CSAB REVIEW DRAFT
Section 2 – Description of Plan Area

Corning Subbasin
Groundwater Sustainability Plan

October 2020

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ACRONYMS AND ABBREVIATIONS

AWMP .....Agricultural Water Management Plan
BLM.....United States Bureau of Land Management
BMO .....Basin Management Objective
CCR.....California Code of Regulations
CDFW .....California Department of Fish and Wildlife
CDP.....census-designated places
CDPR .....California Department of Parks and Recreation
CVP.....Central Valley Project
CVRWQCB .....Central Valley Regional Water Quality Control Board
CV-SALTS .....Central Valley Salinity Alternatives for Long-Term Sustainability
CWD .....Corning Water District
DACs.....Disadvantaged Communities
DDW .....Division of Drinking Water
DNPG.....De Novo Planning Group
DPR.....California Department of Pesticide Regulation
DWR .....California Department of Water Resources
GAMA .....Groundwater Ambient Monitoring and Assessment
GCID.....Glenn-Colusa Irrigation District
HWY .....highway
ILRP.....Irrigated Lands Regulatory Program
IRWMP .....Integrated Regional Water Management Plan
MCLs .....Maximum Contaminant Levels
NSV.....Northern Sacramento Valley
NWIS .....National Water Information System
OUWUA .....Orland Unit Water Users Association
Paskenta Band.....Paskenta Band of Nomlaki Indians
PWS .....potable water system
Reservation .....Paskenta Rancheria Native American Reservation
SCADA .....Supervisory Control and Data Acquisition
SNMPs.....salt and nitrate management plans
SRWA.....Sacramento River Wildlife Area
SVWQC.....Sacramento Valley Water Quality Coalition
SWRCB.....State Water Resources Control Board
TCCA.....Tehama-Colusa Canal Authority
TCWD.....Thomes Creek Water District

Tribal Lands .....Paskenta Rancheria Native American Reservation
USACE .....United States Army Corps of Engineers
USBR .....United States Bureau of Reclamation
USDA.....United States Department of Agriculture
USDI .....United States Department of Interior
USFWS .....United States Fish and Wildlife Service
UWMP .....Urban Water Management Plan
WDR .....Waste Discharge Requirements

2 DESCRIPTION OF PLAN AREA

The plan area section, together with the basin setting section, describe in detail the relevant background information available for the Subbasin that was used to prepare this GSP. These sections provide context for local citizens, interested parties, and state regulatory agencies to understand and participate in this long-term groundwater planning effort.

[NOTE: We will reconcile section numbering when we have the final draft of the Basin Setting]

2.1 Introduction to GSP Area

The plan area section includes a physical description of the Subbasin, land and water use summaries, existing monitoring and management plans related to Plan development, and the public participation process followed for development of the GSP.

According to the SGMA Basin Prioritization Dashboard, the estimated population of the Corning Subbasin was 18,902 people in 2010.

2.1.1 Area Covered by the GSP

The Corning Subbasin lies within the Sacramento Valley Hydrologic Region, which includes the entire Sacramento River watershed (Figure 2-1; DWR, 2016). The Sacramento Valley Groundwater Basin is bounded by the Coast Range to the west, the Sierra Nevada and Cascade Mountain Ranges to the east, the Red Bluff Arch to the north, and the Sacramento River Delta to the south.

The Corning Subbasin shown on Figure 2-2 is one of numerous subbasins defined by DWR in the northern Sacramento Valley Basin. The Subbasin covers approximately 207,342 acres; approximately 78% of the land area is within Tehama County and 22% is within Glenn County. The Subbasin contains the city of Corning, and the census-designated places (CDP) of Richfield and Hamilton City. The Paskenta Band of Nomlaki Indians (Paskenta Band) is a federally recognized tribe and has jurisdiction over the Paskenta Rancheria Native American Reservation (as depicted in Figure 2-3) in the central portion of the Subbasin within Tehama County.

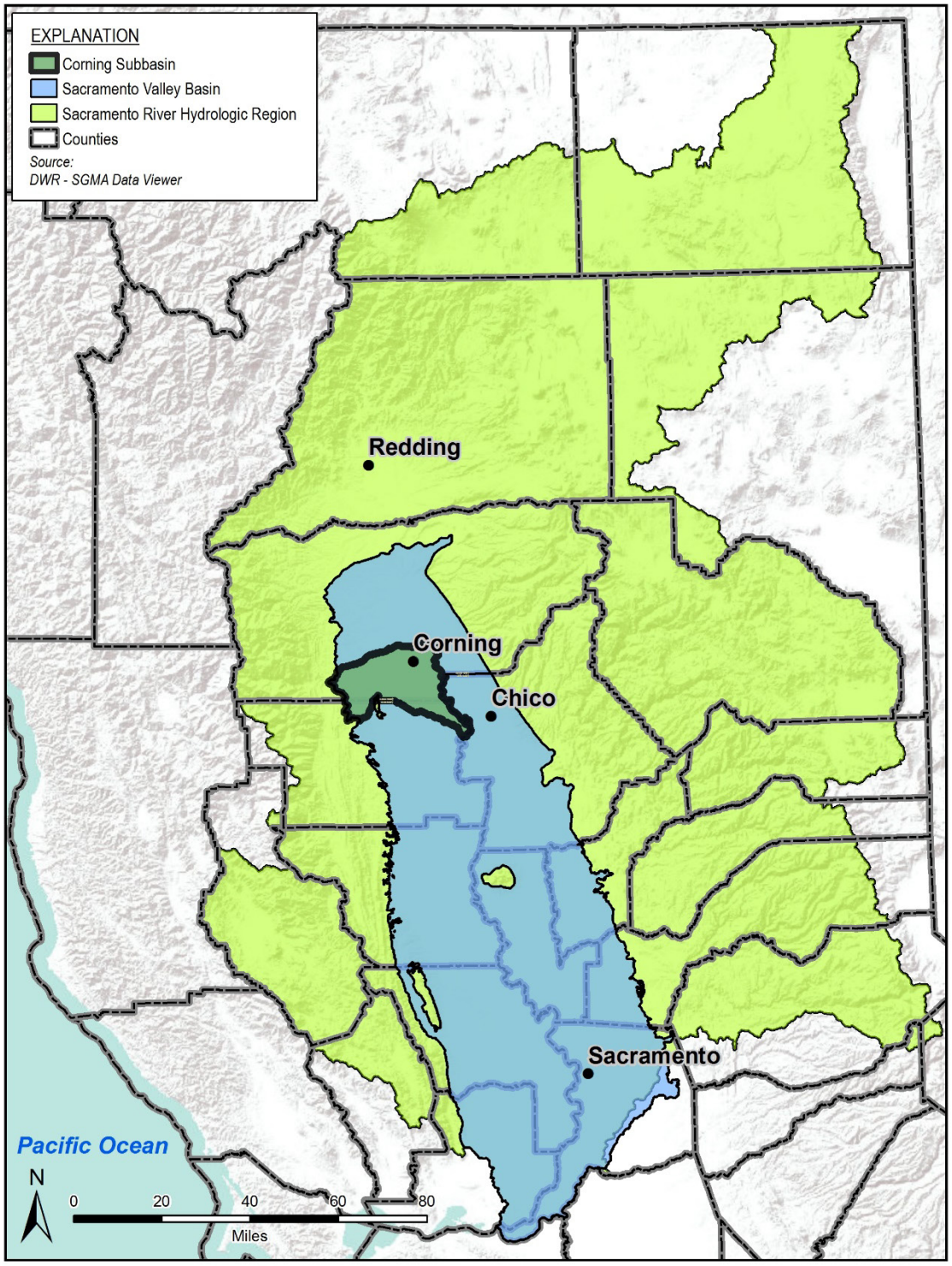

Figure 2-1. Corning Subbasin Location

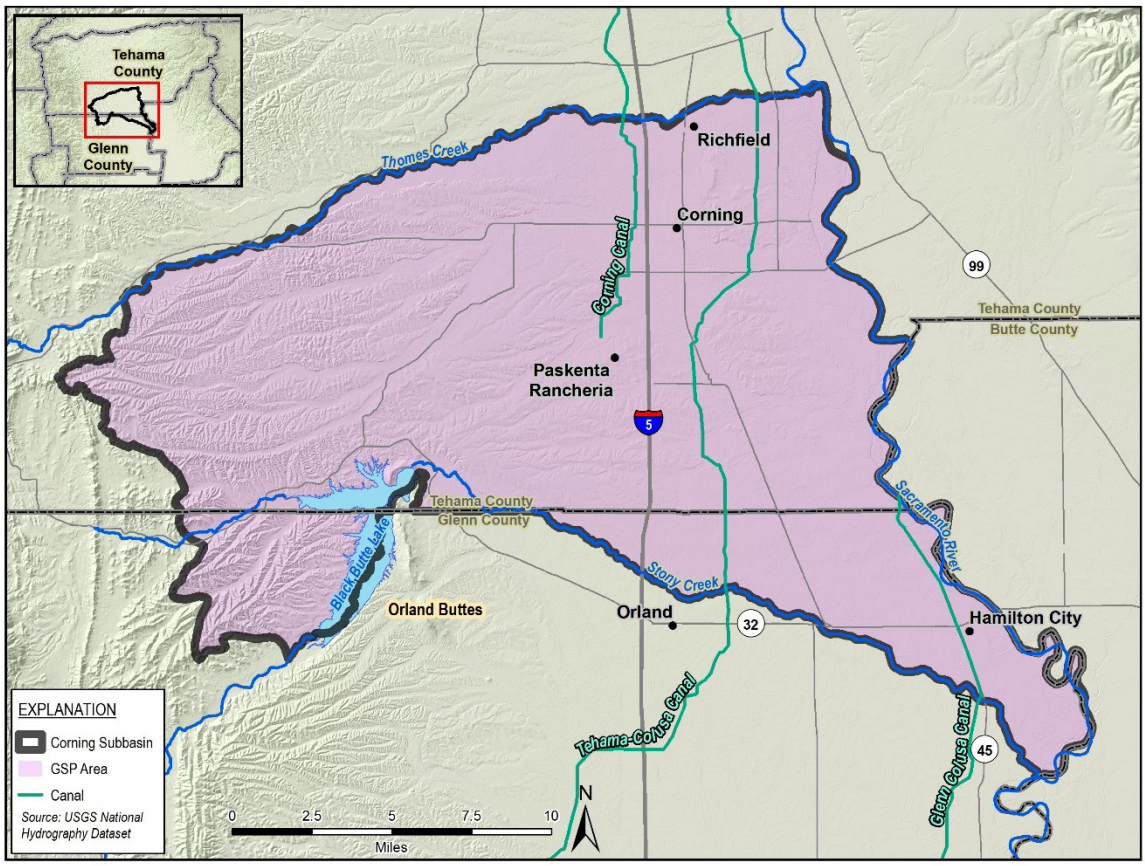

Figure 2-2. Area Covered by Corning Subbasin GSP

The Subbasin extent is defined by a combination of geologic, hydrologic, and jurisdictional boundaries including the Coast Range to the west, Thomes Creek to the north, Sacramento River to the east, and Black Butte Lake, Orland Buttes, Stony Creek, and the Tehama-Glenn County line to the south (Figure 2-1). The Coast Range mountains to the west and the Orland Buttes to the south of Black Butte Lake are not defined as groundwater basins by DWR and consequently are not subject to SGMA. Additional details on the hydrogeologic, geographic, and jurisdictional rationale for the Subbasin boundaries are provided in the Hydrogeologic Conceptual Model Section.

Prominent physical features found within the Subbasin are shown on Figure 2-2. Black Butte Lake in the southwestern corner of the Subbasin is formed by the Black Butte Dam on Stony Creek. There are three major surface water conveyance canals in the Subbasin that run generally north to south, parallel to the Sacramento River: the Corning Canal, the Tehama-Colusa Canal, and the Glenn-Colusa Canal. There are other intermittent streams throughout the Subbasin and a local canal system to the north of Stony Creek and east of the Tehama-Colusa Canal that are not shown on this figure but discussed in subsequent sections of the GSP. United States Interstate 5

(I-5) runs generally north-south through the center of the Subbasin. Other major roads and state highways shown on Figure 2-2 include California State Highways (HWY)-32 and HWY-45 which run east-west and north-south, respectively and intersect in Hamilton City.

2.1.2 Neighboring Subbasins

The Corning Subbasin is bounded by five neighboring Sacramento Valley subbasins for which GSPs are being developed concurrently (Figure 1-2). The Red Bluff Subbasin (#5-021-50) to the north and the Los Molinos Subbasin (#5-021-56) to the northeast are exclusively in Tehama County. The Vina Subbasin (#5-021-57) to the east is exclusively in Butte County. The Butte Subbasin (#5-021-70) to the southeast is in portions of Butte, Colusa, Glenn, and Sutter Counties. The Colusa Subbasin (#5-021-51) to the south extends from Glenn County to Colusa County with a small portion in Yolo County to the south. Like the Corning Subbasin, the Vina and Colusa Subbasins are considered high priority subbasins by the DWR and the Red Bluff, Los Molinos and Butte Subbasins are defined as medium priority subbasins. None of the neighboring subbasins were defined by DWR as critically overdrafted. Coordination with the adjacent GSAs occurred throughout the development of this GSP.

2.1.3 Adjudicated Areas and Alternative Plans

The Subbasin does not contain areas with adjudicated groundwater rights. No alternative groundwater management plans were submitted for the Subbasin or neighboring Subbasins.

2.2 Climate Summary

The Corning Subbasin, like all of the Sacramento Valley, has a Mediterranean climate characterized by warm, dry summers and cool, wet winters with transitional months in the spring and fall. A climate station at the Corning airport, maintained by Cal Fire has reported daily temperature data from 2005 to present and precipitation data from 2000 to present.[1]

The average monthly precipitation and average monthly maximum temperatures are shown in Table 2-1. Monthly average maximum temperatures range from 56.1˚ Fahrenheit (F) in December to 97.1˚F in July. Precipitation is greatest between October and April, with little precipitation in the months of May through September. Annual average precipitation (on a water year[2] basis) is approximately 20 inches per year.

DWR determines a Water Year Type Index each year for the entire Sacramento Valley. The analysis to determine the water year type is based on unimpaired runoff calculations from several

[1] https://cdec.water.ca.gov/webgis/?appid=cdecstation&sta=CRG
[2] A water year starts October 1 and ends September 31

stream gages dispersed throughout the region.[3] Data collected each water year from 1906 to present are classified by the DWR as 'wet', 'above normal', 'below normal', 'dry', and 'critical' depending on the amount of precipitation and water availability in the Sacramento River and major tributaries. This information is used in this GSP to guide interpretation of natural water level fluctuations within the Subbasin. Annual precipitation records are shown on Figure 2-3 in comparison to water year type. In general, greater local precipitation occurs in wetter water year types, though there are some years where local precipitation was not aligned with the regional outlook for the Sacramento Valley, potentially due to carryover storage available in major Sacramento Valley reservoirs.

Table 2-1. Average Monthly Precipitation and Temperature in the Subbasin

Month	Average Monthly Rainfall (inches)[a]	Average Daily Maximum Temperature (°F)[b]
	City of Corning	City of Corning
January	3.6	58.1
February	3.6	61.6
March	2.6	65.8
April	1.3	73.1
May	1.1	82.2
June	0.3	91.8
July	0.0	97.1
August	0.0	95.5
September	0.3	91.0
October	1.1	78.7
November	2.3	65.0
December	3.9	56.1
Monthly Average	1.7	
Average Water Year[c]	20.4	76.4

[3] http://cdec.water.ca.gov/reportapp/javareports?name=WSIHIST

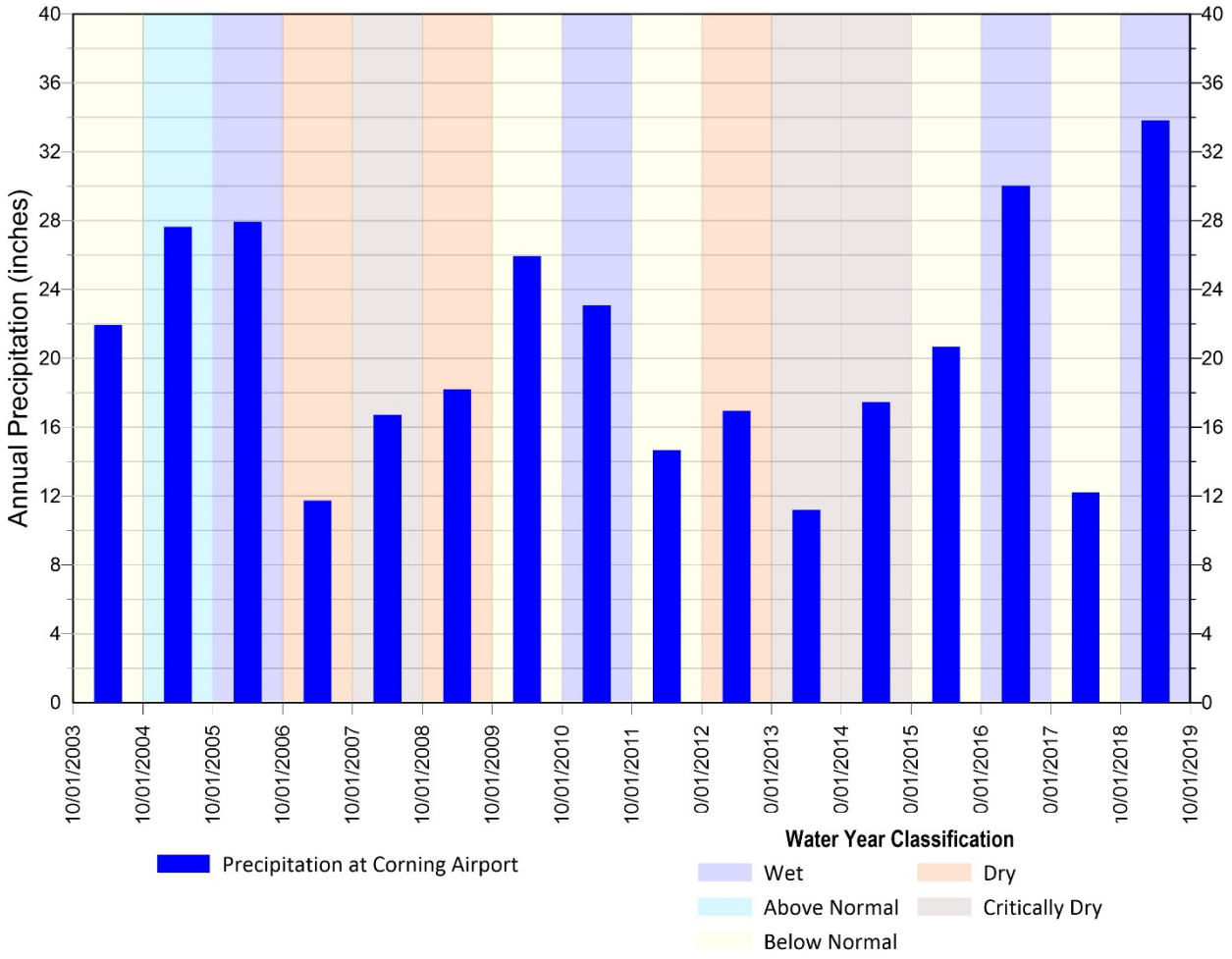

Figure 2-3. Annual Precipitation Record in the Subbasin

2.3 Land Use Summary

Land in the Subbasin is widely utilized for agricultural purposes with the primary land uses being grassland or pasture, followed by agricultural crops. The eastern portion of the Subbasin is generally covered with irrigated crops such as fruit and nut orchards, olives, field crops, and row crops, especially in the areas covered by established water districts described in Section 2.1.8 and in the independent grower areas along the Sacramento River, particularly in the southeast corner of the Subbasin near Hamilton City. Irrigated agricultural crops are less common in the majority of the land west of I-5. This portion of the Subbasin is often used for livestock grazing as well as for open spaces with natural vegetation.

General land use data from the 2019 United States Department of Agriculture (USDA) CropScape satellite imagery dataset is shown in Figure 2-4 and summarized in Table 2-2.[4] In 2019, CropScape estimated that 70% of the Corning Subbasin was open space characterized as grassland, pasture, shrubland, open water, wetlands, barren land, or forested land. Approximately 26% of the Subbasin was used for intensive agricultural purposes (including citrus and subtropical crops). Less than 5% of land in the Subbasin was classified as urban.

Agricultural land use from a 2016 agricultural crop land use survey conducted in cooperation with DWR is summarized on Figure 2-5.[5] The 2016 survey indicated that approximately 73,000 acres in the Subbasin were used for agriculture including fruit and nut orchards, row crops, field crops, and pasture. Of the top five crops by area in the Subbasin in 2016, four were tree crops, including almonds (11,400 acres), walnuts (10,400 acres), olives (8,600 acres), and plums (4,400 acres). An additional 5,100 acres was planted with undifferentiated young perennials. Alfalfa (2,300 acres) was the fifth most common crop in 2016.

There is a slight discrepancy between Figure 2-4 and Figure 2-5. for an approximately 9,000-acre area to the southwest of Corning that was once a groundwater irrigated eucalyptus grove operated by the Action Tree Farm (CDM, 2003). The tree farm is reportedly no longer actively irrigated, which is likely why the 2019 CropScape data summarized it as grassland/pasture but the DWR correctly identified these parcels in 2016 as citrus and subtropical agricultural lands.

Table 2-2. Land Use Summary in 2019

Category	Approximate Area in Subbasin (acres)
Grassland/Pasture	114,200
Agriculture	39,600
Shrubland	18,100
Citrus and Subtropical	15,000
Urban	9,300
Open Water	3,900
Wetland	3,700
Barren	3,100
Forest	300
Total	**207,200**

[4] https://www.nass.usda.gov/Research_and_Science/Cropland/sarsfaqs2.php
[5] https://gis.water.ca.gov/app/CADWRLandUseViewer/

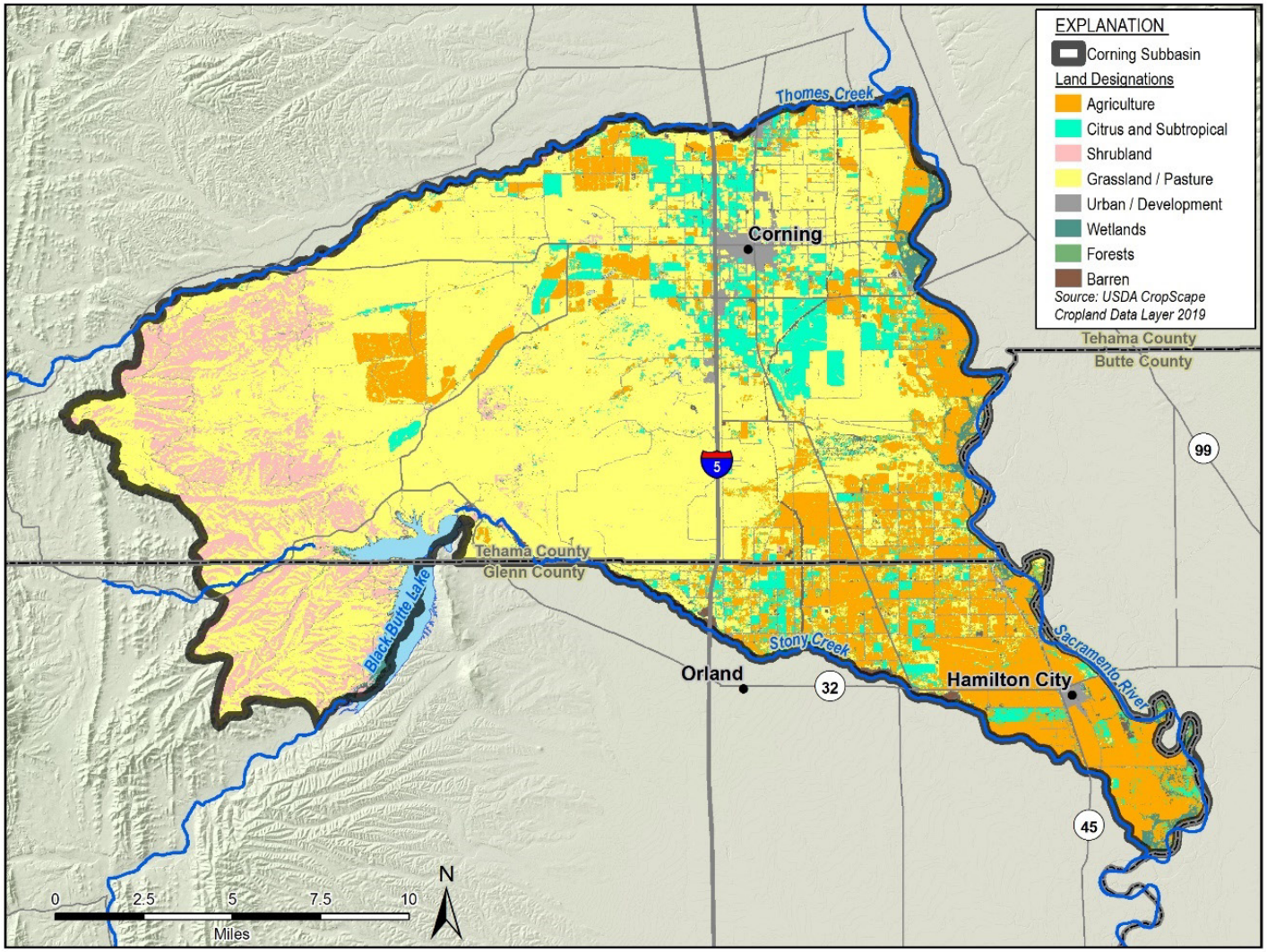

Figure 2-4. General Land Use in the Subbasin (2019)

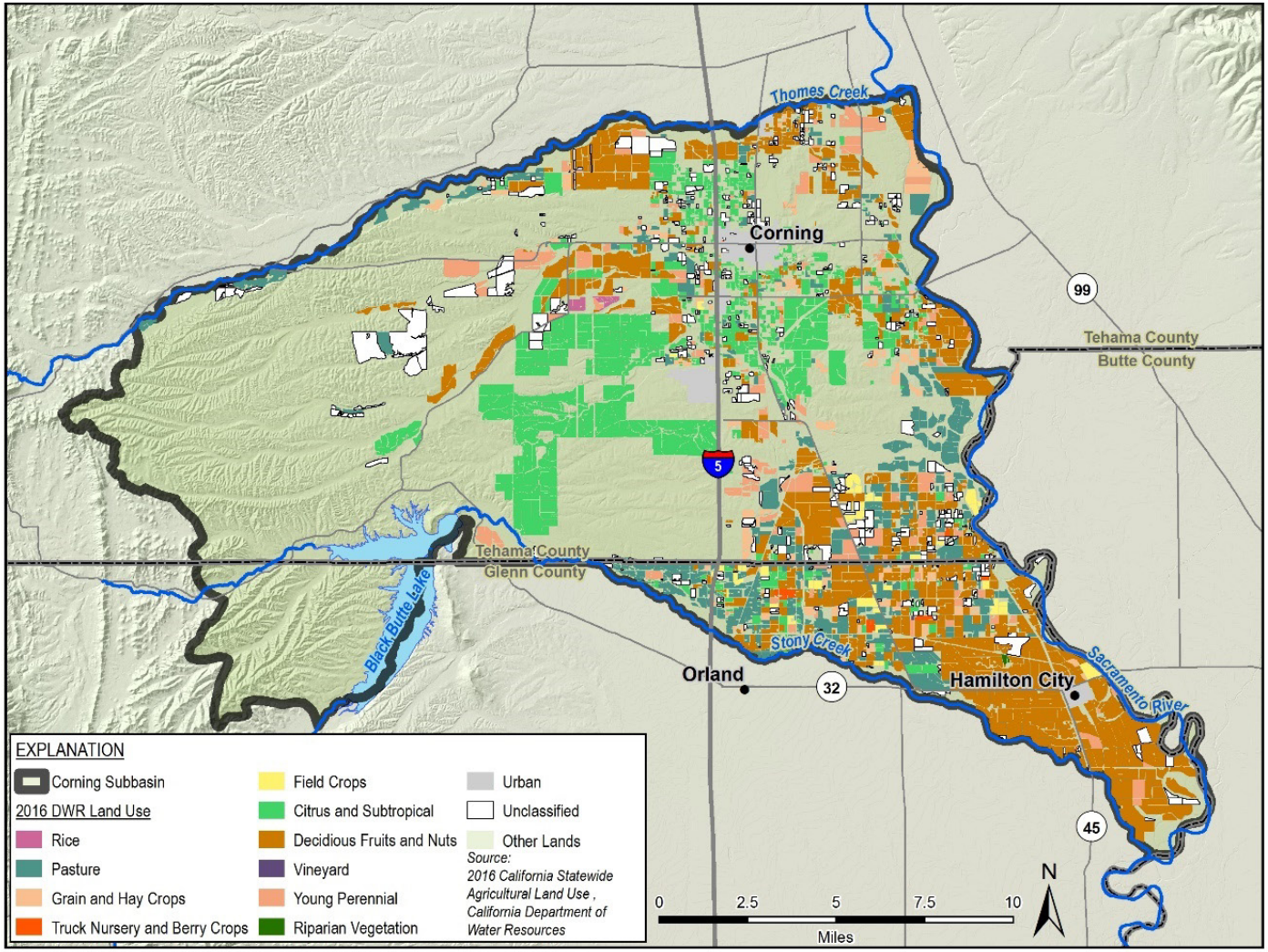

Figure 2-5. Agricultural Land Use in the Subbasin (2016)

Recent cropping trends are relatively stable in the last two decades, except for a recent increase in deciduous fruit and nut orchards that have replaced hay crops and pasture [Davids Engineering, 2017; Corning Water District (CWD), 2017]. Annual crop acreage in the Glenn County portion of the Subbasin was estimated between 1990 and 2015 as shown on Figure 2-6 and Figure 2-7 (Davids Engineering, 2018). The data suggests that total agricultural acreage decreased slightly since 1990, which corresponded to increases in native vegetation and developed land (Figure 2-6). Over this same time period, estimated orchard acreage steadily increased, displacing pasture and alfalfa and to a lesser extent idle lands and other row crops (Figure 2-7). Specifically, between 1990 and 2015, tree crop acreage in the Glenn County portion of the Subbasin increased from approximately 8,000 to 15,000 acres and pasture and alfalfa decreased from approximately 10,000 to 5,000 acres.

The CWD in Tehama County provided similar findings regarding recent land use trends to those for Glenn County (CWD, 2017). Historical cropping data from the CWD from 1994, 2008, and 2016 showed that the primary crop was consistently olives since 1967, but since 1994, almond and walnuts have displaced pasture as the second and third most prevalent crops, respectively. The combined acreage of these nut crops increased from 604 acres in 1994 to 3,191 acres in 2016. Inversely, pastureland in the district steadily decreased from 1,341 acres in 1994 to 521 acres in 2016. CWD is a relatively small part of the Tehama County portion of the Subbasin and is situated on prime agricultural land. Similar trends to the rest of the CWD have also been observed within the Corning Subbasin agricultural lands as a whole.

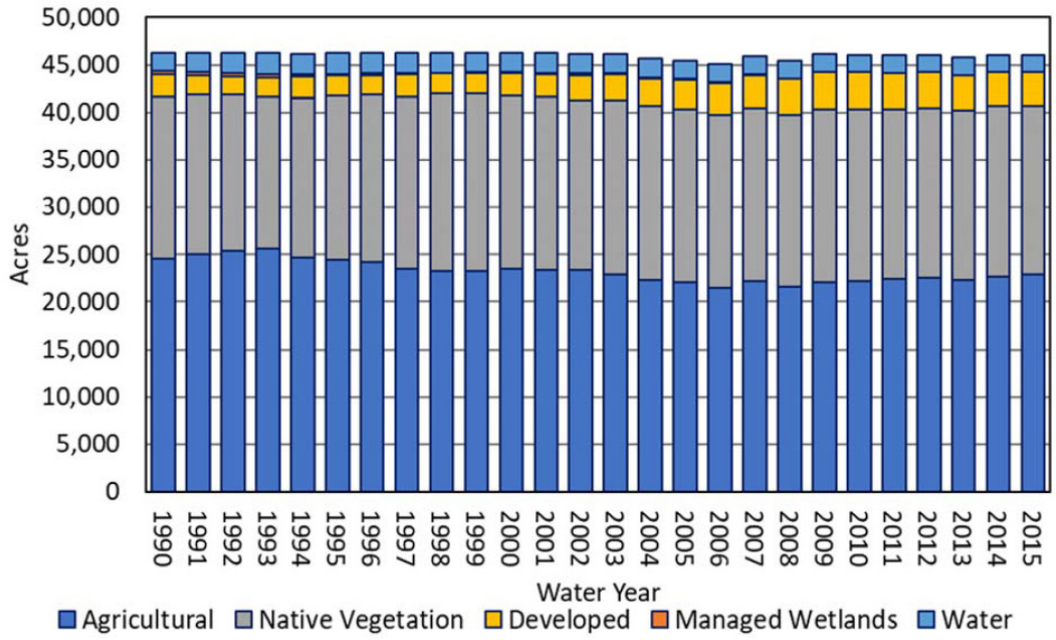

Figure 2-6. Glenn County Portion of Corning Subbasin General Land Uses (Davids Engineering, 2018)

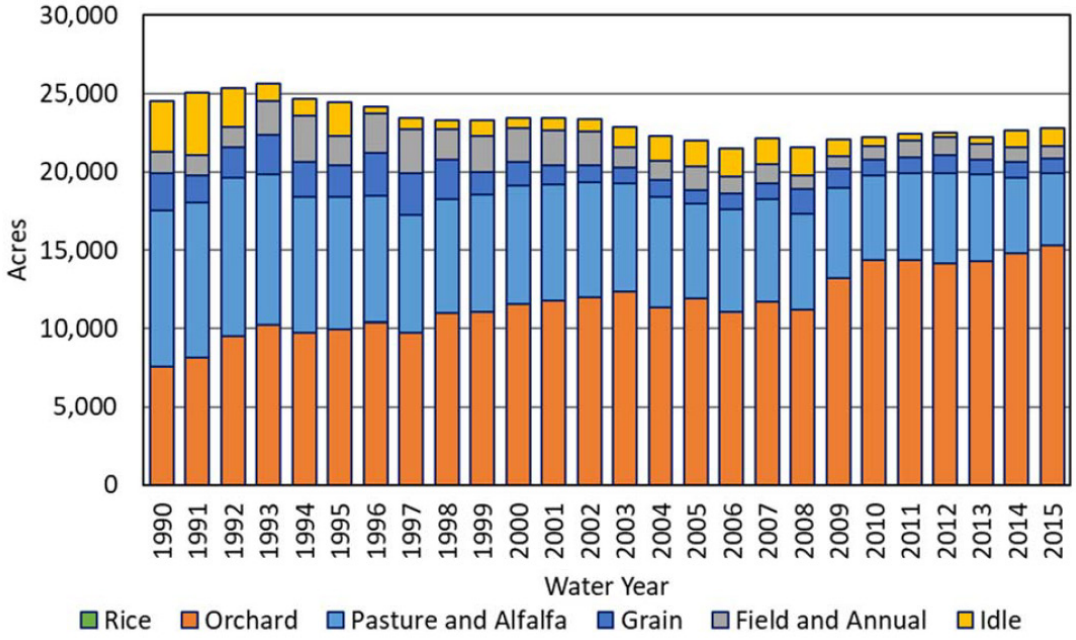

Figure 2-7. Glenn County Portion of Corning Subbasin Agricultural Land Uses (Davids Engineering, 2018)

[Note: similar figures will be developed for the Tehama County portion of the Subbasin]

2.4 Water Use Summary

The following sections summarize the sources of water utilized by the various land use sectors in the Subbasin, the water districts that manage local water supply, and the distribution of known groundwater wells.

2.4.1 Water Source Types

Water sources utilized in the Subbasin include groundwater, surface water, and reused water from canal tailwater and agricultural drains. The primary water source supply in the Subbasin is groundwater, as shown on Figure 2-8. Surface water is accessible in limited portions of the Subbasin, as further described in the following subsection. Reclaimed wastewater is not reused for water supply in the Subbasin. A general summary of water source volume used annually in the Subbasin is provided in Table 2-3.

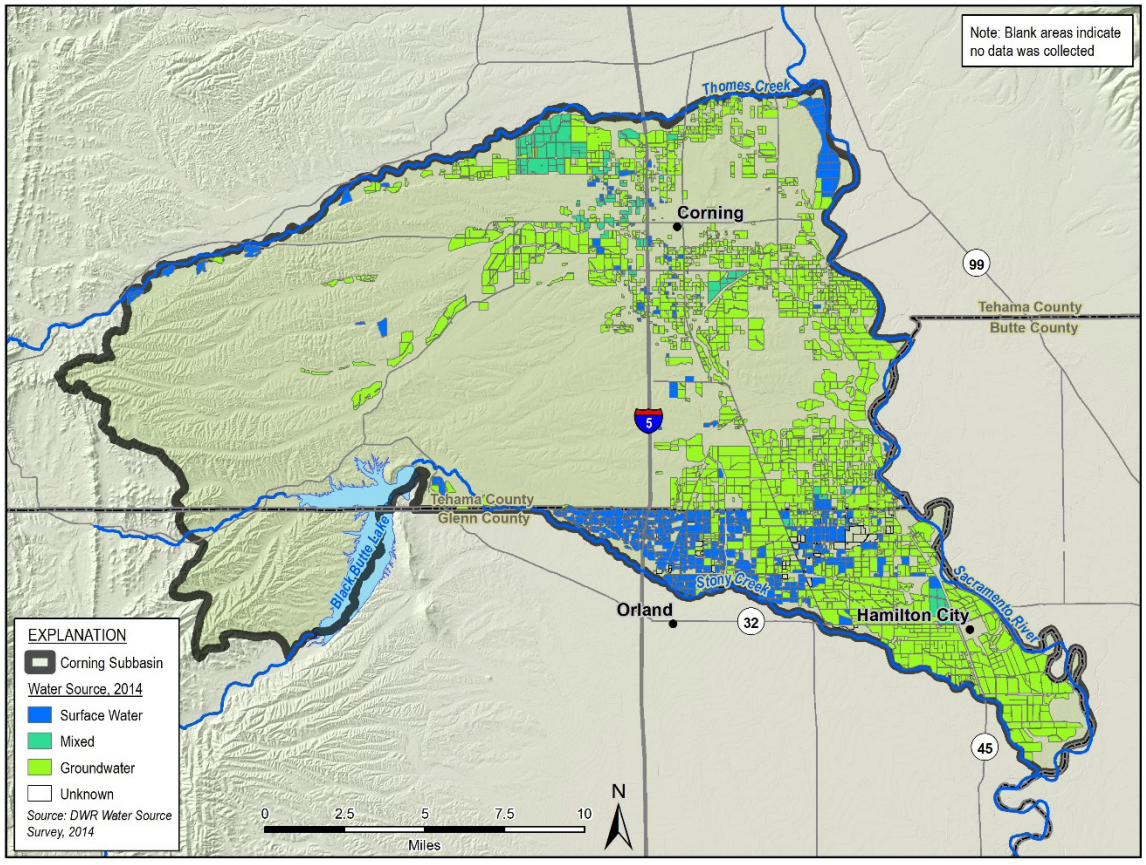

Figure 2-8. Water Source Types in the Subbasin Prior to 2014 (from DWR)

[Note: this initial map from 2014 will be revised and we will include a more map of water uses once all the required and most recent information is made available and reviewed]

Table 2-3. Summary of Water Sources Used in Subbasin

	Water Use in Glenn County Portion of Subbasin (acre-feet per year)[1]			Water Use in Tehama County Portion of Subbasin (acre-feet per year)[2]
	Avg	Dry Year	Wet Year	Avg
Groundwater	52,000	64,200	41,100	104,500
Surface Water	32,900	24,500	46,800	17,000
Reused Water	0	0	0	3,000
Total	**84,900**	--	--	**124,500**

1. **Water use in Glenn County portion of the Subbasin from 2000 to 2015 (Davids Engineering, 2018). The minimum values for surface water are in dry years, and minimum values for groundwater use are in wet years. The volumes in the table for groundwater and surface water are for different years; therefore, they do not sum to a representative dry year or wet year total.**

2. **Water use in Tehama County portion of the Subbasin estimated using cropping pattern from 2000, a relatively average water year (CDM, 2003).**

2.4.2 Groundwater Use Summary

Groundwater is the primary water source for most of the Subbasin and is used for a variety of beneficial uses. Many growers with land supplied through agricultural water providers have access to groundwater that they either use to supplement available surface water supplies or use as their sole water source. Independent growers who do not receive surface water from agricultural water providers typically utilize groundwater as their main water source for irrigation, although a few areas noted in Section 2.1.7.3 have access to surface water either as their primary or supplemental water supply (CDM, 2003; Brown and Caldwell, 2013). Non-agricultural water users also rely entirely on groundwater sources for domestic, municipal, and industrial purposes (CDM, 2003).

A 2003 Water Inventory and Analysis for Tehama County estimated an average groundwater extraction volume of 104,500 acre-feet per year across all sectors in the Tehama County portion of the Subbasin using cropping patterns from 2000, a relatively average water year (CDM, 2003). The majority of this water was extracted from the eastern portion of the Subbasin. In Glenn County, annual groundwater use by all sectors in the Subbasin varied from approximately 41,100 to 64,200 acre-feet between 2000 and 2015 with an average of 52,000 acre-feet per year (Davids Engineering, 2018). As with Tehama County in relatively dry years, the portion of the Subbasin within Glenn County utilized more groundwater to meet crop demands when surface water was limited by drought.

2.4.3 Surface Water Use Summary

Surface water is used in the Subbasin primarily for irrigation. Surface water is available via three general sources: the Sacramento River via the USBR CVP Canal systems, Stony Creek via the

USBR Pre-CVP Canal system, and riparian and appropriative water rights from Thomes Creek and the Sacramento River [CDM, 2003; CWD, 2017; Davids Engineering, 2017]. Stony Creek does not have riparian or appropriative water rights holders and Stony Creek is a fully adjudicated stream. With the exception of water stored in Stony Gorge Reservoir, Stony Creek and its tributaries are adjudicated under what is known as the "Angle Decree", amended in 2009, wherein the USBR acquired water from Stony Creek to serve the Orland Reclamation Project (Davids Engineering, 2017). More information on the surface water storage and conveyance systems in the Subbasin is included in Section 3.1.10 of the Hydrogeologic Conceptual Model.

The CVP Corning and Tehama-Colusa Canals bisect the Subbasin. The Tehama-Colusa Canal Authority (TCCA) manages surface water conveyance for both canals. The Corning Canal provides surface water to the Corning Water District and to Thomes Creek Water District. The Tehama-Colusa Canal historically provided surface water to Kirkwood Water District. CVP water is curtailed for users in Tehama County during periods of drought, making it an unreliable water source at times. For example, no CVP water was supplied to the CWD in 2014 or 2015 (CWD, 2017). Kirkwood Water District has not used surface water in recent years, and the CVP Tehama-Colusa Canal primarily moves water through the Subbasin and is not used as a major water supply source within the Subbasin (CDM, 2003; Davids Engineering, 2018).

The U.S. Orland Project canals are used to divert water from Stony Creek; the northern portion of this canal system is used within the Glenn County portion of the Subbasin, while the southern portion of the system is used within the Colusa Subbasin (Davids Engineering, 2017). This water source is reliable and has generally been available during times of drought (Davids Engineering, 2017).

The Glenn-Colusa Canal, which is owned and operated by GCID, is an important regional canal that diverts water from the Sacramento River in the southeastern portion of the Subbasin near Hamilton City for use in the Colusa Subbasin, to the south of the Corning Subbasin (CH2M, 2018).

Surface water use in the Subbasin was estimated in prior studies for portions of the Subbasin within Tehama and Glenn Counties. The 2003 Water Inventory and Analysis report estimated that 17,000 acre-feet per year of surface water was applied in the Tehama County portion of the Subbasin using cropping data for 2000, an average year; of this total annual volume, approximately 11,800 acre-feet were from the CVP canals and 5,200 acre-feet were from other local sources including Thomes Creek and the Sacramento River (CDM, 2003). The annual volume of surface water supplied in the Glenn County portion of the Subbasin between the years 2000 and 2015 varied between approximately 24,500 and 46,800 acre-feet with an average of 32,900 acre-feet (Davids Engineering, 2018), most of which was by the OUWUA; Davids Engineering, 2017]. Since the 2013-2016 drought, many growers within water districts have switched their supply to groundwater. Several factors led to this conversation: unreliability of

CVP water during droughts, increased cost of surface water, cropping changes from pasture to fruit and nut orchards with modern drip irrigation systems that are not compatible with the surface water flood infrastructure used in the past for pasture or row crop flooding. In addition, algae found in surface water canals plug up the drip irrigation systems if not removed through costly filtration processes. This information was gathered through outreach to District managers and gathering information from their most recent surface water use records and land use patterns observed on lands within their districts. District managers also mentioned that they have unused surface water allocations, and some growers have sold their allocations back to USBR for financial reasons and prefer to use groundwater instead. These patterns show that over the last five years, a major shift in water supply has occurred with more groundwater use than surface water use for irrigation supplies.

2.4.4 Surface Water Reuse Summary

Reused surface water in the Subbasin is mainly from tailwater reuse and agricultural drains (CDM, 2003; Davids Engineering, 2018). In the Tehama County portion of the Subbasin, average surface water reuse was estimated to be 3,000 acre-feet per year (AF/yr) from the year 2000 cropping data (CDM, 2003). Surface water reuse is minimal in the Glenn County portion of the Subbasin. Canal tailwater in this area is typically routed to local streams because the tail ends of the OUWUA canal system are downgradient of member lands (Davids Engineering, 2017).

2.4.5 Water Use Sectors

Water demands in the Subbasin are classified into the six water use sectors identified in the GSP Regulations. Water is supplied to meet the demands of these sectors as described below:

- **Urban**. Urban water use refers to water uses within the cities and census-designated places. Urban water demand in the City of Corning, Hamilton City, Richfield, and Paskenta Rancheria is met entirely by groundwater. The City of Corning used approximately 2,600 acre-feet of groundwater on average between 2011 and 2015. The California Water Service Company (Cal Water) provides Hamilton City with pumped groundwater from a municipal system sourced in conjunction with the much larger City of Chico system. Hamilton City used approximately 363 acre-feet of water in 2015 [California Water Service (Cal Water), 2016]. Water demand at the Paskenta Reservation Rolling Hills Casino was estimated to be about 165 acre-feet per year in 2019 (LACO, 2019). A number of smaller municipal water systems provide groundwater to residences and businesses outside of the cities including the CDP of Richfield, trailer parks, churches, schools, and recreational areas (see Figure 2-9 and Table 2-4).

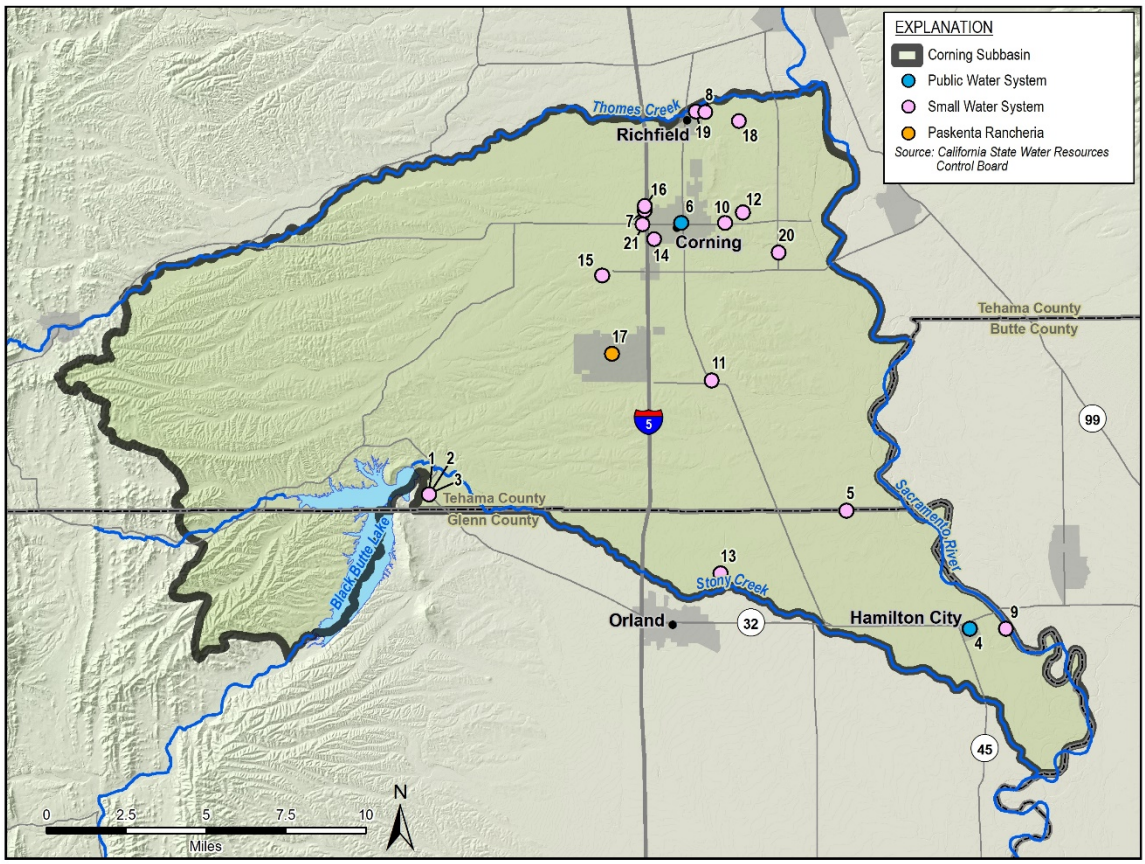

Figure 2-9: Map of Urban Water Systems Using Groundwater in the Corning Subbasin

Table 2-4. Urban Water Systems Using Groundwater in the Corning Subbasin

Water System	Map Label	Type	County	Number of Active Wells
Black Butte Lake, Buckhorn Group, USCOE	1	Small Water System	Tehama	1
Black Butte Lake, Buckhorn RA, USCOE	2	Small Water System	Tehama	1
Black Butte Lake, Headquarters, USCOE	3	Small Water System	Tehama	1
Cal-Water Service Co. - Hamilton City	4	Public Water System	Glenn	3
Capay Joint Union Elementary School	5	Small Water System	Glenn	1
City of Corning	6	Public Water System	Tehama	8
Corning RV Park	7	Small Water System	Tehama	1
E Headstart	8	Small Water System	Tehama	1
Irvine Finch River Access	9	Small Water System	Glenn	1
Jehovah's Witnesses - Corning	10	Small Water System	Tehama	1
Kirkwood Elementary School	11	Small Water System	Tehama	1
Kountry Korners Mobile Home Park	12	Small Water System	Tehama	2
Lake Elementary School	13	Small Water System	Glenn	1
Lazy Corral Mobile Home Park	14	Small Water System	Tehama	1
Maywood Farms	15	Small Water System	Tehama	1
Maywood Mobile Home Park	16	Small Water System	Tehama	1
Paskenta Rancheria	17	Tribal Water System	Tehama	2
Richfield Elementary School	18	Small Water System	Tehama	1
Sierra Pacific Industries - Richfield	19	Small Water System	Tehama	1
Woodson Bridge Mobile Home Park	20	Small Water System	Tehama	1
Bartel's Giant Burger	21	Small Water System	Tehama	1

- **Industrial**. There is limited industrial water use in the Subbasin. The approximate volume of industrial water provided in the Tehama County portion of the Subbasin in 2000 was 1,600 acre-feet (CDM, 2003). The major industrial water users are likely agricultural processing facilities. The City of Corning is home to a notable olive processing facility for Bell-Carter Foods, among other industrial facilities. **[Note to reviewers: if you know of additional information for this topic, please provide as a comment].**
- **Agricultural**. Agriculture is the largest water use sector in the Subbasin. Average water use by the agricultural sector in the Subbasin is estimated to be close to 200,000 acre-feet per year (CDM, 2003; Davids Engineering, 2018). As shown on Figure 2-10, some agricultural lands have access to both surface water and groundwater sources, while the majority rely exclusively on groundwater. In 2000, applied water in the Tehama County portion of the Subbasin was approximately 117,100 acre-feet (CDM, 2003). Groundwater

was estimated to meet 75% of this demand, while the remaining 25% was from surface water sources. The average estimated volume of water used for agriculture in the Glenn County portion of the Subbasin was approximately 77,500 AF/yr between 2000 and 2015 (Davids Engineering, 2018). Of this total, approximately 60% was supplied by groundwater and 40% was supplied by surface water (Davids Engineering, 2018).

- **Managed wetlands**. USDA CropScape dataset shows approximately 3,700 acres of wetlands in the Subbasin (Table 2-2). It is unclear which ones are managed wetlands and natural riparian wetlands. Managed wetlands exist along the Sacramento River and are managed by the Sacramento River National Wildlife Refuge (Figure 2-10). **[Note: this topic will be investigated further, and additional information added as necessary]**
- **Managed recharge.** There are currently no known managed groundwater recharge projects in the Subbasin. Annual groundwater recharge from conveyance losses in the Tehama County portion of the Subbasin was estimated to average 1,700 AF/yr and deep percolation groundwater reuse was estimated to average 17,500 AF/yr (CDM, 2003). Irrigation return flow in the Glenn County portion of the Subbasin was estimated to average approximately 6,500 AF/yr between 2000 and 2015 (Davids Engineering, 2018).
- **Native vegetation.** Native vegetation described as grassland/pasture, shrubland, or barren land use types covers approximately 65% of the Subbasin (Table 2-2, Figure 2-4). Native vegetation relies on precipitation, soil moisture, and in some cases shallow groundwater uptake from the root zone. Native vegetation, as specified by SGMA, also refers to all other unmanaged and non-irrigated land use sectors, including rural domestic water use. The volume of water used in the Subbasin by native vegetation, rural domestic users, and all other unmanaged land use sectors was evaluated during water budget development in this GSP.

2.5 Summary of Jurisdictional Areas

In addition to the GSAs, there are several federal, state, and local agencies that have varying degrees of water or land use management authority in the Subbasin. A map of the jurisdictional extent of the federal and state agency boundaries within the Subbasin shown on Figure 2-10 was compiled from data available through the United States Department of Interior (USDI) Bureau of Land Management (BLM).

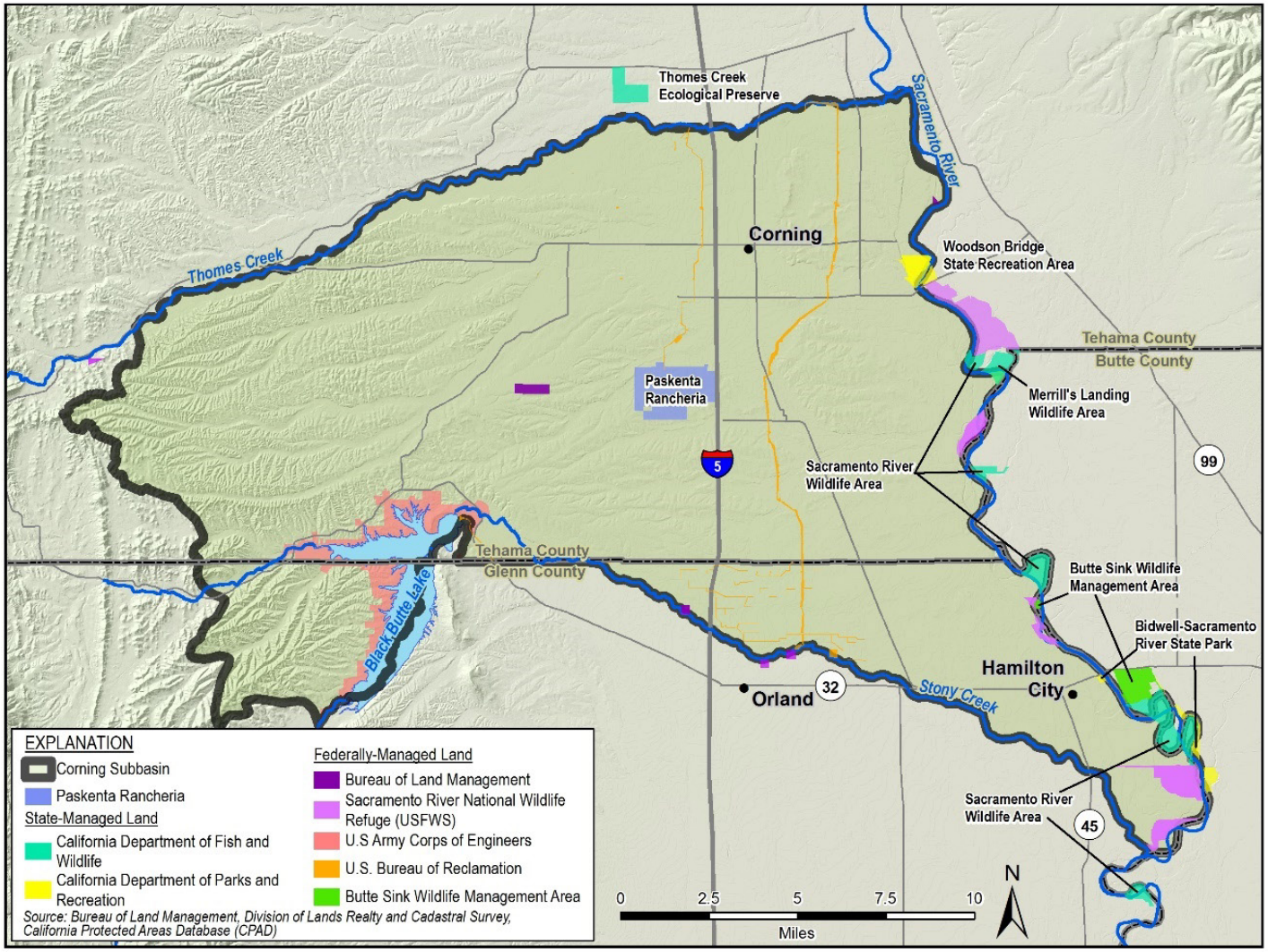

Figure 2-10. Federal and State Jurisdictional Areas in the Subbasin

2.5.1 Federal Jurisdiction

Federal agencies with land holdings in the Subbasin include the BLM, United States Bureau of Reclamation (USBR), United States Fish and Wildlife Service (USFWS) and United States Army Corps of Engineers (USACE).

The BLM owns a tract of land in the center of the Subbasin that is presently undeveloped and vacant. This 160-acre parcel is retained and managed for vernal pools and other wildlife/botanical values (BLM, personal communications with Charles Wright, May 14, 2020). In addition, BLM owns a couple of small holdings of unknown purpose along Stony Creek to the north of Orland and adjacent to the Sacramento River to the east of Corning.

The USBR, has jurisdiction over some of the water conveyance canals in the Subbasin. The Central Valley Project (CVP) Tehama-Colusa and Corning Canals are sourced by the Sacramento River and run north -south through the center of the Subbasin. The Tehama-Colusa Canal Authority operates and maintains the Tehama-Colusa Canal and Corning Canals under contract with the USBR. The Orland Unit Water Users Association canals, originally constructed prior to the CVP, are sourced by Stony Creek in the southwestern portion of the Subbasin. The USBR constructed these conveyance canals and works collaboratively to maintain the infrastructure with the local water districts that they serve.

The USACE oversaw construction of the Black Butte Dam on Stony Creek in the early 1960s for flood control purposes (Davids Engineering, 2017). Black Butte Lake, which was formed by the dam, has the capacity to store approximately 136,000 acre-feet of water (Davids Engineering, 2017). There is a 6.1-megawatt hydroelectric power plant built at the dam.[6] Additional information on water storage and conveyance from Black Butte Lake is provided in Section 2.10.2. The USACE currently maintains a land buffer around the lake with hiking trails, campgrounds, and open space.[7] Fishing on the lake is popular, with available bass species including largemouth and smallmouth bass, bluegill, crappie, and catfish [De Novo Planning Group (DNPG), 2020] .

The USFWS manages several Sacramento River National Wildlife Refuge lands for wildlife conservation along reaches of the Sacramento River on the eastern boundary of the Subbasin. The USFWS lands are on both sides of the Sacramento River; the Subbasin contains approximately one-third of the 338-acre Wilson Landing Unit near the Tehama-Butte County line to the east of Corning, and approximately one-third of the 331-acre Pine Creek Unit southeast of Hamilton City (California Department of Fish and Game, 2004). The refuge lands (including some outside of the Subbasin) support several endangered plants and animals,

[6] http://globalenergyobservatory.org/geoid/165
[7] https://www.spk.usace.army.mil/Locations/Sacramento-District-Parks/Black-Butte-Lake/

including several species of fairy shrimp, vernal pool tadpole shrimp, giant garter snake, wintering peregrine falcon, bald eagle, and breeding tricolored blackbird (DNPG, 2020). In addition to providing wildlife habitat, these areas are accessible by boat for recreation, hunting, and fishing. Hunting permits are granted in season, and approximately 9,000 people hunt on the refuge each year (DNPG, 2020).

2.5.2 Tribal Lands

The Paskenta Band has jurisdiction over the Paskenta Rancheria Native American Reservation (Reservation; Tribal Lands). This approximately 2,000-acre Reservation is located in the center of the Subbasin, southwest of the City of Corning and is completely reliant on groundwater for drinking water and irrigation supplies. As of 2016, there were 269 tribal members in the Paskenta Band (Bold Planning, 2020). The tribal council for the Paskenta Band consists of a chairperson, vice chairperson, public works manager, treasurer, and secretary and there is also a chief executive officer and chief financial officer for the tribal commercial pursuits (Bold Planning, 2020).

Paskenta Rancheria includes numerous business enterprises, including the Rolling Hills Casino, equestrian center, and golf courses (LACO, 2019). The Paskenta Band has two groundwater supply wells that they use to provide water for the casino and golf courses. The supply well for the casino is capable of pumping 600 gallons per minute (Bold Planning, 2020). Water supply for the Reservation is discussed in more detail in the Basin Setting. The tribe utilizes a tertiary wastewater treatment plant to treat and dispose of up to 100,000 gallons per day of water on the Reservation (LACO, 2019). In 2019, the Rolling Hills Casino and Resort proposed a 3.2-acre expansion within the developed footprint of the existing Casino and other commercial enterprises (LACO, 2019).

In addition to the commercial enterprises associated with the casino and golf courses, the Reservation includes 1,400-acres of open space used for wildlife habitat, conservation, hunting, and fishing. Popular hunting attractions include pheasant, quail, chukar, dove, turkey, waterfowl, and wild boar.[8] Luk Lake is a 65-acre lake utilized for bass and trout fishing. [9] The lake was formed by the construction of Top Cat Dam in 1976 (Tehama County, 2018).

2.5.3 State Jurisdiction

The California Department of Fish and Wildlife (CDFW) and California Department of Parks and Recreation (CDPR) oversee conservation and recreation lands along the Sacramento River.

[8] https://rollinghillscasino.com/things-to-do/outdoor-attractions/hunting/
[9] https://rollinghillscasino.com/things-to-do/outdoor-attractions/fly-fishing/

The CDFW manages the Sacramento River Wildlife Area (SRWA), which includes discontinuous land holdings along the Sacramento River in Tehama, Glenn, Butte, and Colusa counties. The SRWA lands in the Subbasin are generally only accessible by boat and allow wildlife viewing, bird watching, and hunting. The only SRWA state land in the Subbasin is the 473-acre Merrill's Landing Wildlife Area to the southeast of Corning (California Department of Fish and Game, 2004).

The Woodson Bridge State Recreation Area to the east of Corning is the only land managed by the CDPR in the Subbasin. Only a small portion of this Recreation area is located in the Subbasin and is inaccessible to the public. The main features of the Recreation Area are a campground and boat launch facility that are located on the east side of the Sacramento River in the Los Molinos Subbasin.

2.5.4 County Jurisdiction

Glenn and Tehama counties have jurisdiction over water management and land use planning in the portions of the Subbasin that are outside of federal, tribal, state, or municipal areas. Applicable topics of the county general plans are described in Section 2.12. Responsibilities of Glenn and Tehama counties with respect to the GSP are to provide land use oversight, watershed management, well permitting, and regulatory compliance assistance for small water systems. As described in Section 1, GSAs are responsible for GSP development, approval, and subsequent implementation. Other local land and water policies are the responsibility of county boards of supervisors and local jurisdictions, as described below. The Counties are part of the GSAs, and they retain all their existing authorities.

In 2020, Glenn County had a population of approximately 29,400. Approximately 8,300 people lived in Orland, 6,200 people lived in Willows, and 14,900 people lived in the remainder of the county (California Department of Finance, 2019). Glenn County has approximately 837,100 acres of land, of which approximately 45,600 acres, or 5.5%, are within the Subbasin (DNPC, 2020).

In 2020, Tehama County had a population of approximately 65,100. Approximately 7,600 people lived in Corning, 14,200 people lived in Red Bluff, 450 people lived in Tehama, and 42,800 people lived in the remainder of the County (California Department of Finance, 2019). Tehama County has approximately 1,892,500 acres of land, of which 161,700 acres, or 8.5%, are within the Subbasin (PMC, 2009).

2.5.5 City and Local Jurisdiction

The Subbasin includes the incorporated City of Corning and the unincorporated CDPs of Hamilton City and Richfield. Of these, Corning is the largest local jurisdiction, and covers 372

acres in the central portion of the Subbasin within Tehama County (Diaz Associates, 2015). The population of Corning in 2020 was approximately 7,600 people (California Department of Finance, 2019). In the 2010 census the population of Hamilton City was 1,759[10], and Richfield was 306[11]. Corning is the only municipal area within the Subbasin with a city council, general plan, and land use jurisdiction.

2.5.6 Agricultural Water Providers and Agricultural Land Use Jurisdiction

Several agricultural water providers operate in the Subbasin (Figure 2-11) to meet parts of the irrigation needs for growers within their boundaries. Summaries of these agricultural water providers are presented below, listed from north to south within the Subbasin boundaries.

[10] https://archive.vn/20140715025342/http://www.census.gov/2010census/popmap/ipmtext.php?fl=06:0631890
[11] https://archive.vn/20140715032653/http://www.census.gov/2010census/popmap/ipmtext.php?fl=06:0660592

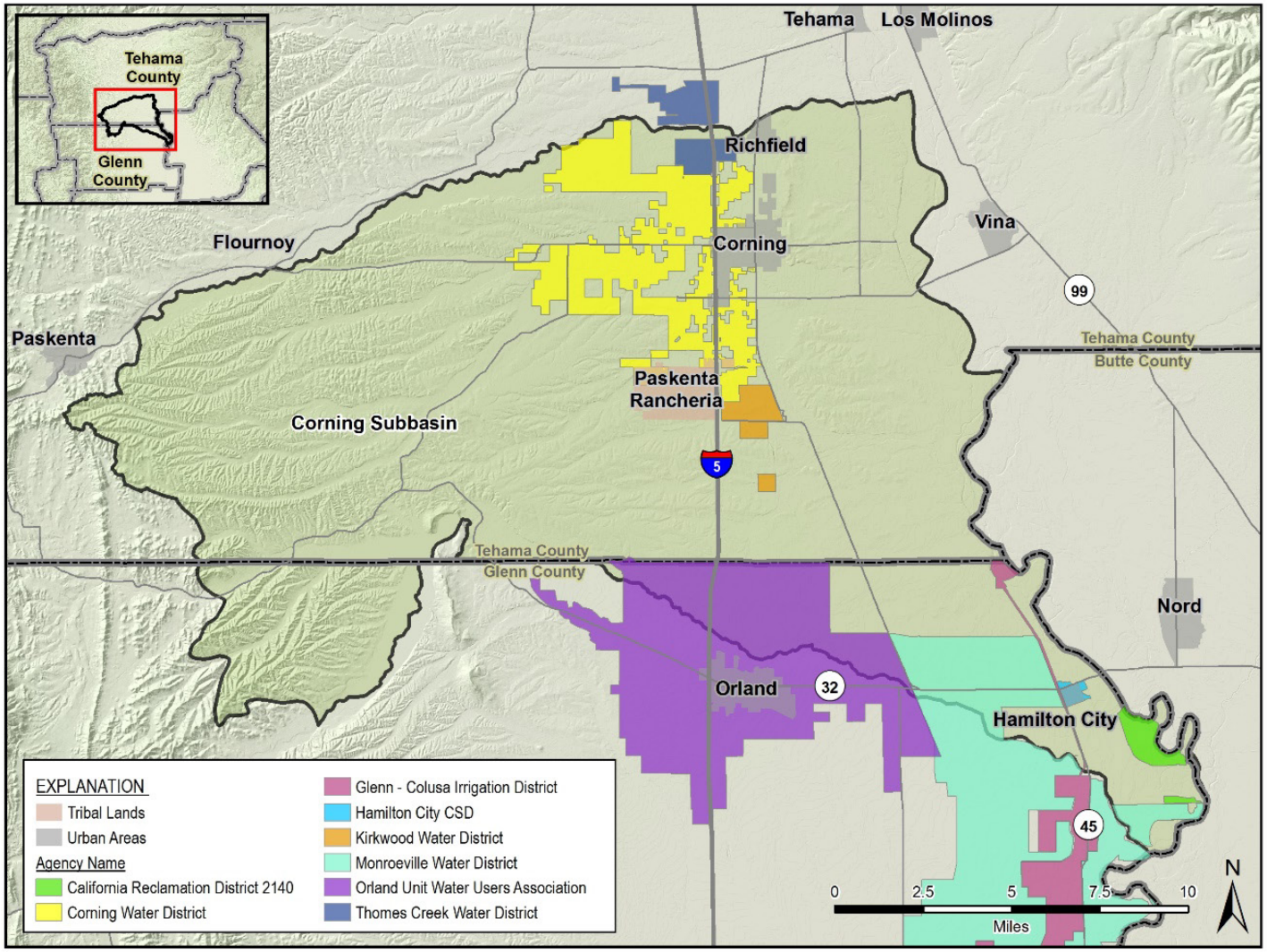

Figure 2-11. Cities and Agricultural Water Providers in the Subbasin

2.5.6.1 Thomes Creek Water District

The Thomes Creek Water District (TCWD) was formed in 1958 when the Corning Canal was constructed to deliver irrigation water in this area. The District currently encompasses approximately 1,870 acres, with approximately 40% within the Corning Subbasin and the other 60% within the Red Bluff Subbasin. In the year 2000, the water district irrigated land in the Subbasin with approximately 900 acre-feet of surface water delivered by the CVP Corning Canal (CDM, 2003). The remaining water demand in the portion of TCWD in the Subbasin was supported by groundwater, which on an average year was estimated to be 500 AF/yr (CDM, 2003). Until 2013, fields were largely flood irrigated with surface water, which was the dominant source of water. In 2014 and 2015, the TCWD received no surface water allocation from USBR, and as a result, many growers turned to groundwater as a more reliable and permanent source of irrigation water. Since 2016, the total surface water use within TCWD is below 200 acre-ft per year and dropped to less than 100 acre-ft in 2020.

2.5.6.2 Corning Water District

The CWD is completely within the Corning Subbasin. The CWD recently summarized land and water use within their water district in an Agricultural Water Management Plan (CWD, 2017). The CWD has existed in the area around the City of Corning since 1954 and has provided CVP water to customers via the Corning Canal since 1967. Groundwater is also pumped in the district to supplement surface water supplies. Total irrigable land in the service area was estimated to be 11,075 acres in the most recent mutual agreement between the USBR and CWD in 1989. In 1967 CWD and USBR completed a water distribution system capable of delivering up to 25,300 acre-feet of CVP water per year to CWD customers allowing growers to widely utilize surface water resources for the first time. The CWD did not receive CVP water in 2014 or 2015 and consequently most growers in the district were forced to strictly use groundwater for irrigation during these dry years. In 2016, the irrigated acreage was 7,287 acres and the volume of CVP water received was 7,240 acre-feet. The maximum volume of CVP water received historically was 7,500 acre-feet, prior to 2016 (CWD, 2017). The remaining water demand in the CWD is supported by privately pumped groundwater. The CWD estimated that 11,176 acre-feet of groundwater was used by growers in 2016, which was a relatively wet year following four years of drought (CWD, 2017).

2.5.6.3 Kirkwood Water District

The Kirkwood Water District (KWD) in Tehama County serves agricultural water users from direct diversions of CVP water from the Tehama-Colusa Canal. The KWD was estimated to use an annual average of 600 AF/yr of CVP water from the Tehama-Colusa Canal and 400 AF/yr of groundwater (CDM, 2003). However, since the 2014-2015 drought years, no surface water

diversions have been made available to KWD and growers within the District use exclusively groundwater for crop irrigation.

2.5.6.4 Capay Rancho Water District

The Capay Rancho Water District was shown on the DWR Water District source file provided to the Subbasin. This water district was located on both sides of the Glenn and Tehama County line near the Sacramento River between the City of Corning and Hamilton City. The Capay Rancho Water District has reportedly been inactive since the 1970s and no longer provides water supply services in the Subbasin (Public Comment, Ian Turnbull, Corning Subbasin Advisory Board Alternate Member, June 3, 2020). Growers in this general area are now organized under the Capay Landowners Association, with no surface water supply.

2.5.6.5 Glenn-Colusa Irrigation District

The Glenn-Colusa Irrigation District (GCID) is located in the central portion of the Sacramento Valley on the west side of the Sacramento River and is the largest irrigation district in the Sacramento Valley, encompassing approximately 175,000 acres (CH2M, 2018). GCID's service area lies almost entirely to the south of the Subbasin in the Colusa Subbasin. GCID's primary diversion facility, the Hamilton City Pump Station, is located in the Subbasin along the Sacramento River. This facility can move 3,000 cubic feet per second of water from the Sacramento River into the Glenn-Colusa Canal and has an average historical diversion of approximately 659,900 acre-feet of water per year (CH2M, 2018). No surface water from the Glenn-Colusa Canal is applied in the Subbasin.

2.5.6.6 Orland Unit Water Users Association

The Orland Unit Water Users Association (OUWUA) is a private, non-profit corporation formed in 1907. Detailed information on water management and land use within the Orland Unit Water Users' Association (OUWUA) was summarized in their 2017 Agricultural Water Management Plan described in more detail in Section 2.1.10.8 (Davids Engineering, 2017). The OUWUA is divided into northern and southern distribution systems on either side of Stony Creek. The northern distribution area is within the Corning Subbasin and the Southern distribution area is within the Colusa Subbasin. Approximately 35% of the OUWUA land area is north of Stony Creek in the Corning Subbasin and approximately 65% of the land area is south of Stony Creek in the Colusa Subbasin. The northern distribution system supplies water within the Corning Subbasin, while the Southern distribution system supplies water to OUWUA -managed areas to the south in the Colusa Subbasin. The OUWUA has operated and maintained the U.S. Orland Project under contract with the U.S. Bureau of Reclamation since 1954. This project is one of the USBR's oldest in the area and predates the CVP. Through a 1964 Agreement with the USBR, the OUWUA exchanges CVP water stored on Stony Creek in Black Butte Lake for U.S. Orland

Project water stored in the Stony Gorge and East Park Reservoirs to the south. In the Subbasin, the OUWUA diverts water from Stony Creek into a series of canals, laterals, and temporary storage basins for year-round delivery for agricultural uses within the Subbasin. An average of 6,720 acres of irrigated agricultural land was operated by OUWUA within the Corning Subbasin between 2002 and 2016. During this same timeframe, OUWUA annual surface water deliveries in the Subbasin ranged from 22,800 to 37,900 acre-feet and averaged 30,200 AF/yr. Some growers augment surface water supplies with groundwater, though OUWUA does not own or operate any wells and does not track groundwater use within their jurisdiction.

2.5.6.7 Reclamation District 2140

California Reclamation District 2140 (RD 2140) is a CA Reclamation District in Glenn County, located adjacent to and west of the Sacramento River. RD 2140 is approximately 5,525 acres in size with majority zoned for agricultural use. RD 2140 was formed in 2005 under Water Code section 50000 et seq. with authority and responsibility under those statutes for acquiring property, acquiring and operating water rights and irrigation systems, and constructing, maintaining, and operating drains, canals, sluices, water gates, levees, and pumping plants (among others) for the reclamation of land and control of flooding within its boundaries. While the primary purpose of the District is to maintain the infrastructure needed to drain agricultural water, winter stormwater is also carried through the same conveyance facilities. Currently, RD 2140 primarily provides services related to the construction and maintenance of a new levee on the Sacramento River, and does not provide any reclamation services (Glenn LAFCO 2019).

2.5.6.8 Hamilton City Community Services District

The Hamilton City Community Services District (Hamilton City CSD) was formed in 1964 to provide wastewater collection and treatment services, streetlights, library services and parks and recreation services. Other services have been added since then (Glenn LAFCO, 2014), but none are related to water supply and are not relevant for the GSP planning and implementation.

2.5.6.9 Monroeville Water District

The Monroeville Water District (MWD) was approved as a CA Special District by the Glenn County LAFCO in 2016 and was purposefully formed to ensure representation of local grower interests pertaining to SGMA. The District was officially formed in November 2017 and regular Board meetings commenced in May 2019. As a Special District, MWD is funded by residents to provide local services and infrastructure. MWD does not currently provide water supply to its members.

2.6 Existing Well Types, Numbers, and Density

[Note: this section provides initial information from the DWR database and will be updated as the GSP database is finalized].

Well density data were derived from the database of well completion reports compiled by the DWR and retrieved on March 24, 2020.[12] Over 4,000 wells are producing water in the Subbasin for a variety of uses summarized in Table 2-5. DWR's Well Completion Report Map Application classifies wells as domestic, production, and municipal (public supply); the majority of wells classified as production wells are assumed to be used for agricultural irrigation, with some production wells used for industrial purposes. Figure 2-12, Figure 2-13, and Figure 2-14 show the density in the Subbasin of the domestic, production (agricultural and industrial), and public supply wells, respectively.

Approximately 66% of the known wells in the Subbasin are domestic wells, 33% are classified as production wells, and only 0.5% are used for public supply (municipal wells). Domestic and production wells have a similar distribution in the Subbasin, with most wells located in the eastern portion of the Subbasin where agricultural land uses are most extensive and surface water supplies are not available. Some of the domestic wells identified by DWR may be classified as *de minimis* extractors, defined as pumping less than 2 AF/yr for domestic purposes. The majority of wells classified as production wells are assumed to be used for agricultural irrigation, with some production wells used for industrial purposes.

There are eight active municipal supply wells within the Subbasin used by the City of Corning and three wells used by Cal Water as a drinking water source for Hamilton City. Other public supply wells near the Subbasin include wells along the Subbasin boundaries north of the Subbasin near Richfield, east of the Subbasin near Vina, and south of the Subbasin near Orland and Black Butte Lake.

Table 2-5. Well Count Summary[13]

Category	Number of Wells
Domestic	2,842
Production	1,434
Public Supply	21
Total	**4,297**

As of March 24, 2020

[12] https://water.ca.gov/Programs/Groundwater-Management/Wells/Well-Completion-Reports
[13] https://dwr.maps.arcgis.com/apps/webappviewer/index.html?id=181078580a214c0986e2da28f8623b37 – Accessed March 24, 2020.

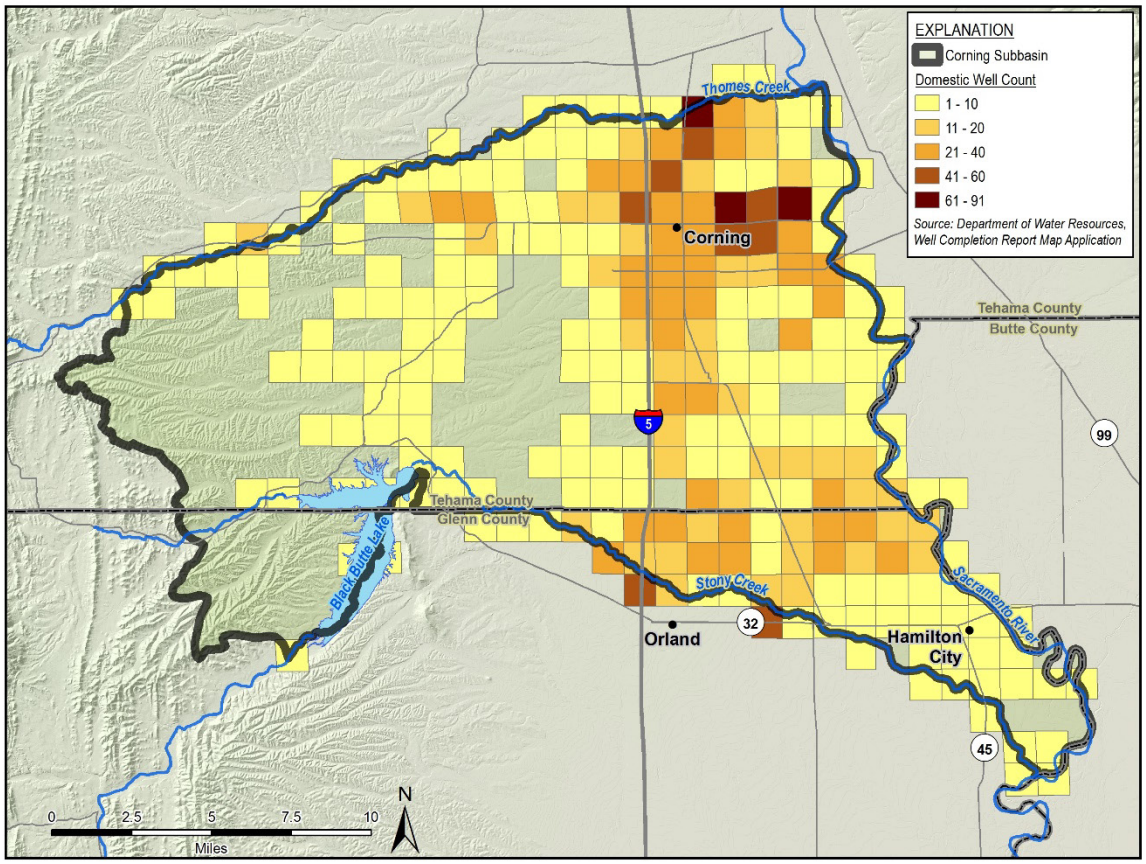

Figure 2-12. Density of Domestic Wells (Number of Wells per Square Mile)[14]

[14] https://dwr.maps.arcgis.com/apps/webappviewer/index.html?id=181078580a214c0986e2da28f8623b37 – Accessed March 24, 2020.

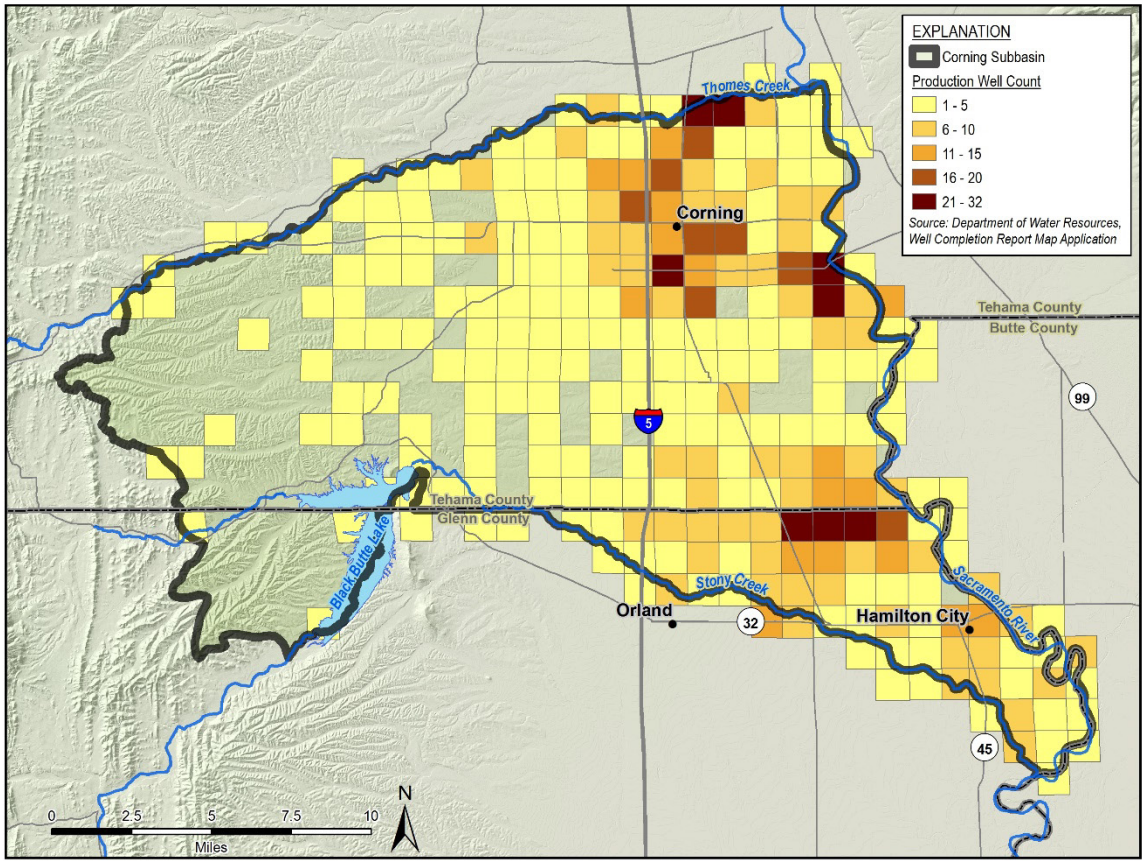

Figure 2-13. Density of Production Wells (Number of Wells per Square Mile)[15]

[15] https://dwr.maps.arcgis.com/apps/webappviewer/index.html?id=181078580a214c0986e2da28f8623b37 – Accessed March 24, 2020.

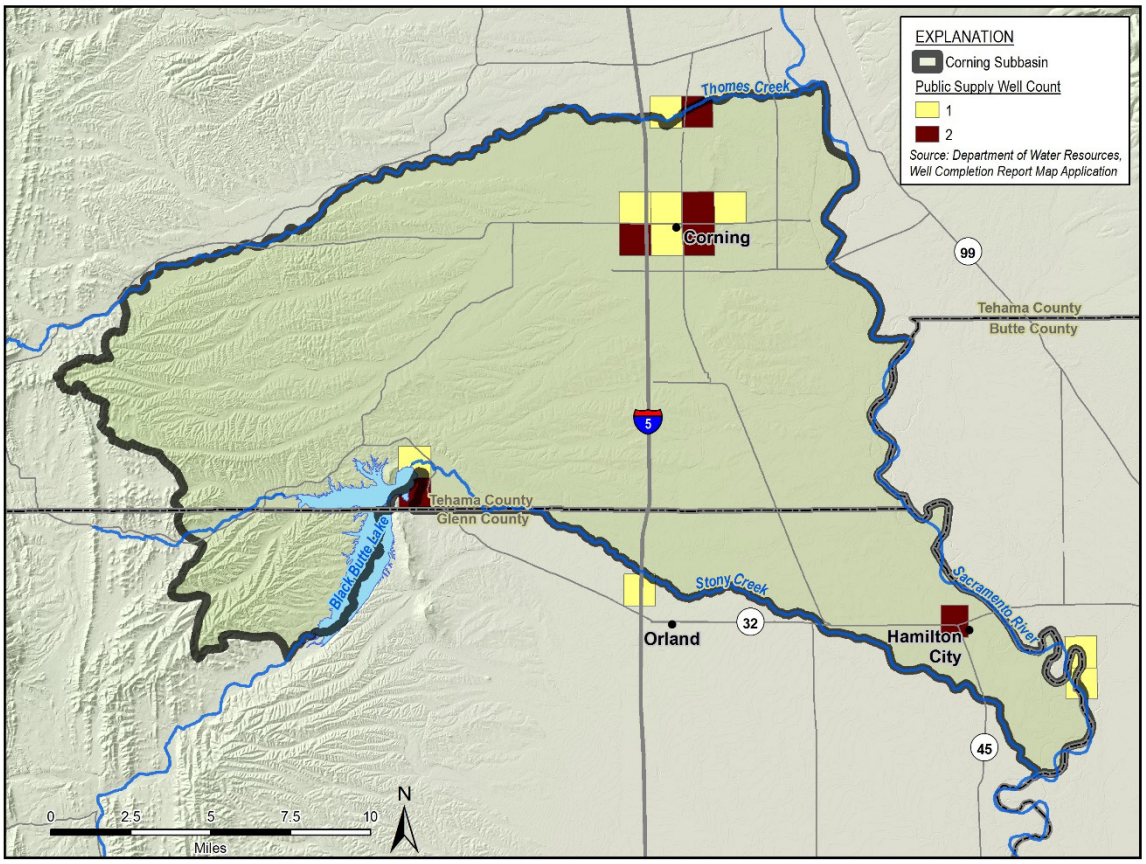

Figure 2-14. Density of Municipal Wells (Number of Wells per Square Mile)[16]

2.7 Existing Water Resource Management Plans

This section describes the existing water resource management plans applicable to the Subbasin and how they affect or interact with groundwater resources.

2.7.1 Tehama County Groundwater Management Planning

The 2012 Tehama County Groundwater Management Plan (Tehama GWMP) update provided a strategy for managing groundwater in the county that is compliant with California Assembly Bill 3030 and Senate Bill 1938 legislation (TCFCWCD, 2012). The Tehama GWMP, in conjunction with the existing regulatory powers of the TCFCWCD and other local agencies with jurisdiction over the plan area (including Chapter 9.40 of the Tehama County Code ["Aquifer Protection"]),

[16] https://dwr.maps.arcgis.com/apps/webappviewer/index.html?id=181078580a214c0986e2da28f8623b37 – Accessed March 24, 2020.

provides a mechanism for the responsible agencies in Tehama County to evaluate, manage, protect, and preserve local groundwater resources.

The primary goals of the Tehama GWMP are to: 1) sustain groundwater levels that balance long-term extraction and replenishment in the groundwater aquifers in the county; 2) ensure sufficient groundwater supplies of useable quality are maintained for reliable, efficient and cost effective extraction; and 3) implement groundwater management through the development of County-wide consensus wherever possible.

The Tehama GWMP acknowledged that a need exists in Tehama County for more reliable sources of water to support local demands. The county stressed that the volume of surface water available for irrigation, particularly those derived from the CVP, have diminished in the county and groundwater and surface water must be carefully managed to provide water security in the future. Reduced water availability was attributed in the Tehama GWMP to increased demand from urban and environmental uses in other parts of the state and a local increase in groundwater demand related to land use changes from pasture to fruit and nut orchards that require more frequent watering than the surface water systems are typically capable of providing. The Tehama GWMP also notes that in general, groundwater is of high quality in the county but in some areas, constituents such as nitrate are present that if not treated, may make groundwater unsuitable for drinking and irrigation of agricultural crops.

Water management activities to date focus on water level, water quality, and land subsidence monitoring, coordination among agencies and interested parties, development of data inventory and evaluation, annual reporting, and promotion and education of groundwater resource management (TCFCWCD, 2012). The County identified two management areas in the Corning Subbasin; Corning East and Corning West. Most of the groundwater pumping and monitoring wells were found in Corning East. The Tehama GWMP established groundwater elevation "trigger levels" for six "key wells" in the Corning East portion of the Subbasin. No "key wells" were identified for monitoring in Corning West due to limited groundwater use in this area. The Tehama GWMP provided a list of actions for the County to take if water levels were measured below the established trigger levels. In addition, the Tehama GWMP identified locations where DWR installed five clusters of multi-level observations wells for water level and water quality monitoring at variable aquifer depths. Finally, the Tehama GWMP identified the subsidence monitoring locations or monuments utilized by the County to support non-routine regional monitoring efforts.

2.7.2 Tehama County Local Hazard Mitigation Plan

Tehama County along with the cities of Corning, Red Bluff, and Tehama completed an update to the Tehama County Multi-Jurisdictional Hazard Mitigation Plan (HMP) in 2018. The plan was

approved by the Federal Emergency Management Agency. The plan updated the 2012 Tehama County HMP and updated and combined the Tehama County Flood Management Plan, which had previously been drafted and updated under separate cover in 2006. Potential identified hazards included dam failure, drought, earthquake, flood, slope failure, severe weather, and wildfire hazards. Potential natural disasters and recommended mitigation strategies relevant to preparation of this GSP were identified in the HMP:

- Flooding and dam failure
    - Natural resource protection measures were recommended to preserve and restore natural areas protection functions.
    - Many small tributaries in the watersheds have high levels of siltation and diminished flood-carrying capacity due to vegetation (such as Arundo and Tamarisk) overgrowth. The establishment of the invasive weeds Arundo and Tamarisk in the streams in Tehama County has seriously limited their conveyance capacity. Removal of silt, debris, and overgrowth of vegetation from streambeds is recommended.
    - Flooding in the Corning urban area is a concern. Flooding in the City of Corning is typically caused by high intensity, short-duration storms concentrated on a stream reach with already saturated soil. City dry wells have also reportedly failed to keep up with flash flooding. The HMP recommends addressing these problems to prevent flood damage.
- Drought resiliency
    - Identify and develop alternative water sources for water source resiliency.
    - Increase groundwater recharge to stabilize groundwater supply for both public and agricultural use.
    - Promote water conservation during both drought and non-drought periods
    - Enforce restrictions on illegal groundwater use and surface water diversion.
    - Develop an identification and mapping protocol for dry wells and water quality issues.
    - Make water supply contingency plans for communities without consistent or reliable domestic supplies.

2.7.3 Glenn County Groundwater Management

[Note: this section may be slightly outdated and will be updated during GSP finalization, as applicable].

Glenn County has developed a locally driven groundwater management planning approach that culminated in the Groundwater Ordinance described below. The Basin Management Objective

(BMO) concept was developed as part of the groundwater management planning approach to overcome potential overdraft issues in the County's groundwater aquifers. The Glenn County Groundwater Management Plan[17] was first adopted in County Code Chapter 20.03 in February 2000 and was amended in 2012 per county Ordinance 1237. The current groundwater management plan includes six key elements:

1. Management Areas and Sub-Areas

The overall management area is primarily within the Sacramento Valley portion of the county, where irrigated agriculture is conducted where irrigated agriculture is conducted. The management area was subdivided into 17 sub-areas based first upon surface water district boundaries and then further divided along known groundwater sub-basin boundaries into similar hydrological and agricultural areas

2. BMO Parameters

The goal of the Groundwater Management Plan was to establish management objectives for minimum groundwater levels, minimum water quality and maximum inelastic subsidence for each of the 17 sub-areas. The management objectives can be considered a set of trigger points where action will be taken if the BMO levels are exceeded.

Currently, BMOs have been established for groundwater levels only. Water quality monitoring began in the summer of 2003. Localized monitoring for subsidence began in the summer of 2002 with the installation of one extensometer.

3. Public Input

Primary public input for the Groundwater Management Plan is provided through the Glenn County Water Advisory Committee (GCWAC), which consists of 21 members who are not affiliated with the county or county government and one County Supervisor as an ex officio member. Each of the 17 sub-areas has one representative on the committee. The GCWAC also includes one representative each from the Glenn County Farm Bureau, the Resource Conservation District, the City of Orland, and the City of Willows. It is the primary responsibility of each GCWAC representative to establish the management objectives for their corresponding management sub-area and to provide a communication path between the local groundwater users, the GCWAC and the Board of Supervisors. The GCWAC also maintains a Technical Advisory Committee (TAC) that provides technical assistance and advises the GCWAC.

[17] https://www.countyofglenn.net/committee/water-advisory-committee/management-plan

4. Monitoring

The California Department of Water Resources (DWR) has been measuring groundwater levels semi-annually in many wells in the county for a long period of time. Many of the sub-areas are using data from selected wells in the DWR monitoring grid to establish and monitor BMO compliance. Additional details on this monitoring network are further described below and reviewed in Section 4 of the GSP (Monitoring Networks) to establish the specific Corning Subbasin monitoring network for GSP implementation.

5. Adaptive Management

Adaptive management results from reviewing monitoring data collected over time and used by Districts and growers to evaluate the probable availability and cost of using groundwater to irrigate their crops, based on hydrologic conditions. The collected data will help better manage and use the groundwater resources in the County.

6. Enforcement/Conflict Resolution

In Glenn County, the controlling authority is the Board of Supervisors, but their police powers are only invoked when conflicts between subareas cannot be resolved through cooperation and negotiation between the affected sub-areas.

If a BMO threshold is exceeded, a process is set in motion, where the TAC is the first group to identify the causes of non-compliance and brings it up with the GCWAC. The GCWAC then tries to resolve the problem in the affected area through negotiations. Some of the possible actions available that may be taken by the GCWAC might be to coordinate the following voluntary actions in the affected area:

- Rescheduling and/or redistributing groundwater extractions
- Termination of groundwater substitution extractions, if deemed the case of the non-compliance
- Reduction of groundwater extraction rates
- Termination of groundwater extractions
- Development of groundwater recharge programs
- Modification of BMO levels

If the GCWAC and affected parties cannot resolve the problem at the local level, the GCWAC may recommend preferred action(s) among those available to the Board of Supervisors to resolve

the non-compliance. The Board of Supervisors may take the enforcement action(s) they deem necessary to resolve the non-compliance. Enforcement actions do not apply to domestic wells.

2.7.4 Glenn County Local Hazard Mitigation Plan

Glenn County along with the cities of Orland, and Willows completed an update to the Glenn County Multi-Jurisdictional Hazard Mitigation Plan (HMP) in 2018 (Michael Baker International, 2018). The plan provides a blueprint for hazard mitigation planning to better protect the people and property of the County and the Cities. Potential identified hazards included dam failure, drought, earthquake, flood, slope failure, severe weather, and wildfire. Recommended mitigation strategies were identified in the HMP for dam failure, drought, flood, geologic hazards (earthquake, expansive soils, and subsidence), levee failure, severe weather (winter storms, heavy rains, snow, storms/floods, and severe storms), and wildfire. Discussion of specific hazard mitigation applicable to the portion of Glenn County within the Subbasin are discussed below:

- The plan outlines ongoing construction and restoration efforts on the "J" Levee adjacent to Hamilton City that will alleviate past flooding issues on this portion of the Sacramento River and restore some of the river floodplain with riparian vegetation. These plans were initiated in 2011 and are ongoing during preparation of this GSP. The project is being collaboratively managed and/or funded by The Nature Conservancy, Reclamation District 2140, Glenn County, USACE, USBR, DWR, and FEMA.

- The plan identifies Arundo as a fast-growing, flammable species that could be eradicated in Stony Creek for mitigation of wildfire hazards. The Orland Public Works, property owners, and Glenn County Planning and Public Works Agency were names as Responsible Agencies for Arundo eradication in Stony Creek.

- Dam failure of the Black Butte Dam is listed as a low-risk hazard. The plan recommends a Dam Failure Study to improve upon flood inundation data and develop/update emergency action plans.

- Subsidence was not identified as a high-risk hazard in the area within the Subbasin.

General hazards and mitigation measures that relate to the entire county like drought, severe storms, and wildfire are addressed through numerous mitigation strategies and reference to other planning documents. The main mitigation measures include the following:

- Stream cleaning and debris removal throughout the county to prevent flooding due to clogging of drainage structures;

- Increase natural hazard education, risk awareness, and household disaster preparedness;
- Monitor drought conditions and develop and enforce water conservation measures to ensure an adequate water supply during times of drought;
- Undertake a flood reduction study for small communities within the 100-year flood zone; and
- Wildfire fuel removal strategies in areas of high wildfire risk.

2.7.5 Northern Sacramento Valley Integrated Regional Water Management Plan

The Northern Sacramento Valley (NSV) Integrated Regional Water Management Plan (NSV IRWMP) was developed to provide a regional plan for water resource development for the Northern Sacramento River basin [Northern California Water Association (NCWA), 2006]. Development of the plan was overseen by the NSV IRWM Board and Technical Advisory Committee, which includes elected officials and staff from the counties of Butte, Colusa, Glenn, Shasta, Sutter, and Tehama. The numerous goals of the NSV IRWMP are summarized as follows:

- Water supply reliability – document baseline conditions including current and future water demands, maximize efficient utilization and reliability of surface and groundwater supplies, protect regional groundwater resources, develop water transfer guidelines, protect surface water rights, preserve area-of-origin statutory protection, preserve CVP and State Water Project contract supplies, increase surface water storage and hydropower generation, develop drought preparedness strategies, improve water resource infrastructure, and implement groundwater monitoring programs through local jurisdictions.
- Flood protection and planning – develop flood risk reduction plans, evaluate new flood control projects, coordinate flood preparedness programs, and implement mutually beneficial flood risk reduction and floodplain ecosystem enhancement programs and projects.
- Water quality protection – Develop infrastructure to meet state and federal water quality standards for drinking water, improve wastewater infrastructure, meet surface water quality objectives, and minimize water quality degradation from both point source and non-point source pollution.
- Watershed protection and enhancement – manage invasive and endangered species, improve and protect riparian and fish habitat, integrate agricultural production with

habitat conservation programs, protect critical wetlands, improve forest management in watersheds, and provide for recreational use.

- Sustainability – preserve autonomy and enhance lines of communication between local government and stakeholders, coordinate with land-use planning and implementation, maintain governance structure to implement IRWMP, coordinate with neighboring regions, and pursue grant funding to implement programs.
- Education and outreach – develop and disseminate information on regional water supplies, sustainability, flood control, water quality, and other relevant topics.

2.7.6 California Water Service (Chico District) Urban Water Management Plan – For Hamilton City

Cal Water provides water in the Subbasin to Hamilton City residential, commercial, and industrial sectors. The Hamilton City system is managed in conjunction with their separate City of Chico system in Butte County. All urban water suppliers that provide water for municipal purposes to more than 3,000 customers or 3,000 acre-feet annually are required to prepare an Urban Water Management Plan (UWMP; CWC §10617). Cal Water last prepared an UWMP in 2015 to fulfill these requirements (Cal Water, 2015). At that time, the Hamilton City portion of the system had 631 connections and utilized three groundwater wells to supply 363 AF/yr. As with all other potable water systems (PWS) in the state, water quality for the Hamilton City portion of the system is monitored by Cal Water on behalf of the Division of Drinking Water (DDW); the Hamilton City PWS number is 1110002. In the 2015 UWMP, Cal Water predicted that the Chico-Hamilton City water supply will remain steady through 2040.

2.7.7 Corning Water District Agricultural Water Management Plan

The CWD prepared an Agricultural Water Management Plan (AWMP) in 2017 (CWD, 2017). The plan includes a description of past and current water use, inventory of water resources, information on cropping patterns, irrigation methods used, water conservation programs, and groundwater management, among other topics.

The CWD water is from the CVP Corning Canal and private overlying groundwater rights. The CWD does not operate any groundwater wells nor manage groundwater recharge projects. The stated goal of the CWD is to price surface water less than the cost to pump groundwater. The purpose of this goal is to incentivize the use of surface water in order to conserve groundwater for dry years. The pricing structure in 2017 for surface water was $64 per acre-foot, which was less than the cost to pump groundwater (approximately $70-$100 per acre-foot). The CWD sets a water price per acre-foot delivered that accounts for the price of surface water from the USBR and the CWD operation costs.

Groundwater use in the CWD area is estimated using assumptions about surface water supplied, precipitation, crop coefficients and evapotranspiration. In 2016, a wet year following four years of drought, 7,240 acre-feet of surface water was provided by the USBR via the Corning Canal and approximately 11,176 acre-feet of groundwater was pumped for irrigation. The organization is a signatory of the 2012 Tehama County Groundwater Management Plan. An observation well cluster monitored by the District which enters the data into the DWR CASGEM program and is used by CWD to track groundwater level trends.

The CWD has little wasted water due to a pressurized pipeline distribution system and low flow irrigation methods. Almost all irrigation is provided by drip emitter or low-volume sprinklers.

CWD growers participate in the Sacramento Valley Water Quality Coalition (SVWQC) for Irrigated Lands Regulatory Program (ILRP) groundwater quality compliance. In addition, surface water quality samples are collected by the TCCA from two locations on the Corning Canal twice per year and analyzed for common salts to confirm that surface water does not contain high salinity. There have been no water quality issues identified in the surface water supplied by the TCCA.

2.7.8 Orland Unit Water Users Association Agricultural Water Management Plan

The OUWUA prepared an AWMP in 2017 (Davids Engineering, 2017). Similar to the CWD AWMP, the plan included a description of past and current water use, inventory of water resources, information on cropping patterns, irrigation methods used, water conservation programs, estimates of water use, climate change contingency, and a drought management plan, among other topics.

In the AWMP, the OUWUA identified the current water distribution practices and potential improvement opportunities that the association can make to encourage water conservation and efficient water use. OUWUA is represented, and participates, in the DWR CASGEM program and the Glenn County Water Advisory Committee that focuses on groundwater issues in the County.

The AWMP summarizes in detail recent efforts by the OUWUA focused on efficiency. OUWUA has implemented many improvement projects over time. For example, in 2012 a 49.5 acre-foot regulating reservoir was constructed to provide requested deliveries more accurately to downstream customers and in 2016 structural improvements were made to improve the efficiency of the Northside distribution system. Approximately $100,000 per year is budgeted for canal and lateral improvements and preventative maintenance. The OUWUA has made efficiency a priority with recent projects focused on reducing operational spillage, increasing canal automation, improving water level and flow control, incorporating flow measurement at canal headings and operational spill sites, and enhancing and expanding the Association's

Supervisory Control and Data Acquisition (SCADA) system. The OUWUA has sought grant funding to help pay for Phase 2 of the Northside capital improvement projects, including construction of a regulating reservoir and other improvements to the distribution and metering system.

OUWUA does not provide groundwater to customers. The OUWUA promotes conjunctive use and encourages the use of available surface water supplies by setting surface water supply rates below the cost of groundwater pumping. Users are charged a surface water delivery rate (2016 rate) of $24 per acre for up to three acre-feet per acre, plus $13 per acre-foot for usage exceeding three acre-feet per acre. Users who plan to use less than three acre-feet per acre can elect to transfer their unused water to a neighbor. The volumetric charge over three acre-feet per acre provides incentive for efficient water use. OUWUA rules and regulations also prevent wasteful use of water. Water can be transferred or sold back to the USBR, though the repayment on this water is an interest free, fifty-year term, leaving little incentive for members to elect this option.

In efforts to increase flexibility, an agreement between OUWUA and the TCCA has been considered that would allow the association to utilize the Tehama-Colusa Canal as an intertie conveyance between its Northside and Southside service areas. No formal activity has yet taken place. Additionally, OUWUA is in discussion with USBR to allow for revenue generation through the transfer and sale of surplus water. OUWUA has two unused existing Tehama-Colusa Canal intertie sites available to transfer any surplus water to TCCA, thus potentially reducing CVP contractor reliance on the Sacramento River diversion in Red Bluff.

Like much of the Sacramento Valley, there is a trend in the OUWUA towards converting cropland to orchards. Many of these orchards utilize drip or sprinkler irrigation and thus use groundwater (not provided by OUWUA). There are some orchards in OUWUA that are flood-irrigated and some that have pressurized drip irrigation systems that can use surface water. There is considerable interest in retrofitting additional laterals to provide pressurized water sources for drip and sprinkler irrigation.

2.8 Existing Groundwater Regulatory Programs

Key regulatory program affecting the use of groundwater resources in the Subbasin are summarized below.

2.8.1 Tehama County Groundwater Ordinances

Water Export Ordinance No. 1617 was adopted in 1994 to limit wasteful use of groundwater and exports of groundwater to areas outside of the County. In addition it also created legal requirements for a permit to extract groundwater from one parcel of land for application on

another parcel when parcels are not contiguous. In addition it also required a permit to pump groundwater from a parcel such that the radius of influence extended beyond the parcel (or contiguous parcels) of land upon which the well was located (excluding existing wells in 1991).

In response to the 2012 to 2015 drought, the Tehama County Board of Supervisors passed Ordinance 2006, which extended permitting requirements for the use of groundwater supply wells. Ordinance 2006 required a permit for use of any water supply well greater than eight inches in diameter. The law also restricted permitting of new wells on a parcel if the parcel was shown to have an existing non-permitted or inactive well that had not been destroyed.

2.8.2 Glenn County Groundwater Ordinance

[Note: this section will be updated during GSP finalization to account for the most up to date information]

The Glenn County Board of Supervisors originally adopted the Groundwater Management Ordinance No. 1115 in 2000 and was codified in the Glenn County Code 20.020. [Glenn County Board of Supervisors (GCBS), 2001]. The original Groundwater Management Ordinance was modified by Ordinance 1237 in 2012 and updated the Glenn County Code 20.030. The intent of the ordinance is to ensure that groundwater of suitable quantity and quality is available for use in Glenn County. Management of groundwater levels, groundwater quality and prevention of land subsidence are the primary objectives of the ordinance. The ordinance states that groundwater management practices including water exports shall not cause harm to adjacent areas and specifically cites modification, reduction, or termination of wells involved with water exports as a first priority in a sequence of management actions to be taken in the event groundwater levels become critical.

Per County Code 20.030.130, if the water level thresholds established by the Glenn County BMO Plans are exceeded, a process is set in motion. First the Technical Advisory Committee will undertake a technical review of the problem to determine the regional extent, magnitude, and cause of the non-compliance. The Technical Advisory Committee will then report its findings to the Water Advisory Committee and recommend possible corrective actions to resolve the problem. The Water Advisory Committee will aim to resolve the problem in the affected area through negotiations. Some of the possible actions available that may be taken by the Water Advisory Committee might be to coordinate the following voluntary actions in the affected area:[18]

- Rescheduling and/or redistributing groundwater extractions

[18] https://www.countyofglenn.net/committee/water-advisory-committee/management-plan

- Termination of groundwater substitution extractions, if deemed the case of the non-compliance
- Reduction of groundwater extraction rates
- Termination of groundwater extractions
- Development of groundwater recharge programs
- Modification of BMO levels

2.8.3 Irrigated Lands Regulatory Program

In 2017 the Central Valley Regional Water Quality Control Board (CVRWQCB) issued Agricultural Order No. R3-2017-0002, a Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands (CVRWQCB, 2017). The permit requires that growers implement practices to reduce nitrate leaching into groundwater and improve receiving water quality. Negotiations with the CVRWQCB staff are ongoing and expected to conclude in 2020 with the adoption of a new ILRP Waste Discharge Requirements (WDR) for farming operations in the Sacramento Valley. As mandated by the State Water Resources Control Board (SWRCB), specific reporting requirements for nitrogen applications and removal, irrigation and surface water discharge management, and groundwater quality monitoring will be included with quantifiable milestones.

In the Sacramento Valley, the implementation of the ILRP is led by two third party coalitions for growers that are enrolled: the California Rice Commission Coalition, which represents Sacramento Valley rice growers; and the SVWQC, which represents all other crops in the Sacramento River Watershed area. Since there is currently no rice grown within the Subbasin, the applicable coalition is SVWQC. The SVWQC is further organized with 13 sub-watershed groups that provide locally enrolled landowner assistance with meeting the ILRP requirements. The Subbasin is located within two sub-watershed groups: the Shasta-Tehama Water Education Coalition represents the Tehama portion of the Subbasin, and the Colusa Glenn Subwatershed represents the Glenn County portion of the Subbasin.

2.8.4 Central Valley – Salinity Alternatives for Long-Term Sustainability and Basin Plan

The Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) was established in 2006 as a collaborative basin planning effort between the CVRWQCB, SWRCB, and stakeholders. CV-SALTS presented a comprehensive salt and nitrate management plan designed to minimize water quality impacts throughout the Central Valley as required per the following (CVRWQCB, 2018):

The State Water Board Recycled Water Policy requires the development of salt and nutrient management plans protective of groundwater and submittal of these plans to the Regional Water Board by May 2016. These plans are to become the basis of basin plan amendments to be considered by the Regional Water Board by May 2017. CV-SALTS is the stakeholder effort working to develop comprehensive salt and nitrate management plans (SNMPs) that will satisfy the Recycled Water Policy's salt and nutrient management plans in the Central Valley.

CV-SALTS developed technical work to analyze salt and nitrate conditions in surface and groundwater in the Central Valley, identify implementation measures, and develop monitoring strategies to ensure environmental and economic sustainability (CVRWQCB, 2018).

The current Water Quality Control Plan for the Sacramento-San Joaquin River Basins (Basin Plan) includes all amendments that have been fully approved as of May 2018.

As a result, compliance with CV-SALTS means complying with the Basin Plan and its newly adopted Central Valley Salt and Nitrate Control Program provisions. Pathways to compliance for each program were outlined in the Salt and Nitrate Control Program portion of the updated Basin Plan (Attachment 1 of Resolution R5-2018-0034). There are two programs outlined in the CV-SALTS Salt and Nitrate Control Program, one for salt, and one for nitrate. Each pathway includes options for different approaches and levels of investigation, that the Sacramento Valley Coalitions are evaluating for compliance.

Information developed during the CV-SALTS process will be incorporated into the revised ILRP Waste Discharge Requirements (WDRs) in the Central Valley, including the Sacramento Valley Order.

2.8.5 Title 22 Drinking Water Program

The SWRCB DDW regulates public water systems in the State to ensure the delivery of safe drinking water to the public. A public water system is defined as a system for the provision of water for human consumption that has 15 or more service connections or regularly serves at least 25 individuals daily at least 60 days out of the year.

Private domestic wells, wells associated with drinking water systems with less than 15 residential service connections, industrial, and irrigation wells are not regulated by the DDW.

The DDW enforces the monitoring requirements established in Title 22 of the California Code of Regulations (CCR) for public water system wells, and all the data collected must be reported to the DDW. Title 22 also designates the Maximum Contaminant Levels (MCLs) for various waterborne contaminants, including volatile organic compounds, non-volatile synthetic organic

compounds, inorganic chemicals, radionuclides, disinfection byproducts, general physical constituents, and other parameters.

2.8.6 Incorporating Regulatory Programs into the GSP

[Placeholder example text to be revised during GSP finalization]

Information in these various plans has been incorporated into this GSP and used during the preparation of Sustainability Goals, when setting Minimum Thresholds and Measurable Objectives when developing Projects and Management Actions.

2.9 Existing Water Monitoring Programs

This section describes existing water monitoring programs in the Subbasin. Other monitoring programs, such as subsidence monitoring are further described in Section 3 Basin Setting, and Section 5 Monitoring Networks.

2.9.1 Groundwater Elevation Monitoring

Groundwater elevation monitoring in the Subbasin is conducted at least semi-annually via the various programs discussed below in order to quantify water level and storage changes over time.

2.9.1.1 California Statewide Groundwater Elevation Monitoring Program

The DWR's California Statewide Groundwater Elevation Monitoring (CASGEM) program is administered by Glenn County and the TCFCWCD. The CASGEM network in the Subbasin includes 10 multi-level observation wells shown on Figure 2-15 that are routinely monitored for water levels by the DWR or the County representatives. Water levels are generally measured and reported to DWR on a semi-annual basis in the spring and fall by either DWR, Glenn County, or TCFCWCD. In addition, there are numerous privately-owned wells also shown on Figure 2-15 whose owners voluntarily provide DWR with access for water level measurements and inclusion in the CASGEM database.

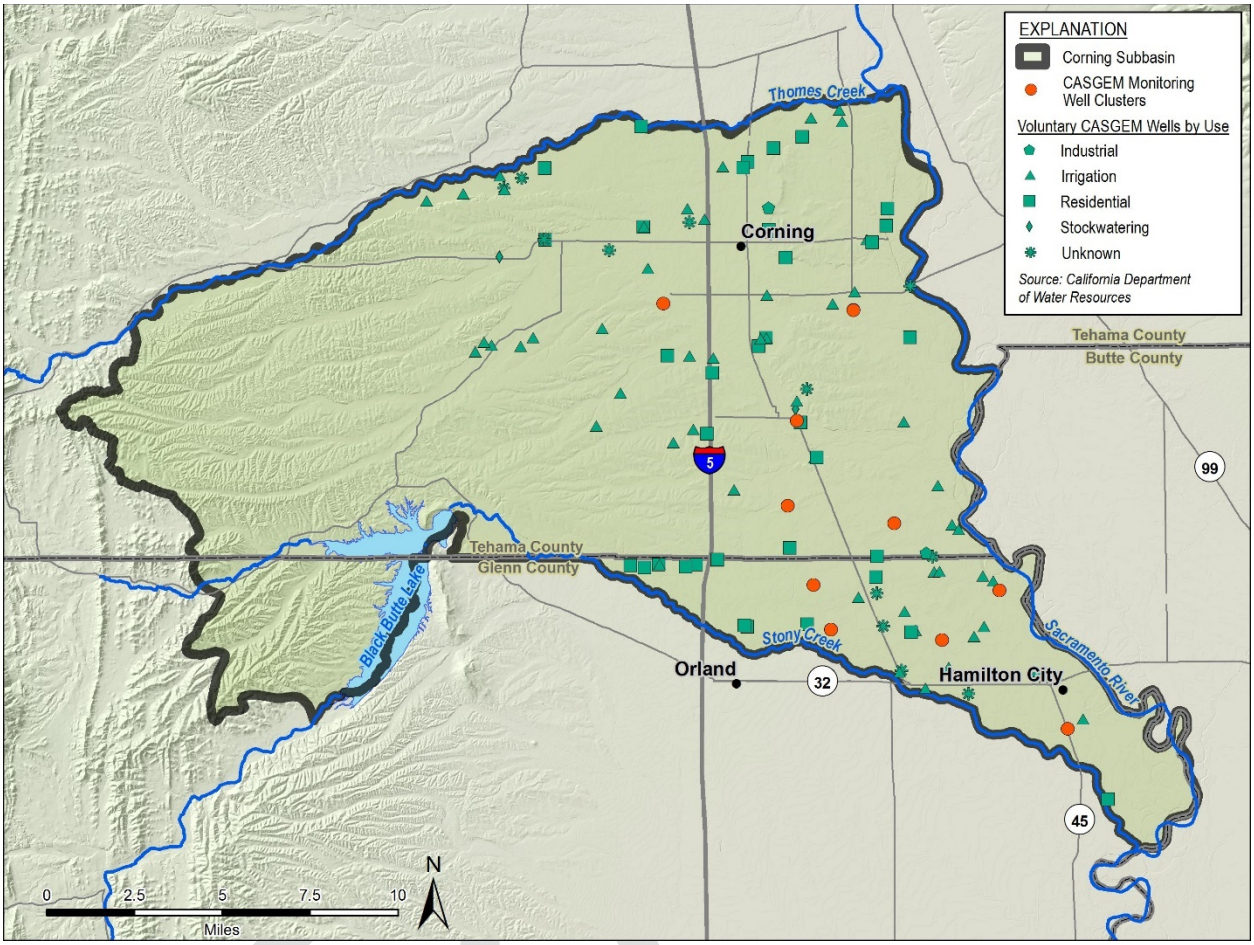

Figure 2-15. Wells Used for Water Level Monitoring in the Subbasin

2.9.1.2 Tehama County Groundwater Elevation Monitoring

The TCFCWCD identified a water level monitoring network of "Key Wells" for the Tehama County GWMP (Tehama County, 2012). The network of wells included five of the shallow CASGEM multi-level observation wells and five additional domestic or irrigation wells. Water levels in the CASGEM multi-level wells are measured continuously using data loggers maintained by the TCFCWCD. "Key Wells" have generally been monitored by TCFCWCD, DWR, or other entities three times per year in the spring, summer, and fall since at least 1976. TCFCWCD does not actively monitor groundwater levels in the "Corning West" area identified in the Tehama GWMP (west of Corning and Thomes Creek Water Districts) as the aquifer has not been used extensively as a water source in this area.

2.9.1.3 Glenn County Groundwater Elevation Monitoring

The water level monitoring program reported by Glenn County includes five multi-level CASGEM observation wells and six additional single completion domestic or irrigation wells

used in the BMO program (GCBS, 2010a and 2010b). DWR has been measuring groundwater elevations in the multi-level observation wells since they were installed in the mid-2000s. Additional CASGEM wells have been monitored by Glenn County, DWR, or other entities at least biannually since 1976. The wells are dispersed throughout the southeastern portion of the Subbasin within Glenn County. The southwestern portion of the Subbasin to the west of Black Butte Lake is largely undeveloped and consequently water levels are not actively monitored in this portion of Glenn County. Water levels measured as part of the BMO program are analyzed for consideration of water resource management objectives as described in Section 2.1.11.1.

2.9.2 Groundwater Quality Monitoring

Groundwater quality is assessed in the Subbasin under a variety of programs summarized below. These programs are conducted with variable intended purpose, frequency, and duration of monitoring. Figure 2-16 provides a summary of the location of wells that have been used for groundwater quality monitoring within the Subbasin. More information on these programs are included in Monitoring Network Section 5 and Sustainable Management Criteria Section 6.

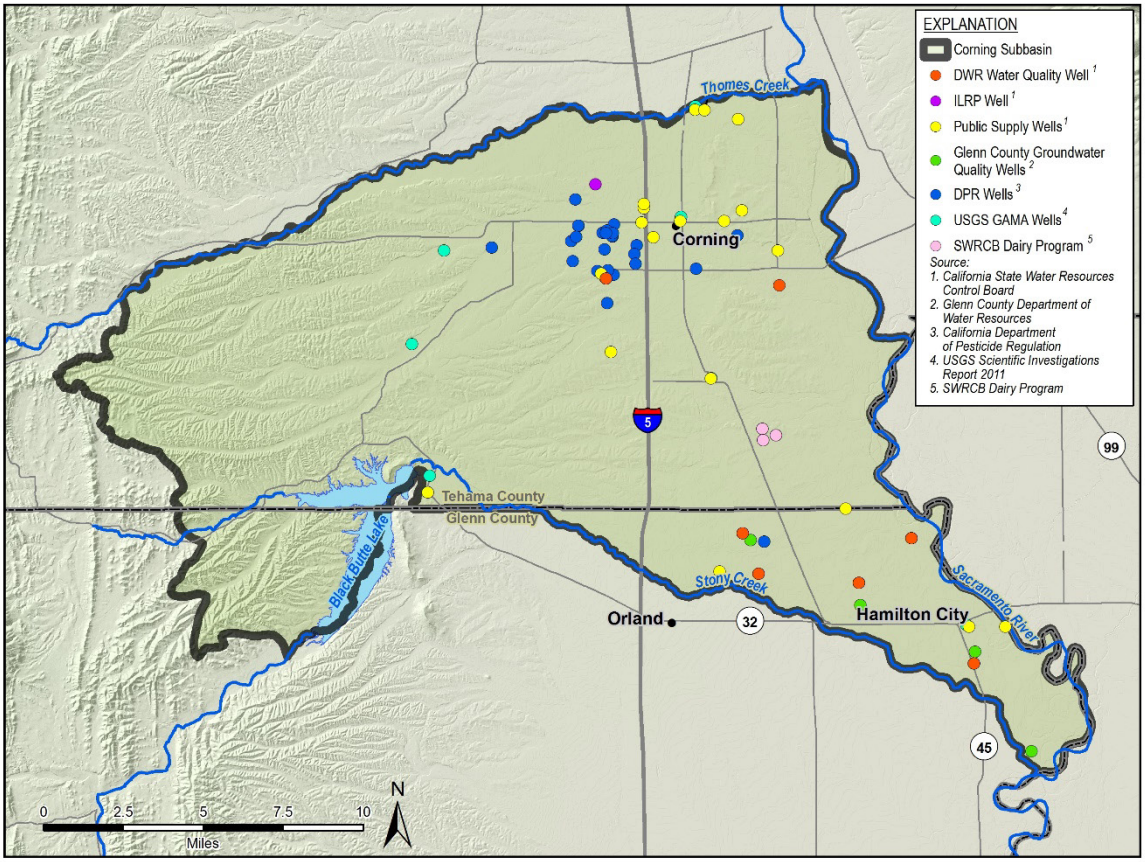

Figure 2-16. Groundwater Quality Monitoring Programs in Corning Subbasin

2.9.2.1 DWR Water Quality Monitoring Network

DWR has conducted two or three water quality monitoring events at seven of the multi-level observation well clusters in the Subbasin. The results of these sampling events are available on the SWRCB Geotracker / Groundwater Ambient Monitoring and Assessment (GAMA) water quality database.[19] The most recent sampling event at each well was in 2016 or 2017. Samples have been analyzed historically for metals, minerals, and volatile organic compounds at two well clusters in Tehama County and five well clusters in Glenn County. Sampling for this program has been intermittent and is conducted when DWR either acquires funding or identifies the need for sample collection.

2.9.2.2 Sacramento Valley Water Quality Coalition Monitoring Program

The CVRWQCB's Waste Discharge Requirements General Order (Order) for Growers in the Sacramento River Watershed requires regional groundwater quality monitoring in the Sacramento Valley. The SVWQC implements the Order. The SVWQC developed and is implementing a Groundwater Quality Trend Monitoring Program to collect the data required by the Order [Luhdorff and Scalmanini Consulting Engineers (LSCE), 2019]. The results of trend monitoring are summarized in annual monitoring reports submitted to the CVRWQCB.

There is one ILRP sampling location in the Subbasin approximately two miles northwest of Corning. This location is routinely sampled for nitrate and total dissolved solids as part of the program (LSCE, 2019).

2.9.2.3 Glenn County Water Quality Monitoring

Per the Glenn County BMOs, there are four wells in the Subbasin used by Glenn County for groundwater quality monitoring. The groundwater quality network was established during the summer of 2003 and includes annual sampling for analysis of pH, electrical conductivity, and temperature. The locations of the Glenn County water quality monitoring wells are provided in Monitoring Network Section 5 of this GSP. The data is collected and compiled by Glenn County representatives.

2.9.2.4 Public Water Systems Monitoring

The SWRCB DDW regulates public water systems in the State per the Title 22 of the CCR for public water system wells. A public water system is defined as a system for the provision of water for human consumption that has 15 or more service connections or regularly serves at least 25 individuals daily at least 60 days out of the year. The DDW enforces the monitoring

[19] http://geotracker.waterboards.ca.gov/gama/gamamap/public/

requirements established in Title 22. Title 22 designates the MCLs and requires periodic testing for various waterborne contaminants, including volatile organic compounds, non-volatile synthetic organic compounds, inorganic chemicals, radionuclides, disinfection byproducts, general physical constituents, and other parameters. There are two public water systems in the Subbasin for the City of Corning and the Cal-Water Service Co. - Hamilton City systems are shown on Figure 2-9 and in Table 2-4.

Tehama County and Glenn County Environmental Health Departments regulate small water systems (five to 14 connections) in their respective counties to ensure the water provided meets federal and state water quality standards. The counties require sampling, testing, and reporting of chemical and biological parameters and oversee regulatory compliance for these systems. There are 17 small water systems in the Subbasin shown on Figure 2-9 and in Table 2-4.

2.9.2.5 Other Groundwater Quality Monitoring

Groundwater quality has also been monitored under several different programs and by different agencies including:

- The United States Geological Survey (USGS) has sporadically collected groundwater quality data under the GAMA program. These data are stored on the Geotracker / GAMA online database[20] and are evaluated in comprehensive technical reports (USGS, 2011).
- The CA Department of Pesticide Regulation (DPR) has a network of wells throughout the Sacramento Valley at which various regulated pesticides are monitored to assess potential impacts on groundwater sources. DPR monitors at domestic, agricultural, public supply, and small system wells on a regular basis. Information on pesticide sampling is made available on the Geotracker/GAMA online database and annual report summaries by region.
- The CVRWQCB's Confined Animal Facilities - Dairy Program regulates monitoring of nitrate in groundwater wells surrounding dairy facilities. One regulated dairy location is within the Subbasin.
- There are multiple sites at which groundwater quality monitoring is conducted as part of a local investigation or compliance monitoring program for point source contaminant assessment and remediation. These sites are monitored under direction of the Central Valley Regional Water Quality Control Board

[20] https://geotracker.waterboards.ca.gov/

2.9.3 Surface Water Monitoring

Streamflow gages have historically been measured in the Subbasin by the USGS, USBR, USACE, and DWR at various locations along the boundaries of the Subbasin on the Sacramento River, Thomes Creek, and Stony Creek. The USGS has operated several stream gages within the Subbasin historically (Figure 2-17). However, these gages are currently all inactive and do not provide any flow measurement or stream stage data. Data collected from these gages are stored electronically in National Water Information System (NWIS) files.[21]

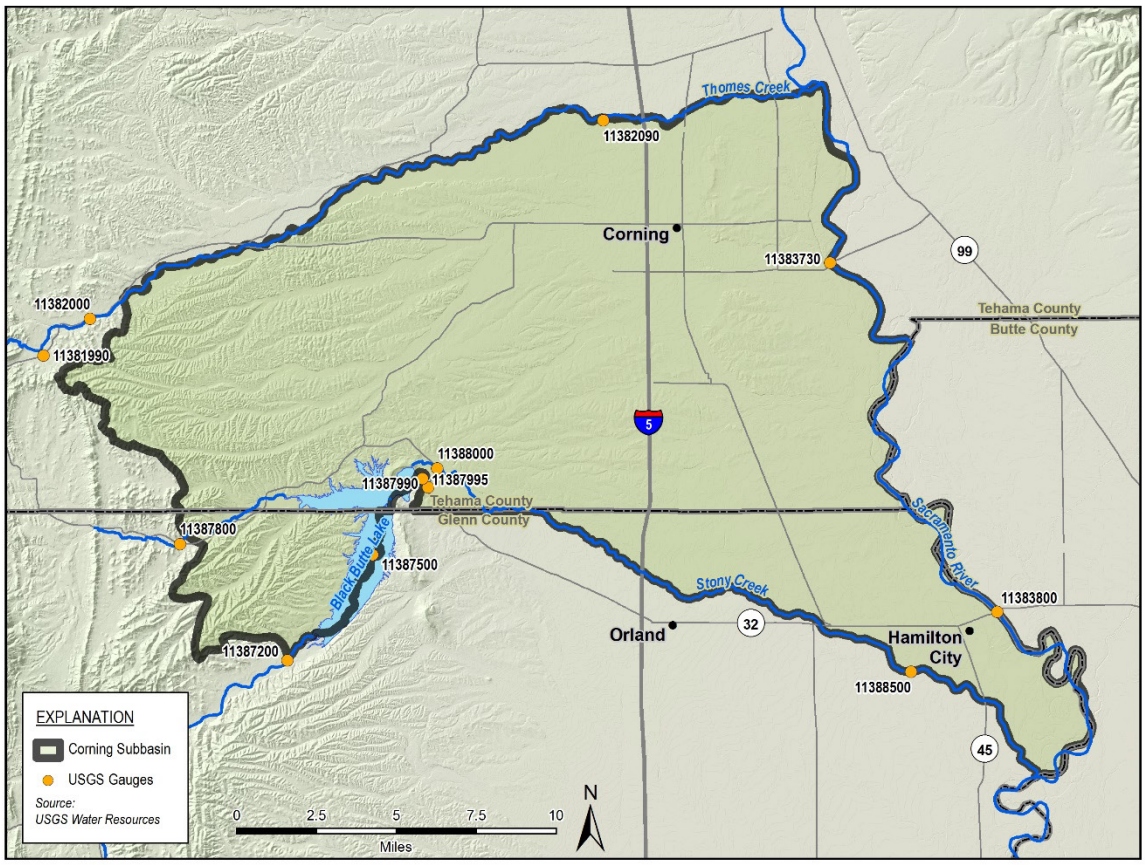

Figure 2-17. USGS Streamflow Gage Locations

The DWR maintains records of streamflow and stream stage on their California Data Exchange Center (CDEC) and the Water Data Library (WDL) databases.[22] These stations are owned and managed by various state and federal agencies and there are five active gages within the Subbasin (Figure 2-18). Three gages are maintained by DWR; one on Thomes Creek directly

[21] https://waterdata.usgs.gov/nwis/sw
[22] https://cdec.water.ca.gov/webgis/?appid=cdecstation

upstream of the Subbasin boundary (THO), and two on the Sacramento River (VIN at the Woodson Bridge and HMC at Hamilton City). USBR maintains a gage on Stony Creek flowing into the Black Butte Lake (SCG) and USACE maintains a gage at the outlet of Black Butte Lake (BBQ).

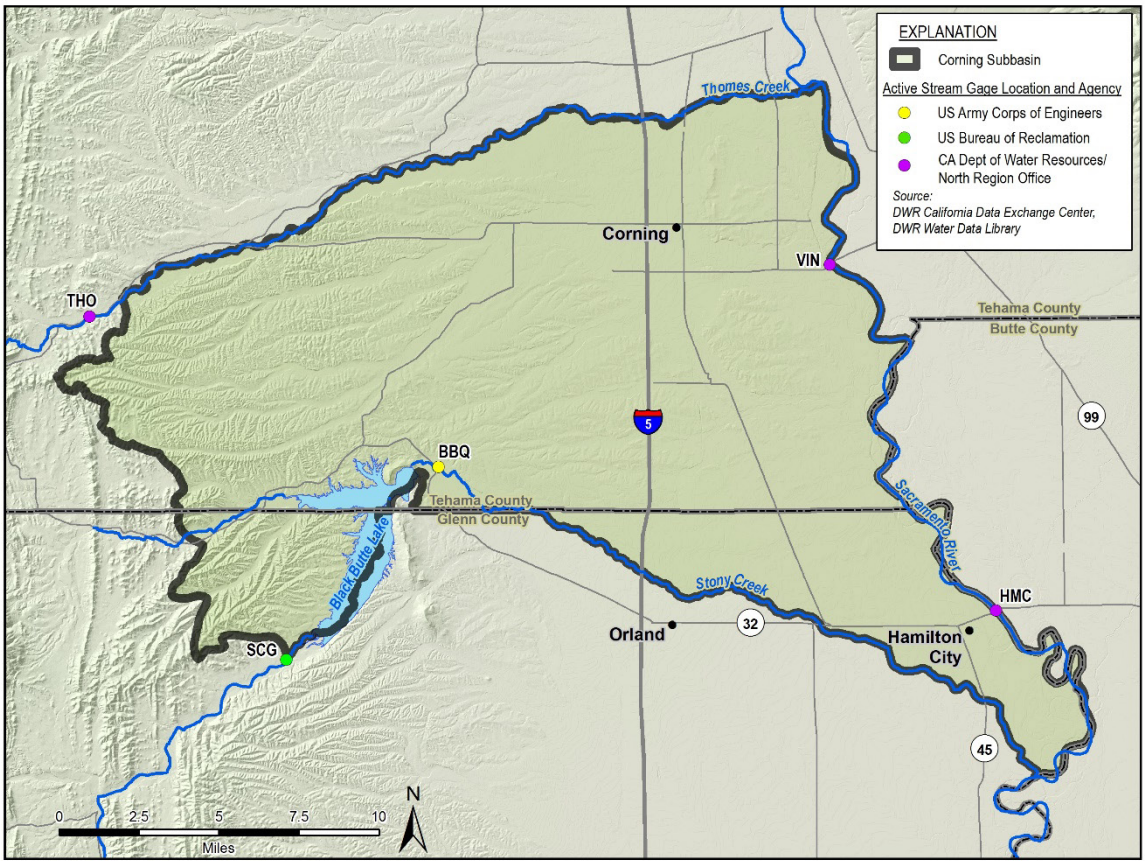

Figure 2-18: CDEC Steamflow Measurement Stations

2.9.4 Incorporating Existing Monitoring Programs into the GSP

The existing monitoring programs and networks constitute a broadly distributed system that provides representative data throughout the Subbasin. The programs are incorporated into the GSP monitoring plan as appropriate, as discussed in Section 5 of this GSP. The existing monitoring programs are not anticipated to limit the operational flexibility of this GSP, but rather to provide the types of data and means for data collection needed to successfully develop and implement the Plan.

2.10 Conjunctive Use Programs

There are no formal conjunctive use programs utilized in the Subbasin. Conjunctive use refers to the coordinated use of surface water and groundwater resources to optimize regional water supply and storage management objectives. In the Subbasin, conjunctive use may include the use of surface water for managed aquifer recharge and/or in-lieu recharge, conserving groundwater for times when surface water is not available.

2.11 Well Permitting

Extraction wells are permitted in Tehama and Glenn counties with the following elements:

2.11.1 Tehama County Well Permitting

The Tehama County Department of Environmental Health reviews and approves well permit applications and conducts on-site inspections to verify proper seals, well locations and site information. .Chapter 9.42 of Tehama County Code provides standards for well construction, testing, and inspection (Ordinance No. 1707, 1999). Well drilling methods, well design and construction, and well development influences extraction rates, the radius of influence, groundwater levels, prevention of groundwater contamination, and overall aquifer performance (TCFCWCD, 2012). The District shall support the County's activities to identify reasonable well construction policy that assists managing competition for groundwater extraction and reduces risk of third-party impacts on pumping levels and groundwater quality. Such policy may be specific to individual groundwater sub-basins (TCFCWCD, 2012).

In 2015, the Tehama County Board of Supervisors passed ordinance (2006) to add a further layer of protection for the groundwater aquifers and water wells connected to it. Water wells not used to supply water for a residence on the same parcel within the past 90 days will be considered dormant and new small wells on vacant parcels will not be allowed without a permitted use.

2.11.2 Glenn County Well Permitting

The Glenn County Department of Environmental Health reviews and approves well permit applications and conducts on-site inspections to verify proper seals, well locations and site information. County well standards are included in County Code 20.08. All new wells must have an approved permit from the Environmental Health Department prior to the start of any construction. The purpose of the program is to protect groundwater quality and to ensure an adequate and safe drinking water supply for the residents of Glenn County (DPNG, 2020).

Improperly constructed, altered, maintained, or destroyed wells are a potential pathway for introducing poor quality water, pollutants, and contaminants into good-quality groundwater. The

Glenn County Water Quality Program is implemented through the Department of Environmental Health. The Water Quality Program is responsible for the enforcement of standards and codes regarding the construction and destruction of water wells, monitoring wells, exploratory soil borings and other special use wells.

2.12 Land Use Management and Other Applicable Topics from General Plans

Tehama and Glenn counties and the City of Corning address land use planning for the Subbasin in their respective general plans. The sections below summarize the relationship between the GSP and the goals, policies, and implementation measures within the applicable General Plans. The General Plans were written to provide the covered areas with guidelines to successfully facilitate anticipated growth and land use change. Implementation of the GSP will continue sustainable management of groundwater in the Subbasin and is not anticipated to affect the water supply assumptions in the general plans.

2.12.1 Land Use Elements of Tehama County General Plan

The Tehama County General Plan was last updated in 2009 and is expected to apply through 2029 (PMC, 2009). The purpose of the General Plan is to reflect upon changing conditions and issues, and to provide a direction for the growth of the county. The General Plan, which serves as the basis for various other planning documents such as this GSP, explicitly states that agriculture is the foundation for the region and will remain one of the primary land uses in Tehama County. Urban uses are encouraged in the General Plan, but only in areas with existing services, or where services can be provided efficiently. Goals are defined in the General Plan as a broad statement describing a desired future condition or achievement reflecting a community's values and ideal future vision; policies are identified in a clear and specific statement as text or a diagram that guides decision making; and implementation measures are presented as an action, program, or procedure that carries out a General Plan policy. Table 2-6, Table 2-7, and Table 2-8 summarize the most relevant goals, policies, and implementation measures related to land use and water resources.

Table 2-6. Summary of Relevant Goals in the Tehama County General Plan

Goal	Description
ED-7	Protect and enhance environmentally sensitive lands and natural resources while, at the same time, promoting business expansion, retention, and recruitment.
PS-4	To promote development in areas where existing water districts have available resources to accommodate development or where existing districts may be expanded to serve new development in a cost-effective manner.
OS-1	To ensure that water supplies of sufficient quality and quantity will be available to serve the needs of the Tehama County, now and into the future.
OS-3	To protect, preserve, and enhance fish and wildlife species by maintaining healthy ecosystems.
SAF-5	To minimize and reduce the risk of personal injury and property damage resulting from flooding

Growth in Tehama County is not presented in the General Plan, but the California Department of Finance anticipates 1.61% annual average population growth in the county from a population of 62,836 in 2008 (Tehama County, 2012).

Table 2-7. Summary of Relevant Policies in the Tehama County General Plan

Policy	Description
SI-5.2	As development demands based on population growth and land availability necessitates, land adjacent to the City of Corning shall be used to accommodate future population in the planning area.
PS-3.2	The County shall ensure that water supply and delivery systems are available in time to meet the demand created by new development or are guaranteed to be built through the use of bonds or other financial sureties.
PS-4.1	The County shall encourage future development to be located with respect to type and intensity/density of land use in order to ensure the long-term, economically feasible and environmentally sound provision of adequate water supply and quality.
ED-6.3	The County shall accommodate urban growth and other non-agricultural development by utilizing, whenever possible, lands that do not have agricultural viability as defined in the Agriculture and Timber Element of the County General Plan.
ED-7.1	The County shall continue to preserve Tehama County's natural resources including agriculture, timberlands, water and water quality, wildlife resources, minerals, natural resource lands, recreation lands, scenic highways, and historic and archaeological resources. The protection of natural resources is of the utmost importance and promoting business expansion, retention, and recruitment should complement and enhance the natural resources while reducing negative impacts.
OS-1.1	The County shall protect and conserve water resources and supply systems through sound watershed management.
OS-1.2	The County shall work to ensure continued reasonable alternate water supplies.
OS-1.3	Surface water quality and stream flows for water supply, water recharge, recreation, and aquatic ecosystem maintenance shall be protected while respecting adjudicated and appropriated (California recognized water rights) rights of use.
OS-1.4	The County shall encourage development of land for the purposes of improving groundwater recharge.
OS-1.5	The County shall ensure the high quality of groundwater by emphasizing programs that minimize erosion and prevent the intrusion of municipal and agricultural wastes into water supplies.
OS-1.6	The County shall explore and encourage new water storage projects that are of local benefit.
OS-1.7	The County shall encourage new development to incorporate water conservation measures.
OS-3.1	The County shall preserve and protect environmentally sensitive and significant lands and water valuable for their plant and wildlife habitat, natural appearance, and character.

Table 2-8. Summary of Relevant Implementation Measures in the Tehama County General Plan

Implementation Measure	Description
ED-6.1b	Secure and develop water resources to sustain agriculture production.
OS 1.1h	The export of groundwater from Tehama County shall be discouraged.
OS-1.6a:	Work with local, regional, and state water suppliers to determine the necessary water storage required for projected growth in the County. Investigate potential federal and state funding opportunities related to water infrastructure. Apply for funding to establish water storage facilities.
OS-1.2a	Encourage water supply agencies and companies in the County to identify and develop water supply sources, other than groundwater, where feasible
OS-1.2c	Encourage the use of treated wastewater to irrigate parks, golf courses, and landscaping.
OS-1.3a	Protect surface and ground water from major sources of pollution, including hazardous materials contamination and urban runoff
OS-1.5b	The Regional Water Quality Control Board shall monitor irrigation runoff to prevent infiltration of herbicides/fertilizers/pesticides and municipal wastes into streams, rivers of the groundwater basin. The County shall also encourage irrigation water recycling.
OS-1.6a	Work with local, regional, and state water suppliers to determine the necessary water storage required for projected growth in the County. Investigate potential federal and state funding opportunities related to water infrastructure. Apply for funding to establish water storage facilities.

2.12.2 Land Use Elements of Glenn County General Plan

[Note: This is a placeholder. The General Plan Update is being reviewed and we will include the most up to date information by the time the GSP is submitted.

The Glenn County General Plan was last updated in 1993 and the County is currently in the process of updating this document. In 2020 an Existing Conditions Report was published that provided the goals, policies, and implementation measures of the 1993 General Plan, and also identified development patterns, natural resources, socioeconomic conditions, and environmental conditions in the county that will guide the forthcoming revision to the General Plan (DNPG, 2020). A goal of many sections of the 1993 General Plan was "preservation of agricultural land," which stressed the importance of agricultural resources in the county. Preservation of water quantity, quality, environmental resources, and flood protection were also addressed. Table 2-9 is a summary of some of the goals in the 1993 General Plan that are related to this GSP.

Table 2-9. Summary of Relevant Goals in the Glenn County General Plan

Goal	Description
CDG-1	Preservation of agricultural land.
CDG-2	Avoidance of land use conflicts in agricultural areas.
CDG-3	Appropriate distribution and regulation of land uses.
NRG-2	Protection and management of local water resources.
PSG-6	Protection and enhancement of water quality.
NRP-3	Preservation and enhancement of the county's biological resources in a manner compatible with a sound local economy.
PSG-5	Protection and reduction of loss of life and personal property due to flooding. Catastrophic failure of levee(s) along the Sacramento River in the region would have a significant negative impact on portions of Glenn County. Five historical crests with water overtopping levees have occurred along the Sacramento River in Hamilton City between 1970 and 1986 and portions of Hamilton City and the surrounding area flooded in 1974. In 2007, levee improvements were authorized to increase the flood protection on the Sacramento River from a 10-year to 75-year water crest.

2.12.3 Land Use Elements of City of Corning General Plan

The City of Corning General Plan was updated in 2015 (Diaz Associates, 2015). The goals that the General Plan advanced related to this GSP are shown in the following table.

Table 2-10. City of Corning General Plan Goals

Goal	Policy
1	Preserve and enhance the quality of life by providing a variety of living environments and accommodating growth.
2	Geographic distribution and the timing of growth shall be directly related to the conservation of natural resources and the provision and/or improvement of public facilities, services, and utilities.
3	Protect wildlife, fish, and native vegetation associations, particularly rare, endangered, and threatened species.
4	Maintain, conserve, and improve existing and future surface and groundwater quantity and quality.
5	Conserve, maintain and protect natural waterways, riparian habitat, and natural open space.
6	Provide current and future public services and facilities (including water and wastewater) in an orderly manner to meet existing needs and accommodate growth.

2.12.4 Land Use Planning Adjacent to Subbasin

The county land use plans are also applicable to the areas outside but adjacent to the Subbasin boundaries, with exception of the Vina and Butte Subbasins to the east, which are in Butte County's jurisdiction. The Butte County General Plan 2030 was updated and adopted on October 26, 2010 (County Resolution 10-152) and Amended on November 6, 2012 (County Resolution 12-124). The City of Tehama, in Tehama County, is located north of the Corning Subbasin, within the Red Bluff Subbasin. The Tehama City Council serves as the Planning Commission that reviews proposed amendments to zoning ordinances, site plans and plat applications, and also makes decisions regarding the current and future development of City of Tehama[23]; however, no general plan has been adopted. The City of Orland, in Glenn County, is located in the Colusa Subbasin, just south of the Corning Subbasin. The City developed its land use plan in 2003 (PMC, 2003).

The Corning Subbasin member agencies have developed good regional partnerships with neighboring land use planning entities, water management agencies, and GSAs and will continue to work collaboratively with partners within the Subbasin and regional partners in neighboring subbasins to coordinate groundwater management efforts that ensure groundwater sustainability is achieved throughout the northern Sacramento Valley.

2.13 Effects of Land Use Plan Implementation on Water Demand

The GSAs do not have authority over land use planning. However, the GSAs will coordinate with the Counties and City of Corning on General Plans and land use planning/zoning as needed when implementing the GSP.

2.14 Effects of GSP Implementation on Water Supply Assumptions of Land Use Plans

[Placeholder example text to be revised during GSP finalization]

Implementation of this GSP is not anticipated to affect water supply assumptions of relevant land use plans over the planning and implementation horizon.

2.15 Potential Additional GSP Elements (Reg. § 354.8 g)

[Placeholder to be discussed with GSAs; Some of these are touched upon above or may be discussed in subsequent sections.]

[23] https://cityoftehama.us/planning-and-zoning

- Wellhead protection
- Conjunctive use and underground storage
- Groundwater contamination cleanup, recharge, diversions to storage, conservation, water recycling, conveyance, and extraction projects
- Efficient water management practices
- Relationships with State and federal regulatory agencies
- Land use plans and efforts to coordinate with land use planning agencies to assess activities that potentially create risks to groundwater quality or quantity

2.16 Notice and Communication

A Communications & Engagement Plan (C&E Plan) has been developed and is included in Appendix 2A.

[Note: More information will be written up here later, when we have finalized the C&E Plan and have completed our outreach tasks]

2.16.1 Beneficial Uses and Users of Groundwater

Among the beneficial groundwater uses supported by the Subbasin are various irrigated and non-irrigated agricultural activities (including but not limited to grazing, orchards, row crops, and field crops); rural domestic/residential wells; municipal and industrial supply; and aquatic ecosystems associated with rivers and streams, some of which provide habitat for threatened or endangered species.

The Subbasin also covers a wide range of Interested Parties, including, but not limited to, the following:

- Land use authorities;
- Private well users;
- Urban users;
- Native American Tribal interests;
- Business interests;
- Agriculture interests;
- Public agencies;

- Public water systems/ community water systems;
- Environmental interests;
- Disadvantaged Communities (DACs); and
- General public

CWC §10723.4 requires GSAs to establish and maintain a list of persons interested in receiving notices regarding plan preparation, meeting announcements, and availability of draft plans, maps, and other relevant documents. For this GSP, a list of interested persons was maintained by the GSAs for relevant communications. The website maintained during development of the GSP is located at the following web address: https://www.corningsubbasingsp.org/.

2.16.2 GSP Communications Summary

[Placeholder to be completed after outreach tasks are completed. We will document CSAB and stakeholder engagement throughout the GSP development process.]

- Initial Notifications (Appendix 2B)
- Decision-making processes
- Public engagement opportunities
- Encouraging active involvement
- Informing the public on GSP implementation progress

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