

## 2. Proposed Management Zone

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### 2.1 Proposed Preliminary Boundary – Turlock Groundwater Subbasin

The proposed boundary for the Turlock Management Zone is the boundary coincident with the California Department of Water Resources (DWR) Bulletin 118 groundwater subbasin boundary for the Turlock Groundwater Subbasin (**Figure 2-1**). This subbasin lies within the San Joaquin Valley Groundwater Basin and the Turlock Subbasin (Groundwater Basin Number 5-22.03) (DWR 2006). DWR periodically updates groundwater basin boundaries.<sup>1</sup> A review of the most recent updates to the DWR groundwater basin boundaries finds that the Turlock Subbasin boundary remains the same as established by DWR. Potential modifications to neighboring subbasins based on recent requests to DWR (Merced Subbasin to the south, and Delta-Mendota Subbasin to the west) will not affect the border of the Turlock Subbasin.

### 2.2 Characterization of Proposed Management Zone

The subsections below describe the area encompassed by the proposed Management Zone, including general geographic and hydrologic characteristics, jurisdictions located within the planning area and key planning agencies and utilities. **Table 2-1** describes several key data sources for the Management Zone.

#### 2.2.1 Geography

The eastern boundary of the Turlock Subbasin and Management Zone aligns with the edge of the alluvial boundary and the edge of the Sierra Nevada foothills. The Management Zone, which lies between the Tuolumne and Merced Rivers, is bounded on the west by the San Joaquin River. The Management Zone encompasses approximately 542 square miles (sq. mi.) (347,000 acres) within portions of both Stanislaus and Merced Counties. **Figure 2-2** illustrates surface water bodies in and around the Management Zone. Key lentic surface water features include:

- Turlock Lake, located in the northeastern part;
- Dawson Lake, located along the northeastern edge; and
- Brush Lake located along the northwestern edge.

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<sup>1</sup> <https://water.ca.gov/Programs/Groundwater-Management/Bulletin-118>

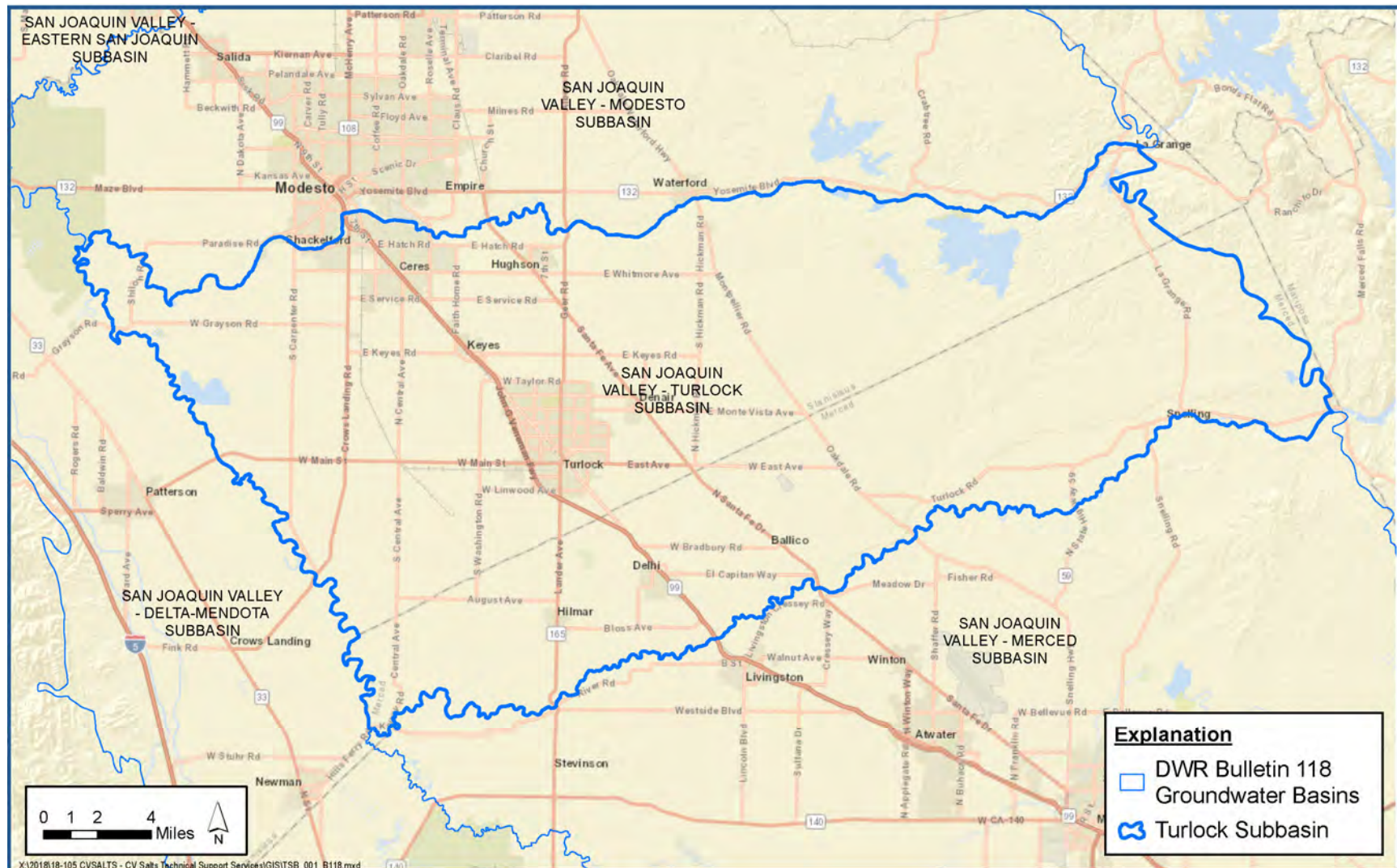


Figure 2-1. Proposed Turlock Management Zone Boundary



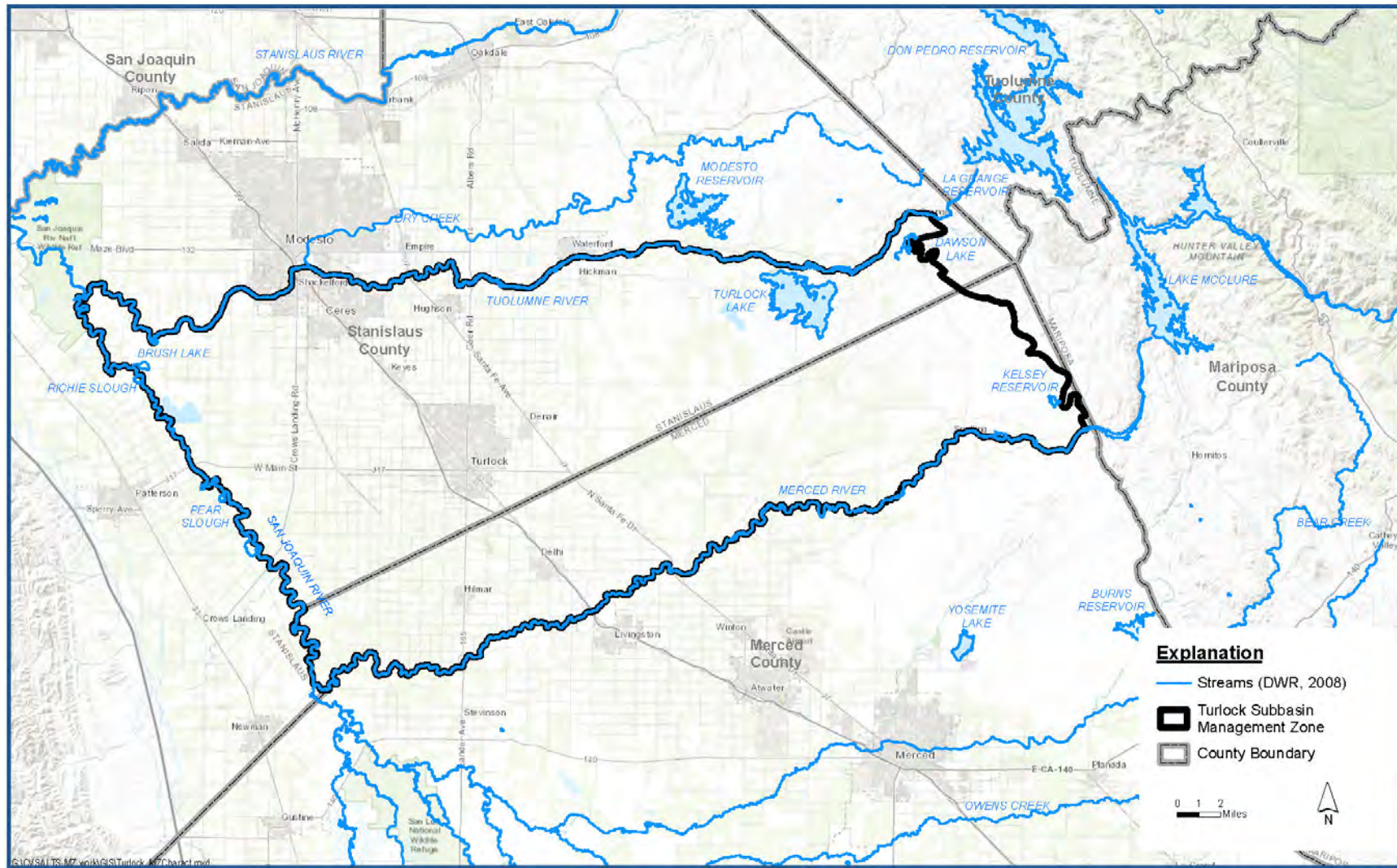


Figure 2-2. Surface Water Characteristics of the Proposed Management Zone

**Table 2-1. Key Data Sources to Characterize the Proposed Management Zone**

Boundary Type	Source for Boundary Data	Comments
Groundwater Sustainability Agency (GSA)	<ul style="list-style-type: none"> <li>DWR Map Viewer: <a href="https://sgma.water.ca.gov/webgis/index.jsp?appid=gasmaster&amp;rz=true">https://sgma.water.ca.gov/webgis/index.jsp?appid=gasmaster&amp;rz=true</a></li> <li>Individual GSA links for finding “Interested Parties”: <a href="https://sgma.water.ca.gov/portal/gsa/all">https://sgma.water.ca.gov/portal/gsa/all</a></li> </ul>	GSA boundaries, and also a list of GSA “Interested Parties”
Groundwater Basin/Subbasin	<ul style="list-style-type: none"> <li>DWR Bulletin 118: <a href="https://water.ca.gov/Programs/Groundwater-Management/Bulletin-118">https://water.ca.gov/Programs/Groundwater-Management/Bulletin-118</a></li> <li>Basin Boundary GIS file: <a href="https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Bulletin-118/Files/Bulletin-118-Groundwater-Basin-Boundary-GIS-Data---v6_1.zip?la=en&amp;hash=D947E7AC9E03D122CC5D707369E581DF41320E50">https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Bulletin-118/Files/Bulletin-118-Groundwater-Basin-Boundary-GIS-Data---v6_1.zip?la=en&amp;hash=D947E7AC9E03D122CC5D707369E581DF41320E50</a></li> <li>DWR Basin Boundary Modification Map Viewer: <a href="https://sgma.water.ca.gov/basinmod/modrequest/map.jsessionid=658C11952F60F610812069F4F5860BCD">https://sgma.water.ca.gov/basinmod/modrequest/map.jsessionid=658C11952F60F610812069F4F5860BCD</a></li> </ul>	DWR Bulletin 118 basin and subbasin boundaries, including basin boundary modification
Water Districts	DWR by request from the Geology and Groundwater Investigations Section, or here: <a href="https://gis.water.ca.gov/arcgis/rest/services/Boundaries/i03_WaterDistricts/MapServer">https://gis.water.ca.gov/arcgis/rest/services/Boundaries/i03_WaterDistricts/MapServer</a>	Irrigation Districts, water districts, community service areas, and community service districts
Public Water Supply Systems	California Environmental Health Tracking Program: <a href="https://trackingcalifornia.org/water-systems/water-systems-landing">https://trackingcalifornia.org/water-systems/water-systems-landing</a>	Division of Drinking Water
State Small Water Supply Systems	By request from county Environmental Health Departments (Merced and Stanislaus Counties)	Boundary data is typically not available for SSWS (usually just an address)
Disadvantaged Communities/Disadvantaged Unincorporated Communities	<ul style="list-style-type: none"> <li>DACs boundaries available from DWR: <a href="https://gis.water.ca.gov/app/dacs/">https://gis.water.ca.gov/app/dacs/</a></li> <li>DUCs boundaries available from PolicyLink by request (<a href="https://www.policylink.org/">https://www.policylink.org/</a>)</li> </ul>	DUC boundaries only available for portions of the San Joaquin Valley

Beyond the eastern boundary of the subbasin, the Don Pedro Reservoir on the Tuolumne River stores surface water for irrigation. The Turlock Irrigation District operates 250 miles of gravity-fed canals and laterals to supply surface water to its district users. Merced Irrigation District also provides surface water to a small area of land (slightly more than 5,000 acres) within the subbasin.

Water users in the Management Zone use both surface water and groundwater to meet the water demands of the area, and users rely more on groundwater when drought periods occur and surface water supplies are reduced. Agricultural water demands are met by the Turlock and Merced Irrigation Districts. Some growers located within an irrigation district’s boundaries have their own private irrigation wells that they use in lieu of, or in addition to,

any water supplied by other districts. In addition to domestic and irrigation uses, water is pumped for other agricultural purposes including dairies and other agricultural facilities in the area.

### **2.2.2 Jurisdictions**

The Management Zone includes the southern portion of Stanislaus County and the northern portion of Merced County (see Figure 2-2). Primary communities within each County include:

- Stanislaus County: Ceres, Hughson, Turlock (incorporated); Denair (unincorporated)
- Merced County: Ballico, Delhi, Hilmar (unincorporated)

### **2.2.3 Groundwater Sustainability Agencies**

Groundwater Sustainability Agencies (GSAs), established under the Sustainable Groundwater Management Act (SGMA), are comprised of water users in the area. GSAs are required to list interested parties, including irrigation districts, public water supply systems, coalitions, etc. that are involved with the management of groundwater resources in the area. As required by SGMA, GSAs are required to prepare Groundwater Sustainability Plans (GSP) which requires the GSA to develop its own Hydrogeologic Conceptual Model (HCM), determine groundwater conditions in the area (including water quality), and estimate water budget components including annual groundwater pumping. Each of these GSP elements is useful with regards to the management of nitrate.

DWR, which oversees the development of GSPs for each GSA in the State of California, has established a web-based Portal for GSA documentation.<sup>2</sup> Two GSAs are located within the proposed Turlock Management Zone (**Figure 2-3**):

- East Turlock Subbasin GSA<sup>3</sup> – Member agencies include: Eastside Water District, Merced County, Stanislaus County, Ballico-Cortez Water District and Merced Irrigation District.
- West Turlock Subbasin GSA<sup>4</sup> - Member agencies include the Cities of Turlock, Ceres, Hughson and Modesto, Stanislaus and Merced Counties; Denair Community Services District; Delhi and Hilmar County Water Districts, and the Turlock Irrigation District. Associate members include the City of Waterford, Stevinson Water District and Keyes Community Services District.

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<sup>2</sup> GSA boundaries: <https://sgma.water.ca.gov/webgis/index.jsp?appid=gasmaster&rz=true>

<sup>3</sup> <https://sgma.water.ca.gov/portal/gsa/print/238>

<sup>4</sup> <https://sgma.water.ca.gov/portal/gsa/print/225>



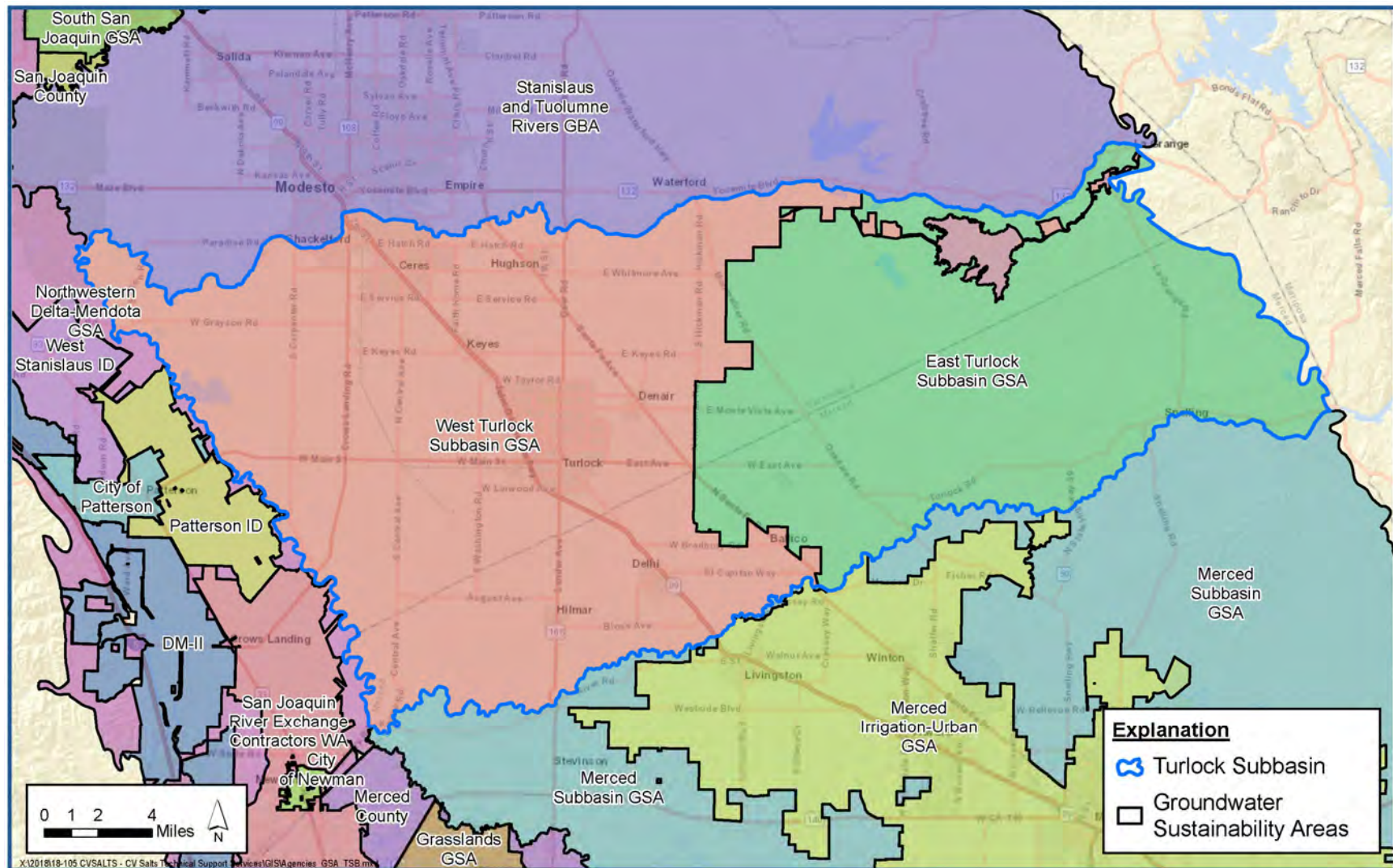


Figure 2-3. Groundwater Sustainability Agencies Established within and adjacent to the Proposed Management Zone.

Adjacent to the Turlock Groundwater Subbasin, there are seven other GSAs (see Figure 2-3): Patterson Irrigation District GSA; San Joaquin River Exchange Contractors Water Authority GSA; Stanislaus and Tuolumne Rivers Groundwater Basin Association GSA; Northwestern Delta-Mendota GSA; Merced Subbasin GSA; Merced Irrigation-Urban GSA; West Stanislaus Irrigation District GSA.

**Attachment B** to this Preliminary Management Zone Proposal provides a summary of resource management agencies associated with the development of GSAs in and around the proposed Management Zone.

### **2.2.4 Water Management Entities**

Water management-related districts include irrigation districts, water districts, community service areas, and community service districts. **Figure 2-4** illustrates the location of these various management areas within and adjacent to the proposed Management Zone:

- Ballico-Cortez Water District,
- Ballico Community Service District,
- City of Ceres W.S.A.,
- City of Turlock W.S.A.,
- Del Este Water Company,
- Delhi County Water District,
- Denair Community Service District,
- Eastside Water District,
- Hilmar County Water District,
- Keyes Community Service District,
- Merced Irrigation District, and
- Turlock Irrigation District.

The Turlock Irrigation District and the Eastside Water District cover the majority of the Management Zone area. In addition, there are several private water systems serving mobile home parks, and other small local entities.



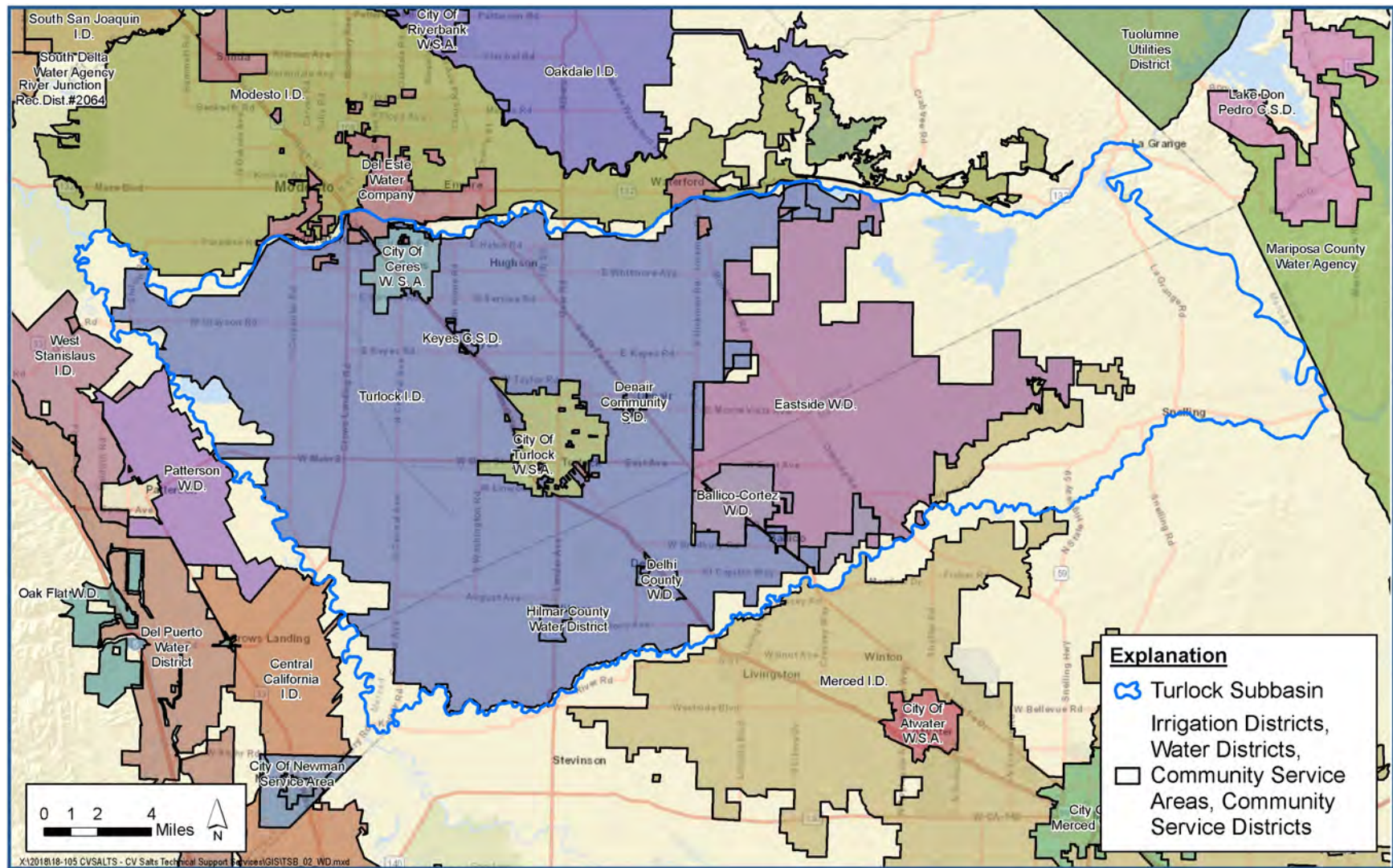


Figure 2-4. Water Management Entities Located within and adjacent to the Proposed Management Zone.



## 2.2.5 Drinking Water Systems

**Table 2-2** summarizes how residential water systems are classified in California. Systems are categorized by use, connections and duration of service over a period of a year. Residential water systems are distinguished by the total number of service connections, e.g., Local Small Water Systems (LSWS) serve 2 to 4 household connections, State Small Water Systems (SSWS) serve 5 to 14 household connections, and residential Public Water Systems (PWS) serve more than 14 household connections. The following subsections provide additional information regarding each of these types of water systems within the proposed Management Zone. Residential PWS are termed Community Systems. The PWS designation also includes non-residential water systems, such as Transient Non-Community Systems (rest stops, retailers, gas stations, markets, parks, etc.), and Non-Transient Non-Community Systems (churches, schools, non-retail companies, etc.).

### 2.2.5.1 Public Water Systems

PWS are defined as systems that provide drinking water to: (1) at least 15 households for Community systems; or (2) at least 25 people 60 days or more per year for non-Community systems (see Table 2-2). PWS, which are regulated by California's Division of Drinking Water (DDW), are required to submit water samples of their raw and delivered water for a broad suite of regulated constituents on various schedules that depend on the constituent and the source water context. All PWS data on water quality, source locations, service areas, and historical data are publicly available on the State Water Resources Control Board (State Water Board) website.<sup>5</sup>

**Table 2-2. Classification of Drinking Water Systems by Constituency, Connections, and Duration of Service per Year (adapted from Boyle et al. 2012)**

Duration of Service	Connections:		< 5	5 +	< 15	15 +	< 200	200 +
	Persons Served:		< 25			25+		
N/A	Small Water System (SWS) <sup>1</sup>	Classification Defined By	Connections					
< 60 days/year	Local Small Water System		Connections & (persons, duration)					
< 60 days/year	State Small Water System			Connections & (persons, duration)				
≥ 60 days/year	Community Public Water System (PWS) <sup>2</sup>					Connections or (persons, duration)		

<sup>1</sup> Classification as a SWS does not preclude classification as any of the other types. SWS may be regulated by DDW or by Local Primary Agency county.

<sup>2</sup> A PWS is a system for the provision of water for human consumption that has 15 or more service connections OR regularly serves at least 25 individuals at least 60 days per year.

<sup>5</sup> <https://data.ca.gov/dataset/drinking-water-public-water-system-information>

The California Environmental Health Tracking Program (CEHTP) maintains a dataset of PWS boundaries in California.<sup>6</sup> These data are provided to CEHTP by the water systems. Some quality control measures are observed by CEHTP, but the data do contain errors, including boundary errors, e.g., overlapping, misplaced boundaries or duplicated boundaries. The data are hosted as a shapefile with attributes for the PWS ID, system name, the number of connections and number of persons served, and the water system type.

The PWS ID and system name are reliable except in the few cases where system boundaries are entirely mis-located. When the connections and population served numbers are compared with those same datapoints in the Safe Drinking Water Information System (SDWIS) database maintained by the State Water Board's DDW, these values appear to either be lacking quality control procedures or are not updated. It is unclear if these numbers are reported by the systems or added by CEHTP based on other data. However, many PWS are wholesalers, thus some populations may inadvertently be counted twice.

**Figure 2-5** provides the locations of PWS boundaries within the proposed Management Zone. A few unexplained overlaps are present; these overlaps are most likely the result of overlap between wholesalers and retail water purveyors.

#### **2.2.5.2 State Small Water Systems**

SSWS are defined as systems serving at least five but not more than 14 residential households. Mutual Water Companies are frequently classified as a SSWS. Typically, SSWS are regulated by county environmental health departments; regulatory oversight of these systems varies by county. Typically, counties require submission of water quality samples annually (at most) for a smaller set of constituents than monitored by a PWS.

SSWS data are public; however, most counties do not have these data compiled in any easily accessible format (many counties require a fee for data retrieval for these systems). Typically, a county will have hard-copy files of the original permit filed for the SSWS, and an annual record of water quality data collected for compliance with county regulations (although such data collection may be sporadic and only for a few constituents). The permit typically includes information on the construction of the water source (well) and the street where service is provided. Most counties do not have maps of SSWS service areas; in most cases, the only way to locate the service area of a SSWS is to use the address recorded on the permit. Some SSWS are included in the PWS boundary data maintained by CEHTP, described above, but this is irregular.

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<sup>6</sup> <https://trackingcalifornia.org/water-systems/water-systems-landing>

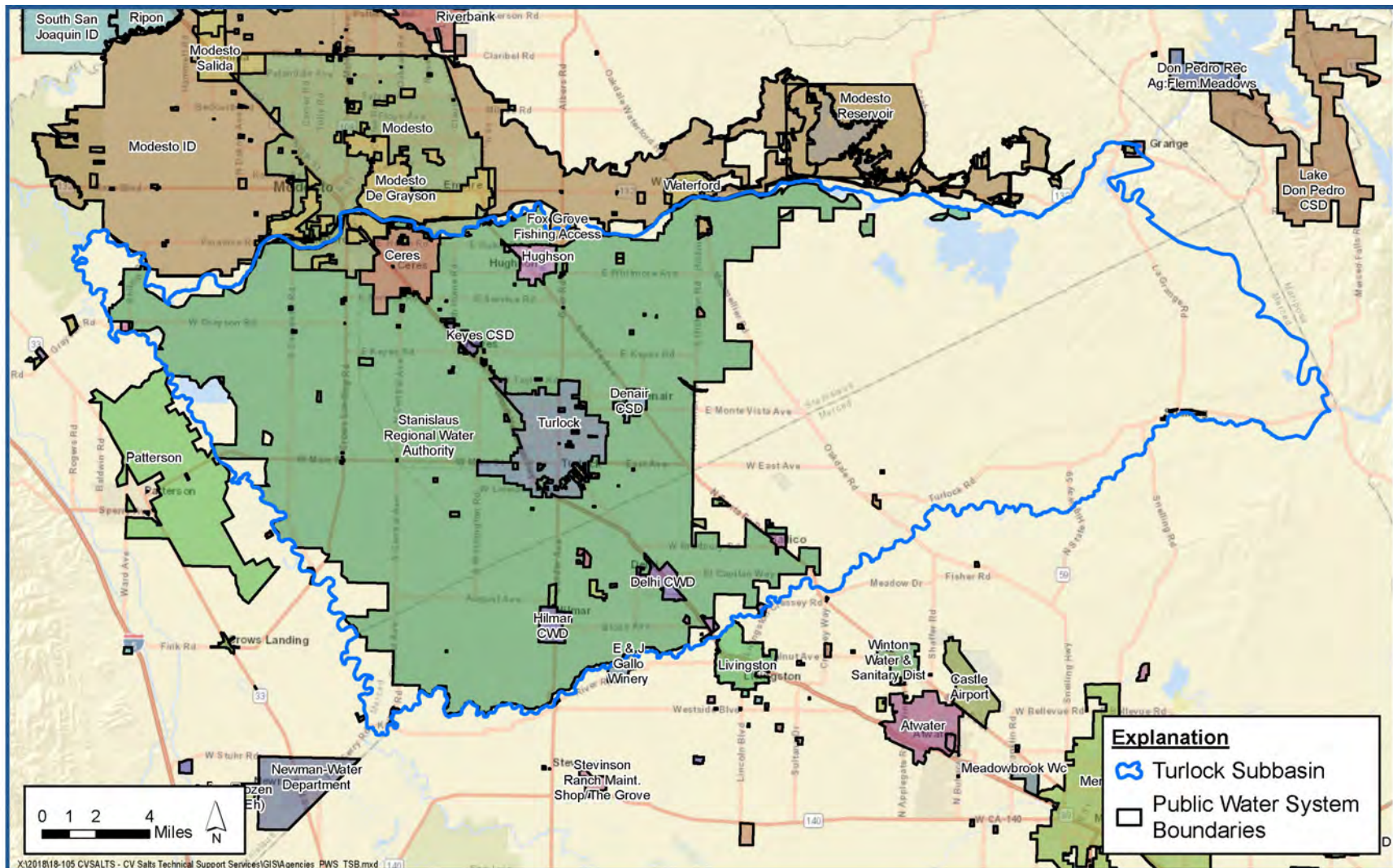


Figure 2-5. Public Water System Boundaries within and adjacent to the Proposed Management Zone.



Merced and Stanislaus County Environmental Health Departments were contacted to obtain available SSWS address data for the Management Zone area. In order to determine if the SSWS is within the Management Zone boundary, the addresses need to be geocoded or plotted on a map. A list of 18 SSWS was provided by Merced County, and a list of 17 SSWS was provided by Stanislaus County. After attempting to geocode the addresses of these water systems (some addresses were incomplete and must be estimated), a total of 16 of the 35 systems in the County databases were determined to be located within the proposed Management Zone (**Table 2-3**). The Counties provided water quality test results, including nitrate test results, as available.

**Table 2-3. State Small Water Systems Located within the Proposed Management Zone**

County	Small Water System Name	Address
<b>Merced County</b>	Boland's Mobile Home Park	15874 N Hwy 59, Snelling
	Fiorini Ranch	11017 N Palm Ave., Delhi
	Sierra Vista Dairy	22426 E. Monte Vista Ave., Denair
	Vista Livestock Company	22323 E. Monte Vista Ave., Denair
<b>Stanislaus County</b>	Ledbetter WS	2337 Don Pedro Road, Ceres
	River Rd Mutual	2935 River Road, Modesto
	El Rancho 4411 Esmar	4411 Esmar Road, Ceres
	Pioneer Village MHP	867 Santa Fe Avenue, Hughson
	Shiloh River Resort	2724 Shiloh Road, Modesto
	Davis Ct	4621 Swanson Road, Denair
	Shasta Motel WS	1580 South 1st Street, Turlock
	Frances Dea WS	3824 El Camino Avenue, Ceres
	B & C Zachariah WS	2222 Herndon Road, Ceres
	Miller Apts	4318 Central Avenue, Ceres
	Rohde Apts	5024 Rohde Road, Ceres
	Cardoza WS	1237 Emerald Way, Turlock

### **2.2.5.3 Local Small Water Systems**

LSWS include residential systems serving two to four households. LSWSs are typically permitted by County Environmental Health Departments. Most counties regulate LSWS as if they were simply private wells – that is, they are unregulated except for the requirements associated with the drilling permit. Typically, no information is available to identify the difference between a single-household well and one used for a LSWS. No water quality data are typically collected on an ongoing basis from an LSWS and domestic wells, though some counties do collect a water quality sample at the time the well is drilled. Some counties do

not maintain their LSWs and domestic well data at their Environmental Health Office; other offices at the county may have these data, such as Community Development Offices, Public Works Offices, or Building Departments.

Merced and Stanislaus County Environmental Health Departments were contacted to obtain available LSWs data for the Management Zone area. Findings include:

- *Merced County* – Merced County Environmental Health provided domestic and LSWs information, including nitrate measurements for 3,178 wells in the County (one nitrate sample taken at the time of well installation). Based on the data, it is not possible to distinguish between LSWs and single-household domestic wells.
- *Stanislaus County* - Stanislaus County does not track data for LSWs or domestic wells. Well permits are maintained as hard copies, and could be reviewed individually to identify domestic wells, but there is currently no way to determine which of those wells serve multiple households.

### **2.2.6 Disadvantaged Communities and Disadvantaged Unincorporated Communities**

Disadvantaged Communities (DACs) and Disadvantaged Unincorporated Communities (DUCs) include many areas of the state that have poor access to regulated drinking water supplies. The neighborhoods in these areas tend to include many households without adequate financial resources to treat their residential domestic supply well water, or even to test for contaminants.

DACs are defined as those areas of the state with Median Household Income (MHI) below 80% of the statewide MHI. These areas are further categorized as Severely Disadvantaged Communities (SDAC) if the local MHI is below 60% of the statewide MHI. DWR, which maintains several databases of DAC Boundaries based on the most recent census,<sup>7</sup> provides three different scales of analysis for DACs:

- *DAC Tracts* – Census Tracts are the largest census areas compiled below the county level. County boundaries are contiguous with Tract boundaries. Tracts consist of groups of Block Groups.
- *DAC Block Groups* – Census Block Groups are the next scale smaller than Tracts. Tract boundaries are contiguous with Block Group boundaries. Block Groups consist of groups of Blocks.
- *DAC Places* – Census Places, or Census Designated Places (CDP) are not contiguous with other Census boundaries and may consist of groups of complete or partial Blocks or Block Groups. CDPs are typically unincorporated residential neighborhoods; but unincorporated status is not a requirement for place designation. CDPs are legacy

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<sup>7</sup> DWR's boundary files for DACs: <https://gis.water.ca.gov/app/dacs/>

designations, with locally known names. Some are distinct from nearby incorporated areas due to geographic boundaries such as rivers, roads, or topography. DAC Places are typically a more accurate representation of neighborhoods with qualifying MHIs rather than Tracts or Block Groups. DWR does not provide an assessment of DAC status at the Block level.

DUCs are areas that meet the above-defined MHI criteria (80% of statewide MHI). PolicyLink (2013) provides the best available information on DUCs located in the proposed Management Zone area. These locations were developed primarily through the use of census data, but neighborhoods were also characterized and individually delineated based on parcel density, more detailed income from counties and state agencies, and with input from local resources. Each DUC is designated as one of the following:

- *Island* – Neighborhood within a city or other incorporated area that has been left out of that incorporated jurisdiction
- *Fringe* – Neighborhood on the outskirts of an incorporated area
- *Legacy* – Neighborhood located well outside the boundaries of any incorporated area.

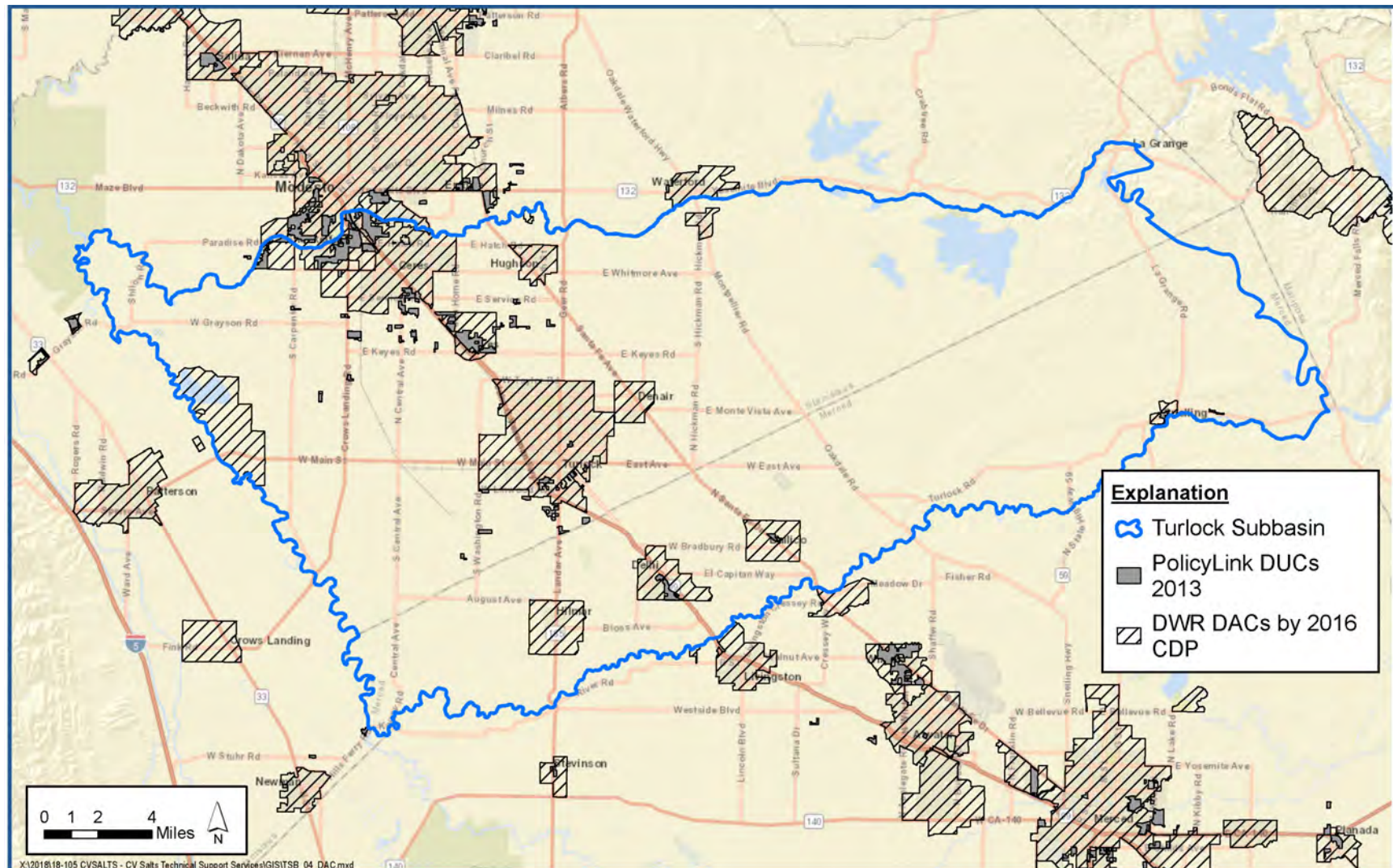
Many of the DUCs identified by PolicyLink overlap with DAC Places identified by DWR (see above) because many CDPs are unincorporated areas that also meet the criteria used by PolicyLink in their study.

**Table 2-4** lists and **Figure 2-6** illustrates the locations of the 17 DACs and 13 DUCs in the proposed Management Zone. These communities are located primarily near the largest population centers and include much of the municipal PWS service areas. **Table 2-5** summarizes the characteristics of DACs and DUCs in the Management Zone area. Combined, non-overlapping DAC and DUC areas comprise approximately 10.9% of Management Zone (37,981 acres or 59.3 sq. mi).

### **2.2.7 Land Use**

**Table 2-6** and **Figure 2-7** provide the land use characteristics of the proposed Management Zone associated with agricultural activity. The land use in the eastern portion of the Management Zone is predominantly classified as deciduous fruits and nuts. To the west agricultural activity shifts to an increased use of field crops. The most eastern portion of the Management Zone is unmapped for land use. Almonds are the most common crop in the Management Zone, comprising almost 32% of the total area.







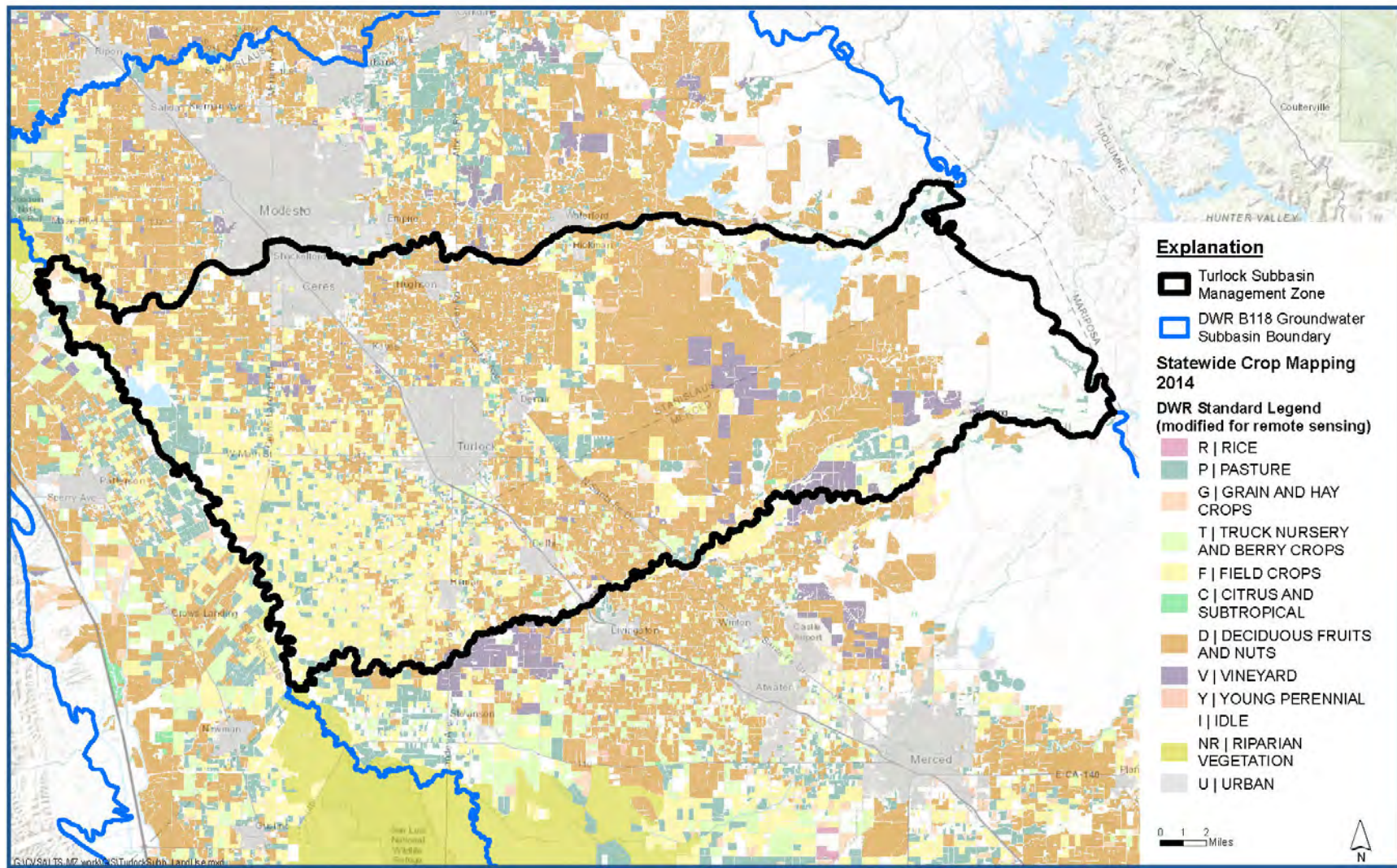


Figure 2-7. Agricultural Land Use in the Proposed Management Zone (Note: Far eastern portion is unmapped).

**Table 2-4. Population of DACs and DUCs located in the Proposed Management Zone**

Community	DWR DAC Populations by 2010 CDP	DUC Population (PolicyLink 2013)
Ballico	318	180
Bret Harte	5,315	--
Bystrom	3,865	6,365
Ceres	47,231	869
Chemurgic	--	91
Cowan	481	
Delhi	10,968	1,306
Denair	4,771	--
Harp	--	749
Hatch	--	129
Hickman	497	--
Hilmar-Irwin	5,250	--
Hughson	7,160	60
Keyes	7,338	5,446
Modesto <sup>1</sup>	44,411	--
Monterey Park Tract	338	--
Parklawn	1,150	--
Riverdale Park	1,056	1,040
Shackelford	--	9,152
Snelling	131	219
Turlock	71,166	1,339
<b>Total Population</b>	<b>211,446</b>	<b>26,945</b>

<sup>1</sup> The City of Modesto comprises a large area north of the Turlock Subbasin, but there are smaller areas that are within the northern boundary of the subbasin, as well as a larger area adjacent to the subbasin's western border. The total population of the Modesto DAC was listed as 208,512, with no distinction of the various separate areas' populations. The areas of the Modesto DAC that lie within the proposed Turlock Management Zone make up about 21% of the total Modesto DAC area. The population listed in this table represents 21% of the total Modesto DAC population provided by DWR, using an equal weighting approach. This may overestimate the population, as the western area is likely not as populated as the main urban area of Modesto.

**Table 2-5. DAC and DUC Characteristics in the Proposed Management Zone**

Category	No. of Locales	Acres (sq. mi.)	Estimated Population
DACS	22 locales	36,851 (57.6)	211,344
DUCs	44 locales	2,925 (4.6)	26,945
DACs without overlap	22 locales	35,056 (54.8)	62,125
Total without overlaps	66 locales	37,981 (59.3)	89,070



**Table 2-6. Land Use Summary for Proposed Turlock Management Zone (land use designations based on DWR 2014)**

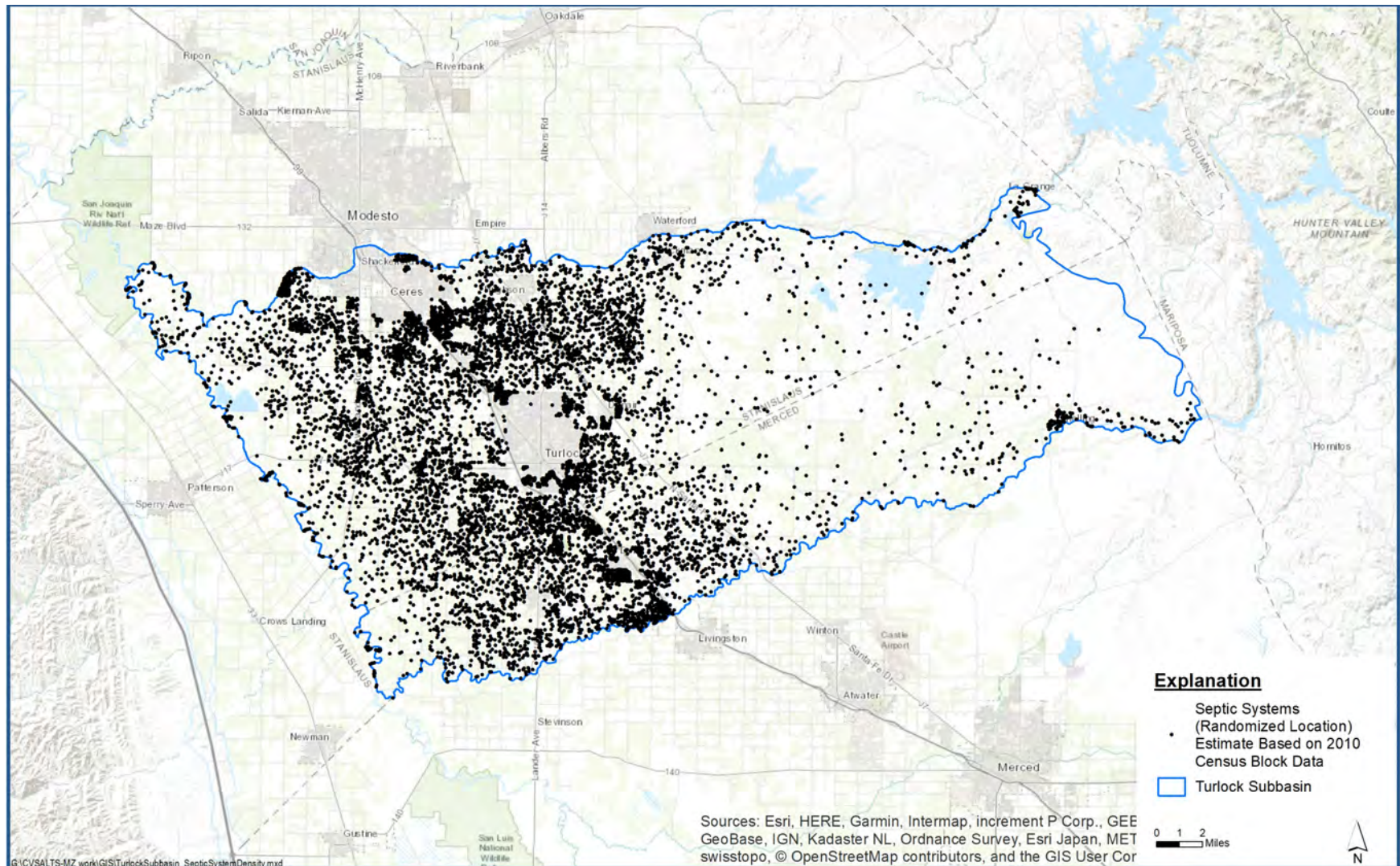
Land Use Designation	Area (sq. mi.)	Area (acres)	Percent of Total Management Zone Area
<b>CITRUS AND SUBTROPICAL</b>	<b>0.37</b>	<b>239</b>	<b>0.07%</b>
Citrus	0.04	28	0.01%
Olives	0.33	211	0.06%
<b>DECIDUOUS FRUITS AND NUTS</b>	<b>193.37</b>	<b>123,758</b>	<b>35.54%</b>
Almonds	171.57	109,803	31.54%
Apples	0.84	538	0.15%
Cherries	1.27	810	0.23%
Kiwis	0.13	86	0.02%
Miscellaneous Deciduous	0.50	321	0.09%
Peaches/Nectarines	6.18	3,958	1.14%
Pears	0.03	18	0.01%
Pistachios	0.13	84	0.02%
Plums, Prunes and Apricots	0.43	273	0.08%
Pomegranates	0.04	26	0.01%
Walnuts	12.25	7,841	2.25%
<b>FIELD CROPS</b>	<b>88.02</b>	<b>56,334</b>	<b>16.18%</b>
Beans (Dry)	0.44	285	0.08%
Corn, Sorghum and Sudan	87.58	56,050	16.10%
<b>GRAIN AND HAY CROPS</b>	<b>6.15</b>	<b>3,934</b>	<b>1.13%</b>
Miscellaneous Grain and Hay	4.35	2,782	0.80%
Wheat	1.80	1,153	0.33%
<b>IDLE</b>	<b>8.58</b>	<b>5,490</b>	<b>1.58%</b>
Idle	8.58	5,490	1.58%
<b>RIPARIAN VEGETATION</b>	<b>0.57</b>	<b>365</b>	<b>0.10%</b>
Managed Wetland	0.57	365	0.10%
<b>PASTURE</b>	<b>34.26</b>	<b>21,927</b>	<b>6.30%</b>
Alfalfa and Alfalfa Mixtures	18.08	11,570	3.32%
Miscellaneous Grasses	2.29	1,463	0.42%
Mixed Pasture	13.90	8,894	2.55%
<b>TRUCK NURSERY AND BERRY CROPS</b>	<b>7.92</b>	<b>5,067</b>	<b>1.46%</b>
Bush Berries	0.04	29	0.01%
Cole Crops	0.00	1	0.00%
Flowers, Nursery and Christmas Tree Farms	2.45	1,566	0.45%
Lettuce/Leafy Greens	0.33	212	0.06%
Melons, Squash and Cucumbers	0.52	333	0.10%
Miscellaneous Truck Crops	0.21	134	0.04%
Onions and Garlic	0.02	12	0.00%
Potatoes and Sweet Potatoes	4.32	2,766	0.79%
Strawberries	0.02	11	0.00%

**Table 2-6. Land Use Summary for Proposed Turlock Management Zone (land use designations based on DWR 2014)**

Land Use Designation	Area (sq. mi.)	Area (acres)	Percent of Total Management Zone Area
Tomatoes	0.00	3	0.00%
<b>URBAN</b>	<b>31.59</b>	<b>20,220</b>	<b>5.81%</b>
Urban	31.59	20,220	5.81%
<b>VINEYARD</b>	<b>15.60</b>	<b>9,983</b>	<b>2.87%</b>
Grapes	15.60	9,983	2.87%
<b>YOUNG PERENNIAL</b>	<b>0.52</b>	<b>334</b>	<b>0.10%</b>
Young Perennials	0.52	334	0.10%
<b>Grand Total</b>	<b>386.96</b>	<b>247,652</b>	<b>71.13%</b>
<b>Unmapped Total</b>	<b>157.09</b>	<b>100,536</b>	<b>28.87%</b>
<b>Total Management Zone Area</b>	<b>544.04</b>	<b>348,187</b>	<b>100.00%</b>

Besides the nonpoint sources of nitrate loading that can occur due to agricultural land uses, septic systems are also a smaller but potential source of localized nitrate loading. The amount of nitrate loading from septic systems is variable, dependent on the rate of denitrification. Denitrification occurs in the soil column below the septic leachfield, with more denitrification occurring where more carbon is available and where clayey or heavy soils slow the downward flow of water (creating larger anaerobic zones that increase denitrification). Conversely, in soils below the septic leachfield where there is less carbon available and there exists sandy, faster soils, the water travels downward more quickly (creating a thin anaerobic zone), which results in lower denitrification rates, and therefore more nitrate potentially reaching the water table.

No current dataset exists that reports the fate of sewage from households. The most recent dataset was from the 1990 Census, which is now almost 30 years old. For the proposed Management Zone, the density of septic systems was estimated using the number of household data from the most recent 2010 census block spatial coverage. The census block coverage was used by erasing areas within City boundaries (CalTrans dataset) or community water system (CWS) service areas (CEHTP dataset). The proportion of area erased was used to reduce the number of households associated with the census block that is likely hooked up to a sewer system. The remaining households outside city and CWS service areas were assumed to have septic systems. **Figure 2-8** illustrates the estimated location and density of septic systems by assigning random locations within remaining census blocks (i.e., areas not served by a sewer system) with the restriction that no septic system can be within 100 feet of another septic system (per California Code).



**Figure 2-8. Estimated Locations of Septic Systems within the Proposed Management Zone.**