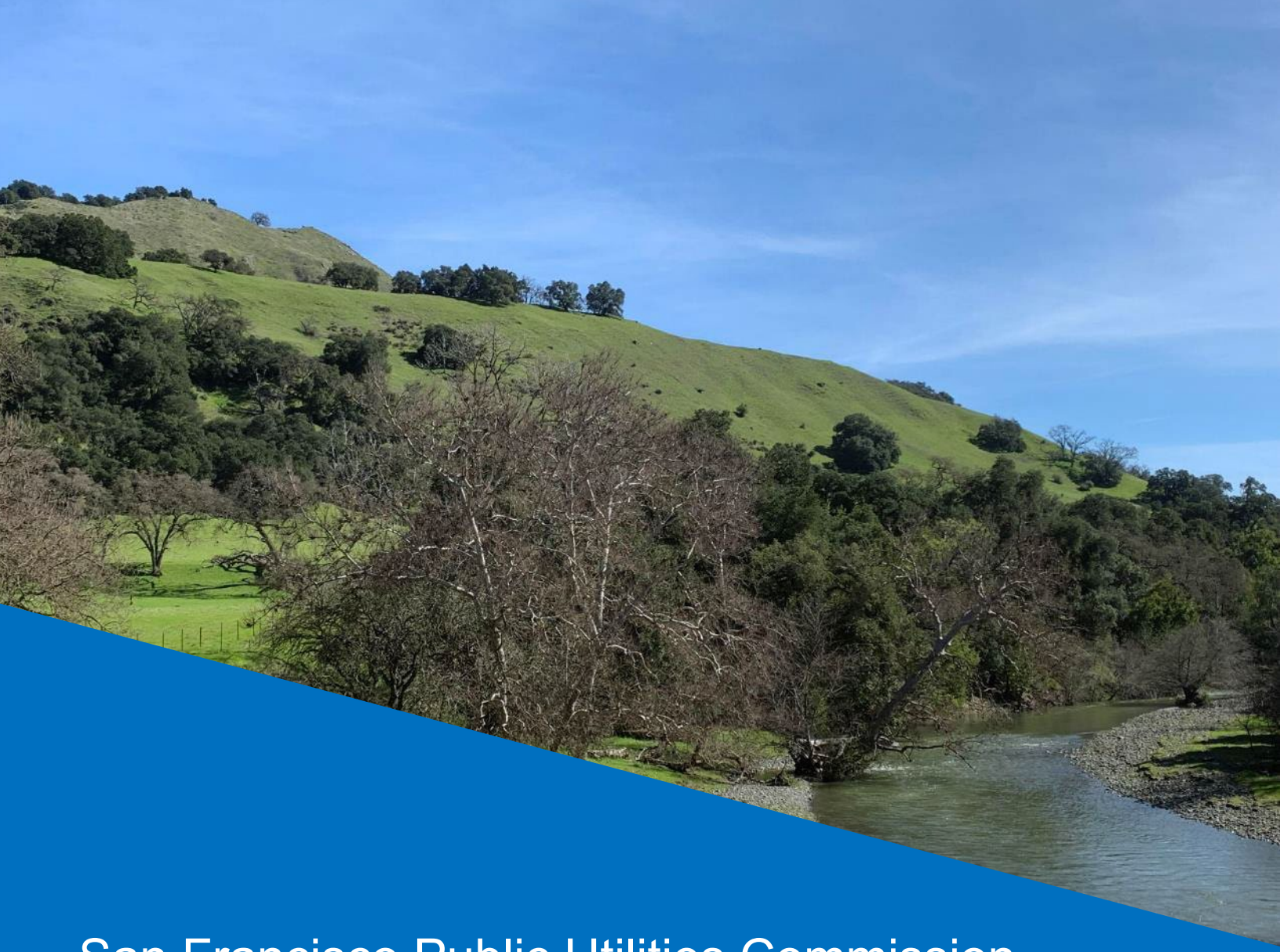


San Francisco Public Utilities Commission
Alameda Creek Watershed
Rangeland Management Plan
Alameda and Santa Clara Counties, California

San Francisco Public Utilities Commission

March 2026

Table of Contents

Executive Summary iv
1. Introduction 1
    1.1 Purpose 1
    1.2 Goals of the RMP 2
    1.3 Guiding Plans and Policies 2
    1.4 Lands Covered by the RMP 3
    1.5 Easements 4
    1.6 Organization of RMP 5
2. Goals, Objectives, and Strategies 6
    2.1 Goal 1: Protect and improve water quality. 6
    2.2 Goal 2: Preserve and enhance the health of ecological systems. 6
    2.3 Goal 3: Adaptively manage the RMP lands based on evolving information and conditions. 9
    2.4 Goal 4: Provide a basis for consistent management of the RMP lands. 9
    2.5 Goal 5: Support economically and ecologically sustainable grazing operations. 9
    2.6 Goal 6: Reduce the threat of wildland fire by decreasing fuel densities on RMP lands. 10
3. Environmental Conditions and Grazing Considerations 11
    3.1 Topography, Climate, and Hydrology 11
    3.2 Geology and Soils 11
    3.3 Vegetation Communities and Wildlife Habitat 12
    3.4 Special-Status Species 18
    3.5 Non-Native Invasive Plant and Nuisance Wildlife Species 26
4. Rangeland Management Program 30
    4.1 AUM-Based Leases 30
    4.2 Grazing Capacity 30
    4.3 Native Vegetation Goals 33
    4.4 Non-Native Invasive Plant and Nuisance Wildlife Control 34
    4.5 Grazing Infrastructure 34
    4.6 Rangeland Monitoring Program 37
    4.7 Grazing Unit Management Plans 38
    4.8 Adaptive Management 38
    4.9 Plan Implementation Roles and Responsibilities 38
References 42

Tables

Table 1-1. SFPUC Alameda Creek Watershed Grazing Leases 3
Table 1-2. BHR Sites in RMP Lands 4
Table 3-1. Vegetation Community Composition and Wildlife Habitat within the RMP Lands 13
Table 3-2. Special-Status Species in the SFPUC Alameda Creek Watershed 19
Table 4-1. Forage Productivity Reduction Factor for Each Vegetation Community Type 32
Table 4-2. Estimated Base Stocking Rates 33
Table 4-3. Summary Inventory of Grazing Features Assessed from 2012 to 2015 35

Figures

Figure 1. SFPUC Alameda Creek Watershed Grazing Unit Overview

Figure 2. Grazing Unit Maps

Acronyms and Abbreviations

°C	degrees Celsius
°F	degrees Fahrenheit
ACCP	Alameda County Conservation Partnership
ACRCD	Alameda County Resource Conservation District
Alameda WMP	Alameda Watershed Management Plan
ATS	Applied Technology and Science
AUM	Animal Unit Month
AUY	Animal Unit Year
BHR	Bioregional Habitat Restoration
BMPs	Best Management Practices
Cal-IPC	California Invasive Plant Council
CCSF	City and County of San Francisco
CDFW	California Department of Fish and Wildlife
CDRP	Calaveras Dam Replacement Project
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CNPS	California Native Plant Society
CRPR	California Rare Plant Rank
CYLE	Cow Year Long Equivalent
DPS	Distinct Population Segment
EBRPD	East Bay Regional Park District
EDRR	Early Detection and Rapid Response
ESU	Evolutionarily Significant Unit
FESA	Federal Endangered Species Act
FR	Federal Register
GIS	Geographic Information System
GPS	Global Positioning System
GRMP	Grazing Resources Management Plan
GUMP	Grazing Unit Management Plan
HACCP	Hazard Analysis and Critical Control Point
IPM	Integrated Pest Management
NNIP	non-native invasive plant
NRCS	Natural Resources Conservation Service
PG&E	Pacific Gas and Electric Company
PPE	personnel protective equipment
RDM	residual dry matter
RMP	Rangeland Management Plan
SCS	USDA Soil Conservation Service
SFPUC	San Francisco Public Utilities Commission
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
WSIP	Water System Improvement Program

Executive Summary

The San Francisco Public Utilities Commission (SFPUC) owns nearly 40,000 acres within the Alameda Creek Watershed that drain to Calaveras and San Antonio reservoirs, which provide drinking water to the Hetch Hetchy Regional Water System. As such, the SFPUC is responsible for managing the watershed to protect, maintain, and enhance source water quality. Grazing has been a central management strategy to cost effectively reduce fire risk on what would otherwise be a high fire risk landscape. As part of the Alameda Watershed Management Plan (Alameda WMP), the SFPUC adopted the 1997 Grazing Resources Management Plan (GRMP), which outlines actions to protect water quality from potential grazing impacts while reducing fire risk. The SFPUC has implemented the GRMP recommendations including but not limited to fencing reservoirs, establishing cattle stocking rates, setting minimum targets for residual dry matter (RDM) in grazed grassland, and limiting the calving period.

This Rangeland Management Plan (RMP) is intended to update and expand upon the GRMP to address new conditions such as additional grazing land acquired by the SFPUC, new listed species, evolving best practices in rangeland management, and current SFPUC policies. A significant new policy is the 2006 Water Enterprise Environmental Stewardship Policy in which the SFPUC commits to proactively managing the watersheds in a manner that maintains the integrity of not just water quality, but also natural resources by restoring habitats for native species and enhancing ecosystem function.

The RMP presents the SFPUC's rangeland management program for livestock grazing applied within the SFPUC-owned and -managed portion of the Alameda Creek watershed. This RMP outlines strategies and recommendations to achieve the following goals:

1. Protect and improve water quality;
2. Preserve and enhance the health of ecological systems;
3. Reduce the threat of wildland fire by decreasing fuel densities;
4. Adaptively manage the RMP lands based on new information and conditions;
5. Provide a basis for consistent management of the RMP lands; and
6. Support an economically and ecologically sustainable grazing operation.

Key management objectives to achieve these goals include the following:

- Maintain sufficient vegetative RDM to protect soil and water quality.
- Minimize negative impacts on sensitive aquatic habitats such as riparian and spring systems.
- Implement rangeland management practices that preserve and protect special-status species and their habitats.
- Maintain or improve native species biodiversity.
- Monitor and control non-native invasive plant and wildlife populations.
- Reduce the risk of introduction or spread of plant diseases, particularly from human activities.
- Reduce sediment sources to riparian habitats associated with road systems and insufficient vegetative cover.

- Reduce risk of introducing livestock- and wildlife-related pathogens into waterways of the RMP lands.
- Use the results of monitoring and routine inspections to adaptively manage the RMP lands
- Effectively communicate and implement rangeland management goals and expectations with the RMP grazing tenant(s).
- Consult with SFPUC rangeland staff and RMP grazing tenant(s) during the development of any policies that would change the management of RMP lands.
- Implement cost-sharing rangeland improvement projects between the SFPUC and its grazing tenant(s) in the RMP lands.
- Use grazing to manage wildland fuel loads.

With the adoption of the RMP, the SFPUC will also update grazing unit leases to ensure consistency with the RMP in stocking rates, fall grassland targets, and rangeland best management practices. The SFPUC will adapt the rangeland management program as needed based on monitoring results, evolving science, regulation changes, and new information.

1. Introduction

1.1 Purpose

The Rangeland Management Plan (RMP) presents the San Francisco Public Utilities Commission (SFPUC) rangeland management program for livestock grazing applied within the SFPUC-owned and -managed portion of the Alameda Creek watershed.

The Alameda Creek watershed lands have long been used for agriculture. During the Spanish occupation of California, from 1769 to 1822, the watershed lands fell within Mission San Jose. During this time, the primary use of the watershed lands by the Spanish was livestock grazing. With Mexican independence and secularization of mission properties, starting in 1822, the watershed lands became part of Rancho el Valle de San Jose, where the watershed continued to be used for livestock grazing, as well as farming. After Mexico ceded California to the United States in 1848, ownership of the watershed lands changed hands again, and the lands were later managed by the Spring Valley Water Company until 1930.

The Spring Valley Water Company leased their lands to ranchers who grazed cattle and sheep and farmers who farmed without irrigation (dryland farming). In 1930, the SFPUC purchased the Spring Valley Water Company properties, as well as several additional parcels from local ranchers, to form the approximately 38,000-acre Alameda Creek watershed lands. The SFPUC continued to lease the watershed land to local and adjacent ranchers on an informal lease basis until the late 1960s. In the early 1970s, following a widespread livestock industry advertising campaign, SFPUC grazing units were offered to the general public at an open oral auction; leases were awarded to many individuals who were not local to the watershed and who had limited experience with ranching (Koopmann, pers. comm., 2010). From that time until 1998, lack of proper management policies led to overstocking of leased land and infrastructure deterioration. Stocking rates for the leases pre-1998 were as high as 0.83 acres per Animal Unit Month (AUM) (9.9 acres per Animal Unit Year [AUY]).

In 1997, the SFPUC developed the Alameda Creek Watershed Grazing Resources Management Plan (GRMP), in response to concerns regarding the appropriateness of grazing on watershed lands, particularly regarding potential impacts on water quality. The GRMP was incorporated as an element of the watershed-wide Alameda Watershed Management Plan (Alameda WMP), which was adopted in 2001. The GRMP outlined practices that reduce potentially negative impacts on water quality resulting from grazing and shared the Alameda WMP's primary goal of water quality protection. To achieve water quality objectives, the GRMP described three watershed protection areas and included within each area recommended improvements to address water quality concerns related to grazing. Improvements have been implemented in each watershed protection area, as detailed in the GRMP and Alameda WMP, and included fencing to control livestock from entering protected zones; water developments to distribute cattle more effectively across grazing units and achieve more uniform utilization of forage; and stock pond rehabilitation to attract cattle to existing off-stream water sources.

The RMP is designed to establish a rangeland management program that is consistent with existing and in-progress plans and policies that apply to management of SFPUC lands, as well as with current best practices in rangeland management. The RMP updates and expands upon the 1997 GRMP and will replace the GRMP once adopted. The RMP is consistent with the grazing management approaches presented in the 1997 GRMP. In some cases, the RMP updates Best Management Practices (BMPs) from the 1997 GRMP based on a better

understanding of best practices in rangeland management from new science, research, and observations of rangeland health. The approach to livestock grazing described in the RMP is expected to be adapted based on monitoring results, new conditions, and evolving science.

1.2 Goals of the RMP

The goals of the SFPUC rangeland management program are to:

- Protect and improve water quality;
- Preserve and enhance the health of ecological systems;
- Reduce the threat of wildland fire by decreasing fuel densities;
- Adaptively manage the RMP lands based on new information and conditions;
- Provide a basis for consistent management of the RMP lands; and
- Support an economically and ecologically sustainable grazing operation.

1.3 Guiding Plans and Policies

Many agreements and policies guide the management of lands covered by the RMP. In addition to watershed policies, the individual lease documents between the existing tenant and the SFPUC guide the practice of livestock grazing within the RMP lands.

The RMP is an element of the SFPUC Alameda WMP (2001), which guides management of the SFPUC lands within the Alameda Creek watershed. The Alameda WMP provides a policy framework to guide the SFPUC in comprehensive management, including grazing management, of its watershed lands. The Alameda WMP establishes goals, policies, and management actions to aid the SFPUC in decision-making regarding management of SFPUC watershed lands. The primary goal of the Alameda WMP is to maintain and improve source water quality to protect public health and safety. The Alameda WMP also has six secondary goals, which are to:

- Maximize water supply;
- Preserve and enhance the ecological and cultural resources of the watershed;
- Protect the watersheds, adjacent urban areas, and the public from fire and other hazards;
- Continue existing compatible uses and provide opportunities for potential compatible uses on watershed lands, including educational, recreational, and scientific uses;
- Provide a fiscal framework that balances financial resources, revenue-generating activities, and overall benefits, and an administrative framework that allows implementation of the Alameda WMP; and
- Enhance public awareness of water quality, water supply, conservation, and watershed protection issues.

The Alameda WMP refers to the RMP as providing “methods the SFPUC will follow to effectively manage and contain grazing activities so that the beneficial aspects related to fire management can be realized without jeopardizing water quality/quantity and biological resources.”

In 2006, the SFPUC adopted the Water Enterprise Environmental Stewardship Policy in which the SFPUC commits to proactively managing the watersheds in a manner that maintains the

integrity of natural resources, restores and protects habitats for native species, and enhances ecosystem function. Additional plans, policies, and programs that apply to the RMP lands include the following:

- Sunol Region Bioregional Habitat Restoration Mitigation and Monitoring Plan (URS 2014a)
- Alameda Watershed Rangeland Monitoring Program (Sage and Associates 2007)
- Alameda Creek Watershed Grazing Resources Management Plan (GRMP) (SFPUC 1997)
- Integrated Pest Management Ordinance (CCSF 1996)
- Sunol Region Grazing Unit Management Plan (GUMP) (URS 2014b)

This RMP outlines goals, strategies, and recommendations to help ensure rangeland management practices that support the goals of these foundational policy documents.

1.4 Lands Covered by the RMP

The RMP Includes 18 grazing units in the SFPUC-owned Alameda Creek watershed lands in Alameda and Santa Clara counties (Figure 1. SFPUC Alameda Creek Watershed Grazing Unit Overview). Grazing units (identified with the letters GU and a unique number) range in size from 8 to 10,184 acres. Table 1-1 lists the name and acreage of each grazing unit. Over 30,000 acres of grazed land comprise the majority of the land owned by the SFPUC in the Alameda Creek watershed. The RMP does not cover lands owned by the SFPUC that are not under a grazing lease, such as those leased to businesses conducting activities other than grazing (e.g., nurseries, gravel mining, etc.). Also, the RMP does not cover adjoining private or public ranchlands that are grazed in conjunction with or by the same grazing tenant as the tenant grazing a particular SFPUC lease.

Table 1-1. SFPUC Alameda Creek Watershed Grazing Leases

Name	Code	Previous Name and Code	Acreage
Andrade Road	GU-18	Hayne's LA-4	808
Arroyo de la Laguna North	GU-10	Miscellaneous LA-8.1	56
Arroyo de la Laguna South	GU-11	Miscellaneous LA-8.2	34
Black Mountain	GU-25	Black Mountain CA-3	1,955
Calaveras Reservoir	GU-23	Calaveras Creek CA-1	10,636
Calaveras Road	GU-26	Calaveras Road South	8
Confluence	GU-15	Miscellaneous CA-8.3	857
Felter Road	GU-28	NA	37
Frog Pond	GU-21	Frog Pond CA-2	1,873
Haynes Gulch	GU-19	Sheridan LA-2	2,067
Maguire Peaks	GU-16	Turner Dam LA-5 and Maguire Peaks LA-3	2,892
Mission Peak	GU-22	Ornellas CA-4	3,056
Niles Canyon	GU-14	Miscellaneous LA-8.3	284
Paloma	GU-13	Paloma Tank Farm LA-7	157
San Antonio Creek	GU-17	San Antonio Creek SA-1	5,806
Sheep Camp Creek	GU-12	Sheep Camp LA-6	474
Sierra Road	GU-29	Miscellaneous CA 5.1	67
Sunol Park	GU-20	Sunol Park LA-1	1,227

1.5 Easements

A number of mitigation sites and easements of different types are present on RMP lands. Details on the types of easements and their effect on grazing operations are discussed below.

1.5.1 Mitigation Easements

There are five mitigation sites on conservation easements within or adjacent to the leases in the RMP lands (Table 1-2). The Bioregional Habitat Restoration (BHR) sites provide compensation for losses to wetland, stream, and special-status species habitat that resulted from construction of the SFPUC Water System Improvement Program (WSIP). Each BHR site provides species and habitat credit for state and federal permits. The BHR sites have conservation easements and are subject to requirements and restrictions through agreements with regulatory agencies into perpetuity. Portions of some BHR sites within the RMP lands include permit-required habitat enhancements. Requirements include restoring or enhancing species habitat (e.g., California red-legged frog (*Rana draytonii*), California tiger salamander (*Ambystoma californiense*), and Alameda whipsnake (*Masticophis lateralis euryxanthus*). Achieving habitat enhancement goals may involve implementation of specific grazing management practices (e.g., seasonal grazing restrictions to benefit native serpentine forbs, installation of troughs to reduce grazing impacts on ponds or riparian areas). Portions of the streams and ponds at the Goldfish Pond, San Antonio Creek, and Sheep Camp Creek BHR sites include grazing exclusion areas. Native vegetation was planted within exclusion areas to restore riparian and pond habitats. Some of these plantings and the soils that support them contain pathogens (introduced by commercial nurseries), so access to these areas is restricted to minimize the risk of pathogen spread to the broader RMP lands.

Table 1-2. BHR Sites in RMP Lands

BHR Site	Grazing Unit the Easement Affects
Grimes	GU-17 – San Antonio Creek
Goat Rock*	GU-21 – Frog Pond
Goldfish Pond	GU-23 – Calaveras Reservoir
San Antonio Creek	GU-17 – San Antonio Creek
Sheep Camp Creek	GU-12 – Sheep Camp Creek

* Unlike the other grazing exclusion areas, the Goat Rock BHR site exclusion area only excludes grazing seasonally in the late spring.

1.5.2 Other Easements

Several other easements are present in the watershed. The types of easements include:

- **Private landowners.** Some private landowners hold road easements to cross through SFPUC lands to reach their property.
- **Gas.** Several private companies, including Chevron, Pacific Gas and Electric Company (PG&E), and Kinder Morgan, have underground pipelines that traverse portions of the watershed. The companies have easements associated with the pipelines and access the watershed to do maintenance of the pipelines.
- **Power.** Overhead power lines are present in the watershed, primarily owned and maintained by PG&E. PG&E has easements for accessing and maintaining infrastructure and electrical transmission lines that cross through the RMP lands.

- **Recreation.** The East Bay Regional Park District (EBRPD) leases SFPUC lands and manages them as a part of the Sunol Regional Wilderness. Recreational trails pass through SFPUC lands and connect to trails on EBRPD-owned lands.

1.5.3 Managed Riparian Areas

The 1997 GRMP identified Managed Riparian Areas to be fenced and restricted from grazing to protect water quality for both habitat and source water protection. Since that time, research has found that grazing can provide ecological benefits when prescribed to achieve specific goals. Therefore, the RMP retains the Managed Riparian Areas (see Figure 2. Grazing Unit Maps) that restrict grazing except for prescribed grazing when approved by the Watershed Resource Manager for watershed and natural resource stewardship purposes, such as to reduce wildfire risk and control non-native invasive plants (NNIPs).

1.6 Organization of RMP

The RMP document is organized into four sections:

Section 1: Introduction

Section 2: Goals, Objectives, and Strategies

Section 3: Environmental Conditions and Grazing Considerations

Section 4: Rangeland Management Program

2. Goals, Objectives, and Strategies

This section includes goals, objectives, and strategies for management of the RMP lands.

2.1 Goal 1: Protect and improve water quality.

Objective 1: Maintain sufficient residual dry matter (RDM) to protect soil and water quality.

Strategy 1: Maintain minimum RDM levels in the RMP lands[1] of 1,000 pounds per acre. Areas with RDM levels below minimums will be evaluated and if there are grazing-related impacts, impact minimization measures will be implemented.

Strategy 2: Install temporary and/or permanent cattle exclusion fencing around erosional features or areas where vegetation has been severely impacted by grazing and soils are susceptible to erosion or slumping (within and adjacent to riparian areas or mature trees used by cattle for shade) or other impacts (e.g., compaction). Allow sufficient time for vegetation to recover prior to resuming grazing.

If RDM levels are high, implement strategies that target fuel reduction to avoid catastrophic wildland fire and associated impacts to water quality (see Goal 6).

Objective 2: Minimize negative impacts on sensitive aquatic habitats such as riparian and spring systems.

Strategy 3: Minimize negative impacts of herbivory and trampling on spring, wetland, and riparian systems by installing exclusions or water troughs, salt licks, and mineral supplements in uplands to attract cattle away from spring, wetland, and riparian areas and more evenly distribute grazing use within upland pastures. Ensure water troughs and mineral supplements are working properly and are adequately stocked and utilized by the cattle, adjusting locations if necessary. Install cattle watering systems in a manner that avoids degrading sensitive upland habitat areas or contributing to erosion. Employ BMPs that minimize potential impacts on spring-dependent species that protect or depend on water quality. Ensure that water withdrawals do not cause significant reductions in the extent or abundance of aquatic and riparian species.

Strategy 4: Prevent grazing in riparian areas except where approved by the Watershed Resources Manager in the Annual Operating Plan or memo to enhance native habitats, reduce wildfire risk, and control NNIPs.

2.2 Goal 2: Preserve and enhance the health of ecological systems.

Objective 3: Implement rangeland management practices that preserve and protect special-status species and their habitats.

Strategy 5: Maintain and repair stock ponds and impoundments that can support special-status aquatic species to prevent deterioration of dams, banks, water-

[1] Exempting locations with thin soils or adjacent to ground squirrel burrow entrances, woody vegetation, troughs, salt licks, and mineral supplements.

holding capacity, and water supply systems; fund and implement repairs as needed to maintain these facilities (including the inclusion of wildlife-friendly trough design features, where possible).

Strategy 6: Adapt rangeland management practices, as necessary, to support special-status species; incorporate the latest research and local expertise (ranchers, scientists, land managers); and monitor findings to guide adaptive management of the RMP lands.

Objective 4: Maintain or improve native species biodiversity.

Strategy 7: Maintain a mosaic of habitats across the RMP lands to benefit multiple species through maintenance of livestock infrastructure and implementation of grazing practices that minimize erosion, increase recruitment of oak and sycamore species, protect mature native trees, decrease the risk of catastrophic fire, and maintain habitat richness, diversity, and extent.

Strategy 8: Manage areas in the RMP lands containing unique native biodiversity for the benefit of the species they support.

Objective 5: Monitor and control non-native invasive plant and wildlife populations.

Strategy 9: Prevent the introduction or spread of NNIPs by inspecting and cleaning vehicles, equipment, and clothing for attached plants when entering the watershed, moving between disturbed sites within the watershed, or leaving the watershed (particularly a disturbed site). Prioritize control of NNIP populations located along roads and in cattle processing and holding facilities and fields. Clean equipment that has been used in areas where NNIPs occur immediately after use to prevent spread. Distribute and implement SFPUC guidance for non-aquatic vehicle, tool, and personnel protective equipment (PPE) decontamination for invasive plants, pests, and pathogens.

Strategy 10: Prevent the spread and colonization of NNIPs by periodically inspecting the RMP lands for newly establishing plant populations (annual driving/walking surveys). Once identified, remove plants by hand pulling, hoeing, spot-application of herbicide, or other control methods.

Strategy 11: Continue to implement feral pig depredation efforts using an approved program, e.g. trapping, to comply with appropriate permits in the RMP lands.

Strategy 12: Where possible, and using the latest science and local expert knowledge, implement grazing strategies (timing, intensity, duration, etc.) that control or reduce NNIP species spread within the RMP lands.

Strategy 13: Develop and implement an Integrated Pest Management (IPM) program for the watershed.

Objective 6: Reduce the risk of introduction or spread of plant diseases, particularly from human activities.

Strategy 14: Distribute and implement the SFPUC guidance for non-aquatic vehicle, tool, and PPE decontamination for invasive plants, pests, and pathogens. Work with grazing tenant(s) to determine if tenant(s) work in areas that are likely to contain plant pathogens (this includes some of the BHR planting areas) that can be transmitted by contaminated soil or plant material (including but not limited to the pathogens that cause root-rot and Sudden Oak Death). If it is determined that the tenant(s) have potentially exposed equipment or livestock, SFPUC staff will work with tenant(s) to take appropriate actions to avoid introducing or spreading plant pathogens to the RMP lands.

Objective 7: Reduce sediment sources to riparian habitats associated with road systems.

Strategy 15: Limit road maintenance and grading or soil disturbance activities to the dry seasons of the year, except in emergency situations to prevent loss of life, loss of property, or (greater) environmental damage.

Strategy 16: Reduce erosion from road runoff and sediment in drainage through proper road design and maintenance. Redistribute road runoff in less concentrated form over a larger vegetated area by out-sloping roads, installing frequent rolling dips, and installing cross-drains at appropriate locations and spacing. Redirect runoff to well-vegetated upland areas.

Objective 8: Reduce risk of introducing livestock- and wildlife-related pathogens into waterways of the RMP lands.

Strategy 17: Require grazing tenant(s) to provide a herd-health program for the prevention and care of general parasitic diseases, to maintain healthy herd immune systems, and to minimize diarrhea-causing infection.

Strategy 18: Restrict the calving period to August through October to prevent potential surface water contamination by *Cryptosporidium*. Research continues into the livestock mediated links of *Cryptosporidium* to human health; revisit restrictions to grazing in the watershed if new research shows that *Cryptosporidium* carried by cattle is not harmful to human health.

Strategy 19: Review the vendor's information for hay imported by tenants for holding fields and corrals to confirm it does not contain weeds or other undesirable pathogens. Any inspections on site would be performed by the SFPUC Rangeland Manager or delegated representative.

See Strategies 1 and 2, which address leaving sufficient RDM, and Strategies 3 and 4, which encourage cattle to occupy areas outside of the riparian zone.

2.3 Goal 3: Adaptively manage the RMP lands based on evolving information and conditions.

Objective 9: Use the results of monitoring and routine inspections to adaptively manage the RMP lands.

Strategy 20: Conduct annual inspections and monitoring of the soil and vegetation of each grazing unit.

Strategy 21: Perform routine inspections of infrastructure, including livestock water systems, roads, fencing, and corrals, to document they are functioning as intended to support meeting the goals of the RMP.

Strategy 22: Utilize rangeland monitoring and inspection results, and biological and other relevant watershed data, to adapt rangeland management practices as needed.

2.4 Goal 4: Provide a basis for consistent management of the RMP lands.

Objective 10: Effectively communicate and implement rangeland management goals and expectations with the RMP grazing tenant(s).

Strategy 23: Discuss roles and responsibilities (of the tenant and the SFPUC) with the tenant for the grazing lease and provide resources, as appropriate, to successfully carry out those roles and responsibilities.

Strategy 24: Meet annually with tenants to review infrastructure needs, inspection and monitoring results, non-native invasive species, seasonal variation, and grazing capacity. Based on discussion and review of information, the SFPUC will update each grazing unit annual management plan to outline proposed infrastructure improvements, any needed protective measures, and stocking rates consistent with the lease.

2.5 Goal 5: Support economically and ecologically sustainable grazing operations.

Objective 11: Consult with SFPUC rangeland staff and RMP grazing tenant(s) during the development of any policies that would change the management of RMP lands.

Strategy 25: Solicit early input from SFPUC grazing tenants and managers in the development of SFPUC projects, policies, or actions to discuss considerations that will directly affect grazing management of the RMP lands.

Objective 12: Implement cost-sharing rangeland improvement projects between the SFPUC and its grazing tenant(s) in the RMP lands.

Strategy 26: Identify and prioritize rangeland improvements that would contribute to meeting the goals and objectives of the RMP.

Strategy 27: Work with grazing tenant(s) to provide timely and reasonable cost sharing of rangeland improvements. Assist grazing tenant(s) with preparation, costs, and submittal of any regulatory permits that are required to implement rangeland improvement.

2.6 Goal 6: Reduce the threat of wildland fire by decreasing fuel densities on RMP lands.

Objective 13: Use grazing to manage wildland fuel loads.

Strategy 28: Continue to use livestock grazing as the primary method to reduce fine fuel loading on the RMP lands.

Strategy 29: If grazing is removed for two years or longer in any portion of the RMP lands, evaluate the need and costs for alternative fine fuel load reduction techniques such as mowing or prescribed burning.

Strategy 30: If tree and/or shrub mortality results in the presence of ladder fuels, coordinate with tenants to remove vegetation that presents a fire hazard while considering habitat objectives.

Strategy 31: Use RDM mapping, fire risk mapping, and other tools to evaluate and explore opportunities to improve watershed fire protection through the grazing program.

3. Environmental Conditions and Grazing Considerations

This section describes the existing environmental conditions found in the RMP lands. The section also describes grazing effects on vegetation, special-status species, and NNIP species.

3.1 Topography, Climate, and Hydrology

The RMP lands fall within the Alameda Creek watershed, which is situated in the Diablo Range, at the western edge of California's Inner Coast Ranges, immediately east of the southern San Francisco Bay. The RMP lands are characterized by broad, low-lying valleys (~120-foot elevation) that are interrupted by narrow, northwest-trending ridgelines where elevations approach 3,000 feet on Poverty and Oak ridges. Within the RMP lands, elevation and the ruggedness of the terrain increase from northwest to southeast. The ridgelines are cut by narrow canyons with steep, rocky, and often dry slopes. The northeast-facing slopes and the deep, narrow canyons of the southwest aspect are relatively mesic and able to support woodland and forest, while the southwest aspect of ridges is generally more xeric and dominated by grasslands.

The dominant hydrologic feature in the Alameda Creek watershed is Alameda Creek, which has its headwaters in the Hamilton Range and flows northwest through the Sunol Valley and Niles Canyon to San Francisco Bay. In normal years, Alameda Creek contains water until early to mid-summer, when flows go subsurface in sections along the creek. Flows in Alameda Creek are influenced by upstream water diversions managed by the SFPUC, particularly at the Alameda Creek Diversion Dam and Calaveras Reservoir. Calaveras Creek and Arroyo Hondo both flow to Calaveras Reservoir before joining Alameda Creek and draining to San Francisco Bay. San Antonio Reservoir, the northernmost of the two reservoirs in the RMP lands, is on San Antonio Creek 1.5 miles upstream from the confluence of San Antonio and Alameda creeks. In addition to the network of creeks, the RMP lands contain many seasonal wetlands and man-made ponds. The seasonal wetlands are primarily natural features that have developed where water from natural seeps and springs is visible at the surface or saturates the soils.

The RMP lands experience a Mediterranean climate with hot, dry summers and mild, wet winters. The regular summer fog present along the coast does not generally reach the RMP lands, and consequently summers are hotter and drier than in the maritime-influenced areas immediately west. Annual temperature fluctuations are extreme and can range from more than 100 degrees Fahrenheit (°F) (38+ degrees Celsius [°C]) in the summer to below freezing in the winter. The terrain is topographically varied, and temperatures vary throughout the day due to the dramatic differences in elevation and aspect. The majority of rainfall occurs between October and April, and little to no precipitation falls during the remainder of the year. Recorded precipitation averages 10 to 20 inches per year. Historically, most storms in the region were of moderate duration and intensity, but occasional storms were heavy and persistent enough to cause flooding and landslides (SCS 1966). Climate change impacts on the region have and are projected to be felt through increases in atmospheric river storm intensity and duration (Dettinger 2011).

3.2 Geology and Soils

Geologic processes in the Alameda Creek watershed are dominated by the Calaveras fault zone. The fault zone created the Sunol Valley and bisected the RMP lands into two areas with markedly different geologic formations and structures. Within RMP lands west of the fault zone, the substrate is mostly marine sedimentary rocks such as sandstone or shale. Within RMP lands east of the fault zone, the substrate is composed of marine sedimentary rocks, primarily

characterized by the Franciscan Complex, a complex assortment of sedimentary rocks deposited in seawater at various depths and mixed with sections of basalt sea floor.

Additional geologic formations of note within the RMP lands include areas of serpentinite ultramafic rock (i.e., serpentine outcrops), several of which are located near Calaveras Reservoir. These serpentine areas are limited in size and distribution, but they contain a disproportionate number of rare and endemic natural resources because of their distinctive chemical and physical properties.

Two major soil associations, which include 75 soil map units, are present in the RMP lands: the Millsholm–Los Gatos–Los Osos association and the Vallecitos-Parrish association (SCS 1966). A majority of the northwest portion of the RMP lands is within the Millsholm–Los Gatos–Los Osos association. These soils are broadly described as “moderately steep to very steep, well-drained clay loams and loams that formed in material weathered from interbedded sedimentary rock on uplands” (SCS 1977). The higher moisture retention of these clay loams supports diverse vegetation, which in turn promotes soil development. On steep slopes, these soils pose a severe erosion hazard. The Vallecitos-Parrish association, located in the southeast portion of the watershed east of Calaveras Reservoir, is also generally characterized by moderately steep and very steep slopes, but unlike the Millsholm–Los Gatos–Los Osos association, it develops on meta-sedimentary and basic igneous rocks. A notable physical feature common to both of these soil associations and the soil series they contain is moderate to high susceptibility to erosion.

3.3 Vegetation Communities and Wildlife Habitat

Table 3-1 lists the vegetation communities found within the RMP lands, including which leases they are found within and the common plant and animal species that they support. The vegetation types listed in Table 3-1 are derived from 2003 geospatial vegetation data of the watershed (Jones & Stokes 2003). Potential grazing effects are discussed for the vegetation types primarily affected by livestock grazing in the RMP lands: grassland, woodlands and forest, riparian, and wetlands. Potential grazing effects are closely linked to the timing, intensity, and duration of grazing.

Table 3-1. Vegetation Community Composition and Wildlife Habitat within the RMP Lands

Vegetation Community Type	Lease	Dominant Plant Species	Common Wildlife
Grassland: Annual grassland	Calaveras Reservoir (GU-23), Frog Pond (GU-21), Black Mountain (GU-25), Mission Peak (GU-22), Sunol Park (GU-20), Haynes Gulch (GU-19), Maguire Peaks (GU-16), Andrade Road (GU-18), Sheep Camp (GU-12), Paloma (GU-13), Arroyo de la Laguna North (GU-10), and San Antonio Creek (GU-17)	Non-native: soft chess (*Bromus hordeaceus*), ripgut brome (*Bromus diandrus*), wild oats (*Avena fatua, A. barbata*), and Italian ryegrass (*Festuca perennis*) Natives: California melic grass (*Melica californica*), purple needle grass (*Stipa pulchra*), squirrel tail (*Elymus elymoides*), California poppy (*Eschscholzia californica*), sky lupine (*Lupinus nanus*), miniature lupine (*L. bicolor*), Johnny-jump-up (*Viola pedunculata*), shining pepperweed (*Lepidium nitidum* var. *nitidum*), and owl's clover (*Castilleja exserta* ssp. *exserta, Orthocarpus* spp., and *Triphysaria* spp.)	Resident species include California ground squirrel *(Otospermophilus beecheyi)*, yellow-billed magpie (*Pica nuttalli*), American crow (*Corvus brachyrhynchos*), acorn woodpecker (*Melanerpes formicivorus*), western fence lizard (*Sceloporus occidentalis*), Pacific rattlesnake (*Crotalus oreganus*), mule deer (*Odocoileus hemionus*), and wild pig (*Sus scrofa*). Coyote (*Canis latrans*), bobcat (*Lynx rufus*), gray fox (*Urocyon cinereoargenteus*), American badger (*Taxidea taxus*), and mountain lion (*Puma concolor*) are regular visitors of the grasslands, preying on small mammals and amphibians.
Grassland: Serpentine grassland	Calaveras Reservoir (GU-23), Sunol Park (GU-20), Frog Pond (GU-21), and Haynes Gulch (GU-19)	Natives: purple needlegrass, junegrass (*Koeleria macrantha*), dwarf plantain (*Plantago erecta*), bird's-eye gilia (*Gilia tricolor*), goldfields (*Lasthenia californica*), and Johnny-jump-up	(see annual grassland above)
Shrubland: Diablan sage shrub	Calaveras Reservoir (GU-23), Frog Pond (GU-21), Black Mountain (GU-25), Mission Peak (GU-22), Sunol Park (GU-20), Haynes Gulch (GU-19), Maguire Peaks (GU-16), Andrade Road (GU-18), and San Antonio Creek (GU-17)	California sagebrush (*Artemisia californica*), with a minor component of bush monkeyflower (*Diplacus aurantiacus*), poison oak (*Toxicodendron diversilobum*), chamise (*Adenostoma fasciculatum*), and coyote bush (*Baccharis pilularis consanguinea*). Rock outcrops support California snakeweed (*Gutierrezia californica*), common deerweed (*Lotus scoparius*), and false goldenaster (*Heterotheca sessiliflora*).	Many species of birds, rodents, reptiles, insects, and other small wildlife use this habitat, including western fence lizards. Diablan sage shrub is core habitat for Alameda whipsnake.

Vegetation Community Type	Lease	Dominant Plant Species	Common Wildlife
Woodland and forest: Blue oak woodland, mixed evergreen forest/oak woodland, oak savannah, and serpentine foothill pine woodland	Calaveras Reservoir (GU-23), Frog Pond (GU-21), Black Mountain (GU-25), Mission Peak (GU-22), Sunol Park (GU-20), Haynes Gulch (GU-19), Maguire Peaks (GU-16), Andrade Road (GU-18), Sheep Camp (GU-12), Paloma (GU-12), Arroyo de la Laguna North (GU-10), and San Antonio Creek (GU-17)	A mixture of one or more oak species: coast live oak (*Quercus agrifolia*), valley oak (*Quercus lobata*), and blue oak (*Quercus douglasii*). Other associated species include madrone (*Arbutus menziesii*), poison oak, California bay (*Umbellularia californica*), big-leaf maple (*Acer macrophyllum*), toyon (*Heteromeles arbutifolia*), California buckeye (*Aesculus californica*), and California blackberry (*Rubus ursinus*). In the case of foothill pine woodland, the dominant species is *Pinus sabiana*.	Various bird species, including chestnut-backed chickadee (*Poecile rufescens*), white-breasted nuthatch (*Sitta carolinensis*), warbling vireo (*Vireo gilvus*), song sparrow (*Melospiza melodia*), California quail (*Callipepla californica*), California towhee (*Melozone crissalis*), and Nuttall's woodpecker (*Dryobates nuttallii*), along with squirrel species (*Sciurus* spp.), use this habitat. Alameda whipsnake and California red-legged frog may use this habitat as a migration corridor.
Riparian: Sycamore alluvial woodland	Calaveras Reservoir (GU-23), Sunol Park (GU-20), Maguire Peaks (GU-16), Andrade Road (GU-18), Arroyo de la Laguna North (GU-10), and San Antonio Creek (GU-17)	Overstory of California sycamore (*Plantanus racemosa*), California buckeye, blue elderberry (*Sambucus mexicana*), and occasionally cottonwood (*Populus fremontii*), coast live oak, and valley oak. Understory dominated by non-native grasses or mulefat (*Baccharis salicifolia*).	Amphibians and riparian bird species including Pacific chorus frog (*Pseudacris regilla*), California red-legged frog, northwestern pond turtle (*Emys marmorata*), common yellowthroat (*Geothlypis trichas*), warbling vireo (*Vireo gilvus*), mallard (*Anas* platyrhynchos), common merganser (*Mergus merganser*), and green-backed heron (*Butorides virescens*). Alameda Creek is a noted migration corridor for annual passerine migrants, such as yellow warbler (*Setophaga petechia*), MacGillivray's warbler (*Geothlypis tolmiei*), and lazuli bunting (*Passerina amoena*). Western harvest mouse (*Reithrodontomys megalotis*), deer mouse (*Peromyscus* sp.), raccoon (*Procyon lotor*), coyote, and California black-tailed deer (*Odocoileus hemionus columbianus*) may also use this habitat for foraging.

Vegetation Community Type	Lease	Dominant Plant Species	Common Wildlife
Riparian: Coast live oak riparian forest	Mission Peak (GU-22), Sunol Park (GU-20), Haynes Gulch (GU-19), Maguire Peaks (GU-16), Frog Pond (GU-21), and San Antonio Creek (GU-17)	Overstory of coast live oak with understory of grasses, poison oak, coyote brush (*Baccharis pilularis)*, mugwort (*Artemisia douglasiana*), and California rose (*Rosa californica*).	Amphibians and riparian bird species including Pacific chorus frog (*Pseudacris regilla*), California red-legged frog, northwestern pond turtle (*Emys marmorata*), common yellowthroat (*Geothlypis trichas*), warbling vireo (*Vireo gilvus*), mallard (*Anas* platyrhynchos), common merganser (*Mergus merganser*), and green-backed heron (*Butorides virescens*). Alameda Creek is a noted migration corridor for annual passerine migrants, such as yellow warbler (*Setophaga petechia*), MacGillivray's warbler (*Geothlypis tolmiei*), and lazuli bunting (*Passerina amoena*). Western harvest mouse (*Reithrodontomys megalotis*), deer mouse (*Peromyscus* sp.), raccoon (*Procyon lotor*), coyote, and California black-tailed deer (*Odocoileus hemionus columbianus*) may also use this habitat for foraging.
Riparian: White alder forest	Calaveras Reservoir (GU-23), Frog Pond (GU-21), Black Mountain (GU-25), Sunol Park (GU-20), Haynes Gulch (GU-19), Andrade Road (GU-18), and San Antonio Creek (GU-17)	Dominant overstory cover of white alder (*Alnus rhombifolia*) with an understory of willow species (*Salix* ssp.), mule fat, poison-oak, and California wild rose (*Rosa californica*).	California red-legged frog, foothill yellow-legged frog (*Rana boylii*), and northwestern pond turtle are listed wildlife species found in riparian habitats. Common mammals found in this habitat include mule deer, raccoon, gray fox, striped skunk (*Mephitis mephitis*), deer mouse, western harvest mouse, and dusky-footed woodrat (*Neotoma fuscipes*). Birds typical of this habitat include Wilson's warbler (*Cardellina pusilla*), yellow warbler, northern flicker (*Colaptes auratus*), Bewick's wren (*Thryomanes bewickii*), white-tailed kite (*Elanus leucurus*), Cooper's hawk (*Accipiter cooperii*), red-shouldered hawk (*Buteo lineatus*), song sparrow, and black-headed grosbeak (*Pheucticus melanocephalus*).

Vegetation Community Type	Lease	Dominant Plant Species	Common Wildlife
Riparian: Willow dominated forest	Calaveras Reservoir (GU-23), Black Mountain (GU-25), Hayne's Gulch (GU-19), Maguire Peaks (GU-16), Arroyo de la Laguna North (GU-10), and San Antonio Creek (GU-17)	Primary willow species include red willow (*Salix laevigata*), arroyo willow (*Salix lasiolepis*), black willow (*Salix nigra*), and shining willow (*Salix lucida*). Some areas also contain mule fat (*Baccharis salicifolia*).	California red-legged frog, foothill yellow-legged frog (*Rana boylii*), and northwestern pond turtle are listed wildlife species found in riparian habitats. Common mammals found in this habitat include mule deer, raccoon, gray fox, striped skunk (*Mephitis mephitis*), deer mouse, western harvest mouse, and dusky-footed woodrat (*Neotoma fuscipes*). Birds typical of this habitat include Wilson's warbler (*Cardellina pusilla*), yellow warbler, northern flicker (*Colaptes auratus*), Bewick's wren (*Thryomanes bewickii*), white-tailed kite (*Elanus leucurus*), Cooper's hawk (*Accipiter cooperii*), red-shouldered hawk (*Buteo lineatus*), song sparrow, and black-headed grosbeak (*Pheucticus melanocephalus*).
Marsh: Freshwater	San Antonio Creek (GU-17)	Predominately tules (*Schoenoplectus californicus*) and cattails (*Typha latifolia*) with an understory of rushes (*Juncus* ssp.).	Many species of amphibians and waterbirds including northwestern pond turtle (*Emys marmorata*), California red-legged frog, marsh wrens (*Cistothorus palustris*), song sparrows, breeding and roosting red-winged blackbird (*Agelaius phoeniceus*), and possibly tricolored blackbird *(A. tricolor)*. Wild pigs are also common visitors to this vegetation community.
Rock outcrop	Calaveras Reservoir (GU-23), Frog Pond (GU-21), Sunol Park (GU-20), Haynes Gulch (GU-19), and Black Mountain (GU-25)	Limited vegetation including lichens, succulents, and ferns. See annual grassland for species that may be present in minor components in this cover type.	Western fence lizard, Pacific rattlesnake, rock wren (*Salpinctes obsoletus*), and several species of raptors that use rock outcrops for nesting or roosting. Rock outcrops with crevices or caves could host roosts Townsend's big-eared bat (*Corynorhinus townsendii*).

3.3.1 Grasslands

Annual grass-dominated grasslands are extensive in the watershed. Although there are no expansive stands of native grass-dominated grasslands, native grasses do occur in the watershed intermixed within the annual grasslands throughout the RMP lands. Serpentine grassland also occurs to a limited extent, primarily in the Frog Pond (GU-21) lease.

Grazing can significantly reduce the biomass of the exotic annual grasses that dominate grasslands, lowering fire risk (Bush 2006), and could prevent the degradation of habitat conditions that would occur if the grasses were left unmanaged (Ford et. al. 2013). Cattle grazing can also maintain native plants on serpentine soils in areas that have a history of disturbance and/or are threatened by exotic plant species (Bartolome et al. 2014), and overall grassland biodiversity can be enhanced by livestock grazing at the landscape level by influencing habitat structure. Grazing can reduce the competitiveness of non-native European grasses, which flower earlier than many native species and produce abundant seed. Native bunchgrasses have a number of adaptations to withstand moderate to heavy grazing, including basal meristems that allow vigorous resprouting after heavy grazing or other disturbances, and voluminous root systems that allow nutrient re-absorption that aids in survival through summer drought and severe clipping (Edwards 1992). Complete exclusion of cattle from grasslands has been shown to favor the growth of non-native forbs and shrubs that compete with native perennial vegetation for space, light, and moisture (Gelbard 2003; Jackson and Bartolome 2007).

Poorly timed grazing or overstocking of cattle can create conditions that favor NNIPs (Billings 1994) and cause soil erosion. Some forms of erosion are exacerbated by cattle grazing and can cause degradation of upland soils as well as sedimentation of waterways (Bush 2006). Erosion on rangelands is often associated with roads (Weaver and Hagans 1994); sheet and rill erosion commonly occur on ranch roads if they are improperly designed and maintained, and cattle trailing adjacent to these roads can create sediment transport channels that can degrade upland habitat. Cattle trailing on steep hillsides produce terracettes that can increase localized infiltration into slopes, thus increasing the potential for landslides on susceptible landscapes (Bush 2006). Well-vegetated, un-compacted terracettes may break up the flow of hillslope runoff, reducing potential for surface or rill erosion. However, cattle trails and terracettes experiencing high hoof traffic can suffer vegetation loss and localized soil compaction, which redirects and concentrates surface runoff down the trail, resulting in hillslope erosion.

3.3.2 Woodlands, Forest, and Savannah

Woodlands, forests, and savannahs are found throughout the uplands of the RMP lands. Dense, contiguous woodlands are more common in the western and southern parts of the watershed. Blue and valley oak savannahs are found throughout much of the middle and southern portions of the watershed on typically dry ridgelines. Many of the grazing effects on grasslands, described above, also apply to woodlands, forests, and savannahs.

Of particular concern within woodlands, forests, and savannahs is woody plant recruitment, which is the establishment of new individuals into an age or size class of a population. Grazing can either directly and indirectly improve or preclude the success of oak seedling establishment. A number of factors affect oak regeneration, including browsing by herbivores, available moisture, and competition from herbaceous vegetation (McCreary and George 2005). Vole activity has been observed to increase in areas with high levels of annual vegetation and/or thatch, and herbivory can compromise seedling growth. Moderate levels of grazing can reduce

both direct pressures on seedlings from voles and other small herbivores and indirect pressure on seedlings from herbaceous vegetation competing with seedlings for space and moisture (ACCP 2011). Poorly planned grazing operations can suppress native woody plant seedlings and saplings. For instance, stocking rates that are too high could increase the opportunity for cattle to trample woody plant seedlings and rub against oak saplings, activities that have been shown to reduce survival in young oaks (McCreary and George 2005). Mature trees are often used for shade by cattle. Care should be taken to protect mature oaks and sycamores from overuse that can damage the root zone.

3.3.3 Riparian and Wetlands

Riparian vegetation communities are found throughout the RMP lands. Key riparian areas are associated with Alameda, Arroyo Hondo, Calaveras, San Antonio, Indian, La Costa, and Arroyo de la Laguna creeks. Seasonal wetlands are associated with all vegetation types in the RMP lands, while freshwater marsh wetlands are limited to only a few locations.

When riparian habitats are open to cattle during drier parts of the year, the cattle are attracted to the availability of browse and shade, as well as water. Heavy grazing and water use in riparian areas can lead to streambank erosion and loss of woody riparian canopy cover trees, which can degrade habitat for many species (Bush 2006).

The removal of riparian vegetation by cattle can lead to increased water temperature, reduced food supply in the aquatic food web, and the removal of aquatic habitat. The removal of vegetation from the riparian system also reduces the viability, recruitment, and survival of riparian trees and shrubs, particularly willows. Woody roots anchor the banks of streams and provide shelter and cover for steelhead (*Oncorhynchus mykiss*). Alameda Creek has been identified as one of the best opportunities for re-establishment of steelhead habitat in the San Francisco Bay Area. Therefore, preventing grazing impacts on water quality and riparian habitats would also benefit future steelhead habitat (Becker et al. 2007; Leidy et al. 2005).

Nutrient and pathogen pollution associated with cattle grazing may degrade water quality, as animal waste products from cattle, such as ammonia, can cause acute toxicity in aquatic species, and pathogens found in animal waste can affect local wildlife populations through contamination of water sources (Barry et al. 2011). There is little evidence, however, that significant amounts of nutrients and pathogens are transported by runoff to aquatic habitats in grazed grasslands, as most are either retained in the fecal pat or trapped by vegetation or RDM within a short distance of the pat (Tate et al. 2006).

3.4 Special-Status Species

SFPUC staff reviewed 172 special-status species that occur or could occur in the RMP lands to evaluate whether they should be included on a list of priority species with potential to be affected by management activities (including grazing) in the watershed. This evaluation resulted in a list that includes 16 species. Six of these species are currently listed as threatened or endangered under the Federal Endangered Species Act (FESA); four are listed under the California Endangered Species Act (CESA); and the others are either candidates for listing, proposed to be listed, or have a high likelihood of becoming listed in the future. Table 3-2 below lists the special-status species that will be addressed further in the RMP.

Table 3-2. Special-Status Species in the SFPUC Alameda Creek Watershed

Common Name	Scientific Name	Listing Status[1]
Wildlife/Fisheries		
Alameda whipsnake	*Masticophis lateralis euryxanthus*	FT, ST, CH
California red-legged frog	*Rana draytonii*	FT, SSC, CH
California tiger salamander – central California Distinct Population Segment (DPS)	*Ambystoma californiense pop. 1*	FT, ST, WL, CH
Chinook salmon – Central Valley fall / late-fall run Evolutionarily Significant Unit (ESU)	*Oncorhynchus tshawytscha*	SSC
Foothill yellow-legged frog – west / central coast DPS	*Rana boylii pop. 4*	FT, SE
Golden eagle	*Aquila chrysaetos*	FP, MBTA
Monarch – California overwintering population	*Danaus plexippus plexippus pop. 1*	FC
Northwestern pond turtle	*Emys marmorata*	Proposed FT[2], SSC
Pacific lamprey	*Entosphenus tridentatus* (=*Lampetra tridentate*)	SSC
Rainbow trout / steelhead – central California coast DPS	*Oncorhynchus mykiss*	FT
Townsend's big-eared bat	*Corynorhinus townsendii*	SSC
Tricolored blackbird	*Agelaius tricolor*	ST, SSC, MBTA
Western burrowing owl	*Athene cunicularia*	SSC, MBTA
Plants		
Congdon's tarplant	*Centromadia parryi* ssp. *congdonii*	CRPR 1B.1, EBCNPS A2
Hospital Canyon larkspur	*Delphinium californicum* ssp. *interius*	CRPR 1B.2, EBCNPS A1
Most beautiful jewelflower "Sunol form"	*Streptanthus albidus* ssp. *peramoenus* "Sunol form"	CRPR 1B.2, EBCNPS A2

[1] Listing Status
Federal Status:
FE = Species in danger of extinction throughout all or a significant portion of its range
FT = Threatened. Species likely to become endangered within the foreseeable future
FC = Candidate for listing under federal Endangered Species Act
CH = Critical Habitat
California (State) Status:
SE = Endangered. Species whose continued existence in California is in jeopardy
ST = Threatened. Species likely to become endangered within the foreseeable future
SSC = California Species of Special Concern
FP = Fully Protected
WL = Watch List
California Rare Plant Rank (CRPR) [formerly known as California Native Plant Society (CNPS) Lists]:
For a full explanation of the California rare plant ranking system, see https://www.cnps.org/rare-plants/california-rare-plant-ranks
1B = Plants that are rare, threatened or endangered in California, most of which are endemic
CRPR Threat Ranks:
0.1 = Seriously threatened in California (over 80% of occurrences threatened / high degree and immediacy of threat)
0.2 = Moderately threatened in California (20-80% occurrences threatened / moderate degree and immediacy of threat)
EBCNPS Local Listing: information obtained from The 8th Edition of "Rare, Unusual and Significant Plants of Alameda and Contra Costa Counties" (Lake, 2010). Local east bay (EB) CNPS rarity ranking.
A1 = Species currently known from two or less regions in Alameda and Contra Costa counties.
A2 = Species currently known from three to five regions in Alameda and Contra Costa counties, or, if more, meeting other criteria such as small populations, stressed/declining populations, small geographic range, limited/threatened habitat.
Other:
MBTA = Migratory Bird Treaty Act species from the Migratory Birds of Concern list (USFWS 2008)
SFPUC = San Francisco Public Utilities Commission

[2] Species is proposed to be listed as threatened as of October 2023; pending finalization (88 Federal Register [FR] 68370

3.4.1 Special-Status Wildlife Species

The following 13 special-status wildlife species are found or have suitable habitat within the RMP lands (Table 3-2). In this section they are described in terms of the current understanding of their life history requirements and location in the RMP lands. As noted by Fehmi et al. (2005), research shows there is substantial variation in the responses of both native plant and animal communities to grazing. Fehmi et al. (2005) observe that "the cumulative effects of livestock grazing on an ecological community are a composite of several different effects, such as herbivory and trampling. It is therefore reasonable to expect variation in the effects of grazing on any particular plant or animal species." With this in mind, the SFPUC will continue to review the most current available science and BMPs for special-status wildlife species and implement the best, feasible grazing management strategies to enhance habitat value and avoid negative impacts on sensitive plants and wildlife.

Alameda whipsnake (*Masticophis lateralis euryxanthus*) is listed as threatened under both the FESA and CESA. The Alameda whipsnake is a diurnal snake primarily associated with shrub and chaparral habitats dominated by open canopy plant species such as coast and black sage (*Artemisia californica* and *A. mellifera*), manzanita (*Arctostaphylos* sp.), and chamise (Lim, pers. comm., 2013; USFWS 2005). Alameda whipsnake is also found in grasslands, open woodlands, and rocky slopes and along open streams and arroyos, which they use for cover and as dispersal habitats between shrub patches (USFWS 2005). Their primary food source is lizards, such as the western fence lizard which depends upon open rock-outcrops and other vertical structures for basking habitat. All these habitat types and features occur within the RMP lands, and Alameda whipsnake is known to occur in the RMP lands.

Western fence lizards are a major food source for Alameda whipsnake, and in an EBRPD study, western fence lizard numbers were three times denser in moderately grazed sites vs. ungrazed sites (Riensche 2008). Alameda whipsnake use California ground squirrel burrows for escape and hibernation, and it has been shown that cattle grazing can have a significant positive effect on the abundance of ground squirrel burrows. For example, one study demonstrated that there were 2.5 times more burrows with grazing when compared to ungrazed plots in upland (but not lowland) plots (Bylo et al. 2014).

California red-legged frog (*Rana draytonii*) is listed as threatened under the FESA and is a California species of special concern that is known to occur on the RMP lands. Much of the RMP lands reside within USFWS-designated critical habitat. Typical aquatic breeding habitat for the species includes a combination of dense, shrubby, or emergent riparian vegetation in ponds deeper than 2 feet (Hayes and Jennings 1988) where predatory fish and bullfrogs are absent. Typical upland dispersal habitat for the species includes downed logs, vegetation, leaf litter, and small mammal burrows that may provide protection from predators (Hayes and Jennings 1986). California red-legged frog breeding and rearing occur in stockponds and spring boxes with emergent or submerged vegetation, as well as pools within creeks. Dispersal habitat in the RMP lands is widespread and includes grasslands, savannahs, and sparse woodlands.

California red-legged frog is known to successfully co-exist with cattle grazing, and individuals are frequently found in artificial impoundments such as stock ponds. The species is found in grazed areas where stock ponds and cattle are present (USFWS 2002). Overall, grazing may both enhance populations and potentially be a detriment to habitat suitability depending on grazing practices, watershed integrity, and conditions of a particular site (USFWS 2002).

Currently, California red-legged frog occurrence data gathered in the Alameda Creek Watershed indicate that grazing in the watershed generally supports habitat for this species. However, many of the stock ponds in the watershed are in need of maintenance, including desilting, reduction of overgrown vegetation, and rebuilding of embankments and spillway structures. Ponds must be inundated for approximately nine months for California red-legged frog larvae to successfully metamorphose. Loss of stock ponds would directly affect critical breeding habitat for this species. Riparian and emergent vegetation provides substrate for oviposition and is therefore necessary for the species to successfully reproduce. Heavy grazing may have negative effects on the species through overgrazing riparian habitat and pond vegetation and by crushing or trampling of egg masses (USFWS 2002).

California red-legged frog utilize California ground squirrel burrows for aestivation habitat and escape from predators. Cattle grazing has been shown to be compatible with California ground squirrel (Fehmi et al. 2005; Bylo et al. 2014); grazing and low vegetation biomass have been correlated with upland California ground squirrel burrow presence (Bylo et al. 2014).

California tiger salamander (*Ambystoma californiense*) central California Distinct Population Segment (DPS) is listed as a threatened species under the FESA and CESA. Suitable habitat for the species in the RMP lands includes ponds, wetlands, annual grasslands, oak woodlands, riparian habitats, and shrub communities. Within the RMP lands, the species typically breeds in seasonal stock ponds and lives in upland burrows created by California ground squirrels and other small mammals near the stock ponds. Many occurrences of breeding salamanders, egg masses, and juvenile salamanders are recorded in association with the ponds on the RMP lands (SFPUC 2013).

Adult California tiger salamanders live in small mammal burrows and breed in ponds or similar habitat. Water must remain ponded for approximately three to six months for California tiger salamander larvae to successfully metamorphose (USFWS 2017). California tiger salamander may sometimes thrive on actively grazed lands because artificial cattle ponds often provide breeding habitat that would not otherwise exist.

Foothill yellow-legged frog – west / central coast DPS (*Rana boylii pop. 4*) is listed as endangered under the CESA and threatened under the FESA. The species breeds and lays egg masses on rocky substrates in streams, and it is associated with low- to moderate-gradient perennial streams and intermittent streams that retain wetted pools throughout the summer. Breeding generally occurs between February and July, but is variable and strongly correlated with temperature and stream flow volume. Individual frogs will return to suitable breeding sites annually due to the specific microhabitat characteristics required for successful reproduction (CDFW 2019). Foothill yellow-legged frog is well documented on Alameda Creek and may be found on streams throughout the RMP rangelands.

Golden eagle (*Aquila chrysaetos*) is a California Fully Protected species and is also protected under the Bald and Golden Eagle Protection Act. In the northern Diablo Range, golden eagle is a year-round resident inhabiting primarily hilly and mountainous terrain in open areas. Preferred habitat for golden eagles generally includes hilly areas with suitable nest sites and sufficient prey availability. Golden eagles nest in large trees, predominantly oak (*Quercus* spp.), pine (*Pinus* spp.), and non-native tree species such as eucalyptus (*Eucalyptus* spp.), but may also utilize transmission towers and cliff faces or rock outcrops. Prey items include medium- to large-sized mammals, as well as birds and reptiles.

Golden eagles rely on rangelands for nesting and foraging habitat and reproductive output is tied to inter-annual fluctuations in prey abundance. California ground squirrels are an important prey item for golden eagles in the northern Diablo Range. Rangelands that support ground squirrel colonies provide foraging opportunities for golden eagles.

Townsend's big-eared bat (*Corynorhinus townsendii*) is a California Species of Special Concern. Townsend's big-eared bat is found throughout California in a wide variety of habitats, but most commonly in mesic sites. The species' distribution is strongly correlated with the availability of caves and cave-like roosting habitat; they prefer to roost in large open areas including caves, large rock cavities, abandoned buildings, mines, and tunnels.

In a habitat use study conducted at Point Reyes National Seashore, Townsend's big-eared bat were found to primarily forage in riparian woodland habitat and did not use grazed grassland areas (Fellers and Pierson 2002). The authors suggested that grazing may reduce foraging habitat for Townsend's big-eared bat, but it was unclear if these foraging patterns described in the study are explained by a preference for forested areas or by an avoidance of grazed areas. Townsend's big-eared bat is reported to forage over old fields and agricultural fields in the eastern U.S.

Tricolored blackbird *(Agelaius tricolor)* is listed as threatened under the CESA, is a California species of special concern, and is protected under the Migratory Bird Treaty Act. The species nest in colonies in emergent wetlands, blackberry patches in irrigated pastures, freshwater marshes, and rice fields throughout their range. The breeding period for the species typically ranges from mid-March to August (Hamilton 2004). Tricolored blackbirds use open grasslands and agricultural areas for foraging. During nesting season, blackbirds routinely forage for insects (such as beetles, grasshoppers, caterpillars) up to 2 miles from their nesting site. Blackbirds are an eruptive foraging species, which means that they typically visit a foraging area repeatedly until the forage has been depleted and then move to a new area.

Temporary impacts on aquatic vegetation from maintenance of the larger ponds could temporarily disrupt or displace potential tricolored blackbird breeding habitat. Loss of habitat due to pond vegetation removal is expected to be minor since most of the known breeding habitat is located in the quarry ponds and along San Antonio Reservoir, outside the grazing lease, and not subject to vegetation clearing. Potential impacts on nesting birds can be avoided by implementing avoidance measures in the large ponds such as conducting pond maintenance activities from August to October after the breeding period, and by performing pre-construction nesting surveys. Grazing is not expected to affect foraging habitat of tricolored blackbirds.

Monarch – California overwintering population (*Danaus plexippus plexippus pop. 1)* is listed as a candidate species under the FESA. Monarch butterflies breed as they migrate, completing migration across the U.S. in multiple generations. The species overwinters in forest groves along the coast from mid-winter to early spring, after which they depart from overwintering sites to breed and lay eggs from spring until summer. Several tree species are associated with monarchs in overwintering sites, including Monterey pine (*Pinus radiata*), Monterey cypress (*Cupressus macrocarpa*), Coast redwood (*Sequoia sempervirens*), coast live oak (*Quercus agrifolia*), Douglas fir (*Pseudotsuga menzesii*), and western sycamore (*Platanus racemosa*). Some of these tree species may occur on RMP lands; however, there are no known monarch overwintering sites within the RMP lands. The Alameda Creek Watershed is within the species' early breeding zone in California, where monarchs lay eggs on milkweed in the early spring and summer. Monarchs utilize early emerging milkweed species such as *Asclepias*

vestita, A. californica, A. cordifolia, and *A. eros* for egg-laying in this region (USFWS 2023). Only *A. californica and A. fascicularis* have been documented in the Alameda Creek Watershed.

Northwestern pond turtle (*Actinemys marmorata*) is proposed to be listed as threatened under the FESA (October 2023, 88 Federal Register [FR] 68370) and is a California species of special concern. The southwestern pond turtle (*Actinemys* pallida) is similarly listed, has nearly identical life history strategies, and has the potential to also occur in the Alameda Creek Watershed. The northwestern pond turtle occupies rivers, streams, lakes, ponds, wetlands, reservoirs, and brackish estuarine waters as high as 6,500 feet above sea level. Numerous occurrences of the species can be found in ponds and streams throughout the watershed lands. They prefer aquatic habitats with high nutrient levels, high productivity, and abundant insects. Northwestern pond turtles also prefer basking sites in the middle of ponds but can thrive in ponds where they are able to bask at the water edge. Northwestern pond turtles require both aquatic and terrestrial habitats for survival. Upland habitat directly adjacent to aquatic habitat is used for both overwintering and nesting. Required refugia habitat for overwintering includes leaf litter or soil, rocks, logs, mud, submerged vegetation, and undercut areas along banks.

In late spring or early summer, female northwestern pond turtles nest in sunny upland habitats in dry, sparsely vegetated sites with compacted soils, including native and non-native grasslands, grazed pastures, agricultural fields, and unpaved road and trail surfaces. Nesting has been reported to occur up to 1,391 feet from water (Jennings and Hayes 1994) but is usually closer, averaging 92 feet from aquatic habitat (Rathbun et al. 2002). They spend much of their time feeding in aquatic habitats and are provided protection from many predators in the deeper waters of streams and ponds. They also find basking spots within aquatic habitats that allow them to optimize thermal functioning. Terrestrial habitats are utilized for aestivation during colder weather conditions, or when aquatic habitats are dry. Predation and competition from American bullfrogs and non-native fishes, in addition to reduction in both terrestrial and aquatic habitat suitability and connectivity, are likely the primary threats for the local population(s).

Providing rocks and logs in ponds for sunning may improve habitat for northwestern pond turtle. Periodic removal of sediment and vegetation from ponds may improve deep open water habitat conditions for the species. Disturbing known nesting sites when removing sediment and vegetation from ponds should be avoided during the nesting season.

Western burrowing owl (*Athene cunicularia hypugea*) is listed as a California species of special concern and is protected under the Migratory Bird Treaty Act. The species requires open, well-drained terrain with sparse, short vegetation for foraging and burrows for predator avoidance. Ideal height of grass is less than 5 inches (Green and Anthony 1989), which has required mowing at ungrazed regional restoration sites throughout the winter/spring growing season. There must be available burrows (typically California ground squirrel burrows) for refuge and nesting, as western burrowing owls rarely excavate their own burrows. This species typically forages and breeds in grasslands, fallow agricultural fields, and open oak savannahs. In the RMP lands, western burrowing owls primarily use annual grasslands and serpentine bunchgrass grassland, as well as a small amount of cultivated agriculture land cover. Western burrowing owls are uncommon in RMP lands and have not been known to breed in the RMP lands; however, overwintering birds have been observed at a few locations, including along Ranch Road north of San Antonio Reservoir, in both Maguire Peaks (GU-16) and San Antonio Creek (GU-17), and in Calaveras Reservoir (GU-23) and Frog Pond (GU-21). The removal of tall grass by grazing cattle can benefit western burrowing owls by improving visibility for foraging and predator avoidance. The maintenance of short grasslands provides suitable habitat for

California ground squirrels to establish burrow complexes, which western burrowing owls use to seek refuge.

Pacific lamprey (*Entosphenus tridentatus*) are listed as a California species of special concern. It is a primitive, jaw-less fish that occurs throughout the western United States and is parasitic as a marine adult. Juveniles (ammocoetes) that are found in streams such as Alameda Creek primarily subsist on algae and detritus (Moyle 2002). Pacific lamprey have been reported from Alameda Creek both historically (Leidy 2007) and more recently and routinely in Sunol Regional Wilderness downstream of Little Yosemite and in the area of the Sunol Valley Water Treatment Plant (SFPUC 2023 and other SFPUC Alameda Creek annual monitoring reports). Habitat requirements are poorly known. Spawning occurs in riffles with fast water; ammocoetes are generally found in slack water with detrital/silt substrate. Like steelhead, juvenile Pacific lamprey remain in freshwater for extended periods; ammocoetes burrow into soft substrates (e.g., sand and silt) where they remain to filter feed presumably for five to seven years. Consequently, like steelhead, Pacific lamprey ammocoetes require suitable flow and temperature conditions year-round for survival.

Lamprey appear to be sensitive to environmental conditions including degradation associated with urbanization (Leidy 2007). Recent observations suggest that existing salmonid barriers downstream of the RMP lands in lower Alameda Creek do not impede lamprey passage into the upper watershed. Indirect effects on lamprey may occur from water quality degradation (turbidity, sedimentation, pollutants) associated with soil disturbance (road and bridge construction, road maintenance, and livestock grazing). The negative effects may be more pronounced for ammocoetes than juvenile salmonids because of their more sedentary nature.

In addition to Pacific lamprey, two species of lamprey within the genus *Lampetra* are known or presumed to occur within the Alameda Creek watershed with similar distribution. The western brook lamprey (*Lampetra richardsonii*) is a non-parasitic and non-anadromous species that resides within small streams throughout its life-stages and is routinely collected in lower Alameda Creek within the Sunol Regional Wilderness (SFPUC 2023). The western river lamprey (*Lampetra ayresii*) is another parasitic and anadromous fish less commonly reported but presumed to be found within the Alameda Creek watershed (CDFW 2024). However, distinguishing between species of *Lampetra* can be difficult *in-situ*, so these lamprey are often reported as *Lampetra* spp.

Steelhead – Central California Coast DPS (*Oncorhynchus mykiss*) is listed as a threatened species under the FESA. Suitable habitat exists in the upper Alameda Creek watershed (and within the RMP lands) to support steelhead and Chinook salmon spawning and rearing (Gunther et al. 2000). Anadromous salmonids typically remain in freshwater for one to three years. Due to unpredictable water year types, the amount of time steelhead spend in freshwater during their lives varies greatly. Steelhead require cool, clean, well-oxygenated water, and an appropriate gravel size of 0.25 inch to 3.0 inches in diameter for successful spawning. Additionally, spawning habitat condition is strongly affected by water flow and quality, especially temperature, dissolved oxygen, shade, and silt load.

Chinook salmon – Central Valley fall / late-fall run Evolutionarily Significant Unit (ESU) (*Oncorhynchus tshawytscha*) is a listed National Marine Fisheries Service-designated species of concern and is a California species of special concern. Recent fish passage improvement projects (i.e. the SFPUC Alameda Creek Diversion Dam [2019] and the Alameda County Water District's Lower Alameda Creek Fish Passage Improvements Program [2022]) have expanded volitional passage for both salmonid species in the Alameda Creek watershed.

RMP lands may be used as a migratory corridor for steelhead and Chinook salmon and are considered suitable for spawning and rearing.

Grazing within the RMP lands could disrupt salmonid, lamprey, and other fish species life histories by trampling redds (where eggs are laid in the gravel streambed), increasing turbidity, contributing sediment to pool habitats, widening and/or incising the creek through trampling, and removing riparian vegetation cover. Removal or reduction of riparian vegetation could decrease shading and result in suboptimal water temperatures and inadequate cover for fish by inhibiting succession (preventing young seedlings and saplings from maturing to overstory shade trees). Reduction or removal of riparian vegetation could also create conditions in which stream banks are more susceptible to erosion due to decreased flow resistance (increased stream velocities) and lower concentration of plant roots that help hold soil together and prevent water erosion.

3.4.2 Special-Status Plant Species

The following three special-status plant species are found within the RMP lands and are described below in terms of their life history requirements and the potential advantages and disadvantages of grazing within suitable habitat for the species.

Congdon's tarplant (*Centromadia parryi* ssp. *congdonii)* is listed by the California Native Plant Society (CNPS) as a California Rare Plant Rank (CRPR) 1B.1 species. Species with a 1B plant rank are considered rare throughout their range and the .1 classification indicates that the species is characterized as being "seriously endangered in California." It is a California endemic, annual herb that grows in annual grasslands. It is usually found on clay soils with a moderately alkaline subsoil layer, typically on gently sloping terraces at the base of low hills, in swales, on the edges of wetlands, or along floodplains of intermittent streams. It most often occurs with NNIP species (usually grasses) that are associated with disturbance. As a result, there is potential for NNIP plant species to compete for limited resources such as water or soil nutrients needed by tarplant. Congdon's tarplant is recorded in the northern portion of the Andrade Road lease (GU-18) near Andrade Road.

Tarplants are not palatable to livestock, so grazing of this species by cattle is not likely. However, populations of NNIPs are known to occur near the known occurrences of the species in the GU-18 lease and may threaten the species.

Hospital Canyon larkspur (*Delphinium californicum* ssp. *interius*) is listed as a CNPS CRPR 1B.2 species. This species is considered rare throughout its range and "fairly endangered in California." It is a California endemic, perennial herb that occurs primarily on slopes in open woodlands on the east side of the Coast Ranges. More specifically, it tends to grow in wet meadows or boggy areas within woodlands or chaparral. During 2009 floristic surveys, 14 occurrences of this species were identified, with the largest occurrence location containing 500 individual plants (Nomad Ecology 2012). The species has been found in the San Antonio Creek lease (GU-17) near the Grimes BHR site, in Williams Gulch, and in the La Costa Creek subwatershed.

Since livestock grazing disturbance within most shrub habitat is minimal, the impact of grazing on the species is anticipated to be neutral.

Most beautiful jewelflower (*Streptanthus albidus* ssp. *peramoenus* "Sunol form") is listed as a CNPS CRPR 1B.2 species. This species is considered rare throughout its range and "fairly endangered in California." It is an annual California serpentine endemic that is restricted to

serpentinite rock outcrops or soils derived from serpentinite. It is generally found within serpentine grasslands dominated by native perennial grasses or in open grasslands dominated by non-native annual grasslands with relatively low cover. It is also found on rock outcrops or grassy openings in serpentine chaparral or where serpentine grassland or chaparral habitats transition to oak woodland. Most beautiful jewelflower occurs near Mission Peak in the southwestern portion of Hayne's Gulch lease (GU-19), in various portions of the Sunol Park lease (GU-20) near Jacobs Valley and Happy Camp, in the Frog Pond lease (GU-21) within the Goat Rock BHR site and eastern portion of the lease, and in the Calaveras Reservoir lease (GU-23) near Arroyo Hondo and the east side of the reservoir.

Cattle browsing and trampling could pose a threat to this species. Appropriate grazing practices related to timing and intensity may benefit this species.

3.5 Non-Native Invasive Plant and Nuisance Wildlife Species

The RMP lands contain several species of non-native invasive plant and wildlife species that have varying considerations related to grazing operations. The eight NNIP species of particular concern in the RMP lands are Barb goatgrass (*Aegilops triuncialis*), yellow starthistle (*Centaurea solstitialis*), purple starthistle (*Centaurea calcitrapa*), medusahead (*Elymus caput-medusae*), stinkwort (*Dittrichia graveolens*), artichoke thistle (*Cynara cardunculus*), Himalayan blackberry (*Rubus armeniacus*), and Italian thistle (*Carduus pycnocephalus*). These species are discussed below and described in terms of their ecology, range, threat they pose to livestock grazing operations, and known location in the RMP lands. However, the distribution and invasive stage of NNIPs are dynamic and can change from year to year. Other NNIPs are present in the watershed and are managed as needed.

The primary non-native invasive wildlife species of concern in the RMP lands is feral pig. The discussion below also considers one native species, the California ground squirrel, as this species poses unique challenges to the management of watershed lands. Other non-native invasive fish and wildlife are present in the watershed but are not currently managed through the SFPUC rangeland program and are therefore not discussed in this document.

Barb goatgrass (*Aegilops triuncialis*) has a California Invasive Plant Council (Cal-IPC) rank of High invasiveness and is a high priority because it readily spreads when introduced to the Alameda Creek Watershed. As of the summer of 2023, there are three known isolated patches: the largest is off Ranch Road, a smaller patch is east of Calaveras Dam, and the third is at the San Antonio Creek BHR site. Barb goatgrass has an impact on rangelands and natural ecosystems. For these reasons, it is a high priority for control. Barb goatgrass is a late-season winter annual that matures in late spring, making it easy to identify as it is still green when most other vegetation has senesced. The seedheads have spikelets arranged alternating along a zigzag rachis. The leaves look somewhat like winter wheat, except they have fine hairs along the margins. The seedheads break apart into joints with barbed awns that readily attach to animals, humans, and equipment and disperse. Seeds germinate in fall and winter. The seeds that do not germinate in the first winter do so in the second. The seed bank is short-lived, lasting only two or three years (DiTomaso et al. 2013).

Yellow starthistle (*Centaurea solstitialis*) has a Cal-IPC rank of High and is one of the rangeland weeds of greatest concern in the western United States (DiTomaso and Healy 2007). Containment management is the recommended control because this plant is already high on the invasive curve. It is a winter annual with a deep taproot and spiny flowering heads that can produce up to 75,000 seeds per plant (DiTomaso and Healy 2007). Yellow starthistle can form dense, impenetrable stands that displace native or otherwise desirable vegetation in natural

areas, rangelands, and grasslands and along roadsides (DiTomaso et al. 2013). The species is toxic to horses and the spiny heads of mature plants make the vegetation unpalatable to grazing livestock, except for goats (*Capra aegagrus hircus*), decreasing the value of infested hay (DiTomaso et al. 2013) and rangeland. Yellow starthistle is spread primarily though human activity: on the undercarriage of vehicles, by road maintenance equipment, and through the movement of contaminated hay and uncertified seed (DiTomaso et al. 2006).

Within the RMP lands, yellow starthistle occurs across hundreds of acres in both large (>10 acres) and small patches throughout grasslands and oak savannahs, with larger infestations in the Sunol Park (GU-20), Maguire Peaks (GU-16), and Calaveras Reservoir (GU-23) leases. Grazing systems used in the watershed are mostly compatible with controlling the spread of the plant from existing locations, as most locations where the plant occurs have year-round grazing and the plants are grazed down to some extent before they bolt to flower.

Purple starthistle (*Centaurea calcitrapa*) has a Cal-IPC rank of Moderate and is prioritized as an Early Detection and Rapid Response (EDRR) NNIP because it is currently not widespread. It is a non-native annual herb that invades pastures, rangeland, open forests, and riparian areas (DiTomaso et al. 2013). Rigid spines on the flower heads and bitter taste make plants unpalatable to grazing livestock and it therefore reduces overall forage quality and production in rangelands where it is found. Additionally, a deep taproot provides purple starthistle with access to water reserves that are inaccessible to annual and perennial grasses (DiTomaso et al. 2013). Within the RMP lands, purple starthistle populations occur in relatively limited abundance; most infestations occur in the Calaveras Reservoir lease, with smaller scattered patches in the Sunol Park (GU-20), Maguire Springs (GU-16), and Mission Peak (GU-22) leases, and in disturbed locations and roadsides of the larger RMP lands. The SFPUC and its tenants have made a concerted effort to control many acres of purple starthistle in the past; however, in recent years that effort has been focused on control of other NNIPs. As a result, populations of purple starthistle are on the rise and are expected to spread in the watershed without focused efforts to control the species. Grazing management effects on controlling purple starthistle are similar to those of yellow starthistle.

Medusahead (*Elymus caput-medusae*) has a Cal-IPC rank of High but is a lower priority because it is already high on the invasive curve. It is a noxious, non-native annual grass that is prevalent in California's rangelands. Mature plants have high silica content and long, stiff awns that can injure the eyes, nostrils, and mouths of grazing animals, rendering mature medusahead grass unpalatable and dangerous to grazing livestock (DiTomaso et al. 2013). The silica-rich plants decompose slowly, accumulating as a heavy layer of thatch that slows nutrient cycling, contributes to fire danger, and suppresses germination of associated species by changing the temperature and moisture profiles of the soil (Bossard et al. 2000). Medusahead exploits disturbed areas. Medusahead has been reported to colonize less disturbed sites and overtake those areas once they are cleared by disturbance (NRCS 2016). Medusahead is widespread but patchy across hundreds of acres in non-native annual grasslands and oak savannahs of the RMP lands. The most extensive populations are in the Calaveras Reservoir (GU-23) lease along Oak Ridge and Cherry Knoll and in the San Antonio Creek (GU-17) lease in the vicinity of the reservoir, but it is also present in the Sheep Camp Creek (GU-12), Maguire Peaks (GU-16), Andrade Road (GU-18), Confluence (GU-15), and Frog Pond (GU-21) leases. Grazing can maintain and, in some cases, reduce medusahead infestations. However, grazing must occur in the spring from when the seed head is emerging to flower head (DiTomaso et al. 2013) and needs to be high intensity.

Stinkwort (*Dittrichia graveolens*) has a Cal-IPC rank of Moderate and is highly invasive but more easily controlled than some NNIPs. It is a fall-flowering annual herb that is native to southern Europe (DiTomaso and Healy 2007). Since its introduction in the 1980s, stinkwort has rapidly expanded its range, primarily invading roadsides and heavily disturbed areas. It has also been recorded in riparian woodlands and grasslands (DiTomaso et al. 2013). Its rapid spread can be attributed to high seed production, an affinity for disturbed habitats, and efficient dispersal by animals (facilitated by the presence of a barbed bristles on the fruits) (Robison 2012). Stinkwort is known to occur throughout the watershed in scattered patches across hundreds of acres of grassland areas of moist soil conditions such as grassy swales and drainages, and disturbed areas along trails and roads. Large populations occur in the Sheep Camp Creek (GU-12), Paloma (GU-13), Confluence (GU-15), and San Antonio Creek (GU-17) leases. In many of these areas, progress has been made due to diligent management efforts. Most populations of stinkwort are associated with disturbed areas of the leases, and/or associated with roads. Heavy grazing in the watershed can result in vulnerability of a site to invasion by stinkwort. Lengthy droughts in California and the resulting decrease in available forage between stocking rate adjustments in some leases likely contributed to the presence of more bare ground and therefore the spread of this species in the watershed. Ground disturbance through construction activities opens up areas for invasion by stinkwort, and the SFPUC has undertaken extensive repairs and upgrades to its water infrastructure in the watershed starting in 2011; some of these areas, such as the haul roads for the Calaveras Dam Replacement Project (CDRP), have supported extensive dense populations of stinkwort that served as a seed source for the adjoining leases.

Artichoke thistle (*Cynara cardunculus*) has a Cal-IPC rank of Moderate and is an escaped cultivar that can form monotypic stands in ranchlands where it out-competes desirable vegetation for light, water, and nutrients (Bossard et al. 2000). This NNIP has been reduced to a few scattered plants on the watershed and thus is currently considered an EDRR level plant. Large infestations can become impenetrable, impeding wildlife and livestock movement. Individual plants are robust, reaching 8 feet tall with a taproot up to 8 feet deep. The perennial taproot must be removed to eliminate artichoke thistle populations. Artichoke thistle is known to occur in limited stands in the San Antonio Creek (GU-17), Calaveras Reservoir (GU-23), and Maguire Springs (GU-16) leases in limited numbers. At the San Antonio Creek lease, in Williams Gulch, artichoke thistle once covered several acres associated with a landslide, but efforts to control the species have almost eradicated this plant from the lease.

Himalayan blackberry (*Rubus armeniacus*) has a Cal-IPC rank of High but is not a high priority because it does not spread where it does not have a year-round water source. It is a deciduous, perennial shrub that forms dense thickets with a canopy that can block sunlight and limit the growth of understory plants (Bossard et al. 2000). Himalayan blackberry can spread via seed dispersal but can also spread vegetatively, producing new shoots from the root crown. In riparian areas, Himalayan blackberry thickets can prevent access to water sources for wildlife and livestock. Himalayan blackberry occurs in scattered patches in the RMP lands, particularly in mesic habitats such as drainages and ponds. A large population occurs in the Maguire Peaks (GU-16) lease along Vallecitos Creek, and in the Confluence (GU-15) lease above pond PA029.

Italian thistle (*Carduus pycnocephalus*) has a Cal-IPC rank of Moderate and is a short-lived thistle that competes poorly with established grasses and other vegetation but can become established in bare, disturbed soil. Italian thistle overwinters as a rosette and populations of rosettes can form a dense groundcover that inhibits germination of other plants. Italian thistle is widespread and occurs in every lease and almost every habitat and across hundreds of acres of the RMP lands. Cattle tend to avoid the spiny vegetation and flowering heads, but horses,

cattle, and goats have been known to eat the flowering heads and sheep will eat the rosettes, especially at a high stocking rate and when the plant is 4 to 6 inches high (DiTomaso et al. 2013).

Wild (feral) pig (*Sus scrofa*). In the early 1700s, settlers introduced domestic pigs (*S. scrofa*) from Eurasia to California as livestock, and escaped pigs became feral. In the 1920s, a subspecies of *S. scrofa* was introduced to Monterey County and bred with feral previously domesticated pigs, creating the current wild/feral domestic pig hybrid that is found throughout California's wildlands. Wild pigs occupy a number of habitats in the RMP lands, including woodlands, chaparral, riparian areas, and open grasslands. They are omnivorous and generally feed on grasses and forbs in the spring, mast and fruits in the summer and fall, and roots, tubers, and invertebrates throughout the year (CDFW 2013). Wild pigs are prolific breeders, producing two litters of five to six piglets per year (Waithman 2001). Adults can be aggressive, especially females with piglets under their protection. Impacts from wild pigs include wallowing in water sources, trampling and browsing on riparian vegetation, and rooting in grasslands leaving large expanses of exposed bare ground. These impacts may disrupt grazing operations and cause damage to resources. The SFPUC funds a pig depredation program in the RMP lands. Pigs are controlled annually through trapping; this program has reduced and continues to suppress wild pig populations significantly in the RMP lands (Koopmann, pers. comm. 2013). However, some areas of the RMP lands, including the San Antonio Creek (GU-17), Frog Pond (GU-21), and Calaveras Reservoir (GU-23) leases, continue to have pig presence and sustain ongoing pig damage.

California ground squirrel (*Otospermophilus beecheyi*) are a native species to California. As described in Section 3.4.1, California ground squirrel burrows benefit a number of special-status species such as western burrowing owl, California tiger salamander, California red-legged frog, and Alameda whipsnake by providing habitat for nesting, aestivating, refuge, and foraging. In some areas of the RMP lands, California ground squirrels are so numerous that they are considered a pest species due to competition for forage, damage to grazing infrastructure, and the hazards posed to cattle and horses from burrows. Burrow complexes of this species can be extensive with multiple openings. Burrows, particularly near ponds, can destabilize embankments by allowing water to pipe through burrows when rains fill the ponds, resulting in erosion that can reduce the capacity of the pond and threaten pond stability. California ground squirrels can contribute to erosion in rangelands when grazing by squirrels denudes the cover of vegetation. Trapping can be productive in reducing populations in small areas but is not effective on a larger scale.

4. Rangeland Management Program

Livestock grazing has evolved over the time that the SFPUC has managed the RMP lands; changes to the grazing program on these lands have been implemented to address species and resource protection, water quality, and variations in annual weather. This section of the RMP outlines general management actions for achieving the goals and objectives of the RMP.

4.1 AUM-Based Leases

Since 2008, the SFPUC has converted all watershed leases from cash per acre to AUM to better regulate grazing use and to meet the overarching goal of water quality protection in the watershed. The SFPUC specifies base stocking rates in the lease, which are based on forage productivity of the lands in the grazing unit, as well as a minimum RDM to be left in the fall. Stocking rates are subject to adjustments by the SFPUC to meet the RMP goals with the aim to leave 1,000 pounds per acre. The base rent is the first yearly payment and is due at the beginning of the grazing season. The base rent for the lease is one half of the estimated sustainable AUM capacity for normal (median) productivity years, multiplied by the annually adjusted price per AUM. The annually adjusted price per AUM is derived from cash price information provided by Cattle Fax, marketing division of the National Cattlemen's Association. A second lease payment is due May 1 and may include adjustments based upon actual utilization as well as rent credits earned.

In addition, leases have been combined or divided to better serve current grazing operations as shown in Figure 1 and Table 1-1. Grazing unit boundaries may need to be evaluated and adjusted over time. Periodically, the SFPUC will review the grazing units to determine if adjustments of the grazing unit boundaries are needed to improve access and better achieve the goals and objectives in this RMP.

4.2 Grazing Capacity

Grazing capacity is the number of animals that can be sustained over the long term by available forage without adverse effects on other resources (Heady and Child 1994). Forage quality in addition to forage quantity (annual production) play a key role in determining carrying capacity for a grazing unit and for the entire property. Forage quality as well as forage production vary based on soil type, topography, and vegetation type. Highly palatable annual grasses and low-growing forbs comprise the majority of vegetation available for grazing livestock.

The base rent for each lease is based on the estimated sustainable capacity (AUMs) for normal (median) productivity years. This section presents estimated grazing capacity values for the watershed based on the watershed vegetation community map (2003) and rangeland forage productivity rates provided by United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) soil surveys. The model may overestimate the available forage for cattle due to historic heavy grazing that may have led to decreased forage productivity over time. Therefore, stocking rates recommended by the RMP for an average forage year (rather than a high forage year) are considered to be the AUM capacities and are generally equivalent to recent stocking rates reported for the leases.

The grazing capacity values provided in this section are a general starting point for setting stocking rates for leases in the watershed. The Rangeland Manager with approval by the Watershed Resources Manager will adjust stocking rates annually based on rangeland health, results of RDM plot monitoring data, and weather variations to meet the stewardship goals of the RMP.

4.2.1 Grazing Capacity Methods

Forage production estimates are utilized to determine livestock carrying capacity and an estimated range of stocking rates. Proposed carrying capacity estimates for the property are established using forage production estimates based on soil class units derived from the NRCS soil survey and verified through site assessments and comparisons to historic stocking levels. Forage production is adjusted based on vegetative cover, and non-forage producing areas of the property, including wooded drainages, reservoirs, and other developed areas, are deducted from the total acres utilized to calculate available forage production. Available forage is calculated by deducting the RDM desired at the end of the grazing season (average of 1,000 pounds per acre) from the total dry weight forage production.

Stocking rates are adjusted downward or upward annually depending on precipitation (distribution and quantity) and annual forage production. Standing forage, along with stewardship goals of the RMP, will determine stocking rates and pasture rotation. At no time should there be significant areas of bare soil void of vegetative cover present in the grazed pastures. The calculated carrying capacity and estimated stocking rates should be used as a reference; actual stocking rates should be adjusted to match actual “live time” forage conditions on the property. Grazing tenants will coordinate with the SFPUC Rangeland Manager throughout the year to assess forage conditions and, if needed, adjust stocking rates with approval from the Watershed Resources Manager.

The following methods were used to estimate grazing capacity for the RMP lands. Data layers, including soils, vegetation, and slope, were analyzed in ArcGIS 10.2 to estimate forage productivity rates, available forage, and stocking rates within the RMP lands.

4.2.2 Rangeland Forage Productivity Rate

The rangeland forage productivity rate is the amount of forage that can be produced in a given area or on a per-acre basis. The NRCS provides estimated forage productivity rates (pounds per acre per year) for groups of soils with characteristics to produce similar amounts of vegetation. Forage productivity rates were assigned to each of the soil mapping units based on table values and site descriptions provided in the NRCS Alameda Area (SCS 1966) and Eastern Santa Clara Area (SCS 1974) soil surveys.[2] Soil map units defined as rockland, riverwash, and water (i.e., ponds, reservoir) were assigned a forage productivity rate of zero.

Forage productivity rates were adjusted by a reduction rate based upon the percentage of non-forage canopy cover estimated for each vegetation community type.[3] Each vegetation community type was assigned one of five canopy cover classes and an associated forage productivity rate reduction. Areas such as shrub, rock outcrop, disturbed (e.g., homes or corrals), roads, and water (reservoir or stock pond) were reduced 100 percent due to absence of forage or inaccessibility for livestock. Table 4-1 lists each vegetation community type, canopy

[2] NRCS online data download of CA609, CA610, CA641, and CA646 databases (NRCS 2013a and 2013b).

[3] Dense forest vegetation communities were assumed to have 50 to 75 percent canopy cover, more open/riparian forest was assumed to have as much as 50 percent cover, and open oak savannah was assumed to have up to 25 percent canopy cover. Shrub was assumed to have 100 percent cover (i.e., no forage) and grasslands were assumed to have 0 to 25 percent cover of non-forage vegetation. The CALVEG classification is a provisional system that meets the floristically based level of the National Vegetation Classification Standard hierarchy (USFS 2010).

cover class, and forage productivity reduction factor (the reduction percentage listed above for each canopy cover class).

Forage productivity and vegetation were analyzed in ArcGIS 10.2 to obtain spatially linked production values for the RMP lands. The forage productivity rate multiplied by the forage productivity reduction factor is the adjusted forage productivity rate for each grazing unit.

Table 4-1. Forage Productivity Reduction Factor for Each Vegetation Community Type

Vegetation Community/Feature Type	Canopy Cover Class[1] (%)	Forage Productivity Reduction Factor
Blue Oak Woodland	25–50	0.8
Central Coast Live Oak Riparian Forest	25–50	0.8
Diablan Sage Shrub	100	0.0
Disturbed	not applicable	0.0
Mixed Evergreen Forest/Oak Woodland	50–75	0.6
Non-Native Grassland	0–25	1.0
Oak Savannah	0–25	1.0
Reservoir	not applicable	0.0
Roads	not applicable	0.0
Rock Outcrop	not applicable	0.0
Serpentine Foothill Pine-Chaparral Woodland	25–50	0.8
Serpentine Grassland	0–25	1.0
Stock Pond	not applicable	0.0
Sycamore Alluvial Woodland	0–25	1.0
Valley Oak Woodland	25–50	0.8
White Alder Riparian Forest	50–75	0.6
Willow Riparian Forest	25–50	0.8

Notes:
[1] Canopy Cover Class (%) represents the canopy cover of non-forage species in a given vegetation community (i.e., canopy cover of shrubs, trees, herbaceous plants and vines).
Source: CNPS 2024

4.2.3 Available Forage

Available forage is the portion of the total adjusted rangeland productivity allocated to cattle grazing and is unique to the site conditions, such as soil and vegetation. A common way to manage grazing intensity on California's annual grassland ranges is to limit grazing capacity through the use of minimum RDM values. RDM is a measure of the desired amount of dead standing forage left at the end of the growing season (measured in pounds per acre) to protect soil productivity and prevent erosion. Available forage is the adjusted forage productivity rate less the RDM value.

To protect soil health and water quality, the SFPUC has selected an RDM of 1,000 pounds per acre, the high range of RDM levels recommended by rangeland scientists to be left in the fall. These values are conservative relative to the minimum RDM values recommended by Bartolome et al. 2002[4] and they are consistent with the RDM specified in the GRMP and applied by the EBRPD.

[4] For 20 to 40 percent slopes with low woody cover, Bartolome recommends a minimum of 700 pounds per acre, whereas this RMP would maintain 1,000 pounds per acre regardless of slope and cover.

4.2.4 Stocking Rates

The stocking rate is the number of livestock a given area can support based upon available forage adjusted by target RDM levels. The stocking rate is described as AUM capacity, which is the number of animal units (defined as a 1,000-pound cow with or without her nursing calf, or cow calf pair) per month per acre, or AUMs per acre. Stocking rates can also be expressed as the number of animal units (cow calf pairs) per year as AUY Capacity (AUYs) or Cow Year Long Equivalent (CYLE).

In practice, stocking rates are normally set at conservative levels to account for low productivity years, and to leave RDM at the end of the growing season. This practice encourages long-term range health and optimal forage growth the next year. An AUM is determined by the amount of available forage necessary to support one animal unit for one month. AUM capacity (AUMs) in the RMP lands was derived by dividing available forage (pounds per acre) by 930 pounds, the amount of forage assumed to be consumed per month by a cow calf pair (Pratt and Rasmussen 2001; Koopmann, pers. comm. 2014). Table 4-2 outlines the base stocking rate for each grazing unit.

Table 4-2. Estimated Base Stocking Rates

Grazing Unit Number	Grazing Unit Name	Grazing Unit Acreage	AUM Capacity
GU-18	Andrade Road	808	465
GU-10	Arroyo de la Laguna North	56	45
GU-11	Arroyo de la Laguna South	34	15
GU-25	Black Mountain	1,955	525
GU-23	Calaveras Reservoir	10,623	5,307
GU-26	Calaveras Road	8	6
GU-15	Confluence	857	552
GU-28	Felter Road	37	41
GU-21	Frog Pond	1,873	366
GU-19	Haynes Gulch	2,067	1,271
GU-16	Maguire Peaks	2,892	2,038
GU-22	Mission Peak	3,057	1,929
GU-14	Niles Canyon	284	54
GU-13	Paloma	157	108
GU-17	San Antonio Creek	6,037	4,257
GU-12	Sheep Camp Creek	475	332
GU-29	Sierra Road	67	50
GU-20	Sunol Park	1,227	413

4.3 Native Vegetation Goals

The Alameda WMP outlines general vegetation management policies for special-status plant species and specific plant communities. These include the following:

- Protect, preserve, and enhance significant botanical resources, including populations of rare, threatened, endangered, and sensitive plant species and their habitat.
- Encourage and allow investigations of special-status plants and communities in the watershed to further the SFPUC's understanding of the watershed's vegetation and its condition.

- Preserve the biodiversity and genetic integrity of the watershed plant communities, where possible.
- Protect, conserve, and enhance wetlands and riparian communities.
- Protect and restore unique, local, and/or indigenous plant species to maintain biodiversity and specialized habitat values.
- Manage grasslands and rangelands to balance, wherever possible, wildlife habitat values, the restoration of native perennial species, and the reduction of fuel loads and noxious weeds.
- Manage shrub communities to reduce fuel loads, prevent soil erosion and sedimentation, improve wildlife habitat access and use, and control invasive plants.
- Manage woodlands and forests to maintain healthy, vigorous, and diverse stands with a multiplicity of age and size classes.
- Use controlled fire to enhance natural vegetation regimes and wildlife habitat.
- Give priority to restoring degraded habitat rather than creating new habitat, with the exception of sites for wetland mitigation banking where new wetland habitat should be created.

Plant communities and condition are unique to each grazing unit based on soils, water, slope, aspect, and other environmental factors, as well as past land use. Therefore, specific vegetation management strategies will be outlined in each GUMP. Management actions to achieve these goals and objectives will be documented in the annual operating plan for each grazing unit.

4.4 Non-Native Invasive Plant and Nuisance Wildlife Control

The SFPUC implements an IPM program for SFPUC lands within the watershed, including rangelands, that is consistent with the City and County of San Francisco (CCSF) Department of the Environment Policies and Procedures. To evaluate, prioritize, and control non-native invasive plant and wildlife species, the SFPUC prioritizes NNIPs based on the annual assessments, the invasive curve for each species, preventative and maintenance measures, damage assessment procedures, thresholds for action, and manual, mechanical, and chemical treatments. From this prioritization, an annual work plan is developed describing control activities for the upcoming year that will inform NNIP management approaches for each grazing unit.

4.5 Grazing Infrastructure

In order to implement an effective rangeland management program, grazing infrastructure (water sources, roads, fences, corrals, and barns) needs to be developed, maintained, and monitored. Grazing infrastructure and water developments can allow the SFPUC to prescribe grazing in discrete areas for achieving RMP goals. Infrastructure will be sited, designed, and constructed to preserve and protect plant communities, special-status species, and their habitats, and to minimize ecological impacts.

A comprehensive inventory and assessment of grazing-related infrastructure was completed between 2012 and 2015. Newly acquired properties added to this RMP were inventoried and assessed in 2022, and additional infrastructure improvements were documented in March 2025. The inventory included existing corrals, barns, and water infrastructure for cattle. In addition, developed and undeveloped springs were inventoried and assessed. Figure 2 shows the locations of all features inventoried. Data collected from the field were organized into a

Geographic Information System (GIS) database. For each feature assessed, the database includes the following detailed information: condition, water source (where applicable), maintenance action needed, water source productivity (where applicable), dimensions, potential for development, notes on potential for development, photo number, assessment date, surrounding rangeland site condition, and general notes. A summary of the grazing-related infrastructure assessed within all the watershed grazing units is shown in Table 4-3.

Table 4-3. Summary Inventory of Grazing Features Assessed from 2012 to 2015

Infrastructure Feature	Infrastructure Condition			Total
	Functioning	Non-Functioning	Unknown	
Barn	6	1	-	7
Corral	25	3	-	28
Solar Panel	4	-	-	4
Solar Pump	6	-	-	6
Spring - Developed	64	42	6	112
Spring - Undeveloped	79	-	3	82
Stream Diversion	4	4	-	8
Tank	28	8	1	37
Trough	111	41	4	156
Water Collection System	2	-	-	2
Groundwater Well	7	2	-	9
Totals	**336**	**101**	**14**	**451**
Pond Feature	**Pond Condition**			**Total**
	Excellent/Good	**Moderate**	**Poor**	
Pond	87	47	47	181
Undeveloped Spring Feature	**Undeveloped Spring Condition**			**Total**
	Productive	**Unproductive**	**Unknown**	
Spring - Undeveloped	79	-	3	82

Note: Some features on newly acquired properties were assessed in 2022.

4.5.1 Fences

The RMP lands contain well over 100 miles of fencing, including boundary fencing and cross fencing. Functional fencing allows grazing to be used as a tool to meet management objectives. Fencing left in poor condition creates the potential for cattle to go where they are not intended to be, such as reservoirs, roads, SFPUC water treatment facilities, mitigation sites, and adjacent lands. There are many segments of fence that need repair or replacement. Some repairs are critical from a safety standpoint, such as along public roadways, while other repairs may be less critical, such as those to facilitate managing or moving a herd. The SFPUC has conducted a full assessment to document the location and condition of perimeter and cross fencing. The assessment needs to be updated regularly as repairs are made. Fencing needs will be discussed annually with each tenant and prioritized based on condition, risk, and available funding.

4.5.2 Roads

Developed roads within the RMP lands include unpaved and paved roads. Vehicle-accessible roads in the RMP lands cover approximately 177 miles. These roads include approximately 4 miles of public paved roadway and 173 miles of unpaved roadway. Much like the fence

assessment, a full condition assessment of roads needs to be updated regularly as repairs are made. While road repairs are ongoing, there are many roads that are adversely affecting rangeland production and water quality and impeding tenants from effectively managing cattle herds. In order to meet the goals and objectives of this RMP, the Watershed Forester will review the road network annually to identify high-priority repairs that should be completed. Roads within the RMP lands are shown in Figure 2.

4.5.3 Corrals and Barns

Corrals and barns in the watershed have been assessed and categorized as excellent, good, moderate, or poor. If there was a water trough or other feature providing water for cattle, those features were noted and assessed separately as described below. Maintenance needs, level of recent use, and potential for development, expansion, or improvement were recorded.

There are a number of corrals and barns in the leases (Figure 2) that are in various stages of use or disrepair. Some are not used and could be demolished. Other corrals and barns may be necessary for infrequent use but are not maintained because the investment is deemed not to be worth the cost given how infrequently the infrastructure is used. Some infrastructure is frequently used but is still in need of repairs or replacement to maintain future functionality. Other facilities, particularly corrals, could benefit from improvements such as water troughs. In order to effectively manage repairs and maintenance costs, the SFPUC will discuss infrastructure needs with tenants annually to determine priorities, timing, and implementation plans. For leases that are planned for or recently reconfigured (such as the McGuire Peaks lease), or leases that change hands from a tenant who grazes adjoining lands that have corrals and barns to a tenant that does not, an assessment of the infrastructure will be necessary to see if additions are needed.

4.5.4 Water Sources

The field assessment of water sources includes ponds, developed and undeveloped springs, groundwater collection systems, stream diversions, troughs, tanks, solar pumps/panels, and wells. Pond condition is categorized as excellent, good, moderate, or poor based on field assessment data. Water trough condition is categorized as functioning or non-functioning. Of the water troughs accessed from 2012 to 2015 and during the new property addition survey in 2022, 49 troughs (approximately 27 percent) were deemed non-functioning. Of those that were non-functioning, 26 troughs (53 percent) required maintenance or replacement. Of the 108 functioning troughs, 22 troughs (20 percent) were identified as needing repair or replacement in the immediate or near future.

Prioritization of water infrastructure repairs or improvements should consider the goals and objectives of the RMP. For example, repairing priority ponds can allow more flexibility and control of cattle, by decreasing pressure on natural water features such as riparian corridors and wetlands, and thus can support the goal of maintaining and improving water quality. Spring box development can also be used to provide water to influence cattle distribution, but spring hydrology, water quality, and ecology should be evaluated to ensure that spring-associated habitats are not negatively affected by spring developments. Some developed water sources in the watershed support important habitat for special-status species, and as such maintenance of these features is critical to meeting the objective of implementing rangeland management practices that preserve and protect special-status species and their habitats.

4.6 Rangeland Monitoring Program

The SFPUC established a rangeland monitoring program in 2007 for the AUM-based grazing leases in the Alameda Creek watershed (Sage and Associates 2007). The program was developed to monitor specified rangeland uses, compliance with applicable SFPUC policies and grazing leases, and effectiveness in meeting the goals of the rangeland program. Within the SFPUC Alameda Creek watershed, 95 permanent plots were established under this program and are primarily used during compliance monitoring efforts. Since that time, additional plots have been added for a total of 100 plots.

Annual and periodic monitoring will be conducted to evaluate rangeland condition and inform changes in management as needed to meet the RMP goals and objectives. The current rangeland monitoring includes annual sampling of RDM, RDM plot photos, and visual RDM assessment maps in the fall, along with species composition measurements on a rotating basis. The SFPUC's rangeland monitoring program will include the following elements.

4.6.1 RDM Monitoring

RDM monitoring is a critical measurement that bridges performance standards in the RMP with on-the-ground management decisions by the SFPUC and the grazing lessees. The RDM maps document conditions continuously across the watershed and are valuable in discussions with lessees and internally among SFPUC staff. RDM recommendations include the following:

- Continue monitoring RDM annually (both plot-based sampling and mapping).
- Integrate RDM monitoring across rangeland management and BHR sites (both plot-based sampling and mapping).
- Collect "total biomass" measurements at RDM sampling plots to evaluate erosion potential and fire fuels.

4.6.2 Production Monitoring

Production monitoring has occurred over a variety of weather years with variable forage production. This monitoring has produced estimates of production in "high" and "low" years at multiple locations. These estimates highlight both temporal and spatial variability in forage production across the watershed. Production measurements are much higher than both the NRCS soil series-based estimates and those from the Rangeland Analysis Platform. The measured production values can be used for planning purposes (e.g., grazing capacity), as well as to better understand production dynamics in different weather years. Now that production measurements have been established, no further production monitoring is recommended in the near future.

4.6.3 Vegetation Composition Monitoring

Vegetation composition is highly variable across the watershed and varies significantly in relation to preliminary ecological site concepts. Although affected by annual weather, vegetation composition on most study plots was relatively stable over the course of the 2009–2023 sampling window, potentially indicating that monitoring frequency could be reduced without missing major shifts in vegetation composition. Now that a range of vegetation composition has been established for a range of weather years, the SFPUC will reduce the total number of plots and monitor a subset of remaining plots annually using a staggered "panel" approach.

4.6.4 Non-Native Invasive Plants

Another element of monitoring to be incorporated into the rangeland monitoring program is early detection of NNIPs. Since they are extremely difficult to eradicate, a key part of management will be early detection and eradication of new infestations and/or new species in the watershed. Regular spring and summer surveys (vehicle/walking) will be conducted for non-native invasive plant and wildlife species in the watershed. Where possible during systematic surveys, monitors will record Global Positioning System (GPS) tracks so that it is easy to keep track of where monitoring has occurred in previous years and better identify monitoring gaps. The SFPUC and its consultants that work in the watershed should be educated on new emerging local NNIPs in Alameda County. A good source of information for this is the Alameda County Department of Agriculture.

4.6.5 Grazing Unit Inspections

The SFPUC will conduct annual inspections of each grazing unit to evaluate infrastructure condition, rangeland health, and biological considerations relative to the goals of the RMP. The annual inspections will be summarized to share with the tenant and inform the Annual Operating Plan.

4.7 Grazing Unit Management Plans

As shown in Figure 1, the SFPUC currently manages 18 grazing units. The SFPUC has developed a GUMP for each grazing unit that provides detailed information on the grazing infrastructure and environmental conditions. The GUMPs also outline site-specific approaches to achieve the goals and objectives of the RMP. Building on the GUMPs, the SFPUC will coordinate with grazing tenants to develop an Annual Operating Plan for each grazing unit. The Annual Operating Plan will outline stocking rates based on forage production and rangeland condition, along with annual management objectives for grazing infrastructure improvements, NNIP management, and environmental stewardship.

4.8 Adaptive Management

The SFPUC will adapt management of the rangelands based on evolving best practices, science, and local conditions. The Natural Resources and Lands Management Division will meet annually with tenants to review infrastructure needs, rangeland monitoring results, non-native invasive species, seasonal variation, and grazing capacity. Based on discussion and review of information, the SFPUC will update each grazing unit's Annual Operating Plan to outline proposed infrastructure improvements, any needed protective measures, and stocking rates consistent with the lease.

4.9 Plan Implementation Roles and Responsibilities

Implementation of the RMP requires a multi-disciplinary team of professionals. This section outlines the roles and responsibilities of the Rangeland Team, which is primarily within the Natural Resources and Lands Management (NRLM) Division of the SFPUC. The team must coordinate regularly to ensure alignment in how to achieve the RMP goals and provide consistent communication to tenants. Each of these staff people has other responsibilities in addition to their RMP roles and must balance competing priorities to fulfill their RMP roles.

4.9.1 Rangeland Manager

The Rangeland Manager is the lead person responsible for implementing the rangeland program. The primary responsibilities include coordinating with tenants to ensure implementation of the RMP, the GUMPs, the Annual Operating Plans, and lease requirements. Specifically, this may include the following:

- Scheduling and facilitating annual tenant meetings with the Rangeland Team
- Developing the annual rangeland assessments for each grazing unit with input from the Rangeland Team
- Coordinating with tenants to develop Annual Operating Plans; Managed Riparian Area prescriptions; fence improvements, funding, and responsibilities; water source improvements, funding, and responsibilities; habitat protection measures; and NNIP management
- Confirming stocking rates and filing monthly grazing reports
- Maintaining the condition of rangeland infrastructure
- Recommending and overseeing repairs and new infrastructure investments
- Processing rent credits
- Addressing minor grazing unit issues
- Coordinating with all Rangeland Team members across different sections as needed to meet the RMP goals and effectively implement the rangeland program
- Serving as the primary point of contact for tenants and being responsible for facilitating positive working relationships between tenants and the rest of the Rangeland Team, other SFPUC staff, agency representatives, consultants, and the rangeland community

4.9.2 Rangeland Technician (Proposed)

Reporting directly to the Rangeland Manager, the Rangeland Technician is responsible for assessing and tracking the condition and performance of rangeland infrastructure (fences, ponds, water tanks and troughs, mineral feeders, etc.) relative to the RMP goals and oversees infrastructure repairs and investments. The Rangeland Technician assists the Rangeland Manager in tenant coordination, documentation, and implementation of other RMP activities as needed.

4.9.3 Senior Terrestrial Biologist

The Senior Terrestrial Biologist is responsible for:

- Assessing performance relative to vegetation management goals to preserve and enhance native plant communities, special-status species, and other priority biological resources
- Consulting with division biologists, coordinating with the Rangeland Manager, Senior Natural Resource Specialist, and tenants
- Identifying and recommending feasible vegetation management actions
- Coordinating implementation with the Rangeland Manager
- Contributing to the annual rangeland assessment

- Tracking condition over time
- Providing recommendations in the development of the Annual Operating Plan

4.9.4 Watershed Forester

Reporting to the Watershed Resources Manager, the Watershed Forester is responsible for maintaining the condition of the watershed roads, managing erosion, and overseeing tree and canopy health. The Watershed Forester coordinates with the Rangeland Manager and tenants to ensure BMPs to protect the condition of roads, soil, and trees. The Watershed Forester may also advise on and oversee wildfire risk reduction strategies and support rangeland infrastructure improvements such as stock ponds.

4.9.5 Senior Natural Resource Specialist

The Senior Natural Resource Specialist reports to the Rangeland Manager and is responsible for managing the program to reduce non-native invasive species in the watershed. Primary responsibilities include tracking invasive plant and animal infestations, prioritizing treatment areas, implementing treatment, and coordinating efforts with the Rangeland Manager, biologists, and SFPUC tenants. The Senior Natural Resource Specialist may recommend tenant BMPs to reduce the introduction and spread of NNIPs in the Annual Operating Plan and throughout the year to address problem occurrences.

4.9.6 Natural Resource Specialist (Proposed, Currently Contracted)

The Natural Resource Specialist reports to and assists the Senior Natural Resource Specialist in implementing the NNIP program, including conducting annual assessments, overseeing crews, and tracking treatments.

4.9.7 Watershed Keeper Supervisor, Watershed Keepers, and Watershed Workers

At the direction of the Rangeland Manager, the Watershed Keeper team helps implement the RMP by assessing and repairing rangeland roads, fences, and other infrastructure; patrolling leased lands; and resolving minor grazing unit issues such as cattle identified outside the lease area.

4.9.8 Watershed Resources Manager

The Watershed Resources Manager is responsible for working with the Rangeland Manager and Rangeland Team to:

- Oversee implementation of the RMP and associated documents to support the Alameda WMP goals;
- Set investment priorities (for infrastructure improvements, NNIPs, erosion control, vegetation management, and other biological resource protection);
- Participate in annual tenant meetings;
- Approve the Annual Operating Plans, stocking rate adjustments, and rent credits;
- Address or elevate significant issues; and
- Support the Rangeland Team in fulfilling their roles and responsibilities.

4.9.9 Natural Resources Planning and Compliance Staff

The Planning and Compliance staff is responsible for reviewing activities with the potential to have impacts on environmental or cultural resources. Planning and Compliance staff work with project or program managers to develop modifications to activities to so that impacts can be avoided and activities are compliant with federal, state, and local laws and regulations as well as consistent with SFPUC plans and policies. In addition, Planning and Compliance staff work with project managers to obtain permits and/or California Environmental Quality Act (CEQA) review. During project activities, Planning and Compliance staff help coordinate and document environmental and cultural regulatory compliance. Planning and Compliance staff also provide biological expertise and work to fill knowledge gaps by leading specialized biological research projects to support regulatory compliance and implementation of SFPUC plans and policies such as the Watershed Environmental Stewardship Policy and Alameda WMP.

4.9.10 Real Estate Services Division

Under general policy direction, from and through ongoing coordination with (NRLM Division staff, the Real Estate Services Division is a transactional department that issues the grazing leases and amendments and administers the financial provisions of the grazing leases. These tasks include working with the City Attorney's Office to issue official notices and notices of defaults for tenant violations identified by NRLM staff; seeking applicable bi-annual tax billings reimbursement by the tenants; enforcing rent collection and insurance compliance; and coordinating with NRLM to determine the appropriateness of, and then effecting, any proposed issuance of rent credits through the General Manager. The Real Estate Services Division will lead audit responses on behalf of the SFPUC regarding financial and routine lease administration functions. The audit response to any operational and performance-based inquiries will be led by NRLM and other applicable SFPUC divisions. The Real Estate Services Division does not perform property management.

References

Personal Communications

Koopmann, Tim, SFPUC Area Land Manager. 2010. In-person communication with URS Rangeland Ecologist Dina Robertson.

———. 2013. Email, phone, and in-person communications with URS Rangeland Ecologist Dina Robertson.

———. 2014. In-person communication with URS Rangeland Ecologist Dina Robertson.

Lim, T. 2013. In-person communication with URS Rangeland Ecologist Dina Robertson.

Printed and Online Resources

ACCP (Alameda County Conservation Partnership). 2009. SFPUC 2009 Rangeland Monitoring Report. Alameda Watershed. Prepared for the San Francisco Public Utilities Commission. January 2009.

———. 2011. Grazing Management Plan for the Arroyo de la Laguna Willow Riparian Scrub and Riparian Habitat Restoration Project (Arroyo 2). Submitted to the SFPUC, December 16, 2011.

———. 2015. SFPUC 2015 Draft Rangeland Monitoring Report. Alameda Watershed. Prepared for the San Francisco Public Utilities Commission. November 2015.

ACRCD (Alameda County Resource Conservation District). 2018a. SFPUC 2017 Rangeland Monitoring Report: Residual Dry Matter. Alameda Watershed. Prepared for the San Francisco Public Utilities Commission. Prepared by Alameda County Resource Conservation District and Rangeland Conservation Science. February 2018.

———. 2018b. SFPUC 2017 Rangeland Monitoring Report: Spring Species Composition and Production. Alameda Watershed. Prepared for the San Francisco Public Utilities Commission. Prepared by Alameda County Resource Conservation District and Rangeland Conservation Science. September 2018.

———. 2018c. SFPUC 2018 Rangeland Monitoring Report: Residual Dry Matter. Alameda Watershed. Prepared for the San Francisco Public Utilities Commission. Prepared by Alameda County Resource Conservation District and Rangeland Conservation Science. November 2018.

———. 2019. SFPUC 2019 Rangeland Monitoring Report: Spring Production in the Alameda Watershed. Prepared for the San Francisco Public Utilities Commission. Prepared by Alameda County Resource Conservation District and Rangeland Conservation Science. July 2019.

———. 2019b. SFPUC Alameda Watershed 2019 Rangeland Monitoring Report: Residual Dry Matter. Prepared for the San Francisco Public Utilities Commission. Prepared by Alameda County Resource Conservation District and Rangeland Conservation Science. January 2020.

———. 2020. SFPUC 2020 Rangeland Monitoring Report: Spring Production in the Alameda Watershed. Prepared for the San Francisco Public Utilities Commission. Prepared by Alameda County Resource Conservation District and Rangeland Conservation Science. September 2020.

———. 2021. SFPUC 2021 Rangeland Monitoring Report: Spring Composition Monitoring in the Alameda Watershed. Prepared for the San Francisco Public Utilities Commission. Prepared by Alameda County Resource Conservation District and Rangeland Conservation Science.

AECOM. 2015a. Alameda Creek Watershed Pond Assessment Geospatial. Prepared for SFPUC. April 2015.

———. 2015b. Alameda Creek Watershed Grazing Infrastructure Assessment Geospatial Data. Prepared for SFPUC. April 2015.

ATS (Applied Technology and Science). 2022a. SFPUC 2022 Rangeland Monitoring Report: Spring Production in the Alameda Watershed. Prepared for the San Francisco Public Utilities Commission. Prepared by ATS and Rangeland Conservation Science. July 2023.

———. 2022b. SFPUC 2022 Rangeland Monitoring Report: Residual Dry Matter. Alameda Watershed. Prepared for the San Francisco Public Utilities Commission. Prepared by ATS and Rangeland Conservation Science. July 2023.

———. 2023. SFPUC 2023 Rangeland Monitoring Report: Spring Production in the Alameda Watershed. Prepared for the San Francisco Public Utilities Commission. Prepared by ATS and Rangeland Conservation Science. July 2023.

———. 2024a. SFPUC 2022 Rangeland Monitoring Report: Spring Species Composition. Alameda Watershed. Prepared for the San Francisco Public Utilities Commission. Prepared by ATS and Rangeland Conservation Science. January 2024.

———. 2024b. SFPUC 2023 Rangeland Monitoring Report: Spring Species Composition. Alameda Watershed. Prepared for the San Francisco Public Utilities Commission. Prepared by ATS and Rangeland Conservation Science. January 2024.

———. 2024c. SFPUC Alameda Watershed 2023 Rangeland Monitoring Report: Residual Dry Matter. Prepared for the San Francisco Public Utilities Commission. Prepared by ATS and Rangeland Conservation Science. January 2024.

Barry, S. 1999. Hazard Analysis and Critical Control Point (HACCP)-Based Source Water Protection Program for the Southern Alameda Creek Watershed in Alameda and Santa Clara Counties, California. UC Cooperative Extension. December.

Barry, S., M. Doran, K. Guenther, and G. Hayes. 2011. Understanding Livestock Grazing Impacts. Richmond: University of California Agricultural and Natural Resource Communication Services.

Barry, S., S. Larson, L. Ford, and L. Bush. 2015. Understanding Working Rangelands. Grazing Systems Management. University of California Agricultural and Natural Resources Publication 8529. August 2015.

Bartolome, J., W. Frost, N. McDougald, and M. Conner. 2002. California Guidelines for Residual Dry Matter (RDM) Management on Coastal and Foothill Annual Rangelands. University of California Publication 8092.

———. 2006. California Guidelines for Residual Dry Matter (RDM) Management on Coastal and Foothill Annual Rangelands. University of California Publication 8092.

Bartolome, J., B.A. Diaz, S. Barry, L. Ford, M. Hammond, P. Hopkins, F. Ratcliff, S. Speigal, and M. White. 2014. Grazing for Biodiversity in California Mediterranean Grasslands. Rangelands, Oct 2014: Vol. 36, Issue 5.

Becker G.S., I.J. Reining, D.A. Asbury, et al. 2007. San Francisco Estuary Watersheds Evaluation: Identifying Promising Locations for Steelhead Restoration in Tributaries of the San Francisco Estuary. Center for Ecosystem Management and Restoration, Oakland, CA.

Billings, W.D. 1994. Ecological Impacts of Cheatgrass and Resultant Fire on Ecosystems in the Western Great Basin. Pages 22-30. S.B. Monsen and S.G. Kitchen, eds. In: Proc. Ecology and Management of Annual Rangelands. USDA Forest Service Intermountain Research Station, General Technical Report. INT-GTR-313, Ogden, UT.

Bossard, C.C., J.M. Randall, and M.C. Hoshovsky. 2000. Invasive Plants of California's Wildlands. University of California Press. Berkeley, CA.

Bush, L. 2006. Grazing Handbook, a Guide for Resource Managers in Coastal California. Santa Rosa: Sotoyome Resource Conservation District.

Bylo, L. N., N. Koper, and K.A. Molloy. 2014. Grazing Intensity Influences Ground Squirrel and American Badger Habitat Use in Mixed-Grass Prairies. Rangeland Ecology & Management. 67(3): 247-254 pp.

CCSF (City and County of San Francisco). 1996. Integrated Pest Management Ordinance.

CDFW (California Department of Fish and Wildlife). 2013. Wild Pig Management Program.

———. 2019. Report to the Fish and Game Commission - Status Review of the Foothill Yellow-legged Frog in California.

———. 2024. Western River Lamprey, Online. Available at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=104364&inline; Accessed March 14, 2024.

CDM. 2009a. SFPUC Technical Memorandum No. 2; Watershed Road Condition Assessment and Recommended Improvements. September 2009.

———. 2009b. Watershed Road Condition Assessment and Recommended Improvements

CNPS. 2024. A Manual of California Vegetation, Online Edition. Available at: http://www.cnps.org/cnps/vegetation/; Accessed February 7, 2024. California Native Plant Society, Sacramento, CA.

Dettinger, M. 2011. Climate Change, Atmospheric Rivers, and Floods in California – A Multimodel Analysis of Storm Frequency and Magnitude Changes. Journal of the American Water Resources Association. 47(3): 514-523.

DiTomaso, J.M., and E. A. Healy. 2007. Weeds of California and Other Western States. University of California Department of Agriculture and Natural Resources.

DiTomaso, J.M., G.B. Kyser, S.R. Oneto, R.G. Wilson, S.B. Orloff, L.W. Anderson, S.D. Wright, J.A. Roncoroni, T.L. Miller, T.S. Prather, C. Ransom, K.G. Beck, C. Duncan, K.A. Wilson, and J.J. Mann. 2013. Weed Control in Natural Areas in the Western United States. Weed Research an Information Center, University of California. 544 pp.

DiTomaso, J.M., G.B. Kyser, and M.J. Pitcairn. 2006. Yellow Starthistle Management Guide. California Invasive Plant Council Publication 2006-03. Berkeley: California Invasive Plant Council. 78 pp. (www.cal-ipc.org).

Edwards, S.W. 1992. Observations on the Prehistory and Ecology of Grazing in California. Fremontia 20(1): pp.3-11.

Fehmi, J.S., S.E. Russo, and J.W. Bartolome. 2005. The Effects of Livestock on California Ground Squirrels (*Spermophilus beecheyii*). Rangeland Ecology and Management. 58:352–359. July.

Fellers, G.M., and Pierson, E.D. 2002. Habitat Use and Foraging Behavior of Townsend's Big-Eared Bat (*Corynorhinus townsendii*) in Coastal California. Journal of Mammalogy 83:167-177 pp.

Ford, L., P. Van Hoorn, D. Rao, N. Scott, P. Trenham, and J.W. Bartolome. 2013. Managing Rangelands to Benefit California Red-legged Frogs and California Tiger Salamanders. Livermore, California: Alameda County Resource Conservation District.

Gelbard, J.L. 2003. Understanding the Distribution of Native vs. Exotic Plant Diversity in California's Grassland Landscapes. Ph.D. Dissertation. University of California at Davis.

Green, G.A., and R.G. Anthony. 1989. Nesting Success and Habitat Relationships of Burrowing Owls in the Columbia Basin, Oregon. Condor 91:347–354.

Gunther, A.J., J. Hagar, and P. Salop. 2000. An Assessment of the Potential for Restoring a Viable Steelhead Trout Population in the Alameda Creek Watershed. Alameda Creek Fisheries Restoration Workgroup. February 7, 2000.

Hamilton, W.J. 2004. Tricolored Blackbird (*Agelaius tricolor*). In The Riparian Bird Conservation Plan: a Strategy for Reversing the Decline of Riparian-associated Birds in California. California Partners in Flight.

Harris, N.R., W.E. Frost, N.K. McDougald, M.R. George, and D.L. Nielsen. 2002. Long-term Residual Dry Matter Mapping for Monitoring California Hardwood Rangelands. In:

Stanford, R.B.; McCreary, D.; Purcell, K.L., technical coordinators. Proceedings of the fifth symposium on oak woodlands: Oaks in California's changing landscape. Gen. Tech. Rep. PSW-GTR-184. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture; 87-96.

Hayes, M.P., and M.R. Jennings. 1986. Decline of Ranid Frog Species in Western North America: Are Bullfrogs (*Rana catesbiana*) Responsible? Journal of Herpetology 20(4):499-509.

Hayes, M.P., and M.R. Jennings. 1988. Habitat Correlates of Distribution of the California Red-legged Frog (*Rana aurora draytonii*) and the Foothill Yellow-legged Frog (*Rana boylii*): Implications for management. In: R. Sarzo, K.E. Severson, and D.R. Patton (Technical coordinators), Proceedings of the Symposium on the Management of Amphibians, Reptiles, and Small Mammals in North America. USDA Forest Service General Technical Report RM-166:144-158.

Heady, H.F., and R.D. Child. 1994. Rangeland Ecology and Management. Westview Press, Boulder, Colorado.

Jackson R.D., and J.W. Bartolome. 2007. Grazing ecology of California Grasslands. In: Corbin J.D., Stromberg M.R. and D'Antonio C. (eds) California grasslands: Ecology and Management, pp. 197–206. Davis, CA, USA: UC Press.

Jennings, M.R., and M.P. Hayes. 1994. Amphibian and Reptile Species of Special Concern in California. Rancho Cordova, CA: California Department of Fish and Game.

Jones & Stokes. 2003. Geospatial Vegetation Data for SFPUC Alameda Creek Watershed Lands. Developed by Jones & Stokes at the request of SFPUC.

Lake, D. 2010. Rare, Unusual and Significant Plants of Alameda and Contra Costa Counties. Eight Edition. Information on newest edition. Available at: Database of Rare, Unusual and Significant Plants of Alameda and Contra Costa Counties.

Leidy, R.A., G.S. Becker, and B.N. Harvey. 2005. Historical Distribution and Current Status of Steelhead (*Oncorhynchus mykiss*), Coho Salmon (*O. kisutch*), and Chinook Salmon (*O. tshawytscha*) in Streams of the San Francisco Estuary, California. Report prepared by the Center for Ecosystem Management and Restoration, Oakland, California.

Leidy, R.A. 2007. Ecology, Assemblage Structure, Distribution, and Status of Fishes in Streams Tributary of the San Francisco Estuary, California. SFEI Contribution #530. San Francisco Estuary Institute. Oakland, California.

McCreary, D.D., and M. George. 2005. Managed Grazing and Seedling Shelters Enhance Oak Regeneration on Rangelands. California Agriculture: October–December 2005.

Moyle, P.B. 2002. *Inland Fishes of California.* University of California Press.

Nomad Ecology. 2009. Non-indigenous Plant Species Inventory and Mapping Alameda Watershed, Alameda and Santa Clara Counties, California. Prepared for the SFPUC. 2009.

———. 2012. Rare Plant Survey Report and Geospatial Data for the Alameda Watershed. Prepared for the SFPUC. June 2012.

———. 2020. 2020 Alameda Watershed Invasive Plant Report. Prepared for the SFPUC. December 2020.

NRCS (Natural Resources Conservation Service). 2013a. USDA Online Web Soil Survey Query for Santa Clara County, CA. Available at: http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx. Accessed June 2013.

———. 2013b. USDA Online Spatial Data Gateway Download of CA609 and CA610 Databases for Soils in Alameda County and Santa Clara County. Available at: http://datagateway.nrcs.usda.gov/GDGOrder.aspx. Accessed June 2013.

———. 2016. Plants Database. Plant Guide for Medusahead.

Pratt, M., and G.A. Rasmussen. 2001. Determining your Stocking Rate. Utah State Cooperative Extension: Range Management Fact Sheet NR/RM/04. Logan, UT. May.

Rathbun, G.B., N.J. Scott, and T.G. Murphy. 2002. Terrestrial Habitat Use by Pacific Pond Turtles in a Mediterranean Climate. The Southwestern Naturalis. 47(2): 225-235.

Reinsche, D.L. 2008. Effect of cattle grazing on lizard diversity in managed central California grasslands. Transactions of the Western Chapter of the Wildlife Society (44):4-10.

Robison, R. 2012. Notes from California Invasive Plant Council Dittrichia graveolens (stinkwort) Working Group. Annual Cal-IPC symposium proceedings, Rohnert Park.

Sage and Associates. 2007. Alameda Watershed Rangeland Monitoring Program. Prepared for San Francisco Public Utilities Commission, San Francisco, CA.

SCS (USDA Soil Conservation Service). 1966. Soil Survey, The Alameda Area, California. March.

———.1974. Soil Survey of Eastern Santa Clara County.

———.1977. Soil Survey of Contra Costa County.

SFPUC (San Francisco Public Utilities Commission). 1997. Alameda Creek Watershed Grazing Resources Management Plan. Prepared by EDAW for the SFPUC. July.

———. 2001. Alameda Watershed Management Plan. Final Report prepared by EDAW for San Francisco Public Utilities Commission, San Francisco, CA. April.

———. 2008. Alameda Creek and Arroyo Hondo Riparian Zone Monitoring Project. Technical memorandum. Prepared by the SFPUC.

———. 2013. Geospatial Data on Rare Plant and Animal Species Occurrences within SFPUC's Lands in the Alameda Creek Watershed. Data is a compilation of documented occurrences observed by SFPUC staff and SFPUC's natural resource consultants in the Alameda Creek Watershed.

———. 2023. Alameda Creek Aquatic Resources Monitoring Report 2021–22. San Francisco Public Utilities Commission, Water Enterprise, Natural Resources and Lands Management Division, Sunol/Moccasin Biological Resources Section. Sunol, CA. viii+122 pp.

———. 2024. Enhanced Riparian Habitat – Riparian Recruitment Technical Memorandum. Submitted to the RWQCB on January 18, 2024.

Tate, K.W., E.R. Atwill, J.W. Bartolome, and G. Nader. 2006. Significant *E. coli* Attenuation by Vegetative Buffers on Annual Grasslands. Journal of Environmental Quality 35:795–805.

———. 2014a. Sunol Region Mitigation and Monitoring Plan. Prepared for the SFPUC. October.

———. 2014b. Sunol Region Grazing Use Management Plan (GUMP). Prepared for the SFPUC. October.

URS. 2014a. Sunol Region Mitigation and Monitoring Plan. Prepared for the SFPUC. September.

———. 2014b. Sunol Region Grazing Unit Management Plan (GUMP). Prepared for the SFPUC. October.

USFS (United States Forest Service). 2010. CALVEG Zone 6, spatial dataset. Pacific Southwest Region (R5), U.S. Forest Service. San Francisco, CA. Available at: http://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb5347185. Accessed: June 2013.

USFWS (United States Fish and Wildlife Service). 2002. Recovery Plan for the California Red-legged Frog (*Rana aurora draytonii*). Portland, OR.

———. 2005. Endangered and Threatened Wildlife and Plants; Proposed Designation of Critical Habitat for the Alameda Whipsnake. Proposed Rule. October 18.

———. 2008. Birds of Conservation Concern 2008. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. 85 pp. Available at: http://www.fws.gov/migratorybirds/. Accessed: March 11, 2024.

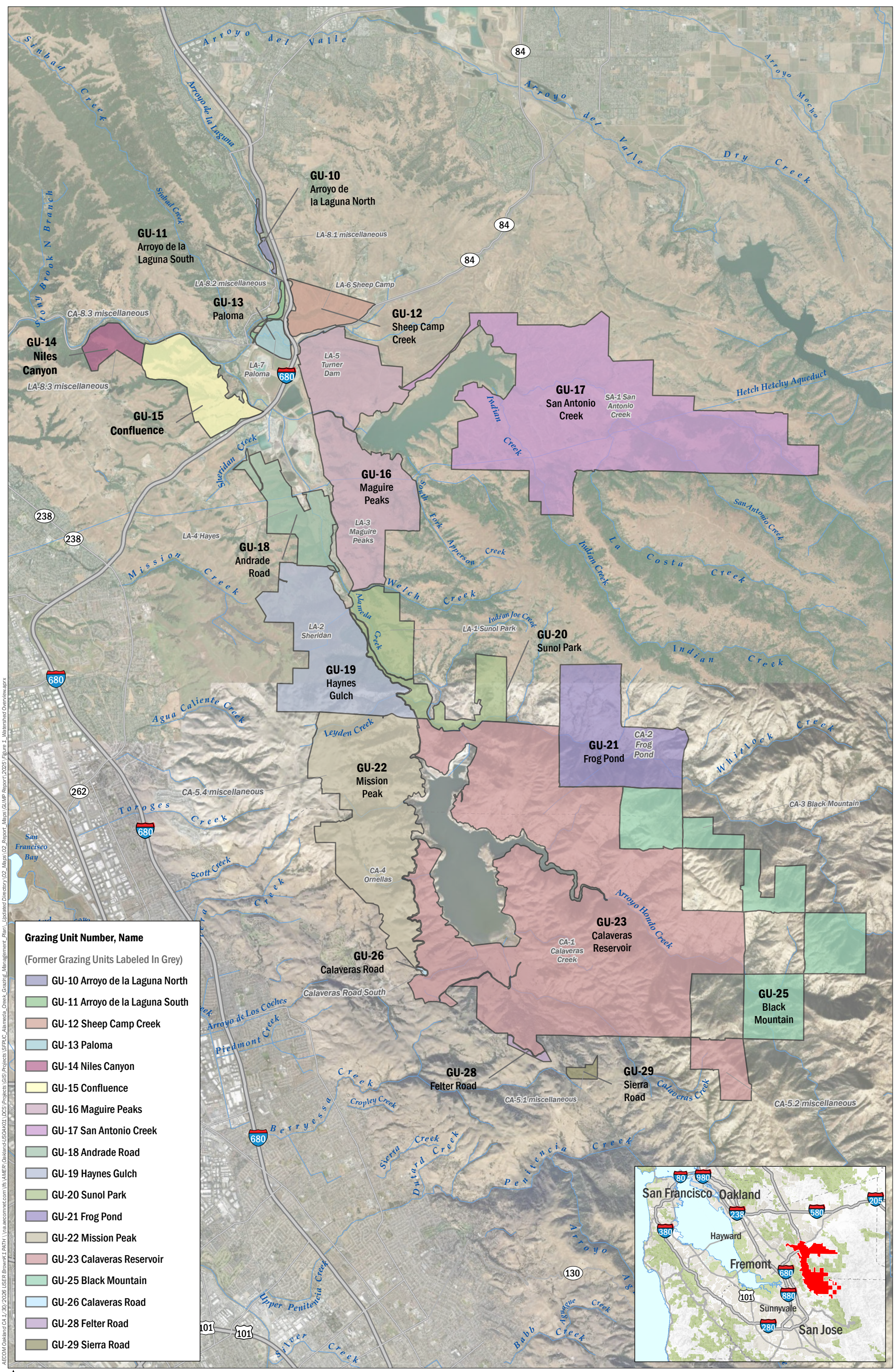
———. 2017. Recovery Plan for the Central California Distinct Population Segment of the California Tiger Salamander (*Ambystoma californiense*). U.S. Fish and Wildlife Service, Pacific Southwest Region, Sacramento, California.

———. 2023. Western Monarch Butterfly Conservation Considerations. Available at: https://xerces.org/publications/planning-management/western-monarch-butterfly-conservation-recommendations. Accessed: February 13, 2024.

Waithman, John. 2001. Guide to Hunting Wild Pigs in California. Prepared for the State of California Department of Fish and Game. Available at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=23231&inline. Accessed: March 2026.

Weaver, W. E., and D. K. Hagans. 1994. Handbook for Forest and Ranch Roads. Mendocino County Resource Conservation District.

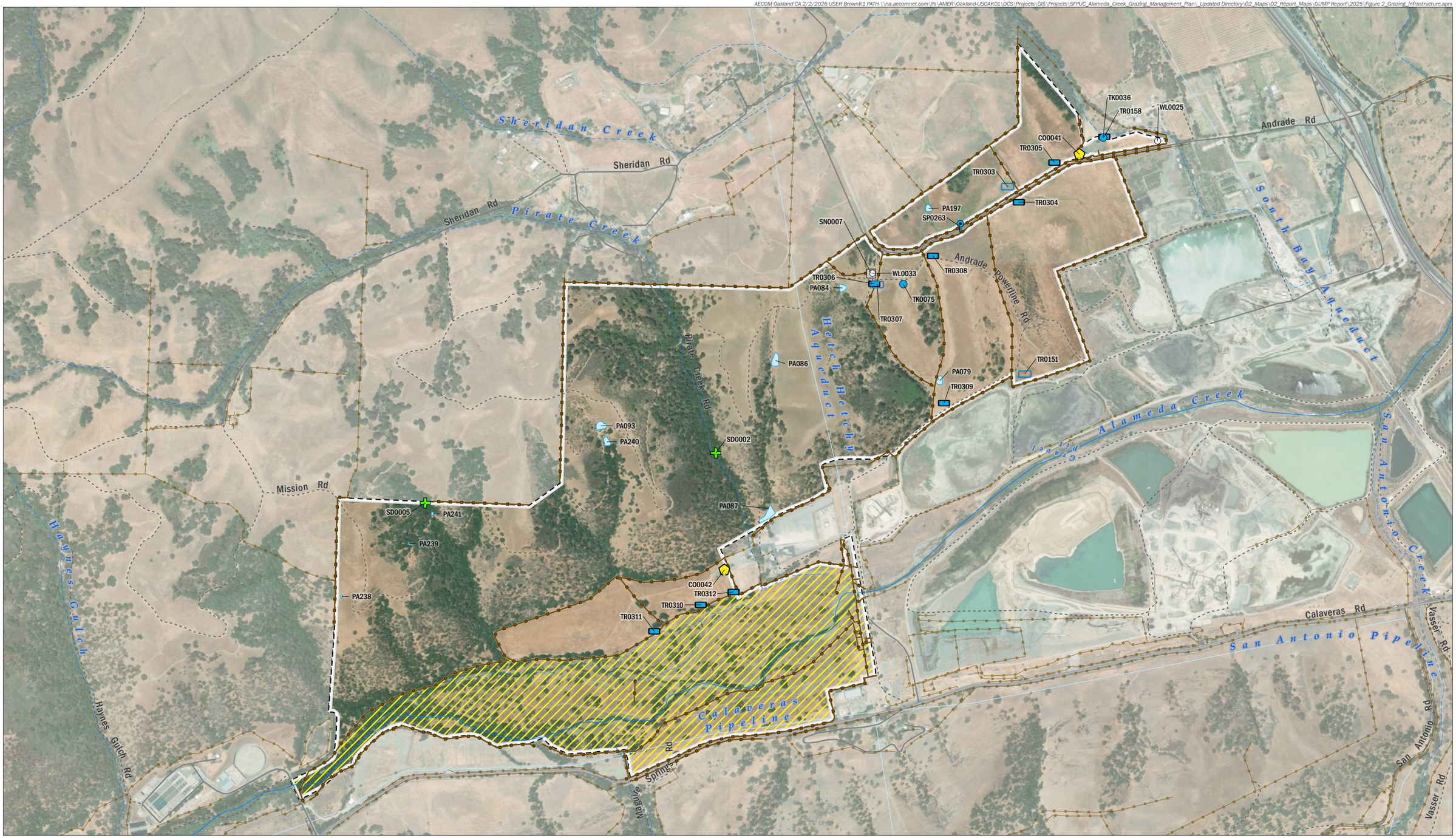
Figures



San Francisco Water Power Sewer

AECOM

Figure 1: SFPUC Alameda Creek Watershed Grazing Unit Overview



0 1,100 Feet

AECOM

SFPUC Grazing Unit Boundary
Managed Riparian Area

Fence
Paved road
Unpaved road

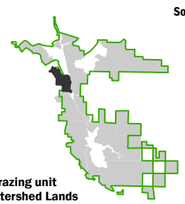
Aqueduct
Intermittent stream
Perennial Stream
Pond

Grazing Infrastructure

Andrade Road (GU-18): Corral CO0042 is tenant-owned.

Corral
Solar Panel
Spring
Stream Diversion

Tank (functioning)
Trough (non-functioning or unknown)
Trough (functioning)
Well



Location of grazing unit within SFPUC Watershed Lands

Sources: AECOM, 2025; ESRI Imagery, 2025; SFPUC, 2025; Rangeland Conservation Science, 2025.

Hetch Hetchy Regional Water System
Services of the San Francisco Public Utilities Commission

Figure 2: GRAZING UNIT 18 ANDRADE ROAD

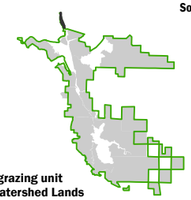
0 525
Feet

SFPUC Grazing Unit Boundary
BHR Site Boundary
Fence
Unpaved road
Intermittent stream

Grazing Infrastructure

Arroyo de la Laguna North (GU-10): Current tenant owns corral, barns and troughs in northern area of lease.

- Barn
- Corral
- Trough (non-functioning or unknown)
- Trough (functioning)



Location of grazing unit within SFPUC Watershed Lands

Sources: AECOM, 2025; ESRI Imagery, 2025; SFPUC, 2025; Rangeland Conservation Science, 2025.

AECOM

Hetch Hetchy Regional Water System
Services of the San Francisco Public Utilities Commission

Figure 2: GRAZING UNIT 10 ARROYO DE LA LAGUNA NORTH

0 660
Feet

SFPUC Grazing Unit Boundary
BHR Site Boundary
Fence
Unpaved road
Intermittent stream

Grazing Infrastructure

Arroyo de la Laguna South (GU-11): Barns and corrals are tenant-owned.

Barn
Corral
Solar Panel
Solar Pump
Tank (functioning)
Trough (functioning)
Well

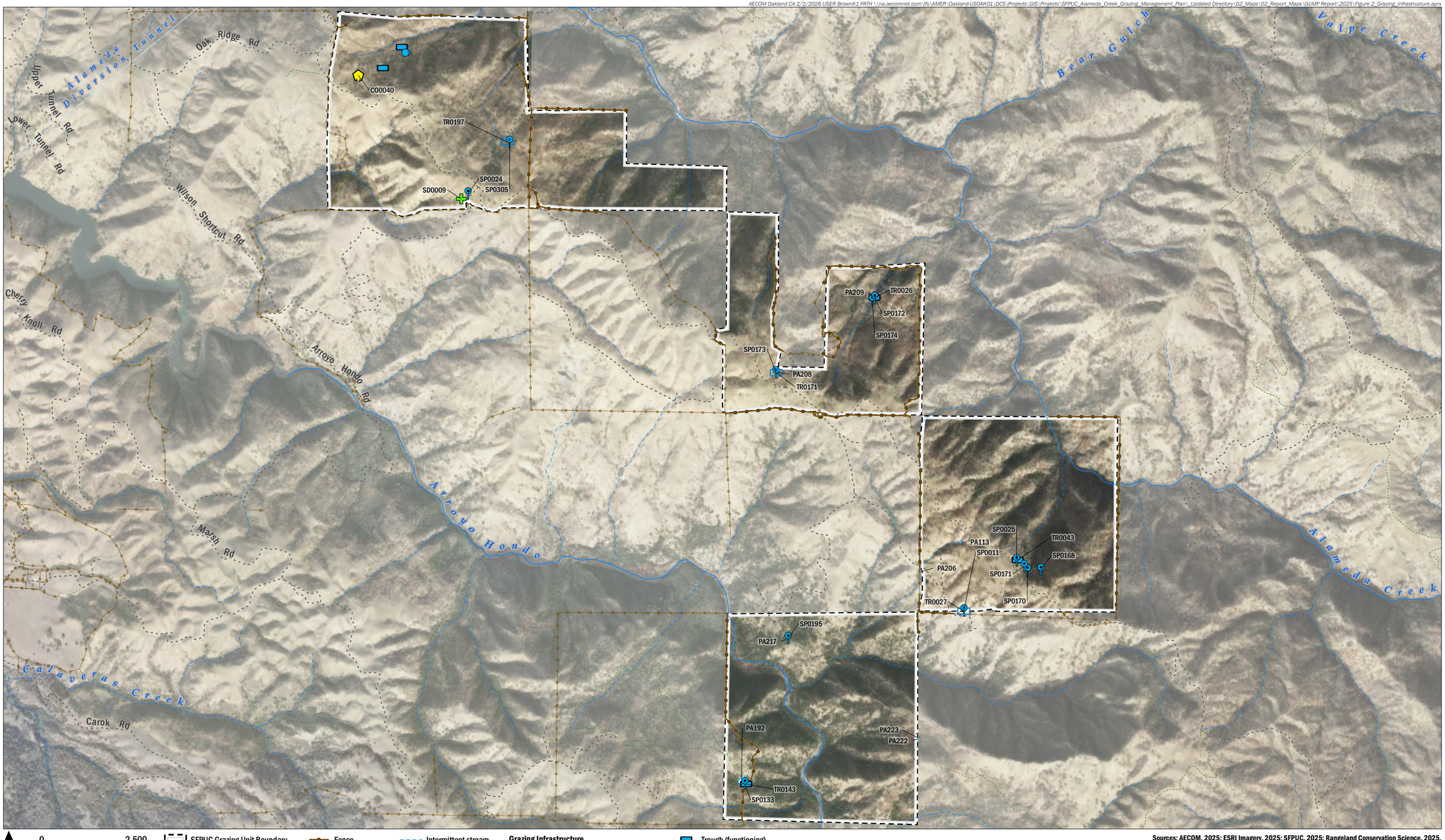
Location of grazing unit within SFPUC Watershed Lands

Sources: AECOM, 2025; ESRI Imagery, 2025; SFPUC, 2025; Rangeland Conservation Science, 2025.

AECOM

Hetch Hetchy Regional Water System
Services of the San Francisco Public Utilities Commission

Figure 2: GRAZING UNIT 11 ARROYO DE LA LAGUNA SOUTH



N

0 2,500 Feet

AECOM

SFPUC Grazing Unit Boundary

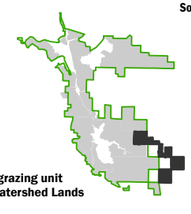
Fence
Unpaved road
Trail

Intermittent stream
Perennial Stream
Pond

Grazing Infrastructure

Corral
Spring
Stream Diversion
Tank (functioning)
Trough (non-functioning or unknown)
Trough (functioning)

Sources: AECOM, 2025; ESRI Imagery, 2025; SFPUC, 2025; Rangeland Conservation Science, 2025.



Location of grazing unit within SFPUC Watershed Lands

Hetch Hetchy Regional Water System
Services of the San Francisco Public Utilities Commission

Figure 2: GRAZING UNIT 25 BLACK MOUNTAIN

N

0 2,100
Feet

AECOM

SFPUC Grazing Unit Boundary
Managed Riparian Area
East Bay Regional Parks District easement for road and public trail access

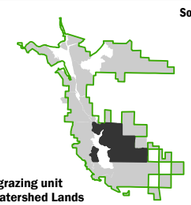
Fence
Secondary highway
Paved road
Unpaved road
Trail

Aqueduct
Intermittent stream
Perennial Stream
Pond

Grazing Infrastructure

Barn
Corral
Spring
Tank (non-functioning or unknown)
Tank (functioning)

Trough (non-functioning or unknown)
Trough (functioning)
Well



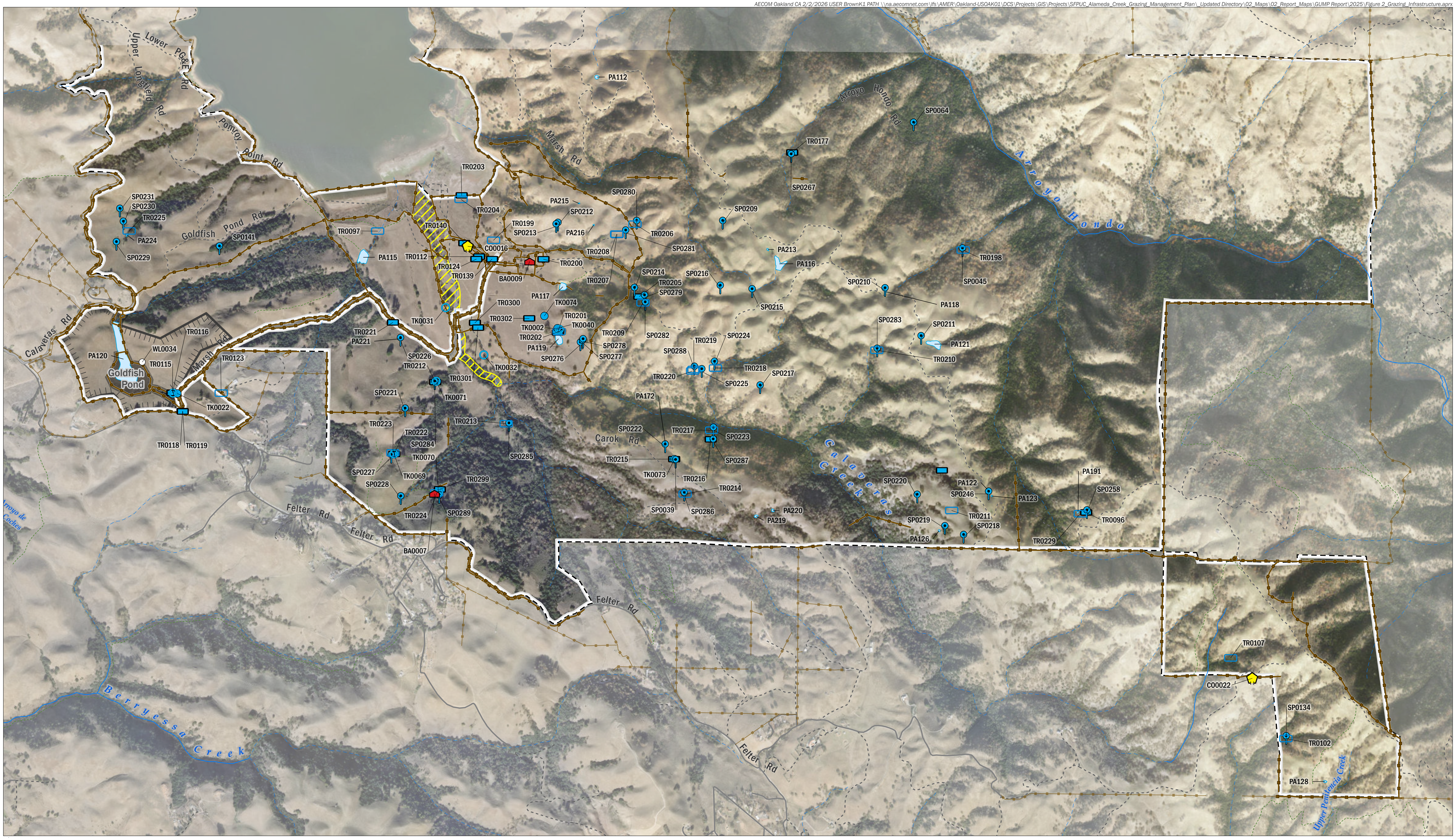
Location of grazing unit within SFPUC Watershed Lands

Sources: AECOM, 2025; ESRI Imagery, 2025; SFPUC, 2025; Rangeland Conservation Science, 2025.

Hetch Hetchy Regional Water System
Services of the San Francisco Public Utilities Commission

Figure 2: GRAZING UNIT 23 CALAVERAS RESERVOIR - PART 1

AECOM Oakland CA 2/2/2026 USER BrownK1 PATH \\na.aecomnet.com\lfs\AMER\Oakland-USOAK01\DCS\Projects\GIS\Projects\SFPUC_Alameda_Creek_Grazing_Management_Plan_Updated Directory\02_Maps\02_Report_Maps\GUMP Report\2025\Figure 2_Grazing_Infrastructure.aprx



N

Feet 0 2,100

AECOM

- SFPUC Grazing Unit Boundary
- BHR Conservation Easement
- BHR Exclusion Area
- Managed Riparian Area
- Fence
- Secondary highway
- Paved road
- Unpaved road
- Trail
- Intermittent stream
- Perennial Stream
- Pond

Grazing Infrastructure

Calaveras Reservoir (GU-23): Corral CO0016 is tenant-owned.

- Barn
- Corral
- Spring
- Tank (non-functioning or unknown)
- Tank (functioning)
- Trough (non-functioning or unknown)
- Trough (functioning)
- Well

Location of grazing unit within SFPUC Watershed Lands

Sources: AECOM, 2025; ESRI Imagery, 2025; SFPUC, 2025; Rangeland Conservation Science, 2025.

Hetch Hetchy Regional Water System

Services of the San Francisco Public Utilities Commission

Figure 2: GRAZING UNIT 23 CALAVERAS RESERVOIR - PART 2

0 1,250
Feet

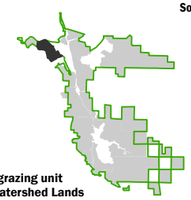
AECOM

- SFPUC Grazing Unit Boundary
- Kinder Morgan LLC Easement
- Fence
- Paved road
- Unpaved road
- Trail
- Aqueduct
- Intermittent stream
- Pond

Grazing Infrastructure

Confluence (GU-15): Corral CO0028 is tenant-owned.

- Corral
- Solar Panel
- Solar Pump
- Stream Diversion
- Tank (non-functioning or unknown)
- Trough (functioning)

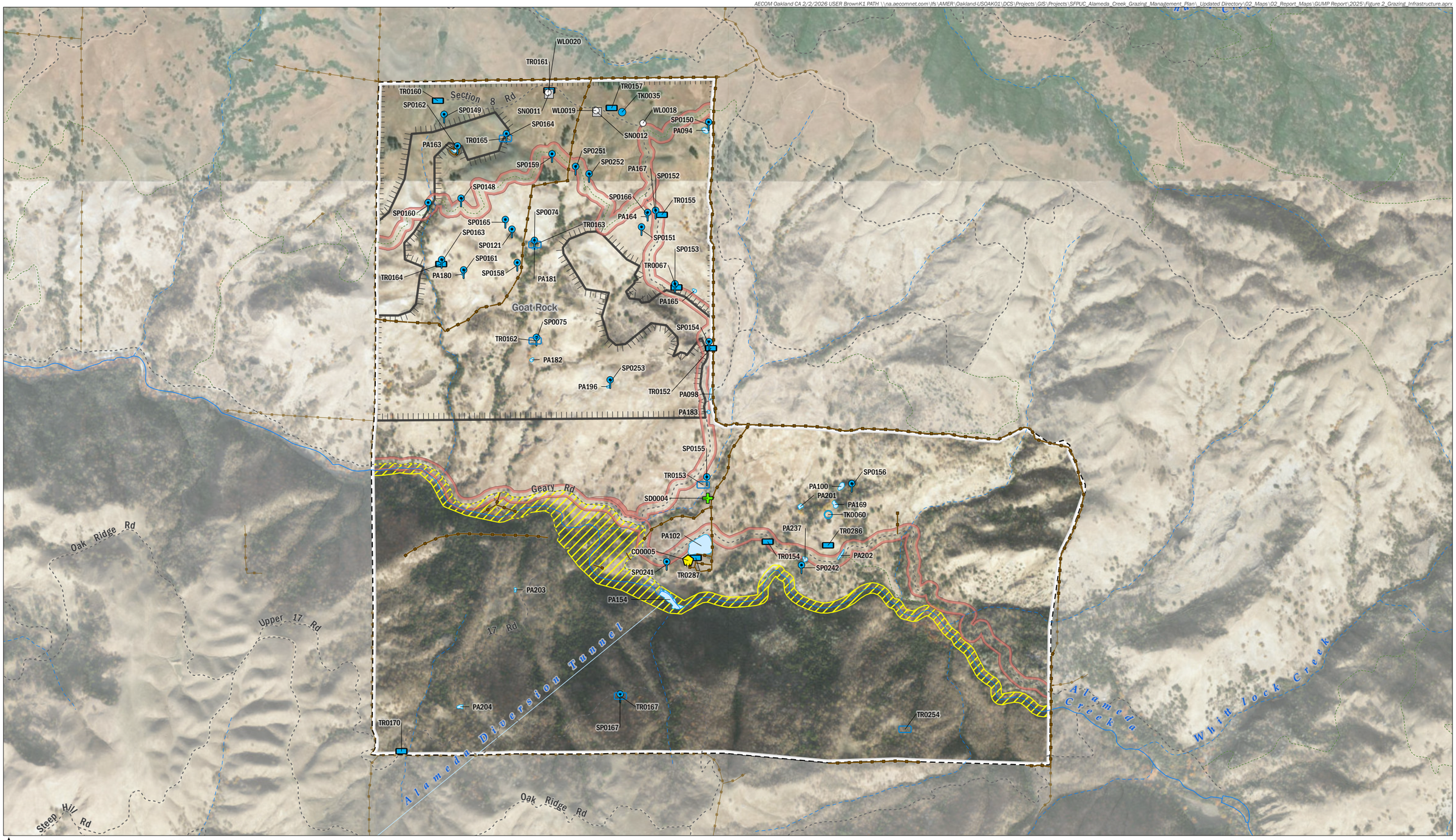


Location of grazing unit within SFPUC Watershed Lands

Sources: AECOM, 2025; ESRI Imagery, 2025; SFPUC, 2025; Rangeland Conservation Science, 2025.

Hetch Hetchy Regional Water System
Services of the San Francisco Public Utilities Commission

Figure 2: GRAZING UNIT 15 CONFLUENCE



N

0 1,500
Feet

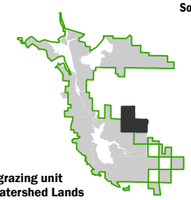
AECOM

- SFPUC Grazing Unit Boundary
- BHR Conservation Easement
- BHR Exclusion Area
- Managed Riparian Area
- East Bay Regional Parks District easement for road and public trail access
- Fence
- Unpaved road
- Trail
- Aqueduct
- Intermittent stream
- Perennial Stream
- Pond

Grazing Infrastructure

Frog Pond (GU-21): Corral is tenant-owned.

- Corral
- Solar Panel
- Spring
- Stream Diversion
- Tank (non-functioning or unknown)
- Tank (functioning)
- Trough (non-functioning or unknown)
- Trough (functioning)
- Well

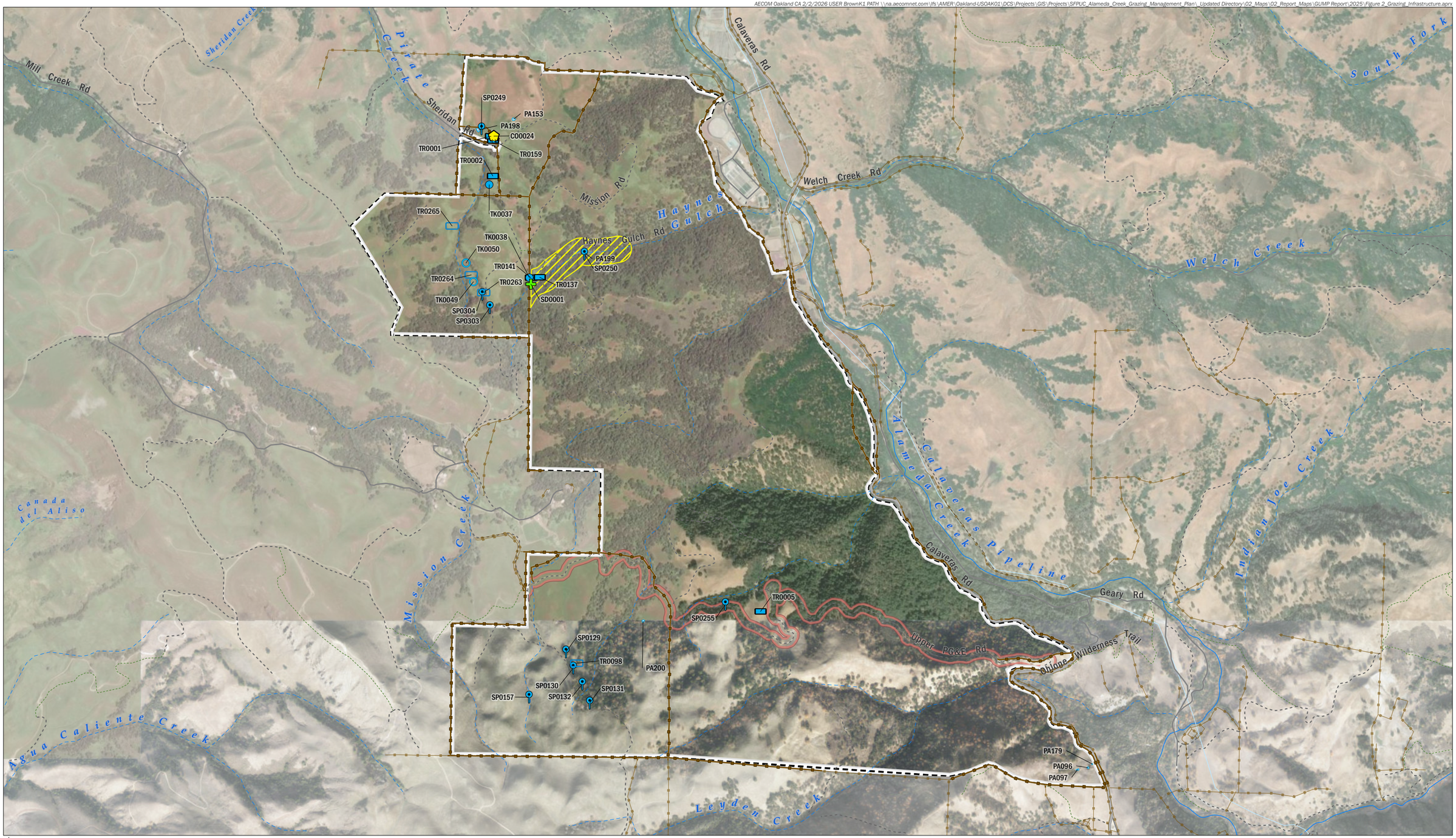


Location of grazing unit within SFPUC Watershed Lands

Sources: AECOM, 2025; ESRI Imagery, 2025; SFPUC, 2025; Rangeland Conservation Science, 2025.

Hetch Hetchy Regional Water System
Services of the San Francisco Public Utilities Commission

Figure 2: GRAZING UNIT 21 FROG POND



N

0 1,750
Feet

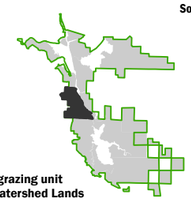
AECOM

- SFPUC Grazing Unit Boundary
- Managed Riparian Area
- East Bay Regional Parks District easement for road and public trail access
- Fence
- Secondary highway
- Paved road
- Unpaved road
- Trail
- Intermittent stream
- Pond

Grazing Infrastructure

Haynes Gulch (GU-19): Corral is tenant-owned.

- Corral
- Spring
- Stream Diversion
- Tank (non-functioning or unknown)
- Tank (functioning)
- Trough (non-functioning or unknown)
- Trough (functioning)



Location of grazing unit within SFPUC Watershed Lands

Sources: AECOM, 2025; ESRI Imagery, 2025; SFPUC, 2025; Rangeland Conservation Science, 2025.

Hetch Hetchy Regional Water System
Services of the San Francisco Public Utilities Commission

Figure 2: GRAZING UNIT 19 HAYNES GULCH

0 1,750
Feet

AECOM

SFPUC Grazing Unit Boundary
Managed Riparian Area

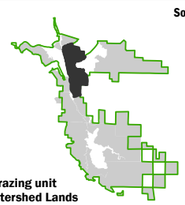
Fence
Secondary highway
Paved road
Unpaved road
Trail

Aqueduct
Intermittent stream
Pond

Grazing Infrastructure
Corral
Solar Panel
Solar Pump
Spring
Stream Diversion

Tank (functioning)
Trough (non-functioning or unknown)
Trough (functioning)

Sources: AECOM, 2025; ESRI Imagery, 2025; SFPUC, 2025; Rangeland Conservation Science, 2025.



Location of grazing unit within SFPUC Watershed Lands

Hetch Hetchy Regional Water System
Services of the San Francisco Public Utilities Commission

Figure 2: GRAZING UNIT 16 MAGUIRE PEAKS

0 1,900 Feet

AECOM

SFPUC Grazing Unit Boundary

Fence
Secondary highway
Paved road
Unpaved road
Trail

Intermittent stream
Pond

Grazing Infrastructure

Mission Peak (GU-22): All corrals are tenant-owned.
The water source for trough TR0259 is on adjacent private property.

Barn
Corral
Spring

Stream Diversion
Tank (functioning)
Trough (non-functioning or unknown)
Trough (functioning)
Well

Location of grazing unit within SFPUC Watershed Lands

Sources: AECOM, 2025; ESRI Imagery, 2025; SFPUC, 2025; Rangeland Conservation Science, 2025.

Hetch Hetchy Regional Water System
Services of the San Francisco Public Utilities Commission

Figure 2: GRAZING UNIT 22 MISSION PEAK

Alameda Creek

Sunol Aqueduct

Dance Hall Rd

SP0294

TR0255

Niles Canyon Rd

0 740

Feet

SFPUC Grazing Unit Boundary

Fence

Trail

Aqueduct

Intermittent stream

Grazing Infrastructure

Spring

Trough (non-functioning or unknown)

AECOM

Sources: AECOM, 2025; ESRI Imagery, 2025; SFPUC, 2025; Rangeland Conservation Science, 2025.

Location of grazing unit within SFPUC Watershed Lands

Hetch Hetchy Regional Water System

Services of the San Francisco Public Utilities Commission

Figure 2: GRAZING UNIT 14 NILES CANYON

N

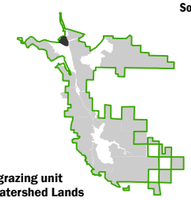
0 460
Feet

SFPUC Grazing Unit Boundary
Managed Riparian Area
Fence
Unpaved road
Intermittent stream

Grazing Infrastructure
Corral
Trough (non-functioning or unknown)

Sources: AECOM, 2025; ESRI Imagery, 2025; SFPUC, 2025; Rangeland Conservation Science, 2025.

AECOM



Location of grazing unit within SFPUC Watershed Lands

Hetch Hetchy Regional Water System
Services of the San Francisco Public Utilities Commission

Figure 2: GRAZING UNIT 13 PALOMA

N

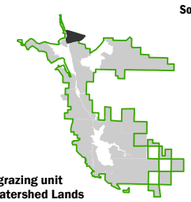
0 840
Feet

AECOM

- SFPUC Grazing Unit Boundary
- BHR Conservation Easement
- BHR Exclusion Area
- Managed Riparian Area
- Fence
- Paved road
- Unpaved road
- Intermittent stream
- Pond

Grazing Infrastructure

- Corral
- Solar Panel
- Stream Diversion
- Tank (non-functioning or unknown)
- Tank (functioning)
- Trough (non-functioning or unknown)
- Trough (functioning)
- Well

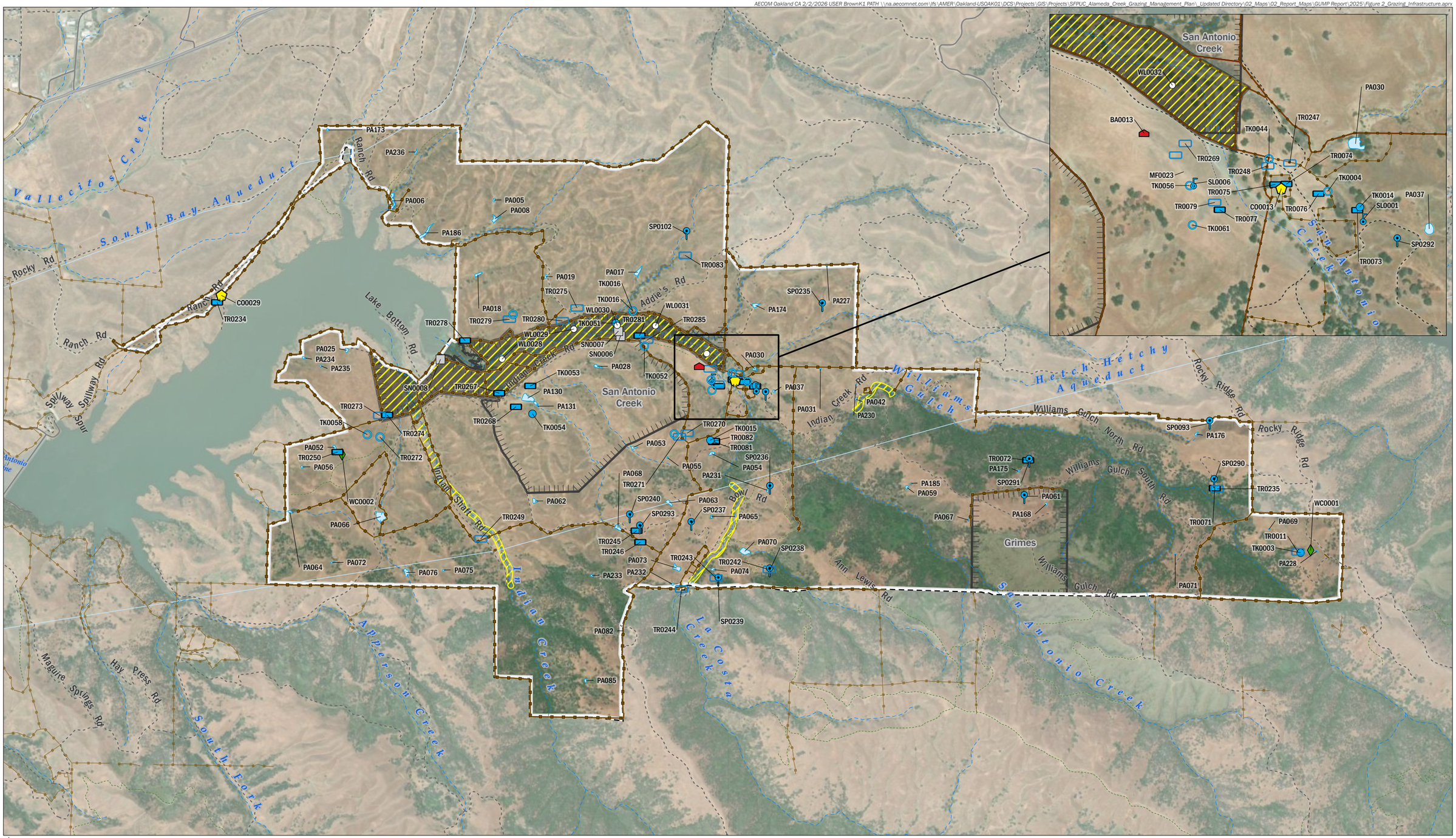


Location of grazing unit within SFPUC Watershed Lands

Sources: AECOM, 2025; ESRI Imagery, 2025; SFPUC, 2025; Rangeland Conservation Science, 2025.

Hetch Hetchy Regional Water System
Services of the San Francisco Public Utilities Commission

Figure 2: GRAZING UNIT 12 SHEEP CAMP CREEK



N

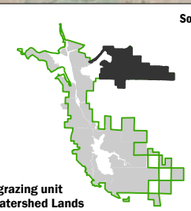
0 2,800
Feet

AECOM

- SFPUC Grazing Unit Boundary
- BHR Conservation Easement
- BHR Exclusion Area
- Managed Riparian Area
- Fence
- Unpaved road
- Trail
- Aqueduct
- Intermittent stream
- Pond

Grazing Infrastructure

- Barn
- Corral
- Solar Panel
- Solar Pump
- Spring
- Tank (non-functioning or unknown)
- Tank (functioning)
- Trough (non-functioning or unknown)
- Trough (functioning)
- Water Treatment Equipment
- Well



Location of grazing unit within SFPUC Watershed Lands

Sources: AECOM, 2025; ESRI Imagery, 2025; SFPUC, 2025; Rangeland Conservation Science, 2025.

Hetch Hetchy Regional Water System
Services of the San Francisco Public Utilities Commission

Figure 2: GRAZING UNIT 17 SAN ANTONIO CREEK