Creek	129,053	28,331	21.95
Dye Creek	31,591	2,379	7.53
Hoag Slough	12,764	130	1.02
Inks Creek	26,179	456	1.74
Paynes Creek	61,410	10,392	16.92
Paynes Slough	5,928	0	0.00
Pine Creek	89,788	0	0.00
Salt Creek	29,426	959	3.26
Seven Mile Creek	6,812	0	0.00
Toomes Creek	48,818	100	0.20
Total	441,769	42,747	9.68

Table 1-3. Ownership – US Forest Service

Watershed	Total Acres	USFS Acres	% of Total
Antelope Creek	129,053	29,221	22.64
Dye Creek	31,591	0	0.00
Hoag Slough	12,764	0	0.00
Inks Creek	26,179	0	0.00
Paynes Creek	61,410	3,514	5.72
Paynes Slough	5,928	288	4.86
Pine Creek	89,788	2,877	3.20
Salt Creek	29,426	0	0.00
Seven Mile Creek	6,812	0	0.00
Toomes Creek	48,818	9,023	18.48
Total	441,769	44,923	10.17

Table 1-4. Ownership - BLM

Watershed	Total Acres	BLM Acres	% of Total
Antelope Creek	129,053	183	0.14
Dye Creek	31,591	1	0.00
Hoag Slough	12,764	0	0.00
Inks Creek	26,179	6,218	23.75
Paynes Creek	61,410	4,721	7.69
Paynes Slough	5,928	89	1.50
Pine Creek	89,788	1,303	1.45
Salt Creek	29,426	223	0.76
Seven Mile Creek	6,812	3,315	48.66
Toomes Creek	48,818	3	0.01
Total	441,769	16,056	3.63

Table 1-5. Ownership - USFWS

Watershed	Total Acres	USFWS Acres	% of Total
Antelope Creek	129,053	28	0.02
Dye Creek	31,591	27	0.09
Hoag Slough	12,764	0	0.00
Inks Creek	26,179	0	0.00
Paynes Creek	61,410	0	0.00
Paynes Slough	5,928	0	0.00
Pine Creek	89,788	0	0.00
Salt Creek	29,426	0	0.00
Seven Mile Creek	6,812	0	0.00
Toomes Creek	48,818	27	0.06
Total	441,769	82	0.02

Table 1-6. Ownership - Private

Watershed	Total Acres	Private Acres	% Private
Antelope Creek	129,053	71,290	55.2
Dye Creek	31,591	29,184	92.8
Hoag Slough	12,764	12,634	99.0
Inks Creek	26,179	19,505	74.5
Paynes Creek	61,410	42,783	69.7
Paynes Slough	5,928	5,551	93.6
Pine Creek	89,788	85,608	95.3
Salt Creek	29,426	28,244	96.0
Seven Mile Creek	6,812	3,497	51.3
Toomes Creek	48,818	39,665	81.3
Total	441,769	337,961	76.5

Topography

The topography of the Tehama East Watershed varies significantly from the flat valley areas of the Sacramento River Valley to the mountainous upper reaches to the east. A steep escarpment running north-south midway up the reaches provides a dramatic change in vegetation type and associated wildlife.

Elevation

The average mean elevation of the watersheds is approximately 1,061 feet above mean sea level (msl), with the lowest elevation of 115 feet msl 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 community with the highest elevation is Paynes Creek, at 1,850 feet msl (USGS, 1976). Watershed topography with elevation bands is included as Table 1-7.

Table 1-7. Elevation: 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	6,896	1,061

USGS 7.5 MINUTE QUADRANGLES

The Tehama East Watersheds lie within the following USUGS 7.5 Minute Quadrangles:

Acorn Hollow
Barkley Mountain
Bend
Campbell Mound
Cohasset
Dales
Deer Creek Flat
Devils Parade Ground
Dewitt Peak
Finley Butte

Foster Island
Gerber
Inskip Hill
Los Molinos
Lyonsville
Mineral
Nord
Onion Butte
Ord Ferry
Panther Spring
Red Bluff East
Richardson Springs NW
Tuscan Buttes NE
Tuscan Springs
Vina
Source: USGS

INTERVIEWS

Interviews of long time residents of the watershed were conducted by TCRCD employees during 2008-2010. The interviews were also made available online at www.tehamacountyrcd.org from January 2010 to March 2010.

The interviews attempted to develop a personal perspective of eastern Tehama County watersheds and determine issues critical for residents of eastern Tehama County.

Appendix 1-1 contains a list of the questions that were asked and a summary of the interviewee responses.

REFERENCES

California Resources Agency. 2004. In *The California Legacy Project.* Cited March 24, 2005. Available from World Wide Web: < http://legacy.ca.gov>.

NRCS (National Resources Conservation Service). 2005. In *Clean Water Action Plan (CWAP) - California Unified Watershed Assessment (1998).* Cited March 24, 2005. Available from World Wide Web: http://www.ca.nrcs.usda.gov/features/projects/cwap>.

SWRCB (State Water Resources Control Board). 2002 update. *Clean Water Act, Section 303(d) list.*

Section 1
Introduction

Appendix

Resident Interviews

Tehama East Landowner Survey

This survey will aid in our assessment of the Tehama East Watershed. Please enter a reply to any/all of the 10 questions that apply.

1. How long have you lived at this particular location?

2. How long has this land been in your family?

3. Historically, what has your land or ranch been used for?

4. What changes, if any, have you noticed on your property?

5. What changes, if any, have you noticed on the land surrounding your property?

6. Do you have any concerns regarding the land around your property?

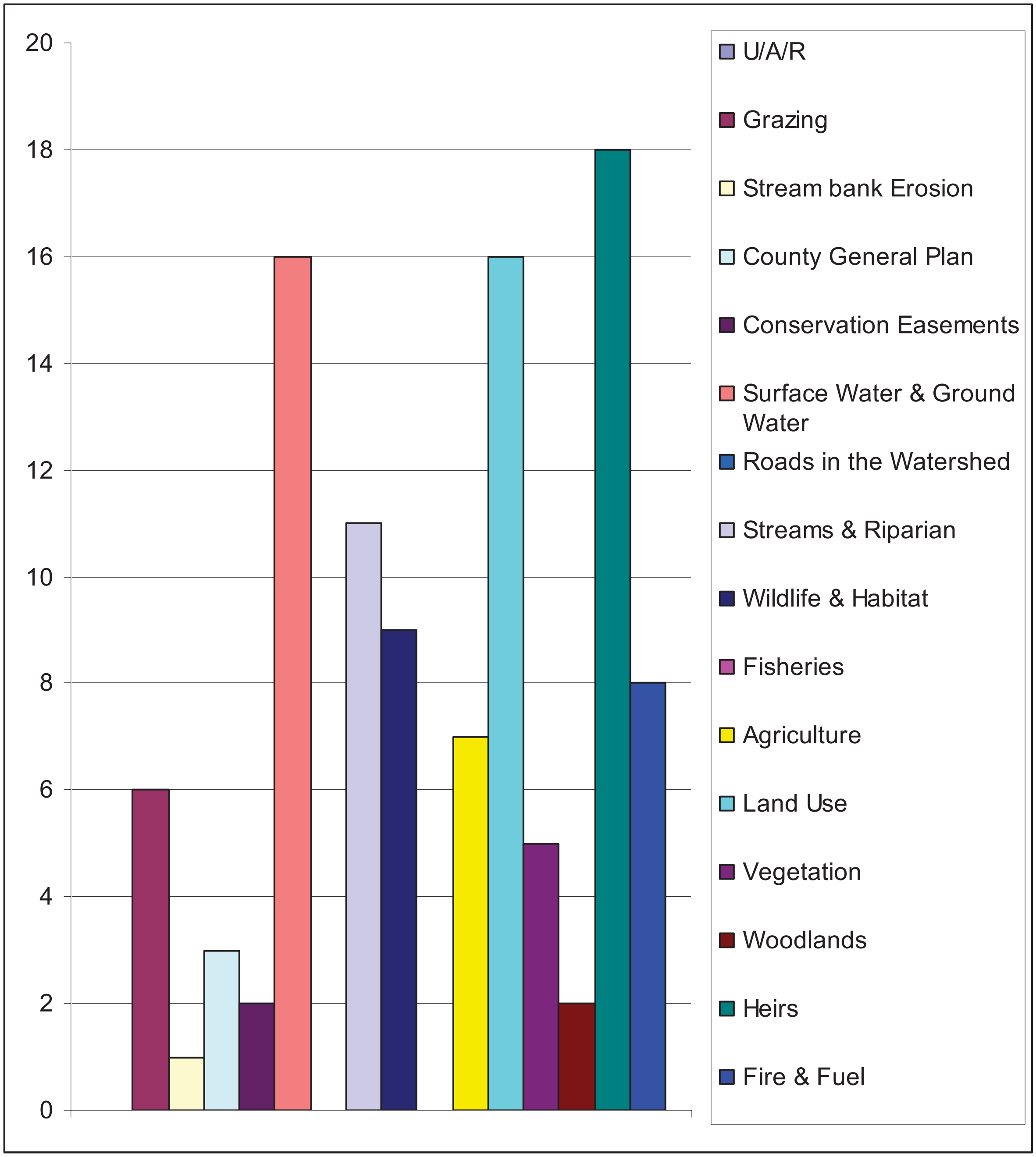
7. What economic or other factors affect your land management decisions?

8. Are there any children or relatives likely to take over your operation someday or settle in Tehama County?

9. Do you have any historic agricultural or landscape photos to share?

10. Please provide your suggestions to us about how we can help the community and its landowners:

Results


20
18
16
14
12
10
8
6
4
2
0
U/A/R
Grazing
Stream bank Erosion
County General Plan
Conservation Easements
Surface Water & Ground Water
Roads in the Watershed
Streams & Riparian
Wildlife & Habitat
Fisheries
Agriculture
Land Use
Vegetation
Woodlands
Heirs
Fire & Fuel

Issue	n/28
Grazing	6
Steam bank Erosion	1
County General Plan	3
Conservation Easement	2
Surface Water & Ground Water	16
Roads in the Waterrshed	0
Steam & Riparian	11
Wildlife & Habitat	9
Fisheries	0
Agriculture	7
Land Use	16
Vegetation	5
Woodlands	2
Heirs	18
Fire & Fuels	8

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

Section 2

Section 2

General History

Introduction

The Tehama East Watershed has been influenced and changed by both man and nature, constantly evolving through time. The arrival of Europeans in the middle of the nineteenth century has most recently and dramatically influenced and changed the watershed. In the last 150 years Europeans have molded the watershed environment to fit their needs. The most significant impacts involved building damns and canals, wildfire suppression, timber harvesting, introduction of non-native grasses and brush species, widespread agricultural planting, as well as development and urbanization.

Sources of Data

The following data sources were used to develop the information presented in this section:

- National Agricultural Statistics Service
- Tehama County Museum
- Tehama County Agricultural Crop Reports
- United States Department of Agriculture Soil Survey of Tehama County
- California Department of Conservation Division of Land Resource Protection
- Tehama County Parcel Data

The National Agricultural Statistics Service (NASS) is responsible for collecting and analyzing agricultural statistical data. The first crop reports were released in July 1863. Subsequent crop reports have been released to provide farmers with detailed market information on a variety of commodities. Agricultural statistical data was available for Tehama County from 1880 to the present. Initially, reports were released in 10-year intervals and have been released in 5-year intervals since 1910. Tehama County Agricultural Crop Reports were analyzed for each of the years between 1950 and 2003. Crop reports contain reports of acreage, as well as production and value of the agricultural crops produced in Tehama County. The information in these reports is derived directly from growers, processors, and government agencies. Primary soils data for Tehama County was extracted from the United States Department of Agriculture's Soil Survey of Tehama County from 1967. The California Department of Conservation's Division of Land Resource Protection was also an essential source of information regarding historic Williamson Act acreage and farmland protection and conservation. Data was compiled from the California Department of Conservation from 1992 to 2002 to monitor agricultural lands in Tehama County. An in-depth look at the 1998 to 2000 Tehama County Field Report and the 2000 to 2002 Tehama County Field Report were analyzed for this report. Data from the 2002 to 2004 report is not yet available and is not included in this report. Historical books and other documents were used to interpret historical agricultural conditions. Interviews with various farmers and ranchers in the county were also used to provide a source of local information.

Native Americans

The first humans to appear in what is now the continental United States would have crossed the land bridge across the Chukchi Sea from Asia approximately as late as 12,000 years ago (Appel, 2006), and concluded the cross-continental migration that may have begun as early as 29,000 years ago. Native Americans are believed to have lived in Tehama County for at least 3,000 years. Over time they developed into two main tribes – the Yana, east of the Sacramento River, and the Nomlaki, east of the river.

Yana

The Yana people were a group of Native Americans indigenous to Northern California in the central Sierra Nevada Mountains, on the eastern side of the range. The Yana people comprised four groups: the Northern Yana, the Central Yana, the Southern Yana, and the Yahi. The noun stem *Ya-* means *person* and the noun suffix is *-na* in the northern dialects and *-hi* [xi] in the southern dialects. Each group had relatively distinct boundaries, dialects and customs. Both groups are now extinct as functional tribes, though some individuals still survive. The Yana people lived on wild game, fished salmon, fruit, acorns and roots. Their territory was approximately 40 miles by 60 miles and contained mountain streams, gorges, boulder-strewn hills, and some lush meadows.

Yahi

The Yahi were the southern portion of the Yana people. They were hunter-gatherers who lived in small egalitarian bands without centralized political authority. They were reclusive, fiercely defending their diminishing territory of mountain canyons. Alfred Kroeber put the 1770 population of the Yana at 1,500 (Kroeber, 1925), while Sherburne Cook estimated their numbers at 1,900 and 1,850 (Cook, 1976).

When James W. Marshall discovered gold in 1848, the gold-miners and ranchers flocked into Yana territory, and the food supply changed dramatically. The tribe suffered great loss and fought with the settlers. By 1865, there were fewer than 50 Yahi combined. The Three Knolls Massacre of 1865 left only 30 survivors. The remaining Yahi retreated after the 1865 massacre and concealed their existence in the mountain wilderness for over 40 years.

The last known survivor of this people was from the Yahi tribe. Tribal custom demanded that he never reveal his name to an enemy. Rather, one would be introduced by a friend, and then the name could be offered. Since he was the last of his people, he had no friends - though he made some friends later. Still, tradition demanded that he never speak his name until he died. Researchers at the University of California, Berkeley gave him the name Ishi, the Yana word for "man". He accepted this name and even went by the name "Mr. Ishi" when he learned enough to speak rudimentary English. Ishi taught his physician Saxton Pope who is considered to be the father of modern bow hunting how to make arrows and bows and to hunt.

He had spent his life in hiding with his tribe members in the Sierra wilderness. He was the most famous Yahi, indeed the only one known to us. Ishi emerged from the mountains near Oroville, California on August 29, 1911 after the last of his family died, having lived his entire life outside of the European-American culture. Known as the *"last wild Indian"*, Ishi was taken to the University of California, Berkeley for study and for his protection, where under the auspices of Alfred Kroeber he lived in and near the Museum of Anthropology in evident contentment until his death from tuberculosis in 1916. His language was recorded and studied in 1911 by Edward Sapir, who had previously done work on the northern dialects.

Yana language

Yana (also Yanan) is an extinct language. The pre-contact distribution of the Yana language was formerly spoken in north-central California between the Feather and Pit Rivers in what is now Shasta and Tehama Counties. The language perished in 1916 with the death of Ishi, the last native speaker who spoke Yahi. Yana is fairly well-documented (mostly by Edward Sapir) compared to other extinct American languages. The names *Yana* and *Yahi* are derived from the Yana words (in two dialects) meaning "people".

Regional variation
There are four known Yanan languages/dialects.
1. Northern Yana
2. Central Yana
(a) Southern dialects
3. South Yana
4. Yahi

Yana is often associated with the hypothetical Hokan stock. Sapir suggested a grouping of Yana within a *Northern* Hokan sub-family with Karuk, Chimariko, Shastan, Palaihnihan, and Pomoan. Each of these languages had the distinctive characteristics of being polysynthetic, and having distinct male and female speech.

(Hinton, L., 1994)

In 1750 AD speakers of Penutian tongues occupied nearly half of California and were a solid block of about 30 groups in the California Heartland. Penutian roots are old in California and expanded after Hokan languages were established in the state. To the extent that language and culture may be related, Penutian was the most typically "Californian" of any linguistic root language.
(Moratto, M., 2004)

European Exploration
The first European to enter the area that is now Tehama County was probably Hudson Bay trapper Louis Pickett. Pickett headed south in 1820 from the Hudson's Bay company headquarters at Fort Vancouver on the Columbia River in Oregon. It is possible that Pickett ventured as far south as Tehama County.

In 1821 a Spanish expedition entered Tehama County. The explorers used the Sacramento River as a guide and followed the path of the meandering river past Red Bluff. The first known American to enter Tehama County was explorer Jedediah Smith. Smith passed through present-day Tehama County in April of 1828. Smith and his exploration party of 18 men and 300 horses and mules stopped along the Sacramento River near Red Bluff to construct a skin canoe to cross the river. Smith chronicled his adventures as he passed through California seeking a route to Oregon.

The Hudson Bay Company was responsible for sending fur trappers to Northern California throughout the early 1800s. The company had a headquarters at Fort Vancouver, located on the banks of the Columbia River in Oregon. The trappers were responsible for some of the earliest trails, maps, and charts of the area. Beaver was the most prized species for the fur trade. Both beaver and otter were heavily trapped in the region. The unrestricted trapping eventually led to the drastic reductions in beaver and other populations in the local streams. This led to the decline of the fur trade in the region. In 1845 the Hudson Bay Company withdrew their trappers from the region.

In the early 1830s when the initial Europeans began migrating to the area, they brought with them the infectious diseases of malaria, influenza, smallpox, and cholera. This initial contact is believed to have spread throughout the entire Native American population in the northern Sacramento Valley, which led to an estimated decrease in population of 50 to 75 percent. During the 1840 – 50s large numbers of settlers migrated into the area slowly taking over the Yana's land. A majority of settlers called for a campaign of extermination or removal of the tribes to reservations. The result was the near extinction of the Yana by 1870.

In 1844 General John Bidwell, William Chard, A.G. Toomes, R.H. Thomes, J.F. Dye, and Pierson B. Reading traveled to the area. These men made notes that the area was occupied only by Indians, large herds of elk and antelope, and an occasional grizzly bear. Wild oats were growing on the soils and grew as high as the skirt of a saddle. These men decided this was the "Promised Land" and immediately put petitions in for a rancho location. These petitions were eventually granted, and became the first Mexican Land Grants established in Tehama County.

Mexican Land Grants

Mexican land grants were the first attempts at permanent settlement in Tehama County. Tehama County had 131,379 acres awarded in seven land grants which averaged 20,000 acres each. In the Tehama East Watershed a few large land grants helped pave the way for establishment of Tehama County. The 26,637 acre Rancho de Los Berrendos (River of Antelope) included the area from Hogsback Road just east of Red Bluff; south between the Lassen Foothills and the Sacramento River to Dye Creek. Other Ranchos within the Tehama East Watershed area include Rancho Rio de Las Molinos (River of the Mills) a 22,172 acre parcel granted to Albert Gallatin Toomes. This property was a long narrow piece of land on the east side of the Sacramento River between Dye Creek and Toomes Creek further to the south. Rancho Bosquejo (The Wooded Ranch) was granted to Peter Lassen and totaled 22,206 acres along the Sacramento River south of Toomes Creek (TCGHS 2007).

Formation of the County

In 1848 California was forever changed with the discovery of gold by John Marshall at Coloma. Later that year, Pierson Reading discovered gold at Reading's Bar in Shasta County. Soon, Euro-Americans swarmed to California from other states. Although gold was not heavily mined in the Tehama East Watershed, the gold rush era played a significant role in the development of early Tehama County.

Originally, Tehama County was a portion of Shasta County (see Figure 2-1). As the southern communities of Shasta County grew, county residents felt the county seat, Shasta City, was too far away. In 1852 the first steps to form a new county were taken, but were unsuccessful. In December of 1855, another attempt to create a new county was made. On February 23, 1856, E.J. Lewis introduced a bill to the state legislature to create Tehama County. On April 9, 1856, Tehama County was created from territory belonging to Shasta, Butte, and Colusi (now Colusa), just six years after California had become a state. Initially, the town of Tehama was to be the county seat. On May 17, 1856, the first Board of Supervisors meeting was held at the county seat in Tehama. As many citizens felt the flood-prone location of Tehama was a poor choice, the county seat was moved to Red Bluffs the following year.

History Of Transportation

In 1849 the first-known steamboat, the "Washington," owned by Peter Lassen, brought supplies up the Sacramento River. Mr. Lassen had a land grant at Deer Creek, and arrived at his rancho on the mouth of Deer Creek. The steamboat soon sank after the trip. In 1850 the second steamboat to enter the area was the "Jack Hayes." This steamer arrived at the town of Tehama, which, at the time, was the farthest upstream a steamboat had ever been on the Sacramento River. For more than a year Tehama was the head of river navigation for the Sacramento River. The town of Red Bluff was soon established as the primary location for navigation on the Sacramento River. Steamboats traveling up the Sacramento River brought essential supplies for the mining camps in the northern portion of the region. In 1852 Red Bluff was receiving many smaller steamers, better equipped to traverse the Sacramento River. By 1853 Red Bluff had become a bustling community. Warehouses sprouted up along the banks of the river to handle the incoming supply shipments and outgoing cargoes of wool, wheat and other agricultural products. The supplies were unloaded in Red Bluff and transported by ground to the various mining camps in the area. Although Red Bluff was a critical location for navigation on the river, the variable Sacramento River with its sand bards, shallow summer depths and snags made travel unreliable. As a result, river passage to Red Bluff was accessible only during eight months out of the year. By 1854 the California Steam Navigation Company was in control of river traffic on the Sacramento River.

The arrival of the railroad in Tehama County was critical during the early stages of the area's infrastructure. In December 1872 the Central Pacific Railroad was completed to Red Bluff. Soon, large warehouses were built along the tracks in Red Bluff to store the agricultural commodities of wool, sheep and cattle, which were being shipped out of the area. This reliable distribution center for agricultural commodities helped shape the area as an agricultural crossroads. The railroad was granted land by the federal government as a way to defray costs. In addition to the right-of-way, the railroad was granted alternate sections of non-mineral land for each mile of rail constructed. The railroad had the responsibility of selling this land to help defray the construction costs. In 1879 the railroad had received title to the land and immediately established a campaign to liquidate the properties. This land was selling from between 5 and 25 dollars an acre in the 1880s, with the creek land being the most expensive.

Due to market collapse in the Depression (1930s), logging was not as important to the local economy as it had previously been. This period however was the greatest episode of trail and road building within eastside forestland. The Civilian Conservation Corp built many roads and trails between 1933 and 1941. One of the most famous of these was Ponderosa Way. This primitive route runs along Tehama's Eastern foothills, traversing the upper third of the county's watershed area. The route was intended to be an alternate route if disaster or war threatened or closed the major highways in low lying areas. It was also developed as fuel break between the area's chaparral lands and forest lands further to the east. This entire road building activity had three important results: establishment of a basic road system within public and private forestland, access to additional timber stand for increased lumber production and employment of otherwise jobless workers from throughout the country.

Settlement History

The main settlement of Tehama County was Red Bluff located originally on the east side of the Sacramento River, but within a few years it had spread over to the East side. Numerous other small settlements were founded throughout the county including, Dairyville, Los Molinos and Bend, near the Sacramento River, Manton and Paynes Creek in the foothills, and Mineral in the high country.

Red Bluff

The town of Red Bluff was primarily shaped by the Gold Rush. Once gold was found in 1848, many prospectors headed to California. Once the southern gold fields were inundated with miners, many miners headed to the northern gold fields. The best mode of transportation was steamboats up the Sacramento. For a while, the town of Tehama was the head of navigation on the river. The seasonal flooding at Tehama was not conducive to the establishment of a large-scale community. Looking farther upstream, Red Bluff was chosen as an ideal location for a commercial center that would fit the needs of the northern Sacramento Valley. The exact location for Red Bluff was chosen by two investors, Colonel Sachell Woods, a Presbyterian Minister, and Colonel Charles Wilson, a partner of Peter Lassen. The site was chosen because of a plateau high above the floodplain. The first survey of the area was completed in 1850. William Myers was the earliest settler in the area and he established a homestead. This homestead was soon recognized as the Red Bluff House, which served as an inn for travelers through the Sacramento Valley. Additional settlements followed in the area. The settlement at this time did not have an established name. The names that were associated with this settlement included Reedsburgh, Cavertsburgh, Bulltown, Red Cliff, and Frogtown. Red Bluffs was referred to as the general area of the settlement. By 1856, the town took the name of Red Bluffs and dropped the "s" at the end. During this formative period for Red Bluff, a devastating fire in Shasta City, the Shasta County seat to the north, established Red Bluff as a permanent settlement. The fire in Shasta City burned nearly everything to the ground, and the settlers soon started re-building the town. Cargo necessary to the development of the town had to be sourced from Red Bluff. This dramatic boom in trade secured the future of Red Bluff. Over the next few decades Red Bluff prospered. The census in 1870 indicated that the town's population had swelled to approximately 2,000 residents. During the 1870s, many events helped pave the way for additional development in Red Bluff. The most important event that occurred was the Central Pacific Railroad coming to town in 1871. In 1876 the Sierra Flume and Lumber Company established one of the most complex lumber operations in the world, building a new factory on the east bank of the Sacramento River across from Red Bluff. Also during the 1870s, a water service, gas lights, and a fire company were all established in Red Bluff. The Centennial Free Bridge was completed in 1876, allowing lumber to be transported by rail across the Sacramento River to the Central Pacific Railroad tracks.

Bend

Horsethief Bend, Horseshoe Bend, Sanders Bend, and Hazelton Bend were four of the names of the area later simplified with the name of Bend. The earliest settlers in the Bend were William A. Sanders (1802-1872) and his family. Sanders was a native of England, and may have been farming at the Bend by the early 1850s. Since the early 1850s, a mining and irrigation ditch has served the Bend area. A 1930 newspaper article about the Bend reports that "in the early fifties an

Englishman with a crew of Chinese had constructed a log and plank dam on Paynes Creek, three miles from its junction with the Sacramento River, and sold the water to miners. Herbert Kraft, banker, had obtained the Bend land in about 1887 and was still the owner of the land when development began in 1894. Kraft was rated as perhaps the wealthiest man in Tehama County with 20,000 acres of land in the Bend and Corning areas, and was instrumental in developing the Bend Colony. In 1892 Kraft established a ferry boat at the Bend. It was replaced by a bridge in 1931. W. F. Luning did the surveys for the colony. The colony was divided into avenues and streets with 40-acre tracts, these again were divided into 10 and 20-acre plots. W. C. Brokaw was the land agent given a contract to sell the land, thereby establishing the Bend Colony. In 1897 Herbert Kraft improved the existing irrigation reservoir and ditch system. Kraft hired J. J. Pope to build a four-foot cement dam on Paynes Creek, anchored by two large sycamore trees. The ditch system was improved and extended in order to provide water for the Bend Colony subdivision. Today, the ditch, in continuous use for over one hundred and fifty years, still supplies water to the Bend area.

Dairyville
This area south of Red Bluff and on the east side of the river was originally dry-land wheat farms and some range cattle. By the 1890s Joseph S. Cone accumulated over 100,000 acres in the area that is now 99E. After his death in 1894 the land was split up and sold. After acquiring the water rights of Antelope and Mill Creeks ranchers had plenty of water for their cattle and the industry began to grow. In 1913 an estimated 1,000 dairy cows arrived from the San Joaquin Valley that were infected with tuberculosis. As the disease spread throughout the region the decision was made to exterminate the entire population. Within a matter of days, the entire cattle population was gone.

As the hope of a rail line passing through the town faded, so did the ideas of reintroducing the cattle population. The discovery of rich loam soils and a Mediterranean climate proved ideal for orchard crops. A number of farmers began planting peaches which became the dominant crop in the area. After World War II farmers began to switch to almonds, prunes, and walnuts. These crops continue to dominate the area today.

Los Molinos
Located about 13 miles southeast of Red Bluff, Los Molinos was part of the land grant of Job Dye. In 1868 Joseph Cone purchased most of the Rancho and Los Molinos was established as a result of a subdivision of the Cone Ranch. After Cone’s death in 1894 the property was split into 4 parcels and eventually subdivided into much smaller plots. The Los Molinos Inn was constructed in 1908 as a location for perspective land buyers to stay. Around that same time the post office and schoolhouse were established. The town stayed fairly

small with the population reaching its peak in the 1970s at around 1,800.

Manton
The arrival of the first homesteaders came in the 1850s. By the 1870s several mills began to sprout up, which along with ranching, served as the main source of employment for the area for many years. In 1899 the Keswick Electric Company choose the surrounding areas of Manton to build powerhouses. Many men were employed and the population of the area swelled. With the surge in population came the construction of the grocery store, trading post, hotel, schoolhouse, and post office. Currently the area has a population of around 1,000, with the two main production crops of grapes and apples.

Paynes Creek
Established in the 1870s approximately 20 miles northeast of Red Bluff, Paynes Creek started off as a small timber harvesting area. The small mill ran by James Paine never materialized as a large employer, and therefore didn't attract many people to the area. In the early 1930s the Little Giant Civilian Conservation Corps Camp was established which helped the small businesses in the area pick up significantly.

Mineral
About 35 miles east of Red Bluff, some of Mineral's first settlers came to the area in the 1860s with herds of sheep. In the late 1890s a stage stop hotel was built, soon followed by a post office, school house and a restaurant business. The region became a small resort area with numerous small cabins for travelers to stay. In 1916 Lassen National Park was established and 12 years later Mineral became the home to the parks headquarters. In 1932 Skiing was introduced to the area on a small ski run at the center of town, which held the California State Ski Jumping Championship in 1935. The area today is still very similar, with numerous cabins for rent, and the ski run that is now more commonly used for sledding.

Farming
The number of farms in Tehama County has fluctuated dramatically over the years. Early in Tehama County history Mexican Land Grants helped pave the way for settlement of the area. These large tracts of land were soon subdivided into smaller farms in the late 1800s and early 1900s (Phillips & Miller, 1915). In the late 1800s, the number of farms reported in Tehama County ranged between 600 and 800. By 1910 over 1,000 farms were in existence, and by 1945 there were 1,890 farms reported, the largest number in county history. Since the 1940s, the number of farms have steadily decreased until the early 1970s, where in 1974, 1160 farms existed. The reduction in farm numbers most likely was the consolidation of existing farms, creating a larger average farm size. In 2002 Tehama County reported a total of 1,573 farms, down six percent from 1,679 farms reported in 1997.

Average farm sizes in Tehama County can be traced back to the late 1800s. In 1880 the average farm size was 820 acres. Since that time, average farm sizes fluctuated between 600 and 1,000 acres. During the 1930s and the 1970s average farm sizes increased. During the 1920s and between the 1940s and 1950s, the average farm sizes have decreased. More recently, average farm sizes in the county have decreased substantially. In 1974 the average farm size was reported at 1,083 acres. In 2002 the average farm size was reported at 548 acres, the loeast ever recorded for Tehama County. The average farm size in California is 346 acres (National Agricultural Statistics Service, 1987, 1992, 1997, 2002). Total acreage in farms increased from the 1880s until the mid 1970s. During this time total acreage peaked at nearly 1.3 million acres. From 1970 to the late 1980s, total acreage exhibited a slight decline. Between 1987 and 1997, it was reported that total farm acreage dropped from 1,104,584 acres to 885,426 acres (NASS 2004).

Cropland

Land used for crop production has fluctuated much over the years. Data indicates that at its peak in 1950, over 280,000 acres in Tehama County was designated as cropland (NASS, 2004). Many lands were farmed without irrigation, producing dryland grain hay and other crops. This trend has slowly decreased over the years, with a low in the 1990s around 120,000 acres. In 2002 total cropland was estimated at 140,000 acres.

Grain

Grain production in Tehama County has decreased significantly in recent years. Barley, oat, and wheat were widely produced and were very important economic crops. Many areas in the lower rolling foothills on the east side of the county were used historically for dryland grain farming (Smith, 1997). Other than a few remnant producers, dryland grain crops have been nearly eliminated from production in Tehama County. The low prices for grain and the increased costs of production are largely responsible for the decline in grain production.

Rice

Rice production has also seen a major decline in the past two decades. Plantings of rice date back the early 1980s, when nearly 3,000 acres were produced (NASS 2004). In 2003 only 600 acres were reported (Tehama County 2003). Increases in the cost of water have nearly eliminated water intensive crops such as rice from agricultural production in Tehama County.

Orchard

Orchard production in Tehama County was initially reported by the NASS in 1930. During the 1930s to the mid 1960s, orchard production remained stagnant with an approximate 10,000 to 15,000 acres in production. By the late 1960s total orchard production jumped to over 20,000 acres. Since this time, total orchard production has experienced a steady increase to 45,236 acres reportedly in orchards in 2002 (NASS, 2004). Tehama County orchards are predominantly walnuts, prunes, almonds, or olives. The combination of the availability of irrigation water, advances in irrigation technologies, relatively good commodity prices for orchard crops, in addition to the availability of processing facilities have been mainly responsible for the drastic increase in the acreage planted in orchards. Many orchards have been established in eastern Tehama County on clay soils with drip irrigation. Earlier in Tehama County history, other factors that led to the increase in orchard plantings were the construction of Shasta Dam in 1945, which drastically minimized the flood risk of prime agricultural lands adjacent to the Sacramento River, the development of the Red Bluff Diversion Dam combined with the Tehama/Colusa Canal and the Corning Canal, and the reduction in copper mine pollution from lower Shasta County in the early 1900s (Kristofors, 1973). Walnuts are the most widely planted crop in the county, with a steep increase in plantings occurring in the 1990s. Walnut acreage in the watershed is currently estimated at 14,057 acres (Tehama County 2003).

Livestock

Tehama County serves as winter grazing ground for many northern California and southern Oregon cattlemen. Historically and to the present, cattle are wintered in the lower foothills of Tehama County and summered in the County's mountain meadows and other surrounding counties (Briggs, 1956). Some livestock producers keep cattle on irrigated pasture on the valley floor during the summer months. Most of the early settlers in Tehama County depended primarily on livestock for their livelihood. In the late 1800s, of the farms reporting inventories, sheep production was much more prolific than cattle or hog production. The large sheep herds of the past are gone, and now beef cattle production is the largest livestock industry in the county.

Cattle

Cattle inventories in Tehama County have drastically increased over the years. In the late 1800s cattle numbers ranged near 10,000 head (NASS 2004). Over the next century cattle numbers steadily increased to a peak in the 1970s with around 100,000 head. In 2002 total cattle inventories for Tehama County indicate approximately 68,000 cattle in the county. Two reasons for the drastic increase in cattle numbers was an increase in cattle commodity prices and the reduction of sheep populations in the county (Briggs, 1956). Urban developments threaten the winter ranges in the foothills. Irrigated pastures serve as a location for cattle in the summer months, and have been slowly reduced over the years. The increasing cost of water and the high land values are challenges to a low-value crop such as irrigated pasture.

Grazing

Congressional authority in the 1850s and 1860s allowed legal land acquisition by Euro-American settlers. Passage of the Homestead Act in 1864 allowed settlers to gain legal title to lands squatted in the

1850s. The general pattern of Euro-American settlement within and around national forests was clearly established by the 1870s. Range grazing and ranching were California's first major industry. The rangelands of California were rapidly stocked after the Gold Rush, with an increase from 300,000 animals (cattle and sheep) in 1850 to nearly 5 million in 1880. After 1850 and reaching a peak in 1910 to 1920, much grazing occurred in open conifer types and mountain meadows. Moving sheep into the high country was in large part a response to drought in the 1860s affecting herds in the Central Valley. Following the Civil War, a high tariff was placed on wool to keep out foreign competition. Wool production became one of the country's major industries. Ranching communities began to take on a more gentrified appearance. Grazing pressures increased due to rapid population growth and demand for meat in the San Francisco Bay Area. There was also a demand for beef in the lumber camps along the coast, and mutton was shipped as an inexpensive substitute for beef. Due to increasing demand and coyote predation, by 1900 many sheep ranchers had switched to cattle.

Grazing caused multiple, cumulative effects and native grasslands were greatly altered by livestock use. Records in diaries, early botanical collections, interviews, and vegetation studies suggest that the replacement of the largely perennial California prairie by annual grassland with few perennials occurred from 1850 to 1880. Sheep introduced from other areas spread non-native plant species, carrying seed on their wool and hooves, and in their manure. These hardy, non-native annual species became abundant, and native grassland vegetation was further reduced by later cultivation, road building, severe droughts, urbanization, and other causes. Range burning was a major grazing-related impact which altered the ecology and productive capacity of the forest. Sheep herders allowed overgrazing of open grass areas, and as these areas became depleted, began to burn timber and thickets to open them up for browse production. Repeated burning caused permanent soil loss in open areas, and thinning and increased fuel loads in timber.

Early officials, concerned about the viability of tree seedlings, noted that in the late nineteenth century "it was possible to count over 100 fires from one high point." Hunters, lumbermen, and others also set fires. President Theodore Roosevelt officially recognized the Lassen National Forest as part of a "forest reserve" system in the East in 1905. It formally became a "national forest" in 1908. At the time of its creation, overgrazing, damage due to stockman's fires, and moving management toward silviculture were the immediate concerns of early Forest Service officials. For over 75 years there was an integral relationship between grazing and wildland fires on the lands that became part of the forest.

Early forest officials were torn between allowing grazing-related burning to continue to help in reducing fuel loading for fire protection, and concern over the other effects of fire. Early forest policy focused on the establishment of individual ranges or grazing allotments based on accessibility and the carrying capacity of the land. Between 1910 and 1920, forest officers surveyed and defined specific grazing allotments within the forest. Due to extensive resource damage, the Forest Service undertook gradual reductions in grazing levels, reducing sheep and goat grazing across the forest while increasing cattle grazing, then eventually removing sheep altogether.

The intense grazing of the nineteenth century had also degraded riparian and water resources in the forest, despite the numerous, smalls scale water developments such as log troughs created to preserve local water sources. Figure 2-11 shows vegetation change over time in the watershed from 1977 to 2002. In the 1920s and 1930s, massive poisoning programs conducted by the U.S. Biological Survey to reduce livestock predators and rodents on federal lands decimated the targeted species, but also had major impacts on other furbearers, birds, and domestic animals. According to reports filed in the 1920s, U.S. Biological Survey crews had eliminated almost all the ground squirrels on the forest. In addition, the report noted that many "egg-eating animals" were also reduced or eliminated. Ranchers also used poison to eliminate species thought to be a threat to livestock. Coyote, mountain lion, bear, and other predators were affected.

Hogs

Hog production was widespread in the late 1800s and the early 1900s, with the average hog population around 20,000 head residing in the county in any given year. Over the years this number has experienced a steady decline. In 2003 only 1,000 domestic hogs were reported in the county (Tehama County 2003). It should be noted that wild pigs have been introduced into certain portions of the county over the years. The lower foothills on the east contain wild pig populations.

Poultry

Chickens and turkeys historically were a large commodity in Tehama County. Over the years, these populations have drastically declined. Chickens especially have declined over the years. In 1939 nearly 135,000 chickens were reported in the county. Poultry populations have been declining for many years now. Population estimates are not calculated by the local Ag Commissioner's office due to the low number of poultry in the county.

Sheep

Sheep were historically the largest livestock commodity in Tehama County. The first reported estimate of sheep populations occurred in 1880, when 121,963 sheep were reported. Sheep production was much more common than cattle production during the early settlement of the county because they were primarily nomadic (Wentworth, 1948). Sheep production in Tehama County peaked in 1930, with nearly 350,000 head. This number has steadily declined since then, and in 2003 only 5,800 head reportedly resided in the county (Tehama County 2003). Reasons for sheep numbers declining include the dramatic increase of predators, reduction in mountain summer ranges available to grazing, low commodity prices, and the availability of labor for sheep-herders (Briggs, 1996).

Timber

Prior to the 1920s, timber within eastside forests was usually harvested by small operators. Mills were established just above the valley floor and moved farther into the forest in the late 1800s as wagon roads were built and mature timber was harvested. The community of Manton was originally developed in the 1870s as a center of lumber production and ranching. Numerous small lumber mills were developed there as well as in the communities of Paynes Creek and Lyonsville to the south. Ponderosa pine, sugar pine and Douglas fir were processed by these local mills. Timber production during the nineteenth century was directed almost entirely to markets within the state, but following the development of transcontinental railroads and the opening of the Panama Canal, markets in other regions of the United States and even export markets became important to local mills.

During and after World War II large trucks were available to haul timber made accessible by the new roads. With the removal of old growth pine stands, extensive areas of smaller second growth pine and fir forests developed. Early logging operations generated considerable amounts of logging debris. In addition, turn of the century efforts to protect rural communities and timberlands resulted in fire and resource agencies extinguishing almost all wildfires. As result of these trends, there has been an increase in forest stand densities, fuel loading as well as the intensity of wildfires when they occur.

Major congressional appropriations for road construction to support timber harvest occurred in the late 1950s and 1960s. Forest timber outputs remained relatively constant in the early to mid 1980s, but have declined significantly during the 1990s. Although average annual timber sale volumes from the forest during 1978 through 1987 were 84 million board feet (MMBF), the volume sold in 1989 was 54 MMBF. By 1991, 27 MMBF of timber were sold. Current projections are that timber supply levels from the forest will continue to decline from those of the 1980s. Starting in the 1960s, as timber harvest became increasingly important on national forest lands, a series of public land management compliance measures came into effect, all of which have affected management of the Lassen National

Forest. The Multiple-Use/Sustained Yield Act of 1960 and the National Forest Management Act (NFMA) of 1976 established a process for managing National Forests including the development of forest plans. In 1969 the National Environmental Policy Act (NEPA) was passed.

The Wilderness Act was passed in 1964. In 1977 the Forest Service started a second Roadless Area Review and Evaluation (RARE II) to determine additional backcountry areas meeting the criteria for wilderness. In 1984 the California Wilderness Act was passed, designating some RARE II lands as wilderness. Those areas not designated were officially released to multiple-use management upon Forest Plan signature. However, management such as timber harvest within released RARE II lands remains controversial due to the continued roadless nature of many of the areas. Timber has always played a large role in the economy of Tehama County as timber harvesting zones are located on the nearby eastern and eastern mountain slopes. Over the years the industry has faced an overall decline. Throughout the 1980s timber harvesting in Tehama County extracted an average of 140 million harvested board feet annually. In the 1990s the average timber harvested dropped to below 100 million board feet annually. In the 2000s harvesting continues to drop below historical numbers. In 2003 approximately 74 million board feet of timber were harvested. This indicates nearly a 50 percent decrease in production compared to harvesting levels from the 1980s. In 2003 the gross value for timber production in the county was estimated at $17 million. Timber production is shown on Figure 2-12.

In 1993, the Quincy Library Group (QLG), a grassroots citizen group interested in collaborative management of national forest lands, developed the "Community Stability Proposal," eventually lobbying for passage of the Forest Recovery Act in October 1998 directing the implementation of a Pilot Project on approximately 1.53 million acres in the northern Sierra. The primary purpose of the Pilot Project is to implement and demonstrate the effectiveness of resource management activities proposed by the Quincy Library Group to promote local economic stability; create healthy, fire-resilient forests that maintain ecological integrity; and construct a strategic network of fuel breaks (Defensible Fuel Profile Zones or DFPZs) that provides for safe and effective fire suppression. Numerous documents and forest plan amendments were developed to facilitate implementing the Act across the Pilot Project. A combination of litigation and limitations in the documents delayed full implementation. The Act was extended an additional 5 years in 2003 and is scheduled to conclude in September 2009. About 50 percent of the DFPZ network is in place, much of which is located in Eastern Tehama County. The Pacific Southeast Research Station is studying the effects of HFQLG treatments on wildlife populations, watershed health and wild land fire threat reduction as part of an Administrative Study. A key component of the QLG is the creation of "off based and deferred" lands within which timber harvesting or the production of other salable materials is prohibited. This probation is one factor in the significant reduction in timber harvest from Nation Forest land within Tehama County described above.

History Of Water Development

Irrigation has played a large role in the intensification and development of agriculture in Tehama County. Throughout the historic past, water was a deciding factor in settlement and land use in and around the forest. Alternating periods of drought and flooding caused early settlers to move their livestock to the Coast Range to escape high water or diminishing forage. Homesteads frequently had to be abandoned as drought, flood and dry wells affected development, agricultural and industrial growth.

Agriculture-related irrigation systems and water impoundments were introduced in the Sacramento Valley as early as the 1850s. The first irrigated field was supposedly located in Rancho Bosque, a Spanish land grant. A gristmill operated by waterpower is supposedly the first water extraction device for irrigation purposes somewhere between 1847 and 1852 (Gowans, 1967). In 1855 an irrigation ditch was created off Elder Creek, supplying water to a fork of Mill Creek, which provided water to a ranch near Paskenta (Bedford, 1991). Since that time, ditches were commonly constructed adjacent to streams to provide water for irrigation.

In the 1890s as orchards began to be planted, it was quickly understood that crops would fail without some sort of reliable water delivery system. In 1907 the Coneland Water Company (later the Los Molinos Water District) acquired the water rights of Antelope and Mill Creeks. The company sold shares of water stock to the farmers in allotments proportional to the acreage of individual farms. With the income from the sold stocks a series of damns and a network of canals were created for the delivery of water to the shareholders. Similar systems were developed on Deer, Thomes and Battle Creeks. Prior to the 1970's approximately one-third of the county's water supply was from groundwater and two-thirds was from surface supplies. By the 1990's two-thirds of the county's water supply was from groundwater and one-third from surface water.

From 1900 to the 1920s the increase in electric power allowed groundwater to become much more feasible to pump. The El Comino Irrigation District was created in 1921 and obtained all of their water from well sources. Throughout the century the practice continued to expand, and reliance upon groundwater in the northern Sacramento Valley is on the rise. In order to preserve this valuable resource groundwater will have to be monitored in order to meet future agricultural, residential, environmental, and industrial needs. Whether groundwater management can be accomplished is uncertain, but there is a genuine need for a comprehensive plan to be put in place in order to preserve the region's most valuable resource.

The livestock industry has played a significant role in the development of stock ponds and reservoirs. Between 1938 and 1954, 554 stock ponds and reservoirs were constructed in the county, with an estimated storage capacity of 3,349 acre-feet (Gowans, 1967). These stock ponds were primarily constructed in the lower foothills of eastern Tehama County, and many have the ability to hold water year-round. On the east side of the county, stock ponds were constructed by digging out small basins down to the bedrock. These smaller basins hold water for livestock during the winter and spring months, but soon dry out during the summer. In 1935 the authorization of the Central Valley Project helped paved the way for the construction of Shasta Dam (United States Bureau of Reclamation, 2004). The construction of Shasta Dam in 1945 was significant to water availability in Tehama County. An extension of the Central Valley Project that directly benefited the Sacramento Valley included the Sacramento Canals Unit, which was designed to provide irrigation water for Tehama, Glenn, and Colusa Counties. The Sacramento Canals Unit was authorized on September 29, 1950. This unit included the construction of the Red Bluff Diversion Dam, Corning Pumping Plant, Tehama-Colusa Canal, and the Corning Canal. The Red Bluff Diversion Dam diverts water from the Sacramento River to the Corning and Tehama- Colusa Canals. This project was completed in August 1964. Central Valley projects are shown on Figure 2-13. The Tehama-Colusa canal serves water to Tehama, Glenn, Colusa, and Yolo counties. The canal is 110.9 miles long with eight different canal reaches. Reaches six and seven were completed in 1979, and the last reach, reach eight, was complete in May 1980. The Tehama-Colusa Canal has a capacity of 2,530 cubic feet per second (cfs) (United States Bureau of Reclamation, 2004). The Corning Canal diverts water from the Tehama-Colusa Canal. This canal is 21 miles long and terminates four miles southeast of Corning. Construction of the canal started in November 1954 and was primarily completed in May 1957. The entire project was completed in July 1959. The Corning Pumping Plant diverts water at the Red Bluff Diversion Dam from the Sacramento River. The pumping plant was completed in November 1960. The Corning Canal has a capacity of 500 cfs (United States Bureau of Reclamation, 2004).

At the turn of the century, the waters of Battle Creek's north and south forks began to be used in the production of hydroelectric power. This resulted in the development of cannels, flumes and penstocks as a means to reroute stream flows into various powerhouses. As a result, the fisheries of Battle Creek were altered, impacting the ability of anadromous species including salmon and steelhead, from migrating upstream. In 1995 various state and federal resource agencies began developing plans for the restoration of Battle Creek as a fishery. In 1999 this planning process identified five hydroelectric dams to be removed from both forks of Battle Creek. In addition the plan proposed to place new fish screens and ladders on three other dams and increase stream flows in the north and south forks of Battle Creek.

This project is expected to both enhance natural production of salmon and steelhead as well as benefit many other native fish and wildlife species. Approximately $102,000,000 has been requested for project work and construction is expected to occur between 2006 and 2009. Importantly, as dams are removed or modified and stream flows increased, an additional fifty miles of aquatic and riparian habitat will be restored for beneficial fish and wildlife use. In 1997, the Battle Creek Watershed Conservancy was organized in order to provide representation for landowners, stakeholders, and residents of the watershed as planning moved forward for the restoration of Battle Creek. Early in the process the Conservancy's steering committee noted that the Battle Creek Working Group's plans to expend tremendous financial resources to "fix" the creek would likely not be enough to ensure the long-term health of the watershed. Consequently the BCWC was established with the goal of considering both creek and land uses of the watershed, their impact on natural processes, and the long-term health of the entire watershed.

References

Briggs, Eleanor Simpson. 1996. *Early day sheep drives from Tehama County.*

Briggs, Eleanor S. Early Day Tehama County Cow Outfits. 1956. *Red Bluff Daily News.*

California Department of Conservation Division of Land Resource Protection. 2004.

Williamson Act County Information. Available from the World Wide Web: http://www.consrv.ca.gov/DLRP/lca/stats_reports/index.htm.

California Department of Conservation Division of Land Resource Protection. 2004. Williamson Act General Information. Available from the World Wide Web: http//www.consrv.ca.gov/DRLP/lea/index.htm.

Dutschke, Dwight. 2004. *American Indians in California.* Five Views: An Ethnic Historic Site Survey for California. Available from World Wide Web: http://www.cr.nps.gov/history/online_books/5views/5views.htm.

Goldschmidt, W. R. 1951. *American Archaeology and Ethnology.* Volume

XLII 1945-1951. University of California Press, Berkeley and Los Angeles.

Gowans, K.D. 1967 Soil Survey of Tehama County, California. United States Department of Agriculture.

Grimes, Mary Lee. 1983. *The First Fifty Years 1856-1906 A Pictorial Essay of Tehama County*. Quality Printing of Red Bluff, CA.

Kristofors, Kris. 1973. *The Copper Mining Era in Shasta County, California, 1896-1919: An Environmental Impact Study*. M.A. Geography thesis. CSU, Chico.

Kraft, Jarith and Woodrum, Barbara. *Historical Overview of the Tehama-Shasta Bend district, California.*

NASS (National Agricultural Statistics Service) [cited 2004] Available from the World Wide Web: http://www.usda.gov/nass.

Phillips, Emmet, and Miller, John H. 1915. *Sacramento Valley and Foothill Counties, California: An Illustrated Description of all the Counties Embraced in this Richly Productive Geographical Subdivision of the Golden State*. The Sacramento Valley Expositions Commission.

Tehama County. 2003. Agricultural Crop Report.

Tehama County Genealogical and Historical Society 2007. *Tehema County 1856-2006 150 Yeas of Photos and History*. Paragon Publixhing, Red Bluff, CA

Tehama County Museum. 2005. *Tehama County Museum*. Tehama, CA: [cited May 2005]. Available from World Wide Web: http://www.tco.net/tehama/museum/Index.html

Tehama County Parcel Data. 2005. Tehama County GIS parcel data and statistics.

United States Bureau of Reclamation. 2004. Central Valley Project- Sacramento Canals Unit. Available from the World Wide Web: http//www.usbr.gov.

United States Census Bureau. 2004. Tehama County. Available from the World Wide Web: http//www.census.gov.

University of California Cooperative Extension. 2008. Tehama County http://cetehama.ucdavis.edu/Agriculture/Groundwater_Management.htm

Wentworth, Edward N. *America's Sheep Trails*. 1948. Iowa State College Press.

Section 3

Section 3
Climate

Tables

Figures

Introduction

The climate of Tehama County's east side is classified as Mediterranean. Mediterranean climates are characterized by warm to hot, dry summers and cool wet winters. Throughout the world Mediterranean climates are very rare and make up approximately two percent of Earth's land surface. The Mediterranean climate can be found at only five locations on the planet including: the range from Southern Oregon to Baja, the central region of Chile, South East Australia, South Africa, and most of the land that borders the Mediterranean Sea.

These climate regions are located roughly between 31 and 40 degrees latitude North and South of the equator, and on the east coasts of the continents. Their extent eastward from the coasts depends largely upon the physical geography of the region. For California and Tehama County the barriers of the Cascades and the Sierra Nevada Mountains mark the eastern limits.

Topography

Tehama East is situated in the relatively flat and low lying Northern Sacramento Valley. The county is bordered on the east side by the Yolla Bolly Mountains, to the North by the Klamath Range, and on the east by the Cascades and the Sierra Nevada. The Sacramento River effectively splits the county into east and west halves.

Meteorology
The main controlling factors for Mediterranean Climates are high pressure systems in the summer and easterly winds in the winter. The distribution of high pressure systems largely determines the character of seasons. In summer months high pressure moves north and sits over much of the Eastern United States. As the storms move east across the Pacific, the blocking ridge of high pressure diverts storm systems well north of Tehama County. High pressure systems cause air to sink and are commonly referred to as stable air. As the air descends toward the Pacific, it is further stabilized as it comes in contact with the cold coastal waters of the California current. These cool and relatively moisture free air masses then push eastward onto the land. As the cool, dry air reaches Tehama County, it counteracts the upward movement of warm air normally associated with hot land masses. The results for Tehama County's east side in the summer are, hot, and dry with virtually cloudless skies.

In the winter months the high pressure shifts south where easterly winds and the subpolar lows move in. As the Pacific high moves out, the easterlies bring in mT (maritime tropical), mP (maritime polar), and cP (continental polar) air. These air masses in combination with the easterly winds bring mid-latitude cyclones and the replenishing winter rains. In general the winter cyclones travel from East to East, moving across the valley toward the higher elevations of the mountains. Through orographic lifting precipitation rates increase as the storms move across Tehama East up into the mountains. Elevations gradually increase and at some point precipitation will begin to come down as snowfall.

Station Information
Tehama's east side has recorded data at four stations: Red Bluff (NCDC STA 047292), Coleman Fisheries (NCDC STA 041907), Paynes Creek (NCDC STA 046761), and Mineral (NCDC STA 045679). Temperature data is not available for the Coleman or the Paynes Creek Stations. Elevations at each station vary: Red Bluff at 35 feet, Coleman Fisheries at 42 feet, Paynes Creek at 184 feet, and Mineral at 4,880 feet. Years of recorded data vary at each station. Red Bluff's records run from 1933-2007, Coleman Fisheries are from 1943 – 2009, Paynes Creek's are 1952 – 1984, and Mineral's are from 1909-2009.

Data
Temperature
The general trends for Tehama's east side are consistent with the Mediterranean description, warm summers and mild winters. For the summer season, in the lower elevations common high temperatures reach the upper 90's to lower 100's. At higher elevations near Mineral, much milder conditions prevail with highs ranging from the mid 70's to low 80's. Summer time lows in the valley range from the mid 50's to the mid 60's. Nighttime lows are cooler at

Mineral where averages range from the high 30's to the low 40's.

For the winter months (December – March) averages at Red Bluff are 49°F, with the average high at

Table 3-1. Temperatures

MINERAL, CA NCDC STATION 045679			
Month	**Average Maximum Temperature (°F)**	**Average Minimum Temperature(°F)**	**Average Precipitation**
January	40.6	21.7	8.9
February	43.3	23.1	8.01
March	47.1	25.4	6.96
April	53.8	28.5	4.04
May	63.1	33.8	2.61
June	72	39.4	1.42
July	81.5	43.1	0.17
August	80.7	41.6	0.37
September	74.2	38.2	1.05
October	63	32.6	3.73
November	48.8	27.4	6.37
December	42.2	23.6	9.02
RED BLUFF, CA NCDC STATION 047292			
Month	**Average Maximum Temperature (°F)**	**Average Minimum Temperature(°F)**	**Average Precipitation**
January	54.6	37.1	4.48
February	60	40.3	3.69
March	64.9	43	3.01
April	71.9	46.9	1.61
May	81.5	53.8	1.08
June	90.3	61.2	0.46
July	97.8	65.5	0.06
August	96	63.1	0.14
September	90.6	59	0.48
October	78.8	50.9	1.37
November	63.6	42.5	3.02
December	55.3	38	4.07

Winter daytime high temperatures in the valley around Red Bluff, are generally in the mid to high 50's. Lows range from the mid 30's to the low 40's. Up at Mineral winter daytime highs are in the low 40's. Nighttime lows range from low to high 20's.

58.7°F, and an average low of 39.6°F. For the summer months (June – September) the average temperature is 77.9°F, with average high at 93.7°F, and an average low of 62.2°F.

For the winter months (December – March) averages at Mineral are

33.3°F, with average high at 43.3°F, and an average low of 23.3°F. For the summer months (June – September) the average temperature is 58.7°F, with average high at 76.8°F, and an average low of 40.5°F. For complete monthly averages for Red Bluff and Mineral, see Table 3-1.

Extreme temperatures at Red Bluff are, a high of 121°F on August 7th 1981, and a low of 17°F on January 9th 1937. For Mineral the high of 100°F was reached three times, most recently on August 8th 1972. The record low of -13°F was reached on January 20th 1937.

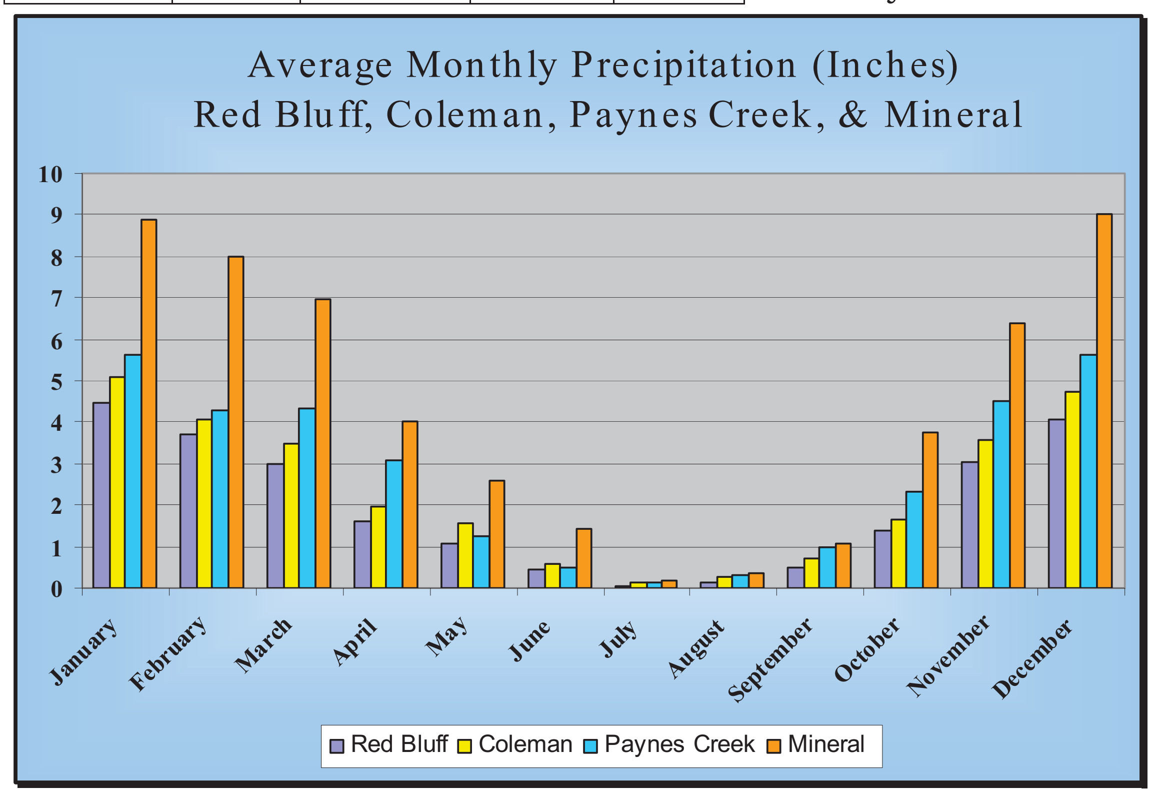
Precipitation

Tehama's east side has recorded precipitation data at all four stations (Red Bluff, Coleman Fisheries, Paynes Creek, and Mineral). For Mediterranean Climates, precipitation occurs mainly in the winter months. All four stations receive less than 6% of their average annual precipitation in the months of June through September. In general, rainfall rates increase with latitude and elevation. As storm systems move east,

Table/Figure 3-2. Precipitation

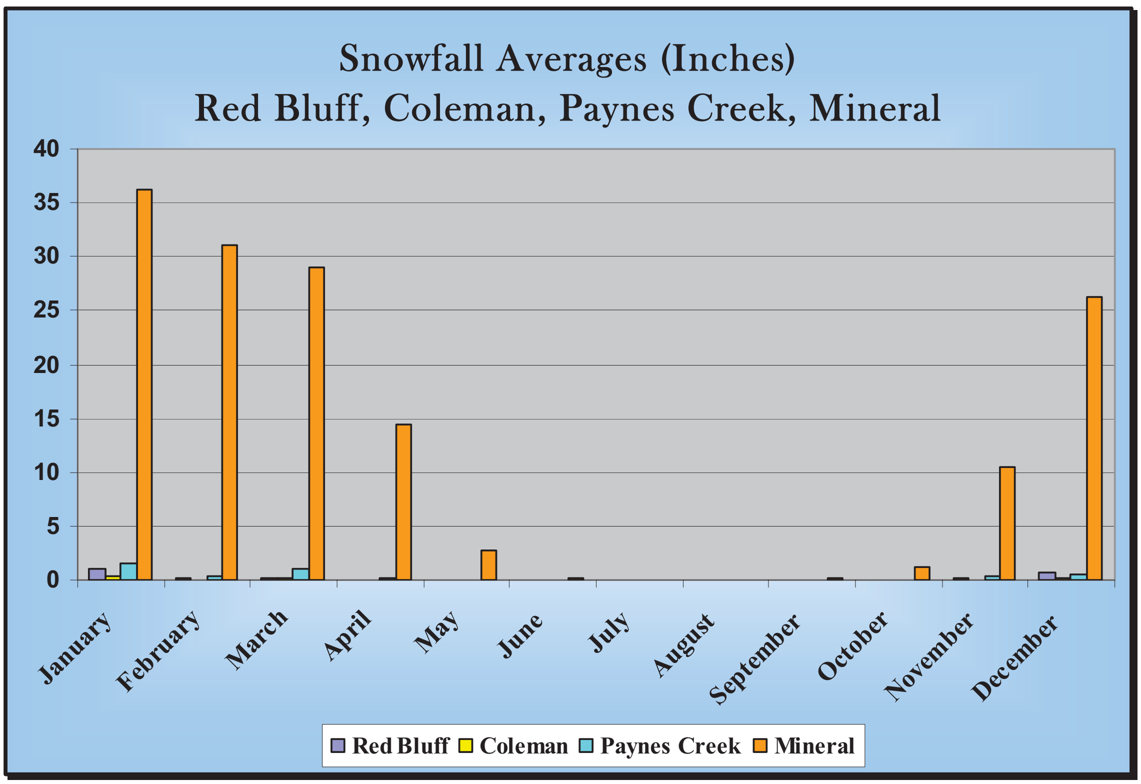
Average Precipitation

Month	Red Bluff	Paynes Creek	Coleman	Mineral
January	4.48	5.62	5.11	8.9
February	3.69	4.29	4.06	8.01
March	3.01	4.33	3.5	6.96
April	1.61	3.08	1.96	4.04
May	1.08	1.24	1.55	2.61
June	0.46	0.47	0.57	1.42
July	0.06	0.15	0.15	0.17
August	0.14	0.32	0.27	0.37
September	0.48	0.96	0.73	1.05
October	1.37	2.33	1.64	3.73
November	3.02	4.49	3.55	6.37
December	4.07	5.63	4.74	9.02

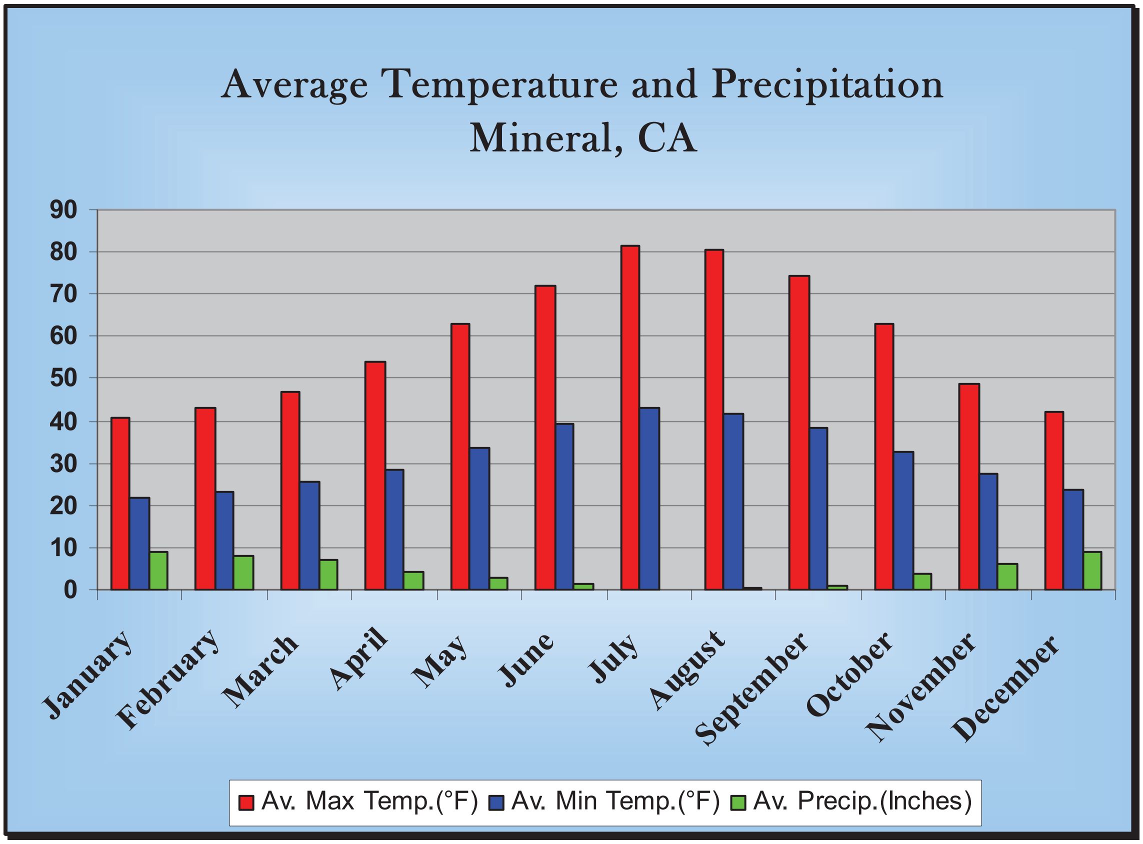


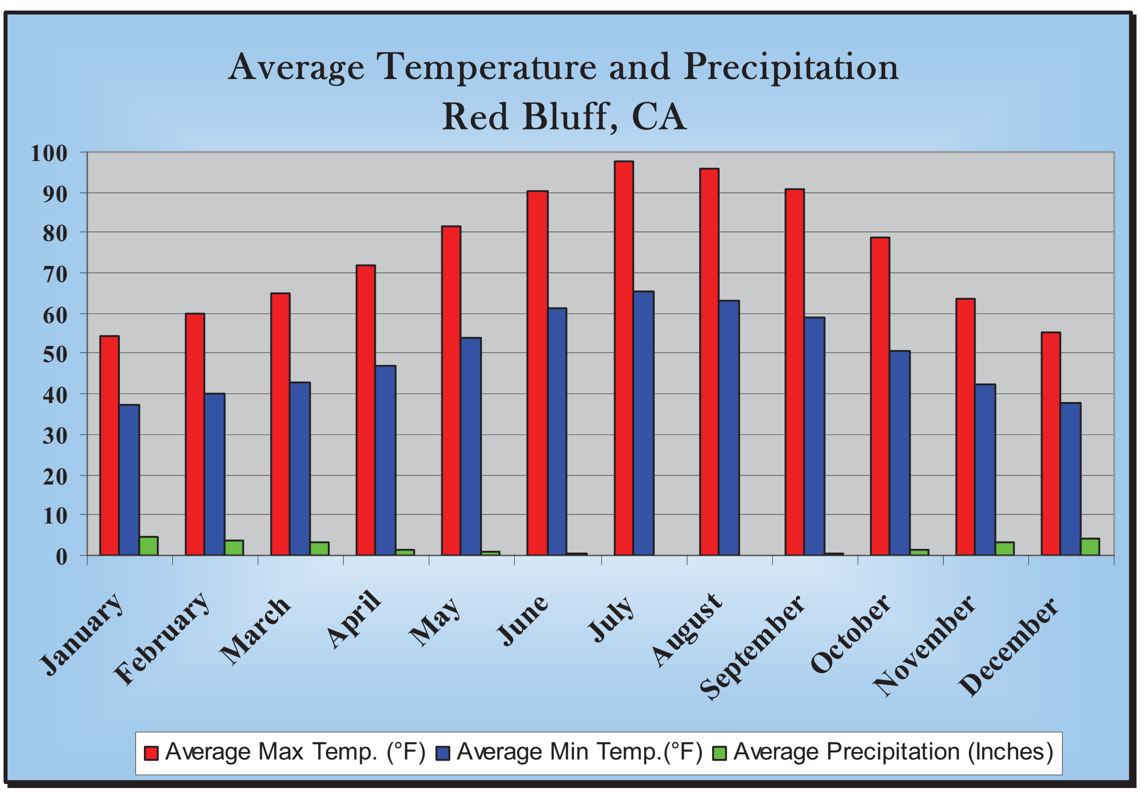
pushing up the hills towards the higher mountains, greater rates of precipitation are released through orographic lifting. In the valley, Red Bluff receives an average of 23.19 inches per year with an extreme high of 48.98 recorded in 1983, and an extreme low of 7.2 inches in 1976. Slightly to the north, the Coleman Fisheries station averages 27.83 inches per year with an extreme high of 55.18 recorded in 1983, and an extreme low of 11.76 inches in 1976. Moving to the east and slightly up in elevation, Paynes Creek averages 32.92 inches per year with an extreme high of 64.03 recorded in 1983, and an extreme low of 11.77 inches in 1976. At nearly 5,000 feet, the Mineral station receives over two times the rainfall as Red Bluff, at 52.64 inches per year, with an extreme high of 113 inches recorded in 1983, and an extreme low of 17.93 inches in 1976. Complete monthly rainfall averages are listed on Table 3-2.

Figure 3-1. Snowfall Averages



Snowfall rates follow a similar pattern of the rain where greater rates are found at higher elevations. In general, snow levels in the valley are very low. Red Bluff averages 2.1 inches per year, though measureable snowfall has been recorded in only 29 out of the last 77 years (or 48 years with zero measured). Of the 29 snowfall years, only 19 received 2 or more inches. Red Bluff's last event occurred in 1994-1995 where .2 inches were recorded, and the last event over 2 inches was in 1988-1989 where 9.4


Average Temperature and Precipitation
Mineral, CA
90
80
70
60
50
40
30
20
10
0
January
February
March
April
May
June
July
August
September
October
November
December
Av. Max Temp.(°F)
Av. Min Temp.(°F)
Av. Precip.(Inches)


Average Temperature and Precipitation
Red Bluff, CA
100
90
80
70
60
50
40
30
20
10
0
January
February
March
April
May
June
July
August
September
October
November
December
Average Max Temp. (°F)
Average Min Temp.(°F)
Average Precipitation (Inches)

inches fell. The extreme high measured 15.6 inches in 1972.

The Coleman Fisheries station receives on average .7 inches of snow per year, with a high of 9 inches in 1988. Paynes Creek located near 200 feet receives slightly more snow than the valley. On average 3.6 inches is recorded with an extreme high event occurring in 1982 at 17.5 inches. Mineral is situated over 4,800 feet higher than Red Bluff and receives significantly higher snowfall rates. On average Mineral receives 151.8 inches per year, with an extreme high of 347.5 inches in 1952. Complete station snowfall totals are listed on Figure 3-1.

Degree-Days

There are three types of degree-days; heating, cooling and growing. Heating and cooling degree-days are used to help determine the weather induced needs and costs of heating and cooling based on a relative scale. Growing degree days incorporate a simple index used by farmers to estimate the maturity of crops and as a pest management indicator.

For heating and cooling degree-days, a base temperature is created. When the temperature raises or falls above or below the base, a degree-day is created. For example, in the summer months if the base is set at 70°F and the average for the day is 85°F, then 15 cooling degree-days would be accumulated. Heating and cooling degree-days are then added up for the year. The total number helps to determine the approximate amount of energy a given location will need for that year.

For each station a range of base rates are listed, usually between 55°F and 70°F, with 65°F being the most common average used. For Red Bluff the number of heating degree-days at a base of 65°F is 2,640, and a base of 50°F is 411. By comparison Mineral, with much colder winter temperatures at a base rate of 65°F has 7,214 heating degree-days, and a base rate of 50°F has 2,949.

Fuel needs can also be estimated for the amount of energy needed to cool a building using cooling degree-days. For Red Bluff the number of cooling degree-days at a base of 70°F is 1,136, and the base of 55°F is 3,808. With more moderate summer time temperatures, Mineral at a base of 70°F has 8 cooling degree-days, and the base of 55°F has 677.

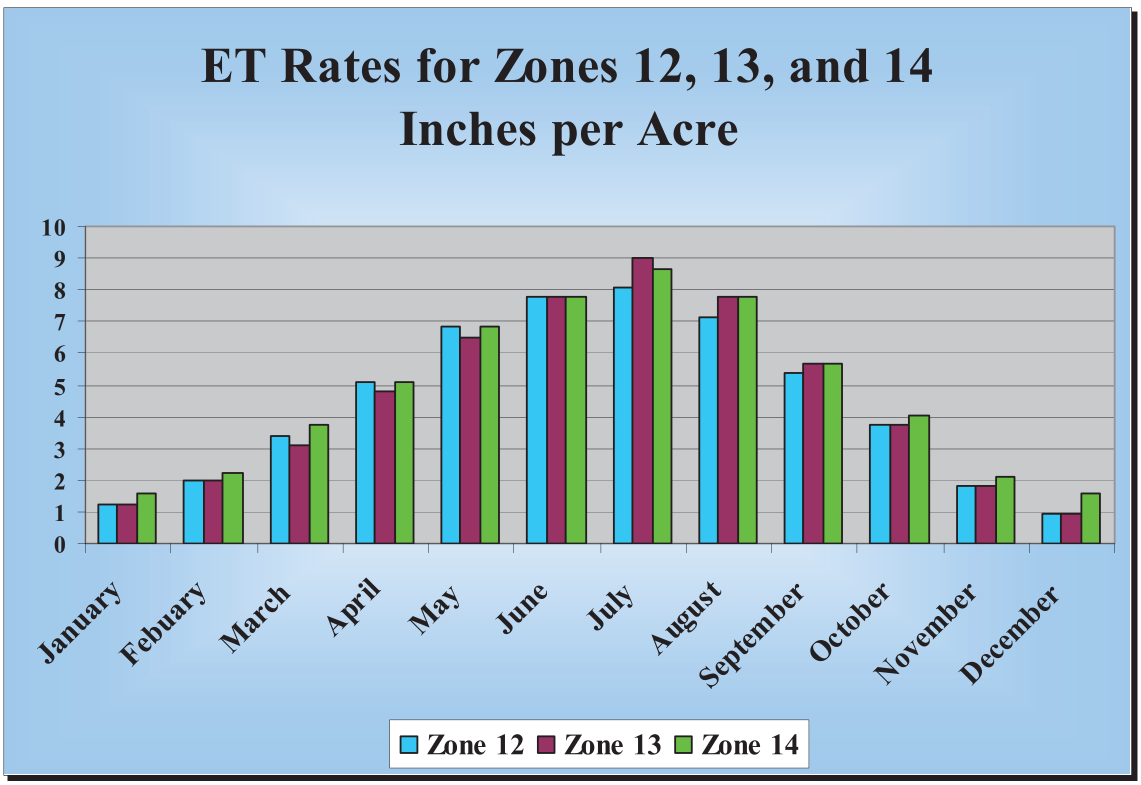
Growing degree-days are useful for several reasons. One use is to apply temperature data to agriculture in order to determine the approximate date when crops will be ready to harvest. Growing degree-days are calculated by subtracting the base temperature of a given crop from the daily average temperature. Red Bluff with a base of 40°F requires about 8,373 growing degree-days, and the base of 60°F requires 2,741. Mineral with a base temperature of 40°F has 3,063 growing degree-days, and the base of 60°F has 267. Growing degree-days are also used by farmers to determine the best time to apply pesticides in order to exterminate insects during a time when they are most vulnerable.

Evapotranspiration

Evapotranspiration (ET) is the loss of water to the atmosphere by the combined processes of evaporation (from soil and plant sources) and transpiration (from plant tissues). It is an indicator of how much water crops, lawns, gardens, and trees need for healthy growth and productivity. Through the California Irrigation Management Information Systems (CIMIS), users can find one of 120 climate stations placed throughout the state. By finding the closest station, users can access climatic data greater in depth than simply temperature and precipitation. Most of the CIMIS stations are on standardized surfaces, and evapotranspiration is commonly referred to as ETo. In order to get an ET rate for a particular plant type, crop coefficients are used. Once the crop coefficient is known it is multiplied by the ETo. This results in an estimated ET for the particular crop.

Farmers, administers of parks and fields, landscapers, gardeners, nursery keepers, and homeowners can all find out ET rates in order to determine exactly how much water a specific grass, tree, or plant will need to stay healthy.

The state of California is divided up into 18 ETo zones. For Tehama County's east side there are three of these zones. From the east side of



the Sacramento River to the base of the Sierra foothills, is ETo zone 14. This zone is geographically situated in the mid-central valley and is characterized with low winter and high summer ET rates with wind in some locations. Located on the east side of the Sacramento River in the south-central portion of Tehama County, is ETo zone 12. This zone makes up a very small portion of the county and has characteristics very similar to zone 14 with slightly lower ET rates. Located in ETo zone 13 is the easternmost part of Tehama County. This region is associated with the northern fringes of the Sierra Nevada Range where elevations are much higher. The area is characterized by high summer sunshine and wind in some locations.

Wind

For Tehama East, winds tend to fluctuate between southerly and northerly trends. The Red Bluff station has wind tendencies blowing from the north northeast from September through January and from the south in July and August. Between the months of February and June, wind directions move between the north and the south southeast. The average wind speed throughout the year is 8 MPH with the highest average in February and April at 8.8 MPH and the least average in August at 7.0 MPH (Average wind speeds are based on the hourly data from 1996-2006 from automated stations at the Red Bluff airport).

Fog

For Tehama East, it is common in the winter months to see heavy fog. The most common form is known as radiation, or Tule fog. Radiation fog forms under clear skies and fairly high relative humidity. As the ground radiates cold air, the adjacent air is also cooled fairly rapidly. When air containing water vapor cools to a specific temperature the dew point temperature is reached, or 100% saturation. This can occur commonly in the winter months throughout the Sacramento Valley. At the Red Bluff station, an average of 17 heavy fog days occur each season when 12 of the 17 days take place in the winter months of January and February.

Relative humidity in the morning for December is around 82, while in July it is 56. For the day time measurements in December, relative humidity is 62 and in July it is 18.

Number of Days with Sun or Clouds

With the Mediterranean climate, the bulk of Tehama East's sunny days occur in the summer and cloudy days in the winter. The Red Bluff station on average receives 119 cloudy days per year. The highest month is in December at 18 days, and the least is in July at one day.

The average percent of possible sunshine for the year in Red Bluff is 78%. The highest month is July at 96% and the least is December at 50%.

Thunderstorms

Thunderstorms do occur in Tehama East in relatively low numbers. Red Bluff averages 10 per year, with the highest occurrences in May and June at 2 per month. November, December and January average 0, while all other months average 1.

Future Climate

Throughout many of the studies indicating the 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 by at least two degrees and up to as much as nine degrees by the end of the century. Some of the climate models indicate that warming would be greater in the summer than in the winter, which would have effects on the demands for energy, agricultural production, ecosystem health, and water use and availability. Two major resources that face alteration within Tehama East are rainfall and the high elevation snowpack. While rainfall was found to change in very slight amounts, the report showed that California's snowpack could decrease by at least 32%. The snowpack is a vital regional resource that provides clean drinking water, irrigation water and a source of energy. The predicted loss of so much spring snowmelt would have dramatic repercussions. Less water runoff would decrease reservoir storage and lead to less electricity production. With an increase in temperature, there is an expected increase in energy consumption, due in large part to the demand for air conditioning during the hottest months of the summer. Less reservoir storage would also mean less ability to deliver water to farmers in order to maintain healthy crop production.

Other related issues concern increases in wildfires and decreases in human health are expected. Conifer tree growth was reduced under all three scenarios, which results in an increase of grasslands. As a result, an expected increase in the likely hood of large wildfires grew to nearly 55% by the end of the century. Air quality would surely be impacted by such a large increase, as well as changes in temperature and humidity which may lead to higher levels of ozone concentration. As a result public health would be of high concern.

The economy of Tehama East relies heavily on agriculture. Another area of concern beyond depleted water storage capacity is the decrease in chill hours over the last 50 years. Winter temperatures are expected to rise which could allow the migration of insect and pests to the region from the warmer areas of Southern California. Fruit and nut trees would be highly susceptible to abundant and new types of pests.

Other possibilities for Tehama's east side are the projections of increased numbers of extreme events such as heat waves, drought, flood, and wildfires. In connection with these are the El Nino events. An expected intensification for wet years would mean either an increase of occurrences and severity of storms or a severe lack of storms causing drought like conditions.

In the coming years, the people and the land of Tehama County's East side will face numerous challenges brought on by a changing climate. While there is a good possibility of dramatic changes to the areas watershed, it is recommended that current practices relating to water use should be fully examined and refined. When working with water, there are numerous sustainable methods and practices that can help maintain the health of the area. Reducing wasteful water consumption, recycling, and implementing the latest in irrigation technology, will all help sustain the health and prosperity of Tehama County's east side.

References

2009 California Climate Adaption Strategy. Sacramento, California. Available from World Wide Web: http://www.climatechange.ca.gov/index.php

CIMIS (California Irrigation Management Information System). 2009. *California Irrigation Management Information System.* Sacramento: California Department of Water Resources. [cited December 2009]. Available from World Wide Web: http://www.cimis.water.ca.gov/cimis/infoGenCimisOverview.jsp

Daniel R. Cayan & Amy L. Luers & Guido Franco & Michael Hanemann & Bart Croes & Edward Vine. *Overview of the California climate change scenarios project.* Springer Science + Business Media B.V. 2007

Emma C. Underwood, Joshua H. Viers, Kirk R. Klausmeyer, Robin L. Cox, and M. Rebecca Shaw. *Threats and biodiversity in the mediterranean biome.* Science Daily, February 26, 2009. Diversity and Distributions. Available from World Wide Web: http://www.sciencedaily.com

/releases/2009/02/0902170 80019.htm

Lutgens, Frederick K, Tarbuck, Edward J. *The Atmosphere 7th Edition*, 1998. Prentice Hall Inc, New Jersey.

Ritter, Michael E. *The Physical Environment: an Introduction to Physical Geography*. 2006. Available from World Wide Web: http://www.uwsp.edu/geo/faculty/ritter/geog101/textbook/climate_systems/mediterranean.html

Moser, Susie, Guido Franco, Sarah Pittiglio, Wendy Chou, Dan Cayan. 2009. *The Future Is Now: An Update on Climate Change Science Impacts and Response Options for California.* California Energy Commission, PIER Energy-Related Environmental Research Program. CEC-500-2008-071.

WRCC (Eastern Region Climate Center). 2009. Eastern Region Climate Center. Reno, Nevada. Available from World Wide Web: http://www.wrcc.dri.edu/CLIMATEDATA.html

Section 4

Section 4

Geology and Soils

Introduction

The following chapter describes geology and soils of the Tehama East Watersheds. The geology section includes an area overview, description of major landforms, geomorphic provinces, geologic units, and dominant faults. The soils section describes the soils association types, soil capabilities, and erosion potential. The conclusion of the geology chapter includes a data gap analysis and recommendations.

Sources of data

- 1999 Geologic Map of the Red Bluff 30' X 60' Quadrangle. U.S. Geological Survey (USGS), U.S. Department of Interior
- 1987 Late Cenozoic Tectonism of the Sacramento Valley California, U.S. Geological Survey (USGS)
- 1986 Geologic Map of the Late Cenozoic Deposits of the Sacramento Valley and Northern Sierran Foothills, California, U.S. Geological Survey (USGS)
- 1967 Soil Survey Tehama County California, USDA

Area Overview

Tehama East watersheds encompass a range of geography from valley floor to mountain peak. The Sacramento Valley is a sediment filled trough, the resulting landscape is relatively level. The Sacramento River meanders through the middle of the valley, and forms the eastern most boundaries to the watersheds. The Cascade and Sierra Nevada Ranges in the east rise from the valley floor, supplying varied topography and geology. See Geology Maps, pages 66-73, of the Tehama East Watershed Assessment Atlas.

Major Landforms

A plethora of landforms exist in the watersheds, the most prevalent of which are mountains and foothills, floodplains, and alluvial fans.

The mountains and foothills of the watersheds precipitously rise from the valley floor, and are products of tectonic activity.

Flood plains consist of agriculturally rich soils washed away from uplifted mountains in the east. The soils are deposited where creeks and rivers overflow their banks. These flood plains are hydrologically connected with streams, and are the most productive areas for natural vegetation and agriculture. Many agricultural properties are found in naturally occurring flood plains, due to the productivity of the land. These lands are subsequently exposed to frequent flooding.

Alluvial Fans are produced where the mountains meet the valley floor. Mountain waters are often confined by rock walls, and steep relief. These waters are forced to cut downward through the local geology, creating sheer canyon walls found at high elevations in the watersheds. When the water reaches the mountain front and enters the valley floor the relief of the channel decreases, and the confining walls broaden, resulting in a depositional environment. The deposits of the channel produce an alluvium filled, fan shaped landform (when viewed from above), known as an alluvial fan.

Geomorphic Provinces

Geomorphic provinces are areas with common geologic histories, topographies, and climates. There are 11 different geomorphic provinces in California. In Tehama County, east of the Sacramento River, three geomorphic provinces adjoin, they are: the Sierra Nevada, the Cascade, and the Great Valley provinces.

Sierra Nevada Province is a 400 mile long northeast trending mountain range. The mountains are shaped like a wedge, with a gentle eastern slope disappearing under the sediments of the Great Valley, and steep eastern escarpment rising high above the Basin and Range Province. The Sierra Nevada is composed of belts of metamorphic rocks- old sedimentary rocks recrystallized by heating, partial melting, and resolidification. Batholiths, large masses of granite intrude the metamorphic sedimentary rocks, and represent the ancient roots of once active volcanoes. The northern Sierra boundary is located where bedrock is buried by the Cenozoic volcanic cover of the Cascade Range.

The Cascade Range Province is characterized as a chain of volcanic cones brought about by tectonic activity. The cascades span the pacific northeast from southern British Columbia to Northern California. The volcanic chain represents the Pacific Northeast portion of the Pacific Ring of Fire. Predominantly volcaniclastic deposits and flows of quaternary and tertiary age characterize the geology of this province. These geologic strata overlay older volcanic and sedimentary formations of the Mesozoic and Paleozoic eras. The Cascade Range is bounded by the Sierra Nevada Province to the south, the Modoc Plateau Province to the East and the Great Valley to the east.

Great Valley Province is a Mesozoic forearc basin, remnant of the collision of the continent with subducting seafloor. The province is a sedimentary basin filled with marine and continental deposits. The basin is roughly 400 miles long and 50 miles wide and as much as 5 miles deep (DWR Existing Conditions in lower deer creek). The alluvium which fills the basin was eroded from the confining structures which border the province, the Coast Range to the east, Cascade and Sierra ranges to the east, and Klamath range to the north. Sediments thin near the edges of basin and expose older underlying rocks. The oldest valley sediments were deposited in a saline environment and typically contain brackish groundwaters. The eastern side of the Sacramento Valley is underlain by volcanic lahar flows of the Tuscan Formation. The Tuscan is segmented into four separate layers, A-D. Tuscan B is the most productive fresh groundwater bearing formation in the north eastern Sacramento valley, and the watersheds of interest.

Significant Geologic Units of the Provinces

Great Valley Province

Red Bluff Formation— The Red Bluff Formation generally forms the highest part of the valley landscape. It originally consisted of a uniform, gently sloping surface. Deformation of this surface is the primary indicator of Quaternary structural deformation, including the Corning Dome, Inks Creek fold system and the Battle Creek Fault. (Buer 2007)

The Red Bluff Formation is typified by thin veneer of brightly red, highly weathered gravels overlying the Tehama and Tuscan Formations. The formation is typified by very coarse, red gravel that contains minor amounts of interstratified sand and silt, and has been know to act as a pediment, or aquaclude to water percolation. (USGS Helley et al 1985)

Terrace Deposits. The Sacramento River and major tributary streams have developed a series of terrace levels flanking the stream channels. These terraces stair-step up in elevation, away from the active channel, with the upper terraces being the oldest. Terrace deposits are typically complexly intertwined, and each mapped terrace may have several minor deposits of different age and elevation associated with it. These are typically not differentiated.

The four Pleistocene terraces that occur in the area, from oldest to youngest, are the Lower Riverbank, Upper Riverbank, Lower Modesto, and Upper Modesto. These terraces have been correlated by their absolute age, soil stratigraphy, and geomorphic expression to the Riverbank and Modesto Formations of the San Joaquin Valley (Buer 2007).

Riverbank Formation (Pleistocene)— The Riverbank Formation is an alluvial deposit that is older than the Red Bluff Formation, and younger than the Modesto Formation. It is typically found to the east of the Sacramento River, but has also been mapped east of the river to minimal extent. The Riverbank Formation has been divided into an upper and lower member. Both members share a resemblance to the overlying Red Bluff Formation in their reddish coloring.

Upper member—The upper Riverbank member is younger, unconsolidated, but compact, dark brown to red alluvium. It is composed of gravel, sand, silt, and some clay. It formed during a long period of stable climatic conditions. This member occurs as extensive flat stream terraces along some of the eastside tributaries. The upper member is lithologically similar to Modesto Formation, but differentiated from it on the basis of both higher geomorphic position, and increased soil formation. Terrace surfaces are geomorphically lower and generally smoother than those of lower member. The unit is usually less than 10 meters thick.

Lower member—The lower member is older, than the upper member. It is lithologically similar to the Red Bluff Formation, and has nearly the same red color. It consists of gravel, sand, silt and clay. Derived from heterogeneous metamorphic, sedimentary, and volcanic rocks; the lower member is more eroded than upper member.

Modesto Formation Pleistocene)— The Modesto Formation is another alluvial terrace deposit. It is derived from heterogeneous metamorphic, sedimentary, and volcanic rocks. Significant deposits of this formation exist predominantly along the eastern banks of the Sacramento River and to a lesser extent the banks of its tributaries. The formation is divided into an upper and lower member each lithologically similar, but with varying soil development.

Upper member— Unconsolidated, unweathered gravel, sand, silt, and clay found on lower Modesto terrace. Lithologically similar to lower member except that soils lack pedogenic B horizon. Unit is less than 5 m thick.

Lower member—alluvium composed of gravel, sand, silt, and clay soils on the lower member contain a pedogenic B-horizon. Terraces display fresh depositional morphology with little if any erosional features. Unit is less than 5 m thick. (Buer 2007)

Geology of the Cascade / Sierra Nevada Province

The Tuscan Formation is the dominant geologic formation in the watersheds. It has a maximum vertical thickness of 2,000 ft or more. The formation resulted from volcanic activity south of current day Mt Lassen area. Mudflows known as lahars, and debris flows deposited the Tuscan Formation. The flows ranged in sediment size, from sandy flows to blocks ranging in size from 1 inch to 5 feet. Erosion of the hardened Tuscan washes away the finer grains and leaves behind the larger blocks, producing the volcanic plains of the eastern watersheds.

The Tuscan formation is exposed along the east side of the Sacramento Valley. The formation outcrops continuously from 15 miles north of Red Bluff to Oroville, and in isolated areas east of Redding. The Tuscan formation interfingers with the sedimentary Tehama formation at it furthest east, and overlaps the Sierran metamorphic and plutonic complex to the south.

See Geology Maps, pages 66-73, of the Tehama East Watershed Assessment Atlas.

Tuscan Formation (Pliocene)—Divided into A-D:

Member D—Block-and-ash deposits composed of juvenile andesitic pyroclastic debris and interbedded lahar deposits; characterized by large monolithologic masses of gray hornblende andesite, augiteolivine basaltic andesite, and black pumiceous mudstone, as well as smaller fragments of black obsidian and white and gray, hornblende-bearing pumice, all in grayish-tan pumiceous-mudstone matrix. Distinguished from member C by presence of large, fractured monolithologic rock masses, black obsidian fragments, and white and dove-gray pumice fragments. Thickness ranges from about 10 to 50 meters.

Member C—Predominantly lahar deposits composed of angular to subrounded volcanic fragments as much as 3 m in diameter in matrix of grayish-tan volcanic mudstone. Both composition and texture of fragments, as well as ratio of fragments to matrix, are highly varied. Scattered large irregular masses of brick-red and gray, commonly massive to locally flow-banded volcanic breccia are present within lahar deposits throughout quadrangle. Poorly sorted, polymict volcanic conglomerate, sandstone, and siltstone are interlayered with lahar deposits and increase in abundance toward east and south. Lahar deposits are generally reversely graded and range in thickness from about 0.5 m to 10 m; upper and lower contacts are sharp. Total thickness of member C is at least 75 m where exposed in eastern part of Antelope Creek.

Ishi Tuff Member—Indurated but nonwelded, white to light-gray, fine-grained pumiceous air-fall tuff commonly reworked and contaminated with varied amounts of volcanic sandstone and siltstone. Readily distinguished by abundant bronze-colored mica flakes about 1 mm in diameter. Along Chico Monocline, Ishi Tuff Member locally separates members B and C. Preliminary potassium-argon ages obtained on biotite, hornblende, and plagioclase separated from pumice clasts are widely discordant; zircons from pumice clasts give fission-track age of about 2.6 Ma, which is currently best estimate of age of Ishi Tuff Member. Maximum thickness is 30cm; source unknown.

Member B—Interbedded lahar deposits and volcanic conglomerate, and volcanic sandstone and siltstone; lithologically similar to rocks of member C except that volcanic conglomerate and volcanic sandstone are more abundant in member B. Lahar deposits and alluvial volcaniclastic rocks are interbedded in approximately equal proportions, giving more regularly layered sequence than in lahar-rich member C. Maximum thickness of conglomerate layers is about 15 m; total thickness of member B is about 130 m along Chico Monocline.

Member A—Interbedded lahar deposits, volcanic conglomerate, volcanic sandstone, and siltstone, all containing scattered fragments of metamorphic rocks. Metamorphicrock fragments, which include white vein quartz, green, gray, and black chert, greenstone, greenish-gray slate, and serpentinite, make up less than 1 percent of rock type. Top of member A is defined by highest lahar deposit or volcanic-conglomerate layer that contains metamorphic-rock fragments. Exposures of member A in quadrangle are found only in canyon of Dye Creek. Thickness is unknown.

Nomlaki Tuff Member—White, light-gray, locally reddish-tan to pink, dacitic pumice tuff and pumice lapilli tuff at or very near base of both Tuscan and Tehama Formations. Pumice fragments as much as 20 cm in diameter are generally white in lower part of member and mixture of white and light- and dark-gray in upper part. Member is generally massive, nonwelded, nonlayered ash-flow tuff well exposed at Tuscan Springs, on Antelope Creek, and at Gas Point on Cottonwood Creek, as well as at several localities south of Gas Point along east margin of valley. Maximum thickness is 25 m at Tuscan Springs, about 20 m at Antelope Creek, and 10 m at Gas Point. Age of Nomlaki given by Evernden and others (1964) as 3.4 Ma.

Basaltic andesite of Antelope Creek (Pliocene)— Dark-gray to greenish-gray, locally altered to brick-red and reddish-gray, massive, highly fractured, fine-grained, sparsely vesicular basaltic andesite exposed in Antelope Creek and, to lesser extent, in Salt Creek. Red and reddish-gray scoria layers about 1 m thick alternate with layers of massive gray basaltic andesite of about equal thickness in eastern exposures of Antelope Creek and Salt Creek, suggesting that these exposures are near distal end of flow. Whole-rock potassium-argon age of 3.99±0.12 Ma. Maximum thickness is 15 m.

Faults

Faults in Tehama County directly influence the surface structures that are visible throughout the county.

Cohasset Ridge Fault
Cohasset ridge is an interfluve that runs south by southeast between Deer and Mill creeks watersheds. The Cohasset Ridge fault is a northeast trending, steeply east dipping fault. It can be traced north of deer creek through an intensely fractured area of the Tuscan to the vicinity of Mill Creek; there it becomes obscured by a complex pattern of east and northeast trending arcuate faults. (Helley Harwood 1981)

Chico Monocline Fault
The northeast trending zone of short fault segments located southeast of Red Bluff marks the northern half of the Chico monocline. (Harwood et al 1981) The fault approximately extends from Red Bluff to Chico. The fault associated with the monocline appears to be a major tectonic boundary. The Chico Monocline fault is believed to mark the boundary between the Mesozoic forearc complex to the east, and the magmatic arc complex to the east.

The monocline is a late Cenozoic tectonic feature. The east side up movement of this feature along with lateral movement may have contributed to the formation of Salt Creek, Tuscan Springs and Seven Mile domes at the north end of the monocline. Possibly influencing the north east trending Inks Creek fold system and Battle Creek fault zone. (Helley Harwood 1981)

See Geology Maps, pages 66-73, of the Tehama East Watershed Assessment Atlas.

Soils

Soils are the foundation of agricultural productivity. Agriculture in Tehama County is dependant on the nutrient rich soils which layer the central valley floor. These soils have been deposited over many years. In the watersheds of interest erosion carries sediment from mountain regions in the east, down to the valley floor. A general soil map showing soil associations is located in figure X.X. at the end of this chapter. A soil association is a landscape that has a distinct proportional pattern of soils. It consists of one or more major soil series and at least one minor soil series, and is named for the major soil. Soils in one association may occur in another, but with different patterns. Soil associations in Tehama County were segmented into spatial groups related to geographical location, they are: mountain soils, foothill soils, and floodplain and terrace soils.

In the Tehama East Watersheds soil associations of the floodplain terrace are: Columbia-Vina association and Tuscan-Inks association. Soil associations of the foothills are: Newville-Dibble, and Toomes-

Guenoc Association. Mountain soil associations are Cohasset-McCarthy, Windy-Iron Mountain and Jiggs-Lyonsville-Forward. The following is a brief summary of the general physical soil properties of each association by geographic location based on NRCS Tehama County Soil Survey 1967.

See Soils: Highly Erodible Land, Hydric Soils, Hydrologic Soils, Land Capability, and NRCS Soil Survey Maps, pages 198-233, of the Tehama East Watershed Assessment Atlas.

Floodplain Terrace Associations

The soils of the floodplains and terraces are dominantly brown or reddish brown. Soils of the flood plains form the nearly level and very gently sloping areas adjacent to the Sacramento River and its tributaries; these soils are deep to very deep. Soils of the terraces are mostly east of the Sacramento River, except one large area east of Vina and Los Molinos.

Columbia-Vina Association-
Most of the acreage of this soil classification is located along the north south trending Sacramento River, which dissects the county into east and east. Elevation range for this soil type is 200-1000 ft, with associated precipitation of 19-25 in. Soils of this association formed through alluvial processes and were derived from sedimentary, volcanic, and granitic rocks. Texture ranges from fine to moderately coarse. These alluvial deposits often form very deep, nearly level, flood plains of the Sacramento River. The Columbia series tends to be brown, and the Vina series is a dark grayish brown. Minor Soils grouped in this association are Zamora, Los Robles, Berrendos and Farewell series.

The soils in this association are typified as agriculturally very productive, among the best in the county. In this soil type beans, alfalfa, corn, sugarbeats, milo, peaches, prunes and walnuts are grown. Native plants are typically cleared from this soil type throughout the county. Along the Sacramento River, where native vegetation persists, sycamores, valley oak, wild grape, elder berry, and other shrubs grow as well as grasses and forbs.

Tuscan-Inks Association-
This soil association lies between the recent alluvial deposits of the Sacramento River and the foothills. It is found on old terraces east of the Sacramento River, and runs north to south, with some individual terraces found in the north by the county line. The elevation range for this association is 300-800 ft, and receives 19 to 30 inches of precipitation annually. The tops of the terraces are nearly level or gently sloping, some of the terrace tops contain a multitude of small basin like formations. The soils are nearly level to steep, cobbly soils which are shallow to moderately deep to hardpan. They are often stratified deposits of alluvium derived from volcanic rocks. Most are andesitic by composition but others can be basaltic or even

rhyolitic. Tuscan soils found on the top of terraces are composed of layers, reddish-brown cobbly loam on top of clay loam cemented hardpan at a depth of typically 20 inches. Inks soils are found on the slopes of the dissected terrace layers of cobbly loam and clay loam over cemented substratum. The minor soils of the association are Anita, Keefer and Laniger.

The vegetation forage production varies and is associated with the soils types. Tuscan, Inks, and Anita are correlated with small to moderate forage quantity, and poor to fair forage quality. While Keefer and Langier range from moderate to large forage quantity and moderate to good forage quality.

Foothills Associations

The foothills soils are made up mainly of brown to reddish brown soils that are shallow to deep. East of the Sacramento River are shallow to moderately deep, rocky loams formed in material from volcanic rock. These soils are gently sloping to steep.

Newville-Dibble-
Predominantly a east side association, the Newville-Dibble association appears in two places in our watersheds east of the Sacramento River. Both appearances are found near the Sacramento River. One north east of the bend at the confluence of Sacramento River and Paynes Creek, the other is just south where seven mile creek and the Sacramento River meet. The elevation range for this association is 500-2000 ft for the whole county, and associated precipitation of 19-30 inches. The soils are brown, shallow to deep, moderately steep to steep, medium to fine textured soils underlain by stratified soft sedimentary rock. It usually occurs on smooth rounded hills. The sediments in which these soils formed are mainly from siltstone, but in places consist of very gravelly material and high in lime or calcium carbonate. Newville soils are a gravelly loam at the surface and gravelly clay in the subsoil. Dibble soils are layers of silt loam or silty clay loam over dense, compact siltstone.

The natural vegetation of this association ranges from grasses and forbs to blue oak, Manzanita, buckbrush, interior live oak and even digger pine. Much of this association is used for pasture and range. The amount of forage produced in the Newville and Dibble is small to moderate, and quality is poor to fair. It should be noted that the minor soils offer a better opportunity for forage production.

Toomes-Guenoc Association-
The Toomes-Guenoc Association is the major soil association in our watersheds. The association is found in the foothills east of the Sacramento River. The area appears to be a plateau sloping up to the east when viewed from a north to south orientation. When viewed from east to east, stream canyons become visible, steep canyon walls,

and sloping ridges etched out by erosion. The elevation of this association ranges form 500-4000 ft and precipitation ranges from 20 to 35 inches. The soils of this association are shallow to moderately deep, rocky, gently sloping to steep soils, underlain by large volcanic mud and lava flows. The underlying volcanic material is mostly andesitic in composition, with some basaltic inclusions. Toomes soil is brown, to reddish brown loams. It is shallow and in many places is less than 15 inches deep, and generally very rocky. Guenoc soils have a reddish brown, rocky loam surface layer, and subsoil of reddish brown dense clay loam or clay. The depth to the hard clay rock ranges from 20 to 40 inches. Minor soils of this association are Supan, Inskip and cone soils.

Vegetation in this association sustains grasses, forbs, manzanita, digger pine, blue oak, interior live oak, and buckbrush. This land is used for pasture and range. The forage produced by this association ranges in quality from moderate to very small, and in quality from fair to very poor.

Mountain Associations

Soils in the mountains range from shallow to moderately deep, and vary in color from brown, to reddish-brown, to lightly grey. Elevation is typically above 3000 ft, and precipitation ranges from 25 inches to 70 inches annually.

Cohasset-Mccarthy Association

The uppermost portions of Paynes, Pine, and Antelope watersheds reach far enough east to include this soil association in their boundaries. The general shape of the soils include a gently sloping plateau and very large fan; both land forms are crossed by deeply entrenched streams. The ridgetops between the deep, sheer-walled canyons formed by the streams are relatively large, partly rounded, and gently sloping. Elevation ranges from 3500 to 6000 feet, and annual precipitation ranges from 40 to 60 inches, with much of the winter precipitation falling as snow. The soils of this association are moderately deep to deep, moderately steep to steep, and stony, and are underlain by volcanic rocks. The rock is mostly volcanic breccias or mudflow composed of cemented andesitic tuff. Cohasset soils are found on ridge tops. Layers of brown stony loam and loam underlain by a subsoil of reddish brown clay loam typify this soil type. Depth to weathered volcanic rock is greater than 40 in. McCarthy Soils are found on the steep canyon slopes. The surface is typically dark brown sandy loam, and the subsurface is strong brown gravelly sandy loam. The depth to weathered volcanic rock in the series is 20 to 40 inches. Aiken is the only minor soil in this association.

Natural vegetation includes but is not limited to yellow pine, sugar pine, white fir, douglas fir, incense cedar, and includes some hardwoods, shrubs, forbs and grasses. This association is considered to be the best for timber growth in the county. Trees are grown on all soils with growth ranging from good to very good.

Windy-Iron Mountain Association
This association is found in the easternmost portions of the watersheds. This area can be thought of as moderately steep plateaus or side slopes. Elevations are greater than 6000 feet and precipitation is 50 to 70 inches, most falls as snow. Soils are very shallow to moderately deep, stony, and are underlain by volcanic breccias, or rock from volcanic flow. The volcanic rock composition is mostly andesitic. Windy soil series is dark brown and stony or gravelly sandy loam at the surface. The subsoil tends to be a strong brown sandy loam or yellowish brown loam. In most cases they are gravelly and stony throughout. Iron mountain soil pertains to a very small acreage in the association. It is defined as a shallow sandy loam, and appears in nearly barren areas.

Conifers and shrubs cover windy soils. The trees are mainly white fir, sugar pine, red fir, white pine, and mountain hemlock. Shrubs consist of green leaf Manzanita, pine mat manzanita, bearbrush, and huckleberry oak. Timber is produced on windy soils and some Christmas tree farms exist as well. Vegetation of the Iron Mountain soils are shrubs, grasses and forbs.

Jiggs-Lyonsville-Forward Association
This association is found in the eastern most areas of the watersheds. It appears where the ridges are fairly broad and canyons are deep and shear walled. The soils range in elevation from 2000-6000 feet and precipitation ranges from 45-60 inches, most of it falling as snow. The soils of this association are light grey and moderately deep moderately steep to steep, and stony. The soils are underlain by rhyolitic rock flow, which nearly caps the tops of the ridges. Jiggs soil series comes in layers of stony sandy loam that are less than 30 inches deep over fractured rhyolitic rock. Lyonsville soils have a layer of gravelly of stony sandy loam over sandy clay loam; depth to fractured rhyolitic soil is about 40 inches. Forward soils consist of layers of sandy loam or loamy sand, over dense partly cemented, volcanic tuff. The minor soils in this association are Childs, Chummy, Elam, and Nanny.

The vegetation is mainly Douglas fir, incense cedar, sugar pine, white pine, white fir, yellow pine, black oak, and also included are shrubs, forbs, and grasses.

Soil Capabilities
Soils are grouped by capability in order to indicate their relative suitability for the production of agricultural products. Capability is based on limitations of the soils and the potential for damage to the soil as a result of use. Capability classification consists of three levels of increasing specificity including class, subclass, and unit. Table 4-1 lists the soil capabilities of the soil associations found within the watershed, based on the dominant

soil types included in each association.

Capability classes are represented by roman numerals (I-VIII), with higher numerals indicating increased limitations on the types of use they can support:

Class I: Soils that have few limitations restricting their use

Class II: Soils with some limitations on the choice of plants or that require moderate conservation practices

Class III: Soils with some limitations that restrict the choice of plants or require special conservation practices, or both

Class IV: Soils that have very severe limitations restricting the choice of plants or that require very careful management, or both

Class V: Soils that are subject to little or no erosion, but have other factors that limit their use largely to pasture, range, woodland, or wildlife food and cover

Class VI: Soils having severe limitations, which make them generally unsuited to cultivation and limit their use largely to pasture, range, woodland, or wildlife food and cover

Class VII: Soils having very severe limitations, which make them unsuited to cultivation, with uses restricted to grazing, woodland, or wildlife

Class VIII: Soils and landforms having limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife, water supply, or to esthetic purposes

Capability subclasses are soil groups within one class. They are designated by adding a small letter (e, w, s or c) to the class numeral:

e: Shows that the main limitation is risk of erosion unless close-growing plant cover is maintained

w: Shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage)

s: Shows that the soil is limited mainly because it is shallow, droughty, or stony

c: Shows that the chief limitation is climate that is too cold or too dry

Capability units are numbers (0-9) that indicate the chief limitation used to group soils in a class or subclass:

0: A problem or limitation caused by very gravelly material in the substratum

1: An erosion hazard, actual or potential

2: A problem or limitation of wetness because of a high water table, seepage, or flooding

3: A problem or limitation of slow permeability of the subsoil

4: A problem or limitation caused by coarse soil texture or excessive gravel

5: A problem or limitation caused by fine soil texture

6: A problem or limitation caused by salt or alkali

7: A problem or limitation caused by stones or rock outcrops

8: A problem or limitation caused by shallow depth of soil over bedrock

9: A problem or limitation caused by low fertility

Timber production is similar to agricultural uses in that the productivity of soil in a given area dictates growth rates and amounts of commercially important timber species. A description of natural vegetation and primary crops by soil association within the watershed follows. See Soils: Land Capability Maps, pages 222-230, of the Tehama East Watershed Assessment Atlas.

Erosion Potential

Soil erosion is the removal of soil material and is controlled by factors such as soil type, slope, precipitation, wind, and vegetative cover. In areas with a high potential for erosion, management or development activities can create undesirable erosion problems, such as loss of productive soils, gullying, or excess sedimentation of streams. Based on the Soil Survey for Tehama County (USDA SCS 1967), the soils most prone to erosion (severe to very severe erosion hazard) within the assessment area include soils with capability classifications of IVe-3, VIe-1, VIw-1, VIe-3, VIe-5, VIIs-1, VIIe-3, and VIIe-4 . This includes some soils within the Columbia-Vina, Newville-Dibble, Cohasset-McCarthy, Windy-Iron Mountain, and Jiggs-Lyonsville-Forward soil associations. It is important to note that the erosion hazard of most soils increases when vegetation is cleared, areas are cultivated, or improper grading methods are used. These hazards can be enhanced by logging practices and wildfire. Three primary sources of sediment generation in the watershed include mass wasting, stream scour, and road generated erosion.

See Erosion Potential Map, page 32, and Soils: Highly Erodible Land Maps, pages 198-205, of the Tehama East Watershed Assessment Atlas.

Section 5

Section 5

Hydrology

TABLES

FIGURES

Introduction

The Sacramento River is the largest river in Tehama County, and in California. It carries nearly 31 percent of the state's runoff, roughly 22.4 million acre feet per year (Carle 2004). For the purpose of this assessment the Sacramento River acts as the easternmost boundary to the watersheds. The creeks that are tributaries to the Sacramento River directly affect the river. If the tributaries of the Sacramento River are going dry, are polluted, or are otherwise negatively affected, the Sacramento River will be proportionally affected.

The watersheds of the east side assessment are tributaries to the Sacramento River and are components in the larger Sacramento River hydrologic region (DWR 2003). Tehama East Watersheds are listed in order of total watershed area from smallest to largest: Paynes Slough, Seven Mile Creek, Hoag Slough, Inks Creek, Dye Creek, Salt Creek, Pine Creek, Toomes Creek, Paynes Creek, and Antelope Creek. It should be noted that Mill, Battle, and Deer Creeks are also tributaries which flow from the east into the Sacramento River in Tehama County, but these tributaries have been excluded from this assessment.

The Cascade Mountains and foothills dominate the eastern region, their terminus punctuated by the majestic Mount Lassen. Precipitation which falls on the river channel or on an impermeable layer begins its descent down-gradient to the Sacramento River in the east. As river order increases, flows build and the channels grow, building power to erode canyons in roughly a symmetrical incline of the eastern cascade and Sierra Nevada Mountains. Eroded sediments are carried out of the mountains and deposited on the valley floor where gradients decline and streams are allowed to meander and overflow. The valley region of the study area is relatively small in comparison to the mountain region and is enriched by alluvial depositions which fan out and are known for their rich agricultural soils.

Data Sources

Primary Sources of information:

Tehama County East Watershed Assessment, VESTRA 2006

Water Inventory and Analysis, CDM in association with California Department of Water Resources

Tehama County Flood Mitigation plan, Tehama County Flood Control and Water Conservation District

Reference Conditions

The following descriptions for reference conditions in California are taken from Vestra's Tehama West Watershed Assessment Chapter 6 Hydrology (VESTRA 2006).

The twentieth century was one of relatively high rainfall compared to the past 500 years. However, current conditions are "normal" in the context of the last 100 years. Droughts exceeding three years are relatively rare in Northern California. Historical multi-year droughts include: 1912–13, 1918-20, 1923–24, 1929–34, 1947-50, 1959–61, 1976–77, and 1987–92 (DWR 2000a).

Reconstruction of Sacramento River runoff from 420-year tree ring data was made for the California Department of Water Resources (DWR) in 1986 by the Laboratory for Tree Ring Research at the University of Arizona. The tree ring data suggested that the 1929–34 drought was the most severe in the reconstructed record from 1560 to 1980. The data also suggested that a few droughts prior to 1900 exceeded 3 years and that none lasted over 6 years, except for one period of less than average runoff from 1839–46. John Bidwell, an early pioneer who arrived in California in 1841, confirmed that 1841, 1843, and 1844 were extremely dry years in the Sacramento area (Meko et al 2001).

A 1994 study of relict tree stumps rooted in present-day lakes, rivers, and marshes suggest that California sustained two epic drought periods. The first epic drought lasted more than two centuries before the year 1112; the second drought lasted more than 140 years before 1350. The conclusion that can be drawn from these investigations is that California is subject to droughts more severe and more prolonged than witnessed in the historical record (DWR 2000a).

The semi arid climate of California is subject to periods of drought. The variability in rainfall through the state has led to numerous long term precipitation gaging locations throughout the state.

Precipitation

In the City of Red Bluff, located in the valley region or the study area, the average annual precipitation is 23.47”. For comparison, the town of Mineral located in the mountain region of the study area, averages 55.34” of precipitation. Precipitation in the study region is distributed in accordance with the definition of the orographic effect. The orographic effect states that an increase in elevation is linked to an increase in precipitation. The orographic effect occurs when moisture rich air meets a structural barrier such as a mountain range. The barrier forces the air to rise, and the rising air cools. Cool air can not hold as much moisture as warm air. The water in the cooled air forms rain or clouds. The isohyetal diagram (See Average Annual Precipitation Map, Page 123, of the Tehama East Watershed Atlas) presents a visual map, displaying the distribution of precipitation throughout the study area. High elevations within the study area are inherently cooler, than low elevations. Precipitation received in these mountain regions during the fall and winter seasons often forms snow.

Table 5-1. Average monthly and yearly rainfall monitored at Red Bluff since 1933, and in Mineral since 1948. Obtained from wrcc.dri.edu.

Monthly Average Precipitation		
Month	Red Bluff Ele 353 ft msl	Mineral Ele 4957 ft msl
	Gaging Station (in)	Gaging Station (in)
Oct	1.37	3.76
Nov	3.02	7.1
Dec	4.07	9.34
Jan	4.48	9.7
Feb	3.69	8.02
Mar	3.01	7.19
Apr	1.61	4.08
May	1.08	2.77
Jun	0.46	1.42
Jul	0.06	0.21
Aug	0.14	0.51
Sep	0.48	1.24
Total	23.47	55.34

Understanding the annual storage of water as snow in the mountains is vital to water management in California. Mindful observations of winter snow pack can help water purveyors predict efficient use of reservoirs to balance summer water budgets. Anticipation of snowmelt has implications on irrigated agriculture, energy generation, recreation, municipal, and industrial users. (CDM, 2003)

Precipitation typically occurs as rain below 4000 feet (McCandles, 1963). Above the snow line precipitation often occurs as snow, and snow pack above 5500 feet can last well through the month of June (Deer Creek Watershed Conservancy, 1998). The following graph is an example of the Lower Lassen Peak snow course data during the 2008 monitoring period. Lower Lassen Peak averages 17 feet of snow depth, and 7 feet of water content as an annual maximum in April and has been monitored since 1930. This snow course provides the only example of snow pack data on the east side. At elevations of 8250 feet, it is not a good representation for this assessment area. Snow data is a data gap within this assessment area.

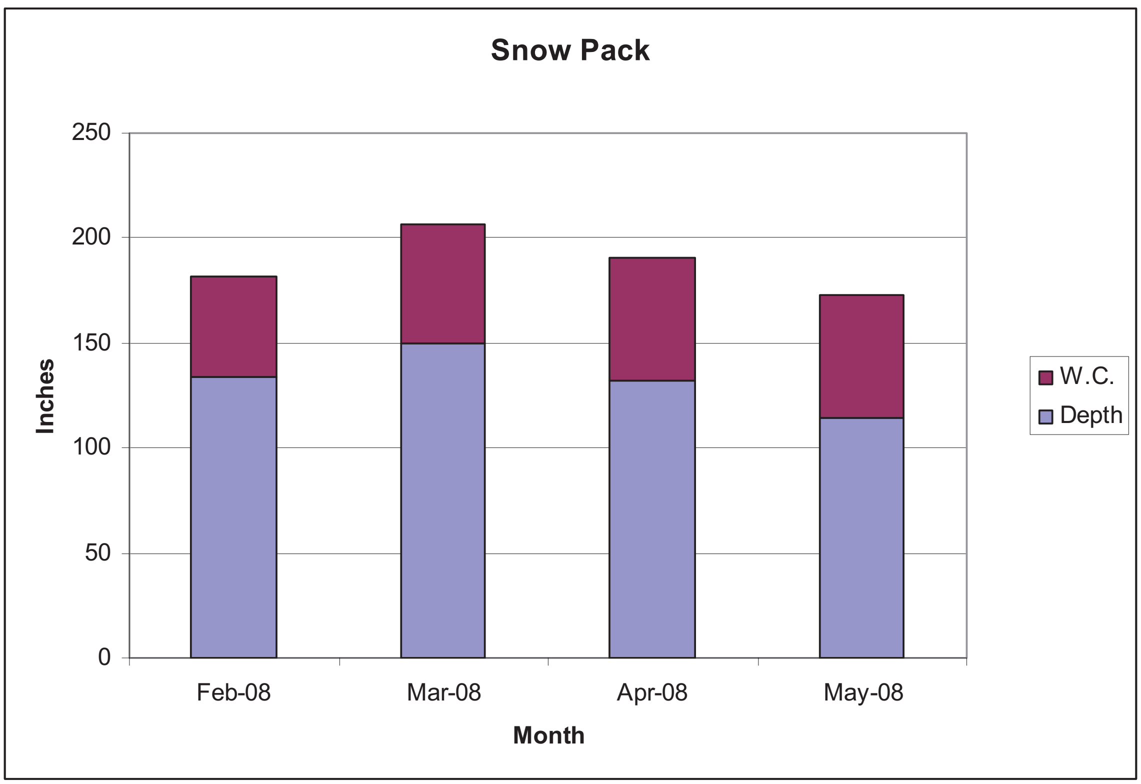


Figure 5-1. 2008 Water Content/ snow depth of Lower Lassen Peak elevation 8500 ft

Stream Discharge

Response of stream discharge to precipitation is dependent on headwater origins, watershed slope, soil types, basin shape, channel morphology, and precipitation patterns. For example basin shape influences the discharge characteristics of a watershed. A circular watershed with a uniform slope, precipitation, and permeability will result in runoff from various parts of the watershed reaching the outlet at the same time. An elongated watershed with the same area, but having the outlet at one end of the major axis, will cause the runoff to be spread out over time, producing lower peak flows at the outlet. (Vestra 2006) Tehama east watershed stream gaging data are presented in Table 5-2. Antelope Creek and Paynes Creek are the only two streams which have been historically monitored. Currently no agency maintained surface water gaging stations exist on any of the east side watershed assessment creeks. Current discharge is a data gap within the assessment area.

Table 5-2. Table of USGS gauges averages on the east side streams.

Table 5.2 Annual Mean Stream Flow United States Geological Survey							
USGS Site Name	**USGS Site #**	**Drainage Area**	**Period of Record**	**Min. (cfs)**	**Max. (cfs)**	**Mean (cfs)**	**Mean (aft/yr)**
Antelope	11379000	(GIS)	1940-1982	40.4	295.7	151.5 ± 69.6	109,000
Paynes	11377500	(GIS)	1949-1966	21.5	155.4	71.4 ± 36.8	52,000

Table 5-3. Mean monthly stream flow of Antelope and Paynes Creeks during specified years.

Table 5.3 Mean Monthly Stream Flow (cfs)						
	Antelope Creek (1940-1982)			**Paynes Creek (1949-1966)**		
Month	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
Jan	314.8	41.9	1191.1	204.3	24.2	603.4
Feb	312.4	43.6	953.4	232.2	24.3	654.6
Mar	241.5	46.5	661.6	107.8	12.2	351.5
Apr	218.0	42.8	566.5	81.2	7.35	356.3
May	153.8	45.3	314.6	22.3	1.8	66
Jun	80.6	33.1	218.8	6.6	0.2	40.5
Jul	43.8	28.5	72.4	1	0	6.91
Aug	38.1	26.5	54.9	0.4	0	1.98
Sep	38.7	27.4	71.8	1.5	0	12.1
Oct	50.8	30.9	232.6	10.4	0.1	89.7
Nov	104.1	35.5	523.0	37.9	1.4	105.2
Dec	221.8	38.6	677.6	151.1	3.2	432.3

Mean monthly flows are shown in Table 5-3 for both Antelope and Paynes Creeks. Annual peak flows are typically due to rain on snow events, and occur in the months of January and February, when snow pack is liable to be present at elevations above the snow line.

An annual mean hydrograph of Antelope Creek reveals prolonged summer discharge, in months with little or no rainfall. The sustained discharge is assumed to be the result of combined summer snow melt and base flow. Snowmelt water may follow one of two paths to the stream channel. The most direct path to the channel is overland flow. The slower path to the channel is by means of base flow. Water infiltrates and percolates into the saturated zone. Once in the subsurface the water generally follows the topography and moves down hydrologic gradients. In the case of an effluent stream, the water table is above the stream channel and feeds the stream.

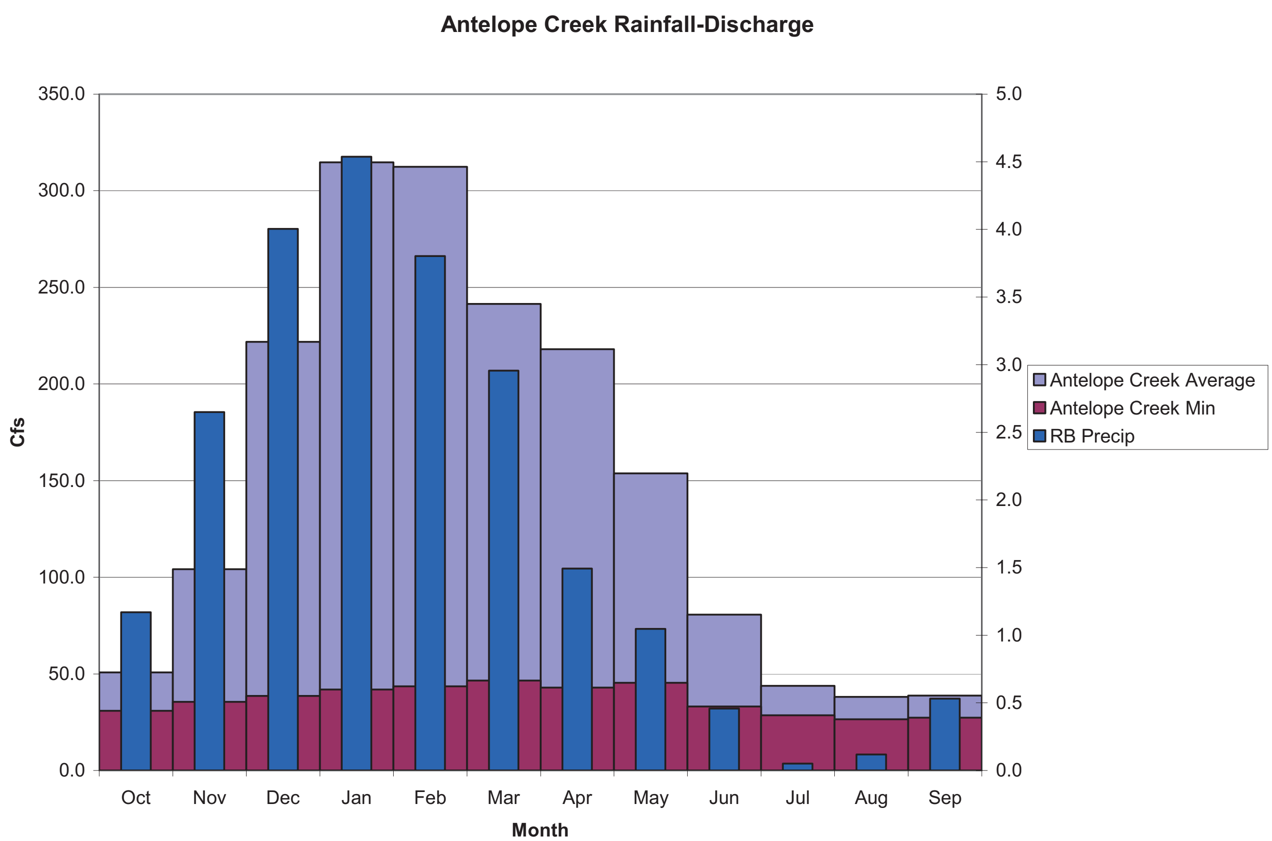


Figure 5-2. Antelope average flow vs. average RB rainfall

Paynes Creek's annual mean hydrograph illustrates a peak discharge the month following peak precipitation. The lagged peak is most likely due to rain on snow events in the month of February. The puzzling portion of the hydrograph is the complete lack of discharge during the summer months. Placement of the gaging station, the number of diversions, or the absence of large snowpack, and hot dry summer months may combine to lead to flows of 0 cfs in the summer. The likely reason for the creeks depleted flow during summer months is the percentage of watershed above snow pack line. Only 5% exists in comparison to Antelope Creek's 20%.
Paynes and Antelope Creeks are indicative of the different flow regimes which can exist given variation of a specific watershed's reach into the snowpacked Cascade and Sierra Nevada Mountain Ranges.

The largest river that flows through Tehama County is the Sacramento River. Sacramento River flow is controlled by the Central Valley Project's Shasta Dam, which was constructed in 1945. Today annual discharge of water in the Sacramento River follows trends in water demand more than natural runoff patterns.

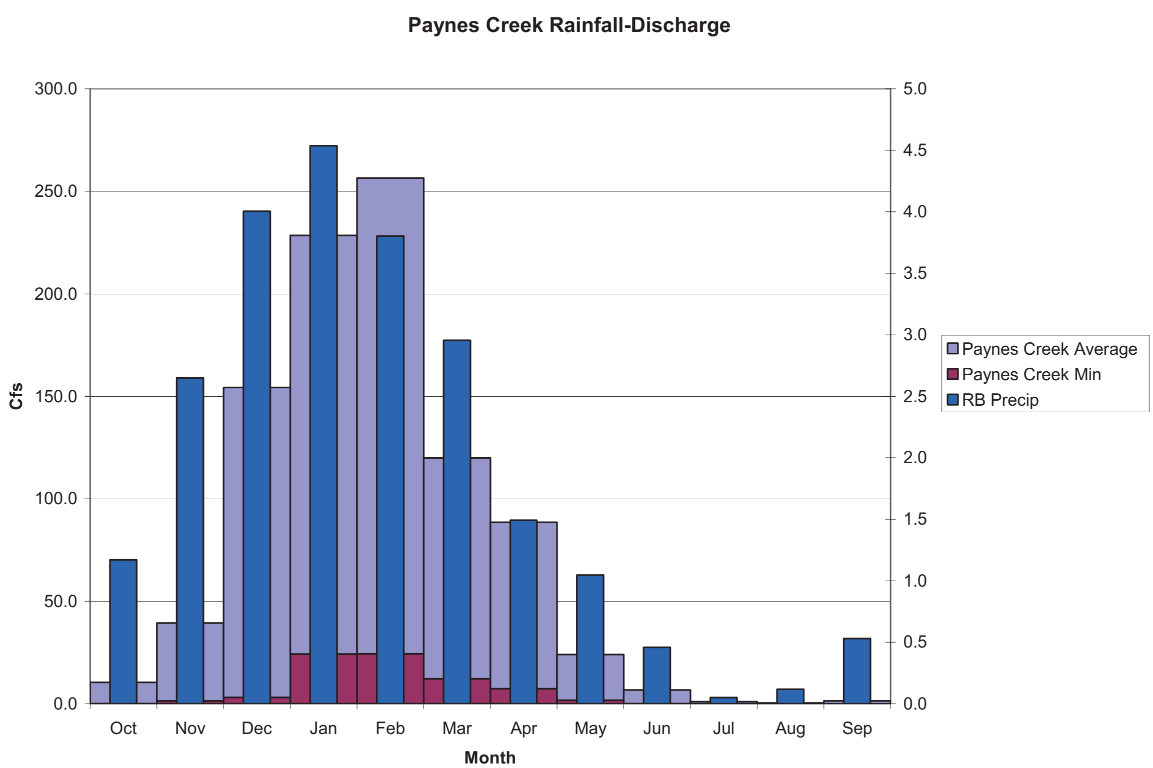


Figure 5-3. Paynes average flow vs. average RB rainfall

Vernal Pools

Vernal pools are perched zones of saturation that are characterized by a unique assemblage of vegetation, soils, and hydrology. Vernal pools are ephemeral; they fill with water in the winter months, dry down in the spring, and are completely desiccated in the summer months. Vernal pools can be found throughout California and range in size from micro relief to vernal lakes. Hogs Lake found along Highway 36 northeast of Red Bluff, is an example of one of the larger vernal pools. Site history and land management practices have an influence on the floristic composition of vernal pools (Buck 1998). There are 80 "special status" plants, animals, and natural communities known or potential in Tehama County (CDM 2003). Two plants and two crustaceans found only in vernal pools habitat hold the highest status.

Vernal pools were mapped using color infrared aerial photography (Snow 1998). The Nature Conservancy bought two areas were vernal pools had been mapped: Dye Creek Preserve and the Vina Plains. Both are within the boundaries of this assessment and have working cattle ranches. Methods such as prescribed burns and various grazing theories are being tested to demonstrate their benefits to vernal pool habitats.

See National Wetland Inventory Maps, pages 147-154, Tehama East Watershed Atlas.

Flooding

Historically the Sacramento Valley was annually inundated with water. The Sacramento River was the main watercourse which drained the valley. The river was able to overflow its banks and meander its way through the wide areas of the valley creating natural flood plains, oxbow lakes, and sloughs.

Today dams and levees have domesticated a majority of the rivers in Northern California. Construction of the Shasta Dam has enabled humans to build farms, industry, and residential areas with minimal risk to annual flooding events. The control of discharge has helped convert a valley of marsh lands into one of the world's premier agricultural centers. Water is now available throughout the dry summer months, and areas which were once annually inundated are protected from annual flooding. Development has prospered, and California's economy thrived, thanks to the protection provided by California's intricate flood control system.

Since 1950 Tehama County has been in a state of emergency nine times due to flooding. Flooding events ranged from twenty year to one hundred year flooding. Flood timing and depth along the Sacramento River is quasi-predictable due to forecast releases from Shasta Dam (Wood Rogers, 2006). The maximum released discharge from Shasta dam is 79,000 cfs. This quantity has been released three times since the construction of the dam in 1958, 1970 and 1974.

The flooding of 1958, 1970, and 1974 were a result of prolonged rainfall produced by Pacific storms. The 1958 rainfall came from a series of severe North Pacific storms. They lasted from January to April, and rainfall over the basin above Shasta dam totaled 40 inches. The frontal storms of 1970 raised the snow line by contributing warm moist air, which fell as rain on snow. The 1970 storms produced annual peak flows on both Paynes and Antelope Creeks. Peak flow events in these watersheds may correlate best with rain on snow events. The 1974 flooding was a product of steady rainfall and saturated soil properties. (Army Corps of Engineers, 1978)

While Sacramento River flow is managed, many of its tributaries are not. Flooding of these tributaries causes damage typically on the valley floor. Flooding in these locations occurs quickly and often without warning. These floods have the ability to cause widespread flooding of property and transportation routes.

Annual peak flows with a return period greater than 5 years are summarized in table 5-4 for Antelope and Paynes Creeks. The return period is not a prediction of the time until the next flow event, but a probability that a given flow might occur in any one year.

Table 5-5
Annual Peak Flows
Return Period > 5 years

Antelope Creek (1940-1982)				**Paynes Creek (1949-1966)**			
Date	Discharge (cfs)	Gauge Height (ft)	Return Period (yrs)	Date	Discharge (cfs)	Gauge Height (ft)	Return Period (yrs)
1/23/1970	17200	17.95	42.0	12/1/1961	10600	11.33	28
2/22/1956	11500	12.43	21.0	12/1/1960	8780	10.56	14
11/15/1981	11300	15.08	14.0	1/23/1970	8140	10.26	9.3
2/24/1958	11100	12.35	10.5	1/5/1965	7500	9.97	7
10/12/1962	11100	13.96	8.4	1/21/1969	7200	9.83	5.6
2/6/1942	10400	13.9	7.0				
12/1/1960	9830	12.06	6.0				
1/21/1969	9430	13.25	5.3				

The Federal Emergency Management Agency has determined areas that are subject to flood inundation. The largest areas of inundation occur near the Sacramento River, but significant floodprone acreage exists on the lower portions of Antelope Creek in the Dairyville area, Salt Creek where Highway 36 meets Highway 99, and the low elevation areas of Paynes and Pine Creeks. These floodplains generally correspond to low gradient areas, where the creeks are free to meander and produce over bank flow.

According to the Tehama County Flood Mitigation Plan, Antelope, Dairyville, and areas south and adjacent to Corning are areas of concern (Wood Rogers 2006). Flood claims documented by the NFIP (National Flood Insurance Program) confirm the Antelope area is experiencing repeated flooding, but not the Corning area. Flood Insurance Rate Maps (FIRM) of the Corning area indicate an existing floodplain; however, pictures taken by locals show the flooding to be greater than portrayed by the FIRM.

The problem of flooding in the Antelope watershed has been recognized for at least 40 years. It is possible that due to low gradient topography, the main channel splits into a braided watercourse. Level topography is conducive to stream bank overflow during flooding events. Plans to build water retention structures have been proposed but have never broken ground. The only flood control work that has been done typically includes bridge improvement and levee repair.

The first Tehama East Watershed Assessment public meeting took place in the Antelope watershed. Attending residents voiced concerns regarding flooding of the area. Compounding the problem of living in a natural flood plain, residents cited the presence of excessive vegetation growing in the stream, particularly water primrose, and debris build up as contributing to the problems facing the area.

The Edwards diversion has recently undergone an upgrade, the installation of a fish ladder, funded by the Department of Fish and Game. Mr. Edwards is concerned with the possibility of the ladder acting as a barrier for debris, thus blocking flow from entering Antelope Creek and concentrating flow into the smaller channels of New Creek.

Surface Water Rights

In 1850 California was admitted into the Union as a free state. At the time the first California water laws were passed, riparian rights were adopted as a part of English common law. Riparian rights give land owners adjacent to waterways an initial claim to the water resources of the waterway.

However, water rights disputes in California date back to before the state was welcomed into the union. Miners in California, whose livelihood depended on availability of water, adopted the rules of prior appropriation. Prior appropriation rights were used by miners to claim water as a "first in time, first in right" system. The individual who first diverted the water had rights over any succeeding diverters.

Riparian rights of the state of California land owners and the appropriated claims of Forty-Niners were conflicting. In 1853 appropriated rights were recognized by the California Supreme Court to carry the power of law. Today California honors both appropriated and riparian rights. "California courts have consistently affirmed that neither riparian nor appropriator 'owns' the corpus of the water in a stream, but has only a private right to use the flow of a stream and to divert it for beneficial purposes." (Schneider, 1978)

Riparian Rights

Riparian rights are related to the ownership of land adjacent to a body of water. The riparian right is not separable from the land and must be bought and sold with the land. Riparian rights entitle the land owner to a "reasonable and beneficial" use of the water in the water course. The riparian right allows for the use of water on the adjacent land through irrigation or drinking water. Transfer of water off the property adjacent to the watercourse is not a riparian right. (CDM, 2003)

Appropriated Rights

Appropriated rights are specific to a water body and are not attached to ownership of land. Appropriated right to water allows the user to divert from the stream and use the water on nonriparian lands. Appropriated rights can therefore be sold separate from land. Appropriated rights are an entitlement to water based on use and timing. The hierarchy of appropriated rights follows a first come, first served basis. The individual who first diverted the water is the senior water right holder and has priority over succeeding diverters, or junior water right holders. Therefore, in dry years when the water supply is less than the water demand, the junior appropriator will lose water rights first.

Table 5-6
Eastside Watersheds: Pre-1914 or Riparian Water Rights Holders

Owner	Right	Filings	Date Filed	Use(s)	Source
Edwards, H. & W.	Pre-1914 or riparian	65,142	7/17/1967	Irrigation	Antelope Creek
Los Molinos Mutual Water Company	Pre-1914 or riparian	65,142	1/1/1967	Irrigation, stock watering	Antelope Creek

In situations where priorities conflict or in situations where rights precede the appropriation system, the court may adjudicate the rights. Adjudicated water rights carry the power of law and divide the water of a natural waterway between parties within the drainage. Adjudication can be applied to surface water or groundwater. Adjudication does not create new water rights but helps to confirm existing water rights. (CDM 2003)

Pine Creek has been fully appropriated, with specific adjudicated water rights distributed between five parties (Judgment No. 7814). The Superior Court of Tehama County adjudicated 5.4 cfs in Pine Creek to serve 392.1 acres of agricultural lands. The use of the water is not only irrigation, but also domestic, and for purposes of stock watering as well. It should be noted that part of these lands extend into Butte County.

Pre-1914 Water Rights

Pre-1914 water rights are those appropriated rights attained before December of 1914. The State Water Resources Control Board has no jurisdiction over pre-1914 water rights; people with these water rights are not responsible by law to report water use to the SWRCB.

California Doctrine

The following descriptions for reference conditions in California are taken from Vestra's Tehama East Watershed Assessment Chapter 6 Hydrology (Vestra, 2006).

The California Doctrine is a system of water rights that recognizes both appropriative and riparian rights. Early California law recognized both appropriation and riparian rights by applying priority to disputes between appropriators and by applying riparian principles to disputes between riparian users. In 1872, California officially recognized the rights of appropriators by allowing the filing of water claims with county recorders. Within 14 years, the California Supreme Court had to determine who had superior water rights when a downstream riparian rancher and an upstream appropriator each claimed a superior right to use water. The Supreme Court held that riparian rights are superior to the rights of an appropriator except in cases where the water had been appropriated before the riparian acquired the patent to his land, and after the passage of the 1866 Mining Act, which recognized appropriation. Generally, a reasonable use by a riparian will trump an appropriative right so long as the patent to the riparian parcel was acquired from the United States prior to the date of appropriation.

In 1926 the Supreme Court held that a riparian could assert priority over an appropriator to make beneficial use of the water even if the riparian use was unreasonable. In response, in 1928 the California Constitution was amended to require all water use in California to be "beneficial and reasonable." Generally today, a riparian user cannot defeat an appropriative right unless the riparian user proves the appropriation is causing undue interference with the riparian user's reasonable use of the water.

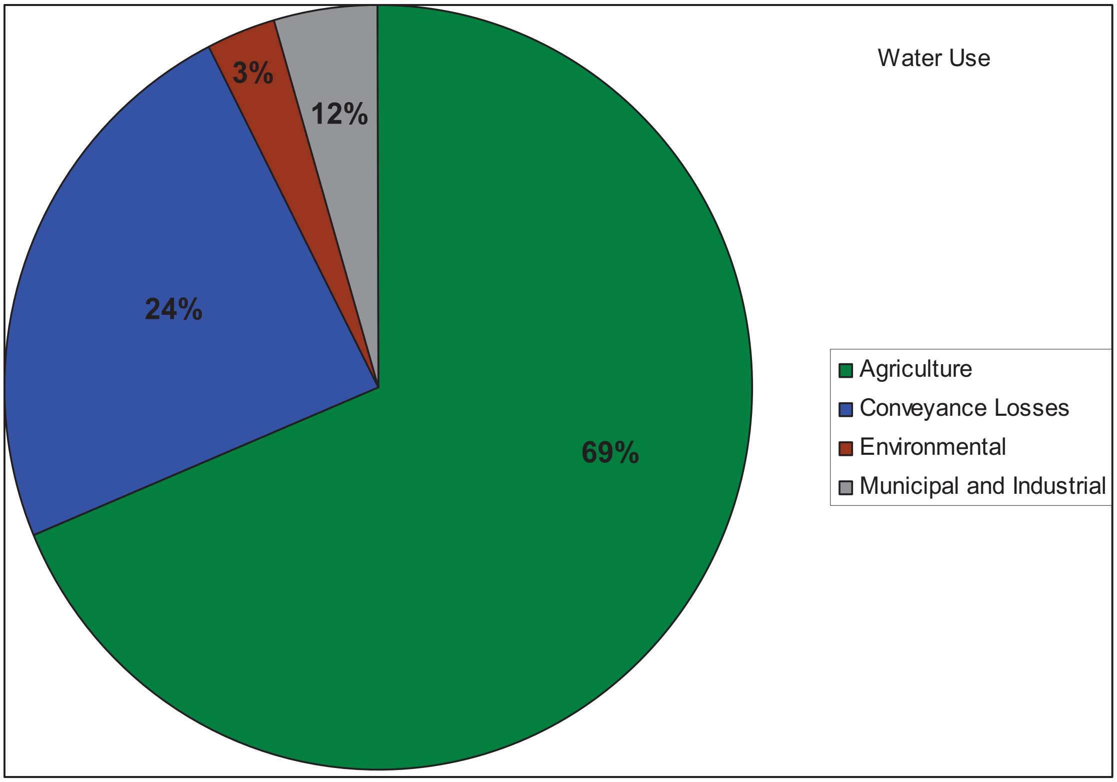
Surface Water Use

Agriculture is an economic driving force in Tehama County. Water use history in the county is intimately tied to the development and use of water to satisfy agricultural needs. (CDM, 2003)

The first major crops of the 1860's to 1880's were dry farmed. In the 1890's fruit orchards were developed. At this time little groundwater was being used, and crops would fail to produce in dry years. Historically farmers worked together to build facilities to divert water from streams to deliver to local farms. These farmers formed groups on the east side that still divert from Deer, Mill, and Antelope Creeks. These groups have evolved into water districts such as the Los Molinos Water District, founded in the early 1900's. (Tehama County, 1856-2006) Irrigation of agricultural lands imposes the largest water demands during the summer months, when surface water supplies are their lowest. For this reason many water districts have incorporated the use of groundwater to subsidize supplies during the drought years.

In the first part of the 1900's surface water was the primary source of water available in the county. Diversions from the Sacramento River and its tributaries supplied much of the water used for irrigation in the county. Los Molinos Water District diverted water from Mill Creek into ditches to deliver to farms. Subsequently the CVP and the construction of the Shasta Dam in 1945 and Corning Canal 1959 helped to provide reliable sources of water to the whole county. (U.S. Bureau of Reclamation at http://www.usbr.gov) By the 1970's the construction of water transport infrastructure maximized the use of surface water, allowing two-thirds of the water in the county to come from surface water sources.

California's thriving economy coupled with the nation's largest population has led to a steady increase in demand for CVP water throughout the state. The increases in demand for CVP water increases the price of the water. In dry years there are shortages in CVP water supply, driving the cost up even more. These factors along with an increase in drip irrigation, which works best with groundwater, have resulted in a reduced



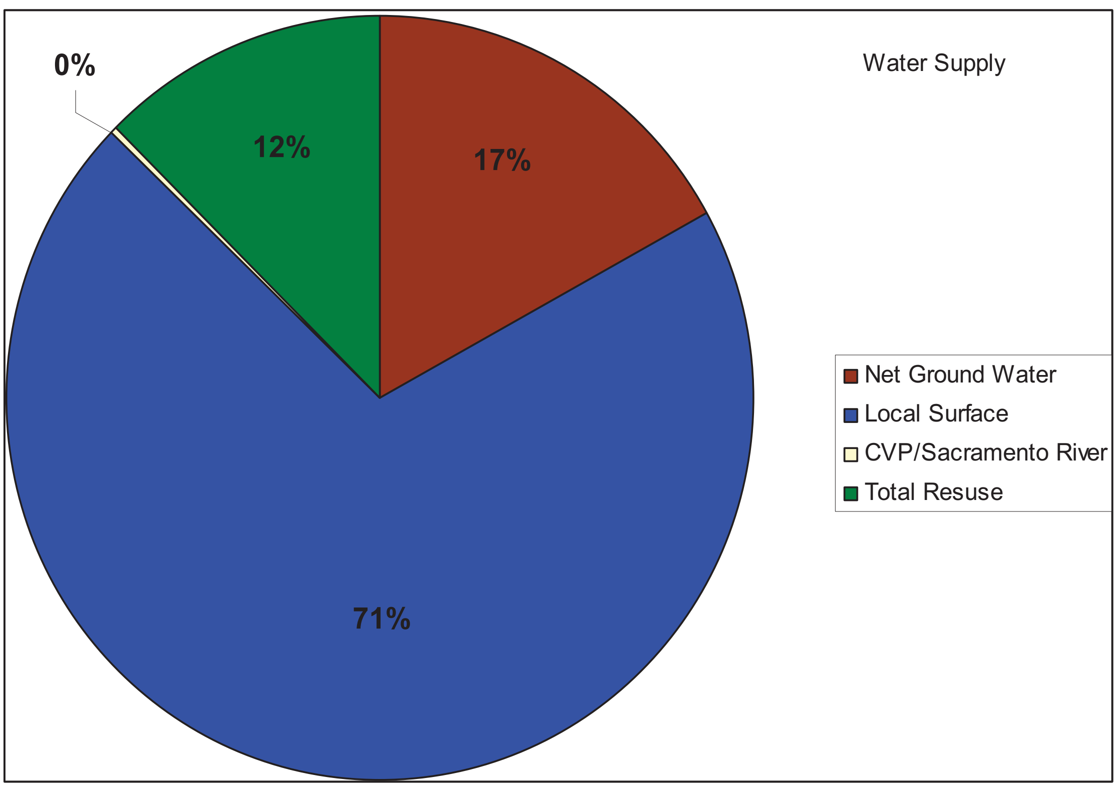


Figure 5-4. These graphs display the relationships between supply of water, and use of water associated with all inventory units. Note that total water supply is equal to water demand.

reliance on CVP water in Tehama County. Today a majority of the county's water (i.e., two-thirds) comes from groundwater supplies.

Some eastside residents receive water supplies from surface water diversions. A majority of these supplies come from Antelope, Deer, and Mill Creeks, although small diversions exist on almost all eastside creeks. These watersheds receive more rain and snow than the east side of the county. Longer watersheds, with substantial area above the snow pack line, typically sustain flow longer into the summer months due to summer snow melt.

Inventory Units

In 2003 Tehama County Flood Control and Water Conservation District, CDM, and the Department of Water Resources produced a "Water Inventory and Analysis" report. This report divided the east side of the county into inventory units including Antelope, Bend, Vina, Los Molinos, Dye Creek, and South Battle Creek. Table 5-7 summarizes water demand and supply in relation to the inventory units mentioned above.

Tehama County eastern inventory units use a majority of their waters for agricultural irrigation (approximately 70%). The primary source of that water is surface water sources (approximately 70%). The use of surface water in summer has led to depletion of summer flows. Low flows are inhibiting the migration of spawning salmon. The Steelhead and Chinook salmon are species of special concern. (See fisheries section for more information).

Table 5-7
Water demand and supply in East inventory units in 2000

	Antelope	Bend	Dye	East Mountain	Los Molinos	Vina	Totals
Supply (acre-feet in 2000)							
Net Groundwater	14,300	0	4,100	0	2,100	3,000	23,500
Local Surface	13,300	1,600	31,100	5,000	21,200	24,900	97,100
CVP/Sacramento River	0	200	0	0	400	0	600
Total Reuse	3,700	500	3,100	500	4,700	4,600	17,100
Total Supply	31,300	2,300	38,300	5,500	28,400	32,500	138,300
Demand (acre-feet in 2000)							
Agriculture	24,000	1,700	24,600	5,100	16,800	22,500	94,700
Conveyance Losses	5,100	200	10,400	300	7,600	9,800	33,400
Environmental	0	200	2,000	0	1,900	0	4,100
Municipal and Industrial	2,200	200	1,300	100	2,100	200	6,100
Total Demand	31,300	2,300	38,300	5,500	28,400	32,500	138,300

Groundwater

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 (DWR, 2003). Alluvium is typically coarse grained sediments of sand and gravel, or finer grained deposits such as clay or silt. The alluvial deposits that make up the aquifers of the Central Valley are eroded from the mountains that confine the valley.

Deposition due to fluvial processes produce layers; these layers are separated by sediment size. Larger sediments such as gravel and sand will be deposited first. Finer sediments such as clay and silt will be deposited where flow velocity decreases. In the subsurface these layers of clay and silt will act as confining layers or aquitards, layers that limit the movement of water. The larger sediments such as sand and gravel usually result in aquifers, layers of deposited material that will yield "significant" or "economic" amounts of water to a well or spring. The term aquifer is therefore an economic term which varies over time, sometimes substantially, depending on the value of the commodity and the cost of production.

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. The Central Valley is home to the largest groundwater basins (Carle, 2004).

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 (DWR 2003). 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 (CDM, 2003). Because of reliable stream flow of eastside tributaries, groundwater in these areas has been historically safe from overdraft.

Since 1997, 48 dedicated single or multi-completion monitoring wells have been installed in the northern Sacramento Valley for the purpose of monitoring the hydrogeology of the valley. E-logs were used to identify geologic strata underlying the surface of the valley based on resistivity of the strata. Figure 5.5 displays results of the e-logs (Fulton, 2005).

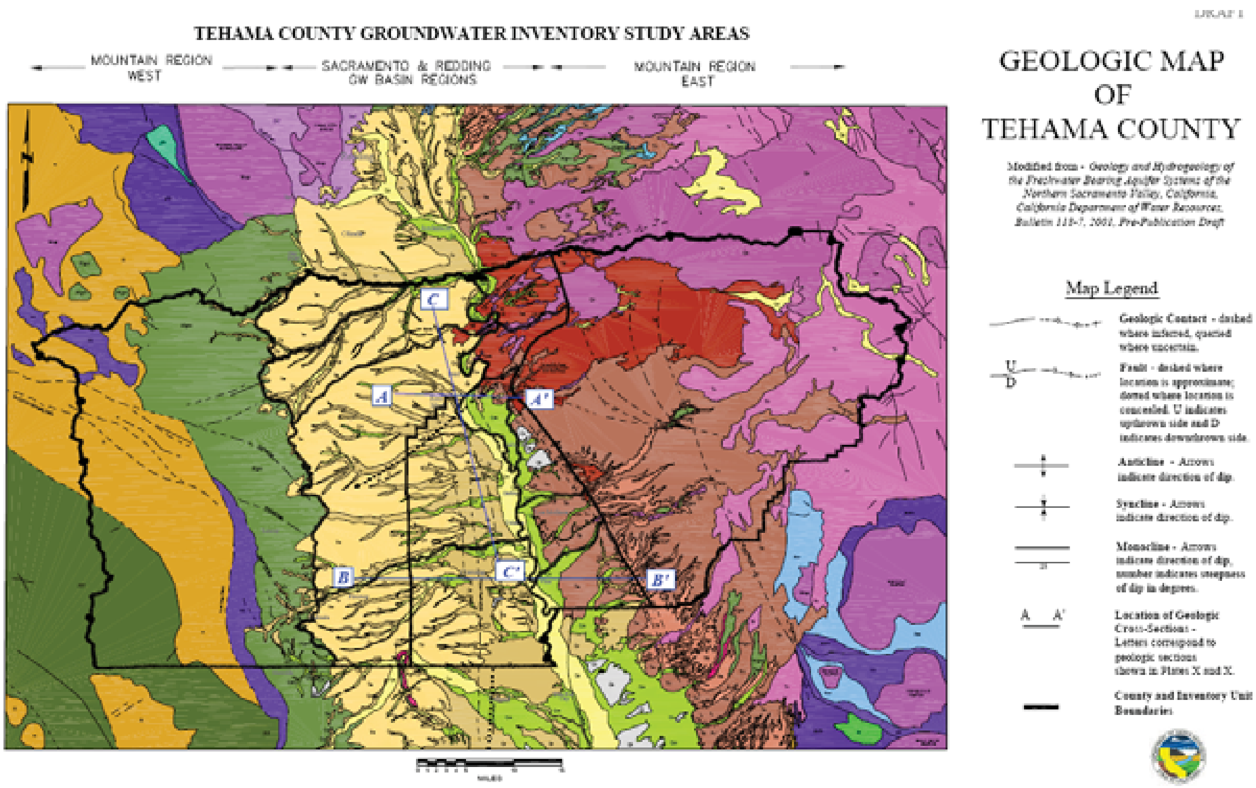


Figure 5.5 Location of cross sections

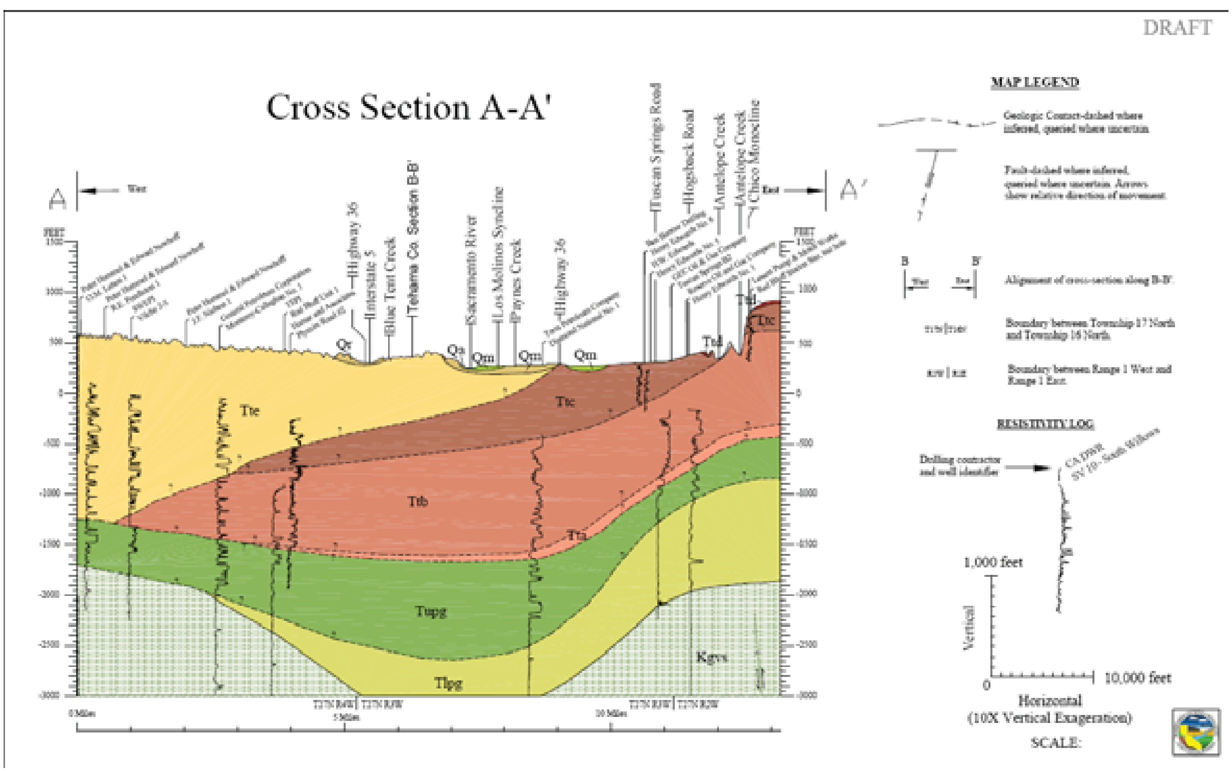


Figure 5.5.- This diagram is a cross section produced by E-logs and shows aquifers of Cross Section A-A from the diagram above.

Groundwater basins identified by the eastside assessment are shown in Figure 5.6 below. These boundaries represent groundwater subbasins as defined by the Department of Water Resources in "Bulletin 118: California's Groundwater." The Redding and Sacramento groundwater basins are separated by a geologic structure called the Red Bluff Arc. Within these two larger basins exist the six subbasins of interest. The six subbasins of the Valley are South Battle, Bend, Antelope, Dye Creek, Los Molinos, and Vina. Within each subbasin exists aquifers thought to be the most productive and reliable in the eastern area. The remaining area is fractured rock of the southern Cascades and the Sierra Nevadas. This area is known as Mountain Region East. Wells within the Mountain Region East tend to provide more variability and generally lower yields, and are regarded as less reliable.

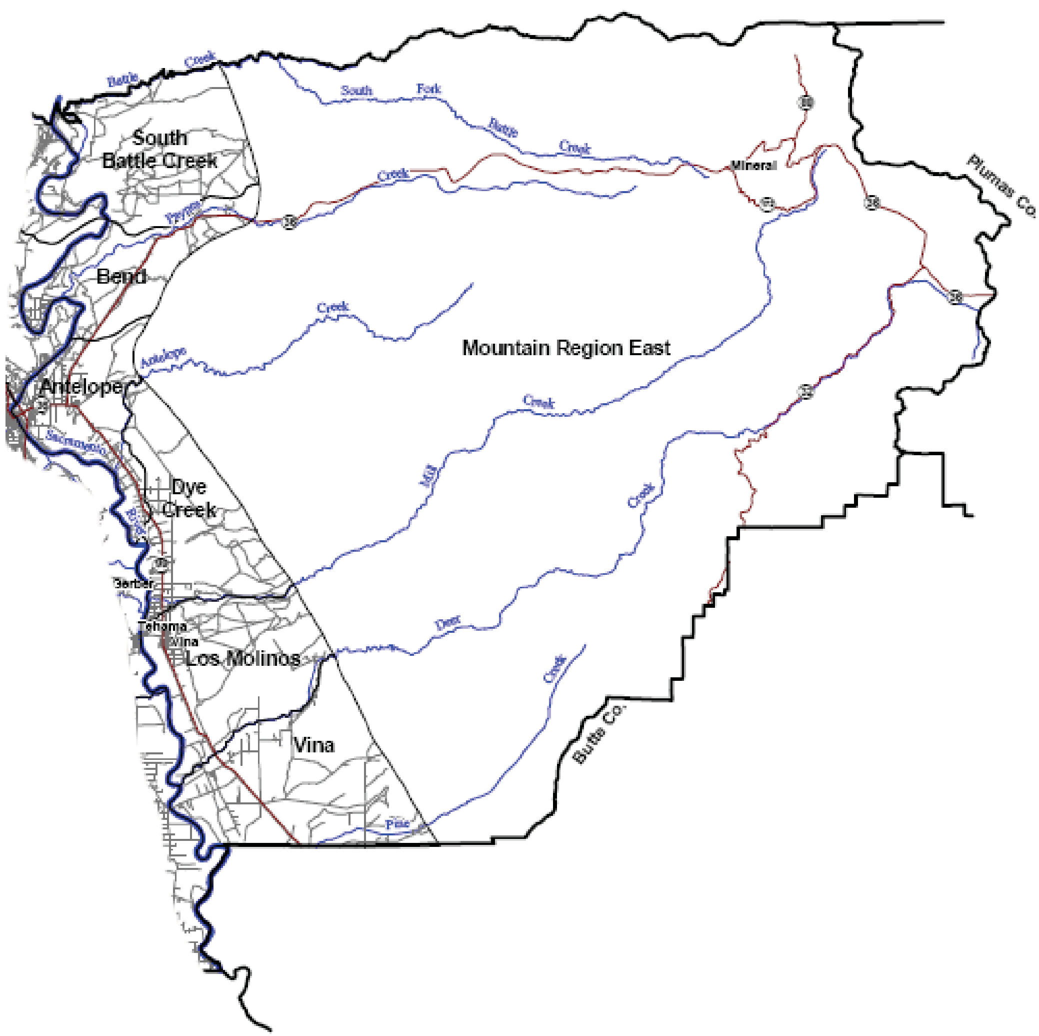


Figure 5.6 Subbasin Delineation

The main freshwater bearing geologic structures in the valley are the Tuscan, Tehama, Riverbank, and Modesto formations. Groundwater in these formations exists in primary porosity—spaces within an individual rock type—or secondary porosity—subsequent space between formations caused by fracturing or jointing of competent volcanic rocks.

Deeper aquifers within the valley are remnant of the inland sea which existed in the valley millions of years ago. These aquifers produce brackish saline waters and are found near the surface at the edge of the valley and at depth in the center of the valley. The base of the fresh groundwater bearing formations is associated with post Eocene continental deposits. Along the Sacramento River, these continental deposits are found at a depth of about 1700 feet. Where the valley meets the foothills, the base of fresh water moves slowly upward along with the tilting marine sediments.

The groundwater basins were studied by DWR and the following descriptions come from Bulletin 118-03 (DWR 2003).

Hydrogeology

Bend Subbasin

The Bend Subbasin is located in the far northeastern portion of the Sacramento Valley Groundwater Basin. The Sacramento River serves as the subbasin boundary to the east and the Cascade Range to the east. The subbasin is bounded on the north by the hydrologic divide between the Redding and Sacramento groundwater basins along the north side of Paynes Creek. The anticlinal structure above the projected trace of the Red Bluff fault serves as the subbasin boundary to the south. Annual precipitation ranges between 23 and 31 inches, increasing to the east.

The Bend Subbasin aquifer system is comprised of continental deposits of late Tertiary to Quaternary age. The Quaternary deposits include stream channel deposits, Holocene alluvium, and Pleistocene deposits of Modesto and Riverbank formations. The Tertiary deposits include the Tuscan Formation. Information on water-bearing formations is taken primarily from Helley and Harwood (1985).

Holocene Alluvium. Alluvial deposits in the subbasin consist of unconsolidated gravel, sand, silt, and clay from stream channel and floodplain deposits. These deposits are found along stream and river channels. The thickness ranges up to 30 feet. This unit represents the perched water table and the upper part of the unconfined zone of the aquifer. Although the alluvium is moderately permeable, it is not a significant contributor to groundwater usage.

Pleistocene Modesto and Riverbank Formations. The Modesto and Riverbank Formations consist of poorly consolidated gravel with some sand and silt deposited during the Pleistocene. They are usually found as terrace deposits near the surface along the Sacramento River and its tributaries. The thickness ranges up to 50 feet. The deposits are highly permeable and yield limited domestic water supplies.

Pliocene Tuscan Formation. The Tuscan Formation is composed of a series of volcanic mudflows, tuff breccia, tuffaceous sandstone and volcanic ash layers and is the principal water-bearing formation in the subbasin. The formation is described as four separate but lithologically similar units, Units A through D (with Unit A being the oldest), which in some areas are separated by layers of thin tuff or ash units.

Antelope Subbasin

The Antelope Subbasin comprises the portion of the Sacramento Valley Groundwater Basin bounded on the east by the Sacramento River, on the north by the Red Bluff Arch, on the northeast by the Cascade Range, and the southeast by Antelope Creek. The Antelope Subbasin is contiguous with the Dye Creek Subbasin to the south. Annual precipitation in the subbasin ranges from 23 to 27 inches, increasing to the east.

The aquifer system in this subbasin is comprised of continental deposits of Tertiary to late Quaternary age. The Quarternary deposits include Pleistocene Modesto and Riverbank Formations. The Tertiary deposits include the Pliocene Tehama Formation and the Tuscan Formation. The Tuscan Formation is the primary water producing zone in the basin.

Pleistocene Modesto Formation. The Pleistocene Modesto Formation (deposited between 14,000 to 42,000 years ago) consists of poorly indurated gravel and cobbles with sand, silt, and clay derived from reworking and deposition of the Tehama, Tuscan, and Riverbank Formations. Well logs for wells drilled on the floodplain east of Red Bluff indicate that coarse grained clean sand and gravel extend to a depth of approximately 50 feet below the surface. Below this depth, cemented gravel, sandstone, and hard clay of the Tehama and Tuscan Formations are encountered (Omsted and Davis 1961). The Modesto Formation yields limited groundwater due to its limited thickness (DWR 1987).

Pleistocene Riverbank Formation. The Pleistocene Riverbank Formation (deposited between 130,000 and 450,000 years ago) is observed in the far northern extents of the subbasin. The Riverbank Formation yields limited groundwater due to its limited thickness and areal extents.

Pliocene Tuscan Formation. The Tuscan Formation is composed of volcanic breccia, tuff, tuff breccia, volcanic sandstone and conglomerate, basalt flows, and tuffaceous silt and clay. The formation is mostly consolidated tuff in the area of exposure east of the valley in the Cascade Range foothills. From there, tuff breccias grade easterly into volcanic sands, gravels, and clay (DWR 1978). The Tuscan Formation is the major waterbearing aquifer in the northeastern portion of the Sacramento Valley. Thickness of the formation within the subbasin is approximately 1,500 feet (DWR 1987).

Pliocene Tehama Formation. The Tehama Formation interfingers with the Tuscan Formation along the Sacramento River and is exposed in Eastside Sacramento River banks. The formation consists of fluvial deposits of predominantly silt and clay with gravel and sand interbeds (DWR 1987). The formation is identified within the subbasin at depths ranging from 100 to 150 feet (DWR 1987).

Impairments. High concentrations of boron, chloride, and TDS are found in groundwater in the vicinity of Salt Creek and Little Salt Creek. Nitrate concentrations of 20 to 45 mg/L have been observed within the east-central portion of the basin (DWR 1987).

Dye Creek Subbasin
The Dye Creek Subbasin comprises the portion of the Sacramento Valley Groundwater Basin bounded on the southeast by the Sacramento River, on the northeast by Antelope Creek, on the east by the Chico Monocline, and on the south by Mill Creek. The Chico Monocline is a geographic boundary with some recharge likely occurring east of the boundary line. The subbasin is contiguous with Antelope and Los Molinos subbasins at depth. Annual precipitation is approximately 17 inches.

The aquifer system is comprised of continental deposits of Tertiary to late Quaternary age. The Quaternary deposits include Holocene basin deposits and Pleistocene deposits of the Modesto and Riverbank formations and Pleistocene fanglomerate. The Tertiary deposits include Pliocene Tehama and Tuscan formations.

Holocene Basin Deposits. The basin deposits are exposed east of Highway 99, north and south of Dairyville, within the central portion of the subbasin. Basin deposits are the result of sediment-laden floodwaters rising above the natural levees of streams and rivers and spreading across low-lying areas. Thickness of the deposits has not been determined. The deposits generally have low permeability and yield low quantities of water to wells. The quality of groundwater produced from basin deposits is often poor (USBR 1960).

Pleistocene Modesto Formation. The Modesto Formation (deposited between 14,000 and 42,000 years ago) is observed along the eastern extents of the subbasin. The formation consists of undifferentiated terrace deposits of unconsolidated weathered and unweathered gravel, sand, silt and clay. Thickness of the unit can range from zero to 150 feet (DWR 2000).

Pleistocene Riverbank Formation. The Riverbank Formation (deposited between 130,000 and 450,000 years ago) is exposed east of the Sacramento River north of Mill Creek. The formation is not a significant waterbearing formation due to its limited depth and areal extents.

Pleistocene Fanglomerate. The fanglomerate is observed along the eastern foothills and within the southern third of the subbasin. The formation is an alluvial fan deposit derived from erosion and deposition of volcanic mudflows of the Tuscan Formation and consists of polylithic volcanic clasts set in weathered tuffaceous matix. The fan deposits are poorly sorted and somewhat indurated to well cemented. Thickness of the fan deposits is up to 150 feet (Ely 1994). The fanglomerate is not sufficiently thick to produce large quantities of groundwater (Olmsted and Davis 1961).

Pliocene Tuscan Formation. The Tuscan Formation is composed of a series of volcanic breccia, tuff, tuff breccia, volcanic sandstone and conglomerate, basalt flows, and tuffaceous silt and clay layers. The formation is described as four separate but lithologically similar units, A through D (with Unit A being the oldest), which in some areas are separated by layers of thin tuff or ash units (Helley and Harwood 1985). Units A, B, and C are found within the subbasin and extend in the subsurface east to the Sacramento River. Surface exposures of Unit D appear along the east side of the subbasin and east of the subbasin boundary. The subsurface extents of Unit D are unknown.

Unit A is the oldest water bearing unit of the formation and is characterized by the presence of metamorphic clasts within interbedded lahars, volcanic conglomerate, volcanic sandstone and siltstone. Unit B is composed of fairly equal distribution of lahars, tuffaceous sandstone, and conglomerate. Unit C consists of massive mudflow or lahar deposits with some interbedded volcanic conglomerate and sandstone. In the subsurface, these low permeability lahars form thick, confining layers for groundwater contained in the more permeable sediments of Unit B. The Tuscan Formation reaches a thickness of 1,500 feet over older sedimentary deposits (DWR 2000). The slope of the formation averages approximately 2.5 degrees, east of the valley, and steepens sharply to 10 to 20 degrees southeastward towards the valley at the Chico Monocline (Olmsted and Davis 1961). The formation flattens beneath valley sediments.

Pliocene Tehama Formation. The Tehama Formation consists of fluvial deposits of predominantly silt and clay with gravel and sand interbeds and occurs in the subsurface along the eastern boundary of the subbasin (DWR 1987).

Groundwater Recharge and Discharge

Natural recharge of aquifers occurs where mountain ranges intersect with a groundwater basin, where streams pass over permeable geologic formation, and where precipitation infiltrates through permeable soil and the underlying formations (Vestra 2006). In some cases, recharge occurs from infiltration from drainage ditches. A large fraction of groundwater recharge east of the Sacramento River is "deep percolation" infiltration of applied irrigation and or rainfall to depths below the deepest root zones of crops or local vegetation such that it returns to the aquifer. Percolation from surface water bodies where there are cross-permeable formations are considered to represent a significant portion of the natural recharge to aquifers in Tehama County (CDM 2003). Recharge is critically important, because it sustains much of the eastside's water supply and maintains its quality. However, there are no studies that quantify the amount of recharge that occurs in this or other manners. Currently a study to quantify recharge to the Tuscan aquifer in Butte County is being funded by Proposition 50.

Groundwater Movement

Spring movement of groundwater through prescribed inventory units typically moves toward the Sacramento River. The river is an effluent stream gaining water from the water table. The river can be thought of as a drain being recharged by groundwater from the valley aquifer system. Above the Red Bluff Arc the groundwater moves north and east toward the Sacramento River. Below the Red Bluff arc the groundwater moves south and east, toward the Sacramento River. In the mountains to the east groundwater is thought to move down gradient and eventually out into the valley floor, where it can either move to deep percolation or return to the Sacramento River as base flow.

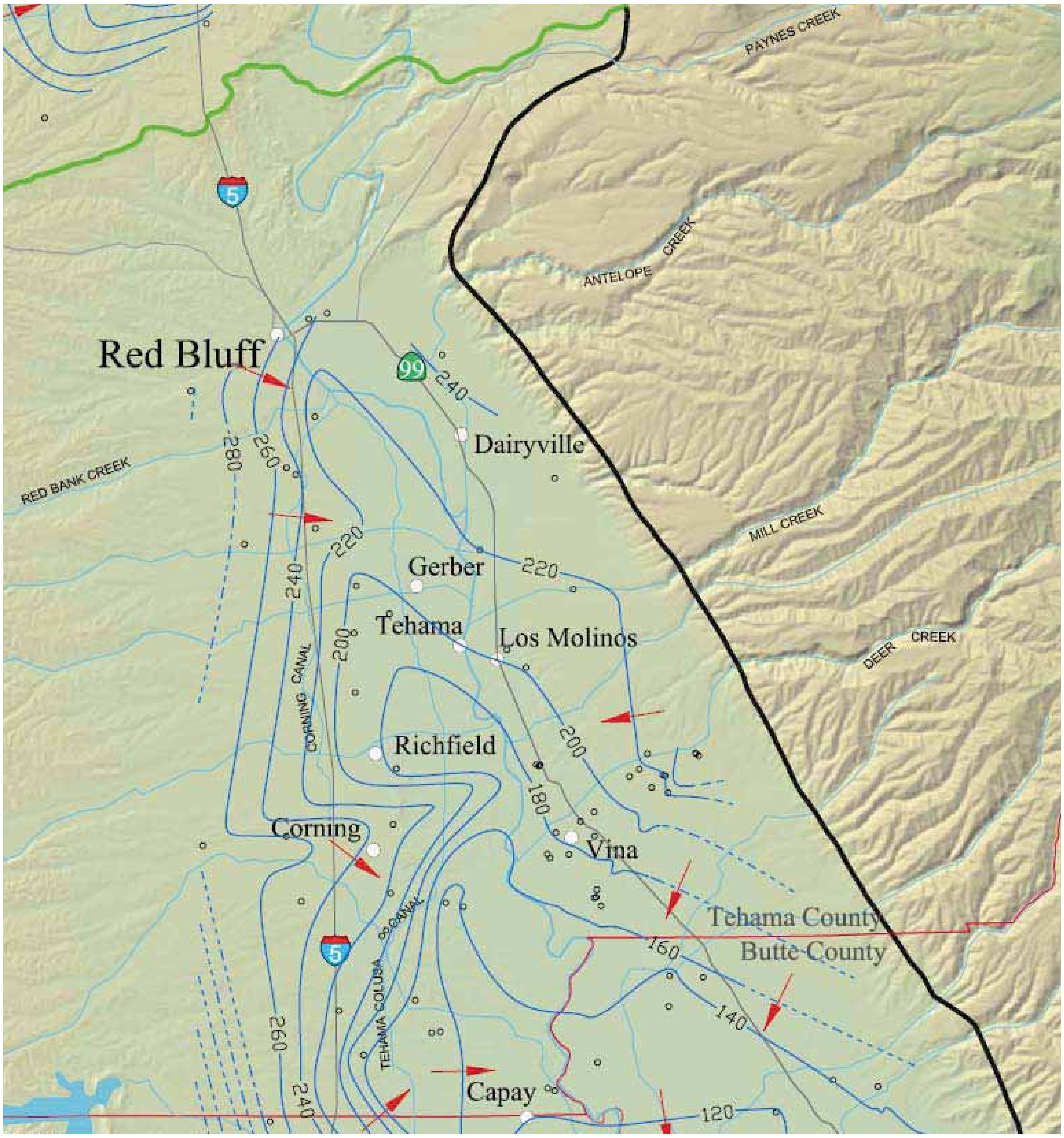


Figure 5-7. Lines of equipotential groundwater contours

Groundwater Use

Since the 1970's there has been a greater reliance on groundwater to support growing water demand throughout the state, especially in the Northern Sacramento Valley where the number of domestic wells increased from 6,519 wells before 1970 to 31,006 wells in 2002. Irrigation wells increased from 2,590 wells prior to 1970 to 6,040 wells in 2002 (Incentives for Groundwater management in northern California, Alan Fulton, UC Extension). The increases of individual domestic wells as a primary source for water supply in the north state points to a shortage in the availability and affordability of surface waters.

Estimates of groundwater use were taken from the "Water Inventory Analysis" done by CDM and the Department of Water Resources in 2003. Estimates of total groundwater use in Tehama east watersheds was approximately 23,500 acre-feet during 2000, of which 14,300 acre-feet were pumped from the Antelope subbasin. The results of the analysis show a five year decreasing trend in Tehama County groundwater in storage by 95,000 acre-feet. The decrease in groundwater is not associated with drought or agricultural land use increase.

Geomorphology

Geomorphology is a study of the forces that shape the surface of the earth. For Tehama east, both fluvial geomorphology—or the study of channel forming processes—and soil/geomorphic analysis—or the study of how older surfaces affect hydrology and soil properties—are important.

Channel forming processes include erosion and deposition. Fluvial erosion entails the movement of sediment by water. Streams have the ability to displace sediments from the bank and bed of a channel. The erosion potential of a stream depends on the discharge of water through the stream. Greater discharge accompanies relatively larger suspended sediment potential.

Deposition occurs when the velocity of the stream is slowed enough that sediments which were once held in suspension by the flow of water can no longer be suspended. Deposition of sediments can occur in the channel and typically occurs when a watercourse changes direction. The water moves slowest on the inside bank of a stream turn, and so material is deposited there. Oppositely, the water moves fastest on the outside bank, and material is eroded there.

Channel development is greatly dependent on the slope of the channel. Greater slope produces more downward force, increasing downward erosion of the creek bed. The headwaters of the watersheds are typically found confined in canyons where the slope is high. Areas with gentle slopes have a tendency to meander, allowing the channel to widen and erode at the edges. As the streams meet the valley floor, the gradient of relief decreases and the stream is allowed to meander. Lower Antelope Creek is bifurcated due to the low gradient slope of the valley floor. The bifurcated channel splits into Millrace Creek, New Creek, and Craig Creek.

Channel Characteristics of Antelope and Paynes Creeks

Antelope Creek originates at an elevation of 6800 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 it's flow through the summer months. Antelope Creek flows roughly 30 miles east to east 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 6200 ft at the headwaters, to 220ft where it meets the Sacramento River.

Antelope basin is longer than it is wide, 9 miles at its widest and 5 miles at its narrowest. Antelope Creek grows in stages, with three separate channels combining as the south, north, and middle forks of Antelope Creek converge. The North and Middle Forks have their headwaters at the highest elevations and converge first, roughly ten miles from the headwaters of the North Fork. Four miles later they are met by Antelope Creek's South Fork. These main channels are bounded by canyon walls, and the stream is actively eroding downward into the underlying geology. Visits to the upper watershed revealed meadows and a health riparian zone. The North and middle forks of the creek have an average gradient of .06 from their headwaters to the confluence with south fork. South fork has a slightly lower gradient of .05 from its headwaters to the confluence with the north fork. From the major confluence to the valley floor, the gradient changes to .02. Once the creek reaches the Valley floor, the stream splits and becomes braided. The bifurcation of the stream is a result of two forces: low gradient channel slopes (approximately .006) and the end of the canyon's confinement, providing the stream an opportunity to meander. Craig, New, and Millrace Creeks all stem from the main channel of Antelope Creek and flow east while Antelope Creek flows south. The Antelope Creek channel stretches roughly 38 miles and enters the Sacramento River at River Mile 235, nine miles south of Red Bluff.

Paynes Creek originates at an elevation of 5400 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.

Paynes Creek Basin ranges from 5.5 miles to .5 miles in width. Paynes Creek flows roughly 28 miles from east to west toward its confluence with the Sacramento River. From Paynes Creek headwaters to the confluence with Plum Creek is a distance of approximately 15 miles. The Town of Paynes Creek is located roughly four miles upstream of this confluence. The longitudinal profile in this segment is concave, and the average slope of the creek bed is .04. Upstream approximately 1.5 mi from the confluence with Plum Creek, the slope of Paynes Creek increases to .07. This signals an active channel which is cutting away at the material in the channel. This slope continues to the Mount Lassen Trout Farm and the confluence with Plum Creek. Here the waters take a break from their rapid descent down the foothills and meander along the Paynes Creek Canyon floor. The slope of the creek along this segment is .01. The complete journey of Paynes Creek flows east to west roughly 31 miles and meets with the Sacramento River at River Mile 253, roughly five miles north of the town of Red Bluff.

Conclusions and Recommendations

--Background investigation into the watershed characteristics which influence the fish passage; i.e., flow timing, quantification, and duration, and water quality.

-Follow AB 3030 Groundwater management warning levels to monitor the progression of groundwater consumption.

-Research into groundwater limitations and understanding of groundwater conjunctive management.

-Implications of climate change and the effect on the summer water supply.

References

Charles S. McCandles and Company, Consulting Engineers, 1963. Preliminary Reconnaissance Watershed Survey Antelope Creek, Salt Creek, and Tributaries Prepared for the Lassen View Soil Conservation District.

CDM and Department of Water Resources, Northern District, 2003. Water Inventory and Analysis. Prepared for Tehama County Flood Control and Water Conservation District.

Vestra, 2006. Tehama West Watershed Assessment. Prepared for Tehama County Resource Conservation District.

Wood, Rogers, 2006. Tehama County Flood Mitigation Plan. Prepared for Tehama County Flood Control and Water Conservation District.

Davis, 2005. U.S. Department of Agriculture, NRCS, Antelope Creek Project Area – Flood Plain Planning Maps, Hydrology Model, and Hydraulic Model.

Carle, David, 2004. Introduction to Water in California.

Department of the Army, Sacramento District Corps of Engineers, 1978. Flood Hazard Information, Sacramento River and

Cottonwood and Battle Creeks Cottonwood Bend Area California.

DWR, 2003. California's Groundwater: California Department of Water Resources Bulletin 118-03

Snow, 1998. Tehama County Vernal Pool Inventory, Project Map. Available at: http://www.gic.csuchico.edu/projects/veg_mapping/vernal/index.html. Accessed Sept 25, 2008.

Section 6

Section 6

Water Quality

Introduction

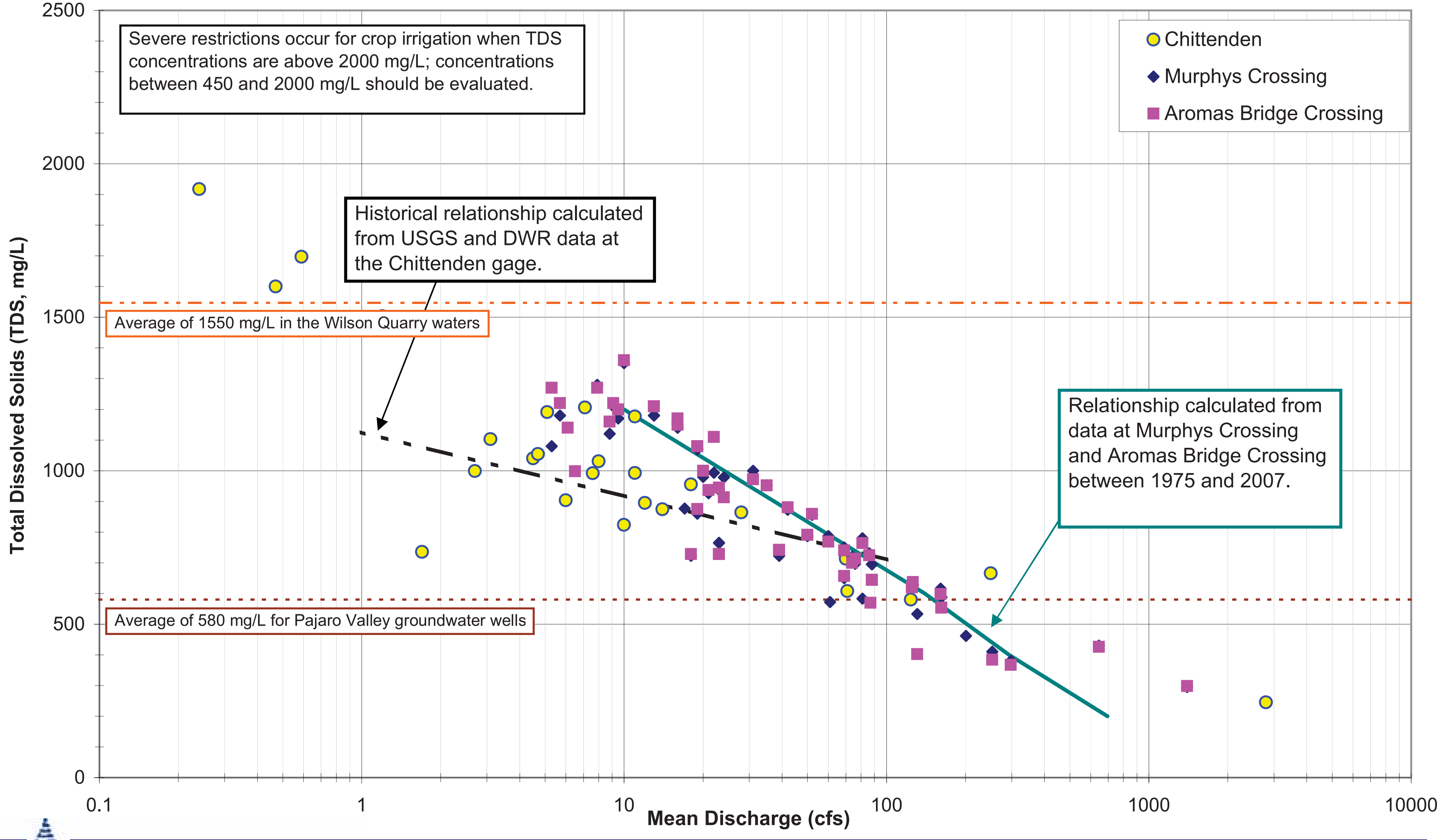
The following data was provided by Balance Hydrologics, Inc.

A recommendation by Balance for the TCRCD can be found in Appendix A.

Table 1. Long-term water-quality and flow data available in Tehama East Watersheds.

	Watershed	Station ID	Period of record	Source
Water Quality				
	Paynes Creek	A0462000	1955 - 2008	DWR data, as analyzed by Blankinship & Associates (2008)
	Antelope Creek	A0452050	1955 - 2008	DWR data, as analyzed by Blankinship & Associates (2008)
Flow				
	Paynes Creek	11377500 PAYNES C NR RED BLUFF CA	Oct. 1, 1949 - Oct. 31, 1966	USGS
	Antelope Creek	11379000 ANTELOPE C NR RED BLUFF CA	Oct. 1, 1940 - Sept. 30, 1982	USGS
	Mill Creek	11383500 DEER C NR VINA CA	Oct. 1, 1911 - Present	USGS
	Deer Creek	11381500 MILL C NR LOS MOLINOS CA	Oct. 1, 1928 - Present	USGS

207123 Tables.xlsTable 1



Balance Hydrologics, Inc.®

Figure 1. **Example of graphing changes over time: Concentrations of total dissolved solids (TDS) at varying discharge of the Pajaro River.** The shift in the constituent-rating curve indicates the concentration of TDS at a given flow has been increasing in the last three decades. At typical mid-range flows, TDS concentrations are now 10-40 percent higher, though the causes are not clear (Munster and Hecht, 2009).

207123 Figures.xls;Figure 1

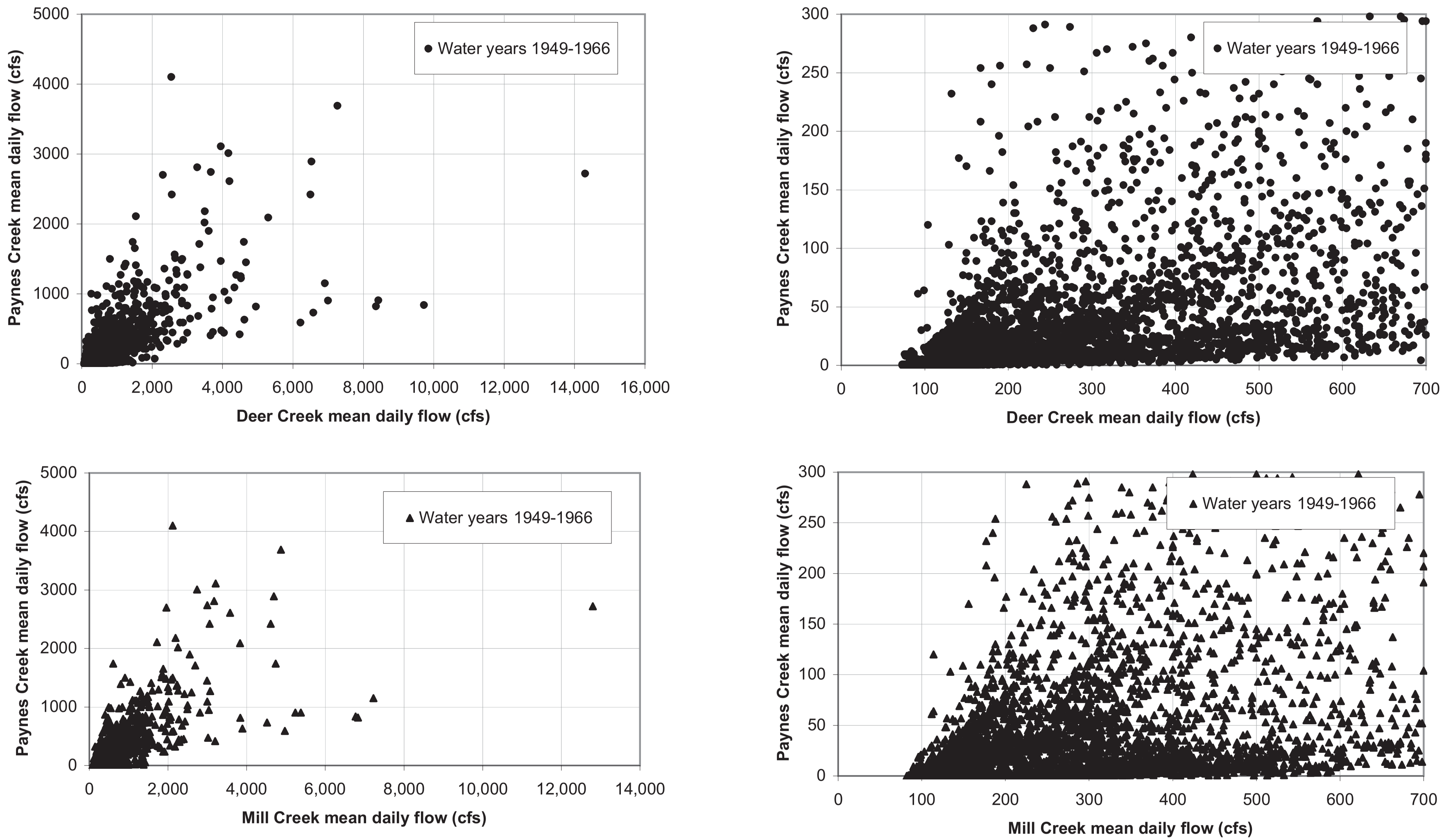
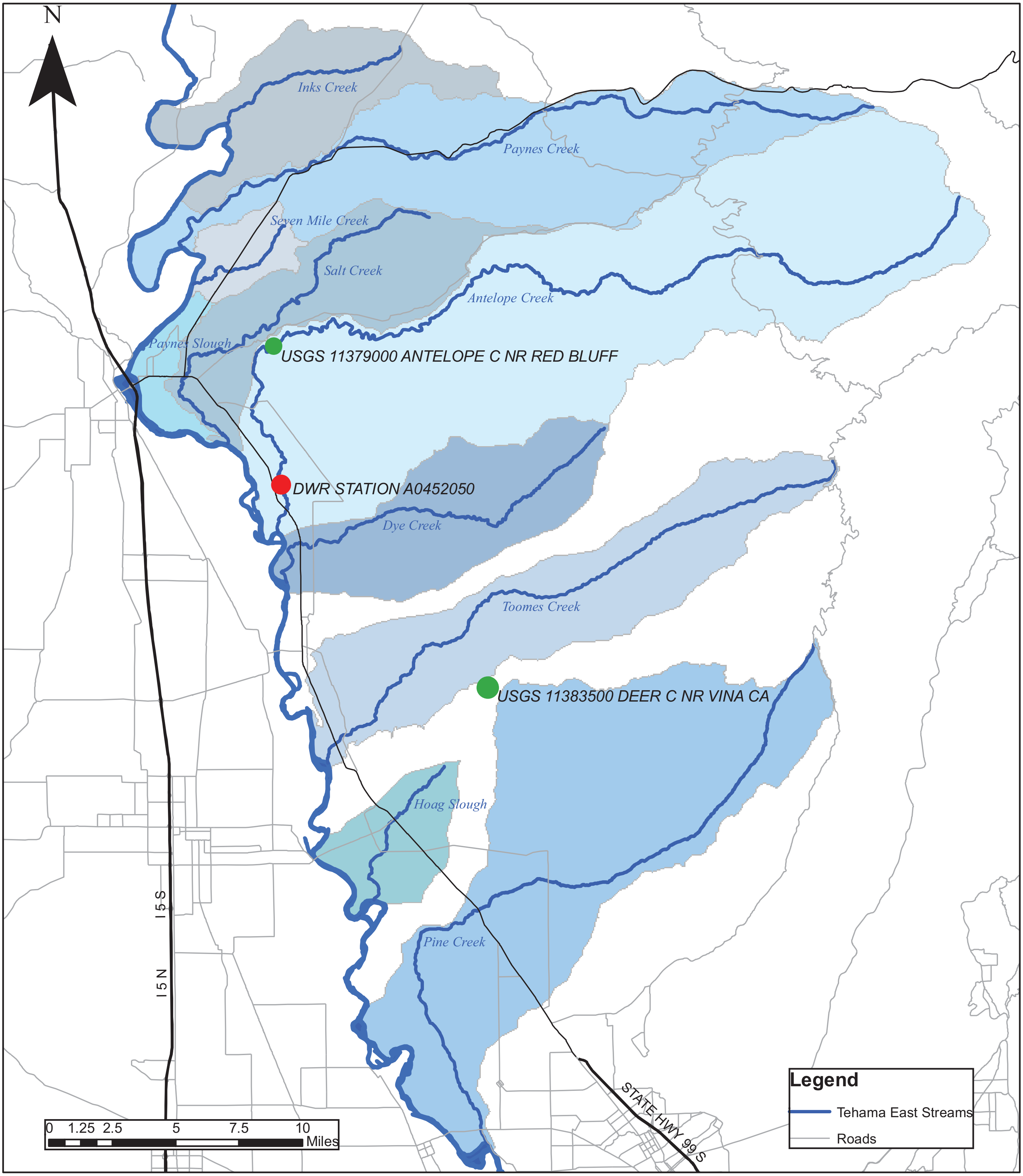


Figure 2. Regression analysis of Paynes Creek with Deer and Mill Creeks. The plots to the right are zoomed in versions of the plots to the left, showing the intense scatter of Paynes Creek flow versus that of nearby streams.

Balance Hydrologics, Inc.®

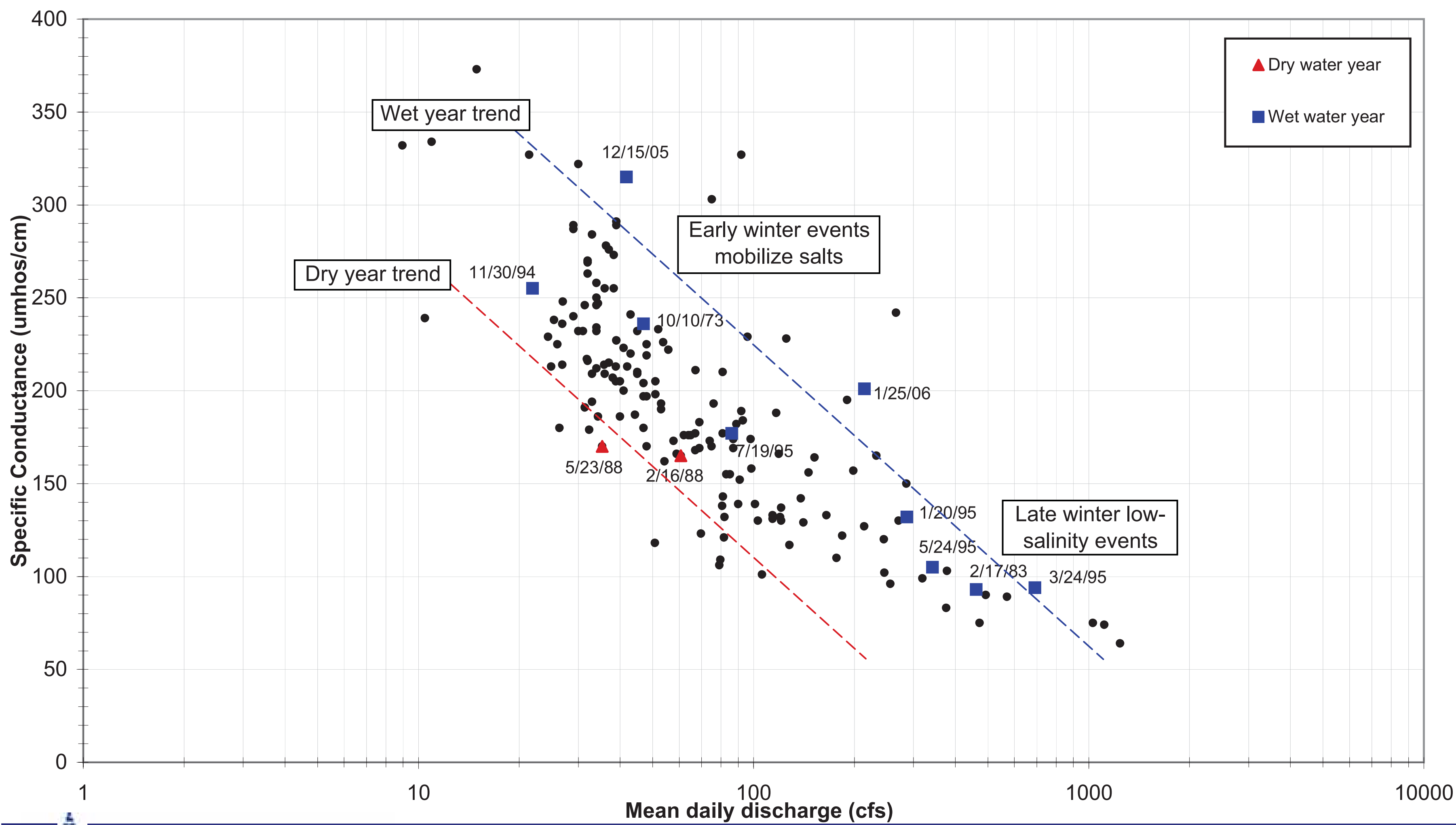
207123 Antelope Paynes Correlations 1949-1966.xlsFigure 2



Balance Hydrologics, Inc.®

Figure 3. Antelope Creek water quality and flow stations, Tehama East Watersheds, California.

207123 Tehama location map.mxd



Balance Hydrologics, Inc.®

Figure 4. Specific conductance at varying flow of Antelope Creek. Specific conductance has an inverse semi-log relationship with flow, where wet years tend to plot on the upper side of the curve and dry years tend to plot on the lower side of the curve. The dates correspond to wet water year points and highlight seasonal differences in specific conductance that also occur in dry and normal years.

207123 Antelope data 3-3.xlsFigure 4

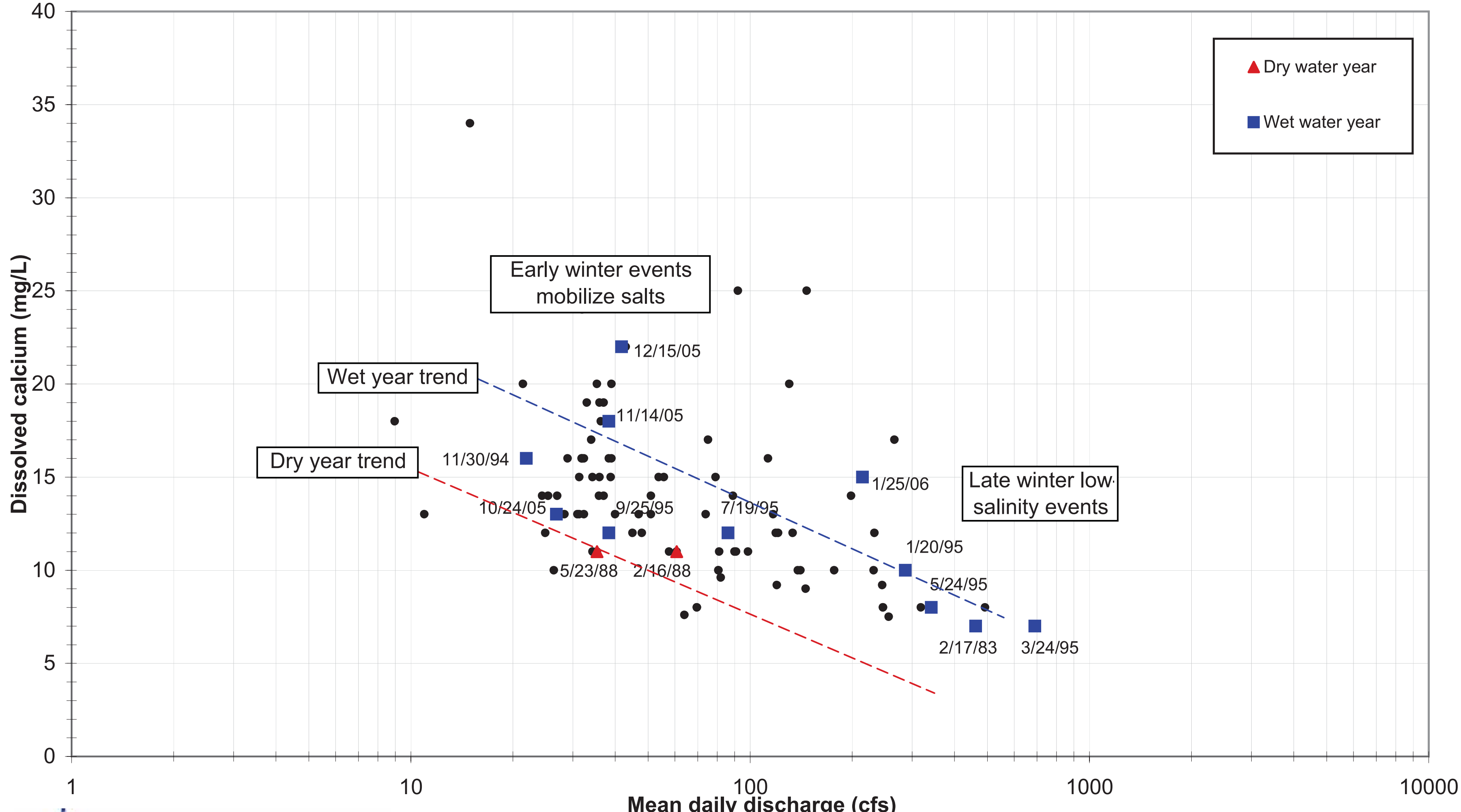


Figure 5. Concentrations of dissolved calcium at varying flow of Antelope Creek. Dissolved calcium has an inverse semi-log relationship with flow, where wet years tend to plot on the upper side of the curve and dry years tend to plot on the lower side of the curve. The dates correspond to wet water year points and highlight seasonal differences in dissolved calcium that also occur in dry and normal years.

207123 Antelope data 3-3.xlsFigure 5

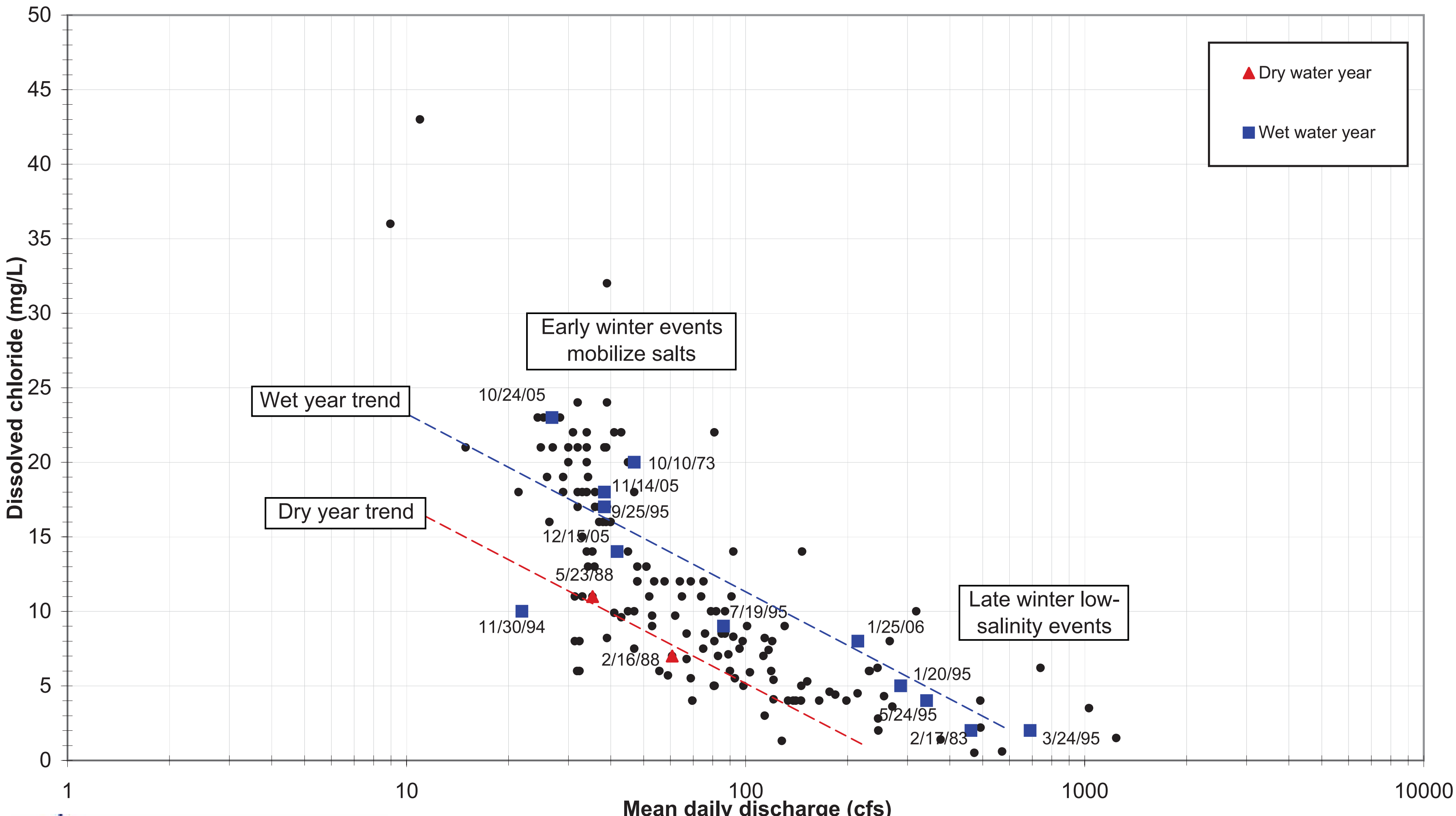


Figure 6. Concentrations of dissolved chloride at varying flow of Antelope Creek. Dissolved chloride has an inverse semi-log relationship with flow, where wet years tend to plot on the upper side of the curve and dry years tend to plot on the lower side of the curve. The dates correspond to wet water year points and highlight seasonal differences in dissolved chloride that also occur in dry and normal years.

207123 Antelope data 3-3.xlsFigure 6

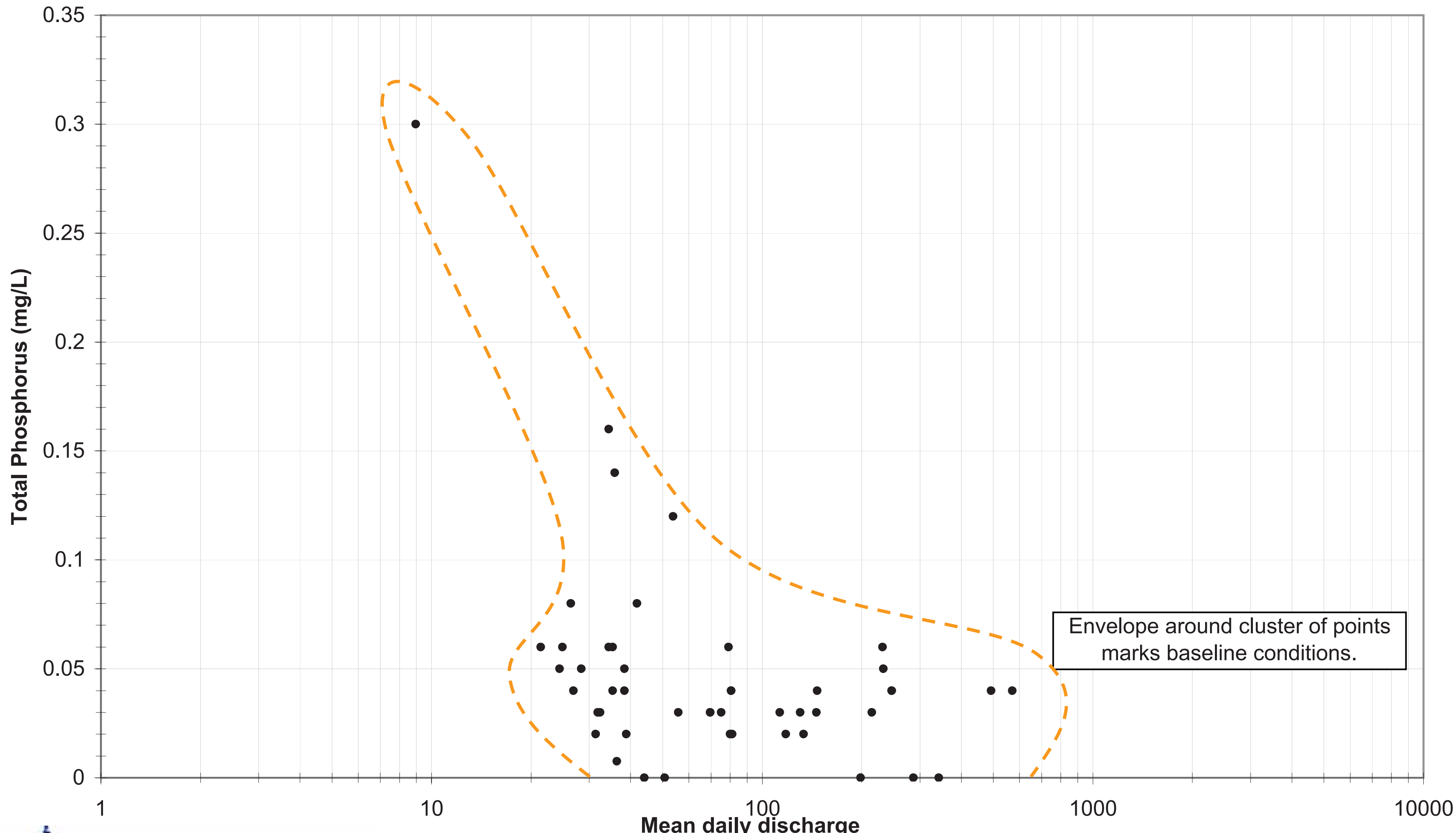


Figure 7. Envelope around total phosphorus-rating curve marks baseline conditions on Antelope Creek. Future points outside this envelope may indicate a change over time or a watershed disturbance.

207123 Antelope data 3-3.xlsFigure 7

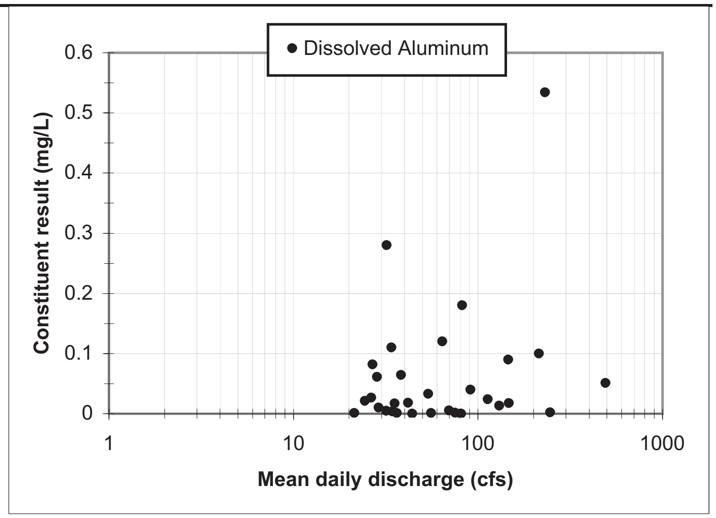
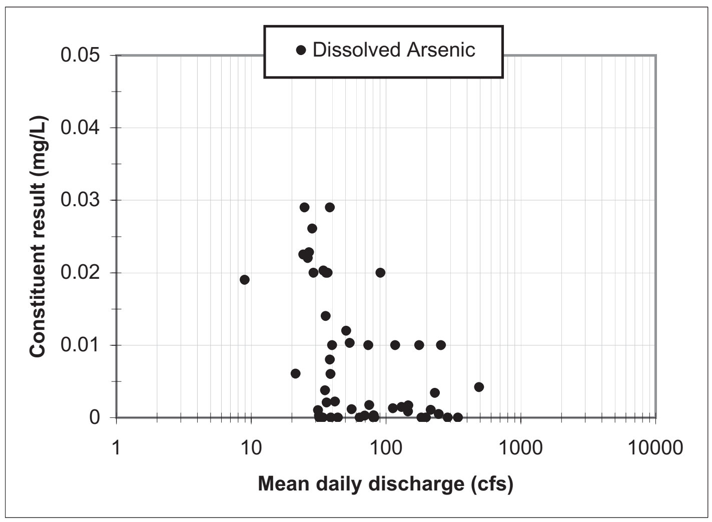
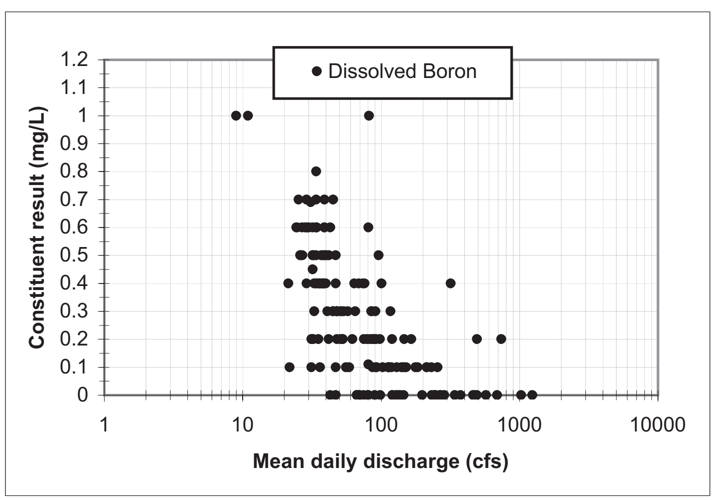
Appendix A. Excerpts describing constituent-rating curves from Section 5.1, Hecht and White (2009)

The existing data for the West Tehama streams have an unusual advantage which may allow the RCD to detect long-term changes in these watersheds – use of constituent rating curves. One of the most effective ways of making comparisons over time is to measure the concentration (or total load) of at a given flow (see Jones and others, 1963, p. J14). For one hypothetical example, if the concentration of suspended sediment when Elder Creek was flowing at 200 cubic feet per second (cfs) was generally about 250 mg/L in 1983 and now may be about 150 mg/L, watershed conditions – and bed habitat conditions for fish or other aquatic biota – would have likely improved. Conversely (and still hypothetically), if current concentrations are generally about 400 mg/L at 200 cfs, watershed conditions likely reflect additional erosion or other deterioration. If differences can be detected over a broad range of flows, overall watershed improvement or deterioration may be inferred. Statistical tests may be used to estimate the significance of the difference over time, either at one measurement location or at multiple measurement locations, and can enable comparisons between streams or at upstream and downstream gages on the same stream (such as Elder Creek near Paskenta and at Gerber).

One form of a constituent-rating curve is a suspended-sediment rating curve (see Jones and others, 1963, p. J14). If, over time, concentrations at a given flow decrease, improved watershed conditions probably are responsible. If concentrations increase at a given flow, conditions may be disturbed (such as after a large wildfire, or following a cycle of timber harvests) or have deteriorated more broadly. Similar curves can be created for other constituents of concern, such as for phosphorus, or nitrate. Such curves may have somewhat different shapes, but the principal remains the same. To use such curves, however, available data must include both the concentration and the measured flow at the time of sampling.

The historical data for the Western Tehama streams include an unusually high number of locations at, and periods during, which both (a) constituent concentrations and (b) the flow at the time of sampling are known. It is therefore possible to evaluate long-term changes in watershed conditions by collecting samples at locations where the streamflow is gaged, or where a spot measurement of streamflow can be made at the time of sampling. We therefore suggest that the RCD encourage that information on streamflow be collected at the same time that future samples are collected. Streamflow data can be established concurrent with sample collection if (1) the samples are collected at a working stream gage, or (2) streamflow is concurrently measured. The RCD may wish, when grant funding may be available, to install stream gages or to purchase current meters allowing qualified staff to measure streamflow.

Appendix B. Antelope Creek constituent-rating curve relationships based on data compiled by Blankinship & Associates (2008).

Constituent	Relationship	Plot
Dissolved Aluminum	None	
Dissolved Arsenic	None	
Dissolved Boron	Inverse	

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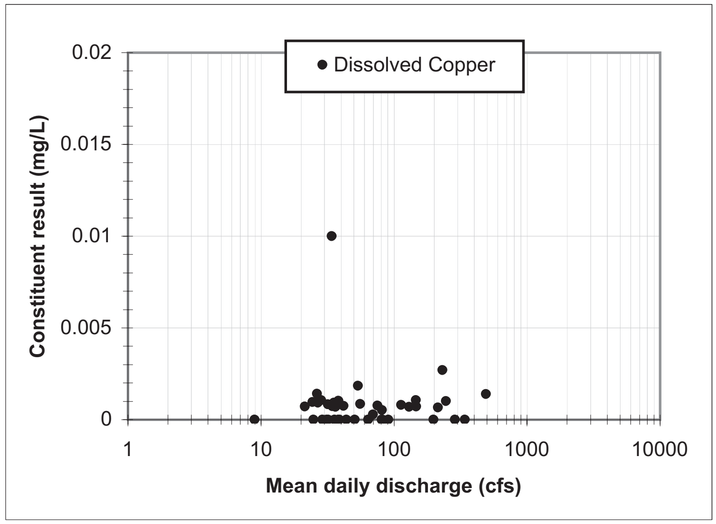
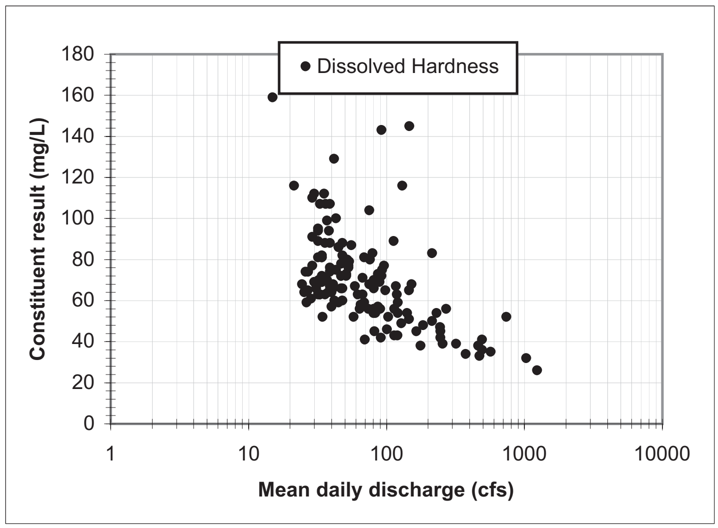
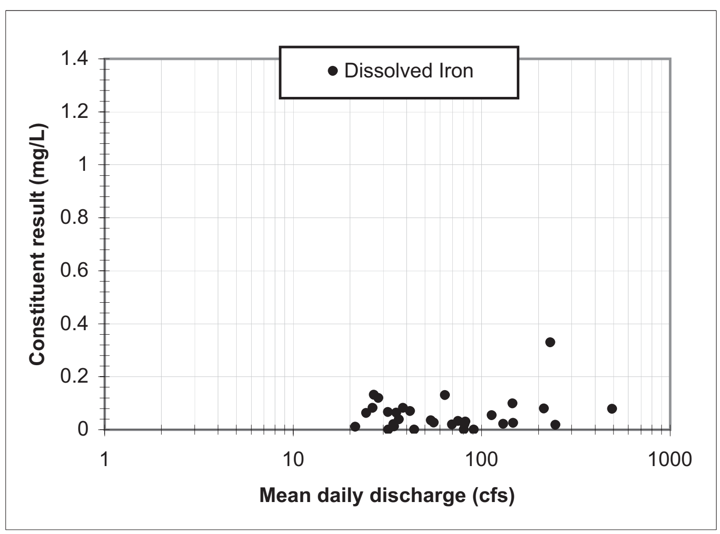
Dissolved Copper None



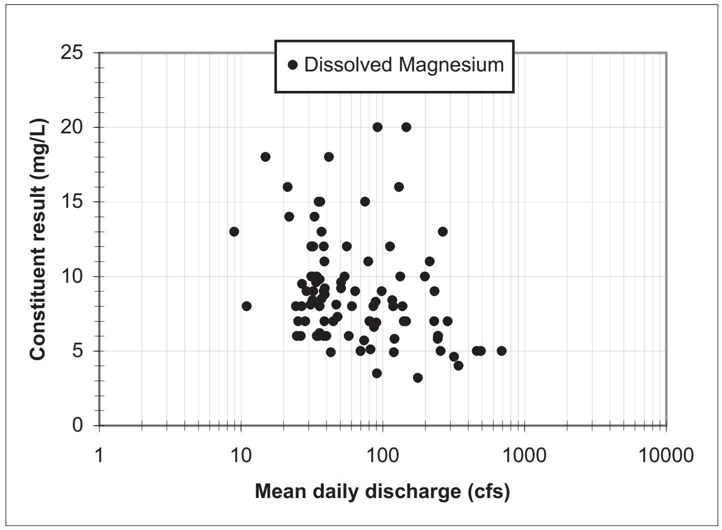
Dissolved Hardness Inverse



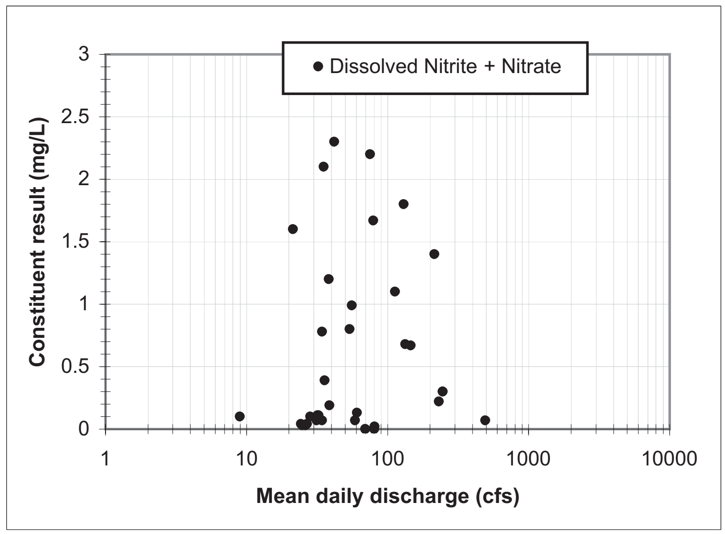
Dissolved Iron None



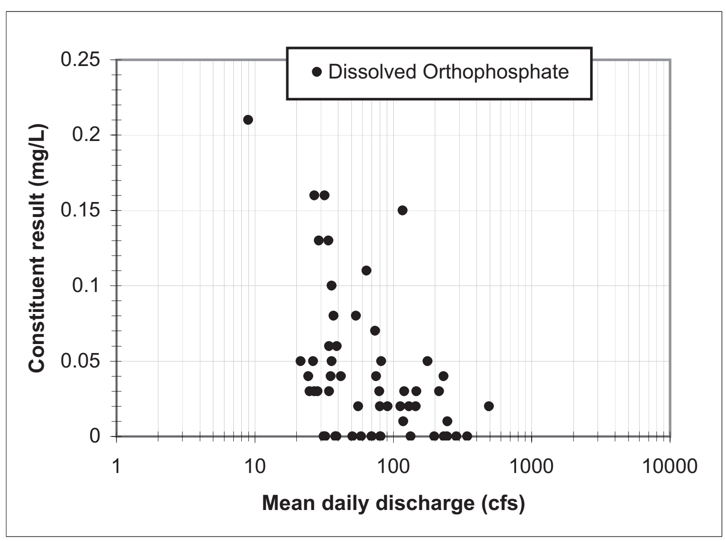
Dissolved Magnesium Inverse



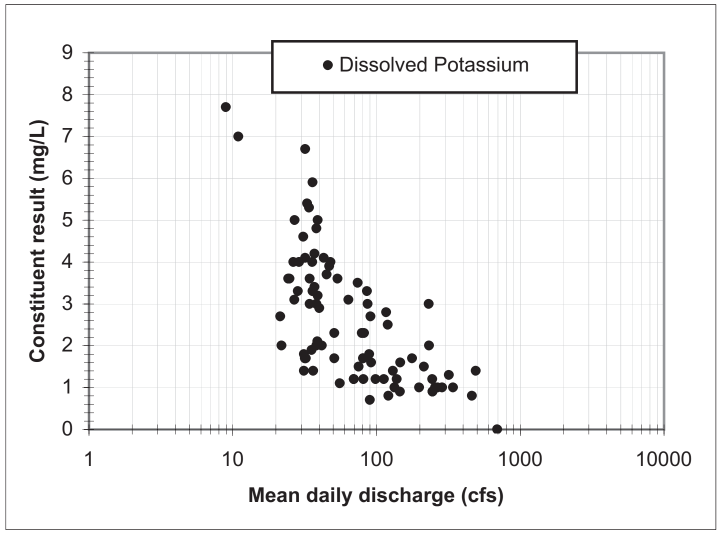
Dissolved Nitrite + Nitrate None



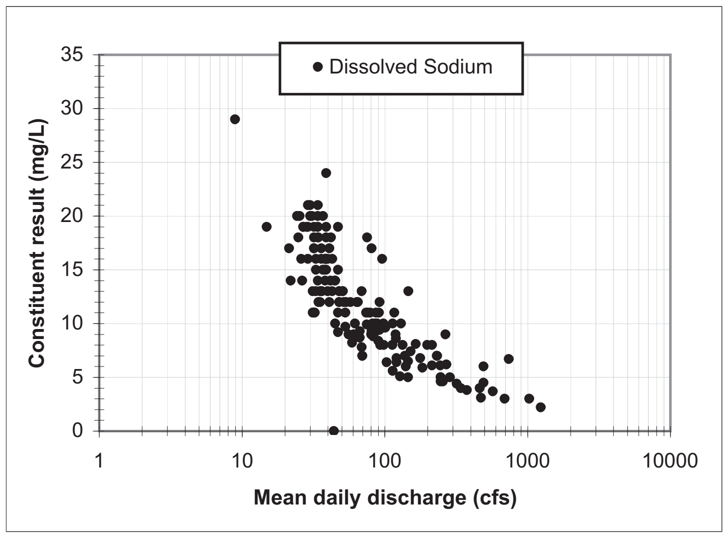
Dissolved Orthophosphate Inverse



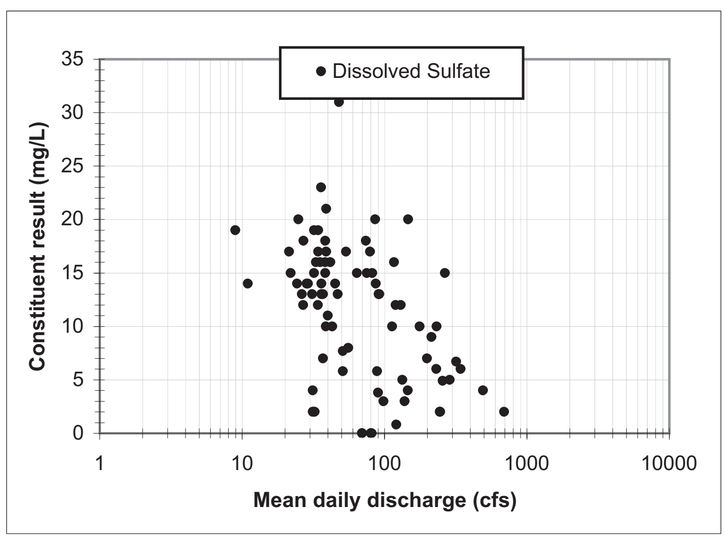
Dissolved Potassium Inverse



Dissolved Sodium Inverse



Dissolved Sulfate Inverse



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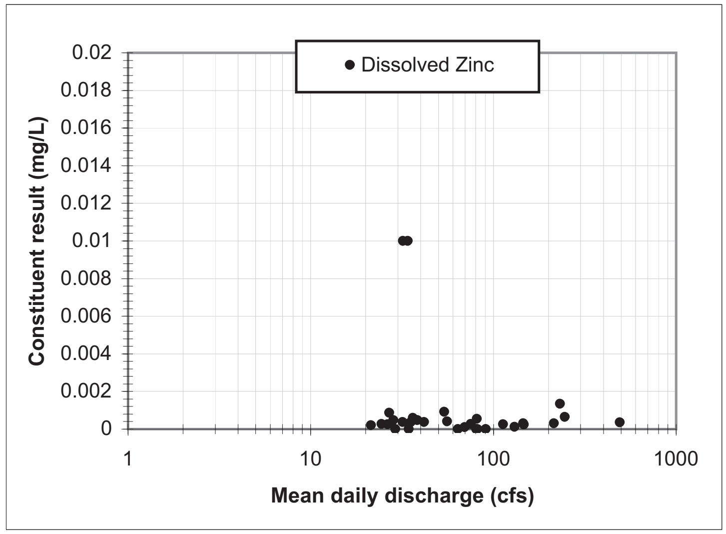
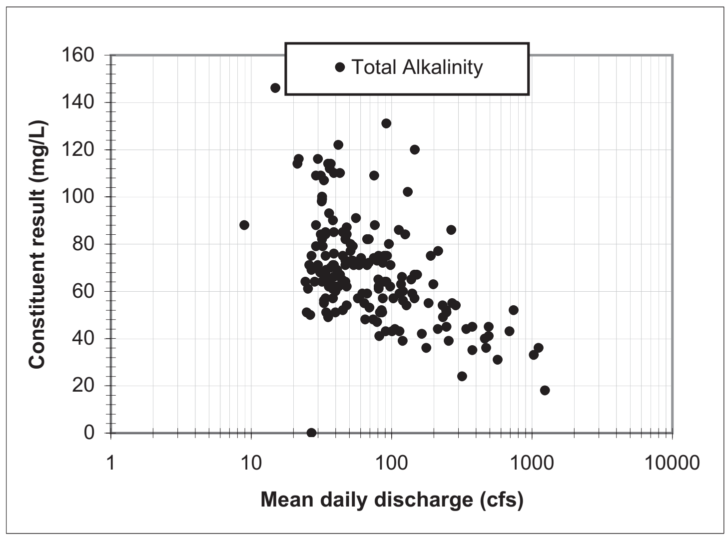
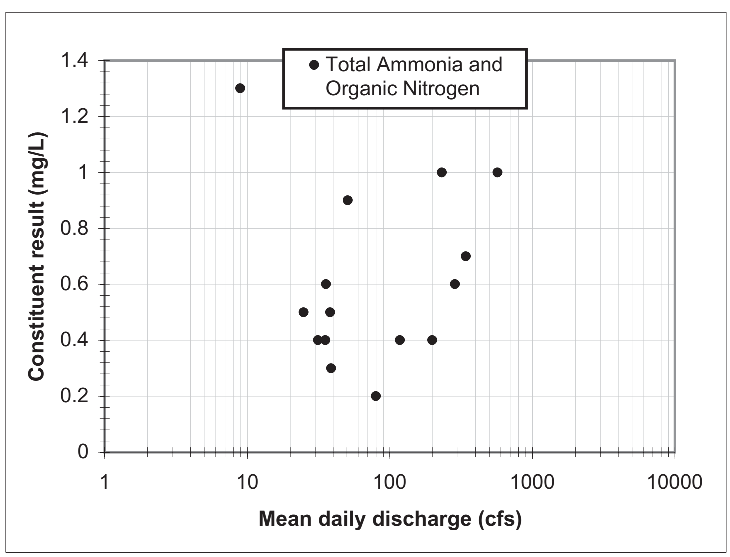
Dissolved Zinc	None	
Total Alkalinity	Inverse	
Total Ammonia and Organic Nitrogen	None	

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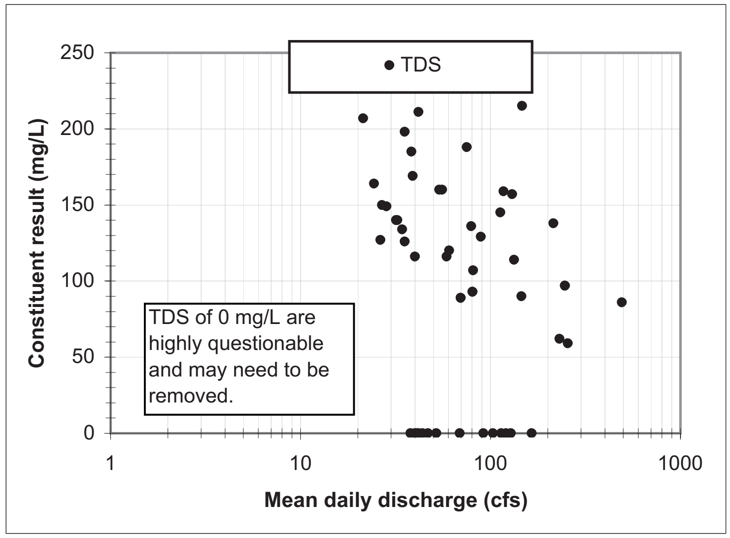
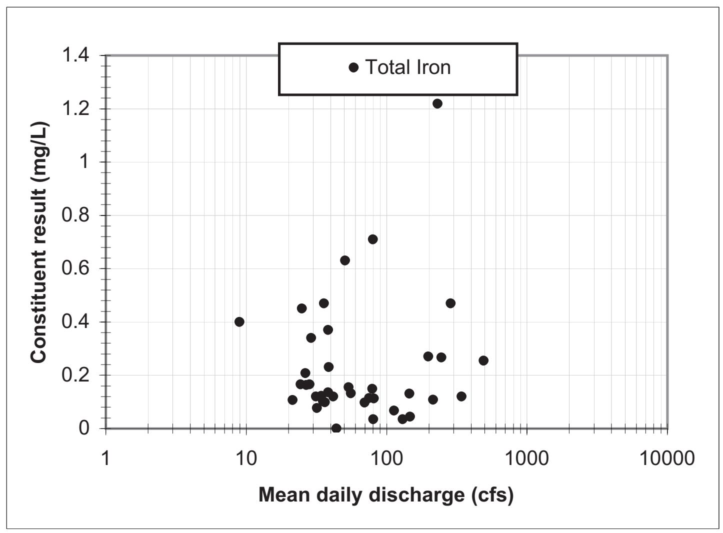
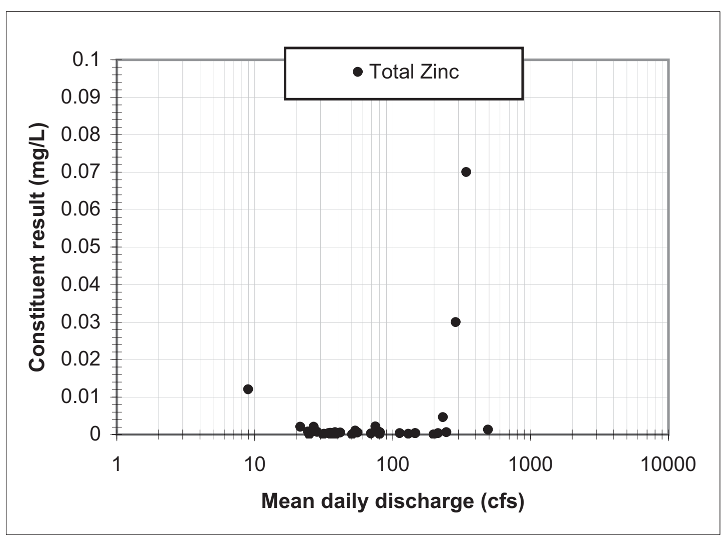
Total Dissolved Solids | Inverse



Total Iron | None



Total Zinc | None



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Section 7

Section 7

Fisheries

LIST OF FIGURES

LIST OF TABLES

SOURCES OF DATA

This assessment chapter is based upon the review of existing fisheries and fish habitat management plans, assessments, existing field surveys and monitoring programs, published literature and interviews with area experts. No new field work and data collection was performed. Sources used are cited directly and full citations for all literature are provided in the references section at the end of the chapter.

HISTORICAL CONTEXT

The rivers and streams of California's Central Valley provide a wide variety of aquatic habitats that support a diversity of fisheries and aquatic resources. Central Valley aquatic habitats support 17 fish species that are endemic and not found anywhere else, with this number increasing to 40 to 50 endemic species if subspecies and distinct salmon runs are included (Moyle 2002). Historically, Chinook salmon and steelhead were highly abundant and widely distributed throughout the Central Valley (Yoshiyama et al. 2001; McEwan 2001). Presently, the amount of Chinook salmon spawning and rearing habitat available is likely less than 28% of that available historically, due primarily to the presence of impassable dams (Yoshiyama et al. 2001). Steelhead trout spawning and rearing habitat losses are anticipated to be greater than those of Chinook salmon as steelhead are capable of using habitats that extend farther upstream within watersheds (McEwan 2001).

Salmon and steelhead habitats that occur in Tehama County are very significant to Central Valley salmonids as these streams are not impaired by large impassable dams. For example, Deer, Mill, Antelope, and Battle Creeks provide spring-run Chinook habitats which are currently rare in the Central Valley and are critical to the recovery of this stock. Both the larger and smaller streams within Tehama County contribute to the greater Central Valley salmonid habitat complex. The larger streams (e.g. Deer and Mill Creeks) support self sustaining populations of salmon and steelhead while the smaller and often intermittent streams provide high quality rearing habitats for juvenile salmon that were spawned elsewhere.

This watershed assessment focuses on the smaller streams in Tehama County that flow into the Sacramento River from the east. From north to south, these streams include; Inks, Paynes, Seven Mile, Salt, Antelope, Dye, and Toomes Creeks, Hoag Slough, and Pine Creek. While none of these streams support large populations of salmon and steelhead, the spawning and rearing habitats they do offer are significant and warrant restoration attention where their ecological functions may be impaired. These smaller streams can be subject to a wide variety of impairments and have generally received less focused attention to assess their condition and prescribe restoration treatments than the larger streams in the same region.

This chapter characterizes the fisheries and aquatic resources present in these smaller east side Tehama County streams, identifies adverse conditions and data gaps, and concludes with a set of recommendations. The chapter is organized first by a more general treatment of aquatic resources and potential adverse conditions within the study area, and then provides a more focused summary of these topics by watershed or groups of watersheds that share similar characteristics.

FISH ASSEMBLAGES

Relative to zoogeographic classification, the streams within Tehama County fall within the Central Valley Subprovince of the greater Sacramento-San Joaquin Aquatic Zoogeographic Region (Moyle 2002). Within Tehama County, at least four distinct fish assemblages can be identified within Sacramento River tributary streams. These assemblages, from higher to lower elevations, include: rainbow trout assemblage; California roach assemblage; pikeminnow-hardhead assemblage; and deep-bodied fishes assemblage. These fish assemblage categorizations are generalizations as species compositions within assemblages are dynamic in response to changing environmental conditions. In Sacramento River tributaries these assemblages can also overlap a great deal.

The rainbow trout assemblage occurs at higher elevations where permanent stream flows are present and seldom exceed 70° F. Native fish that are commonly present in this assemblage are rainbow trout, riffle sculpin, Sacramento sucker, speckled dace and at times California roach (Moyle 2002). Rainbow trout are typically not found in stream habitats below 1,200 to 1,400' in elevation due to high water temperatures, though this can be mediated by cold spring sources as is the case in Battle Creek. The rainbow trout assemblage occurs in the uppermost reaches of the larger watersheds within this assessment, including Paynes, Antelope and possibly Dye Creeks.

The California roach assemblage can be found in the small, warm, and intermittent tributaries to larger streams within the foothill region (Moyle 2002). California roach can persist through the summer in these warm isolated pool habitats where other fish cannot. These stream habitats may also be used for spawning in the winter and spring by Sacramento suckers, Sacramento pikeminnows and native minnow species (Moyle 2002).

The pikeminnow-hardhead assemblage occurs in the lower elevations of Sacramento Valley Foothill streams that typically have deep pools, wide riffles and summer baseflows of at least 10.5 cfs, however this assemblage sometimes occurs in streams that have lower or intermittent summer flows (Moyle 2002). Within Deer Creek, the pikeminnow-hardhead assemblage spans the approximate elevational range of 300’ to 1800’ (Moyle 2002). Sacramento pikeminnow, Sacramento sucker and hardhead are commonly the most abundant fishes within this assemblage though California roach, riffle sculpin, tule perch, speckled dace and rainbow trout may also be present (Moyle 2002).

For Tehama County streams the deep-bodied fish assemblage occurs in the warmer waters of the Central Valley floor in close proximity to the Sacramento River and its historic floodplain. Native fish found within this assemblage may include Sacramento perch, tule perch, hitch, Sacramento blackfish, Sacramento splittail, Sacramento pikeminnow and Sacramento sucker (Moyle 2002). Today, as a consequence of habitat modifications and non-native species colonizations (including fish, plants and invertebrates) the dominant fishes in this assemblage are non-native species with native species found within the less disturbed habitats (Moyle 2002).

DESCRIPTION OF FISH SPECIES

Native Fish Species

Several native fish species can be found within low elevation Tehama County streams east of the Sacramento River for at least a portion of their life cycle (Table 1.) Fish families present include salmon and trout, suckers, sculpin, minnows, surfperches, stickleback and lamprey (Table 1). The fish species present in these watersheds and their general life histories are described below organized by fish family.

Table 1. Native fish species and salmon stocks with documented or likely presence within the Tehama East Watershed Assessment planning area.

Fish Families and Species/Distinct Runs	Scientific Name
Salmon and Trout	Family Salmonidae
Winter-run Chinook Salmon	*Oncorhynchus tshawytscha*
Spring-run Chinook Salmon	*Oncorhynchus tshawytscha*
Fall-run Chinook Salmon	*Oncorhynchus tshawytscha*
Late Fall-run Chinook Salmon	*Oncorhynchus tshawytscha*
Steelhead / Rainbow Trout	*Oncorhynchus mykiss*
Suckers	Family Catostomidae
Sacramento Sucker	*Catostomus occidentalis*
Sculpins	Family Cottidae
Prickly Sculpin	*Cottus asper*
Riffle Sculpin	*Cottus gulosus*
Minnows	Family Cyprinidae
California Roach	*Lavinia symmetricus*
Hardhead	*Mylopharodon conocephalus*
Hitch	*Lavinia exilicauda*
Sacramento Pikeminnow	*Ptychocheilus grandis*
Sacramento Splittail	*Pogonichthys macrolepidotus*
Speckled Dace	*Rhinichthys osculus*
Surfperches	Family Embiotocidae
Tule Perch	*Hysterocarpus traski*
Stickleback	Family Gasterosteidae
Threespine Stickleback	*Gasterosteus aculeatus*
Lampreys	Family Petromyzontidae
Pacific Lamprey	*Lampetra tridentate*

Salmon and Trout

Chinook Salmon

Chinook Salmon are an anadromous species that return to freshwater habitats for spawning as adults and where young salmon rear prior to returning to the ocean environment. After spawning, adults die, a process referred to as senescence. There are four distinct runs of Chinook salmon that use stream habitats within the Tehama East planning area for at least a portion of their life history including: winter-run, spring-run, fall-run and late fall-run Chinook. The names of these stocks refer to the season in which adults migrate back to freshwater habitats in order to spawn. Chinook salmon have specialized over time into these distinct runs to take advantage of the variety of stream habitat opportunities available which is reflected in their differences in migration timing, habitat use, and the duration of freshwater residency. These life history strategies are categorized into two general types: Stream-type Chinook where adults migrate to spawning habitats before fully mature and juveniles rear for an extended time in freshwater prior to emigration, and; Ocean-type Chinook that migrate to spawning grounds when mature, are quick to spawn, and juveniles spend a shorter time rearing in freshwater habitats.

Fall-run Chinook

The fall-run Chinook life history strategy is characterized by the use of lowland stream reaches for spawning, which occurs shortly after adults reach spawning grounds, and a limited duration of juvenile rearing. Chinook salmon life history strategies with limited time spent in freshwater as that of fall-run are referred to as “ocean type” (Moyle 2002). Fall-run Chinook are the most abundant run of Chinook salmon within the Central Valley, largely the consequence of not being reliant on summer stream habitats that are often a limiting factor to other Chinook salmon run types. Therefore, many more stream within the Central Valley provide suitable habitat.

Fall-run Chinook return to freshwater between June and December with the peak migration period occurring in September and October (Moyle 2002). In many Central Valley streams, access to spawning grounds for returning salmon adult can be restricted or delayed due to low stream flows. For streams within the Tehama East planning area low fall stream flows are a common limitation for returning Fall-run Chinook adults. In years of substantial fall rains, higher stream flows result in many more fall run chinook spawners even in small and intermittent streams. The peak of spawning occurs in October and November though spawning occurs from late-September through December (Moyle 2002). Fall-run chinook juveniles emerge from spawning gravels between December and March, begin moving downstream within a few months and have a total stream residency of 1 to 7 months (Moyle 2002).

For the 10 year period from 1998 to 2007 fall-run returns to the mainstem Sacramento River above Princeton Ferry averaged approximately 66,700 fish (CDFG 2009). In 2007, adult spawners in this area of mainstem Sacramento River fell to approximately 17,000 (CDFG 2009). Both of these run-size figures exclude hatchery returns to Battle Creek which is heavily influenced by the Coleman National Fish Hatchery (CNFH). Average annual adult returns to Battle Creek including those to the CNFH averaged approximately 139,000 from 1998 to 2007 (CDFG 2009).

The limited freshwater use of Fall-run Chinook life history strategy has made it highly successful fish for artificial propagation within fish hatchery environments. Fish hatcheries are used extensively throughout the Central Valley to mitigate for salmon losses from water development projects such as impassable dams that limit access to historic upstream salmon spawning and rearing habitats. The extensive hatchery production of this run has resulted in significant unintended negative consequences to the remaining wild fall-run stocks. A recent genetic analysis of the Central Valley fall-run Chinook ESU has documented the loss of genetic diversity or the homogenization of the entire Central Valley ESU (Williamson and May 2005). Homogenization of genetic diversity is thought to reduce the long-term viability of ESU's (McElhany et al. 2000). This genetic homogenization is hypothesized to be the consequence of the historic interbasin transfers of hatchery stocks and high stray rates resulting from the off-site releases of hatchery raised juveniles (Williamson and May 2005).

Late fall-run Chinook

The late fall-run Chinook life history strategy is characterized by the use of cold and deep mainstem rivers for spawning and rearing which provide over-summer habitats for rearing juveniles. Late fall-run Chinook are currently found mainly in the Sacramento River and exhibit a "stream type" life history with juveniles having an extended stream residency (Moyle 2002).

Late fall-run Chinook migrate upstream as adults in October through April with peak migration occurring in December (Moyle 2002). The peak of spawning occurs in February and March though spawning can occur from early January though April (Moyle 2002). Late fall-run chinook juveniles emerge from spawning gravels from April through June, and spend between 7 to 13 months rearing in stream habitats (Moyle 2002).

Late fall-run Chinook returns within the Sacramento River mainstem over the last 10 years (1998-2007) averaged 17,300 fish and ranged from 5,500 in 2003 to over 39,000 in 1998 (CDFG 2009). These figures exclude late fall-run returns to the Coleman National Fish Hatchery which propagates this stock.

Winter-run Chinook

Winter-run Chinook are a unique life history form of Chinook salmon found only in California's Central Valley. Historically winter-run Chinook almost exclusively used the spring-fed rivers of the upper Sacramento River such as the McCloud, Little Sacramento and Pit Rivers for spawning and rearing. Winter-run Chinook were extirpated from these rivers as a consequence of the construction of Shasta Dam which was completed in 1944. Battle Creek (Shasta and Tehama Counties) is the only stream habitat below Shasta Dam that may also have supported winter-run Chinook though to a much lesser extent as habitat is limited.

Winter-run Chinook return to freshwater primarily as three year old adults between December and July with peak migration in March (Moyle 2002). The peak spawning period is in May and June but can extend from late April into early August (Moyle 2002). The majority of winter-run Chinook spawning in the mainstem Sacramento River occurs in the first 18 miles of habitat below Keswick Dam. This reach supported 98% and 99% of redds in 2002 and 2003 respectively (CDFG 2004b). Winter-run compatible coldwater spawning habitat can extend downstream as far as Red Bluff, approximately 59 river miles. After emerging from spawning gravels Winter-run Chinook juveniles rear in mainstem and non-natal stream habitats from 5 to 10 months. Winter-run Chinook make seasonal use of non-natal rearing habitats in the many streams within the Tehama East planning area.

The Central Valley winter-run Chinook Evolutionary Significant Unit (ESU) is comprised of a single naturally spawning population in the mainstem Sacramento River. Winter-run Chinook are also propagated by the Livingston Stone National Fish Hatchery (LSNFH) in Redding and adults are collected at a fish trap near Keswick Dam. Hatchery adults return to spawn with other winter-run adults in the mainstem Sacramento River. A draft recovery plan was developed for this ESU in 1997 (NMFS 1997) and additional recovery planning initiated by NOAA Fisheries in 2003 is in progress (CDFG 2004b).

Mainstem Sacramento River winter-run adult returns averaged 86,000 in 1967-1969, though by the late 1980's had declined to 2,000 fish (NMFS 1997). By the early 1990's run sizes averaged less than 500 for years 1990-1994 (CDFG 2004b). The steady decline in run sizes in the 1980's through 1990's were attributed to poor survival in inland habitat due primarily to high water temperatures in the upper Sacramento River, the operation of Red Bluff Diversion Dam (RBDD) and increases in water exports from the Delta, rather than poor ocean conditions (NMFS 1997). The draft recovery goals established by NMFS in 1997 include an average female spawners per year target of 10,000 for any 13 year period (CDFG 2004b, NMFS 1997). Average adult returns for both sexes combined substantially increased in 2001-2003 to 8,150 fish (CDFG 2004b) and in 2005 and 2006 when returns exceeded 15,000 (CDFG 2009). In 2007 adult returns (both sexes combined) dropped dramatically to approximately 2,500 fish (CDFG 2009).

Winter-run Chinook restoration efforts included the installation of a temperature control device at Shasta Dam in 1997 to provide for colder downstream releases into the Sacramento River. Low runoff or storage conditions in Shasta Reservoir remain a significant threat to winter-run Chinook recovery goals (10,000 female spawners) in dry and critically dry years (BOR 2004). It is anticipated that winter-run Chinook in the Sacramento River mainstem will experience partial reproductive failure one year out of every 10 and total reproductive failure 2 years out of every 100 (BOR 1991). Restoration opportunities for establishing additional winter-run populations in the Central Valley below Shasta and Keswick Dams are limited to the

Battle Creek watershed. Implementing the planned restoration of Battle Creek would enable the establishment of a second possibly independent population within the winter-run ESU. USFWS (1995) suggests that a restored Battle Creek could support a run size of 2,500 winter-run Chinook salmon.

Spring-run Chinook

The spring-run Chinook life history strategy uses high elevation habitats for spawning and rearing by migrating to habitats in the spring when flows are high and stream temperatures are low. This spatially isolates spring-run from other Chinook stocks such as fall-run that cannot access high elevation habitats in the fall due to low stream flow and high water temperatures. Historically, spring-run Chinook were nearly as abundant as fall-run Chinook within the Central Valley (Moyle 2002). Currently, populations of spring-run that are forced to spawn below low elevation dams that lack fish passage facilities (e.g. Shasta/ Keswick Dams) often crossbreed with fall-run Chinook because spawning dates overlap in September and stocks are not spatially isolated. The primary remaining habitats that support wild Central Valley spring-run Chinook populations are Mill, Deer and Butte Creeks (Tehama and Butte Counties) which from a historical perspective were minor spring-run Chinook habitats (Moyle 2002). These three watersheds support the largest naturally spawning spring-run Chinook populations in the ESU and have been identified as retaining genetic differences from other Chinook stocks in the Central Valley (Lindley et al. 2004).

Spring-run Chinook return to freshwater between March and September with peak migration in May through June (Moyle 2002). Spring run enter stream habitats as immature fish and hold over summer in deep, cold pool habitats for several months (Moyle 2002). Mill, Deer and Butte Creeks offer approximately 41, 21 and 10 miles of spring-run Chinook salmon over-summer holding and spawning habitats respectively. The lack of sufficiently cold summer stream temperatures is the primary factor that limits most streams from meeting life history requirements of spring-run Chinook. The peak spawning period is in mid-September but can extend from late August to October (Moyle 2002). After emerging from spawning gravels Spring-run Chinook juveniles rear in mainstem and non-natal stream habitats from 3 to 15 months. Juveniles most commonly express a “stream type” life history with extended rearing in freshwater stream habitats of greater than a year (Moyle 2002).

Sacramento River spring-run adult returns that exceeded 100,000 were common between the late 1800’s and 1940 (Moyle 2002). Over the last decade, run-sizes in Mill and Deer Creeks have ranged from the mid hundreds to low thousands with Deer Creek having larger returns (CDFG 2004a). Run sizes for 2001 through 2003 were comparatively high and three year averages were approximately 1,400 and 2,200 for Mill and Deer Creeks respectively (CDFG 2004a). Averages run sizes for 2004 through 2007 were approximately 1,000 and 1,500 for Mill and Deer Creeks respectively (CDFG 2009). Butte Creek run sizes over the last decade have been substantially higher and have ranged from 635 fish in 1997, to over 20,000 in 1998 (CDFG 2004a). The three year average for 2001 through 2003 was 7,596 based upon dive counts and 12,424 based upon mark-recapture carcass surveys (CDFG 2004a). Butte Creek returns for years 2004 through 2007 were similar and averaged approximately 6,800 fish (CDFG 2009).

The mainstem Sacramento River spring-run Chinook population that is restricted to spawning below Keswick Dam averaged 6,700 returning adults between 1969 and 1997 and 2,500 in the 1990's (Moyle 2002). This stock was thought to have significantly hybridized with fall-run Chinook as the two populations lack spatial isolation of spawning habitat and timing (CDFG 1998). In recent years fish with characteristic spring-run migration timing returning to spawn in the mainstem Sacramento River have nearly disappeared (Lindley et al. 2004) with estimated returns at potentially a few hundred in 2002 and none at all in 2003 (CDFG 2004a).

Numerous other streams contain very small though possibly remnant native runs of spring-run Chinook and include; Cottonwood/ Beegum Creek, Battle Creek, Antelope Creek, Big Chico Creek, and the Yuba River. The average abundance of adults from snorkel surveys within the nine year period of 1995 to 2003 has been less than 150 for each these streams, though the Yuba River is represented by a single year's count of 108 fish in 2001 (CDFG 2004a). Genetic analyses of these small runs have not been performed to determine if they have suffered introgression by hatchery or fall-run stocks with the exception of the Yuba River (Lindley et al. 2004). The lack of cold water habitat within most of these watersheds that support remnant runs remains a limiting factor for their restoration. Historically, the populations in Big Chico, Antelope, Clear, and Cottonwood/ Beegum Creeks did not have enough habitat to support populations large enough to persist in isolation and are classified as dependent populations (Lindley et al. 2004).

Available habitats for Central Valley spring-run Chinook are limited though have been the focus of substantial restoration. Barriers to Spring-run upstream migration were removed in Butte Creek where adult run sizes showed significant increase. Clear Creek has recently been restored with the removal of the McCormick-Saeltzer Dam in 2001 enabling access to 12 miles of habitat below Whiskeytown Dam. The AFRP (USFWS 2001) has established the goal of providing cold water releases from Keswick Dam to meet spring-run Chinook temperature requirements for the first 5 miles below the dam. Restoration actions are also planned for Battle Creek which will restore 41 miles of historic anadromous salmonid habitat (USFWS 1995). It is estimated that a restored Battle Creek will support a population of 2,500 spring-run Chinook (USFWS 1995).

<u>Non-Natal Rearing</u>

Central Valley Chinook salmon juveniles of all life history types make use of streams in which they were not spawned for rearing. This non-natal rearing is common in intermittent tributaries to the Sacramento River. The advantages of intermittent tributary rearing are significant for juvenile salmon. Juvenile in these habitats and reach smolt size earlier, are in better condition, and can achieve greater growth rates than juveniles rearing in mainstem Sacramento habitats (Maslin 1997,1998; Limm and Marchetti 2003). Enhanced growth opportunities have also been demonstrated for juvenile Chinook salmon in Sacramento River floodplain habitats (Sommer et al. 2001). Higher prey densities and warmer water temperatures are thought to be factors for enhanced growth in these habitats which can result in higher juvenile survival (Lemm and Marchetti 2003). Stream turbidity can also be less in intermittent tributaries than mainstem habitats (Maslin 1998).

Winter-run Chinook appear to make use of non-natal rearing habitats in intermittent streams at greater proportions and use habitats farther upstream (Maslin 1998).

Distributions of Spring Chinook juveniles also indicate that greater use is made of non-natal tributaries in the vicinity of natal streams (Maslin 1998). Chinook salmon use of non-natal rearing habitats in the Tehama East assessment area may increase with salmon restoration efforts that seek to re-establish populations of spring-run and winter-run Chinook in Battle Creek. With much of the historic Sacramento River floodplain habitats lost to reclamation and flood control, the value of intermittent stream habitats and their restoration are significant and enable the continued expression of this life history adaptation for Chinook salmon.

Steelhead / Rainbow Trout

Steelhead and rainbow trout have the most flexible life history of the salmonids present within Central Valley streams. Rainbow trout can express both an anadromous steelhead form that takes advantage of growth opportunities in the ocean and a resident form that completes its entire lifecycle in freshwater streams. As steelhead trout juveniles have an extended freshwater residency, both forms are reliant on summer coldwater habitats.

Steelhead present in the Central Valley are described as a winter steelhead though adults begin freshwater upstream migration as early as August and peak migration occurs in September and October (Moyle 2002). Spawning generally occurs between December to April. Steelhead will hold within mainstem rivers until tributary flows are sufficient to enable passage upstream to spawning reaches. Steelhead can generally ascend to spawning reaches farther upstream than Chinook salmon. Post-spawning adults can return to the ocean if conditions permit. Steelhead juveniles remain in cold, fast flowing streams and rivers with riffle habitats from one to two years (Moyle 2002). Downstream migration can take place between fall and spring when stream flows are sufficient.

The population status of Central Valley steelhead adult returns is not well know as there is a general lack of monitoring data available. There is evidence to suggest that remaining wild populations have low population sizes. Moyle (2002) suggests that the principal remaining wild populations occur in Mill and Deer Creeks which amount to a few hundred fish per year.

Suckers

Sacramento Sucker

Sacramento suckers are most abundant in cool streams and rivers at elevations from 650’ to 2000’. They have a wide range of temperature tolerance and can be found in cold fast flowing streams as well as warmer slough habitats (Moyle 2002). Adults are more abundant in larger streams and prefer deeper habitats or those with a great deal of cover. Juveniles are most abundant in smaller tributary streams or in the margins of larger streams and rivers. Adults migrate to tributaries as early as December in preparation for spawning. Age at maturity is 4 to 6 years when fish are approximately 8 to 12 inches in length (Moyle 2002). This species can be long lived to 30 years or more and fish of that age can reach 22 inches in length. Juveniles use smaller stream habitats where they were spawned for variable lengths of time as some migrate to larger rivers the following spring and others may not migrate until 2 to 3 years of age (Moyle 2002).

Sculpins

Prickly Sculpin

Prickly sculpin have great tolerance to a wide variety of environmental conditions and can be found from cold water, warm water, brackish and seawater habitats (Moyle 2002). They are typically found within clear moderate sized low elevation streams within the Central Valley and feed on benthic macroinvertebrates (Moyle 2002). Prickly sculpin spawn most often in March and April under loose rocks in flowing waters (Moyle 2002). Juvenile are often swept downstream after hatching and migrate upstream as they grow in size (Moyle 2002). Prickly sculpin can live to age 7 and presumably longer, with larger individuals approximately 4 inches in length (Moyle 2002).

Riffle Sculpin

Riffle Sculpin occupy cold headwater streams that have year round stream flows and abundant riffle habitats (Moyle 2002). Riffle sculpin are non-migratory and poor dispersals. They are commonly replaced by prickly sculpin in lower warmer water reaches. Fish mature in two years at approximately 2.5 to 3 inches in length and are thought to seldom live past 4 years of age or exceed 4 inches in length (Moyle 2002). Riffle sculpins spawn under rocks in riffles or in the cavities of submerged logs (Moyle 2002).

Minnows

California Roach

California roach are found in a wide variety habitats though most commonly in small warm mid-elevation streams including intermittent streams (Moyle 2002). They can also have wide distributions within watersheds from colder headwaters through the warmer habitats found in lower reaches (Moyle 2002). Roach can be excluded from stream habitats by the presence of piscivorous fish especially those of non-native origin (Moyle 2002). Hitch are omnivores and in small warmer streams feed mainly on filamentous algae, crustaceans and insects on stream bottoms (Moyle 2002). California roach reach maturity between 2 and 3 years of age (approximately 2 inches in length) and rarely live longer than 3 years or exceed 5 inches in length (Moyle 2002). The spawning period is dependant on water temperatures (exceeding 61°F) and generally occurs between March and July (Moyle 2002). Roach spawn in shallow cobble bottomed stream habitats that enable the deposition of eggs in the crevices between rocks (Moyle 2002).

Hardhead

Hardhead are widely distributed in undisturbed low and mid-elevation tributaries of the Sacramento River found up to approximately 4,900 feet in elevation (Moyle 2002). They can also be found in the mainstem Sacramento River. Hardhead are generally absent from habitats that are dominated by non-native introduced species. Hardhead are always found associated with Sacramento Pikeminnow with which they share a similar resemblance and can occasionally exceed 24 inches in length (Moyle 2002). Hardhead are typically found in streams that exceed 68° F while stream temperatures over 82° F are sub-optimal (Moyle 2002). Preferred habitats are slow moving, clear and deep pools and runs. Hardhead reach sexual maturity in their 3rd year at a size of 6 to 7 inches and spawn primarily in April and May in gravel beds (Moyle 2002). Fish using larger rivers migrate to smaller tributaries for spawning.

Hitch

Hitch are closely related to California roach with which they can hybridize. Hitch have the highest tolerances of Central Valley fishes and can be found in clear, low-gradient streams, sloughs and in slow moving stretches of rivers (Moyle 2002). Vegetative cover is an important habitat element in smaller streams. Hitch live from 4 to 6 years or longer and in streams can reach 8 to 10 inches in length at 3 to 4 years of age (Moyle 2002). Fish will mature in their 2nd or 3rd

year and spawn in the riffle habitats of nearby tributaries (Moyle 2002).

Sacramento Pikeminnow

Sacramento Pikeminnow (previously known as squawfish) are widespread in Central Valley streams and rivers that have low turbidity and are unpolluted. Similar to Hardhead, they are most commonly found in low to mid-elevation streams within slow moving runs and deep pool habitats (Moyle 2002). They generally inhabit streams that have summer temperatures between 64° F and 82° F (Moyle 2002). Pikeminnows can be highly site specific or migrate long distances with peak upstream spawning migrations in March through May (Moyle 2002). Sacramento pike minnows feed on stream insects, larval fish and at larger sizes prey upon crayfish, fish and amphibians. Pikemminnows are long lived with 12 to 16 year old fish not uncommon which buffers their populations from drought conditions. At five years of age pikeminnows can range from 10 to 14 inches in length (Moyle 2002). Pikeminnows become mature at 3 to 4 years of age and spawn in the gravels shallower stream habitats such as riffles or the base of pools (Moyle 2002).

Sacramento Splittail

Sacramento splittail are endemic to California and historically were found as far up the Sacramento River as Battle Creek (Moyle 2002). Currently, few are thought to reach the Red Bluff Diversion Dam during upstream spawning migrations except in wetter water years. Splittail have not been documented within tributaries of the Tehama East assessment area but have been seen in near proximity in Kusal Slough (Maslin 1997). Sacramento Splittail are adapted to use estuarine waters and can be found in Central Valley rivers, sloughs, and lakes. Splittail live generally 5 to 7 years and mature at 2 years of age at which time they are between 6 and 7 inches in length (Moyle 2002). Splittail move into flooded vegetation during spawning which can occur between February and July though more frequently in March and April (Moyle 2002). Eggs attach to submerged vegetation and debris. Within their first year, splittail juvenile will migrate downstream into the delta and estuary.

Speckled Dace

Within the Sacramento River drainage, speckled dace are typically less than 3 to 4 inches in length and inhabit a wide variety of habitats that have clear, cold, well-oxygenated, flowing waters with and plenty if instream or overhanging cover (Moyle 2002). Seasonally, speckled dace may live in more extreme conditions such as those in intermittent tributaries. Dace generally feed on aquatic insects on stream bottoms though may include feed seasonally on filamentous algae. Dace typically mature in their second summer and few fish exceed 3 years of age (Moyle 2002). Most spawning takes place in June and July in shallow gravel areas where eggs attach to rocks (Moyle 2002).

Surfperches

Tule Perch

Tule Perch are widely distributed in various lowland habitats in the Sacramento River drainage including clear streams and larger rivers, estuarine slough and lakes. (Moyle 2002). In streams they prefer cool well-oxygenated water, deep pool and run habitats with emergent vegetation and woody debris, undercut banks and hanging vegetation (Moyle 2002). In streams, tule perch feed on zooplankton, and small invertebrates on stream bottoms or aquatic vegetation (Moyle 2002). Mating takes place between July and September and fertilization occurs internally in January and rather than deposited as eggs in stream habitats, young are live born in May or June (Moyle 2002). Tule perch have variable life spans 2 to 7 years and age at maturity which is dependent upon the stream environments to which they are adapted (Moyle 2002). Tule perch are approximately 3 inches in length in their 1st year and at 5 years of age they can be 6 inches or greater though these sizes will vary with habitat conditions.

Stickleback

Threespine Stickleback

Freshwater resident threespine stickleback are found as far North as Redding within the Sacramento River and tributaries. Freshwater threespine stickleback are a small fish, typically 1 to 2 inches in length, seldom exceeding 2 inches. They live in quiet-water vegetated habitats such as shallow pools, backwaters and stream margins and are more dependent on heavy vegetative cover when piscivorous fish are present (Moyle 2002). Sticklebacks complete their lifecycle primarily within a single year and few live to 2 or 3 years of age (Moyle 2002). Stickleback move to breeding areas in April through July and construct nests among aquatic plants.

Lampreys

Pacific Lamprey

Pacific lampreys are anadromous species that spend their adult predatory phase in the ocean environment and return to spawn in freshwater streams. Lamprey typically migrate upstream to spawn in habitats with fairly swift water and gravel substrates between early March and late June (Moyle 2002). After hatching, ammocoetes (filter feeding life stage) occupy soft sand or mud habitats for 5 to 7 years prior to their metamorphosis into predatory adults.

Non-Native Fish Species

Several introduced non-native fish species are found within Tehama County streams. Those with documented or likely presence within the Tehama East planning area are listed in Table 2. Coldwater introduced species are few and include hatchery rainbow trout and brown trout. The rest of introduced non-native species are warm water fishes including those in the sunfish and minnow families and mosquitofish.

Table 2. Introduced, non-native fish species with documented or likely presence within the Tehama East Watershed Assessment planning area.

Fish Families and Species/Distinct Runs	Scientific Name
Salmon and Trout	Family Salmonidae
Rainbow Trout (Hatchery)	*Oncorhynchus mykiss*
Brown Trout	*Salmo trutta*
Sunfishes	Family Centrarchidae
Green Sunfish	*Lepomis cyanellus*
Bluegill Sunfish	*Lepomis macrochirus*
Smallmouth Bass	*Micropterus dolomieu*
Largemouth Bass	*Micropterus salmoides*
Minnows	Family Cyprinidae
Golden Shiner	*Notemigonus chrysoleucas*
Live bearers	Family Poeciliidae
Eastern mosquitofish	*Gambusia affinis*

THREATENED, ENDANGERED, AND SPECIAL CONCERN FISH SPECIES

Several fish species and distinct salmon runs that use stream habitats within the Tehama East Watershed Assessment area have been designated by federal and/or state agencies as Threatened, Endangered, or as Species of Concern. Federal status designations are formal listings under the Endangered Species Act (ESA) of 1973. The National Marine Fisheries Service (NMFS) has ESA jurisdiction over anadromous fish species such as salmon and steelhead trout. The US Fish and Wildlife Service has ESA jurisdiction over inland fish species. Endangered species are those that are in danger of extinction throughout all or a significant portion of their range. Threatened species are those that are considered likely to become endangered within the foreseeable future. Federal Species of Concern are species for which there is concern about their status and threats, but insufficient information is available to indicate a need to list the species under the ESA. California Department of Fish and Game (CDFG) defines Species of Special Concern as those that are vulnerable to extinction due to declining population levels, limited ranges and/or continuing threats.

Several fish species and distinct salmon runs with federal and/or state status listings use aquatic habitats within the Tehama East Watershed Assessment planning area. Salmonid species and runs include: winter-run Chinook, classified as Endangered; spring-run chinook and steelhead trout classified as Threatened; and fall-run and late fall-run Chinook that are of special concern (Table 3). Currently there are no inland fishes present in the planning area that are listed as threatened or endangered though several are classified by CDFG as species of special concern (Table 3; Moyle et al. 1995).

Table 3. Threatened, endangered and special concern fish species present in the Tehama East Watershed Assessment planning area.

Species / Stock	Federal Designation (date)	CA State Designation
Steelhead Trout	Threatened (3/19/98)	None
Winter-run Chinook Salmon	Endangered (1/4/94)	Endangered
Spring-run Chinook Salmon	Threatened (3/19/98)	Threatened
Fall-run Chinook Salmon	Species of Concern (9/16/99)	None
Late Fall-run Chinook Salmon	Species of Concern (9/16/99)	Species of Special Concern
Sacramento Splittail	None	Species of Special Concern
Hardhead	None	Species of Special Concern

Anadromous Salmonids

Water development systems (e.g. reservoir storage, hydropower) in California's Central Valley have had profound impacts on anadromous salmonid species. The historic habitats of at-risk anadromous salmonid have been reduced by approximately 80% to 100% depending upon the species and Evolutionary Significant Unit (ESU) (Table 4). The Central Valley spring-run Chinook ESU is restricted to 10% to 20% of its historic spawning and rearing habitat (DWR 2005). The winter-run Chinook ESU has suffered a loss of 100% of their historic habitat (Lindley et al. 2004). Habitat loss estimates for the Central Valley Steelhead ESU are 80% (Lindley et al. 2006). The remaining habitats for at-risk anadromous salmonids are often restricted to habitats below dam complexes that lack fish passage facilities and to numerous other smaller streams.

Table 4. Threatened and Endangered Central Valley anadromous salmonids and percent loss of historic habitats to water development projects.

Evolutionary Significant Unit (ESU)	% Loss of Spawning and Rearing Habitat	Source
Central Valley Spring-run Chinook	80% - 90%	DWR (2005)
Central Valley Winter-run Chinook	100%	Lindley et al. (2004)
Central Valley Steelhead	80%	Lindley et al. (2006)

Populations of Central Valley anadromous salmonids have experienced dramatic declines over time. Recent focused restoration efforts have helped to increase the abundance of many populations. The National Marine Fisheries Service (NMFS) is responsible for the recovery planning of federally listed threatened and endangered anadromous species in the Central Valley. NMFS completed a draft winter-run Chinook recovery plan in 1997 (NMFS 1997) and recovery planning for spring-run Chinook and steelhead ESU's began in 2003 (CDFG 2004a). This latest recovery planning effort will cover all listed Central Valley anadromous salmonids and is currently in draft form. It is anticipated that the recovery plan will be finalized within the next year.

Within the last decade, populations of at-risk Central Valley anadromous salmonids have been the focus of substantial restoration.

In the absence of comprehensive NMFS recovery planning, Central Valley wide frameworks such as the Anadromous Fish Restoration Plan (AFRP) and several elements of the CALFED Bay-Delta Program (e.g. the Ecological Restoration Program (ERP), Environmental Water Program (EWP) and Multi-species Conservation Strategy (MSCS)) have provided guidance on prioritized restoration. The smaller streams that are the focus of this assessment have generally received limited attention under these existing restoration plans which may reflect the abundance of higher priority restoration actions identified for other streams with greater restoration potential.

The AFRP does identify several restoration goals for Paynes and Antelope Creeks and was instrumental in funding research into the use of non-natal rearing habitats within many of the smaller Tehama County streams included in this assessment. The AFRP was developed to implement the Central Valley Project Improvement Act (CVPIA) goal of doubling the abundance of naturally spawned anadromous fish species in the Central Valley that have been negatively impacted by the operations of the Central Valley Project (USFWS 2001). Watersheds specific restoration actions recommended by the AFRP are summarized within the watershed specific sections of this report.

CRITICAL HABITAT

Once a species or a distinct population segment (e.g. specific salmon run) becomes formally listed as threatened or endangered under the federal ESA, critical habitat is designated by NMFS. Under the ESA, critical habitat for threatened and endangered species is defined as:

> "1. Specific areas within the geographical area occupied by the species at the time of listing, if they contain physical or biological features essential to conservation, and those features may require special management considerations or protection; and
> 2. Specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation." (NOAA 2008).

Central Valley critical habitat for winter-run Chinook was designated in 1989, 1992 and 1993 when winter-run was listed as threatened and being considered for endangered status. There was no critical habitat identified within the Tehama East planning area in the early 1990's as the use on non-natal rearing habitats in smaller tributary streams was not well documented. Future critical habitat reviews for winter-run Chinook will likely include these non-natal rearing habitats as winter-run have since been documented to use this habitat. The distribution of non-natal critical habitat will likely be the same as that identified for spring-run Chinook.

Spring-run Chinook critical habitat was designated in 2005 (NOAA 2005). The only critical habitats within the planning area that support over-summering spring-run Chinook salmon adults are found within the Antelope Creek watershed. All other occurrences of critical spring-run habitats are juvenile rearing habitats. Spring-run critical habitats within lower Antelope Creek include all segments of the braided channel including the full lengths of Butler Slough, Craig Creek, New Creek, and two irrigation canals. The upstream endpoints for critical spring-run Chinook habitat are listed in Table 5. Downstream endpoints for these habitats are where these streams flow into the Sacramento River.

Table 5. Upstream endpoints of critical habitat for spring-run Chinook in the Tehama East Watershed Assessment planning area. All downstream endpoints are the confluence with the Sacramento River.

Watershed	Latitude	Longitude
Inks Creek	40.3418	–122.1332
Paynes Creek	40.2810	–122.1587
Salt Creek	40.1869	–122.1845
Antelope Creek		
Antelope Creek North Fork	40.2691	–121.8226
Antelope Creek South Fork	40.2309	–121.8325
Dye Creek	40.0904	–122.0767
Toomes Creek	39.9808	–122.0642
Pine Creek	39.8760	–121.9777
Singer Creek	39.9200	–121.9612

Steelhead trout critical habitat was also designated in 2005 (NOAA 2005). Generally, steelhead trout habitats extend farther into watersheds than Chinook salmon as steelhead are more capable of navigating the steeper gradient headwaters. Therefore critical habitat designations in some cases exceed those of spring-run Chinook as is the case in Antelope Creek. Some of the smaller streams identified as critical Chinook salmon habitat are not classified as critical for steelhead trout such as Pine Creek, Toomes Creek and Salt Creek upstream of the New Creek confluence.

The final steelhead trout critical habitat designation in Paynes Creek was much reduced from that initially proposed as a result of weighing the economic impacts of the designation against the benefits of these habitats.

Currently, the upstream extent of critical steelhead habitat in Paynes Creek ends at the approximate boundary of Bureau of Land Managements (BLM) ownership similar to that of Spring-run Chinook. Also similar to the spring-run Chinook designation, the steelhead trout critical habitats within lower Antelope Creek include all segments of the braided channel including the full lengths of Butler Slough, Craig Creek, New Creek, and two irrigation canals. The upstream endpoints for steelhead trout critical habitat are listed in Table 6. Downstream endpoints for these habitats are where these streams flow into the Sacramento River.

Table 6. Upstream endpoints of critical habitat for steelhead trout in the Tehama East Watershed Assessment planning area. All downstream endpoints are the confluence with the Sacramento River.

Watershed	Latitude	Longitude
Inks Creek	40.3418	–122.1332
Paynes Creek	40.3024	–122.1012
Salt Creek	40.1572	–122.1646
Antelope Creek		
Antelope Creek North Fork	40.2807	–121.7645
Antelope Creek Middle Fork	40.2673	–121.7744
Antelope Creek South Fork	40.2521	–121.7575
Dye Creek	40.0996	–121.9612

POTENTIAL ADVERSE CONDITIONS

Watersheds and aquatic ecosystems are in a constant state of change due to natural processes. Native aquatic organisms within Central Valley watersheds have adapted over time to historic patterns in natural disturbances, the timing and amount of stream flows, channel processes and forms, floodplain connectivity and riparian forests interactions. While natural disturbances can at times have catastrophic local consequences for aquatic ecosystems (e.g. flooding, catastrophic wildfires, landslides) these processes are also important in maintaining longer term channel form and processes such as through sediment and woody debris recruitment and riparian interactions. When adverse stream conditions arise due to natural processes, species often have adaptations to cope with these conditions given that the structure and function of the channel, riparian zone and floodplain is intact. In some cases species are locally extirpated from streams and recolonize from nearby populations when habitat conditions improve.

The potential adverse conditions that are the focus of this section are from anthropogenic activities that can create stream conditions that fall outside the range of variability for which species are adapted. These adverse conditions can include modifications to watershed processes, channel form, floodplain processes, riparian zone interactions, and the volume and quality of water. Additionally, potential adverse conditions can arise from barriers, entrainments, non-native species, and hatcheries. Once the adverse conditions that are limiting aquatic resources and at-risk species are identified, creative solutions can be developed that meet both land-use needs and life history requirements for aquatic species.

Water Quality and Temperature

Water quality attributes (dissolved oxygen, pH, heavy metal concentrations, temperature etc.) have a significant influence on the structure and function of aquatic ecosystems. In unaltered Central Valley streams water quality attributes such as dissolved oxygen, closely linked to stream temperature, can vary along the longitudinal length of the stream channel and vary at a given site throughout the seasons. Native fish species have life histories adapted to these longitudinal and season patterns and take advantage of aquatic habitats as they meet their physiological and life history requirements. Potential adverse conditions can arise whenever water quality is altered to the extent that it cannot meet the physiological requirements of the fish species reliant on the habitat.

Activities that modify stream temperatures can alter fish community structure if the stream temperatures regime can no longer meet the life history requirements of fish species. For salmon and trout increased stream temperatures can reduce the survival of adults, juveniles and eggs within both pre-spawning adults and spawning nests (redds). As higher stream temperatures occur in late spring through early fall, species occupying stream habitats at these times are susceptible to impacts of excessive stream warming.

Water temperatures within Tehama County east side streams can be increased due to the unintended consequences of several watershed activities. Stream diversions can reduce the quantity of stream flow reducing thermal mass and causing the stream to be more susceptible to increases due to high air temperature and solar insolation. Excessive sediment loads (coarse and fine) within the stream channel can reduce pool depths which can reduce the potential for thermally stratified pool habitats to provide cooler temperatures in the bottoms of deeper pools. Loss of riparian vegetation shading can increase the amount of direct sunlight reaching the stream thereby increasing solar insolation and stream temperatures.

Diversions and Return Waters

In Tehama County the diversion of stream waters support agriculture, livestock, and fish hatcheries / aquaculture. Potential adverse effects can occur if water volumes remaining in stream networks cannot meet the life history or water quality requirements of native fish species. Low stream volumes during the diversion season can potentially limit upstream and downstream fish migrations if they occur when diversions are active. Losses in stream water volumes can also make streams more susceptible to warming during summer months. During the irrigation season, return waters can potentially carry warmer and/or higher nutrient laden waters back to stream channels which can impact water quality.

Entrainment

Entrainment typically refers to the routing of fish out of the active stream channel commonly by way of stream diversions that lack appropriate fish screening. This is especially detrimental for fish species that are migrating downstream when stream diversions are active as can be the case with downstream migrating juvenile salmon and steelhead trout in the spring. Fish mortality can be greatly is increased if entrained fish have limited opportunities to once again reach the stream.

Fish can also be trapped and stranded in modified floodplains after waters recede from flood events. Naturally formed floodplains often offer low velocity refuges for fish during flood events and have developed a network of return channels to route flood waters back to the active stream channel as waters recede. Streams that are confined by man made levies can strand adult and juvenile fish where flood waters expand outward from the active channel and return channels are modified preventing an efficient return to the channel as waters recede. This can results in fish being stranded in water ponded in agricultural fields, sinks or gravel and borrow pits with little chance of returning to the active channel precluding another flood event.

Physical Barriers

Physical barriers can prevent the efficient upstream migration of both adult and juvenile fish. Physical barriers that can impede fish movement can include road crossings other than bridges and stream water diversions and dams that lack adequate passage. Physical barriers are often fitted with passage facilities such as fish ladders to enable the passage of upstream migrating salmon and trout adults. Upstream juvenile fish passage is often problematic at physical barriers as juvenile fish are small and more limited in the height of barrier they can successfully navigate including fish ladders. In the Central Valley, physical barriers can sometimes be beneficially used to prevent the upstream spread of exotic fish species and limiting their impact on native fish assemblages upstream by confining them to downstream habitats. The spread of exotic fish must be considered when providing increased passage opportunities at existing fish barriers.

Spawning Areas and Sediment

For fish species such as salmon and steelhead trout that rely on stream gravels for spawning, the type and amount of sediment within stream channels is important. Spawning salmon and steelhead trout can be adversely impacted by limited gravel supplies or coarse sediment delivery to the stream channel, modified stream channels that prevent the development of spawning habitats (e.g. gravels accumulated into riffle habitats), and high levels of fine sediments in spawning gravels that reduce larval survival.

Loss of Riparian Habitat

Riparian zones are an important part of stream ecosystems. Riparian vegetation provides stream shading, leaf and insect inputs, large and small woody debris recruitment, and low velocity refuges during periods of high stream flows. Riparian zones can be modified through channel confinement, reclamation for agriculture, grazing, and direct harvest.

Stream Channel Confinement

Artificially confined channels can narrow riparian zones along stream channels, reduce floodplain interactions that provide growth opportunities and low velocity refuges for fish, result in the loss of channel complexity by altering the fluvial geomorphic processes that create and maintain habitat. Stream channels are often confined to reclaim floodplains for agricultural and residential use and to reduce the negative impacts of flooding.

Predation

While predation is a natural occurrence within stream ecosystems, non-native predatory fish can adversely impact native species. The early life stages of native fish are particularly susceptible to predatory non-native fishes. The recruitment of certain native fish larvae can be largely restricted to those habitats which lack non-native predators. In Central Valley streams, predatory largemouth bass and green sunfish have had an adverse effect on the recruitment of hardhead and

California roach respectively (Moyle 2002).

Fish Hatcheries

Fish hatcheries have been used for decades to mitigate reductions in salmonid habitat and abundance due to dams that lack fish passage facilities (e.g. Shasta and Oroville Dams). Unintended negative consequences to native stocks from extensive hatchery propagation have been many and are ongoing. Returning adult hatchery fish can stray from hatchery streams and breed with wild which can reduce genetic diversity and adaptation to local environments. A recent genetic analysis of the most robust Evolutionary Significant Unit (ESU) in the Central Valley, fall-run Chinook, has documented the loss of genetic diversity or the homogenization of the entire ESU (Williamson and May 2005). Homogenization of genetic diversity reduces the long-term viability of ESU's (McElhany et al. 2000). This genetic homogenization is hypothesized to be the consequence of the historic interbasin transfers of hatchery stocks and high stray rates resulting from the off-site releases of hatchery raised juveniles (Williamson and May 2005). The interbreeding of hatchery fish with wild fish can also potentially reduce the fitness of wild stocks. Araki et al. (2007) documented the rapid and cumulative loss in fitness for wild steelhead subjected to crossbreeding with hatchery strains over multiple generations.

Relative to small east-side tributaries, juveniles from hatchery straying fall-run Chinook salmon that spawn in intermittent tributaries could be in direct competition with wild non-natal rearing Chinook juveniles if a density dependant relationship exists within those habitats. High rates of hatchery strays into small wild populations would likely have a greater capacity to have detrimental effects.

Invasive Species

Invasive plants and animals can negatively impact aquatic ecosystems and the native species they support. Modifications in natural stream processes or attributes can benefit invasive species putting native species at a competitive disadvantage. Invasive fish can modify native fish community structure and can have predation effects on native species as previously described. Once invasive species are established they can often be difficult to eradicate as additional source populations may also inhabit nearby streams or the invasive may be present in great densities (e.g. invasive mollusks).

Of concern for smaller east side Tehama County watersheds is the potential for invasion by the New Zealand Mudsnail (*Potamopygus antipodarum*). New Zealand mudsnails reproduce rapidly and modify aquatic ecosystems by consuming algae and competing with bottom dwelling stream insects. Reductions in stream insects can impact native fishes that rely on those insects as food. Native fish receive little to no nutrition from feeding on New Zealand Mudsnails. Once a stream is colonized, densities can greatly increase as is evident in the Sacramento River tributary of Putah Creek where densities have been documented in excess of 100,000 snails per square meter (Hosea and Finlayson 2005).

The New Zealand mudsnails were undocumented in California in the mid 1990's. Since then this species has invaded several Central Valley rivers and streams. Since 2007, this invasive species has been newly detected in the American River and Lake Shasta. This is seen as an area of active expansion and other streams between these two locations are expected to harbor undocumented occurrences of this species. As of yet no New Zealand Mudsnails has been found in Tehama East watersheds though it is likely that surveys have not been performed to detect their presence.

New Zealand Mudsnails are very small in size, from a grain of sand up to a quarter inch in length and are easy to overlook. They are thought to be spread by anglers, recreationists, boaters, and researchers and possibly wildlife that inadvertently transport debris and mudsnails from one location to another. Once established, there is no known method for eradication so preventing further introductions is the only method of control.

Aquaculture

While Tehama County supports many state, federal and private fish hatcheries, the relatively small watersheds that are focus of this assessment support few. The opportunity for cold water species aquaculture (e.g. trout) is limited in for these watersheds due to low stream baseflows and lack of cold spring water inputs. Private fish hatcheries are regulated by CDFG and must additionally comply with state water quality objectives for return waters that re-enter streams. The limited aquaculture activities within the assessment area are not likely a significant contributor to adverse stream conditions.

Fish Planting

Potential adverse conditions resulting from cold-water fish planting include: 1. The potential for impacts to native aquatic species (e.g. amphibian species of concern), especially in areas that historically did not contain fish; 2. A potential increase in competition with native fish species for limited resources; 3. The potential loss of local adaptations for native fish species if hatchery strains are successful at reproducing and cross-breeding. Fish planting for recreational fishing is relatively common within Tehama County though not common within most of east side tributaries that are the focus of this watershed assessment.

PAYNES CREEK

Watershed Description

Paynes Creek originates from several small springs east of the town of Mineral and flows into the Sacramento River five miles north of Red Bluff. The drainage area of Paynes Creek is approximately 93 square miles with a maximum watershed elevation of approximately 5,700 feet. Most of the watershed is privately held and the Lassen National Forest has limited holdings in the upper watershed. A large portion of the lower watershed is managed by the Bureau of Land Management (BLM) including the Paynes Creek Wetlands. BLM manages this wetland area for the benefit of neotropical migratory birds and bird species and to "protect and enhance the existing riparian habitat and wildlife communities, as well as provide for recreational use, cultural and natural interpretation, and educational opportunities." (BLM 2008).

Many small diversions (16) are spread throughout the watershed for irrigation, a fish hatchery and stock watering, though there are no large dams present (CDFG 1993). A diversion approximately 2 miles upstream of the mouth of Paynes Creek provides water for the BLM wetlands and the Bend District and has a capacity of 8 cfs (CDFG 1993). The Mount Lassen Trout Farm operates a small aquaculture facility for the rearing of multiple age classes of rainbow trout near the Paynes Creek mainstem in the town of Dales Station (Phil Mackey, Pers. Comm.). The facility is fed by spring waters rather than flows from the Paynes Creek mainstem. Waters discharged from the facility are regulated by the California State Water Quality Control Board to meet water quality objectives.

Until recently, catchable sized trout were planted in Plum Creek, a tributary to Paynes Creek. The California Department of Fish and Game (CDFG) statewide fish stocking program is currently developing an Environmental Impact Report/Statement (EIR/EIS) to guide future stocking activities and is operating under a temporary interim stocking schedule (CDFG 2008a; 2008b). Consistent with interim stocking guidelines, CDFG ceased the stocking of trout into Plum Creek in 2009 due to the presence of amphibians of concern (S. Baumgartner Pers. Comm.). The final Environmental Impact Report/Statement (EIR/EIS) will determine whether fish stocking in Plum Creek will resume.

Fish Species

Paynes Creek supports several native fish species including fall-run Chinook salmon, steelhead/rainbow trout, Sacramento sucker, hardhead, and threespine stickleback (Table 6). Other native fish species are also likely present including riffle sculpin, California roach, Sacramento pikeminnow, and pacific lamprey. Documented non-native fish species include hatchery rainbow trout and green sunfish (Table 7). It is also likely that lower stream reaches include more undocumented non-native fish species than identified here.

Table 7. Native and non-native fish species with documented presence within the Paynes Creek Watershed and their federal and state listing status.

Fish Species/Distinct Runs	Scientific Name	Federal / State Listing
Native Fish		
Fall-run Chinook Salmon	*Oncorhynchus tshawytscha*	*SC*
Steelhead / Rainbow Trout	*Oncorhynchus mykiss*	*T*
Sacramento Sucker	*Catostomus occidentalis*	
Hardhead	*Mylopharodon conocephalus*	*SSC*
Threespine Stickleback	*Gasterosteus aculeatus*	
Non-native Fish		
Rainbow Trout (Hatchery)	*Oncorhynchus mykiss*	
Green Sunfish	*Lepomis cyanellus*	

T = Federally Threatened
SC = Federal Species of Concern
SSC = State Species of Special Concern

Threatened, Endangered, and Special Concern Fish Species

The Paynes Creek Watershed supports three anadromous salmonids with special listing status including fall and spring-run Chinook salmon and steelhead trout (Table 6). Within the upper watershed, steelhead trout (threatened) use habitats within the mainstem and Plum Creek. Resident populations of native trout are likely confined to available habitats in Plum Creek as low stream flows and high temperatures in the lower gradient reaches of Paynes Creek are limiting factors for resident trout in the summer. It is uncertain if a resident trout population persists in the higher gradient reaches of the upper Paynes Creek mainstem.

The use of the watershed by fall-run Chinook is opportunistic and depends on sufficient flows in the fall for upstream migration in the lower reaches. Fall-run Chinook spawn within the lower 3 miles of Paynes Creek. Fall-run adult run sizes from the 1960's average 143 and 300 fish were the most observed in a single year (CDFG 1993). The 1967 to 1991 baseline for AFRP is 170 adults with a restoration target of 330. No data is available for steelhead trout run sizes. There are no ongoing surveys for Chinook or steelhead trout within the watershed.

The extent of use of non-natal rearing habitats by Chinook salmon in lower Paynes Creek is uncertain. Non-natal rearing surveys were performed in the lower Paynes Creek in 1997 resulted in a single fall chinook juvenile captured just upstream of the confluence with the Sacramento River, and no juveniles were observed in samples 1.5 miles upstream (Maslin 1997).

Critical Habitat

The Paynes Creek watershed contains designated critical habitat for spring-run Chinook and steelhead trout which is limited to the lower watershed. The upstream extent of critical habitat is at the approximate boundary of BLM's ownership (Figure 1). Critical habitat for steelhead was initially proposed to extend much farther upstream to coincide with the known steelhead distribution but was not classified as critical habitat as economic impacts of the designation outweighed the potential benefit of these habitats to the steelhead ESU (NOAA 2005).

Potential Adverse Conditions

Potential adverse conditions within Paynes Creek are primarily related to altered stream flows from the many stream diversion throughout the watershed (16 diversions). Low stream flows are thought to create migration barriers for adult and juvenile salmonids (AFRP 2001, CDFG 1993). Both the Restoring California Streams: A Plan For Action (CDFG 1993) and the Final Restoration Plan for the Anadromous Fish Restoration Program (USFWS 2001) identify potential actions to undertake to try and remedy these issues (Tables 8 and 9). To this date no actions to augment stream flows have been undertaken.

Table 8. Recommended actions from Restoring California Streams: A Plan For Action (CDFG 1993), to improve anadromous fish habitat in Paynes Creek.

Priority	**AFRP Action**	**Cost**
C-2	Replenish gravel on reconstructed spawning riffles on an as-needed basis.	$3,000/yr
Priority	**Administrative Action to improve fish habitat**	**Agency**
C-2	Obtain increased flow to allow adult and juvenile salmon and steelhead unimpaired up- and downstream passage.	DFG, SWRCB, Water Users
Priority	**Evaluation Actions to determine habitat needs for anadromous fish**	**Cost**
C-2	Investigate the feasibility of developing alternative water supplies for diverters in Paynes Creek drainage.	$25,000

Table 9. Recommended actions from the Final Restoration Plan for the Anadromous Fish Restoration Program (USFWS 2001), to improve anadromous fish habitat in Paynes Creek.

Action	Involved parties	Tools	Priority
1. Supplement flows with water acquired from willing sellers consistent with applicable guidelines or negotiate agreements to improve spawning, rearing and migration opportunities for fall run chinook salmon and steelhead.	Diverters, CDFG, BLM, USFWS, USBR, Tehama County RCD	3406(b)(3)	High
2. Restore and enhance spawning gravel.	CDFG, BLM, USFWS, USBR, Tehama County RCD	3406(b)(3)	Medium

The lack of spawning gravel has also been identified as a limiting factor for fall-run Chinook within Paynes Creek. CDFG placed 1,000 tons of gravel into Paynes Creek in 1988 to improve spawning habitat. Currently it is thought that much of this gravel has been transported downstream (C. Harvey-Arrison pers. comm.). Narrow riparian buffers may also adversely affect Paynes Creek. Maslin (1997) recommended re-vegetation for narrow riparian buffers near the mouth of Paynes Creek. It is uncertain if upper stream reaches may also benefit from this type of restoration action.

ANTELOPE CREEK

Watershed Description

Antelope Creek is a watershed approximately 123 square miles in size with the headwaters reaching 6893 feet in elevation (Turner Mountain). Antelope Creek flows into the Sacramento River through a series of braided channels in the Dairyville area bounded by Salt Creek to the north and Dye Creek to the south. An approximate 6 miles reach of the Sacramento River receives waters from Antelope Creek through this series of channels which includes New Creek which flows into Salt Creek, Craig Creek, Butler Slough, and mainstem Antelope Creek. Antelope Creek is the largest watershed and climbs higher in the elevation than other streams within the Tehama East Watershed Assessment planning area. With greater summer stream flows and fish habitats available at higher elevations, Antelope Creek provides aquatic habitat opportunities not seen in other smaller east side streams that are the focus of this assessment.

Much of the upper watershed is contained within public lands including both the Tehama State Wildlife Area and the Lassen National Forest (LNF). A significant portion of the watershed above the valley floor is also comprised of private timber holdings and grazing lands. Upon leaving the canyon and the entering the valley floor, the watershed area is primarily agricultural where the channel becomes braided into several channels and agricultural diversions.

In 1998 the Lassen National Forest completed a watershed assessment of its ownership within Antelope Creek to support the development of a long-term strategy for the conservation of anadromous fish habitat (LNF 1998). Since that time, LNF has implemented several sediment source reduction treatments to reduce the risk of sediment inputs into anadromous fish habitats (Table 10).

Table 10. Lassen National Forest sediment source reduction treatments implemented in the Antelope Creek watershed from 1999 to 2007 (LNF, unpublished data).

Year	Road Surfacing (miles)	Road Drainage (miles)	Crossings	Diversion Potential Dips	Road Closures (miles)	Road Decommission (miles)	Landings	Other*
2001	0	0.8	4	1	0.8	2.1	2	1
2003	0	0	1	0	0	0.3	0	0
2004	2.9	6.2	10	37	0.8	7.4	0	0
Total	2.9	7	15	38	0.8	9.8	2	1

Fish Species

Antelope Creek supports a wide variety of native fish species including 3 runs of Chinook salmon and steelhead trout (Table 11). Non-native fish species are also present and likely include more undocumented species in the lower stream reaches that are identified here (Table 11).

Table 11. Native and non-native fish species with documented presence within the Antelope Creek Watershed and their federal and state listing status.

Fish Species/Distinct Runs	Scientific Name	Federal / State Listing
Native Fish		
Spring-run Chinook Salmon	*Oncorhynchus tshawytscha*	*T*
Fall-run Chinook Salmon	*Oncorhynchus tshawytscha*	*SC*
Late Fall-run Chinook Salmon	*Oncorhynchus tshawytscha*	*SC*
Steelhead / Rainbow Trout	*Oncorhynchus mykiss*	*T*
Sacramento Sucker	*Catostomus occidentalis*	
Riffle Sculpin	*Cottus gulosus*	
California Roach	*Lavinia symmetricus*	
Hardhead	*Mylopharodon conocephalus*	*SSC*
Sacramento Pikeminnow	*Ptychocheilus grandis*	
Speckled Dace	*Rhinichthys osculus*	
Threespine Stickleback	*Gasterosteus aculeatus*	
Pacific Lamprey	*Lampetra tridentate*	

Non-native Fish		
Rainbow Trout (Hatchery)	*Oncorhynchus mykiss*	
Brown Trout	*Salmo trutta*	
Green Sunfish	*Lepomis cyanellus*	
Smallmouth Bass	*Micropterus dolomieu*	

T = Federally Threatened
SC = Federal Species of Concern
SSC = State Species of Special Concern

Threatened, Endangered, and Special Concern Fish Species

The Antelope Creek Watershed supports several anadromous salmonids with special listing status including fall, late fall and spring runs of Chinook salmon and steelhead trout (Table 8). Within the upper watershed, steelhead trout and spring-run Chinook salmon use habitats within the North and South Forks of Antelope Creek. It is uncertain whether steelhead trout utilize the Middle Fork of Antelope Creek due to a steep cascade at its mouth that may limit passage (C. Harvey Arrison, pers. comm.). The use of the watershed by fall and late fall-runs is opportunistic and depends on sufficient flows in the fall and winter for upstream migration in the lower reaches. Fall run use spawning habitats in all 4 lower channels with primary spawning occurring between the confluence of Little Antelope Creek and the decommissioned USGS gauging station (NMFS 2008).

Fall-run adult run sizes from 1953 to 1984 averaged 467 fish annually and ranged from 50 to 4,000 (CDFG 1993). It is thought that Antelope Creek could support a sustainable population of 3,000 fall run spawners. The AFRP established a restoration goal of 720 fish which is double the 1967 to 1991 baseline of 361 (USFWS 2001). There were no adult returns in 1992 and adult returns have not been monitored since that time (CDFG GrandTab 2009). Likewise there is has been no monitoring performed for late fall-run spawners. The recent installation of a video weir at the Edwards diversion has the potential to monitor the adult returns of fall and late fall run Chinook that spawn upstream of the diversion. However, the video weir was only operated for a single year (2007).

Antelope Creek is limited in the amount of habitat it provides for spring-run Chinook and is not thought to be able to support a long-term viable population without strays from other watersheds (Lindley et al. 2004). Populations with these characteristics are referred to as dependant populations. Historically, it is estimated that the Antelope Creek supported 500 adult spring-run Chinook (CDFG 1993). While CDFG (1993) also states that Antelope Creek has the potential to produce a sustainable population of 2,000 spring-run Chinook, this estimate is not based upon an assessment of upper watershed habitat. This estimate was based upon a 1964 scheme that included the placement of flow maintenance dams and the rechanneling of tributaries (C. Harvey Arrison, pers. comm.)

The 500 fish carrying capacity is more realistic as high summer stream temperatures are thought to be a limiting factor in upstream holding areas that are largely unmodified. In years with higher water temperatures and lower stream flows, spawning surveys in spring-run Chinook holding areas are observing fewer redds than expected relative to the number of holding adults (C. Harvey Arrison, pers. comm.). This suggests that thermal conditions may be affecting adult fish survival or egg viability in dry water years (C. Harvey Arrison, pers. comm.). Spring-run Chinook within Antelope Creek also use holding and spawning habitats that are lower in elevation than populations spawning in the larger nearby streams of Mill and Deer Creeks (C. Harvey Arrison, pers. comm.).

An ongoing spring-run Chinook adult monitoring program is performed annually through the use of summer dive counts. Dive counts of adult spring-run Chinook indicate that the population size is highly variable and consistently below its hypothesized carrying capacity (Figure 2). Over the last 16 years (1992-2007) adult counts have average 33 fish with none seen in some years and a maximum of 154 observed in 1998 (Figure 2). Spring-run Chinook spawning surveys have also been performed for the past 3 years and are expected to continue (C. Harvey Arrison, pers. comm.).

CDFG (1993) estimated that historically 300 steelhead returned annually to Antelope Creek. Monitoring steelhead in the upper watershed has been sporadic. The monitoring of steelhead adults returns recently began in 2007 with the use of a video monitoring weir installed at the Edwards Diversion though this was performed for only one year. This video weir may have the potential to monitor the adult returns of all four anadromous salmonid stocks that use the watershed. The lack of population monitoring data precludes assessments of the status of the steelhead trout population within Antelope Creek.

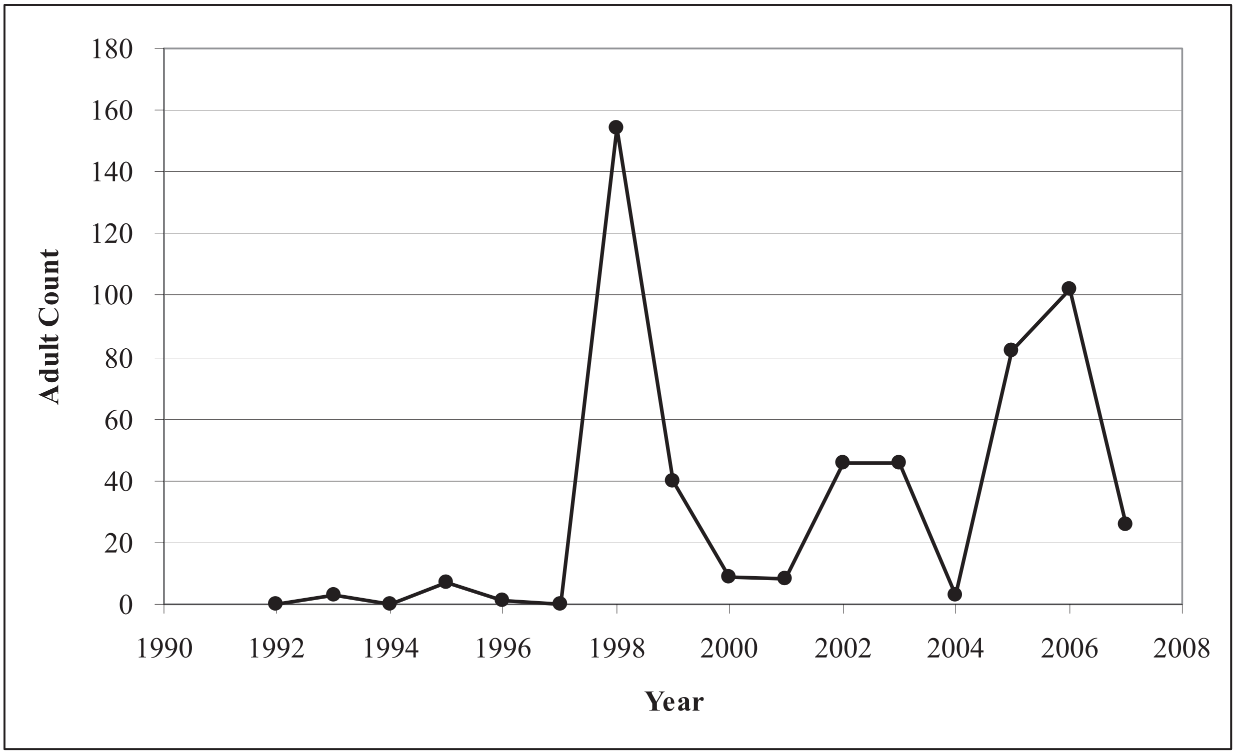

Figure 1. Spring-run Chinook adult counts made within the over-summer holding habitats of Antelope Creek.

Critical Habitat

Critical habitats for spring-run Chinook salmon and steelhead trout identified by NMFS within the Antelope Creek watershed are illustrated below in Figure 3. The critical habitats for these species are include the downstream migration corridors and potential rearing habitats, holding habitats in canyon reaches, and upper spawning and rearing areas. Critical habitats closely resemble the known distribution of these species within the watershed.

Spring-run and steelhead critical habitats within lower Antelope Creek include all segments of the braided channel including the full lengths of Butler Slough, Craig Creek, New Creek, and two irrigation canals. There are approximately 15 miles of spring-run Chinook salmon holding and spawning habitats within Antelope Creek (CDFG 2001). The downstream extent of this habitat begins near Facht Place crossing on the Antelope Creek mainstem and extends upstream into both the North and South Forks. Few adult fish are observed holding downstream of the steel tower transmission lines which Cross Antelope Creek approximately 2.8

miles upstream of Facht Place (C. Harvey Arrison, pers. comm.). Approximately 4 miles of holding/spawning habitat are present on the North Fork where a natural boulder cascade prevents upstream migration in most water years (C. Harvey Arrison, pers. comm.). This cascade is approximately ¼ mile upstream from the confluence of Judd Creek (McClure Place). On the South Fork, the approximate upstream extent of holding/spawning habitat is a series of bedrock chutes ¼ of a mile below Ponderosa Way (C. Harvey Arrison, pers. comm.) which is approximately 7.4 miles upstream of the North Fork confluence.

It is uncertain if lower Antelope Creek provides non-natal rearing habitat for Chinook salmon from other watersheds. With the intermittent use by fall and late fall Chinook spawners, this is certainly a possibility. The research performed on non-natal rearing habitats by Maslin and others (1995-1998) has focused primarily on intermittent streams and not the larger perennial streams like Antelope Creek. Investigations of non-natal use of the lower braided channel by spring-run and winter-run Chinook salmon juveniles may be warranted prior to any modifications to the current braided stream network.

Potential Adverse Conditions

Potential adverse conditions within Antelope Creek are primarily in the low lying areas of the watershed downstream of the mouth of the canyon. The USFS is taking proactive steps to reduce potential sediment source inputs into anadromous salmonid habitats of the headwaters of the watershed. It is uncertain if land use practices at mid-elevations are negatively impacting channel conditions though these areas have not been previously identified as potential problems. However, road crossings may pose migration barriers within the middle elevations. Additionally, the activities associated with the illegal cultivation of marijuana plantations may be impacting the water quality and quantity within streams.

Potential adverse condition in the low lying areas of the valley floor are primarily related to low stream flows resulting from the combination of agricultural diversions and the braided nature of the lower channel. Low flows in these areas are thought to migration barriers for adult and juvenile salmonids. Both the Restoring California Streams: A Plan For Action (CDFG 1993) and the Final Restoration Plan for the Anadromous Fish Restoration Program (USFWS 2001) identify potential actions to undertake to try and remedy these issues (Tables 12 and 13). To this date no actions to augment stream flows have been undertaken.

Table 12. Recommended actions from Restoring California Streams: A Plan For Action (CDFG 1993), to improve anadromous fish habitat in Antelope Creek.

Priority	AFRP Action	Agency
A-1	Negotiate with the Los Molinos Mutual Water Company for additional instream flows for salmon and steelhead	DFG, Water District
A-1	Establish a program to exchange surface water for ground water with landowners with existing wells.	DFG
A-1	Evaluate the benefit of drilling new wells to establish a water exchange program with private landowners.	DFG
A-1	Consider administrative or legal remedies to obtain streamflows to ensure restoration of habitat for salmon and steelhead.	DFG, SWRCB

Table 13. Recommended actions from the Final Restoration Plan for the Anadromous Fish Restoration Program (USFWS 2001), to improve anadromous fish habitat in Antelope Creek.

Action	Involved parties	Tools	Priority
•1. Supplement flows with water acquired from willing sellers consistent with applicable guidelines or negotiate agreements to allow passage of juvenile and adult spring-, fall- and late-fall-run chinook salmon and steelhead	Diverters, CDFG, USFWS, USBR, USFS	3406(b)(3)	High
Evaluation	Involved parties	Tools	Priority
•1. Evaluate the creation of a more defined stream channel to facilitate fish passage by minimizing water infiltration into the streambed and maintaining flows to the Sacramento River.	Landowners, CDFG, USFWS, USBR	3406(e)(3)	Medium

Additional potential adverse conditions in the lower watershed include confined channels and riparian zones, and the impeding of downstream migrating juveniles at diversion structures. Recent fish ladder modifications have already been made to address upstream adult migration problems associated with the fish ladder at the Edwards diversion that was originally installed in 1981. While the agricultural diversions are currently screened, juvenile fish entrained within the diversion prior to the screens are manually captured and passed downstream into Antelope Creek. Installing a bypass for entrained downstream migrating juveniles at the Edwards diversion is currently under investigation.

High nutrient levels also exist in lower Antelope Creek as reported in the water quality evaluation within this watershed assessment (Blankinship and Associates 2008). Nutrients of concern include phosphorous, nitrite and nitrate and may be related to agricultural practices in the vicinity and upstream of water quality monitoring sites. High nutrient loads in combination with warming water temperatures can lead to algal blooms and a depletion of dissolved oxygen level in stream potentially threatening native fish species.

There is a potential migration barrier within the middle elevations of Antelope Creek. The metal grate crossing at Paynes Place on the mainstem of Antelope Creek may pose an intermittent barrier depending on stream flow (Figure 4). The Paynes Place crossing is approximately 6 miles above Facht Place, the lower extent of spring-run Chinook holding habitat. In recent years, summer surveys of Spring-run Chinook adults have detected a change in holding distribution suggesting that Paynes Place crossing may be impeding movement (C. Harvey Arrison, pers. comm.). The crossing is constructed of steel grating and the cobble beneath it has eroded enabling stream flows to flow through the grate itself at low flows. Additionally, the pool depth downstream of the crossing is shallow, which can limit the vertical height that fish can jump to successfully pass barriers.
This barrier being within the range of spring-run Chinook holding and spawning habitat may also entrain or impede the seasonal movement of spring-run Chinook and steelhead juveniles as these fish often rear for greater than a year in freshwater habitats. Designs for the replacement of this crossing with a bridge are currently being developed. Farther downstream, the Facht crossing which was re-surfaced in the mid 1990's does not appear to be a migration barrier as annual fish snorkel surveys have found no evidence that fish passage is being impeded (C. Harvey Arrison, pers. comm.).

Figure 2. Road crossing at Paynes Place on the mainstem of Antelope Creek within spring-run Chinook salmon holding and spawning habitat (9/10/09).

PINE, INKS, SEVEN MILE, SALT, DYE, TOOMES CREEKS AND HOAG SLOUGH

Watershed Description

The watersheds of Inks, Seven Mile, Salt, Dye, Toomes (Dry) and Pine Creeks and Hoag Slough have less watershed area and headwaters at much lower elevations than Paynes and Antelope Creeks (Table 14). The larger watersheds of Pine and Toomes Creeks have headwaters reaching approximately 4,000 feet in elevation. The remaining watersheds have headwaters of less than 2,500 feet. Consequently, with low elevation headwaters, a greater proportion of the watershed area for these streams often occurs on the Central Valley floor. These streams are characterized by intermittent flows to their confluence with the Sacramento River. Primary stream flow occurs in the winter and the lack of precipitation in summer months can result in significant portions of channels running dry.

Table 14. Drainage areas (square miles) for Inks, Seven Mile, Salt, Dye, Toomes and Pine Creeks (Adapted from Maslin et al. 1997)

Watershed	Drainage Area (Square Miles)
Antelope Creek	128
Paynes Creek	93
Inks Creek	20*
Seven Mile Creek	30*
Salt Creek	47
Dye Creek	42
Toomes (Dry) Creek	61
Pine Creek	70*

* Drainage area estimated

Once on the Valley floor, stream channels are often confined by levees to control floodwaters from inundating the historic floodplains that have been converted to agriculture. While these streams have limited capacity to contribute large amounts of water for agricultural irrigation through the growing season, they do intersect the network of diversions from other streams that supply the regions agriculture. In some cases inputs from other diversions or seepage from irrigated agricultural areas can contribute small amounts to stream flow during the irrigation season.

All of these streams lack gauging stations to document stream flows throughout the year. In late June of 2008, Toomes Creek was the only stream of this group to exhibit substantial stream flow connectivity with the Sacramento River. It is not certain if agricultural diversion inputs (e.g. North Main Canal from Deer Creek) or seepage contributes to Toomes Creek baseflows at this time of year. Lower Hoag Slough in the vicinity of Rowles Road (~2.5 miles from the Sacramento River confluence) also retains water during this time of year but this can likely be attributed to a combination agricultural diversions or seepage and potential connectivity with the water table, rather than natural stream flow from upland areas.

With less of a contribution to recreational and commercial fisheries, these streams have not attracted as much attention relative to identifying fish species present, monitoring fish populations, stream flows and water quality through time, and stream related restoration activities. An exception is the work of Paul Maslin and others (1996-1999), funded through the Anadromous Fish Restoration Program, to identify non-natal rearing stream habitat usage by Chinook salmon juveniles which included most of these streams.

Some recent examples of restoration activities within these watersheds include: Dye Creek in the vicinity of the Dye Creek Preserve, managed by The Nature Conservancy, has received some stream channel restoration and removal of a diversion structure that supported exotic amphibians. Singer Creek, a tributary to Pine Creek, has received some restoration to establish riparian vegetation. In 1997, 420 acres of agricultural lands between the Sacramento River and Pine Creek were acquired as an addition to the Sacramento River National Wildlife Refuge (AFRP 2009). Project goals included riparian restoration and protection rearing habitats of Chinook salmon juveniles within Pine Creek.

Fish Species

The warm and coldwater fish species found within these smaller streams east of the Sacramento River are largely the same species encountered in Paynes and Antelope Creeks. However, the smaller watershed areas and lower elevation headwaters limit the amount of year-round coldwater habitats at higher elevations and the lower elevation reaches often go dry in the summer. The intermittent flows within valley floor reaches often prohibit fish from using these habitats until stream flows increase in winter and spring. The recent work of Paul Maslin and others (1996 -1999) on non-natal Chinook rearing habitats in the lower several miles of these streams provides one of the best sources of data for the fish species present during these months. The native species documented in the lower reaches by Maslin and others (1996-1999) include juvenile trout and salmon, suckers, sculpin, roach, hardhead, hitch, pikeminnow, stickleback and lamprey (Table 15). There is limited fish distribution information for upper elevations within these watersheds. An exception is the unpublished data of P. Crain and P. B. Moyle (1996) who surveyed fish distributions within the Dye Creek Preserve to aid The Nature Conservancy in developing a management plan for the watershed (Moyle and Marchetti 1999). Fish species observed in upper Dye Creek which were not observed in the lower Dye Creek seasonal rearing habitats include rainbow trout, speckled dace and Sacramento pikeminnow (Table 15).

Table 15. Fish species with documented presence within Inks, Salt, Dye, Toomes and Pine Creeks. Seven Mile Creek and Hoag Slough were not sampled during non-natal rearing studies.

Fish Species / Distinct Runs (Federal / State Status)	Inks Creek	Salt Creek	Dye Creek	Toomes Creek	Pine Creek
Native Fish					
Winter-run Chinook (E)		x	x	x	x
Spring-run Chinook (T)	x	x	x	x	x
Fall-run Chinook (SC)	x	x	x	x	x
Late Fall-run Chinook (SC)				x	x
Steelhead/Rainbow Trout (T)	x		x		x
Sacramento Sucker	x	x	x	x	x
Riffle Sculpin					
Prickly Sculpin			x		
California Roach	x	x	x	x	x
Hardhead (SSC)	x	x	x	x	x
Hitch				x	
Sacramento Pikeminnow	x		x	x	x
Speckled Dace			x		
Threespine Stickleback		x	x	x	x
Pacific Lamprey		x		x	
Non-native Fish					
Green Sunfish			x		x
Bluegill Sunfish	x	x			x
Smallmouth Bass					
Largemouth Bass					x
Golden Shiner		x			
Eastern mosquitofish	x		x	x	x

E = Federally Endangered
T = Federally Threatened
SC = Federal Species of Concern
SSC = State Species of Special Concern

In contrast to other California waters, fish found within the lower reaches of intermittent tributaries are largely native fish with non-native fish comprising only 3.2% of individuals (Maslin et al. 1997).

Non-native fish present include sunfish, bass, shiner and mosquitofish (Table 15). Dye Creek Preserve fish surveys also document the presence of green sunfish at higher elevations within the Dye Creek watershed.

The low elevation intermittent reaches of these streams provide important rearing habitats for non-natal Chinook salmon juveniles. Small numbers of adult Chinook salmon (fall and late-fall) spawn in the lower reaches of some these streams when higher flows coincide with spawning migrations. While the surveys of Maslin (1996-1999) took place within the last several miles of these streams, several of these species might also be found at higher elevations provided sufficient water is present throughout the year. These species include; Sacramento sucker, Sacramento pikeminnow, California roach, and speckled dace. All of these species were found at higher elevations within the Dye Creek watershed (Moyle and Marchetti 1999). The general lack of systematic inventory data limits what is known about native and non-native fish distributions at higher elevations for most of these smaller watersheds.

Coldwater resident fish species may be present within watersheds if sufficient coldwater habitat is present throughout the summer at higher elevations. Even in the larger tributaries east of the Sacramento River such as Deer Creek, resident trout are typically confined to areas above 1,200 to 1,400' feet in elevation due to the high water temperatures at lower elevations. Only Toomes (Dry) and Pine Creek appear to have a significant quantity of stream habitat above 1,200 feet. Dye Creek, identified as critical steelhead habitat up to 900 feet in elevation, has a limited amount of potential resident trout habitat above 1,200 feet. Fish surveys in upper Dye Creek did document small numbers of rainbow trout present (Moyle and Marchetti 1999). Riffle sculpin which were not detected at lower elevations may also be present at higher elevation if sufficient cool water habitats persist through the summer.

Threatened, Endangered, and Special Concern Fish Species

The threatened, endangered and special concern fish species present within these watersheds include fall, late-fall, winter and spring-runs of Chinook salmon, steelhead trout and hardhead (Table 15). The Chinook salmon and trout present are primarily juveniles that were spawned in other watersheds and migrated to rear in temporary stream habitats that provide superior feeding opportunities. Within these streams, non-natal rearing juvenile salmonids can be found many miles upstream of the Sacramento River (see Critical Habitat). Fall, winter and spring-run Chinook juveniles have been documented to use these non-natal rearing habitats. Within these streams population totals for rearing juvenile Chinook salmon vary according to the quantity and quality of habitat available (Table 16).

Table 16. Chinook salmon (all runs) juvenile population totals within non-natal rearing habitats in Inks, Salt, Dye, Toomes (Dry) and Pine Creeks (Adapted from Maslin et al. 1998).

Watershed	Rearing Habitat (Miles)	Calculated Population Size
Inks Creek	1.2	400
Salt Creek	6.8	11,550
Dye Creek	3.9	11,780
Toomes (Dry) Creek	1.9	4,050
Pine Creek	11.2	28,000

Adult Chinook salmon (fall and late-fall) occasionally spawn in the lower reaches of some these streams when higher flows coincide with spawning migrations. Toomes (Dry) Creek may support a small population of fall-run Chinook (C. Harvey Arrison, pers. comm.). CDFG records from 1956-1984 document adult salmon entering and spawning November 15th through January 31st consistent with fall and late-fall run Chinook salmon. Small numbers of adult fall-run Chinook have additionally been documented in Inks, Salt, Dye, Toomes, and Pine (Singer) Creeks (NMFS 1998). None of these streams are monitored regularly to enumerate the adult spawners present. Winter and spring-run Chinook adults are absent from these streams as they lack compatible spawning and holding habitats at sufficiently cold water temperatures.

The lack of coldwater trout rearing habitats limits the regular use of many of these smaller watersheds by steelhead trout, as juveniles typically rear for a year or more prior to downstream migration. Toomes (Dry) Creek may support a small steelhead population (C. Harvey Arrison, pers. comm.). The extent of steelhead trout use of Dye Creek is uncertain though critical habitat within this watershed was identified by the National Marine Fisheries Service (NMFS) and small numbers of trout were observed at higher elevations (Moyle and Marchetti 1999). Pine Creek may have some capacity to support juvenile rearing steelhead trout at elevations above 1,200 feet, though steelhead use of this watershed by steelhead has not been documented.

Critical Habitat

In 2005, NMFS delineated critical habitats for the threatened species of spring-run Chinook salmon and steelhead trout within five of these watersheds. Watersheds that contain critical spring-run Chinook habitats include Inks, Salt, Dye, Toomes, and Pine Creeks (Figure 5). The critical habitats for spring-run Chinook are solely non-natal rearing habitats on the valley floor extending upstream from the confluence with the Sacramento River. Critical habitat in Inks and Toomes Creek are less than 2 miles in length. Salt and Dye Creeks each have approximately 4 miles of critical habitat. Pine Creek, including its tributary Singer Creek, has the greatest extent of Chinook critical habitat at approximately 18 miles. Singer Creek represents approximately 4.5 miles of this habitat. Initial critical habitat determinations for winter-run Chinook in 1993 did not include non-natal rearing habitats as research documenting their use by winter-run had not yet been performed. It is likely that future revisions of winter-run critical habitat will include these non-natal rearing habitats.

Non-natal rearing habitats for Chinook salmon are significant in several respects. Similar to floodplain rearing habitats, intermittent streams provide greater growth opportunities than the mainstem Sacramento River (Limm and Marchetti 2003; Maslin et al. 1997). These habitats provide juvenile fish the opportunity to attain migratory size earlier or attain greater size prior to downstream migration. Greater size can confer advantages such as reducing the risk of predation. Research has demonstrated that the extent of non-natal habitat use is widespread and non-natal Chinook juveniles travel many miles upstream. This may represent a significant component of life history diversity that may aid recovery, long-term persistence and lessen extinction risk. For example, in addition to the advantages conferred by increased growth and better condition, non-natal rearing could buffer juveniles from potential catastrophes that might simultaneously impact the mainstem and floodplain rearing habitats as they are hydrologically connected.

Critical habitat for steelhead trout was identified by NMFS within Inks, Salt and Dye Creeks (Figure 5). The one mile of steelhead habitat in Salt Creek is entirely below its confluence with New Creek, an Antelope Creek channel, and is likely based upon the hydrologic connectivity to steelhead habitats in Antelope Creek. Steelhead habitat in Inks Creek is the same as that for non-natal spring-run Chinook habitat, which is approximately the first 1.5 miles of stream channel. Critical habitat in Dye Creek runs from the confluence with the Sacramento River upstream approximately 12 miles to an elevation of approximately 900 feet. As year round juvenile trout rearing is typically confined to areas above 1,200 to 1,400' feet in elevation due water temperatures, steelhead rearing habitats within Dye Creek may be marginal in condition.

Potential Adverse Conditions

Unlike the larger east side Tehama County tributaries that support anadromous salmonids including Antelope and Paynes Creeks, the smaller streams have received comparatively limited assessment, planning, and restoration to address adverse conditions. The two Central Valley wide restoration documents that provided restoration action recommendations for Paynes and Antelope Creeks (CDFG 1993; USFWS 2001) do not directly address restoration actions for the smaller tributaries covered in this section. A high priority action identified in the Final Restoration Plan of the Anadromous Fisheries Restoration Program (AFRP) was to “evaluate the contribution of small Sacramento River tributaries as rearing areas for juvenile winter-, spring-, fall- and late-fall-run chinook salmon and steelhead” (USFWS 2001). The resulting work of Maslin and others (1996-1999) on anadromous salmonid non-natal rearing habitats provides some of the best summaries of adverse conditions within most of these smaller streams. The channel and riparian condition results and restoration recommendations of Maslin and others (1996-1999) are included here though are limited to the lowermost portions of these streams consistent with the distributions of non-natal rearing habitats.

East-side Tehama County streams used for non-natal rearing largely retain basic stream processes and structure with adverse conditions resulting primarily from localized loss of channel diversity and riparian vegetation (Maslin et al. 1999). Maslin et al.(1999) attributes the degradation of these streams to three primary causes: 1. Channelization, bank protection or flood control; 2. Human encroachment (farmland or residences) on riparian zones and channels; 3. Loss of channel form and riparian vegetation to unregulated grazing over the last 100 years.

The physical stability of non-natal rearing stream reaches were assessed by Maslin et al. (1997) by approximating the Proper Function Condition (PFC) classes of the Bureau of Land Managements (BLM) Proper Functioning Condition Protocol (BLM 1995). Non-functioning conditions do not necessarily mean that these reaches do not currently serve as rearing habitats but rather channel condition is poor and could be vulnerable to further degradation (Maslin et al. 1999). Surveys performed in Inks, Salt, Dye, Toomes and Pine Creeks identified areas of poor channel condition within most of these streams (Table 17).

Table 17. Areas of riparian degradation within non-natal rearing habitats within Inks, Salt, Dye, Toomes (Dry) and Pine Creeks (adapted from Maslin et al. 1997).

Stream	Stream km (from Sac. River)	Condition Class
Inks Creek	0.1	Functioning At Risk
Inks Creek	1.0	Properly Functioning Condition
Inks Creek	1.8	Properly Functioning Condition
Salt Creek	1.6	Functioning At Risk
Salt Creek	5.8	Non Functioning
Dye Creek	1.6	Properly Functioning Condition
Dye Creek	3.6	Properly Functioning Condition
Dye Creek	4.7	Non Functioning
Dye Creek	4.8	Non Functioning
Toomes Creek	1.0	Functioning At Risk
Toomes Creek	1.5	Properly Functioning Condition
Toomes Creek	2.4	Functioning At Risk
Pine Creek	4.0	Properly Functioning Condition
Pine Creek	7.1	Properly Functioning Condition
Pine Creek	9.1	Properly Functioning Condition
Pine Creek	10.6	Non Functioning

Areas of riparian vegetation degradation for non-natal rearing reaches within these streams were also identified by Maslin et al. (1997). Maslin et al. (1997) found that most devegetated riparian areas were the result of deliberated management decisions and that riparian vegetation would likely regenerate on their own if not continually suppressed. Salt, Dye, Toomes and Pine Creeks contain areas of riparian degradation (Table 18).

Table 18. Areas of riparian degradation within non-natal rearing habitats within Inks, Salt, Dye, Toomes (Dry) and Pine Creeks (adapted from Maslin et al. 1997).

Stream	Vicinity	Adverse Condition	Length of Stream Affected (km)
Salt Creek	Hwy 99	No Vegetation	1.60
Salt Creek	Tuscan Springs Blvd.	No Vegetation	4.35
Dye Creek	Shasta Blvd.	Sparse Vegetation	2.95
Toomes Creek	Hwy 99	Sparse Vegetation	0.60
Pine Creek	Bennett Road	Denuded Canal	2.99
Pine Creek	Wilson Landing Road	Exotic Vegetation	1.10

DATA GAPS

Several data gaps limit the certainty of this assessment in determining the current status of and potential adverse conditions confronting the fisheries and aquatic resources found within streams of the Tehama East planning area. These data gaps fall roughly into three categories: Status and trends of fish; Specifics of habitat use by fish; Quality of existing habitat; Migration barriers; and Condition of riparian zones.

Fish Status and Trends

In general there is limited information on fish status and trends within the assessment area. Presently, adult salmonid monitoring is limited to Antelope Creek where spring-run Chinook adults are monitored by summer dive counts and spawning surveys. Steelhead adult returns could potentially be monitored by the video weir established in 2007, though this was in operation for only a single year. Data gaps include the monitoring of steelhead and Chinook salmon adult returns and spawning in all other streams that support these species.

Monitoring the abundance and condition of juveniles or juvenile out-migrants is also not performed on any of the streams within the planning area. Exploratory downstream migrant monitoring for steelhead smolts in Paynes Creek could determine if this stream still supports a remnant steelhead run. For Antelope Creek, that supports regular Chinook salmon and steelhead spawning, the collection of data on juvenile salmon and steelhead may be warranted. In-stream monitoring in rearing areas could establish reproductive success, over-summer/winter survival and potential limitations of freshwater carrying capacity. Downstream migrant monitoring in the lower reaches of Antelope Creek could achieve overall juvenile production rates per spawner for spring run Chinook and help identify potential adverse conditions within the migration corridor.

Habitat Use

In some cases data is limited on how fish are utilizing habitats under current conditions. For several of these streams there is little information regarding how steelhead trout are using potential spawning and rearing habitats. In particular, Paynes, Dye, Toomes and Pine Creeks may have spawning and rearing habitats that support steelhead trout. Documenting steelhead presence/absence, year to year variability in habitat use, and identifying spawning and rearing distributions would enable the development of focused actions to address any potential adverse conditions within the upper watersheds or migration corridors.

Channel and Riparian Conditions

Maslin (1996-1999) provided a useful though limited description of channel characteristics and riparian zones for non-natal rearing habitats in these smaller east-side streams. As these habitat assessments were limited to the lower reaches of streams, an assessment of channel and riparian conditions for a greater portion of the stream network would be beneficial. Additional focused study may also be warranted to identify the channel characteristics that increase fish abundance, growth and survival in non-natal rearing habitats. This may aid in identifying superior site specific restoration prescriptions. The restoration of degraded channel and riparian areas identified by Maslin et al. (1997) are actions that can be implemented in the short term without reliance on further habitat assessments.

Diversions and Fish Migration

There is little compiled information on how seasonal diversions may be modifying stream flows for most of the streams within this assessment. The sampling methodology of Maslin et al. (1997) did not identify the potential impact of upstream diversions on intermittent streams. Rearing juvenile salmonids, natal or non-natal, can get trapped in stream channels in the spring if stream waters recede prior to downstream migration. Identifying the potential impact of diversions that divert water prior to the completion of juvenile downstream migration from these streams would be beneficial. Additionally, the braided channel configuration of lower Antelope Creek would also benefit from an assessment of how fish are currently using and migrating through these reaches and if the reductions in flow due to diversions and channel braiding are a limiting factor for upstream and downstream fish migration.

Hoag Slough and Seven Mile Creek

Hoag Slough and Seven Mile Creek are largely a data gaps in themselves. These water bodies were not included in the non-natal rearing habitat studies of Maslin et al. (1996-1999). Data gaps include the native and non-native fish that use these streams and the potential adverse conditions present.

CONCLUSIONS AND RECOMMENDATIONS

This assessment has identified the species diversity and potential adverse conditions of the fisheries and aquatic resources for nine smaller Tehama County streams east of the Sacramento River. While most of these streams lack large populations of spawning salmon and steelhead, their value as habitats for native fish and rearing habitats for threatened and endangered salmonids spawned elsewhere is significant. Recent research has documented that intermittent streams provide superior growth rates and condition for salmonids than available in the mainstem Sacramento River (Limm and Marchetti 2003; Maslin et al. 1997). Additionally, Maslin (1997) documented a general trend for increased non-natal stream use by spring-run Chinook in the vicinity of streams used for spawning. Looking to the future, large salmon and steelhead restoration projects in Tehama County like the one in Battle Creek may serve to increase the use of these nearby intermittent tributaries by winter-run and spring-run Chinook salmon. As the use of intermittent tributaries by hatchery produced salmonids and non-native fishes are less common, restoration efforts would primarily benefit native fishes including threatened and endangered salmonids. Recommendations include: restoring degraded stream channel and riparian zones; addressing impediments to migration; and addressing the data gaps that limit effective management.

The restoration of degraded stream channels and riparian zones should proceed with the eventual goal of restoring stream and riparian processes that create and maintain habitats and not be limited to a single species approach (e.g. Chinook salmon). As many of the riparian and channel modifications occur on the valley floor and within juvenile rearing reaches, these reaches are a high priority for restoration efforts. The watershed specific descriptions of degraded channel reaches and riparian conditions within rearing reaches provide sufficient information to develop restoration actions for these sites. Strategies that combine channel restoration actions with flood prevention goals can often simultaneously provide fish access to low velocity refuges and increase channel capacity to reduce the risk of flooding on private ownerships.

Current impediments to up and down stream fish migration should be remedied where they have been identified, (e.g. road crossings in Antelope, Dye and Salt Creeks) and assessed in greater detail where information is lacking. Areas in need of further assessment include the Antelope Creek braided channel, potential steelhead trout migration corridor in Paynes Creek and potential stream flow reductions in intermittent rearing habitats by upstream diversions in the remaining watersheds.

High nutrient levels in lower Antelope Creek may also warrant treatment or more focused assessment. From the data available, combine nitrate and nitrite levels appear to be increasing steadily since approximately 1988 (Blankinship and Associates 2008). While high nutrient loads can lead to a depletion of dissolved oxygen conditions in streams and threaten native fish, the current impact on Antelope Creek fish are not known.

Several data gaps also need to be addressed as previously summarized. These include: 1. Identifying the channel and riparian conditions in a greater portion of the upper watershed to identify degraded reaches that warrant restoration; 2. Long term monitoring, at a minimum, for all adult anadromous salmonids; 3.

Documenting the potential steelhead trout use of stream habitats within Paynes, Dye, Toomes and Pine Creeks as this is a necessary first step in identifying potential limiting factors in upstream spawning and rearing habitats and the migration corridor; 4. Fish use and habitat conditions in Seven Mile Creek and Hoag Slough.

REFERENCES

AFRP 2009. Pine Creek Orchards watershed riparian easement acquisition: Project Description. http://www.fws.gov/stockton/afrp/project.cfm?code=1996-10

Araki, H. B. Cooper, and M. S. Blouin. 2007. Genetic effects of captive breeding causes a rapid, cumulative fitness decline in the wild. Science 318: 100-103.

Blankinship and Associates. 2008. East side Tehama county watershed assessment: Surface water quality data evaluation.

BLM 2008: Tehama Recreation Summary. Bureau of Land Management. http://www.blm.gov/ca/st/en/fo/redding/recreationmain/reddingrecreationtehama.html

BLM 1995. Riparian area management, Process for assessing proper functioning condition. U.S. Dept. of the Interior, Bureau of Land Management. Technical Reference 1737-9.

BOR 2004. Shasta Lake water resources investigation: Initial alternatives information report. U.S. Bureau of Reclamation, Mid-Pacific Region.

BOR 1991. Planning Report/Final Environmental Statement: Shasta Outflow Temperature Control. U.S. Bureau of Reclamation, Sacramento, California.

CDFG 2009. “Grand Tab” of Chinook Adult Returns. California Department of Fish and Game. http://www.calfish.org/LinkClick.aspx?fileticket=wBrov44wiSY%3d&tabid=104&mid=524

CDFG 2008a. Press Release: Fish Stocking Program Will Continue Following Court Order, California Department of Fish and Game. http://www.dfg.ca.gov/news/news08/08131.html

CDFG 2008b. DFG Fish Stocking (Planting) 11/24/2008 through 1/1/2010, California Department of Fish and Game. http://www.dfg.ca.gov/news/stocking/

CDFG 2004a. Sacramento River spring-run Chinook salmon 2002-2003 Biennial Report. California Department of Fish and Game, Habitat

Conservation Division, Native Anadromous Fish and Watershed Branch. 35p.

CDFG 2004b. Sacramento River winter-run Chinook salmon 2002-2003 Biennial Report. California Department of Fish and Game, Habitat Conservation Division, Native Anadromous Fish and Watershed Branch. 23p.

CDFG 2001. Sacramento River spring-run Chinook salmon: 2001 Annual Report. .California Department of Fish and Game.

CDFG 1993. Restoring California Streams: A Plan For Action. California Department of Fish and Game.

DWR 2005. Fish passage improvement. California Department of Water Resources, Bulletin 250.

Hosea, R.C. and B. Finlayson. 2005. Controlling the spread of New Zealand mudsnails on wading gear. California Department of Fish and Game.

Lindley, S. T., Robert S. Schick, Aditya Agrawal, Matthew Goslin, Thomas E. Pearson, Ethan Mora, James J. Anderson, Bernard May, Sheila Greene, Charles Hanson, Alice Low, Dennis McEwan, R. Bruce MacFarlane, Christina Swanson, and John G. Williams. 2006. Historical population structure of Central Valley steelhead and its alteration by dams. San Francisco Estuary and Watershed Science. Vol. 4, Issue 1 (February 2006), Article 3.

Lindley, ST, Schick, R, May, BP, Anderson, JJ, Greene, S, Hanson, C, Low, A, McEwan, D, MacFarlane, RB, Swanson, C, Williams, JG. 2004. Population structure of threatened and endangered Chinook salmon ESUs in California's Central Valley Basin. NOAA-TN-NMFS-SWFSC-370.

Limm, M. P. and M. P. Marchetti. 2003. Contrasting patterns of juvenile Chinook salmon growth, diet and prey densities in off-channel and mainstem habitats on the Sacramento River. Prepared for The Nature Conservancy.

LNF 1998. Watershed Analysis for Mill, Deer and antelope Creeks, Almanor Ranger District, Lassen National Forest, U.S. Forest Service.

Maslin, P., W. R. McKinney, and T. L. Moore. 1996. Intermittent streams as rearing habitat for Sacramento River Chinook salmon (*Oncorhynchus tshawytscha*): 1996 Update.

Maslin, P., J. Kindopp, M. Lennox and W. R. McKinney. 1997. Intermittent streams as rearing habitat for Sacramento River Chinook salmon (*Oncorhynchus tshawytscha*): 1997 Update.

Maslin, P., J. Kindopp and M. Lennox. 1998. Intermittent streams as rearing habitat for Sacramento River Chinook salmon (*Oncorhynchus tshawytscha*): 1998 Update.

Maslin, P., J. Kindopp, M. Lennox and C. Storm. 1999. Intermittent streams as rearing habitat for Sacramento River Chinook salmon (*Oncorhynchus tshawytscha*): 1999 Update.

McElhany, P., M.H. Ruckelshaus, M.J. Ford, T.C. Wainwright, and E.P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionarily significant units. U.S. Dept. of Commerce, NOAA Tech. Memo. NMFS-NWFSC-42,156 p.

McEwan, D. R. 2001. Central Valley Steelhead. Pages 1-44 *In* Contributions to the Biology of Central Valley Salmonids, State of California, The Resources Agency, Department of Fish and Game, Fish Bulletin 179.

Moyle, P. B. 2002. Inland fishes of California. Revised and expanded. University of California Press, Berkeley, CA. 502 pp.

Moyle, P. B., and M. P. Marchetti. 1999. Applications of indices of biotic integrity to California streas and watersheds. Pages 367-380, *In* T.P. Simon ed., Assessing the sustainability and biological integrity of water resources using fish communities.

Moyle, P. B., R. M. Yoshiyama, J. Williams, and E. D. Wikramanayake. 1995. Fish species of special concern in California. Second Edition. Prepared for the State of California, The Resources Agency, California Department of Fish and Game.

NMFS 1998. Central Valley Chinook Salmon: Current Stream Habitat Distribution Table. National Marine Fisheries Service. http://swr.nmfs.noaa.gov/hcd/dist2.htm

NMFS 1997. NMFS Proposed Recovery Plan for the Sacramento River Winter-run Chinook Salmon. National Marine Fisheries Service, Southeast Region, Long Beach, California.

NOAA 2008. Critical Habitat Description. NOAA Fisheries. http://www.nmfs.noaa.gov/pr/species/criticalhabitat.htm

NOAA 2005. Endangered and Threatened Species; Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon and Steelhead in California; Final Rule. Federal Register / Vol. 70, No. 170 / Friday, September 2, 2005 / Rules and Regulations.

Sommer, T. R., M. L. Nobriga, W. C. Harrell, W. Batham, and W.j. Kimmerer. 2001. Floodplain rearing of juvenile Chinook salmon: evidence of enhanced growth and survival. Canadian Journal of Fisheries and Aquatic Sciences 58(2): 325-333.

USFWS 2001. Final Restoration Plan for the Anadromous Fish Restoration Program: A Plan to Increase Natural Production of Anadromous Fish in the Central Valley of California. U.S. Fish and Wildlife Service.

USFWS 1995. Working paper on restoration needs: habitat restoration actions to double natural production of anadromous fish in the Central Valley of California. Volumes 1-3. May 9,1995. Prepared by the U.S. Fish and Wildlife Service under direction of the Anadromous Fish Restoration Core Group. Stockton, California.

Williamson, K.S. and B. May. 2005. Homogenization of Fall-Run Chinook Salmon Gene Pools in the Central Valley of California, USA. North American Journal of Fisheries Management 25:993–1009.

Yoshiyama, R.M., E.R. Gerstung, F.W. Fisher, and P.B. Moyle. 2001. Historical and Present Distribution of Chinook Salmon in the Central Valley Drainage of California. Pages 71-176 *In* Contributions to the Biology of Central Valley Salmonids, State of California, The Resources Agency, Department of Fish and Game, Fish Bulletin 179.

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Section 8

Section 8

Vegetation Resources

TABLES

FIGURES

SOURCES OF DATA

The following is a list of primary resources utilized for the vegetation resources section of the Tehama East Watershed Assessment:

- CALVEG habitat mappings and GIS layers (U.S. Forest Service 1999)
- Wildlife Habitats of California (Mayer and Laudenslayer 1988)
- Lassen Foothills Vegetation Mapping Project (Buck and Evans 2009)
- California Natural Diversity Database (2010)
- California Native Plant Society Electronic Inventory (2010)
- Tehama County General Plan (2008)
- Butte County General Plan Public Review Draft (2009)
- USDA Lassen National Forest Land and Resource Management Plan (1992)
- Annual Crop Report (Tehama County Agricultural Commissioner 2009)
- California Invasive Pest Council Inventory (2006 and 2007a)
- California Department of Food and Agriculture Noxious Weed List (2009)
- California Interagency Noxious Weed Coordinating Committee CalWeed Database
- Tehama County Voluntary Oak Woodland Management Plan
- California Department of Conservation Land Mapping Program

The vegetation community information in this section is largely based on the CALVEG classification which meets the floristically based level of the National Vegetation Classification Standard hierarchy (U.S. Forest Service 1999). The mission of the CALVEG team is to classify vegetation communities throughout California for statewide resource planning. Vegetation community mapping is completed by life form using canopy reflectance values in the LANDSAT satellite. The area within the Tehama East watershed boundary was last updated in 1999 using a 2.5 acres minimum mapping unit. The CALVEG community types were cross-walked with the Wildlife Habitats of California (Mayer and Laundenslayer 1988). Information on special-status plant species was primarily taken from the California Natural Diversity Database (CNDDB; CDFG 2010), California Native Plant Society (CNPS 2010) and the USFWS (USFWS 2010). Invasive species information was derived mostly from the California Invasive Pest Council (Cal-IPC 2006 and 2007a) and the California Department of Food and Agriculture (CDFG 2009).

HISTORICAL CONTEXT

American Indian Tribes such as the Nomlaki, and Yana inhabited the Tehama East Watershed for at least 4,500 years prior to Euro-American settlement, and since that time humans have influenced vegetation types and patterns throughout the area (PMC 2008). Riparian forests dominated the vast floodplain adjacent to the Sacramento River. These forests gave way to blue oak-foothill pine woodland with grasses and forbs. It is believed that Native Americans intentionally burned the watershed's rangelands, based on the existing diversity of plant communities and the complexity of their distribution across the landscape. Their sustainable management and use of the watershed's once abundant natural resources was the basis of their subsistence hunter/gatherer economy. The population of American Indians in the watershed plummeted following the discovery of gold in 1848. Euro-American settlers and prospectors took control of waterways and land where the American Indians fished salmon, hunted game, and foraged for fruits, acorns and roots.

The earliest Euro-American settlers arrived in 1844, received land grants along the Sacramento River, and established cattle ranches and farms up into the Sierra foothills. The earliest towns (Tehama, Red Bluff, and Vina) occurred along the River where barges of supplies could be loaded and unloaded en route to the San Francisco Bay Area and Sierra settlements and gold mines. Settlers cut down much of the riparian forests along the Sacramento River and its tributaries as well as blue oaks and foothill pine to provide wood for construction and fuel and to open up land for pastures and farmland. With the completion of the Oregon & California Railroad in the mid 1870s, the area's population grew and productivity increased. Land owners managed their land with frequent fires and heavy grazing. Introduced grasses and forbs outcompeted native species and the landscape forever changed.

Flour and saw mills opened near Red Bluff and Antelope Creek in the 1850s (Lewis 1891). The Sierra Flume and Lumber Co. opened a mill in Red Bluff and by 1877 was the largest lumber company in the world (Moon 2003). Farms in Tehama County grew in number from 600-800 in the late 1800s to over 1,000 in 1910 (PMC 2008). Fire suppression efforts began in the early 1900s which lengthened historic fire return intervals (Schmidt 2009). Reservoir and canal construction beginning in the 1930s led to the regulation and storage of water for irrigation and municipal purposes and significantly altered the watershed's hydrology. The number of farms in Tehama County peaked at 1,890 in 1945 (PMC 2008) with the completion of Shasta Dam. While the number of farms in the county began to level off, farm acreage grew steadily until the mid 1970s at which time orchard production increased (PMC 2008).

Tehama County's first General Plan, written in 1962, as well as the Williamson Act of 1965, helped manage growth and development and promote land conservation. Organizations such as The Nature Conservancy (TNC), Department of Fish and Game (DFG), and Bureau of Land Management (BLM) created wildlife preserves along Dye, Antelope and Paynes Creek and Vina Plains. Senate Bill 1086, passed in 1986, mandated the protection and restoration of riparian habitat along the Sacramento River. In 2004, the California Legislature passed the Oak Woodlands Conservation Act providing greater protection under CEQA.

FOREST MANAGEMENT

Historically, the timber industry has been an important component of the economic base in Tehama and Butte County. The area provided lumber during periods of high demand such as the Gold Rush and both World Wars. Active timber management and harvesting began shortly after the Second World War and by the 1970s, selective harvesting was practiced in order to regenerate understory vegetation and maintain wildlife habitat as part of the Forest Practice Act of 1973. Timber harvests in Tehama County decreased by nearly 50 percent between 1980 and 2003 due to increased restrictions on public lands (PMC 2008). Concerns over endangered and threatened species contributed to a decline in logging during the 1990s. Today, timber resources make up over 239,000 acres or approximately 13 percent of Tehama County land (PMC 2008). Approximately 24 percent of the County's land is managed by the Federal Government and over 70 percent is privately owned (PMC 2008).

Timber harvesting is limited to the eastern, or forested, portion of the watershed in Paynes, Antelope, and Pine Creek. Much of the forests in the upper watershed are managed by the National Forest Service and Sierra Pacific Industries. Their Management Plans include provisions to maintain plant species diversity and acreages of vegetation successional stages. They also address concerns over threatened and endangered species, old growth retention, reduced clear cutting, and management of riparian areas. Much of the National Forest's Antelope Creek Management Area has burned at least two times over the last 80 years (USDA 1992). Prescribed fire programs are being implemented to reduce understory fuel loads in susceptible areas; however fire suppression is practiced for the purpose of protecting property and human lives.

DFG manages 46,482-acres of oak woodland, grassland and chaparral in the Tehama Wildlife Area in the Paynes and Antelope Creek portions of East Tehama Watershed. TNC manages the 37,540-acre Dye Creek Preserve and the Vina Plains preserve.

EXISTING PLANT COMMUNITIES

The distribution and abundance of vegetation in a given region is governed by climatic, edaphic and biotic factors. Climatic factors include patterns of temperature, precipitation, wind, and other meteorological elements over long periods of time. Edaphic factors refer to the soil conditions (e.g. sand, silt, loam, volcanic) while biotic factors refer to organism-organism interactions such as competition, predation, herbivory, and disease. All three factors set the conditions for plant communities to exist. Vegetation patterns closely correlate with elevation, aspect, microclimate, soils, and human-caused and natural disturbances. A diverse mosaic of vegetation exists within the Tehama East Watershed. Conifer, hardwood, shrub, and herbaceous vegetation form communities that provide ecological functions such as soil retention, flood control, and habitat for wildlife.

Vegetation habitats within the Tehama East Watershed were classified using CALVEG and cross-walked with Wildlife Habitat Relationship (WHR) habitat types (Mayer and Laudenslayer 1988). CALVEG is a state-wide vegetation community mapping layer developed by the California Gap Analysis Program. The CALVEG classification was selected because it provides comprehensive vegetation map data that covers the study area at a level of detail that is appropriate for this relatively broad-scale assessment. The WHR characterizes habitats into different types according to dominant vegetation and characteristics that are important to wildlife. The habitat types found within the Tehama East Watershed are shown in Figure 8-1. Corresponding acreages given in Table 1 were provided by the Tehama RCD.

Although the CALVEG system is a comprehensive mapping resource that covers the entire Tehama East Watershed area, Buck and Evans (2009) completed a detailed vegetation mapping and classification project that was completed for a significant portion of the watershed. The project area covers 108,400 acres in eastern Tehama County and includes South Denny Ranch, Tehama Wildlife Area, and Dye Creek Preserve. Classification of these 3 large parcels resulted in 35 vegetation alliances and 37 vegetation map units (Buck and Evans 2009).

The following is a description of the plant communities found within the Tehama East Watershed. The communities are organized by life form and the information is largely taken from CALVEG (U.S. Forest Service 1999) and Wildlife Habitats of California (Mayer and Laudenslayer 1988).

See Land Cove Maps, pages 85-92, Tehama East Watershed Assessment Atlas.

Table 1. Vegetation Types Found Within the Tehama East Watershed.

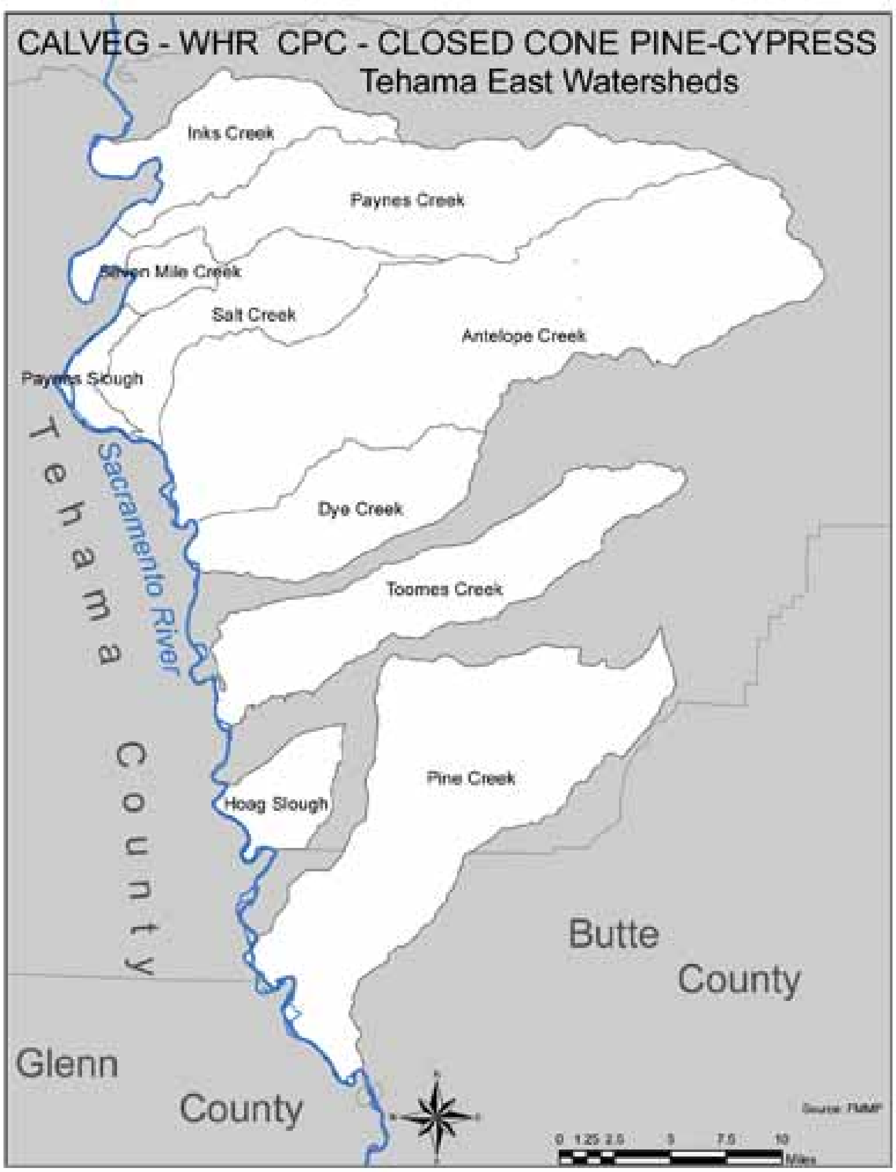
WHR TYPE	Acres	Percent of Tehama East Watershed
Conifer-dominated Habitats		
Closed Cone Pine-Cypress	9	0.00%
Douglas Fir	252	0.06%
Lodgepole Pine	20	0.00%
Ponderosa Pine	6,441	1.62%
Red Fir	42	0.01%
Sierran Mixed Conifer	39,719	10.01%
Montane Hardwoods Conifer	1,454	0.37%
White Fir	1,634	0.41%
Total	49,571	12.51%
Hardwood-dominated Habitats		
Blue Oak Foothill Pine	5,933	1.50%
Blue Oak Woodland	110,137	27.75%
Montane Hardwood	9,292	2.34%
Montane Riparian	86	0.02%
Valley Oak Woodland	2,646	0.67%
Total	128,094	32.33%
Shrub-dominated Habitats		
Mixed Chaparral	47,932	12.08%
Montane Chaparral	1,581	0.40%
Total	49,513	12.50%
Herbaceous-dominated Habitats		
Annual Grassland	126,415	31.85%
Wet Meadow	251	0.06%
Total	126,666	31.97%
Agriculture-Crops	4,488	1.13%
Urban	538	0.14%
Barren	93	0.02%
Lacustrine	654	0.16%
Unclassified Areas	37,258	9.39%
TOTAL	**396,221**	**100.00%**

Conifer-dominated Habitats

Conifer-dominated habitats make up nearly 13 percent of the Tehama East Watershed (nearly 50,000 acres). These habitats include closed-cone pine cypress, douglas fir, lodgepole pine, ponderosa pine, red fir, Sierran mixed conifer, montane hardwoods conifer, and white fir.

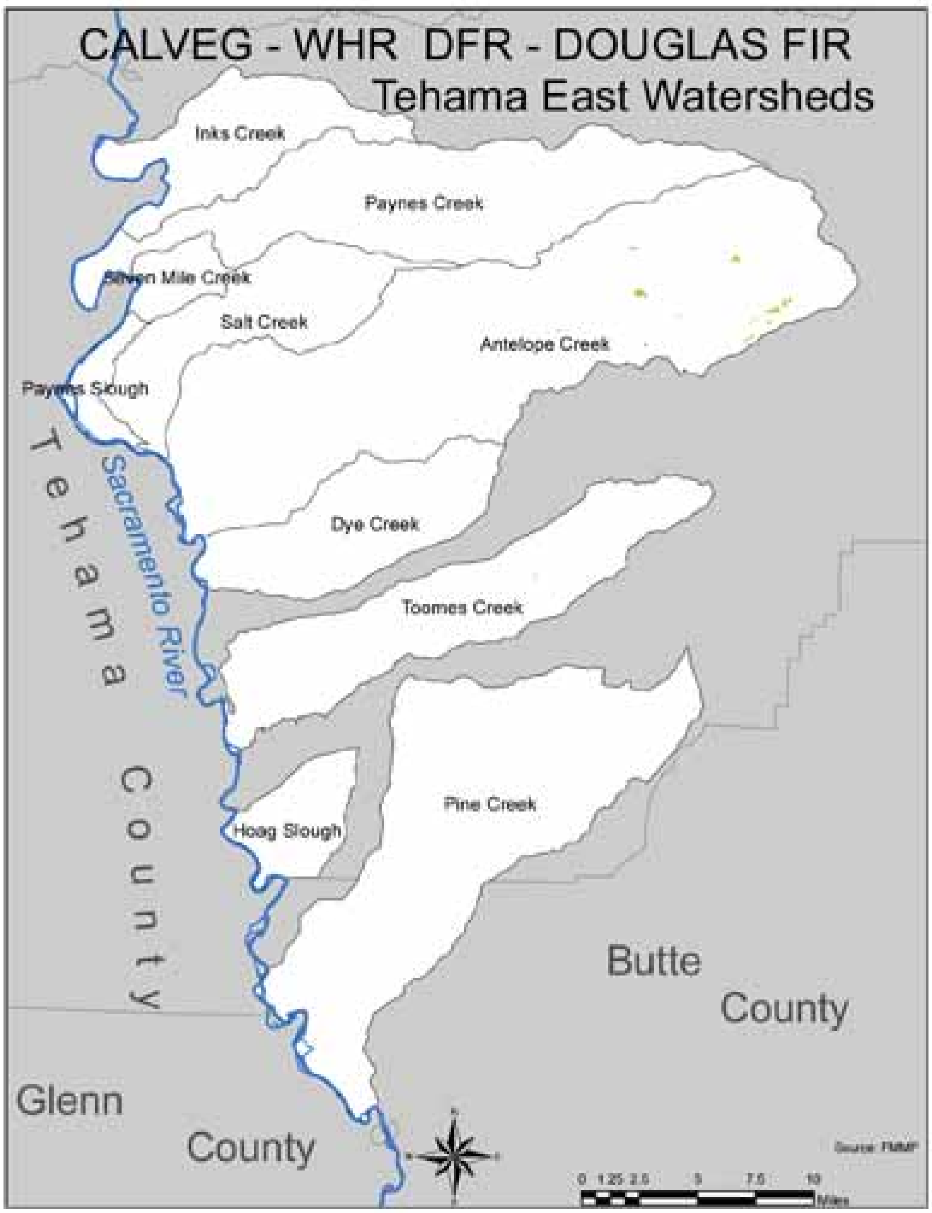
Closed Cone Pine-Cypress

Closed cone pine-cypress habitat (WHR:CPC) occurs on 9 acres of land within the watershed and has a scattered distribution among chaparral and forest habitats on rocky and infertile soils below 6,500 feet elevation. Dominant species include knobcone pine (*Pinus attenuata*), chamise (*Adenostoma fasciculatum*), and manzanita (*Arctostaphylos* spp.).

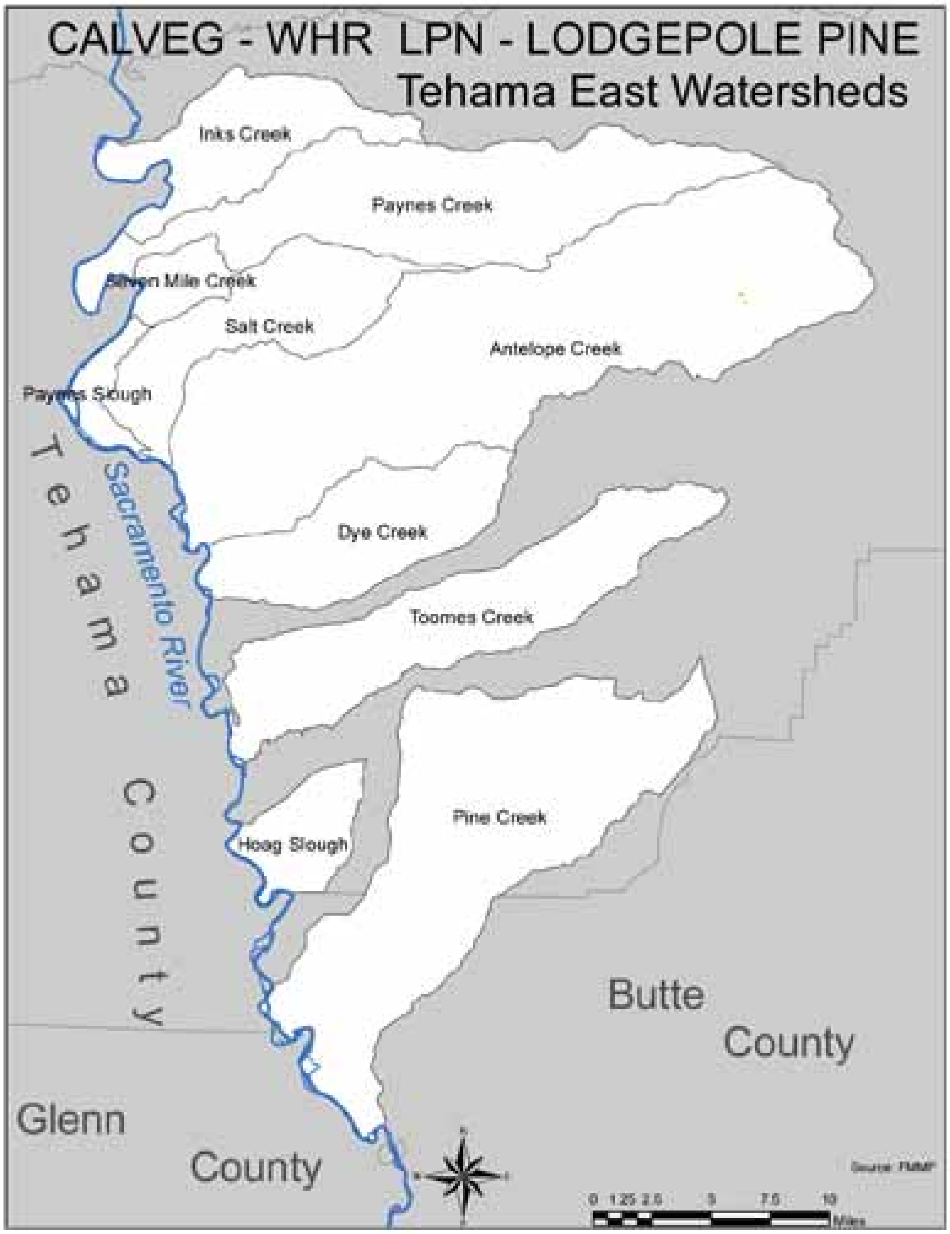


Douglas Fir

Douglas fir habitat (WHR:DFR) covers just over 250 acres of habitat within the watershed and occurs in a variety of conditions including dry steep slopes on volcanic and granitic soils as well as deep mesic soils. Douglas fir (*Pseudotsuga menziesii*) is associated with numerous species including tanoak (*Lithocarpus densiflora*), bigleaf maple (*Acer macrophyllum*), canyon live oak (*Quercus chrysolepis*), and chinquapin (*Chrysolepis* spp.).

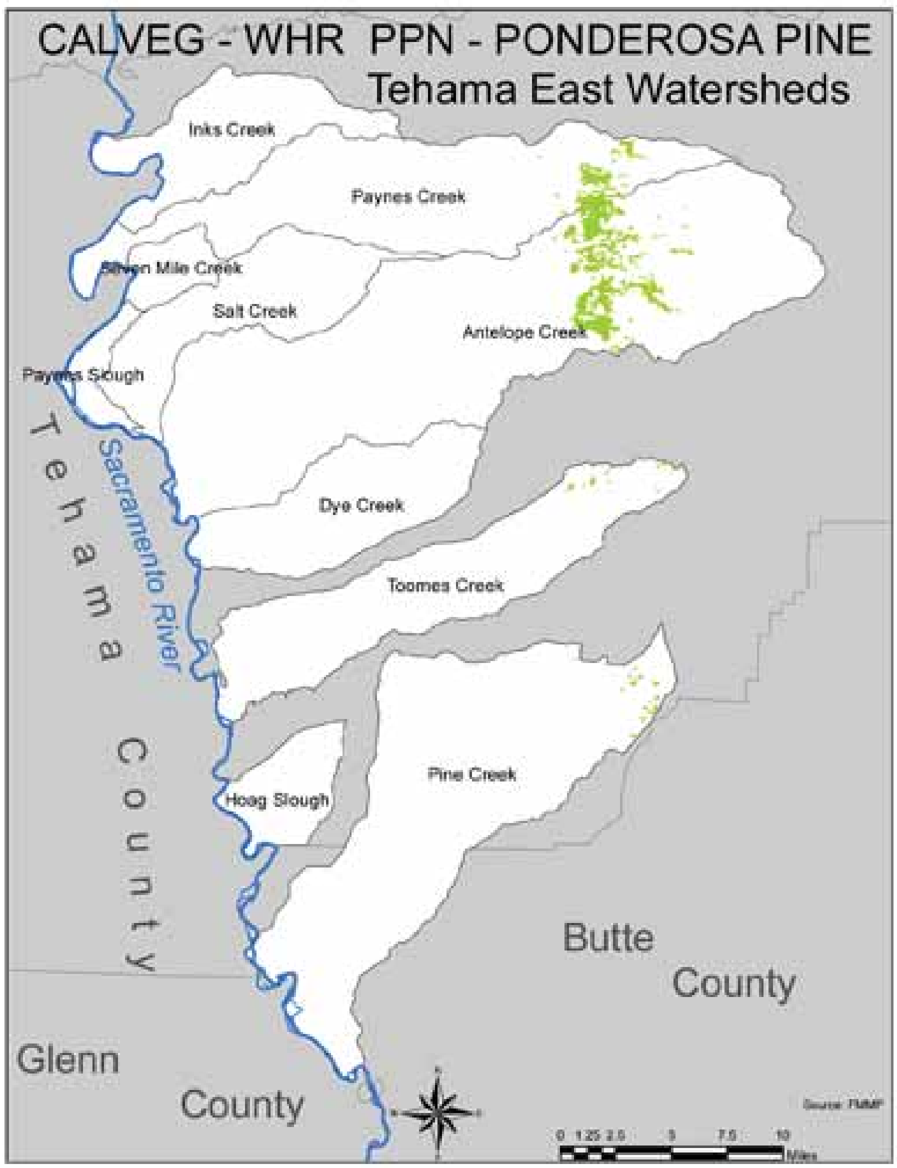


Lodgepole Pine
Lodgepole pine habitat (WHR:LPN) is associated with upper montane and subalpine seasonally saturated meadow margins and red fir habitat. It occurs on 20 acres of the watershed and is dominated by lodgepole pine (*P. contorta*).

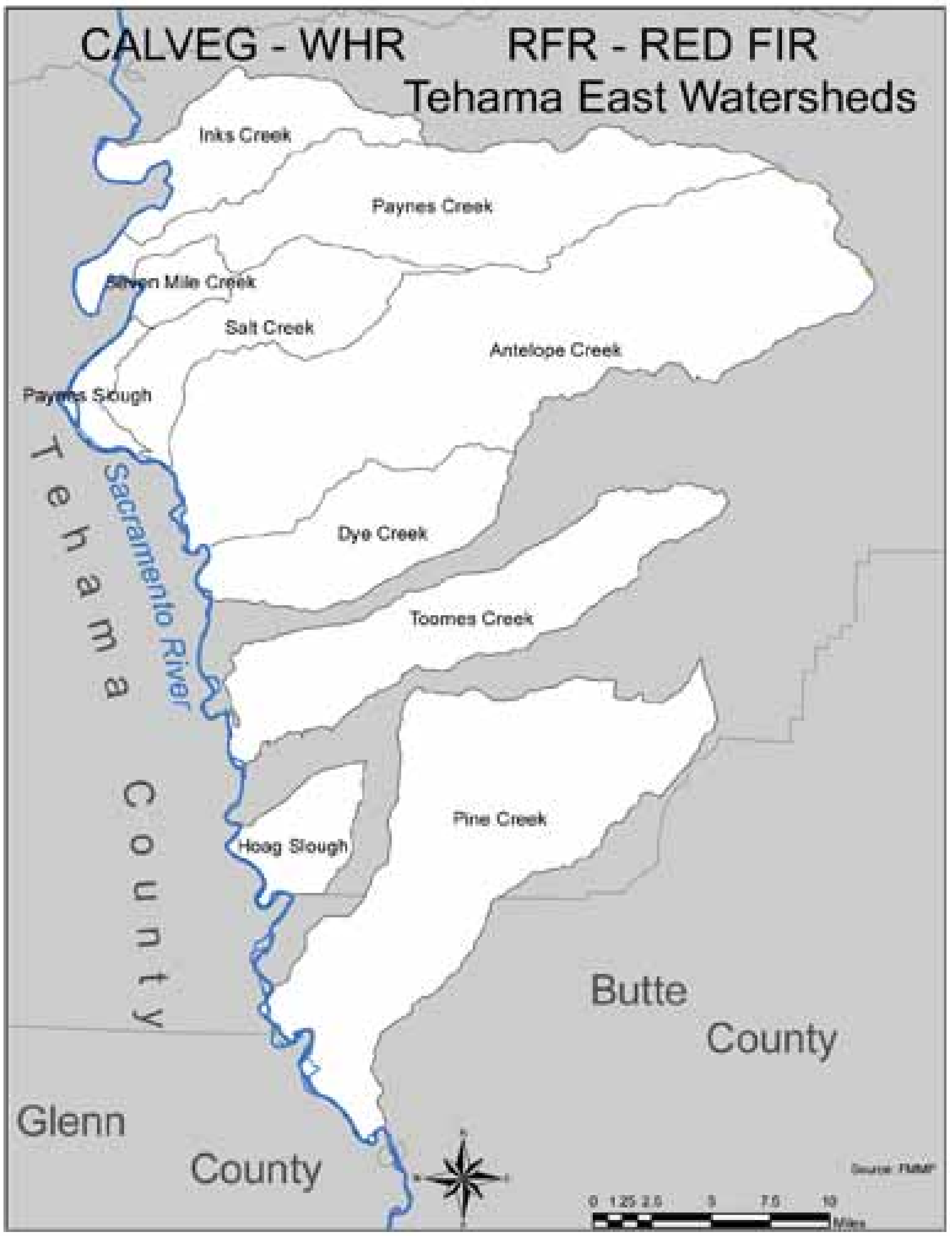


Ponderosa Pine

Ponderosa pine (WHR:PPN) covers over 6,400 acres of land within the Tehama East Watershed. It typically occurs above blue oak woodland and below mixed conifer habitats on well-drained soils with Sierran mixed conifer. Tree spacing in PPN ranges from open to dense. Species associated with ponderosa pine (*P. ponderosa*) include incense cedar (*Calocedrus decurrens*), Douglas fir, canyon live oak, black oak (*Q. kelloggii*), manzanita, ceanothus (*Ceanothus* spp.), poison oak (*Toxicodendron diversilobum*) and several others.

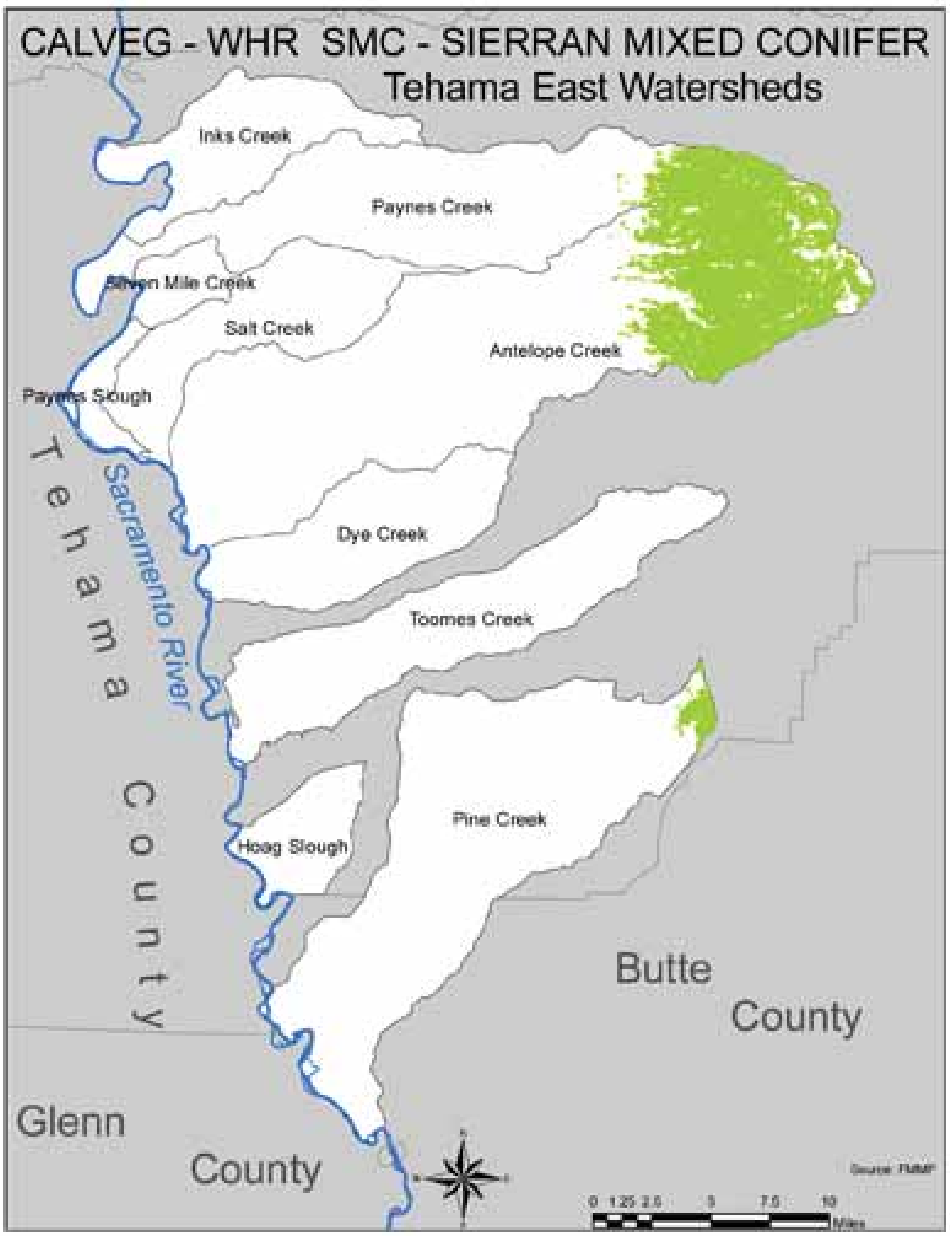


Red Fir
Red fir habitat (WHR:RFR) occurs at elevations greater than 6,000 feet on frigid soils and is found on just 42 acres within the watershed. Red fir (*Abies magnifica*) often forms dense monotypic stands which shade out most understory vegetation. RFR neighbors white fir, Sierran mixed conifer, LPN, and wet meadow habitats at its lower elevation range.

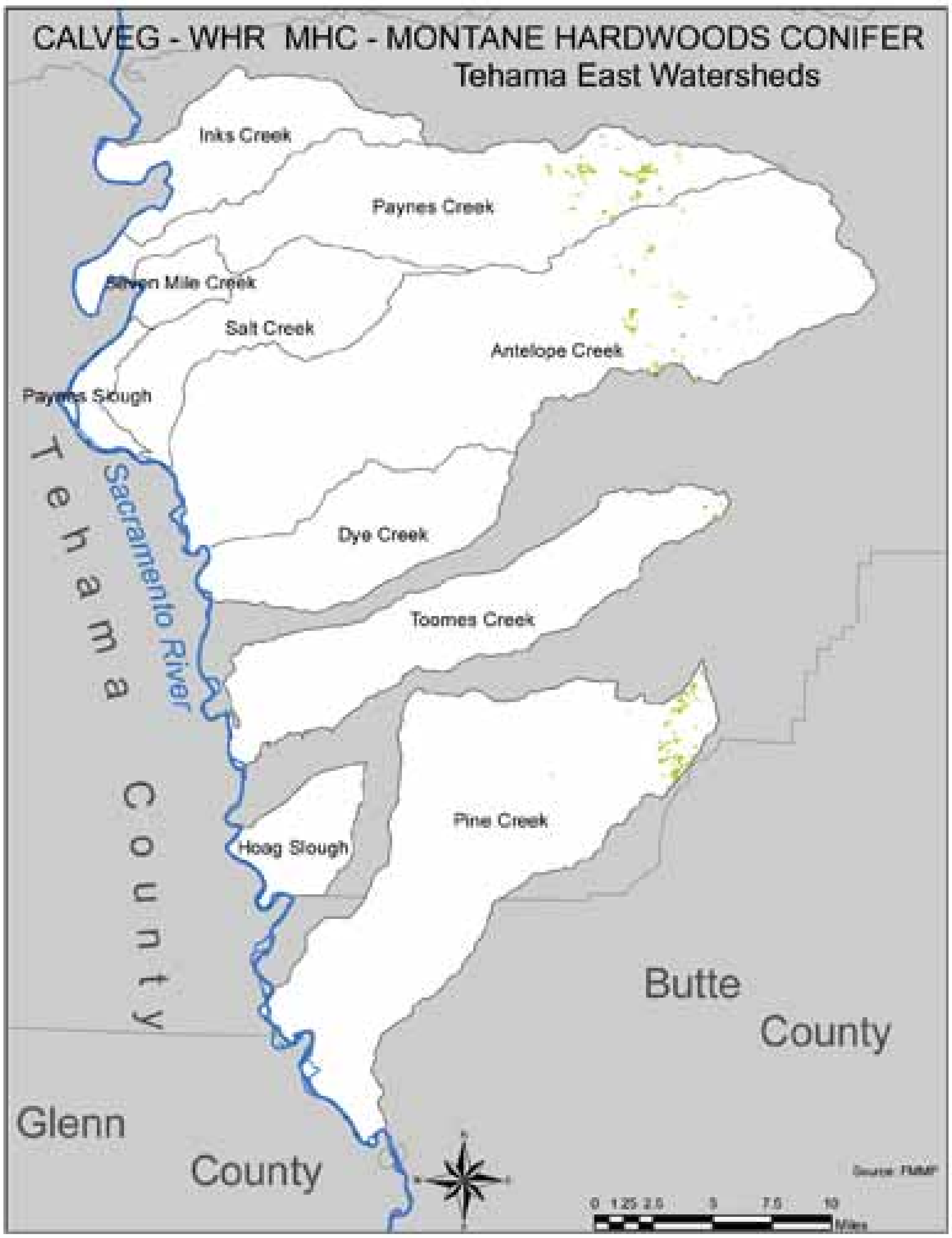


Sierran Mixed Conifer

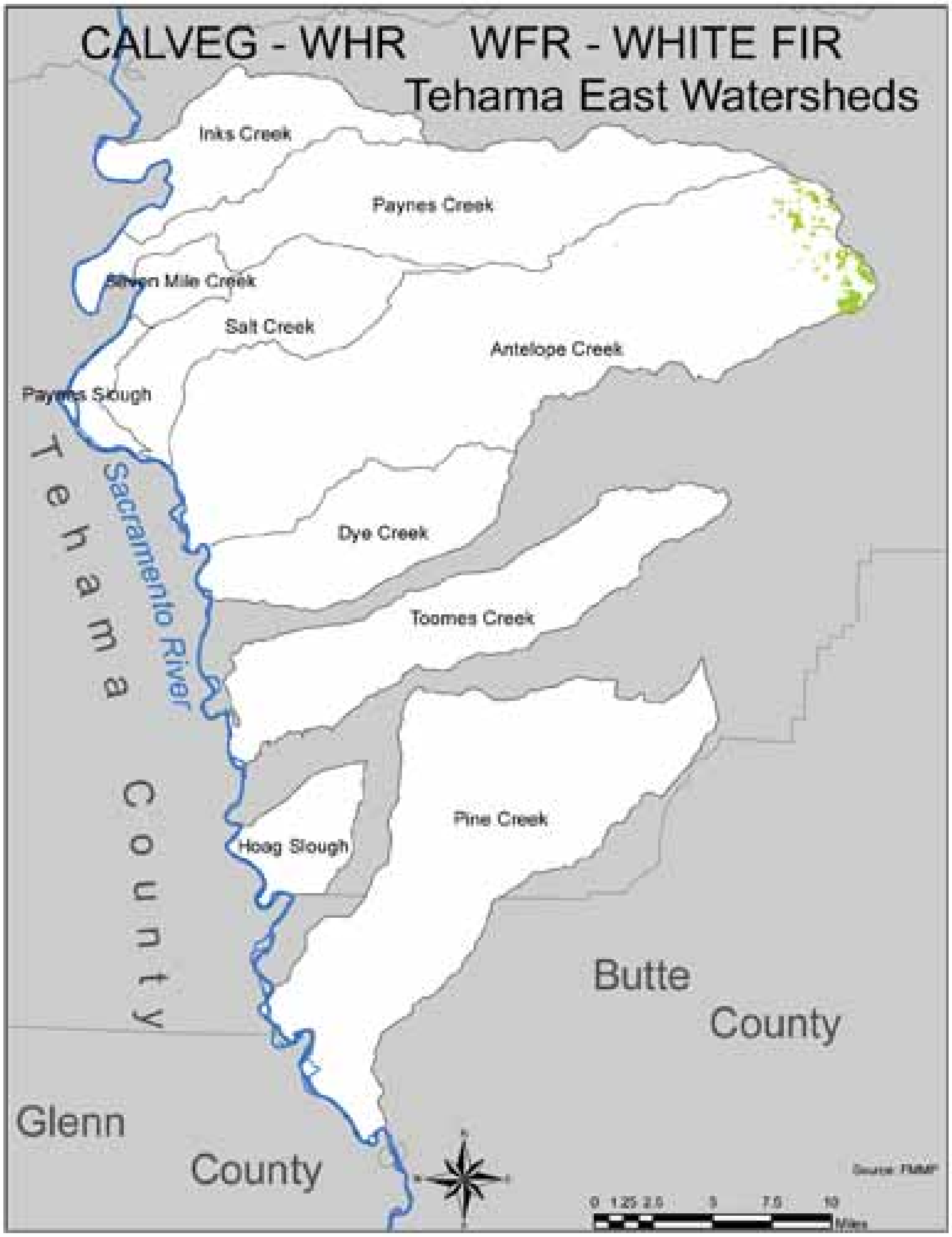
Douglas fir, ponderosa pine, sugar pine (*P. lambertiana*) , incense cedar, and black oak make up Sierran mixed conifer habitat (WHR:SMC) which occurs on approximately 40,000 acres within the Tehama East Watershed. Stands are typically dense, however canopy openings give way to understory shrubs such as deerbrush (*Ceanothus integerrimus*), manzanita, chinquapin, tanoak, gooseberry (*Ribes menziesii*), and rose (*Rosa* spp.). SMC occurs next to PPN at lower elevation and drier sites and with RFR at higher elevations.



Montane Hardwoods Conifer
Montane hardwood conifer habitat (WHR:MHC) occurs on less than 1,500 acres within the watershed. It is composed of at least one-third conifer crown cover and one-third hardwood crown cover and occurs on well-drained mesic soils at elevations up to 4,000 feet. This habitat is associated with black oak, bigleaf maple, white alder (*Alnus rhombifolia*), dogwood (*Cornus* spp.), Douglas fir, incense cedar and ponderosa pine.



White Fir
White fir habitat (WHR:WFR) occurs on over 1,600 acres of land within the watershed. It grows on a variety of soils often on north-facing slopes between SMC and RFR habitats. Trees typically form dense monotypic canopies; however the habitat occasionally associates with sugar pine, black oak, and Douglas fir.

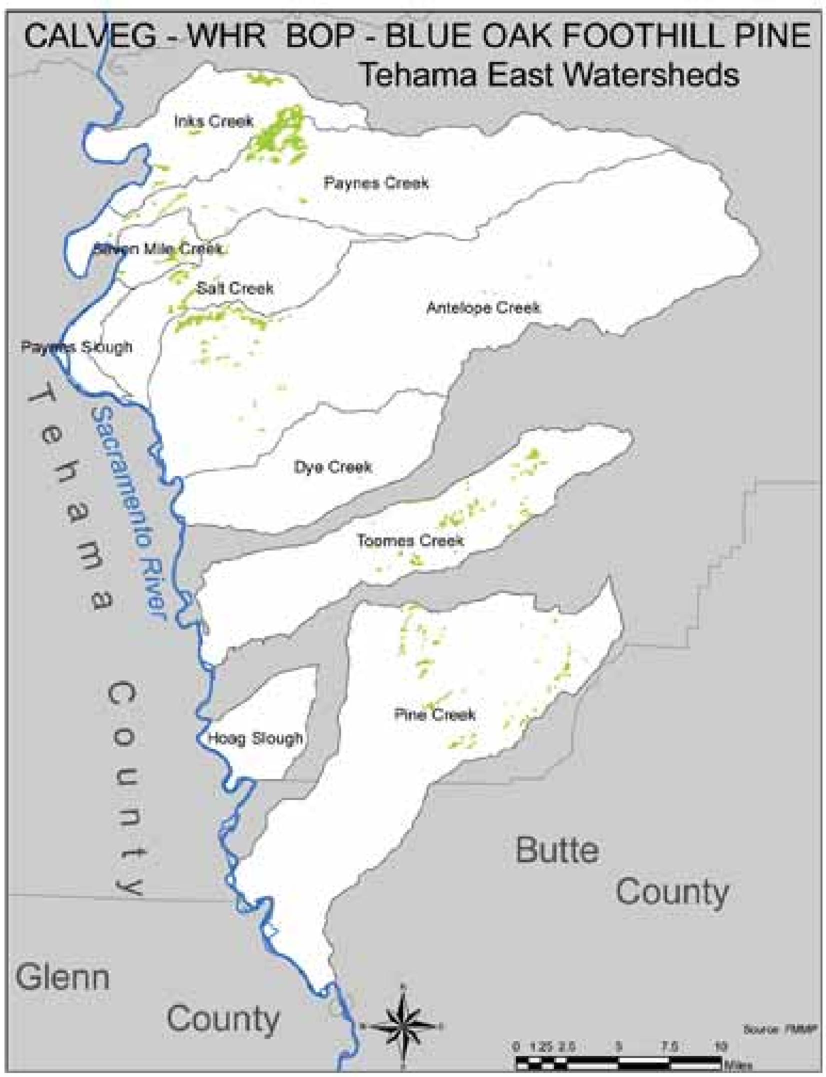


Hardwood-dominated Habitats

Hardwood-dominated habitats make up over 32 percent of the habitat types of the Tehama East Watershed (over 128,000 acres). These habitats include blue-oak foothill pine, blue oak woodland, montane hardwood, montane riparian, and valley oak woodland.

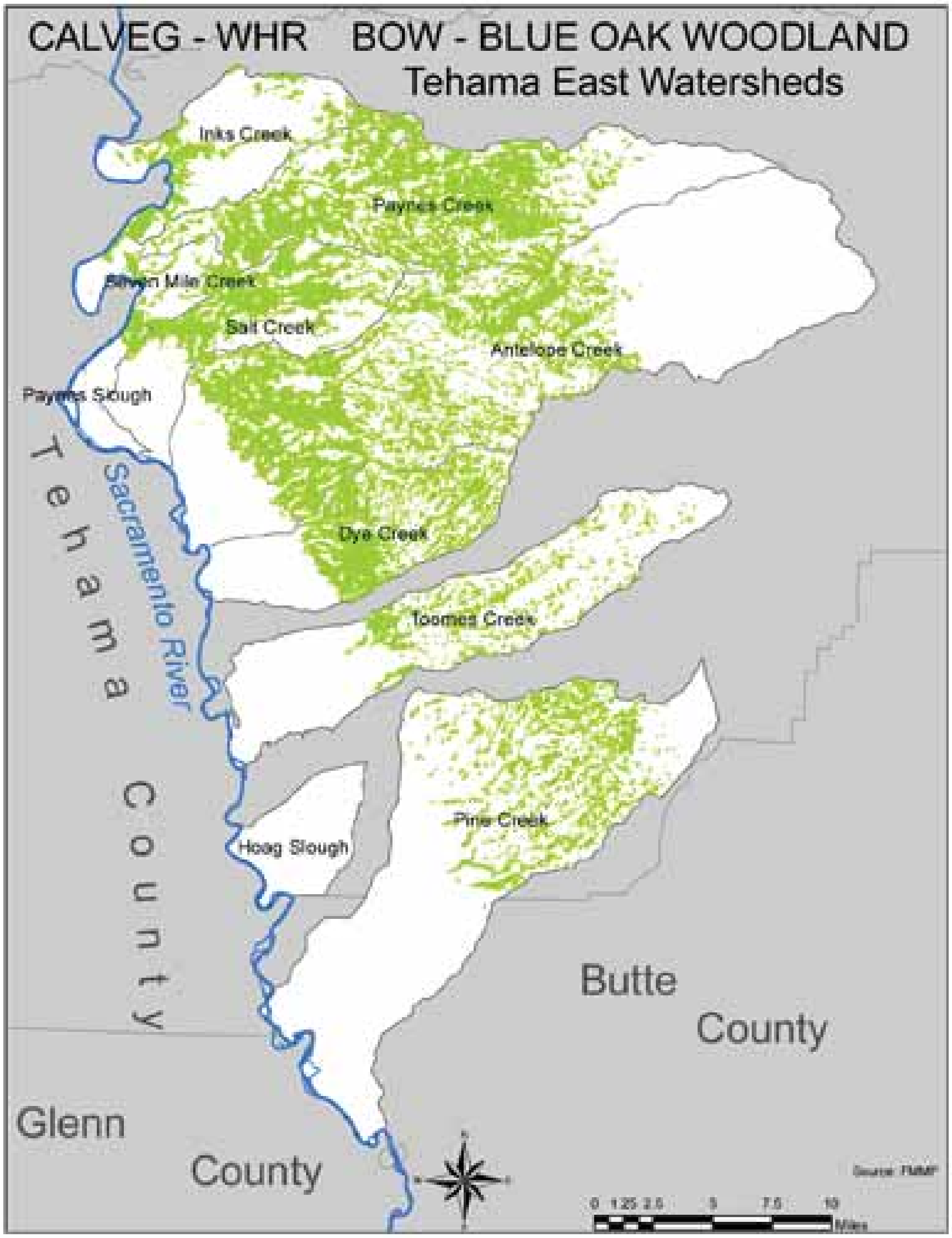
Blue Oak Foothill Pine

Blue oak foothill pine (WHR:BOP) habitat occurs on nearly 6,000 acres within the Tehama East Watershed, is dominated by blue oak (*Q. douglasii*), and is associated with interior live oak (*Q. wislizenii*) and California buckeye (*Aesculus californica*). Understory is typically made up of annual grasses, especially at lower elevations. Upper elevation sites may occur adjacent to PPN and mixed chaparral habitats and include shrubs such as ceanothus, manzanita, coffeeberry (*Rhamnus californica*), and poison oak.



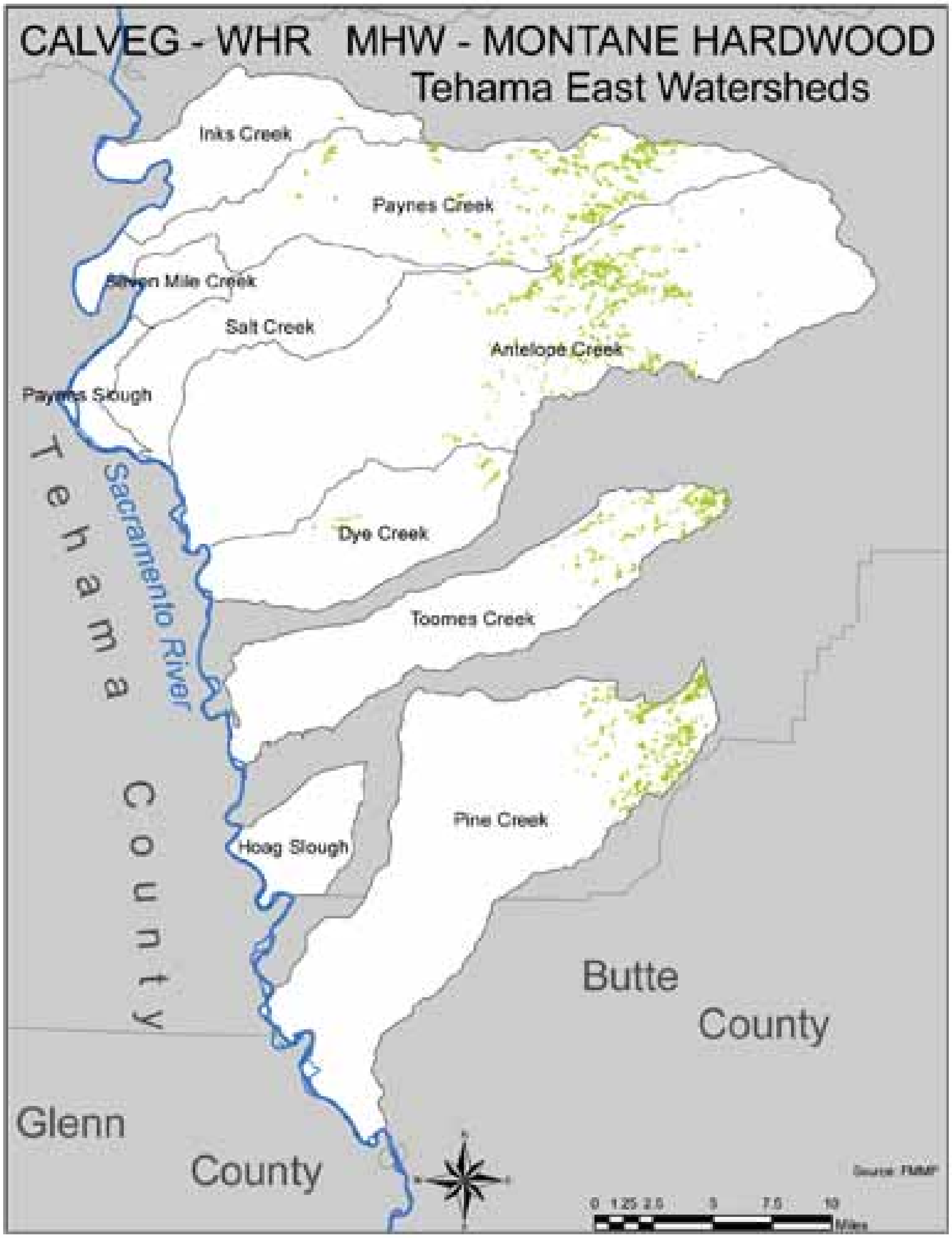
Blue Oak Woodland

Blue oak woodland habitat (WHR:BOW) is a dominant habitat type in the watershed covering more than 110,000 acres. It occurs below BOP on shallow, rocky, infertile, and well-drained soils with annual grassland and occasional shrubs including poison oak, coffeeberry, buckbrush (*Ceanothus cuneatus*), buckeye and manzanita.

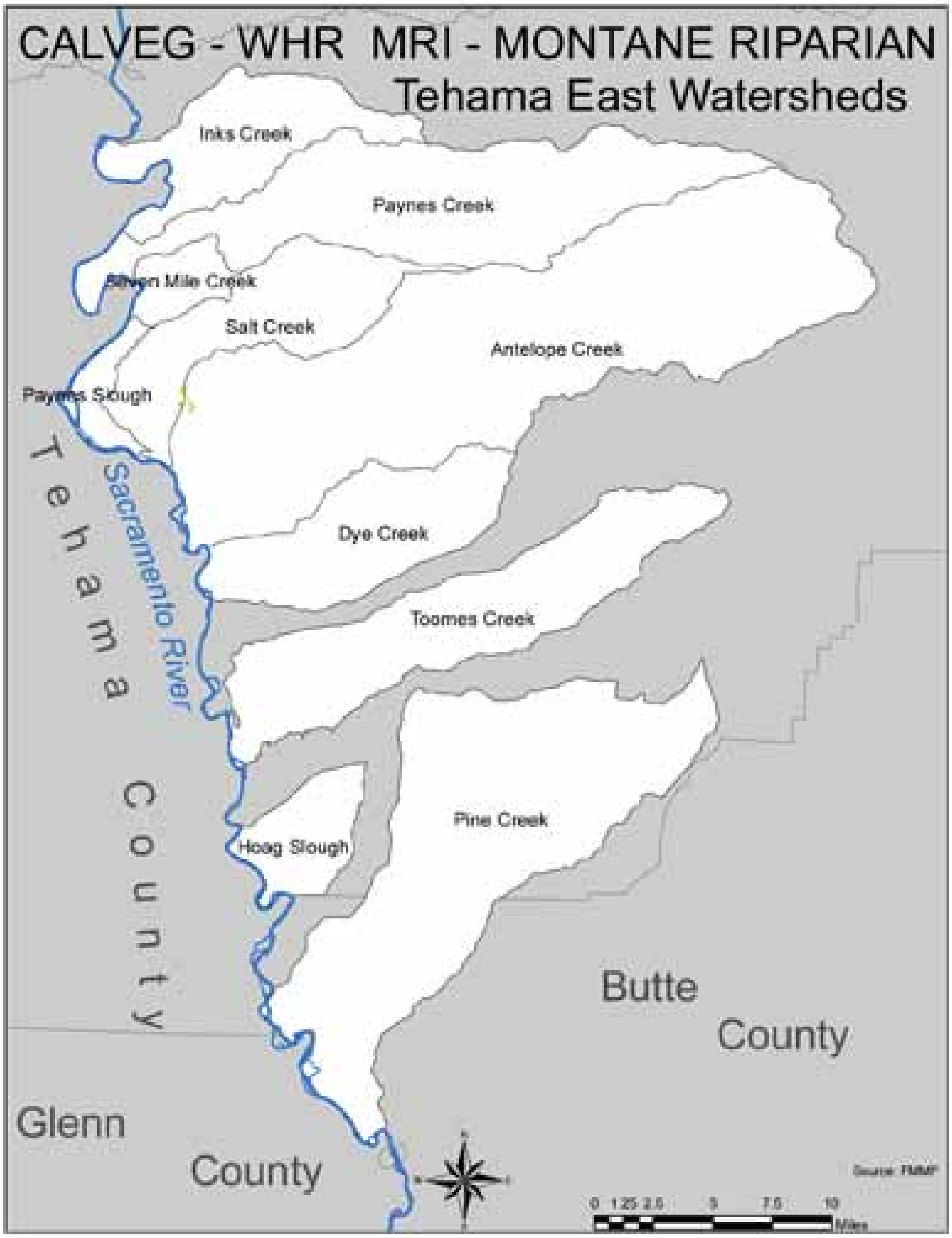


Montane Hardwood

Montane hardwood habitat (WHR:MHW) occurs on over 9,000 acres on steep canyon slopes and rocky ridgetops within the watershed and is associated with canyon live oak, Douglas fir, and black oak at elevations above 2,000 feet. It neighbors mixed chaparral, MHC, SMC, and DFR.

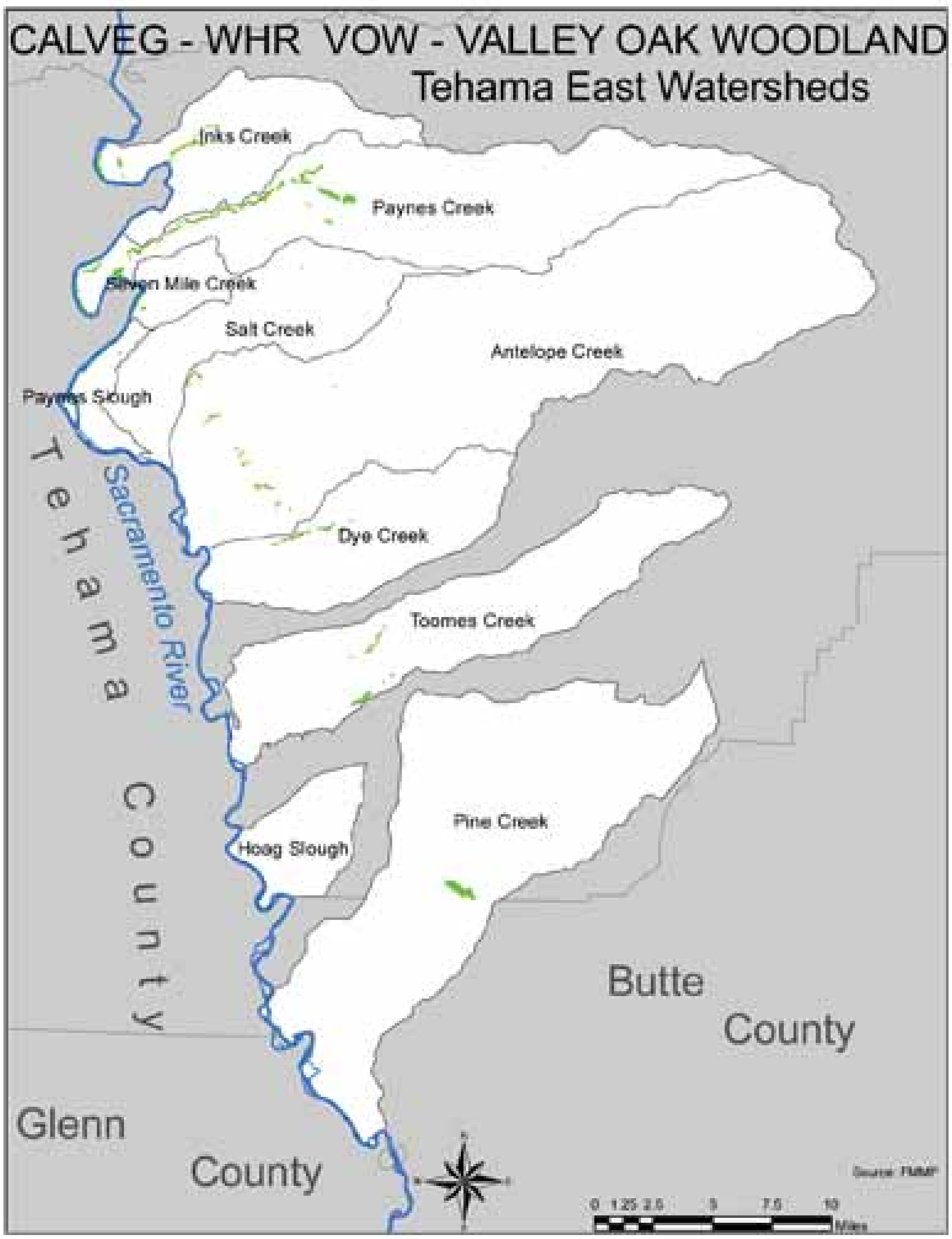


Montane Riparian
Montane riparian habitat (WHR:MRI) occurs on 86 acres within the watershed as dense groves of broad-leaved, winter deciduous trees such a white alder and dogwood along creeks and streams. Neighboring habitats include montane chaparral, MHW, MHC, LPN, and RFR.



Valley Oak Woodland

Valley oak woodland habitat (WHR:VOW) structure ranges from dense forest-like stands in deep alluvial soils to savanna-like woodlands in xeric, less fertile soils. This habitat makes up 2,600 acres within the watershed and is dominated by valley oak (*Q. lobata*). VOW is associated with sycamore (*Platanus racemosa*), black walnut (*Juglans* spp.), interior live oak, box elder (*Acer negundo*), and blue oak. Understory shrubs include coffeeberry and blackberry. VOW habitat typically merges with annual grassland below BOW habitat.

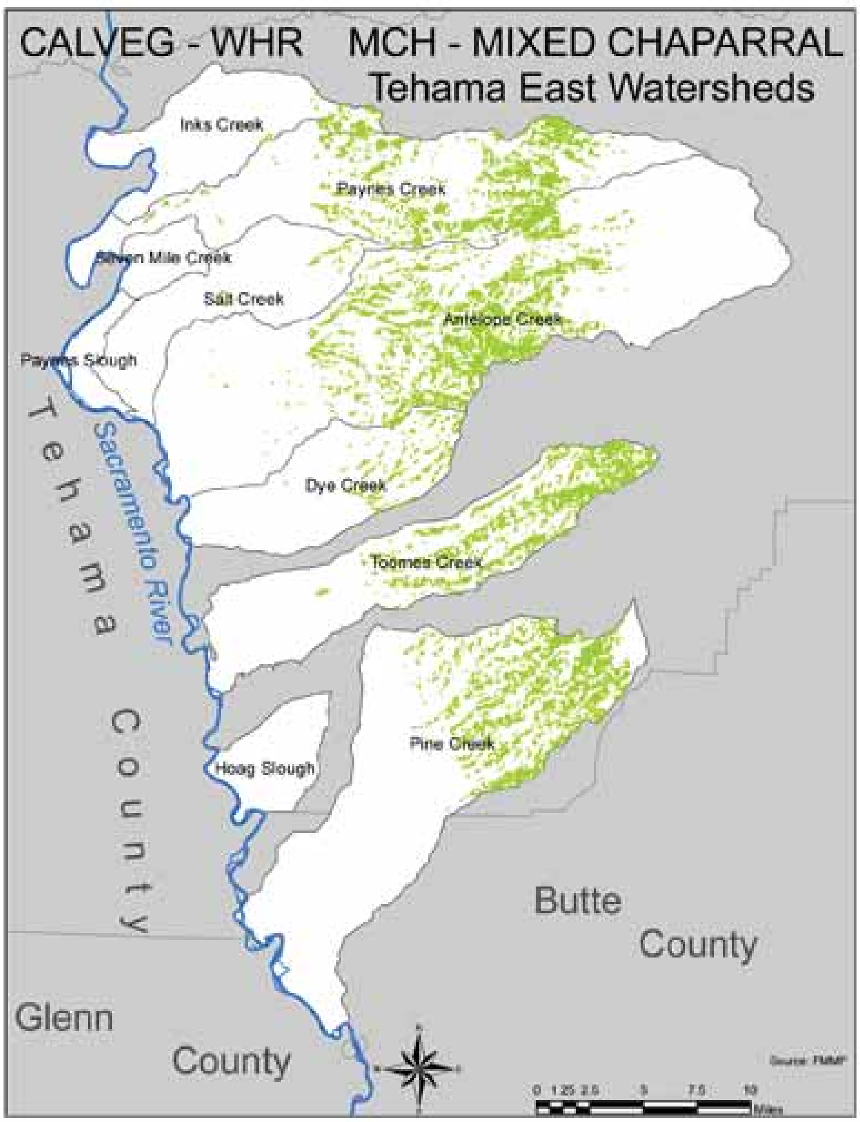


Shrub-dominated Habitats

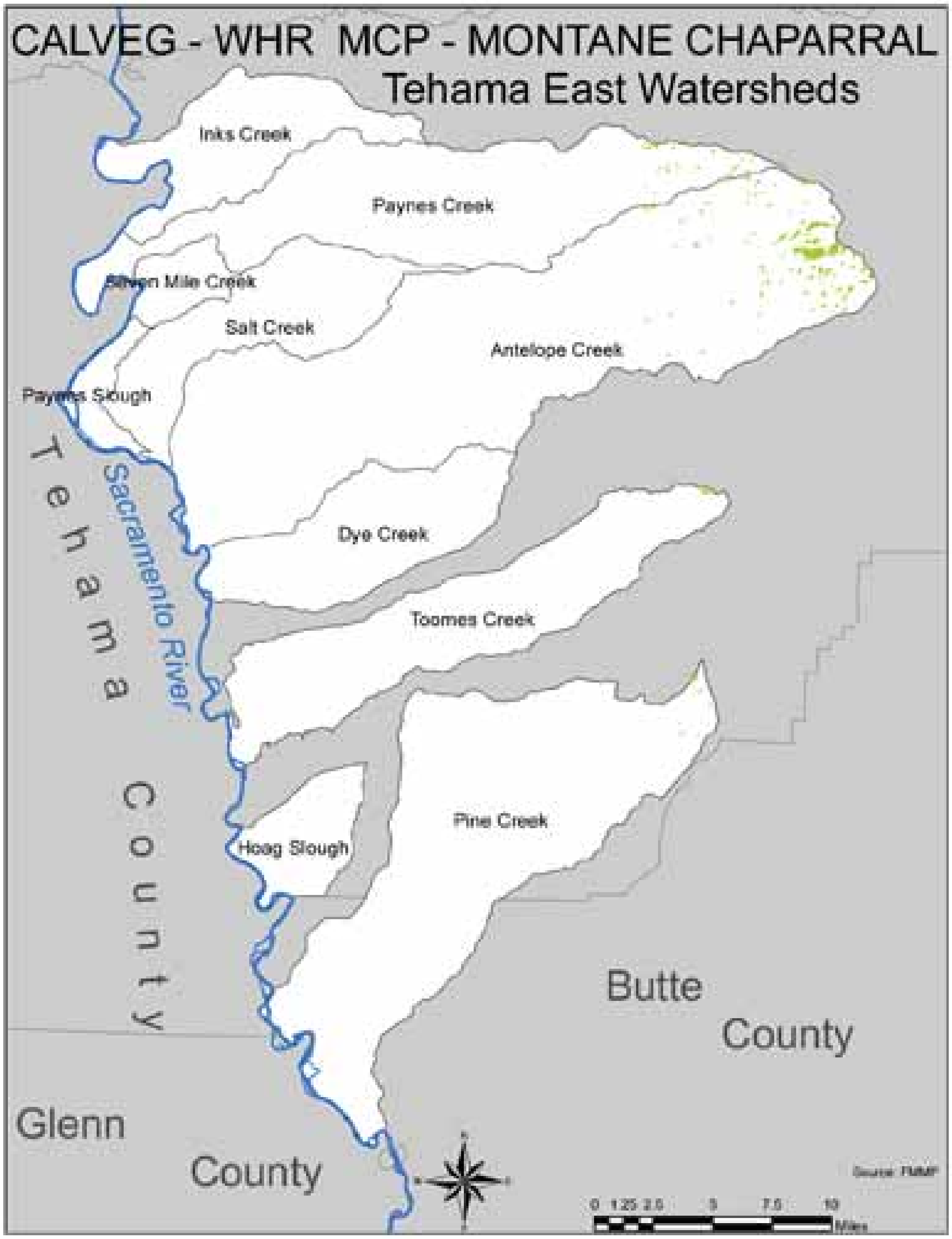
Shrub-dominated habitats make up over 12 percent of the Tehama East Watershed (approximately 49,500 acres). These habitats include mixed chaparral and montane chaparral.

Mixed Chaparral

Mixed chaparral habitat (WHR:MCH) occurs typically on slopes and ridges below 5,000 feet on well-drained soils. It merges with annual grassland and BOP across 48,000 acres of land within the watershed. Chamise, mountain mahogany (*Cercocarpus betuloides*), toyon (*Heteromeles arbutifolia*), buckeye, poison oak, ceanothus and manzanita are some of the shrubs associated with this habitat.



Montane Chaparral
Ceanothus, manzanita, chinquapin, mountain mahogany, and toyon help make up the 1,500 acres of montane chaparral habitat (WHR:MCP) in the Tehama East Watershed. Most of these species are fire adapted and resprout from root crowns or burls. MCP occurs above 3,000 feet elevation near MRI, MCH, PPN, SMC, RFR, and LPN habitats.



Herbaceous-dominated Habitats

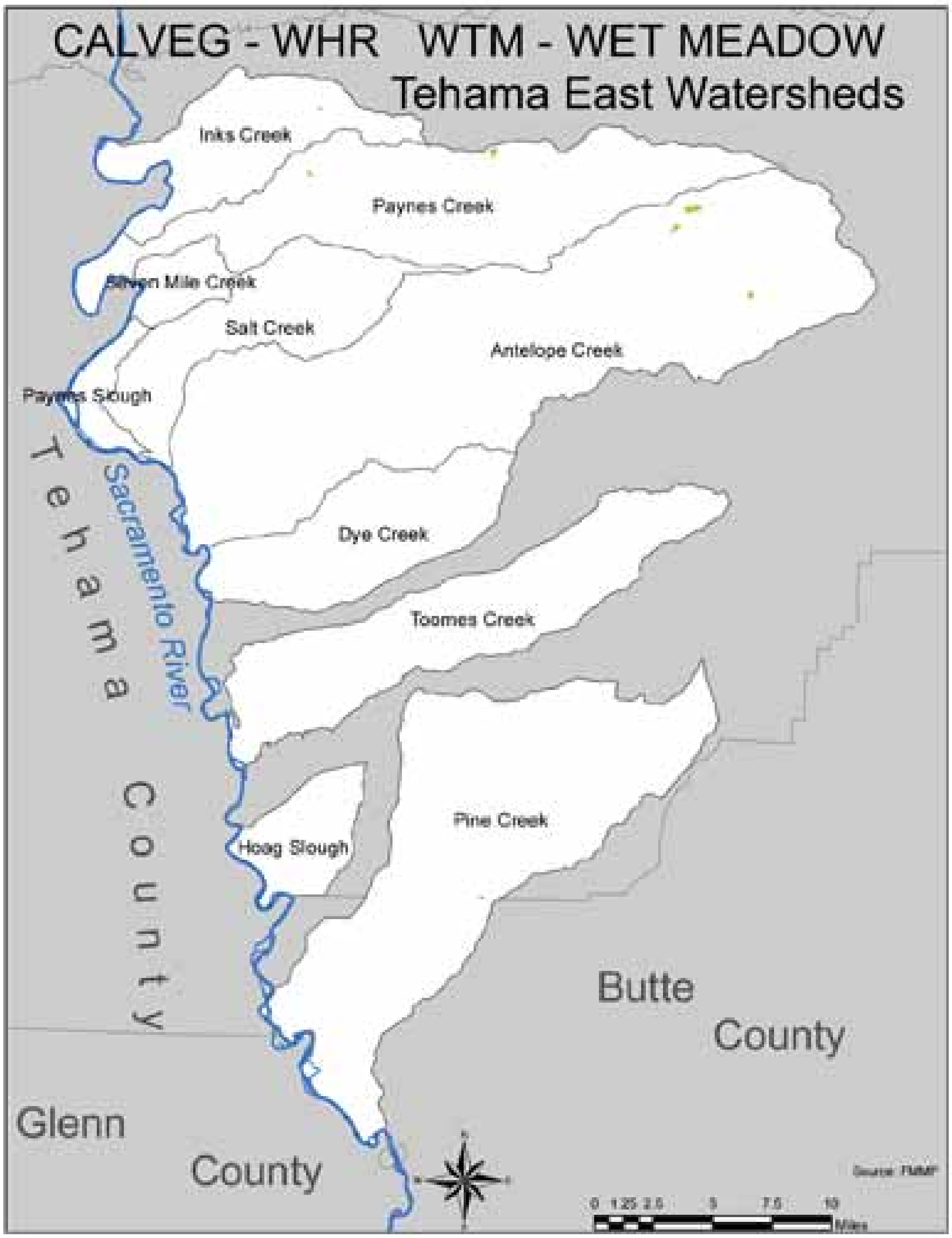
Herbaceous-dominated habitats, most of which is annual grassland, make up nearly 32 percent of the Tehama East Watershed (over 126,500 acres). Wet meadows are also considered herbaceous-dominated.

Annual Grassland

Annual grassland habitat (WHR:AGS) occurs across nearly a third of the Tehama East Watershed and is largely maintained by livestock grazing and weather patterns. Most of the annual grass and forb species that make up AGS are exotic, however native wildflowers such as the California poppy, several species of lupine, popcorn flowers and many more can be found here. AGS is found above or surrounding VOW, BOW, BOP, MCH, CPC, and agriculture-crop-dominated habitats on flat plains to gently rolling foothills.

See Land Cove Maps, pages 85-92, Tehama East Watershed Assessment Atlas.

Wet Meadow
Wet meadow habitat (WHR:WTM) consists of an herbaceous layer of plants including sedges (*Carex* spp.), rushes (*Juncus* spp.) and other perennial grass and grass-like plants and willows (*Salix* spp.) that grow on poorly or moderately drained soils. This habitat occurs on 251 acres of land within the watershed.



Agriculture-Crop-Dominated Habitats
Agriculture-Crop-Dominated habitats refer to the cropland (WHR:CRP) and orchard-vineyard (WHR:OVN) habitats that make up nearly 4,500 acres of the watershed. Table 2 describes the type and amount of acres of agriculture crops present in Tehama County. This information was taken from the 2008 Agricultural Crop Report (Tehama County Department of Agriculture/Weights and Measures 2009).

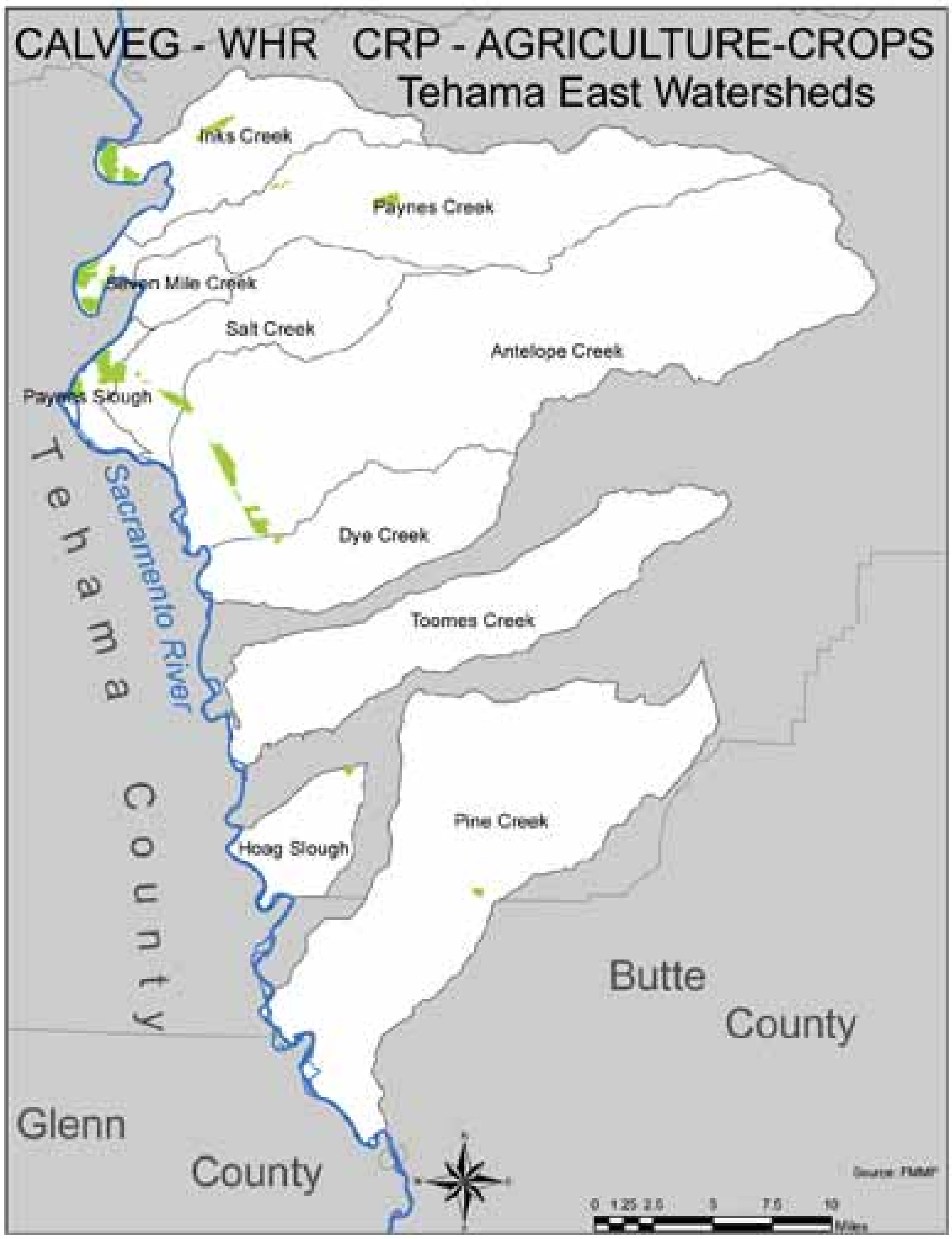
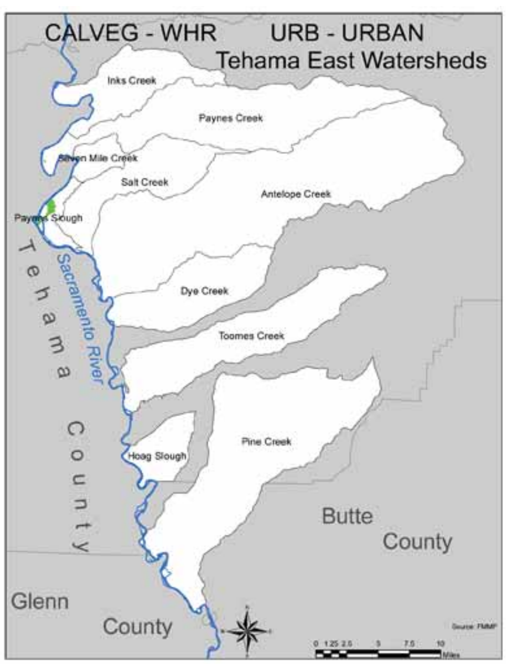


Table 2. Agriculture Lands in Tehama County.

Crop	Acres
Fruit and Nut Crops	
Almont	8,786
Olive	5,262
Prune	8,527
Walnut	16,748
Grape	219
Pistachio	181
Crops	**Acres**
Field Crops	
Wheat	1,014
Corn	1,610
Alfalfa, hay	3,798
Grain, hay	4,551
Hay, other	2,000
Silage, corn	500
Miscellaneous vegetable crops	100

Urban-dominated Habitats

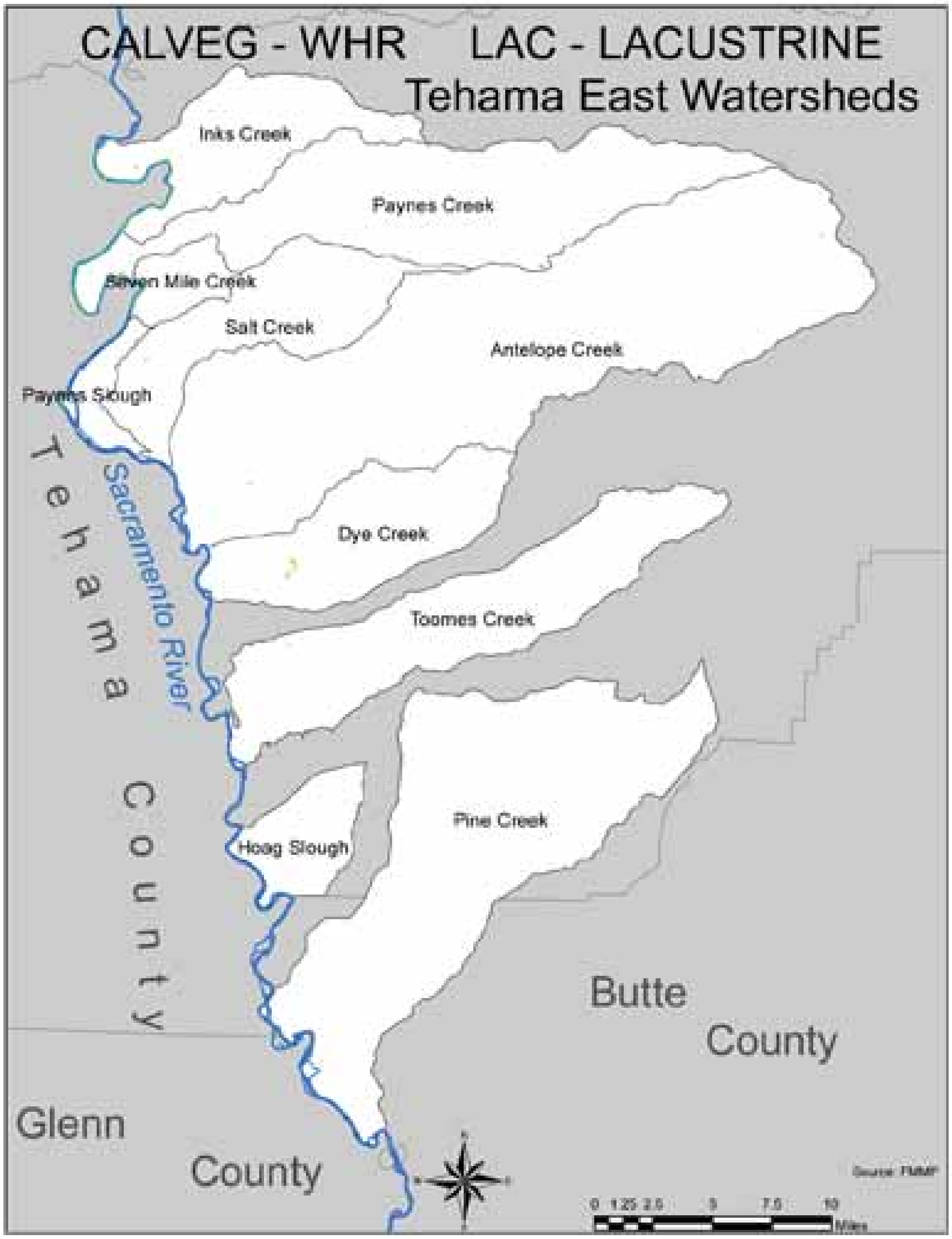
Urban and built-up land makes up over 2,300 acres of the watershed and is characterized by tree groves, street tree strips, lawns, and shrub cover of both native and non-native species. Because this habitat is man-made and maintained, it remains relatively static over time compared to natural communities.



Barren-dominated Habitats

Barren-dominated habitats (WHR:BAR) are areas of rock, gravel, or bare soil that contain little or no vegetation. BAR is scattered throughout the watershed covering a total of 93 acres. Lower elevation patches may be invaded by exotic plants while upper elevation areas may harbor rare or threatened native species that are capable of growing in conditions that are unfavorable for most plants.

Lacustrine-dominated Habitats
Lacustrine habitat (WHR:LAC) occurs on more than 650 acres within the watershed. LAC is characterized by standing water on inland depressions or dammed riverine channels and includes ponds, lakes, and reservoirs. Aquatic plants such as pondweed and algae provide food for a variety of herbivorous animals.



While much of the managed lands within the Tehama East Watershed are devoted to livestock grazing, a considerable amount is utilized as farmland. Table 3 describes the land use types and acres of managed lands throughout the Tehama East Watershed. This information was provided by Tehama RCD.

Table 3. Managed Lands in the Tehama East Watershed

Land Use Description	Acres
Urban and Built-Up Land	2,340
Grazing Land	363,592
Farmland of Local Importance	8,152
Prime Farmland	15,598
Farmland of Statewide Importance	1,010
Unique Farmland	1,934
Water	1,184
Other Land	3,082

SENSITIVE BOTANICAL RESOURCES

Sensitive plant communities indicated on the California Natural Diversity Database (CNDDB) in the Tehama East Watershed (Figure 8-2) include:

- Great Valley Cottonwood Riparian Forest
- Great Valley Mixed Riparian Forest
- Coastal and Valley Freshwater Marsh
- Great Valley Valley Oak Riparian Forest
- Great Valley Willow Scrub
- Northern Interior Cypress Forest
- Northern Hardpan Vernal Pool

There are two other communities considered sensitive within the Tehama East Watershed that are not listed in the CNDDB. These include northern claypan vernal pool and blue oak woodland.

Each sensitive plant community is described briefly below in terms of its abiotic habitat requirements, dominant and typical species, degree of rarity, and general location and extent in the watershed. The degrees of rarity are conveyed by the rating provided after each community type heading (e.g., G3 S2.1). The degrees of rarity ratings are defined at the end of this section.

Great Valley Cottonwood Riparian Forest (G2 S2.1)

This habitat occurs along floodplains, stream and river banks, levees, and terraces subject to seasonal or intermittent flooding. This habitat is dominated by tree cover <82 ft tall consisting of Fremont cottonwood (*Populus fremontii* ssp. *fremontii*), though California sycamore (*Platanus racemosa*), Oregon ash (*Fraxinus latifolia*), box elder (*Acer negundo* var. *californicum*), Northern California black walnut (*Juglans hindsii*), and willow species (*Salix exigua*, *S. lasiolepis*, *S. laevigata* etc.) are frequently present as well (Sawyer and Keeler-Wolf 1995). The understory often includes wild grape vines (*Vitis californica*) and may include a shrub layer consisting of willow species, blue elderberry (*Sambucus mexicana*), and/or California blackberry (*Rubus ursinus*), along with an herbaceous layer including mugwort (*Artemisia douglasiana*) and blue wildrye (*Elymus glaucus*) (Vaghti 2003). Surface soils may be moderately coarse (loamy sand) to moderately fine (silt loam). This habitat can be found along the Sacramento River near Paynes Slough, Hoag Slough, and Pine Creek within the Tehama East Watershed.

Great Valley Mixed Riparian Forest (G2 S2.2)

This habitat is similar to Great Valley Cottonwood Riparian Forest, except that it is not

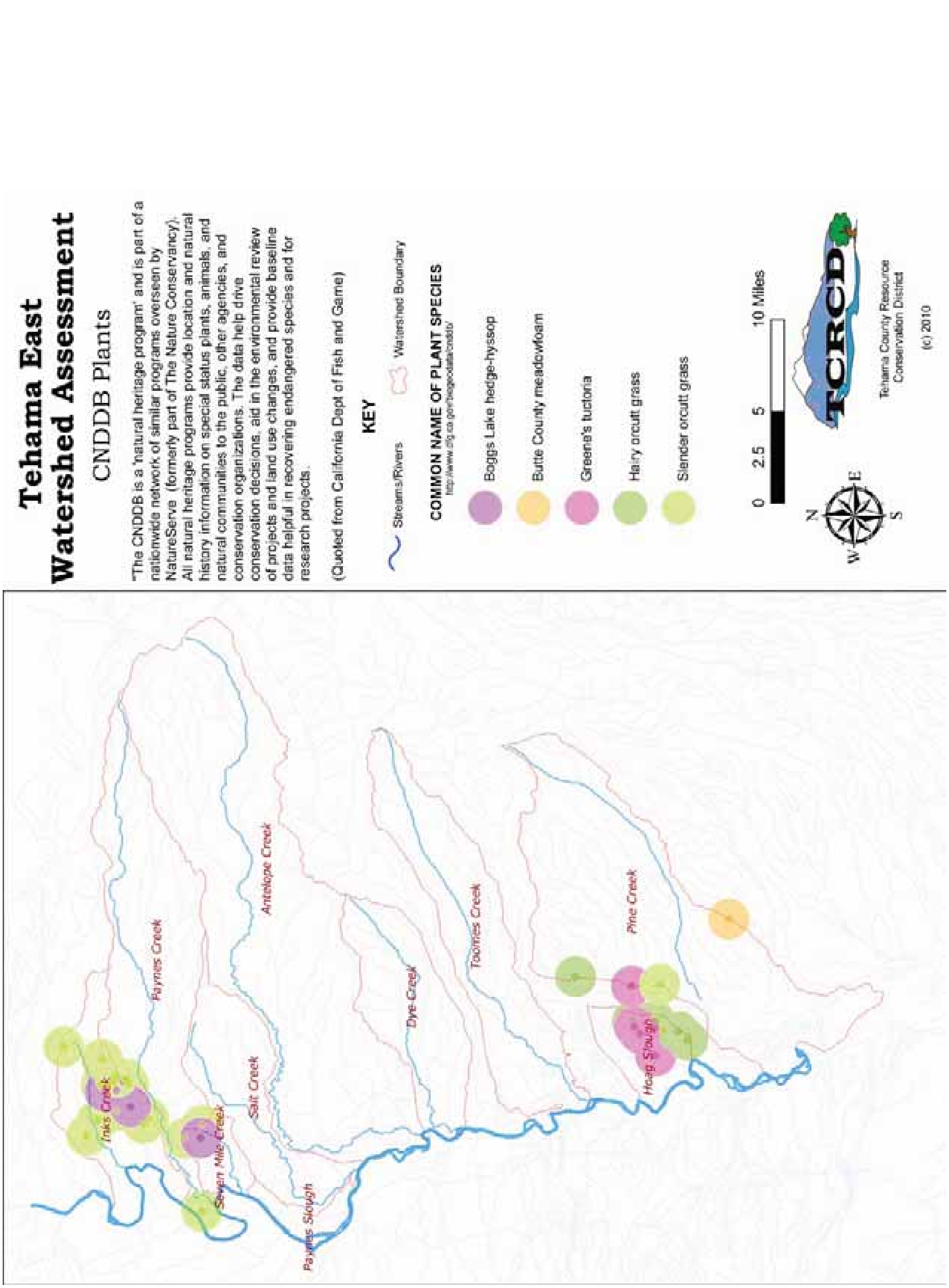

Tehama East Watershed Assessment
CNDDB Plants
"The CNDDB is a 'natural heritage program' and is part of a nationwide network of similar programs overseen by NatureServe (formerly part of The Nature Conservancy). All natural heritage programs provide location and natural history information on special status plants, animals, and natural communities to the public, other agencies, and conservation organizations. The data help drive conservation decisions, aid in the environmental review of projects and land use changes, and provide baseline data helpful in recovering endangered species and for research projects.
(Quoted from California Dept of Fish and Game)
KEY
Streams/Rivers
Watershed Boundary
COMMON NAME OF PLANT SPECIES
Boggs Lake hedge-hyssop
Butte County meadowfoam
Greene's tuctoria
Hairy orcutt grass
Slender orcutt grass
0
2.5
5
10 Miles
N
S
E
W
TCRCD
Tehama County Resource Conservation District
(c) 2010
Paynes Creek
Antelope Creek
Dye Creek
Toomes Creek
Pine Creek
Salt Creek
Inks Creek
Seven Mile Creek
Hoag Slough
Paynes Slough

Figure 8-1

dominated by a single species (Fremont cottonwood), but rather is composed of a number of co-dominant tree species. Additional tree species may include big leaf maple (*Acer macrophyllum*), white alder (*Alnus rhombifolia*), California sycamore, Oregon ash, box elder, valley oak (*Quercus lobata*), arroyo willow, or red willow (Sawyer and Keeler-Wolf 1995). Understory species composition and abiotic factors such as flood frequency, soil type, and soil moisture are comparable to Great Valley Cottonwood Riparian Forest. This habitat can be found along the floodplains of the Sacramento River located within the Tehama East Watershed.

Coastal and Valley Freshwater Marsh (G3 S2.1)
Freshwater marsh habitats are dominated by emergent perennial herbaceous species that tolerate seasonal, frequent, or permanent flooding. In the Tehama East Watershed this habitat is most likely to be found along the bottomland margins of rivers, creeks, ditches, and sloughs as well as in natural depressions with fine textured or organic soils (Sawyer and Keeler-Wolf 1995). Typical species include bulrushes (*Scirpus* spp.), cattail (*Typha* spp.), saltgrass (*Distichilis spicata*), and sedges (*Carex* spp.). These plants usually form a continuous canopy that is <12 ft tall. This habitat can be found within the Hoag Slough portion of the Tehama East Watershed.

Great Valley Valley Oak Riparian Forest (G1 S1.1)
Valley oak woodlands occur in both riparian settings and valley bottomlands where they are able to root into groundwater. When they occur along riparian areas they are found on older (>100 yr) floodplains that are flooded intermittently or seasonally. Soil textures range from loamy sand to silty clay (Sawyer and Keeler-Wolf 1995). Associated tree species include box elder, California sycamore, Oregon ash, and Northern California black walnut. Wild grape vines are commonly found in the understory along with California dutchman's pipe (*Aristolochia californica*) and poison oak (*Toxicodendron diversilobum*) (Vaghti 2003). Frequently, the ground layer is grass, which may be composed of native bunchgrasses, non-native annual grasses, or a mixture of both. This habitat can be found along the Sacramento River near Paynes Slough, Toomes Creek, and Hoag Slough within the Tehama East Watershed.

Great Valley Willow Scrub G3 S3.2.
This habitat is composed of thicket-forming small (<32.8 ft) trees and shrubs dominated by willow species. Typical willow species include shining (*Salix lucida*), arroyo, Goodding's (*Salix gooddingii*), narrowleaf, and red

willow. The groundcover layer is sparse or absent due to shading and disturbance (flooding). Willow scrub occurs along seasonally flooded, relatively young (<30 yrs) floodplains or other low-gradient depositional areas along rivers and streams (Sawyer and Keeler-Wolf 1995, Vaghti 2003). Once established it may persist on older (100 yrs) floodplain surfaces (Vaghti 2003). Surface soil texture may be relatively coarse (loamy sand) to quite fine (silty clay, Vaghti 2003). This habitat can be found along the Sacramento River near Toomes Creek within the Tehama East Watershed.

Northern Interior Cypress Forest G2 S2.2.
This, scrubby, open, fire-adapted habitat occurs on dry, rocky, sterile, often ultramafic soils and is dominated in Tehama County by MacNab's cypress (*Cupressus macnabiana*). Stands may reach up to 15 m tall and integrade with mixed chaparral, montane chaparral, mixed evergreen forest and montane conifer forest. This habitat can be found between Inks Creek and Paynes Creek just north of Highway 36 within the Tehama East Watershed.

Northern Hardpan Vernal Pool G3 S3.1.
This habitat occurs on old, very acid, iron-silica cemented hardpan soils. Herbaceous annuals dominate this habitat. Germination of annual begins during the winter rains as water begins to pool. During the warming months of spring, the water begins to evaporate leaving behind concentric rings of blooming grasses and herbs. Plants adapted for extremely dry conditions thrive in the empty pool bottom during the hot summer months. This habitat occurs on the valley floor within the Pine Creek portion of the Tehama East Watershed.

Northern Claypan Vernal Pool G1 S1.1.
This habitat occurs on silica-cemented hardpan soils, which retard drainage. These depressions are flooded or saturated seasonally during winter, drying out by late spring. The soil may be fresh or slightly saline, neutral to alkaline. The dominant vegetation consists of a mixture of annual and perennial herbs and grasses such as goldfields (*Lasthenia* spp.), coyote thistle (*Eryngium* spp.), Fremont tidytips (*Layia* spp.), common sticky seed (*Blennosperma nanum*), and tufted hair grass (*Deschampsia cespitosa*). Vernal pool habitats host numerous plant, amphibian, and invertebrate species, many of which are rare. This habitat does not appear on the CNDDB list for the watershed; however, based on the knowledge, it occurs primarily on the flatter grassland dominated and wetter sites of the watershed.

Blue Oak Woodland G3 S3.2.
Blue oak woodland occurs on the slopes of the foothills and valley

bottom where soils are moderately to excessively well-drained. The habitat structure can be savannah or continuous closed canopy. The tree canopy is dominated by blue oak (*Quercus douglasii*), but may include foothill pine (*Pinus sabiniana*), interior live oak (*Quercus wislizenii*), or valley oak. This habitat can be found throughout the Tehama East Watershed foothills.

Rarity Ratings. Rarity ratings are given as global rankings and state rankings with threat-level codes appended to the state ranking. The global rank is a reflection of the overall condition of an element throughout its global range. Global rank codes are defined as follows:

- G1 = Less than 6 viable element occurrences [EOs] OR less than 1000 individuals **or** less than 2000 ac.
- G2 = 6-20 EOs **or** 1000-3000 individuals **or** 2000-10,000 ac.
- G3 = 21-80 EOs **or** 3000-10,000 individuals **or** 10,000-50,000 ac.
- G4 = Apparently secure, but factors exist to cause some concern; i.e., there is some threat or somewhat narrow habitat
- G5 = Population or stand demonstrably secure to ineradicable due to being commonly found in the world

The state rank is assigned much the same way as the global rank, except state ranks in California often also contain a threat designation attached to the S-rank. State rank codes are defined as follows:

- S1 = Less than 6 EOs or less than 1000 individuals **or** less than 2000 ac
- S2 = 6-20 EOs OR 1000-3000 individuals **or** 2000-10,000 ac
- S3 = 21-80 EOs or 3000-10,000 individuals **or** 10,000-50,000 ac
- S4 = Apparently secure within California; this rank is clearly lower than S3 but factors exist to cause some concern; i.e., there is some threat or somewhat narrow habitat
- S5 = Demonstrably secure to ineradicable in California

California's threat level gradations are shown as decimal suffixes to the state ranking numbers. The threat levels are defined as follows:

- 0.1- Seriously threatened in California (high degree/immediacy of threat)

0.2- Fairly threatened in California (moderate degree/immediacy of threat)

0.3- Not very threatened in California (low degree/immediacy of threats or no current threats known)

THREATENED AND ENDANGERED SPECIES

Special-status Plant Species Criteria. An evaluation of the potential for occurrence of special-status plant and animal species was prepared. In evaluating the potential presence of special-status species, the following criteria were used to determine which species should be included:

- Plant species listed, or proposed for listing, as threatened or endangered under the FESA (50 CFR 17.12 [listed plants], and various notices in the FR [proposed species]);
- Plant species included on California Native Plant Society (CNPS) List 1A, 1B, 2, 3, or 4;
- Federal or state listed plants.

California Natural Diversity Database. Figure 8-2 shows the locations of special-status plant records within the CNDDB in the Tehama East Watershed.

Special-status Plants. A list of potentially occurring special-status plants within the Tehama East Watershed was developed through a literature and database review. A search of the California Department of Fish and Games' (CDFG) California Natural Diversity Data Base (CNDDB; CDFG 2009) was conducted to identify known occurrences of special-status plants that occur in the project U.S. Geological Survey (USGS) quadrangles within the Tehama East Watershed boundary. The California Native Plant Society's (CNPS) Electronic Inventory of Rare and Endangered Vascular Plants of California (CNPS 2009) and a United States Fish and Wildlife Service (USFWS) federal endangered and threatened species list were also reviewed for the same quadrangles. The special-status plant species (those species listed under the State or Federal Endangered Species Acts or on CNPS List 1A, 1B, 2, 3, or 4) with potential to occur within the Tehama East Watershed are summarized in Table 4. Plants have the potential to occur if potential habitat is present in the watershed and there are known occurrences within five miles of the watershed's boundary. Based on literature review, 106 special-status plant species were originally identified as potentially occurring in the Tehama East Watershed vicinity. Based on habitat requirements six of these species are considered to be unlikely to occur within the watershed. Of the 100 remaining species, 14 are present and 86 have the potential to occur within the Tehama East Watershed boundary. Eight of the 14 special-status plant species present within the watershed are associated with vernal pool habitats. Five of these species are listed as state and/or federally threatened or endangered. Field reconnaissance and species-specific surveys were not conducted as such surveys were beyond our scope of work.

Table 4. Special-status Plant Species Potential to Occur in the Tehama East Watershed.

Special-status Plant Species Potential to Occur in the Tehama East Watershed.				
Name	**Status**	**Blooming Period**	**Habitat**	**Potential to Occur**
Henderson's bentgrass (*Agrostis hendersonii*)	CNPS 3	April - May	Valley and foothill grassland in mesic soils and vernal pools. Known elevation range: 230-1001 feet (70-305 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary.
Jepson onion (*Allium jepsonii*)	CNPS 1B	April - August	Serpentinite or volcanic substrate in chaparral, cismontane woodland, and lower montane coniferous forest. Known elevation range: 984-4331 feet (300-1320 meters).	**Low.** It is unlikely there is potential habitat within the watershed boundary, and there are no known occurrences within 5 mi of the watershed boundary.
Sanborn's onion (*Allium sanbornii* var. *sanbornii*)	CNPS 4	May - September	Chaparral, cismontane woodland, lower montane coniferous forest. Usually on serpentinite, gravelly soils. Known elevation range: 853-4954 feet (260-1510 meters).	**Low.** It is unlikely there is potential habitat, but there are two known occurrences within 5 mi of the watershed boundary.
True's manzanita (*Arctostaphylos mewukka* ssp. *truei*)	CNPS 4	February - May	Chaparral, lower montane coniferous forest, sometimes roadside. Known elevation range: 1394-4298 feet (425-1310 meters).	**High.** Potential habitat is present, and there is a known occurrence within 5 mi of the watershed boundary
northern spleenwort (*Asplenium septentrionale*)	CNPS 2	July - August	Rocky, granitic substrate in chaparral, lower montane coniferous forest, subalpine coniferous forest, and upper montane coniferous forest. Known elevation range: 5298-10991feet (1615-3350 meters).	**High.** Potential habitat is present, and there is a known occurrence within 5 mi of the watershed boundary
depauperate milk-vetch (*Astragalus pauperculus*)	CNPS 4	March - June	Chaparral, cismontane woodland, valley and foothill grassland, often on vernally mesic, volcanic soils. Known elevation range: 197-3675 feet (60-1120 meters).	**High.** Potential habitat is present, and there are four known occurrences within 5 mi of the watershed boundary

Ferris's milk-vetch (*Astragalus tener* var. *ferrisiae*)	CNPS 1B	April - May	Vernally mesic meadows and seeps, subalkaline flats in valley and foothill grassland. Known elevation range: 16-246 feet (5-75 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
Woolly balsamroot (*Balsamorhiza lanata*)	CNPS 1B	April - June	Rocky, volcanic substrate within cismontane woodland. Known elevation range: 2624-6217 feet (800-1895 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary

Name	Status	Blooming Period	Habitat	Potential to Occur
dwarf resin birch (*Betula glandulosa*)	CNPS 2	May - June	Mesic substrates in bogs and fens, lower montane coniferous forest, meadows and seeps, marshes and swamps, and subalpine coniferous forest. Known elevation range: 4265-7546 feet (1300-2300 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
upswept moonwort (*Botrychium ascendens*)	CNPS 2	July - August	Mesic substrate in lower montane coniferous forest and meadows and seeps. Known elevation range: 4921-7497 feet (1500-2285 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
Scalloped moowort (*Botrychium crenulatum*)	CNPS 2	Fertile June - July	Bogs and fens, lower montane coniferous forest, meadows and seeps, and freshwater marshes and swamps. Known elevation range: 4921-10761 feet (1500-3280 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
Mingan moonwort (*Botrychium minganense*)	CNPS 2	Fertile July - September	Mesic substrates in bogs and fens, lower montane coniferous forest, upper montane coniferous forest. Known elevation range: 4773-6743 feet (1455-2055 meters).	**High.** Potential habitat is present, and there is a known occurrence within 5 mi of the watershed boundary
Eastern goblin (*Botrychium montanum*)	CNPS 2	Fertile July - September	Mesic substrates within lower montane coniferous forest, meadows and seeps, and upper montane coniferous forest. Known elevation range: 4806-6989 feet (1465-2130 meters).	**High.** Potential habitat is present, and there is a known occurrence within 5 mi of the watershed boundary
northeastern moonwort (*Botrychium pinnatum*)	CNPS 2	July - October	Mesic substrate in lower montane coniferous forest, meadows and seeps, and upper montane coniferous forest. Known elevation range: 5807-6693 feet (1770-2040 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
Bolander's bruchia (*Bruchia bolanderi*)	CNPS 2	moss	Damp soil in lower montane coniferous forest, meadows and seeps, and upper montane coniferous forest. Known elevation range: 5577-9187 feet (1700-2800 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary

thread-leaved toothwort (*Bulbostylis capillaris*)	CNPS 4	June - August	Lower montane coniferous forest, meadows and seeps, upper montane coniferous forests. Known elevation range: 1296-6808 feet (395-2075 meters).	**High.** Potential habitat is present, and there is a known occurrence within 5 mi of the watershed boundary

Name	Status	Blooming Period	Habitat	Potential to Occur
round-leaved filaree (*California macrophyllum*)	CNPS 1B	March - May	Clay soils in cismontane woodland, and valley and foothill grassland. Known elevation range: 49-3937 feet (15-1200 meters).	**Present.** Occurs within the watershed boundary.
Butte County calycadenia (*Calycadenia oppositifolia*)	CNPS 4	April - June	Chaparral, cismontane woodland, lower montane coniferous forest, meadows and seeps, valley and foothill grassland. Found in openings usually on volcanic, granitic, or serpentinite soils. Known elevation range: 295-3100 feet (90-945 meters).	**High.** Potential habitat is present, and there are three known occurrences within 5 mi of the watershed boundary
Butte County morning-glory (*Calystegia atriplicifolia* ssp. *buttensis*)	CNPS 4	May - July	Lower montane coniferous forest. Known elevation range: 1968-3937 feet (600-1200 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
Wilkins' harebell (*Campanula wilkinsiana*)	CNPS 1B	July - September	Meadows and seeps, subalpine coniferous forest, and upper montane coniferous forest. Known elevation range: 5003-8530 feet (1525-2600 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
Dissected-leaved toothwort (*Cardamine pachystigma* var. *dissectifolia*)	CNPS 3	February - May	Usually serpentinite, rocky substrates within chaparral and lower montane coniferous forests. Known elevation range: 836-6890 feet (255-2100 meters).	**High.** Potential habitat is present, and there are two known occurrences within 5 mi of the watershed boundary
Geyer's sedge (*Carex geyeri*)	CNPS 4	May - August	Great Basin scrub and lower montane coniferous forest. Known elevation range: 3789-6890 feet (1155-2100 meters).	**High.** Potential habitat is present, and there is a known occurrence within 5 mi of the watershed boundary
woolly-fruited sedge (*Carex lasiocarpa*)	CNPS 2	June - July	Bogs and fens, and margins of freshwater marshes and swamps. Known elevation range: 5905-6890 feet (1800-2100 meters).	**Low.** It is unlikely there is potential habitat within the watershed boundary, and there are no known occurrences within 5 mi of the watershed boundary.

mud sedge (*Carex limosa*)	CNPS 2	June - August	Bogs and fens, lower montane coniferous forest, meadows and seeps, marshes and swamps, and upper montane coniferous forest. Known elevation range: 3937-8858 feet (1200-2700 meters).	**Low.** It is unlikely there is potential habitat within the watershed boundary, and there are no known occurrences within 5 mi of the watershed boundary.

Name	Status	Blooming Period	Habitat	Potential to Occur
pointed broom sedge (*Carex scoparia*)	CNPS 2	May	Gravelly streambeds in cismontane woodland, lower montane coniferous forest, riparian scrub, riparian woodland, and valley and foothill grassland. Known elevation range: 279-984 feet (85-300 meters).	**Low.** It is unlikely there is potential habitat within the watershed boundary, and there are no known occurrences within 5 mi of the watershed boundary.
fox sedge (*Carex vulpinoidea*)	CNPS 2	May - June	Freshwater marshes and swamps, riparian woodland. Known elevation range: 98-3937 feet (30-1200 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
Hoover's spurge (*Chamaesyce hooveri*)	FT, CNPS 1B	July - August	Vernal pools on volcanic mudflow or clay substrate. Known elevation range: 82-820 feet (25-250 meters).	**Present.** Occurs within the watershed boundary.
Stony Creek spurge (*Chamaesyce ocellata* spp. *rattanii*)	CNPS 1B	May - October	Chaparral and valley and foothill grassland. Known elevation range: 279-2625 feet (85-800 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
Red Hills soaproot (*Chlorogalum grandiflorum*)	CNPS 1B	May - June	Chaparral, cismontane woodland, lower montane coniferous forest usually on serpentinite or gabbroic soils. Known elevation range: 804-4068 feet (245-1240 meters).	**High.** Potential habitat is present, and there is a known occurrence within 5 mi of the watershed boundary
Shasta clarkia (*Clarkia borealis* ssp. *arida*)	CNPS 1B	June - August	Cismontane woodland and openings in lower montane coniferous forest. Known elevation range: 1607-1953 feet (490-595 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
whtie-stemmed clarkia (*Clarkia gracilis* ssp. *albicaulis*)	CNPS 1B	May - July	Cismontane woodland, sometimes on serpentine soils. Known elevation range: 804-3560 feet (245-1085 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
Mildred's clarkia (*Clarkia mildrediae* ssp. *mildrediae*)	CNPS 1B	May - August	Sandy, usually granitic substrates within cismontane woodland and lower montane coniferous forest. Known elevation range: 803-5611 feet (245-1710 meters).	**High.** Potential habitat is present, and there is a known occurrence within 5 mi of the watershed boundary.

marsh claytonia (*Claytonia palustris*)	CNPS 4	May - October	Meadows and seeps, marshes and swamps, upper montane coniferous forest. Known elevation range: 3281-8202 feet (1000-2500 meters).	**High.** Potential habitat is present, and there are three known occurrences within 5 mi of the watershed boundary.

Name	Status	Blooming Period	Habitat	Potential to Occur
talus collomia (*Collomia larsenii*)	CNPS 2	July - September	Volcanic talus in alpine boulder and rock field, closed-cone coniferous forest, subalpine coniferous forest, and upper montane coniferous forest. Known elevation range: 7250-11483 feet (2210-3500 meters).	**Low.** It is unlikely there is potential habitat within the watershed boundary, and there are no known occurrences within 5 mi of the watershed boundary.
Silky cryptantha (*Cryptantha crinita*)	CNPS 1B	April - May	Gravelly streambeds in cismontane woodland, lower montane coniferous forest, riparian scrub, riparian woodland, and valley and foothill grassland. Known elevation range: 279-984 feet (85-300 meters).	**Present.** Occurs within the watershed boundary.
clustered lady's-slipper (*Cypripedium fasciculatum*)	CNPS 4	March - August	Lower montane coniferous forest usually on serpentinite seeps and streambanks. Known elevation range: 328-7989 feet (100-2435 meters).	**Low.** It is unlikely there is potential habitat within the watershed boundary, but there is a known occurrence within 5 mi of the watershed boundary.
mountain lady's-slipper (*Cypripedium montanum*)	CNPS 4	March - August	Broad-leafed upland forest, cismontane woodland, lower montane coniferous forest. Known elevation range: 607-7300 feet (185-2225 meters).	**High.** Potential habitat is present, and there is a known occurrence within 5 mi of the watershed boundary.
recruved larkspur (*Delphium recurvatum*)	CNPS 1B	March - June	Alkaline substrate in cismontane woodland and valley and foothill grassland. Known elevation range: 9-2461 feet (3-750 meters).	**Low.** It is unlikely there is potential habitat within the watershed boundary, and there are no known occurrences within 5 mi of the watershed boundary.
Morris' beard-moss (*Didymodon norrisii*)	CNPS 2	N/A	Cismontane woodland and on intermittently mesic rock in lower montane coniferous forest. Known elevation range: 1968-5577 feet (600-1700 meters).	**Present.** Occurs within the watershed boundary.
Dwarf downingia (*Downingia pusilla*)	CNPS 2	March-May	Valley and foothill grassland in mesic soils and vernal pools. Known elevation range: 3-1460 feet (1-445 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary

English sundew (*Drosera anglica*)	CNPS 2	June - September	Bogs and fens, and mesic substrate in meadows and seeps. Known elevation range: 4265-6562 feet (1300-2000 meters).	**Low.** It is unlikely there is potential habitat within the watershed boundary, and there are no known occurrences within 5 mi of the watershed boundary .

Name	Status	Blooming Period	Habitat	Potential to Occur
Clifton's eremogone (*Eremogone cliftonii*)	CNPS 1B	April - September	Openings, usually on granitic substrate in chaparral, lower montane coniferous forest, and upper montane coniferous forest. Known elevation range: 1492-5807 feet (455-1770 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
volcanic daisy (*Erigeron elegantulus*)	CNPS 4	March - August	Alpine boulder and rock field, Great Basin scrub, pinyon and juniper woodland, subalpine coniferous forest, and upper montane coniferous forest usually on volcanic soils. Known elevation range: 3281-8743 feet (1000-2665 meters).	**High.** Potential habitat is present, and there is a known occurrence within 5 mi of the watershed boundary.
hot rock daisy (*Erigeron inornatus* var. *calidipetris*)	CNPS 4	June - September	Lower montane coniferous forest on sandy, volcanic soils. Known elevation range: 3609-6348 feet (1100-1935 meters).	**High.** Potential habitat is present, and there is a known occurrence within 5 mi of the watershed boundary.
snow fleabane daisy (*Erigeron nivalis*)	CNPS 2	July - August	Volcanic, rocky substrate in alpine boulder and rock field, meadows and seeps, and subalpine coniferous forest. Known elevation range: 5692-9514 feet (1735-2900 meters).	**High.** Potential habitat is present, and there is a known occurrence within 5 mi of the watershed boundary.
pyrola-leaved buckwheat (*Eriogonum pyrolifolium* var. *pyrolifolium*)	CNPS 2	July - September	Sandy or gravelly pumice substrate in alpine boulder and rock field. Known elevation range: 5495-10499 feet (1675-3200 meters).	**Low.** Potential habitat is unlikely, and there are no known occurrences within 5 mi of the watershed boundary.
Butte County fritillary (*Fritillaria eastwoodiae*)	CNPS 3	March - June	Chaparral, cismontane woodland, and openings in lower montane coniferous forest, sometimes on serpentine soils. Known elevation range: 164-4921 feet (50-1500 meters).	**Present.** Occurs within the watershed boundary.
adobe-lily (*Fritillaria pluriflora*)	CNPS 1B	February - April	Chaparral, cismontane woodland, valley and foothill grassland, often on adobe soils. Known elevation range: 197-2313 feet (60-705 meters).	**Present.** Occurs within the watershed boundary.

Boggs Lake hedge-hyssop (*Gratiola heterosepala*)	SE, CNPS 1B	April - August	Clay soils in margins of marshes and swamps, and vernal pools. Known elevation range: 33-7792 feet (10-2375 meters).	**Present.** Occurs within the watershed boundary.

Name	Status	Blooming Period	Habitat	Potential to Occur
hogwallow starfish (*Hesperevax caulescens*)	CNPS 4	March - June	Valley foothill grassland in mesic, clay soil and shallow vernal pools. Known elevation range: 0-1657 feet (0-505 meters).	**High.** Potential habitat is present, and there is a known occurrence within 5 mi of the watershed boundary
rose-mallow (*Hibiscus lasiocarpus*)	CNPS 2	June - September	Freshwater marshes and swamps. Known elevation range: 0-394 feet (0-120 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
nodding vanilla-grass (*Hierochloe odorata*)	CNPS 2	April - July	Mesic substrate in meadows and seeps. Known elevation range: 4921-6217 feet (1500-1895 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
little hulsea (*Hulsea nana*)	CNPS 2	July - August	Rocky, gravelly, or volcanic substrate in alpine boulder and rock field, or subalpine coniferous forest. Known elevation range: 5643-11007 feet (1720-3355 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
Baker's globe mallow (*Iiamna bakeri*)	CNPS 4	June - September	Volcanic, often in burned areas within chaparral, and pinyon and juniper woodland. Known elevation range: 3280-8203 feet (1000-2500 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
California satintail (Imperata brevifolia)	CNPS 2	September - May	Chaparral, meadows and seeps, riparian scrub. Known elevation range: 0-1640 feet (0-500 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
Northern California black walnut (*Juglans hindsii*)	CNPS 1B	April - May	Riparian forest and riparian woodland. Known elevation range: 0-1444 feet (0-440 meters).	**High.** Potential habitat is present, and there is a known occurrence within 5 mi of the watershed boundary
finger rush (*Juncus digitatus*)	CNPS 1B	May - June	Openings in cismontane woodland or lower montane coniferous forest, or xeric substrates in vernal pools. Known elevation range: 2165-2592 feet (660-790 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary

Ahart's dwarf rush (*Juncus leiospermus* var. *ahartii*)	CNPS 1B	March-May	Valley and foothill grassland in mesic soils. Known elevation range: 98-328 feet (30-100 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
Red Bluff dwarf rush (*Juncus leiospermus* var. *leiospermus*)	CNPS 1B	March - May	Vernally mesic chaparral, cismontane woodland, meadows, valley and foothill grassland, and vernal pools. Known elevation range: 115-3346 feet (35-1020 meters).	**Present.** Occurs within the watershed boundary.

Name	Status	Blooming Period	Habitat	Potential to Occur
Legenere (*Legenere limosa*)	CNPS 1B	April - June	Vernal pools. Known elevation range: 3-2887 feet (1-880 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
Hutchinson's lewisia (*Lewisia kelloggii* ssp. *hutchisonii*)	CNPS 1B	June - August	Openings with slate substrate in upper montane coniferous forest. Known elevation range: 4799-7759 feet (1463-2365 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
Humboldt lily (*Lilium humboldtii* ssp. *humboldtii*)	CNPS 4	May - July	Chaparral, cismontane woodland, lower montane coniferous forests in openings. Known elevation range: 295-3921 feet (90-1195 meters).	**High.** Potential habitat is present, and there are two known occurrences within 5 mi of the watershed boundary
Butte County meadowfoam (*Limnanthes floccosa* ssp. *californica)*	FE, SE, CNPS 1B	March - May	Vernal pool complexes and mesic valley and foothill grassland. Known elevation range: 164-3051 feet (50-930 meters).	**High.** Potential habitat is present, and there are two known occurrences within 5 mi of the watershed boundary
Woolly meadowfoam (*Limnanthes floccosa* ssp. *floccosa*)	CNPS 4	March - June	Vernally mesic soils in chaparral, cismontane woodland, valley and foothill grassland, and vernal pools. Known elevation range: 197-3592 feet (60-1095 meters).	**Present.** Occurs within the watershed boundary.
Red-flowered lotus (*Lotus rubriflorus*)	CNPS 1B	April - June	Cismontane woodland, and valley and foothill grassland. Known elevation range: 656-1394 feet (200-425 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
Three-ranked hump moss (*Meesia triquetra*)	CNPS 4	moss	Soil substrate within bogs and fens, meadows and seeps, and mesic sites within upper montane coniferous forest. Known elevation range: 4265-8203 feet (1300-2500 meters).	**High.** Potential habitat is present, and there are three known occurrences within 5 mi of the watershed boundary
broad-nerved hump moss (*Meesia uliginosa*)	CNPS 2	October	Damp soil in bogs and fens, meadows and seeps, subalpine coniferous forest, and upper montane coniferous forest. Known elevation range: 4265-9199 feet (1300-2804).	**High.** Potential habitat is present, and there are two known occurrences within 5 mi of the watershed boundary

Lassen Peak copper moss (*Mielichhoferia tehamensis*)	CNPS 1B	moss	Volcanic, mesic, rock and soil substrate in alpine boulder and rock field. Known elevation range: 8202-9186 feet (2500-2800 meters).	**High.** Potential habitat is present, and there is a known occurrence within 5 mi of the watershed boundary

Name	Status	Blooming Period	Habitat	Potential to Occur
shield-bracted monkeyflower (*Mimulus glaucescens*)	CNPS 4	February - August	Chaparral, cismontane woodland, lower montane coniferous forest, valley and foothill grassland usually on serpentinite seeps. Known elevation range: 197-4068 feet (60-1240 meters).	**Moderate.** Potential habitat is unlikely, but there are six known occurrences within 5 mi of the watershed boundary, and up to 35% of all known occurrences have been on non-ultramafic soils.
Tehama navarretia (*Navarretia heterandra*)	CNPS 4	April - June	Valley and foothill grassland, vernal pools. Known elevation range: 98-3314 feet (30-1010 meters).	**High.** Potential habitat is present, and there is a known occurrence within 5 mi of the watershed boundary
Baker's navarretia (*Navarretia leucocephala* ssp. *bakeri*)	CNPS 1B	May - July	Mesic soils in cismontane woodland, lower montane coniferous forest, meadows and seeps, valley and foothill grassland, and vernal pools. Known elevation range: 49-5709 feet (15-1740 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
awl-leaved mavarretia (*Navarretia subuligera*)	CNPS 4	April - August	Chaparral, cismontane woodland, lower montane coniferous forest on rocky, mesic soils. Known elevation range: 492-3609 feet (150-1100 meters).	**High.** Potential habitat is present, and there is a known occurrence within 5 mi of the watershed boundary
hairy orcutt grass (*Orcuttia pilosa*)	FE, SE, CNPS 1B	May - September	Vernal pools. Known elevation range: 180-656 feet (55-200 meters).	**Present.** Occurs within the watershed boundary.
slender orcutt grass (*Orcuttia tenuis*)	FT, SE, CNPS 1B	May - October	Vernal pools. Known elevation range: 115-5774 feet (35-1760 meters).	**Present.** Occurs within the watershed boundary.
tall alpine-aster (*Oreostemma elatum*)	CNPS 1B	June - August	Mesic substrate in bogs and fens, meadows and seeps, and upper montane coniferous forest. Known elevation range: 3297-6890 feet (1005-2100 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
rayless mountain ragwort (*Packera indecora*)	CNPS 2	July - August	Mesic substrate in meadows and seeps. Known elevation range: 5249-6562 feet (1600-2000 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary

Ahart's paronychia (*Paronychia ahartii*)	CNPS 1B	March - June	Cismontane woodland, valley and foothill grassland, and vernal pools. Known elevation range: 98-1673 feet (30-510 meters).	**Present.** Occurs within the watershed boundary.

Name	Status	Blooming Period	Habitat	Potential to Occur
closed-throated beardtongue (*Penstemon personatus*)	CNPS 1B	June - September	Metavolcanic substrate in chaparral, lower montane coniferous forest, and upper montane coniferous forest. Known elevation range: 3494-6955 feet (1065-2120 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
squarestem phlox (*Phlox muscoides*)	CNPS 2	June - August	Gravelly or rocky substrate in alpine boulder and rock field, Great Basin scrub, or subalpine coniferous forest. Known elevation range: 4199-8858 feet (1280-2700 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
Bidwell's knotweed (*Polygonum bidwelliae*)	CNPS 4	April - July	Chaparral, cismontane woodland, valley and foothill grassland on volcanic soil. Known elevation range: 197-3937 feet (60-1200 meters).	**High.** Potential habitat is present, and there are three known occurrences within 5 mi of the watershed boundary
slender-leaved pondweed (*Potamogeton filiformis*)	CNPS 2	May - July	Assorted shallow freshwater marshes and swamps. Known elevation range: 984-7054 feet (300-2150 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
white beaked-rush (*Rhynchospora alba*)	CNPS 2	July - August	Bogs and fens, and lake margins in marshes and swamps. Known elevation range: 4494-6562 feet (1370-2000 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
California beaked-rush (*Rhynchospora californica*)	CNPS 1B	May - July	Bogs and fens, lower montane coniferous forest, meadow seeps, and freshwater marshes and swamps. Known elevation range: 148-3314 feet (45-1010 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
brownish beaked-rush (*Rhynchospora capitellata*)	CNPS 2	July - August	Mesic soils in lower montane coniferous forest, meadows and seeps, marshes and swamps, and upper montane coniferous forest. Known elevation range: 1493-6562 feet (455-2000 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary

Hall's rupertia (*Rupertia hallii*)	CNPS 1B	June - August	Cismontane woodland and lower montane coniferous forest. Known elevation range: 1788-7382 feet (545-2250 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
Sanford's arrowhead (*Sagittaria sanfordii*)	CNPS 1B	May - October	Shallow freshwater marshes and swamps. Known elevation range: 0-2001 feet (0-610 meters).	**Present.** Occurs within the watershed boundary.

Name	Status	Blooming Period	Habitat	Potential to Occur
Tracy's sanicle (Sanicula tracyi)	CNPS 4	April - July	Openings within cismontane woodland, lower montane coniferous forest, and upper montane coniferous forest. Known elevation range: 328-5201 feet (100-1585 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
American scheuchzeria (*Scheuchzeria palustris* var. *americana*)	CNPS 2	July - August	Bogs and fens, and lake margins in marshes and swamps. Known elevation range: 4494-6562 feet (1370-2000 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
slender bulrush (*Schoenoplectus heterochaetus*)	CNPS 2	August	Lower montane coniferous forest and lake margins along marshes and swamps. Known elevation range: 5249 feet (1600 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
water bulrush (*Schoenoplectus subterminalis*)	CNPS 2	June - August	Bogs and fens, and montane lake margins along marshes and swamps. Known elevation range: 2460-7382 feet (750-2250 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary
Butte County checkerbloom (*Sidalcea robusta*)	CNPS 1B	April - June	Chaparral and cismontane woodland. Known elevation range: 295-5249 feet (90-1600 meters).	**High.** Potential habitat is present, and there is a known occurrence within 5 mi of the watershed boundary
Long-stiped campion (*Silene occidentalis* ssp. *longistipitata*)	CNPS 1B	June - August	Chaparral, lower montane coniferous forest, and upper montane coniferous forest. Known elevation range: 3280-6562 feet (1000-2000 meters).	**High.** Potential habitat is present, and there is a known occurrence within 5 mi of the watershed boundary
Cascade alpine campion (*Silene suksdorfii*)	CNPS 2	July - September	Volcanic, rocky substrate in alpine boulder and rock field, subalpine coniferous forest, and upper montane coniferous forest. Known elevation range: 7726-10203 feet (2355-3110 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary

Lassen Peak smelowskia (*Smelowskia ovalis* var. *congesta*)	CNPS 1B	July - August	Alpine boulder and rock field. Known elevation range: 8005-10171 feet (2440-3100 meters).	**Low.** Potential habitat is unlikely, and there are no known occurrences within 5 mi of the watershed boundary.
long-leaved starwort (*Stellaria longifolia*)	CNPS 2	May - August	Bogs and fens, meadows and seeps, riparian woodland, and upper montane coniferous forest. Known elevation range: 2952-6004 feet (900-1830 meters).	**High.** Potential habitat is present, and there is a known occurrence within 5 mi of the watershed boundary

Name	Status	Blooming Period	Habitat	Potential to Occur
obtuse starwort (*Stellaria obtusa*)	CNPS 4	May - October	Mesic soils in lower montane coniferous forest, riparian woodland, upper montane coniferous forest. Known elevation range: 492-7005 feet (150-2135 meters).	**High.** Potential habitat is present, and there are two known occurrences within 5 mi of the watershed boundary
Greene's tuctoria (*Tuctoria greenei*)	FE, SR, CNPS 1B	May - September	Vernal pools. Known elevation range: 98-3510 feet (30-1070 meters).	**Present.** Occurs within the watershed boundary.
flat-leaved bladderwort (*Utricularia intermedia*)	CNPS 2	July - August	Bogs and fens, mesic sites in meadows and seeps, and lake margins along marshes and swamps. Known elevation range: 3937-8858 feet (1200-2700 meters).	**High.** Potential habitat is present, and there is a known occurrence within 5 mi of the watershed boundary
cream-flowered bladderwort (*Utricularia ochroleuca*)	CNPS 2	June - July	Mesic sites in meadows and seeps, and lake margins along marshes and swamps. Known elevation range: 4708-4724 feet (1435-1440 meters).	**High.** Potential habitat is present, and there is a known occurrence within 5 mi of the watershed boundary
Columbian watermeal (*Wolffia brasiliensis*)	CNPS 2	April - December	Assorted shallow freshwater marshes and swamps. Known elevation range: 98-328 feet (30-100 meters).	**Moderate.** Potential habitat is present, but there are no known occurrences within 5 mi of the watershed boundary

Key to Special-status Plant Species Rarity Ratings

FE=Federally Endangered
FT=Federally Threatened
SE=State Endangered
SR=State Rare
CNPS List 1A=Plants presumed to be extinct in California
CNPS List 1B= Plants rare and endangered in California and elsewhere
CNPS List 2= Plants rare and endangered in California, more common elsewhere
CNPS List 3= Plants about which more information is needed, review list
CNPS List 4= Plants of limited distribution, watch list

INVASIVE PLANTS AND OTHER NOXIOUS WEEDS

Non-native, invasive plant species present a management concern within native habitats, rangelands, and agricultural fields. Invasive species may be detrimental or destructive to native plant species, ecosystem structure and function, rangeland and agronomic crops. They are often difficult to control or eradicate. They compete with native or crop plant species for nutrients, sunlight, and water; they provide poor habitat for wildlife (relative to native habitats and species), use large quantities of water, and can increase flooding and erosion along waterways. The following section provides an overview of the invasive plant species of particular concern in the Tehama East Watershed due to potential impacts to native habitats and rangelands.

Although there is no centralized repository of spatial data of invasive plant species extents or rates of spread for the state or counties, each County Agriculture Commissioner's office provides leadership and guidance for invasive species in their respective county. The California Department of Agriculture (CDFA) maintains a list of CDFA-rated invasive plants known to occur in California (CDFA 2009). Their work is further supported through cooperative Weed Management Areas that incorporate federal, state, and local agencies along with local residents. The California Invasive Plant Species Council (Cal-IPC) provides generalized risk detection maps of individual invasive species that contain information about the extent and rate of spread within each county based on information collected from section-surveys or collected from a variety of local sources such as local land managers or Weed Management Areas coordinators. This assessment relies on these sources of existing information to characterize the status and extent of invasive plant species within the Tehama East Watershed.

In the Tehama East Watershed there are numerous invasive species; however, specific organizations rate plant species based on their extent, rate of spread, and ecosystem impacts. The Cal-IPC is a non-profit organization whose mission is to protect California wildlands from invasive plants through restoration, research, and education. They maintain an inventory that categorizes non-native invasive plants that threaten California wildlands (Cal-IPC 2006 and 2007a). The categorization of each species is based on the best available knowledge of invasive plant experts in the state. The CDFA and Cal-IPC list categories are explained in more detail in Table 5. Lists of invasive plants from CDFA and Cal-IPC are provided in Tables 6 and 7, respectively. Locality was based on information provided by the Cal-IPC, CDFA, and data provided by the participants of the Consortium of California Herbaria as well as personal communications with David Stoffel, Agricultural Biologist of Tehama County.

Table 5. CDFA and Cal-IPC List Categories for Invasive Plants and Noxious Weeds.

CDFA List Categories	
A	A pest of known economic or environmental detriment and is either not known to be established in California or it is present in a limited distribution that allows for the possibility of eradication or successful containment. A-rated pests are prohibited from entering the state because, by virtue of their rating, they have been placed on the of Plant Health and Pest Prevention Services Director's list of organisms "detrimental to agriculture" in accordance with the FAC Sections 5261 and 6461. The only exception is for organisms accompanied by an approved CDFA or USDA live organism permit for contained exhibit or research purposes. If found entering or established in the state, A-rated pests are subject to state (or commissioner when acting as a state agent) enforced action involving eradication, quarantine regulation, containment, rejection, or other holding action.
B	A pest of known economic or environmental detriment and, if present in California, it is of limited distribution. B-rated pests are eligible to enter the state if the receiving county has agreed to accept them. If found in the state, they are subject to state endorsed holding action and eradication only to provide for containment, as when found in a nursery. At the discretion of the individual county agricultural commissioner they are subject to eradication, containment, suppression, control, or other holding action.
C	A pest of known economic or environmental detriment and, if present in California, it is usually widespread. C-rated organisms are eligible to enter the state as long as the commodities with which they are associated conform to pest cleanliness standards when found in nursery stock shipments. If found in the state, they are subject to regulations designed to retard spread or to suppress at the discretion of the individual county agricultural commissioner. There is no state enforced action other than providing for pest cleanliness.
Q	An organism or disorder suspected to be of economic or environmental detriment, but whose status is uncertain because of incomplete identification or inadequate information.
D	An organism known to be of little or no economic or

	environmental detriment, to have an extremely low likelihood of weediness, or is known to be a parasite or predator. There is no state enforced action.
Cal-IPC Inventory Categories	
High	These species have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.
Cal-IPC Inventory Categories	
Moderate	These species have substantial and apparent—but generally not severe—ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.
Limited	These species are invasive but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic.

Table 6. CDFA Noxious Weeds Found in Tehama County.

Rating	Scientific Name	Common Name
A		
	Centaurea maculosa (=*C. bibersteinii*)	spotted knapweed
	Euphorbia esula	leafy spurge
	Helianthus ciliaris	blueweed
B		
	Aegilops triuncialis	barb goatgrass
	Arundo donax	giant reed
	Cardaria chalepensis (=*C. draba* ssp. *chalepensis*)	lens-podded whitetop
	Cardaria pubescens	hairy whitetop
	Centaurea calcitrapa	purple starthistle
	Cirsium arvense	Canada thistle
	Cynodon dactylon	bermudagrass
	Cyperus esculentus	yellow nutsedge
	Cyperus rotundus	purple nutsedge
	Euphorbia oblongata	oblong spurge
	Isatis tinctoria	dyer's woad

	Lepidium latifolium	perennial pepperweed, tall whitetop
	Solanum elaeagnifolium	white horsenettle
	Tamarix parviflora	smallflower tamarisk
	Tamarix ramosissima	saltcedar, tamarisk
C		
	Ailanthus altissima	tree-of-heaven
	Carduus pycnocephalus	Italian thistle
	Centaurea melitensis	Malta starthistle, tocalote
	Centaurea solstitialis	yellow starthistle
	Cirsium vulgare	bull thistle
	Convolvulus arvensis	field bindweed
	Malvella leprosa	alkali mallow
	Scientific Name	**Common Name**
	Polygonum amphibium	kelp
	Salsola tragus	Russian-thistle
	Sorghum halepense	Johnsongrass
	Spartium junceum	Spanish broom
	Taeniatherum caput-medusae	medusahead
	Tribulus terrestris	puncturevine
Q		
	Hypericum perforatum	common St. Johnswort, klamathweed

Table 7. Cal-IPC Listed Invasive Non-native Plants that Threaten Wildlands in California and are found in the Tehama East Watershed.

Rank	Scientific Name	Common Name	CAL-IPC Abundance Rating[1]	CAL-IPC Spread Rating[2]
High				
	Aegilops triuncialis	barb goatgrass	2	B
	Arundo donax	giant reed	2/3	B
	Brassica tournefortii	Saharan mustard, African mustard		
	Bromus madritensis ssp. *rubens* (=*B. rubens*)	red brome		
	Bromus tectorum	downy brome, cheatgrass		
	Centaurea maculosa (=*C. biebersteinii*)	spotted knapweed		
	Centaurea solstitialis	yellow starthistle		
	Cortaderia jubata	jubatagrass		
	Cortaderia selloana	pampasgrass	1	B
	Cytisus scoparius	Scotch broom	2	B
	Egeria densa	Brazilian egeria		
	Eichhornia crassipes[3]	water hyacinth		
	Euphorbia esula[3]	leafy spurge		
	Foeniculum vulgare	fennel	1	B
	Genista monspessulana	French broom		

	Hedera helix, *H. canariensis*	English ivy, Algerian ivy	1	B
	Hydrilla verticillata	hydrilla		
	Lepidium latifolium	perennial pepperweed, tall whitetop	1/2	B
	Ludwigia hexapetala (=*L.. uruguayensis*)[3]	Uruguay water-primrose		
	Ludwigia peploides ssp. *montevidensis*	creeping water-primrose		
	Lythrum salicaria	purple loosestrife		
	Myriophyllum aquaticum[3]	parrotfeather		
	Myriophyllum spicatum	Eurasian watermilfoil		
	Onopordum acanthium	Scotch thistle		
	Rubus armeniacus (=*R. discolor*)	Himalayan blackberry, Armenian blackberry	3	B
	Sesbania punicea[3]	red sesbania, scarlet wisteria		
	Spartium junceum	Spanish broom		
	Taeniatherum caput-medusae	medusahead	3	B
	Tamarix parviflora	smallflower tamarisk	1/2	B
	Tamarix ramosissima	saltcedar, tamarisk	1/2	B
	Ulex europaeus	gorse		

Moderate				
	Acacia dealbata	silver wattle		
	Ailanthus altissima	tree-of-heaven	3/1	C
	Alhagi maurorum (=*A. pseudalhagi*)	camelthorn		
	Anthoxanthum odoratum	sweet vernalgrass		
	Atriplex semibaccata	Australian saltbush		
	Avena barbata	slender wild oat		
	Avena fatua	wild oat		
	Brachypodium distachyon	annual false-brome		
	Brassica nigra	black mustard		
	Bromus diandrus	ripgut brome		
	Cardaria chalepensis (=*C. draba ssp. chalepensis*)[3]	lens-podded whitetop		
	Cardaria draba	hoary cress		
	Carduus nutans	musk thistle		
	Carduus pycnocephalus	Italian thistle	3	B
	Carthamus lanatus[3]	woolly distaff thistle		
	Centaurea calcitrapa	purple starthistle		
	Centaurea debeauxii (=*C. x pratensis*)[3]	meadow knapweed		

Centaurea melitensis	Malta starthistle, tocalote	2	B
Centaurea virgata ssp. squarrosa (=*C. squarrosa*)	squarrose knapweed		
Chondrilla juncea	rush skeletonweed		
Chrysanthemum coronarium	crown daisy		
Cirsium arvense	Canada thistle		
Cirsium vulgare	bull thistle		
Conium maculatum	poison-hemlock		
Cotoneaster lacteus	Parney's cotoneaster		
Cotoneaster pannosus	silverleaf cotoneaster		
Cynara cardunculus	artichoke thistle		
Cynodon dactylon	bermudagrass		
Cynoglossum officinale	houndstongue		
Cynosurus echinatus	hedgehog dogtailgrass		
Dipsacus fullonum	wild teasel		
Dipsacus sativus	fuller's teasel		
Dittrichia graveolens[3]	stinkwort		
Elaeagnus angustifolia	Russian-olive		
Eucalyptus globulus	Tasmanian blue gum		
Festuca arundinacea	tall fescue		
Ficus carica	edible fig		
Geranium dissectum	cutleaf geranium		
Glyceria declinata	waxy mannagrass		
Halogeton glomeratus	halogeton		

Hirschfeldia incana	shortpod mustard, summer mustard		
Holcus lanatus	common velvetgrass		
Hordeum marinum, H. murinum	Mediterranean barley, hare barley, wall barley		
Hypericum perforatum[3]	common St. Johnswort, klamathweed		
Hypochaeris radicata	rough catsear, hairy dandelion		
Isatis tinctoria	dyer's woad		
Kochia scoparia	kochia		
Leucanthemum vulgare	oxeye daisy		
Linaria genistifolia ssp. dalmatica (=*L. dalmatica*)	Dalmation toadflax		
Linaria vulgaris	yellow toadflax		
Lolium multiflorum	Italian ryegrass		
Lythrum hyssopifolium	hyssop loosestrife		
Mentha pulegium	pennyroyal		
Nicotiana glauca	tree tobacco		
Oxalis pes-caprae	buttercup oxalis, yellow oxalis, Bermuda buttercup		
Pennisetum setaceum	crimson fountaingrass		
Phalaris aquatica	hardinggrass	2	C

	Polygonum cuspidatum (=*Fallopia japonica*)[3]	Japanese knotweed		
	Polygonum sachalinense[3]	Sakhalin knotweed, giant knotweed		
	Potamogeton crispus	curlyleaf pondweed		
	Rumex acetosella	red sorrel, sheep sorrel		
	Saccharum ravennae[3]	ravennagrass		
	Salsola soda	oppositeleaf Russian thistle		
	Sapium sebiferum[3]	Chinese tallowtree		
	Sisymbrium irio	London rocket		
	Tanacetum vulgare	common tansy		
	Torilis arvensis	hedgeparsley		
	Trifolium hirtum	rose clover		
	Vinca major	big periwinkle	2	C
	Vulpia myuros	rattail fescue		
Limited				
	Agrostis avenacea	Pacific bentgrass		
	Agrostis stolonifera	creeping bentgrass		
	Bassia hyssopifolia	fivehook bassia		
	Bellardia trixago	bellardia		
	Brassica rapa	birdsrape mustard, field mustard		
	Briza maxima	big quackinggrass, rattlesnakegrass		
	Bromus hordeaceus	soft brome		
	Bromus japonicus	Japanese brome		

	Cardaria pubescens	hairy whitetop		
	Carduus acanthoides	plumeless thistle		
	Carduus tenuiflorus	slenderflower thistle		
	Cotula coronopifolia	brassbuttons		
	Crataegus monogyna	English hawthorn		
	Dactylis glomerata	orchardgrass		
	Descurainia sophia	flixweed, tansy mustard		
	Digitalis purpurea	foxglove		
	Erodium cicutarium	redstem filaree		
	Eucalyptus camaldulensis	red gum		
	Euphorbia oblongata	oblong spurge	1	B
	Hypochaeris glabra	smooth catsear		
	Iris pseudacorus	yellowflag iris	1	B
	Lobularia maritima	sweet alyssum		
	Marrubium vulgare	white horehound		
	Medicago polymorpha	California burclover		
	Olea europaea	olive		
	Parentucellia viscosa	yellow glandweed, sticky parentucellia		
	Pennisetum clandestinum	kikuyugrass		
	Phoenix canariensis	Canary Island date palm		
	Phytolacca americana	common pokeweed		
	Picris echioides	bristly oxtongue	2	C
	Piptatherum miliaceum	smilograss	2	C

	Plantago lanceolata	buckhorn plantain, English plantain		
	Poa pratensis	Kentucky bluegrass		
	Polypogon monspeliensis	rabbitfoot annual beardgrass, rabbitfoot grass		
	Prunus cerasifera	cherry plum, wild plum		
	Pyracantha angustifolia, P. crenulata, P. coccinea, etc.	pyracantha, firethorn		
	Ranunculus repens	creeping buttercup		
	Raphanus sativus	radish		
	Ricinus communis	castorbean	1	C
	Robinia pseudoacacia	black locust		
	Rumex crispus	curly dock		
	Salsola tragus	Russian-thistle		
	Salvia aethiopis	Mediterranean sage		
	Saponaria officinalis	bouncingbet		
	Schinus molle	Peruvian peppertree		
	Schismus arabicus, S. barbatus	mediterraneangrass		
	Senecio jacobaea	tansy ragwort		
	Silybum marianum	blessed milkthistle	2/3	B
	Sinapis arvensis	wild mustard, charlock		
	Tamarix aphylla	athel tamarisk		
	Verbascum thapsus	common mullein, woolly mullein		

	Zantesdeschia aethiopica	calla lily		

[1] Abundance Ratings: 1 = Low (<10 net acres), 2 = Moderate (up to 100 acres), 3 = High (up to 1000 acres), 4 = Widespread (up to 10,000 acres);
[2] Spread Ratings: A = Number of acres infested increasing rapidly, at least doubling in last ten years, B = Number of acres infested increasing, but not doubling in ten years, C = Number of acres infested stable, D = Number of acres infested declining.
[3] Alert Status: In addition to the overall ratings, specific combinations of section scores that indicate significant potential for invading new ecosystems triggers an alert designation so that land managers may watch for range expansions.

In addition, there is a weed management area program that support groups of local land managers, public agencies, private land owners, agriculturalists, and conservationists to cooperatively address invasive plant impacts in a local region (IPCB of CDFA 2006).

The Tehama East Watershed is part of the Glenn-Tehama-Colusa Weed Management Area (WMA). This WMA cooperative published a "dirty dozen" noxious weed list in 2002. These are provided in Table 8.

Table 8. 2002 Dirty Dozen Noxious Weeds List for the Cooperative Weed Management Area of Colusa, Glenn and Tehama Counties. All twelve occur in the Tehama East Watershed.

Scientific Name	Common Name
Centaurea calcitrapa	purple starthistle
Chondrilla juncea	rush skeletonweed
Arundo donax	giant reed
Tamarix ramosissima	saltcedar, tamarisk
Solanum elaeagnifolium	white horsenettle, silverleaf nightshade
Aegilops triuncialis	barb goatgrass
Centaurea solstitialis	yellow starthistle
Carduus acanthoides	plumeless thistle
Hypericum perforatum	common St. Johnswort, klamathweed
Lepidium latifolium	perennial pepperweed, tall whitetop
Taeniatherum caput-medusae	medusahead
Cardaria draba	hoary cress

The Glenn-Tehama-Colusa WMA had a weed eradication base funding work plan for 2009 to fulfill the following objectives: focus on eradication of A-rated and some B-rated noxious weeds from Tehama County; hire a seasonal Agricultural Aide that will map and work with county spray crews based on project priorities established by county agriculture department; and survey and treat skeleton weed along I-5 and known areas in County, whitehorse nettle in various locations north and south of Red Bluff, and oblong spurge in the Los Molinos area to the Sacramento River. The Glenn-Tehama-Colusa WMA current project list includes an early detection and eradication project for barbed goat grass (*Aegilops triuncialis*) in Tehama, Glenn, and Colusa Counties.

A group of 16 State and Federal agencies together with a stakeholder group joined to form the California Interagency Noxious Weed Coordinating Committee. One of the major projects of the group has been to create the CalWeed Database which includes information on noxious weed control projects throughout California. This database has been incorporated into the more inclusive Natural Resource Projects Inventory Database. There are 14 projects listed in the database currently for Tehama County and several of these projects are located in the Tehama East Watershed (CINWCC 2010). There are several projects listed for individual invasive species eradication throughout Tehama County including dalmatian toadflax (*Linaria genistifolia* ssp. *dalmatica*), klamathweed (*Hypericum perforatum*), puncturevine (*Tribulus terrestris),* rush skeletonweed (*Chondrilla juncea),* spotted knapweed (*Centaurea maculosa*), yellow starthistle (*Centaurea solstitialis).* There is also a Lower Inks Creek medusahead (*Taeniatherum caput-medusae*) abatement project listed in the database.

Using livestock grazing for weed control has been utilized in Tehama County. Davy et al. (2007) put together "An Introduction to Grazing for Weed Control." They describe that timing and duration of livestock use is important in controlling specific invasive species. Studies in the 1980's in Tehama County found that a high density of livestock during two growing seasons reduced thatch and let desirable species increase in abundance (Davy et al. 2007).

Practical emphasis has been provided for the invasive species that have been verified in the Tehama East Watershed and occur on all three lists from Cal-IPC, CDFA, and the Glenn-Colusa-Tehama Weed Management Area Cooperative. Creeping water-primrose (*Ludwigia peploides* ssp. *montevidensis*) has also been noted as a management priority in the Tehama East Watershed and is described below. These plant species are not organized in any particular order and have not yet been ranked according to their priority for control in the Tehama East Watershed. The relative length of information given for each species below is a reflection of the amount of readily available information published on each species, rather than an indication of priority for control. Additional information on these and other invasive plants can be found at Cal-IPC and CDFA's Integrated Pest Control Branch.

Barb Goatgrass (*Aegilops triuncialis*)
Barb goatgrass is an annual grass that invades grassland, rangeland, and oak woodland habitats found in the eastern foothills. Once it is mature, it is essentially unpalatable to livestock. The Glenn-Colusa-Tehama County Weed Management Area has a project aimed at early detection and eradication of barbed goatgrass in Tehama, Glenn, and Colusa counties (Sacramento River Watershed Program 2007). Research in Mendocino County concluded that two consecutive years of late spring prescribed burning nearly eliminated barbed goatgrass (DiTomaso et al. 2001).

Giant Reed (*Arundo donax*)
Giant reed is a perennial, reed-like grass that can grow extremely quickly (up to two inches a day) and can reach a height of 30 feet tall (Hoshovsky 1987). The species is believed to be native to eastern Asia

and was intentionally introduced to southern California in the 1820s for use as erosion control in drainage canals and thatching for roofs (Bell 2002). It is also used for reeds in musical instruments and in ornamental landscaping (CSU Sacramento and Sonoma Ecology Center 2005). Giant reed is an invasive plant that can be found throughout California, usually below 1000 feet elevation (Dudley 2006). The stalks of giant reed, called "culms," resemble those of bamboo can reach diameters of 1.5 inches (Hoshovsky 1987). Giant reed has fleshy rhizomes from which tough fibrous roots grow and penetrate deeply into the soil. Giant reed's primary mode of reproduction is vegetative and occurs through the rooting of stem fragments or the colonial extension of underground rhizomes (EIP Associates 2002). Seed produced by giant reed are seldom, if ever, fertile (Bell 2002). However, a recent study showed that sampled seed from Ventura County in Southern California had a seven percent germination rate in "ideal" laboratory conditions (NRCS 2005).

Giant reed can tolerate a wide range of abiotic conditions. It grows best in well-drained soils with an abundance of available moisture. In California, the largest colonies occur in riparian areas and floodplains, often along streams that have been physically disturbed and dammed upstream (Dudley 2006). However, giant reed is also quite drought-tolerant, and populations occur well beyond the margins of riparian vegetation (Dudley 2006). Giant reed is shade tolerant and can grow beneath existing riparian vegetation. The growth of giant reed can be impeded by lack of moisture during the first year, but plants two to three years old can survive drought without a problem. The ability of giant reed to survive drought is due to its coarse, drought resistant rhizomes and roots that can grow deeply into the soil. Giant reed plants can also survive periods of excessive moisture (Hoshovsky 1987). Overall, giant reed is well adapted to disturbance dynamics of riparian systems. For example, when flood events break up clumps of giant reed and spread the pieces downstream, fragmented stem nodes and rhizomes can take root and establish as new plant clones. The rapid growth rate and strong competitive ability enables giant reed to invade recently disturbed areas quickly and out-compete native vegetation (Hoshovsky 1987). Giant reed tends to form large, continuous, clonal root masses that can cover several acres, often at the expense of native riparian vegetation that cannot compete. Root masses can become more than three feet thick and are capable of stabilizing stream banks and terraces, altering flow regimes. In addition giant reed can reduce groundwater availability within aquifers by using large amounts of water to supply its relatively high growth rate (Bell 2002). Giant reed is highly flammable even when green and can carry fire into a creek corridor. The dense growth habit of giant reed can more than double the available fuel for wildfires compared to native vegetation (Dudley 2006). After fire disturbance, giant reed grows back rapidly from its roots without competition from other plants, often thicker than before the fire (CSU Sacramento and Sonoma Ecology Center 2005).

Perennial Pepperweed (*Lepidium latifolium*)
Perennial pepperweed is an herbaceous perennial plant from southeast Europe that can invade a wide variety of habitat types including riparian areas, marshes, and floodplains as well as hay fields, roadsides, and rangelands. Pepperweed can form large monospecific stands that exclude regeneration of native plant species, thereby decreasing plant species diversity and structural complexity (CAL-IPC 2007b). Its root system is extensive, at times reaching nine feet deep. Such root architecture is thought to be a factor in its competitive advantage over native plant species and contributes to the difficulty of eradication via mechanical methods (Renz 2000). Pepperweed can also transport salts from lower soil horizons and deposit them at the soil surface, which can further shift plant composition to favor halophytes (Renz 2000). Control treatments include continual flooding or chemical methods.

Medusahead (*Taeniatherum caput-medusae*)
Medusahead is an annual grass that invades disturbed grassland, chaparral, and oak woodland habitats. Medusahead often occurs on clay soils where there is late season moisture, whereas well-drained soils are less likely to host this species (Maurer et al. 1988). The thatch layer of medusahead enhances its own germination, while preventing germination of native grasses and forb species. Livestock do not usually find it palatable, except in early spring or under forced grazing management scenarios (Maurer et al. 1988). Control has been achieved using springtime controlled burning or heavy sheep grazing. Chemical treatment can be effective, but also negatively impacts native grasses. Maintaining diverse, intact native perennial grassland habitat seems to exclude medusahead, though restoration of this habitat following disturbance (such as overgrazing) requires initial eradication of medusahead followed by seeding with an appropriate native grass seed mix and three to five years of follow-up invasive species control to be successful (Maurer et al. 1988).

Salt Cedar (*Tamarix parviflora, T. ramosissima*)
Salt cedar is a deciduous, loosely branched shrub or small tree. It derives its name from its cedar-like foliage and its ability to grow in saline or alkaline soils (Carpenter 1998). Salt cedar is a non-native, invasive plant species indigenous to Eastern Europe and the Mediterranean, North Africa, northeastern China, India, and Japan. Although it is uncertain how salt cedar was introduced to North America, it was first identified in the eastern U.S. in the 1800s and was available at California nurseries as early as 1856 (Zouhar 2003). Salt cedar is thought to have been

introduced in the U.S. to be used in wind breaks, to control erosion, and as an ornamental plant (DiTomaso 1998). From the 1920s to the 1960s, salt cedar rapidly spread, particularly in the southeastern U.S. The rapid increase is primarily due to the regulation of stream flows following the construction of large dams and water diversion projects. Once salt cedar establishes along major drainages, it easily spreads to outlying streams, wetlands, and springs via windblown seeds (Zouhar 2003). Salt cedar has numerous, large basal branches that can grow to approximately 20 feet tall (Carpenter 1998). The leaves are scale-like and the foliage deciduous. Salt cedar flowers produce numerous tiny, tufted seeds, and the seed can be dispersed by wind or water (DiTomaso 1998). The root system is much deeper than giant reed, extending to the water table, and is also capable of extracting water from unsaturated soil layers (Zouhar 2003). Salt cedar is a facultative phreatophyte, meaning that it can draw water from underground sources but once established it can survive without access to ground water. Unlike giant reed, salt cedar can propagate from seed easily as well as from buried or submerged stems (Carpenter 1998). Even after the aboveground portion of the plant is removed, mature salt cedar plants can reproduce from adventitious roots (root sprouting, Zouhar 2003). Salt cedar is tolerant of highly saline habitats, and it concentrates assimilated salt in its leaves. Over time, as leaf litter accumulates under the plants, the surface soil can become highly saline and impede future colonization by many native plant species (Carpenter 1998). The accumulation of salt in surface soils can occur particularly along dammed rivers that are no longer subjected to annual flooding and scouring (Zouhar 2003). Similar to giant reed, salt cedar is an aggressive, invasive species that can tolerate a wide range of environmental conditions once established. It can replace or displace native woody species, such as cottonwood and willow, which occupy similar habitats. Other undesirable ecological attributes of salt cedar include providing generally lower wildlife habitat value than native vegetation, drying up springs, wetlands, riparian areas, and small streams by lowering the surface water table, and obstructing stream channels by forming dense stands within the channel. Unlike giant reed, salt cedar seedlings usually grow more slowly than native riparian plant species and mature plants are highly susceptible to shade (Carpenter 1998). Cache Creek Conservancy and UC Davis are testing biological control options for salt cedar in the adjacent Cache Creek Watershed and have documented the efficiency of control methods (SERCAL 2007).

Creeping water-primrose (*Ludwigia peploides* ssp. *montevidensis*)

Creeping water primrose is an aquatic weed species that forms dense mats above and below the water surface in shallow, stagnant, nutrient-rich pools, and in areas with hydrological disturbance, such as flood control channels, irrigation ditches and irrigation ponds (Verdone 2004). It can also persist in drier transition zones as well. Once established, it can spread very rapidly via asexual reproduction (stem fragments). Seed from populations in Sonoma County were not found to be viable (Verdone 2004). The plant escaped from ornamental/domestic use and continues to spread via animals, boats, flooding, and flowing water (Verdone 2004). Heavily invaded waterways can potentially experience altered water-flow, increased sedimentation, and decreased water quality (Verdone 2004). Creeping water primrose can outcompete native aquatic and wetland plant species, thereby reducing species diversity. Areas that were once open water habitat become closed mats of creeping water primrose, which degrades waterfowl habitat (Verdone 2004). Some public agencies in other states have used mechanical and chemical methods to control it including aquatic-approved form of glyphosate (Rodeo®) or covering with opaque materials (WA DOE 2008).

CHANGES IN COMMUNITIES OVER TIME

Historically, much of the East Tehama Watershed was characterized by blue oak woodland and herbaceous/shrub vegetation in the hills and riparian/wetland vegetation on the valley floor. It is believed that over 98 percent of the riparian forest that occurred along the Sacramento River between Red Bluff and Colusa prior to Euro-American settlement in the mid 1800s has been removed, mainly being converted to agricultural land (Griggs 1993). In the hills above the valley floor, fire, livestock grazing and clearing of trees for fuel, home building, and farms have contributed to the decline in blue oak woodlands and conifer forests.

Fire has also played an important role in community change over time. Prior to Euro-American settlement, much of the landscape burned every 12 years or less (Schmidt 2009). It is believed that Native Americans intentionally burned the watershed’s rangeland for thousands of year. Their practice of burning the groundcover of blue oak woodlands (under-burning) in the summer conflicted with the Euro-American settlers’ desire to graze livestock. Domestic livestock grazing and the end of under-burning of these areas eventually led to native-perennial bunch grasses being replaced by exotic-annual European grasses. Because of climatic and other factors including burning by both Native Americans and Euro-Americans, plant communities in these vegetation zones developed under a regime of frequent fires until about 1917, when fire prevention and control policies were implemented on both public and private lands in the watershed (Gerlach 2003, USDA 2000). Since this time, the fire return interval has lengthened. For example, one-third of the Lassen Foothills Area has burned just one time since 1910 (Schmidt 2009). Lengthened fire return intervals can cause changes in species composition within plant communities. For example, fire suppression decreases wedgeleaf ceanothus (*C. cuneatus*) abundance within mixed chaparral habitat and allows for the invasion of conifers into black oak stands within Sierran mixed conifer habitat (USDA 1992). These alterations are likely to be exacerbated by climate change.

Climate change is expected to influence fire frequency and extent in the Sierra Nevada and alter species composition within its plant communities (Miller and Urban 1999). Increased precipitation in Sierran mixed conifer habitats could cause increased fuel loads in the form of shrub and herb biomass if fire return intervals are not shortened to historic conditions (Hurteau et al. 2009). The region surrounding the watershed experienced an increase in high severity, stand replacing fires between 1984 and 2006, and this may have contributed to increased ecosystem impacts related to habitat availability, soil erosion and sedimentation rates, post-fire seedling recruitment, and carbon sequestration (Miller et al. 2009). A future climate scenario with increased temperatures in the region could cause a shift in dominance from conifers to hardwood trees (Lenihan et al. 2003). Special status plants could also be affected by climate change impacts on habitat range and suitability (Loarie et al. 2008).

Plant diseases can also influence changes in community composition over time. For example, sugar pine mortality in Sierran mixed conifer due to white pine blister rust (caused by *Cronartium ribicola*) has led to increased white fir dominance (Waring and O'Hara 2009). Blue oak woodland could be negatively impacted by sudden oak death (caused by *Phytophthora ramorum*); however the Tehama County Watershed has a low to very low risk of sudden oak death establishment and spread due to its moderate climate suitability and the fact that little or no foliar hosts have been identified (Meentemeyer et al. 2004).

Although we do not know the full extent of human-induced changes on vegetation communities in the watershed, efforts are being made to map current community occurrences. The California Land Cover Mapping and Monitoring Program (LCMMP) uses Landsat Thematic Mapper Satellite Imagery to map vegetation and derive land cover change (losses and gains) within 5-year time periods. The Cascade Northeast project area, one of 5 project areas in California, includes the Cascade Range floristic province area of Tehama County. This encompasses 37 percent of Tehama County and the majority of the Tehama East Watershed. The area that is excluded from the analysis includes an area immediately east of the Sacramento River in the southern portion of the watershed including portions of Hoag Slough and Pine Creek subwatersheds. The most recent analysis for the Cascade Northeast project area was completed for the five-year time period of 1994-1999. The report assesses vegetation cover changes for 10.8 million acres within hardwood, conifer, shrub/chaparral, and grass/forb vegetation types (LCMMP 2003). The monitoring data for this analysis has an overall accuracy of 84.5 percent determined by randomly selecting areas with known reference information.

Of the nearly 700,000 acres of land monitored in the study area within Tehama County, 97 percent experienced little or no change (i.e. +15 to -15 percent cover change). A summary of the results in canopy cover change by lifeform is provided in Table 9.

Table 9. Canopy Cover Change by Lifeform within Cascade Range Floristic Province Area of Tehama County from 1994-1999.

	Conifer*	Hardwood*	Shrub/ Chaparral*	Grass/Forb and NFO*
Cover Change (Acres)				
Decrease in Vegetation	11,775	458	1,533	N/A
% Decrease	4.6	0.2	1.4	N/A
Increase in Vegetation	4,018	664	507	N/A
% Increase	1.6	0.4	0.5	N/A
Total Change	15,793	1,122	2,040	N/A
Total % Change	6.2	0.6	1.9	N/A
Cause of Change (Acres)				
Fire	281	18	984	39
Harvest	9,817	349	310	36
Development	0	0	0	0
Regrowth	3,442	155	310	0
Pest Related	0	0	0	0
Other	107	0	5	0
Unverified Cause	2,146	598	430	35

NFO = "Non-Forested Other" including land classified as water, urban, agriculture, and barren.
* Values provided by California Land Cover Mapping and Monitoring Program, 2003

Within the Cascade Range Floristic Province Area (CRFPA) of Tehama County, the amount of total acreage change in conifer cover was five times greater than that of hardwood and shrub/chaparral cover combined. Nearly 66 percent of the total change in conifer cover was due to timber harvesting, 22 percent was due to regrowth, and 14 percent was due to unverified causes. Fire accounted for less than two percent of the total change in conifer cover. The largest decrease in conifer cover (>15 percent) occurred in Sierran mixed conifer (10,011 acres) followed by ponderosa pine (1,331 acres), and montane hardwood-conifer (228 acres). The largest increase in conifer cover (>15 percent) occurred in Sierran mixed conifer (3,247 acres) and ponderosa pine (357 acres).
Canopy cover of shrub/chaparral showed the second greatest total acreage change in the CRFPA of Tehama County. More than 48 percent of this change was due to fire and 21 percent was due to unverified causes. Harvest and regrowth each contributed 15 percent to the total shrub/chaparral cover change. The largest changes in shrub/chaparral cover occurred in mixed chaparral (-784 acres and +306 acres) and montane chaparral (-749 acres and +201 acres).

Hardwoods represented the lifeform with the third greatest change in canopy cover with 53 percent due to unverified causes, 31 percent due to harvest, 14 percent due to regrowth, and two percent due to fire. The largest decrease in hardwood cover occurred in montane hardwood (386 acres) and blue oak woodland (68 acres). The largest increase occurred in blue oak woodland (458 acres) followed by montane hardwood (199 acres).

DATA GAPS

- Inventory of target invasive plant species within the watershed and noxious weed monitoring and management plan.
- Historical distribution of riparian habitat and other sensitive habitats within the watershed.
- Detailed locations of sensitive habitats (e.g., vernal pools, wetlands, riparian, oak woodland) that are currently not protected in conservation lands.
- Detailed locations of special status plant species.
- Data concerning historical/fuels/forest management.

CONCLUSIONS AND RECOMMENDATIONS

Development

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, among others. Sacramento River Watershed Program' Best Management Practices provides information on rural residential development strategies.

Grazing and Grasslands
Livestock grazing provides economic benefits to people living in and around the Tehama East Watershed 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. The following policies should be considered in the Tehama East Watershed.

- Policies and practices should be 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.
- The interests of various stakeholders such as the Cattlemen's Association, private ranchers, conservationists, and land owners should be taken into account 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 provide guidance for landowners, the planning department and developers. The following goals and policies from this plan should be implemented to the extent feasible in the Tehama East Watershed.

- Encourage 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.
    1. When harvesting oaks for fuel or range improvement, encourage land owners to maintain an average leaf canopy of at least 30 percent (Standiford and Tinnin 1996).
    2. Retain trees of all sizes and species represented at the site.
    3. When safety permits, leave old hollow trees and those actively being used for nesting, roosting and feeding.
    4. Where low fire risk and aesthetics allow, pile limbs and brush to provide wildlife cover.
    5. Where commercial or extensive harvest is being contemplated, seek professional advice from such resources as UC Cooperative Extension (Farm Advisor), USDA Natural Resource Conservation Service (NRCS), California Department of Forestry and Fire Protection (CDF) and private consultants.

- When building within oak woodland encourage land owners to:
    1. Consider the impact of construction practices on the long-term management of oaks found on their property.
    2. Cluster houses to preserve wildlife corridors and habitats.
    3. Protect existing oaks during construction.
    4. Avoid root compaction by limiting heavy equipment in the root zone.
    5. Carefully plan roads, cuts and fills, building foundation and septic systems to avoid damage to tree roots.
    6. Design roads to minimize erosion and sedimentation to downstream resources.
    7. Avoid landscaping which requires or allows irrigation and

runoff within the drip line of oak trees.

8. Consider replacing trees, whose removal during construction is unavoidable, with native tree species.
9. Remove dead and rotting trees from areas immediately adjacent to homes and other structures.

- Inform private landowners regarding the value of well-managed oak woodlands.
    1. Educate landowners about potential threats to this resource.
    2. Seek funding that supports outreach to private landowners through the Tehama County RCD, the NRCS, UC Cooperative Extension, Wildlife Conservation Board as well as others.
- Encourage landowners to protect oak woodlands for future generations.
- Conserve large working ranches with significant oak woodlands
    1. Recognize sites according to landscape variables (size, shape, and connectivity to other habitats such as riparian) that support rich sustainable wildlife populations
    2. Recognize sites where prescribed fire can be safely used as a management tool
    3. Recognize sites that warrant voluntary protection according to threat and funding potential
- Encourage the voluntary protection of woodlands through these and other voluntary options:
    1. Development of sustainable ranching and farming operations
    2. Partnerships between government and non-profits
    3. Establishing Williamson Act contracts
    4. Conservation easements and other forms of real estate transactions

- Encourage the restoration of oak woodlands that suffer from lack of regeneration and exotic species invasions.
- Restore oak woodlands that lack regeneration.
    1. In areas where oaks have been removed and are not regenerating, promote voluntary

tree planting programs and measures that provide protection of oak seedlings from browsing and weeds.

2. Participate in state and federal cost share programs and grants.

- Control invasive weed species in oak woodlands.
    1. In coordination with the Colusa-Glenn-Tehama Weed Management Area seek funding to map the location and abundance of target weeds in woodlands.
    2. Where possible introduce prescribed fire and other methods to help control the spread of medusahead grass, yellow starthistle, giant reed, and other invasive wildland weed species.
- Reestablish native understory species.
    1. Encourage restoration of native plants as an alternative to exotic grasses (native plants will reduce weeds and may provide a longer grazing season for livestock).
    2. Encourage diverse understory vegetation including shrubs (habitat with multiple layers of vegetation provide habitat for many bird species).
- Establish a monitoring program to evaluate the success of this plan.
- 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.
- Increase communication between land managers, ranchers, and scientists regarding the protection and management of oak woodlands.
    1. Encourage workshops, symposiums, field trips and other methods of outreach regarding oak woodlands.
- Encourage research on oak woodland habitats.
    1. Encourage studies which evaluate oak regeneration in Tehama County
    2. Encourage studies that evaluate the effects of changing

land uses on oak woodland's current values (wildlife, ranching, water, economics, etc.)
3. Encourage studies that provide Tehama County ranchers with better and more specific information about sustainable management of oak woodlands.

When the Tehama County Voluntary Oak Woodland Management Plan (2005) was adopted by the Board of Supervisors (resolution 8-2005, 1 March 2005), this document fulfilled the requirement to obtain funding through the California Oak Woodlands Conservation Act of 2001. This conservation act allows landowners, conservation organizations, city and county municipalities an opportunity to conserve and/or restore oak woodland habitat at a local level (WCB 2001). The Tehama County Resource Conservation could pursue funds or encourage local landowners, cities, or counties to pursue grants for purchase of oak woodland easements, restoration or enhancement projects, long-term leases, or cost-sharing incentive payments (WCB 2001).

Vernal Pools
Vernal pools provide refuge for native plants, food sources for migrating waterfowl, and moderate seasonal flooding. They should be protected as important resources within the Tehama East Watershed.

- Educate government and private employees, developers and the general public working/living within the watershed about the importance of vernal pool ecosystems and the threats to them.

- Work collaboratively with land owners to address concerns associated with the presence of vernal pools on their property.

- 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
Agriculture lands contribute greatly to the economy of the region. Efforts should be made to preserve as much prime agricultural land as is reasonably possible.

- 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 Watershed.

Fire Management
Fire management is important in protecting the vegetation resources of the Tehama East Watershed. The Tehama East Community Wildfire Protection Plan and Risk

Assessment with Recommendations for Fire and Pre-fire Fuels Treatment Opportunities (Tehama County RCD 2008) is an essential fire management planning document for the Tehama East Watershed. The following action items from this document should be implemented for the Tehama East Watershed:

- Tehama-Glenn Fire Safe Council should develop a list of all currently unfunded fire and fuels management projects.

- Tehama-Glenn Fire Safe Council with assistance from the Tehama County Resource Conservation District, Tehama County Resource Advisory Committee, and Manton Fire Safe Council should identify possible sources of public and private funding for unfunded projects. Funding is expected to be in the form of public and private grants, self funding through the sale of biomass product, the assessment of fees, taxes, or other revenue sources. Proceeds from such funding could be used to finance both the initial completion of project work as well as the permanent maintenance of already completed infrastructure improvements.

- Tehama–Glenn Fire Safe Council in conjunction with CAL FIRE and county regulatory agencies should establish a work group to review those local ordinances that impact fire safety and development within the fire prone areas throughout Tehama County. *Tehama East Community Wildfire Protection Plan (Rev. 10/30/2008), Summary and Conclusions—Page XII-2*

- The efforts of the Tehama–Glenn Fire Safe Council; the United States Forest Service, and Bureau of Land Management personnel should be coordinated in order to create additional Wildland Urban Interface areas.

Riparian Communities
Encourage the protection, conservation, enhancement, and restoration of riparian vegetation within the Tehama East watershed.

- 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 Watershed. This information could be utilized to inform future management planning,

and be used to identify reference sites for habitat restoration projects. Characterization of these reference sites could help determine target ecosystem goals for ecological restoration projects (e.g., target topography, soils, hydrology, and plant community composition).

- Conduct a large-scale assessment to characterize the existing condition of riparian vegetation and floodplain conductivity along each creek within the Tehama East Watershed.
- Develop a ranking system to prioritize stream reaches within the watershed 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.
- Prepare a riparian corridor study with policies, standards, and guidelines for riparian habitat buffer setbacks for the Tehama East Watershed.

Invasive Plants
Develop a systematic plan for the control of target invasive species within the Tehama East Watershed. In general, this plan should include at a minimum:

- Prepare a target list of invasive plant species in collaboration with the appropriate local organizations;
- Map and inventory target invasive plant species throughout the watershed;
- evaluate control methods for each target species while minimizing impacts to natural resources;
- Prioritize existing populations for removal efforts;
- Research potential funding sources for eradication projects;
- Implement control/removal efforts as funding is available;
- Develop a monitoring program to minimize future spread after removal efforts;
- Develop minimization measures for spread of target invasive species to new locations; and
- Develop education programs for the general public on the impacts of invasive species on natural lands.

REFERENCES

Bell, G. P. 2002. Ecology and management of Arundo donax, and approaches to riparian habitat restoration in Southern California. Santa Fe: The Nature Conservancy. 10 pp.

Buck and Evans. 2009. Lassen foothills vegetation mapping project. Prepared for the Tehama County Resource Conservation District and Resources Legacy Fund Foundation.

Butte County. 2009. Butte County General Plan Public Review Draft. September 2009.

California Department of Fish and Game (CDFG). 2010. Rarefind. California Natural Diversity Data Base (CNDDB). Electronic Database.

California Department of Food and Agriculture (CDFA) State of California Division of Plant Health and Pest Protection Services. 2009. Pest ratings of noxious weed species and noxious weed seed.

California genealogy and history archives. A memorial and biographical history of Northern California: Tehama County history. http://www.calarchives4u.com/history/history-tehama.htm

California Interagency Noxious Weed Coordinating Committee (CINWCC). 2010. CalWeed Database. Accessed through the Natural Resources Projects Inventory.

California Invasive Plant Council (Cal-IPC). 2006. California Invasive Plant Inventory. February 2006.

California Invasive Plant Council (Cal-IPC). 2007a. New weeds added to Cal-IPC Inventory. Spring 2007.

[Cal-IPC] California Invasive Plant Council. 2007b. Invasive Plant Profiles and Statewide Draft Maps. [online]: http://www.cal-ipc.org/ip/management/plant_profiles/ index.php and http://www.cal-ipc.org/ip/mapping/statewide_maps/index.php. Accessed September 2007.

California Native Plant Society (CNPS). 2010. Inventory of Rare and Endangered Plants of California. Electronic Database.

California Land Cover Mapping and Monitoring Program (CLCMMP). 2003. Monitoring Land Cover Changes in California Cascade Northeast Project Area Cycle II. December 2003.

Carpenter, A. T. 1998. Element Stewardship Abstract for Tamarix ramosissima, T.

pentandra, T. chinensis and T. parviflora. Arlington: The Nature Conservancy. 33 pp.

CSU Sacramento and Sonoma Ecology Center. 2005. Arundo Streamside Invader [Brochure]. Prepared for the California Department of Fish and Game. [online]: http://teamarundo.org/education/index.html#brochure. Accessed March 2008.

Davy, J., M. George, and B. Burrows. 2007. An Introduction to Grazing for Weed Control. University of California. Northern California Ranch Update 1(4):5.

DiTomaso, J. 1998. Impact, Biology, and Ecology of Saltcedar (Tamarix spp.) in the Southeastern United States. Weed Technology 12(2):326-336.

DiTomaso, J., K. Heise, A. Merenlender, and G. Kyser. 2001. Successful Burning Strategy to Control Barbed Goatgrass. Oaks 'n' Folks Vol. 17(1). Newsletter of the Integrated Hardwood Range Management Program. [online]: http://danr.ucop.edu/ihrmp/oak108.htm. Accessed March 2008.

DiTomaso, J., G. Kyser, and M. Pitcairn. 2006. Yellow starthistle management guide. California Invasive Plant Council Publication. Berkeley, California.

Dudley, T. 2006. Arundo donax. California Invasive Plant Council. [online]: http://www.cal-ipc.org. Accessed 8 February 2006.

EIP Associates. 2002. Southern California Integrated Watershed Program Arundo Removal Protocol. Prepared for Santa Ana Watershed Project Authority.

Gerlach, J. D. 2003. A Literature Review of the Impacts of Vegetation Conversion Practices on Shrub Dominated Ecosystems in California, an Assessment of the Factors that Drive the Success or Failure of Vegetation Conversion Projects and Restoration projects in Shrub Dominated Ecosystems, and a Research Program for Native Vegetation Restoration, Rangeland Improvement, and the Detection of Hydrological Impacts. Prepared for the Glenn County Resource Conservation District and the U.S. Bureau of Reclamation.

Griggs, F. T. 1993. Protecting biological diversity through partnerships: the Sacramento River Project. Pages 235-237 in J. E. Keeley, editor. Interface between ecology and land development in California. Southern California Academy of Sciences, Los Angeles.

Hoshovsky, M. 1987. Element Stewardship Abstract for Arundo donax (Giant Reed). Arlington: The Nature Conservancy. 8 pp.

Hurteau, M. D., M. North, T. Foin. 2009. Modeling the influence of precipitation and nitrogen deposition on forest understory fuel connectivity in Sierra Nevada mixed-conifer forest. Ecological Modelling 220:2460-2468.

Integrated Pest Control Branch of the California Department of Agriculture (IPCB of CDFA). 2006. Noxious weed management area support program. Final report on the SB 1740 (Legislative 2000) Funding Program. July 2006.

Lenihan, J. M., R. Drapek, D. Bachelet, and R. P. Neilson. 2003. Climate change effects on vegetation distribution, carbon, and fire in California. Ecological Applications 13:1667-1681.

Lewis, E. J. 1891. Tehama County history: a memorial and biographical history of Northern California. Lewis Publishing Co., Chicago, IL.

Loarie, S. R., B. E. Carter, K. Hayhoe, S. McMahon, R. Moe, C. A. Knight, D. D. Ackerly. 2008. Climate change and the future of California's endemic flora. PloS one 3:e2502.

Maurer, T., M. Russo, and A. Godell. 1988. Element Stewardship Abstract for Taeniatherum caput-medusae Medusahead. Arlington: The Nature Conservancy.

Mayer, K. E. and Laudenslayer, W. F. Jr. 1988. A guide to wildlife habitats of California. Sacramento: California Department of Fish and Game.

Meentemeyer, R., D. Rizzo, W. Mark, and E. Lotz. 2004. Mapping the risk of establishment and spread of sudden oak death in California. Forest Ecology and Management 200:195-214.

Miller, C. and D. L. Urban. 1999. Forest pattern, fire, and climatic change in the Sierra Nevada. Ecosystems 2:76-87.

Miller, J. D., H. D. Safford, M. Crimmins, and A. E. Thode. 2009. Quantitative evidence for increasing forest severity in the Sierra Nevada and Southern Cascade Mountains, California and Nevada, USA. Ecosystems 12:16-32.

Moon, D. 2003. Chico: Life and times of a city of fortune (CA) (Making of America). Acadia Publishing, Mount Pleasant, SC.

Natural Resources Conservation Service (NRCS). 2005. Arundo

Seed Viability Study Project Summary.

PMC. 2008. Tehama County General Plan. Prepared for Tehama County. September 2008.

Renz, M. 2000. Element Stewardship Abstract for Lepidium latifolium perennial pepperweed tall whitetop. Arlington: The Nature Conservancy.

Sacramento River Watershed Program. 2007. [online]: http://www.sacriver.org/issues/plants/organizations/wma_yolo.php and http://www.sacriver.org/issues/plants/organizations/wma_colusa_glenn_tehama.php. Accessed 1 November 2007.

Sawyer, J., and T. Keeler-Wolf. 1995. A Manual of California Vegetation. Sacramento: California Native Plant Society.

Schmidt, D. 2009. Mapping departure from historic fire return intervals in the Lassen Foothills of Eastern Tehama County, California. Report to Tehama County Resource Conservation District. The Nature Conservancy.

Society for Ecological Restoration (SERCAL; California). 2007. Controlling costs during Arundo and Tamarisk removal on Putah and Cache Creek. Ecesis 17(4).

Standiford, R. B. and P. Tinnin. 1996. Guidelines for managing California's hardwood rangelands. University of California Division of Agriculture and Natural Resources Leaflet no. 3368.

Tehama County. 2005. Tehama County Voluntary Oak Woodland Management Plan.

Tehama County Department of Agriculture Weights and Measures. 2009. Tehama County 2008 Agricultural Crop Report.

Tehama County Resource Conservation District (RCD). 2008. Tehama east community wildfire protection plan and risk assessment with recommendations for fire and pre-fire fuels treatment opportunities. Report to the California Fire-Safe Council, Tehama County Resource Advisory Committee, Lassen National Forest, Bureau of Land Management, Tehama-Glenn Fire Safe Council, and Manton Fire Safe Council.

U. S. Department of Agriculture (USDA), Forest Service, Lassen National Forest. 1992. Land and Resource Management Plan. Lassen National Forest, Susanville, CA.

U. S. Department of Agriculture (USDA), Forest Service, Mendocino National Forest. 2000. Watershed Analysis Report: Upper Stony Watershed Analysis Area, U.S. Department of Agriculture Forest Service. Vi +93 pp.

U. S. Fish and Wildlife Service. 2010. Official Species List for Project and Surrounding U.S.G.S. Quadrangles.

U. S. Forest Service. 1999. Classification and Assessment with Landsat of Visible Ecological Groupings (CALVEG) existing vegetation layer.

Vaghti, M. 2003. Riparian Vegetation Classification in Relation to Environmental Gradients, Sacramento River, California. Master's thesis. UC Davis.

Verdone, L. 2004. From Data Collected in the Laguna de Santa Rosa, Sonoma County, California. California Invasive Plant Council. [online]: http://www.cal-ipc.org/ip/inventory/PAF/Ludwigia%20hexapetala.pdf. Accessed 24 March 2008.

Waring, K. M. and K. L. O'Hara. 2009. Stand development and tree growth response to sugar pine mortality in Sierran mixed-conifer forests. Northeast Science 83:89-100.

Washington State Department of Ecology (WA DOE). 2007. Water Quality Program, Aquatic Plants, Algae & Lakes. [online]: http://www.ecy.wa.gov/programs/wq/links/plants.html. Accessed 24 March 2008.

Wildlife Conservation Board (WCB) State of California Resource Agency. 2001. The oak woodlands conservation act of 2001, program application and guidelines.

Zouhar, K. 2003. Tamarix spp. In: USDA, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. Fire Effects Information System. [Online]: http://www.fs.fed.us/database/feis/. Accessed 8 February 2006

Section 9
Wildlife

Introduction

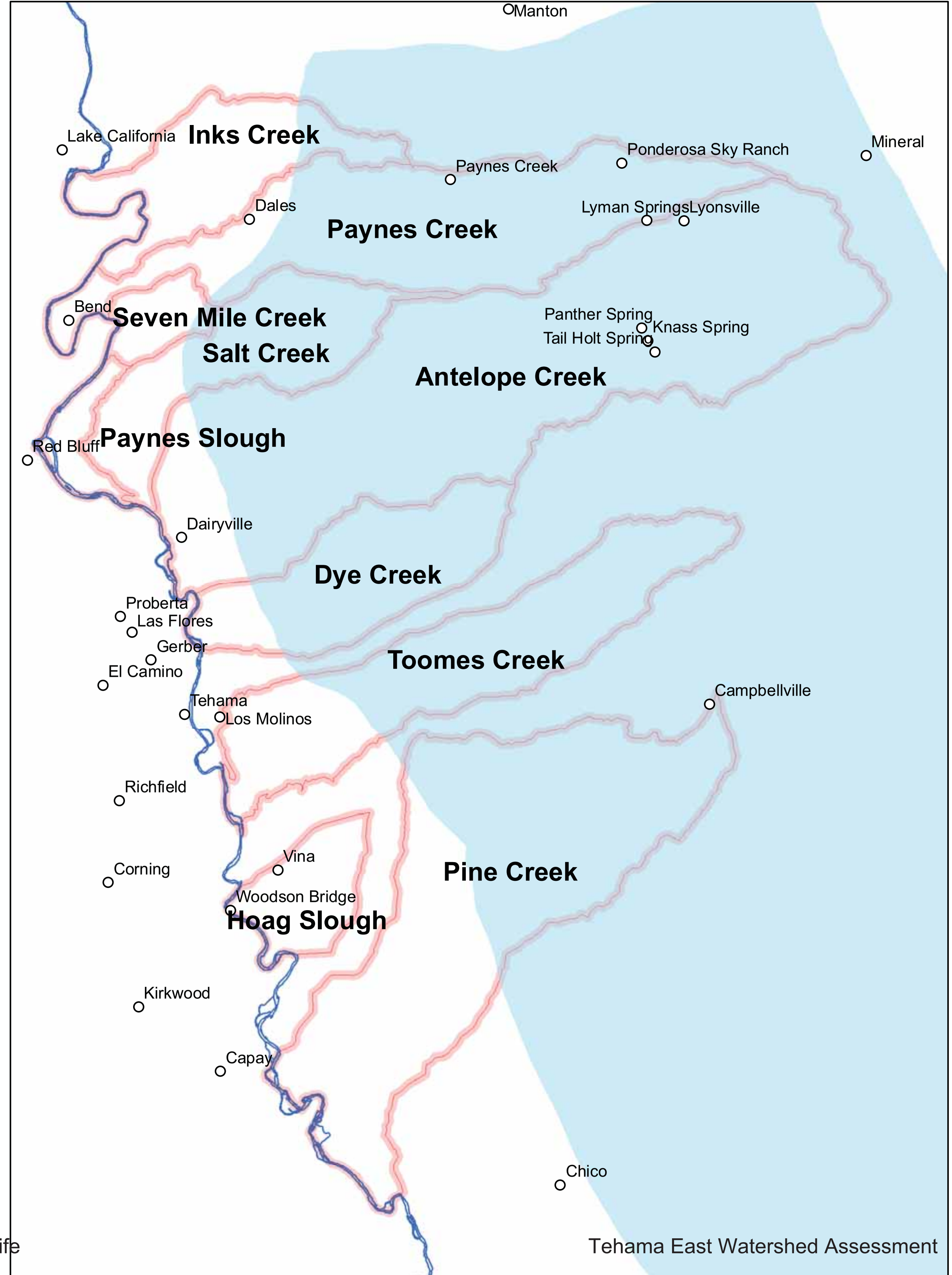
The California Wildlife Habitat Relationships information system contains data concerning the life history, geographic range, habitat relationships, and management information on nearly 700 vertebrate species in California. The following pages consist of maps showing the geographic range of the various amphibians, reptiles, birds, and mammals that occur within the Tehama East Watersheds Study Area. This is not a complete atlas, but it does show the biodiversity of vertebrate species that can be found in Tehama County.

"The California Wildlife-Habitat Relationships (WHR) System is the most extensive complication of such information in California today. It represents a state-of-the-art tool for wildlife-habitat management and research. The goal of the system is to provide credibility to wildlife analyses and resource management decisions. Currently, the WHR System is composed of: (1) a wildlife species list; (2) species notes (a summary of the status, distribution, habitat requirements, and life history of each vertebrate species that regularly occurs in California); (3) species distribution maps; (4) computer data base (species habitat relationship models); and (5) habitat classification and vegetation descriptions (found within this Guide). These components can be used separately or in combination. However, to address wildlife responses to changes in habitat, all components should be used collectively, as no single component contains the breadth of information needed for a comprehensive analysis."

Quoted from:
A Guide to Wildlife Habitats of California. 1988.
Edited by Kenneth E. Mayer and William F. Laudenslayer, Jr.
State of California, Resources Agency, Department of Fish and Game
Sacramento, CA. 166 pp.
http://www.dfg.ca.gov/biogeodata/cwhr/wildlife_habitats.asp

California Wildlife Habitat Relationships (CWHR)

Amphibians



Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

"CWHR has been used for several large wildlife resource conservation efforts including California's GAP effort, the Legislatively-authorized Timberland Task Force effort, and the Sierra Nevada Framework effort. It is one of the primary biological data sets used in an assessment of California's biodiversity for the "Atlas of the Biodiversity of California". CWHR is used in sustained yield planning efforts by several large private timber companies and is part of regulations a dopted by the California Board of Forestry."

Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

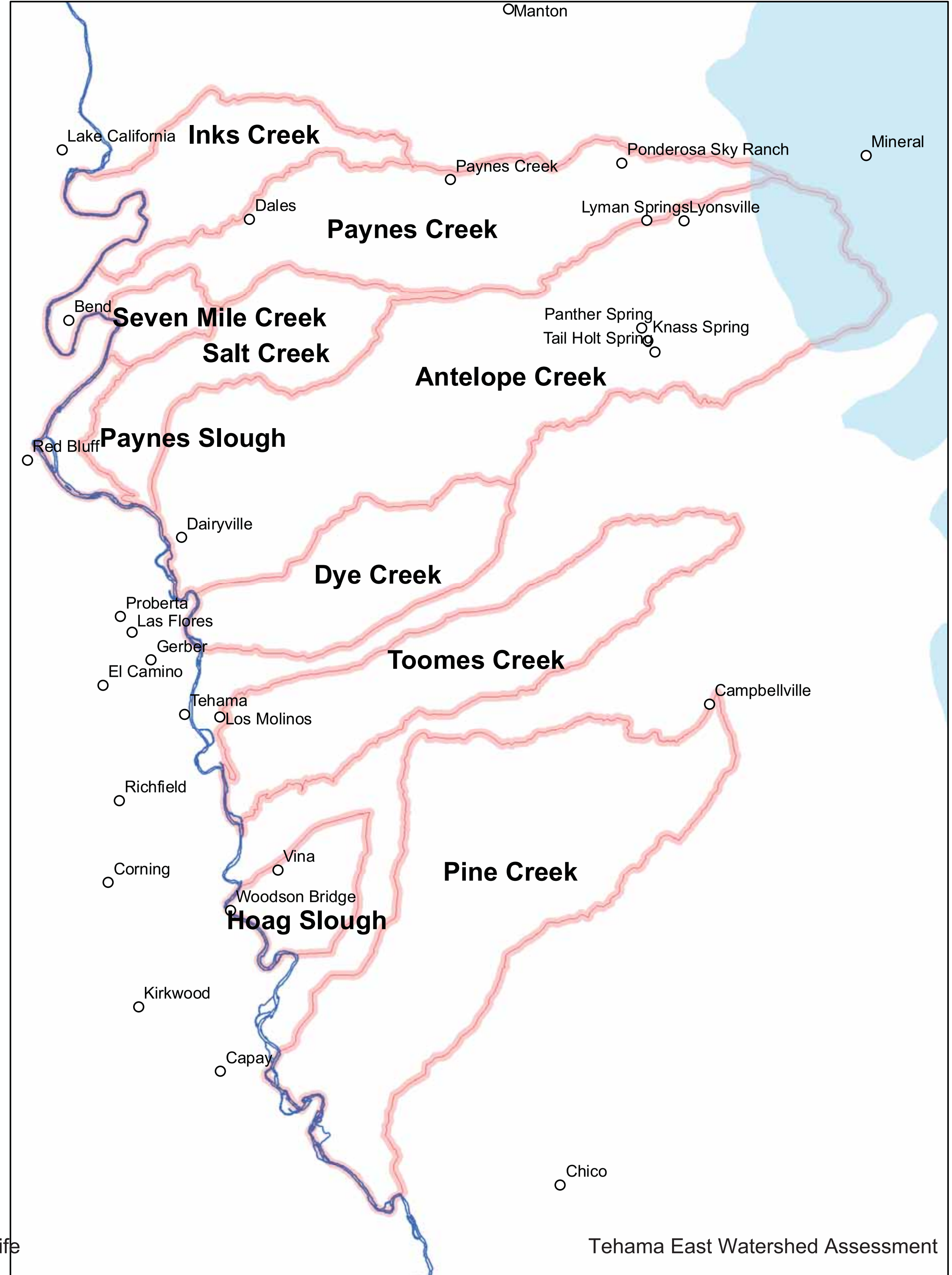
CALIFORNIA NEWT (TARICHA TOROSA)

Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 2.5 5 10 Miles



Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

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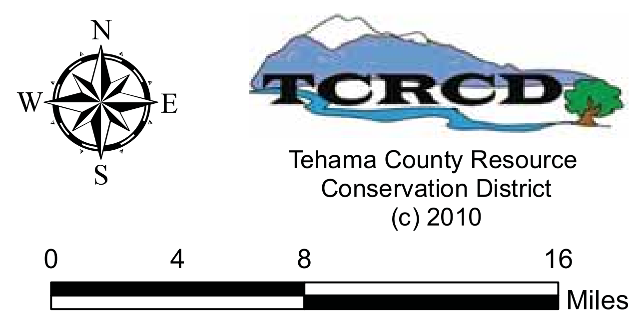
Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

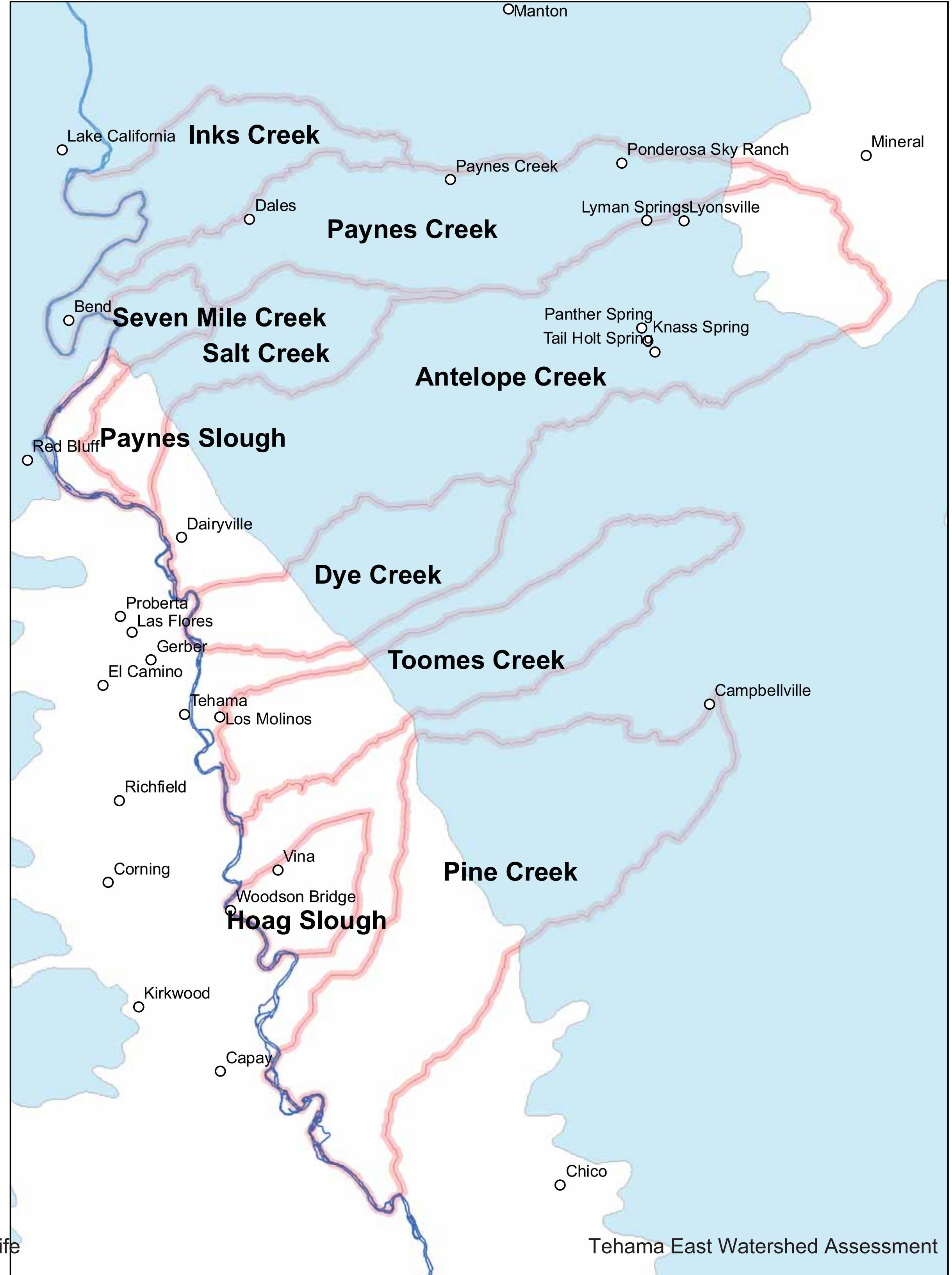
KEY

CASCADES FROG (RANA CASCADAE)

Watershed Boundary



Tehama County Resource Conservation District
(c) 2010



Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds

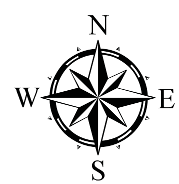
"CWHR has been used for several large wildlife resource conservation efforts including California's GAP effort, the Legislatively-authorized Timberland Task Force effort, and the Sierra Nevada Framework effort. It is one of the primary biological data sets used in an assessment of California's biodiversity for the "Atlas of the Biodiversity of California". CWHR is used in sustained yield planning efforts by several large private timber companies and is part of regulations a dopted by the California Board of Forestry."

Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

ENSATINA
(ENSATINA ESCHSCHOLTZII)

Watershed Boundary



Tehama County Resource Conservation District
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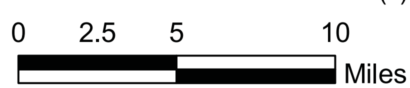
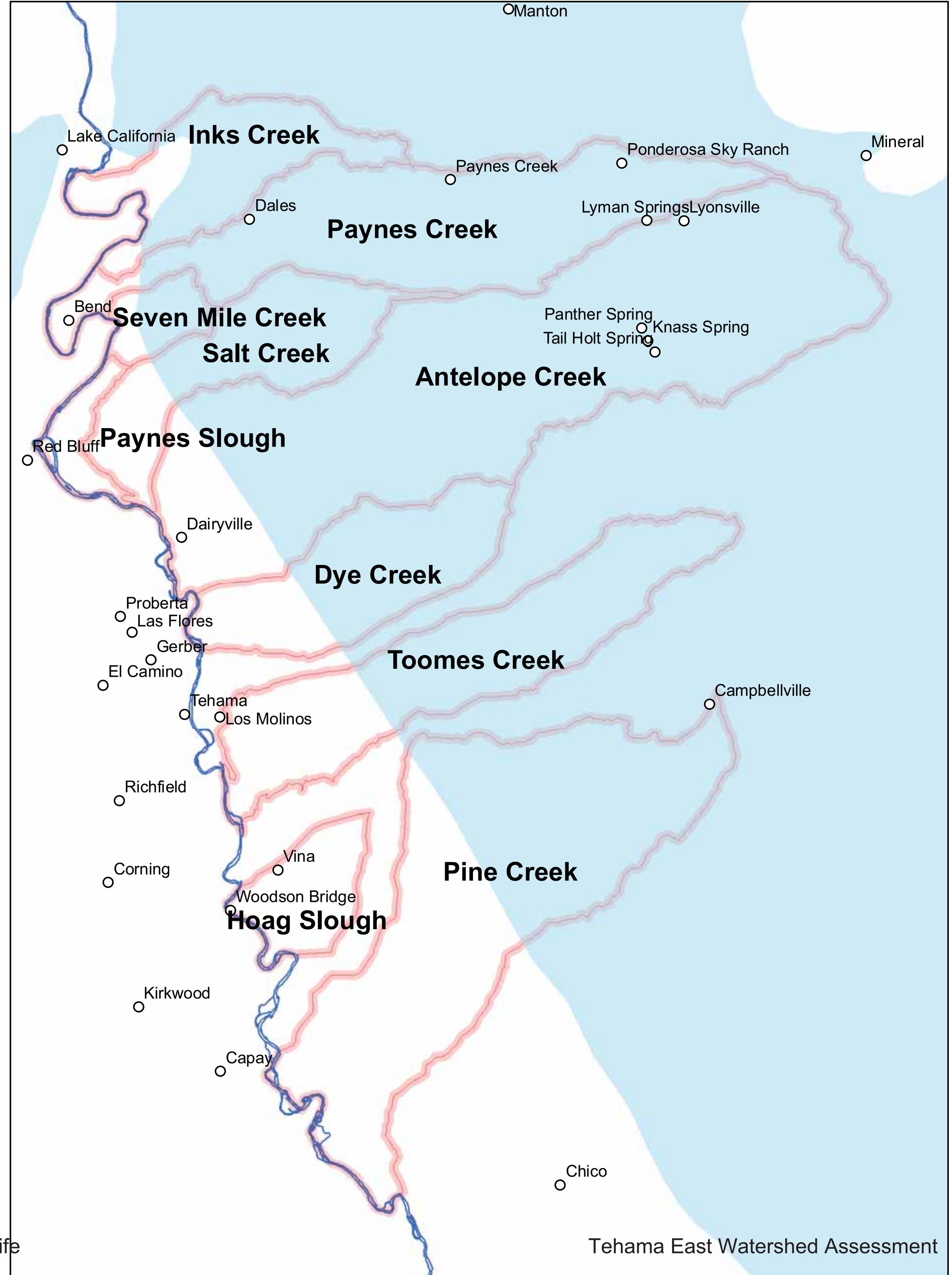


Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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Quoted from:
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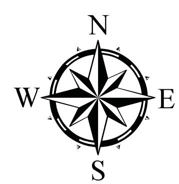
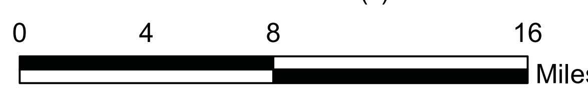
KEY

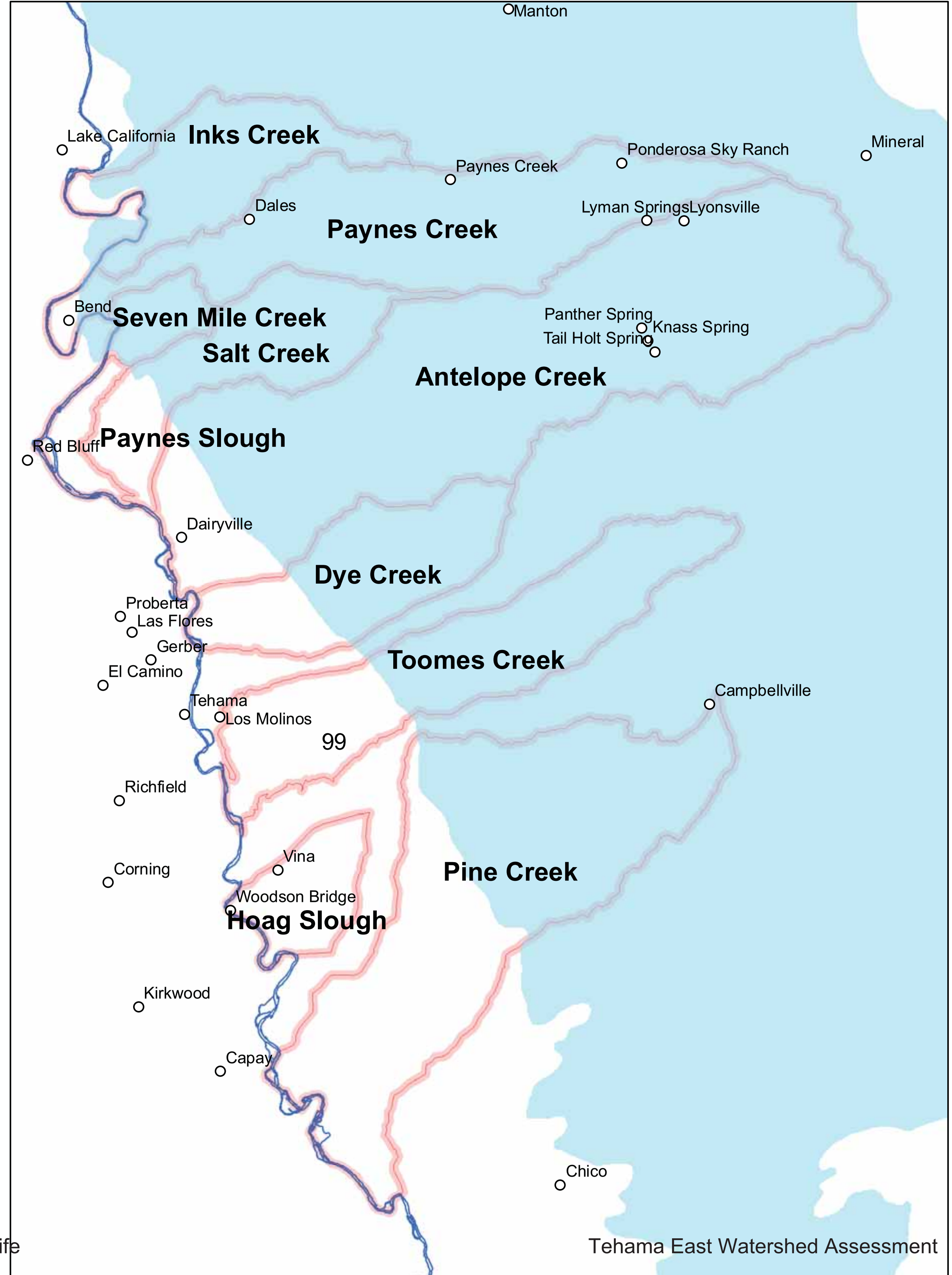
FOOTHILL YELLOW-LEGGED FROG (RANA BOYLII)

Watershed Boundary



Tehama County Resource Conservation District
(c) 2010





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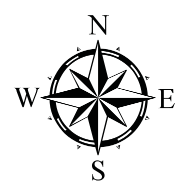
Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

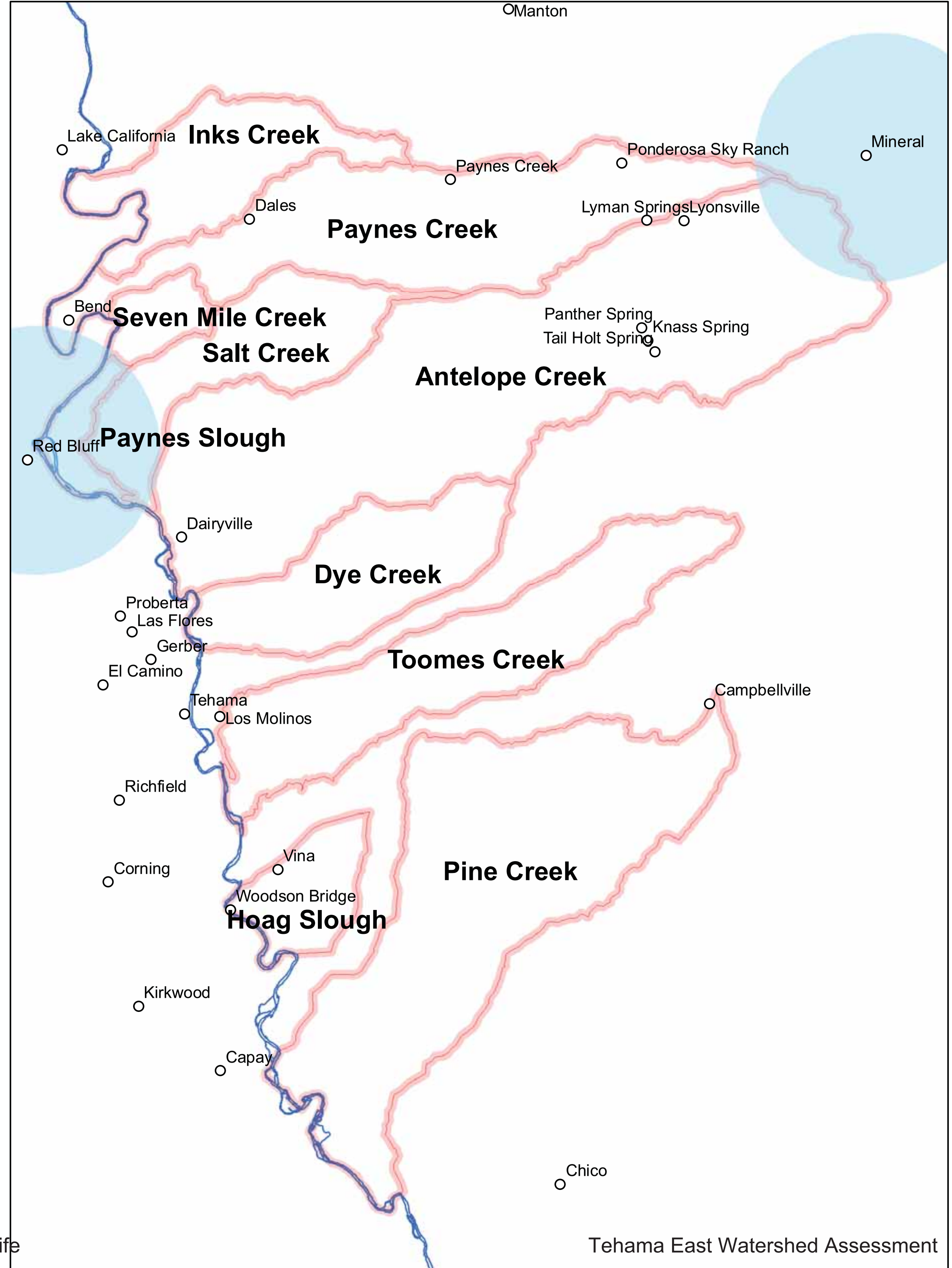
ROUGHSKIN NEWT (TARICHA GRANULOSA)

Watershed Boundary



Tehama County Resource Conservation District
(c) 2010

0 2.5 5 10 Miles



Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

NORTHERN LEOPARD FROG (RANA PIPIENS)

Watershed Boundary

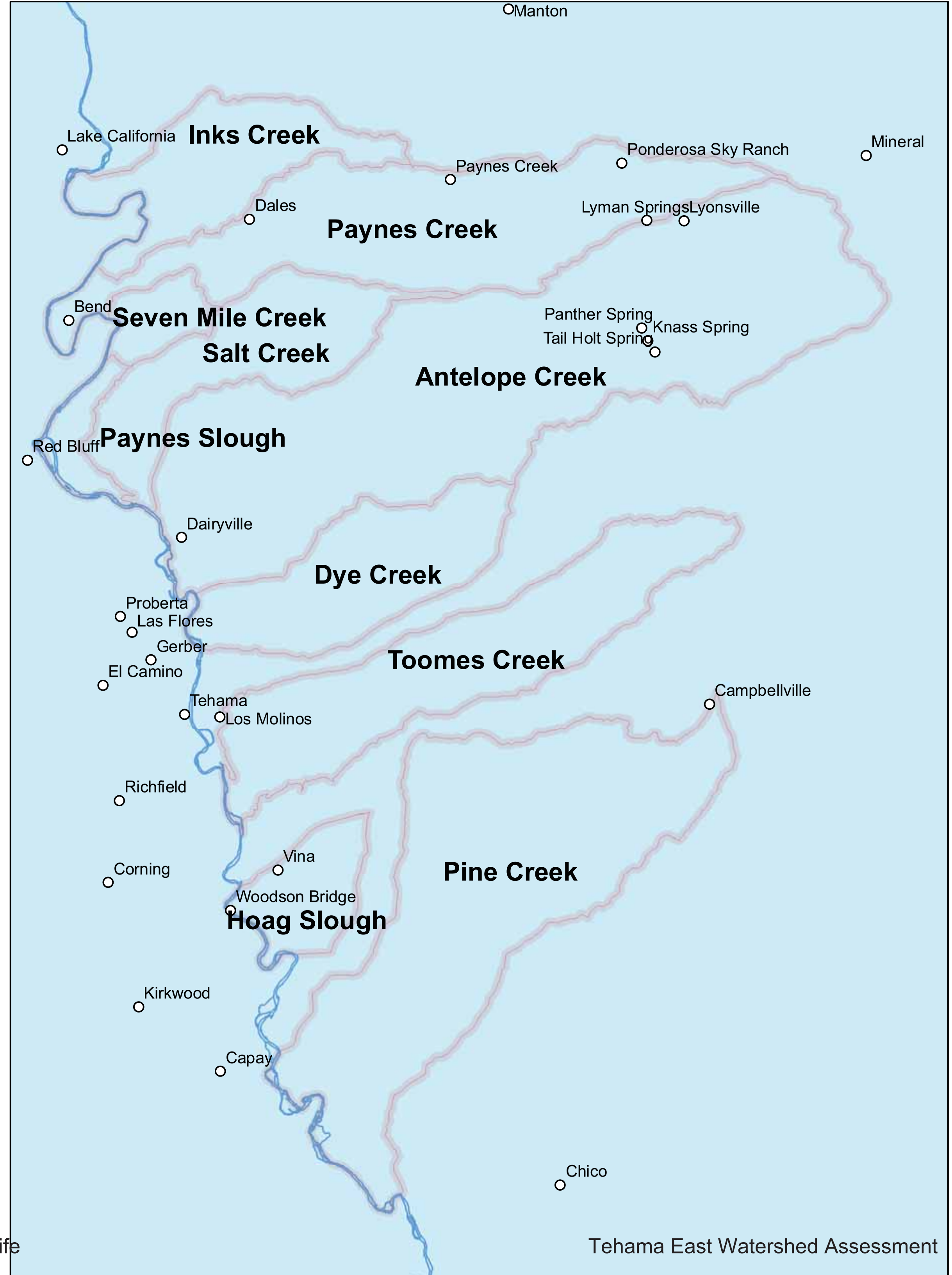
N W E S

Tehama County Resource Conservation District (c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds



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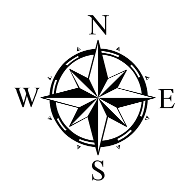
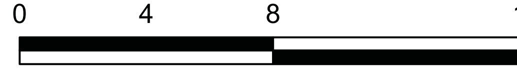
KEY

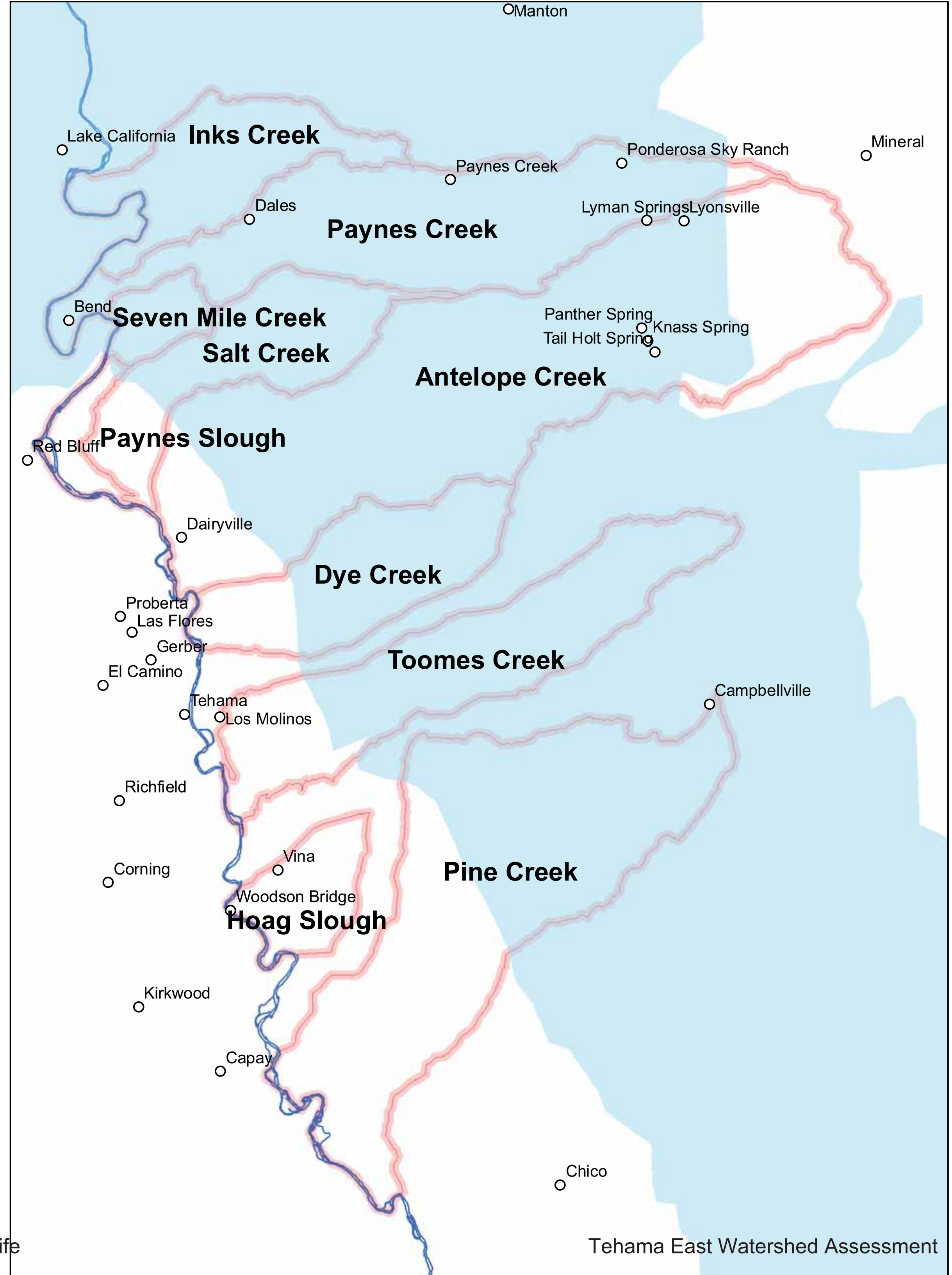
PACIFIC CHORUS FROG (PSEUDACRIS REGILLA)

Watershed Boundary



Tehama County Resource Conservation District
(c) 2010





Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds

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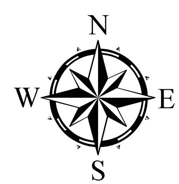
KEY

RED-LEGGED FROG (RANA AURORA)

Watershed Boundary



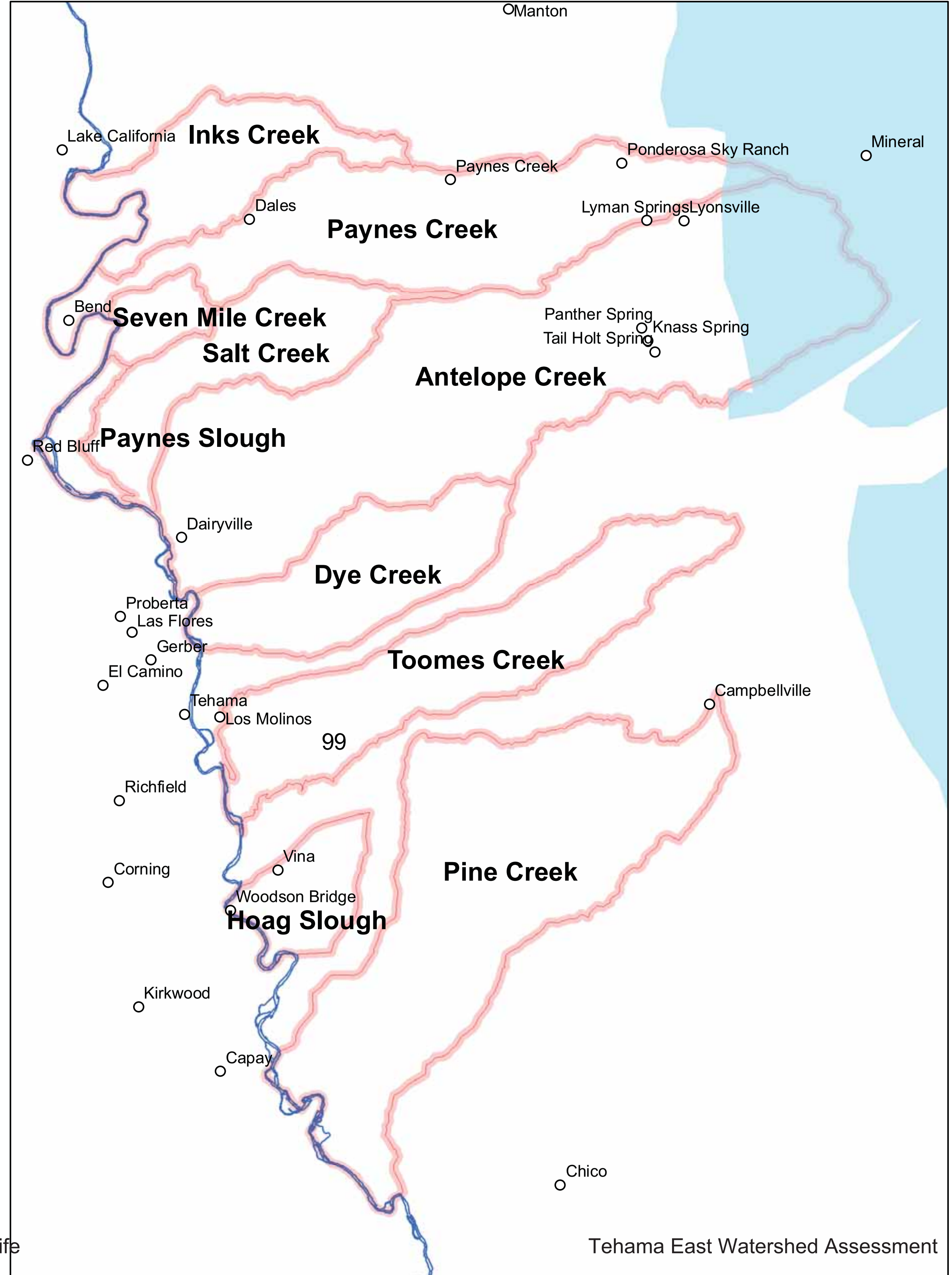
TCRCD

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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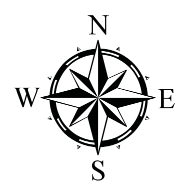
KEY

LONG-TOED SALAMANDER (AMBYSTOMA MACRODACTYLUM)

Watershed Boundary



Tehama County Resource Conservation District
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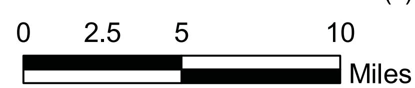

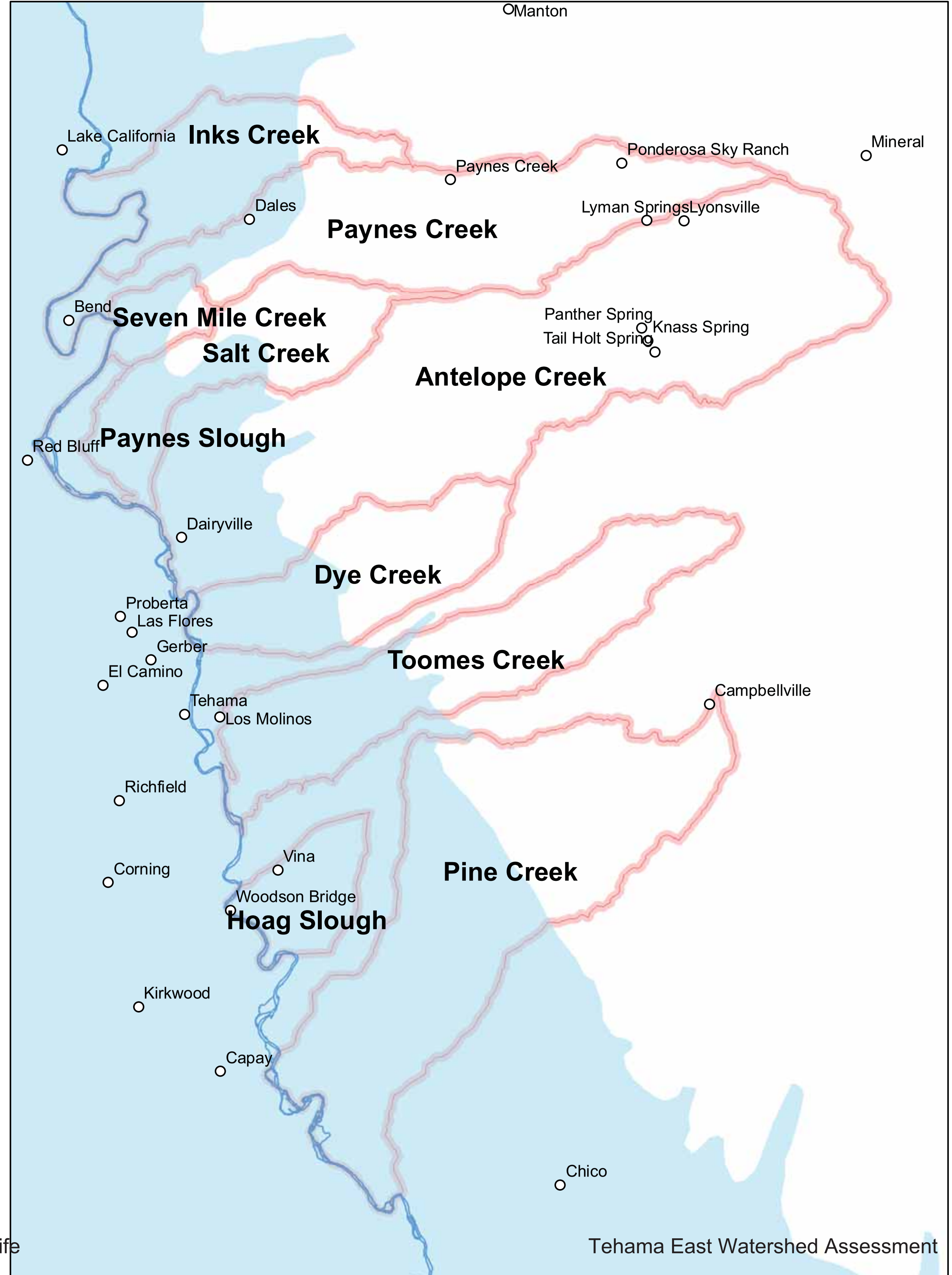

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds

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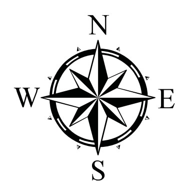
KEY

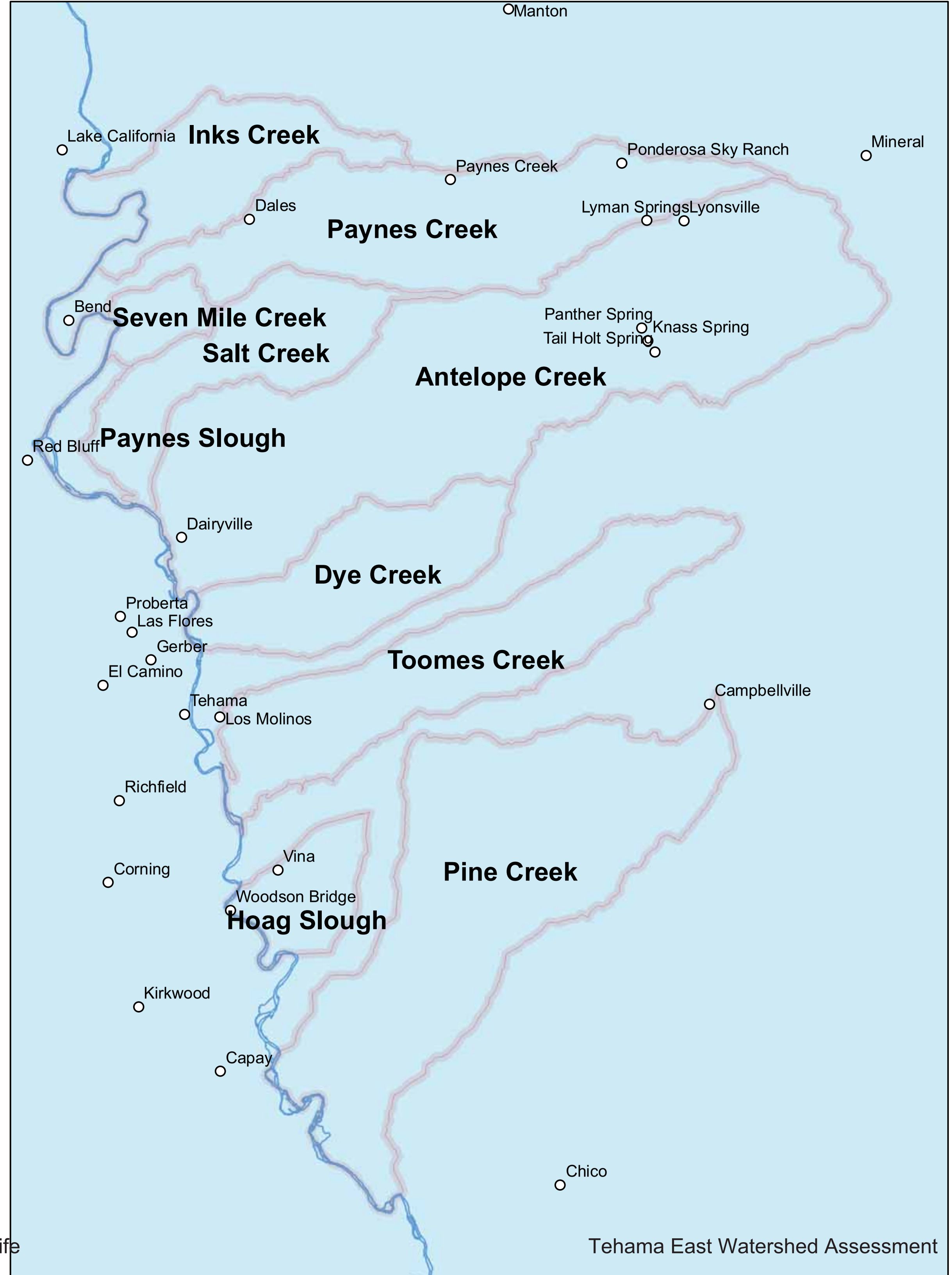
WESTERN SPADEFOOT (SCAPHIOPUS HAMMONDII)

Watershed Boundary



Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds

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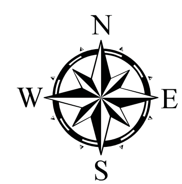
KEY

WESTERN TOAD (BUFO BOREAS)

Watershed Boundary

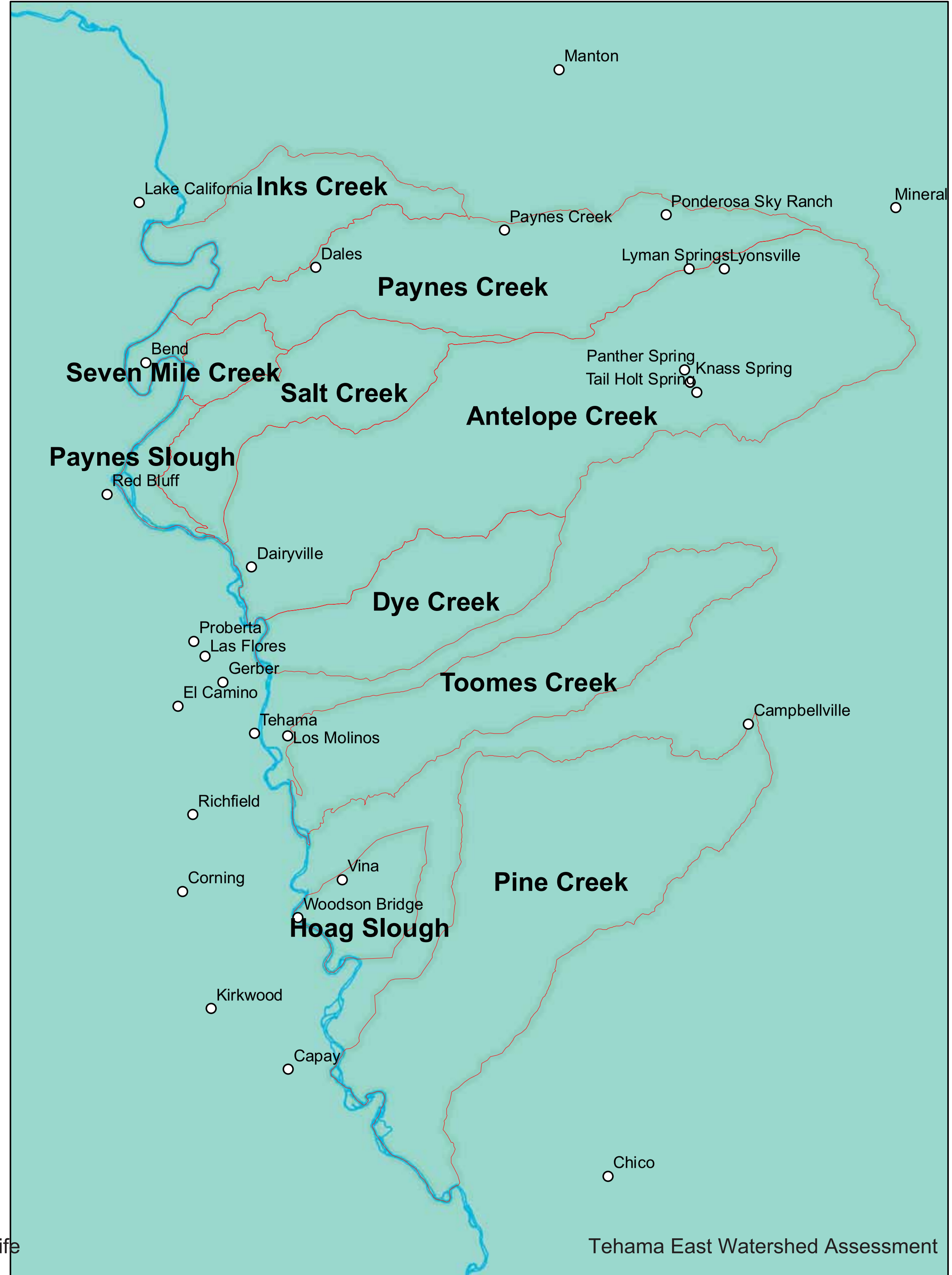


Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

California Wildlife Habitat Relationships (CWHR)

Birds



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California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

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KEY

ACORN WOODPECKER
(MELANERPES FORMICIVORUS)

SEASON

- Summer
- Year Round
- Winter

Watershed Boundary

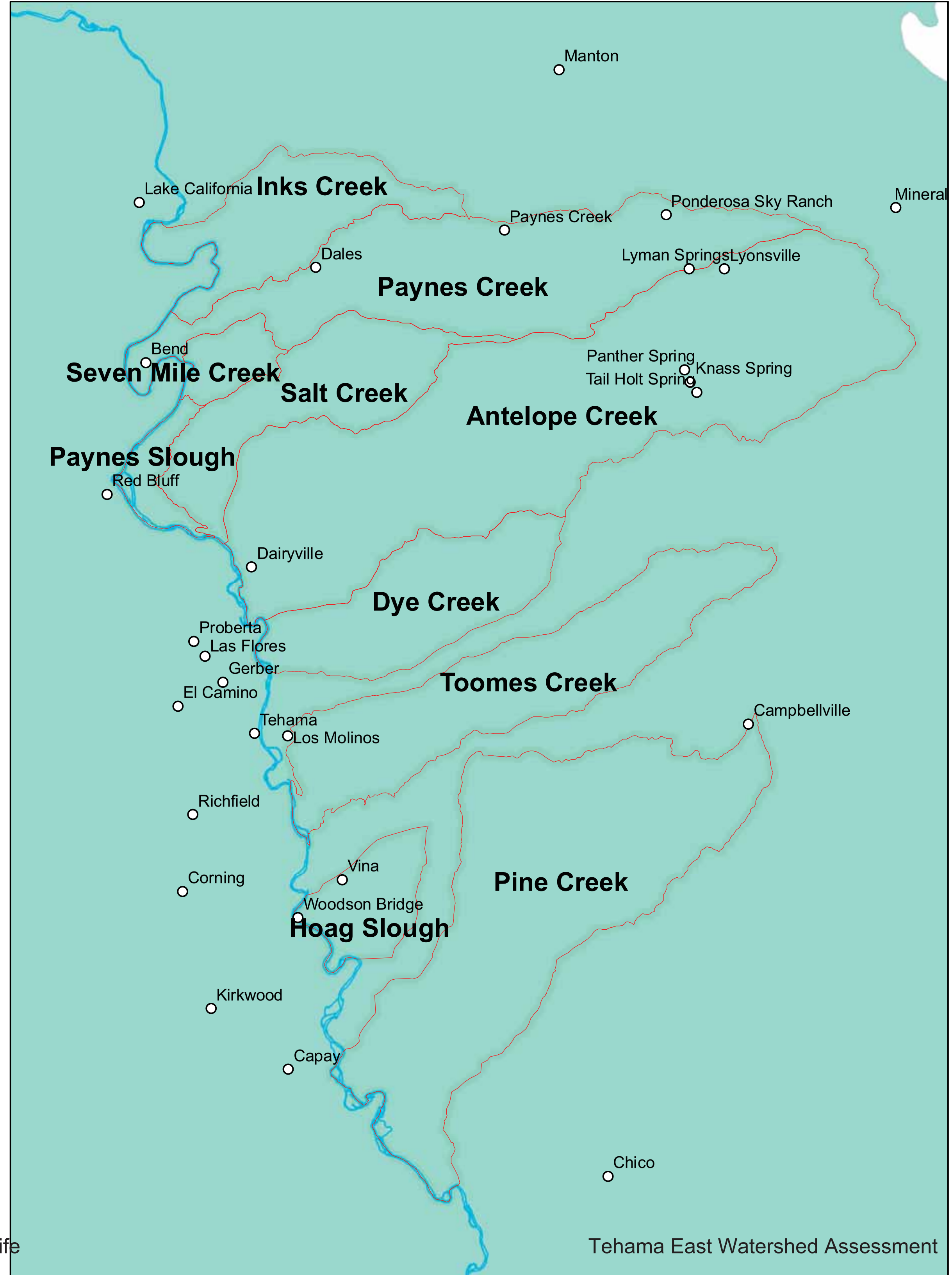
N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds



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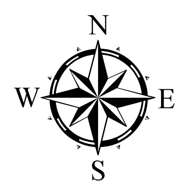
KEY

AMERICAN KESTREL
(FALCO SPARVERIUS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



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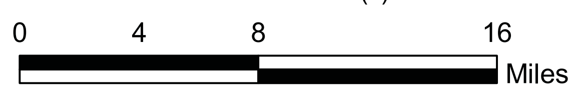

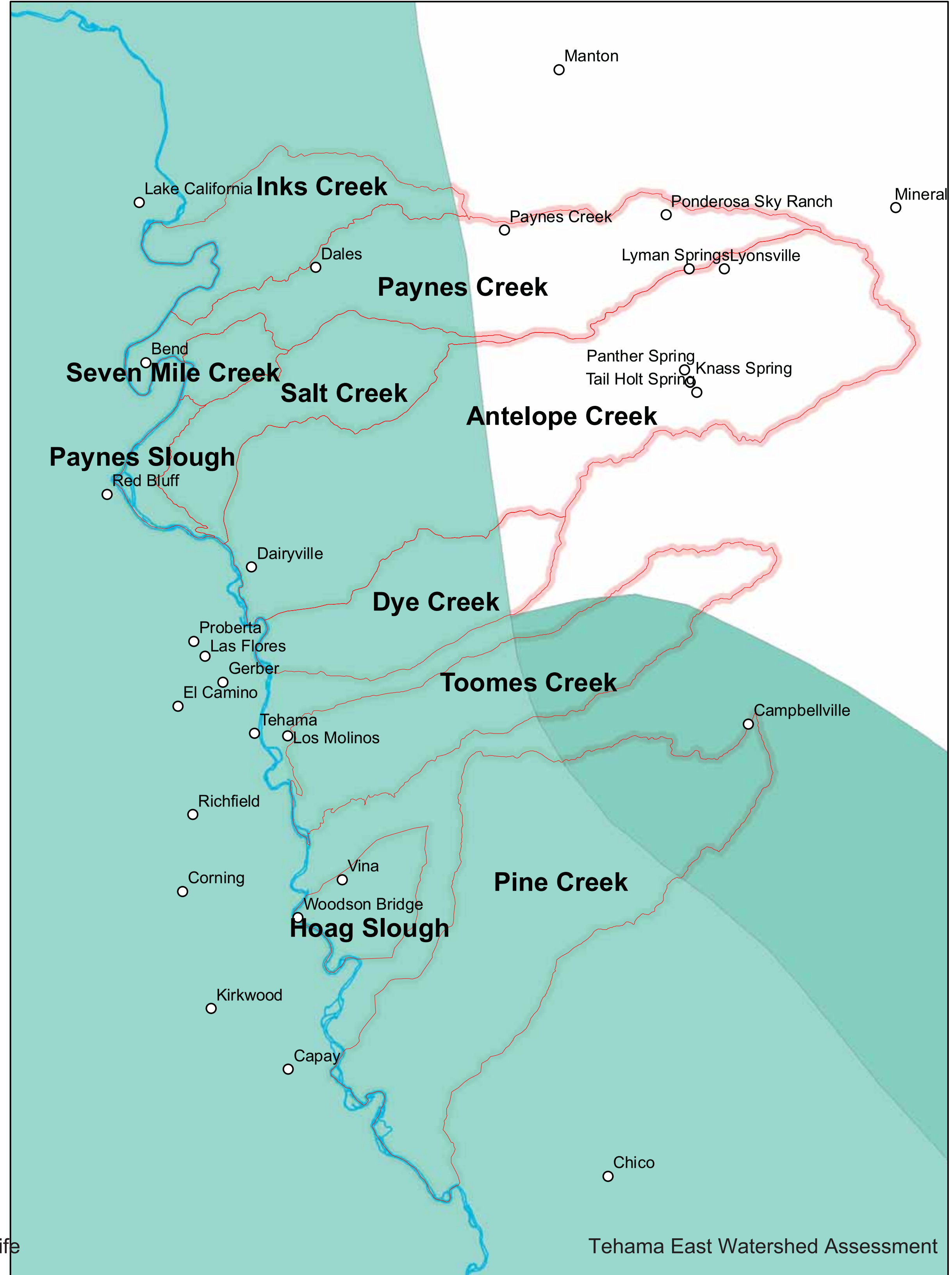

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds

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KEY

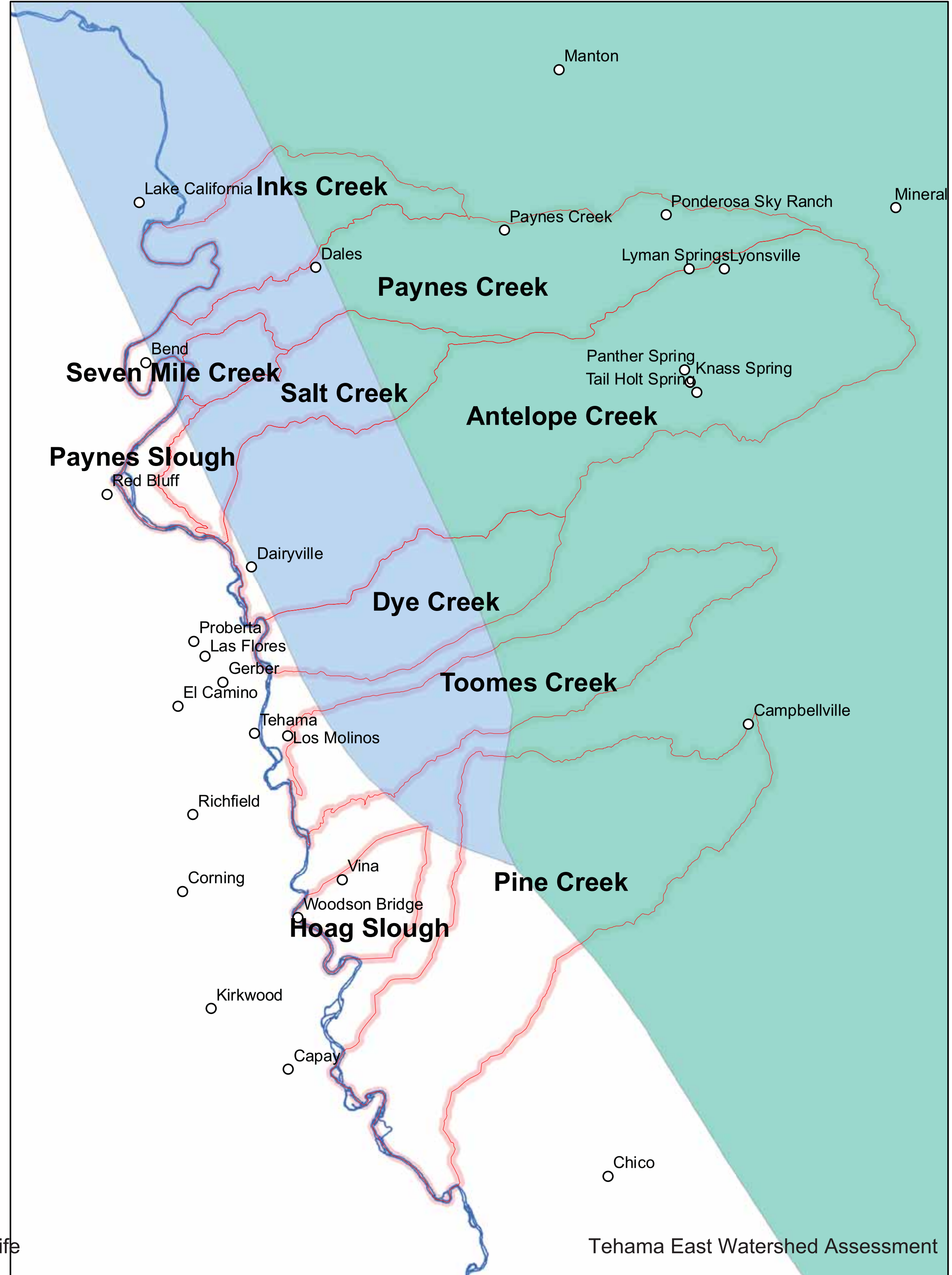
AMERICAN CROW
(CORVUS BRACHYRHYNCHOS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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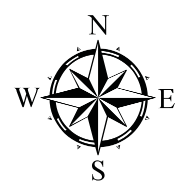
KEY

AMERICAN DIPPER
(CINCLUS MEXICANUS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



Tehama County Resource
Conservation District
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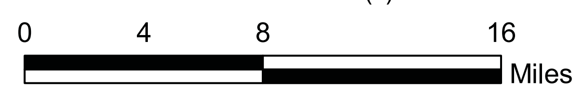

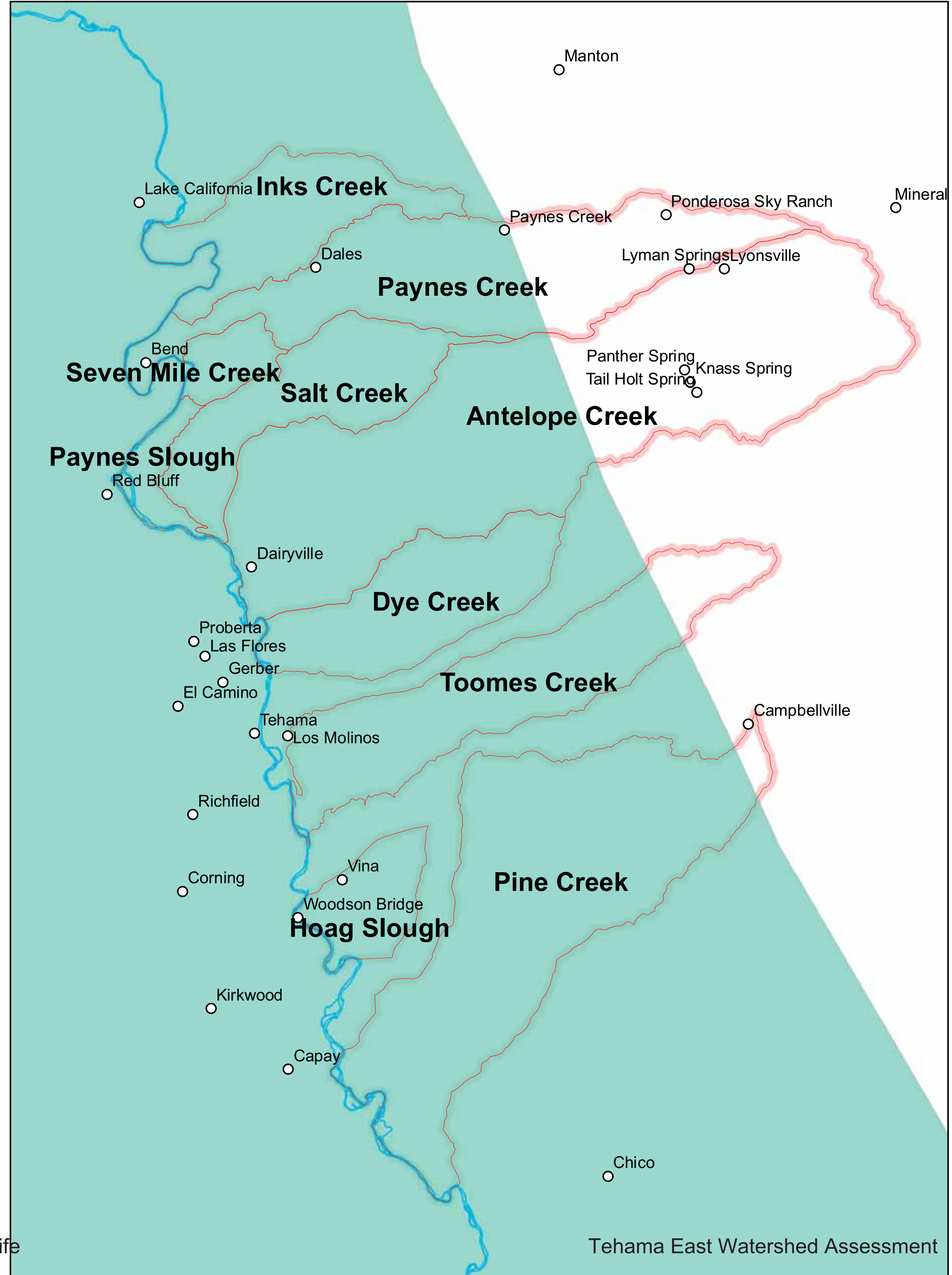

Tehama East Watershed Assessment

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Tehama East Watersheds

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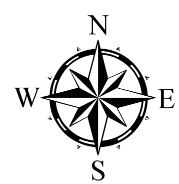
KEY

AMERICAN GOLDFINCH
(CARDUELIS TRISTIS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



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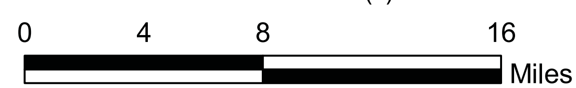
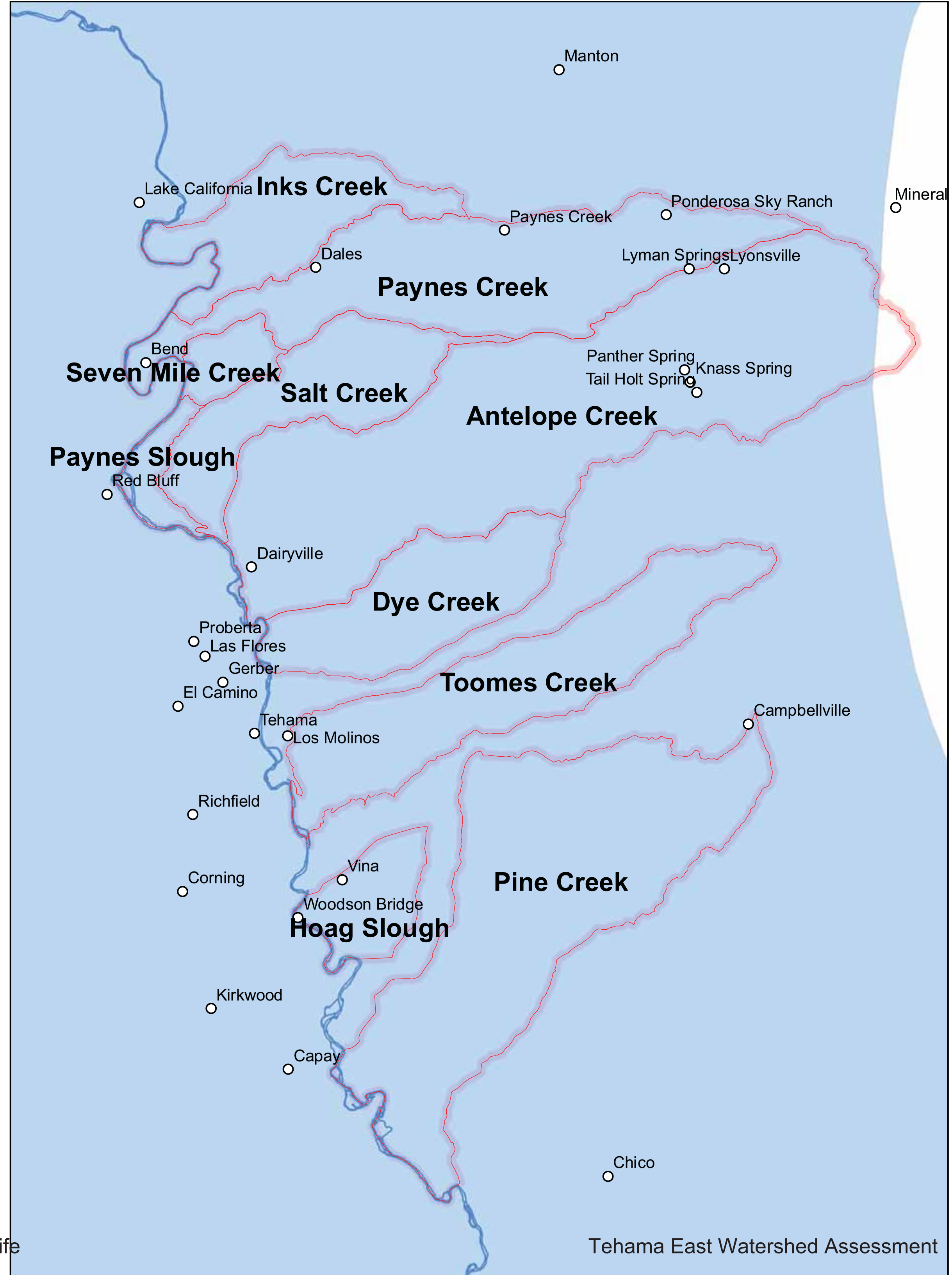
(c) 2010



Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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KEY

AMERICAN PIPIT
(ANTHUS RUBESCENS)

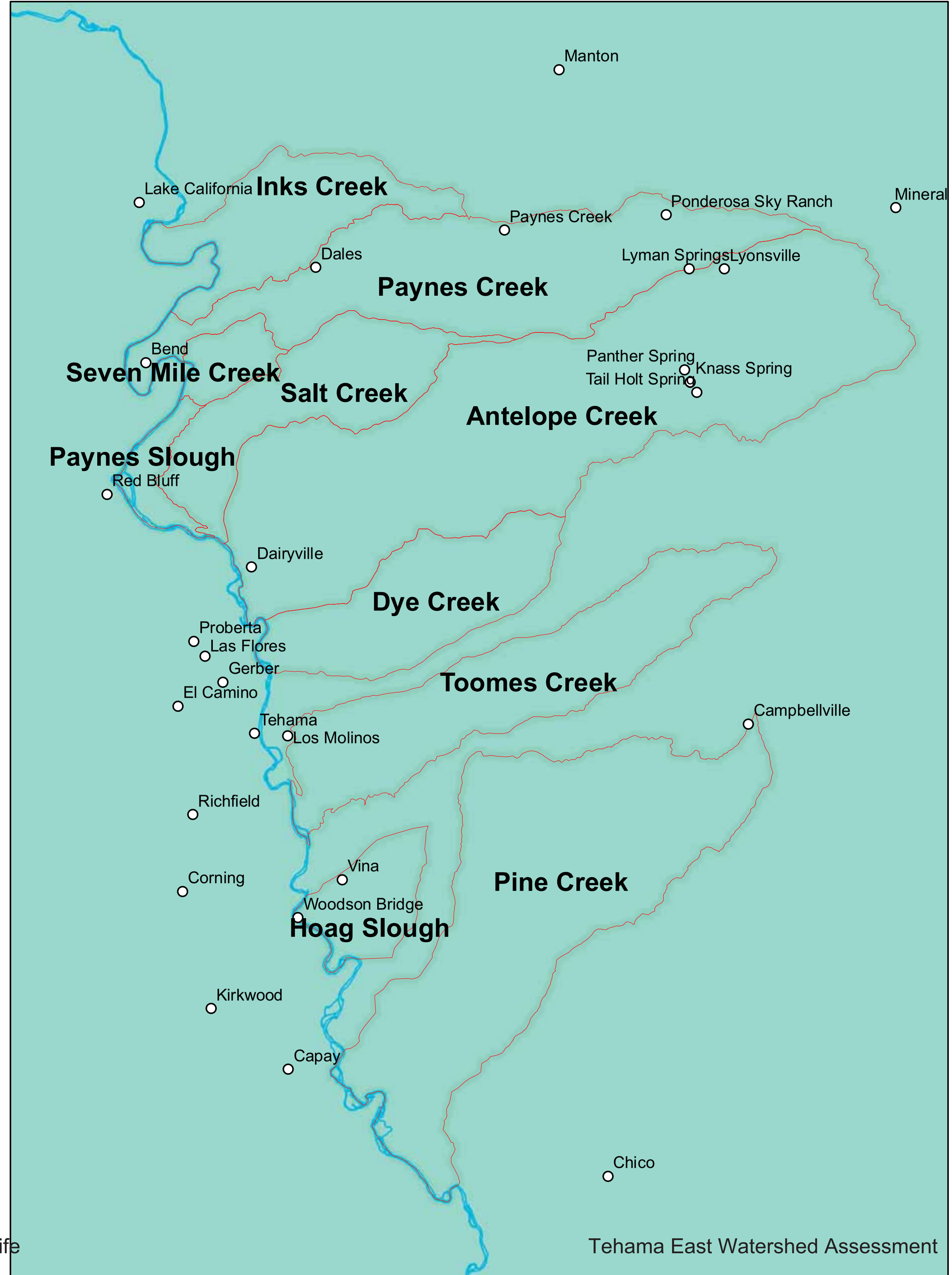
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles



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Tehama East Watersheds

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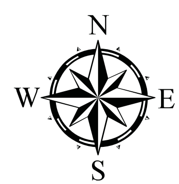
KEY

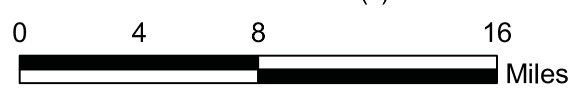
AMERICAN ROBIN
(TURDUS MIGRATORIUS)

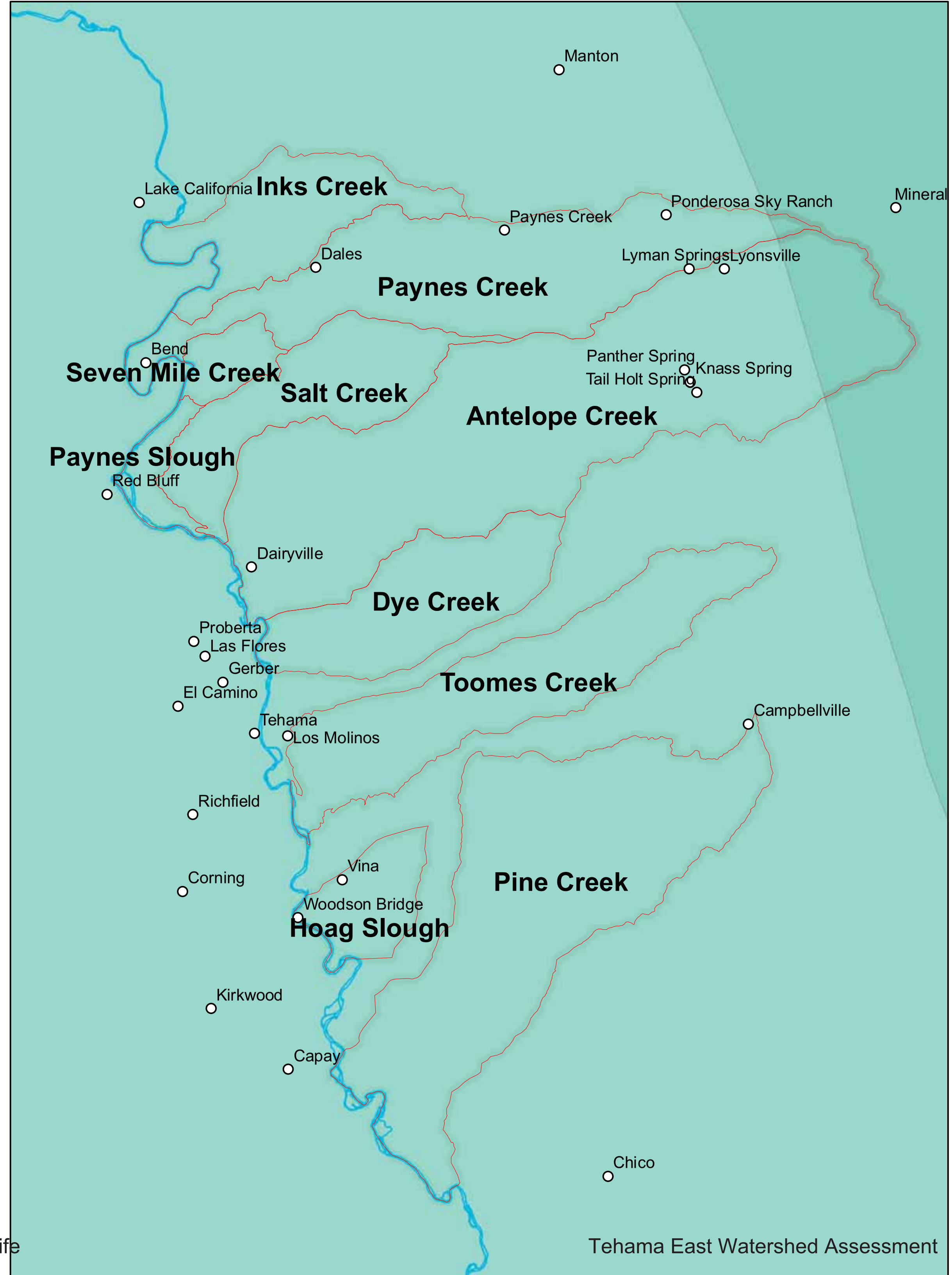
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



Tehama County Resource
Conservation District
(c) 2010





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KEY

ANNA'S HUMMINGBIRD
(CALYPTE ANNA)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

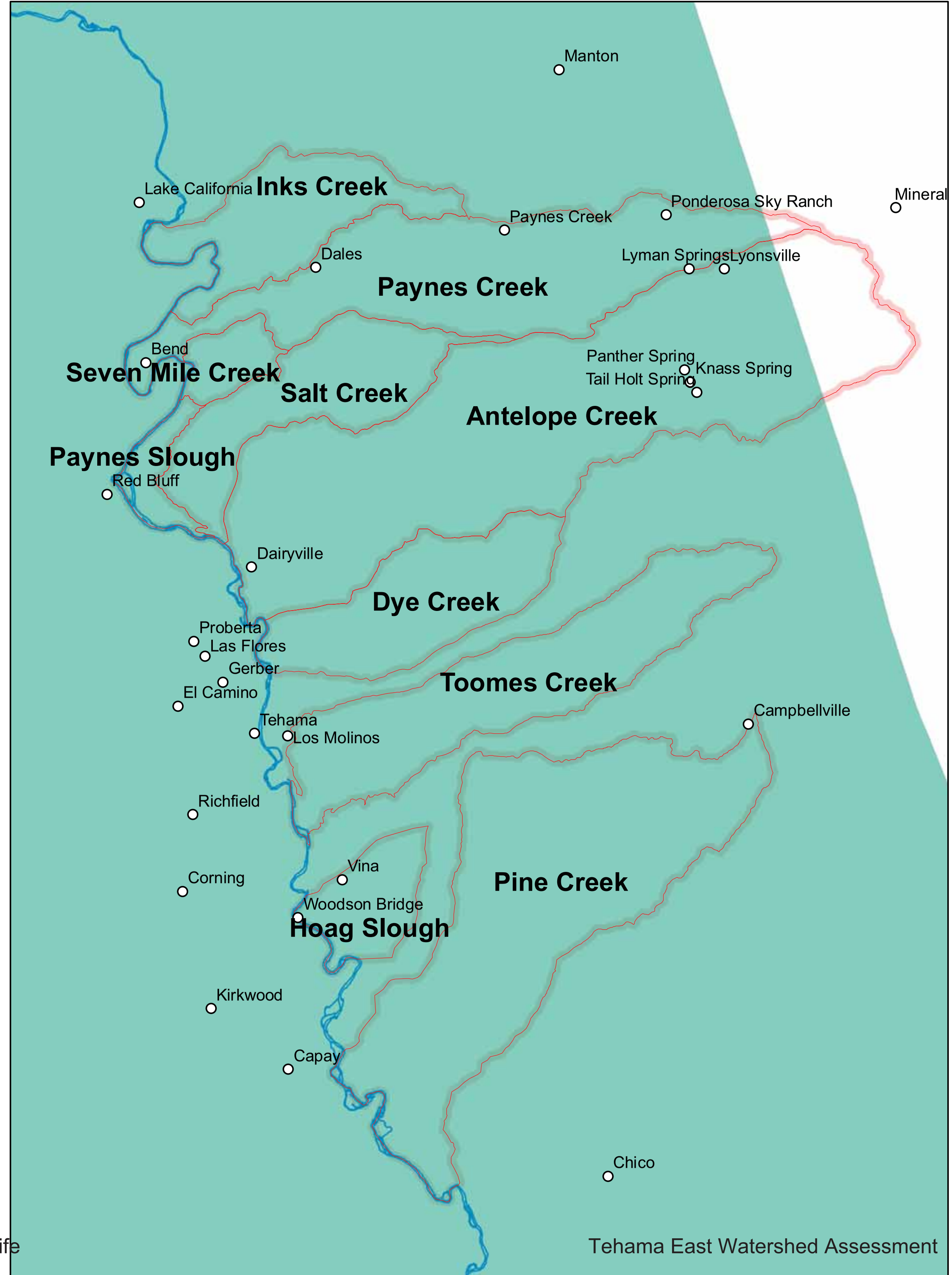
N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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KEY

ASH-THROATED FLYCATCHER
(MYIARCHUS CINERASCENS)

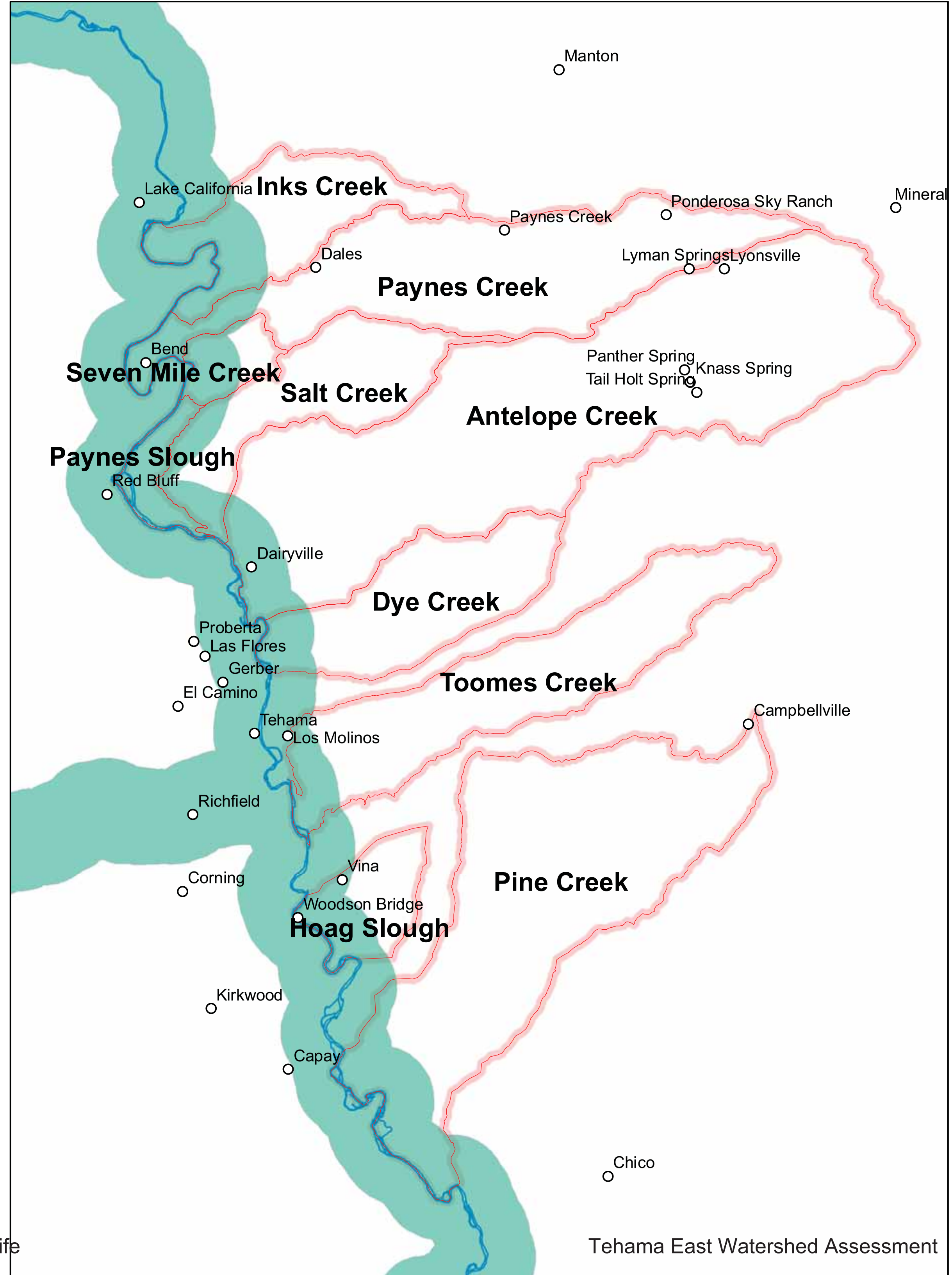
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles



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Quoted from:
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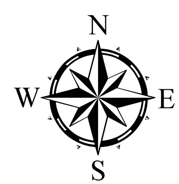
KEY

BANK SWALLOW
(RIPARIA RIPARIA)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



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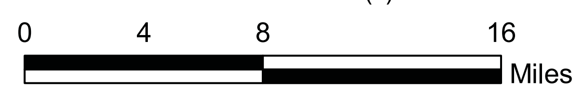

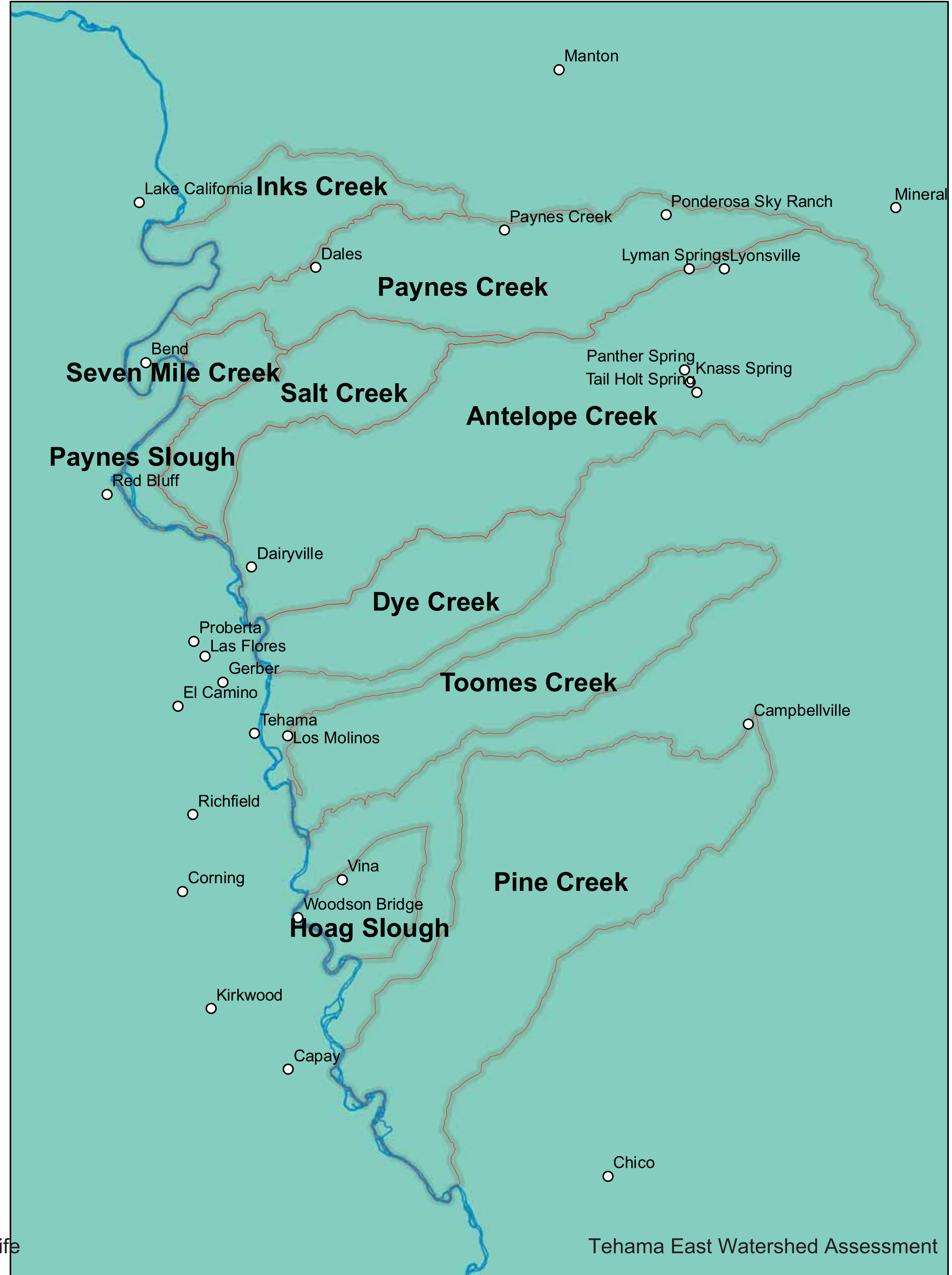

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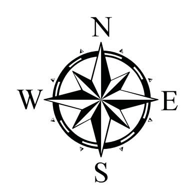
KEY

BARN SWALLOW
(HIRUNDO RUSTICA)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



Tehama County Resource Conservation District
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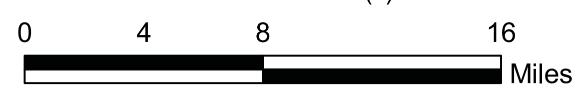

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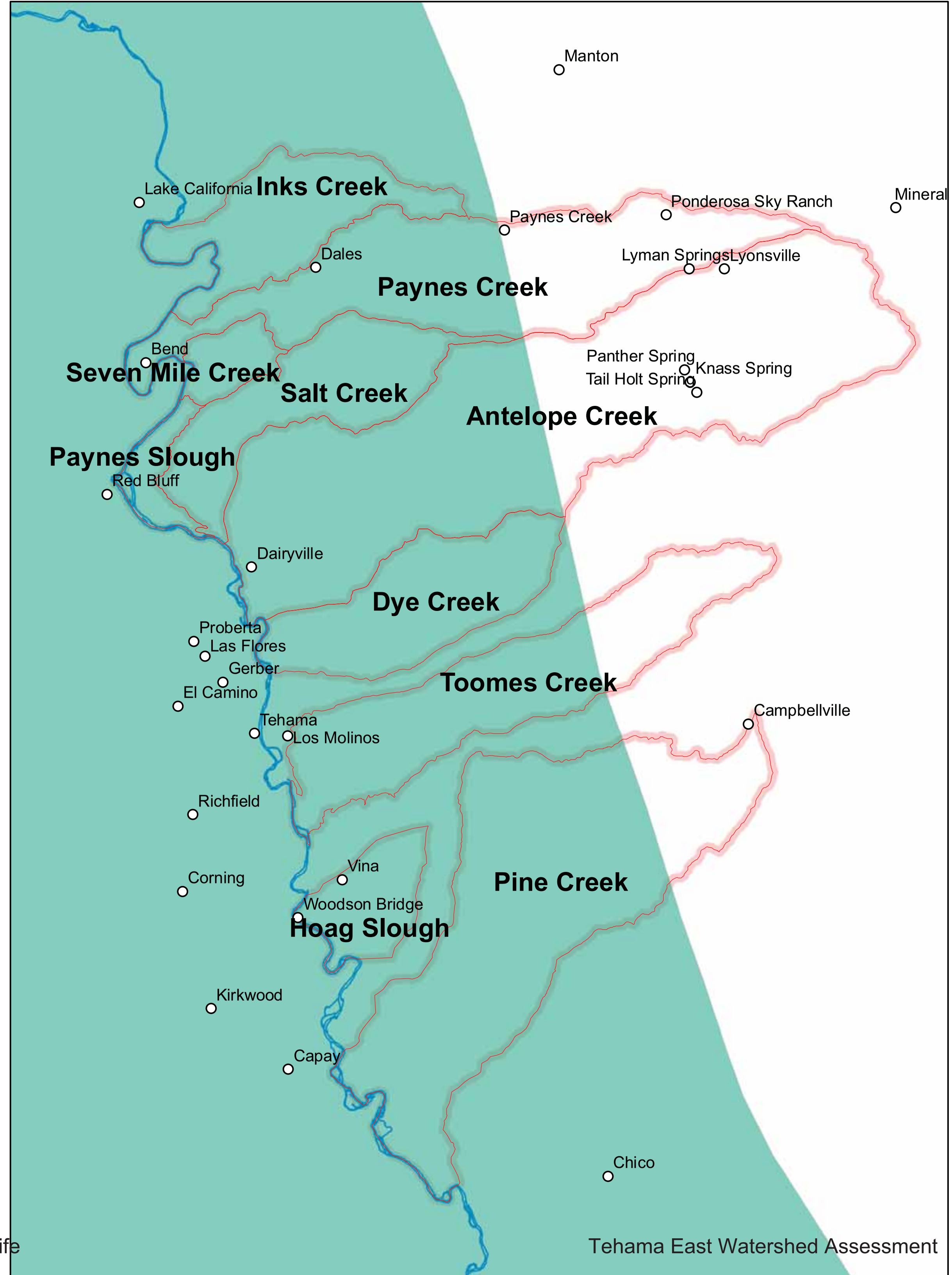
California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds



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KEY

BLACK-CHINNED HUMMINGBIRD
(ARCHILOCHUS ALEXANDRI)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

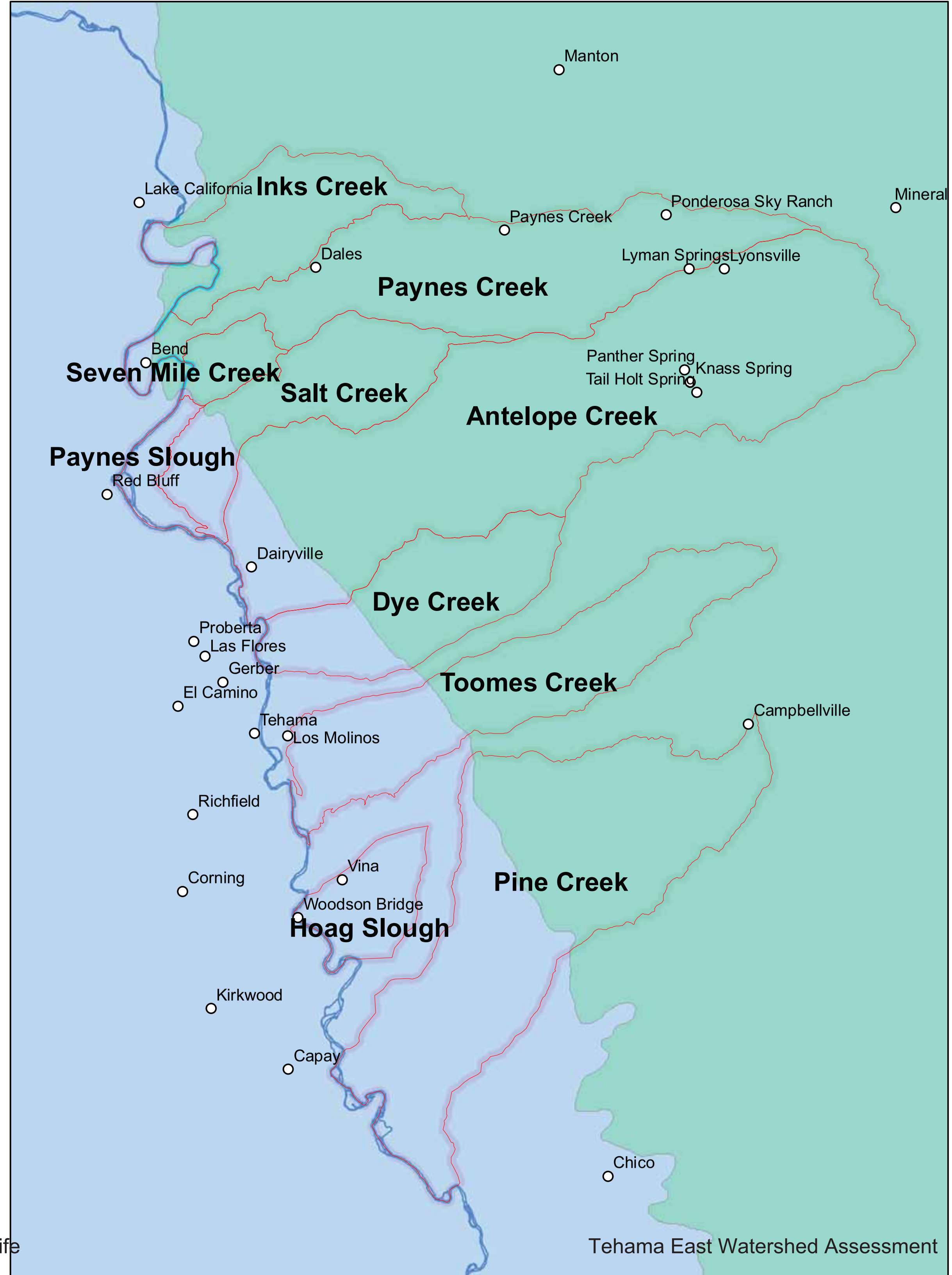
N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds



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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

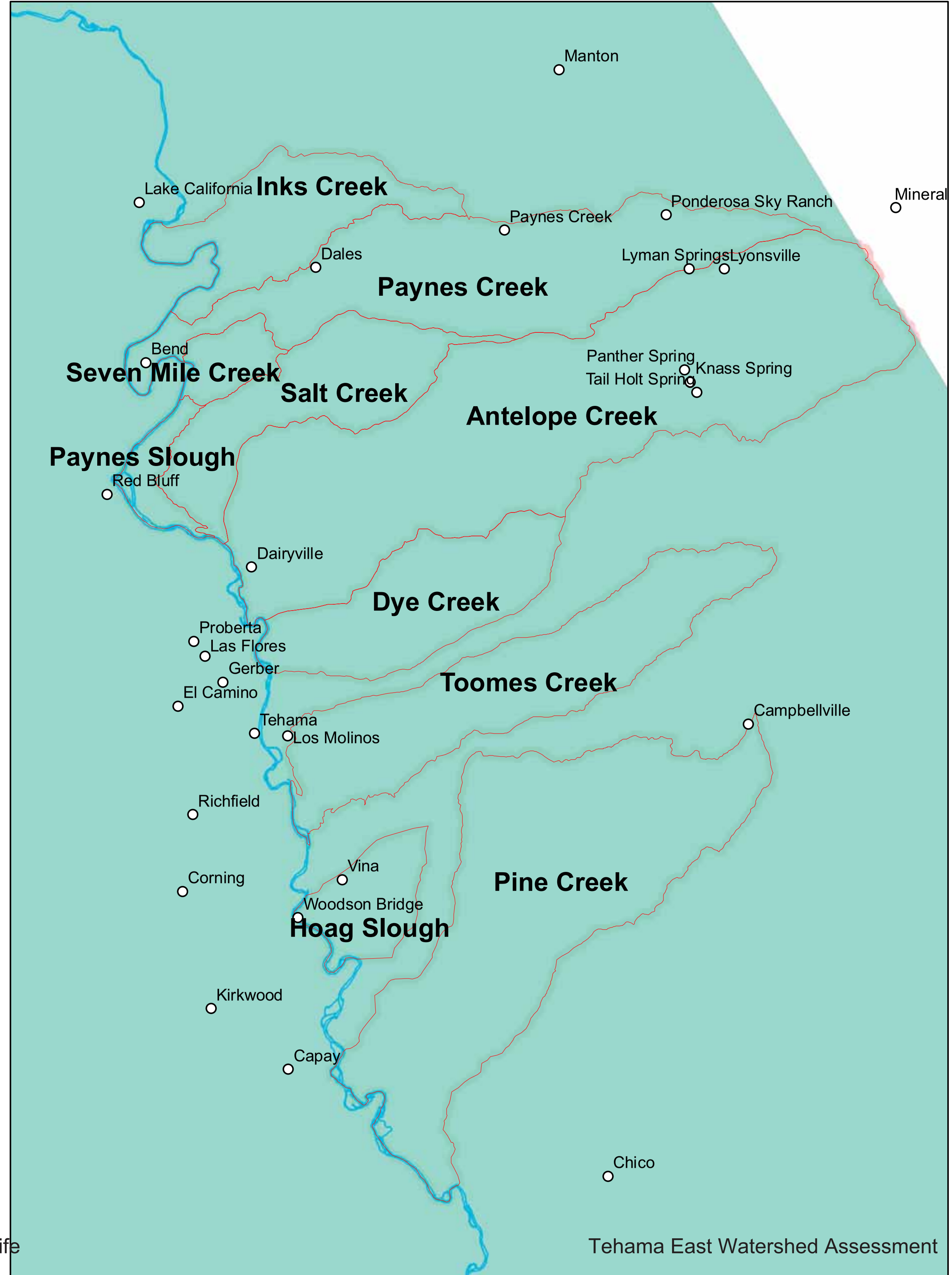
BALD EAGLE
(HALIAEETUS LEUCOCEPHALUS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds

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Quoted from:
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KEY

BEWICK'S WREN
(THRYOMANES BEWICKII)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

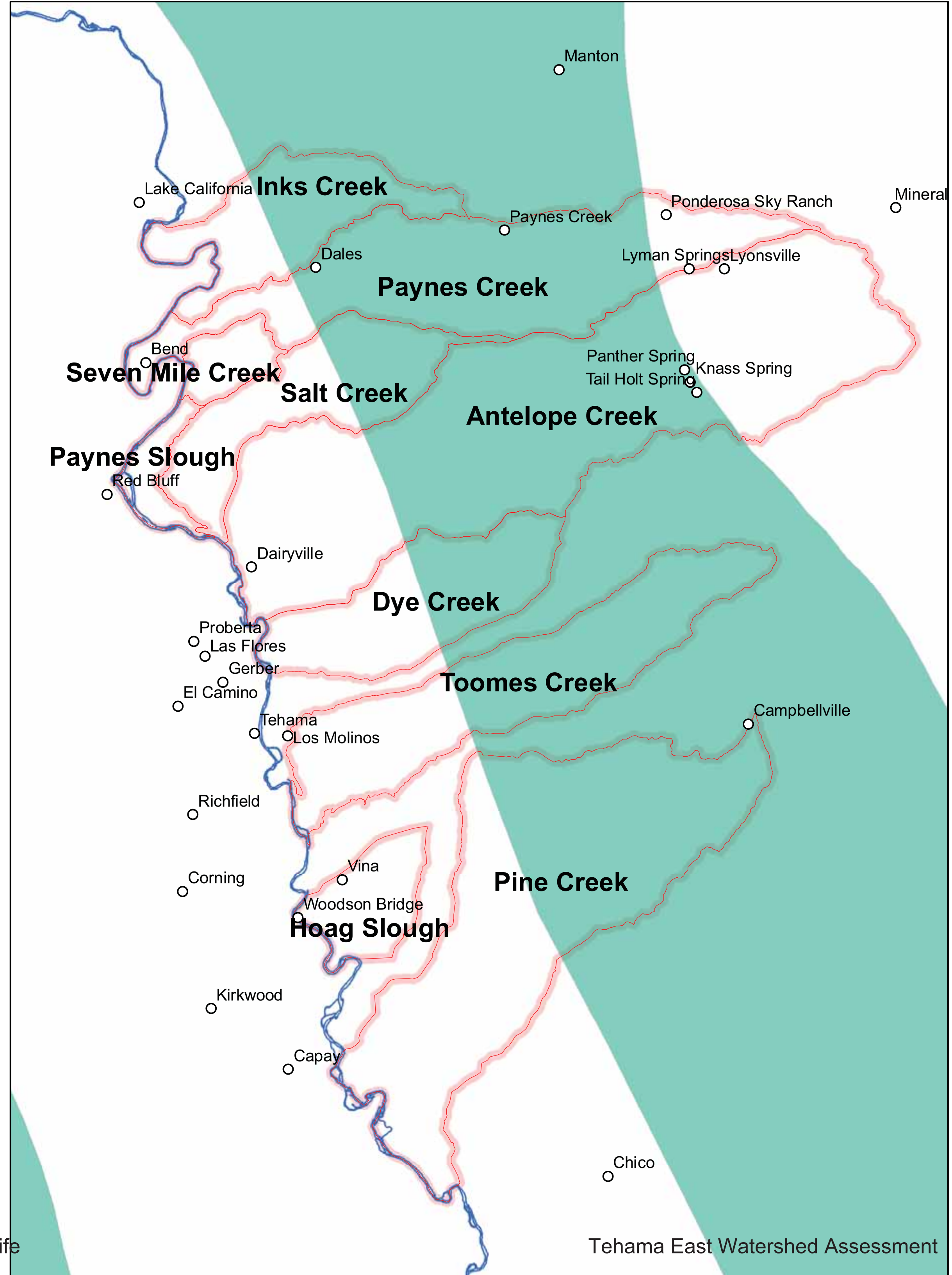
N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

BLUE-GRAY GNATCATCHER
(POLIOPTILA CAERULEA)

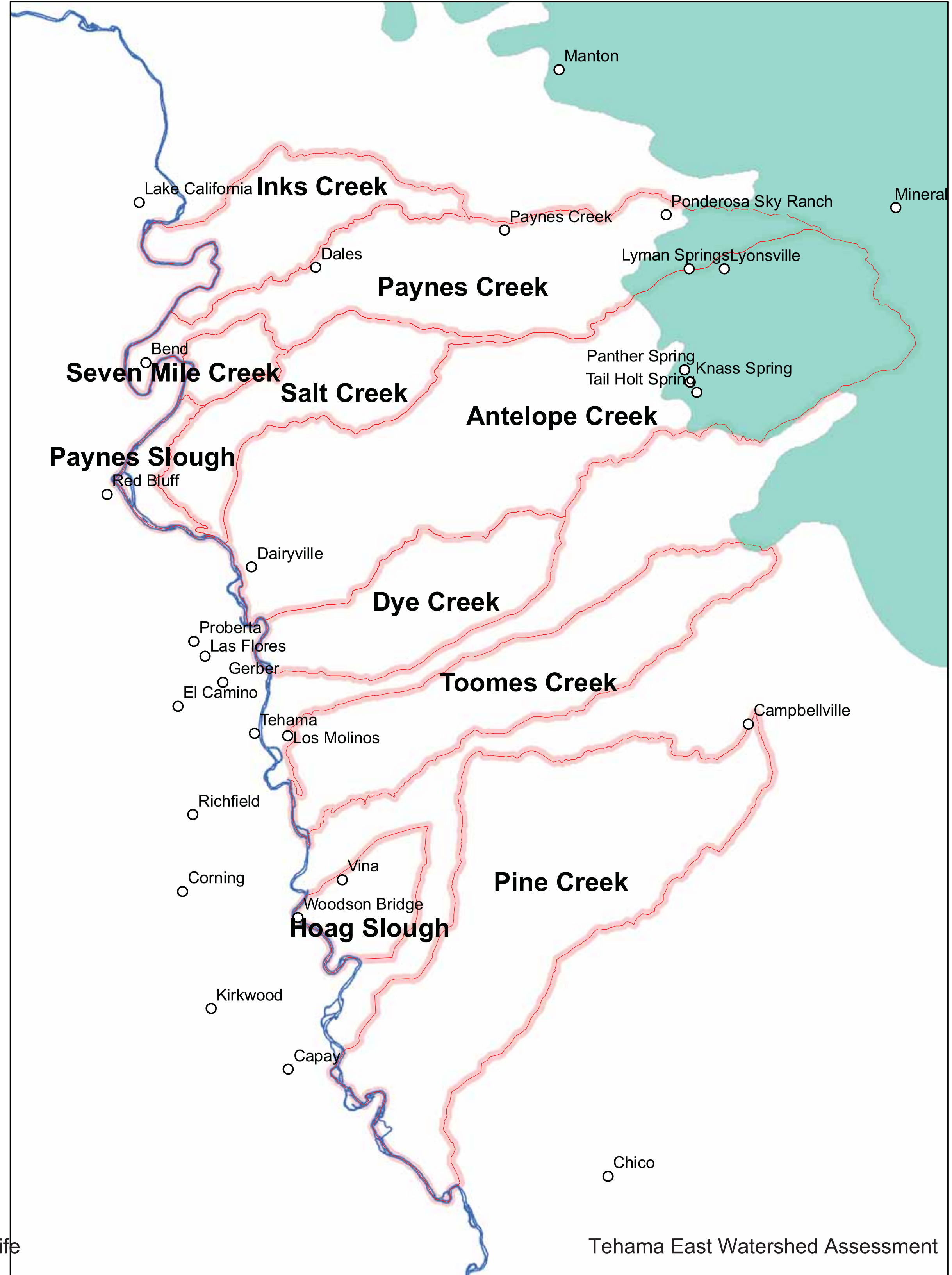
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds

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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

BLUE GROUSE
(DENDRAGAPUS OBSCURUS)

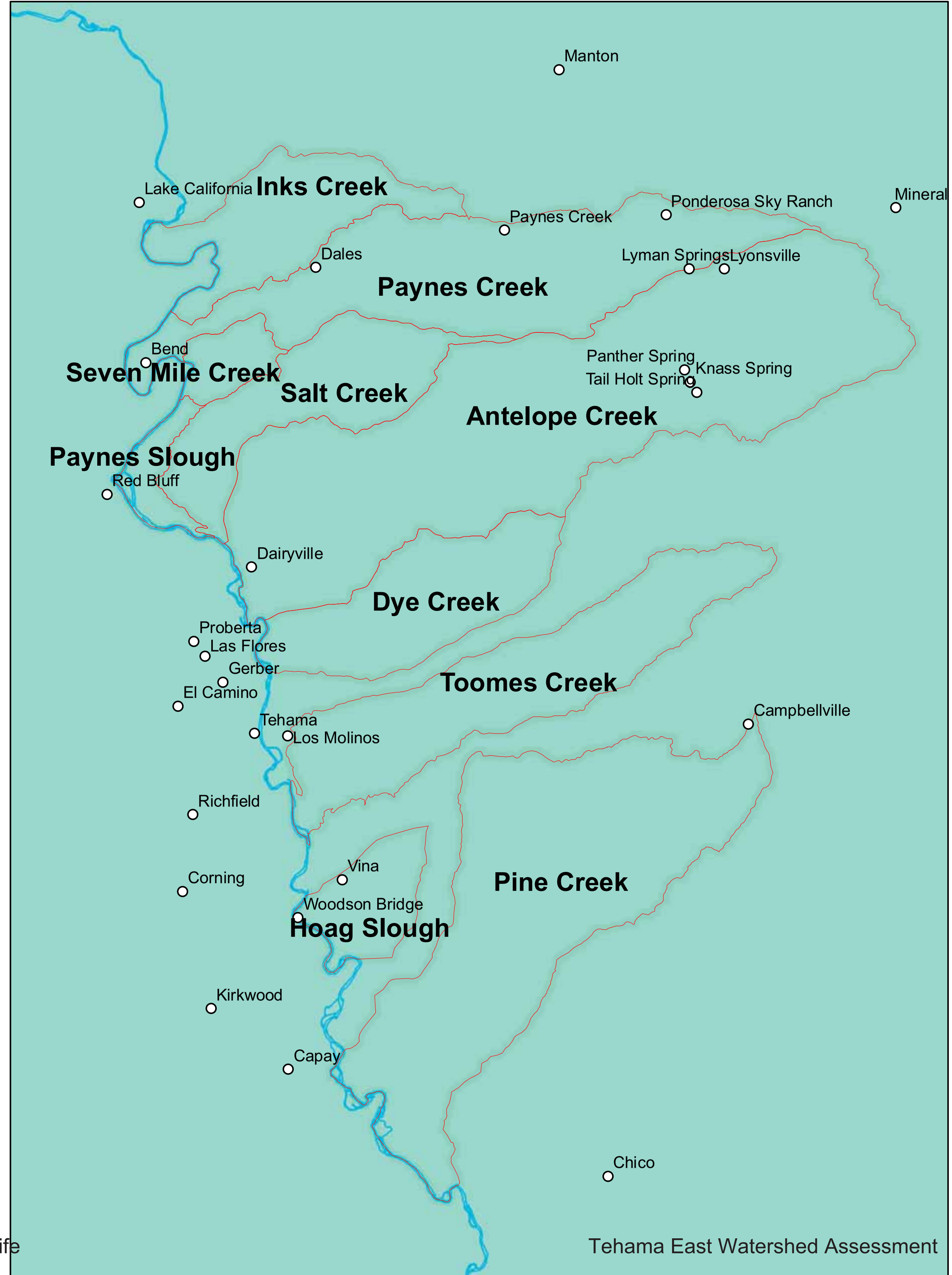
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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Tehama East Watersheds

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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

BELTED KINGFISHER
(CERYLE ALCYON)

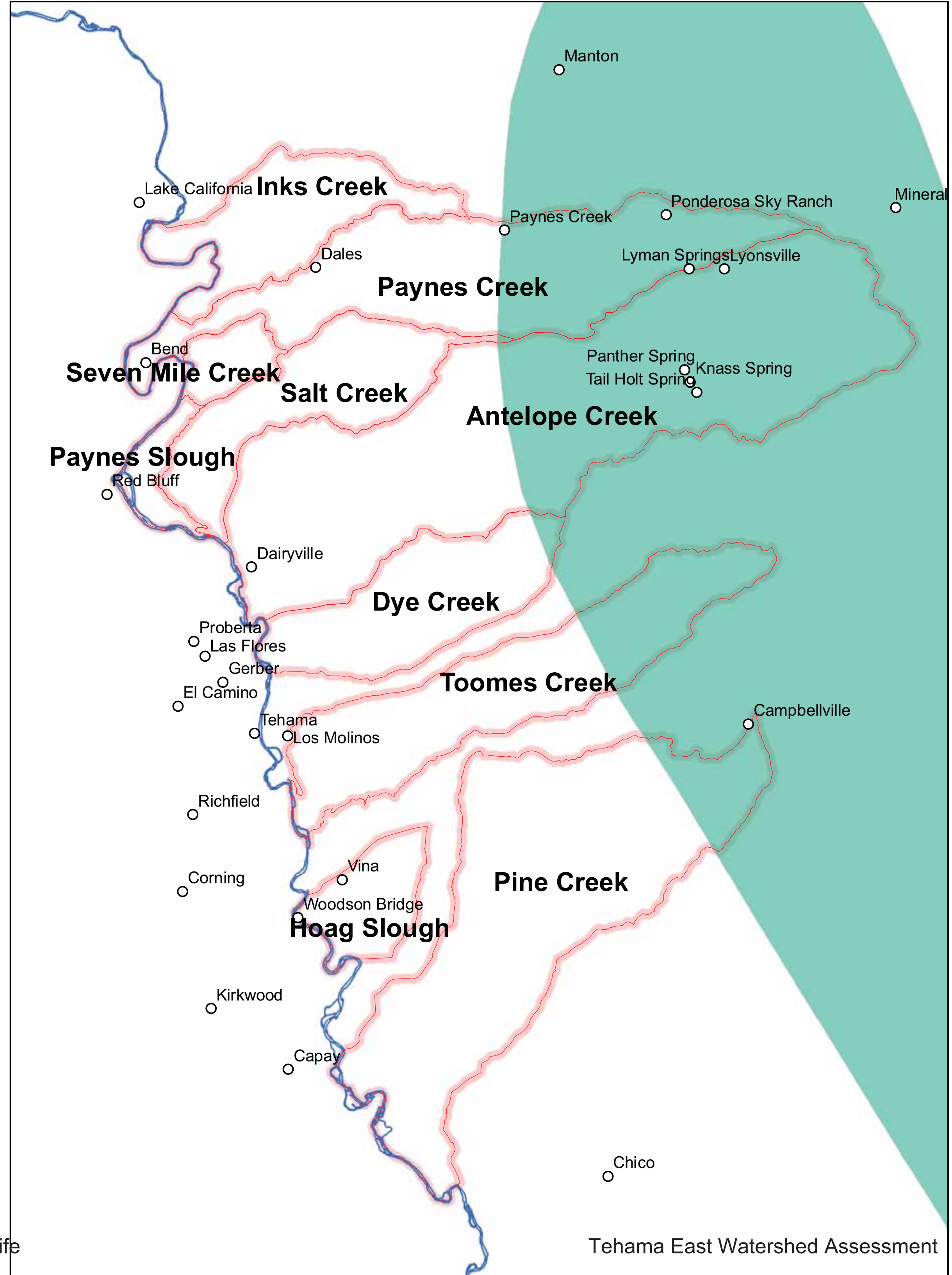
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles



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Quoted from:
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KEY

BLACK-CHINNED SPARROW
(SPIZELLA ATROGULARIS)

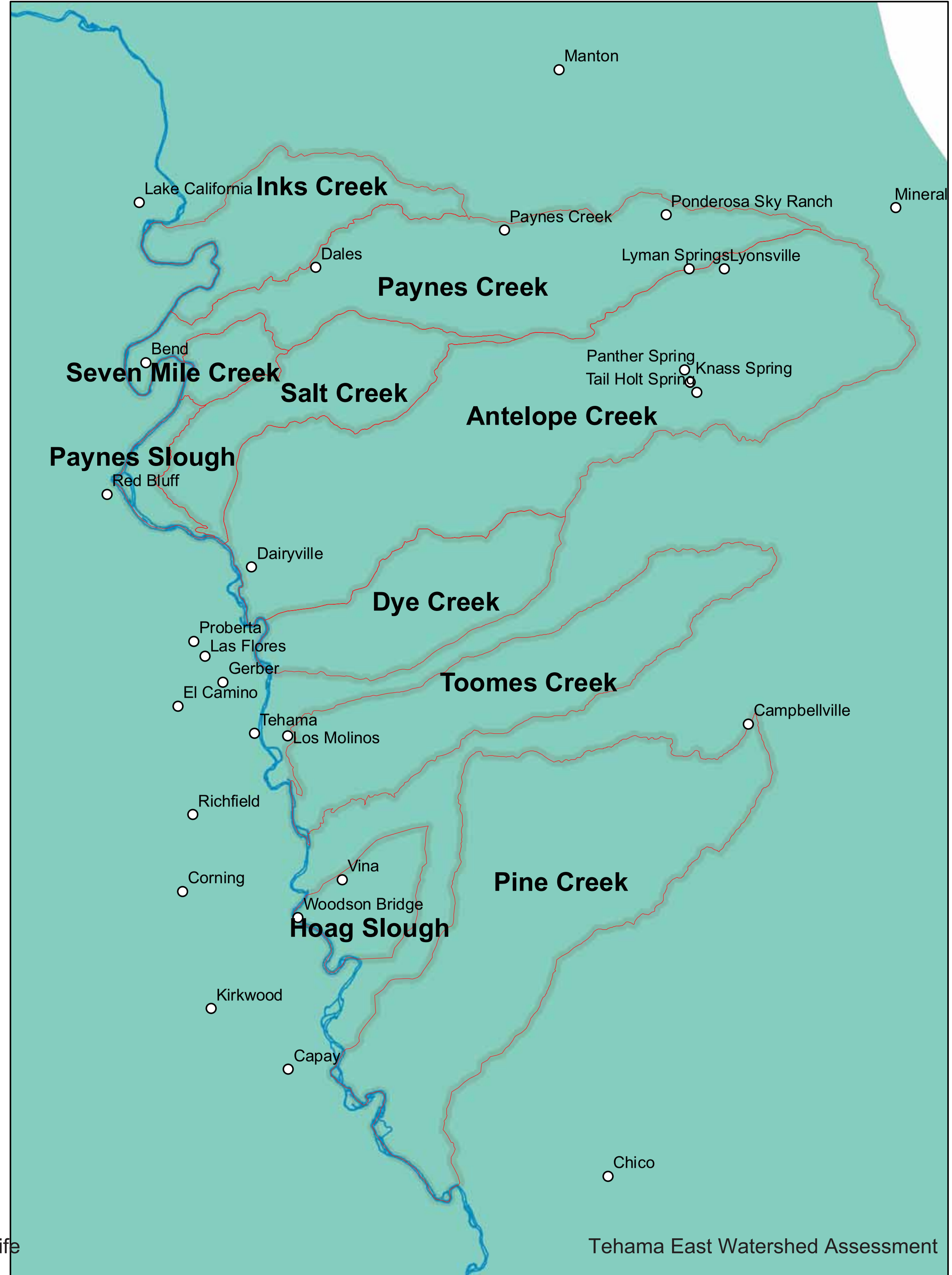
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



Tehama East Watershed Assessment

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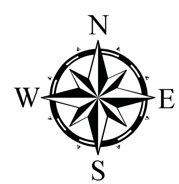
Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

BLACK-HEADED GROSBEAK
(PHEUCTICUS MELANOCEPHALUS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



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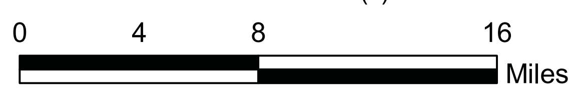
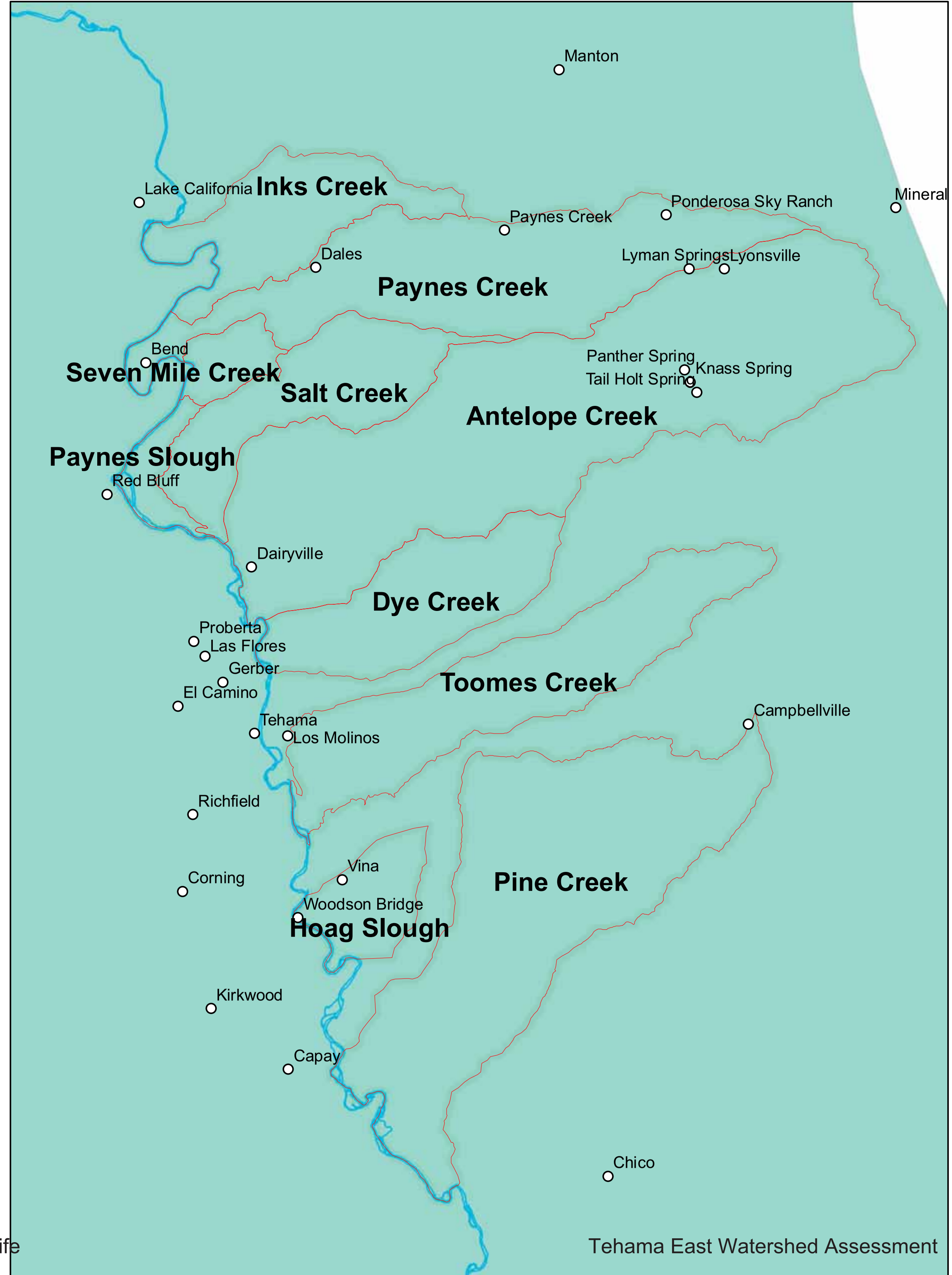
(c) 2010





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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

BLACK PHOEBE
(SAYORNIS NIGRICANS)

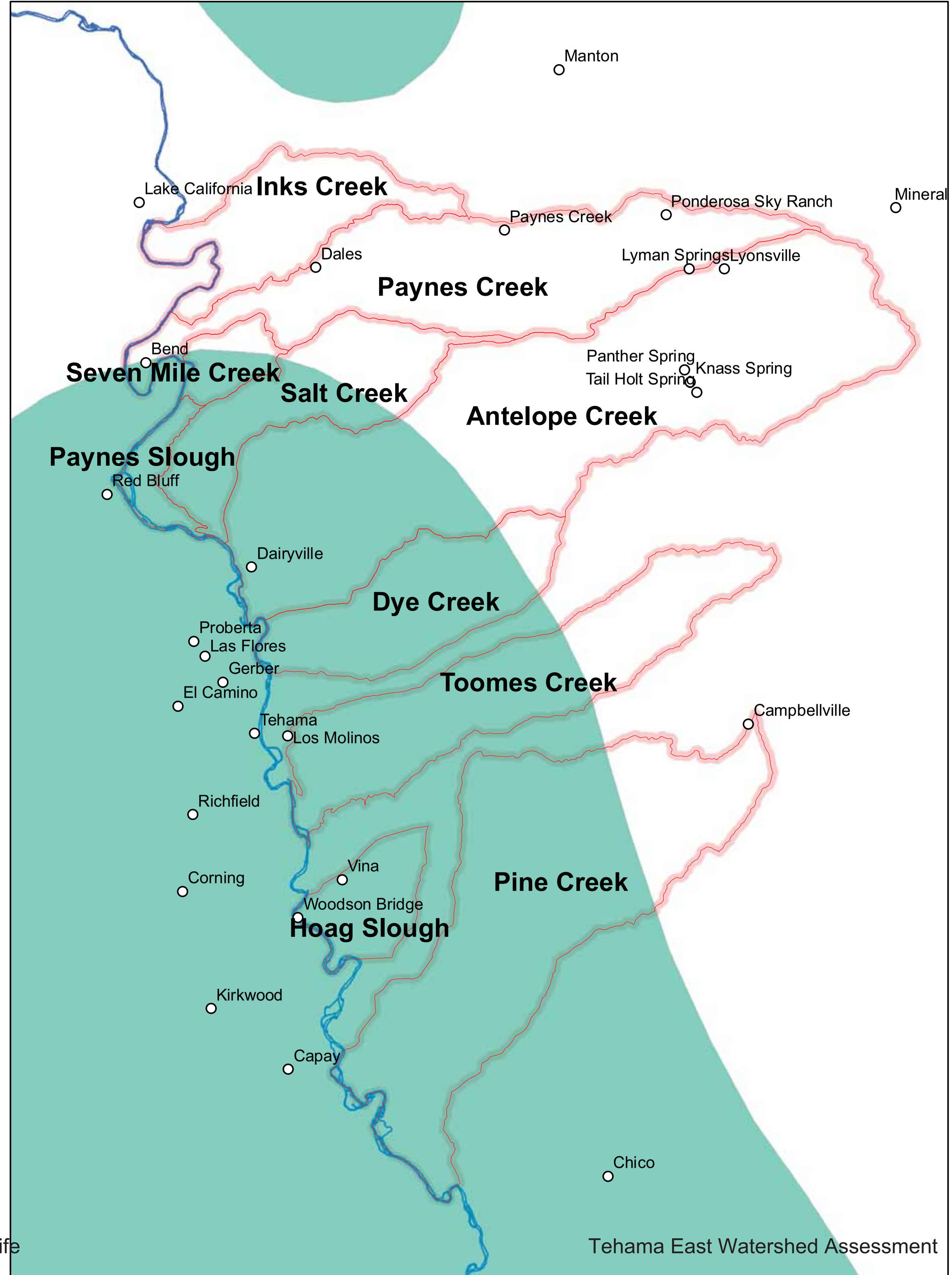
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds

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Quoted from:
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KEY

BLUE GROSBEAK
(GUIRACA CAERULEA)

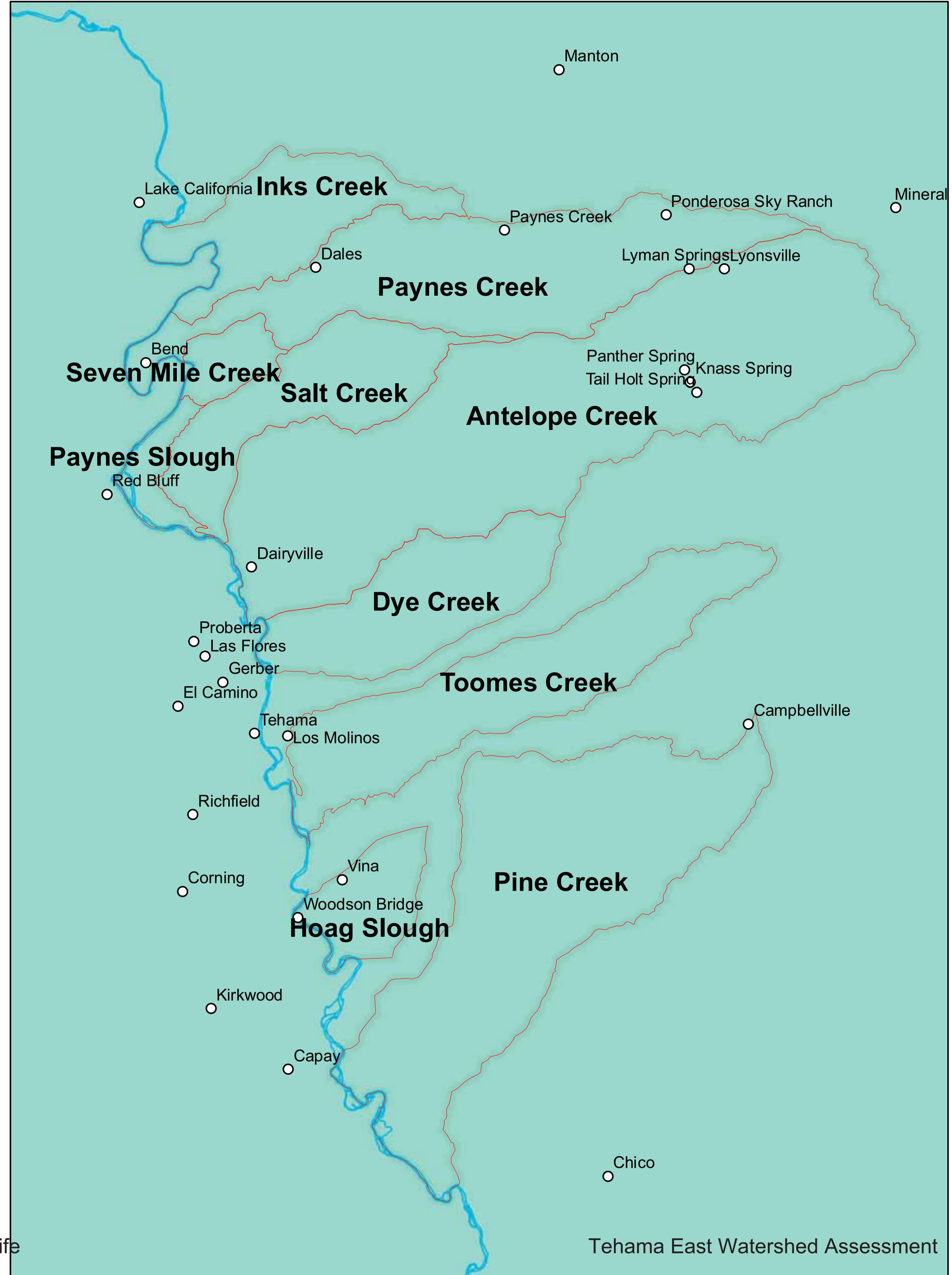
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles



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Quoted from:
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KEY

BARN OWL
(TYTO ALBA)

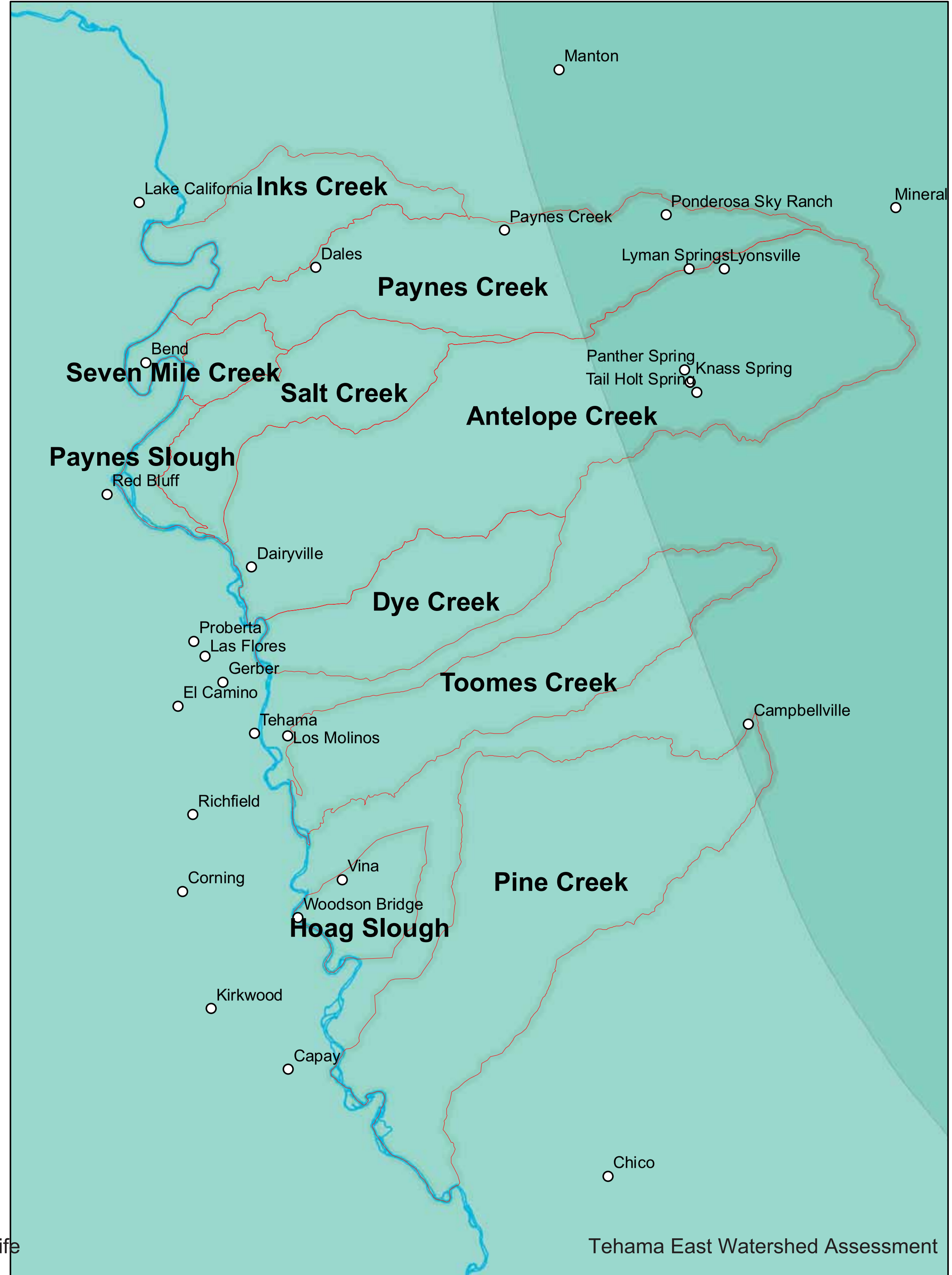
SEASON

Summer
Year Round
Winter
Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

BREWER'S BLACKBIRD
(EUPHAGUS CYANOCEPHALUS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

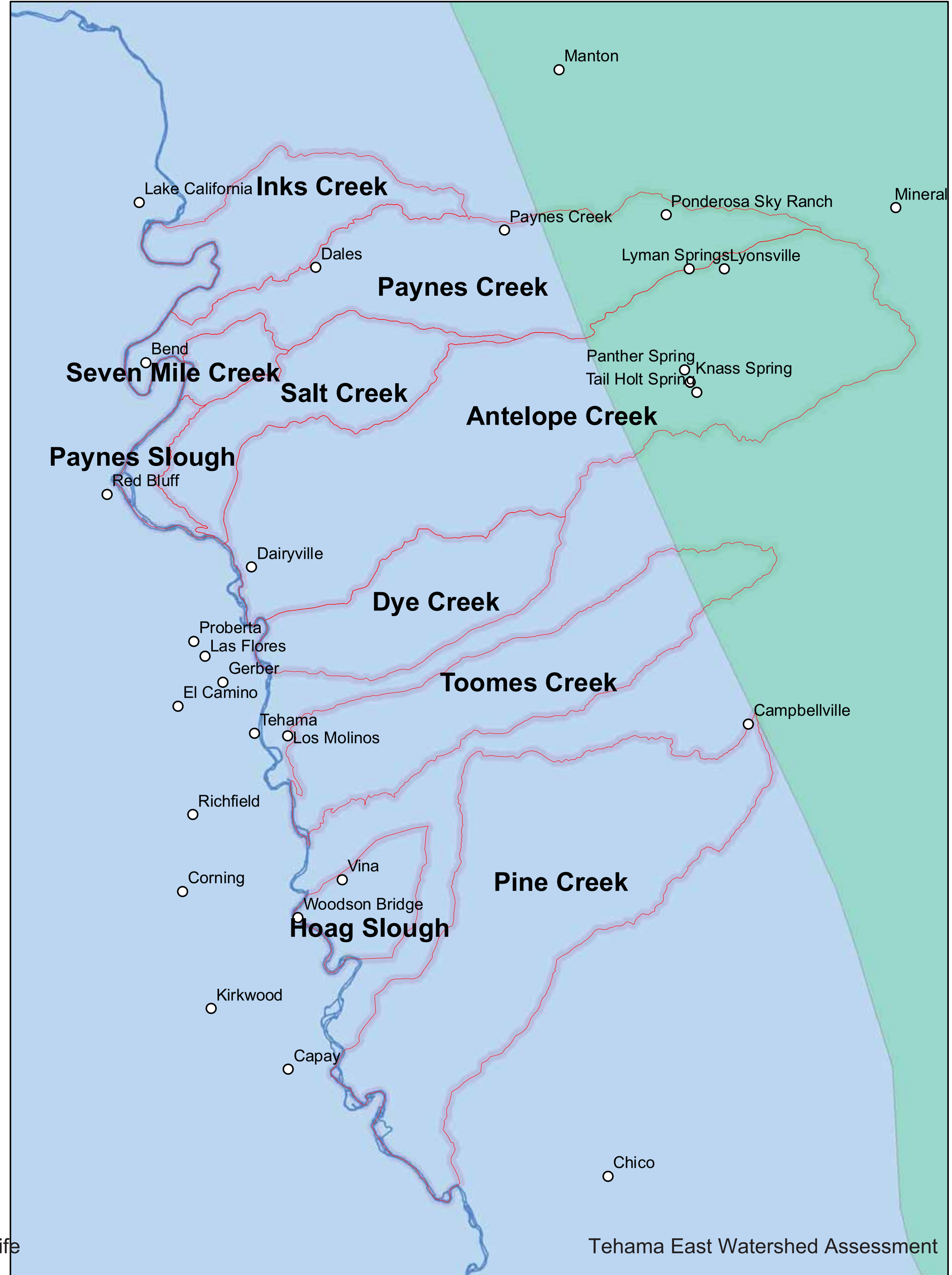
N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds



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KEY

BROWN CREEPER
(CERTHIA AMERICANA)

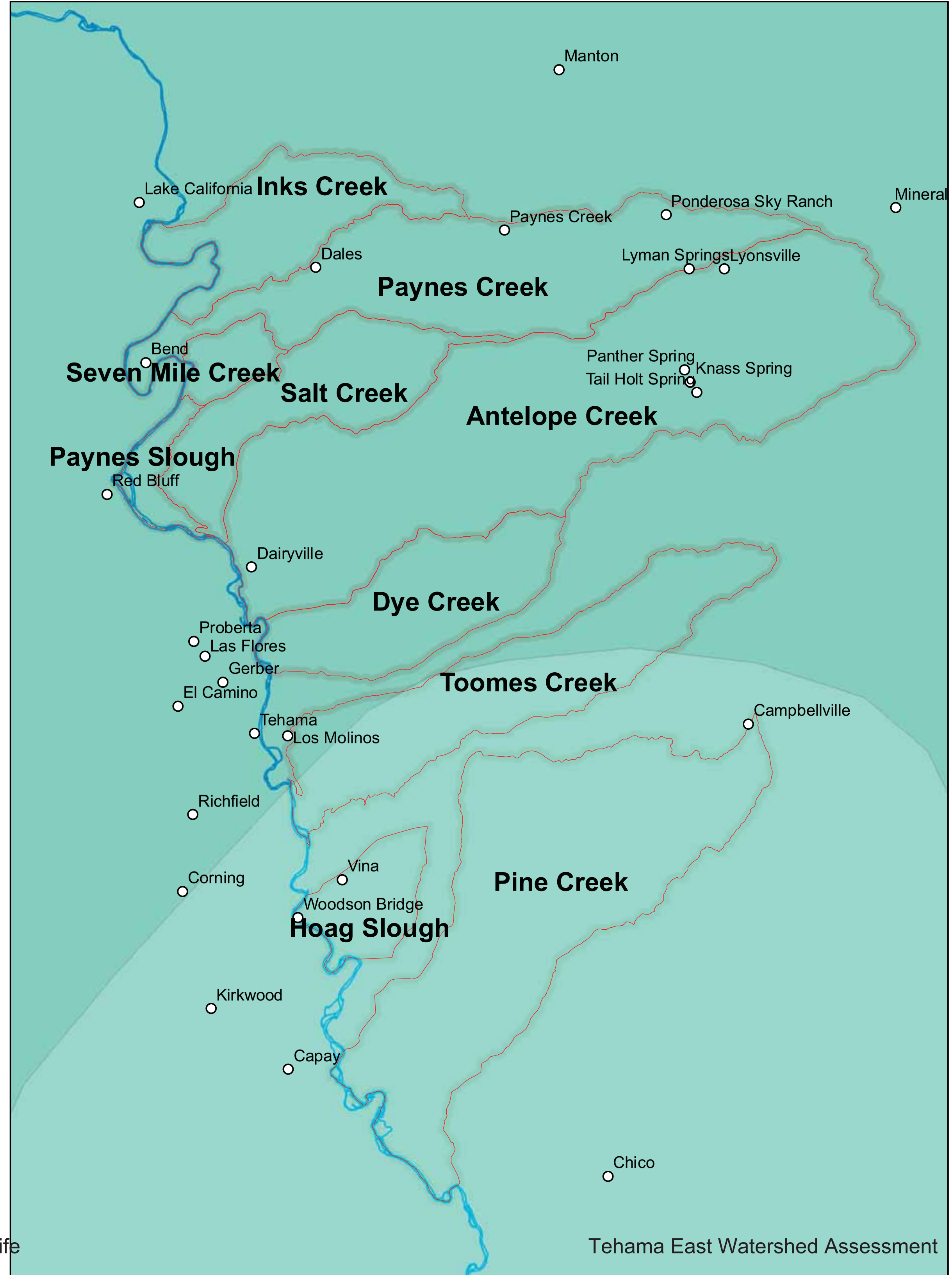
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

Tehama County Resource
Conservation District
(c) 2010

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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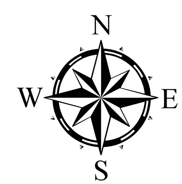
KEY

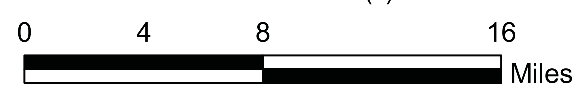
BROWN-HEADED COWBIRD
(MOLOTHRUS ATER)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



Tehama County Resource
Conservation District
(c) 2010



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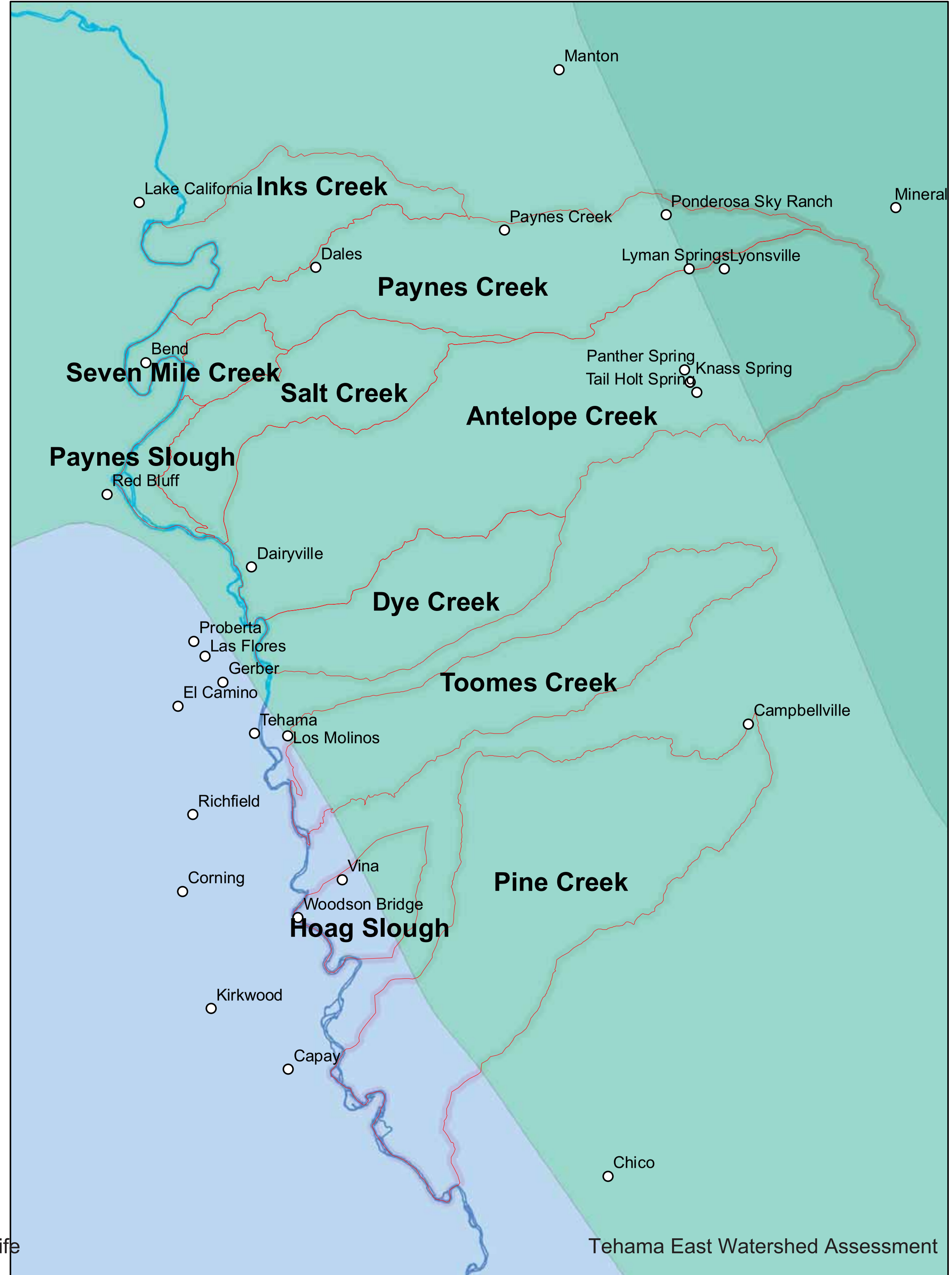
California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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Quoted from:
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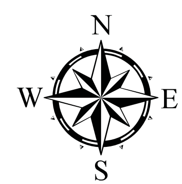
KEY

BLACK-TAILED GNATCATCHER
(POLIOPTILA MELANURA)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



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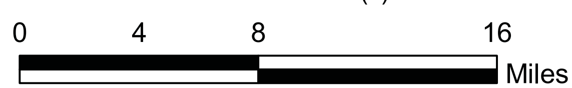

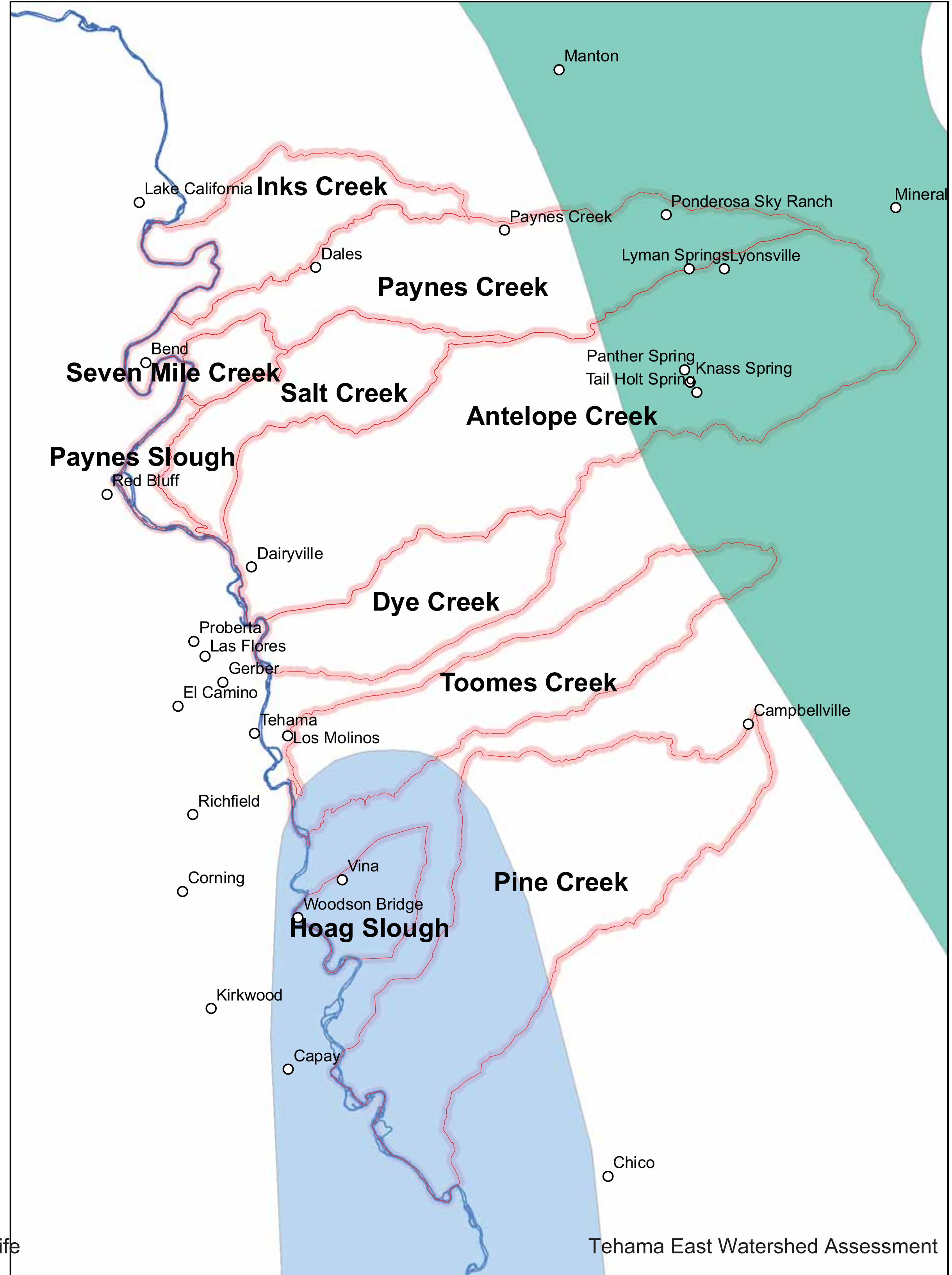

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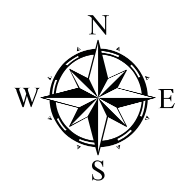
KEY

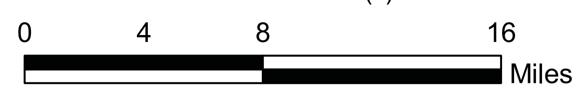
BLACK-THROATED GRAY WARBLER (DENDROICA NIGRESCENS)

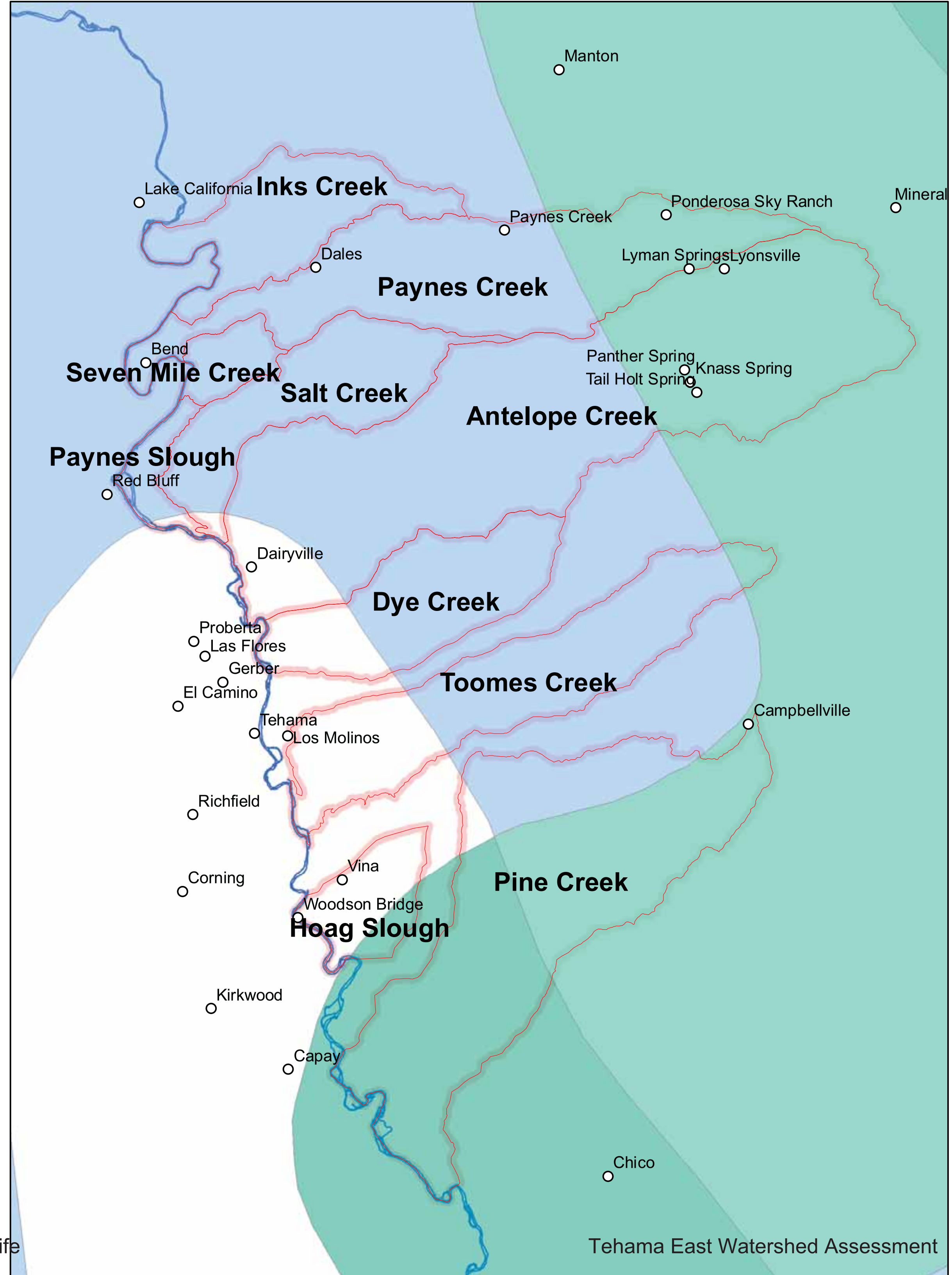
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



Tehama County Resource Conservation District (c) 2010





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Quoted from:
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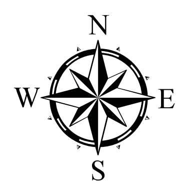
KEY

BAND-TAILED PIGEON
(COLUMBA FASCIATA)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



Tehama County Resource Conservation District
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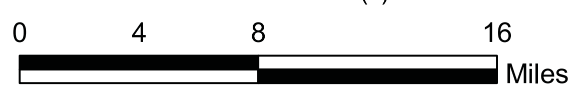

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Tehama East Watersheds

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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

BURROWING OWL
(SPEOTYTO CUNICULARIA)

SEASON

Summer

Year Round

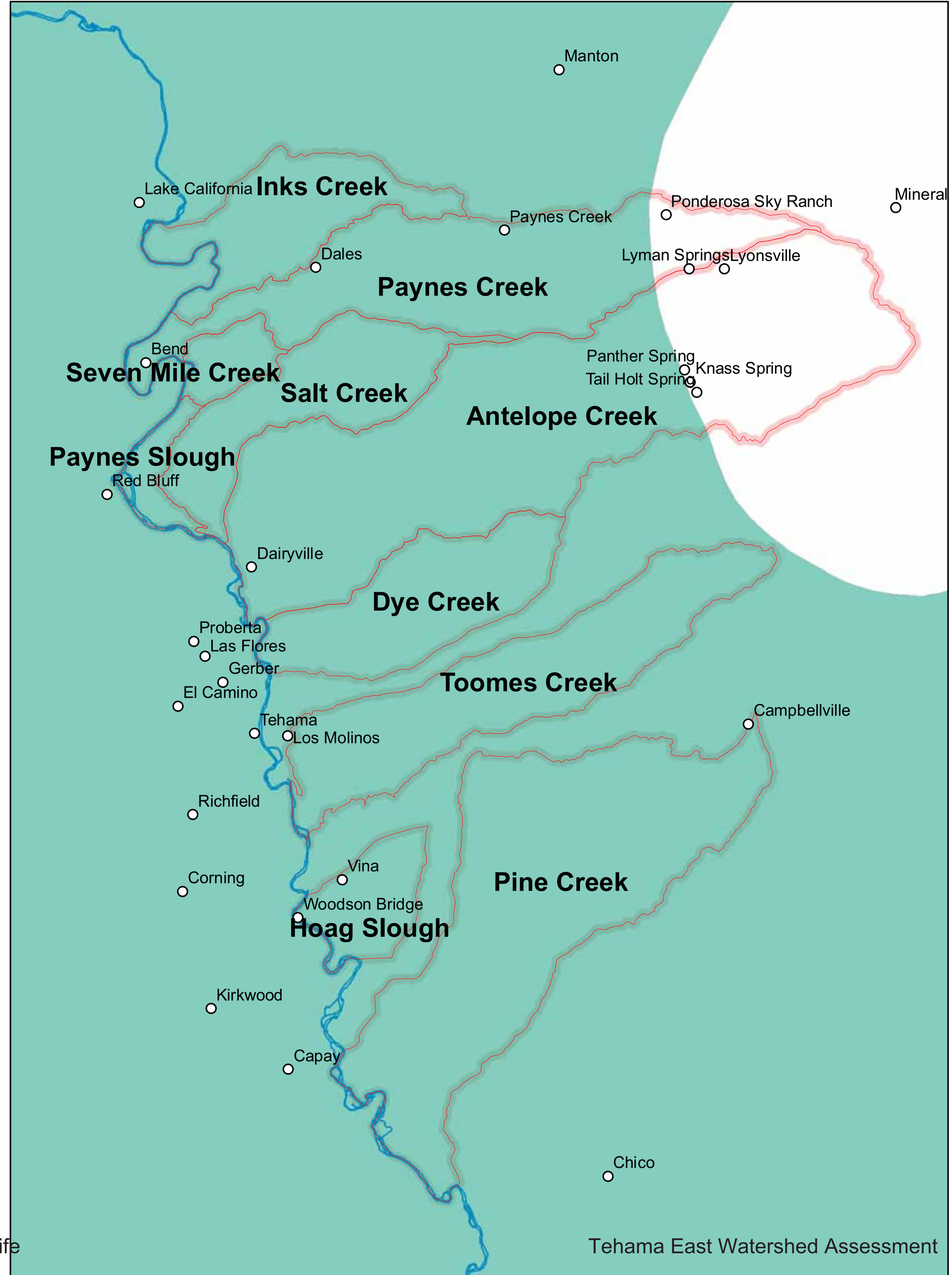
Winter

Watershed Boundary

N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles



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Quoted from:
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KEY

BUSHTIT
(PSALTRIPARUS MINIMUS)

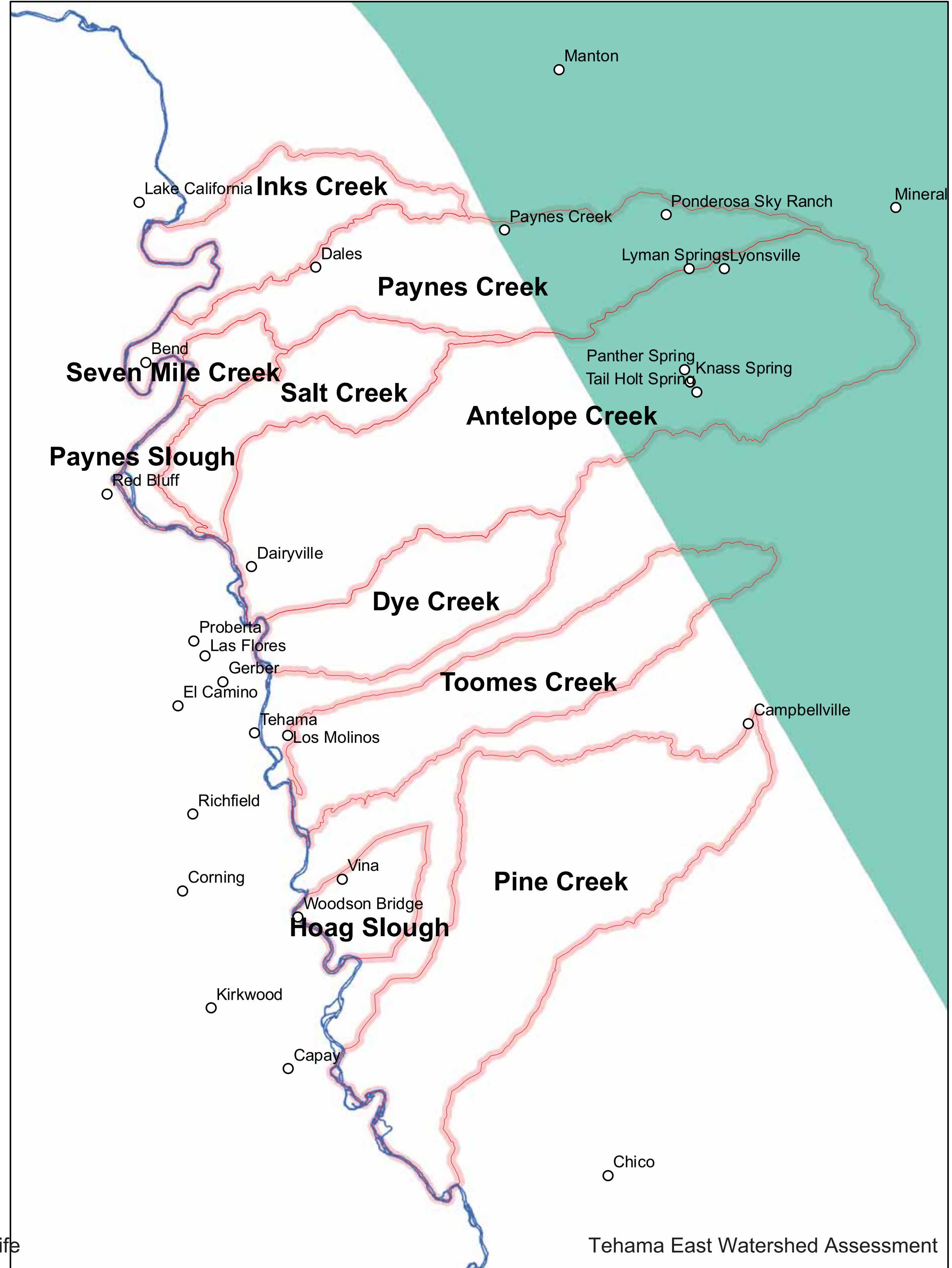
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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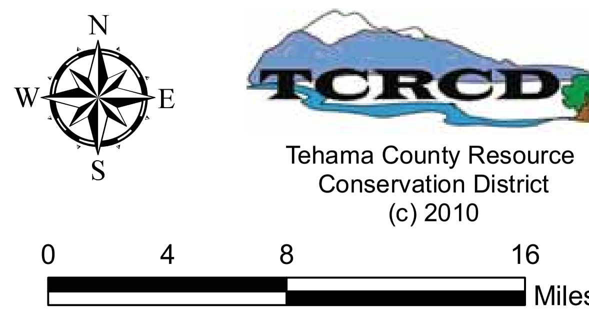
KEY

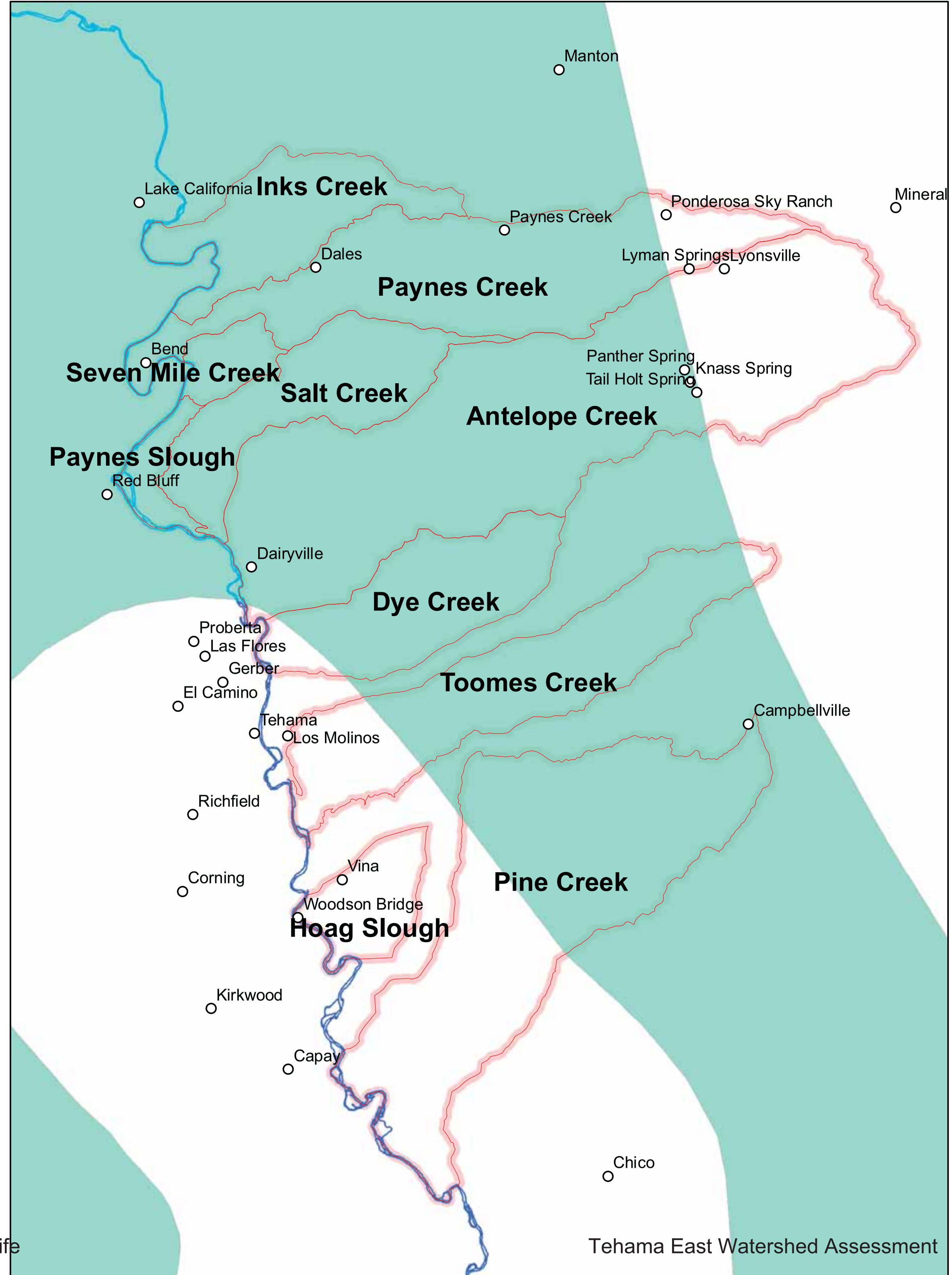
CALLIOPE HUMMINGBIRD
(STELLULA CALLIOPE)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



Tehama County Resource Conservation District
(c) 2010



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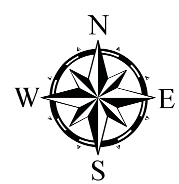
KEY

CALIFORNIA THRASHER
(TOXOSTOMA REDIVIVUM)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



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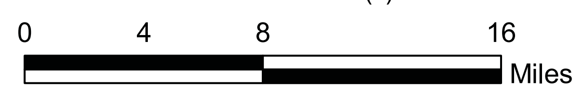
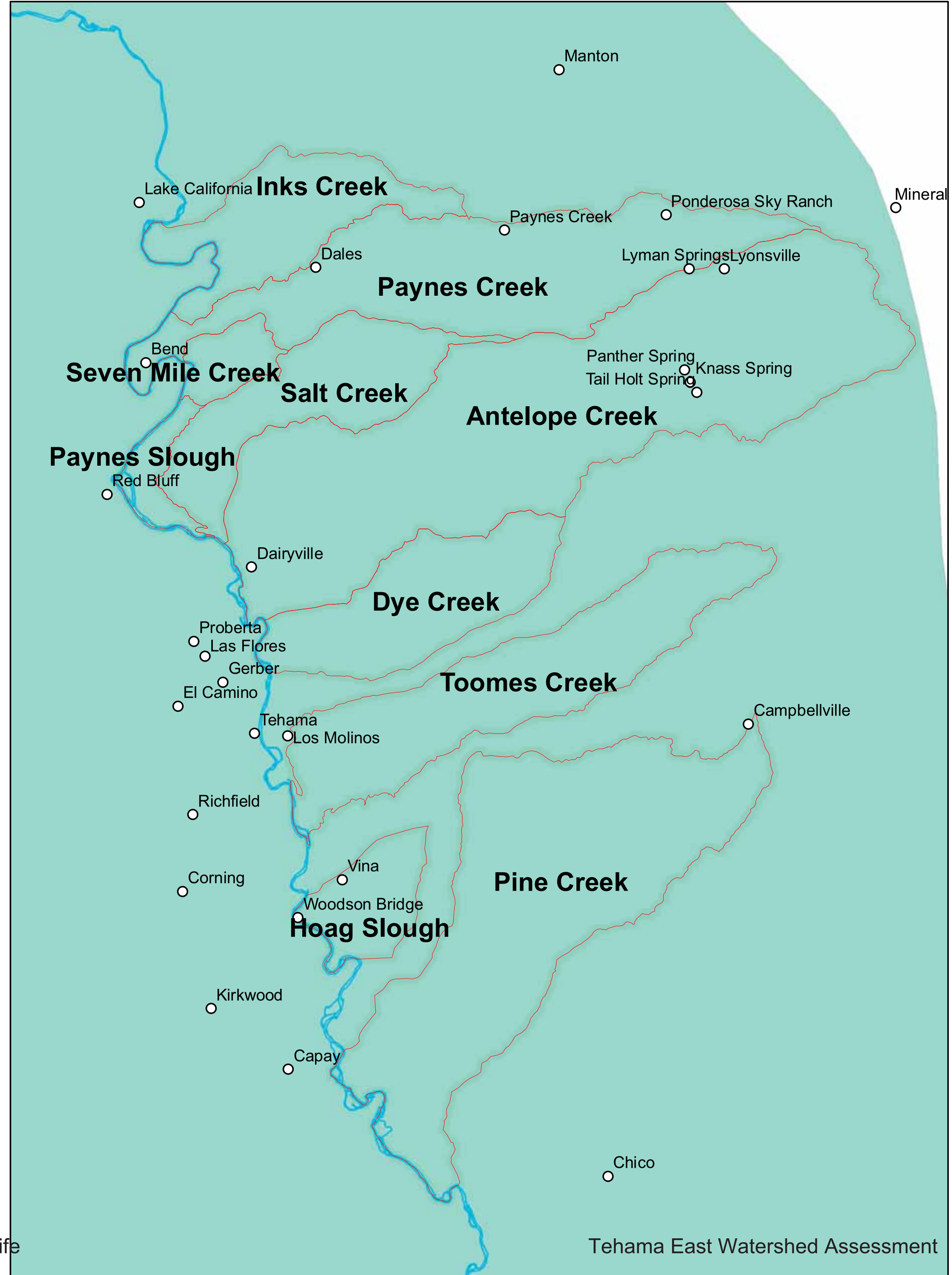
(c) 2010





Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

CALIFORNIA TOWHEE
(PIPILO CRISSALIS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

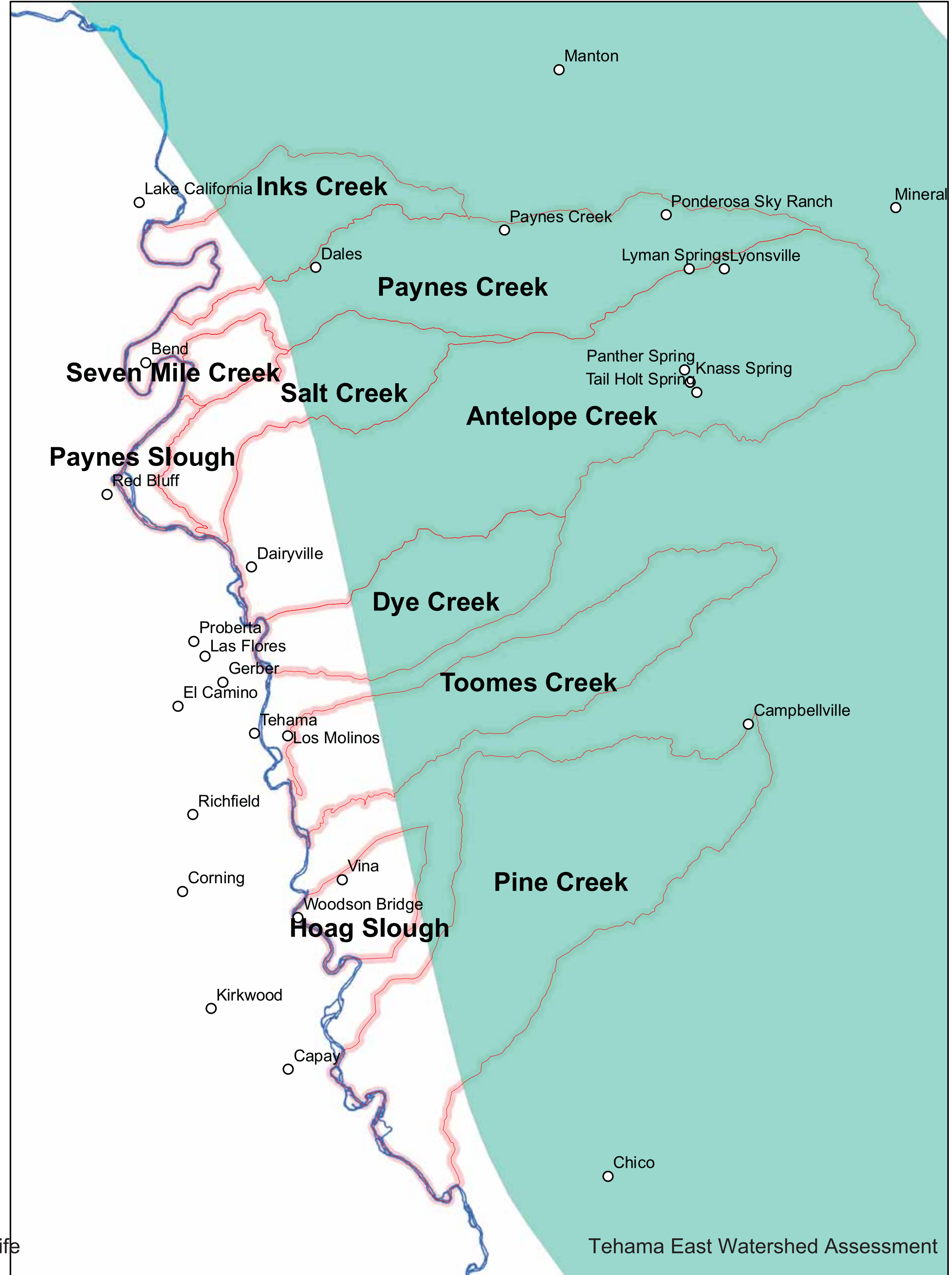
N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds



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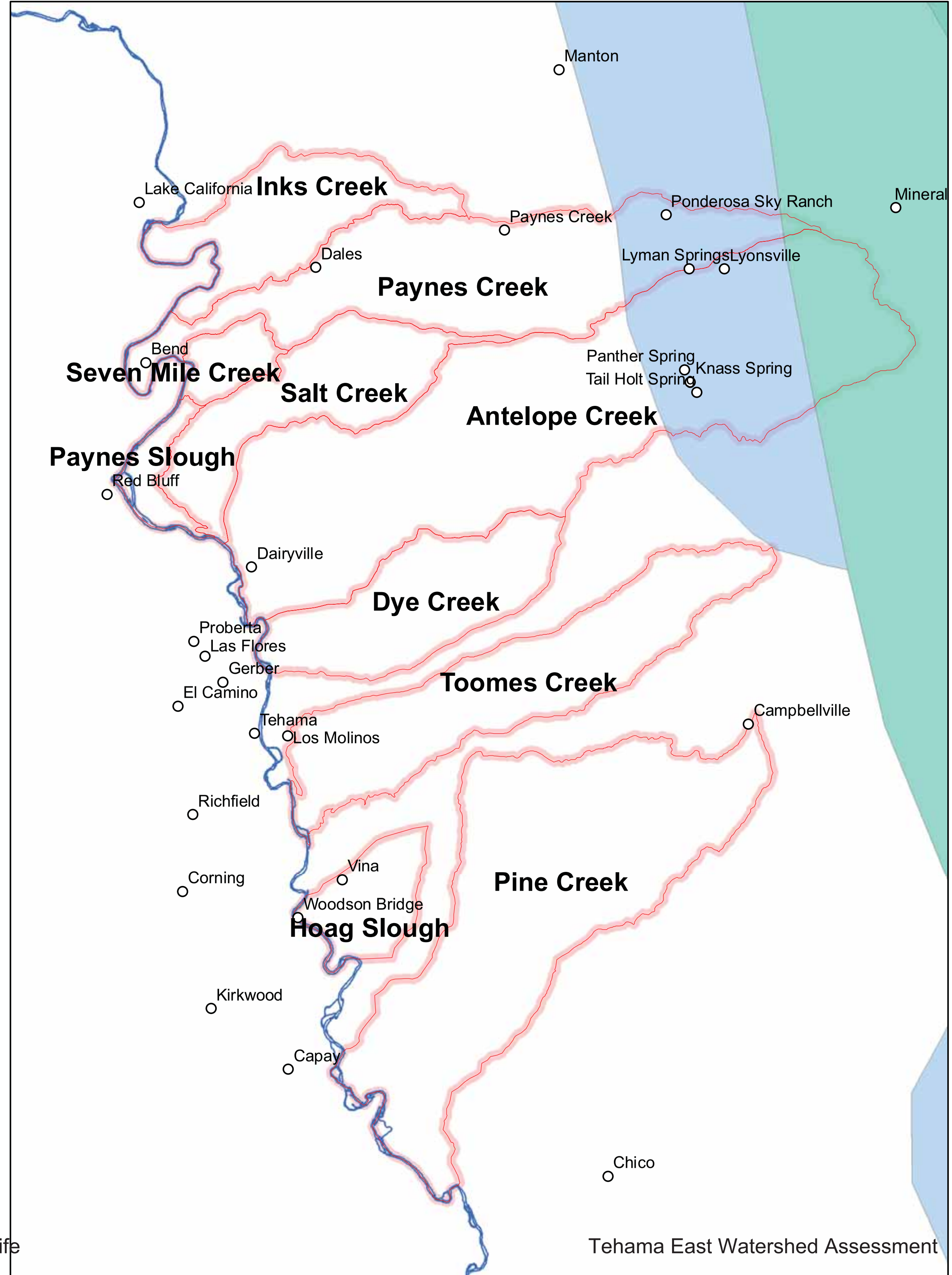
KEY

CANYON WREN
(CATHERPES MEXICANUS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

Tehama County Resource Conservation District
(c) 2010



Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds

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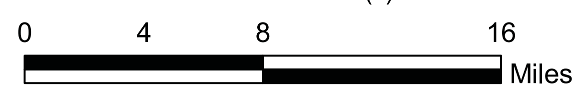
KEY

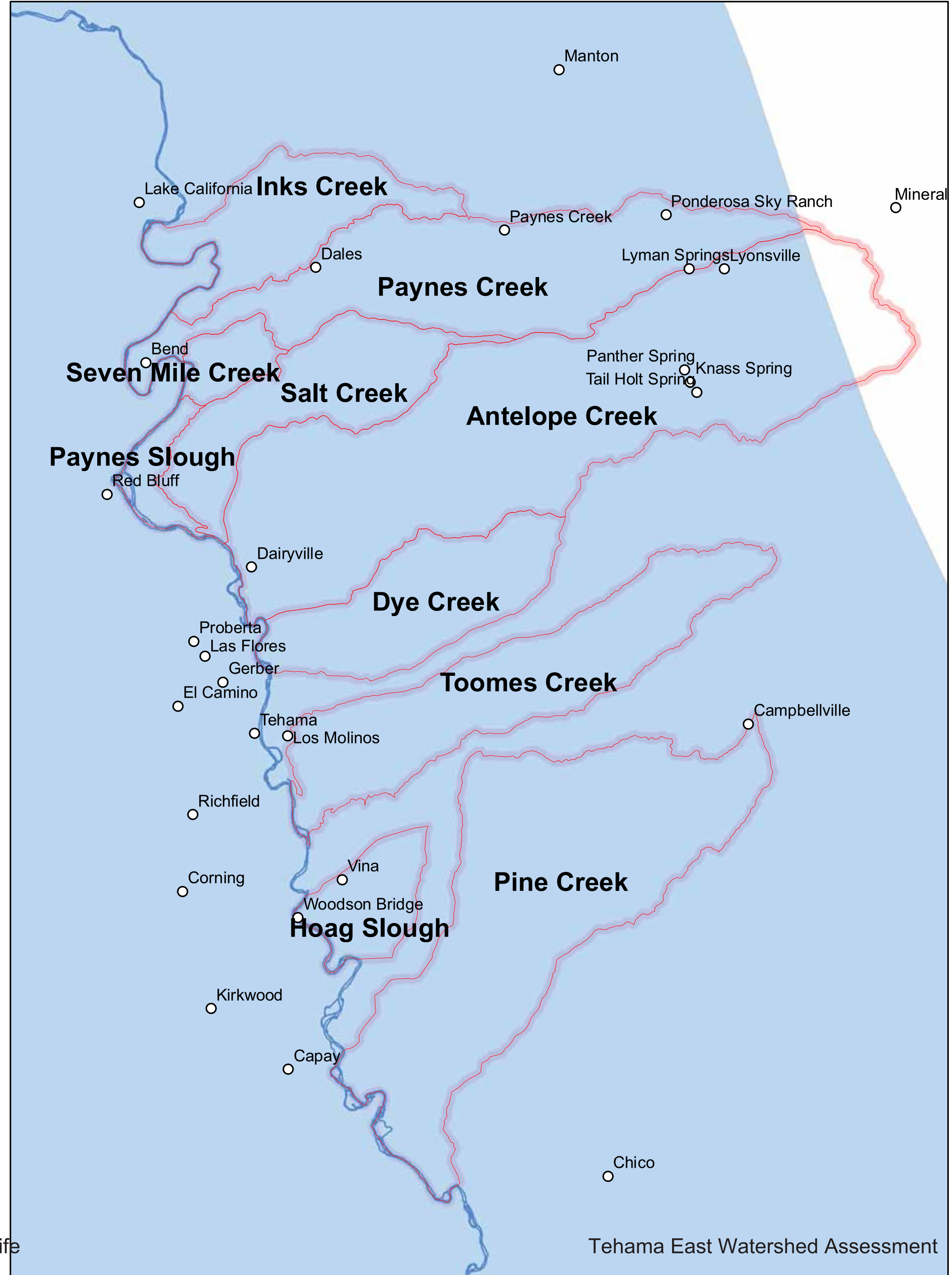
CASSIN'S FINCH
(CARPODACUS CASSINII)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

Tehama County Resource
Conservation District
(c) 2010





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California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds

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KEY

CEDAR WAXWING
(BOMBYCILLA CEDRORUM)

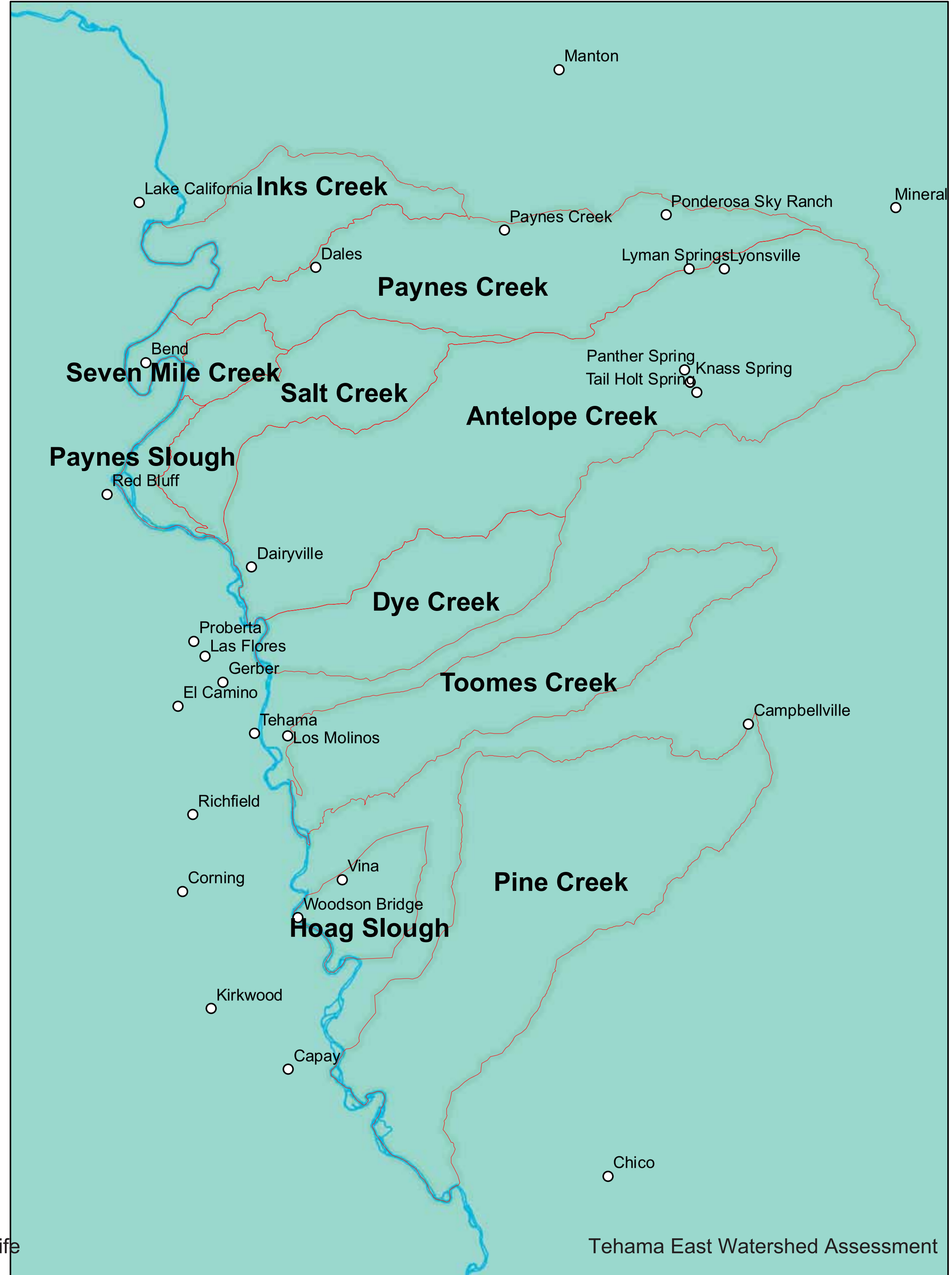
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles



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California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

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KEY

COOPER'S HAWK
(ACCIPITER COOPERII)

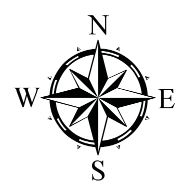
SEASON

Summer

Year Round

Winter

Watershed Boundary



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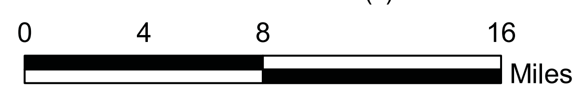
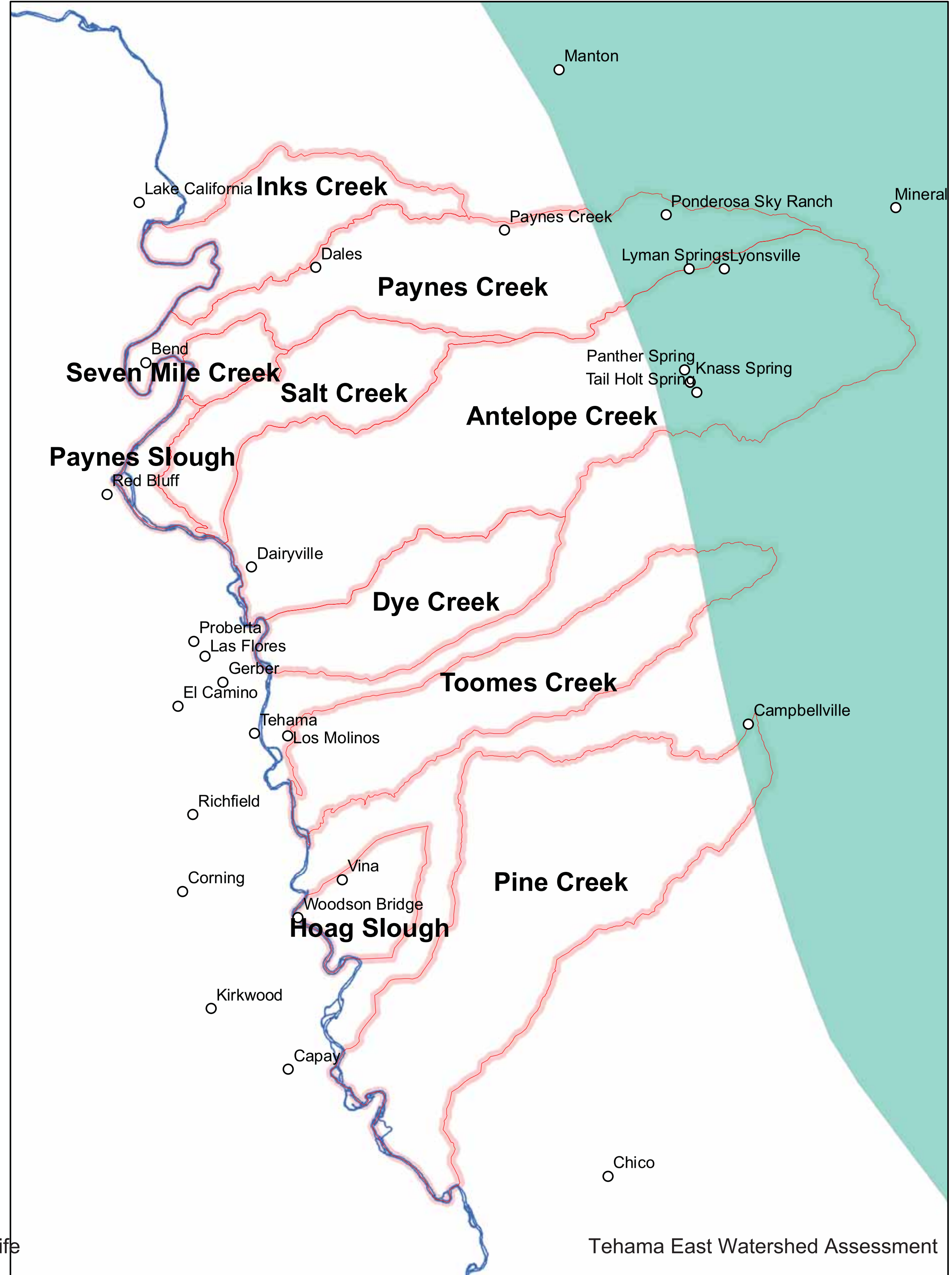
Conservation District
(c) 2010





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Tehama East Watersheds

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KEY

CHESTNUT-BACKED CHICKADEE
(PARUS RUFESCENS)

SEASON

Summer

Year Round

Winter

Watershed Boundary

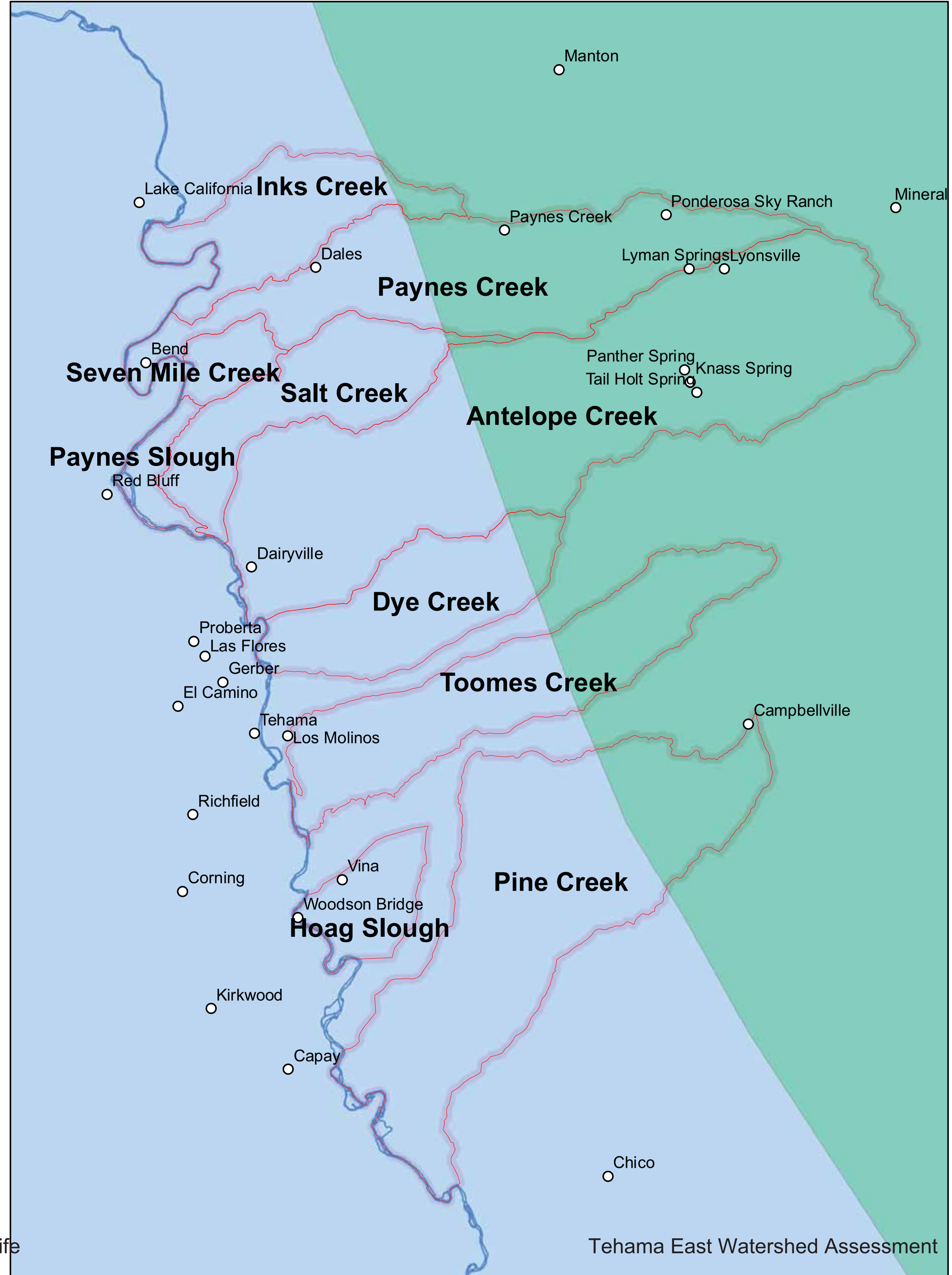
N
W E
S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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Quoted from:
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KEY

CHIPPING SPARROW
(SPIZELLA PASSERINA)

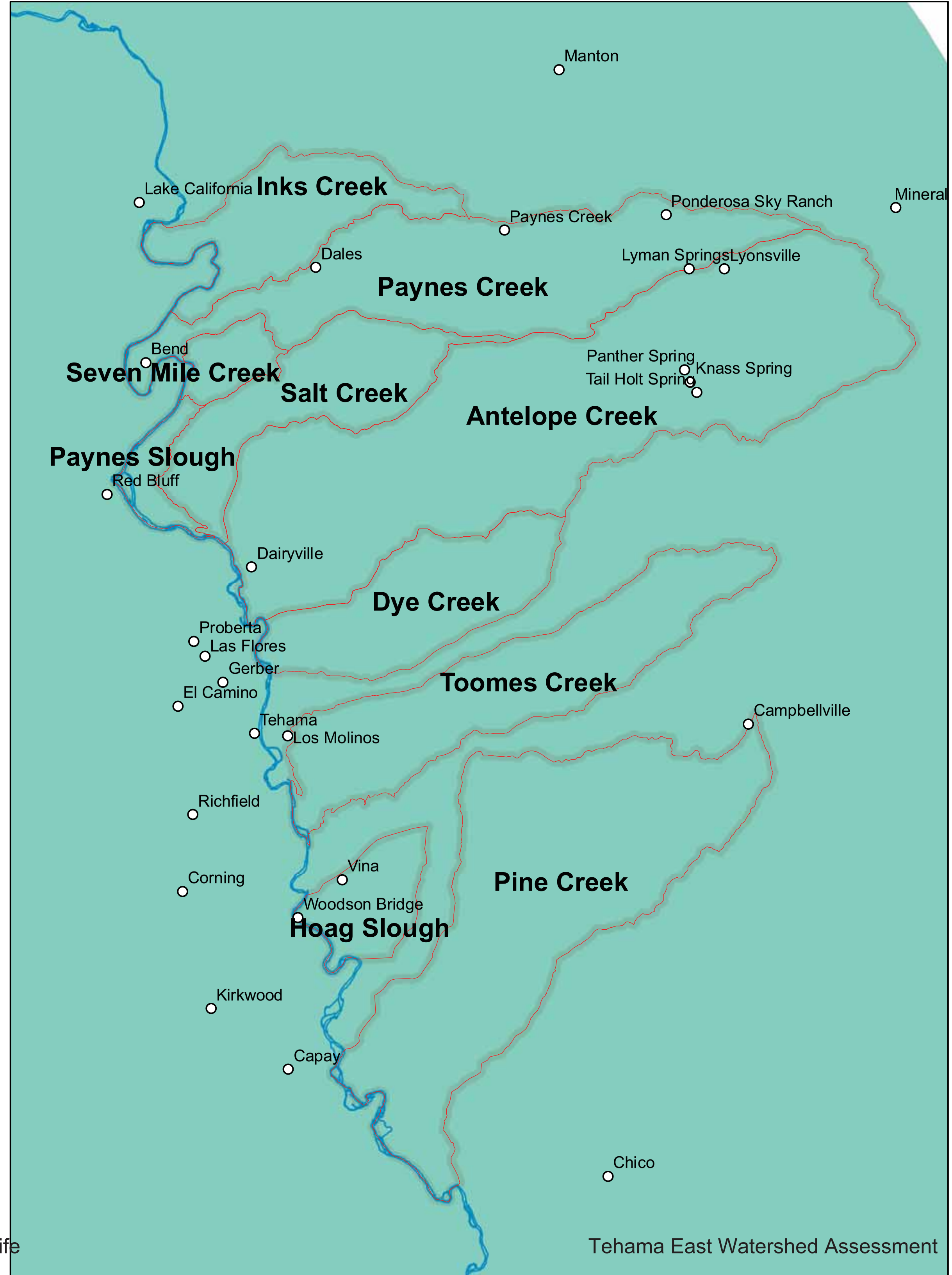
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds

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KEY

CLIFF SWALLOW
(HIRUNDO PYRRHONOTA)

SEASON

Summer

Year Round

Winter

Watershed Boundary

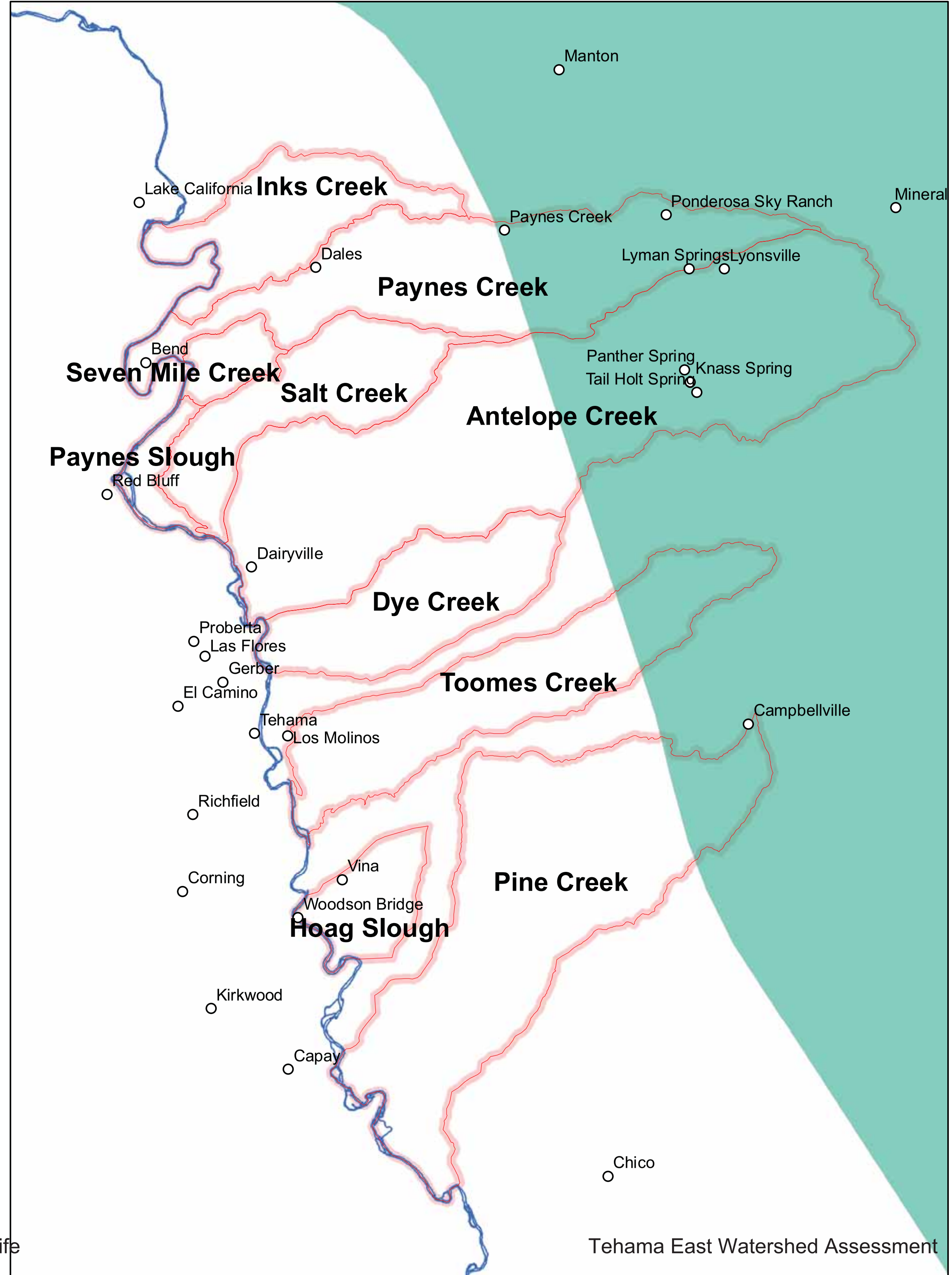
N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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KEY

COMMON NIGHTHAWK
(CHORDEILES MINOR)

SEASON

Summer

Year Round

Winter

Watershed Boundary

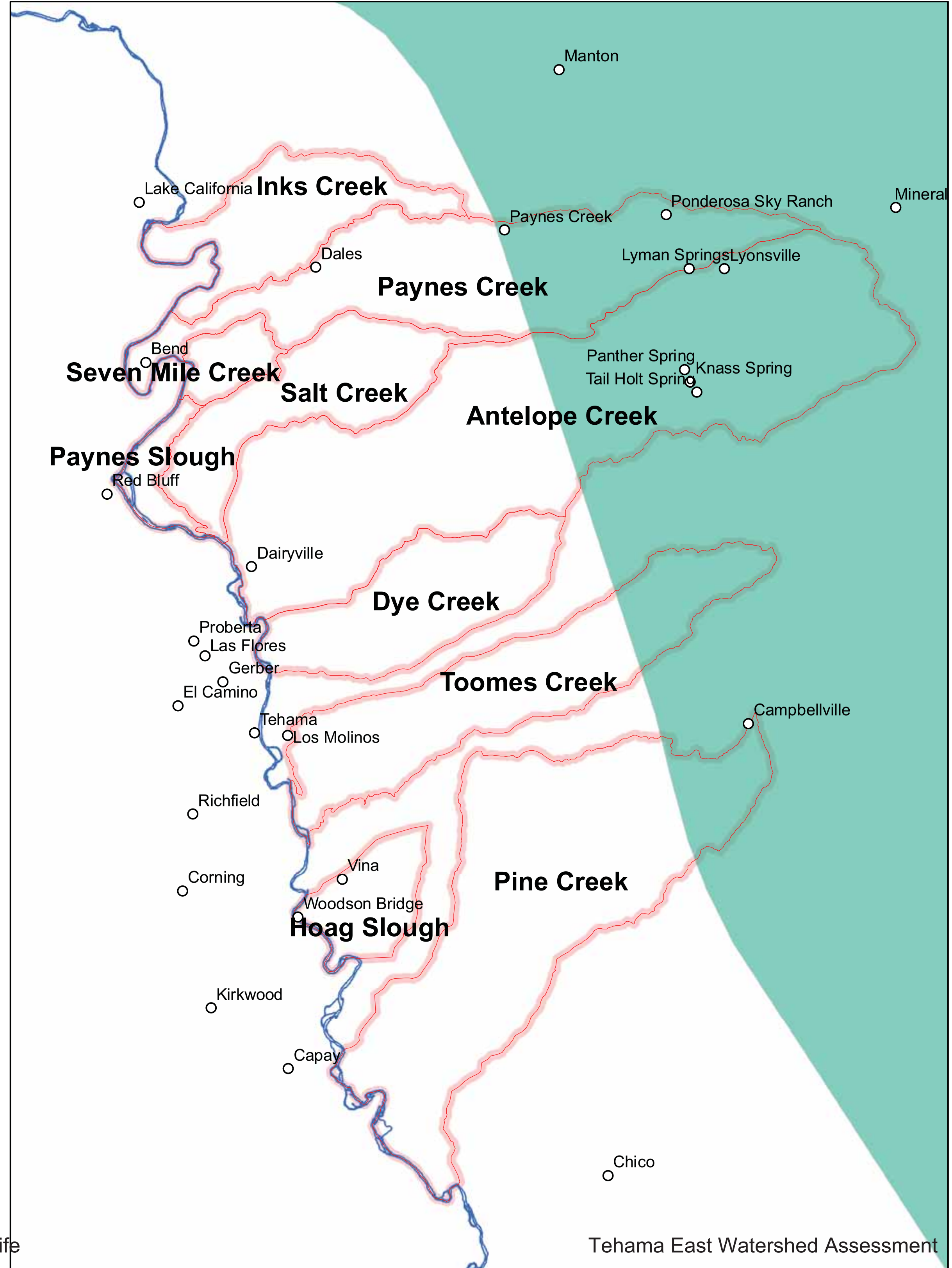
N
W E
S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

COMMON POORWILL
(PHALAENOPTILUS NUTTALLII)

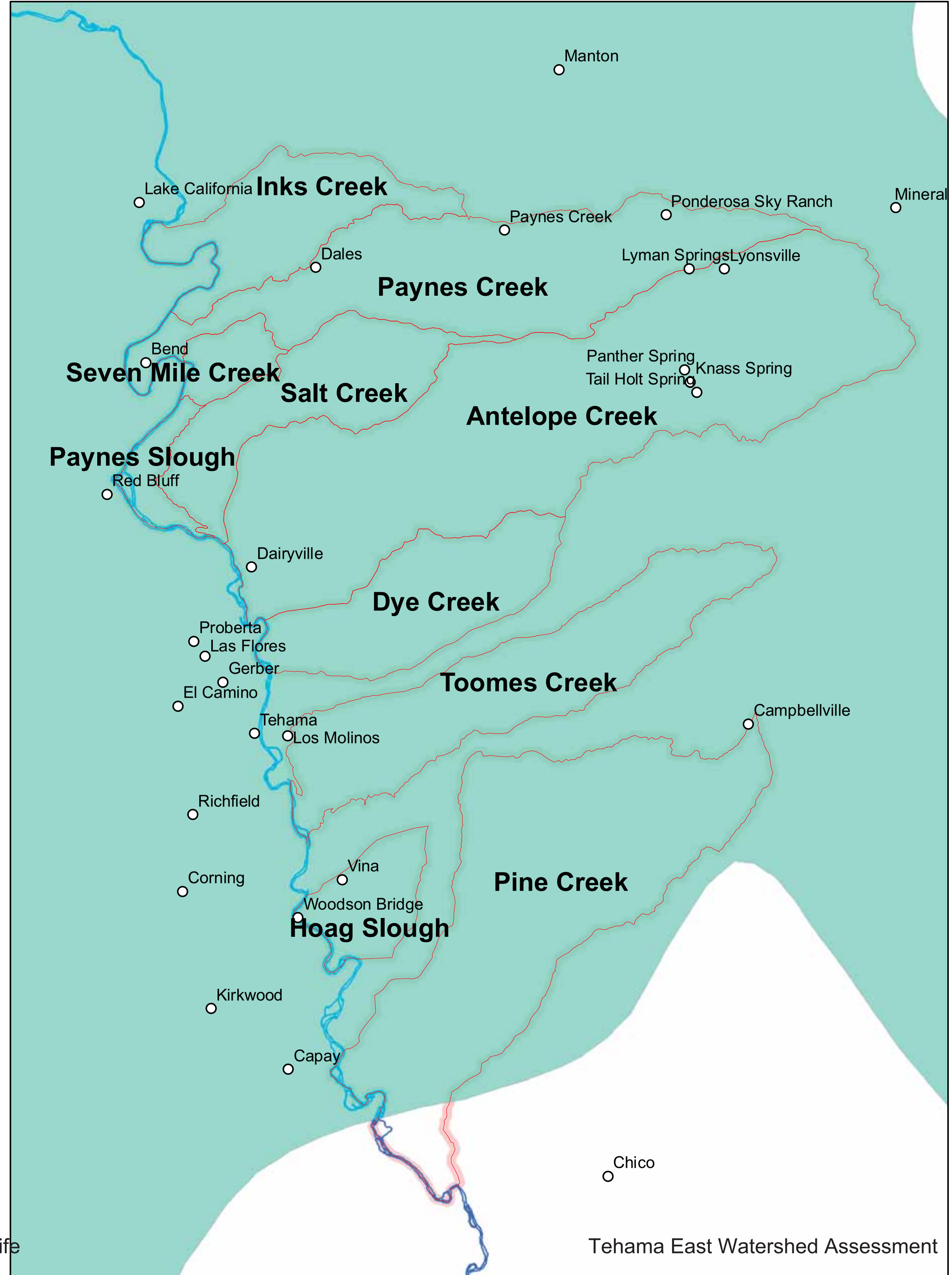
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



Tehama East Watershed Assessment

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Tehama East Watersheds

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KEY

COMMON RAVEN
(CORVUS CORAX)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

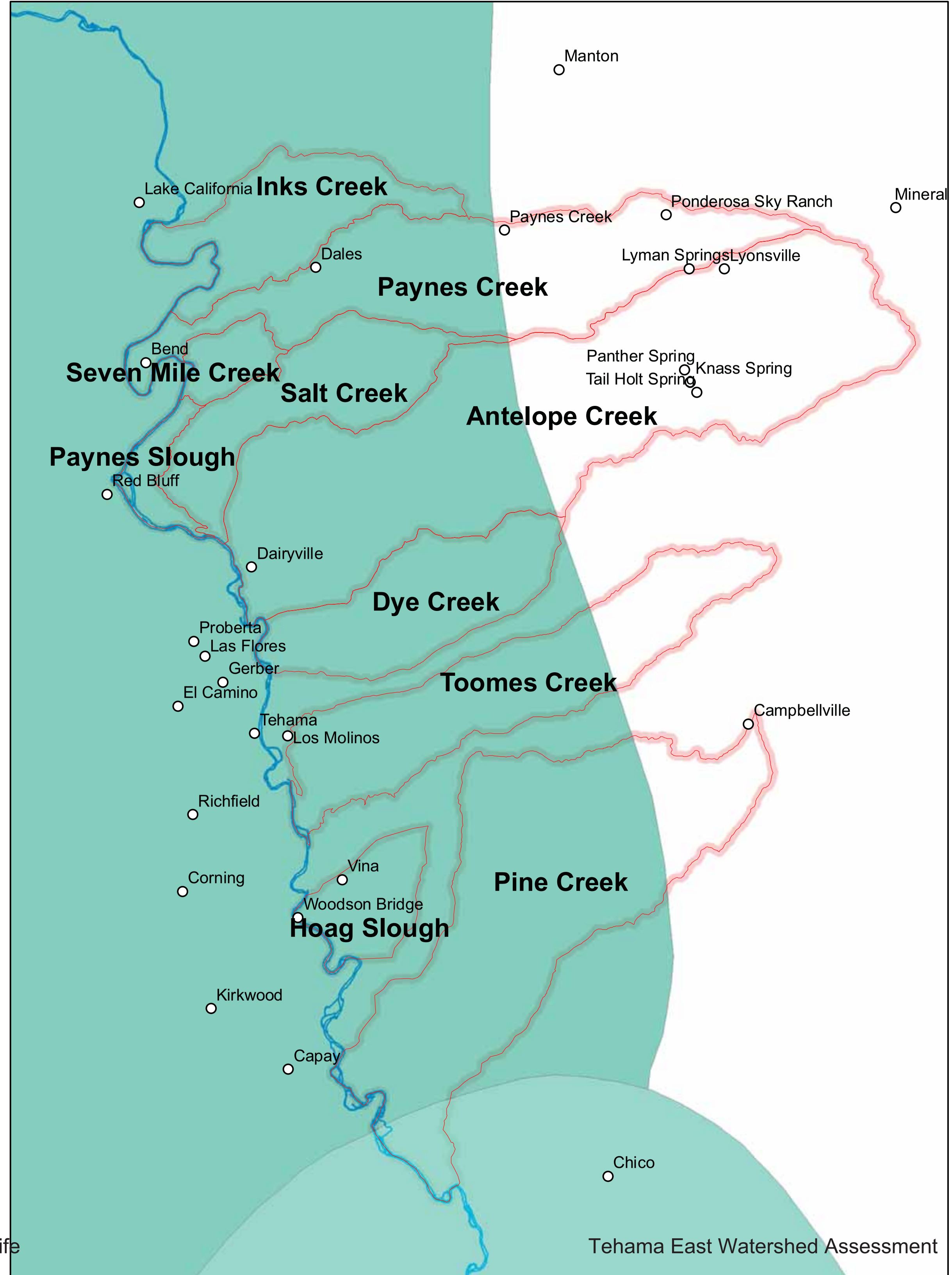
N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds



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KEY

COMMON YELLOWTHROAT
(GEOTHLYPIS TRICHAS)

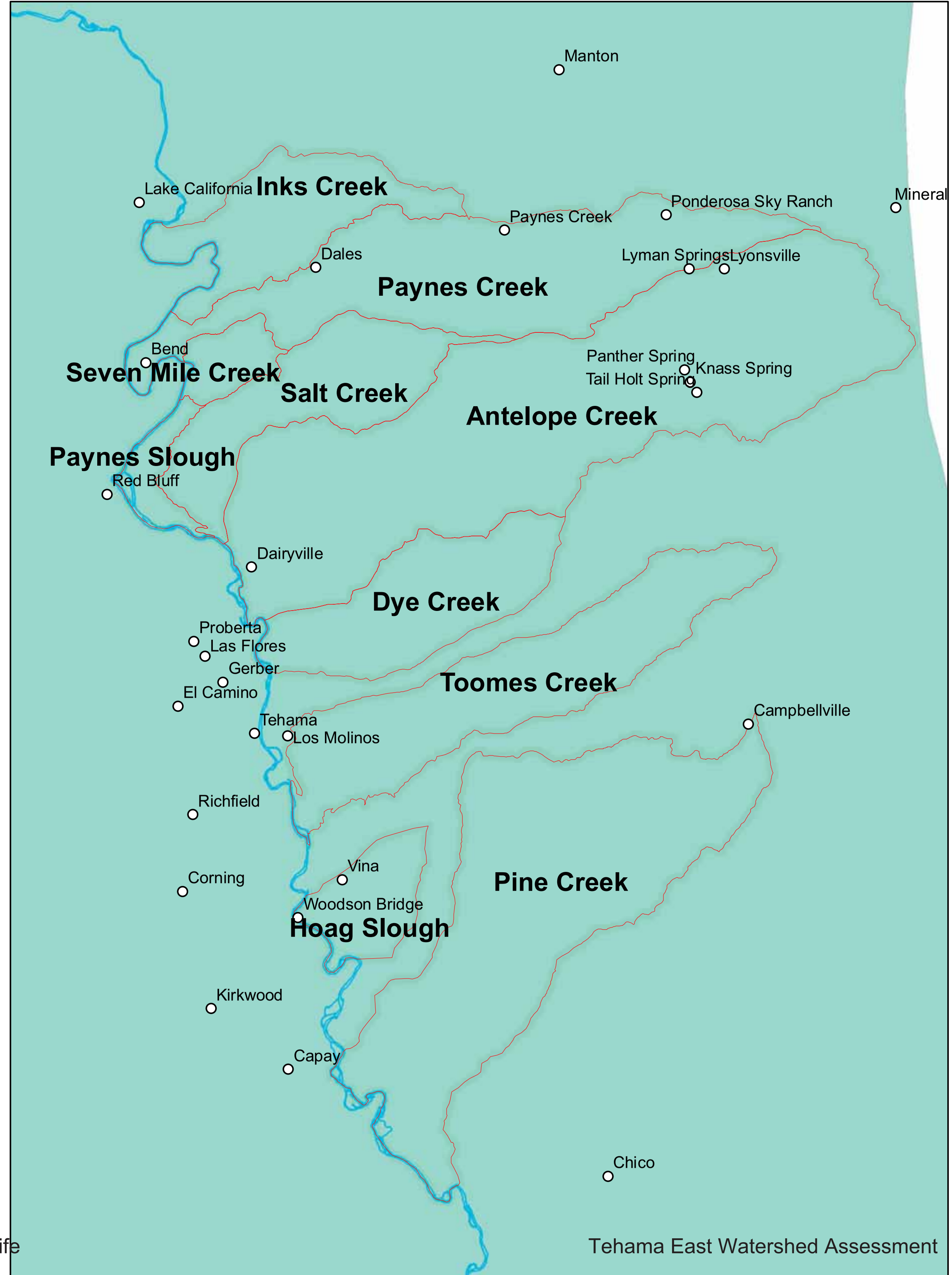
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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KEY

CALIFORNIA QUAIL
(CALLIPEPLA CALIFORNICA)

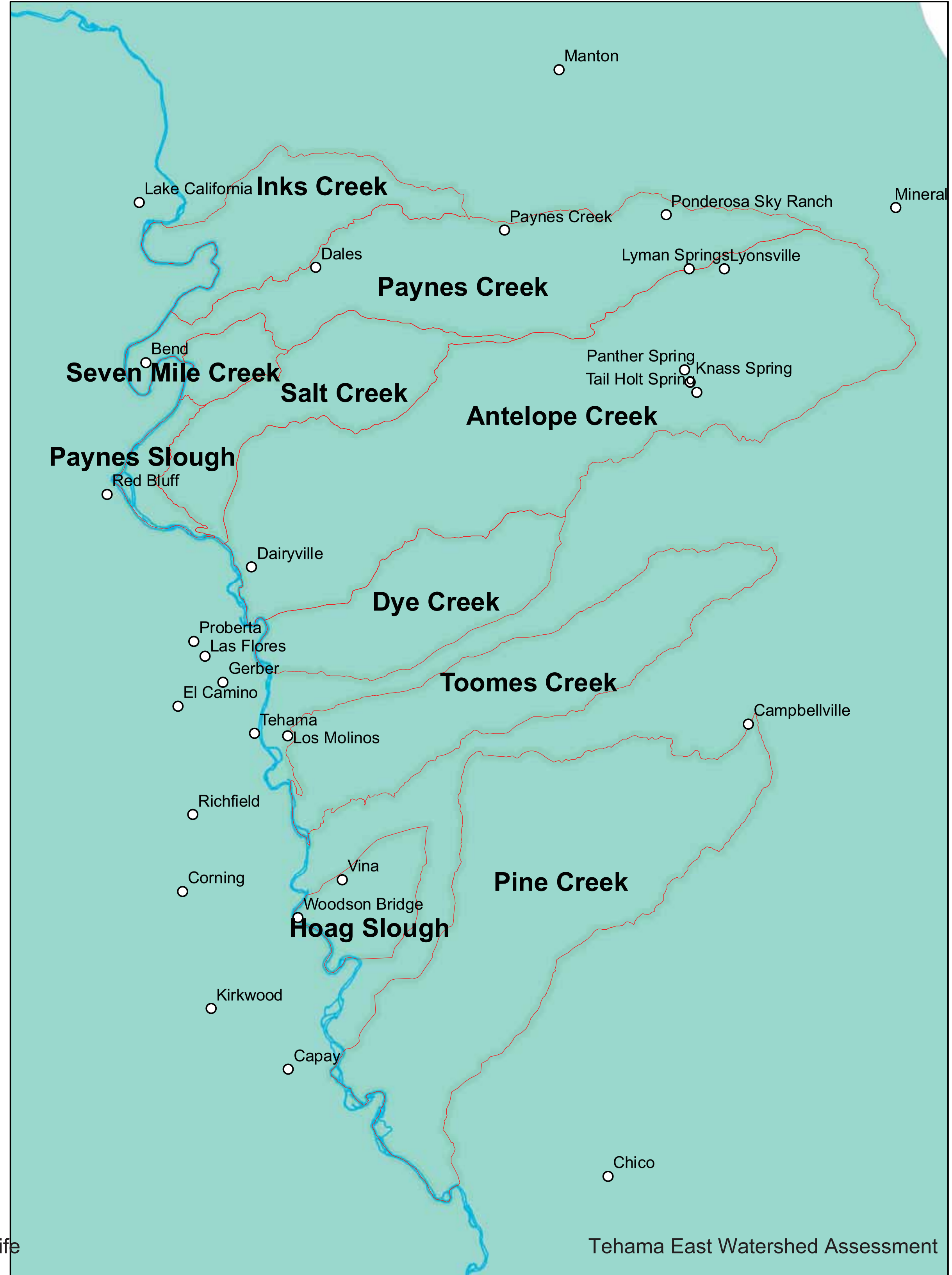
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles



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KEY

DOWNY WOODPECKER
(PICOIDES PUBESCENS)

SEASON

Summer

Year Round

Winter

Watershed Boundary

N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles

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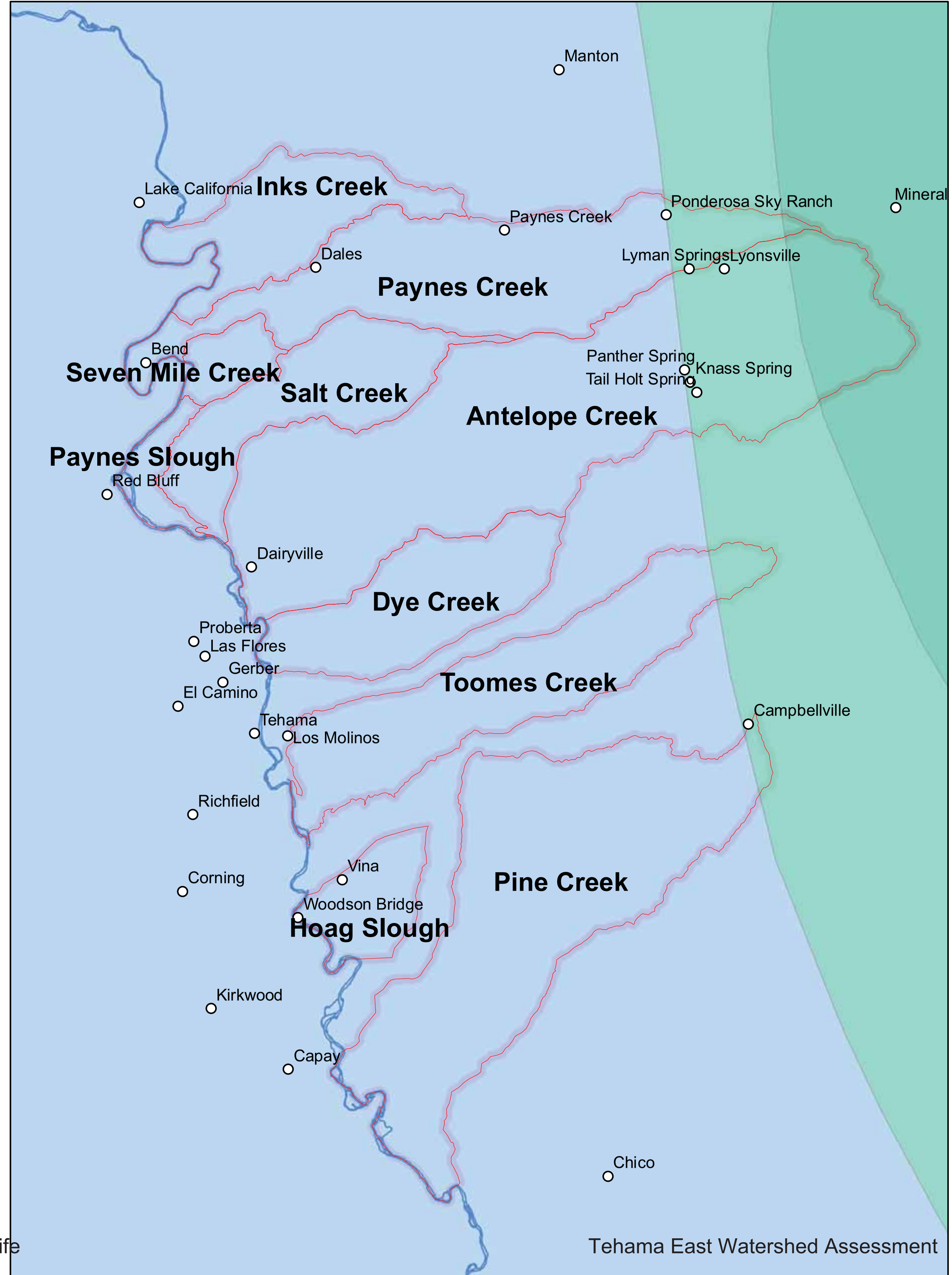
California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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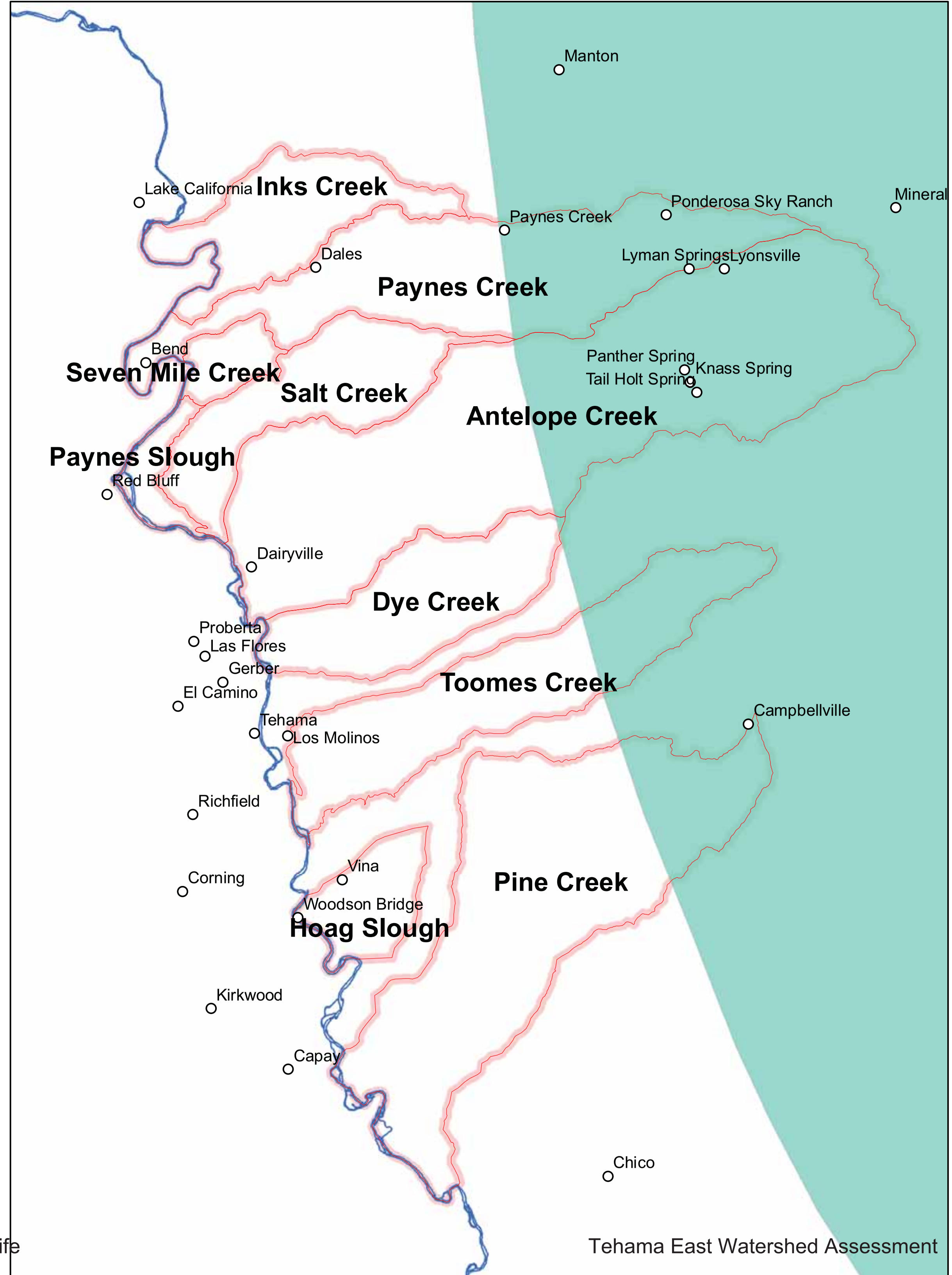
KEY

DARK-EYED JUNCO
(JUNCO HYEMALIS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

Tehama County Resource
Conservation District



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KEY

DUSKY FLYCATCHER
(EMPIDONAX OBERHOLSERI)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

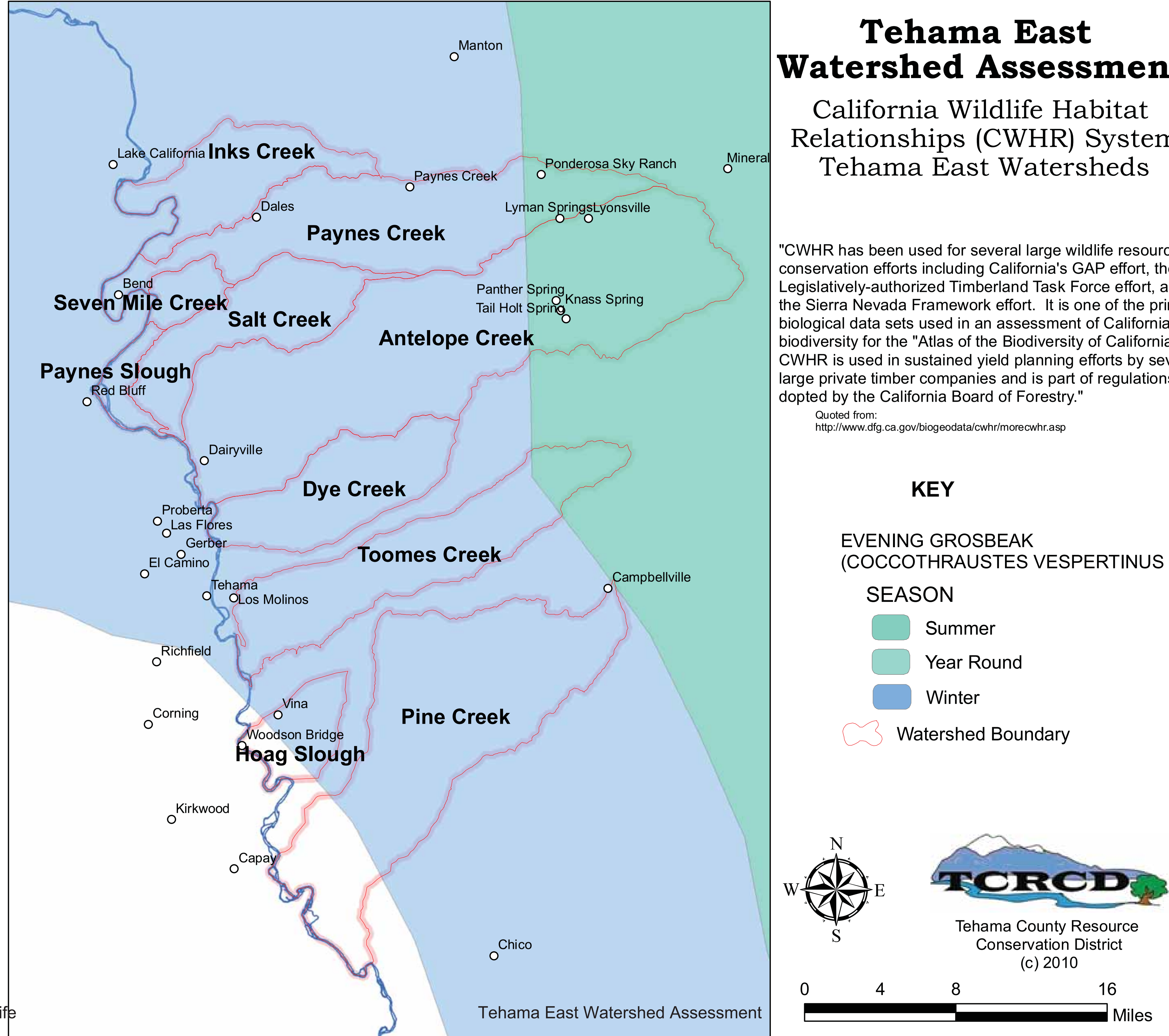
N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds



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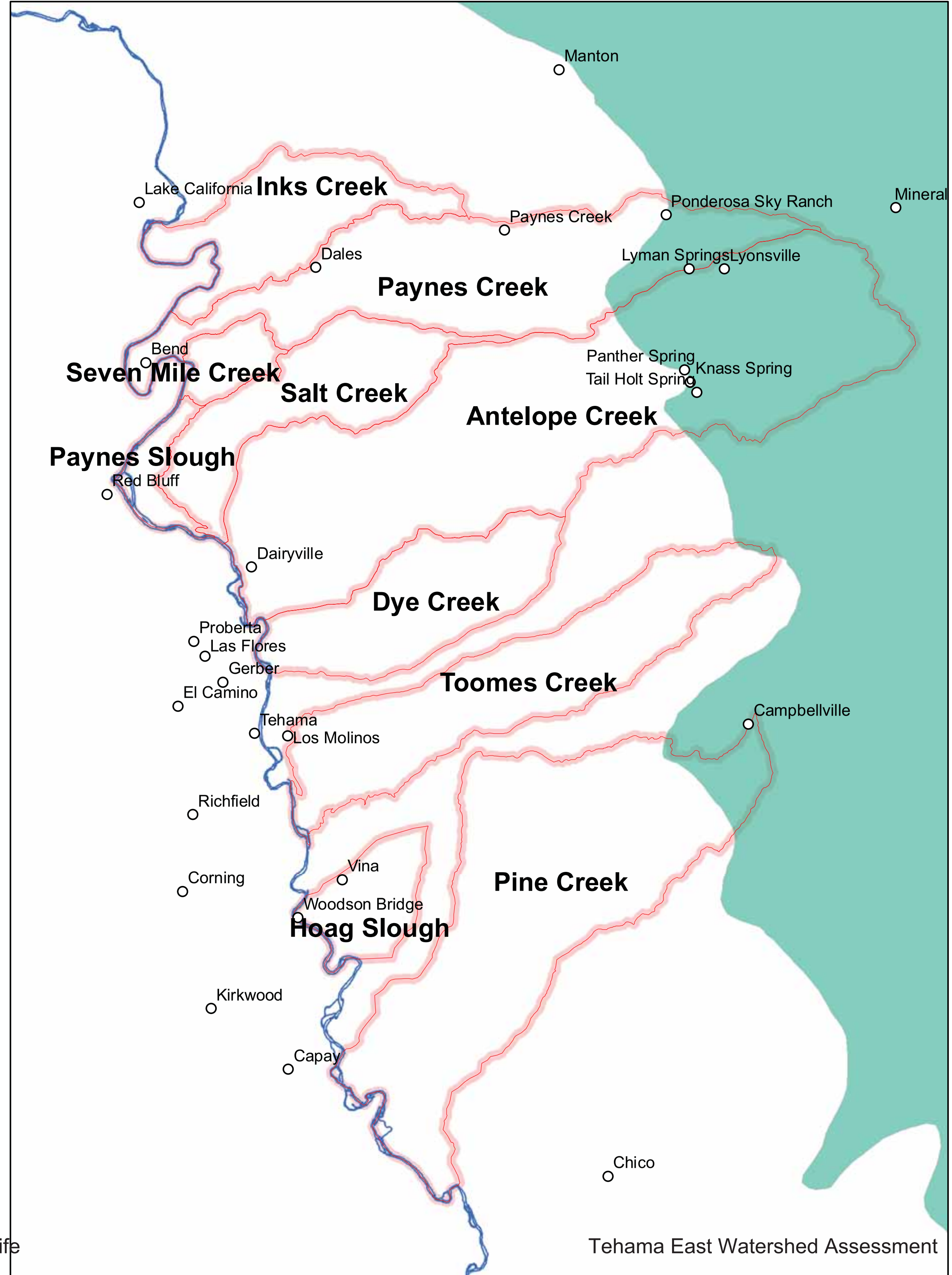

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KEY

FLAMMULATED OWL
(OTUS FLAMMEOLUS)

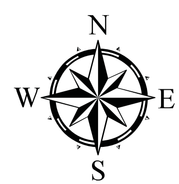
SEASON

Summer

Year Round

Winter

Watershed Boundary



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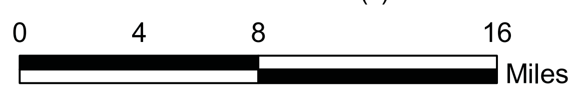

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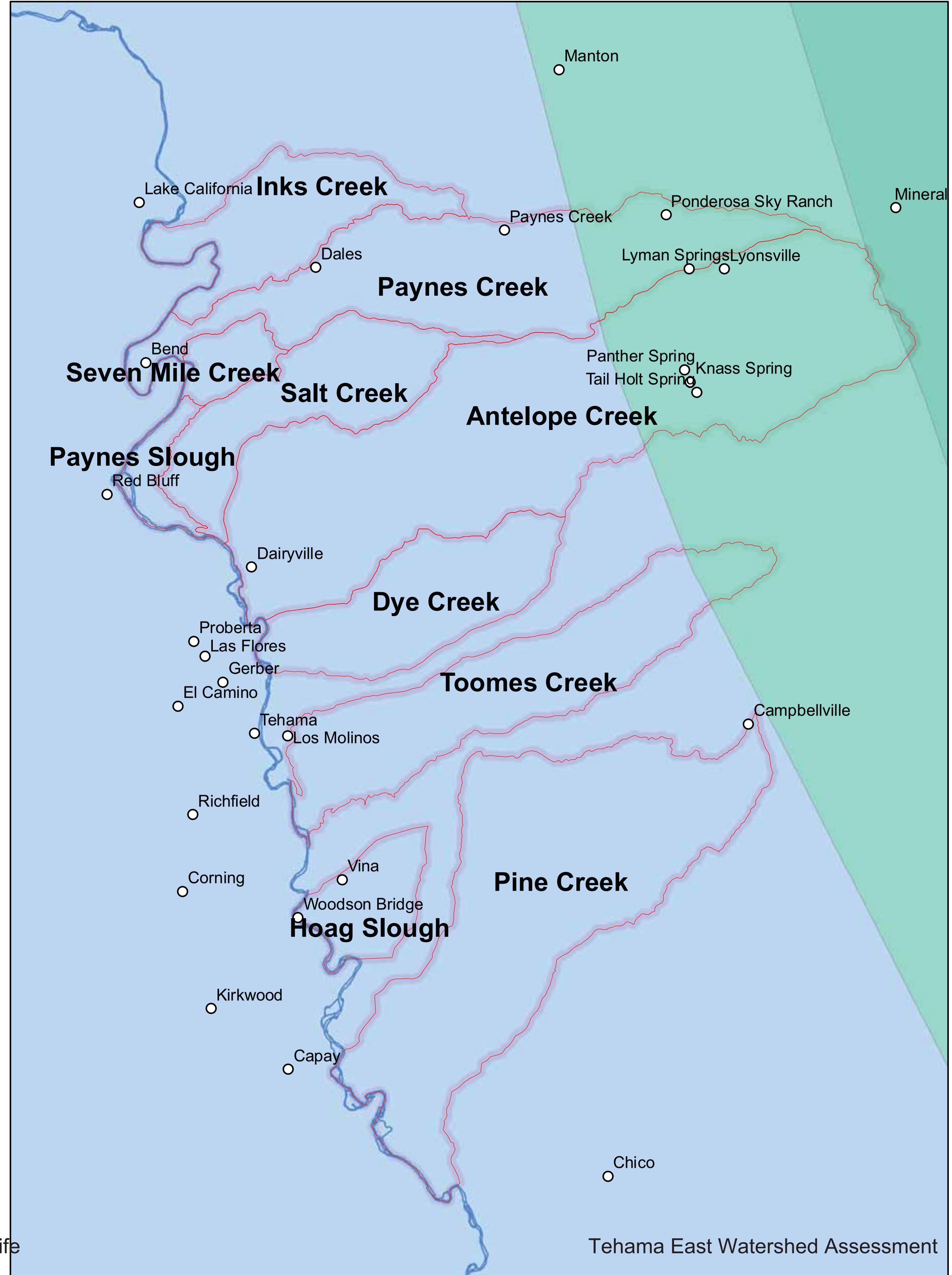
California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds



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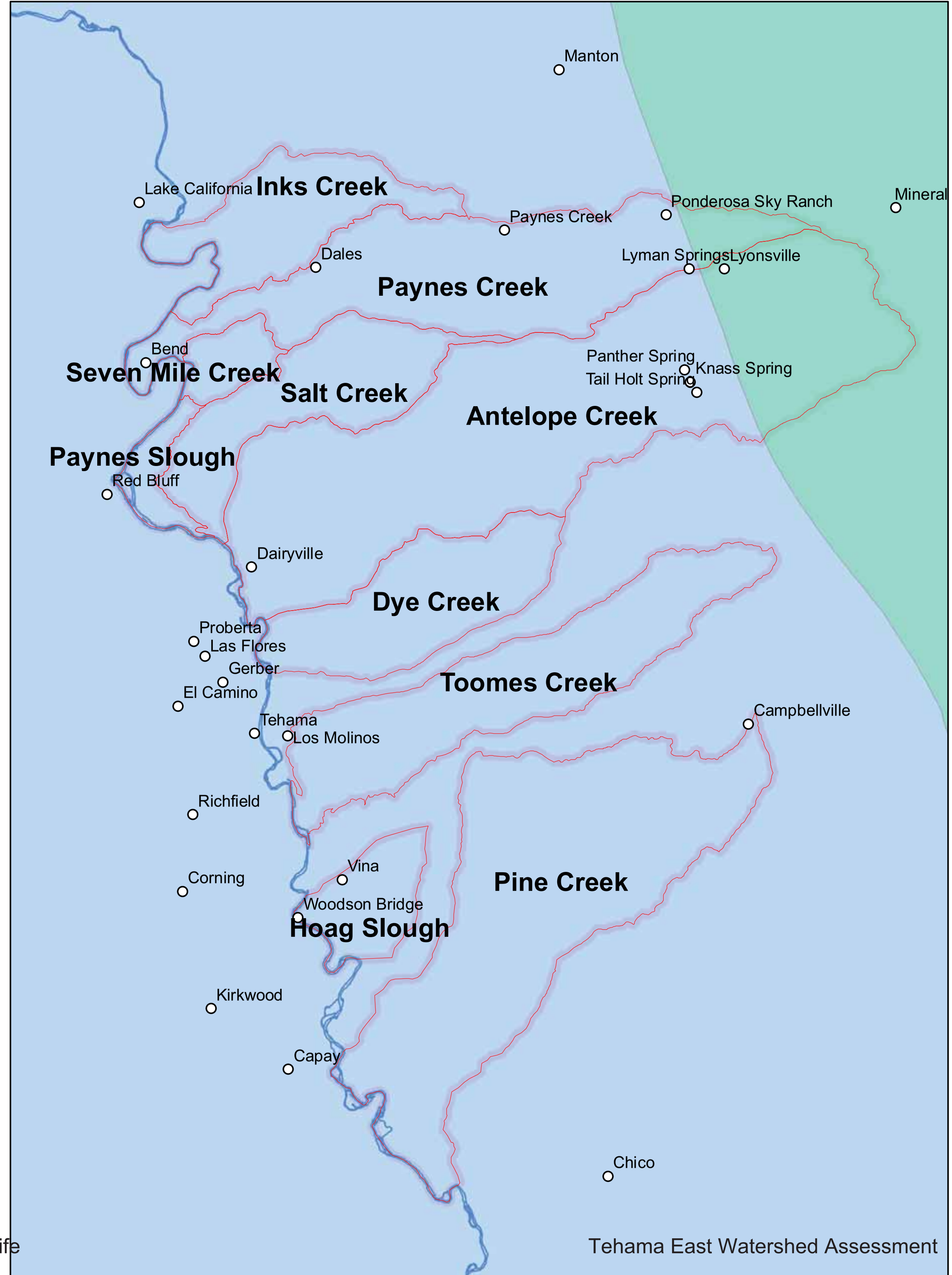
KEY

FOX SPARROW
(PASSERELLA ILIACA)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

Tehama County Resource
Conservation District
(c) 2010



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KEY

GOLDEN-CROWNED KINGLET
(REGULUS SATRAPA)

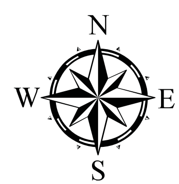
SEASON

Summer

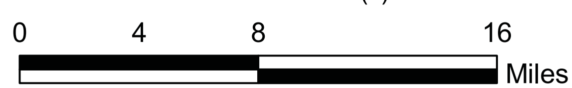
Year Round

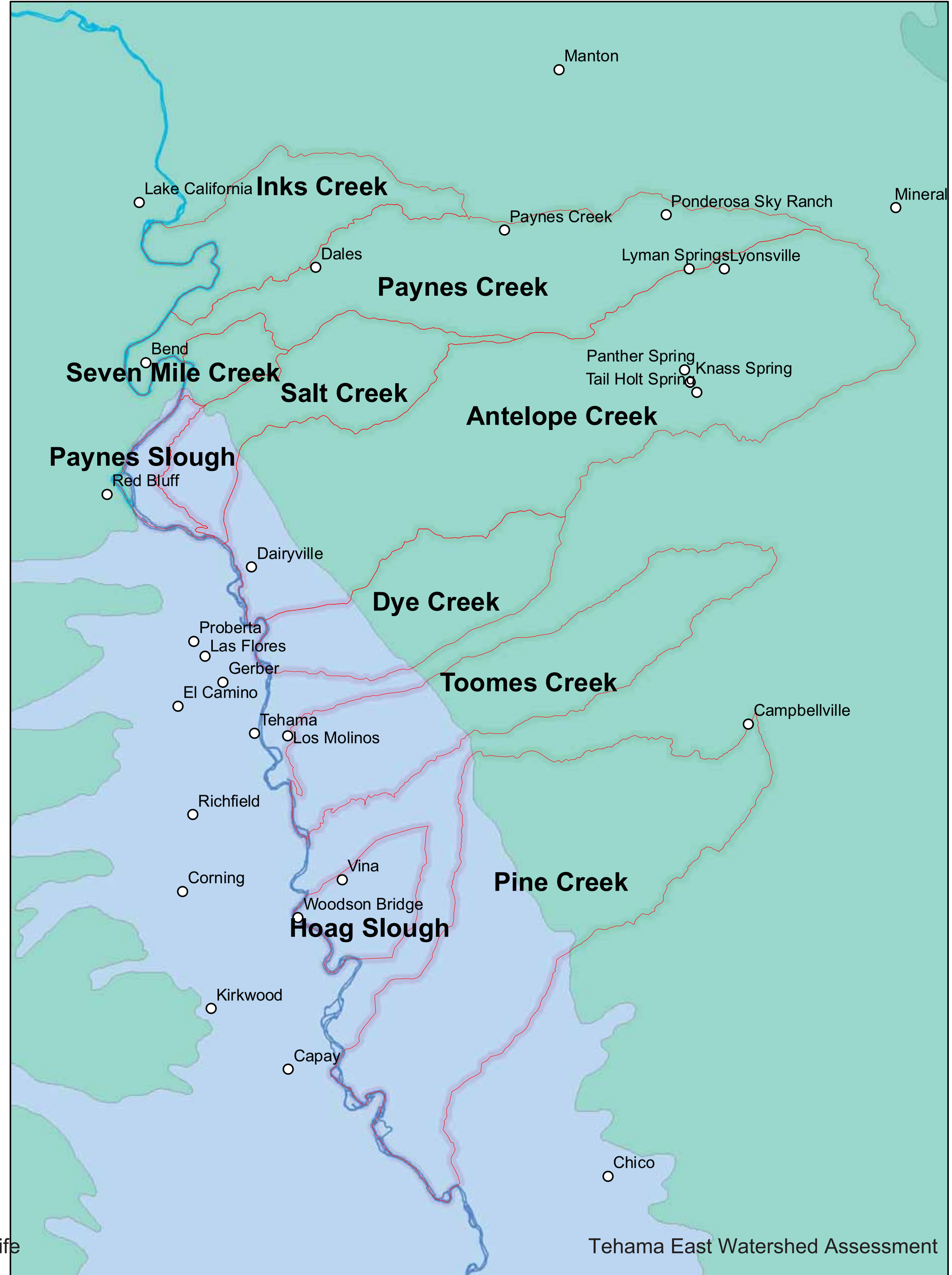
Winter

Watershed Boundary



Tehama County Resource
Conservation District
(c) 2010





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Tehama East Watersheds

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KEY

GOLDEN EAGLE
(AQUILA CHRYSAETOS)

SEASON

Summer

Year Round

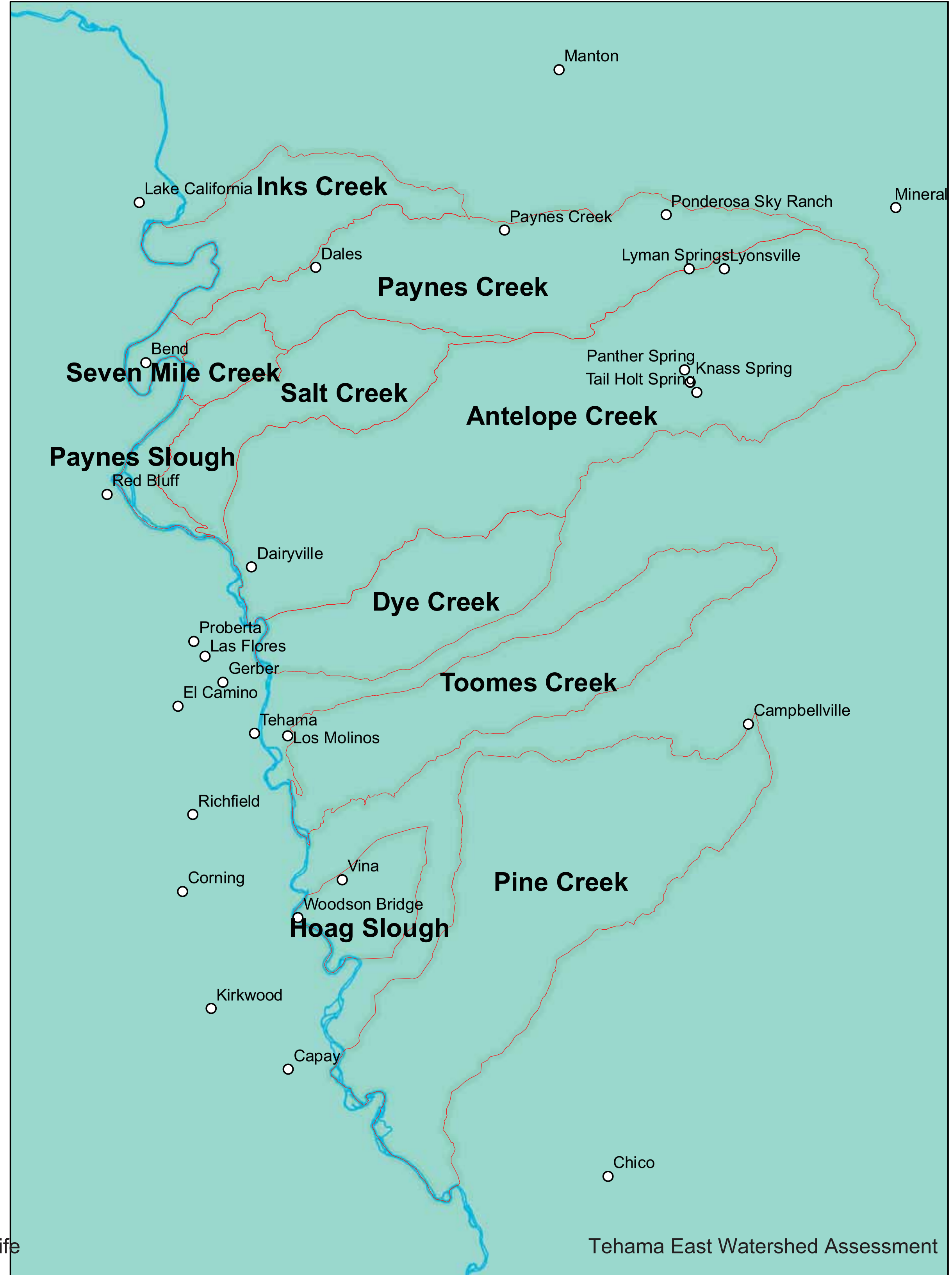
Winter

Watershed Boundary

N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles



Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds

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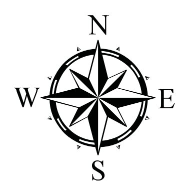
Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

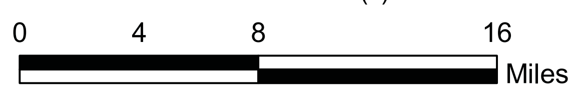
GREAT HORNED OWL
(BUBO VIRGINIANUS)

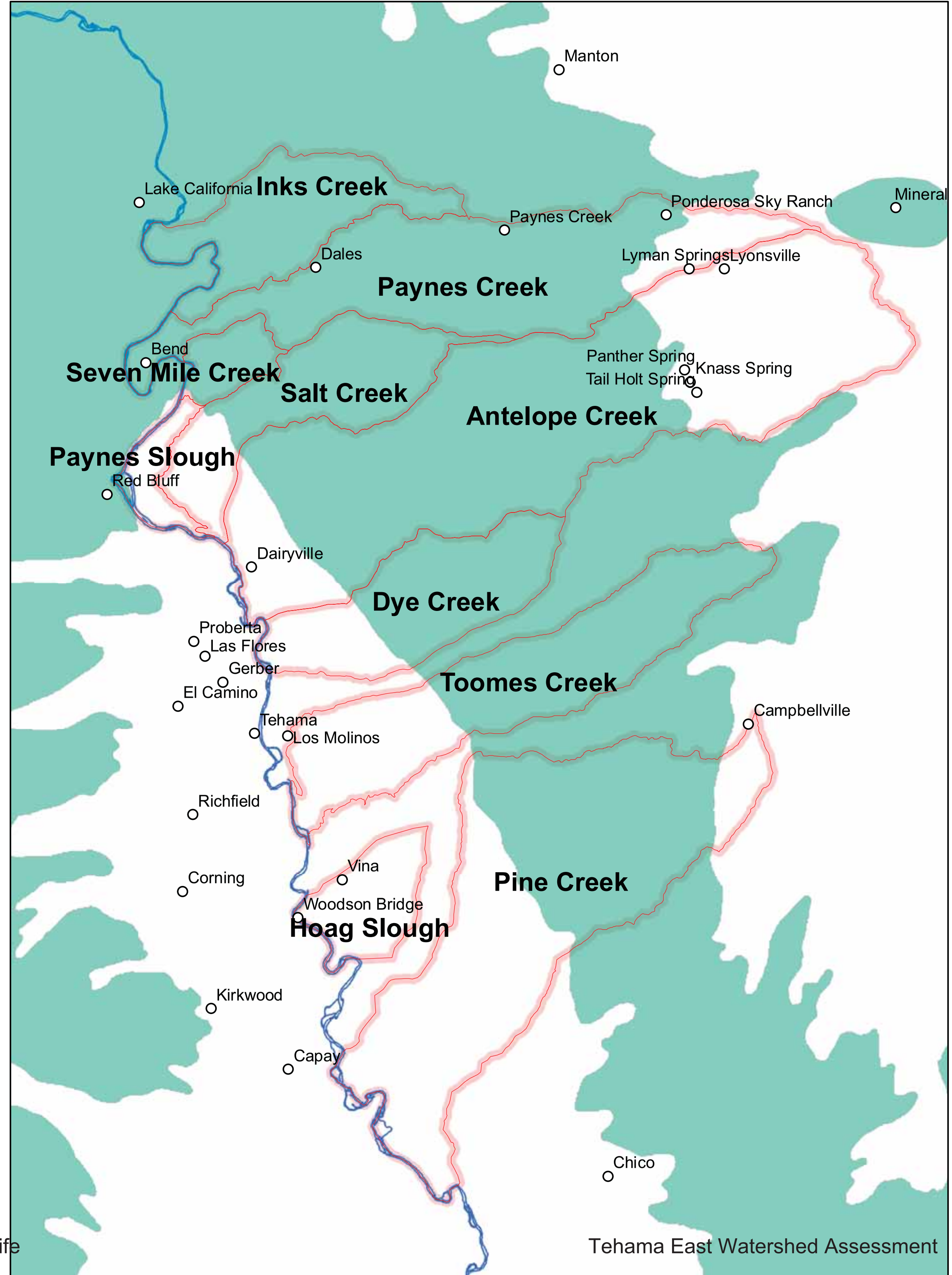
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



Tehama County Resource Conservation District
(c) 2010





Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

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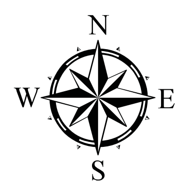
KEY

GRASSHOPPER SPARROW
(AMMODRAMUS SAVANNARUM)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



Tehama County Resource Conservation District
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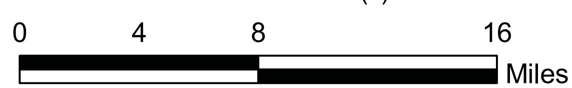
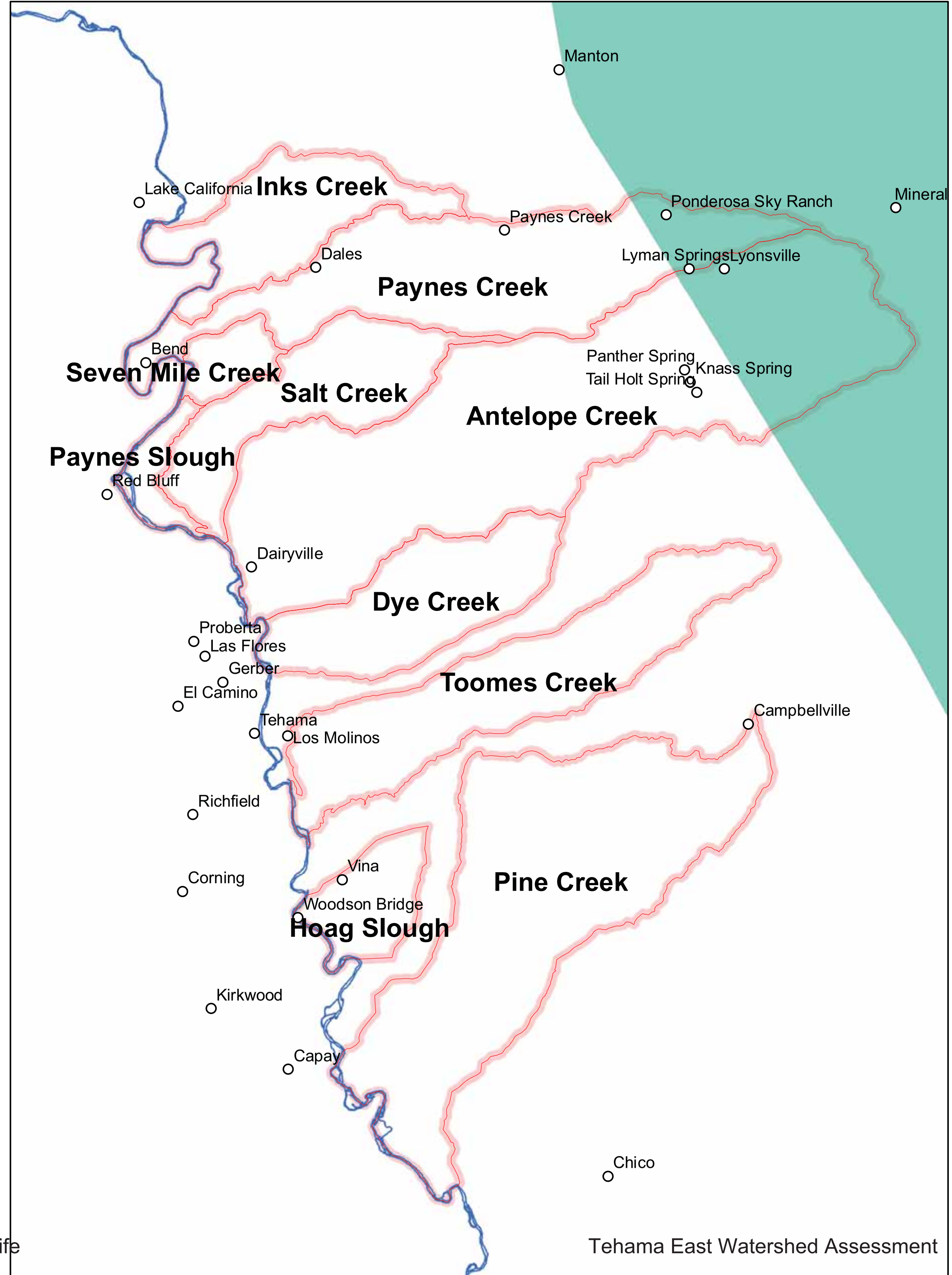


Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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KEY

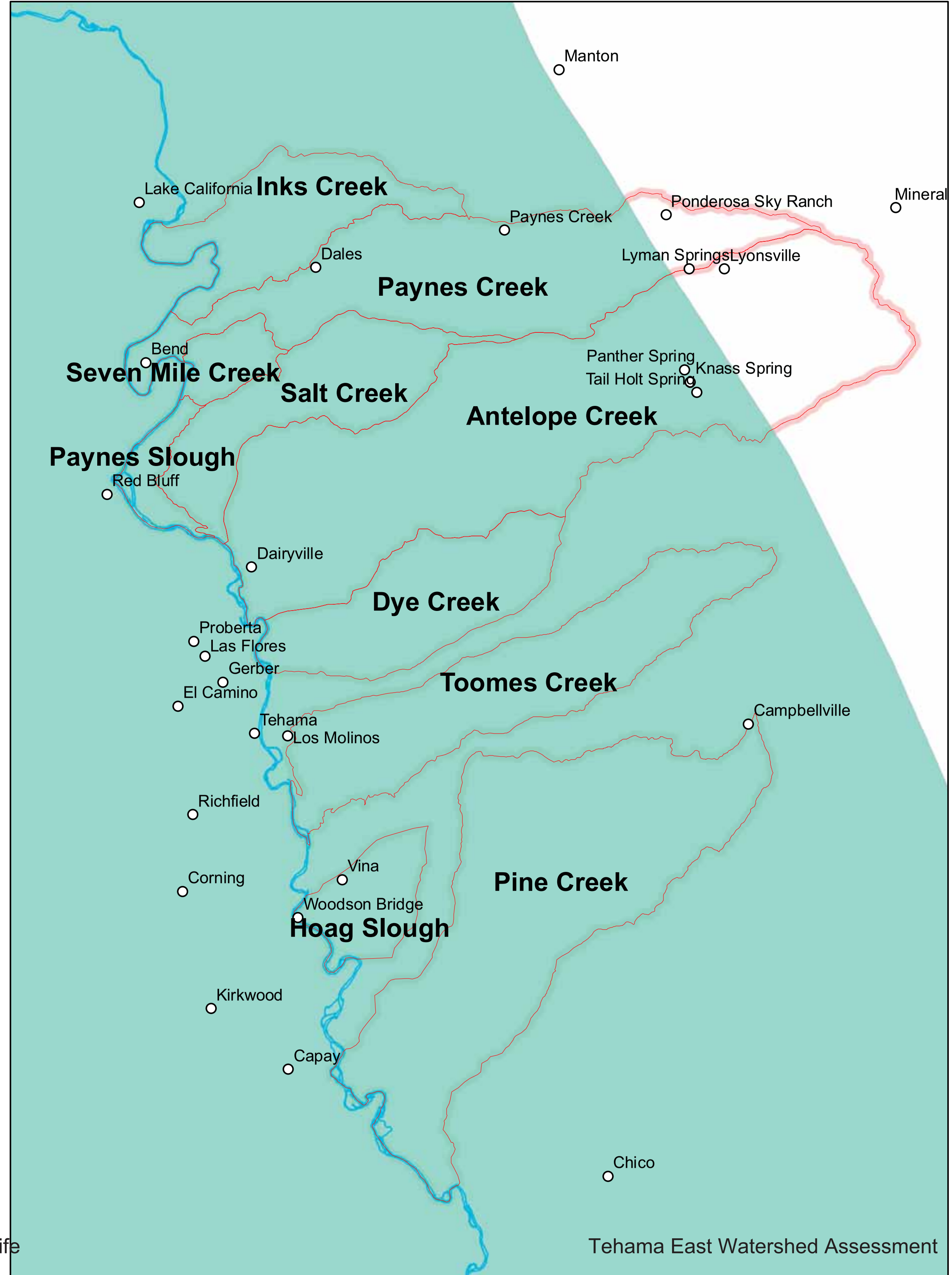
GREEN-TAILED TOWHEE
(PIPILO CHLORURUS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles



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KEY

GREATER ROADRUNNER
(GEOCOCCYX CALIFORNIANUS)

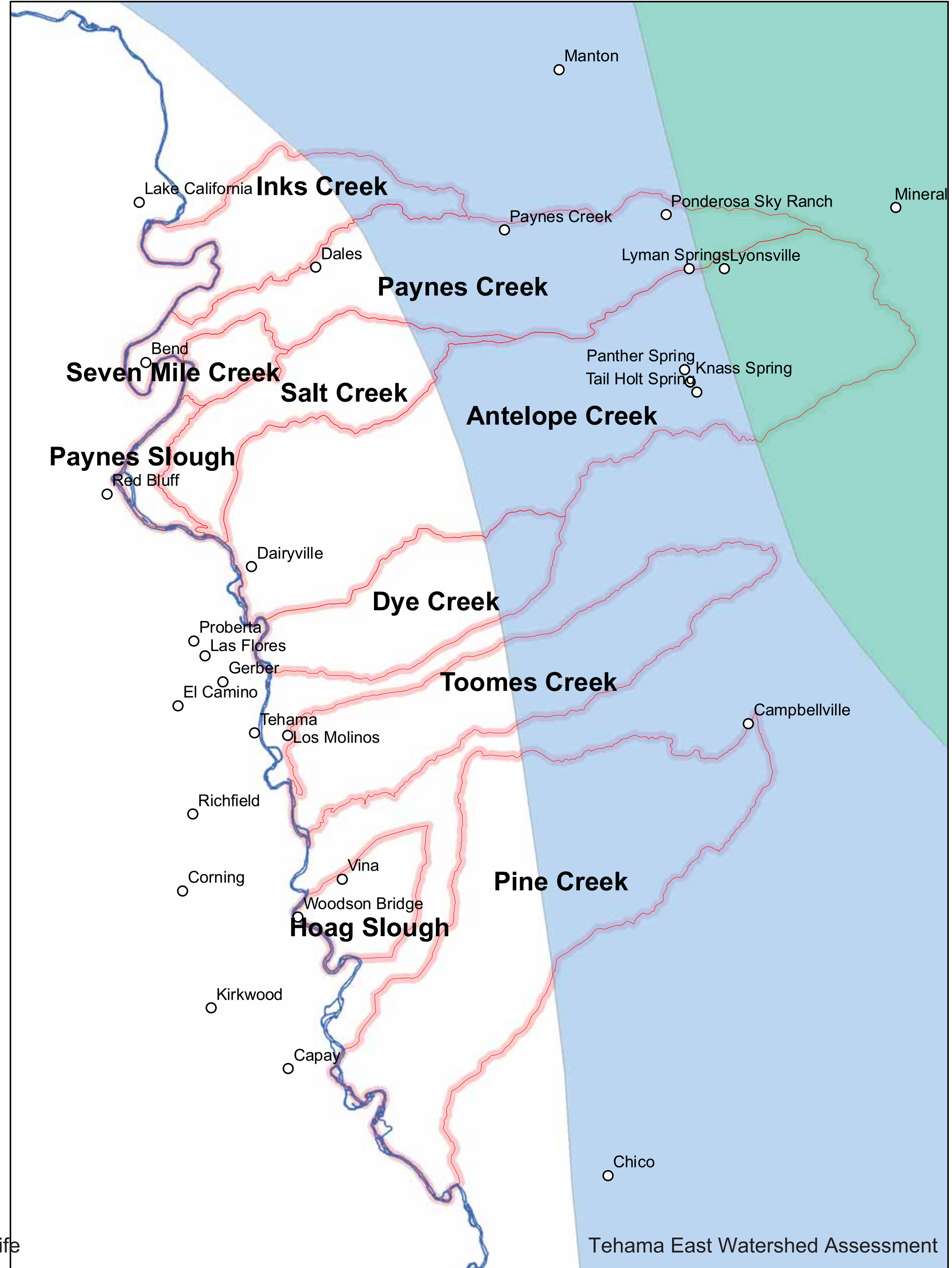
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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Quoted from:
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KEY

HAIRY WOODPECKER
(PICOIDES VILLOSUS)

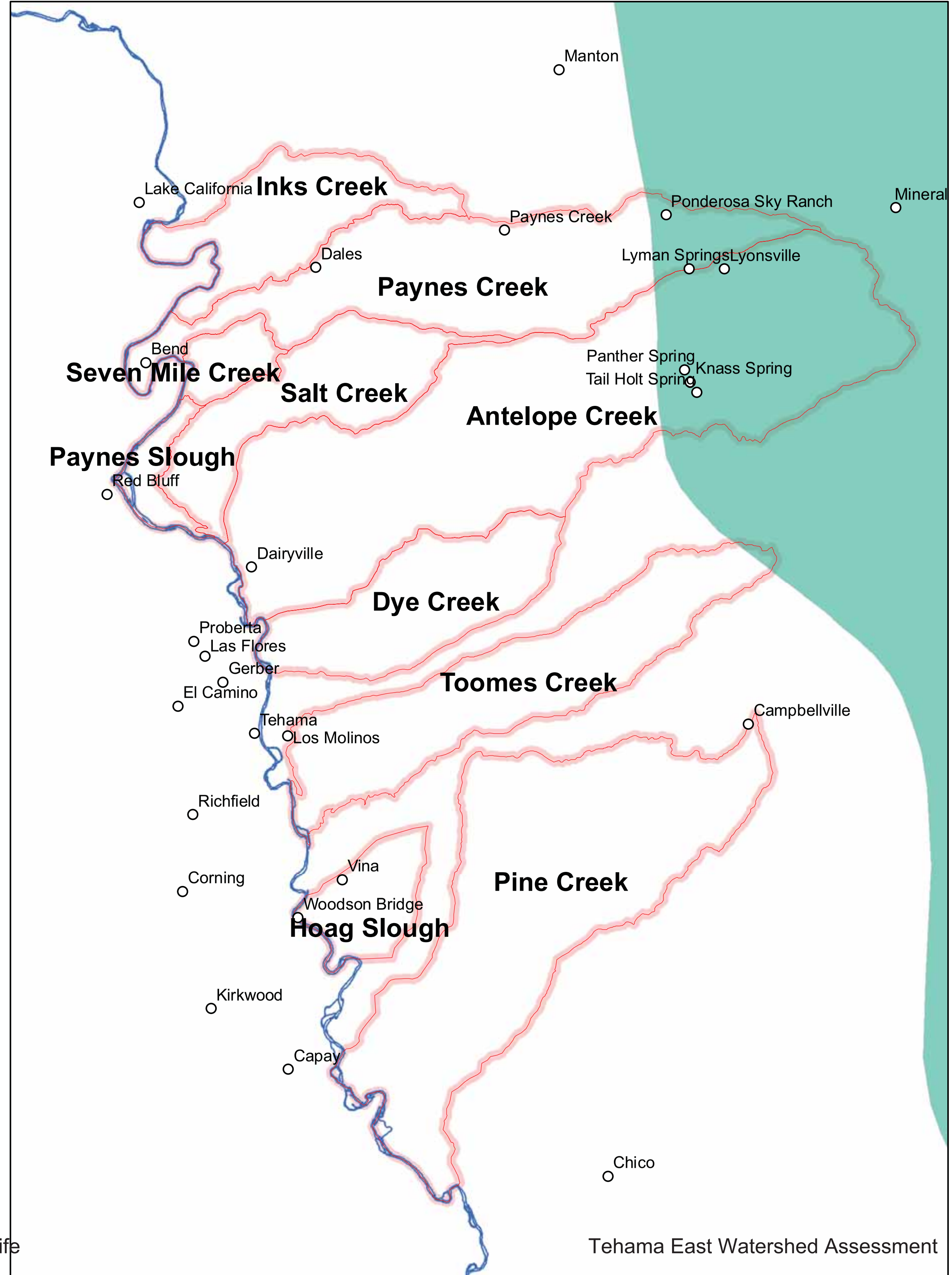
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles



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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

HAMMOND'S FLYCATCHER
(EMPIDONAX HAMMONDII)

SEASON

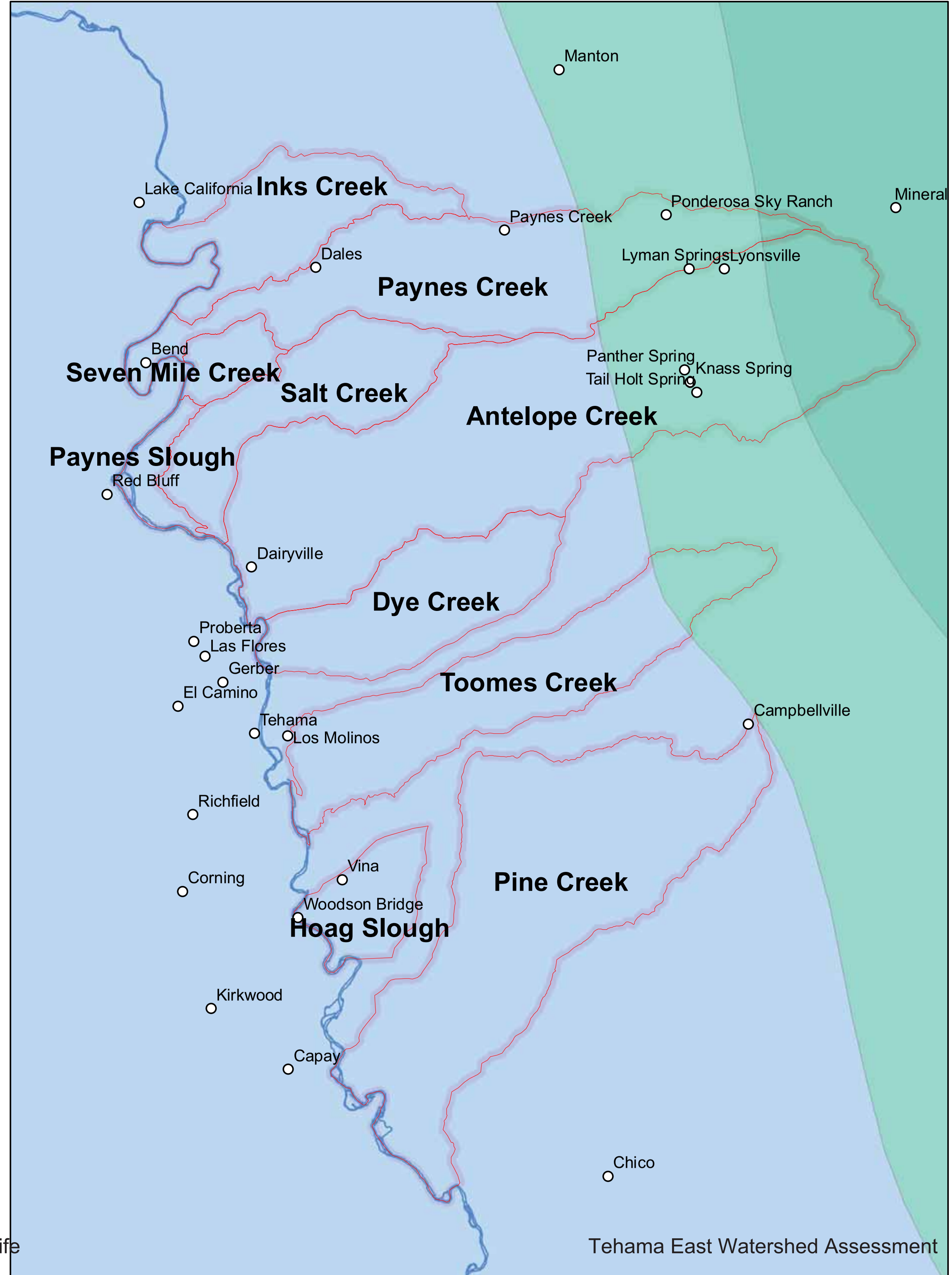
- Summer
- Year Round
- Winter
- Watershed Boundary

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds



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Quoted from:
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KEY

HERMIT THRUSH
(CATHARUS GUTTATUS)

SEASON

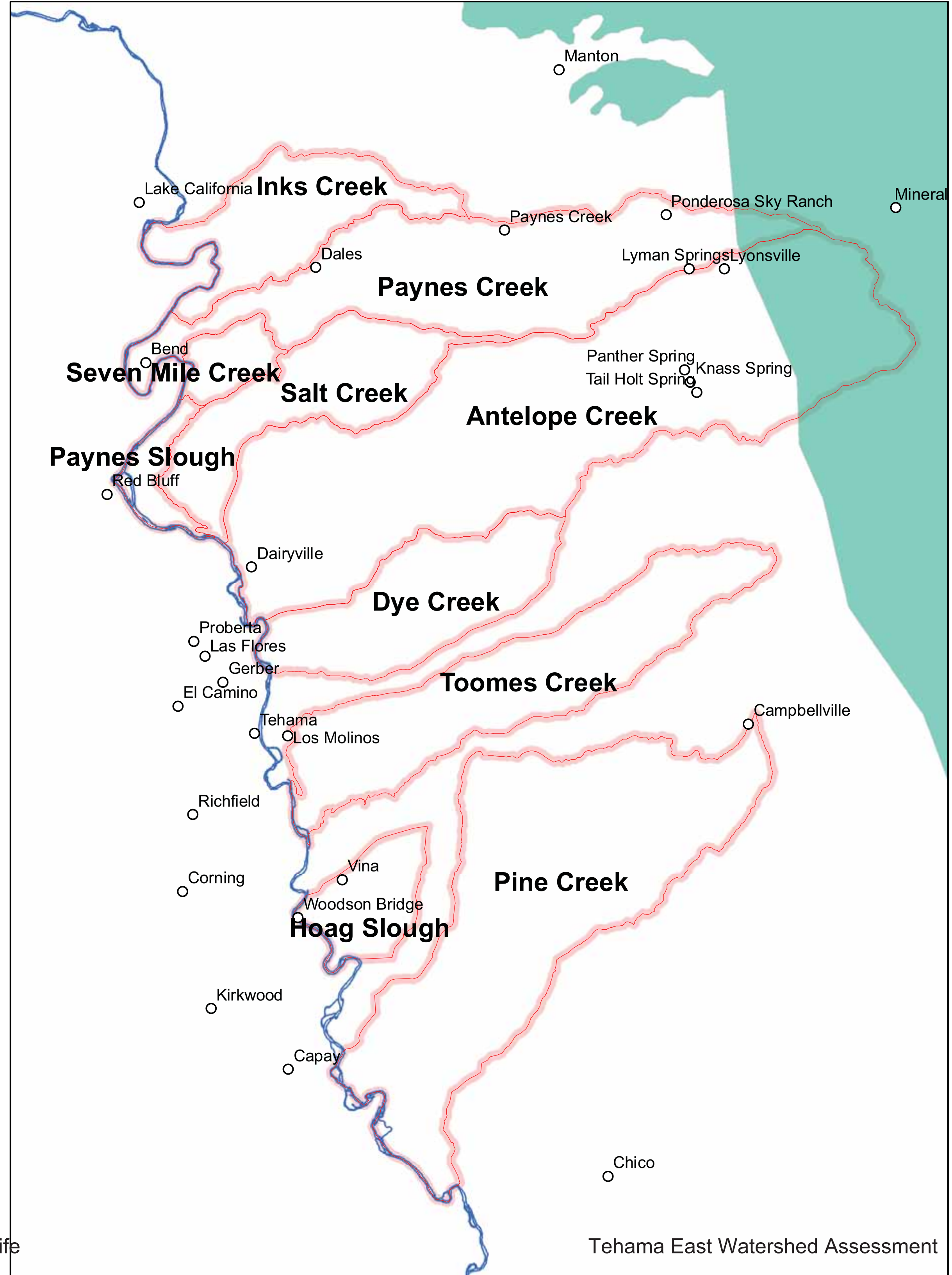
- Summer
- Year Round
- Winter
- Watershed Boundary

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds



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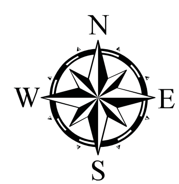
KEY

HERMIT WARBLER
(DENDROICA OCCIDENTALIS)

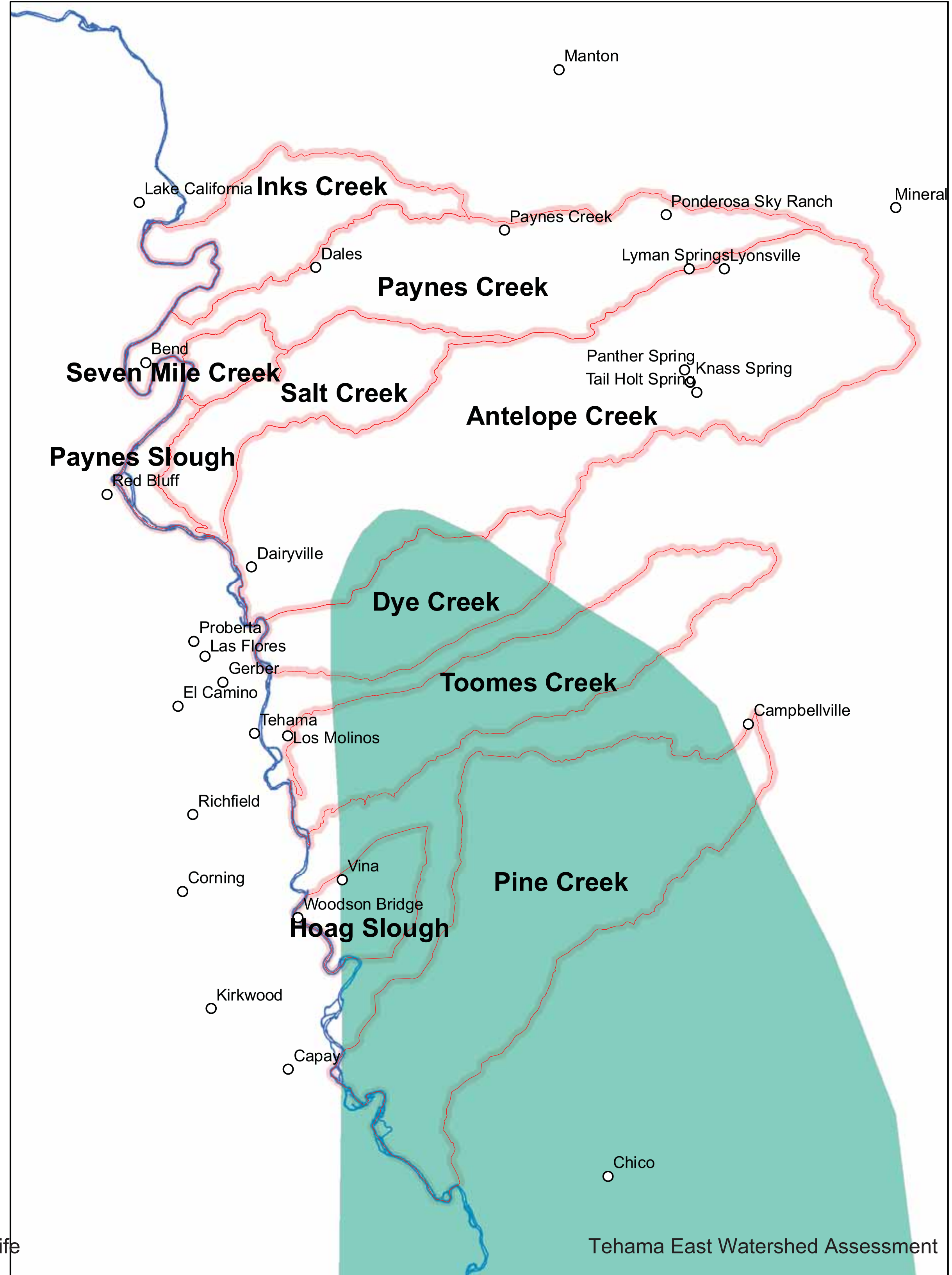
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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Quoted from:
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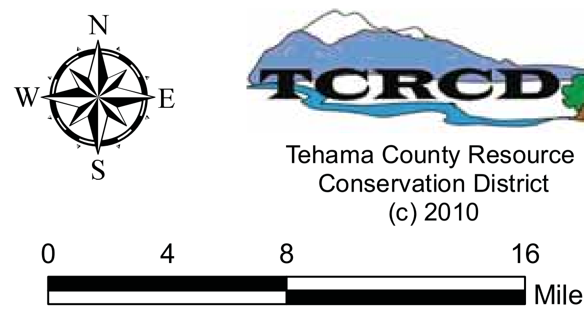
KEY

HOODED ORIOLE
(ICTERUS CUCULLATUS)

SEASON

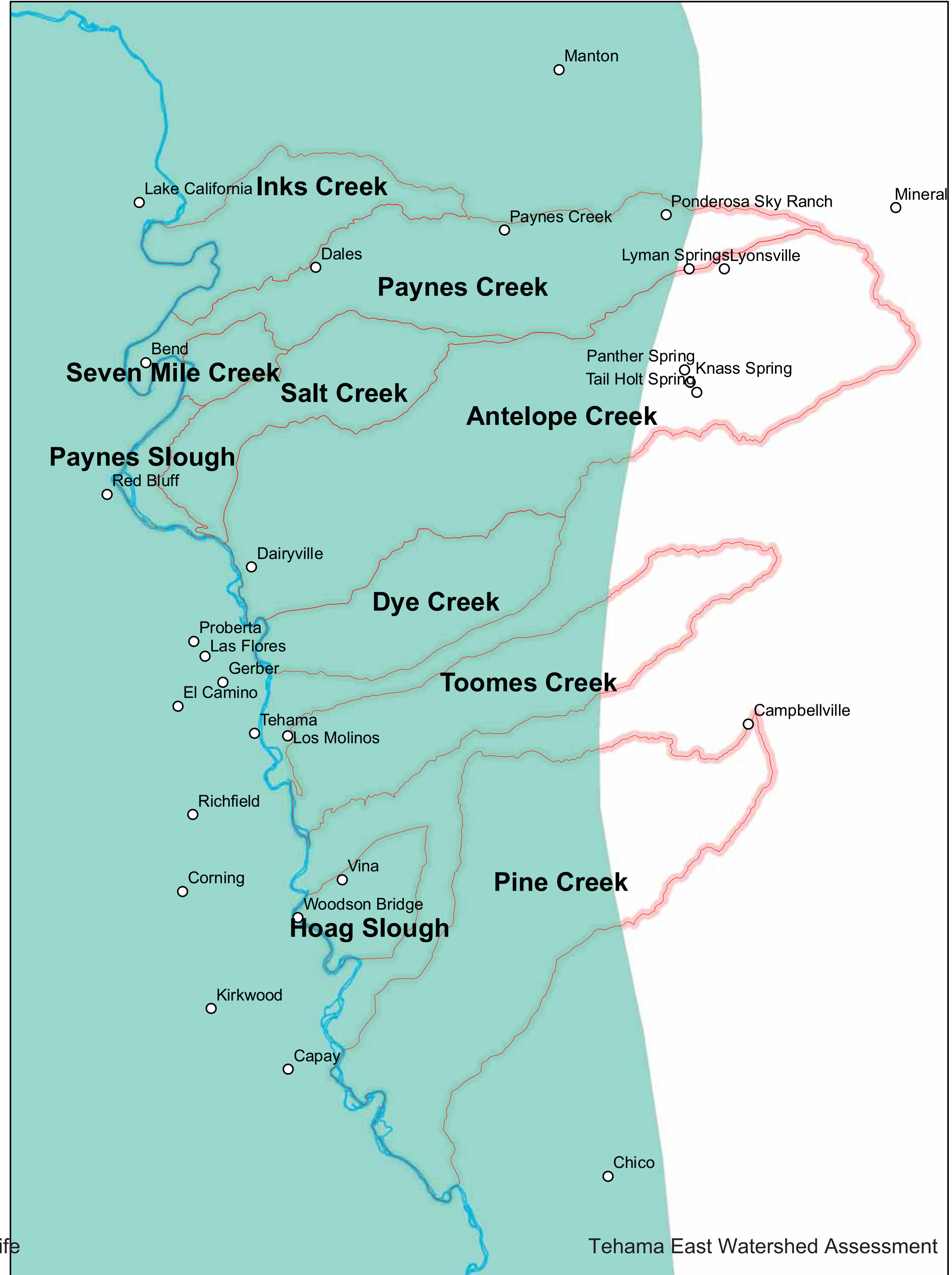
- Summer
- Year Round
- Winter
- Watershed Boundary



Tehama County Resource Conservation District
(c) 2010

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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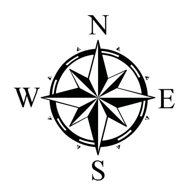
KEY

HORNED LARK
(EREMOPHILA ALPESTRIS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



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Conservation District
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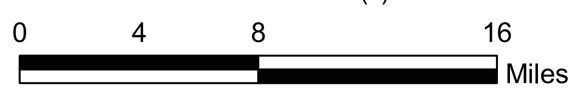

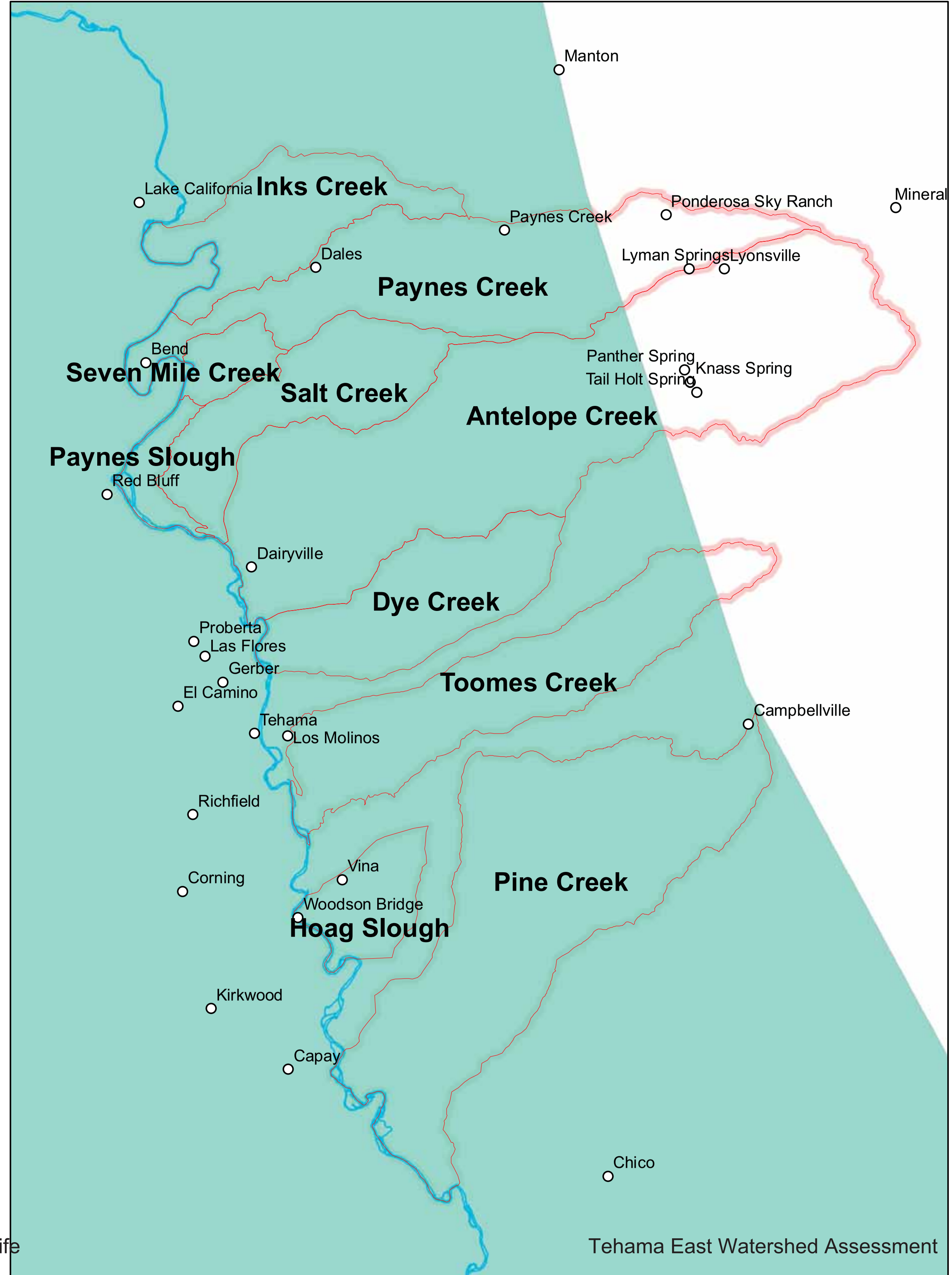

Tehama East Watershed Assessment

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Tehama East Watersheds

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KEY

HOUSE FINCH
(CARPODACUS MEXICANUS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

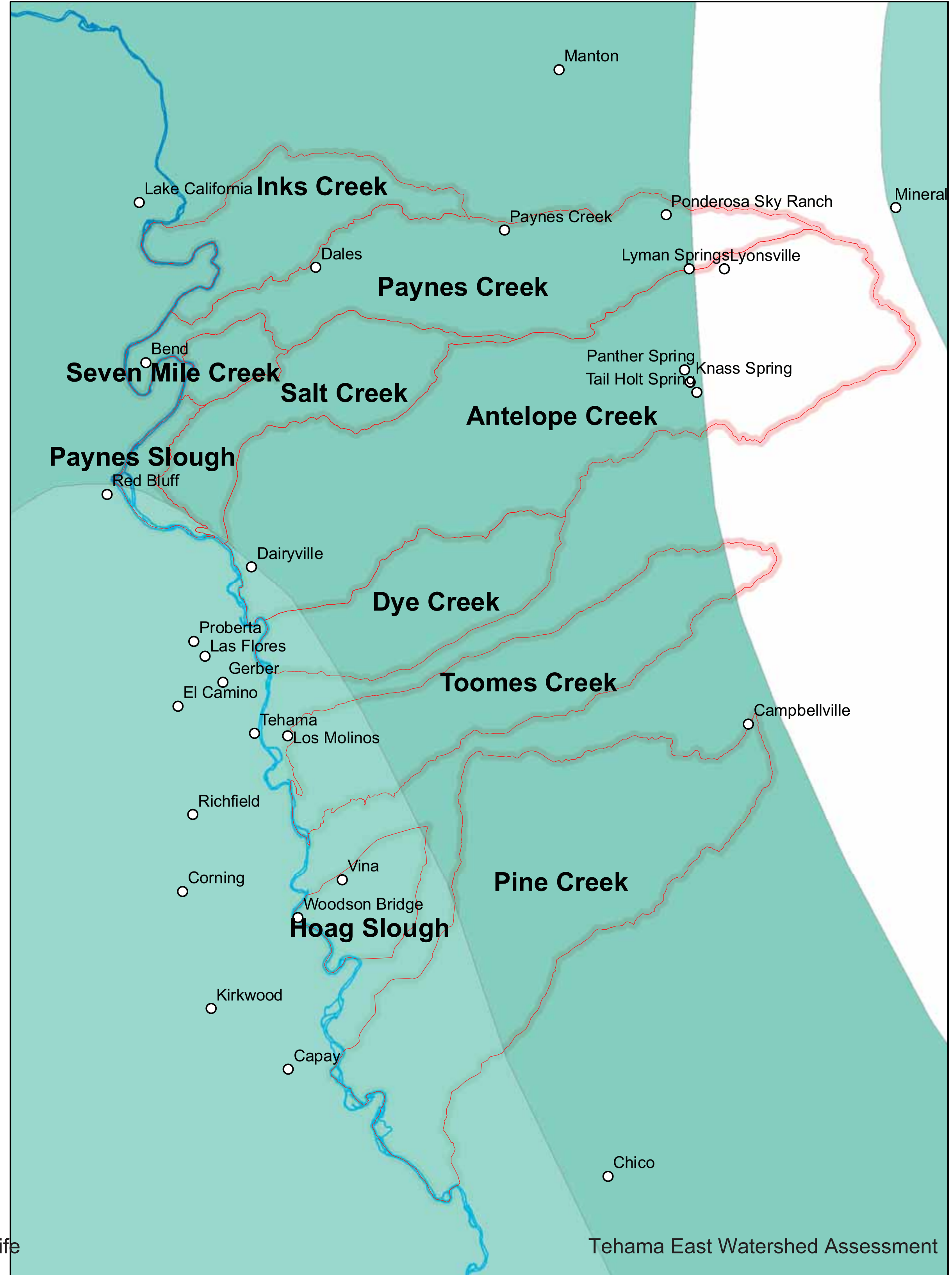
N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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KEY

HOUSE WREN
(TROGLODYTES AEDON)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

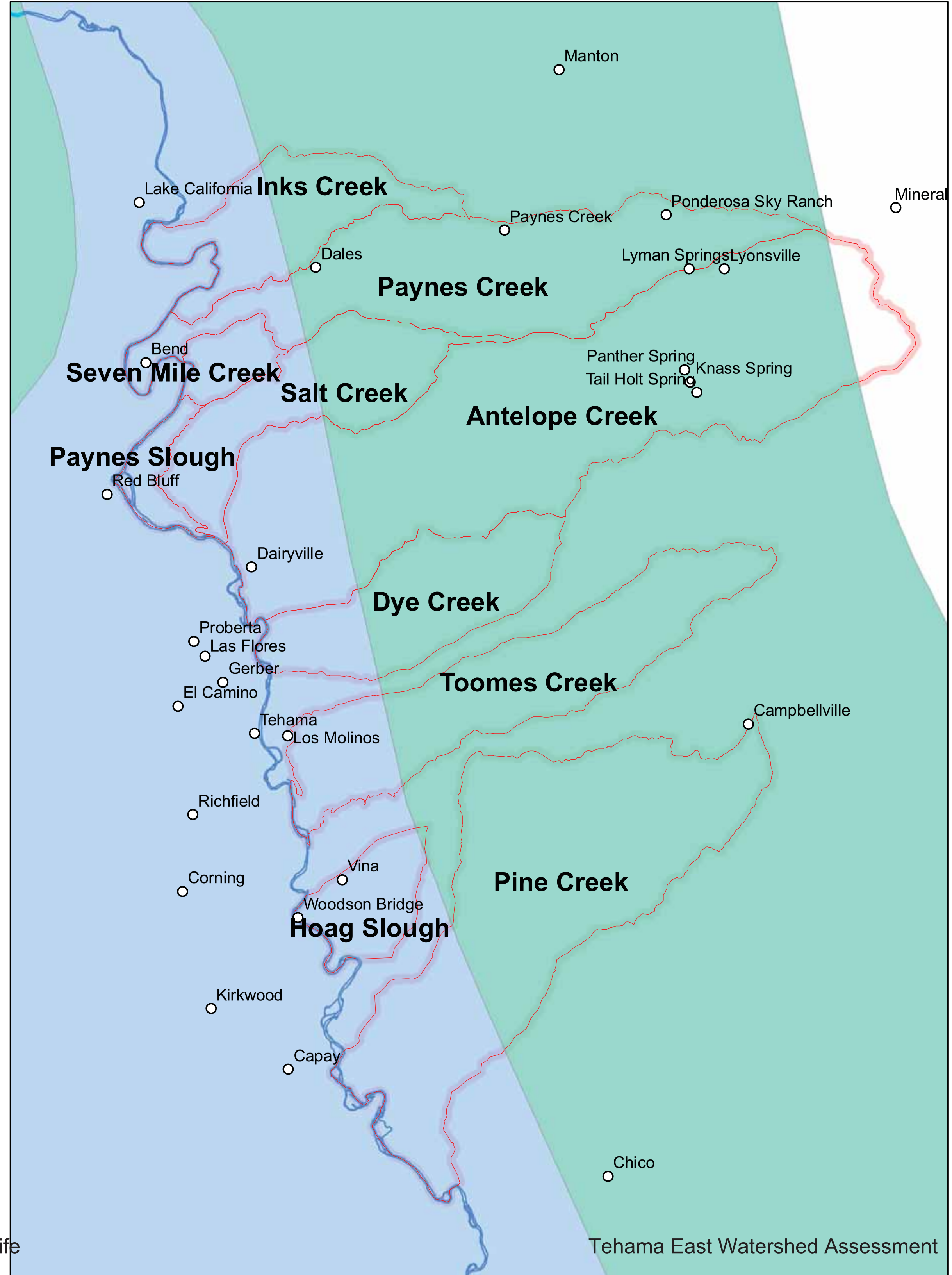
N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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KEY

HUTTON'S VIREO
(VIREO HUTTONI)

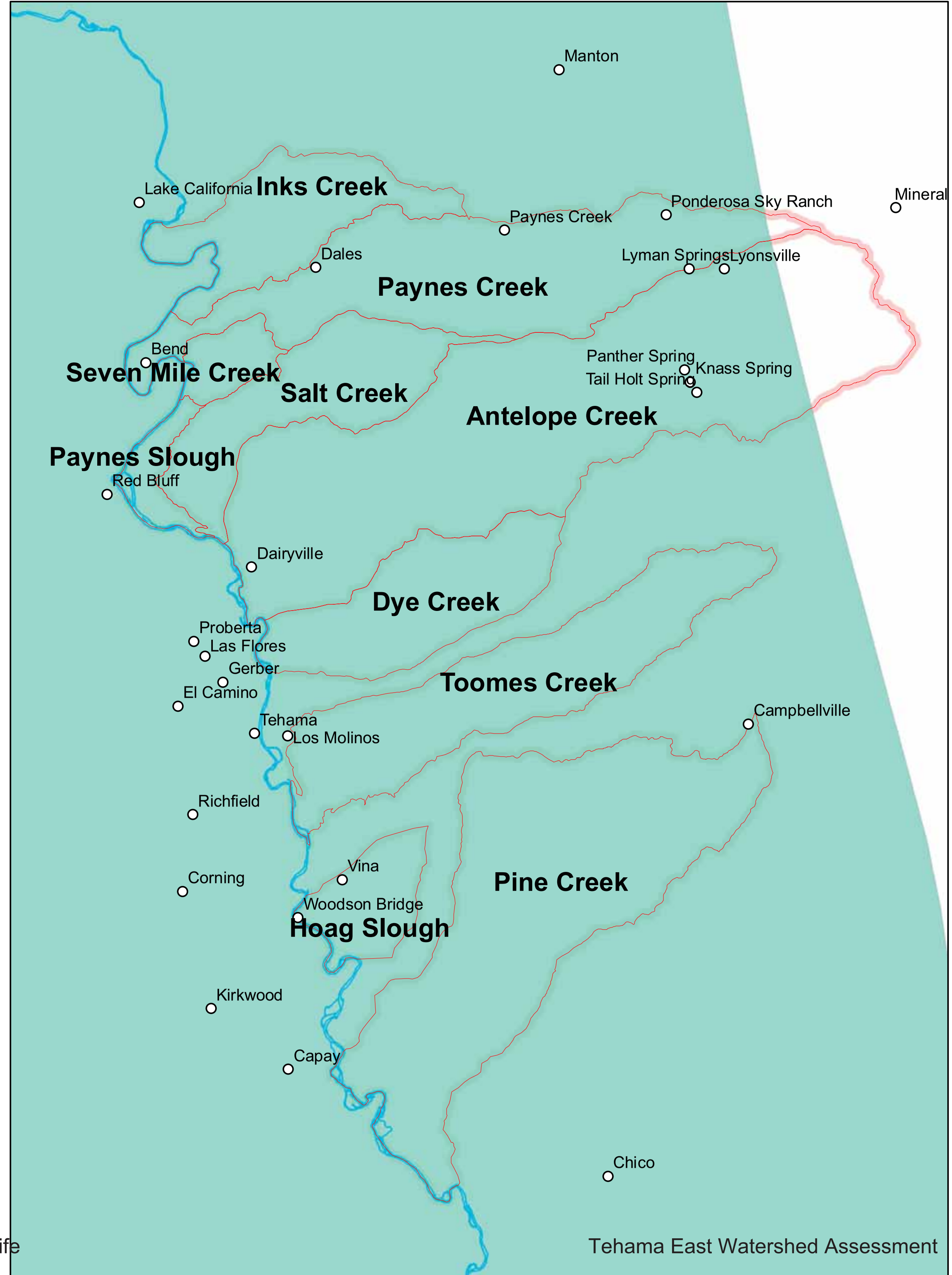
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles



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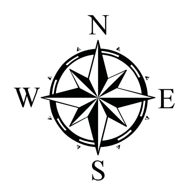
KEY

LARK SPARROW
(CHONDESTES GRAMMACUS)

SEASON

- Summer
- Year Round
- Winter

Watershed Boundary



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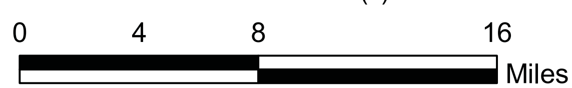

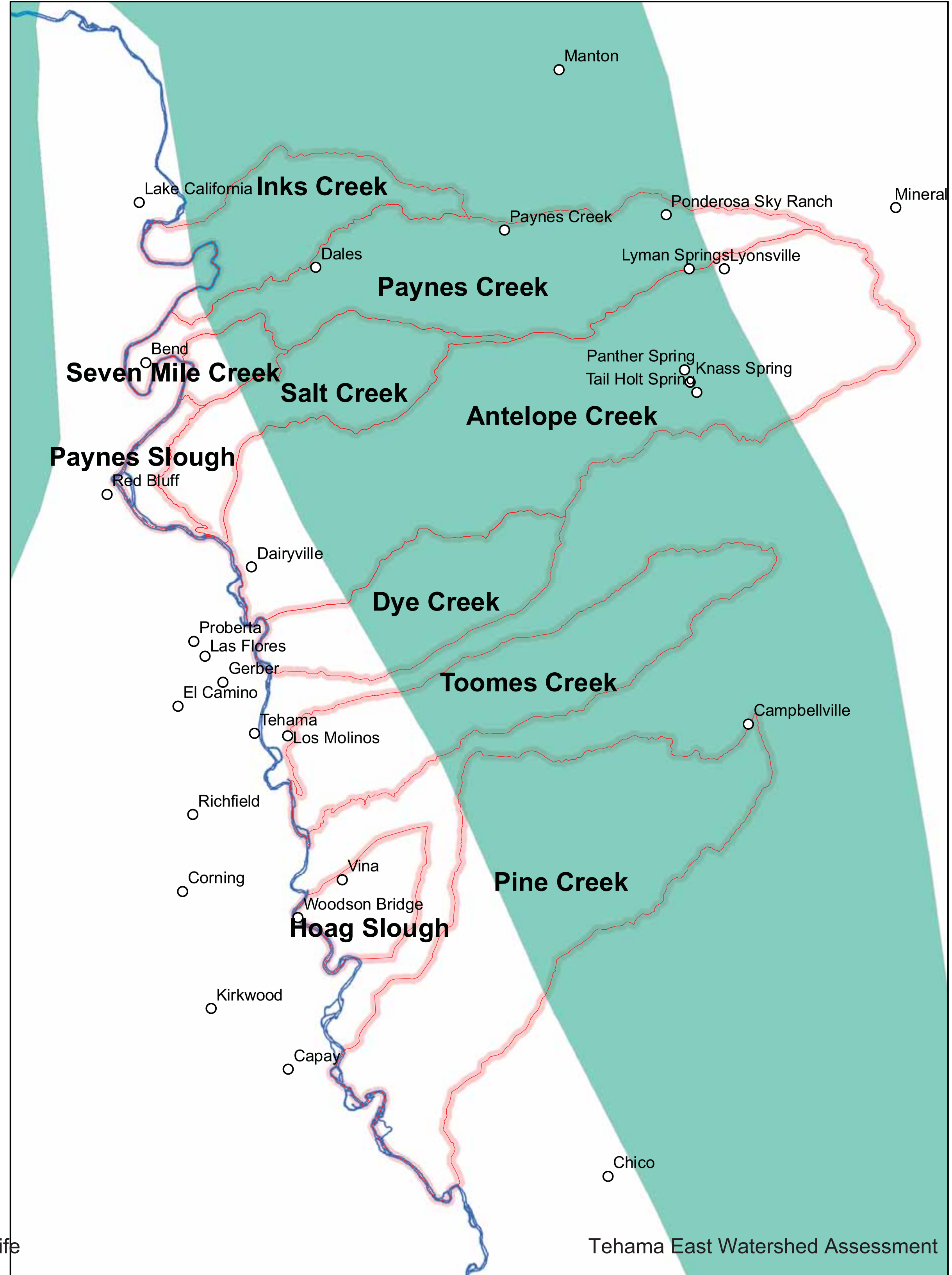

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KEY

LAWRENCE'S GOLDFINCH
(CARDUELIS LAWRENCEI)

SEASON

Summer

Year Round

Winter

Watershed Boundary

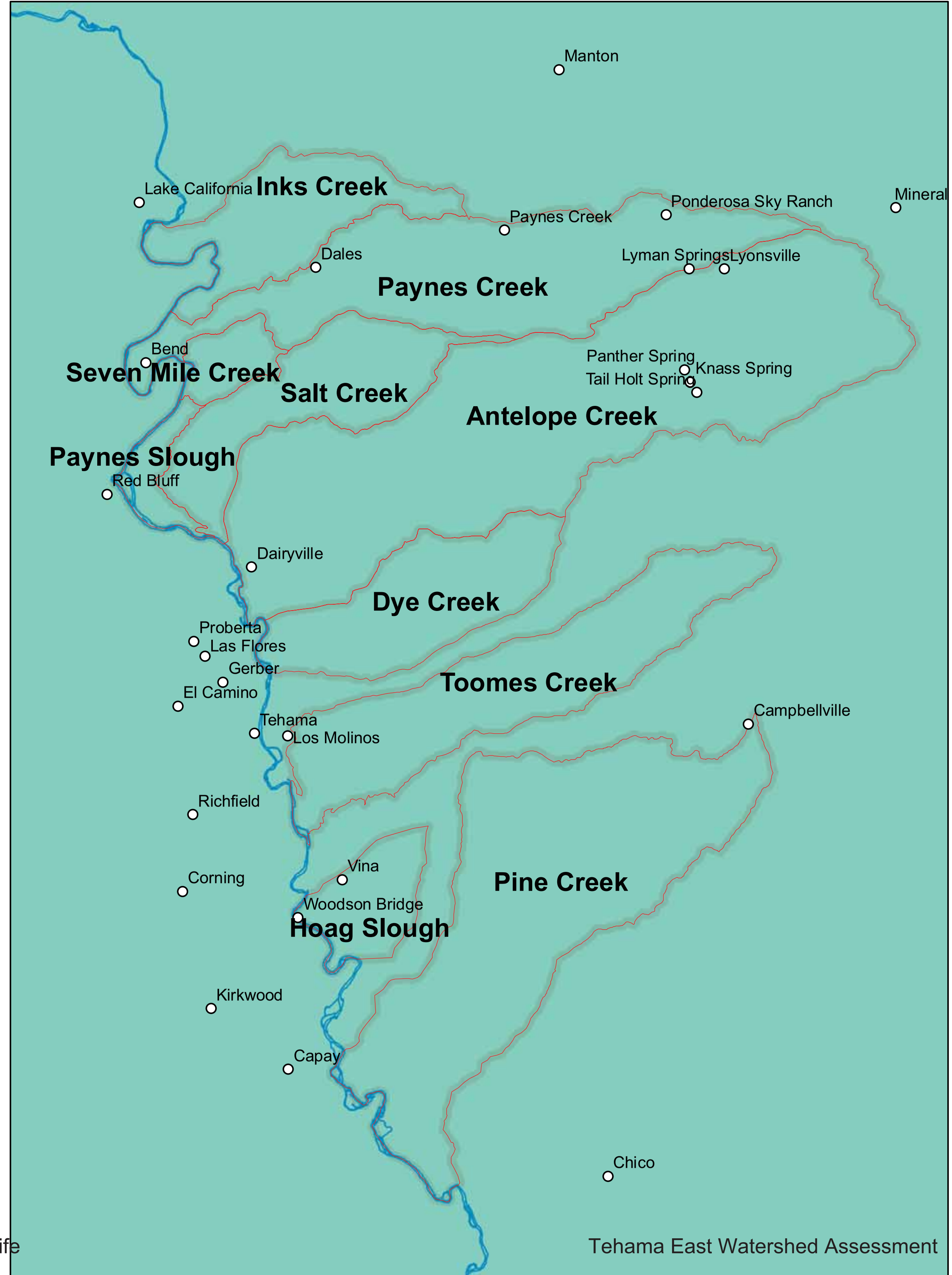
N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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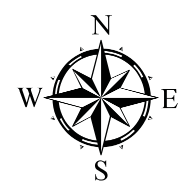
KEY

LAZULI BUNTING
(PASSERINA AMOENA)

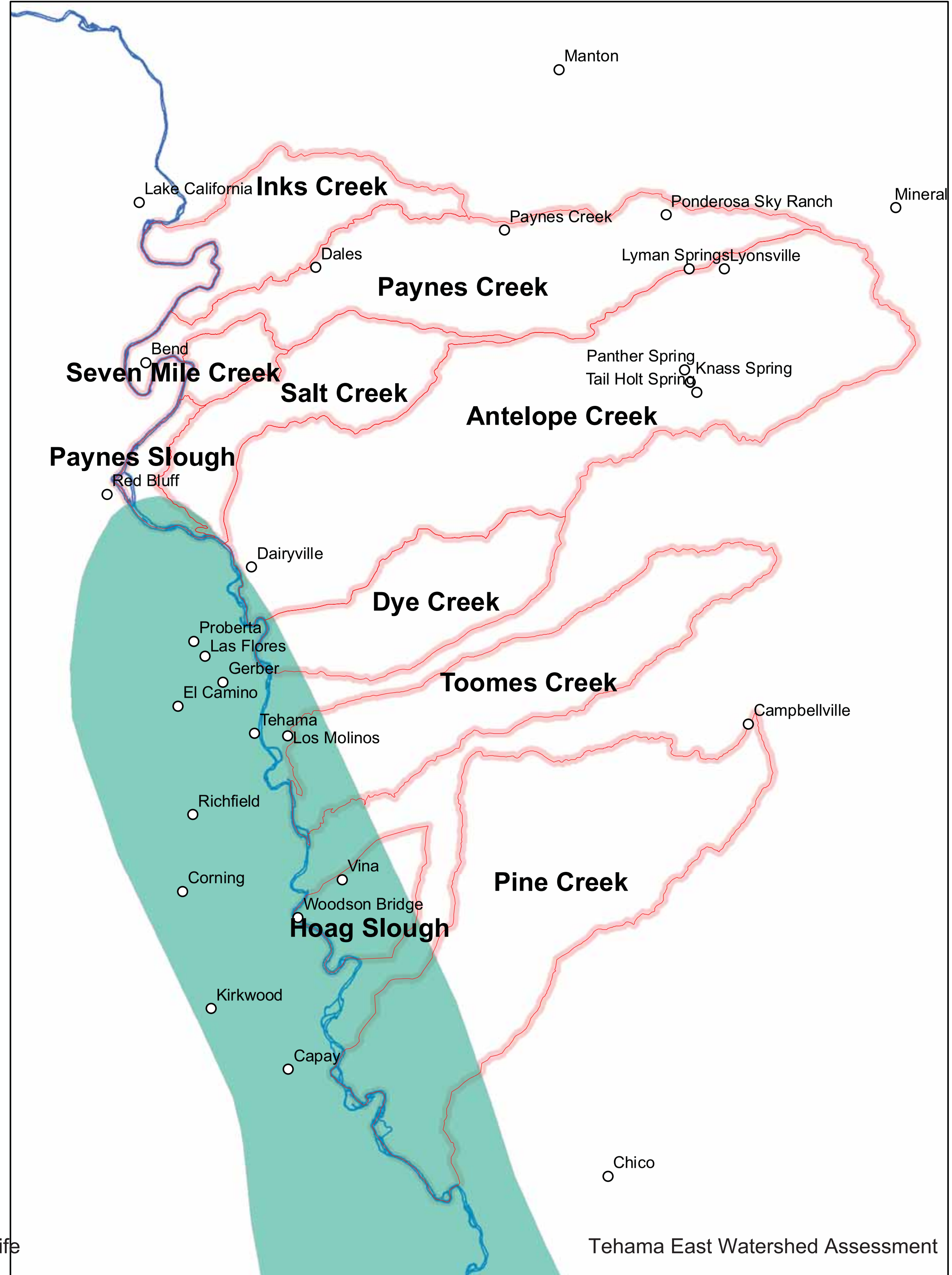
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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KEY

YELLOW-BILLED CUCKOO
(COCCYZUS AMERICANUS)

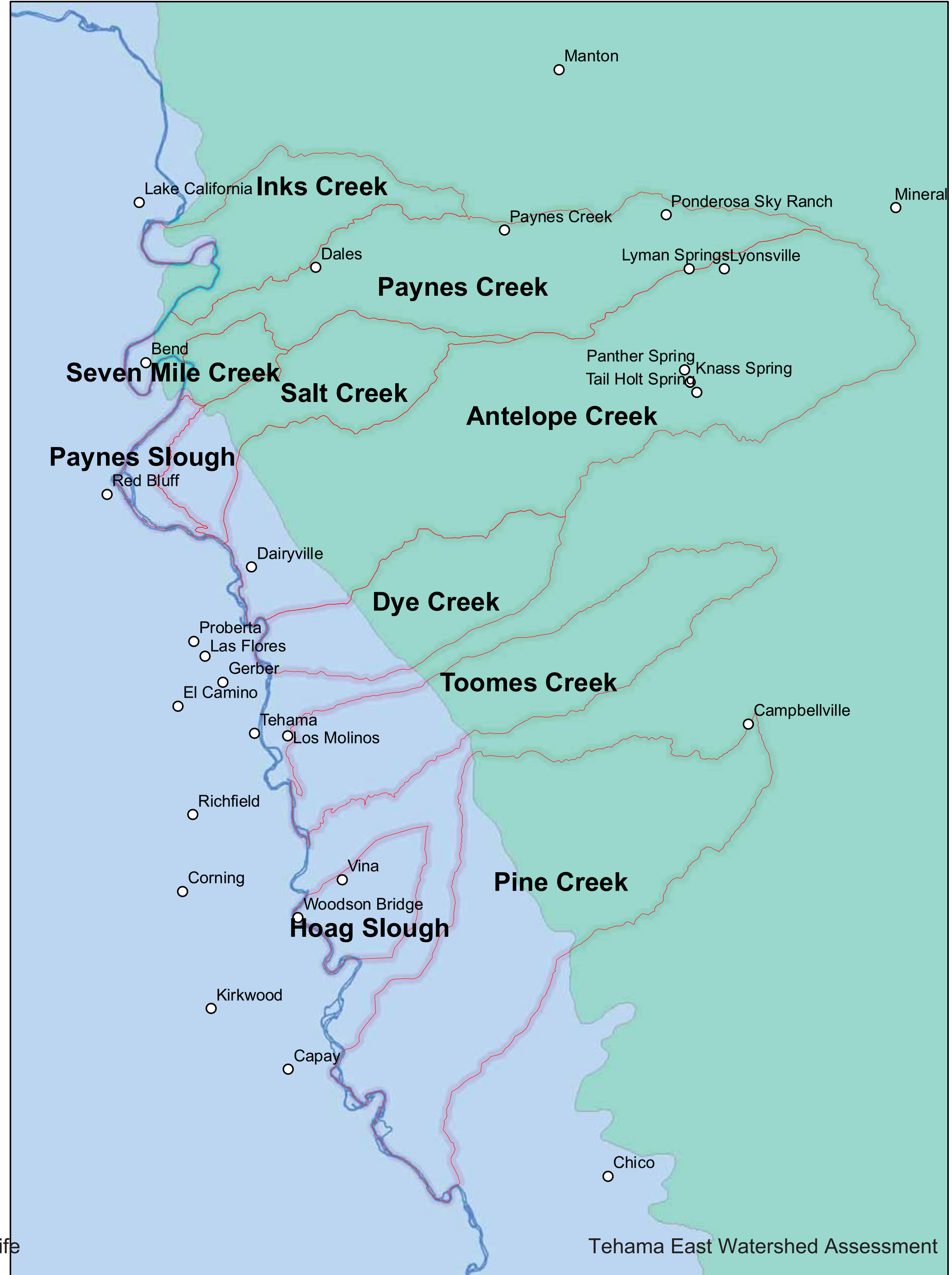
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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Quoted from:
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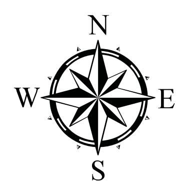
KEY

LONG-EARED OWL
(ASIO OTUS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



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Conservation District
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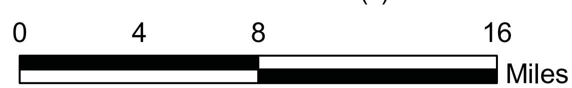

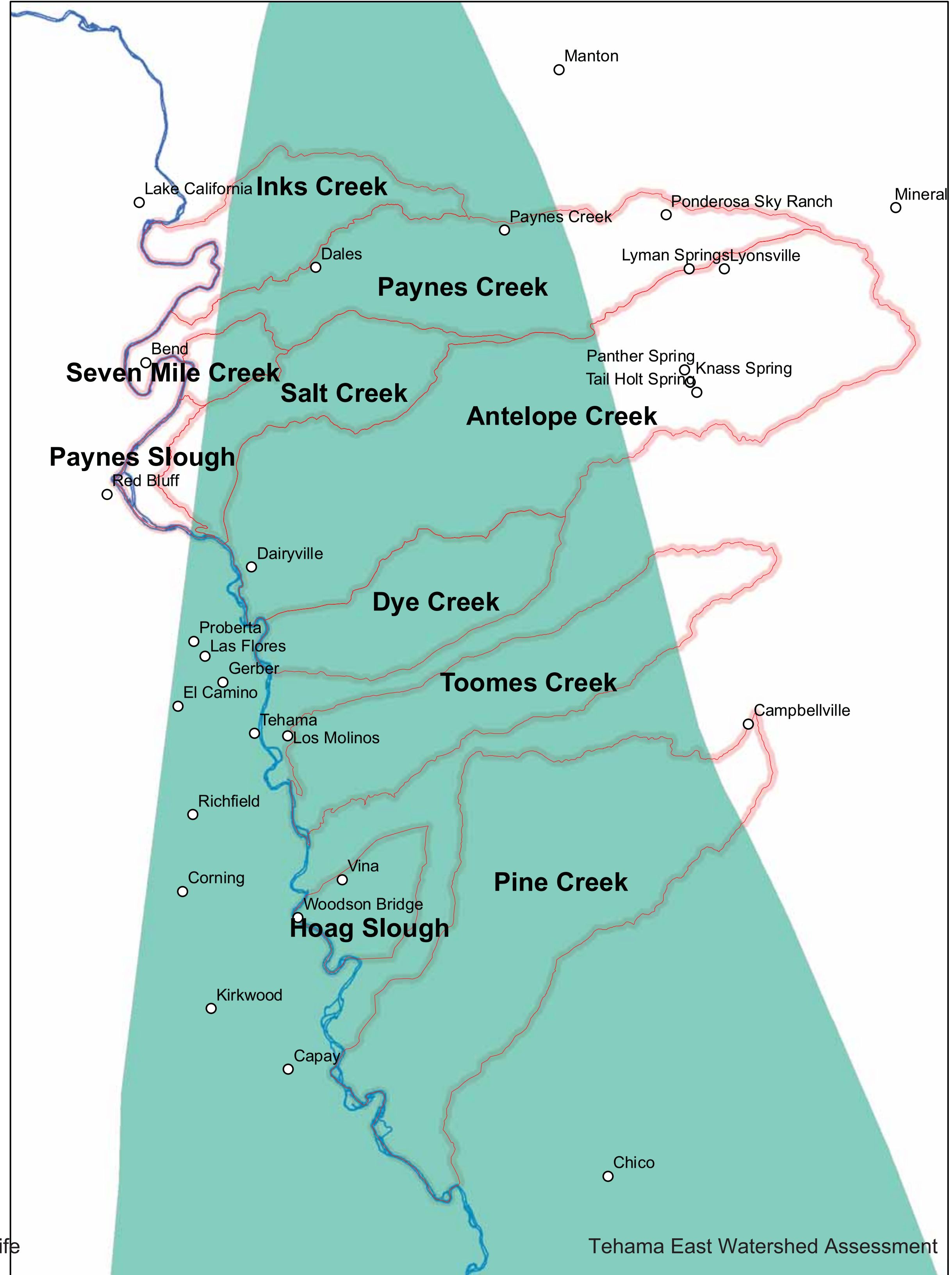

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Tehama East Watersheds

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Quoted from:
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KEY

LESSER NIGHTHAWK
(CHORDEILES ACUTIPENNIS)

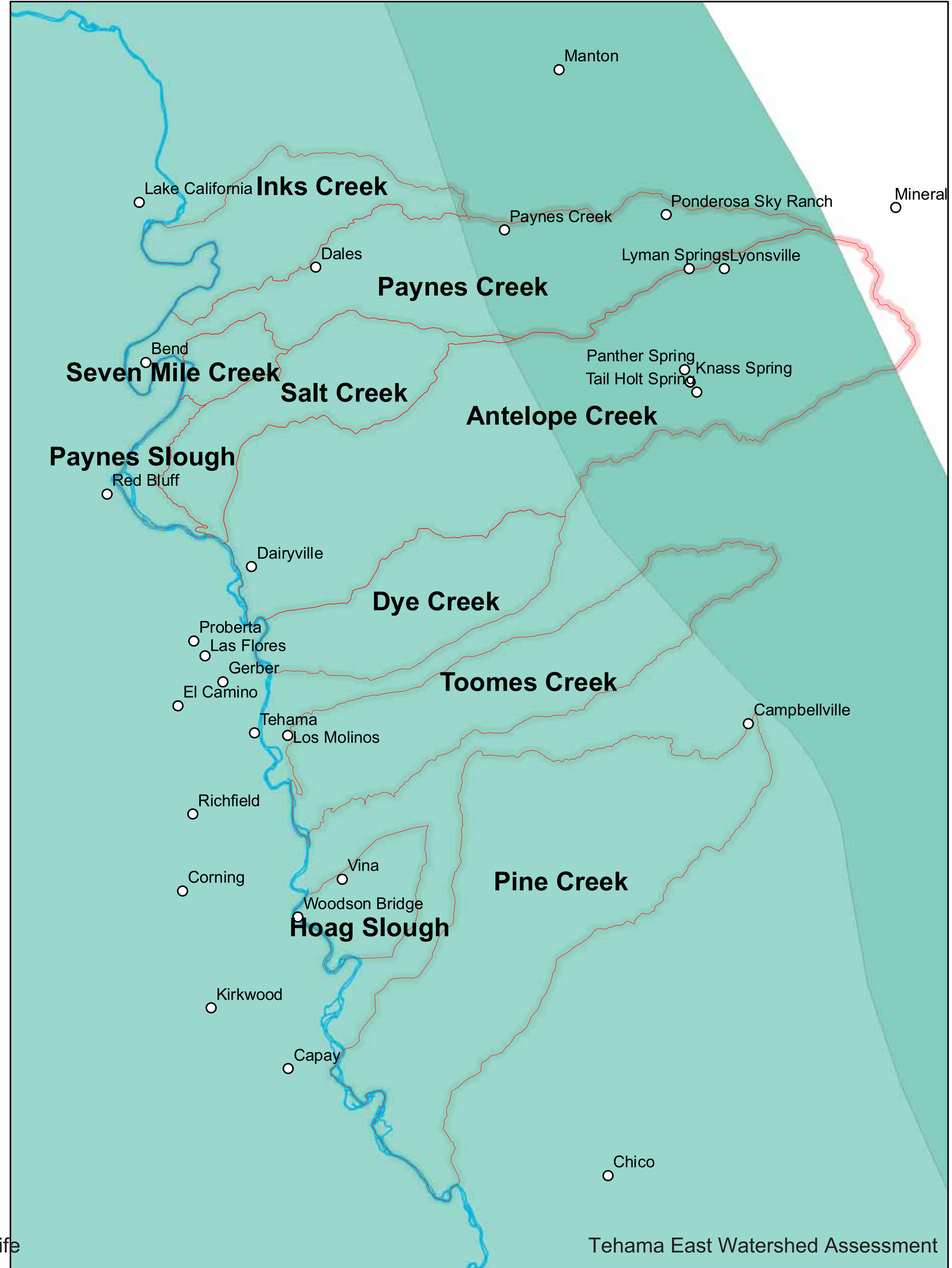
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N S E W

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles



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KEY

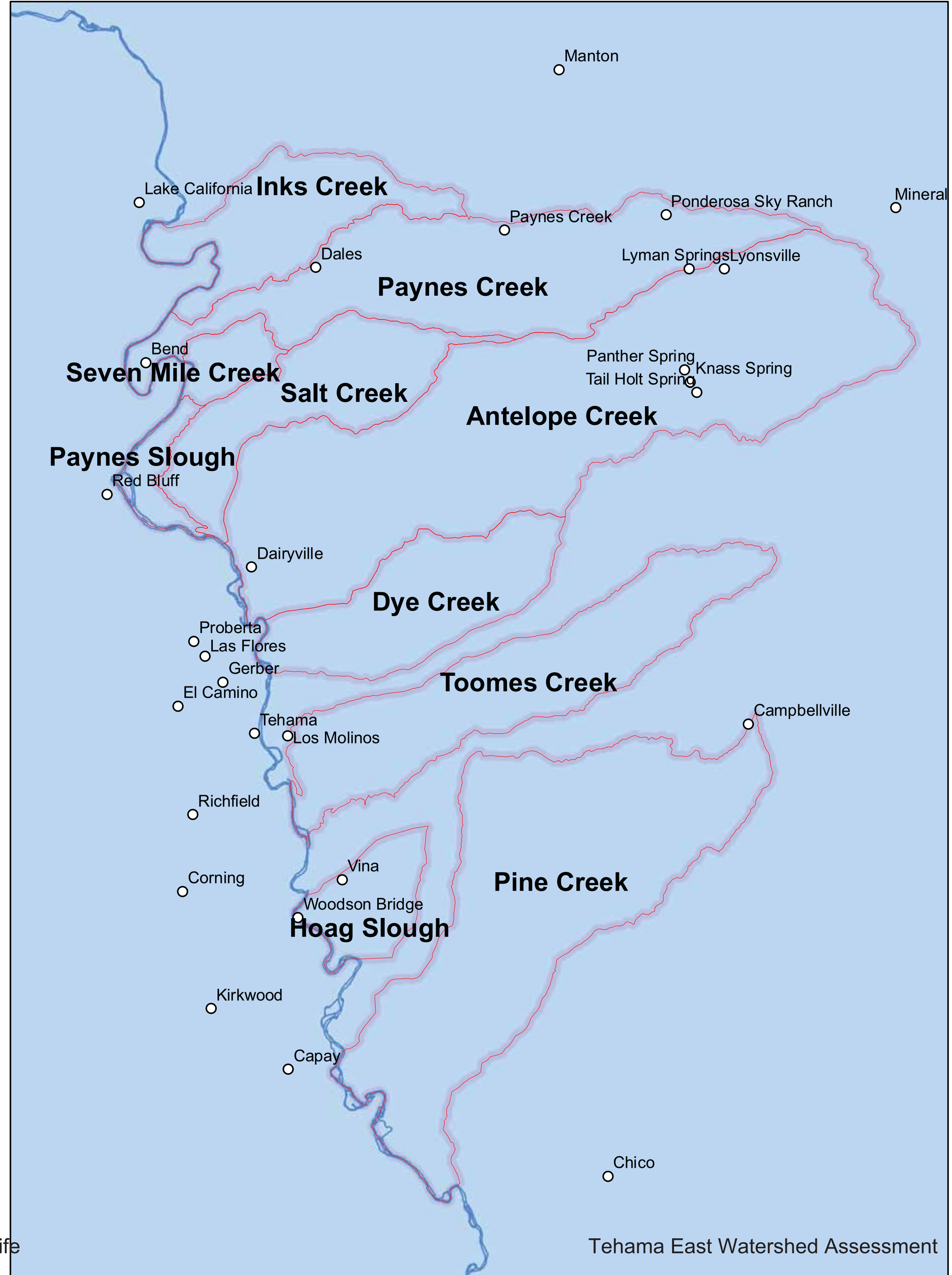
LESSER GOLDFINCH
(CARDUELIS PSALTRIA)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles



Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

LEWIS' WOODPECKER
(MELANERPES LEWIS)

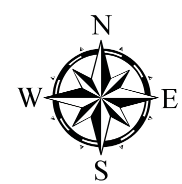
SEASON

Summer

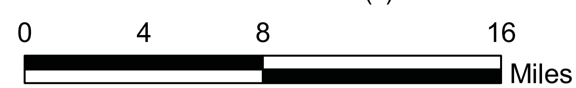
Year Round

Winter

Watershed Boundary

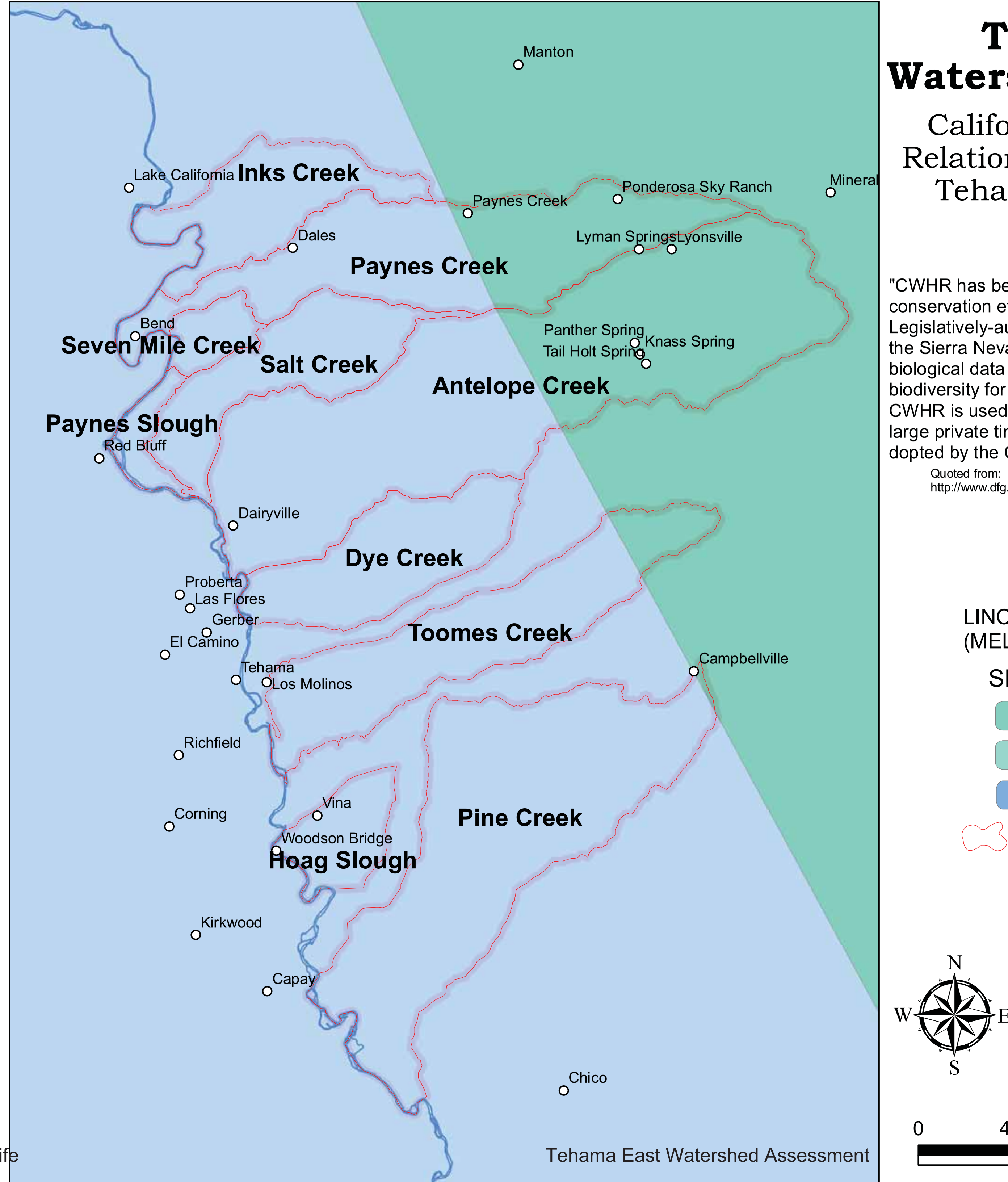


Tehama County Resource Conservation District
(c) 2010



Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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Quoted from:
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KEY

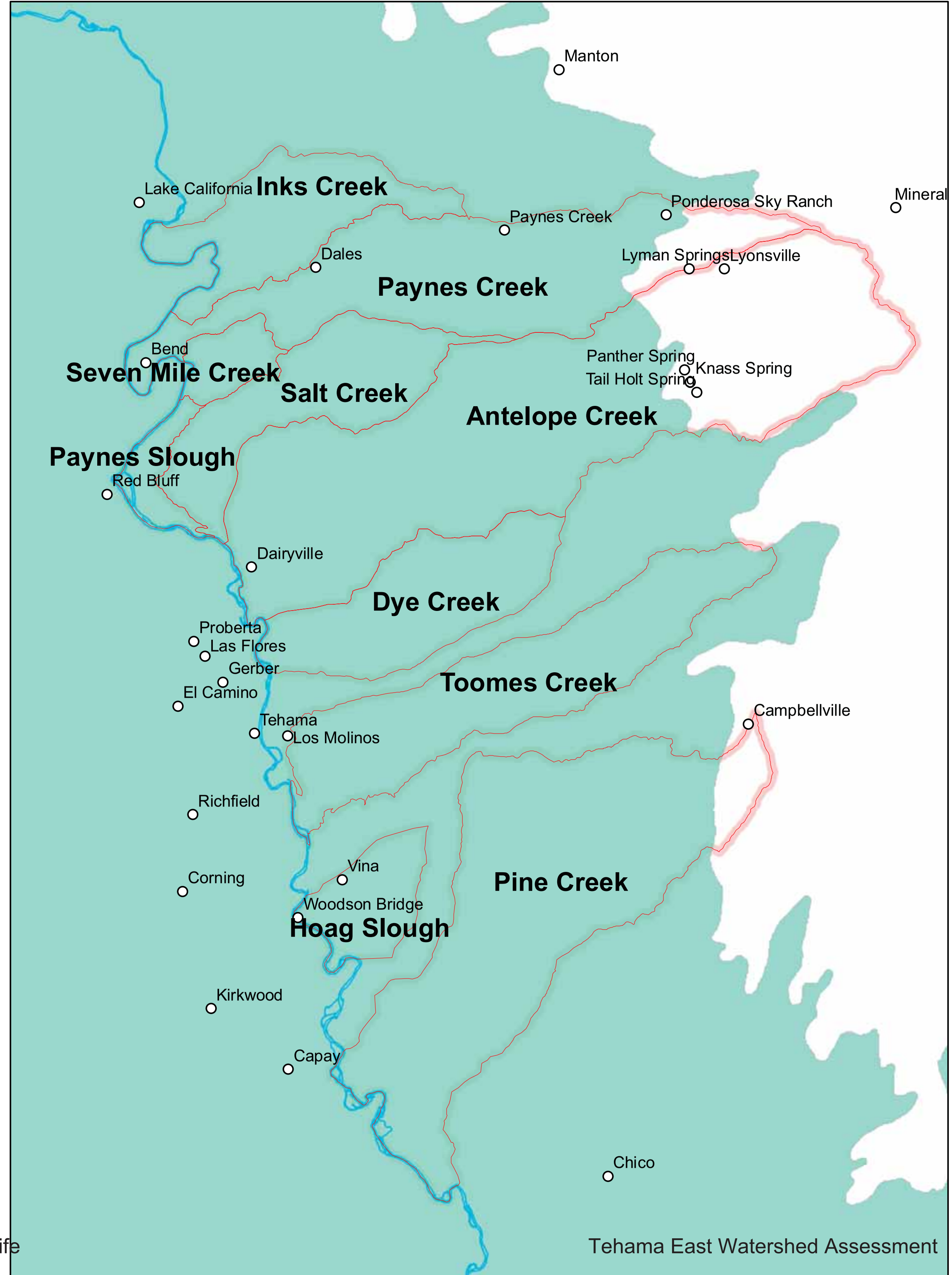
LINCOLN'S SPARROW
(MELOSPIZA LINCOLNII)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles



Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

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Quoted from:
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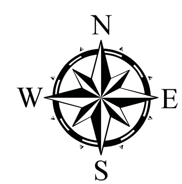
KEY

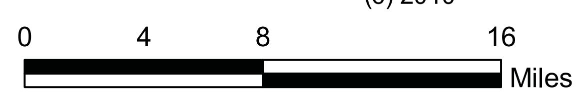
LOGGERHEAD SHRIKE
(LANIUS LUDOVICIANUS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

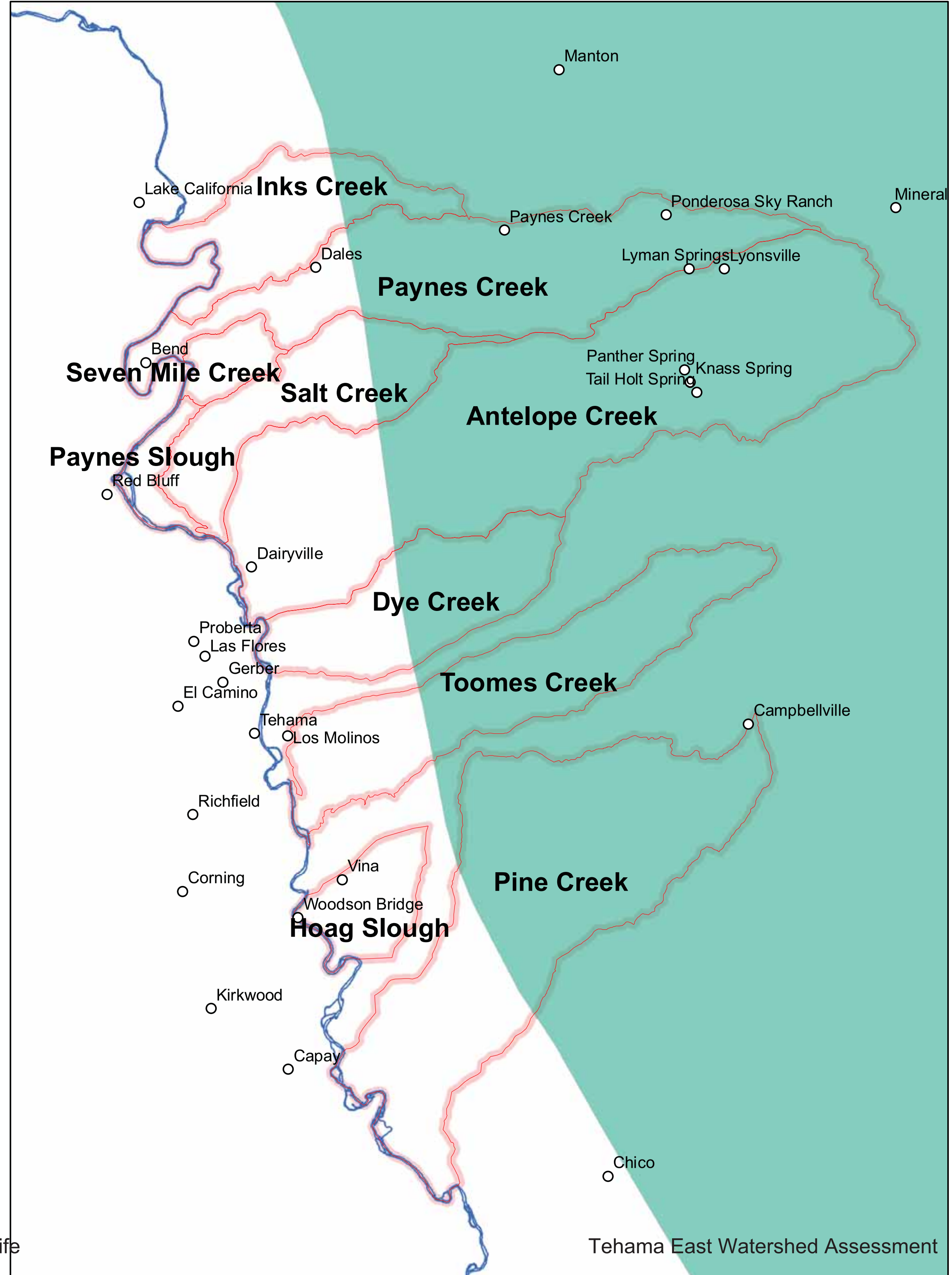


Tehama County Resource
Conservation District
(c) 2010



Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds



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Quoted from:
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KEY

SOLITARY VIREO
(VIREO SOLITARIUS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

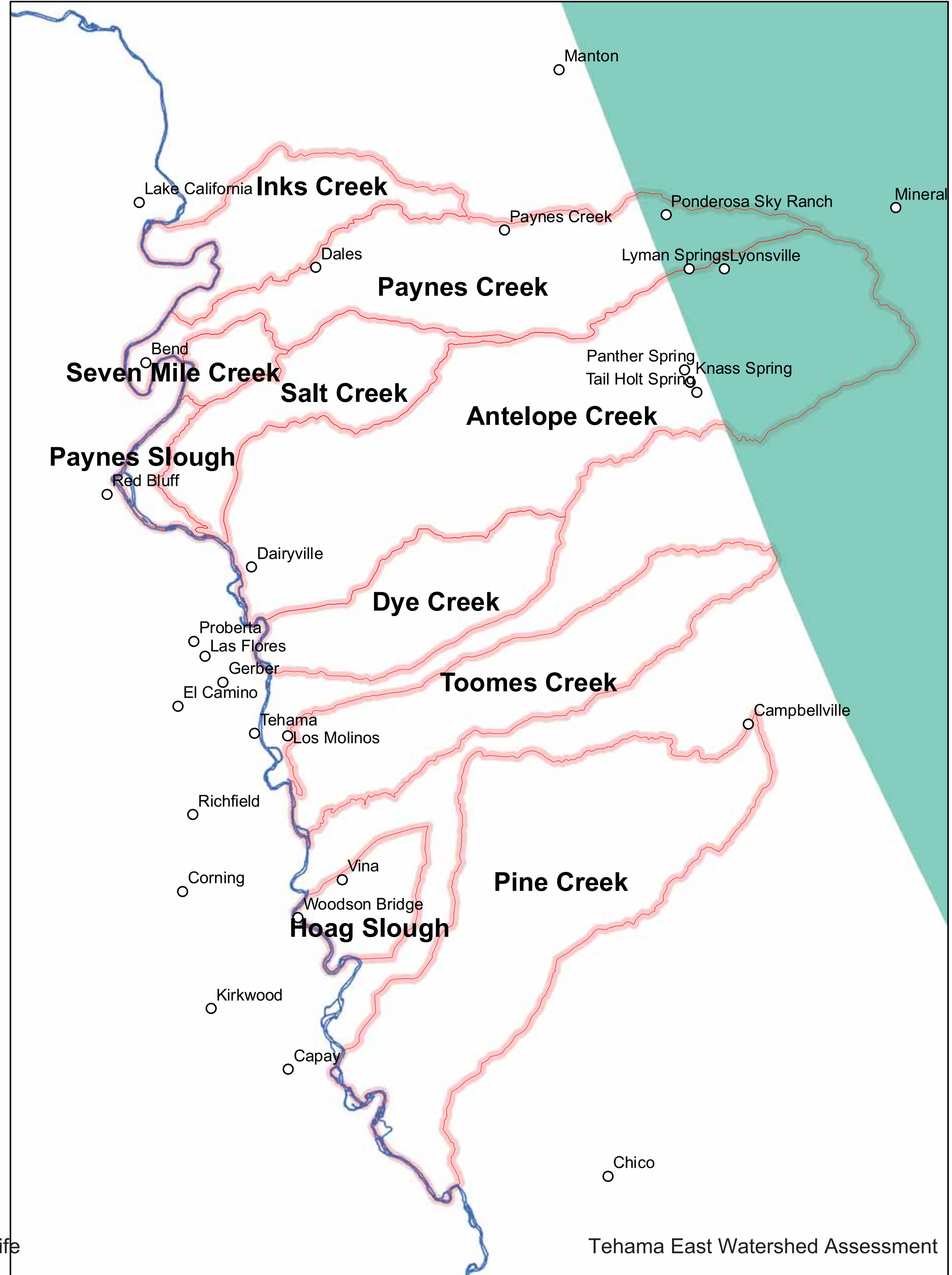
N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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Quoted from:
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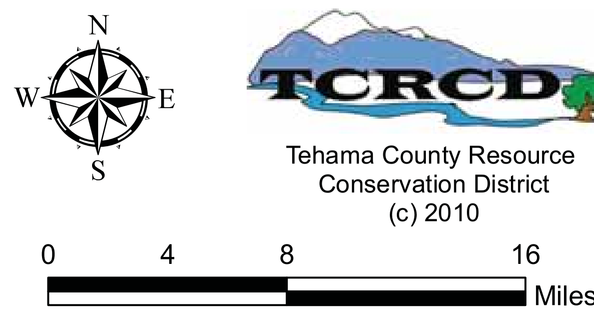
KEY

MACGILLIVRAY'S WARBLER
(OPORORNIS TOLMIEI)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



Tehama County Resource Conservation District
(c) 2010

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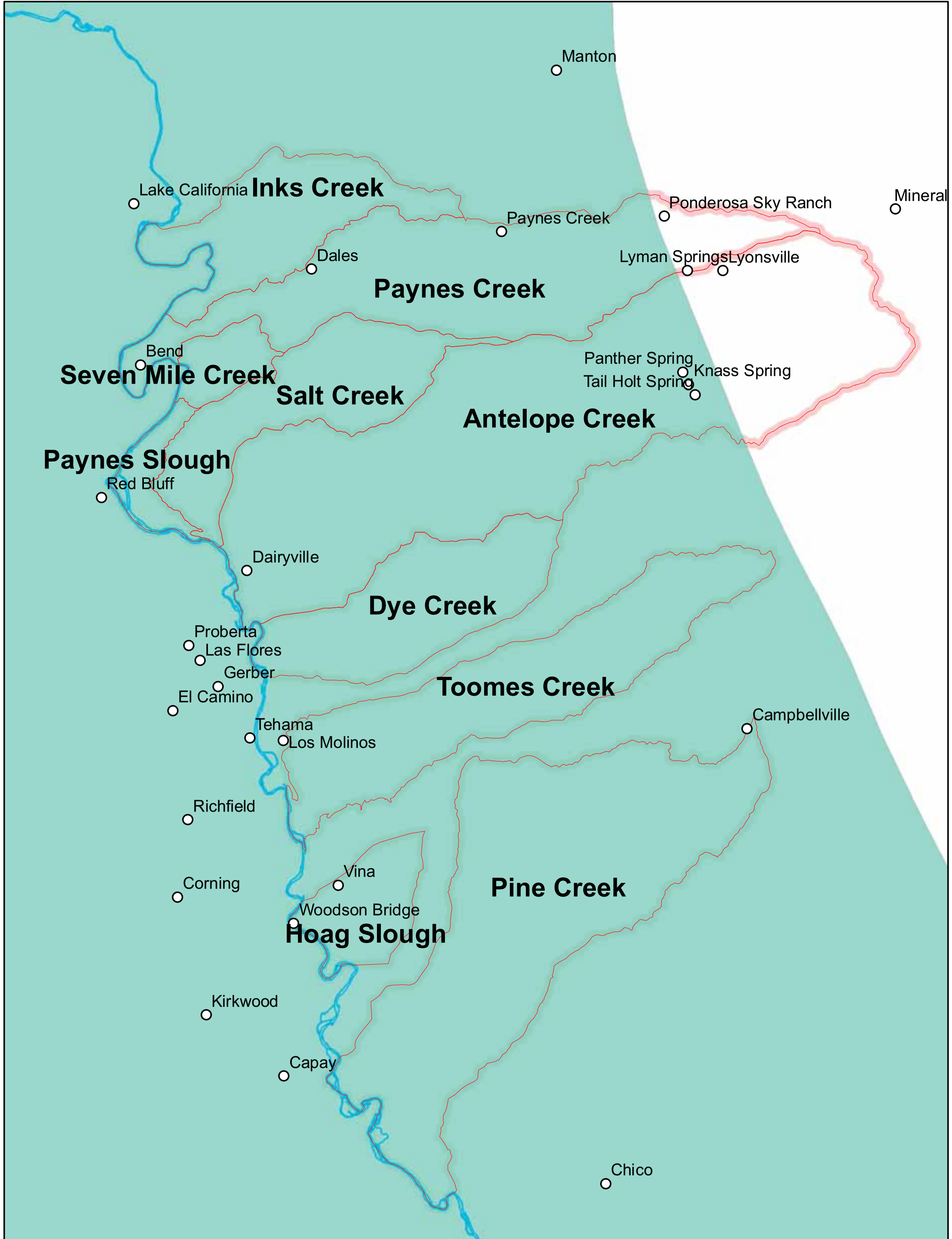
California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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KEY

MARSH WREN
(CISTOTHORUS PALUSTRIS)

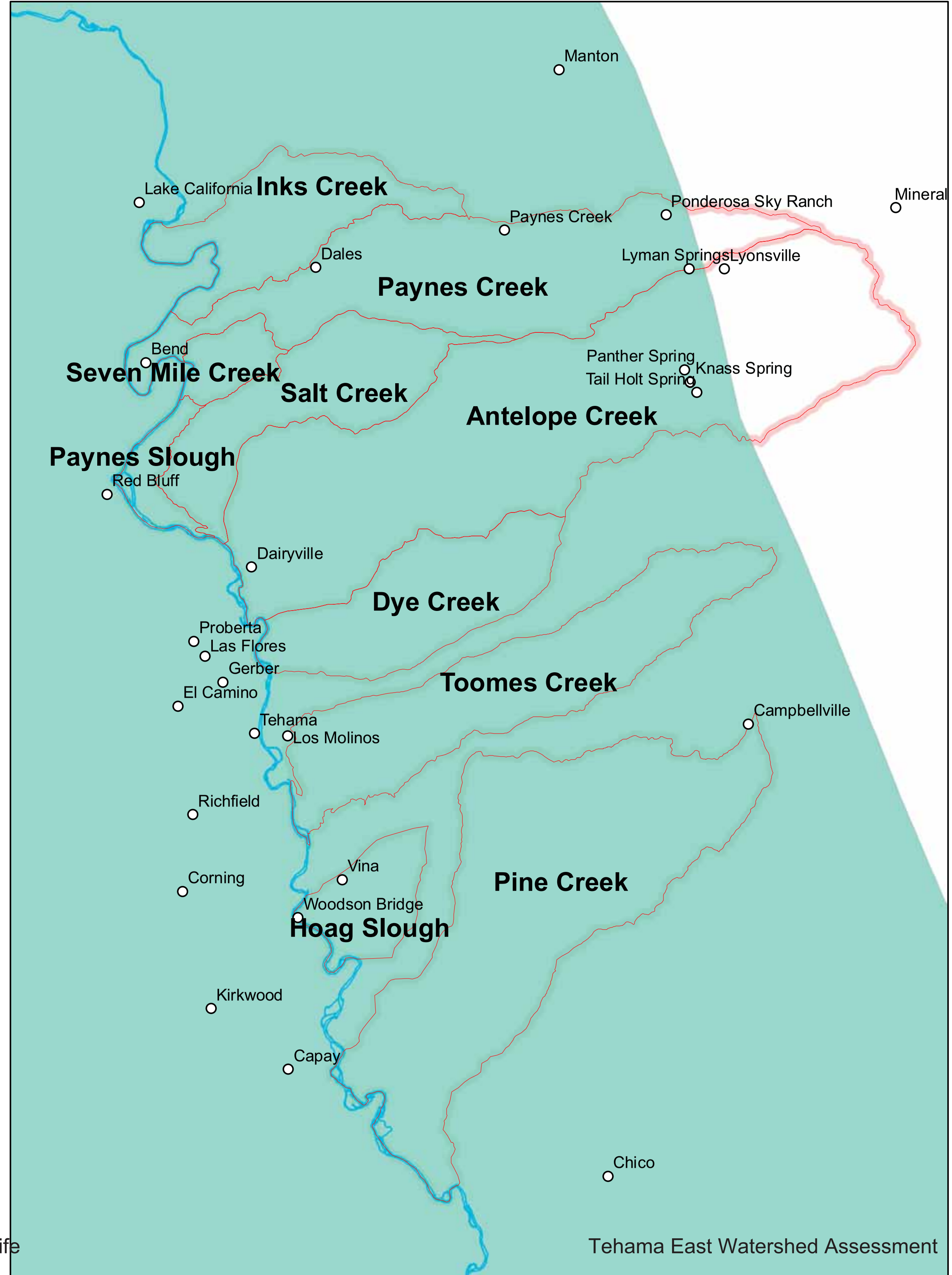
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles



Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

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KEY

MOURNING DOVE
(ZENAIDA MACROURA)

SEASON
- Summer
- Year Round
- Winter
- Watershed Boundary

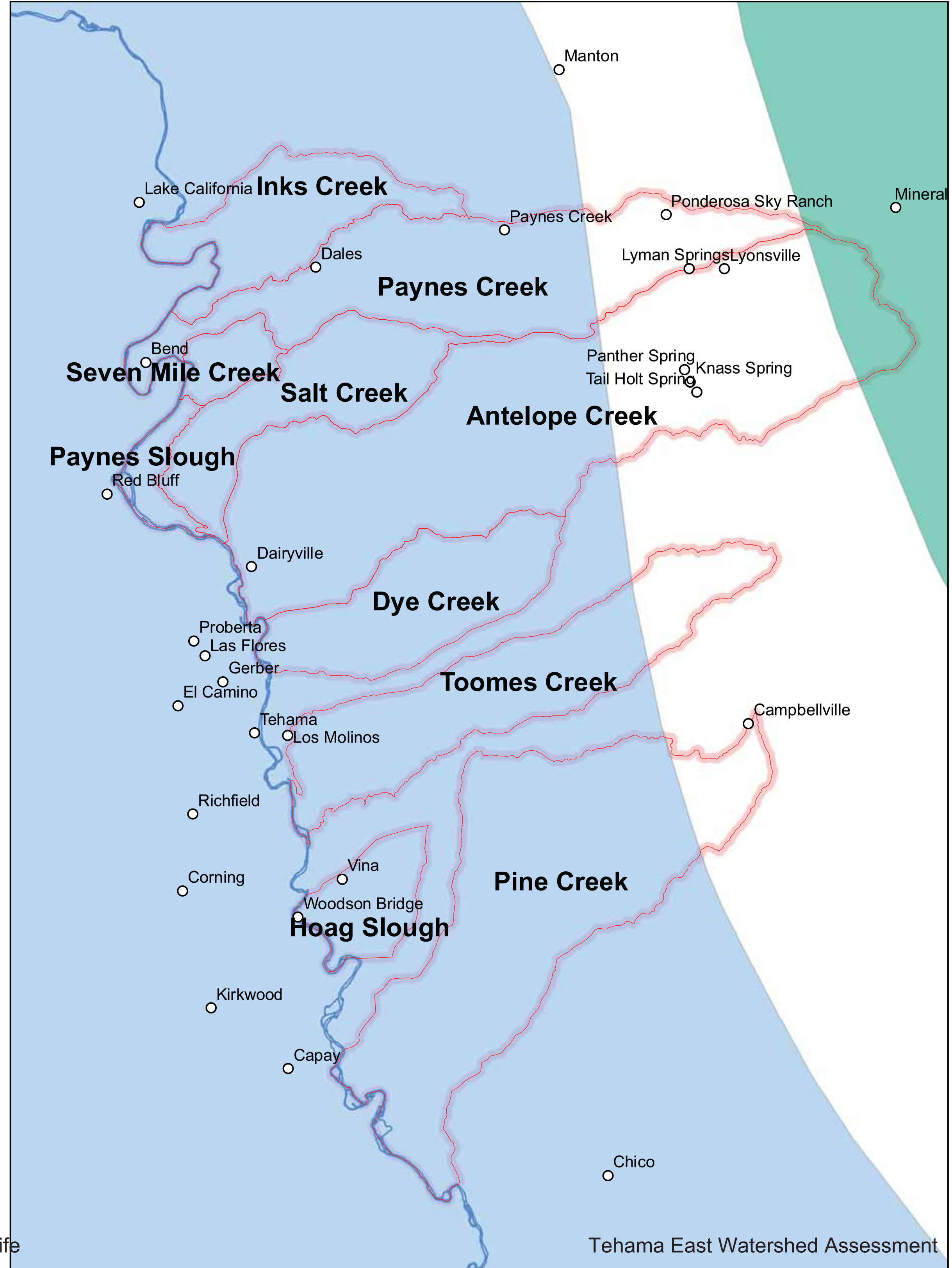
N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds



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Quoted from:
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KEY

MOUNTAIN BLUEBIRD
(SIALIA CURRUCOIDES)

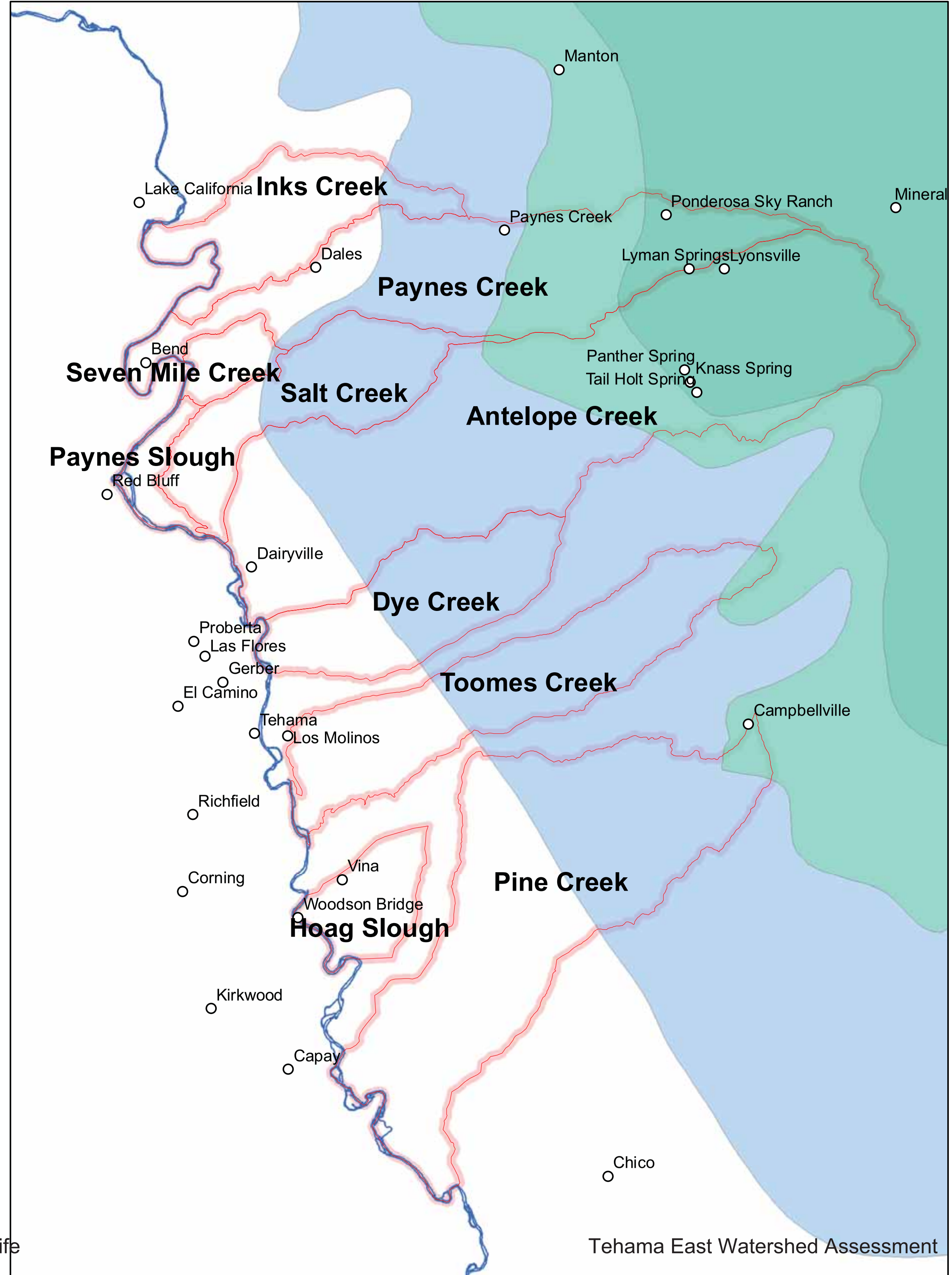
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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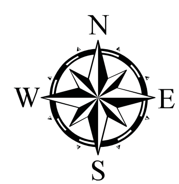
KEY

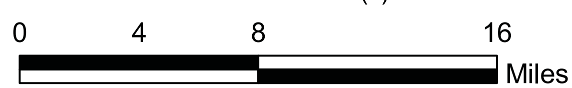
MOUNTAIN QUAIL
(OREORTYX PICTUS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



Tehama County Resource
Conservation District
(c) 2010



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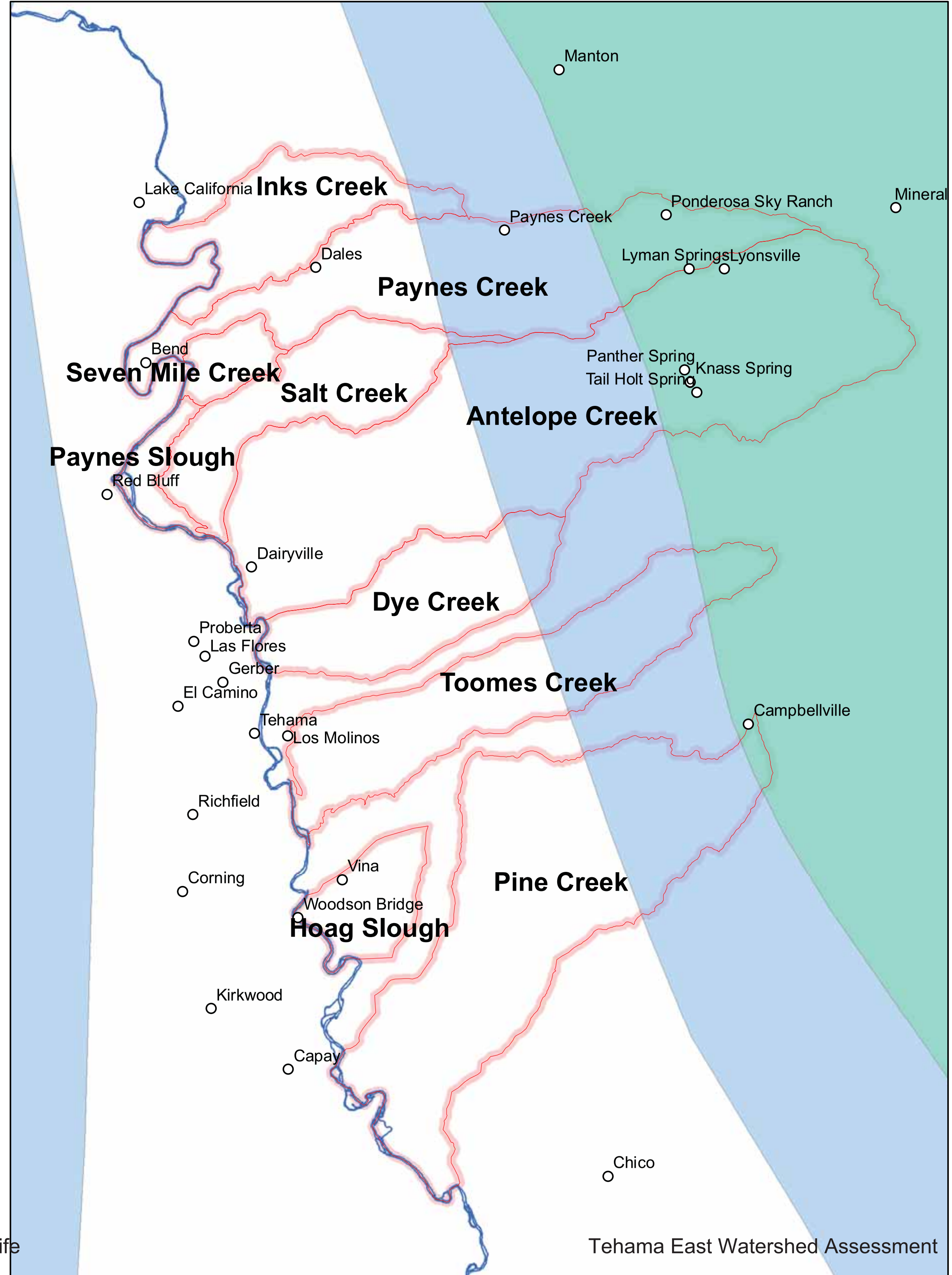
California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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KEY

MOUNTAIN CHICKADEE
(PARUS GAMBELI)

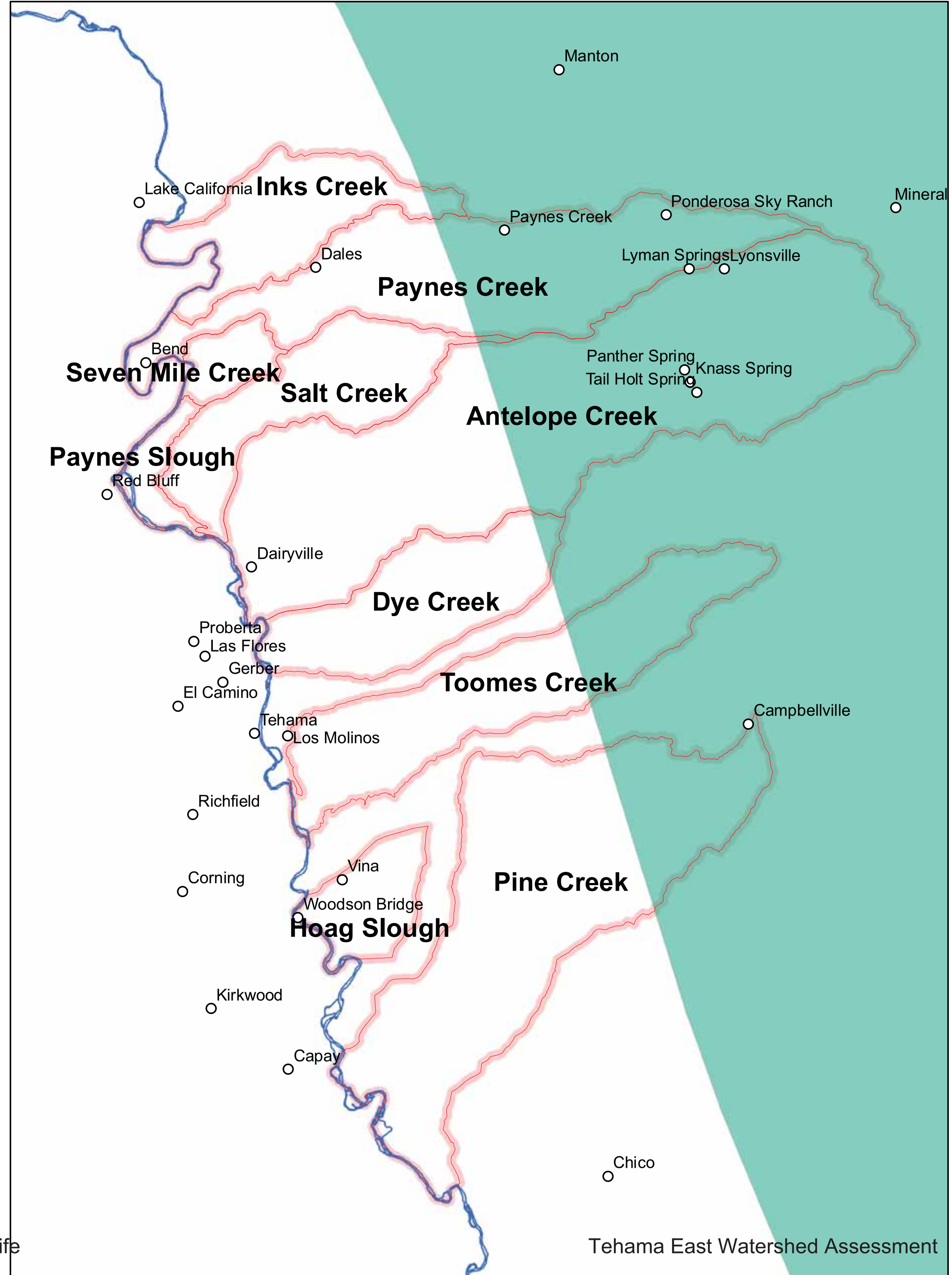
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N
W E
S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

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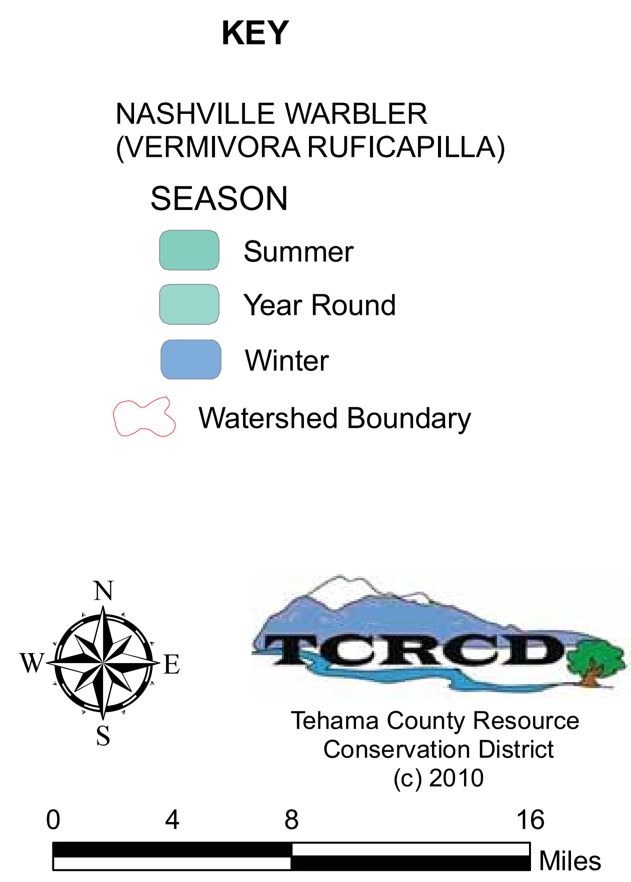

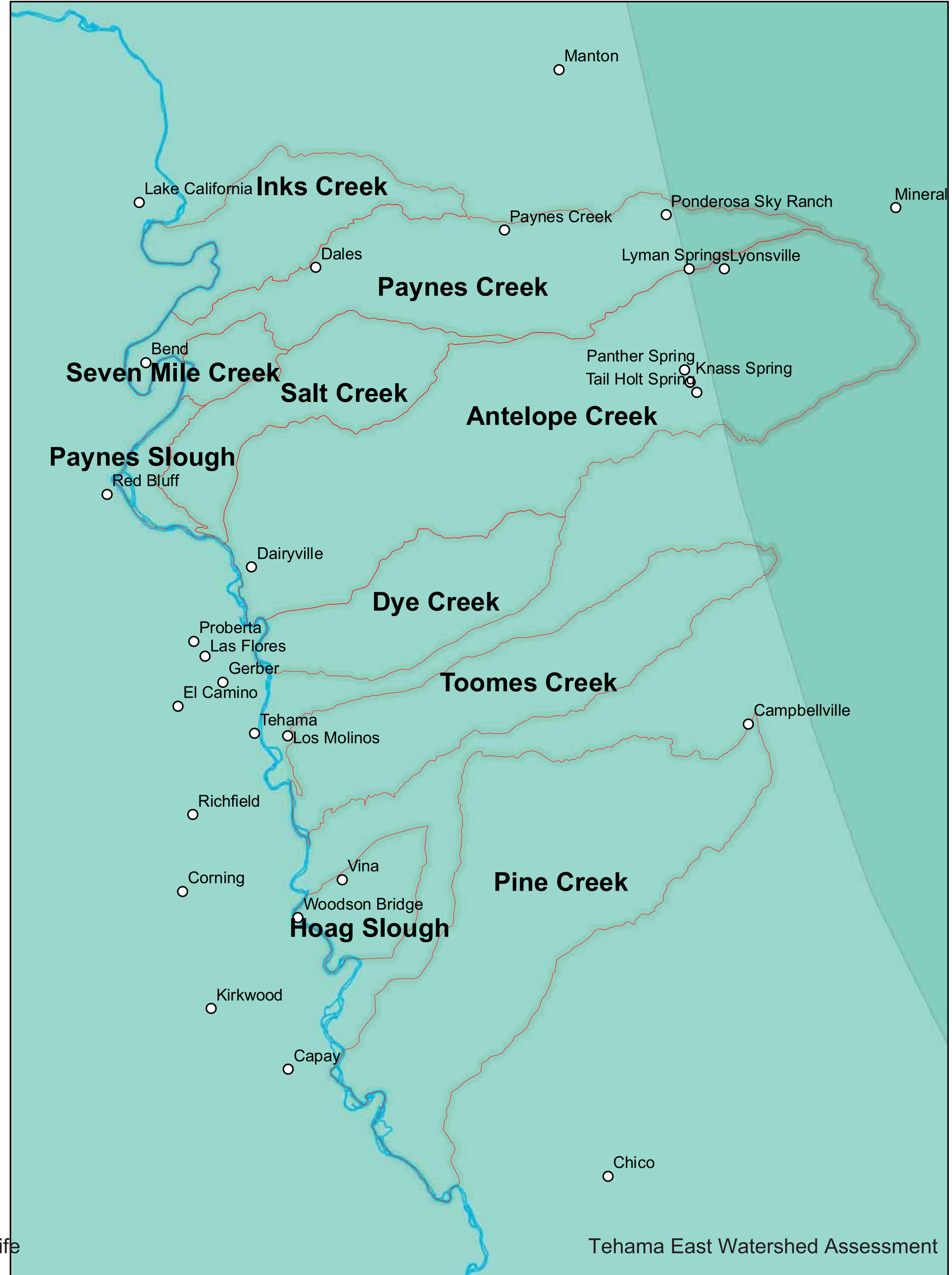

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KEY

NORTHERN FLICKER
(COLAPTES AURATUS)

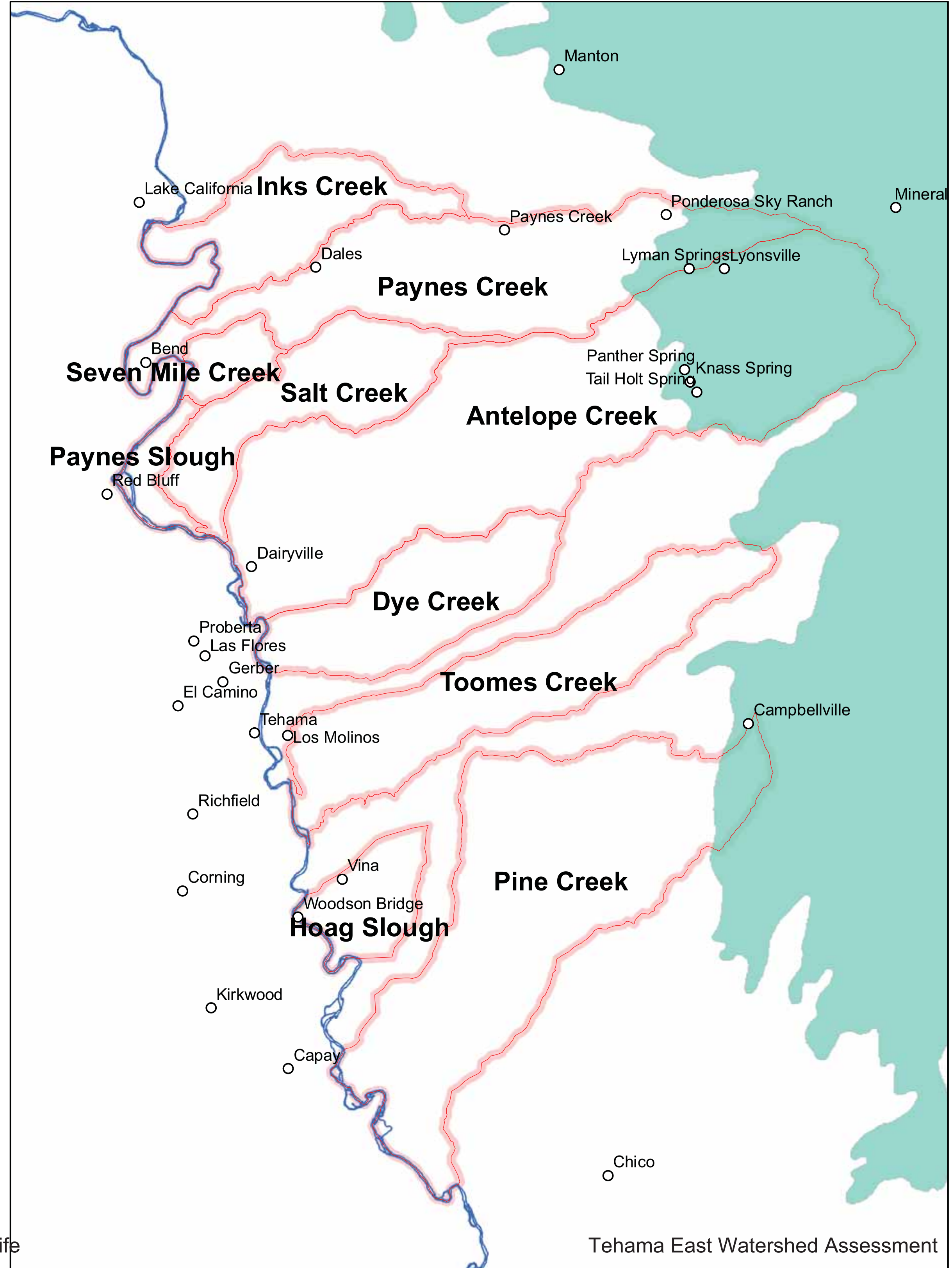
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



Tehama East Watershed Assessment

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Tehama East Watersheds

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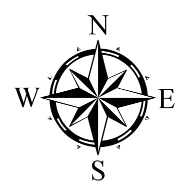
KEY

NORTHERN GOSHAWK
(ACCIPITER GENTILIS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



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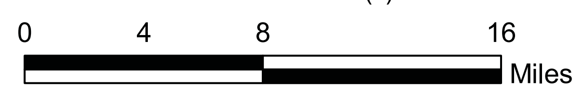

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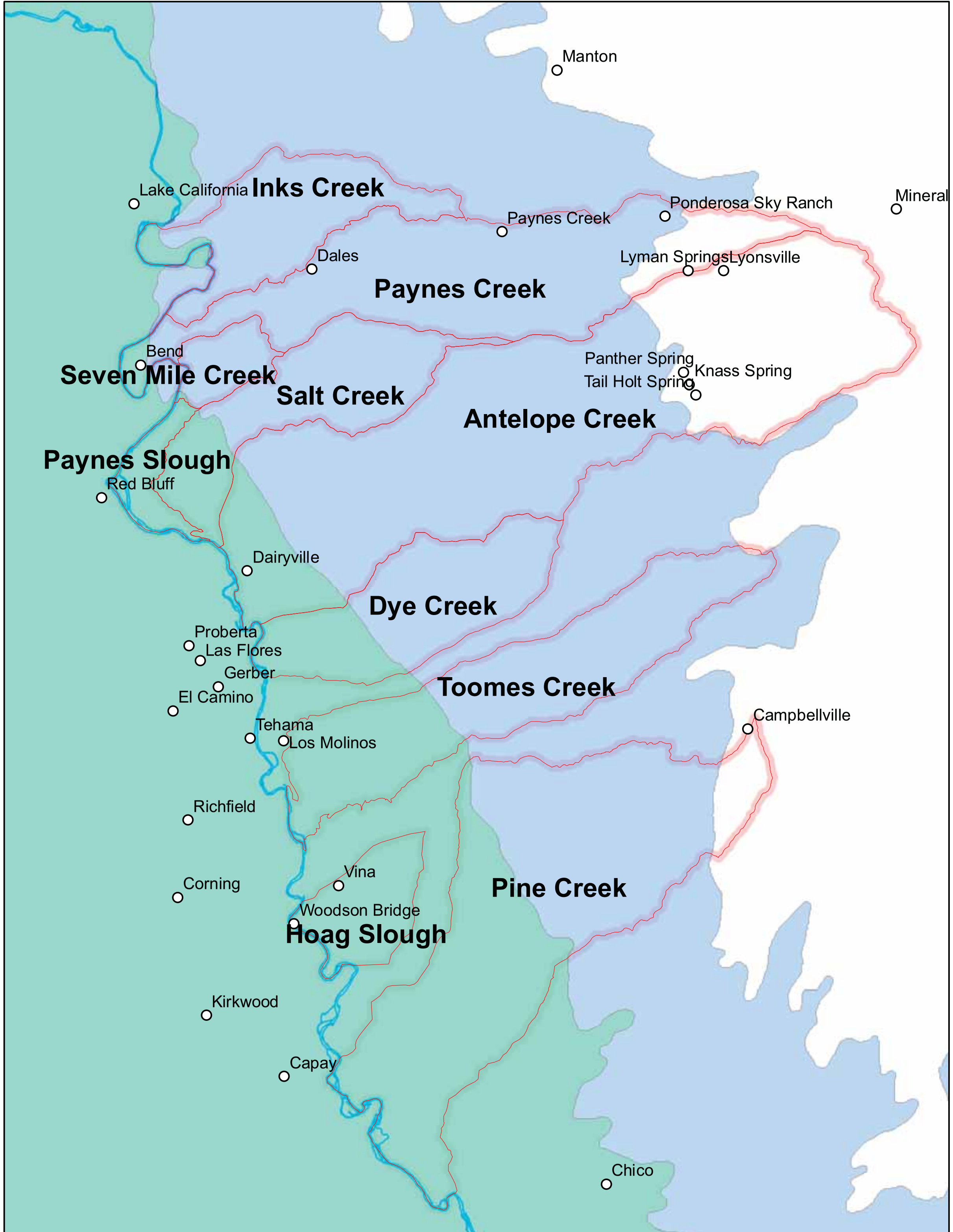
California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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KEY

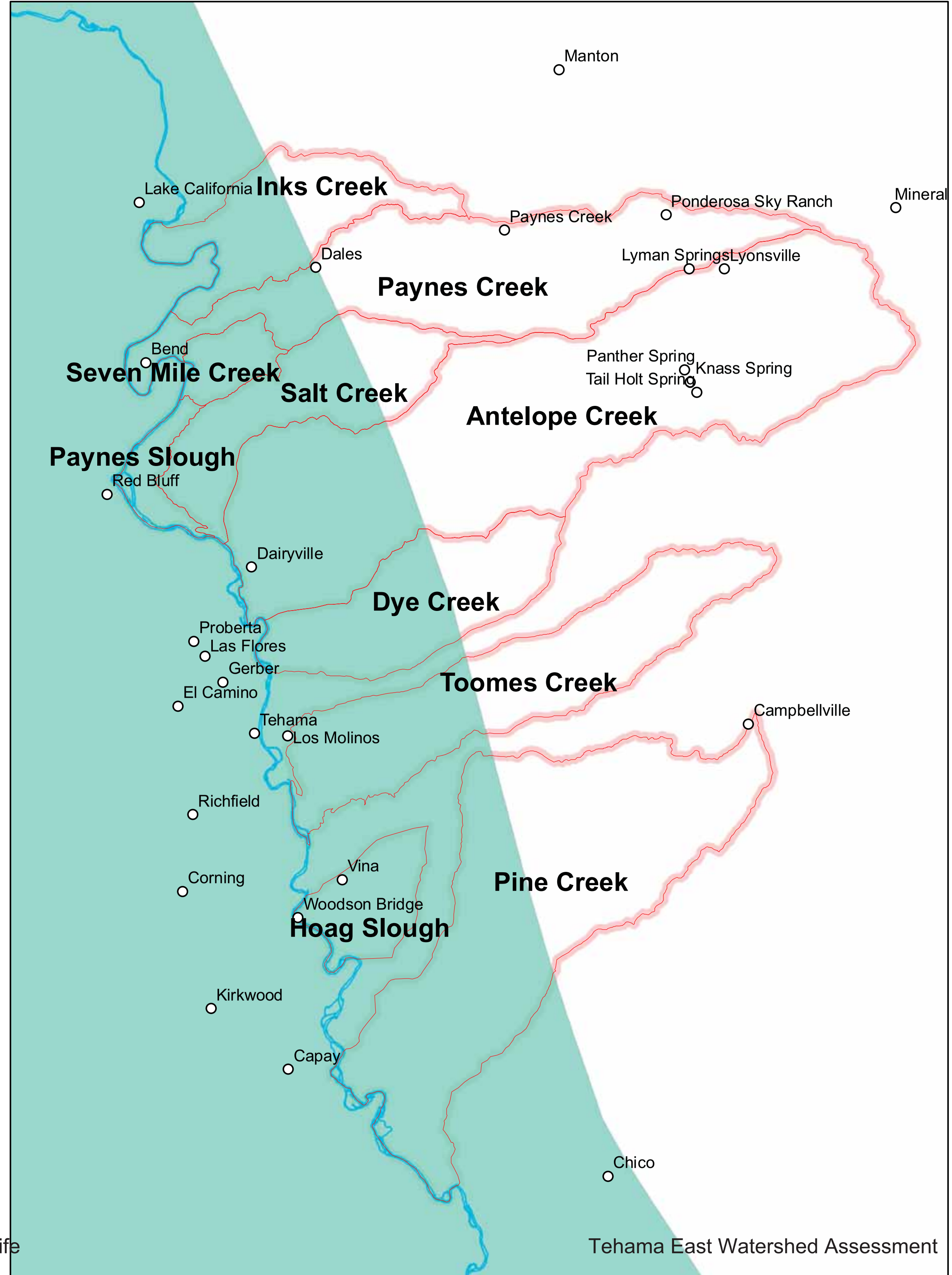
NORTHERN HARRIER
(CIRCUS CYANEUS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles



Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
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Quoted from:
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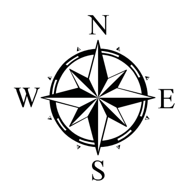
KEY

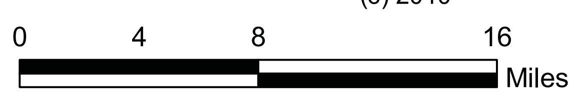
NORTHERN MOCKINGBIRD
(MIMUS POLYGLOTTOS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

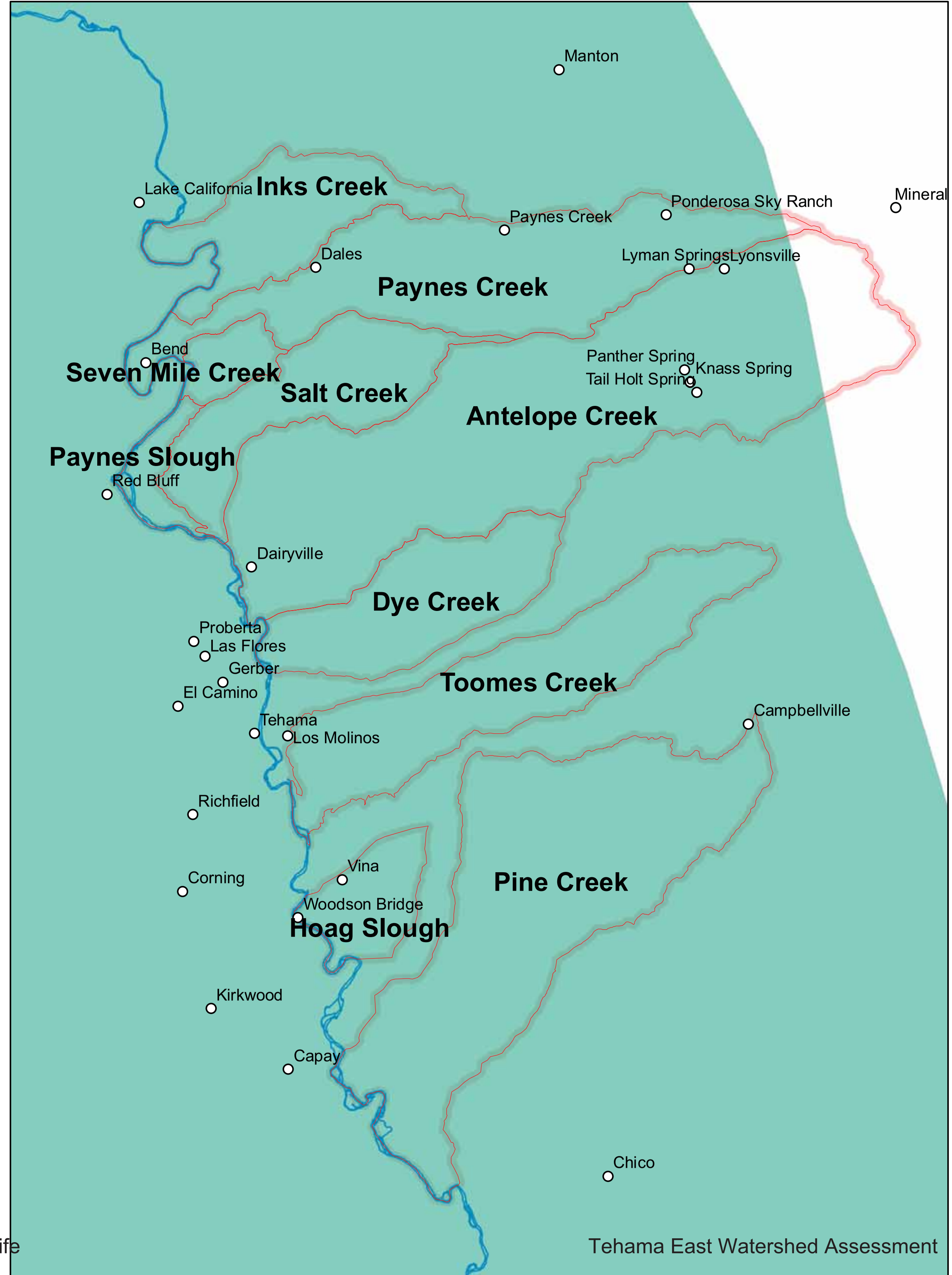


Tehama County Resource Conservation District
(c) 2010



Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds



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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

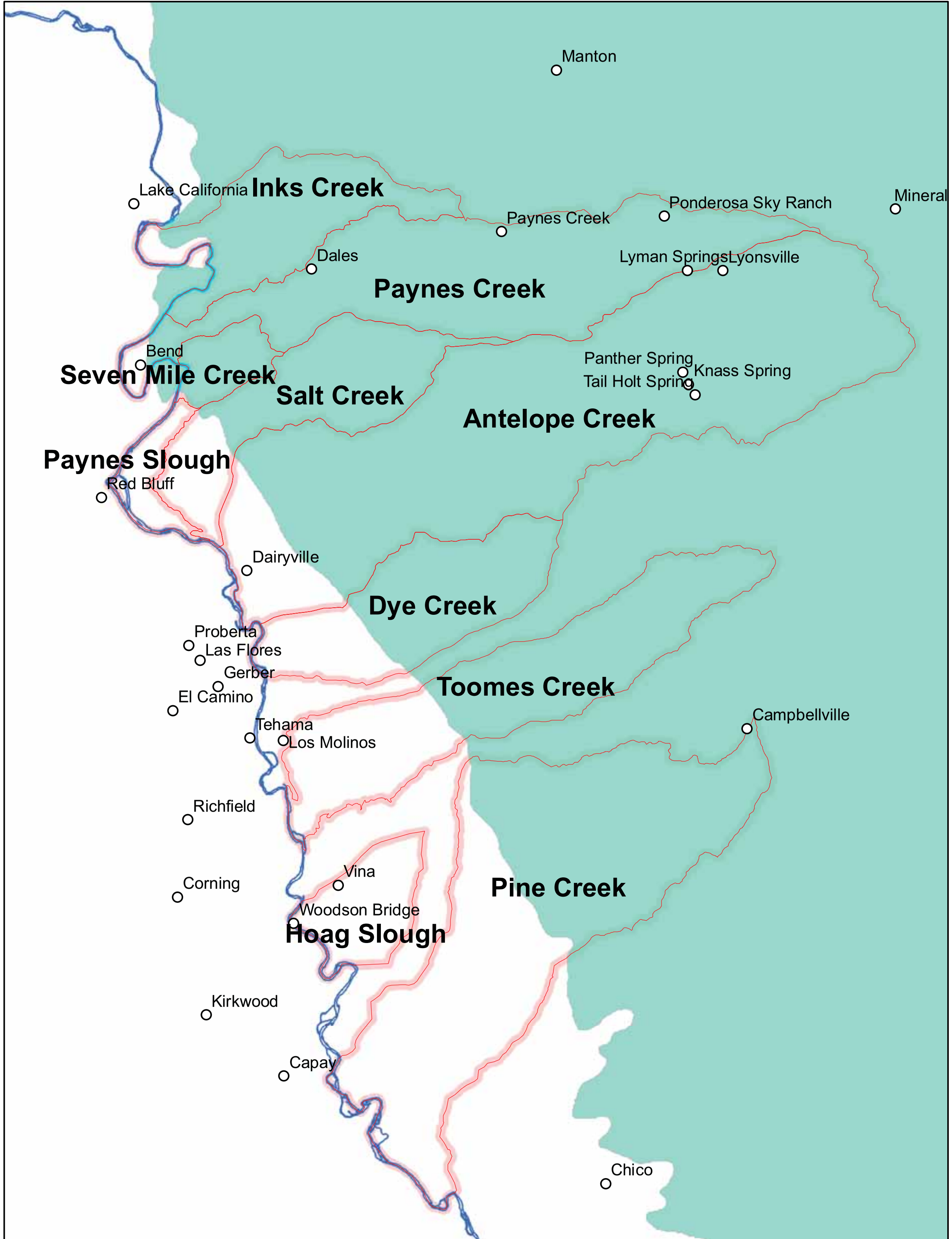
NORTHERN ORIOLE
(ICTERUS GALBULA

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds

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Quoted from:
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KEY

NORTHERN PYGMY-OWL
(GLAUCIDIUM GNOMA)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

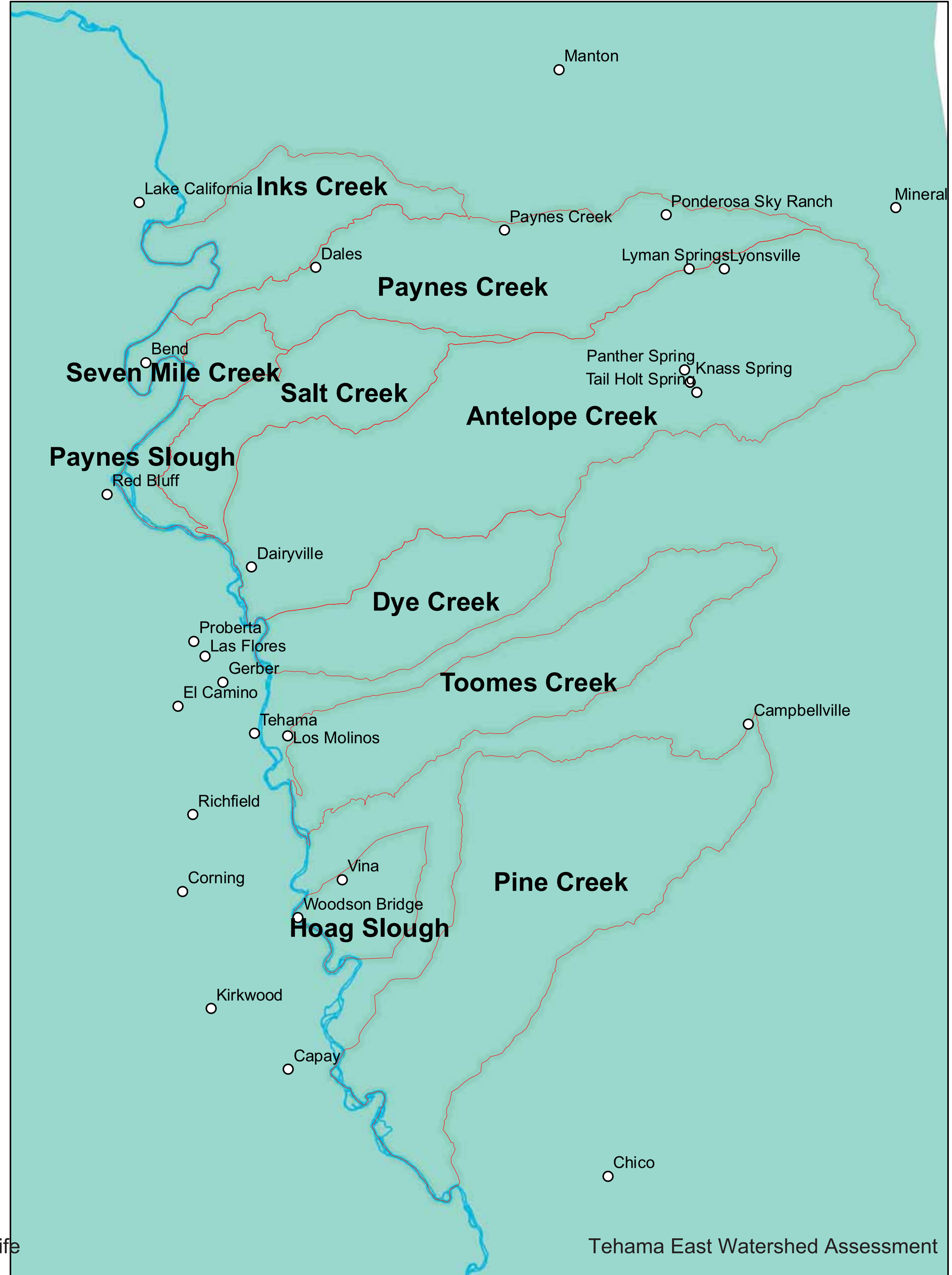
N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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Quoted from:
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KEY

NORTHERN ROUGH-WINGED SWALLOW
(STELGIDOPTERYX SERRIPENNIS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

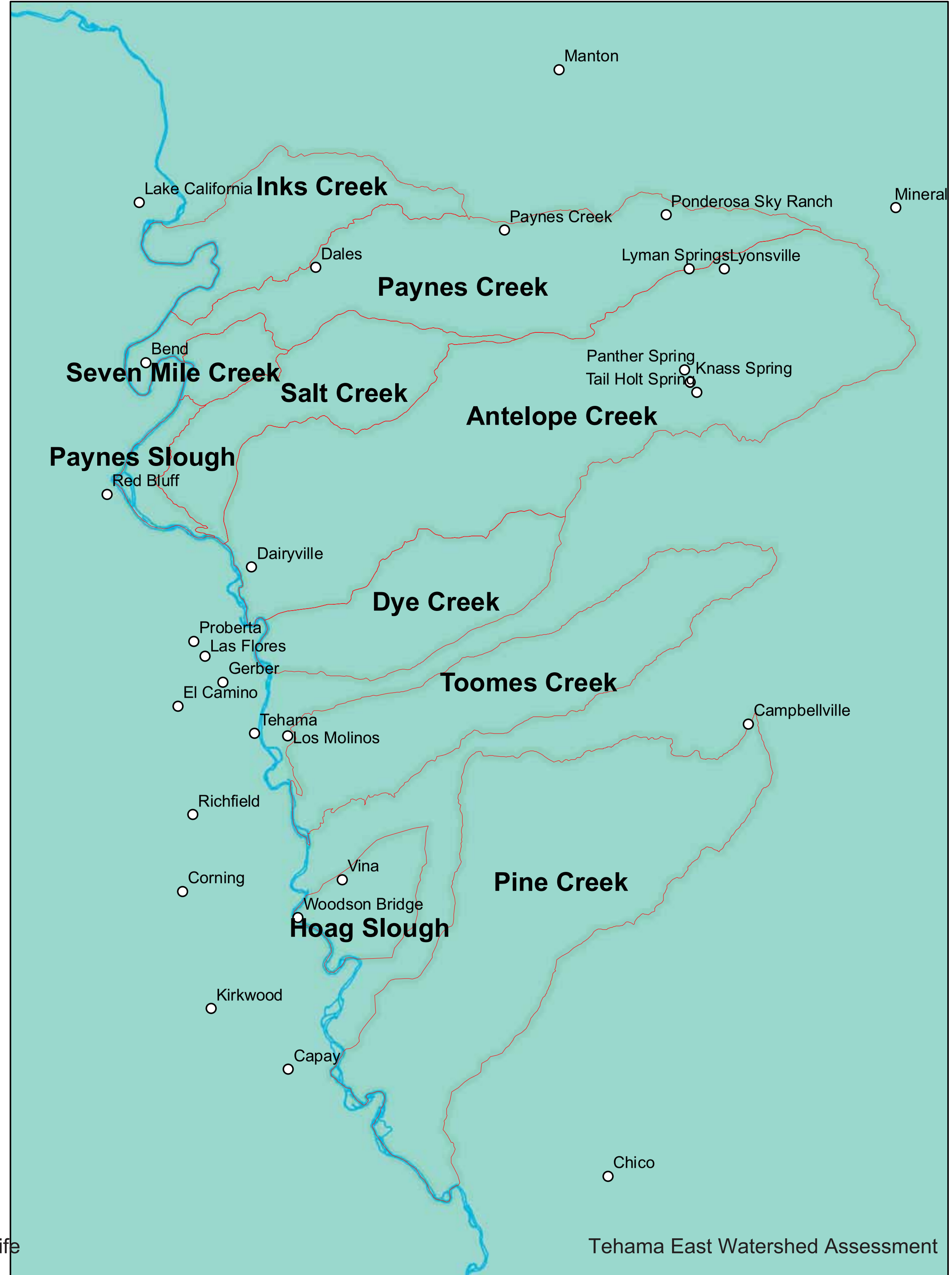
N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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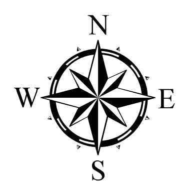
Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

NUTTALL'S WOODPECKER
(PICOIDES NUTTALLII)

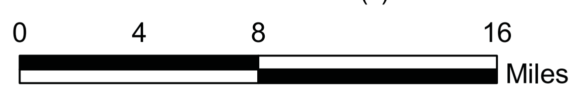
SEASON

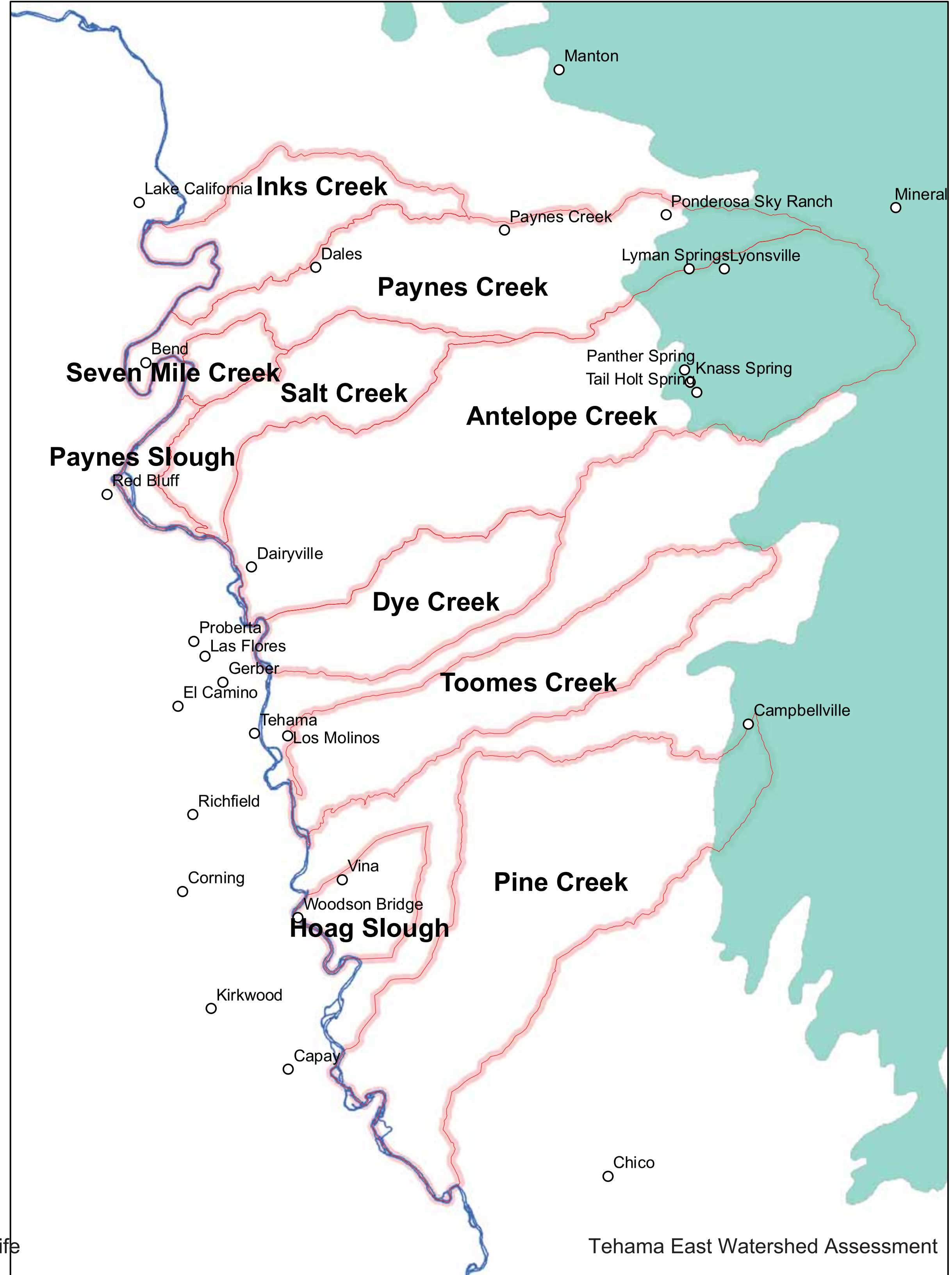
- Summer
- Year Round
- Winter
- Watershed Boundary



TCRCD

Tehama County Resource Conservation District
(c) 2010





Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

NORTHERN SAW-WHET OWL
(AEGOLIUS ACADICUS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

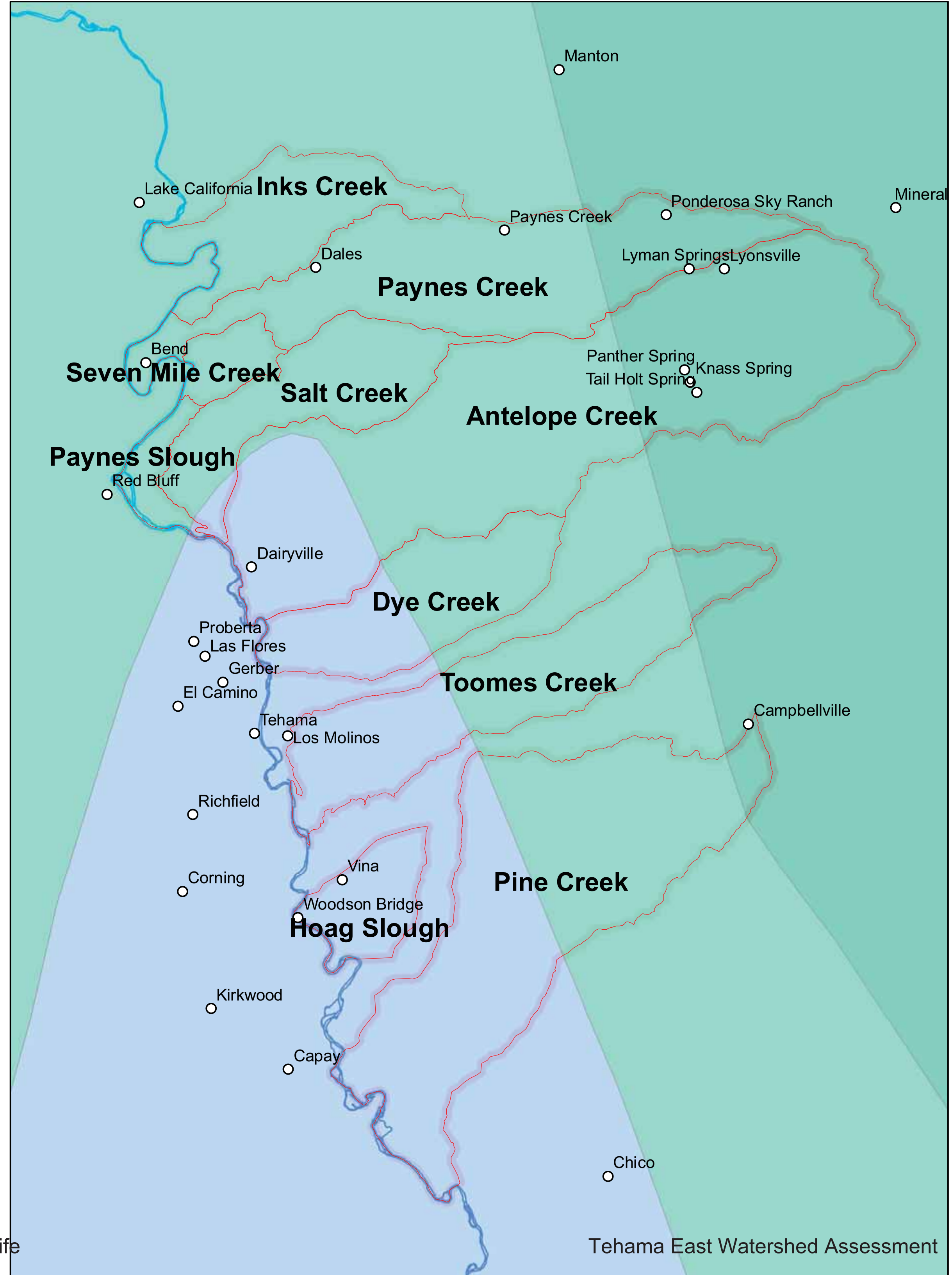
N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds



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KEY

ORANGE-CROWNED WARBLER
(VERMIVORA CELATA)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

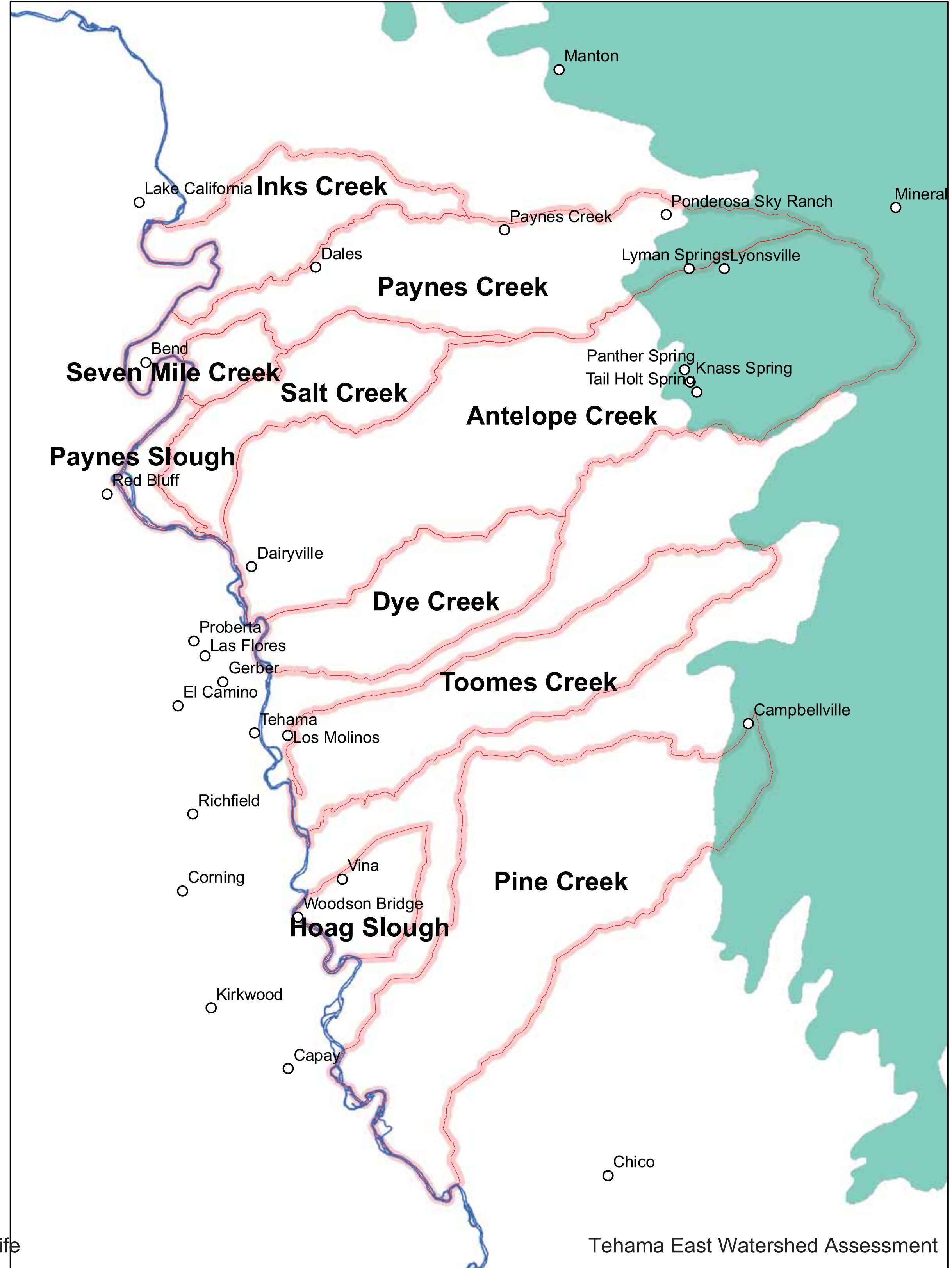
N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

OLIVE-SIDED FLYCATCHER
(CONTOPUS BOREALIS)

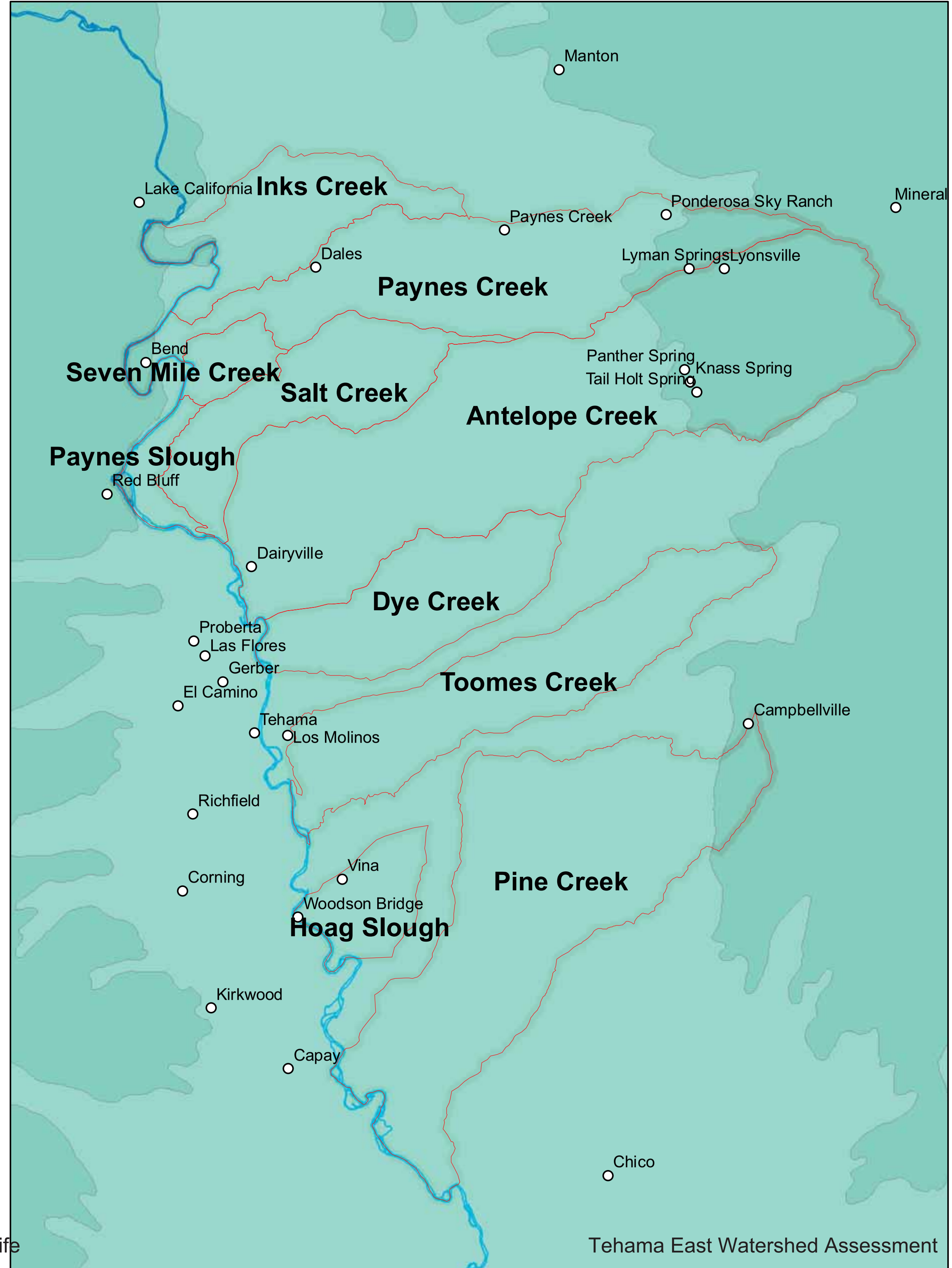
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds

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KEY

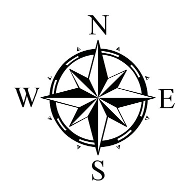
OSPREY
(PANDION HALIAETUS)

SEASON

Summer

Year Round

Watershed Boundary



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Conservation District
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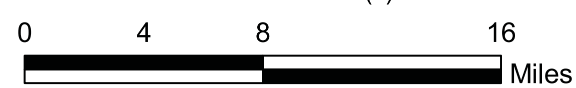

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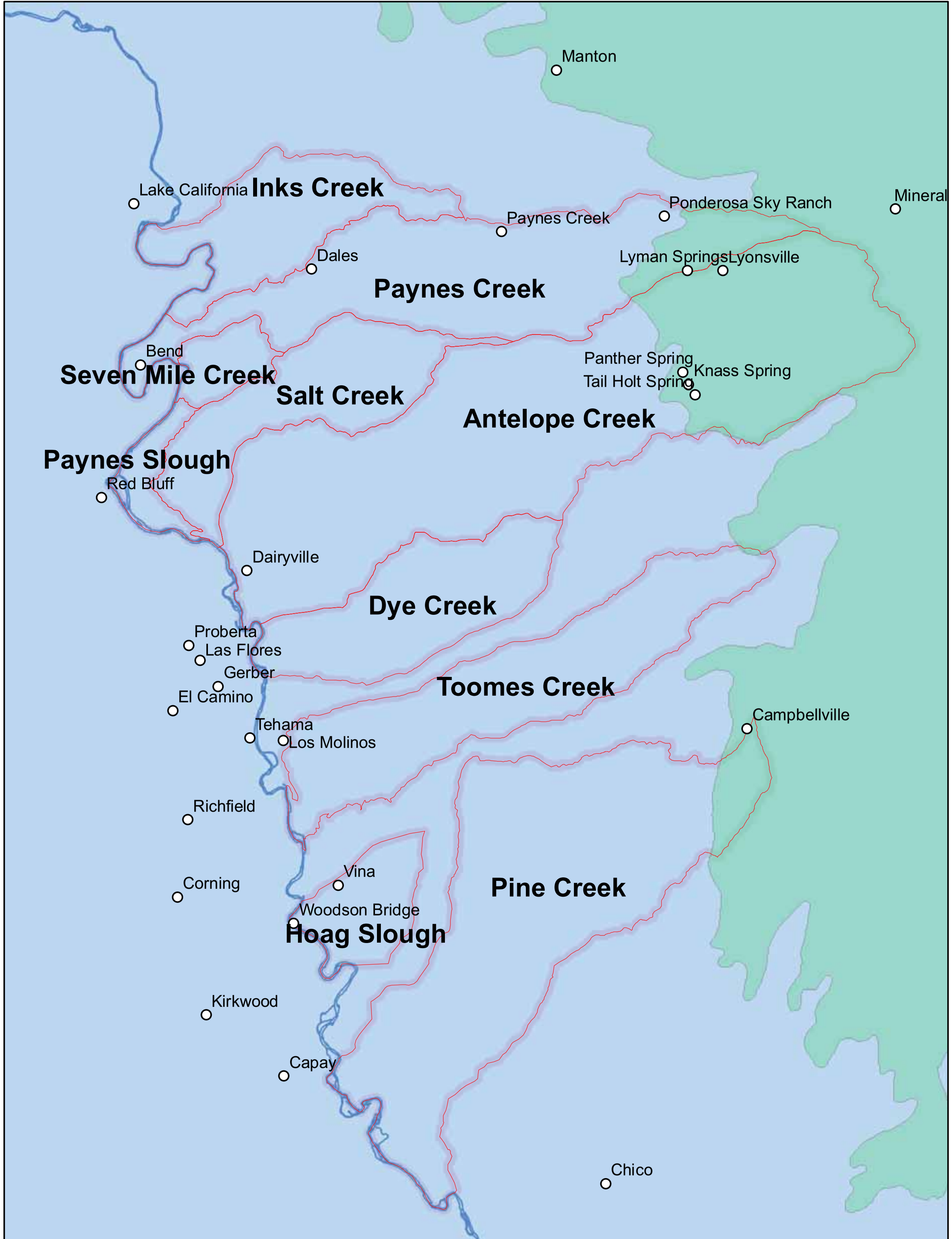
Tehama East Watersheds



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KEY

PEREGRINE FALCON
(FALCO PEREGRINUS)

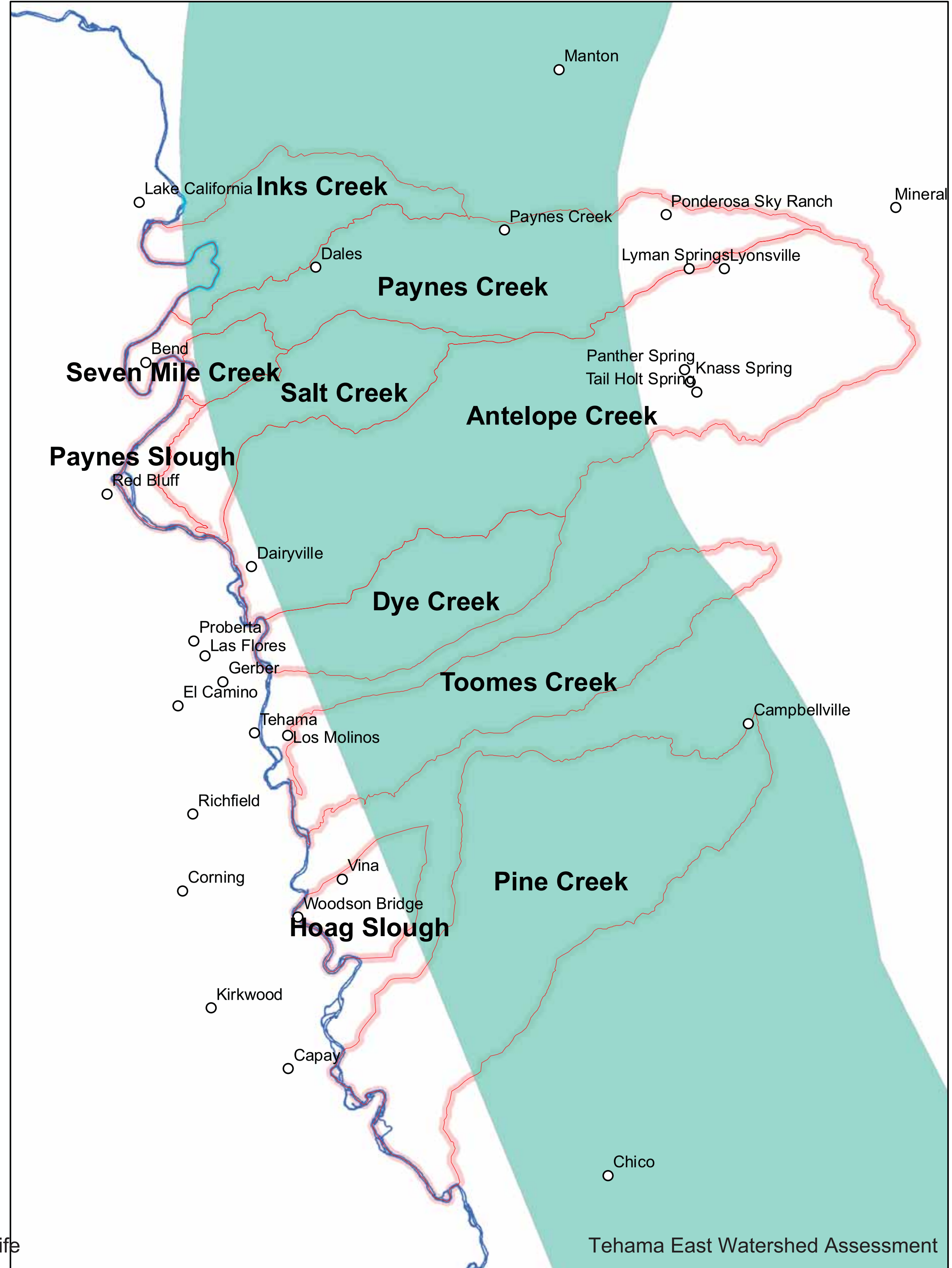
SEASON

- Summer
- Year Round
- Winter

Watershed Boundary

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles



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Quoted from:
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KEY

PHAINOPEPLA
(PHAINOPEPLA NITENS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

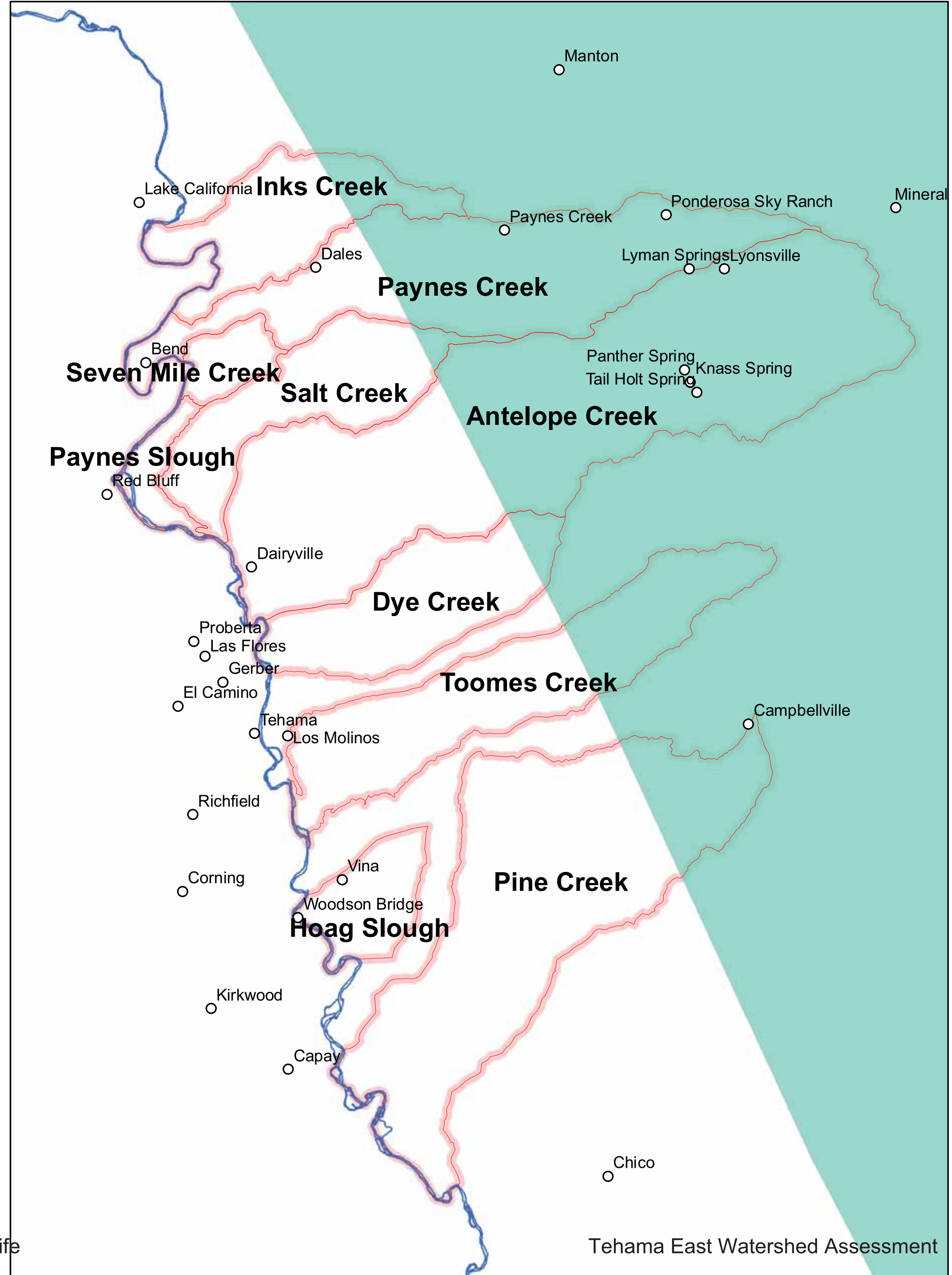
N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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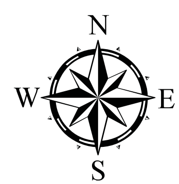
KEY

PILEATED WOODPECKER
(DRYOCOPUS PILEATUS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



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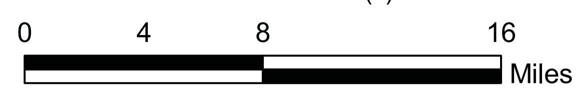

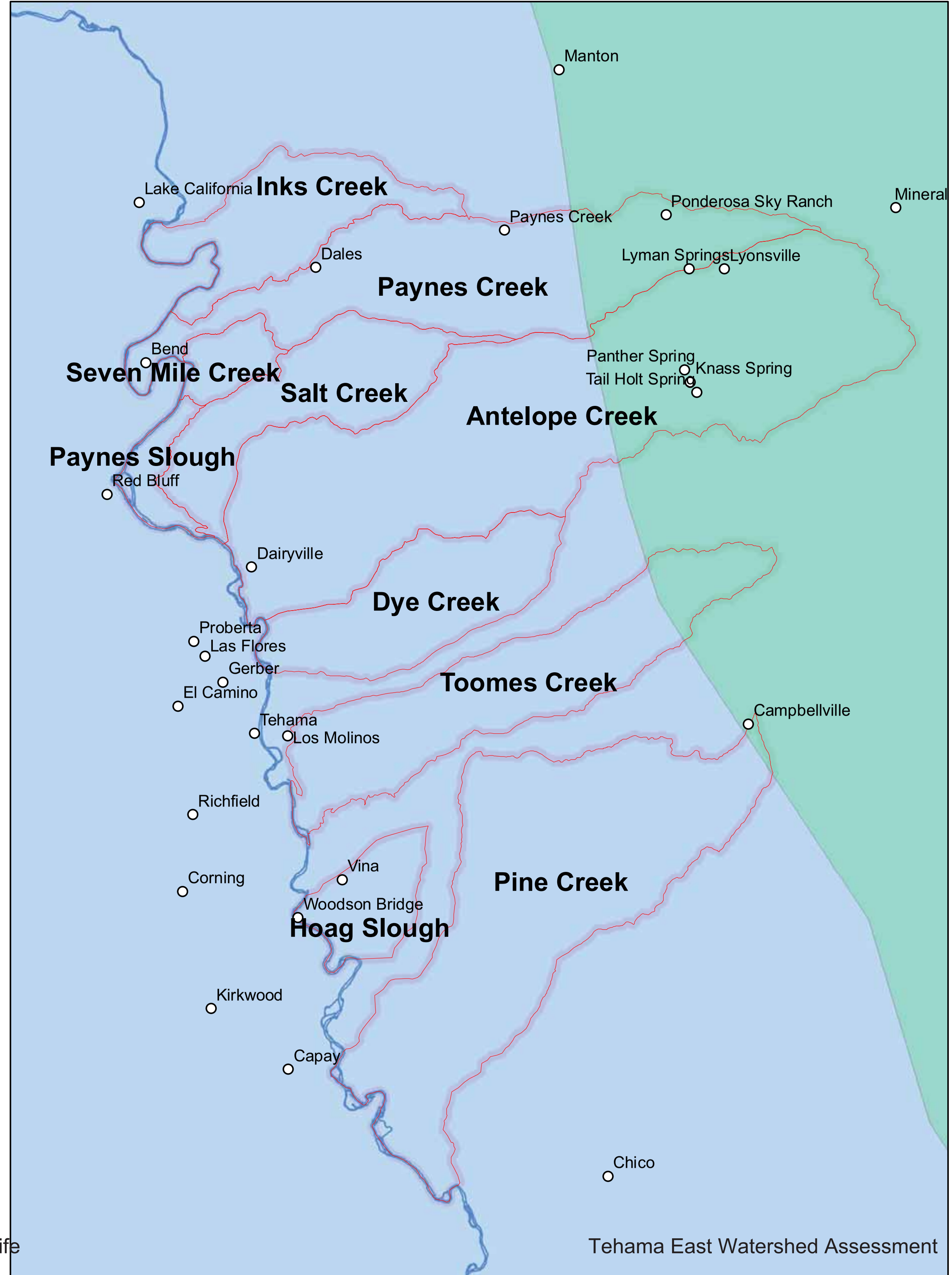

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds

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KEY

PINE SISKIN
(CARDUELIS PINUS)

SEASON

Summer

Year Round

Winter

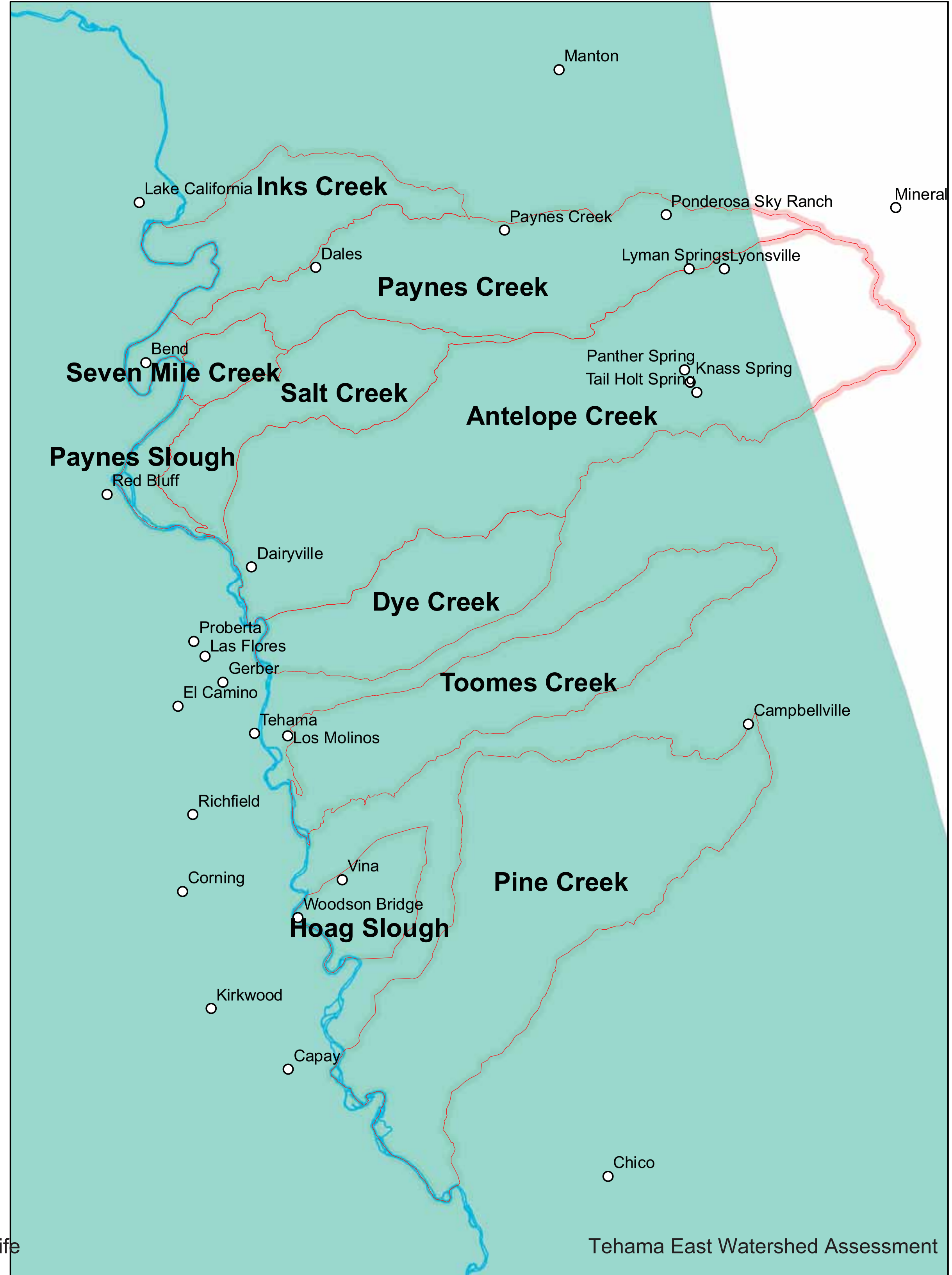
Watershed Boundary

N W E S

TCRCD

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles



Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds

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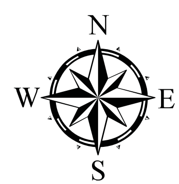
KEY

PLAIN TITMOUSE
(PARUS INORNATUS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



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Conservation District
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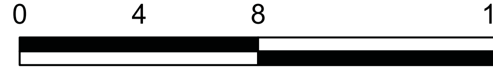

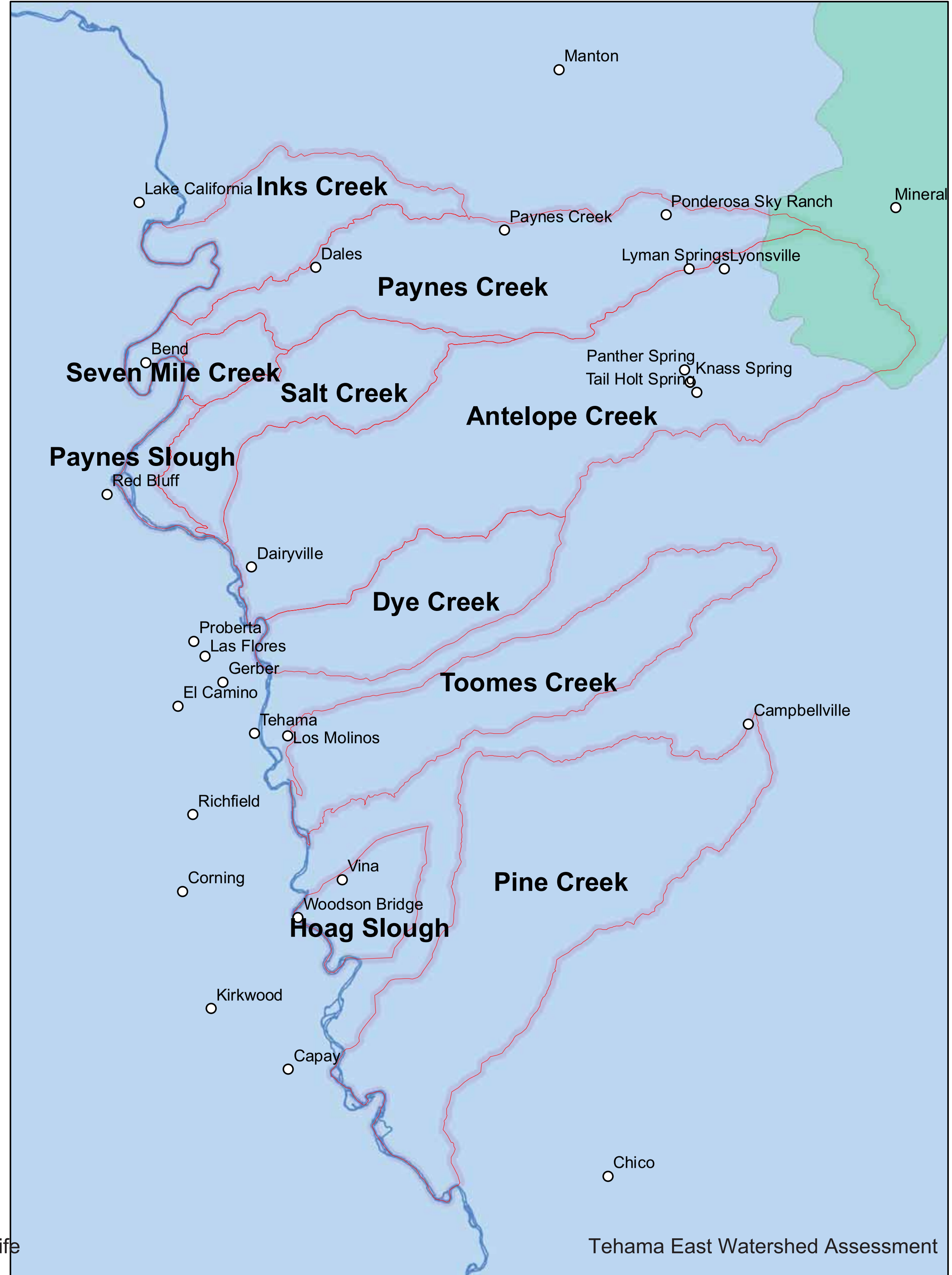

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KEY

PRAIRIE FALCON
(FALCO MEXICANUS)

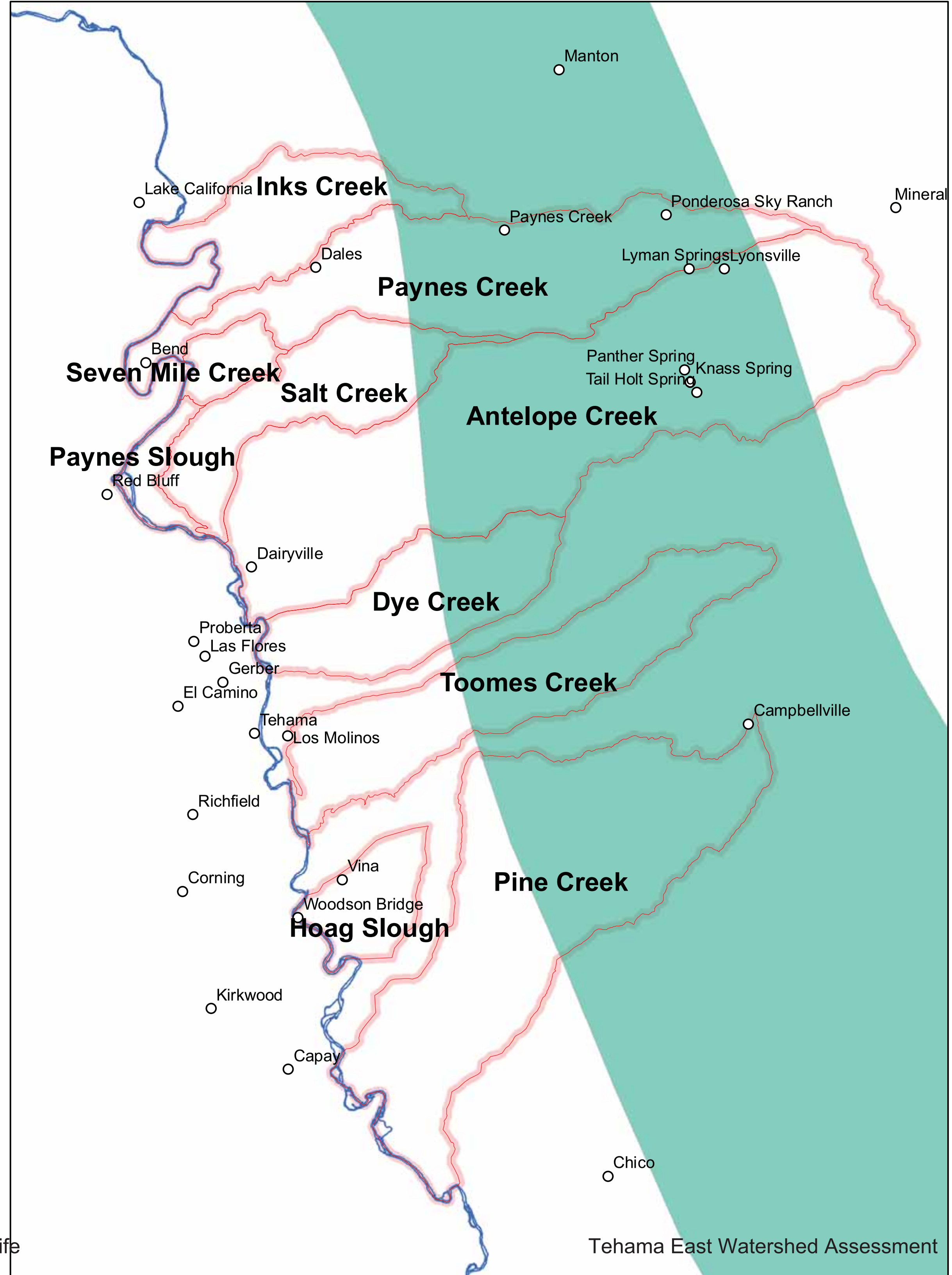
SEASON

- Summer
- Year Round
- Winter

Watershed Boundary

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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Tehama East Watersheds

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KEY

PACIFIC-SLOPE FLYCATCHER
(EMPIDONAX DIFFICILIS)

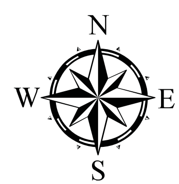
SEASON

Summer

Year Round

Winter

Watershed Boundary



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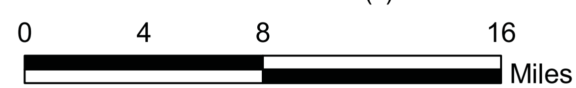

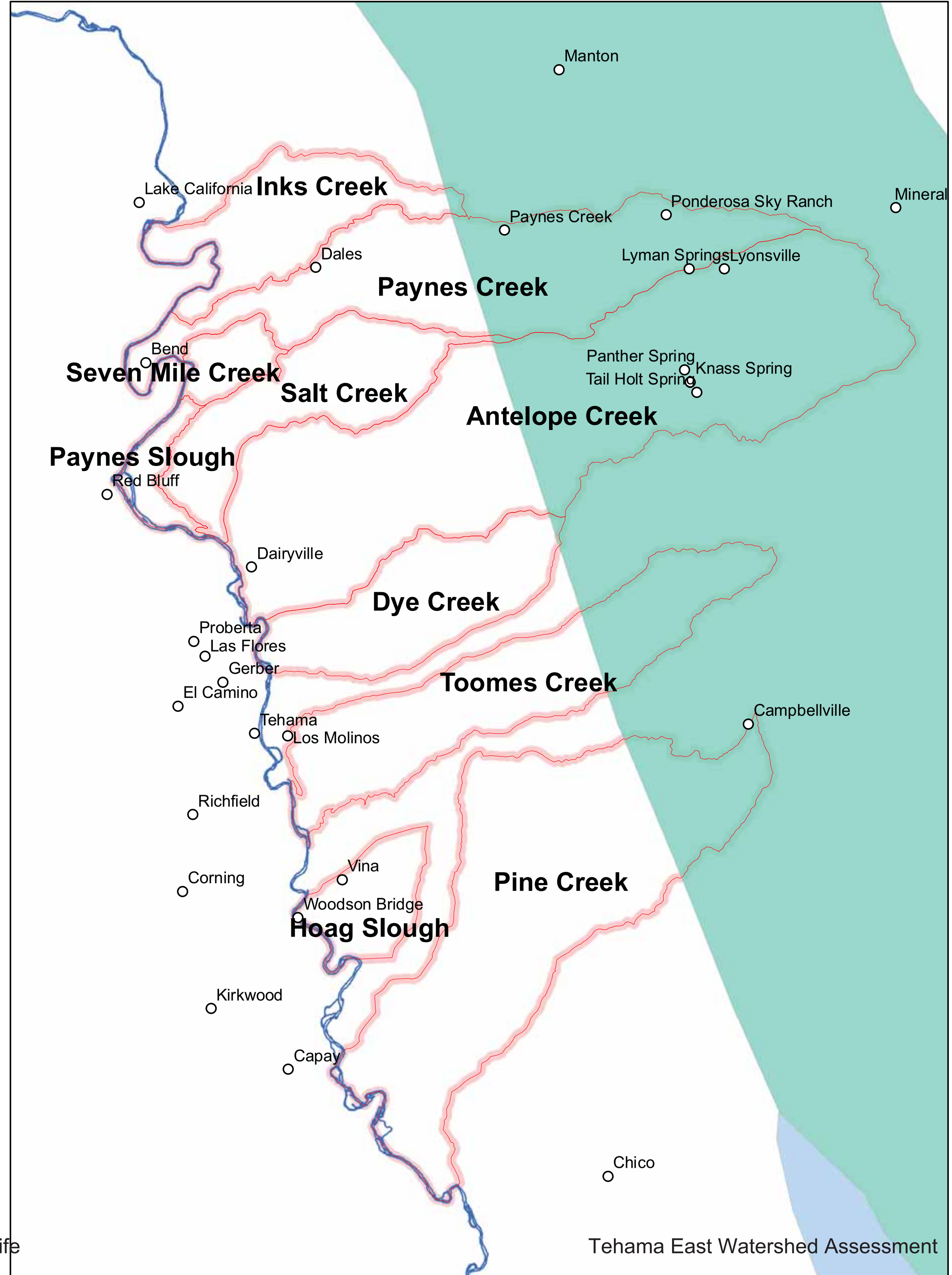

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KEY

PURPLE FINCH
(CARPODACUS PURPUREUS)

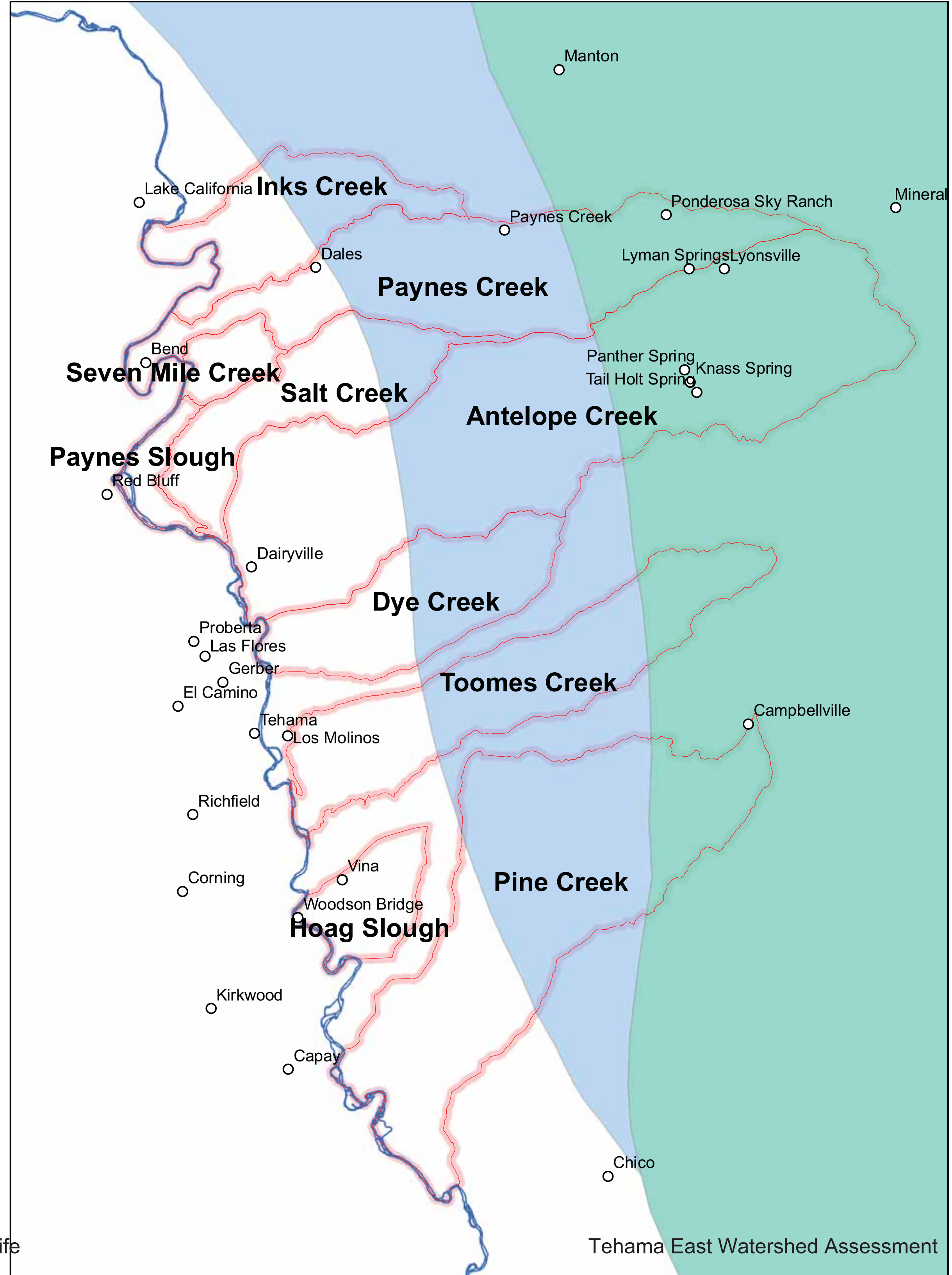
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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KEY

RED-BREASTED NUTHATCH
(SITTA CANADENSIS)

SEASON

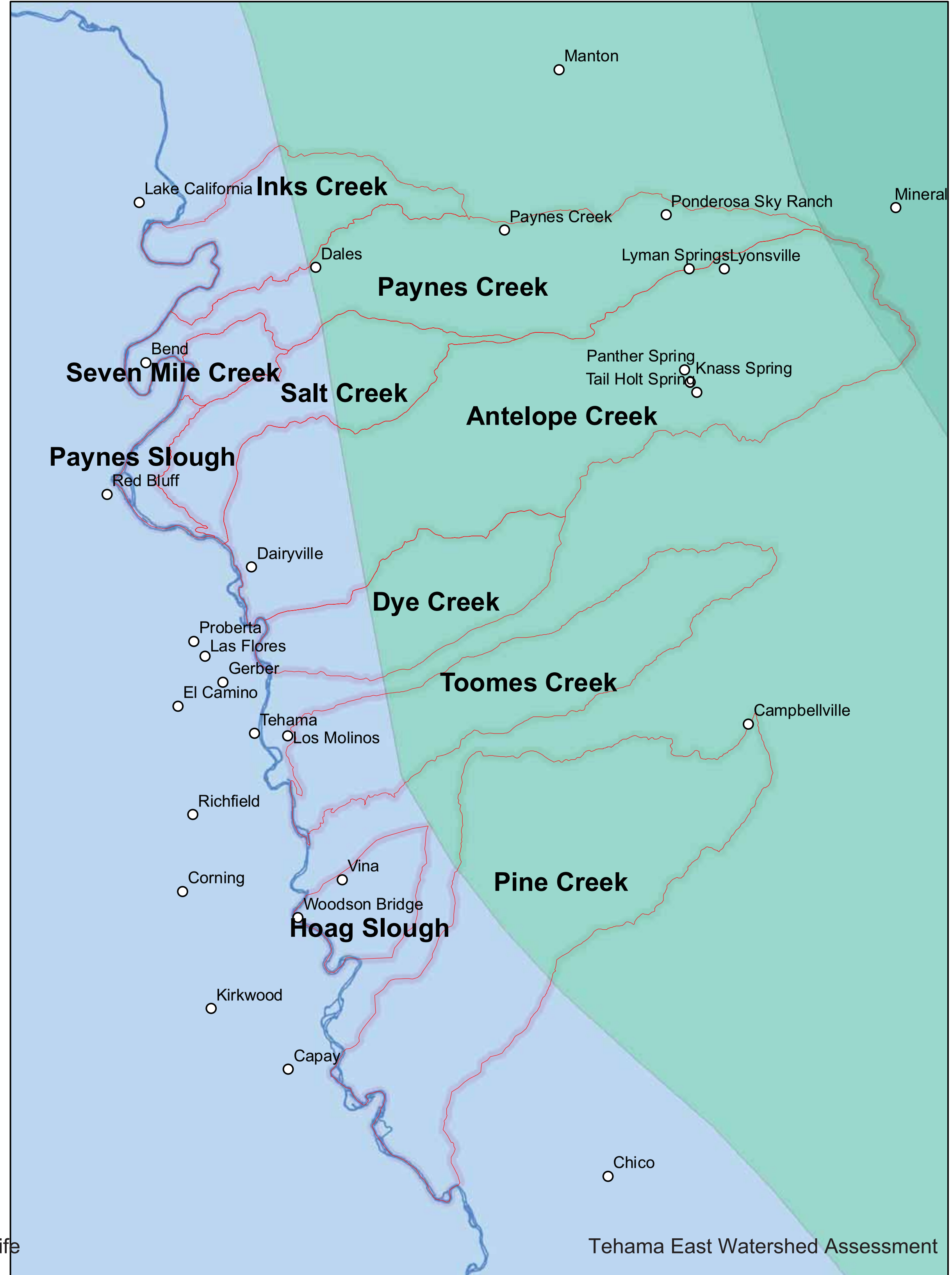
- Summer
- Year Round
- Winter
- Watershed Boundary

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds



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KEY

RED-BREASTED SAPSUCKER
(SPHYRAPICUS RUBER)

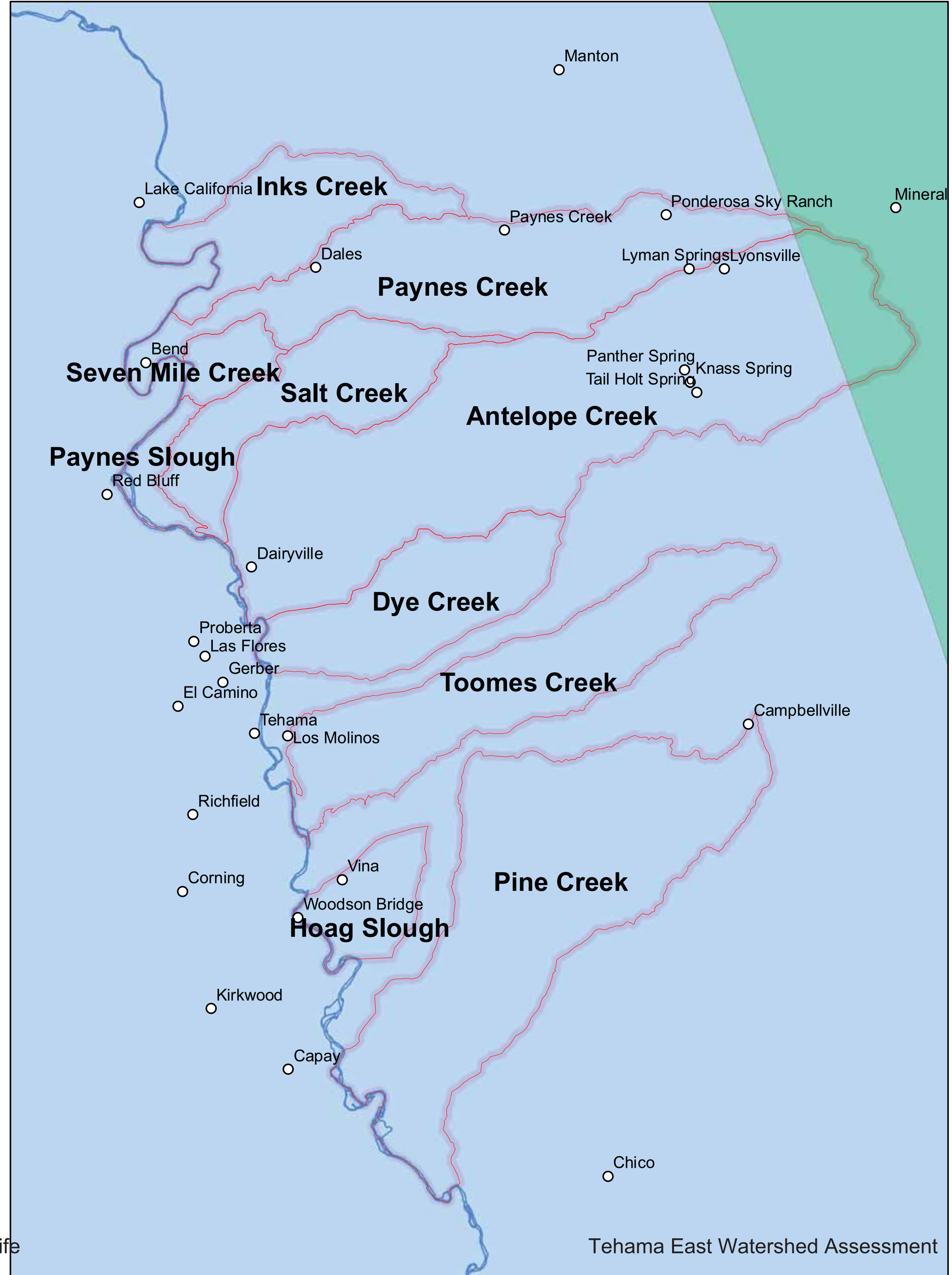
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N S E W

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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KEY

RUBY-CROWNED KINGLET
(REGULUS CALENDULA)

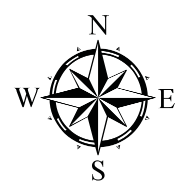
SEASON

Summer

Year Round

Winter

Watershed Boundary



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Conservation District
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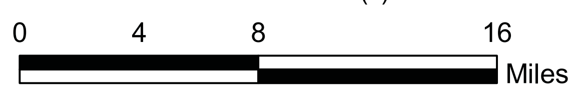

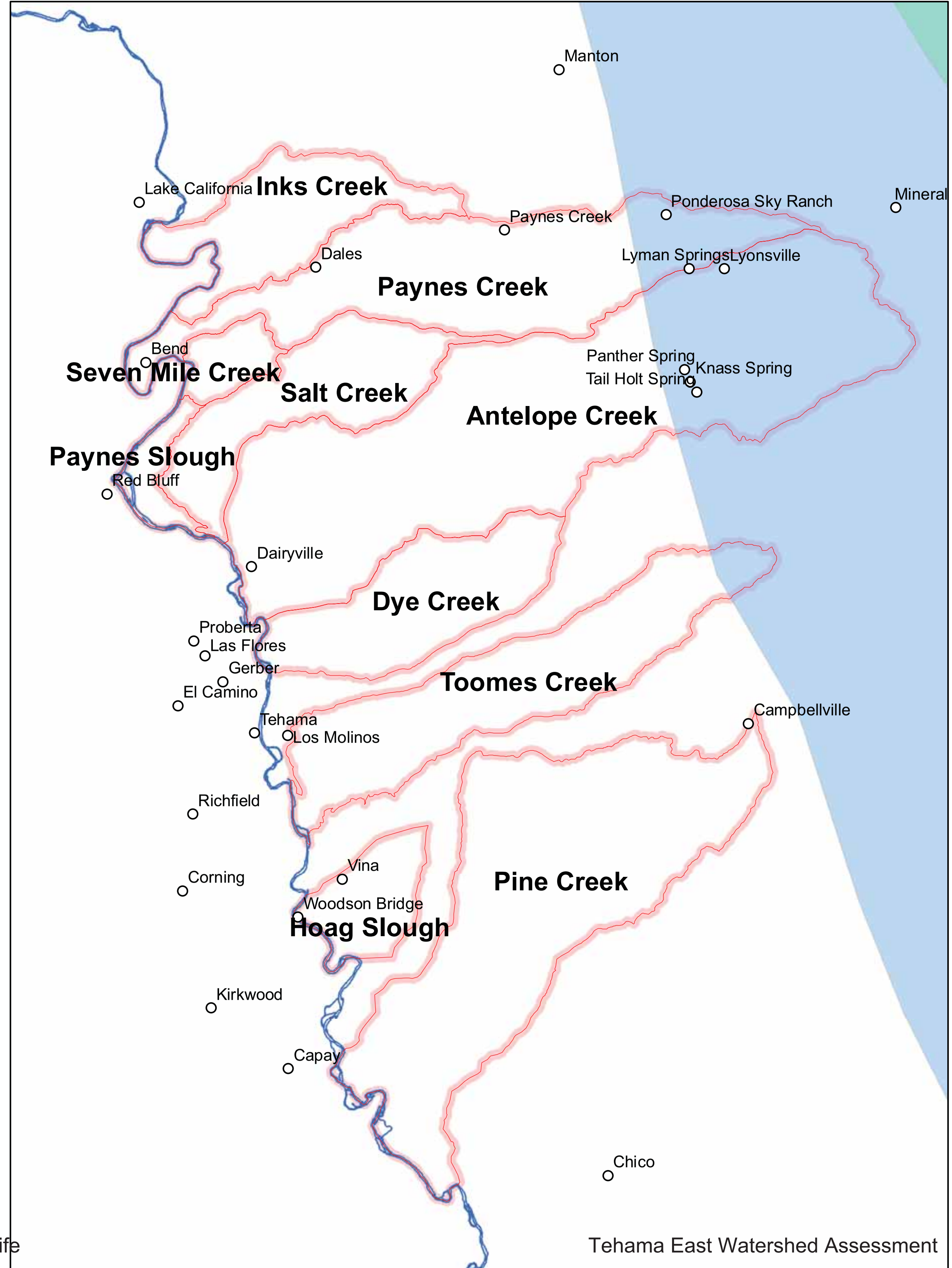

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KEY

RED CROSSBILL
(LOXIA CURVIROSTRA)

SEASON

Summer

Year Round

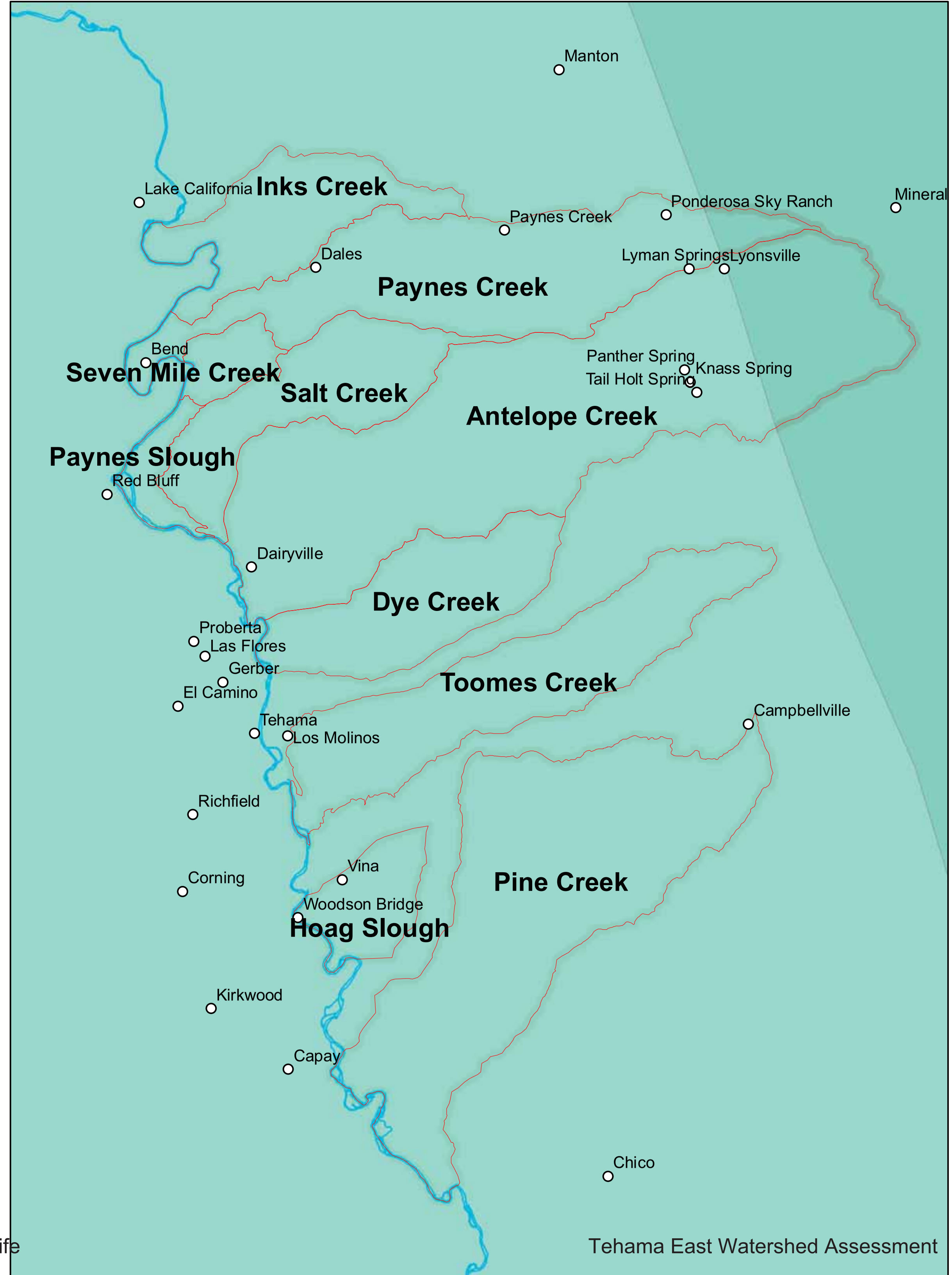
Winter

Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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KEY

RED-WINGED BLACKBIRD
(AGELAIUS PHOENICEUS)

SEASON

Summer

Year Round

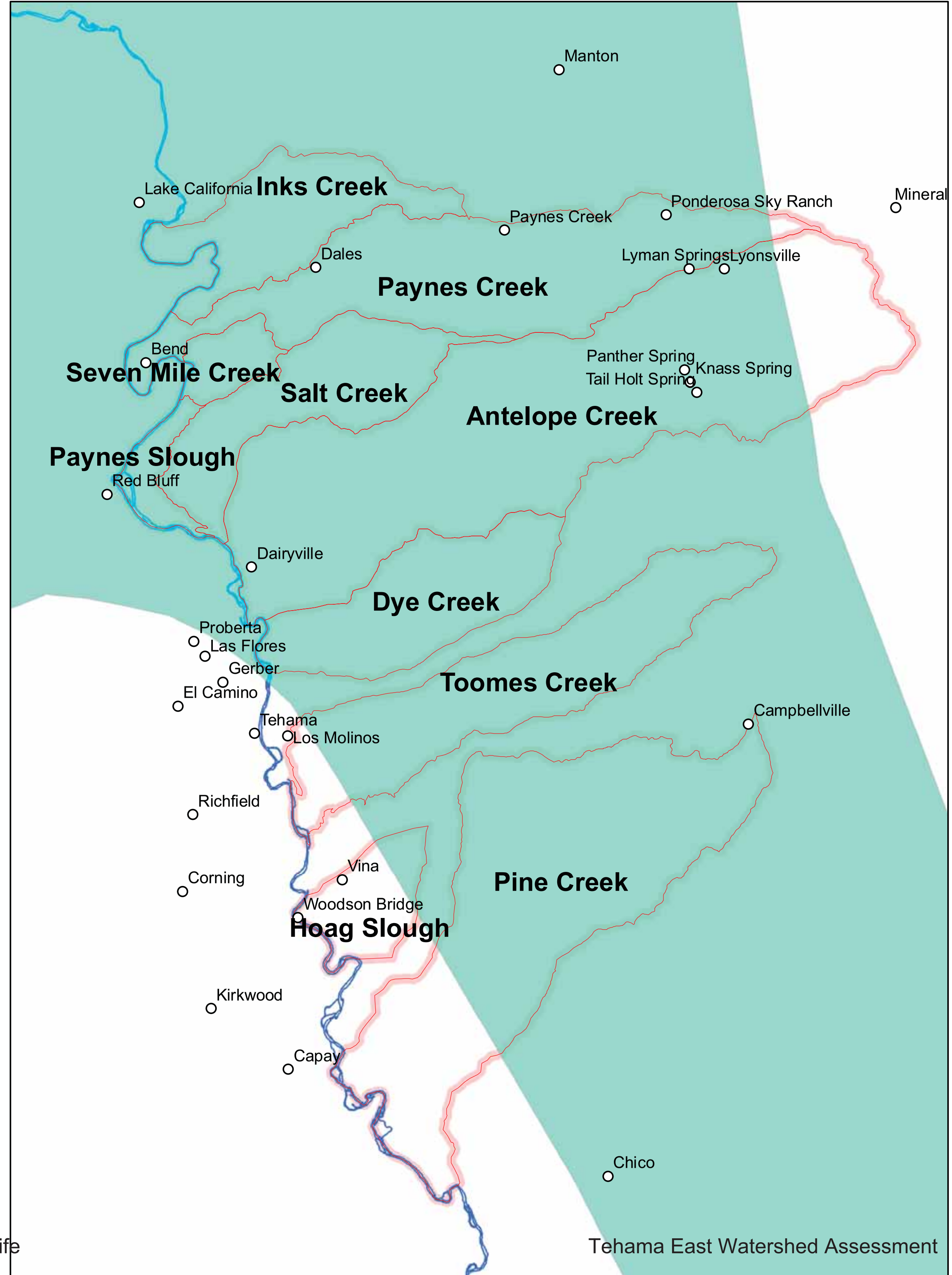
Winter

Watershed Boundary

N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles



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KEY

ROCK WREN
(SALPINCTES OBSOLETUS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N S E W

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles

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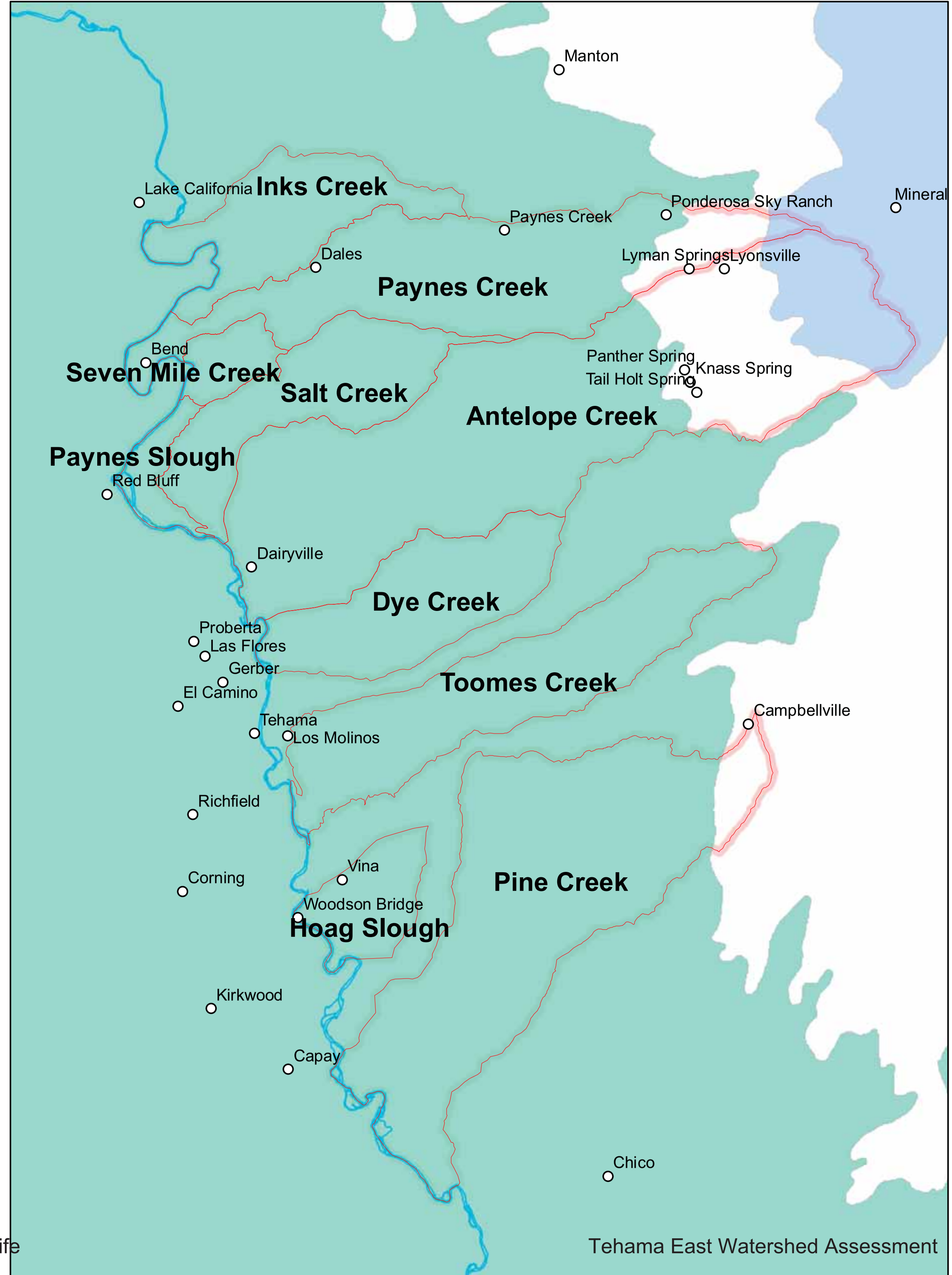
California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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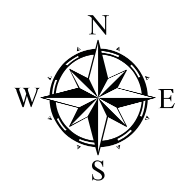
KEY

RED-SHOULDERED HAWK
(BUTEO LINEATUS)

SEASON

Summer
Year Round
Winter
Watershed Boundary



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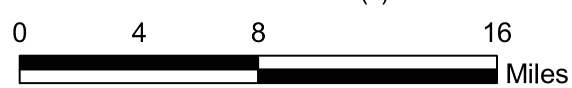
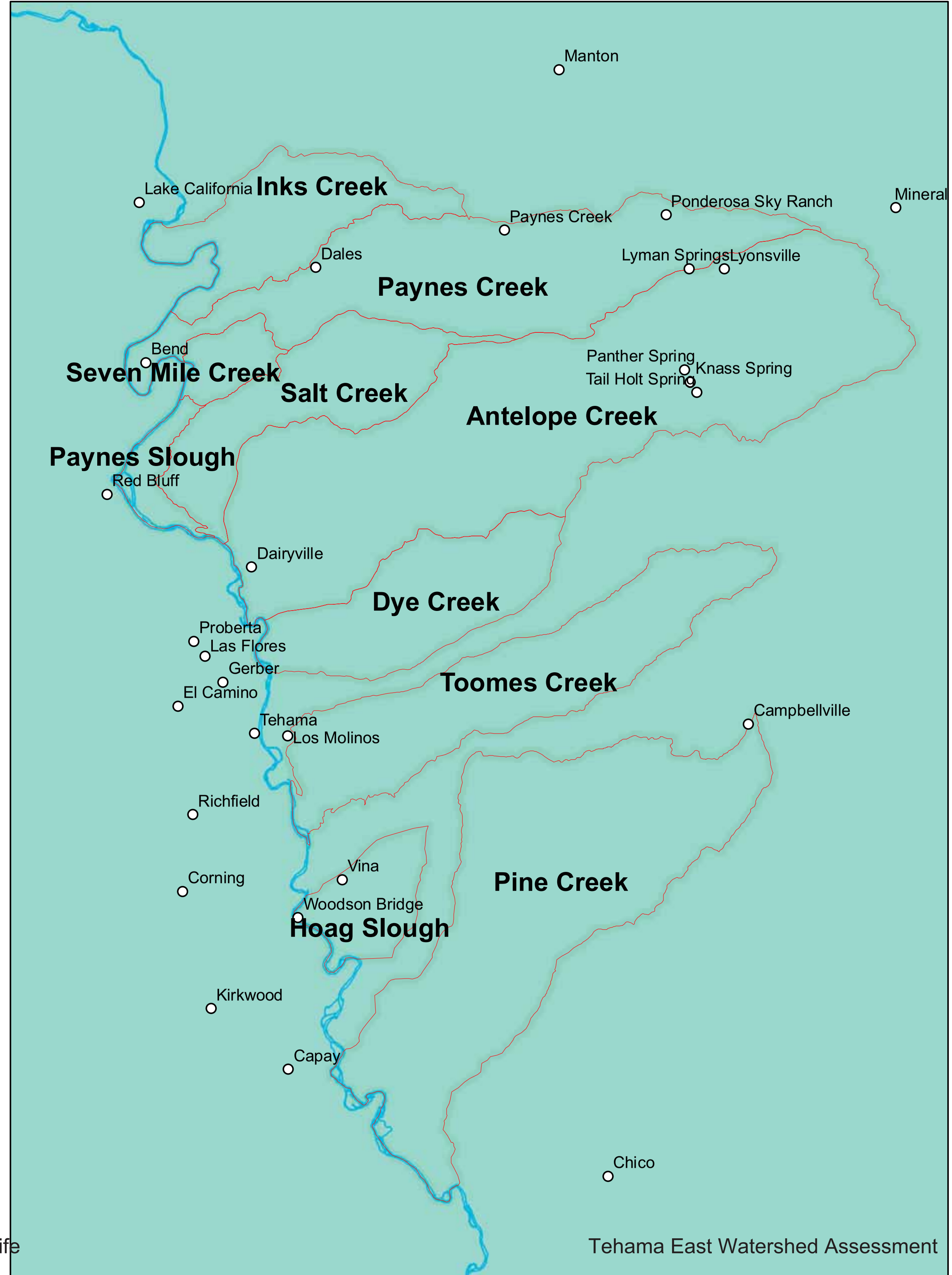
Conservation District
(c) 2010





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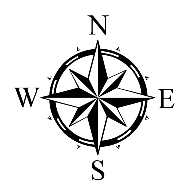
KEY

RED-TAILED HAWK
(BUTEO JAMAICENSIS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



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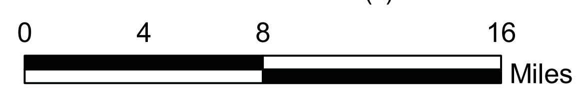
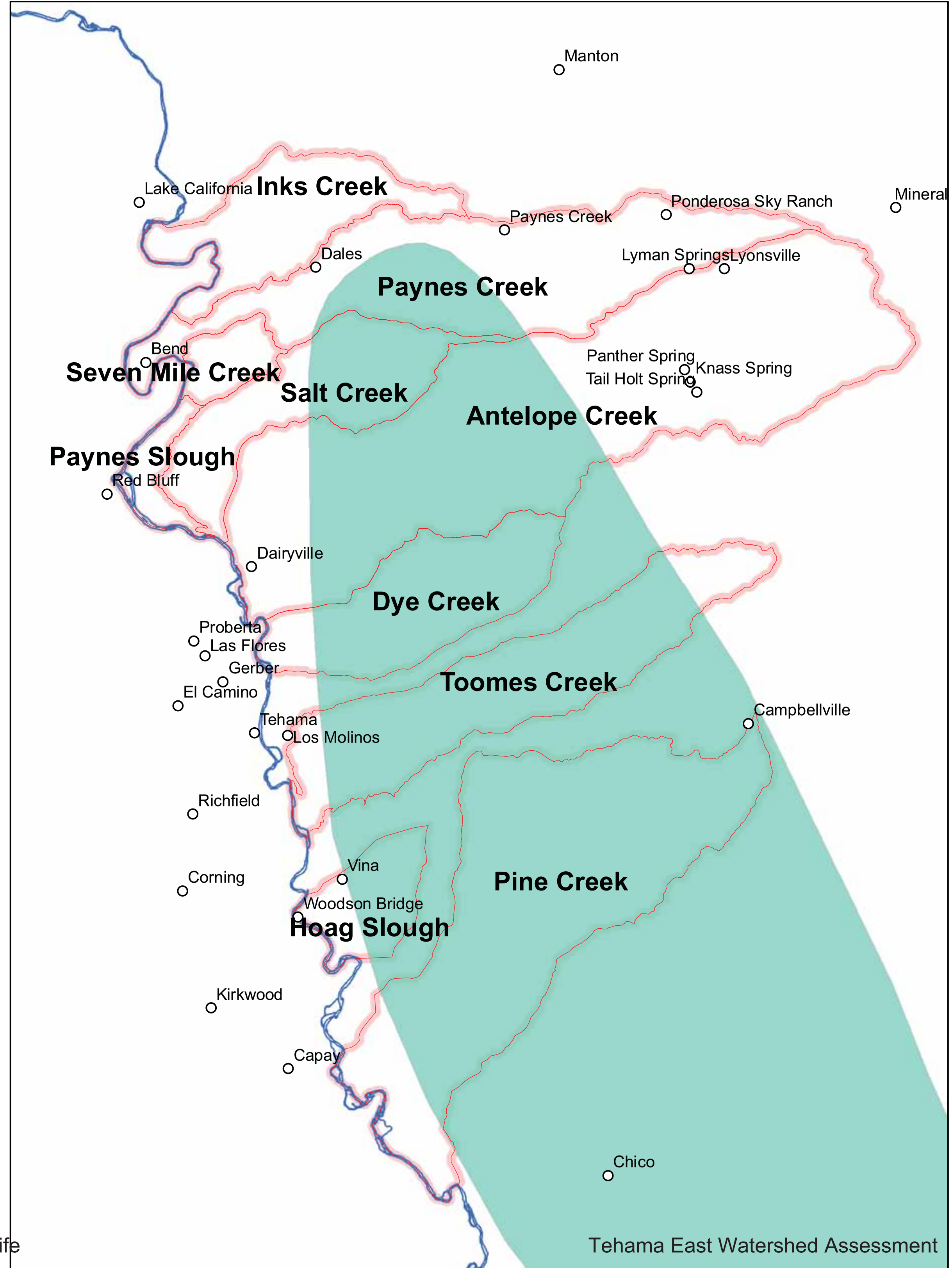
Conservation District
(c) 2010



Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

RUFOUS-CROWNED SPARROW
(AIMOPHILA RUFICEPS)

SEASON
- Summer
- Year Round
- Winter
- Watershed Boundary

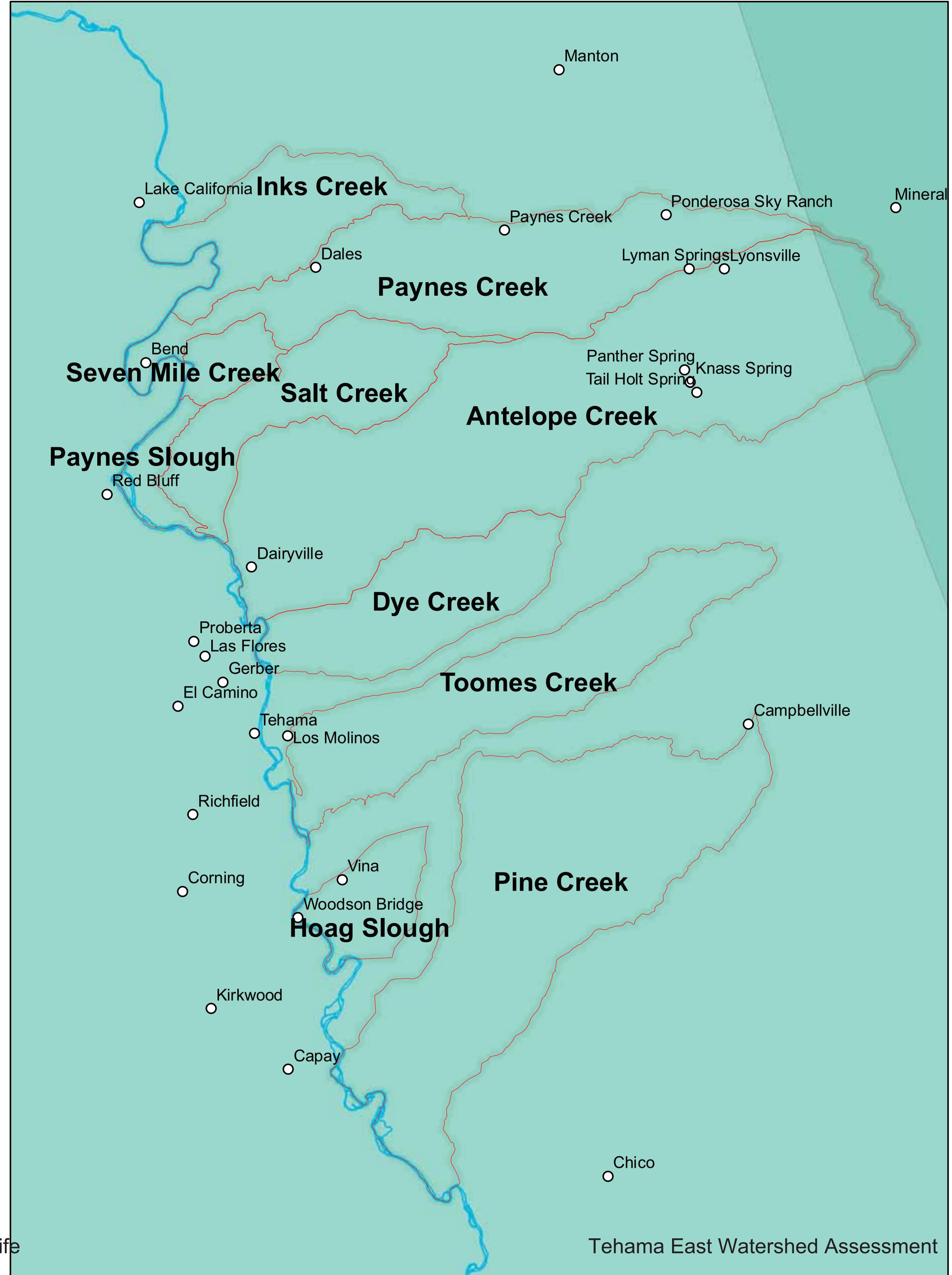
N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

RUFOUS-SIDED TOWHEE
(PIPILO ERYTHROPHTHALMUS)

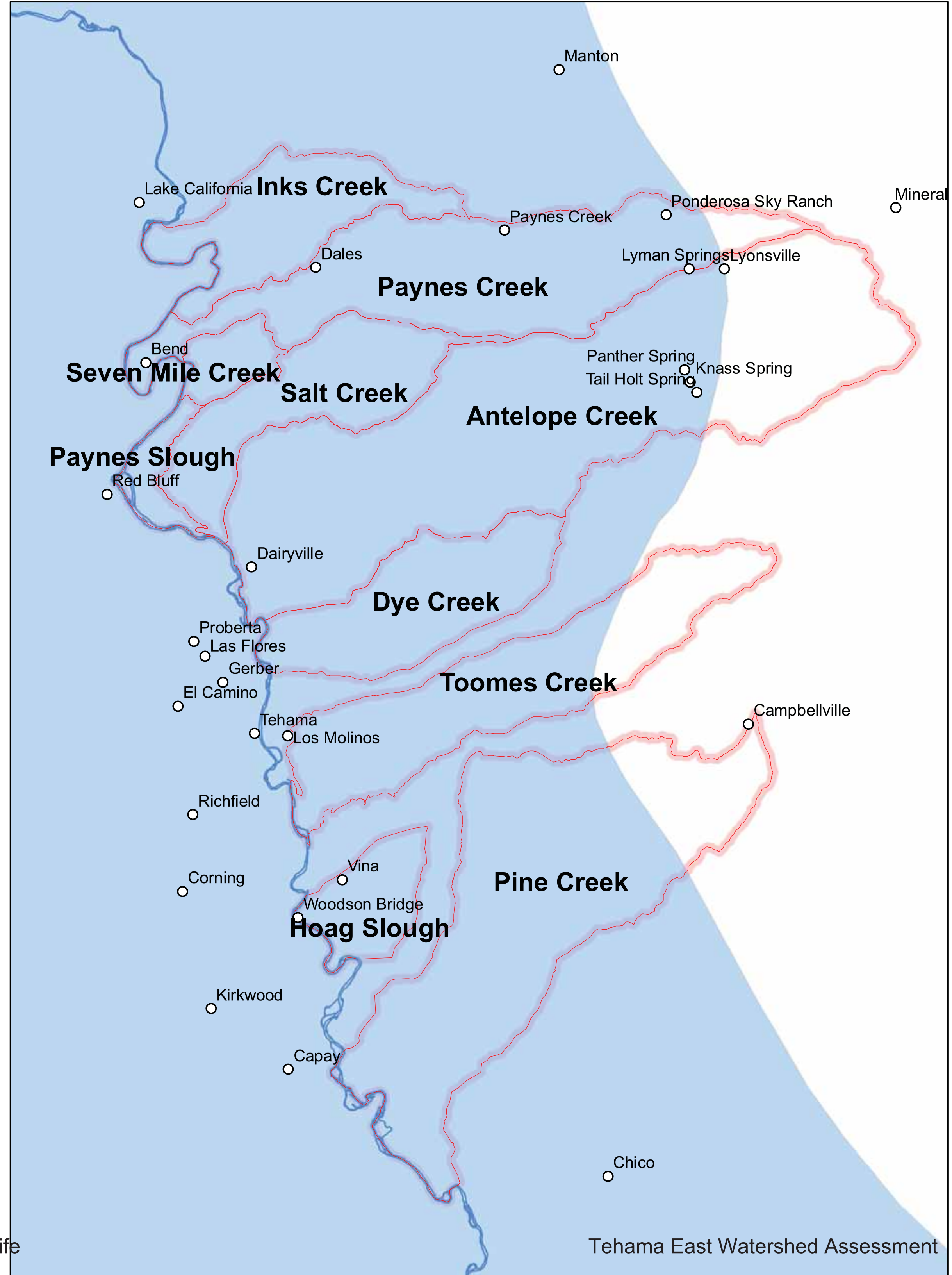
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

Tehama County Resource
Conservation District
(c) 2010

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

SAVANNAH SPARROW
(PASSERCULUS SANDWICHENSIS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

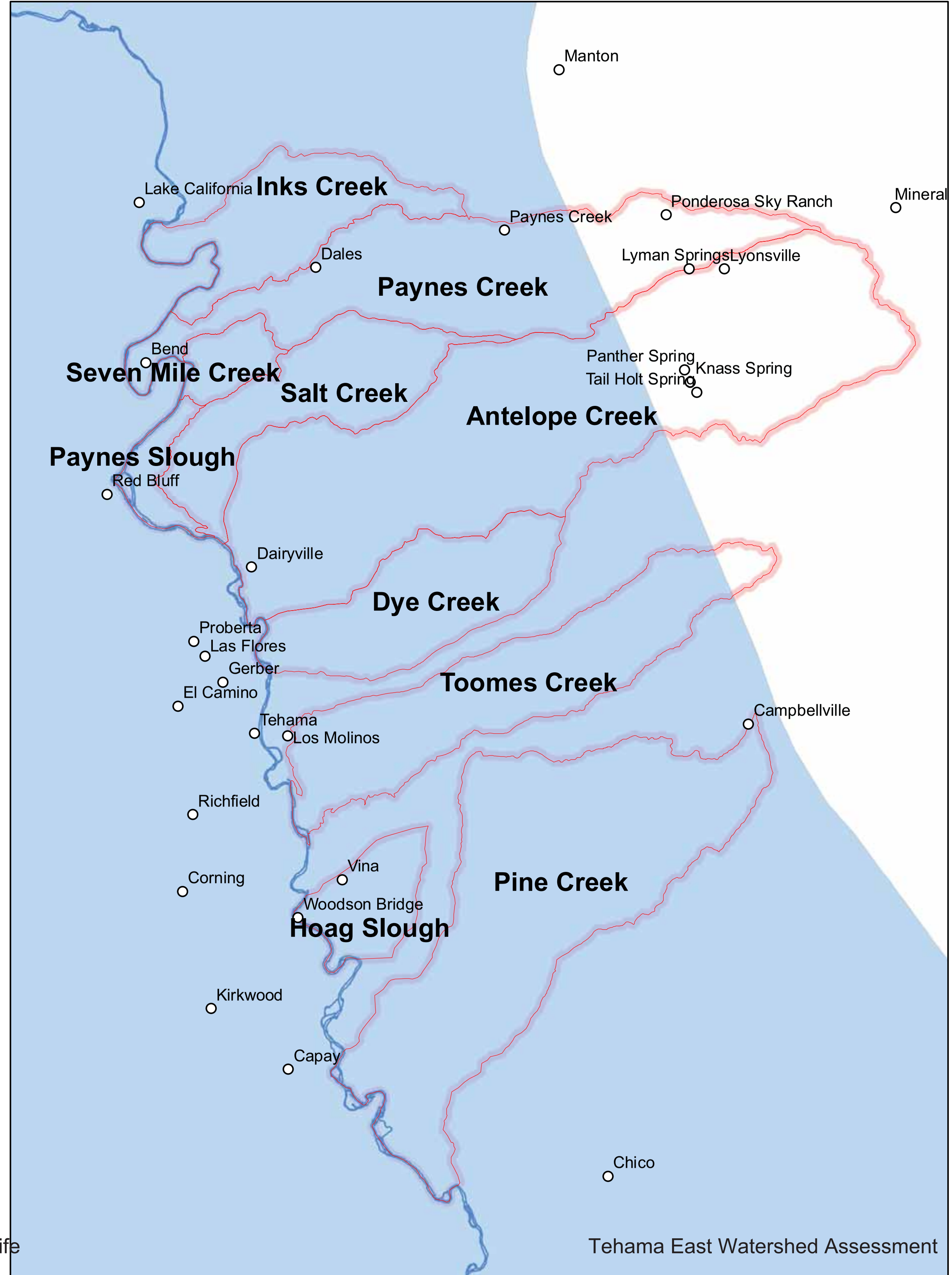
N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds



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Quoted from:
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KEY

SAY'S PHOEBE
(SAYORNIS SAYA)

SEASON

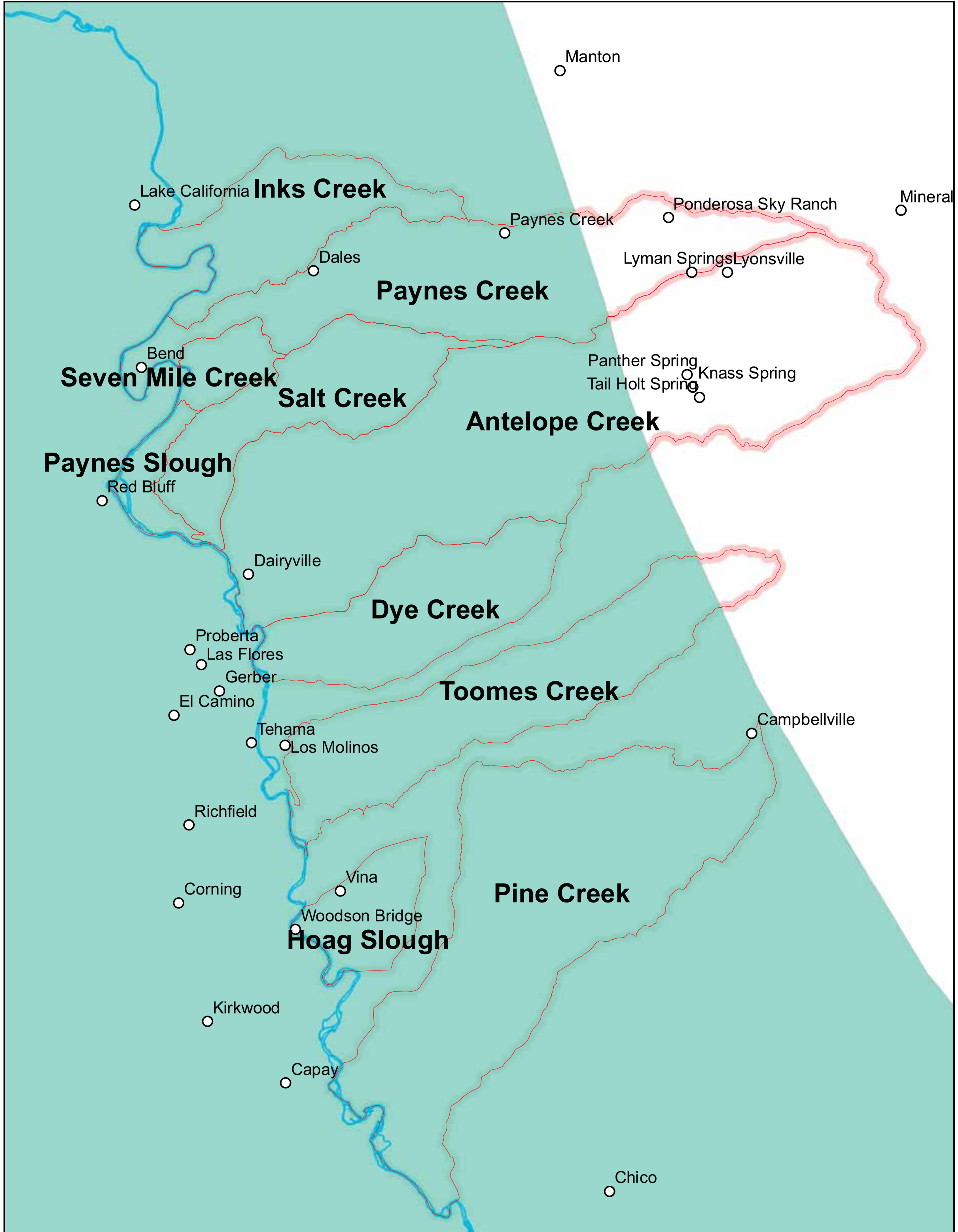
- Summer
- Year Round
- Winter
- Watershed Boundary

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

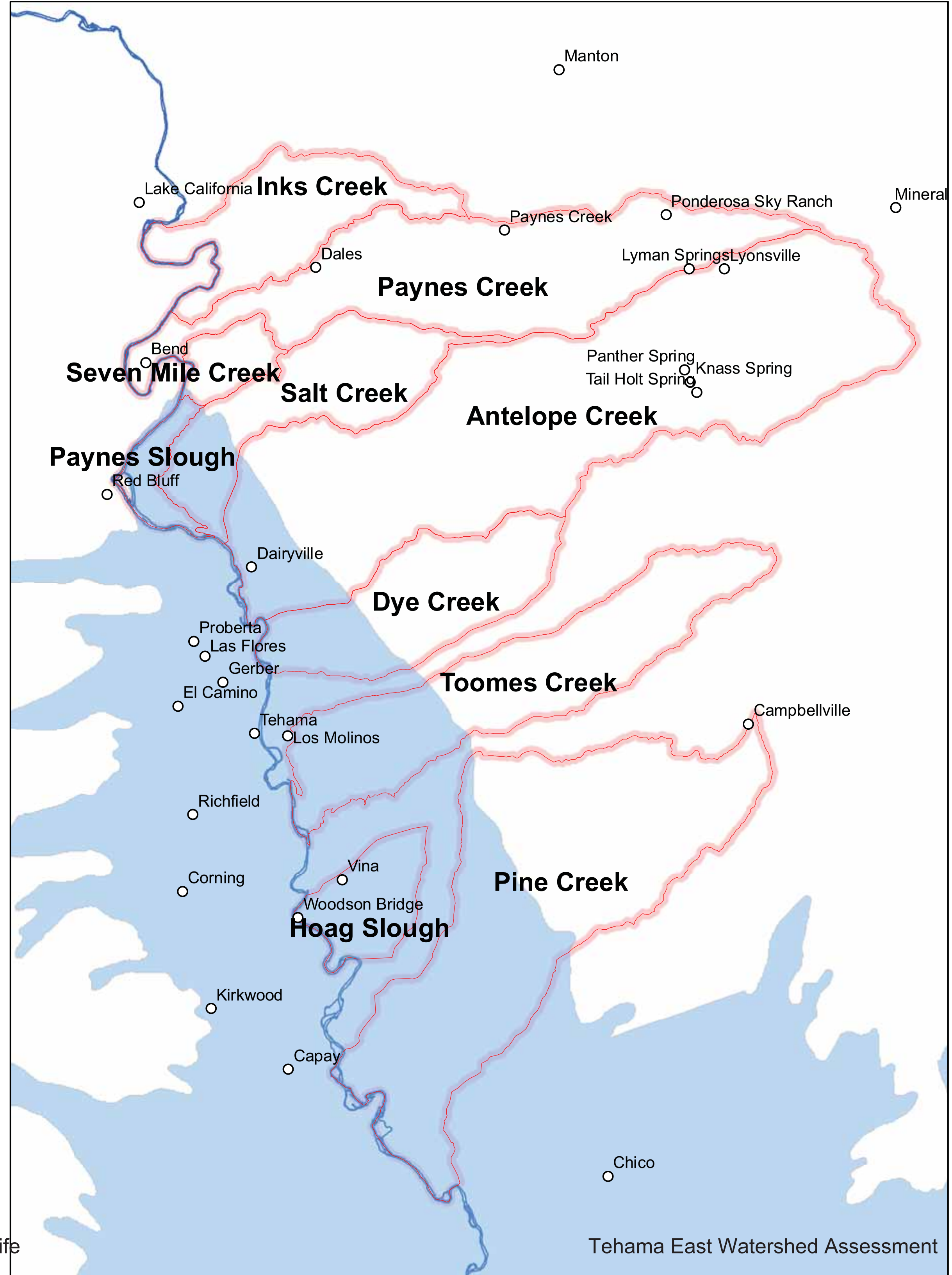
SCRUB JAY
(APHELOCOMA COERULESCENS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles



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California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

SHORT-EARED OWL
(ASIO FLAMMEUS)

SEASON

Summer

Year Round

Winter

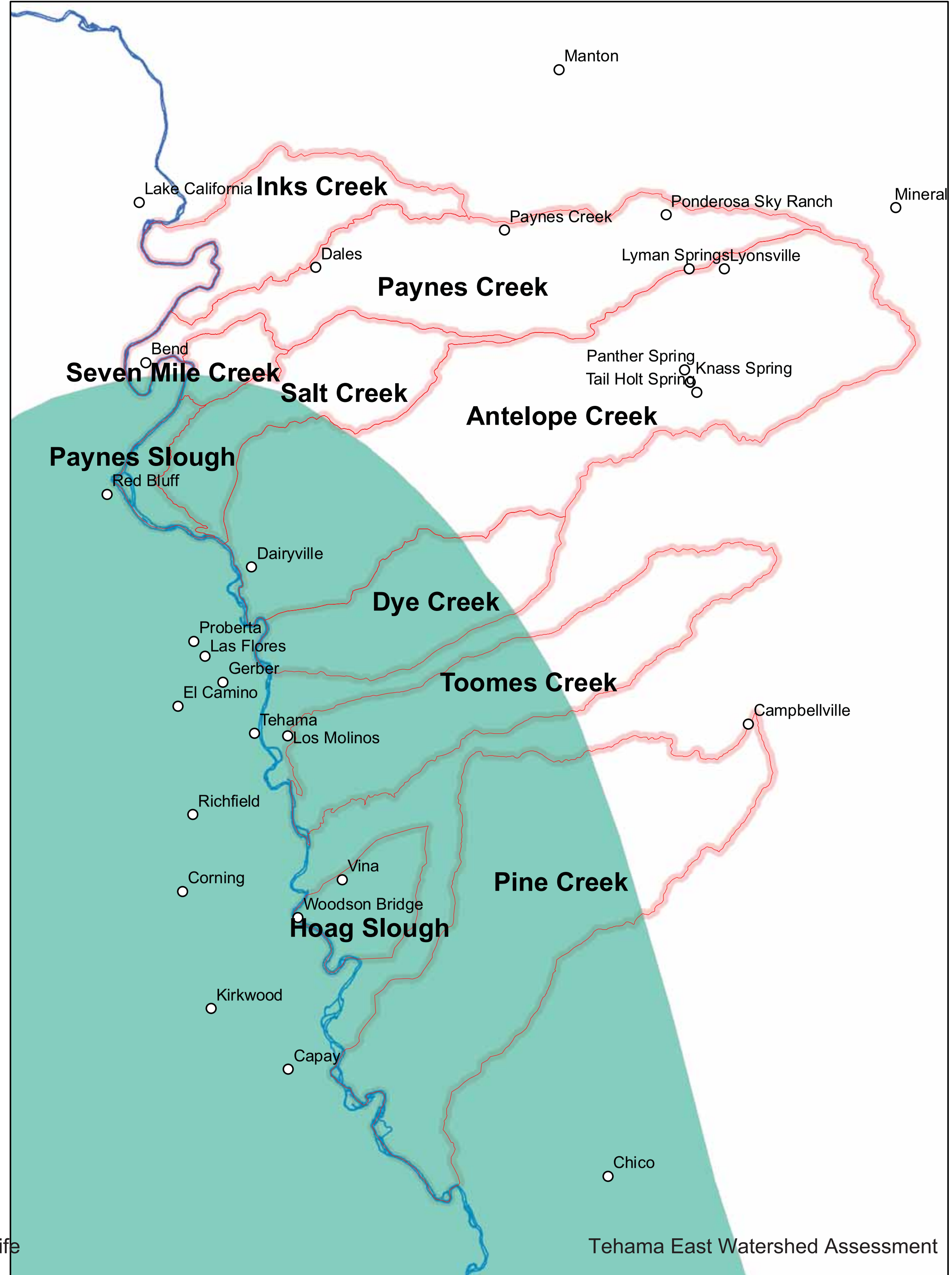
Watershed Boundary

N W E S

TCRCD

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles



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Tehama East Watersheds

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KEY

SWAINSON'S HAWK
(BUTEO SWAINSONI)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

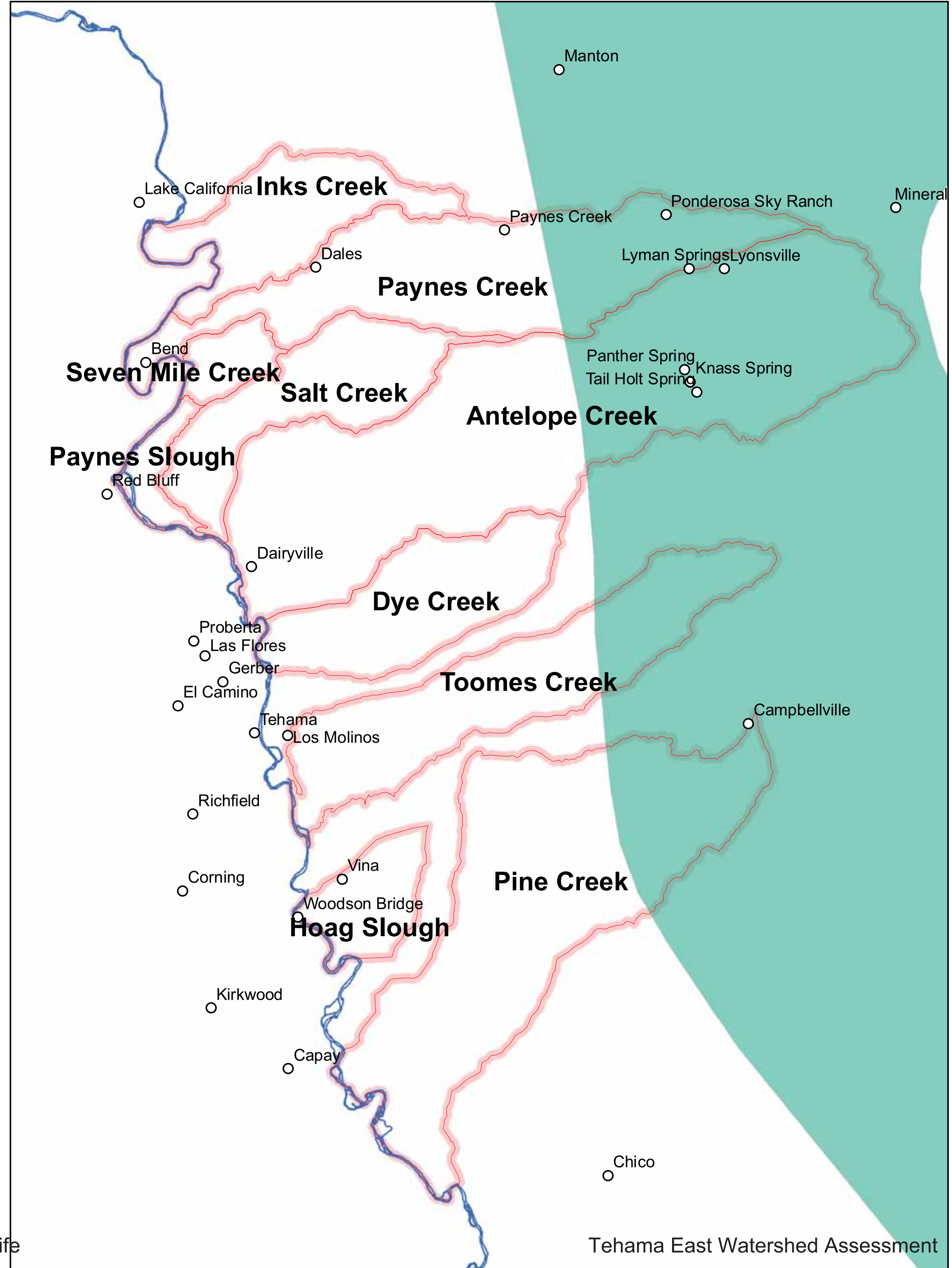
N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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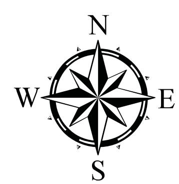
KEY

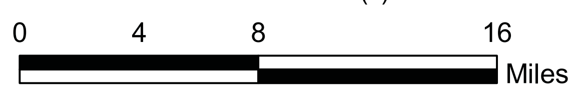
SONG SPARROW
(MELOSPIZA MELODIA)

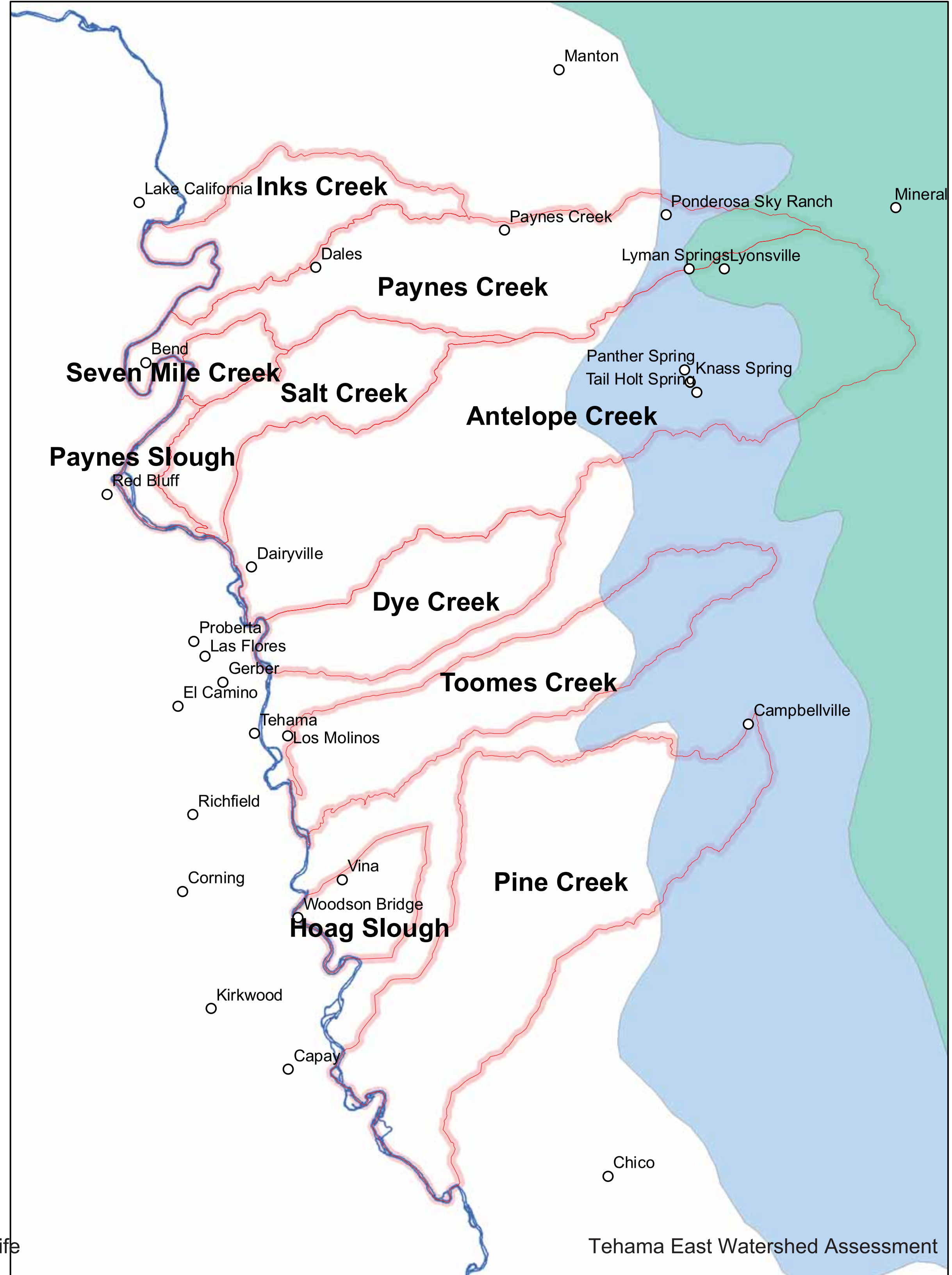
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



Tehama County Resource
Conservation District
(c) 2010





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Quoted from:
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KEY

SPOTTED OWL
(STRIX OCCIDENTALIS)

SEASON

Summer

Year Round

Winter

Watershed Boundary

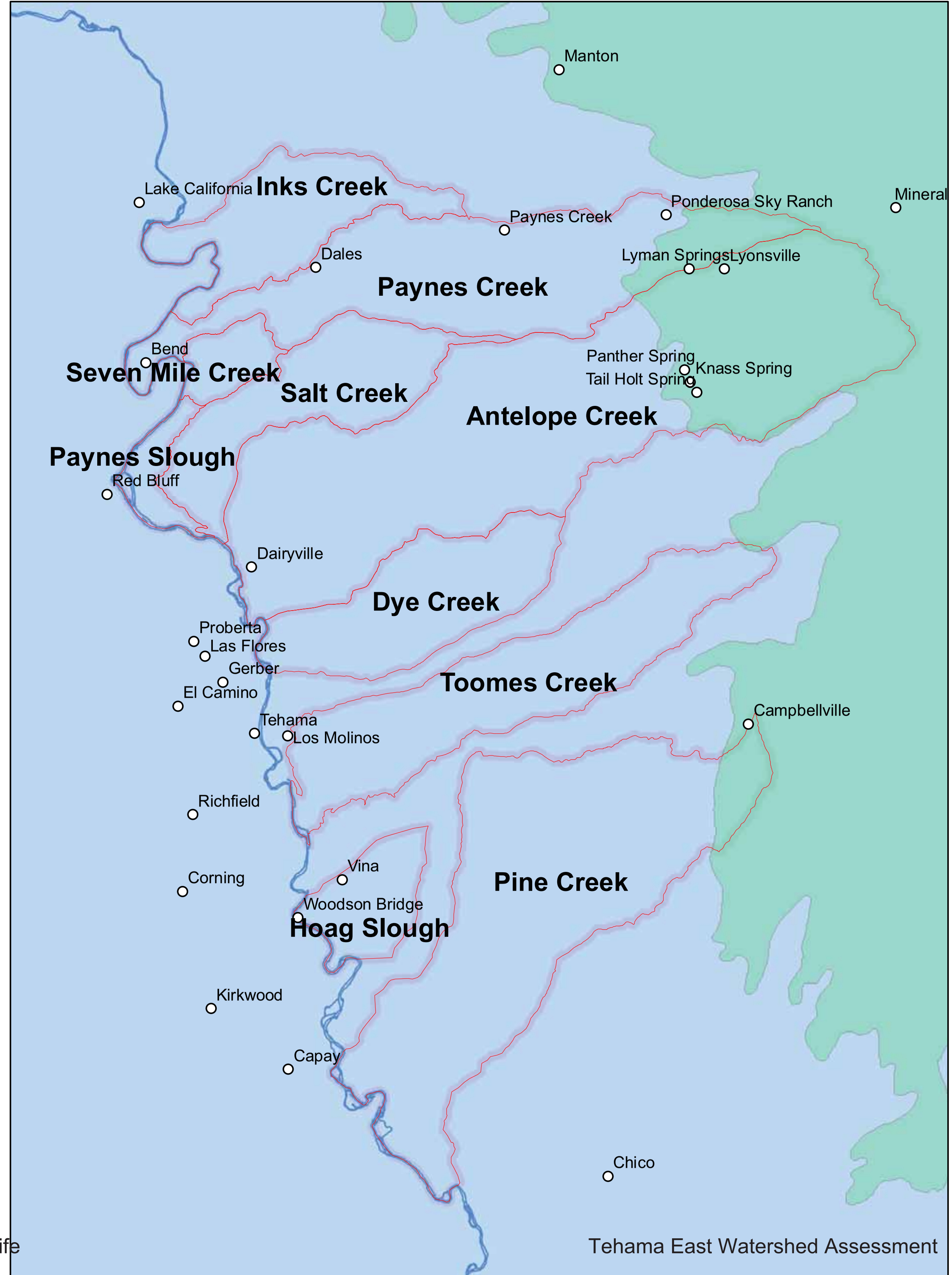
N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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Quoted from:
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KEY

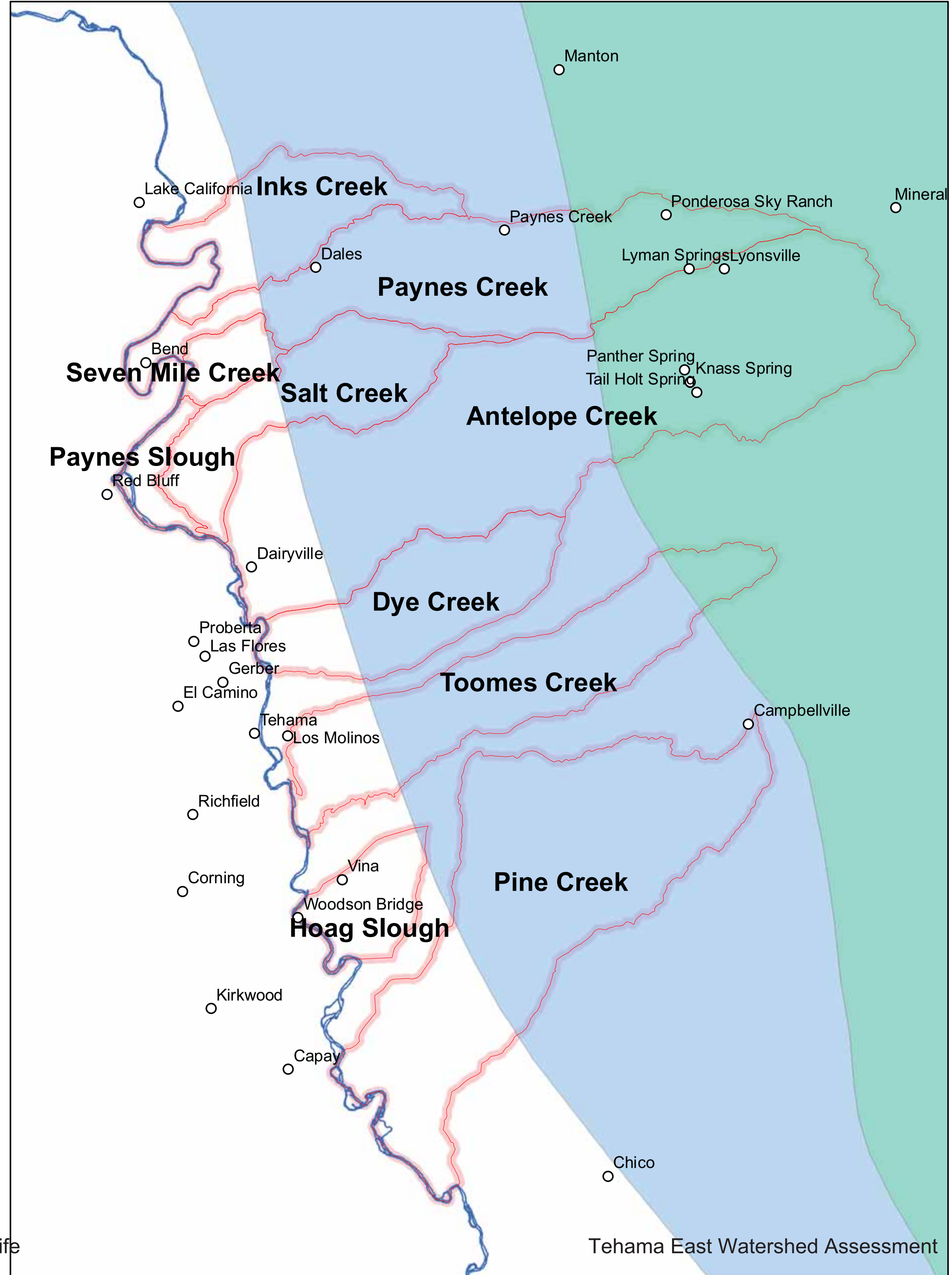
SHARP-SHINNED HAWK
(ACCIPITER STRIATUS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds

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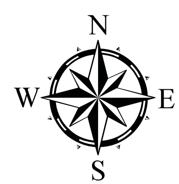
Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

STELLER'S JAY
(CYANOCITTA STELLERI)

SEASON

Summer
Year Round
Winter
Watershed Boundary

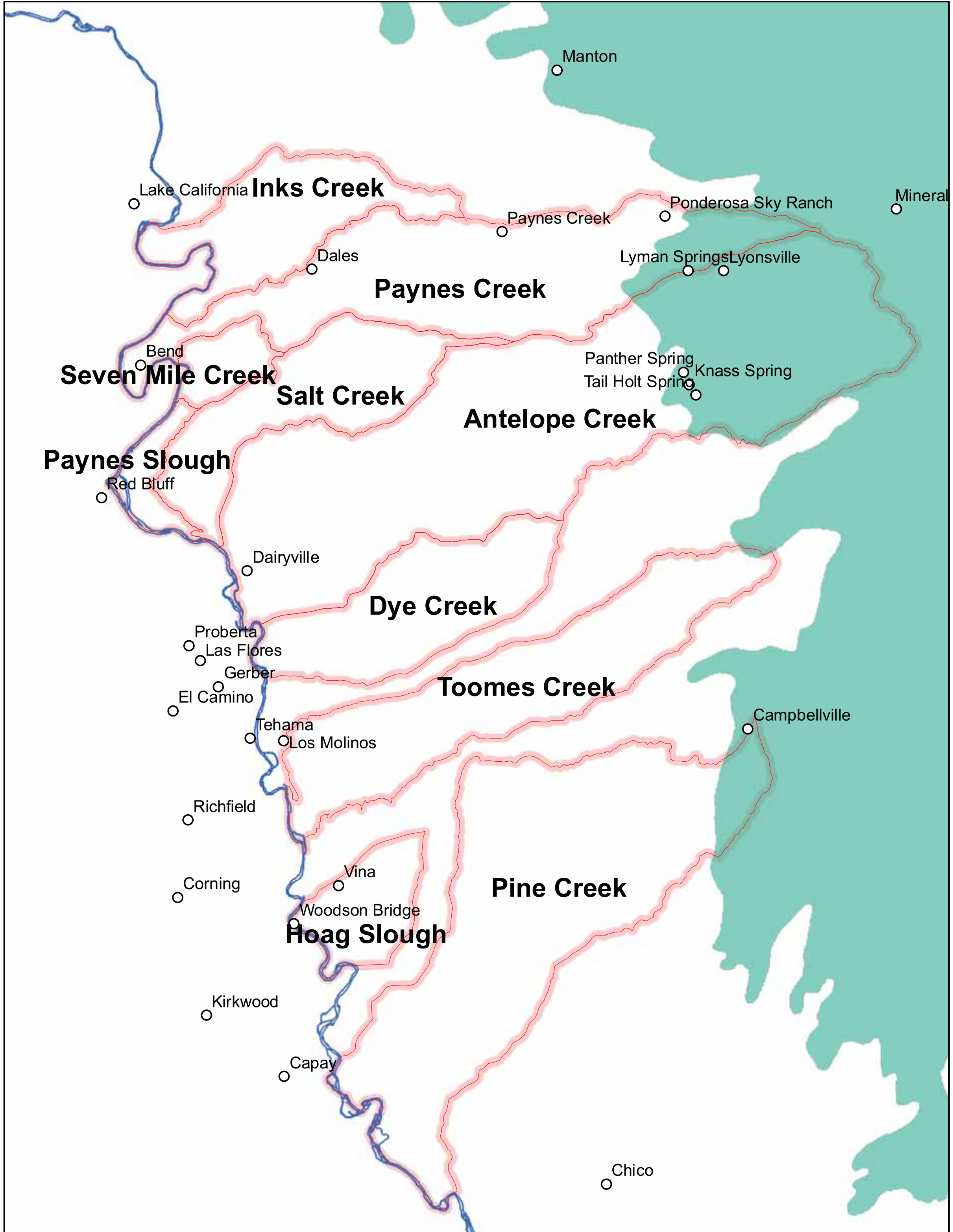


Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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KEY

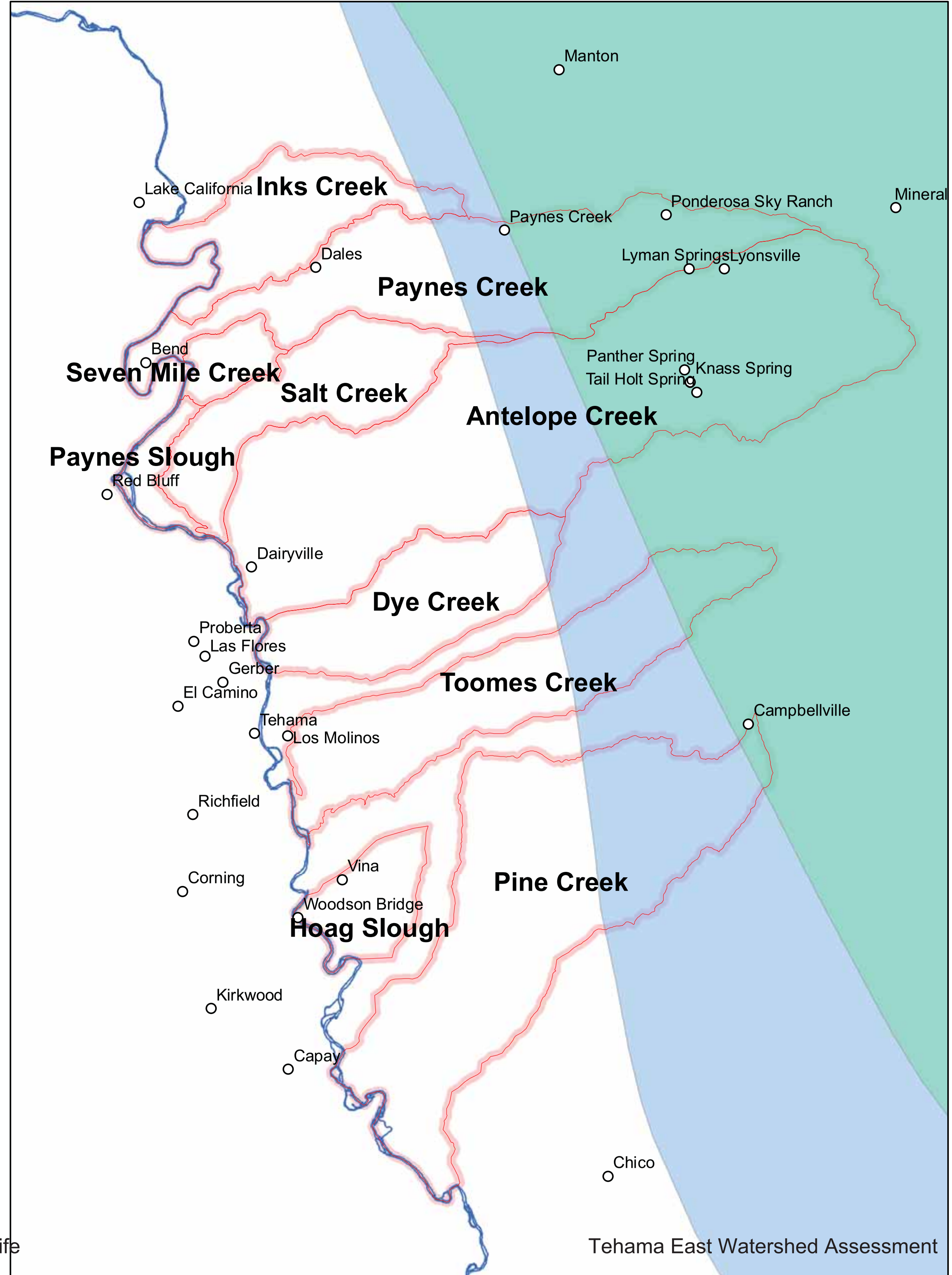
SWAINSON'S THRUSH
(CATHARUS USTULATUS)

SEASON
- Summer
- Year Round
- Winter
- Watershed Boundary

N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles



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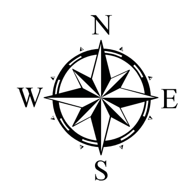
KEY

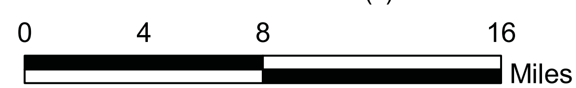
TOWNSEND'S SOLITAIRE
(MYADESTES TOWNSENDI)

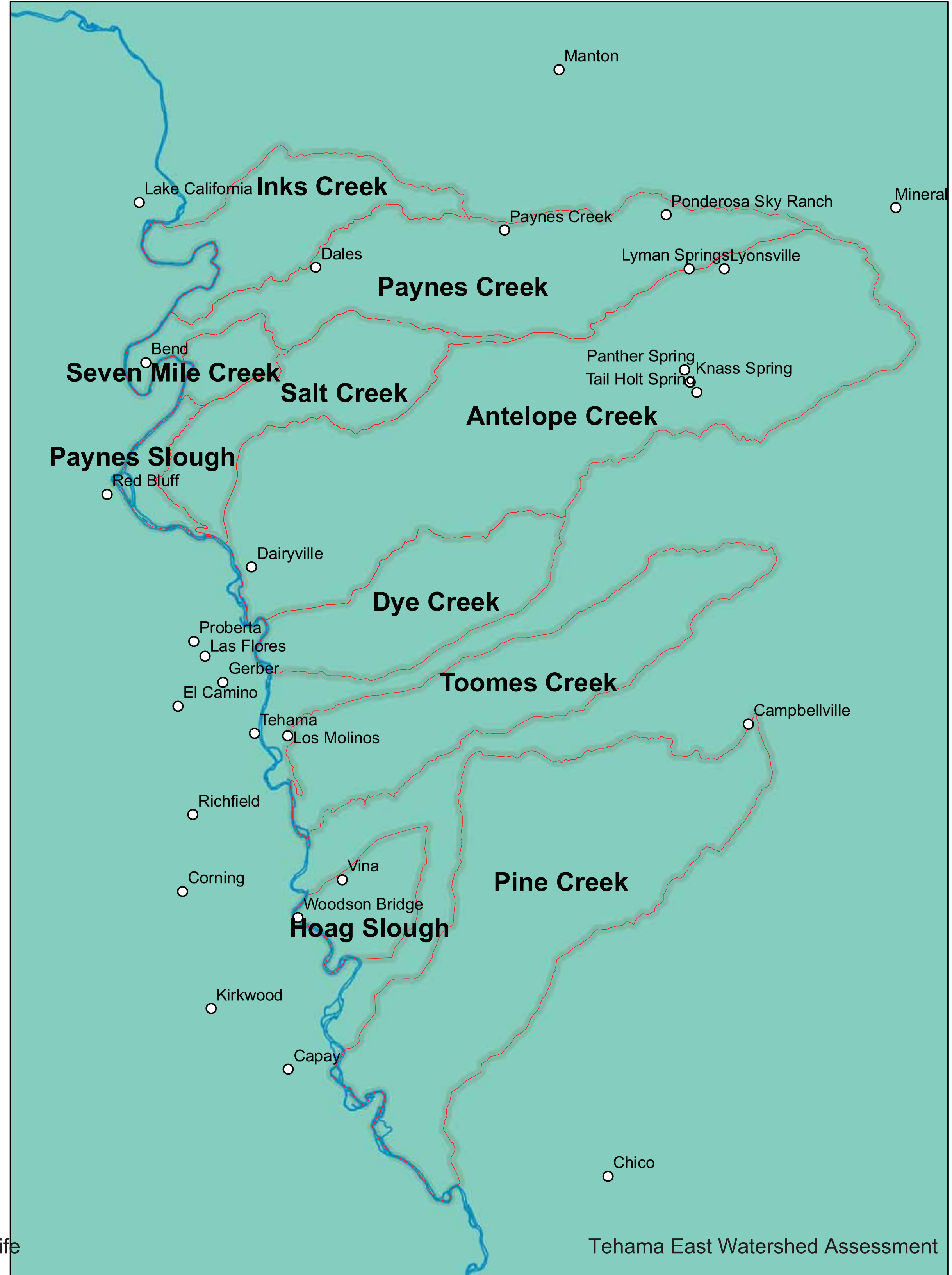
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



Tehama County Resource
Conservation District
(c) 2010





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KEY

TREE SWALLOW
(TACHYCINETA BICOLOR)

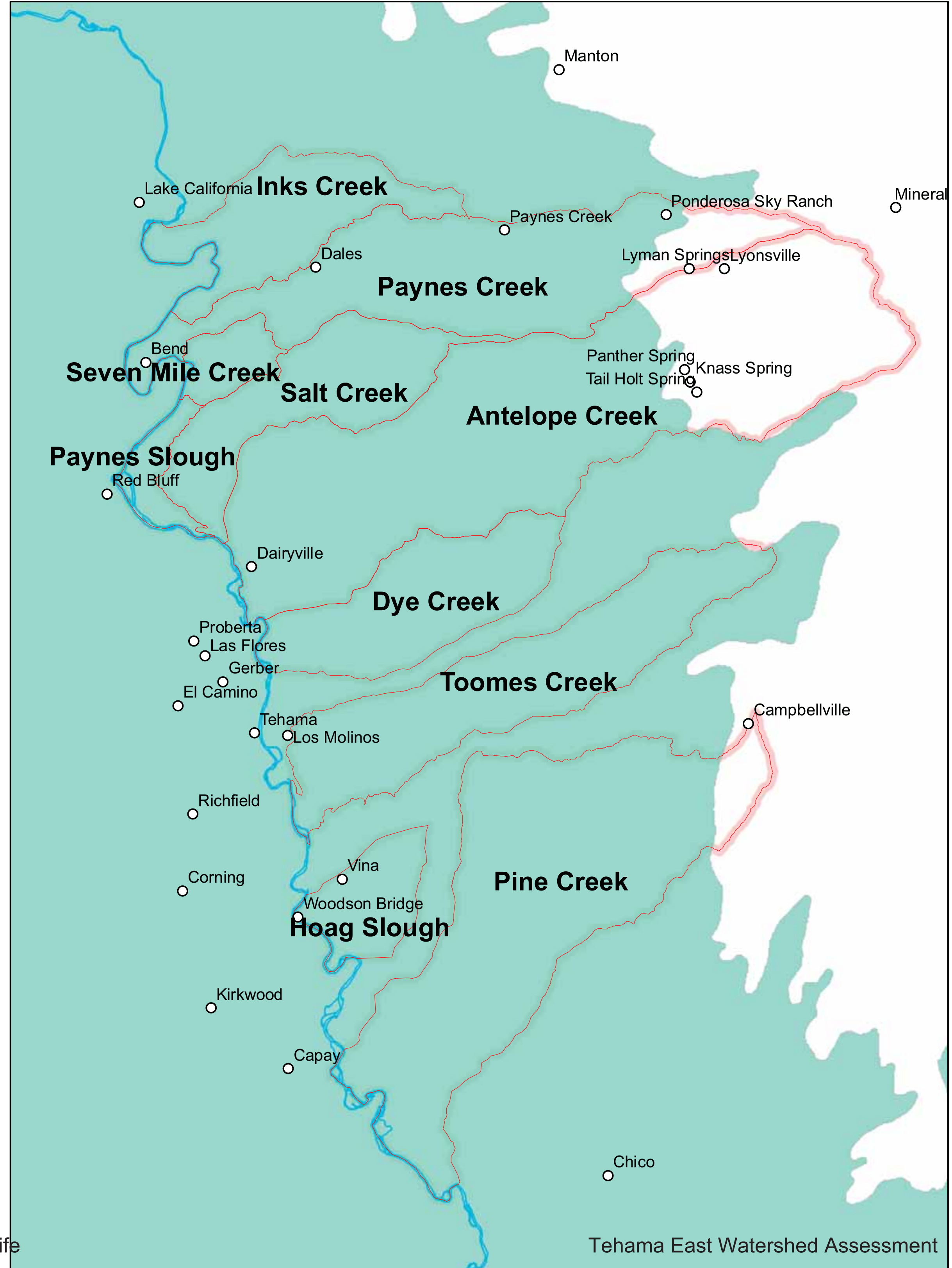
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles



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Tehama East Watersheds

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KEY

TRICOLORED BLACKBIRD
(AGELAIUS TRICOLOR)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

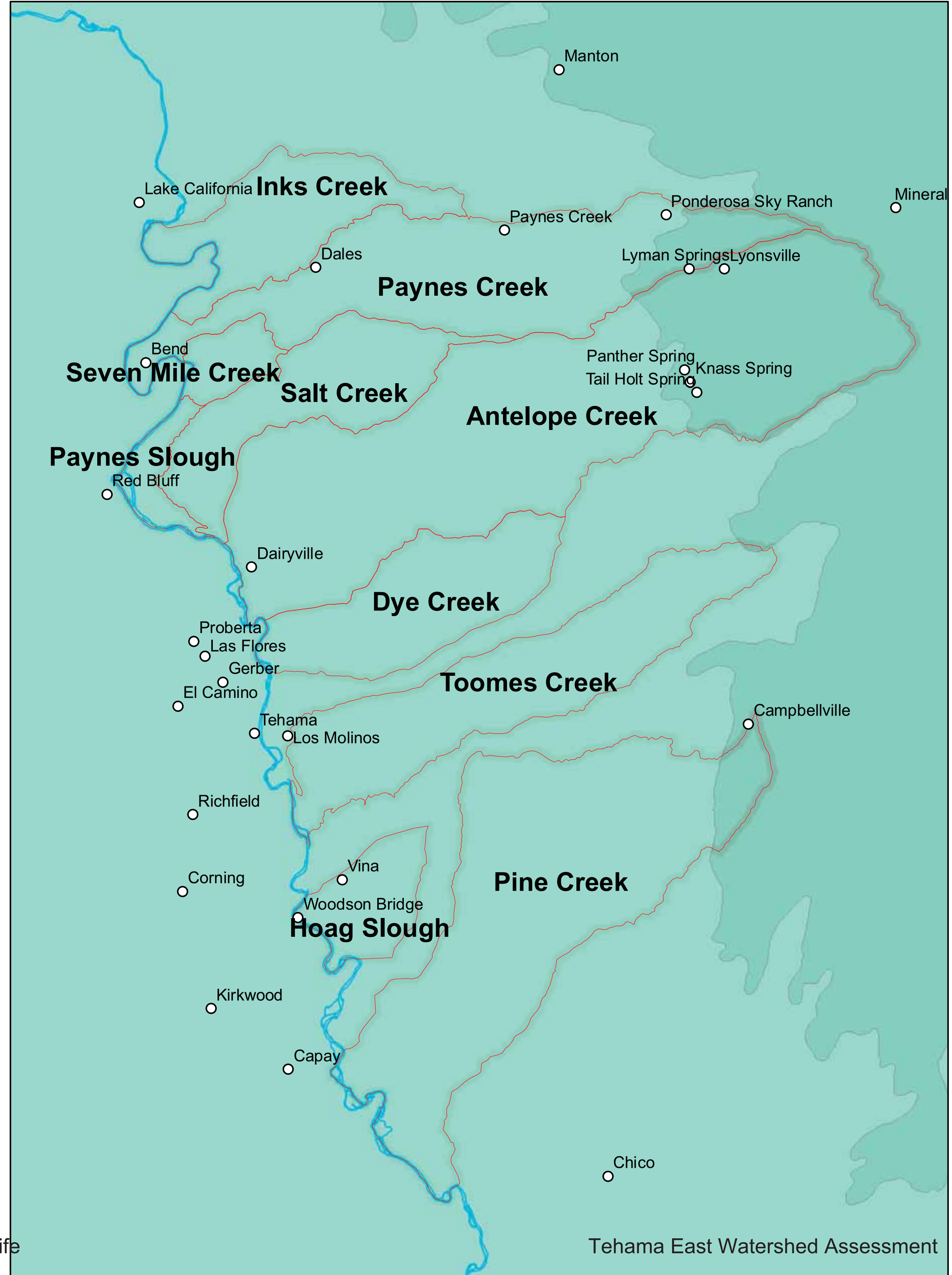
N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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Quoted from:
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KEY

TURKEY VULTURE
(CATHARTES AURA)

SEASON

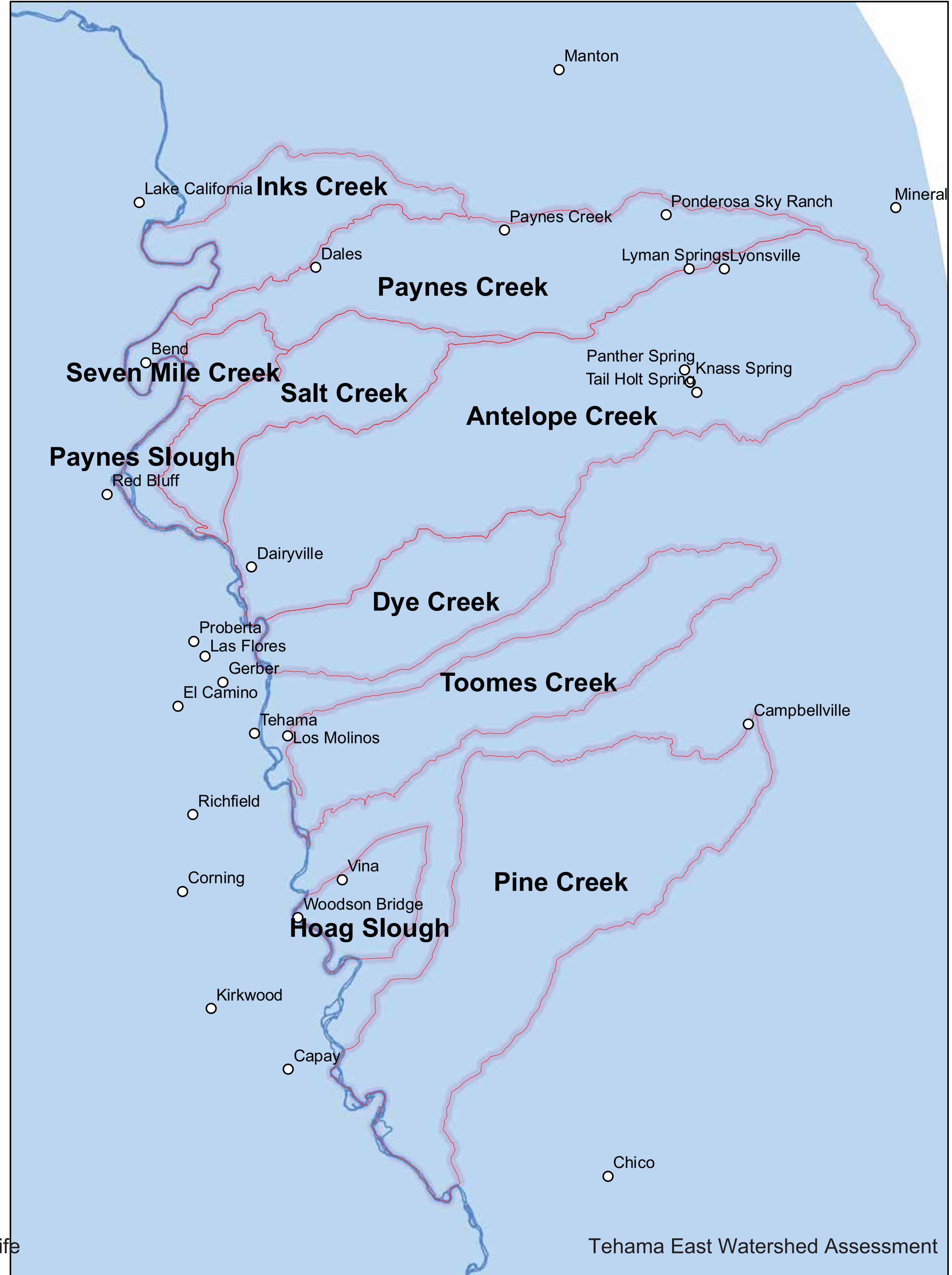
- Summer
- Year Round

Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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Quoted from:
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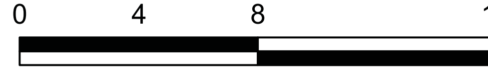
KEY

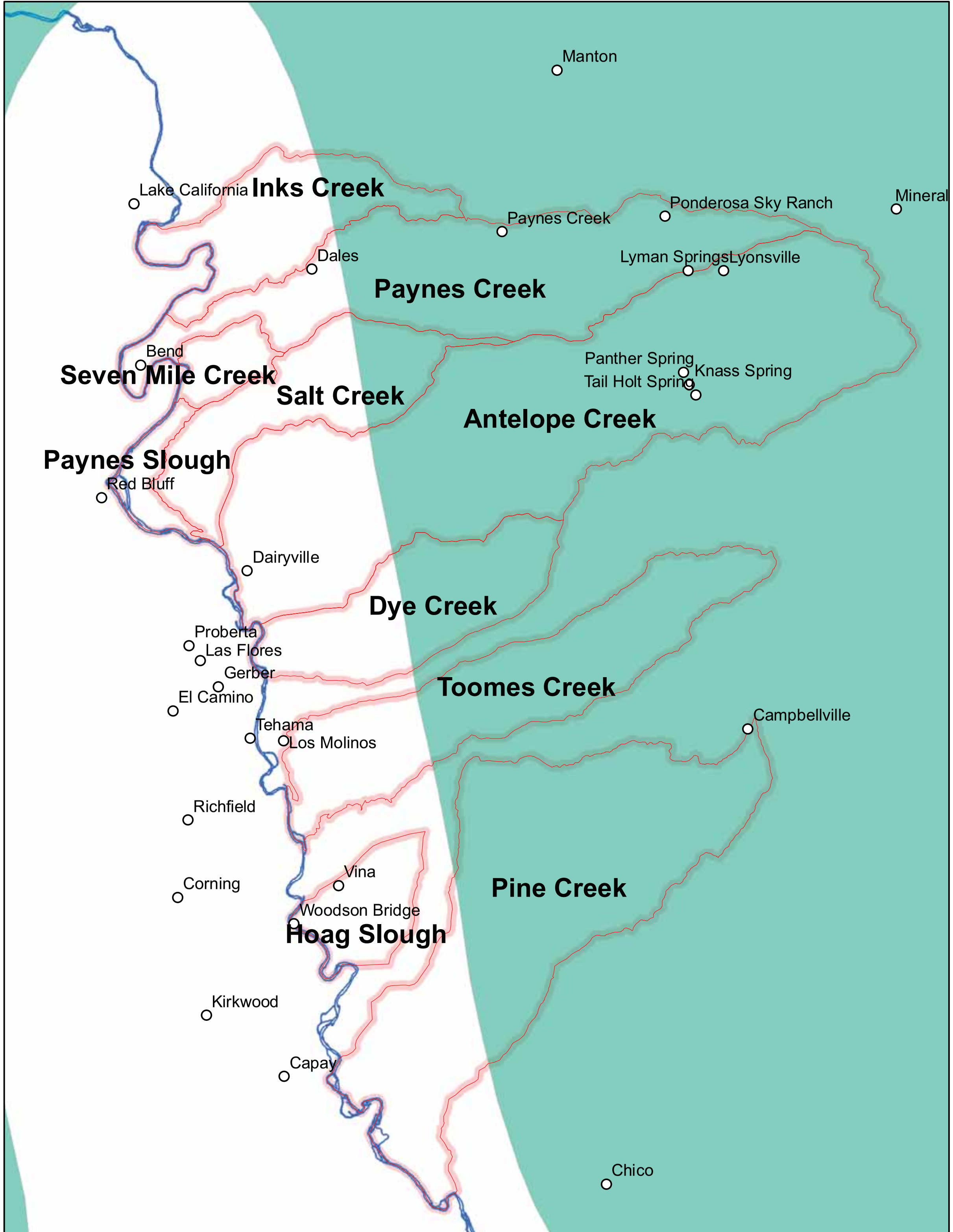
VARIED THRUSH
(IXOREUS NAEVIUS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

Tehama County Resource
Conservation District
(c) 2010





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KEY

VIOLET-GREEN SWALLOW
(TACHYCINETA THALASSINA)

SEASON

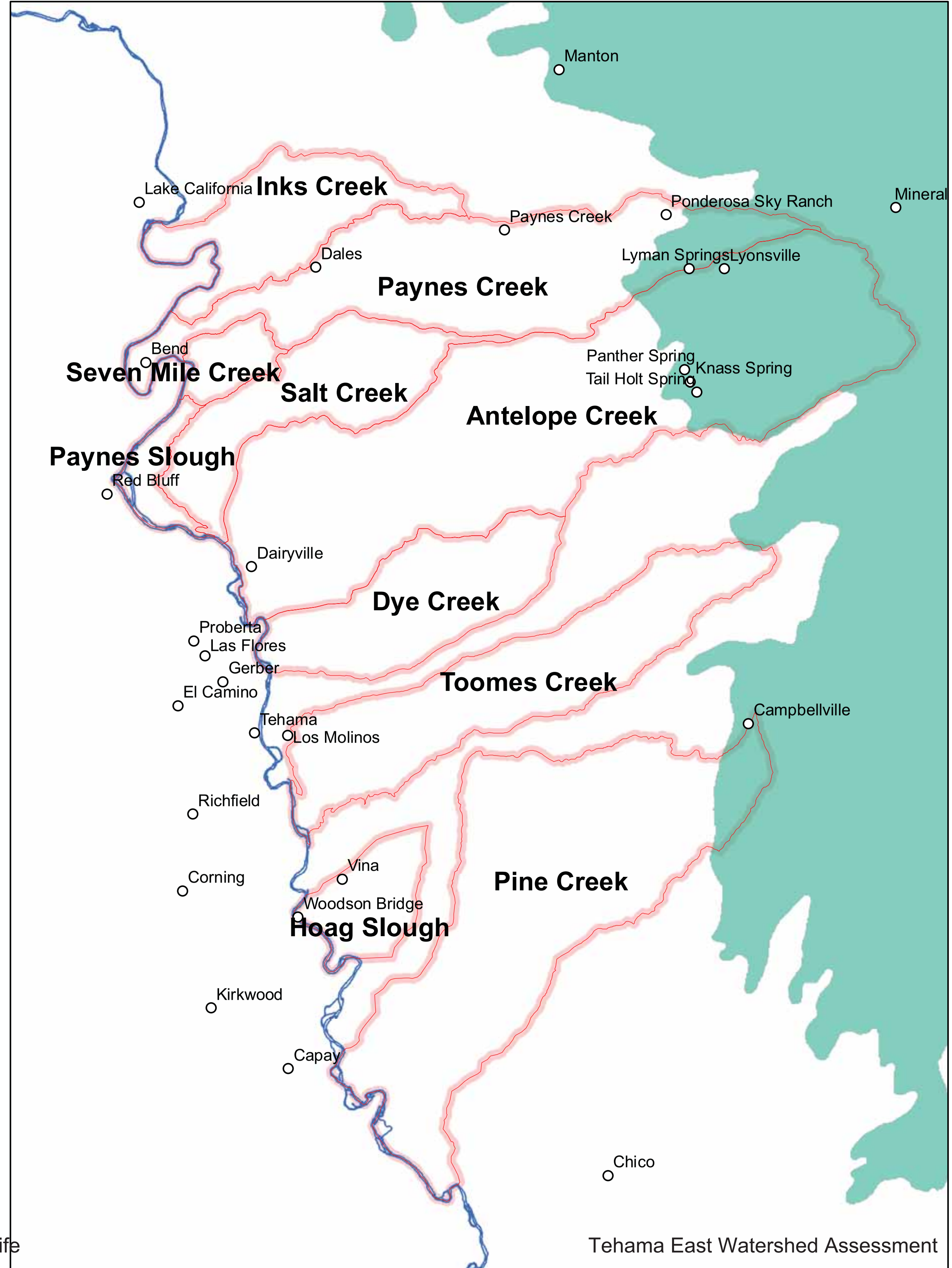
- Summer
- Year Round
- Winter

Watershed Boundary

N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16
Miles



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KEY

VAUX'S SWIFT
(CHAETURA VAUXI)

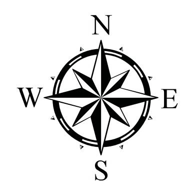
SEASON

Summer

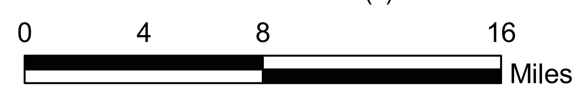
Year Round

Winter

Watershed Boundary



Tehama County Resource
Conservation District
(c) 2010



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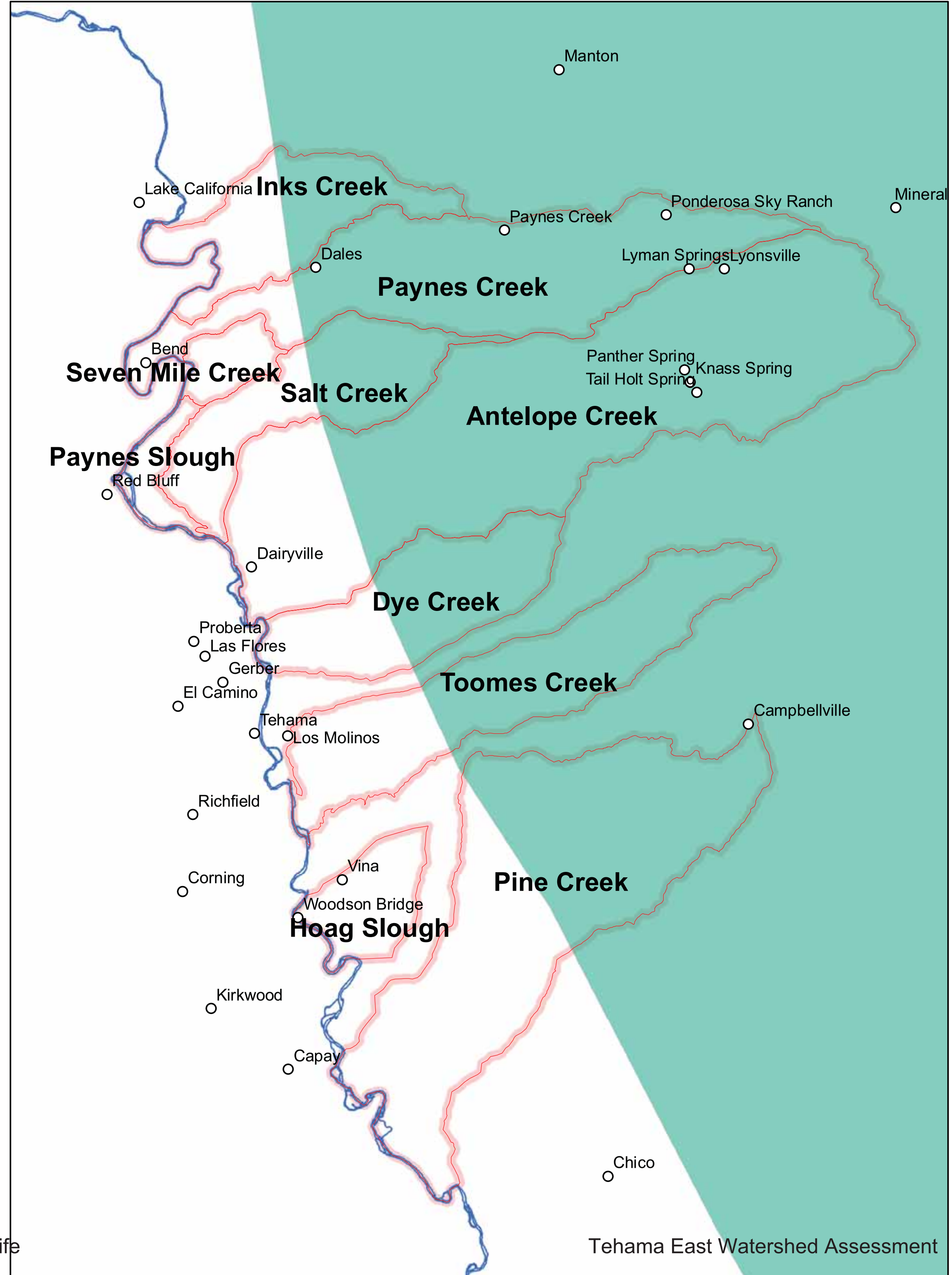
California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

WARBLING VIREO
(VIREO GILVUS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

WHITE-BREASTED NUTHATCH
(SITTA CAROLINENSIS)

SEASON

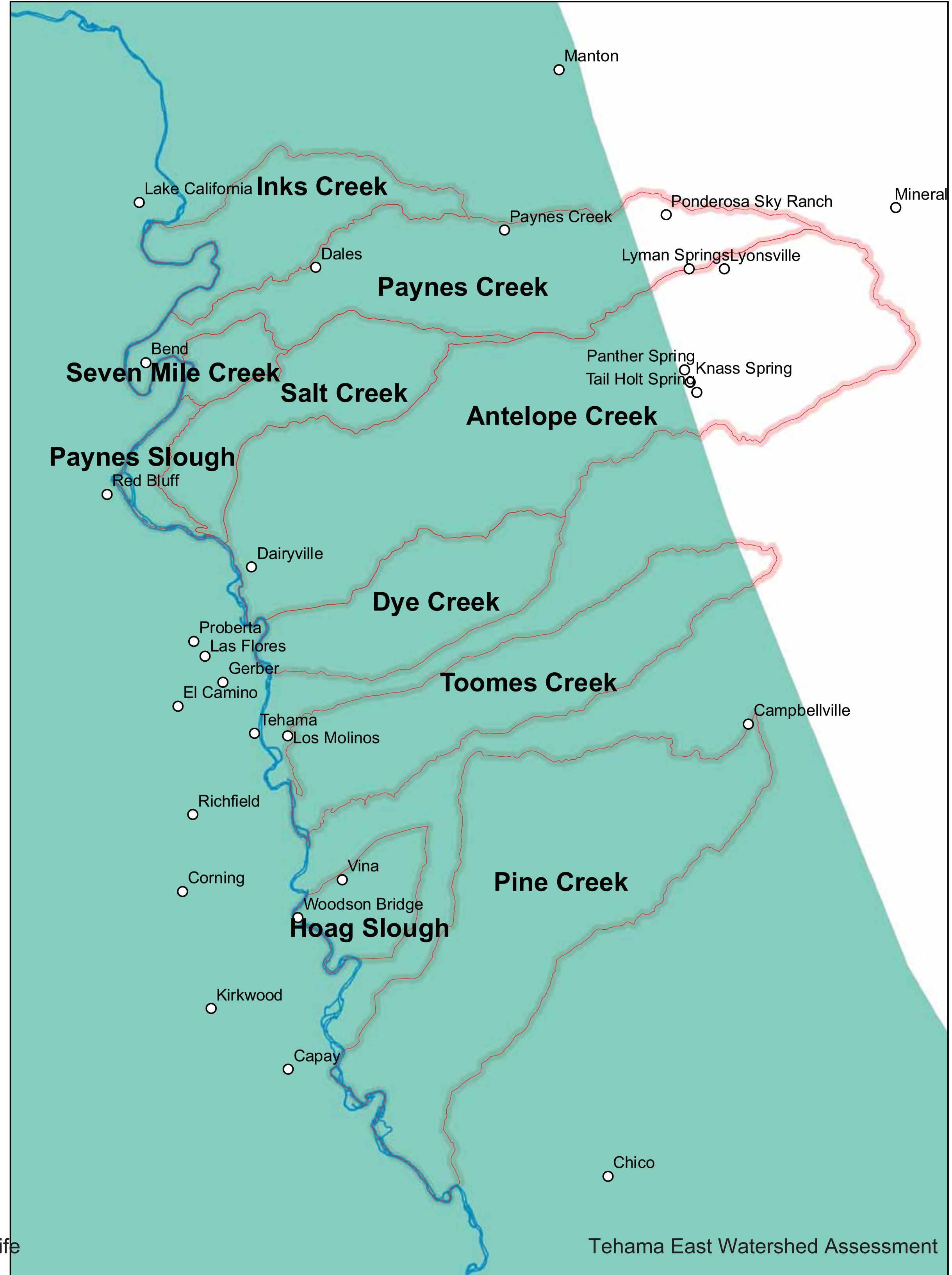
- Summer
- Year Round
- Winter
- Watershed Boundary

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds



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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

WESTERN KINGBIRD
(TYRANNUS VERTICALIS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

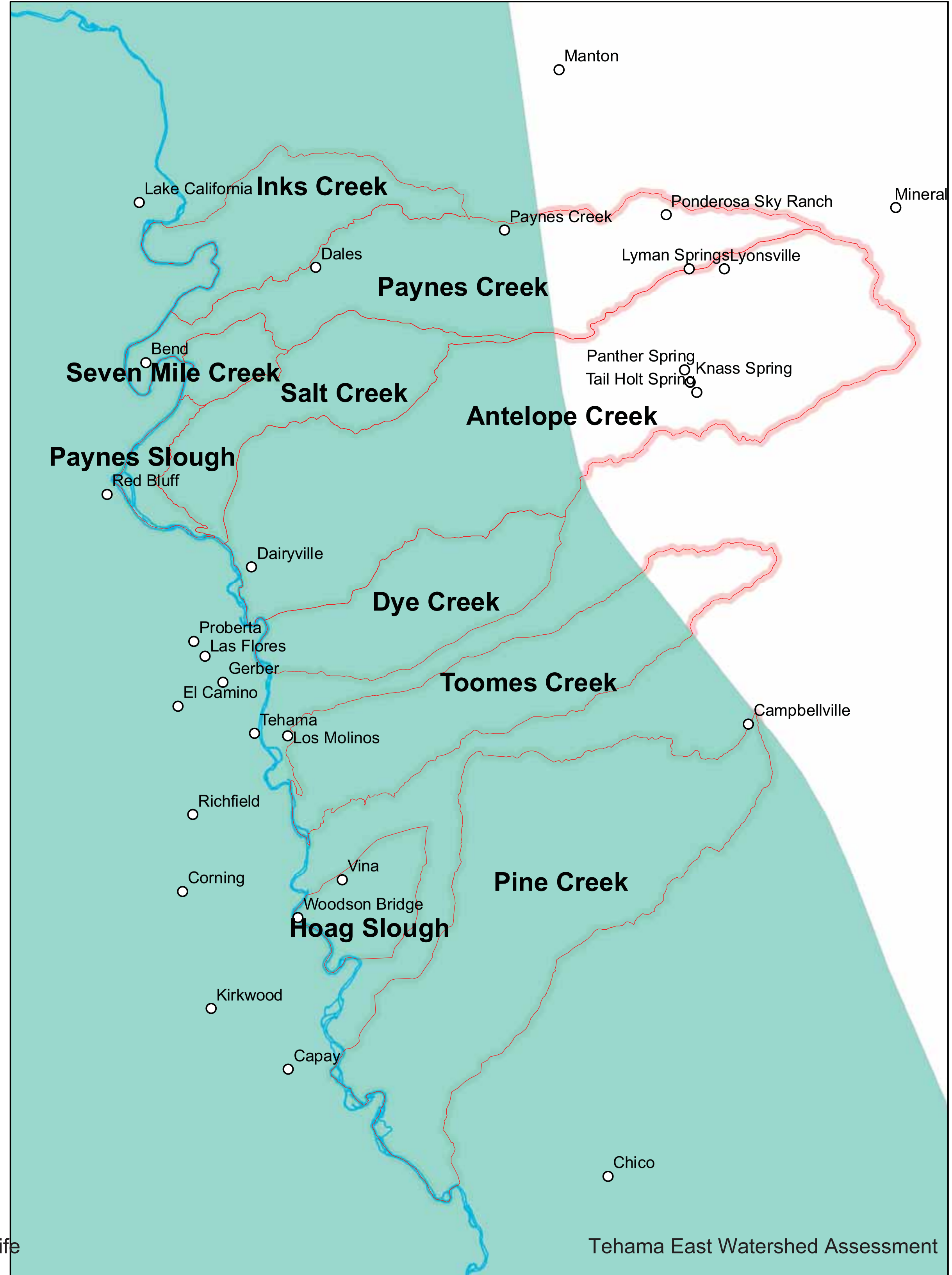
N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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Quoted from:
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KEY

WESTERN MEADOWLARK
(STURNELLA NEGLECTA)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

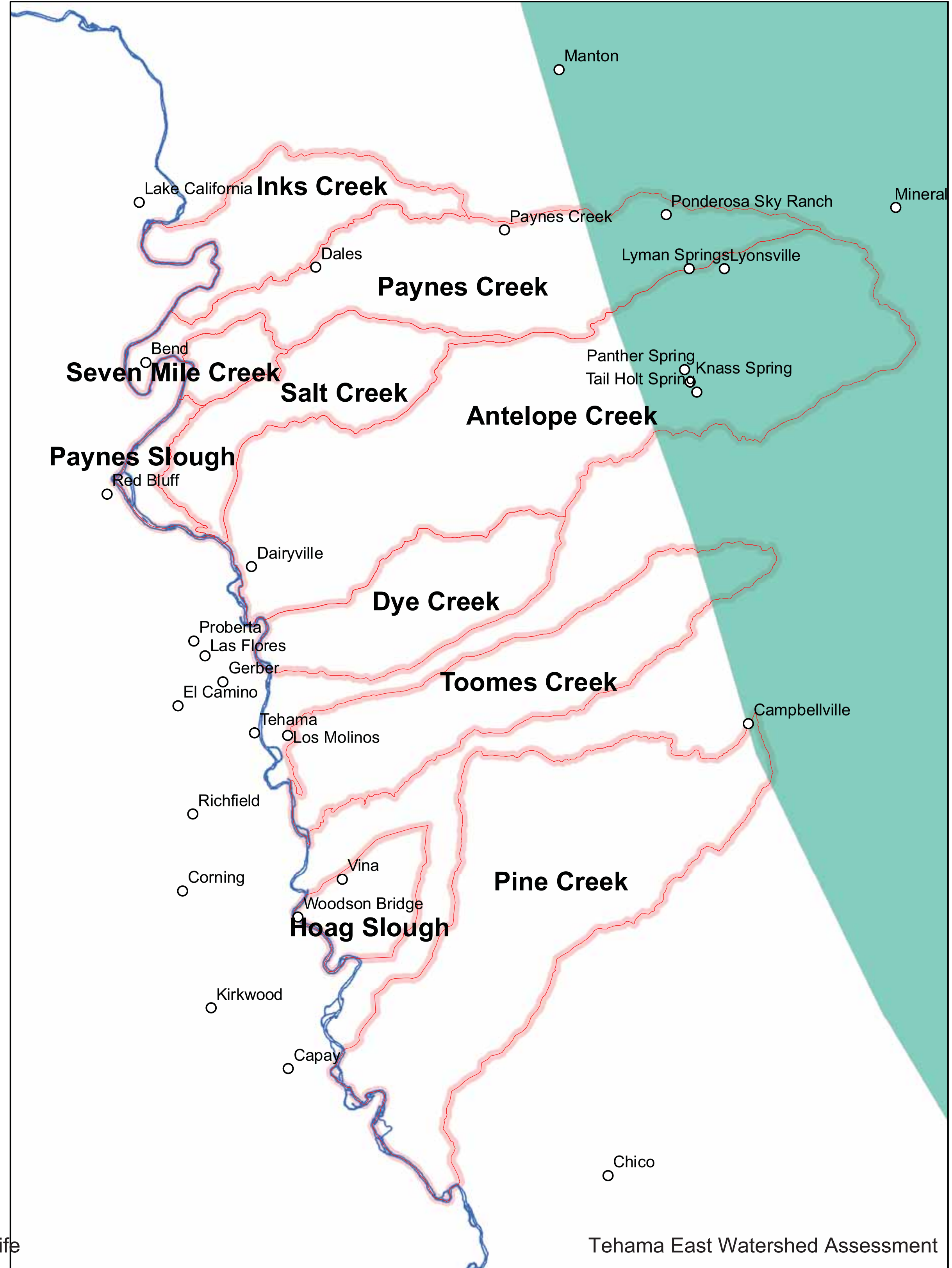
N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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Quoted from:
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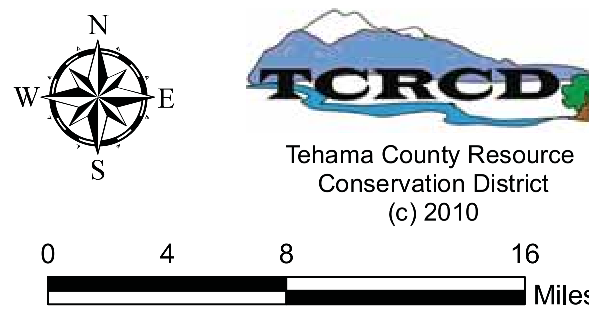
KEY

WESTERN TANAGER
(PIRANGA LUDOVICIANA)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



Tehama County Resource
Conservation District
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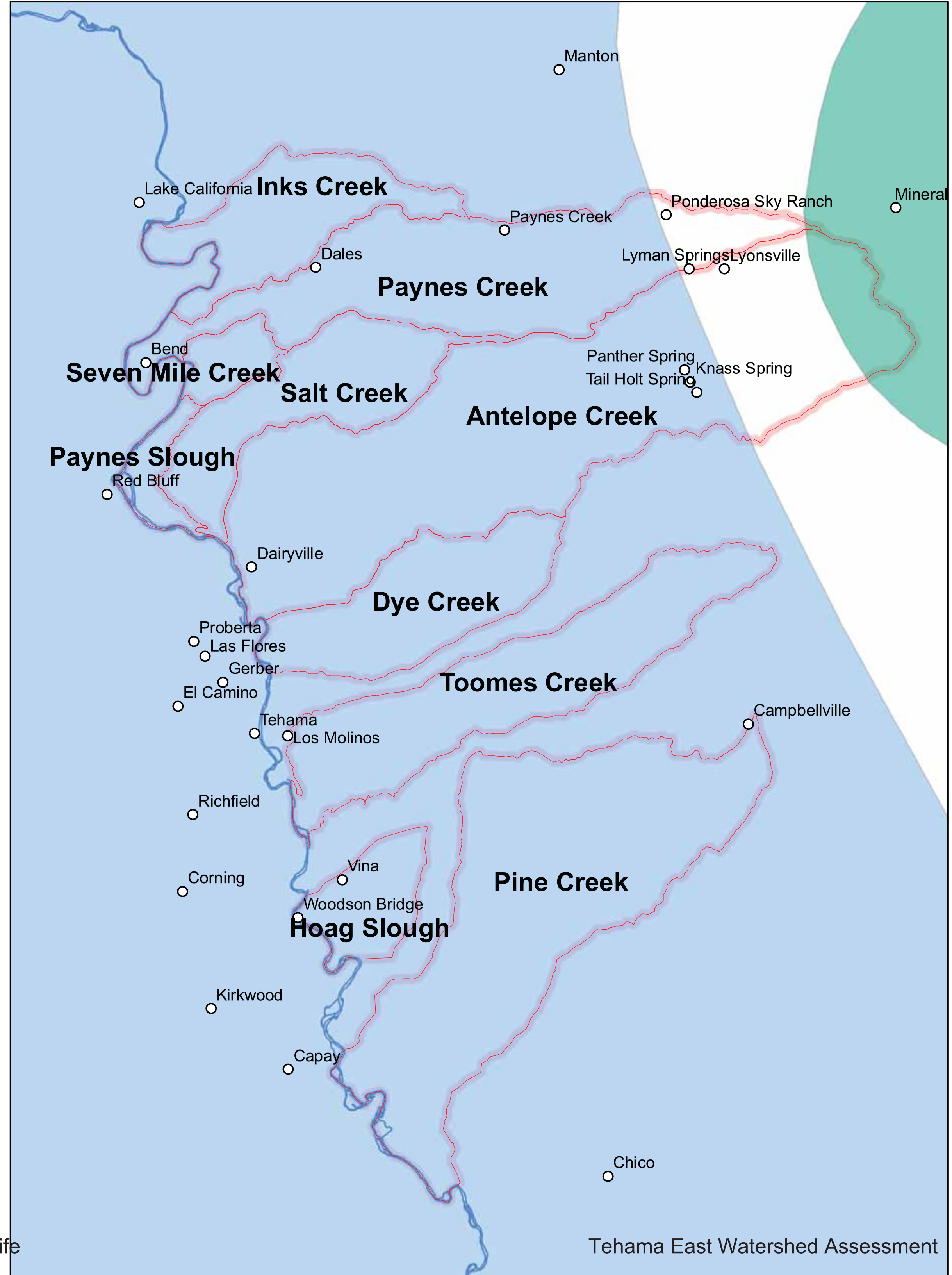
California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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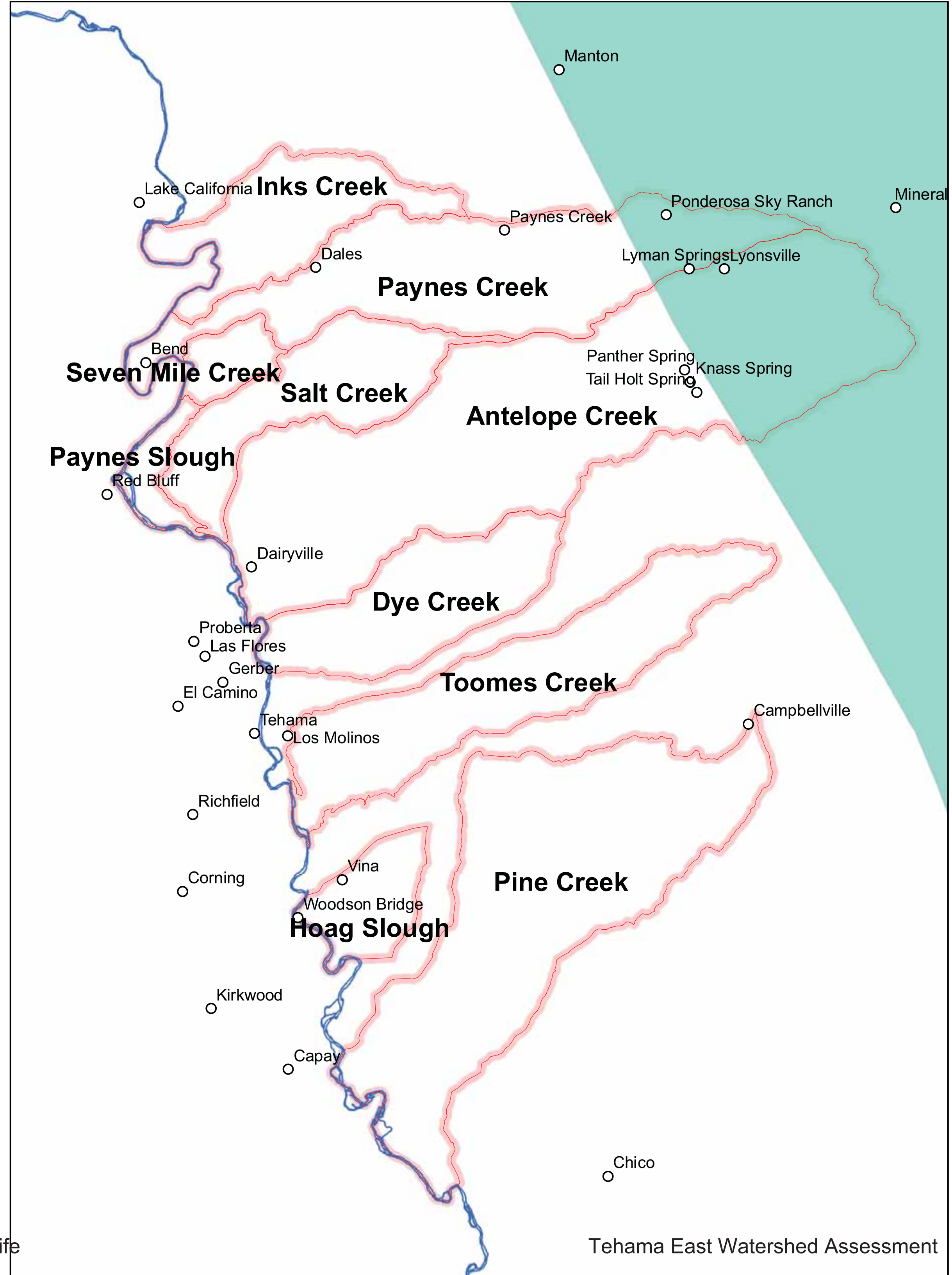

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California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

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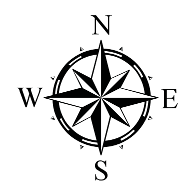
KEY

WHITE-HEADED WOODPECKER (PICOIDES ALBOLARVATUS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



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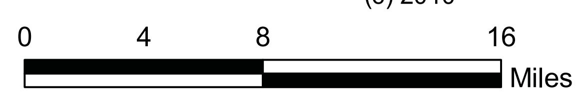

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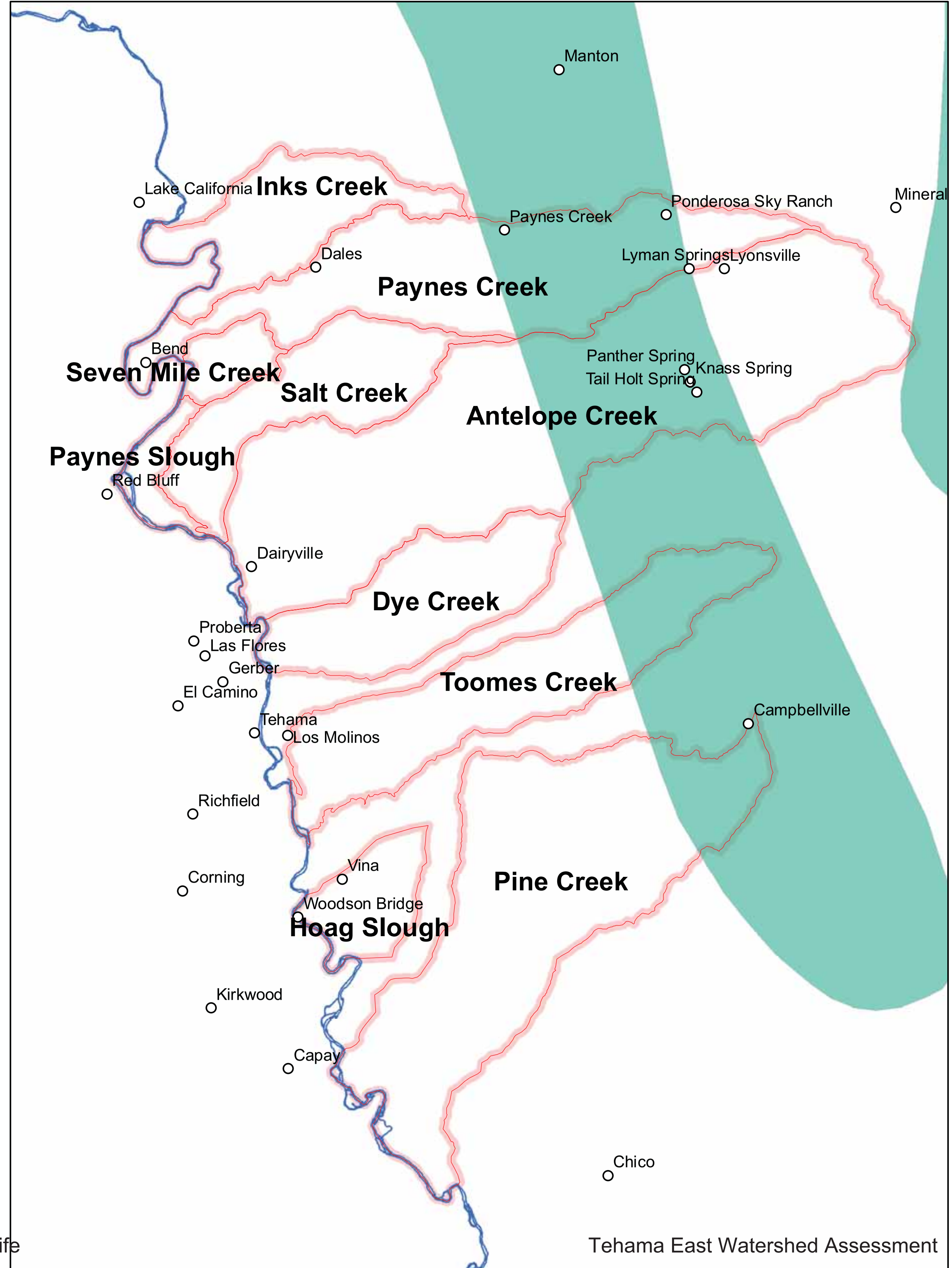
California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds



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KEY

WILLOW FLYCATCHER
(EMPIDONAX TRAILLII)

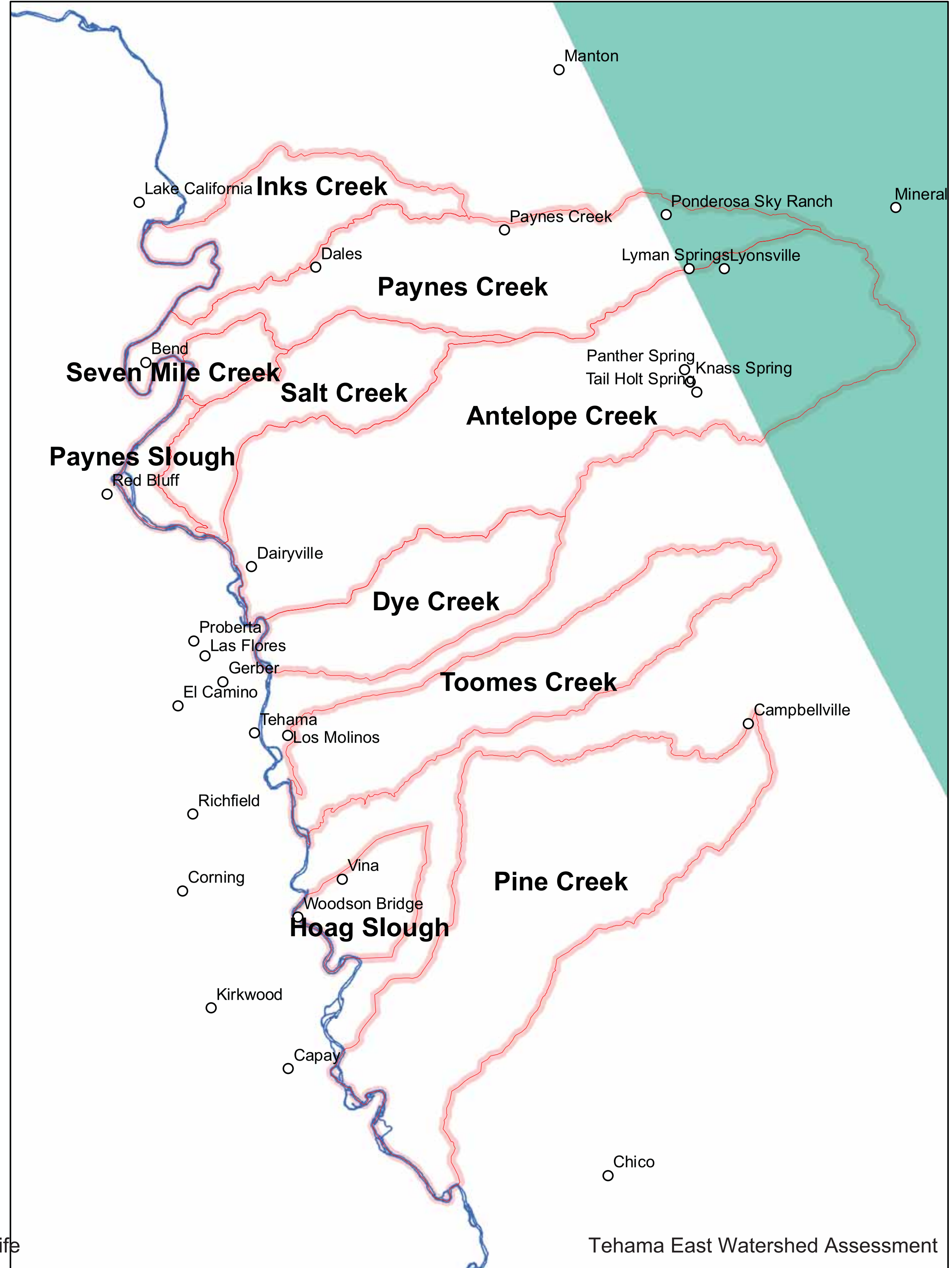
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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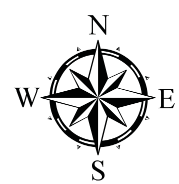
KEY

WILSON'S WARBLER
(WILSONIA PUSILLA)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



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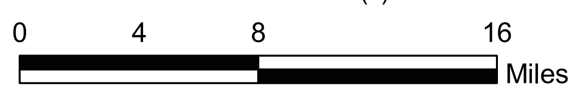

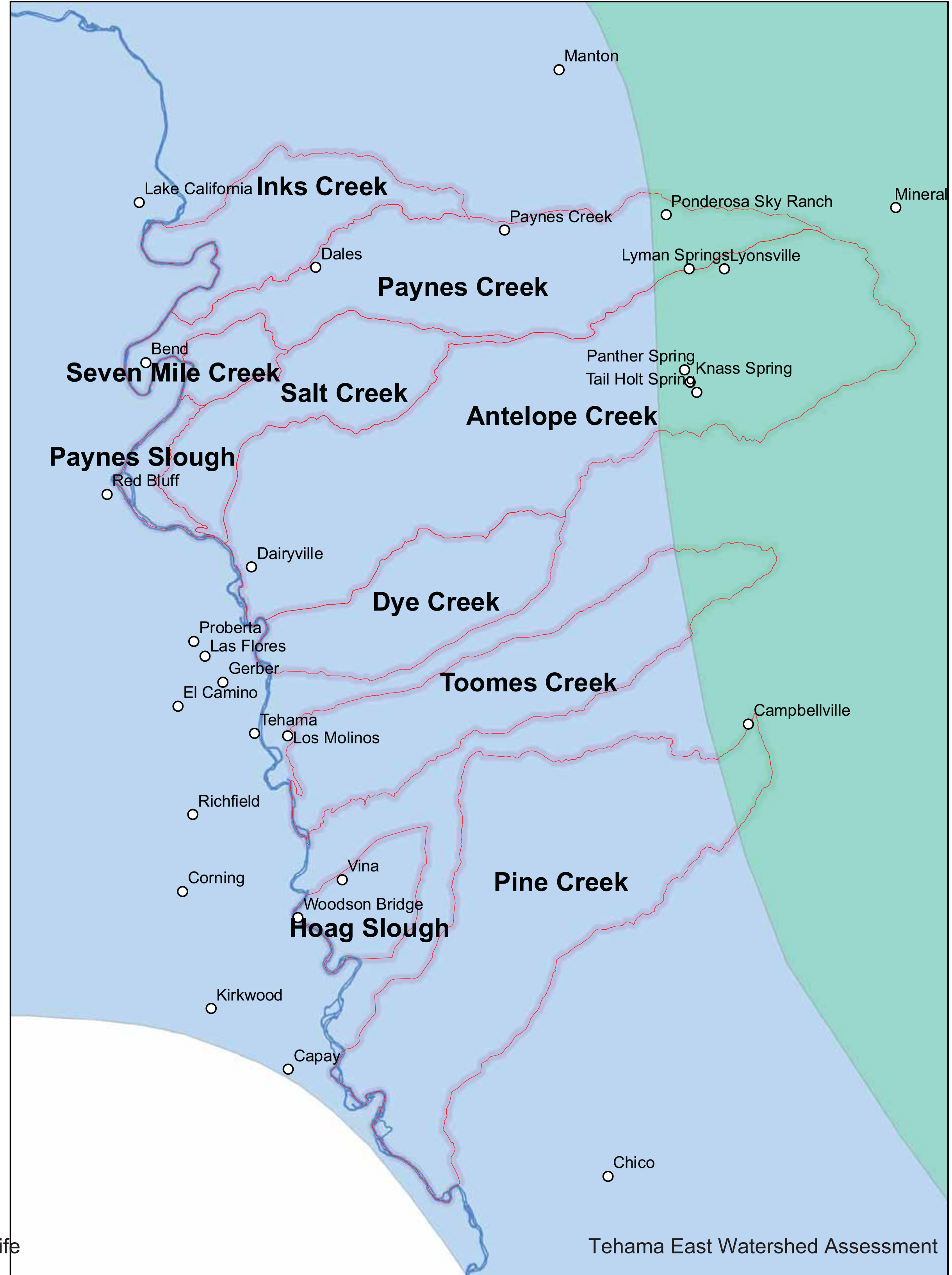

Tehama East Watershed Assessment

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Tehama East Watersheds

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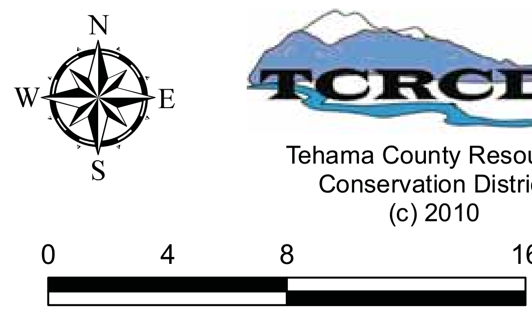
KEY

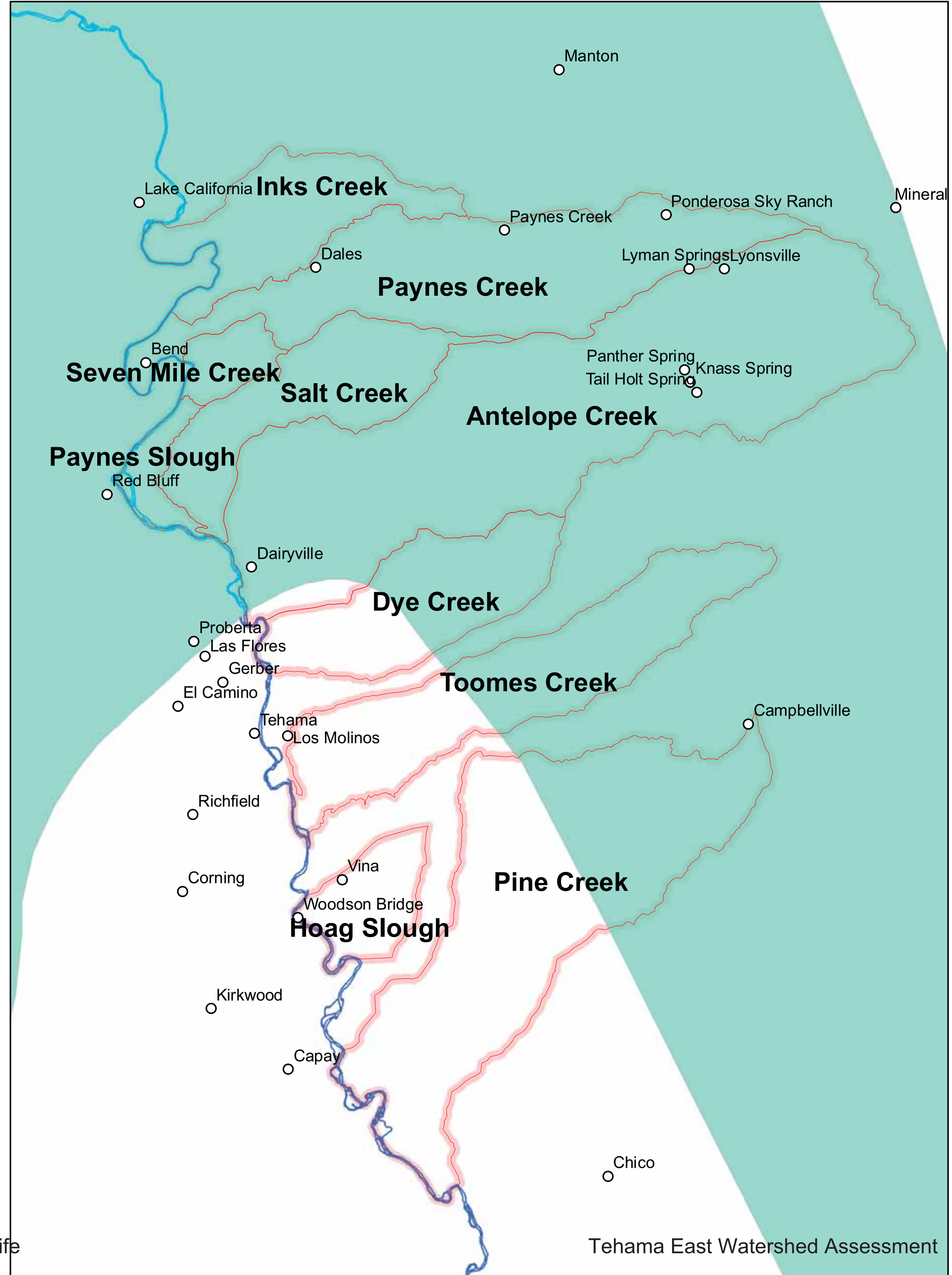
WINTER WREN
(TROGLODYTES TROGLODYTES)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



Tehama County Resource
Conservation District
(c) 2010



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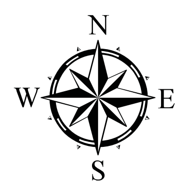
KEY

WRENTIT
(CHAMAEA FASCIATA)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



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Conservation District
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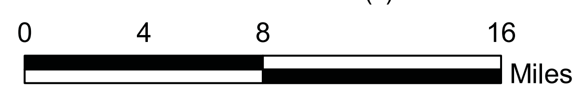

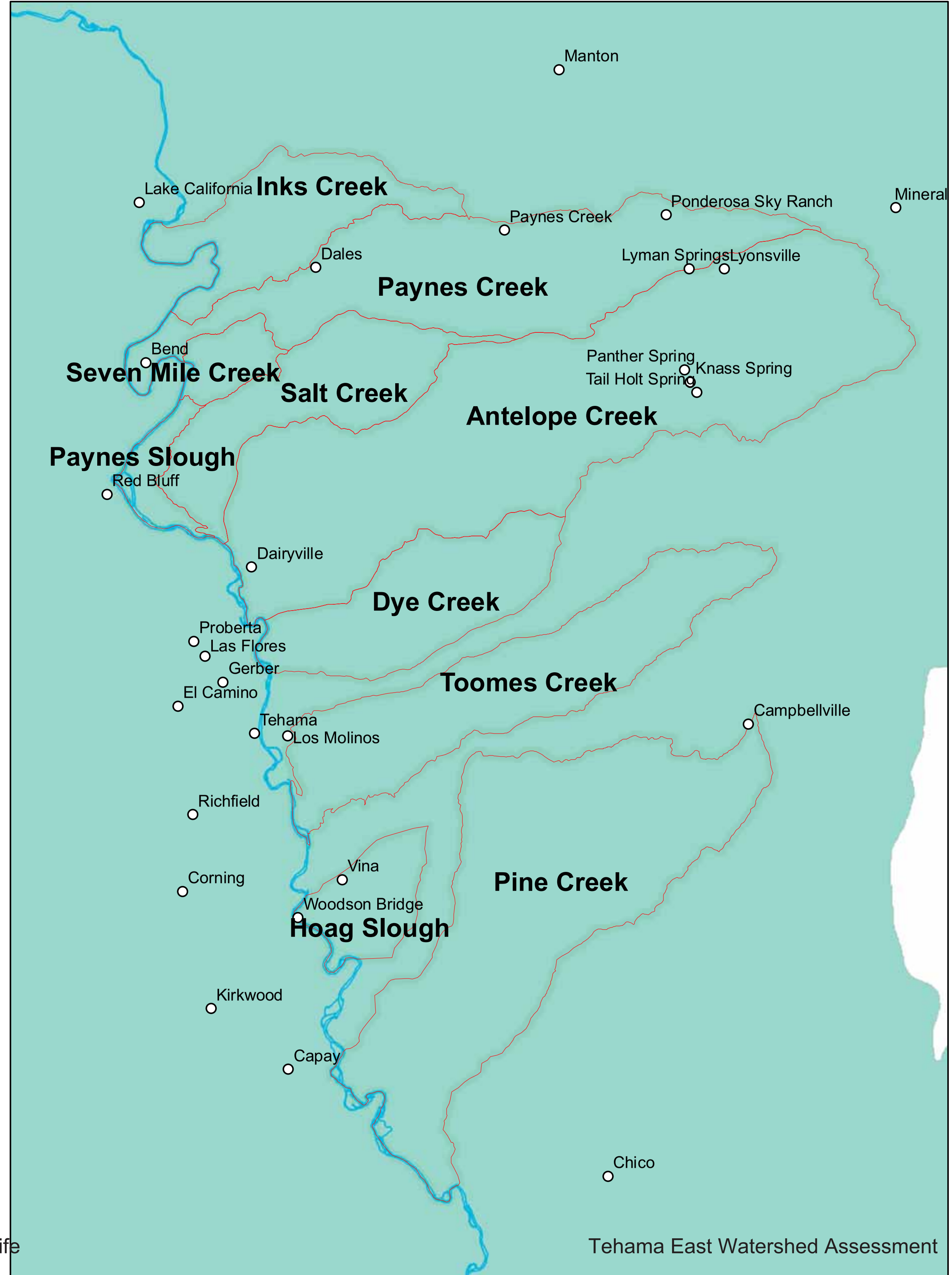

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California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

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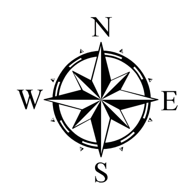
KEY

WESTERN SCREECH-OWL
(OTUS KENNICOTTII)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



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Conservation District
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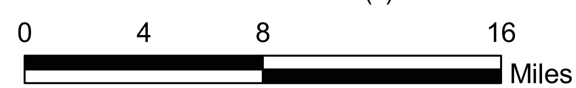

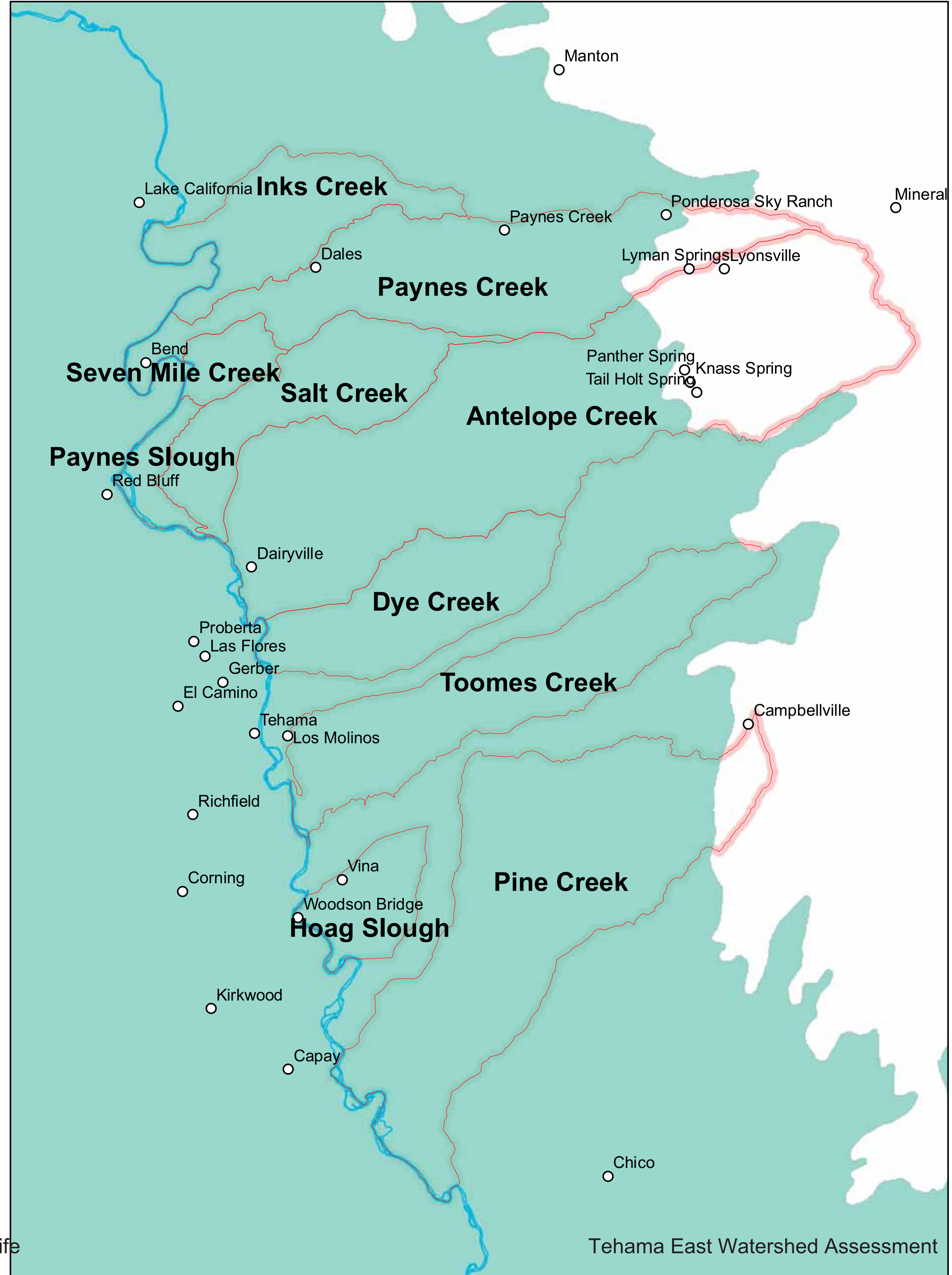

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Tehama East Watersheds

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KEY

WHITE-TAILED KITE
(ELANUS LEUCURUS)

SEASON

Summer

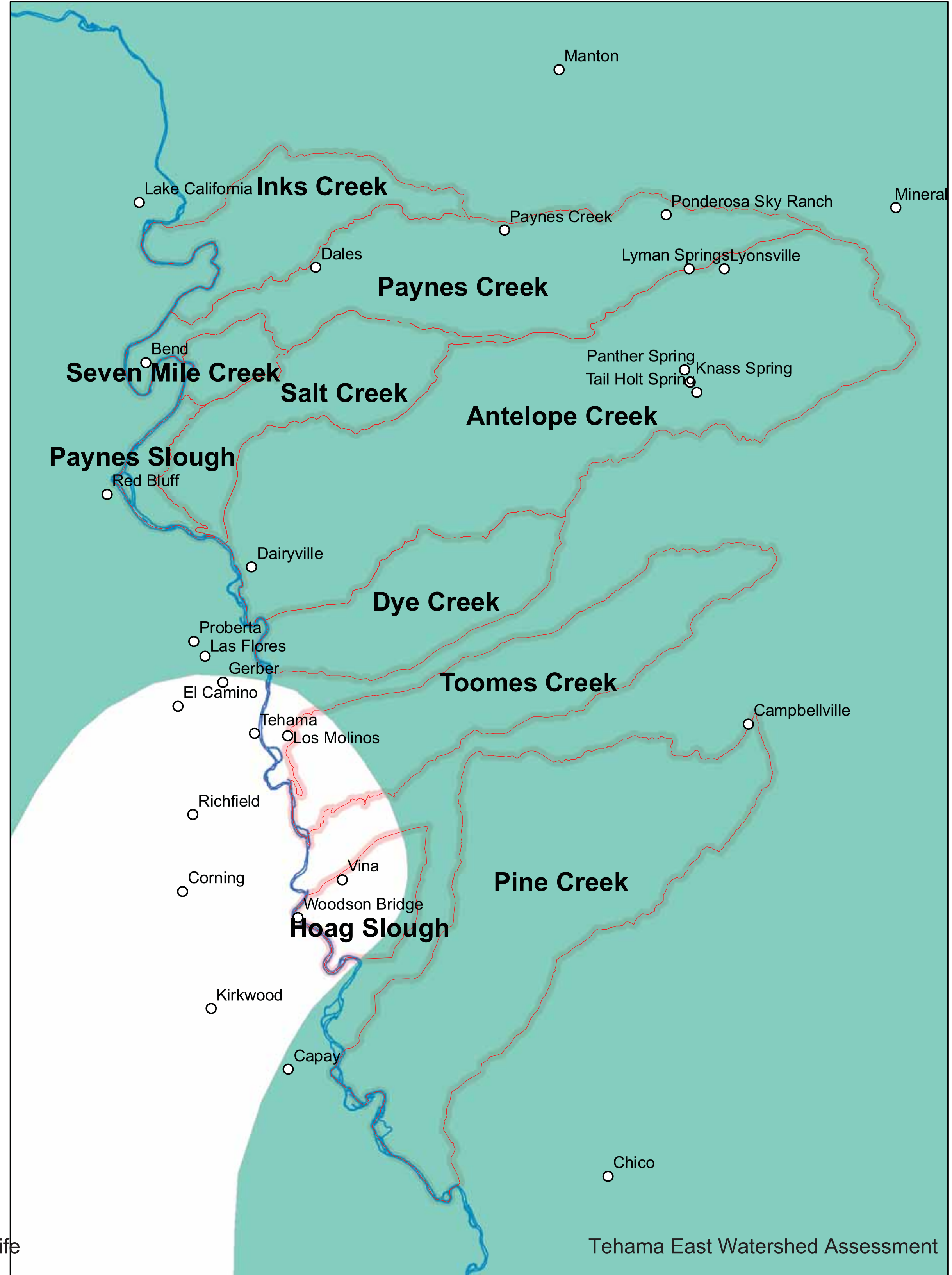
Year Round

Watershed Boundary

N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles



Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

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KEY

WESTERN WOOD-PEWEE
(CONTOPUS SORDIDULUS)

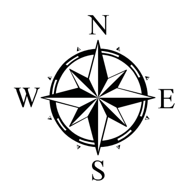
SEASON

Summer

Year Round

Winter

Watershed Boundary



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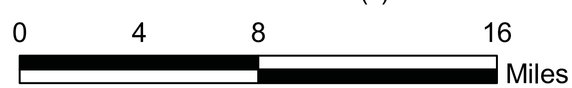

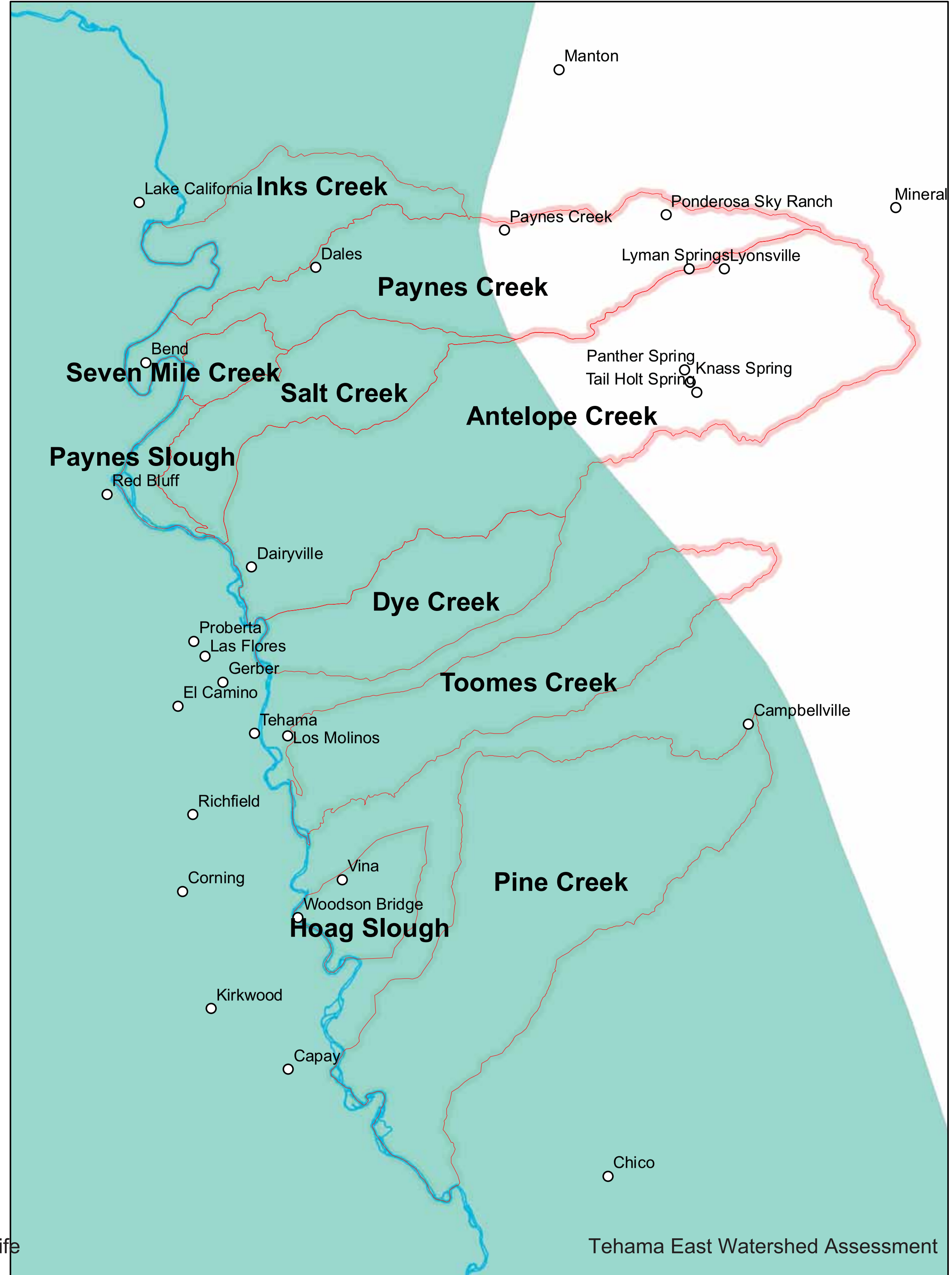

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Tehama East Watersheds

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KEY

YELLOW-BILLED MAGPIE
(PICA NUTTALLI)

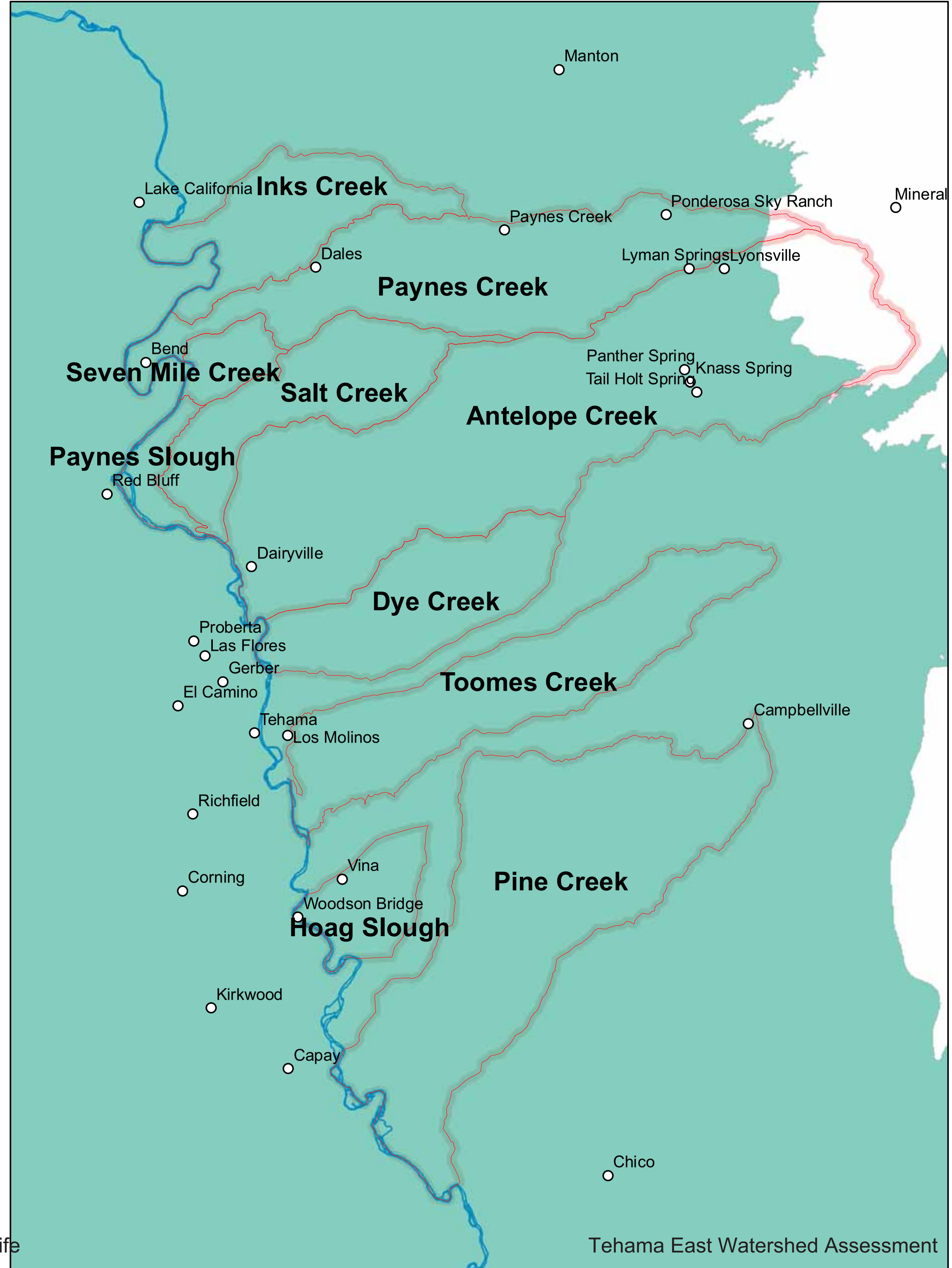
SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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Tehama East Watersheds

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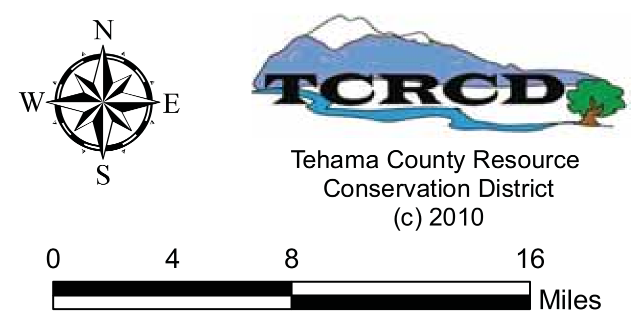
KEY

YELLOW-BREASTED CHAT
(ICTERIA VIRENS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary



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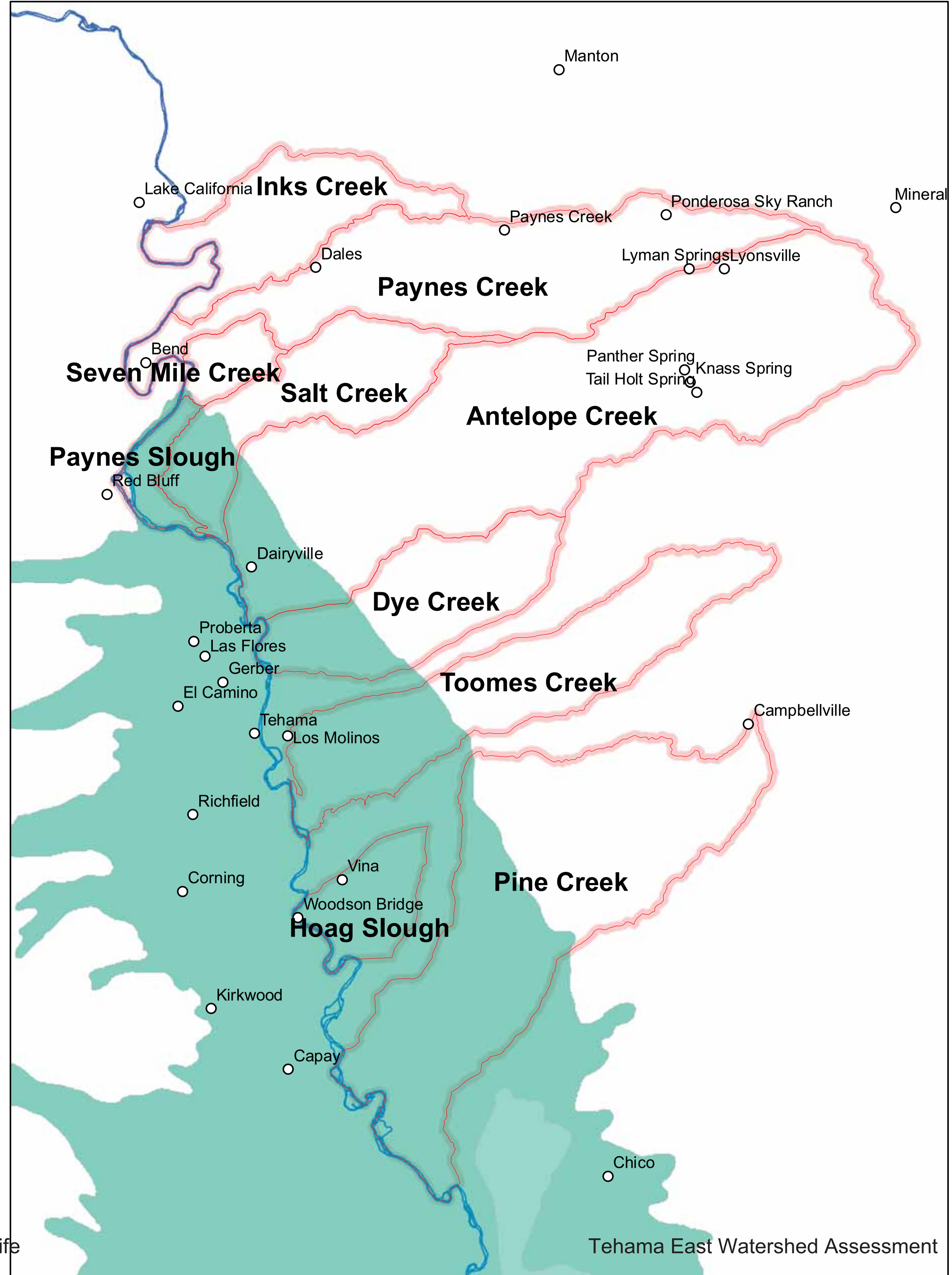
California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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KEY

YELLOW-HEADED BLACKBIRD
(XANTHOCEPHALUS XANTHOCEPHALUS)

SEASON

- Summer
- Year Round
- Winter
- Watershed Boundary

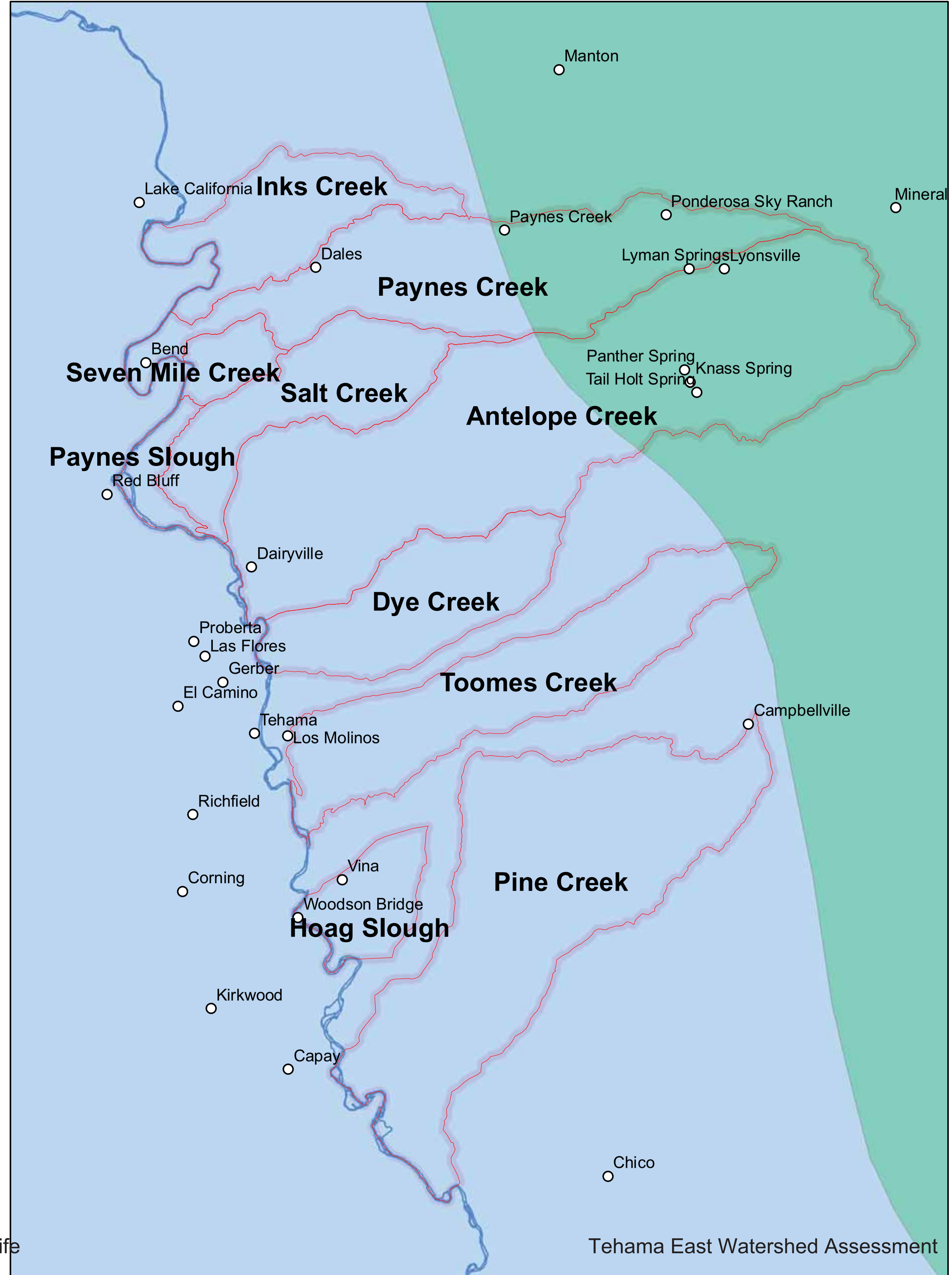
N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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Quoted from:
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KEY

YELLOW-RUMPED WARBLER
(DENDROICA CORONATA)

SEASON

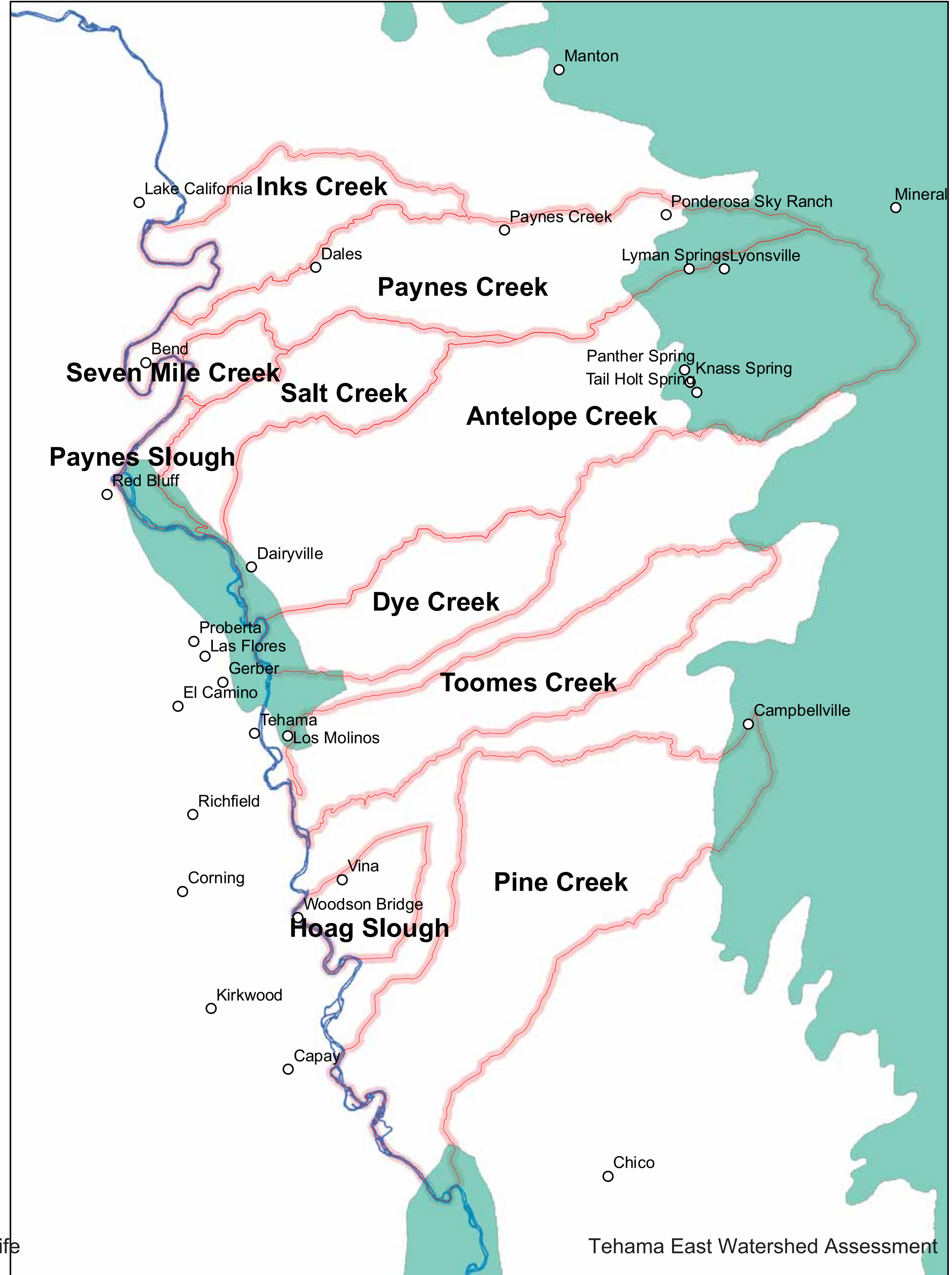
- Summer
- Year Round
- Winter
- Watershed Boundary

N W E S

TCRCD

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles



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KEY

YELLOW WARBLER
(DENDROICA PETECHIA)

SEASON

Summer

Year Round

Winter

Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

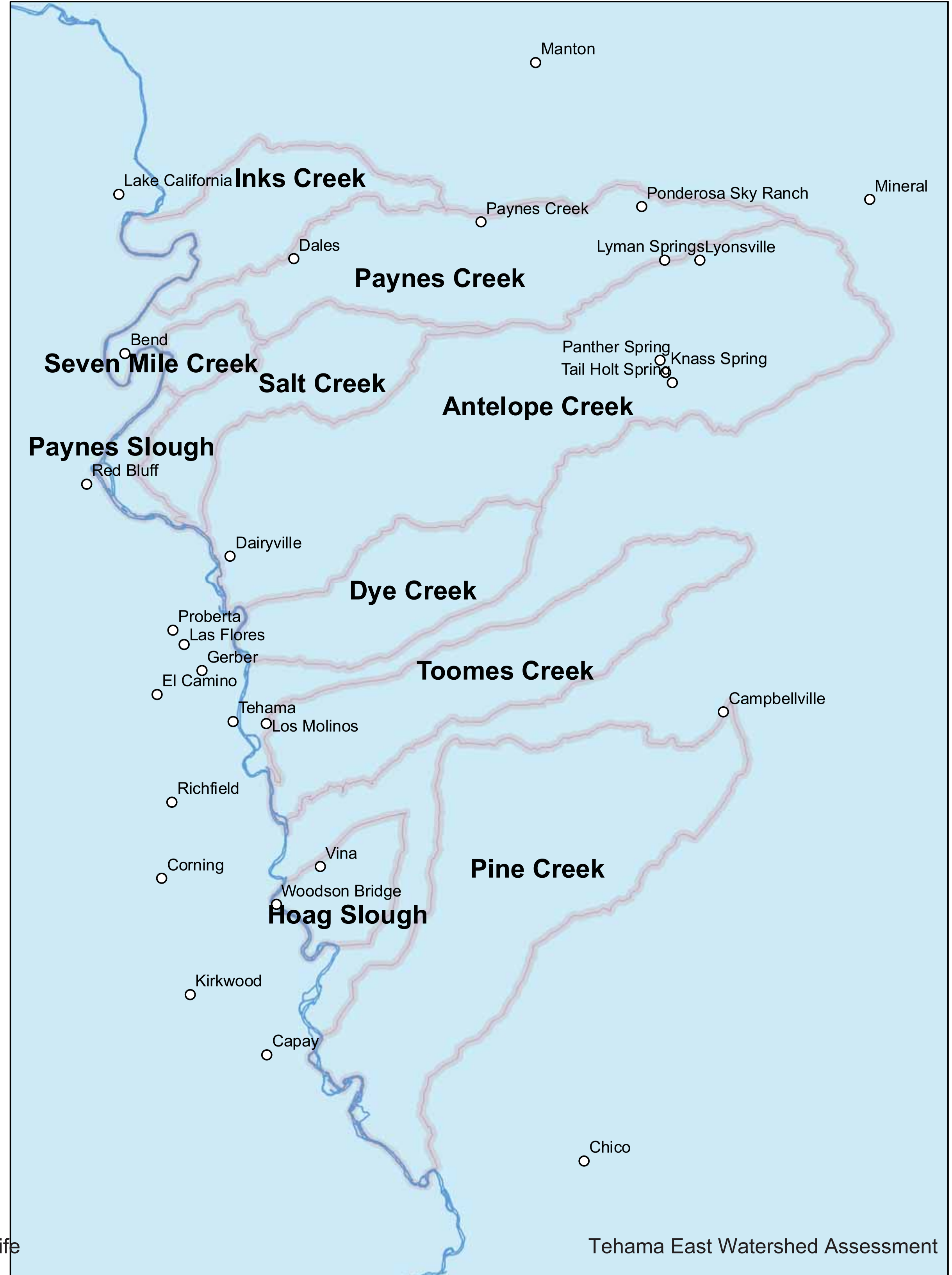
0 4 8 16 Miles

California Wildlife Habitat Relationships (CWHR)

Mammals

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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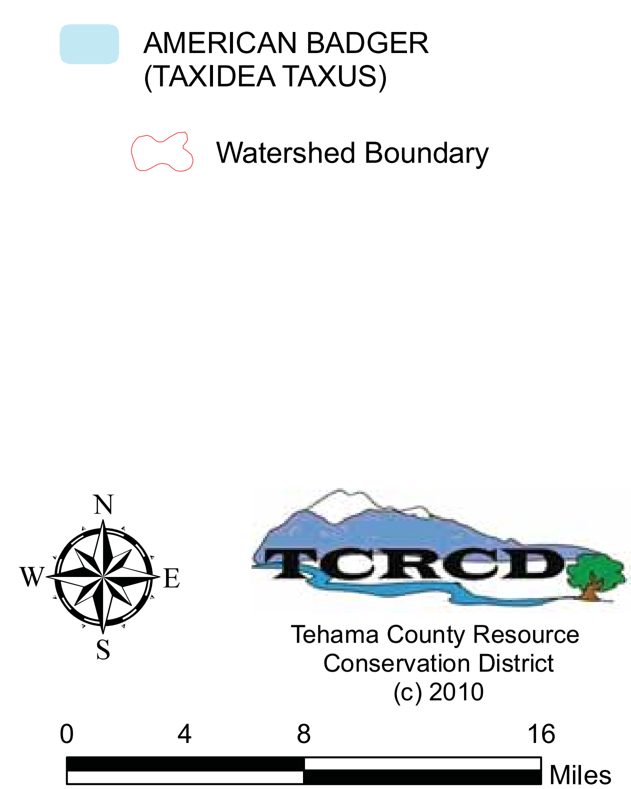
KEY



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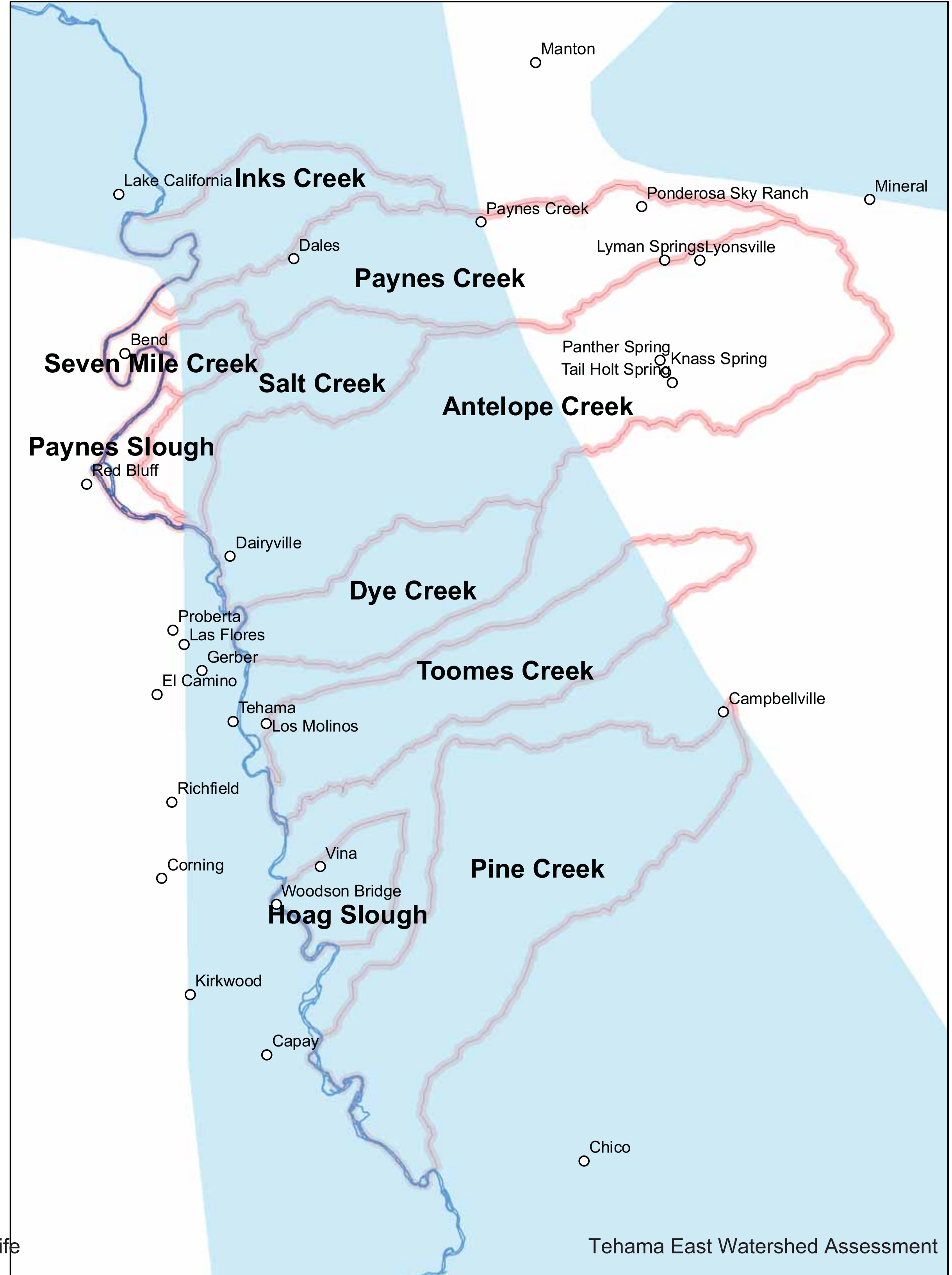
(c) 2010



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Tehama East Watersheds

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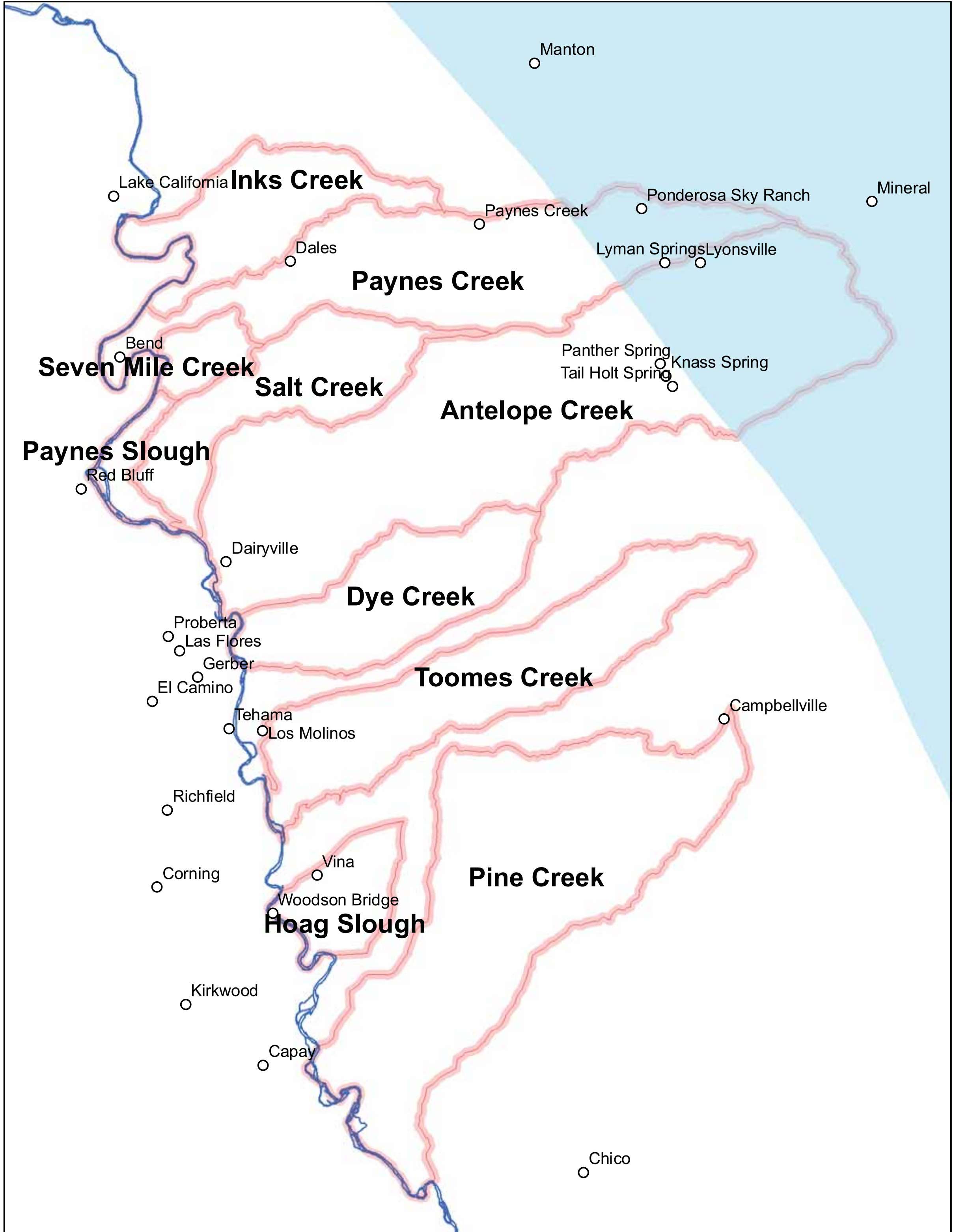
KEY

AMERICAN BEAVER (CASTOR CANADENSIS)

Watershed Boundary

Tehama County Resource Conservation District
(c) 2010



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KEY

AMERICAN MARTEN (MARTES AMERICANA)

Watershed Boundary

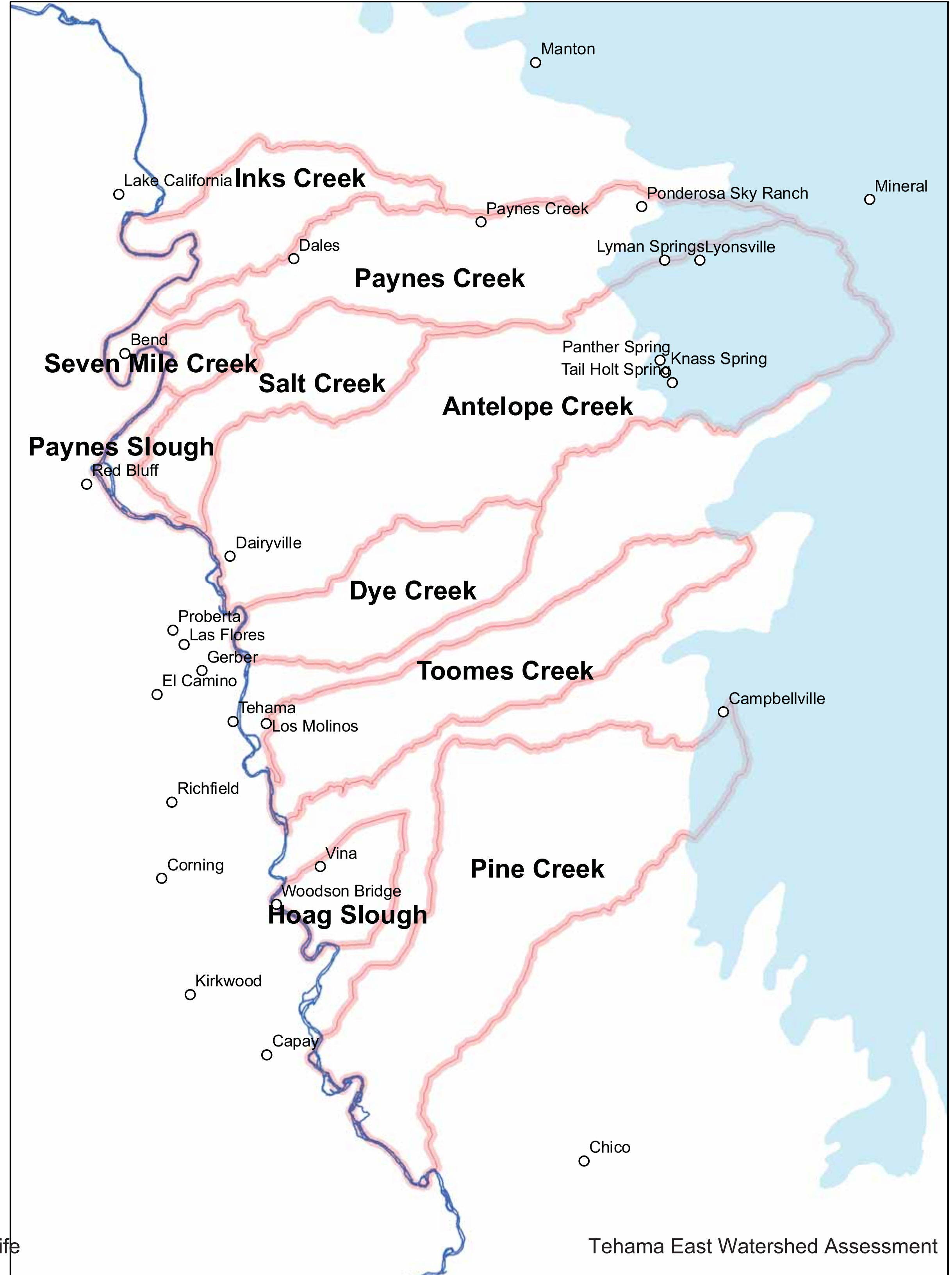
N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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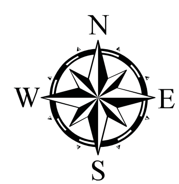
Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

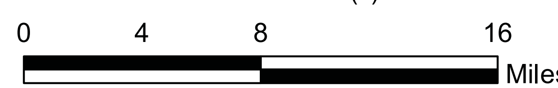
KEY

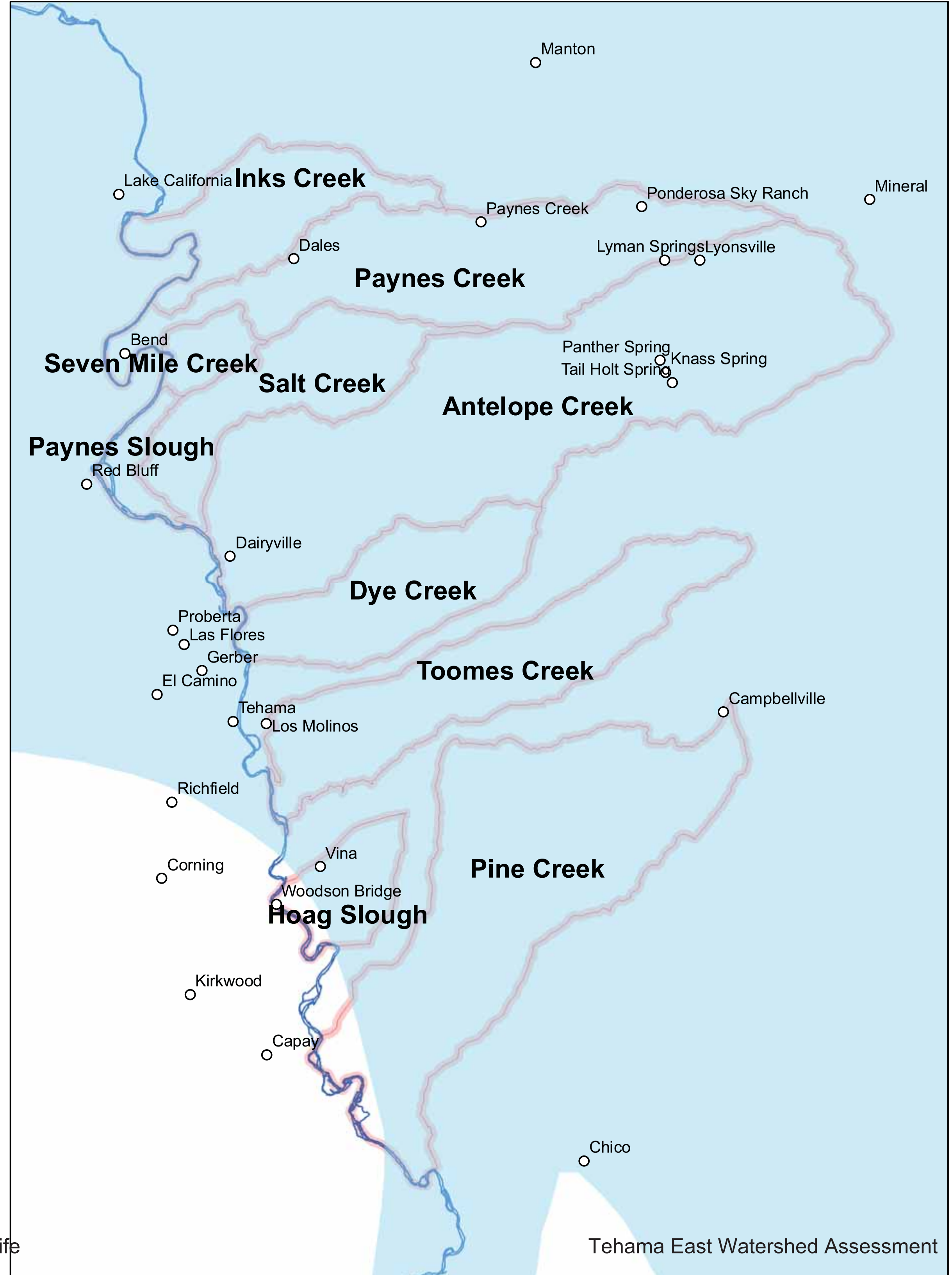
BLACK BEAR (URSUS AMERICANUS)

Watershed Boundary



Tehama County Resource Conservation District
(c) 2010





Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

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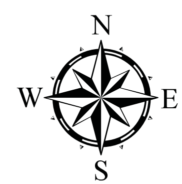
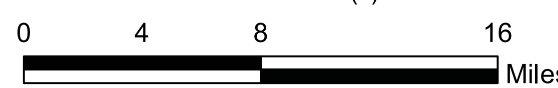
KEY

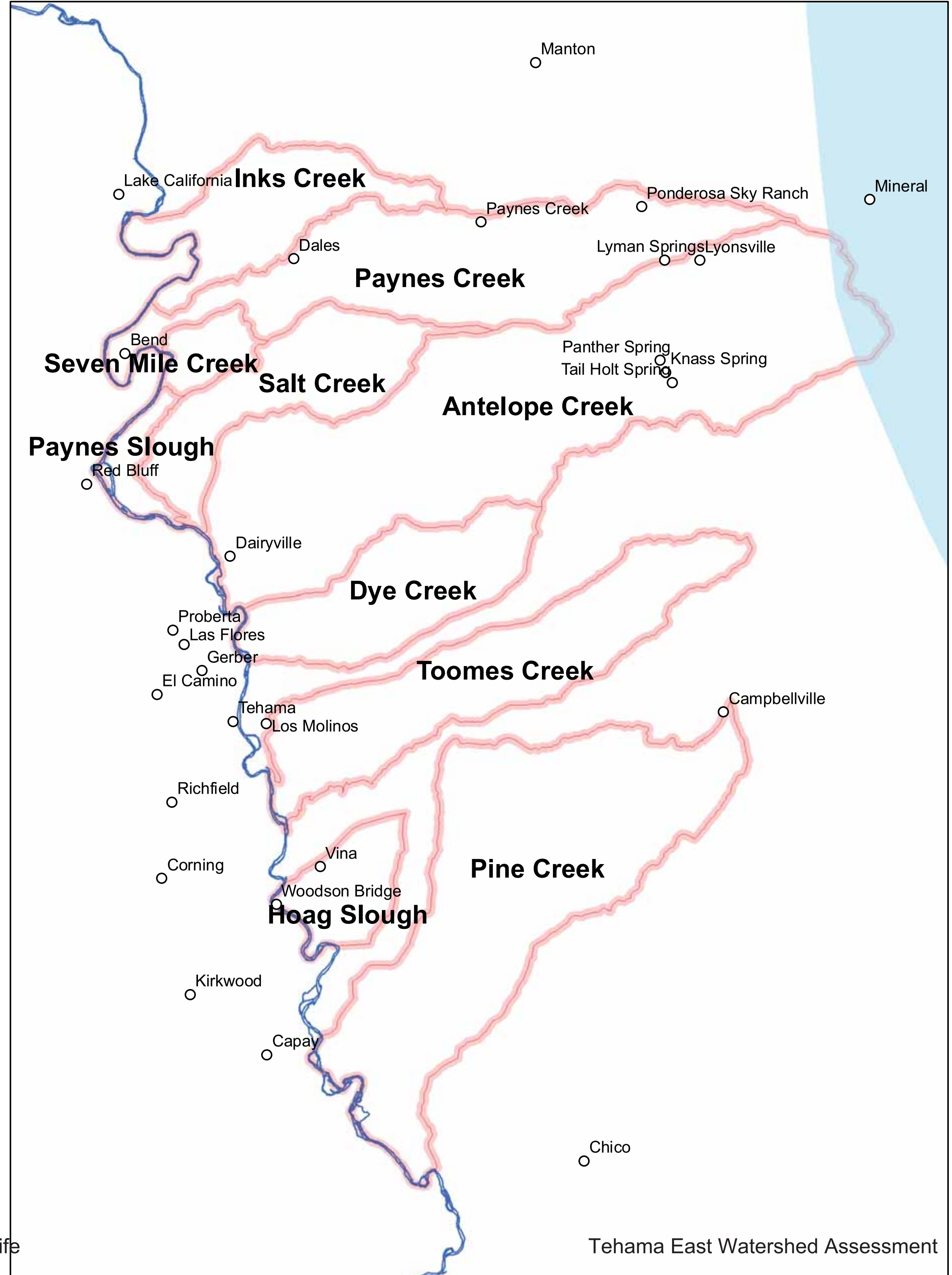
BROAD-FOOTED MOLE (SCAPANUS LATIMANUS)

Watershed Boundary



Tehama County Resource Conservation District
(c) 2010





Tehama East Watershed Assessment

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Tehama East Watersheds

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Quoted from:
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KEY

BELDING'S GROUND SQUIRREL (SPERMOPHILUS BELDINGI)

Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

BRUSH MOUSE (PEROMYSCUS BOYLII)

Watershed Boundary

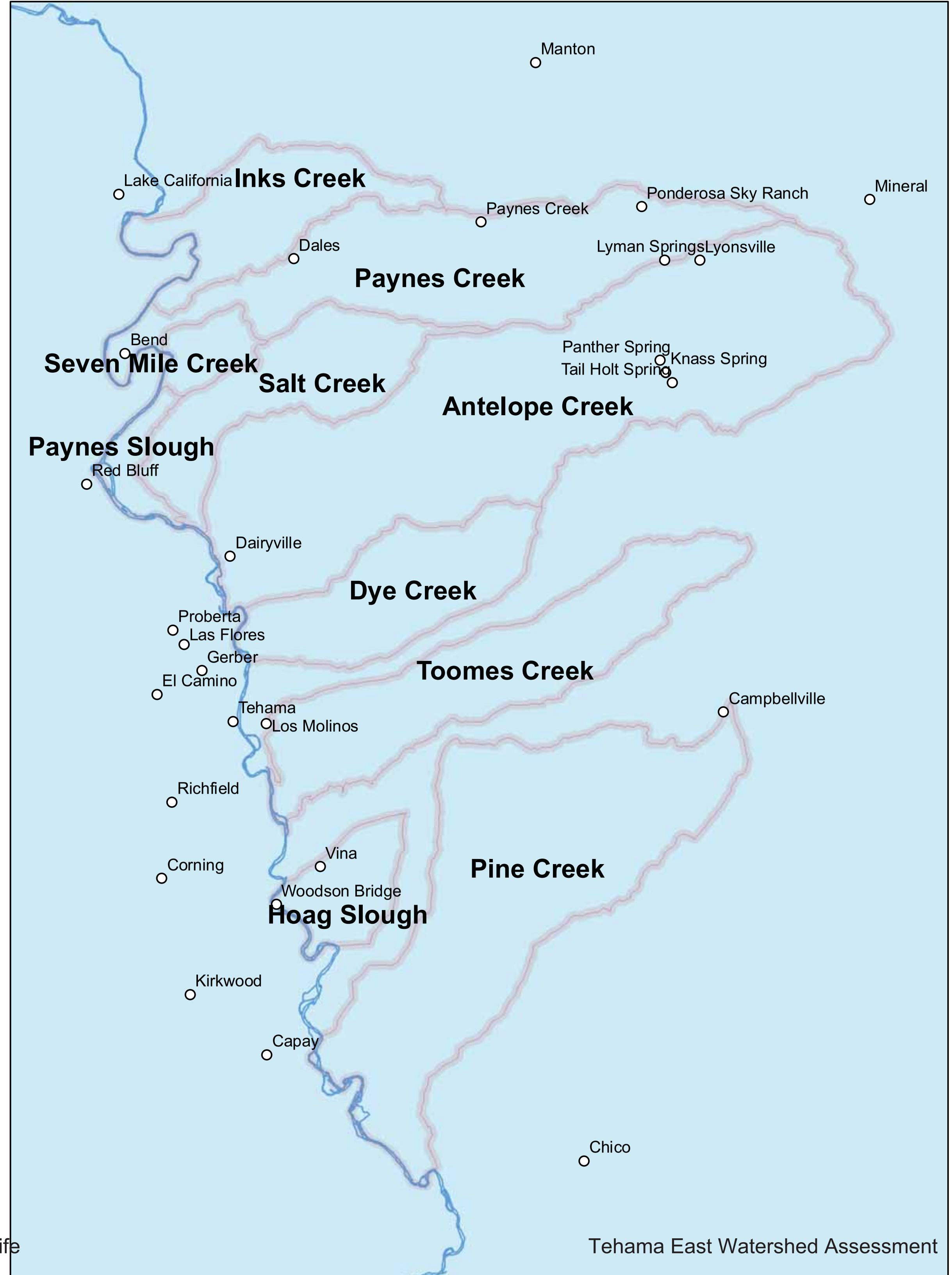
N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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KEY

BOBCAT (LYNX RUFUS)

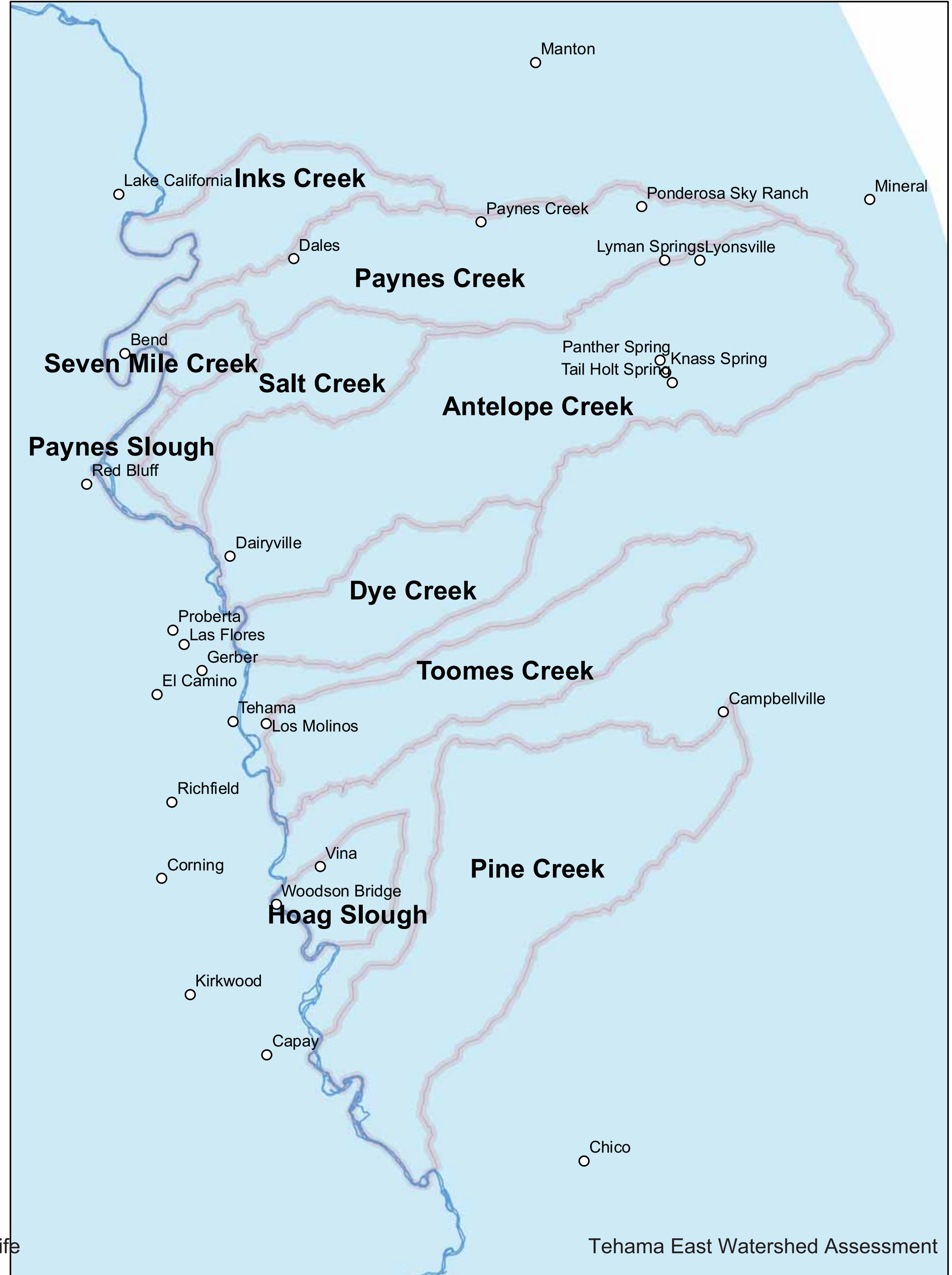
Watershed Boundary

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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Quoted from:
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KEY

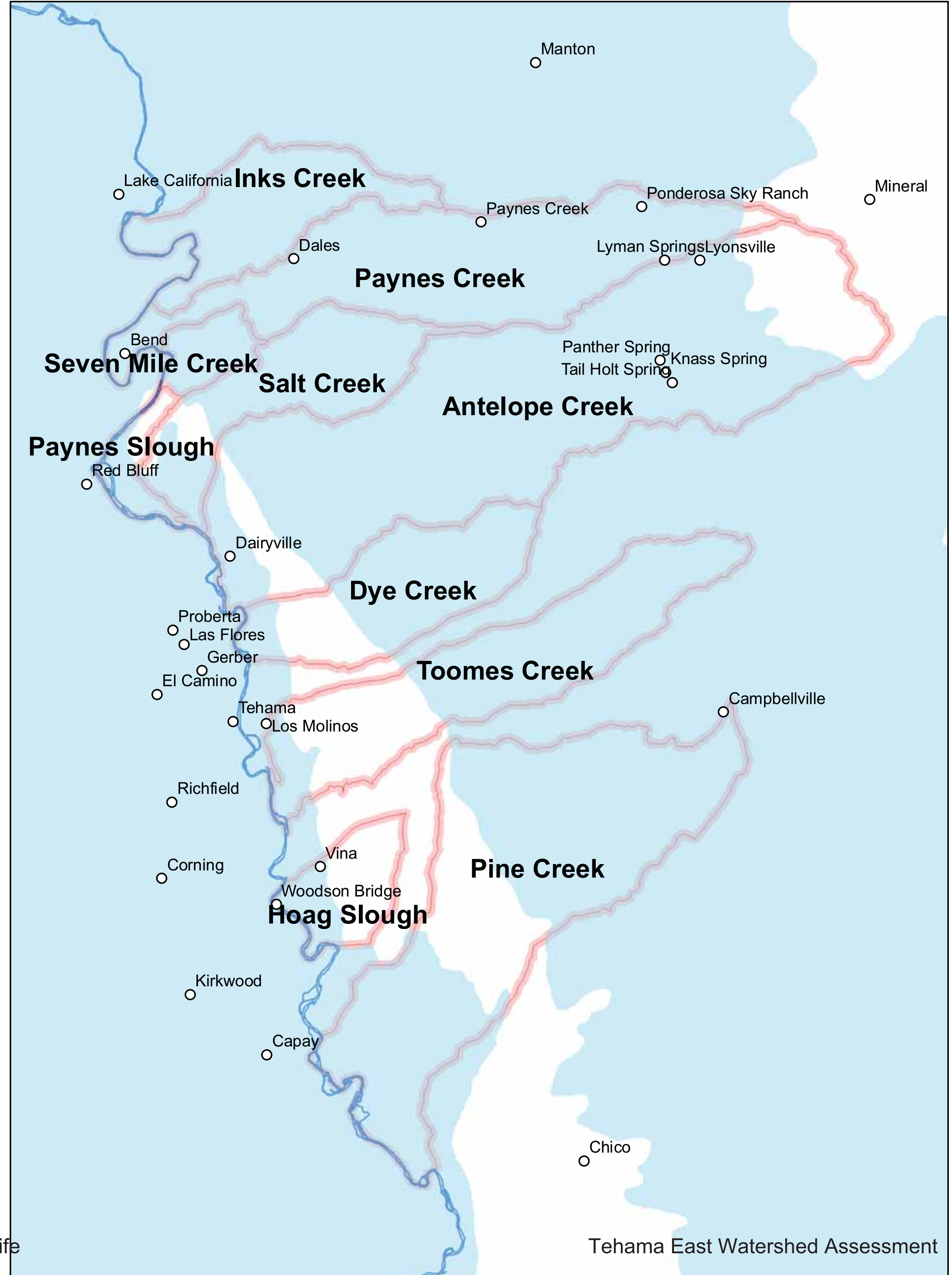
BOTTA'S POCKET GOPHER (THOMOMYS BOTTAE)

Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds

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KEY

BRUSH RABBIT (SYLVILAGUS BACHMANI)

Watershed Boundary

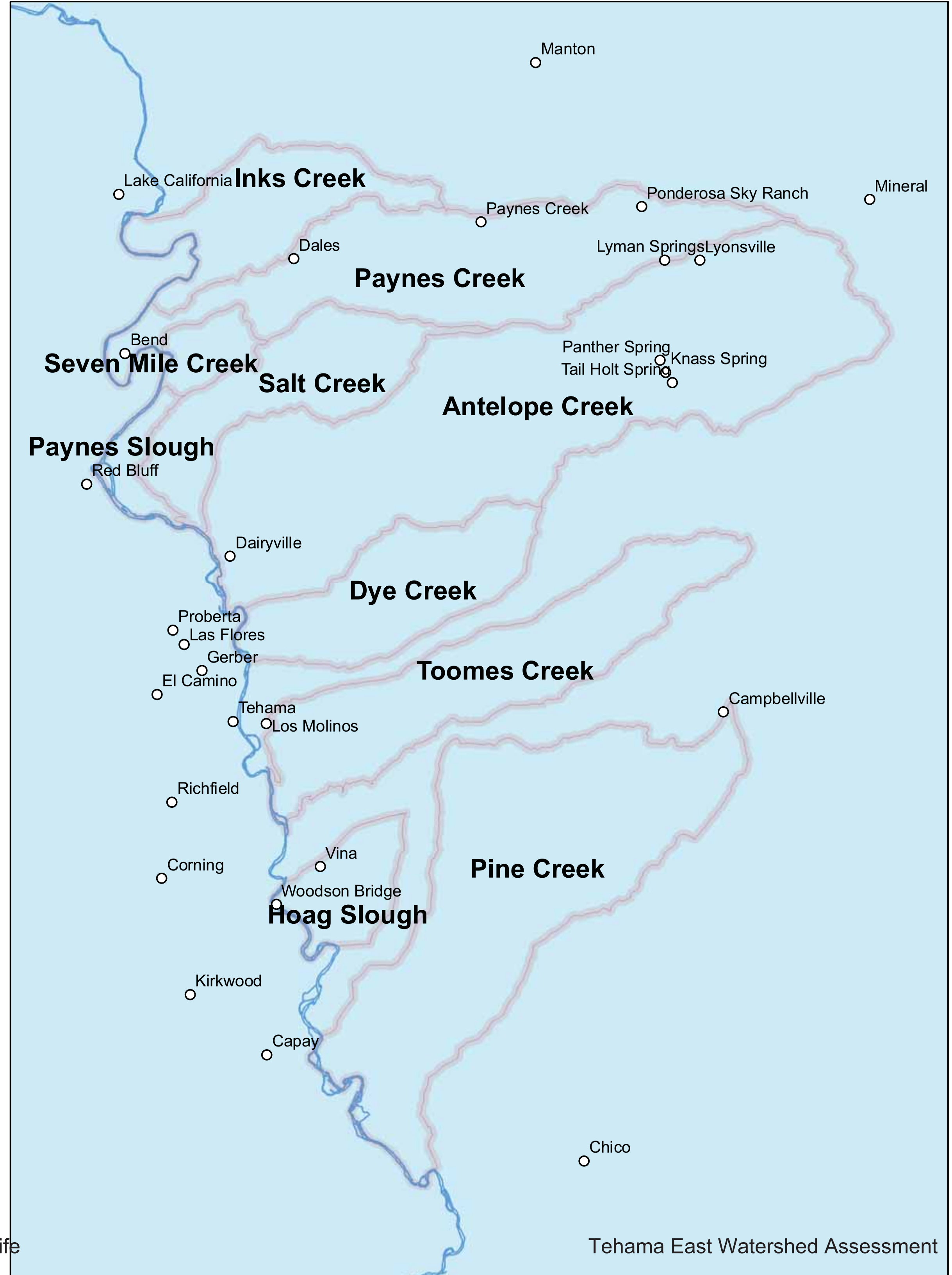
N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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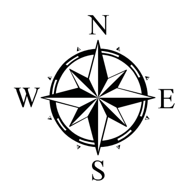
KEY

BLACK-TAILED JACK RABBIT (HARE) (LEPUS CALIFORNICUS)

Watershed Boundary



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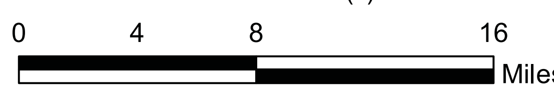

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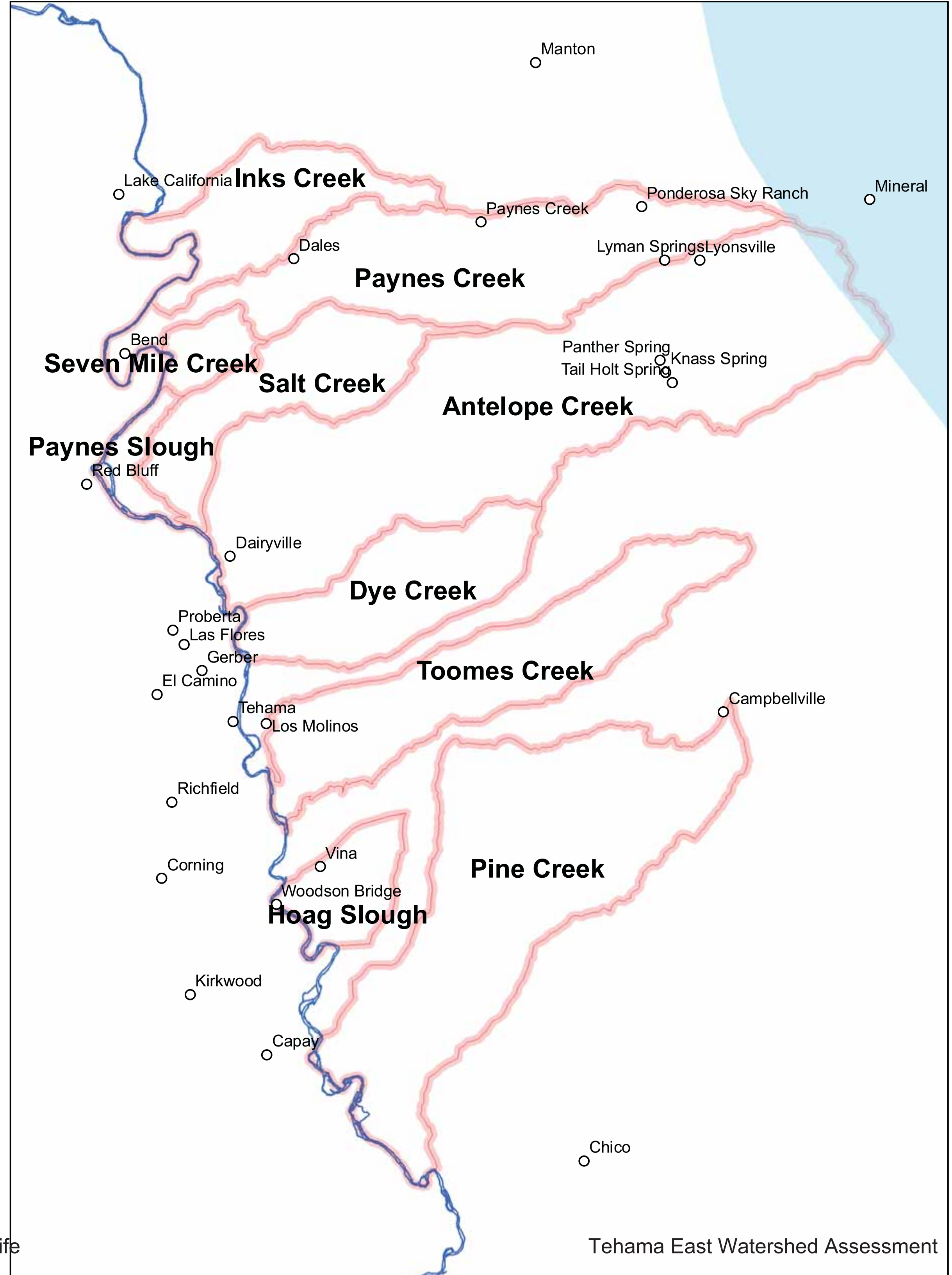
California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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KEY

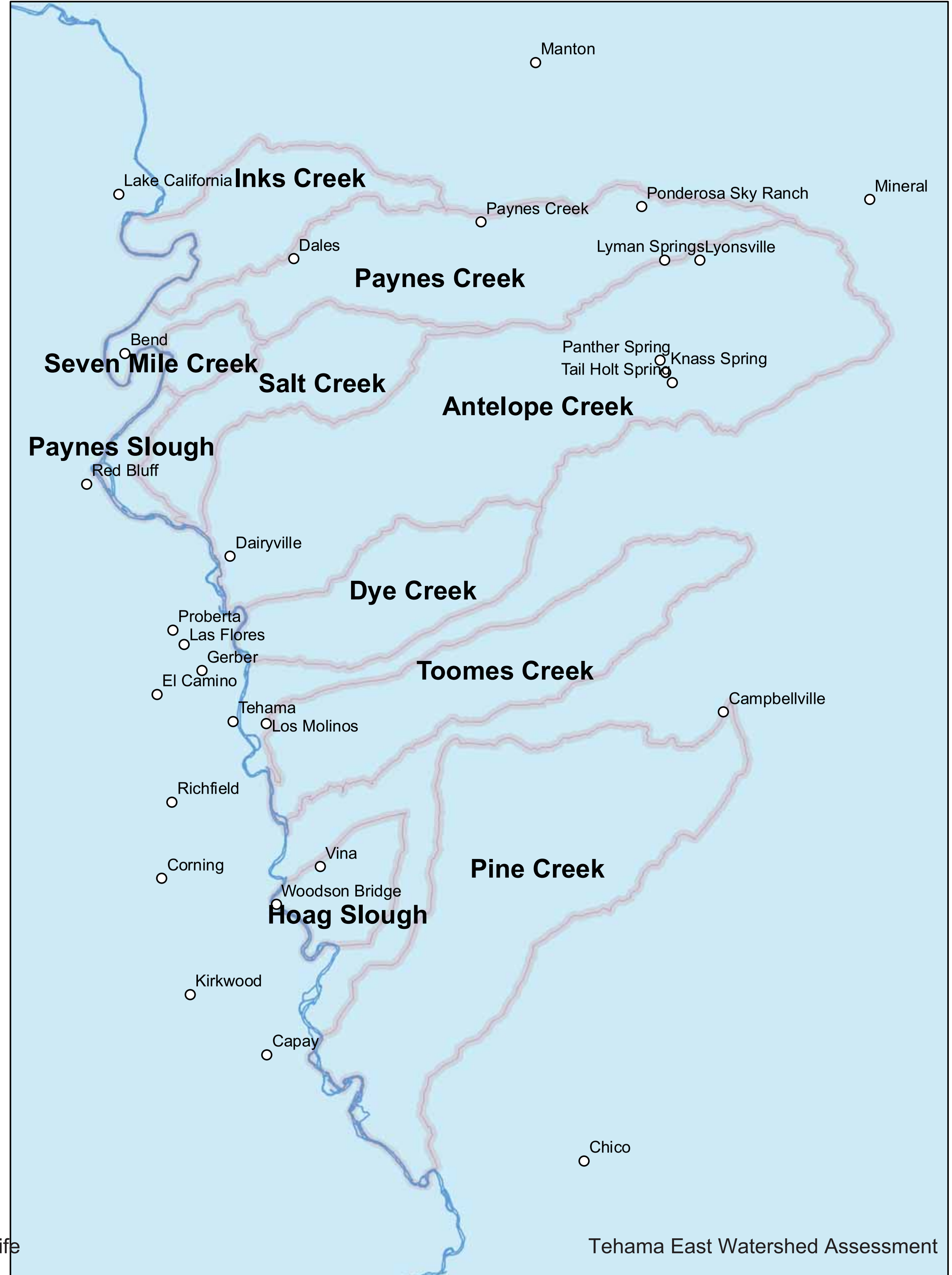
BUSHY-TAILED WOODRAT (NEOTOMA CINEREA)

Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



Tehama East Watershed Assessment

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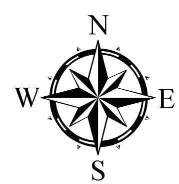
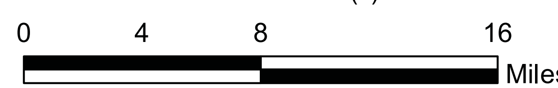
KEY

COMMON GRAY FOX (UROCYON CINEREOARGENTEUS)

Watershed Boundary



Tehama County Resource Conservation District (c) 2010



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KEY

CALIFORNIA GROUND SQUIRREL (SPERMOPHILUS BEECHEYI)

Watershed Boundary

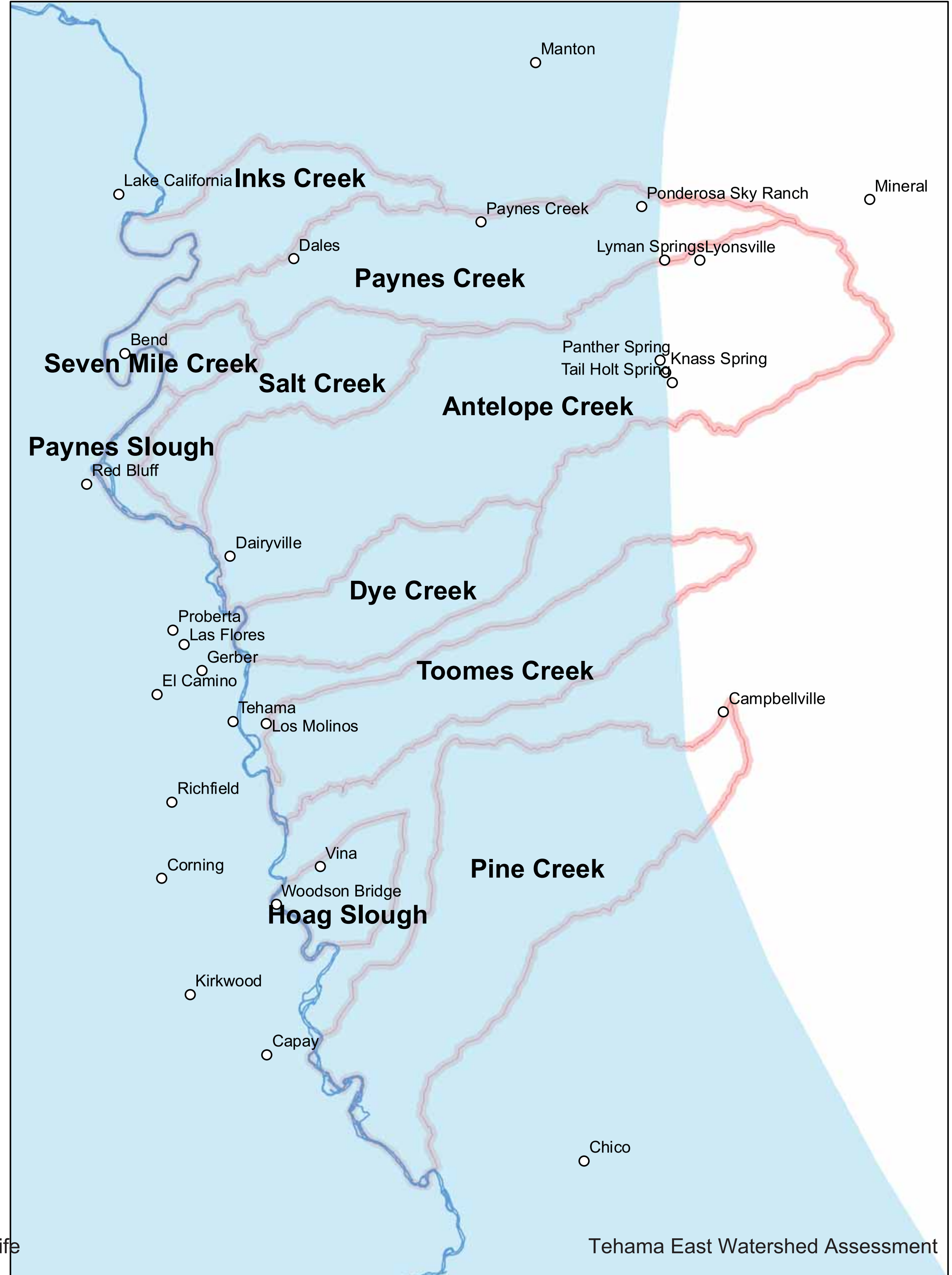
N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds



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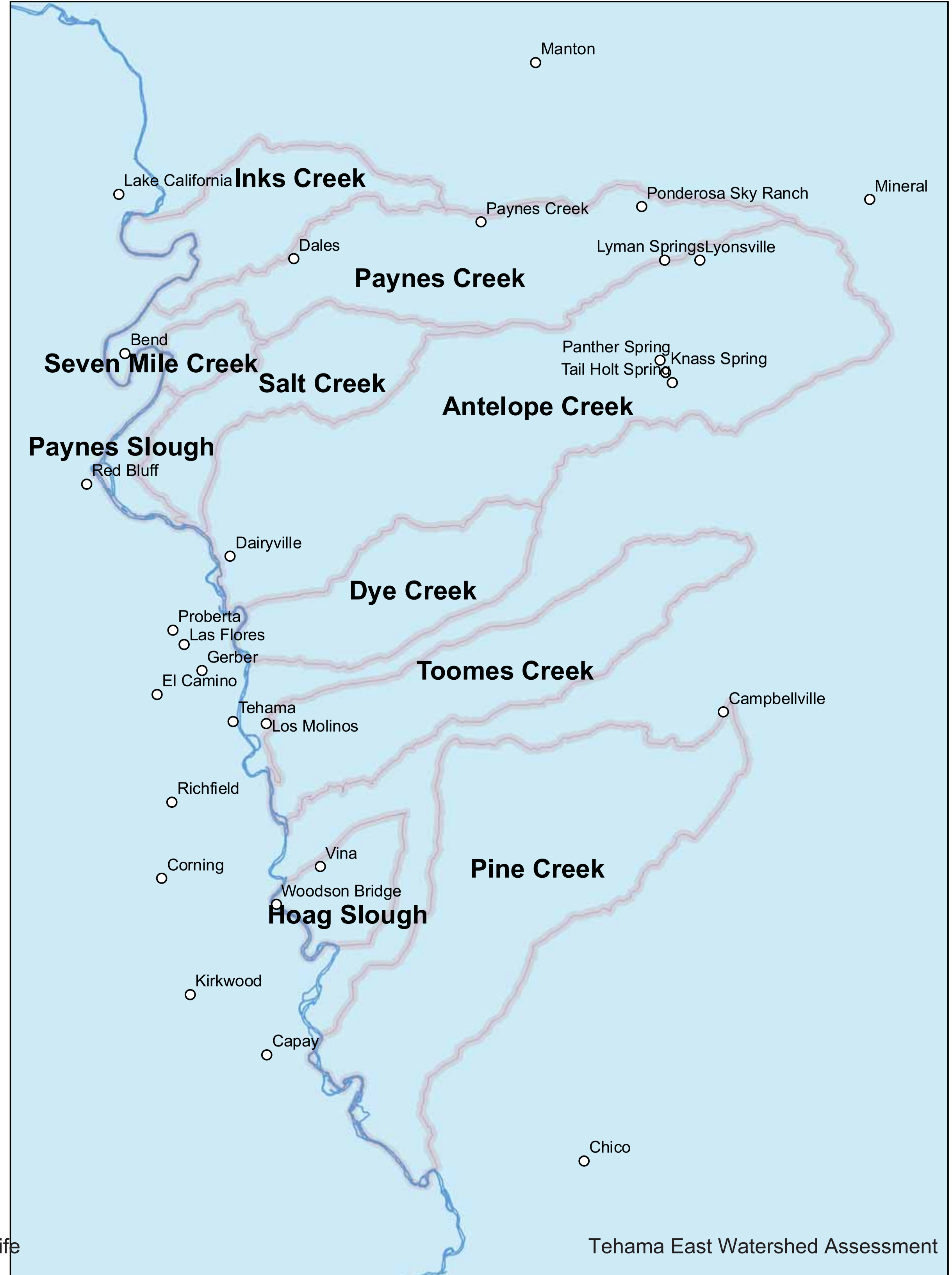
KEY

CALIFORNIA KANGAROO RAT (DIPODOMYS CALIFORNICUS)

Watershed Boundary

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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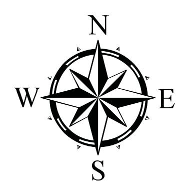
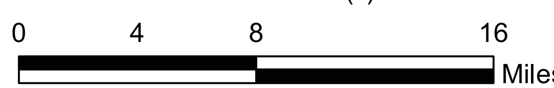
KEY

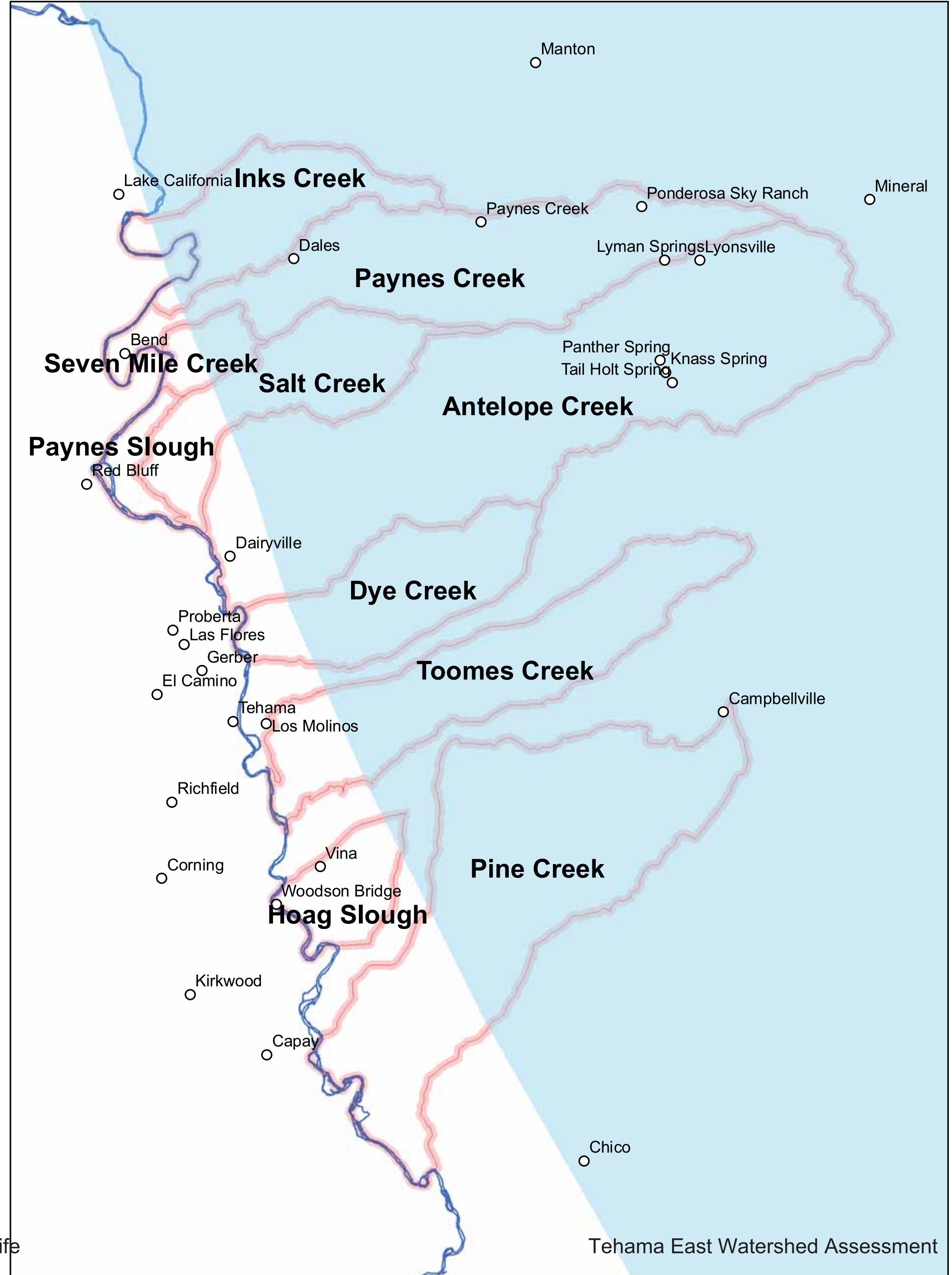
COYOTE
(CANIS LATRANS)

Watershed Boundary



Tehama County Resource
Conservation District
(c) 2010





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KEY

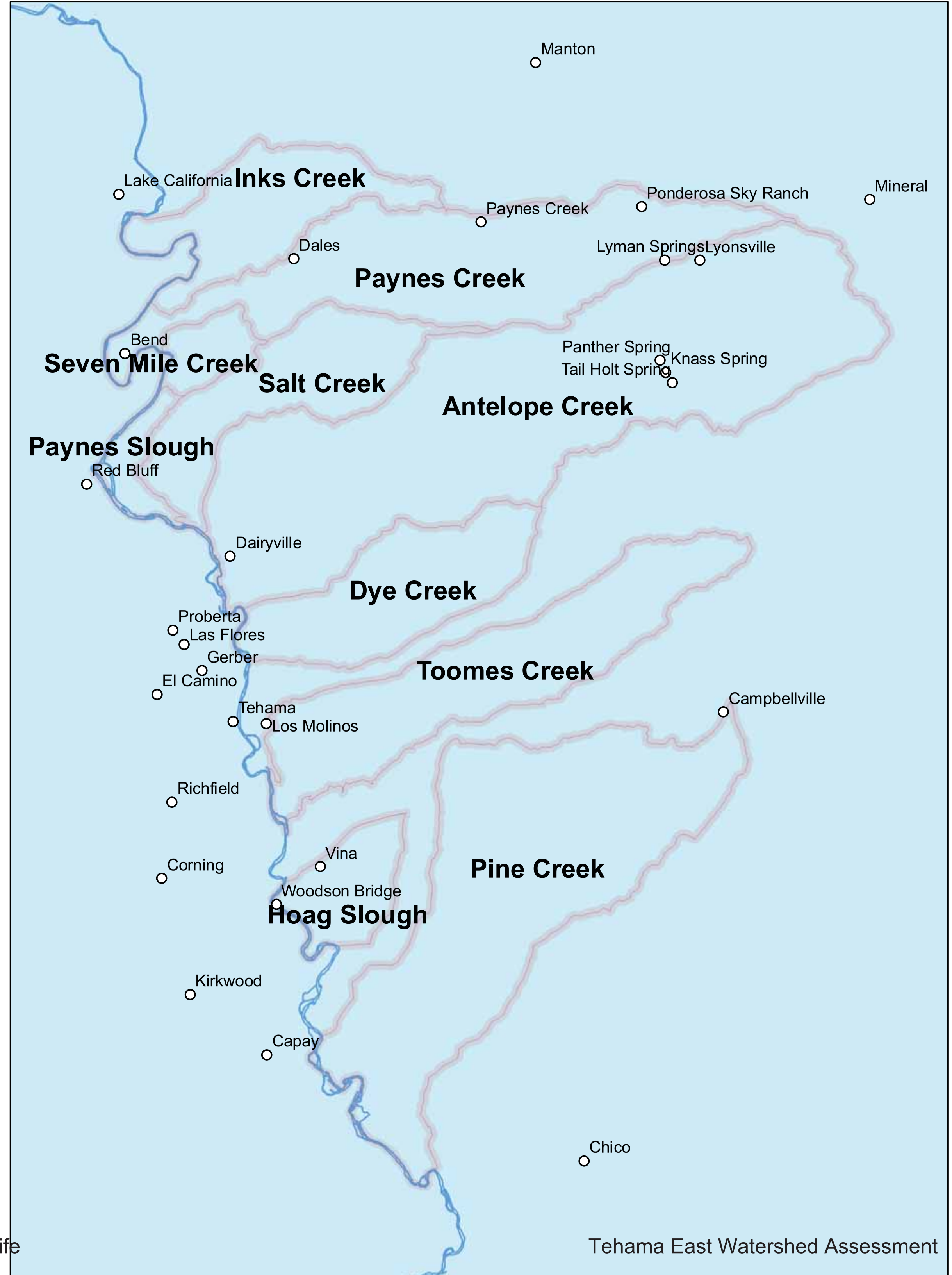
COMMON PORCUPINE (ERETHIZON DORSATUM)

Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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KEY

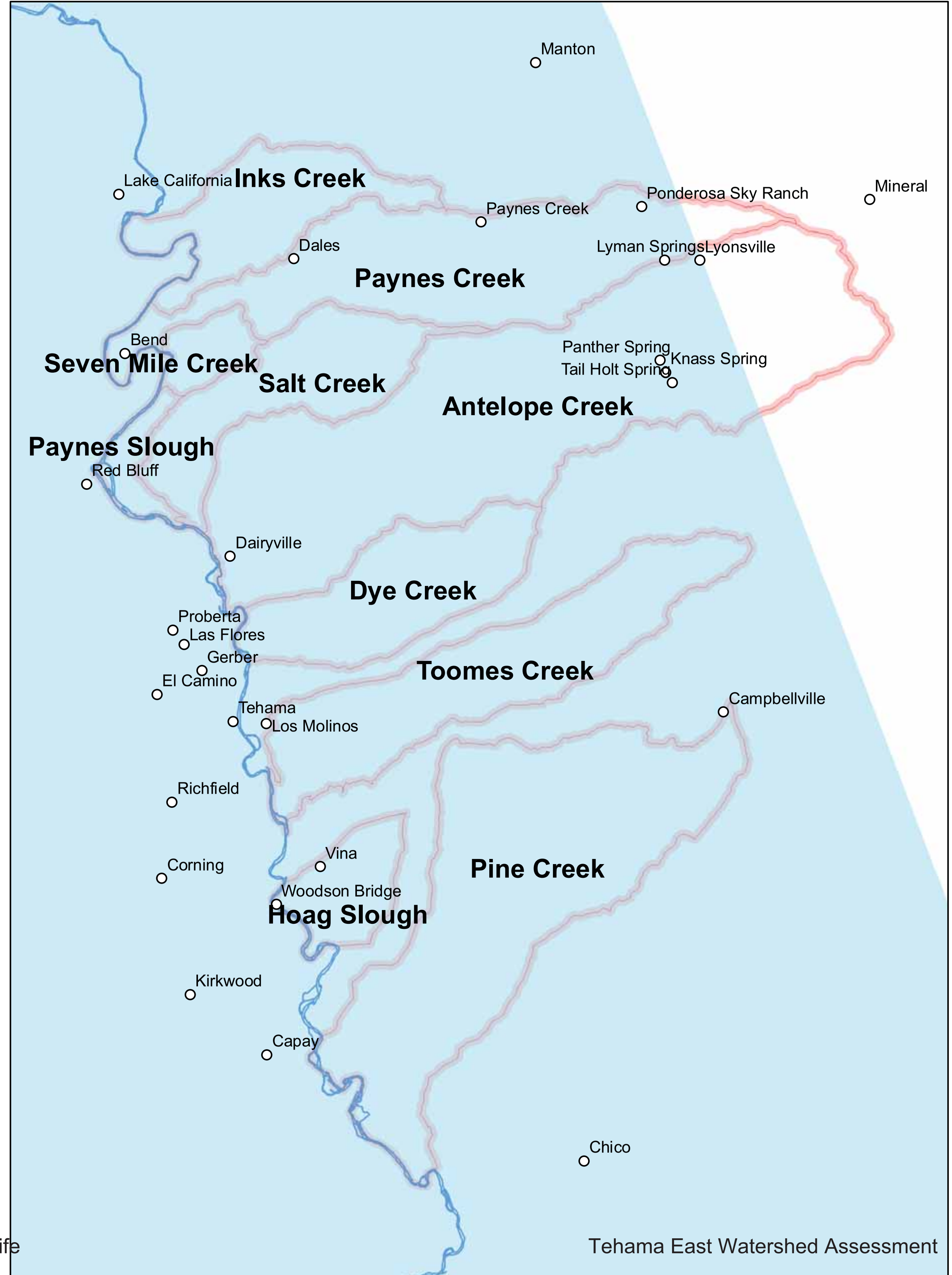
COMMON RACCOON
(PROCYON LOTOR)

Watershed Boundary

N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles



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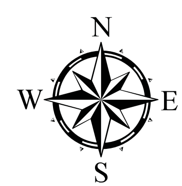
KEY

CALIFORNIA VOLE (MICROTUS CALIFORNICUS)

Watershed Boundary



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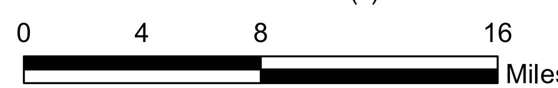
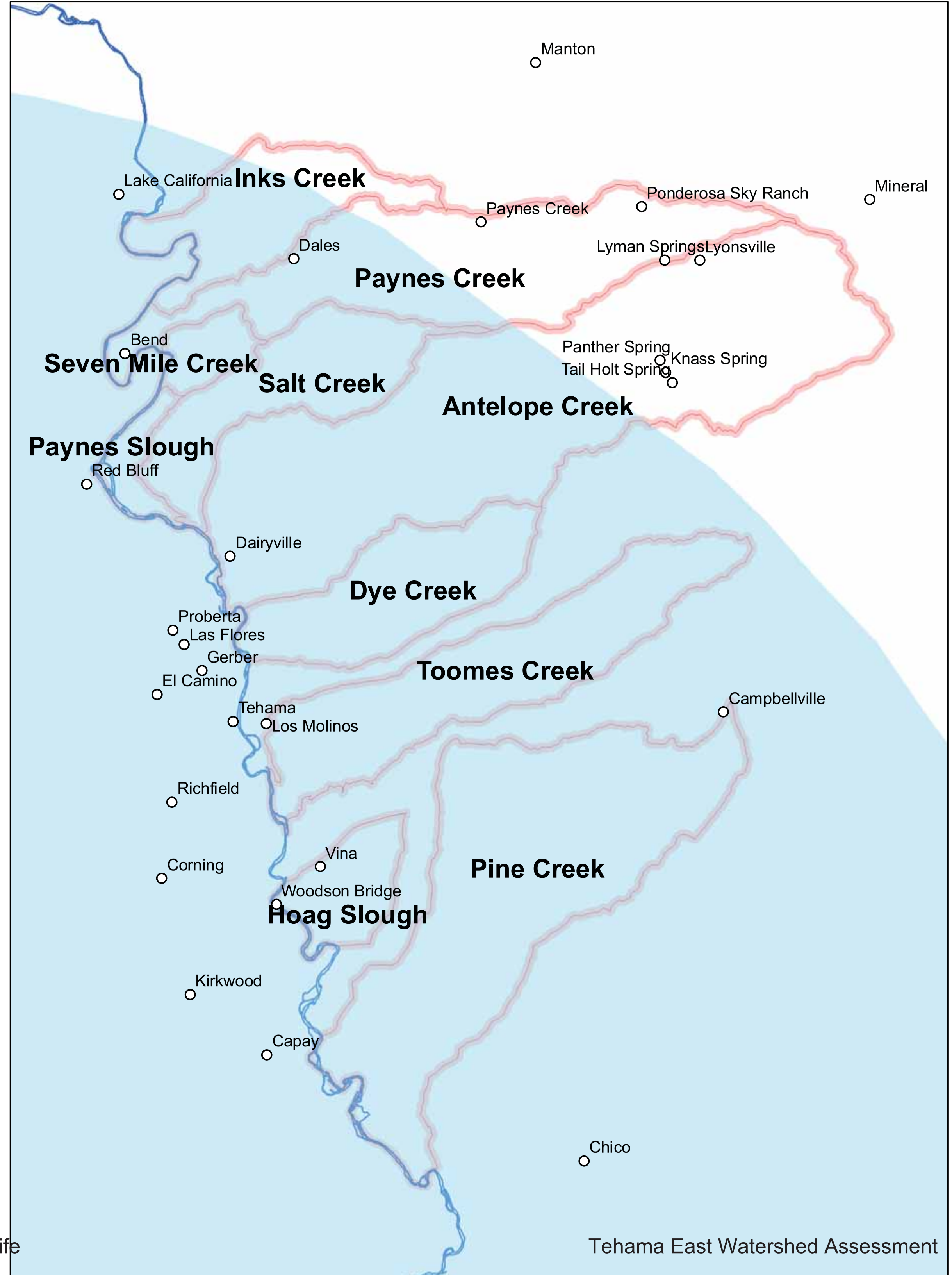
(c) 2010





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KEY

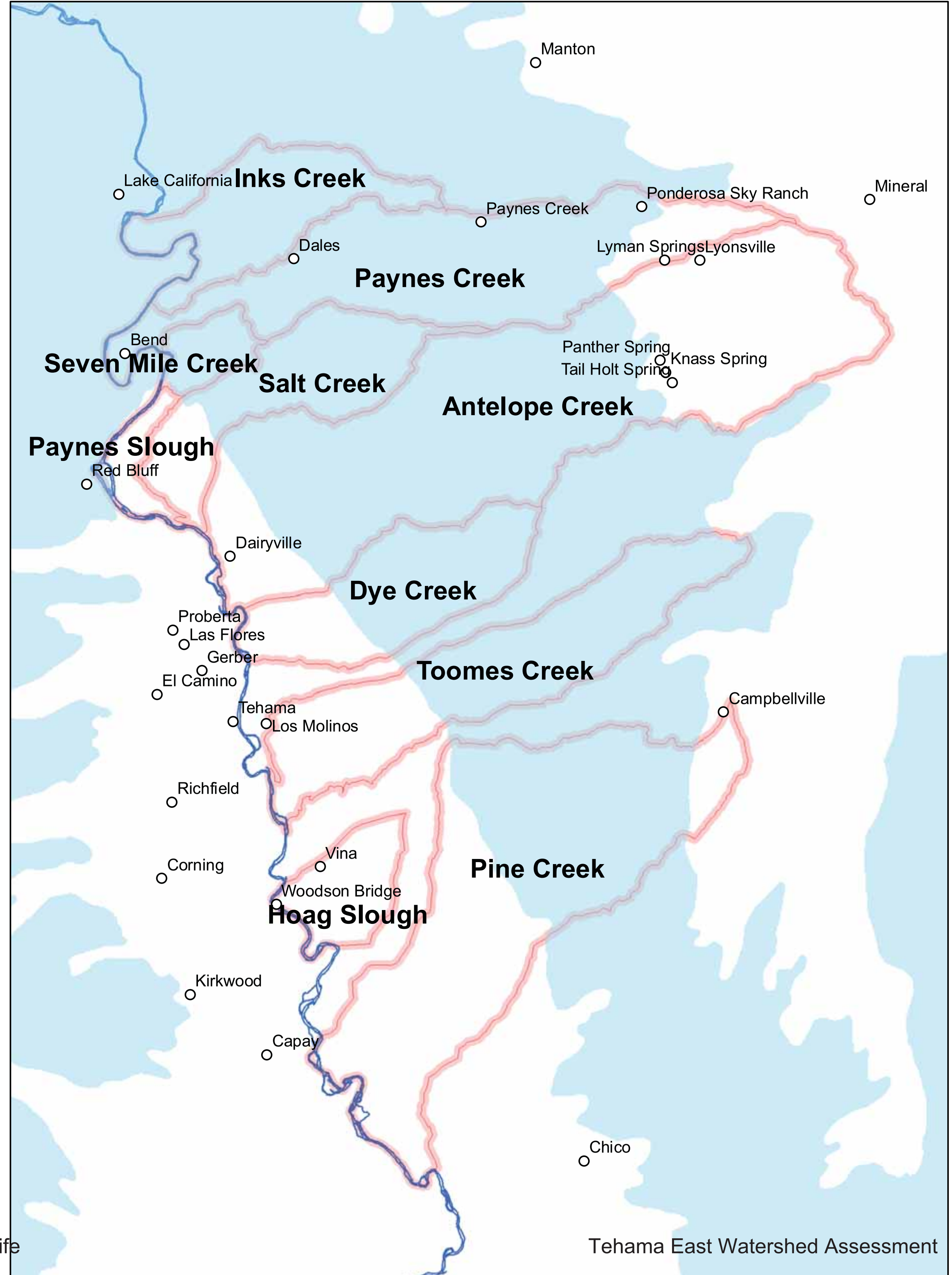
DESERT COTTONTAIL (SYLVILAGUS AUDUBONII)

Watershed Boundary

N S E W

Tehama County Resource Conservation District (c) 2010

0 4 8 16 Miles



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KEY

DUSKY-FOOTED WOODRAT (NEOTOMA FUSCIPES)

Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

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KEY

DEER MOUSE (PEROMYSCUS MANICULATUS)

Watershed Boundary

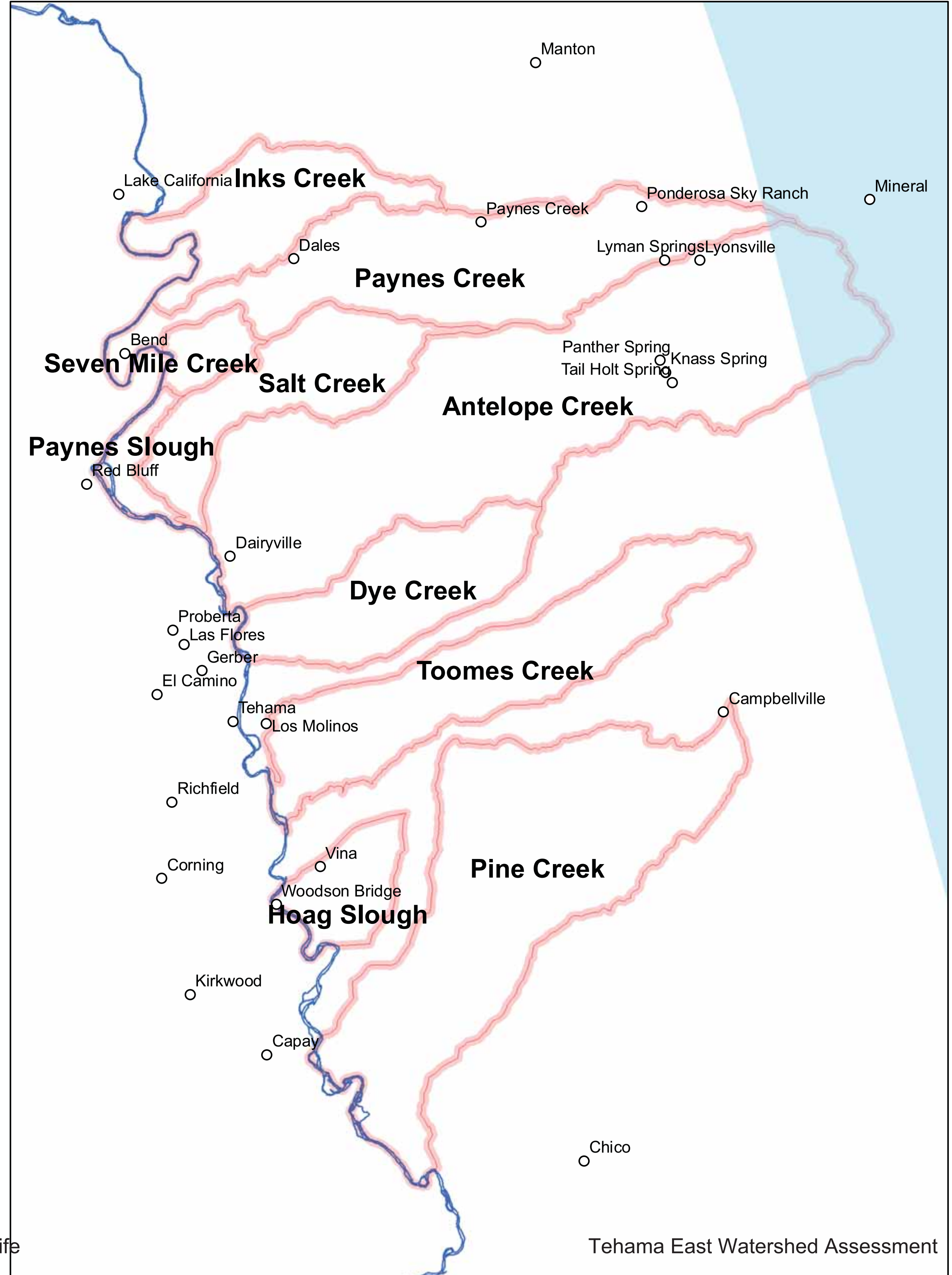
N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds



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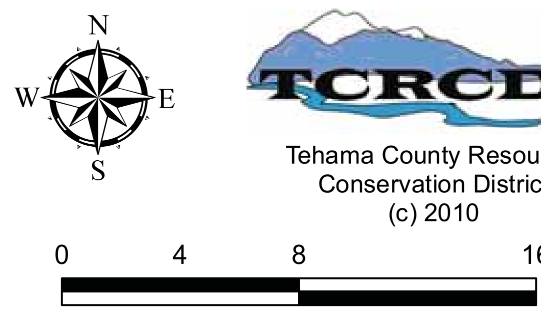
KEY

DOUGLAS' SQUIRREL (TAMIASCIURUS DOUGLASII)

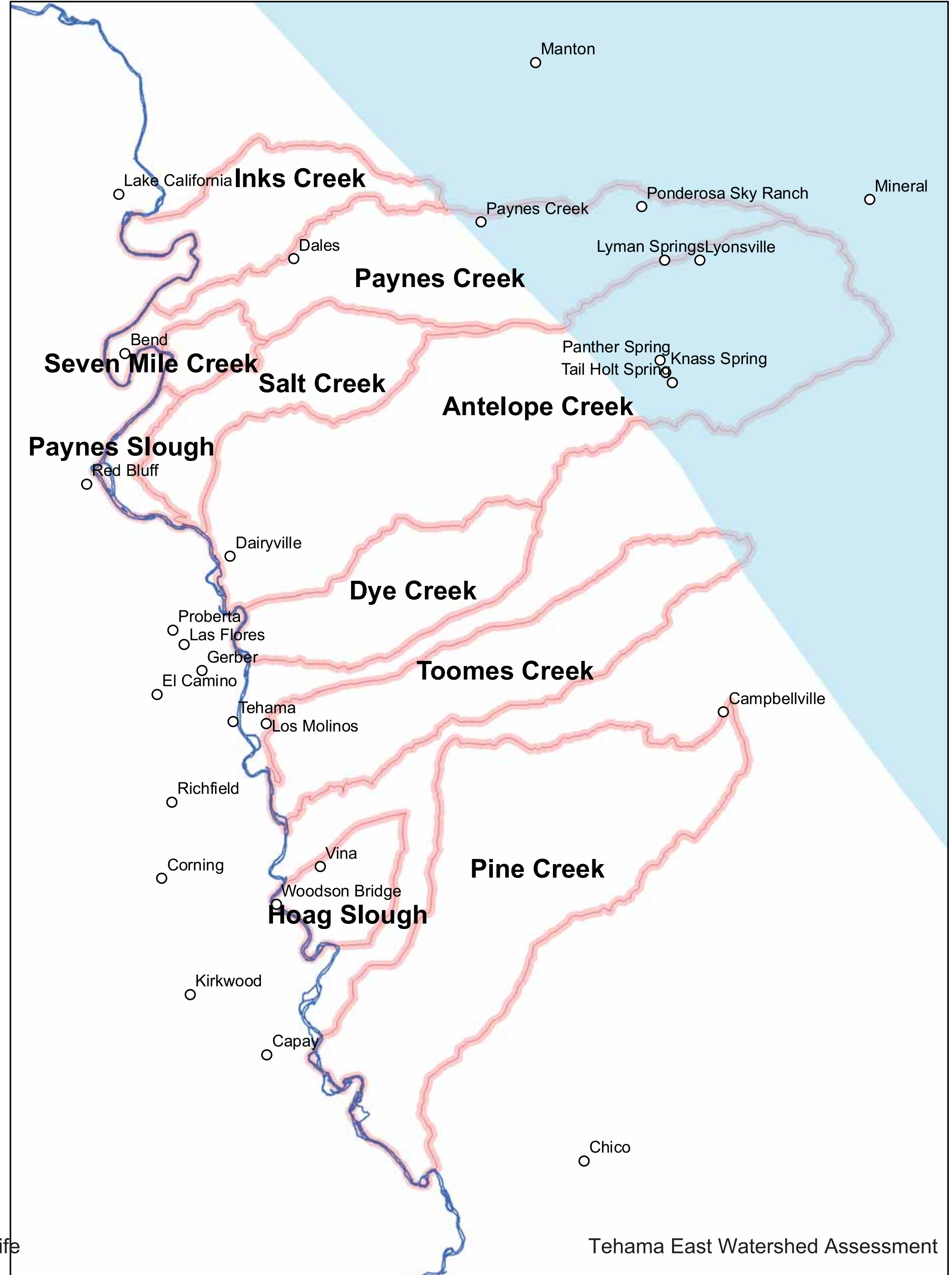
Watershed Boundary



Tehama County Resource Conservation District
(c) 2010

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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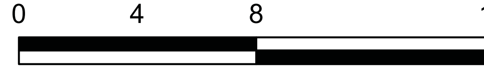
KEY

ERMINE (MUSTELA ERMINEA)

Watershed Boundary

Tehama County Resource Conservation District
(c) 2010



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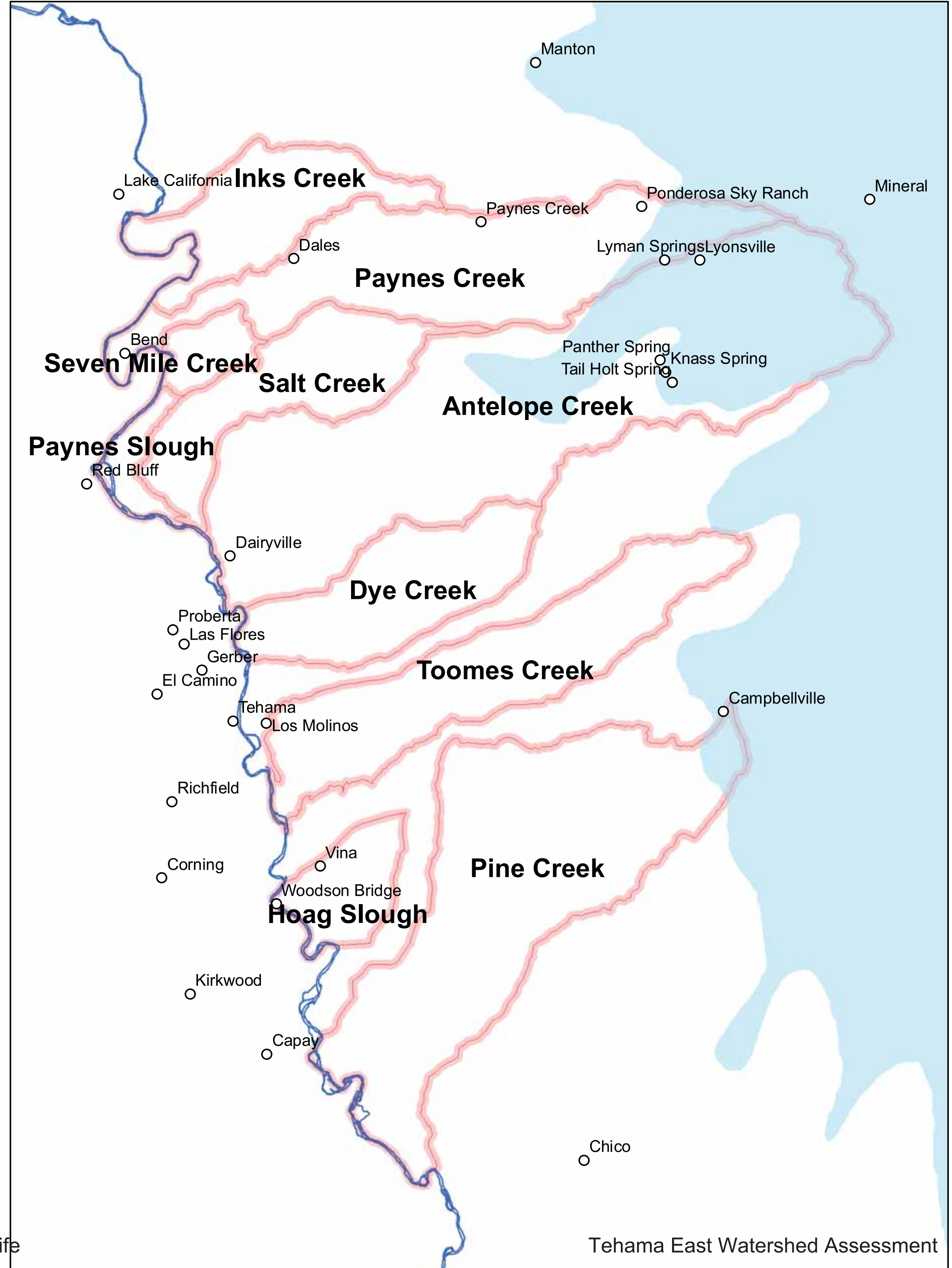
California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds



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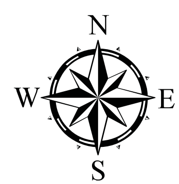
Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

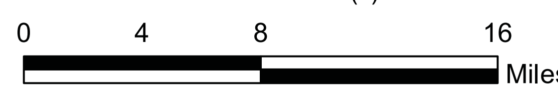
KEY

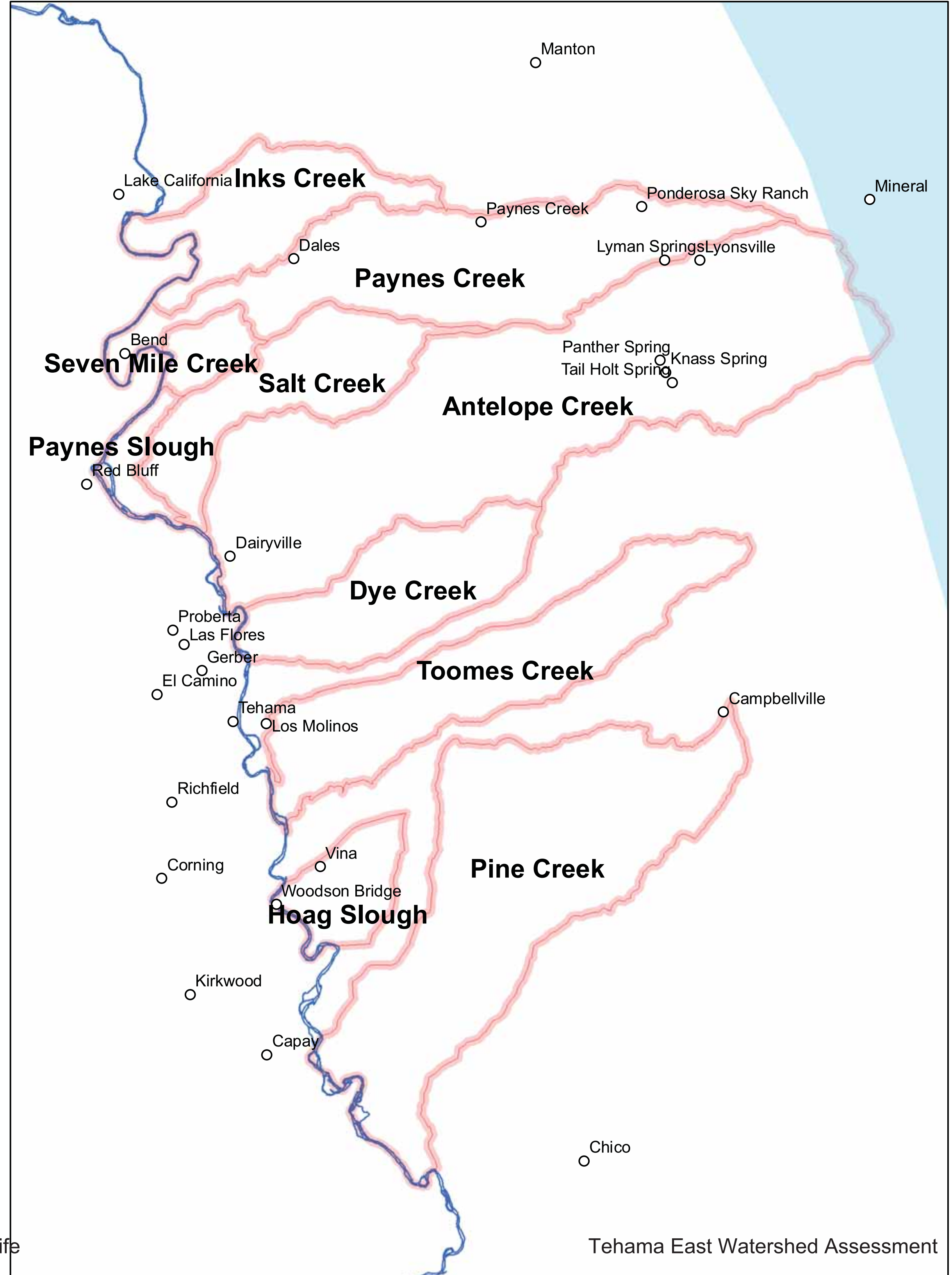
FISHER (MARTES PENNANTI)

Watershed Boundary



Tehama County Resource Conservation District
(c) 2010





Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

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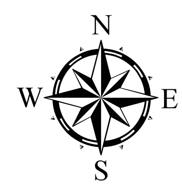
KEY

LONG-TAILED VOLE (MICROTUS LONGICAUDUS)

Watershed Boundary



Tehama County Resource Conservation District
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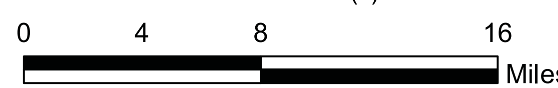

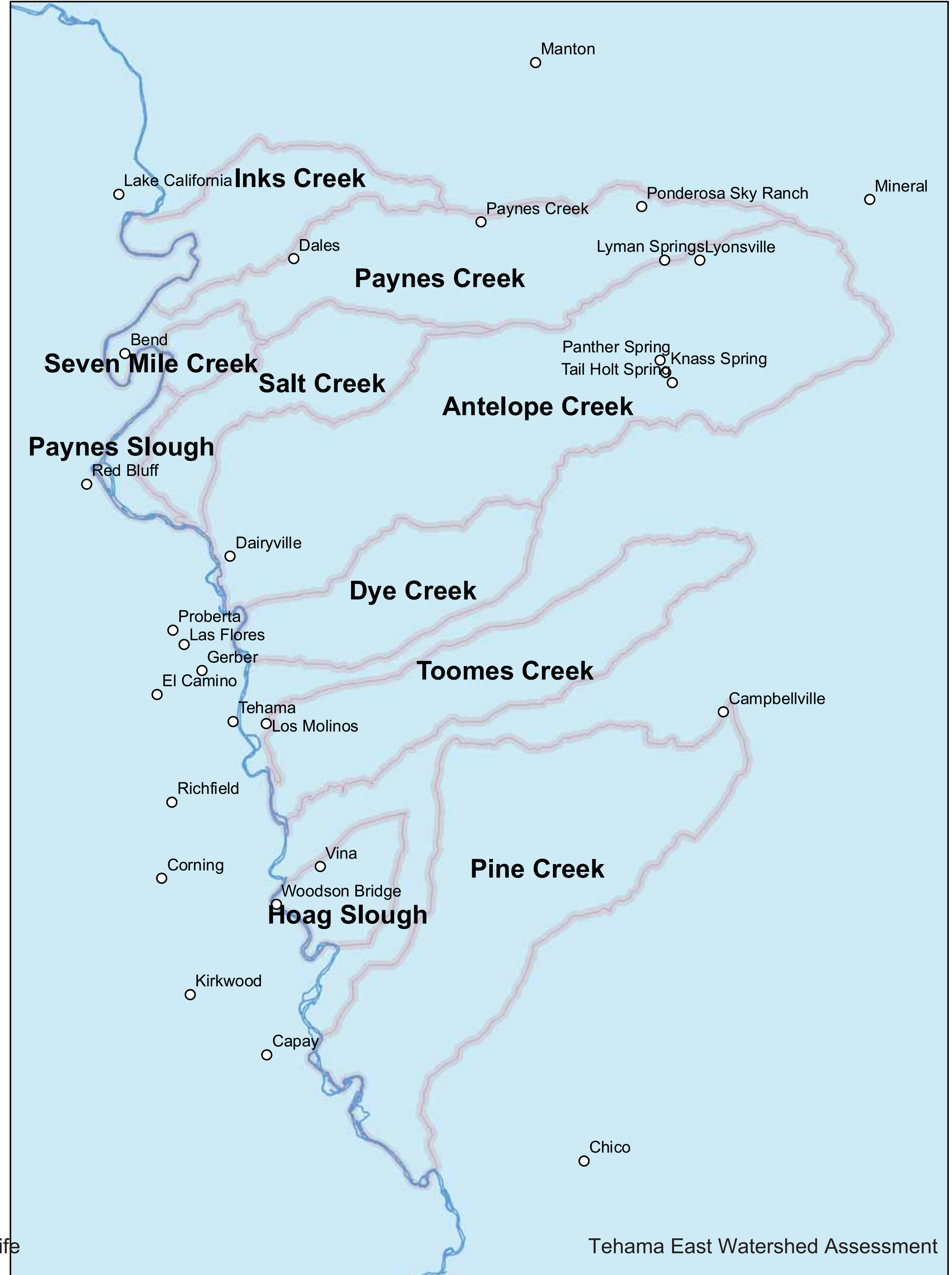

Tehama East Watershed Assessment

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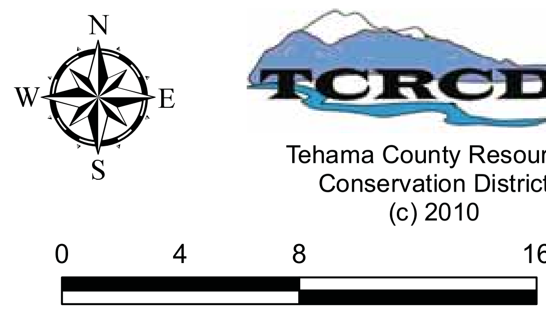
KEY

LONG-TAILED WEASEL (MUSTELA FRENATA)

Watershed Boundary



Tehama County Resource Conservation District
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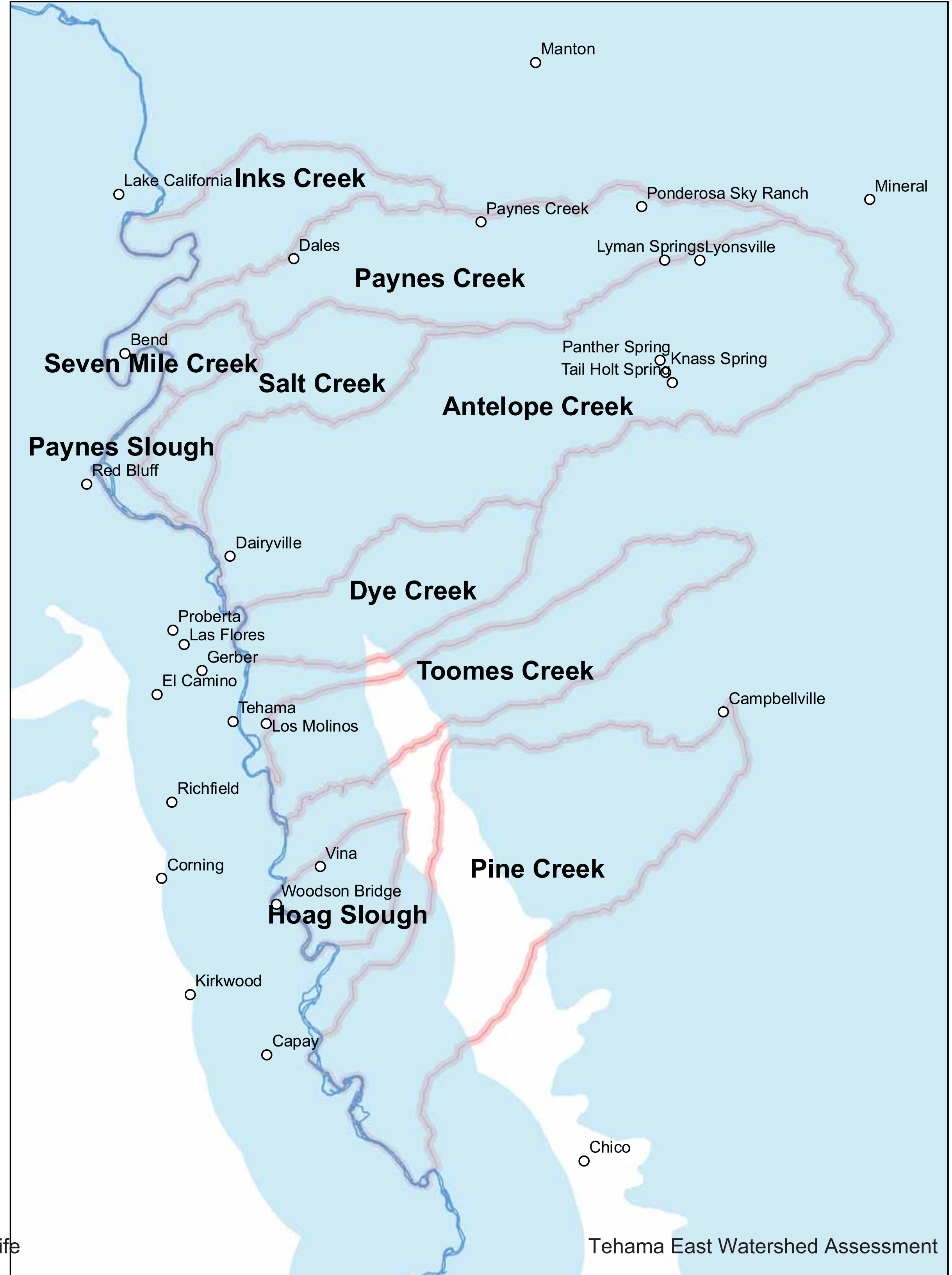

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Tehama East Watersheds

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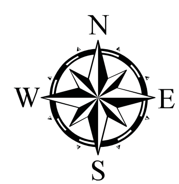
KEY

MULE DEER (ODOCOILEUS HEMIONUS)

Watershed Boundary



Tehama County Resource Conservation District
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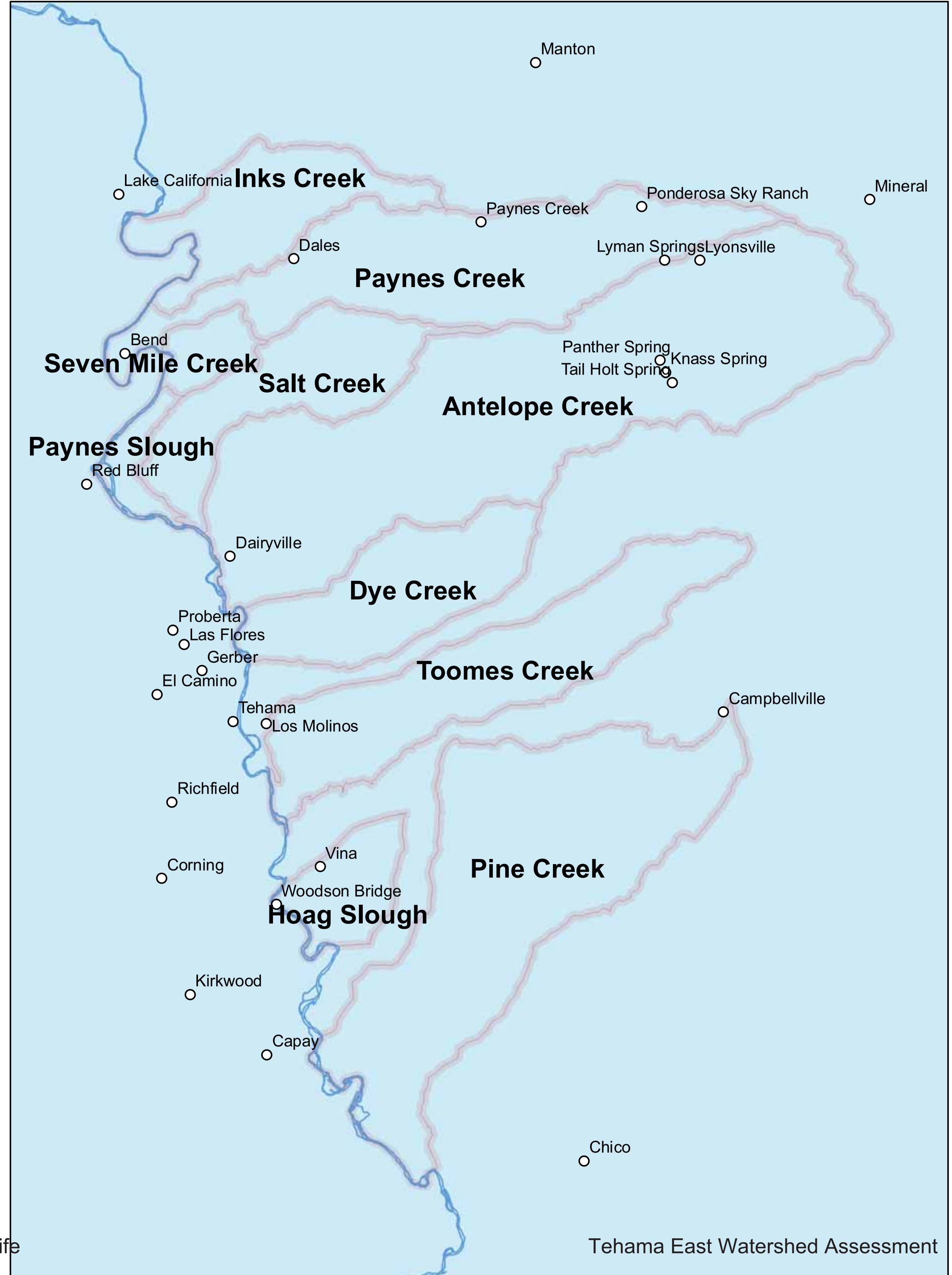

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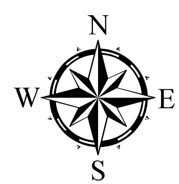
KEY

MINK (MUSTELA VISON)

Watershed Boundary



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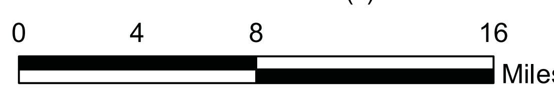

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Tehama East Watersheds

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KEY

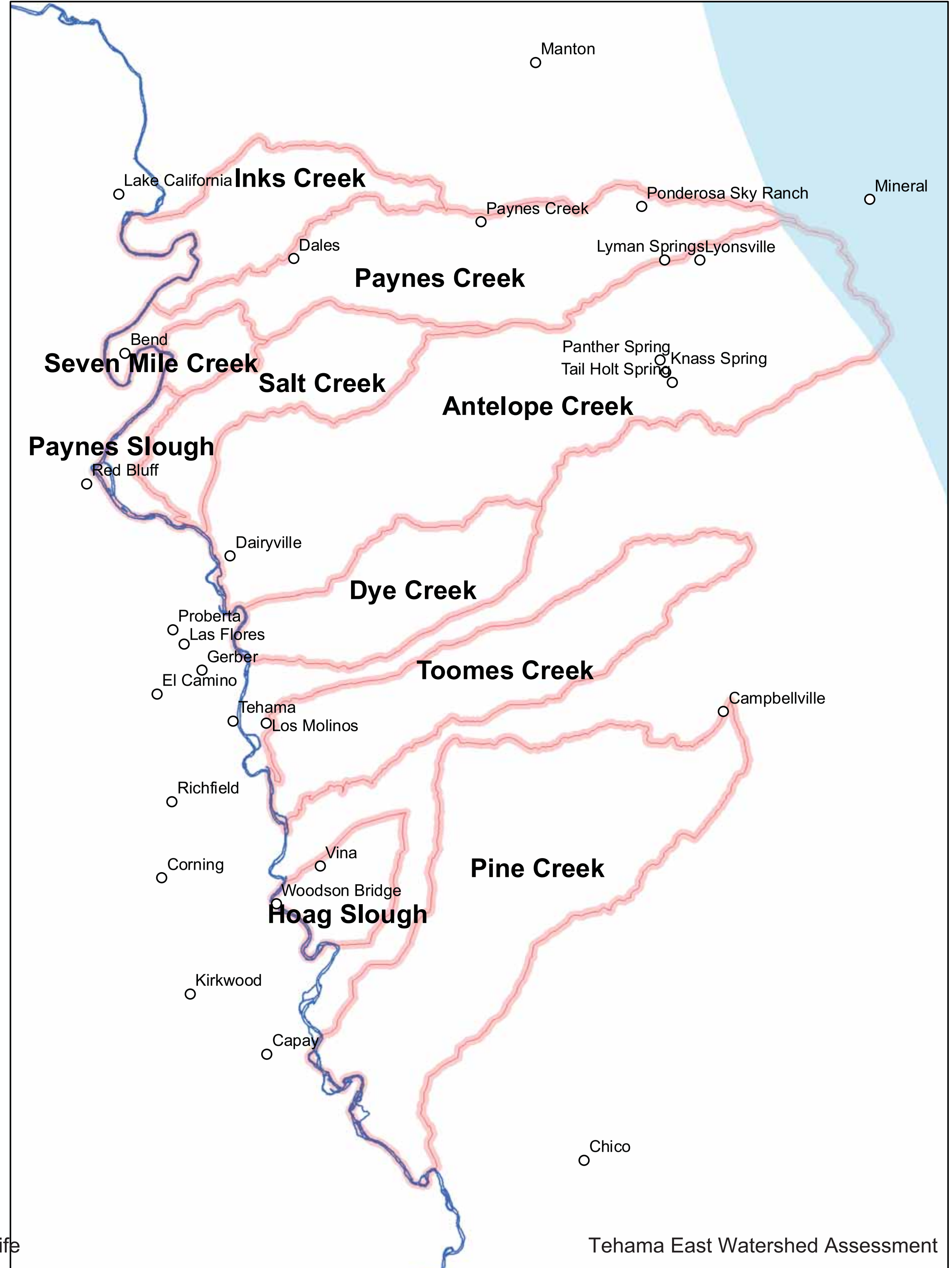
MOUNTAIN LION (FELIS CONCOLOR)

Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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Tehama East Watersheds

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KEY

MOUNTAIN POCKET GOPHER (THOMOMYS MONTICOLA)

Watershed Boundary

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

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KEY

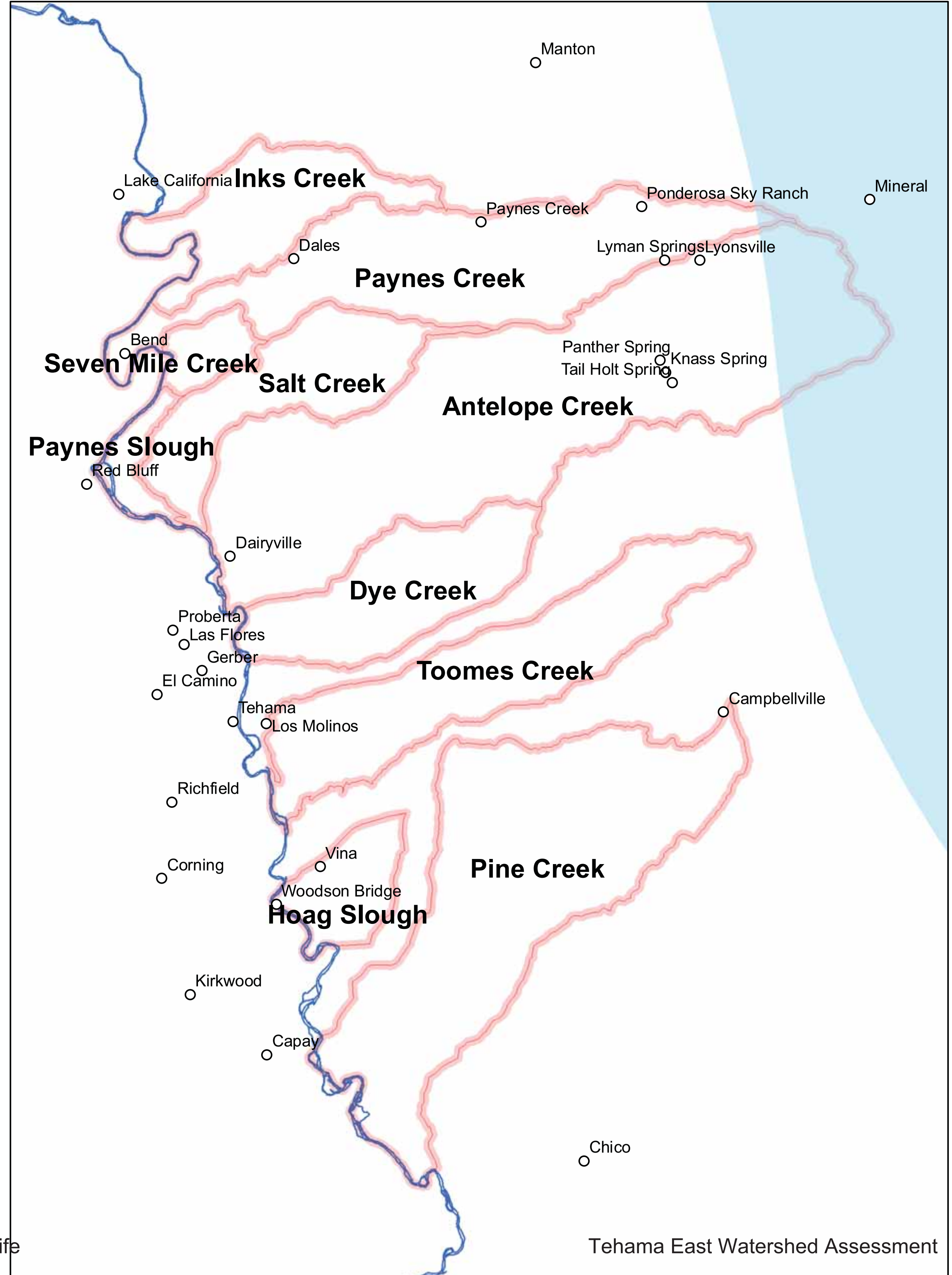
MUSKRAT
(ONDATRA ZIBETHICUS)

Watershed Boundary

N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles



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KEY

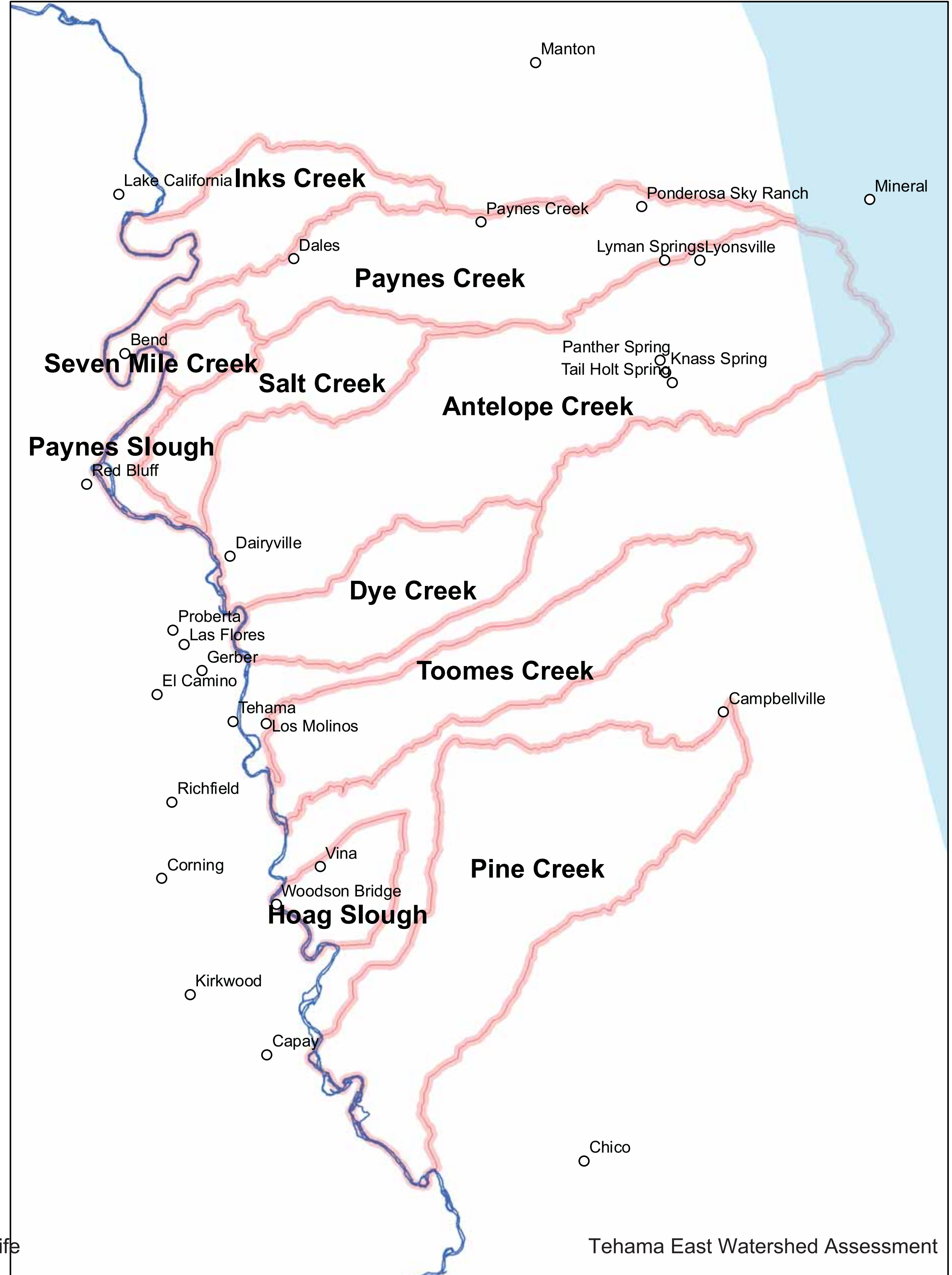
MONTANE VOLE (MICROTUS MONTANUS)

Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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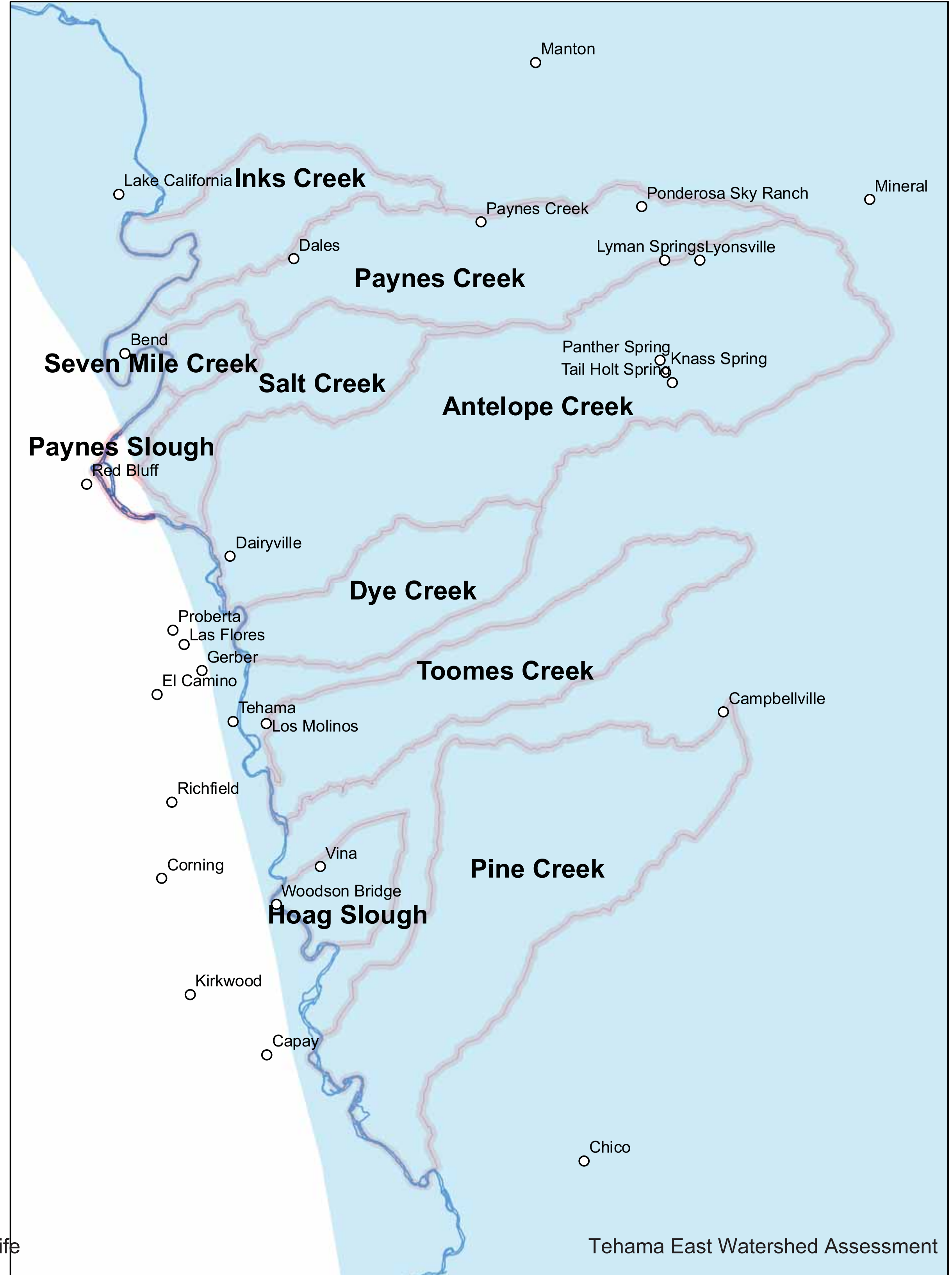
KEY

NORTHERN FLYING SQUIRREL (GLAUCOMYS SABRINUS)

Watershed Boundary

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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KEY

NORTHERN RIVER OTTER (LUTRA CANADENSIS)

Watershed Boundary

N W E S

Tehama County Resource Conservation District (c) 2010

0 4 8 16 Miles

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Tehama East Watersheds

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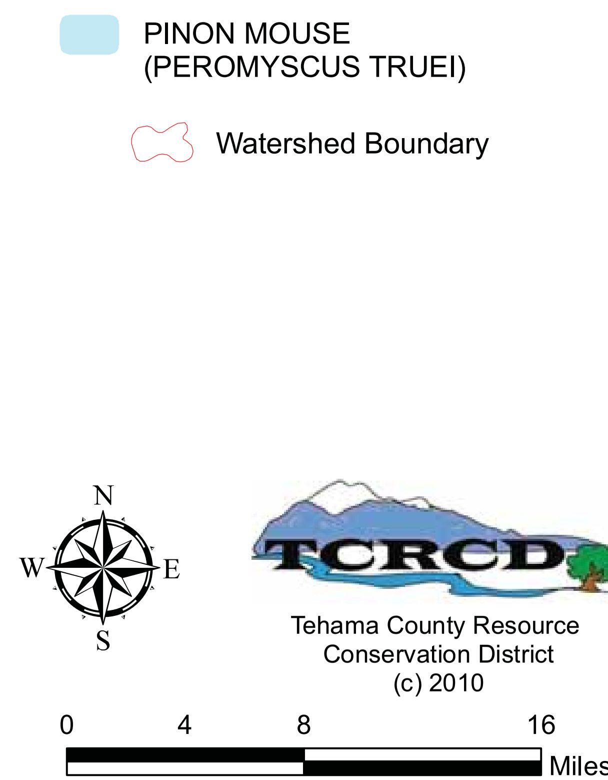

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California Wildlife Habitat Relationships (CWHR) System
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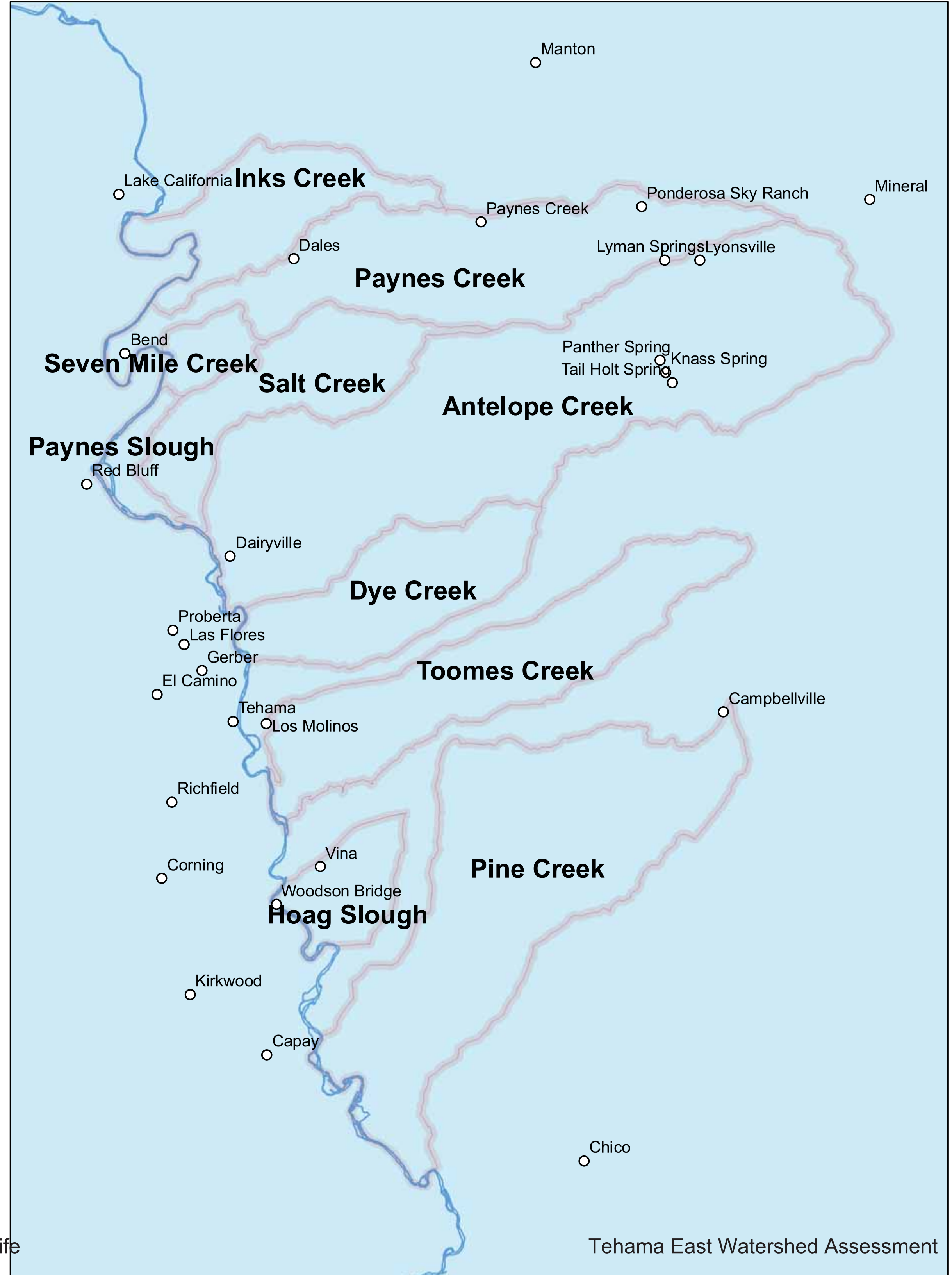

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KEY

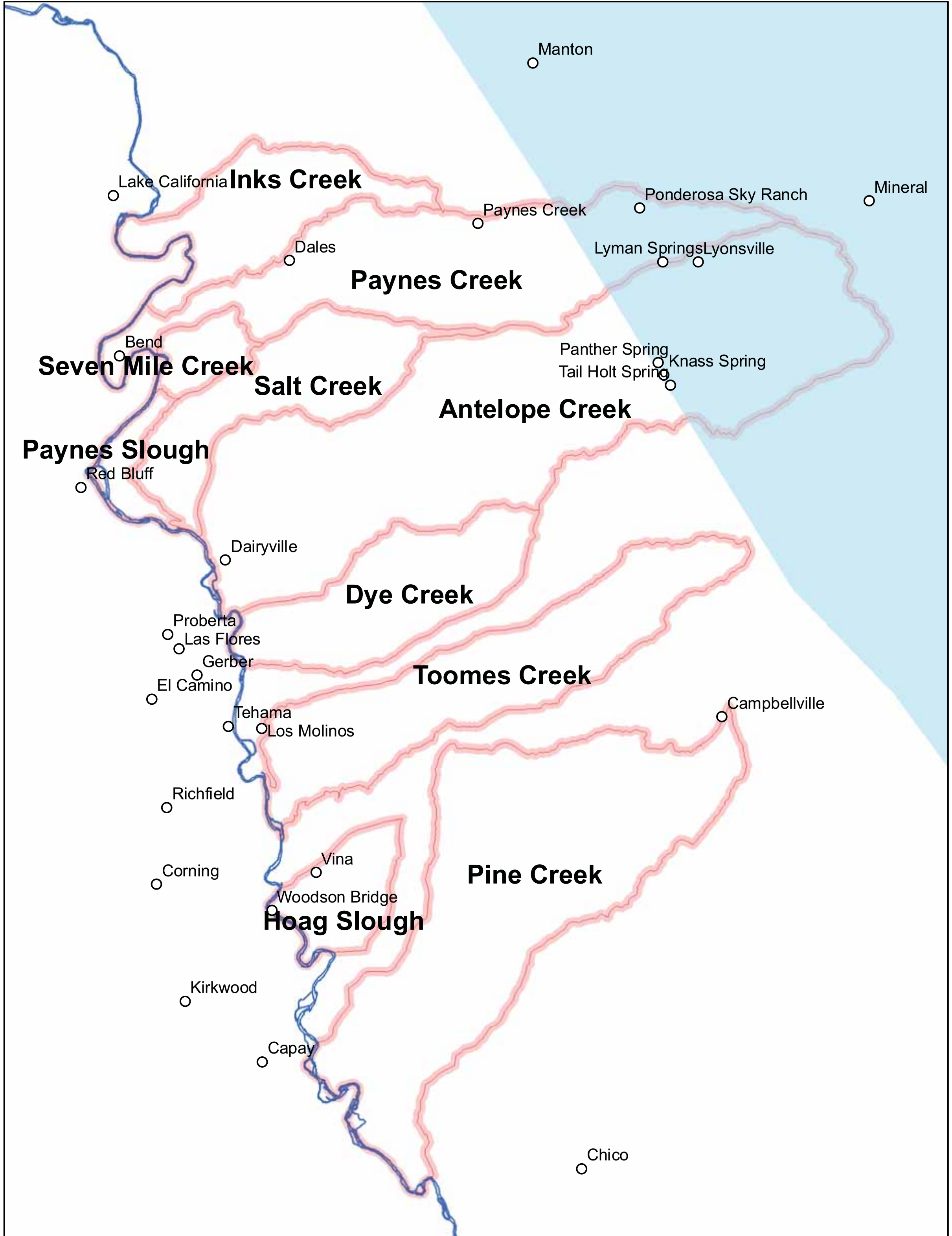
RINGTAIL (BASSARISCUS ASTUTUS)

Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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Tehama East Watersheds

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KEY

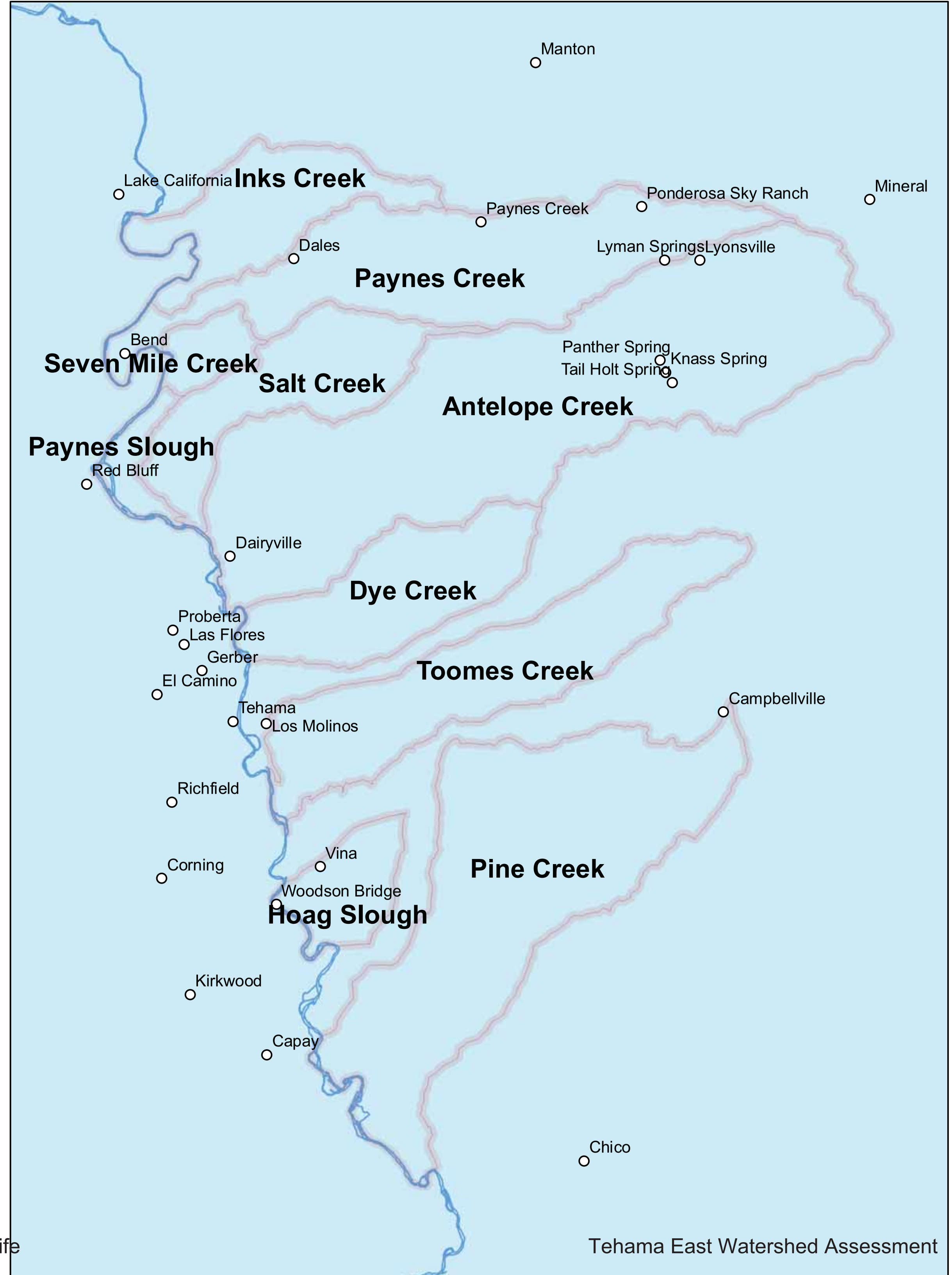
SNOWSHOE HARE (LEPUS AMERICANUS)

Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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KEY

STRIPED SKUNK (MEPHITIS MEPHITIS)

Watershed Boundary

N W E S

Tehama County Resource Conservation District
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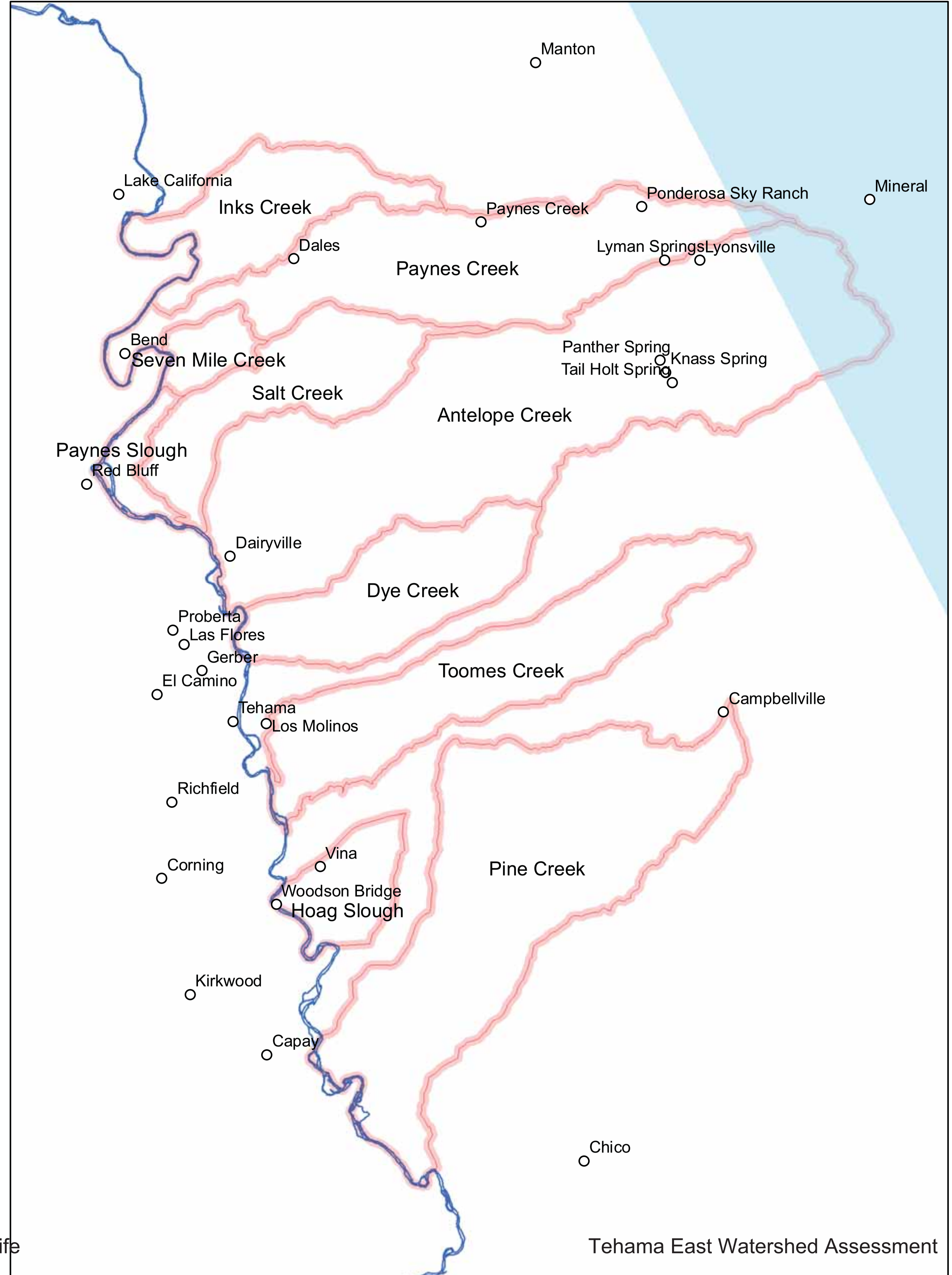
0 4 8 16 Miles



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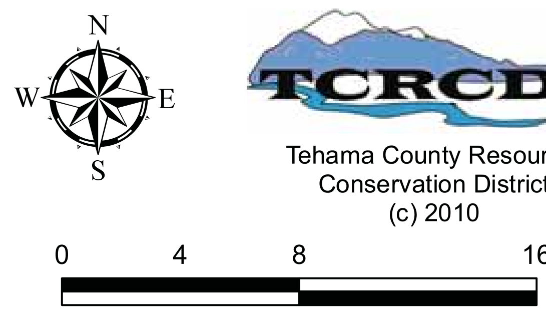
KEY

TROWBRIDGE'S SHREW (SOREX TROWBRIDGII)

Watershed Boundary



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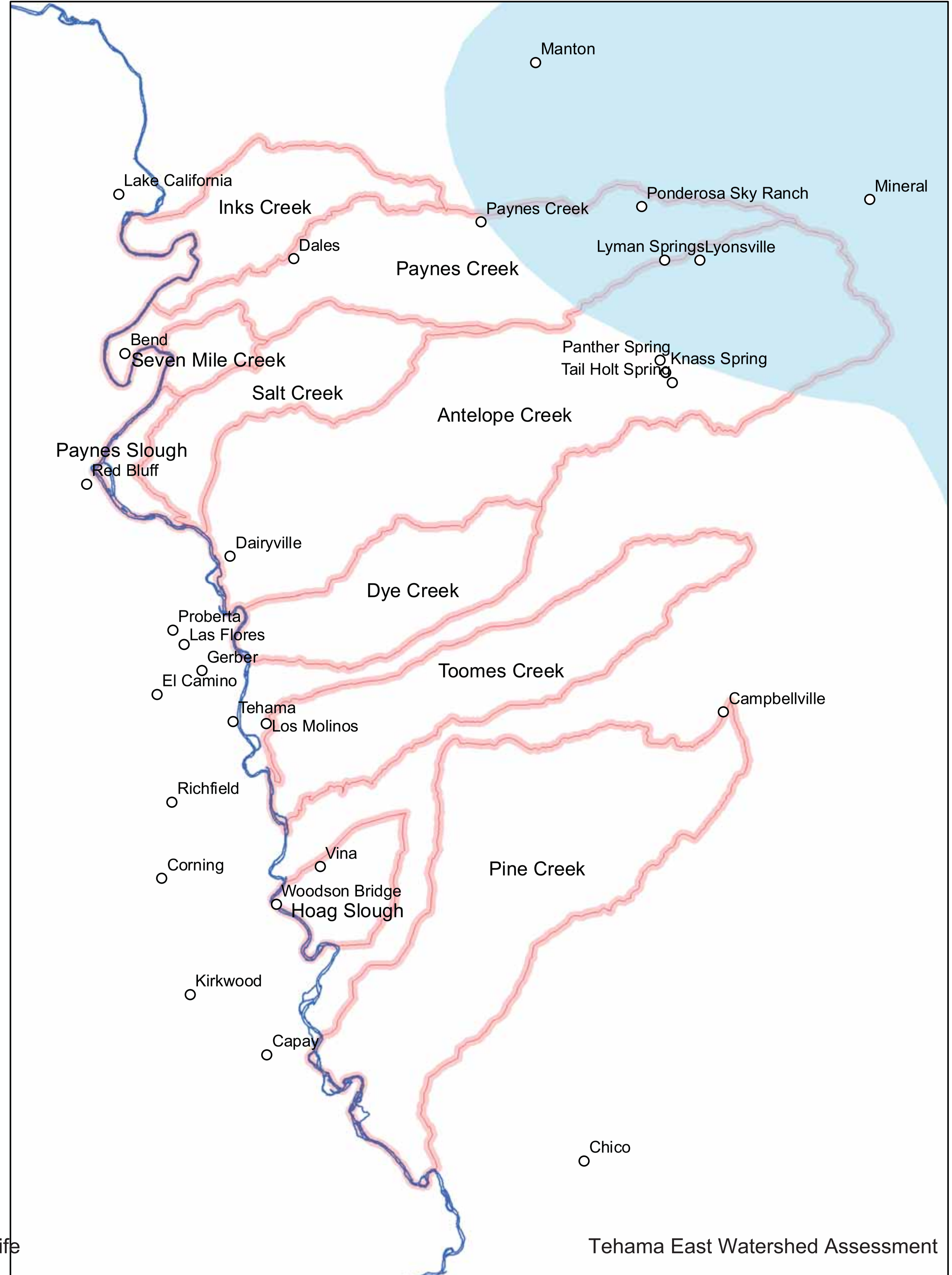

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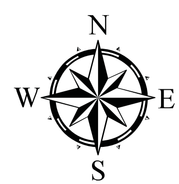
KEY

VAGRANT SHREW (SOREX VAGRANS)

Watershed Boundary



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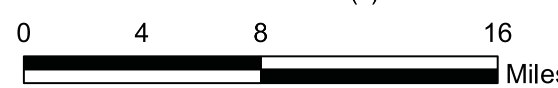

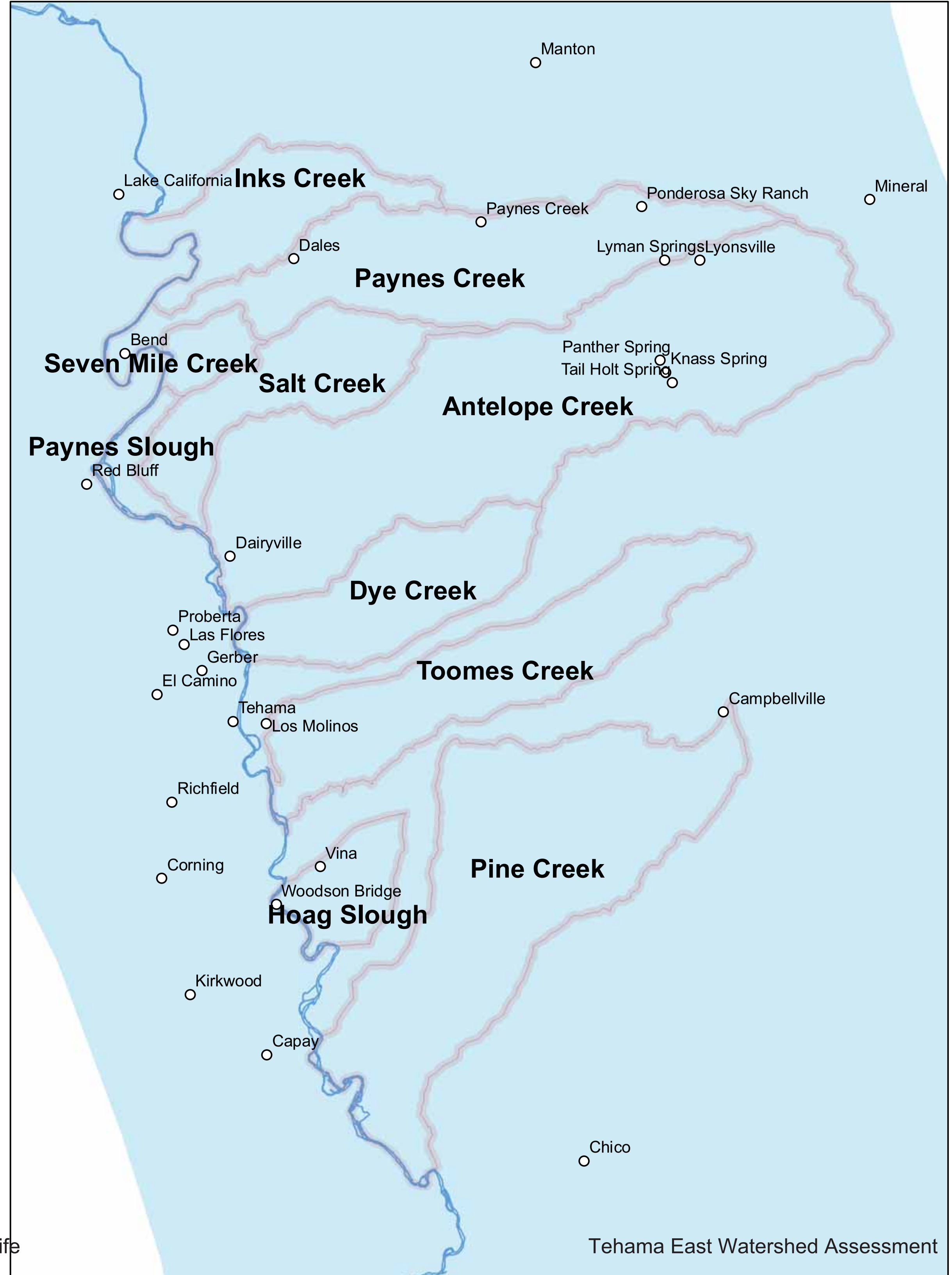

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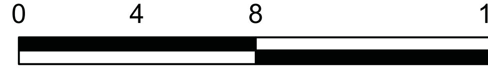
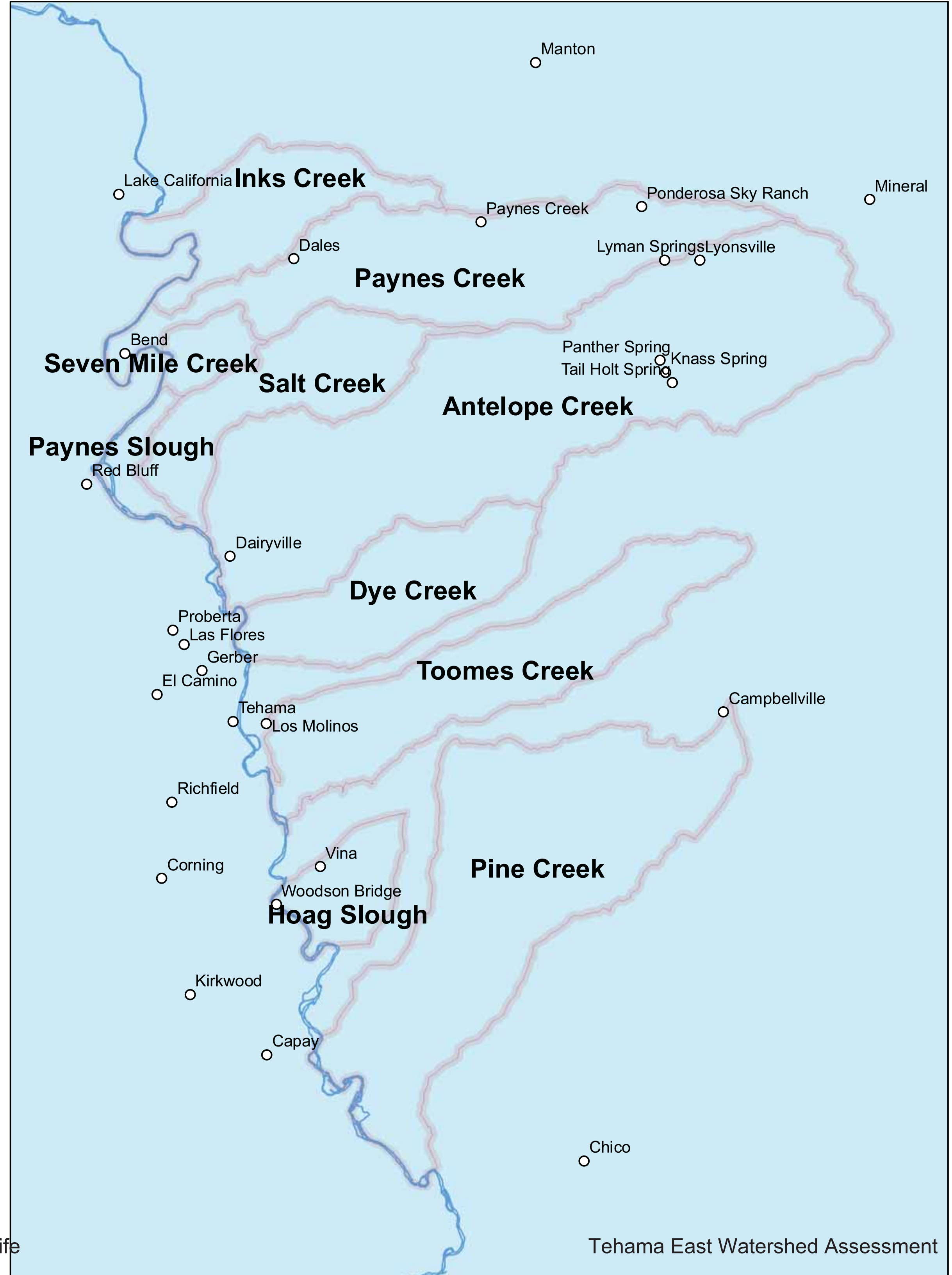
KEY

WESTERN GRAY SQUIRREL (SCIURUS GRISEUS)

Watershed Boundary

Tehama County Resource Conservation District
(c) 2010





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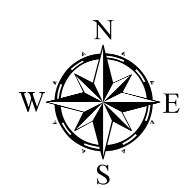
KEY

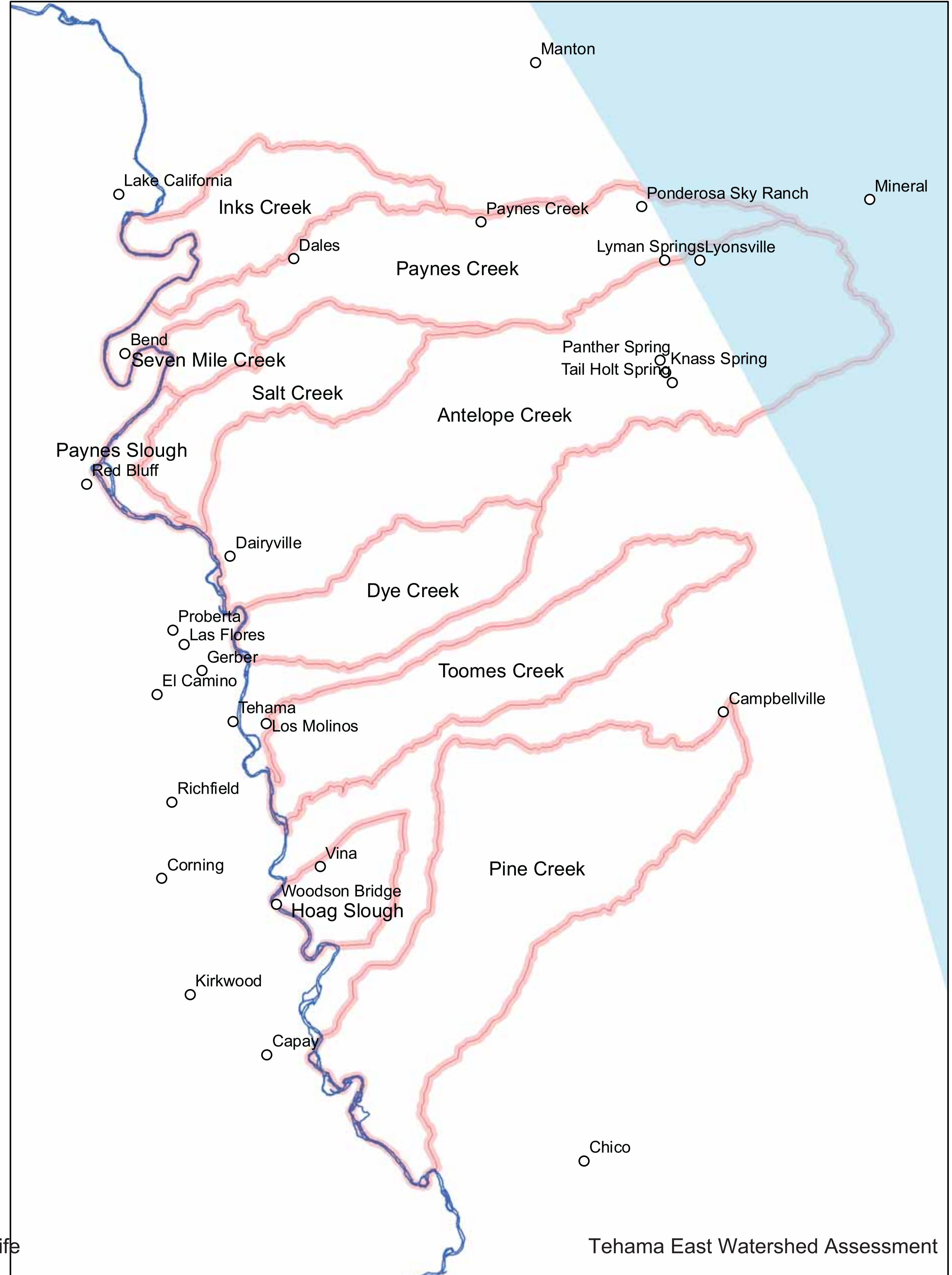
WESTERN HARVEST MOUSE (REITHRODONTOMYS MEGALOTIS)

Watershed Boundary



Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



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Quoted from:
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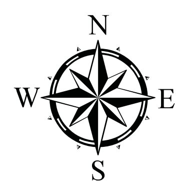
KEY

WATER SHREW (SOREX PALUSTRIS)

Watershed Boundary



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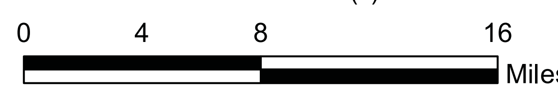

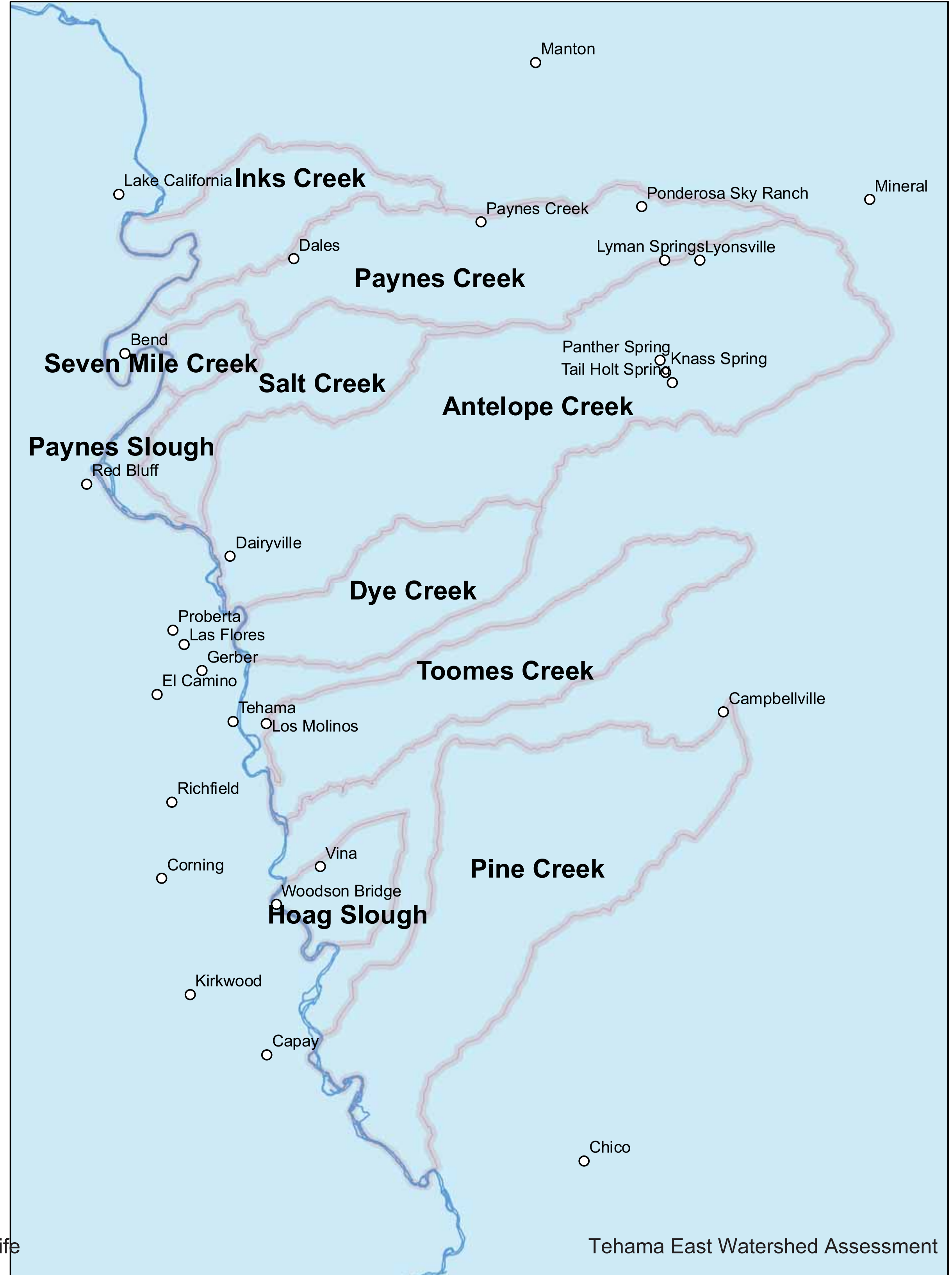

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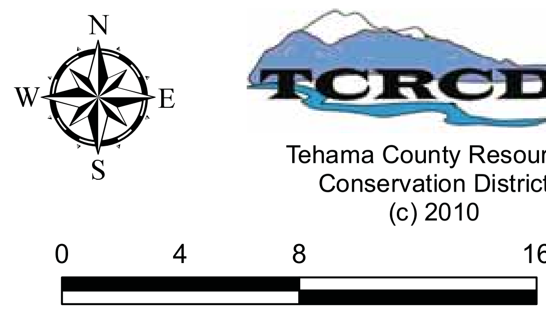
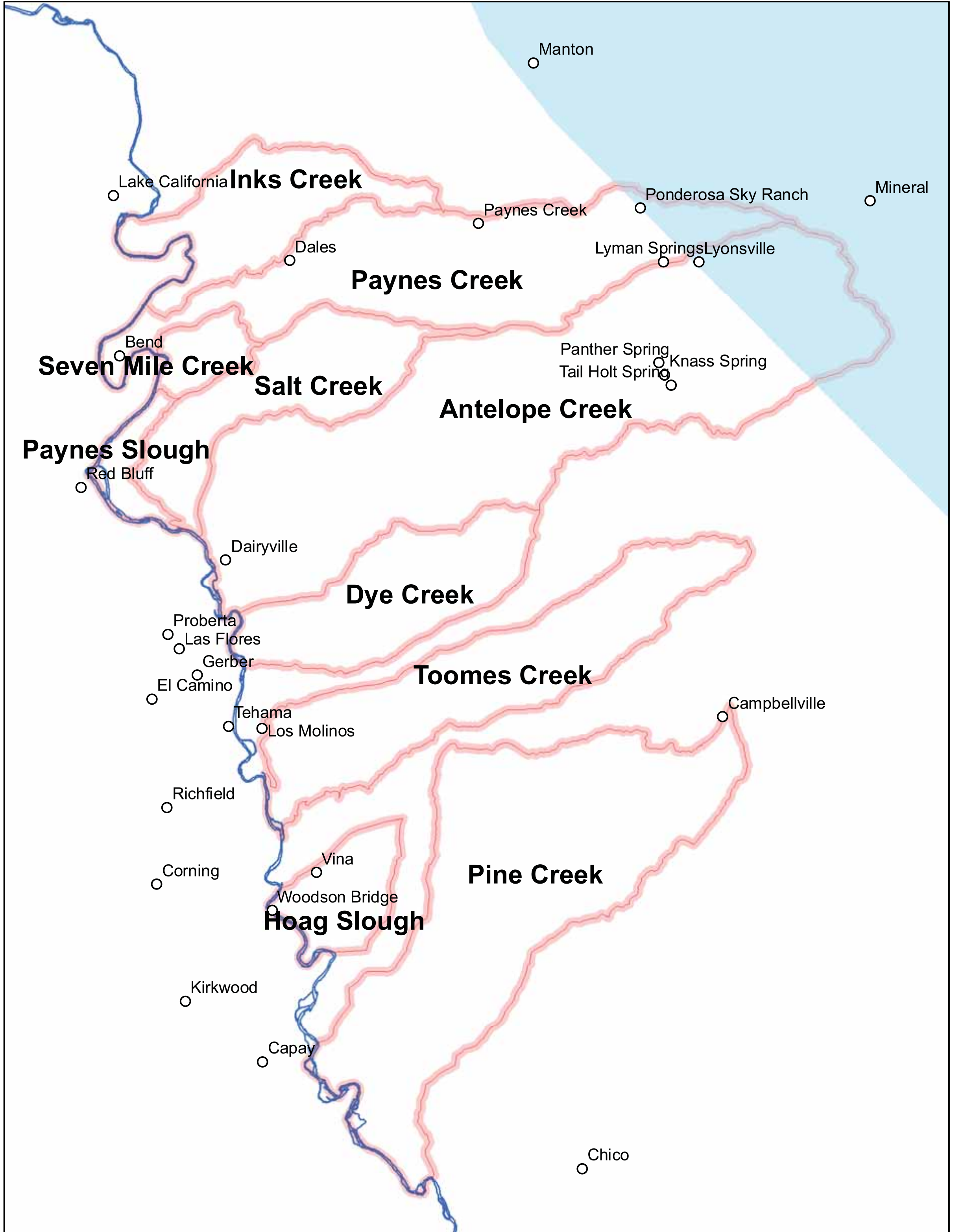
KEY

WESTERN SPOTTED SKUNK (SPILOGALE GRACILIS)

Watershed Boundary

Tehama County Resource Conservation District
(c) 2010





Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

"CWHR has been used for several large wildlife resource conservation efforts including California's GAP effort, the Legislatively-authorized Timberland Task Force effort, and the Sierra Nevada Framework effort. It is one of the primary biological data sets used in an assessment of California's biodiversity for the "Atlas of the Biodiversity of California". CWHR is used in sustained yield planning efforts by several large private timber companies and is part of regulations a dopted by the California Board of Forestry."

Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

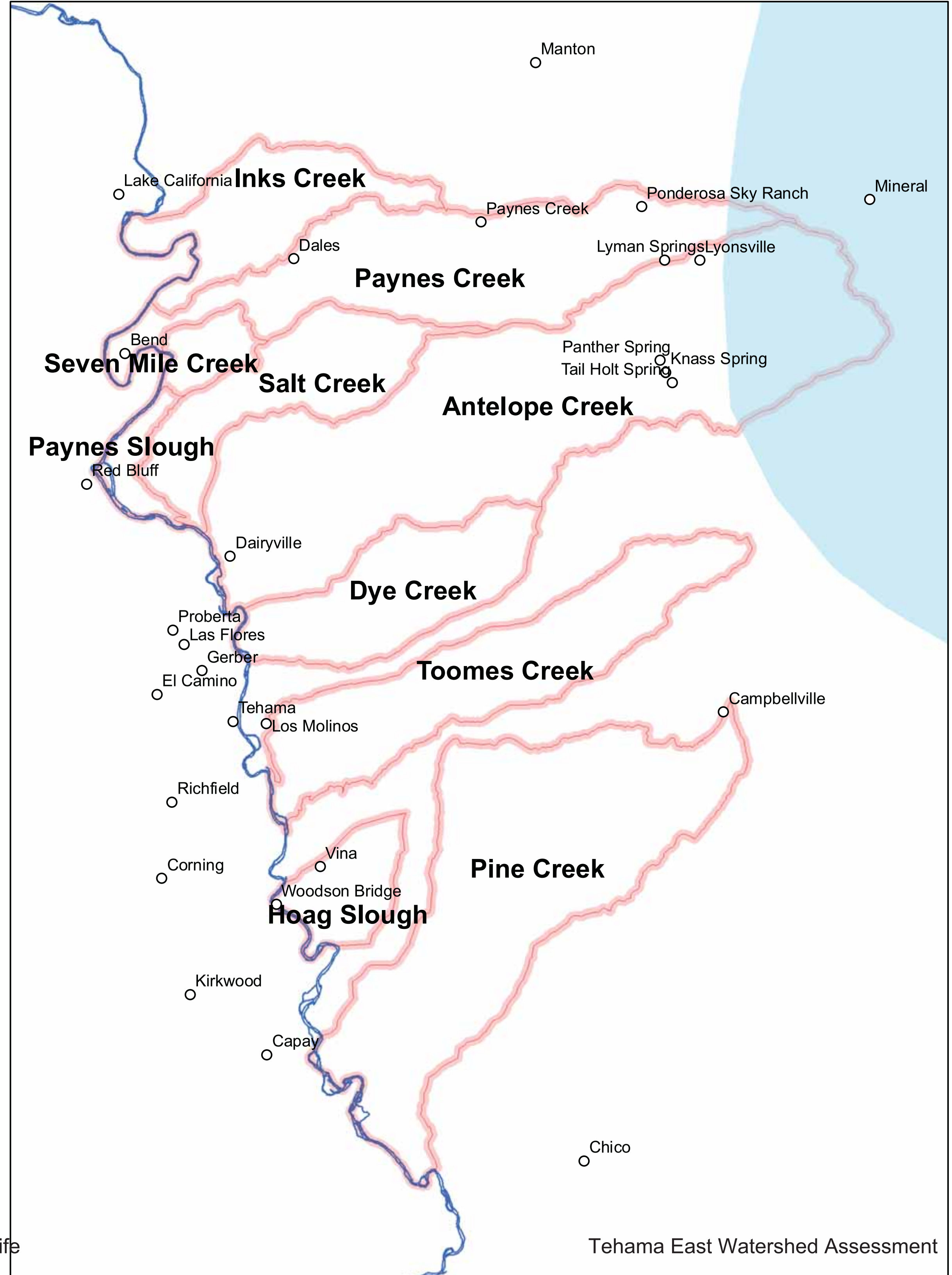
YELLOW-BELLIED MARMOT (MARMOTA FLAVIVENTRIS)

Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



Tehama East Watershed Assessment

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Tehama East Watersheds

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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

YELLOW-PINE CHIPMUNK (TAMIAS AMOENUS)

Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

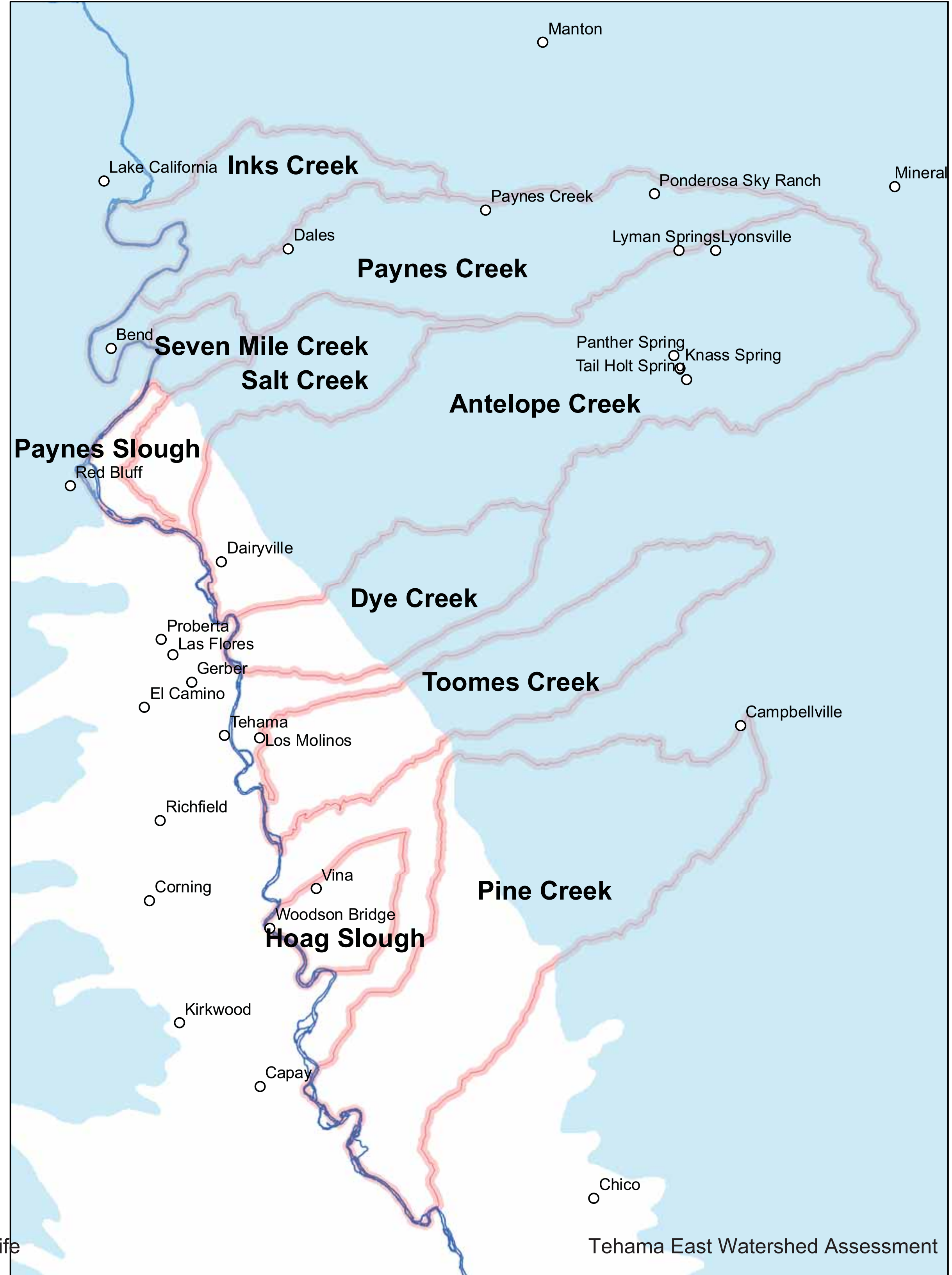
0 4 8 16 Miles

California Wildlife Habitat Relationships (CWHR)

Reptiles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

CALIFORNIA WHIPSNAKE (MASTICOPHIS LATERALIS)

Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

COMMON GARTER SNAKE (THAMNOPHIS SIRTALIS)

Watershed Boundary

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

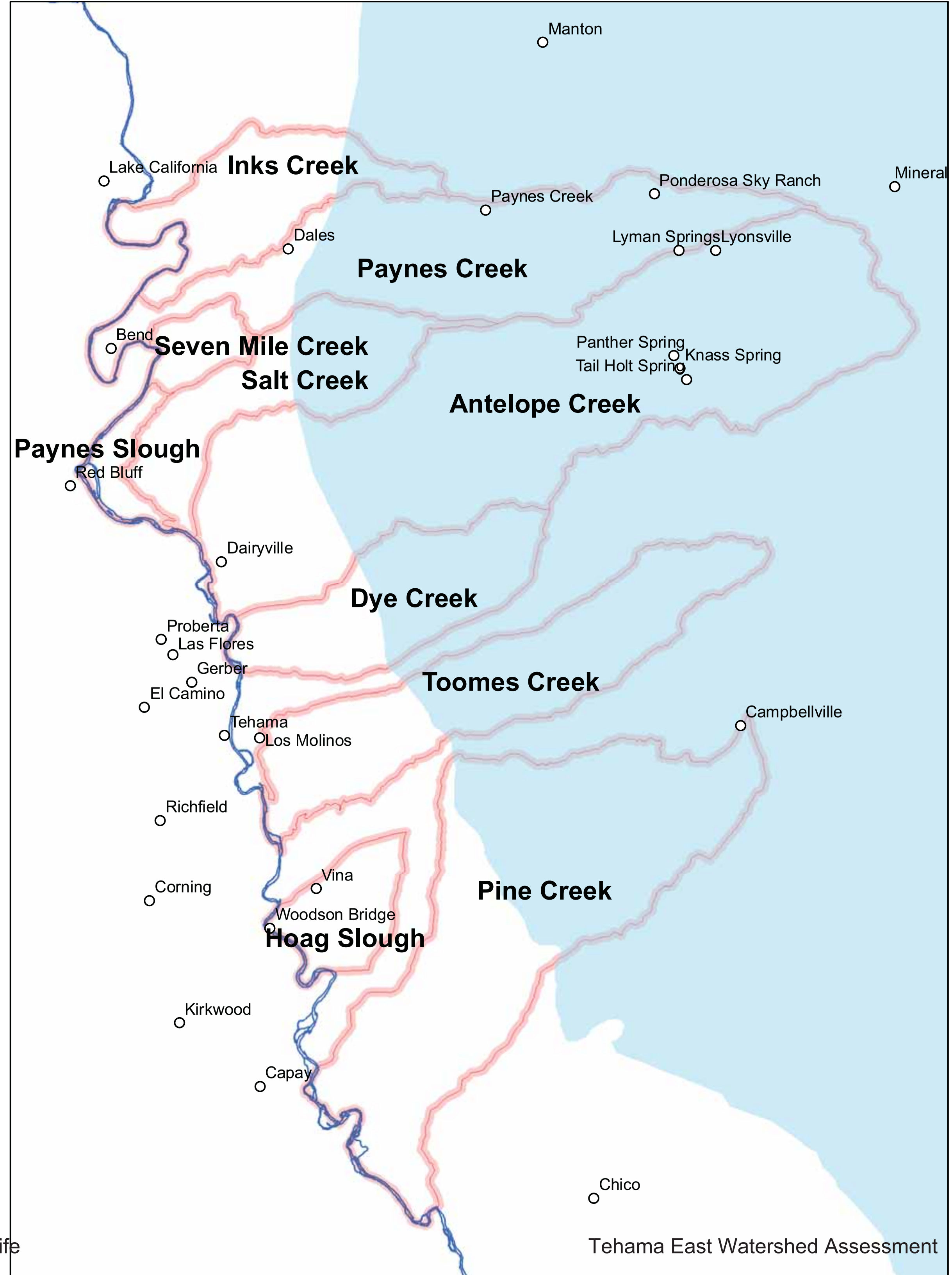
COMMON KINGSNAKE (LAMPROPELTIS GETULA)

Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

CALIFORNIA MOUNTAIN KINGSNAKE (LAMPROPELTIS ZONATA)

Watershed Boundary

N W E S

0 4 8 16 Miles

Tehama County Resource Conservation District
(c) 2010

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

GOPHER SNAKE (PITUOPHIS MELANOLEUCUS)

Watershed Boundary

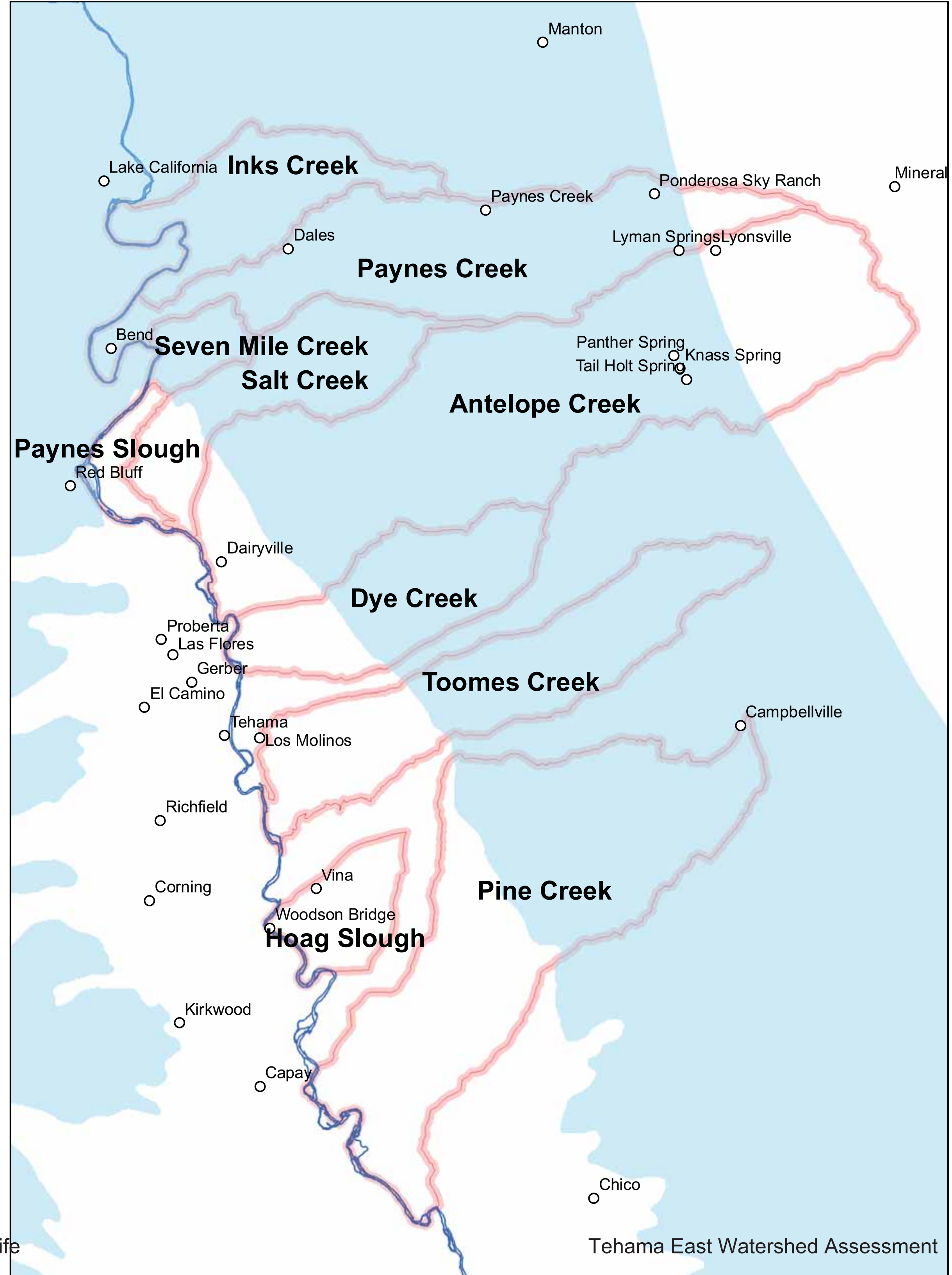
N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds



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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

NIGHT SNAKE (HYPSIGLENA TORQUATA)

Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

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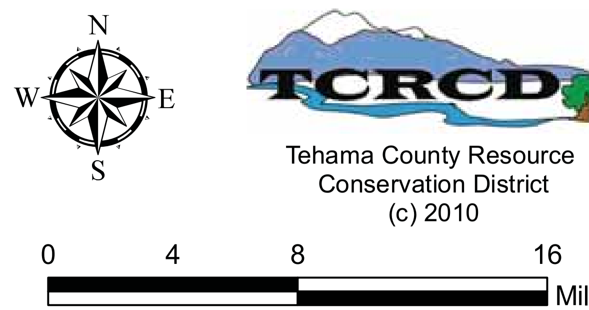
Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

RACER (COLUBER CONSTRICTOR)

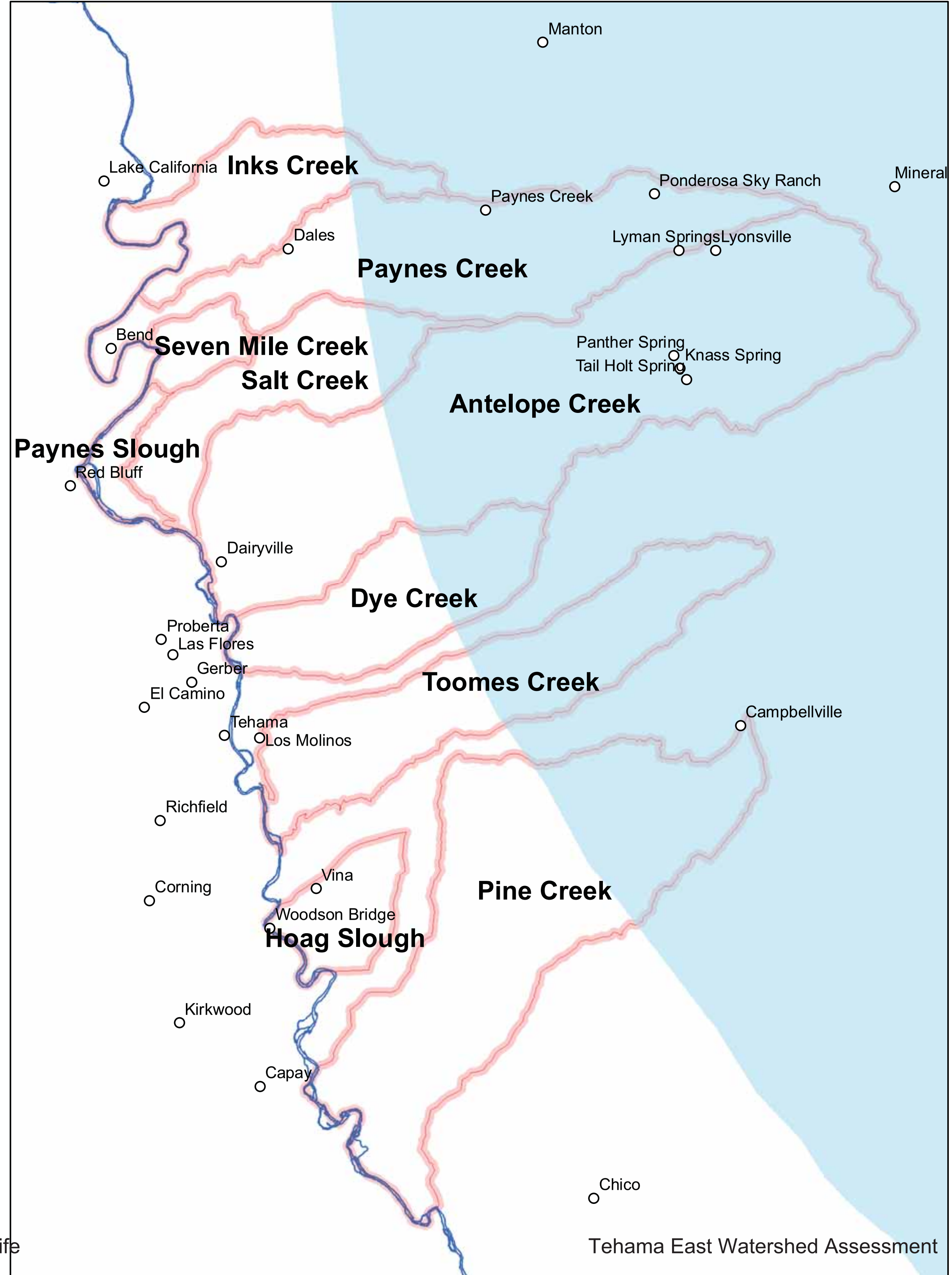
Watershed Boundary



Tehama County Resource Conservation District
(c) 2010

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds



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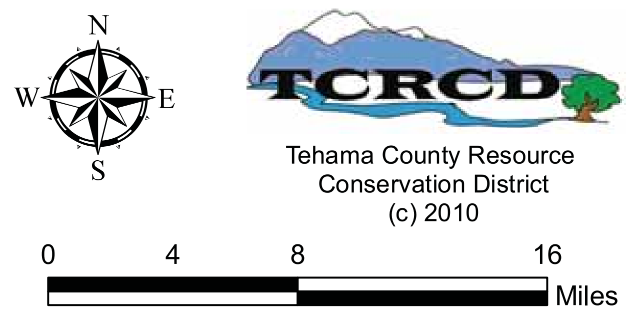
Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

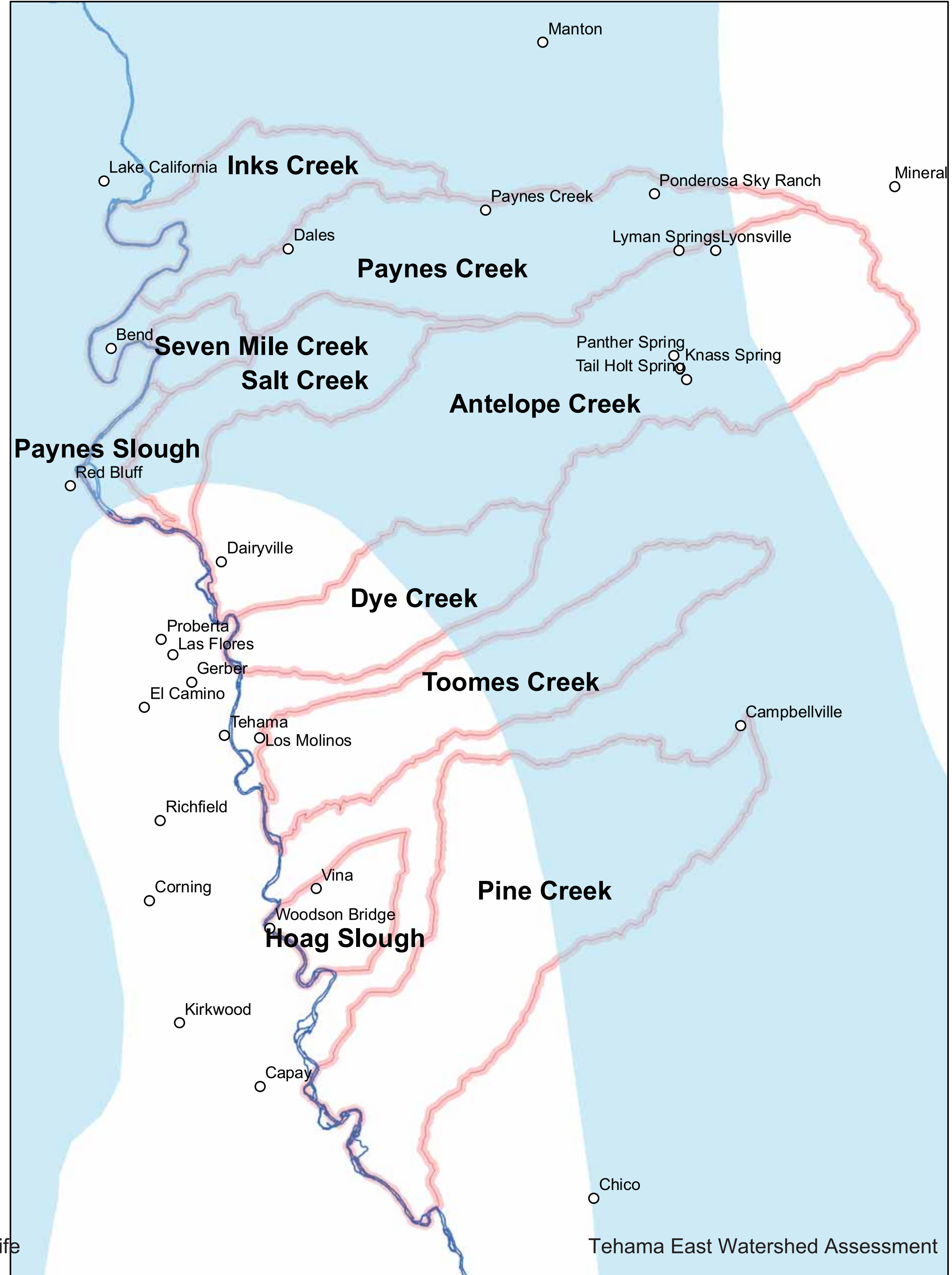
KEY

RUBBER BOA (CHARINA BOTTAE)

Watershed Boundary



Tehama County Resource Conservation District
(c) 2010



Tehama East Watershed Assessment

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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

RINGNECK SNAKE
(DIADOPHIS PUNCTATUS)

Watershed Boundary

N W E S

Tehama County Resource
Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds

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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

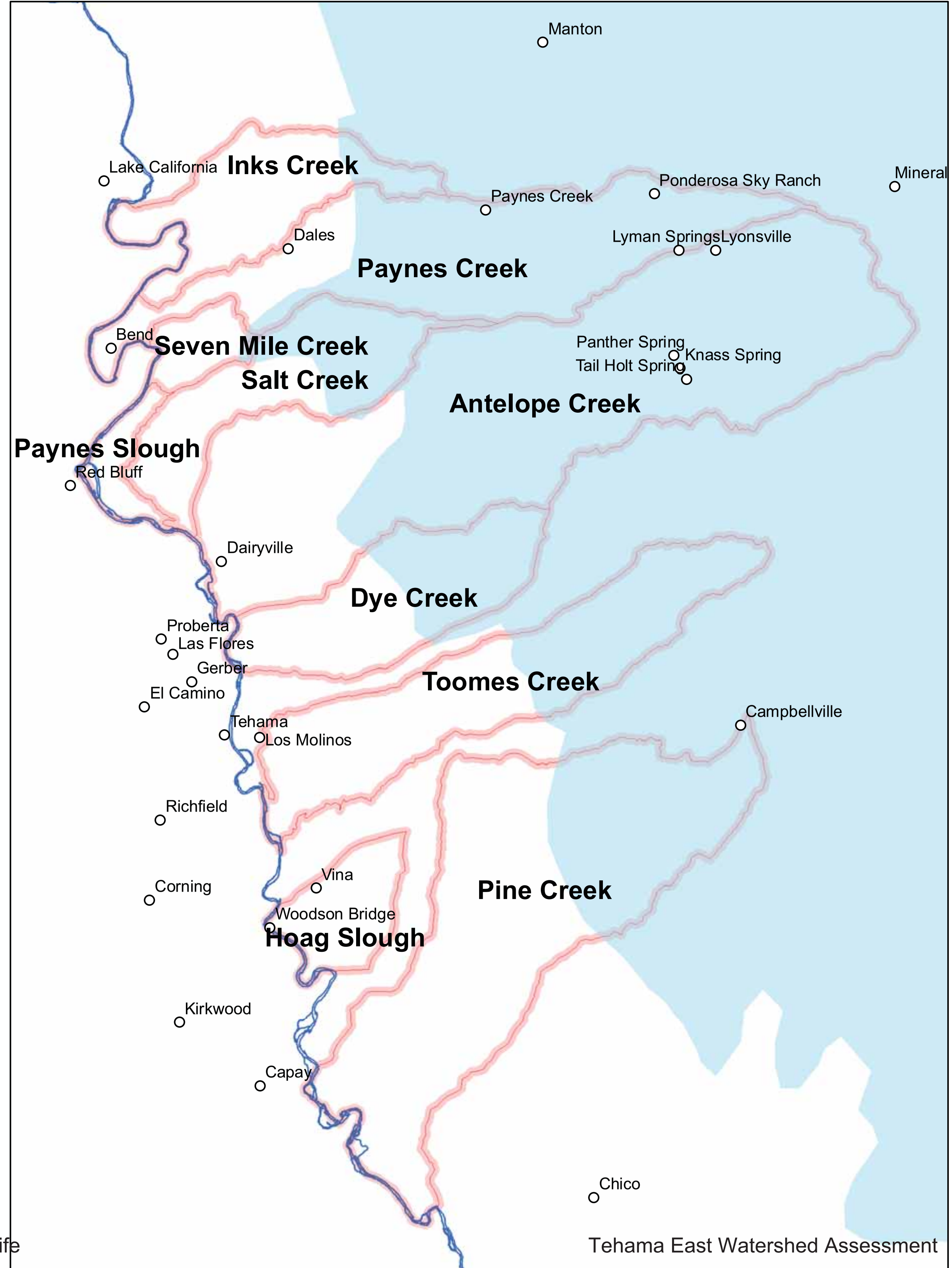
SOUTHERN ALLIGATOR LIZARD (ELGARIA MULTICARINATA)

Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles



Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

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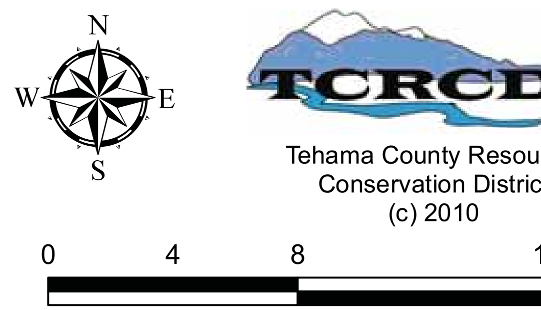
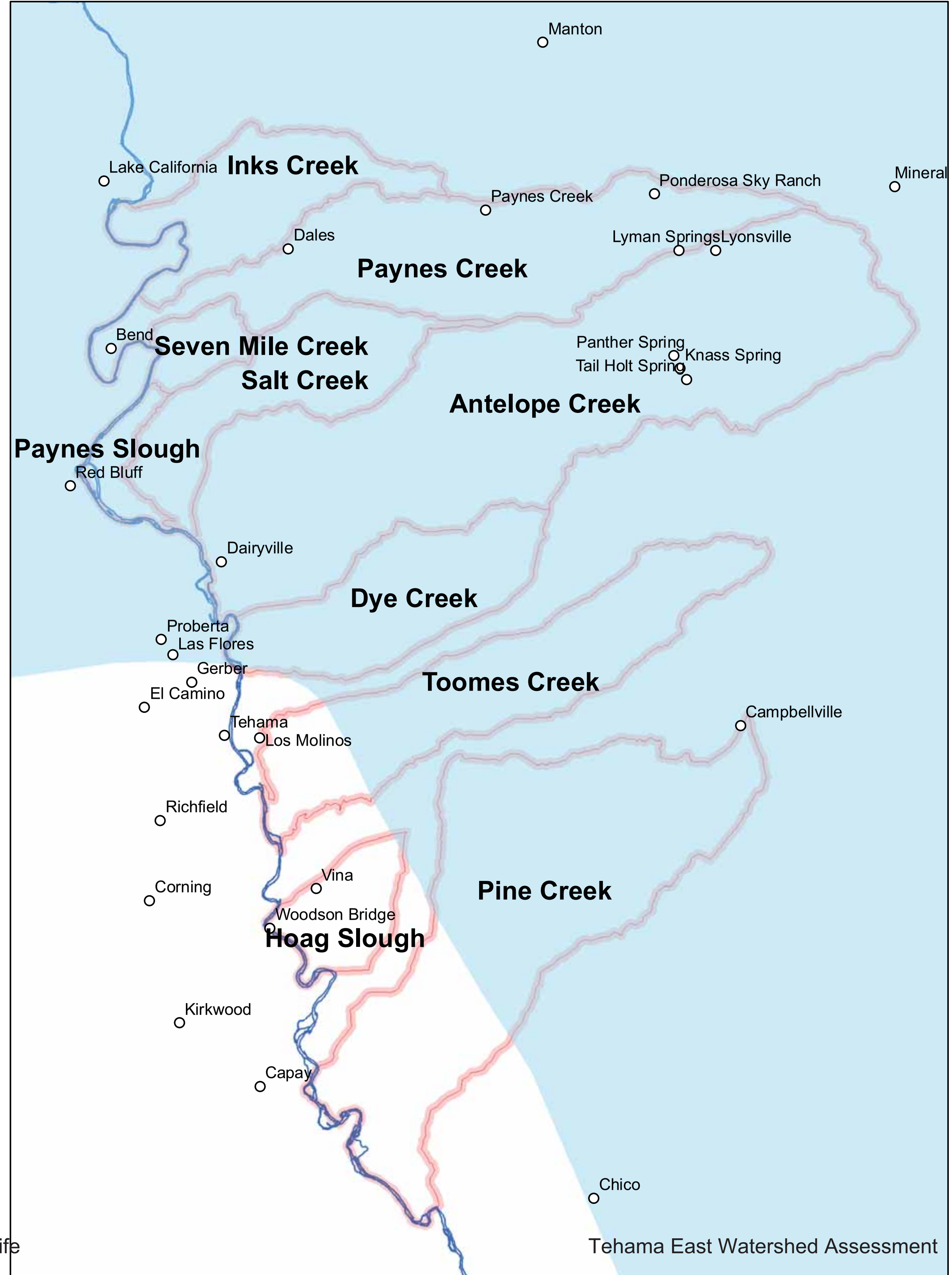
KEY

SAGEBRUSH LIZARD (SCELOPORUS GRACIOSUS)

Watershed Boundary



Tehama County Resource Conservation District
(c) 2010



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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

SHARPTAIL SNAKE (CONTIA TENUIS)

Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

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KEY

WESTERN AQUATIC GARTER SNAKE (THAMNOPHIS COUCHII)

Watershed Boundary

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

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http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

WESTERN FENCE LIZARD (SCELOPORUS OCCIDENTALIS)

Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 2.5 5 10 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds

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http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

WESTERN POND TURTLE (CLEMMYS MARMORATA)

Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 2.5 5 10 Miles

Tehama East Watershed Assessment

California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds

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Quoted from:
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KEY

WESTERN RATTLESNAKE (CROTALUS VIRIDIS)

Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

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Tehama East Watersheds

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Quoted from:
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KEY

WESTERN SKINK (EUMECES SKILTONIANUS)

Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

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California Wildlife Habitat Relationships (CWHR) System
Tehama East Watersheds

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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

WESTERN TERRESTRIAL GARTER SNAKE (THAMNOPHIS ELEGANS)

Watershed Boundary

N W E S

Tehama County Resource Conservation District
(c) 2010

0 4 8 16 Miles

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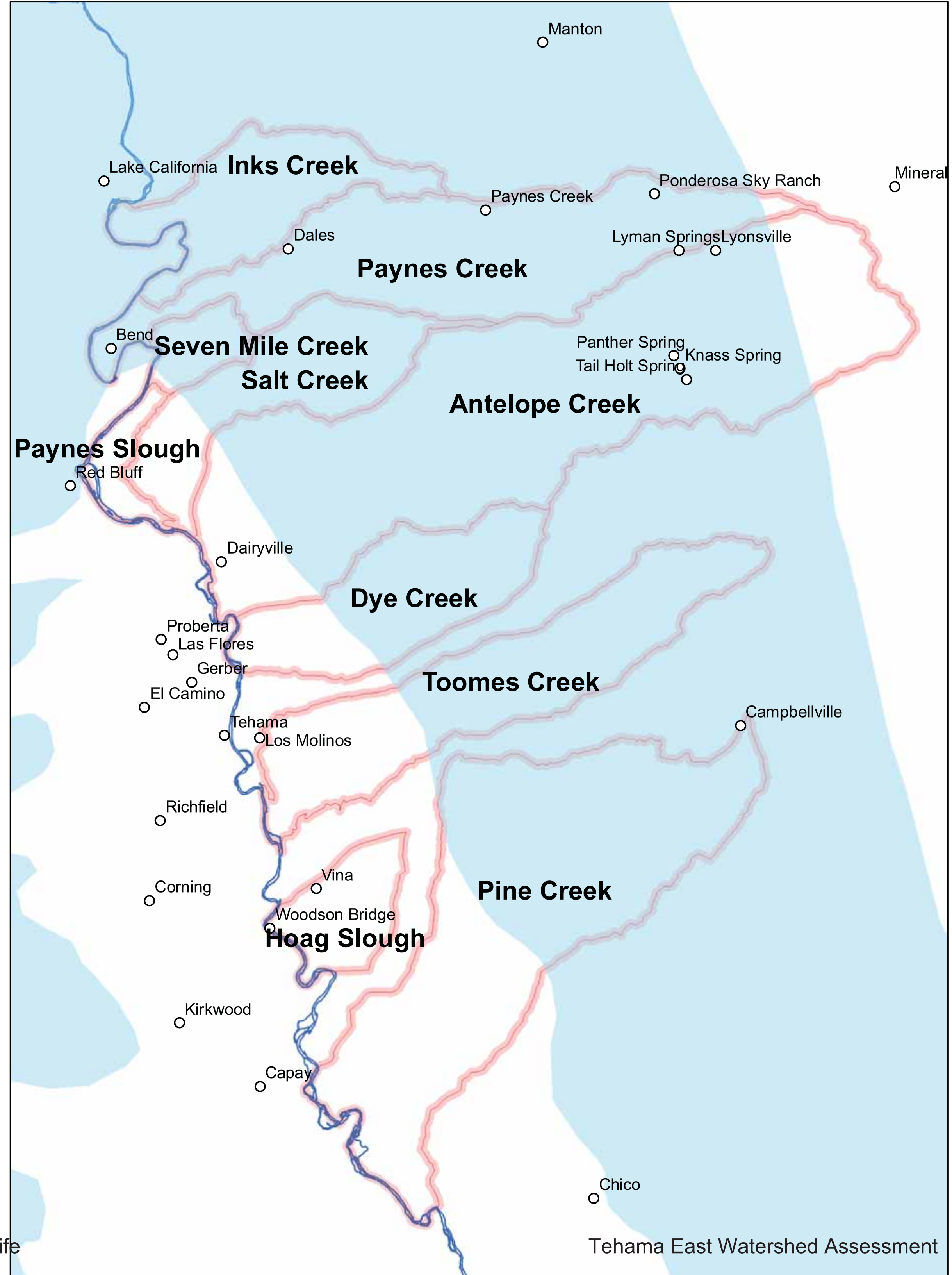
California Wildlife Habitat Relationships (CWHR) System Tehama East Watersheds



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Quoted from:
http://www.dfg.ca.gov/biogeodata/cwhr/morecwhr.asp

KEY

WESTERN WHIPTAIL (CNEMIDOPHORUS TIGRIS)

Watershed Boundary

N W E S

Tehama County Resource Conservation District (c) 2010

0 4 8 16 Miles

Section 9
Wildlife

Appendix

Literature Search for Wildlife Section prepared for TCRCD by:
Williams Wildland Consulting

Buck, J. Evens J., and J. Menke. 2009. "Lassen Foothills Vegetation Mapping Project: Final Vegetation Map and Classification Report," California Native Plant Society and Aerial Information Systems; 2009; PDF, 1.4MB. *http://www.tehamacountyrcd.org/documents/lassenFoothills/lassen_fthills_report_2009_online07302009.pdf*

Lassen Foothills Vegetation Map *("Vegetation Mapping: Lassen Foothills - Dye Creek and Surrounding Areas," California Native Plant Society and Aerial Information Systems; May 29, 2009; PDF, 15.7MB)* http://www.tehamacountyrcd.org/documents/lassenFoothills/lassen_vegetation_map_online07302009.pdf

PMC. 2008. Tehama County 2008-2028 General Plan Update- Draft Environmental Impact Report.: http://www.tehamagp.com/html/documents.html
Biological Resources element http://www.tehamagp.com/documents/draft_environmental_impact_report_091908/EIR%20Sections/4.4%20BIOLOGICAL%20RESOURCES.pdf

TCRCD biannual report. July 1, 2005-June 30,2007. (visited 1/20/2010). http://www.tehamacountyrcd.org/documents/annual_reports/Annual%20report%2005-07final3.pdf

TCRCD. Tehama east community wildfire protection plan and risk assessment, with recommendations from fire and pre-fore fuels treatment opportunities://www.battle-creek.net/docs/fire/FirePlanTE08.pdf . Revised 10/30/2008 http

Tehama County General Plan. 2008-2028, updated March 31, 2009. Available on the World Wide Web link: http://www.tehamagp.com/html/documents.html. Section 6.0- Open Space and Conservation Element: http://www.tehamagp.com/documents/final_general_plan/6%200%20Open%20Space_032309.pdf

Tehama County Resource Conservation District. 2005. Tehama County Voluntary Oak Management Plan. Available online: http://www.tehamacountyrcd.org/documents/oaks/OakMgtPlan_1_05-1_2.pdf

Vestra Resources, Inc. 2006. Tehama East Watershed Assessment, Final Draft. Prepared for the Tehama County Resource Conservation District. Available from the World Wide Web: http://www.tehamacountyrcd.org/ixwa.htm

Birds
Bogiatto R. J. and J.D. Karnegis. 2006. The use of eastern Sacramento valley vernal pools by ducks. California Department of Fish and Game 92(1):125-141.

Burnett R. D. and G. R. Geupel. 2001. Songbird monitoring in the Lassen National Forest, results from the 2001 field season. Point Reyes Bird Observatory, Stinson Beach, CA.

CalPIF (California Partners in Flight). 2002. Version 2.0. The oak woodland bird conservation plan: a strategy for protecting and managing oak woodland habitats and associated bird in CA. (S. Zack, lead author). Point Reyes Bird Observatory, Stinson Beach, CA. http://www.prbo.org/calfpif/plans.html

Garcia, D.. 2009. Thesis MS: Spatial and Temporal Patterns of the Bank Swallow on the Sacramento River. California State University at Chico, Chico, CA.

Gardali, T., Holmes, A. L, Small, L. S., Nur, N., Geupel, G. R., and G. Golet, 2006. Abundance patterns of landbirds in restored and remnant riparian forests on the Sacramento River, California, U.S.A. Restoration Ecology. Vol 14 (3): 391-403.

Hammond, J. pers.comm. California State University at Chico, Chico, CA.

Shuford, W. D. and Gardali, T. editors. 2008. California Bird Species of Special Concern: A ranked assessment of species, subspecies and distinct populations of birds of immediate conservation concern in California. Studies of Eastern Birds 1, Eastern field Ornithologists, Camarillo, California, and California Department of Fish and Game, Sacramento.

Siegel, R. B. and D. F. Desante. 1999. Avian conservation plan for the Sierra Nevada Bioregion: conservation priorities and strategies for safeguarding Sierra bird populations. California Partners in Flight and the Institute for Bird Populations. Available on the World Wide Web link: http://www.birdpop.org/DownloadDocuments/pif_sierra_cons_plan.pdf

Siegel R. B. and D. R. Kaschube. 2007. Landbird monitoring results from the monitoring avian productivity and survivorship (MAPS) Program in the Sierra Nevada.
The Institute for Bird Populations. Available on the World Wide Web link: http://www.birdpop.org/DownloadDocuments/sn5_final_report.pdf

Siegal, R. B., Wilkerson R. L. and D. L. Mauer. 2008. Black-backed woodpecker (*Picoides arcticus*) surveys on Sierra Nevada national forests: 2008 pilot study. Institute for Bird Populations. Point Reyes Station, CA.

Silveira, J. G. 998. Avian uses of vernal pools and implications for conservation practice. In: C. W. Witham, E. T. Bauder, D. Belk, W. R. Ferren Jr., and R. Ornduff (editors). Ecology, Conservation, and Management of Vernal Pool Ecosystems- proceedings from a 1996 conference. California Native Plant Society, Sacramento, CA.

Small , S. L., Gardali T., J. DeStaebler. 2001. Habitat associations and species composition of riparian bird communities in the Sacramento Valley and Lassen Foothill tributaries: a report of the 2000 field season. A report of the Point Reyes Bird Observatory to: The Nature Conservancy, U.S Fish and Wildlife Service, California Department of Parks and Recreation, and Sacramento River Partners. PRBO publication number 962. Stinson Beach, CA.

Strahlberg D. and R. Burnett. 2007. Local and landscape –level predictors of Oak Woodland bird species richness and abundance. In: Lassen foothills final report. Chapter 1, PRBO Conservation Science. Petaluma, CA.

Strahlberg D. and R. Burnett. 2007. Short-term reponse of oak woodland birds to prescribed fire in the Lassen Foothills. In: Lassen foothills final report. Chapter 2, PRBO Conservation Science. Petaluma, CA.

Strahlberg D. and R. Burnett. 2007. Predicting species distribution of oak woodland birds in the Lassen Foothills. In: Lassen foothills final report. Chapter

3, PRBO Conservation Science. Petaluma, CA.

Unpublished-sent by Rich Reiner (TNC) Systematic Bird List for Vina Plains Preserve
68 species, as of March 2007

Unpublished-sent by Rich Reiner Systematic Bird List for Dye Creek Preserve

Mammals

Barrett, R.H. 1971. Ecology of the feral hog in Tehama County, California. Dissertation. University of California, Berkeley.

Barrett, R.H. 1982. Habitat preferences of feral hogs, deer and cattle on a Sierra foothill range. Journal of Range Management. 35(3):342-346

Benjamin N. Sacks, B.R. Mitchell, C.L Williams and H. B Ernst. 2005. Coyote movements and social structure along a cryptic population genetic subdivision. Molecular Ecology (14): 1241-1249. Available on the World Wide Web link: http://www.uvm.edu/~bmitchel/publications.html

Congalton, RG,|Stenback JM,,Barrett, RH. 1993. Mapping deer habitat suitability using remote sensing and geographic information systems. Geocarto International. Vol 8,(3) pp. 23-34.

Kucera, T. E., Zielinski, W. J., and R. H. Barrett. 199. Current distribution of the American marten, *Martes americana*, in Califiornia. California Department of Fish and Game. Vol 81(3):96-103

Mitchell, B. R. 2004. Coyote vocal communication and its application to the selective management of problem individuals. Dissertation, University of California, Berkeley.

Perrine, J. D. 2005. Ecology of the Red Fox (*Vulpes vulpes*) in the Lassen Peak region of California, USA. Dissertation. University of California, Berkeley.

Perrine, J. D. 2006. Lassen Volcanic National Park small vertebrate inventory project 2000-2004. Museum of Vertebrate Zoology, University of California, Berkeley. http://www.nps.gov/lavo/parkmgmt/upload/LAVO_Small_Vertebrate_Inventory_Report.pdf

Perrine, J. D., Pollinger, J. P., Sacks, B. N., Barrett, R. H. and R. K. Wayne. 2007. Genetic evidence for the persistence of the critically endangered Sierra Nevada red fox in CA. 2007. Conservation Genetics. (8):1083-1095.

Quinn, R. D. Habitat preferences and distribution of mammals in California chaparral. USDA Forest Service Research Paper. PSW-202.

Ramsey, T. E. 1981. Eastern Tehama deer herd plan, management plan. (not sure if this was published).

Sacks, B. N., Mitchell, B. R., Williams, L., and H. B. Ernests. 2005. Coyote movements and social structure along a cryptic population subdivision. Molecular Ecology. 14:1241-1249.

Tietje, W. D., Barrett, R. H., Kleinfelter, E. B., and B. T., Carre. 1991. Wildlife diversity in the valley-foothill riparian habitat: north central vs. central coast California. USDA Forest Service Gen. Tech. Rep. PSW-126.

Waithman, J. D., Sweitzer, R. A., van Vuren, D., Drew, J. D. Brinkhaus, A. J., Gardner, I. A., and W. M. Boyce. Range expansion , population sizes and management of wild pigs in California. 1999. The Journal of Wildlife Management. Vol 63 (1): 298-308.

Herps

Block, W. M. and M. L. Morrison. 1998. Habitat relationships of amphibians and reptiles in California oak woodlands. Journal of Herpetology. Vol 32 (1):51-50.

Fellers, G. M., Pope, K.L. Stead, J.E., Koo, M. S, and H.H. Welsh Jr. 2007. Turning population trend monitoring into active conservation: can we save the cascades frog (*Rana cascade*) in the Lassen region of California.

Hayes M. P. and M. R. Jennings. 1986. Decline of Ranid frog species in eastern North America: are bullfrogs (*Rana catesbeiana*) responsible? Journal of Herpetology, Vol 20 (4):490-509.

Jennings, M. R. 1993. Status of amphibians In: Sierra Nevada Ecosystem Project: final report to Congress, vol II. Assessments and scientific basis for management options. University of California Davis, Centers of Water and Wildland Resources.

Jennings, M. R. and M. P. Hayes. 1994. Amphibian and reptile species of special concern in California. California Department of Fish and Game. Rancho Cordova, California.

Pope, K. L. 2008. Population monitoring or remnant populations Cascades Frogs (*Rana cascadae*) in the Lassen region of CA, Final report to Lassen National Forest. USDA Forest Service, PSW research station, Redwood Sciences Lab.

Invertebrates

Gilbart, M. 2009. The health of blue elderberry (*Sambucus mexicana*) and colonization by the valley elderberry longhorn beetle (*Democerus claifornicus dimorphus*) in restored riparian habitat. Thesis: CSU Chico. Chico, CA.

Underwood and Christian, 2004
Underwood, E.C., Christian, C.E. 2004. Effects of Prescribed Fire and Cattle Grazing on Ant Assemblages in Blue Oak Savannas in the Lassen Foothills, California. Ph.D. thesis, University of California, Davis (chapter 1).

General_wildlife_veg

Block, W. M. and M. L. Morrison. 1991. Influence of Scale on the Management of Wildlife in California Oak Woodlands. In: Standiford, Richard B., tech. coord. 1991. Proceedings of the symposium on oak woodlands and hardwood rangeland management; October 31 - November 2, 1990; Davis, California. Gen. Tech. Rep. PSW-GTR-126. Berkeley, CA: Pacific Southeast Research Station, Forest Service, U.S. Department of Agriculture; p. 96-104

Mitchell, J. C., Paton, P.W.C., and C. J. Raithel. The importance of vernal pools to reptiles, birds and mammals. In: Science and Conservation of Vernal Pools in Northeastern North America. Chapter 9.

Tietje, W.D. and J.K. Vreeland. 1997. Cover Story: Vertebrates diverse and abundant in well-structured oak woodland. California Agriculture 51 (6): 8-14. Online: **http://californiaagriculture.ucanr.org/landingpage.cfm?article=ca.v051n06p8&fulltext=yes**

W. Tietje, K. Purcell, and S. Drill. 2005. Oak Woodlands as Wildlife Habitat. Pages 15-31 in G.A. Giusti, D.D. McCreary, and R.B. Standiford (eds.). A Planner's Guide for Oak Woodlands. University of California, Division of

Agriculture and Natural Resources Publication 3491. 116 pp
Online:
http://books.google.com/books?hl=en&lr=&id=T18IDGRSt78C&oi=fnd&pg=PA15&dq=Tietje,+W.D.,+K.L.+Waddell,+J.K.+Vreeland,+and+C.L.+Bolsinger.+Course+woody+debris+in+oak+woodlands+of+California.+Eastern+Journal+of+Applied+Forestry+17(3)+139146&ots=BzXa1gZQ8H&sig=603Jap76zOMDfJ6WbyJLpwHjfWc#v=onepage&q=&f=false

Vegetation/Habitat/Management

National Park Service. 2009. Lassen Volcanic National Park, a summary of resource management activities for 2008. National Park Service, Lassen National Park, Mineral, CA.

Reiner, R. J., Hunk, P .M. and J. F. Pollack. 2007. Assumptions used to justify prescribed fire as a restoration tool in California annual grasslands. Pages RR1-RR& in R.A. Schlisling and D.G. Alexander (Editors), Vernal Pool Landscapes. Studies from the Herbarium, Number 14. California State University , Chico, CA.

The Nature Conservancy. 2009. Lassen Foothills- Last Great Place (LGP). Climate Stress Reports: Version 1.

USDI- National Park Service. 2009. Reach the Peak, Lassen Peak Trail Rehabilitation Environment Assessment. Chapter 1V-Affected Environment, Section 5, Wildlife: pp 52-58.

U.S. Forest Service. 2006. Lassen National Forest Management Indicator Species Report, December 2006. Susanville, CA

U.S. Forest Service. 2010. Biological assessment and evaluation for wildlife species. Motorized travel management final environmental impact statement. Lassen National Forest, Pacific Southeast Region, USDA Forest Service.

U.S. Forest Service. 2010. Travel Management Downloads:
http://fs.usda.gov/wps/portal/fsinternet/!ut/p/c4/04_SB8K8xLLM9MSSzPy8xBz9CP0os3gDfxMDT8MwRydLA1cj72DTUE8TAwjQL8h2VAQAMtzFUw!!/?ss=110506&navtype=BROWSEBYSUBJECT&cid=stelprdb5108498&navid=091000000000000&pnavid=null&position=Not Yet Determined.Html&ttype=detailfull&pname=Lassen National Forest- Home

USFWS. 2005. Sacramento River National Wildlife Refuge, final comprehensive conservation plan summary. Available from the World Wide Web link:
http://www.fws.gov/pacific/planning/draft/docs/CA/docssacriver.htm

USFWS - SRNWR map:
http://www.fws.gov/sacramentovalleyrefuges/pdf/Location%20Map/SNWR%20Complex%20Location%20Map%20with%20River%20Unit%20Names%202009.pdf.

Verner, Jared; Boss, Allan S., technical coordinators 1980. California wildlife and their habitats: eastern Sierra Nevada Gen. Tech. Rep. PSW-GTR-37. Berkeley, CA: Pacific Southeast Forest and Range Exp. Stn., Forest Service, U.S. Department of Agriculture: 439 p.

SNEP (Sierra Nevada Ecosystem Project). 1996. Volume 1 Ch. 1. Sierra Nevada Ecosystems> Regents of the University of California.
http://ceres.ca.gov/snep/pubs/web/PDF/v1_ch01.pdf

Warren, G. R., Howe, G. J. and J. Major. A survey of riparian forest flora and fauna in California, Chapter 2. In

A. Sands, Riparian forests of California: their ecology and conservation. University of California, Institute of Ecology. Publication No. 1, Davis, CA.

USFS.1992. Lassen LRMP Chapter 3 - Sec 25 Wildlife : http://fs.usda.gov/goto/lassen/sopa For Tehama County following Management Areas: #26, 27, 34, 35, 36, 40, 41, 42, 48

USFS.1992. Final Environmental Impact Statement: Chapter 3 Affected Environment, Section 25 Wildlife, Chapter 4 Environmental Consequences, Section 25 Wildlife. http://fs.usda.gov/goto/lassen/sopa

Databases_pers. comm
California Avian Database Center (CADC) http://data.prbo.org/cadc2/index.php?page=maps

CDFG California Wildlife Habitat Relationship (CWHR): http://www.dfg.ca.gov/biogeodata/cwhr/wildlife_habitats.asp

CDFG, California Natural Diversity Database (CNDDB): http://imaps.dfg.ca.gov/viewers/cnddb_quickviewer/app.asp. All hits for Tehama County. Visited 1/20/2010.

californiaherps.com: http://californiaherps.com/salamanders/pages/a.f.flavipunctatus.html: shows Black Salamander in TC!

Magnusun. M. pers.comm. notes on mammals in LNP

Museum of Vertebrate Zoology. UC Berkeley: database accessed 1/18/2009 for Tehama

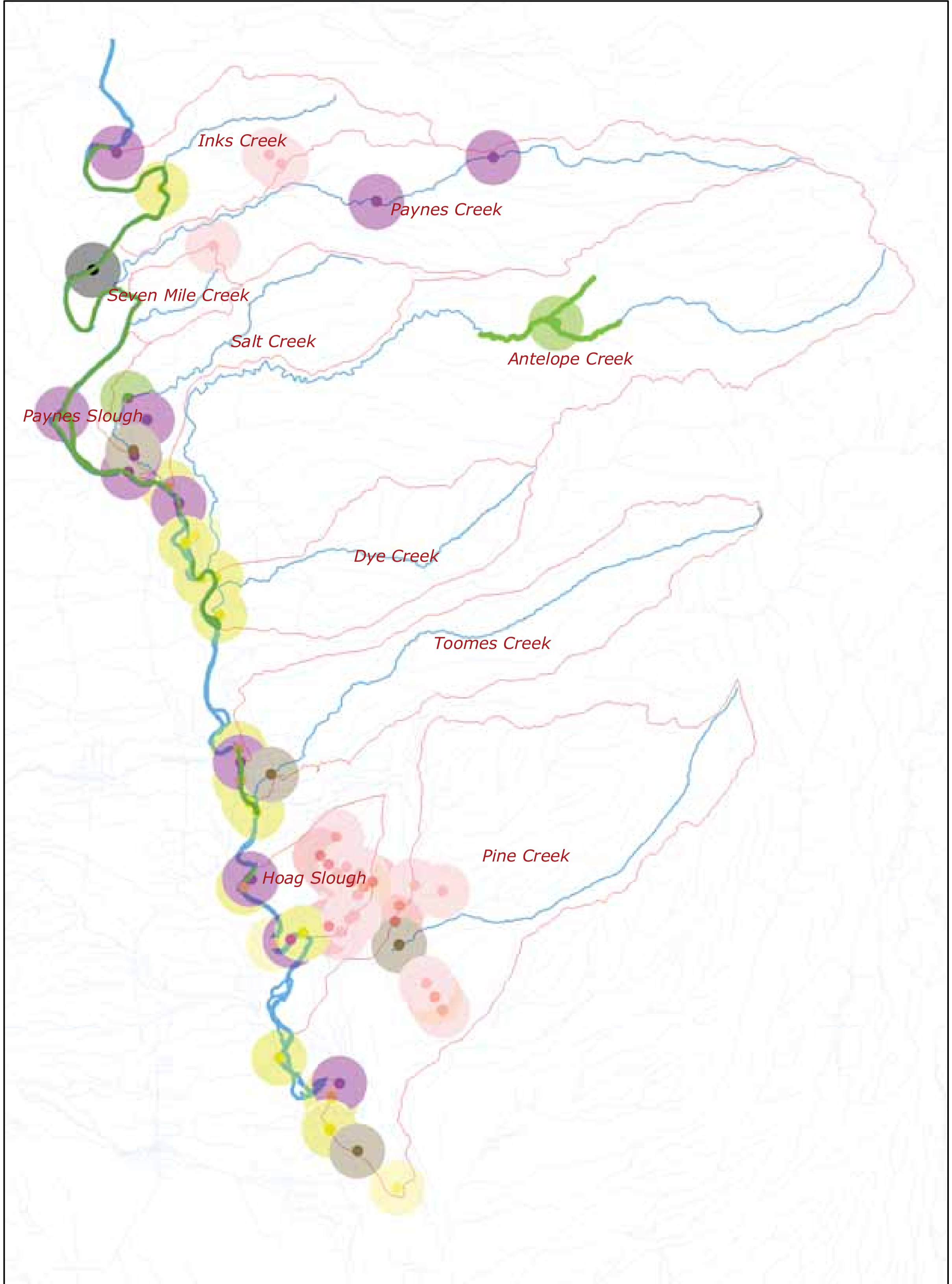
Shedd, Jackson. Pers. comm.. word doc, sent notes for TC herps and some databases

Tietje 4 February 2010. List of OAK PUBLICATIONS

UC Davis Museum of Wildlife and Fish Biology Holdings for Tehama County -I Engilis- sent info from database.

Tehama East Watershed Assessment

CNDDB Animals



"The CNDDB is a 'natural heritage program' and is part of a nationwide network of similar programs overseen by NatureServe (formerly part of The Nature Conservancy). All natural heritage programs provide location and natural history information on special status plants, animals, and natural communities to the public, other agencies, and conservation organizations. The data help drive conservation decisions, aid in the environmental review of projects and land use changes, and provide baseline data helpful in recovering endangered species and for research projects.

(Quoted from California Dept of Fish and Game)

KEY

Streams/Rivers

Watershed Boundary

COMMON NAME OF ANIMAL SPECIES
http://www.dfg.ca.gov/biogeodata/cnddb/

- Chinook salmon, winter-run
- Chinook salmon, spring-run
- Bald eagle
- Swainson's hawk
- Bank swallow
- Western yellow-billed cuckoo
- Valley elderberry longhorn beetle
- Conservancy fairy shrimp
- Vernal pool fairy shrimp
- Vernal pool tadpole shrimp

0 2.5 5 10 Miles

N W E S

Tehama County Resource Conservation District

Section 10

Section 10

FIRE HISTORY, WILDLAND FUELS, AND FIRE MANAGEMENT

Tables

INTRODUCTION

Societal pressures make increasing demands upon the environment. 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 eastern landscapes. This control however, 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.

Eastern Tehama County, like much of Northern California, is at very high risk of experiencing catastrophic wildfire. A portion of the county's eastside area is rural or in the wildland/urban interface between urban development and those lands managed for ranching, timber production, open space, and watershed resources. Among these interface areas are the communities of Manton, Paynes Creek, Ponderosa Sky Ranch as well as numerous remote developments such as Panther Springs, Lyonsville and Cambelville. Over the past 90 years, many of these areas have developed high levels of fuel loading due to aggressive fire suppression by state and federal agencies as well as private landowners. These high fuel loads have increased the potential for large wildfires that could destroy an array of natural resources along with millions of dollars worth of public and private property. The problem of hazardous fuel conditions continues to grow each year as more people move into and utilize the area's grasslands, oak woodlands, chaparral lands and forested areas. Greater recreational use of Bureau of Land Management parcels and Lassen National Forest lands has also contributed to an increase in the threat of wildfire on local public lands as well as adjacent private parcels.

The objective of this section is to present a general overview of fire and fuel issues found within Eastern Tehama County as developed through the Tehama East watershed assessment process. Additional detail on fire management and planning specific to the Tehama East watershed is included in the Tehama East Community Wildfire Protection Plan (TECWPP) prepared by the Tehama County Resource Conservation District (TCRCD).

SOURCES OF DATA

A variety of literature provided general information on fire and fuels management in areas with characteristics similar to those found within the Tehama East Watershed. Included were published results of regional, statewide, or national research on issues such as fuel, fire severity, policy, and protection. Other significant sources of information included:

- The California Department of Forestry and Fire Protection (CDF) as a primary source of watershed specific information on fire history and fuel loading within the Tehama East Watershed.
- The CDF Fire and Resource Assessment Program (FRAP) data was utilized in developing fuel ranks and fire hazard severity zones. These sources were also used to categorize fuel distribution and potential fire severity areas.
- FRAP data provided fire severity and vegetation hazard and density rankings for the area within the watershed boundaries.

The Tehama East Community Wildfire Protection Plan was used as a primary reference to ensure consistency between the watershed assessment and management plan portions of this project. The TECWPP was developed as a means of describing current fire related conditions within Tehama County; identifying public and private assets at risk from wildfire as well as to assess currently in place infrastructure developed in order to protect those assets. The plan also recommends, justifies, and prioritizes future short-term and long-term mitigation measures that are expected to provide increased fire protection within the county's eastside area. Finally, this document provides planning and background information necessary for local organizations to obtain grants and secure funding for future fuel reduction projects and other mitigation measures. This fire planning document is attached to the related Tehama East Watershed Management Plan as an addendum and includes a complete bibliography of references.

Human-Wildland Interactions and Communities at Risk Within Eastern Tehama County

Throughout eastern Tehama County, communities adjacent to wildlands have experienced dramatic growth. In terms of wildfire threat, these areas of rural development have been described as a point where the fuel feeding a wildfire changes from natural (wildland) to manmade fuel such as structures, crops, and urban debris. Development in these areas has taken a number of forms. In addition to the simple expansion of the urban fringe, rural subdivisions have sprung up far from urban centers, and lots splits have allowed homes and small ranches to be built on individual parcels. This has created residential densities that approach those of urban areas. This conversion of wild areas into urban and residential uses is currently taking place largely within the county's grasslands and oak woodlands. Significant development is also occurring within the eastside area's chaparral and forested areas at the urban fringe of communities such as Bend, Manton, Paynes Creek, and Ponderosa Sky Ranch. Scattered development of individual homes and structures is also found near very rural population centers such as Lyonsville, Panther Spring, Lyman Springs, and Cohasset.

This intermingling of wildland and manmade fuel is often referred to as the "wildland-urban interface/intermix" (WUI) and has made the control of wildland fires more difficult and costly. During large wildfire events, widely scattered development requires fire fighting forces to disperse in order to protect numerous isolated structures. As a result, manpower and other resources necessary to initiate attack on a fire front cannot be organized, allowing fires to spread and build in intensity much more rapidly. This dispersal of urban development also makes rescue and evacuation efforts during such emergencies more difficult, dangerous, and time consuming. These remote areas of development are often created without many of the infrastructure components and fire safety features that are integral to fire protection. Significant among these deficiencies are insufficient access on two lane roads for ingress and egress of fire fighting equipment, inadequate water supply systems, and the presence of mobile homes as residences on many small rural parcels. Considering that mobile homes are often installed with little or no vegetation removal, this type of residence is more susceptible to flash fires. See Wilderness and Urban Interface Map, Page 130, Tehama East Watershed Assessment Atlas.

FUELS, WEATHER, AND TOPOGRAPHY

Understanding basic fire behavior is helpful in better comprehending the current and historical role of fire in the watershed. Fire behavior is a complex science, but can be generally described as the speed a fire travels or rate of spread, and the intensity with which it burns. There are three key factors that influence fire behavior:

- Fuel
- Weather
- Topography

All three factors can influence fire behavior independently, but they are all interconnected and accounted for in assessing fire behavior.

Local weather conditions such as wind direction, wind speed, precipitation and humidity are important in predicting how a fire will behave. Within the lower elevations of the Tehama East Fire Plan project area, winds blow from the north during the early part of summer and from the south during the latter part of the summer season. Within Tehama County's eastern foothills, winds tend to blow up the canyons and along hillsides during early morning hours and down slope in the late afternoon and evening. In the valley, wind patterns push wildfire in a northerly or southerly direction, while in foothill areas winds trend in a easterly direction. The average wind speed in the eastside area has been determined to be between approximately 1.1 to 4.8 miles per hour. During the fire season (June to October), daily temperatures within the project area are usually in excess of 90° Fahrenheit, and relative humidity is typically less than 30 percent. The majority of the area's precipitation occurs between October and April.

Topography can affect the direction and rate of fire spread. Topographic factors important to fire behavior are elevation, aspect, steepness, and shape of slopes. When fire crews are considering fire suppression methods, topography is always critical in determining the safest and most effective plan of attack. When accessible, ridge lines are very important features from which to conduct fire suppression activities and can be a strategic area to conduct fuels management activities.

Of the three components affecting fire threat, fuel is the only factor that can be controlled. Fuel characteristics that influence fire behavior are fuel moisture, loading, size, compactness, horizontal or vertical continuity, and chemical content. Fuel moisture is the amount of water in vegetative fuel and is expressed as a percentage of its oven dry weight. Fuel loading is defined as the oven dry weight of fuels in a given area, usually expressed in bone dry tons, or 2,000 pounds of vegetation when rated at zero percent moisture content. Fuel size refers to the dimension of fuels, and compactness refers to the spacing between fuel particles. Continuity is defined as the proximity of fuels to each other, vertically or horizontally which governs a fire's capability to sustain itself. Chemical content in fuels such as oils or other flammable compounds can either retard or increase the rate of combustion. All of these factors will influence the amount of heat delivered and the duration, flame length, and rate of spread of a particular fire and will be considered prior to developing fire prevent projects or initiating fire suppression activities.

CALFIRE Hazard Rankings Within Eastern Tehama County

The California Department of Forestry and Fire Protection provides fire and other resource information to the public through FRAP. California Public Resource Code 4789 requires CDF to periodically assess California's forest and rangeland resources. FRAP data layers are presented to describe graphically the fire environment within the Tehama East watershed. Zones are classified into three ratings: moderate, high, or very high. Zones were delineated based on areas with similar vegetative cover, slope, and weather. The zones are designed to give an average hazard rating for the area and do not define the exact conditions for all areas within the zones. Variations in fuels, slope, weather, aspect, elevation, and air stability will influence hazard conditions at actual locations within each zone. For individual structures, the risk of damage from fire also depends on site-specific factors such as access, water supply, clearance, and characteristics of the structure. As a result, the fire hazard map cannot be used as a measure of risk to individual structures. See Fire Hazard Severity Zone map, Page 56,

Tehama East Watershed Assessment Atlas.

Surface Fuels

Surface fuels are generally described as vegetative materials near the ground through which fire will spread. These fuels include downed woody material such as dead branches, longs, and other loose surface litter on the soil surface along with living plants such as grasses, shrubs, tree seedlings, and forbs. The amount, size, and moisture content of surface fuel types determine how fast a fire spreads, how hot it burns, and how high its flames reach. CDF has developed surface fuels data by translating vegetation data from a variety of sources into several fuel characteristic models used to predict fire behavior. The fuel models are based on vegetation attributes such as cover type, vegetation type, size, and crown closure, as well as other factors such as slope, aspect, elevation, and topography. Annual fire perimeter data is used to update fuel model characteristics based on "time since last burned" to account for both initial changes in fuels resulting from fuel consumption by the fire and for vegetation re-growth.

Fire Threat

Fire threat is a combination of fire frequency or the likelihood that a given area will burn as well as potential fire behavior. These two factors are combined to create four threat classes ranging from moderate to extreme. Fire threat can also be used to estimate the potential for impacts on various assets and values susceptible to wildfire. Impacts are more likely to occur and/or be of increased severity for higher threat classes. CDF calculated a numerical index for fire threat based on the combination of fuel rank and fire rotation class. A one to three ranking of fuel ranks was summed with the one to three ranking from rotation class to develop a threat index ranging from two to six. This threat index is then grouped into four threat classes. Areas that do no support wildland fuels (e.g. open water, agriculture lands, etc.) were omitted from the calculation; however, areas of very large urban centers were left but received a moderate threat value.

Condition Class

Condition class refers to the general deviation of an ecosystem from its pre-settlement or natural fire regime. It can be viewed as a measure of sensitivity to fire damage, or a measure of fire-related risk to ecosystem health. Classes are assigned based on current vegetation type and structure, an understanding of its pre-settlement fire regime, and current conditions regarding expected fire frequency and potential fire behavior. The conceptual basis for assigning condition classes is that in fire-adapted ecosystems much of their ecological structure and processes are driven by fire, and disruption of fire regimes leads to many alterations to the ecosystem including changes in plant composition and structure, uncharacteristic fire behavior and other disturbance agents (pests), altered hydrologic processes, and increased smoke production. Condition Class 1 is associated with low level disruption of fire regime, and consequently low risk to loss or damage to the ecosystem. Condition Class 2 indicates some degree of departure from natural fire regimes, with some loss and change in elements and processes within the ecosystem. Condition Class 3 is highly divergent from natural regime conditions, and represents the highest level of risk of loss. See Fire Condition Class Maps, Pages 40-47, Tehama East Watershed Assessment Atlas.

Fire Regime

Fire regime refers to the pattern and variability of fire occurrence and its effect on vegetation. A simple statewide fire regime classification system provides an approximate idea of the range in fire frequency and severity as it existed before European settlement. This classification is based on a similar classification system developed in conjunction with the Coarse-Scale Condition Class assessment done for the National Fire Plan, modified from the USFS National Fire Plan Condition Class Assessment. This classification, while highly generalized, can illustrate only coarse differences in fire regimes.

HISTORY OF FIRE AND FUELS MANAGEMENT IN EASTERN TEHAMA COUNTY

With the creation of the United States Forest Service in the early 20th century and the California Department of Forestry and Fire Protection (Cal Fire) in 1905, a federal and state infrastructure was created to prevent and suppress all wildfires within eastern Tehama County. As of 1905, statewide efforts had established full suppression of wildfires throughout Tehama County and the rest of the North State. Fire suppression success was defined in terms of an overall decline in the number and size of wildfires. At the same time, it was becoming apparent that when wildfires did occur, they were often more intense, resulting in large areas of severe vegetation destruction. (See Figure 10-1 below.) The increase in fire occurrence and intensity was becoming particularly acute in forested areas, where large expanses containing substantial amounts of debris, brush, and dense thickets of small timber had developed as result of logging and other resource extraction activities. The occurrence and intensity of wildfire was also found to be increasing in open wildlands where naturally occurring fires were being extinguished without exception in order to protect manmade resources and to maintain vegetative cover in watersheds.

WATERSHED VALUES AT RISK

Uncontrolled stand replacing wildfire is detrimental to both watershed function and quality, and can negatively impact all aspects of the watershed. In a catastrophic wildfire, typically all vegetation is removed or damaged, including seeds, soil microorganisms, minerals, and nutrients. Prescribed or planned fires generally remove some vegetation but soil micrograms and many elements of the ecosystem remain unaffected. All fires produce a range of conditions across the landscape, from benign to stand-replacing. A “catastrophic” fire is large in acreage and a higher proportion of it is stand-replacing. The high intensity and high acreage causes a multiplier effect on water quality sedimentation, wildlife, and damage to human infrastructure.

Soil

The frequency and severity of wildfire affects the magnitude of accelerated erosion. The potential for accelerated erosion is primarily through its effects and removal of vegetation. During an intense wildfire, all vegetation may be destroyed and organic material in the soil may be burned away or decomposed into a water-repellent substance that prevents water from percolating into the soil (hydrophobic soils). The potential for fire to increase erosion increases with fire severity, soil credibility, steepness of slope, and intensity or amount of precipitation.

Table 10-1. Historic Fire Acreages by Decade

Decade	Fire Events	Acres
1900	1	948
1920s	7	59,518
1930s	12	61,254
1940s	32	59,914
1950s	18	13,234
1960s	12	5,758
1970s	8	103,188
1980	11	12,023
1990	17	12,892
2000	14	10,484
Total	132	339,213

The extreme temperature gradient just below the surface layer protects dormant seeds in the soil allowing them to germinate during the spring after the fire. As the temperature of the wildfire increases, quality of soil decreases. Minerals and nutrients at temperatures 220 to 460°C begin to mineralize, nitrogen vaporizes, organic materials oxidize, and more sand size particles are formed. At temperatures greater than 460°C, permanent changes in structure, texture, porosity, plasticity, and elasticity occur.

Soil pH may increase after a wildfire. This is a result of the addition of ash minerals leaching out after precipitation events. Many fungi and bacteria thrive in basic conditions, and with the increased pH levels and the scarring effect of fire, may increase the likelihood of disease to the forest. Wildfires result in the net loss of nutrients from the ecosystem. Although there are few estimates of such loss, four mechanisms generally account for declines in soil nutrients:

- Oxidation of compounds to a gaseous form (gasification), nitrogen and sulfur, easily oxidized, are directly proportional to the loss of organic matter
- Vaporization of compounds that were solid at normal temperatures
- Convection of ash particles in fire generated winds, loss of important plant development nutrients
- Leaching of ions in solution out of soils

Water

Large intense fires have a much greater effect on stream ecology, form and function than smaller, less-intense fires. In addition, the proportion of the burned area within the watershed also influences the effects of the fire on stream characteristics. The increase of sediment into streams and rivers is often one of the most dramatic responses associated with fire. Loss of ground cover such as needles and small branches along with chemical transformations that occur within burned soils make watersheds more susceptible to erosion from precipitation events. High precipitation events in the watershed can increase sediment discharge. Depending upon the amount of precipitation, the discharge to the basin can range from 0.1 to 0.8 acre-feet per acre of burned forest. Additional sediment storage can alter a stream's form and function in a deleterious manner. Studies in the Stanislaus National Forest indicate large intense fires produce an average of 20 to 50 tons of sediment per acre per year of erosion for the first 2 years. Increases in specific ions or pH can cause fish mortality. Large woody debris jams often increase post-fire because of fire-killed snags falling into the stream and new recruitment of debris will be reduced in subsequent years. In addition, retention of woody debris (which creates pools and habitat for fish) may be decreased post-fire because of increased stream flow.

Turbid waters tend to have higher temperatures and lower dissolved oxygen concentrations. A decrease in dissolved oxygen levels can kill aquatic vegetation, fish, and other aquatic organisms. Increases (or decreases) in water temperature outside the tolerance limits can be detrimental or even lethal to aquatic organisms, especially cold-water fish such as trout and salmon. Elevated temperatures may also occur due to loss of protective canopy. Tree removal reduces evapotranspiration, which increases water availability to stream systems. Increased stream flows can scour channels, erode stream banks, increase sedimentation, and augment peak flows. Hoyt and Troxell first documented the effects of wildfire on stream flow in 1932. They found that burning chaparral caused the average annual stream flow of one specific creek to increase 29 percent. In addition they found that peak discharges and sediment loads carried by the streams also increased. See Fire Rotation Class map on Page 64 of the Tehama East Watershed Assessment Atlas.

Air

National Ambient Air Quality Standards (NAAQS) are defined in the Clean Air Act as the amount of pollutants above which detrimental effects to public health or welfare may result. NAAQS has established criteria for particulate matter (PM) also called total suspended solids (TSP), based upon size. PM10 is particulate matter less than 10 microns in diameter and PM2.5 is less then 2.5 microns in diameter. The major pollutant for wildfire in smoke is fine particulate matter, PM10 and PM2.5. Studies show that 90 percent of all smoke particles emitted during wildland burning are PM10, and 90 percent of PM10 is PM2.5.

Suppression of wildfires provides a short-term benefit to air quality by reducing the amount of vegetation consumed, which reduces smoke emissions. However, by delaying a natural event to a later date, poor air quality is simply pushed to a future time. Estimating the impacts from air pollutants is difficult in general, and is more complex in a wildland setting. Wildfire smoke, and in some cases prescribed burning, can affect visibility, human health, and vegetation. Overall air quality impacts of smoke are important, especially given the fact that the Sacramento Valley Air Basin has a non-attainment status for PM10. Wildland fires are categorized as an “area source” by many pollution agencies, since they tend to release pollutants over large areas. A single wildfire that consumes 100 acres of heavy forest fuels can emit as much as 90 tons of particulate matter into the atmosphere. Wildfires generally Health issues contributed to prescribed burns and wildfires affect the younger and older generations, as shown in **Table 10-2**. Reactions to smoke exposure range from itchy and scratchy throat to more serious reactions such as asthma, emphysema, and congestive heart failure. Ozone, a product of biomass combustion, is a precursor to greenhouse gases. Although ozone produced by prescribed fire usually is quickly diluted and dispersed into the air, it may bring wildland fire under scrutiny as a contributor to the greenhouse effect.

Wildlife

The major impact of wildfire on wildlife centers is its influence on vegetation structure and composition. The loss of down and dead woody material, during wild and prescribed burns, removes essential structural habitat components for a variety of wildlife and reduces species diversity. Loss of brush fields and forestlands restrict the ability of wildlife to forage for food and find shelter. Fire has the potential to accentuate impacts on fish and wildlife associated with other landscape fragmentation and development (timber harvesting, road building, and forest management practices). For fish, the primary concerns relative to fire are increases in water temperature, sediment loading, stream cover, and the long-term loss of woody debris from stream channels. Vegetation also decreases the rate of erosion along stream banks.

Table 10-2
Health Effects Based On Visibility

Visibility	Health Category	Health Effects	Cautionary Statements
10+ miles	Good	None	None
6 to 9 miles	Moderate	Possibility of aggravation of heart or lung disease among persons with Cardiopulmonary disease and the elderly.	None
3 to 5 miles	Unhealthy for sensitive groups	Increasing likelihood of respiratory symptoms in sensitive individuals, aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly.	People with respiratory or heart disease, the elderly and children should limit prolonged exertion.
1 to 2 miles	Unhealthy	Increase aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; increased respiratory effects in general population.	People with respiratory or heart disease, the elderly and children should avoid prolonged exertion; everyone else should limit prolonged exertion.

1 mile	Very unhealthy	Significant aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; significant increase in respiratory effects in general population.	People with respiratory or heart disease, the elderly and children should avoid any outdoor activity; everyone else should avoid prolonged exertion.
Under 1 mile	Hazardous	Serious aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; serious risk of respiratory effects in general population.	Everyone should avoid any outdoor exertion; people with respiratory or heart disease, the elderly and children should remain indoors.

Source: Air Quality: Department of Environmental Quality, Oregon

Change in species composition from intense wildfire favor early successional habitat and its assorted wildlife populations. Significant increases in browsing species populations (such as deer) are common following severe fire. Physical movement of animals is also enhanced after wildfire. However, in chaparral, mountain lions are attracted to the edges of the burned area where deer tend to congregate. Low intensity fires do not generally result in significant changes to vegetation composition and resulting wildlife species, but may have similar benefits by increasing the diversity of vegetation mosaics providing better food and cover border areas. Low intensity fires tend to modify species composition and seral stage, thus affecting habitat elements used by wildlife. The overall effect on the wildlife population depends on the landscape distribution of those habitat components.

Bird populations generally respond to changes in food, cover, and nesting caused by fire. Fire effects on insect and plant-eating bird population depend on alterations in food and cover. Some species of birds may increase in numbers after a fire, such as the swallow, swifts, and flycatchers, allowing greater access to forage. Several species such as the California gnatcatcher require structure and cover provided by mature scrub. Bird nest site selection, territory establishment, and nesting success can be affected by season of fire. Spring burns may destroy active nest.

Direct effects on wildlife population due to wildfires vary, depending on body size, mobility of the species, and intensity of the fire. The majority of animals move away from wildfires, but some (insectivorous birds, raptors) may be attracted, to take advantage of available prey. Large mammal mortality most likely occurs when fire fronts are wide and fast moving, fires are actively crowning, and thick ground smoke occurs. Although few studies have been conducted, it is believed that losses to wildlife caused by fire are negligible. The large Yellowstone fire of 1988 killed about 1 percent of the elk population. Most of the larger animals died of smoke inhalation. However, like birds, spring fires may impact mammal population due to limited ability of cover and the availability of food. Carnivores and omnivores are opportunistic species and although little increase in species occurs, they tend to thrive in areas where their preferred prey or forage is most plentiful which is often recently burned areas.

Recreation
Wildfire impacts recreation values through loss of use, reduced wildlife habitat, and change in species mix of vegetation. Burned areas that attract visitors for hunting and fishing and wildlife viewing will diminish in value after wildfire. Wildlife that loses habitat and forage will disperse to other locations, resulting in lower hunting numbers for several years. While direct economic loss from land use can be measured, it is more difficult to estimate losses to recreational activities. Recreation use numbers tend to display visitors in terms of users per day and are detailed toward specific attractions (campgrounds, park, and forests). Three National Park Service (NPS) studies determined that air quality conditions affected the amount of time and money visitors are willing to spend at NPS units.

Within the boundaries of the Tehama East Watershed Assessment and Management Plan project area the most important industries are related to grazing and timber production. With more than half of the watershed covered by grasslands, oak woodlands and chaparral, this is an area historically devoted to rangeland. Fires in this type of vegetation can move quickly and can cover large areas. As the population of Tehama County grows, urban areas are being stretched and pushed outward into these traditional rangelands. In the Tehama-Glenn Unit Fire Plan, the CDF notes that these circumstances have required them to place a greater emphasis on the protection of structures and lives rather than rangeland resources. If the area's rangelands burn in the summer, grasses will not regenerate until the following spring. With the loss of feed, ranchers then have to truck in outside feed to their cattle.

Communities at Risk
In an attempt to improve the effects of wildfire upon urban areas, federal fire managers authorized State Foresters to determine which communities adjacent to federal lands were exposed to a significant threat from wildland fire originating on public property. CAL FIRE undertook the task of generating a list of at-risk communities showing

developed areas in California in the vicinity of National Forests and Bureau of Land Management properties. In developing the California list, CAL FIRE assessed all areas of the state, regardless of ownership. Three main factors were used to determine fire threats to Wildland Urban Interface (WUI) areas within the state:

- Fuel hazards ranking (ranking vegetation types by their potential fire behavior during a wildfire)
- Assessing the probability of fire (the annual likelihood that a large damaging wildfire would occur within a particular vegetation type)
- Assessing housing densities in WUI areas (areas of intermingled wildland fuels and urban environmental that are in the vicinity of fire threats)

Out of this statewide assessment, a list of 1,283 fire threatened communities was developed. Of these threatened communities, 843 were found to be adjacent to federal lands. Table 10-3 lists these officially recognized communities that are within eastern Tehama County. The Hazard Level Code shown designates a community's fire threat level, with 3 indicating the highest level of threat.

Table 10-3. Officially Recognized Communities at Risk Within Eastern Tehama County[1.]

Community Number	Community Name	Federal Threat [2.]	Hazard Level [3.]
85	Bend	X	2
283	Dairyville		2
656	Los Molinos	X	2
678	Manton	X	3
840	Paynes Creek	X	3
920	Red Bluff	X	3

1. The community of Ponderosa Sky Ranch is also a significant community within the eastern Tehama County fire plan project area. Although not currently on the National Registry of Fire Threatened Communities, it was deter-mined to be possibly at risk by CAL FIRE during development of the 2005 Tehama-Glenn Unit Fire Management Plan.
2. Federal Threat Code "X" indicates some or all of the wildland fire threat to the community comes from federal lands (e.g. US Forest Service, BLM, or Department of Defense).
3. Hazard Level Code indicates the fire threat level, with 2 denoting moderate threat and 3 denoting high threat.

Overview of Tehama County Fire Protection Organizations

Firefighting responsibilities in Tehama County are divided into a number of organizational units whose responsibilities are described below. Those firefighting units dealing primarily with fires within eastern Tehama County's wildlands and wildland/urban interface areas are listed in Table 10-4 below:

Table 10-4
Summary of Fire Facilities within Eastern Tehama County

Department	Station Name	Address	City
CDF/TCFC	Station 1	04 Antelope Blvd.	Red Bluff
CDF/TCFC	Station 5	22310 Bend Ferry Road	Bend
CDF/TCFC	Station 10	7930 Sherwood Blvd	Los Molinos
CDF/TCFC	Station 16	4560 Rowles Road	Vina
CDF/TCFC	Station 18	31291 Manton Rd	Manton
CDF/TCFC	Station 20	37900 Hwy 36E	Mineral
CDF/TCFC	Station 21	29960 Plum Creek Rd	Paynes Creek
CDF/TCFC	Paynes Creek	29105 Hwy 36E	Paynes Creek
CDF	Vina Helitack Base	4520 Highway 99E	Vina
USFS	Mineral	38965 Highway 36E	Mineral
USFS	Mineral	38050 Highway 36E	Mineral

FEDERAL RESPONSE AREA EAST

Federal Response Area East (FRA) consists of federal lands managed by the Lassen National Forest along with a number of Bureau of Land Management parcels. Portions of these lands are protected from wildfire through cooperative response agreements with CDF. Under this agreement, the firefighting agency having available equipment and manpower closest to a wildfire incident will respond. In addition, some federal lands are protected on a permanent basis utilizing CDF firefighting resources, and some non-federal land adjacent to the National Forest is protected by USFS resources.

LOCAL RESPONSIBILITY AREA

In addition to lands within Tehama County under direct state fire protection responsibility and those protected through intergovernmental agreements established between the State of California and federal firefighting agencies, portions of the county, particularly in the valley regions closest to the Sacramento River, are classified as Local Responsibility Areas (LRA). Within these LRAs, fire protection is provided by the County Fire Department, other local firefighting entities, or through CDF via contract. At the present time, fuels reduction efforts within the LRAs are limited to wildlands and other areas along the Sacramento River.

City of Red Bluff Fire Department

Primary responsibility of this department is for the City of Red Bluff and rural areas immediately adjacent to city limits. The Department operates one fire station.

Tehama County Fire Department

Primary responsibility is for Tehama County's Local Response Area. The fire department operates six fire stations within the Tehama East Watershed area.

CAL FIRE

CAL FIRE is responsible for controlling wildland fires on 283,778 acres of State Responsibility Area (SRA) lands throughout Tehama County and has fiscal responsibility over an additional 10,767 acres of SRA lands which are directly protected by the U.S. Forest Service.

California Public Resources Code 4125 establishes that local and federal agencies have primary responsibility for fire prevention and suppression in all county areas not classified as SRA. Every five years, CAL FIRE reissues maps identifying the boundaries of the SRA with any modifications approved by the Board of Forestry. In addition to the stations within the county that CAL FIRE operates or for which CAL FIRE is responsible, other firefighting resources are available in neighboring counties, including aerial attack bases.

Historic catastrophic losses of structures in the WUI have resulted in an array of laws and regulations to protect the public. On a yearly basis, each Battalion of the Tehama-Glenn Unit performs LE38 inspections of clearance around structures (Public Resource Code 4291) in order to aid residents in understanding and complying with the regulations that affect the impact of wildfire events. Tehama County Ordinance 1537 includes Chapter 9.14, known as the "Tehama County Fire Safe Regulations," that went into effect after October 1, 1991. The Fire Safe Regulations constitute the basic wildland fire protection standards of the California Board of Forestry. These regulations have been prepared and adopted for the purpose of establishing minimum wildfire protection standards in conjunction with building construction and development in Tehama County. Items identified include basic road access, signing and building numbering, private water supply reserves for emergency fire use, and vegetation modification. Fire department personnel attend stakeholder meetings in order to aid the public with information and possible resources to utilize for fuel management projects in high priority/fire hazard areas.

Recently, changes to Public Resources Code 4291 expanded the defensible space clearance requirement around structures in wildland areas from 30 feet 100 feet. This defensible space area is within the perimeter of a parcel where basic wildfire protection practices are implemented. The area is characterized by the establishment and maintenance of emergency vehicle access, emergency water reserves, street names and building identification, and fuel modification measures. The focus of these regulations is to assure that fuel modification ensures a reduction in the spread and intensity of encroaching wildfires or escaping structure fires.

The Tehama County Fire Prevention and Education Officer (TCFPEO) plays a key role in the placement and construction of building projects. During plot plan and project plan review, building site placement is considered. Design recommendations and special mitigation requirements are established for structures that do not have adequate vegetation clearance. The TCFPEO works cooperatively with the Tehama County Sheriff's Office and the Office of Emergency Services to develop documents for public reference in the form of Fire Prevention Calendars and Multi-Hazard Emergency Evacuation Plans. The Multi-Hazard Emergency Evacuation Plan for the communities of Tehama County provides a detailed checklist for conducting pre-incident preparation and lists the proper procedures to follow during an emergency. These plans were developed by the TCFPEO to address the critical needs of fire department and law enforcement personnel during emergencies such as wildland fires, hazardous material leaks, floods, natural disasters, and homeland security emergencies. In addition, the Tehama County Fire Prevention and Education Officer was involved in drafting the fire chapter of the county's Disaster Mitigation Act of 2000 (DMA 2000) Multi-Hazard Plan and continues to provide input into the document's impact on fire related issues. The DMA 2000 Plan is required by the Federal Emergency Management Agency in order for local agencies to apply for pre-disaster mitigation funds.

CAL FIRE/California Department of Corrections Ishi Conservation Camp

The CAL FIRE and the California Department of Corrections jointly operate this minimum security facility. The camp provides inmate fire and conservation crews that can be dispatched throughout the county and the entire state. At the present time, the camp has an array of wildland firefighting, service, and transportation equipment.

United States Forest Service
The Lassen National Forest manages a significant portion of those lands within easternmost 1/3 of Tehama County. The primary responsibility of this agency is for the control and suppression of wildland fires (not structural fires) on federal land. Two United States Forest Service fire facilities are located in the community of Mineral. U.S. Forest Service crews and equipment are also available at stations located throughout the Lassen National Forest within Plumas, Lassen, and Shasta Counties. In addition, the agency has access to substantial firefighting personnel and equipment throughout the region utilizing operating agreements established between the National Forests.

Lassen Volcanic National Park
The Lassen Volcanic National Park headquarters maintains a seasonal fire station manned by 22 seasonal and two permanent firefighting personnel. Suppression equipment at the station includes one Type 6 engine and one patrol unit. Through a mutual response agreement with the Lassen National Forest and CAL FIRE, these firefighting resources could be made available for fire incidents within the Tehama East assessment and panning area.

Bureau of Land Management
The United States Department of Interior's Bureau of Land Management (BLM) oversees the management and operation of the Ishi Fire Management Unit located within eastern Tehama County. This fire management unit includes the Bend Area of Critical Environmental Concern located just north of Red Bluff along the Sacramento River near the community of Bend. At the present time, either the U.S. Forest Service or CAL FIRE conducts all fire suppression operations on these lands. In the event of a wildfire, BLM fire management and fuels personnel would serve as duty officers and agency representatives to an interagency team. In addition, several local BLM staff members have Red Cards, which allow them to join fire suppression forces if needed.

The Nature Conservancy Dye Creek Preserve
The Nature Conservancy (TNC) provides the Dye Creek Preserve with an active fire management program. As a result, the organization maintains significant fire and fuels management infrastructure. In addition to TNC personnel trained in wildland fire fighting and prescribed burning techniques, Dye Creek Preserve has a fire station and small tanker available for use during wildfire events on TNC-owned and adjacent lands, as well as when conducting fuels management operations.

Interagency Approach to Firefighting In Tehama County
Wildland fires ignore civil boundaries. Consequently, it is necessary for cities, counties, special districts, and state and federal agencies to work together in order to minimize the adverse impacts of wildfires. All Tehama

County firefighting organizations are coordinated through automatic mutual aid agreements and can assist one another as needed. This interagency array of firefighting forces is dispatched by the Tehama-Glenn Emergency Command Center (TGECC) in Red Bluff according to a Standard Response Plan (SRP). The TGECC will dispatch fire engines, other emergency equipment, and personnel from the closest resources available to fill the requirements of the SRP, regardless of jurisdiction. Through early detection, fire lookouts play a crucial role in preventing small fires from becoming large catastrophic wildfires. Currently, two lookouts are operational on a seasonal basis within Eastern Tehama County and were manned by either U.S. Forest Service or CAL FIRE Personnel. These lookout facilities are listed below:

Table 10-5 Lookout Facilities Servicing the Tehama East Fire Plan Area

Lookout Name	Managing Agency	Location
Inskip Butte	CAL FIRE	Tehama County
Digger Butte	U.S. Forest Service	Tehama County

Community ISO Rating

As a means to standardize the rating of communities in terms of their ability to protect homes and other structures from fire, the ISO (Insurance Service Office) system was developed by the firefighting and fire insurance communities. The ISO system rates the following fire protection criteria:

- Quality and capacity of community emergency water delivery systems
- Fire protection level of service or lack of service in terms of proximity to paid fire fighting personnel
- Level and quality of emergency

The "10 point" rating system (with 1 being the best and 10 being the worst) is often used by insurers in order to determine the availability and rate of fire insurance policies.

Roads

Roads are an essential part of fire safety, fire management, and fuels reduction planning. These linear features provide access to communities, homes, and wildlands, as well as escape routes in the event of wildfire or other disasters. In addition, roads of all types provide a defensible space from which firefighters can conduct direct attack on wildfires and provide a strategic location for roadside fuel breaks.

Utility Infrastructure

Numerous power lines, gas lines, and water conveyance infrastructure features are found throughout the

Tehama East Watershed area. When constructed, a considerable amount of vegetation was removed within the utility right of way that continues to be maintained in order to reduce the potential of these features to pose a fire threat. A number of these facilities traverse more than one planning unit; as such, they could be developed into regional fire protection infrastructure. These manmade features can, be developed into linear fire breaks or ingress routes for firefighting forces. See Roads Map (Page 190) and High Voltage Powerline Map (Page 122), Tehama East Watershed Assessment Atlas.

Fire and Fuels Management Project Work

As previously mentioned, the Tehama County Resource Conservation District in conjunction with the Tehama-Glenn Fire Safe Council has completed a fire plan which covers a considerable potion of the Tehama East Watershed area. The plan focuses on fire management, fuels reduction and fire prevention issues. The following describes in general terms, the types of projects that were developed in order to improve the current fire and fuels situation within Eastern Tehama County. Proposed project work is described in greater detailed within the Tehama East Community Wildfire Protection Plan which is incorporated as an appendix to the Tehama East Watershed Management Plan.

<u>Shaded Fuel Breaks</u>

Shaded fuel breaks are constructed as a means to create a defensible space in which firefighters can conduct relatively safe fire suppression activities. Fuel breaks may also slow a wildfire's progress enough to allow attack by firefighters. The main idea behind fuel break construction is to break up fuel continuity and prevent a fire from reaching the treetops, thus forcing the fire to stay on the ground, where it can be more easily and safely extinguished. Fuel breaks may also be utilized to replace flammable vegetation with less combustible vegetation that burns less intensely. In addition to fuel reduction, a well-designed shaded fuel break also provides an aesthetic setting for people and a desirable habitat for wildlife. The following are general design features normally found within successful shaded fuel breaks:

- Fuel breaks should be easily accessible by fire crews and equipment at several points. Rapid response and the ability to staff a fire line are very important for quick containment of a wildfire.

- The edges of a fuel break should be varied to create a mosaic or natural look. Where possible, fuel breaks should compliment natural or man-made barriers such as meadows, rock outcroppings, and roadways.

- A maintenance plan should be developed before construction of a fuel break. Although a fuel break can be constructed in a few weeks, maintenance must be conducted periodically to keep the fuel break functioning properly.

- The establishment of a shaded fuel break can lead to erosion if not properly constructed. Short ground cover, such as grass, should be maintained throughout the fuel break to protect the soil from erosion.

- A properly treated area should consist of well-spaced vegetation with little or no ground fuels or understory brush. Tree crowns should be approximately 10–15 feet apart. The area should be characterized by an abundance of open space and have a "park like look" after treatment.

Mechanical Treatments

Mechanical methods to remove fuels include the utilization of bulldozers with or without brush rakes, excavators, chainsaws, mechanized falling machines, masticators, chippers, and grinders. Mechanical treatments are typically conducted on chaparral landscapes with some type of masticator, which grinds standing brush and reduces it to chips, which are typically left on the ground. Brush may also be mechanically removed and fed into a grinder for biomass production. Mechanical treatments are also utilized on industrial and non-industrial timberlands, where trees are thinned by mechanized tree cutting or falling machines. In most cases stands of trees are thinned from below as a means to eliminate the fuels that allows a fire to shoot higher into the tree canopy (ladder fuels). However, stands of trees may also be thinned from above to eliminate crown continuity. Due to air quality concerns, the mechanical treatment method is fast becoming the acceptable method of fuel reduction in Urban Interface areas. Compared to prescribed fire, mechanical treatment involves less risk, produces less air pollutants, is more aesthetically pleasing and allows landowners to leave desirable vegetation.

Defensible Fuel Profile Zones (DFPZs)

Defensible Fuel Profile Zones are strategically located lineal fuel reduction and fire protection areas that are generally constructed a quarter mile wide along public and private roads that traverse communities, watersheds, and areas of special concern. These are similar to shaded fuel breaks. The shaded fuel break objective is to reduce fire intensity, while DFPZ fuel management is designed to allow fire fighters quicker and safer access for attacking and suppressing oncoming forest fires. The DFPZ is more of a defensive line fighting area that manages fire behavior through fuels management. The lineal connectivity of the DFPZ network allows various property owners within a watershed the opportunity to connect fuel reduction projects to adjoining properties. The DFPZ network is the starting point for addressing the scale of the existing hazardous fuel problems at the appropriate pace of annual acres treated.

DFPZs are best placed primarily on ridges and upper south and east slopes and, where possible, along existing roads. They should also be located with respect to urban-wildland intermix and other high-value areas (such as old-growth or wildlife habitat areas), areas of high historical fire occurrence, and/or areas of heavy fuel concentration. Thinning from below and treatment of surface fuels can result in fairly open stands, dominated mostly by larger trees of fire-tolerant species. Successful DFPZs need not be areas of uniform vegetation and may encompass considerable diversity in age, size, and distribution of trees. The key feature should be the general openness and discontinuity of crown fuels, both horizontally and vertically, producing a very low probability of sustained crown fire. DFPZs should offer multiple benefits by providing not only local protection to treated areas (as with any fuel-management treatment) but also safe zones, within which firefighters have improved odds of stopping a fire. In addition DFPZs interrupt the continuity of hazardous fuels across a landscape, and provide various benefits not related to fire, including improved forest health, greater landscape diversity, and increased availability of relatively open forest habitats dominated by large trees.

Prescribed Fire

Prescribed fire is the controlled application of fire to the land used to accomplish specific land management goals. These goals can vary from annual burning around residences to clear grass and weeds, agricultural field burning for preparation of crop planting, range improvement burning, burning of brush piles, and landscape burning of forest to remove brush and accumulation of forest fuel. Forestlands can benefit from prescribed fire by attempting to regulate or moderate the frequency and intensity of wildfires. The use of prescribed fire and mechanical fuels reduction techniques to restore and maintain seral, fire-resistant species often has the following benefits:

- Forest stands generally become resistance to insect and disease epidemics as well as severe wildfire
- Improved forest cover for aesthetics and wildlife habitat
- Production of timber products
- Stimulation of forage species
- Generation of moderate site disturbance that allows for tree regeneration

Wildland Fire Use

Prescribed burning on a regular basis can result in a measure of protection from catastrophic loss through a reduction in the volume and concentration of brush and forest fuels. In many forests and chaparral areas fuel structures are currently too hazardous to safely attempt prescribed ignitions without pre-treating the stand either mechanically or through the planned use of wildland fires (wildland fire use). The use of carefully managed naturally occurring fires can be a cost effective and environmentally benign method of accomplishing resource management objectives within sensitive landscapes such as wilderness areas. In using this tool, current and forecasted weather conditions, fuel conditions, availability of fire resources, along with resource goals for the specific site are all taken into account before designating a particular fire as fire use. These factors are then continuously monitored as the fire progresses. In addition, detailed plans are drafted that outline the conditions required for the fire to continue burning under this designation. The presence of structures in the vicinity of a fire often excludes that area as a fire use zone.

The intensity and temperature of most prescribed fire scenarios (either artificial or natural ignitions) are significantly less than catastrophic wildfire and produce positive rather than negative ecosystem impacts. Both types of prescribed fire provide the following benefits:

- Reduction of dead wood, overcrowded forest stands, unhealthy individual trees, thick layers of pine needles and ground vegetation that can contribute to high intensity uncontrolled wildfires. Thinning of overcrowded forests can also result in healthier and more vigorous timber stands that are more resistant to insect and disease attacks
- Preparation of sites for new growth through the removal of excess vegetation and needles. As the excess vegetation is burned, nitrogen and other nutrients are released, allowing the soil to be receptive for new plant growth and conifer seed germination. Some forms of conifers and brush (knob cone pine, lodge pole pine manzanita, deer brush) rely on frequent fire for germination of seeds and new growth development
- Creation of diverse vegetation for wildlife forage and shelter through the development of varying ages and types of plants.
- Increases in water and spring yields through the removal of encroaching chaparral and shade-tolerant species as well as the decrease in evapo-transpiration. Increases occur in local springs and groundwater discharge to creeks. Significant increased flows are common after fires.
- Increases in nutrients such as phosphorus, potassium, calcium, and magnesium in the ash deposits.

CAL FIRE
Vegetation Management Program

The CALFIRE Vegetation Management Program (VMP) is a cost-share program that focuses on the use of prescribed fire and mechanical fuels reduction in order to address wildland fire fuel hazards and other resource management issues on State Responsibility Area (SRA) lands. VMP allows private landowners to enter into a contract with CALFIRE to use prescribed fire in order to accomplish a combination of management goals on both forestlands and grasslands. In addition to providing funding, manpower and other forms of technical assistance, the VMP provides indemnification to landowners who participate in project work. Since 1981 approximately 500,000 acres (an average of 31,000 acres per year) have been treated throughout California using prescribed fire under this program. Cost of the prescribed burning averages $25 to $30 per acre but can vary depending upon the number of acres and resources necessary for the prescribed fire project. Cost share requirements of the program stipulate landowner contributions for project costs between of 25 to 30 percent.

DATA GAPS

No major data gaps related to wildfire were identified during the watershed analysis process. The Tehama East Community Wildfire Protection Plan will be used to present planning and implementation projects.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions and recommendations related to fire and fuels management within the Tehama East Watershed can be found in the Tehama East Community Wildfire Protection Plan which will be attached to the Tehama East Watershed Management Plan as an addendum.

Tehama East Watershed Assessment

For more information, please contact:

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