3.2.2.3 Zone 5

Zone 5 comprises the lower portion of the Auburn Ravine watershed where agricultural water deliveries are made to PCWA customers through the Moore and Pleasant Grove canals.

Although water quality measurements were not taken in the Auburn Ravine watershed during this study, some data were collected by other sources and are summarized below.

Water Temperature and Dissolved Oxygen

Water temperature data collected from other sources include hourly temperature monitoring conducted by Bailey Environmental between April 1999 and August 2003 at Fowler Road, the NID gaging station near Highway 65 in Lincoln, Moore Road, and the Aitken Ranch. Temperature data from this project show summer values (May 28 to August 4, 2003) ranging from approximately 62 °F to 82 °F, fall values (September 9 to December 28, 2002) ranging from 48 °F to 69 °F, winter values (January 1 to April 27, 2003) ranging from 43 °F to 64 °F, and spring values (May 1 to July 31, 2003) ranging from 50 °F to 73 °F (Sierra Business Council 2003).

pH, Alkalinity, and Hardness

Data on pH were collected monthly by the DWR in the lower portion of the Auburn Ravine watershed. The data reveal a wide range of pH values (5.6 to 7.7), but the lower end of this range is considered extremely low for the types of streams found in the Sierra Nevada Foothills (Placer County Planning Department 2003).

Results for pH were also measured by the Lincoln High School Water Quality Monitoring Program (funded by NID, Placer County, and the City of Lincoln) at three sites along the Auburn Ravine: Mackenroth Property (September 21, 2002), the Highway 193 Bridge crossing (October 7, 2002) and the Joiner Parkway Bridge crossing (September 23, 2001). Results for pH were 7.7, 7.7, and 7.16, respectively (Placer County Planning Department 2003).

Turbidity and Total Suspended Solids

Turbidity and TSS in the Auburn Ravine were measured at the Lincoln and Auburn WWTPs under NPDES permit requirements. TSS loads were observed to significantly increase in winter and spring, likely from stormwater runoff. During low flows in Auburn Ravine, turbidity was measured at less than 1 NTU. Turbidity loads of greater than 2 NTUs were measured in the effluent from the Lincoln WWTP during this time (Placer County 2002). Turbidity was also measured in the Auburn Ravine by DWR between January 2001 and January 2002. Turbidity results ranged from 5 to 33 NTUs, with one higher value of 136 NTUs in December 2001.

Specific Conductivity and Ions

Previous water quality studies characterizing SC values within the Auburn Ravine watershed in Zone 5 were not identified for this study. Electrical conductivity, not SC, which is normalized to a temperature of 77 °F (25 °C), was measured by the Lincoln High School Water Quality Monitoring Program at three sites along the Auburn Ravine: Mackenroth Property (September 21, 2002), the Highway 193 Bridge crossing (October 7, 2002) and the Joiner Parkway Bridge

crossing (September 23, 2001). Electrical conductivity was measured at 0.152, 0.056, and 0.072 mS/cm, respectively (Sierra Business Council 2003).

Nitrogen and phosphorus were measured at the Auburn WWTP in 1995 (Placer County 2002). Although nitrogen and phosphorus levels in Auburn WWTP effluent averaged 0.5 mg/L, Auburn Ravine downstream from the Auburn WWTP did not show evidence of eutrophication. However, Auburn Ravine downstream from the Lincoln WWTP was observed to be influenced by both wastewater effluent and stormwater runoff.

Nitrates were also measured by the Lincoln High School Water Quality Monitoring Program at three sites along the Auburn Ravine: Mackenroth Property (September 21, 2002), the Highway 193 Bridge crossing (October 7, 2002) and the Joiner Parkway Bridge crossing (September 23, 2001). Nitrates were measured at 0.7 mg/L, 1.1 mg/L, and 1.9 mg/L, respectively (Placer County Planning Department 2003).

Trace Elements

Data collected by Placer County for the Auburn Ravine/Coon Creek Ecosystem Restoration Plan in 1999 and 2000 show cadmium, copper, and zinc levels in the Auburn Ravine all exceed the CTR standards for aquatic life at various times throughout the year (Placer County 2002). Copper exceeded CTR standards in June, July, and October 1999 and in January, February, and April 2000.

3.2.3 Soil and Sediment Quality

The USDA-NRCS soil data indicate that 39 different soil classes and combinations of soil classes are present in PCWA Zones 1, 3, and 5. To facilitate mapping, these soil classes have been generalized into six different soil textures. Details about the distribution of these soil textures and classes are discussed by zone below. Soil permeability for Zones 1 and 3 is also discussed based on a previously published report by PCWA (2005).

3.2.3.1 Zone 3

Zone 3 is dominated by gravelly, cobbly, and stony loams of the Mariposa, Mariposa-Josephine, Cohasset, and Dubakella soil types. These coarse loams are found particularly at the heads of the steep ravines that characterize the zone. Other types of loams including sandy loam, coarse sandy loam, and silt loam are also common. Xerorthents, which include various soil textures, are found in old placer areas and cut-and-fill sites. Soils are listed by texture and classification in the order of their prevalence in **Table 3-9**. **Figure 3-95** is a map of soils by texture in Zone 3.

TABLE 3-9
ZONE 3 SOILS BY GENERALIZED TEXTURE AND CLASSIFICATION

Soil Texture[1]	Soil Classifications[2]
Gravelly, cobbly, and stony loam	Mariposa, Mariposa-Josephine, Cohasset, Dubakella
Loam	Sites, Josephine, Boomer, Cohasset
Sandy loam and coarse sandy loam	Maymen, Boomer
Variable	Xerorthents
Silt loam	Auburn-Sobrante

Source: Soil Survey Staff, Natural Resources Conservation Service (USDA-NRCS). 2008.
Note:
[1] Soil textures provided in order of prevalence
[2]The soil classifications listed in this table account for 95 percent of the total area of Zone 3. The remaining 5 percent of the area is covered by eight additional classes.

Soil permeability is moderate to high (26 to 480 inches per day) within much of lower Zone 3 (PCWA 2005).

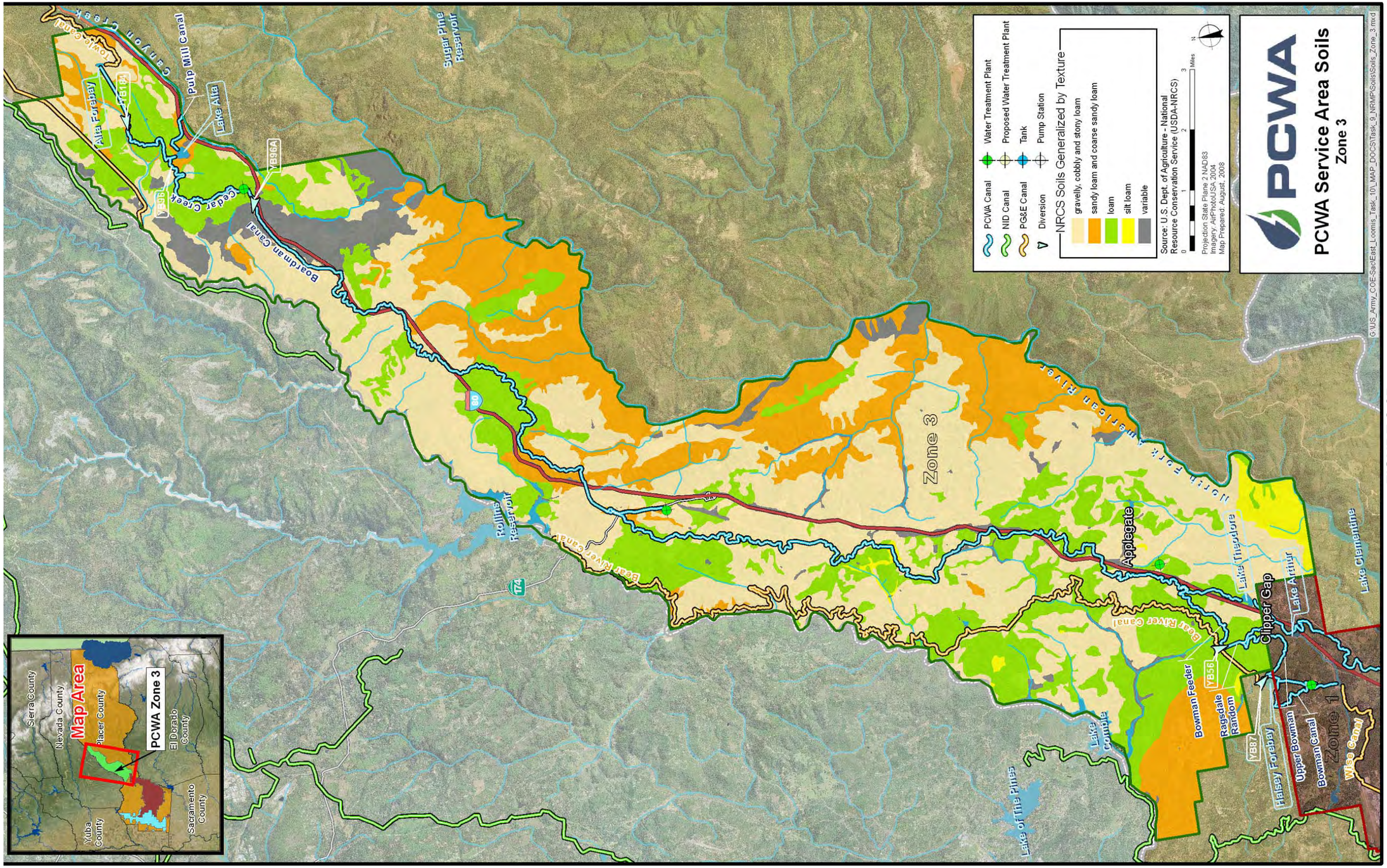

FIGURE 3-95
ZONE 3 SOILS MAP

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3.2.3.2 Zone 1

Much of Zone 1 is underlain by the Rocklin Pluton, an igneous formation intruded during the Lower Cretaceous period[1]. The Rocklin Pluton is composed of quartz-diorite (Olmsted 1961, Swanson 1978, Wagner et al. 1987). In southwestern Zone 1, the sedimentary Mehrten Formation overlies the Rocklin Pluton. The Mehrten is a groundwater-bearing formation composed of moderately to well-indurated andesitic sand to sandstone interbedded with conglomerate, tuffaceous siltstone, and claystone. It was deposited in the mid-Cenozoic era[2] (DWR 2006).

The minerals composing the parent material for soils throughout the Zone 1 service area include quartz, plagioclase feldspar, alkali feldspar, biotite, and hornblende. Common chemical constituents in these minerals include aluminum, oxygen, and silica. Additional chemical constituents, depending on the parent material, may include calcium, iron, magnesium, potassium, and sodium.

Upper Zone 1 is characterized by silt loams, while lower Zone 1 is dominated by the coarser Andregg and other sandy loams. Gravelly, cobbly, and stony loams are found in western Zone 1, along with small areas of Alamo clay soil. Xerofluvents with variable textures are located along unlined canals, drainages, and along Auburn, Secret and Miners ravines. Xerorthents, also with variable textures, are present in cut and fill areas in western Zone 1. Soils in Zone 1 are listed by texture and classification in the order of their prevalence in **Table 3-10**. Zone 1 soils are mapped by texture in **Figures 3-96** and **3-97**.

TABLE 3-10
ZONE 1 SOILS BY GENERALIZED TEXTURE AND CLASSIFICATION

Soil Texture[1]	Soil Classifications[2]
Sandy loam and coarse sandy loam	Andregg, Sierra, Cometa-Ramona, Caperton-Andregg, Boomer
Gravelly, cobbly, and stony loam	Exchequer, Inks, Inks-Exchequer,
Loam	Fiddyment-Kaseberg, Boomer, Cometa-Fiddyment
Silt loam	Auburn, Auburn-Sobrante
Clay	Alamo
Variable	Xerorthents, Xerofluvents

Source: Soil Survey Staff, Natural Resources Conservation Service (USDA-NRCS). 2008.
Notes:
[1] Soil textures provided in order of prevalence
[2] The soil classifications listed in this table account for 85 percent of the total area of Zone 1. The remaining 15 percent of the area is covered by 18 additional classes.

Soil permeability is moderate to high (26 to 480 inches per day) within much of lower Zone 1. Soils of moderately low permeability (9 inches per day) to low permeability (1 to 3 inches per day) lie along the center of lower Zone 1, from the northeast head of the system to the head of Dry Creek in the southwest (PCWA 2005).

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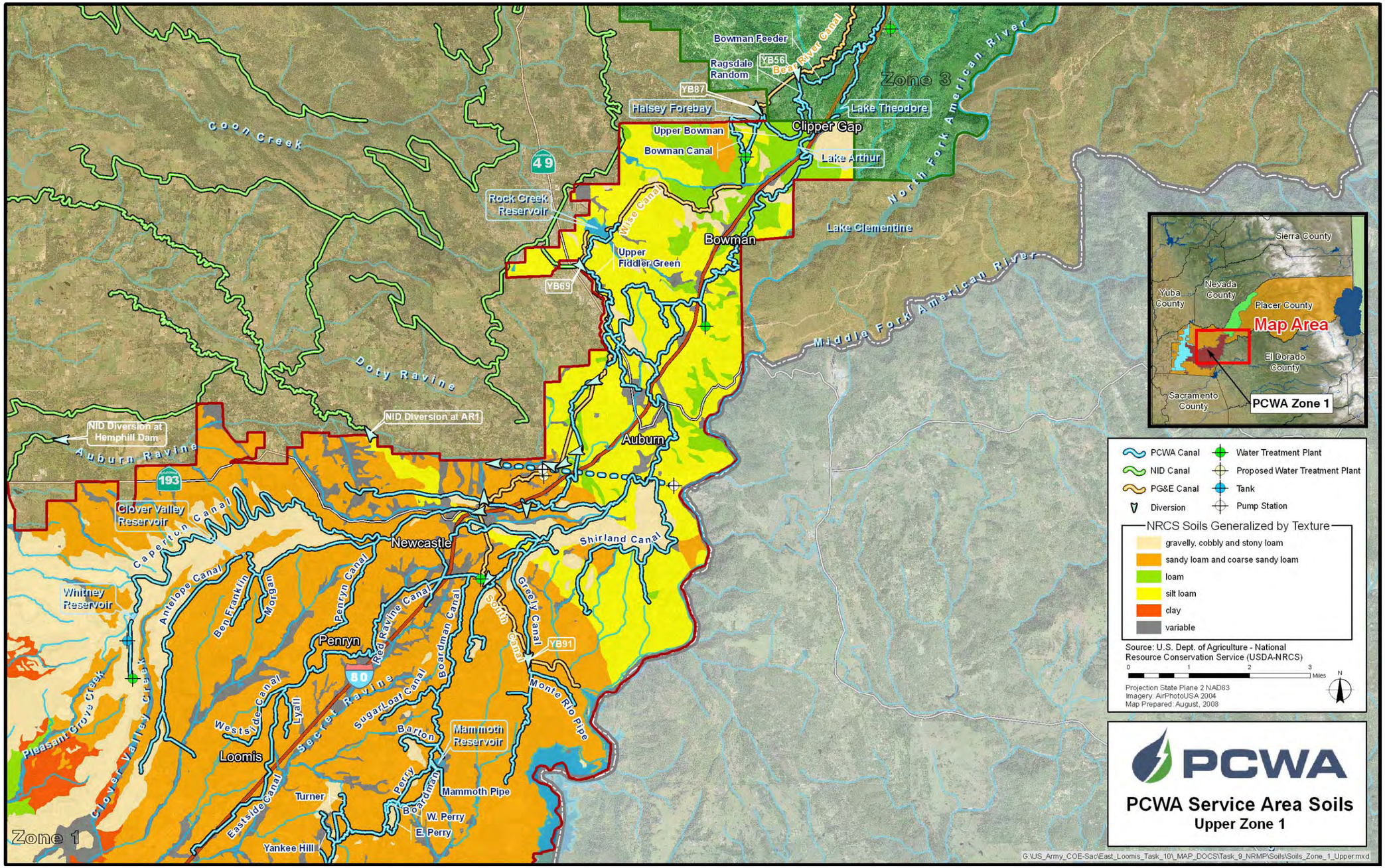

FIGURE 3-96
UPPER ZONE 1 SOILS MAP

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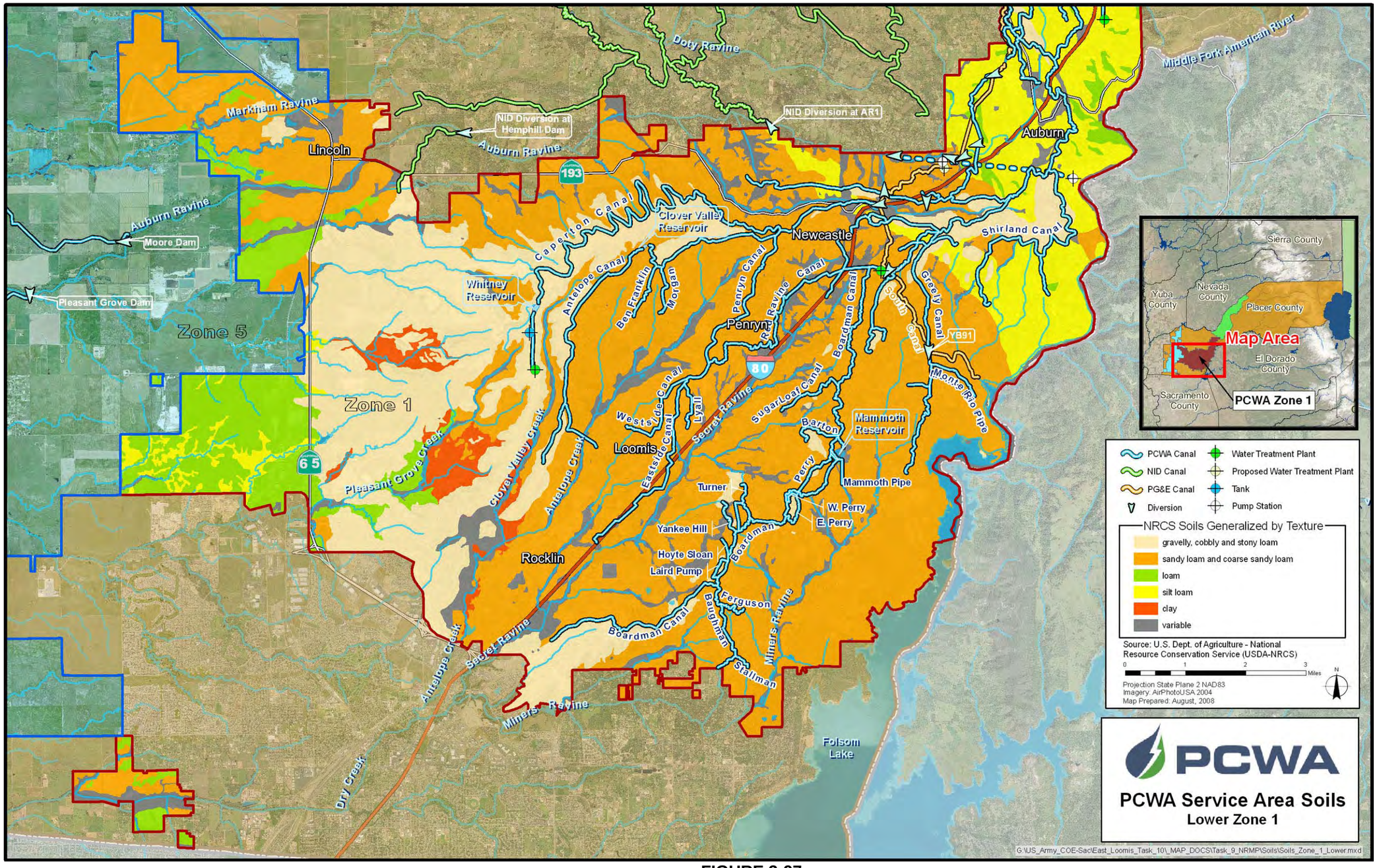

FIGURE 3-97
LOWER ZONE 1 SOILS MAP

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3.2.3.3 Zone 5

Zone 5 is dominated by Cometa-Fiddyment, Kilaga, and Fiddyment loams, which are found in the southern part of the zone. Sandy loam and coarse sandy loams are present in central Zone 5, and gravelly, cobbly, and stony loams make up the majority of soils in the northern part of the zone. Xerofluvents with variable textures are found at the bottoms of the major drainages, including Auburn and Doty ravines and Pleasant Grove Creek. Soils in Zone 5 are listed by texture and classification in the order of their prevalence in **Table 3-11**. Zone 5 soils are mapped by texture in **Figure 3-98**.

TABLE 3-11
ZONE 5 SOILS BY GENERALIZED TEXTURE AND CLASSIFICATION

Soil Texture[1]	Soil Classifications[2]
Loam	Cometa-Fiddyment, Kilaga, Fiddyment
Sandy loam and coarse sandy loam	San Joaquin-Cometa, Cometa-Ramona
Gravelly, cobbly, and stony loam	Redding-Corning
Silt loam	Alamo-Fiddyment
Variable	Xerofluvents

Source: Soil Survey Staff, Natural Resources Conservation Service (USDA-NRCS). 2008.
Note:
[1] Soil textures provided in order of prevalence
[2]The soil classifications listed in this table account for 95 percent of the total area of Zone 5. The remaining 5 percent of the area is covered by eight additional classes.

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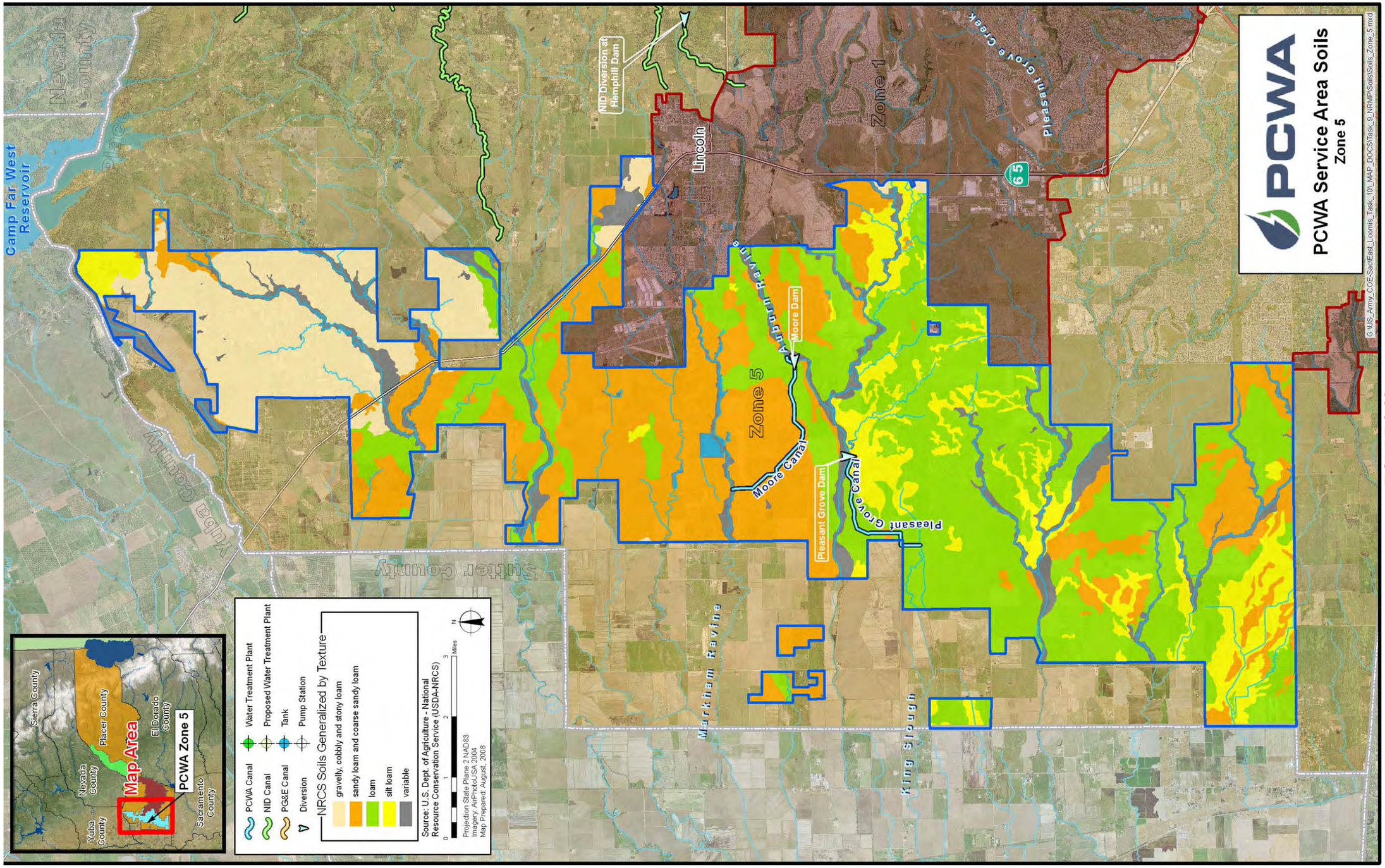

FIGURE 3-98
ZONE 5 SOILS MAP

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3.3 BIOLOGICAL RESOURCES SETTING

The following sections describe terrestrial and aquatic habitat and species within the PCWA raw water distribution system area during routine canal operations.

3.3.1 Terrestrial Habitat and Species

Habitat types in the study area vary in structure and composition throughout the study area. The study area ranges from Lake Alta in the Sierra Nevada foothills at an elevation greater than 3,000 feet msl down to nearly sea level at the western boundary of Zone 3, approximately 50 miles to the southwest. In general, forested habitat types are more common in the higher elevations in the eastern portions of Zone 3. Moving west through Zones 1 and 5, agricultural, urban (including rural residential), and herbaceous habitat types become more common. The following sections describe habitats in the areas that may be directly or indirectly affected by O&M activities. Refer to **Section 3.1** for a description of habitat types, including discussions of associated species.

3.3.1.1 Zone 3

Habitat types along canals in Zone 3 (primarily Boardman Canal) are generally forested, with montane hardwood being the most common (**Figure 3-99**). Douglas-fir and ponderosa pine habitats also frequently occur. Less common habitats include urban (forested and rural residential) and annual grassland.

Reservoirs in Zone 3 that could be directly affected by O&M activities include Lake Alta, Lake Theodore, and Lake Arthur. Lake Alta is located within Sierra Nevada montane forest habitat dominated by Douglas-fir. Oaks and incense cedar also occur in the canopy. Habitat surrounding Lake Theodore is mapped as an urban, oak woodland, and annual grassland. The area around Lake Arthur is mapped as oak woodland, montane hardwood, and montane hardwood conifer.

Canyon Creek traverses a variety of habitats, predominately montane hardwood, montane hardwood conifer, ponderosa pine, urban, and barren.

3.3.1.2 Zone 1

Zone 1 contains the largest number and extent of canals in the study area. Canals traverse a number of different habitat types (**Figures 3-100** and **3-101**). Urban habitats are the most common along canals, specifically rural residential, suburban, and forested urban areas. Forested habitat types are also very common and are largely dominated by oaks. Other less common habitat types include wetlands, agricultural areas, and chaparral.

Five reservoirs have been identified in Zone 1 that may be directly impacted by O&M activities. McCrary Reservoir occurs in a rural residential area. Mammoth Reservoir is surrounded by several habitat types including rural residential, rural residential forested, annual grassland, and agricultural. Clover Valley Reservoir occurs in an oak woodland area, with valley foothill riparian forests bordering the Antelope Canal, which drains into and out of the reservoir. Caperton Reservoir is bordered by rural residential, oak woodland, and annual grassland habitat types. Whitney Reservoir is bordered by oak savannah and oak woodland habitats.

Auburn Ravine in Zone 1 lies within the City of Lincoln. In this area, Auburn Ravine is predominately forested, composed of mature trees with canopy cover generally more than 50 percent. Tree species include Fremont cottonwood, Oregon ash, and willow (Placer County Planning Department 2002).

3.3.1.3 Zone 5

Two canals that could be affected by O&M activities fall within Zone 5: Pleasant Grove Canal and Moore Canal. Habitat types along these canals are primarily disturbed, agricultural lands, generally grasslands and croplands, including rice fields (**Figure 3-102**). Some grassland areas adjacent to these canals have been identified as containing vernal pool complexes.

Auburn Ravine in Zone 5 is predominately forested and supports Fremont cottonwood, Oregon ash, and willow. The eastern portion of Auburn Ravine in Zone 5 is more densely forested, with canopy cover generally greater than 50 percent. Canopy cover decreases to less than 50 percent in the western portion of Zone 5 (Placer County Planning Department 2002).