# Nacimiento Water Project
# Initial
# Watershed Sanitary Survey

San Luis Obispo County
Flood Control and Water Conservation District

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## Submitted to

California Department of Public Health
Division of Drinking Water and Environmental Management
Drinking Water Program District 06 – Santa Barbara
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## Prepared by

County of San Luis Obispo
Flood Control and Water Conservation District
Department of Public Works and Transportation
Water Quality Laboratory

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# INITIAL WATERSHED SANITARY SURVEY INFORMATION

## SYSTEM INFORMATION

California Department of Public Health System Number 4010080
Nacimiento Water Project

| | |
|---|---|
| Survey Completed: | 2011 |
| Survey Report Written: | 2012 |
| Report Submitted to CDPH: | 2014 |

## PREPARER INFORMATION

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## SURVEY DESCRIPTION

| | |
|---|---|
| Name of Watershed: | Nacimiento Reservoir Watershed |
| Total Watershed Size: | 208,060 acres |
| Location: | Monterey County and San Luis Obispo County |

Agencies using this watershed as a source of supply:

Nacimiento Water Project Participants

- City of Paso Robles
- Templeton Community Services District
- Atascadero Mutual Water Company
- City of San Luis Obispo

Other agencies

- Heritage Ranch Community Services District
- Laguna Vista Boat Club
- Monterey County Parks Department
- Nacimiento Water Company (Oak Shores)
- Northshore S&B

# WATERSHED SANITARY SURVEY CHECKLIST

The guidance manual that was followed in writing this report includes a Watershed Sanitary Survey Checklist (American Water Works Association). According to the guidance manual, the checklist is "intended to aid water agencies in identifying key areas that will require investigation or research efforts to adequately complete the initial sanitary survey. All 'significant' answers should be addressed in the sanitary survey. All 'unknown' answers signify that insufficient information is available, and should also be considered to require further investigation or explanation. All 'not significant' answers need not be addressed in the sanitary survey. In the 'comments' column, indicate the source of information."

The guidance manual places the checklist here, at the beginning of the report. During the review period it was discovered that this placement of the checklist was confusing to readers and led to misunderstandings about its purpose. Therefore the completed checklist has been moved to Appendix 9.1.

# SUMMARY

The Nacimiento Reservoir and its watershed are both large and complex. Many public agencies and private parties own land in the watershed. Many different entities and individuals work, live, and recreate in the watershed and on the reservoir. The Nacimiento Reservoir is a drinking water supply. The San Luis Obispo County Flood Control and Water Conservation District (District) has an allocation of 17,500 acre-feet per year of Nacimiento Reservoir water. Many different agencies have jurisdictional authority in the watershed.

The reservoir is highly valued for the water-based recreational opportunities that it affords, including fishing, swimming, boating, and water skiing. The reservoir and its watershed both provide highly valued rural living opportunities. The watershed provides opportunities for extensive agricultural activities, including grazing and cropland, especially viticulture. Many other activities occur or have taken place in the watershed, including military uses and mining.

Consequently, there are many potential contaminant sources in the watershed which present a risk to the reservoir as a drinking water source. Many of these present both short term and long term water quality risks. Several sources are anticipated to increase in coming years.

The greatest risks to the Nacimiento Reservoir as a drinking water supply come from extensive grazing, unlimited body contact recreation, numerous domestic wastewater facilities, and the potential for a large wildland fire. Urban development and agricultural cropland are increasing and may present future risks. Variable risk levels are presented by military activities and illicit commercial crops.

A special contaminant of concern is mercury from abandoned mercury mines in the watershed. Although mercury currently does not present a risk to the reservoir as a drinking water supply, its presence in the environment has led to its accumulation in fish in Nacimiento Reservoir at levels that are unsafe for human consumption. Public awareness of this issue can lead to concerns about the safety of the water supply.

These potential contaminant sources can lead to pathogen loading, solids loading, and algal growth, along with many other deleterious water quality effects. These in turn can lead to the following problems in the drinking water supply:

- Increased consumer health risk (short term and long term effects)
- Decreased consumer acceptance
- Increased treatment costs
- Increased risk of not meeting regulatory requirements for drinking water purveyors

Control measures that will help reduce the risk from these potential contaminant sources include the use of best management practices in agricultural and industrial operations, implementation of stormwater pollution prevention practices in developed areas, and remediation of abandoned mercury mines.

Whereas the District has no jurisdictional authority in the watershed, and therefore has little ability to directly affect watershed activities and watershed management practices, the County of San Luis Obispo has land use approval authority over the lower portion of the Nacimiento watershed. There are some existing control measures that may protect water quality, but only to the degree that they are implemented and enforced. The large number of potential contaminant sources, the watershed's large size, and the reservoir's remote location make effective implementation and enforcement efforts difficult. Instead, the District must rely on developing cooperative efforts to protect water quality with individuals and entities that use the watershed and that may have jurisdictional authority. A well-designed water quality monitoring program is important to help the District identify significant water quality impacts from potential contaminant sources and to focus water quality protection efforts where they can be most effective.

# 1 INTRODUCTION

## 1.1 Sanitary Survey Requirements

In 1974 Congress passed the Safe Drinking Water Act (SDWA) to protect public health by regulating the nation's public drinking water supply. Originally, the SDWA focused primarily on treatment as the means of providing safe drinking water at the tap. Amendments passed in 1996 established a strong new emphasis on preventing contamination problems through source water protection and enhanced water system management.

Surface water (lakes, reservoirs, rivers, and ground water under the influence of surface water) can contain many contaminants which may pose a risk to drinking water consumers. Following passage of the 1996 SDWA amendments, the federal government and the state of California developed a series of regulations to minimize the health risk to consumers whose drinking water source is from a surface water supply or from a ground water system that is under the direct influence of surface water. These regulations include a requirement to conduct a watershed sanitary survey (see California Code of Regulations, Title 22, Chapter 17, Article 7, section 64655).

The purpose of the watershed sanitary survey is to protect surface water sources from contamination by doing the following:

- Identify existing or potential sources of contamination or any other watershed-related factor which might adversely affect water quality
- Compare relative risks to water quality from existing or potential contaminant sources
- Interpret existing water quality data
- Describe existing control measures to protect water quality
- Identify gaps in existing water quality protection controls
- Identify ways to improve water quality protection
- Design a water quality monitoring program to evaluate the impact of existing and potential contaminant sources and of water quality protection measures

Protecting source water from contamination means that the cleanest possible water will enter the drinking water treatment plant or ground water system, which has the following benefits:

- Protects public health by reducing the risk of contaminants reaching consumers should there be a failure in the treatment process. This is especially important for sensitive subpopulations such as infants and immuno-suppressed individuals.
- Improves effectiveness of treatment process
- Reduces cost of treatment
- Increases water treatment plant's ability to comply with existing and future regulatory requirements

- Reduces risk to consumers from uncertainties posed by a growing number of unknown or unregulated contaminants
- Reduces risk of adversely impacting ground water supply

## 1.2 Objectives

The main objectives of this watershed sanitary survey are to:

- Satisfy the regulatory requirement for a watershed sanitary survey
- Describe the Nacimiento Water Project water system
- Describe existing environmental conditions in the Nacimiento Reservoir watershed
- Identify and assess existing and future potential sources of contamination in the Nacimiento Reservoir watershed
- Evaluate existing water quality data in the Nacimiento Reservoir watershed
- Describe existing watershed control and management regulations, policies, and practices
- Develop a water quality monitoring program to assess the impact of existing and potential contaminant sources and water quality control measures over time
- Make recommendations for improving watershed management practices to protect water quality in the Nacimiento Reservoir related to its use as a drinking water source

## 1.3 Conduct of Study

The survey was conducted by San Luis Obispo County Flood Control and Water Conservation District Staff. The survey covers the entire watershed for Lake Nacimiento, also referred to as Nacimiento Reservoir. This includes the watershed for the Nacimiento River upstream of the reservoir and for the reservoir itself, up to the Nacimiento Dam. It does not cover areas that drain into the Nacimiento River downstream of the dam (Figure 1).

Information was obtained from the following sources. Primary sources were sought and used whenever possible, but some secondary sources were used as well.

- Publicly available maps[1], documents, databases, and internet web sites provided by federal, state, and local agencies and by reputable scientific institutions
- Interviews with federal, state, and local agency staff
- Field surveys on foot, by car, by boat, and by air

1 Unless indicated otherwise, all maps in this report were produced by the San Luis Obispo County Department of Public Works and Transportation.

## 1.4 Report Organization

The report is organized according to the *Watershed Sanitary Survey Guidance Manual,* published by the American Water Works Association, California-Nevada Section, 1993, and contains the following major sections:

- Introduction
- Watershed and Water Supply System
- Potential Contaminant Sources in the Watersheds
- Watershed Control and Management Practices
- Water Quality
- Conclusions and Recommendations


**Figure 1: Nacimiento Reservoir Watershed**

# 2 WATERSHED AND WATER SUPPLY SYSTEM

## 2.1 WATERSHED

### 2.1.1 Land Use and Natural Setting

#### 2.1.1.1 Land Use

The Nacimiento Reservoir watershed encompasses 208,060 acres[2] (325 square miles). Almost exactly half of this area, 104,480 acres, lies in Monterey County. The other half, 103,580 acres, lies in San Luis Obispo County.

The watershed can be divided into two major sections – the upper watershed, which drains into the Nacimiento River, and the lower watershed, which drains directly into the Nacimiento Reservoir. These two major sections are also nearly identical in size, with 104,670 acres in the upper watershed, and 103,390 acres in the lower watershed. The upper watershed lies almost entirely in Monterey County, and the lower watershed lies almost entirely in San Luis Obispo County (Figure 2).

The upper watershed is comprised largely of federally owned land (87%). The Nacimiento River originates in the Santa Lucia Mountains just south of Cone Peak, within the Los Padres National Forest (LPNF). The Forest is owned and managed by the United States Department of Agriculture Forest Service, and covers 11,400 acres (11%) of the upper watershed. The river travels 10 miles through the forest before reaching Fort Hunter Liggett (FHL), a United States Department of the Army training installation, which occupies 79,960 acres (76%) of the upper watershed (Figure 3, Figure 4). The river travels 19 miles through FHL, then another 7 miles through privately owned land before reaching the 800' elevation which marks the beginning of the reservoir. Nearly all of the remaining 13% of the upper watershed is privately owned and zoned for agricultural use (13,310 acres) (Figure 5).

The lower watershed is comprised largely of privately owned land, much of which is zoned for agricultural use (54,500 acres; 53% of lower watershed), along with rural lands (23,400 acres; 23% of lower watershed) and open space (11,250 acres; 11% of lower watershed). At maximum capacity Nacimiento Reservoir occupies 5,727 acres. The remaining 8,510 acres in the lower watershed are zoned for residential use or recreation.

The only significant public land ownership in the lower watershed is that which is owned by the Monterey County Water Resources Agency (MCWRA), which owns and operates the dam and the reservoir. MCWRA owns 10,062 acres of land in the lower watershed.

2 All measurements have some inherent error. Acreage values reported here may differ slightly from those reported elsewhere. All acreages were rounded to the nearest ten for use in this report.

Of this, 7,114 acres are above the 800’ elevation and adjacent to the reservoir, and 2,948 acres are below the 800’ elevation. Additionally, the Federal Bureau of Land Management owns 2,208 acres of land in the lower watershed (Figure 6).

A majority of the watershed is undeveloped open space. The only significant population centers in the watershed are located on the shore of Lake Nacimiento; the remainder of the watershed is rural and sparsely populated. Numerous small communities have been developed along the lake shore (Figure 7). A total of approximately 2,933 lots[3] have been developed for residential use around the lake shore (Table 1).

**Table 1: Developed lots around Lake Nacimiento**

| Shore | Community | Number of developed lots* |
|---|---|---|
| North | Christmas Cove | 40 |
| North | Individual lots | ~78 |
| North | Laguna Vista Boat Club | 21 |
| North | North Shore Ski & Boat Club | 16 |
| North | Oak Shores | 634 |
| South | Cal Shasta Club | 120 |
| South | Heritage Ranch | 1,750 |
| South | Individual lots | ~20 |
| South | Ranchos del Lago | 29 |
| South | Running Deer Ranch | 105 |
| South | South Shore Village | 40 |
| South | Tri Counties Ski & Boat Club | 80 |
| | **Total** | **2,933** |

**For the purpose of this data tabulation, a lot that has a residential structure and a sewer connection is counted as a developed lot.*

3 The estimated number of developed lots is based on the number of sewer connections, including both community wastewater systems and individual septic tanks. The lot may be developed with a permanent house or with a residential trailer.

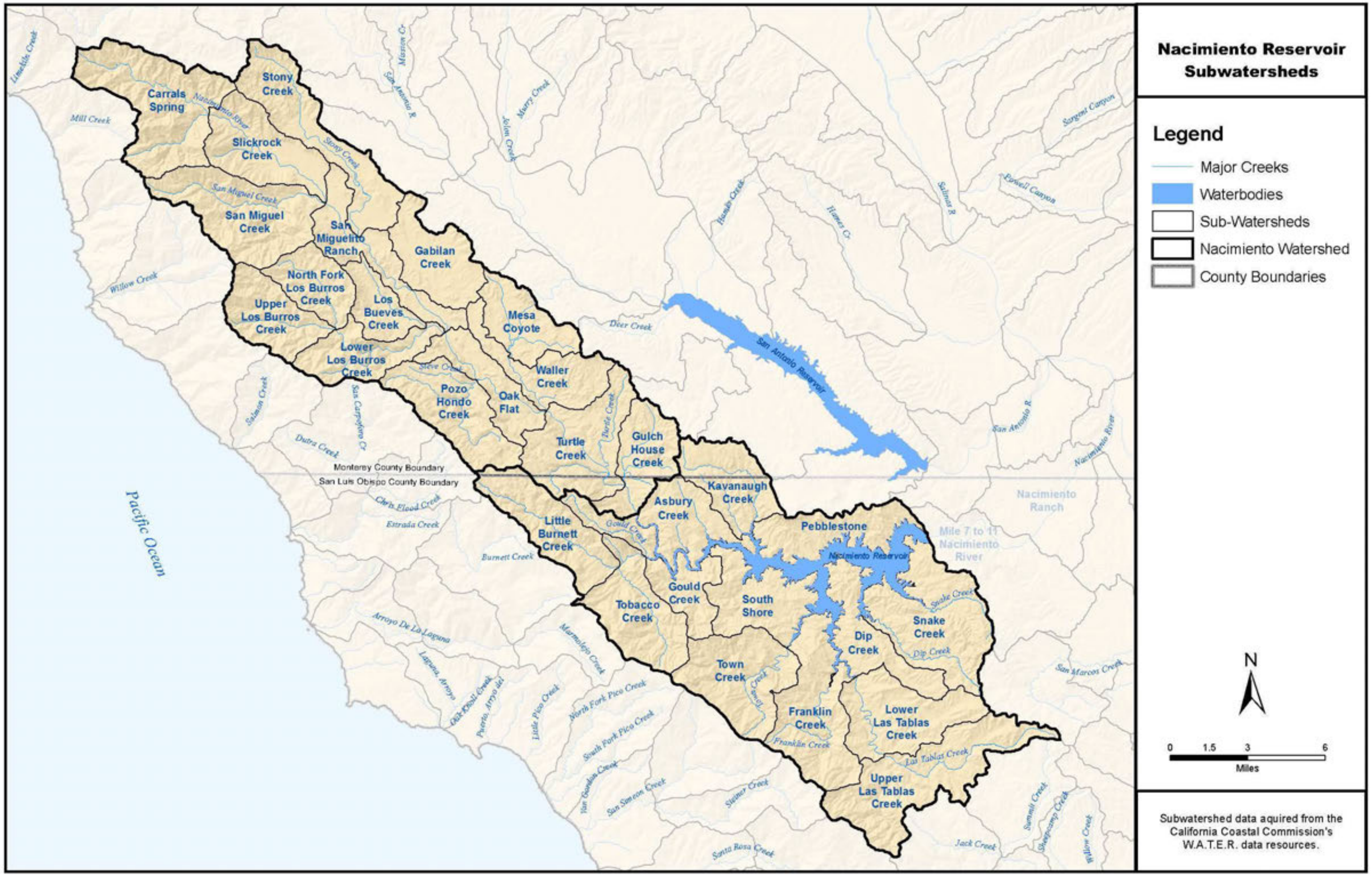



**Figure 2: Nacimiento Reservoir Watershed - Subwatersheds**

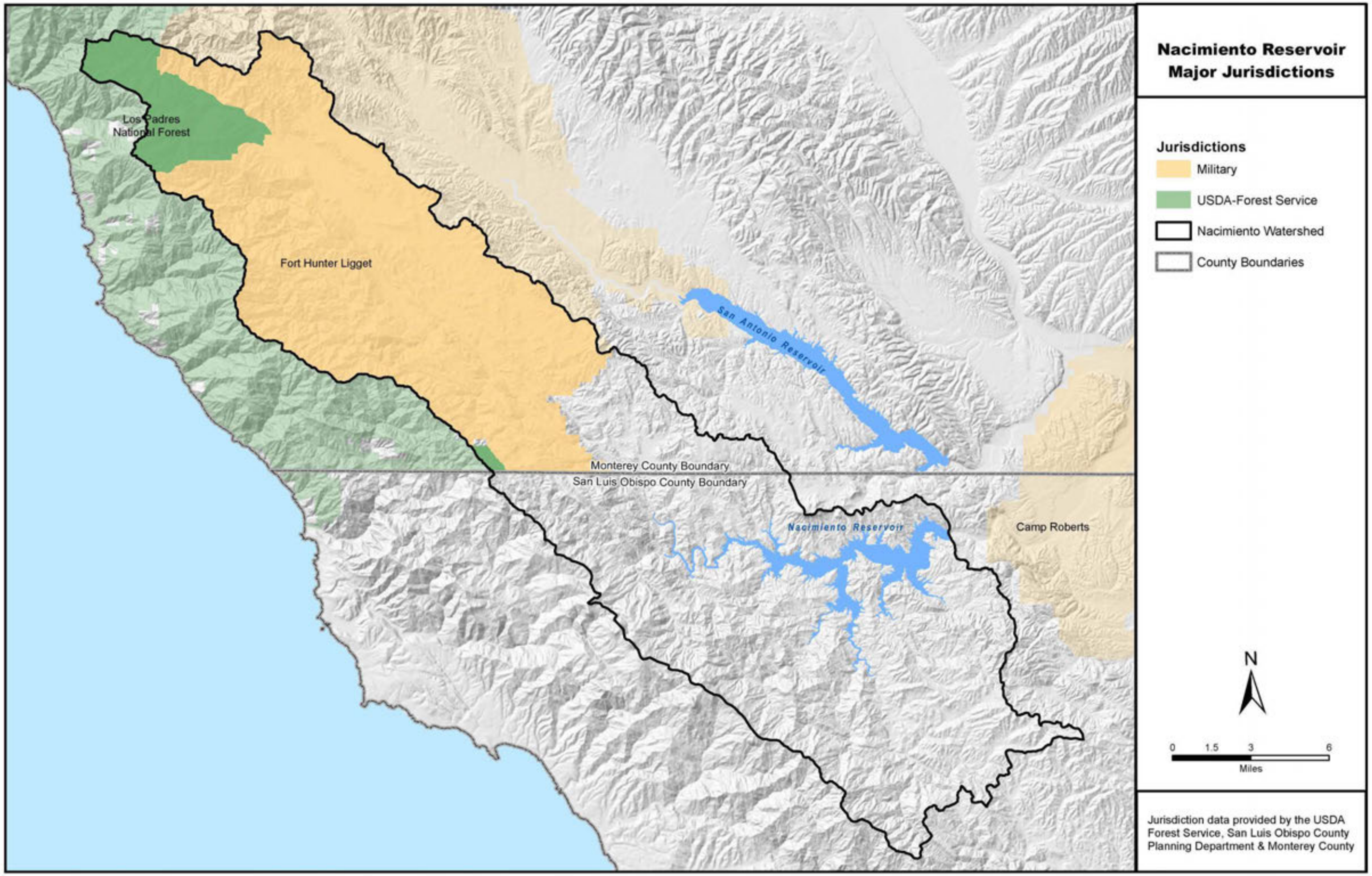



**Figure 3: Nacimiento Reservoir Watershed – Major Jurisdictions**

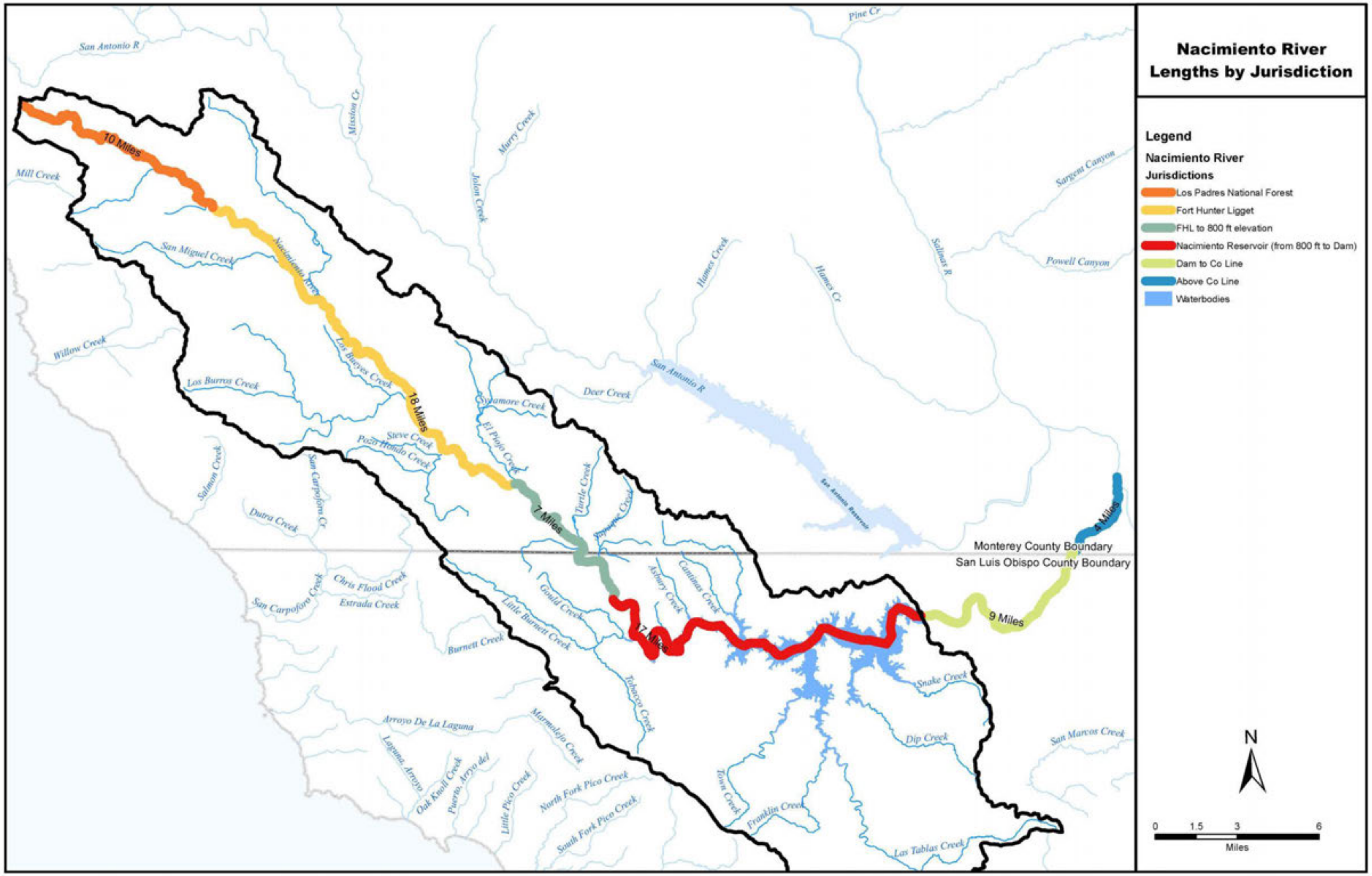



**Figure 4: Nacimiento River Lengths by Jurisdiction**

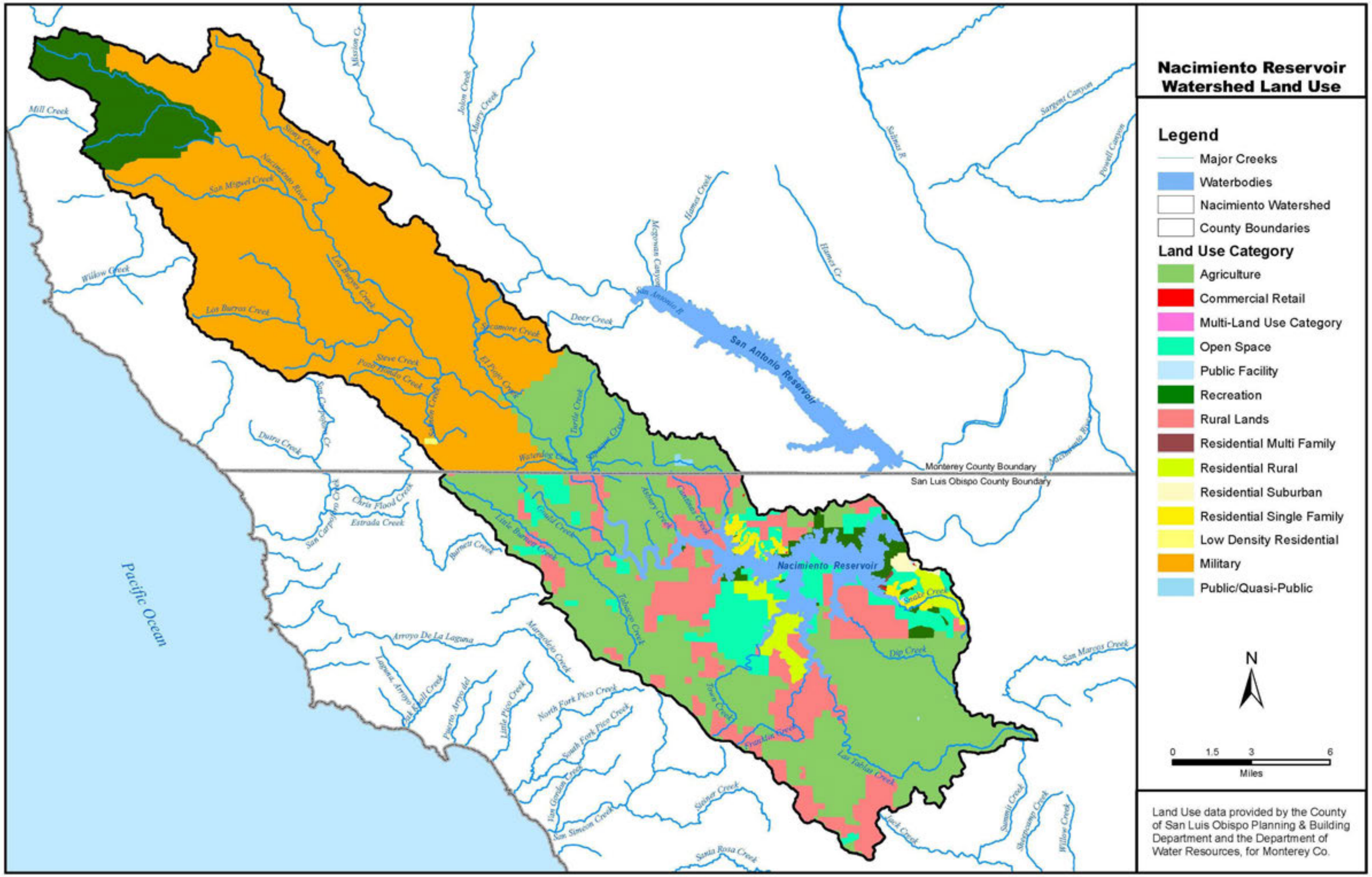



**Figure 5: Nacimiento Reservoir Watershed – Land Use**

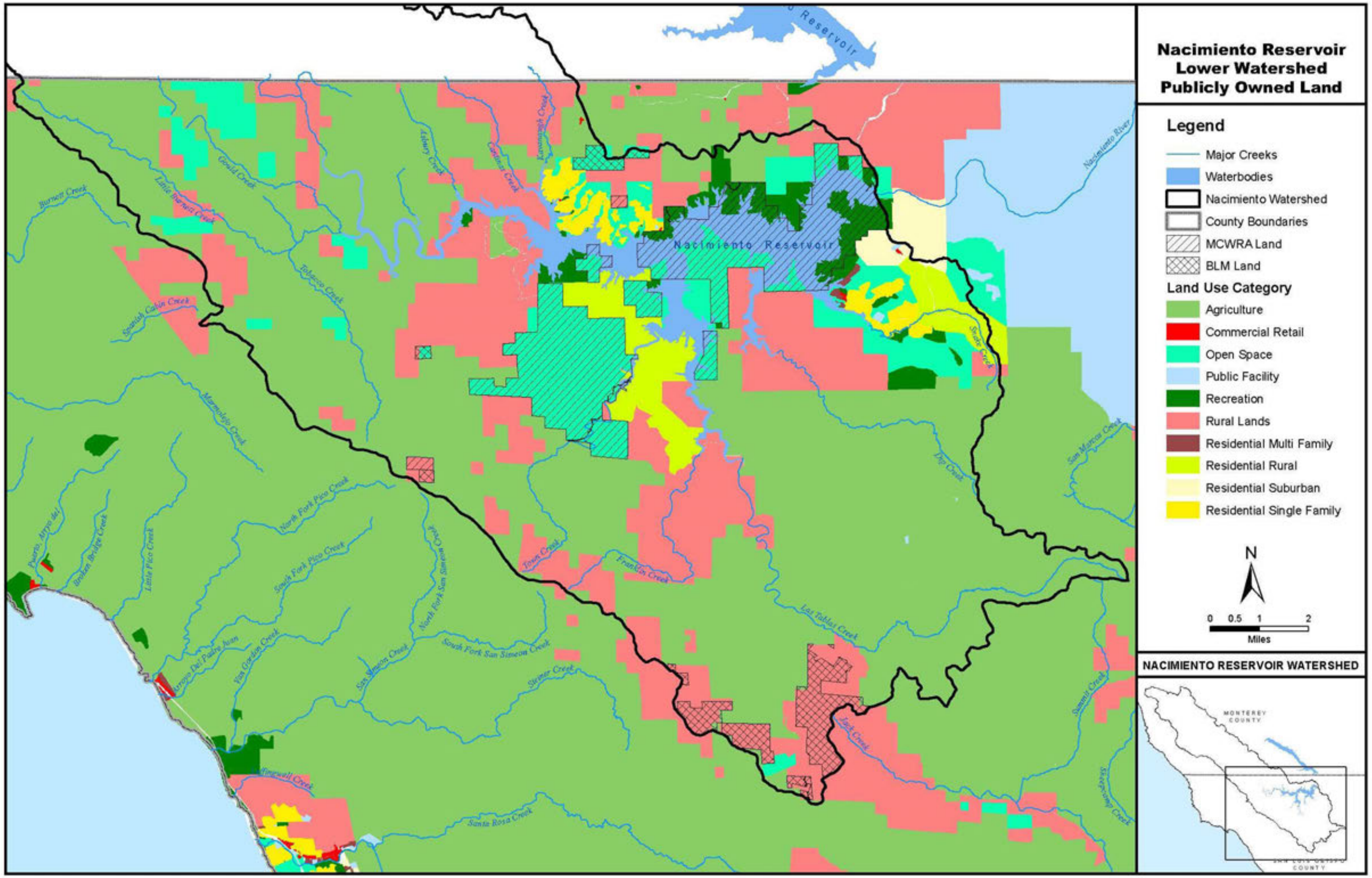



**Figure 6: Nacimiento Reservoir Lower Watershed – Publicly Owned Land**

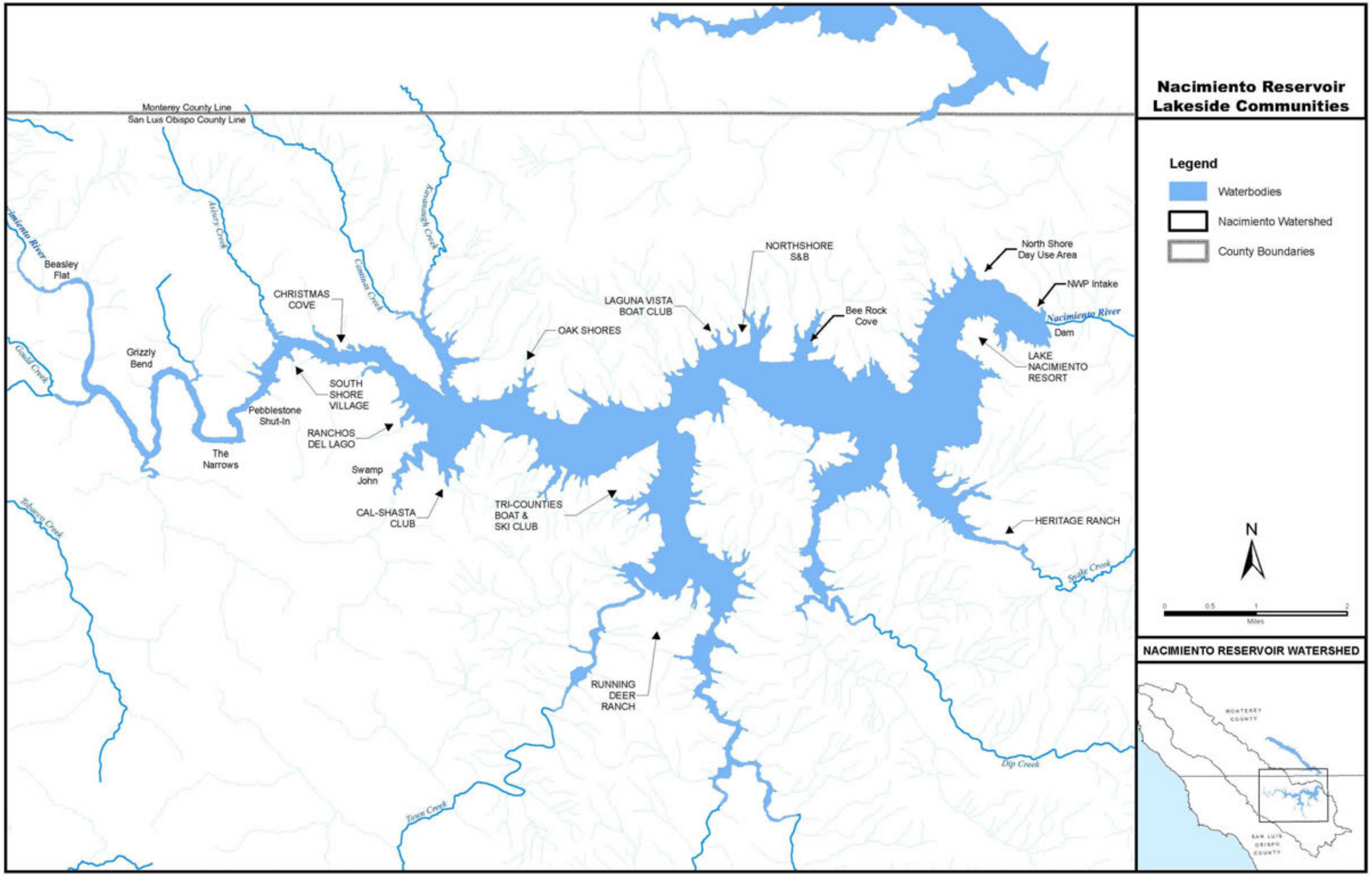
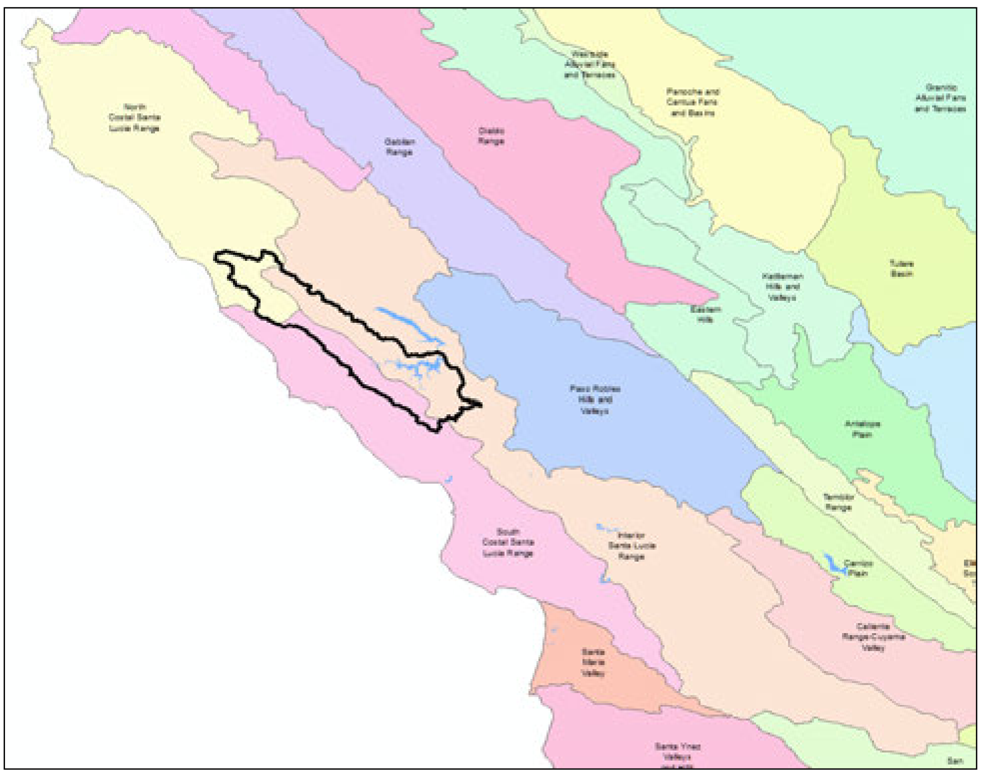



**Figure 7: Nacimiento Reservoir Lakeside Communities**

### 2.1.1.2 Natural Setting

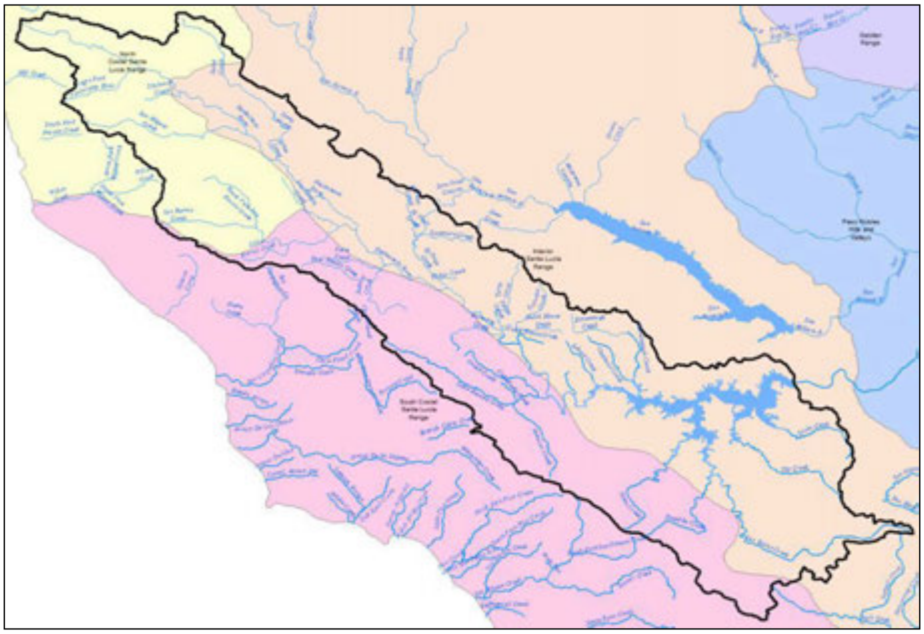
Several resources were used to find information about the natural setting in the Nacimiento Reservoir watershed.

For information about the entire watershed, a key resource used was the publication *Ecological Subregions of California, Section and Subsection Descriptions*, 1997, by the United States Department of Agriculture (USDA). The Nacimiento Reservoir watershed lies across two ecological regions (sections) as described in this publication – the Central California Coast section (section 261A) and the Central California Coast Ranges section (section M262A). These sections are further divided into subregions (subsections). The Nacimiento Reservoir watershed lies across three of these subregions. The northern and northwestern portions of the watershed lie in the southernmost part of Subsection 261Aj – North Coastal Santa Lucia Range. The western and southwestern portion of the watershed lies along the northeastern edge of Subsection 261Ak – South Coastal Santa Lucia Range. Most of the eastern portion of the watershed lies along the northwestern edge of Subsection M262Ae – Interior Santa Lucia Range (Figure 8, Figure 9).



Source: *Ecological Subregions of California*, USDA Forest Service, USDA NRCS, USDI BLM, Sept. 1997, R5-EM-TP-005
Black line = Nacimiento Reservoir Watershed boundary

**Figure 8: Nacimiento Reservoir Watershed and USDA Ecological Subsections - overview**

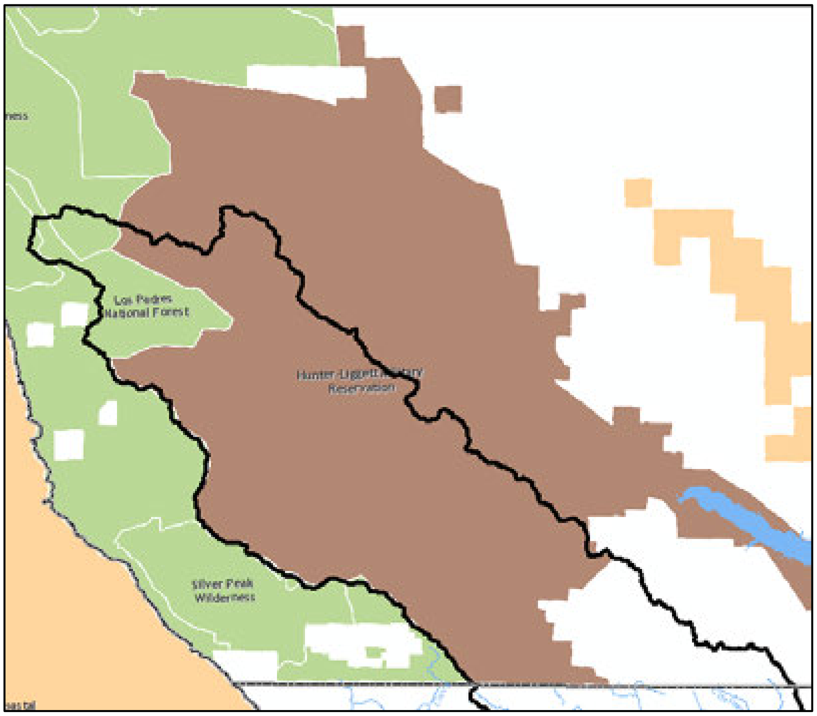


Source: *Ecological Subregions of California*, USDA, Sept 1997, R5-EM-TP-005
Black line = Nacimiento Reservoir Watershed boundary

**Figure 9: Nacimiento Reservoir watershed and USDA Ecological Subregions – detail**

The southwestern portion of FHL covers 76% of the upper watershed for the Nacimiento Reservoir (Figure 10). For information about natural features of the upper Nacimiento Reservoir watershed, two reports about Fort Hunter Liggett (FHL) constituted a key resource. These two reports are the *Integrated Natural Resources Management Plan*, August, 2004, by the United States Army Reserve Training Center, Fort Hunter Liggett (US Army Reserve Training Center, Fort Hunter Liggett, CA), and the *Fort Hunter Liggett Special Resource Study*, January 2007, by the United States Department of the Interior, National Park Service (NPS) (USDI National Park Service). The portion of the NPS report that describes natural features of FHL is reproduced in Appendix 9.2.

Other resources were used as well, including information provided by the San Luis Obispo County Department of Planning and Building, information gathered from other government agencies, and site visits by District staff.




Black line = Nacimiento Reservoir Watershed boundary
Brown area = Fort Hunter Liggett

**Figure 10: Relationship between Nacimiento Reservoir upper watershed and FHL**

### 2.1.1.2.a Topography

The Nacimiento River originates in the Santa Lucia mountain range, which forms the western border of the watershed. The watershed is characterized by rugged, largely mountainous and undeveloped terrain (Figure 11). Most of the mountains trend northwest to southeast, with rounded ridges, steep sides, and narrow canyons (USDA Forest Service). The steepest mountains are found in the northwest portion of the watershed, where the Nacimiento River originates, ranging up to 3,744 ft. high at Alder Peak, and becoming somewhat gentler toward the eastern and southern portions of the watershed, although many areas with slopes of greater than 30% can be found here (refer back to Figure 1). Within Fort Hunter Liggett in the upper watershed, slopes in the upper Nacimiento River Valley are typically less than 20%; steeper slopes (61-80%) occur primarily in the western area of the watershed, and some very small areas have slopes greater than 80% (US Army Reserve Training Center, Fort Hunter Liggett, CA).

*Photo: San Luis Obispo County Public Works Department*

**Figure 11: Nacimiento Reservoir upper watershed terrain**

### 2.1.1.2.b Geology

**Overall**

Excerpts from the USDA 1997 *Ecological Subregions* report (USDA Forest Service) that relate to the geology of the Nacimiento River watershed follow here[4]:

> Subsection 261Aj - North Coastal Santa Lucia Range This subsection is mostly on the Salinian Block, between the San Andreas and Nacimiento faults. It is predominantly Mesozoic granitic and pre-Cretaceous metamorphic rocks. There is some Cretaceous sedimentary rock of the Great Valley Sequence, considerable Miocene marine sediments, and some other Tertiary sediments. Also, there are some rocks of the Franciscan Complex on the southwest edge where the subsection crosses the Sur-Nacimiento fault zone.
>
> Subsection 261Ak - South Coastal Santa Lucia Range This subsection consists of mostly folded, faulted, and generally metamorphosed sedimentary and volcanic rocks of the Franciscan Complex and much less extensive Cretaceous sediments of the great valley sequence. Some ultramafic rock occurs in this subsection.
>
> Subsection M262Ae - Interior Santa Lucia Range This subsection is predominantly Cretaceous sedimentary rocks of the Great Valley Sequence and Miocene marine sediments. It is mostly on the Salinian block. Some rocks of the Franciscan Complex are present in the south part where the subsection crosses the Nacimiento fault.

**Upper watershed**

The geology of the Nacimiento River watershed that lies within FHL is described in the following two report excerpts. The first excerpt is from FHL's 2004 *Integrated Natural Resources Management Plan* (US Army Reserve Training Center, Fort Hunter Liggett, CA)*:*

> Fort Hunter Liggett is located in the Santa Lucia Mountain Range of the central Coast Ranges of California…The central Coast Range is underlain by two series of basement rocks. The first of the series, the Franciscan eugeosynclinal and basic intrusive rocks, is mostly composed of sandstones that were formed from the marine deposition of volcanic material. This bedrock formation is quite massive and is approximately 25,000 feet thick. The second of the series, the Sur series granitic-metamorphic complex, lies between the San Andreas and Nacimiento fault zones. This series, also known as the Salinan block, is exposed on the western portion of the installation in the Santa Lucia Range…The Nacimiento Fault separates marine sediments of the

4 Sources are excerpted *verbatim*; no corrections of grammar, punctuation, etc. were made.

> eastern portion from the western portion's metavolcanic and Franciscan volcanic rocks. Mesozoic ultramafic rocks have intruded into the volcanic rocks of the western portion of FHL. Pre-Cretaceous metamorphic rocks dominate the northern portion of the installation…

The second excerpt is from the 2007 NPS *Fort Hunter Liggett Special Resource Study* (USDI National Park Service)*:*

> The Franciscan complex … underlies the southwestern part of Fort Hunter Liggett in the Santa Lucia Range. The Franciscan rocks are dominated by greywacke (a type of sandstone)…Chert and greenstone (altered basaltic lava) commonly are found in association with greywacke … Ultramafic rocks are widely distributed throughout the Franciscan complex. Strategic minerals such as nickel and chromium are associated with these rocks. The largest mass of ultramafic rocks on Fort Hunter Liggett is located at Burro Mountain …. The ultramafic rocks … contain silicate minerals rich in magnesium…To varying degrees, the ultramafic masses have been replaced by serpentine…Small masses of serpentine are locally found along shear zones….
>
> The Nacimiento Fault separates marine sediments in the eastern third of Fort Hunter Liggett from Franciscan greenstone in the western portions of the installation …
>
> Much of the area is underlain by rocks of the Franciscan Formation that contain dark sandstone that is the chief host rock of gold-bearing deposits. In addition to gold, silver and copper deposits were found in this region …

According to the NPS study, in the late 1800s gold was mined in the Los Burros Mining District, which stretched from the Pacific Ocean to Nacimiento River; a portion of this district is located on FHL. Additionally, the study says that:

> Serpentine outcroppings in Fort Hunter Liggett have been successfully mined for asbestos and chromite … and … Small scale mining for cinnabar, serpentine and lime deposits continued into the 1950s…

**Lower watershed**

Geologic formations that are found in more than 5% of the lower Nacimiento watershed are listed in Table 2 and illustrated in Figure 12.

**Table 2: Predominant Geologic Formations in lower Nacimiento Reservoir Watershed**

| Map symbol | Geologic Formation | Acres | Approximate % of lower watershed* |
|---|---|---|---|
| Kep | El Piojo Formation, undivided | 25,857 | 25.0% |
| KJfm | Franciscan melange | 18,213 | 17.6% |
| Tml | Monterey Formation, silty shale | 15,771 | 15.2% |
| Kas | Atascadero Formation, sandstone and mudstone | 9,951 | 9.6% |
| Tvq | Vaqueros Formation, Quail Canyon Sandstone | 6,591 | 6.4% |
| KJt | Toro Formation, undifferentiated | 5,969 | 5.8% |
| *Source: San Luis Obispo County Department of Planning and Building* | | | |
| **Data is for San Luis Obispo County, which is a close approximation for the lower watershed.* | | | |

Cinnabar deposits are found throughout the lower watershed, and mercury mining occurred at several locations in this area from 1862 to 1970 (Rice, Chipping and Eatough).

One active calcium carbonate mine is located in the lower watershed, south of Nacimiento Reservoir, in the Franklin Creek subwatershed (Figure 13).

The U.S. Bureau of Land Management (BLM) has designated two Areas of Critical Environmental Concern (ACECs) which lie partially in the lower watershed (Figure 14). The Tierra Redonda ACEC encompasses Tierra Redonda Mountain, on the north side of the lower watershed. According to the BLM's 1997 *Caliente Area Resource Management Plan* (USDI Bureau of Land Management), Tierra Redonda Mountain is the type area for the Tierra Redonda Formation, a sequence of marine sedimentary rocks. This is its thickest locality, where it forms sandstone cliffs. On the south side of Tierra Redonda Mountain, the highly fossiliferous Vaqueros Formation underlies the Tierra Redonda Formation. There are sandy beds several feet thick on the south side of Tierra Redonda Mountain. The Cypress Mountain ACEC encompasses Cypress Mountain, at the southernmost end of the lower watershed. Cypress Mountain is primarily underlain by rocks of the Franciscan Complex, including serpentine and shale. Historic mines for mercury and manganese are located here; the manganese is associated with volcanic rocks found there.

**Earthquakes**

Several earthquake faults run along the west side of the entire watershed (Figure 15). Although the Nacimiento Fault Zone is considered to be inactive by some experts, this is not definitive, and the Bryson earthquake of 1952 (magnitude 6.2) is sometimes assigned to the Nacimiento fault zone. The nearby Rinconada fault zone, located immediately east of the reservoir, is considered to be potentially active.

According to the NPS *FHL Special Resource Study* (USDI National Park Service), In 1991, a seismic study by the U.S. Army Corps of Engineers predicted the Rinconada Fault could generate an earthquake with a potential 7.5 magnitude on the Richter scale, with rock (ground) accelerations ranging from 0.5 to 1.0 gravity (g) near the eastern boundary of Fort Hunter Liggett to 0.3 g along the western boundary. Given its proximity to the San Andreas and Rinconada faults and the overall geologic activity in the region, Fort Hunter Liggett is in Seismic Risk Zone II, defined as … an earthquake zone of moderate risk to people and structures…

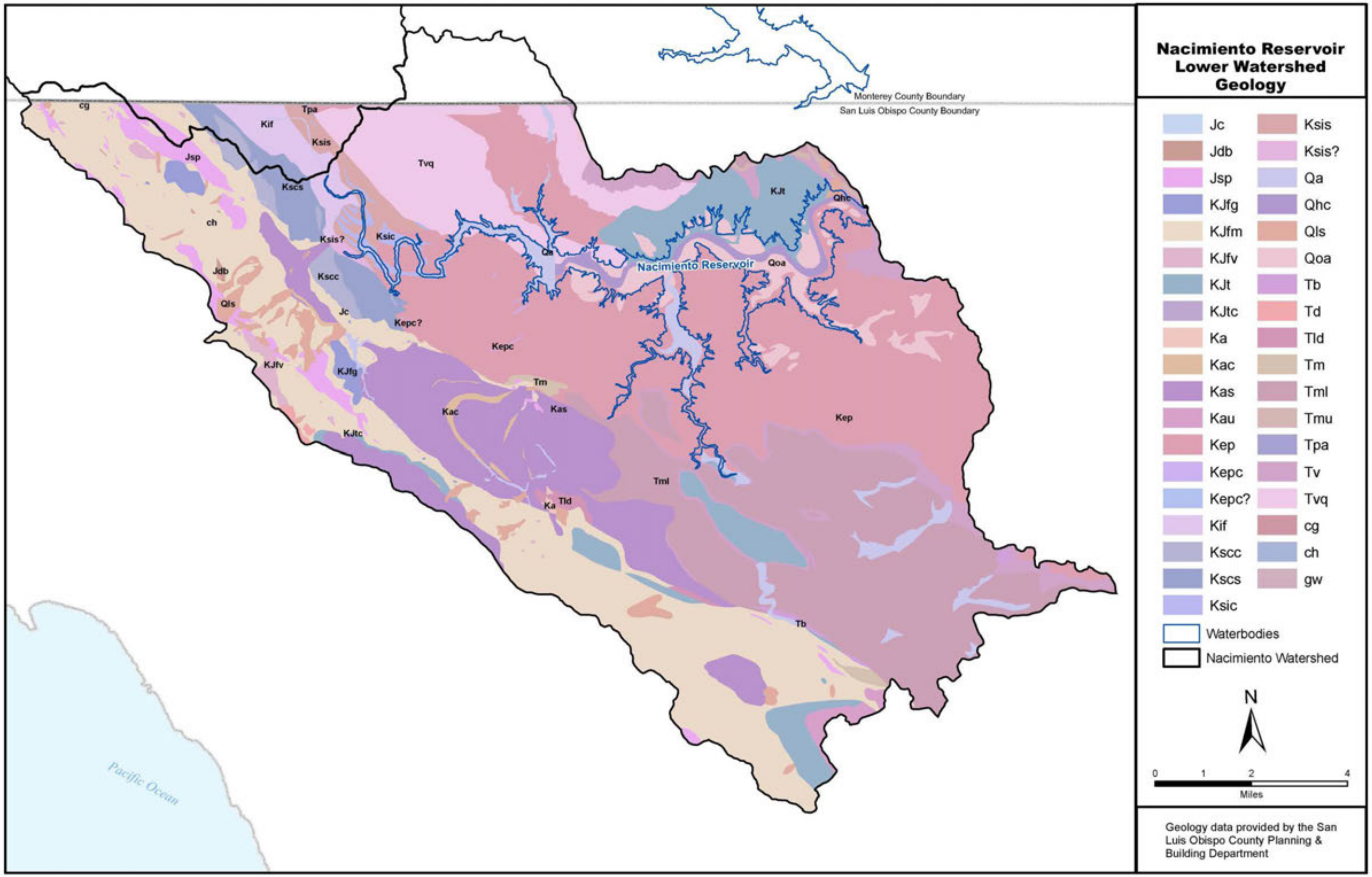



**Figure 12: Nacimiento Reservoir Lower Watershed Geology**

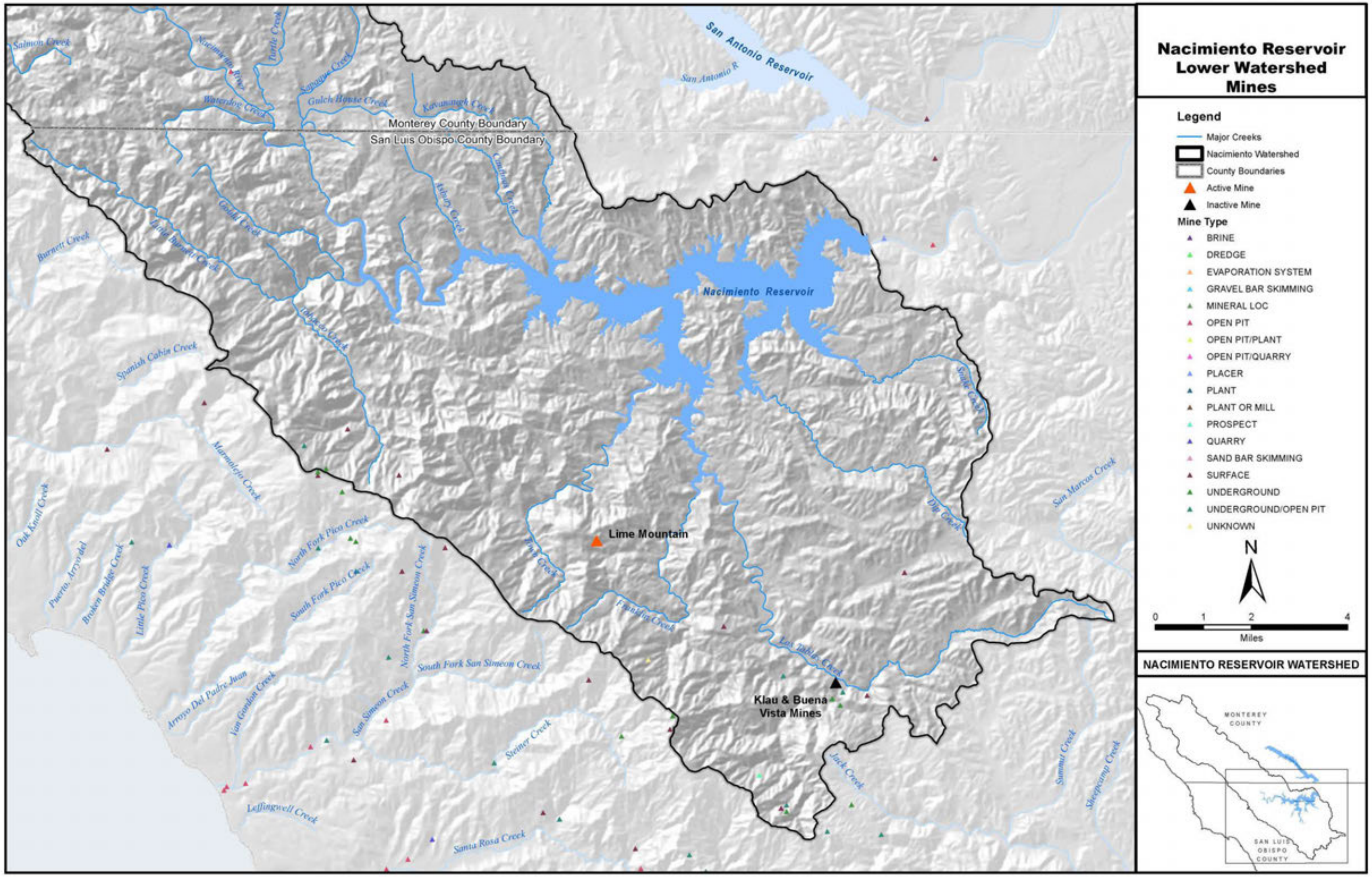



**Figure 13: Nacimiento Reservoir Lower Watershed Mines**

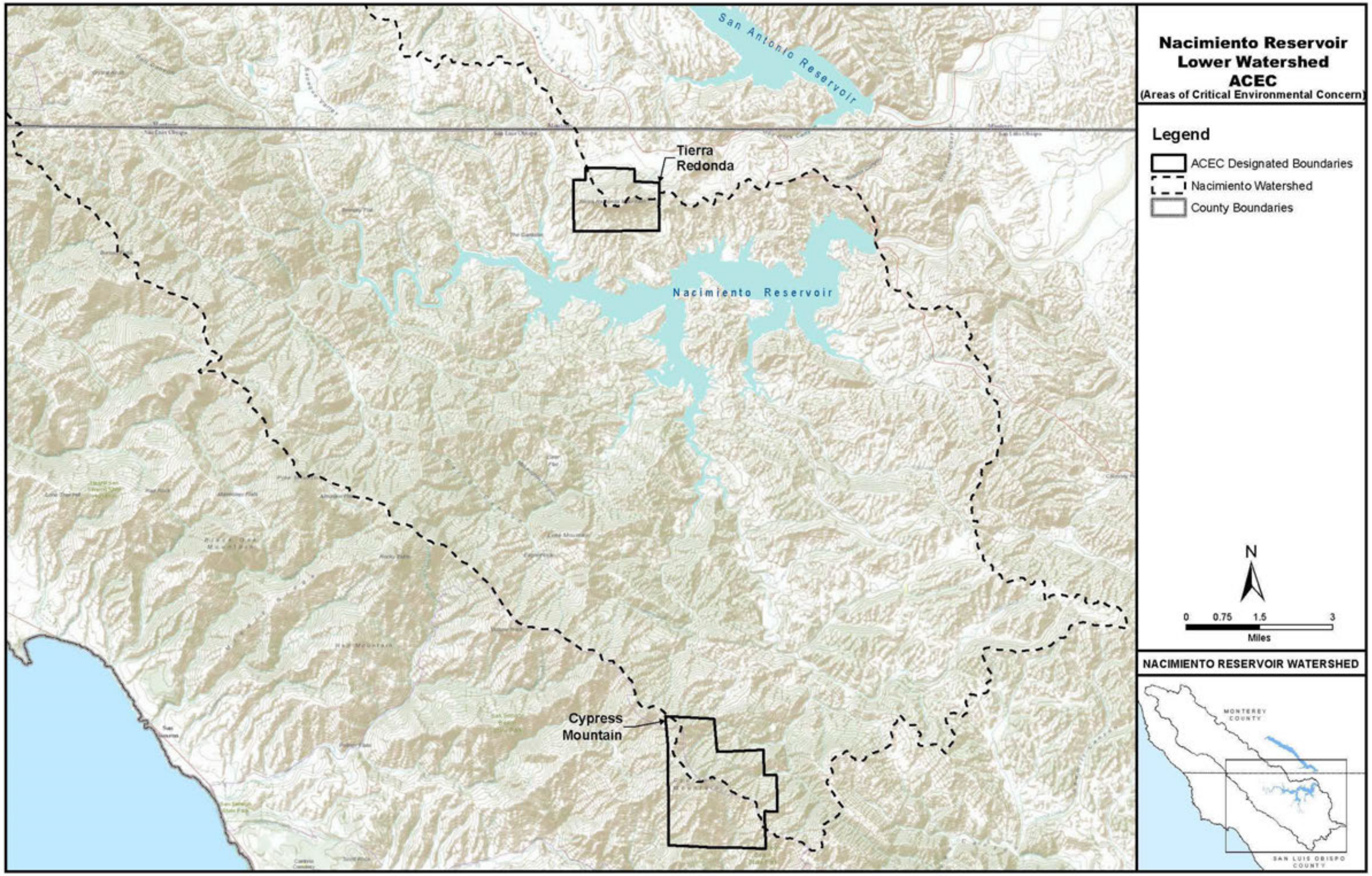



**Figure 14: Nacimiento Reservoir Lower Watershed – USBLM Areas of Critical Environmental Concern**

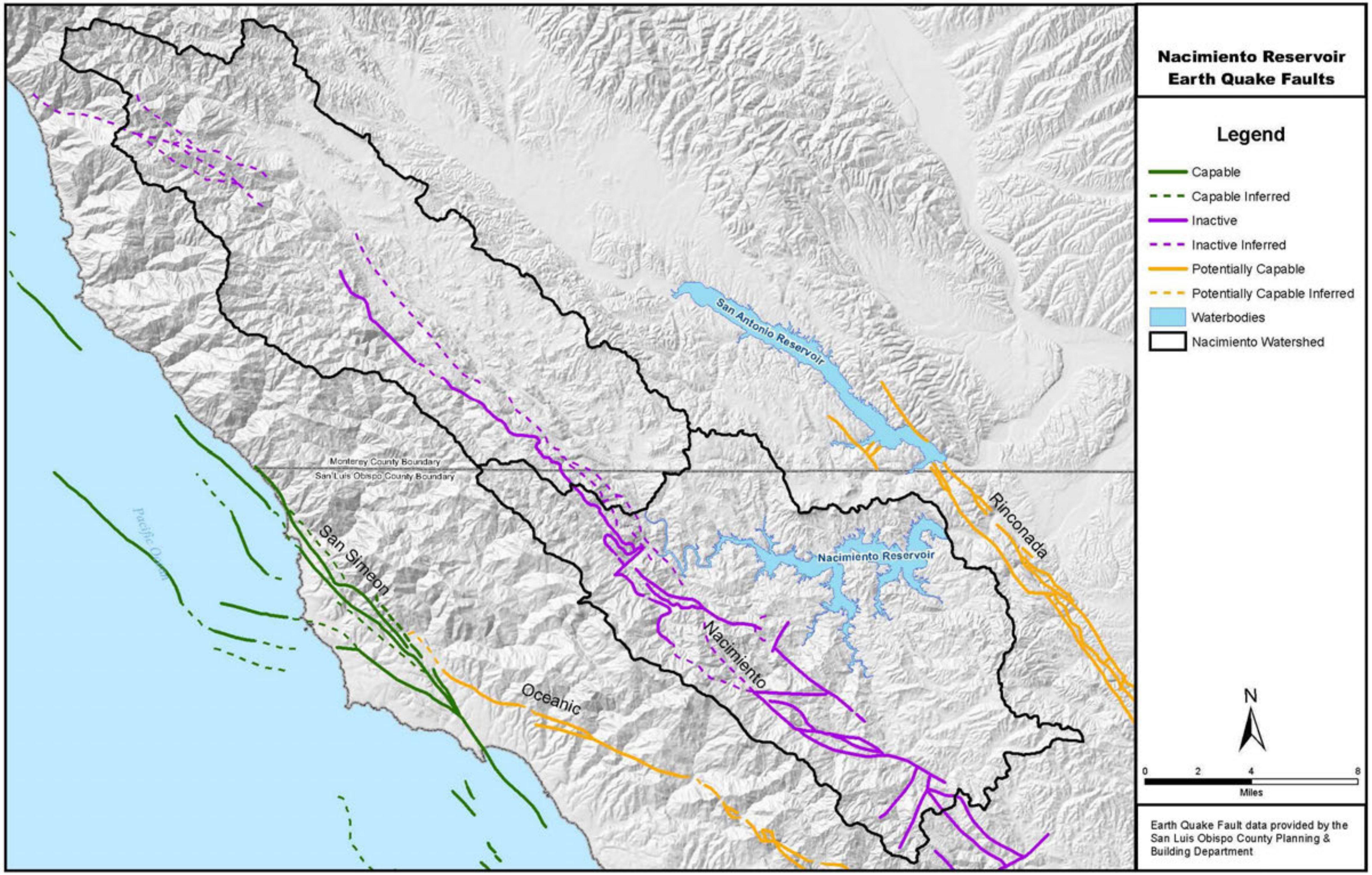



**Figure 15: Nacimiento Reservoir Watershed Earthquake Faults**

### 2.1.1.2.c Soils

**Overall**

Soil orders along the western portion of the watershed are predominantly mollisols and entisols, while the rest of the watershed is made up primarily of alfisols (Figure 16). Mollisols are characterized by a significant accumulation of humus in the uppermost layer, which is almost always formed under native grass vegetation. These fertile soils are highly arable and the important mineral nutrients calcium, magnesium, potassium, and sodium are found through most layers of the Mollisol profile. Entisols are soils of recent origin, with little definition. Many Entisols are found in steep, rocky settings. Alfisols are arable soils, with relatively high native fertility, although alfisols are lower in humus content than Mollisols. Alfisols are depleted in calcium carbonate but enriched in aluminum- and iron-bearing minerals (Encyclopedia Britannica), (University of Idaho College of Agricultural and Life Sciences).

Soil information provided by the USDA 1997 *Ecological Subregions* report is excerpted here:

> Subsection 261Aj - North Coastal Santa Lucia Range The soils are mostly shallow Typic Xerorthents, Entic and Pachic Ultic Haploxerolls, and Pachic Argixerolls. On Cretaceous and Miocene sedimentary rocks they are Lithic Xerorthents and Calcic and Pachic Ultic Haploxerolls ... The soils are well drained, and most of them are leached free of carbonates. The soil temperature regimes are mostly thermic, mesic at higher elevation …. Soil moisture regimes are mostly xeric, and possibly some ustic.
>
> Subsection 261Ak - South Coastal Santa Lucia Range The soils are mostly Lithic Xerorthents, Lithic and Pachic Ultic Haploxerolls, serpentinitic Lithic Argixerolls, and Chromic Pelloxererts. Most of these soils are present on Miocene rocks ... Pachic Haploxerolls and Chromic Pelloxererts are common on alluvium and marine terraces. Typic and Alfic Xeropsamments prevail in eolian sand behind beaches and on some marine terraces. The soils are well drained, and most are leached free of carbonates ... The soil temperature regimes are thermic. Soil moisture regimes are xeric.
>
> Subsection M262Ae - Interior Santa Lucia Range The soils of Great Valley Sequence terrain are mostly Lithic Xerochrepts, Lithic Haploxerolls, and Mollic Haploxeralfs. Those on Miocene sediments are mostly Pachic Haploxerolls, Calcic Haploxerolls, Argixerolls, and Lithic Xerorthents. Soils on granitic rocks are shallow Typic Xerorthents, Typic Xerochrepts, and Ultic Haploxerolls. Xerorthents, Haploxerolls, Argixerolls, Palexerolls, and Palexeralfs are common on nonmarine Plio-Pleistocene sediments. Most of the soils are leached free of carbonates, but the subsoil is calcareous in some. They are well

> drained. Soil temperature regimes are predominantly thermic, but mesic on north-facing slopes at higher elevation. Soil moisture regimes are xeric.

A complete soil inventory is found in Appendix 9.3.

**Upper watershed**

Soils found on Fort Hunter Liggett are described in the FHL 2004 *Integrated Natural Resources Management Plan* as follows, and are presented in tabular form in Table 3:

> Shallow soils and rock outcrops dominate steep highlands; deeper soils derived from alluvial terraces or underlying parent material prevail in the rolling hills; and alluvial deposits occur in the river valleys. The three dominant soil parent materials on FHL are sedimentary (shale and sandstone), metamorphosed sedimentary, and granitic rocks. Metamorphosed and granitic rocks are concentrated in the northwestern portion of FHL. Granitic and sandstone parent materials have given rise to coarse, sandy soils, while shale and fine sandstone have given rise to finer soils …
>
> FHL soils on slopes are classed as moderately to highly erodible. As the topography becomes more extreme on the slopes of surrounding mountains, the erosion potential increases.
>
> The Nacimiento watershed also has large areas with a sandy loam surface texture, as well as substantial areas of bedrock in the western, mountainous areas and more loam than is apparent in the San Antonio watershed. There is a narrow strip of sand and loamy sand associated with portions of the Nacimiento River. However, these sandy soil types are scarce.

**Table 3: Soils in Nacimiento River Watershed within Fort Hunter Liggett**

| Soils in Nacimiento River watershed within Fort Hunter Liggett | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Soils | | | | | | | | | | | | | | |
| Training Area | Location | Acres | % of Nacimiento River watershed within FHL | loam | gravelly loam | clay loam | silty clay loam | channery clay loam | gravelly sandy loam | stony sandy loam | coarse sandy loam | sandy loam | silty loam | very channery loam | sand | unweathered bedrock | silty clay | Others |
| 19 | Along the Nacimiento River | 3,622 | 4% | | | | | | | | | x | | | | x | | |
| 15 | Nacimiento Valley | 4,709 | 6% | x | | | | | | | x | x | | | | | | x |
| 20 | Nacimiento Valley | 4,628 | 6% | | | x | x | | | | | x | | | | | | |
| 24 | Nacimiento Valley | 5,111 | 6% | | | | | x | | | | x | | | | | | |
| 27 | Nacimiento Valley | 8,331 | 10% | | | | | x | | | | x | x | | | x | | x |
| 12A | Nacimiento Valley | 2,102 | 3% | | | | | | | | x | x | | | | | x | x |
| 12B | Nacimiento Valley | 3,259 | 4% | x | | | | | | | x | x | | | x | | | x |
| 8 | North Nacimiento Valley | 5,830 | 7% | | | | | | x | x | x | | | | | x | | x |
| 11 | Western boundary of FHL | 7,806 | 10% | | x | | | | | x | | x | | x | | x | | |
| 14 | Western boundary of FHL | 5,011 | 6% | | x | | | | | | | x | | | | x | | |
| 17 | Western boundary of FHL | 5,662 | 7% | | x | | | | | x | | | | | | x | | x |
| 18 | Western boundary of FHL | 5,351 | 7% | | x | x | | | | | | x | | | | x | | x |
| 23 | Western boundary of FHL | 6,960 | 9% | | x | x | | | | | | x | | | | x | | |
| 26 | Western boundary of FHL | 4,985 | 6% | | x | x | | | | | | x | | | | x | | x |
| 28 | Western boundary of FHL | 7,464 | 9% | | x | x | | | | | | x | | | | x | | x |
| | | 80,831 | 100% | | | | | | | | | | | | | | | |
| *Source: FHL 2004 Integrated Natural Resources Management Plan* | | | | | | | | | | | | | | | | | | |

Soils found on Fort Hunter Liggett are also described in the NPS 2004 *Special Resource Study,* as follows:

> Steep highlands in the west consist of rock outcrops and shallow soils derived from the underlying parent material. The rolling hills that make up most of the central … portions of Fort Hunter Liggett consist primarily of alluvial terraces or soils associated with marine sedimentary rocks.

Soil erosion in Fort Hunger Liggett is described in the NPS 2004 *Special Resource Study* as follows:

> Soil erosion at Fort Hunter Liggett is primarily the result of natural processes, existing training and testing activities, prescribed burns on the steep-sloped chaparral and woodland areas, past grazing practices, and borrow pit excavations. … the Natural Resources Conservation Service classifies most of Fort Hunter Liggett as having high or moderate erosion hazard … The steep uplands have a very severe erosion potential.

Soils that are found in more than 5% of the upper watershed are shown in Table 4.

**Table 4: Soils that occur in >5% of upper Nacimiento Reservoir watershed**

| Soil | Acres | % of upper watershed area |
|---|---|---|
| Cieneba-Rock outcrop complex | 5,781 | 5.52% |
| Gaviota sandy loam, 30 to 75 percent slopes | 9,935 | 9.49% |
| Gaviota-San Andreas complex, 15 to 30 percent slopes | 8,093 | 7.73% |
| Gaviota-San Andreas complex, 30 to 75 percent slopes | 9,669 | 9.24% |
| McMullin-Plaskett complex | 7,643 | 7.30% |
| Rock outcrop-Xerorthent association | 21,091 | 20.15% |
| *Source: USDA Natural Resources Conservation Service Soil Survey Geographic* | | |

### Lower watershed

Soils that are found in more than 5% of the lower watershed are shown in Table 5.

**Table 5: Soils that occur in >5% of lower Nacimiento Reservoir watershed**

| Soil | Acres | % of lower watershed area |
|---|---|---|
| Dibble clay loam, 30 to 50 percent slopes | 8,449 | 8.17% |
| Dibble clay loam, 50 to 75 percent slopes | 6,169 | 5.97% |
| Gaviota-Rock outcrop complex, 30 to 75 percent slopes | 10,952 | 10.59% |
| Henneke-Rock outcrop complex, 15 to 75 percent slopes | 6,110 | 5.91% |
| Lompico-McMullin complex, 50 to 75 percent slopes | 5,346 | 5.17% |
| Los Osos-Lodo complex, 50 to 75 percent slopes | 7,677 | 7.42% |
| Shimmon-Dibble association, very steep | 9,565 | 9.25% |
| *Source: USDA Natural Resources Conservation Service Soil Survey Geographic* | | |

Soils of the Dibble series surround the reservoir itself (Figure 17). The Dibble series consists of well drained soils that formed in material underlain by sandstone or shale.

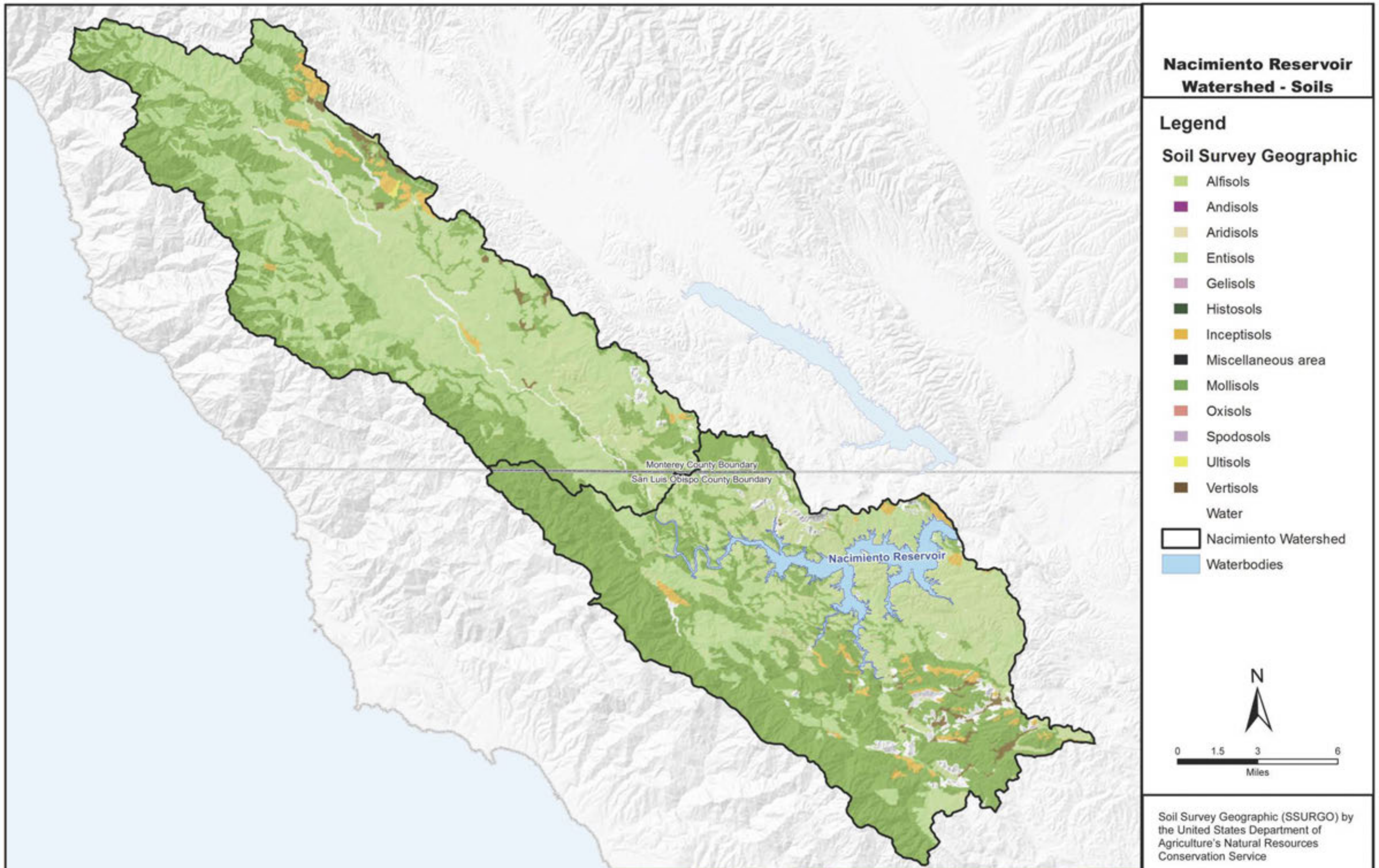



**Figure 16: Nacimiento Reservoir Watershed Soils**

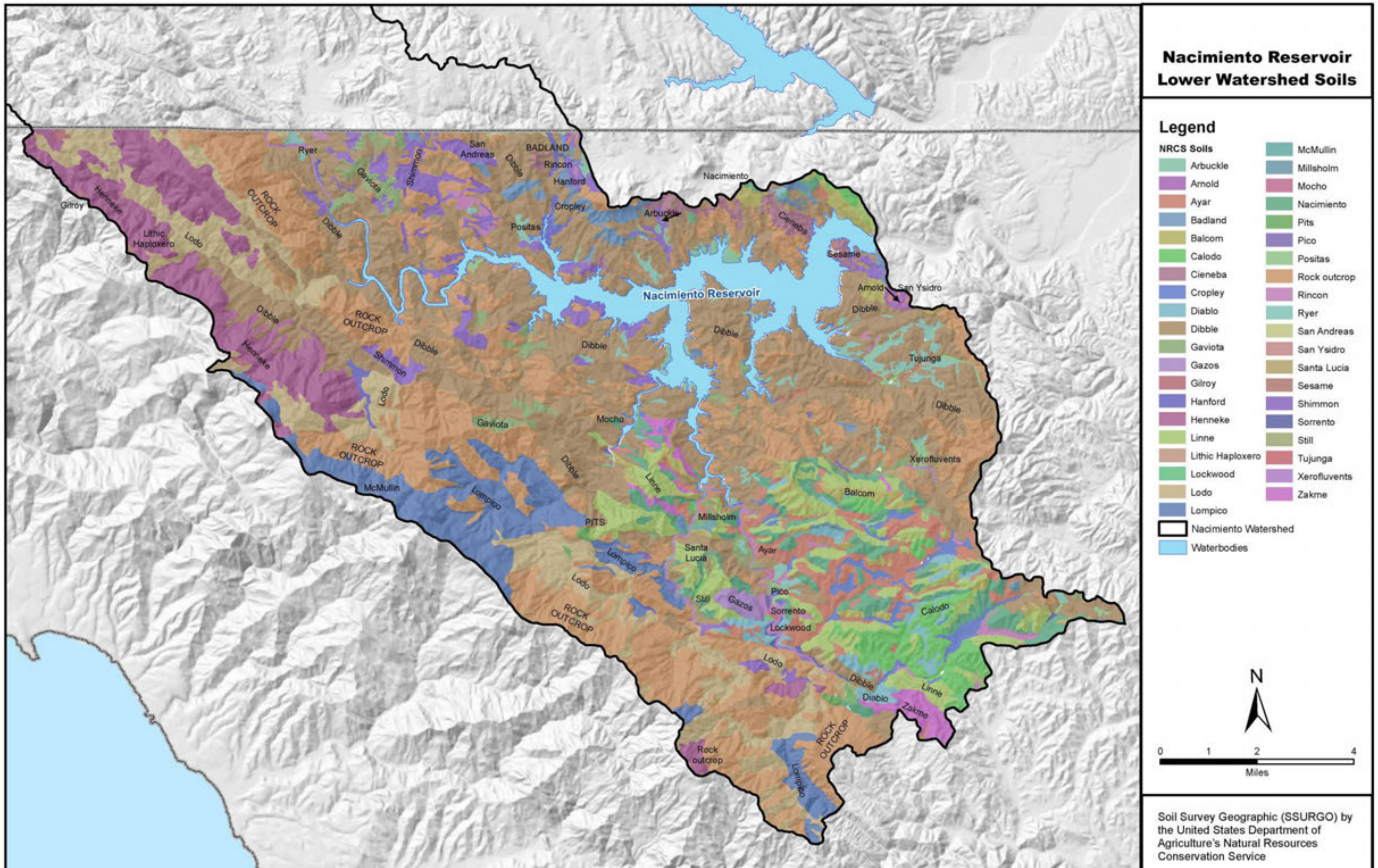



**Figure 17: Nacimiento Reservoir Lower Watershed Soils**

#### 2.1.1.2.d Vegetation

**Overall**

Vegetation information found in the USDA 1997 *Ecological Subregions* report is excerpted here. Characteristic series by lifeform may be found in Appendix 9.4.

> Subsection 261Aj - North Coastal Santa Lucia Range The predominant natural plant communities are Douglas-fir - tanoak series, with some Redwood series in canyons on the southwest side of the subsection; Coast live oak series on north-facing and California sagebrush - black sage series on south-facing slopes near the northwest end of the Santa Lucia Range and inland; Canyon live oak series on steep canyon sideslopes; and Chamise series and Live oak shrublands on shallow soils inland and at higher elevations. There are smaller amounts of Blue oak series adjacent to the Salinas Valley … with some Mixed conifer series at higher elevations. … Santa Lucia fir series on the coastal side of the mountain range are not extensive but are of special interest.
>
> Subsection 261Ak - South Coastal Santa Lucia Range The predominant natural plant communities are Coast live oak series, Chamise series, Manzanita shrublands, and Needlegrass grasslands. Some edaphic associations are Chamise series on shallow soils, Leather oak series on shallow serpentinitic soils, Needlegrass grasslands on Vertisols, and Manzanita shrublands on silicic sandstones. California sagebrush - black sage series is common near the coast …
>
> Subsection M262Ae - Interior Santa Lucia Range The predominant natural plant community is Blue oak series. There is some Coast live oak series on north-facing slopes and Mixed conifer series at higher elevations. Chamise series is common on shallow soils, and soils that are very rocky or low in fertility. Mixed chaparral shrublands also occur in the unit.

**Upper watershed**

According to the FHL 2004 *Integrated Natural Resources Management Plan*, chaparral comprises 48% of the Nacimiento River watershed area that lies within FHL; 69% of this is mixed chaparral and 31% is chamisal chaparral. Chaparral on FHL typically occurs on south facing slopes and is the dominant vegetation community along western mountainous areas, and on ridges and slopes separating the San Antonio and Nacimiento watersheds. Oak communities comprise 41% of the Nacimiento River watershed area that lies within FHL; oak savannas (primarily valley oak and blue oak) comprise 12% of the area and are typically restricted to the valley floor and lower foothills, oak woodlands (primarily blue oak) cover 27% of the area, and live-oak forests cover 2%. Grasslands cover 8% of the Nacimiento River watershed that lies within FHL, riparian communities cover slightly more than 2% of this area, and seasonal and perennial wetlands cover less than 1% of this area.

According to the NPS 2007 *FHL Special Resource Study*, rare chaparral communities are associated with serpentine areas found along the southwestern boundary of FHL and along the Nacimiento River.

**Lower watershed**

According to data developed from aerial photographs taken in 2007, half of the lower watershed is covered with oaks, primarily Coast Live Oak and Blue Oak (Table 6, Figure 18). Twenty four percent of the lower watershed is covered with shrubs, and 14% is covered with herbaceous vegetation (Table 7, Figure 19).

**Table 6: Lower Nacimiento Reservoir Watershed Oak Communities**

| | Acres | Approximate % of lower watershed* |
|---|---|---|
| Coast Live Oak | 16,578 | 16% |
| Blue Oak | 14,522 | 14% |
| Coast Live Oak - mixed hardwood | 7,630 | 7% |
| Coast Live Oak - Blue Oak | 7,573 | 7% |
| Valley Oak | 4,458 | 4% |
| Black Oak | 961 | 1% |
| Canyon Live Oak | 255 | <1% |
| All oaks | 51,977 | 50% |
| *Source: Aerial Information Systems* | | |
| * Data is for San Luis Obispo County portion of Nacimiento Reservoir watershed, which is approximately the same as the lower watershed. | | |

**Table 7: Lower Nacimiento Reservoir Watershed Vegetation Types**

| | Acres | Approximate % of lower watershed* |
|---|---|---|
| Tree | 55,208 | 53% |
| Shrub | 24,331 | 24% |
| Herbaceous | 14,009 | 14% |
| Wooded Wetland | 669 | 1% |
| Herbaceous Wetland | 3 | <1% |
| Unvegetated | 9,286 | 9% |
| Total | 103,507 | 100% |
| *Source: Aerial Information Systems* | | |
| *Data is for San Luis Obispo County portion of Nacimiento Reservoir watershed, which is approximately the same as the lower watershed. | | |

According to the BLM's 1997 *Caliente Area Resource Management Plan*, the dominant plant community in the Tierra Redonda Mountain ACEC is blue-oak woodland. Grassland and chaparral also occur here. This ACEC contains several rare or endemic plant species, including *Chorizanthe*, one-awned spineflower, Salinas Valley goldfields, San Luis Obispo County lupine, and ribbonwood. Two rare plant communities occur in the Cypress Mountain ACEC - Northern Interior Cypress Forest and Serpentine Chaparral. The Northern Interior Cypress Forest on Cypress Mountain is dominated by Sargent cypress. Several serpentine endemics that are associated with Sargent cypress may occur here; one of these, Hardham's bedstraw, is known to occur within the ACEC.

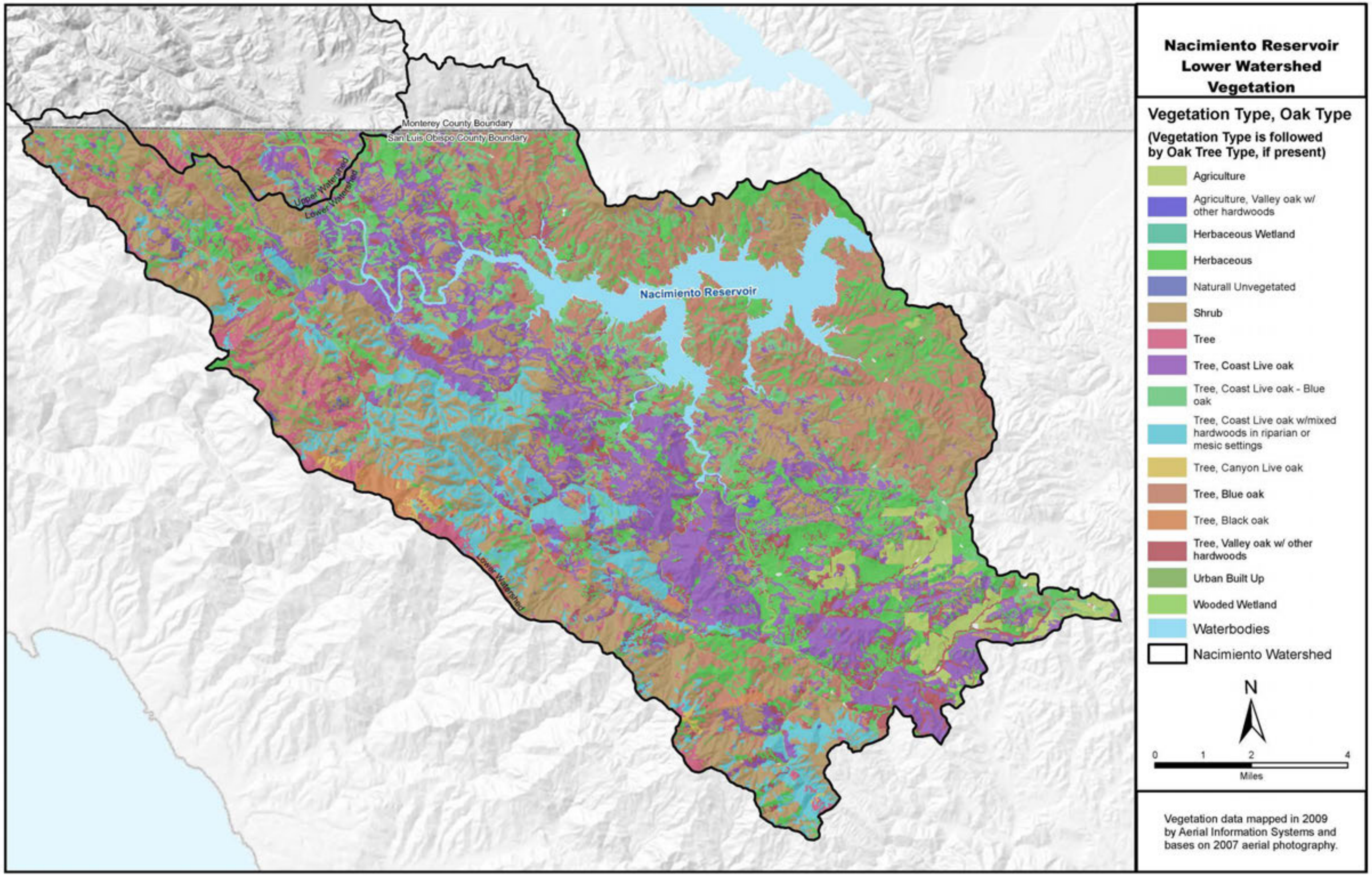



**Figure 18: Nacimiento Reservoir Lower Watershed Vegetation - Oaks**

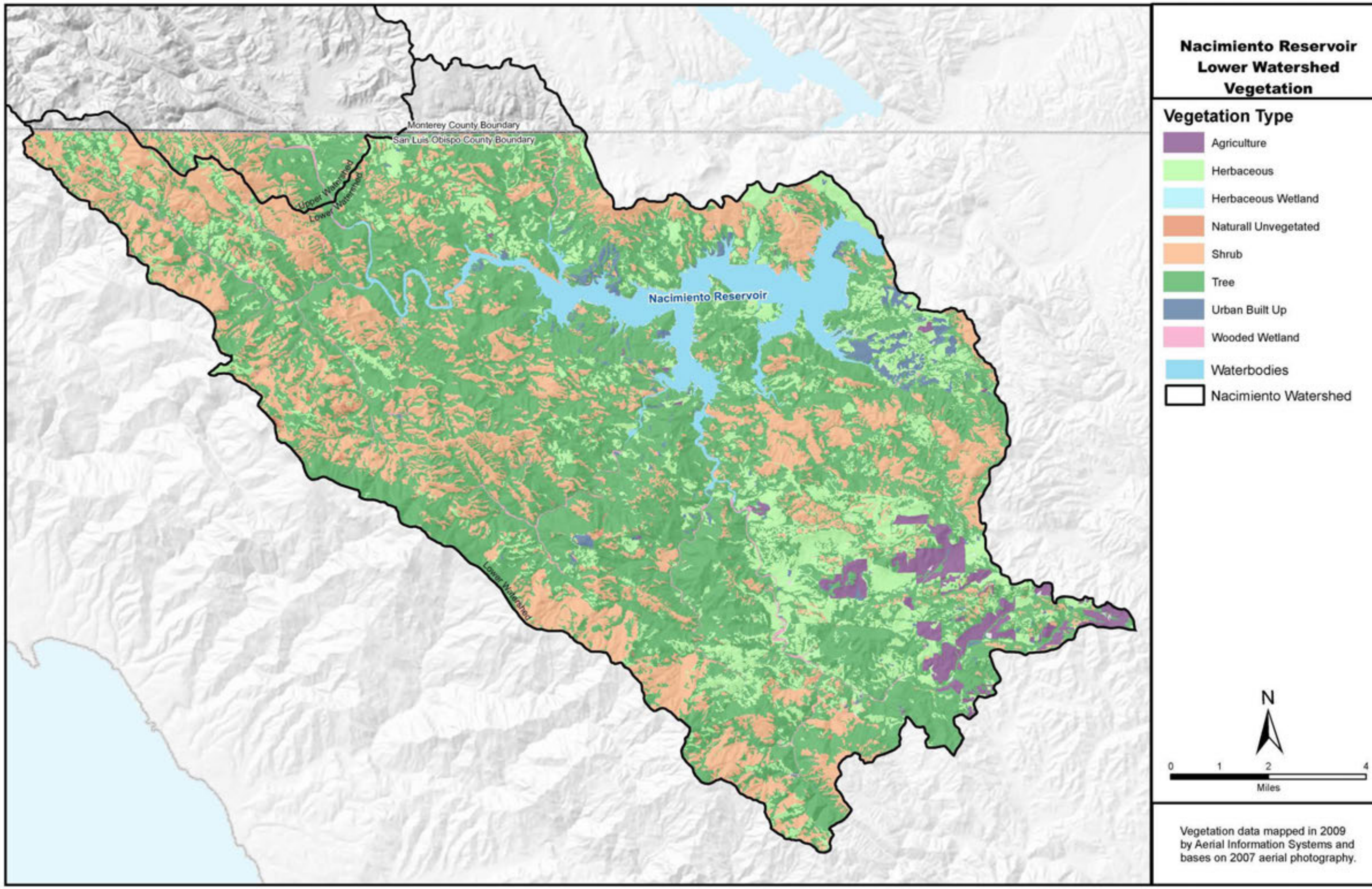



**Figure 19: Nacimiento Reservoir Lower Watershed Vegetation - Shrubs**

### 2.1.1.2.e Wildlife

**Upper watershed**

Fort Hunter Liggett's large amount of undisturbed terrain is home to a wide variety of fauna as well as flora. According to the NPS 2007 *FHL Special Resource Study*, scientists have recorded over 300 animal species inhabiting FHL. According to the FHL 2004 *Integrated Natural Resources Management Plan*, the Nacimiento River watershed within FHL contains suitable habitat for several federally and state listed endangered and threatened species, and nearly all of these species have been sighted there over the course of many years, including the American peregrine falcon, California condor, bald eagle, least Bell's vireo, San Joaquin kit fox, California red-legged frog, and the California tiger salamander.

Fort Hunter Liggett is also home to a large number of both game and non-game species. Games species found throughout FHL include deer, tule elk, coyotes, rabbits, gray squirrels, bobcats, wild turkey, quail, doves, pigeons, mallards, wood ducks, and various fish species. Nongame species found throughout FHL include a wide variety of mammals, reptiles, amphibians, fish and birds. An inventory of wildlife for Fort Hunter Liggett is found in Appendix 9.5.

**Lower watershed**

Wildlife inventories were not found for any significant areas of the lower watershed. However, much of the lower watershed consists of undeveloped terrain that is similar to that found in the upper watershed, so it is reasonable to expect that many species that may be found in the upper watershed may also be found in the lower watershed. However, the lower watershed has some urban development and some agricultural development, and the terrain is somewhat gentler than that in the upper watershed, so some differences in the diversity and abundance of wildlife is expected. Wildlife habitats in the lower watershed are shown in Figure 20.

The California Natural Diversity Database (California Department of Fish and Game) lists the bald eagle, prairie falcon, and western pond turtle as having been observed in the lower watershed. The U.S. Fish and Wildlife Service has reported numerous California condor sightings in the lower watershed (Figure 21).

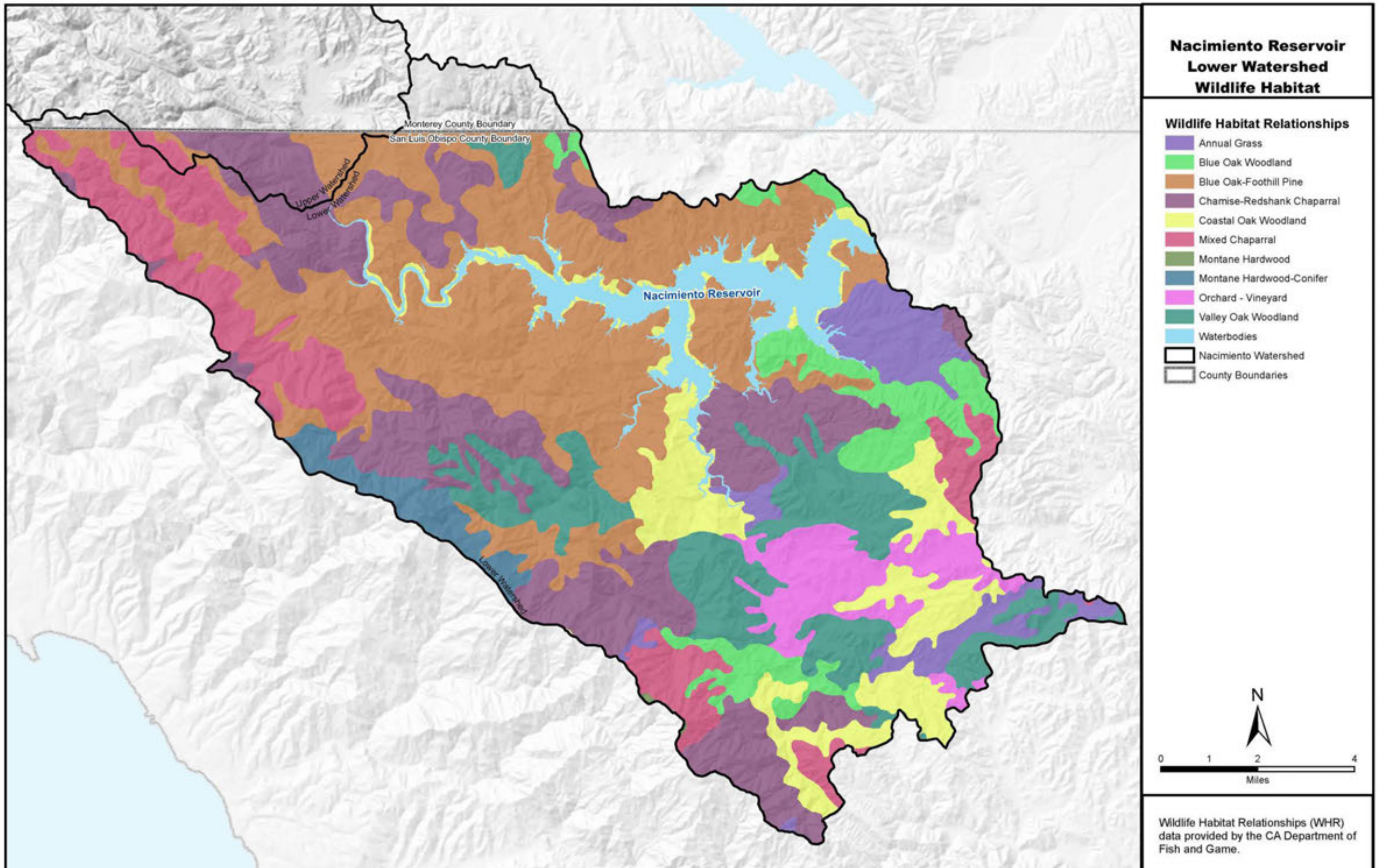
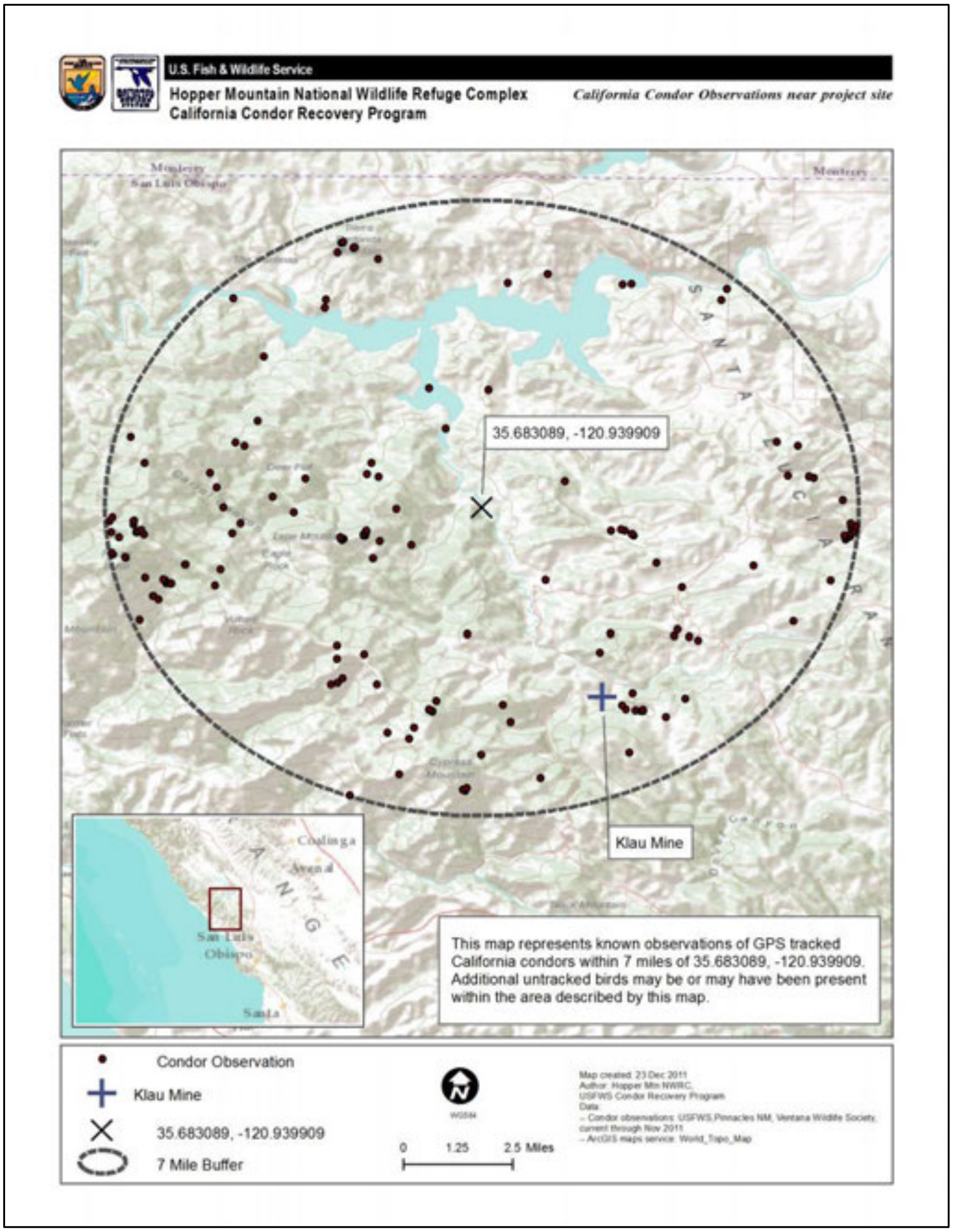



**Figure 20: Nacimiento Reservoir Lower Watershed Wildlife Habitat**




*Source: US Fish and Wildlife Service*

**Figure 21: California condor sightings in Nacimiento Reservoir lower watershed**

## 2.1.2 Existing Hydrology

### 2.1.2.1 Precipitation Patterns and Stream Flow Characteristics

#### 2.1.2.1.a Precipitation Patterns

The watershed lies in the rain shadow of the Santa Lucia mountain range. Average annual precipitation is highest along the western edge of the watershed, coinciding with the crest of the range (35-55 inches/year), and decreases going eastward, to a low of 14 inches per year at the dam. The precipitation is nearly all rain, with some snow falling occasionally at higher elevations (Figure 22). The majority of the precipitation occurs from November through March, when heavy rain is carried in by winter storms from the Pacific Ocean, although storms may occasionally occur in October or April. The remainder of the year (May through September) is typically dry, with no precipitation. The climate is Mediterranean and generally semiarid. Temperatures range from below freezing in the winter to over 100ºF in the summer. (USDA Forest Service) (USDI National Park Service)

#### 2.1.2.1.b Stream Flow Characteristics

The Nacimiento River originates in the Santa Lucia Mountains, just southeast of Cone Peak. It flows southeast in a linear pattern until it reaches the 800' elevation, where it begins to form the Nacimiento Reservoir. Flow is perennial, however much of the surface is dry during the summer, except for some isolated pools that occur in the area known as the Palisades, located on Fort Hunter Liggett. Numerous intermittent streams flow into the Nacimiento River in the upper watershed, and directly into the Nacimiento Reservoir in the lower watershed (Figure 23, Figure 24). (USDI National Park Service)

The Nacimiento River is the only tributary to Nacimiento Reservoir that has a stream gauge. Located at the 800' elevation (NGVD 29), this gauge is operated by the United States Geological Survey (Figure 25). Because the greatest rainfall occurs in the steepest mountain areas and is the result of storm activity, runoff is rapid, and river flow both increases and decreases dramatically during the rainy season (Figure 26). Typical summer flows at the gauge are 0 cfs/min; winter flows often exceed 5,000 cfs. The maximum flow recorded since data gathering began in 1971 is 24,400 cfs in March 1995. (USGS)

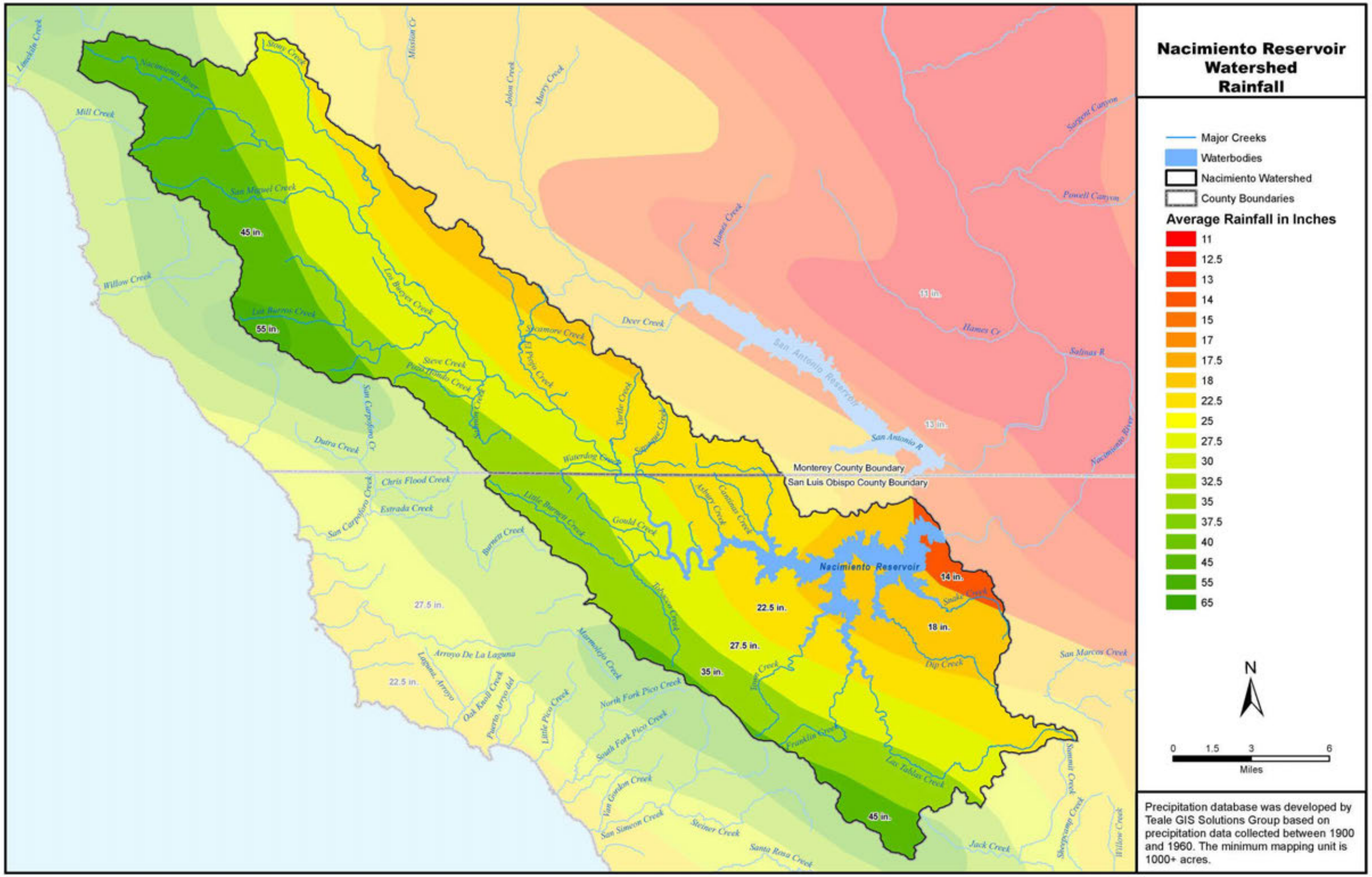



**Figure 22: Nacimiento Reservoir Watershed Rainfall**


**Figure 23: Nacimiento Reservoir Watershed – Upper Subwatersheds**

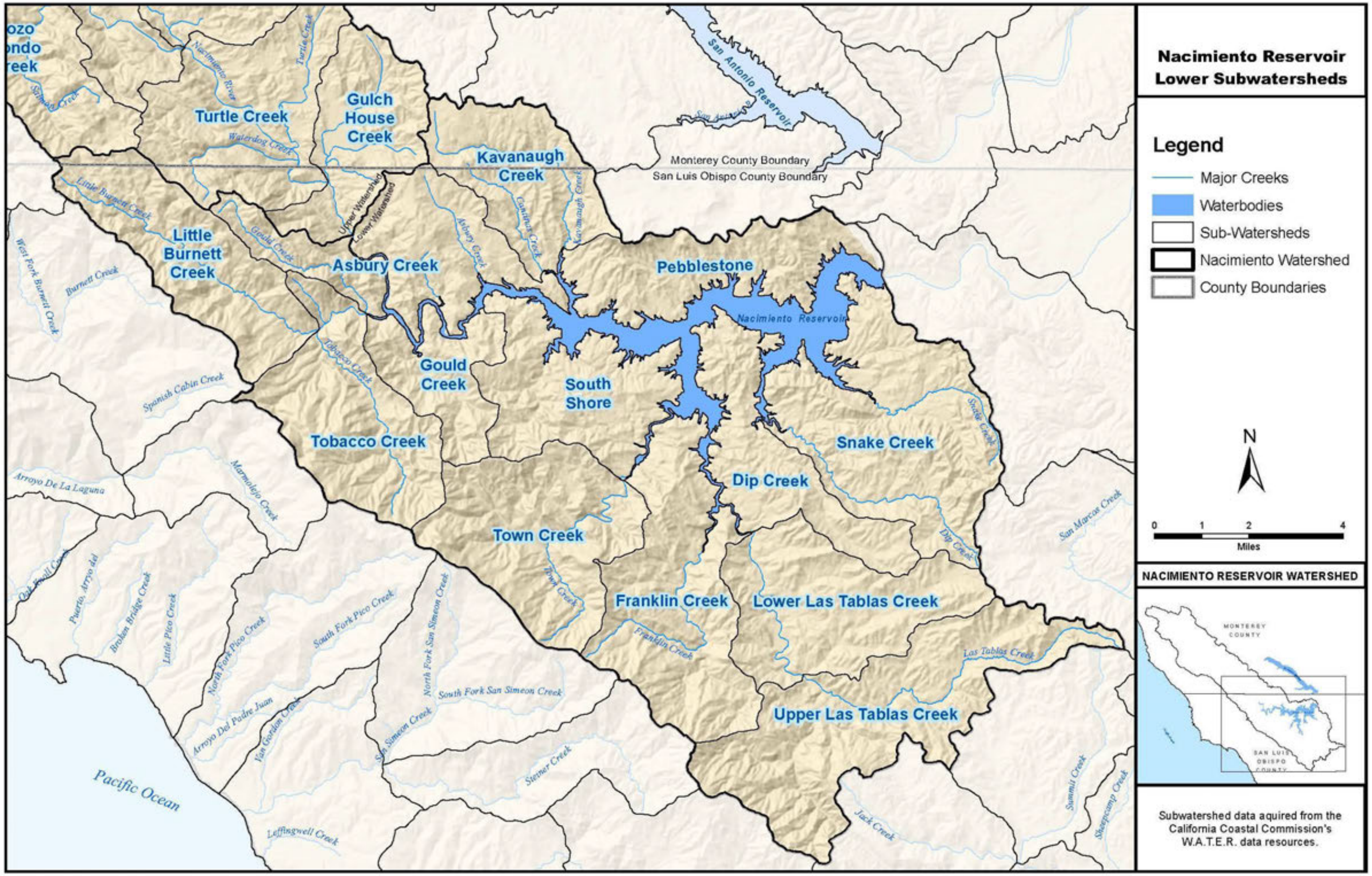



**Figure 24: Nacimiento Lower Watershed – Lower Subwatersheds**

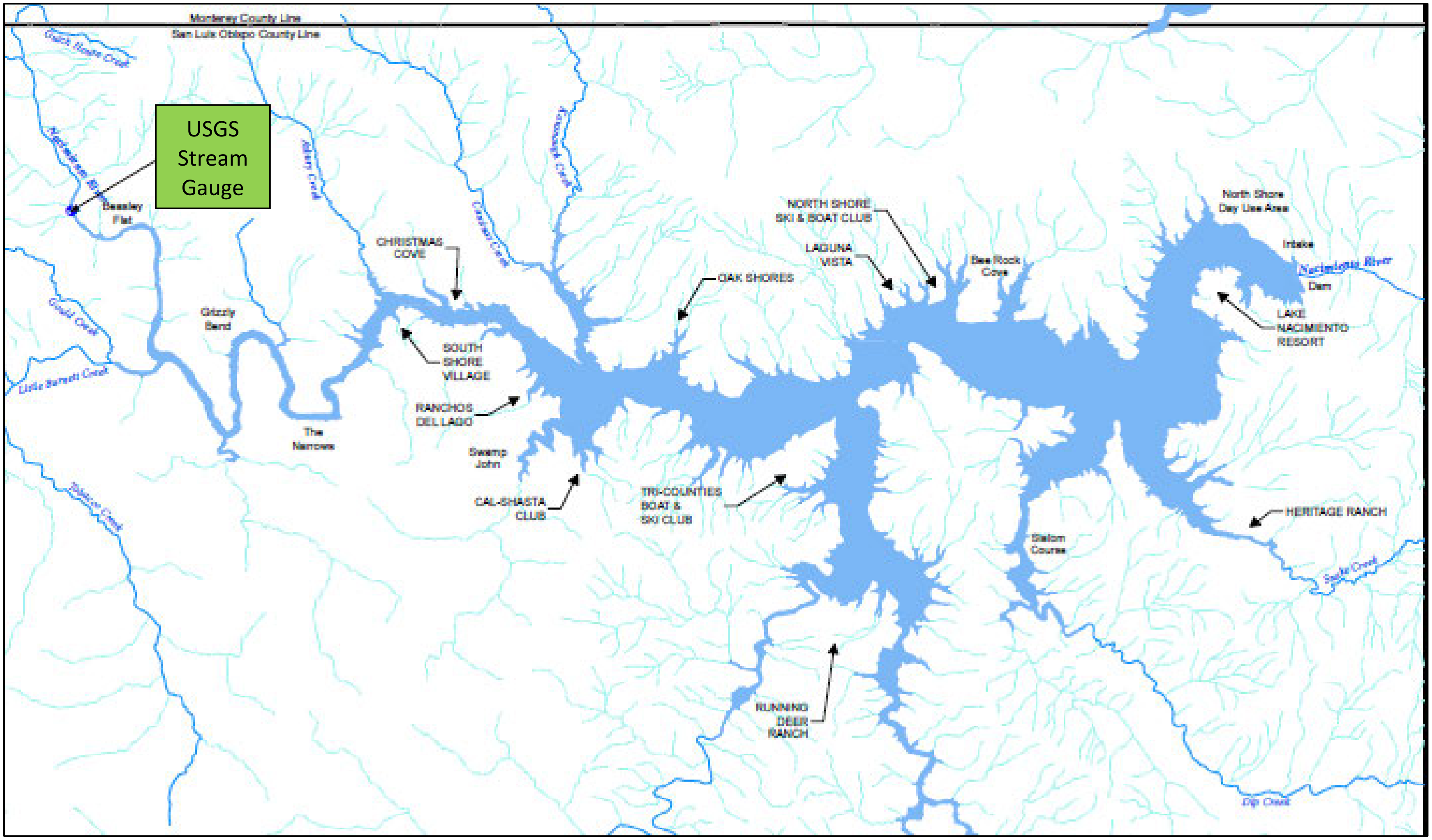



**Figure 25: USGS stream gauge location on Nacimiento River**

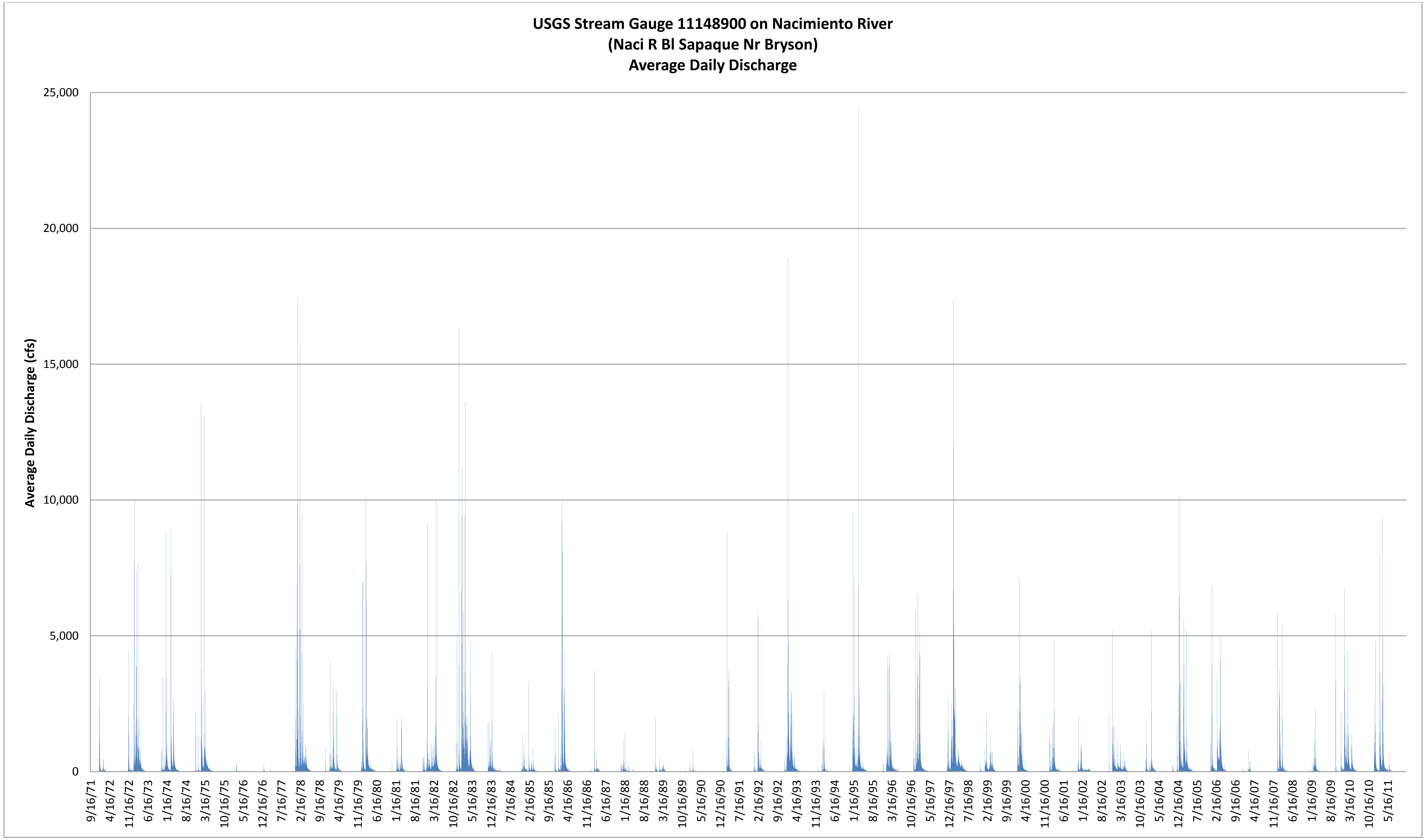



**Figure 26: Nacimiento River Flows**

### 2.1.2.2 Reservoir Characteristics

When the reservoir is full, at an elevation of 800' above mean sea level (NGVD 29), it has the following dimensions (Monterey County Water Resources Agency):

- Storage capacity: 377,900 acre-feet
- Surface area: 5,727 acres
- Length: 18 miles
- Shoreline: 165 miles
- Depth: 190 ft at deepest point

The reservoir is operated by the Monterey County Water Resources Agency (MCWRA). MCWRA operates the dam to meet two principal needs: 1) water conservation (storage) in order to provide groundwater recharge downstream of the dam, in the Salinas River valley, and 2) flood control in the Salinas Valley. (Monterey County Water Resources Agency) Additionally, the dam is operated to maintain steelhead trout habitat on the Salinas River. (MCWRA and USACE) (NOAA National Marine Fisheries Service) Consequently, water is released year round. The combination of water releases, drought cycles, and storms result in dramatic fluctuations in the reservoir surface elevation, often rising by more than 100 ft. in one year, and dropping by the same amount over the course of just two or three years (Figure 27). The greatest one day change occurred in October 2009, when a major early season storm caused the surface elevation to rise 19 ft. in a 24 hour period.

Water flows in an easterly direction, from the Nacimiento River entry point on the west end toward the dam on the east end. The reservoir is monomictic; a thermocline forms gradually starting in March, and the reservoir becomes stratified, peaking in late summer (July, August, September). In the fall (October, November) the thermocline gradually disappears. Temperatures are typically uniform from top to bottom in December and January. (Figure 28).

Dissolved oxygen (DO) often exhibits a negative heterograde curve. In this case, as the thermocline develops, dissolved oxygen is highest at the surface, then decreases through the thermocline, then rises in the hypolimnion before decreasing again (Figure 29, Figure 30). This uncommon pattern occurs most often when oxygen consumption from decomposition of organic matter exceeds oxygen inputs as the rate of organic matter sinking from the epilimnion is slowed upon entering the colder, denser water of the thermocline. It may also occur due to respiratory demand from large concentrations of zooplankton, and from certain lake mixing patterns. (Biodiversity Institue of Ontario) (Government of British Columbia, Ministry of Environment)

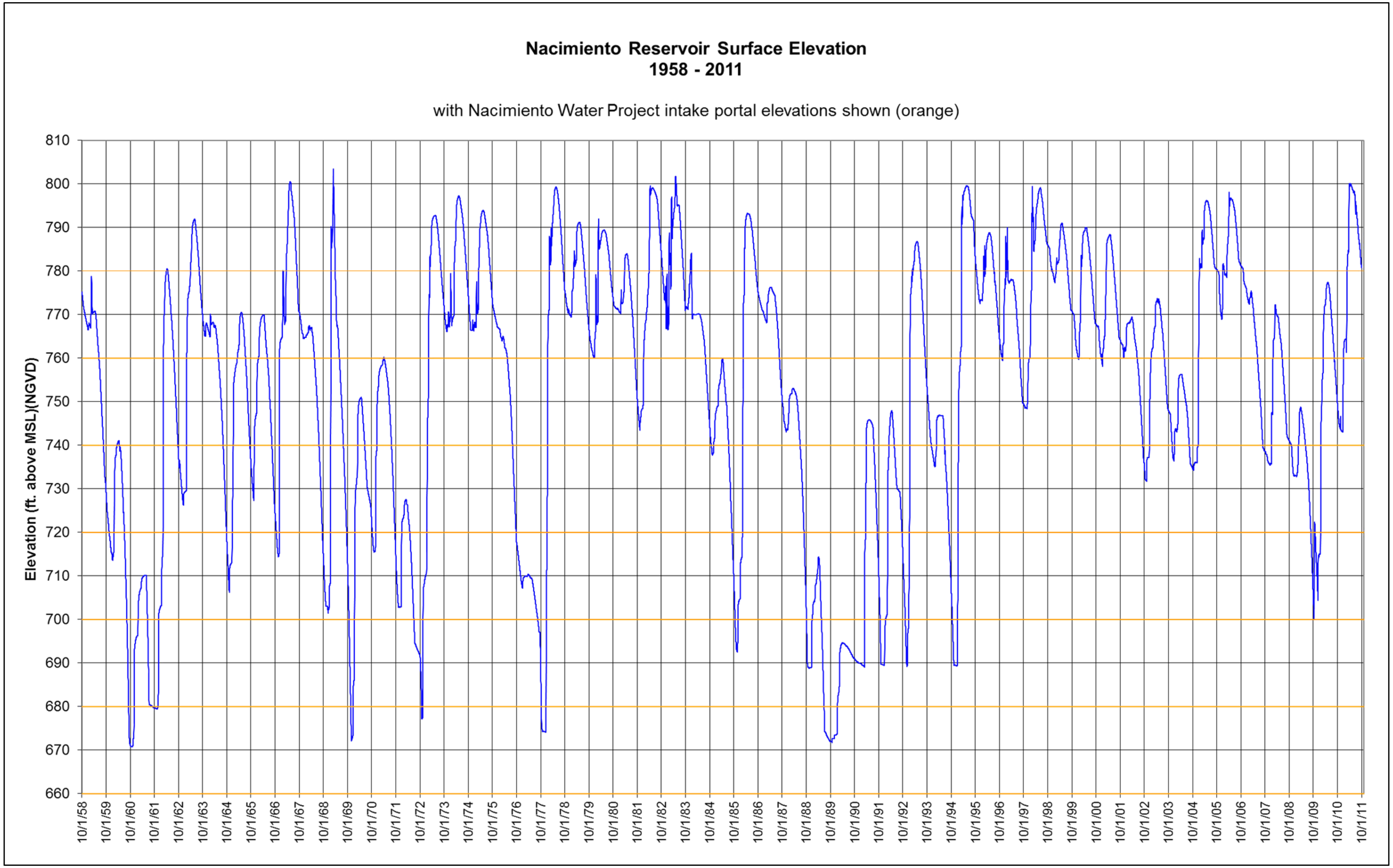
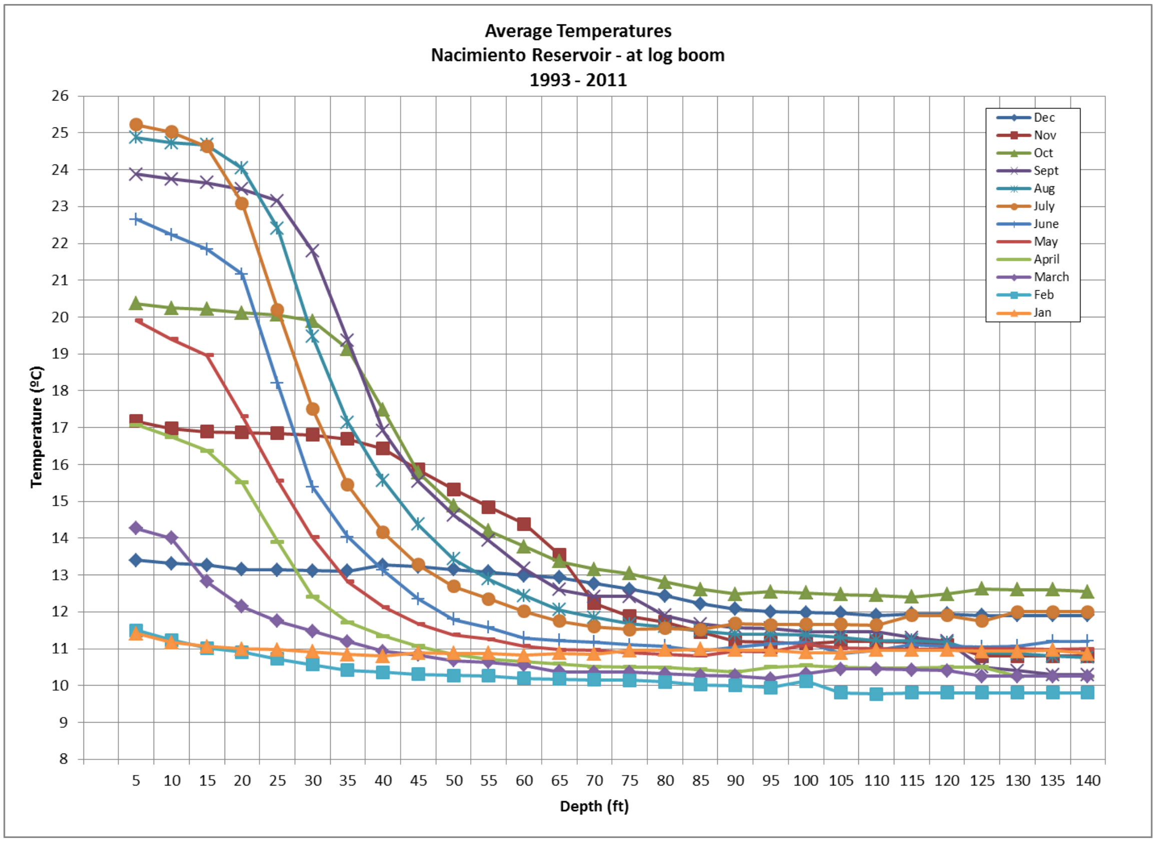
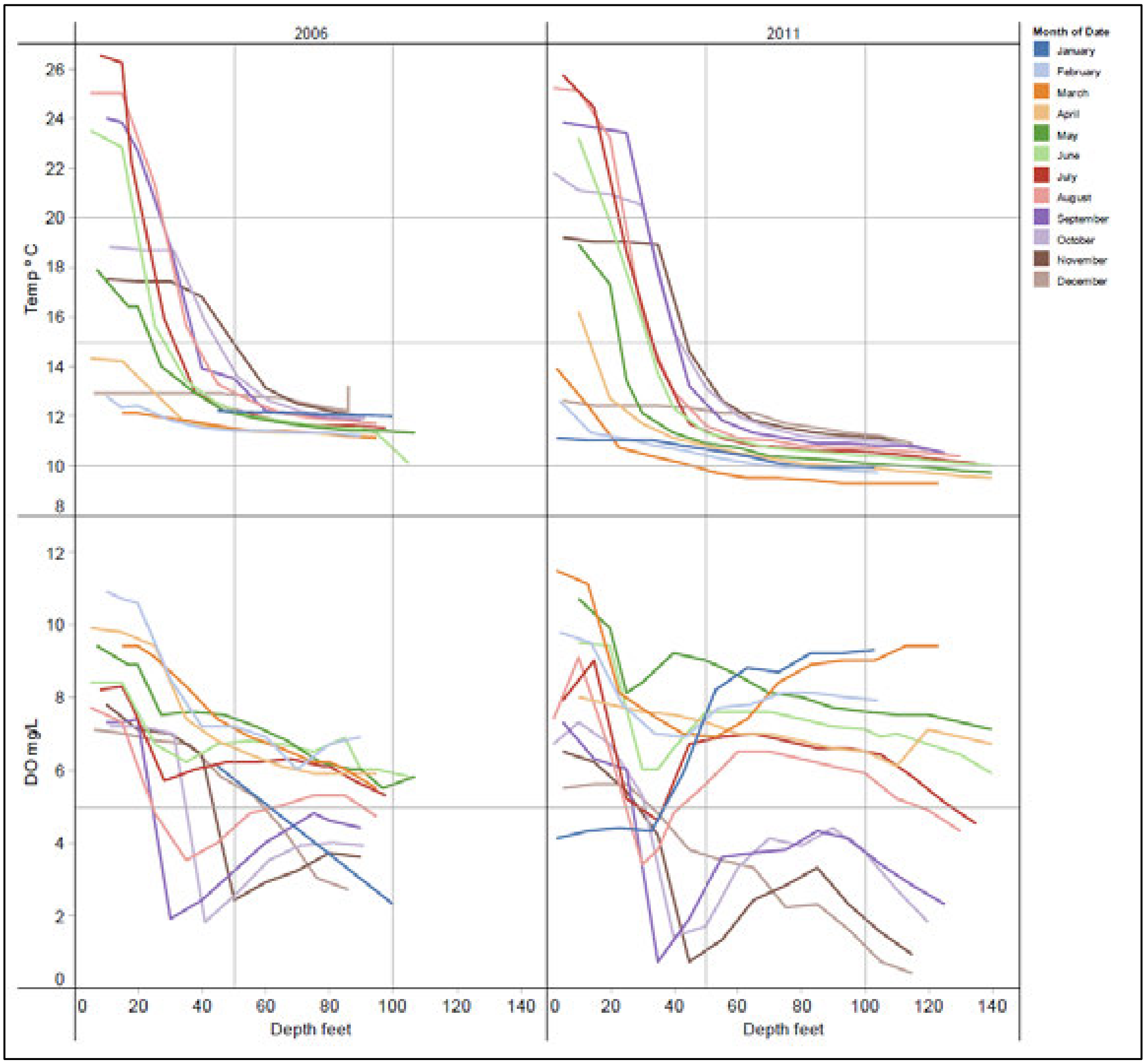



**Figure 27: Nacimiento Reservoir Surface Elevations**




*Source: San Luis Obispo County Department of Public Works, Water Quality Laboratory*

**Figure 28: Nacimiento Reservoir average temperature profiles**




*Source: San Luis Obispo County Department of Public Works, Water Quality Laboratory*

**Figure 29: Nacimiento Reservoir dissolved oxygen negative heterograde curve**

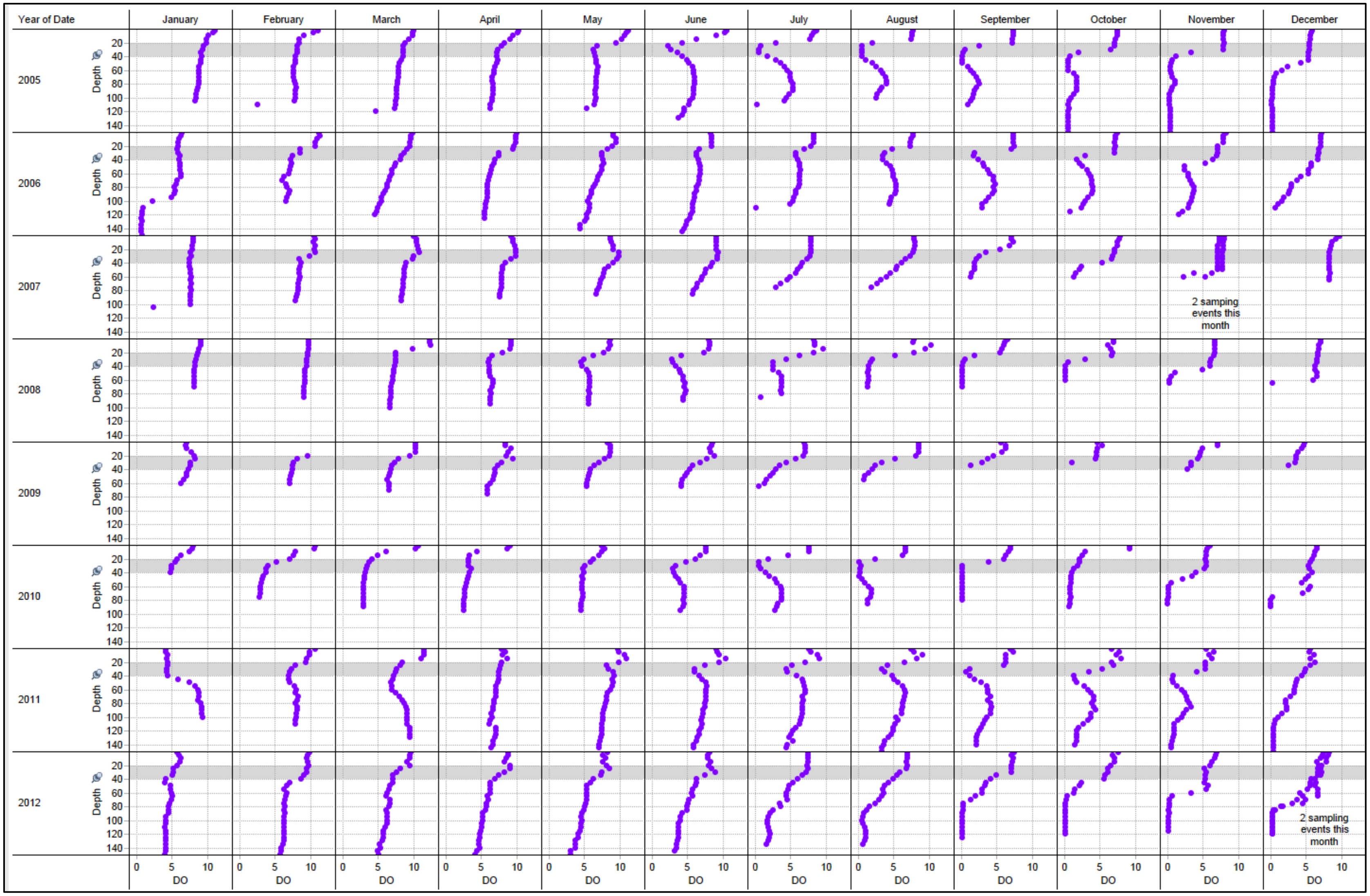



**Figure 30: Dissolved oxygen profiles at Nacimiento Reservoir log boom 2005-2012**

#### 2.1.2.3 Wetlands

There are no known wetlands of any significance in the reservoir watershed.

#### 2.1.2.4 Groundwater recharge

There is no known groundwater recharge to the reservoir or its tributaries.

# 2.2 WATER SUPPLY SYSTEM

## 2.2.1 Background

### 2.2.1.1 History

In 1959 an agreement was signed between the Monterey County Flood Control and Water Conservation District and the San Luis Obispo County Flood Control and Water Conservation District (San Luis Obispo District) granting the San Luis Obispo County District the right to withdraw 17,500 acre-feet of water per year from Nacimiento Reservoir. Of that allotment, 1,750 acre-feet per year are set aside for lakeside use; the remaining 15,750 acre-feet per year are available for the Nacimiento Water Project. In 2005 water delivery entitlement contracts for Nacimiento reservoir water were signed between the San Luis Obispo District and four water purveyors, thus creating The Nacimiento Water Project; project design began soon thereafter. The four water purveyors (agencies) were the City of Paso Robles, Templeton Community Services District, Atascadero Mutual Water Company, and the City of San Luis Obispo In 2006 the San Luis Obispo District signed a water delivery entitlement contract with the San Luis Obispo County Service Area No. 10A (CSA10A - Cayucos) for Nacimiento Project water. Water for CSA10A is actually delivered to CSA10A from Whale Rock Reservoir, not from Nacimiento Reservoir, per an exchange agreement between CSA10A and the City of San Luis Obispo, which has rights to Whale Rock Reservoir water. Construction of the Nacimiento Water Project (NWP) began in 2007 and was completed in late 2010; initial deliveries began in January 2011.

The contracts are for the delivery of raw water to the agencies, which are responsible for treatment before delivery to consumers. The contracts describe certain aspects of how the water is to be delivered, but they do not guarantee delivery. Nacimiento Project water is intended to be a supplemental supply only, not a primary source.

As of this writing, all current NWP customers are public water agencies. Approximate populations served by each agency are as follows:

| | |
|---|---:|
| City of Paso Robles | 30,072 |
| Templeton Community Services District | 7,500 |
| Atascadero Mutual Water Company | >29,000 |
| City of San Luis Obispo | 45,119 |
| County Service Area 10A | 1,345 |
| Total | 113,036 |

(Todd Engineers), (Templeton Community Services District), (Atascadero Mutual Water Company), (City of San Luis Obispo), (Boyle Engineering) The service area is shown in Figure 31.

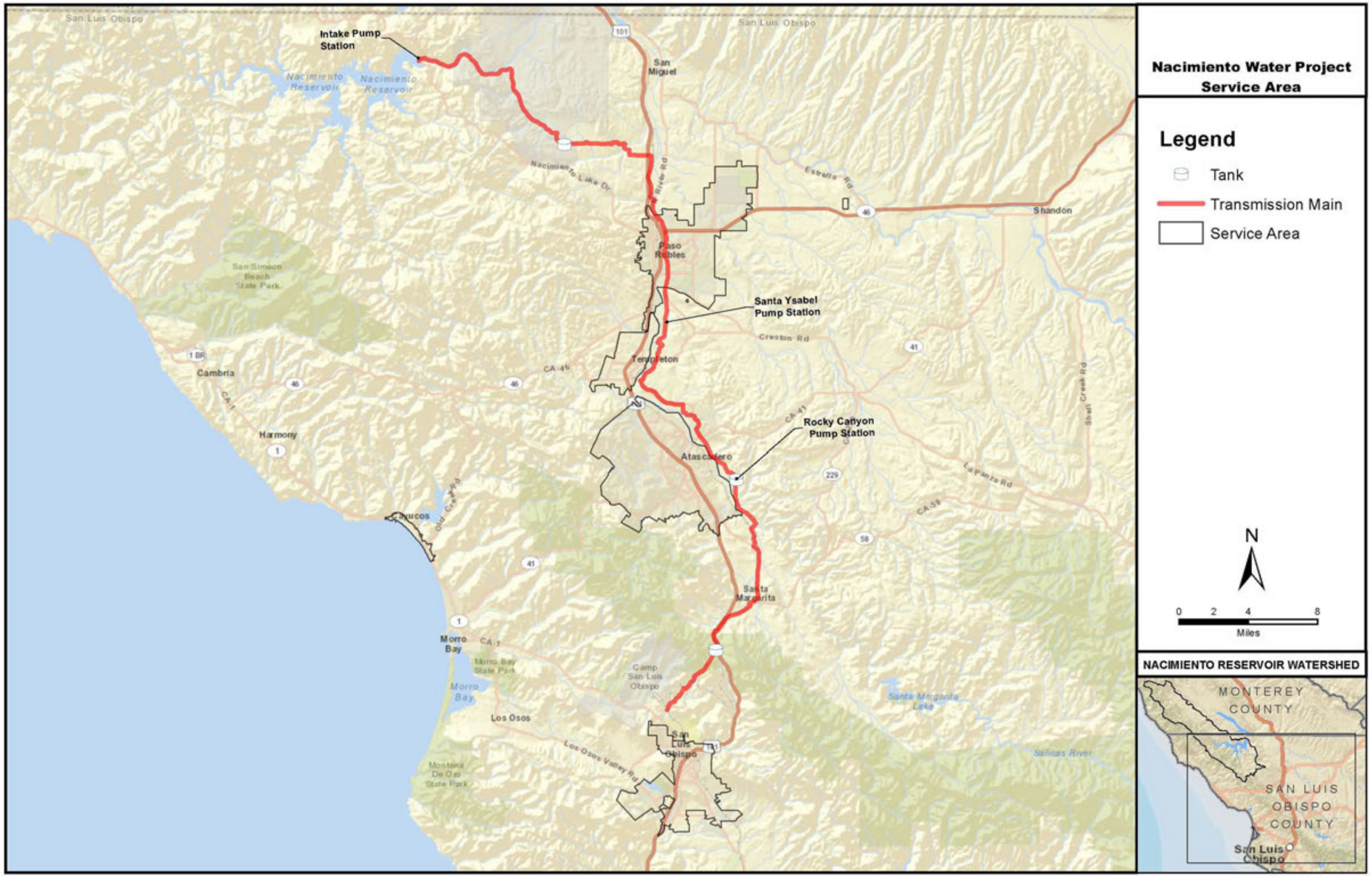



**Figure 31: Nacimiento Water Project Service Area**

#### 2.2.1.2 Water Sources

The Nacimiento Water Project relies on a single source, the Nacimiento Reservoir, which was formed when the Nacimiento Dam was built on the Nacimiento River. Completed in 1957, Nacimiento Dam is owned and operated by the Monterey County Water Resources Agency (MCWRA). MCWRA operates the dam primarily for the purposes of flood control and groundwater recharge in the Salinas River Valley, as well as for steelhead trout conservation. If the reservoir water level drops to 687.8 feet, a 1959 agreement between the District and MCWRA requires that the only water to be released will be to meet the District's entitlement of 17,500 AFY. (Monterey County Water Resources Agency), (MCWRA and USACE) (NOAA National Marine Fisheries Service) (SLOCFC&WCD and MCFC&WCD)

### 2.2.2 Facilities

Nacimiento Reservoir is 18 miles long and has approximately 165 miles of shoreline. At maximum pool the reservoir's storage capacity is 377,900 acre-feet with a surface elevation of 800 feet (NGVD 29) (Figure 32) and surface area of 5,727 acres. Maximum depth is 175 feet. Key elevations are described in Table 8.

*Photo: San Luis Obispo County Public Works Department*
**Figure 32: Nacimiento Reservoir dam and spillway**

**Table 8: Key Elevations of Lake Nacimiento**

| **KEY ELEVATIONS OF LAKE NACIMIENTO** | | |
|---|---|---|
| **Elevation (ft above MSL, NGVD 29)** | **Storage (acre-feet)** | **Description** |
| 800.0 | 377,900 | Elevation at which Lake Nacimiento is considered full; top of spillway; maximum physical permanent water elevation |
| 782.5 | 285,050 | Bottom of the FERC Flood Pool; maximum water surface elevation during January and February without maximum releases being made |
| 777.3 | 260,000 | Top of the Water Conservation Pool; bottom of the MCWRA Flood Pool |
| 766.5 | 212,700 | Both launch ramps at Lake Nacimiento Resort are operational in a range of two to three feet above this elevation |
| 755.0 | 168,350 | Minimum elevation at which water can be released from the High Level Gates |
| 748.0 | 144,200 | Elevation defined in MOA with Fish & Game, below which drought conditions are defined to exist, and the minimum release can be reduced from 25 cfs to 10 cfs |
| 730.0 | 92,150 | Elevation above which most boat ramps around the Lake are operational |
| 687.8 | 22,300 | Minimum pool; lowest Lake elevation at which water is available to MCWRA for release |
| 670.0 | 10,300 | Minimum elevation (at which) water can be released from the Low Level Outlet Works; physical minimum pool; lowest possible Lake elevation (at which) water can flow from outlet works by gravity. |
| *Source: Monterey County Water Resources Agency, provided to Nacimiento and San Antonio Watershed Committee, September 2008* | | |

The Nacimiento Reservoir is operated by the Monterey County Water Resources Agency (MCWRA) primarily for the purpose of downstream flood control and ground water conservation, as well as for steelhead trout conservation and recreational use. Drinking water supply is incidental to the dam's operation and is not a consideration in MCWRA's operational policies.

The Nacimiento Water Project is a raw water, supplemental supply only. No treatment is provided before the water reaches participating agencies' turnouts. The Project is operated in accordance with the water delivery entitlement contracts signed by the San Luis Obispo County Flood Control & Water Conservation District (District) and participating agencies. Each contract specifies the maximum number of acre-feet per year that each agency may take, the maximum instantaneous rate of flow to be delivered to each agency, and the maximum amount of water to be delivered in any one month. Current delivery entitlements are shown in Table 9.

**Table 9: Nacimiento Water Project Water Delivery Entitlements (as of Nov. 2011)**

| Participant | Total Amount Each Water Year (AF) | Max. Instantaneous Rate of Flow (cfs) | Max. Amount In Any One Month (AF) |
|---|---|---|---|
| Paso Robles | 4,000 | 9.03 | 537 |
| TCSD | 250 | 1.03 | 63 |
| AMWC | 2,000 | 8.29 | 500 |
| City of SLO | 3,380 | 5.10 | 310 |
| CSA10A | 25 | 0.04 | 2.3 |
| Subtotal | 9,655 | 23.49 | 1,412.3 |
| Reserve Capacity | 6,095 | 9.30 | 558.7 |
| **Total** | **15,750** | **32.79** | **1,971** |
| (Subject to revision of existing Water Delivery Entitlement Contracts to conform to current design flows.) | | | |
| *Source: Nacimiento Water Project iMOP (Electronic Manual of Procedures)* | | | |

Each year, project participants submit three year projections of specific delivery requests to the District. The District then develops a water delivery schedule for the project, taking participants' requests into account.

Project facilities consist of the following major components (Figure 33).

Intake Facility

- Location – north shore of Nacimiento Reservoir, eastern end, adjacent to the dam
- Intake shaft - a 180 foot deep, 20 foot diameter vertical shaft and wet well
- Intake tunnel – a 500 foot long, 48 inch minimum diameter horizontal tunnel, located at elevation 660', which connects the bottom of the shaft to the intake pipe
- Intake pipe – the intake pipe connects to the intake tunnel. It slopes up along the lake bottom from elevation 660' to 810'. Seven ports are located at 20 ft intervals along the intake pipe, from elevation 660' to 780'. The ports are opened and closed using hydraulic pressure system actuating valves. Each port is fitted with a fish screen (Figure 34). A drawing of the intake pipe is shown in Figure 35.

Pipeline

- Length – 45 miles
- Size - 36" to 12"
- Materials - ductile iron, welded steel
- River crossings – one below Nacimiento River, five beneath the Salinas River
- Route – from Nacimiento Dam, through Camp Roberts, the communities of Paso Robles, Templeton, Atascadero, and Santa Margarita, through the Cuesta Tunnel

(at the top of Cuesta Grade), ending just north of the city of San Luis Obispo.

Turnouts

- Materials – ductile iron, welded steel
- Locations - one each in
  - Paso Robles
  - Templeton
  - Atascadero
  - San Luis Obispo

Pump Stations

- Intake – five pumps, 500 hp each
- Santa Ysabel (south of Paso Robles) – four pumps, 600 hp each
- Rocky Canyon (southeast of Atascadero) – three pumps, 400 hp each

Storage Tanks

- Camp Roberts – 850,000 gallons
- Rocky Canyon (southeast of Atascadero) – 850,000 gallons
- Cuesta Tunnel (top of Cuesta Grade on Highway 101, between Santa Margarita and San Luis Obispo) - 300,000 gallons

Supervisory Control and Data Acquisition (SCADA) system

- Uses fiber optic cable that was installed for this project

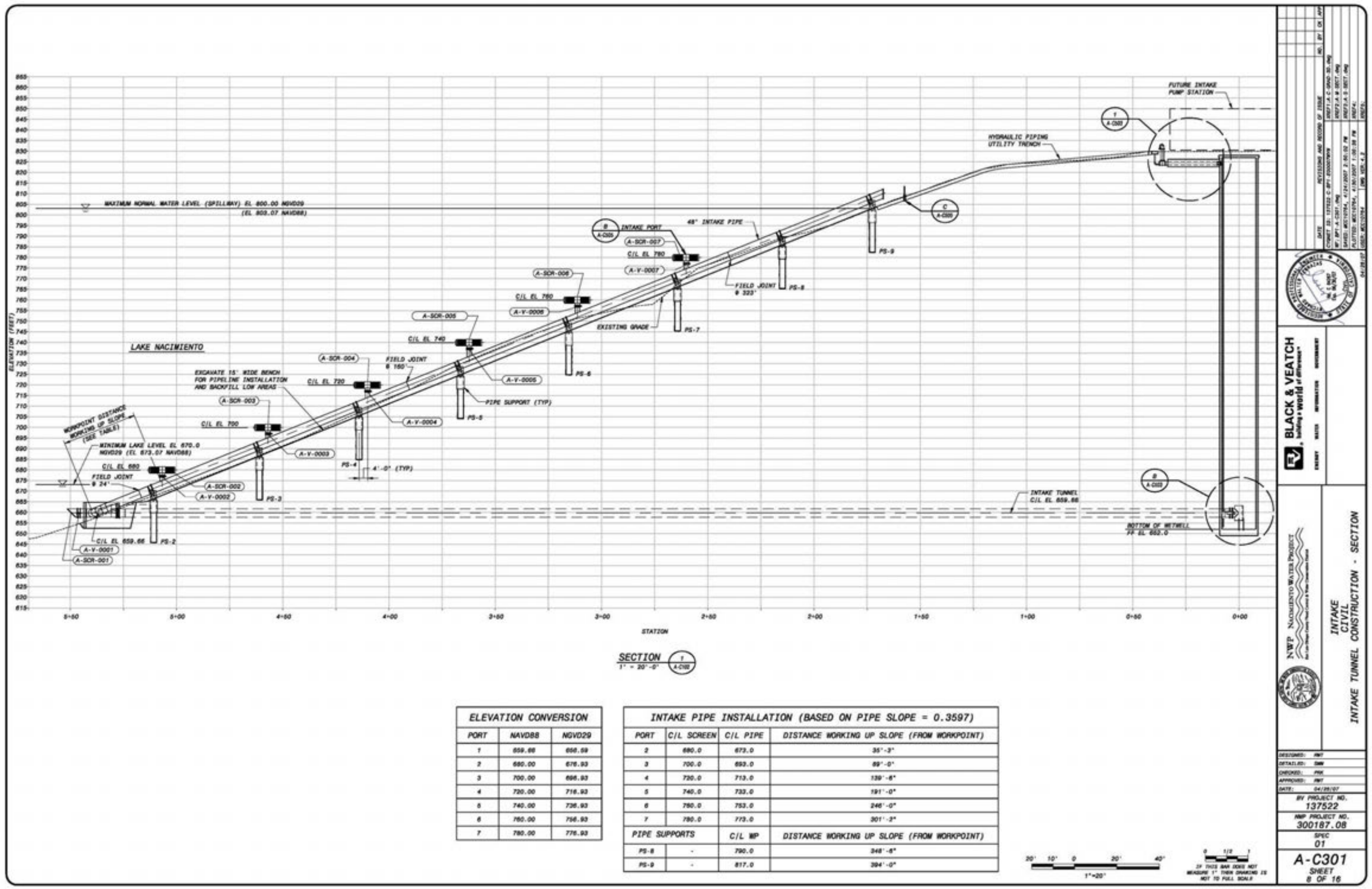
Intake protection is provided by a log boom on the lake and fencing along the shore. A new log boom was installed in 2008. It is located a minimum of 500’ away from the intake pipe at all points (Figure 36, Figure 37). Fencing is installed along the lake shore adjacent to the intake, and all around the intake building (Figure 38). No trespassing signs are posted at frequent intervals along the fence to prohibit public access to the lake near the intake and dam (Figure 39, Figure 40).


*Source: San Luis Obispo County Public Works Department*

**Figure 33: Nacimiento Water Project Overview**


*Photo: San Luis Obispo County Public Works Department*

**Figure 34: Nacimiento Water Project intake ports**




| ELEVATION CONVERSION | | |
|---|---|---|
| PORT | NAVD88 | NGVD29 |
| 1 | 659.66 | 656.59 |
| 2 | 680.00 | 676.93 |
| 3 | 700.00 | 696.93 |
| 4 | 720.00 | 716.93 |
| 5 | 740.00 | 736.93 |
| 6 | 760.00 | 756.93 |
| 7 | 780.00 | 776.93 |

| INTAKE PIPE INSTALLATION (BASED ON PIPE SLOPE = 0.3597) | | | |
|---|---|---|---|
| PORT | C/L SCREEN | C/L PIPE | DISTANCE WORKING UP SLOPE (FROM WORKPOINT) |
| 2 | 680.0 | 673.0 | 35'-3" |
| 3 | 700.0 | 693.0 | 89'-0" |
| 4 | 720.0 | 713.0 | 139'-6" |
| 5 | 740.0 | 733.0 | 191'-0" |
| 6 | 760.0 | 753.0 | 246'-0" |
| 7 | 780.0 | 773.0 | 301'-3" |
| PIPE SUPPORTS | | C/L WP | DISTANCE WORKING UP SLOPE (FROM WORKPOINT) |
| PS-8 | - | 790.0 | 348'-6" |
| PS-9 | - | 817.0 | 394'-0" |

**Figure 35: Nacimiento Water Project Intake Structure Drawing**

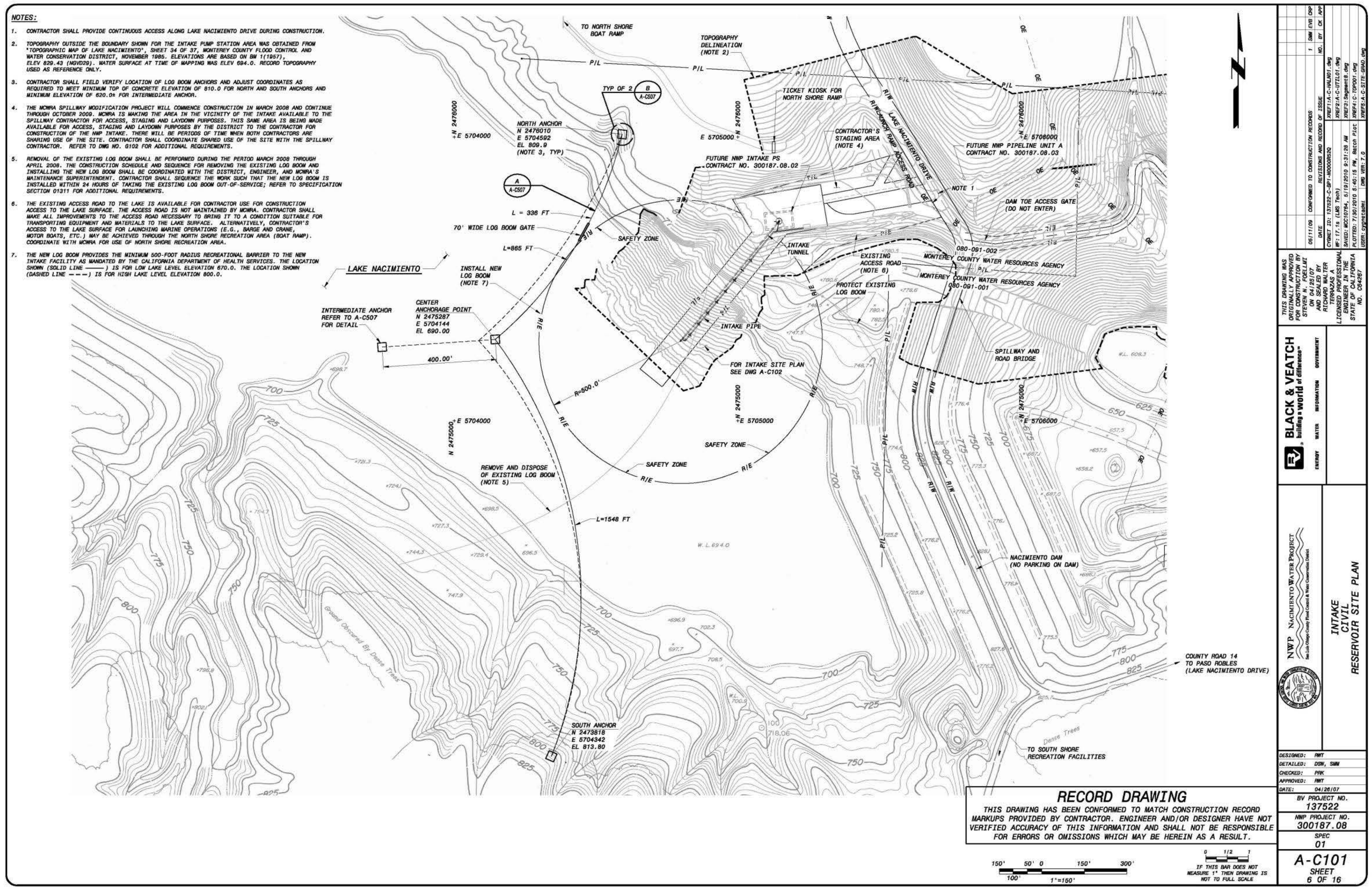



**Figure 36: Nacimiento Reservoir Log Boom**

*Photo: San Luis Obispo County Public Works Department*
**Figure 37: Log boom, intake structure, and dam**

*Photo: San Luis Obispo County Public Works Department*
**Figure 38: Fencing around NWP intake pump station**

*Photo: San Luis Obispo County Public Works Department*
**Figure 39: "No trespassing" signs at intake area**


*Photo: San Luis Obispo County Public Works Department*
**Figure 40: "No water contact" signs at intake area**

Participating agencies receive Nacimiento Project water as follows:

- The City of San Luis Obispo receives the water directly into a conventional water treatment plant year-round
- Templeton Community Services District (TCSD) receives the water into a percolation pond for a ground water recharge and recovery (GWRR) system year-round. TCSD originally planned to take its entire allocation during only warm weather months, however concerns expressed by the California State Regional Water Quality Control Board, Central Coast Region about recharge pond recovery rates prompted the change to a year-round schedule so that the entire allocation can be received, but at a lower flow rate each month. TCSD is actively considering purchase and installation of a small package surface water treatment plant in order to receive NWP water on its preferred schedule of warm weather months.
- Atascadero Mutual Water Company (AMWC) began receiving the water into a recharge pond for a GWRR system for a few months each year in July 2012, following completion of a tracer study to determine the rate of subsurface water movement between the recharge pond and the nearest drinking water well. The tracer study showed that the subsurface water travel time was more than 10 days, which met California Department of Public Health criteria for classifying the recovery well as not being under the influence of surface water. The recovery well is therefore only subject to ordinary groundwater treatment regulations. AMWC has long term plans to build a surface water treatment plant.
- The City of Paso Robles plans to take water year-round pending construction of a water treatment plant, which is currently in the design phase.
- CSA10 receives water year-round from Whale Rock Reservoir via an exchange agreement with the City of San Luis Obispo for an allocation of NWP water.

## 2.2.3 Emergency Plans

### 2.2.3.1 Emergency Plan for Nacimiento Water Project

The San Luis Obispo County Flood Control and Water Conservation District has an Emergency Response Plan for the Nacimiento Water Project dated June 1, 2010. This plan describes response measures to be taken in the event of introduction of a contaminant to the water, explosion, flooding, earthquake, or wildland fire. (San Luis Obispo County Public Works Department)

The plan addresses these events as they apply to the pipeline itself, which, except for the intake pump station, is located outside the reservoir watershed. Other than the introduction of a contaminant to the reservoir or an event occurring at the intake pump station, the plan does not describe responses to emergencies occurring within the reservoir watershed.

### 2.2.3.2 Emergency Plans for Other Entities

Several entities store hazardous materials and/or have wastewater collection and treatment facilities within the watershed, including several lakeside communities, Lake Nacimiento Resort, wineries, and Lime Mountain Quarry; these are described in sections 3.2.1 and 3.2.10 below. All such entities have developed emergency response plans for their operations that include measures which reduce the risk of surface water contamination from a spill.

Several Monterey County Parks Department staff stationed at both Lake Nacimiento and nearby Lake San Antonio are certified to respond to hazardous material spills, and the department maintains 300 ft. of containment boom at each lake.

The California Department of Forestry and Fire Protection maintains three fire stations in the area. Staff at all three stations are trained to respond to all emergency incidents including hazardous material spills. The stations are each operated differently, as follows:

- Heritage Ranch
    - Located in the Village of Heritage Ranch
    - Professional staff on site full time, year round
    - Equipment includes emergency response vessel as well as vehicles
- Oak Shores
    - Located in the community of Oak Shores
    - Volunteer staff only, year round
    - Equipment includes emergency response vessel as well as vehicles
- Las Tablas Fire Station
    - Located at corner of Cypress Mountain Drive and Chimney Rock Road

(Adelaida area)

- Professional staff on site full time during summer months of a declared fire season

# 3 POTENTIAL CONTAMINANT SOURCES IN THE WATERSHED

## 3.1 SURVEY METHODS

The watershed survey was conducted using several different methods, including driving, boating, flying, internet research, review of publicly available documents, maps developed by district staff from many different sources, and personal communications with public agency staff and private residents.

# 3.2 POTENTIAL CONTAMINANT SOURCES

## 3.2.1 Wastewater

**Significance**: Pathogens (viruses, *E. coli, Cryptosporidium, Giardia*), coliforms, nutrients (N, P), organic carbon, oxygen demanding substances

**Description**

There are over 2,900 developed residential lots in the immediate vicinity of Nacimiento Reservoir, which employ a variety of domestic wastewater treatment, collection, and disposal methods (Figure 41, Table 10). The rest of the watershed is primarily open space, with a few scattered residences located on large agricultural parcels that use onsite wastewater treatment systems (OWTS, commonly called septic systems). Key contaminants of concern from domestic wastewater are pathogenic organisms, nutrients, and oxygen demanding substances.

Additionally, several wineries are located in the southeast portion of the Nacimiento Reservoir watershed. All are located in the Adelaida area, several miles away from the main body of the reservoir (Figure 42). Winery waste water is typically treated in lagoons then disposed on land. Winery waste water contains high levels of organic material and may also contain high levels of salts (from water softening processes). Also, wineries produce organic solids that are typically composted on site. Wastewater production is high for about two months each year (during the fall “crush”) then is low for the remainder of the year.

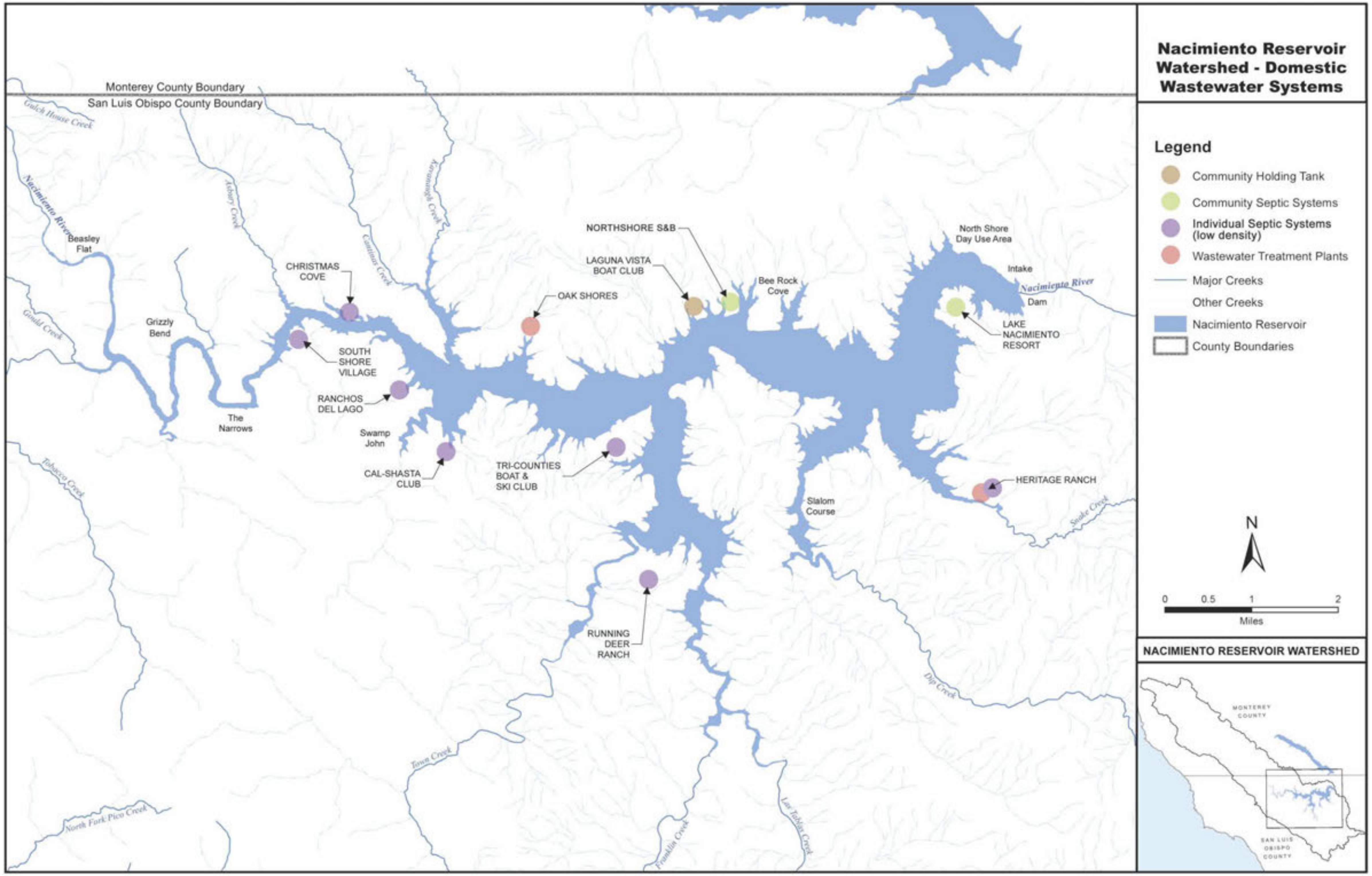



**Figure 41: Nacimiento Reservoir Lower Watershed Wastewater Systems Overview**

### Table 10: Nacimiento Reservoir Lower Watershed Wastewater Treatment Systems

| NACIMIENTO RESERVOIR - LAKESIDE DOMESTIC WASTEWATER SYSTEMS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Community - Agency** | **Shore** | **WDR** | **Approx no. of sewered lots** | **Population served (estimate)** | **Collection system** | **Treatment method** | **Treatment site location** | **Treatment in Nacimiento Reservoir watershed?** | **Disposal method** | **Disposal in Nacimiento Reservoir watershed?** | **Disposal area address/location** | **Design capacity (MGD)** | **Max flow (MGD)** | **Avg flow (MGD)** |
| Christmas Cove | North | --- | 40 | 40 lots | Individual OWS (septic tanks) | Individual OWS (septic tanks) | On site | Yes | Infiltration (leach field) | Yes | On-site | --- | --- | --- |
| Individual lots - private owners | North | --- | 78 | 78 lots | Individual OWS (septic tanks) | Individual OWS (septic tanks) | On site | Yes | Infiltration (leach field) | Yes | On-site | --- | --- | --- |
| Laguna Vista Boat Club | North | --- | 21 | 21 cabins; 2 undeveloped lots | Community collection system & holding tank | Hauled off-site | Hauled away for disposal in approved facility | No | Off-site disposal | No | Off-site - out of watershed | --- | --- | --- |
| Northshore S&B | North | 97-010-DWQ | 16 | 16 developed lots; 14 undeveloped lots; 24 RVs | Community collection system | Community OWS (septic tanks) | 6075 Nacimiento Shores Rd (Northshore S&B) | Yes | Infiltration (leach field) | Yes | 6075 Nacimiento Shores Rd, Bradley (on site) | 0.010 | --- | 0.002 |
| Oak Shores - County of San Luis Obispo | North | 01-139 | 626 | 626 homes as of 3/2012; 912 lots approved | Community collection system | WWTP - aeration, settling | 2167 Ridge Rider Rd (Oak Shores) | Yes | Evaporation/percolation pond + sprayfield | Yes | Oak Shores Road, ~1 mile S of Lynch Cyn Dr (near Oak Shores) | 0.100 | 0.093 | 0.043 |
| Cal Shasta Club | South | --- | 120 | 120 members | Individual OWS (septic tanks) | Individual OWS (septic tanks) | On site | Yes | Infiltration (leach field) | Yes | On-site | --- | --- | --- |
| Cappy Culver Elementary School - Heritage Ranch | South | 97-010-DWQ | 1 | 280 (transient) | Community OWS (septic tanks) | Community OWS (septic tanks) | 11011 Heritage Loop Road (Heritage Ranch) | Yes | Infiltration (leach field) | Yes | On-site | --- | --- | --- |
| Heritage Ranch - Heritage Ranch Community Services District | South | R3-2006-0012 | 1590 | 1,590 connections as of 2/2011; 1,880 lots approved | Community collection system | WWTP - aeration, chlorination | 4879 Heritage Rd (Heritage Ranch) | Yes | Percolation pond + sand filtration | No | Unnamed drainage, tributary to Nacimiento River downstream of dam | 0.400 | 0.395 | 0.148 |
| Heritage Ranch - individual lots | South | --- | 160 | 160 lots | Individual OWS (septic tanks) | Individual OWS (septic tanks) | On site | Yes | Infiltration (leach field) | Yes | On-site | --- | --- | --- |
| Individual lots - private owners | South | --- | 20 | ~20 lots | Individual OWS (septic tanks) | Individual OWS (septic tanks) | On site | Yes | Infiltration (leach field) | Yes | On-site | --- | --- | --- |
| Lake Nacimiento Resort - Monterey County Parks Department | South | 96-26 | 1 | 800 | Community collection system | Community OWS (septic tanks) | 10625 Nacimiento Lake Dr (Lake Nacimiento Resort) | Yes | Evaporation/percolation pond + sprayfield | No | Outside of watershed | 0.036 | 0.033 | --- |
| Ranchos del Lago | South | --- | 29 | 29 owners | Individual OWS (septic tanks) | Individual OWS (septic tanks) | On site | Yes | Infiltration (leach field) | Yes | On-site | --- | --- | --- |
| Running Deer Ranch | South | --- | 105 | 105 members | Individual OWS (septic tanks) | Individual OWS (septic tanks) | On site | Yes | Infiltration (leach field) | Yes | On-site | --- | --- | --- |
| South Shore Village | South | --- | 40 | 40 members | Individual OWS (septic tanks) | Individual OWS (septic tanks) | On site | Yes | Infiltration (leach field) | Yes | On-site | --- | --- | --- |
| Tri Counties Ski & Boat Club | South | --- | 80 | 80 members | Individual OWS (septic tanks) | Individual OWS (septic tanks) | On site | Yes | Infiltration (leach field) | Yes | On-site | --- | --- | --- |
| | | | 2927 | Approx total no of sewered lots, including individual Onsite Wastewater Treatment Systems (OWTS) | | | | | | | | | | |
| | | | 672 | Approx no of individual lots with Onsite Wastewater Treatment Systems (OWTS) | | | | | | | | | | |

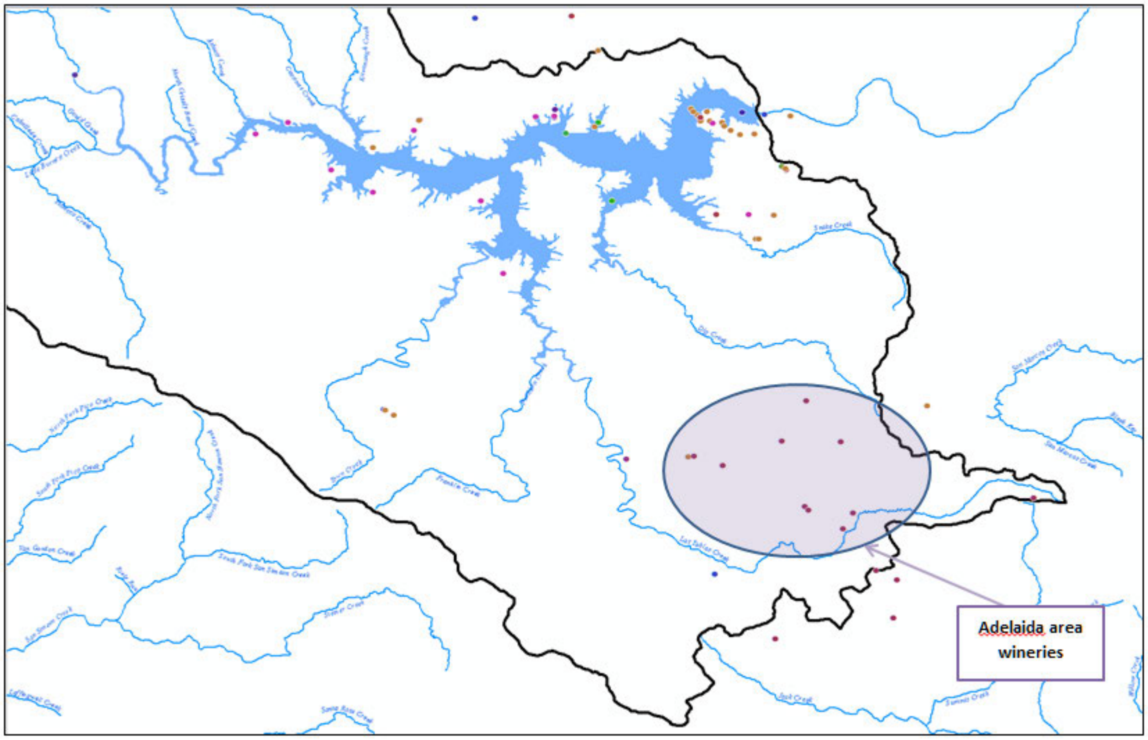



**Figure 42: Adelaida area wineries**

#### 3.2.1.1 Wastewater Discharges

##### 3.2.1.1.a Domestic Wastewater

Of the many residential communities located around Nacimiento Reservoir, only one is served by a wastewater system which disposes its effluent above ground within the Nacimiento Reservoir watershed; that is the community of Oak Shores. All other wastewater systems either use below ground onsite disposal (leach fields), or the effluent is disposed of outside the watershed.

**Oak Shores**

Although the Oak Shores wastewater system is located near the lake shore, it is more than 7 river miles away from the NWP intake structure (see Figure 41, above)

System operation Oak Shores is served by a community wastewater system that is operated by the San Luis Obispo County Department of Public Works, County Service Area 7A under the provisions of State Water Resources Control Board Order No. 2006-0003-DWQ (collection system) and Central Coast Regional Water Quality Control Board Order No. 01-130 (treatment and disposal). The system, built in 1975, currently has 638 service connections. Approximately 120 residences are occupied year round; the rest are used seasonally. Staffing is provided by the San Luis Obispo County Public Works Department and currently includes one full time certified Grade 2 wastewater treatment operator; backup support is available from three certified Grade 1 operators and all operations are overseen by a certified Grade 2 wastewater treatment operator.

Treatment plant Wastewater receives secondary treatment via two aeration ponds and two settling lagoons. The treatment plant is located approximately 1,000 ft horizontally away from and more than 100 ft above the HWL (Figure 43). It has a design capacity of 0.100 MGD; actual average flows from 2005 to 2010 varied from 0.025 MGD in the winter to 0.093 MGD during peak periods. The plant has 24 hour design flow capacity, and was built with dual facilities for redundancy.

Effluent disposal Disposal is to an evaporation/percolation pond and disposal area. Effluent is pumped nearly two miles from the treatment plan to a spray field that is located within the reservoir watershed, over 2,000 ft horizontally away from the HWL, in the upper reaches of the Kavanaugh Creek subwatershed. This area has a capacity of two million gallons. Surface runoff is diverted around the spray fields. When the spray field ponds become saturated during very wet winters, effluent is pumped approximately 1,700 ft downslope to percolation ponds that are located approximately 700 ft horizontally from the HWL.

Sludge disposal Sludge is hauled away and disposed outside the watershed.

Flow and effluent limitations Waste Discharge Requirements Order 01-130 specifies the following limitations on flow and on effluent constituents of concern (California Regional Water Quality Control Board, Central Coast Region):

- Daily flow averaged over each month shall not exceed 100,000 gallons
- Effluent shall not have dissolved oxygen concentrations less than 2.0 mg/L

| **Constituent/Parameter** | **Units** | **30 Day Average** | **Daily Maximum** |
|---|---|---|---|
| BOD5 | mg/L | 50 | 100 |
| Total Suspended Solids | mg/L | 50 | 100 |
| Settleable Solids | mL/L | --- | 0.5 |

Graphs of effluent monitoring data reported to the RWQCB for 2007-2011 are presented in Appendix 9.6.

Compliance history: A single WDR violation occurred in 2008, when suspended solids exceeded the limit on one occasion. All other regulated constituents have been well within prescribed limits. (State Water Resources Control Board)

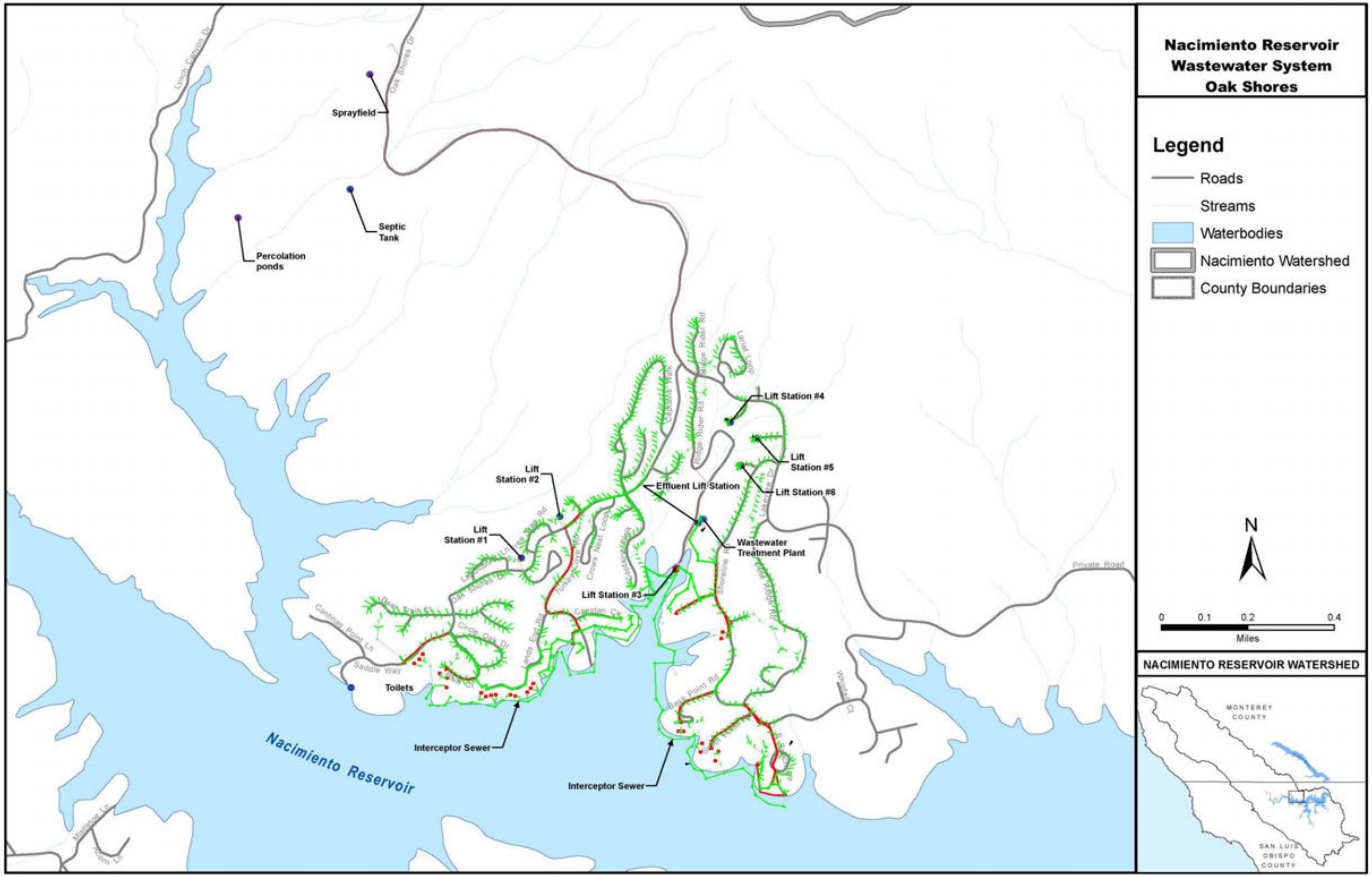



**Figure 43: Oak Shores Wastewater System**

#### 3.2.1.1.b Industrial Wastewater

As of this writing, there are seven wineries in the Nacimiento Reservoir watershed that are regulated under the Central Coast Regional Water Quality Board's General Waste Discharge Requirements R3-2008-0018 for Discharges of Winery Waste (Table 11). All but one are located within the Las Tablas Creek subwatershed (Figure 44).

Order R3-2008-0018 specifies the following effluent limitations:

- Winery wastewater flow shall not exceed the design capacity of the treatment and disposal system. Wastewater flows shall be limited to the flows described in the NOI[5].
- Where winery wastewater is discharged to land (such as to a spreading basin or vineyard), organic loading rate shall not exceed 300 pounds of Biochemical Oxygen Demand (BOD5) per acre per day at any time.
- The discharger shall not discharge salt brine from water-softening devices into winery process water stream unless approved in writing by the Executive Officer. The Executive Officer may condition approval on groundwater monitoring and/or a salts management plan for facilities discharging salt brine into winery process water streams.

All seven regulated wineries have remained fully in compliance with discharge requirements during the last five years. (California Regional Water Quality Control Board, Central Coast Region) (State Water Resources Control Board)

**Table 11: Wineries - Waste Discharge Program Information**

| Winery | Address | Subwatershed | Date enrolled with RWQCB | No. of WDR violations since 2007 |
|---|---|---|---|---|
| Adelaida Cellars | 5805 Adelaida Road | Las Tablas Ck | 11/23/04 | 0 |
| Dubost Ranch | 9988 Chimney Rock Road | Las Tablas Ck | 6/2/09 | 0 |
| Halter Ranch Vineyard | 8910 Adelaida Road | Las Tablas Ck | 5/12/10 | 0 |
| Justin Winery | 11680 Chimney Rock Road | Las Tablas Ck | 8/16/04 | 0 |
| Starr Ranch Vineyard & Winery | 9320 Chimney Rock Road | Las Tablas Ck and Dip Creek | 10/23/06 | 0 |
| Tablas Creek Vineyard | 9339 Adelaida Road | Las Tablas Ck | 11/1/02 | 0 |
| Whalebone Winery | 8325 Vineyard Drive | Las Tablas Ck | 9/21/06 | 0 |

5 NOI = Notice of Intent to Comply with the Terms of the General Waste Discharge Requirements for Discharges of Winery Waste.

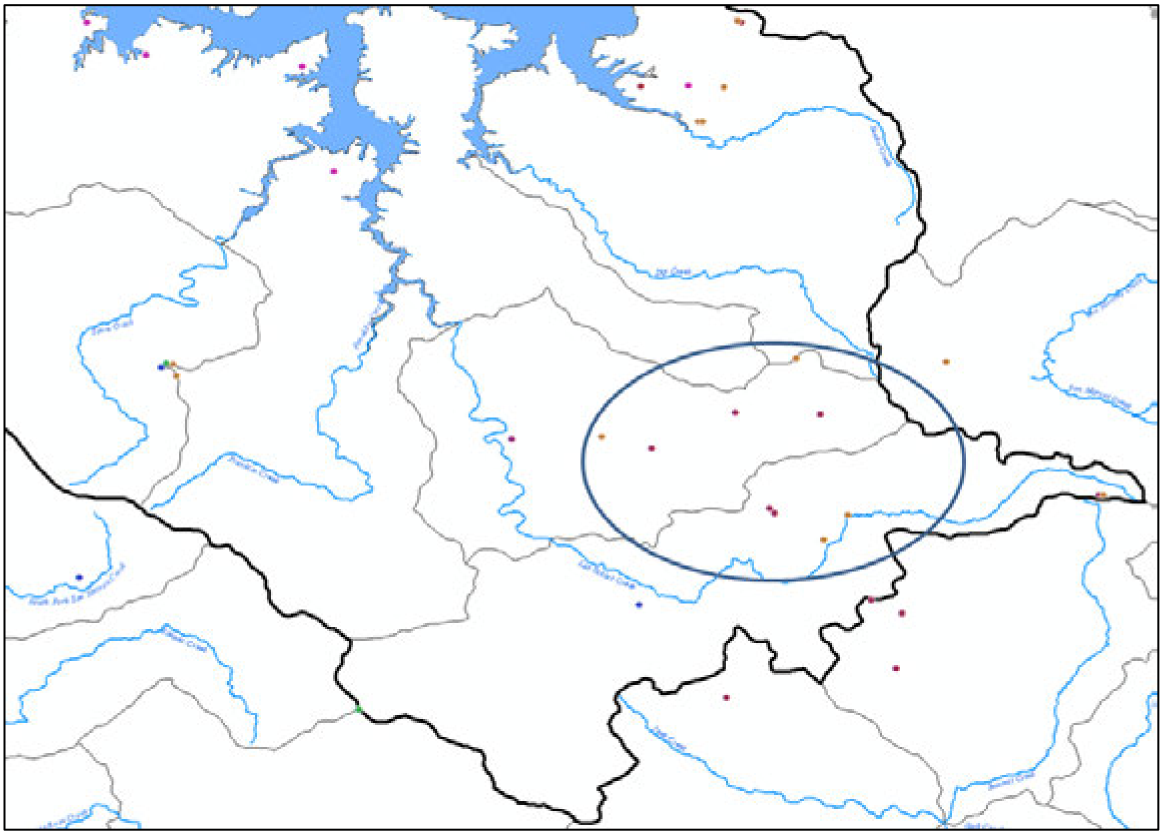


**Figure 44: Relationship between Nacimiento area wineries and subwatersheds**

### 3.2.1.2 Wastewater Collection Systems

There are five community domestic wastewater collection systems located in the immediate vicinity of Nacimiento Reservoir:

- Laguna Vista Boat Club
- Northshore S&B
- Lake Nacimiento Resort
- Heritage Ranch
- Oak Shores

These communities are shown in Figure 41 above.

#### 3.2.1.2.a Laguna Vista Boat Club

The small community of Laguna Vista Boat Club is located approximately 4.6 river miles from the NWP intake structure. It has 21 developed lots and 2 undeveloped lots, and is occupied only seasonally. It is served by a community wastewater collection system and holding tank that were installed when the club was established in 1964. There is less than one mile of collection line, and no lift stations. The entire collection system is located within 1,000 ft. of the high water line (HWL). The 3,500 gallon capacity collection tank is located approximately 70 feet from the HWL (Figure 45). The tank level is checked frequently when residents are on site, and the tank is pumped out when it is 75% full. The waste water and solids are disposed of outside the watershed. There have been no sewage spills since the community was built in 1964. (Capps)


**Figure 45: Laguna Vista Boat Club and Northshore S&B Wastewater Systems**

#### 3.2.1.2.b Northshore S&B

The community of Northshore S&B (formerly known as Northshore Ski & Boat Club) is located about 4.3 river miles from the NWP intake structure. It has 40 members and is comprised of 16 developed lots, 14 undeveloped lots, 24 recreational vehicles, and a small community building. Currently three homes are occupied year-round; all others are used only seasonally. It is served by a community septic system that was built in 1972 (Figure 45, above)

Wastewater is collected via less than 1 mile of collection line into three 1,500 gallon septic tanks. The entire collection system is located within 1,000 ft of the HWL. There are no lift stations in the collection system. All alarms and spill control measures are associated with the septic tanks (described below). Only one section of the collection system has suffered a breach since the system was built in 1972, due to saturated soil movement following winter rains over a 2-3 year period. Each spill was small, as the line served only one full time residence, and each breach was repaired promptly. The ground in that area was stabilized in 1997 and no soil movement nor breaches have occurred since then. (Green) (Northshore S&B, Inc.)

#### 3.2.1.2.c Lake Nacimiento Resort

System description This public recreation area, comprised of a 300 space campground, day use area, marina, and other amenities, is served by a community septic system. Both the resort and the wastewater system are operated by the Monterey County Parks Department. The wastewater collection line, lift stations, septic tanks, and holding tanks are located within the Nacimiento Reservoir watershed. Liquid effluent is pumped to a disposal area that is located outside of the watershed. Solid waste is pumped out of the septic tanks periodically and disposed outside the watershed as well.

Collection system The system collects waste water from eight public restrooms located on shore, two public toilets located on the marina docks, an RV dump station, three staff residences, 19 lodging units, an administration building, and the park rangers' office building.

The collection line for this system is made up of numerous short segments of both gravity line and force main; the total length is less than one mile long. There are 10 lift stations in the system; two of them (Pine Knoll and Oak Knoll) pump all of the resort's collected wastewater approximately 1.6 miles via a force main to a disposal area that is located outside of the watershed. At least 7 lift stations are located more than 200 ft horizontally from the HWL; estimates based on an examination of aerial photographs indicate that up to 3 lift stations may be located within 200 ft of the HWL. Public restrooms located on shore and lift stations are shown in Figure 46; a map of the collection lines is not available at this time. The disposal area is shown in the lower right corner of Figure 47.

Spill prevention and control All lift stations have both visual and audible high level alarms. A 20KW portable backup generator is located at the largest lift station (Pine Knoll). Two maintenance staff and one park ranger live on site and are available for 24 hour callout. A backhoe and a vacuum truck are both stored on site, and an additional vacuum truck is available within 17 miles at Lake San Antonio. Three hundred feet of containment boom is available at both Lake Nacimiento and Lake San Antonio, and the Monterey County Parks Department maintains emergency response vessels.

(San Luis Obispo County Flood Control and Water Conservation District)

Spill history The total collection system length is less than one mile and so it is not tracked in the State Water Resources Control Board's CIWQS[6] database. Consequently,

6 The California Integrated Water Quality System (CIWQS) is a computer system used by the State and Regional Water Quality Control Boards to track information about places of environmental interest, manage permits and other orders, track inspections, and manage violations and enforcement activities. CIWQS also allows online submittal of information by Permittees within certain programs and makes data available to the public through reports

no publicly available data could be found on the collection system's spill history for the last five years.


**Figure 46: Lake Nacimiento Resort Wastewater System**

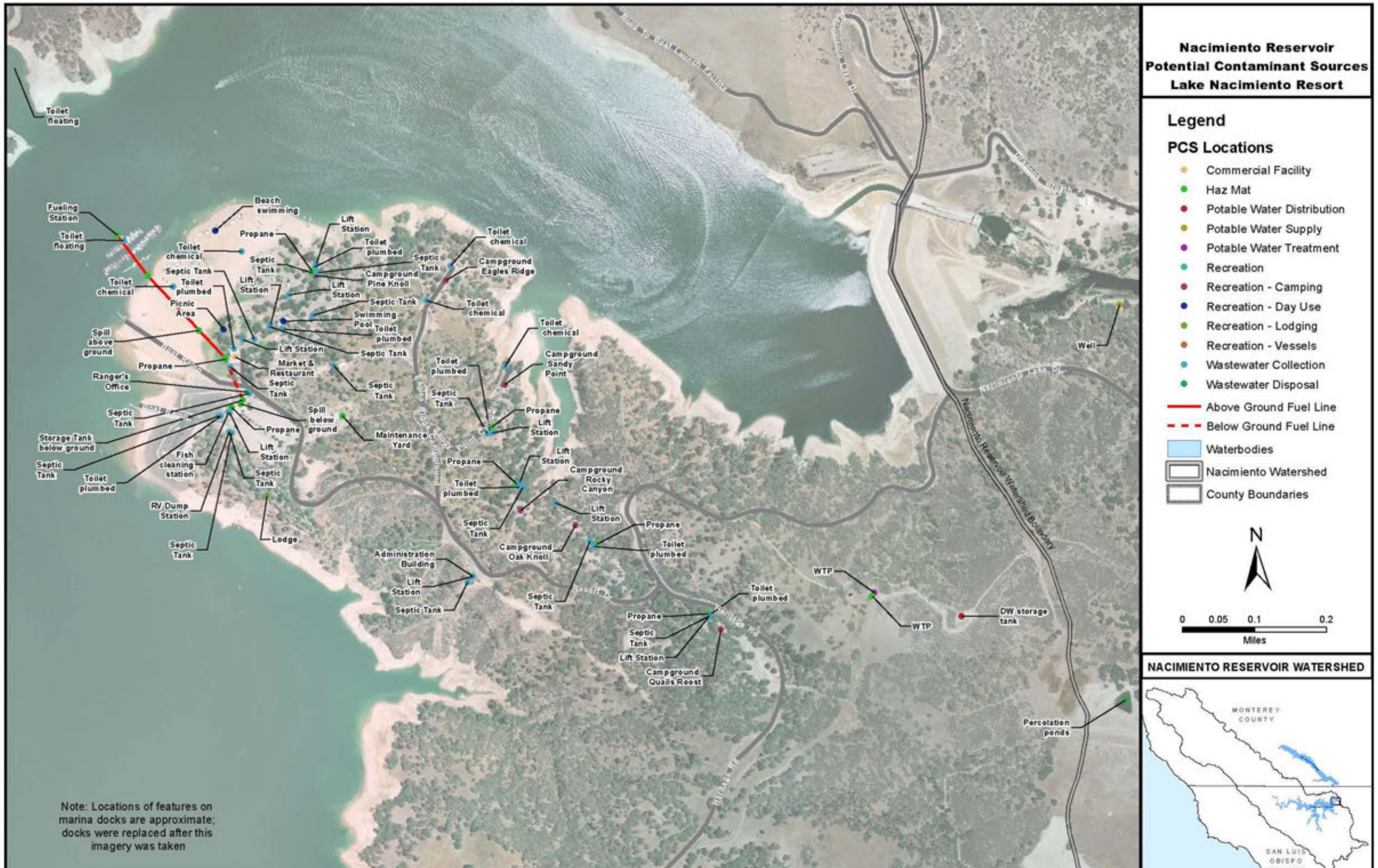



**Figure 47: Lake Nacimiento Resort Wastewater System Disposal Ponds**

### 3.2.1.2.d Heritage Ranch

System operation Most of Heritage Ranch is served by a community wastewater collection, treatment, and disposal system that is operated by the Heritage Ranch Community Services District (HRCSD) under the provisions of State Water Resources Control Board Order No. 2006-0003-DWQ (collection system) and Central Coast RWQCB Order No. R3-2011-0007 (NPDES Permit No. CA0048941) (treatment and disposal). The system currently has 1,590 connections, with an additional 290 undeveloped parcels that are approved for connection to the system. At present the District employs two certified Grade 2 wastewater treatment operators and three certified Grade 1 wastewater treatment operators.

System description Approximately 12 miles of collection line and 10 lift stations bring wastewater to the secondary level wastewater treatment plant. One lift station (LS #5) is approximately 200 ft horizontally away from the HWL; all other lift stations are further away, and all are at least 25 feet vertically above the HWL. The treatment plant is located approximately 1,100 ft horizontally from the HWL and has a design capacity of 0.4 MGD, however, actual flows are about half that amount. Effluent is pumped approximately 3.5 miles to a disposal area (storage pond, sand filters) that is located outside of the reservoir watershed (Figure 48).

Spill prevention and control All lift stations have dual pumps. The District has five permanent backup generators and three portable backup generators to serve ten lift stations. The two lift stations that do not have dedicated generators have several days of storage capacity. The treatment plant and six of the most critical lift stations are equipped with a Supervisory Control and Data Acquisition (SCADA) system, which allows operators to monitor flow continuously. All lift stations have high level alarms.

(Heritage Ranch Community Services District) (D'Ornellas)

Spill history Two spills have occurred in the collection line since 2007. These are described on the CIWQS website as follows[7] (State Water Resources Control Board):

> *Date 10/26/2007*
>
> *Violation Description: High water at lift station resulted in overflow. Electrical fuse failure caused telemitry to not activate alarms and lift station to not operate resulting in a 330 gallon sewage spill behind 2700 Chaparral Lane to manhole in vacant lot/open space behind street. No waterbody affected. Replaced fuse and installed 12V battery for insurance against telemitry failure.*
>
> *Corrective Action: Replaced fuse and installed 12V battery for insurance against telemitry failure.*

7 Excerpted here *verbatim*.

*Date 04/01/2009*

*Violation Description: Private contractor hit and broke a 10 inch gravity line while illegally digging adjacent to a sewer lift station. causing a 450 gallon sewage spill adjacent to lift station 1, Heritage Ranch, CA 93446. to the ground. No waterbody was affected.*

*Corrective Action: Cleaned-up (mitigated effects of spill);Contained all or portion of spill;Restored flow;Returned all or portion of spill to sanitary sewer system.*

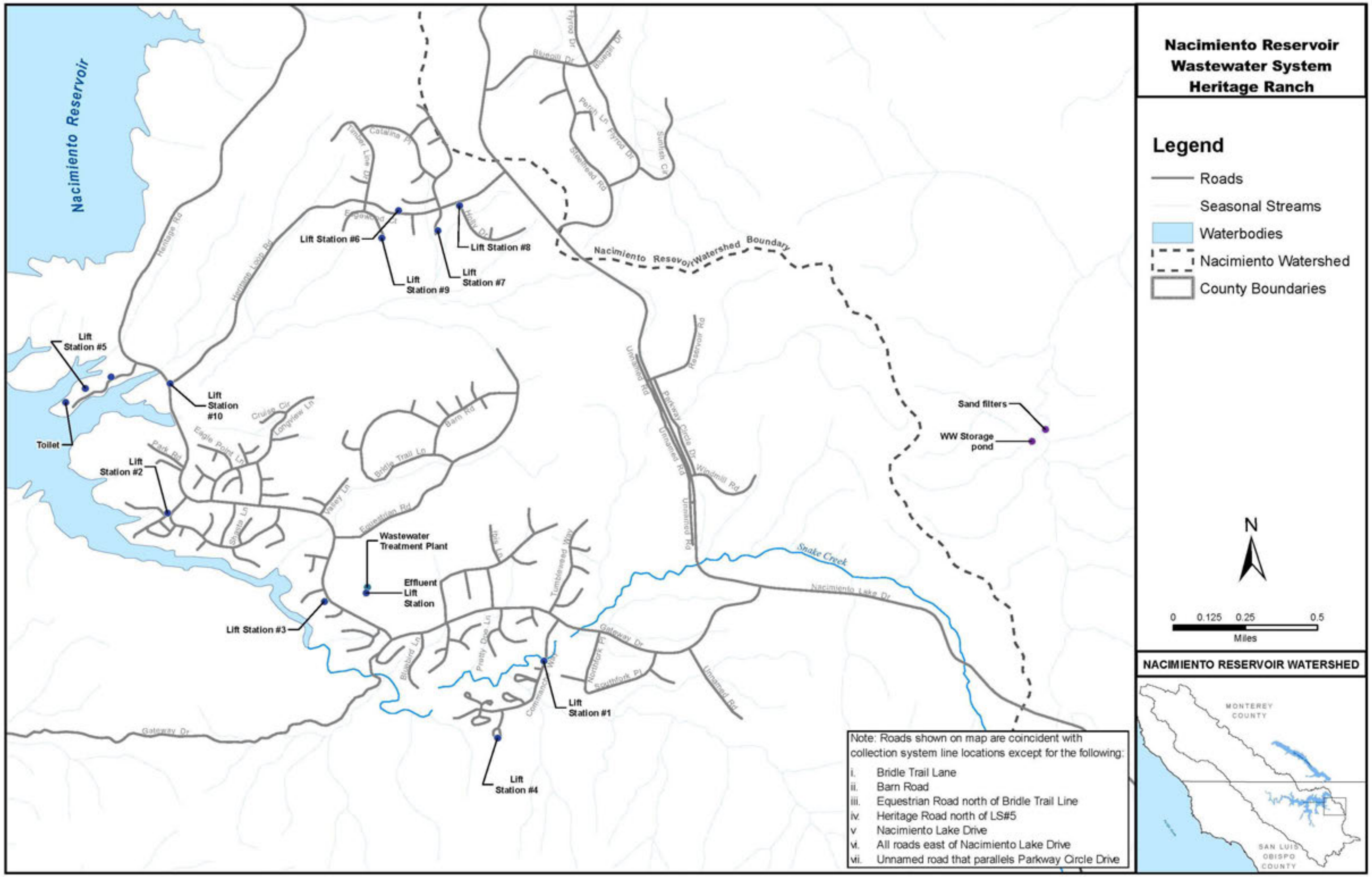



**Figure 48: Heritage Ranch Wastewater System**

#### 3.2.1.2.e Oak Shores

Collection system The wastewater collection system is operated by the San Luis Obispo Department of Public Works, County Service Area 7A under the provisions of State Water Resources Control Board Order No. 2006-0003-DWQ. Approximately six miles of collection line and six lift stations bring wastewater to the secondary level wastewater treatment plant. Because residential development extends to the high water line of the reservoir, the gravity collection system includes an interceptor line which is buried in the ground below the HWL (800 ft. NGVD 29), including one 60 ft. deep lift station (LS #3) and 49 manholes. All other lift stations are located at least 1,000 ft. away from the HWL (Figure 49). Erosion of the shore over time has caused portions of the interceptor line and many lateral lines to become exposed, which increases the risk of damage due to undermining of pipe support and consequent joint failure, and also to vandalism or through inadvertent actions by lake users (Figure 50, Figure 51).

Spill prevention and control Each lift station has dual pumps. All lift stations are equipped with auto dialer alarms and emergency power hookup for a diesel generator. The alarms have battery backup and utilize an auto dialer to provide 24-hour emergency notification. The smaller wet wells have 8-12 hours of emergency storage and all are constructed to operate using CSA 7A's gasoline powered pumps or a generator. The large interceptor wet well (Lift Station #3) has about three days of storage. One portable backup generator is located permanently at the wastewater treatment plant. The interceptor line is inspected visually each year, and an annual dye test is performed as well.

Spill history Three spills have occurred in the collection line since 2007. These are described on the CIWQS website as follows[8] (State Water Resources Control Board):

> *Date: 06/14/2009*
>
> *Violation description: Root intrusion blockage caused a 200 gallon sewage spill at Oakshores Collection System Manhole to the area surrounding the manhole. No waterbody was affected.*
>
> *Corrective Action: Cleaned-up (mitigated effects of spill);Contained all or portion of spill;Restored flow. HTH was applied and a berm was built downslope of the spill. Standing water was pumped to adjacent manhole. Blockage was cleared and pipe was repaired. Contaminated dirt was removed and replaced with clean dirt.*
>
> *Date: 02/25/2011*

8 Spill descriptions are nearly *verbatim*, with only minimal editing for clarity. Full text can be found on CIWQS website.

> *Violation description: Spill occurred doing corrective maintenance operations. caused 300.0 gallons of sewage to spill from Sewer line lateral cleanout while main line was being worked on. at 2877 Saddle Way - Outside Cleanout toConstructed holding pit. No surface water body affected*
>
> *Corrective Action: Contained all or portion of spill. Permitting staff recommends no further action at this time.*
>
> *Date: 03/30/2011*
>
> *Violation description: Pipe structural problem/failure caused 500.0 gallons of sewage to spill from Force main or pressure sewer at 2167 Ridge Rider Road, Bradley CA 93450. Spill was pumped directly into wastewater plant from soil pit that was excavated to reach leak at wastewater plant location.. No surface water body affected.*
>
> *Corrective Action: Cleaned-up (mitigated effects of spill);Contained all or portion of spill;Returned all or portion of spill to sanitary sewer system. Permitting staff recommends no further action at this time.*

Another incident occurred at the end of March 2011 that was initially reported as a spill, but in fact was not a spill. A summary of the incident follows. A more detailed report that was submitted to the San Luis Obispo County Board of Supervisors is included in Appendix 9.7.

Beginning on March 26, flow into the wastewater treatment plant began to increase above normal levels. This coincided with the lake level rising to the dam spillway elevation of 800 ft. (NGVD 29) for the first time since 1983. It was eventually determined that the increased flows were likely due to a breach in the interceptor line that allowed lake water to flow into the line to the treatment plant, rather than some other possible causes. SLO County Public Works Department staff immediately took the following actions:

- Notified the California Emergency Management Agency, the RWQCB, CDPH, the San Luis Obispo County Department of Public Health (SLO County DPH), MCWRA, MCPD, and others
- Implemented daily water quality sampling
- Began to search for the breach location
- Discontinued water deliveries from Nacimiento Reservoir to the City of San Luis Obispo (the only agency that was taking NWP deliveries at the time).

As a precaution, the California Department of Public Health (CDPH) and SLO County Department of Public Health (DPH) issued orders prohibiting all domestic use of the lake water to some lakeside drinking water systems, and SLO County DPH issued a body contact prohibition order to the public at large.

On March 30 the breach was located; it was a broken pipe repair coupling on a clean out lateral. On April 1 a temporary repair was made, with plans for a permanent repair to be done later, after the lake level dropped so that the repair could be done above the water surface. Upon completion of the temporary repair flows into the wastewater treatment plant immediately dropped to normal levels. CDPH and SLO County DPH rescinded the domestic use and body contact prohibition orders. No adverse impacts to the lake water quality were detected at any time. Later in the year the lake level dropped to an elevation that allowed for inspection and reinforcement of the temporary repair, but then the lake level rose again following a rain event before a permanent repair could be made. Permanent repairs were anticipated to occur in summer of 2012.

Throughout this incident, SLO County Public Works Department staff adjusted plant operations so that the plant was able to keep adequate pace with the increased flow, and all inflow entering the plant was properly treated.

Although the breach resulted in lake water entering the wastewater treatment plant, not in wastewater entering the lake, and did not adversely affect lake water quality, this incident caused a great deal of consternation for NWP participants, as well as for most lakeside public agencies, private residents, and recreational users of the lake. The County of San Luis Obispo conducted an audit of all of its wastewater collection systems and presented a report to the County Board of Supervisors on November 1, 2011. The audit concluded that the County met all regulatory requirements for sanitary sewer management plans. However, the CSA7A infiltration incident did reveal the need for improved communications during such incidents, so the SLO County Public Works Department developed and adopted a communications plan for any potential future events. Additionally, because portions of the collection system that are below the HWL have become exposed over the years due to bank and lake bottom erosion, increasing the potential for joint failure, the Department also planned to conduct a risk assessment of the interceptor line by June 2012.

(County of San Luis Obispo, Public Works Department), (Bird), (Beaton)


**Figure 49: Oak Shores Wastewater Collection System**

*Photo: San Luis Obispo County Public Works Department*
**Figure 50: Exposed interceptor line and manhole, Oak Shores**

*Photo: San Luis Obispo County Public Works Department*
**Figure 51: Exposed lateral from homes to interceptor line, Oak Shores**

### 3.2.1.3 Septic Systems

Onsite wastewater treatment systems (OWTS) are commonly called septic systems. The public recreation area (Lake Nacimiento Resort), one small community (Northshore S&B) and one elementary school (Cappy Culver) each have a community septic system. Numerous homes and some small private businesses have individual septic sytems.

#### 3.2.1.3.a Lake Nacimiento Resort

System operation Located less than one mile away from the NWP intake structure, this public recreation area is served by a community septic system that is operated by Monterey County Parks Department staff under the provisions of Central Coast RWQCB Order No. 96-26. Staffing includes one full time Grade 1 certified wastewater operator, and all operations are overseen by a Grade 3 certified wastewater operator.

System description The system is comprised of 16 septic tanks and 10 lift stations. Total system design capacity is 36,000 gpd. At least 12 septic tanks are located more than 200 ft. horizontally from the HWL; estimates based on an examination of aerial photographs indicate that up to 4 septic tanks may be located within 200 ft. of the HWL (Figure 46, above). Effluent from septic tanks in the lower portion of the resort is consolidated in a holding tank in the Pine Knoll campground that is approximately 300 ft. horizontally from the HWL. Effluent from the Pine Knoll lift station is pumped approximately 1.6 miles from this tank to a disposal area that is located outside of the reservoir watershed (percolation/evaporation ponds and spray field). Effluent from septic tanks in the upper campgrounds is consolidated in a holding tank in the Oak Knoll campground that is less than 200 ft. horizontally from the HWL. Effluent from the Oak Knoll lift station is pumped up to the disposal area via the same force main that serves the lower portion of the resort. RWQCB Order No. 96-26 permits a maximum discharge of 36,000 gallons per day to the disposal area. Solid waste is pumped out of all of the tanks once a year and hauled out of the watershed for disposal.

Spill prevention and control All lift stations have both visual and audible high level alarms. A 20KW portable backup generator is located at the largest lift station (Pine Knoll). Two maintenance staff and one park ranger live on site and are available for 24 hour callout. A backhoe and a vacuum truck are both stored on site, and an additional vacuum truck is available within 17 miles at Lake San Antonio, which is also operated by the MCPD. Likewise, 300 feet of containment boom is stored on site at Lake Nacimiento, and an additional 300 ft. is available at Lake San Antonio. The MCPD maintains emergency response vessels that can be deployed at a moment's notice.

Spill history From 1972 to 2007 the resort was managed and operated by a private leaseholder, including the wastewater system. During this time, several WDR violations occurred. In late 2007 the lease was terminated and MCPD took over all resort operations. All resort infrastructure was in severe disrepair, including the wastewater system. Over the next four years MCPD made many major improvements to the wastewater system, investing over $300,000 in materials and labor, including replacing and rebuilding most pumps, rebuilding lift stations, and installing alarm systems and electrical controls. Since MCPD took over operations in 2007, only one spill has occurred. In December 2011 a union gasket failure occurred at the main Pine Knoll lift station. Approximately 300 gallons of effluent spilled in the immediate vicinity of the lift station; none of it reached surface water. The spill was immediately contained and the break was repaired. Plans are now underway to install check valves in the line to minimize the impact of possible line breaks in the future.

(San Luis Obispo County Flood Control and Water Conservation District)

#### 3.2.1.3.b Northshore S&B

System operation Northshore S&B is located about 4.3 river miles from the NWP intake structure. It is served by a community septic system that is operated by the association under the provisions of State Water Resources Control Board Order No. 97-10-DWQ. As noted above, this system, built in 1972, serves 40 members, which includes 16 developed lots 14 undeveloped lots, 24 recreational vehicles, and a small community building. Currently three homes are occupied year-round; all others are used only seasonally.

System description Wastewater is collected via less than 1 mile of collection line into three 1,500 gallon septic tanks that operate in series, followed by an effluent tank. Effluent is pumped from this tank approximately 700 ft. to a leach field that is served by an eight line distribution box. The tanks are located 20 ft. above and within 100 ft. horizontally of the HWL. The leach field is located 47 ft. above and within 500 ft. horizontally of the HWL (Figure 45, above). System design capacity is 10,000 gpd, with actual flows ranging from 1,500 gpd in the off-season to 5,000 gpd during peak usage. The septic tanks are pumped once per year. Although the facility is located near the HWL, it is approximately six river miles away from the NWP intake structure.

Spill prevention and control The effluent tank has dual pumps and a high level alarm. A backup generator is available on site. Effluent flow is recorded daily and the septic tank/effluent tank area is inspected for overflows at the same time. The leach field distribution box has 16 ports but only eight lines are currently in use; eight more lines can be added should the need arise.

Spill history The only septic tank failure that has occurred since the system was built in 1972 happened in 1993, when a tank collapsed due to excessive pressure from mud flow due to underground water flow. The tank was replaced and adequate drainage was installed to prevent a recurrence. No other incidents have occurred since then.

(Green) (Northshore S&B, Inc.)

#### 3.2.1.3.c Cappy Culver Elementary School

Cappy Culver Elementary School is located in the north part of the Village of Heritage Ranch, slightly more than 1 mile away from the HWL at its closest point. The school, which had an enrollment of 261 students for the 2011-12 school year, plus 18 faculty and staff, utilizes a septic system that is regulated by State Water Resources Control Board Order 97-010-DWQ.

Spill history No spills have been reported to the RWQCB since 2007. (State Water Resources Control Board)

#### 3.2.1.3.d Individual homes and private businesses

Individual septic systems are used in the communities of Cal Shasta Club, Christmas Cove, Ranchos del Lago, Running Deer Ranch, South Shore Village, Tri Counties Ski and Boat Club, portions of Heritage Ranch, and in all other individual lots, totaling about 670 in all. These lots and communities are scattered along both the north and the south shore of the reservoir (Figure 33, above). All such systems are located on parcels that are at least one acre in size.

Two private campgrounds and several ranches and wineries are located in the southern portion of the watershed, several miles away from the reservoir, which also utilize septic systems.

Spill history Records of reported septic system failures for individual lots could not be obtained.

Depending upon the age of the local site development around the lake, many of the individual sewage disposal systems were installed before meaningful code requirements were adopted and/or enforced. Many of the older improvements were not installed in conformance with current stringent County and State (Regional Water Quality Control Board) percolation testing and sewage system design requirements. (Pfost)

### 3.2.1.4 Chemical toilets

#### 3.2.1.4.a Lake Nacimiento Resort

MCPD owns 22 portable chemical toilets which are placed around the recreation area as needed, including the north shore day use area as well as the more heavily used beaches at the resort on the south shore (Figure 52). Typically only 2-3 chemical toilets are used during the off season, while all 22 or more are used in the summer season. Additional chemical toilets are rented when needed for peak usage periods. MCPD owns a pumper truck and services the toilets as needed. Waste is disposed into the resort septic system. (Staff, Personal Communication)


*Photo: San Luis Obispo County Public Works Department*

**Figure 52: Chemical toilets on shore at Lake Nacimiento Resort**

#### 3.2.1.4.b Private lakeside communities

The Oak Shores Community Association places chemical toilets at the Oak Shores west side launch ramp. During peak usage periods (generally May through September) Heritage Ranch and Running Deer Ranch place chemical toilets at their launch ramps. All private community chemical toilets are serviced by a private waste disposal company.

### 3.2.1.4.c Fort Hunter Liggett

Troop training exercises are held in the Nacimiento River watershed on Fort Hunter Liggett (FHL), more than 25 miles from the NWP intake structure. Chemical toilets are used when troops are in the field. Also, hunting and fishing are allowed on Fort Hunter Liggett. There are no permanent facilities for sportsmen on FHL, but chemical toilets are set up for large events (e.g. fishing derby).

All chemical toilets are pumped out and the waste is disposed in the FHL wastewater treatment plant which is located outside the Nacimiento River watershed. (Dunphy)

### 3.2.1.5 Floating toilets

MCPD places three floating toilets on the reservoir that can be towed to any location as needed (Figure 53). In the summer of 2011 one was located in Dip Creek (~3.5 miles from the NWP intake), one was in Las Tablas Creek (more than 5 miles from the NWP intake), and one was in a cove just east of Oak Shores (~6.5 miles from the NWP intake). The water flush toilets that are located on the docks are also classified as floating toilets. Approximate locations of floating toilets are shown in Figure 54.

Each of the towable floating toilets has a triple walled holding tank with a capacity of 550 gallons. The tanks are located between the pontoons, which provide protection against impacts. All floating toilets are designed to automatically shut down when full. No failures of the floating toilets have occurred in at least the last 15 years, including leaks, spills, or sinking. MCPD services these toilets as needed using its own pumper truck. The tanks are pumped out at least monthly in the busy summer season, and more often if needed, and the units are inspected daily. During the off season pumping and inspections are done on an as-needed basis. Waste is disposed into the resort septic system.

The restroom (floating toilet) on the docks is brand new, clean and well kept. Its 175 gallon holding tank is pumped up to the nearest septic tank on shore via a 2 inch line which is protected from vehicles by the same barriers that protect the above ground fuel line (described in section 3.2.10.2 below). Shutoff valves are located along the line, and a check valve at the top of the line prevents backflow from the septic tank. The line is inspected daily. The holding tank has two pumps which turn on in sequence as needed. If the tank level continues to rise after the second pump turns on, then water supply to the restrooms is automatically shut off, and visible and audible alarms sound.

(San Luis Obispo County Flood Control and Water Conservation District)

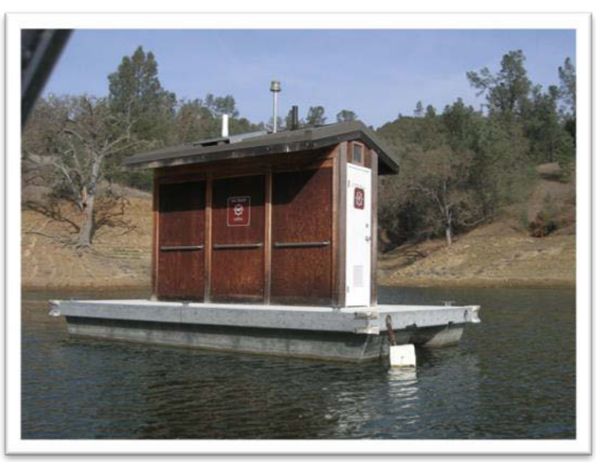


*Photo: San Luis Obispo County Public Works Department*

**Figure 53: Floating toilet in cove on Nacimiento Reservoir**

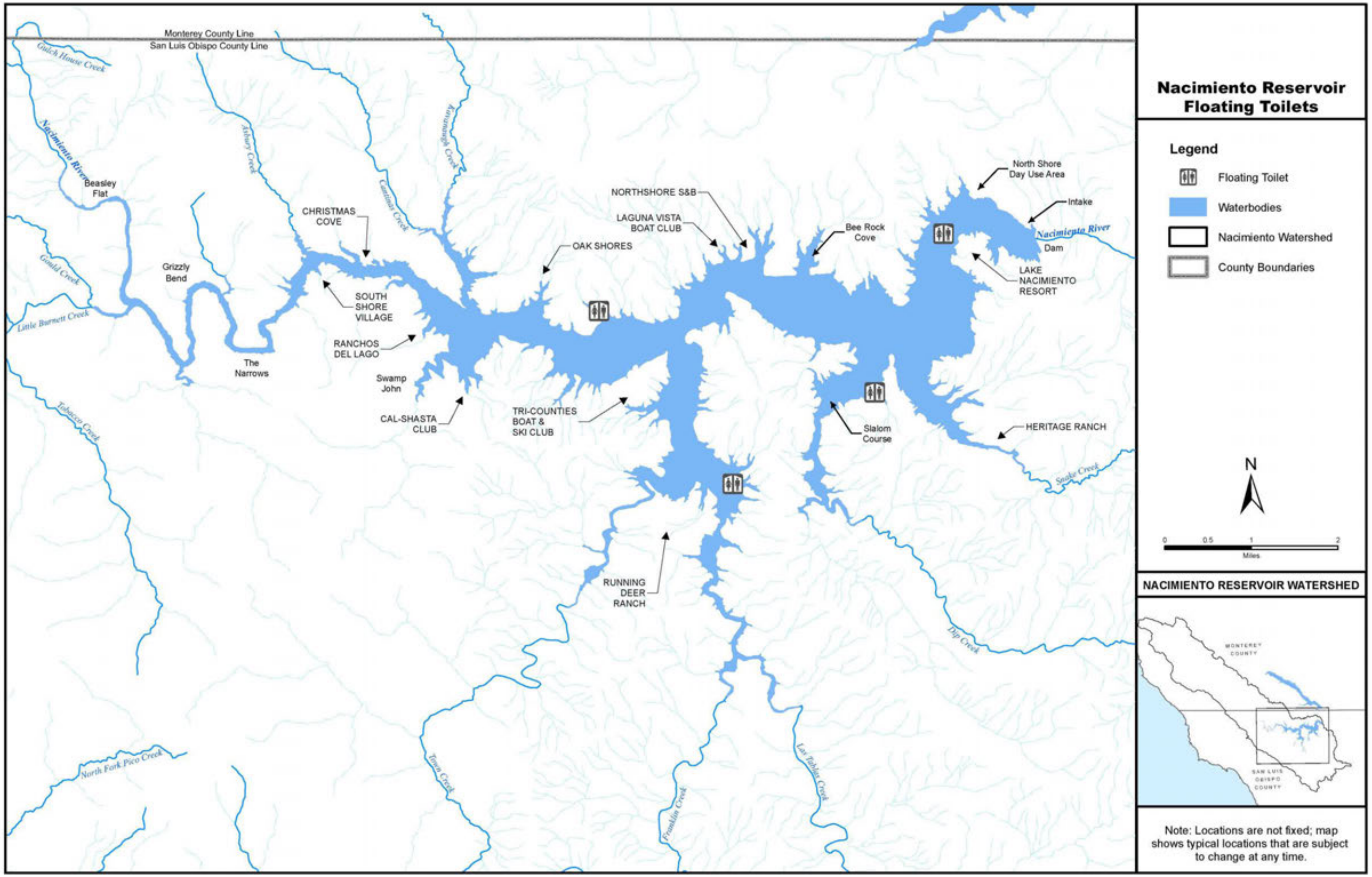



**Figure 54: Typical locations of floating toilets on Nacimiento Reservoir**

#### 3.2.1.6 Vault toilets

Two public campgrounds are located in the upper reaches of the watershed, more than 40 miles from the NWP intake structure. Located in the Los Padres National forest, adjacent to the Nacimiento River, these campgrounds are small (31 spaces total), and one is only used seasonally. Each campground has two vault toilets that are maintained by National Forest Service staff. (San Luis Obispo County Flood Control and Water Conservation District)

## 3.2.2 Reclaimed Water

**Significance:** Organic chemicals, microorganisms

**Description**

There is no known use of reclaimed water in the Nacimiento Reservoir watershed.

## 3.2.3 Urban Runoff and Industrial Area Runoff

### 3.2.3.1 Urban Runoff

**Significance**: Pollutants of concern in urban runoff include sediments, non-sediment solids, nutrients, pathogens, oxygen-demanding substances, petroleum hydrocarbons, heavy metals, floatables, polycyclic aromatic hydrocarbons, trash, pesticides, and herbicides. (State Water Resources Control Board)

**Description**

The two largest population centers in the Nacimiento Reservoir watershed are the two private residential communities of Heritage Ranch and Oak Shores; both are located adjacent to the reservoir itself (Figure 55).

The Village of Heritage Ranch, located on the Snake Creek tributary to the reservoir (Figure 7, above) currently has 1,750 developed lots, and an additional 340 lots have been approved for development, for a total of 2,090 lots that are currently approved for development. The SLO County approved master plan for Heritage Ranch allows for 2,900 residential units total. (Heritage Ranch Community Services District)

The community of Oak Shores, located on the north shore of the reservoir, currently has 638 developed lots, and an additional 274 lots have been approved for development, for a total of 912 lots that are currently approved for development. (Wallace Group) This community is still primarily a vacation destination, with only approximately 20% of the homes occupied year round. The community's population swells from Memorial Day through Labor Day, then decreases in the winter months.

Several hundred vehicles enter Lake Nacimiento Resort each week between Memorial Day and Labor Day weekend, along with lower usage during the rest of the year.

Storm drains installed around the lake direct storm water flow directly to Nacimiento Reservoir. While a few storm drains may have an oil separator (Figure 56), most do not (Figure 57, Figure 58).

Due to their relatively small populations, neither Oak Shores nor Heritage Ranch are currently required to comply with the SLO County National Pollutant Discharge Elimination System Phase II Stormwater Management Program. Stormwater monitoring is not typically performed in these communities, nor elsewhere around the reservoir.

*Photo: San Luis Obispo County Public Works Department*
**Figure 55: Homes adjacent to Nacimiento Reservoir**

*Photo: San Luis Obispo County Public Works Department*
**Figure 56: Storm drain at Lake Nacimiento Resort marina parking lot**

*Photo: San Luis Obispo County Public Works Department*

**Figure 57: Storm drain at Lake Nacimiento Resort campground**

*Photo: San Luis Obispo County Public Works Department*

**Figure 58: Storm drain at Lake Nacimiento Resort campground (lake visible through drain)**

### 3.2.3.2 Industrial Area Runoff

#### 3.2.3.2.a Wineries

**Significance**

Organic carbon, nutrients, solids

**Description**

As noted in section 3.2.1, there currently are seven wineries located in the southeast portion of the watershed that have waste discharge requirements ordered by the RWQCB. Only one winery, Justin Vineyards Winery, is currently also enrolled in the RWQCB's industrial storm water program (WQO 97-03-DWQ). (State Water Resources Control Board)

#### 3.2.3.2.b Mines

**Significance**: Acid mine drainage (metals, low pH), solids

**Description**

One active and several inactive mines are located in the lower watershed. No mines that are located in the watershed are currently enrolled in the RWQCB's industrial storm water program. Mines and mine runoff are described and discussed in section 3.2.9 below.

#### 3.2.3.2.c Military Facilities

**Significance**

VOCs, SOCs, metals, pathogens, nutrients, solids, perchlorate

**Description**

In the upper watershed, military field training exercises occur on Fort Hunter Liggett in the Nacimiento River watershed. All permanent FHL facilities (administration buildings, troop housing etc.) are located outside of the Nacimiento River watershed (in the San Antonio River watershed). Field training exercises may include live-fire exercises, establishing temporary encampments, constructing defensive positions, constructing field supply centers and hospitals, and conducting a variety of other training activities. Permanent facilities are not constructed for field training exercises. These activities typically occur on the floor of the Nacimiento River valley, often immediately adjacent to the river itself. Annual prescribed fires are used in training areas to control nuisance vegetation and to reduce the risk of wildland fires that may be caused by training activities (Figure 59).

*Photo: San Luis Obispo County Public Works Department*

**Figure 59: Training area on Fort Hunger Liggett in Nacimiento River valley**

The level of activity that occurs on FHL can vary greatly from year to year, depending on national security needs and other Defense Department considerations. The most recent usage statistics are for the period of October 1, 2008 – September 30, 2009. During this time frame, approximately 27,900 personnel used the entire installation for training, and there were approximately 574,741 person-days of training throughout the entire installation. Data specific to the Nacimiento River watershed is not available. Small units (<100 personnel) made up the majority of the training exercises, although some larger exercises (>1,000 personnel) were conducted as well.

Industrial storm water monitoring was conducted on FHL during this time frame, however, all such monitoring occurred in the San Antonio River watershed; none occurred in the Nacimiento River watershed.

(US Army Reserve Training Center, Fort Hunter Liggett, CA), (United States Army Garrison Fort Hunter Liggett)

### 3.2.4 Agricultural Crop Land Use

**Significance:** Nonpoint source pollution including nutrients, pesticides, herbicides, organic carbon, total dissolved solids, and suspended solids.

**Description**

In the lower watershed, cultivated agriculture occurs in the south east portion of the watershed, in the Adelaida area. Nearly all cultivated land is found in the Las Tablas Creek subwatershed (Figure 42, above). Wine grapes are the primary crop, along with olives, walnuts, persimmons, and pomegranates. Complete data on the number of acres under cultivation is not available. Pesticide use on cropland that was registered with the SLO County Agricultural Commissioner's office in 2011 covered only 2,619 acres, representing just 2.5% of the lower watershed area, and just 1.3% of the total watershed area (Table 12, Figure 60). The actual area of land under cultivation may be much higher than this figure.

**Table 12: Cropland registered for pesticide use in lower Nacimiento Reservoir watershed in 2011**

| Crop | Acres |
|---|---|
| Field - rotational | 847 |
| Orchard | 481 |
| Total site | 129 |
| Vineyard | 1,162 |
| **Total** | **2,619** |
| *Source: San Luis Obispo County Department of Agriculture* | |

In the upper watershed approximately 13,000 acres (13%) of land are zoned for agricultural use. Data could not be obtained regarding the number of acres under cultivation, however, an examination of aerial photographs taken in 2010 reveals mostly undisturbed land in that region, and very little evidence of cultivated agricultural operations.

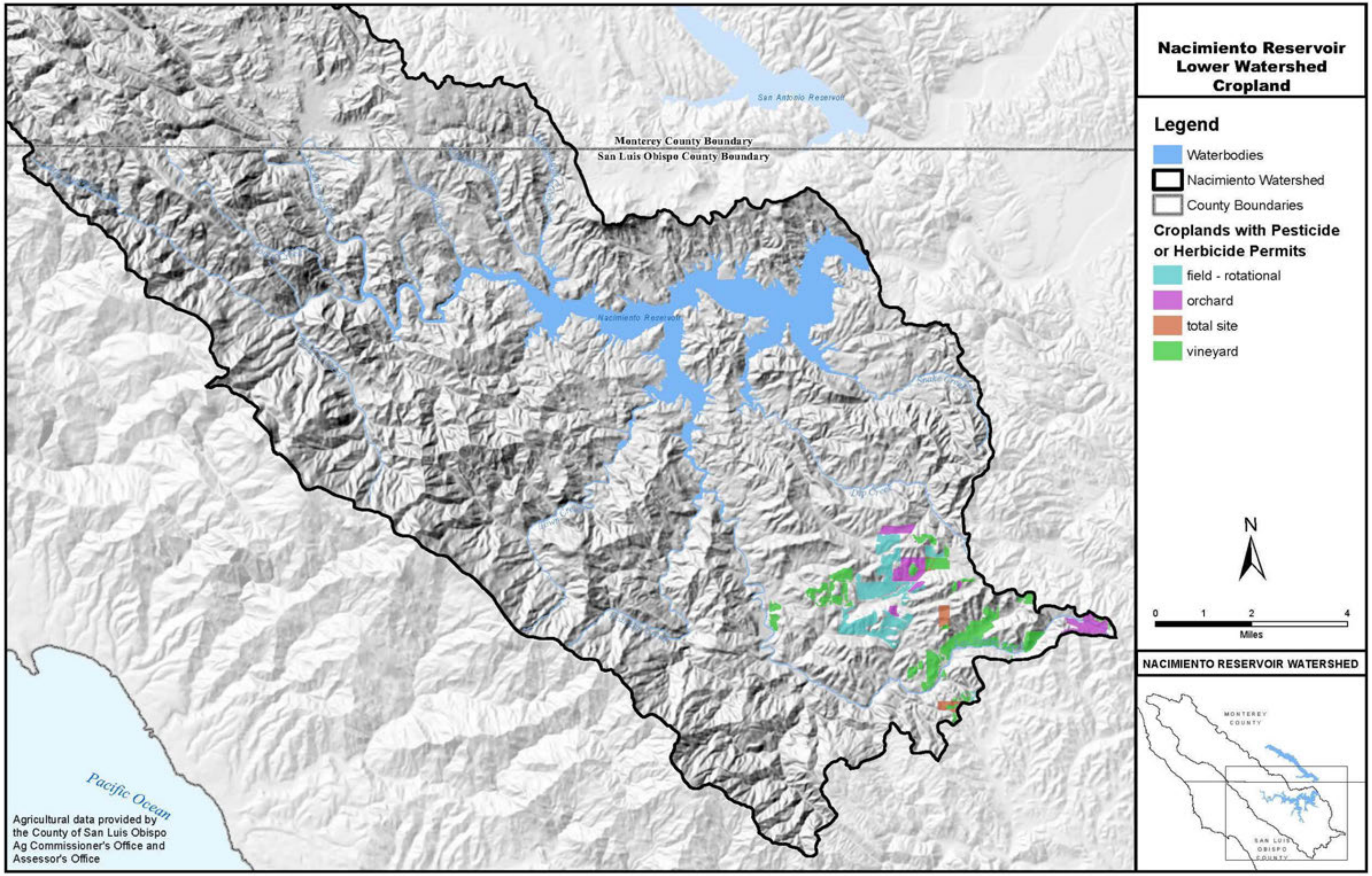



**Figure 60: Nacimiento Reservoir Lower Watershed Cropland**

## 3.2.5 Pesticide/Herbicide Use

**Significance**: VOCs, SOCs – pesticides, herbicides, and their breakdown products

**Description**

In the lower watershed, pesticides and herbicides were registered for use on 6,624 acres of land (6.4% of lower watershed, 3.2% of entire watershed) in 2011, as shown in Table 13 and Figure 61.

**Table 13: Acreage of registered pesticide and herbicide use in lower Nacimiento Reservoir watershed in 2011**

| Pesticide/herbicide use | Acres |
|---|---|
| Field - rotational | 847 |
| Inactive | 80 |
| Livestock | 118 |
| Non-crop | 560 |
| Orchard | 481 |
| Rangeland | 713 |
| Total site | 129 |
| Uncultivated ag | 2,534 |
| Vineyard | 1,162 |
| **Total** | **6,624** |
| *Source: San Luis Obispo County Department of Agriculture* | |

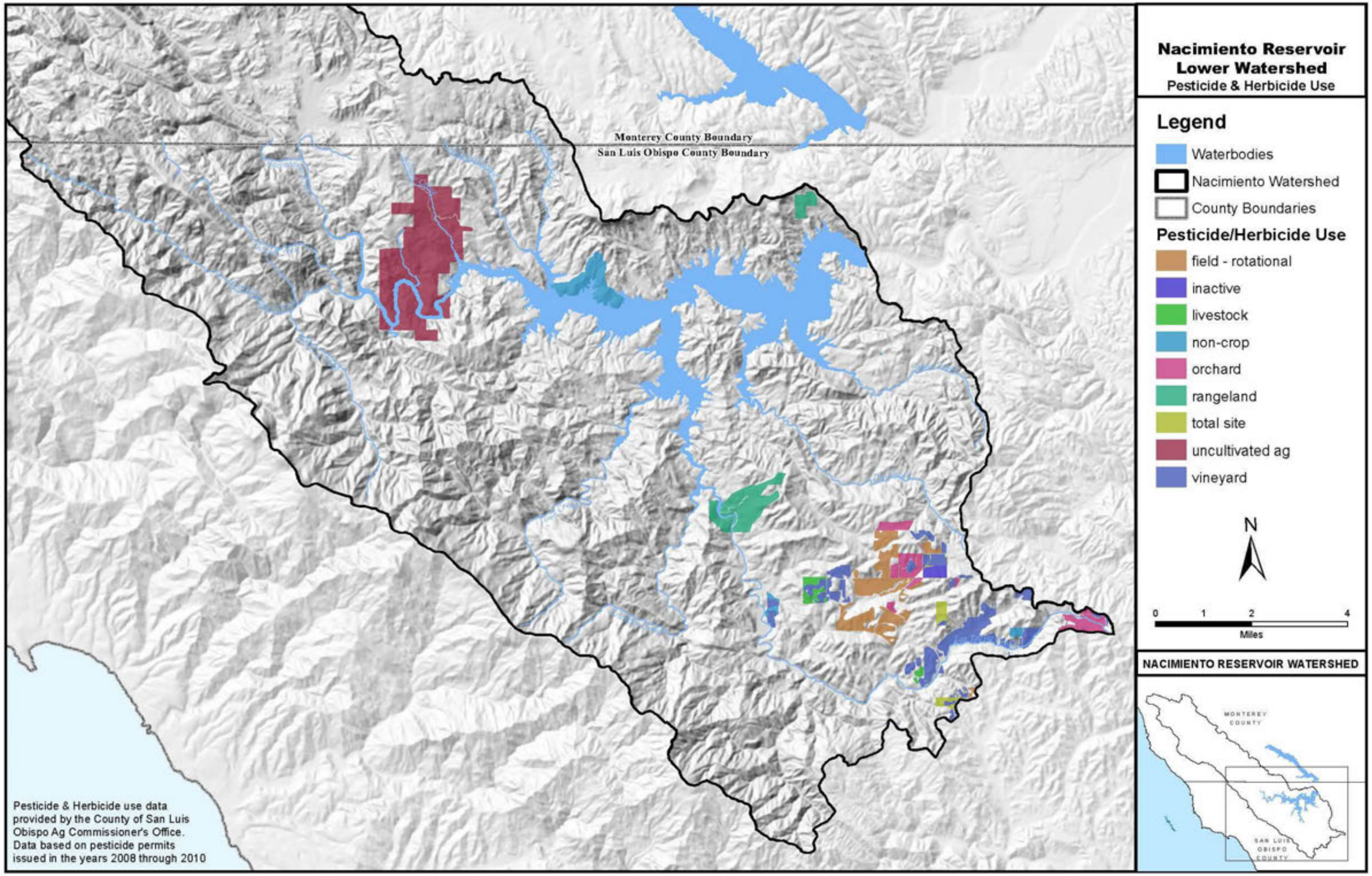
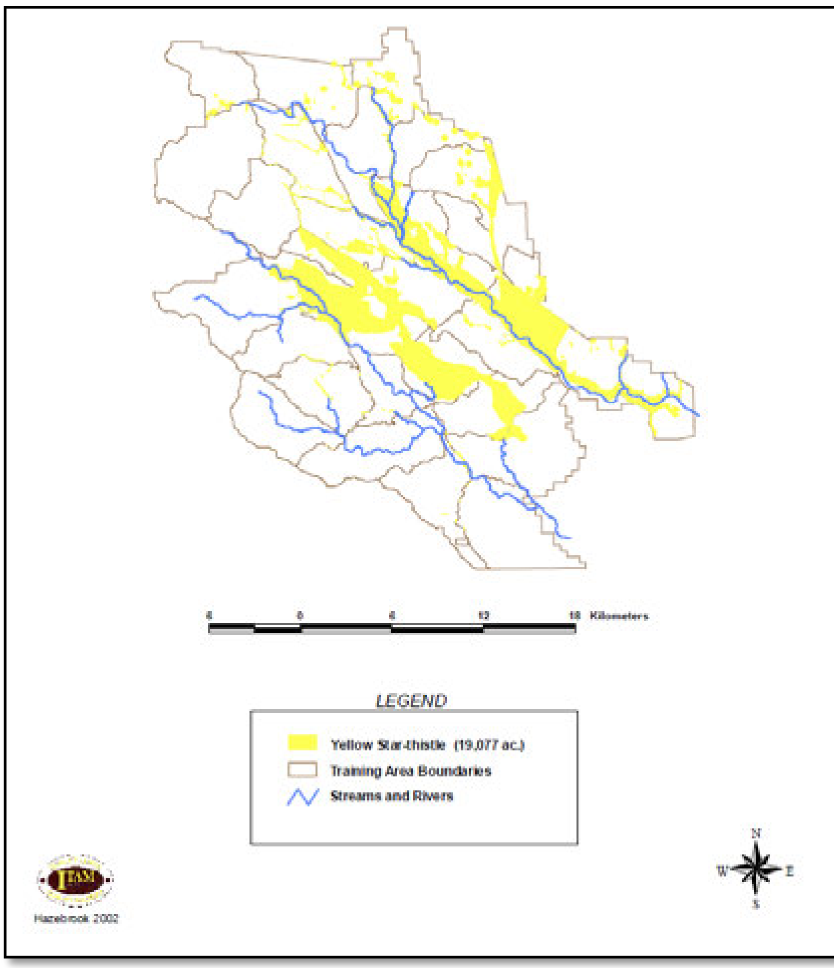



**Figure 61: Nacimiento Reservoir Lower Watershed Pesticide & Herbicide Use**

In the upper watershed, no pesticides or herbicides were registered for use in 2010 (the last year for which data is available). Given the small area of disturbed, privately owned land, little registered pesticide or herbicide use is expected for agricultural purposes. In Fort Hunter Liggett, the non-native yellow star thistle plant has infested over 19,000 acres of land; much of it occurs in the Nacimiento River watershed (Figure 62). FHL employs integrated pest management practices to control this weed, including the use of Transline. (US Army Reserve Training Center, Fort Hunter Liggett, CA) Specific data on the use of Transline in the Nacimiento River watershed were not available, but it is reasonable to assume that some use has occurred there or may occur in the future.

In addition to larger quantities of pesticides and herbicides that are registered for use on agricultural crops, military facilities, and roadside weed control, smaller quantities of these chemicals are used throughout the watershed by small businesses and by private individuals in their homes and yards, and also by illicit marijuana crop growers as described in section 3.2.13 below.




*Source: Integrated Natural Resources Management Plan, FY2004-2008, Fort Hunter Liggett*

**Figure 62: Yellow Star Thistle infestations on Fort Hunter Liggett**

Pesticides and herbicides registered for use throughout the entire watershed and amounts applied in 2010 are shown in Table 14. All registered pesticide/herbicide usage was in the Adelaida area (township 26S range 10E sections 1, 6, 7, 10, 14-27, 34-36; township 26S range 11 E sections 19, 30; township 27 range 10E sections 2, 3, 7) (Figure 63). The majority of pesticides/herbicides used were mineral oil (4,186 lb, 53% of total) and sulfur (2,226 lb, 28% of total). Nearly all registered pesticides/herbicides were used on wine grapes, with only 1 lb. of chemical applied for other uses (rangeland).

## Table 14: Registered pesticides and herbicides applied in Nacimiento Reservoir watershed in 2010

| CHEMICAL NAME | POUNDS CHEMICAL APPLIED* | PRODUCT NAME (as listed in CDPR database) |
|---|---|---|
| PETROLEUM DISTILLATES, REFINED (mineral oil) | 3395 | JMS STYLET-OIL |
| SULFUR | 2226 | CLEAN CROP THIOLUX DRY FLOWABLE- MICRONIZED WETTABLE SULFUR IAP DUSTING SULFUR, MICRO-SULF, MICROTHIOL DISPERSS, THIOLUX DRY FLOWABLE MICRONIZED SULFUR, THIOLUX JET, SULFUR 6L, MICROTHIOL SPECIAL MICRONIZED WETTABLE SULFUR, THAT FLOWABLE SULFUR, MICROSULF |
| MINERAL OIL | 791 | ORGANIC JMS STYLET-OIL |
| GLYPHOSATE, ISOPROPYLAMINE SALT | 398 | ALECTO 41S, BUCCANEER GLYPHOSATE HERBICIDE, GLYSTAR ORIGINAL, GLYPHOGAN HERBICIDE, HONCHO PLUS HERBICIDE, MAD DOG PLUS, MIRAGE PLUS, ROUNDUP PRO HERBICIDE |
| BOSCALID | 179 | PRISTINE FUNGICIDE |
| LIME-SULFUR | 151 | GREEN CYPRESS LIME-SULFUR SOLUTION |
| POTASSIUM BICARBONATE | 110 | KALIGREEN |
| COPPER HYDROXIDE | 106 | DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE |
| PYRACLOSTROBIN | 92 | PRISTINE FUNGICIDE |
| GLUFOSINATE-AMMONIUM | 71 | RELY 200 HERBICIDE, RELY 280, RELY HERBICIDE |
| ORYZALIN | 69 | ORYZALIN 4 A.S., FARMSAVER.COM ORYZALIN 4 A.S. |
| COPPER SULFATE (BASIC) | 54 | CUPROFIX ULTRA 40 DISPERSS |
| GLYPHOSATE | 48 | GLYFOS HERBICIDE |
| MYCLOBUTANIL | 45 | RALLY 40 WSP, RALLY 40W AGRICULTURAL FUNGICIDE IN WATER SOLUBLE POUCHES (WITHDRAWN) |
| OXYFLUORFEN | 44 | GOAL 2XL HERBICIDE, OXYSTAR 2E, GOAL 2XL |
| QUINOXYFEN | 37 | QUINTEC |
| TEBUCONAZOLE | 36 | ELITE 45 WP FOLIAR FUNGICIDE IN WATER SOLUBLE PACKETS, ORIUS 20AQ, TEBUSTAR 45 WSP, TEBUZOL 45 DF FUNGICIDE |
| KRESOXIM-METHYL | 19 | SOVRAN FUNGICIDE |
| TRIFLUMIZOLE | 18 | VITICURE |
| AMINOPYRALID, TRIISOPROPANOLAMINE SALT | 15 | MILESTONE |
| GLYPHOSATE, POTASSIUM SALT | 14 | ROUNDUP WEATHERMAX HERBICIDE |
| TRIFOXYSTROBIN | 9 | ADAMENT 50 WG FUNGICIDE, FLINT FUNGICIDE, FLINT, ADAMENT 50 WG FUNGICIDE |
| SIMAZINE | 6 | SIM-TROL 90DF |
| BACILLUS PUMILUS, STRAIN QST 2808 | 4 | SONATA |
| FENPROPATHRIN | 3 | DANITOL 2.4 EC SPRAY |
| IMIDACLOPRID | 3 | MONTANA 2F INSECTICIDE, IMPULSE 1.6 FL, PASADA 1.6 F FLOWABLE INSECTICIDE |
| RIMSULFURON | 2 | PRUVIN HERBICIDE |
| ALUMINUM PHOSPHIDE | 1 | DEGESCH PHOSTOXIN NEW COATED TABLETS |
| ETOXAZOLE | 1 | ZEAL MITICIDE(1) |
| **TOTAL** | **7947** | |
| * rounded to nearest whole number | | |
| *Source: California Department of Pesticide Regulation (http://calpip.cdpr.ca.gov/main.cfm)* | | |

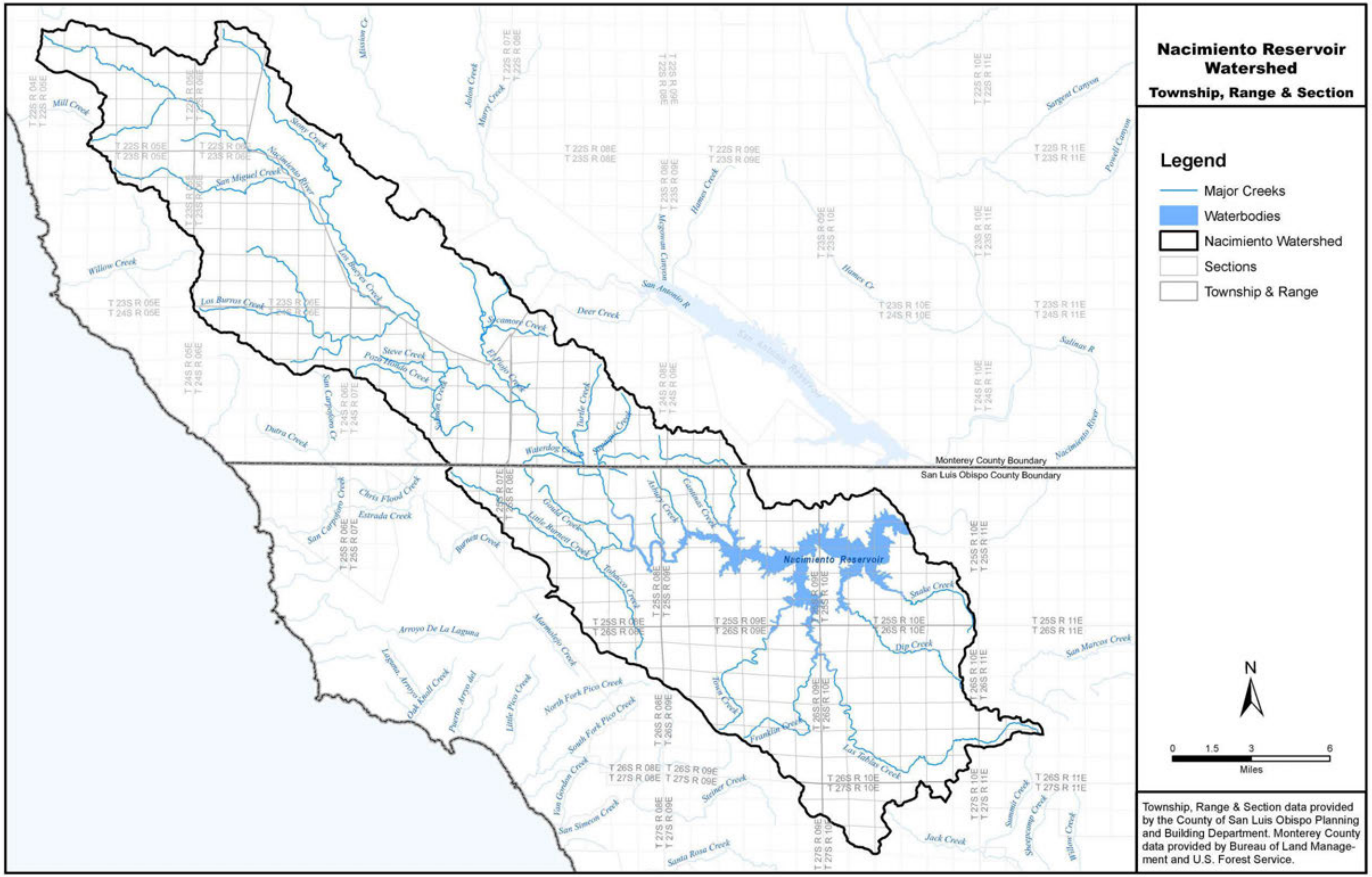



**Figure 63: Nacimiento Reservoir Watershed Township, Range, and Section Map**

## 3.2.6 Grazing Animals

**Significance:** Pathogens *(*viruses, *E. coli, Giardia*, *Cryptosporidium)*, nutrients (N, P), organic carbon, solids loading

**Description**

Extensive grazing occurs throughout the lower watershed (Figure 64). 66,123 acres (66%) of the lower watershed are identified by the SLO County Tax Assessor's office as having a primary or secondary land use of grazing. Most of this land is in private ownership, however, the Monterey County Water Resources Agency, which owns several thousand acres of land adjacent to the reservoir, leases 8,759 acres for cattle grazing, primarily for grass and weed control (fire prevention) (Figure 65).

Cattle can be seen throughout the watershed year round, often very near to or directly in the water. Cattle have unrestricted access to the reservoir itself in many places, and have been observed by SLO County PWD staff on the north and south shores of the reservoir, on the shores of the Las Tablas Creek arm and Snake Creek arm, all along Las Tablas Creek from the Klau and Buena Vista mines site to the reservoir, and along the north shore of Nacimiento River in the area known as the Narrows (Figure 66, Figure 67).

Flocks of sheep have been used in Heritage Ranch for weed control as recently as 2011 (Figure 68). An estimated 2,000 sheep have been observed for several weeks at a time in the village. (D'Ornellas)

In the upper watershed, there is no grazing in the rugged mountainous area of the Los Padres National forest. Grazing has been allowed on Fort Hunter Liggett in the past, however this activity was discontinued in 1991, and there currently are no plans to reinstate grazing on FHL. (US Army Reserve Training Center, Fort Hunter Liggett, CA) The remaining ~13,000 acres of the upper watershed are privately owned and zoned for agricultural use, however data could not be obtained on the extent of grazing in this region.

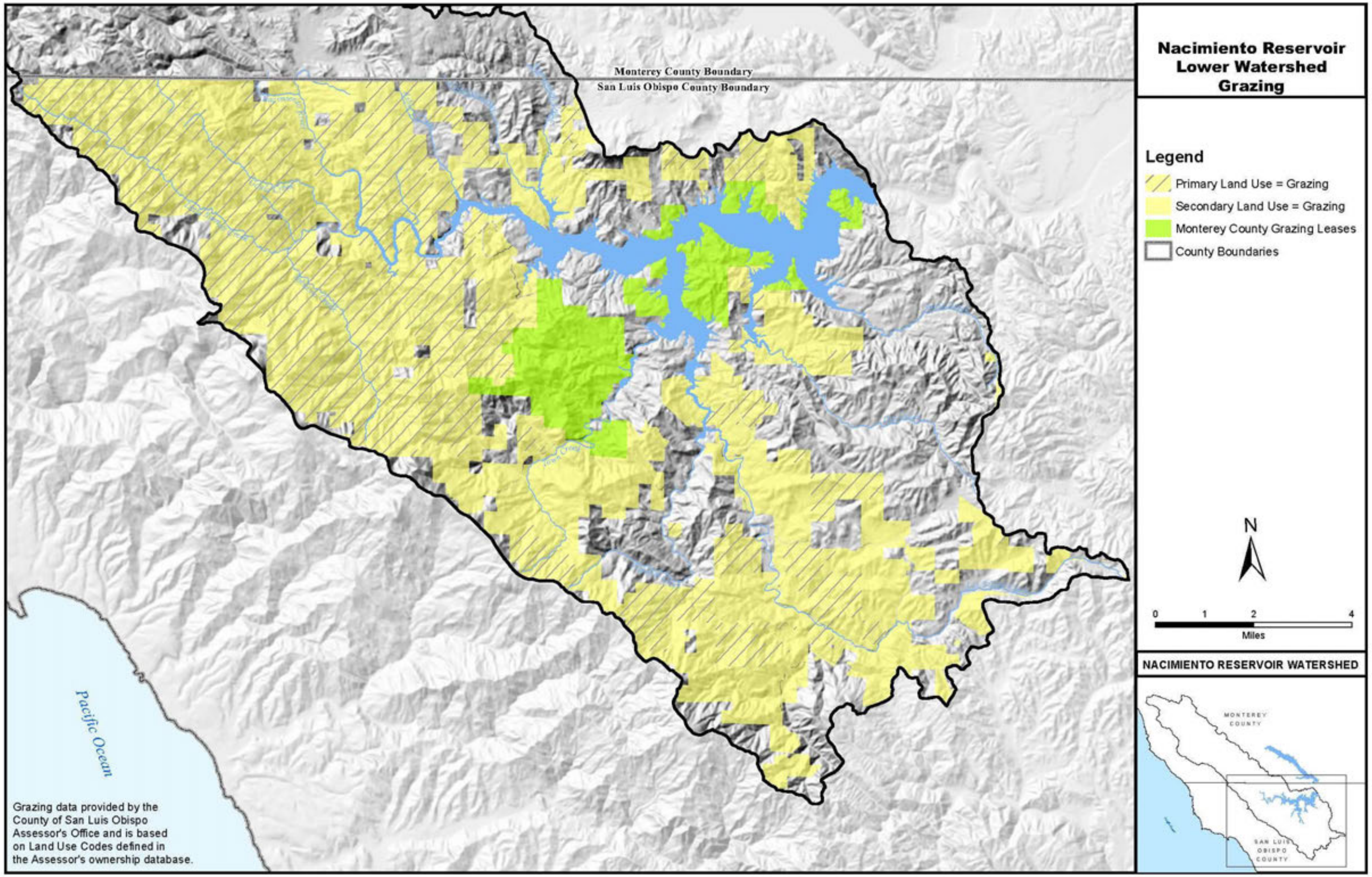
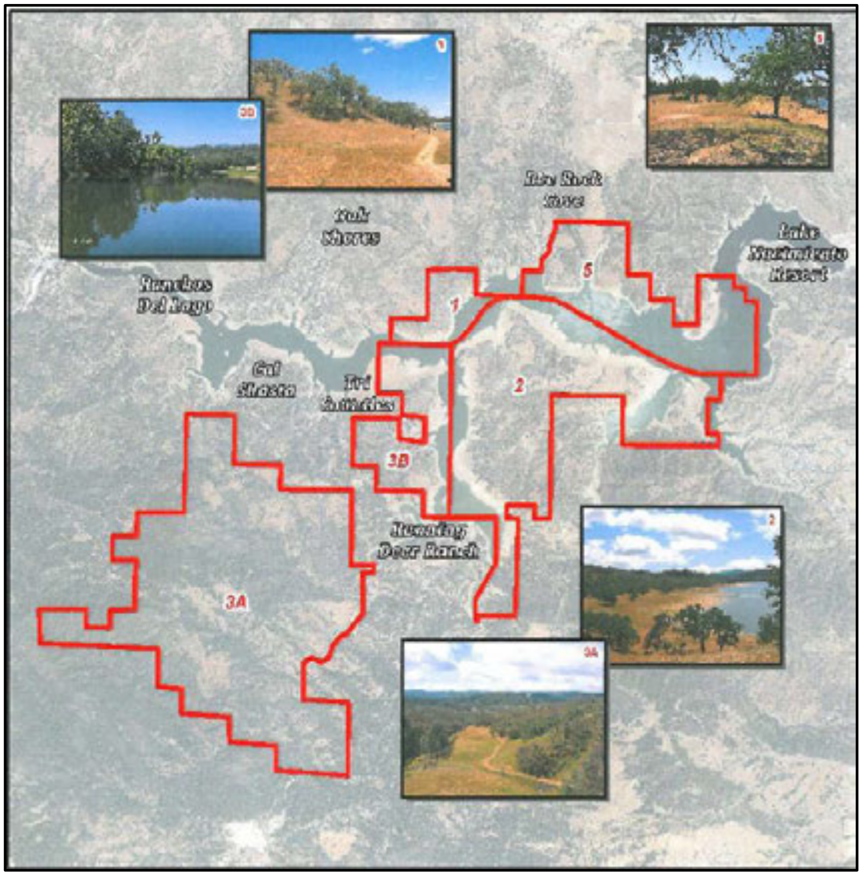



**Figure 64: Nacimiento Reservoir Lower Watershed Grazing Areas**




*Source: MCWRA Nacimiento Reservoir Grazing Leases 2010-2017 bid packet*

**Figure 65: MCWRA grazing leases in Nacimiento Reservoir watershed**

*Photo: San Luis Obispo County Public Works Department*

**Figure 66: Cattle grazing on shore of Nacimiento Reservoir**

*Photo: San Luis Obispo County Public Works Department*
**Figure 67: Cow standing in water in Nacimiento Reservoir**

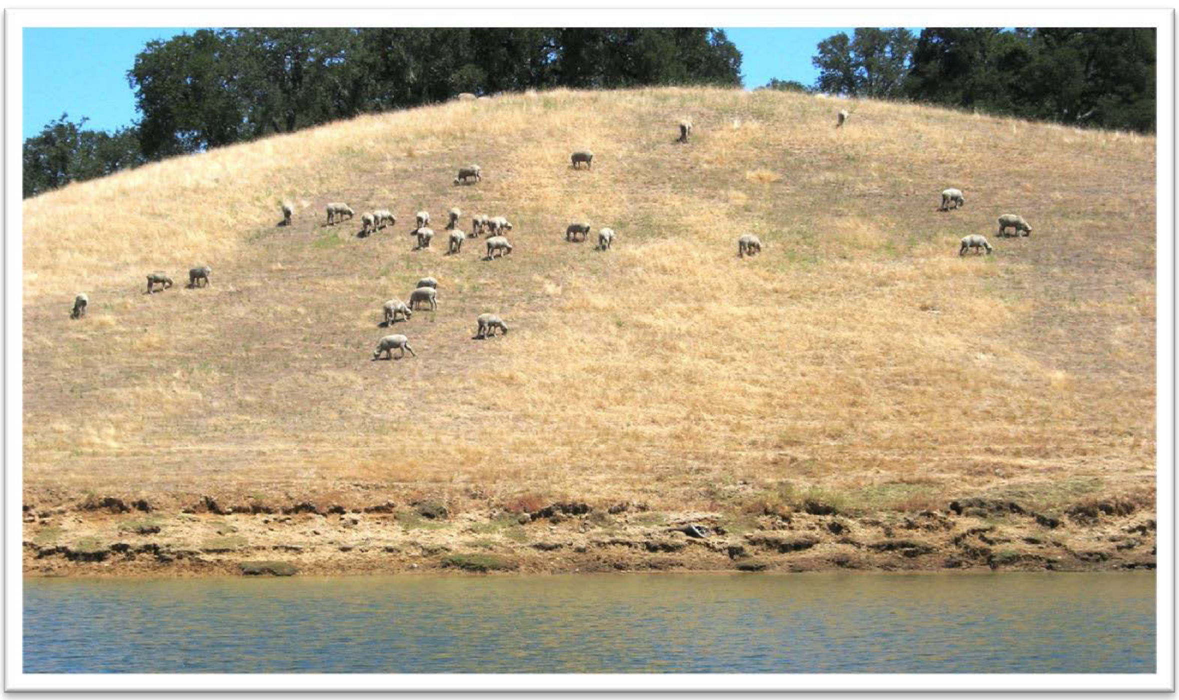


*Photo: San Luis Obispo County Public Works Department*
**Figure 68: Sheep grazing in Snake Creek arm of Nacimiento Reservoir**

## 3.2.7 Concentrated Animal Facilities

**Significance:** Pathogens (*E. coli, Cryptosporidium, Giardia*), nutrients (N, P), organic carbon, oxygen demanding substances

**Description**

There are no concentrated animal facilities in the Nacimiento Reservoir watershed.

## 3.2.8 Wild Animals

**Significance:** Pathogens *(E. coli, Giardia*, *Cryptosporidium)*, nutrients (nitrogen, phosphorous), organic carbon

**Description**

As described above in section 2.1.1.1, much of the Nacimiento Reservoir watershed is undeveloped open space. As described in section 1.1.1.1.a, numerous wildlife sightings have been reported by various entities, and there is an abundance of habitat that is suitable to support populations of various wild animals.

Wild life that has been observed in the watershed includes the American peregrine falcon, California condor, bald eagle, least Bell's vireo, San Joaquin kit fox, California red-legged frog, and the California tiger salamander, deer, tule elk, coyotes, rabbits, gray squirrels, bobcats, wild turkey, quail, doves, pigeons, mallards, wood ducks, various fish species, bald eagle, prairie falcon, western pond turtle, California condor, and many other mammals, reptiles, amphibians, fish and birds. (US Army Reserve Training Center, Fort Hunter Liggett, CA). San Luis Obispo County staff frequently observe wildlife at the reservoir (Figure 69, Figure 70, Figure 71).


*Photo: San Luis Obispo County Public Works Department*

**Figure 69: Deer on Nacimiento Reservoir shore**

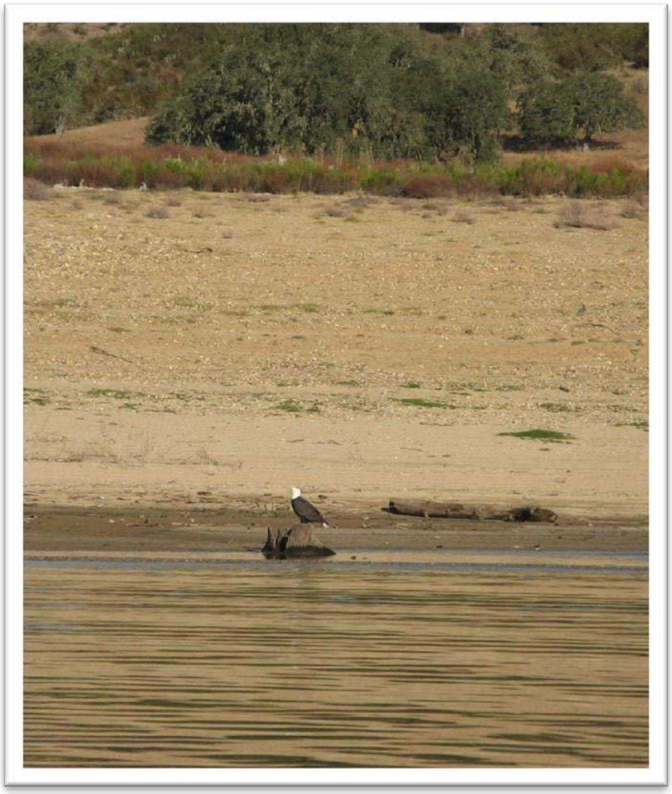


*Photo: San Luis Obispo County Public Works Department*
**Figure 70: Eagle at Nacimiento Reservoir**

*Photo: San Luis Obispo County Public Works Department*
**Figure 71: Pelicans at Nacimiento Reservoir**

## 3.2.9 Mine Runoff

**Significance**: Acid mine drainage (metals, low pH) metals, solids

**Description**

Inactive mines occur throughout the Nacimiento watershed (Figure 72). Mining activity, especially for mercury, has been greatest in the lower watershed. All mines have been inactive for many years except for one calcium carbonate mine, described below. Of the mercury mines, two have been identified as a significant potential source of contamination to Nacimiento Reservoir, also described below.

### 3.2.9.1 Active Mine – Lime Mountain

An open pit calcium carbonate mine is located in the lower watershed, at Lime Mountain, approximately 4 miles south of Nacimiento Reservoir. The mine straddles the divide between the Town Creek subwatershed and the Franklin Creek subwatershed (Figure 73). Operated by Lime Mountain Company, the mine has approximately 89 acres of disturbed land. Runoff is contained in detention basins on site. The mine is not currently enrolled in the RWQCB industrial storm water program, however, the mine is inspected annually by the SLO County Department of Planning and Building acting as an agent of the California Department of Conservation, Office of Mine Reclamation. Inspection reports from 2010 and 2011 indicate that all runoff is contained on site and no drainage concerns were identified.

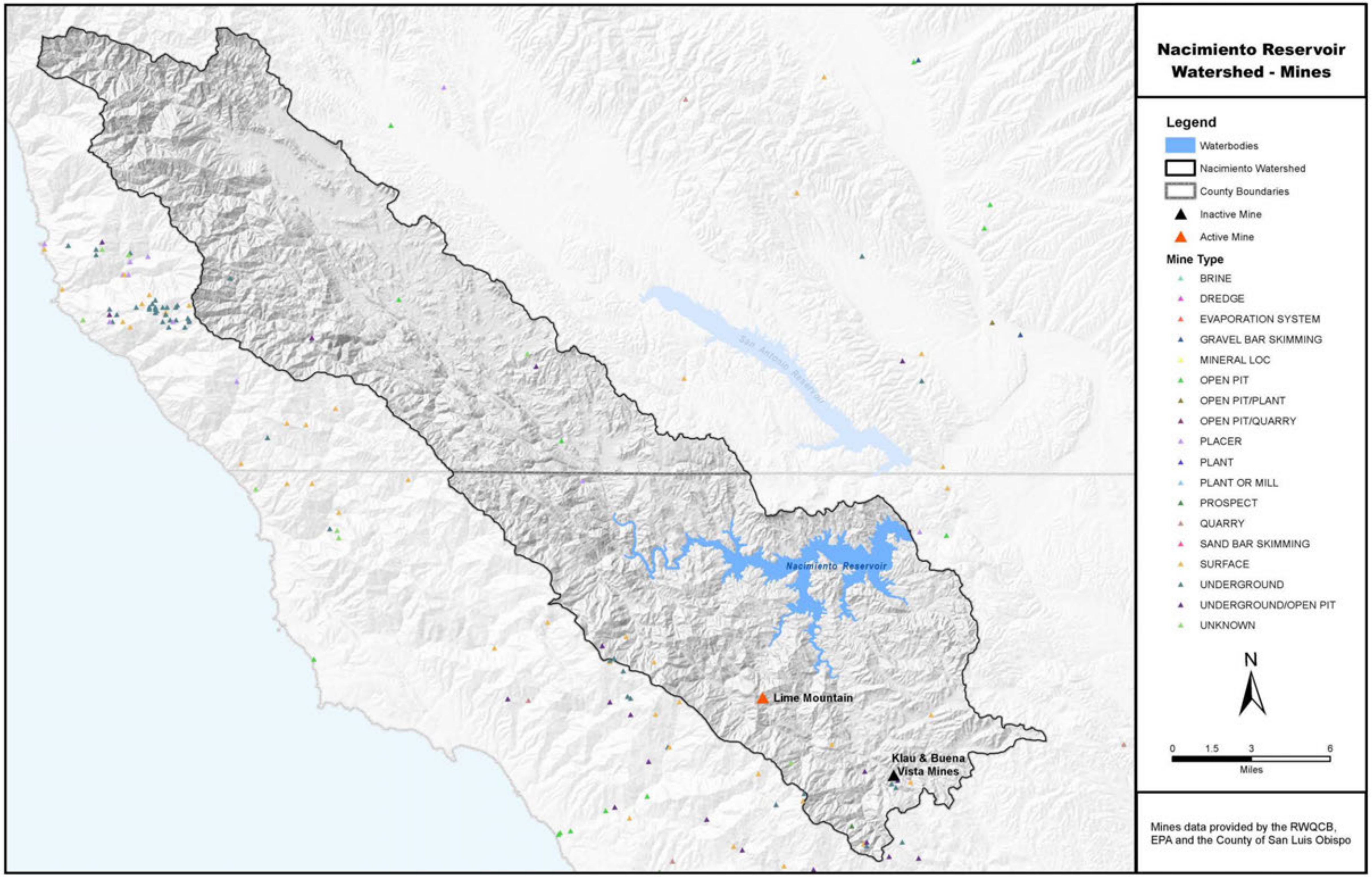



**Figure 72: Nacimiento Reservoir Watershed Mines**

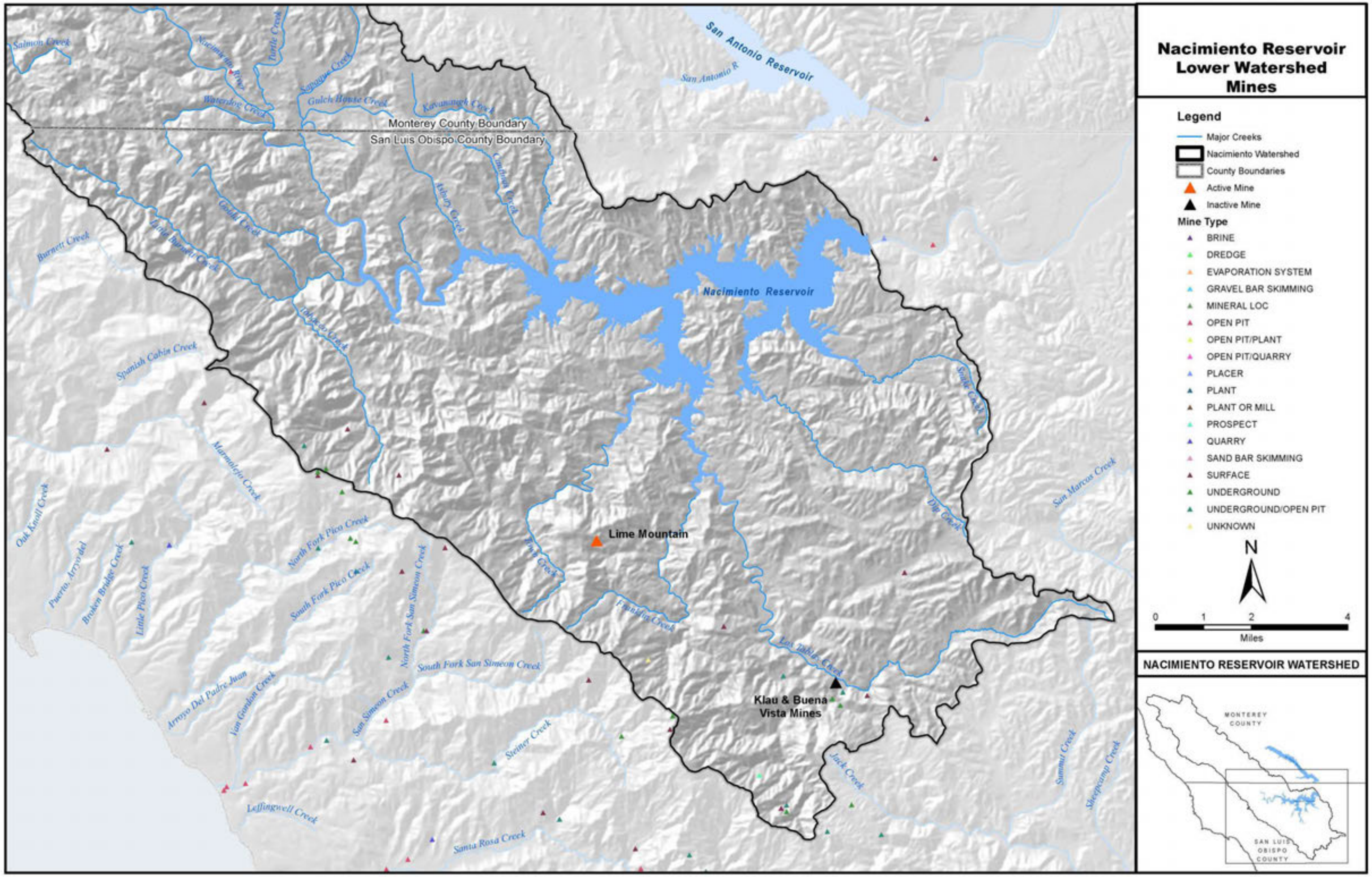



**Figure 73: Nacimiento Reservoir Lower Watershed Mines**

### 3.2.9.2 Inactive Mines

The lower Nacimiento Reservoir watershed is the site of many historical mercury mines. The two largest producers, the Klau Mine and the Buena Vista Mine, were operated between 1868 and 1970. Most of the other mines ceased operation many years earlier. The Klau and Buena Vista mines (K/BV) are located about 6 miles south of Nacimiento Reservoir, in the Las Tablas Creek drainage (Figure 73, above). Both mining and processing activities occurred here.

The Central Coast Regional Water Quality Control Board (RWQCB) first identified unacceptable mine waste discharges from the K/BV site in the 1960s. Over the next several years the RWQCB issued a series of cease and desist orders to the mines' owner, Buena Vista Mines, Inc. (BVMI) related to unacceptable mine waste discharges from the mines, including sediments, acid mine drainage (Figure 74), and dissolved metals. Although BVMI made some attempts to comply with the board's orders, these measures were insufficient to remedy the situation, and unacceptable discharges continued. A long series of legal actions between the RWQCB, BVMI, and other entities related to mine wastes occurred over a period of about four decades.

*Photo: San Luis Obispo County Public Works Department*

**Figure 74: Acid mine drainage in Klau Branch, South Fork of Las Tablas Creek (2009)**

In the late 1980s or early 1990s the California Department of Health Services (now CDPH) posted a health advisory calling for reduced consumption of largemouth bass and white bass from Nacimiento Reservoir due to high tissue mercury concentrations.

Following a new study of fish issue conducted in 2008, CDPH issued a revised fish consumption advisory for mercury, which covered more species of fish, and had varying recommendations for different demographic groups.

In the early 1990s a study[9] was conducted by California Polytechnic State University, San Luis Obispo for the RWQCB to evaluate the sources of mercury to Nacimiento Reservoir. The study report noted that there were about 14 abandoned mercury mine operations in the entire Lake Nacimiento watershed. The study identified several sites that are mercury sources, including several mines, some roads that had been paved with mine wastes, and naturally occurring geologic deposits. The K/BV mines were identified as the most significant contributor of mercury to Nacimiento Reservoir. The study report stated that that the Klau and Buena Vista mines " . . . contribute the largest portion of Hg-rich alluvial sediments in the Las Tablas Creek watershed that end up as Lake Nacimiento bottom sediments . . . ". The report further stated that " . . . the Las Tablas Creek watershed is the primary Hg source contributor for over one-half (50%) of the total Hg load to Lake Nacimiento." The report concluded that "Prevention of additional lake mercury loading from waterways, especially Las Tablas Creek, appears to be the best strategy to decrease mercury levels in the lake sediment and water column and, subsequently, in the lake fish population".

In 1999 the RWQCB requested assistance from USEPA's Emergency Response Section to prevent further releases of mercury laden sediments and other contaminants from the K/BV site. In 2000 EPA began the first of several Comprehensive Environmental Resource Compensation Liability Act (CERCLA) emergency removal actions that have occurred in the years since then. Ultimately, the K/BV site was placed on the EPA's National Priorities List on April 19, 2006, thus becoming San Luis Obispo County's first, and thus far only, Superfund cleanup site. Although EPA now has legal control of the land for cleanup purposes, BVMI remains the property owner.

EPA began a remedial investigation of the K/BV mines site in 2007. Both USEPA and the California Department of Public Health conducted human health risk assessments at the mines site. USEPA also conducted an ecological risk assessment at the mines site. Contaminant sources identified by these studies at the mines site include tailings, retort wastes, overburden waste piles, the BLM reservoir dam, acid mine drainage seeping out of mine workings and tailings, and mine waste in creeks, ponds, and gravel roads, both on and off site. Initially, levels of contaminants were found that pose risks for ecological or human health for the following metals (Sickles):

- Ecological: aluminum, antimony, arsenic, barium, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, thallium,

9 *Clean Lakes Assistance Program for Lake Nacimiento*, prepared for the Regional Water Quality Control Board by the Coastal Resources Institute, California Polytechnic State University, San Luis Obispo, April, 1994.

vanadium, zinc

- Human health (residential exposure): aluminum, arsenic, chromium, iron, manganese, mercury, nickel, thallium, vanadium
- Human health (industrial exposure): arsenic, chromium, lead, mercury, thallium

Further studies have shown that the primary risks to humans are due to mercury, thallium, arsenic, and cobalt (CH2MHILL). All human health risks identified at the mines site are associated with exposure to soil, sediments, or fish; none are associated with surface water. (California Department of Public Health), (CH2MHILL)

The initial EPA study area was limited to the mines site. In 2009 the study area was expanded to include all of Las Tablas Creek from the mines site (at the confluence of North Las Tablas Creek and South Las Tablas Creek) to Harcourt Dam (at the south end of the Las Tablas arm of Nacimiento Reservoir). The human health risk assessment for Las Tablas Creek found that the soil, sediments, and water do not pose a significant risk, however, fish consumption is not advised for children and women of child-bearing age due to methyl mercury contamination. The ecological risk assessment found that there is a risk to plants and animals from mercury in soil and sediments and from methyl mercury found in sediments.

In 2011 the study area was expanded further to include all of Nacimiento Reservoir. As of this writing EPA's investigation of the reservoir is in the initial planning stages.

The next step for each study area will be issuance of a Remedial Investigation/Feasibility Study report, which will describe the nature and extent of contamination, assess its treatability, and evaluate potential treatment technologies. Then a Record of Decision will be published, which will explain the cleanup alternatives to be used. Ultimately, actual remediation measures will be implemented, pending procurement of funding. Long term monitoring will be conducted to ensure the remediation was effective. (USEPA)

Placement of the site on the National Priorities List essentially settled all litigation that was pending at the time. The most recent WDRS and CDOs issued by the RWQCB (93-47, 93-48, 93-56, 93-57) were rescinded in May 2010. (California Regional Water Quality Control Board, Central Coast Region) Nacimiento Reservoir and Las Tablas Creek have been on the federal government's 303(d) list of impaired water bodies for several years for metals pollution, including mercury, and remains on that list as of 2011 with a requirement for development of a Total Daily Maximum Load (TMDL). However, the RWQCB has suspended development of a TMDL until after EPA issues its Record of Decision for the project. CDPH's fish consumption advisory remains in effect until new data is gathered that may warrant a revision.

(California Regional Water Quality Control Board, Central Coast Region), (USEPA), (USEPA), (California Regional Water Quality Control Board, Central Coast Region)

## 3.2.10 Hazardous Materials

**Significance:** VOCs, SOCs, metals, dissolved solids, nutrients, organic chemicals, etc.

**Description**

### 3.2.10.1 Solid and Hazardous Waste Disposal Facilities

There are no solid and hazardous waste disposal facilities in the Nacimiento Reservoir watershed. There is a household hazardous waste collection center in Heritage Ranch, which is permitted to collect all types of household hazardous wastes, including used oil, water- and oil-based paint, antifreeze, gasoline, solvents, roofing tar, and other materials. Maximum storage capacity at the facility is 5,000 gallons. In 2004 the estimated volume collected at the facility each month was 150 gallons. All collected materials are transported out of the watershed for disposal at an approved facility.

### 3.2.10.2 Hazardous Material Storage

Hazardous materials are stored and used in scattered locations throughout the lower watershed. Petroleum products (gasoline, diesel fuel, motor oil, lubricants, solvents) and ethylene glycol (antifreeze) are stored and used in maintenance yards of lakeside communities, the public recreation area (Lake Nacimiento Resort), rural agricultural operations (including wineries), and at Lime Mountain Quarry. Sodium hypochlorite is used in several lakeside community drinking water systems. The surface water treatment plant located in Oak Shores stores and uses drinking water treatment chemicals such as aluminum sulfate and ferric chloride. Wineries may use sulfuric acid, sulfurous acid, tartaric acid, citric acid, and aqueous ammonia. Communication facilities store lead acid batteries. Boats occasionally sink in Nacimiento Reservoir, which can result in gasoline and oil spills. Sites with larger quantities of hazardous materials, including those that have filed business plans with the San Luis Obispo County Certified Unified Program Agency (CUPA)[10] are shown in Figure 75; smaller quantities of hazardous materials may be found in other locations as well.

Above ground propane and liquefied natural gas (LNG) tanks are located at businesses and residences surrounding the lake, at wineries in the Adelaida area, and at other residences and agricultural operations in the lower watershed. Propane and LNG do not pose a direct threat to water quality, as both of these materials vaporize to their natural gaseous state when released from the pressurized vessels in which they are stored. However, they pose an indirect threat as a fuel source for wild fires.

10 SLO County CUPA is the local enforcement agency for state and federal hazardous waste laws and regulations.

The Oak Hill Commercial Center located at the north end of Heritage Ranch has a vehicle fueling station with four pumps. Three double-walled storage tanks were installed in 2010; one has a capacity of 20,000 gallons, and the other two each have a capacity of 6,000 gallons. The station is located approximately 1.2 linear miles from the high water line of Nacimiento Reservoir; the path that a spilled liquid or storm runoff would follow from the station to the reservoir is more than 1.4 miles long.

The Lake Nacimiento Resort public recreation area has a fueling station for boats that is located on the reservoir. Two fuel pumps are located on the docks at the resort marina (Figure 76). Two double-walled 12,000 gallon underground storage tanks that service these pumps are located beneath the marina parking lot; these tanks were installed in 1988 (Figure 77). A double-walled pipeline runs underground from the storage tanks for approximately 100 yards to a junction box (Figure 78). A flexible triple-walled fuel line runs above ground from the junction box along the shore to the fuel pumps on the dock (Figure 80, Figure 79). The distance from the junction box to the pumps varies as the lake elevation changes; it can range from less than 25 yards to approximately 400 yards. Boaters fill their vessels over open water.

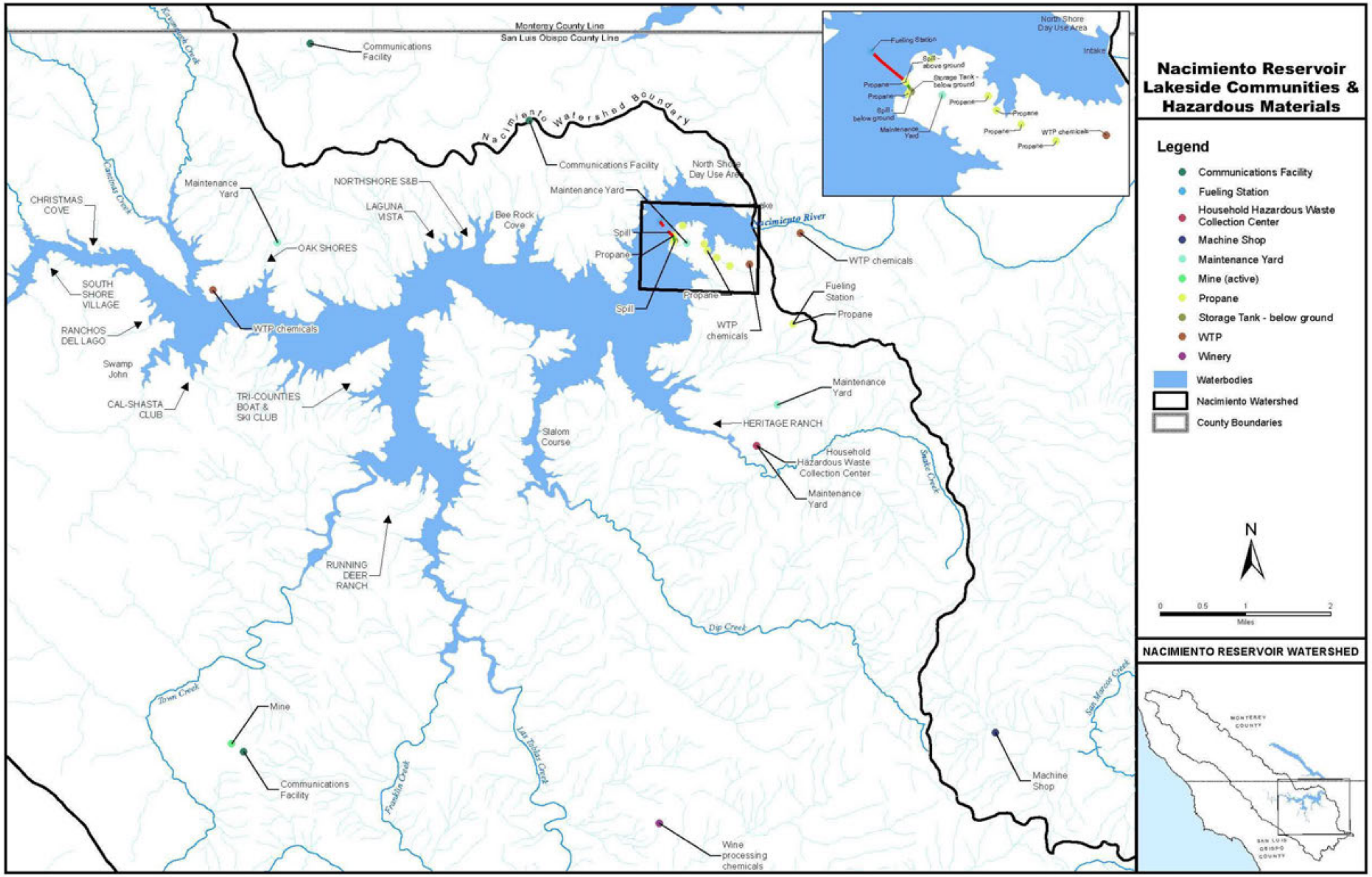



**Figure 75: Nacimiento Reservoir Watershed - Selected Hazardous Material Sites**


*Photo: San Luis Obispo County Public Works Department*

**Figure 76: Fuel pumps on Lake Nacimiento Resort docks**


*Photo: San Luis Obispo County Public Works Department*

**Figure 77: Underground fuel storage tanks loading ports at Lake Nacimiento Resort**

*Photo: San Luis Obispo County Public Works Department*
**Figure 78: Lines that run to Lake Nacimiento Resort docks**

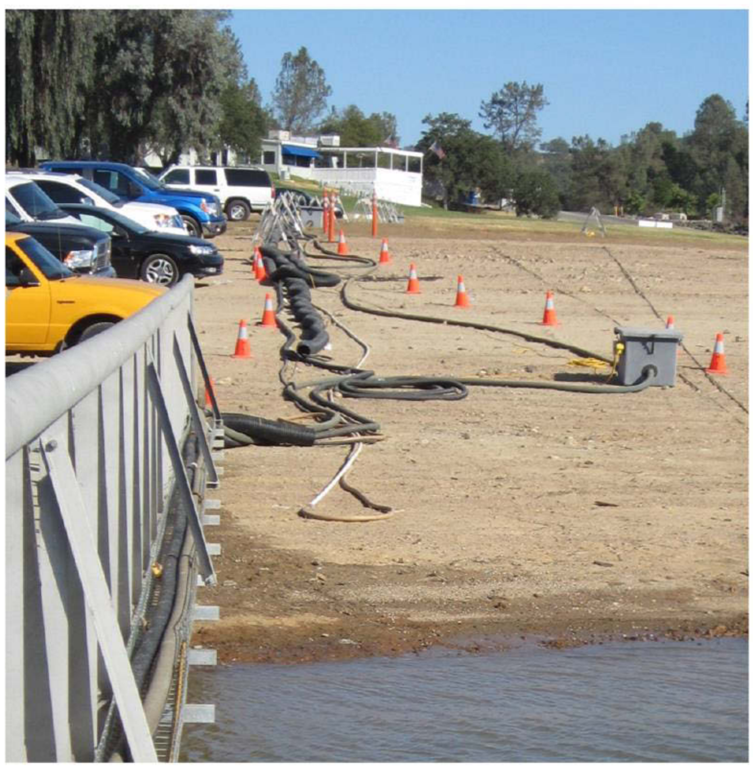


*Photo: San Luis Obispo County Public Works Department*
**Figure 79: Lines to run to Lake Nacimiento Resort docks**

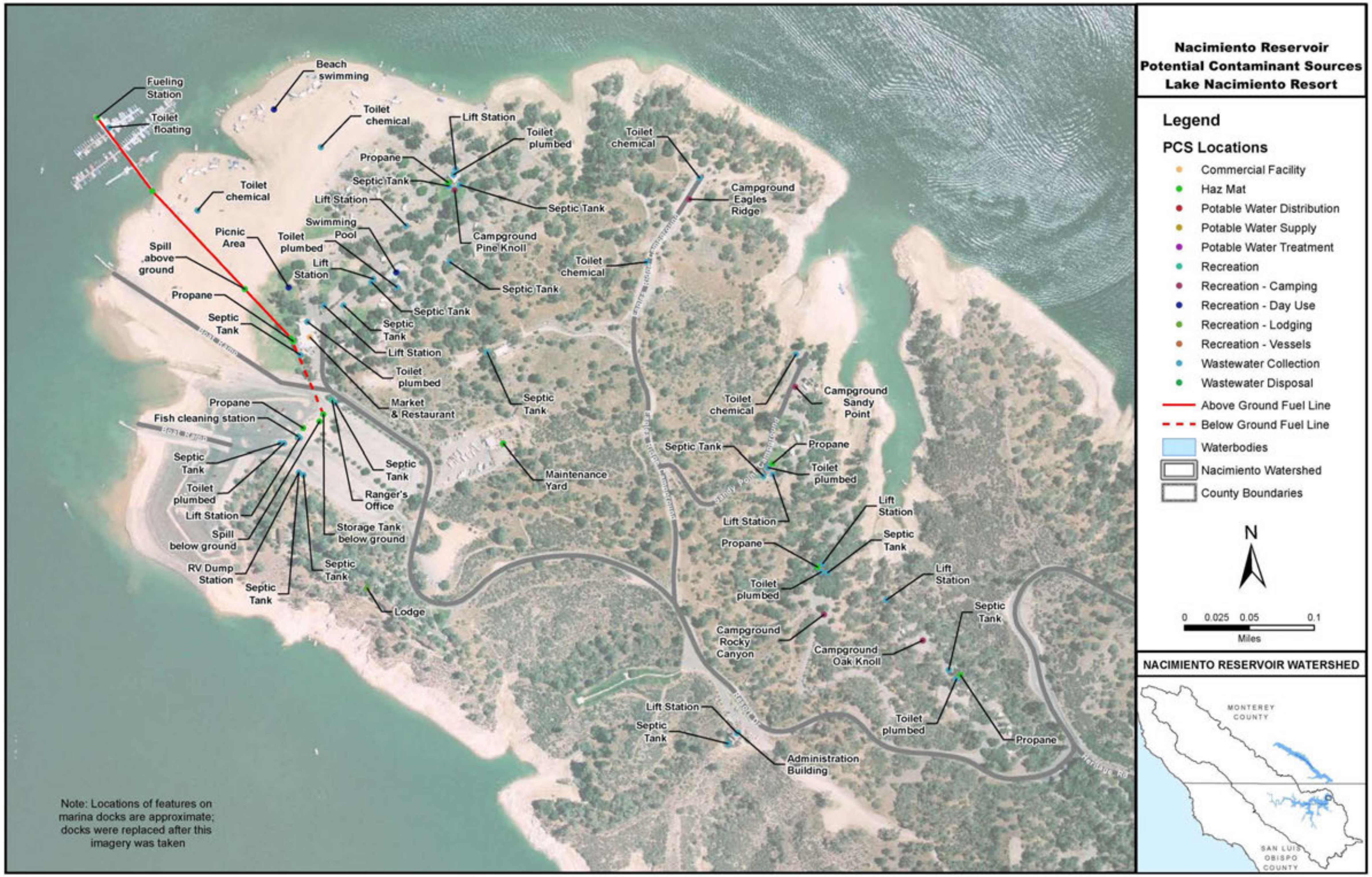



**Figure 80: Lake Nacimiento Resort Fuel Line to Docks**

Spill prevention

A new above ground fuel line was installed in spring 2010; it is triple walled and is sectioned into 250 ft. lengths. At each junction there is a sump with a leak detector that is part of an automatic shutoff system that includes both visual and audible alarms (Figure 81). When the lake level is low, MCPD installs barriers along the length of the above ground fuel line on both sides to reduce the risk of vehicles driving over it. The lines are inspected at least daily, and the entire system is inspected monthly.

*Photo: San Luis Obispo County Public Works Department*
**Figure 81: Fuel line sump at Lake Nacimiento Resort marina**

**Fuel leaks at Lake Nacimiento Resort**

Two leaks have been reported to the RWQCB related to the resort's marina fuel system in the last 10 years. One was discovered below ground in 2005, and one occurred above ground in 2008.

Below Ground Leak

In 1963 three 8,000 gallon single-walled underground fuel storage tanks were installed beneath the marina parking lot, in a former natural drainage that was filled for parking lot construction. In July 1988 these tanks were removed and replaced with two double-walled 12,000 gallon underground fuel storage tanks, which remain in service at this time. The tanks serviced a set of fuel dispensers located in the parking lot until November 2005 when a fuel release was discovered. The fuel dispensers and product piping were then taken out of service and removed. Soil samples collected at the release site showed elevated levels of TPHg, benzene, and MTBE. In May 2006 400 cubic yards of contaminated soil were removed from the site.

In June 2006 Monterey County Water Resources Agency began conducting a site investigation. The Central Coast Regional Water Quality Control Board and the San Luis Obispo County Environmental Health Department provide oversight and direction to MCWRA.

Quarterly ground water sampling at the site began in 2006. Elevated levels of TPHg, TBA and MTBE have been detected in ground water. Quarterly surface water sampling at a location in the reservoir that is downstream from the site began in September 2009. No constituents of concern have been detected in surface water to date.

The most recent publicly available report[11] on this investigation includes the following conclusions:

- MTBE and TBA are the significant contaminants that have been quantified in groundwater below the parking lot
- MTBE appears to be migrating laterally in a westerly direction in the parking lot area
- MTBE levels in groundwater samples are highest in wells that are associated with the buried drainage channel
- 1,400 ug/L of MTBE was found in one of the drainage channel wells in early 2011
- The buried drainage channel appears to provide a preferential pathway for groundwater flow from the fuel release area
- Remedial action should be taken to reduce the MTBE concentrations in groundwater. The primary objective would be to prevent groundwater with the highest MTBE concentrations from entering Nacimiento Reservoir.

Additional information and ongoing updates may be found on the SWRCB's GeoTracker website[12].

<u>Above Ground Leak</u>

In November 2008 MCPD staff observed fuel leaking from several of the piping connections located along the above ground gasoline conveyance piping system. Staff immediately shut the fueling system off, isolated each section of pipe by closing the valves at each connection, and notified all appropriate federal, state, and county emergency response offices. MCPD immediately began emergency response remedial excavation of soils that were observed to have been impacted by the release, and removed the above-ground piping as well. The initial excavation area was located at a

11 *Well Installation Report, Lake Nacimiento Resort, RWQCB Case #3652*, prepared by Georestoration, Inc, July 19, 2011
12 http://geotracker.waterboards.ca.gov/profile_report.asp?global_id=SL0607963934

piping connection approximately 270 feet from the piping junction box. The excavation area was subsequently expanded to remove additional contaminated soils.

Soil samples were collected from several sites along the above-ground piping and from the remedial excavation area. A report[13] on the incident submitted to SLO County Environmental Health Service (EHS) in March 2009 includes the following conclusions:

- Both recent and previous fuel releases have occurred at the site
- Dates and quantities of fuel that may have been released (both recent and older releases) are unknown
- In the November 2008 incident, approximately 185 gallons of adsorbed-phase gasoline are estimated to have been present in the soil excavated from this area
- An unknown quantity of gasoline-contaminated soil, and potentially groundwater contamination, remains at the site of the November 2008 incident
- A fuel release identified at a location where older, unused underground piping was encountered along the lake shore likely occurred before MCPD began operations at the lake, as indicated by the presence of MTBE in the soil samples collected there.

Additional sampling was conducted in 2010 to further assess the extent of contamination in soil and groundwater. No surface water sampling was conducted. This sampling revealed elevated levels of the following contaminants:

- Soil: benzene, toluene
- Groundwater: benzene, toluene, ethylbenzene, total xylenes, TPH-G (total petroleum hydrocarbons, gasoline), TBA (tertiary butyl alcohol)

In September 2010 SLO County PHD directed MCPD to further assess groundwater contamination at the site. Subsequently the incident was referred to the RWQCB for continued direction. Additional testing has been conducted, and the investigation is ongoing. At this time, further soil and groundwater testing is planned. Updates may be found on the SWRCB's GeoTracker website. As of this writing no surface water monitoring has been ordered related to this leak.

13 DMI EMK Environmental Services Inc letter to Linnea Grossman, SLO County Environmental Health Services, March 16, 2009.

### 3.2.11 Logging

**Significance:** Erosion

**Description**

There is no history of commercial logging activity in the Nacimiento Reservoir watershed.

## 3.2.12 Recreational Use

**Significance:** Pathogens (viruses, *E. coli, Cryptosporidium, Giardia*), nutrients (N, P), organic carbon, petroleum products, invasive species, solids loading from erosion

**Description**

The majority of the Nacimiento Reservoir watershed is open space. Extensive recreational use and supporting facilities have developed around the reservoir itself. Some limited recreation occurs in the rest of the watershed, including camping in the upper reaches of the watershed in the Los Padres National Forest, hunting and fishing on Fort Hunter Liggett, and two small private camps in the lower watershed, several miles away from the reservoir.

Nacimiento Reservoir allows for many types of recreation, both on shore and on the water, including camping, hiking, horseback riding, fishing, boating, swimming, water skiing, and personal water craft use.

Body contact recreation is usually prohibited on drinking water reservoirs due to the risk of pathogen contamination of the drinking water supply. Nacimiento Reservoir is one of only a few drinking water supply reservoirs in the State of California where body contact recreation is allowed. Because body contact recreation is allowed, Nacimiento Reservoir attracts water skiers, wake boarders, swimmers, and waders from throughout the state and beyond, as well as many local visitors who enjoy these activities in the remote reservoir's natural beauty, generally calm water, large wide open spaces, numerous coves, and warm weather (Figure 82, Figure 83, Figure 84, Figure 85). In past years an area upstream of the Narrows was a popular party destination, where hundreds of vessels would congregate at one time; more recently however the party area has moved to the upper reaches of Las Tablas Creek. The reservoir is also a popular fishing destination, known especially for its population of white bass.

*Photo: San Luis Obispo County Public Works Department*
**Figure 82: An example of Nacimiento Reservoir's natural beauty**

*Photo: San Luis Obispo County Public Works Department*
**Figure 83: Personal watercraft on Nacimiento Reservoir**

*Photo: San Luis Obispo County Public Works Department*
**Figure 84: Water skier on Nacimiento Reservoir**

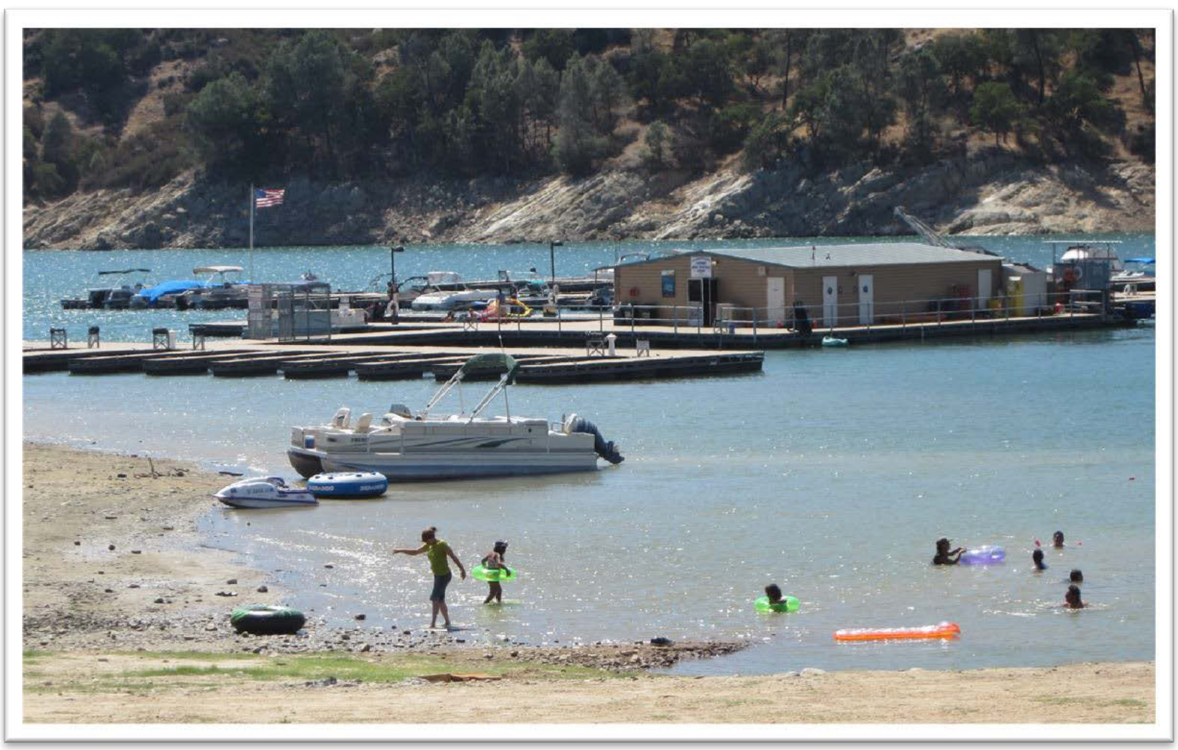


*Photo: San Luis Obispo County Public Works Department*
**Figure 85: Bathers in Nacimiento Reservoir**

Lake Nacimiento Resort provides the most extensive recreation facilities at the reservoir, and the only facilities that are open to the general public. Resort amenities on the south shore include approximately 330 marked camping spaces, a 19 unit lodge, a restaurant, a market, laundry facilities, day use areas (Figure 86), picnic areas, a swimming pool, horseshoe pits, volleyball and basketball courts, a marina including a large paved parking lot, two boat launch ramps, docks, 120 boat rental slips, fuel pumps, and a fish cleaning station. Camping is also allowed on the exposed beach adjacent to the developed campground (Figure 87, Figure 88). Resort amenities on the north shore are limited to a boat launch ramp which is open for day use only.

*Photo: San Luis Obispo County Public Works Department*
**Figure 86: Day users at Lake Nacimiento Resort**

*Photo: San Luis Obispo County Public Works Department*
**Figure 87: Camping on shore at Lake Nacimiento Resort**

*Photo: San Luis Obispo County Public Works Department*
**Figure 88: Camping on shore at Lake Nacimiento Resort**

Heritage Ranch, Oak Shores, other lakeside residential developments, and recreational clubs also contribute visitors to the lake area at their respective facilities. In addition to both permanent residences and vacation rental homes, Heritage Ranch and Oak Shores each have a small campground, marina, boat launch ramps, picnic areas, and swimming pools (Figure 89, Figure 90). Heritage Ranch also has an equestrian facility.

*Photo: San Luis Obispo County Public Works Department*
**Figure 89: Heritage Ranch marina**

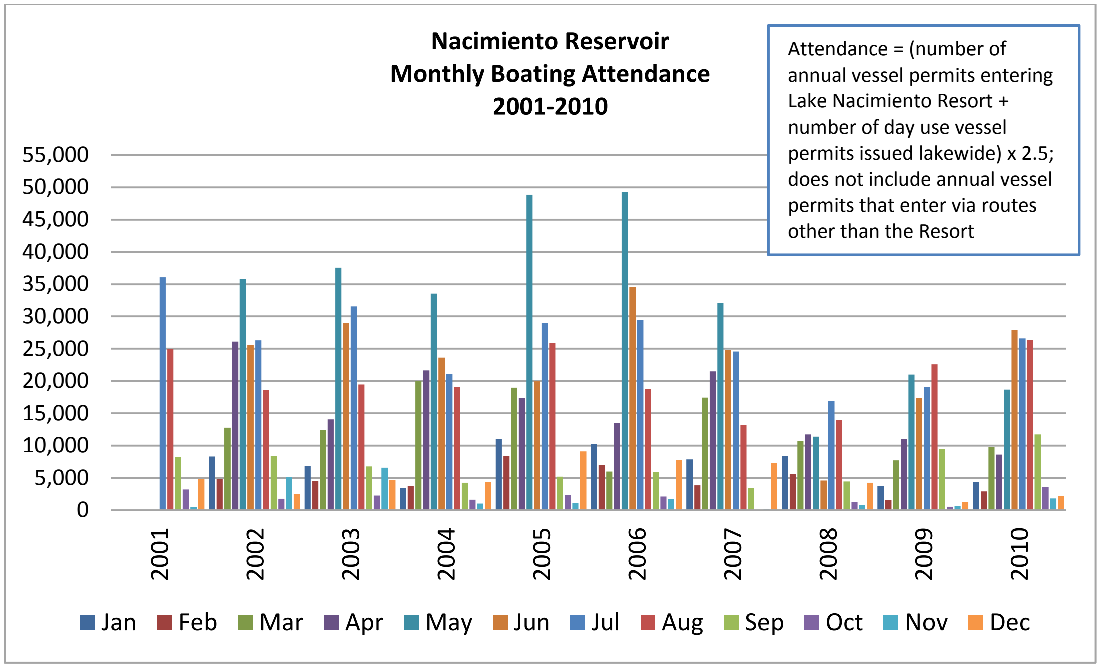
*Photo: San Luis Obispo County Public Works Department*
**Figure 90: Day users at Heritage Ranch**

Numerous other small communities and individual lots have been developed along the lake shore as well. Access to the reservoir is unrestricted, and most of these communities and lots have their own boat launch ramp and shoreline (Figure 91). A total of approximately 2,933 lots have been developed for residential use around the lake shore.

*Photo: San Luis Obispo County Public Works Department*
**Figure 91: Private ramps on Nacimiento Reservoir**

The only publicly available usage statistics for the reservoir are compiled by the Monterey County Parks Department. MCPD issues annual and day use permits for all vessels that use the reservoir and uses that data to generate boating attendance figures; these records are available for the past several years. MCPD also issues camping and day use permits for Lake Nacimiento Resort; these records are only available beginning in June 2009. All attendance records are compiled by MCPD on a weekly basis.

Boating attendance figures are based on the number of vessel day use permits issued at the resort and at other locations around the reservoir, plus the number of vessels that enter the resort bearing an annual permit. These numbers are multiplied by an attendance factor of 2.5. The highest boating attendance occurs from March through August (Figure 92). Peak weekly attendance typically occurs around Memorial Day. During the 2001-2010 time frame, the highest boating attendance in a single week was 23,403 during Memorial Day week in 2003.




*Data: Monterey County Parks Department*

**Figure 92: Nacimiento Reservoir Boating Attendance 2001-2010**

Camping and day use attendance statistics for Lake Nacimiento Resort are calculated as follows:

- Camping attendance = number of camping permits issued x 3
- Day use attendance[14] = (number of daily permits issued x 3) + (number of annual day use permits used x 60)

Camping and day use statistics are only available beginning in July 2009. Since then the highest weekly camping attendance was 10,030 campers in August 2010 (average 1,432/day), and the highest day use attendance was 6,492 visitors in July 2010 (average 927/day).

The California Department of Public Health (CDPH) has drafted guidelines to evaluate the impact of recreational use of a drinking water reservoir on reservoir water quality from the standpoint of pathogen loading to the reservoir. (California Department of Public Health). The District performed this evaluation in 2011 using a limited data set and found visitorship to the reservoir to be within CDPH guidelines. (San Luis Obispo County Flood Control and Water Conservation District)

Dogs are allowed everywhere around the reservoir. Although SLO County Code requires dogs be on a leash at all times, they are often allowed off leash and in the water (Figure 93).

14 The loading factor for Annual Day Use Passes is undoubtedly high. All raw attendance data is reported here as received from Monterey County Parks Department.

*Photo: San Luis Obispo County Public Works Department*
**Figure 93: Dog off leash and in water at Nacimiento Reservoir**

A new concern has arisen in recent years related to boating, which is the potential introduction of non-native species, especially quagga mussels or zebra mussels, to the reservoir via a vessel that has recently been in another, infested reservoir. Quagga mussels and zebra mussels are members of the *Dreissena* family. These invasive species are filter feeders; they strain out certain phytoplankton while rejecting others, and produce a waste product called psuedofeces that contains concentrated toxins and that decreases pH in the surrounding water. An infestation of these mussels could result in increased water clarity, increased water temperature at greater depths, an increase in blue-green algae, and other changes in the reservoir's ecology and water quality. Moreover, the mussels attach to both hard and soft substrates and reproduce in prodigious numbers; for waterworks facilities this results in clogged pipes and reduced flows, as well as creating corrosive conditions on metal surfaces.

Nacimiento Reservoir is at high risk for a mussel infestation due to its high visitorship, its large number of access points, and its innate characteristics (generally warm water, calcium levels well above the threshold needed for mussel growth, etc).

A more extensive description of recreational activities in the Nacimiento Reservoir watershed can be found in the *Nacimiento Water Project Recreation Report Update 2011*. (San Luis Obispo County Flood Control and Water Conservation District)

## 3.2.13 Unauthorized Activity

**Significance:** specific to activity

**Description**

### 3.2.13.1 Unauthorized dumping

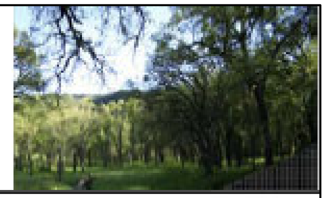
There are no known significant unauthorized dump sites in the watershed.

### 3.2.13.2 Commercial marijuana cultivation

Several large commercial marijuana cultivation operations (grow sites) have been discovered in the upper Nacimiento River watershed, in both the Los Padres National Forest and on Fort Hunter Liggett, and there may be many more undiscovered sites. Large grow sites have been discovered in the lower watershed as well (Figure 94).

The growers camp on site for months at a time, setting up cooking areas and latrine areas. They remove large swaths of natural vegetation and create terraces for planting which creates an erosion hazard. The removed vegetation is piled up on site, where it dries out and creates a fire hazard. Upon discovery of a site, law enforcement officials conduct a raid, taking all evidence but leaving everything else behind. Items left behind include insecticides, herbicides, rodenticides, chemical fertilizers, laundry soap, dish soap, propane tanks, car batteries, camping equipment, clothing, miles of plastic irrigation tubing, thousands of small plastic bags, plastic mesh, and other items used in the growing operation and for long term camping (Figure 95, Figure 96, Figure 97, Figure 98). Local volunteers (including District staff) worked with the US Forest Service to clean up a few of these sites starting in 2008, until this effort was suspended by the Forest Service in 2010. (Abraham) (Anderson) (Ventana Wilderness Alliance)

SAN LUIS OBISPO COUNTY
SHERIFF'S OFFICE



PRESS RELEASES

Current Press Release   Archived Press Releases

| Contact: | Tony Cipolla | FOR IMMEDIATE RELEASE |
|---|---|---|
| Phone: | (805) 781-4547 | |

**Type of Incident:**
Narcotics Investigation

**Date and Time of Incident:**
8-23-12

**Place of Occurrence:**
Lime Mountain area, West of Nacimiento Lake

**Victim Information:**
N/A

**Suspect Information:**
N/A

**Details of News Release:**
On 8-23-12, investigators with the San Luis Obispo County Sheriff's Office Narcotics Unit, along with agents from the Department of Justice and CAMP (Campaign Against Marijuana Planting) completed a three week investigation of a large marijuana cultivation operation. Three different grow sites were located in the Lime Mountain area, West of Nacimiento Lake. Investigators confiscated 22,400 marijuana plants. Investigators also found several large campsites along with 10 five-gallon propane tanks, 8 car batteries, and numerous containers of pesticides and fertilizer. Investigators also discovered 9mm ammunition and two empty gun holsters. The marijuana was legally destroyed. The investigation is continuing based on evidence found at the campsites. No arrests have been made at this time.

| Prepared By: tcipolla | Watch Commander: |
|---|---|
| Released: Thursday 08/23/2012 4:47:57 PM | cipolla |

Crime Stoppers – (805) 549-STOP

**Figure 94: Press release for grow site bust in Nacimiento Reservoir watershed**

*Photo: Lisa Wallender*[15]

**Figure 95: Raided grow site camp in upper Nacimiento River watershed**


*Photo: Ventana Wilderness Alliance*

**Figure 96: Raided grow site - herbicides**

15 San Luis Obispo County Public Works Department staff and Ventana Wilderness Alliance volunteer

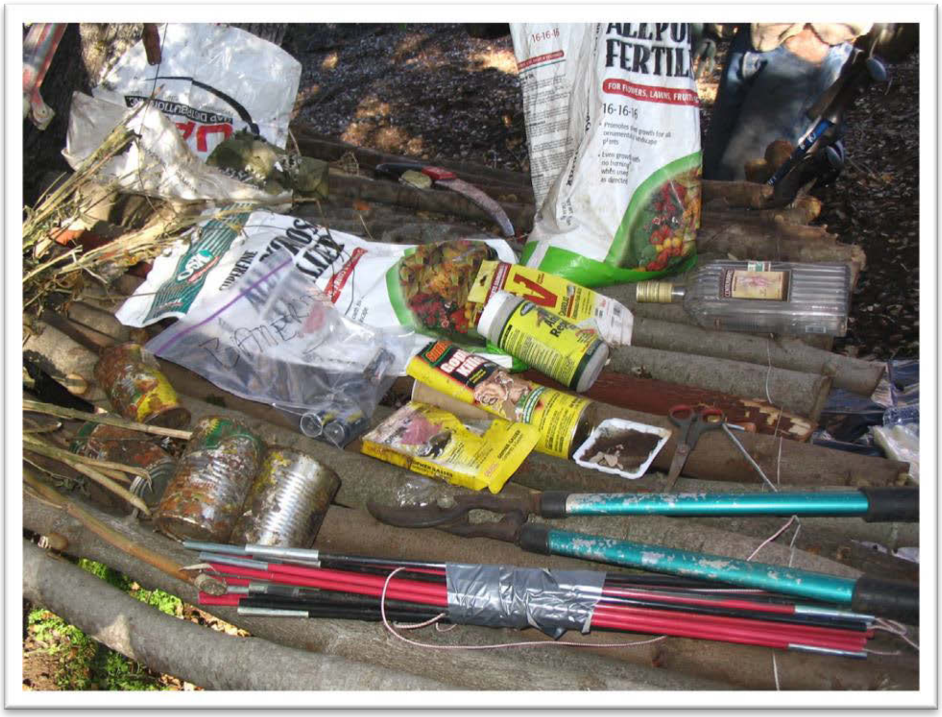



*Photo: Ventana Wilderness Alliance*

**Figure 97: Raided grow site - fertilizer, rodenticides, garbage**

*Photo: Lisa Wallender*

**Figure 98: Raided grow site in Nacimiento River watershed - cut vegetation, garbage**

### 3.2.14 Traffic Accidents/Spills

**Significance:** Pathogens, nutrients, organic carbon from domestic waste pumper truck spill, fuel spills

**Description**

Septic tank pumper trucks and fuel delivery trucks service lakeside communities and other scattered homes and agricultural operations in the watershed. The sparse population in the watershed at large and the mostly seasonal lakeside population makes for relatively infrequent trips throughout most of the year. In the busy summer season domestic waste pumper trucks are used at Lake Nacimiento Resort to service chemical toilets in the campground and floating toilets on the reservoir. These trucks are owned and operated by MCPD, and used as often as needed to maintain sanitary conditions.

Large trucks carry materials between Lime Mountain Quarry and US Highway 101 via Chimney Rock Road (Figure 99). District staff have observed numerous such trucks on this road in the course of a day.

There is no known history of spills resulting in surface water contamination caused by accidents in transportation corridors.

*Photo: San Luis Obispo County Public Works Department*
**Figure 99: Large truck on Chimney Rock Road**

### 3.2.15 Groundwater Which Influences Surface Water Quality

**Significance**: Specific to groundwater quality. Potential contribution of high salinity or other contaminants such as nitrate

**Description**

There is no known groundwater influence on surface water in the Nacimiento Reservoir watershed.

### 3.2.16 Seawater Intrusion

**Significance:** Salinity, total dissolved solids, bromide

**Description**

There is no seawater intrusion in the Nacimiento Reservoir watershed.

### 3.2.17 Geologic Hazards

**Significance:** Earthquakes, landslides, mudslides can destroy portions of the water supply system. These events contribute large amounts of suspended solids to the water supply in a short period of time. Long term effects can include higher loading of suspended solids and other contaminants associated with solids. Earthquakes can disrupt sewage collection lines and treatment facilities and can cause ruptures in hazardous material storage tanks, leading to spills of untreated sewage and hazardous material into the water and the watershed.

**Description**

Several earthquake faults run along the west side of the entire watershed (Figure 100). Although the Nacimiento Fault Zone is considered to be inactive by some experts, this is not definitive, and the Bryson earthquake of 1952 (magnitude 6.2) is sometimes assigned to the Nacimiento fault zone. The nearby Rinconada fault zone is considered to be potentially active and could cause damage in the Nacimiento Reservoir watershed.

87% of the lower watershed is classified as having a high or very high potential for landslides (Figure 101). Landslide risk data could not be obtained for the upper watershed. However, given the similar geography and generally steeper topography of the upper watershed compared to the lower watershed, it is reasonable to expect that the landslide potential of the upper watershed is of equal or greater magnitude than it is in the lower watershed.


**Figure 100: Nacimiento Reservoir Watershed Earthquake Faults**

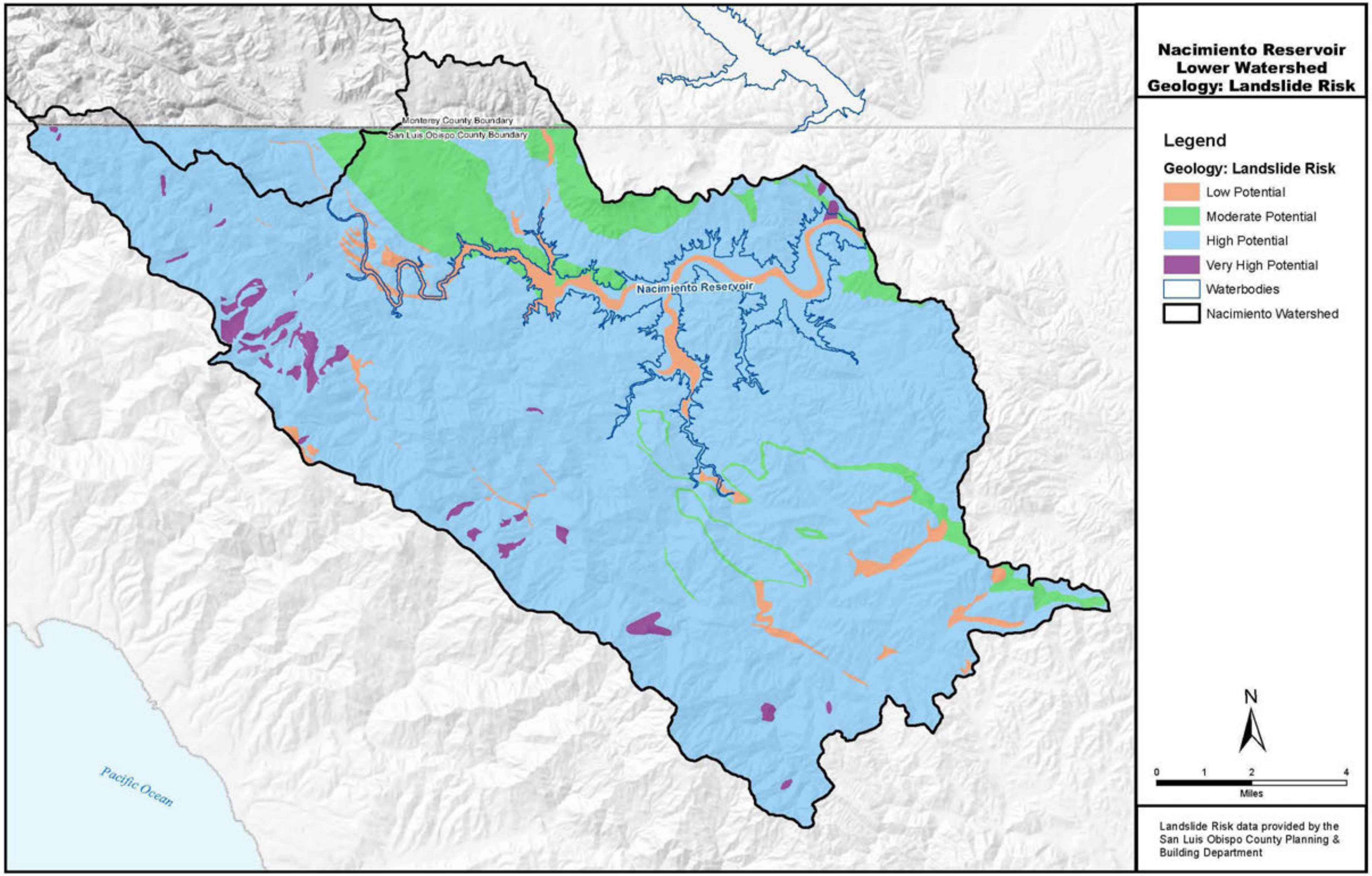



**Figure 101: Nacimiento Reservoir Lower Watershed Landslide Risk**

## 3.2.18 Fires

**Significance**: Significant increase in runoff volume, solids (settleable, suspended, and dissolved), turbidity, nutrients (nitrogen, phosphorous), organic matter, minerals (calcium, potassium), metals (manganese, copper, zinc), pH, cyanide (from fire retardants); decrease in dissolved oxygen. Effects are generally most severe following the first significant rainfall event but some may persist for years.

(USDA Forest Service) (University of California, Los Alamos National Laboratory) (Kalabokidis)

**Description**

The entire lower watershed is classified as having either a high or very high fire hazard severity rating. (Figure 102).

Fire hazard severity classification data could only be obtained for a small portion of the upper watershed; that portion is classified as having high or very high fire hazard severity. Much of the remainder of the upper watershed is characterized by steep, rugged mountain slopes covered with oak woodlands, pine forests, and highly flammable chaparral; it is reasonable to assume that fire hazard severity is high or very high throughout the entire upper watershed. Firefighting is very difficult in this rugged terrain, and it can take several weeks to fully contain a wildfire.

Many wildfires have occurred throughout the watershed over the years. Wildfires that have occurred in the past in this region have been severe. Two of the ten largest fires in recorded California history occurred in this region (1977 Marble-Cone fire, 177,866 acres, and 2008 Basin Complex fire, 162,818 acres). (California Department of Forestry and Fire Protection) These two fires occurred just outside the Nacimiento Reservoir watershed, in the same kind of terrain that characterizes much of the Nacimiento Reservoir watershed, especially the upper watershed (Figure 103). The Chalk Fire of 2008 burned 16,318 acres over a four week period in October 2008. Chemicals as well as water and other techniques were used to fight this fire (Figure 104). Nearly half of the burned area is in the upper reaches of the Nacimiento River watershed. Photographs taken one month later in this area illustrate the denuded landscape (Figure 105).

Much of the western portion of the watershed is classified as having a high post-fire soil erosion potential (Figure 106).

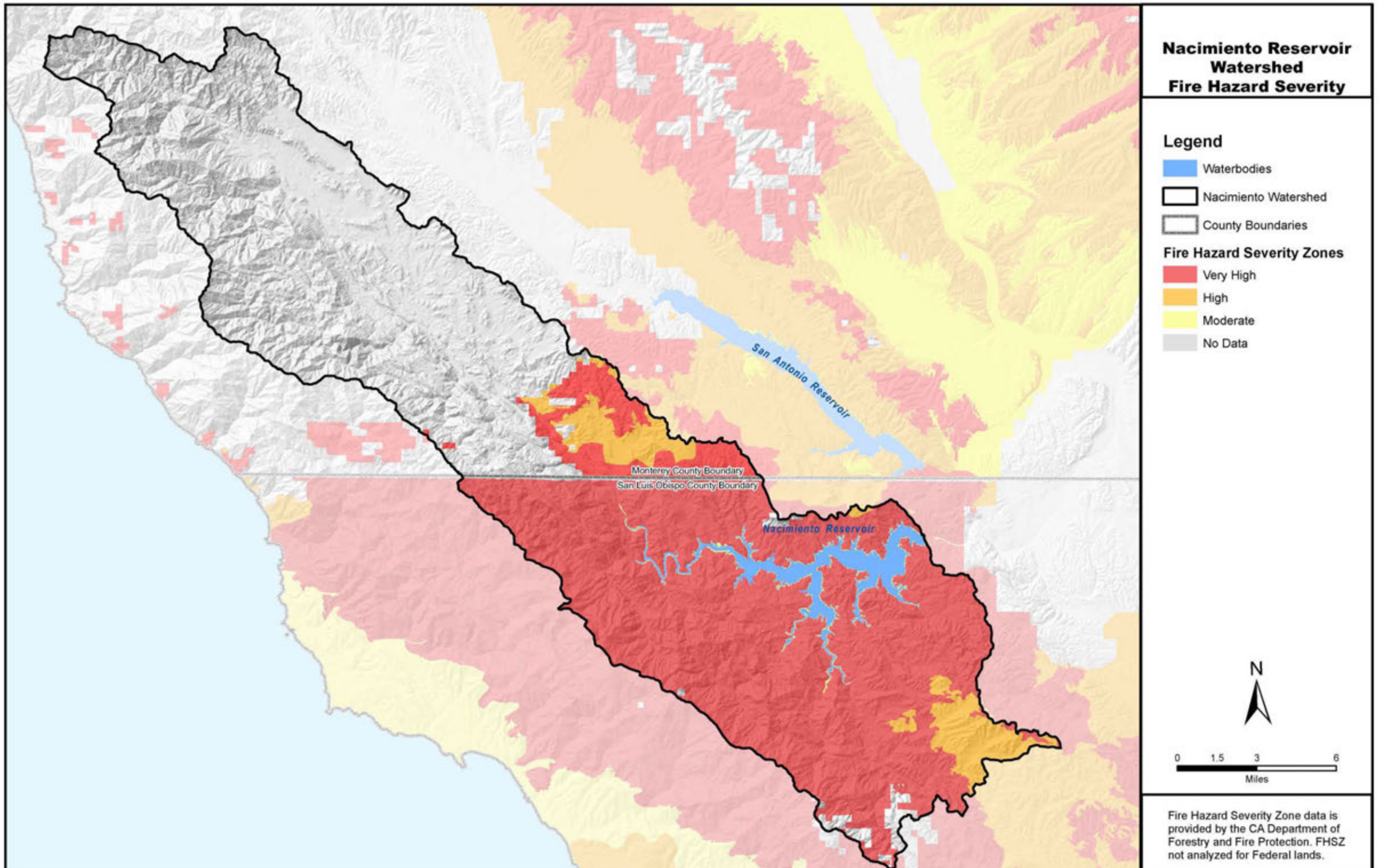



**Figure 102: Nacimiento Reservoir Lower Watershed Fire Hazard Severity**

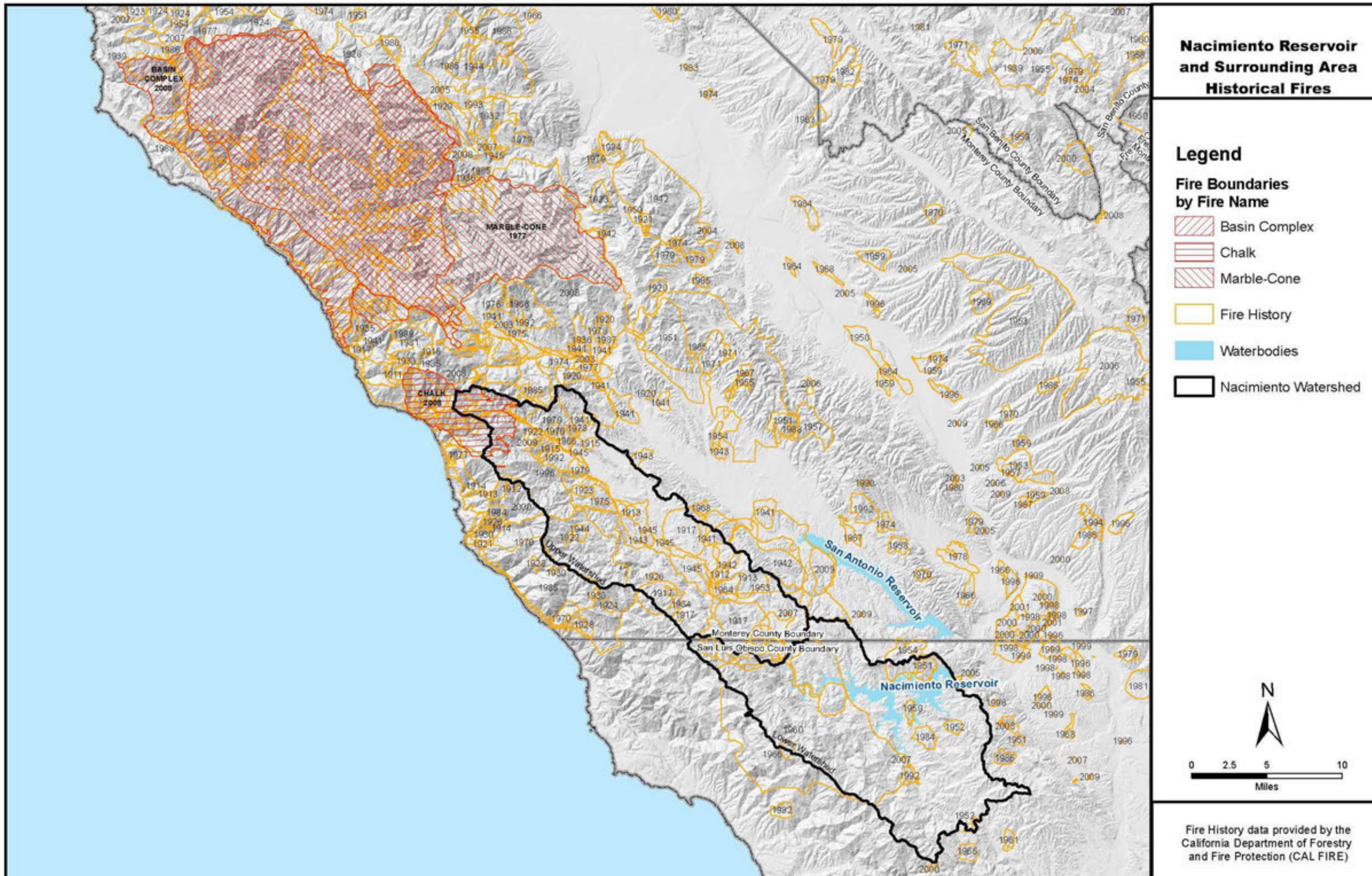



**Figure 103: Nacimiento Reservoir Watershed Area Historical Fires**

*Photo: Inciweb* (USDA Forest Service et. al.)

**Figure 104: Chemicals used to fight Chalk Fire, September 2008.**

*Photo: Lisa Wallender*[16]

**Figure 105: Burned area in upper Nacimiento River watershed, November 2008**

16 SLO County Public Works Department staff and Ventana Wilderness Alliance volunteer

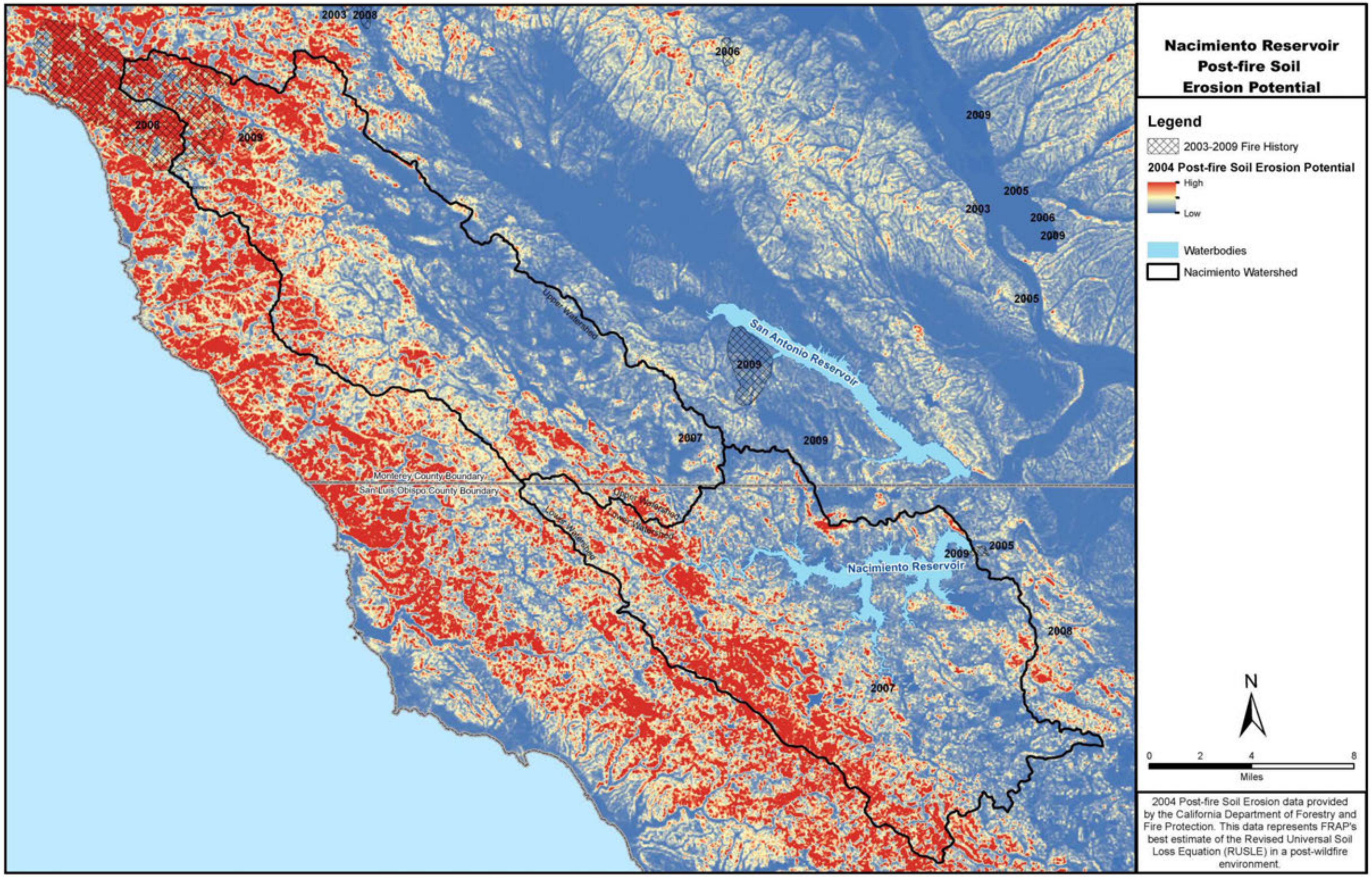



**Figure 106: Nacimiento Reservoir Watershed Post Fire Soil Erosion Potential**

## 3.2.19 Significance of Potential Contaminant Sources

**High risk: Fecal contamination and viruses from grazing, body contact recreation, domestic wastewater facilities, and domestic and wild animals**

Based on information obtained in this watershed sanitary survey, the greatest risks to Nacimiento Reservoir as a drinking water supply appear to be sources in the watershed that may contribute fecal contamination and viruses to the water. Fecal contamination may contribute viral, bacterial, and other infectious organisms including *E. coli, Cryptosporidium parvum*, and *Giardia* to the water supply. *E. coli, Cryptosporidium parvum*, and *Giardia* are microorganisms that live in the intestinal tract of mammals including humans, cattle, horses, dogs, and some wild animals. All three of these microorganisms are pathogens (disease-causing organisms). A person who becomes infected with any of these microorganisms may experience severe gastrointestinal distress, and in some cases, death may ensue. This is especially true for vulnerable populations such as infants, elderly, and immunocompromised persons. All three of these microorganisms are viable in water and may be easily passed from one species to another. A single exposure to one of these infectious agents can cause illness.

Grazing, body contact recreation, and community domestic wastewater collection, treatment, and disposal facilities pose the greatest risk to the drinking water supply from the standpoint of contributing these waterborne pathogens to the reservoir.

Grazing occurs throughout the watershed, including in many locations along the shore of the reservoir. Since cattle have unrestricted access to the water in many places, they may be a source of pathogen contamination at any time. Additionally, high pathogen loading may be expected in the winter when large storm runoff events carry materials into the water.

Body contact recreation occurs throughout the entire reservoir. The highest usage occurs for about three months, from Memorial Day weekend through Labor Day weekend. During this time usage is high and constant. Moderate usage occurs in the spring. The remainder of the year usage is lower, with very little usage occurring during the winter months.

In addition to human contact, dogs are often allowed in the reservoir. In the public recreation area and some lakeside communities, dog usage peaks with visitor usage in the summer months. In Heritage Ranch, however, a significant year-round resident population also means the year-round presence of dogs, and also cats.

The largest community domestic wastewater facilities are found in the Village of Heritage Ranch, the community of Oak Shores, and Lake Nacimiento Resort; all are located on the lake shore, immediately adjacent to the water supply. The communities of Northshore S&B and Laguna Vista have wastewater collection tanks that are near the water as well, but these have comparatively low usage. Under ordinary circumstances none of these facilities should pose a risk to the drinking water supply. However, if a facility failure occurs in which untreated sewage reaches the reservoir, there may be some risk to the water supply. The magnitude of risk would depend primarily on the volume of waste water entering the reservoir. Historically, few facility failures have occurred, and none have resulted in untreated sewage entering the reservoir. This risk is expected to decrease further as regulations have become stricter and facilities have been upgraded and undergone numerous improvements designed to reduce this risk. Nonetheless, some level of risk will always be present.

The wastewater interceptor line at Oak Shores which is located beneath the high water line of the reservoir remains a particular concern. From a practical standpoint, a small leak in the interceptor line does not pose a direct threat to the reservoir, because when the lake level is high enough to be above the interceptor line, the hydraulic pressure is such that a leak in the line means that lake water enters the interceptor line; in this situation, wastewater does not spill out of the line into the lake. However, in this situation there may be an indirect threat to the lake if excessive inflow to the wastewater treatment plant exceeds the plant's capacity, resulting in inadequately treated wastewater being spilled and/or discharged into the watershed. A larger break in the interceptor could result in sewage entering the lake from the "upstream" side of the break. When the lake level is below the interceptor line, the risk is the same as for the numerous other wastewater collection lines located around the lake. And, public perception is important; relocation of the interceptor line above the high water line of the lake would alleviate many concerns held by the public at large.

Older on-site wastewater treatment systems (septic systems) that may have been poorly designed or poorly tested may contribute fecal contamination to the watershed.

Floating toilets are located in three places on the reservoir, as well as on the docks. Although they are used year round, the heaviest usage occurs in the busy summer months. Just as with the Oak Shores interceptor line, if a holding tank experienced a small failure, lake water would enter the tank, and hydraulic pressure would prevent sewage from entering the lake. A catastrophic failure, however, could result in untreated sewage entering the lake. The volume would be no greater than the holding tank capacity, however, thereby limiting the risk to the water supply.

Domestic and wild animals defecate in the watershed, increasing the risks to the water supply from fecal contamination.

**High risk: Algal blooms induced by grazing, body contact recreation, domestic and wild animals, agriculture, and natural vegetation**

High levels of algae are undesirable in a drinking water supply for several reasons.

Certain algae pose a direct health risk from the production of cyanotoxins. Algae in source water can make it more difficult to treat, which increases treatment costs and also poses an indirect health risk to consumers by compromising the treatment process. Certain algae can clog treatment plant filters so quickly and thoroughly that a plant must be shut down altogether until the source water improves. Algae can clog percolation ponds used in ground water recharge and recovery systems. Additionally, certain algae can cause taste and odor problems that render drinking water unpalatable. Although not a health risk, unpalatable drinking water can greatly reduce consumer confidence in the drinking water supply and supplier.

Grazing, body contact recreation, domestic and wild animals, agricultural operations, and natural vegetation contribute algal nutrients (nitrogen, phosphorous) to the water supply.

**High risk: Increased solids loading from grazing**

Turbidity and solids can carry pathogens and other contaminants to a water treatment plant, which increases consumer health risks. High turbidity and solids can compromise treatment processes, and increase treatment costs. High solids can compromise ground water recharge and recovery systems.

Grazing causes increased turbidity and solids loading in the water compared to undisturbed land. Grazing reduces the vegetative cover which normally helps keep soil in place, and trampling by livestock disturbs the soil surface. Reduced vegetative cover and disturbed soil result in more soil being carried into the reservoir with storm runoff than otherwise, increasing solids loading in the water. These activities also cause erosion, which further accelerates movement of soil into the water.

**High risk: Water quality degradation from wildfire**

A large wildfire can pose significant water quality risks, especially from solids loading which can have very deleterious effects on a drinking water treatment plant and on ground water recharge and recovery systems. Additionally, organic carbon loading can increase disinfectant byproduct formation, and nutrient loading can increase algae growth. Metal loading can increase treatment chemical demand. The greatest risk is associated with the first few major storm runoff events following a wildfire, which may occur within a few months of the fire, or which may occur in later years, depending on weather conditions. Some elevated risk will remain until new vegetation growth is established, usually within a few years of the fire.

**High risk: Organic carbon loading from grazing, body contact recreation, domestic and wild animals, and natural vegetation**

Many drinking water systems use chlorine to disinfect the water. Chlorine combines with organic carbon to form harmful disinfectant by-products in the water.

Grazing, body contact recreation, domestic and wild animals, and natural vegetation all contribute organic carbon to the water.

**Lesser risks: Hazardous materials, urban runoff, agricultural runoff, industrial runoff, marijuana grow sites, recreational vessels, recreational vehicles**

The transport, storage and use of hazardous materials throughout the reservoir, along with urban runoff, can contribute VOCs, SOCs, nutrients, and metals to the water supply.

VOCs and SOCs can pose a health risk from short term exposure to high levels of these chemicals, and from long term exposure to low levels.

Nutrients can lead to harmful algal blooms, which can compromise drinking water treatment processes and groundwater recharge and recovery systems, and can contribute toxins and undesirable taste and odor to the water.

Some metals can negatively drinking water treatment plant processes, especially by increasing the usage of pathogen-killing oxidants. This increases human health risk and also increases treatment costs. Some metals also cause aesthetic concerns such as color and/or turbidity in the water and staining of fixtures and/or clothing.

Erosion from military activities, agricultural operations, and recreational activities[17] can increase solids loading. Solids can carry bacteria, pathogens, nutrients, and other unwanted material into the water, and can also have direct negative impact on water treatment processes, thereby increasing risks to drinking water consumers

Chemicals used in marijuana grow sites can negatively impact water quality, including the introduction of nutrients (from fertilizers and household soaps), pesticides, herbicides, rodenticides, and fecal contamination from latrines.

Non-native species, including quagga mussels and zebra mussels, can be introduced to the reservoir via a vessel that has recently been in another, infested reservoir. These mussels are filter feeders; they strain out certain phytoplankton while rejecting others, and produce a waste product called pseudofeces that can release concentrated toxins and decrease the pH in the surrounding water. An infestation of these mussels could result in increased water clarity, increased water temperature at greater depths, an increase in blue-green algae, and other changes in the reservoir's ecology and water quality. Moreover, the mussels attach to both hard and soft substrates and reproduce

17 Erosion can result from vehicles driven on unpaved surfaces, from deliberate disturbance of the soil, and from the wave action of recreational boats on the water.

in prodigious numbers. For waterworks facilities, this results in clogged pipes and reduced flows, as well as creating corrosive conditions on metal surfaces. Chemical treatment for these mussels can result in unacceptable water quality impacts.

The risk to human health from these various sources is lower than those identified above, and any one source may pose a comparatively low risk by itself. However, the cumulative effect is important to consider, especially over time, and may be significant.

**Special concern: Mercury**

From the standpoint of human consumption of properly treated drinking water from Nacimiento Reservoir, mercury contamination is not a health risk. Mercury does not easily dissolve in water. Any mercury that may be present in the water is typically associated with particulate matter that would be removed in a drinking water treatment plant. From a public perception standpoint, however, mercury is a very significant concern. High levels of mercury have been found in fish caught in Nacimiento Reservoir, prompting the California Department of Public Health to issue a fish advisory for the reservoir. This leads to concerns among many consumers about the safety of the reservoir as a drinking water supply.

**Risks Identified by California Department of Public Health**

In 2002 CDPH conducted source water assessments on the following public water systems that take water either directly from Nacimiento Reservoir or from wells that are under the direct influence of Nacimiento Reservoir water (Table 15):

**Table 15: Public Drinking Water Systems Under Direct Influence of Nacimiento Reservoir Water**

| System Name | System Number | Intake type | Intake location |
|---|---|---|---|
| Northshore S&B | 4000652 | Direct intake when reservoir surface elevation is >700' (wells when surface elevation is <700') | Direct intake: Nacimiento Reservoir adjacent to Northshore S&B. (Wells are not under the influence of surface water) |
| Nacimiento Water Company (Oak Shores) | 4010027 | Infiltration gallery well | Nacimiento Reservoir bank adjacent to Oak Shores |
| County of Monterey – Lake Nacimiento Resort | 4000590 | Infiltration gallery well | Nacimiento River bank < 1 mile downstream of dam |
| Heritage Ranch CSD | 4010012 | Infiltration gallery wells | Nacimiento River bank < 1 mile downstream of dam |

For all systems except Heritage Ranch CSD, the CDPH identified recreational use as a high risk to the source water. Other risks that were identified in the assessments include (in alphabetical order):

- Above ground storage tanks
- Drinking water treatment plants
- Grazing
- Irrigated crops
- Lagoons/liquid wastes
- Mining operations
- Septic systems
- Sewer collection systems
- Transportation corridors

Each system's vulnerability to each risk varies according to several factors which are described in each source water assessment. (California Department of Public Health)

## 3.3 Anticipated Growth and Projected Changes in Sources of Contaminants

**Anticipated increase: Lakeside residency**

In the next ten years, the biggest anticipated change in the watershed is an expected increase in lakeside residency, both year-round and part-time. The primary effect of this change will be an increase in urban runoff as well as increased usage of domestic wastewater treatment facilities.

Historically, Heritage Ranch was considered a vacation rental area with a large part-time population. However, this is no longer the case; the Heritage Ranch Community Services Districts now estimates that only approximately 30% of the water connections can be considered part-time. Most homes in the community are now occupied by full-time residents. This change in demographics warranted the inclusion of Heritage Ranch in the 2009-2010 SLO County Annual Resource Summary Report for the first time in this report's history. (San Luis Obispo County Department of Planning and Building) This report is used when reviewing and updating the SLO County General Plan. Inclusion of Heritage Ranch in this report indicates its new significance as a population center. Currently there are 810 undeveloped lots in Heritage Ranch that are approved for development.

The community of Oak Shores currently has 583 existing dwellings, and 329 vacant lots that have been approved to connect to the wastewater system. In the 2000's there was a serious effort to develop 60 of these lots plus approximately 800 more, for a full build-out of 1,713 residential units. This effort was halted when the economy crashed in 2008, but may be revived once the economy recovers.

In 2010 the Oak Hill Commercial Center opened at the north end of Heritage Ranch, on a site which is fully accessible to the public. The center includes a large, modern grocery store, a fueling station, car washing and RV washing bays, a post office, and other amenities.

Other than Heritage Ranch most communities around Nacimiento Reservoir are fairly remote and inaccessible in relationship to larger population centers in the area. Consequently these communities are less likely to become full time residences for working people. However as more lakeside amenities are offered these communities may become more attractive to early retirees for full time residency, and development of lots for vacation use also becomes more attractive.

Clear evidence that area demographics are changing can be seen in enrollment statistics for the local elementary school. Cappy Culver Elementary School serves the homes in this area. In 2005, when the school was relocated from a site inside Heritage Ranch to a site across from the Oak Hill Commercial Center, enrollment was 88 students. Within six years enrollment nearly tripled; 261 students were enrolled at the start of the 2011-12 school year. (Staff, San Miguel Joint Union School District)

**Potential increase: Agricultural activity**

Agricultural activity in the Adelaida area has increased in recent years, especially viticulture, and continued growth may occur here too. Additional vineyards and orchards may be planted and additional wineries may begin operating in the next ten years. The primary effect of this change would be an increase in agricultural runoff.

**Potential increase: Recreational activity**

An increase in full-time and part-time lakeside residency will no doubt lead to increased recreational use of the reservoir, especially by vacationers.

Additionally, a new organizational camp has been proposed on the north shore of Nacimiento Reservoir. The Cantinas Ranch Foundation owns several contiguous lots immediately west of the community of Oak Shores, encompassing a total of 560 acres. In October 2011 the foundation submitted an application to the San Luis Obispo County Department of Planning and Building for a conditional use permit to build an organizational camp on this property.

Designed for up to 200 campers and 100 staff, the preliminary plan includes several buildings totaling 90,237 sq. ft. on 8.1 acres of land, and a new bridge to be built over Kavanaugh Creek. Elements of the plan that are noteworthy with regard to reservoir water quality include the following:

- Equestrian center
- Septic tank effluent gravity (STEG) wastewater collection system
- On-site two-stage trickling filter and constructed wetland wastewater treatment system
- On site disposal of tertiary treated wastewater via re-use and leach fields

Full build out is expected to take nine years. As of June 2012 the conditional use permit application had not yet been accepted for processing by SLO County, pending receipt of additional information from the applicant. The speed with which the application may be processed and the project may proceed can not be predicted at this time.

**Other potential changes**

<u>Fort Hunter Liggett</u>

Activity in Fort Hunter Liggett varies depending on national security needs and is not predictable. Training area maintenance does not vary much, but the impact of troops on the ground will vary according to activity levels.

Mercury Mine Cleanup

The EPA investigation into the Klau and Buena Vista mines site will produce recommendations to reduce the risk that these mines pose to the water supply. These recommendations may not be final for a few years however, and funding to implement any recommendations is uncertain. Therefore, although the investigation's purpose is to ultimately reduce the risk, it is unpredictable if that will occur, or even begin, in the next ten years.

# 4 WATERSHED CONTROL AND MANAGEMENT PRACTICES

## 4.1 WATER AGENCY MANAGEMENT PRACTICES

### 4.1.1 Organizational Structure

The San Luis Obispo Flood Control and Water Conservation District only has the right to withdraw water from Nacimiento Reservoir. The District does not have control authority over any part of the Nacimiento Reservoir watershed, including the reservoir. All land in the watershed is owned by other government agencies or private parties. Monterey County Water Resources Agency owns and operates Nacimiento Reservoir and dam. Several other agencies, including the federal government, the state of California, Monterey County, San Luis Obispo County, and local agencies have varying levels of control authority in the watershed, as described below in section 4.2.

## 4.1.2 Watershed and Reservoir Management and Operations

As described in section 4.1.1, the San Luis Obispo County Flood Control and Water Conservation District (District) does not have control authority over any part of the Nacimiento Reservoir watershed. Although the District operates other drinking water reservoirs in San Luis Obispo County, it does not have control authority over any part of those watersheds either. Consequently, the District has not developed a watershed management plan for the Nacimiento Reservoir watershed, nor has it developed policies with respect to watershed management and source water protection.

### 4.1.3 Inspection and Surveillance of the Watershed

At this time, the District's watershed inspection and surveillance program consists of the following ongoing practices:

- Observing conditions on the reservoir and the shoreline east of Lake Nacimiento Resort, including in the vicinity of the NWP intake structure, during monthly profile sample collection events that occur on the lake at the log boom near the Nacimiento Reservoir dam
- Observing conditions on the reservoir and the shoreline west of Lake Nacimiento Resort during monthly watershed sample collection events that occur on the lake at several locations around the perimeter of the main body of the lake
- Observing conditions on shore and on the reservoir at the intake structure during monthly sample collection events at the intake pump station
- Observing conditions on shore and on the reservoir at the intake structure during routine operational visits to the intake pump station, one to five times per week
- Observing conditions on shore in the public recreation area (Lake Nacimiento Resort) including all campgrounds, day use areas, and the marina during monthly recreation area inspections
- Collecting water samples for water quality monitoring and evaluating analytical results from various locations on the reservoir (described in section 5.2.1 below)
- Gathering and evaluating data from other water quality monitoring programs that occur in the watershed (see section 5.2.1)
- Fostering cooperative working relationships and maintaining communication with public agencies that own property and/or have jurisdictional authority in the watershed
- Fostering positive relationships and maintaining communication with private associations and individuals who own property and/or have some other type of authority in the watershed
- Participating in the technical support group and in the stakeholders group for the EPA Superfund investigation of the Klau/Buena Vista mines site, Las Tablas Creek, and Nacimiento Reservoir

The watershed is large and mostly undeveloped; many parts of it are inaccessible by land or by water. In the areas that are accessible by land, roads are narrow and winding, and travel is slow. Additionally, access to many areas is restricted (e.g. private lakeside communities, and most of Fort Hunter Liggett). Consequently, routine, frequent surveillance of most of the watershed is impractical.

Occasionally District staff have an opportunity to visit parts of the watershed that are remote or otherwise normally inaccessible. Any time such an opportunity presents itself, District staff have taken advantage of it, and will continue to do so. Such occasions that have occurred to date include:

- Three visits in the remote upper reaches of the watershed in Los Padres National Forest, provided by the Ventana Wilderness Alliance (two visits off road, reached by hiking)
- A jeep tour of the upper watershed in Fort Hunter Liggett, including the Nacimiento River Valley floor and the western boundary along the spine of the Santa Lucia Mountains, provided by FHL staff
- An aerial tour of the Klau/Buena Vista mines site, Las Tablas Creek, and the western part of the main body of the reservoir, provided by the federal EPA

## 4.2 OTHER AGENCIES WITH WATERSHED CONTROL AUTHORITY

The San Luis Obispo County Flood Control and Water Conservation District does not have control authority over any part of the Nacimiento Reservoir watershed. Other agencies that have control authority in the watershed (and the geographic area where they have authority) include:

- United States of America
    - Department of Agriculture
        - Forest Service (Los Padres National Forest)
    - Department of Defense
        - Department of the Army (Fort Hunter Liggett)
    - Department of the Interior
        - Bureau of Land Management (properties owned by BLM)
        - Fish and Wildlife Service (entire watershed)
- State of California
    - Environmental Protection Agency
        - State Water Resources Control Board (entire watershed)
            - Central Coast Regional Water Quality Control Board (entire watershed)
    - Health and Human Services Agency
        - Department of Public Health (entire watershed)
            - Division of Drinking Water and Environmental Management (entire watershed)
    - Natural Resources Agency
        - Department of Fish and Game (entire watershed)
        - Department of Boating and Waterways (Nacimiento Reservoir)
        - Department of Forestry and Fire Protection (entire watershed)
        - Department of Water Resources (Nacimiento Reservoir)
- San Luis Obispo County
    - Department of Agriculture/Weights and Measures (SLO County)
    - Department of Planning and Building (SLO County)
    - Department of Public Health
        - Environmental Health Division (SLO County)
    - Department of Public Works and Transportation (SLO County)
    - Department of the Sheriff-Coroner (SLO County)
- Monterey County
    - Agricultural Commissioner (Monterey County)
    - Health Department
        - Environmental Health Services (Monterey County)
    - Parks Department (Nacimiento Reservoir and Lake Nacimiento Resort)
    - Resource Management Agency (all of Monterey County)

        - Planning Department (Monterey County)
        - Roads Department (Monterey County)
    - Water Resources Agency (Nacimiento Reservoir)
- Local agencies, including
    - Heritage Ranch Community Services District
    - South Nacimiento Road Association
    - Owners associations for the following lakeside communities
        - Cal-Shasta Club
        - Christmas Cove
        - Happy Landing
        - Heritage Ranch
        - Laguna Vista Boat Club
        - Northshore S&B
        - Oak Shores
        - Running Deer Ranch
        - South Shore Village Club
        - Tri Counties Boat & Ski Club

Time constraints during the writing of this report allowed for only a cursory review of selected regulations, policies, and programs. Several such items are listed in this section; some are briefly described. Additional research will be done as time allows, with a goal of filling in gaps in the five year update to this report.

## 4.2.1 County General Plan Policies

### 4.2.1.1 San Luis Obispo County

#### 4.2.1.1.a General Plan

The San Luis Obispo County General Plan has several interrelated elements that guide decisions on land use and which can affect surface water quality in the Nacimiento Reservoir watershed. These elements are:

- Agriculture Element
- Conservation and Open Space Element
- Land Use and Circulation Element
    - Framework for Planning (Inland)
    - Nacimiento Area Plan
    - Adelaida Planning Area
    - Lake Nacimiento Resort Specific Plan
- Safety Element

In 2005 SLO County adopted Strategic Growth Principles to serve as planning guidelines on how growth should occur in a more sustainable manner. Guiding principles for strategic growth include preservation of open space and natural resources, protection of agricultural land and resources, and directing development toward existing and strategically planned communities. These principles are integrated into the general plan as specific goals, policies, and implementation strategies.

**Agriculture Element**

The Agriculture Element was adopted in 1998, amended in 2006, and revised in 2010. The stated mission of the element is to "Identify those areas of the county with productive farms, ranches and soils, and establish goals, policies and implementation measures that will enable their long-term stability and productivity." This mission is addressed through the following four goals, and their associated policies and implementation strategies:

- Support county agricultural production
- Conserve agricultural resources
- Protect agricultural lands
- Encourage public education and participation

**Conservation and Open Space Element**

The Conservation and Open Space Element (COSE) has been rewritten since the strategic growth principles were adopted. The current COSE was adopted in May 2010. Several goals within the COSE relate to the Nacimiento Reservoir watershed, including the following:

- Biological Resources
    - Native habitat and biodiversity will be protected, restored, and enhanced.
    - Threatened, rare, endangered, and sensitive species will be protected
    - Maintain the acreage of native woodlands, forests, and trees at 2008 levels.
    - The natural structure and function of streams and riparian habitat will be protected and restored.
    - The county's fisheries and aquatic habitats will be preserved and improved.
- Mineral Resources
    - Conservation and development of significant mineral deposits will be a high priority, but will be balanced with other County General Plan goals and policies.
    - Balance mining of mineral resources with sensitive natural resources and existing adjacent uses
- Open Space Resources
    - Important open space areas will be identified, protected, sustained, and where necessary, restored and reclaimed.
    - Open space resources will be protected and sustained on public lands
    - Urban sprawl and inappropriate development of rural areas will be prevented.
- Soil Resources
    - Soils will be protected from wind and water erosion, particularly that caused by poor soil management practices.
    - Watershed and ecological function will be maintained through soil conservation.
    - Important agricultural soils will be conserved.
- Water Resources
    - Excellent water quality will be maintained for the health of people and natural communities.

The water quality protection goal contains the following policies and their associated implementation strategies:

- Policy: Prevent water pollution
    - Support TMDLs
    - Employ pollution prevention in County operations
    - Minimize construction-related impacts to water quality
    - Continue water quality-related public education

- Policy: Protect watersheds
    - Minimize runoff from new development
    - Permeable materials
- Policy: Improve groundwater quality
    - Prioritization and preparation of groundwater management plans
    - Maintain database of onsite wastewater systems
    - Abatement of failing septic systems
- Policy: Water quality restoration
- Policy: Support Resource Conservation Districts
- Policy: Prevent pollution of water sources
    - Protect drinking water sources from grading
    - Abate recreation-related pollution of drinking water sources
    - Control Quagga mussels and similar invasive species

**Land Use and Circulation Element**

All of the Nacimiento Reservoir watershed that lies in San Luis Obispo is covered by either the Nacimiento Area Plan or the Adelaida Planning Area (Figure 107). The Nacimiento Planning Area encompasses 97,665 acres. Of that area, 67,223 acres (69%) fall within the Nacimiento Reservoir watershed. The Adelaida Planning Area encompasses 208,008 acres, of which 36,204 acres (17%) fall within the Nacimiento Reservoir watershed. Both the Nacimiento Area Plan and the Adelaida Area Plan were adopted in 1980. Although both plans were revised in 2003, and some of the content remains relevant, much of the material is very outdated[18].

The Lake Nacimiento Resort Specific Plan was adopted in 1976, in response to a request by the then-operator of the resort to significantly expand the facility (from 240 campsites to 1,252 overnight units (campsites, cabins, lodge)).

**Safety Element**

Adopted in 1999, the Safety Element's primary relationship to the Nacimiento Reservoir watershed is the section on fire safety, which has a single goal, which is to "reduce the risk to life, structures, and the environment caused by fire", and its associated policies and implementation strategies.

#### 4.2.1.1.b Ordinances

General plan policies are implemented as ordinances that have been adopted by the San

18 For instance, County Service Area 19 (CSA19), which provided water and sewer services to Heritage Ranch, was dissolved in 1990 and the Heritage Ranch Community Services District (HRCSD) was formed in its stead. However, the Nacimiento Area Plan (2003 revision) refers to CSA19 throughout, with no mention of the HRCSD.

Luis Obispo County Board of Supervisors. Portions of San Luis Obispo County code that relate either directly or indirectly to surface water quality protection in the Nacimiento Reservoir watershed include the following sections:

- Title 22 – Land Use Ordinance
    - Chapter 22.10 – General Property Development and Operating Standards
        - 22.10.150 – Solid Waste Collection and Disposal
        - 22.10.155 – Stormwater Management
    - Chapter 22.30 – Standards for Specific Land Uses
        - 22.30.070 – Agricultural Processing Uses
    - Chapter 22.36 – Surface Mining and Reclamation
    - Chapter 22.52 – Grading and Drainage
        - 22.52.110 – Drainage Plan Required
        - 22.52.120 – Erosion and Sedimentation Control Plan Required
        - 22.52.130 – Stormwater Pollution Prevention Plan Required
    - Chapter 22.92 – Adelaida Planning Area
    - Chapter 22.102 – Nacimiento Planning Area


**Figure 107: San Luis Obispo County Planning Areas in Lower Nacimiento Reservoir Watershed**

## 4.2.1.2 Monterey County

### 4.2.1.2.a General Plan

Approximately 13,000 acres, or just 6% of the total Nacimiento Reservoir watershed, is under direct jurisdictional control of Monterey County. The remainder of the watershed that lies within Monterey County is federal land. Elements of the Monterey County General Plan which guide land use and can affect surface water quality in this portion of the watershed include:

- Land Use Element
- Conservation and Open Space Element
- South County Area Plan

The South County Area Plan contains the following policies that relate either directly or indirectly to surface water quality protection in the Nacimiento Reservoir watershed:

- Land Use
  - On lands adjacent to Fort Hunter Liggett, only low residential densities shall be allowed….
- Public Services
  - Cooperative soil conservation, water quality protection, and resource restoration programs within watershed basins shared with neighboring counties shall be pursued.
  - New development may not encroach on the main channels and associated floodways of the Nacimiento, San Antonio, and Salinas Rivers….

### 4.2.1.2.b Ordinances

General plan policies are implemented as ordinances that have been adopted by the Monterey County Board of Supervisors. Portions of Monterey County code that relate either directly or indirectly to surface water quality protection in the Nacimiento Reservoir watershed include the following sections:

- Title 10 – Health and Safety
- Title 15 – Public Services
- Title 16 - Environment
- Title 21 – Zoning

## 4.2.2 Federal Agency Plans and Policies

### 4.2.2.1 Los Padres National Forest Land Management Plan

As described in section 2.1.1.1, the headwaters of the Nacimiento River occur in the Los Padres National Forest (LPNF). In 2005 the United States Department of Agriculture Forest Service adopted a Land Management Plan for the Los Padres National Forest. The objective of the plan is to reduce the following four threats to the forest (USDA Forest Service):

- Fire and Fuels
- Invasive Species
- Loss of Open Space
- Unmanaged Recreation

The plan includes the following key factors:

Access:
- Limits motorized public access to designated Forest System routes
- Allows the resolution of non-system routes gradually over time
- Retains administrative access
- Allows use of temporary roads

Limited Development:
- Emphasizes the expansion or improvement of existing facilities before building new ones
- Reduces the loss of open space
- Retains undeveloped character
- Leaves options for future generations

Community Protection:
- Emphasizes the protection of lives and property
- Includes the flexibility to adjust Wildland/Urban Interface according to Community Protection Plans
- Retains access

Conservation of Plant and Animal Species:
- Plant and Wildlife management emphasized in all program areas
- Community protection emphasizes plant and animal management as long as defense zone objectives can be met
- Emphasizes the gradual reduction of invasive species
- Acknowledges uncertainty
- Emphasizes the importance of monitoring

For the most part, these objectives are also protective of water quality, and implementation of a plan that meets these objectives should aid in water quality protection.

#### 4.2.2.2 Fort Hunter Liggett Integrated Natural Resources Management Plan

As described in section 2.1.1.1, the majority of the upper Nacimiento Reservoir watershed occurs on Fort Hunter Liggett (FHL), a training facility for the United States Army. FHL has and implements an Integrated Natural Resources Management Plan (INRMP). The most current version of FHL's INRMP available at the time of this writing is the plan that was published in 2004 (US Army Reserve Training Center, Fort Hunter Liggett, CA). The plan's stated purpose is as follows:

> The purpose of the INRMP is to ensure that natural resources are managed in support of the FHL military training mission and that all activities are in compliance with appropriate Federal and State laws and regulations and with appropriate Army and FHL regulations.

The INRMP indicates that:

> This INRMP emphasizes an ecosystem management approach to natural resources management, consistent with DoD policies. Ecosystem management supports the use of natural resources on FHL for both military and other human-related values and purposes. Ecosystem management has an over-riding goal of protecting the properties and functions of natural ecosystems. Since ecosystems often go beyond installation boundaries, management of FHL's natural resources will include development of partnerships with neighbors.

The "…over-riding goal of protecting the properties and functions of natural ecosystems" is protective of water quality.

The INRMP describes current natural resources programs and projects, and includes some planned new initiatives, including the following:

- Implementing an ecosystem management philosophy
- Restoring military lands through the continuing implementation of the ITAM program
- Improving surface water quality and monitoring
- Continuing ongoing biodiversity inventories
- Using a geographic information system to assist decision-making for the use and management of FHL lands
- Providing protection for special status wildlife and plants
- Continuing the threatened and endangered species program
- Upgrading the post road, trail, and firebreak system to improve military training, reduce maintenance, maintain fire protection, and reduce negative environmental effects

- Ensuring that the pest management program is consistent with Army initiatives and ecosystem management concerns
- Continuing the hunting and fishing program

These planned initiatives are generally protective of water quality. To the degree that they are implemented in the Nacimiento Reservoir watershed, most of them will be protective of water quality in that reservoir.

## 4.2.3 Wastewater Discharge Permits

The Federal Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. The basis of the CWA was enacted in 1948 and was called the Federal Water Pollution Control Act, but the Act was significantly reorganized and expanded in 1972. "Clean Water Act" became the Act's common name with amendments in 1972.

Under the CWA, EPA has implemented pollution control programs such as setting wastewater standards for industry, and setting water quality standards for all contaminants in surface waters.

The CWA made it unlawful to discharge any pollutant from a point source into navigable waters, unless a permit was obtained. EPA's National Pollutant Discharge Elimination System (NPDES) permit program controls discharges. Point sources are discrete conveyances such as pipes or man-made ditches. Individual homes that are connected to a municipal system, use a septic system, or do not have a surface discharge do not need an NPDES permit; however, industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters. (USEPA)

In California, waste discharge requirements (WDRs) for discharge to surface waters are established through NPDES permits, which are issued by RWQCBs under the jurisdiction of the SWRCB. The Regional Boards are the implementing authority within California for the Federal Clean Water Act. NPDES permits for wastewater discharge contain limits on contaminants of concern in the discharge. Many of these contaminants present hazards to water supplies. NPDES permits typically do not set limits for all constituents of concern to a water supply. Notably, protozoans (e.g. Giardia and Cryptosporidium) are not regulated.

Wastewater discharges to leachfield systems or engineered on-site systems may be regulated by either the RWQCB or a local county agency through health or sanitation ordinances. Typically, ordinances set guidelines for the siting and sizing of leachfield and engineered systems to promote effective treatment. (American Water Works Association)

The Central Coast Regional Water Quality Control Board's (RWQCB) Water Quality Control Plan for the Central Coast Basin guides the Board's issuance and enforcement of Waste Discharge Requirements (WDRs). Informally known as the Basin Plan, this document describes its function and legal basis as follows (California Regional Water Quality Control Board, Central Coast Region):

## I. FUNCTION OF THE WATER QUALITY CONTROL PLAN (BASIN PLAN)

The objective of this Water Quality Control Plan for the Central Coastal Basin, or Basin Plan, is to show how the quality of the surface and ground waters in the Central Coast Region should be managed to provide the highest water quality reasonably possible. Water uses and water benefits vary. Water quality is an important factor in determining use and benefit. For example, drinking water has to be of higher quality than the water used to irrigate pastures. Both are legitimate uses, but the quality requirements for irrigation are different from those for domestic use. The plan recognizes such variations.

This Basin Plan lists the various water uses (Beneficial Uses, Chapter Two). Second, it describes the water quality which must be maintained to allow those uses (Water Quality Objectives, Chapter Three). Federal terminology is somewhat different, in that beneficial uses and water quality objectives are combined and the combination is called Water Quality Standards. Chapter Four, the Implementation Plan, then describes the programs, projects, and other actions which are necessary to achieve the standards established in this plan. Chapter Five, Plans and Policies, summarizes State Water Resources Control Board (State Board) and Regional Water Quality Control Board (Regional Board) plans and policies to protect water quality. Chapter Six describes statewide surveillance and monitoring programs as well as regional surveillance and monitoring programs.

The Regional Board implements the Basin Plan by issuing and enforcing waste discharge requirements to individuals, communities, or businesses whose waste discharges can affect water quality. These requirements can be either State Waste Discharge Requirements for discharges to land, or federally delegated National Pollutant Discharge Elimination System (NPDES) permits for discharges to surface water. Methods of treatment are not specified. When such discharges are managed so that: 1) they meet these requirements; 2) water quality objectives are met; and, 3) beneficial uses are protected, water quality is controlled.

The Basin Plan is also implemented by encouraging water users to improve the quality of their water supplies, particularly where the wastewater they discharge is likely to be reused. Public works or other projects which can affect water quality are reviewed and their impacts identified. Proposals which implement or help achieve the goals of the Basin Plan are supported; the Regional Board makes water quality control recommendations for other projects.

## II. LEGAL BASIS AND AUTHORITY

California's Porter-Cologne Water Quality Control Act (1969), which became

Division Seven ("Water Quality") of the State Water Code, establishes the responsibilities and authorities of the nine Regional Water Quality Control Boards (previously called Water Pollution Control Boards) and the State Water Resources Control Board (SWRCB). The Porter- Cologne Act names these Boards "... the principal State agencies with primary responsibility for the coordination and control of water quality" (Section 13001). Each Regional Board is directed to "...formulate and adopt water quality control plans for all areas within the region." A water quality control plan for the waters of an area is defined as having three components: beneficial uses which are to be protected, water quality objectives which protect those uses, and an implementation plan which accomplishes those objectives (Section 13050). Further, "such plans shall be periodically reviewed and may be revised" (13240). The federal Clean Water Act (Public Law 92-500, as amended) provides for the delegation of certain responsibilities in water quality control and water quality planning to the states. Where the Environmental Protection Agency (EPA) and the SWRCB have agreed to such delegation, the Regional Boards implement portions of the Clean Water Act, such as the NPDES program and toxic substance control programs.

The Porter-Cologne and Clean Water Acts also describe how enforcement of waste discharge regulations is to be carried out. Enforcement tools available to the Regional Board range from simple letters to the discharger, through formal Regional Board order, and direct penalty assessments, to judicial abatement for civil and/or criminal penalties. Legally noticed public hearings are required for most actions, but some enforcement actions (e.g., Cleanup or Abatement Orders) have been delegated to staff to allow for a quicker response than regularly scheduled Regional Board meetings can provide.

#### 4.2.3.1 Domestic Wastewater Treatment Systems

Specific WDRs that have been issued by the RWQCB in the Nacimiento Reservoir for domestic wastewater treatment systems are described in this report in section 3.2.1.1.a.

#### 4.2.3.2 Industrial Wastewater Treatment Systems

Specific WDRs that have been issued by the RWQCB in the Nacimiento Reservoir for industrial wastewater treatment systems are described in this report in section 1.1.1.1.a.

#### 4.2.3.3 Domestic Wastewater Collection Systems

Agencies which own or operate domestic wastewater collection systems greater than one mile in length must comply with State Water Resources Control Board Order No. 2006-0003-DWQ, Statewide General Waste Discharge Requirements for Sanitary Sewer

Systems. Under this order, regulated agencies must comply with several requirements, including:

- Take all feasible steps to eliminate sanitary sewer overflows
- In the event of a sanitary sewer overflow:
    - Take all feasible steps to prevent untreated or partially treated wastewater from discharging from storm drains into waters of the United States (essentially most surface waters)
    - Report certain information about the spill to
        - RWQCB
        - State Office of Emergency Services
        - County Health officials
- Develop and implement a written Sewer System Management Plan (SSMP). The SSMP must include the following elements:
    - Goal
    - Organization
    - Legal Authority
    - Operation and Maintenance Program for the system, including
        - Up-to-date maps of the sanitary sewer system
        - Description of routine preventive operation and maintenance activities that are performed
        - Rehabilitation and replacement plan to identify and prioritize system deficiencies and implement actions to address each deficiency.
        - Regular staff training in sanitary sewer system operations and maintenance
        - Equipment and replacement part inventories
    - Design and Performance Provisions for new sanitary sewer systems
    - Overflow Emergency Response Plan for the system
    - FOG (Fats, Oils, and Grease) Control Program, if applicable
    - System Evaluation and Capacity Assurance Plan - a capital improvement plan that will provide hydraulic capacity of key sanitary sewer system elements for dry weather peak flow conditions, as well as the appropriate design storm or wet weather event.
    - Monitoring, Measurement, and Program Modifications
    - SSMP Program Audits

### 4.2.3.4 Onsite Wastewater Treatment Systems

#### 4.2.3.4.a <u>County of San Luis Obispo Ordinances</u>

Onsite wastewater treatment systems (OWTS, often called septic systems) are regulated by the County of San Luis Obispo in its Building and Construction Code (Title 19), Chapter 7, Plumbing Code. This code includes the following items:

- Section 19.07.022 Private Sewage Disposal Systems
- Section 19.07.023 Alternative and Supplemental Treatment System
- Section 19.07.024 Community Sewage Disposal Systems

Section 19.07.022 Private Sewage Disposal Systems includes requirements for the following items:

- General requirements
    - Percolation tests
    - Minimum site area with well
    - Minimum site area in reservoir watershed
- Septic tank and leach area systems
    - Minimum site characteristics
        - Subsurface geology
        - Site flooding
        - Minimum percolation required
        - Site slope
        - Separation from impermeable strata
        - Groundwater separation
    - System location
    - Seepage pit standards
    - System design and sizing
    - Replacement of failed private sewage disposal systems
- Use of non-standard engineered systems
- Relief from standards

#### 4.2.3.4.b State Water Resources Control Board Policy

In June 2012 the California State Water Resources Control Board adopted a Water Quality Control Policy for Siting, Design, Operation, and Maintenance of Onsite Wastewater Treatment Systems (OWTS). The stated purpose and scope of this policy are as follows (California State Water Resources Control Board):

> The purpose of this Policy is to allow the continued use of OWTS, while protecting water quality and public health. This Policy recognizes that responsible local agencies can provide the most effective means to manage OWTS on a routine basis. Therefore as an important element, it is the intent of this policy to efficiently utilize and improve upon where necessary existing local programs through coordination between the State and local agencies. To accomplish this purpose, this Policy establishes a statewide, risk-based, tiered approach for the regulation and management of OWTS installations and replacements and sets the level of performance and protection expected from OWTS. In particular, the Policy requires actions for water bodies specifically identified as part this Policy where OWTS contribute to water quality degradation that adversely affect beneficial uses.

This Policy only authorizes subsurface disposal of domestic strength, and in limited instances high strength, wastewater and establishes minimum requirements for the permitting, monitoring, and operation of OWTS for protecting beneficial uses of waters of the State and preventing or correcting conditions of pollution and nuisance. And finally, this Policy also conditionally waives the requirement for owners of OWTS to apply for and receive Waste Discharge Requirements in order to operate their systems when they meet the conditions set forth in the Policy. Nothing in this Policy supersedes or requires modification of Total Maximum Daily Loads or Basin Plan prohibitions of discharges from OWTS.

This Policy also applies to OWTS on federal, state, and Tribal lands to the extent authorized by law or agreement.

### 4.2.3.5 Irrigated Agricultural Land

The following information about the RWQCB program to regulate discharges from irrigated agricultural land is excerpted verbatim from the program website (California Regional Water Quality Control Board, Central Coast Region):

The Central Coast Water Board regulates discharges from irrigated agricultural lands to protect surface water and groundwater, using a permit called a Conditional Waiver of Waste Discharge Requirements that applies to owners and operators of irrigated land used for commercial crop production. The Central Coast Water Board is focusing on priority water quality issues, such as pesticides and toxicity, nutrients, and sediments – especially nitrate impacts to drinking water sources. Staff is prioritizing efforts in the major agricultural areas of the region - the Salinas River, Santa Maria, and Pajaro River watersheds.

**2012 Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands**

On March 15, 2012, the Central Coast Water Board adopted an updated Conditional Waiver of Waste Discharge Requirements (Agricultural Order No. RB3-2012-0011). The updated Order and Monitoring and Reporting Program are available at the links below. The Order places farms in one of three tiers, based on risk to water quality. For many farms (Tier 1 and Tier 2), the new requirements are similar or less stringent than the previous Order. Farms in Tier 3 have more stringent requirements. Water Board staff will contact owners and operators to confirm the appropriate tier for their farm(s). Each grower enrolled in the Order will receive a packet of information (including a copy of the Order, a list of requirements for each tier, a 5-year compliance calendar, a list of Water Board contacts, and a list of resources and assistance available to growers). In addition, Water Board staff will also announce dates for upcoming workshops to inform growers of the new requirements. Growers can view which Tier their farm is in by accessing their eNOI in GeoTracker.

IN SUMMARY, GROWERS MUST DO THE FOLLOWING TO COMPLY WITH REQUIREMENTS:

1. Enroll in the Order by filing an electronic-Notice of Intent (eNOI)
2. Develop and Implement a Farm Plan
3. Implement management practices to protect water quality
4. Conduct Surface Water Receiving Monitoring and Reporting (Cooperatively or Individually)
5. Conduct Groundwater Monitoring and Reporting (Cooperatively or Individually)
6. Install Backflow Prevention devices
7. Submit Annual Compliance Form (Tier 2 and Tier 3 ONLY)
8. Conduct Individual Discharge Monitoring and Reporting (Tier 3 ONLY)
9. Develop and Implement Certified Irrigation and Nutrient Management Plan (Tier 3 ONLY)
10. Develop and Implement Water Quality Buffer Plan (Tier 3 ONLY)

## 4.2.4 Stormwater Regulations

As described above in section 4.2.3 the Federal Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. EPA's National Pollutant Discharge Elimination System (NPDES) permit program controls discharges. (USEPA)

In California, urban stormwater discharges are regulated by RWQCBs through NPDES permits. The RWQCBs implement Federal CWA provisions that govern urban runoff. California has established permit processes governing municipal stormwater discharges, discharge of stormwater from construction sites, and discharges of stormwater associated with industrial activity. With some exceptions, permits are not issued for individual sites. Rather, a statewide "General Permit" was adopted by the SWRCB, and compliance is achieved by filing a "Notice of Intent" to comply with the provisions in the statewide permit. (American Water Works Association)

The information presented in the remainder of this section is excerpted verbatim from the Central Coast RWQCB Stormwater Program website (California Regional Water Quality Control Board, Central Coast Region):

> The purpose of the Storm Water Program is to prevent stormwater runoff from acting as the vehicle for the discharge of pollutants to surface water bodies.
>
> The Storm Water Program is a National Pollutant Discharge Elimination System (NPDES) Program implemented in two phases. The November 16, 1990 Federal Register describes the requirements of the Phase I Regulations and the December 8, 1999 Federal Register describes the Phase II regulations. The State of California carries out the Storm Water Regulations according to the California Water Code.
>
> The Storm Water Program carries out its purpose by permitting three categories of potential pollution sources:
> - Construction Activities
> - Industrial Activities
> - Municipalities
>
> **Phase I (1990 - March 9, 2003)**
> For Region 3, Phase I includes three general permits and one individual permit. Construction Activities, Industrial activities and Caltrans activities are covered under separate general permits.
>
> **Phase II (began March 10, 2003)**
> The Phase II Final Rule was published in the Federal Register on December 8, 1999.

The SWRCB adopted general permits for Phase II Regulated Small MS4s[19] and Small Construction Activity. On March 10, 2003, Operators of Phase II Regulated Small MS4s and Small Construction Activity were required to obtain permit coverage.

### 4.2.4.1 Construction Activities

**General Permit**
The State Water Resources Control Board (SWRCB) adopted a statewide General Storm Water Permit for Construction Activities. The permit is reissued every 5 years. The last reissuance was in 1999 when the SWRCB adopted Order 99-08-DWQ. The permit requires all land disturbances of 1acre or more to implement Best Management Practices (BMPs) to prevent the discharge of sediment-laden water off site. The site specific plan to implement BMPs is called the Storm Water Pollution Prevention Plan (SWPPP). Annual reports are due to the SWRCB each September 1. These reports include information about the site topography and the BMPs that were used to prevent erosion during the rainy season.

**Modifications**
Following the reissuance of the Construction Permit, the SWRCB was sued by the San Francisco, Santa Monica, San Diego, and Orange Coast Bay Keepers. In September of 2000, the Superior Court ordered the SWRCB to modify the permit to require permittees to implement specific sampling and analytical procedures to determine whether BMPs implemented on a construction site are: (1) preventing further impairment of 303(d) listed water bodies for sediment or silt by storm water discharges, and (2) preventing pollutants, that are known or should be known by permittees to occur on construction sites and that are not visually detectable in storm water discharges, from causing or contributing to exceedances of water quality objectives.

The monitoring provisions in the permit were modified pursuant to the court order in April of 2001. The permit now also requires:

1. All permitted construction sites to sample for pollutants that can not be seen in the runoff if there is reason to believe those pollutants may be present in the runoff.
2. All permitted construction sites that discharge directly to 303(d) listed water bodies that are impaired by Sediment/Silt to sample the receiving water upstream and downstream every storm event (not to exceed 4 events/month).

### 4.2.4.2 Industrial Activities

The SWRCB adopted a statewide General Storm Water Permit for Industrial

19 MS4 = Municipal Separate Storm Sewer System.

Activities. The permit is reissued every 5 years. The last reissuance was in 1997 when the SWRCB adopted Order 97-03-DWQ. Ten categories of industrial activity are required to obtain permit coverage.

Industrial facilities obtain permit coverage based on whether or not their Standard Industrial Classification (SIC) code is included in those categories. A general description of the categories are:

1. Facilities subject to storm water effluent limitations guidelines, new source performance standards, or toxic pollutant effluent standards (40 CFR Subchapter N);
2. Manufacturing facilities;
3. Mining/oil and gas facilities;
4. Hazardous waste treatment, storage, or disposal facilities;
5. Landfills, land application sites, and open dumps that receive industrial waste;
6. Recycling facilities such as metal scrap yards, battery reclaimers, salvage yards, automobile yards;
7. Steam electric generating facilities;
8. Transportation facilities that conduct any type of vehicle maintenance such as fueling, cleaning, repairing, etc.;
9. Sewage treatment plants;
10. Certain facilities (often referred to as "light industry") where industrial materials, equipment, or activities are exposed to storm water.

All permit holders are required to implement BMPs to prevent the discharge of polluted storm water off site. The site specific plan to implement BMPs is called the SWPPP. Permit holders are required to sample their storm water runoff during a minimum of two storm events each rainy season. Samples are analyzed for pH, Total Suspended Solids, Specific Conductance, and Oil &Grease or Total Organic Compounds. Table D of the permit lists other parameters that must be tested for based on the SIC code of the facility. Visual Observations are required throughout the rainy season. The monitoring and sampling results are recorded on an annual report, which is submitted to the SWRCB on July 1 of each year.

#### 4.2.4.3 Municipalities

Phase II Regulations required automatically designated small MS4s to obtain coverage under a State Board issued general permit by March 10, 2003. An automatically designated small MS4 is any unpermitted Municipal Separate Storm Sewer System (MS4) located in an Urbanized Area (UA), as defined by the Bureau of the Census (an area of population of 50,000 and a population density of 1,000/square mile). These are listed in Attachment 1 of the permit.

A small MS4 could be designated to be covered by the Phase II permit if it is located in an Urban Cluster (UC), as defined by the Bureau of the Census, or meets one or more of the designation criteria listed in the permit itself. These are listed in Attachment 2 of the permit.

Federal and State facilities such as universities, military bases, hospitals, and school districts (also known as non-traditional MS4s) located within a designated MS4, or within a UA or a UC are also required to obtain permit coverage, either individually, or as a co-permittee with a/the contiguous municipality(s). These are listed in Attachment 3 of the permit.

## 4.2.5 Lease Agreements

### 4.2.5.1 MCWRA Grazing Leases

Monterey County Water Resources Agency leases four parcels of land in the Nacimiento Reservoir watershed, totaling 8,750 acres, for grazing (see section 3.2.6, above). All current leases are for the period of November 1, 2010 through October 31, 2017. Introductory information in the lease bid packets that were published in 2010 state that:

> The focus of the Agency's Grazing Lease Agreement is implementation of management methods that meet the Agency's conservation goals of protecting the water quality and quantity of both reservoirs[20]. (Monterey County Water Resources Agency)

The lease agreements contain the following provision which may harm water quality:

> 8. Pest control. Tenant will at the request of and no cost to Landlord and in conformity with all applicable governmental regulations, poison squirrel and/or noxious weeds, or take other appropriate steps to control the population of such pests.

The lease agreements contain the following provisions which may help protect water quality:

> 9. Fire precautions. At a minimum, tenant will at no cost to Landlord, take whatever fire prevention and control measures are required on the premises by duly constituted authorities.
>
> 10. Clearing land. Tenant shall not clear any portion of the land, and shall not cut any trees on the land, without first obtaining the written consent of Landlord's General Manager.
>
> 14. Credit for improvements.
> (b) Fencing which works toward the Landlord's goal of eliminating stock contact with reservoir waters will be eligible for a rent credit of up to an additional 30% credit over the 20% allowed in Section 14A if approved by the Monterey County Water Resources Agency Board of Directors Personnel and Administration Committee.

Additionally, the lease agreements contain provisions that prohibit overgrazing, provide remedies if overgrazing does occur, and requires that a Ranch Plan be written and implemented. The Ranch Plan is to include Best Management Practices which meet the

20 MCWRA also leases parcels for grazing at San Antonio Reservoir; the lease bid packets apply to all parcels at both reservoirs.

following stated conservation goals and objectives:

1. Protect the Water Quality and Quantity of Reservoirs. A goal of the Agency is to eliminate access by cattle to reservoir waters as soon as practicable.

2. Minimization of fire hazards through vegetative fuel management and responsible livestock management.

3. Preservation of open space for recreation, scenic beauty and education, and preservation of native plants and animals, and biotic communities; all or portions of the Agency Land, including the Premises, may be made open to the public subject to reasonable restrictions determined by Landlord.

4. Maintenance of rich and productive grassland and oak woodland communities with healthy populations of rare, threatened or endangered vertebrates, significant native grasses, and for components and minimal exotic pest plants.

5. Restoration of degraded vegetation and wildlife habitat.

6. Maintenance of livestock distribution over the Premises, to achieve uniform range utilization, reduce overall fire hazard, minimize sacrifice forage areas and meet conservation objectives.

7. A key requirement for any lease will be the completion of a ranch plan within one year of execution of a contract which will lay out specific measures that will be used on each lease to protect the water quality and quantity of the reservoirs.

MCWRA employs a rangeland management contractor to oversee and aid in implementation of the ranch plans.

### 4.2.6 Mines/Mining Reclamation

Mining activity is regulated by both state law and county ordinances. The following information is excerpted from the California Department of Conservation Mine Reclamation website (California Department of Conservation):

> The Surface Mining and Reclamation Act of 1975 (SMARA, Public Resources Code, Sections 2710-2796) provides a comprehensive surface mining and reclamation policy with the regulation of surface mining operations to assure that adverse environmental impacts are minimized and mined lands are reclaimed to a usable condition. SMARA also encourages the production, conservation, and protection of the state's mineral resources. Public Resources Code Section 2207 provides annual reporting requirements for all mines in the state, under which the State Mining and Geology Board is also granted authority and obligations.
>
> The Surface Mining and Reclamation Act (SMARA), Chapter 9, Division 2 of the Public Resources Code, requires the State Mining and Geology Board to adopt State policy for the reclamation of mined lands and the conservation of mineral resources. These policies are prepared in accordance with the Administrative Procedures Act, (Government Code) and are found in California Code of Regulations, Title 14, Division 2, Chapter 8, Subchapter 1.

San Luis Obispo County Code Title 22 Chapter 22.36 regulates surface mining in San Luis Obispo County in the inland areas, including the Nacimiento Reservoir watershed, and includes the following sections:

22.36.010 - Purpose
22.36.020 - Applicability
22.36.030 - Surface Mining Practices
22.36.040 - Permit Requirements for Surface Mining
22.36.050 - Reclamation Plan
22.36.060 - Financial Assurances for Guarantee of Reclamation
22.36.070 - Public Records
22.36.080 - Annual Review
22.36.090 - Nuisance Abatement
22.36.100 - Underground Mining
22.36.110 - Use of County Roads by Extraction Operations

## 4.2.7 Recreational Activities and Policies

### 4.2.7.1 California Assembly Bill 1460

For many years, water-based recreational activities have taken place on Nacimiento Reservoir, including fishing, water skiing, wakeboarding, swimming, and wading. Body contact recreation is normally prohibited in drinking water reservoirs in California to protect the drinking water supply from pathogen contamination. In the 1990's, as development of the Nacimiento Water Project appeared to be looming on the horizon, recreational users of Nacimiento Reservoir sought to protect those uses, including body contact activities. In 1997 a local assemblyman sponsored legislation that was passed by the California legislature that specifically allowed body contact recreation in the reservoir, thereby circumventing that important water quality protection measure. The text of the bill follows.

BILL NUMBER: AB 1460 CHAPTERED
BILL TEXT
CHAPTER 524
FILED WITH SECRETARY OF STATE SEPTEMBER 29, 1997
APPROVED BY GOVERNOR SEPTEMBER 28, 1997
PASSED THE ASSEMBLY SEPTEMBER 10, 1997
PASSED THE SENATE SEPTEMBER 4, 1997
AMENDED IN SENATE JULY 18, 1997
AMENDED IN ASSEMBLY MAY 8, 1997
AMENDED IN ASSEMBLY APRIL 17, 1997
INTRODUCED BY Assembly Member Bordonaro
FEBRUARY 28, 1997

An act to amend Section 115825 of, and to add Section 115841 to, the Health and Safety Code, relating to water.

LEGISLATIVE COUNSEL'S DIGEST
AB 1460, Bordonaro. Nacimiento Reservoir.
Under existing law, the Monterey County Water Resources Agency operates the Nacimiento Reservoir. Under existing law, bodily contact with water is generally prohibited in a reservoir in which water is stored for domestic use.
This bill would authorize recreational activity in which there is bodily contact with the water by any participant, in the Nacimiento Reservoir, in accordance with certain requirements.

THE PEOPLE OF THE STATE OF CALIFORNIA DO ENACT AS FOLLOWS:
SECTION 1. Section 115825 of the Health and Safety Code is amended

to read:
115825. (a) It is hereby declared to be the policy of this state that multiple use should be made of all public water within the state, to the extent that multiple use is consistent with public health and public safety.
(b) Except as provided in Sections 115840 and 115841, recreational uses shall not, with respect to a reservoir in which water is stored for domestic use, include recreation in which there is bodily contact with the water by any participant.
SEC. 2. Section 115841 is added to the Health and Safety Code, to read:
115841. Recreational activity in which there is bodily contact with the water by any participant shall continue to be allowed in Nacimiento Reservoir in accordance with all of the following requirements :
(a) Any agency that removes water from the reservoir for domestic use shall comply with any, or at a minimum, one of the following with regard to the water removed:
(1) The water subsequently receives complete water treatment in compliance with all applicable department regulations, including coagulation, flocculation, sedimentation, filtration, and disinfection, before being used for domestic purposes.
(2) The water is discharged in a manner that allows percolation into a subsurface groundwater basin for subsequent extraction from only those groundwater wells that have been determined by the department not to be under the influence of surface water pursuant to Chapter 17 (commencing with Section 64650) of Division 4 of Title 22 of the California Code of Regulations and subsequently receives disinfection and complies with all applicable department regulations before being used for domestic purposes.
(3) The water is discharged in a manner that allows percolation into a subsurface groundwater basin for subsequent extraction from groundwater wells under the influence of surface water that receives treatment pursuant to Chapter 17 (commencing with Section 64650) of Division 4 of Title 22 of the California Code of Regulations and complies with all applicable department regulations.
(b) The reservoir is operated in compliance with regulations of the department.
(c) The water stored for domestic purposes that may be excepted from the requirements of subdivision (b) of Section 115825 is removed from the reservoir by an agency for domestic purposes only in San Luis Obispo County and only in an amount for which that agency has a contractual right.
SEC. 3. The Legislature finds and declares that Section 2, which

is applicable only to the Nacimiento Reservoir, is necessary because of the unique recreational needs in the County of San Luis Obispo. It is therefore, declared that a general law within the meaning of Section 16 of Article IV of the California Constitution cannot be made applicable, and that the enactment of this special law is necessary for the use of water for the public good.

#### 4.2.7.2 San Luis Obispo County Code – Parks and Recreation – Nacimiento Lake

Recreational activities at Nacimiento Reservoir are primarily regulated by San Luis Obispo County Code, Chapter 11.20. This section of code is specific to Nacimiento Reservoir, and contains the following sections:

11.20.005 - Preamble and purposes.
11.20.010 - Definitions.
11.20.020 - Penalty for violation.
11.20.030 - Permit and fee schedules.
11.20.040 - Permit and fee required—Refund.
11.20.050 - Permit and fee—Exemptions.
11.20.060 - Annual vehicle and vessel permits.
11.20.070 - Permit revocation.
11.20.080 - Shoreline camping and day use limitations.
11.20.090 - Camping and day use regulations.
11.20.100 - Camping prohibited on public property.
11.20.110 - Vessel operation in prohibited areas.
11.20.120 - Vessel regulations.
11.20.130 - Vessel speed limits—Posted zones.
11.20.140 - Motor vehicle operation regulations.
11.20.150 - Motor vehicle parking regulations.
11.20.160 - Bicycle regulations.
11.20.170 - Pets.
11.20.180 - Firearms and other weapons.
11.20.190 - Sign posting—Structure and buoy construction.
11.20.200 - Urinate or defecate in public.
11.20.210 - Miscellaneous prohibited acts.
11.20.220 - Fireworks prohibited.
11.20.230 - Swimming regulations.
11.20.240 - Aerial activities.
11.20.250 - Enforcement—Power to direct public.
11.20.260 - Enforcement—Park closure.
11.20.270 - Enforcement—Arrest and citation authority.
11.20.280 - Delegation of powers by San Luis Obispo County board of

supervisors.
11.20.290 - Fees.

This entire section of code can be found in Appendix 9.8.

### 4.2.8 Open Space Policies

Open space policies are addressed in San Luis Obispo County and Monterey County General Plans, as noted above in section 4.2.1. The Nacimiento Area Plan section of the San Luis Obispo County General Plan includes the following provisions related to open space:

**NACIMIENTO AREA PLAN**
ADOPTED BY
THE SAN LUIS OBISPO COUNTY BOARD OF SUPERVISORS
SEPTEMBER 22, 1980 - RESOLUTION 80-350
Revised January 1, 2003

**Chapter 6, Section A, Page 6-3 – Rural Land Use**

**Open Space**
The Open Space category has been applied to much of the land owned by Monterey County Flood Control and Water Conservation District, as well as to areas previously designated as open space in the Oak Shores, Heritage Ranch and Lake Nacimiento Resort specific plans. Some of these lands are now located outside the village reserve lines. The intent of retaining these areas in Open Space is not only to preserve portions of the watershed, but to provide areas for passive recreational uses such as primitive campgrounds, riding and hiking areas and picnic areas.

The north shore portion of the Lake Nacimiento Resort development is included within the Open Space category.
Retaining these various areas in open space will maintain the rural and scenic qualities which make the lake such a desirable recreational facility. The location of facilities to be provided in these areas are indicated on Figure 1 and the intensity of development is discussed under "Recreational Services" in Chapter 3.

In addition to the above areas, several Bureau of Land Management parcels have been included in the Open Space category. These properties should remain under the ownership and administration of the BLM.

The portion of the Janeway property owned by Monterey County and lying south and west of the South Shore area is to be retained in public ownership. This parcel is a valuable undeveloped area proposed as a wilderness park.

**Chapter 6, Section B, Page 6-5 – Heritage Ranch**
Heritage Ranch developers have previously agreed with the county to retain approximately 5,100 acres in permanent open space. Recorded easements limit

use of open space lands to grazing, agriculture, and passive recreation. The area within the village reserve line under the Open Space land use category is considerably less than the 5,100 acre total. The Open Space category is applied within the VRL to areas shown in the previous Heritage Ranch Specific Plan as open space or rangeland, as well as commonly-held lots in existing and planned subdivisions.

**Chapter 6, Section C, Page 6-7 – Oak Shores**

Open space lots within the existing tracts (Tracts 378 thru 381) were created to help preserve the rural character of the area and to provide natural areas accessible from most of the lots. The open space lots are primarily in natural drainage channels and are required to remain in open space as a condition of the subdivision approvals. Areas within the village boundary designated in the Open Space land use category are lands proposed for permanent open space. The development potential of these lands has been transferred into the designated development clusters. The only developments allowable in this land use category are hiking and riding trails, and a sewage effluent spray irrigation disposal area in the northern portion of the village. A portion of the originally planned spray irrigation site was authorized for use as a temporary office facility, to be removed when the property owner proposed residential development on other portions of the ownership, when the Oak Shores Community Association constructs any additional structures, or when the commercial center begins development.

**Chapter 6, Section D, Page 6-9 – South Shore**

The Open Space category is applied to land owned by Monterey County Flood Control and Water Conservation District along the southwesterly edge of South Shore, west of Running Deer Ranch (generally referred to as the Janeway property). This area should be retained in public ownership as part of a wilderness park.

**Chapter 6, Section E, Page 6-13 – Planning Area Land Use Programs**

**Wilderness Park**. The county should work with Monterey County Flood Control and Water Conservation District to develop plans for a wilderness park with appropriate passive recreational uses.

### 4.2.9 Erosion Control/Soil Management Policies

Erosion control and soil management policies are addressed in San Luis Obispo County and Monterey County General Plans, as noted above in section 4.2.1, and in the Fort Hunter Liggett Integrated Natural Resources Management Plan (US Army Reserve Training Center, Fort Hunter Liggett, CA).

## 4.2.10 Fire Management

Fire management policies in the Nacimiento Reservoir watershed are primarily under the purview of The United States Forest Service, the California Department of Forestry and Fire (Cal Fire), and the United States Army Garrison at Fort Hunter Liggett (FHL). Fire management is also briefly discussed in the Nacimiento Area Plan section of San Luis Obispo County Code.

### 4.2.10.1 US Forest Service – Los Padres National Forest

The US Forest Service Land Management Plan for Los Padres National Forest includes the following information on fire management practices (USDA Forest Service):

> The national forest's Fire Program is guided by the Fire Management Plan, which is updated annually. The Fire Program on the Los Padres National Forest is supported by approximately 350 permanent and temporary personnel and is comprised of four main functions:
>
> - Management and administration
> - Fire prevention
> - Wildland fire suppression and preparedness
> - Hazardous fuels program
>
> Management and administration provides for direction and oversight of all fire management activities including fighting forest fires, adhering to approved employee safety practices, community protection and forest health projects, educating the public and responding to inquiries. An Emergency Command Center coordinates fire activities throughout the year.
>
> Primary pre-suppression activities include fire prevention, maintaining fire suppression equipment, fire suppression training and first aid training. Fire prevention activities focus on four primary areas: fire prevention engineering, education, community preparedness, and enforcement. Education includes Smokey Bear programs to instill a fire prevention ethic in school children and Firewise community programs that target civic and homeowner groups. Engineering includes abatement of fire hazard along roadways and in high-use areas. Enforcement includes execution of county, state, and federal fire laws regarding fire related violations and hazard abatement around structures on both public and private lands in the national forest.
>
> Wildland fire suppression and preparedness encompass all firefighting activities included in containing and mitigating the damages of wildland fires, caused by either natural or human means. Fire crews and disaster teams supported by this program

also respond to other areas of the country to help with wildland fires and disasters. Fire suppression resources on the Los Padres National Forest include fire engine modules, 20-person hand crews, helicopters, fixed wing aircraft, fire prevention personnel, bulldozers, and water tenders.

Frequently, Los Padres National Forest fire personnel are called to fight fires on other national forests and assist in mitigating the effects from other disasters, such as earthquakes or terrorist activity. However, most of these assignments relate to fighting large forest fires in the United States. In addition to supporting large suppression operations nationally, other types of assignments come via the Federal Emergency Management Agency (FEMA). Past assignments have included earthquakes, floods, hurricanes, 9/11 disaster support, wildland fires in Australia, and supervision of the Columbia Space Shuttle debris recovery.

The fourth element of the Fire Program is hazardous fuels. Hazardous fuels include chaparral and all other vegetation types that are susceptible to carrying a fire. The Fuels Program is accomplished through vegetation treatments to restore the plant community to the desired fire regime while protecting urban communities and resource values. Fuels management consists of planning and evaluating national forest conditions, prescribed burns, and the mechanical removal of hazardous material in high-risk areas.

To safely reintroduce fire into the ecosystem, land managers conduct prescribed burns that are intentionally ignited by experts under carefully monitored weather and fuel conditions. Prescribed fires clear dead, dry plant and chaparral material; improve conditions for wildlife; and protect water sources from erosion caused by wildland fire.

All wildland fires burning on southern California National Forest System land are considered a threat to communities. Under severe burning conditions, a wildland fire burning in the back country or wilderness can be a threat to one of the many at-risk mountain or foothill communities within one burn period. Aggressive fire suppression and prevention strategies are implemented throughout the national forest to achieve the objectives of protecting life, property and natural resources. Maintain cooperative relationships vital to fire and fuels management effectiveness. Maintain the suppression organization at 95 percent of the most efficient level or higher, subject to annual funding (see also: Fire 1 - Fire Prevention; Fire 3 - Fire Suppression Emphasis; and Fire 4 - Firefighter and Public Safety).

Vegetative treatments will be strategically integrated to maximize community protection efforts and minimize wildland fire size, while considering habitat needs. Annually review and implement the national forest's five-year fuels strategy (see also: Fire 2 - Direct Community Protection; Fire 5 - Fuelbreaks and Indirect Community Protection; and FH 3 - Restoration of Forest Health).

### 4.2.10.2 California Department of Forestry and Fire

Information on Cal Fire fire management policies and practices from its website is excerpted here (California Department of Forestry and Fire):

**2010 Fire Plan**

In 2010 the Board of Forestry and Fire Protection adopted the Strategic Fire Plan for California.

**What is the 2010 Strategic Fire Plan?**
The California Strategic Fire Plan is the basis for assessing California's complex and dynamic natural and man-made environment, and identifying a variety of actions to minimize the negative effects of wildland fire.

**Vision**
A natural environment that is more resilient and man-made assets which are more resistant to the occurrence and effects of wildland fire through local, state, federal and private partnerships.

The California Fire Plan is the state's road map for reducing the risk of wildfire. The Fire Plan is a cooperative effort between the State Board of Forestry and Fire Protection and the California Department of Forestry and Fire Protection. By placing the emphasis on what needs to be done long before a fire starts, the Fire Plan looks to reduce firefighting costs and property losses, increase firefighter safety, and to contribute to ecosystem health.

The foundation of the 2010 Strategic Fire Plan is built upon seven goals and their associated objectives. Collectively, these goals and objectives provide a framework to address the protection of lives, property and natural resources from wildland fire and improve environmental resilience to wildland fire.

**Goals as Summarized**
The central goals that are critical to reducing and preventing the impacts of fire revolve around both suppression efforts and fire prevention efforts. Major components are:

- Improved availability and use of information on hazard and risk assessment
- Land use planning: including general plans, new development, and existing developments
- Shared vision among communities and the multiple fire protection jurisdictions, including county-based plans and community-based plans such as Community Wildfire Protection Plans (CWPP)

- Establishing fire resistance in assets at risk, such as homes and neighborhoods
- Shared vision among multiple fire protection jurisdictions and agencies
- Levels of fire suppression and related services
- Post fire recovery

**What is a Unit Strategic Fire Plan?**

The largest and most visible part of CALFIRE operations is fire suppression. Operational Units are organized to address fire suppression over a geographic area, and divided by region (North or South). California has 21 Operational Units, which geographically follow county lines. Each unit consists of one to three counties.

Each Operational Unit varies greatly in size, terrain, and fire suppression strategies. For this reason, individual Unit Strategic Fire Plans are completed annually to address how each Unit is achieving the goals and objectives of the Strategic Fire Plan. Annual updates to the Unit Fire Plans will be due June 1 of each year. To simplify the process for annual updates, a Unit Fire Plan Template has been created. This template will allow for the inclusion of minor updates in addendums to the existing plan. Major changes in Unit priorities, partnerships, projects, or plan components may require a new Unit Fire Plan to be submitted.

The Nacimiento Reservoir watershed lies in the San Benito-Monterey and the San Luis Obispo Operational Units.

The Executive Summary for the San Benito-Monterey Unit Fire Plan states:

California's Strategic Fire Plan is the state's road map for reducing the risk of wildfire. By placing the emphasis on what needs to be done long before a fire starts, the Strategic Fire Plan seeks to reduce firefighting costs and property losses, increase firefighter safety, and to contribute to ecosystem health. The San Benito – Monterey Unit, with the cooperation of key stakeholders, has designed a plan with the intention of meeting the goals set by both the stakeholders and the California Strategic Fire Plan. Pre-fire management projects are designed to reduce costs and losses, especially during periods of severe fire weather. With the use of fire resistant landscaping, mechanical fuels treatment, prescribed burns, building construction standards, infrastructure, land use planning and pre-fire safety zones and escape plans, the Unit strives to keep what would otherwise be a large, catastrophic fire, to smaller fire with less intensity, reducing suppression costs and property loss.

The San Benito-Monterey Unit management intends to support the Fire Plan and make it successful by meeting the following objectives:

- Collect, analyze and prepare data to assess communities at risk and in need

> of fuel reduction or other projects
>
> ➢ Work with grant writers and stakeholders to secure funds to implement projects.
>
> ➢ Utilize CAL FIRE personnel and resources in conjunction with other public and private efforts to assist with the project work on the ground.
>
> ➢ Educate the public on fire prevention and incorporating fire resistant landscaping and construction to their property, as well as hazardous fuel reduction to keep their lives, homes, property and natural resources safe from catastrophic wildfires.
>
> With these goals in mind, the Unit strives to reduce fire suppression costs, property loss and damage to our environment and local ecosystems in the San Benito-Monterey Unit through our pre-fire work and by protecting life, property and the environment from destructive wildfires.

The Executive Summary for the San Luis Obispo Unit Fire Plan states:

> This Unit Strategic Fire Plan and Community Wildfire Protection Plan (Plan) covers San Luis Obispo County, California. This Plan serves as both the CAL FIRE Unit Strategic Fire Plan for the San Luis Obispo Unit and the Community Wildfire Protection Plan for San Luis Obispo County and was developed to collaboratively address fire protection planning efforts occurring in the County to minimize wildfire risk to communities, assets, firefighters, and the public. This Plan presents the County's physical and social characteristics, identifies and evaluates landscape-scale fire hazard variables, utilizes Priority Landscape data sets for evaluating wildfire risk, identifies measures for reducing structural ignitability, and identifies potential fuel reduction projects and techniques for minimizing wildfire risk. The goal of this Plan is to provide a planning-level framework for hazardous fuel assessment and reduction within San Luis Obispo County so that structures and assets are provided additional protection, reducing the potential for wildfire-originated ignitions. This Plan is intended to be a living document managed and updated routinely by CAL FIRE/SLO with community and stakeholder input and involvement.
>
> As a key component of the Healthy Forest Restoration Act (HFRA) of 2003, a Community Wildfire Protection Plan (CWPP) serves as a mechanism for community input and identification of areas presenting high fire hazard risk as well as identification of potential projects intended to mitigate such risk. Further, the CWPP process is intended to provide the community a forum for identifying values at risk from wildfire, which may include people, property, natural resources, cultural values, economic interests, and infrastructure. A CWPP must be collaboratively developed with input from interested parties, local, state, and federal agencies managing land within the County, and local government representatives. It must also identify and prioritize areas for hazardous fuel reduction treatments and recommend measures to reduce the

ignitability of structures within wildland urban interface areas. CWPPs are intended to better protect communities from the threat of wildfires by promoting community-level fuel reduction projects.

The CAL FIRE Unit Strategic Fire Plan is intended to support the vision, goals, and objectives of the California Fire Plan which will create a state that is more resistant and resilient to the damaging effects of catastrophic wildfire while recognizing fire's beneficial aspects. Similar to the goals of the CWPP, the Unit Strategic Fire Plan is intended to improve fire prevention and suppression efforts, reduce hazardous fuels, restore fire-adapted ecosystems, and promote community assistance. The goals of the Unit Strategic Fire Plan include: improving the availability and use of information regarding hazard and risk assessment; providing guidance for land use planning efforts; promoting a shared vision among communities and multiple fire jurisdictions; establishing fire resistance in communities; prioritizing protection of communities and other high-priority watersheds; collaborating with government agencies and a broad representation of stakeholders; improving fire suppression and prevention capabilities; promoting post-fire recovery efforts; and maintaining accountability through monitoring based on performance standards. The Unit Strategic Fire Plan utilizes the following strategies to accomplish its goals:

- Collaborate with stakeholders and multiple fire jurisdictions
- Conduct and refine risk assessments for wildland urban interface (WUI) areas
- Develop high-hazard wildfire community pre-attack plans
- Foster community involvement in pre-fire planning efforts
- Monitor the effectiveness of programs, projects and initial attack success.

This Plan, with the cooperation of key stakeholders, has been developed with the intention of meeting the goals set by community stakeholders and the California Fire Plan while integrating a community input-focused approach consistent with CWPP requirements. As a combined document, this Plan prioritizes protection of communities, natural resources, and the lives of the public and firefighters. This priority is shared among federal agencies, state and local governments, and other community stakeholders. Collaboration, priority setting, and accountability provide the framework for the guiding tactical principles of this Plan, which include:

- Increase the safety to residents and firefighters during wildland fires
- Reduce the costs and losses associated with wildland fires
- Support implementation of WUI building standards through coordination and cooperation with local government planning departments
- Support the implementation and maintenance of defensible space around structures
- Support project work and planning efforts that encourage the development and/or maintenance of safe ingress and egress routes for emergency incidents

- Promote cooperation between fire agencies in the County to minimize wildland fire damage through strategic fuel treatment projects
- Utilize fire prevention efforts to reduce ignitions within the County
- Conduct post-incident analysis to evaluate success in achieving the 95% threshold of keeping fires less than 10 acres in size
- Promote public education efforts about wildland fire through the support of the San Luis Obispo County Community FireSafe Council (SLOFSC) and Firewise community activities.

### 4.2.10.3 US Army – Fort Hunter Liggett

The Integrated Natural Resources Management Plan for Fort Hunter Liggett contains the following information on fire management policies and practices (US Army Reserve Training Center, Fort Hunter Liggett, CA):

> Fire is an integral part of the local ecosystem. Most plant communities at FHL are fire dependent, such as chaparral, or are fire adapted, such as oaks and grasslands. To maintain and enhance the plant communities, some level of fire disturbance must occur. The question managers must answer is, what level will balance ecosystem needs with training and safety needs?
>
> **8.8.1 Wildfire Prevention and Suppression**
> **Background**
> The nature of the military mission is such that complete prevention of wildfires is impossible without virtual mission shutdown during the fire season. However, it is possible to concentrate military missions that are most likely to start fires to certain areas of the installation and to use prescribed burns and firebreaks to limit the extent of wildfires.
>
> FHL has mutual aid agreements with the U.S. Forest Service, Monterey County, and the California Department of Forestry. FHL has contracted to develop a Fire Management Plan.
>
> FHL has a small firefighting staff to respond to wildfires. Backburning is the primary technique used to contain wildfires.
>
> Most wildfires are caused by pyrotechnic devices and tracer ammunition used during training exercises. Wildfires can occur throughout the year, but the primary fire season is after winter-spring rains (typically May) until fall rains occur (typically October-November). Weather is monitored by DFS. If fire danger is high, Range Control is notified to disseminate this information to military units in the field and, if needed, to restrict certain types of military training

Provisions to prevent wildfires while training on the installation are included in Chapter 14, *Range Fire Prevention and Fire Fighting*, from FHL Training Regulation 350-2. The regulation includes the following provisions for range fire prevention:

- No restrictions on pyrotechnics in training areas 12, 15, 20, 21, 22, and 24; significant restrictions in other areas;
- Immediate actions to suppress fires by the units which started them;
- Immediate reporting of fires;
- Provisions for the DFS to advise Range Control when to restrict the use of ammunition that may start fires;
- Prohibition of open fires; and
- Requirements for clearing areas prior to the use of pyrotechnics.

DSS (Roads and Grounds Section) is responsible for firebreak maintenance. There are about 1127 km (≈ 700 mi) of roads and boundary/interior firebreaks are on the installation. Most roads serve as firebreaks and vice-versa. Terrain and other factors determine the widths of the firebreaks, but they are generally about 14-35 ft (≈ 4.3 – 10.7 m) wide.

Firebreaks are generally maintained during April and May, near the end of the normal growing season. Firebreaks are cut to bare ground using graders or bulldozers. In many areas, firebreak maintenance can be a serious erosion problem due to steep slopes and unstable soils. The LRAM program (Section 4.6.2) is used to address these erosion problems.

The firebreak and road system is being evaluated for duplicity and environmental sensitivity. The goal is to remove unnecessary or environmentally damaging roads and firebreaks. New roads and firebreaks will be established in the most efficient locations with regard to fire suppression, maintenance, access, and environmental considerations. This effort should improve access, improve or maintain wildfire control capabilities, and reduce erosion and damage to sensitive areas.

### 8.8.2 Prescribed Burning

Prescribed burning is a management tool used to reduce the number and severity of wildfires. Prescribed burning can also maintain or enhance certain plant and wildlife habitats. Knowing that certain military activities will start fires during the dry season, prescribed burning is used to reduce the fuel loads to a minimal level. Thus, if a wildfire does occur in the dry season, its intensity will be less severe as will the wildfire's effects on plant and animal habitats.

Prescribed burning is performed by the DFS each year. Areas burned include strips along the perimeter of the installation, areas likely to be burned by military activities (especially impact areas), and chaparral covered mountains. These latter areas are burned using a contract helitorch. FHL began using a helitorch for prescribed burning in 1980.

Prescribed burning for habitat enhancement is not conducted on a strict cycle. Such factors as patchiness of previous burns, species composition, stand age and condition, and fuel loads affect prescribed fire decisions. Areas to be burned annually is a decision of the DFS Fire Chief. These decisions are coordinated with the DFS and Range Control, and they are included in the installation's annual control burn plan prepared by the Directorate of Fire Services and subject to Environmental Review (Section 8.6).

If burns are timed during seasons of proper fuel moisture, a 1200 ha (≈ 3000 acre), for example, will often only have 400 ha (≈ 1000 acres) burned in various-sized patches throughout the total block. This creates an ideal situation for many species of wildlife due to the edge that is created when one habitat or vegetation type ends and another begins.

The FHL DFS plans annual prescribed burns by analyzing the number of troops projected and the types of training to be conducted. The Fire Chief submits an annual burn plan each spring to each Directorate, including the ENV, for comments and approval. Typically, portions of training areas 9, 20, 21, and 24 and all of training areas 12, 15, and 22 are included in this burn plan since these areas are most susceptible to military mission-related fires. Strip burns are used along the boundary in training areas 2, 3, 7, 10, 13, and 27 to keep wildfires from leaving the installation, and burns are often used in training areas 5, 8, 17, 18, 19, and 23 to control chaparral growth and improve deer habitat. Prescribed fire may be conducted in other areas as needed.

Prescribed burns are an integral part of weed management on FHL, especially control of yellow starthistle in conjunction with use of pre-emergent herbicides. Cattails are also occasionally burned for local, seasonal control.

FHL supports wildland firefighting schools, typically in TA 2. Wildland firefighting schools conducted at FHL are an extremely valuable source of training for DFS and other agencies. FHL is unique in that it can support such training year after year without adverse effects to the land. Although most who attend are from local county Directorate of Fire Services in California, FHL wildfire schools have gotten trainees from as far as New Mexico. Trainees are put through various wildfire scenarios and learn techniques for protecting structures and wildlands. Trainees also learn how to integrate departments and to work as a single team. The schools are typically held during early June.

Prescribed burning requires coordination with other fire agencies, as well as obtaining Monterey Bay Unified Air Pollution Control District permission to burn due to air quality requirements. FHL prescribed fire use is subject to regulation by Section 176(c)(1) of the Clean Air Act (CAA) that contains the legislation mandating the general conformity rule. This legislation prohibits the Federal Government from conducting, supporting or approving any actions that do not conform to an U.S. Environmental Protection Agency (EPA)-approved State Implementation Plan (SIP). A SIP is a State's self-authored blueprint for achieving and maintaining compliance with the goals of the CAA.

#### 4.2.10.4 SLO County Code – Nacimiento Area Plan

The Nacimiento Area Plan section of San Luis Obispo County Code contains the following information on fire management (County of San Luis Obispo):

Chapter 3, Section C, page 3-4

**Fire Protection**
*Because of the dry summer climate, highly flammable vegetation and rugged terrain, fire hazard in the lake area is high and fire control is difficult. Increasing recreation users will intensify that hazard in developed areas, as well as along the miles of shoreline accessible by boat.*
*Fire protection for the Nacimiento planning area is provided by the California Department of Forestry. The CDF serves primarily from the station south of Paso Robles, from the Las Tablas station during the summer, from Lockwood (in Monterey County), and from Cambria in the western edge of the planning area. Though the primary responsibility of the CDF in the Nacimiento area is the control of brush and forest fires, they are under contract with the county to also combat structural fires. The CDF air tanker squadron based at the Paso Robles airport responds to forest and brush fires in remote areas.*
*In addition to fire protection provided by the state and county, separate volunteer fire companies serve Heritage Ranch and Oak Shores. Approximately 15 state-trained volunteers and two operating fire trucks based at each station. Area fire protection would be more efficient and responsive if the volunteer companies were organized into a unified area system administered by a county service area. A future fire station site has been reserved within the Oak Shores village reserve line (shown on the combining designations map in Chapter 7). Similarly, fire services would be included at the government and emergency services center proposed to be located near the intersection of Lake Nacimiento Drive and Heritage Road extension in Heritage Ranch.*

## 4.2.11 Other Ordinances, Policies, or Regulations

### 4.2.11.1 Hazardous Materials

Hazardous materials storage and disposal is regulated by the California Department of Toxic Substances Control (DTSC). The following information is excerpted from the DTSC website (California Department of Toxic Substances Control)

> Enforcement and Emergency Response are core programs of DTSC's mission to protect public health and the environment. Inspection, monitoring, training, and investigative activities secure effective, measurable levels of compliance with state and federal hazardous waste laws and regulations. The department's enforcement program provides a credible deterrent to polluters and incentives to achieve a greater level of compliance with hazardous waste laws and regulations.
>
> The Enforcement and Emergency Response Program (EERP) administers the technical implementation of the state's Unified Program - a consolidation of six environmental programs at the local level. EERP conducts triennial reviews of Unified Program agencies to ensure their programs are consistent statewide, conform to standards, and deliver quality environmental protection at the local level. EERP oversees the hazardous waste generator and onsite waste treatment surveillance and enforcement program carried out by local Unified Programs.

The San Luis Obispo County Public Health Department, Environmental Health Division is the local authority for implementing the state’s Unified Program. The following information is excerpted from the Environmental Health Division website (San Luis Obispo County Public Health Department):

> Aboveground Storage Tanks (AGT): The purpose of this program is to protect public health and the environment from a potential source of surface and groundwater contamination by regulating aboveground storage tanks containing hazardous materials. Program objectives are accomplished through inspection, plan check, incident investigation, enforcement, public education, and assistance to industry.
>
> Business Plans: The purpose of this program is to protect the public health and the environment from the release of hazardous materials by establishing minimum statewide standards on the location, type and quantity of hazardous materials handled and stored, and provide timely and adequate information to emergency response personnel and to the public.
>
> California Accidental Release Prevention (Cal-ARP) Program: The purpose of this

program is to protect the public health and the environment from the uncontrolled release of extremely hazardous substances (EHS) by requiring businesses to establish programs to reduce the risk of an accidental EHS release and manage emergency operations in the event of a release.

Emergency Response: The purpose of this program is to respond to toxic substance spills such as those indicated above, help properly identify the spilled material, oversee safety issues at the site, recommend clean-up procedures, and oversee clean-up operations. In addition, this program responds to other emergency environmental health situations such as sewage spills and food facility fires

Hazardous Waste Generator: The purpose of this program is to protect the public health and the environment from the release of hazardous wastes by regulating industries that generate hazardous waste. Program objectives are accomplished through inspection, surveillance, incident investigation, assistance to industry, enforcement, and public education.

Household Hazardous Waste: This program is implemented by the San Luis Obispo County Integrated Waste Management Authority. Information about household hazardous waste drop off locations and times can be found at the following link. (http://www.iwma.com/tabfaq.html).

Tiered Permitting: The purpose of the tiered permitting program is to protect public health and the environment from improper treatment, disposal and potential releases of hazardous wastes. This is accomplished through routine inspections, complaint investigation, and monitoring of generators that treat hazardous waste in the Conditional Exempt, Grant of Conditional Authority, and Permit-By-Rule (PBR) tiers tiered permit system.

Underground Storage Tanks (UST): The purpose of this program is to protect public health and the environment from a potential source of groundwater contamination by regulating underground storage tanks containing hazardous materials. Program objectives are accomplished through inspection, plan check, incident investigation, enforcement, public education, and assistance to industry.

#### 4.2.11.2 Pesticides

Pesticide use is regulated by the California Department of Pesticide Regulation (DPR). According to the DPR website (California Department of Pesticide Regulation):

> The Department of Pesticide Regulation (DPR) is vested with primary authority through the U.S. Environmental Protection Agency (U.S. EPA) to enforce federal and

state laws pertaining to the proper and safe use of pesticides. DPR's enforcement of pesticide use in the field is largely carried out in California's 58 counties by County Agricultural Commissioners (CACs) and their staffs (approximately 400 inspector/biologists).

### 4.2.11.3 Invasive Mussels

#### 4.2.11.3.a California Code

California code addresses invasive mussels as follows (California Code of Regulations):

Fish and Game Code - FGC

DIVISION 3. FISH AND GAME GENERALLY [2000 - 2948] (Division 3 enacted by Stats. 1957, Ch. 456.)

CHAPTER 3.5. Aquatic Invasive Species [2300 - 2302] (Heading of Chapter 3.5 amended by Stats. 2007, Ch. 419, Sec. 3.)

2301.

(a) (1) Except as authorized by the department, a person shall not possess, import, ship, or transport in the state, or place, plant, or cause to be placed or planted in any water within the state, dreissenid mussels.

(2) The director or his or her designee may do all of the following:

(A) Conduct inspections of conveyances, which include vehicles, boats and other watercraft, containers, and trailers, that may carry or contain adult or larval dreissenid mussels. Included as part of this authority to conduct inspections is the authority to temporarily stop conveyances that may carry or contain adult or larval dreissenid mussels on any roadway or waterway in order to conduct inspections.

(B) Order that areas in a conveyance that contain water be drained, dried, or decontaminated pursuant to procedures approved by the department.

(C) Impound or quarantine conveyances in locations designated by the department for up to five days or the period of time necessary to ensure that dreissenid mussels can no longer live on or in the conveyance.

(D) (i) Conduct inspections of waters of the state and facilities located within waters of the state that may contain dreissenid mussels. If dreissenid mussels are detected or may be present, the director or his or her designee may order the affected waters or facilities closed to conveyances or otherwise restrict access to the affected waters or facilities, and shall order that conveyances removed from, or introduced to, the affected waters or facilities be inspected, quarantined, or disinfected in a manner and for a duration necessary to detect and prevent the spread of dreissenid mussels within the state.

(ii) For the purpose of implementing clause (i), the director or his or her designee shall order the closure or quarantine of, or restrict access to, these waters, areas, or facilities in a manner and duration necessary to detect and prevent the spread of dreissenid mussels within the state. No closure, quarantine, or restriction shall be authorized by the director or his or her designee without the concurrence of the Secretary of the Natural Resources Agency. If a closure lasts longer than seven days, the department shall update the operator of the affected facility every 10 days on efforts to address the dreissenid infestation. The department shall provide these updates in writing and also post these updates on the department's Internet Web site in an easily accessible manner.

(iii) The department shall develop procedures to ensure proper notification of affected local and federal agencies, and, as appropriate, the Department of Water Resources, the Department of Parks and Recreation, and the State Lands Commission in the event of a decision to close, quarantine, or restrict a facility pursuant to this paragraph. These procedures shall include the reasons for the closure, quarantine, or restriction, and methods for providing updated information to those affected. These procedures shall also include protocols for the posting of the notifications on the department's Internet Web site required by clause (ii).

(iv) When deciding the scope, duration, level, and type of restrictions, and specific location of a closure or quarantine, the director shall consult with the agency, entity, owner, or operator with jurisdiction, control, or management responsibility over the marina, boat launch facility, or other facility, in order to focus the closure or quarantine to specific areas and facilities so as to avoid or minimize disruption of economic or recreational activity in the vicinity.

(b) (1) Upon a determination by the director that it would further the purposes of this section, other state agencies, including, but not limited to, the Department of Parks and Recreation, the Department of Water Resources, the Department of Food and Agriculture, and the State Lands Commission, may exercise the authority granted to the department in subdivision (a).

(2) A determination made pursuant to paragraph (1) shall be in writing and shall remain in effect until withdrawn, in writing, by the director.

(c) (1) Except as provided in paragraph (2), Division 13 (commencing with Section 21000) of the Public Resources Code does not apply to the implementation of this section.

(2) An action undertaken pursuant to subparagraph (B) of paragraph (2) of subdivision (a) involving the use of chemicals other than salt or hot water to

decontaminate a conveyance or a facility is subject to Division 13 (commencing with Section 21000) of the Public Resources Code.

(d) (1) A public or private agency that operates a water supply system shall cooperate with the department to implement measures to avoid infestation by dreissenid mussels and to control or eradicate any infestation that may occur in a water supply system. If dreissenid mussels are detected, the operator of the water supply system, in cooperation with the department, shall prepare and implement a plan to control or eradicate dreissenid mussels within the system. The approved plan shall contain the following minimum elements:

(A) Methods for delineation of infestation, including both adult mussels and veligers.

(B) Methods for control or eradication of adult mussels and decontamination of water containing larval mussels.

(C) A systematic monitoring program to determine any changes in conditions.

(D) The requirement that the operator of the water supply system permit inspections by the department as well as cooperate with the department to update or revise control or eradication measures in the approved plan to address scientific advances in the methods of controlling or eradicating mussels and veligers.

(2) If the operator of water delivery and storage facilities for public water supply purposes has prepared, initiated, and is in compliance with all the elements of an approved plan to control or eradicate dreissenid mussels in accordance with paragraph (1), the requirements of subdivision (a) do not apply to the operation of those water delivery and storage facilities, and the operator is not subject to any civil or criminal liability for the introduction of dreissenid mussel species as a result of those operations. The department may require the operator of a facility to update its plan, and if the plan is not updated or revised as described in subparagraph (D) of paragraph (1), subdivision (a) shall apply to the operation of the water delivery and storage facilities covered by the plan until the operator updates or revises the plan and initiates and complies with all of the elements of the updated or revised plan.

(e) Any entity that discovers dreissenid mussels within this state shall immediately report the discovery to the department.

(f) (1) In addition to any other penalty provided by law, any person who violates this section, violates any verbal or written order or regulation adopted pursuant to this section, or who resists, delays, obstructs, or interferes with the implementation of this section, is subject to a penalty, in an amount not to exceed one thousand dollars ($1,000), that is imposed administratively by the department.

(2) A penalty shall not be imposed pursuant to paragraph (1) unless the department has adopted regulations specifying the amount of the penalty and the procedure for imposing and appealing the penalty.

(g) The department may adopt regulations to carry out this section.

(h) Pursuant to Section 818.4 of the Government Code, the department and any other state agency exercising authority under this section shall not be liable with regard to any determination or authorization made pursuant to this section.

(i) This section shall remain in effect only until January 1, 2017, and as of that date is repealed, unless a later enacted statute, that is enacted before January 1, 2017, deletes or extends that date.

2302.

(a) Any person, or federal, state, or local agency, district, or authority that owns or manages a reservoir, as defined in Section 6004.5 of the Water Code, where recreational, boating, or fishing activities are permitted, except a privately owned reservoir that is not open to the public, shall do both of the following:

(1) Assess the vulnerability of the reservoir for the introduction of nonnative dreissenid mussel species.

(2) Develop and implement a program designed to prevent the introduction of nonnative dreissenid mussel species.

(b) The program shall include, at a minimum, all of the following:

(1) Public education.

(2) Monitoring.

(3) Management of those recreational, boating, or fishing activities that are permitted.

(c) Any person, or federal, state, or local agency, district, or authority, that owns or manages a reservoir, as defined in Section 6004.5 of the Water Code, where recreational, boating, or fishing activities of any kind are not permitted, except a privately owned reservoir that is not open to the public, shall, based on its available resources and staffing, include visual monitoring for the presence of mussels as part of its routine field activities.

(d) Any entity that owns or manages a reservoir, as defined in Section 6004.5 of the Water Code, except a privately owned reservoir that is not open to the public for recreational, boating, or fishing activities, may refuse the planting of fish in that reservoir by the department unless the department can demonstrate that the fish are not known to be infected with nonnative dreissenid mussels.

(e) Except as specifically set forth in this section, this section applies both to reservoirs that are owned or managed by governmental entities and reservoirs that are owned or managed by private persons or entities.

(f) Violation of this section is not subject to the sanctions set forth in Section 12000. In lieu of any other penalty provided by law, a person who violates this section shall, instead, be subject to a civil penalty, in an amount not to exceed one thousand dollars ($1,000) per violation, that is imposed administratively by the department. To the extent that sufficient funds and personnel are available to do so, the department may adopt regulations establishing procedures to implement this subdivision and enforce this section.

(g) This section shall not apply to a reservoir in which nonnative dreissenid mussels have been detected.

(Amended by Stats. 2009, Ch. 140, Sec. 73. Effective January 1, 2010.)

#### 4.2.11.3.b San Luis Obispo County Code

The following excerpts from San Luis Obispo County Code address invasive mussels at Nacimiento Reservoir (San Luis Obispo County Municipal Code):

Title 11 - PARKS AND RECREATION

Chapter 11.20 – NACIMIENTO LAKE

11.20.120 Vessel regulations.

(e) The Monterey County parks department, the San Luis Obispo County sheriff's department, and other peace officers with concurrent jurisdiction are authorized to board and inspect or re-inspect any vessel, vessel trailer or vehicle transporting or towing said vessel at Nacimiento Lake and the Nacimiento recreation area, to ensure compliance with this chapter, and all applicable local, state and federal rules, laws, and regulations, including, without limitation, those laws, rules and regulations relating to invasive species which pose a threat to the waters of Nacimiento Lake and related infrastructure.

(j) No person shall do any of the following within Nacimiento Lake:

(9) Launch any vessel that is polluted, infested with invasive aquatic species, or is not seaworthy or sanitary. All vessels must be "clean, drained, and dry" in order to receive an annual and/or daily vessel permit and any required local inspection certification to operate on Nacimiento Lake. Any vessel trailer coming into contact with Nacimiento Lake shall be free of all invasive aquatic species.

## 4.3 WATER AGENCY COORDINATION MEASURES

Lacking any jurisdictional control in the Nacimiento Reservoir watershed, the District does not have any control measures in place for the purpose of source water protection. The County of San Luis Obispo has some policies and ordinances that protect water resources, either by design or incidentally, as outlined above in section 4.2.

## 4.4 RECOMMENDED CONTROL MEASURES

Ideally, a surface water reservoir that is a source of supply for a drinking water system will be completely protected from all potential sources of contamination. Realistically, however, this is not feasible, especially in California, with its limited water resources, and especially not for a large watershed with many established uses, as in the Nacimiento Reservoir watershed. Therefore, water purveyors must seek ways to reduce the impacts of contaminant sources on the reservoir.

Control measures that should be considered in the Nacimiento Reservoir watershed in order to protect water quality and to improve consumer confidence include the following:

- Encourage implementation of best management practices in agricultural and industrial operations (grazing, crop land, wineries, mines) to minimize:
    - Pathogen loading to reservoir
        - Top priority: restrict direct access of cattle to reservoir and its tributaries
    - Nutrient loading to reservoir
    - Solids loading to reservoir
- Encourage implementation of best management practices for stormwater pollution prevention in lakeside communities and public recreation areas
- Relocate the Oak Shores sewer interceptor system so that the laterals are realigned to a new sewer main to convey wastewater to the treatment plant and abandon the existing interceptor system
- Aid EPA remediation of Klau/Buena Vista mines site
- Advocate property development adherence to currently approved levels and uses (unless the proposed change would result in greater protection of water quality); discourage additional local subdivision and intensification of development; consider potential water quality impacts and advocate water quality protection when evaluating land use or development proposals
- Monitor water quality impacts by recreation and related activities in the watershed; identify, advocate, and implement control measures to minimize adverse water quality impacts

Although the County of San Luis Obispo has land use authority over the lower Nacimiento watershed, the San Luis Obispo County Flood Control and Water Conservation District (District) does not have jurisdictional authority in any part of the Nacimiento Reservoir watershed, and therefore has no direct means of protecting water quality. However, in recent years District staff members have developed numerous contacts with agencies and individuals in the watershed that may allow some cooperative work efforts with other entities (public and private) for the purpose of protecting source water quality in future years.

A key element to identifying source water protection needs and especially to implementing solutions is having good, strong, cooperative working relationships with the agencies and individuals who live, work, recreate, and create regulations in the watershed. Existing relationships should be strengthened and new relationships should be developed. This may be accomplished through participation in advisory groups, public events, and through individual contacts that District staff may initiate and foster.

The District should emphasize development of cooperative working relationships and positive, voluntary solutions to problems and problem prevention. If necessary, regulatory protection of the source water may be used (existing statutes) or sought (new statutes), but only after all reasonable efforts to find an effective voluntary solution in a reasonable amount of time have failed.

# 5 WATER QUALITY

## 5.1 DRINKING WATER REGULATIONS

### 5.1.1 Surface Water Treatment Regulations

#### 5.1.1.1 Background

##### 5.1.1.1.a Safe Drinking Water Act

In 1974 Congress passed the Safe Drinking Water Act (SDWA) to protect public health by regulating the nation's public drinking water supply. Under the SDWA, USEPA is authorized to set national health-based standards for drinking water to protect against both naturally-occurring and human-made contaminants that may be found in drinking water. US EPA, states, and water systems then work together to make sure that these standards are met.

The SDWA was amended in 1986 and 1996, and now requires many actions to protect drinking water and its sources. Originally, the SDWA focused primarily on treatment as the means of providing safe drinking water at the tap. The 1996 amendments established a strong new emphasis on preventing contamination problems through source water protection and enhanced water system management. That emphasis transformed the previous law, with its largely after-the-fact, regulatory focus, into a truly environmental statute that can better provide for the sustainable use of water by all public water systems and their customers. The states are central to this effort by creating and focusing prevention programs, and by helping water systems improve operations and avoid contamination problems. This approach ensures the quality of drinking water by protecting it from source to tap. (USEPA)

In 1976 California enacted its own Safe Drinking Water Act, requiring the California Department of Public Health (then known as the Department of Health Services) to administer laws relating to drinking water standards, administer water quality testing programs, and administer permits for public water system operations. The standards established by CDPH are found in the California Code of Regulations Title 22. (City of San Diego, Public Utilities Department)

The State of California has primacy to regulate and monitor public water systems within the state. That means that California regulations must be at least as stringent as federal regulations. In many cases, California regulations are more stringent than federal regulations.

For very small public water systems, CDPH, under the provisions of Section 116330 of the California Health and Safety Code, has delegated primacy to 35 local primacy agencies (LPAs) for the regulation of public water systems serving fewer than 200 service connections. LPAs are county environmental health jurisdictions that have applied for and were granted regulatory authority over a portion of the public water systems in their county.

##### 5.1.1.1.b Surface Water Regulations

In 1990 the federal EPA's Science Advisory Board, an independent panel of experts established by Congress, cited drinking water contamination as one of the most important environmental risks and indicated that disease-causing microbial contaminants (*i.e*. viruses, bacteria, and protozoa such as *Cryptosporidium* and *Giardia*) are the greatest remaining health risk challenge for drinking water suppliers.

Surface water (lakes, reservoirs, rivers, and ground water under the influence of surface water) can contain many contaminants which may pose a risk to drinking water consumers, including these pathogens, which can cause severe short term illness and death, as well as other contaminants which may cause serious illnesses after long term exposure (e.g. cancer, liver disease, etc).

Following passage of the SDWA, the federal government and the state of California passed a series of laws to minimize the health risk to consumers whose drinking water source is from a surface water supply or from a ground water system that is under the direct influence of surface water (GWUDI). The federal Environmental Protection Agency and California Department of Public Health have developed regulations based on these laws, which require drinking water purveyors to take appropriate measures to protect public health.

The overarching principle of these laws is the multi-barrier approach to drinking water consumer protection. This approach begins with source water protection, which has been increasingly emphasized in recent years as one of the best means of protecting consumers, and continues with strengthening drinking water treatment requirements. Protecting source water from contamination means that the cleanest possible water will enter the drinking water treatment plant or ground water system, which has the following benefits to consumers:

- Reduces risk of contaminants reaching consumers should there be a failure in the treatment process
- Improves effectiveness of treatment process
- Reduces cost of treatment
- Reduces risk of adversely impacting ground water supply

The importance of protecting source water came to the forefront following an outbreak of cryptosporidiosis in Milwaukee, Wisconsin in 1993. *Cryptosporidium*-contaminated water from Lake Michigan passed through the city's drinking water treatment plant and caused over 400,000 people to become ill with diarrhea, of whom 4,400 were hospitalized, and at least 104 died. (Kramer, Herwaldt and Calderon) (Hoxie)

Other elements of the multi-barrier approach include stringent treatment standards for surface water treatment plants and GWUDI systems, and stringent standards for finished water quality from the supplier to the customer's tap.

(USEPA)

### 5.1.1.2 Surface Water Treatment Regulations

A brief summary of key provisions of regulations that relate to treatment of surface water or of ground water under the direct influence of surface water (GWUDI) is presented here. For more detailed information, refer to the regulations.

#### 5.1.1.2.a Federal Regulations

Surface Water Treatment Rule (SWTR)

40 CFR 141.70-141.75
54 FR 27486, June 29, 1989

- Requires most drinking water systems that use surface water or ground water under the direct influence of surface water (GWUDI) to remove microbial contaminants physically through filtration.
- Sets maximum contaminant level goals (MCLGs) for certain microbial contaminants (*Legionella, Giardia lamblia*, and viruses) at zero, since any exposure to these contaminants presents some level of health risk.
- Requires surface water and GWUDI systems to reduce the concentration of *Giardia lamblia* by 99.9 percent (3 log) and viruses by 99.99 percent (4 log).
- Requires that systems maintain a detectable disinfectant residual throughout the entire distribution system.
- Uses turbidity to measure the performance of filtration systems.
- Does not specifically control for *Cryptosporidium.*

Interim Enhanced Surface Water Treatment Rule (IESWTR)

40 CFR 141.170-141.175
63 FR 69477 – 69521, December 16, 1998, Vol. 63, No. 241

- Establishes 99% (2 log) *Cryptosporidium* removal requirement for filtered systems
- Establishes MCLG of zero for Cryptosporidium

- Requires surface water and GWUDI systems that serve ≥10,000 people to improve filtration performance by lowering the turbidity standard that was established in the SWTR.
    - Conventional and direct filtration combined filter effluent requirements:
        - Measure combined filter effluent turbidity every 4 hours
        - ≤ 0.3 NTU in ≥ 95% of measurements taken each month
        - Maximum level of 1 NTU at all times
    - Measure individual filter effluent turbidity every 15 minutes
- Requires sanitary surveys for all public water systems using surface water or GWUDI.

<u>Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR)</u>

40 CFR 141.500-141.571
67 FR 1812, January 14, 2002, Vol. 67, No. 9

- Extends the filtration performance standard established in the IESWTR to surface water and GWUDI systems serving <10,000 people.

<u>Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR)</u>

40 CFR 141.700-141.723
71 FR 654, January 5, 2006, Vol. 71, No. 3

- Requires surface water and GWUDI filtered systems that serve ≥10,000 people to conduct source water monitoring for *Cryptosporidium, E. coli,* and turbidity.
- Requires surface water and GWUDI filtered systems that serve <10,000 people to conduct source water monitoring for *E. coli*, and for *Cryptosporidium* if *E. coli* levels are high.
- Requires additional treatment for *Cryptosporidium* at systems that have significant levels of this pathogen in their source waters.
- Requires covers for finished water reservoirs, or treatment of discharges from uncovered finished water reservoirs for pathogens.
- Requires evaluation of disinfection effectiveness before a system is allowed to change their disinfection process.
- Allows filtered systems to implement a watershed control program in lieu of a portion of their treatment requirement.

<u>Filter Backwash Recycling Rule (FBRR)</u>

40 CFR 141.76
66 FR 31086, June 8, 2001, Vol. 66, No. 111

- Reduces pathogen concentrations in the finished water by properly managing the backwash water and waste streams at water treatment plants.

Total Trihalomethane Rule (TTHM Rule)

44 FR 68624, November 29, 1979

- Establishes a maximum contaminant level (MCL) of 0.010 mg/L for certain disinfection byproducts (total trihalomethanes (TTHMs)) for all community water systems serving ≥10,000 people.

Total Coliform Rule

40 CFR 141.21
54 FR 27544, June 29, 1989, Vol. 54, No. 124

- Establishes monitoring and reporting requirements and limits for the presence of total coliforms in all public water supplies.

Stage 1 Disinfectants and Disinfection Byproducts Rule (Stage 1 DBPR)

40 CFR 141.130-135
63 FR 69390, December 16, 1998, Vol. 63, No. 241

- Applies to all community water systems that add a disinfectant
- Lowers the existing TTHM MCL to 80 mg/L.
- Establishes new MCLs for additional disinfection byproducts

| Disinfection byproduct | MCL (mg/L) |
|---|---|
| Haloacetic acids (HAA5) | 0.060 |
| Bromate | 0.010 |
| Chlorite | 1.0 |

- Establishes maximum residual disinfectant levels (MRDL) for certain disinfectants in the finished water

| Disinfectant | MRDL (mg/L) |
|---|---|
| Chlorine | 4.0 as $Cl_2$ |
| Chloramines | 4.0 as $Cl_2$ |
| Chlorine dioxide | 0.8 |

- Requires surface water treatment plants with conventional filtration systems to remove specified percentages of organic matter, which may react with disinfectants to form disinfection byproducts

Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR)

40 CFR 141.620-629
71 FR 388, January 4, 2006, Vol. 71, No. 2

- Requires an initial distribution system evaluation to identify locations with high TTHM and HAA5 levels
- Requires use of high TTHM and HAA5 sites for compliance monitoring
- Requires compliance at each monitoring location

#### 5.1.1.2.b California State Regulations

California Surface Water Treatment Rule (CSWTR)

Title 22, Chapter 17

- Establishes treatment standards for the removal and/or inactivation of turbidity and several pathogens from surface water sources.
- Requires multibarrier treatment for surface water sources.
- Requires completion of a watershed sanitary survey every five years.

California Disinfectant and Disinfectant ByProduct Rule (D/DBPR)

- Establishes limits, monitoring requirements, and treatment techniques for disinfectant residuals, disinfectant byproducts, and disinfectant byproduct precursors for all water systems that use surface water or GWUDI.

### 5.1.2 Constituents of Concern

Constituents of concern in finished drinking water are primarily those which
- may pose a health risk to consumers
- may render the water aesthetically unpleasant for consumers
- may have deleterious effects in the finished water delivery pipeline.

Constituents of concern in raw source water are primarily those which
- may lead to unacceptable levels of constituents of concern in the finished water
- may pose operational problems for agencies that receive the water
- may have deleterious effects in the raw water pipeline.

In the case of the Nacimiento Water Project, the source water is a surface water reservoir; the raw water pipeline is 45 miles long with three covered storage tanks. As of this writing, agencies receive the water as follows:
- The City of San Luis Obispo receives the water directly into a conventional

surface water treatment plant year-round

- Templeton Community Services District (TCSD) receives the water into a percolation pond for a ground water recharge and recovery (GWRR) system year-round. TCSD is actively considering purchase of a small package surface water treatment plant which would provide more flexibility in its delivery schedule (currently restricted due to recharge pond recovery rate limits).
- Atascadero Mutual Water Company (AMWC) receives the water into a percolation pond for a ground water recharge and recovery system for a few months each year. AMWC has long term plans to build a surface water treatment plant.
- The City of Paso Robles currently is not receiving water as of this writing, but plans to take water year-round pending construction of a conventional surface water treatment plant, which is currently in the design phase.

Given this configuration of the Nacimiento Water Project, constituents of concern that are specific to the Project are discussed here. Federal and state drinking water contaminant limits are presented in Appendix 9.9. Regulated contaminants are broken into two main groups – those which can pose health risks to consumers, and those which may cause cosmetic or aesthetic effects.

### 5.1.2.1 Microbiological contaminants - pathogens

The major microbiological contaminants of concern in both source water and finished water are total coliforms, fecal coliforms, *E. coli, Giardia, Cryptosporidium*, and viruses. They are a concern in finished water because all of these groups of microorganisms may contain strains which are pathogenic (cause disease). They are a concern in source water because of the potential for them to reach consumers in the finished water, and because their presence can strain water treatment processes (resulting in higher treatment costs and strained ability to adequately remove contaminants) and can have deleterious effects on groundwater recharge basins (by accumulating or growing in recharge ponds or below the soil-water interface, thereby retarding percolation rates). (Carollo Engineers)

Most pathogens that can contaminate water supplies come from the feces of humans or animals. These organisms can enter the water supply from body contact recreation, from animal defecation, with runoff, and from wastewater sources.

There are many significant sources of microbiological contaminants in the Nacimiento Reservoir watershed, including cattle, horses, sheep, humans, pets, and wild animals.

#### 5.1.2.1.a Total coliforms, fecal coliforms, *E. coli*

Coliforms are bacteria that are present in the environment and in the feces of all warm-blooded animals and humans. Their presence in water indicates that pathogens could be in the water.

<u>Total coliforms</u> is a large group comprised of many different kinds of bacteria. Total coliform bacteria are commonly found in the environment (e.g., soil or vegetation) and are generally harmless. If only total coliform bacteria are detected in water, the source is probably environmental, not fecal.

<u>Fecal coliforms</u> are a sub-group of total coliform bacteria. They appear in great quantities in the intestines and feces of people and animals. The presence of fecal coliform in a water sample often indicates recent fecal contamination, meaning that there is a greater risk that pathogens are present than if only total coliform bacteria is detected.

<u>*E. coli*</u> is a sub-group of the fecal coliform group. Most *E. coli* bacteria are harmless and are found in great quantities in the intestines of people and warm-blooded animals. Some strains, however, can cause illness. The presence of *E. coli* in a water sample almost always indicates recent fecal contamination, meaning that there is a greater risk that pathogens are present. (Connecticut Department of Public Health)

*E. coli* O157:H7 and *Campylobacter* are two examples of water-borne pathogenic bacteria. In May 2000 a municipal drinking water well in Walkerton, Ontario became contaminated with both of these bacteria, causing seven deaths and more than 2,300 illnesses, including 27 cases of hemolytic uremic syndrome, a serious kidney ailment with potential lifelong implications. An investigation determined that the source of contamination was manure from a nearby farm that entered the well with heavy rain runoff. (Hrudley and Walker) In September 1999 a well at a fairground in Washington County, New York became contaminated with both of these bacteria, causing two deaths and more than 700 illnesses. An investigation pointed to two possible sources for the contamination; a dormitory septic system on the fairgrounds was the most likely source, but manure runoff from a nearby cattle barn could not be ruled out. (New York State Health Commission)

#### 5.1.2.1.b *<u>Cryptosporidium, Giardia</u>*

*Cryptosporidium* and *Giardia* are comparatively large single-celled organisms called protozoa. Both of these organisms are parasites that live in the intestine of infected humans or animals. They are shed by infected hosts with the feces as an oocyst, which may remain in the environment for very long periods without loss of infectivity due to a very robust cell wall which protects them against physical and chemical damage.

Both *Cryptosporidium* and *Giardia* are carried by humans and animals and are easily spread through water. Symptoms of infection include stomach cramps, nausea, vomiting, and diarrhea. Cryptosporidiosis typically lasts 1 to 2 weeks, and may relapse several times. Giardisis typically lasts 2 to 6 weeks, but a significant proportion of the infected population develops a chronic infection.

As noted above, a major outbreak of cryptosporidiosis occurred in Milwaukee, Wisconsin in 1993. *Cryptosporidium*-contaminated water from Lake Michigan passed through the city's drinking water treatment plant and caused over 400,000 people to become ill with diarrhea, of whom 4,400 were hospitalized, and at least 104 died.

(USDHHS Center for Disease Control and Prevention), (USDHHS Center for Disease Control and Prevention), (World Health Organization)

#### 5.1.2.1.c Viruses

Viruses are extremely small pathogenic microorganisms. Unlike the bacterial and protozoan pathogen described above, which can be transmitted from one species to another, viruses are host specific, which means that viruses that infect animals or plants do not usually infect humans.

Most viruses also infect only certain types of cells within a host; consequently, the health effects associated with a viral infection vary widely. Viruses that can multiply in the gastrointestinal tract of humans or animals are known as "enteric viruses." There are more than 140 enteric viruses known to infect humans.

The human illnesses associated with enteric viruses are diverse. The main health effect associated with enteric viruses is gastrointestinal illness. The incubation time and severity of health effects are dependent on the specific virus responsible for the infection. In addition to gastroenteritis, enteric viruses can cause serious acute illnesses, such as meningitis, poliomyelitus and non-specific febrile illnesses. They have also been implicated in chronic diseases, such as diabetes mellitus and chronic fatigue syndrome. The seriousness of the health effects from a viral infection will depend on the specific virus, as well as the characteristics of the individual affected. In theory, a single infectious virus particle can cause infection; however, it usually takes more than a single particle. For many enteric viruses, the number of infectious virus particles needed to cause an infection is presumed to be low.

Enteric viruses cannot multiply in the environment, but they can survive longer in water than most intestinal bacteria and are more infectious than most other microorganisms. Enteric viruses are excreted in the feces of infected individuals, and some enteric viruses can also be excreted in urine. Enteric viruses have been detected in surface water and groundwater sources. (Health Canada, Federal-Provincial-Territorial Committee on Drinking Water)

#### 5.1.2.2 Turbidity

Simply stated, turbidity is a measure of the cloudiness of water. Particles of matter are naturally suspended in water. Turbidity is a measurement of how light scatters when it is aimed at water and bounces off the suspended particles or other impurities that interfere with the clarity of water. The impurities may be clay, silt, finely divided organic and inorganic matter, plankton and other microscopic organisms, asbestos, metal oxides, and metal hydroxides. (USEPA), (Health Canada)

There are numerous potential sources of turbidity in surface water, including waste discharges, surface runoff, algae or aquatic weeds and their breakdown products, and humic acids and other organic compounds resulting from decay of vegetation. (USEPA), (Health Canada)

In a drinking water system, turbidity is a significant concern in both the source water and the finished water. Aesthetically, excessive turbidity (cloudiness or color) in drinking water is unappealing. Particulate matter can be a food source for microorganisms, including pathogens, and can shelter microorganisms from disinfection processes, including both chemical disinfection and ultraviolet light. Particulate matter can also carry undesirable chemical contaminants such as heavy metals. (USEPA), (Health Canada) In surface water treatment plants, turbidity in source water can increase chemical demand and challenge treatment processes. In groundwater recharge ponds, turbidity can accumulate on and in the soil, reducing soil permeability and consequently recharge rates. (Carollo Engineers)

Surface water sources are at a significantly higher risk for turbidity contamination than properly sealed ground water wells.

#### 5.1.2.3 Disinfection ByProducts

Disinfection byproducts (DBPs) are chemicals that are formed when disinfectants that are used in water treatment processes react with certain naturally-occurring organic or inorganic matter in the water, or when the disinfectant chemical breaks down.

For drinking water systems, DBPs are a concern in the finished water. Surface water reservoirs often contain a fair amount of naturally-occurring organic matter, which derives from animal sources and decaying vegetation. Consequently, finished drinking water that comes from a surface water source has a high risk of containing high levels of disinfection byproducts. DBPs that are of most concern are described here.

##### 5.1.2.3.a Trihalomethanes (THMs)

Trihalomethanes are a group of four chemicals that are formed when naturally-occurring organic and inorganic matter in the water reacts with the disinfectants chlorine and chloramine. Some people who drink water containing total THMs (TTHMs) above a certain level over many years could experience liver, kidney, or central nervous system problems and increased risk of cancer.

#### 5.1.2.3.b Haloacetic Acids (HAA5)

Haloacetic acids are a group of five chemicals that are formed when naturally-occurring organic and inorganic matter in the water reacts with the disinfectants chlorine and chloramine. Some people who drink water containing haloacetic acids above a certain level over many years may have an increased risk of getting cancer.

#### 5.1.2.3.c Bromate

Bromate is a chemical that forms when naturally-occurring bromide in the water reacts with the disinfectant ozone. Some people who drink water containing bromate above a certain level over many years may have an increased risk of getting cancer. (USEPA) (USEPA)

### 5.1.2.4 Disinfectant By-Product Precursors

Disinfectant by-product precursors (DBP precursors) are naturally-occurring compounds or elements which react with disinfectants to form disinfectant by-products.

For drinking water systems, DBP precursors are a concern in the source water. Surface water reservoirs typically contain significantly higher amounts of DBP precursors than properly sealed ground water wells. Consequently, finished drinking water that comes from a surface water source has a high risk of forming disinfection byproducts. The two most significant DBP precursors are organic carbon and bromide.

#### 5.1.2.4.a Organic Carbon

Organic carbon derives from plant and animal sources. There are many sources of organic carbon in a surface water reservoir, including algae and other aquatic plants, aquatic animals, terrestrial plants and animals, and direct human and animal contact with the water. Certain organic carbon compounds cause the formation of THMs and HAAs in drinking water that is disinfected with chlorine and chloramines.

#### 5.1.2.4.b Bromide

Bromide occurs naturally in the environment in various classes of minerals and soils, and is a component of some agricultural pesticides and fertilizers. Bromide causes the formation of bromate in drinking water that is disinfected with ozone. (Flury and Papritz)

### 5.1.2.5 Organics

Organic chemicals all contain carbon and hydrogen in various combinations. Organic chemicals may enter surface water from natural sources or from anthropogenic (human-made) sources.

#### 5.1.2.5.a Natural Organic Matter

Natural organic matter (NOM) is a complex mixture of compounds formed from the breakdown of animal and plant material in the environment. The composition of the mixture depends strongly on the environmental source. NOM consists mainly of carbon, oxygen, and hydrogen; nitrogen and sulfur may also be present as well. (Cooperative Research Centre for Water Quality and Treatment, Australia)

Natural organic matter in water is derived from both external and internal sources. External NOM results from the decay of terrestrial biomass either directly or through soil leaching, and is typically the cause of highly colored waters. External NOM occurs primarily during major rainfall events and is dependent on the hydrologic, geologic, and vegetative patterns of the drainage area. Internal NOM is generated within the aquatic system through photosynthetic activity and is due to the excretion or decay products of algae, other phytoplankton, and macrophytes. Internal NOM is generated during periods of high photosynthetic activity and is primarily a function of the trophic level of the aquatic system. (Kornegay, Torres and Kornegay)

Because NOM is so complex and variable its specific composition is usually not analyzed; rather, gross measurements are typically made, using techniques such as total organic carbon (TOC), dissolved organic carbon (DOC), color, UV absorbance, and fluorescence analysis. TOC and DOC measure all of the organic carbon (total, or dissolved) amenable to oxidation, including both humic and nonhumic fractions, while the other three techniques are more indicative of the humic fraction. (Kornegay, Torres and Kornegay)

NOM is a concern in source water because of the many possible negative effects that it can have on water treatment plants and ground water recharge ponds. In water treatment plants NOM can cause increased chemical demand (coagulants, disinfectants), increased activated carbon demand, and membrane fouling. (Kornegay, Torres and Kornegay), (The Cooperative Centre for Water Quality and Treatment) In groundwater recharge systems, the introduction of NOM may stimulate biological activity in deeper regions of the vadose zone and in aquifers. (Carollo Engineers)

NOM is a concern in finished drinking water because it can combine with certain disinfectants to form DBPs, and it can promote microbial growth in the distribution system. (Kornegay, Torres and Kornegay), (The Cooperative Centre for Water Quality and Treatment)

#### 5.1.2.5.b Synthetic Organic Chemicals

Anthropogenic (human-made) organic substances are called synthetic organic chemicals. Synthetic organic chemicals that are capable of vaporizing at relatively low temperatures are called volatile organic chemicals (VOCS). Synthetic organic chemicals that are less volatile are called Non-Volatile Synthetic Organic Chemicals, or Semi-Volatile Organic Chemicals. Both the broad class of synthetic organic chemicals, and the subclass of non-volatile (semi-volatile) organic chemicals, are abbreviated as SOCs. In this document, following CDPH convention, SOCs will refer to the subclass of non-volatile (semi-volatile) organic chemicals.

Synthetic organic chemicals in surface water result from the manufacture, use, and disposal of pesticides (herbicides, fungicides, insecticides, bactericides, rodenticides), petroleum products (gasoline, fuel oil, solvents), and other chemical products, including Styrofoam, plastics, cleaning compounds, paints, and fire retardants. These chemicals can enter surface water sources directly (such as fuel spills and in fire-fighting operations) or can be carried into the reservoir with stormwater runoff. (USDI Bureau of Reclamation)

Synthetic organic chemicals are a concern in finished drinking water because they have health risks. They are a concern in source water because of the potential for them to reach consumers in the finished water.

CDPH currently regulates 27 VOCs and 33 SOCs in drinking water; these are listed in Appendix 9.9. In the Nacimiento Reservoir watershed, VOCs and SOCs which are most likely to contaminate the water are those associated with agricultural operations (pesticides), with urban land use (pesticides and petroleum products), and with vessels (fuel).

### 5.1.2.6 Algae

Algae are aquatic plants. Many algae are microscopic in size and float freely in water; these are often referred to as phytoplankton. Other algae are macroscopic, and may attach to surfaces. Algae can cause a multitude of problems in both source water and finished drinking water. In the drinking water industry, discussions of algal-related problems typically include two groups of bacteria, cyanobacteria and actinomycetes, along with true algae. Cyanobacteria are often referred to as “blue-green algae”. Under certain conditions algae growth may proliferate, resulting in an algal bloom. There are many types of algae, cyanobacteria, and actinomycetes, which can exert various deleterious effects on a drinking water treatment and distribution system.

Algae are a significant concern in source water because of their impact on intakes, on surface water treatment processes, and on groundwater recharge ponds. Algae may clog the screens on intake portals, preventing or slowing pumping of water from the reservoir to water purveyors, and stressing intake pumps. In surface water treatment plants, algae can have the following effects (Plummer):

- affect treatment chemical effectiveness (coagulants and flocculant aids), resulting in compromised treatment process
- increase chemical demand (coagulants and disinfectants),
- increase sludge production
- clog filters, resulting in plant shutdowns
- penetrate filters, resulting in shortened filter runs and increased filter backwashing
- break through filters and pass into the distribution system, resulting in regrowth, slime accumulation, and loss of disinfectant residual.

In ground water recharge ponds, algae can accumulate at the soil-water interface, and under certain conditions may grow in the recharge pond, resulting in reduced recharge rates. (Carollo Engineers)

Algae are a significant concern for finished drinking water because of health risks and consumer acceptance issues. In finished drinking water algae can cause (Plummer):

- formation of disinfection by-products
- presence of neurotoxins, hepatotoxins, and dermatoxins
- unacceptable taste and odor

There are many different algae, which can have many different effects in water. Some selected algal genera of concern are shown in Table 16; within each genus there are many species of concern.

**Table 16: Selected Algal Genera and Water Quality Issues**

| Genus | Water Quality Issues | | | | |
|---|---|---|---|---|---|
| | Taste & Odor | Filter- & screen clogger | Dermatoxin | Hepatotoxin | Neurotoxin |
| **Blue-Greens (cyanobacteria)** | | | | | |
| *Anabaena* | x | x | x | x | x |
| *Anabaenopsis* | | | x | x | |
| *Aphanizomenon* | x | | x | x | x |
| *Cylindrospermopsis* | | | x | x | x |
| *Lyngbya (Plectonema)* | x | | x | x | x |
| *Microcystis* | | | x | x | x |
| *Oscillatoria* | x | | x | x | x |
| | | | | | |
| **Diatoms** | | | | | |
| *Asterionella* | x | x | | | |
| *Cymbella* | | x | | | |
| *Fragilaria* | | x | | | |
| *Navicula* | | x | | | |
| *Synedra* | x | x | | | |
| *Tabellaria* | x | x | | | |
| | | | | | |
| **Flagellates** | | | | | |
| *Ceratium* | x | | | | |
| | | | | | |
| **Greens** | | | | | |
| *Chlorella* | | x | | | |
| *Dinobryon* | x | x | | | |
| *Pandorina* | x | | | | |
| *Spirogyra* | | x | | | |
| *Staurastrum* | x | | | | |
| *Trachelomonas* | | x | | | |

*Sources:*
*Standard Methods of the Examination of Water and Wastewater, 19th edition*
*www.nalms.org/home/programs/blue-green-algae-initiative/General%20Information.cmsx*

In the drinking water industry, *Ceratium* is most commonly known as a source of taste and odor problems. For the Nacimiento Water Project, *Ceratium* is also known as a significant filter clogger for the surface water treatment plant that is operated by the City of San Luis Obispo.

#### 5.1.2.7 Nutrients

Nitrogen (N) and phosphorus (P) are key nutrients for bacteria, algae, and other aquatic life forms. Both N and P can exist in various forms in water, and they can change from one form to another depending on conditions such as pH, temperature, and dissolved oxygen levels. Some forms are more easily taken up by plants (including algae) than others. Significant forms of nitrogen that can act as a nutrient are nitrate, nitrite, ammonia, organic nitrogen, total nitrogen. Significant forms of phosphorus that can act as a nutrient are reactive phosphorus and total phosphorus.

Nutrients are a significant concern in source water because they can stimulate excessive algae growth. Algae can have many deleterious effects on drinking water quality, as discussed above in section 5.1.2.6. Nutrients are also a concern in source water because they can stimulate microbial growth in ground water recharge ponds, thereby reducing percolation rates. (Carollo Engineers)

The most significant sources of excess nutrients that can enter water bodies are (USEPA):

- Agriculture – manure, fertilizers, soil erosion – deposited directly, or carried with runoff
- Urban runoff – fertilizers, yard waste, pet waste, some soaps and detergents
- Wastewater – sewer and septic system spills and leaks.

All of these sources exist in the Nacimiento Reservoir watershed.

### 5.1.2.8 Metals

Metals occur naturally in the earth's crust. Some human activities, such as mining, can increase the amount of metals released from the earth into the environment. High levels of some metals may also enter surface water with runoff from urban areas and with runoff from burned areas following a wildfire. Some metals that enter source water can be a concern because of their effect on treatment processes. Some metals that reach the finished drinking water can be a concern because of potential health risks or aesthetic concerns.

#### 5.1.2.8.a Iron and Manganese

Iron and manganese are two very abundant metals of significant concern. In source water, they are a concern because they can increase oxidant demand in the treatment process. If they are present in the reduced form in raw source water, they may oxidize in GWRR system recharge ponds, forming fine suspended solids that may be filtered out and accumulate in the soil, thereby reducing injection capacity and decreasing soil permeability. (Carollo Engineers)

In finished drinking water iron and manganese can cause undesirable color and can stain clothes and plumbing fixtures. In both source water and finished water, iron and manganese can promote the growth of iron bacteria in the pipeline. Iron bacteria can cause corrosion in the pipeline, and can also produce undesirable tastes and odors in the finished water.

#### 5.1.2.8.b Aluminum

Aluminum is the most abundant metal in the earth's crust. Aluminum may be a concern in the finished water because of associated health risks and also due to aesthetic concerns. From a health risk standpoint, aluminum is a neurotoxin, and it has also been associated with Alzheimer's disease and other dementia, although a causal link has not been established. (California EPA, Office of Environmental Health Hazard Assessment) From an aesthetic standpoint, excess aluminum in drinking water may cause unacceptable color. (USEPA)

#### 5.1.2.8.c Trace metals

Other metals are typically found in small (trace) amounts in water and therefore are often called "trace metals". Regulated trace metals in drinking water include antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, selenium, and thallium. Some trace metals are a concern in the finished drinking water because they may pose health risks to consumers. The most well-known health risks are those posed by long term exposure to these metals, and many drinking water regulations are based on this kind of exposure. In recent years studies have shown that many metals can accumulate in deposits in finished drinking water distribution system pipes, and may pose a health risk if they are released from the piping in large quantities at various intervals. (Hill, Friedman and Reiber)

Arsenic

Human exposure to arsenic can cause both short and long term health effects. Long term exposure to arsenic has been linked to cancer of the bladder, lungs, skin, kidneys, nasal passages, liver and prostate. Short term exposure to high doses of arsenic can cause other adverse health effects, but such effects are unlikely to occur from U.S. public water supplies that are in compliance with the arsenic standard. (USEPA)

Higher levels of arsenic tend to be found more in ground water sources than in surface water sources. (USEPA) Arsenic is not a concern in the raw water taken from the Nacimiento Water Project, however, it may be a concern for project participants that use a groundwater recharge and recovery (GWRR) system to accept project water. Some GWRR systems in other locales have measured arsenic in the recovered water when no measurable arsenic was detected in either the water prior to storage or the natural aquifer. It was the introduction of the "new" water that mobilized the contaminant from the surrounding rock. (Carollo Engineers)

Mercury

Mercury can exist in three different forms (oxidation states). Mercury can be converted from one form to another depending on environmental conditions. Nearly all mercury found in water, soil, sediments, and biota (all environmental media except air) is in the form of inorganic mercuric salts and organomercuric compounds. Mercury cycling and partitioning in the environment, especially in aquatic systems, is a very complex phenomenon. (USEPA), (USGS)

Mercury's toxicity depends on its form. The most toxic form of mercury is an organic compound called methylmercury. Methylmercury impairs neurological development in fetuses, infants, and children, and high levels of methylmercury exposure can affect adult neurological systems as well.

Methylmercury is formed when inorganic mercury is carried into a water body where it is converted to the organic form, usually by bacteria, although some other abiotic processes may also accomplish this conversion. Methylmercury is very bioavailable. Most methylmercury produced ends up in biota, especially fish, and it accumulates as it moves up through the food chain. People are exposed to methylmercury almost entirely by eating contaminated fish and wildlife that are at the top of aquatic food chains. (USEPA), (USGS)

In a fresh water body, both inorganic mercury and methylmercury have a very strong preference to remain bound to sediment or to suspended matter compared to dissolving in water (partition coefficients ~100,000:1 and >100,000:1 respectively). Of the mercury that enters the water column, most is bound to organic matter (dissolved organic carbon or suspended particulate matter), and most (typically >90%) is in the less toxic inorganic form. (USEPA)

As described in section 3.2.9 above, there are many historical mercury mines in the Nacimiento Reservoir watershed. Consequently, mercury far above normal background levels has been released to the environment in the watershed. As described above, natural processes convert the mercury to methylmercury, which accumulates in the food chain. Consequently, mercury in some Nacimiento Reservoir fish can be a significant health risk.

For the Nacimiento Water Project, mercury can be a concern in the source water because of its potential to reach consumers in the finished drinking water. In the source water, mercury would most likely be associated with suspended particles or with dissolved organic carbon. The actual risk to consumers is negligible, as the amount of mercury in the water column should be extremely low, and any small amount that might be present should be removed by a properly functioning water treatment plant or groundwater recharge system. In the scientific literature extensive documentation of health effects from other exposure pathways can be found (fish consumption, vapors, etc), but not a single instance of health effects from drinking water is documented. Nonetheless, these distinctions may not be known to consumers, or if known may not be fully grasped. Therefore, mercury is primarily a concern from the standpoint of public perception and consumer assurance.

Other trace metals

The only known additional source of other trace metals to the Nacimiento Reservoir watershed above background levels is the Klau/Buena Vista Mines site, described above in section 3.2.9. In addition to mercury, trace metals found at the mines site at levels that pose risks for humans include aluminum, arsenic, chromium, manganese, nickel, thallium, vanadium, iron, and lead. However, as noted previously, all human health risks identified at the mines site are associated with exposure to soil, sediments, and/or fish; none are associated with surface water.

### 5.1.2.9 Inorganic Chemicals

Many inorganic chemicals occur naturally in water at low levels. Excess amounts may be contributed from human activities, as described above in section 3.2. Regulated inorganic chemicals in drinking water include asbestos, cyanide, fluoride, nitrate, and nitrite. Inorganic chemicals are a concern in the source water because they may reach the finished drinking water. Inorganic chemicals are a concern in the finished drinking water due to the health risks that they can pose to consumers.

#### 5.1.2.9.a Asbestos

Asbestos is the name given to a group of six different fibrous minerals (amosite, chrysotile, crocidolite, and the fibrous varieties of tremolite, actinolite, and anthophyllite) that occur naturally in the environment. (Agency for Toxic Substances and Disease Registry) Asbestos has been mined for use in many consumer products over the years, including some cement water pipes.

Some people who drink water containing asbestos well in excess of the maximum contaminant level (the maximum amount allowed by law in drinking water) for many years may have an increased risk of developing benign intestinal polyps. (USEPA)

#### 5.1.2.9.b Cyanide

A cyanide is a chemical compound that contains a certain combination of carbon and nitrogen (-CN, a cyano group); various other chemicals can combine with the cyano group to form a cyanide. Cyanide can be made by certain microorganisms and it occurs naturally in some foods and seeds. Cyanide can also be manufactured; the major source of cyanide in drinking water is discharge from industrial chemical factories. (USDHHS Agency for Toxic Substances and Disease Registry)

Some people who drink water containing cyanide well in excess of the maximum contaminant level for many years cold experience nerve damage or problems with their thyroid. (USEPA)

There are no known sources of potentially harmful amounts of cyanide in the Nacimiento Reservoir watershed. (USEPA)

#### 5.1.2.9.c Fluoride

Fluoride ($F^-$) is a form of the naturally occurring element fluorine. Fluoride is found in a wide variety of minerals, including fluorspar, rock phosphate, cryolite, apatite, mica, hornblende, and others. (USEPA) Some fluoride compounds dissolve easily in water. Most water supplies contain some naturally occurring fluoride. (World Health Organization)

Excessive exposure to fluoride over a lifetime may lead to increased likelihood of bone fractures in adults, and may result in effects on bone leading to pain and tenderness. Children aged 8 years and younger exposed to excessive amounts of fluoride have an increased chance of developing pits in the tooth enamel, along with a range of cosmetic effects to teeth. (World Health Organization)

There are no known sources of potentially harmful amounts of fluoride in the Nacimiento Reservoir watershed.

#### 5.1.2.9.d Nitrate and Nitrite

Nitrate and nitrite are certain combinations of nitrogen and oxygen ($NO_3^-$ and $NO_2^-$ respectively) that combines with other inorganic and organic compounds. The major sources of nitrate and nitrite in drinking water are runoff from fertilizer use, leakage from septic tanks, sewage, and erosion of natural deposits. (USEPA)

Infants below six months who drink water containing nitrate or nitrite in excess of the maximum contaminant level could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue baby syndrome. (USEPA)

Nitrate and nitrite are also a concern in the raw source water due to their roles as microbiological and algal nutrients, as discussed above in section 5.1.2.7.

There are many potentially significant sources of nitrate and nitrite in the Nacimiento Reservoir watershed, including agricultural activities (cultivated land, livestock), domestic wastewater treatment facilities, direct human contact with the water, pets, and wild animals.

#### 5.1.2.10 Radiological Constituents

Radiological constituents, known also as radionuclides, are atoms that can emit ionizing radiation. (USEPA) Radionuclides may be a concern in source water due to their potential to reach finished drinking water. Radionuclides may be a concern in finished drinking water due to their potential health risks.

USEPA regulates the following radionuclides in drinking water: (adjusted) gross alpha emitters, beta particle and photon (gamma) radioactivity, radium-226 and radium-228 (combined) and uranium. Some people who drink water containing these radionuclides in excess of the MCL over many years may have an increased risk of getting cancer. Additionally, exposure to uranium in drinking water may result in toxic effects to the kidney. (USEPA)

Naturally occurring radioactive elements (NORM) are dissolved in very low concentrations during normal reactions between water and rock or soil. (USGS) High concentrations of NORM are associated with ground waters that coexist with oil- and gas-bearing geological deposits for long periods of time. (USGS), (Paleontological Research Institution)

Ionizing radiation has always been a part of the human environment. Along with natural radioactive sources present in the Earth's crust and cosmic radiation, man-made sources also contribute to our continuous exposure to ionizing radiation. Environmental radioactive pollution has resulted from past nuclear weapons testing, nuclear waste disposal, accidents at nuclear power plants, as well as from transportation, storage, loss, and misuse of radioactive sources. (World Health Organization)

There are no known risks factors for radionuclides in the Nacimiento Reservoir watershed.

#### 5.1.2.11 Other Water Quality Constituents

Other water quality constituents of concern are those which do not pose known health risks to consumers, but are important for other reasons. Some of these constituents may cause unwanted aesthetic or cosmetic effects for consumers; others may affect the drinking water treatment process, groundwater recharge ponds, or water delivery infrastructure (pipelines and tanks).

##### 5.1.2.11.a Alkalinity

Alkalinity is the ability of a water to neutralize acids. Several naturally occurring chemical species contribute to this ability; the predominant species are bicarbonate and carbonate. These species also confer buffering capacity on water – that is, its ability to resist sudden changes in pH when chemicals are added. Other species that may contribute to a water's alkalinity include hydroxide, borates, silicates, and phosphates.

Alkalinity enters surface water sources through the dissolution of naturally occurring minerals in the rocks and soil in the watershed, and through the interaction of carbon dioxide in the air with the water.

Alkalinity is important in source water because it affect water treatment processes. In drinking water treatment, chemicals are added that help remove contaminants from the water. Alkalinity in the source water helps treatment chemical effectiveness. If alkalinity is too low, water treatment plants may have to add lime to provide buffering capacity to the water.

Alkalinity is also important in both the source water and the finished drinking water because it can affect pipe and tank corrosion. Water that is low in alkalinity may become corrosive more easily than water that is high in alkalinity. (California State University, Sacramento)

#### 5.1.2.11.b Chloride

Chloride is a naturally occurring element in the earth's crust. Chloride is important in both source water and finished drinking water because it can affect pipe and tank corrosion. Chloride ions in water may inhibit the formation of protective scales by keeping hardness ions in solution. As discussed below, hardness in water helps prevent corrosion by forming a protective scale on the inside of pipes and tanks.

Chloride is also important in finished drinking water because it can affect the water's taste. Excessive chloride in water can impart a salty taste to it that is unacceptable to consumers.

#### 5.1.2.11.c Dissolved Oxygen

Oxygen enters a surface water reservoir when air at the air-water interface dissolves into the water. It is removed from water through bacterial decomposition of other living things. Dissolved oxygen in a reservoir can be rapidly depleted during the die-off phase that follows an algal bloom, resulting in fish kills and other unwanted effects.

Dissolved oxygen is important in source water because it affects other constituents of concern in the source water. The amount of dissolved oxygen in water affects whether iron and manganese occur in dissolved form or if they are insoluble, which affects how they behave in the water and in treatment processes. Low dissolved oxygen creates reducing conditions. Reduced iron and manganese are more soluble than the oxidized forms, and therefore can occur in greater concentrations in the water. Reduced iron and manganese that reach water treatment plants are oxidized by disinfectants, creating a high disinfectant demand. This can compromise effective treatment and increase treatment costs.

#### 5.1.2.11.d Hardness,

Hardness in water is principally caused by the presence of calcium and magnesium ions, though other ions such as iron, manganese, and strontium may contribute to hardness as well. (California State University, Sacramento) These naturally occurring elements enter a surface water reservoir from the dissolution of rocks and minerals in the watershed.

Hardness is important in both source water and finished water because of its effect on pipes, tanks, and plumbing fixtures. Hardness ions can combine with other water constituents (carbonates, bicarbonate, sulfates, etc) to form deposits inside pipes, tanks, and on plumbing fixtures; this process is sometimes called scaling, and the deposits may be called scale. Excessive hardness deposits can significantly restrict water flow, and can be unsightly. A certain amount of scaling, however, protects infrastructure from corrosion. Therefore, some hardness is desirable; water that is too soft can promote corrosion.

Hardness is also important in finished water because it affects the effectiveness of soaps and detergents; these important consumer products are less effective in hard water that in soft water.

#### 5.1.2.11.e pH

pH is a measurement of the hydrogen ion ($H^+$) activity in solution. Put more simply, pH is a measurement of how acidic or how basic a solution is.

pH levels in surface water sources are a very complex phenomenon. pH levels in surface water are affected by many factors, including components found in surface runoff, precipitation, mixing of air into the water, and biological activity in the water. Conversely, pH levels have an effect on many chemical and biological processes that occur in a surface water reservoir.

pH is important in source water primarily because of its effect on water treatment processes. Excessively high pH levels can greatly reduce the effectiveness of treatment chemicals, both coagulants and disinfectants, which in turn compromises the treatment process and increases treatment costs. pH is important in finished drinking water primarily because of aesthetic concerns – low pH water may have a bitter or metallic taste, while high pH water may have a slippery feeling. pH is important in both raw source water and finished drinking water because it can affect corrosion and scaling processes in the infrastructure; low pH water is more corrosive than high pH water, while high pH water can promote scaling. (California State University, Sacramento),

(USEPA)

#### 5.1.2.11.f Solids

Dissolved solids

Total dissolved solids (TDS) is the term used to describe the inorganic salts and small amounts of organic matter present in solution in water. The principal constituents are usually calcium, magnesium, sodium, and potassium cations and carbonate, bicarbonate, chloride, sulfate, and nitrate anions. (World Health Organization)

TDS is important in both raw source water and in finished drinking water because of its effect on the corrosiveness of the water. Dissolved solids are mainly present as ions, which increase the electrical conductivity of the water. Generally, the higher the dissolved solids content of the water, the greater the potential for corrosion to occur due to the increased conductivity. Conversely, some dissolved solids can deposit on pipes and fixtures, causing scaling. (California State University, Sacramento)

TDS is also important in the raw source water due to its potential impact on groundwater recharge and recovery systems. Depending on the composition of the dissolved solids, chemical reactions between the raw recharge water and the native groundwater can result in precipitation. This precipitation can clog pores and reduce injection capacity. (Carollo Engineers)

TDS is also important in the finished drinking water because of its aesthetic effect. Water that is high in TDS may have an unacceptable color, it may stain plumbing fixtures, and it may taste salty. (USEPA)

Suspended solids

Suspended solids are solids which are not dissolved in water (those which do not pass through a certain filter size under certain conditions). Suspended solids may remain in suspension, or they may settle out. Suspended solids may be comprised of soil particles, sediment particles, other inorganic material, and organic material (animal sources, vegetation sources, and some microorganisms).

Suspended solids are primarily a concern in raw source water because of their effect on pipelines, tanks, treatment processes, and groundwater recharge ponds.

Solids may settle out of the water into pipelines and tanks. In pipelines solids can build up and restrict flow. Solids that have built up in a tank or pipeline can be dislodged and carried *en masse* downstream, where they cause problems to treatment processes and groundwater recharge ponds. Solids that settle in pipelines and tanks may contain constituents that promote bacterial growth, corrosion, and taste and odor problems.

In treatment processes solids can reduce treatment chemical effectiveness, increase chemical demand, and clog filters.

In groundwater recharge ponds suspended solids can settle out or be filtered out in the basin, accumulating on the soil-water interface, consequently reducing soil permeability and slowing percolation rates. (Carollo Engineers)

#### 5.1.2.11.g Temperature

Temperature is a concern in the raw source water because of its effect on chemical reactions in the treatment process. Warmer temperatures generally speed up chemical reactions, so treatment processes, including disinfection, are typically more effective than when water is cold. Additionally, particles settle out from warm water more quickly than they do from cold water, which is another advantage in the treatment process. (California State University, Sacramento), (USEPA), (USEPA) However, gaseous disinfectants such as chlorine and ozone break down more quickly in warm water, resulting in increased demand. (USEPA)

Temperature is a concern in the finished drinking water because the increased rate of chemical reactions means that more disinfection by-products are formed than in colder water. (USEPA)

Temperature is a concern in both the raw source water and the finished drinking water because of its potential effect on corrosion. This effect varies depending on several factors. Generally speaking, warmer temperatures can increase corrosion, however, they can also increase the rate of scaling, which can protect pipes from corrosion. (California State University, Sacramento)

# 5.2 Existing Water Quality

## 5.2.1 Monitoring Programs

### 5.2.1.1 San Luis Obispo County Flood Control and Water Conservation District

The San Luis Obispo County Flood Control and Water Conservation District (District) currently conducts three water quality monitoring programs in Nacimiento Reservoir in support of the Nacimiento Water Project, as described below. Additionally, the District monitors for the presence of invasive mussels; a brief program description is included here as well.

#### 5.2.1.1.a CDPH Required Monitoring

The District conducts monitoring in accordance with its Domestic Water Supply Permit (No. 04-06-10P-006) issued by the California Department of Public Health on October 21, 2010, as follows:

Location: Intake in Use
Duration: Ongoing. Began in 2010.

| **Constituent (individual or group)** | **Frequency** |
|---|---|
| Coliform bacteria, E. coli bacteria | Monthly |
| General Mineral | Annual |
| General Physical | Annual |
| Inorganic Chemicals | Annual |
| Asbestos, Cyanide | Every 9 years |
| Radiological (Gross Alpha only) | Every 9 years |
| Regulated VOCs | Every 3 years |
| Regulated SOCs (Atrazine, Simazine only) | Every 9 years |

#### 5.2.1.1.b Source Water Assessment and Protection

Log Boom

In 1993, in anticipation of the potential development of the Nacimiento Water Project, the District began to conduct some limited monitoring in Nacimiento Reservoir. The initial purpose of this monitoring was to aid project evaluation, to aid project design decisions, and to provide information for potential treatment alternatives. Since project completion in 2010, some monitoring has continued for the purposes of treatment plant design and source water assessment and protection.

Samples have been collected at various depth intervals. Most often, two samples have been collected per sampling event; one from the upper portion of the water column and one from the lower portion of the water column. These sites are referred to as epilimnion and hypolimnion respectively, even when there is no temperature stratification in the lake. The exact depth from which these two samples have been collected varies.

| | |
|---|---|
| Location: | Log boom near dam at east end of reservoir. |
| Duration: | Intermittent, ongoing. Began in 1993 |
| Frequency: | Varied. Typically monthly or quarterly |
| Constituents: | Varied. Primarily total coliforms, E. coli, algae, general physical, general minerals, inorganic chemicals |

Lakewide

In fall 2011 the District began monitoring at various sites around the reservoir for the purpose of source water assessment and protection. All sites are collected on the reservoir itself. Stream sampling is neither practical nor meaningful due to lack of year-round stream flow, difficult topography, lack of roads in some areas, and long driving times in others.[21]

| | |
|---|---|
| Location: | Oak Shores marina, the Narrows, Las Tablas Creek arm, Dip Creek arm, Heritage Ranch marina, Lake Nacimiento Resort marina |
| Duration: | Ongoing. Began November 2011 |
| Frequency: | Monthly |
| Constituents: | Total coliforms, E. coli, algae, general physical, nutrients |

#### 5.2.1.1.c Intake Selection

The Nacimiento Water Project intake structure has 7 portals located at 20 ft. intervals, ranging from elevation 660' to 780' (NAVD88). The concentration of many water quality constituents varies from top to bottom and also over time, and is dependent on several factors, including lake stratification, surface runoff, and other factors. Several constituents are monitored at various depths through the water column in order to aid District staff in selecting the best water quality for downstream use. The best water quality is that which:

- Minimizes health risks to consumers
- Is most aesthetically acceptable to consumers
- Minimizes treatment costs
- Minimizes operating costs

21 Note: Lakewide monitoring was discontinued in July 2013 due to lack of funding support.

| | |
|---|---|
| Location: | Log boom near dam at east end of reservoir |
| Duration: | Ongoing. Partial profiles began in 2006; complete profiles began in 2011 |
| Frequency: | Monthly |
| Constituents: | Algae, total coliforms, E. coli, general physical, DBP precursors, iron, manganese |

#### 5.2.1.1.d Invasive Mussels

Monitoring for the presence of invasive mussels began in June 2008 and is ongoing. Eight monitoring sites have been established at various locations around the reservoir. Sites are checked on a monthly basis. Additionally, staff perform visual and tactile inspections of infrastructure surfaces that may be seen or felt below the surface of the water, and of surfaces that become exposed as the reservoir surface elevation decreases. The monitoring program is a cooperative effort among several agencies, with resources (staff and/or infrastructure) currently provided by the District, Monterey County Parks Department, Monterey County Water Resources Agency, Oak Shores Community Association, and Heritage Ranch Owners Association.

### 5.2.1.2 Monterey County Water Resources Agency

The Monterey County Water Resources Agency (MCWRA) currently conducts two water quality monitoring programs on Nacimiento Reservoir, as described below.

#### 5.2.1.2.a Dam

This program began in approximately the early 1970s. Specifics have varied through the years, but generally can be described as follows:

| | |
|---|---|
| Location: | Log boom – one sample at surface and one sample at depth for chemical analysis, plus DO/temp profile at 10’ intervals. |
| Duration: | Ongoing. Start date uncertain; approximately early 1970s. |
| Frequency: | Semi-annual (just before Memorial Day and just after Labor Day) |
| Constituents: | Ammonia, calcium, chloride, conductivity, magnesium, nitrate, orthophosphate, pH, potassium, sulfate, sodium, total alkalinity, EC |

#### 5.2.1.2.b Marina

As described above in section 3.2.10.1, a below ground fuel release was discovered beneath the Lake Nacimiento Resort marina parking lot in November 2005, where two fuel dispensers were located. MCWRA is conducting an investigation of the spill under the auspices of the Central Coast Regional Water Quality Control Board and the San Luis Obispo County Environmental Health Department. The investigation includes groundwater monitoring in the immediate vicinity of the spill, and the following surface water quality monitoring:

| | |
|---|---|
| Location: | Lake Nacimiento Resort marina boat ramp |
| Duration: | Ongoing. Began 2009. |
| Frequency: | 2009-2011 quarterly. Semi-annual starting in 2012 (during annual highest elevation and annual lowest elevation) |
| Constituents: | TPHg, TPHd, BTEX, MTBE, TAME, TBA, DIPE, ETBE, DCA, EDB |

#### 5.2.1.3 Other

No other surface water monitoring program information for the Nacimiento Reservoir Watershed could be found.

## 5.2.2 Evaluation of Monitoring Data

Many variables can influence constituent concentrations in both the short term and the long term, including seasonal temperature differences, drought conditions, runoff events, and dam operation, in addition to changes in potential contaminant sources such as extent of recreational use of the reservoir and surroundings, increased urban development, changes in agricultural uses and practices, changes in military base operations, and other factors.

Other than the program described in section 5.2.1.2.b and the lake wide monitoring described in section 5.2.1.1.b, none of the water quality monitoring conducted in the Nacimiento Reservoir watershed has been done for the express purpose of evaluating the effect of potential contaminant sources in the watershed, and an examination of the data collected shows that none is sufficient for that purpose[22]. Despite this limitation, the data gathered to date has some value. The majority of data has been collected via the District's monitoring programs conducted at the log boom by the dam. A summary of this data (which also includes CDPH-required monitoring results) is presented in Table 17. Graphs of selected constituents can be found in Appendix 9.10. Brief discussions of selected constituents are presented here. Overall recommendations for a meaningful program to evaluate watershed changes are presented in section 5.4.

Nearly all of the data has been collected when the reservoir surface elevation has been greater than 730 ft. (above MSL, NGVD29), and most of the data has been collected when the elevation has been greater than 750 ft (above MSL, NGVD29). It is not known how water quality may be affected by lower surface elevations.

### 5.2.2.1 Microbiological Contaminants

#### 5.2.2.1.a Total Coliforms, *E. coli*

Drinking water limits

- Primary MCL: See Table 17.
- MCLG: Zero

Monitoring conducted

More than 600 samples have been analyzed for total coliform bacteria and *E. coli*; the majority of these were collected from various depths in the upper and lower level of the

22 As noted in section 5.2.1.1.b, a limited lakewide monitoring program began in fall 2011. The program followed the proposed minimum water quality program found in section 5.4, Table 19 of this report. This program was scheduled to end in July 2013 due to budget issues. Data gathered during this monitoring period will be evaluated in the first 5 year update to this report.

water column (called "epilimnion" and "hypolimnion" respectively, regardless of presence of thermocline) on an approximately monthly basis. The depth of the "epilimnion" samples ranges from 5 to 45 feet. The depth of the "hypolimnion" samples ranges from 25 to 130 ft. Limited monitoring began in 1997. Full profile sampling at consistent depths and on a consistent schedule did not begin until 2011.

Results

Total coliform bacteria are found throughout the water column. Values vary widely, ranging from undetected to 77,000 MPN/100 mL. The average total coliform value for all sites is 1,298 MPN/100 mL. Somewhat higher levels of total coliforms were found in the upper levels of the water column compared to lower levels.

*E. coli* is also found throughout the water column. Values vary from undetected to 170 MPN/100 mL. The average *E. coli* value for all sites is 2 MPN/100 mL. Somewhat higher levels of *E. coli* were found in the lower levels of the water column compared to the upper levels.

See data in Table 17, and graphs in Appendix 9.10.

Discussion

The data is not sufficient to draw meaningful conclusions about spatial or temporal trends, nor about the relationship between potential contaminant sources in the watershed and levels of total coliforms or *E. coli* found in the water. Continued profile monitoring on a monthly basis, and frequent (e.g. monthly) monitoring in several locations throughout the reservoir and watershed would provide a more meaningful data set for these purposes.

#### 5.2.2.1.b Cryptosporidium, Giardia

Drinking water limits

- Primary MCLs
  - *Cryptosporidium*: Treatment technique (see Table 17)
  - *Giardia lamblia* : 99.9% removal/inactivation (see Table 17)
- MCLG: Zero

Monitoring conducted

Limited sampling for *Cryptosporidium* and *Giardia* was conducted over a 5 year period starting in late 2001. Eleven samples were collected from the upper level of the water column ("epilimnion); none showed the presence of these microorganisms.

Results

| Sample Site | Collected Date | Analysis ID | Result | Reporting Units |
|---|---|---|---|---|
| EPILIMNION | 12/17/2001 | Cyst | <0.1 | Orgs/L |
| EPILIMNION | 4/16/2002 | Cyst | <0.1 | Orgs/L |
| EPILIMNION | 12/18/2002 | Cyst | <0.1 | Orgs/L |
| EPILIMNION | 7/30/2003 | Cyst | <0.1 | Orgs/L |
| EPILIMNION | 12/17/2003 | Cyst | <0.1 | Orgs/L |
| EPILIMNION | 7/13/2004 | Cyst | <0.1 | Orgs/L |
| EPILIMNION | 12/14/2004 | Cyst | <0.1 | Orgs/L |
| EPILIMNION | 7/12/2005 | Cyst | <0.1 | Orgs/L |
| EPILIMNION | 12/13/2005 | Cyst | <0.1 | Orgs/L |
| EPILIMNION | 7/17/2006 | Cyst | <0.1 | Orgs/L |
| EPILIMNION | 12/13/2006 | Cyst | < 0.1 | Orgs/L |

Discussion

The data is not sufficient to draw meaningful conclusions about spatial or temporal trends, nor about the relationship between potential contaminant sources in the watershed and levels of *Cryptosporidium* or *Giardia* found in the water. More frequent (e.g. monthly) monitoring, and monitoring at more locations throughout the reservoir and watershed, is needed to provide a more meaningful data set.

### 5.2.2.2 Turbidity

Drinking water limits

- Primary MCL: Treatment technique (see appendix 9.9):
  - Conventional or direct filtration systems:
    - At no time can turbidity exceed 1 NTU
    - Samples for turbidity must be less than or equal to 0.3 NTU in at least 95 percent of the samples in any month
  - Systems that use filtration other than conventional or direct filtration must follow state limits, which must include turbidity at no time exceeding 5 NTU.
- MCLG: Not established

Monitoring conducted

More than 900 samples have been analyzed for turbidity; the majority of these were collected at various depths from the upper and lower level of water column (called "epilimnion" and "hypolimnion" respectively, regardless of presence of a thermocline) on an approximately monthly basis. Limited monitoring began in 1997. Full profile sampling at consistent depths and on a consistent schedule did not begin until 2011.

Results

Turbidity is found throughout the water column. Values vary widely, ranging from 0.5 to 44 NTU. Somewhat higher turbidity levels are seen in the lower levels of the water column than the upper level.

See data in Table 17, and graphs in Appendix 9.10.

Discussion

Turbidity appears to increase rapidly in the late fall and winter, then decrease slowly throughout spring and summer. The rapid increase in turbidity in late fall and winter is likely associated with runoff from rain events. Incorporating additional data such as precipitation, river flow, and/or lake levels into this analysis would help to evaluate this assumption. There is insufficient data to draw conclusions about sources of turbidity. Measuring turbidity at various locations around the lake would help show areas that contribute the most turbidity.

### 5.2.2.3 Disinfectant By-Product Precursors

#### 5.2.2.3.a Organic Carbon

Drinking water limits

Typically, the higher the level of total organic carbon (TOC) or dissolved organic carbon (DOC) in a source water, the greater the risk of disinfectant byproduct (DBP) formation. However, the relationship between source water quality, treatment technique, and DBP formation is actually very complex. The Federal Stage 1 Disinfectant and Disinfection Byproducts Rule addresses this complexity through several provisions. The major provisions are as follows:

- Conventional surface water treatment plants and GWUDI systems must remove a certain percent of TOC in the source water; the percent to be removed depends on the level of TOC and the level of alkalinity in the water, as follows:

| Source Water TOC | Source Water Alkalinity (mg/L as CaCO3) | | |
|---|---|---|---|
| | **0 to 60** | **>60 to 120** | **>120** |
| >2.0 - 4.0 | 35.0% | 25.0% | 15.0% |
| >4.0 - 8.0 | 45.0% | 35.0% | 25.0% |
| >8.0 | 50.0% | 40.0% | 30.0% |

- Conventional and GWUDI systems may develop alternative TOC removal requirements by following a certain procedure prescribed by the Stage 1 Rule.

- These water systems may also comply with the rule by meeting any of several other alternative compliance criteria, including:
    - Source water TOC <2.0 mg/L (annual average of monthly samples))
    - Source water SUVA ≤2.0 L/mg-m (annual average of monthly samples)
    - Source water TOC <4.0 mg/L, alkalinity > 60 mg/L, and TTHM/HHA5 ≤50% of MCLs
    - Treated water TOC <2.0 mg/L (annual average of monthly samples)
    - Treated water SUVA ≤2.0 L/mg-m (annual average of monthly samples)

Monitoring conducted

More than 700 samples have been analyzed for total organic carbon (TOC) since 1997. The majority of these were collected at various depths from the upper and lower level of water column ("epilimnion" and "hypolimnion" respectively, regardless of presence of a thermocline) on an approximately monthly basis. Limited TOC monitoring began in 1997. Full profile sampling for TOC at consistent depths and on a consistent schedule did not begin until 2011.

Additionally, just over 100 samples have been analyzed for dissolved organic carbon. All of these were collected from the "epilimnion" and "hypolimnion" sites on an approximately quarterly basis; sample depths were as described for TOC analysis. Of the DOC samples collected, 72 have also been analyzed for UV254, and a SUVA value has been calculated.

Results

TOC is found throughout the water column. Values vary from 2.6 to 6.4 mg/L. Average TOC is 3.6 mg/L. DOC values generally differ very little from TOC values. SUVA values range from 1.3 to 5.2 L/mg-m. The average SUVA value is 2.9.

See data in Table 17, and graphs in Appendix 9.10.

Discussion

There is insufficient data to draw meaningful conclusions about spatial or temporal trends, nor about the relationship between potential contaminant sources in the watershed and levels of organic carbon found in the water. Continued profile monitoring on a monthly basis, and frequent (e.g. monthly) monitoring in several locations throughout the reservoir and watershed would provide a more meaningful data set for these purposes.

#### 5.2.2.3.b Bromide

Drinking water limits

Bromide is not regulated in drinking water systems. However, bromide is a precursor for bromate, which has a Federal MCL of 0.010 mg/L and a MCLG of zero. Based strictly on stoichiometry, bromide levels would need to be below 0.006 mg/L to keep bromate levels below 0.010 mg/L. However, the actual relationship between bromide levels in water and bromate formation is a function of several variables, including pH, TOC levels, and ozone dose. Very little information is available in the scientific literature about this relationship. Generally speaking, however, higher levels of bromide in source water are expected to yield higher levels of bromate formation in the finished drinking water.

Monitoring conducted

Just over 500 samples have been analyzed for bromide since 2003 . Most of these were from various depths in the upper and lower levels in the water column ("epilimnion" and "hypolimnion" respectively, regardless of presence of a thermocline) beginning in 2003. Sample collection frequency has varied; most often it has been quarterly, but in some years it was monthly. Full profile sampling for bromide at consistent depths and on a consistent schedule did not begin until 2011.

Results

Bromide is found throughout the water column. Bromide values range from not detected to 0.030 mg/L, with an average value of 0.016 mg/L.

See data in Table 17, and graphs in Appendix 9.10.

Discussion

Data collected on a quarterly basis at a single location is insufficient to show spatial or temporal trends. Data collected on a monthly basis appears to show a gradual increase in the fall and a gradual decrease in the spring. However, the data set is too limited to draw definitive conclusions. Continued profile monitoring on a monthly basis would provide a more meaningful data set for interpretation for temporal trends. Monitoring at various locations around the lake is needed to determine spatial relationships.

### 5.2.2.4 Organics

#### 5.2.2.4.a NOM

See discussion of organic carbon in section 5.2.2.3.a.

#### 5.2.2.4.b Synthetic Organic Chemicals

Drinking water limits

See appendix 9.9.

Monitoring conducted

Samples for all regulated VOCs were collected at the main log boom by the dam in the upper level of the water column ("epilimnion") on a quarterly basis from late 2001 through 2010.

Additionally, as described in section 5.2.1.2.b, samples for selected VOCs were collected near the public marina at Lake Nacimiento Resort on a quarterly basis from 2009 through 2011.

Results

Some samples collected before 2004 showed low levels of MTBE. In 2004 a ban on MTBE in gasoline went into effect in California, and no MTBE has been detected in samples collected since then.

One sample collected in 2004 showed DEHP at 4.6 µg/L, which is just above the primary MCL of 4 ug/L.

No other VOCs have been detected in any other sample.

Discussion

The data set is too limited to draw any meaningful conclusions about VOC contamination in the reservoir, or about spatial or temporal trends. More frequent (e.g. monthly) monitoring at the log boom and frequent monitoring (e.g. monthly) monitoring at additional locations throughout the reservoir would provide a more meaningful data set for interpretation. An example of petroleum hydrocarbon contamination in the reservoir is shown in Figure 108.


*Photo: San Luis Obispo County Public Works Department*

**Figure 108: Fuel sheen on surface of water in a boat dock at Nacimiento Reservoir**

### 5.2.2.5 Algae

Drinking water limits

Algae is not regulated in drinking water systems. However, many constituents that derive from the presence of algae in source water are regulated, including TOC, odor, color, and turbidity. Additionally, certain algal toxins are under consideration for regulation. Generally speaking, higher levels of algae may lead to higher levels of these constituents, as well as causing other deleterious effects on drinking water systems as described above in section 5.1.2.6. Algae type, quantity, and behavior can each affect the level of concern. Typically, algae counts under 5000 no./mL are not problematic.

Monitoring conducted

Approximately 1,000 samples have been analyzed for algae. The majority of these were from various depths in the upper and lower levels in the water column (“epilimnion” and “hypolimnion” respectively, regardless of presence of a thermocline). Sporadic monitoring for algae occurred from 1993 through 2001. More consistent algae monitoring began in 2002. Full profile sampling for algae at consistent depths and on a consistent schedule did not begin until 2011.

Results

Total algae counts range from not detected to 11,000 no./mL. The average value is 249 no./mL. Green algae range as high as 10,000 no./mL, blue greens range to 4,000 no./mL, and diatoms range to 3,400 no./mL.

Algae are found throughout the water column year round. In summer months higher algae levels generally occur in the upper level of the water column. Fairly uniform and significant numbers of algae have been found throughout the water column in winter months. Different algal groups have predominated on different occasions.

See data in Table 17, and graphs in Appendix 9.10.

Discussion

Many variables can affect algal growth. Additionally, algal blooms can occur and end rapidly; samples collected at one month intervals may not capture peak growth. The data set is insufficient to describe spatial or temporal trends, nor the effect of different contaminant sources in the watershed on algae levels. The following actions may provide a more meaningful data set for interpretation: continue monthly profile monitoring at the log boom, increase monitoring frequency, collect samples from other locations in the reservoir on a regular basis, collect and evaluate other data in relationship to algae levels (nutrients, temperature, etc).

#### 5.2.2.6 Nutrients

Drinking water limits

| | |
|---|---|
| Nitrate ($NO_3$) | Primary MCL = 10 mg/L as N |
| Nitrite ($NO_2$) | Primary MCL = 1 mg/L as N |

Nitrate and nitrite are regulated due to direct health risks that they pose. These two compounds also are algal nutrients, along with other forms of nitrogen (TN, TKN, OKN, $NH_3$) and also various forms of phosphorus (total, reactive). These other nutrients are not regulated in drinking water.

The relationships between nutrient species, nutrient levels, nutrient sources, algal species, and algal levels is complex. A few very general relationships are (Wagner):

- Increased phosphorus levels can encourage algae growth
- Phosphorus levels <0.010 mg/L in a source water may help limit algae growth
- Phosphorus levels >0.100 mg/L in a source water may lead to significant algal growth

- A nitrogen-to-phosphorus (N:P) ratio of < 10 favors cyanobacterial growth
- N:P > 20 favors blue-green algal growth in winter months
- Certain N:P ratios may be associated with different nutrient sources (natural land, crops, livestock)

Monitoring conducted

Very limited nutrient monitoring has been conducted. All nutrient samples have been collected from various depths in the upper and lower levels in the water column ("epilimnion" and "hypolimnion" respectively, regardless of presence of a thermocline) at various frequencies starting in 1993. Nitrate and nitrite have most often been analyzed quarterly. Total nitrogen and total phosphorus were analyzed quarterly from 2002 through 2006, and monthly from 2008 through 2011.

Results

Nitrate levels are well below the MCL, with a maximum value of 0.84 mg/L as N, and an average value of 0.088 mg/L as N. Nitrite has only been detected on a few occasions.

Greater levels of nitrate are found in the lower level of the water column than in the upper level of the water column. Nitrite is generally undetected throughout the water column.

Total phosphorus values range from not detected to 0.34 mg/L. Total Kjeldahl nitrogen (organic nitrogen + NH3) values range from not detected to 1.6 mg/L.

See data in Table 17, and graphs in Appendix 9.10.

Discussion

Other than the limited information presented above, the data is insufficient to describe temporal or spatial relationships for any nutrient species, nor between nutrient levels and algae levels. The following actions may provide a more meaningful data set for interpretation: establish uniform depths for upper and lower water column samples, continue monitoring upper and lower water column samples monthly, collect samples from other locations in the reservoir.

### 5.2.2.7 Metals

#### 5.2.2.7.a Iron and Manganese

Drinking water limits

Iron Secondary MCL = 300 µg/L
Manganese Secondary MCL = 50 µg/L

Monitoring conducted

Over 800 samples have been collected and analyzed for iron (Fe) and manganese (Mn). Samples have been collected from various depths in the upper and lower levels in the water column ("epilimnion" and "hypolimnion" respectively, regardless of presence of a thermocline) at various frequencies, most often quarterly, starting in 1993. Full profile sampling at consistent depths did not begin until 2011.

Results

Iron is found throughout the water column. Values vary widely, ranging from 24 to 6,100 µg/L. Higher values are found in winter months than in the summer.

Manganese is also found throughout the water column. Values vary widely, ranging from not detected to 820 µg/L. Higher values are found in the fall and early winter months compared to spring and summer.

See data in Table 17, and graphs in Appendix 9.10.

Discussion

Iron and manganese levels are known to be affected by dissolved oxygen levels and temperature as well as by input from the watershed. Continued full profile monitoring at consistent depths on a monthly basis will help to evaluate these relationships and will show if amounts are changing over time. Monitoring at additional locations around the reservoir may help determine the most significant sources of iron and manganese in the reservoir.

#### 5.2.2.7.b Aluminum

Drinking water limits

Primary MCL 1,000 µg/L
Secondary MCL 200 µg/L

Monitoring conducted

Over 900 samples have been collected for aluminum. Samples were collected from various depths in the upper and lower levels in the water column (called "epilimnion" and "hypolimnion" respectively, regardless of presence of a thermocline) at various frequencies between 1997 and mid-2011. Full profile sampling at consistent depths began on a monthly basis in 2011.

Results

Aluminum is found throughout the water column. Results vary widely, ranging from not detected to 2,400 µg/L. Samples collected monthly show higher levels in winter months and lower levels in the summer. Aluminum levels appear to increase with depth.

See data in Table 17, and graphs in Appendix 9.10.

Discussion

Aluminum levels appear to experience a seasonal effect. Additional monitoring should be conducted to confirm this, and to determine aluminum's relationship to other parameters. Continued monitoring will help to show if aluminum levels are changing over time. Monitoring at additional locations around the reservoir may help determine the most significant sources of aluminum in the reservoir.

#### 5.2.2.7.c Trace metals

**Arsenic**

Drinking water limits

Primary MCL = 10 µg/L

Monitoring conducted

125 samples have been collected for arsenic analysis at various depths in the upper and lower levels of the water column (called "epilimnion" and "hypolimnion' respectively, regardless of presence of a thermocline) since 1997. Samples were collected a various frequencies, most often quarterly.

Results

Arsenic has been detected in only 12 samples collected. The maximum level detected is 3 µg/L.

Discussion

There is no meaningful evidence of arsenic contamination in the water column.

**Mercury**

Drinking water limits

Primary MCL = 2 µg/L

Monitoring conducted

As of this writing 463 samples have been collected for mercury since 1993. Approximately half of those were collected at various depths in the upper and lower levels of the reservoir (called "epilimnion" and "hypolimnion" regardless of presence of a thermocline). These samples were sometimes collected on a monthly basis, but most often on a quarterly basis. From 2008 through early 2011 profile samples were collected on a monthly basis.

Results

Mercury was detected in only one sample; mercury was not detected in the other 462 samples. In that one sample, mercury was present at a level of 0.29 µg/L, well below the MCL.

See data in Table 17, and graphs in Appendix 9.10.

Discussion

There is no meaningful evidence of mercury contamination in the water column to date.

**Other trace metals**

Drinking water limits

See Table 17 and Appendix 9.8.

Monitoring conducted

A number of samples have been collected and analyzed for other trace metals, including silver, barium, beryllium, cadmium, chromium, copper, nickel, lead, antimony, selenium, titanium, and zinc since 1993. These samples were collected at various depths in the upper and lower levels of the reservoir (called "epilimnion" and "hypolimnion" regardless of presence of a thermocline) at various intervals and frequencies.

Results

All results were either undetected, or detected at levels well below the MCLs.

See data in Table 17.

Discussion

There is no meaningful evidence of contamination by these trace metals in the water column to date.

### 5.2.2.8 Inorganic Chemicals

#### 5.2.2.8.a Asbestos

Drinking water limits

Primary MCL = 7 MFL.

Monitoring conducted

Ten samples have been collected and analyzed for asbestos since 2001. These samples were collected at various depths in the upper and lower levels of the reservoir (called "epilimnion" and "hypolimnion" regardless of presence of a thermocline) at various intervals and frequencies.

Results

| Sample Site | Collected Date | Analysis ID | Result | Units |
|---|---|---|---|---|
| EPILIMNION | 8/22/2001 | Asbestos | <0.2 | MFL |
| EPILIMNION | 2/6/2002 | Asbestos | <.2 | MFL |
| EPILIMNION | 8/13/2002 | Asbestos | <0.20 | MFL |
| EPILIMNION | 11/16/2004 | Asbestos | < 0.2 | MFL |
| EPILIMNION | 8/16/2005 | Asbestos | <0.2 | MFL |
| EPILIMNION | 8/15/2006 | Asbestos | <0.2 | MFL |
| EPILIMNION | 8/6/2007 | Asbestos | < 0.20 | MFL |
| EPILIMNION | 8/11/2008 | Asbestos | < 0.2 | MFL |
| EPILIMNION | 9/14/2009 | Asbestos | <6.2* | MFL |
| EPILIMNION | 3/9/2010 | Asbestos | <0.20 | MFL |

*matrix interference

Discussion

There is no meaningful evidence of contamination by asbestos in the water column to date.

#### 5.2.2.8.b Cyanide

Drinking water limits

Primary MCL = 150 µg/L (California)

Monitoring conducted

Seventy two samples have been collected and analyzed for cyanide starting in 1997. These samples were collected at various depths in the upper and lower levels of the reservoir (called "epilimnion" and "hypolimnion" regardless of presence of a thermocline) at various intervals and frequencies.

Results

All results were either undetected.

See data in Table 17.

Discussion

There is no meaningful evidence of cyanide contamination in the water column to date.

#### 5.2.2.8.c Fluoride

Drinking water limits

Primary MCL = 2 mg/L

Monitoring conducted

117 samples have been collected and analyzed for fluoride starting in 1993. These samples were collected at various depths in the upper and lower levels of the reservoir (called "epilimnion" and "hypolimnion" regardless of presence of a thermocline) at various intervals and frequencies.

Results

The maximum fluoride level detected was 0.28 mg/L. The average level detected was

0.14 mg/L. These values are well below the MCL.

See data in Table 17.

<u>Discussion</u>

There is no evidence of excess fluoride in the water column to date.

#### 5.2.2.9 Radiological Constituents

<u>Drinking water limits</u>

Gross alpha    Primary MCL = 15 pCi/L
Radium-228    Primary MCL = 5 pCi/L

<u>Monitoring conducted</u>

Thirty one samples were collected for gross alpha activity from 2001 through 2010. Three samples were collected for radium-228 in 2010. All samples were collected from the upper level of the water column ("epilimnion").

<u>Results</u>

Results for both gross alpha activity and radium-228 were well below MCLs. See following table.

| Sample Site | Collected Date | Units | Gross Alpha | Gross Alpha Counting Error | Radium228 | Ra228 Counting Error |
|---|---|---|---|---|---|---|
| EPILIMNION | 8/22/2001 | pCi/L | <1.00 | | | |
| EPILIMNION | 11/5/2001 | pCi/L | 1.8 | ±1.1 | | |
| EPILIMNION | 2/6/2002 | pCi/L | 1 | ±0.84 | | |
| EPILIMNION | 5/14/2002 | pCi/L | <1.00 | | | |
| EPILIMNION | 8/13/2002 | pCi/L | <1 | | | |
| EPILIMNION | 11/19/2002 | pCi/L | <1.00 | | | |
| EPILIMNION | 2/11/2003 | pCi/L | <1.00 | | | |
| EPILIMNION | 5/15/2003 | pCi/L | <1.0 | | | |
| EPILIMNION | 11/19/2003 | pCi/L | <2 | ±2 | | |
| EPILIMNION | 2/19/2004 | pCi/L | 1.1 | ±0.71 | | |
| EPILIMNION | 5/12/2004 | pCi/L | < 3.0 | | | |
| EPILIMNION | 8/10/2004 | pCi/L | < 3.00 | ± 1.2 | | |
| EPILIMNION | 11/16/2004 | pCi/L | 0.499 | ± 0.707 | | |
| EPILIMNION | 2/15/2005 | pCi/L | 0.672 | ±0.841 | | |
| EPILIMNION | 5/10/2005 | pCi/L | 0.281 | ± 0.809 | | |
| EPILIMNION | 8/16/2005 | pCi/L | <3.00 | 1.1 | | |
| EPILIMNION | 11/15/2005 | pCi/L | <3.00 | 1.1 | | |
| EPILIMNION | 2/7/2006 | pCi/L | < 3.0 | ± 1.1 | | |
| EPILIMNION | 5/8/2006 | pCi/L | <3.00 | 1.2 | | |
| EPILIMNION | 8/15/2006 | pCi/L | <3.00 | ± 0.88 | | |
| EPILIMNION | 11/7/2006 | pCi/L | < 3.00 | ± 1.1 | | |
| EPILIMNION | 2/20/2007 | pCi/L | <3.00 | 0.91 | | |
| EPILIMNION | 5/14/2007 | pCi/L | <3.00 | 1.3 | | |
| EPILIMNION | 8/6/2007 | pCi/L | < 3.00 | ± 1.2 | | |
| EPILIMNION | 11/5/2007 | pCi/L | < 3.0 | ± 1.2 | | |
| EPILIMNION | 8/11/2008 | pCi/L | < 3.00 | ± 1.4 | | |
| EPILIMNION | 8/3/2009 | pCi/L | <3.0 | ±1.4 | | |
| EPILIMNION | 11/2/2009 | pCi/L | <3 | 1 | | |
| EPILIMNION | 2/1/2010 | pCi/L | <3 | 0.52 | 0.438 | 0.36 |
| EPILIMNION | 5/3/2010 | pCi/L | <3 | 1.2 | <1 | 0.45 |
| EPILIMNION | 8/9/2010 | pCi/L | <3 | 1.5 | <1 | 0.33 |

<u>Discussion</u>

There is no evidence of radiological contamination of the water column to date.

## 5.2.2.10 Other Water Quality Constituents

### 5.2.2.10.a Alkalinity

Drinking water limits

There are no drinking water limits for alkalinity. Alkalinity is monitored because it can affect water treatment processes.

Monitoring conducted

Just over 250 samples have been collected and analyzed for alkalinity since 1993. About half of the samples were collected at various depths in the upper and lower levels of the reservoir (called "epilimnion" and "hypolimnion" regardless of presence of a thermocline), typically on a quarterly basis. Monthly profile samples collected at consistent depths starting in mid-2011 constitute the other half of the samples.

Results

Alkalinity levels range from 69 to 140 mg/L as CaCO3. The average value is 97 mg/L as CaCO3.

See data in Table 17, and graph in Appendix 9.10.

Discussion

There does not appear to be a significant difference between alkalinity found in the upper and lower levels in the water column. Alkalinity values vary from year to year. For source water assessment quarterly monitoring at consistent depths in the upper and lower levels of the water column should be sufficient for ongoing monitoring at this time. Additional monitoring may be valuable for process control.

### 5.2.2.10.b Chloride

Drinking water limits

Secondary MCLs (CDPH)

- Recommended 250 mg/L
- Upper 500 mg/L
- Short term 600 mg/L

Monitoring conducted

Over 120 samples have been collected and analyzed for chloride since 1993. All samples were collected at various depths in the upper and lower levels of the reservoir (called "epilimnion" and "hypolimnion" regardless of presence of a thermocline), generally on a quarterly basis starting in 2002.

Results

Chloride levels range from 2 to 12 mg/L. The average value is 6 mg/L.

See data in Table 17 and graph in Appendix 9.10.

Discussion

There does not appear to be a significant difference between chloride found in the upper and lower levels in the water column. Chloride values vary from year to year, but all are well below the recommended maximum level of 250 mg/L.

#### 5.2.2.10.c Dissolved Oxygen

Drinking water limits

No drinking water limits have been established for dissolved oxygen. Dissolved oxygen is monitored because of its effect on other water quality constituents.

Monitoring conducted

Well over 800 dissolved oxygen (DO) measurements have been made since 1993. Measurements have been monthly starting in 2002, and at various intervals before that. DO measurements have been taken at 5 ft. intervals starting at the top of the water column, and ending at various depths, up to a maximum of 120 ft.

Results

DO levels range from not detected to 12 mg/L. DO levels are generally highest near the beginning of the year and decline as the year progresses. The lowest values generally occur at the greatest depths at the end of the year.

Dissolved oxygen (DO) exhibits a negative heterograde curve. As the thermocline develops, dissolved oxygen is highest at the surface, then decreases through the thermocline, then rises in the hypolimnion before decreasing again.

See data in Table 17 and graph in Appendix 9.10.

Discussion

A negative heterograde pattern occurs most often when oxygen consumption from decomposition of organic matter exceeds oxygen inputs as the rate of organic matter sinking from the epilimnion is slowed upon entering the colder, denser water of the thermocline. It may also occur due to respiratory demand from large concentrations of zooplankton, and from certain lake mixing patterns. (Biodiversity Institue of Ontario) (Government of British Columbia, Ministry of Environment).

Nearly all of the data has been collected when the reservoir surface elevation has been greater than 730 ft (above MSL, NGVD29), and most of the data has been collected when the elevation has been greater than 750 ft (above MSL, NGVD29). It is not known how dissolved oxygen profiles may be affected by lower surface elevations.

#### 5.2.2.10.d Hardness

Drinking water limits

There are no drinking water limits for hardness. Hardness is monitored because it can affect drinking water system infrastructure and consumer acceptance. Generally speaking, the following guidelines apply to characterizing the hardness of water:

| Hardness (mg/L as CaCO3) | Qualitative description |
|---|---|
| < 100 | Soft |
| 100 – 200 | Ideal |
| 200 – 250 | Hard |
| > 250 | Very hard |

Monitoring conducted

Over 120 samples have been collected and analyzed for hardness since 1993. All samples were collected at various depths in the upper and lower levels of the reservoir (called “epilimnion” and “hypolimnion” regardless of presence of a thermocline), typically on a quarterly basis.

Results

Hardness levels range from 87 to 150 mg/L as CaCO3. The average value is 120 mg/L as CaCO3. There does not appear to be a significant difference between hardness found in the upper and lower levels in the water column. Hardness values can vary somewhat from year to year.

See data in Table 17 and graph in Appendix 9.10.

Discussion

Hardness generally falls within the "ideal" range and is not a concern at this time. Quarterly monitoring at consistent depths in the upper and lower levels of the water column should be sufficient for ongoing monitoring at this time.

#### 5.2.2.10.e pH

Drinking water limits

Secondary standard (federal) = 6.5 – 8.5 pH units

Monitoring conducted

Over 300 samples have been collected and analyzed for pH. Only limited, sporadic sampling occurred before 2004. Starting in 2004, samples were collected at various depths in the upper and lower levels of the reservoir (called "epilimnion" and "hypolimnion" regardless of presence of a thermocline) on a monthly basis. Partial profile sampling began in 2006 on a monthly basis. Full profile sampling at consistent depths on a monthly basis began in 2011. Most samples have been measured both in the field and in the laboratory.

Results

pH values range from 6.2 to 8.9. pH values can fluctuate across a depth profiles, but generally higher pH values are found near the upper part of the water column, and lower pH values are found at greater depths.

See data in Table 17 and graphs in Appendix 9.10.

Discussion

With very few exceptions, pH values fall within normal ranges and are not a concern at this time. However, changes in pH can indicate changes in other water quality parameters of concern, and pH can have a profound effect on other water quality parameters and treatment processes. Continued monitoring for pH is necessary to provide baseline information about water quality.

#### 5.2.2.10.f Solids

**Dissolved solids**

Drinking water limits

Secondary MCLs (CDPH)

- Recommended 500 mg/L
- Upper 1,000 mg/L
- Short term 1,500 mg/L

Monitoring conducted

Over 250 samples have been collected and analyzed for total dissolved solids (TDS) since 1993. Most samples were collected at various depths in the upper and lower levels of the reservoir (called "epilimnion" and "hypolimnion" regardless of presence of a thermocline), generally on a quarterly basis starting in 2002.

Results

Dissolved solids levels range from 130 to 306 mg/L. Most samples fall between 150 and 200 mg/L.

See data in Table 17 and graphs in Appendix 9.10.

Discussion

Dissolved solids levels fall well below the maximum recommended value and are not a concern at this time. Quarterly monitoring at consistent depths in the upper and lower levels of the water column should be sufficient for ongoing monitoring at this time.

**Suspended solids**

Drinking water limits

There are no drinking water limits for suspended solids. Suspended solids are monitored because of their potential impact on drinking water infrastructure and treatment processes.

Monitoring conducted

Suspended solids monitoring at consistent depths (profiles) began in 2011 on a monthly basis.

Results

Suspended solids values range from not detected to 18 mg/L.

See data in Table 17.

Discussion

There is insufficient data available at this time to draw any meaningful conclusions about temporal or spatial trends. Continued profile monitoring at consistent depths on a monthly basis should continue until sufficient data is available for a meaningful assessment for temporal relationships. Samples collected at several locations throughout the reservoir, especially during or immediately after storms, would be valuable to help determine sources of suspended solids.

#### 5.2.2.10.g Temperature

Drinking water limits

No drinking water limits have been established for temperature. Temperature is monitored because of its effect on water movement and the resultant impacts on water quality constituents.

Monitoring conducted

Well over 1,000 temperature measurements have been made since 1993. Measurements have been monthly starting in 2002, and at various intervals before that. Temperature measurements have been taken at 5 ft. intervals starting at the top of the water column, and ending at various depths, up to a maximum of 120 ft.

Results

Temperature measurements range from 6.8 to 27ºC. Temperatures typically are uniformly low, typically around 10ºC, throughout the water column in January. Early in the year the lake surface begins to warm, increasing through the summer months, while temperatures at greater depths remain near 10ºC, thus creating a strong thermocline. Starting in September surface temperatures gradually fall, until uniform temperatures are again seen throughout the water column in December.

See data in Table 17 and graph in Appendix 9.10.

Discussion

Nearly all of the data has been collected when the reservoir surface elevation has been greater than 730 ft (above MSL, NGVD29), and most of the data has been collected when the elevation has been greater than 750 ft (above MSL, NGVD29). It is not known how temperature profiles may be affected by lower surface elevations.

Temperature can have a profound effect on other water quality parameters. The strong thermocline that develops leads to differences in water quality above and below the thermocline. Water quality throughout the water column changes when temperatures become uniform in the winter, which causes mixing of the water from top to bottom.

## Table 17: Summary of selected Nacimiento Reservoir Water Quality Data

| Samples collected at various depths at log boom by dam, 1993-2011 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Algae** | **Units** | **Min(1)** | **Max(2)** | **Median(3)** | **Mean(3)** | **n** | **DLR** | **1º MCL** | **2ºMCL** | **PHG** |
| Total Algae | no./mL | 0 | 11,000 | 86 | 249 | 1,004 | | | | |
| Blue Greens | no./mL | 0 | 4,000 | 0 | 30 | 1,004 | | | | |
| Diatoms | no./mL | 0 | 3,400 | 18 | 68 | 1,004 | | | | |
| Flagellates | no./mL | 0 | 640 | 0 | 9 | 1,004 | | | | |
| Greens | no./mL | 0 | 10,000 | 36 | 141 | 1,004 | | | | |
| **Coliforms** | **Units** | **Min(1)** | **Max(2)** | **Median(3)** | **Mean(3)** | **n** | **DLR** | **1º MCL** | **2ºMCL** | **PHG** |
| Total coliforms | MPN/100 mL | 0 | 77,000 | 220 | 1,300 | 635 | | 5% or 1(4) | | |
| E. coli | MPN/100 mL | 0 | 170 | 0 | 2 | 635 | | 1 repeat(4) | | |
| **Crypto/Giardia** | **Units** | **Min(1)** | **Max(2)** | **Median(3)** | **Mean(3)** | **n** | **DLR** | **1º MCL** | **2ºMCL** | **PHG** |
| Crypto/Giardia | orgs/L | 0 | 0 | 0 | 0 | 11 | | | | |
| **Nutrients** | **Units** | **Min(1)** | **Max(2)** | **Median(3)** | **Mean(3)** | **n** | **DLR** | **1º MCL** | **2ºMCL** | **PHG** |
| NH3-N | mg/L | 0 | 0.22 | 0.00 | 0.01 | 63 | | | | |
| NO2-N | µg/L | 0 | 13 | 0.00 | 0.22 | 159 | 400 | 1,000 | | |
| NO3-N | µg/L | 0 | 844 | 0.00 | 88 | 167 | 450 | 10,000 | | |
| NO3 | mg/L | 0 | 3.74 | 0.00 | 0.39 | 167 | | | | |
| OKN | mg/L | 0 | 0.00 | 0.00 | 0.00 | 29 | | | | |
| TKN | mg/L | 0 | 1.60 | 0.29 | 0.30 | 164 | | | | |
| Reactive Si | mg/L | 7 | 18 | 12 | 12 | 353 | | | | |
| PO4-P (total) | mg/L | 0 | 0.34 | 0.00 | 0.02 | 195 | | | | |
| PO4-P-ortho (reactive P) | mg/L | 0 | 0.06 | 0.01 | 0.02 | 36 | | | | |

| DBP Precursors | Units | Min[1] | Max[2] | Median[3] | Mean[3] | n | DLR | 1º MCL | 2ºMCL | PHG |
|---|---|---|---|---|---|---|---|---|---|---|
| Bromide | mg/L | 0.000 | 0.030 | 0.016 | 0.016 | 535 | | | | |
| TOC | mg/L | 2.6 | 6.4 | 3.4 | 3.6 | 793 | | | | |
| DOC | mg/L | 2.7 | 6.0 | 3.5 | 3.7 | 102 | | | | |
| UV254 | 1/cm | 0.041 | 0.199 | 0.097 | 0.107 | 102 | | | | |
| SUVA | L/mg-m | 1.3 | 5.2 | 3.0 | 2.9 | 72 | | | | |

| General Minerals | Units | Min[1] | Max[2] | Median[3] | Mean[3] | n | DLR | 1º MCL | 2ºMCL | PHG |
|---|---|---|---|---|---|---|---|---|---|---|
| Aggressive Index | --- | 11 | 13 | 12 | 12 | 90 | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 69 | 140 | 97 | 97 | 254 | | | | |
| Ca | mg/L | 19 | 38 | 27 | 27 | 127 | | | | |
| Cl | mg/L | 2 | 12 | 6 | 6 | 125 | | | 250 | |
| CO3 | mg/L | 0 | 20 | 0 | 1 | 125 | | | | |
| Cu | µg/L | 0 | 27 | 0 | 2 | 141 | 50 | 1,300 (AL) | 1,000 | 300 |
| EC | µmhos/cm | 180 | 380 | 270 | 269 | 121 | | | 900 | |
| Fe | µg/L | 24 | 6,100 | 155 | 291 | 864 | | | 300 | |
| Hardness, total (as CaCO3) | mg/L | 84 | 150 | 120 | 119 | 125 | | | | |
| HCO3 | mg/L | 70 | 140 | 100 | 102 | 125 | | | | |
| Langelier Index | --- | -1.5 | 0.8 | -0.5 | 0 | 127 | | | | |
| MBAS | mg/L | 0 | 0 | 0 | 0 | 123 | | | 0.5 | |
| Mg | µg/L | 8 | 20 | 12 | 13 | 125 | | | | |
| Mn | µg/L | 0 | 820 | 12 | 39 | 864 | | | 50 | |
| Na | mg/L | 6 | 11 | 8 | 8 | 125 | | | | |
| NO2-N | µg/L | 0 | 13 | 0 | 0 | 159 | 400 | 1,000 | | 1,000 |
| NO3-N | µg/L | 0 | 844 | 0 | 88 | 167 | 450 | 10,000 | | 10,000 |
| OH | mg/L | 0 | 0 | 0 | 0 | 125 | | | | |
| SO4 | mg/L | 5 | 39 | 29 | 29 | 125 | | | 250 | |
| TDS | mg/L | 130 | 306 | 170 | 173 | 254 | | | 500 | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Zn | µg/L | 0 | 57 | 0 | 3 | 141 | | | | |
| **Inorganics** | **Units** | **Min(1)** | **Max(2)** | **Median(3)** | **Mean(3)** | **n** | **DLR** | **1º MCL** | **2ºMCL** | **PHG** |
| Ag | µg/L | 0 | 0.58 | 0 | 0 | 125 | --- | --- | 100 | --- |
| Al - total | µg/L | 0 | 2,400 | 72 | 168 | 931 | 50 | 1,000 | 200 | 600 |
| Al - dissolved | µg/L | 0 | 160 | 0 | 20 | 244 | | | | |
| As | µg/L | 0 | 3.00 | 0 | 0.18 | 125 | 3 | 10 | | 0.004 |
| Asbestos | MFL | 0 | 0 | 0 | 0 | 10 | 0.2 | 7 | | 7 |
| Ba | µg/L | 0 | 60 | 38 | 39 | 109 | 100 | 1,000 | | 2 |
| Be | µg/L | 0 | 0 | 0 | 0 | 81 | 1 | 4 | | 1 |
| Cd | µg/L | 0 | 0.53 | 0 | 0.01 | 109 | 1 | 5 | | 0.04 |
| CN | µg/L | 0 | 0 | 0 | 0 | 72 | 100 | 150 | | 150 |
| Cr | µg/L | 0 | 4.10 | 0 | 0.54 | 109 | 10 | 50 | | --- |
| F | mg/L | 0 | 0.28 | 0.14 | 0.14 | 117 | 0.1 | 2 | | 1 |
| Hg | µg/L | 0 | 0.29 | 0 | 0 | 463 | 1 | 2 | | 1.2 |
| Ni | µg/L | 0 | 6.90 | 0 | 0.71 | 101 | 10 | 100 | | 12 |
| NO3-N | µg/L | 0 | 844 | 0 | 88 | 167 | 450 | 10,000 | | 10,000 |
| Pb | µg/L | 0 | 4.20 | 0 | 0.15 | 109 | 5 | 15 (AL) | | 0.001 |
| Perchlorate | µg/L | 0 | 0 | 0 | 0 | 12 | 4 | 6 | | 6 |
| Sb | µg/L | 0 | 0 | 0 | 0 | 81 | 6 | 6 | | 20 |
| Se | µg/L | 0 | 0 | 0 | 0 | 109 | 5 | 50 | | 30 |
| Tl | µg/L | 0 | 0 | 0 | 0 | 81 | 1 | 2 | | 0.1 |
| **Physicals** | **Units** | **Min(1)** | **Max(2)** | **Median(3)** | **Mean(3)** | **n** | **DLR** | **1º MCL** | **2ºMCL** | **PHG** |
| Apparent Color | C.U. | 4.0 | 55 | 15 | 17 | 264 | | | 15 | |
| Odor | TON | 0 | 30 | 3 | 3 | 1,010 | | | 3 | |
| True Color | CU | 0.0 | 37 | 8 | 10 | 989 | | | | |
| Turb | NTU | 0.5 | 44 | 3 | 5 | 966 | | | 5 | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Settleable solids | mg/L | 0 | 0 | 0 | 0 | 17 | | | | |
| Suspended Solids | mg/L | 0 | 18 | 1 | 2 | 178 | | | | |
| Depth | ft | 2.0 | 140 | 44 | 48 | 1,083 | | | | |
| DO | mg/L | 0 | 12 | 6 | 6 | 864 | | | | |
| Temp | ºC | 6.8 | 27 | 12 | 14 | 1,107 | | | | |
| pH (lab) | --- | 7.0 | 8.9 | 7.7 | 7.8 | 340 | | | | |
| pH (field) | --- | 6.2 | 8.9 | 7.6 | 7.6 | 1,047 | | | | |

| **Radiologicals** | **Units** | **Min(1)** | **Max(2)** | **Median(3)** | **Mean(3)** | **n** | **DLR** | **1º MCL** | **2ºMCL** | **PHG** |
|---|---|---|---|---|---|---|---|---|---|---|
| GrossA | pCi/L | 0 | 1.8 | 0 | 0 | 31 | 3 | 15 | | |
| Ra228 | pCi/L | 0 | 0 | 0 | 0 | 3 | 1 | 5 (w/Ra226) | | 19 |

| **VOCs/SOCs** | **Units** | **Min(1)** | **Max(2)** | **Median(3)** | **Mean(3)** | **n** | **DLR** | **1º MCL** | **2ºMCL** | **PHG** |
|---|---|---|---|---|---|---|---|---|---|---|
| Atrazine | µg/L | 0 | 0 | 0 | 0 | 8 | 0.5 | 1 | | 0.15 |
| Benzo(a)pyrene | µg/L | 0 | 0 | 0 | 0 | 2 | 0.1 | 0.2 | | 0.004 |
| Chlordane | µg/L | 0 | 0 | 0 | 0 | 4 | 0.1 | 0.1 | | 0.03 |
| DBCP | µg/L | 0 | 0 | 0 | 0 | 4 | 0.01 | 0.2 | | 0.0017 |
| DEHA | µg/L | 0 | 0 | 0 | 0 | 3 | 5 | 400 | | 200 |
| DEHP | µg/L | 0 | 5 | 0 | 1 | 7 | 3 | 4 | | 12 |
| EDB | µg/L | 0 | 0 | 0 | 0 | 4 | 0.02 | 0.05 | | 0.01 |
| Endrin | µg/L | 0 | 0 | 0 | 0 | 4 | 0.1 | 2 | | 1.8 |
| Hexachlorobenzene | µg/L | 0 | 0 | 0 | 0 | 3 | 0.5 | 1 | | 0.03 |
| Heptachlor | µg/L | 0 | 0 | 0 | 0 | 3 | 0.01 | 0.01 | | 0.008 |
| Heptachlor epoxide | µg/L | 0 | 0 | 0 | 0 | 4 | 0.01 | 0.01 | | 0.006 |
| Hexachlorocyclopentadiene | µg/L | 0 | 0 | 0 | 0 | 3 | 1 | 50 | | 50 |
| Methoxychlor | µg/L | 0 | 0 | 0 | 0 | 4 | 10 | 30 | | 30 |
| MTBE | µg/L | 0 | 14 | 0 | 3 | 8 | 3 | 13 | 5 | 13 |
| Picloram | µg/L | 0 | 0 | 0 | 0 | 4 | 1 | 500 | | 500 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Phenol | µg/L | N/A | N/A | N/A | N/A | N/A | N/A | --- | --- | --- |
| Simazine | µg/L | 0 | 0 | 0 | 0 | 2 | 1 | 4 | | 4 |
| SOC | pkg | | | | | | | --- | | |
| VOC | pkg | | | | | | | --- | | |

***Notes***

*<u>1. Minimum values - reporting</u> Detection limits frequently vary depending on the lab and the method used. However, all are ≤ the DLR for that constituent. Results reported by a lab as "less than" a detection limit were reported on this summary as zero. For example, a result reported by a lab as "< 5" was reported as 0 in this summary.*

*<u>2. Maximum values - reporting</u> Results reported by a lab as "greater than" some value were reported on this summary as the maximum known value. For example, a result reported by a lab as " > 24,000" was reported as 24,000 on this summary*

*<u>3. Calculations</u>*

*<u>Minimum values</u> Results reported by a lab as "less than" a detection limit were all converted to zero for use in calculations. For example, a result reported as "< 5" was converted to 0 for use in calculations.*

*<u>Maximum values</u> Results reported by a lab as "greater than" some value were converted to the maximum known value for use in calculations. For example, a result reported as " > 24,000" was converted to 24,000 for use in calculations*

*<u>4. California Code of Regulations Section Title 22 Section 64426.1</u>*

*(b) A public water system is in violation of the total coliform MCL when any of the following occurs:*

*(1) For a public water system which collects at least 40 samples, per month, more than 5.0 percent of the samples collected during any month are total coliform-positive; or*

*(2) For a public water system which collects fewer than 40 samples per month, more than one sample collected during any month is total coliform-positive; or*

*(3) Any repeat sample is fecal coliform-positive or E. coli-positive; or*

*(4) Any repeat sample following a fecal coliform-positive or E. coli-positive routine sample is total coliform-positive.*

#### 5.2.2.11 Invasive Mussels

As of this writing invasive mussels have not been detected in Nacimiento Reservoir.

## 5.3 Evaluation of Ability to Meet Surface Water Treatment Rule Requirements

As described above in section 2.2.2, as of this writing only one agency, the City of San Luis Obispo, currently uses Nacimiento Project water as a source for a surface water treatment plant (WTP). The City of Paso Robles is currently designing a WTP that will be built for the purpose of treating Nacimiento Project water starting in approximately 2015-16.

**City of San Luis Obispo**

The City of San Luis Obispo's WTP was built in 1964 to treat surface water from two other reservoirs in the area (Salinas Reservoir and Whale Rock Reservoir). The WTP has been upgraded three times since it was built (in 1977, 1994, 2008) to increase capacity and to improve plant operations and performance in order to ensure compliance with increasingly stringent surface water treatment regulations that have been adopted over the years. The most recent upgrade was done specifically in anticipation of receiving Nacimiento Project Water.

The City's WTP is a conventional plant with a capacity of 16.0 MGD. It uses the following processes:

- Primary disinfection (ozone)
- Coagulation
- Ballasted flocculation (includes settling)
- Filtration (anthracite, sand)
- Final disinfection (free chlorine)

The City operates its WTP to meet all requirements, including SWTR requirements, under its CDPH Water Permit No. 04-06-07P006. This includes Nacimiento Project water along with its two other approved surface water sources (Salinas Reservoir and Whale Rock Reservoir). The WTP is designed and operated to achieve a minimum 99.9% (3-log) reduction/inactivation of Giardia cysts and 99.99% (4-log) reduction/inactivation of viruses.

**City of Paso Robles**

The City of Paso Robles' WTP is currently in the design phase. According to the current schedule, construction should be complete and the WTP may begin operating in FY 2015/16. The WTP will be a conventional plant with an initial capacity of 2.4 MGD. The City plans to add an additional 4 MGD of treatment capacity by FY 2021/22, for a total treatment capacity of 6.4 MGD. The planned design includes the following processes:

- Preliminary oxidation (permanganate)

- Coagulation/flocculation
- Dissolved air flotation
- Membrane filtration
- Final disinfection (free chlorine)
- Baffled clearwell

The WTP is being designed to meet all regulatory requirements for surface water treatment, including the SWTR. The membranes will provide 4-log removal of *Giardia* and *Cryptosporidium* and 0.5-log removal of viruses. The clearwell will provide sufficient disinfectant contact time to achieve 0.5-log *Giardia* inactivation and 3.5-log virus inactivation. DBP formation will be controlled by an anticipated 25% TOC removal, optional use of activated carbon (GAC), and optional blending with well water.

## 5.4 Recommended Water Quality Monitoring Program

As noted in section 5.2.1, none of the water quality monitoring that has been done to date is adequate to provide a meaningful assessment of the impacts of contaminant sources in the watershed. Given the large number of potentially significant sources of contamination in the watershed and the reservoir's complex hydrology, a comprehensive long term monitoring program is needed to adequately assess these impacts. A basic framework for a recommended water quality program is presented in Table 18.

Unfortunately, several factors make implementation of such a program unlikely, including the following:

- Limited access to many proposed sample sites
- Limited staff availability
- Limited budget

Therefore a minimal water quality monitoring program is proposed for implementation at this time, as shown in Table 19. Proposed sample sites are shown in Figure 109. Should additional resources become available to expand the monitoring program, then at that time the recommended monitoring program should be reviewed and refined as necessary to account for priorities, changes in conditions, ability to distinguish among potential contaminant sources, and other relevant factors.

Both the recommended monitoring program and the proposed monitoring program may include additional parameters that are not shown here (e.g. speciation of some constituents, standard parameters such as temperature, dissolved oxygen, pH, etc).

The proposed monitoring program is designed to meet the following goals:

- Minimize costs
- Provide baseline spatial and temporal information about reservoir water quality in relationship to highest priority potential contaminant sources (body contact recreation, grazing, domestic wastewater)
- Provide baseline spatial and temporal information about reservoir water quality data in relationship to other potential contaminant sources and background water quality
- Provide consumer confidence information about mercury levels.
- Provide the maximum amount of information with the fewest number of analyses

Notes

- The program may be revised at any time as needed based on changing conditions in the watershed and/or results of evaluating the data
- Drastic changes in reservoir surface level or other conditions may warrant an

extended monitoring period for adequate characterization of potential contaminant sources' influence on water quality.

**Table 18: Framework for Recommended Water Quality Monitoring Program**

| FRAMEWORK FOR RECOMMENDED WATER QUALITY MONITORING PROGRAM | | | | | | |
|---|---|---|---|---|---|---|
| **Potential Contaminant Source (PCS)** | **Location(s)** | **Concern** | **Constituent(s)** | **Background site(s)** | **Site(s) downstream of PCS** | **Frequency** |
| Agricultural crop Land | Primarily Las Tablas Ck subwatershed | • DBP precursors<br>• Nutrients<br>• Solids<br>• VOCs, SOCs | • TOC<br>• Nitrogen, phosphorus<br>• Turbidity, suspended solids<br>• VOCs, SOCs | Uppermost reach of Las Tablas Ck | Just downstream of last winery on Las Tablas Ck | During first 3 significant rainstorms each season |
| Geologic hazards - earthquakes | Anywhere in watershed is possible | • DBP precursors<br>• Metals<br>• Nutrients<br>• Pathogens<br>• Solids | • TOC, bromide<br>• General minerals suite, Inorganics suite<br>• Nitrogen, phosphorus<br>• Total coliforms, *E. coli, Cryptosporidium, Giardia*<br>• Turbidity, suspended solids | To be determined based on location of incident. | To be determined based on location of incident. | To be determined based on location and severity of incident. |
| Geologic hazards - landslides | Anywhere in watershed is possible | • Metals<br>• Solids | • General minerals suite, Inorganics suite<br>• Turbidity, suspended solids | To be determined based on location of incident. | To be determined based on location of incident. | To be determined based on location and severity of incident. |
| Grazing animals | Throughout lower watershed | • Algae<br>• DBP precursors<br>• Nutrients<br>• Pathogens<br>• Solids | • Algae<br>• TOC<br>• Nitrogen, phosphorus<br>• Total coliforms, *E. coli, Cryptosporidium, Giardia*<br>• Turbidity, suspended solids | Just upstream of grazed areas on all major creeks | Just downstream of grazed areas on all major creeks | During first 3 significant rainstorms each season |
| Hazardous materials | Throughout watershed, especially lower watershed | • SOCs<br>• VOCs | • SOCs<br>• VOCs | • Snake Ck upstream of Heritage Ranch<br>• Uppermost reach of Las Tablas Ck<br>• Franklin Ck and Town Ck upstream of Lime Mtn<br>• Nacimiento River upstream of westernmost house (the Narrows)<br>• Nacimiento Reservoir just upstream of Lake Nacimiento Resort | • Snake Ck downstream of Heritage Ranch<br>• Las Tablas Ck just upstream of confluence with Franklin Ck<br>• Franklin Ck just upstream of confluence with Las Tablas Ck<br>• Town Ck just upstream of confluence with Franklin Ck<br>• Oak Shores cove<br>• Nacimiento Reservoir just downstream of Lake Nacimiento Resort | During first 3 significant rainstorms each season |
| Industrial area runoff - military facilities | Upper watershed (Fort Hunter Liggett) | • Metals<br>• Nutrients<br>• Pathogens<br>• Solids<br>• VOCs, SOCs | • General minerals suite, Inorganics suite<br>• Nitrogen, phosphorus<br>• Total coliforms, *E. coli, Cryptosporidium, Giardia*<br>• Turbidity, suspended solids<br>• VOCs, SOCs | Nacimiento River just upstream of Fort Hunter Liggett | Nacimiento River just downstream of Fort Hunter Liggett | During first 3 significant rainstorms each season |

**FRAMEWORK FOR RECOMMENDED WATER QUALITY MONITORING PROGRAM**

| Potential Contaminant Source (PCS) | Location(s) | Concern | Constituent(s) | Background site(s) | Site(s) downstream of PCS | Frequency |
|---|---|---|---|---|---|---|
| Industrial area runoff - mines | Lower watershed, especially:<br>• Town Ck subwatershed<br>• Franklin Ck subwatershed<br>• Las Tablas Ck subwatershed | • Mercury<br>• Other metals<br>• pH<br>• Solids | • Mercury<br>• Arsenic, thallium<br>• pH<br>• Turbidity, suspended solids | • Town Ck, Franklin Ck just upstream of Lime Mtn<br>• Las Tablas Ck just upstream of K/BV mines site | • Town Ck, Franklin Ck just downstream of Lime Mtn<br>• Las Tablas Ck just downstream of K/BV mines site | During first 3 significant rainstorms each season |
| Industrial area runoff - wineries | Primarily Las Tablas Ck subwatershed | • Nutrients<br>• DBP precursors<br>• Solids | • Nitrogen, phosphorus<br>• TOC<br>• Turbidity, suspended solids | Uppermost reach of Las Tablas Ck | Just downstream of last winery on Las Tablas Ck | During first 3 significant rainstorms each season |
| Natural environment | Throughout watershed | • DBP precursors<br>• Metals | • TOC, bromide<br>• General minerals suite, Inorganics suite | Uppermost reach of each tributary to Nacimiento Reservoir and Nacimiento River | At point where each tributary enters Nacimiento Reservoir and Nacimiento River | During first 3 significant rainstorms each season |
| Pesticides/Herbicides | Throughout watershed, especially:<br>• Developed communities on lake shore<br>• Cropland in Las Tables Creek watershed<br>• Fort Hunter Liggett<br>• Marijuana grow sites in furthest reaches of watershed (upper & lower) | • VOCs, SOCs | • VOCs, SOCs | See:<br>• Agricultural crop land<br>• Industrial area runoff – military facilities<br>• Urban runoff | See:<br>• Agricultural crop land<br>• Industrial area runoff – military facilities<br>• Urban runoff | See:<br>• Agricultural crop land<br>• Industrial area runoff – military facilities<br>• Urban runoff |
| Recreational use - body contact | Everywhere on Nacimiento Reservoir | • Algae<br>• Nutrients<br>• Pathogens | • Algae<br>• Nitrogen, phosphorus<br>• Total coliforms, *E. coli, Cryptosporidium, Giardia* | Uppermost reach of Nacimiento Reservoir ("The Narrows") | Several locations throughout reservoir from west to east | Monthly |
| Recreational use - vessels | Everywhere on Nacimiento Reservoir. | • Invasive species<br>• VOCs | • Quagga mussels, zebra mussels<br>• VOCs | Uppermost reach of Nacimiento Reservoir ("The Narrows") | Several locations throughout reservoir from west to east | Monthly |
| Traffic accidents/spills | Lower watershed is most likely. | To be determined based on nature of incident; may include:<br>• DBP precursors<br>• Nutrients<br>• Pathogens<br>• VOCs, SOCs | To be determined based on nature of incident; may include:<br>• TOC<br>• Nitrogen, phosphorus<br>• Total coliforms, *E. coli, Cryptosporidium, Giardia*<br>• VOCs, SOCs | To be determined based on location of incident. | To be determined based on location of incident. | To be determined based on location, nature, and severity of incident. |

**FRAMEWORK FOR RECOMMENDED WATER QUALITY MONITORING PROGRAM**

| Potential Contaminant Source (PCS) | Location(s) | Concern | Constituent(s) | Background site(s) | Site(s) downstream of PCS | Frequency |
|---|---|---|---|---|---|---|
| Unauthorized activity - grow sites | Remote areas that have a road nearby. | • Algae<br>• DBP precursors<br>• Nutrients<br>• Pathogens<br>• Solids<br>• VOCs, SOCs | • Algae<br>• TOC<br>• Nitrogen, phosphorus<br>• Total coliforms, *E. coli, Cryptosporidium, Giardia*<br>• Turbidity, suspended solids<br>• VOCs, SOCs | Uppermost reaches of<br>• Nacimiento River<br>• Major creeks west of Las Tablas Ck | • Nacimiento River at northernmost boundary of FHL<br>• Where each major creek enters Nacimiento Reservoir | During first 3 significant rainstorms each season |
| Urban runoff | Around most of lake shore, especially Lake Nacimiento Resort and communities of Heritage Ranch and Oak Shores | • Algae<br>• DBP precursors<br>• Nutrients<br>• Pathogens<br>• Metals<br>• Solids<br>• VOCs, SOCs | • Algae<br>• TOC<br>• Nitrogen, phosphorus<br>• Total coliforms, *E. coli, Cryptosporidium, Giardia*<br>• General minerals suite, Inorganics suite<br>• Turbidity, suspended solids<br>• VOCs, SOCs | Nacimiento River upstream of Asbury Ck | Several locations throughout reservoir from west to east, especially upstream and downstream of Oak Shores, Heritage Ranch, and Lake Nacimiento Resort | During first 3 significant rainstorms each season |
| Wastewater - domestic | All around lake shore | • DBP precursors<br>• Nutrients<br>• Pathogens | • TOC<br>• Nitrogen, phosphorus<br>• Total coliforms, *E. coli, Cryptosporidium, Giardia* | Uppermost reach of Nacimiento Reservoir ("The Narrows") | Several locations throughout reservoir from west to east, especially upstream and downstream of Oak Shores, Heritage Ranch, and Lake Nacimiento Resort | During first 3 significant rainstorms each season |
| Wastewater – industrial (wineries) | Primarily Las Tablas Ck subwatershed | • DBP precursors<br>• Nutrients | • TOC<br>• Nitrogen, phosphorus | Uppermost reach of Las Tablas Ck | Just downstream of last winery on Las Tablas Ck | During first 3 significant rainstorms each season |
| Wild animals | Throughout watershed | • DBP precursors<br>• Nutrients<br>• Pathogens | • TOC<br>• Nitrogen, phosphorus<br>• Total coliforms, E. coli | Uppermost reach of each tributary to Nacimiento Reservoir and Nacimiento River | At point where each tributary enters Nacimiento Reservoir and Nacimiento River | During first 3 significant rainstorms each season |
| Wildland fire | Anywhere in watershed is possible | • Cyanide<br>• DBP precursors<br>• Metals<br>• Nutrients<br>• Solids<br>• VOCs, SOCs | • Cyanide<br>• TOC<br>• General minerals suite, Inorganics suite<br>• Nitrogen, phosphorus<br>• Turbidity, suspended solids<br>• VOCs, SOCs | To be determined based on location of incident. | To be determined based on location of incident. | To be determined based on location and severity of incident. |

## Table 19: Proposed Minimum Water Quality Program

| PROPOSED MINIMUM WATER QUALITY MONITORING PROGRAM | | | | | | |
|---|---|---|---|---|---|---|
| **Potential Contaminant Source (PCS)** | **Location(s)** | **Concern** | **Constituent(s)** | **Background site(s)** | **Site(s) downstream of PCS** | **Frequency** |
| Agricultural crop Land | Primarily Las Tablas Ck subwatershed | • Nutrients<br>• Solids | • Nitrogen, phosphorus<br>• Turbidity | Not feasible | Entrance of Las Tablas Creek arm to main part of reservoir | Monthly |
| Grazing animals | Throughout lower watershed | • Algae<br>• Nutrients<br>• Pathogens<br>• Solids | • Algae<br>• Nitrogen, phosphorus<br>• Total coliforms, *E. coli, Cryptosporidium, Giardia*<br>• Turbidity | Not feasible | • Just upstream of Asbury Creek<br>• Oak Shores marina<br>• Entrance of Las Tablas Creek arm to main part of reservoir<br>• Entrance of Dip Creek arm to main part of reservoir<br>• Heritage Ranch marina<br>• Lake Nacimiento Resort marina<br>• Main log boom by dam | Monthly |
| Industrial area runoff - military facilities | Upper watershed (Fort Hunter Liggett) | • Metals<br>• Nutrients<br>• Pathogens | • General minerals suite, Inorganics suite<br>• Nitrogen, phosphorus<br>• Total coliforms, *E. coli,* Turbidity | Not feasible | Main log boom by dam | Quarterly |
| Industrial area runoff - mines | Las Tablas Ck subwatershed | • Mercury<br>• Arsenic, thallium<br>• pH<br>• Turbidity | • Mercury<br>• Arsenic, thallium<br>• pH<br>• Turbidity | Not feasible | Main log boom by dam | Quarterly |
| | | • Mercury | • Mercury | Not feasible | Intake in use | Monthly |
| | Town Ck subwatershed<br>Franklin Ck subwatershed | Solids | Turbidity | Not feasible | At entrance of Las Tablas Creek to Nacimiento Reservoir | Monthly |
| Industrial area runoff - wineries | Primarily Las Tablas Ck subwatershed | • Nutrients<br>• Solids | • Nitrogen, phosphorus<br>• Turbidity | Not feasible | At entrance of Las Tablas Creek to Nacimiento Reservoir | Monthly |
| Natural environment | Throughout watershed | • DBP precursors<br>• Metals<br>• Alkalinity<br>• Solids | • TOC, bromide<br>• General minerals suite, Inorganics suite<br>• Alkalinity<br>• Turbidity | Not feasible | Main log boom by dam | Quarterly |

**PROPOSED MINIMUM WATER QUALITY MONITORING PROGRAM**

| Potential Contaminant Source (PCS) | Location(s) | Concern | Constituent(s) | Background site(s) | Site(s) downstream of PCS | Frequency |
|---|---|---|---|---|---|---|
| Recreational use - body contact | Everywhere on Nacimiento Reservoir | • Algae<br>• Nutrients<br>• Pathogens | • Algae<br>• Nitrogen, phosphorus<br>• Total coliforms, *E. coli,* | • Uppermost reach of Nacimiento Reservoir ("The Narrows")<br>• Uppermost reach of Las Tablas Creek | • Just upstream of Asbury Creek<br>• Oak Shores marina<br>• Entrance of Las Tablas Creek arm to main part of reservoir<br>• Entrance of Dip Creek arm to main part of reservoir<br>• Heritage Ranch marina<br>• Lake Nacimiento Resort marina<br>• Main log boom by dam | Monthly |
| Recreational use - vessels | Everywhere on Nacimiento Reservoir | • Invasive species | • Quagga mussels, zebra mussels | Not applicable | • Oak Shores marina<br>• Heritage Ranch marina<br>• Lake Nacimiento Resort marina<br>• Main log boom by dam | Monthly |
| Unauthorized activity - grow sites | Remote areas that have a road nearby | • Algae<br>• Nutrients<br>• Pathogens<br>• Solids | • Algae<br>• Nitrogen, phosphorus<br>• Total coliforms, *E. coli,*<br>• Turbidity | Not feasible | • Uppermost reach of Nacimiento Reservoir<br>• Entrance of Las Tablas Creek arm to main part of reservoir | Monthly |
| Urban runoff | Around most of lake shore, especially Lake Nacimiento Resort and communities of Heritage Ranch and Oak Shores. | • Algae<br>• DBP precursors<br>• Nutrients<br>• Pathogens<br>• Metals<br>• Solids | • Algae<br>• TOC<br>• Nitrogen, phosphorus<br>• Total coliforms, *E. coli,*<br>• General minerals suite, Inorganics suite<br>• Turbidity | Nacimiento River upstream of Asbury Ck | Main log boom by dam | Quarterly |
| Wastewater - domestic | All around lake shore. | • Nutrients<br>• Pathogens | • Nitrogen, phosphorus<br>• Total coliforms, *E. coli,* | Nacimiento River upstream of Asbury Ck | • Oak Shores marina<br>• Heritage Ranch marina<br>• Lake Nacimiento Resort marina<br>• Main log boom by dam | Monthly |
| Wastewater – industrial (wineries) | Primarily Las Tablas Ck subwatershed | • Nutrients | • Nitrogen, phosphorus | Not feasible | Main log boom by dam | Quarterly |

Notes:
- Samples to be collected at a uniform depth of 10 feet below the reservoir surface.
- Nutrients should be speciated in order to provide information about their origin.

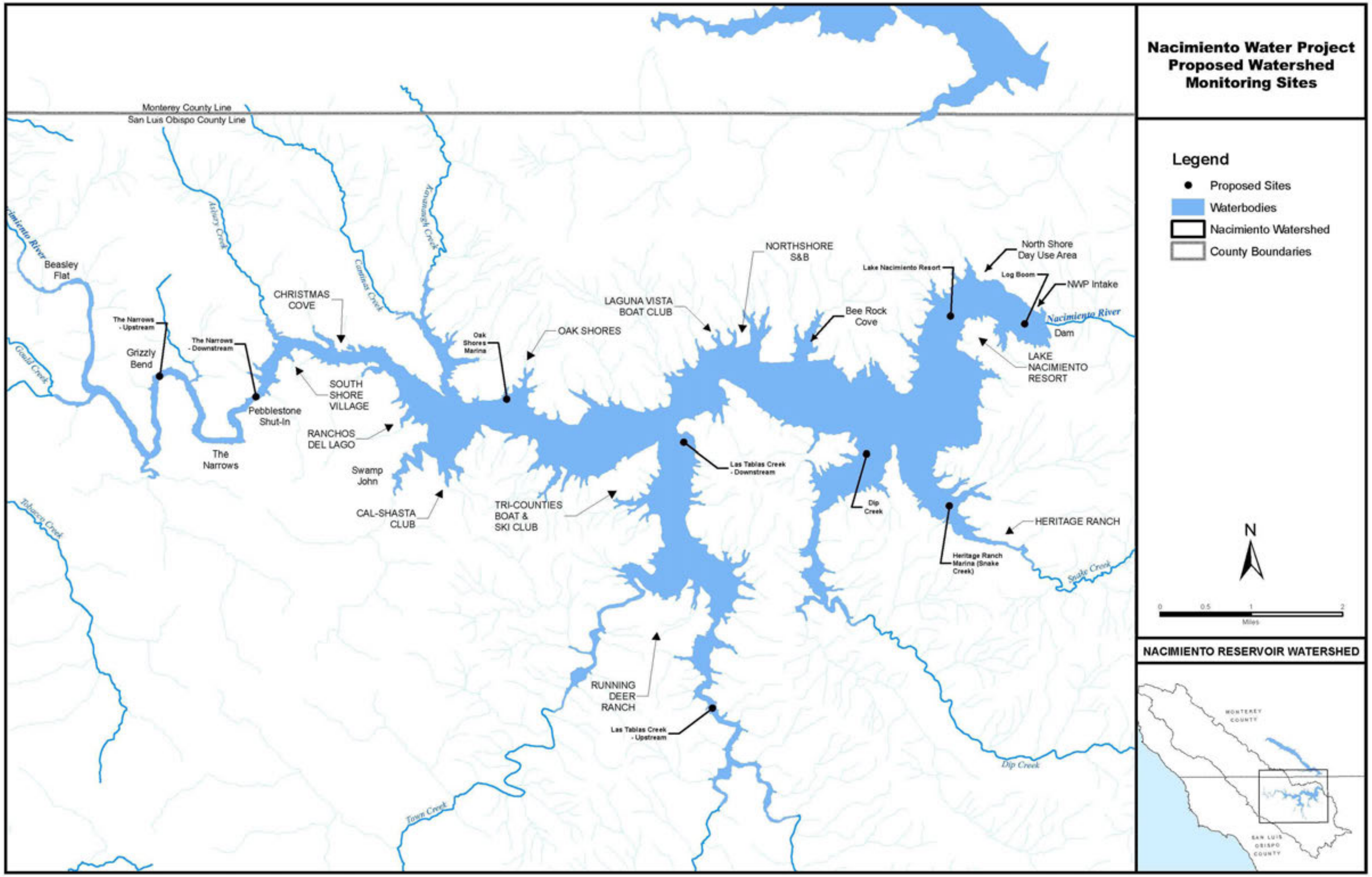



**Figure 109: Nacimiento Water Project Proposed Watershed Monitoring Sites**

# 6 CONCLUSIONS AND RECOMMENDATIONS

## 6.1 CONCLUSIONS

The Nacimiento Reservoir watershed is large and complex. There are many potential contaminant sources in the watershed which present a risk to the reservoir as a drinking water source, nearly all of which derive from human activities. Many of these present both short term and long term water quality risks.

The following existing or potential contaminant sources present the greatest risk to water quality in the Nacimiento Reservoir watershed:

- Grazing
- Body contact recreation
- Domestic wastewater facilities
- Domestic animals
- Wildland fire

The two highest risk sources, grazing and body contact recreation, occur extensively and without any meaningful restrictions on and around the reservoir itself. Additionally, grazing occurs extensively throughout the lower watershed.

These contaminant sources present the following primary risks to Nacimiento Reservoir water quality:

- Pathogen loading
- Nutrient loading
- Organic carbon loading
- Solids loading

These water quality risks can lead to the following problems in the drinking water supply:

- Increased consumer health risk (short term and long term effects)
- Decreased consumer acceptance
- Increased treatment costs
- Increased risk of not meeting regulatory requirements for drinking water purveyors

The following contaminant sources also present some degree of risk to water quality in the Nacimiento Reservoir watershed:

- Hazardous materials
- Urban development
- Agricultural cropland
- Industrial uses
- Unauthorized activities (marijuana grow sites)

Although individually these sources are a lesser concern, they can not be dismissed entirely for the following reasons:

- Possible cumulative effects
- Anticipated increases in:
    - Lakeside residency
    - Recreational activity
    - Agricultural cropland
- Possible increase in activity at Fort Hunter Liggett
- A single incident may have a significant short term effect (e.g. a hazardous material spill or a sewer line break)

These contaminant sources present the following primary risks to Nacimiento Reservoir water quality:

- Pathogen loading
- Organic carbon loading
- Nutrient loading
- Solids loading
- VOC, SOC loading

These water quality risks can lead to the following problems in the drinking water supply:

- Increased consumer health risk
- Decreased consumer acceptance
- Increased treatment costs
- Increased risk of not meeting regulatory requirements for drinking water purveyors

A special contaminant of concern is mercury, not because of any actual risk to the drinking water supply, but rather because of public perception concerns.

Although the County of San Luis Obispo has land use authority over the lower Nacimiento watershed, the San Luis Obispo County Flood Control and Water Conservation District (District) has no jurisdictional authority in the watershed, and therefore has little ability to directly affect watershed activities and watershed management practices. There are some existing control measures that may protect water quality, but only to the degree that they are implemented and enforced. The large number of potential contaminant sources, the watershed's large size, and the reservoir's remote location make effective implementation and enforcement efforts difficult.

Many public agencies and private individuals or entities have an interest in the Nacimiento Reservoir watershed. In terms of water quality impacts and protection, some of these interests are complimentary to others, and some are not. The multiplicity of agencies that have jurisdictional authority in the watershed can present challenges for the District to improve watershed control regulations, policies, and practices. District efforts to develop and foster good working relationships with other agencies and private parties who have an interest in the watershed may help to overcome at least some of these hurdles.

## 6.2 RECOMMENDATIONS

The District should support and pursue efforts to reduce the risk to Nacimiento Reservoir water quality from potential contaminant sources in the watershed, and to increase consumer awareness of the means and benefit of protecting this raw water supply. The District should work with other agencies and private parties to implement the following control measures:

- Encourage implementation of best management practices in agricultural and industrial operations (grazing, crop land, wineries, mines) to minimize:
    - Pathogen loading to reservoir
        - Top priority: restrict direct access of cattle to reservoir and its tributaries
    - Nutrient loading to reservoir
    - Solids loading to reservoir
- Encourage implementation of best management practices for stormwater pollution prevention in lakeside communities and public recreation areas
- Relocate the Oak Shores sewer interceptor system so that the laterals are realigned to a new sewer main to convey wastewater to the treatment plant and abandon the existing interceptor system
- Aid EPA remediation of Klau/Buena Vista mines site
- Advocate property development adherence to currently approved levels and uses (unless the proposed change would result in greater protection of water quality); discourage additional local subdivision and intensification of development; consider potential water quality impacts and advocate water quality protection when evaluating land use or development proposals
- Monitor water quality impacts by recreation and related activities in the watershed; identify, advocate, and implement control measures to minimize adverse water quality impacts

Some of these goals may be accomplished in part or in whole through public outreach and education, through securing funding for infrastructure improvements, or through regulatory action if necessary.

Additionally, the District should continue to monitor source water quality to accomplish the following:

- Identify and evaluate specific sources of contaminants of concern, including magnitude of contamination and temporal and spatial trends
- Evaluate effectiveness of control measures

# 7 ABBREVIATIONS

| | |
|---|---|
| ACEC | Area of Critical Environmental Concern |
| AMWC | Atascadero Mutual Water Company |
| BLM | Bureau of Land Management |
| BOD5 | 5 day Biochemical Oxygen Demand |
| BVMI | Buena Vista Mines, Inc. |
| CA | California |
| CDFG | California Department of Fish and Game |
| CDPH | California Department of Public Health |
| CIWQS | California Integrated Water Quality System |
| CNDDB | California Natural Diversity Database |
| CSA10A | (San Luis Obispo) County Service Area 10A |
| CSA7A | County Service Area 7A |
| CSWTR | California Surface Water Treatment Rule |
| DLR | Detection Limit for the Purposes of Reporting |
| DOC | Dissolved Organic Carbon |
| EPA | (United States) Environmental Protection Agency |
| FHL | Fort Hunter Liggett |
| ft | Feet |
| FY | Fiscal Year |
| GAC | Granular Activated Carbon |
| gpd | Gallons per day |
| GWUDI | Ground Water Under the Direct Influence of Surface Water |
| HAA or HAA5 | Haloacetic Acids |
| Hg | Mercury |
| HR | (Village of) Heritage Ranch |
| HRCSD | Heritage Ranch Community Services District |
| HROA | Heritage Ranch Owners Association |
| HWL | High water line (or high water level) |
| INRMP | Integrated Natural Resources Management Plan |
| K/BV | Klau and Buena Vista Mines |
| lb | Pounds |
| LPNF | Los Padres National Forest |
| MCFC&WCD | Monterey County Flood Control and Water Conservation District |
| MCL | Maximum Contaminant Level |
| MCLG | Maximum Contaminant Level Goal |
| MCPD | Monterey County Parks Department |
| MCWRA | Monterey County Water Resources Agency |
| mg/L | Milligrams per liter |
| µg/L | Micrograms per liter |
| MGD | Million gallons per day |
| MOA | Memorandum of Agreement |

| | |
|---|---|
| MOU | Memorandum of Understanding |
| MRDL | Maximum Residual Disinfectant Level |
| MRP | Monitoring and Reporting Program |
| MSL | Mean sea level |
| MTBE | Methyl *tert*-butyl ethylene |
| N | Nitrogen |
| NGVD29 | National Geodetic Vertical Datum of 1929 |
| NOAA | National Oceanic and Atmospheric Administration |
| NOM | Natural Organic Matter |
| NPDES | National Pollutant Discharge Elimination System |
| NPS | National Park Service |
| NRCS | Natural Resources Conservation Service |
| NWP | Nacimiento Water Project |
| OS | (Community of) Oak Shores |
| OSCA | Oak Shores Community Association |
| P | Phosphorus |
| PCS | Potential Contaminant Source |
| PHD | Public Health Department |
| PHG | Public Health Goal |
| PR | (City of) Paso Robles |
| PWD | Public Works Department |
| RWQCB | Regional Water Quality Control Board (Central Coast Region) |
| SDWA | Safe Drinking Water Act |
| SLO | San Luis Obispo |
| SLOCFC&WCD | San Luis Obispo County Flood Control and Water Conservation District |
| SOC | Synthetic Organic Chemical(s) or Semi-volatile Organic Chemical(s) |
| SUVA | Specific Ultraviolet Absorbance |
| SWRCB | (California) State Water Resources Control Board |
| SWTR | (Federal) Surface Water Treatment Rule |
| TBA | *Tert*-butyl alcohol |
| TCSD | Templeton Community Services District |
| TMDL | Total Maximum Daily Load |
| TOC | Total Organic Carbon |
| TPHg | Total Petroleum Hydrocarbons (gasoline) |
| TTHM | Total Trihalomethanes |
| USACE | United States Army Corps of Engineers |
| USDA | United States Department of Agriculture |
| USDHHS | United States Department of Health and Human Services |
| USDI | United States Department of the Interior |
| USEPA | United States Environmental Protection Agency |
| USFWS | United States Fish and Wildlife Service |
| USGS | United States Geological Survey |
| UV254 | Ultraviolet Absorbance at 254 nm |
| VOC | Volatile Organic Chemical(s) |

| | |
|---|---|
| VWA | Ventana Wilderness Alliance |
| WDR | Waste Discharge Requirement |
| WHO | World Health Organization |
| WQ | Water Quality |
| WQO | Water Quality Order |
| WTP | Water Treatment Plant |

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# 9 APPENDICES

## 9.1 Initial Watershed Sanitary Survey Checklist Form

The guidance manual that was followed in writing this report includes a Watershed Sanitary Survey Checklist (American Water Works Association). According to the guidance manual, the checklist is "intended to aid water agencies in identifying key areas that will require investigation or research efforts to adequately complete the initial sanitary survey. All 'significant' answers should be addressed in the sanitary survey. All 'unknown' answers signify that insufficient information is available, and should also be considered to require further investigation or explanation. All 'not significant' answers need not be addressed in the sanitary survey. In the 'comments' column, indicate the source of information."

Please note that characterizations of "significant", "not significant", and "unknown" were based on general knowledge of District staff about the watershed before beginning the survey; these characterizations do not necessarily reflect survey conclusions. Also, many "significant" characterizations in this checklist would more correctly be called "potentially significant", while "unknown" characterizations represent a real absence of knowledge about that topic.

| | Significant[23] | Not Significant | Unknown |
|---|---|---|---|
| **GENERAL CONDITIONS** | | | |
| Changes in available water quantity | | | X |
| Construction of water diversion or reservoir projects | | X | |
| Relocation of intakes | | X | |
| | | | |
| **CONTAMINANT SOURCES** | | | |
| Wastewater Treatment | | | |
| • Treatment plant effluent discharges | X | | |
| • Storage, transport, treatment, disposal to land | X | | |
| • Residential septic systems | | | X |
| • Commercial/industrial septic systems | | X | |
| Reclaimed Water | | X | |
| Urban Areas | X | | |
| Agricultural Crop Land Use | X | | |
| Pesticide/Herbicide Use | X | | |
| Grazing Animals | X | | |
| Concentrated Animal Facilities | | X | |
| Wild Animal Populations | | | X |
| Mines | | | |
| • Active | | | X |
| • Inactive | X | | |
| Disposal Facilities | | | |
| • Solid waste | | X | |
| • Hazardous waste | | X | |
| Logging | | X | |
| Recreation | | | |
| • Reservoir body contact | X | | |
| • Reservoir non-body contact | X | | |
| • Watershed activities | | | X |
| Unauthorized Activity | | | |
| • Illegal dumping | | | X |
| • Underground storage tank leaks | | | X |
| • Other | X | | |
| Traffic Accidents/Spills | | | |
| • Transportation corridors | | X | |
| • History of accidents/spills | | X | |

23 All characterizations of "significant", "not significant", or "unknown" are based on general knowledge of agency staff before starting the sanitary survey. See preceding comments.

| | Significant[23] | Not Significant | Unknown |
|---|---|---|---|
| Groundwater discharges | | | |
| • Natural discharges | | X | |
| • Gas, oil, geothermal wells | | X | |
| Seawater Intrusion | | X | |
| Geologic Hazards | | | |
| • Landslides | | | X |
| • Earthquakes | | | X |
| • Floods | | X | |
| • Other | | | X |
| Fires | X | | |
| | | | |
| **GROWTH** | | | |
| Population/General Urban Area Increase | | | X |
| Land Use Changes | | | X |
| Industrial Use Increase | | X | |
| | | | |
| **WATER QUALITY** | | | |
| Changes in raw WQ | | | X |
| Difficulty meeting drinking water standards | | | X |

## 9.2 Fort Hunter Liggett Special Resource Study Excerpts

Selected sections and figures reproduced from:

*Final Fort Hunter Liggett Special Resource Study*
January 2007
National Park Service
United States Department of the Interior

## Natural Resources

Fort Hunter Liggett's 164,261 acres contain exceptional natural resources and biological communities of a relatively undisturbed and expansive nature. The cantonment area on Fort Hunter Liggett has been intensively developed, but the surrounding hills and the mountainous western part of the installation have changed little despite periods of Army training and weapons testing.

The abundance and diversity of plant and animal species within Fort Hunter Liggett relate to several factors: the underlying diversity of geologic substrate, soils, water features, and topography; the relative lack of development and disturbance of the area; and the connectivity with larger surrounding ecosystems, primarily within Los Padres National Forest.

### Topography and Drainage

Fort Hunter Liggett is situated between two northwest-trending mountain ranges, the Santa Lucia Range on the southwest and the Gabilan Range on the northeast. The southwestern boundary of Fort Hunter Liggett follows the crest of the Santa Lucia Range, along which elevations range from approximately 2,500 feet to 3,740 feet at Atlas Peak, the highest point in the installation. Junipero Serra Peak and Cone Peak, located 3 to 4 miles outside the installation along its north and northwest margins, respectively, are the highest points in the vicinity of Fort Hunter Liggett; both peaks have elevations in excess of 5,750 feet. These ranges are part of the Coast Ranges, the largest geomorphic province in California. (See Figure 8a. Topography and Drainage in the "Figures" section).

The major water courses of Fort Hunter Liggett are the San Antonio and the Nacimiento Rivers. These distinctly linear drainages are subparallel, about 5 miles apart, and flow southeast. The drainage divide separating the watersheds of these rivers extends from Bald Mountain (2,132 ft elev.) at the southeast boundary of Fort Hunter Liggett to the northwest corner of the installation. The San Antonio River has its headwaters in the vicinity of Cone and Junipero Serra Peaks and runs some 25 miles through the installation from its northwest to southeast corners. The Nacimiento River, located about 5 miles southwest of the San Antonio River, has its headwaters in the Santa Lucia Range south of Cone Peak, flows along or just outside of the installation's western boundary for about 5 miles, and continues southeast through the installation for about 15 miles. Both rivers are dammed about 15 to 20 miles southeast of the Fort Hunter Liggett boundary. The uppermost 2.5 miles of the 17-mile long San Antonio Reservoir is included within the southeast corner of the installation. This area has the lowest elevation in Fort Hunter Liggett, about 800 feet. The upper reaches of the Nacimiento Reservoir are located several miles outside and south of the installation. Below the reservoirs, both rivers drain into the Salinas River which flows northwest, in the opposite direction of the main rivers in Fort Hunter Liggett, and eventually empties into Monterey Bay.

Flow regimes of surface water on Fort Hunter Liggett are seasonal. The San Antonio and Nacimiento Rivers have perennial flow. There are a number of intermittent streams that feed these rivers. Spring -fed water flows through the upper portion of the San Antonio River throughout the year while lower reaches have intermittent flow. Much of the Nacimiento River surface remains dry during the summer. However, year round water can be found in various pools along portions of the river. In addition to the two rivers, there are numerous creeks, the Lake San Antonio shoreline, and 14 impoundments that provide aquatic and riparian habitats. The 14 impoundments are located throughout the installation in both watersheds. The impoundments were constructed to provide water sources for cattle, wildlife, fire fighting needs and flood control (US Army Reserve Training Center, Fort Hunter Liggett, 2003).

The western part of the installation, corresponding to the east slope of the Santa Lucia Range, is dominated by steep hillsides covered with chaparral, scrub, and live oak forest. The area from vicinity of the Nacimiento River to the east, comprising about three-fourths of Fort Hunter Liggett, is mostly low hills intersected by flat to rolling river valleys of grassland, oak savanna, and oak woodland.

### Climate

The climate is Mediterranean and generally semiarid. Hot periods (frequently 90–100° F and higher) of low humidity (20%) typically begin in mid-May and occur with increasing frequency into mid-October. Lows of 32° F and less usually occur by mid-November, although freezes can occur earlier. Most rain falls December through March. The beginning of winter season is marked by the arrival of the first cool storm system originating in the northern Pacific, typically in November or December. Rain concludes in April or May and is followed by a dry period lasting 6 to 7 months. Fort Hunter Liggett lies in the rain shadow of the Santa Lucia Range. Precipitation can be several times greater on the seaward slope and crest than in the eastern valleys. While the western slope of the Santa Lucia Range receives about 59 inches average annual precipitation (at Alder Creek), the cantonment area averages only about 19 inches annually.

### Geology

This section describes the geologic setting and soils of Fort Hunter Liggett and adjacent contiguous land, the underlying geologic formations, and regional faults. Geological resources are described according to the geologic time scale (see illustration). Fort Hunter Liggett is part of the northwest-trending Coast Ranges geological province that stretches from Humboldt County in northern California 400 miles south to Santa Barbara County, where they meet the Transverse Ranges.

Fort Hunter Liggett is underlain by three distinctly different groups of pre-Quaternary rocks reflecting different origins and geologic history: The Salinan block, also known as the Salinian terrane or Sur series; the Franciscan complex, and late Cretaceous through late Tertiary sedimentary strata deposited in marine and non-marine basins along the Pacific margin of North America (See Figure 8b. Geology in the "Figures" section).

The Salinian block underlies the northern part of Fort Hunter Liggett and includes Mesozoic crystalline intrusive rocks (granitoid plutons) and metamorphic rocks whose protoliths (original rocks prior to metamorphism) range in age from Precambrian to Mesozoic.

The Franciscan complex (the "Franciscan") underlies the southwestern part of Fort Hunter Liggett in the Santa Lucia Range. The Franciscan rocks are dominated by graywacke (a type of sandstone) and span a range of ages from Jurassic through Cretaceous. Chert and greenstone (altered basaltic lava) commonly are found in association with graywacke. The Franciscan rocks formed during the Mesozoic era along a subduction zone, an area where oceanic crust was being subducted, or thrust beneath, continental crust along the edge of the North American continent.

The Franciscan rocks have been tectonically dismembered by faulting associated with subduction. Sediments deposited in basins along the subduction zone have been severely disrupted by faulting, with such displacement occurring concurrent with deposition. The faulting also interleaved fragments of oceanic crust with these sediments. As a result, these rocks are pervasively faulted, and also multiply folded, such that there exists minimal or no lateral continuity or vertical sequence.

Ultramafic rocks are widely distributed throughout the Franciscan complex. Strategic minerals such as nickel and chromium are associated with these rocks. The largest mass of ultramafic rocks on Fort Hunter Liggett is located at Burro Mountain in Training Area 23. This formation is uniquely exposed by Los Burros Creek which forms a deep gorge through its center. Narrow masses of ultramafic rocks, elongate to the northwest, also are found in the southern end of Fort Hunter Liggett. The ultramafic rocks, shown in Figure 8b: Geology contain silicate minerals rich in magnesium (magnesian olivine and orthopyroxene), and are known by the general term peridotite (or olivine - rich rock — named after peridote, the gem form of olivine).

To varying degrees, the ultramafic masses have been replaced by serpentine, resulting in serpentinized peridotite, or "ultramafic serpentine" in the jargon of biologists. These rocks differ from rocks composed of nearly pure serpentine in that the texture and parts of the original minerals in serpentinized peridotite (with orthopyroxene preferentially retained over olivine) are often preserved. Small masses of serpentine are locally found along shear zones.

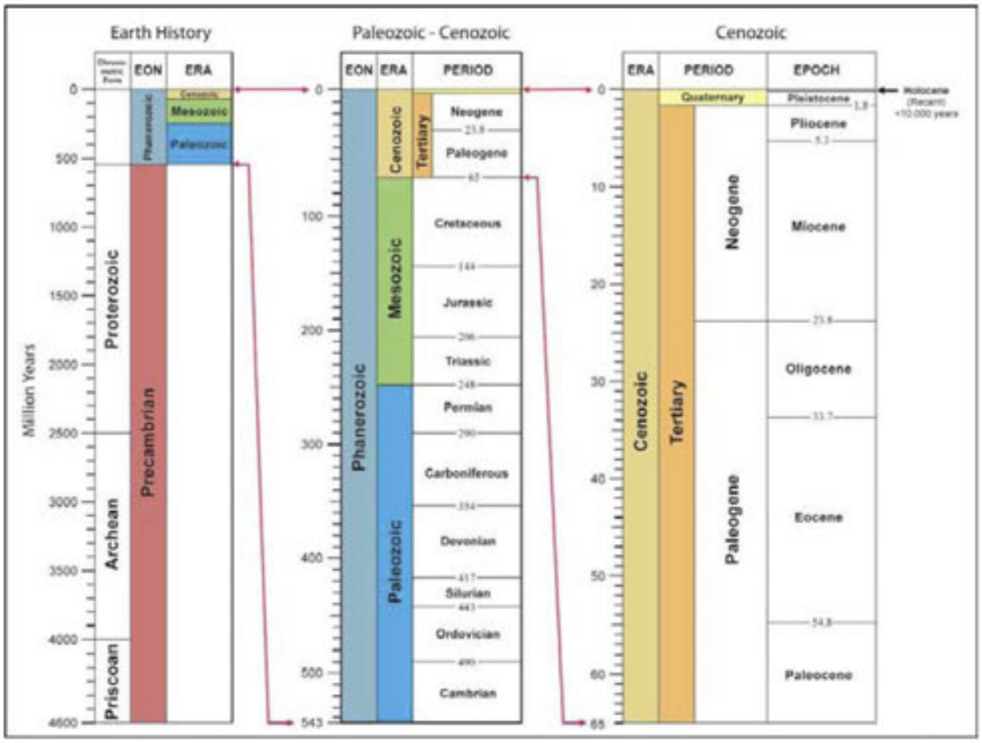
Serpentinitic rocks, including those rocks that retain their original texture and even original mineralogy (serpentinized peridotite) as well as small areas of serpentine lacking any vestige of the original parent rock, play an important role in the endemism of the California floristic province. More than 20 percent of California's endemic plant species are associated with serpentinitic soils. Such plants have adapted to the combination of high toxicity (high chrome and nickel contents), as well as the low mineral nutrients (extremely low $K_2O$), of serpentinitic soils. Within Fort Hunter Liggett, plant communities mapped as associated with serpentinitic soils show a broader distribution than do outcrops of serpentinized peridotite. The toxicity and nutrient deficiency of serpentinitic rocks are translated down slope as colluvium or as alluvium within drainages. The upper Burro Creek watershed harbors an exceptionally high diversity of rare and endangered plants.

Late Cretaceous and younger sedimentary strata underlie the eastern two - thirds of the installation. Upper Cretaceous and Paleocene deposits of sandstone, shale, and conglomerate, and the Miocene Monterey Formation form subparallel northwest - trending belts. These groups of rocks are likely tilted to the northeast or southwest in order to form this linear map pattern, and possibly they are truncated by major faults. The Upper Cretaceous and Paleocene deposits underlie much of the watershed of the Nacimiento River. An unnamed formation of the Paleocene era consists of massive and medium - to- coarse grained sandstone, conglomerate, mudstone and siltstone of marine origin up to 3,500 feet thick. Fossils in sandstone beds, *Turritella pacheoensis*, date this formation to the Paleocene age (Durham 1965).

Miocene deposits of the Vaqueros Formation and the Monterey Shale form the divide between the watersheds of the Nacimiento and San Antonio Rivers. The Vaqueros Formation of the early Miocene age consists primarily of marine sandstone, siltstone and mudstone about 850 feet thick. Overlaying the Vaqueros formation is Monterey Shale which consists of marine porcelaneous rocks, mudstone, chert dolomitic carbonate beds, concretions, shale, siltstone and sandstone. This formation is dominated by porcelanite and porcelaneous mudstone which comprises three-fourths of the Monterey Shale. The dominant calcerous beds in the lower part of the Monterey Shale constitute the Sandholdt Member which is comprised mostly of calcareous mudstone and shale deposits up to 480 feet thick. The Monterey Shale ranges in thickness up to 6,600 feet (Durham 1965).

Pliocene and Pleistocene marine sediment underlies much of the eastern third of Fort Hunter Liggett, except where covered by alluvial deposits associated with the San Antonio River. An unnamed formation of the Pliocene era overlies the Monterey Shale consisting mostly of very fine - grained sandstone and diatomaceous mudstone. Mollusk shells are abundant throughout this formation indicating Pliocene age and marine origin. The Paso Robles Formation that overlies the Monterey Shale and the unnamed Pliocene formation are exposed south of the San Antonio River. The thickness of the Paso Robles Formation in the San Antonio River Valley varies from a few feet to more than 150 feet. This formation is comprised mostly of non - marine, conglomerate, pebble conglomerate, conglomerate sandstone, and sandstone. (Durham 1965).

**Geologic Time Scale**




Geologic Time Scale. Younger time intervals are successively expanded to the right; arrows point to correlative ages in adjacent columns. Scale and boundary ages are in million years (boundary "pick ages" are from compilation by A. R. Palmer and John Geissman, Geological Society of America, 1999; layout adapted from A. MacRae, Univ. Calgary, 1996).


San Antonio River delta, NPS photo


Santa Lucia Range, NPS photo

The southern reaches of the San Antonio River on Fort Hunter Liggett are underlain by alluvium. The irregular map pattern of the Pliocene and younger units suggest that these units are sub-horizontal and have not undergone significant structural deformation except locally in close proximity to major faults. Pleistocene and Holocene formations that underlie the San Antonio River are characterized by unconsolidated alluvial deposits to 40 feet thick, consisting of sand gravel with variable amounts of sand and clay (Durham 1965).

Fort Hunter Liggett is situated west of the San Andreas Fault and has been translated northwestward since motion on the San Andreas Fault began, probably between 10 and 6 million years ago. The 320 km of displacement of the volcanic rocks of the Pinnacles National Monument (dated at approximately 21 million years ago and located about 30 miles north of Fort Hunter Liggett) from correlative rocks in the western Mojave known as the Neenach volcanics applies to all pre- middle Miocene rocks in the installation, and possibly to all rocks of Miocene age and older. Thus, except for the Pliocene and younger rocks along the eastern side of the installation, Fort Hunter Liggett was located in the western Mojave Desert not earlier than 10 million years ago and possibly as recently as 6 million years ago. The granitic and metamorphic terrane of the Salinian block / Sur series likely has been translated even further. It perhaps represents a segment of the southern Sierra Nevada that was translated westward prior to formation of the San Andreas Fault not earlier than 10 millions years ago.

**Faults.** The Jolon, Nacimiento, and several other small faults underlie Fort Hunter Liggett. Epicenters of historic earthquakes are located close to the main traces of both the Rinconada and Nacimiento Faults (see Figure 8b). These faults trend subparallel to the San Andreas Fault.

The Rinconada and Nacimiento faults control the fundamental geomorphology and hydrology of the installation, namely, the linear northwest-trending valleys of the San Antonio and Nacimiento Rivers. The Nacimiento Fault separates marine sediments in the eastern third of Fort Hunter Liggett from Franciscan greenstone in the western portion of the installation. The Rinconada Fault, which traverses the southern end of the San Antonio Reservoir, has experienced Quaternary movement (i.e. within the last 11,000 years). Small faults on Fort Hunter Liggett generally trend northwest paralleling the San Andreas Fault.

In 1991, a seismic study by the U.S. Army Corps of Engineers predicted the Rinconada Fault could generate an earthquake with a potential 7.5 magnitude on the Richter scale, with rock (ground) accelerations ranging from 0.5 to 1.0 gravity (g) near the eastern boundary of Fort Hunter Liggett to 0.3 g along the western boundary. Given its proximity to the San Andreas and Rinconada faults and the overall geologic activity in the region, Fort Hunter Liggett is in Seismic Risk Zone II, defined by the California Division of Mines and Geology as an earthquake zone of moderate risk to people and structures (US Army Corps of Engineers 2000b).

**Mineral Resources.** Mining played an important role in the settlement of areas around the Santa Lucia Range and Fort Hunter Liggett. Much of the area is underlain by rocks of the Franciscan Formation that contain dark sandstone that is the chief host rock of gold-bearing deposits. In addition to gold, silver and copper deposits were also found in this region (Clark 1998).

Documented history of gold in the Santa Lucia Range dates back to the 1850s when small amounts of placer gold were recovered from streams in the Jolon area. Chinese miners played a key role in placer mining during this time. These industrious miners were known to have sold several thousand dollars worth of gold to the local store in Jolon. Placer prospecting in the Jolon area ended around 1914. This form of mining only occurred in small alluvial deposits and had less economic importance in the region (Reinstedt 1977; Eidsness and Jackson 1994a).

Mining continued in the western portion of Fort Hunter Liggett following the establishment of the Los Burros Mining district in 1875. The Los Burros Mining District was located in the southwest corner of Monterey County stretching from the Pacific Coast east to the Nacimiento River. A portion of the mining district is located on Fort Hunter Liggett. In 1887, lode gold was discovered by W.D. Cruikshank just west of Fort Hunter Liggett's current boundary at the Buclimo Mine near the head of Alder Creek. Most placer gold in the Los Burros Mining District came from Willow Creek with small amounts found in Alder, Plaskett, and Salmon Creeks. Ore from the Los Burros Mining district was transported from the mines to Jolon and into King City. Most mining activity related to gold was conducted between 1887 and 1892 (Reinstedt 1977; Clark 1998)

Serpentine outcroppings in Fort Hunter Liggett have been successfully mined for asbestos and chromite (Eidsness, 1994a). Asbestos is a nonmetallic mineral that was used heavily by construction and transportation industries in the manufacture of asbestos-cement products such as pipe, shingles, wallboard, corrugated sheets, floor tiles and brakes. Chromite is the only economic source of chromium, an essential component for steel alloys (California Division of Mines and Geology 1966).

Small scale mining for cinnabar, serpentine and lime deposits continued into the 1950s (Eidsness and Jackson 1994a). Cinnabar is the principal mercury ore mineral. Mercury's mineral qualities are valuable for industrial production and were in heavy demand during World War I, World War II and the Korean War (California Division of Mines and Geology 1966).

### Soils

The diversity of soils at Fort Hunter Liggett reflects the geologic and topographic variety of the region. Fort Hunter Liggett contains more than 130 soil types in 57 soil series (US Army Reserve Training Center, Fort Hunter Liggett, 2003). Steep highlands in the west consist of rock outcrops and shallow soils derived from the underlying parent material. The rolling hills that make up most of the central and eastern portions of Fort Hunter Liggett consist primarily of alluvial terraces or soils associated with marine sedimentary rocks.

Soil erosion at Fort Hunter Liggett is primarily the result of natural processes, existing training and testing activities, prescribed burns on the steep-sloped chaparral and woodland areas, past grazing practices, and borrow pit excavations. Except for portions of the cantonment area, the Natural Resource Conservation Service classifies most of Fort Hunter Liggett as having high or moderate erosion hazard. The erosion hazard on the San Antonio River Valley floor, which includes the cantonment area, is minimal because of its relatively gentle topography. The surrounding hills, however, are much more susceptible to erosion. The steep uplands have a very severe erosion potential.

### Biological Resources

Fort Hunter Liggett includes a diversity of rare species and habitats. The following section describes the habitat and species that can be found at Fort Hunter Liggett.

#### Vegetation

Fort Hunter Liggett contains a variety of plant communities containing more than 1,000 vascular species, many of which are rare and sensitive (see Table 2: Vegetation Communities on Fort Hunter Liggett and Table 3: Federally and State Listed Threatened and Endangered Species that May Occur on Fort Hunter Liggett). The high species diversity is a result of the soil diversity, geology, and Fort Hunter Liggett's primarily undeveloped state.

Interspersed valley oaks and grasslands are the predominant vegetation on the valley floors while chaparral dominates the western mountainous areas. Major watercourses support riparian vegetation comprised mainly of sycamore, cottonwood, willow, and alder. Rolling hills and the more gentle slopes are predominantly covered with blue oak woodland. The steeper slopes, such as those rising from the Nacimiento River Valley to the crest of the Santa Lucia Range, typically support dense chaparral composed mainly of deer brush and chamise (See Figures 9a. Habitat Types and 9B. Habitat Relationships to Underlying Geology in the "Figures" section). Plant communities on Fort Hunter Liggett provide suitable habitat for 9 state and Federally-listed threatened and endangered wildlife species and 1 species that is a candidate for federal listing (see Table 3: Federally and State Listed Threatened and Endangered Species that May Occur on Fort Hunter Liggett).

**Wetlands.** Wetlands support a prevalence of hydrophytic vegetation, hydric soils, and wetland hydrology. Fort Hunter Liggett has several types of wetland communities, both natural and human-made. These wetlands support a variety of plants. They are also vital for supporting animal resources at Fort Hunter Liggett including a high diversity of migratory waterfowl. Wetland types on Fort Hunter Liggett include vernal pool, vernal swale, ephemeral, drainage, wet meadow, freshwater marsh, stock pond, creek, and river.

Vernal pools are considered rare and endangered habitat. Approximately ninety percent or more of California's vernal pools have been lost (Ferren, et al., 1996). These losses are continuing as ranches and other undeveloped lands are plowed or developed (CEMML 1999). Vernal pools are found throughout Fort Hunter Liggett. They provide the sole habitat for a number of plant taxa and the Federally-listed endangered, vernal pool fairy shrimp (*branchinecti lynchi*). Santa Lucia mint (*Pogogyne clareana*) is a state-listed endangered species found only along stream banks and at the edges of vernal pools on Fort Hunter Liggett.

**Riparian Communities.** Riparian communities can be found along the rivers and streams at Fort Hunter Liggett. Fort Hunter Liggett's riparian communities include sycamore alluvial woodlands, cottonwood, and willow. Sycamore alluvial woodlands have been determined to be a "special-status community" of limited distribution by the California Department of Fish and Game (CDFG) because they provide important habitat for rare or unusual plant and wildlife species (US Army Reserve Training Center, Fort Hunter Liggett, 2003). Riparian communities typically support high species diversity. California's riparian communities have been reduced to less than 10% of their former range, due to development and irrigation practices.

**Grassland.** Grassland on Fort Hunter Liggett includes annual, valley needlegrass, and ruderal (disturbance tolerated, introduced grasses). In much of California, native grasses have been replaced by exotic annual grasses (Hamilton, 1997; Stevens, et al., 1998). On Fort Hunter Liggett, the native grasses are often extensive, and are significant components of a number of rare community types. For example, "barrens" and grasslands associated with serpentine soils have been documented on the installation.

Native grasses include three species of Nassella, five species of Melica, two species of Muhlenbergia, as well as other native bunchgrasses and annual grasses. Fort Hunter Liggett natural resource managers consider valley needlegrass (*Nassella*) grassland to be an important rare natural community on Fort Hunter Liggett (CEMML 1999). These native bunchgrasses have survived despite the area's history of grazing (Hoover 2001).

*Chlorogalum purpureum* var. *purpureum* (purple amole) is a Federally-listed threatened species associated with grassland and oak communities. It is known only from Fort Hunter Liggett and nearby Camp Roberts. The U.S. Fish and Wildlife Service proposed a critical habitat area of 15,000 acres at Camp Roberts and Fort Hunter Liggett in November 2001. It was later found that direct and indirect costs to the Army would exceed the benefits of critical habitat designation on Department of Army land. On October 24, 2002, the U.S. Fish and Wildlife Service designated 1,532 acres of critical habitat for the purple amole on private land near Jolon Road (67 Federal Register No. 206, October 24, 2002). Fort Hunter Liggett has conducted long-term studies on purple amole. These studies have shown a low level of disturbance over time to plots of purple amole.

Recovery from some level of disturbance is considered likely as purple amole occurs in both undisturbed and highly disturbed areas (US Army Reserve Training Center, Fort Hunter Liggett, 2003).

**Coastal scrub.** Westman (1987) and O'Leary (1990) identified coastal scrub as a rare plant community type in need of conservation. On Fort Hunter Liggett, coastal scrub exists only in small patches (CEMML 1999). At least one rare plant species (*Malacothamnus davidsonii*) is frequently associated with coastal scrub on Fort Hunter Liggett. Fort Hunter Liggett contains a rare instance of coast rock cress (*Arabis belpharophylla*). This species is typically found in northern areas from Santa Cruz to Sonoma Counties.

**Chaparral.** Chaparral communities consist of drought-resistant evergreen shrubs that grow on California slopes and coastal mesas. Chamise and mixed chaparral are the dominant types on Fort Hunter Liggett, found on 39% of the installation. On Fort Hunter Liggett, chaparral is typically found on ridgetops, south facing slopes and the western mountain range (US Army Reserve Training Center, Fort Hunter Liggett, 2003). Cooper and Perlman (1997) pointed out that Fort Hunter Liggett has "endemic-rich serpentine chaparral." Fort Hunter Liggett's serpentine chaparral is generally dominated by *Arctostaphyllos obispoensis*, *Adenostoma fasciculatum*, *Quercus durata*, and/or *Ceanothus* spp.

Rare chaparral communities are associated with serpentine areas found along the Coast Ridge Road (at the southwestern boundary with Los Padres National Forest) in training areas 23, 26 and 28 and along the Nacimiento River in Training Area 19. These include both wetland and upland communities. Burro Mountain in training area 23 contains the largest serpentine bed on Fort Hunter Liggett. Wetland communities can be found at Los Burros and Salmon Creeks. Unique endemic plant communities are associated with these formations. The California Native Plant Society lists 285 endemic taxa found mostly or only on serpentine. These taxa make up a major component of California's endemic species (Skinner & Pavlik 1994, Faber 1997).

**Oak Woodlands and Savanna.** The oak woodland and oak savanna areas are visually dominant features of the Fort Hunter Liggett landscape, and provide valuable habitat for many species of wildlife. Oak woodlands can be found along the hillsides, protected ravines and canyons and cover 46% of the installation (US Army Reserve Training Center, Fort Hunter Liggett, 2003). Oak savanna is found on flat and alluvial terraces. Fort Hunter Liggett may contain the widest diversity of oak taxa of any area of its size in California. The 12 oak taxa found on Fort Hunter Liggett include valley oak (*Quercus lobata*), blue oak (*Q. douglasii*), coast live oak (*Q. agrifolia* var. *agrifolia*), canyon live oak (*Q. chrysolepis*), interior live oak (*Q. wislizeni* var. *wislizeni*), shrub interior live oak (*Q. wislizeni* var. *frutescens*), scrub oak (*Q. berberidifolia*), leather oak (*Q. durata* var. *durata*), Tucker's oak (*Q. john-tukeri*), Shreve oak (*Q. parvula* var. *shrevei*), Alvord oak (*Q.* × *alvordiana*), and Jolon oak (*Q.* × *jolonensis*) (Painter 2000).

Blue oak woodlands and savanna are the most prevalent oak communities on Fort Hunter Liggett. The installation contains approximately 52,000 acres of blue oak communities, almost one-third of the total land area. While many blue oaks are part of foothill woodlands, pure stands can be found throughout training areas 25 and 29 in the southwestern portion of Fort Hunter Liggett (US Army Reserve Training Center, Fort Hunter Liggett, 2003).

The Valley oak (*Quercus lobata*) plant community, which occurs only in California, is considered by the California Department of Fish and Game to be a rare community type. Less than 100 high quality stands and less than 10,000 acres of high quality habitat remain in California, a significant portion of which is located on Fort Hunter Liggett (California Department of Fish and Game 1999). The valley oak series is also included in the rare California series listed by Sawyer and Keeler-Wolf (1995).

Fort Hunter Liggett has outstanding examples of valley oak savanna and woodland (Pavlik et al., 1991). Over 17,000 acres of valley oak communities straddle the boundary between Fort Hunter Liggett and Los Padres National Forest (see Figure 9a: Habitat Types in the "Figures" section). In an effort to control valley oak loss, the Army implemented a Valley Oak Replacement Program in 1997, with the objective of planting and irrigating at least 50 oak seedlings per year. The two-year survival rate is 80% (Clark 2000).

Live oak communities comprise 1,800 acres (or 3%) of Fort Hunter Liggett, occurring frequently in foothill woodlands. Shrub varieties of live oak occur most commonly in the higher elevations. Dominant species include coast live oak, canyon oak and interior live oak (US Army Reserve Training Center, Fort Hunter Liggett, 2003).

California oaks are currently threatened by the disease known as sudden oak death. First identified in 1995, sudden oak death is caused by the pathogenic fungus, *Phytophthora ramorum*. This pathogen has caused widespread dieback of tanoak and several oak species in the central and northern coastal counties of California, and has to date been associated with 26 different plant species. Infections occur on trunks, branches and leaves. Cankers, brown spots on leaves, and dieback of the tree crown are symptoms of the disease.

Sudden oak death is present in northern Monterey County; however there are no confirmed reports on Fort Hunter Liggett. The California Oak Mortality Task force has documented sudden oak death in portions of northern Monterey County including Pfeiffer Big Sur State Park, Prunedale, and Torrey Canyon (California Oak Mortality Task Force 2003).

**Mixed-evergreen forest.** Mixed-evergreen forest is found at higher elevations on Fort Hunter Liggett on northfacing slopes. It is dominated by coast live oak (*Quercus agrifolia*), black oak (*Quercus kelloggii*), canyon live oak (*Quercus chrysolepsis*), bay (*Umbellularia californica*), madrone (*Arbutus menziesii*), tanoak (*Lithocarpus densiflora*), and maple (*Acer macrophyllum*).

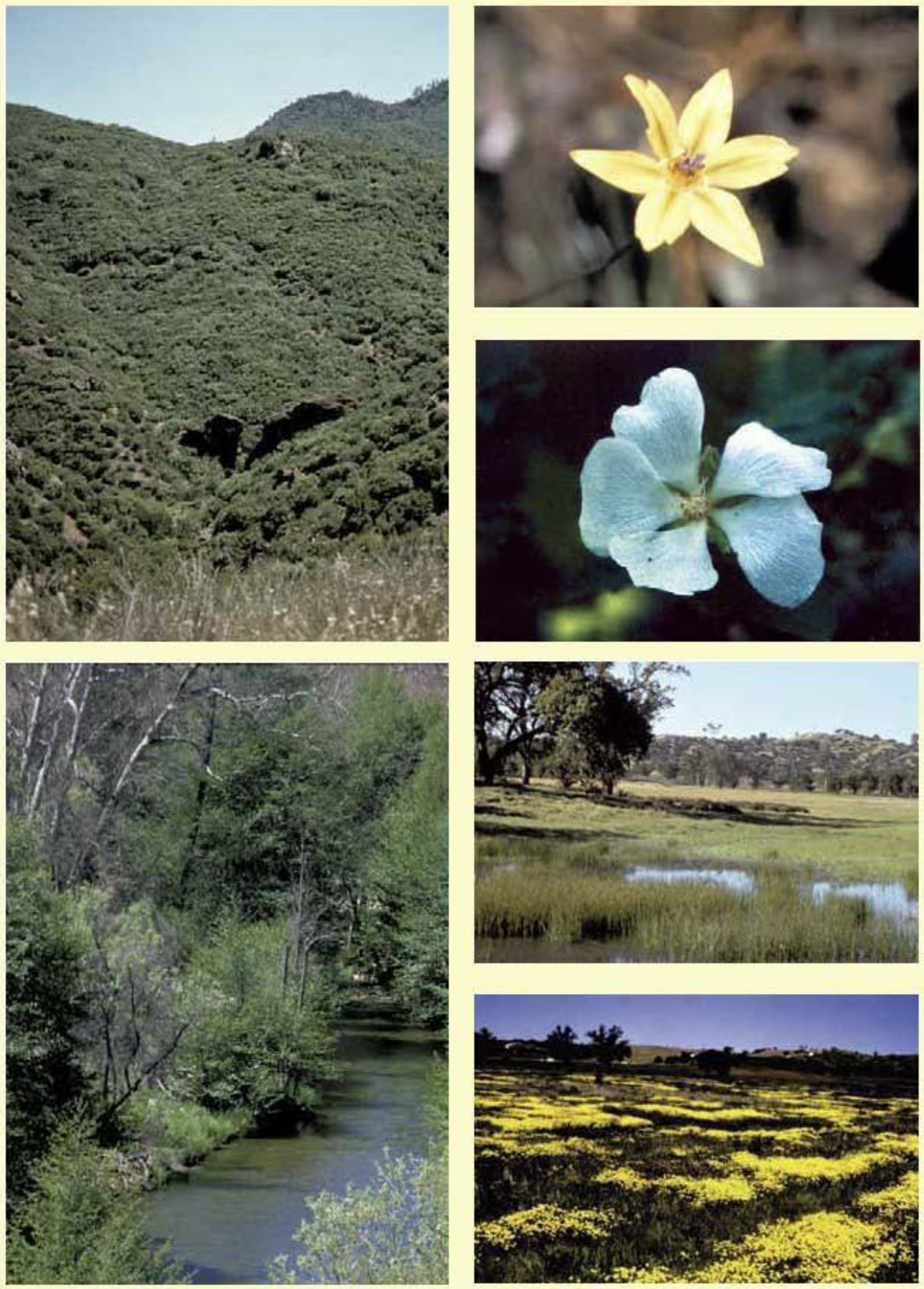
**Coniferous forest.** Coniferous forest on Fort Hunter Liggett includes closed-cone pine-cypress forest and yellow pine forest. Closed-cone pine-cypress includes Sargent cypress (*Cupressus sargentii*), generally found on serpentine (Kruckeberg 1984). Sargent cypress is included in the rare California series listed by Sawyer and Keeler-Wolf. Yellow pine forest is dominated by ponderosa pine (*Pinus ponderosa*) and Coulter pine (*Pinus coulteri*). A single stand of Santa Lucia fir (*Abies bracteata*) located on Fort Hunter Liggett appears to have been first discovered here in the 19th century. Santa Lucia fir is included in the rare California series listed by Sawyer and Keeler-Wolf.

Rock Outcrops. Rock outcrops on Fort Hunter Liggett are common in the Nacimiento watershed where two larger formations known as the Palisades and the Piedras Atlas are known to occur. Rock outcrops provide unique substrates for plant communities and serve as roosting and nesting sites for raptor species (US Army Reserve Training Center, Fort Hunter Liggett, 2003).

**Table 2: Vegetation Communities on Fort Hunter Liggett**

| TYPE | AREA | LOCATION | ASSOCIATED PLANTS | ASSOCIATED WILDLIFE |
|---|---|---|---|---|
| Grassland: annual, valley needlegrass, and ruderal | 10% | Cantonment, main gate, Stony Valley, Gabilan Valley, along San Antonio River | Miscellaneous forbs and grasses | California vole, California ground squirrel, black-tailed hare, western meadowlark, horned lark, savanna sparrow, American pipit, western kingbird (forage) |
| Chaparral: chamise and mixed | 39% | Hillsides and ridges | Chamise, yerba santa, backbrush, manzanita, holly leaf cherry, mountain mahogany, poison oak | Orange-crowned warbler, wrentit, California thrasher, brush rabbit, Merriam's chipmunk, California mouse, west spotted skunk, grayfox, small carnivores, western fence lizard, southern alligator lizard |
| Oak Communities | 46% | Hillsides and protected ravines and canyons | Overstory - Valley oak, blue oak, coastal live oak Understory - miscellaneous forbs and grasses | Deer, western gray squirrel, dusky footed woodrat, grayfox, striped skunk, wild turkey, acorn woodpecker, western bluebird, American kestrel, bushtits |
| Riparian: mixed; willow-cottonwood; willow, valley oak; sycamore alluvial | 3% | San Antonio River, Nacimiento River, and many intermittent streams | Cottonwood, California sycamore, alder, valley oak, willow, muletat, California wild rose, Pacific blackberry, elderberries, and giant creek nettle | Wood duck, wild turkey, California quail, red-shouldered hawk, Nattal's and downy woodpecker, northern oriole, Bewick's wren, rufous-sided towhee, deer, western gray squirrel, opossum, raccoon, long-tailed weasel, shrew, mountain lion, Pacific tree frog, California newt |
| Wetlands: vernal pool; vernal swale, ephemeral drainage; wet meadow; freshwater marsh; stockpond; creek; and river. | < 1% | Areas that are permanently or seasonally inundated or saturated by surface water or ground water in low-lying areas and open water areas | Hydrophytic vegetation | Vernal pool fairy shrimp, California tiger salamander |
| Rock outcrop | < 1% | Stony Valley and Training Areas 3, 90 and 23 | Patches of sedimentary, granite or ultramafic rocks (serpentine) lichens and mosses and unique vegetation | American kestrels, red-tailed hawk, turkey vulture, western fence lizard, striped racer, various bat species |

Sources: US Army Reserve Training Center, Fort Hunter Liggett, 2003; CEMML, 1999



Clockwise from top left: (1) Chaparral, Burro Mountain, (2) Cook's tritelia, serpentine chaparral sp., (3) Santa Lucia Bush Mallow, endemic chaparral sp., (4) Vernal Pool (5) Salinas Valley Goldfields, grassland sp., (6) Riparian habitat, Mission Creek; (1-5) Elizabeth Painter photos, (6) Brenda Tharp photo

**Wildlife**

Scientists have recorded over 300 animal species inhabiting Fort Hunter Liggett, including at least 223 breeding and migrant birds, 17 fishes, 19 amphibians, and 11 snakes. This includes essential habitat for 9 Federally/State-listed and candidate animal species, 8 special status (protected or of special concern) mammal species, 18 special status bird species, and 6 special status reptile, amphibian and fish species (see Table 3: Federally and State Listed Threatened and Endangered Species that May Occur on Fort Hunter Liggett and Table 5: Other Special Status Wildlife Species that Occur on Fort Hunter Liggett).

FEDERALLY-LISTED CANDIDATE, THREATENED, AND ENDANGERED SPECIES

**San Joaquin Kit Fox (endangered).** The kit fox is the smallest member of the dog family in North America. The San Joaquin kit fox (*Vulpes macrotis mutica*) inhabits grasslands, scrublands, oak woodlands, and vernal pool areas in the California Central Valley floor and the interior coastal ranges. On Fort Hunter Liggett, valley bottom areas of the San Antonio and Nacimiento rivers provide potential habitat for the kit fox. Kit fox were present and breeding at Fort Hunter Liggett in 1990; pupping dens were identified in the southeast portion of Fort Hunter Liggett along the San Antonio River (training areas 22 and 25) (US Army Reserve Training Center, Fort Hunter Liggett, 2003).

Decline of the kit fox can be attributed to loss, fragmentation and degradation of habitat due to agricultural, industrial and urban development (Brown, et al. 2002). Loss of habitat is not a threat to kit fox on Fort Hunter Liggett. Fort Hunter Liggett practices protection measures such as pre-activity surveys to limit the potential impacts of military activity on the kit fox (US Army Reserve Training Center, Fort Hunter Liggett, 2003).

**Bald Eagle (threatened).** Bald eagles (*Haliaeetus leucocephalus*) at Fort Hunter Liggett are most commonly found wintering along the San Antonio River. An active nesting site has also been located in Training Area 22, between Jolon Road and the San Antonio River (US Army Reserve Training Center, Fort Hunter Liggett, 2003). Nest sites are typically in large trees along shorelines in remote areas. The major threats to the bald eagle for the present and foreseeable future include destruction and degradation of habitat and environmental contaminants.

The bald eagle was Federally-listed as an endangered species in 1971. In 1995, the bald eagle was removed from the endangered list and upgraded to threatened status as its population grew. Delisting of the bald eagle under the Endangered Species Act was proposed by the U.S. Fish and Wildlife Service in 1999. While this rule would remove the bald eagle from protection status under the Endangered Species Act, it would still be protected by the Bald and Golden Eagle Protection Act (60 Federal Register 133, July 12, 1995; 64 Federal Register 128, July 6, 1999).

**California Condor (endangered).** Suitable habitat for condors (*Gymnogyps californicus*) includes foothill rangeland and forest in remote areas where the birds can roost and nest in tall trees and on cliffs. Rock outcrops in the Nacimiento River Valley provide suitable habitat for condors. Recently a condor was sighted feeding in training area 20 (US Army Reserve Training Center, Fort Hunter Liggett, 2003). The California condor is considered the largest land bird in North America. Although critical habitat was designated in 1976, the condor's vulnerability to extinction required a captive breeding and release program. Captive breeding release sites are located nearby at Pinnacles National Monument and in the Ventana Wilderness Area in Los Padres National Forest.

**Least Bell's Vireo (endangered).** The Least Bell's vireo (*Vireo belii pusillus*) inhabits riparian woodlands with tall trees and shorter thick shrubs. Loss of riparian habitat, military disturbance, non-native species invasion and predation, and long-term camping threaten the Least Bell's vireo. In 1986, the US Fish and Wildlife Service listed the Least Bell's vireo as endangered. Fort Hunter Liggett contains suitable

Clockwise from top left: (1) Bald Eagle, (2) Tule Elk, (3) Badger, (4) Mountain Lion (5) Western Pond Turtle, (6) Burrowing Owl; (1) California Department of Fish and Game photo, (2) NPS photo, (3, 4 and 6) John Sorenson photos, (5) U.S. Fish and Wildlife Service photo habitat for the Least Bell's vireo, although the only documented sighting was a single male sited near the Palisades area in 1988 (US Army Reserve Training Center, Fort Hunter Liggett, 2003).

**Arroyo Toad (endangered).** Arroyo toads (*Bufo microscaphus californicus*) are found in seasonal pools and streams where natural disturbance is common (US Army Reserve Training Center, Fort Hunter Liggett, 2003). A highly sensitive species, arroyo toads are known to have one of the most specialized habitat requirements of any amphibian found in California. Shallow breeding pools with a minimum of silt and free of predatory fish are necessary for successful juvenile development. Breeding pools must be located adjacent to adult habitat that includes inflow channels of 3rd- to greater- order streams with sandy channels and terraces (CDFG 2000). The arroyo toad is threatened by urban development, agriculture and water diversions and was listed as endangered in 1994. Critical habitat designation is pending. Suitable habitat for arroyo toads can be found along stretches of the San Antonio River (US Army Reserve Training Center, Fort Hunter Liggett, 2003).

**Red-legged Frog (threatened).** California red-legged frogs (*Rana aurora draytonii*) inhabit shrubby riparian areas and deep, slow moving water. Threats to the California red-legged frog include habitat degradation, off-road vehicles, reservoir construction, grazing, non-native aquatic predators, and water quality. Critical habitat for the red-legged frog was designated on March 13, 2001. However, as a result of recent litigation, the red-legged frog critical habitat designation has been vacated, and a revised critical habitat designation will be promulgated following further consideration of the economic impacts of the designation (CDFG 2000; 66 Federal Register 49, March 13, 2001). Although Fort Hunter Liggett contains suitable habitat for the red-legged frog, no frogs have been found during recent surveys. The only known specimens documented were found in the Nacimiento River in 1948 (US Army Reserve Training Center, Fort Hunter Liggett, 2003).

**California Tiger Salamander (candidate).** The California tiger salamander (*Ambystoma californiense*) can be found in grasslands and low foothill regions in Central and Northern California. Vernal pools and seasonal ponds are required for breeding (CDFG 2000). California tiger salamanders found on Fort Hunter Liggett are hybrids of California tiger salamander and the non-native eastern tiger salamander (*Ambystoma tigrinum*). Biologists have identified sixteen known breeding sites in both the San Antonio and Nacimiento river valleys (US Army Reserve Training Center, Fort Hunter Liggett, 2003).

**Vernal Pool Fairy Shrimp (threatened).** Vernal pool fairy shrimp (*Branchinecta lynchi*) are small crustaceans that inhabit vernal pools found in grasslands or mud bottomed swales. Threats to the species include destruction of vernal pools from urban development, flood control, agricultural development, highway and utility projects. Vernal pool fairy shrimp were listed as threatened in 1994 (59 Federal Register 180, September 19, 1994).

Recent surveys at Fort Hunter Liggett have identified 59 vernal pools that would provide high quality habitat for the vernal pool fairy shrimp. Of the 59 pools identified, 47 were found to contain vernal pool fairy shrimp. Fort Hunter Liggett limits land use and application of herbicides and pesticides in areas with highly sensitive habitat for vernal pool fairy shrimp (US Army Reserve Training Center, Fort Hunter Liggett, 2003).

**Smith's Blue Butterfly (endangered).** Smith's blue butterfly (*Euphilotes enoptes smithi*) inhabits coastal sand dunes, serpentine grasslands, and chaparral in Monterey County. Threatened by development, highway projects, foot and vehicular traffic, Smith's blue butterfly was listed as endangered in 1976 (41 Federal Register 106, June 1, 1976). Although Smith's blue butterfly does not inhabit Fort Hunter Liggett, it is known to occur in adjacent coastal areas (US Army Corps of Engineers 2000b).

**Other Protected Species.** Fort Hunter Liggett provides important habitat for mountain lion, tule elk, and the ring-tailed cat, state-protected large mammals that require extensive ranges to survive. The installation is part of a major mountain lion stronghold, and hosts 16–20 of these large felines. Tule elk, endemic to California, were once abundant, but declined in the late 19th century. During the Gold Rush era they served as an important source of meat and were hunted to near extinction. By 1874, the herd had declined from an estimated 500,000 head to less than 15 (Deck, et. al., n.d.; Ventana Wildlands Project 2000). They were reintroduced into Fort Hunter Liggett in 1978 and 1981 as part of a federal and state-legislated effort to establish new herds and prevent extinction. Fort Hunter Liggett's oak woodlands and grasslands are now home to a herd of approximately 400–450 tule elk (Fischer 2001). This herd comprises 15%–25% of the total population of tule elk, and is one of only two populations that meet the conditions necessary to sustain long-term genetic diversity (Ventana Wildlands Project 2000). Tule elk travel large distances, make extensive seasonal movements within their range, and therefore require large interconnected tracts of land that preserve a combination of grassland, oak savanna and chaparral. Recovery efforts, including protective legislation, have increased the current population of tule elk in California to more than 2,500. Hunting is allowed to maintain the herd within population objectives established in Fort Hunter Liggett's tule elk management plan (US Army Reserve Training Center, Fort Hunter Liggett, 2003).

### Fisheries

Warmwater fish are the primary seasonal inhabitants of the San Antonio and Nacimiento rivers. Native minnows such as California roach, hitch, Sacramento squawfish, and speckled dace, as well as several gamefish species, may be present throughout most of the river systems when adequate flows are present (winter periods).

Vernal pools, Brenda Tharp photo

Fish populations at Fort Hunter Liggett vary seasonally. As the river flows diminish during summer, some fish become stranded and die. Other fish seek permanent shelter in small isolated pools, such as those found in the Palisades area on the Nacimiento River, where they remain throughout the dry summer and fall (US Army Corps of Engineers 1995). Fishing is prohibited in Fort Hunter Liggett's rivers and streams to protect cultural resources, sensitive species, and to protect the safety of anglers (US Army Reserve Training Center, Fort Hunter Liggett, 2003).

Recreational fishing is permitted in eleven ponds throughout Fort Hunter Liggett. Bass, sunfish, and bluegill natural reproduction is good; however, Fort Hunter Liggett continues to restock to maintain fishable populations. Each year, rainbow trout and other species (bass, catfish, and mosquito fish) are stocked in various ponds and reservoirs for sport fishing.

## Visual Resources

While much of the original vegetation within the cantonment area has been replaced by military and residential land uses, the remainder of the installation retains highly scenic qualities associated with the oak woodlands, oak savannas, and riparian zones on the eastern side, and the chaparral covered peaks of the Santa Lucia Range on the west side. Rock outcrops known as the Palisades and Piedras Atlas are exceptionally scenic as they overlook the Nacimiento River.

The rolling oak landscape combined with historic resources such as the Mission San Antonio de Padua still hold the romantic image of the picturesque Spanish California landscape embodied in Helen Hunt Jackson's famous 1884 novel, *Ramona*. The release of this novel coincided with the arrival of Southern Pacific Railroad. This brought thousands of settlers and tourists to California inspired by this image of the California landscape and spurred the popularity of Mission Revival architecture. Although partially compromised by development in the cantonment area, some views from the Milpitas Hacienda are similar to what they were 70 years ago.

Views from Mission San Antonio de Padua are considered sensitive, and training exercises and vehicle movement are restricted near the Mission. Military convoys avoid use of Tank, Mission Creek, and Del Venturi roads on Sundays, and helicopters or other aircraft are prohibited over the Mission unless approved by Range Control. All military field training in that portion of the cantonment area west of Silo and Sulphur Springs roads is prohibited except for light infantry, which is restricted to the west side of the San Antonio River, south of Grid Line 86 (US Army Corps of Engineers, 2000b).

The Army permits public travel on Mission Creek, Del Venturi, Sam Jones (partial), and Nacimiento-Fergusson roads as long as it does not interfere with training or testing activities. Training activities sometimes disturb ground forms and vegetation in areas visible from these roads. Other areas are disturbed in some locations by burning and fire control measures such as firebreaks, as well as by maintenance of roads and training facilities.

**Table 3: Federally and State Listed Threatened and Endangered Species that May Occur on Fort Hunter Liggett**

| SPECIES | STATUS* Federal/State | NOTES |
|---|---|---|
| **Mammals** | | |
| San Joaquin kit fox *Vulpes macrotis mutica* | E/T | Kit fox has been seen at FHL in training areas 10, 12, 13, 15, 22, 24, 25, the cantonment area and the ASP. |
| **Birds** | | |
| Bald Eagle *Haliaeetus leucocephalus* | T/E | Sightings have occurred in training areas 2, 7, 12, 22, 23, 24, 25, the ASP, and the cantonment area. Training Area 22 contains an active nesting site. |
| California condor *Gymnogyps californianus* | E/E | In May 2002, a condor was sited foraging in Training Area 20. |
| Least Bell's vireo *Vireo bellii pusillus* | E/E | FHL provides suitable habitat in training areas 7, 22, 25, and 29. |
| Peregrine falcon *Falco peregrinus* | Delisted/E | No breeding birds are known to occur at the Palisades or other rock outcrops which provide suitable nesting habitat; wintering birds are known to forage at FHL. |
| **Amphibians** | | |
| Arroyo toad *Bufo microscaphus* | E/- | A 17-mile stretch of the San Antonio River harbors breeding populations of the northern-most occurrence of arroyo toad. This site (on FHL) has been determined to be essential to the recovery of this species. |
| California red-legged frog *Rana aurora draytoni* | T/- | Historic sightings are known for FHL; however, there are currently no known occurrences of this species. |
| California tiger salamander *Ambystoma californiense* | Candidate/- | There are 16 confirmed breeding pools for California tiger salamander in training areas 10, 12B, 15, 20, 22, and 27. |
| **Invertebrates** | | |
| Vernal pool fairy shrimp *Branchinecta lynchi* | T/- | In 2003, 59 high priority vernal pools were found at FHL in training areas 12, 14, 20, 22, 24, 25, 27, the ASP and the cantonment area. Of these 59 pools, 47 contained vernal pool fairy shrimp. |
| Smith's blue butterfly *Euphilotes enoptes smithi* | E/- | Potentially occurs at FHL. |
| **Plants** | | |
| Santa Lucia Mint *Pogogyne clareana* | -/E | Occurs only at FHL in training areas 17, 18, 19, and 23, 26; Los Bueyes Creek; Los Burros Creek; North Fork Creek; Italian Flat. |
| Dwarf calycadenia *Calycadenia villosa* | SOC/- | Occurs in training areas 1, 2, 3, 5, 6, 7, 9, 12, 13, 15, 18, 19, 20, 22, 23, 24, 25, 26, 27, and 28, 29; northwest of San Antonio Mission; south of Burro Mountain; Oak Flat; the Jolon area; ASP; cantonment area. |
| Purple amole *Chlorogalum purpureum* var. *purpureum* | T/- | This variety of purple amole occurs only at FHL. Occurs in training areas 13, 22, 23, 24, 25; grasslands, ; oak woodlands;, the cantonment area, ; ASP, ; the Jolon area; Milpitas Ranch; near Argyle Road;and training areas, 13, 22, 23, 24, and 25. |
| Late-flowering mariposa lily *Calochortus weedii* var. *vestus* | SOC/- | Occurs in training areas 14, 17, 18, 23, 26, and 28. |
| Cone Peak bedstraw *Galium californicum* ssp. *luciense* | SOC/- | Occurs at the border of training areas 2 and 5 near the west boundary; and Training training Area areas 4, 5, 8, 17, 23. |

| SPECIES | STATUS* Federal/State | NOTES |
|---|---|---|
| Davidson's bush mallow *Malacothamnus palmeri* var. *involucratus* | SOC/- | Occurs in training areas 2, 3, 7, 24, and 27. |
| Carmel Valley bush mallow *Malacothamnus palmeri* var. *involucratus* | SOC/- | Occurs in training areas 7 and, 10; Cosio Knob; Sulpher Springs Road; Jolon; northeast of San Antonio Mission. |
| Morrison's jewel flower *Streptanthus morrisonii* | SOC/- | Occurs in Training areas 18., 23; Los Burros Creek; ridge between Salmon and Los Burros creeks. |
| Caper-fruited tropidocarpum *Tropidocarpum Capperideum* | SOC/- | Occurs in training areas 15 and 24. |
| Hardham's evening-primrose *Camissonia hardhamiae* | SOC/- | Cantonment area; training areas 2, 3, 6. |
| Prostrate navarretia *Navarretia prostrata* | SOC/- | ASP; around Jolon. |
| Davidson's bush mallow *Malacothamnus davidsonii* | SOC/- | Training areas 2, 3, 7, 10, 24, 27; Sulphur Springs Road; NW of San Antonio Mission; Sam Jones Road; Bald Mountain. |
| Pale-yellow layia *Layia heterotricha* | SOC/- | Cantonment area; Training Area 27; San Antonio Mission Road; Sam Jones Road. |
| Hooked popcorn-flower *Plagiobothrys uncinatus* | SOC/- | Training Area 23; Los Bueyes Creek; Los Burros Creek. |
| Most beautiful jewel-flower *Streptanthus albidus* ssp. *peramoenus* | SOC/- | Occurs in training areas 17, 23, 28, Jolon; Stony Valley; San Miguelito Ranch; Los Bueyes Road; Los Bueyes Creek; south of Burro Mountain; Los Burros Creek. |
| South Coast Range morning-glory *Calystegia collina Brummitt* ssp. *venusta* | SOC/- | |
| San Benito thorn-mint *Acanthomintha obovata* ssp. *obovata* | SOC/- | Training areas 3, 7, 10' northeast of San Antonio Mission. |
| One-awned spineflower *Chorizanthe rectispina* | SOC/- | In or near ASP, training areas 1, 7, 10, 13, 25, 29; near Jolon; NE, SE of Jolon; Jolon Valley. |

**Sources:** US Army Reserve Training Center, Fort Hunter Liggett, 2003; Painter 2004; USFWS 2001; USFWS 2004

ASP= Ammunition Supply Point
FHL= Fort Hunter Liggett

*** Status explanations**
**Federal**
E= listed as endangered under the federal Endangered Species Act.
T = listed as threatened under the federal Endangered Species Act.
PE = Proposed for listing as endangered under the federal Endangered Species Act.
Candidate = Former Category 1 candidate. Includes species for which USFWS has on file enough substantial information on biological vulnerability and threat to support proposals to list them.
SOC (Plant Species of Concern) = Former Category 2. Biological information may warrant listing as threatened or endangered, but more information is needed. Specie s of concern receive no legal protection.

**State**
E = listed as endangered under the California Endangered Species Act.
T = listed as threatened under the California Endangered Species Act.

****Fort Hunter Liggett has documented species by training area location. See Figure 9a. Habitat Types for the location of training areas.**

**Table 4: Other Special Interest Plant Species Documented on Fort Hunter Liggett**

| Species | Status: State | CNPS |
|---|---|---|
| *Abies bracteata*<br>Bristle cone fir | CEQA | 1B |
| *Aristocapsa insignis*<br>Indian Valley spineflower | CEQA | 1B |
| *Baccharis plumerae* ssp. *glabrata*<br>San Simeon baccharis | CEQA | 1B |
| *Calycadenia truncata* ssp. *microcephala*<br>Snow Mountain calycadenia | CEQA | 1B |
| *Castilleja densiflora* ssp. *obispoensis*<br>Obispo Indian paintbrush | CEQA | 1B |
| *Caulanthus coulteri* var. *lemmonii*<br>Lemmon's jewelflower | CEQA | 1B |
| *Chorizanthe rectispina*<br>Straight-awned spineflower | CEQA | 1B |
| *Clarkia jolonensis*<br>Jolon clarkia | CEQA | 1B |
| *Collinsia antonina*<br>San Antonio collinsia | CEQA | 1B |
| *Delphinium umbraculorum* [on or very near FHL]<br>Umbrella larkspur | CEQA | 1B |
| *Eriastrum luteum*<br>Yellow-flowered eriastrum | CEQA | 1B |
| *Fritillaria viridea*<br>San Benito fritillary | CEQA | 1B |
| *Galium hardhamiae*<br>Hardham's bedstraw | CEQA | 1B |
| *Monardella palmeri*<br>Palmer's monardella | CEQA | 1B |
| *Navarretia nigelliformis* ssp. *radians*<br>Shining navarretia | CEQA | 1B |
| *Pentachaeta exilis* ssp.*aeolica*<br>Slender pentachaeta | CEQA | 1B |
| *Sidalcea hickmanii* ssp. *hickmanii*<br>Hickman's checkerbloom | CEQA | 1B |
| *Streptanthus albidus* ssp. *paramoenus*<br>Metcalf Canyon jewelflower | CEQA | 1B |
| *Triteleia ixioides* ssp. *cookii*<br>Cook's triteleia | CEQA | 1B |
| *Senecio aphanactis*<br>Rayless ragwort | sp | 2 |
| *Calyptridium parryi* var. *hesseae*<br>Santa Cruz Mountains pussypaws | sp | 3 |
| *Lupinus albifrons* var. *abramsii*<br>Abram's lupine | sp | 3 |

| Species | Status: State | CNPS |
|---|---|---|
| *Micropus amphibolus*<br>Mt. Diablo cottonweed | sp | 3 |
| *Monardella antonina* ssp. *antonina*<br>San Antonio Hills monardella | sp | 3 |
| *Acanthomintha obovata* ssp. *obovata*<br>San Benito thorn-mint | sp | 4 |
| *Arabis blepharophylla*<br>Coast rock cress | sp | 4 |
| *Arctostaphylos hooveri*<br>Hoover's manzanita | sp | 4 |
| *Arctostaphylos obispoensis*<br>Bishop manzanita | sp | 4 |
| *Aspidotis carlotta-halliae*<br>Carlotta Hall's lace fern | sp | 4 |
| *Astraglus macrodon*<br>Salinas milk-vetch | sp | 4 |
| *Calandrinia breweri*<br>Brewer's calandrinia | sp | 4 |
| *Chorizanthe douglasii*<br>Douglas's spineflower | sp | 4 |
| *Chorizanthe palmeri*<br>Palmer's spineflower | sp | 4 |
| *Clarkia lewisii*<br>Lewis's clarkia | sp | 4 |
| *Cryptantha rattanii*<br>Rattan's cryptantha | sp | 4 |
| *Delphinium gypsophylum* ssp. *parviflorum*<br>Small-flowered gypsum-loving larkspur | sp | 4 |
| *Eriogonum nudum* var. *indictum*<br>Protruding buckwheat | sp | 4 |
| *Eschscholzia hypecoides*<br>San Benito poppy | sp | 4 |
| *Fritillaria agrestis*<br>Stinkbells | sp | 4 |
| *Galium andrewsii* ssp. *gatense*<br>Serpentine bedstraw | sp | 4 |
| *Gilia tenuiflora* ssp. *amplifaucalis*<br>Trumpet-throated gilia | sp | 4 |
| *Horkelia yadonii*<br>Santa Lucia horkelia | sp | 4 |
| *Lasthenia leptalea*<br>Salinas Valley goldfields | sp | 4 |
| *Lessingia tenuis*<br>Spring lessingia | sp | 4 |

| **Species** | **Status: State** | **CNPS** |
|---|---|---|
| *Lomatium parvifolium*<br>Small-leaved lomatium | sp | 4 |
| *Lupinus cervinus*<br>Santa Lucia lupine | sp | 4 |
| *Malacothamnus jonesii*<br>Slender bush mallow | sp | 4 |
| *Mimulus subsecundus*<br>One-sided monkeyflower | sp | 4 |
| *Mucronea californica*<br>California spineflower | sp | 4 |
| *Navarretia jaredii*<br>Paso Robles navarettia | sp | 4 |
| *Perideridia pringlei*<br>Adobe yampah | sp | 4 |
| *Piperia michaelii*<br>Michael's rein orchid | sp | 4 |
| *Syntrichopappus lemmonii*<br>Lemmon's syntrichopappus | sp | 4 |
| *Systenotheca vortriedei*<br>Straight-awned spineflower | sp | 4 |
| *Zigadenus micranthus* var. *fontanus*<br>Marsh zigadenus | sp | 4 |

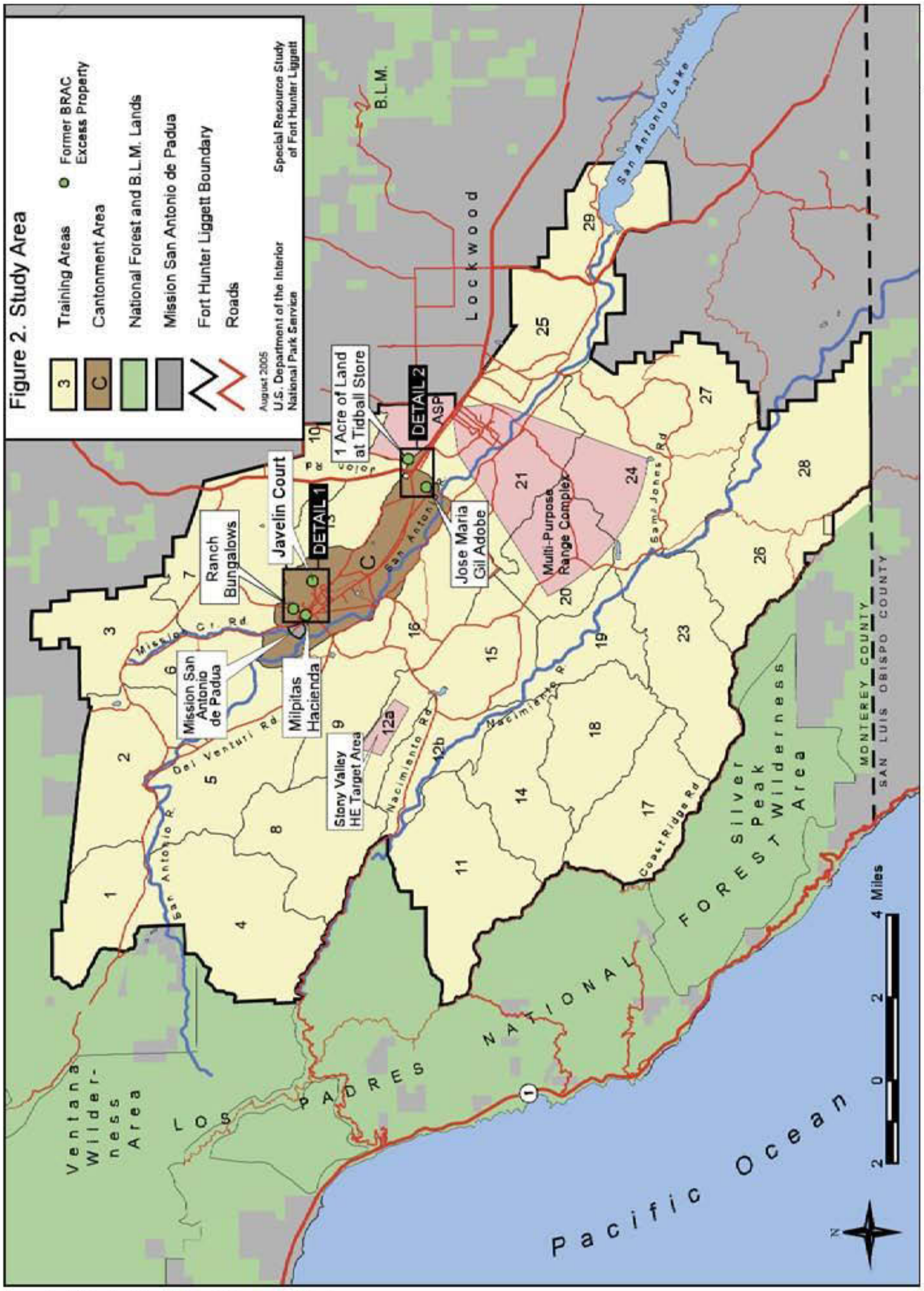
**Sources:** CEMML 1999; Painter 2001; Painter 2004; CDFG 2000b; CDFG 2004.

**State**
sp = Special plants: plants included in California Department of Fish and Game Natural Diversity Database Special Vascular Plant, Bryophytes, and Lichens List (July 2001; April 2004)
CEQA = Species which meet the criteria for listing, even if not included on any list, as described in Section 15380 of the California Environmental Quality Act (CEQA) Guidelines

**CNPS**
1A = Presumed Extinct in California
1B = Rare or Endangered in California and Elsewhere
2 = Rare or Endangered in California More Common Elsewhere
3 = Need More Information
4 = Plants of Limited Distribution

**Table 5: Other Special Status Wildlife Species that Occur on Fort Hunter Liggett**

| SPECIES | CA STATUS |
|---|---|
| **Mammals** | |
| American badger, *Taxidea taxus* | Special Concern |
| Monterey dusky-footed woodrat, *Neotoma fuscipes luciana* | Special Concern |
| Mountain lion, *Felix concolor* | Protected |
| Pale big-eared bat, *Plecotus townsendii palescens* | Special Concern |
| Pallid bat, *Antrozus pallidus* | Candidate - needs confirmation |
| Ring-tailed cat, *Bassariscus astutus* | Protected |
| Salinas pocket mouse, *Perognathus inornatus psammophilus* | Special Concern |
| Tule elk, *Cervus elaphus nannodes* | Protected |
| **Birds * = breeding species; others are winterers or migrants** | |
| American white pelican, *Pelecanus erythrorhynchos* | Special Concern |
| Black swift, *Cypseloides niger* | Special Concern |
| Burrowing owl, *Athene cunicularia* | Special Concern |
| California gull, *Larus californicus* | Special Concern |
| Double-crested cormorant, *Phalacrocorax auritus* | Special Concern |
| Ferruginous hawk, *Buteo regalis* | Special Concern |
| Golden eagle*, *Aguila cyrysaetos* | Special Concern |
| Long-eared owl*, *Asio otus* | Special Concern |
| Northern harrier*, *Circus cyaneus* | Special Concern |
| Osprey, *Pandion halietus* | Special Concern |
| Prairie falcon*, *Falco mexicanus* | Special Concern |
| Purple martin*, *Progne subis* | Special Concern |
| Sharp-shinned hawk*, *Accipiter striatus* | Special Concern |
| Short-eared owl, *Asio flammeus* | Special Concern |
| Tricolored blackbird*, *Agelaius tricolor* | Special Concern |
| Western grebe*, *Aechmophorus occidentalis* | Candidate |
| Yellow-breasted chat*, *Icteria virens* | Special Concern |
| Yellow warbler*, *Dendroica petechia brewsteri* | Special Concern |
| **Reptiles** | |
| Coast horned lizard, *Phrynomosa coronatum frontale* | Special Concern |
| Western pond turtle, *Clemmys marmorata pallida* | Special Concern |
| **Amphibians** | |
| Foothill yellow-legged frog, *Rana boylei* | Special Concern |
| Western spadefoot toad, *Scaphiophus hammondii* | Special Concern |
| **Fish** | |
| Hardhed, *Mylopharadon conocephalus* | Special Concern |
| San Joaquin Roach, *Lavinia symmetricus ssp.* | Special Concern - needs confirmation |




Fort Hunter Liggett Special Resource Study

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Figures

F Figures

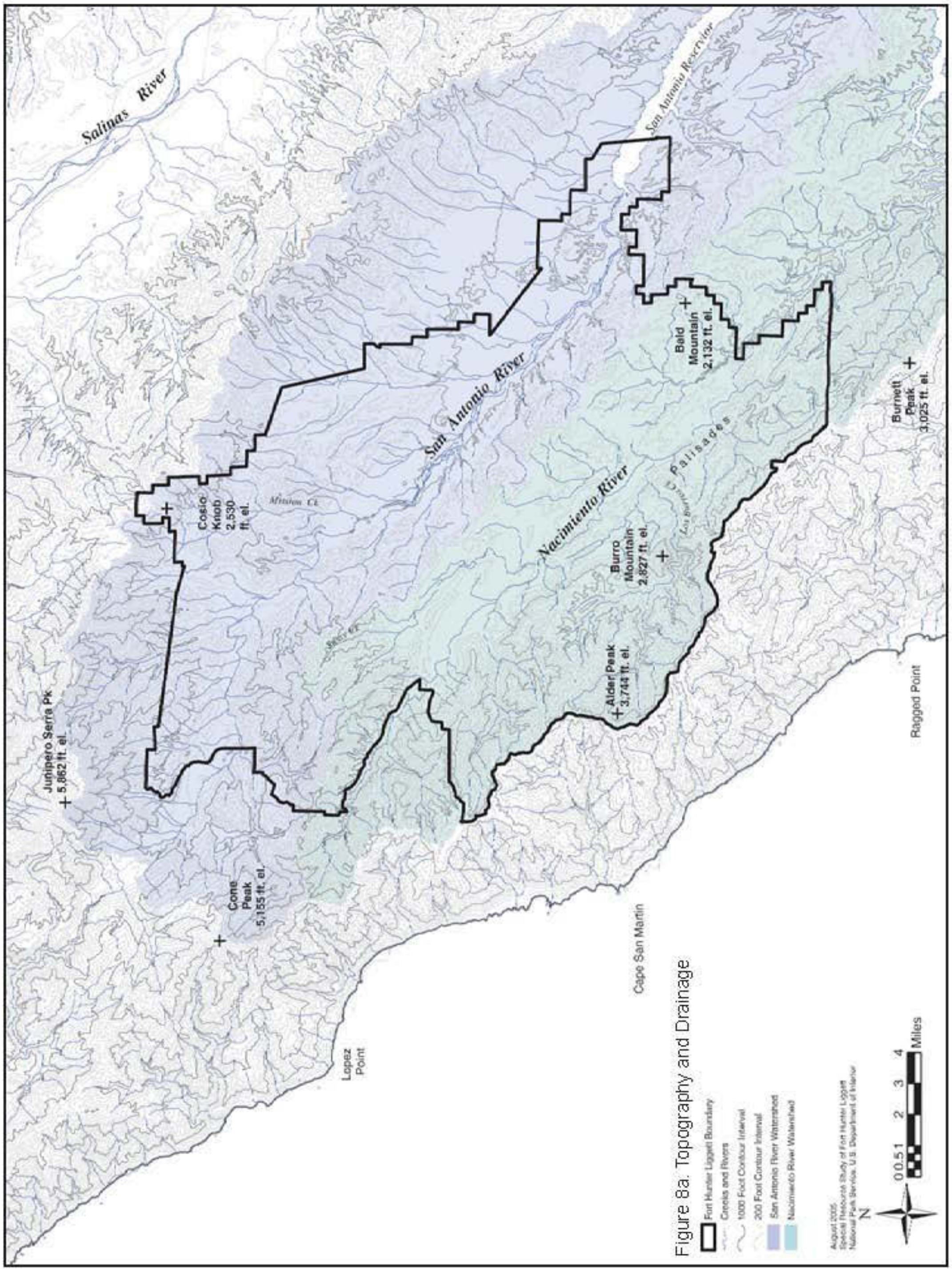
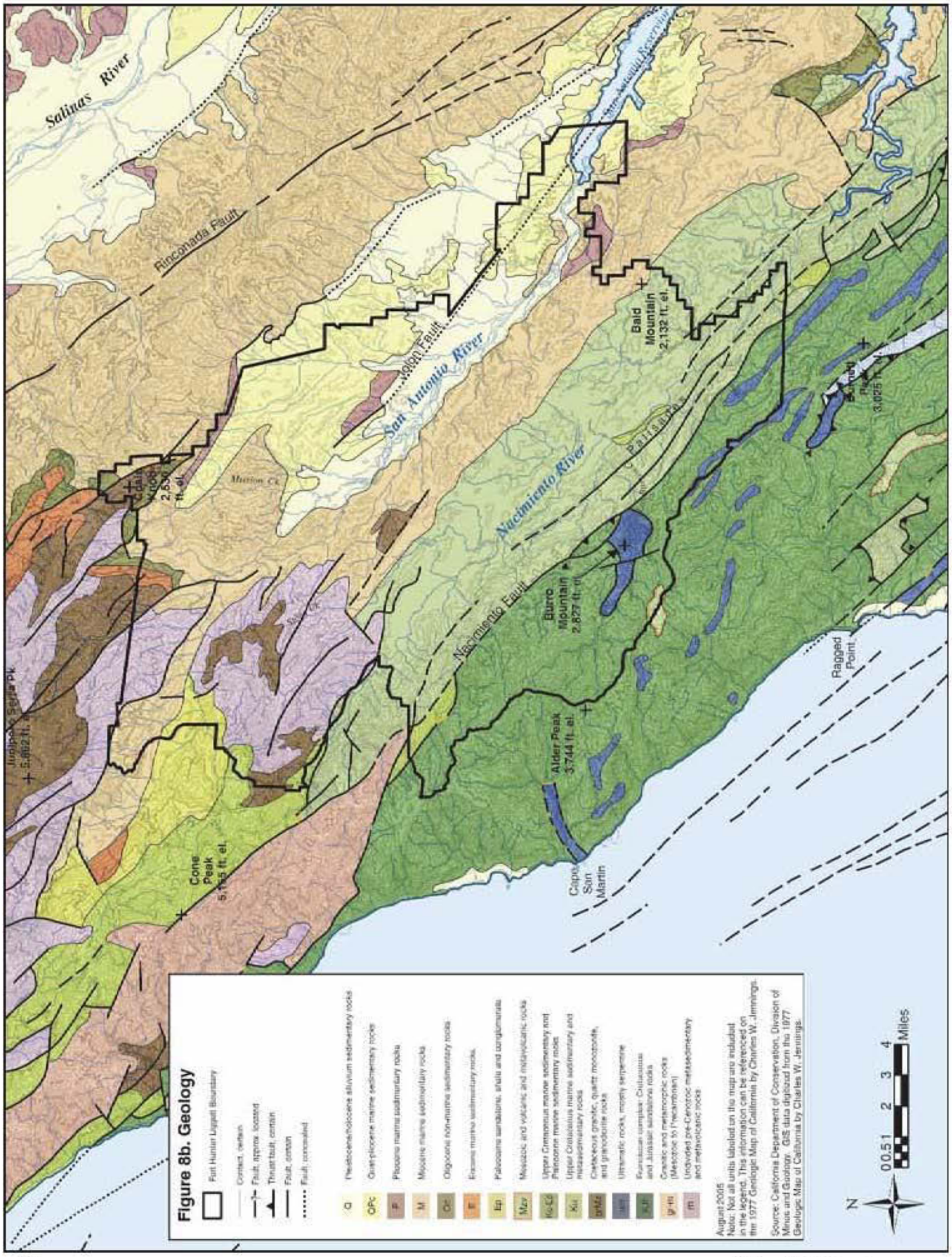



Figure 8a. Topography and Drainage

*Fort Hunter Liggett Special Resource Study* 125

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*National Park Service*

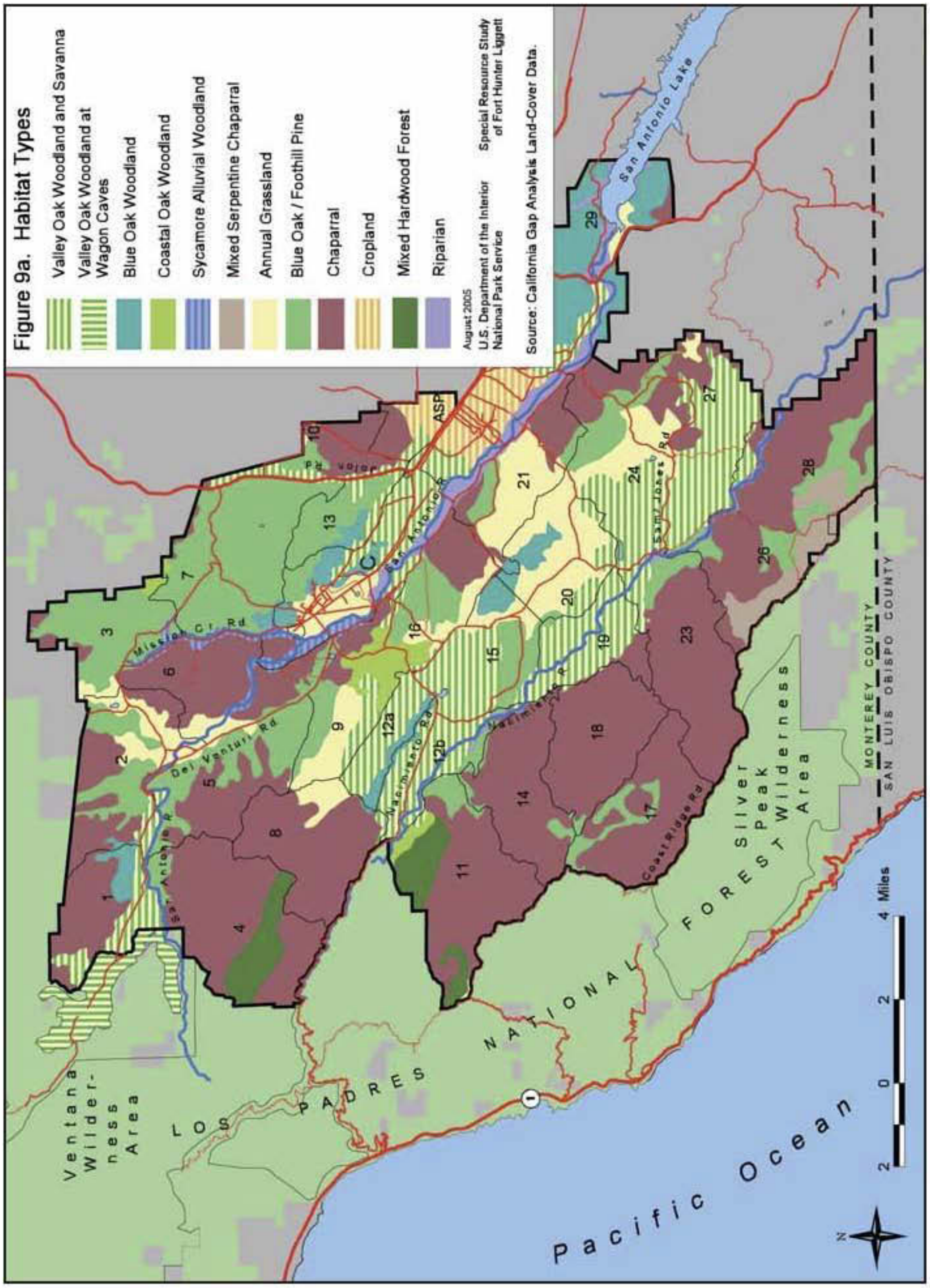
Figure 9a. Habitat Types
Valley Oak Woodland and Savanna
Valley Oak Woodland at Wagon Caves
Blue Oak Woodland
Coastal Oak Woodland
Sycamore Alluvial Woodland
Mixed Serpentine Chaparral
Annual Grassland
Blue Oak / Foothill Pine
Chaparral
Cropland
Mixed Hardwood Forest
Riparian
August 2005
U.S. Department of the Interior
National Park Service
Special Resource Study of Fort Hunter Liggett
Source: California Gap Analysis Land-Cover Data.
Ventana Wilderness Area
Los Padres National Forest
Silver Peak Wilderness Area
Pacific Ocean
San Antonio Lake
Monterey County
San Luis Obispo County
Mission Cr Rd
Del Venturi Rd
Nacimiento R
San Antonio R
Jolon Rd
Sam Jones Rd
Coast Ridge Rd
ASP
4 Miles

F Figures

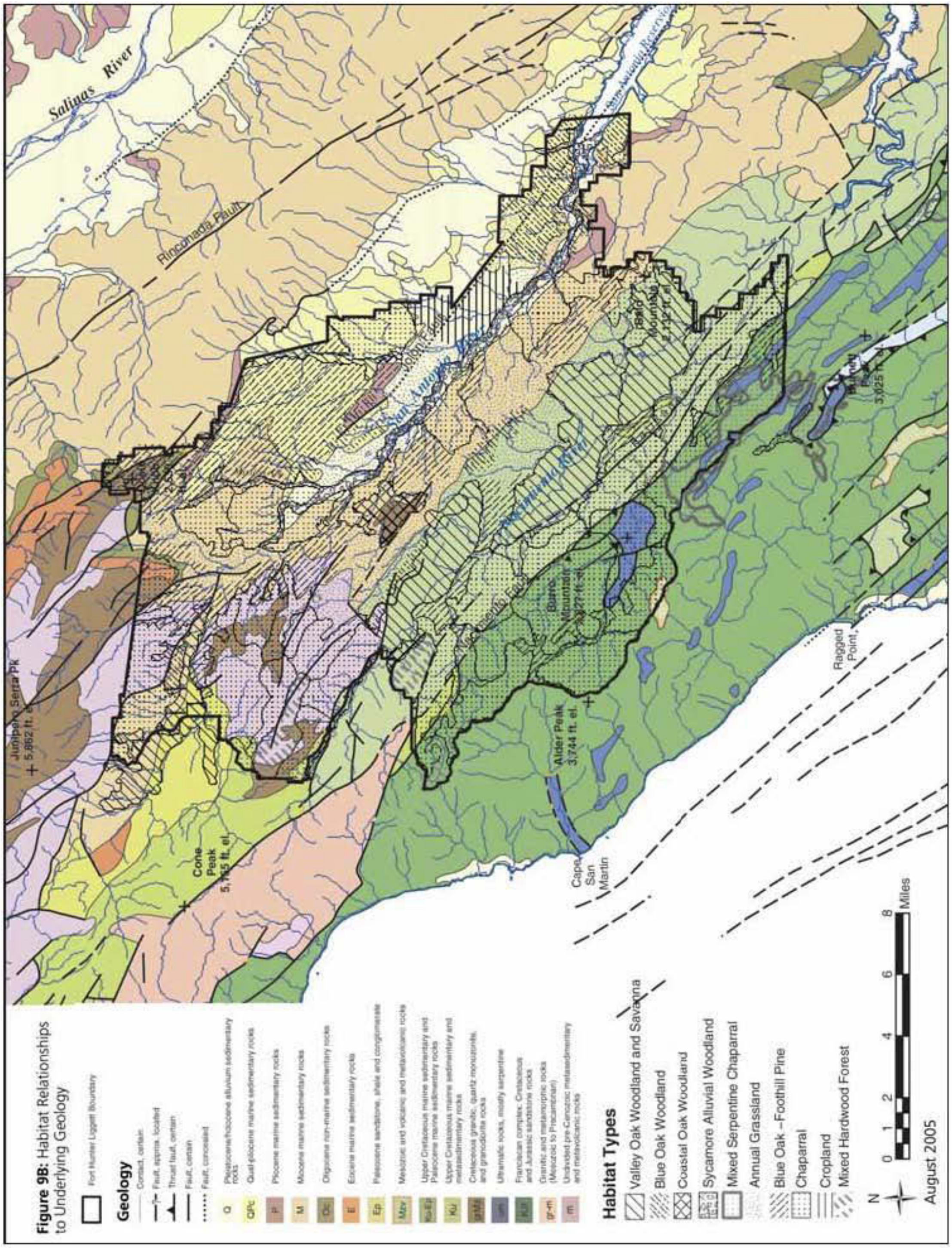


Figure 9B: Habitat Relationships to Underlying Geology

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*National Park Service*

## 9.3 Soil Inventory

Source:

United States Department of Agriculture
Natural Resources Conservation Service Soil Survey Geographic

## Soils in upper Nacimiento Reservoir watershed

| Soil | Acres | % of upper watershed area |
|---|---|---|
| Alo silty clay, 15 to 30 percent slopes | 87 | 0.08% |
| Alo silty clay, 2 to 9 percent slopes | 28 | 0.03% |
| Alo silty clay, 30 to 50 percent slopes | 1 | 0.00% |
| Alo silty clay, 9 to 15 percent slopes | 19 | 0.02% |
| Arroyo Seco gravelly loam, 2 to 5 percent slopes | 36 | 0.03% |
| Arroyo Seco gravelly sandy loam, 2 to 5 percent slopes | 360 | 0.34% |
| Arroyo Seco gravelly sandy loam, 5 to 9 percent slopes | 18 | 0.02% |
| Ayar silty clay, 30 to 50 percent slopes | 12 | 0.01% |
| Ayar silty clay, 5 to 15 percent slopes | 53 | 0.05% |
| Badland | 447 | 0.43% |
| Chualar loam, 0 to 2 percent slopes | 85 | 0.08% |
| Chualar loam, 2 to 5 percent slopes | 978 | 0.93% |
| Chualar loam, 5 to 9 percent slopes | 431 | 0.41% |
| Cieneba fine gravelly sandy loam, 30 to 75 percent slopes | 226 | 0.22% |
| Cieneba-Rock outcrop complex | 5,781 | 5.52% |
| Cieneba-Sur-Rock outcrop complex | 195 | 0.19% |
| Clear Lake clay, moderately wet | 49 | 0.05% |
| Cropley silty clay, 0 to 2 percent slopes | 227 | 0.22% |
| Cropley silty clay, 2 to 9 percent slopes | 150 | 0.14% |
| Danville sandy clay loam, 2 to 9 percent slopes | 54 | 0.05% |
| Diablo clay, 15 to 30 percent slopes | 1 | 0.00% |
| Diablo clay, 30 to 50 percent slopes | 46 | 0.04% |
| Diablo clay, 9 to 15 percent slopes | 119 | 0.11% |
| Dibble clay loam, 15 to 30 percent slopes | 80 | 0.08% |
| Dibble clay loam, 30 to 50 percent slopes | 432 | 0.41% |
| Dibble clay loam, 9 to 15 percent slopes | 11 | 0.01% |
| Dibble loam, 2 to 9 percent slopes | 1,163 | 1.11% |
| Dibble silt loam, 15 to 30 percent slopes | 731 | 0.70% |
| Dibble silt loam, 30 to 50 percent slopes | 2,980 | 2.85% |
| Dibble silt loam, 9 to 15 percent slopes | 417 | 0.40% |
| Docas silty clay loam, 2 to 9 percent slopes | 107 | 0.10% |
| Elder sandy loam, 0 to 2 percent slopes | 290 | 0.28% |
| Elder very fine sandy loam, 2 to 9 percent slopes | 207 | 0.20% |
| Fluvents, stony | 220 | 0.21% |
| Gamboa-Sur complex | 68 | 0.06% |
| Gaviota sandy loam, 15 to 30 percent slopes | 20 | 0.02% |
| Gaviota sandy loam, 30 to 75 percent slopes | 9,935 | 9.49% |
| Gaviota-Rock outcrop complex, 30 to 75 percent slopes | 1,173 | 1.12% |
| Gaviota-San Andreas association, moderately steep | 26 | 0.03% |
| Gaviota-San Andreas association, very steep | 59 | 0.06% |
| Gaviota-San Andreas complex, 15 to 30 percent slopes | 8,093 | 7.73% |
| Gaviota-San Andreas complex, 30 to 75 percent slopes | 9,669 | 9.24% |
| Gazos silt loam, 15 to 30 percent slopes | 135 | 0.13% |
| Gazos silt loam, 30 to 50 percent slopes | 817 | 0.78% |
| Gilroy gravelly loam, 15 to 50 percent slopes | 82 | 0.08% |
| Gilroy gravelly loam, 30 to 75 percent slopes, eroded | 716 | 0.68% |

| | | |
|---|---|---|
| Gilroy-Rock outcrop complex, 30 to 50 percent slopes | 20 | 0.02% |
| Gorgonio sandy loam, 0 to 5 percent slopes | 120 | 0.11% |
| Greenfield fine sandy loam, 9 to 15 percent slopes | 28 | 0.03% |
| Haire loam, 15 to 30 percent slopes | 75 | 0.07% |
| Hanford and Greenfield soils, 2 to 9 percent slopes | 22 | 0.02% |
| Henneke extremely stony clay loam, 15 to 75 percent slopes | 2,546 | 2.43% |
| Henneke-Rock outcrop complex, 15 to 75 percent slopes | 272 | 0.26% |
| Junipero sandy loam, 30 to 75 percent slopes | 411 | 0.39% |
| Linne silty clay loam, 30 to 50 percent slopes | 16 | 0.02% |
| Linne-Shedd silty clay loams, 15 to 50 percent slopes, eroded | 31 | 0.03% |
| Linne-Shedd silty clay loams, 30 to 50 percent slopes | 6 | 0.01% |
| Lockwood loam, 0 to 2 percent slopes | 19 | 0.02% |
| Lockwood loam, 2 to 9 percent slopes | 74 | 0.07% |
| Lockwood shaly loam, 2 to 9 percent slopes | 35 | 0.03% |
| Lockwood shaly loam, 9 to 15 percent slopes | 29 | 0.03% |
| Los Gatos gravelly loam, 30 to 50 percent slopes | 36 | 0.03% |
| Los Osos clay loam, 15 to 30 percent slopes | 66 | 0.06% |
| Los Osos clay loam, 30 to 50 percent slopes | 1,115 | 1.06% |
| Los Osos clay loam, 50 to 75 percent slopes | 675 | 0.64% |
| Los Osos-Lodo complex, 50 to 75 percent slopes | 230 | 0.22% |
| Los Osos-Millsholm complex | 2,463 | 2.35% |
| McMullin-Plaskett complex | 7,643 | 7.30% |
| Millsholm loam, 30 to 75 percent slopes | 347 | 0.33% |
| Nacimiento silty clay loam, 15 to 30 percent slopes | 168 | 0.16% |
| Nacimiento silty clay loam, 30 to 50 percent slopes | 212 | 0.20% |
| Nacimiento silty clay loam, 9 to 15 percent slopes | 46 | 0.04% |
| Nacimiento-Los Osos complex, 30 to 50 percent slopes | 246 | 0.23% |
| Nacimiento-Los Osos complex, 50 to 75 percent slopes | 52 | 0.05% |
| Pacheco clay loam | 78 | 0.07% |
| Pfeiffer fine sandy loam, 2 to 9 percent slopes | 140 | 0.13% |
| Pinnacles coarse sandy loam, very gravelly subsoil variant, 5 to 30 percent slopes | 77 | 0.07% |
| Placentia sandy loam, 2 to 9 percent slopes | 300 | 0.29% |
| Placentia sandy loam, 9 to 15 percent slopes | 113 | 0.11% |
| Plaskett-Reliz complex | 2,056 | 1.96% |
| Psamments and Fluvents, frequently flooded | 1,392 | 1.33% |
| Rincon clay loam, 2 to 9 percent slopes | 78 | 0.07% |
| Rincon clay loam, 9 to 15 percent slopes | 152 | 0.15% |
| Rock outcrop-Gaviota complex, 30 to 75 percent slopes | 73 | 0.07% |
| Rock outcrop-Xerorthent association | 21,091 | 20.15% |
| Ryer clay loam, 2 to 9 percent slopes | 59 | 0.06% |
| Salinas clay loam, 0 to 2 percent slopes | 810 | 0.77% |
| Salinas loam, 0 to 2 percent slopes | 44 | 0.04% |
| San Andreas fine sandy loam, 15 to 30 percent slopes | 65 | 0.06% |
| San Andreas fine sandy loam, 30 to 75 percent slopes | 35 | 0.03% |
| Santa Lucia shaly clay loam, 30 to 50 percent slopes | 114 | 0.11% |
| Santa Lucia-Reliz association | 368 | 0.35% |
| Santa Ynez fine sandy loam, 15 to 30 percent slopes | 6 | 0.01% |
| Santa Ynez fine sandy loam, 2 to 9 percent slopes | 99 | 0.09% |
| Santa Ynez fine sandy loam, 5 to 15 percent slopes, eroded | 214 | 0.20% |
| Santa Ynez fine sandy loam, 9 to 15 percent slopes | 45 | 0.04% |

| | | |
|---|---|---|
| Shedd silt loam, 30 to 75 percent slopes, severely eroded | 296 | 0.28% |
| Shedd silty clay loam, 30 to 50 percent slopes, eroded | 359 | 0.34% |
| Sheridan coarse sandy loam, 15 to 30 percent slopes | 232 | 0.22% |
| Sheridan coarse sandy loam, 30 to 75 percent slopes | 1,497 | 1.43% |
| Sheridan coarse sandy loam, 5 to 15 percent slopes | 76 | 0.07% |
| Shimmon loam, 15 to 30 percent slopes | 20 | 0.02% |
| Shimmon loam, 30 to 50 percent slopes | 48 | 0.05% |
| Shimmon-Dibble association, steep | 106 | 0.10% |
| Shimmon-Dibble association, very steep | 427 | 0.41% |
| Snelling-Greenfield complex, 5 to 15 percent slopes | 454 | 0.43% |
| Sorrento clay loam, 0 to 2 percent slopes | 106 | 0.10% |
| Sorrento clay loam, 2 to 9 percent slopes | 414 | 0.40% |
| Sur-Junipero complex | 3,815 | 3.64% |
| Sur-Plaskett complex | 3,338 | 3.19% |
| Vista coarse sandy loam, 15 to 30 percent slopes | 119 | 0.11% |
| Vista coarse sandy loam, 30 to 75 percent slopes | 1,385 | 1.32% |
| Vista coarse sandy loam, 5 to 15 percent slopes | 146 | 0.14% |
| Vista-Rock outcrop complex | 99 | 0.09% |
| Water | 117 | 0.11% |
| Xerofluvents-Riverwash association | 74 | 0.07% |
| Xerorthents, dissected | 175 | 0.17% |
| Xerorthents, sandy | 124 | 0.12% |
| **Total** | **104,669** | **100.00%** |

## Soils in lower Nacimiento Reservoir watershed

| Soil | Acres | % of lower watershed area |
|---|---|---|
| Alo silty clay, 30 to 50 percent slopes | 12 | 0.01% |
| Arbuckle fine sandy loam, 2 to 9 percent slopes | 121 | 0.12% |
| Arbuckle-Positas complex, 50 to 75 percent slopes | 376 | 0.36% |
| Arbuckle-Positas complex, 9 to 15 percent slopes | 55 | 0.05% |
| Arbuckle-San Ysidro complex, 2 to 9 percent slopes | 81 | 0.08% |
| Arnold loamy sand, 9 to 30 percent slopes | 111 | 0.11% |
| Arnold-San Andreas complex | 104 | 0.10% |
| Arnold-San Andreas complex, 30 to 75 percent slopes | 65 | 0.06% |
| Ayar and Diablo soils, 15 to 30 percent slopes | 978 | 0.95% |
| Ayar and Diablo soils, 30 to 50 percent slopes | 766 | 0.74% |
| Ayar and Diablo soils, 9 to 15 percent slopes | 601 | 0.58% |
| BADLAND | 958 | 0.93% |
| Badland | 8 | 0.01% |
| Balcom-Calleguas complex, 50 to 75 percent slopes | 1,093 | 1.06% |
| Balcom-Nacimiento association, moderately steep | 149 | 0.14% |
| Balcom-Nacimiento association,steep | 464 | 0.45% |
| Chualar loam, 5 to 9 percent slopes | 85 | 0.08% |
| Cieneba coarse sandy loam, 30 to 75 percent slopes | 880 | 0.85% |
| Cropley clay, 0 to 2 percent slopes | 16 | 0.02% |
| Cropley clay, 2 to 9 percent slopes | 960 | 0.93% |
| Cropley silty clay, 2 to 9 percent slopes | 17 | 0.02% |

| | | |
|---|---|---|
| Diablo clay, 9 to 15 percent slopes | 12 | 0.01% |
| Dibble clay loam, 15 to 30 percent slopes | 2,256 | 2.18% |
| Dibble clay loam, 30 to 50 percent slopes | 8,449 | 8.17% |
| Dibble clay loam, 50 to 75 percent slopes | 6,169 | 5.97% |
| Dibble clay loam, 9 to 15 percent slopes | 1,468 | 1.42% |
| Gaviota sandy loam, 15 to 30 percent slopes | 121 | 0.12% |
| Gaviota sandy loam, 30 to 75 percent slopes | 124 | 0.12% |
| Gaviota-Rock outcrop complex, 30 to 75 percent slopes | 10,952 | 10.59% |
| Gaviota-San Andreas association, moderately steep | 599 | 0.58% |
| Gaviota-San Andreas association, very steep | 771 | 0.75% |
| Gaviota-San Andreas complex, 15 to 30 percent slopes | 5 | 0.00% |
| Gaviota-San Andreas complex, 30 to 75 percent slopes | 4 | 0.00% |
| Gazos shaly clay loam, 9 to 30 percent slopes | 4 | 0.00% |
| Gazos silt loam, 15 to 30 percent slopes | 10 | 0.01% |
| Gilroy gravelly loam, 15 to 50 percent slopes | 39 | 0.04% |
| Gilroy gravelly loam, 30 to 75 percent slopes, eroded | 40 | 0.04% |
| Gilroy-Rock outcrop complex, 30 to 50 percent slopes | 81 | 0.08% |
| Hanford and Greenfield soils, 2 to 9 percent slopes | 340 | 0.33% |
| Henneke extremely stony clay loam, 15 to 75 percent slopes | 109 | 0.11% |
| Henneke-Rock outcrop complex, 15 to 75 percent slopes | 6,110 | 5.91% |
| Linne-Calodo complex, 30 to 50 percent slopes | 1,121 | 1.08% |
| Linne-Calodo complex, 50 to 75 percent lsopes | 2,692 | 2.60% |
| Linne-Calodo complex, 9 to 30 percent slopes | 890 | 0.86% |
| Linne-Diablo complex, 9 to 15 percent slopes | 312 | 0.30% |
| Linne-Zakme complex, 30 to 50 percent slopes | 1,659 | 1.60% |
| Lockwood shaly loam, 2 to 9 percent slopes | 35 | 0.03% |
| Lodo clay loam, 50 to 75 percent slopes | 9 | 0.01% |
| Lompico-McMullin complex, 50 to 75 percent slopes | 5,346 | 5.17% |
| Lompico-McMullin loams, 30 to 75 percent slopes | 27 | 0.03% |
| Los Osos clay loam, 15 to 30 percent slopes | 84 | 0.08% |
| Los Osos clay loam, 30 to 50 percent slopes | 92 | 0.09% |
| Los Osos clay loam, 9 to 15 percent slopes | 68 | 0.07% |
| Los Osos-Lodo complex, 30 to 75 percent slopes | 42 | 0.04% |
| Los Osos-Lodo complex, 50 to 75 percent slopes | 7,677 | 7.42% |
| Los Osos-Millsholm complex | 117 | 0.11% |
| Los Osos-Rock outcrop complex, 30 to 50 percent slopes | 1,241 | 1.20% |
| McMullin-Rock outcrop complex, 50 to 75 percent slopes | 3,953 | 3.82% |
| Metz-Tujunga complex, occasionally flooded, 0 to 5 percent | 96 | 0.09% |
| Millsholm-Ayar complex, 50 to 75 percent slopes | 96 | 0.09% |
| Millsholm-Dibble complex, 30 to 50 percent slopes | 257 | 0.25% |
| Millsholm-Rock outcrop complex, 50 to 75 percent slopes | 316 | 0.31% |
| Mocho clay loam, 2 to 9 percent slopes | 42 | 0.04% |
| Nacimiento silty clay loam, 30 to 50 percent slopes | 612 | 0.59% |
| Nacimiento silty clay loam, 9 to 30 percent slopes | 231 | 0.22% |
| Nacimiento-Ayar complex, 30 to 50 percent slopes | 2,053 | 1.99% |
| Nacimiento-Ayar complex, 9 to 30 percent slopes | 1,423 | 1.38% |
| Pfeiffer fine sandy loam, 2 to 9 percent slopes | 122 | 0.12% |
| Pfeiffer fine sandy loam, 9 to 15 percent slopes | 85 | 0.08% |
| Pico fine sandy loam, 0 to 2 percent slopes | 6 | 0.01% |
| Pico fine sandy loam, 2 to 9 percent slopes | 11 | 0.01% |

| | | |
|---|---|---|
| PITS | 141 | 0.14% |
| Rincon clay loam, 0 to 2 percent slopes | 10 | 0.01% |
| Rincon clay loam, 2 to 9 percent slopes | 326 | 0.32% |
| Rincon clay loam, 9 to 15 percent slopes | 185 | 0.18% |
| Rock outcrop-Gaviota complex, 30 to 75 percent slopes | 4,264 | 4.12% |
| Rock outcrop-Lithic Haploxerolls complex, 30 to 75 percent slope | 9 | 0.01% |
| Rock outcrop-Xerorthent association | 153 | 0.15% |
| Ryer clay loam, 2 to 9 percent slopes | 1,146 | 1.11% |
| San Andreas fine sandy loam, 15 to 30 percent slopes | 268 | 0.26% |
| San Andreas fine sandy loam, 30 to 75 percent slopes | 688 | 0.66% |
| San Ysidro sandy loam, 2 to 9 percent slopes | 52 | 0.05% |
| Santa Lucia-Gazos complex, 50 to 75 percent slopes | 281 | 0.27% |
| Santa Lucia-Lopez complex, 15 to 50 percent slopes | 31 | 0.03% |
| Santa Ynez fine sandy loam, 2 to 9 percent slopes | 95 | 0.09% |
| Santa Ynez fine sandy loam, 5 to 15 percent slopes, eroded | 21 | 0.02% |
| Santa Ynez fine sandy loam, 9 to 15 percent slopes | 268 | 0.26% |
| Sesame sandy loam, 9 to 30 percent slopes | 13 | 0.01% |
| Shimmon loam, 15 to 30 percent slopes | 400 | 0.39% |
| Shimmon loam, 30 to 50 percent slopes | 1,025 | 0.99% |
| Shimmon-Dibble association, steep | 1,550 | 1.50% |
| Shimmon-Dibble association, very steep | 9,565 | 9.25% |
| Sorrento clay loam, 0 to 2 percent slopes | 12 | 0.01% |
| Sorrento clay loam, 2 to 9 percent slopes | 100 | 0.10% |
| Still clay loam, 2 to 9 percent slopes | 54 | 0.05% |
| WATER | 5,008 | 4.84% |
| Xerofluvents-Riverwash association | 322 | 0.31% |
| Xerorthents, dissected | 203 | 0.20% |
| Zakme clay, 30 to 50 percent slopes | 928 | 0.90% |
| **Total** | **103,391** | **100.00%** |

# 9.4 Vegetation – Characteristic Lifeforms

Excerpted from:

*Ecological Subregions of California*
*Section and Subsection Descriptions*
United States Department of Agriculture, Forest Service
September 1997

## Subsection 261Aj - North Coastal Santa Lucia Range

**Vegetation**. The predominant natural plant communities are Douglas-fir - tanoak series, with some Redwood series in canyons on the southwest side of the subsection; Coast live oak series on north-facing and California sagebrush - black sage series on south-facing slopes near the northwest end of the Santa Lucia Range and inland; Canyon live oak series on steep canyon sideslopes; and Chamise series and Live oak shrublands on shallow soils inland and at higher elevations. There are smaller amounts of Blue oak series adjacent to the Salinas Valley, Valley oak series in Carmel Valley, California sagebrush series and California oatgrass series near the ocean, and with some Mixed conifer series at higher elevations. Monterey pine series on the Monterey Peninsula and Santa Lucia fir series on the coastal side of the mountain range are not extensive but are of special interest.

***Characteristic series by lifeform include:***

*Grasslands:* California annual grassland series, California oatgrass series, Montane meadow habitat, Purple needlegrass series.
*Shrublands:* Black sage series, Blue blossom series, California sagebrush series, Chamise series, Chamise - bigberry manzanita series, Chamise - black sage series, Chamise - wedgeleaf ceanothus series, Coyote brush series, Deer brush series, Coyote brush - black sage series, Coyote brush - California sagebrush series, Eastwood manzanita series, Holdiscus series, Hoover’s manzanita series, Montane wetland shrub habitat, Rubber rabbitbrush series, Scrub oak series, Wartleaf ceanothus series, Wartleaf ceanothus - chamise series, Wedgeleaf ceanothus series, Woollyleaf manzanita series.
*Forests and woodlands:* Bishop pine series, Black oak series, Blue oak series, California bay series, California buckeye series, California sycamore series, Canyon live oak series, Coast live oak series, Coulter pine series, Coulter pine - canyon live oak series, Douglas-fir - tanoak series, Gowen cypress stands, Interior live oak series, Knobcone pine series, Mixed oak series, Monterey cypress stands, Monterey pine series, Ponderosa pine series, Redwood series, Santa Lucia fir series, Tanoak series, Valley oak series, White alder series.

## Subsection 261Ak - South Coastal Santa Lucia Range

**Vegetation**. The predominant natural plant communities are Coast live oak series, Chamise series, Manzanita shrublands, and Needlegrass grasslands. Some edaphic associations are Chamise series on shallow soils, Leather oak series on shallow serpentinitic soils, Needlegrass grasslands on Vertisols, and Manzanita shrublands on silicic sandstones. California sagebrush - black sage series is common near the coast and Coast live oak series and Valley oak series are common in Los Osos Valley. The dunes support a succession of plant communities, from bare dune through herbaceous communities and Coyote brush series to California sagebrush - black sage series on stabilized dunes.

***Characteristic series by lifeform include:***

*Dune vegetation:* Dune lupine-goldenbrush series, Sand-verbena - beach bursage series, Yellow bush lupine series.
Saltmarsh vegetation: Cordgrass series, Ditchgrass series, Pickleweed series, Saltgrass series, Sedge series.
*Grasslands:* California annual grassland series, Purple needlegrass series.
*Shrublands:* Black sage series, Blue blossom series, California encelia series, California sagebrush series, California sagebrush - black sage series, Chamise series, Chamise - bigberry manzanita series, Chamise - black sage series, Chamise - wedgeleaf ceanothus series, Coyote brush series, Deer brush series, Eastwood manzanita series, Leather oak series, Scrub oak series, Wedgeleaf ceanothus series, Woollyleaf manzanita series.
*Forests and woodlands:* Bishop pine series, California bay series, California sycamore series, Coast live oak series, Knobcone pine series, Mixed oak series, Sargent cypress series, Tanoak series, Valley oak series, White alder series.

## Subsection M262Ae - Interior Santa Lucia Range

**Vegetation**. The predominant natural plant community is Blue oak series. There is some Coast live oak series on north-facing slopes and Mixed conifer series at higher elevations. Chamise series is common on shallow soils, and soils that are very rocky or low in fertility. Mixed chaparral shrublands also occur in the unit.

***Characteristic series by lifeform include:***

*Grasslands:* California annual grassland series.
*Shrublands:* Bigberry manzanita series, Black sage series, California buckwheat series, California sagebrush series, California sagebrush - purple sage series, Chamise series, Chamise - bigberry manzanita series, Chamise - Eastwood manzanita series, Chamise - scrub oak series, Chamise - wedgeleaf ceanothus series, Chaparral whitethorn series, Chaparral yucca - California buckwheat series, Deer brush series, Eastwood manzanita series, Mixed sage series, Mountain-mahogany series, Mountain-mahogany - scrub oak series, Purple sage series, Red shank series, Chamise - red shank series, Scrub oak series, Tucker's oak series, Wedgeleaf ceanothus series.
*Forests and woodlands:* Bigcone Douglas-fir series, Bigcone Douglas-fir - canyon live oak series, Blue oak series, California sycamore series, Canyon live oak series, Coulter pine series, Coulter pine - canyon live oak series, Knobcone pine series, Foothill pine series, Incense-cedar series, Interior live oak series, Sargent cypress series, Tanoak series, Valley oak series.

# 9.5 Wildlife Inventory for Fort Hunter Liggett

Excerpted from:

*Integrated Natural Resources Management Plan*
FY2004-2008
U.S. Army Reserve Training Center
Fort Hunter Liggett, California

**Appendix C. Common and scientific names of animal species known to occur or within their distribution on Fort Hunter Liggett, including observed occurrences of resident and migratory (seasonally resident or transient) species and species whose range occurs in the FHL region.**

**FISHES**

**Common Name Scientific Name**

Ictaluridae (Catfish)
- Black Bullhead[1] *Ictalurus melas*
- Brown Bullhead[1] *Ictalurus nebulosus*
- Channel Catfish[1] *Ictalurus punctatus*

Poeciliidae (Livebearer)
- Mosquito Fish[1] *Gambusia affinis*

Salmonidae (Trout & Salmon)
- Rainbow Trout *Salmo gairdneri*

Percichthyidae (Temperate Bass)
- WhiteBass[1] *Morone chrysops*

Centrarchidae (Sunfish)
- Largemouth Bass[1] *Micropterus salmoides*
- Smallmouth Bass[1] *Micropterus dolomieui*
- Bluegill[1] *Lepomis macrochirus*
- Redear Sunfish[1] *Lepomis microlophus*

Catostomidae (Suckers)
- Sacramento Sucker *Catostomas occidentalis*

Cyprinidae (Minnows)
- California Roach *Hesperoleucus) symmetricus*

Sacramento Squawfish *Ptychocheilus grandis*
Hardhead *Mylopharodon conocephalus*
Speckled Dace *Rhinichthys osculus*
Carp[1] *Cyprinus carpio*
Goldfish[1] *Carassius auratus*
Hitch *Lavinia exilicauda*

**AMPHIBIANS AND REPTILES**

Alligator Lizards and Allies (Anguidae)
- Southern Alligator Lizard *Gerrhonotus multicarinatus*

Legless Lizards (Anniellidae)
- California Legless Lizard *Anniella pulchra*

Colubrids (Colubridae)
- Ringneck Snake *Diadophis punctatus*
- Sharp-tailed Snake *Contia tenuis*
- Racer *Coluber constrictor*
- Coachwhip *Masticophis flagellum*
- Striped Racer *Masticophis lateralis*
- Gopher Snake *Pituophis metanoleucus*
- Common Kingsnake *Lampropeltis getulus*
- California Mountain Kingsnake *Lampropeltis zonata*
- Common Garter Snake *Thamnophis sirtalis*
- Western Terrestrial Garter Snake *Thamnophis elegans*
- Western Black-headed Snake *Tantilla planiceps*

Viperidae (Vipers)
- Western Rattlesnake *Crotalus viridis*

Mole Salamanders and Relatives (Ambystomidae)
- Tiger Salamander[1] *Ambystoma tigrinum*
- California Tiger Salamander *Ambystoma californiense*

Newts (Salamandridae)

California Newt *Taricha torosa*
Lungless Salamanders (Plethodontidae)
Ensatina *Ensatina escholtzi*
California Slender Salamander *Batrachoseps attenuatus*
Arboreal Salamander *Aneides lugubris*
Spade foot Toads (Pelobatidae)
Western Spadefoot *Scaphiopus hammondi*
True Toads (Bufonidae)
Western Toad *Bufo boreas*
Arroyo Toad *Bufo californicus*
Treefrogs and Allies (Hylidae)
Chorus Frog *Hyla regil1a*
Canyon Treefrog *Hyla arenicolor*
True Frogs and Allies (Ranidae)
Foothill Yellow-legged Frog *Rana boylei*
California Red-legged Frog *Rana aurora draytonii*
Bull Frog (exotic) *Rana catesbeiana*
Water and Box Turtles, Tortoises and Allies (Testudinidae)
Western Pond Turtle *Clemmys marmorata*
Iguanids (Iguanidae)
Western Fence Lizard *Sceloporus occidentalis*
Side-blotched Lizard *Uta stansbqriana*
Coast Horned Lizard *Phrynosoma coronatum*
Skinks (Scincidae)
Western Skink *Eumeces skiltonianus*
Whiptails and Allies (Teiidae)
Western Whiptail *Cnemidophorus tigris*

**BIRDS**
Grebes (Podicipedidae)
Western Grebe *Aechmophorus occidentalis*
Eared Grebe *Podiceps nigricollis*
Pied-billed Grebe *Podilymbus podiceps*
Pelicans (Pelecanidae)
American White Pelican *Pelecanus erythrorhynchos*
Cormorants (Phalacrocoracidae)
Double-crested Cormorant *Phalacrocorax auritus*
Herons, Egrets, Bitterns (Ardeidae)
American Bittern *Botaurus lentiginosus*
Black-crowned Night Heron *Nycticorax nycticorax*
Green-backed Heron *Butorides striatus*
*Green Heron Butorides virescens*
Snowy Egret *Egretta thula*
Great Egret *Casmerodius albus*
Great Blue Heron *Ardea herodias*
Swans, Geese, Ducks (Anatidae)
Canada Goose *Branta canadensis*
Pacific Brant *Branta nigricans*
Mallard *Anas platyrhynchos*
Gadwall *Anas strepera*
Green-winged Teal *Anas crecca*
American Wigeon *Anas americana*
Northern Pintail *Anas acuta*
Northern Shoveler *Anas clypeata*
Blue-winged Teal *Anas discors*
Cinnamon Teal *Anas cyanoptera*

Wood Duck *Aix sponsa*
Ruddy Duck *Oxyura jamaicensis*
Canvasback *Aytha valisineria*
Redhead *Aytha americana*
Ring-necked Duck *Aytha collaris*
Lesser Scaup *Aytha affinis*
Common Goldeneye *Bucephala clangula*
Bufflehead *Bucephala albeola*
Common Merganser *Mergus merganser*
Hooded Merganser *Lophodytes cucullatus*

Rails, Gallinules, Coots (Rallidae)
Virginia Rail *Rallus limicola*
Sora *Porzana carolina*
Common Moorhen *Gallinula chloropus*
American Coot *Fulica americana*

Stilts and Avocets (Recurvicrostridae)
American Avocet *Recurvirostra americana*
Black-necked Stilt *Himantopus mexicanus*

Plovers (Charadriidae)
Semi-palmated Plover *Charadrius semipalmatus*
Killdeer *Charadrius vociferus*
Black-bellied Plover *Pluvialis squatarola*

Sandpipers (Scolopacidae)
Whimbrel *Numenius phaeopus*
Long-billed Curlew *Numenius americanus*
Greater Yellowlegs *Tringa melanolenca*
Lesser Yellowlegs *Tringa flavipes*
Solitary Sandpiper *Tringa solitaria*
Spotted Sandpiper *Actitis macularia*
Wilson's Phalarope *Phalaropus tricolor*
Long-billed Dowitcher *Limnodromus scolopaceus*
Common Snipe *Gallinago gallinago*
Dunlin *Calidris alpina*
Western Sandpiper *Calidris mauri*
Least Sandpiper *Calidris minutilla*
Pectoral Sandpiper *Calidris melanotos*

Skuas, Jaegers, Gulls, Terns (Laridae)
Bonaparte's Gull *Larus philadelphia*
Ring-billed Gull *Larus delawarensis*
California Gull *Larus californicus*
Forster's Tern *Sterna forsteri*
Caspian Tern *Sterna caspia*

American Vultures (Cathartidae)
Turkey Vulture *Cathartes aura*
California Condor *Gymnogyps californianus*

Eagles, Kites, Harriers, Hawks (Accipitridae)
Golden Eagle *Aquila chrysaetos*
Bald Eagle *Haliaeetus leucocephalus*
Black-shouldered Kite *Elanus caeruleus*
Northern Harrier *Circus cyaneus*
Sharp-shinned Hawk *Accipiter striatus*
Cooper's Hawk *Accipiter cooperii*
Red-shouldered Hawk *Buteo lineatus*
Red-tailed Hawk *Buteo jamaicensis*
Rough-legged Hawk *Buteo lagopus*
Ferruginous Hawk *Buteo regalis*

Osprey *Pandion haliaeetus*
Falcons (Falconidae)
American Kestrel *Falco sparverius*
Merlin *Falco columbarius*
Prairie Falcon *Falco mexicanus*
Peregrine Falcon *Falco peregrinus*
Grouse, Ptarmigan (Phasianidae)
California Quail *Callipepla californica*
Mountain Quail *Oreortyx pictus*
Wild Turkey *Meleagris gallopavo*
Pigeons and Doves (Columbidae)
Band-tailed Pigeon *Columba fasciata*
Rock Dove (exotic) *Columba livia*
Mourning Dove *Zenaida macroura*
Cuckoos and Anis (Cuculidae)
Greater Roadrunner *Geococcyx californianus*
Owls (Tytonidae and Strigidae)
Common Barn-Owl *Tyto alba*
Short-eared Owl *Asio flammeus*
Long-eared Owl *Asio otus*
Great Horned Owl *Bubo virginianus*
Western Screech Owl' *Otus kennicottii*
Northern Pygmy Owl *Glaucidium gnoma*
Northern Saw-whet Owl *Aegolius acadicus*
Burrowing Owl *Athene cunicularja*
Night jars (Caprimulgidae)
Common Poorwill *Phalaenoptilus nuttallii*
Swifts (Apodidae)
Black Swift *Cypseloides niger*
Vaux's Swift *Chaetura vauxi*
White-throated Swift *Aeronautes saxatalis*
Hummingbirds (Trochilidae)
Black-chinned Hummingbird *Archilochus alexandri*
Costa's Hummingbird *Calypte costae*
Anna's Hummingbird *Calypte annae*
Rufous Hummingbird *Selasphorus rufus*
Allen's Hummingbird *Selasphorus sasin*
Kingfishers (Alcedinidae)
Belted Kingfisher *Ceryle alcyon*
Woodpeckers (Picidae)
Northern Flicker *Colaptes auratus*
Acorn Woodpecker *Melanerpes formicivorus*
Lewis Woodpecker *Melanerpes lewis*
Red-breasted Sapsucker *Sphyrapicus ruber*
Downy Woodpecker *Picoides pubescens*
Hairy Woodpecker *Picoides villosus*
Nuttall's Woodpecker *Picoides nuttallii*
Tyrant Flycatchers (Tyrannidae)
Western Kingbird *Tyrannus vociferans*
Cassin's Kingbird *Tyrannus verticalis*
Ash-throated Flycatcher *Myiarchus cinerascens*
Olive-sided Flycatcher *Contopus borealis*
Western Wood-Pewee *Contopus sordidulus*
Black Phoebe *Sayornis nigricans*
Say's Phoebe *Sayornis saya*
Pacific Slope Flycatcher *Empidonax difficilis*

Lark (Alaudidae)
Horned Lark *Eremophila alpestri*
Swallows (Hirundinidae)
Tree Swallow *Tachycineta bicolor*
Violet-green Swallow *Tachycineta thalassina*
Purple Martin *Progne subis*
Northern Rough-winged Swallow *Stelgidopteryx serripennis*
Cliff Swallow *Hirundo pyrrhonota*
Barn Swallow *Hirundo rustica*
Jays, Crows, Magpies (Corvidae)
Scrub Jay *Aphelocoma coerulescens*
Steller's Jay *Cyanocitta stelleri*
Yellow-billed Magpie *Pica nuttalli*
American Crow *Corvus brachyrhrynchos*
Common Raven *Corvus corax*
Wrentit (Muscicapidae)
Wrentit *Chamaea fasciata*
Titmice and Chickadees (Paridae)
Plain Titmouse *Parus inornatus (Baeolophus inornatus)*
Chestnut-backed Chickadee *Parus rufescens*
Bushtit (Aegithalidae)
Bushtit *Psaltriparus minimus*
Creepers (Certhiidae)
Brown Creeper *Certhia americana*
Nuthatchers (Sittidae)
White-breasted Nuthatch *Sitta carolinensis*
Red-breasted Nuthatch *Sitta canadensis*
Wrens (Troglodytidae)
House Wren *Troglodytes aedon*
Winter Wren *Troglodytes troglodytes*
Bewick's Wren *Thryomanes bewickii*
Marsh Wren *Cistothorus palustris*
Canyon Wren *Catherpes mexicanus*
Rock Wren *Salpinctes obsoletus*
Thrushes, Gnatcatchers, Kinglets (Muscicapidae)
Golden-crowned Kinglet *Regulus satrapa*
Ruby-crowned Kinglet *Regulus calendula*
Blue-gray Gnatcatcher *Polioptila nigriceps*
Western Bluebird *Sialia mexicana*
Mountain Bluebird *Sialia currucoides*
Townsend's Solitaire *Myadestes townsendi*
Swainson's Thrush *Catharus ustulatus*
Hermit Thrush *Catharus guttatus*
Varied Thrush *Ixoreus naevius*
American Robin *Turdus migratorius*
Shrikes (Laniidae)
Loggerhead Shrike *Lanius ludovicianus*
Northern Shrike *Lanius excubitor*
Mimic Thrushes (Mimidae)
Northern Mockingbird *Mimus polyglottos*
California Thrasher *Toxostoma redivivum*
Pipits and Wagtails (Motacillidae)
Water Pipit *Anthus spinoletta*
Waxwings (Bombycillidae)
Cedar Waxwing *Bombycilla cedrorum*
Silky Flycatchers (Ptilogonatidae)

Phainopepla *Phainopepla nitens*
Starlings (Sturnidae)
European Starling[1] S*turnus vulagris*
Vireos (Vireonidae)
Bell's Vireo *Vireo bellii*
Hutton's Vireo *Vireo huttoni*
Solitary Vireo *Vireo solitarius*
Warbling Vireo *Vireo gilvus*
Cassin's vireo *Vireo cassinii*
Warblers, Sparrows, and Relatives (Emberizidae)
Orange-crowned Warbler *Vermivora celata*
Nashville Warbler *Vermivora ruficapilla*
Yellow-rumped Warbler *Dendroica coronata*
Black-throated Gray Warbler *Dendroica nigrescens*
Townsend's Warbler *Dendroica townsendi*
Hermit Warbler *Dendroica occidentalis*
Yellow Warbler *Dendroica petechia*
MacGillivray's Warbler *Oporornis tolmiei*
Wilson's Warbler *Wilsonia pusilla*
Common Yellowthroat *Geothlypis trichas*
Yellow-breasted Chat *Icteria virens*
Rufous-sided Towhee *Pipilo erythrophthalmus*
Brown Towhee *Pipilo fuscus (=P. crissalis)*
Grasshopper Sparrow *Ammodramas savannarum*
Savannah Sparrow *Passerculus sandwichensis*
Song Sparrow *Melospiza melodia*
Lark Sparrow *Chondestes grammacus*
Sage Sparrow *Amphispiza belli*
Rufous-crowned Sparrow *Aimophila ruficeps*
Chipping Sparrow *Spizella passerina*
Black-chinned Sparrow *Spizella atrogularis*
Dark-eyed Junco *Junco hyemalis*
White-crowned Sparrow *Zonotrichia leucophrys*
Golden-crowned Sparrow *Zonotrichia atricapilla*
Fox Sparrow *Passerella iliaca*
Lincoln's Sparrow *Melospiza lincolnii*
Western Meadowlark *Sturnella neglecta*
Yellow-headed Blackbird *Xanthocephalus xanthocefhalus*
Red-winged Blackbird *Agelaius phoeniceus*
Tricolored Blackbird *Agelaius tricolor*
Brewer's Blackbird *Euphagus cyanocephalus*
Brown-headed Cowbird *Molothru.s ater*
Northern Oriole *Icterus parisorum*
Hooded Oriole *Icterus cucullatus*
Western Tanager *Piranga ludoviciana*
Weavers (Passeridae)
House Sparrow[1] *Passer domesticus*
Finches (Fringillidae)
Pine Siskin *Carduelis pinus*
American Goldfinch *Carduelis tristis*
Lesser Goldfinch *Carduelis psaltria*
Lawrence's Goldfinch *Carduelis lawrencei*
Purple Finch *Carpodacus purpureus*
House Finch *Carpodacus mexicanus*
Evening Grosbeak *Coccothraustes vespertinus*
Black-headed Grosbeak *Pheucticus melanocephalus*

Blue Grosbeak *Guiraca caerulea*
Lazuli Bunting *Passerina amoena*

**MAMMALS**

Old World Rats and Mice (Muridae)
Norway Rat *Rattus norvegicus*
Black Rat *Rattus rattus*
House Mouse *Mus muscul'us*
Hares and Rabbits (Leporidae)
Blacktail Jackrabbit *Lepus californicus*
Desert Cottontail *Sylvilagus auduboni*
Brush Rabbit *Sylvilagus bachmani*
Old World Swine (Suidae)
Wild Boar[1] *Sus scrofa*
Deer (Cervidae)
Elk *Cervus elaphus*
Mule Deer *Odocoileus hemionus*
Weasels and relatives (Mustelidae)
Longtail Weasel *Mustela frenata*
Badger *Taxidea taxus*
Spotted Skunk *Spilogale putorius*
Striped Skunk *Mephitis mephitis*
Foxes, Wolves, Coyotes (Canidae)
Coyote *Canis latrans*
Red Fox (exotic) *Vulpes fulva*
San Joaquin Kit Fox *Vulpes macrotis mutica*
Gray Fox *Urocyon cinereoargenteus*
Cats (Felidae)
Mountain Lion *Puma concolor*
Bobcat *Lynx rufus*
Squirrels and relatives (Sciuridae)
California Ground Squirrel *Spermophilus beecheyi*
Merriam Chipmunk *Tamias merriami*
Western Gray Squirrel *Sciurus griseus*
Pocket Gophers (Geomyidae)
Valley Pocket Gopher *Thomomys bottae*
Pocket Mice, Kangaroo Mice, Kangaroo Rats (Heteromyidae)
Calif. Pocket Mouse *Perognathus californicus*
Heermann Kangaroo Rat *Dipodomys heermanni*
Santa Cruz Kangaroo Rat *Dipodomys venustus*
Beaver (Castoridae)
Beaver (exotic) *Castor canadensis*
Mice, Rats, Lemmings, Voles (Criceidae)
Western Harvest Mouse *Reithrodontomys megalotis*
California Mouse *Peromyscus californicus*
Deer Mouse *Peromyscus maniculatus*
Brush Mouse *Peromyscus boylei*
Pinon Mouse *Peromysucs truei*
Desert Woodrat *Neotoma lepida*
Dusky-footed Woodrat *Neotoma fuscipes*
California Vole *Microtus californicus*
Marsupials
Opossum *Didelphis virginiana*
Shrews (Soricidae)
Trowbridge Shrew *Sorex trowbridgei*
Ornate Shrew *Sorex ornatus*

Moles (Talpidae)
    California Mole *Scapanus latimanus*
Mouse-eared Bats (Vespertilionidae)
    Little Brown Myotis *Myotis lucifugus*
    Yuma Myotis *Myotis yumanensis*
    Long-eared Myotis *Myotis evotis*
    Fringed Myotis *Myotis thysanodes*
    Long-leged Myotis *Myotis volans*
    California Myotis *Myotis californicus*
    Small-footed Myotis *Myotis subulatus*
    Silver-haired Bat *Lasionycteris noctivagans*
    Western Pipistrel *Pipistrellus hesperus*
    Big Brown Bat *Eptesicus fuscus*
    Red Bat *Lasiurus borealis*
    Hoary Bat *Lasiurus cinereus*
    Western Big-eared *Plecotus townsendi*
    Pallid Bat *Antrozous pallidus*
Free-tailed Bats (Molossidae)
    Mexican Freetail Bat *Tadarida brasiliensis*
    Western Mastiff Bat *Eumops perotis*
Bears (Ursidae)
    Black Bear *Ursus americanus*
Racoons and Coatis (Procyonidae)
    Racoon *Procyon lotor*
Ringtails (Bassariscidae)
    Ringtail *Bassariscus astatus*

[1] Exotic species.

## 9.6 Oak Shores Wastewater Treatment Plant Effluent Monitoring Data

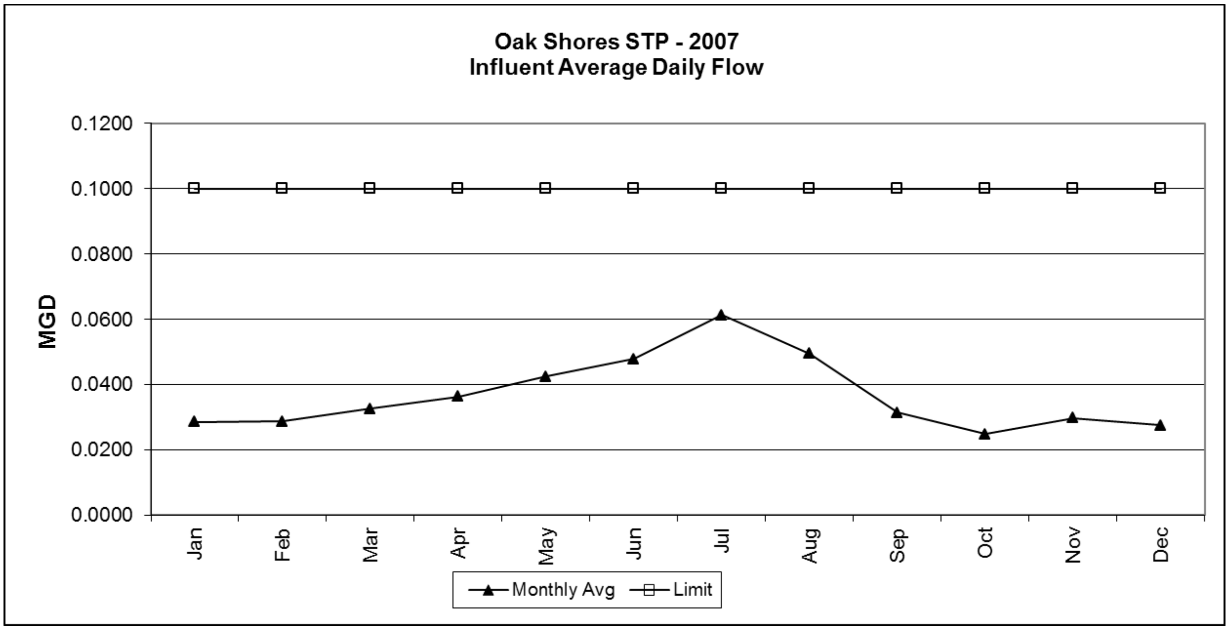
**San Luis Obispo County Service Area 7A – Oak Shores**
**Monitoring Data on Flow and Effluent Constituents of Concern for 2007-2011**

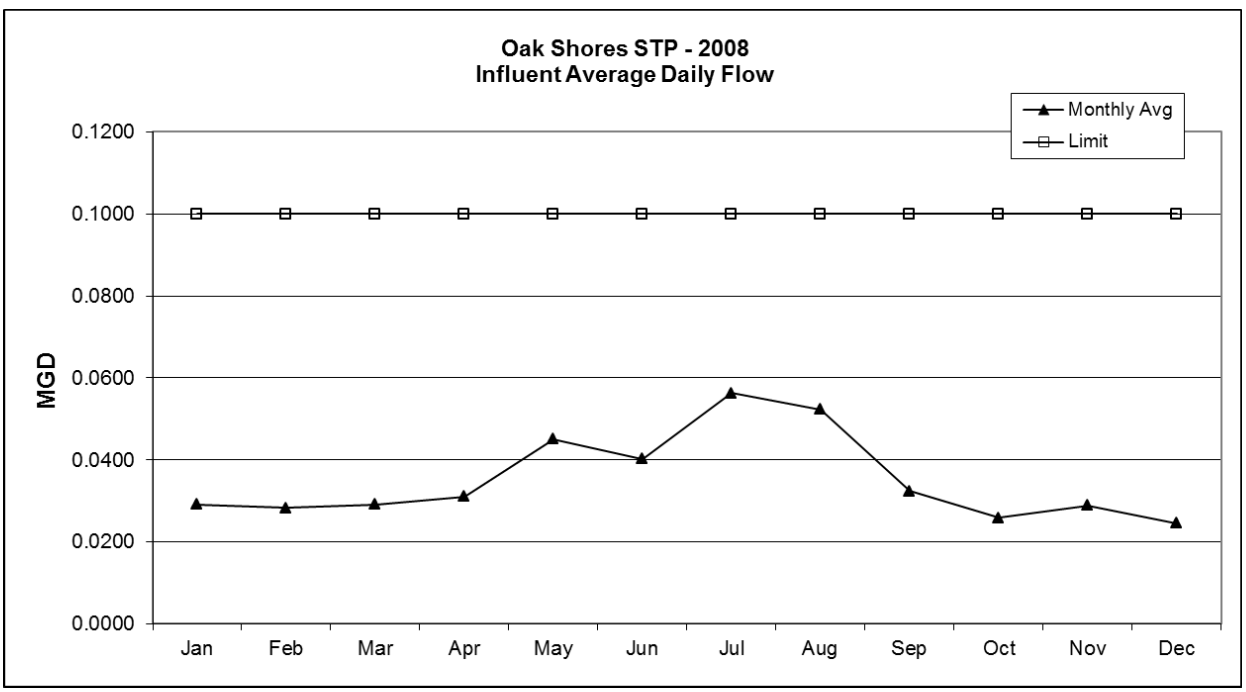
Source of data:

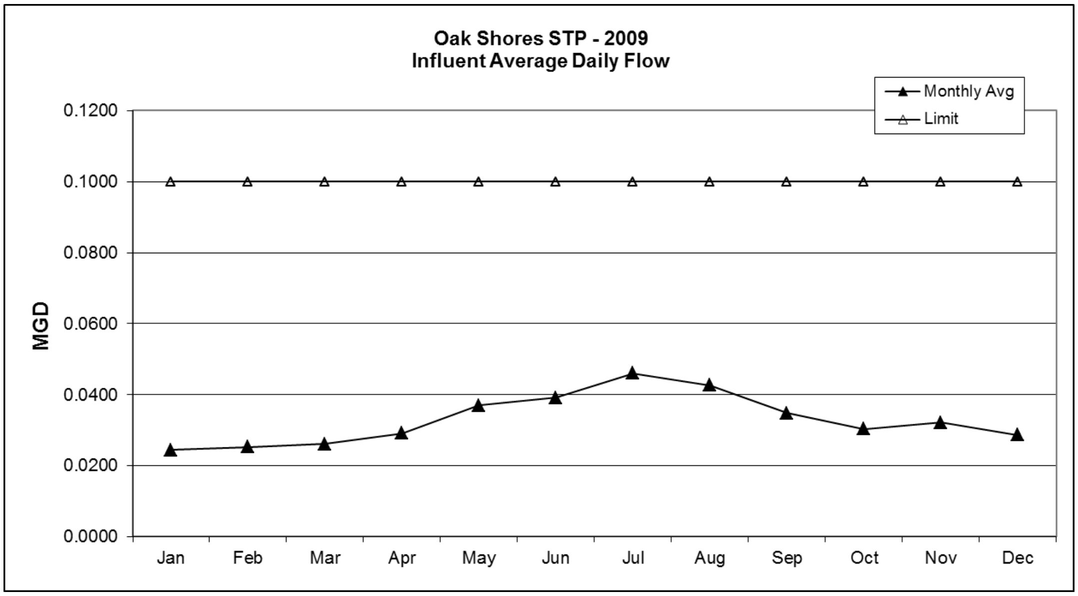
Annual reports to Central Coast Regional Water Quality Control Board

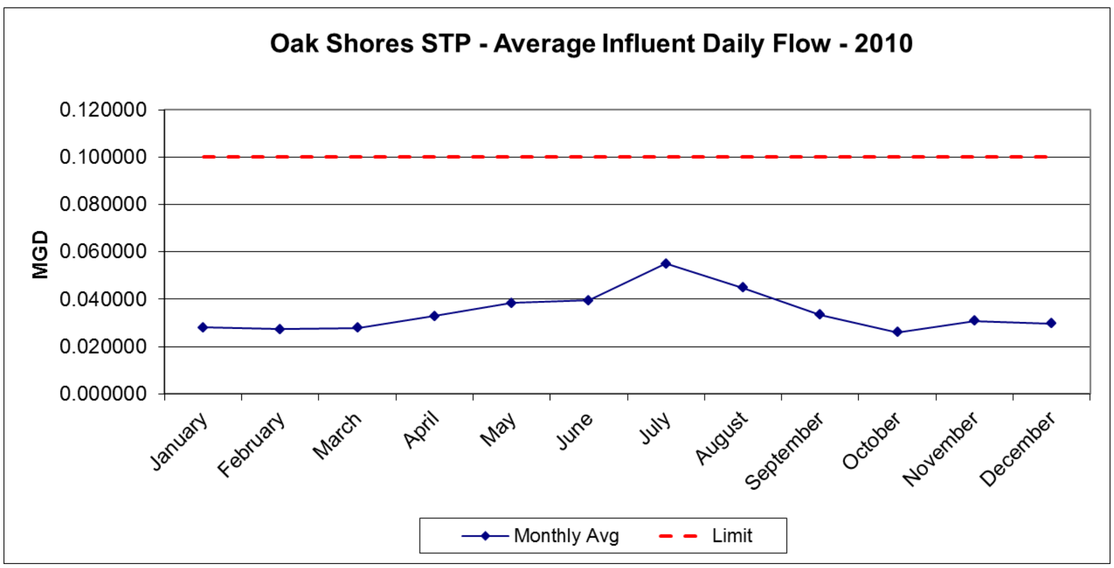
## Flow

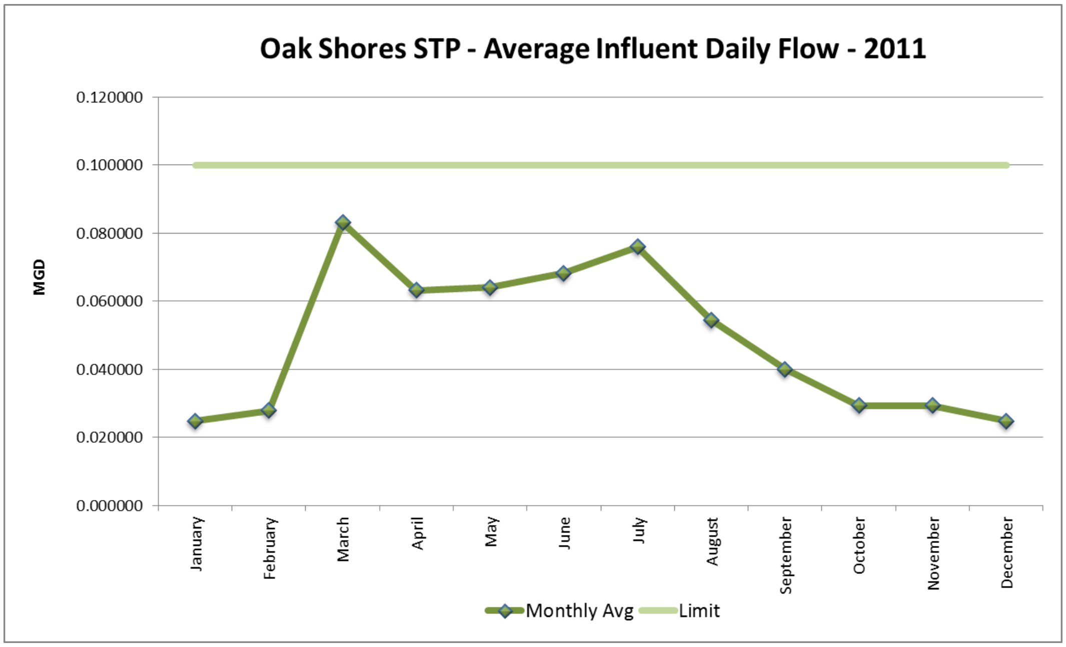
WDR limit: Daily flow averaged over each month shall not exceed 100,000 gallons




Oak Shores STP - 2009
Influent Average Daily Flow
Monthly Avg
Limit
MGD
0.1200
0.1000
0.0800
0.0600
0.0400
0.0200
0.0000
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

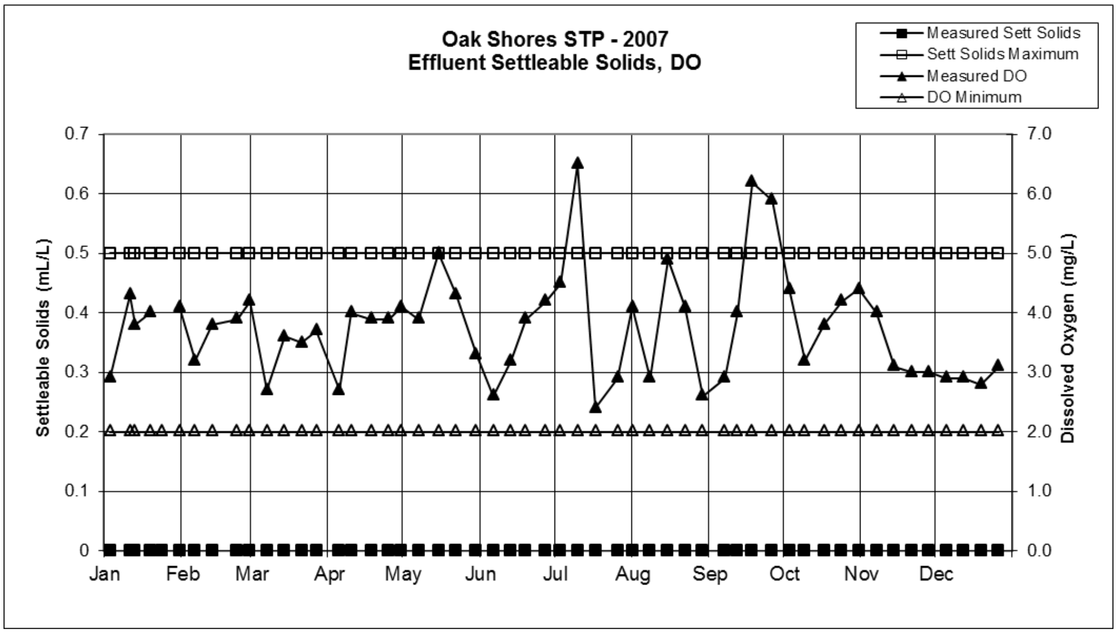

Oak Shores STP - Average Influent Daily Flow - 2010
MGD
0.120000
0.100000
0.080000
0.060000
0.040000
0.020000
0.000000
January
February
March
April
May
June
July
August
September
October
November
December
Monthly Avg
Limit

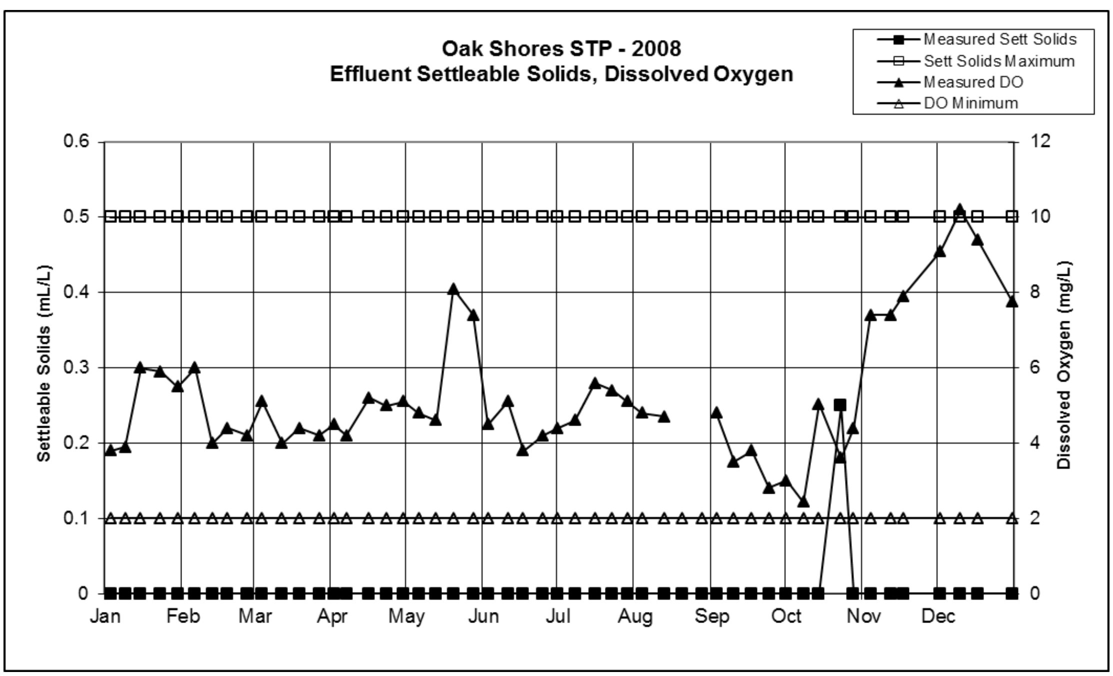

Oak Shores STP - Average Influent Daily Flow - 2011
MGD
0.120000
0.100000
0.080000
0.060000
0.040000
0.020000
0.000000
January
February
March
April
May
June
July
August
September
October
November
December
Monthly Avg
Limit

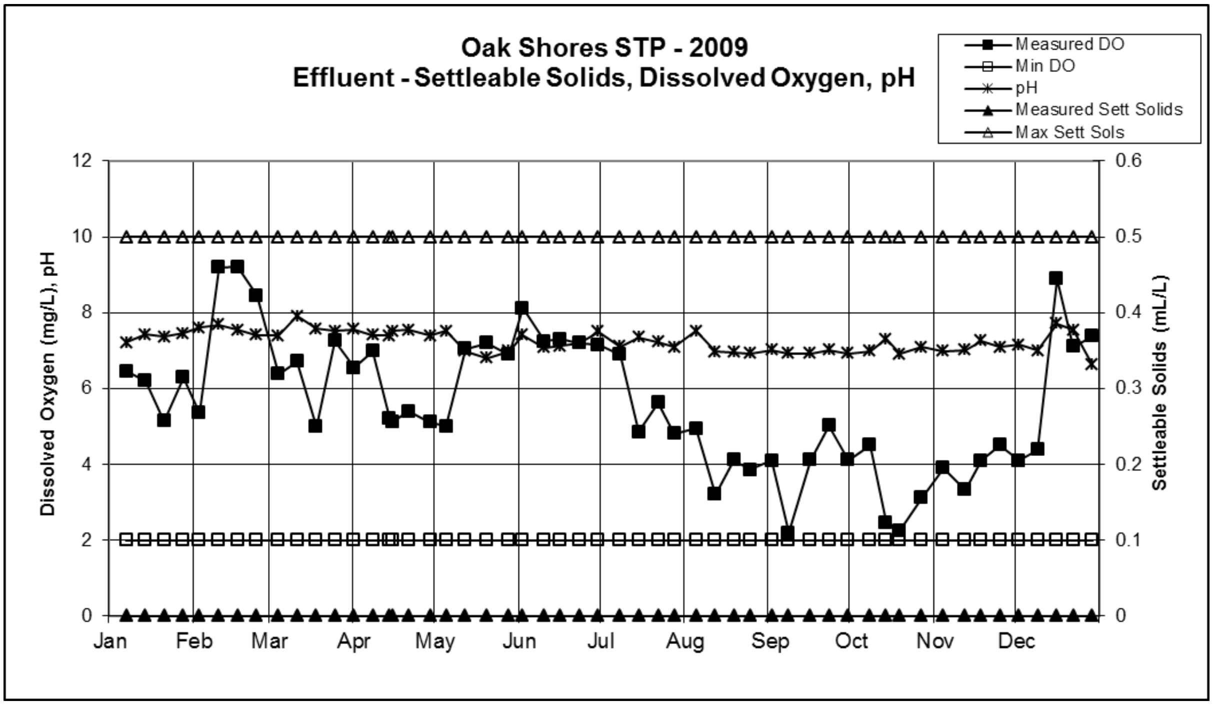
## Effluent Dissolved Oxygen, Settleable Solids

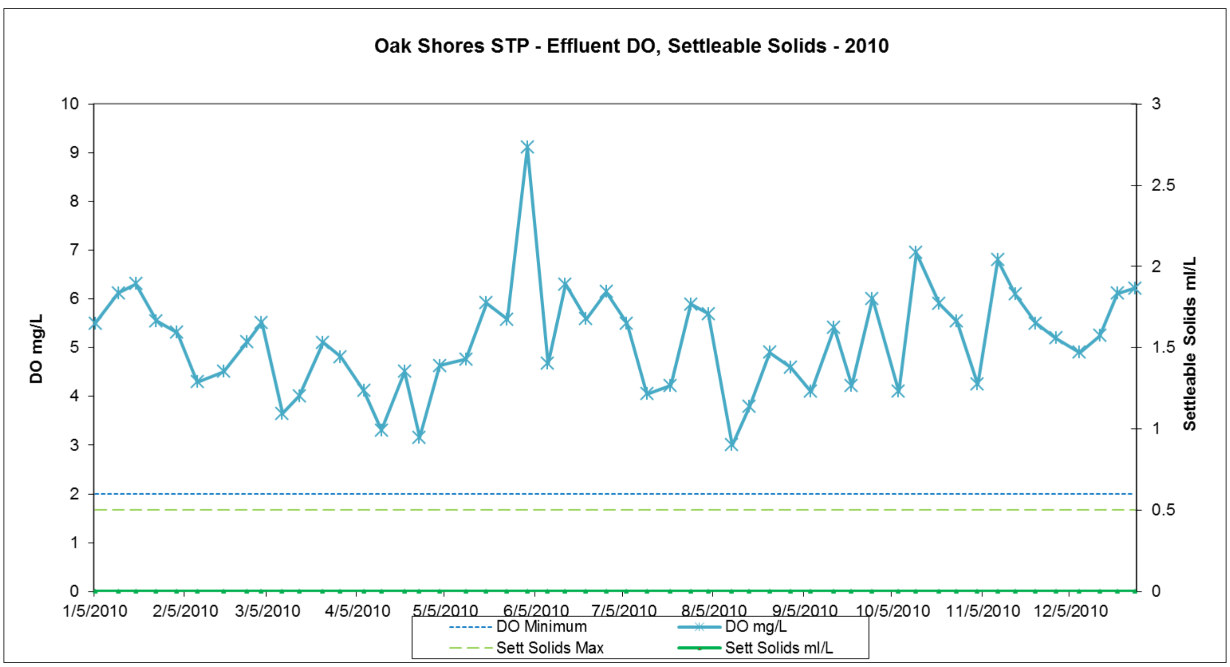
WDR limits:

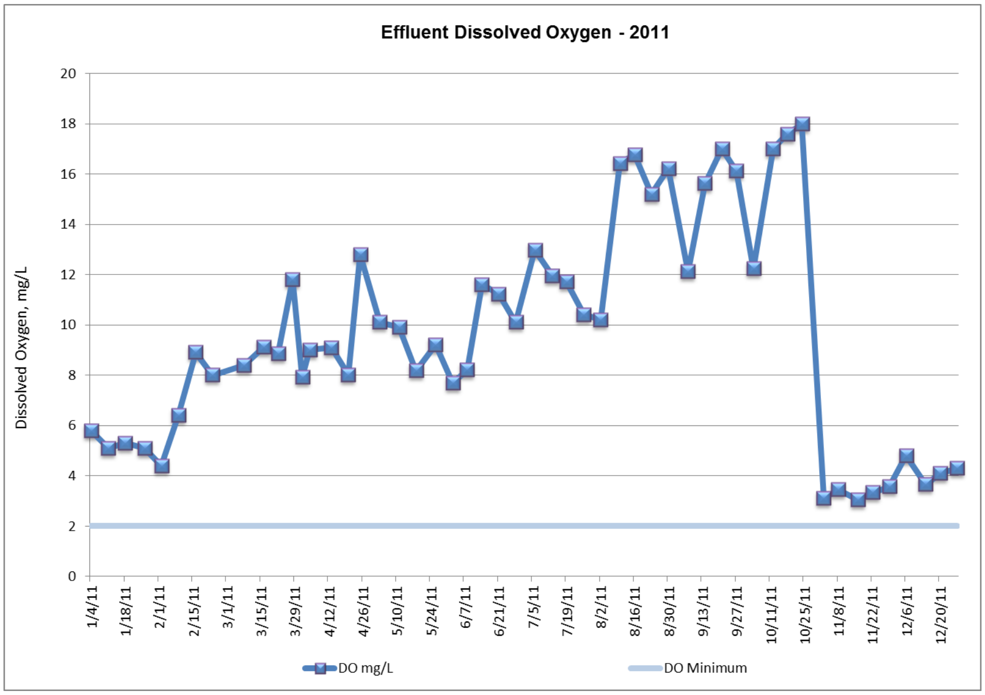
Effluent shall not have dissolved oxygen concentrations less than 2.0 mg/L
Effluent settleable solids daily maximum = 0.5 mL/L




Oak Shores STP - 2009
Effluent - Settleable Solids, Dissolved Oxygen, pH
Measured DO
Min DO
pH
Measured Sett Solids
Max Sett Sols
Dissolved Oxygen (mg/L), pH
Settleable Solids (mL/L)
0
2
4
6
8
10
12
0
0.1
0.2
0.3
0.4
0.5
0.6
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec


Oak Shores STP - Effluent DO, Settleable Solids - 2010
DO mg/L
Settleable Solids ml/L
0
1
2
3
4
5
6
7
8
9
10
0
0.5
1
1.5
2
2.5
3
1/5/2010
2/5/2010
3/5/2010
4/5/2010
5/5/2010
6/5/2010
7/5/2010
8/5/2010
9/5/2010
10/5/2010
11/5/2010
12/5/2010
DO Minimum
DO mg/L
Sett Solids Max
Sett Solids ml/L

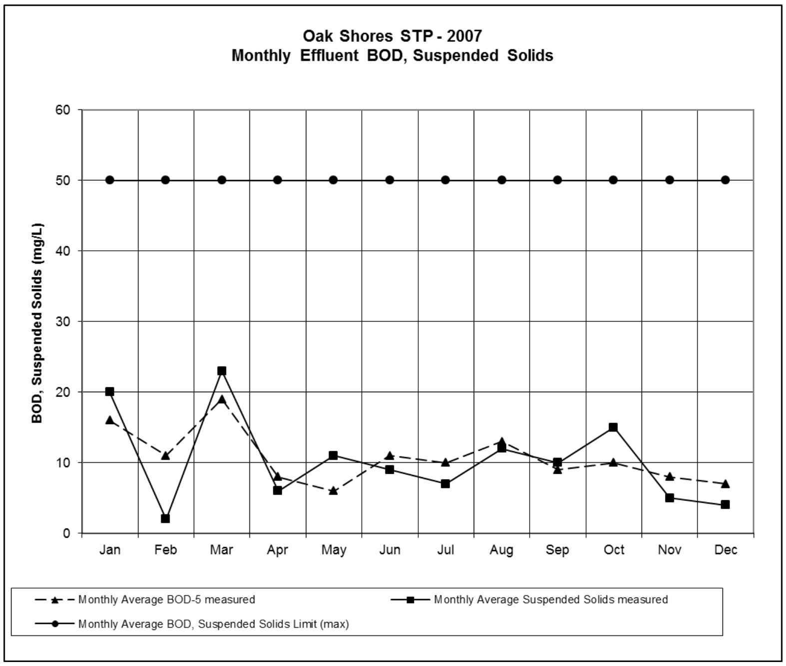


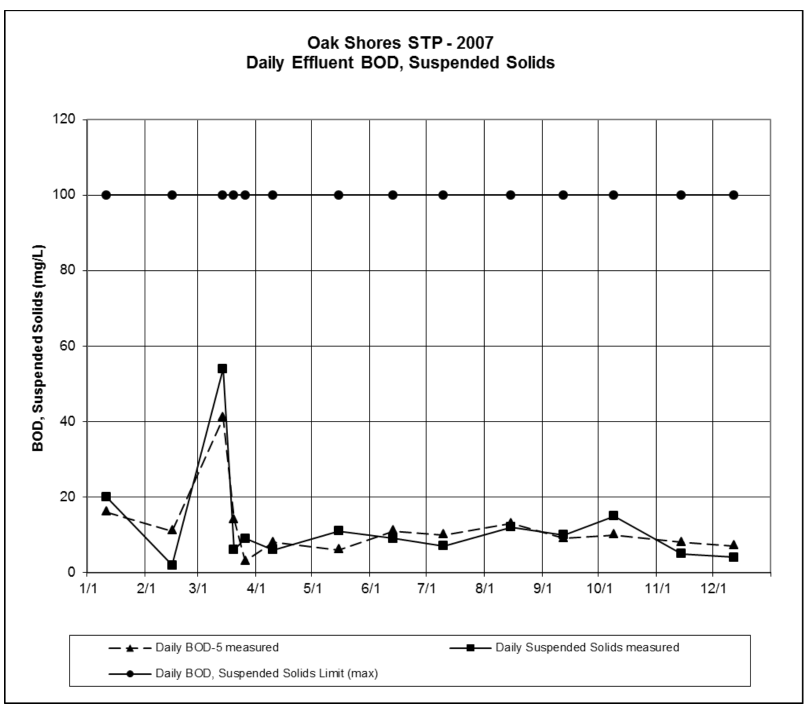

Effluent settleable solids for 2011 were not graphed as they were all < 0.5 mg/L

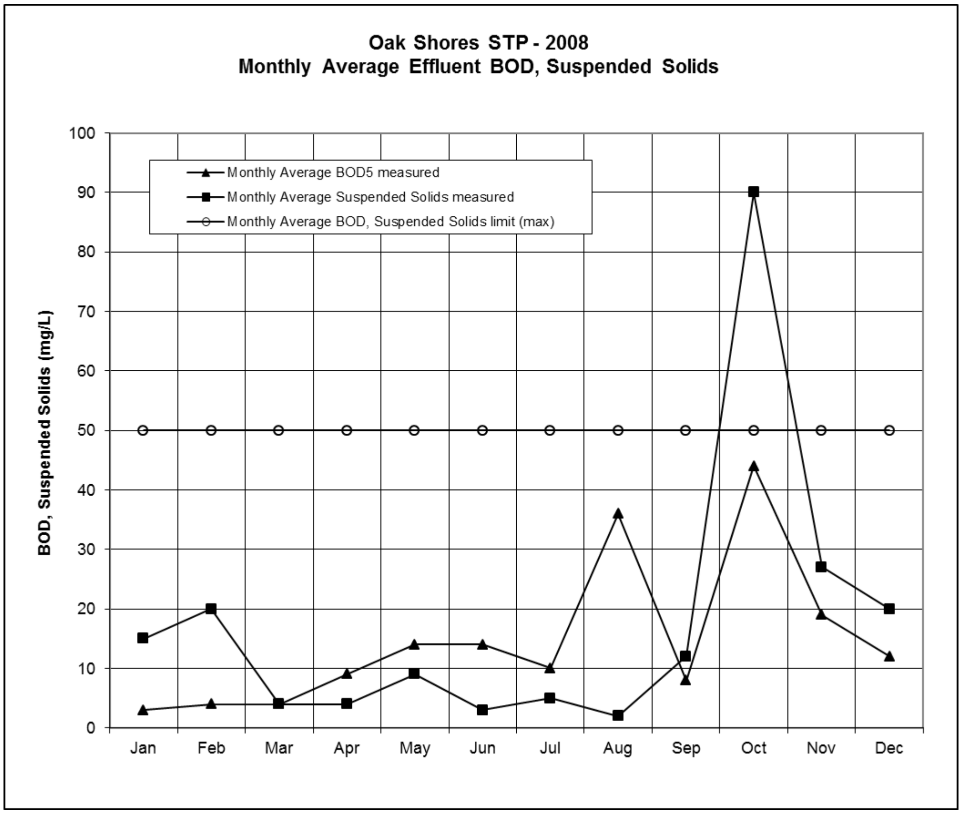
## Effluent BOD, Total Suspended Solids

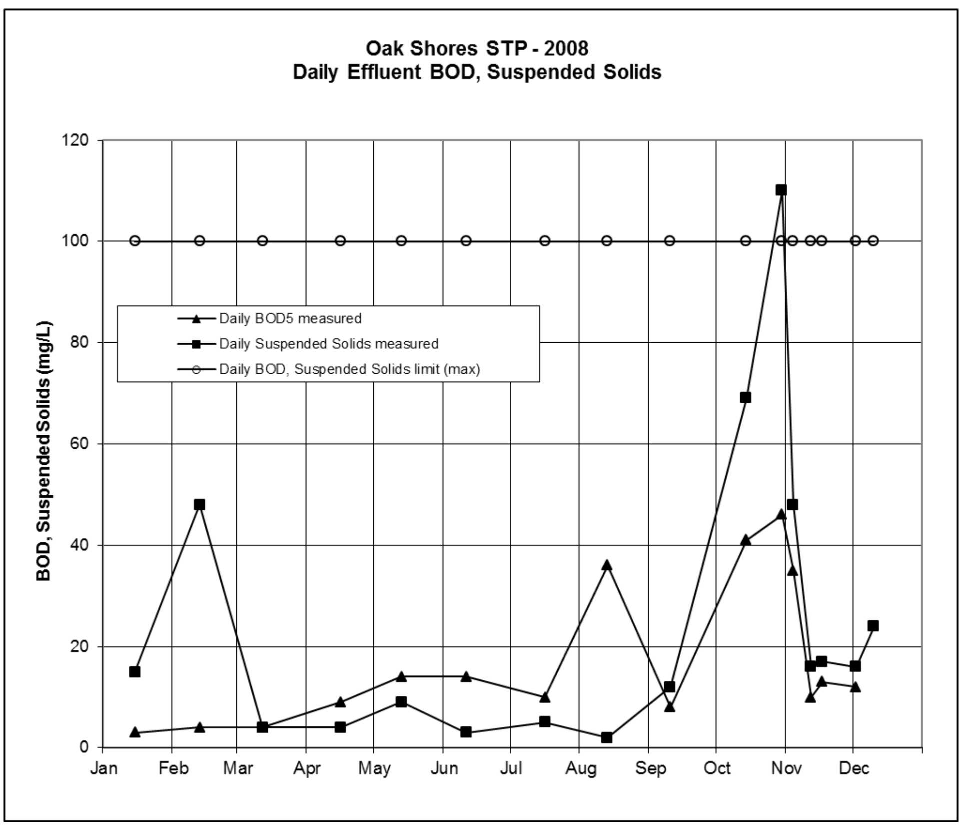
WDR limits:

| Constituent/Parameter | Units | 30 Day Average | Daily Maximum |
|---|---|---|---|
| BOD5 | mg/L | 50 | 100 |
| Total Suspended Solids | mg/L | 50 | 100 |

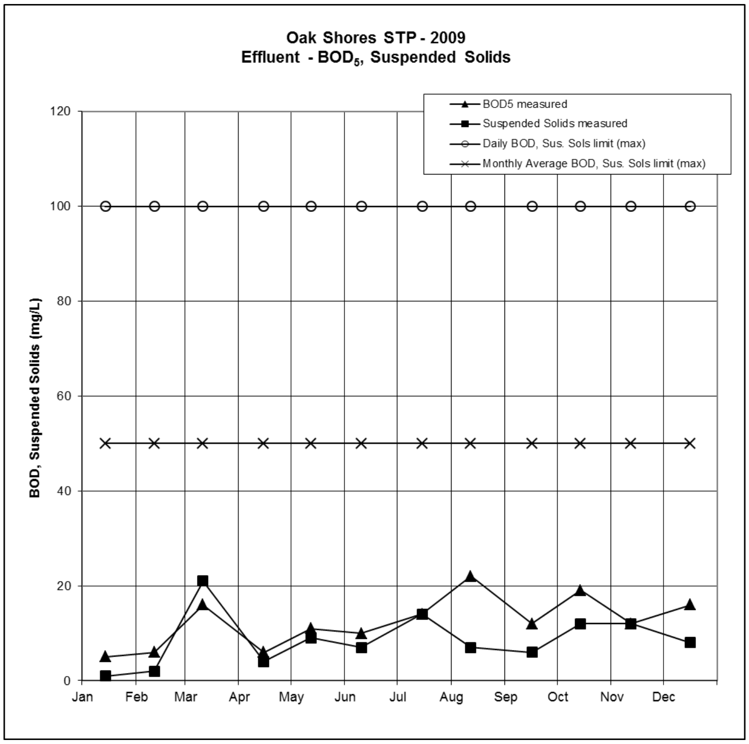


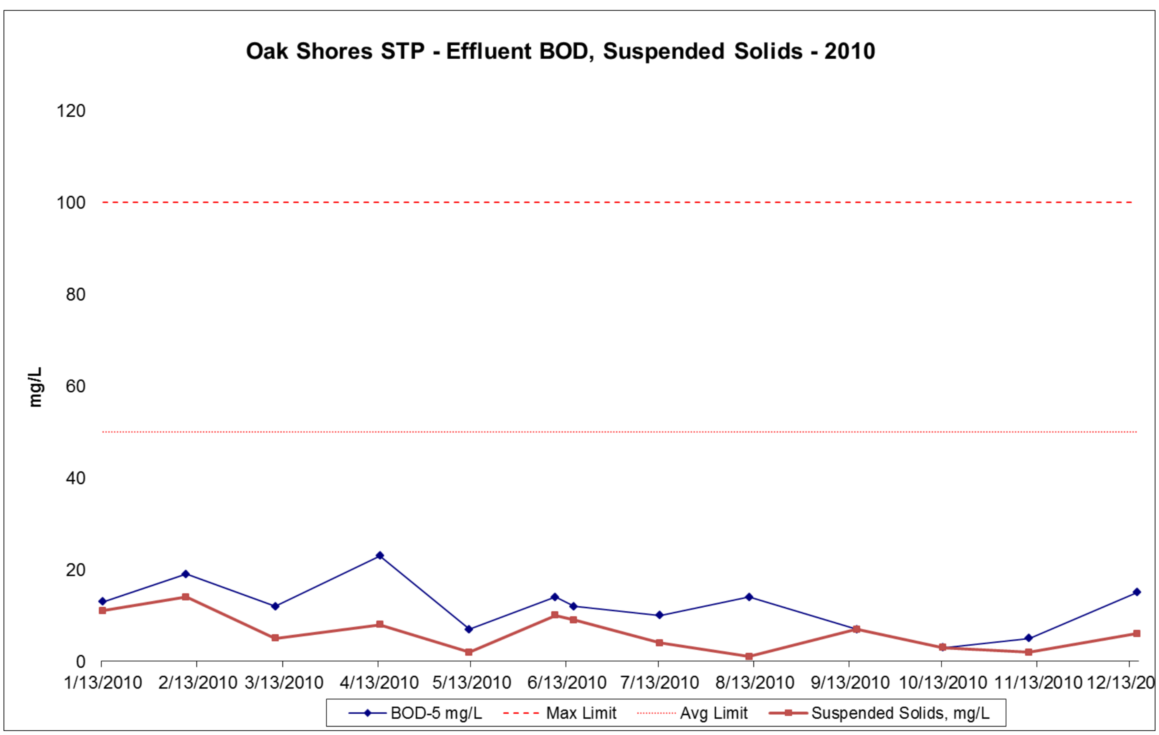



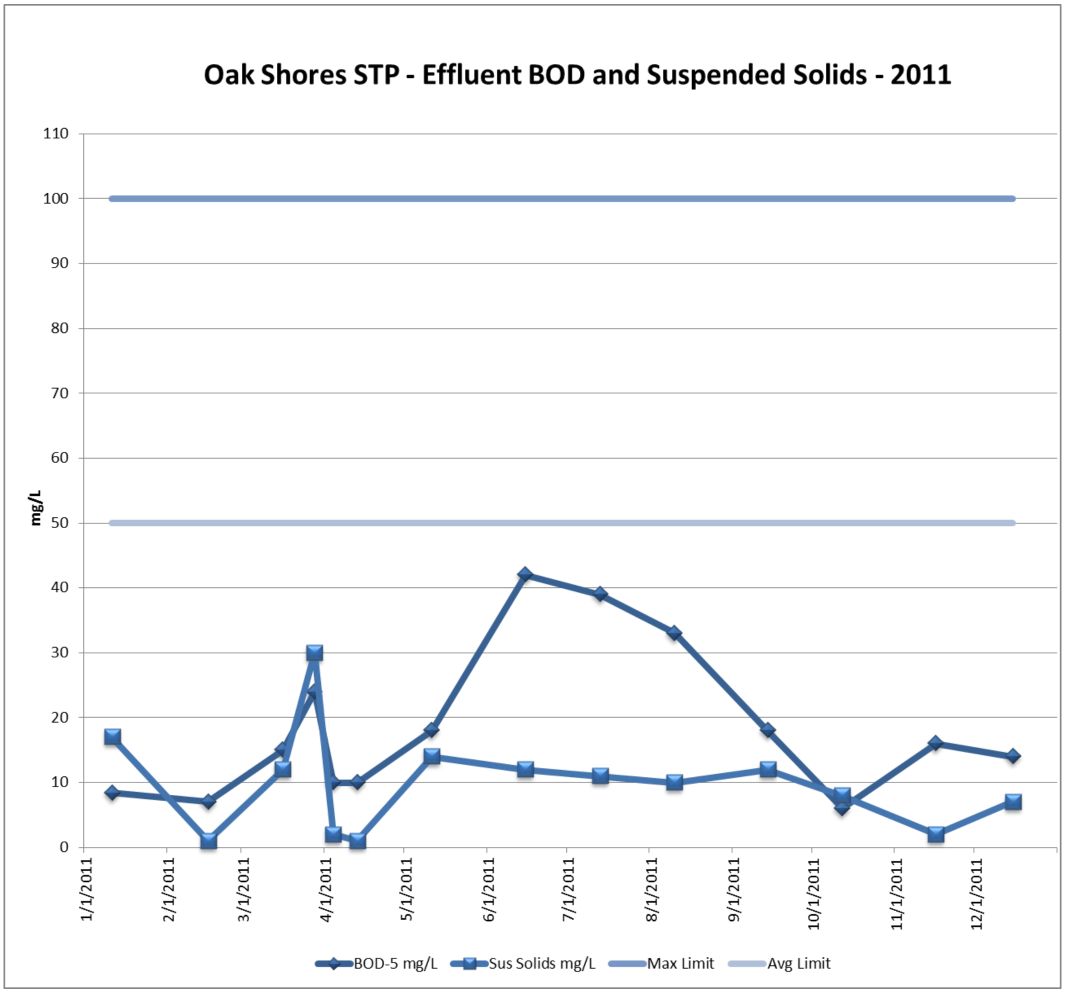

Oak Shores STP - 2008
Monthly Average Effluent BOD, Suspended Solids
Monthly Average BOD5 measured
Monthly Average Suspended Solids measured
Monthly Average BOD, Suspended Solids limit (max)
BOD, Suspended Solids (mg/L)
0
10
20
30
40
50
60
70
80
90
100
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec


Oak Shores STP - 2008
Daily Effluent BOD, Suspended Solids
Daily BOD5 measured
Daily Suspended Solids measured
Daily BOD, Suspended Solids limit (max)
BOD, Suspended Solids (mg/L)
0
20
40
60
80
100
120
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

Beginning in 2009, BOD and suspended solids monitoring was reduced to once per month. Consequently, daily values and monthly values are the same




Oak Shores STP - Effluent BOD and Suspended Solids - 2011
110
100
90
80
70
60
50
40
30
20
10
0
mg/L
1/1/2011
2/1/2011
3/1/2011
4/1/2011
5/1/2011
6/1/2011
7/1/2011
8/1/2011
9/1/2011
10/1/2011
11/1/2011
12/1/2011
BOD-5 mg/L
Sus Solids mg/L
Max Limit
Avg Limit

# 9.7 Oak Shores Interceptor Line Breach Report

SAN LUIS OBISPO COUNTY
**DEPARTMENT OF PUBLIC WORKS**
Paavo Ogren, Director

County Government Center, Room 207 • San Luis Obispo, CA 93408 • (805) 781-5252
Fax (805) 781-1229 email address: pwd@co.slo.ca.us

| | |
|---|---|
| TO: | **Board of Supervisors** |
| FROM: | **Doug Bird, Hydrologic Operations Administrator** |
| VIA: | **Dean Benedix, Utilities Division Manager** |
| DATE: | **April 5, 2011** |
| SUBJECT: | **Report on CSA 7A Oak Shores Wastewater System and Reporting Event Beginning March 29, 2011** |

<u>Recommendation</u>

It is our recommendation that your Honorable Board receive the attached report on the status of Wastewater System and Reporting Event of March 29, 2011.

<u>Discussion</u>

Beginning on March 26, 2011, system operations staff at the CSA 7A wastewater treatment plant, which serves the Community of Oak Shores, noted increasing volume inflows into the system. This coincided with the significant rise in the Nacimiento Lake levels which resulted in the Dam spilling for the first time since 1983. Preceding the increased inflow due to the breach, the plant was receiving influent volumes of approximately 55,000 gallons per day. During this event, staff tracked volumes entering the system at over 250,000 gallons per day. The CSA 7A wastewater system serves two main areas of Oak Shores and has two primary interceptor mains at the bottom of the Oak Shores Development that lie within the ultimate lake footprint. The easterly interceptor main was identified as the source of the significant inflows on Tuesday March 29, 2011. Also, due to the increased pumping to the wastewater treatment plant, a leak in the force main adjacent to the plant was detected and isolated on March 30, 2011.

Staff made operational adjustments to keep flow into the plant regulated as the plant itself is designed and permitted to receive up to 100,000 gallons per day. This enabled the plant to keep adequate pace with the increased flows during the event, and resulted in all inflows entering the plant to be properly treated. Emergency holding ponds were utilized to control the volumes of treated effluent. As there was no abating the flows and suspecting a breach to the system, our Water Quality Manager reported the event to the appropriate regulatory agencies.

Under such a breach notification, the County Department of Environmental Health and the State Department of Public Health issued, as precautionary measures, mandatory “Boil Water” notices as well as restrictions to prevent body contact activities within the lake. The Boil Water Notices affected service to customers at the following Water Purveyor Systems:

- Nacimiento Water Company (Oak Shores Development)
- Lake Nacimiento Resort
- Northshore Ski and Boat Club

The Nacimiento Water Project, which serves the Cities of Paso Robles and San Luis Obispo, the Templeton Community Services District, Atascadero Mutual Water Company and Cayucos CSA 10A, was not issued a Boil Water Notice but all deliveries to the City of San Luis Obispo were curtailed during the event. The City is the only agency taking Nacimiento Water Project water at this time.

Operations staff then initiated the work to locate and identify the breach in the system. Due to the lake’s increased elevation, the breach was essentially acting as a drain, allowing lake water inflow of approximately 100 to 200 gallons per minute into the sewer pipeline. On Wednesday, March 30, 2011, crews found the breach which was a broken pipe repair coupling on a clean out lateral. A temporary packing, clamp and visquene wrap were installed around the breached coupling, effectively sealing the pipe and preventing further inflow from the lake into the pipe. This high amount of inflow into the system resulted in a very low risk of wastewater discharging into the lake. Based on testing results, any wastewater amounts that may have entered the lake have been determined to be undetectable.

The other leak, which had occurred in the force main, was contained on March 30, 2011, in an isolated excavated pit. A temporary pump and pipeline were installed to convey effluent directly to the treatment plant without any significant spill. The small amount that did spill (less than 500 gallons) was pumped into the plant.

Detection and repair of the breach and force main leak locations were accomplished through the use of the following procedures:

- Visual inspection of the interceptor alignment along the shoreline area indicated no obvious location of infiltration or leakage.
- Dye was introduced into the pipeline laterals which flow to the interceptor. No evidence of release of dye into lake water was observed.
- A video camera was inserted into the laterals to observe pipe water levels relative to the lake water levels.
- Audio monitoring of lateral flows.
- A diver searched suspect lateral locations and found a tactile inflow of water at a lateral pipe repair coupling approximately 20’ from the shore under approximately 5’ of water.

Water Quality sampling and testing of the lake was conducted commencing on March 29 thru March 31, 2011, by the Public Works Department Water Quality Laboratory staff, in conjunction with the County Environmental Health Division. All sample test reports yielded values well below the Recreational and Ocean Water Bacteriological Standard (body contact) standard. There were no significant test result differences between upstream samples and samples taken along the suspect interceptor/collector lines.

Subsequent actions at this time are:

a. On Thursday, March 31, 2011, the diver removed the temporary seal on the pipe and installed a hypalon rubber wrap and epoxy sealer, a semi permanent closure to the pipeline. This seal is anticipated to be employed as long as the repaired collector remains below lake water level.

b. After the lake level is reduced, to provide land access to the repair location, the repaired section of pipe will be cut out and a new section of pipe will be installed as a fully permanent replacement.

c. Staff will monitor both the east and west interceptor flows at a high alert level while the lake level is elevated to assure that any subsequent potential pipeline breach is immediately identified and repaired.

d. We are evaluating the pipeline collector system for modifications to reduce and minimize the potential for high lake level inflows and breaches.

The force main leak was repaired on April 1, 2011, by replacing a pipeline coupling which had broken. No further action to this force main system is anticipated to be required.

Background

The Oak Shores Development wastewater system was constructed in the early 1970's and was completed in 1974 by General Resource Development (GRD). GRD was the original owner/operator of the wastewater system until the County took over the facilities under direction of the Regional Water Quality Control Board due to GRD's inability to properly maintain and operate the system. County Service Area 7, Zone A (CSA 7A) was formed at that time to create a zone of benefit for the operations and maintenance of the sewer system.

The unusual features of the wastewater system are the interceptor mains, along with manholes and laterals which reside within the boundary of the lake and can be submerged during periods of high lake levels.

An Interceptor Bypass Study completed by Public Works Department staff in July 2004, evaluated replacing the under lake interceptor system. The study evaluated abandoning the interceptor and deep lift station (No. 3) and replacement with a conventional gravity sewer with lift stations above the high water level. The conclusion was that the estimated cost for such a replacement would be approximately $6 million, resulting in costs to the 913 CSA 7A property owners of approximately $6,600 (exclusive of financing costs). The study concluded that the risk of spills or overflow of raw sewage reaching the lake would not be eliminated, but could potentially increase, due to the increased number of new lift stations (8) and individual homeowner maintained sewer ejector pump systems (22).

Attachment “A” provides a detailed chronology of the formation of both County Service Area No. 7 and subsequently CSA 7A as well as the conditions of the wastewater system while under ownership by GRD and its eventual take over by the County.

Permit requirements for CSA 7A Wastewater Treatment System

The system is regulated by the California Regional Water Quality Control Board’s Waste Discharge Requirements Order No. 01-130. Operational procedures are established in CSA 7A’s Operations and Maintenance Manual, Sanitary Sewer System Management Plan, and Public Works Procedural Memorandum O-8 (Procedures for Sewage Spill Handling and Reporting) that were developed in compliance with the Waste Discharge Requirements.

Record of Emergency Notifications

Attachment “B” provides a record of notifications to regulatory agencies in accordance with our Department’s Sanitary Sewer System Management Plan (SSMP) approved by your Board on May 4, 2010.

**Other Agency Involvement/Impact**

During the event several agencies, private water purveyors and property interests were affected. These included: Monterey County Water Resources Agency, Monterey County Parks Department, Nacimiento Water Company, Lake Nacimiento Resort, Northshore Ski and Boat Club, and the Nacimiento Water Project.

The regulatory agencies contacted include County Department of Environmental Health, State Department of Public Health, and Regional Water Quality Control Board. Work was coordinated in a cooperative manner during the entire incident.

**Financial Considerations**

Expenses to date for investigation, plant operations, coordination, water quality sampling and testing, and repair of the wastewater system are estimated to have cost $50,000. An additional cost of $10,000 is anticipated to complete the investigation and repairs.

The project costs for location, repair, notification, and monitoring will be funded from the CSA 7A operating and reserve funds. Operating reserve balances are currently $190,000 which are sufficient to cover these expenses. Work conducted to date is within the fund balance. The overall CSA 7 fund balance also is available to provide support for investigations and repairs to the system.

**Results**

Receipt and filing of this report will inform the Board of the events which occurred and actions taken in response to the incident, and on follow up activities. Summarization and dissemination of this information supports and contributes to the County's Communitywide goals of providing a well governed, safe and healthy community.

Attachments: Vicinity Map
Attachment A - CSA 7A History
Attachment B - Record of Event

File: CSA 7A

Reference: 11APR05-C-13

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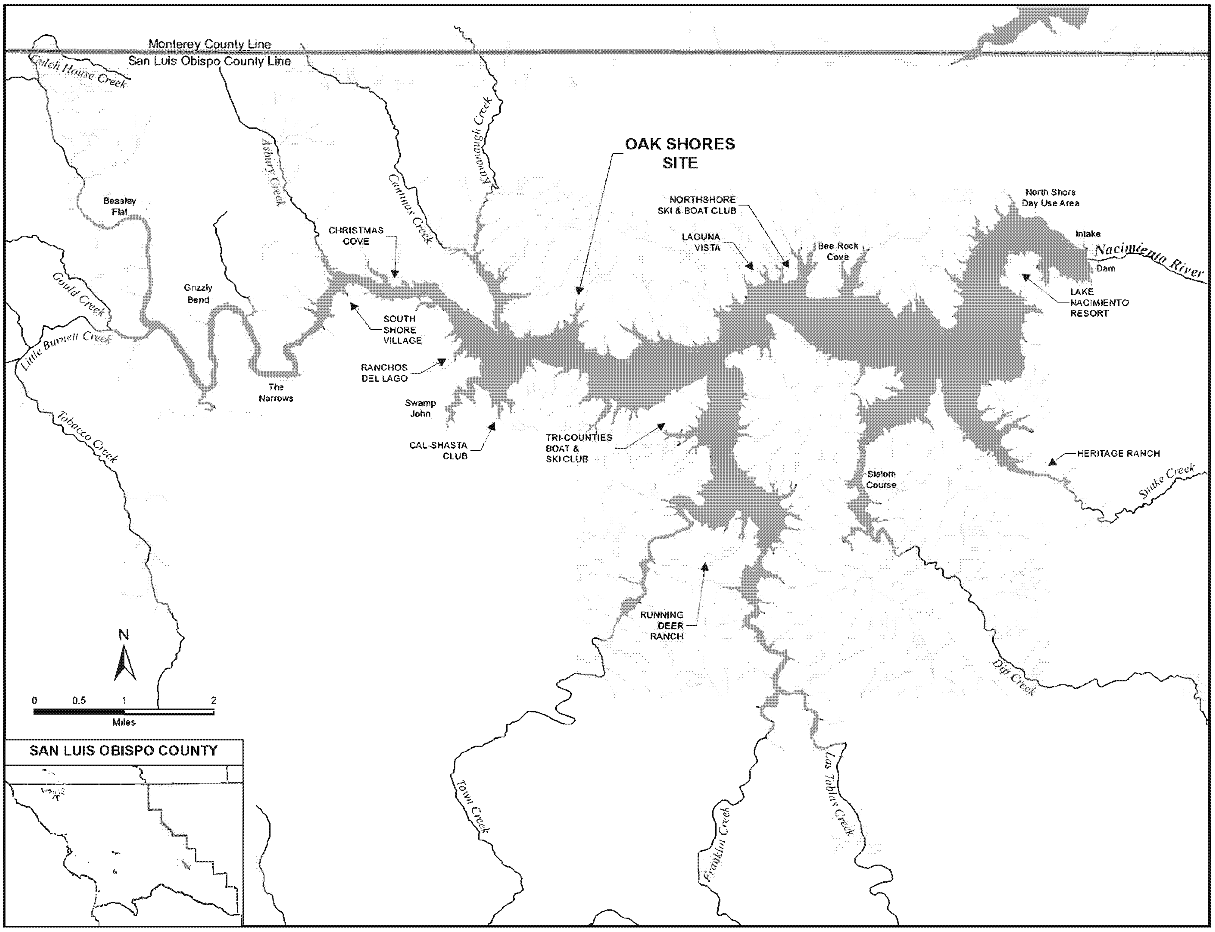
Monterey County Line
San Luis Obispo County Line
OAK SHORES SITE
NORTHSHORE SKI & BOAT CLUB
LAGUNA VISTA
Bee Rock Cove
North Shore Day Use Area
Intake
Nacimiento River
Dam
LAKE NACIMIENTO RESORT
CHRISTMAS COVE
SOUTH SHORE VILLAGE
RANCHOS DEL LAGO
Swamp John
CAL-SHASTA CLUB
TRI-COUNTIES BOAT & SKI CLUB
Slalom Course
HERITAGE RANCH
Snake Creek
RUNNING DEER RANCH
Dip Creek
Beasley Flat
Grizzly Bend
The Narrows
Gatch House Creek
Gould Creek
Little Burnett Creek
Tobacco Creek
Asbury Creek
Cummus Creek
Kavanaugh Creek
Town Creek
Franklin Creek
Las Tablas Creek
N
0 0.5 1 2
Miles
SAN LUIS OBISPO COUNTY

# Attachment A

**TO:** **Paavo Ogren, Deputy Director – Administration, Public Works Dept.**

**FROM:** **Jeff Werst, Staff Engineer**

**DATE:** **August 3, 2004**

**SUBJECT:** **General CSA 7A History**

In accordance with your request, the purpose of this memorandum is to provide a general summary of the sequence of events leading to the County's ownership of the Oak Shores wastewater collection, treatment and disposal system, including formation of CSA 7A. The information was culled from CSA 7A files in the Utilities Division and Accounting and Budget department and is presented in outline form, based on key dates.

1. **December 11, 1967.** The County Board of Supervisors (BOS) adopted Resolution 67-595 establishing "County Service Area No. 7, Nacimiento Reservoir – North Shore." Proposed services included "providing, operating and maintaining of facilities for the collection and disposal of sewage."
2. **May 12, 1970; September 28, 1970; August 2, 1971.** The BOS approved agreements between the County and General Resource Development ("GRD"), the original developer of Oak Shores. As a condition for approval of the final maps for Tracts 378, 379, 380 and 381 of the Oak Shores central neighborhood, GRD agreed to construct wastewater collection, treatment and disposal facilities to accommodate effluent from the project. The agreements stipulated that GRD would post a bond for the construction, and dedicate the wastewater facilities to the County within two years of the date of completion of construction, after proving successful operation.
3. **October 7, 1974.** The BOS approved Resolution 74-553, exonerating the performance bonds for Tract 381.
4. **June 27, 1975.** The County Engineering Department sent a letter to the Regional Water Quality Control Board (RWQCB) detailing major concerns regarding the existing wastewater facilities at Oak Shores.
5. **July 3, 1975.** The RWQCB responded to the County's letter, stating that the current owner/operator of the system (GRD) was responsible to correct existing deficiencies the sewage facilities, including sealing an aeration pond, performing slope repair adjacent to the pond, and installing an influent flowmeter to allow detection of infiltration to the collection system. The RWQCB felt the flowmeter was necessary because there had been leaks in the Interceptor causing inflow of lake water to the collection system, overwhelming the treatment and disposal systems. The RWQCB stated that if the items were not corrected, they would take enforcement action and that if the County assumed responsibility for the system before the corrections were made, enforcement action could be taken against the County.

6. **July 23, 1975.** In an internal memorandum to George Protopapas (County Engineer) from Ed McDonald (Hydraulics Operations Engineer), it was stated that the RWQCB had been trying unsuccessfully for two years to get GRD to address problems with the wastewater system at Oak Shores. Therefore, the memo recommended that the County not accept responsibility for operating the facilities until the developer made required repairs and proved successful operation.
7. **July 29, 1975.** In a letter to the BOS from George Protopapas, it was stated that the developer (GRD) had not completed contractual expansion of the wastewater treatment facilities for Tracts 379 and 381, and that the developer had indicated that there were insufficient funds to complete the expansion. The letter recommended that the BOS direct the County District Attorney's office to notify the bonding company (Argonaut Insurance) that the bonded guarantees were to be utilized by the County to complete the required expansion. The BOS approved such an order on August 4, 1975.
8. **October 20, 1975.** The BOS adopted Resolution 75-640 conditionally accepting the sewer treatment plant and disposal system for the Oak Shores development (Tracts 378, 379, 380, and 381) on behalf of CSA 7. The resolution acknowledged that the developer (GRD) had not maintained the sewer facilities in an acceptable manner, was unable to make needed repairs to the system, and that substantial damage could result from winter storms if immediate corrective work was not done. Therefore, the resolution ordered that the sewer facilities be conditionally accepted on behalf of CSA 7A and that repairs be made.
9. **February 23, 1976.** The BOS adopted Resolution 76-215 conditionally accepting the sewer collection system for the Oak Shores development (Tracts 378, 379, 380, and 381) on behalf of CSA 7.
10. **March 30, 1976.** In a letter to the BOS from George Protopapas, it was recommended that a resolution be adopted establishing Zones A and B of County Service Area No. 7, with separate property tax rates for each. The letter stated that Zone of Benefit A would consist of the Oak Shores Development only and would provide monies for maintenance and operation for the Oak Shores sewer collection and treatment facilities. Zone of Benefit B would include all areas of CSA 7 other than the Oak Shores Development and would provide for maintenance of public roads within that area.
11. **April 5, 1976.** The BOS adopted Resolution 76-306, establishing and forming Zone A for the "installation, maintenance, repair, operation, enlargement, and construction of the sewer collection and treatment system." An exhibit attached to the resolution showed the Zone A boundary as being contiguous with the boundary for Tracts 378, 379, 380 and 381.

# Attachment B
# Record of Event

**Oak Shores Infiltration Chronology**

| | |
|---|---|
| **3/25/11** | Oak Shores STP operator notices increase in plant influent flow. |
| | |
| **3/26/11** | Operator notes flow has not changed and estimates rate of 150,000 gpd. Plant is handling flow. |
| | |
| **3/27/11** | Operator notes flow has not changed and continues to estimate rate of 150,000 gpd. Plant is handling flow. |
| | |
| **3/28/11** | In the morning, operators note significant change from overnight, the re-calculate flows and determine flow Saturday was actually 278,000 gpd and 300,000 gpd Sunday. Implement measures at plant to handle increased flows. Examine influent flow rate over three hour period and estimate rate now at 150,000 gpd. Believe plant will be able to recover if flow rate doesn't increase. Compared lake level records to plant flow records. Determined plant flow increased at 1:00 AM, last Thursday when lake elevation was 799'. Suspect infiltration in lateral line based on lake elevation data. Operators discussed situation with Water Quality Lab staff. Late in the day, re-evaluated flow rate and determined it to be 300,000 gpd. Believed continued operation would be unsustainable. Operator performed field inspection but could not identify infiltration site. |
| | |
| **3/29/11** | Operators note no change from overnight. |
| 7:30 – 9:00 am | Operators discussed options with lab staff. Evaluated disposal options including additional effluent treatment and potential impact to lake. Contacted Fluid Resources Management and requested they enter Lift Station 3 to help determine which "side" of the collection system is having the problem. Operators indicate intention to reduce influent flow and believe that "backing up" water in the collection line will increase backpressure in the line and reduce infiltration rate. Discuss possibility that this action could increase the potential of a sewage release from the line. Operators plan to introduce dye into interceptor line and patrol lake over the interceptor looking for evidence of leak or infiltration. Will attempt to TV lines where possible. Plan to bring in diver to look for a breach in the system. |
| 9:30 am | Water Quality Manager and Utilities Manager meet and discuss situation and options. |
| 10:30 am | Deputy Director informed and options discussed. Notified PW Director, noted potential for sewage release to lake, discussed procedures and options, developed initial plan. Informed by operators that east side interceptor line was the source of the increased flow. |

| | |
|---|---|
| 11:50 am | Called RWQCB (David LaCaro) and discussed situation and plan. Called California Office of Emergency Services and notified them of the potential for a sewage release in Lake Nacimiento. Called County Environmental Health (J. Demery) and provided report. Lab staff were sent to Oak Shores and directed to collect samples from lake upstream and over the suspect interceptor line. Samples will be collected in duplicate so that analyses can be performed by the Water Quality Lab and the Public Health Lab. |
| 12:15 pm | Notified Dennis Javens, Oak Shores Community Association, of situation and need for lake sampling. They offered assistance and use of their boat. |
| 1:00 pm | Contacted Rob Johnson and Brent Buche of MCWRA. They indicated that the lake level will likely remain the same for at least two weeks. |
| 2:00 pm | Discussed situation with Mike Ali, California Department of Public Health. Discussed water systems in the area, especially those under the influence of surface water.<br>Contacted Casey Nielson, Monterey County Parks Department and discussed situation with him. He noted the County code requirement to obtain permission for diving in the lake. He requested we email necessary information and indicated he would expedite request. He also offered any assistance needed. Information was emailed as requested. |
| 3:00 pm | Conference call with Mike Ali (CDPH), Curt Batson (Env. Health), Brad Prior, Rich Lichtenfels, and John Beaton (PW). Discussed situation and potential for sewage release. Discussed water quality monitoring plans. Discussed public water systems in the area and their vulnerability. Given the possibility that sewage may have or will enter the lake and our inability to confirm that it has not, Batson and Ali decide that “boil water” and “no body contact” orders are warranted. Nacimiento Project deliveries will be stopped. Anticipate orders will be issued today. Environmental Health will issue orders to the affected “small” water systems and CDPH will issue orders to the affected larger systems.<br>Press release is prepared by Environmental Health.<br>Notified Utilities Manager and Public Works Deputy Director of impending orders and press release. |
| 4:15 pm | Called Casey Nielsen to inform him of impending boil water order. Attempted voice contact with John D’Ornellas, HRCSD, to inform him of impending orders, but office closed. Emailed information to him. |
| 4:30 pm | Water quality samples collected. Operators note that dye test did not reveal any leak from the interceptor line. |
| 4:45 pm | Contacted Public Health Lab and arranged for drop off of samples after hours. |
| 5:00 pm | Operators note they were able to TV line at a manhole at a midpoint in the interceptor line. No evidence of increased flow or water backup at that site. |
| 5:09 pm | Receive permission to dive in lake from Tom Shepherd |
| 6:00 pm | Nacimiento water deliveries to City of San Luis Obispo shut off. |
| 6:15 pm | Water quality samples arrive at laboratory and analysis is initiated.<br>Press release sent late in day. |

| | |
|---|---|
| **3/30/11** | |
| 7:30 am | Contacted by Dean Furukawa, City of San Luis Obispo. Discuss situation and plans. |
| 10:00 am | Conference with Paavo Ogren, Dave Flynn, Dean Benedix, Doug Bird, County Administration, and BOS aides in Public Works office. Discussed situation and plans. Dave Flynn will be department's point of contact with media. Dean Benedix will focus on locating and repairing breach. Doug Bird will compile documents and coordinate Board of Supervisors report. John Beaton will coordinate water quality monitoring and regulatory agency updates, compile chronology. |
| 10:50 am | Operators predict diver will be onsite at noon. Note minor leak has developed in force main entering the plant. Implement temporary remedy but permanent fix must await location and repair of the breach.<br>Lab staff directed to collect day's samples.<br>Ray Green, North Shore Ski and Boat Club, contacted in response to email inquiry related to boil water order. We noted that they already have 1 week's worth of water stored in their tank. |
| 11:15 am | John Beaton contacted Richard LeWarne, Monterey County Environmental Health, and provided a status report. |
| 11:20 am | Contacted by John D'Onellas (HRCSD). Indicates he has not received any boil water order but has received many calls. |
| 11:30 am | Contacted by Mike Ali. He notes that the Nacimiento Water Company treatment plant has been off for a week and they have sufficient storage on hand to meet their immediate needs. Nacimiento Project is offline. Heritage Ranch is excluded from the boil water order due to their distance from Oak Shores. Nacimiento Resort and North Shore Boat and Ski have boil water orders. |
| 11:45 am | Lab contacted by Doug Bird asking about contacts with MCPD. Lisa Wallender (PW) has been providing them with updates. |
| 12:05 pm | Dave Flynn endorses continued communication with MCPD and requests cc to Dean, Doug, and Dave. |
| 1:00 pm | Casey Nielsen calls and receives update.<br>Bill Phillips, MCWRA contacts Wallender. He notes his is media contact for MCWRA. Receives update. |
| 2:00 pm | Beaton and Wallender meet with Flynn. Discuss water quality. Discuss continued contact of affected agencies. |
| 2:20 pm | Received bact samples from Nacimiento Water Company. Email received from CDPH indicated that boil water order for them would be lifted if the analysis results were acceptable. |
| 3:00 pm | Received email from Mike Ali listing boil water orders to affected systems dated 3/30/11. Contacted by Chris Alakel, Water Resources Manager for Paso Robles. Provided him with an update. |
| 5:45 pm | Updates sent to MCPD, City of SLO, HRCSD, NSSBC, PR, MCWRA, NWC |
| 6:00 pm | Sample received by labs for analysis. |
| | |

| | |
|---|---|
| **3/31/11** | |
| 8:15 am | Update from operators. Breach located and temporary fix achieved. Lab staff receive direction for day's sampling. |
| 9:00 am | Initial water quality results distributed. All results look good and meet body contact standards. Multiple attempted calls to Dave LaCaro (RWQCB) and Mike Ali throughout the day. Left message with both but received no contact. Beaton contacts Rich Lichtenfels and discusses water quality and monitoring plans. Indicates possible conference call with Jim Beebe, Curt Batson later in the day |
| 5:45 pm | Emailed Nacimiento Water Company bact results to CDPH and Nacimiento WC. All OK. |
| 7:00 pm | Submit report to RWQCB and CIWQS database on minor sewer release from force main. |
| | |
| **4/1/11** | |
| 6:30 am | Distribute water quality results summary |
| 9:35 am | Contacted by Mike Ali. Discuss status. He indicated he wants to review with County Environmental Health and lift boil water orders. |
| 9:40 am | Contacted by Mike Ali – all looks good for lifting boil water orders today |
| 10:00 am | Conference call with CDPH and Env Health. Pending acceptable results from yesterday's samples, boil water and no body contact orders will be lifted today. |

# 9.8 San Luis Obispo County Code of Ordinances, Chapter 11.20 Nacimiento Lake

San Luis Obispo County, California, Code of Ordinances >> Title 11 - PARKS AND RECREATION >> Chapter 11.20 - NACIMIENTO LAKE >>

## Chapter 11.20 – Nacimiento Lake

### Sections:



11.20.005 - Preamble and purposes.

This chapter is enacted in order to establish rules and regulations for the safe and peaceful use and enjoyment of Nacimiento Lake, to advance the public health, safety and welfare at the lake, for the protection and preservation of property and natural resources, and for the general safety and welfare of the public. The county of San Luis Obispo and the San Luis Obispo County flood control and water conservation district reserve all rights and interests each may have at Nacimiento Lake, as they exist under any federal, state or local law.

(Ord. No. 3191, § 1, 5-11-10)

11.20.010 - Definitions.

As used in this chapter the following terms shall have the following meanings, unless otherwise apparent from the context that a different meaning is intended:

"Aquaplane" or "aquaplaning" means any aquaplane, plank, surfboard, water ski, wakeboard, or other device used for transportation, conveying or carrying a person who is being towed or pulled by a vessel or other watercraft by means of a rope, chain, cable, wire, or other flexible connection.

"Bicycle" means any device as defined by the California Vehicle Code as a "bicycle," "motor-driven cycle," motorized bicycle or moped," "motorized quadricycle and motorized tricycle" and/or "motorized scooter."

"Fireworks" means anything defined as "fireworks" in California Health and Safety Code Section 12511, including, but not limited to, "dangerous fireworks" (Health and Safety Code Section 12505), "safe and sane fireworks" (Health and Safety Code Section 12529), but not including auto flares when used for the purpose of warning other vehicles or other Emergency Signaling Devices (Health and Safety Code Section 12506) if they are used for emergency purposes.

"Horse" means any member of the equine family and includes mule and donkey, or other rideable animal.

"Lake" means Nacimiento Lake.

"Log boom" means the continuous floating barrier than spans fully across Nacimiento Lake from the north to the south shores in the vicinity of Nacimiento Dam.

"Monterey County" means the county of Monterey.

"Monterey County parks department" means the Monterey County parks department and its uniformed employees.

"Motorcycle" means that device as defined by the California Vehicle Code.

"Nacimiento Dam" means the dam which forms the Lake.

"Nacimiento Lake" or lake" means the reservoir created by Nacimiento Dam, and lands flooded up to elevation eight hundred twenty-five feet — NGVD29, located in the county of San Luis Obispo.

"Nacimiento recreation area" means that portion of Nacimiento Lake and the land owned or leased by the Monterey County water resources agency and/or the county of Monterey located in San Luis Obispo County.

"Operator" means any concessionaire of the Monterey County parks department contracted to provide services at the Nacimiento recreation area. Authority for the operator shall be limited to that provided in the contract or agreement between Monterey County and the operator.

"Parks director" means the chief ranger or director of the Monterey County parks department or any employee to whom such authority is delegated to by the parks director.

"San Luis Obispo County" means the county of San Luis Obispo.

"San Luis Obispo County flood district" means the San Luis Obispo County flood control and water conservation district as created under Chapter 1294 of the Statutes of 1945.

"Sheriff's department" means safety employees of the San Luis Obispo County sheriff's department.

"Vehicle" means a "motor vehicle" as that device is defined by the California Vehicle Code, including, but not limited to, a "motor truck, motorcycle, tow truck, and/or truck tractor," as those terms are defined in the California Vehicle Code, excepting a device moved solely by human power or as otherwise defined by this chapter as a "bicycle."

"Vehicle Code" means the California Vehicle Code. Whenever any reference is made to any portion of the Vehicle Code or of any other law including, without limitation, the Penal Code and Health and Safety Code, such reference shall apply to all amendments and additions hereafter made to such sections.

"Vessel" includes every description of watercraft used or capable of being used as a means of transportation on water, except the following:

(1) A seaplane on the water;
(2) A watercraft specifically designed to operate on a permanently fixed course, the movement of which is restricted to, or guided on, such permanently fixed course by a mechanical device that restricts the watercraft's movement to the fixed course; and
(3) A floating structure which is designed and built to be used as a stationary waterborne residential dwelling which does not have and is not designed to have a mode of power on its own and is dependent for utilities upon a continuous utility linkage to a source originating on shore and has a permanent, continuous hookup to a shoreside sewage system.

"Vessel trailer" means any trailer or equipment used to transport a vessel and which is placed in the water to launch the vessel.

Words used in the present tense include the future as well as the present. Words used in the masculine gender include the feminine and neuter. The singular number includes the plural and the plural the singular. Section headings, when contained in this chapter shall not be deemed to govern, limit, modify or in any manner affect the scope, meaning or intent of the provisions of any section. "Shall" is mandatory and "may" is permissive.

(Ord. No. 3191, § 1, 5-11-10)

<u>11.20.020 - Penalty for violation.</u>

Every person who violates any of the provisions of this chapter, except for peace officers acting under their scope and authority, and personnel of the San Luis Obispo County District, San Luis Obispo County, and/or Monterey County parks department when in the course of the performance of their official duties, may be deemed guilty of a misdemeanor and upon conviction thereof is punishable by imprisonment in the San Luis Obispo County jail for not more than one year, or by a fine of not more than one thousand dollars, or by both. A peace officer issuing a citation for a violation may at his or her discretion reduce any offense charged under this chapter to an infraction.

(Ord. No. 3191, § 1, 5-11-10)

<u>11.20.030 - Permit and fee schedules.</u>

All permits, certificates, or decals issued by the Monterey County parks department authorizing the use of the Nacimiento recreation area and its facilities, and the fees, if any, for the same, shall be in accordance with schedules adopted, from time to time, by resolution of the Monterey County board of supervisors.

(Ord. No. 3191, § 1, 5-11-10)

11.20.040 - Permit and fee required—Refund.

No person shall enter or use the Nacimiento recreation area without first paying the prescribed fee, if any, to the Monterey County parks department at an established point of entry or collection and receiving an appropriate permit, certificate, or decal unless exempted under this chapter. No person shall, upon leaving the Nacimiento recreation area, refuse to exhibit to the Monterey County parks department, upon its demand, any permit, certificate, or decal which has been issued to him or her. No fee shall be refunded unless refunds have been authorized by resolution of the Monterey County board of supervisors.

(Ord. No. 3191, § 1, 5-11-10)

11.20.050 - Permit and fee—Exemptions.

The following persons are exempt from the permit and fee requirements of this chapter: Officers, employees, agents, and contractors (and employees of the latter) of any governmental entity, while engaged in the performance of their duties; concessionaires of Monterey County and their agents, employees, suppliers, and contractors, while on the business of the concessionaire; employees of public utilities while in the performance of their duties; such other persons as may be designated by resolution of the Monterey County board of supervisors.

(Ord. No. 3191, § 1, 5-11-10)

11.20.060 - Annual vehicle and vessel permits.

(a) Annual vehicle and vessel permits shall be valid for the calendar year in which issued, terminating on December 31st thereof, unless sooner revoked.
(b) Annual vehicle permits shall be issued to an individual for noncommercial use by him or her and/or his or her immediate family only.
(c) Annual vessel permits are issued for a single vessel and may not be transferred to another vessel.
(d) The annual vessel permit shall be affixed to the outboard side of the vessel approximately midboat on the port side, or on the port side of the vessel windshield, and is not transferable to other vessels owned concurrently by the same or other owners. No person shall move, mutilate, alter, or destroy any annual Vessel permit without the prior consent of the Monterey County parks department.

(Ord. No. 3191, § 1, 5-11-10)

11.20.070 - Permit revocation.

The Monterey County parks department and the San Luis Obispo County sheriff's department are each authorized to revoke any permit, certificate, or decal which has been issued when:

(1) Such permit, certificate, or decal was issued unlawfully or erroneously; or
(2) Such personnel has reasonable grounds to believe that the person to whom such permit, certificate, or decal was issued, or any person who enters the Nacimiento recreation area using such permit, certificate, or decal, has violated any provision of this chapter or any applicable local, state, or federal law, rule or regulation. In such cases, the Monterey County parks department and San Luis Obispo County sheriff's

department may expel such persons from the Nacimiento recreation area and cause such vessels to be removed from Nacimiento Lake and the Nacimiento Lake recreation area.

No person who has been ordered expelled from the Nacimiento recreation area shall remain therein. The Monterey County parks department may, in its discretion, refuse to admit to the Nacimiento recreation area any person who or vehicle, vessel, trailer, vessel trailer or other equipment which has been expelled from Nacimiento Lake or the Nacimiento recreation area within the immediately preceding six months.

(Ord. No. 3191, § 1, 5-11-10)

11.20.080 - Shoreline camping and day use limitations.

It is unlawful at any time to picnic or at any time after dark to camp on any land adjacent to the shoreline of Nacimiento Lake, except at areas specifically designated for picnicking or for overnight camping by the owner of such areas and which are also approved for such uses by the San Luis Obispo County planning and building department and the San Luis Obispo County health agency. For the purposes of this section, "after dark" means any time from one-half hour after sunset to one-half hour before sunrise. "Camping" means erecting a tent or shelter or arranging bedding and/or both, or the use of a recreational vehicle for the purpose of, or in such a way as will permit, remaining overnight.

(Ord. No. 3191, § 1, 5-11-10)

11.20.090 - Camping and day use regulations.

(a) No person shall enter or camp within the Nacimiento recreation area without a valid, unexpired, unrevoked permit for such entrance or day-use. The Monterey County parks department and sheriff's department may, at any time, revoke the camping or day-use permit of any person if the campsite or day-use area occupied by such person is not maintained by him or her in a reasonably clean, sanitary, and attractive manner.
(b) No person shall camp within the Nacimiento recreation area except within designated camping areas. No person shall enter or remain in any day-use park area after the posted closing time without prior approval of the Monterey County parks department.
(c) The holder of a camping or day-use permit shall maintain possession of the permit at all times and present it when requested by personnel of the Monterey County parks department or San Luis Obispo County sheriff's department. No person shall move, mutilate, alter, or destroy any campsite marker or permit without the prior consent of the Monterey County parks department.
(d) Camping permits may be issued so as to expire after a maximum of fifteen consecutive days, and campground occupancy by the same person(s), equipment, or vehicle(s) at any camping facility within the Nacimiento recreation area shall not exceed thirty total days per year, unless otherwise extended at the discretion of the Monterey County parks director or designee. After the first fifteen-day permit has expired, the occupant(s) equipment, and vehicle(s) must vacate the campground for a minimum of two consecutive days before a second permit may be issued. All camping permits expire at the time noted on the permit.
(e) No person shall, without prior approval of the Monterey County parks department, park more than two vehicles, or one vehicle and one vessel trailer, at any one campsite at the Nacimiento recreation area.
(f) Quiet shall be observed in all areas of the Nacimiento recreation area between the hours of ten p.m. and seven a.m. No person shall make any loud or boisterous noise of such a nature as to disturb other persons in such areas between said hours.
(g) No person under the age of eighteen shall camp within the Nacimiento recreation area unless accompanied by an adult.
(h) No person shall camp below the high water line at the Nacimiento recreation area unless authorized by the Monterey County parks department.
(i) Campsites or day-use areas must be physically occupied at least once every twenty-four hours by the permittee or designee. The Monterey County parks department, the San Luis Obispo County sheriff's

department, and/or an operator (if permitted by contract) are authorized to remove from any campsite or day-use area any property which is left in violation of this chapter.
(j) No person shall occupy any day-use area or campsite that is not maintained in a reasonably clean, attractive, safe or sanitary manner. It shall be the responsibility of any person using such an area to notify the Monterey County parks department immediately upon arrival of any deficiencies noted.

(Ord. No. 3191, § 1, 5-11-10)

11.20.100 - Camping prohibited on public property.

No person shall camp within the Nacimiento recreation area between the hours of six p.m. and six a.m. on any:

(1) Public road; or
(2) Public property, except when the public property is expressly designated and posted for overnight camping.

(Ord. No. 3191, § 1, 5-11-10)

11.20.110 - Vessel operation in prohibited areas.

It is unlawful for any person within Nacimiento Lake to operate a vessel within a prohibited area designated by official standard waterway markers on the lake. The Monterey County parks department is authorized to designate such prohibited areas, as needed, to protect the safety and property of visitors to Nacimiento Lake. No person shall operate a recreational vessel between the log boom and Nacimiento Dam.

(Ord. No. 3191, § 1, 5-11-10)

11.20.120 - Vessel regulations.

(a) The Monterey County parks department is authorized to establish and designate such restricted boating areas and speed zones at Nacimiento Lake as are reasonably necessary for the safety of persons and property.
(b) The Monterey County parks department is authorized to designate parts of Nacimiento Lake for the exclusive use of such specific classes of vessels and during such specific times as will, in its judgment, best serve the safety, welfare, and/or interests of the boating public.
(c) The Monterey County parks department is authorized to establish and designate health, sanitation and pollution standards for vessels operating at Nacimiento Lake. It shall be unlawful for any person to have, use or operate a vessel or vessel trailer at Nacimiento Lake that does not meet such minimum health, sanitation and/or pollution standards, and that does not have an annual or daily vessel permit and any required local inspection certification, unless otherwise exempted.
(d) The Monterey County parks department, the San Luis Obispo County sheriff's department, and other peace officers with concurrent jurisdiction are authorized to inspect, upon entry to Nacimiento Lake and/or the Nacimiento recreation area, all vessels, vessel trailers and vehicles transporting or towing said vessels, to determine that such vessels, vessel trailers and vehicles are in compliance with this chapter, and all other applicable local, state, and federal rules, laws and regulations, including, without limitation, those pertaining to the health and safety of the visiting public, and the health, safety, and sanitation of Nacimiento Lake and related infrastructure.
(e) The Monterey County parks department, the San Luis Obispo County sheriff's department, and other peace officers with concurrent jurisdiction are authorized to board and inspect or re-inspect any vessel, vessel trailer or vehicle transporting or towing said vessel at Nacimiento Lake and the Nacimiento recreation area, to ensure compliance with this chapter, and all applicable local, state and federal rules,

laws, and regulations, including, without limitation, those laws, rules and regulations relating to invasive species which pose a threat to the waters of Nacimiento Lake and related infrastructure.

(f) If, after a vessel permit and/or any required local inspection certification is issued, a vessel, vessel trailer or vehicle is found to be in violation of this chapter, or any applicable local, state, and/or federal rules, laws, and regulations, including, without limitation, those rules, laws and regulations pertaining to health, safety and/or sanitation, then the Monterey County parks department, the San Luis Obispo County sheriff's department, and other peace officers with concurrent jurisdiction are authorized to revoke, for noncompliance, any annual or daily vessel permit previously issued and may remove said vessel, vessel trailer or vehicle from the waters of Nacimiento Lake and/or the Nacimiento recreation area. Any person who refuses to allow such inspection shall immediately remove his/her vessel, vessel trailer and/or vehicle from the waters of Nacimiento Lake. It shall be unlawful for any person to operate a vessel on Nacimiento Lake when the vessel does not comply with all applicable local, state, and federal laws, rules and or regulations.

(g) Annual vessel permits shall be affixed to the outboard side of the vessel, approximately midvessel on the port side, or on the port side of the vessel windshield, and are not transferable to other vessels owned concurrently by the same or other owners. Daily vessel permits and any required local inspection certification must be carried on a vessel at all times. Vessel permits and any required local inspection certification are for the exclusive noncommercial use of the vessel for which the permit was issued by the Monterey County parks department. No person shall move, mutilate, alter, or destroy any vessel permit without the prior consent of the Monterey County parks department.

(h) Vessels owned or used by the San Luis Obispo County sheriff's department, the Monterey County parks department, governmental agencies, and operators at Nacimiento Lake may not be required to obtain vessel permits or other local inspection certifications, but shall be subject to all other provisions of this chapter.

(i) No person shall place, use, or operate, without a daily or annual vessel permit from the Monterey County parks department, any vessel on Nacimiento Lake which:

(1) Fails to comply with all safety requirements.

(2) Lacks a valid state registration decal, and a valid Monterey County daily or annual vessel permit.

(3) Is not in a clean, safe, and sanitary or seaworthy condition.

(4) Is not, in the judgment of the Monterey County parks department or the San Luis Obispo County sheriff's department, of safe design and construction.

(5) Possesses an operable sink drain or toilet.

(6) Is of such size as to constitute, in the judgment of the Monterey County parks department or the San Luis Obispo County sheriff's department, an unreasonable hazard, in which case it may, in the discretion of said personnel, be confined to certain areas of the lake.

(j) No person shall do any of the following within Nacimiento Lake:

(1) Operate a vessel without a valid and unrevoked annual or daily vessel permit from the Monterey County parks department, or any required local inspection certification.

(2) Operate a vessel within a prohibited area when such area has been so designated by official Monterey County parks department waterway markers.

(3) Operate a vessel in violation of sailing patterns and buoy markings posted or placed by the Monterey County parks department.

(4) Operate a vessel within two hundred fifty feet astern of any trolling fishing vessel.

(5) Operate or occupy any vessel for the purpose of camping while afloat during hours of darkness, without prior approval of the Monterey County parks department.

(6) Keep any vessel on shore within the Nacimiento recreation area overnight, except in areas designated by the Monterey County parks department.

(7) Leave a vessel which is in his or her care, custody and control unattended, at a dock or public launch ramp, on a trailer or afloat, for a period of more than fifteen minutes; or, at any other place while afloat, for a period of more than eight hours, without prior written approval of the Monterey County parks department.

(8) Launch, land, or beach any vessel other than at docks, ramps, or other launching areas designated by the Monterey County parks department.

(9) Launch any vessel that is polluted, infested with invasive aquatic species, or is not seaworthy or sanitary. All vessels must be "clean, drained, and dry" in order to receive an annual and/or daily vessel permit and any required local inspection certification to operate on Nacimiento Lake. Any vessel trailer coming into contact with Nacimiento Lake shall be free of all invasive aquatic species.

(10) Operate any vessel bilge pump causing a discharge of material into the lake, except in an emergency.
(11) Allow waste from vessel washing to discharge into the lake, any stream within or onto any shore or bank thereof, except at such places as may be designated by the Monterey County parks department.
(12) Engage in any vessel race, regatta, tournament, or exhibition, or operate a vessel for hire, or engage in sales promotion activities of any kind, rent or deliver a rental vessel, without first obtaining the prior written consent of the Monterey County parks department.
(13) Use a vessel in a reckless or negligent manner so as to endanger the life, limb, or property of any person.
(14) Operate any vessel contrary to the lawful directions given by the Monterey County parks department or the San Luis Obispo County sheriff's department.
(k) Any vessel which has been left unattended in violation of any provision of this chapter may be towed to a suitable storage area by the Monterey County parks department and/or the San Luis Obispo County sheriff's department, at the expense of the owner or other person responsible for such vessel. The charges made by the Monterey County parks department for such towing and storage shall be those established by the Monterey County parks director, and Monterey County shall have a possessory special lien on such vessel until such charges are paid. Such lien may be foreclosed in the manner provided by law which may include, without limitation, selling the vessel at a public auction. From the proceeds of such sale, the cost of impounding and auction may first be deducted and retained.
(l) No person shall leave, abandon or store any vessel within the Nacimiento recreation area or on the waters of Nacimiento Lake that is not in a safely operable condition. It is the owner of record's responsibility to immediately remove any vessel that the Monterey County parks department determines to be in violation of this section. In the event the owner cannot be contacted, or is not able to immediately remove the Vessel from the Nacimiento recreation area and/or Nacimiento Lake, the Monterey County parks department and/or the San Luis Obispo County sheriff's department may take action to remove the vessel and charge the owner for all such costs of removal and an administrative fee of twenty percent.

(Ord. No. 3191, § 1, 5-11-10)

11.20.130 - Vessel speed limits—Posted zones.

It is unlawful for any person to operate a vessel on Nacimiento Lake in a prohibited, restricted or special speed zone at speeds in excess of that posted by official Monterey County parks department waterway markers. In addition, the following specific speed restrictions shall apply:

(1) Within two hundred feet of any vessel landing dock, ramp, log boom, or regular beaching area: Five nautical miles per hour or in such a manner as to create a wake.
(2) Within one hundred feet of any vessel that is not under way: Five nautical miles per hour, or in such a manner as to create a wake.

The provisions of Harbors and Navigation Code Section 655.2 shall also apply. The San Luis Obispo County board of supervisors has designated, by resolution, restricted speed zones for Nacimiento Lake. A copy of the resolution is kept on file in the county of San Luis Obispo office of the clerk-recorder and in the office of the San Luis Obispo County sheriff's department. No person shall violate any speed zone so designated provided; however, the speed zone is posted by official standard waterway markers. In addition to the areas which the San Luis Obispo County board of supervisors have designated as restricted speed zones, the Monterey County parks department is authorized to designate additional restricted speed zones, as needed, as well as closed and restricted areas, which may include relocating buoys to provide the necessary safety zone, in order to protect the safety and property of visitors to Nacimiento Lake. Such designations shall be posted by official standard waterway markers.

(Ord. No. 3191, § 1, 5-11-10)

11.20.140 - Motor vehicle operation regulations.

No person shall do any of the following within the Nacimiento recreation area:

(1) Drive a vehicle at a speed greater than five miles per hour in a picnic area, campground, or parking lot, or at a speed greater than fifteen miles per hour in any other area, unless a different maximum speed, not more than thirty-five miles per hour, has been established by the Monterey County parks department and signs have been erected giving notice thereof.
(2) Drive a vehicle on other than established vehicular roads, trails, parking areas or vessel launching areas.
(3) Drive a vehicle unless he or she then holds a valid driver's license issued to him or her by this state, another state, or foreign jurisdiction of which he or she is a resident.
(4) Drive a vehicle which has not been licensed by the motor vehicle licensing authority of California, another state, or a foreign jurisdiction.
(5) Drive any vehicle in willful or wanton disregard for the safety of person or property.
(6) Drive a motorcycle which is not equipped with an effective spark arrester and muffler and otherwise in full compliance with the California Vehicle Code imposed equipment installation requirements on motorcycles.

(Ord. No. 3191, § 1, 5-11-10)

<u>11.20.150 - Motor vehicle parking regulations.</u>

The following may be cited as parking infractions at the discretion of the peace officer issuing such a citation:

(1) Park any vehicle within the Nacimiento recreation area without displaying a valid day-use or camping permit issued by the Monterey County parks department for camping or day use;
(2) Park or leave unattended any vehicle, trailer, or vessel trailer in other than a single parking stall or area designated by the Monterey County parks department for such parking; or on any vessel launching ramp or so near thereto as to hinder or impede the drivers of other vehicles;
(3) Park or leave unattended any vehicle, trailer, or vessel trailer so as to block or restrict the free flow of traffic on an established dirt or paved road; or
(4) Park or leave unattended any vehicle, trailer, or vessel trailer for more than fourteen days unless a valid long-term parking permit for such parking is affixed on the vehicle in a location readily seen by a peace officer.

The Monterey County parks department and the San Luis Obispo County sheriff's department each are authorized to move or remove any vehicle, trailer, or vessel trailer which has been illegally parked or left unattended in violation of this chapter.

(Ord. No. 3191, § 1, 5-11-10)

<u>11.20.160 - Bicycle regulations.</u>

No person shall do any of the following within the Nacimiento recreation area:

(1) Ride, use, or be in possession of a bicycle on any trail not authorized for such use by the Monterey County parks department.
(2) Ride, use, or be in possession of a bicycle without having identification in his or her possession.
(3) Ride a bicycle on any authorized dirt trail without wearing a protective helmet that is certified by ANSI, SNELL, or both.
(4) Ride a bicycle or animal in willful or wanton disregard for the safety of persons or property.

(Ord. No. 3191, § 1, 5-11-10)

11.20.170 - Pets.

(a) The Monterey County parks department may refuse to admit into the Nacimiento recreation area any person who proposes to enter with a dog, unless such person can exhibit either a current license or a certificate of rabies inoculation of the dog. Upon presentation of either such license or such certificate, the Monterey County parks department may register such dog and collect a fee for its admission.
(b) The Monterey County parks department may refuse to issue a camping permit when it appears that there will be more than two dogs per campsite.
(c) The Monterey County parks department may refuse to admit into the Nacimiento recreation area any person who possesses:
(1) A pet that appears to be dangerous;
(2) More than two pets per vehicle; or
(3) A pet which, in the judgment of the Monterey County parks department, is likely to disturb other persons.
(d) No person shall do any of the following within the Nacimiento recreation area:
(1) Allow any dog or other pet in his or her custody to run unrestrained or upon a secure leash over seven feet long, except in the case of an authorized service dog.
(2) Allow any dog or other pet to be upon any beach, trail, or other public assembly area posted to the contrary by the Monterey County parks department.
(3) Allow any dog or other pet in his or her custody to molest or annoy any person.
(4) Allow any dog or other pet in his or her custody to be or remain tied up and left unattended outside of a tent, trailer, or vehicle in a camp area or day-use area.
(5) Abandon any animal in his or her custody.
(6) Allow any livestock under their ownership or care to enter the Nacimiento recreation area without the written permission of the Monterey County parks department. Such owners shall be responsible for cost recovery for all damage done to the Nacimiento recreation area property and environment.
(e) The Monterey County parks department is authorized within the Nacimiento recreation area to impound animals or pets involved in any violation of the provisions of this section and to charge the custodian of said animal or pet a reasonable fee or fees for the release of the animal or pet. Such fee or fees are established by the Monterey County parks department.

(Ord. No. 3191, § 1, 5-11-10)

11.20.180 - Firearms and other weapons.

(a) No person shall, within the Nacimiento recreation area, possess, use, or discharge any firearm, pellet gun, bow and arrow, crossbow, slingshot, or missile launching device, except for:
(1) A peace officer; or
(2) A person, other than a peace officer, who is employed by, or in the service of, a governmental agency which authorizes him or her to carry or use any of said weapons or devices in the performance of his or her official duty and who is on official duty.
(b) If an archery range is established by Monterey County at Nacimiento Lake, it is lawful to possess, use, or discharge a bow and arrow or crossbow thereon during such times as it is open for public use, and it is lawful to transport such archery equipment between the archery range and the entrance of the Nacimiento recreation area.
(c) The Monterey County parks department is authorized to establish and post notices of the times when the range may be open or closed to public use.

(Ord. No. 3191, § 1, 5-11-10)

11.20.190 - Sign posting—Structure and buoy construction.

It is unlawful for any person other than the Monterey County parks department and the San Luis Obispo County sheriff's department to post or erect any sign, set or maintain any buoy or to construct any temporary or permanent structure within the Nacimiento recreation area without the prior written permission of the Monterey County parks department and/or the Monterey County water resources agency. The Monterey County parks department and/or Monterey County water resources agency may remove and dispose of any such signs and structures and recover all costs from the person(s) who placed the signs and structures including a twenty percent administrative fee.

(Ord. No. 3191, § 1, 5-11-10)

11.20.200 - Urinate or defecate in public.

It is unlawful for any person over the age of ten years to intentionally urinate, defecate or otherwise discard or dispose of human waste or excretion in a public place other than in a toilet receptacle or urinal provided for such purpose within the structure of any restroom, bathroom, or similar enclosure, or in a place open to public view, or upon the private property of another without the consent of the owner.

(Ord. No. 3191, § 1, 5-11-10)

11.20.210 - Miscellaneous prohibited acts.

No person shall do any of the following at Nacimiento Lake and the Nacimiento recreation area:

(1) Throw, dump, or deposit upon the surface of the ground, except in containers placed by the Monterey County parks department, any trash, refuse, garbage, litter, or waste material.
(2) Bring a vehicle, trash, refuse, garbage, litter, or waste material to Nacimiento recreation area for the purpose of dumping.
(3) Throw, dump, or deposit into the waters of Nacimiento Lake, or upon the shore or banks of Nacimiento Lake, any trash, refuse, garbage, litter, waste material, petroleum or other chemical product.
(4) Throw or deposit any burning substance into or onto any combustible place or area, except into an authorized fire pit or incinerator.
(5) Build, kindle or use fire, except in a camping or picnicking area in a fire pit, stove, incinerator, or other similar facility provided by, or approved by, the Monterey County parks department.
(6) Leave unattended any fire kindled by him or her.
(7) Smoke in any area of the Nacimiento recreation area which the Monterey County parks department has determined to be a nonsmoking area, provided signs are in place giving notice of the restricted area.
(8) Hunt, kill, injure, or molest any animal or bird, or allow any child or animal in his or her care and custody to do so.
(9) Operate any noise-producing equipment, whether or not electrically amplified, which is likely to disturb other people, except in accordance with the terms and conditions of a permit issued by the Monterey County parks department.
(10) Sell or advertise any product or service, rent or deliver for rental any vehicle or vessel in any area of the Nacimiento recreation area or carry on any other commercial activity; or distribute any handbill, tract, or other literature, without authorization by the Monterey County parks director.
(11) Perform or participate in any political rally or meeting, religious service or function, or any fund raising activity, without prior approval of the Monterey County board of supervisors; for the purposes of this section a wedding service or reception shall not be considered a religious service or function, provided however a permit for a wedding service or reception shall be obtained in advance from the Monterey County parks director.
(12) Bring or allow a horse to enter into the Nacimiento recreation area without first obtaining a valid equestrian permit from the Monterey County parks department.
(13) Allow any horse which is permitted to be at Nacimiento Lake to be in any camping or picnicking area thereof, or in any part of the Nacimiento recreation area outside of established equestrian trails or designated equestrian areas.
(14) Cut, pick, mutilate, remove, or destroy any vegetation, or grade, disturb or remove soil or rock or natural material, except as authorized by the Monterey County parks department.

(15) Clean fish, except at such places as are designated by the Monterey County parks department.
(16) Fish off public docks or commercial marinas within the Nacimiento recreation area. Fish within a distance of three hundred feet from a point where fish have been planted within a period of twenty-four hours after such plant. The Monterey County parks department shall post such areas with appropriate and visible "no fishing" signs at the time of plant, and such signs shall remain in place during the period fishing in such area is prohibited.
(17) Possess or use live bait, or bring or receive any fish, amphibian animal, or aquatic plant for the purpose of propagation or use as fish bait, without the approval of the Monterey County parks department and the California Department of Fish and Game.
(18) Enter any area of public property when signs have been erected forbidding such entry.
(19) Enter any fenced utility area, or remove, destroy, or tamper with any valve, switch, or control of any telephone, electrical, water, or sewer line or system owned or operated by any public entity or public utility.
(20) Commit any act of vandalism, including, but not limited to, removing fixtures or equipment, or destroying, painting, marking, tagging, or defacing any building, sign, fixture, or other equipment.
(21) Engage in any riotous, boisterous, threatening, or indecent conduct, or use profane or indecent language, or operate a radio, noise producing device or musical instrument in such a manner as is likely to disturb other persons.
(22) Willfully fail or refuse to comply with any lawful order, signal, or direction of any authorized safety employee of the Monterey County parks department employee or San Luis Obispo County sheriff's department.
(23) Engage in scuba or free diving without prior written permission from the Monterey County parks department.
(24) Operate or cause to operate any generator in an area designated as a no generator area by the Monterey County parks department or during posted no generator hours.
(25) Engage in any activity that is reasonably likely to cause injury or death of the participant or any other person or damage property.

(Ord. No. 3191, § 1, 5-11-10)

<u>11.20.220 - Fireworks prohibited.</u>

No person shall use, discharge, or possess for the purpose of sale, use or discharge any fireworks or other explosives within the Nacimiento recreation area. Excluded from the prohibition of fireworks under this chapter are the following types of fireworks if written approval is first secured from the responsible fire jurisdiction:

(1) Agricultural and wildlife fireworks (as defined in Health and Safety Code Section 12503).
(2) Emergency signaling devices when used for non-emergency purposes (Health and Safety Code Section 12506).
(3) Exempt fireworks (Health and Safety Code Section 12508).
(4) Model rocket engines (Health and Safety [Code] Section 12520).
(5) Special effects (Health and Safety Code Section 12532).

(Ord. No. 3191, § 1, 5-11-10)

<u>11.20.230 - Swimming regulations.</u>

It is unlawful for any person within the Nacimiento recreation area to do any of the following:

(1) To swim or float farther than one hundred feet from the shoreline except while on an aquaplane and except at designated areas signed for swimming.
(2) To swim within three hundred feet of public docks or commercial marinas.
(3) To engage in swimming, rafting or other water contact activity between the log boom and Nacimiento Dam.

(Ord. No. 3191, § 1, 5-11-10)

11.20.240 - Aerial activities.

It is unlawful for any person to land, take-off, or use any seaplane, aircraft, or any other device capable of carrying a person in the air, including, without limitation, a hang glider, hot air balloon, and paraglider, except in an emergency, or when authorized in writing and in advance by the Monterey County parks department, or as may be otherwise permitted by the Monterey County parks department in specially designated areas.

(Ord. No. 3191, § 1, 5-11-10)

11.20.250 - Enforcement—Power to direct public.

The Monterey County parks department and San Luis Obispo County sheriff's department each are authorized to direct the visiting public in their use of the lake and all facilities within the Nacimiento recreation area according to applicable statutes, ordinances and rules and regulations. In the event of fire, flood, earthquake, or other natural catastrophe or emergency, or to expedite traffic, ensure safety of the public, or to prevent pollution of Nacimiento Lake, the Monterey County parks department and San Luis Obispo County sheriff's department may each direct the public as conditions may require notwithstanding the provisions of this chapter. If written rules and regulations are established by the Monterey County parks department for the good order, health and safety of the people and waters of Nacimiento recreation area, such rules and regulations, once promulgated shall be complied with by all users of Nacimiento Lake.

(Ord. No. 3191, § 1, 5-11-10)

11.20.260 - Enforcement—Park closure.

(a) The Monterey County parks department and San Luis Obispo County sheriff's department each are authorized to close to public use the Nacimiento recreation area, or portion thereof, or any lake or stream within Nacimiento Lake, or restrict the times when the same shall be open to such use, or limit or prohibit boating, fishing, or other recreational uses thereof, whenever, in its judgment, it deems it prudent to take any of said actions in order to safeguard the health or safety of the public or the health and/or safety of the Nacimiento recreation area, its waters, or any of its facilities.

(b) Good cause to take any of the actions outlined in this section shall include, but not be limited to, the following: unreasonable fire hazard; dangerous weather or water conditions; sanitary protection of a watershed; construction or repairs; conservation of fish and game; excessive vessel traffic; unsafe or unsuitable shoreline, ramp, parking, or road conditions; the prevention of damage to the Nacimiento recreation area, its waters, or any of its facilities; or any dangerous, unsafe, or unhealthful condition.

(Ord. No. 3191, § 1, 5-11-10)

11.20.270 - Enforcement—Arrest and citation authority.

(a) Pursuant to the authority vested in the San Luis Obispo County board of supervisors pursuant to Section 5380 of the Public Resources Code, all persons duly appointed as peace officers including, but not limited to, uniformed employees of the Monterey County parks department and the San Luis Obispo County sheriff's department, are empowered to enforce the provisions of this chapter. Pursuant to Section 836.5 of the Penal Code, the Monterey County parks director, uniformed Monterey County parks department employees, and safety employees of the San Luis Obispo County sheriff's department are authorized to arrest a person without a warrant whenever the Monterey County parks director, uniformed Monterey County parks department employees, or safety employees of the San Luis Obispo County sheriff's department have reasonable cause to believe that the person to be arrested has committed a misdemeanor in his or her presence that is a violation of any statute, law, or ordinance that he/she has the duty to enforce.

(b) In any case in which a person is arrested for a misdemeanor pursuant to this section, and the person arrested does not demand to be taken before a magistrate, the public officer or employee making the arrest shall prepare a written notice to appear and release the person on his or her promise to appear, as prescribed by Chapter 5C (commencing with Section 853.6), Title 3, Part 2 of the Penal Code. Notwithstanding, nothing in this chapter shall be construed as prohibiting an officer from taking a person before a magistrate instead of being released, in accordance with Penal Code Section 853.6(i). The provision of that chapter shall thereafter apply with reference to any proceeding based upon the issuance of a notice to appear pursuant to this chapter.

(Ord. No. 3191, § 1, 5-11-10)

<u>11.20.280 - Delegation of powers by San Luis Obispo County board of supervisors.</u>

Powers granted to Monterey County parks department, the San Luis Obispo County sheriff's department and other uniformed personnel under this chapter shall be construed to be powers delegated by the San Luis Obispo County board of supervisors for the purpose of issuing citations at Nacimiento Lake in accordance with Section 853.6, Title 3, Part 2 of Penal Code (and pursuant to Public Resources Code Section 5380), for misdemeanor violations of the laws of this state or this chapter, maintaining the peace, protecting the property of visitors, and general enforcement of the ordinances of the San Luis Obispo County. The San Luis Obispo County board of supervisors, in enacting this chapter, does not waive any authority or rights that the county of San Luis Obispo and/or the San Luis Obispo County flood district may otherwise have under the law within the Nacimiento recreation area and Nacimiento Lake.

(Ord. No. 3191, § 1, 5-11-10)

<u>11.20.290 - Fees.</u>

(a) Nacimiento Lake Schedule of Fees. A schedule of fees will be established by Monterey County for the use of the Nacimiento recreation area. These fees will be approved and adopted by the Monterey County board of supervisors by resolution. The schedule may include, without limitation, day use fees, campsites (regular), campsites (hookup — electric and water), campsites (full utility), motorcycle, group picnic areas, extra vehicles accompanying campers, dogs, youth group camping, firewood sales, disposal site fees for non-registered campers, for each sewage dump, group reservations, group camping, vessels (annual and daily), bicycles, reservation fees, vessels (inspection), and photography permits.
(b) General Provisions.
(1) Annual day-use vehicle permits may not be valid when a special event fee is being charged.
(2) The Monterey County park director is authorized to approve limited term special discount programs and to reduce and/or waive fees for facilities used for promotional purposes.
(3) A penalty fee may be established and collected for nonpayment of day-use, camping, and boating fees.
(4) A fee for use of facilities during non-operating hours at the Nacimiento recreation area, based upon the hourly cost of employees along with associated benefits, may be charged if supervision is required.
(c) Daily Fees for use of the Nacimiento Recreation Area for Commercial Activities. Monterey County has or will establish fees for use of the Nacimiento recreation area and/or Nacimiento Lake for the purposes of:
(1) Feature motion picture; or
(2) Television series pilots, productions, specials, television shorts, or advertisements.
(d) Special Conditions.
(1) The fee for any size production involving pyrotechnic or high-speed stunts for any site/time not generally available for filming shall be the maximum for each activity.
(2) A damage deposit equal to not less than fifty percent of the first full day's fee or a minimum of five hundred dollars, whichever is greater.
(e) Concession Agreement or Special Event Permit Fees.

(1) For special events sponsored by the Monterey County parks department, or for events coordinated by the Monterey County parks department with less than five thousand participants, the Monterey County parks director is authorized to approve admissions, concessions and other related fees for each specific event.
(2) User fees not less than the current user fees approved for the Nacimiento recreation area shall apply. This includes day-use, camping, boating, and other miscellaneous fees as listed on the current Monterey County parks department fee schedule. The Monterey County parks director may waive user fees in the event that there is a special event or concession agreement fee for which a percentage of the gross receipts is to be paid to Monterey County and which includes the day-use fee.
(3) Registration fees will be established proportional to the number of anticipated participants in the special event. The Monterey County parks department will collect the registration fee in advance and such fees are not refundable.
(4) Permittee shall pay to Monterey County a minimum of seven percent of the gross receipts for the sale of food, beverages, and merchandise items, and a minimum of five percent of the gross receipts for admission tickets or for revenue received for services rendered. The Monterey County parks director is authorized to negotiate above this minimum when it is in Monterey County's best interest depending on the situation and the event.
(5) In the event that the Monterey County parks department incurs excess costs for the operation of the Nacimiento recreation area as a result of a special event, these costs shall be allocated to permittee. Such costs shall include, without limitation, directing traffic and parking, providing security, providing trash disposal services or utilization of Monterey County equipment in support of permittee activities. Monterey County will charge for labor, materials, and equipment rental rates as currently established by the Monterey County department of public works.
(6) If the anticipated percentage of gross receipts which Monterey County will receive from the special event exceeds two thousand dollars, permittee may be required to deposit a cash bond with Monterey County.
(7) A damage deposit may be charged proportionate to the number of anticipated participants in the special event. It may be included in the amount of the cash bond described above. Upon completion of the event, all or any unused portion of the damage deposit will be refunded to permittee after final cost out of the special event.

(Ord. No. 3191, § 1, 5-11-10)

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FOOTNOTE(S):

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[12] **Editor's note—** Ord. No. 3191, § 1, adopted May 11, 2010, in effect repealed the former Chapter 11.20, §§ 11.20.010—11.20.740, and enacted a new Chapter 11.20 as set out herein. The former Chapter 11.20 pertained to the Nacimiento recreation area and derived from Ord. No. 1650, 1976; Ord. No. 2121, 1983; Ord. No. 2274, 1986 and Ord. No. 2292, 1987. (Back)

## 9.9 Federal and California Drinking Water Contaminant Limits

The following information is excerpted from

- USEPA website for Drinking Water Contaminants (http://water.epa.gov/drink/contaminants/index.cfm)
- CDPH website for Drinking Water Certificates and Licenses (http://www.cdph.ca.gov/certlic/drinkingwater/Pages/MCLsandPHGs.aspx)

## National Primary Drinking Water Regulations

National Primary Drinking Water Regulations (NPDWRs or primary standards) are legally enforceable standards that apply to public water systems. Primary standards protect public health by limiting the levels of contaminants in drinking water.

| **Microorganisms** | | | | |
|---|---|---|---|---|
| **Contaminant** | **MCLG[1] (mg/L)[2]** | **MCL or TT[1] (mg/L)[2]** | **Potential Health Effects from Long-Term Exposure Above the MCL (unless specified as short-term)** | **Sources of Contaminant in Drinking Water** |
| *Cryptosporidium* | zero | TT [3] | Gastrointestinal illness (e.g., diarrhea, vomiting, cramps) | Human and animal fecal waste |
| *Giardia lamblia* | zero | TT[3] | Gastrointestinal illness (e.g., diarrhea, vomiting, cramps) | Human and animal fecal waste |
| Heterotrophic plate count | n/a | TT[3] | HPC has no health effects; it is an analytic method used to measure the variety of bacteria that are common in water. The lower the concentration of bacteria in drinking water, the better maintained the water system is. | HPC measures a range of bacteria that are naturally present in the environment |
| *Legionella* | zero | TT[3] | Legionnaire's Disease, a type of pneumonia | Found naturally in water; multiplies in heating systems |
| Total Coliforms (including fecal coliform and *E. Coli*) | zero | 5.0%[4] | Not a health threat in itself; it is used to indicate whether other potentially harmful bacteria may be present[5] | Coliforms are naturally present in the environment; as well as feces; fecal coliforms and *E. coli* only come from human and animal fecal waste. |
| Turbidity | n/a | TT[3] | Turbidity is a measure of the cloudiness of water. It is used to indicate water quality and filtration effectiveness (e.g., whether disease-causing organisms are present). Higher turbidity levels are often associated with higher levels of disease-causing microorganisms such as viruses, parasites and some bacteria. These organisms can cause symptoms such as nausea, cramps, diarrhea, and associated headaches. | Soil runoff |
| Viruses (enteric) | zero | TT[3] | Gastrointestinal illness (e.g., diarrhea, vomiting, cramps) | Human and animal fecal waste |

## Disinfection Byproducts

| Contaminant | MCLG[1] (mg/L)[2] | MCL or TT[1] (mg/L)[2] | Potential Health Effects from Long-Term Exposure Above the MCL (unless specified as short-term) | Sources of Contaminant in Drinking Water |
|---|---|---|---|---|
| Bromate | zero | 0.010 | Increased risk of cancer | Byproduct of drinking water disinfection |
| Chlorite | 0.8 | 1.0 | Anemia; infants & young children: nervous system effects | Byproduct of drinking water disinfection |
| Haloacetic acids (HAA5) | n/a[6] | 0.060[7] | Increased risk of cancer | Byproduct of drinking water disinfection |
| Total Trihalomethanes (TTHMs) | --> n/a[6] | --> 0.080[7] | Liver, kidney or central nervous system problems; increased risk of cancer | Byproduct of drinking water disinfection |

## Disinfectants

| Contaminant | MCLG[1] (mg/L)[2] | MCL or TT[1] (mg/L)[2] | Potential Health Effects from Long-Term Exposure Above the MCL (unless specified as short-term) | Sources of Contaminant in Drinking Water |
|---|---|---|---|---|
| Chloramines (as $Cl_2$) | MRDLG=4[1] | MRDL=4.0[1] | Eye/nose irritation; stomach discomfort, anemia | Water additive used to control microbes |
| Chlorine (as $Cl_2$) | MRDLG=4[1] | MRDL=4.0[1] | Eye/nose irritation; stomach discomfort | Water additive used to control microbes |
| Chlorine dioxide (as $ClO_2$) | MRDLG=0.8[1] | MRDL=0.8[1] | Anemia; infants & young children: nervous system effects | Water additive used to control microbes |

## Inorganic Chemicals

| Contaminant | MCLG[1] (mg/L)[2] | MCL or TT[1] (mg/L)[2] | Potential Health Effects from Long-Term Exposure Above the MCL (unless specified as short-term) | Sources of Contaminant in Drinking Water |
|---|---|---|---|---|
| Antimony | 0.006 | 0.006 | Increase in blood cholesterol; decrease in blood sugar | Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder |
| Arsenic | 0[7] | 0.010 as of 01/23/06 | Skin damage or problems with circulatory systems, and may have increased risk of getting cancer | Erosion of natural deposits; runoff from orchards, runoff from glass & electronicsproduction wastes |
| Asbestos (fiber >10 micrometers) | 7 million fibers per liter | 7 MFL | Increased risk of developing benign intestinal polyps | Decay of asbestos cement in water mains; erosion of natural deposits |

| | | | | |
|---|---|---|---|---|
| Barium | 2 | 2 | Increase in blood pressure | Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits |
| Beryllium | 0.004 | 0.004 | Intestinal lesions | Discharge from metal refineries and coal-burning factories; discharge from electrical, aerospace, and defense industries |
| Cadmium | 0.005 | 0.005 | Kidney damage | Corrosion of galvanized pipes; erosion of natural deposits; discharge from metal refineries; runoff from waste batteries and paints |
| Chromium (total) | 0.1 | 0.1 | Allergic dermatitis | Discharge from steel and pulp mills; erosion of natural deposits |
| Copper | 1.3 | TT[7]; Action Level=1.3 | Short term exposure: Gastrointestinal distress<br><br>Long term exposure: Liver or kidney damage<br><br>People with Wilson's Disease should consult their personal doctor if the amount of copper in their water exceeds the action level | Corrosion of household plumbing systems; erosion of natural deposits |
| Cyanide (as free cyanide) | 0.2 | 0.2 | Nerve damage or thyroid problems | Discharge from steel/metal factories; discharge from plastic and fertilizer factories |
| Fluoride | 4.0 | 4.0 | Bone disease (pain and tenderness of the bones); Children may get mottled teeth | Water additive which promotes strong teeth; erosion of natural deposits; discharge from fertilizer and aluminum factories |
| Lead | zero | TT[7]; Action Level=0.015 | Infants and children: Delays in physical or mental development; children could show slight deficits in attention span and learning abilities<br><br>Adults: Kidney problems; high blood pressure | Corrosion of household plumbing systems; erosion of natural deposits |
| Mercury (inorganic) | 0.002 | 0.002 | Kidney damage | Erosion of natural deposits; discharge from refineries and factories; runoff from landfills and croplands |
| Nitrate (measured as | 10 | 10 | Infants below the age of six months who drink water | Runoff from fertilizer use; leaking from septic tanks, |

| | | | | |
|---|---|---|---|---|
| Nitrogen) | | | containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome. | sewage; erosion of natural deposits |
| Nitrite (measured as Nitrogen) | 1 | 1 | Infants below the age of six months who drink water containing nitrite in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome. | Runoff from fertilizer use; leaking from septic tanks, sewage; erosion of natural deposits |
| Selenium | 0.05 | 0.05 | Hair or fingernail loss; numbness in fingers or toes; circulatory problems | Discharge from petroleum refineries; erosion of natural deposits; discharge from mines |
| Thallium | 0.0005 | 0.002 | Hair loss; changes in blood; kidney, intestine, or liver problems | Leaching from ore-processing sites; discharge from electronics, glass, and drug factories |

## Organic Chemicals

| Contaminant | MCLG[1] (mg/L)[2] | MCL or TT[1] (mg/L)[2] | Potential Health Effects from Long-Term Exposure Above the MCL (unless specified as short-term) | Sources of Contaminant in Drinking Water |
|---|---|---|---|---|
| Acrylamide | zero | TT[8] | Nervous system or blood problems; increased risk of cancer | Added to water during sewage/wastewater treatment |
| Alachlor | zero | 0.002 | Eye, liver, kidney or spleen problems; anemia; increased risk of cancer | Runoff from herbicide used on row crops |
| Atrazine | 0.003 | 0.003 | Cardiovascular system or reproductive problems | Runoff from herbicide used on row crops |
| Benzene | zero | 0.005 | Anemia; decrease in blood platelets; increased risk of cancer | Discharge from factories; leaching from gas storage tanks and landfills |
| Benzo(a)pyrene (PAHs) | zero | 0.0002 | Reproductive difficulties; increased risk of cancer | Leaching from linings of water storage tanks and distribution lines |

| | | | | |
|---|---|---|---|---|
| Carbofuran | 0.04 | 0.04 | Problems with blood, nervous system, or reproductive system | Leaching of soil fumigant used on rice and alfalfa |
| Carbon tetrachloride | zero | 0.005 | Liver problems; increased risk of cancer | Discharge from chemical plants and other industrial activities |
| Chlordane | zero | 0.002 | Liver or nervous system problems; increased risk of cancer | Residue of banned termiticide |
| Chlorobenzene | 0.1 | 0.1 | Liver or kidney problems | Discharge from chemical and agricultural chemical factories |
| 2,4-D | 0.07 | 0.07 | Kidney, liver, or adrenal gland problems | Runoff from herbicide used on row crops |
| Dalapon | 0.2 | 0.2 | Minor kidney changes | Runoff from herbicide used on rights of way |
| 1,2-Dibromo-3-chloropropane (DBCP) | zero | 0.0002 | Reproductive difficulties; increased risk of cancer | Runoff/leaching from soil fumigant used on soybeans, cotton, pineapples, and orchards |
| o-Dichlorobenzene | 0.6 | 0.6 | Liver, kidney, or circulatory system problems | Discharge from industrial chemical factories |
| p-Dichlorobenzene | 0.075 | 0.075 | Anemia; liver, kidney or spleen damage; changes in blood | Discharge from industrial chemical factories |
| 1,2-Dichloroethane | zero | 0.005 | Increased risk of cancer | Discharge from industrial chemical factories |
| 1,1-Dichloroethylene | 0.007 | 0.007 | Liver problems | Discharge from industrial chemical factories |
| cis-1,2-Dichloroethylene | 0.07 | 0.07 | Liver problems | Discharge from industrial chemical factories |
| trans-1,2-Dichloroethylene | 0.1 | 0.1 | Liver problems | Discharge from industrial chemical factories |
| Dichloromethane | zero | 0.005 | Liver problems; increased risk of cancer | Discharge from drug and chemical factories |
| 1,2-Dichloropropane | zero | 0.005 | Increased risk of cancer | Discharge from industrial chemical factories |
| Di(2-ethylhexyl) adipate | 0.4 | 0.4 | Weight loss, liver problems, or possible reproductive difficulties. | Discharge from chemical factories |

| | | | | |
|---|---|---|---|---|
| Di(2-ethylhexyl) phthalate | zero | 0.006 | Reproductive difficulties; liver problems; increased risk of cancer | Discharge from rubber and chemical factories |
| Dinoseb | 0.007 | 0.007 | Reproductive difficulties | Runoff from herbicide used on soybeans and vegetables |
| Dioxin (2,3,7,8-TCDD) | zero | 0.00000003 | Reproductive difficulties; increased risk of cancer | Emissions from waste incineration and other combustion; discharge from chemical factories |
| Diquat | 0.02 | 0.02 | Cataracts | Runoff from herbicide use |
| Endothall | 0.1 | 0.1 | Stomach and intestinal problems | Runoff from herbicide use |
| Endrin | 0.002 | 0.002 | Liver problems | Residue of banned insecticide |
| Epichlorohydrin | zero | TT[8] | Increased cancer risk, and over a long period of time, stomach problems | Discharge from industrial chemical factories; an impurity of some water treatment chemicals |
| Ethylbenzene | 0.7 | 0.7 | Liver or kidneys problems | Discharge from petroleum refineries |
| Ethylene dibromide | zero | 0.00005 | Problems with liver, stomach, reproductive system, or kidneys; increased risk of cancer | Discharge from petroleum refineries |
| Glyphosate | 0.7 | 0.7 | Kidney problems; reproductive difficulties | Runoff from herbicide use |
| Heptachlor | zero | 0.0004 | Liver damage; increased risk of cancer | Residue of banned termiticide |
| Heptachlor epoxide | zero | 0.0002 | Liver damage; increased risk of cancer | Breakdown of heptachlor |
| Hexachlorobenzene | zero | 0.001 | Liver or kidney problems; reproductive difficulties; increased risk of cancer | Discharge from metal refineries and agricultural chemical factories |
| Hexachlorocyclopentadiene | 0.05 | 0.05 | Kidney or stomach problems | Discharge from chemical factories |
| Lindane | 0.0002 | 0.0002 | Liver or kidney problems | Runoff/leaching from insecticide used on cattle, lumber, gardens |
| Methoxychlor | 0.04 | 0.04 | Reproductive difficulties | Runoff/leaching from insecticide used on fruits, vegetables, |

| | | | | |
|---|---|---|---|---|
| | | | | alfalfa, livestock |
| Oxamyl (Vydate) | 0.2 | 0.2 | Slight nervous system effects | Runoff/leaching from insecticide used on apples, potatoes, and tomatoes |
| Polychlorinated biphenyls (PCBs) | zero | 0.0005 | Skin changes; thymus gland problems; immune deficiencies; reproductive or nervous system difficulties; increased risk of cancer | Runoff from landfills; discharge of waste chemicals |
| Pentachlorophenol | zero | 0.001 | Liver or kidney problems; increased cancer risk | Discharge from wood preserving factories |
| Picloram | 0.5 | 0.5 | Liver problems | Herbicide runoff |
| Simazine | 0.004 | 0.004 | Problems with blood | Herbicide runoff |
| Styrene | 0.1 | 0.1 | Liver, kidney, or circulatory system problems | Discharge from rubber and plastic factories; leaching from landfills |
| Tetrachloroethylene | zero | 0.005 | Liver problems; increased risk of cancer | Discharge from factories and dry cleaners |
| Toluene | 1 | 1 | Nervous system, kidney, or liver problems | Discharge from petroleum factories |
| Toxaphene | zero | 0.003 | Kidney, liver, or thyroid problems; increased risk of cancer | Runoff/leaching from insecticide used on cotton and cattle |
| 2,4,5-TP (Silvex) | 0.05 | 0.05 | Liver problems | Residue of banned herbicide |
| 1,2,4-Trichlorobenzene | 0.07 | 0.07 | Changes in adrenal glands | Discharge from textile finishing factories |
| 1,1,1-Trichloroethane | 0.20 | 0.2 | Liver, nervous system, or circulatory problems | Discharge from metal degreasing sites and other factories |
| 1,1,2-Trichloroethane | 0.003 | 0.005 | Liver, kidney, or immune system problems | Discharge from industrial chemical factories |
| Trichloroethylene | zero | 0.005 | Liver problems; increased risk of cancer | Discharge from metal degreasing sites and other factories |
| Vinyl chloride | zero | 0.002 | Increased risk of cancer | Leaching from PVC pipes; discharge from plastic factories |
| Xylenes (total) | 10 | 10 | Nervous system damage | Discharge from petroleum factories; discharge from chemical factories |

| Radionuclides | | | | |
|---|---|---|---|---|
| **Contaminant** | **MCLG[1] (mg/L)[2]** | **MCL or TT[1] (mg/L)[2]** | **Potential Health Effects from Long-Term Exposure Above the MCL (unless specified as short-term)** | **Sources of Contaminant in Drinking Water** |
| Alpha particles | none[7] ---------- zero | 15 picocuries per Liter (pCi/L) | Increased risk of cancer | Erosion of natural deposits of certain minerals that are radioactive and may emit a form of radiation known as alpha radiation |
| Beta particles and photon emitters | none[7] ---------- zero | 4 millirems per year | Increased risk of cancer | Decay of natural and man-made deposits of<br><br>certain minerals that are radioactive and may emit forms of radiation known as photons and beta radiation |
| Radium 226 and Radium 228 (combined) | none[7] ---------- zero | 5 pCi/L | Increased risk of cancer | Erosion of natural deposits |
| Uranium | zero | 30 ug/L as of 12/08/03 | Increased risk of cancer, kidney toxicity | Erosion of natural deposits |

Notes

[1] Definitions:

Maximum Contaminant Level Goal (MCLG) - The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.

Maximum Contaminant Level (MCL) - The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.

Maximum Residual Disinfectant Level Goal (MRDLG) - The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

(TT) Treatment Technique - A required process intended to reduce the level of a contaminant in drinking water. Maximum Residual Disinfectant Level (MRDL) - The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

[2] Units are in milligrams per liter (mg/L) unless otherwise noted. Milligrams per liter are equivalent to parts per million.

[3] EPA's surface water treatment rules require systems using surface water or ground water under the direct influence of surface water to (1) disinfect their water, and (2) filter their water or meet criteria for avoiding filtration so that the following contaminants are controlled at the following levels:

- *Cryptosporidium: Unfiltered systems are required to include Cryptosporidium in their existing watershed control provisions.*
- *Giardia lamblia: 99.9% removal/inactivation*
- Viruses: 99.99% removal/inactivation
- *Legionella: No limit, but EPA believes that if Giardia* and viruses are removed/inactivated, according to the treatment techniques in the Surface Water Treatment Rule, *Legionella* will also be controlled.
- Turbidity: For systems that use conventional or direct filtration, at no time can turbidity (cloudiness of water) go higher than 1 nephelolometric turbidity unit NTU), and samples for turbidity must be less than or equal to 0.3 NTU in at least 95 percent of the samples in any month. Systems that use filtration other than the conventional or direct filtration must follow state limits, which must include turbidity at no time exceeding 5 NTU.
- HPC: No more than 500 bacterial colonies per milliliter.
- Long Term 1 Enhanced Surface Water Treatment: Surface water systems or (GWUDI) systems serving fewer than 10,000 people must comply with the applicable Long Term 1 Enhanced Surface Water Treatment Rule provisions (e.g. turbidity standards, individual filter monitoring, *Cryptosporidium* removal requirements, updated watershed control requirements for unfiltered systems).
- *Long Term 2 Enhanced Surface Water Treatment Rule This rule applies to all surface water systems or ground water systems under the direct influence of surface water. The rule targets additional Cryptosporidium treatment requirements for higher risk systems and includes provisions to reduce risks from uncovered finished water storage facilities and to ensure that the systems maintain microbial protection as they take steps to reduce the formation of disinfection byproducts.*
- Filter Backwash Recycling; The Filter Backwash Recycling Rule requires systems that recycle to return specific recycle flows through all processes of the system's existing conventional or direct filtration system or at an alternate location approved by the state.

[4] *No more than 5.0% samples total coliform-positive in a month. (For water systems that collect fewer than 40 routine samples per month, no more than one sample can be total coliform-positive per month.) Every sample that has total coliform must be analyzed for either fecal coliforms or E. coli* if two consecutive TC-positive samples, and one is also positive for *E.coli fecal coliforms, system has an acute MCL violation.*

[5] Fecal coliform and E. coli are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Disease-causing microbes (pathogens) in these wastes can cause diarrhea, cramps, nausea, headaches, or other symptoms. These pathogens may pose a special health risk for infants, young children, and people with severely compromised immune systems.

[6] Although there is no collective MCLG for this contaminant group, there are individual MCLGs for some of the individual contaminants:

- Trihalomethanes: bromodichloromethane (zero); bromoform (zero); dibromochloromethane (0.06 mg/L): chloroform (0.07mg/L).
- Haloacetic acids: dichloroacetic acid (zero); trichloroacetic acid (0.02 mg/L); monochloroacetic acid (0.07 mg/L). Bromoacetic acid and dibromoacetic acid are regulated with this group but have no MCLGs.

[7] Lead and copper are regulated by a Treatment Technique that requires systems to control the corrosiveness of their water. If more than 10% of tap water samples exceed the action level, water systems must take additional steps. For copper, the action level is 1.3 mg/L, and for lead is 0.015 mg/L.

[8] Each water system must certify, in writing, to the state (using third-party or manufacturer's certification) that when acrylamide and epichlorohydrin are used to treat water, the combination (or product) of dose and monomer level does not exceed the levels specified, as follows:

- Acrylamide = 0.05% dosed at 1 mg/L (or equivalent)
- Epichlorohydrin = 0.01% dosed at 20 mg/L (or equivalent)

## National Secondary Drinking Water Regulations

National Secondary Drinking Water Regulations (NSDWRs or secondary standards) are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards to water systems but does not require systems to comply. However, states may choose to adopt them as enforceable standards.

| Contaminant | Secondary Standard |
|---|---|
| Aluminum | 0.05 to 0.2 mg/L |
| Chloride | 250 mg/L |
| Color | 15 (color units) |
| Copper | 1.0 mg/L |
| Corrosivity | noncorrosive |
| Fluoride | 2.0 mg/L |
| Foaming Agents | 0.5 mg/L |
| Iron | 0.3 mg/L |
| Manganese | 0.05 mg/L |
| Odor | 3 threshold odor number |
| pH | 6.5-8.5 |
| Silver | 0.10 mg/L |
| Sulfate | 250 mg/L |
| Total Dissolved Solids | 500 mg/L |
| Zinc | 5 mg/L |

## State of California Drinking Water Regulations

## MCLs

MCLs are adopted as regulations by CDPH. They are health protective drinking water standards to be met by public water systems. MCLs take into account not only chemicals' health risks but also factors such as their detectability and treatability, as well as costs of treatment. Health & Safety Code §116365(a) requires CDPH to establish a contaminant's MCL at a level as close to its PHG as is technically and economically feasible, placing primary emphasis on the protection of public health (see the MCL process).

Along with the MCL, a regulated chemical also has a detection limit for purposes of reporting (DLR), the level at which CDPH is confident about quantification being reported.

## PHGs

PHGs are established by Cal/EPA's Office of Environmental Health Hazard Assessment (OEHHA). They are concentrations of drinking water contaminants that pose no significant health risk if consumed for a lifetime, based on current risk assessment principles, practices, and methods. OEHHA establishes PHGs pursuant to Health & Safety Code §116365(c) for contaminants with MCLs, and for those for which CDPH will be adopting MCLs.

## Review of MCLs in Response to PHGs

Once OEHHA establishes or revises a PHG for a contaminant with an MCL, CDPH determines whether the MCL should be considered for possible revision. For a chemicals so designated, CDPH subsequently conducts an in-depth risk management analysis to determine whether or not to propose a revision.

**MCLs, DLRs, and PHGs for Regulated Drinking Water Contaminants**

**(Units are in milligrams per liter (mg/L), unless otherwise noted.)**

**Last Update: July 27, 2011**

This table includes:

CDPH's maximum contaminant levels (MCLs)

CDPH's detection limits for purposes of reporting (DLRs)

Public health goals (PHGs) from the Office of Environmental Health Hazard Assessment (OEHHA)

Also, PHGs for NDMA and 1,2,3-Trichloropropane (which are not yet regulated) are included at the bottom of this table.

| | MCL | DLR | PHG | Date of PHG |
|---|---|---|---|---|
| ***Chemicals with MCLs in 22 CCR §64431—Inorganic Chemicals*** | | | | |
| Aluminum | 1 | 0.05 | 0.6 | 2001 |
| Antimony | 0.006 | 0.006 | 0.02 | 1997 |
| Antimony | -- | -- | 0.0007 | 2009 draft |
| Arsenic | 0.010 | 0.002 | 0.000004 | 2004 |
| Asbestos (MFL = million fibers per liter; for fibers >10 microns long) | 7 MFL | 0.2 MFL | 7 MFL | 2003 |
| Barium | 1 | 0.1 | 2 | 2003 |
| Beryllium | 0.004 | 0.001 | 0.001 | 2003 |
| Cadmium | 0.005 | 0.001 | 0.00004 | 2006 |
| Chromium, Total - OEHHA withdrew the 0.0025-mg/L PHG | 0.05 | 0.01 | withdrawn Nov. 2001 | 1999 |
| Chromium, Hexavalent (Chromium-6) - MCL to be established - currently regulated under the total chromium MCL | -- | 0.001 | 0.00002 | 2011 |
| Cyanide | 0.15 | 0.1 | 0.15 | 1997 |
| Fluoride | 2 | 0.1 | 1 | 1997 |
| Mercury (inorganic) | 0.002 | 0.001 | 0.0012 | 1999 (rev2005)* |
| Nickel | 0.1 | 0.01 | 0.012 | 2001 |
| Nitrate (as NO3) | 45 | 2 | 45 | 1997 |
| Nitrite (as N) | 1 as N | 0.4 | 1 as N | 1997 |
| Nitrate + Nitrite | 10 as N | -- | 10 as N | 1997 |
| Perchlorate | 0.006 | 0.004 | 0.006 | 2004 |
| Perchlorate | -- | -- | 0.001 | 2011 draft |
| Selenium | 0.05 | 0.005 | 0.03 | 2010 |
| Thallium | 0.002 | 0.001 | 0.0001 | 1999 (rev2004) |
| ***Copper and Lead, 22 CCR §64672.3*** | | | | |
| *Values referred to as MCLs for lead and copper are not actually MCLs; instead, they are called "Action Levels" under the lead and copper rule* | | | | |

| | | | | |
|---|---|---|---|---|
| Copper | 1.3 | 0.05 | 0.3 | 2008 |
| Lead | 0.015 | 0.005 | 0.0002 | 2009 |
| ***Radionuclides with MCLs in 22 CCR §64441 and §64443—Radioactivity*** | | | | |
| [units are picocuries per liter (pCi/L), unless otherwise stated; n/a = not applicable] | | | | |
| Gross alpha particle activity - OEHHA concluded in 2003 that a PHG was not practical | 15 | 3 | none | n/a |
| Gross beta particle activity - OEHHA concluded in 2003 that a PHG was not practical | 4 mrem/yr | 4 | none | n/a |
| Radium-226 | -- | 1 | 0.05 | 2006 |
| Radium-228 | -- | 1 | 0.019 | 2006 |
| Radium-226 + Radium-228 | 5 | -- | -- | -- |
| Strontium-90 | 8 | 2 | 0.35 | 2006 |
| Tritium | 20,000 | 1,000 | 400 | 2006 |
| Uranium | 20 | 1 | 0.43 | 2001 |
| ***Chemicals with MCLs in 22 CCR §64444—Organic Chemicals*** | | | | |
| ***(a) Volatile Organic Chemicals (VOCs)*** | | | | |
| Benzene | 0.001 | 0.0005 | 0.00015 | 2001 |
| Carbon tetrachloride | 0.0005 | 0.0005 | 0.0001 | 2000 |
| 1,2-Dichlorobenzene | 0.6 | 0.0005 | 0.6 | 1997 (rev2009) |
| 1,4-Dichlorobenzene (p-DCB) | 0.005 | 0.0005 | 0.006 | 1997 |
| 1,1-Dichloroethane (1,1-DCA) | 0.005 | 0.0005 | 0.003 | 2003 |
| 1,2-Dichloroethane (1,2-DCA) | 0.0005 | 0.0005 | 0.0004 | 1999 (rev2005) |
| 1,1-Dichloroethylene (1,1-DCE) | 0.006 | 0.0005 | 0.01 | 1999 |
| cis-1,2-Dichloroethylene | 0.006 | 0.0005 | 0.1 | 2006 |
| trans-1,2-Dichloroethylene | 0.01 | 0.0005 | 0.06 | 2006 |
| Dichloromethane (Methylene chloride) | 0.005 | 0.0005 | 0.004 | 2000 |
| 1,2-Dichloropropane | 0.005 | 0.0005 | 0.0005 | 1999 |
| 1,3-Dichloropropene | 0.0005 | 0.0005 | 0.0002 | 1999 (rev2006) |
| Ethylbenzene | 0.3 | 0.0005 | 0.3 | 1997 |
| Methyl tertiary butyl ether (MTBE) | 0.013 | 0.003 | 0.013 | 1999 |
| Monochlorobenzene | 0.07 | 0.0005 | 0.2 | 2003 |
| Styrene | 0.1 | 0.0005 | 0.0005 | 2010 |
| 1,1,2,2-Tetrachloroethane | 0.001 | 0.0005 | 0.0001 | 2003 |
| Tetrachloroethylene (PCE) | 0.005 | 0.0005 | 0.00006 | 2001 |
| Toluene | 0.15 | 0.0005 | 0.15 | 1999 |
| 1,2,4-Trichlorobenzene | 0.005 | 0.0005 | 0.005 | 1999 |
| 1,1,1-Trichloroethane (1,1,1-TCA) | 0.2 | 0.0005 | 1 | 2006 |
| 1,1,2-Trichloroethane (1,1,2-TCA) | 0.005 | 0.0005 | 0.0003 | 2006 |
| Trichloroethylene (TCE) | 0.005 | 0.0005 | 0.0017 | 2009 |
| Trichlorofluoromethane (Freon 11) | 0.15 | 0.005 | 0.7 | 1997 |

| | | | | |
|---|---|---|---|---|
| 1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113) | 1.2 | 0.01 | 4 | 1997 (rev2011) |
| Vinyl chloride | 0.0005 | 0.0005 | 0.00005 | 2000 |
| Xylenes | 1.75 | 0.0005 | 1.8 | 1997 |
| ***(b) Non-Volatile Synthetic Organic Chemicals (SOCs)*** | | | | |
| Alachlor | 0.002 | 0.001 | 0.004 | 1997 |
| Atrazine | 0.001 | 0.0005 | 0.00015 | 1999 |
| Bentazon | 0.018 | 0.002 | 0.2 | 1999 (rev2009) |
| Benzo(a)pyrene | 0.0002 | 0.0001 | 0.000007 | 2010 |
| Carbofuran | 0.018 | 0.005 | 0.0017 | 2000 |
| Chlordane | 0.0001 | 0.0001 | 0.00003 | 1997 (rev2006) |
| Dalapon | 0.2 | 0.01 | 0.79 | 1997 (rev2009) |
| 1,2-Dibromo-3-chloropropane (DBCP) | 0.0002 | 0.00001 | 0.0000017 | 1999 |
| 2,4-Dichlorophenoxyacetic acid (2,4-D) | 0.07 | 0.01 | 0.02 | 2009 |
| Di(2-ethylhexyl)adipate | 0.4 | 0.005 | 0.2 | 2003 |
| Di(2-ethylhexyl)phthalate (DEHP) | 0.004 | 0.003 | 0.012 | 1997 |
| Dinoseb | 0.007 | 0.002 | 0.014 | 1997 (rev2010) |
| Diquat | 0.02 | 0.004 | 0.015 | 2000 |
| Endrin | 0.002 | 0.0001 | 0.0018 | 1999 (rev2008) |
| Endothal | 0.1 | 0.045 | 0.58 | 1997 |
| Ethylene dibromide (EDB) | 0.00005 | 0.00002 | 0.00001 | 2003 |
| Glyphosate | 0.7 | 0.025 | 0.9 | 2007 |
| Heptachlor | 0.00001 | 0.00001 | 0.000008 | 1999 |
| Heptachlor epoxide | 0.00001 | 0.00001 | 0.000006 | 1999 |
| Hexachlorobenzene | 0.001 | 0.0005 | 0.00003 | 2003 |
| Hexachlorocyclopentadiene | 0.05 | 0.001 | 0.05 | 1999 |
| Lindane | 0.0002 | 0.0002 | 0.000032 | 1999 (rev2005) |
| Methoxychlor | 0.03 | 0.01 | 0.00009 | 2010 |
| Molinate | 0.02 | 0.002 | 0.001 | 2008 |
| Oxamyl | 0.05 | 0.02 | 0.026 | 2009 |
| Pentachlorophenol | 0.001 | 0.0002 | 0.0003 | 2009 |
| Picloram | 0.5 | 0.001 | 0.5 | 1997 |
| Polychlorinated biphenyls (PCBs) | 0.0005 | 0.0005 | 0.00009 | 2007 |
| Simazine | 0.004 | 0.001 | 0.004 | 2001 |
| 2,4,5-TP (Silvex) | 0.05 | 0.001 | 0.025 | 2003 |
| 2,3,7,8-TCDD (dioxin) | $3\times10^{-8}$ | $5\times10^{-9}$ | $5\times10^{-11}$ | 2010 |
| Thiobencarb | 0.07 | 0.001 | 0.07 | 2000 |
| Toxaphene | 0.003 | 0.001 | 0.00003 | 2003 |
| ***Chemicals with MCLs in 22 CCR §64533—Disinfection Byproducts*** | | | | |
| Total Trihalomethanes | 0.080 | -- | 0.0008 | 2010 draft |

| | | | | |
|---|---|---|---|---|
| Bromodichloromethane | -- | 0.0005 | -- | -- |
| Bromoform | -- | 0.0005 | -- | -- |
| Chloroform | -- | 0.0005 | -- | -- |
| Dibromochloromethane | -- | 0.0005 | -- | -- |
| Haloacetic Acids (five) (HAA5) | 0.060 | -- | -- | -- |
| Monochloroacetic Acid | -- | 0.002 | -- | -- |
| Dichloroacetic Adic | -- | 0.001 | -- | -- |
| Trichloroacetic Acid | -- | 0.001 | -- | -- |
| Monobromoacetic Acid | -- | 0.001 | -- | -- |
| Dibromoacetic Acid | -- | 0.001 | -- | -- |
| Bromate | 0.010 | 0.005 | 0.0001 | 2009 |
| Chlorite | 1.0 | 0.02 | 0.05 | 2009 |
| ***Chemicals with PHGs established in response to CDPH requests. These are not currently regulated drinking water contaminants.*** | | | | |
| N-Nitrosodimethylamine (NDMA) | -- | -- | 0.000003 | 2006 |
| 1,2,3-Trichloropropane | -- | -- | 0.0000007 | 2009 |
| *OEHHA's review of this chemical during the year indicated (rev20XX) resulted in no change in the PHG. | | | | |

The following two tables are excerpted from the California Code of Regulations Title 22, Division 5, Chapter 15, Aricle 16, Secondary Drinking Water Standards

***Article 16. Secondary Drinking Water Standards***

**§64449. Secondary Maximum Contaminant Levels and Compliance.**

(a) The secondary MCLs shown in Tables 64449-A and 64449-B shall not be exceeded in the water supplied to the public by community water systems.

**Table 64449-A**
**Secondary Maximum Contaminant Levels**
**"Consumer Acceptance Contaminant Levels"**

| *Constituents* | *Maximum Contaminant Levels/Units* |
|---|---|
| Aluminum | 0.2 mg/L |
| Color | 15 Units |
| Copper | 1.0 mg/L |
| Foaming Agents (MBAS) | 0.5 mg/L |
| Iron | 0.3 mg/L |
| Manganese | 0.05 mg/L |
| Methyl-*tert*-butyl ether (MTBE) | 0.005 mg/L |
| Odor—Threshold | 3 Units |
| Silver | 0.1 mg/L |
| Thiobencarb | 0.001 mg/L |
| Turbidity | 5 Units |
| Zinc | 5.0 mg/L |

**Table 64449-B**
**Secondary Maximum Contaminant Levels**
**"Consumer Acceptance Contaminant Level Ranges"**

| | *Maximum Contaminant Level Ranges* | | |
|---|---|---|---|
| *Constituent, Units* | *Recommended* | *Upper* | *Short Term* |
| Total Dissolved Solids, mg/L or | 500 | 1,000 | 1,500 |
| Specific Conductance, μS/cm | 900 | 1,600 | 2,200 |
| Chloride, mg/L | 250 | 500 | 600 |
| Sulfate, mg/L | 250 | 500 | 600 |

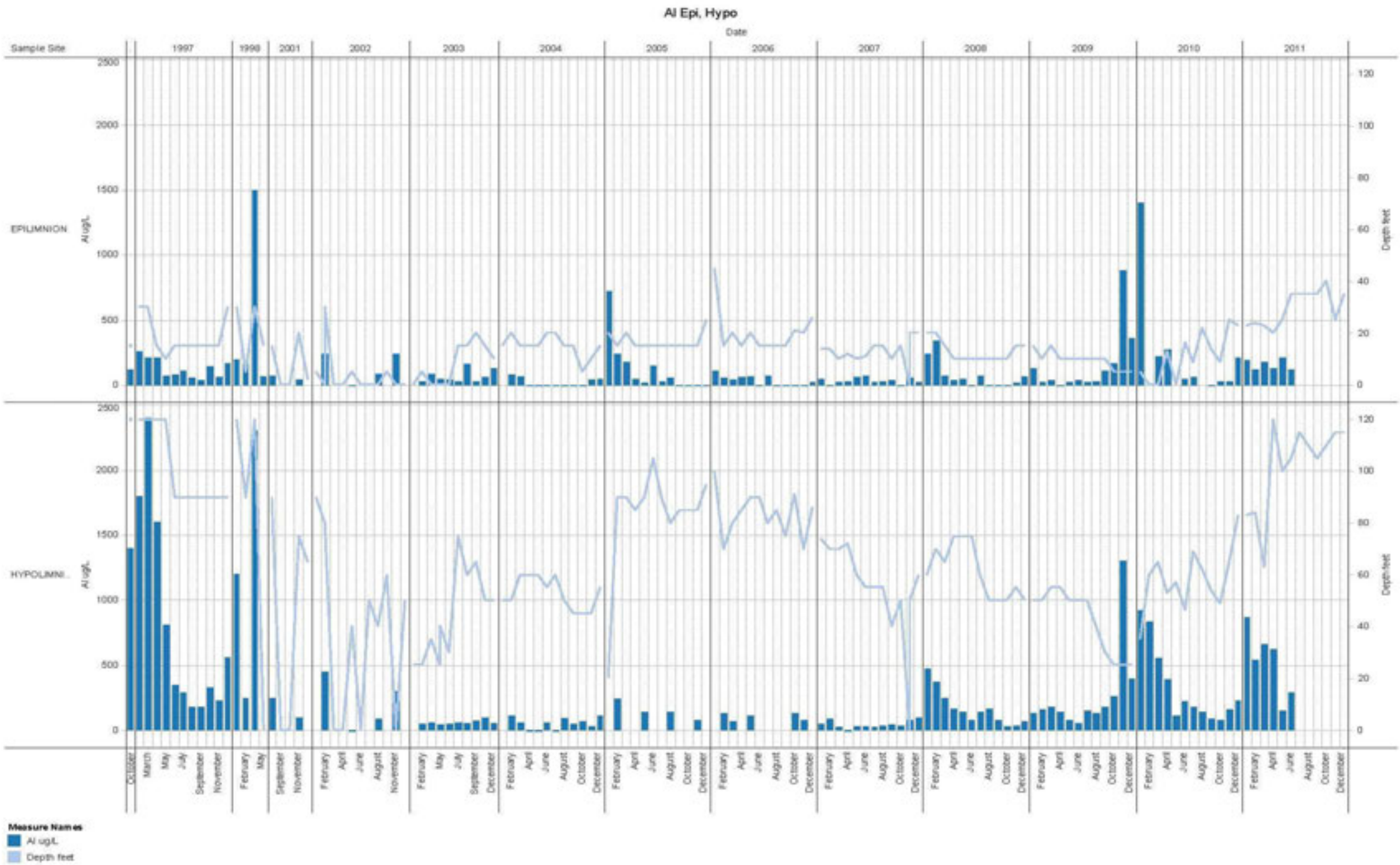
(d) For the constituents shown on Table 64449-B, no fixed consumer acceptance contaminant level has been established.
(1) Constituent concentrations lower than the Recommended contaminant level are desirable for a higher degree of consumer acceptance.
(2) Constituent concentrations ranging to the Upper contaminant level are acceptable if it is neither reasonable nor feasible to provide more suitable waters.
(3) Constituent concentrations ranging to the short term contaminant level are acceptable only for existing

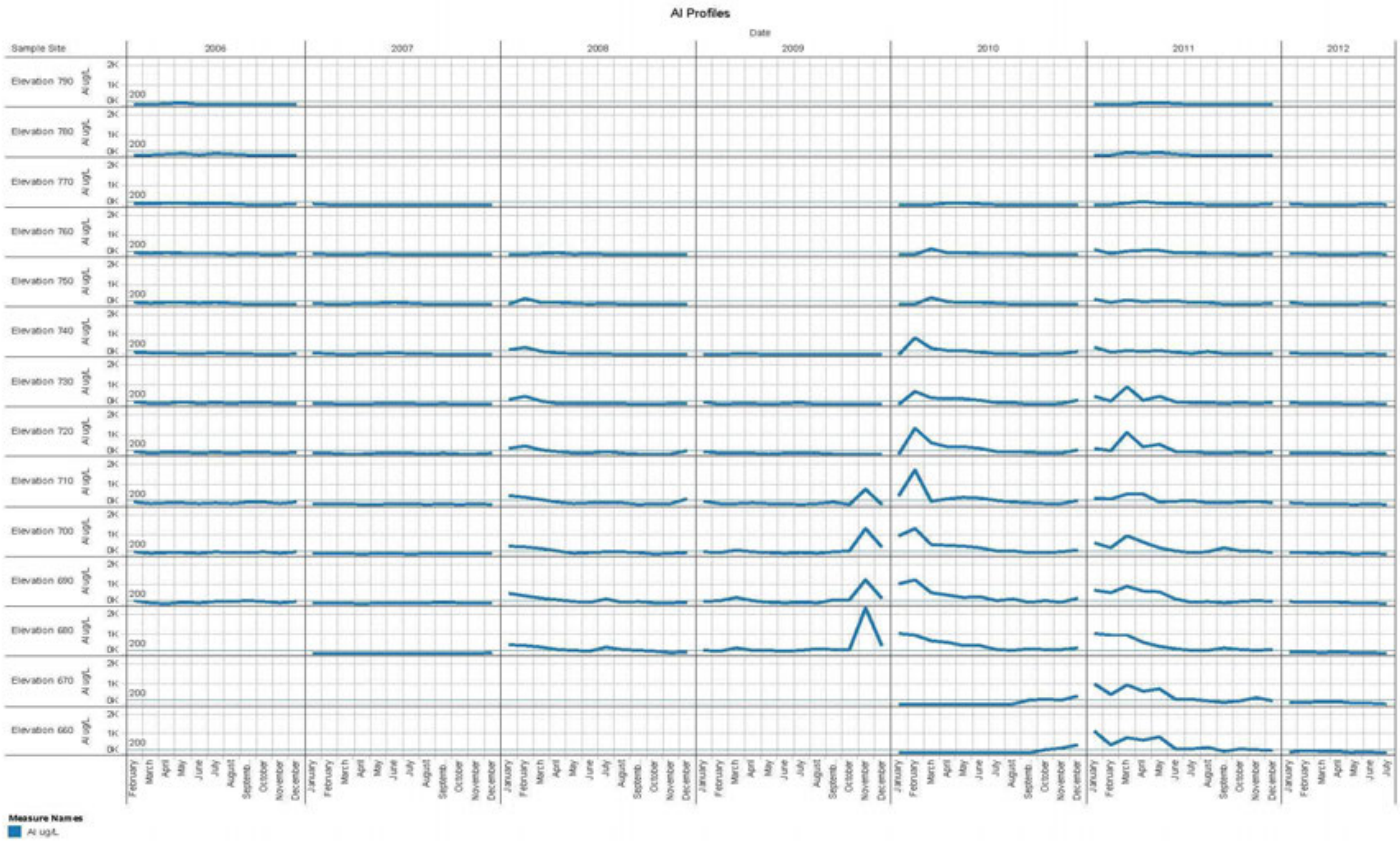
community water systems on a temporary basis pending construction of treatment facilities or development of acceptable new water sources.

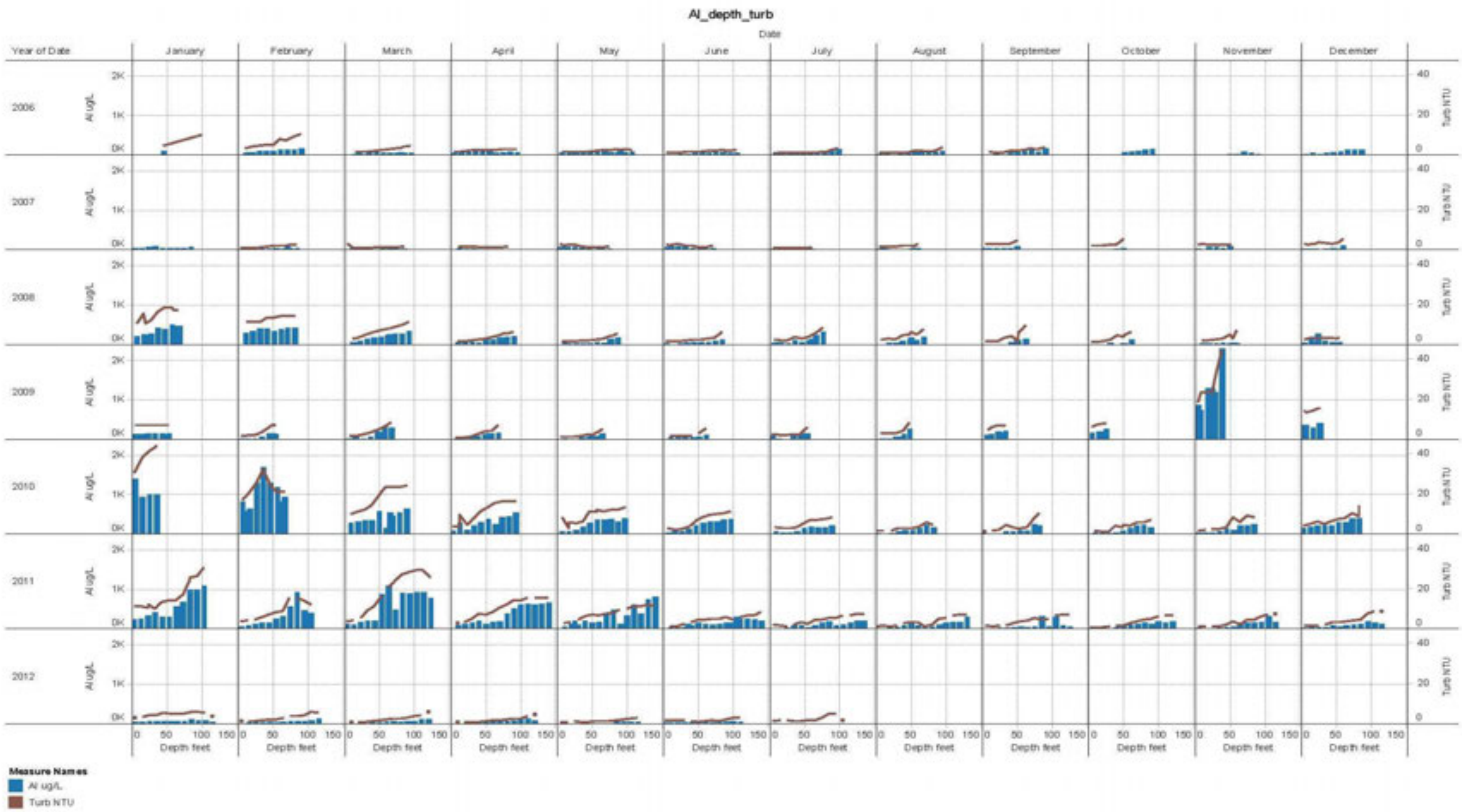
## 9.10 Nacimiento Reservoir Water Quality Monitoring Data

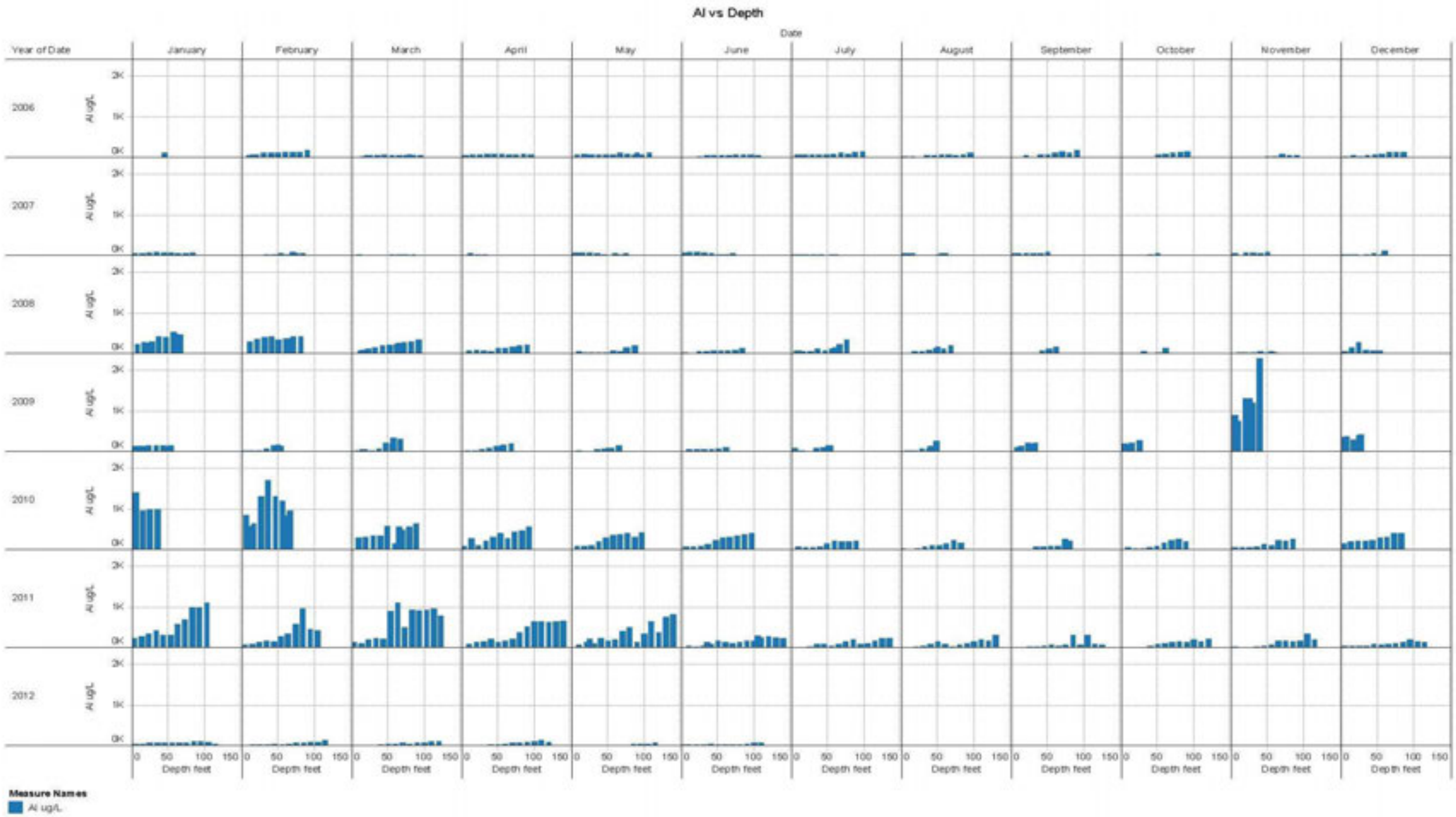
| | |
|---|---|
| Data collected by: | San Luis Obispo County Flood Control and Water Conservation District |
| Sample location: | Main log boom at east end of reservoir, by dam |
| Monitoring period: | 1993-2011 |

Graphs are presented in alphabetical order by constituent.

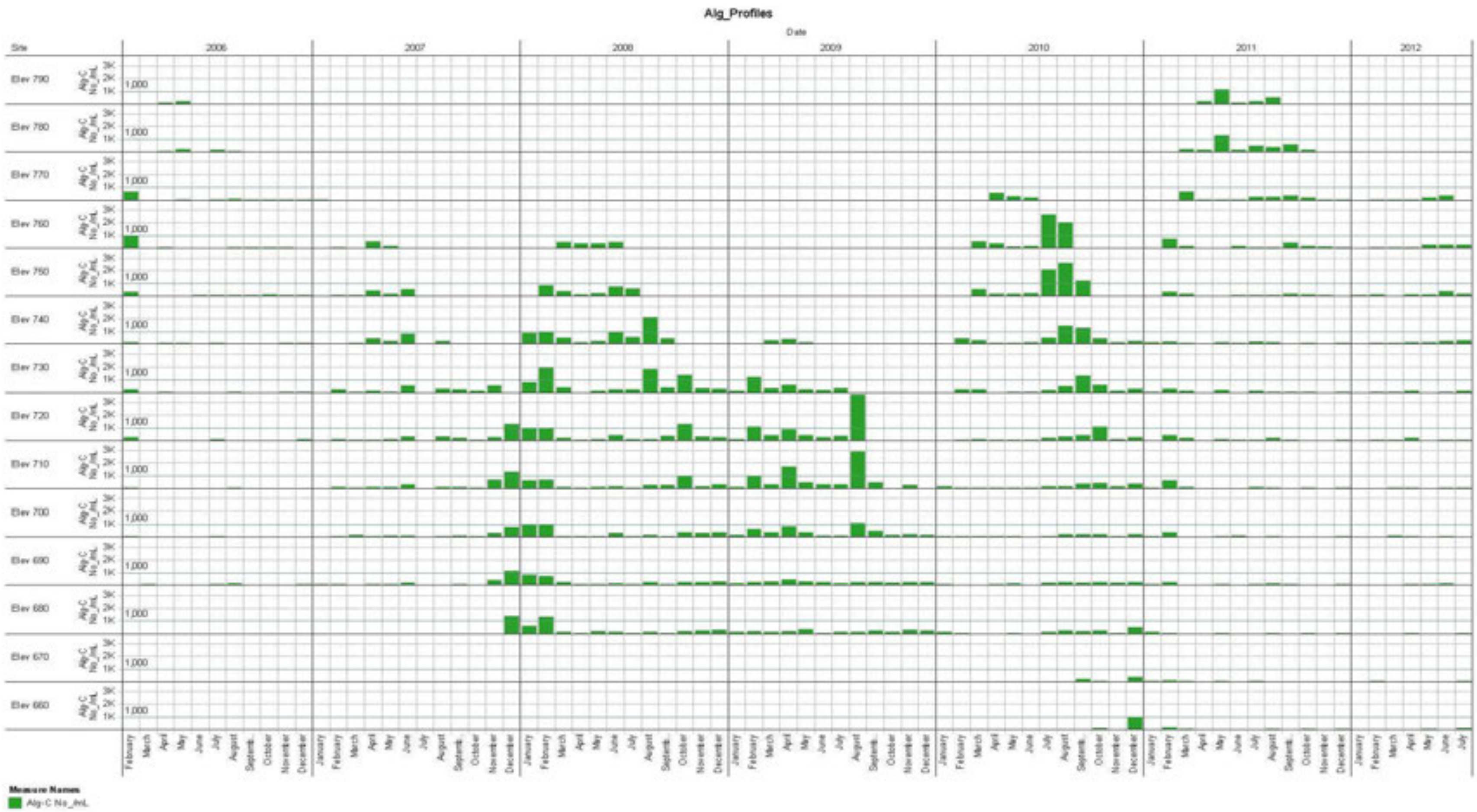

Al Epi, Hypo
Date
Sample Site
1997
1998
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
EPILIMNION
HYPOLIMNI..
Al ug/L
Depth feet
Measure Names
Al ug/L
Depth feet


Al Profiles
Date
Sample Site
2006
2007
2008
2009
2010
2011
2012
Elevation 790
Elevation 780
Elevation 770
Elevation 760
Elevation 750
Elevation 740
Elevation 730
Elevation 720
Elevation 710
Elevation 700
Elevation 690
Elevation 680
Elevation 670
Elevation 660
Al ug/L
2K
1K
0K
200
Measure Names
Al ug/L

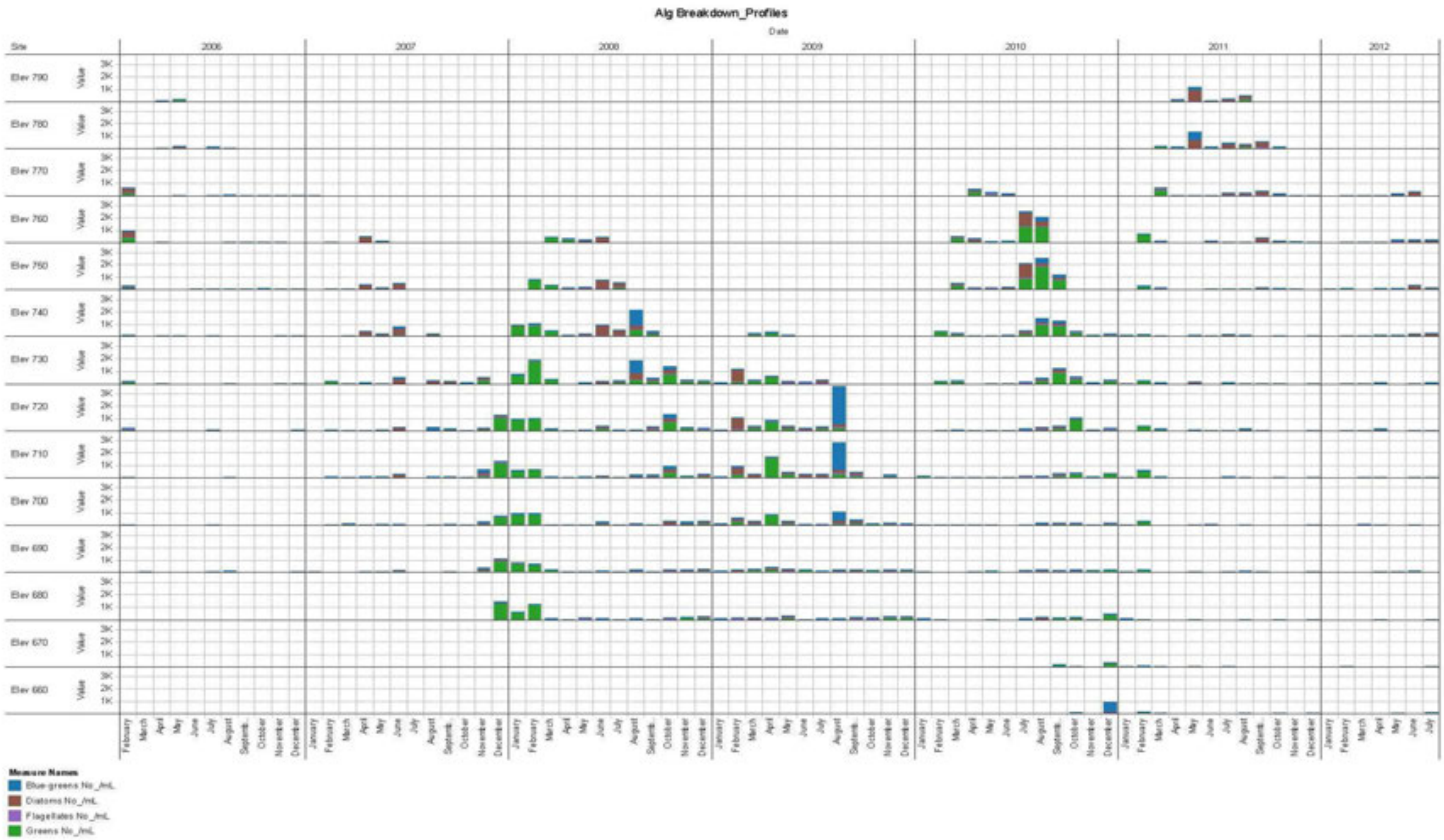

Al_depth_turb
Date
Year of Date
January
February
March
April
May
June
July
August
September
October
November
December
2006
2007
2008
2009
2010
2011
2012
Al ug/L
Turb NTU
Depth feet
Measure Names
Al ug/L
Turb NTU

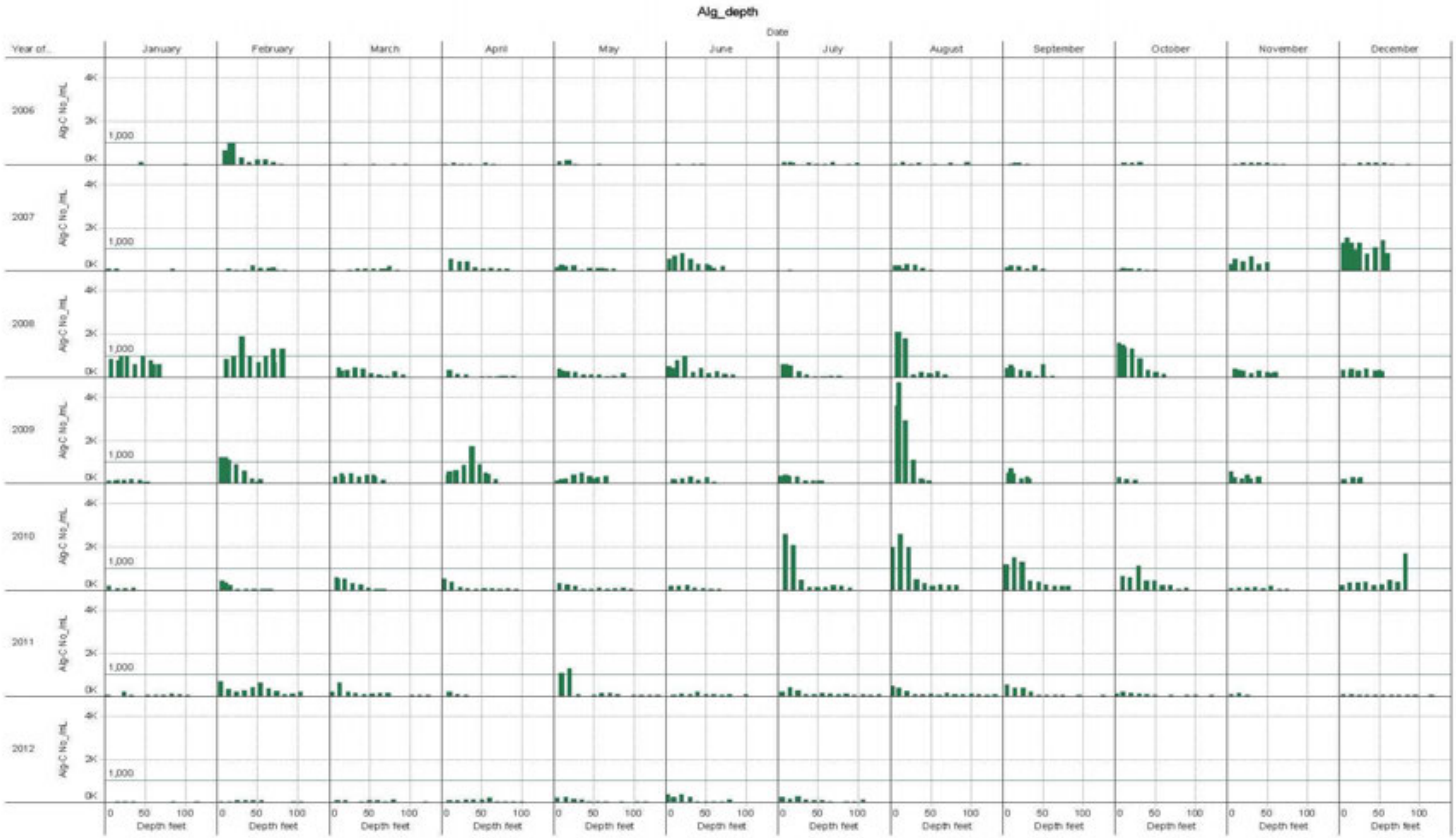

Al vs Depth
Date
Year of Date
January
February
March
April
May
June
July
August
September
October
November
December
2006
2007
2008
2009
2010
2011
2012
Al ug/L
2K
1K
0K
0
50
100
150
Depth feet
Measure Names
Al ug/L

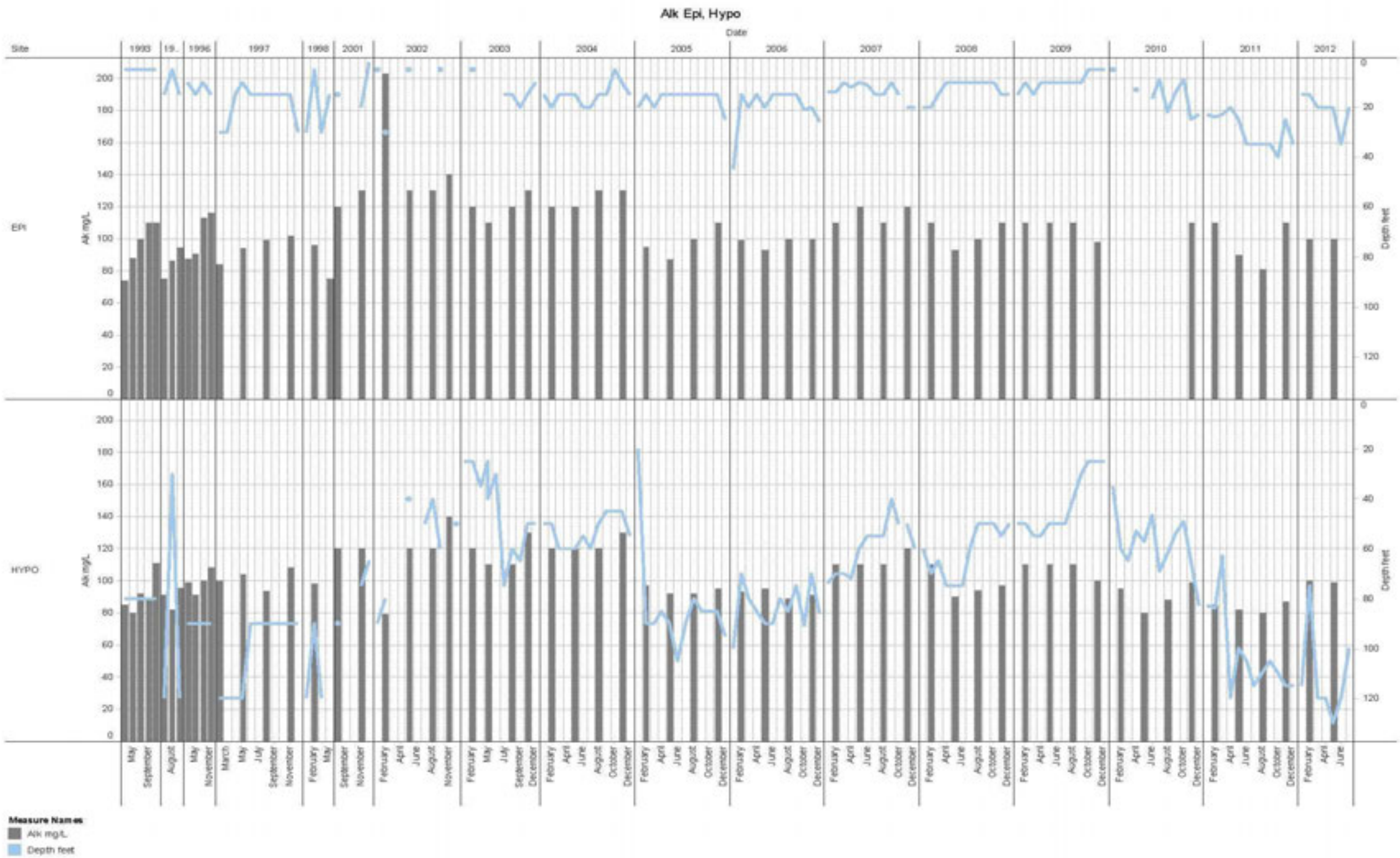

Alg_Epi, Hypo
Date
Site
2002
2003
2004
2005
2006
2007
2008
2009
2010
EPI
HYPO
Alg-C No_mL
Depth feet
1,000
Measure Names
Alg-C No_mL
Depth feet

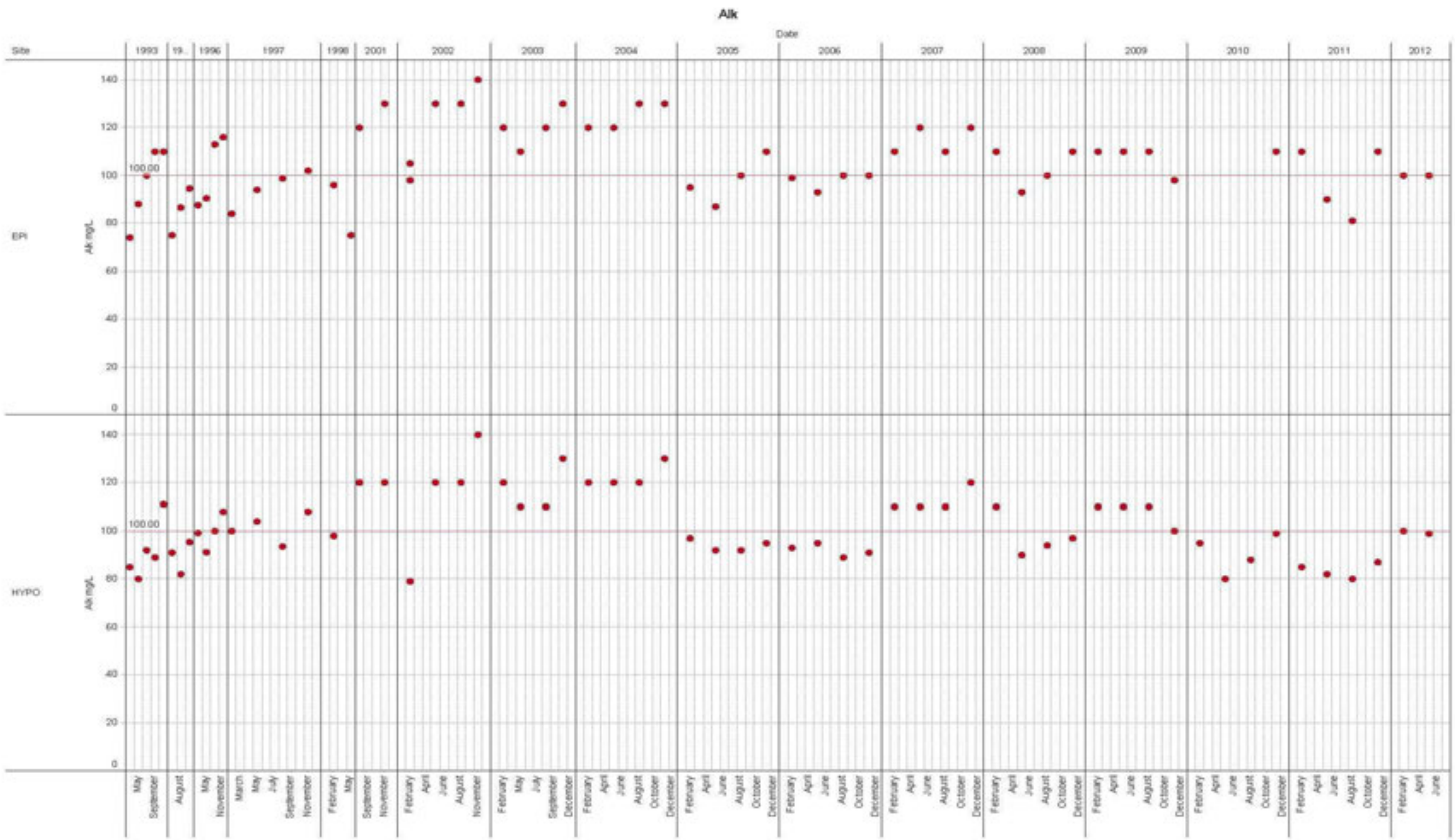

Alg_Profiles
Date
Site
2006
2007
2008
2009
2010
2011
2012
Elev 790
Elev 780
Elev 770
Elev 760
Elev 750
Elev 740
Elev 730
Elev 720
Elev 710
Elev 700
Elev 690
Elev 680
Elev 670
Elev 660
Measure Names
Alg-C No_/mL

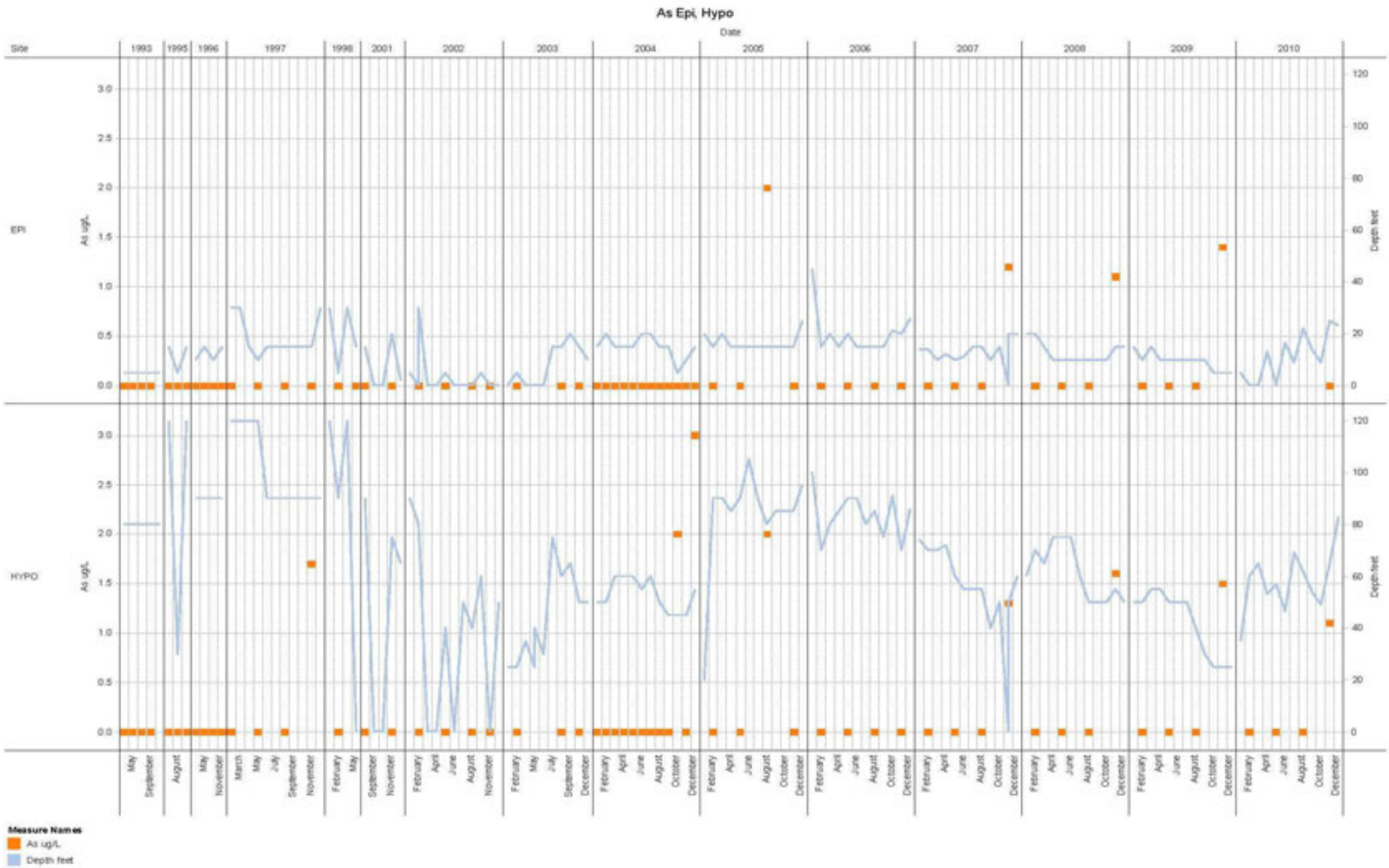

Alg Breakdown - Epi, Hypo
Date
Site
2002
2003
2004
2005
2006
2007
2008
2009
2010
EPI
HYPO
Value
Depth feet
Measure Names
Blue-greens No_/mL
Diatoms No_/mL
Flagellates No_/mL
Greens No_/mL
Depth feet


Alg Breakdown_Profiles
Date
Site
2006
2007
2008
2009
2010
2011
2012
Elev 790
Elev 780
Elev 770
Elev 760
Elev 750
Elev 740
Elev 730
Elev 720
Elev 710
Elev 700
Elev 690
Elev 680
Elev 670
Elev 660
Value
3K
2K
1K
Measure Names
Blue-greens No_/mL
Diatoms No_/mL
Flagellates No_/mL
Greens No_/mL


Alg_depth
Date
Year of..
January
February
March
April
May
June
July
August
September
October
November
December
2006
2007
2008
2009
2010
2011
2012
Alg-C No_mL
4K
2K
0K
1,000
0
50
100
Depth feet


Alk Epi, Hypo
Date
Site
EPI
HYPO
Alk mg/L
Depth feet
Measure Names
Alk mg/L
Depth feet


Alk
Date
Site
1993
19..
1996
1997
1998
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
EPI
HYPO
Alk mg/L
100.00


As Epi, Hypo
Date
Site
1993
1995
1996
1997
1998
2001
2002
2003
2004
2005
2006
2007
2008
2009
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EPI
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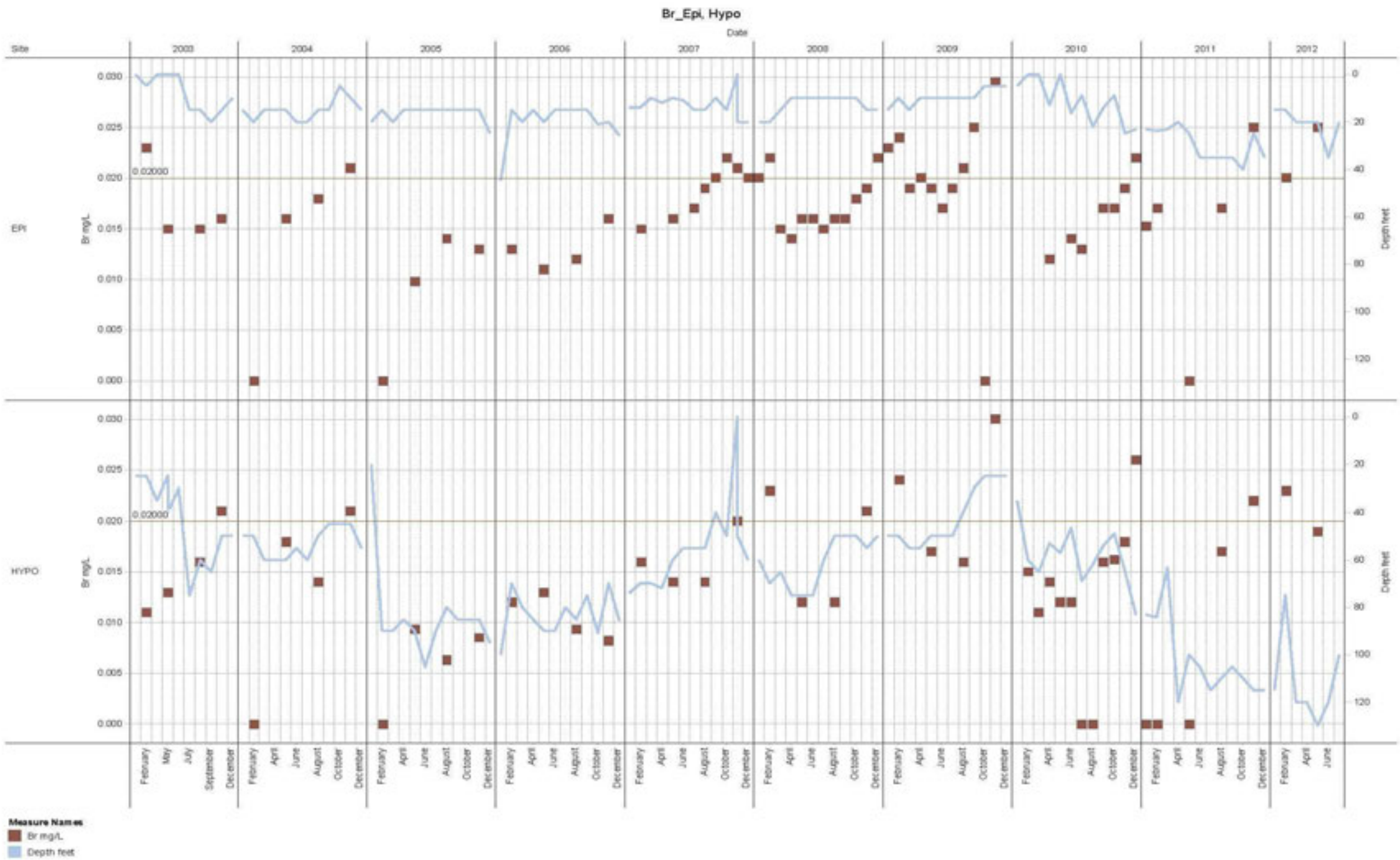
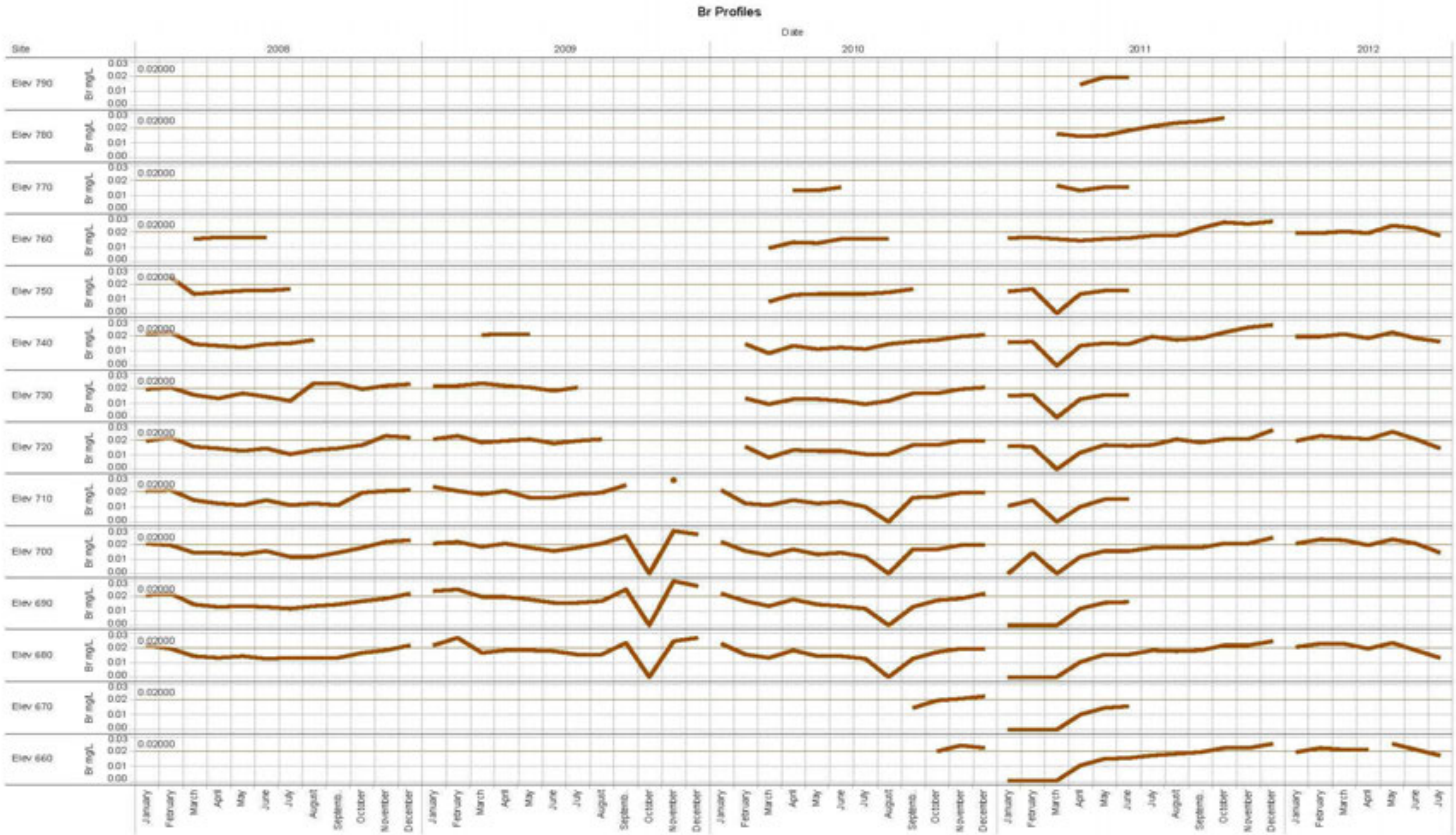
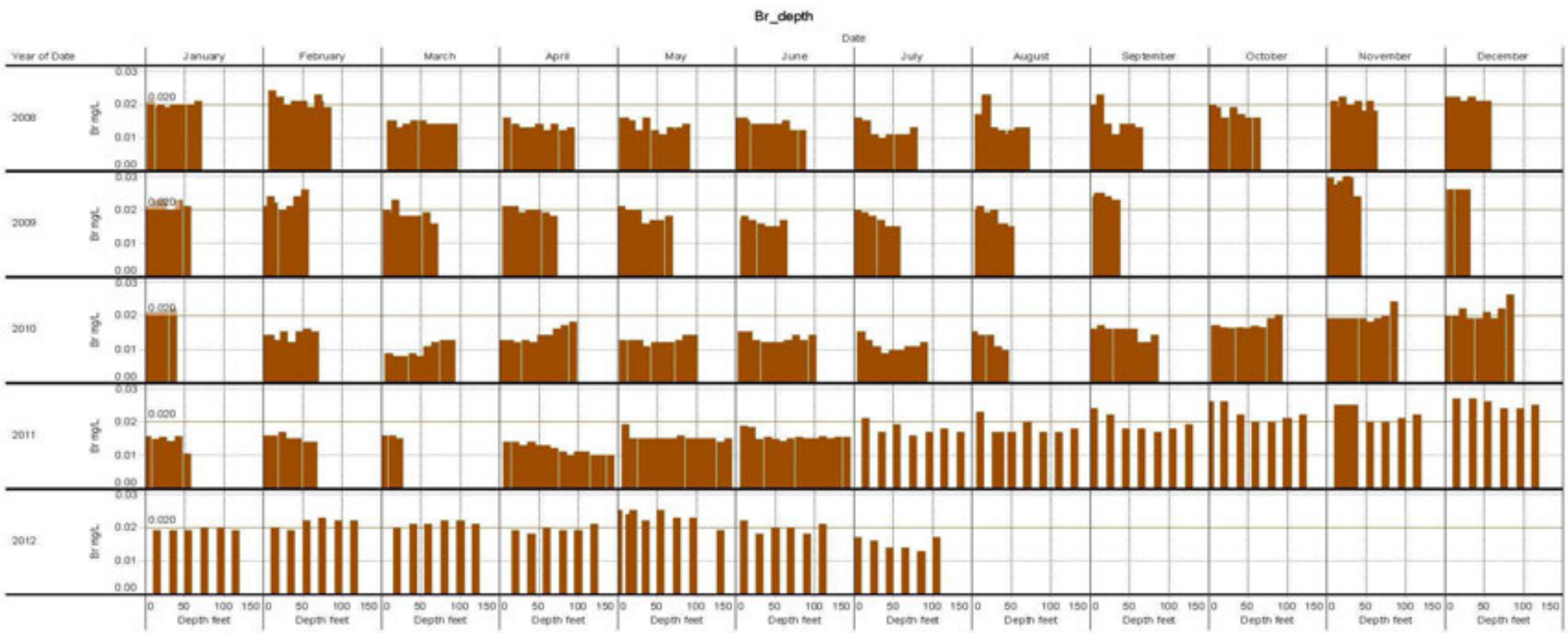
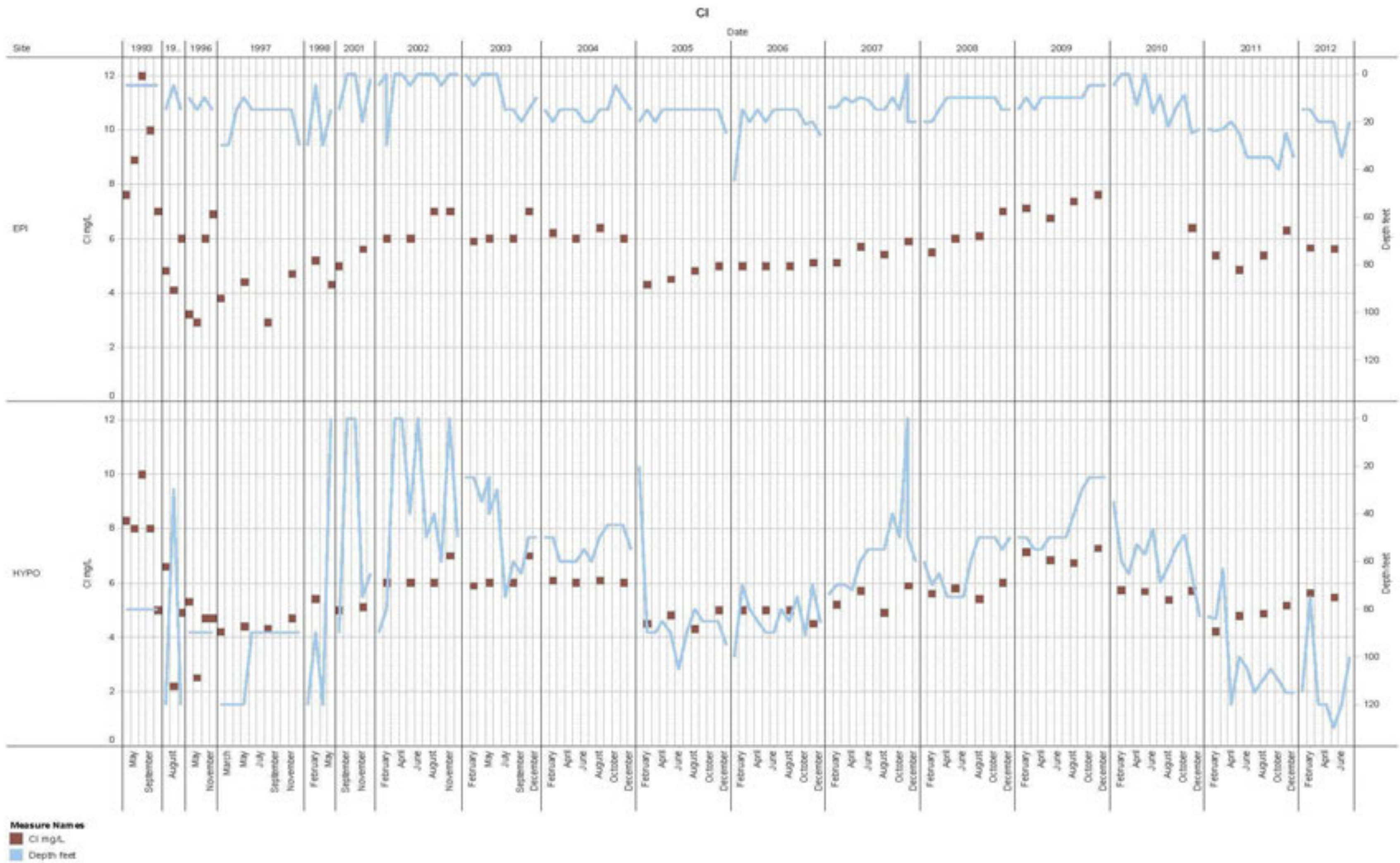
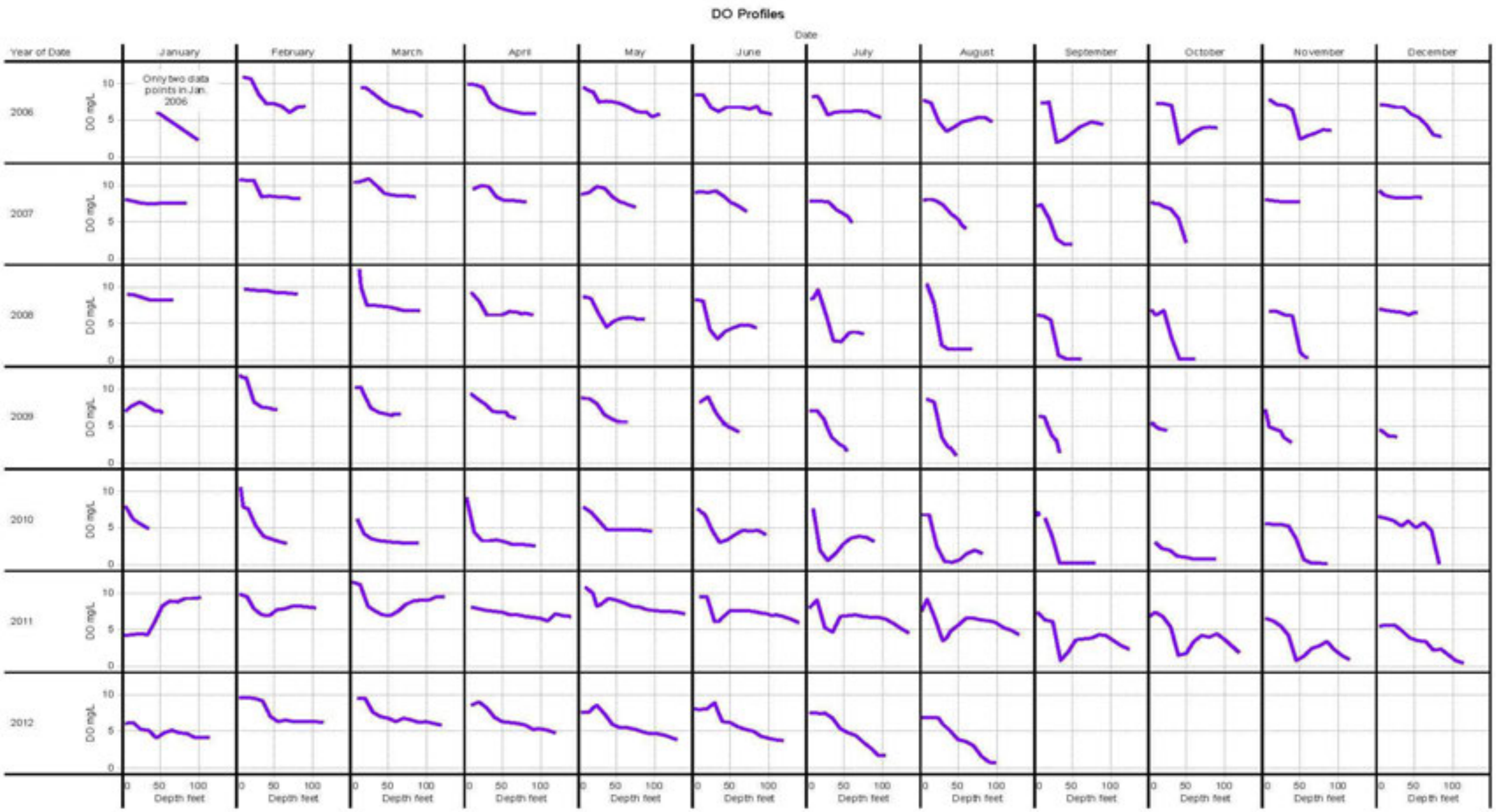
As ug/L
Depth feet
Measure Names
As ug/L
Depth feet

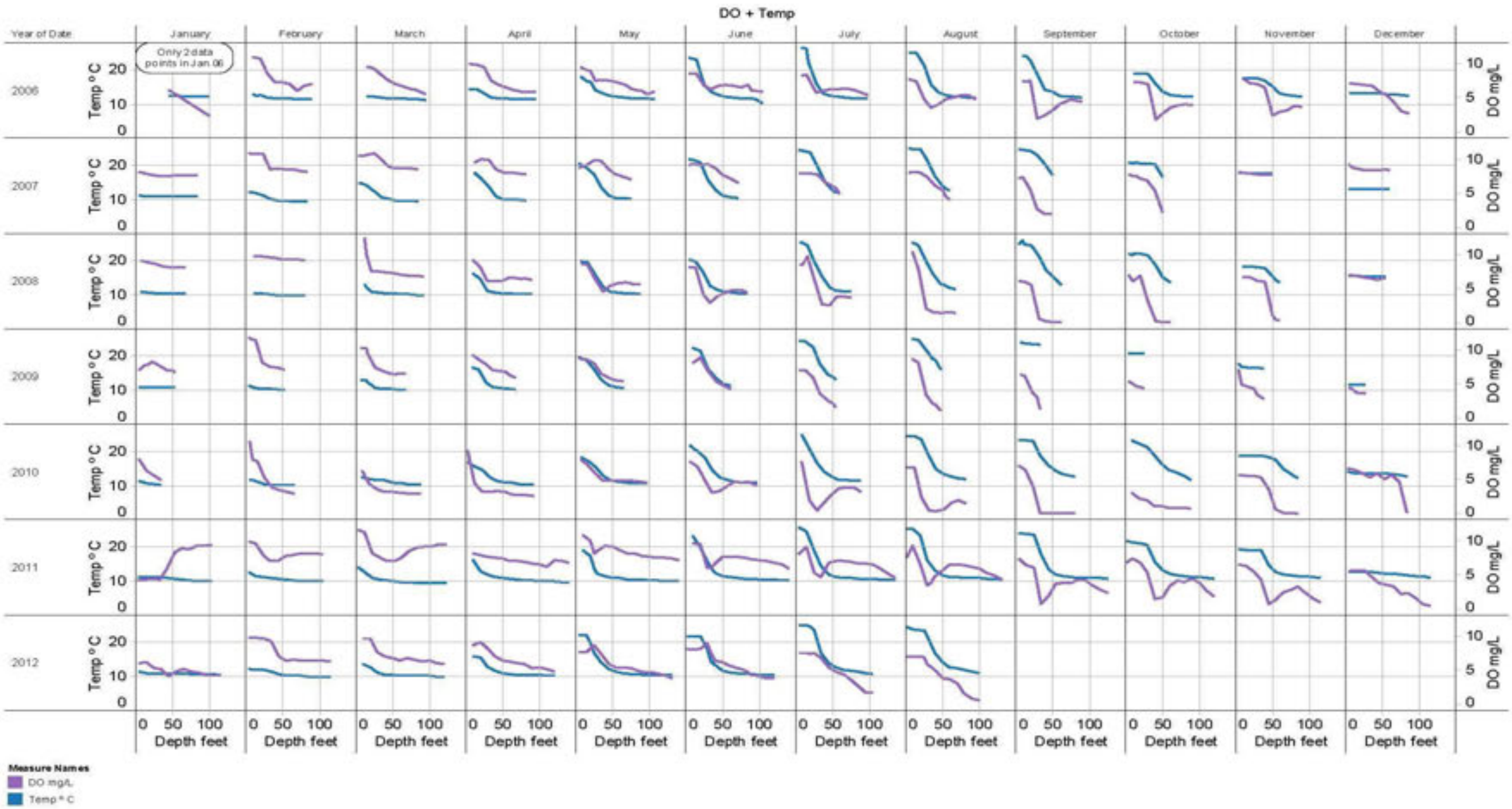

Br_Epi, Hypo
Date
Site
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
EPI
HYPO
Br mg/L
Depth feet
0.02000
Measure Names
Br mg/L
Depth feet

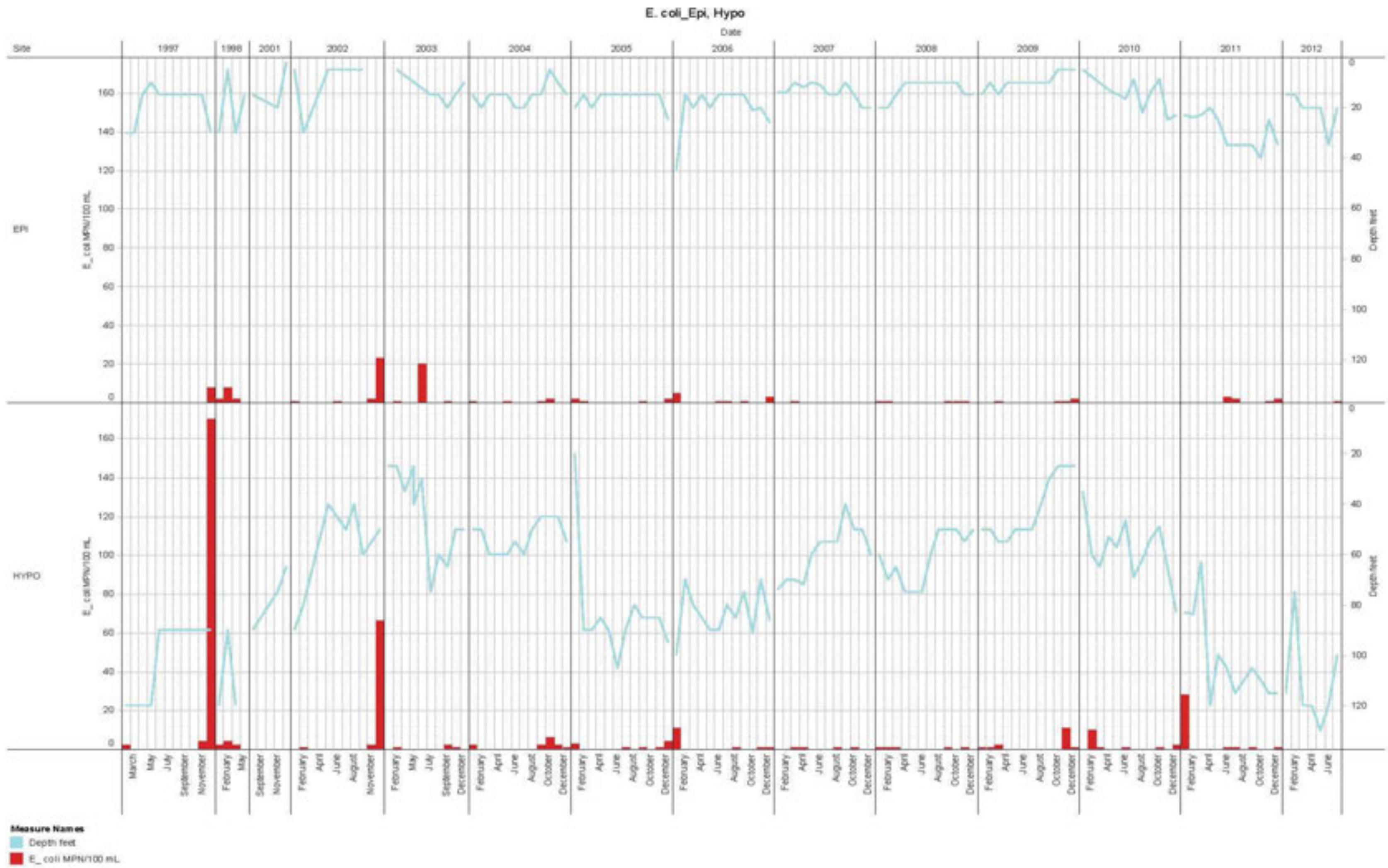

Br Profiles
Date
Site
2008
2009
2010
2011
2012
Elev 790
Elev 780
Elev 770
Elev 760
Elev 750
Elev 740
Elev 730
Elev 720
Elev 710
Elev 700
Elev 690
Elev 680
Elev 670
Elev 660
Br mg/L
0.03
0.02
0.01
0.00
0.02000

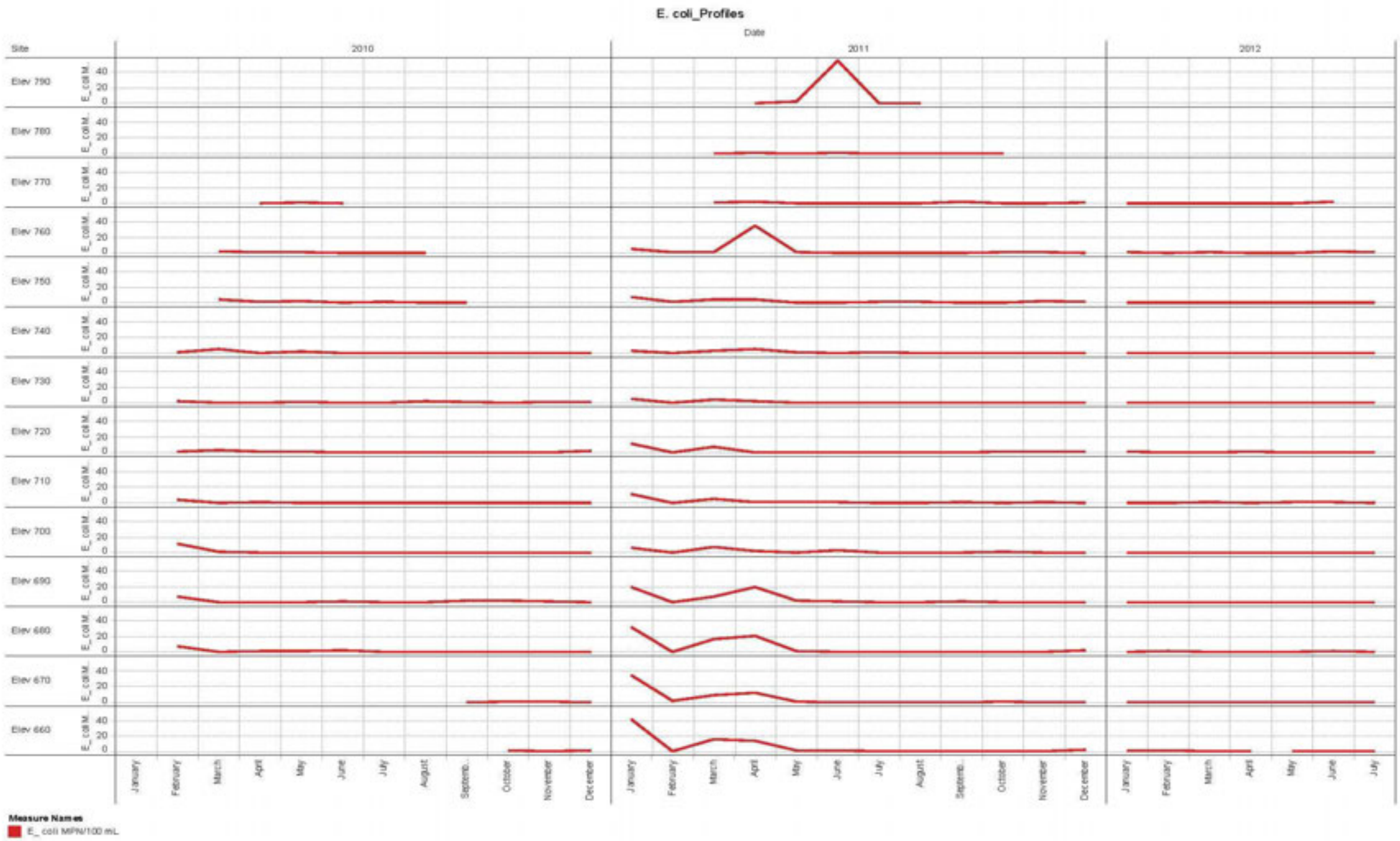

Br_depth
Date
Year of Date
January
February
March
April
May
June
July
August
September
October
November
December
2008
2009
2010
2011
2012
Br mg/L
0.03
0.02
0.01
0.00
0.020
Depth feet
0
50
100
150

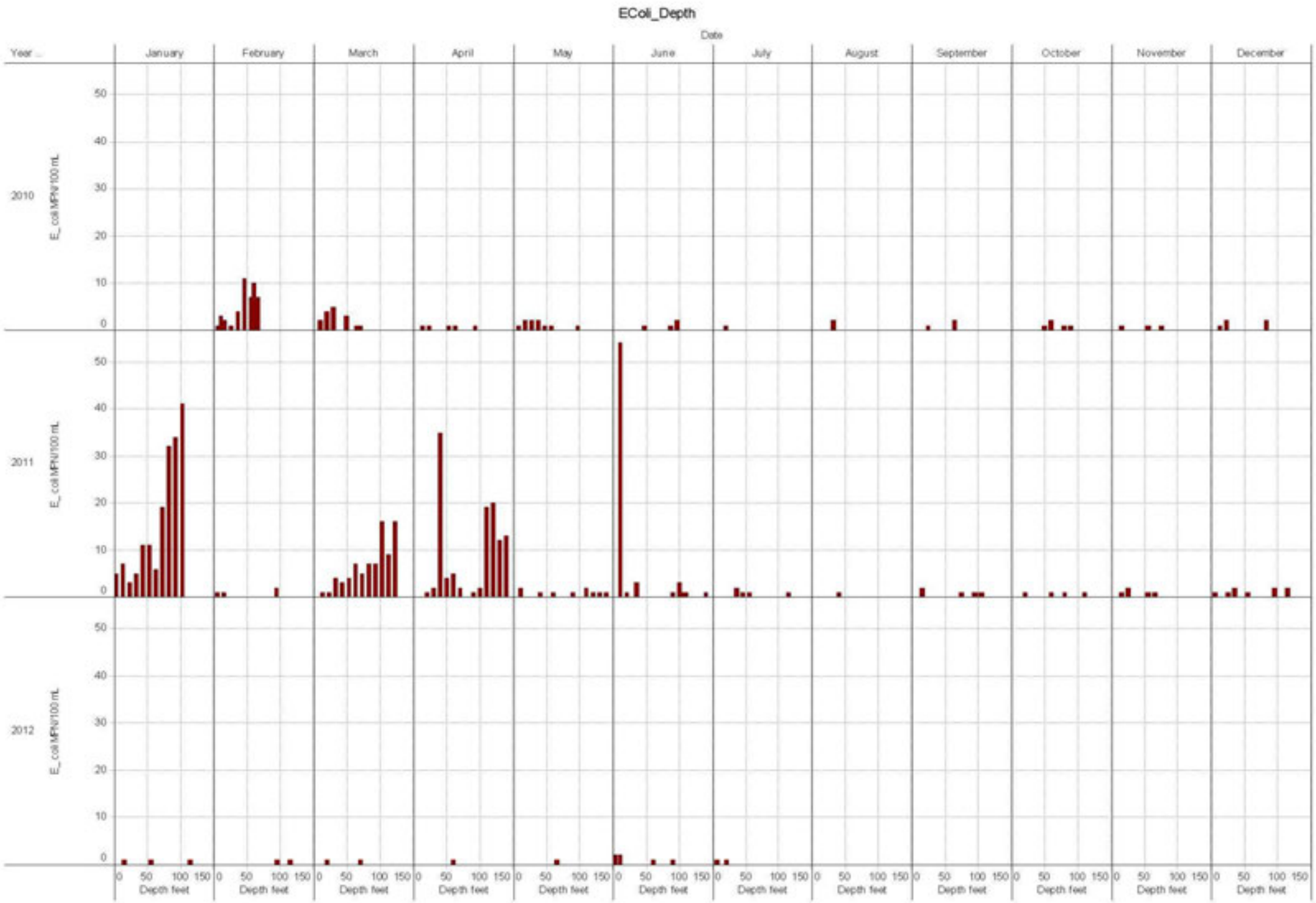

Cl
Date
Site
1993
1996
1997
1998
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
EPI
HYPO
Cl mg/L
Depth feet
Measure Names
Cl mg/L
Depth feet

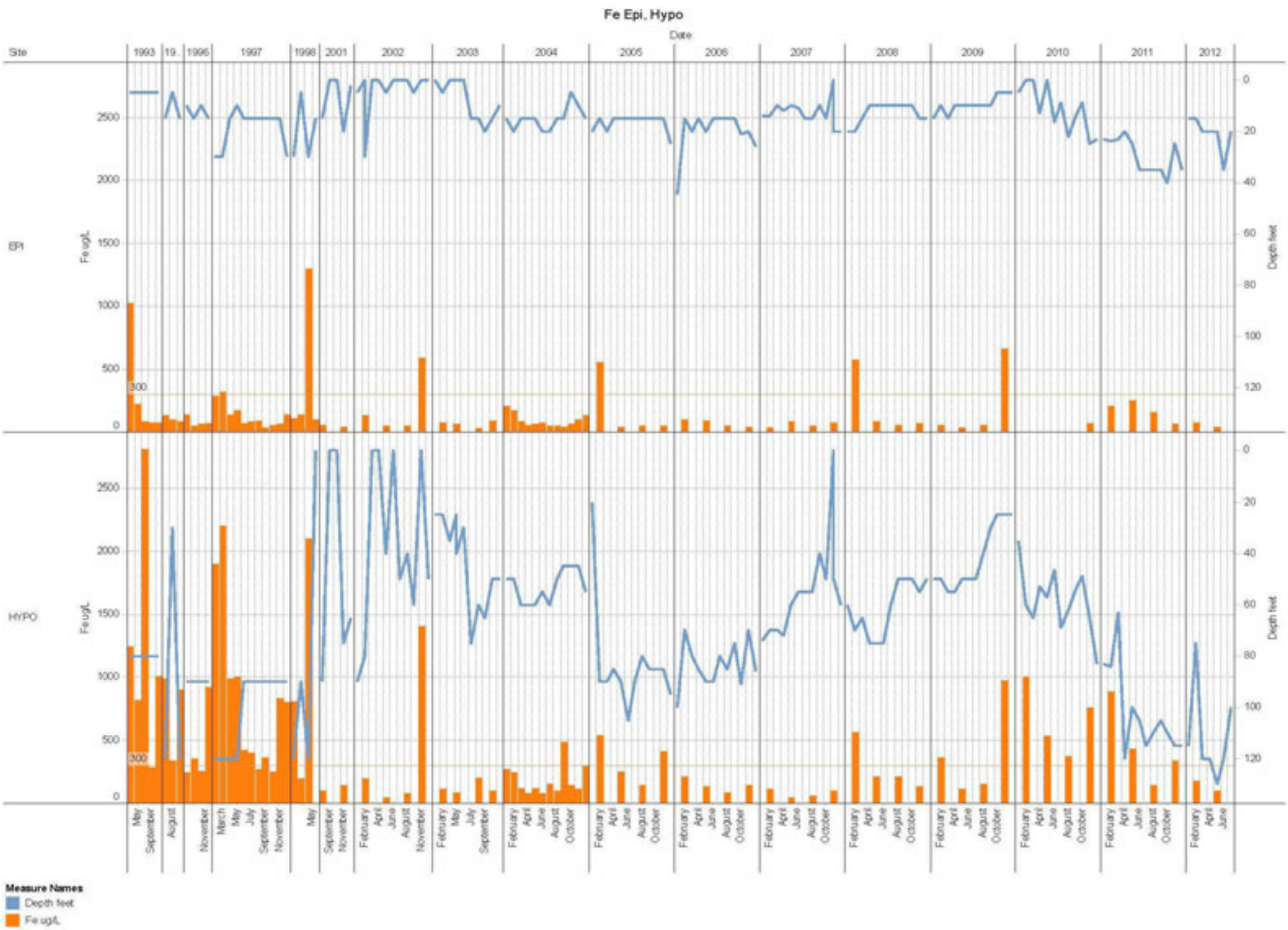

DO Profiles
Date
Year of Date
January
February
March
April
May
June
July
August
September
October
November
December
2006
2007
2008
2009
2010
2011
2012
DO mg/L
Only two data points in Jan. 2006
Depth feet

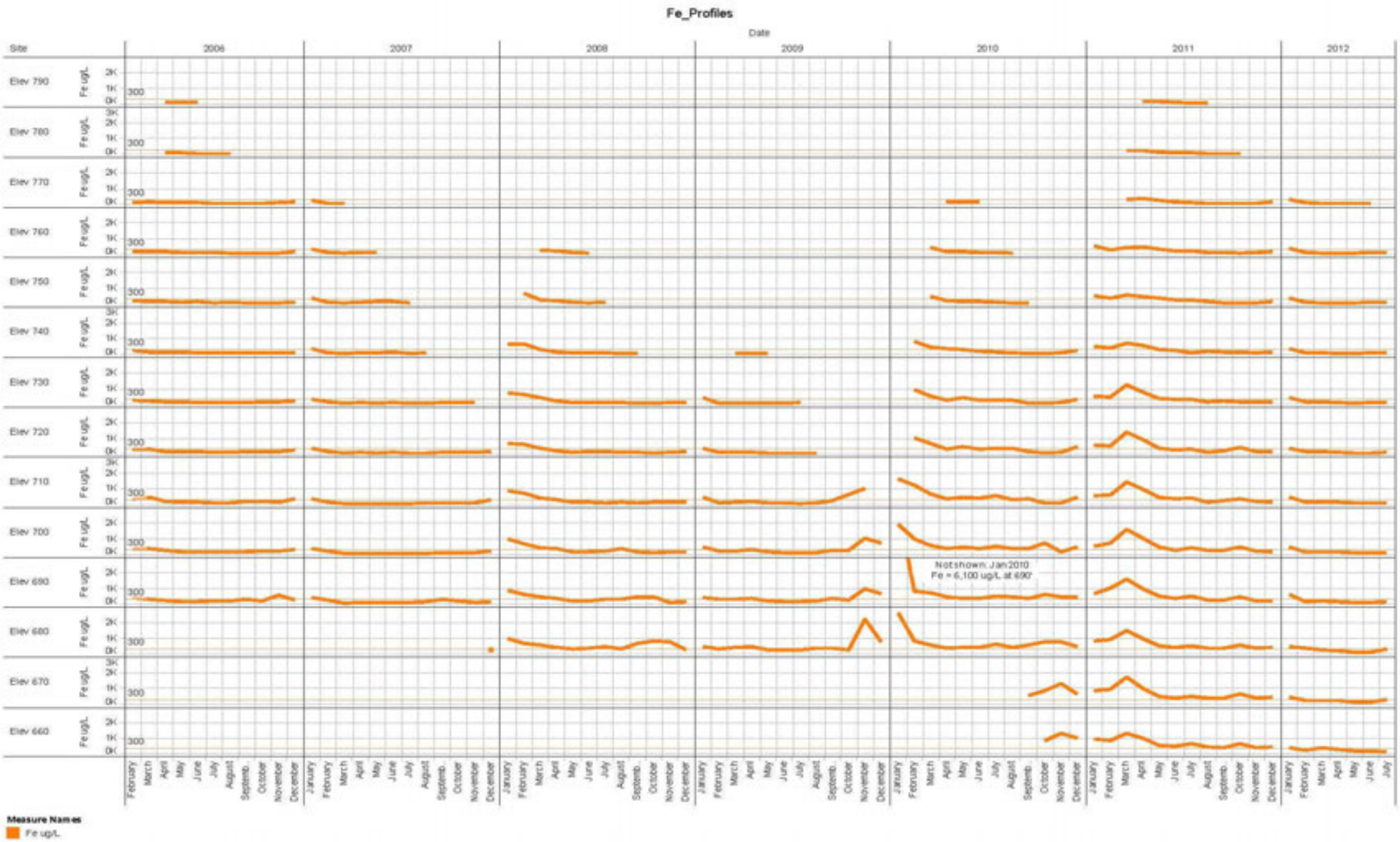

DO + Temp
Year of Date
January
February
March
April
May
June
July
August
September
October
November
December
2006
2007
2008
2009
2010
2011
2012
Only 2 data points in Jan.06
Temp °C
DO mg/L
Depth feet
Measure Names
DO mg/L
Temp ° C

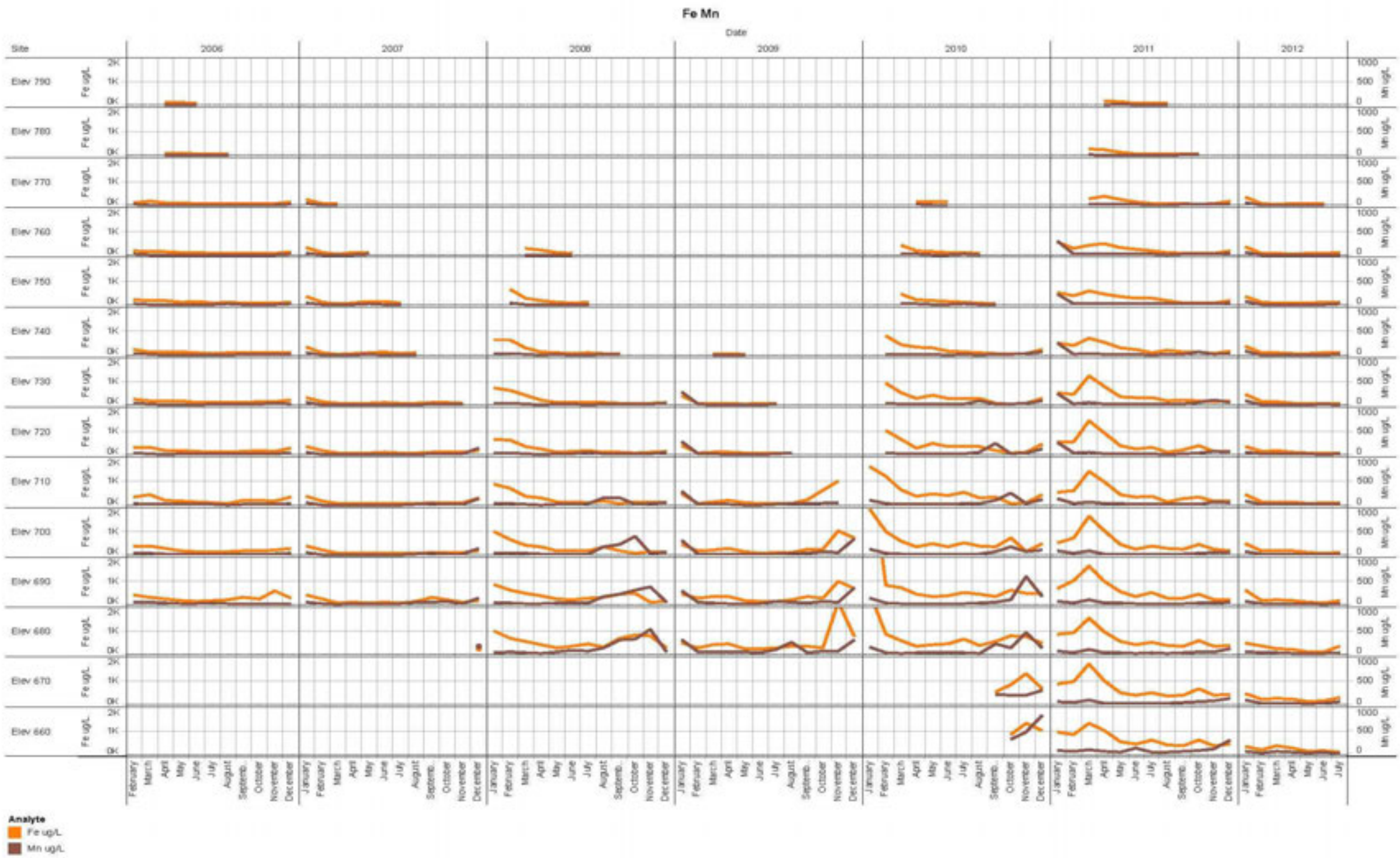

E. coli_Epi, Hypo
Date
Site
1997
1998
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
EPI
HYPO
E_coli MPN/100 mL
Depth feet
Measure Names
Depth feet
E_coli MPN/100 mL

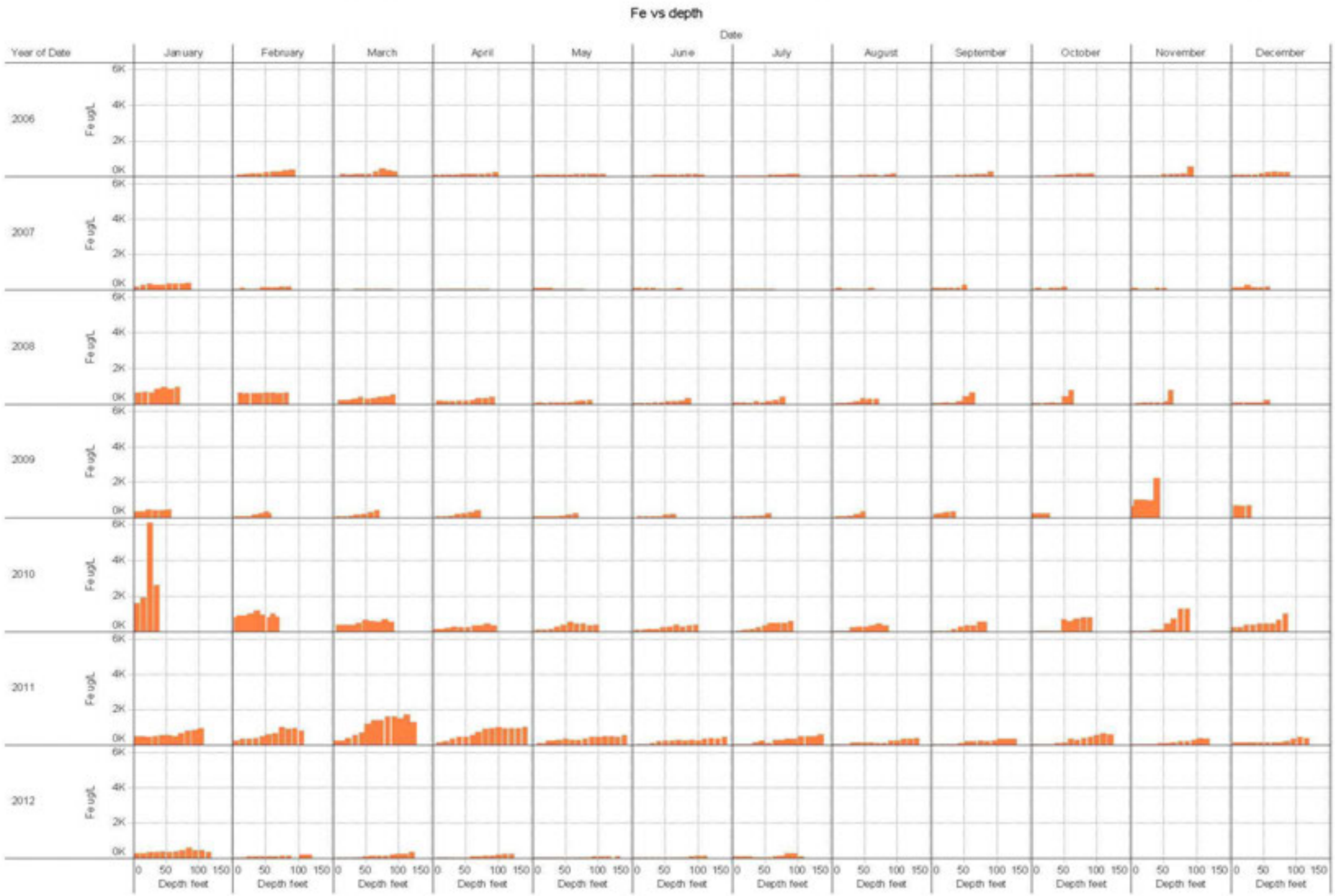

E. coli_Profiles
Date
Site
2010
2011
2012
Elev 790
Elev 780
Elev 770
Elev 760
Elev 750
Elev 740
Elev 730
Elev 720
Elev 710
Elev 700
Elev 690
Elev 680
Elev 670
Elev 660
E_coli M..
0
20
40
January
February
March
April
May
June
July
August
Septem..
October
November
December
Measure Names
E_ coli MPN/100 mL

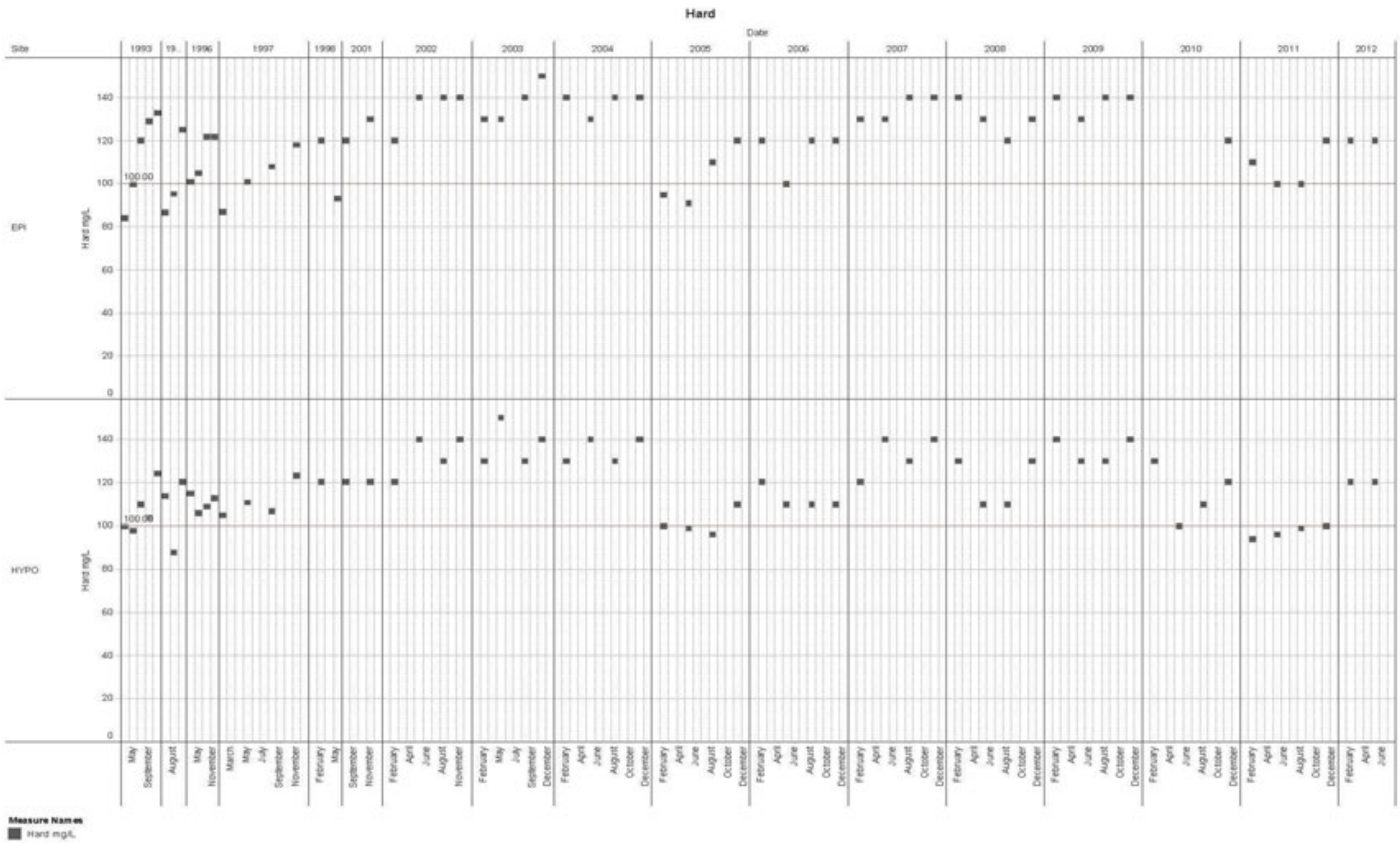

EColi_Depth
Date
Year
January
February
March
April
May
June
July
August
September
October
November
December
2010
2011
2012
E_coli MPN/100 mL
0
10
20
30
40
50
0
50
100
150
Depth feet

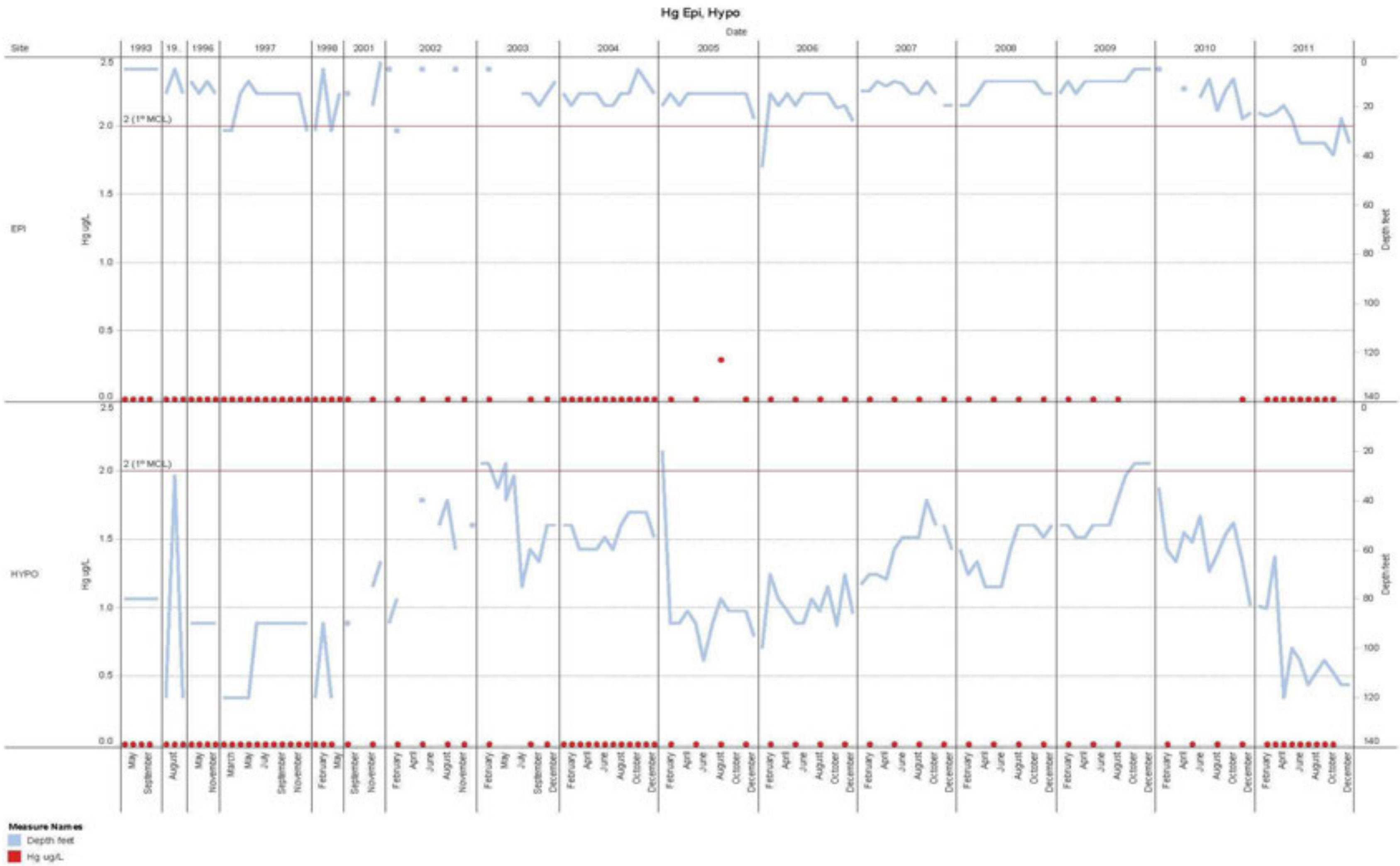

Fe Epi, Hypo
Date
Site
EPI
HYPO
Fe ug/L
Depth feet
Measure Names
Depth feet
Fe ug/L

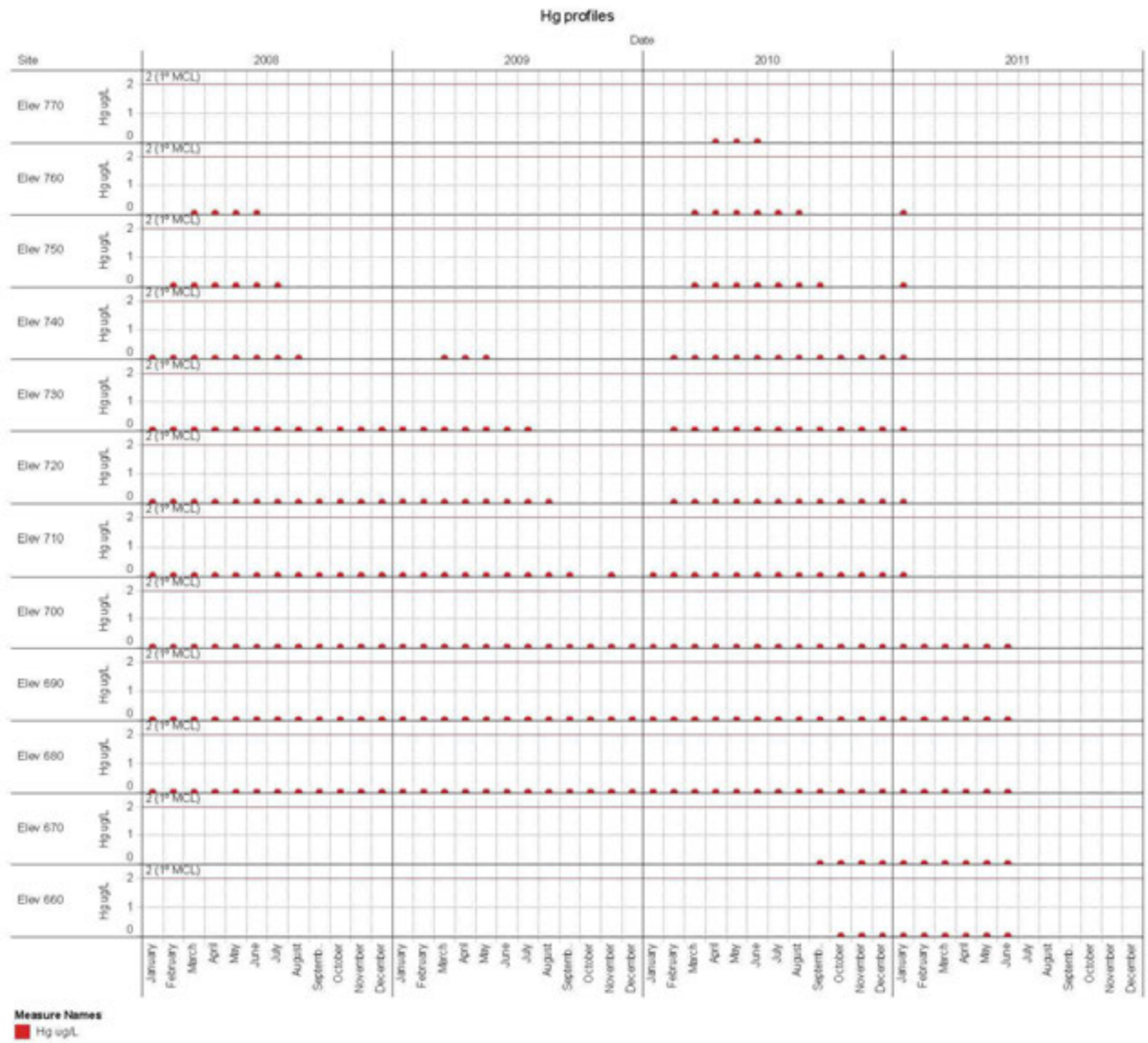

Fe_Profiles
Date
Site
2006
2007
2008
2009
2010
2011
2012
Elev 790
Elev 780
Elev 770
Elev 760
Elev 750
Elev 740
Elev 730
Elev 720
Elev 710
Elev 700
Elev 690
Elev 680
Elev 670
Elev 660
Fe ug/L
3K
2K
1K
0K
300
Not shown: Jan 2010
Fe = 6,100 ug/L at 690'
January
February
March
April
May
June
July
August
Septemb..
October
November
December
Measure Names
Fe ug/L

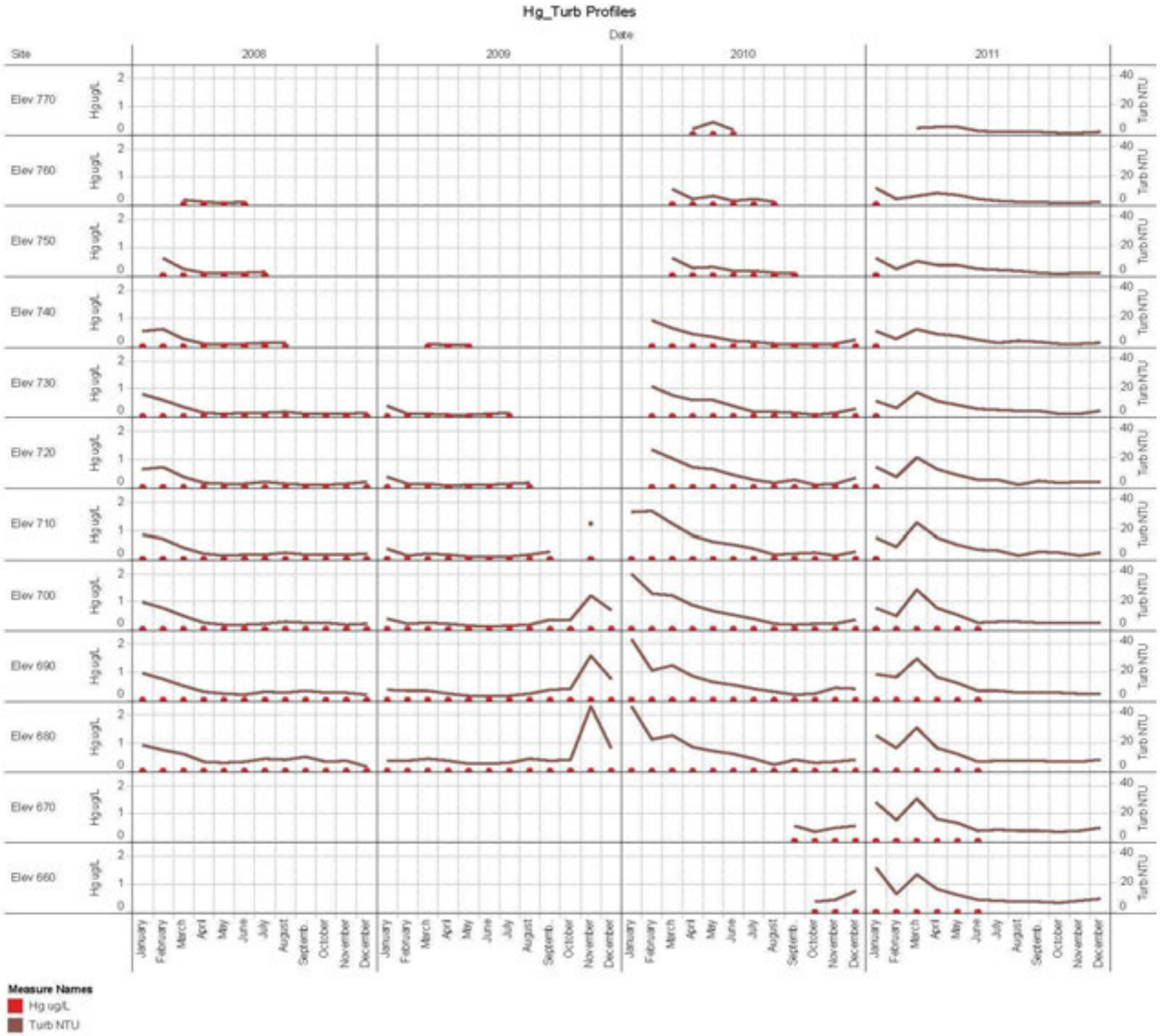

Fe Mn
Date
Site
2006
2007
2008
2009
2010
2011
2012
Elev 790
Elev 780
Elev 770
Elev 760
Elev 750
Elev 740
Elev 730
Elev 720
Elev 710
Elev 700
Elev 690
Elev 680
Elev 670
Elev 660
Fe ug/L
Mn ug/L
2K
1K
0K
1000
500
0
Analyte
Fe ug/L
Mn ug/L

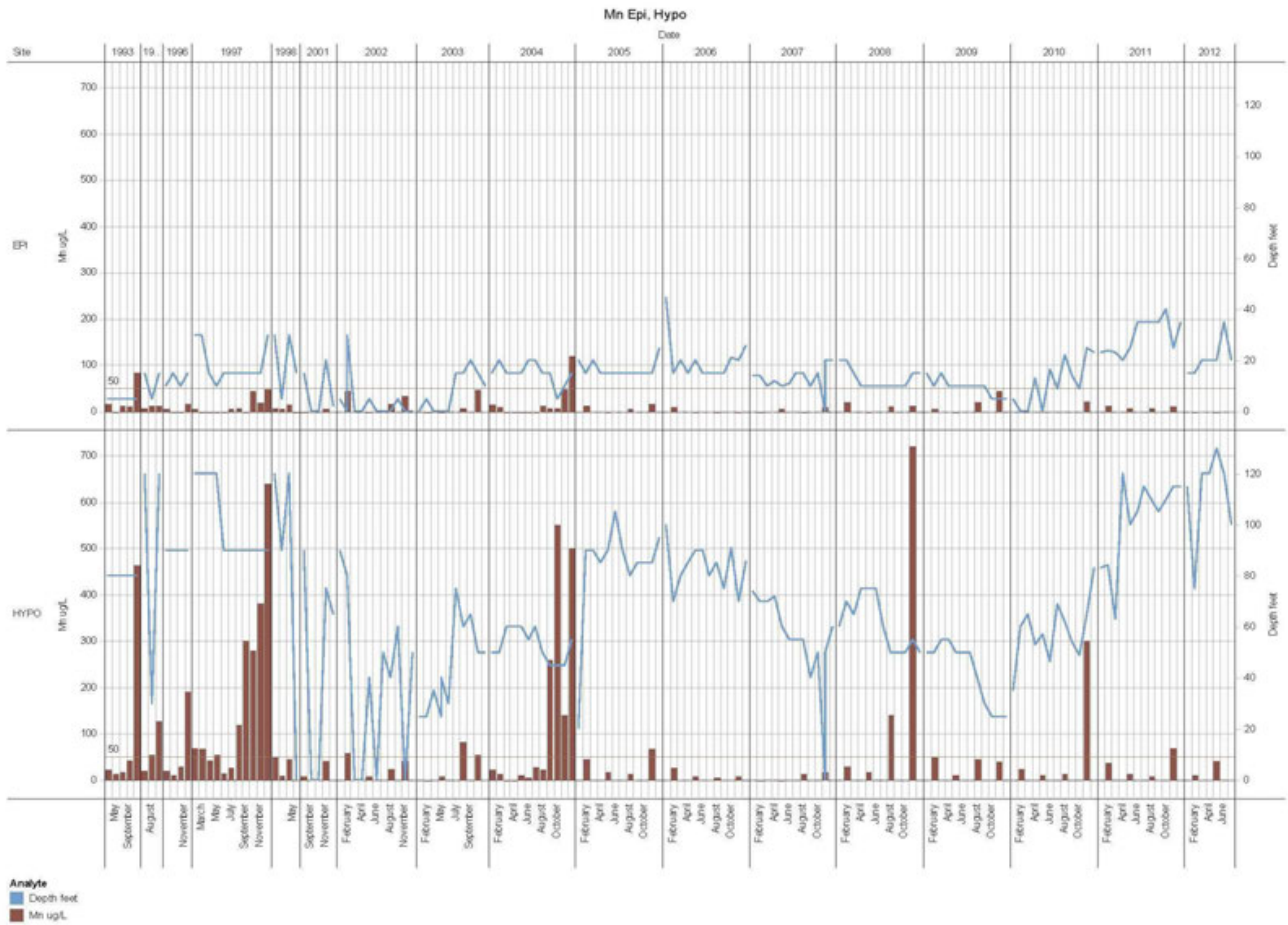

Fe vs depth
Date
Year of Date
January
February
March
April
May
June
July
August
September
October
November
December
2006
2007
2008
2009
2010
2011
2012
Fe ug/L
6K
4K
2K
0K
0
50
100
150
Depth feet

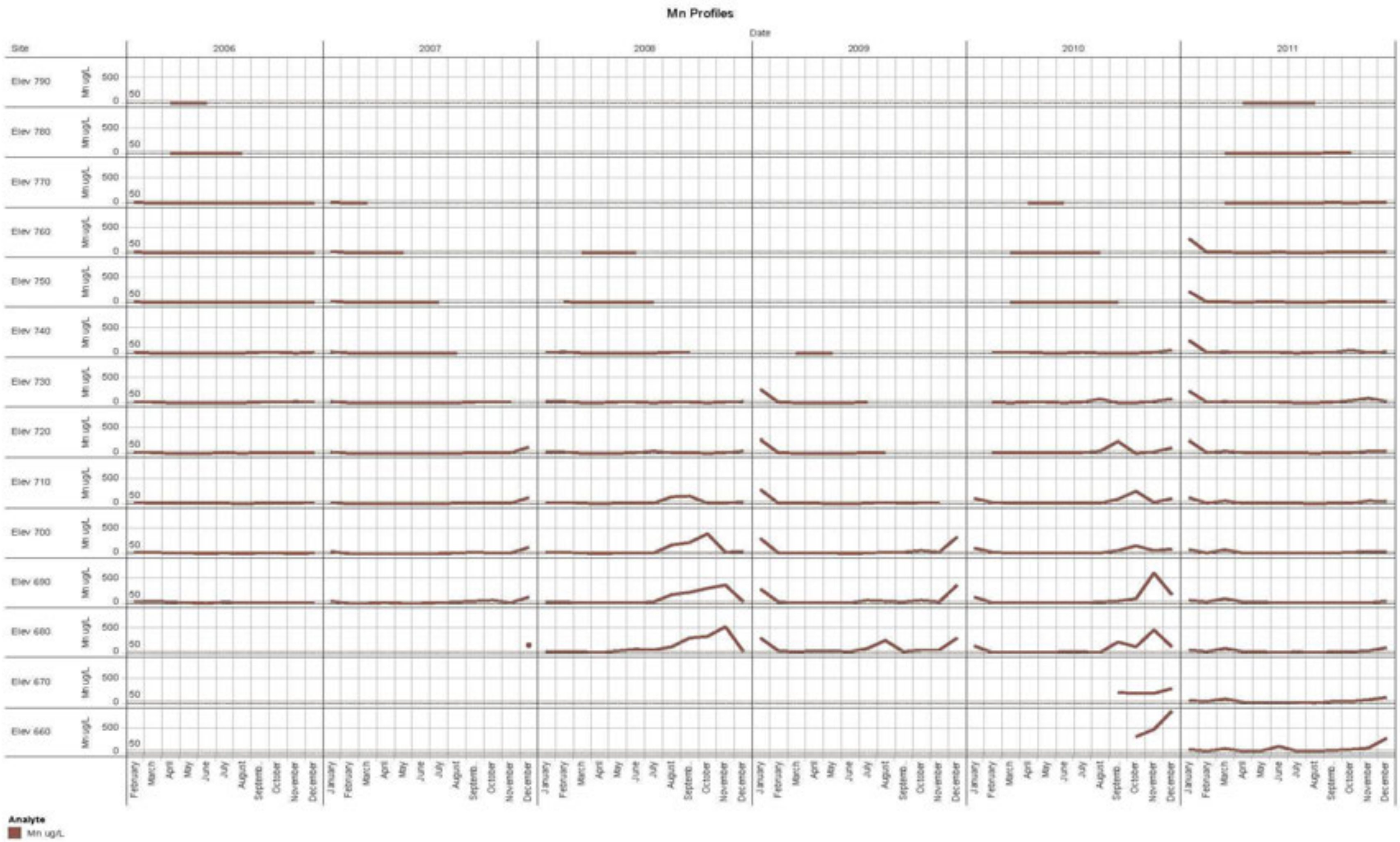

Hard
Date
Site
EPI
HYPO
Hard mg/L
Measure Names
Hard mg/L

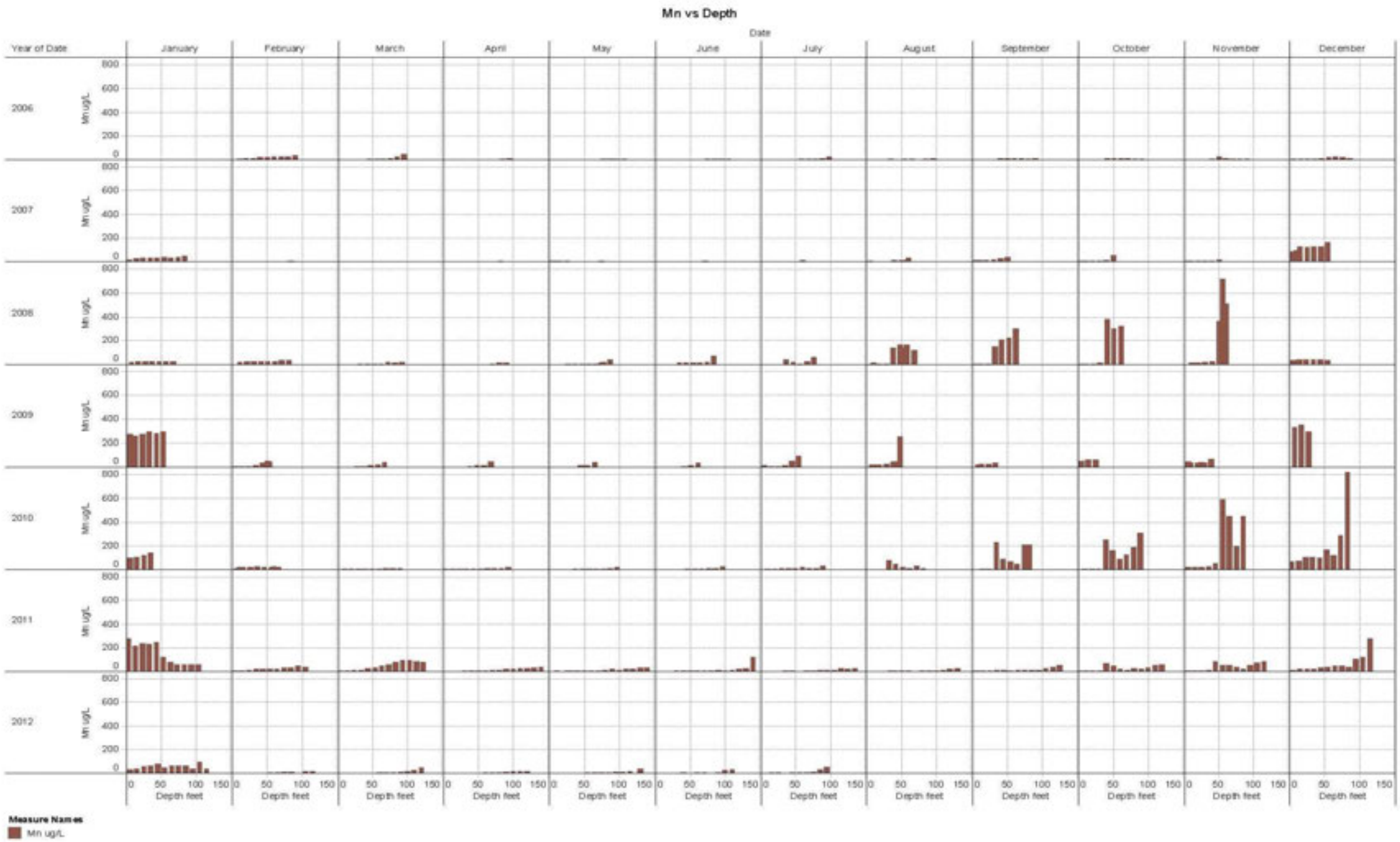

Hg Epi, Hypo
Date
Site
1993
19
1996
1997
1998
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
EPI
HYPO
Hg ug/L
Depth feet
2 (1° MCL)
Measure Names
Depth feet
Hg ug/L

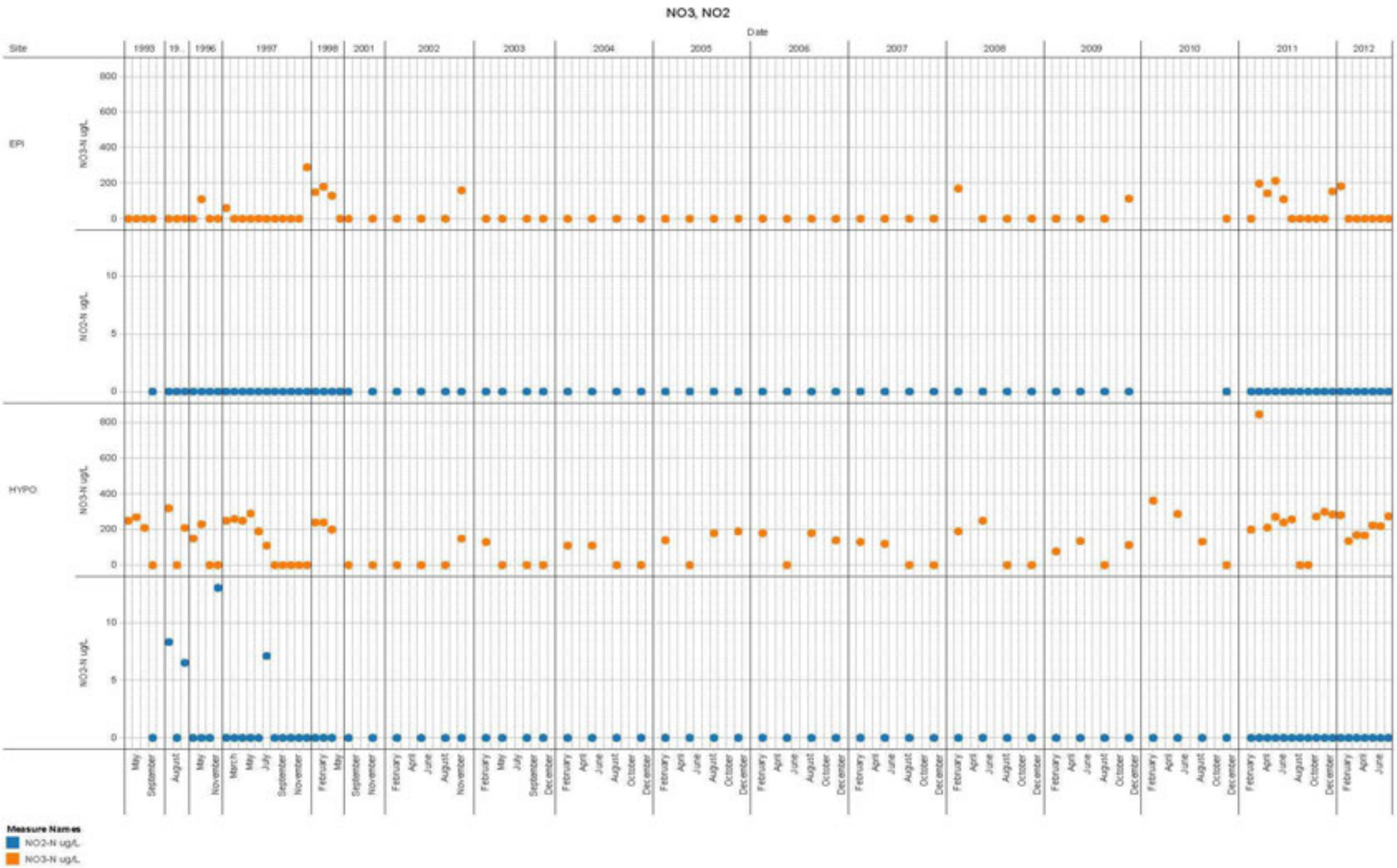

Hg profiles
Date
Site
2008
2009
2010
2011
Elev 770
Elev 760
Elev 750
Elev 740
Elev 730
Elev 720
Elev 710
Elev 700
Elev 690
Elev 680
Elev 670
Elev 660
Hg ug/L
2 (1° MCL)
Measure Names
Hg ug/L

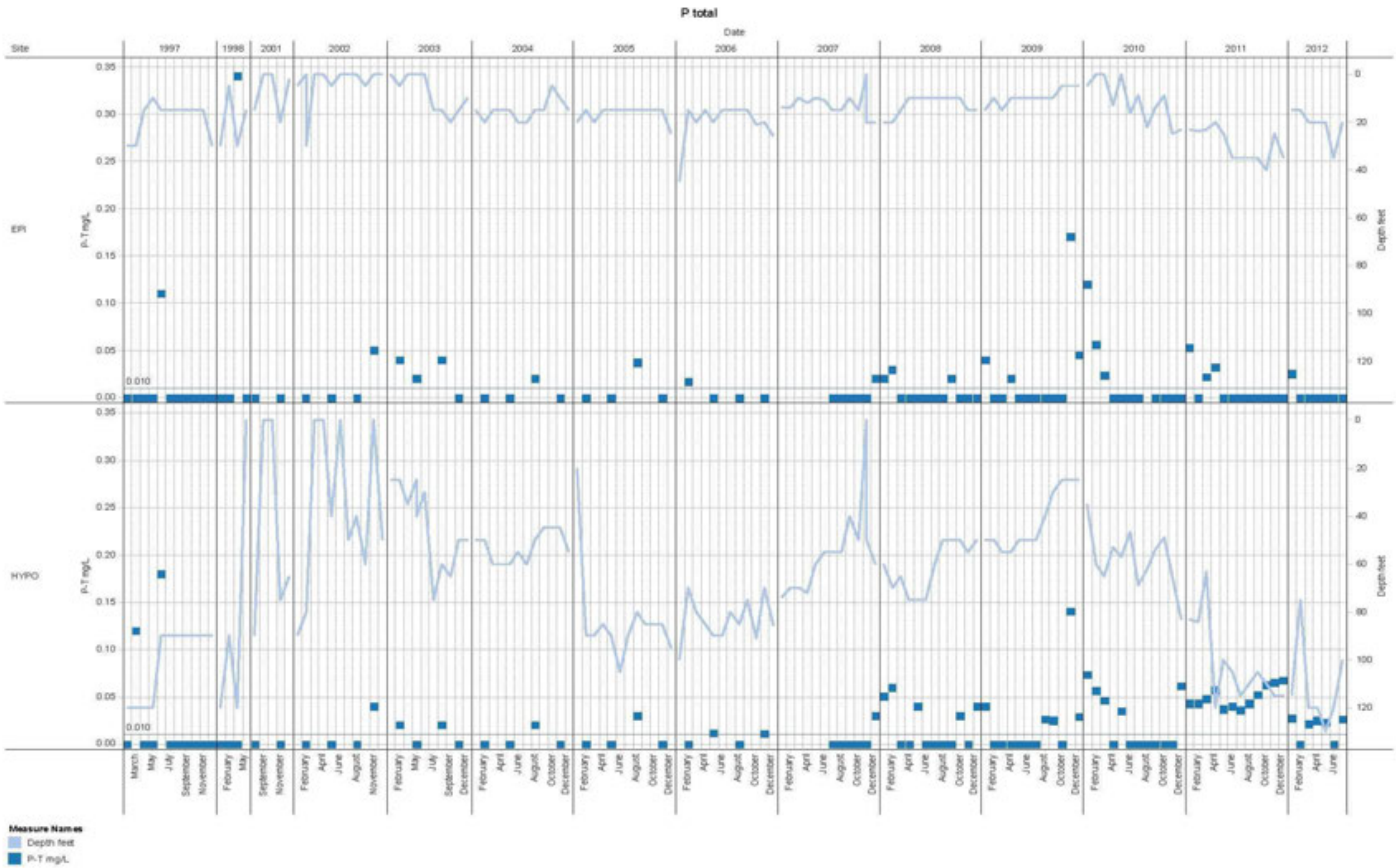

Hg_Turb Profiles
Date
Site
2008
2009
2010
2011
Elev 770
Elev 760
Elev 750
Elev 740
Elev 730
Elev 720
Elev 710
Elev 700
Elev 690
Elev 680
Elev 670
Elev 660
Hg ug/L
Turb NTU
January
February
March
April
May
June
July
August
Septemb.
October
November
December
Measure Names
Hg ug/L
Turb NTU

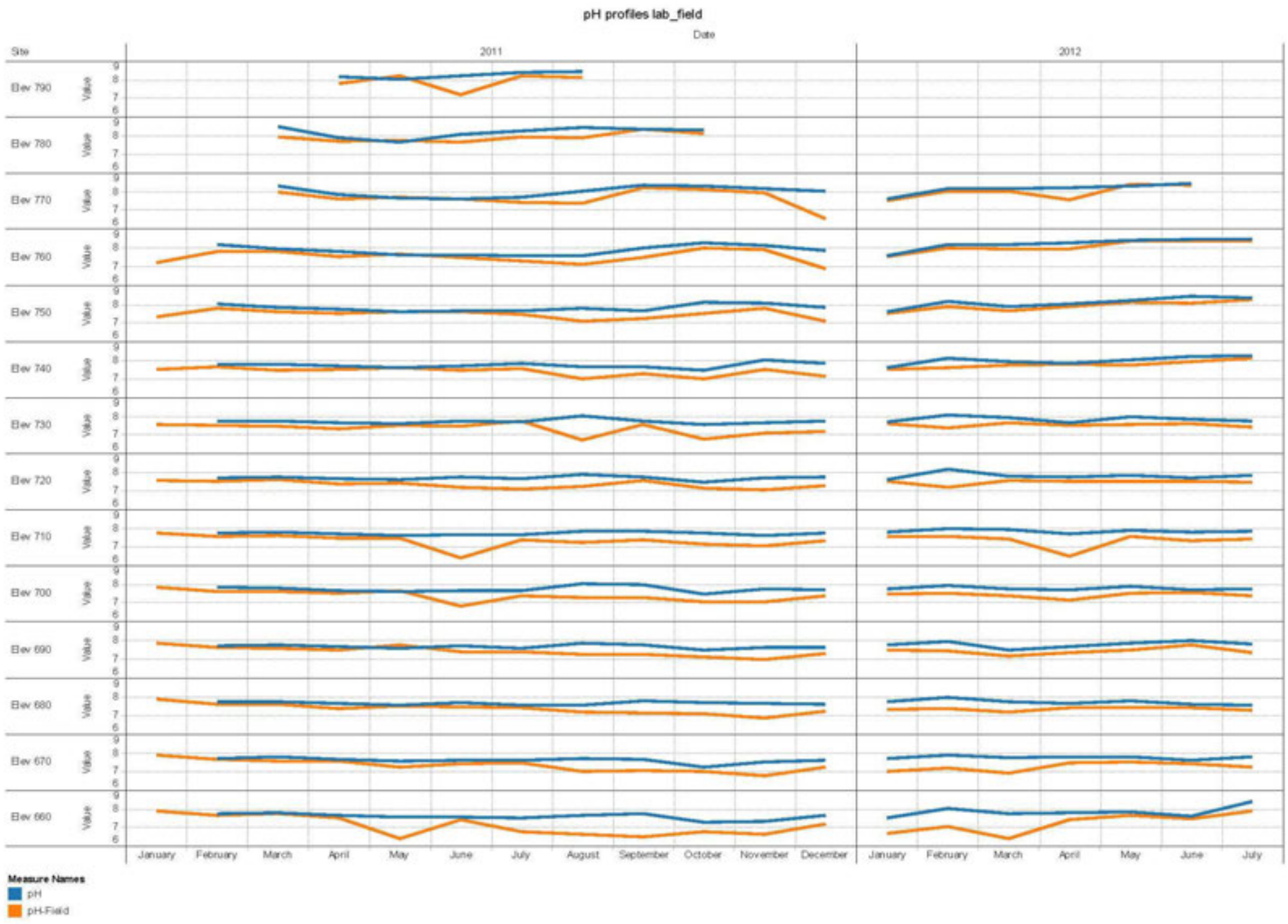

Mn Epi, Hypo
Date
Site
1993 19.. 1996 1997 1998 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012
EPI
HYPO
Mn ug/L
Depth feet
Analyte
Depth feet
Mn ug/L

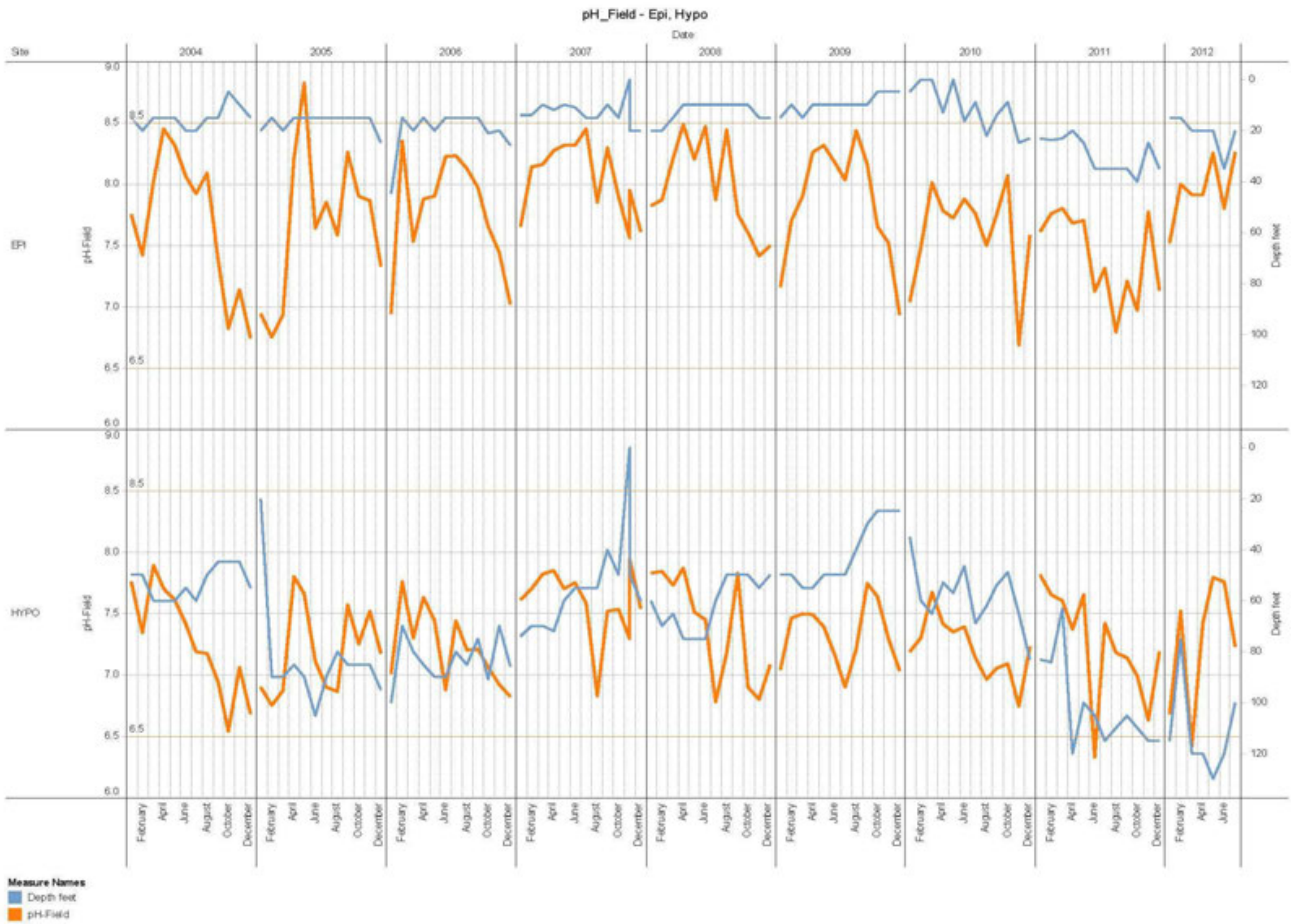

Mn Profiles
Date
Site
2006
2007
2008
2009
2010
2011
Elev 790
Elev 780
Elev 770
Elev 760
Elev 750
Elev 740
Elev 730
Elev 720
Elev 710
Elev 700
Elev 690
Elev 680
Elev 670
Elev 660
Mn ug/L
500
0
50
Analyte
Mn ug/L

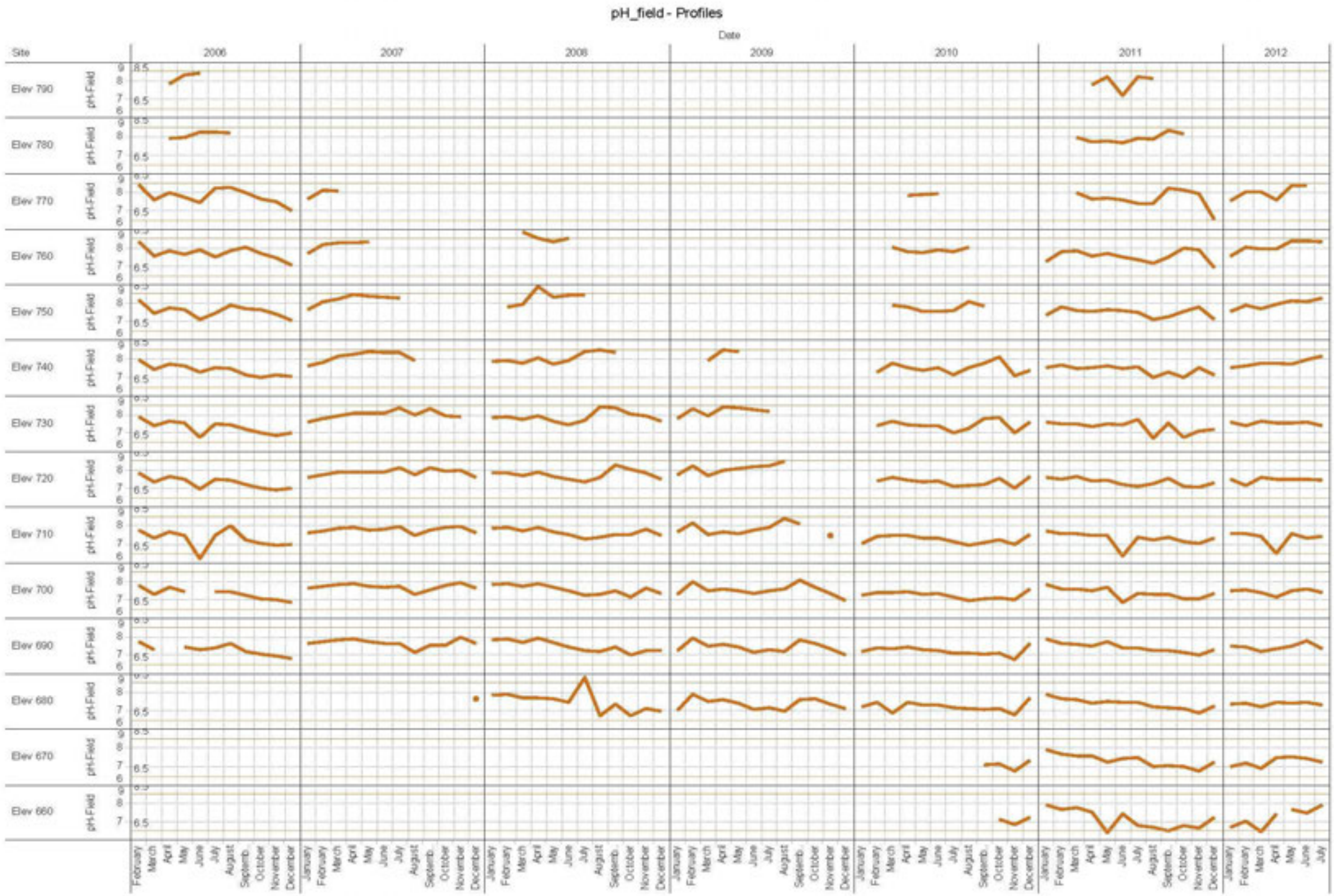

Mn vs Depth
Date
Year of Date
January
February
March
April
May
June
July
August
September
October
November
December
2006
2007
2008
2009
2010
2011
2012
Mn ug/L
0
200
400
600
800
0
50
100
150
Depth feet
Measure Names
Mn ug/L

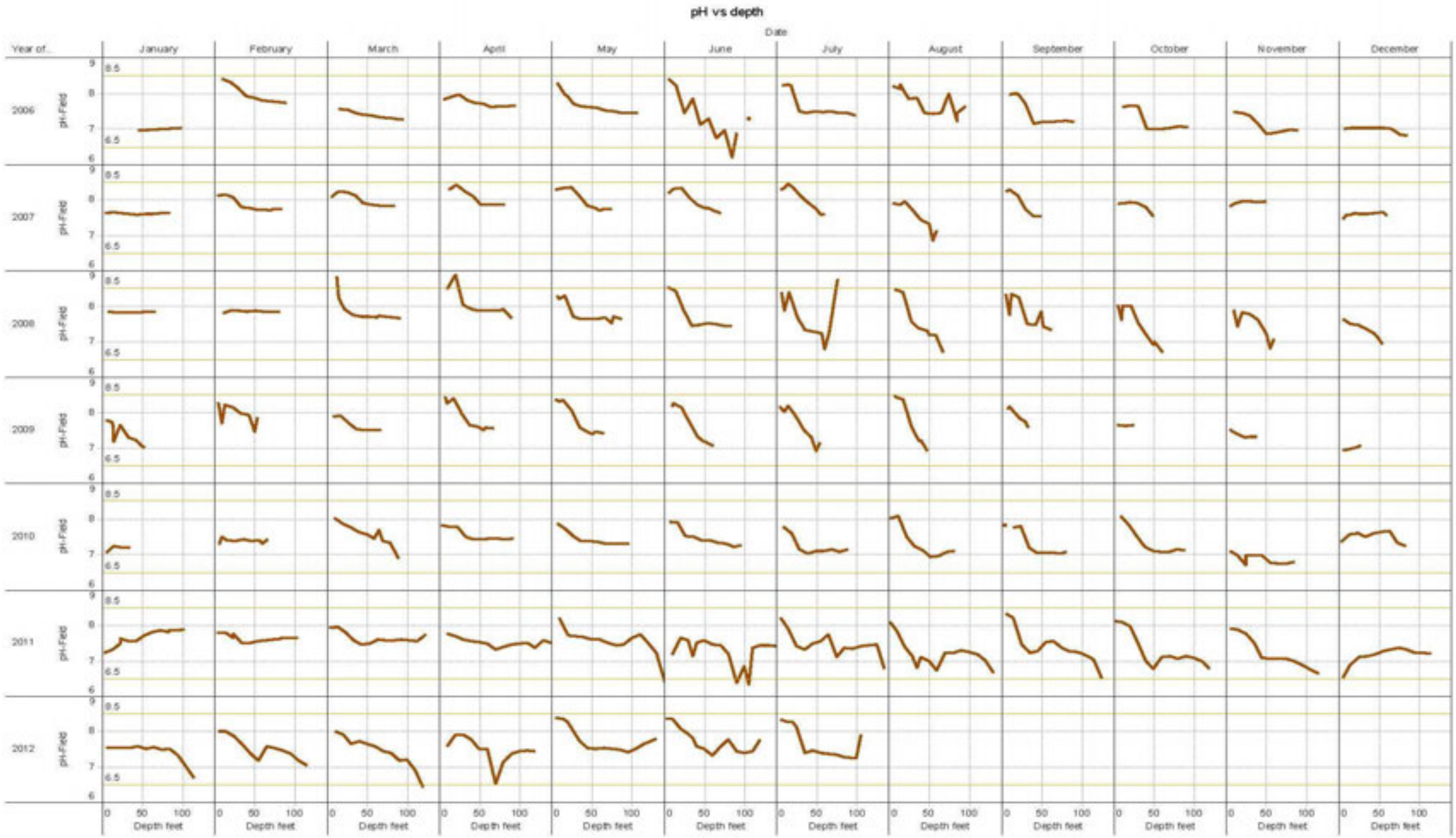

NO3, NO2
Date
Site
EPI
HYPO
NO3-N ug/L
NO2-N ug/L
1993
1996
1997
1998
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Measure Names
NO2-N ug/L
NO3-N ug/L

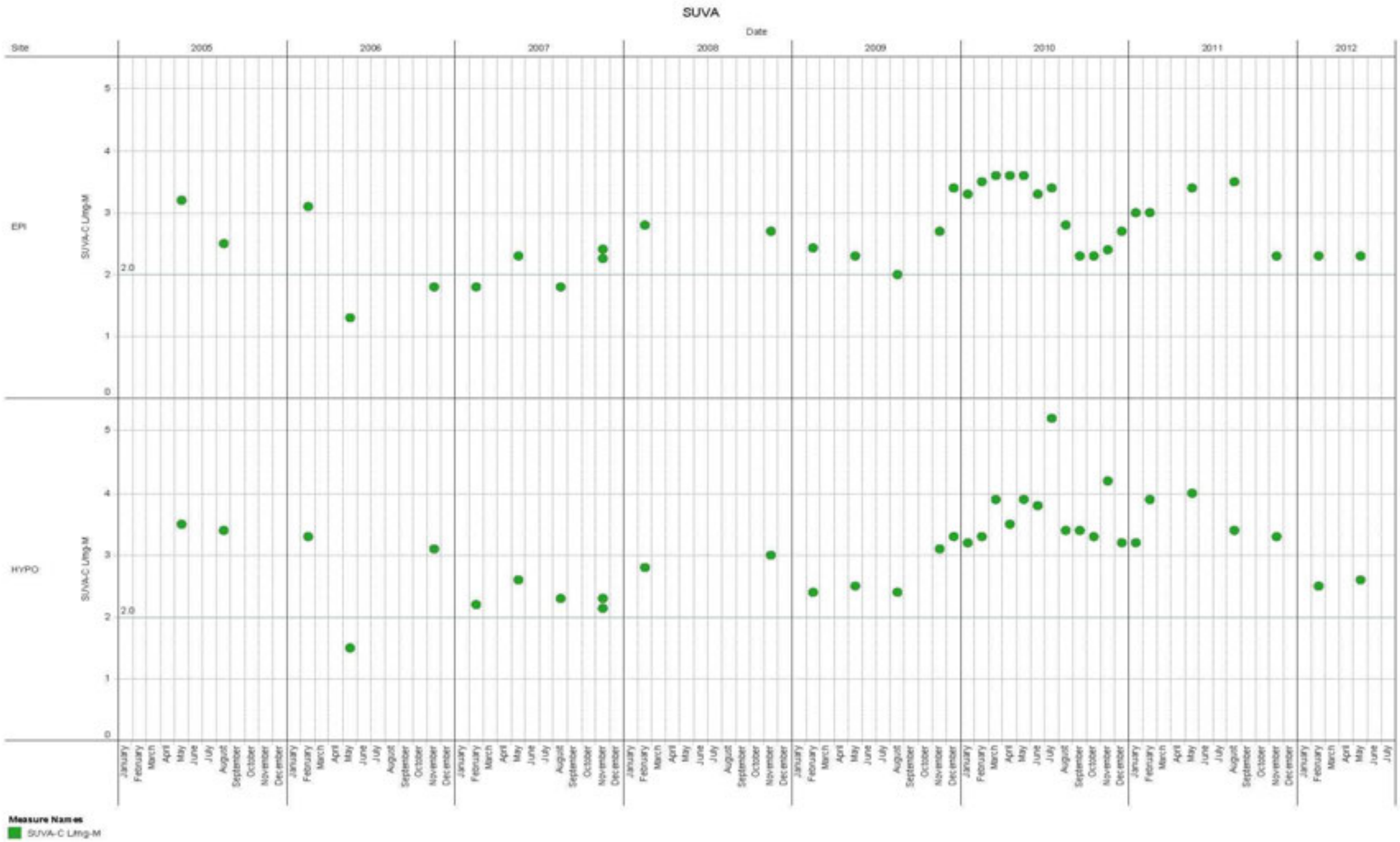

P total
Date
Site
1997
1998
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
EPI
HYPO
P-T mg/L
Depth feet
0.010
Measure Names
Depth feet
P-T mg/L

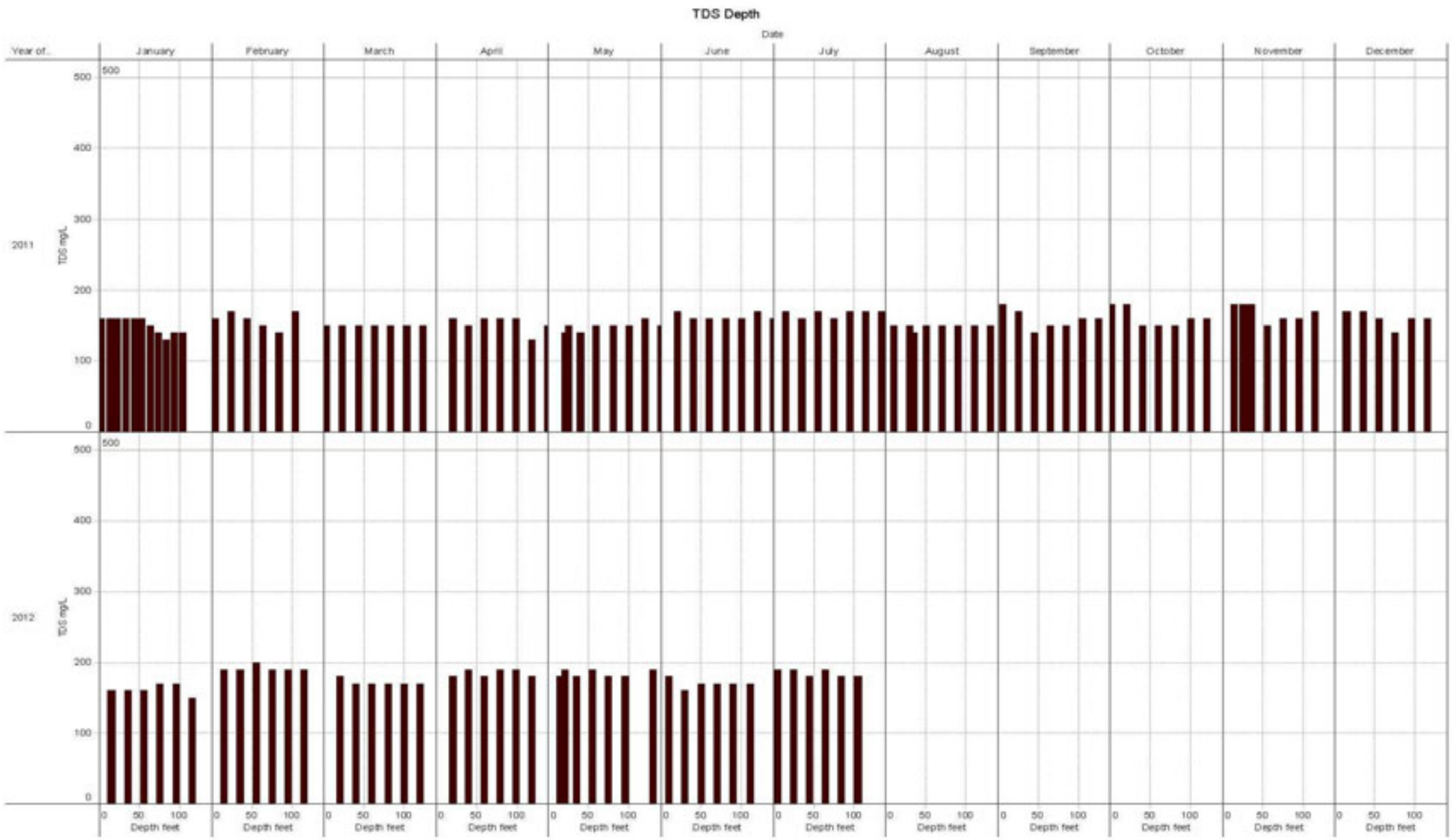

pH profiles lab_field
Date
Site
2011
2012
Elev 790
Elev 780
Elev 770
Elev 760
Elev 750
Elev 740
Elev 730
Elev 720
Elev 710
Elev 700
Elev 690
Elev 680
Elev 670
Elev 660
Value
January
February
March
April
May
June
July
August
September
October
November
December
Measure Names
pH
pH-Field

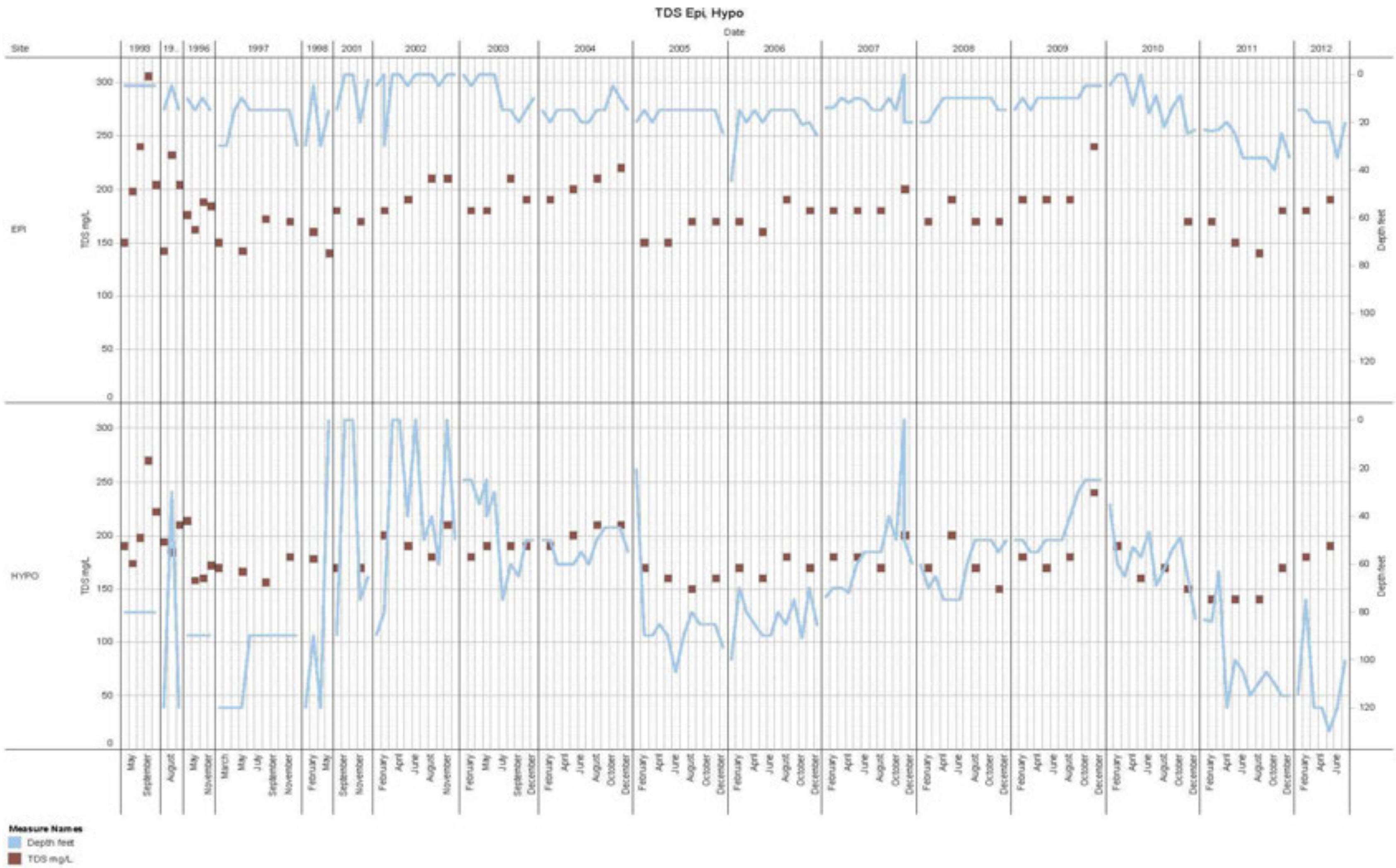

pH_Field - Epi, Hypo
Date
Site
2004
2005
2006
2007
2008
2009
2010
2011
2012
EPI
HYPO
pH-Field
Depth feet
February
April
June
August
October
December
Measure Names
Depth feet
pH-Field

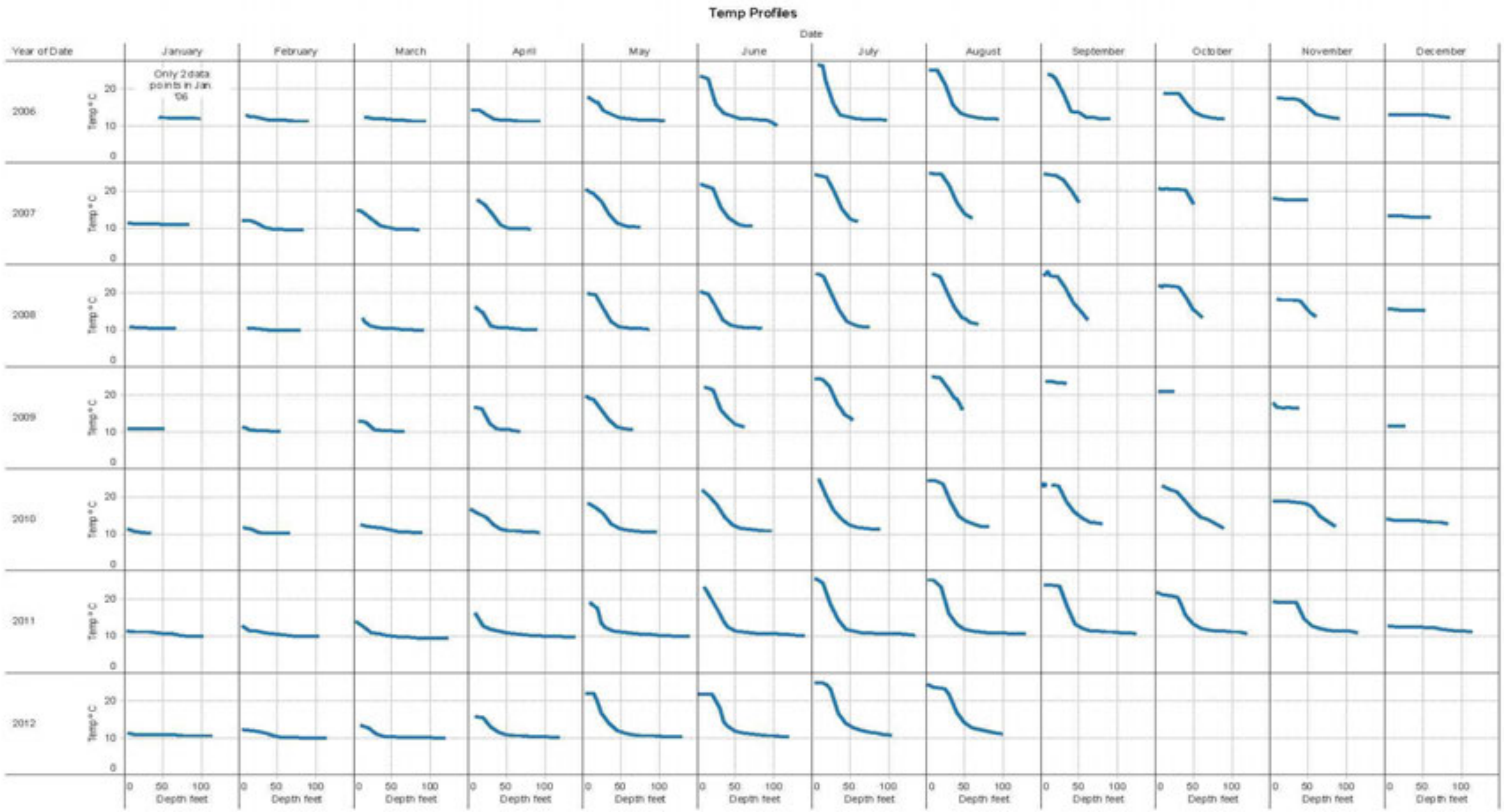

pH_field - Profiles
Date
Site
2006
2007
2008
2009
2010
2011
2012
Elev 790
Elev 780
Elev 770
Elev 760
Elev 750
Elev 740
Elev 730
Elev 720
Elev 710
Elev 700
Elev 690
Elev 680
Elev 670
Elev 660
pH-Field

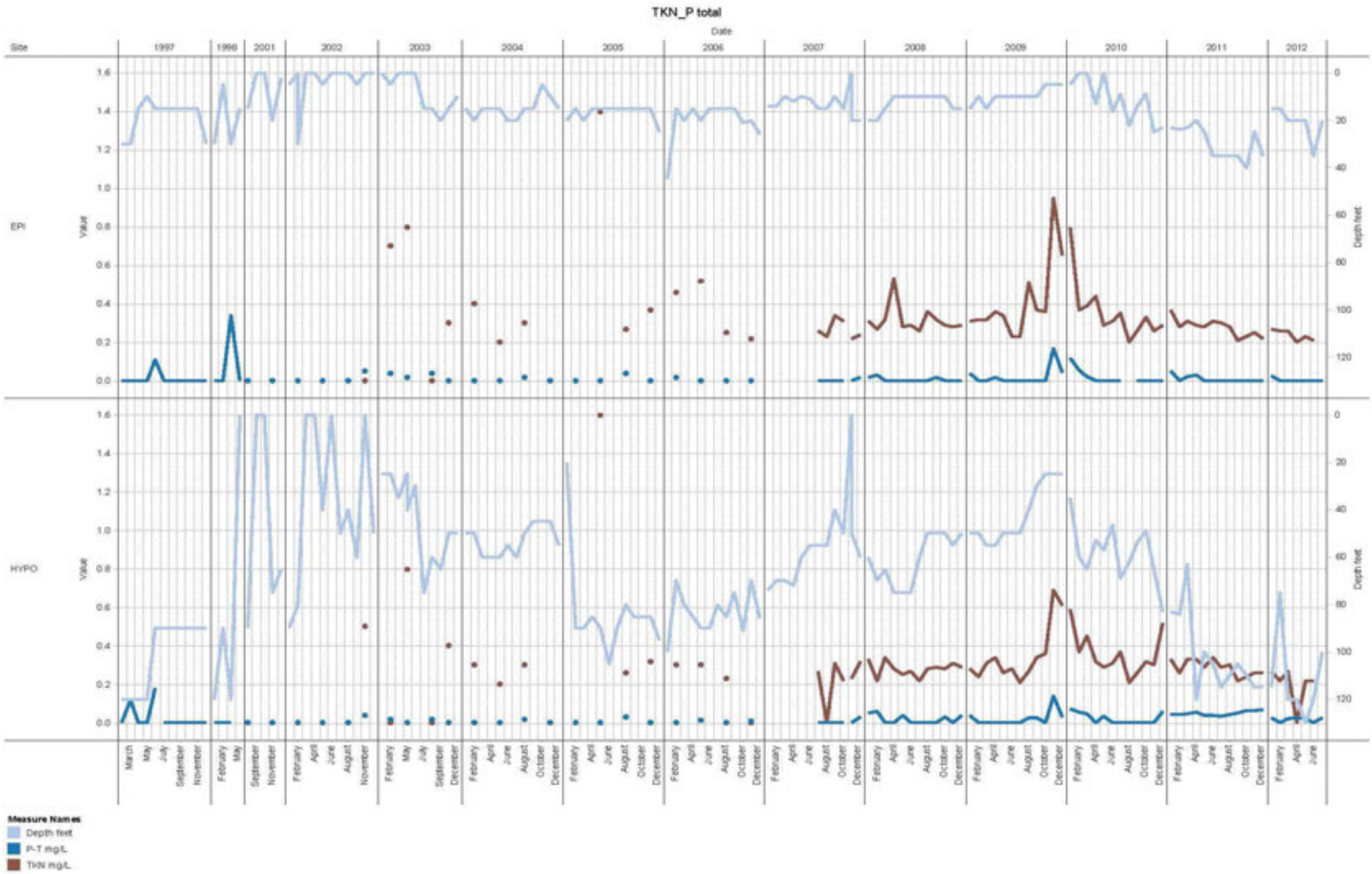

pH vs depth
Date
Year of...
January
February
March
April
May
June
July
August
September
October
November
December
2006
2007
2008
2009
2010
2011
2012
pH-Field
Depth feet

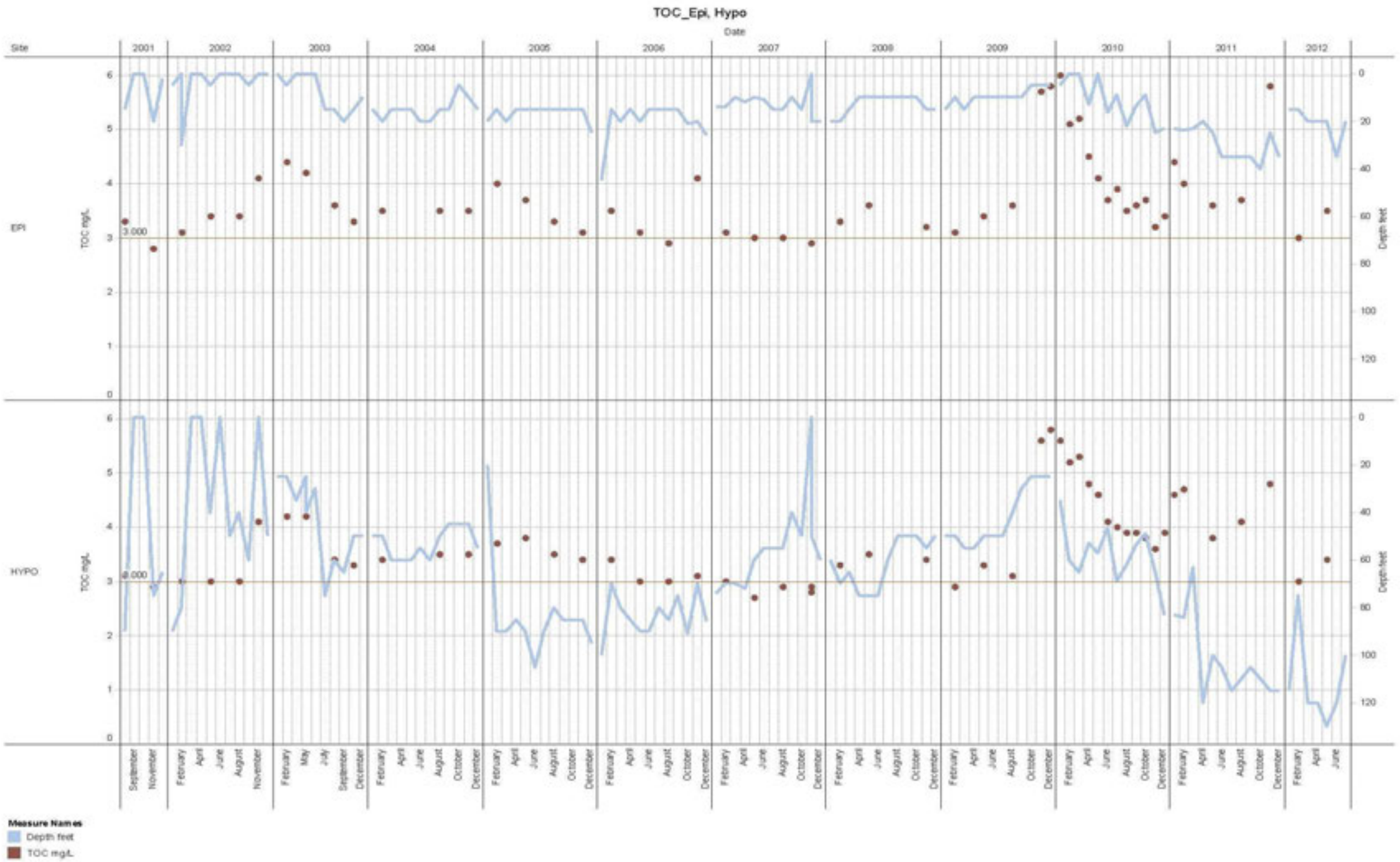

SUVA
Date
Site
2005
2006
2007
2008
2009
2010
2011
2012
EPI
HYPO
SUVA-C L/mg-M
Measure Names
SUVA-C L/mg-M

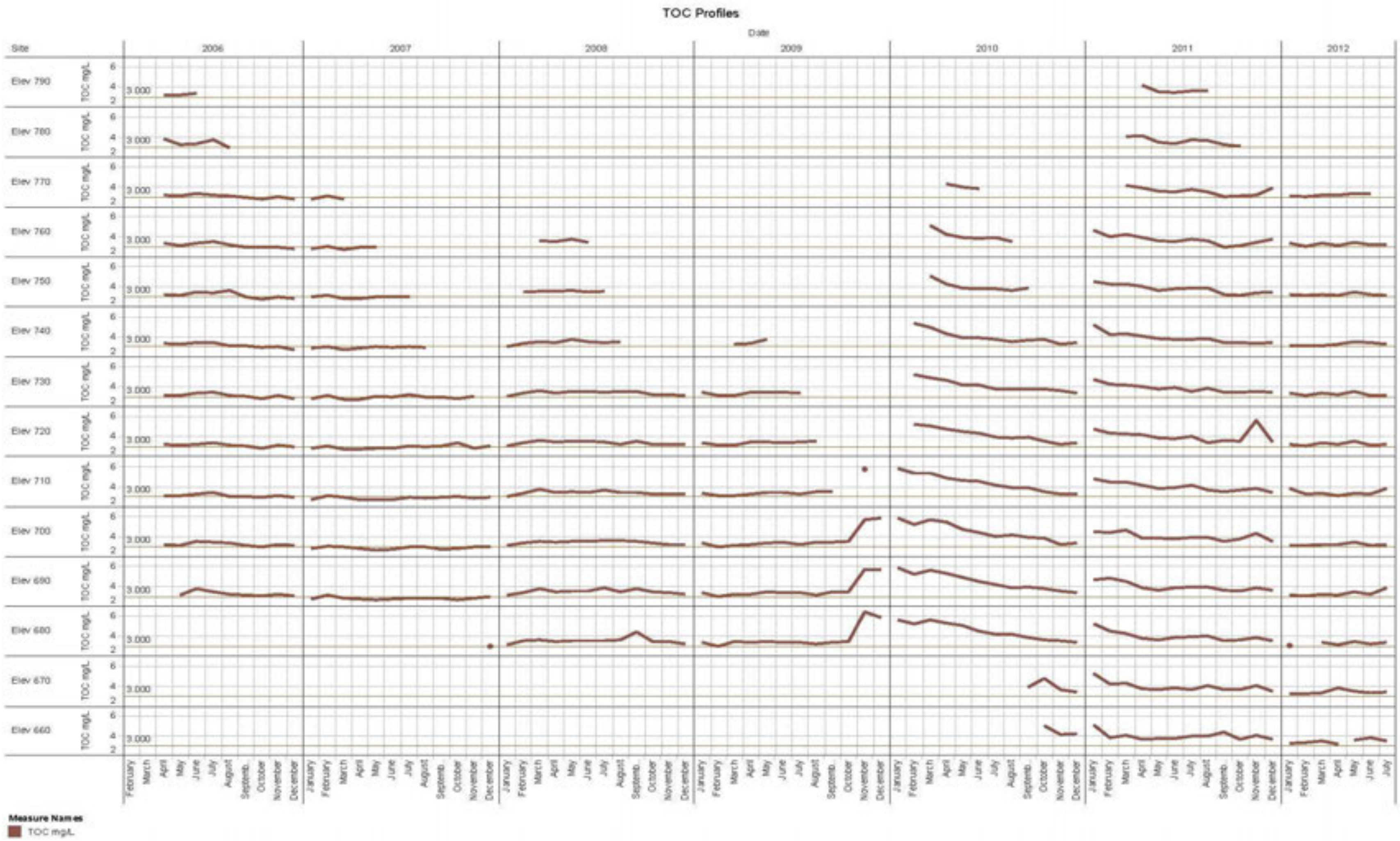

TDS Depth
Date
Year of..
January
February
March
April
May
June
July
August
September
October
November
December
2011
2012
TDS mg/L
500
400
300
200
100
0
0 50 100
Depth feet

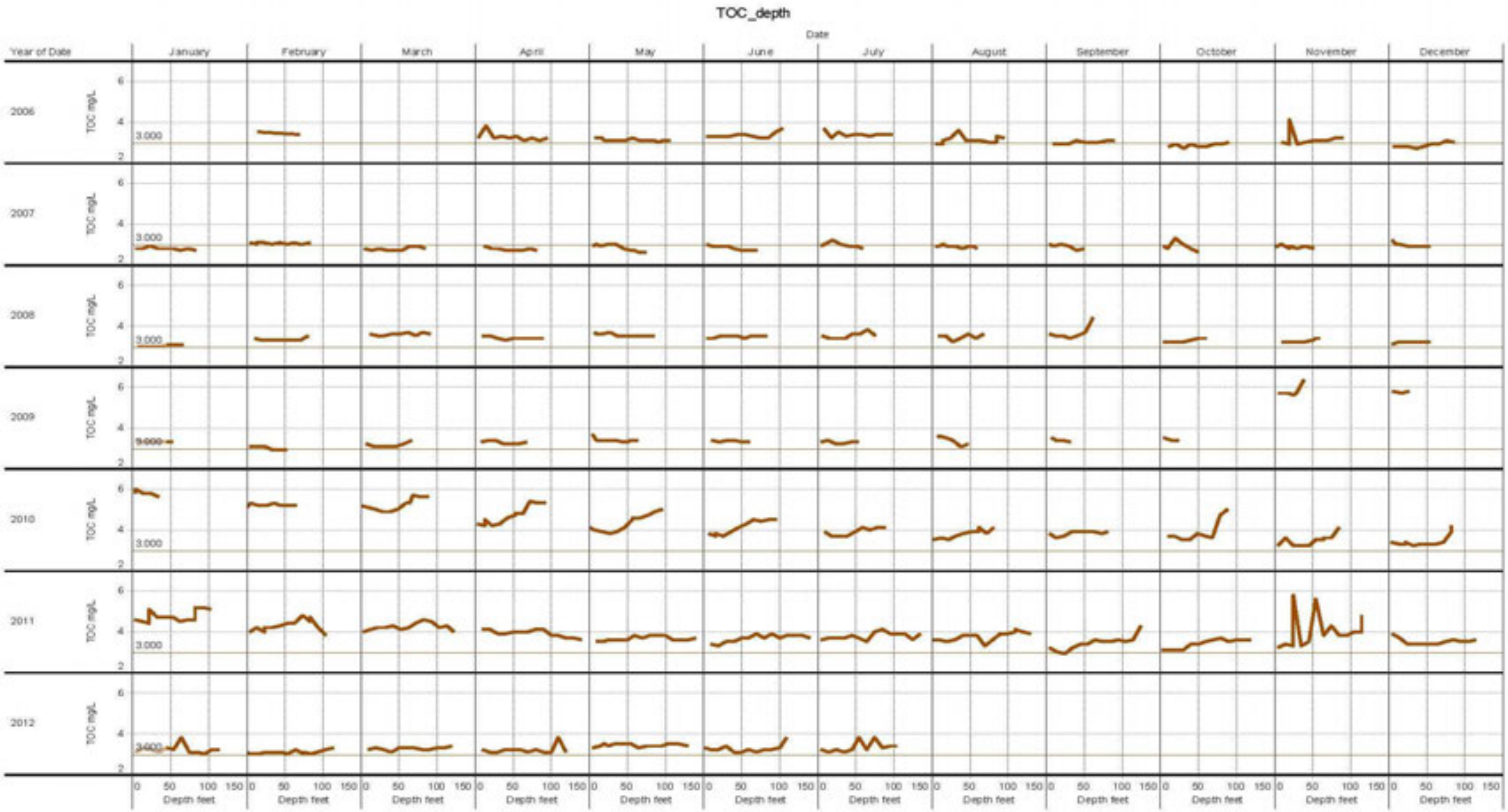

TDS Epi, Hypo
Date
Site
EPI
HYPO
TDS mg/L
Depth feet
Measure Names
Depth feet
TDS mg/L

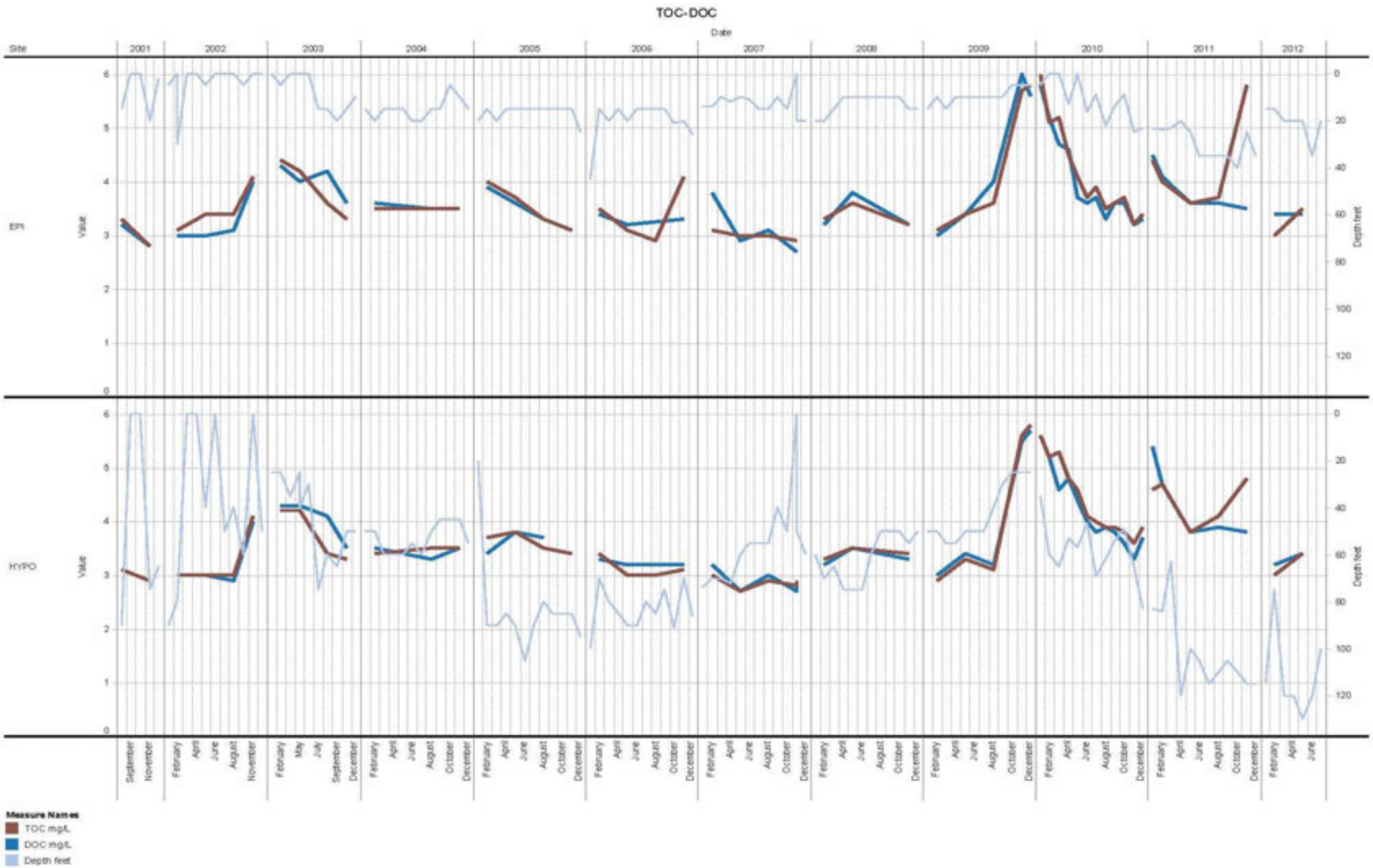

Temp Profiles
Date
Year of Date
January
February
March
April
May
June
July
August
September
October
November
December
Only 2 data points in Jan '06
2006
2007
2008
2009
2010
2011
2012
Temp °C
Depth feet

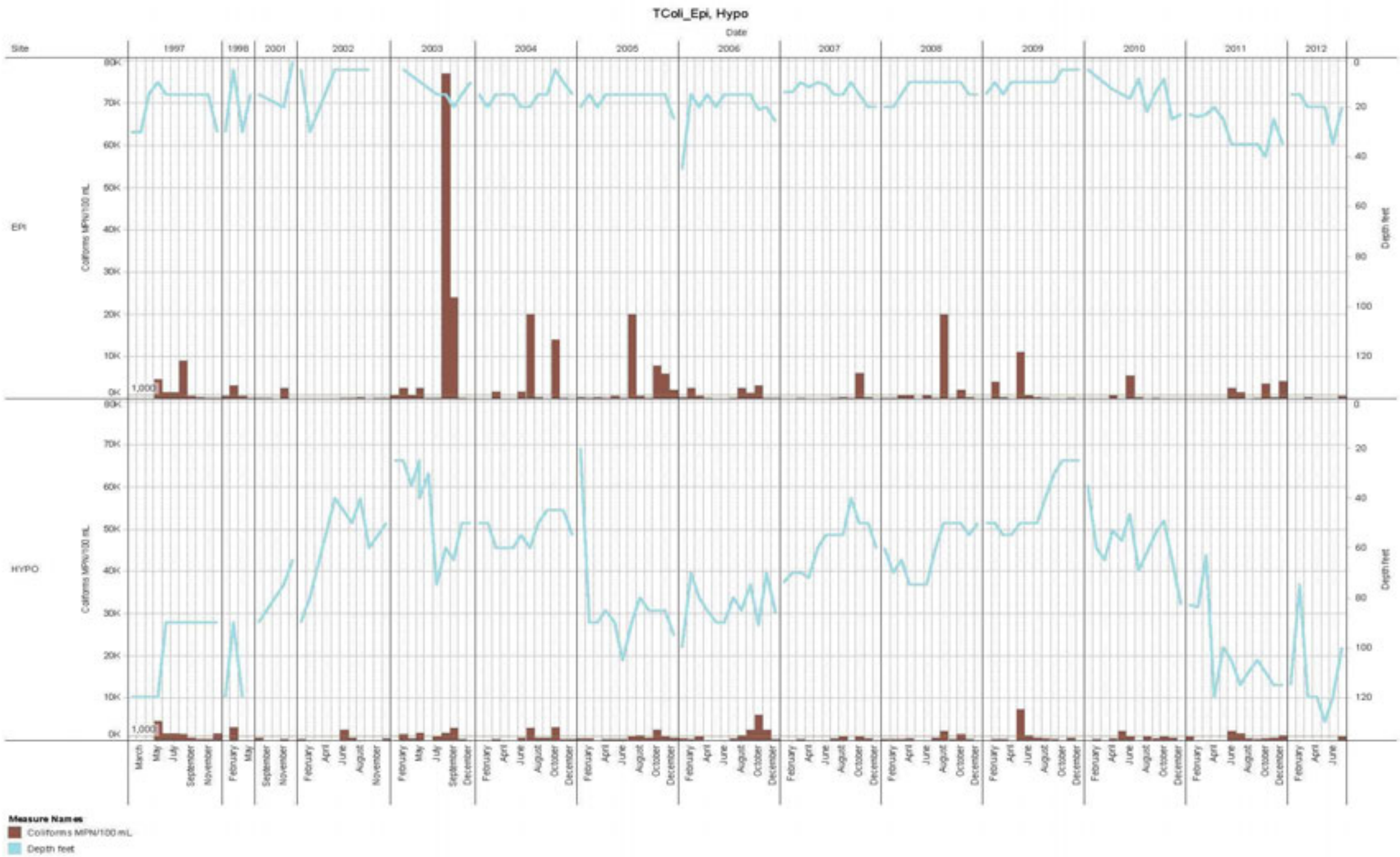

TKN_P total
Date
Site
1997
1998
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
EPI
HYPO
Value
Depth feet
Measure Names
Depth feet
P-T mg/L
TKN mg/L

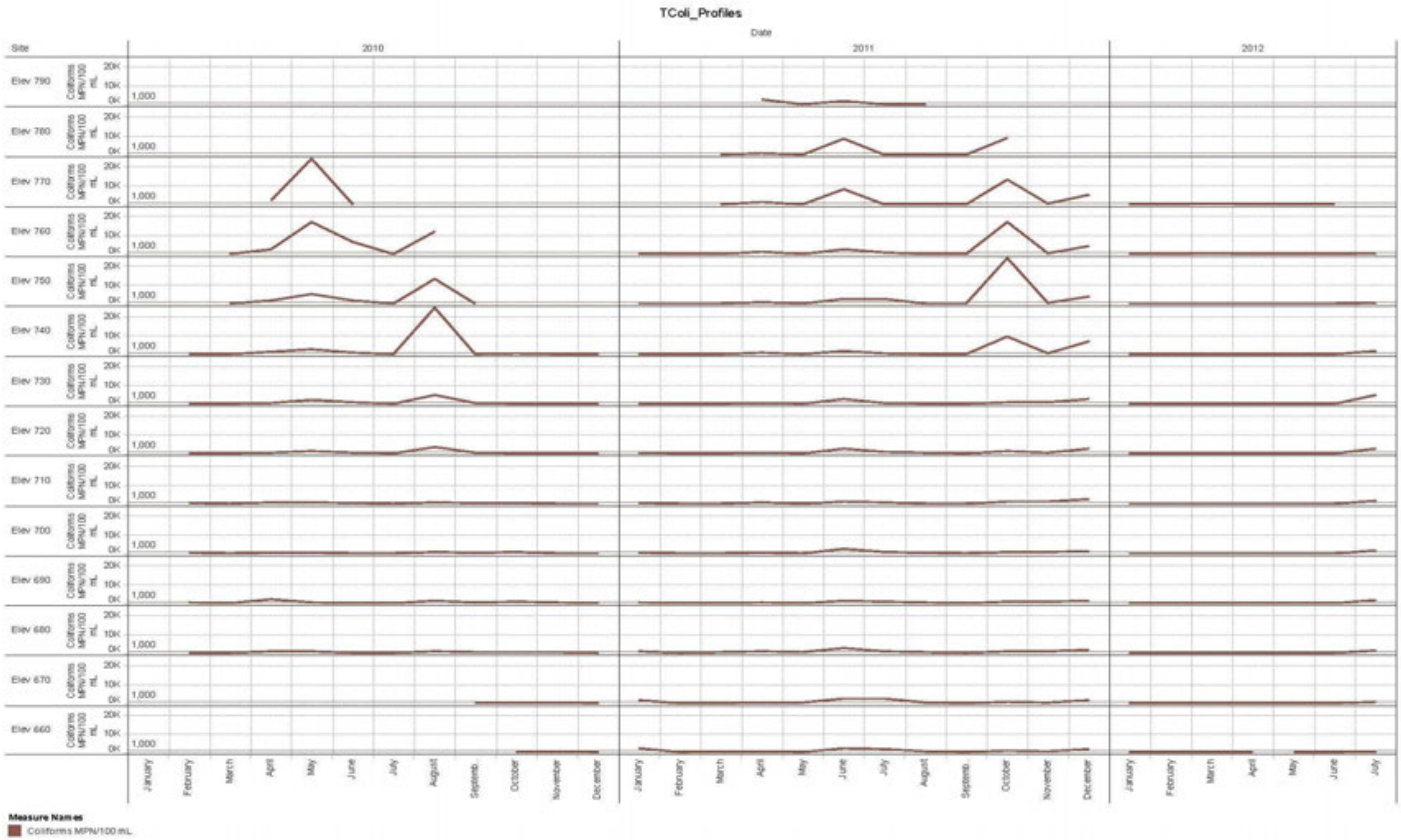

TOC_Epi, Hypo
Date
Site
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
EPI
HYPO
TOC mg/L
Depth feet
3.000
Measure Names
Depth feet
TOC mg/L

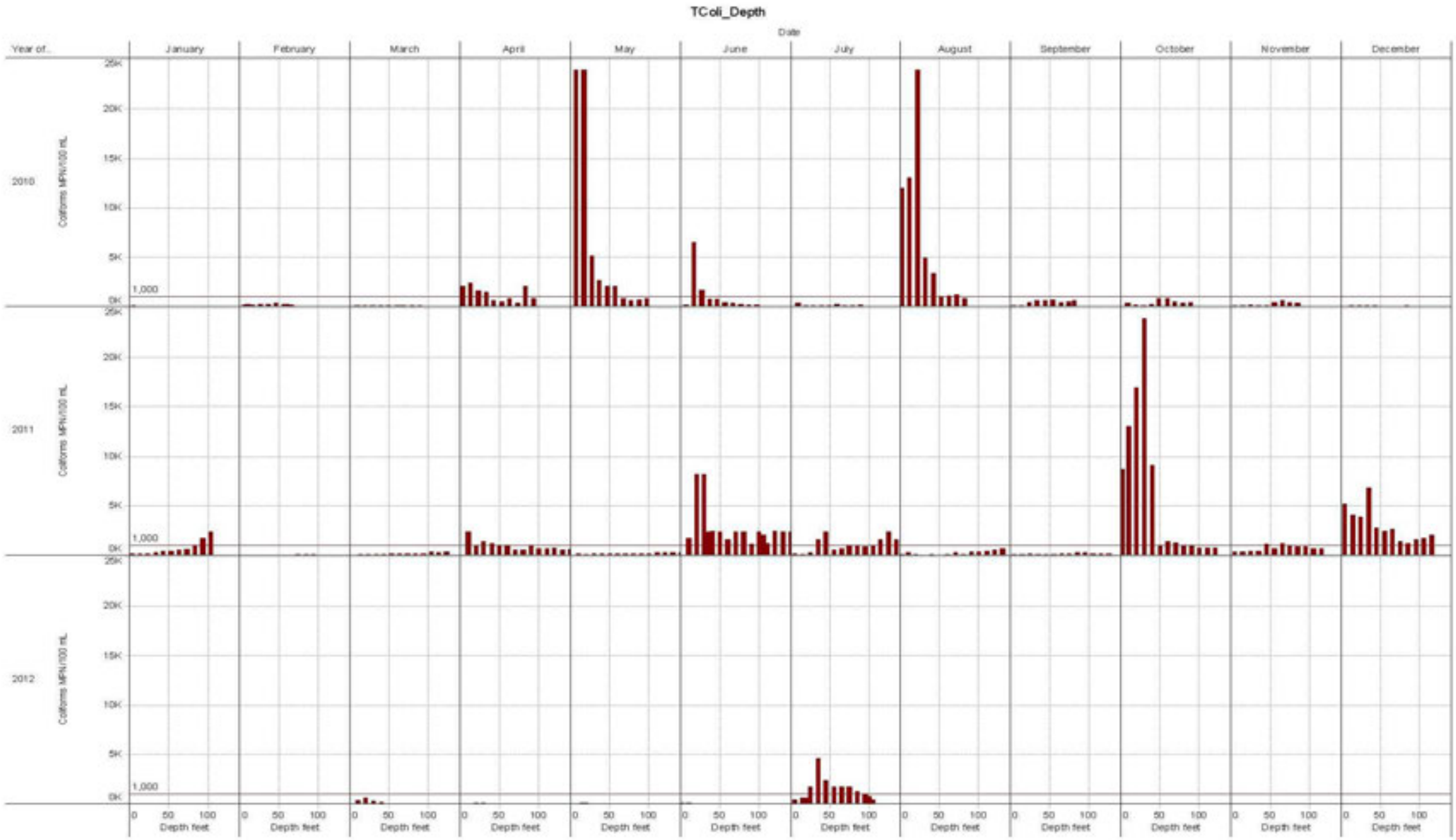

TOC Profiles
Date
Site
2006
2007
2008
2009
2010
2011
2012
Elev 790
Elev 780
Elev 770
Elev 760
Elev 750
Elev 740
Elev 730
Elev 720
Elev 710
Elev 700
Elev 690
Elev 680
Elev 670
Elev 660
TOC mg/L
3.000
Measure Names
TOC mg/L

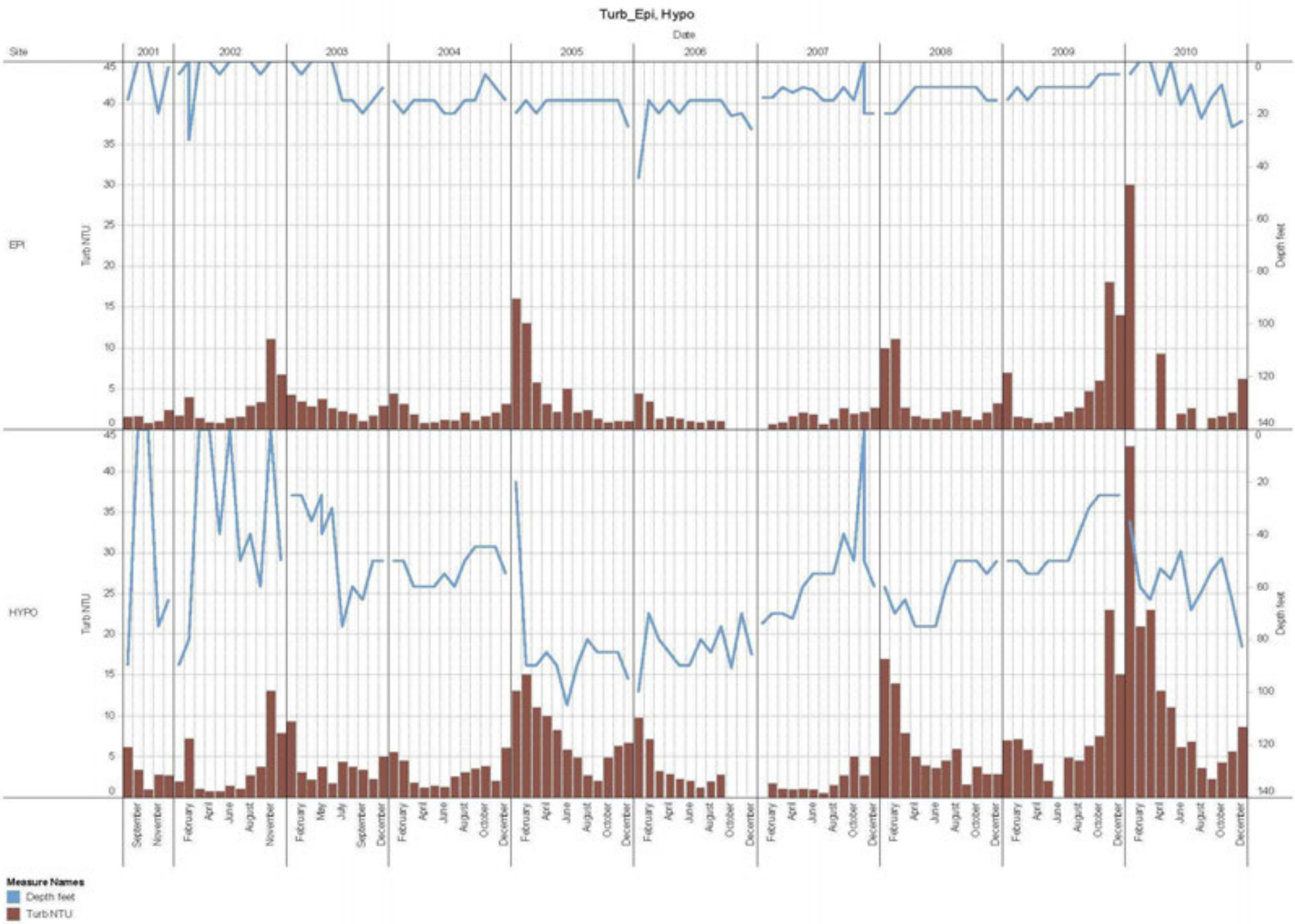

TOC_depth
Date
Year of Date
January
February
March
April
May
June
July
August
September
October
November
December
2006
2007
2008
2009
2010
2011
2012
TOC mg/L
3.000
Depth feet

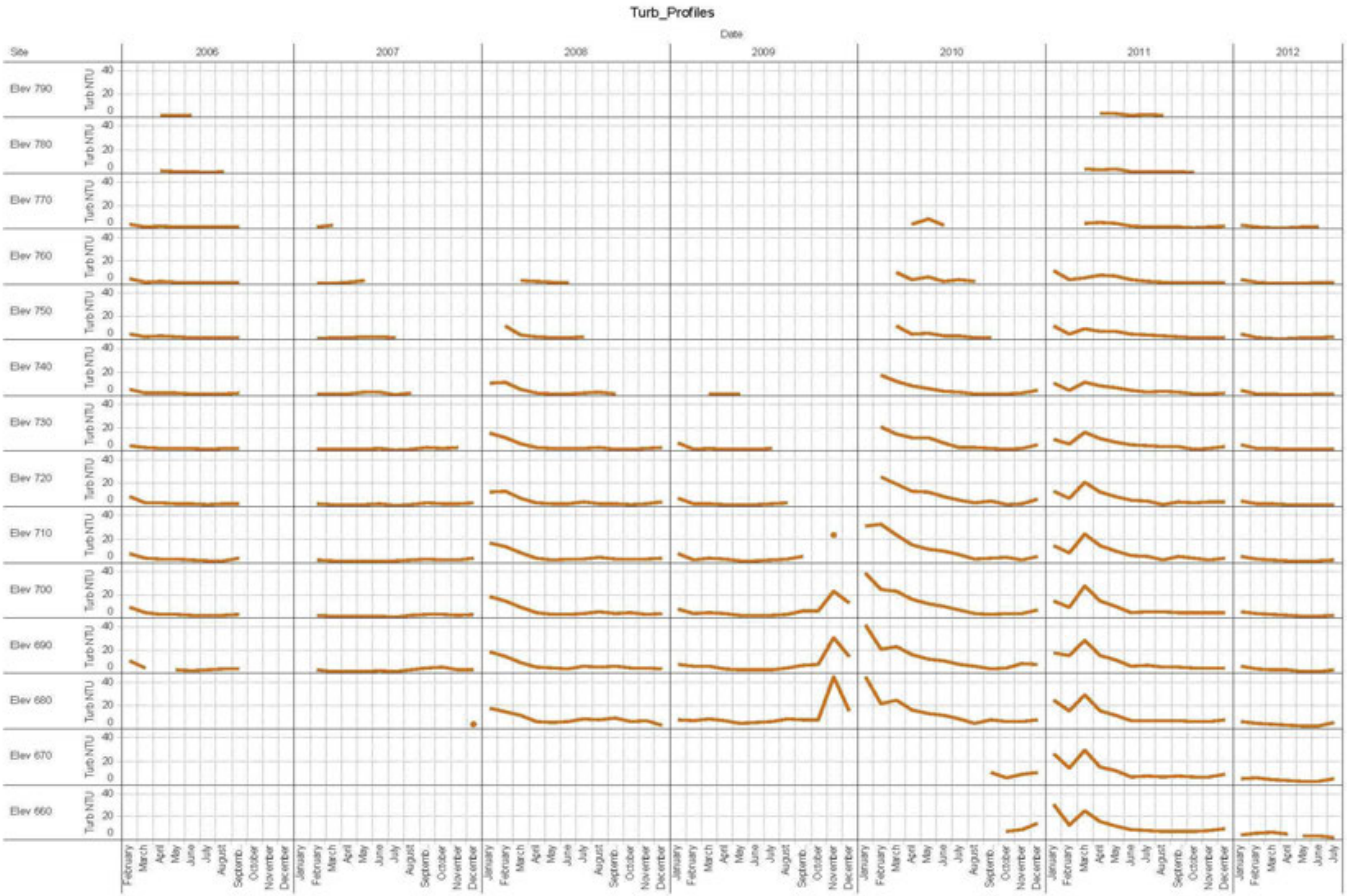

TOC-DOC
Date
Site
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
EPI
HYPO
Value
Depth feet
Measure Names
TOC mg/L
DOC mg/L
Depth feet

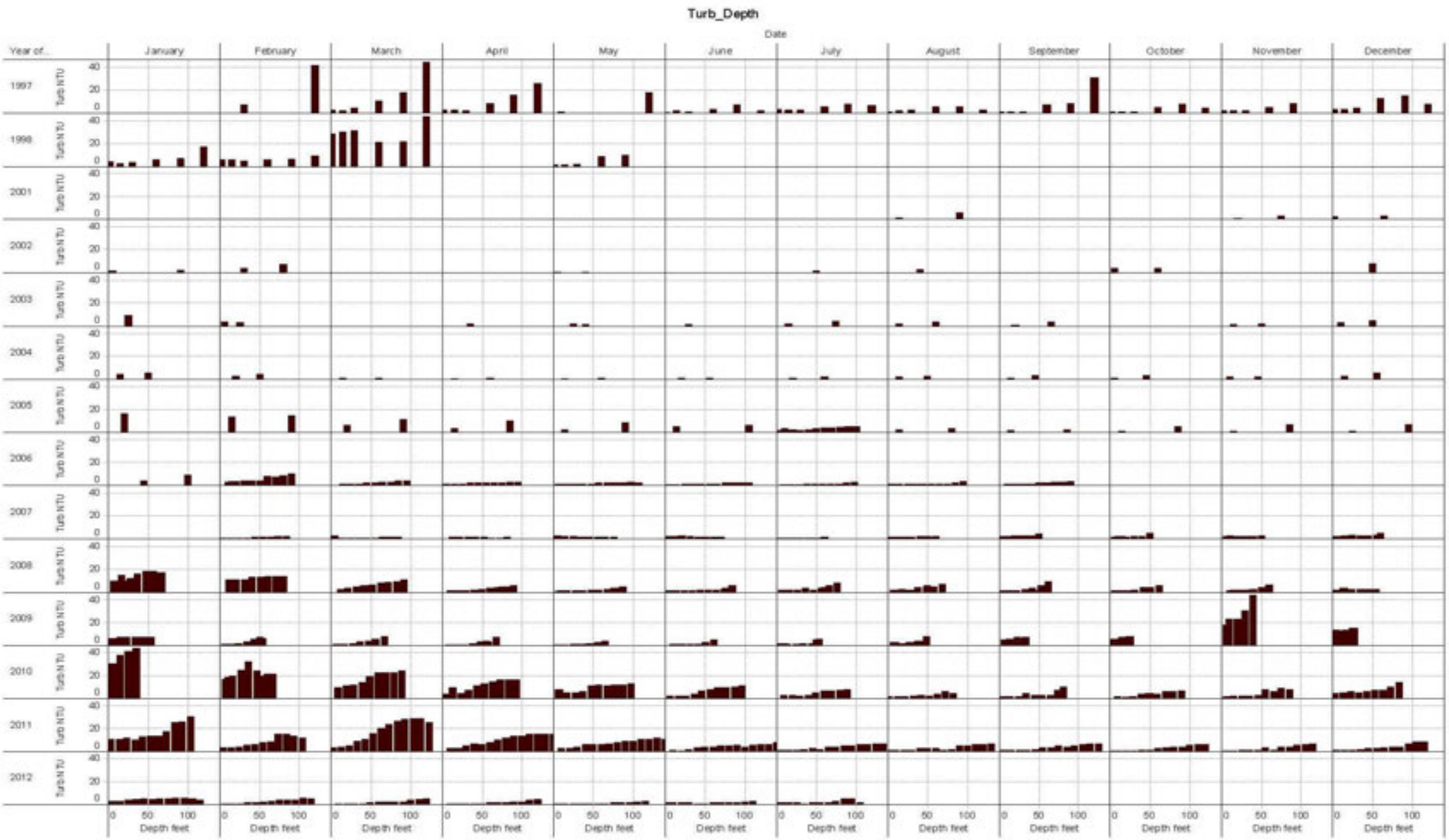

TColi_Epi, Hypo
Date
Site
1997
1998
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
EPI
HYPO
Coliforms MPN/100 mL
Depth feet
Measure Names
Coliforms MPN/100 mL
Depth feet


TColi_Profiles
Date
Site
2010
2011
2012
Elev 790
Elev 780
Elev 770
Elev 760
Elev 750
Elev 740
Elev 730
Elev 720
Elev 710
Elev 700
Elev 690
Elev 680
Elev 670
Elev 660
Coliforms MPN/100 mL
20K
10K
0K
1,000
January
February
March
April
May
June
July
August
Septemb..
October
November
December
Measure Names
Coliforms MPN/100 mL


TColi_Depth
Date
Year of..
January
February
March
April
May
June
July
August
September
October
November
December
2010
2011
2012
Coliforms MPN/100 mL
25K
20K
15K
10K
5K
1,000
0K
0
50
100
Depth feet


Turb_Epi, Hypo
Date
Site
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
EPI
HYPO
Turb NTU
Depth feet
Measure Names
Depth feet
Turb NTU


Turb_Profiles
Date
Site
2006
2007
2008
2009
2010
2011
2012
Elev 790
Elev 780
Elev 770
Elev 760
Elev 750
Elev 740
Elev 730
Elev 720
Elev 710
Elev 700
Elev 690
Elev 680
Elev 670
Elev 660
Turb NTU
40
20
0


Turb_Depth
Date
Year of...
January
February
March
April
May
June
July
August
September
October
November
December
1997
1998
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Turb NTU
0
20
40
0
50
100
Depth feet