Grazing Management Plan
Santa Teresa County Park, San Jose, California

Prepared by

Lawrence D. Ford

Rangeland Management and Conservation Science

and

EcoSystems West Consulting Group

October 12, 2011

Grazing Management Plan
Santa Teresa County Park, San Jose, California

Prepared for

County of Santa Clara Department of Parks and Recreation

Prepared by

Lawrence D. Ford
Rangeland Management and Conservation Science
5984 Plateau Drive, Felton, CA 95018
(831) 335-3959
www.rangelandconservation.com

and

EcoSystems West Consulting Group
180 7th Avenue, Suite 201, Santa Cruz, CA 95062
(831) 429-6730
www.ecosystemswest.com

October 12, 2011

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION

1.1 Overview

The Grazing Management Plan (GMP) for Santa Teresa County Park (Park) was prepared by Rangeland Management and Conservation Science and EcoSystems West Consulting Group for the County of Santa Clara Parks and Recreation Department (County Parks). The GMP was developed in order to use grazing management as an effective conservation and management tool, while preserving the Park's unique recreational opportunities. Rangeland Management and Conservation Science worked in close collaboration with County Parks to determine preferences for the grazing field positions, infrastructure requirements, and livestock operations. County Parks provided access to maps and documents from park archives and previous reports; and prepared most of the working maps for fieldwork and figures used in this report. Sections on biological and physical resource specialty topics were prepared in collaboration with consultants, identified in Appendix A, along with the sections for which each was the primary contributor.

The Grazing Management Plan is organized into seven technical chapters. Subsequently, eleven appendices contain supplemental information pertaining to the resources present at Santa Teresa County Park, as well as to guidelines and practices relevant to grazing management activities. A brief summary of each chapter is provided below.

1. **INTRODUCTION**
   The Introduction identifies and describes the planning policies that provide the impetus for this Grazing Management Plan, the 1992 Parkland Range Management Policy for the Santa Clara County Park System (Santa Clara County 1992) and the 1992 Master Plan for Santa Teresa County Park (Titro Patri and Associates 1992). The purpose of this GMP is summarized, including the objective of enhancement of Bay checkerspot butterfly (BCB) (*Euphydryas editha bayensis*) habitat, and the goals of this GMP are outlined. The introduction also describes the location, ownership, and history of Santa Teresa County Park.

2. **SUMMARY OF EXISTING CONDITIONS**
   Chapter 2 is an overview of the existing conditions of biological and physical resources within Santa Teresa County Park, including botanical and wildlife resources, potential management concerns for the Park (including pest plants, shrub encroachment and fuel loads/fire hazards), soils, and hydrology. This chapter also contains brief descriptions of the cultural and recreational resources that are present within the Park. Chapter 2 defines all the resources that were considered as the GMP was developed.

3. **GRAZING MANAGEMENT GOALS, OBJECTIVES, AND PERFORMANCE STANDARDS**
   Chapter 3 describes the eleven primary goals that were identified for grazing management activities within the Park. Each goal is accompanied by its associated objectives and performance standards. These goals and objectives are in accordance with the County of Santa Clara County Park Management Policy (County of Santa Clara 1992).

4. **PREDICTED EFFECTS AND DESIRED CONDITIONS**
   Chapter 4 describes the predicted effects that the reintroduction of grazing may have on existing and potential resources within the Park. Chapter 4 evaluates both positive and negative potential impacts on the resources that were identified in Chapter 2. Also evaluated are potential impacts to neighboring lands and the potential interaction between climate change and grazing activities at the Park. Chapter 4 outlines all of the factors that were considered in developing grazing management strategies, so as to maximize potential positive impacts and minimize potential negative impacts.

5. **GRAZING MANAGEMENT SPECIFICATIONS**
   Chapter 5 defines and explains the grazing management practices necessary to achieve the goals and objectives identified for this GMP, taking into account the potential impacts identified in Chapter 4. Chapter 5 describes alternative cattle operations, defines grazing field boundaries, types of grazing fields, and associated management activities. Chapter 5 also evaluates the grazing capacity of the fields, the grazing period for the Park, and livestock stocking rates. This chapter describes specific management activities to address management concerns with the Park (pest plants, shrub encroachment and fire hazards), as well as restrictions imposed to protect biological, physical, and recreational resources. Finally, Chapter 5 describes the infrastructure requirements associated with grazing activities, including fencing, gates, and watering options and facilities. This chapter includes both the specifications for grazing at Santa Teresa County Park as well as the rationale for these recommendations.

6. **MONITORING OF CONDITIONS AND PLANNED EFFECTS ON RESOURCES RELATED TO GRAZING**
   Chapter 6 describes and justifies the recommended monitoring activities to ensure that grazing activities are meeting the identified performance standards necessary to achieve the desired management goals and objectives. Chapter 6 outlines the variables that will be monitored (as well as the methods) on both monthly and annual timescales. Chapter 6 also defines how monitoring activities and subsequent analysis of monitoring data may lead to adaptation of the GMP, such as adjustments to stocking rates and timing of grazing activities.

7. **ASSUMPTIONS AND RECOMMENDED SUPPLEMENTARY PLANNING**
   Chapter 7 describes the assumptions that were made in the development of this GMP as well as recommendations for supplementary planning related to grazing management, such as recommended additional studies on the Park's natural resources and management concerns, and recommended education and outreach activities.

1.2 Impetus for the Grazing Management Plan

The Grazing Management Plan for Santa Teresa County Park is a direct result of two important planning policies, the 1992 Parkland Range Management Policy for the Santa Clara County Park System (Santa Clara County 1992) and the 1992 Master Plan for Santa Teresa County Park (Tito Patri & Associates 1992). The Grazing Management Plan is in accordance with the Mission of the County Parks: to provide, protect and preserve regional parklands for the enjoyment, education and inspiration of this and future generations.

1.2.1 1992 PARKLAND RANGE MANAGEMENT POLICY

The Parkland Range Management Policy (Santa Clara County 1992) was adopted by the Board of Supervisors on July 21, 1992. The policy formalized grazing activities in order to protect, conserve and enhance the natural resources of parklands in recognition of grazing as an effective parkland management tool. Land management objectives of the policy include:

1. Provide visitor access and recreational opportunities
2. Provide for the safety of park users
3. Protect, conserve, and enhance natural plant communities.
4. Minimize fire hazards to parklands and private property by managing vegetative fuels.
5. Rehabilitate degraded vegetation and wildlife habitat.
6. Establish cooperative relationships with adjacent property owners.

Each park, under consideration for a grazing program, must:

1. Have a management plan that complies with CEQA (i.e., EIR if applicable) and which describes the natural resources present and the specific goals, techniques and monitoring programs to be used.
2. The management plan will provide sufficient detail on management techniques to support their use in accomplishing the stated goals.
3. Appropriate vegetation management technique(s) should be selected after considering a variety of options including:
   a. No option
   b. Prescribed fire
   c. Mowing
   d. Integrated pest management
   e. Herbicides
   f. Grazing

   The County of Santa Clara Parks and Recreation Department may opt to provide any, all, or none of the above in combination in a park.
4. A monitoring program should include appropriate periodic measurements of plant and wildlife species composition, density and frequency.
5. Special attention will be given to the effects of grazing on rare plants and rare plant communities, oak regeneration, riparian and wetland areas, and native perennial grasslands, and threatened or endangered wildlife.
6. Seasonal, rather than year-round, grazing will be encouraged at parks which experience heavy summer visitor use, so as to minimize user conflicts.
7. A conservative approach will be used to determine parkland cattle stocking rates so as to avoid short-term resource damages or long-term range decline.
8. Appropriate fencing will be required to ensure the protection of sensitive natural resource areas.
9. Rare species of plants and animals and their habitat will be identified, inventoried and protected.

Grazing operators will enter into grazing license agreements with the County of Santa Clara Parks and Recreation Department in order to manage the activity to meet these objectives.

1.2.2 1992 SANTA TERESA COUNTY PARK MASTER PLAN

The County of Santa Clara Parks and Recreation Department undertook a master planning effort for Santa Teresa County Park in order to guide the development of future uses of the expanding park (from 1,463 acres to 1,667 acres). The Master Plan provides an analysis of the Park's natural plant communities, wildlife species and habitats, and sensitive plant and wildlife species (pages 18-22). Among the sensitive species listed, the Master Plan acknowledges:

> The Bay checkerspot butterfly, a federally listed endangered species, is associated with serpentine host plants for reproductive purposes and may also be found in the park. The serpentine bunchgrasses of the park offer potentially suitable breeding sites for this species.

Further, eight resource management zones are identified in the Master Plan, and some form of fire management is recommended in all of the resource management zones:

> A common means of minimizing fire hazard is to allow grazing by cattle or sheep, usually under controlled circumstances. …The extent of non-native grassland is such (in and adjacent to the park) that grazing could be considered. This might include a cooperative arrangement with large adjacent landowners, such as IBM, which would help make such a program feasible by making much larger tracts of land available.

1.3 Purpose of the Grazing Management Plan

This Grazing Management Plan for Santa Teresa County Park is a site specific, phased approach to introduce cattle grazing to the Park to manage primary serpentine habitat, habitat for other sensitive species, fuel loads, and pest plant encroachment, balanced with recreational access and enjoyment. Management of the serpentine habitat is in alignment with the U.S. Fish and Wildlife Service (USFWS) Recovery Plan for Serpentine Species of the San Francisco Bay Area (1998). This Grazing Management Plan was developed to guide County Parks and its future Grazing Operator in their management actions related to livestock grazing at the Park. This document is designed to serve as a stand-alone reference for both strategic and tactical management decisions as well as education and outreach to the public.

The County of Santa Clara Parks and Recreation Department has had success in utilizing cattle grazing as a management tool, at several County parks (Joseph D. Grant, Ed Levin and Coyote Lake-Harvey Bear County Parks), as well as open space preserves such as Tulare Hill, and Rancho San Vicente. Cattle grazing provides a cost-effective and efficient means to provide vegetation control over significant tracts of land. Grazing is a preferred method over other management tools such as prescribed fires (which is heavily dependent on environmental factors and coordination with local firefighting agencies for a successful burn), manual methods of vegetation removal (which are labor intensive), or herbicide application (limited by County of Santa Clara's Integrated Pest Management Ordinance).

In general, cattle grazing is an effective conservation management tool for grasslands dominated by non-native annual grasses and pest (non-native, invasive) plants. Habitat for many special-status animals and plants in California's Coast Range grasslands is improved by management activities that reduce the height and mass of the non-native herbaceous plants, and thus non-native competition with native plants for space, sunlight, and nutrients.

The effects of modern livestock grazing on grasslands resemble the effects of native ungulates (hoofed mammals): the reduction of height and biomass of grassland herbaceous plants and the reduced cover of native woody plants. Other factors are different. The native perennial grassland with its associated native annual forbs was replaced over time by grassland dominated by European annual grasses and pest plants that outcompete natives. In addition, the behavioral patterns of livestock differ significantly from the behavior of native ungulates, and consequently the timing, intensity, and uniformity of herbivory and trampling effects differ. The prospects of mimicking pre-Columbian grazing effects with livestock are uncertain, and not supported by the scientific literature. Livestock grazing can be ecologically beneficial if careful strategies and grazing prescriptions are devised to achieve specific conservation objectives in the non-native dominated grassland, and to minimize the negative impacts based on the conditions at the grazed sites (Edwards 1992; Ford 2001; Ford and Huntsinger 2004). The risks of grazing at the Park will be avoided or reduced by measures defined in this GMP.

1.3.1 BAY CHECKERSPOT BUTTERFLY

A critical objective of this GMP is the enhancement of potential habitat for the federally threatened Bay checkerspot butterfly (BCB) (*Euphydryas editha bayensis*). The Santa Teresa County Park Master Plan (Tito Patri & Associates 1992) identified areas within the Park that should not be grazed due to the presence of native grasses and potential habitat for the threatened BCB. Through implementation of the Parkland Range Management Policy (Santa Clara County 1992) by the introduction of cattle grazing at other parks, as well as from the results of a growing body of scientific research on the subject (R. Arnold, pers. comm. 2011, Conservation Biology Institute 2006, USFWS 1998, Weiss, S.B. 1999, Weiss, S.B. et al 2007) County Parks has recognized the benefits of grazing to BCB and other special-status species.

The BCB does not currently occur at Santa Teresa County Park. The Report of Independent Science Advisors for the Santa Clara Valley Habitat Conservation Plan/Natural Community Conservation Plan (HCP/NCCP) (Conservation Biology Institute 2006) stated that, even though the BCB only occurs at Coyote Ridge, on the east side of Santa Clara Valley, appropriate serpentine habitat on the west side should be managed as a contingency to diminish the possibility of extinction. In addition, the USFWS Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area states that suitable potential serpentine grassland at Santa Teresa County Park provides a potential dispersal location for the metapopulation at Coyote Ridge (USFWS 1998). Santa Teresa County Park, in addition to the contiguous serpentine grassland at the IBM Almaden Research Center facility, Tulare Hill and Coyote Ridge Conservation areas, Rancho San Vicente (Calero County Park) (County of Santa Clara Parks and Recreation Department 2010), has enough potential BCB habitat to warrant management for the species. Since the writing of the HCP/NCCP, BCB have been observed in the vicinity of the Park, including a confirmed BCB at Calero County Park (Rancho San Vicente Property) in 2010. These west Santa Clara Valley suitable habitats provide potential locations for dispersal of the existing metapopulation, as noted in USFWS (1998). The management of the serpentine habitats contiguous to Santa Teresa County Park would maximize enhancement of potential BCB habitat (R. Arnold, pers. comm. 2011, USFWS 1998).

Historic livestock grazing and related grassland management at the Park and in the region provided conditions favorable to the persistence of BCB and other special-status plants and wildlife species at several sites associated with serpentine soils. Conversion to urban land uses, invasion and increased density of non-native grassland plants, and the decline of traditional rangeland management have degraded the remaining BCB habitat sites (ICF International 2010). Implementation of this GMP is expected to reverse this trend at Santa Teresa County Park. Grazing prescriptions and practices to manage potential BCB habitat at the park will include the practical testing of hypotheses to maintain and enhance habitat quality, and then adapting those prescriptions based on the results of monitoring.

1.4 Goals of the Grazing Management Plan

The eleven goals of the Grazing Management Plan for Santa Teresa County Park are in alignment with goals identified by County Parks, the Parkland Range Management Policy, the Master Plan, observations from conducted field studies, public input from community meetings, as well as with the Mission of the County of Santa Clara Parks and Recreation Department, in providing public recreation resources as well as protecting and preserving the natural resources of regional parklands. The eleven goals are listed below, while their corresponding objectives and performance standards are described in Section 3, Table 7.

GOAL 1: Maintain rangeland conditions conducive to the long-term persistence of the existing and potential sensitive biological resources: special-status plants and wildlife, and sensitive natural communities.

GOAL 2: Maintain the health of the rangeland ecosystem, including soil integrity, water quality, biodiversity, and resilience.

GOAL 3: Maintain recreational access, enjoyment, and appreciation.

GOAL 4: Reduce the fire hazards associated with the mass of dry herbaceous vegetation in the grasslands during the summer and autumn seasons, and associated with the mass of woody fuels in the scrub, chaparral, and woodland communities.

GOAL 5: Minimize the impacts of invasive non-native “pest” plants.

GOAL 6: Maintain forage, infrastructure, and other conditions to sustain a livestock operation and healthy livestock.

GOAL 7: Provide the working conditions for County Parks and Livestock Operator to maintain a cooperative and productive relationship.

GOAL 8: Maintain cooperative relationships with adjacent property owners.

GOAL 9: Protect the pre-Columbian and historic cultural resources.

GOAL 10: Improve wildflower displays and oak regeneration.

GOAL 11: Reduce shrub encroachment into grassland habitats and maintain minimum grass/shrub mosaic.

1.5 Site Description

Santa Teresa County Park is located roughly 10 miles south of downtown San Jose with Bernal Road being the primary access (Tito Patri & Associates 1992) (Figure 1). The Park encompasses 1,668 acres of the southern portion of Santa Teresa Ridge, which divides the Almaden and Santa Clara Valleys. Elevation ranges from 400 to 1,100 feet. Many slopes throughout the park are greater than 30% and are primarily composed of the Bernal formation. The Park is part of an "island" of open space in an almost entirely urban landscape, with the exception of the IBM Corporation-owned open space along the western boundary of the Park (Figure 2). The southern edge of the Park is bordered by agricultural lands and residential development (Tito Patri Associates 1992).

Santa Teresa County Park supports a diverse flora and fauna because it has remained undeveloped, has complex topography, and contains expansive serpentine soils to which an unusual plant community is adapted.

1.6 Ownership

Lands that make up Santa Teresa County Park were purchased by the County of Santa Clara in several acquisitions starting in 1954 with the 466-acre Fitzgerald Ranch (Tito Patri & Associates 1992). In addition, the County has two easements on land owned by IBM Corporation: a 30-acre recreational and open space easement and a trail easement on the Stile Ranch trail. PG&E, American Towers, and Great Oaks Water Company hold road easements in the park and have permission to drive service vehicles within those easements. One 44-acre privately-owned in-holding parcel is situated completely within the park boundary (Tito Patri & Associates April 1992).

N
W E
S

Santa Teresa County Park Project Location

SANTA CLARA COUNTY PARKS

This map generated by the County of Santa Clara Department of Parks and Recreation. The GIS files were compiled from various sources. While deemed reliable, the Department assumes no liability.

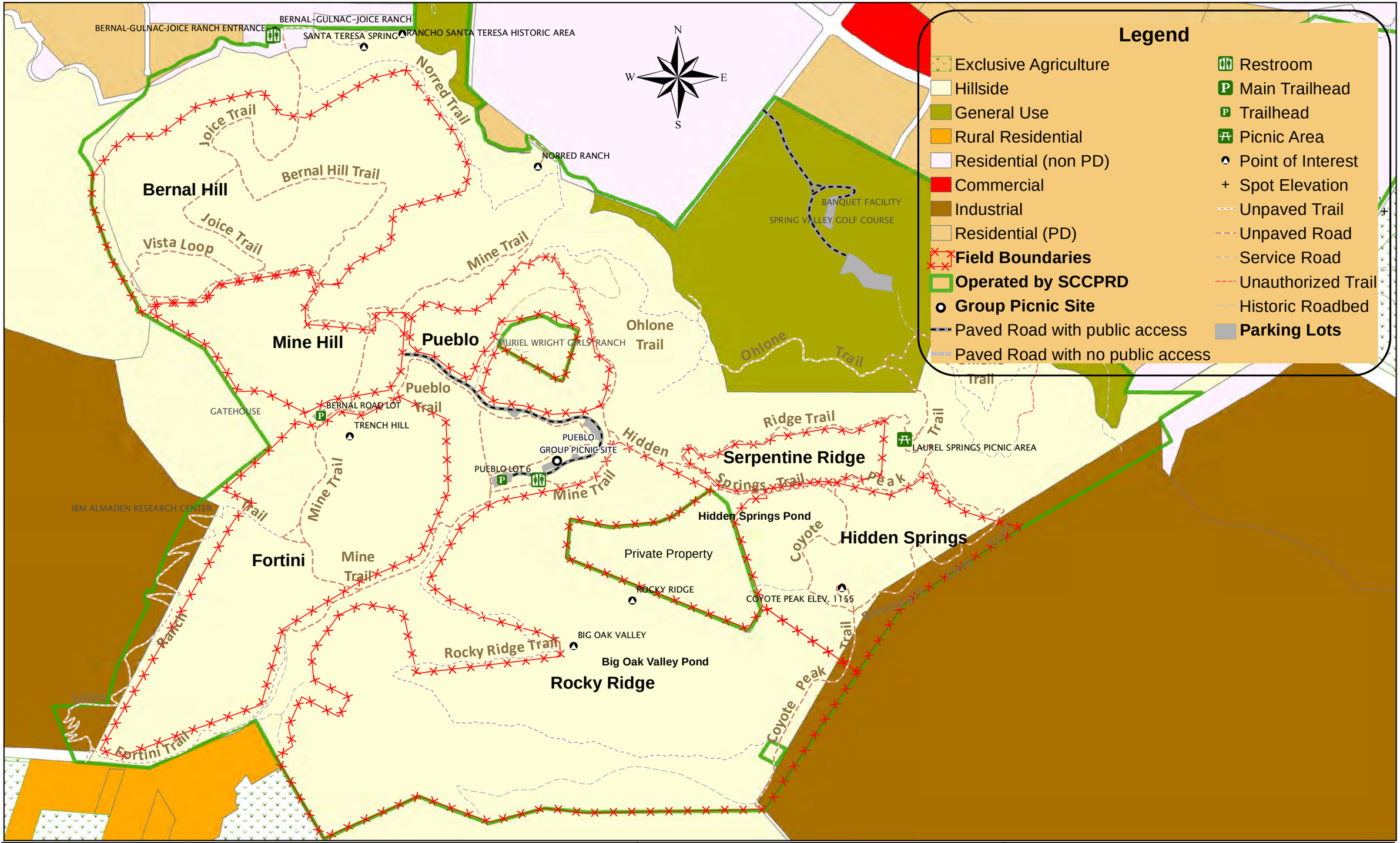
Title: Figure 1. Location Map, Santa Teresa County Park
Santa Clara County, CA

Comments:

Date: July 29, 2011

Created By: DRocha

Scale: 0 115,000 230,000 460,000 690,000 920,000 Feet



SANTA CLARA COUNTY PARKS

This map generated by the County of Santa Clara Department of Parks and Recreation. The GIS files were compiled from various sources. While deemed reliable, the Department assumes no liability.

Title:
Figure 2. Neighboring Land Use Map, Santa Teresa County Park
Santa Clara County, CA

Comments:

Date:
August 24, 2011

Created By:
DRocha

Scale:
0 270 540 1,080 1,620 2,160 Feet

1.7 History of Land Use

The lands that currently comprise Santa Teresa County Park were acquired for various purposes over many decades, starting in the 1950s, with the earliest acquisitions becoming an official park in 1958 (Tito Patri & Associates 1992). Cattle grazing and recreation were the two primary historical uses of the Park. Don Jose Joaquin Bernal arrived with the De Anza expedition in 1776 and settled near the Santa Teresa Spring area in 1826. In 1834 Bernal was granted 9,647 acres by the Mexican government and established the original Rancho Santa Teresa. Over the next 34 years the Rancho Santa Teresa boundaries were reconfigured numerous times. Agositin Bernal, son of Jose Joaquin, petitioned the U.S. government in 1853 for the Santa Teresa grant. The grant was ultimately confirmed by the U.S. District Court, but only for 4,460 acres. By 1868 the Bernal property was further subdivided as much of the land had been sold to pay legal fees. When Carlos Gulnac married into the Bernal family, he inherited the remaining Bernal Rancho and constructed the Joice Ranch structures in the late 1850's. His descendants occupied and operated the ranch where more than 2,000 cattle grazed into the late 1960s. During the 1950s through the 1970s Ginina Fortini and Daniel Rosetto maintained a private recreational facility along the eastern property boundary known as the 14E Club (referred to in this document as the Rosetto Ranch). The Buck Norred Ranch Stables, another popular private recreation facility, operated during the 1970s and 1980s in what is now the northern portion of the park immediately west of Bernal Road. The Fortini-Rossetto and Norred properties were acquired by the County in the early 1990's. Planning for the existing public golf course began in 1960 and opened for play in 1962 (Tito Patri & Associates 1992). The course is now operated by a private concessionaire. In 1962, the County of Santa Clara purchased the 196 acre Martin Property to build the Wright Center probation facility which exists today in the center of the Park east of Bernal Road. Planning for the Pueblo group picnic area began in 1975 and included a proposal to irrigate the turf at the Pueblo group picnic area. This area was irrigated until 1983. When scheduled turf irrigation was discontinued by the Park due to drought, Park staff reported fewer visitors using the area in the summer; however, irrigation has not resumed in this area. Hiking, mountain biking, horseback riding, dog walking and interpretive/educational programs are primary current activities at the park.

On June 5, 1992, the County of Santa Clara Board of Supervisors adopted a Parkland Range Management policy and Parkland Grazing License for Santa Clara County Parks that allows for grazing licenses instead of leases, allowing park staff to be more involved with the grazing operations. Historically, the area above the Buck Norred Ranch was grazed until 1983 (D. Rocha, pers. comm. 2011). Grazing has not occurred at Santa Teresa County Park since the termination of that lease. Grazing currently occurs on the neighboring IBM Santa Teresa Laboratory lands and historically occurred on IBM Almaden Research Center lands.

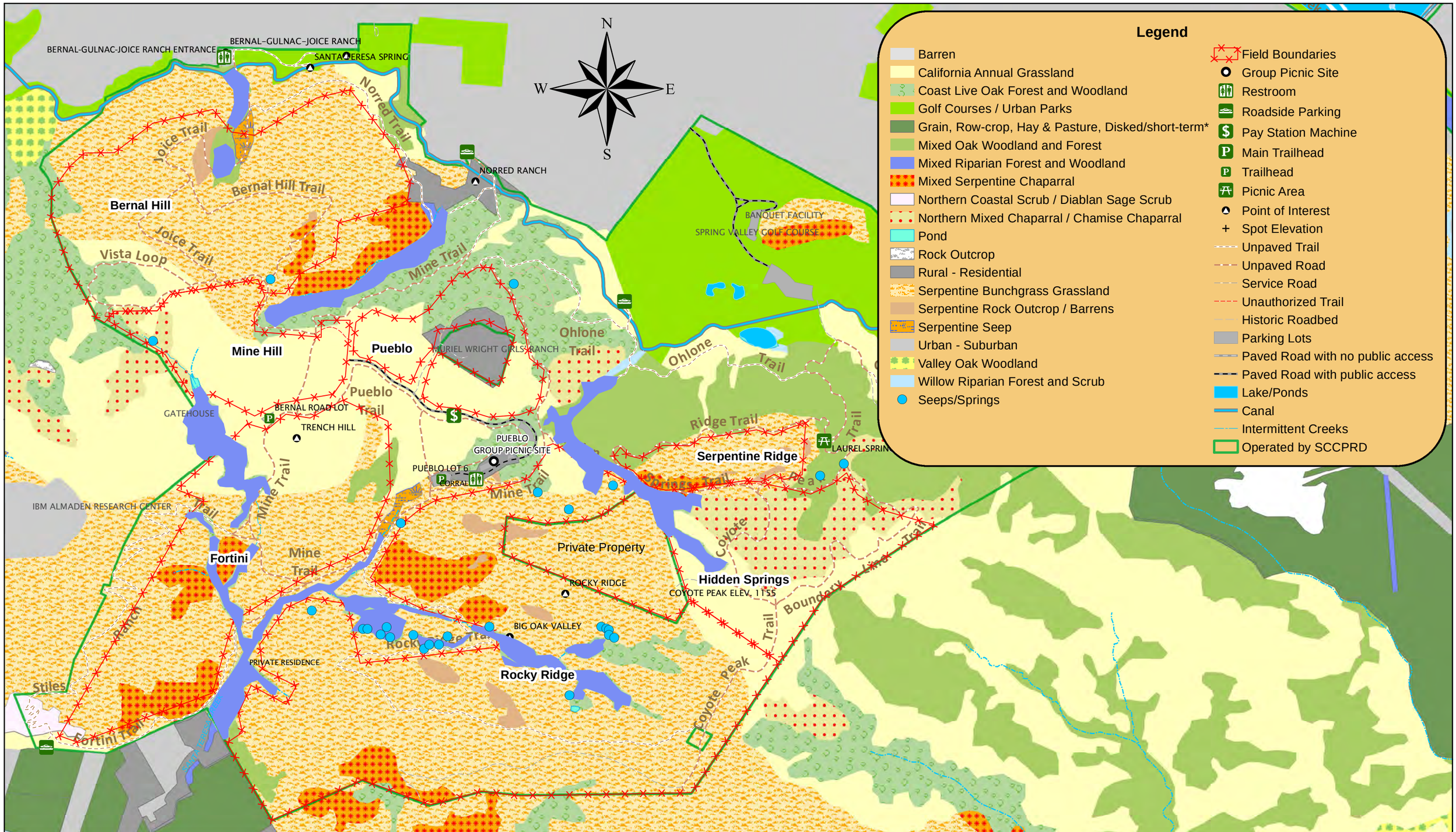
2 SUMMARY OF EXISTING CONDITIONS

2.1 Botanical Resources

2.1.1 NATURAL (PLANT) COMMUNITIES

Natural (plant) communities at Santa Teresa County Park include annual grassland, mixed oak woodland and forest, freshwater marsh, chaparral, riparian woodland and forest, and non-native landscaping (Figure 3) [1]. Annual grasslands are wide-spread in clayey soils that become saturated during the rainy season and are dry throughout the rest of the year. Low-nutrient, rocky soils support chaparral (Environmental Science Associates, Inc. 1992). Coast live oak, valley oak, California buckeye, California bay, and blue oak are part of the mixed oak plant communities and typically occur on north-facing slopes. Those plant communities recognized as sensitive natural communities for conservation purposes are summarized in Section 2.1.3 and described in detail in Appendix B.

[1] Ecological Site Descriptions are now available from the U.S.D.A. Natural Resources Conservation Service for several soils types (e.g. Vallecitos soils; refer to George et al. 2004), which are found in the southeast portion of Santa Teresa County Park. Ecological Site Descriptions include descriptions of historic and reference community composition, forage production, and state and transition models, and are useful for vegetation ecology studies and management planning.



SANTA CLARA COUNTY PARKS

This map generated by the County of Santa Clara Department of Parks and Recreation. The GIS files were compiled from various sources. While deemed reliable, the Department assumes no liability.

Title: Figure 3. Natural (Plant) Communities Map

Comments:

Date: August 24, 2011

Created By: DRocha

Scale: 0 287.5 575 1,150 1,725 2,300 Feet

2.1.2 SPECIAL-STATUS PLANTS

The special-status plants known to occur or with potential to occur (but undocumented) at Santa Teresa County Park are listed in Table 1 and mapped in Figure 4. Habitat requirements and distribution in the vicinity of the Park for these plants are listed in Table B-1 of Appendix B.

Table 1. Special-Status Plants at Santa Teresa County Park, Santa Clara County, CA.

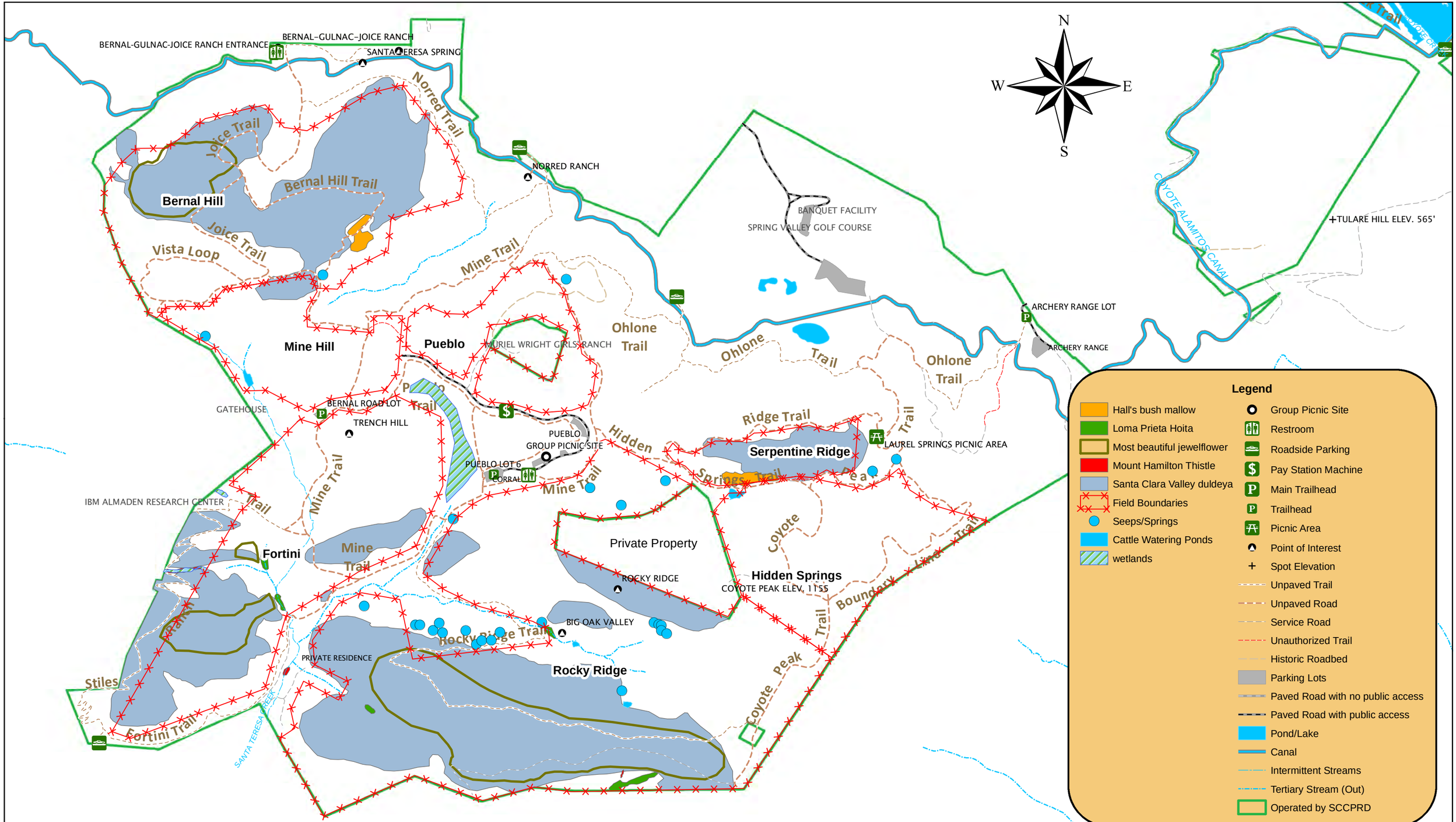
Species		Status	Blooming Period[iv]
Common Name	**Scientific Name**	Federal[i]/State[ii]/CNPS[iii]	
Known Occurrences at Santa Teresa County Park			
Mt. Hamilton thistle	*Cirsium fontinale var. campylon*	-/-/1B.2	(Feb)April-October
Santa Clara Valley dudleya	*Dudleya setchellii*	FT/-/1B.1	April-July
Loma Prieta hoita	*Hoita strobilina*	-/-/1B.1	May-July(Aug-Oct)
Smooth lessingia	*Lessingia micradenia var. glabrata*	-/-/1B.2	July-November
Hall's bush mallow	*Malacothamnus hallii*	-/-/1B.2	May-September
Woodland monolopia	*Monolopia gracilens*	-/-/1B.2	March-July
Most beautiful jewelflower	*Streptanthus albidus* ssp. *peramoneus*	-/-/1B.2	(Mar)April-September(Oct)
Potential/Undocumented Occurrences at Santa Teresa County Park			
Coyote ceanothus	*Ceanothus ferrisiae*	FE/-/1B.1	January-May
Fragrant fritillary	*Fritillaria liliaceae*	-/-/1B.2	February-April
Arcuate bush mallow	*Malacothamnus arcuatus*	-/-/1B.2	April-September
Metcalf Canyon jewelflower	*Streptanthus albidus* ssp. *albidus*	FE/-/1B.1	April-July

[i] U.S. Fish and Wildlife Service (20010 a, b, c).
FE = Endangered: Endangered of becoming extinct throughout all, or a significant portion of its range. FT =Threatened: Threatened of becoming endangered within the foreseeable future throughout all, or a significant portion of its range.

[ii] Section 1904, California Fish and Game Code (California Department of Fish and Game 2011).

[iii] Tibor (2001); California Native Plant Society (2011).
CNPS Lists: List 1A: Presumed extinct in California. List 1B: Rare, Threatened, or Endangered in California and elsewhere. List 2: Rare, Threatened, or Endangered in California, more common elsewhere. List 3: Plants about which more information is needed. List 4: Plants of limited distribution: a watch list.
Threat Code extensions: .1: Seriously endangered in California. .2: Fairly endangered in California. .3 Not very endangered in California.

[iv] Munz and Keck (1973); Tibor (2001); California Native Plant Society (2010); Parentheses indicate an infrequent but occasional extension of the blooming period, corresponding to abnormal weather conditions in a given year.



SANTA CLARA COUNTY PARKS

This map generated by the County of Santa Clara Department of Parks and Recreation. The GIS files were compiled from various sources. While deemed reliable, the Department assumes no liability.

Title: Figure 4. Special-Status Plants Map

Comments:

Date: August 24, 2011

Created By: DRocha

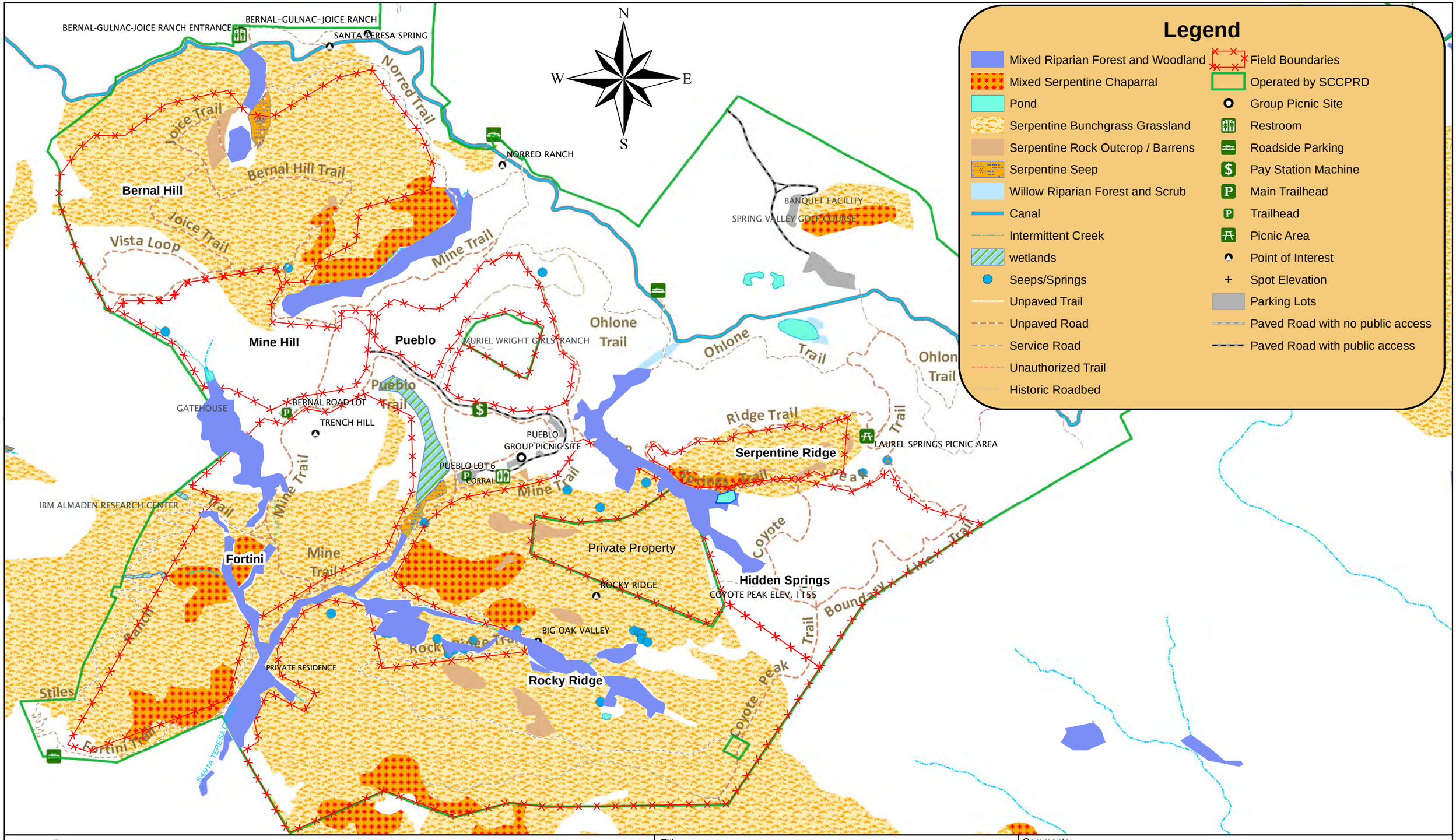
Scale: 0 287.5 575 1,150 1,725 2,300 Feet

2.1.3 SENSITIVE NATURAL COMMUNITIES

EcoSystems West identified four sensitive natural communities[2] within Santa Teresa County Park: serpentine grassland (serpentine bunchgrass grassland), mixed serpentine chaparral, riparian forests and woodlands (mixed riparian forest and woodland and willow riparian forest and scrub), emergent freshwater wetlands (wetlands, serpentine seep, seep/springs). These communities are described in Appendix B and mapped in Figure 5.

In addition, the Santa Clara County Parkland Range Management Policy (Section 3.e, Santa Clara County 1992) identifies oak woodlands ("oak regeneration") as warranting "special attention". The Santa Clara County General Plan Policies (Resource Conservation Chapter, Habitat and Biodiversity and Heritage Resource Elements, Santa Clara County 1994) and the Tree Preservation and Removal Ordinance (Santa Clara County 1998) that protect oak woodlands focus mostly on restrictions to new urban development and protection of large, heritage trees or trees with historical qualities. The Oak Woodlands Management Plan for Santa Clara County (Santa Clara County 2005) provides general voluntary guidelines for the protection of oak woodland. These sources generally indicate that oak woodlands and oak trees are highly valuable, and should be protected in places like Santa Teresa County Park. Oak woodlands in the vicinity of Santa Teresa County Park were likely reduced in their extent by historic ranching and mining practices, including excessive grazing and cutting for fuel wood. Although not typically designated as sensitive habitats, mixed oak woodlands and forest will be considered for management for the purpose of this GMP (Section 4).

[2] Sensitive natural communities include riparian corridors, wetlands, habitats for legally protected species and CDFG 'Species of Special Concern', areas of high biological diversity, areas providing important wildlife habitat, unusual or regionally restricted habitat types, those listed on the CNDDB working list of 'high priority' habitats for inventory (i.e., rare or endangered within the borders of California) (Holland 1986; CDFG 2003) and areas considered to be 'sensitive habitats' under county General Plans an Park Master Plans.



SANTA CLARA COUNTY PARKS

This map generated by the County of Santa Clara Department of Parks and Recreation. The GIS files were compiled from various sources. While deemed reliable, the Department assumes no liability.

Title: Figure 5. Sensitive Natural Communiities Map

Comments:

Date: March 24, 2011

Created By: DRocha

Scale: 0 295 590 1,180 1,770 2,360 Feet

2.2 Wildlife

A general description of the fauna of Santa Teresa County Park may be found in Chapter V, Section B.4 of the Santa Teresa County Park Final Master Plan Report (Tito Patri & Associates 1992).

2.2.1 SPECIAL-STATUS INVERTEBRATES

Table 2 identifies four special-status or sensitive invertebrate species for which their historic or present-day ranges include Santa Teresa County Park. The Draft Santa Clara Valley Habitat Plan provides a detailed species account of the BCB, including life history and seasonal timing of the BCB life stages. This species account is contained in Appendix C (ICF International 2010, Appendix D, Species Accounts, pp. 3-30). Appendix C also provides pertinent background information about the geographic range, habitat requirements, and natural history of the other special-status invertebrate taxa listed below.

Table 2. Special-Status Invertebrates of Santa Teresa County Park, Santa Clara County, CA.

Common Name	Scientifc Name	Class, Order and Family	Status
Bay Checkerspot Butterfly	*Euphydryas editha bayensis*	Insecta: Lepidoptera: Nymphalidae	Federal: Threatened
Hom's Microblind Harvestman	*Microcina homi*	Arachnida: Opiliones: Phalangodidae	CNDDB: G1 S1
Jung's Microblind Harvestman	*Microcina jungi*	Arachnida: Opiliones: Phalangodidae	CNDDB: G1 S1
Opler's Longhorn Moth	*Adela oplerella*	Insecta: Lepidoptera: Incurvariidae	CNDDB: G2G3 S2S3

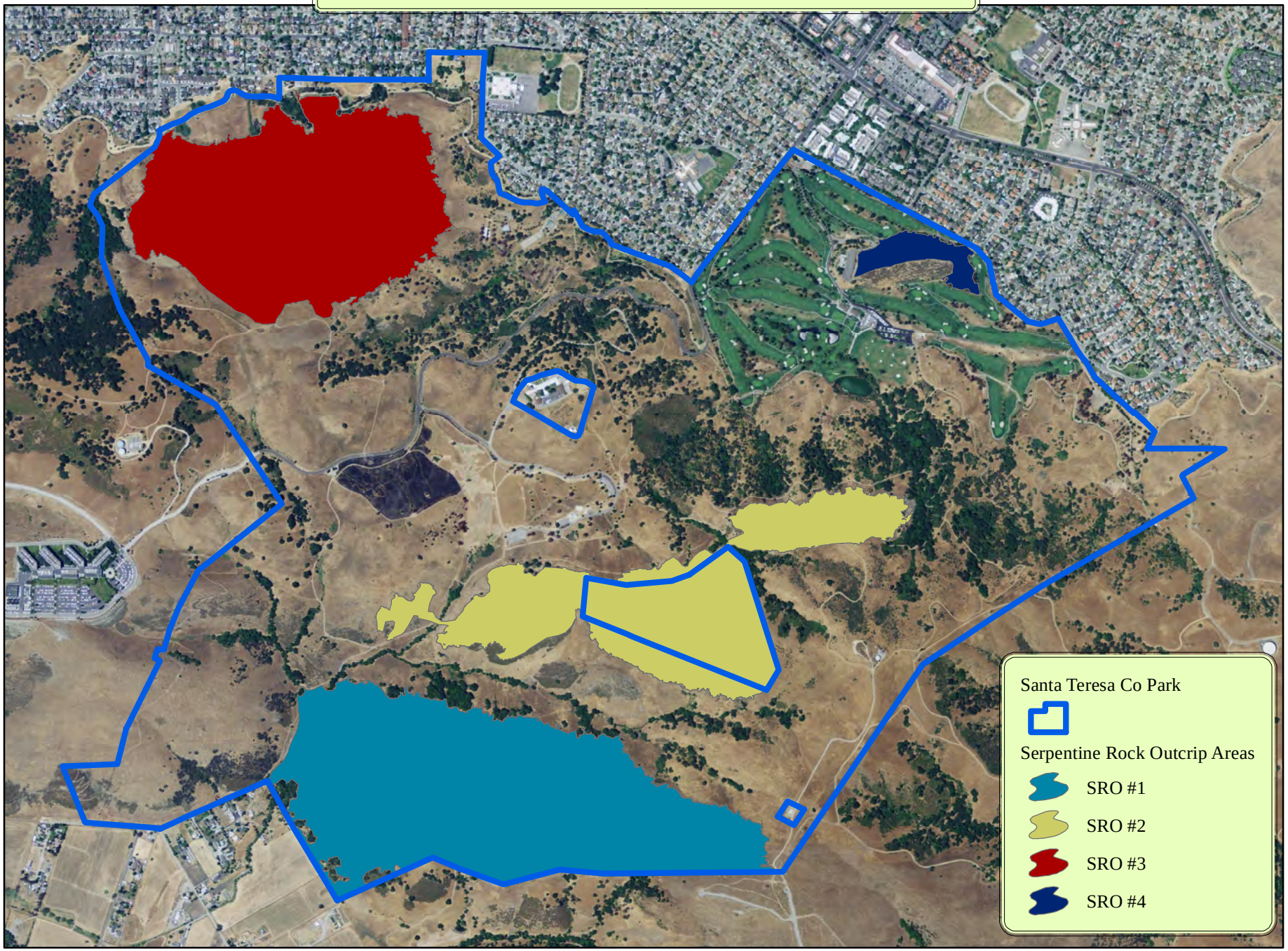
Two additional species were included in the original compiled list but were subsequently eliminated from further consideration: the San Francisco forktail damselfly (*Ischnura gemina*), which no longer has conservation status, and the Edgewood blind harvestman (*Calicina minor*), which does not occur at Santa Teresa County Park. Further explanations for these determinations are included in Appendix C.

Bay Checkerspot Butterfly

This grazing plan is specifically intended to benefit the threatened Bay checkerspot butterfly (BCB) through the enhancement of potential habitat at Santa Teresa County Park, including the improvement of habitat conditions for the BCB's host plant species. Figure 6 identifies areas of serpentine soils and vegetation where habitat for the BCB could be improved through an appropriate grazing prescription.

Figure 6 illustrates four serpentine grassland areas at the park that support at least the BCB's primary larval food plant, California plantain (*Plantago erecta*), and one or more adult nectar plants. These mapped areas are referred to as serpentine rock outcrops (SRO) in Figure 6 and are derived from the BCB habitat study (R. Arnold, pers. comm. 2011) conducted for the Park's Master Plan (Tito Patri & Associates 1992). Annual grasses, especially wild oats and ryegrass, are common in the four mapped areas, but there are good representations of most BCB larval food plants and adult nectar plants. Table 3 summarizes the presence of the BCB's larval food and adult nectar plants in these serpentine areas.

Figure 6. Potential Bay Checkerspot Butterfly Habitat Map



August 25, 2011
Entomological Consulting Services, Ltd.

Table 3. Presence of Bay Checkerspot Butterfly (BCB) Food Plants in Serpentine Outcrop (SRO) Areas, Santa Teresa County Park, Santa Clara County, CA.

Serpentine Rock Outcrop (SRO)	Presence of Bay Checkerspot Butterfly (BCB) Food Plants
1	All larval and adult nectar plants
2[i]	All larval and adult nectar plants, but in smaller numbers
3	All larval and adult nectar plants
4	Lacks some adult nectar plants and possibly the secondary larval food plant, *Castilleja* (= O*rthocarpus*).

i The private inholding north of Rocky Ridge Field is included in SRO #2 as it supports good habitat and is a significant part of SRO #2.

Other small widely-scattered serpentine outcrops occur within Santa Teresa County Park. These areas are more dominated by the non-native annual grasses. Because the BCB needs dozens, if not hundreds of acres of more contiguous habitat to support a population, these areas were not mapped for the purposes of this GMP.

Bay checkerspot butterflies were observed primarily at SRO #2 (including the private inholding north of Rocky Ridge Field) and at SRO #1 during the previous study of serpentine substrates and BCB habitat (R. Arnold, pers. comm. 2011) conducted for the Santa Teresa County Park Master Plan (Tito Patri & Associates 1992). If the BCB recolonizes the park in the future, SRO #1 and #3 are the most likely areas to be recolonized, with SRO #2 a close second, based on the current presence of larval and adult nectar food plants. SRO #4 is less likely due to the lack of nectar plants and low biomass of larval food plants; nonetheless, BCBs would likely make some use of SRO #4 if they are present in other portions of the park. Individual adults have been documented to disperse several kilometers.

In general, upper slopes and hilltops of serpentine grassland are considered better habitat for the BCB than lower slopes or lowlands on similar habitat. Adult BCBs congregate at hilltops to locate potential mates. Also, the hilltops often offer more topographic diversity than slopes. Slope and aspect are important determinants in the development of BCB larvae and senescence of its food plants. Larval food plants growing on south-facing and west-facing slopes tend to dry out and die earlier than food plants growing on north-facing and east-facing slopes. For this reason, in years of drought or even with normal precipitation, pre-diapause larvae of the BCB often fail to successfully reach their diapause size when located on south-facing and west-facing slopes[3]. Santa Teresa County Park has potential serpentine grassland habitat that provides these desirable habitat features. Larger contiguous tracts of potential habitat (Santa Teresa County Park together with adjacent serpentine grassland habitat properties) may be necessary to sustain a population of BCB, but suitable potential serpentine grassland at the Park provides a potential dispersal location for the metapopulation at Coyote Ridge (USFWS 1998).

As explained in the soils section of this plan GMP (Section 2.3.1), the serpentine derived soils in the Montara series (especially Montara stoney clay loam, MxF3) are often more eroded (i.e., shallow), and

[3] Diapause = dormancy through the summer dry season, broken once host plants germinate with the onset of the rainy season in the fall.

thus favor the growth of the BCB's larval food plants and adult nectar plants. In contrast, Montara rocky clay loam (MwF3) is a deeper soil, promoting the establishment of annual grasses and weeds that require deeper, moister soil conditions. The soils mapping that is currently available for the Park does not distinguish between these two types of soils in the Montara series, which may explain why the serpentine grassland habitat is not as extensive as the serpentine soils. BCB larvae often must disperse from one patch of *Plantago erecta* to another. The sparse vegetation and short stature of serpentine adapted grasses and forbs probably facilitates BCB larval dispersal compared to high density and taller annual grasses and weeds that are more difficult to traverse.

Other Invertebrates

The three other invertebrates listed in Table 3 are also associated with serpentine habitats[4]. Hom's microblind harvestman was observed at several locations in the southern serpentine grasslands of Santa Teresa County Park during surveys (R. Arnold, pers. comm. 2011) for the Park Master Plan (Tito Patri & Associates 1992), in polygon SRO #1 (Figure 6). Jung's microblind harvestman's status at Santa Teresa County Park is unknown. Opler's Longhorn moths were observed in the southern serpentine grasslands during 1992 surveys (R. Arnold, pers. comm. 2011), in polygons SRO #1 and #2 (Figure 6). Based on the habitat assessment for this GMP, this species also likely occurs in SRO#3 and possibly SRO #4. For the purpose of preparing this GMP, these three species are likely to be found throughout the same serpentine grasslands that will be managed to benefit BCB. Additional information about these species is contained in Appendix C.

2.2.2 SPECIAL-STATUS (VERTEBRATE) WILDLIFE

Twenty special-status vertebrate species occur at Santa Teresa County Park or in its vicinity. These species, along with their conservation status, are identified in Table 4. Appendix D describes these species' habitat requirements and occurrence information in the vicinity of the Park. Figure 7 depicts the locations of potential habitat features or observations of special-status wildlife (vertebrate) species within the Park. Six species that were originally identified by County Parks as having a potential to occur, were subsequently eliminated from consideration for this GMP because their conservation status does not warrant consideration under CEQA (the Cooper's hawk, the great blue heron, the Berkeley kangaroo rat, and the mountain lion) or because Santa Teresa County Park does not provide suitable habitat for the species (the black swift and the bank swallow). Detailed explanation of these determinations is included in Appendix D.

[4] We have not included a habitat map for the other special-status invertebrates because their locations at Santa Teresa County Park are unknown. Surveys are needed to determine their actual occurrences at the Park. We do know the other special-status invertebrates tend to occur in the same, though more restricted, grassland habitat as the BCB.

Table 4. Special-Status Wildlife (Vertebrates) in the Vicinity of Santa Teresa County Park, Santa Clara County, CA.

Common Name	Scientific Name	Status Federal[i]/State[ii]/Other[iii]
Fish		
Steelhead [Central California Coast Distinct Population Segment (DPS)]	*Oncorhynchus mykiss*	FT/ -/AFS-TH
Amphibians and Reptiles		
California tiger salamander	*Ambystoma californiense*	FT/ST/CSC
California red-legged frog	*Rana draytonii*	FT/-/CSC
Foothill yellow-legged frog	*Rana boylii*	-/-/CSC
Blainville's horned lizard [= Coast horned lizard]	*Phrynosoma blainvillii*	-/-/CSC
Western pond turtle	*Emys marmorata*	-/-/CSC
Ground Nesting Raptors/Birds		
Northern harrier	*Cirus cyaneus*	-/-/CSC
Western burrowing owl	*Athene cunicularia*	-/-/CSC; BCC
Grasshopper sparrow (nesting)	*Ammodramus savannarum*	-/-/CSC
Above-Ground Nesting Raptors/Birds		
Golden eagle (nesting & wintering)	*Aquila chrysaetos*	-/-/FP; BCC
Bald eagle (nesting & wintering)	*Haliaeetus leucocephalus*	Delisted/SE/FP; BCC
White-tailed kite	*Elanus leucurus*	-/-/FP
Loggerhead shrike	*Lanius ludovicianus*	-/-/CSC; BCC
Least bell's vireo	*Vireo belli pusillus*	FE/SE/CSC; BCC
Tricolored blackbird (nesting colony)	*Agelaius tricolor*	-/-/CSC; BCC
Mammals		
Townsend's big-eared bat	*Corynorhinus townsendii*	-/-/CSC; HP
Pallid bat	*Antrozous pallidus*	-/-/CSC; HP
San Francisco dusky-footed woodrat	*Neotoma fuscipes annectens*	-/-/CSC
American badger	*Taxidea taxus*	-/-/CSC
San Joaquin kit fox	*Vulpes macrotis mutica*	FE/ST/-

Table 4. (Continued)

[i] CDFG 2011a, b
- FE = Endangered: Endangered of becoming extinct throughout all, or a significant portion of its range.
- FT = Threatened: Threatened of becoming endangered within the foreseeable future throughout all, or a significant portion of its range.
- Delisted = Delisted from the federal Endangered Species List.

[ii] CDFG 2011a, b; CRNR 2010
- SE = Endangered: A native species or subspecies of animal which is in serious danger of becoming extinct throughout all, or a significant portion of its range, due to loss of habitat, change in habitat, over exploitation, predation, competition and/or disease.
- ST = Threatened: A native species or subspecies that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of special protection and management efforts.

[iii] CDFG 2011a; USFWS-BCC 2008b; Jelks et. al, 2008; WBWG 1998
- CSC = CDFG Species of Special Concern are taxa given special consideration because they are biologically rare, very restricted in distribution, declining throughout their range, or at a critical stage in their life cycle when residing in California or taxa that are closely associated with a habitat that is declining in California (e.g.,wetlands)
- FP = Fully Protected: This classification was the State's initial effort in the 1960's to identify and provide additional protection to those animals that were rare or faced possible extinction. Fully Protected species may not be taken or possessed at any time and no licenses or permits may be issued for their take except for collecting these species for necessary scientific research and relocation of the bird species for the protection of livestock.
- AFS-TH = Fish species considered 'Threatened' by the American Fisheries Society under a set of criteria developed from peer review and expert scientific opinion.
- BCC = Species of migratory nongame birds that USFWS considers to be of concern in the United States because of (1) documented or apparent population declines, (2) small or restricted populations, (3) dependence on restricted or vulnerable habitats.
- HP = Considered "High Priority" on the Western Bat Working Group's (WBWG) Western Bat Species Regional Priority Matrix (1998)
- ** = Included on preliminary list of revised CDFG Mammal Species of Special Concern (Williams 1986).

BERNAL-GULNAC-JOICE RANCH ENTRANCE
BERNAL–GULNAC–JOICE RANCH
SANTA TERESA SPRING
Norred Trail
Joice Trail
Bernal Hill Trail
Bernal Hill
Joice Trail
Vista Loop
Mine Trail
NORRED RANCH
BANQUET FACILITY
SPRING VALLEY GOLF COURSE
Ohlone Trail
Mine Hill
Pueblo
MURIEL WRIGHT GIRLS' RANCH
Ohlone Trail
Ohlone Trail
GATEHOUSE
BERNAL ROAD LOT
TRENCH HILL
Pueblo Trail
PUEBLO GROUP PICNIC SITE
PUEBLO LOT 6
CORRAL
Ridge Trail
Serpentine Ridge
LAUREL SPRINGS PICNIC AREA
Springs Trail
Mine Trail
IBM ALMADEN RESEARCH CENTER
Private Property
Coyote Trail
Fortini
Mine Trail
Hidden Springs
ROCKY RIDGE
COYOTE PEAK ELEV. 1155
Ranch
BIG OAK VALLEY
Rocky Ridge Trail
PRIVATE RESIDENCE
Rocky Ridge
Boundary Line Trail
Stiles
SANTA TERESA CREEK
Coyote Peak Trail
Fortini Trail

N
W
E
S

Legend

- Wintering grasshopper sparrow
- Potential CRLF, CTS & WPT
- Potenial CRLF only
- Potenial CRLF, WPT & TRBL
- Potential golden eagle nest
- Potential white tailed kite nest
- Potential CRLF Creeks
- Potential WPT Creeks
- WPT buffer
- Seeps/Springs
- wetlands
- Pond/Lake
- Canal
- Intermittent Creek
- Parking Lots
- Operated by SCCPRD
- Field Boundaries
- Group Picnic Site
- Restroom
- Roadside Parking
- Pay Station Machine
- Main Trailhead
- Trailhead
- Picnic Area
- Point of Interest
- Spot Elevation
- Unpaved Trail
- Unpaved Road
- Service Road
- Unauthorized Trail
- Historic Roadbed
- Paved Road with no public access
- Paved Road with public access

SANTA CLARA COUNTY PARKS

This map generated by the County of Santa Clara Department of Parks and Recreation. The GIS files were compiled from various sources. While deemed reliable, the Department assumes no liability.

Title: Figure 7. Potential Habitat & Observations of Special-Status (Vertebrate) Wildlife Map

Comments:

Date: August 24, 2011

Created By: DRocha

Scale: 0 270 540 1,080 1,620 2,160 Feet

2.3 Pest Plants

Pest plants are those species that evolved in one region and moved to another region (usually with human assistance), then have aggressively crowded out native plants and habitats, or have altered ecosystem processes such as hydrology, fire regimes, and soil chemistry (Cal-IPC 2011). They are usually competitive with native species because of the absence of natural predators or other control agents.

Eight pest plant species commonly occur at Santa Teresa County Park. These species, along with their pest rating, period, habitat requirements and distribution information, are identified in Table 5[5]. In general, ruderal areas, roadsides, and annual grasslands lacking serpentine are heavily invaded by pest plants, whereas most other areas within the Park are not. The weediest areas are in the center of the park on either side of Bernal Road, especially Trench Hill area (site of the 18-acre training burn conducted by County Parks and San Jose Fire Department in 2009).

Several other invasive species encountered at the Park are not included in the table for various reasons. These include Himalayan blackberry, wild radish, purple starthistle, stinkwort, barbed goatgrass, and false brome. These species were not considered widely distributed or problematic during the reconnaissance level field visits, but may warrant future consideration if infestations increase significantly or new populations are discovered. Additionally, several of these species are relatively new invaders to the region and extensive research is not available regarding their control, in particular with respect to grazing management. Common invasive grasses (wild oats, ryegrass, brome grasses) were not included because they are so ubiquitous and difficult to control.

[5] Some plant pest species are considered "noxious weeds" by the California Department of Food and Agriculture, and are subject to regulation or quarantine by county agricultural departments. For more information, see CDFA's Integrated Pest Control Branch. These weeds are typically agricultural pests, though many also have impacts on natural areas.

Table 5. Pest Plants of Santa Teresa County Park (Park), Santa Clara County, CA.

Species[i]	Pest Rating[ii] Cal-IPC CDFA	Blooming Period	Habitat Requirements/Occurrence Information
Black mustard (*Brassica nigra*)	Moderate-B,B,A None	April-July	**General.** Ruderal, agricultural fields, disturbed annual grassland. **Park.** Observed throughout annual grassland without serpentine soils. Heaviest infestations along roads and on 18-acre hillside previously treated with a prescribed "training" burn in July 2009.
Italian thistle (*Carduus pycnocephalus*)	Moderate-B,B,A C	May-July	**General.** Annual grassland, oak woodland; disturbed areas with nutrient rich soils. **Park.** Primarily in open grassland and oak woodland in areas lacking serpentine soils. Heaviest infestation along roads and in grasslands north of Bernal Road. Some Italian thistle infestations also observed in riparian corridors that may worsen if cattle are allowed to congregate in these areas.
Yellow starthistle (*Centaurea solstitialis*)	High-A,B,A C	May-September	**General.** Annual grassland and disturbed areas (roadcuts, fallow agriculture land). Prefer nutrient rich, deep, well drained soils. Not usually prevalent on serpentine soils. **Park.** Not the most prevalent weed in the park, but ubiquitous on previously burned 18-acre hillside in the center of the park immediately north of the Ohlone picnic area. Also common throughout annual grassland lacking serpentine soils.
Bull thistle (*Cirsium vulgare*)	Moderate-B,B,B C	May-October	**General.** Ruderal, annual grassland, riparian. **Park.** Disturbed annual grassland and riparian areas. Most infestations are relatively small and limited in size and distribution.
Common teasel (*Dipsacus fullonum*)	Moderate-B,B,B None	July-October	**General.** Meadows, disturbed annual grassland, openings in riparian woodland, pond margins. **Park.** Although not widespread, dense infestation in wetlands and meadows adjacent to the Ohlone Picnic Area and along the margin of the existing Mine Hill stock pond in the western portion of the park north of Bernal Road.
Blue gum eucalyptus (*Eucalyptus globulus*)	Moderate-B,B,B None	November-April	**General.** Annual grassland, mixed woodland, riparian; typically on disturbed, well drained soils. **Park.** Scattered trees on lower portion of a south-facing slope immediately west of the Pueblo Day Use Area.
Fennel (*Foeniculum vulgare*)	High-A,B,A None	June-July	**General.** Ruderal, waste areas, disturbed annual grassland. **Park.** Located along roads and levee embankments of the Coyote-Alamitos canal.
Milk thistle (*Silybum marianum*)	Limited- C,C,A (although very problematic at Santa Teresa County Park) None	April-October	**General.** Ruderal areas and disturbed annual grasslands with nutrient rich soils. Often found along roadways or in reclaimed lands. **Park.** Very dense impenetrable stands of milk thistle are located along roads and trails in the center of the park near Bernal Road. One of the more abundant invasive weeds in non-serpentine annual grassland north of Bernal Road. Unknown reason for high nutrient levels in the soils as grazing was eliminated several decades ago.

Table 5. (Continued)

[i] List based on vegetation mapping provided by County of Santa Clara Department of Parks and Recreation and observations by EcoSystems West, 2010.

[ii] Cal-IPC: California Invasive Plant Council Inventory (2007).

High	Severe ecological impacts on physical processes, plant and animal communities and vegetation structure
Moderate	Substantial and apparent, but generally not severe, ecological impacts on physical processes, plant and animal communities, and vegetation structure
Limited	Ecological impacts are minor on a statewide level or there was not enough information to justify a higher score
Alert	Species with the potential to rapidly invade unexploited ecosystems

Cal-IPC assessment of ecological impact levels- Impact, Invasiveness, Distribution:

A	Severe, possibly irreversible, alteration or disruption of an ecosystem process
B	Moderate alteration of an ecosystem process
C	Minor alteration of an ecosystem process
D	Negligible perceived impact on an ecosystem process
U	Unknown

CDFA: California Department of Food and Agriculture (2010)-

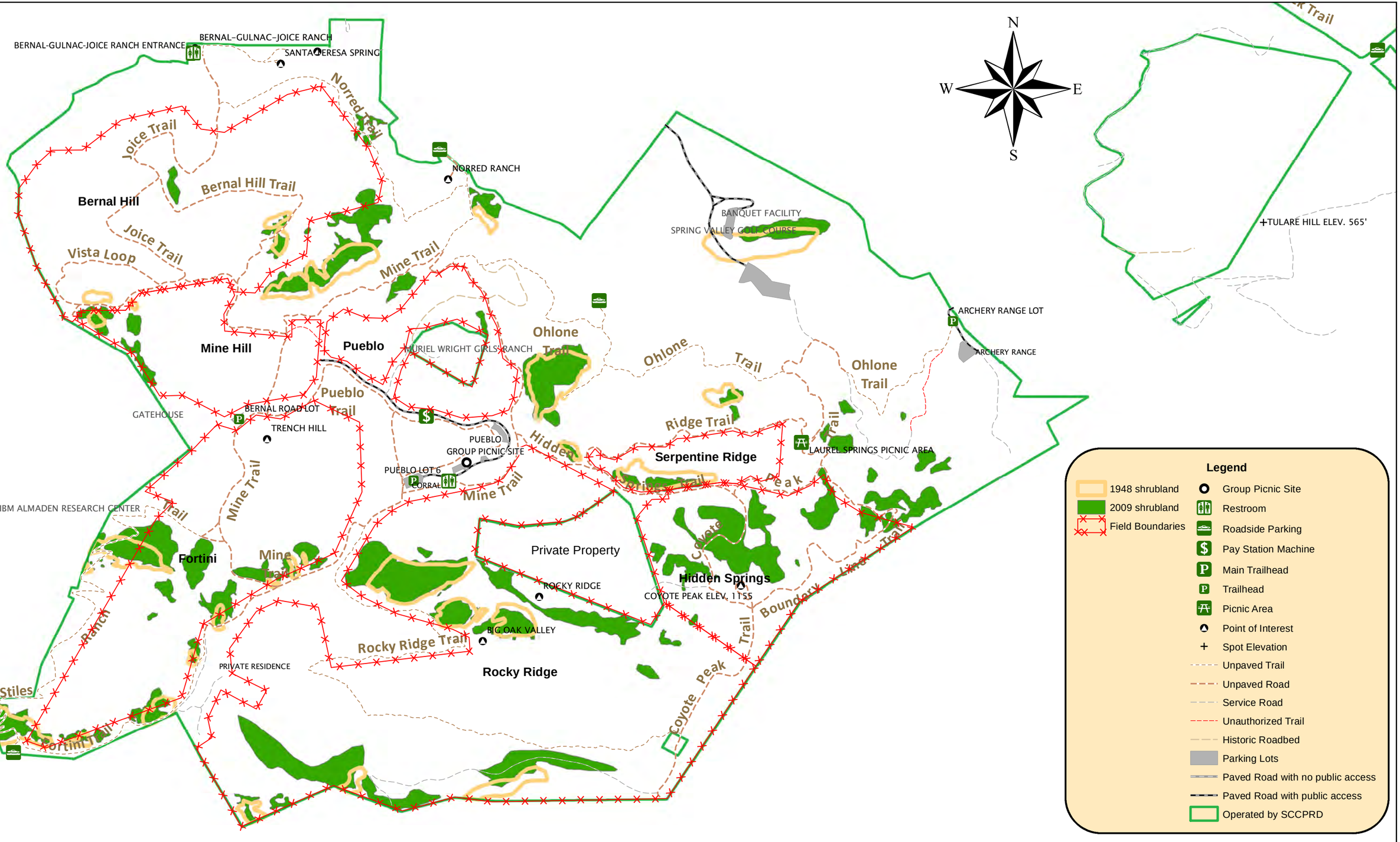
A	Action required
B	Action required at discretion of Agriculture Commissioner
C	Action only when found in a nursery at discretion of Agriculture Commissioner

2.4 Shrub Encroachment into Grassland

Natural succession from grassland to northern coastal scrub and chaparral to mixed woodland is typical of central California sites influenced by the coastal maritime climate (Ford and Hayes 2007). In the absence of grazing and fire, natural succession from grassland to shrubland is common. Coyote brush (*Baccharis pilularis*) and other common shrubs are encroaching into many low-lying grasslands sites in Santa Clara County.

At Santa Teresa County Park, shrub encroachment, particularly by northern coastal scrub and chaparral species such as coyote brush, California sage (*Artemisia californica*), and chamise (*Adenostoma fasciculatum*), has reduced the amount of grassland habitat in many areas; as seen by comparing high resolution aerial photos from 1948 to 2009 (Figure 8). Approximately 68 acres of shrubland was mapped using the 1948 aerial photo, increasing to approximately 143 acres by 2009. Shrubland has expanded by approximately 110% in 61 years, or by 1.8% (1.2 acres) per year. In addition to the northern coastal scrub, other woody types have likely expanded as well, and probably contributed to the displacement of the grassland.

Encroachment into grasslands occurs most readily in the lower elevations adjacent to existing stands of coyote brush or other shrubs, as a result of expected natural succession as well as climate change, which could accelerate the process. Favorable conditions for scrub encroachment include above-normal precipitation, precipitation extending into the summer, and absence of livestock grazing during the dry months. Under favorable climate conditions, within a few decades even more of the Park's grasslands could be encroached upon by woody vegetation unless management action is taken.



SANTA CLARA COUNTY PARKS

This map generated by the County of Santa Clara Department of Parks and Recreation. The GIS files were compiled from various sources. While deemed reliable, the Department assumes no liability.

Title: Figure 8. Shrub Encroachment Map

Comments:

Date: August 24, 2011

Created By: DRocha

Scale: 0 280 560 1,120 1,680 2,240 Feet

2.5 Fuel Loads and Fire Hazards

The accumulation of highly flammable herbaceous fuels in annual grasslands is a well-known problem during the dry seasons. Frequent fires occur at Santa Teresa County Park and typically start along public access trails and public roadways through the park (Bernal Road) (D. Rocha, pers. comm. 2011). Recent fires at the Park have burned as much as 80 acres. The cost of suppressing a single fire can be very high. The goal of fire suppression is to prevent fire damage to Park Infrastructure as well as any fire damage to the surrounding lands; however, fire suppression has allowed substantial woody and herbaceous fire fuel to build. Figure 9 displays a fire hazards map of the different habitats within Santa Teresa County Park. Each fire behavior fuel model number is shown along with the estimated flame length and rate of fire spread.

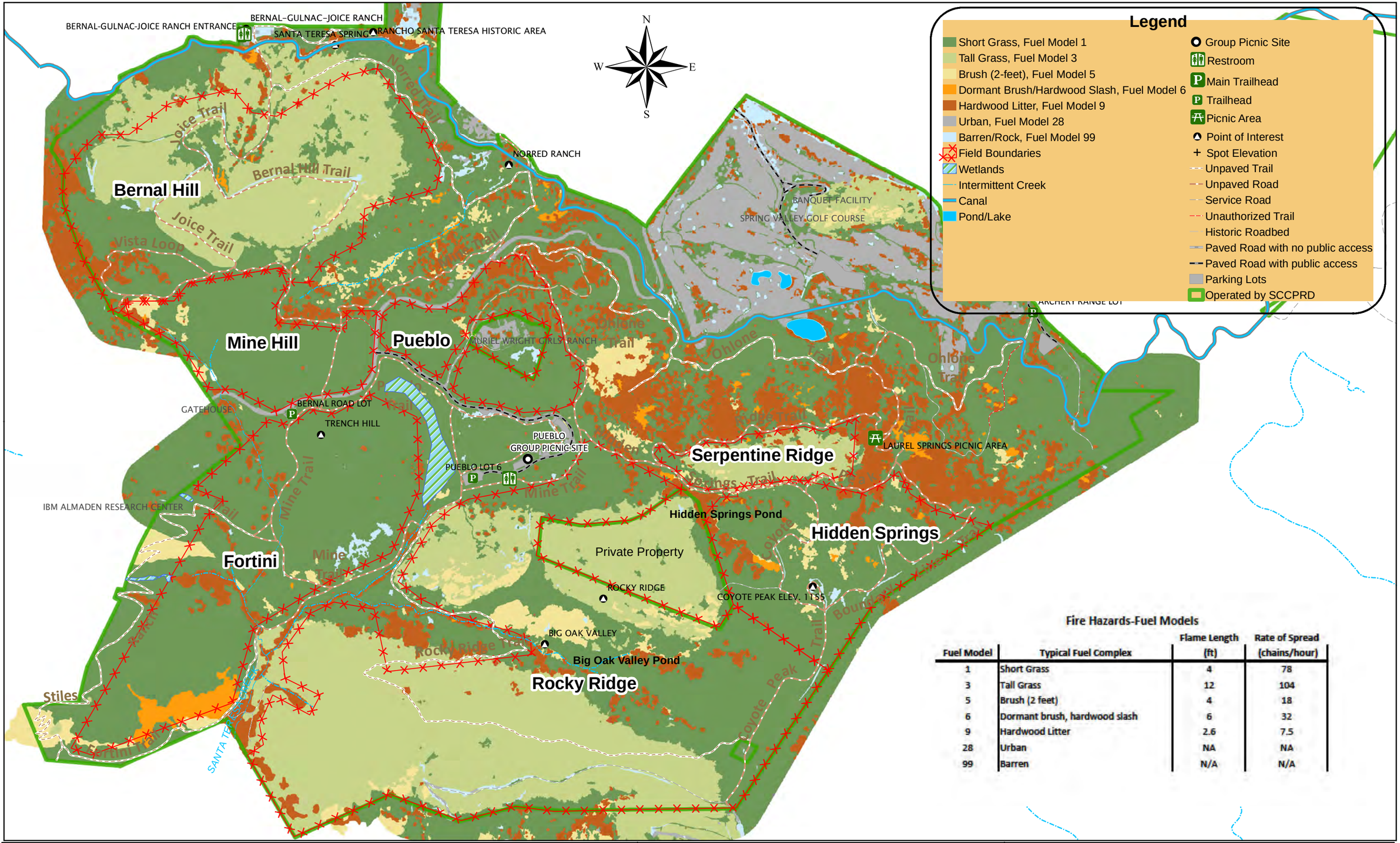
Grazing has not occurred at Santa Teresa County Park since the early 1980's in area above the Buck Norred Ranch (Tito Patri & Associates 1992). Because the highly productive grasslands at the Park are not grazed currently, the fire hazard potential is very significant. The grassland herbaceous fuels would be likely to carry a wildfire very quickly during the dry seasons, and potentially carry the fire to the woody fuels of the shrublands, woodlands, and riparian habitats, increasing the potential for a major fire.

Significant fire hazards exist throughout the park, encompassing each of the existing vegetation types. A formal assessment of fire fuel loads in the park was not conducted for this GMP; however, some general conclusions may be drawn based on preliminary observations, as well as from the County Parks Inventory of Vegetation and Fuels (County Parks 2000):

- Under existing conditions, wildfires in Santa Teresa County Park have the potential to be severe under certain fire and weather conditions. The fine fire fuel loads of the park's ungrazed grasslands, and woody fuel loads of chaparral and woodlands constitute a significant fire hazard in the absence of fuels management.

- Fuel loads in the chaparral and woodlands are currently large enough that controlling a wildfire in this area might not be possible during moderate or extreme fire weather. Depending on the prevailing winds and fire behavior, burning embers could be transported downwind. Post-fire erosion would also be expected, causing additional damage.

- The likelihood of negative long-term ecological effects from a wildfire in the park is lower than the potential harm to human structures. A wildfire in the oak woodlands would kill some trees, but the majority would survive. Wildfire in the chaparral would produce extensive regeneration and erosion, but this is expected in this vegetation community. Fires in ungrazed grasslands may increase the abundance of forbs on the short-term because of the reduction of thatch.



Fire Hazards-Fuel Models

Fuel Model	Typical Fuel Complex	Flame Length (ft)	Rate of Spread (chains/hour)
1	Short Grass	4	78
3	Tall Grass	12	104
5	Brush (2 feet)	4	18
6	Dormant brush, hardwood slash	6	32
9	Hardwood Litter	2.6	7.5
28	Urban	NA	NA
99	Barren	N/A	N/A

SANTA CLARA COUNTY PARKS

This map generated by the County of Santa Clara Department of Parks and Recreation. The GIS files were compiled from various sources. While deemed reliable, the Department assumes no liability.

Title: Figure 9. Fire Hazards Map

Comments:

Date: August 24, 2011

Created By: DRocha

Scale: 0 275 550 1,100 1,650 2,200 Feet

2.6 Physical Resources

2.6.1 Soils

Soil is the unconsolidated material on the surface of the earth consisting of minerals, organic matter, air spaces, and water; and that is capable of supporting plant growth. Soil erosion is a three-step process consisting of detachment, transport, and deposition of soil particles. Soil particles deposited elsewhere are called soil sediment, and can be a major pollutant of streams, degrading their water quality. Soil compaction is the process by which soil particles are squeezed together thereby reducing void space. Compaction blocks internal drainage, restricts root growth, and decreases the availability of nutrients and water. Once compacted a soil will remain in a compacted state forever unless it is physically manipulated.

The Grazing Management Plan (GMP) for Santa Teresa County Park (Park) includes management strategies to avoid potential adverse impacts to the Park's soil resources associated with the re-introduction of grazing: soil erosion and soil compaction. To that end, an assessment of the Park's soils was conducted, including an assessment of serpentine soils that underlay sensitive serpentine habitats. Based on literature review and 2010 reconnaissance surveys, soils were identified that may require special consideration during grazing operations.

In the 2010 soil survey (U.S.D.A. Natural Resources Conservation Service 2010), eight different soil series were delineated within Santa Teresa County Park[6]. These soil series are listed in Table 6 and mapped in Figure 10. Present are:

- Alo Clay (in complex with Altamont Clay)(305)
- Altamont Clay (in complex with Alo Clay)(305)
- Alumrock Fine Sandy Loam (in complex with Zeppelin Sandy Loam)(375)
- Cropley Clay (316)
- Lodo Sandy Clay Loam (in complex with Zeppelin Sandy Loam)(380)
- Montara Clay Loam (in complex with Santerhill Clay)(303 or 304
- Santerhill Clay (in complex with Montara Clay Loam) (303 or 304), and
- Zeppelin Sandy Loam (in complex with either Alumrock Fine Sandy Loam or Lodo Sandy Clay Loam)(375 or 380)

These eight soil series (Table 6) are members of two different soil orders – Vertisols and Mollisols (U.S.D.A. Natural Resources Conservation Service 2011). Vertisols contain more than 30% clay particles and are very hard when dry and very sticky when wet. Vehicle, livestock, and park user traffic on these soils when wet will create soil compaction that is difficult to mitigate or correct. Runoff and infiltration rates will vary widely between wet and dry conditions. When the soil is dry, an extensive network of open cracks will drain surface water and little runoff is produced. When wet, the cracks swell shut and there is almost no infiltration and the runoff rates are very high. Soils within this order are Alo, Altamont, Cropley, and Santerhill.

[6] Soils in Santa Teresa County Park were re-surveyed and re-classified by the Natural Resources Conservation Service in 2009 and 2010 using the new soil taxonomy system (Soil Survey Staff 2010). Most of the soil series in the park dating from the 1968 soil survey (U.S. Soil Conservation Service 1968) were dropped and new soil series were described and delineated.

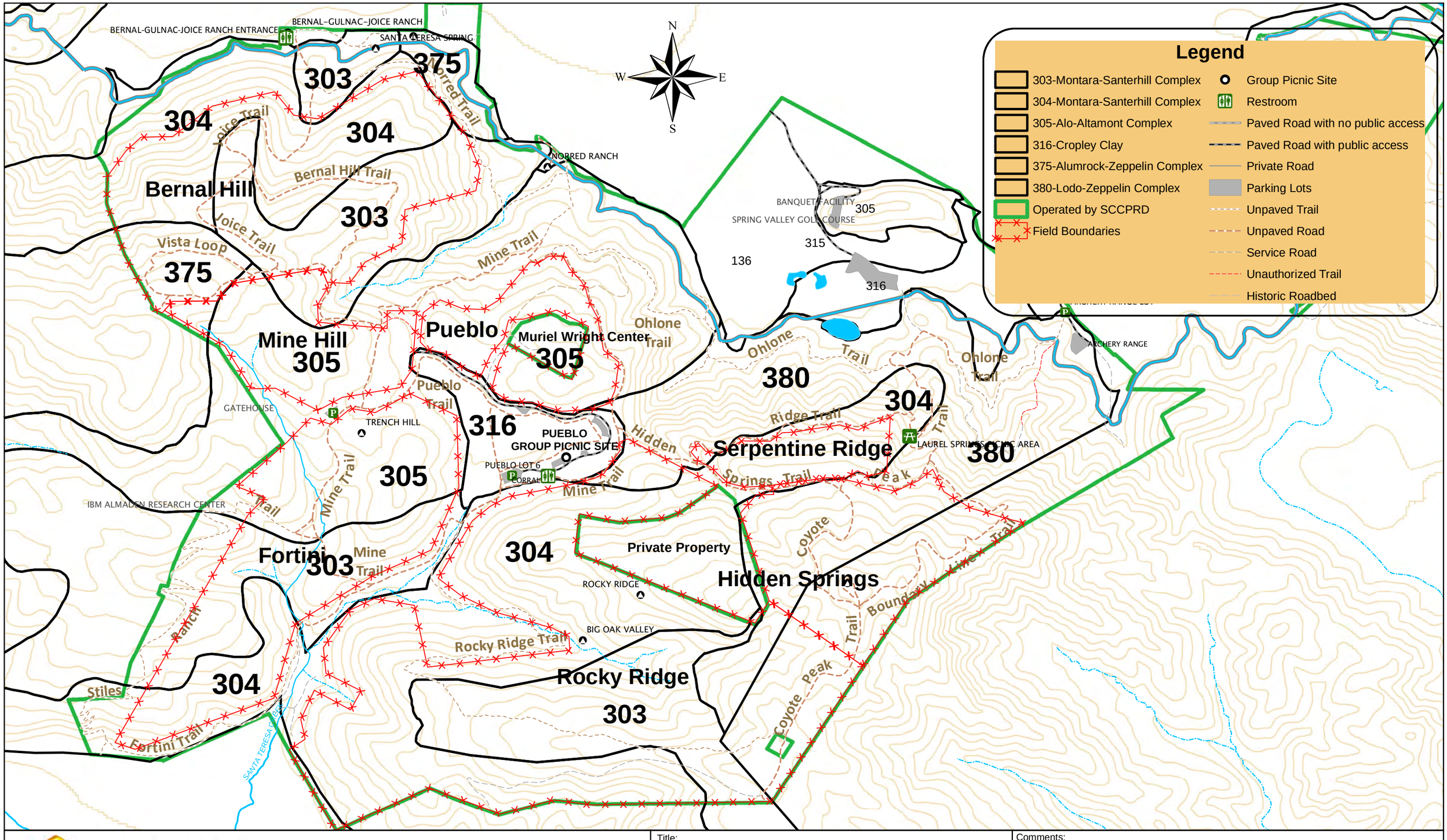
Table 6. Physical Properties of Soils of Santa Teresa County Park, Santa Clara County, CA .
(Important or extreme values within table are in **boldface** type.)

Soil Name	Rock Substrate	Soil Depth (inches)	Kw Value[i]	T Value[ii]	Hydrologic Soil Group[iii]
Alo Clay (305)	Shale or sandstone	20 – 40	0.17	3	**D**
Altamont Clay Loam (305)	Shale or sandstone	40 – 60	0.28	4	C
Alumrock Fine Sandy Loam (375)	Sandstone or shale	20 – 40	0.28	3	C
Cropley Clay (316)	None within 60"	60 +	0.24	5	C
Lodo Gravelly Sandy Clay Loam (380)	Sandstone	10 – 20	0.20	**1**	**D**
Montara Clay Loam (303 or 304)	**Serpentinite**	**8 – 10**	0.32	**1**	**D**
Santerhill Clay (303 or 304)	**Serpentinite**	40 – 60	0.24	4	C
Zeppelin Sandy Loam (375 or 380)	Sandstone	40 – 50	0.20	3	C

[i] Kw = Soil erodibility factor with theoretical values range from 0 to 1.0, with 1.0 being the most erodible. Includes adjustment for surface gravels if any.

[ii] T Value = Soil-loss tolerance factor which is defined as the maximum rate of soil erosion in tons/acre/year that can occur without reducing productivity or environmental quality.

[iii] Hydrologic Soil Group = An estimate of expected runoff from rain with group "A" soils having the lowest runoff potential when wet, and group "D" soils having the highest.



Legend

- 303-Montara-Santerhill Complex
- 304-Montara-Santerhill Complex
- 305-Alo-Altamont Complex
- 316-Cropley Clay
- 375-Alumrock-Zeppelin Complex
- 380-Lodo-Zeppelin Complex
- Operated by SCCPRD
- Field Boundaries
- Group Picnic Site
- Restroom
- Paved Road with no public access
- Paved Road with public access
- Private Road
- Parking Lots
- Unpaved Trail
- Unpaved Road
- Service Road
- Unauthorized Trail
- Historic Roadbed

SANTA CLARA COUNTY PARKS

This map generated by the County of Santa Clara Department of Parks and Recreation. The GIS files were compiled from various sources. While deemed reliable, the Department assumes no liability.

Title: Figure 10. Soils and Contours Map

Comments:

Date: August 24, 2011

Created By: DRocha

Scale: 0 312.5 625 1,250 1,875 2,500 Feet

Mollisols have a deep, dark-colored surface horizon with less clay. With the exception of those Mollisols developed on serpentine material, Mollisols are generally considered to be highly fertile soils. They do not display the network of cracks found in Vertisol soils, and are much more tolerant of animal, people, or vehicle traffic when wet. Soils within this order are Alumrock, Lodo, Montara, and Zeppelin.

The combination of Montara soils (shallow, rocky, loamy texture - Mollisol) with Santerhill soils (deep, no rock, clayey texture - Vertisol) in the same mapping unit means that different parts of the mapping unit may behave differently in terms of erodibility, compaction risk, and runoff generation. Santerhill Clay soils can be found on about 20% of the soil mapping unit and are more common on the gentle lower slopes and valley floor. Both the Montara and Santerhill soils are derived from serpentine rock.

Serpentine Soils

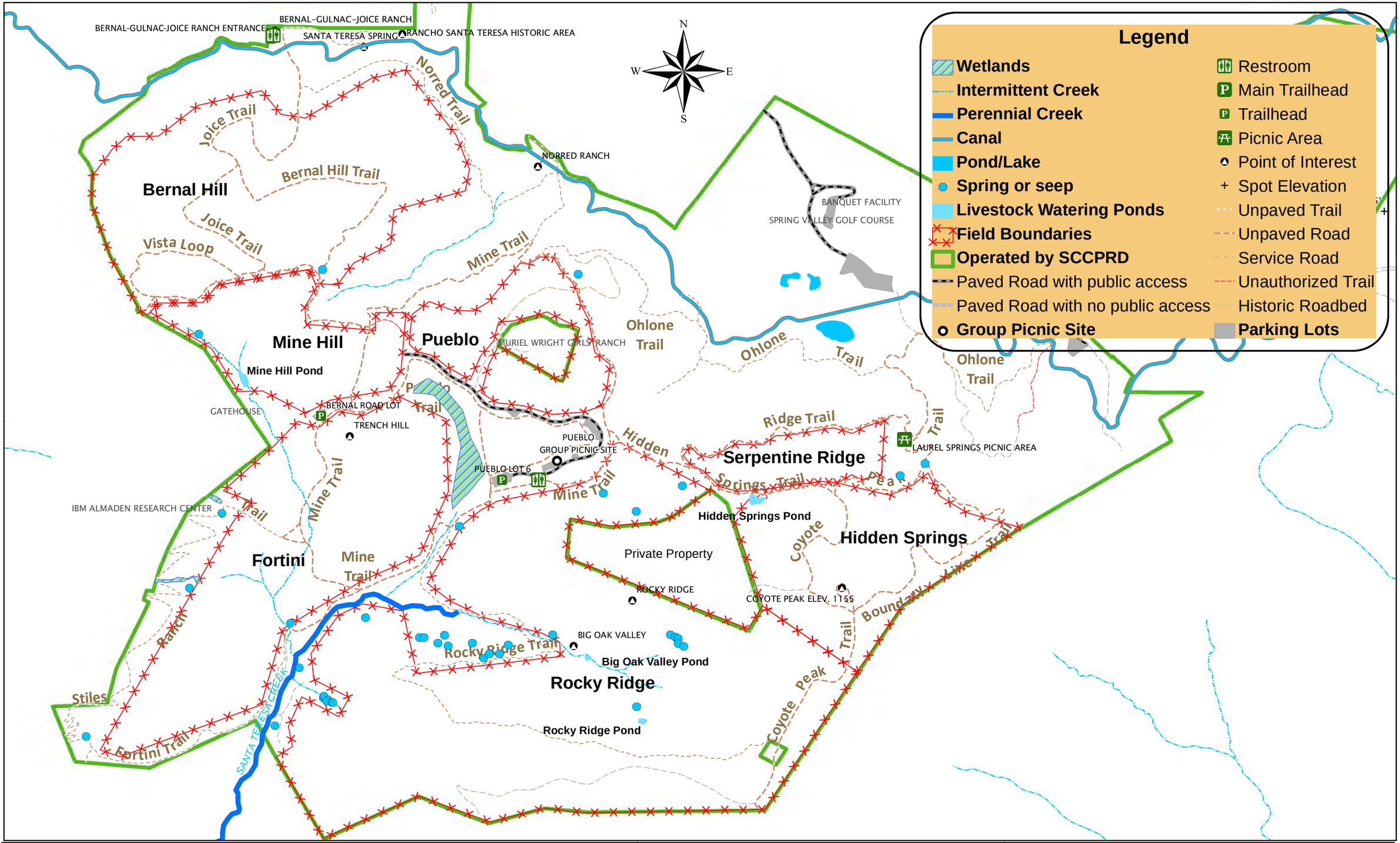
Montara and Santerhill soils are derived from weathered serpentine rock materials such that they are commonly referred to as serpentine soils. Serpentine soils are "chemically infertile" since they are deficient in such essential plant nutrients as nitrogen, calcium, phosphorus, and potassium; while they have excessive concentrations of the toxic elements nickel and chromium (Kruckeberg 1984). Because they are inhospitable to the growth of most plants, they support a specialized flora of plant species and plant species ecotypes that can tolerate these conditions.

Most introduced grasses are not especially tolerant of serpentine soils, so these soils favor native wildflowers and herbs that benefit from the reduced competition. One of the herbs that benefits from this, and consequently is preferentially found on serpentine soils, is California plantain, the primary larval food plant of the Bay checkerspot butterfly.

2.6.2 HYDROLOGY

In addition to the Los Alamitos Canal (along the northern boundary of the Park) and the perennial Santa Teresa Creek (in the southwest portion of the Park), Santa Teresa County Park has multiple seeps, springs, and intermittent creeks, as well as a seasonal wetland and stock ponds. Figure 11 displays a hydrology map of the park.

Water from the Park potentially affects the water quality of private, municipal, and regional water resources including drinking water sources, a recreational water facility, groundwater recharge percolation ponds, the Guadalupe River watershed, and the San Francisco Bay. The intermittent creeks in the northern part of the Park drain towards the Santa Teresa Golf Course or to the city's urban storm drainage facilities. Water from the north of the Park also drains into Los Alamitos Canal, which flows west and northwest from the Park to enter the northern portion of Almaden Lake, an artificial lake that allows public recreation and swimming, located near the intersection of the Almaden Expressway and Coleman Road. Water originating in the southern part of the Park flows into Santa Teresa Creek. Near the Park boundary water from the creek is drawn up from wells, to supply water to private homes, farms, and stables. Santa Teresa Creek flows southwest from the Park boundary then northwest, converging with Alamitos Creek and entering Lake Almaden from the south. Water is diverted into Santa Clara Valley Water District’s Los Alamitos (groundwater recharge) percolation ponds, located just north of the Almaden Lake. From the lake and percolation ponds, water flows via the Guadalupe River to the San Francisco Bay.



SANTA CLARA COUNTY PARKS

This map generated by the County of Santa Clara Department of Parks and Recreation. The GIS files were compiled from various sources. While deemed reliable, the Department assumes no liability.

Title: Figure 11. Hydrology Map

Comments:

Date: August 24, 2011

Created By: DRocha

Scale: 0 275 550 1,100 1,650 2,200 Feet

2.7 Cultural Resources

Various historic and pre-Columbian resources of cultural importance are present both within and immediately adjacent to Santa Teresa County Park. The majority of these are related to the historic Bernal-Gulnac-Joice (Santa Teresa) Rancho first settled by Don Jose Joaquin Bernal in 1826. The former rancho is located along the northeast boundary of the park. There are several remaining structures, now referred to as the Joice Ranch, constructed in the 1860s.

The Rosetto Ranch located along the east property boundary was a private inholding until 1991. The Rosetto family ran a popular recreational facility on the ranch known as Club 14E from the 1940s until 1970s. The majority of structures associated with this property are presently in various states of decay and disrepair and are not considered culturally significant.

Artifacts and petroglyphs related to the pre-Columbian habitation sites of the first identified inhabitants of the area, the Muwekma Ohlone Indians, have been documented throughout the park. The precise locations of many of these occurrences have not been mapped or remain intentionally unpublished in an effort to discourage vandalism and theft. Many of the larger culturally significant sites are located east of the existing park boundary.

A stacked rock wall approximately four-feet in height originates immediately upslope of Manila Drive and extends beyond the park boundary to the southwest. The stacked rock wall is sturdy and has existed in place for many decades under previous grazing regimes prior to acquisition of the park by the County of Santa Clara.

The defunct Bernal Mine is another historic mining resource at the Park and is located in a steep ravine and is currently restricted from public access. A small brick cooker associated with Bernal Mine is located near Mine Trail and is visible from Bernal Road. [The information in this section was derived from the Santa Teresa County Park Historic Area Site Plan (D. J. Powers & Assoc. 2008).]

2.8 Recreational Resources

Santa Teresa County Park affords a wide range of recreational activities over the diverse 1,627 acres of parkland. The Park offers over 18 miles of unpaved trails for equestrian, hiking and bicycle use, with spectacular views above the Almaden and Santa Clara Valleys, and secluded upland valleys for exploring the natural environment. Magnificent wildflower displays may be found from March through June on the Stile Ranch Trail as well as many other trails in the Park.

The Pueblo Day Use area provides individual picnic tables and barbecues throughout the day use area as well as a group picnic area with a large barbeque pit. This area provides ample parking as well as an equestrian staging area. The historic Bernal-Gulnac-Joice Ranch and Santa Teresa Springs are open to the public and available for school tours.

The Santa Teresa Golf Club, operated by a concessionaire, offers an 18 hole championship course and a 9 hole/par three course. The clubhouse includes a restaurant and pro shop. An archery range, operated and maintained by the Black Mountain Bowmen Archery Club, is open for public use except when tournaments are scheduled. [The information in this section was obtained from the County of Santa Clara Department of Parks and Recreation website (County Parks 2011a) and the County Parks brochure (County Parks 2011b).]

3 GRAZING MANAGEMENT GOALS, OBJECTIVES, AND PERFORMANCE STANDARDS

Eleven primary goals have been identified for grazing management at Santa Teresa County Park. These goals are appropriate to the County of Santa Clara Department of Parks and Recreation, and are based on relevant law, policies, intended resource uses, and on the features and conditions of the existing ecosystems and resources at the Park. The goals of the Santa Teresa County Park Grazing Management Plan are based upon goals identified by the County of Santa Clara Parks and Recreation Department, the goals of the Board-adopted County of Santa Clara Parkland Range Management Policy, direct observations from field studies, and public input from community meetings. Each goal is described below, as related to the Mission of the County of Santa Clara Parks and Recreation Department, in providing public recreation resources as well as protecting and preserving the natural resources of regional parklands.

Table 7 outlines the eleven primary goals and associated objectives and variables/performance standards for grazing management at the Park. A goal identifies *what* you want to achieve, and an objective describe *how* you will achieve that goal (SRCD 2006, George and Rilla 2005). Goals are broad statements about desired conditions. Objectives are practical and measurable. The results of grazing management will be monitored and evaluated using the performance standards listed in Table 7. These grazing management goals, objectives, and performance standards may need to be adapted due to altered management conditions or new information garnered after grazing and monitoring programs have begun.

The County of Santa Clara Parkland Range Management Policy (County of Santa Clara 1992) identified land use goals for Santa Clara County Parks. These goals are incorporated into Table 7, as follows:

a. Provide visitor access and recreational opportunities (incorporated as Goal #3).
b. Provide for the safety of park users (Goal #3).
c. Protect, conserve, and enhance natural plant communities (Goals #1 and #5).
d. Minimize fire hazards to parklands and private property by managing vegetative fuels (Goal #4).
e. Rehabilitate degraded vegetation and wildlife habitat (Goals #1 and #5).
f. Establish cooperative relationships with adjacent property owners (Goal #8).

Table 7. Goals, Objectives, and Performance Standards for Grazing Management of Santa Teresa County Park.

Goals	Objectives	Performance Standards (PS)
Goal 1: Maintain rangeland conditions conducive to the long-term persistence of the existing and potential sensitive biological resources: special-status plants and wildlife, and sensitive natural communities.	**Objective 1a:** Maintain grassland herbaceous height, mass [Residual Dry Matter (RDM)[i]] in the autumn; phytomass in other seasons), and heterogeneity of height to benefit the special-status plants and biodiversity generally.	**PS 1a:** Acceptable minimum RDM levels (in autumn) are (Santa Clara County 1992): 600 lbs./acre on slopes less than 30% (alert level is 800 lbs./acre) 800 lbs./acre on 30-50% slopes (alert level is 1000 lbs./acre); and 1000 lbs./acre on slopes greater than 50% (alert level 1200 lbs./acre). Acceptable maximum RDM levels are up to two times the minimum: 1200 lbs./acre 1600 lbs./acre, and 2000 lbs./acre, respectively. Spring phytomass target means: as stated above plus 50%, acceptable up to 1800 lbs/acre on slopes less than 30%. Herbaceous foliage height: maintained between 2 and 10 inches year-long, a maximum herbaceous height of 14 inches would be acceptable for short periods during the growing season; target standard deviation of mean height of transect measurements in spring and summer (for heterogeneity): 2 inches, acceptable between 1.5 to 2.5 inches.
	Objective 1b: Maintain or increase special-status plant populations by reducing non-native herbaceous competition in grasslands and wetlands; avoid significant grazing damage to oak saplings in oak woodland areas; and avoid significant grazing damage to herbaceous and woody riparian species.	**PS 1a, plus PS 1b:** • Special plant populations: cattle exclosures, if needed, maintained in functional condition; • maintain population sizes of the currently occurring special-status plants, native grasses, riparian herbaceous plants, wetland plants, and oak saplings at appropriate levels considering long-term averages and fluctuations of weather and other natural population fluctuations (to be developed and tested by qualified/trained personnel; • maintain cattle browsing of riparian woody species at less than 20% utilization in order to avoid excessive herbivory and trampling damage to riparian woodlands.
	Objective 1c: Maintain or increase special-status wildlife populations by maintaining/enhancing habitat conditions that can be affected by grazing programs and operations.	**PS1c:** • Special-status wildlife habitat quality—maintain population sizes of the currently occurring host plants at appropriate levels considering long-term averages and fluctuations of weather and other natural population fluctuations (to be developed and tested by wildlife biologist); • maintain structural heterogeneity of woody plants forming habitat (to be developed and tested by qualified/trained personnel.

Table 7. (Continued)

Goals	Objectives	Performance Standards (PS)
Goal 2: Maintain the overall health of the rangeland ecosystem, including soil integrity, water quality, biodiversity, and resilience.	**Objectives 1a and 1b, plus Objective 2:** Control soil erosion at priority sites where grazing management is contributing to significant sediment movement and where erosion is active.	**PS 1a and 1b, plus PS 2:** Maintain or reduce occurrences of significant new erosion or expansion (in width and depth) of existing erosion sites.
Goal 3: Maintain recreational access, enjoyment, and appreciation.	**Objective 3:** Avoid conflicts between recreational users and grazing program operations.	**PS 3:** monitoring and assessment of potential conflicts with recreational users by working with community and park ranger staff; installation of interpretive/educational signage; and implementation of outreach and education programs.
Goal 4: Reduce the fire hazards associated with the mass of dry herbaceous vegetation in the grasslands during the summer and autumn seasons, and associated with the mass of woody fuels in the scrub, chaparral, and woodland communities.	**Objective 1a, plus Objective 4:** Limit woody fire hazard to a low level to the extent feasible using grazing and related methods (a management plan for woody fire fuels, including a revision to this objective, should be included in the fire management plan recommended in Section 5.5.6).	**PS 1a, plus PS 4:** a performance standard for woody fire fuels should be included in the fire management plan recommended in Section 5.5.6
Goal 5: Minimize the impacts of invasive non-native "pest" plants.	**Objective 5:** Avoid and control the introduction and expansion of invasive non-native pest plants in grasslands associated with the grazing program and operations (a management plan for pest plants, including a revision to this objective, should be included in the pest plant management plan recommended in Section 5.5.5).	**PS 5:** Occurrences (cover) of high-priority pest plants (new infestations, existing occurrences, and expansions) maintained at level of initial infestation or eradicated if possible; a management plan for pest plants, including a revision to this performance standard, should be included in the pest plant management plan recommended in Section 5.5.5).
Goal 6: Maintain forage, infrastructure, and other conditions to sustain a livestock operation and healthy livestock.	**Objective 1a, plus Objective 6:** Install and maintain adequate conditions of the grazing infrastructure to support the effectiveness and efficiency of the livestock grazing operation.	**PS 1a, plus PS 6:** The perimeter and internal fencing, gates, staging area, livestock movement corridors, service vehicle/horse access for livestock operations, and watering facilities are installed and maintained in good functional condition.

Table 7. (Continued)

Goals	Objectives	Performance Standards (PS)
Goal 7: Provide the working conditions for County Parks and Livestock Operator to maintain a cooperative and productive relationship.	**Objective 7:** Provide reasonable opportunity and flexibility for the livestock operation to function profitably; and facilitate communications between park staff and Livestock Operator.	**PS 1a, plus PS 7:** Recommended infrastructure improvements are prioritized and installed as feasible (per Licensing Agreement); responses to requests for cooperation and maintenance of infrastructure are prompt and effective; reporting is on schedule; exchange of relevant technical literature occurs regularly; joint participation in professional organization events are supported; both parties are engaged in the regular monitoring and adaptive management process.
Goal 8: Maintain cooperative relationships with adjacent property owners.	**Objective 8:** Provide reasonable opportunities for adjacent property owners to express views on the grazing management at the Park.	**PS 8:** Monitoring and assessment of impacts to neighboring lands through active communication with adjacent landowners and Park unit staff.
Goal 9: Protect the pre-Columbian and historic cultural resources.	**Objective 9:** Avoid cultural resource sites and provide effective protections of the known sites of cultural resources that are vulnerable to the grazing program and operations.	**PS 9:** Grazing exclusions are installed to protect vulnerable cultural resource sites.
Goal 10: Improve wildflower displays and oak regeneration.	**Objective 1a and 1b, plus Objective 10:** Reduce thatch and thus habitat for rodents that can damage oak seedlings and saplings	**PS 1a and PS 1b**
Goal 11: Reduce shrub encroachment into grassland habitats and maintain minimum grass/shrub mosaic.	**Objective 11:** Promote herbivory and trampling of encroaching shrubs to maintain the relative proportions and arrangements of grassland and shrubland as occur the year grazing is initiated. Employ supplementary treatments as needed.	**PS 11:** Maintain shrub cover at the extent areal coverage at first year of grazing; usually requires extension of grazing into the summer season and/or supplementary treatments, including manual and herbicides.

[i] RDM refers to the dry mass (and height) of plant matter left on the ground from previous growth before the start of the next winter growing season (September/October). The amount and species of forage that is produced in a growing season is largely dependent on the environment of soil and RDM during the previous late autumn. This affects seed germination and seedling growth, and will be optimized under the indicated range of herbaceous mass and height. The RDM standards are based on Bartolome et al. (2006).

4 PREDICTED EFFECTS AND DESIRED CONDITIONS

4.1 Overview of Grazing Effects on Natural Resources

The potential effects of grazing on the existing and potential (but undocumented) sensitive resources of Santa Teresa County Park vary seasonally. Table 8 summarizes the timing of the potential grazing effects on each of the Park's sensitive biological resources. The table reveals grazing effects, both positive and negative, by month. A "+" indicates months when grazing could be beneficial to the resource; a "-" indicates months when grazing could be detrimental to the resource.

In Table 8, grazing effects are evaluated only in terms of each existing or potential resource, independent of other resources and independent of the conservation goals of the GMP. Often for each resource, there are both benefits and negative effects associated with grazing, and they may occur simultaneously. In order to effectively manage these potential effects, the GMP must consider both positive and negative effects for all the resources, in concert. Grazing must be timed to minimize negative impacts and maximize the benefits to all of the sensitive resources. This is accomplished by focusing on the general conservation goals of the GMP and timing grazing accordingly. Negative effects on some resources will still potentially occur within the established grazing timelines; therefore, additional management strategies and a monitoring program have been developed to protect existing and potential resources, and to ensure the effectiveness of these strategies. Further, grazing outside of the general timelines may be employed under certain controlled circumstances to manage for specific conservation goals, such as invasive non-native plant control and shrub encroachment.

In general, grazing applied between January and May would maximize the benefits of reduced mass and height of the annual grasses. Grazing before February poses significant risks of soil erosion during above-normal rainfall years. Whereas, grazing after May may cause RDM[7] levels to fall below allowable limits, reduce native plant species richness, and increase erosion potential in subsequent years. Grazing after May also poses risks to woody plant species in the riparian habitats, wetlands, and oak woodlands, but can help to control shrub and tree encroachment into grasslands. Both beneficial and negative impacts to special-status plants are associated with spring grazing: reduction of the mass and height of annual grasses would favor special-status plants, but direct herbivory of special-status flowers would reduce reproductive success.

Grazing has both beneficial and negative effects on potential special-status wildlife species. Potential benefits associated with moderate grazing include increased heterogeneity of the landscape, increased native plant populations, and lower herbaceous cover, all of which improve opportunities for foraging and movement, and improve habitat for small mammals. Small mammals, in turn, provide a prey base as well as burrows for upland, refuge, and denning habitat for many potential special-status wildlife species. Potential negative impacts include many wildlife species' vulnerability to trampling at all life stages, including nest sites, and excessive herbivory of riparian and/or wetland plants for wildlife species dependent on those habitats. Table 8 highlights the challenge of developing a GMP which maximizes benefits and minimizes negative effects, taking into account the variety of resources, often with conflicting requirements.

[7] RDM refers to the dry mass (and height) of plant matter left on the ground from previous growth before the start of the next winter growing season (September/October). The amount and species of forage that is produced in a growing season is largely dependent on the environment of soil and RDM during the previous late autumn. This affects seed germination and seedling growth, and will be optimized under the indicated range of herbaceous mass and height. The RDM standards are based on Bartolome et al. (2006).

Table 8. Timing of the Potential Effects of Grazing on Sensitive Biological and Physical Resources, Santa Teresa County Park, Santa Clara County, CA.

\+ = grazing could be beneficial to management of the resource

\- = grazing could be detrimental to management of the resource

Sensitive Resource	*Sep*	*Oct*	*Nov*	*Dec*	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	Management Concerns
Water Quality				-	-	-	-	-	-				Seasons of precipitation and greatest creek flows; potential for water pollution
				+	+	+	+	+	+				Reduction of thatch associated with moderate grazing allows increased plant productivity and thus increased nitrogen uptake by herbaceous wetland plants (B. Allen-Diaz et. al. 2004)
Soil Erosion			-	-	-	-	-						Soil surfaces are most sensitive to hoof traffic during wet seasons
Spring Flowering Special-Status Plants							-	-	-				Flowering stems, flowers, and seed production vulnerable to damage during the flowering season
				+	+	+	+	+	+				Competition from non-natives reduced; natives favored by grazing
Summer Flowering Special-Status Plants										-	-	-	Flowering stems, flowers, and seed production vulnerable to damage during the flowering season
				+	+	+	+	+	+				Competition from non-natives reduced; natives favored by grazing
Serpentine Grassland/ Native Perennial Grasslands					+	+	+	+	+				Competition from non-natives reduced; native grasses favored by grazing
Mixed Serpentine Chaparral	-	-								-	-	-	Seedlings and sprouts of chamise, big-berry manzanita, toyon, and leather oak sensitive to excessive herbivory
						+	+	+	+				Competition from non-natives reduced; natives favored by grazing
Riparian Woodlands and Forest/ Emergent Freshwater Wetlands	-	-								-	-	-	Riparian and wetland woody seedlings and herbaceous plants sensitive to hoof traffic and excessive herbivory
						+	+	+	+				Competition from non-natives reduced; natives favored by grazing; herbaceous plant diversity increases with moderate grazing; soil compaction beneficial to many native wetland plant species
Oak Regeneration	-	-								-	-	-	Seedlings sensitive to hoof traffic and excessive herbivory
						+	+	+	+				Grazing to maintain low herbaceous cover reduces rodent damage and moisture competition

Table 8. (Continued)

Sensitive Resource	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Management Concerns
Steelhead	-	-	-	-	-	-	-	-	-	-	-	-	Stream habitat directly affected by cattle hoof traffic and waste deposition
California Tiger Salamander			-	-	-	-	-	-	-	-	-	-	Vulnerable to crushing by cattle and vehicles, especially when salamander movement is greatest, during rain and heavy fog events, at night, and/or when aquatic habitat sites dry down
					+	+	+	+	+				Grazing to maintain low herbaceous cover reduces visual impediments for dispersing salamanders and improves habitat for ground squirrels and other small mammals, which provide burrows (upland habitat) for CTS
California Red-legged Frog			-	-	-	-	-	-	-	-	-	-	Vulnerable to crushing by cattle and vehicles especially when movement is greatest, during rain and heavy fog events, at night, and/or when aquatic habitat sites dry down. Egg masses, tadpoles, and metamorphs at pond sites also vulnerable to crushing by cattle
	+						+	+	+	+	+	+	Grazing to reduce high densities of emergent vegetation along pond shorelines enhances basking habitat.
Foothill Yellow-legged Frog	-	-	-	-	-	-	-	-	-	-	-	-	Grazing cattle may trample upland refuge sites (generally up to 164 ft. from aquatic drainages); egg masses and developing larvae vulnerable to trampling, as well as to increased sediment loads from surface erosion.
Blainville's Horned Lizard [= Coast HornedLlizard]	-	-	-	-	-	-	-	-	-	-	-	-	Trampling of nest sites, eggs, hatchlings, and adults
						+	+	+	+				Grazing to maintain low, open habitat
Western Pond Turtle	-	-	-	-	-	-	-	-	-	-	-	-	Adults, juveniles and hatchlings vulnerable to trampling in upland habitat between permanent waters and nests
						+	+	+	+	+	+		Grazing to maintain low herbaceous cover aids dispersal
Northern Harrier							-	-	-	-	-	-	Ground nests vulnerable to livestock trampling in spring and summer
						+	+	+	+	+			Grazing to maintain low herbaceous cover improves foraging habitat
Western Burrowing Owl					-	-	-	-	-	-			Burrows vulnerable to trampling during wet winters and spring (nesting season)
						+	+	+	+	+			Grazing to maintain low herbaceous cover increases visibility, improves habitat for ground squirrels, which provide burrows for refuge and nesting; moderate intensity dispersed grazing to maintain patchy herbaceous cover may increase prey diversity

Table 8. (Continued)

Sensitive Resource	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Management Concerns
Grasshopper Sparrow							-	-	-	-	-	-	Ground nests vulnerable to trampling in spring and summer
				+	+	+	+	+	+				Competition from non-native vegetation reduced and native vegetation favored by grazing, thus improving habitat
Golden Eagle/Bald Eagle (nesting & wintering)						+	+	+	+	+			Grazing to maintain low herbaceous cover improves exposure of and habitat for ground squirrels, a prey species
White-tailed Kite						+	+	+	+	+			Grazing to maintain low herbaceous cover improves exposure of and habitat for small mammal prey species, especially voles
Loggerhead Shrike						+	+	+	+	+			Grazing to maintain low herbaceous cover improves exposure of and habitat for rodents and other prey species
Least bell's Vireo	-	-					-	-	-	-	-	-	Riparian woody seedlings and herbaceous plants sensitive to hoof traffic and excessive herbivory
						+	+	+	+				Moderate grazing can improve vireo willow riparian habitat if understory is dominated by non-native invasive plant species; moderate grazing may reduce competition from non-natives and favor natives, and increase herbaceous plant diversity
Tricolored Blackbird (nesting colony)							-	-	-	-	-	-	Active nesting colonies at wetland or pond sites are sensitive to livestock herbivory during spring and summer
						+	+	+	+	+			Grazing to maintain low herbaceous vegetation of open grassland habitat adjacent to or near colony sites
Townsend's Big-eared Bat				+	+	+	+	+	+				Grazing along the edge of riparian vegetation edges improves Townsend's big-eared bat habitat if edge habitat is dominated by non-native invasive plant species, competition from non-native vegetation is reduced, and natives are favored by grazing; insect prey species may increase as plant diversity increases
Pallid Bat				+	+	+	+	+	+				Light grazing applied to concentrations of non-native invasive vegetation throughout the park may enable native plant species to colonize, increasing the availability and diversity of ground-dwelling insects; once native vegetation has established, exclude concentrated grazing, especially of riparian vegetation

Table 8. (Continued)

Sensitive Resource	*Sep*	*Oct*	*Nov*	*Dec*	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	Management Concerns
San Francisco Dusky-footed Woodrat	-	-								-	-	-	Understory habitat and herbaceous food sources along riparian corridors sensitive to hoof traffic and excessive herbivory
						+	+	+	+				Grazing may improve potential unoccupied woodrat habitat in riparian vegetation that is dominated by non-native invasive plant species, by reducing competition from non-native vegetation, favoring native plants, and increasing herbaceous plant diversit.; Exclude cattle from habitat occupied by woodrats.
American Badger					+	+	+	+	+	+			Moderate grazing to maintain low herbaceous cover improves habitat for ground squirrels and other prey species; also increases burrows (denning habitat) for refuge and reproduction
San Joaquin Kit Fox						+	+	+	+	+			Moderate grazing to maintain low herbaceous cover improves visibility and improves habitat for ground squirrels and other small mammal prey species; burrows may be utilized for denning habitat; moderate dispersed grazing leaves patchy herbaceous cover, which increases prey diversity

4.2 Special-Status Plants

Table 9 lists the special-status plants that are known to occur or have potential to occur at Santa Teresa County Park or in the vicinity, and describes the potential sensitivities and opportunities associated with grazing.

In summary, moderate spring seasonal grazing is expected to not affect or benefit (through the reduction of competition from non-native grasses) the following serpentine grassland and chaparral/scrub plants: Santa Clara Valley dudleya, smooth lessingia, Hall's bush mallow, most beautiful jewelflower, and Metcalf Canyon jewelflower. The riparian plants, Mt. Hamilton thistle and Loma Prieta hoita are sensitive to grazing, but will be protected by the planned grazing exclusions in much of the major canyons and riparian areas. The fragrant fritillary, if observed at the park, would be sensitive to grazing, and the area will be temporarily fenced to exclude grazing during its full growing, flowering and seed-setting period.

Table 9. Special-Status Plants and Grazing Considerations at Santa Teresa County Park, Santa Clara County, CA.

Species	Blooming Period[i]	Grazing Management Considerations
Known Occurrences at Santa Teresa County Park		
Mt. Hamilton thistle (*Cirsium fontinale var. campylon*)	(Feb)April-October	**Exclusion.** This species, particularly while in flower, is very sensitive to cattle grazing. Because it is a perennial herb restricted to serpentine seeps and springs, it does not tolerate trampling. Additionally, it is not as spiny as other members of the *Cirsium* genus and is thereby more palatable. Because it is green most of the year, this plant would be desirable to livestock even during the drier summer months.
Santa Clara Valley dudleya (*Dudleya setchellii*)	April-July	**Timing.** In general, this species is very tolerant of cattle grazing. It is far more susceptible to predation by small mammals, including ground squirrels. When not in flower, Santa Clara Valley dudleya may actually benefit from grazing due to the removal of annual grasses that may limit sunlight penetration. Furthermore, this species is restricted entirely to rocky outcrops (the rocks themselves) that provide little additional forage and may be avoided by cattle due to the unevenness of the terrain. Nevertheless, grazing during peak blooming may result in damage to the succulent leaves or ingestion of the flowering stalk prior to the plants setting seed and could be detrimental to future recruitment. This potential impact is discussed by Dr. Stuart Weiss (2007) in South Bay serpentine study conducted for the USFWS.
Loma Prieta hoita (*Hoita strobilina*)	May-July(Aug-Oct)	**Exclusion.** Loma Prieta hoita occupies habitats similar to the Mount Hamilton thistle and is not especially tolerant of cattle grazing. Within the park, this species is restricted to serpentine seeps and riparian corridors and is often found in areas that would be prime cattle rest/watering areas. Populations are localized and relatively dense and could easily be excluded from grazing using fencing or other diversionary tactics.
Smooth lessingia (*Lessingia micradenia var. glabrata*)	July-November	**None.** This species is fairly widespread throughout serpentine grasslands of the southern Santa Clara Valley. Smooth lessingia is often found in contiguous populations with greater than 5,000 individuals. It tolerates, and to a certain extent prefers moderate disturbance regimes, including grazing. This species was not observed during reconnaissance level surveys due to its late blooming period. Assume that smooth lessingia will occupy similar habitat to the most beautiful jewelflower.
Hall's bush mallow (*Malacothamnus hallii*)	May-September	**None.** Hall's bush mallow is largely restricted to chaparral with serpentine soils and co-occurs with dense patches of black sage (*Salvia melifera*) and poison oak (*Toxicodendron diversilobum*). This plant was observed in very low numbers in 2010 and was restricted to the interior portions of these chaparral communities. As a result, it is very unlikely these plants will be affected by grazing. Hall's bush mallow benefits from low intensity fire; however, this management activity is unlikely due to concerns by neighbors and for public safety.
Woodland monolopia (*Monolopia gracilens*)	March-July	**Timing/Intensity.** Woodland monolopia is an annual plant in the sunflower family (Asteraceae) closely related to goldfields (*Lasthenia* sp.) Individuals have a widely branching infloresence and are likely tolerant of grazing similar to most beautiful jewelflower although no data exists to support or refute this. This is a colonial species that appears in greatest numbers following years with above average rainfall. It is also commonly associated with recently burned sites and may require fire for seed scarification, or the increased germination may be due to less competition with other annual plants. This species grows on steep embankments along south facing road cuts in denuded, rocky soils at nearby Coyote Ridge (D. Mayall, pers. comm. 2011). Cattle in the vicinity are not a threat due to the steep, precarious slopes and lack of other suitable forage. This is likely to be the case for woodland monolopia in Santa Teresa County Park.

Table 9. (Continued)

Species	Blooming Period	Grazing Management Considerations
Most beautiful jewelflower (*Streptanthus albidus* ssp. *peramoneus*)	(Mar)April-September(Oct)	**Timing/Intensity.** Most beautiful jewelflower is most common in serpentine grassland with shallow soils. In general, it prefers north and west facing slopes, but will occur on any aspect. This species has a good tolerance for grazing, but does best under early to mid-spring grazing. Simulated grazing experiments (clipping) by S. Weiss (2007) show that most beautiful jewelflower is flexible in the face of physical damage, sending out lateral stalks after the loss of the apex. Nevertheless, grazing throughout the majority of the blooming period would substantially reduce the number of plants that go to seed. Because this is an annual plant species that sprouts yearly from seed, this could potentially lead to heavy population declines.
Potential/Undocumented Occurrences at Santa Teresa County Park		
Coyote ceanothus (*Ceanothus ferrisiae*)	January-May	**None.** Highly unlikely to be present within Santa Teresa County Park due the plant being conspicuous and likely to have been observed previously. This species is found in dense chaparral on serpentine soils and is unlikely to be significantly impacted by grazing. Moreover, coyote ceanothus commonly co-occurs with woody shrubs and trees such as foothill pine (*Pinus sabiniana*), big-berry manzanita (*Arctosaphylos glauca*), leather oak (*Quercus durata*), and toyon (*Heteromeles arbutifolia*), which have limited distribution within the park.
Fragrant fritillary (*Fritillaria liliaceae*)	February-April	**Timing/Intensity/Exclusion.** Although not observed or recorded within Santa Teresa County Park, this species has a high likelihood for occurrence based on the proximity of nearby populations and the presence of suitable habitat within the park. This annual plant only flowers for a few weeks each year and is highly desirable/palatable to grazing herbivores. If this plant is eventually observed within the park, cattle should be discouraged from grazing these areas until the plant has gone to seed.
Arcuate bush mallow (*Malacothamnus arcuatus*)	April-September	**None.** Although not currently known with Santa Teresa County Park, arcuate bush mallow is primarily limited to small patches within dense chaparral that would not likely be affected by grazing. This species requires periodic, low intensity fire for reproduction, which is largely infeasible as an ongoing management strategy due to concerns by neighbors and for public safety.
Metcalf Canyon jewelflower (*Streptanthus albidus* ssp. *albidus*)	April-July	**Timing/Intensity.** This plant is closely related to the most beautiful jewelflower, although it produces white flowers instead of pink ones. It is only known from several populations on the east side of the Santa Clara Valley in the immediate vicinity of Metcalf Canyon Road. Grazing considerations are the same as the most beautiful jewelflower. However, because this plant is listed as Federally Endangered, more specific monitoring and adaptive management strategies would be required should this species be observed within the Park.

[i] Munz and Keck (1973); Tibor (2001); California Native Plant Society (2010); Parentheses indicate an infrequent but occasional extension of the blooming period, corresponding to abnormal weather conditions in a given year.

4.3 Sensitive Natural Communities

This section describes the potential effects of grazing on the four sensitive natural communities within Santa Teresa County Park: serpentine grassland (and other native grasses and wildflowers), mixed serpentine chaparral, riparian forests and woodlands, and emergent freshwater wetlands. These communities are described in detail in Appendix B and mapped in Figure 5. Additionally, we describe here how grazing can affect oak regeneration at the Park.

4.3.1 Serpentine Grassland, Native Grasses, and Wildflowers

Studies on the effects of cattle grazing on grassland species composition have shown varied results, with existing species composition, climate and management strategies all factors. Conclusions also vary between serpentine and non-serpentine grasslands. Serpentine grasslands generally support increased abundance of native grasses and wildflowers compared to adjacent non-native grasslands. This is largely due to serpentine native plant species' evolved tolerance of ultramafic[8] (serpentine) soils. While non-native species are less prevalent in serpentine grasslands, they may still be problematic and increase their distribution and abundance in the absence of management. Several recent studies of serpentine grasslands have demonstrated that light to moderate intensity cattle grazing can increase native species richness[9] and promote the establishment and persistence of nectar species preferred by the Bay checkerpot butterfly (Harrison 1999, Safford and Harrison 2001, Gelbard and Harrison 2003,Harrison et al. 2003, Weiss et al. 2007). However, whereas native forbs increased in both richness and abundance in response to grazing, native grass abundance often decreased or remained the same (Gelbard and Harrison 2003, Weiss et al. 2007).

In non-serpentine annual grassland, properly timed grazing has been demonstrated to suppress non-native herbaceous competition with native plants, and may favor native grasses and wildflowers. The density and vigor of native perennial grasses can be improved when intensive spring grazing is curtailed just before the existing native perennial grasses re-grow, flower, and set seed and before the soil moisture is exhausted (Menke 1992). This specialized grazing removes much of the density and mass of the non-native annual grasses through their growing season, which is earlier and shorter than that of the native perennial grasses. Other research has shown mixed results, and suggests caution in grazing prescriptions to favor native grasses. A study at Jepson Prairie by Dyer et al. (1996) found that grazing was not an effective technique to increase purple needlegrass (*Nassella pulchra*), and that climate is the more influential factor. Hatch et al. (1999) suggest that different native grasses and forbs have different and sometimes conflicting responses to management, and therefore more research is needed to guide grazing and burning practices. In a study of coastal prairie, Hayes and Holl (2003) found that native grasses were not more abundant in grazed areas than ungrazed areas; however, they found native forbs were more abundant in grazed areas due to the reduction of competition with non-native herbaceous plants and reduction of build-up of thatch. Edwards (1992) also found that spring and summer grassland wildflowers are typically showier where grazing has occurred.

Because research on the use of grazing to enhance grasslands for native plant species has produced varied conclusions, a grazing management program that achieves a heterogeneous pattern—some

[8] Ultramafic soils are those that with low silica content and levels of magnesium and iron. Serpentinite is a type of ultramafic rock.

[9] Species richness refers to the total number of species present in a given area, without accounting for their relative abundance.

patches grazed more and some less might be the most effective management strategy. Such grazing would favor a diversity of conditions on both serpentine and non-native annual grassland, including those more favorable to expansion and persistence of native grasses and wildflowers (Fuhlendorf and Engle 2001). Grazing management to achieve heterogeneity is discussed further in Section 5.3.2 under the *Serpentine Habitat Fields* and *Wildlife Habitat Fields* headings.

4.3.2 MIXED SERPENTINE CHAPARRAL

Grazing is not expected to directly impact mixed serpentine chaparral within the park other than by preventing further encroachment of shrubs into grassland. The dense assortment of woody shrubs is largely impenetrable to cattle and the sclerophyllous, often aromatic foliage is generally unpalatable or not preferable forage. Only sparse grassy and/or herbaceous cover is available in this community type. Moreover, the uneven, rocky ground beneath the shrubs poses a tripping hazard, acting as an additional deterrent to grazing livestock.

4.3.3 RIPARIAN WOODLANDS AND FORESTS AND EMERGENT FRESHWATER WETLAND

Cattle presence can affect riparian habitats and wetlands through livestock trampling, herbivory, nutrient loading and other impacts to water quality. Cattle trampling and herbivory can inhibit the growth of healthy riparian and wetland seedlings, herbaceous plants, and woody vegetation. During the winter and spring, cattle will generally graze on their preferred forage, the nutritious green herbaceous forage of upland grassland habitats, whereas during the summer and fall, cattle are attracted to the cooler shade and water of the riparian zone, and to the relatively more nutritious riparian herbaceous and woody plants; therefore summer and fall grazing generally leads to greater hoof traffic and herbivory impacts. Cattle can damage stream banks and wetlands during the winter months when the soils are moist and susceptible to compaction and erosion, and cattle wastes can contribute to eutrophication[10] of ponds. Livestock fencing to exclude such areas from grazing or to create a "riparian pasture" for shortened grazing periods during times of reduced vulnerability can reduce damage to vegetation, eliminate or reduce impacts to soils, and buffer the overland transport of sediments and nutrients from grazed lands into the surface water. On the other hand, significant problems can arise with grazing exclusion, including increased fire hazards and infestations of non-native invasive plants.

[10] Excess nutrient loads, often from polluted runoff in the watershed, can cause ponds to become opaque from dense growths of algae, which results in the death of aquatic animals due to reduced oxygen.

4.3.4 OAK REGENERATION

Livestock browsing and trampling may impact reproduction and long-term persistence of oak stands in the park. Livestock hoof traffic can damage oak seedlings by severing plant bases and roots. Browsing and trampling occur most commonly during the dry summer, autumn and early winter months, when herbaceous forage is not available, and livestock preferentially select oak foliage and acorns, as well as other woody browse. During these seasons the browse contains greater nutritive value than the dry or decomposing residual herbaceous forage (Barrett and Menke 1976).

Grazing that is limited to late winter and spring minimizes livestock damage (McCreary 2001). (Young oaks will still be subject to herbivory by browsing deer.) Oaks benefit from moderate grazing that reduces the height and density of grass cover near seedlings and saplings, because the grasses directly compete for moisture, nutrients and light with the oak seedlings. Grazing to maintain low herbaceous cover also reduces rodent damage to young trees. Spring grazing can favor the persistence and regeneration potential of oak stands by reducing the fine fuel fire hazard and the associated destructive potential of wildfire. Generally, moderate grazing causes less damage to oak seedlings (especially if limited to the spring seasons) than wildfire.

4.4 Special-Status Wildlife

4.4.1 INVERTEBRATES

Bay Checkerspot Butterfly

In general, winter and spring grazing (prior to seed set of the annual grasses and weeds) improves BCB habitat quality. Over a period of years, this grazing schedule favors the BCB's larval and food plants, and they increase in abundance and area of occupation as the annual grass and weed cover is reduced.

While appropriate timing and intensity of cattle grazing can positively benefit the BCB by improving its habitat quality, the cattle and cattle management activities will cause some temporary and on-going mortality of BCB life stages, most of which are largely unavoidable. Examples of such direct or indirect mortality factors include, but are not limited to, the following:

- Cattle hooves, vehicles, or horses trample and lay-down individuals of BCB food plants;
- Cattle forage on food plants;
- Cattle deposit excrement on immature stages of BCB;
- Temporary or permanent water troughs and attractants, such as salt licks or other supplements placed in BCB habitat;
- Development of new water sources require piping or other materials to be routed through the BCB habitat;
- Herbicide to control noxious weeds drifts onto BCB food plants;
- New fence posts installed in serpentine grassland habitat; and
- Excessive grazing, whereby the biomass of BCB food plants (along with other serpentine grasses and forbs) is reduced to levels such that larvae cannot successfully complete their development or adults are unable to find nectar.

Other Special-Status Invertebrates

There is not sufficient data about other special-status invertebrates at Santa Teresa County Park to understand how grazing might affect them. Grazing practices to control/eradicate invasive plants and annual grasses are presumed to benefit the harvestmen since these plants were not originally components of their habitat.

4.4.2 VERTEBRATES

Table 10 describes how livestock grazing can influence, positively or negatively, the twenty special-status vertebrate species that occur or have potential to occur at Santa Teresa County Park.

Potential CRLF and other potential wildlife species that occupy ponds and riparian habitats can be negatively affected by grazing in summer and fall because there is less herbaceous forage in the adjacent uplands, and the cattle will consume oaks, willows, cattails, tules, and other pond vegetation. Cattle will wade into ponds and reduce the water level (by consumption, breaking down banks, and stirring up sediments), especially during the summer and fall as the water level drops. For these reasons, year-round grazing is not recommended near such ponds. Seasonal grazing as prescribed in this GMP will reduce these potential effects on wildlife species that may occupy wetland and riparian habitats.

Cattle may trample a number of wildlife species that occur or potentially occur within the grasslands. Nest sites of potential ground-nesting birds are particularly vulnerable. Conversely, grazing will reduce thatch and non-native herbaceous cover in grasslands, thus enhancing habitat for ground squirrels and other small mammals, as well as improving foraging opportunities for raptors. In turn, small mammals provide food sources for a range of potential special-status wildlife species, while small mammal burrows provide upland, refuge, nesting, and denning habitat for potential wildlife species.

Table 10. Special-Status Vertebrates and Grazing Considerations at Santa Teresa County Park, Santa Clara County, CA.

Common Name *Scientific Name*	Grazing Considerations
Fish	
Steelhead Central California Coast Distinct Population Segment (DPS) (*Oncorhynchus mykiss*)	**Exclusion.** According to J. Smith of San Jose State University, steelhead are not known occur within Santa Teresa Creek above Arroyo Calero and Calero Reservoir. Santa Teresa Creek and its associated tributaries are not federally designated as critical habitat (NOAA 2005 and 2006). Unconfirmed observations of steelhead; however, have been made within the Park boundary by park staff. If steelhead observations are confirmed, install livestock exclusion fencing along the lower reaches of Santa Teresa Creek (e.g. Fortini Field). Buffer zones established along watercourses for other resources within the Park will exclude cattle from potential steelhead stream habitat and reduce direct impacts to aquatic environments (Appendix E).
Amphibians and Reptiles	
California tiger salamander (*Ambystoma californiense*)	**Beneficial/Timing.** Grazing can be beneficial by enhancing potential upland refuge habitat for California tiger salamanders (CTS). A reduction in thatch from tall, dense fields of non-native grasslands present throughout the park may encourage an expansion of burrowing small mammals (i.e. California ground squirrel and pocket gophers) within the park. Currently, small colonies of California ground squirrels are limited to open areas near the Pueblo Day Use Area of the park and near the historical ranch at the northwest end of the park. An expansion of small mammal burrows/California ground squirrel colonies may increase potential upland habitat for CTS, especially near pond sites. Recommend installing cattle-proof fencing to exclude portions of potential aquatic habitats and to buffer adjacent upland habitats to prevent cattle trampling on CTS egg masses, larvae, and/or breeding adults. As small mammal burrows become more abundant over time, re-assess the ponds within the park to determine if additional upland buffer widths should temporarily widened during the peak CTS migration season to avoid trampling.
California red-legged frog (*Rana draytonii*)	**Beneficial/ Timing.** California red-legged frogs (CRLF) are compatible with utilizing livestock as a tool to enhance habitat. Pond sites within the park provide (marginal) potential CRLF breeding habitat. Intermittent pools found along the park drainages may provide potential foraging/refuge habitat for non-reproductive CRLF dispersing between aquatic sites. Care should be taken to avoid cattle from excessively trampling through drainage pools and in ponds. Also recommend grazing around aquatic sites take place after the local rainy season (late spring). Incorporate concept of partial exclusion fence in pond sites (if occupied) as mentioned in CTS above. A minimum of 25% emergent vegetation cover should be retained for potential aquatic breeding, cover, and foraging habitat at pond sites providing potential habitat.
Foothill yellow-legged frog (*Rana boylii*)	**Exclusion.** Grazing may impact Foothill yellow-legged frogs' (FYLF) upland refuge sites (generally up to 164 ft. from aquatic drainages. Pond sites near ST creek and its tributaries within the park may provide additional potential foraging and refuge habitat for FYLF. Restrictions on livestock in and around aquatic sites may be necessary because grazing activities are known to reduce FYLF survivorship from trampling of egg masses and hatchlings. Recommend FYLF surveys of aquatic sites to determine where possible livestock exclusion buffers should be incorporated to exclude and enhance aquatic and potential upland habitats. (Same exclusion for western pond turtle.)

Table 10. (Continued)

Common Name *Scientific Name*	Grazing Considerations
Blainville's horned lizard [= Coast horned lizard] (*Phrynosoma blainvillii*)	**Exclusion –** Grazing may impact Blainville's horned lizard. Restrictions on livestock accessing drainages, especially with open sandy areas, may be necessary to prevent nest sites, eggs, hatchlings, and adults from being trampled. Recommend surveys of potential habitats to determine where possible exclusion buffers should be incorporated to exclude and/or enhance habitats. (Western pond turtle exclusions will benefit Blainville's horned lizard.)
Western pond turtle (*Actinemys marmorata*)	**Exclusion/Timing.** Grazing may impact western pond turtle (WPT) upland nest or aestivation sites (generally between approx. 100 ft and 500 ft from aquatic habitats (Rathbun et al. 2002; ICF Jones and Stokes 2007). No grazing activities are planned around features where WPT have been observed. Other pond sites and Santa Teresa Creek and its tributaries may provide additional foraging and dispersal habitat for WPT. Restrictions on livestock around aquatic sites may be necessary because they are known to reduce WPT survivorship through trampling of eggs and hatchlings. Short term, light grazing practices during spring, however, may not significantly reduce suitability of nesting habitat for WPT. Recommend WPT surveys of aquatic sites to determine where possible exclusion buffers should be incorporated.
Ground Nesting Raptors/Birds	
Northern harrier (*Cirus cyaneus*)	**Exclusion/Timing.** Northern harriers are late successional grassland species. They will not use grasslands that are grazed heavily; even light grazing during the nesting season can destroy nests. Avoid grazing until after the nesting season. Light grazing after the nesting season may benefit rodent populations, which in turn may provide foraging areas for northern harriers. Exclude grazing in the vicinity of active nests and or where brooding behavior is observed.
Western burrowing owl (*Athene cunicularia*)	**Beneficial -** Grazing can be beneficial by enhancing potential habitat for western burrowing owls. A reduction in thatch in tall, dense fields of non-native grasslands present throughout the park may encourage an expansion of California ground squirrels within the park. Currently small colonies of California ground squirrels are limited to small open areas near the Pueblo Day Use area of the park and near the historical ranch at the northwest end of the park. Over time, an expansion of small mammal burrows/colonies may increase the availability of suitable foraging and burrowing habitat for breeding and/or wintering western burrowing owls. Recommend grazing in or near areas where California ground squirrels currently occur to encourage expansion. Monitor areas to see if western burrowing owls move into area over time.
Grasshopper sparrow (*Ammodramus savannarum*)	**Exclusion/Timing-** Grasshopper sparrows may benefit from grazing by reducing non-native invasive plant species over time. The reduction of non-native invasives may provide the opportunity for native plant species and bunch grasses to colonize areas of the park thereby offering better quality habitat for grasshopper sparrows. The timing of grazing should occur after the nesting season to avoid nest failure and mortality of eggs and/or young. Studies have shown that GRSP respond differently to grazing. Generally, grasshopper sparrows responded positively to light, late season grazing (Walk and Werner 2000), while in Arizona they only occurred in un-grazed sites (Bock and Web 1984). Generally, light to moderate grazing is beneficial in lush habitats and heavy grazing in shorter, drier habitats are detrimental (Saab et al. 1995). Recommend grazing applications achieve a mosaic of grazed and ungrazed areas so that grasshopper sparrows have access to ungrazed lands. This mosaic approach can be used to encompass habitat requirements of other grassland dependent wildlife species.

Table 10. (Continued)

Common Name *Scientific Name*	Grazing Considerations
Above- Ground Nesting Raptors/Birds	
Golden eagle (nesting & wintering) (*Aquila chrysaetos*)	**Beneficial**. Grazing can be beneficial by enhancing potential foraging habitat for golden eagles. A reduction in thatch from tall, dense fields of non-native grasslands present throughout the park may encourage an expansion of burrowing small mammals within the park. Currently small colonies of California ground squirrels are limited to small open areas near the Pueblo Day Use area of the park and near the historical ranch at the northwest end of the park. Over time, an expansion of small mammal burrows/colonies may increase suitable foraging habitat for golden eagles.
Bald eagle (nesting & wintering) *(Haliaeetus leucocephalus)*	**None.** The Park lacks large water bodies and prominent stands of old growth trees for suitable foraging and nesting/breeding habitats. At neighboring Calero Reservoir County Park, bald eagles occur as a wintering population, and may occur year-round. Nesting at Calero Reservoir County Park is unconfirmed. Bald eagles are likely to occur as wintering migrants over Santa Teresa County Park.
White-tailed kite (*Elanus leucurus*)	**Timing.** White-tailed kite nesting may occur in either single isolated trees or within large tree stands adjacent to open undisturbed areas in the park. Un-grazed lands generally support higher prey populations of small rodents than grazed lands. Light grazing may continue to support rodent populations and maintain a prey base to sustain resident white-tailed kite. Recommend grazing applications achieve a mosaic of grazed and ungrazed areas so that white-tailed kite have access to ungrazed lands for foraging.
Loggerhead shrike (*Lanius ludovicianus*)	**Beneficial/Timing-** Loggerhead shrike may benefit from grazing by reducing the dense thatch and non-native invasive plant species over time and allow for native plant species to colonize areas of the Park, thereby offering better quality foraging and possible nesting habitat. If nesting loggerhead shrikes are found in the park, avoid grazing near their nests during their breeding season.
Least Bell's vireo (*Vireo belli pusillus*)	**Exclusion** – Exclude grazing from areas currently providing dense riparian vegetation. (Note: A goal of the Santa Clara Valley Habitat Conservation Plan (SCVHCP) is to facilitate the [possible] northward expansion of least Bell's vireo, through restoration efforts along streams in the southern region of Santa Clara County. The SCVHCP emphasizes restoring understory habitats along riparian corridors with native vegetation to provide a mosaic of successional stages within the plant community and provide potential least Bell's vireo habitat. Manual removal of non-native understory vegetation may be necessary achieve this goal.)
Tricolored blackbird (*Agelaius tricolor*) (nesting colony)	**Exclusion/Timing** –Tricolored blackbirds may utilize the large pond bordering the park and neighboring golf course along the northeast boundary of the park. Ideal foraging conditions for tricolored blackbirds are created when grazing, mowing, or shallow flood irrigation of cultivated lands keeps the vegetation at an optimal height of (<15 cm) (Tricolored Blackbird Working Group 2007). Preferred foraging habitats include annual grasslands and cut-grain fields and open marsh borders adjacent to or near their colony sites. Grazing may benefit tricolored blackbirds by reducing the height of tall thatch and abundance of non-native invasive plants. Promoting native vegetation to expand in the park may improve the quality of foraging habitat. Avoid grazing in pond sites during breeding season if tricolored blackbirds are actively nesting.

Table 10. (Continued)

Common Name *Scientific Name*	Grazing Considerations
Mammals	
Townsend's big-eared bat *(Corynorhinus townsendii)*	**Beneficial.** Heterogeneous grazing practices (a mosaic of grazed and ungrazed areas) may be beneficial, so that Townsend's big-eared bats have foraging access to insects over both types of landscapes. Grazing applied to concentrations of non-native invasive plants occurring along the edges of riparian vegetation may enable native plant species to colonize and enhance foraging habitat over time. Once native vegetation has established along riparian edges, exclude grazing from these settings. It is not anticipated that grazing activities will occur where the mines and/or closed structures are located in the Park.
Pallid bat *(Antrozous pallidus)*	**Benefit/ Exclusion** Heterogeneous grazing practices (a mosaic of grazed and ungrazed areas) may be beneficial, so that Townsend's big-eared bats have foraging access to insects over both types of landscapes. Grazing applied to concentrations of non-native invasives occurring throughout the Park may enable native plant species to colonize and increase the availability and diversity in ground-dwelling insects. Once native vegetation has established, especially along riparian vegetation, exclude any concentrated grazing from these settings. It is not anticipated that grazing activities will occur where potential roosts sites occur (e.g., mines and/or closed structures) in the park. It is assumed livestock will not be able to access these potential roosting structures.
San Francisco dusky-footed woodrat *(Neotoma fuscipes annectens)*	**Exclusion-** Grazing along riparian zones may impact riparian and upland understory structure occupied by woodrats. San Francisco dusky-footed woodrats are sensitive to trampling, browsing, and grazing by livestock. Exclude grazing from habitats utilized by woodrats for nesting and foraging, primarily along riparian corridors. Implement light grazing practices (unoccupied by woodrats) in riparian habitats dominated by non-native invasive plant species to enable native plants species to expand and re-develop native understory assemblages. Once established or if woodrats occupy new areas, exclude grazing from these areas.
American badger (*Taxidea taxus*)	**Beneficial**. Grazing can be beneficial by enhancing potential foraging habitat for American badger. A reduction in thatch from tall, dense fields of non-native grasslands present throughout the park may encourage an expansion of burrowing small mammals (i.e. California ground squirrels) within the park. Currently small colonies of ground squirrels are limited to small open areas near the Pueblo Day Use area of the park and near the historical ranch at the northwest end of the park. Over time, an expansion of small mammal burrows/colonies may increase suitable habitat for American badger.
San Joaquin kit fox *(Vulpes macrotis mutica)*	**Beneficial** –Moderate intensity grazing is thought to benefit San Joaquin kit fox because it can potentially enhance the prey base and reduce vegetation to allow kit fox to detect and avoid predators. Grazing applied to concentrations of non-native invasives occurring throughout the park may enable native plant species to colonize and increase the availability and diversity in seed sources for small native rodents (e.g. kangaroo rats). A reduction in thatch from tall dense fields of non-native grasslands may encourage an expansion of California ground squirrels within the park. Recommend grazing applications achieve a mosaic of grazed and lightly grazed areas so that kit fox have access to forage for small rodents over both types of landscapes. Over time, an expansion of small mammal burrows/colonies may increase suitable foraging habitat for San Joaquin kit fox in the event they are found to utilize the Park.

4.5 Shrub Encroachment into Grassland

Grazing is most likely to impact seedlings and saplings of encroaching scrub and tree species. By allowing herbivory and trampling of young shrubs and trees, potential colonization can be limited (McBride 1974). Livestock grazing that is limited to the winter and spring seasons, when cattle prefer grass to woody foliage, minimizes these trampling and herbivory impacts. By extending the grazing period into early summer, when their preferred forage (grass) has senesced[11], livestock will begin to graze on succulent woody foliage (seedlings). This method can be used to control shrub encroachment into grassland habitat. As a result of early summer grazing, late-blooming special-status annuals could also be damaged by herbivory. Periodic early summer grazing would reduce this potential impact.

4.6 Pest Plants

Grazing is a feasible weed control method that will provide reliable, affordable, and continual reduction of weed competition with the serpentine native plants. Table 11 describes how livestock grazing can influence, positively or negatively, the eight primary pest plant species that occur at Santa Teresa County Park. Pest plants may be partially controlled (but not eliminated) by targeting specific stands encompassed temporarily by portable electric fencing with short-duration high-intensity grazing at the time of greatest vulnerability. As an example, Italian thistle may be controlled by short-duration high-intensity grazing (Bossard, Randall, and Hoshovsky 2000). High stocking densities are generally required to achieve high intensity grazing; because Santa Teresa County Park's infestations are currently few and small, such concentrated treatments should be feasible.

New introductions and expansion of pest plants can be limited by grazing management that avoids the creation of bare ground or disturbed soils around corrals, feeding stations, and other cattle concentration areas. Additionally, cattle may bring weed seeds into the park via cow excrement or on their hooves and fur. Research on seeds of typical grass and forb species has shown that almost every species was able to pass through the digestive system of cattle and germinate in cow excrement (C. A. Call, pers. comm. 2010); therefore, it is presumed that weeds at the Park are likely to disperse via cow excrement. It typically takes 48 to 96 hours for seeds to pass through the digestive system of cattle. One solution is to hold cattle in a quarantine area for 5 days or more to allow enough time for weeds seeds to pass through their digestive systems before bringing them into an un-infested grazing field.

[11] Senescence = the final stage in the life cycle of a plant, leading to the death of part or all of the plant; in annual grasses senescence corresponds to the seed setting and drying phase.

Table 11. Pest Plants and Grazing Considerations at Santa Teresa County Park, Santa Clara County, CA.

Species	Management Considerations[i]
Black mustard (*Brassica nigra*)	**Grazing Management (Timing/Intensity).** Disturbance, including excessive grazing, promotes the dominance and spread of black mustard. The fast growing, fibrous stems and branches of black mustard are generally not preferable to livestock. Black mustard favors nutrient-rich soils that are especially prevalent in areas used by cattle. Once dominance by black mustard is established, allelopathic chemicals leaching from dead stalks and tissues further prevents the establishment of other plants. **Fire.** Dense black mustard stands may increase the fire frequency as plants are extremely flammable upon desiccation. There is no evidence in the available literature that prescribed burning is an effective technique to control black mustard infestations. The increased nitrification of soil and lack of viable competitors may increase the level of infestation as evidenced at Santa Teresa County Park following the 2009 prescribed burn. **Mechanical.** Mowing and hand pulling is very effective for controlling relatively small populations of black mustard. Mowing should be timed for early spring, prior to the production of viable seeds. **Herbicides.** 2-4-D and glyphosphate (Roundup®) are both effective herbicides for control of black mustard. These are best applied to rosettes immediately after mowing.
Italian thistle (*Carduus pycnocephalus*)	**Grazing Management (Timing/Intensity).** Although cattle grazing has demonstrated limited success in controlling Italian thistle, properly timed grazing will minimize the spread of seed and slow the rate of infestation. Light to moderate intensity early to mid-spring grazing prior to the production of flowering heads is preferable and will minimize soil disturbance and nitrification of soil, which favors Italian thistle establishment and spread. **Fire.** Very little data supports the use of fire as an effective mechanism for Italian thistle control. Many ecologists have observed dramatic increases in the size of Italian thistle infestations following fire. This is likely due to the increased nutrients released into the soils and lack of competition from other annual plants. However, similar to yellow starthistle, burning over 2 or more consecutive years is likely to reduce the viable seedbank and decrease the size and density of Italian thistle colonies. This strategy is best used as part of an integrated pest management program. **Mechanical.** For relatively small infestations of Italian thistle, mowing is the preferred method for control. This technique requires mowing before seed production over several consecutive years (or even within years). Slashing is even more effective because more of the above ground plant material is removed. Italian thistle has been shown to readily flower in plants that are cut at or above 8 cm above the ground. Further, if plants are cut too close to flowering, they can still produce viable seed after they have been mowed. Hand hoeing is the most effective technique for small patches, especially if roots are severed 10 cm below the ground surface because plants will not resprout in the same growing season. **Herbicides.** Herbicides are most effective in combination with other weed management techniques. 2-4-D has shown some success and is best applied directly to the roots when thistles are less than 0.25m.

Table 11. (Continued)

Species	Management Considerations
Yellow star thistle (*Centaurea solstitialis*)	**Grazing Management. (Timing/Intensity).** Cattle grazing must occur prior to blooming period of spiny flower heads. High intensity early spring grazing followed by mowing/herbicide application is an effective method for control although full eradication is highly improbable. Note: Goats are preferable to cattle because they will browse on spiny flower heads later in the year. Yellow starthistle is highly toxic and may be fatal to horses. **Fire.** Prescribed burning has proven effective only after repeated burns over 2 or more consecutive years. Otherwise, fire is counterproductive and will increase germination and spread of yellow starthistle due to increased light penetration and soil warming resulting from the removal of thatch and other competing plant species. Prescribed burning in a single year may be effective as part of an integrated pest management strategy including mowing and herbicides. **Mechanical.** Although labor intensive and time consuming, mowing is an effective strategy for controlling yellow starthistle after plants have bolted[ii], but prior to the production of viable seeds. This technique is most effective for small, isolated populations. **Herbicides.** Clopyralid is the most effective herbicide for full season control of yellow starthistle registered for use in California. Unlike most post-emergence herbicides, it provides both foliar and soil activity. The best timing for application is when YST is in the early rosette stage. Glyphosphate (Roundup) is useful for control after plants have bolted. Herbicides are best utilized as part of an integrated pest management program.
Bull thistle (*Cirsium vulgare*)	**Grazing Management (Timing/Intensity).** Cattle will not consume bull thistle due to long, stiff spines at the end of the leaves and subtending the flowers. However, bull thistle tends to colonize in disturbed excessively grazed areas including wallows near water troughs. **Fire.** Biennial forbs, including most thistles, require burning over 2 or more consecutive years for effective control. A single fire will likely increase the level of bull thistle infestation. **Mechanical.** Repeated mowing will control infestations of bull thistle, but mowing must be timed before the production of flowers and viable seeds. **Chemical.** 2-4-D, clopyralid, picloram, and dicamba are effective herbicides for controlling bull thistle. Herbicide application is most effective when applied to rosettes prior to the production of flowers and viable seeds. Herbicides are best utilized as part of an integrated pest management program.

Table 11. (Continued)

Species	Management Considerations
Common teasel (*Dipsacus fullonum*)	**Grazing Management (Exclusion).** In general, spiny flower-heads are natural deterrent to cattle grazing. Dense infestations are generally impenetrable to livestock. There is evidence that cattle will not consume teasel prior to flower production due to the bitter taste and spiny leaves. However, because teasel is spread by seed, cattle may incidentally translocate seeds and spread teasel to other sites. Disturbance and denuded vegetation from heavy grazing is also likely to facilitate teasel establishment due to increased nutrients (nitrification) and lack of competition from other plants. **Fire.** Late spring prescribed burns may be somewhat effective for teasel control. However, because fire will not carry well through dense stands of mature plants, fire alone will not eradicate teasel. Prescribed burning may make it easier to locate rosettes for mechanical or chemical control. **Mechanical.** Mowing prior to the production of mature flowers is effective for control of teasel, but will not eradicate common teasel. Hand pulling or mattocking is preferable due to full removal of perennial root systems. **Chemical.** 2-4-D applied in the spring to rosettes prior to mature flower production is effective for teasel eradication. This strategy is best used in combination with mowing as part of an integrated pest management program.
Blue gum eucalyptus (*Eucalyptus globulus*)	**Grazing Management. (None).** Eucalyptus displaces native plant communities/wildlife habitat due to rapid establishment and growth. Allelopathic properties in the leaves and stems prevent recruitment of all but the hardiest understory vegetation. Eucalyptus will rapidly invade grasslands, reducing the available forage for cattle. Furthermore, aromatic and woody seedlings/saplings are unlikely to be ingested by cattle. **Fire.** No data exists to support the use of prescribed fire to control eucalyptus. However, there is some speculation that prescribed burning prior to cutting trees may assist with herbicide application. In general, eucalyptus infestations are expected to increase the wildfire frequency due to fast growing and highly flammable properties of this species. **Mechanical.** Cutting trees and leaving stumps flat and low to the ground is the common method for control followed by stump grinding or direct herbicide application. Hand pulling of seedlings and saplings up to one inch is diameter is also an effective means of control. **Chemical.** Various herbicides are typically applied to cut stumps. The most commonly used herbicide is 25-50% dilute glyphosphate applied directly to the stump within several minutes of cutting. Because eucalyptus will resprout from cut stumps, new growth should be monitored and controlled for up to three years. It has been postulated the best time to remove regrowth is when shoots are 6-8 feet high and are still a major net energy investment for the tree.

Table 11. (Continued)

Species	Management Considerations
Fennel (*Foeniculum vulgare*)	**Grazing Management (None).** Grazing management will not control existing fennel infestations in Santa Teresa County Park. Mature fennel is not palatable to livestock and most infestations are located outside of selected grazing management units. However, fennel is not typically found in grazed pastures. Moderate intensity grazing should prevent the establishment of new fennel infestations. **Fire.** Prescribed burning is not a feasible strategy for fennel control in the Park due to proximity to roads and private residences. **Mechanical.** While mowing prior to seed production may prevent further spread of fennel, eradication requires cultivation of plants including full removal of the roots. Although labor intensive, mattocking or hand digging are the preferred strategies for eradication. **Chemical.** Application of 2-4-D while plants are growing but prior to flower production has proven effective. Plants must be wetted prior to application, particularly the crowns. However, because fennel is often located on embankments adjacent to waterways or impermeable road surfaces, herbicide application may not be feasible.
Milk thistle (*Silybum marianum*)	**Grazing Management (Intensity).** Accumulated nitrates in milk thistle leaves are toxic to cattle. Thorny spines on the leaf margins and flower heads will cause selective avoidance by cattle as well. Residual dry matter (litter) in the late summer and fall is a highly important inhibitive factor in the germination of milk thistle seed. Thus, the level of grazing in areas supporting this plant should be carefully managed for appropriate levels of RDM re: Bartolome et al. (1980). **Fire.** No data exists to support the use of prescribed fire to control milk thistle infestations. Some observers have noticed a decrease in milk thistle following accidental burns, but this has not been corroborated experimentally. It is generally believed that nutrient loading from fire and lack of competitors will increase milk thistle germination. Prescribed burning may be useful if repeated over 2+ consecutive years. **Mechanical.** Mowing alone is not an effective method of control for milk thistle. Plants are often able to resprout and grow back in the same year, or produce viable flower heads below the level of the mower. Tilling or digging prior to flower productions is far more effective in that it removes the entire plant. Plants removed in this manner should be bagged and disposed of offsite because any flowers will still go to seed even after they have been uprooted. Tilled areas should be revegetated using a non-invasive, preferably native seed mix to avoid further establishment of milk thistle and other invasive species. **Herbicides.** Spot spray application of 2, 4-D during the seedling to rosette phases of milk thistle development has demonstrated effective control. A recent experiment using the herbicides picloram and methabenzthiazuron in combination with phenoxyacetic acid compound was 100% effective in eradicating milk thistle; however, these herbicides are not included in the County of Santa Clara Approved Pesticide List and would require an exemption for use.

[i] All herbicide applications must be compliant with the County of Santa Clara Integrated Pest Management and Pesticide Use Ordinance (Ordinance No. NS-517.70, Section 28-5(a). 2004). All herbicides recommended in this table are on the approved list of pesticides prepared by Dr. Lois Levitan for the County of Santa Clara dated March 30, 2004 (Levitan 2004) . Glyphosphate (Roundup®) is allowed under a limited use exemption on a case by case basis. Glyphosphate and 2, 4-D should not be used in close proximity to waterbodies (typically within 60 feet) due to potential adverse affects to aquatic and terrestrial phases of the federally threatened California red-legged frog (U.S. EPA 2003 and 2006).

[ii] Bolting = the growth of an elongated stalk with flowers in a short period of time.

4.7 Soils Erosion and Compaction, and Water Quality

The purpose of this section is to describe the potential impacts that cattle grazing in Santa Teresa County Park will have on soil erosion and water quality.

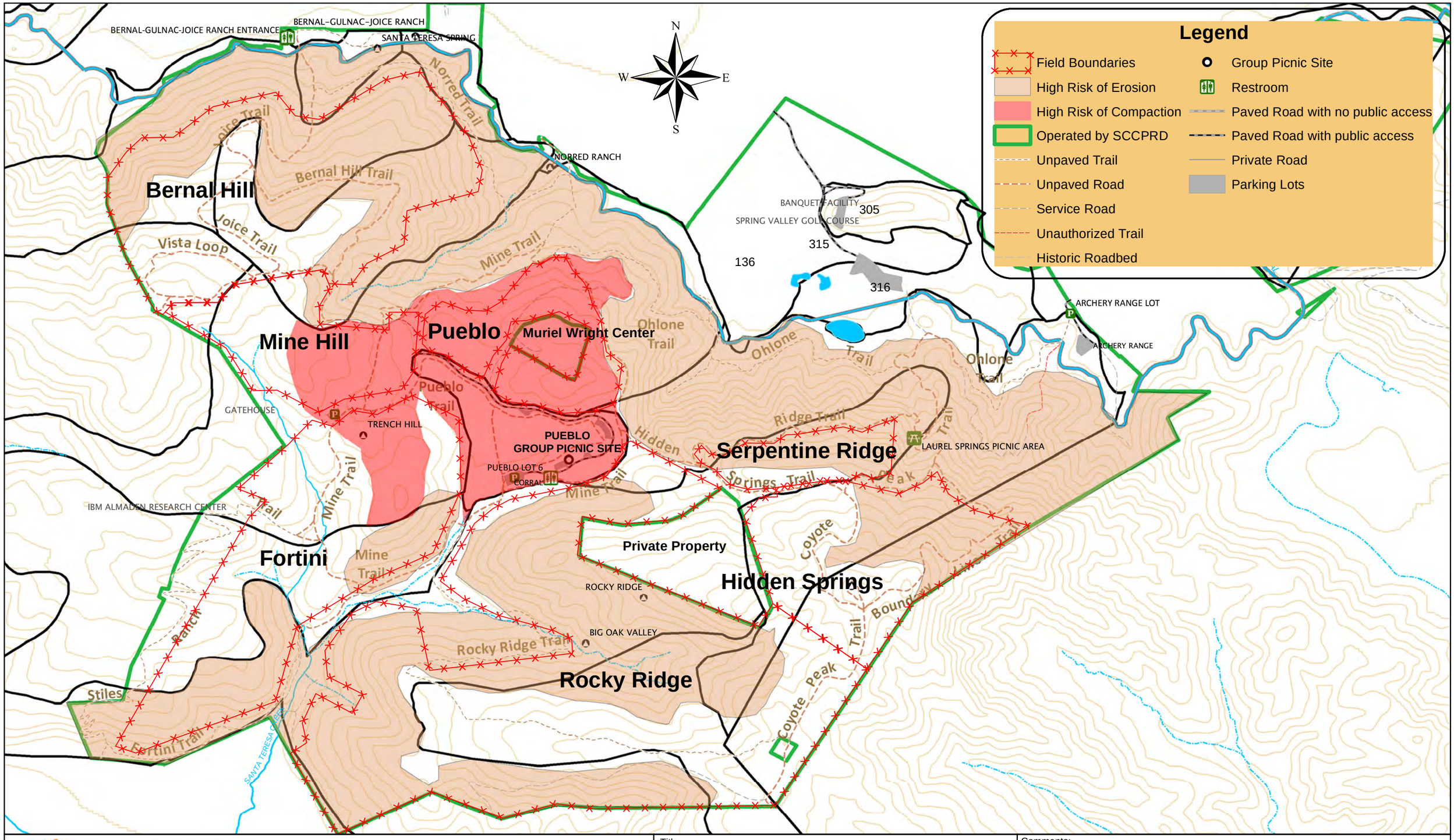
4.7.1 Potential Soil Limitations

The potential soil limitations for cattle grazing posed by different soil series and field slopes are presented in Table 12 and Figure 12. Figure 13 shows the areas where a high level of rainfall runoff can be expected, which comprise most of the park.

Table 12. Potential Limitations of Different Soil Series for Cattle Grazing, Santa Teresa County Park, Santa Clara County, CA.

Soil Series	Soil Mapping Unit	Potential[i] for High Soil Erosion?[ii]	Potential[i] for Compaction When Wet?[iii]	Amount of Surface Runoff[iv]	Additional Comments
Montara	303 (part) 304 (part)	YES	NO	High or Very High	Soil only 18 – 21" deep. Mapped in complex with Santerhill series.
Santerhill	303 (part) 304 (part)	YES, on steeper slopes	YES	Moderate to High	Mapped in complex with Montara. Likely found on lower slopes and valley bottoms. Precise location is unknown, but is 20% of the complex.
Alo	305 (part)	NO	YES	High	Mapped in complex with Altamont
Altamont	305 (part)	NO	YES	Very High	Mapped in complex with Alo series.
Alumrock	375 (part)	NO	NO	High	Mapped in complex with Zeppelin series.
Lodo	380 (part)	YES	NO	Very High	Soil only 17" deep. Mapped in complex with Zeppelin series.
Cropley	316	NO	YES	Moderate	Greatest risk of compaction of all soils found in the Park.
Zeppelin	375 (part) 380 (part)	YES, on steeper slopes	NO	Moderate	Mapped in complex with Alumrock, and with Lodo.

i The difference between potential and actual is usually determined by slope steepness and other physical factors in combination with management practices.
ii Based primarily on slope steepness, with 30% as the threshold.
iii Based primarily on clay content but with slope a secondary factor since it controls the extent of temporary ponding.
iv Runoff amount is based solely on NRCS runoff class.



SANTA CLARA COUNTY PARKS

This map generated by the County of Santa Clara Department of Parks and Recreation. The GIS files were compiled from various sources. While deemed reliable, the Department assumes no liability.

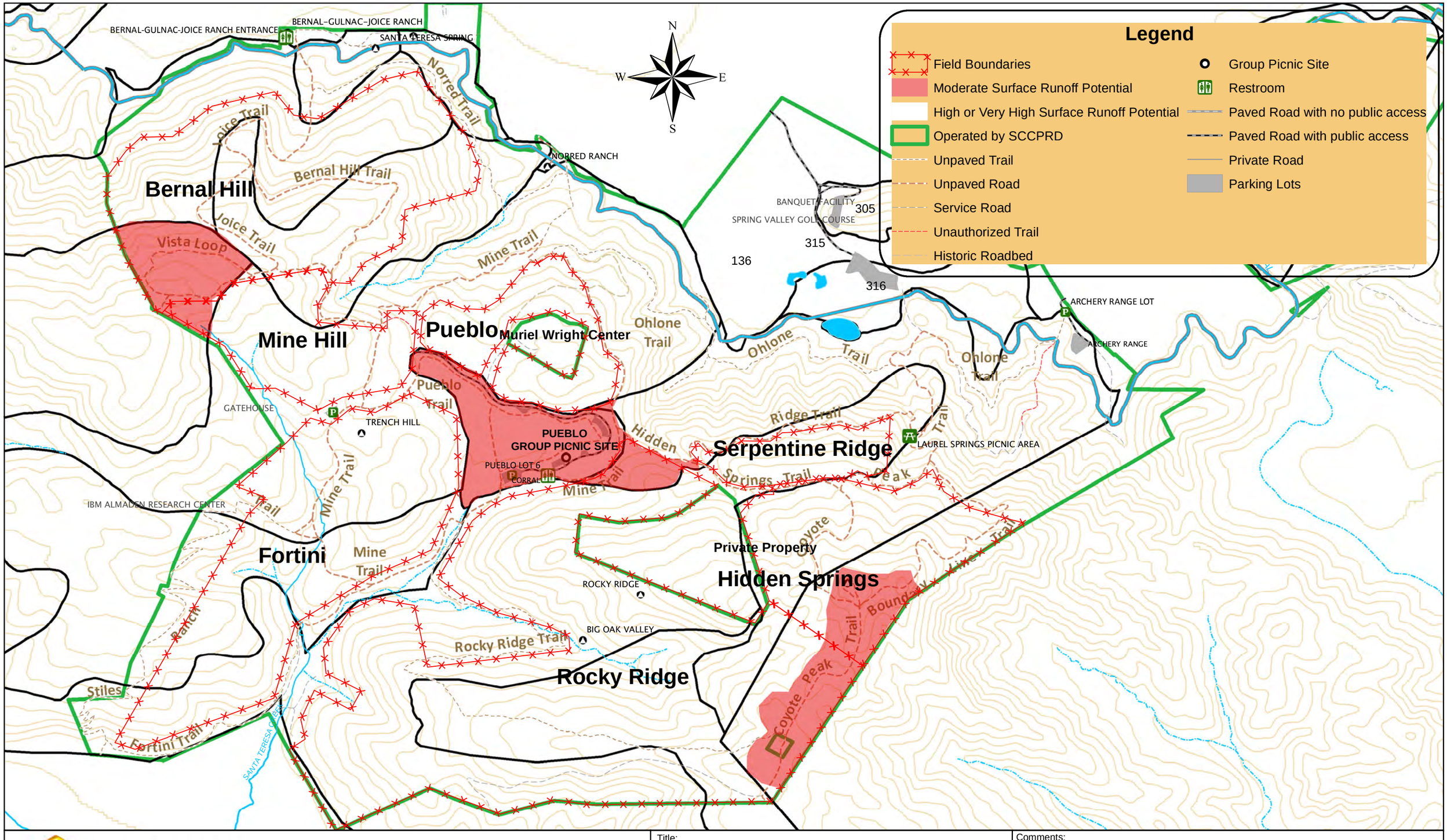
Title: Figure 12. Map of Soil Susceptibility to Surface Erosion or Compaction

Comments:

Date: August 24, 2011

Created By: DRocha

Scale:



SANTA CLARA COUNTY PARKS

This map generated by the County of Santa Clara Department of Parks and Recreation. The GIS files were compiled from various sources. While deemed reliable, the Department assumes no liability.

Title: Figure 13. Surface Runoff Potential Map

Comments:

Date: August 24, 2011

Created By: DRocha

Scale: 0 310 620 1,240 1,860 2,480 Feet

Poorly-managed cattle grazing operations can create soil erosion or otherwise degrade water quality through a number of different practices:

- Authorized or unauthorized vehicle travel routes to access grazing fields;
- Excessive grazing and the reduction of plant cover [i.e., residual dry matter (RDM) levels];
- Cattle trailing and the initiation of gully erosion, especially on steep slopes;
- Livestock trampling and physical disturbance of the soil surface in areas of concentrated use;
- Uncontrolled grazing in streamside areas;
- High density grazing in areas that generate high runoff; and
- Hoof traffic on compaction-sensitive soils when they are wet (compaction can kills plant, destroy soil structure, and create permanent bare areas [Singer 1997]).

4.7.2 Surface Water Drainage and Water Quality Risks

Water quality can be degraded not only by soil sediment and suspended soil particles, but also by fecal matter produced by cattle grazing. Contaminants from manure include bacteria, nitrogen, and phosphorous.

The Cryptosporidium protozoan is another potential contaminant of water. The Cryptosporidium protozoan is a pathogen that can be transmitted to other animals, including humans, by distribution in waters and ingestion of contaminated foods or other materials. The link between livestock and humans has not been clearly established, and could be derived from the feces of infected wildlife and humans (UCCE 1997). In an infected herd of cattle, only calves up to four months old shed Cryptosporidium in their feces, and older animals are not significant sources (Drake et al. 2001). The pathogen can be transported to water bodies mainly during the first few rainfall events of the year or during major storms (Tate et al. 2000).

Pathogens from the manure of young calves are a concern in well water and especially Almaden Lake where public swimming is allowed (E. R. Atwill, pers. comm. 2011). Calves under 6 months old at the Park during January and February rains would pose the highest pathogen risk. If wells are deeper than 100 feet, there is less of a concern for pathogen contamination because, as long as soils are tight and without fractures, pathogens will be filtered out; however, if there are fractures in the ground, well water could be contaminated. On the other hand, surface water flowing to Almaden Lake, if contaminated with pathogens, could cause a greater threat to human health due to existing public recreation and swimming uses at the City of San Jose regional park, especially to people with compromised immune systems.

4.8 Fire Hazards

Livestock grazing is the preferred method for reducing fire fuel loads, among the common methods. Mowing is expensive, can spark a wildfire, and is impractical in uneven terrain. Prescribed fire causes smoke pollution, can potentially escape to cause damage to property and human health, and is impractical for repeated treatment of large areas. Figure 9 displays a fire hazards map of the different habitats within Santa Teresa County Park.

Most grassland managers find the benefit of fire hazard reduction to be the primary incentive to employ grazing on their lands; however, grazing of annual grasslands at conventional levels has been shown to reduce the hazard of fuel loads and thus to alter the behavior of wildfires, but not to significantly reduce the risk of fire ignition and spread (Stechman 1983). Grazing to achieve fire hazard reduction objectives should occur during the wet seasons prior to the dry wildfire season, and at a high enough intensity to minimize the fuel load. Lower fuel loads are expected in serpentine grasslands (due to lower productivity and shorter herbaceous growing season); therefore grazing of fields with serpentine might require a shorter period of grazing or lower stocking rate than the fields without serpentine.

4.9 Infrastructure

Currently no functional grazing infrastructure exists at Santa Teresa County Park.

4.10 Cultural Resources

Various historic and cultural resources are present both within and immediately adjacent to Santa Teresa County Park. Most of these resources will not be affected by grazing because of their locations, outside of the targeted grazing fields. The historic Bernal-Gulnac-Joice (Santa Teresa) Rancho is located along the northeast boundary of the park and will not be affected by grazing. Structures associated with the Rosetto Ranch are not considered culturally significant. Many of the artifacts and petroglyphs of the pre-Columbian native peoples are located east of the existing park boundary, including the large settlement situated east of the Santa Teresa Golf Club, and will not be affected by cattle grazing.

The stacked stone wall located just upslope of Manila Drive and extending to beyond the park boundary to the southwest is sturdy, has existed in place for many decades under previous grazing regimes and will likely not be affected by grazing. Portions of the wall are located within one proposed grazing field. Because the wall is not a contiguous feature, it will not be necessary to remove sections of the wall to allow cattle to move freely. The small brick cooker associated with the defunct Bernal Mine is not located within a planned grazing field and will not be impacted by grazing in the Park.

4.11 Recreation and Neighboring Lands

Grazing on parklands yields many benefits for park users and neighbors. Generally, grazing results in the enhancement of habitats for native plant and wildlife species. In turn, grazing increases biodiversity and the potential for sightings of rare plants and animals and showier displays, thus enriching the experience of the park for park users and neighbors. Grazing plays a key role in fire management by reducing fire fuels, increasing safety as well as aesthetics for park users and neighbors. Grazing may also increase safety for park users through the reduction of rattlesnakes (Tito Patri & Associates 1992).

Potential impacts associated with the shared use of trails and roads for both livestock and recreation will be considered in this GMP, such as:

- park users may be fearful of cattle and avoid trails where cattle are present
- cattle may display behavior that are unfamiliar to the public
- horses may react unpredictably to cattle on trails
- loose dogs may chase cattle
- cattle may damage trail treads, and deposit manure on trail treads.

A well-designed GMP strives to minimize negative impacts on recreational park users and adjacent neighbors, through the regulation of grazing regimes and schedules. These concerns are addressed in Section 5.7.

4.12 Climate Change Effects

As the regional climate continues to change in the next few decades, the park is expected to be influenced by continuing shifts in the amount and timing of precipitation, with effects on soil moisture available for plants, runoff and ground water recharge, and sediment movement from the hillsides to the ponds and stream channels. Two climate models and predictions of climate change for Northern California are widely accepted by scientists (Suttle and Thomsen 2007). Both models predict increases in annual rainfall totals and rainfall event totals for Northern California, but the models differ in timing changes. In one model, the typical mid-winter rain-free period would decrease, thereby favoring the soil moisture environment for native grass and woody plant seedling establishment. This would potentially improve the native grass component of grasslands, increase shrub encroachment into grasslands, and increase oak regeneration. In the second model, the rainy season would be extended from spring into summer, thus potentially benefiting native grasses and summer annual forbs, including summer wildflowers and the pest plant yellow starthistle. Increased herbaceous and woody biomass growth in response to increased precipitation would increase the risk of fire hazards. More frequent drought years are predicted which, in combination with more intense rainfall events, would increase risks of soil erosion and decrease ground water levels.

In response to potential climate change, Park management should emphasize the maintenance of the fundamental rangeland health performance standards, including the amount of herbaceous ground cover at the start of the rainy season (Section 3). Grazing can be managed, particularly at areas designated for special management, to provide some control of increased shrub encroachment (Section 5.5.4) and pest plants (Section 5.5.5).

5 GRAZING MANAGEMENT SPECIFICATIONS

5.1 Grazing Management Overview

This section of the GMP defines the grazing management practices[12] necessary to achieve the objectives and performance standards listed in Section 3. Grazing management specifications include:

- Alternative grazing management scenarios;
- The planned grazing fields and management strategies;
- Grazing capacity, the livestock grazing period, and stocking rates;
- Additional management considerations, such as livestock distribution; grazing to control shrub encroachment, pest plant populations, and reduce fire hazards; as well as protection of soils and water;
- Public access, recreational use considerations, compatibility with adjacent neighbors; and
- Infrastructure requirements

This section of the GMP outlines the practices and considerations required to both achieve the desired conservation objectives and to sustain a livestock production. Grazing must be an effective and flexible management tool in order to address both of these elements. The intent of this GMP is to utilize grazing to optimize the primary characteristics of the grassland ecosystem that sustain special-status plants and wildlife, and in particular, the BCB. The grazing capacity assessment provides the baseline for expected herbaceous forage available for grazing and the appropriate stocking rates to obtain the desired rangeland conditions. The GMP defines a monitoring and adaptive management plan (Section 7) to ensure this plan is followed and its implementation is effective.

5.2 Alternative Grazing Management Scenarios

County of Santa Clara Department of Parks and Recreation will need to determine the type of livestock grazing operation to be used at Santa Teresa County Park, seasonal vs. year-round, and cow/calf vs. stocker[13]. These three types of livestock operations were compared in terms of achieving the Park's conservation objectives. The County Park staff initially preferred a cow/calf operation to a stocker operation because their experience is that cows and calves are more compatible than stockers in areas used for recreation; however, seasonal cattle grazing with stockers is more likely to achieve conservation goals while minimizing potential impacts to sensitive resources. The following discussion summarizes this assessment:

[12] The management practices described here encompass what are often referred to as "best management practices," plus related management and maintenance activities commonly accepted in the rangeland management profession as effective to achieve the conservation goals.

[13] No bulls will be allowed because of the increased risk of escape and conflicts with visitors or neighbors.

a. *Year-round cow/calf operation*. The potential for water development is limited at Santa Teresa Count Park; thus, the planned grazing fields do not have enough water to adequately supply cattle during a year-round grazing operation. In addition, the grazing fields were designed specifically for seasonal grazing in order to protect and enhance habitat for sensitive resources. This means a substantial portion of the streams were excluded, further limiting the amount of water available for livestock. A year-round operation would necessitate the purchase water from a domestic water supplier, adding an additional cost to the operation.

b. *Seasonal cow/calf operation*. There are several reasons why a seasonal cow/calf operation is not the preferred alternative. It would be difficult for a Livestock Operator to run a cow-calf operation on a seasonal lease/license at the Park because mother cows are retained for the entire year, and would need to be moved to a different property during the Park's off season. Cows with calves require more supplementary feeding because of the nursing calves.[14] Cows with calves distribute less thoroughly across a grazing field and graze less on steep hillsides than stockers. Additionally, there are water quality risks associated with calves, especially under 6 months old (refer to Section 4.7.2 and 5.6.3). If County Parks decides to graze calves under 6 months old at the Park, additional fencing will be needed to exclude calves from creeks and ponds. On the other hand, County Parks has experience with seasonal cow/calf operations at other parks, and has determined that this type of grazing operation is more compatible than a stocker operation in areas used for recreation. (See "c" below for additional reasons to use seasonal grazing as opposed to year-round grazing.)

c. *Seasonal stocker operation*. Cattle grazing could be managed to accomplish the conservation objectives during only 6 months each year. So a year-round operation is not required, and it could potentially negatively affect special resources such as water quality, summer flowering plants, riparian vegetation, and oak seedlings. A seasonal cattle grazing lease/license would be less controversial in terms of exposure of the cattle to the public, and would require less maintenance and lease/license management by County Parks. A seasonal stocker operation would have less public safety risk and greater flexibility than a seasonal or year-round cow-calf operation. Stocker cattle require less supplementary feeding and more thoroughly distribute the herbivory effects across a grazing field; however stocker cattle require stronger fences (or more fence maintenance) because of their exploratory behavior. The County of Santa Clara Parkland Range Management Policy (Section 3.f, County of Santa Clara 1992) indicated that it is preferable for parks with high visitation to use seasonal grazing to reduce livestock-visitor conflicts. Seasonal grazing is preferred for parks where forage or water is not adequate for a year-round operation or where seasonal grazing would improve protection of natural resources.

[14] Note that "supplementary feeding" refers to nutritional supplements, not replacement feeding. The latter is restricted due to the risks of introducing pest plants.

5.3 Grazing Management Areas

This GMP recommends that the Park's rangeland resources be divided into seven areas, thus establishing a set of grazing fields[15] sufficient for the key purposes related to grazing. Figure 14 is a map showing the planned grazing fields, their sizes (in acres), grazeable acres, and the amount of available forage expected during a normal weather year. The planned grazing fields are Rocky Ridge Field, Pueblo Field, Hidden Springs Field, Bernal Hill Field, Mine Hill Field, Serpentine Ridge Field, and Fortini Field. The boundaries of each field are defined in Section 5.3.1 below. No functional livestock fencing currently exists at Santa Teresa County Park, except at its perimeter with neighboring grazed lands. New livestock fencing will be installed to define the existing park uses from the grazing fields, as feasible.

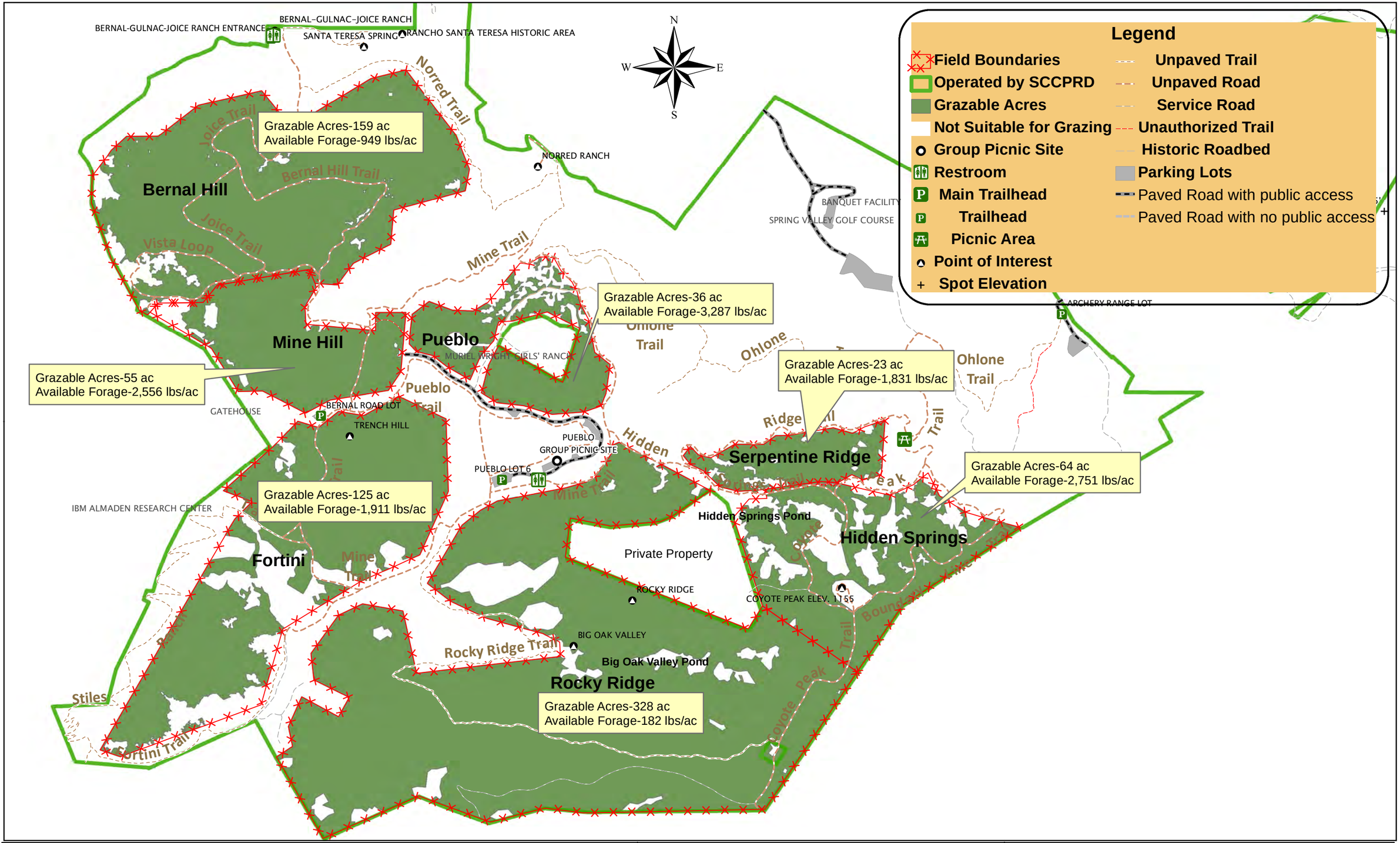
Further sub-division of the grazing fields is not planned at this time for the following reasons:

a. To minimize internal park fencing and interference with recreation activities;
b. To minimize costs for construction and maintenance;
c. While additional sub-division of grazing units would add some flexibility in livestock management, rotational grazing systems in annual grasslands would not necessarily prove beneficial (Heady 1961; Briske et al. 2008); less sub-division appears to be associated with more heterogeneity of grassland habitat, which is preferred for biodiversity maintenance (Fuhlendorf and Engle 2001).

The grazing fields generally include allowed grazeable areas of the park excluding those areas with poor forage value. Grazing fields were designed to exclude recreational trails, where possible, and thus avoid and/or minimize conflicts with park users. Lands on the north slope of the park, facing the dense residential areas, were excluded to reduce potential conflicts with the neighbors' viewshed. The area between the established grazing fields and the Santa Teresa Golf Club will not grazed because it is steep, mostly wooded, has low forage value, and does not contain serpentine BCB habitat. Excluding that area from grazing also provides a visual buffer between the designated grazing fields and associated cattle impacts, and the irrigated turf areas and adjacent homes, as well as the public who use that area.

The grazing fields are separated into three categories based on grazing management: Serpentine Habitat Fields (Rocky Ridge Field, Serpentine Ridge Field, and Bernal Hill Field), Wildlife Habitat Fields Fortini Field), and Auxiliary Fields (Pueblo Field, Hidden Springs Field, and Mine Hill Field). Serpentine Habitat Fields were designed to manage habitat for BCB and associated special-status animals and plants. These grazing fields contain the highest-priority habitat for management. Wildlife Habitat Fields were designed to manage habitat for special-status animals other than BCB, primarily raptors. These grazing fields contain the second highest priority habitat for management. Auxiliary Fields have the lowest priority habitat for management because they are less likely to be used by special-status species. In addition, Mine Hill and Pueblo Fields contain large areas where wet soils are a compaction risk, and thus will require additional management-- cattle will be moved out when the soils are very wet. The category assigned to each grazing field, along with the defined boundaries of each field, is described in Section 5.3.1 below. Management activities associated with each category of field are discussed further in Section 5.3.2.

[15] We generally use the term "Grazing Management Unit" or "GMU" to refer to an area that is managed as a discrete unit for livestock grazing. However, in this document we use the term "grazing field."



SANTA CLARA COUNTY PARKS

This map generated by the County of Santa Clara Department of Parks and Recreation. The GIS files were compiled from various sources. While deemed reliable, the Department assumes no liability.

Title: Figure 14. Grazing Capacity Map

Comments:

Date: August 24, 2011

Created By: DRocha

Scale: 0 270 540 1,080 1,620 2,160 Feet

County Parks will phase in grazing operations, to initiate grazing quickly and in consideration of the limited budget. County Parks applied for a USFWS grant to begin Phase 1 with construction of infrastructure for Rocky Ridge Field, Pueblo Field, and Hidden Springs Field. This subset of grazing fields is bigger (and thus more feasible to graze) than the other planned subset (Bernal Hill Field, Mine Hill Field, and Pueblo Field). Both subsets include high-priority BCB habitat (Serpentine Habitat Fields), an Auxiliary Field, and Pueblo Field. Because of its central location and size, Pueblo Field can be used as an additional Auxiliary Field and can accommodate a staging area for temporary corrals, watering facilities, livestock truck loading, parking, portable restroom, and turn-around, with all vehicle traffic areas of permeable baserock as needed). Such a staging area must be large enough to accommodate the maximum combined number of cattle and operators at the height of the grazing period during any periods of acclimation, weed or disease quarantine, health care, and shipping. The constructed area would need to occupy no more than about two acres on a temporary basis to accommodate the largest number of cattle expected (Section 5.4). The remainder of this field would be used for holding the cattle when not being processed. Prior to the start of the first grazing period, County Parks will need to determine an appropriate schedule for securing funding then planning, contracting, and developing the needed infrastructure and grazing leases/licenses. If County Parks receives the USFWS funds and determines that establishment of Phase 1 grazing fields are feasible, then work can begin for those grazing fields, concurrent with planning infrastructure development for Phase 2 grazing fields in subsequent years.

5.3.1 GRAZING FIELD BOUNDARIES

In this section the rationale behind the boundaries for each grazing field are outlined. Field size and fenced perimeter length estimates for each grazing field are shown in Table 13.

Table 13. Grazing Field Size and Fenced Perimeter Length Estimates[i], Santa Teresa County Park, Santa Clara County, CA.

Grazing Field	Size (acres)	Fenced Perimeter Length (feet)
Pueblo	45	10,600
Rocky Ridge	340	27,000
Fortini	156	13,400
Hidden Springs	83	8,350
Serpentine Ridge	25	6,500
Mine Hill	58	4,400
Bernal Hill	172	12,100

[i] These estimates were calculated by Daniel Clark, Parks Natural Resource Management Technician, Santa Clara County Parks in spreadsheet of infrastructure costs, dated September 28, 2010.

Pueblo Field (Auxiliary Field)

Pueblo Field is bounded on all sides by either existing roads or trails. In the center of this field, the Wright Center, a juvenile detention center, is excluded from the grazing operation. The northwest boundary of Pueblo Field is the high-traffic public road, Bernal Road. Its southern boundary is the park access road leading to the Pueblo Group Picnic Site.

Rocky Ridge Field (Serpentine Habitat Field)

The northeast boundary of Rocky Ridge Field is a private inholding. The southern and southeastern boundaries are the park's edge. The northwest boundary was pulled back from the creek to allow a buffer between the grazing field and the homes and water development in the Rosetto Ranch area. (Vegetated buffers to protect riparian and aquatic habitat are discussed further in Appendix E.) The west-central boundary excludes a portion of the creek and a series of springs to protect potential western pond turtle habitat. Fencing will be installed around Big Oak Valley Pond to manage for California red-legged frog habitat. Upper Big Oak Valley will be open to grazing.

Fortini Field (Wildlife Habitat Field)

The east boundary of Fortini Field was designed to exclude the busy Fortini Trail, and has little grazeable forage. It was not necessary to exclude the creek in the center of the grazing field because it was not identified as western pond turtle habitat. The Stile Ranch Trail to the east was excluded, as it contains scrub vegetation and is very steep. The north side of Fortini Field is bounded by the high-traffic public road, Bernal Road. The northeast side was designed to allow for an ungrazed vegetated buffer to protect the wetland to the north (see also Appendix E).

Hidden Springs Field (Auxiliary Field)

The eastern boundary of Hidden Springs Field is the park's edge. The southern boundary is the boundary with Rocky Ridge Field. The western boundary is adjacent to the private inholding. The north side of the field was designed to exclude roads and trails. Fencing will be installed around Hidden Springs Pond to manage for California red-legged frog habitat.

Serpentine Ridge Field (Serpentine Habitat Field)

Serpentine Ridge Field was designed to exclude the surrounding roads and trails to minimize conflicts with recreationists. The eastern boundary excludes a steep, wooded area that is not grazeable.

Mine Hill Field (Auxiliary Field)

The southern and eastern portions of Mine Hill Field are bounded by Bernal Road. The western boundary is the park boundary. The northern boundary was designed to exclude trails. The northeastern boundary excludes a steep canyon with scrub vegetation, a creek and the defunct Bernal Mine, thereby excluding features that are potentially hazardous to livestock. There is little forage value in that area. Fencing will be installed around Mine Hill Pond to manage for California red-legged frog habitat.

Bernal Hill Field (Serpentine Habitat Field)

The southern boundary of Bernal Hill Field is adjacent to Mine Hill Field. The western boundary is the park boundary. The northern boundary cuts across the lower flank of the hillside and was designed to concentrate grazing in the higher elevation area containing serpentine habitat and create an ungrazed visual buffer adjacent to the residential area. The northeastern boundary excludes Norred Trail to minimize impacts to Park users.

5.3.2 GRAZING FIELD TYPES BASED ON MANAGEMENT

There are two main types of special management areas identified within the park:

1) Fields to be grazed by cattle, including Habitat Fields and Auxiliary Fields; and
2) Areas to be excluded from grazing, such as recreational use areas, interpretive sites and historic/cultural resource areas; habitat for special-status species, sensitive natural communities, or other sensitive natural resource areas that could be adversely impacted by grazing; as well as areas that are potentially hazardous to cattle; including:

    a. Recreational trails (where possible) and other recreation sites, such as Pueblo Group Picnic Site;
    b. Steep and potentially unstable slopes (such as those crossed by Norred Trail in the northern portion of the Park) and potentially hazardous areas (such as the ravine and intermittent creek above Norred Ranch);
    c. Woodlands and forests on the north facing slopes above the golf club;
    d. Riparian zones (along the perennial portion of Santa Teresa Creek and the lower reaches of the tributary of Santa Teresa Creek in Big Oak Valley);
    e. Spring and seep area (on the south side of the tributary of Santa Teresa Creek in lower Big Oak Valley) and wetland (west of the Pueblo Group Picnic Site); and
    f. Vulnerable rare plant sites, notably those restricted to the riparian zones and, if found, rare fritillary sites.

Riparian Habitat, Springs and Seeps, Wetland, and Ponds

Grazing at Santa Teresa County Park will be managed to minimize or avoid negative impacts to both habitat quality and water quality (sedimentation or the introduction of pathogens and excessive nitrogen loads) of riparian habitat, springs, seeps, wetlands, and ponds. Grazing management strategies employed in this GMP are in accordance with recommendations made by the Stream Stewardship Unit of the Santa Clara Valley Water District to exclude cattle from perennial creek segments and the soft grassy areas upstream from those areas was to prevent damage to riparian vegetation. (B. Calhoun, per. comm. 2010). When complete, the Habitat Conservation Plan that is being developed for the County of Santa Clara may identify additional grazing restrictions related to water quality and the protection of riparian corridors (J. Reilly, pers. comm. 2011).

Much of the Santa Teresa creek system and the large wetland west of Pueblo Field (Figure 5) have been excluded from grazing in the planned grazing fields for the benefit of the sensitive natural communities and special-status wildlife species[16]. Exclusions of the main riparian areas from grazing will sustain riparian woodland and forest habitats and benefit special-status wildlife species such as western pond turtle, California tiger salamander, California red-legged frog, dusky-footed woodrat, and least Bell's vireo.

[16] The Santa Clara County Parkland Range Management Policy (Section 3.j, Santa Clara County 1992) states, "Appropriate fencing will be required to ensure the protection of sensitive natural resource areas such as springs and ponds and riparian habitats. Such fencing may not inhibit wildlife or human access to water." Section 3.q of the same policy states, "Public access to all park areas will be maintained."

Other creek segments, such as those in Fortini, Rocky Ridge, and Mine Hill Fields, will not be fenced, but will be monitored as a special resource (Section 7). The planned grazing prescription will generally benefit the riparian woodlands/forests and emergent freshwater wetlands by limiting the presence of grazing cattle to the winter and spring seasons, when cattle spend more time in the uplands consuming the relatively more nutritious green herbaceous forage of those seasons. A biological monitor will qualitatively evaluate riparian areas to which cattle have access, to ensure that no erosion, excessive trampling and/or herbivory problems arise. Habitat quality will be evaluated by the biological monitor. If damage occurs in the riparian area, exclosure[17] fencing might be required. Monitoring efforts will ensure that there are no impacts on special-status wildlife associated with unfenced riparian areas. The western pond turtle can likely tolerate spring seasonal grazing. Exclosures may be necessary to protect WPT adults, juveniles, and nest sites. The western pond turtle buffer exclosure should be between 100-500 feet from the edge of the stream.

With exclusion from grazing it is possible that pest plant populations may encroach upon ungrazed riparian borders. Making the riparian exclosures wide enough to function as separate "riparian pastures" with periodic pulse grazing to control pest plants could be effective. Non-grazing means to control pest plant infestations within riparian exclosures should be investigated further before investing in exclosure fencing and related special management. If fenced exclosures are determined to be promising, then a cautious approach should be taken with an experimental exclosure of a small part of one riparian segment, followed by long-term monitoring to determine effectiveness.

Springs that are developed and used as livestock watering sources will be fenced. In addition, many springs identified in the Hydrology Map (Figure 11) are excluded from grazing by the configurations of the field boundaries, e.g. the large group of springs east of Big Oak Valley Pond. Stock ponds will be partially excluded from grazing, which will reduce cattle impact while maintaining public access. Partial grazing of pond sites will benefit (through reduction of dense vegetation) and minimize harm to the California tiger salamander and California red-legged frog, and avoid harm to the tricolored blackbird. Grazing practices around ponds are discussed in more detail in Section 5.7.3.

Oak Forest and Woodland

Most sites in the park that support oak forests and woodlands will not be included in the planned grazing fields. Where oaks occur within the grazing fields, they will not be excluded or managed separately, but will be monitored as a special resource (Section 7). The planned grazing prescription will generally benefit oak populations.

Serpentine Habitat Fields

Serpentine Habitat Fields generally correspond to serpentine substrates that are considered to have the highest potential for re-colonization by BCB. Grazing to reduce non-native herbaceous competition in the serpentine grasslands generally benefits BCB by promoting host plants, including California plantain. Serpentine Habitat Fields will be managed to expand potential BCB habitat as much as feasible. Grazing generally benefits the special-status plants associated with serpentine grasslands. Serpentine grasslands have an inherent low productivity. Atmospheric nitrogen deposition associated with air pollution has led to recent, dramatic increases in available nitrogen in serpentine habitats, and consequent dramatic increases in colonization of serpentine habitats by Italian ryegrass, overall herbaceous production and

[17] The term "exclosure" is commonly used by rangeland managers for a fenced area from which livestock are excluded; opposite of enclosure.

resulting competition with native plants (Weiss 1999). Serpentine grassland has a different growing season than the typical California annual grassland, ending earlier than adjacent grasslands on non-serpentine substrates. The Serpentine Habitat Fields were separated from the Auxiliary Fields in order to address these productivity and timing issues, as well as to manage grazing effects more precisely for BCB habitat. To enhance for the BCB, the serpentine grassland areas (SRO #1 - #4 in Figure 6) require winter-spring grazing. Smaller serpentine outcrops located in other portions of the Park that are dominated by annual grasslands may also benefit from a similar grazing schedule.

Lands adjacent to the Park possess serpentine substrates and thus have the potential to support BCB. Because the butterfly can disperse several kilometers and has a home range of dozens to hundreds of acres, it requires larger serpentine grassland patches to support a self-sustaining population. The chances of re-establishment of a self-sustaining population of BCB at Santa Teresa County Park would likely improve if adjacent lands were managed to enhance potential habitat as well. The properties neighboring Serpentine Habitat Fields (SRO #1 and #3- See Figure 6) and the private inholding north of Rocky Ridge Field possess potential BCB habitat. Lands to the east of the Park support low quality potential BCB habitat, but perhaps could be improved with the proper grazing regime. Even under the best of circumstances, Santa Teresa County Park by itself may not have enough high quality serpentine grassland habitat to support a self-sustaining population of the BCB but, according to USFWS (1998), may serve as a metapopulation dispersal location for existing BCB at Coyote Ridge. Cooperation with the owners of adjacent serpentine properties for the management of potential BCB habitat will greatly increase the potential of successful long-term maintenance of a population at Santa Teresa County Park.

It is likely that other special-status invertebrates occur in the serpentine habitat fields. In order to assess positive and negative potential impacts of the prescribed grazing regime on these invertebrates, additional information is required. We need to know where each species occurs and the existing habitat conditions. For example, since the harvestmen live in the soil, soil compaction caused by the cattle hooves may be detrimental to them. The management plan could incorporate distribution information in order to determine locations for water troughs, salt licks, feeding stations, etc. and thus minimize adverse effects. County Parks would need to conduct surveys for the other special-status invertebrates species and incorporate those findings into the GMP at a later date.

Serpentine Habitat Fields are likely to support stands of native grasses and wildflowers. Research on the use of grazing to enhance grasslands for native grasses and wildflowers through the reduction of non-native herbaceous competition has produced varied conclusions. In view of the uncertainty of relevant research results, it would be prudent to use grazing management to achieve a heterogeneous pattern—some patches grazed more and some less. Such grazing would favor a diversity of conditions, including those more favorable to expansion and persistence of native grasses and wildflowers (Fuhlendorf and Engle 2001). Extensive grazing of large pastures with the livestock dispersed for the entire grazing period will be more effective at producing such heterogeneity than would higher intensity rotational grazing of smaller pastures. This management strategy has the advantage of requiring fewer controls (fencing and gates) and imposing fewer restrictions on public access. Sites of native grass and wildflower stands will not be excluded or managed separately, but will be monitored as a special resource (Section 7). The grazing prescription described here will generally benefit the native grass and wildflower populations.

Wildlife Habitat Fields

Wildlife Habitat Fields were designated as such primarily for the raptors which are known to use the grasslands for hunting. The Wildlife Habitat Fields can be managed in a similar manner as the Serpentine Habitat Fields, by increasing or decreasing cattle numbers depending on the weather and habitat conditions; however, these fields will have lower priority for precise habitat management. Cattle can be moved between the Wildlife Habitat Fields and the Auxiliary Fields to meet the performance standards for the Wildlife Habitat Fields. Grazing to reduce herbaceous cover and increase the heterogeneity of the landscape will improve wildlife opportunities for foraging and movement, and benefit the ground squirrel and other small mammals. Small mammals provide a prey base for other wildlife species while their burrows provide upland, refuge, and denning habitat for a variety of wildlife species.

The grasslands provide potential habitat for ground nesting birds (northern harrier, western burrowing owl, and grasshopper sparrow). If mating or nesting behavior is observed in a grazing field (most likely a Wildlife Habitat Field), cattle will be excluded from the area with temporary fencing.

Wildlife Habitat Fields may support native grasses and wildflowers, if competition with herbaceous non-natives is sufficiently reduced. Wildlife Habitat Fields can be managed for enhancement of native grasses and wildflowers as described above for Serpentine Habitat Fields.

Auxiliary Grazing Fields

This Grazing Management Plan includes some Auxiliary Fields of significant sizes to allow careful grazing management of the Serpentine Habitat Fields. Additional cattle can be moved from the Serpentine Habitat Fields to Auxilliary Fields on short notice when the forage drops below-normal, or when management performance standards have been met (as determined through monitoring). Conversely, additional cattle can be moved from the Auxiliary Fields to the Serpentine Habitat Fields on short notice when the forage is above-normal, or management performance standards won't be met without an increase in stocking rate. Because it can be difficult and time consuming to bring additional animals to or remove animals from the Park, having multiple grazing fields will allow for more effective management.

Auxiliary Fields will be used depending on precipitation/production. In a high production year, Auxiliary Fields might not be used at all (if all cattle are needed in the Serpentine Habitat Fields to obtain performance standards). In a normal precipitation/production year, gates between Auxiliary Fields and their adjacent grazing fields can be left open so cattle can move freely between grazing fields. Auxiliary Fields will probably be most heavily used during low production years when cattle are excluded from the Serpentine Habitat Fields and, possibly, from the Wildlife Habitat Fields. The Auxiliary Fields will also be used for calving, as needed. Fall calving will typically be August through November. In addition to being an Auxiliary Field, because of its central location, Pueblo Field will be used as an operation staging area that can accommodate the Livestock Operator's truck for parking and turning around. This grazing field will be used to quarantine cattle for a short period if they are coming to the Park from an area with pest plant species of concern at the Park and if deemed necessary by Park staff. Because of these multiple uses, this grazing field may be grazed to less than optimal conditions including occasional heavy use (such as during drought years), and it may be underutilized during some years (above normal production years). Typical livestock operations in California annual grasslands show impact areas associated with livestock operations. These are referred to as "service areas" and are generally considered necessary and acceptable as long as their locations are planned and monitored to address any water quality, erosion, and high public visibility or other issues.

Management Standards

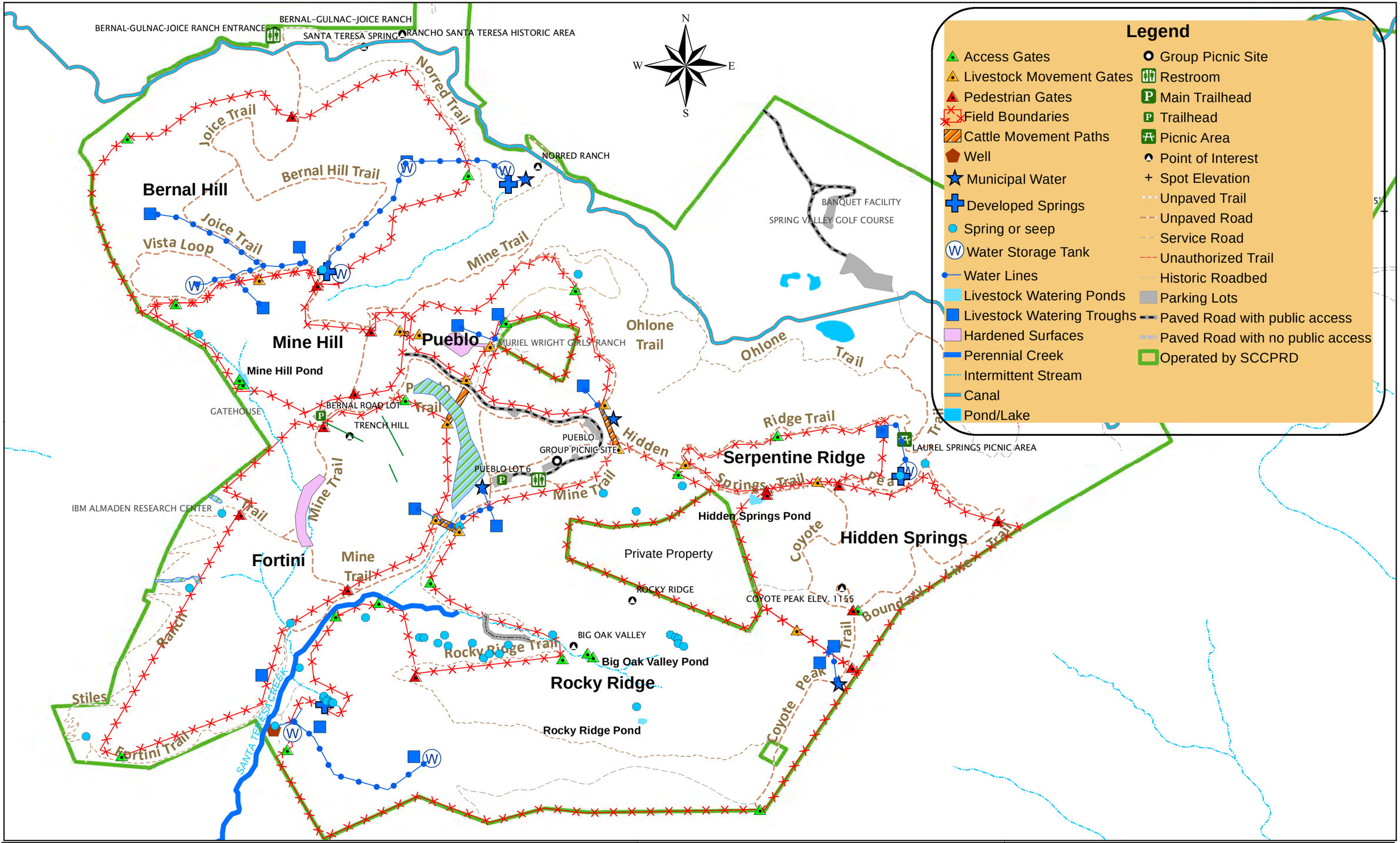
The objectives and performance standards identified in Table 7 focus primarily on Habitat Fields (Serpentine and Wildlife Fields). These standards may be exceeded at times in Auxiliary Fields since the Auxiliary Fields were designed to be used as needed (potentially more or less stocking rates and lengths of time than the Habitat Fields) and do not contain primary habitat for special-status resources. However, management of Auxiliary Fields will at least comply with the goal, objective, and associated performance standard (PS 2) related to maintaining the health of the rangeland ecosystem.

5.3.3 CATTLE MOVEMENT

Table 14 summarizes a timeframe of alternative management actions for the movement of cattle between the grazing fields, based on grassland conditions, and notes some associated risks. The Bernal Hill and Mine Hill Fields are adjacent to each other as are the Hidden Springs and Rocky Ridge Fields. Typically, during a normal precipitation year, the gates can be left open between the adjacent Serpentine and Auxiliary grazing fields to allow free movement of cattle. Some grazing fields are not directly adjacent to each other (due to roads and trails). The gates that allow access into these non-adjacent fields will be kept closed except when moving cattle from one grazing field to the other. The cattle crossings between non-adjacent grazing fields must be supervised and follow the designated movement paths (Figure 15). Wherever feasible, gates will be installed within the interior fencing to allow cattle movement between fields without using park trails. Cattle will be moved to the non-adjacent grazing fields when appropriate to meet management performance standards. Some of these supervised cattle crossings will be across creeks. The supervised cattle crossings will be quick and minimize potential damage to the creek and riparian areas as well as to minimize potential recreational impacts.

Table 14. Cattle Movement Schedule and Associated Risks, Santa Teresa County Park, Santa Clara County, CA.

Time	Grassland Conditions	Actions	Risks
Fall Months prior to start of growing season; normal start of grazing period	Weather conditions dry; annual plants dead and dry	If necessary, cattle may be present and grazing may occur only in Auxiliary Fields	Damage to riparian vegetation, woody seedlings and saplings, or native grasses
December - February beginning of growing season	Weather mostly cool and wet, but predictions uncertain for remainder of growing season	Start with number of cattle appropriate for a normal precipitation year in all grazing fields	Damage to riparian vegetation, woody seedlings and saplings, or native grasses if forage growth is low
		Start with all gates open so cattle have access to all grazeable areas, except designated exclusion areas; close gates if necessary to adjust stocking numbers	
	Weather very wet	Remove all cattle from Mine Hill and Pueblo Fields (to Hidden Springs Field only) temporarily when soils are very wet	Compaction of vulnerable soils during wet periods
March - April beginning of rapid spring growth period through growing season	If production is low	Reduce cattle numbers, remove cattle entirely, or remove cattle early from Serpentine Habitat Fields, and move to Wildlife Habitat Fields and/or Auxiliary Fields	Auxiliary Fields might appear to be over-utilized, but this is necessary to optimally manage Serpentine Habitat Fields
	If production is normal	Leave gates open and monitor grazing fields to make sure Serpentine Habitat Fields are grazed to optimum degree	None
	If production is high	Increase cattle numbers, add all cattle, or gradually increase cattle numbers in Serpentine Habitat Fields.	Auxiliary Fields might appear to be under-utilized, but this is necessary to optimally manage Serpentine Habitat Fields
	Weather very wet	Remove all cattle from Mine Hill and Pueblo Fields (to other fields) temporarily when soils are very wet	Compaction of vulnerable soils during wet periods
May - September end of growing season through summer	Weather dry and annual plants dead and dry	If necessary, cattle may be present and grazing may occur only in Auxiliary Fields	Damage to riparian vegetation, woody seedlings and saplings, or native grasses if little herbaceous forage
		If necessary to control pest plants or perform other conservation “service,” grazing period may be extended and cattle used only in defined concentration areas of Serpentine Habitat Fields	



Legend

- Access Gates
- Livestock Movement Gates
- Pedestrian Gates
- Field Boundaries
- Cattle Movement Paths
- Well
- Municipal Water
- Developed Springs
- Spring or seep
- Water Storage Tank
- Water Lines
- Livestock Watering Ponds
- Livestock Watering Troughs
- Hardened Surfaces
- Perennial Creek
- Intermittent Stream
- Canal
- Pond/Lake
- Group Picnic Site
- Restroom
- Main Trailhead
- Trailhead
- Picnic Area
- Point of Interest
- Spot Elevation
- Unpaved Trail
- Unpaved Road
- Service Road
- Unauthorized Trail
- Historic Roadbed
- Parking Lots
- Paved Road with public access
- Paved Road with no public access
- Operated by SCCPRD

SANTA CLARA COUNTY PARKS

This map generated by the County of Santa Clara Department of Parks and Recreation. The GIS files were compiled from various sources. While deemed reliable, the Department assumes no liability.

Title: Figure 15. Livestock Infrastructure Map

Comments:

Date: August 24, 2011

Created By: DRocha

Scale: 0 270 540 1,080 1,620 2,160 Feet

5.4 Grazing Capacity

Grazing capacity is a term equivalent to "carrying capacity," and is used by rangeland ecologists and managers to estimate the maximum number of livestock and months to be grazed during a given year to avoid damage and sustain vegetation and related resources. The production estimates of the Park's grazing capacity were based on the mapping of vegetation types and soils, and the measurements of their average forage production. Estimates of forage available for livestock were then extrapolated from the Soil Conservation Service (SCS) soil types and production estimates (SCS 1974). County Park staff provided a GIS soils layer (digitized from a hard copy) and associated map unit data. While there is no metadata for that GIS layer and associated map unit data, the data were based on a combination of the 1968 and 1974 soil surveys. The map unit symbols provided by County Park staff were used and cross referenced with the Soil Survey of Eastern Santa Clara Area, California (SCS 1974) to determine range sites and the related forage production values. However, the 1974 soil survey did not have production values for all soil types identified in the Park data. Therefore, herbaceous vegetation was clipped and weighed for the "missing" soil types identified during a site visit on 18 April 2010. Additionally, some map unit symbols identified in the Park GIS soils layer were not found in the 1974 soil survey. Those map unit symbols and names were found in the Soils of Santa Clara County (SCS 1968).

The stocking rate recommendations shown below (Tables 15 – 17)[18] are conservative and must be applied with flexibility due to the variable and unpredictable nature of California's weather, which dramatically affects herbaceous plant growth patterns. It will be necessary for County Parks and the eventual Livestock Operator to make adjustments to the stocking rates each year to meet park objectives and performance standards based on their experience and each year's weather predictions.

Table 15 shows the expected forage production in the grazeable parts of the park, identified by planned grazing field name. The grazeable acreages were determined by subtracting from the area of each grazing field the small percentage of area occupied by un-vegetated trails and roads, as well as forest and chaparral communities.

Table 15. Grazeable Acres and Expected Rangeland Forage Production by Weather Year[i], Santa Teresa County Park, Santa Clara County, CA.

	Planned Grazing Fields						
	Bernal Hill	**Fortini**	**Hidden Springs**	**Mine Hill**	**Pueblo**	**Rocky Ridge**	**Serpentine Ridge**
Potentially Grazeable Acres	159	125	64	55	36	328	23
Rangeland Forage Production (Lbs.)							
Drier (Unfavorable) Weather Year	200,774	228,633	153,924	121,085	97,019	266,801	42,917
Normal Weather Year	328,287	366,189	249,144	193,042	154,511	422,222	70,324
Wetter (Favorable) Weather Year	447,306	501,610	343,940	265,000	212,004	577,268	95,660

[i] "Weather years" are terms used by the NRCS and rangeland managers to describe the variation in the combination of precipitation and temperatures experienced by grassland plants during the growing season that affect germination and the production of biomass. A normal weather year corresponds to the average precipitation and temperatures; unfavorable weather years are significantly drier and colder; favorable weather years are significantly wetter and warmer.

[18] The complete grazing capacity spreadsheet, which was used to produces these tables, is available upon request.

Estimates of forage production and forage available for grazing during drier, normal, and wetter years at the park are shown in Table 16. These estimates represent the expected forage production minus the minimum RDM[19] to be left ungrazed, predicted summer decomposition,[20] potential wildlife utilization, and livestock trampling losses.

Table 16. Forage Available by Weather Year, Santa Teresa County Park, Santa Clara County, CA.

	Bernal Hill	Fortini	Hidden Springs	Mine Hill	Pueblo	Rocky Ridge	Serpentine Ridge
RDM Standard (Lbs/acre)	900-1600	900-1600	900-1600	900-1600	900-1600	900-1600	900-1600
Deduction[i] (Total Lbs)	177,410	128,201	72,478	53,734	36,398	362,531	28,374
Forage Available (Lbs) ***Animal Unit Months (AUMs)***							
Drier (Unfavorable) Weather Year							
Forage Available	23,364	100,432	81,445	67,351	60,620	0	14,543
AUMs	*23*	*100*	*81*	*67*	*61*	*0*	*15*
Normal Weather Year							
Forage Available	150,877	237,987	176,666	139,309	118,113	59,690	41,951
AUMs	*151*	*238*	*177*	*139*	*118*	*60*	*42*
Wetter (Favorable) Weather Year							
Forage Available	269,897	373,409	271,461	211,266	175,606	214,736	67,287
AUMs	*270*	*373*	*271*	*211*	*176*	*215*	*67*

[i] For Autumn RDM, plus 36% of RDM for Summer Decomposition, Wildlife Utilization, and Trampling

[19] RDM refers to the dry mass (and height) of plant matter left on the ground from previous growth before the start of the next winter growing season (September/October). The amount and species of forage that is produced in a growing season is largely dependent on the environment of soil and RDM during the previous late autumn. This affects seed germination and seedling growth, and will be optimized under the indicated range of herbaceous mass and height. The RDM standards are based on Bartolome et al. (2006).

[20] Refer to Frost, Bartolome, and Churches (2005); Decomposition of dry herbaceous biomass during the summer and fall occurs at the rate of about 7% per month. Compounding that decomposition rate plus 1 % (total 8%) for the other factors for four months (June through September) would result in about 36% additional herbaceous biomass. Therefore, those percentages more of residual biomass should be added to the recommended RDM level at the end of the grazing period.

The recommended initial stocking rates were based on the amount of forage available for grazing (after deduction of the recommended RDM, summer decomposition, wildlife utilization, and livestock trampling loss), and calculated from the number of pounds of forage to be consumed by the livestock per month. The number of Animal Units (AUs) to be grazed for a given grazing period can be calculated by dividing the Animal Unit Months[21] (AUMs) by the number of months in the grazing period, then adjusting for varying stocking schedules. That number would be less for a single steer; so it should be calculated on a per animal basis, and adjusted with experience to achieve the objectives and performance standards adopted by this GMP (Section 3).

Estimates of the potential maximum stocking rates to achieve the desired degree of forage utilization from the forage available during drier, normal, and wetter years at the park are shown in Table 17.

Table 17. Initial Stocking Rate Estimates (numbers of 1000 lb. cattle grazing for 6 months and 10 months) by Weather Year, Santa Teresa County Park, Santa Clara County, CA.

Number of 1000 lb. Cattle Grazing for 6 Months	Bernal Hill	Fortini	Hidden Springs	Mine Hill	Pueblo	Rocky Ridge	Serpentine Ridge	Total
Drier (Unfavorable) Weather Year	4	17	14	11	10	0	2	58
Normal Weather Year	25	40	29	23	20	10	7	154
Wetter (Favorable) Weather Year	45	62	45	35	29	36	11	263

Number of 1000 lb. Cattle Grazing for 10 months	Bernal Hill	Fortini	Hidden Springs	Mine Hill	Pueblo	Rocky Ridge	Serpentine Ridge	Total
Drier (Unfavorable) Weather Year	2	10	8	7	6	0	1	34
Normal Weather Year	15	24	18	14	12	6	4	93
Wetter (Favorable) Weather Year	27	37	27	21	18	21	7	158

Note that these calculations predict there will be no forage available for grazing in Rocky Ridge Field during drier (unfavorable) weather years for both the 6-month and 10-month grazing period—due to the lower productivity of serpentine soils in that field. The cattle stocking rate for six months of grazing during normal weather years at the park are listed in Table 17. For a 6-month grazing period, this translates to between 2 and 6 acres/AU for all the grazing fields (except for Rocky Ridge), which is a relatively normal rate for typical dry California annual rangeland. The typical grazing period will be 6 months (December 1 through May 31). However, if a cow/calf operator needs to bring animals to the park before the calves are born, the grazing period could begin as early as August, and be restricted to the Auxiliary Fields, allowing a 10-month grazing period. Section 5.2 summarizes alternative grazing management scenarios. Monitoring results will indicate any needed adjustments.

[21] An Animal Unit Month (AUM) refers to the standard of 1000 lbs. of forage, which is the amount of forage normally consumed by a 1000 lbs. cow, with or without her unweaned calf, in one month; thus the AUM standard for such a cow is 1.0.

5.5 Grazing Management/Maintenance Prescriptions

5.5.1 The Livestock Grazing Period and its Adjustment

The grazing period should be as short as feasible for four reasons:

- To limit the time period in which negative effects of grazing may occur;
- To minimize grazing during the time periods with a higher potential for negative effects;
- To address public concerns related to livestock grazing; and
- To avoid or minimize the potential for conflict between cattle and recreationists at this heavily used park.

Livestock grazing is the most feasible tool available to achieve the conservation objectives associated with fire hazard reduction and the enhancement of habitat for special-status species. Where ungrazed and during above-normal weather years, the non-native grasses and forbs grow tall and dense, dominating the grasslands and woodlands of the park and degrading habitat and/or potential habitat for the BCB and other special-status animals, special-status plants, wetlands, riparian woodlands, native perennial grasslands, and oaks. To reduce the herbaceous height, density, and biomass of non-native grasses and forbs, grazing will occur mainly during the herbaceous growing seasons of winter and spring. Grazing will be avoided during other seasons because of the increased likelihood that grazing would harm native riparian and oak woodland woody plants, excessively remove herbaceous forage, damage riparian areas and wetlands, or cause soil erosion.

Under ideal circumstances the grazing period will begin December 1 and end May 31. This will be the most effective period to reduce herbaceous height and mass, and minimize conflicts with recreational activities. Extensions of this grazing period may be beneficial when the non-native annual growing season is extended by late spring precipitation, or if pest plants expand their current infestations, and other non-grazing control efforts are not effective. If the Livestock Operator prefers to bring the cattle to the Park before December 1 (and it meets County Parks' annual goals and objectives), the Auxiliary Fields may be used. For a cow/calf operation this early introduction of cattle to the Park may be necessary, in order to have cattle on site before the calves are born. Under this circumstance, the grazing period could begin as early as August, allowing a 10 month grazing period. Note that there are water quality risks associated with bringing in calves under 6 months; if this type of operation is selected, additional riparian and pond fencing will likely be necessary. In cases where an early start is required and approved and during below-normal or late precipitation years, replacement feeding[22] might be necessary if sufficient natural forage is not available in the fields. County Parks does not permit such replacement feeding of livestock due to the risk of introducing pest plants. Therefore, any arrangement to use replacement feed may be approved on a per-occurrence basis only, and will be restricted to the Pueblo Field only, and monitored by both the Livestock Operator and Park Managers to detect and control any introductions of pest plants.

[22] Replacement feed is hay or other feed imported to the grazing field to support the grazing livestock when natural feed is unavailable in sufficient quantity or quality to provide for the livestock's basic nutritional needs. This is distinguished from "supplements" or "supplemental feed," which refers to specialized feed with particular nutrients that correct deficiencies in the available diet of the livestock.

Park staff, in consultation with the Livestock Operator, will determine range readiness (when the land is ready for grazing to begin for the season). This is when there is adequate RDM and/or green herbaceous forage to support the herd and protect soil from erosion (Brady and Associates, Inc. 1996, Appendix I Range Analysis). If cover and forage are insufficient at the expected turn-on date, then the cattle may be held in Pueblo Field and provided replacement feed as necessary until adequate forage is available.

The preferred grazing period is seasonal during the winter through late spring (six months) under normal circumstances. The normal grazing period will be somewhat flexible in start and end dates to accommodate cases of unusual weather, unpredicted loss of forage (drier than normal year, wildfire, etc.), unusually excessive forage, or otherwise to meet the objectives and performance standards defined in Section 3. The grazing period will be adaptable to meet special objectives in special areas, such as to control infestations of pest plants or to enhance stands of native plants by extending or shortening the grazing period, by concentrating grazing effects within temporary enclosures, or to experiment with other grazing regimes. The winter through late spring grazing period will be most effective in achieving conservation goals, and in avoiding high-priority impacts. Minimum and maximum standards of herbaceous height, mass, cover and other measures will apply to all grazing fields to achieve the objectives and performance standards. The performance standards will be met to the extent feasible by using non-fencing means to improve livestock distribution, such as mineral licks, herding, or other means (Section 5.5.3).

This grazing period begins after the non-native herbaceous forage commences with slower winter growth, but before the beginning of rapid spring growth. It ends after the shift from live green to dead dry annual grass and grass seed set, the time that annual grass normally stops growing. This corresponds to the period when grazing is required to control herbaceous growth in order to enhance habitat conditions for the BCB and associated special-status species. The starting date was set to delay grazing until after the early winter period, when riparian zones, wetlands, and wet soils are most vulnerable to impacts. During the spring, the relatively more nutritious and green herbaceous forage normally attracts grazing animals to the higher elevations, and away from the valley bottoms and riparian zones. At this time, the nutritious green grass is preferred over woody forage, and can be grazed intensively prior to elongation of inflorescences of native grasses and forbs. Focusing the grazing on the spring season will favor wildflowers, native grasses, and oak seedlings and saplings in competition with non-native annual grasses; in addition spring grazing will minimize fire hazards before the dangerous summer and fall dry seasons. Reduction of thatch associated with spring grazing enhances habitat conditions for native plants and sensitive plant and wildlife species. The grazing season ending date may be extended somewhat in defined locations to inhibit yellow starthistle growth, and thus avoid the potential favoring of yellow starthistle associated with earlier termination of grazing. Suspension of grazing during the summer and fall months will reduce the impacts of grazing on oaks, riparian, and wetland plants, when grazing animals often prefer woody browse and wetland plants because of the relatively higher nutritional value.

The grazing standard will be managed to maintain a mean herbaceous height between 2 and 10 inches, year long. In addition, RDM standards will be maintained, in accordance with the Santa Clara County Parkland Range Management Policy (Section 3.h, Santa Clara County 1992), at 600 lbs./acre (slopes that are less than 30%), 800 lbs./acre (30% to 50% slopes), and 1000 lbs./acre (slopes that are greater than 50%).[23] The same policy stated these RDM standards equal a vegetation height of approximately 4 to 6 inches. A maximum herbaceous height of 14 inches would be acceptable for short periods during the growing season, if necessary for feasibility of the livestock operation or due to excessive spring growth. Grazing only in the spring will maintain the prescribed range of herbaceous height and mass levels year-long. The livestock operation will maintain a mean absolute foliar cover of all herbaceous species (forage and non-forage) combined at 70% or greater year-long.

The minimum height and mass performance standards are required to achieve optimum forage production and good rangeland ecological condition in California annual grassland after moderate grazing. The upper end of the height range (10 inches [or 14 inches if necessary for short periods]) should not be exceeded because doing so would result in degradation of future forage quality and production, and in excess fire hazard.[24] The prescribed stocking rates and schedule should keep the herbaceous height closer to the lower limit of the range by the end of the grazing period in years of normal precipitation. The consequences of below-normal precipitation are discussed below.

5.5.2 Initial Livestock Stocking Rates and Adjustments

The normal stocking rate for each grazing field during the six-month grazing period is based on the estimated number of pounds of forage available in a normal year (Section 5.4). An appropriate stocking rate must be calculated for the size and age of the class of cattle.[25] Each type of animal will be included separately in a stocking rate formula based on their equivalent forage requirements by age categories, and substituted accordingly. During the spring months, green grass will likely grow faster than the livestock consume it, and heights will be at (or temporarily exceed) the high end of the optimal range. It will be County Parks's and the Livestock Operator's joint responsibilities to discuss and determine increases or decreases in the number of livestock, to achieve the objectives and performance standards in each grazing field each year.

When the weather predictions indicate a normal year and normal forage production, the normal stocking rates will be utilized. Such predictions can be made with reasonable precision in the late winter.

---

[23] The herbaceous height range prescribed here is the height of Residual Dry Matter (RDM) expected under moderate grazing conditions and best range management practices. RDM refers to the dry mass (and height) of plant matter left on the ground from previous growth before the start of the next winter growing season. It can be measured by visual estimation or by clipping and weighing (Wildland Solutions 2008). The amount and species of forage that is produced in a growing season is largely dependent upon the environment of soil and RDM during the previous late autumn. This environment affects seed germination and seedling growth, and will be optimized under the indicated range of herbaceous height. These RDM standards are based on the relevant annual grassland standard for moderate slopes developed by the University of California Division of Agriculture and Natural Resources (Bartolome, Frost, and McDougald 2006).

[24] The effect of such herbaceous heights on forage production at sites with moderate precipitation is variable, but can decrease forage production the following year (Bartolome, Stroud, and Heady 1980). That result would not be detrimental in this situation. Such flexibility is needed for feasibility of the planned grazing operation.

[25] Animal Unit Equivalents (AUEs) are the weights of an animal as percentages of the weight of a mature cow (1000 lbs.). In this case, the AUEs for stockers should be based on their weights at selected ages or times, e.g. a 200 lbs. calf would be a 20% AUE. The AUEs for yearling stocker steers would be 75% (Holechek, Pieper, and Herbel 1989:195). For example, using 10 AUs as the base, the AUE stocking rate for 750 lbs. stocker steers would be 13 steers [10 AU / (0.75 AU/steer) = 13.33 steers], which means that 13 steers are equivalent to 10 cows.

Planned stocking rates can be reduced to appropriate levels when a substantial deficit of forage is predicted. When a substantial forage deficit occurs, but was not predicted, the stocking rates may be reduced within no less than one month period of time, per the License requirements.

When a wetter year is predicted or occurs, and forage production exceeds the normal amounts, temporary increases in the stocking rates can make use of the excess forage during the forage growing season. This will be considered an exceptional circumstance and response, which will benefit conservation at the park. Monitoring will determine whether the increased rates should continue.

Rest from grazing is not a critical requirement in well-managed healthy California annual grasslands. In a normal production year, rest from grazing could reduce habitat quality by allowing non-native annual plants to maximize their potential and out-compete native grasses and sensitive plant species, results which are contrary to the goals and objectives of this GMP. County Parks does not need to plan for rest unless merited by monitoring results that indicate poor ecosystem health conditions, and unless the predicted forage production for the year will be poor enough to maintain average herbaceous height below the upper limit of the optimal range without grazing. In such an unusual case, the excess herbaceous height due to rest would probably not reduce habitat quality for the potential special-status plants and animals.

5.5.3 LIVESTOCK DISTRIBUTION

Mineral or molasses licks (livestock attractants) can be placed throughout the Park as needed to improve the distribution of livestock, and for greater herbivory or trampling effects. Such livestock attractants can be used to reduce undesirable livestock congregation around special-status plant species and natural communities. To maintain water quality, it is important to place the attractants away from waterways and wetlands, preferably on ridges, which have limited hydrologic connectivity to waterways. In addition, attractants should be located away from recreational facilities, roadways and trails to avoid impacts to Park users and preserve parkland aesthetics. Tate et al. (2003) found there were more livestock fecal deposits in areas where attractants were placed, suggesting effectiveness in this practice.

If monitoring results indicate the grazing management performance standards are exceeded, grazing utilization is insufficiently distributed, or livestock traffic is excessive; then additional livestock dispersal incentives can be placed at less utilized sites. The Livestock Operator may also use horses and riders to herd the livestock periodically as needed to achieve better livestock distribution.

5.5.4 GRAZING TO CONTROL SHRUB ENCROACHMENT

Extending grazing into the early summer can be an effective method for controlling shrub encroachment into grassland habitat. In early summer, when grass has senesced, livestock will begin to graze on the succulent, woody foliage of seedlings and saplings. As a result of early summer grazing, late-blooming special-status annuals could also be damaged by herbivory. Periodic early summer grazing (depending on seasonal weather conditions) would reduce this potential impact.

Alternately, County Parks could implement manual scrub control, gradually and experimentally, in order to increase benefits and reduce risks to special-status plants and the BCB host plants. County Parks could minimize risks associated with scrub removal though the following methods:

- conduct scrub removal activities after herbaceous plant species have gone to seed (fall);
- establish temporary protection for special-status and BCB host plants;
- avoid disturbance and removal of soil containing the special-status plant or BCB host plant seed bank; and
- during scrub removal activities, establish an appropriate path to remove debris from the site.

5.5.5 GRAZING TO CONTROL PEST PLANTS

The continual invasion of the region by new pest plants and the spread of existing pest plants is a high priority threat that needs continual monitoring and response by County Parks. New introductions and expansion of pest plants will be minimized by avoiding excessive grazing, in general, and by minimizing livestock concentrations that could create bare ground or disturbed soil surfaces. This can be done by using distribution incentives, including extra water infrastructure development and mineral strategically placed licks.

Cattle can bring weed seeds into the park via cow manure or on their hooves and fur. Research on seeds of typical grass and forb species has shown that almost every species was able to pass through the digestive system of cattle and germinate in cow manure (C. A. Call, pers. comm. 2010); therefore, weeds at the Park are likely to disperse via cow manure. It typically takes 48 to 96 hours for seeds to pass through the digestive system of cattle. One solution is to hold cattle in a quarantine area for 5 days or more to allow enough time for weeds seeds to pass through their digestive systems before bringing them into an un-infested grazing field. The planned Pueblo Auxiliary Field will be used for this purpose.

Weeds can be introduced via imported cattle feed, and thus replacement feeding is not permitted by County Parks. If an exemption is granted, use imported cattle feed that is "certified weed-free" only, within Pueblo Field, and by prior arrangement. Any replacement feeding should occur only at a designated place in Pueblo Field that can be monitored and treated as necessary.

If the park suffers a significant increase in introduction and/or expansion of infestations of pest plants, then County Parks should consider the development of a formal Pest Management Plan, including a thorough assessment of each infestation, causes of those infestations, future prevention and rapid response to new infestations, management options, experiments in control of small infestation areas, and a plan for monitoring and adaptation of control plans.[26]

Livestock grazing is generally not an effective management tool to extirpate infestations of non-native invasive pest plants. Specialized grazing can be useful in controlling some pest plants, particularly the pest's phytomass. Focused management with means other than grazing, such as selective applications of herbicides (compliant with County of Santa Clara IPM ordinance), are more likely to be required to extirpate or further minimize infestations. The best strategy is to determine pest plant control priorities based on the degree of the hazard and annoyance of the infestation, feasibility of control, and budget availability. The value and potential to control each pest should be investigated separately before investing in control technologies and related special management. In general, grazing management practices that do not exceed the lower limit of RDM guidelines will help minimize new infestations.

[26] Costs for such planning and the personnel, equipment, and materials required to implement were not estimated.

County Parks will need to identify high priority areas of pest plant infestations, and employ intensive grazing as feasible. It may be feasible to collect the equipment for small-scale temporary enclosures using electric fencing, and to assemble cattle periodically for a program of rotation between sites to control the target pest plant stands. County Parks may implement other methods, particularly manual grubbing, stump cutting, and herbicide applications to control other pest plants that are not vulnerable to grazing treatment.

Yellow starthistle could develop into a more broadly-occurring or ubiquitous problem that needs treatment; in such a case the grazing termination date may be extended (to June 15) to allow continued grazing effects at the park either throughout the park or in concentrated special areas, whichever is necessary. Yellow starthistle flowers after the annual grasses begin to die in the late spring. Livestock will graze yellow starthistle until the spiny flower heads begin to develop (Thomsen et al. 1996). Early summer grazing is expected to reduce the number of flowers and the mass of these pest plants; and therefore control its expansion, but probably not its density, on the landscape. Other thistle infestations at the park may be reduced by targeted early and mid-spring grazing.

Sections 2.3 and 4.6 and Tables 5 and 11 provide additional information about pest plants with the Park. Tale 5 summarizes the distribution of pest plant species within the Park while Table 11 outlines management considerations, including both grazing and alternate control methods.

5.5.6 GRAZING TO REDUCE FIRE HAZARDS

Grazing of annual grasslands at conventional levels has been shown to reduce the hazard of fuel loads and to alter the behavior of wildfires, but not to significantly reduce the risk of fire ignition and spread (Stechman 1983). Higher intensity grazing is often required to achieve fire hazard reduction objectives.

Regular livestock grazing at Santa Teresa County Park at stocking rates and times prescribed to utilize most of the available forage by the start of summer will greatly reduce fire hazards. Herbaceous fuel loads of grasslands fluctuate with weather conditions, from year to year, so stocking rates to reduce the risks posed by these fuels could fluctuate accordingly. As further precaution, fuel breaks could be maintained with grazing in grassland areas adjacent to developed properties by placing mineral licks to attract greater livestock use.

Formal fire management planning is essential for long-term protection from damages and injury and to integrate fire management with conservation purposes. County Parks should cooperate with local fire management authorities to refine fire management plans for the site, and conduct fire management activities in addition to grazing that will reduce the risks of wildfire damage.

5.6 Management Restrictions Related to Grazing and Livestock Operations

5.6.1 Small Mammals and Burrows

California ground squirrels and other small mammals are often regarded as "pests" by ranchers. These species dig burrows that can cause injury to livestock, and can denude areas of forage; however, small mammals and burrows are part of the native grassland ecosystem and provide a prey base as well as upland habitat, refuge, and denning sites for special-status species. Small mammals are prey species for raptors and badger, while small mammal burrows provide important habitat features for CRLF, CTS, western burrowing owl, badger, and kit fox. These special-status species are known to occur or have potential to occur at Santa Teresa County Park. Any control of ground squirrels or other pest animals is prohibited, except when the proposal is approved by County Parks for a conservation or emergency purpose.

5.6.2 Soil Compaction, Erosion, and Vehicle Traffic

County Parks will determine priorities for soil compaction and erosion control activities through periodical monitoring and assessment of compacted and eroded sites (Section 7). For eroded sites, priorities will be based on the relative amounts of sediment moved and cost feasibility to correct the erosion problem (Lewis, Tate, and Harper 2000). Table 18 shows the major soil limitations found on each planned grazing field.

Table 18. Soil Management Concerns for each Grazing Field, Santa Teresa County Park, Santa Clara County, CA.

Field	Predominant Soil Mapping Units	Slope Range (%)	Major Limitations for Grazing
Bernal Hill	303/304 Montera-Santerhill Complex 375 Alumrock-Zeppelin Complex	15-50	- Steep slopes - High erosion hazard - Montara soil is very shallow
Mine Hill	305 Alo-Altamont Complex	15-30	- Compaction risk when wet
Fortini	303/304 Montara-Santerhill Complex 305 Alo-Altamont Complex	15-50	- Some steep slopes - Montara soil is very shallow - Alo & Altamont soils are at risk of compaction when wet
Rocky Ridge	303/304 Montara-Santerhill Complex 380 Lodo-Zeppelin Complex	15-50	- Steep slopes - High erosion hazard - Montara & Lodo soils are shallow or very shallow
Hidden Springs	380 Lodo-Zeppelin Complex	30-50	- Some steep slopes - Some erosion hazard - Lodo soils are shallow
Serpentine Ridge	304 Montara-Santerhill Complex	30-50	- Steep slopes - High erosion hazard - Montara soil is very shallow
Pueblo	305 Alo-Altamont Complex	15-30	- Compaction risk when wet

The areas of high potential erosion shown on Figure 12 are still suitable for grazing with effective grazing management practices in place, such as regulating numbers of cattle, controlling the duration of grazing field use, limiting the time of year the grazing field is used, and other parameters. The plan must exclude animals from sensitive areas by fencing, and include enough grazing fields so that use (and rest, if necessary) cycles are keyed to the soil's carrying capacity. Streams or wetlands that occur within the mapped "high erosion" areas are more susceptible to erosion or fecal matter contaminants and should be excluded from cattle entry. Within Santa Teresa County Park the following areas have been excluded from grazing fields (Figure 12**)**:

- Grassland bordering the Coyote – Alamitos Canal;
- Steep inner slopes associated with the unnamed ephemeral stream that drains north into the Norred Ranch;
- Main stem and east branch of Santa Teresa Creek;
- Area of springs and seeps along the lower south side of the Big Oak Valley tributary stream; and
- Seasonal wetland on the east side of the Connector Trail in the Pueblo Day Use Area (this last area is not actually in an area of high erosion hazard, but is in an area of high compaction hazard).

Two susceptible areas within the Park can be grazed with minimal concerns by implementing the specific management measures given below:

- Rocky Ridge Field contains the upper one-third of the Big Oak Valley Creek; within the proposed grazing field boundaries, this reach of the stream is not excluded from grazing. If cattle are present in the Park during the summer and early fall seasons they are likely to seek out the cooler temperatures, shade, moisture, and green forage of the riparian areas, en lieu of the senesced grassland. Exclude cattle during these seasons.

- Fortini and Pueblo Fields contain significant areas of compaction-susceptible soils. Monitor soil conditions closely during the rainy season. If compaction is occurring, move cattle to other grazing fields during times when the soil is saturated.

The following measures apply to all grazing fields:

- During the wet season, vehicle traffic on the natural rangeland surface would subject soils to potential compaction or erosion. If the vehicle is leaving wheel ruts, then the soil should be considered too wet to drive on. Use of light-weight vehicles, such as ATVs, is permitted for normal grazing operations, per the License Agreement.

- Adjust animal numbers and duration of grazing to leave sufficient residual dry matter on the ground before the start of the rainy season. This dead mulch will be crucial in preventing soil erosion.

- Do not create permanent areas where animals concentrate for feeding or loafing. Use grazing field layout and placement of water troughs and salt licks to spread the distribution of animals more widely throughout the grazing field.

- Locate permanent water troughs on level areas and protect the surrounding ground from compaction with a 4 inch-thick layer of coarse rock aggregate underlain by geotextile fabric.

If the above recommendations are followed, there should be no significant adverse impacts associated with grazing in the planned grazing fields.

5.6.3 WATER QUALITY (AND LIVESTOCK HEALTH)

Grazing at Santa Teresa County Park will be managed to minimize or avoid negative impacts to water quality (sedimentation or the introduction of pathogens and excessive nitrogen loads) of riparian habitats, springs, seeps, wetlands, and ponds. Water quality impacts will be reduced by several different management options including:

- fencing cattle out of streams, wetlands and other waterways;
- reducing the incentive for cattle to graze in or near the stream by grazing fields only during the cool, green-grass period,
- providing attractive supplements or watering troughs away from the stream;
- limiting the number of animals grazing in areas with high rainfall runoff, and/or
- leaving an ungrazed or lightly-grazed grass buffer along each side of the stream (Appendix E).

These management strategies are in alignment with recommendations made by the Stream Stewardship Unit of the Santa Clara Valley Water District (B. Calhoun, pers. comm. 2010)[27]. Through the configurations of the grazing field boundaries, cattle will not have access to most of Santa Teresa Creek, the headwater springs, and the emergent wetland within Santa Teresa County Park (Figure 5) and there will be a buffer, of at least 30 feet, between the grazed fields and the perennial portion of the creek (Appendix E)[28]. Some tributaries, such as those in Fortini, Rocky Ridge, and Mine Hill Fields will be unfenced. Cattle will have partial access to the stock ponds. Restricting grazing to winter and spring seasons, when cattle prefer grassland habitat, will further reduce water quality impacts.

If calves under 6 months old are grazed at the Park, then additional actions will be implemented to protect water quality, such as excluding calves less than 6 months old from creeks that lead to a drinking source or human swimming location or removing calves 1 to 2 months prior to the beginning of the swimming season. Swimming at Almaden Lake can begin as early as Memorial Day (late-May). If County Parks chooses to graze cows and calves, additional restrictions in a few grazing fields might be needed, plus additional fencing to keep young calves from accessing Santa Teresa Creek. Livestock health will be monitored by the Livestock Operator to determine whether significant pathogens are present, and supplemental animal health care is needed. To minimize the risk of pathogens, the Livestock Operator will control internal and external parasites and pathogens of the cattle to be grazed at the park with the best conventional health care means available.

[27] The San Francisco Bay Regional Water Quality Control Board (Region 2) does not have any water quality regulations associated with livestock grazing operations in Santa Clara County (C. R. Fewless, pers. comm. 2011). The Santa Clara Valley Water District is not a land use agency and does not regulate grazing (S. Tippets, pers. comm. 2011). The County of Santa Clara Planning Office does not have any requirements related to grazing; however, they indicated the Habitat Conservation Plan that is being developed for the County might identify grazing restrictions related to water quality when it is complete (J. Reilly, pers. comm. 2011).

[28] The County of Santa Clara Parkland Range Management Policy (Section 3.j, County of Santa Clara 1992) states, "Appropriate fencing will be required to ensure the protection of sensitive natural resource areas such as springs and ponds and riparian habitats".

5.7 Public Access

At Santa Teresa County Park, grazing management will be re-introduced and grazing cattle herds will be newly interacting with the public. Possible impacts to recreational uses are described in Section 4.11. This section discusses strategies to anticipate and reduce potential impacts. County Parks will work to anticipate and address these potential impacts to park users.

A period of familiarization, with public educational outreach to ensure public support and understanding, often reduces conflict. County Parks will continue to conduct public outreach efforts that disseminate information about grazing as a conservation and management strategy, and discuss potential conflicts and conflict avoidance. Efforts may include:

- communication with local residents and neighbors,
- communication with community and neighborhood organizations,
- communication with park visitors and user groups, such as mountain biking, hiking and equestrian groups,
- Informational flyers, brochures and/or signage
- public meetings
- County of Santa Clara website

County Parks should develop and post informational signage at recreational staging and public use areas. Signs should explain how livestock will be used at the park for conservation purposes (and with minimized impacts)[29].

To avoid cattle behavior conflicts, County Parks should respond to complaints by discussing the issue and developing solutions. As much as feasible, livestock facilities (watering facilities, livestock crossings of streams and gullies, livestock grates, and corrals) and livestock trails (movement corridors) should be located away from public use trails and roads to avoid close interactions with the public. Most of the "single track" dirt trails, with limited visibility due to sharp corners and undulating topography, are excluded from the planned grazing fields, thereby avoiding potential conflicts in these areas.

Regular trail maintenance and repair after the wet season can minimize cattle damage to trails. County Parks will address damage to public trails through routine trail maintenance, construction of trail hardening, construction of water crossings to address seeps, springs and other wet trail tread areas that may be impacted by cattle grazing activities, and construction of cattle barriers at sites of regular trail damage. County Parks will perform regular maintenance (repair of cattle damages) on the trails used by both visitors and cattle, as well as regular trail tread maintenance following the wet season (and drying of the soil). Trail tread maintenance will reduce the problem of holes in the trail caused by livestock the previous winter. Soil impacts and mitigations are discussed in Section 5.6.2.

One segment of a foot and bike trail in the Fortini Field has highly erodible and compactable soils (Figure 12). During the rainy season this segment of trail will be closed to biking to reduce the amount of mud, bike tire ruts, and footprints. All trails at the Park are subject to wet season closures to bikes and equestrians, per wet season trail closure procedures.

[29] A useful model of such signage was recently developed by the East Bay Regional Park District.

5.8 Infrastructure Improvements Required

Currently no functional grazing infrastructure exists at Santa Teresa County Park. The Park staff has developed a detailed infrastructure plan, including an associated infrastructure budget spreadsheet, and has applied for grant funding to begin installing the recommended infrastructure. This section will describe generally what infrastructure will be needed to run an effective livestock operation. All grazing-related infrastructure at the Park must be maintained in good visual, in addition to functional, condition, in accordance with the Santa Clara County Parkland Range Management Policy (Section 3.o, Santa Clara County 1992)[30]. Three main types of infrastructure will be needed: fencing, watering facilities, and gates. Figure 15 displays the planned infrastructure.

The cost of infrastructure installation is a significant impact associated with the reintroduction of cattle grazing to the Park. Along with the expense, there is a significant risk that, once the infrastructure is constructed, and habitat appears to improve, the BCB will not be attracted to or sustained at the Park (Section 2.2.1). Nevertheless, grazing is likely to result in a number of benefits to the Park, including increased biodiversity and enhancement of native plant communities, reduction of fire risks, reduction of pest plant populations, and overall range management and ecosystem health.

Other impacts might occur in association with construction, maintenance, and on-going presence of grazing infrastructure. Construction impacts might include short-term hole-digging, trench-digging, off-road vehicle driving, and use of a tractor for fence installation or spring development. A rocked surface road for the Livestock Operator's vehicle will be installed at the cattle operation staging area, as will hardened surfaces at target locations for the protection of trails in winter (County of Santa Clara Parks and Recreation Department 2010). Longer-term construction impacts could include soil erosion along the trench lines. If the construction methods and locations are well-designed, then these impacts will be insignificant. Maintenance of infrastructure can be done on foot, with an ATV or, occasionally, with a service vehicle driving off-road; therefore impacts will be minimal. The fencing layout is designed to minimize conflicts with park users (hikers, mountain bikers and equestrian). The views of fencing will not significantly change the "rural" landscape from what it has been for centuries.

[30] The Santa Clara County Parkland Range Management Policy (Section 3.o, Santa Clara County 1992) states, "Agricultural landscapes and improvements will be maintained to good visual standards and not detract from positive visitor experience."

5.8.1 LIVESTOCK FENCING

All existing and new livestock fencing for perimeters, internal cross-fence, and exclosures for the Santa Teresa County Park grazing management program and for the park's border, must be built and maintained in good working condition to contain the grazing livestock, prevent passage by trespassing livestock, limit unauthorized vehicle access, and allow authorized access for management activities. Recommended fencing locations and specifications for the Park are designed to achieve the combined conservation, recreation, and cattle management goals. Perimeter fencing and any associated access points at the Park must be built and maintained to meet the legal requirements of California Livestock Law[31], thus reducing risks of liability claims against the County for negligence in the event of livestock escape and resulting accidents or other damages.

For perimeter fencing use designs equivalent to or better than the standard 4- or 5-strand fence specifications provided by the NRCS (Appendix F), with the exception that the top strand of barbed wire on perimeter fences will be 48 inches above the ground to meet the legal requirements (see footnote on Legal Fencing above). Smooth wires (which are often recommended as wildlife-friendly) are less effective for a livestock operation, especially a year-round cow-calf operation (L. Bush, pers. comm. 2010). Smooth wire should not be used for perimeter fencing because calves can pass under a smooth wire, and cattle will lean on smooth wire fences more than they will on barbed wire fences. [Smooth top and bottom wires are better suited for interior fences (e.g. riparian fences).] The fencing specifications recommended in this GMP meet the CDFG (2003) guidance for WFF: adult deer can easily jump over the top strand and fawns, skunks, raccoons, and coyotes can crawl under the bottom strand. While the recommended livestock fencing standards do not meet some wildlife specifications (Paige 2008) (See also Appendix G), they are necessary to keep livestock within the Park boundaries and meet California state law.

---

[31] A lawful fence as designated by the California Livestock Law, California Food and Agriculture Code (http://asci.uvm.edu/equine/law/fence/ca_fnc.htm) is as follows:

> "*17121. 'Lawful fence'; Wire fence; Good and substantial fence; Cattle guards*
> A lawful fence is any fence which is good, strong, substantial, and sufficient to prevent the ingress and egress of livestock. No wire fence is a good and substantial fence within the meaning of this article unless it has three tightly stretched barbed wires securely fastened to posts of reasonable strength, firmly set in the ground not more than one rod [16.5 feet] apart, one of which wires shall be at least four feet above the surface of the ground. Any kind of wire or other fence of height, strength and capacity equal to or greater than the wire fence herein described is a good and substantial fence within the meaning of this article. The term 'lawful fence' includes cattle guards of such width, depth, rail spacing, and construction as will effectively turn livestock."

The lawful fence standard must be met in order to comply with the following section of the same code:

> "*16902. Permitting livestock on highway*
> A person that owns or controls the possession of any livestock shall not willfully or negligently permit any of the livestock to stray upon, or remain unaccompanied by a person in charge or control of the livestock upon, a public highway, if both sides of the highway are adjoined by property which is separated from the highway by a fence, wall, hedge, sidewalk, curb, lawn, or building."

The local community surrounding the Park is concerned about Wildlife Friendly Fencing (WFF); although there are no known records of wildlife injuries as a result of existing fencing at the Park or in the vicinity. A more detailed discussion of WFF is contained in Appendix G. In general, if conflicts between the recommended fencing and a particular species are observed at the Park, then WFF recommendations should be made for that species. If additional WFF elements are desired, County Parks can consult and contract a qualified fencing contractor (possibly the Livestock Operator) with experience in building fences for conservation, recreation, and livestock management purposes for fence installations, modifications, and/or repairs. As described in Appendix G, most WFF guidelines are from out of state and there are a wide range of recommendations among these various sources. Recommendations from most sources do not meet the California Food and Agriculture Code of a lawful fence (See footnote on Legal Fencing below). The Park must meet the standards of this Code; therefore WFF elements can be incorporated where appropriate and legal. County Parks could plan to change from conventional to WFF fencing, as feasible, giving highest priority to areas where the most fence-related wildlife injuries occur.

5.8.2 GATES

Three types of gates will be needed: cattle movement gates, general vehicle access gates, and recreational access gates (Figure 15). Cattle movement gates should have two adjacent gates wide enough to facilitate moving a herd of cattle. These gates will also need to be large enough to allow the Livestock Operator to deliver or remove livestock through the perimeter fence line.[32] General vehicle access gates only need to be as wide as required for maintenance vehicles, and emergency vehicles, especially fire-fighting equipment. Recreational access gates will be self-closing and will be the same type used at other Santa Clara County Parks. All of these gates should be sufficiently durable to resist damage by livestock and recreationists and will be maintained in good working condition to contain the grazing livestock, limit unauthorized vehicle access, and allow authorized access for management and recreational activities.

5.8.3 WATERING OPTIONS

During the course of surveys of Santa Teresa County Park for this GMP, a stock water assessment was conducted. Additional information regarding this assessment is contained in Appendix H. The assessment included a grazing field reconnaissance of the various springs and ponds of interest and an analysis to estimate:

a. If the ponds reliably fill to capacity during normal and wetter years.
b. A rough estimate of the number of days required for each pond to dry to 10% of its available capacity, assuming various starting dates for seasonal drying (the date at which the evaporation rate exceeds the inflow rate), based on an assumed stocking rate and cattle water consumption rate and an assumed seepage loss rate.
c. The number of cattle that could be supported by each spring, using an assumed cattle water consumption rate.
d. Recommendations for repairing the three priority stock ponds.

[32] A preferred gate design is the lever-latch “Powder River” livestock gate.

Based on the assessment and the practical experience of Park staff, the potential livestock watering sources at the Park appear to be:

a. Domestic water sources of the Great Oaks Water Company, Crew House, and Wright Center, where tie-ins are needed. These sources might not be needed every year or during all seasons, but they are especially needed in four circumstances:

    i. Pueblo Field, domestic water will be the only available source;
    ii. During unfavorable (below-normal) precipitation years when the natural sources are reduced or unavailable;
    iii. During favorable (above-normal) precipitation years and when cattle numbers are increased to the higher numbers needed for serpentine habitat management (Bernal Hill Field, Rocky Ridge Field);
    iv. During the summer and fall months (if grazed then) when the ponds and streams dry up (Fortini Field, Hidden Springs Field). If the capacity of the well at Rosetto Ranch is high enough, the dependency on the domestic water tie-ins for the Rocky Ridge Field and Fortini Field might be reduced.

    Adding these domestic water sources to the watering system would diversify the potential sources, and thus improve certainty that at least one water supply will be available at all times. County Parks anticipates being able to access all three domestic water sources. Transporting water from the Crew House to Bernal Hill will be costly, but feasible. Water from Great Oaks is currently piped from Coyote Point to park restrooms and the Wright Center and should be feasible for livestock watering as well.

    Domestic water tie-ins are not needed for Mine Hill Field because the Bernal Hill Spring is adequate, nor for Serpentine Ridge Field because the Laurel Spring is adequate.

b. The natural water sources, including non-excluded streams, developed springs, and functioning ponds, appear to be sufficient to supply the projected numbers of cattle without additional supplies from domestic sources during normal precipitation years (see a. above for when domestic water supplies may be required) in all grazing fields except the Pueblo Field (which has no natural water sources). This conclusion assumes the well at Rosetto Ranch can provide an adequate water supply and that the Hidden Springs Pond will be repaired. A test will be required to determine the cost of developing the well at Rosetto Ranch. County Parks plans to repair the Big Oak Pond to provide water to cattle in Rocky Ridge Field. Hidden Springs Pond will provide water to Hidden Springs Field.

c. County Parks will need to contract water supply capacity studies of the Rosetto Spring to supply the watering troughs in Rocky Ridge Field and of the upper un-excluded tributaries of Santa Teresa Creek to supply grazing animals in Fortini Field.

Springs

There are several springs that have been identified for possible reconstruction to support cattle. These include the Bernal Hill Spring, Laurel Spring, and a complex of small springs at the Rosetto Ranch site.

The Rosetto Ranch spring and well complex, which is located in a small draw above the abandoned resort, appears to have yields which are too small to be viable compared to alternative sources of supply at that location: namely, streamflow in Santa Teresa Creek over an abandoned diversion dam a short distance upstream of the abandoned resort or, alternately, an abandoned well located a short distance from the stream at the resort.

Bernal Hill and Laurel Springs appear to have sufficient water to sustain aquatic habitat and provide water for cattle, based on late summer measurements (2007-2010) collected by County Park staff. Additional information about spring flow measurements is contained in Appendix H. Both springs are located off nearby drainage bottoms. This indicates their flow is likely less seasonally variable.

Table 19 gives the number of cattle that could be supported based on the flows observed. Until additional flow measurements can be made, the numbers given should be used with caution. Additionally, cattle should not exhaust the flow available as some is required to support wildlife and riparian vegetation. Evaporation from a 4 x 8 foot trough is accounted for.

Table 19. Number of Cattle which could be supported by the Observed Flows based on a Consumption Rate of 15 gal/day.

Water Source	Flow on Aug 31, 2010 (gal/minute)	Number of Cattle
Bernal Spring	0.28	27
Laurel Spring	0.25	24
Santa Teresa Creek Above Rosetto Ranch	22	2,100

Ponds

Many stock ponds of the region are in disrepair due to age and neglect, as well as to the complications of permitting requirements for grading and excavating, water quality maintenance, and modifications of special-status species habitat. The ponds of the Park were surveyed and assessed for repair and maintenance needs. The results of water yield analysis are discussed here. Permitting, repair and maintenance needs are discussed below.

A water yield analysis was performed by computing the mean water yield, in area-inches of several gauged basins in the vicinity. This analysis is provided in Appendix H. Table 20 summarizes the results of for the three stock ponds analyzed. A very small stockpond on the hillside in Big Oak Canyon was not analyzed since it is supported by spring flow.

Table 20. Stock Pond Analysis, Santa Teresa County Park, Santa Clara County, CA.

Pond Name	Watershed (acres)	Water Yield (acre-feet)	Pond Volume (acre-feet)	Ratio: Yield to Storage
Hidden Spring	22	5.5	0.92	6.0
Mine Field	39	9.8	0.71	13.7
Big Oak Valley	116	29.0	0.29 *	98.3
* assuming repair of outlet to yield an average maximum depth of 5 feet				

The results indicate that all of the stockponds will reliably fill during normal and wet years and possibly even in moderately dry years. Table 21 gives an example from the spreadsheet (Appendix H, Table H-5) of how many days past the assumed inflow cessation date of April 1 would it take to drawn down the capacity of the pond by 90 percent.

Table 21. Number of Days Past Assumed Inflow Cessation Date of April 1 for 60 Cattle to Utilize 90 percent of Storage Capacity.

Pond Name	Days
Hidden Spring	113
Mine Field	101
Big Oak Valley	59
Assumptions: • Individual Water Consumption rate is 15 gal/day • Evaporation rate based on June average for Gilroy of 5.55 inches/month • Pond Seepage Loss Rate is 2 inches/month	

Based on Table 21, the Hidden Springs pond would be able to support 60 cattle until July 22 during an average year. The supplied spreadsheet (Appendix H, Table H-5) provides several other scenarios, and the variables in the spreadsheet are in blue for easy identification; these parameters can be modified. It should be noted that evaporation has been accounted for in the analysis. Somewhat higher water usage might be expected because of water use by other wildlife (for example, feral pigs) and because riparian vegetation around the perimeter of the pond could also draw on pond storage to support transpiration (in effect, the net pond water surface is larger than measured).

All of the stock ponds appear to have been built without any formal hydrologic, hydraulic, or structural design. The dams are all composed of earth, most likely obtained through excavation immediately upslope. Given their age, there has been some loss of storage volume associated with sediment accumulation; however, only 10-20% of the original volume of the ponds has been lost to sediment accumulation.

Before such maintenance activities begin, the permitting requirements must be determined and initiated. The following permitting requirements might apply[33], and should be investigated in the planning process:[34]

[33]See also footnote 34 and 35 below regarding USFWS 4(d) exemptions to "take" of CRLF.

[34] Refer to the Sacramento River Watershed Program, On-Line Regulatory Permitting Guide, accessed 24 November 2007, http://www.sacriver.org/watershed/permitguide/projects/habitat.php .

a. The U.S. Army Corps of Engineers might require a Section 404 permit if pond construction or maintenance includes grading, excavating, dredging below the plane of the ordinary high water mark, placement of fill, dewatering, or building of a dam;

b. The Regional Water Quality Control Board might require a Section 401 Water Quality Certification if the U.S. Army Corps of Engineers required a Section 404 permit; a National Pollutant Discharge Elimination System permit might be required if the pond construction or maintenance will result in discharge of fill or other waste material into surface waters;

c. The California Department of Fish and Game might require a consultation under the California Endangered Species Act if the pond construction or maintenance will affect state-listed animals, including the CTS (should this species be encountered in the future); a Section 1602 Streambed Alteration Agreement might be required if the pond is associated with a stream, and the stream bed, bank, or channel will be altered or modified, including grading, excavation, and removal of riparian vegetation;

d. The USFWS or National Marine Fisheries Service might require a biological consultation under the federal Endangered Species Act if the pond maintenance will affect federally-listed plants or animals (other than CRLF); a Section 10 incidental take permit would be required for construction of a new pond should any federally listed wildlife species (such as CRLF and/or CTS) be encountered in the future.

e. None of the ponds meet the criterion as jurisdictional with respect to the California Division of Safety of Dams (http://damsafety.water.ca.gov) and no conceivable modifications/repairs would bring them under jurisdiction.

f. The State Water Resources Control Board Division of Water Rights requires a water rights application process for construction of new stock ponds and that agency's Stock Pond Registration program requires registration of all existing stock ponds.

All of the ponds need to be equipped with an adequate spillway, through which a "design flow" can pass without erosion. Since these are modest investments, the spillway should be sized to pass a 50-year flood, but in no case should be sized to pass less than a 25-year event.

Hidden Spring Pond

The Hidden Spring pond is immediately adjacent to a native surface road and the outlet/spillway is at the edge of the road fill. This pond has the smallest water yield:storage ratio, such that the small watershed has not generated a peak flow of sufficient magnitude to erode the outlet. It appears that up to three feet of sediment may have accumulated here. There is some opportunity to significantly expand the capacity of the pond by excavating a portion of low-sloped ground that protrudes into the pond footprint.

Big Oak Pond

The outlet of the Big Oak pond has eroded down through the dam and this process appears to be actively continuing. The spillway would need to be repaired if this feature is needed for stock watering.

Mine Field Pond

The Mine Field pond is still functional in that it appears that a portion of the dam remains completely intact; however currently, it appears that overflows spill over the dam crest, then quickly converge, and are currently eroding a channel through the downstream toe of the dam. Further investigation of overflows will be necessary.

Each of the bigger ponds in Rocky Ridge, Hidden Springs, and Mine Hill Fields need repairs, but only the Big Oak Pond needs immediate repairs in order to be serviceable for use by livestock. Estimates suggest that each pond has lost only 10-20% of original capacity. Repairs of the Big Oak Valley and Mine Field Pond dams will require scarification and compaction of surfaces to be graded and compaction of any material placed as fill, so some provision for water for this purpose will be planned.

Any sediment removed from the ponds will be placed outside of the floodplain according to the following practices: determine the location for placement of sediments, strip the designated footprint of topsoil to a depth of 0.4 feet, add sediment fill, grade and then replace topsoil over the finish-graded fill.

County Parks should investigate any potential additional costs for engineering and permitting before proceeding with pond work. County Parks and the Livestock Operator will conduct the repair and maintenance of the ponds, as well as ongoing use for grazing operations, such that negative effects on special-status wildlife species are minimized[35]. Water facility development and spring withdrawal volumes will be designed to avoid negative impacts to potential amphibians and their aquatic habitats. The livestock ponds and troughs will be filled with water from the springs; however, spring flows are expected to be sufficient for both expected water use for livestock and maintenance of aquatic habitats for potential special-status amphibians.

Pond habitat will be managed for the benefit of potential CRLF and CTS; although a recent ruling waives federal CRLF “take” prohibitions[36] on rangelands[37] (Appendix I). The potential of a pond to provide habitat for CRLF/CTS habitat depends on its size and depth. Detailed information about designing ponds for CRLF can be found in Appendix I. In general, Powder River style steel pipe panels should be used as

[35] The Santa Clara County Parkland Range Management Policy (Section 3.j, Santa Clara County 1992) stated, "Appropriate fencing will be required to ensure the protection of sensitive natural resource areas such as springs and ponds and riparian habitats. Such fencing may not inhibit wildlife or human access to water." Section 3.q of the same policy stated, "Public access to all park areas will be maintained."

[36] Section 3(18) of the ESA defines “take” to mean to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Service regulations (50 CFR 17.3) define “harm” to include significant habitat modification or degradation which actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering. Harassment” is defined by the Service as an intentional or negligent action that creates the likelihood of injury to listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering.

[37] A recent special rule adopted under Section 4(d) of the federal Endangered Species Act waives the CRLF “take” prohibitions on routine ranching activities on non-federal rangelands, including accidental kill or injury and modifications to habitat of the CRLF associated with operation of stock watering ponds (USFWS 2006). The USFWS states that incentives to continue routine ranching activities will provide a net benefit to the CRLF by conserving its habitat. Exemption under this rule appears to require, by definition, that affected ponds be used routinely in ranching, and thus an exempt pond must be open (not entirely enclosed by fencing) for routine livestock access to the water. This exemption does not apply to construction of a new pond (See also Appendix X).

adjustable fencing to exclude a portion of each pond bank and shallow water edge to minimize impacts on amphibian habitat (see Appendix I for description of an ideal stock pond). Such exclosures are preferable to fixed fencing at smaller or shallower ponds, because of the risk that the exclosure will fill with dense growth over both bank and pond edge. The configuration of the panels could be adjusted as needed to improve amphibian habitat, such as changing the location of the enclosure by moving the panels around the perimeter of the pond to allow re-growth of woody and emergent plants in denuded areas. The excluded area can be expanded or reduced as necessary. Larger ponds will likely require fixed fencing. If fixed fencing is used, the fencing should be placed to encompass a large enough area too allow cattle access periodically, in order to control the herbaceous growth.

A qualified biologist should survey and evaluate each pond site on an annual basis to determine which areas of the pond should be excluded. In general, no less than one-quarter of the pond area, including the bank and shallow water edge, should be excluded from grazing. Broader areas may be excluded if CRLF or CTS are observed outside the previously installed panels. If the seasonal grazing effect is too light, allowing too much growth of cattails, tules, and other emergent vegetation outside of the exclosure, or if the vegetation inside the exclosure gets too dense, as determined by a qualified biologist, the Powder River panels can be moved around to exclude a different portion of the pond, and thus control weeds, allow woody plants to grow tall, or manage for a structurally more heterogeneous area of pond vegetation.

There is an increasing base of scientific literature and several reliable management reports describing CRLF pond use and habitat management effects. Although the pond design described in Appendix I is from a draft document, the U.S. Fish and Wildlife Service (USFWS) was involved in its development. The design has been approved by the USFWS and NRCS.

5.8.4 WATERING FACILITIES

Properly designed and functional watering facilities are needed prior to and after commencing the livestock grazing operation. The recommended watering trough locations are shown in Figure 15. Such systems must provide healthful water of sufficient supply and in appropriate locations to be feasible for the livestock operation, maintenance, and improved livestock distribution. Watering troughs can also be located away from recreational use areas to lessen potential impacts to Park users.

Water is pumped through pipelines from the water source to water tanks. From the water tanks, water is fed to water troughs through another set of pipelines. If possible, the pipelines will be installed under Park roads/trails and service roads to reduce erosion problems associated with digging in native soil. Tanks are important for continuous supply when cattle water demand is high. A sufficiently sized tank allows water to be drained from the tank to the trough without exhaustion of the water supply. See Figure 15 for water source locations. Water sources include natural ponds filled from natural flow from the watershed, springs, wells, and domestic water company connections. Only existing, previously developed ponds, springs, and wells will be used. While there are multiple domestic water sources from water companies, these sources could be expensive, and should only be needed rarely as the existing stock ponds, springs, and wells should be adequate for the planned seasonal grazing.

At least one functioning watering trough is needed within the each grazing field during the grazing period. When the gates are open between the grazing fields, having multiple troughs will aid in the distribution of livestock and, if placed appropriately, attract them away from sensitive habitats and recreational facilities, and to habitats that will benefit from grazing. The watering systems should be

designed to allow the system to be shut off both at the source and at the troughs during the remainder of the year.[38] In addition, the Livestock Operator can use the shut-off valves to improve livestock distribution by leaving only certain troughs working and the others empty. The trough water supply should have float valves in the trough to maintain the trough water level[39]. Troughs should be located in areas accessible to both livestock and the Livestock Operator, away from recreational facilities to reduce potential impacts to those facilities.

Development of watering facilities will require the design assistance of a qualified engineer to assure the water facilities are effective, safe, cost-efficient, and meet other objectives. While a preliminary assessment of livestock water availability has been done, the engineer should help determine if the planned watering facilities will deliver the required livestock water volumes during the grazing period, and include alternatives in the event that the recommended facilities will not function adequately. Some construction and all maintenance of the watering system are usually within the capabilities of the Livestock Operator and might be included in negotiations for the grazing license. Access to all parts of these facilities will be needed for construction, maintenance, and (potentially) water delivery.

Livestock Water Demand

Livestock require sufficient water for maintenance and growth. This demand may be calculated using a formula based on the physiological requirement of 10-20 gallons of water per day by one typical 1000-pound cow (UCCE 2001). Watering demand varies primarily with air temperature; summer air temperatures of 90 degrees F would increase the watering demand of the 1000-pound cow to 20 gallons per day. Thus, the size of the water tanks should be based on the expected water supply rate and the water demand of the cattle. Cattle water demand can be computed by multiplying the number of cattle times the daily water demand during different seasons (winter <13 gals/day, spring and fall <17 galls/day, and summer <21 gals/day). This formula should be adjusted for different kinds, classes, and weights of livestock, and multiplied by the number of animals. The water source, storage, and delivery system to the trough must accommodate both daily demand (typically two drinking periods per day) of the livestock herd in the affected grazing field and loss of water due to leakage, fouling, evaporation, and wildlife use. The Livestock Operator will be required (in the grazing license) to conduct proper maintenance of the troughs, thus minimizing leakage, excessive algal growth and contamination by dead animals. The other loss factors can be estimated and accommodated by increasing capacity based on knowledge of wildlife demand and assumption of 25% evaporative loss compounded over the grazing period.

[38] An argument and conditions required to supply water for wildlife during the non-grazing period is made in the section below on wildlife friendly troughs.

[39] Hudson float valves are preferred for durability and ease of maintenance.

Wildlife-Friendly Troughs

County Parks will determine whether the trough design should include enhancements for wildlife use (and avoidance of drowning or entanglement) with the objectives of providing safe and effective access to water for drinking and bathing by the typical grassland wildlife, such as birds, bats, deer, rodents, coyotes, and butterflies. Wildlife-friendly trough design criteria include (Taylor and Tuttle 2007; NRCS 2007; Appendix J):

a. Use water regulation devices to maintain the trough water levels at less than a few inches below the top rim (to facilitate drinking without falling from the rim into the trough);
b. Provide for escape and access of small animals by using rough surfaces that provide traction for animals and secured ramps (concrete,[40] composite plastic, or expanded metal with slope no greater than 45 degrees) from the bottom of the trough, up the perimeter (attached flush to the side, at one end if the trough is rectangular) of the trough, to the top rim of the trough (Appendix J, Photos #1-2); temporary or unsecured devices made of rocks, branches, or boards often fail, and thus should be avoided; install more than one ramp if feasible to increase the chances of wildlife escape (Figure 1 in Sherrets 1989:23 shown in Appendix J)
c. Eliminate obstructions in flight paths (for birds and bats) and entanglements (for larger animals), such as plumbing housings or overhanging posts, wires, braces, and vegetation;
d. Design trough height as low as feasible [20 inches for access by low-stature mammals, such as deer (Sherrets 1989)] and length as long as feasible [trough length, minus any plumbing housing should provide at least four feet (ten feet is preferred) of open water surface for in-flight drinking (by bats)]; avoid ground-level or very low troughs which pose risks to livestock as well as fouling due to collection of animal wastes and contamination from surface run-off;
e. Maintain the water supply to the trough sufficient for both livestock and wildlife use during the grazing period; water supply for wildlife adds to the demand and the water delivery capacity required during the grazing period; thus, total demand and capacity will vary during the non-grazing period or when wildlife demand is reduced;
f. If regular maintenance is curtailed during the non-grazing period, and trough water levels and water quality won't be maintained, then the troughs must be drained to avoid attracting and harming wildlife.[41]

Protect the soil from compaction and erosion around the trough (within a 15-feet radius), where livestock trample and congregate, and water overflows, by installing gravel in a slightly elevated platform under and around the trough to form a hard semi-permeable surface(Appendix K)[42]. The precise siting of troughs is important to minimize erosion and settling of the foundation, and ensure a feasible topographic position for delivery of the water from the source to the trough. Trough components will be located on a relatively level place to allow maintenance vehicle access, where feasible and not potentially in conflict with recreational facilities and use. The distribution pipelines will be buried to reduce water temperatures. If plastic pipelines are used, direct sun could degrade the pipe and allow toxins to leach from the pipe over time. If water is allowed to become too hot, more algae will

[40] Concrete is the preferred trough material at sites with the potential for puncture by bullets.

[41] A 3-inch diameter drain should be built into one wall of the trough for cleaning.

[42] The photo of the watering trough in Appendix K does not clearly show the hardened surfacing on all sides of the trough; in this example, gravel should be in place on the sides not covered by concrete.

grow in the water cisterns and troughs, reducing the water quality and increasing the need for maintenance. Considerations for the precise location of watering facilities include avoidance of sensitive habitat areas, restoration planting sites, soil erosion, topography and cultural resources.

Access will be considered in selecting the installation sites. Development of watering facilities requires adequate access for installation of the trough's foundation, hardening material around the trough, and associated piping and water source. Required materials must be transported to the site including a pre-constructed trough unit or a portable trough[43], as well as concrete, gravel, and other materials. Access considerations for water tanker trucks to refill any storage tanks (if needed) and for future maintenance need to be considered as well.

This GMP identifies the needs, potential options, conservation issues, and preferred locations for watering facilities. The NRCS watering facility practice standards are shown in Appendix K[44].

[43] This choice will depend on cost and if the grazing lessee/licensee has portable troughs and other materials available to bring to the site or is willing to construct permanent facilities as part of the lease/license arrangements.

[44] We recommend County Parks contact their local office of the NRCS (Hollister Service Center, 2337 Technology Pkwy., Suite A, Hollister, CA 95023-2544, 831-637-4360) for more guidance on recommended designs for all elements of the livestock watering systems.

5.8.5 STOCK WATERING RECOMMENDATIONS

Considerable uncertainty exists with respect to the number of cattle which can be supported by the various water sources because of a lack of knowledge of both seasonal, as well as dry to wet year fluctuations and duration. Grazing field monitoring is the only reliable way to increase the accuracy of the preliminary estimates given above. The GMP recommends the following:

a. Perform a pump test at the abandoned Rosetto resort well to test the sustainable discharge from the well.
b. Take discharge measurements on Santa Teresa Creek and the springs on or about September 1, November 1, and April 1. The April 1 data should correlate to the seasonal high for the springs and near the high for non-storm associated flows in Santa Teresa Creek. If the November 1 reading in the springs is the same or lower than the September 1 reading, it indicates the springs are tapping deep sources of percolating groundwater, not subject to extraction by vegetation. If that is the case, it is likely the spring flows may not vary substantially seasonally, although the springs will eventually respond to lower rates of recharge during dry years.
c. In the spring, conduct weekly monitoring of the streams supplying each pond, and record the date at which there is no longer flow.
d. Install a recording precipitation gauge at a representative location within the park not subject to vandalism. Long-term records of precipitation can be correlated with the dates of flow cessation and seasonal maximum and minimum flows in the springs and in Santa Teresa Creek. This correlation can be used to predict water supply in future years.
e. Perform a ground survey of the stock ponds to compute their present volume and the volume which might be gained through repairs to the spillways and/or removal of accumulated sediment.
f. Design and install an outlet at each of the stock ponds so peak flow passes over/through the dam in a manner which causes neither erosion of the dam, nor of the downstream channel. Typically, the stock ponds would be equipped with a rock-lined spillway with the invert at the top of normal water surface when the pond is full, with sufficient spillway depth to pass the design flood without overtopping the dam. The rock lining would typically be composed of a graded rock geotextile blanket to be placed over the subgrade followed by crushed gravel and rock of sufficient dimension that it will not be moved during the design peak flow.
g. Design the dam with capabilities to withstand a specified magnitude of storm (and associated flow) based on a cost/benefit analysis. Such analysis would include the cost of installation versus the cost of repairing or replacing the dam once a storm of larger magnitude overtops the dam.
h. The work envisioned would likely fall within one of the Nationwide permits under the Corps of Engineers' 404 permit program. Consultation with Fish & Game will be made to determine if a Streambed Alteration Agreement is required. Other permits might be necessary as well (See *Ponds*, Section 5.8.3).

6 MONITORING OF CONDITIONS AND PLANNED EFFECTS ON RESOURCES RELATED TO GRAZING

County Parks will monitor the effects of grazing management on the following:

a. Grassland composition of late-germinating annual forbs and wildflowers;
b. Serpentine grasslands and associated sensitive species known to occur within the management zones;
c. Other sensitive habitats, including wetlands and riparian forests and woodlands, within the park;
d. Residual Dry Matter (RDM);
e. Effects upon ground nesting birds.

The Range Management Policy (County of Santa Clara 1992) states "3d. A monitoring program should include appropriate periodic measurements of plant and wildlife species composition, density, and frequency. (Other standards, like residual dry matter and stubble height, are useful operational tools, but they do not examine the effects of management on the native vegetation)."

The monitoring program will measure achievement of the performance standards defined in Section 3 based on the specified monitoring variables and methods. The monitoring program will provide an accurate assessment of the balance between forage supply and utilization, as well as other resource conditions, to assure that stocking rates, schedules, and other grazing practices are achieving the conservation and livestock production goals. It will provide the basis for adjustment of the estimates of future forage production and utilization, and adjustment to the conservation and grazing practices. If feasible, the monitoring program will measure ungrazed control areas with similar environmental conditions within each grazing field using the same variables and methods, in order to compare production and other conditions on both grazed and ungrazed fields. This monitoring program requires measurements supplementary to those ordinarily used for livestock production purposes alone, to accommodate the specialized conservation goals associated with sustaining sensitive resources. This GMP uses a combination of sampling and photographic stations to provide the most useful records and analyses.

Three monitoring purposes are incorporated in combination; compliance, effectiveness, and rangeland health monitoring. Compliance monitoring determines whether the grazing prescription was followed by the Livestock Operator (SRCD 2006). Effectiveness monitoring determines whether the management goals and objectives were achieved by the grazing prescription. Rangeland health monitoring determines whether soils, vegetation, water, and overall ecological processes are being maintained over time (Pellant et al. 2005). The monitoring will be conducted by a qualified person who understands the complexities of grazing and its effects on special resources, and can provide an evaluation of results.[45] The effectiveness monitoring must include evaluations of the effects of the grazing and related management on the status of the special-status animal and plant populations by a qualified entomologist, wildlife biologist, and botanist.

The associated adaptive management program will provide the means to make needed modifications to this GMP to achieve the performance standards based on the decision “triggers” discussed in Section 7.5.

[45] The California Board of Forestry and Fire Protection requires a licensed Certified Rangeland Manager for the conduct of rangeland management, planning, and conservation activities on non-federal rangelands that support or have the potential to support cover of native woodland.

6.1 Monitoring Variables, Methods, and Schedule

The monitoring program is limited to a minimum set of variables, schedule, and reporting that will achieve the monitoring objectives while being reasonable in requirements for personnel time, and costs (Tables 22 and 23). Consequently, the sampling size will be too small to be statistically rigorous but instead will rely on "professional judgment" to achieve representation of the landscape's variety.[46] The Livestock Operator will perform basic and regular field observations and reporting to the best of his/her ability. The more technically demanding elements of the monitoring and the data analyses, management evaluations, recommendations for adaptations to this GMP, and formal reporting will be performed directly by or under supervision of County Parks and may be phased to accommodate funding availability.

Monitoring will include a minimal set of indicator variables (quantitative and observational) to assess performance toward the standards for each objective (Section 3). All the herbaceous variables and most of the other variables focus on the herbaceous vegetation of the grasslands (the other vegetation types generally do not support grazeable forage). Two types of variables are outlined in Table 22 below: 1) Routine Monitoring Variables and 2) Special Variables. Additional planning and time will be needed to implement monitoring of the Special Variables. Because of the variety in topography, herbaceous foliage measurements (RDM/Phytomass, Height, and Absolute Cover) will be stratified into the seven grazing fields. Temporary sampling stations will be used for these variables to achieve a systematic representation of the grazeable areas. Selected Special Management Areas and Special-status Animal Habitats will be photographed to record significant impacts and problems. Illustrative Views will have permanent stations for repeated photography which will provide a visual record and reference for general rangeland conditions and wildlife habitat parameters. The permanent stations for the Illustrative Views will be determined by County Parks after careful review of available vistas and study of photo-monitoring guidelines (e.g. Hall 2002).

Some monitoring variables and/or methods might need to be adjusted after the grazing and monitoring programs begin, due to changed conditions or new information. In conjunction with preliminary training and testing of the monitoring methods, County Parks will prepare a plan for improved monitoring and measurement of the initial baseline conditions as soon as feasible. Specific assignments, monitoring protocols, data forms, analysis procedures, and record keeping and reporting procedures will be re-evaluated and determined at the conclusion of this preliminary monitoring. County Parks will then periodically conduct the monitoring.

[46] Monitoring associated with this GMP is not required as mitigation for a plan-related impact; therefore a higher sampling intensity and more rigorous methodology are not needed.

Table 22. Annual Monitoring Summary.

Variable (units)	Method	Timing/Frequency
Routine Monitoring Variables		
Herbaceous foliage: Biomass -- RDM/Phytomass (pounds/acre) (Biomass is measured as RDM in autumn and Phytomass in spring.)	Measure two representative sample sites in each of the seven grazing fields; clip, air dry (if needed),[i] and weigh samples from 1 sq. foot plots at each site using methods of Frost, McDougald, and George (1990) or UC Center for Range and Forested Ecosystems (1998; chp. 6); measure current green and dead foliage of all species together (distinguish proportions of summer annuals and non-forage plants); survey the entire grazing field using the measured sites as references, and prepare a map of general classes of the RDM/phytomass for each grazing field.[ii]	Before (Oct) and after (June) the grazing period
Herbaceous foliage: Height (inches)--1	Obtain an average from the same two mass sample sites in each grazing field; determine average forage height (top of foliage mass, not grass inflorescence; obstruction height) of each site on a representative 10-feet transect (ten measurements at 1 through 10 feet) by visual comparison with Robel pole.	Before (Oct) and after (June) the grazing period
Herbaceous foliage: Absolute Cover (percent)--1	Obtain an average from the same two mass sample sites in each grazing field; determine average percent cover of three variables (green foliage, litter, and bare soil/gravel/rocks) for each site within 10-feet radius circle by visual estimate.	Before (Oct) and after (June) the grazing period
Soil Erosion (location; severity; changes)	Map and record descriptions of status of sites of significant erosion; assess status; photograph significant changes.	After grazing period (June)
Actual Cattle Use (types and numbers)	Note the locations of any under or over-utilization patterns.	Maintain a log for the year
Recreation	Interview park rangers about reports of recreational issues related to cattle grazing operations during the past year.	Before grazing period (Oct)
Cattle Operation	Review accomplishments with the Livestock Operator (*prioritization and development of recommended infrastructure improvements; prompt responses to requests for cooperation and maintenance of infrastructure; reporting on schedule; exchange of relevant technical literature for education; support of joint participation in professional organizations; engage both parties in the monitoring and adaptive management*); note improvements needed	After grazing period (June)

Table 22. (Continued)

Variable (units)	Method	Timing/Frequency
Special Variables		
Illustrative Views	Establish stations for repeated photo documentation at permanently marked locations that represent each grazing field, plus banks of streams and lakes, watering facilities, and fence lines with adjoining properties	Photograph stations during and after grazing period; maintain log
Special Management Resources and Areas: special-status plants, native grasses, wildflowers, riparian areas, oak woodland[iii], and wetlands (species, locations, status)	Conduct focused surveys, with the assistance of a qualified botanist if needed, to determine status of the targeted species and habitat conditions	During and after grazing period (June)
Special-Status Animals and Habitat Areas: Bay checkerspot butterfly and others (target species and host plants, locations, status)	Conduct focused surveys, with the assistance of a qualified entomologist and wildlife biologist if needed, to determine status of the targeted species and habitat conditions	During and after grazing period (June)
Pest Plants (species, locations, status)	Map general distributions of high-priority pests (with the assistance of a qualified botanist, if needed); assess status of these infestations; photograph significant changes or new infestations. Record notes on control treatments applied and their effects.	After grazing period (June)

[i] If conditions are wet or the sample is green, then drying might be necessary. In such a case, the data form should include a column for "field weights," both for the clipped samples and the estimates. After drying, a dry/wet conversion percentage can be applied to the field weights, and noted on the data form as "dry weight."

[ii] The number of clipped samples shown here is the minimum required to assure accuracy of the biomass estimation. If feasible, a larger number of clipped samples should be measured. In any case, the monitoring personnel will need to survey the remainder of each field, making residual biomass estimates based on their "calibrated eye" from the clipped samples. The Guenther method, using a Robel pole, golfballs, and reference photos, is appropriate for fall season RDM estimating only, but is recommended here only to assist with the estimations. It is not appropriate for the spring phytomass measurements.

[iii] Deer are browsers of oaks. Any assessment of oak damage should not exclude deer browsing effects or confuse them with those of livestock. If deer populations are high or if plantings will occur in restoration areas, establishment will be aided by the use of reinforced tree shelters in grazed settings and exclosures. Use of exclosures will require the supplemental clearing of herbaceous foliage from at least two feet in radius around the main trunks of the planted trees by scraping, mowing or mulching.

Table 23. Monthly Monitoring Summary

Variable (units)	Method	Timing
Herbaceous Foliage: Biomass --RDM/Phytomass (pounds/acre) (Biomass is measured as RDM in autumn and Phytomass in spring.)	Obtain an average from two sample sites in each grazing field adjacent to convenient roadside locations; make remote visual estimates of average herbaceous biomass of each site within an approximate three-yard radius circle (Wildland Solutions 2008).	Monthly, during grazing period
Herbaceous Foliage: Height (inches)--2	Obtain an average from the same measured sample sites adjacent to convenient roadside locations in each grazing field; make remote visual estimates of average foliage height at each site within an approximate three-yard radius circle	Monthly, during grazing period
Herbaceous Foliage: Absolute Cover (percent)--2	Obtain an average from the same measured sample sites adjacent to convenient roadside locations in each grazing field; make remote visual estimates of average cover at each site within an approximate three-yard radius circle	Monthly, during grazing period
Unplanned Disturbance (type, date, location, severity)	Record descriptions of events (e.g. wildfires, pest infestations, vandalism) with dates, locations, and judgments of importance and effects; photograph significant changes	Maintain log for the year
Actual Cattle Use (types and numbers)	Record schedule of livestock types and numbers present at each grazing field, and any under or over-utilization patterns	Maintain log for the year, during grazing period
Infrastructure (type, location, condition)	Record the type, location, and condition of fences, gates, roads, trails, stream crossings, corrals, and other facilities that are in need of repair	Maintain log for the year
Operational Feasibility and Cooperation	Review accomplishments with County Parks (prioritization and development of recommended infrastructure improvements; prompt responses to requests for cooperation and maintenance of infrastructure; reporting on schedule; exchange of relevant technical literature for education; support of joint participation in professional organizations; engage both parties in the monitoring and adaptive management); note improvements needed	After grazing period (June)

6.2 Rationale for Inclusion of Monitoring Variables

The monitoring strategies recommended in this GMP will provide County Parks with qualitative and quantitative information about the effects of grazing at Santa Teresa County Park and will enable County Parks to evaluate the effectiveness of the grazing management strategies. County Parks will implement the monitoring plan in order to have first-hand experience with grazing field conditions. Further, monitoring must be conducted before, during, and after the grazing period in order to distinguish between the effects associated with grazing management vs. environmental effects, such as annual weather. County Parks will use the monitoring data to make computations and maps of forage production, utilization, and effects on habitat quality parameters in the grazing fields. With this information, they can evaluate the performance of the Livestock Operator and his/her accomplishment of performance standards. Based on the monitoring results and analysis, County Parks can make adjustments to tactical grazing operations and practices, and adjustments to the grazing prescription and strategy in the GMP (Section 5.5).

Monitoring data for RDM/phytomass, height, and cover of the herbaceous foliage provide crucial information about different dimensions of related habitat and forage qualities. These variables do not always fluctuate synchronously because of different responses to annual weather patterns. For example, grass can grow tall while its phytomass and areal cover grow proportionately less during a year with a cool dry winter and a warm wet spring. The same grassland could produce shorter more dense masses of grass and forbs during a year with a warmer wet winter and a dry spring. Consequently, height will not always predict phytomass, although height is regularly used as a main visual cue of RDM (Wildland Solutions 2008).

Herbaceous mass is measured to assess forage production, fire hazard, and utilization by livestock. Utilization measures the percentage of the current annual herbaceous production that has been removed. Residual measurement, including RDM, is the determination of herbage material or stubble height left after grazing. RDM is a measure of mulch at the beginning of the following growing season and includes all herbaceous species and herbaceous litter, but not summer annuals (such as tarweed and yellow starthistle) or woody leaves or stems (Bartolome et al. 2006). Forage mass measurements typically exclude non-forage or unpalatable species, litter, and woody materials. Fine (herbaceous) fire fuel measurements typically exclude only litter. Consequently, separate measurements are needed. Residual measurements and utilization data can be used to: identify cattle herbivory patterns, help establish cause-and-effect interpretations of range trend data, and aid in adjusting stocking rates when combined with other monitoring data (BLM 1999). The cover and phytomass measures are important measures to predict future herbaceous productivity as well as protection of the soil from erosion.

Concurrent measurements of the primary herbaceous foliage variables must be taken within ungrazed reference areas (existing exclosures, adjacent ungrazed lands, or semi-portable cage exclosures), at sample sites representing similar physical conditions to the grazed park lands. Without such measurements, an accurate assessment of potential herbaceous production (and fire hazard) and livestock utilization (fuel reduction) would be impossible. If measuring such reference areas is not feasible, then one exclosure made from Powder River panels (or a “cattle panel”) will be installed within each grazing field at a representative location, from which ungrazed comparative measurements can be taken. The cage will be moved to a new representative location each year before the start of the growing season to assure it will demonstrate growth for the current year, not multiple years (as it would if the cage was not moved). The timing of these measurements will be the same as noted in the table above.

Observations of Special Management Areas and Special-status Wildlife Habitat will provide information vital to the protection of the sensitive resources. For example, if a segment of exclosure fence is found to be in poor condition, it will be reported, and then repaired by the Livestock Operator. If the monitoring indicates excessive or insufficient livestock traffic or herbivory in specific areas, then a request would be made to the Livestock Operator to use mineral licks or other cattle attractants to attract the cattle away from or to that area to achieve better distribution. Observations of yellow starthistle and other pest plants will inform County Parks about the expansion of these infestations, and lead to decisions about whether grazing control is effective and whether non-grazing control measures are needed.

As noted in Table 22, monitoring of the special-status plants and animals will require the services of qualified personnel. Monitoring of the BCB will be conducted by a qualified personnel, while handling of the species requires a permit from the USFWS. Since the butterfly has not been found at the park, there should be a focus on monitoring on the butterfly habitat only (California plantain), which can be conducted by trained staff/personnel. If the butterfly is found, County Parks should hire an entomologist with the proper credentials to assess the habitat management success and future requirements.

Observations of soil erosion and disturbances will provide information about the expansion of erosion and status of disturbed sites, so that County Parks can make decisions about whether or not control measures are warranted. Any new or expanded erosion areas found in the regular monitoring will be referred for more-detailed assessment. Information about the actual livestock use and livestock traffic areas will help determine whether the grazing prescription has been applied and will inform decisions about measures to improve the distribution of the livestock. Observations of the condition of infrastructure will provide information so that any damage can be reported, then repaired in a timely manner. Making note of the accomplishments in operational feasibility and cooperation can lead to better communication and cooperation between County Parks and the Livestock Operator.

6.3 Analysis

County Parks will enter the monitoring data (including that provided by the Livestock Operator) into simple spreadsheets, conduct simple analyses, develop the summary tables, make the professional judgments noted above, and prepare the summary annual report. The data resulting from the monitoring and further assessment by the specialists (as needed) will be entered into simple spreadsheets, evaluated, and reported to County Parks.

The collected monitoring data will be analyzed and presented in a table summarizing the results, including mean, range, and standard error, where appropriate. Cumulative inter-annual summaries will be included in these tables for each of the variables. Herbaceous biomass will be presented both in tables and in a map of each grazing field. Heterogeneity in herbaceous height data will be evaluated using multiples of the standard deviation (Table 7, PS1.a). Minimization of the impacts of livestock herbivory and trampling on riparian zones and ponds will be judged from the observations. The degree of introduction and expansion of pest plant infestations will be assessed from the field maps of these plants, developed after baseline surveys are conducted. Changes in pest plants infestations will be summarized with area and percent inter-annual change. Improvement and maintenance of high quality vegetation conditions, habitat of sensitive natural communities, and ecosystem functions will be judged from observations and the results for all variables. The quality of forage and other conditions of rangeland ecosystem health will also be judged from the results for all variables. The need for additional

infrastructure or repair will be determined based on infrastructure and livestock use observations. The need and means to further protect sensitive resources or repair problems will be decided by County Parks in consultation with the Livestock Operator. Judgments for the observational variables will be presented in individual tables as defined in the methods columns in Tables 22 and 23 above. The photo documentation stations will be maintained in a manner allowing easy comparison between years, and sample photos can be used to illustrate key results in each annual report.

6.4 Timeframe

The timing and frequencies for monitoring of the different variables by the different parties are shown in Tables 22 and 23.

Monitoring need not require excessive time by any of the parties involved, except when problems are found that need further investigation. Collection of monitoring data for all variables should take no more than two weeks per year for all grazing fields in the park, plus time for analyses and reports. Collection of In-Field/On-Going monitoring data should take no more than one day per month during the grazing period. Monitoring of any newly discovered special resources or problem areas that are directly affected by grazing will require extra time and provide important information to help determine whether additional protection or adaptation of the management plans are needed.

Monitoring and adaptation are essential parts of state-of-the-art professional rangeland management and "Best Management Practices." Without monitoring information and planning adaptations, the managers would risk failures in meeting the short and long-term management objectives, avoiding the chance to correct inappropriate practices, and making changes to practices in accordance with shifts in knowledge of special resources or climate. Therefore, the monitoring and adaptation described here will continue indefinitely, and be considered by County Parks to be regular practices and costs of management of the park. A regular schedule of monitoring and adaptation planning will follow from year to year.

6.5 Adaptation of Management Plans

Adaptation of this GMP, including the objectives and performance standards, stocking schedule, and other actions will be made following an annual evaluation of the monitoring results by County Parks and the Livestock Operator. Any adaptations will be based on those evaluations and the determination of significant potential for improved results due to modified management practices or new information.

The Santa Clara County Parkland Range Management Policy (Section 3.g, Santa Clara County 1992) indicated that stocking rates are to be adjusted as needed on a quarterly basis. In this GMP, we recommend monthly monitoring by the Livestock Operator to inform that process, and to make adjustments to the stocking rate if needed. Adaptations may be triggered by the results of monitoring, indicating the performance of the grazing operations at each grazing field according to the objectives and performance standards described in Section 3. When the performance standards have been not been met, as shown at the time of any formal monitoring or incidental observation by County Parks or the Livestock Operator, the two parties will discuss the significance of the situation, and make plans for a more detailed review leading to potential adaptation of plans. Any plan adaptations will be made at least within one year, and before the start of the next grazing period, if feasible. Decisions will be based on whether or not the performance standards have been met, as described in Tables 24.

6.6 Reporting

The eventual agreement with a Livestock Operator will include annual reporting. The Livestock Operator will also verbally report any unusual conditions or unplanned disturbance observed to County Parks as soon as possible. County Parks will prepare written reports of monitoring results soon after each fall and spring monitoring period to provide feedback on grazing effects to the Livestock Operator and its managers, and to use these monitoring results to make recommendations for adaptations of the management plan.

Table 24. Summary of Adaptive Management Decisions, Santa Teresa County Park, Santa Clara County, CA.

Monitored Variable	Affected Management Practice	Determinations
Biomass— RDM/Phytomass	Stocking rate and distribution	• If near or below standards at start of grazing period, then reduce stocking for current year and plan reduction for following year; • If significantly above or below standards at end of grazing period, then plan to adjust stocking for following year; • If landscape patterns of biomass and utilization are uneven and significant patches are above or below standards at any time of year, then plan adjustments of livestock distribution, using mineral licks, watering, or fencing.
Height	Stocking rate and distribution	• If near or below standards at start of grazing period, then stocking reduction for current year and plan reduction for following year; • If significantly above or below standards during grazing period, then stocking adjustments and better distribution incentives for current year; • If significantly above or below standards at end of grazing period, then stocking adjustments and better distribution incentives for following year; • If landscape patterns are uneven and significant patches are above or below standards at any time of year, then plan adjustments of livestock distribution using mineral licks, watering, or fencing.
Absolute Cover	Stocking rate and distribution	• If near or below standards at start of grazing period, then stocking reduction by Livestock Operator for current year and plans reduction for following year; • If significantly below standards during grazing period, then stocking adjustments and better distribution incentives for current year; • If significantly below standards at end of grazing period, then plan stocking adjustments and better distribution incentives for following year; • If landscape patterns are uneven and significant patches are below standards at any time of year, then plan adjustments of livestock distribution using mineral licks, watering, or fencing.
Soil Erosion	• Special Grazing Treatment • Other Erosion Control Treatments	• If an existing significant erosion site expands in area by more than 10%, or if a new erosion site is discovered, then plan special grazing treatment or other control for that site.
Special Management Areas: Special-status Plants, Native Grasses, Oak Woodlands, Wildflowers, Streams, and Wetlands	• Special Grazing Treatment • Infrastructure Maintenance • Additional infrastructure • Grazing schedule	• If related exclosure fencing or watering facilities damaged, then perform repairs; • If the monitoring determines that excessive livestock traffic and herbivory has exceeded the threshold for habitat quality in the unfenced habitat areas, then plan to adjust the grazing schedule or other means of avoiding livestock pressure in the habitat areas.

Table 24. (Continued)

Monitored Variable	Affected Management Practice	Determinations
Special-Status Animals Habitat: Bay Checkerspot Butterfly and Other Animals	• Special Grazing Treatment • Infrastructure Maintenance • Additional infrastructure • Grazing schedule	• If related exclosure fencing or watering facilities damaged, then repair; • If the monitoring determines that excessive livestock traffic and herbivory has exceeded the threshold for habitat quality in the unfenced habitat areas, then plan to adjust the grazing schedule or other means of avoiding livestock pressure in the habitat areas.
Pest Plants	• Special Grazing Treatment • Other Pest Control Treatments	• If an existing significant infestation of any one of the pest plants rated high priority exceeds the performance standards, or if a new infestation is discovered, then plan a special grazing treatment or other control for the site.
Unplanned Disturbance	• Documentation • Repair or Response Treatments • Stocking Timing	• If an unplanned significant disturbance occurs, then plan and perform a repair or response for the affected area, and plan a stocking timing adjustment.
Actual Cattle Use	• Documentation • Stocking rate and distribution	• If the actual number of livestock grazing either are less or exceed the numbers prescribed, then adjust stocking as soon as feasible, particularly to assure the prescribed numbers are present in the habitat fields.
Infrastructure	• Maintenance	• If any facility is at serious risk of failure or is not functional, then plan and implement repairs.
Illustrative Views	• Documentation	• Qualitative assessment of grazing effects. The photos may prove valuable to aid memory or clarification.
Recreation	• Documentation • Grazing Prescription	• If the number of valid and reasonable complaints is significant, then improve communications with the users, and consider adjustments to the GMP.
Cattle Operations	• Communication • Maintenance	• If cooperation is not adequate or effective between County Parks and Livestock Operator, then parties will meet (with a facilitator if necessary) to resolve conflicts and plan for improved cooperation.

7 ASSUMPTIONS AND RECOMMENDED SUPPLEMENTARY PLANNING

The determination of management goals, estimation of grazing capacity, and development of management guidelines for this document were based on the following assumptions:

a. The primary management issues are limited to those described in the available reports of resource surveys and management planning for the special-status species, sensitive natural communities, erosion control, and public access. No other resource management plans or agreements, such as local zoning plans, water resource use plans, or land use plans, are active that would conflict with the grazing management plans described here.
b. No cultural resources impacts exist (other than those described in Section 2.7) that would conflict with the grazing management plans described here. Section 3.l of the County of Santa Clara Parkland Range Management Policy (County of Santa Clara 1992) stated, "Archeological sites will be preserved in undisturbed condition."
c. If new grazing management issues or requirements for further management actions are raised by the monitoring activities, such as expansion of pest plant populations or risk of water contamination, then the GMP will be revised as needed.

Recommended supplementary planning related to grazing management includes:

a. Comprehensive biological surveys to confirm and extend identifications, locations, populations status, and threats, particularly for the special-status plants and wildlife, and sensitive natural communities; these would be part of development of the supplementary monitoring plans for the special resources, and would provide the baselines for future monitoring.
b. Pest management plan, with detailed assessment of non-grazing control options and priorities, control of sources of new infestations, early detection and rapid response to new infestations, animal pests, and diseases, if determined to be necessary due to increased infestation in the future.
c. Fire management plan with goals, objectives, and monitoring performance standards, wildfire scenarios and expected behavior, risks assessment, and cooperation with local fire control and emergency response agencies.
d. Water quality management plan related to rangeland grazing, as required under expected new rules of the San Francisco Bay Regional Water Quality Control Board.
e. Section 7 of the County of Santa Clara Parkland Range Management Policy (County of Santa Clara 1992) stated, "The Department of Parks and Recreation will ensure proper and effective management of the grazing program by educating and maintaining expertise on staff and using outside experts as necessary to audit the program and/or provide necessary staff training."
f. Section 10 of the same document states, "...grazing policy and practices of the County of Santa Clara will be reviewed in a public forum at least every four (4) years, beginning in two years from the date when grazing begins under this policy. These policy reviews will be based on a comprehensive Department report which includes: (a) progress toward goals stated in the site management plans; (b) a full exposition of costs and revenues. The Parks and Recreation Commission shall review the Department report and if appropriate recommend modification to the Board of Supervisors.
g. An education and outreach plan is needed to ensure public safety and sustainability of a grazing operation that will achieve County Park conservation objectives.

8 REFERENCES

Abrams, L. 1923. Illustrated flora of the Pacific states, Vol. I. Stanford University Press, Stanford, CA. 538 pp.

Abrams, L. 1944. Illustrated flora of the Pacific states, Vol. II. Stanford University Press, Stanford, CA. 635 pp.

Abrams, L. 1951. Illustrated flora of the Pacific states, Vol. III. Stanford University Press, Stanford, CA. 866 pp.

Abrams, L and R. S. Ferris. 1960. Illustrated flora of the Pacific states, Vol. IV. Stanford University Press, Stanford, CA. 732 pp.

Agouridis, C.T., S.R. Workman, R.C. Warner, and G.D. Jennings. 2005. Livestock Grazing Management Impacts on Stream Water Quality: A Review. Journal of the American Water Resources Association 41(3):591-606.

Allen-Diaz, B., R. D. Jackson, J. W. Bartolome, K. W. Tate, and L.G. Oates. 2004. Long-term grazing study in spring-fed wetlands reveals management tradeoffs. California Agriculture, 58(3).

Atwill, E.R. 2010. Presentation From Workshop on Grazing Livestock and Water Quality: Options and Solutions for California Rangelands. April 27, 2010. Lucchesi Park Community Center, Petaluma, California.

Barbour, M., T. Keeler-Wolf, and A.A. Schoenherr. 2008. (eds.), Terrestrial vegetation of California. Viewed online at: http://www.dfg.ca.gov/ whdab/pdfs/TEPlants.pdf (2010).

Barrett, R.H. and T.E. Kucera. 2005. Wild turkey in Sonoma County parks. A Final Report to the California Department of Parks and Recreation, in partial fulfillment of Contract C023B034, dated June 30, 2005.

Barrett, R.H. and J.W. Menke. 1976. A review of the value of hardwoods to wildlife in California with recommendations for research. Unpublished report for the Tahoe National Forest. Berkeley: University of California, Berkeley, Department of Forestry and Natural Resources.

Bartolome, J.W., M.C. Stroud, and H.F. Heady. 1980. Influence of natural mulch on forage production on differing California Annual Range sites. *J. Range Management* 33(1):4-8.

Bartolome, J., W. Frost, and N. McDougald. 2006. Guidelines for Residual Dry Matter on Coastal and Foothill Rangelands in California. Pub. #8092. University of California Division of Agriculture and Natural Resources.

Bean, C. 2006. Element stewardship abstract for Silybum marianum—blessed milk thistle. The Nature Conservancy.

Bean, C. and M.J. Russo. 2004. Element stewardship abstract for Eucalyptus globulus—Tasmanian blue gum. The Nature Conservancy.

Bean, C. and M.J. Russo. 2004. Element stewardship abstract for Foeniculum vulgare—sweet fennel. The Nature Conservancy.

Bell D.T. and C.H. Muller. 1973. Dominance of California annual grasslands by Brassica nigra. American Midland Naturalist 90:227-299.

BLM. 1999. Utilization Studies and Residual Measurements. Interagency Technical Reference BLM/RS/ST-96/004+1730. Cooperative Extension Service, U.S. Department of Agriculture Forest Service, Natural Resource Conservation Service Grazing Land Technology Institute, U.S. Department of the Interior Bureau of Land Management.

Bock, C.E. and B. Webb. 1984. Birds as grazing indicator species in southeastern Arizona. Journal of Wildlife Management. 48:1045–1049.

Bolster, B.C. (ed.). 1998. Terrestrial Mammal Species of Special Concern in California. Draft Final Report prepared by P.V. Brylski, P.W. Collins, E.D. Pierson, W.E. Rainey and T.E. Kucera. Report submitted to California Department of Fish and Game Wildlife Management Division, Nongame Bird and Mammal Conservation Program for ContractNo.FG3146WM. Viewed online at: http://www.dfg.ca.gov/wildlife/nongame/ssc/1998mssc.html

Brady and Associates, Inc. 1996. "Joseph D. Grant and Ed R. Levin County Parks Resource Management Plan." Prepared for Santa Clara County Parks and Recreation Department.

Briggs, T.S. and D. Ubick. 1989. The harvestman family Phalangodidae. 2. The new genus *Microcina* (Opiliones, Laniatores). Journal of Arachnology 17: 207-220.

Briggs, T.S. and K. Hom. 1966. Five new species of Phalangodidae from California. The Pan-Pacific Entomologist: 12:262-269.

Briske, D.D., J.D. Derner, J.R. Brown, S.D. Fuhlendorf, W.R. Teague, K.M. Havstad, R.L. Gillen, A.J. Ash, and W.D. Willms. 2008. Rotational grazing on rangelands: reconciliation of perception and experimental evidence. *Rangeland Ecology and Management* 61:3-17.

Brossard C.C. 2000. Fennel (*Foeniculum vulgare*). pp. 198-202 in Bossard, C.C., J.M. Randall, and M.C. Hoshovsky. Invasive Plants of California's Wildlands. University of California Press. Berkeley, CA.

Brossard, C.C. and R. Lichti. 2000. Italian thistle (*Carduus pycnocephalus*). pp. 86-90 in Bossard, C.C., J.M. Randall, and M.C. Hoshovsky. Invasive Plants of California's Wildlands. University of California Press. Berkeley, CA.

Brossard, C.C., J.M. Randall, and M.C. Hoshovsky (Eds.). 2000. Invasive plants of California's wildlands. Berkeley: University of California Press.

Brown, P.E., R.D. Berry, and C. Brown. 1994. Foraging behavior of Townsend's big-eared bats (*Plecotus townsendii*) on Santa Cruz Island. Pp.367–369 in W. L. Halvorson and G. J. Maender, editors. Fourth California Islands Symposium, Santa Barbara Museum of Natural History, Santa Barbara, CA.

Brown, P.E., RD. Berry and E.D. Pierson. 1996. Recommended bat survey methods checklist. Transactions of the Western Section of the Wildlife Society. 1996(32): 48.

BUGGY Database. 2011a. Maintained by Entomological Consulting Services, Ltd.

BUGGY Database. 2011b. Report for the San Francisco Fork-tail Damselfly. Data Base maintained by Entomological Consulting Services, Ltd. Pleasant Hill, CA.

Bulger, J.B., N. Scott Jr., and R.B. Seymour. 2003. Terrestrial activity and conservation of adult California red-legged frogs (*Rana aurora draytonii)* in Coastal forests and grasslands. Biological Conservation 110:85-95.

California Burrowing Owl Consortium. 2003. Burrowing Owl Consortium Survey Protocol and Mitigation Guidelines.

California Department of Fish and Game. 2010. Report to the Fish and Game Commission: A Status Review of the California Tiger Salamander (*Ambystoma californiense*). Viewed online at: http://www.dfg.ca.gov/wildlife/nongame/publications/docs/CTS-StatusEvaluation.pdf.

California Department of Fish and Game. 2011a. Special Animals List. Viewed online at: http://www.dfg.ca.gov/ whdab/spanimals.pdf (January 2011).

California Department of Fish and Game. 2011b. State and Federally listed endangered animals of California. (January 2011). Viewed online at: http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/TEAnimals.pdf

California Department of Fish and Game. 2011c. Biogeographic Data Branch - Biogeographic Information and Observation System (BIOS) Internet Map (IMAP) Viewer (January 2011). Viewed online at: http://bios.dfg.ca.gov/

California Department of Fish and Game. 2011d. Biogeographic Data Branch - Biogeographic Information and Observation System (BIOS) Internet Map (IMAP) Viewer (August 2011). http://bios.dfg.ca.gov/

California Fish and Game Commission. 2010. Staff summary of vote to list the California tiger salamander as 'Threatened' under the California Endangered Species Act. Meeting held on March 3, 2010. Viewed online at: http://www.fgc.ca.gov/meetings/2010/030310summary.pdf

California Native Plant Society. 2001. CNPS Botanical Survey Guidelines. Published December 1983, revised June 2001.

California Natural Diversity Database (CNDDB). 2011. Rarefind report occurrence records. Published by California Department of Fish and Game Natural Heritage Division, Sacramento, California.

California Natural Diversity Database (CNDDB). 2010. California Native Plant Society inventory of rare and endangered plants. Online edition. Version 7-07b, April 2010. Viewed online at: http://cnps.web.aplus.net/cgi-bin/inv/inventory.cgi.

California Partners in Flight. 2002. Version 2.0 The oak woodland bird conservation plan: a strategy for protecting and managing oak woodland habitats and associated birds in California. (S. Zack – lead author). Point Reyes Bird Observatory, Stinson Beach, California. Viewed online at: http://www.prbo.org/calpif/plans.html.

California Regulatory Notice Register. 2010. Proposed Action on Regulations: Title 14. Fish and Game Commission, California tiger salamander – Notice File No. Z2010-0309-08, No. 12-Z, March 19, 2010. Viewed online at: http://www.oal.ca.gov/res/docs/pdf/notice/12z-2010.pdf .

[Cal-IPC] California Invasive Plant Council. 2011. Viewed online at: http://www.cal-ipc.org/ip/definitions/index.php .

Castelle, J.A., A.W. Johnson, and C. Conolly. 1994. Wetland and stream buffer size requirements—a review. *Journal of Environmental Quality* 23:878-882.

[CDFG]. California Department of Fish and Game. 2003. Draft Wildlife Friendly Fencing Guidelines. Prepared by Allan Buckmann, Associate Wildlife Biologist, Central Coast Region.

Conservation Biology Institute. 2006. Report of Independent Science Advisors for Santa Clara Valley Habitat Conservation Plan / Natural Community Conservation Plan (HCP/NCCP). December 2006.

Cornell Lab of Ornithology. 2009. All about birds informational website: http://www.allaboutbirds.org/NetCommunity/

County of Santa Clara Department of Parks and Recreation (County Parks). 1993. Santa Clara County Heritage Resource Inventory 1993 Update—Rancho Santa Teresa.

County of Santa Clara Department of Parks and Recreation (County Parks) and Bellinger Foster Steinmetz Landscape Architecture. 2009. Santa Teresa County Park Historic Area Site Plan—Final Initial Study and Mitigated Negative Declaration. SCH# 2009082008.

County of Santa Clara Department of Parks and Recreation (County Parks). 2000. Inventory of Vegetation and Fuels.

County of Santa Clara Department of Parks and Recreation (County Parks). 2010. Grant proposal to USFWS titled, "Central Valley Project Conservation Program and Central Valley Project Improvement Act Habitat Restoration Program: Serpentine Soils Grazing Implementation for Santa Teresa County Park," dated November 12, 2010.

County of Santa Clara Department of Parks and Recreation (County Parks). 2011a. Santa Teresa County Park website. Viewed on line at: http://www.parkhere.org/portal/site/parks/parksarticle?path=%252Fv7%252FParks%2520and%2520Recreation%252C%2520Department%2520of%2520%2528DEP%2529&contentId=87565e7505e21110VgnVCM10000048dc4a92____&cpsextcurrchannel=1

County of Santa Clara Department of Parks and Recreation (County Parks). 2011b. Playhere! Parks Brochure. Viewed on line at: http://www.parkhere.org/portal/site/parks/

Cushman, J.H., Tierney, T.A. & Hinds, J. M. 2004. Variable Effects Of Feral Pig Disturbances on Native and Exotic Plants in a California Grassland. Ecological Applications, 14, 1746-1756.

DiTomaso, J.M. 2002. Element stewardship abstract for Centaurea solstitialis—yellow starthistle. The Nature Conservancy.

DiTomaso, J.M. and D.W. Johnson. 2006. The Use of Fire as a Tool for Controlling Invasive Plants. Cal-IPC Publication 2006-01. California Invasive Plant Council: Berkeley, CA. 56 pp.

DiTomaso, J.M., M.L. Brooks, E.B. Allen, R. Minnich, P.M. Rice, and G.B. Kyser. 2006. Control of invasive weeds with prescribed burning. Weed Technology 20:535-548.

DiTomaso, J.M., G.. Kyser, and M.J. Pitcairn. 2006. Yellow starthistle management guide. Cal-IPC publication 2006-03. California Invasive Plant Council, Berkeley CA. 78 pp. http://www.cal-ipc.org/ip/management/pdf/YSTMgmtweb.pdf .

DiTomaso, J.M. and E.A. Healy. 2007. Weeds of California and Other Western States. Vols. 1 and 2. University of California Agriculture and Natural Resources, Oakland, CA.

Donaldson S. 2002. Identification and management of common teasel (Dipsacus fullonum). University of Nevada Cooperative Extenstion. Fact Sheet 02-40.

Drake, D.J., E.R. Atwill, R. Phillips, and E. Johnson. 2001. Internal parasites prevalent in California's beef cattle. *California Agriculture* 55(2):28-32.

Dyer, A.R., H.C. Fossum, and J.W. Menke. 1996. Emergence and survival of Nassella pulchra in a California grassland. *Madrono* 43(2):316-333.

eBird of California. 2011. Database observation records for bird species in Santa Clara County. Website sponsored by the Cornell Laboratory of Ornithology and the Audubon Society. Viewed online at: http://ebird.org/content/ebird.

Edwards, S.W. 1992. Observations on the prehistory and ecology of grazing in California. *Fremontia* 20(1):3-11.

Environmental Science Associates, Inc. 1992. Santa Teresa Master Plan Environmental Impact Report, April 1992.

Feldman, M., 1982. Notes on reproduction in *Clemmys marmorata*. Herpetological Review. 13:10-11.

Fellers, G.M. and E.D. Pierson. 2002. Habitat use and foraging behavior of Townsend's big-eared bat (*Corynorhinus townsendii*) in coastal California, Western Ecological Research Center, United States Geological Survey, Point Reyes National Seashore, Point Reyes, CA, Journal of Mammalogy Vol. 8 3, N1, pp.167-177(bibl.: 1p.3/4).

Ford, L.D. 2001. Prescribed grazing for conservation of special-status wildlife in California Annual Grassland. Paper presented at the annual meeting of the Society for Range Management, Kailua-Kona, Hawaii, 17-23 February 2001.

Ford, L.D. and G.F. Hayes. 2007. Northern coastal scrub and coastal prairie. Chp. 7 in: M.G. Barbour, T. Keeler-Wolf, and A. Schoenherr (Eds.). Terrestrial vegetation of California, Third Ed. Berkeley: University of California Press.

Ford, L.D. and L. Huntsinger. 2004. "Report of Science Advisors: *Supplement on Rangeland Management,* Solano County Habitat Conservation Plan and Natural Community Conservation Plan." Prepared for the Solano County Water Agency.

Frost, W.E., J.W. Bartolome, and K.R. Churches. 2005. Disappearance of residual dry matter (RDM) on annual grassland in the absence of grazing. XX International Grassland Congress.

Frost, W.E., N.K. McDougald, and M.R. George. 1990. Herbaceous plant measurements. Pp: 3-6 in: W.J. Clawson (Tech. Ed.). Monitoring California's annual rangeland vegetation. Cooperative Extension Leaflet 21486. Oakland: University of California Division of Agriculture and Natural Resources. 25p.

Fuhlendorf, S.D. and D.M. Engle. 2001. Restoring heterogeneity on rangelands: ecosystem management based on evolutionary grazing patterns. *Bioscience* 51(8):625-632.

Gabay, R., U. Plitmann, and A. Danin. 1994. Factors affecting the dominance of Silybum marianum L. (Asteraceae), in its specific habitats. Flora 189:201-206.

Gelbard, J. L. and S. Harrison. 2003. Roadless habitats as refuges for native grasslands: interactions with soil, aspect, and grazing. Ecological Applications. 13:404-415.

George, M. T. Becchetti, K. Oster, and S. Barry. 2004. Ecological Site Description for Shallow Loamy Upland (R015XI011CA) (approved by K. Moseley, 3/17/08). U.S.D.A. Natural Resources Conservation Service, Ecological Site Information System.

George, H. and E. Rilla. 2005. Agritourism and Nature Tourism in California. University of California Agriculture and Natural Resources Publication 3484.

Gerlach, J. D. and J. M. DiTomaso. 2000. Yellow starthistle (Centaurea solstitialis). pp. 101-106 in Bossard, C. C., J. M. Randall, and M. C. Hoshovsky. Invasive Plants of California's Wildlands. University of California Press. Berkeley, CA.

Habitat Partnership Program. Undated. Fencing With Wildlife in Mind: Understanding the Impact on Wildlife When Fencing Your Property. Available at: http://wildlife.state.co.us/NR/rdonlyres/B0D65D61-6CB0-4746-94F1-6EE194E1C230/0/fencing.pdf.

Hall, F.C. 2002. Photo point monitoring handbook: part A—field procedures. Gen. Tech. Rep. PNW-GTR-526. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 48 pp. 2 parts.

Harrison, S. 1999. Native and alien species diversity at the local and regional scales in a grazed California grassland. Oecologia. 121:99-106.

Harrison, S., B. D. Inouye, and H. D. Safford. Ecological heterogeneity in the effects of grazing and fire on grassland diversity. Conservation Biology. 17:837-845.

Harrison, S.P. and J. Viers. 2007. Serpentine Grassland. Chp. 12 in Stromberg, M. R., J. D. Corbin, and C. M. D'Antonio. 2007. California Grasslands—Ecology and Management. University of California Press, Berkeley, CA.

Harrington, J.L. and M.R. Conover. 2006. Characteristics of ungulate behavior and mortality associated with wire fences. Wildlife Society Bulletin 34(5): 1295-1305.

Hatch, D.A., J.W. Bartolome, J.S. Fehmi, and D.S. Hillyard. 1999. Effects of burning and grazing on a coastal grassland. Restoration Ecology 7(4):376-381.

Hayes, G. and K.D. Holl. 2003. Cattle grazing impacts on annual forbs and vegetation composition of mesic grasslands in California. *Conservation Biology* 17:1694-1702.

Hayes, M.P. and M.R. Jennings. 1989. Habitat correlates of distribution of the California red-legged frog (*Rana aurora draytonii*) and the foothill yellow-legged frog (Rana boylii): implications for management. Pages 144-158. In: R.E. Szaro, K.E. Severson, and D.R. Patton (technical coordinators): Management of amphibians, reptiles, and small mammals in North America, Proceedings of the July 19-21, 1988 symposium, Flagstaff, AZ. USDA Gen. Technical Report RM-166:1-458.

Heady, H.F. 1961. Continuous vs. specialized grazing systems; a review and application to the California annual type. *Journal of Range Management* 14:182-193.

Hickman, J. C. (ed.). 1993. The Jepson manual: higher plants of California. University of California Press, Berkeley, CA.

Holechek, J.L., H. Gomez, F. Molinar, and D. Galt. 1999. Grazing Studies: What we've learned, Rangelands 21(2). University of Arizona Institutional Repository: http://digitalcommons.library.arizona.edu/search

Holechek, J.L., R.D. Peiper, and C.H. Herbel. 1989. *Range management: principles and practices*. Englewood Cliffs, NJ: Prentice Hall.

Holland, R. F. 1986. Preliminary descriptions of the terrestrial natural communities of California. Nongame-Heritage Program, California Department of Fish and Game, Sacramento, CA. 156pp.

Holland, D.C. and R.B. Bury, 1998. *Clemmys marmorata* (Baird and Girard 1852) western pond turtle. *In* P.C.H. Pritchard and A G.J. Rhodin (eds.), The Conservation Biology of Freshwater Turtles. Chelonian Research Monographs 2(2).

Holloran, P., A. Mackenzie, S. Farrell, and D. Johnson. 2004. The Weed Workers Handbook.

Hopkinson P., M. Stevenson, M. Hammond, S. Gennet, D. Rao, and J.W. Bartolome. 2008. Italian ryegrass—A new central California dominant? Fremontia 36-1: 20-24.

H.T. Harvey and Associates. 1997. Santa Clara Valley Water District, California red-legged frog distribution and status. Project No. 1164-01. (Dated June 3, 1997).

H.T. Harvey and Associates. 1999a. Santa Clara Valley Water District, foothill yellow-legged frog distribution and status. Project No. 1563-01. (Dated December 3, 1999).

H.T. Harvey and Associates. 1999b. Santa Clara Valley Water District, western pond turtle distribution and status. Project No. 1563-01. (Dated December 2, 1999).

ICF Jones and Stokes. Conservancy. 2007. East Contra Costa County Habitat Conservation Plan and Natural Community Conservation Plan Species Profiles. Prepared for East Contra Costa County Habitat Conservation Plan Association, Contra Costa County Community Development Department. Viewed online at: http://www.co.contra costa.ca.us/depart/cd/water/HCP/archive/final-hcp-rev/final_hcp_nccp_figures.html#AppD.

ICF International. 2010. Draft Santa Clara Valley Habitat Plan – Public Draft. Prepared for the County of Santa Clara County Planning Office, San Jose, California. Viewed online at: http://www.scv-habitatplan.org/www/site/alias__default/341/public_draft_habitat_plan.aspx

Jackson Hole Wildlife Foundation. Undated. How to Create Wildlife Friendly Fencing (Brochure). Available at: http://www.jhwildlife.org/pdf/createwff.pdf.

Jelks, H.L., S.J. Walsh, N.M. Burkhead, S. Contreras-Balderas, E. Díaz-Pardo, D.A. Hendrickson, J. Lyons, N.E. Mandrak, F. McCormick, J.S. Nelson, S.P. Platania, B.A. Porter, C.B. Renaud, J.J. Schmitter-Soto, E.B. Taylor, and M.L. Warren, Jr. 2008. Conservation status of imperiled North American freshwater and diadromous fishes. Fisheries in *American Fisheries Society* 33(8):372-407. Available at: http://www.fisheries.org/afs/docs/fisheries/fisheries_3308.pdf.

Jennings, M.R. and M.P Hayes. 1994. Amphibian and reptile species of special concern in California. California Department of Fish and Game Contract No. 8023.

Johnston, D.S. 2002. [Abstract]. Prey discrimination by olfactory cues in the Pallid bat (*Antrozous pallidus*). Bat Research News. 42(4): 162.

Johnston, D.S., G. Tatarian, and E.D. Pierson. 2004. California bat mitigation techniques, solutions, and effectiveness. H.T. Harvey & Associates project no. 2394-01. Prepared for California Department of Transportation (Caltrans). Office of Biological Studies and Technical Assistance. Sacramento, California. 167 pp.

Johnston, D.S. and M.B. Fenton. 2001. Individual and population-level variability in diets of Pallid bats (*Antrozous pallidus*). Journal of Mammalogy. 82(2): 362-373.

Keeley, J.E. 2007. Chaparral. Chp. 13 in Barbour, M. G., T. Keeler-Wolf, and A. A. Schoenherr (eds.), Terrestrial vegetation of California, Third Edition. University of California Press, Berkeley, CA.

Kiesecker M J. And R.A. Blaustein. 1998. Effects of introduced bullfrogs and small mouth bass on microhabitat use, growth and survival of native red-legged frogs (Irana Aurora). Conservation Biology, 12:776-787.

Kotanen, P.M. 1997. Effects of Experiemental Soil Disturbance on Revegetation By Natives and Exotics in Coastal California Meadows. Journal of Applied Ecology 34:631-644.

Kotanen, P. M. 2004. Revegetation following soil disturbance and invasion in a Californian meadow: a 10-year history of recovery. Biological Invasions 6:245-254.

Kruckeberg, A.R. 1984. California Serpentines: Flora, Vegetation, Geology, Soils, and Management Problems. Univ. of Calif. Press, Berkeley, CA.

Leidy, R.A., G.S. Becker, B.N. Harvey. 2005. Historical distribution and current status of steelhead/rainbow trout *(Oncorhynchus mykiss)* in streams of the San Francisco Estuary, California. Center for Ecosystem Management and Restoration, Oakland, CA. Viewed online at: http://www.cemar.org/pdf/santaclara.pdf.

Levitan, L. 2004. Santa Clara County: Approved List of Pesticides. (Ordinance No. NS-517.70, Section 28-5(a))

Lewis, D.J., K.W. Tate, and J.M. Harper. 2000. Sediment Delivery Inventory and Monitoring: A Method for Water Quality Management in Rangeland Watersheds. Publication 8014. University of California Division of Agriculture and Natural Resources.

Lind, A. and H. Welsh. 1996. Habitat and reproductive timing of the foothill yellow-legged frog (*Rana boylii*) on a dammed river in Northwestern California. In Transactions of the Western Section Meeting of the Wildlife Society.

Martin, C.O. 2002. Riparian Habitat for Mammals on Corps of Engineers Projects, Ecosystem Management and Restoration Program Technical Note – EMRRP-S1-29. Viewed online at: http://el.erdc.usace.army.mil/elpubs/pdf/si29.pdf.

McBride, J.R. 1974. Plant succession in the Berkeley Hills, California. Madrono 22(7):317-329.

McCreary, D.D. 2001. Regenerating rangeland oaks in California. University of California, Division of Agriculture and Natural Resources. 62p.

Menke, J.W. 1992. Grazing and fire management for native perennial grass restoration in California grasslands. *Fremontia* 20(2):22-25.

Munz, P.A. & D.D. Keck, 1959. A California Flora. Univ. of California Press, Berkeley. Museum of Vertebrate Zoology (MVZ). 2010. University of California at Berkeley museum records available online at: http://mvz.berkeley.edu/Collections.html.

National Oceanic and Atmospheric Administration (NOAA). 2005. Endangered and threatened species; Designation of critical habitat for seven evolutionary significant units of Pacific salmon and steelhead in California; Final Rule; Federal Register Vol. 70, No. 170, September 2, 2005. Viewed online at: http://www.nwr.noaa.gov/Publications/FR-Notices/2005/loader.cfm?csModule=security/getfile&pageid=33705.

National Oceanic Atmospheric Administration (NOAA). 2006. Final ESA Listing Determinations for 10 Distinct Population Segments of West Coast Steelhead, Final Rule; Federal Register Vol 71, No. 834, May 1, 2006. Viewed online at: http://www.nwr.noaa.gov/Publications/FR-Notices/2006/loader.cfm?csModule=security/getfile&pageid=26415.

NOAA. Undated. HydroData commercial database, Boulder, Co.

NRCS. 2006. “Draft Pond Restoration Design and Plan per Practice Requirements 632.” Alameda County Permit Coordination Program. (Although this is a draft document it has been approved by USFWS and NRCS).

NRCS. 2007. “Watering Facility, Practice #614.” Natural Resources Conservation Service, Conservation Practice Standard for California.

Nussbaum, R.A., E.D. Brodie, Jr., and R.M. Storm. 1983. Amphibians and Reptiles of the Pacific Northwest. The University Press of Idaho, Moscow, Idaho. 332pp.

O'Geen, A. 2010. Presentation From Workshop on Grazing Livestock and Water Quality: Options and Solutions for California Rangelands. April 27, 2010. Lucchesi Park Community Center, Petaluma, California.

O'Geen, A.T., R.A. Dahlgren, and D. Sanchez-Mata. 2007. California Soils and Examples of Ultramaphic Vegetation. Chp.3 in Barbour, M.G., T. Keeler-Wolf, and A.A. Schoenherr (eds.), Terrestrial vegetation of California, Third Edition. University of California Press, Berkeley, CA.

Paczek, S and S. Cummings. 2004. Species information for grasshopper sparrow (*Ammodramus savannarum*) in Accounts for Managing Identified Wildlife – Accounts V. Viewed online at: http://www.env.gov.bc.ca/wld/frpa/iwms/documents/Birds/b_grasshoppersparrow.pdf.

Paige, C. 2008. A Landowner's Guide to Wildlife Friendly Fences. Landowner/Wildlife Resource Program, Montana Fish, Wildlife and Parks, Helena, MT. 44 pp. Available at: http://fwpiis.mt.gov/content/getItem.aspx?id=34461.

Painter, E.L. 1995. Threats to the California flora: ungulate grazers and browsers. *Madrono* 42(2):180-188.

Pellant, M., P. Shaver, D.A. Pyke, and J.E. Herrick. 2005. Interpreting indicators of rangeland health, version 4. Technical Reference 1734-6. U.S. Department of the Interior, Bureau of Land Management, National Science and Technology Center, Denver, CO. BLM/WO/ST-00/001+1734/REV05. 122pp.

Pitcher D. and M.J. Russo. 2004. Element stewardship abstract for *Carduus pycnocephalus*—Italian thistle. The Nature Conservancy.

Powell, J.A. 1969. A synopsis of nearctic adelid moths, with descriptions of new species (Incurvariidae). Journal of the Lepidopterists' Society 23:211-240.

Powers, David J., and Associates. 2008. Santa Teresa County Park Historic Area Site Plan. Existing Setting and Constraints Report.

Ralph, C. John; Geupel, Geoffrey R.; Pyle, Peter; Martin, Thomas E.; DeSante, David F. 1993. Handbook of Field Methods for Monitoring Landbirds. Gen. Tech. Rep. PSW-GTR-144-www. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture; 41 p.

Rambaldini, D.A. 2006. Behavioural Ecology of Pallid bats (Chiroptera: *Antrozous pallidus*) in British Columbia, Final report prepared for: Osoyoos (Nk'Mip) Indian Band, Oliver, British Columbia, BC Ministry of Environment, Penticton, BC and Canadian Wildlife Service, Delta, B.C. Viewed online at: http://www.wbwg.org/conservation/papers/PallidbatEcologyinBC2006.pdf.

Randall, J.M. 2000. Bull thistle (*Cirsium vulgare*). pp. 112-116 in Bossard, C.C., J.M. Randall, and M.C. Hoshovsky. Invasive Plants of California's Wildlands. University of California Press. Berkeley, CA.

Rathbun, G.B., N.J. Scott, and T.G. Murphy. 2002. Terrestrial habitat use by Pacific pond turtles in a Mediterranean climate, in The Southwestern Naturalist, Vo. 47, No. 2 (June 2002), pp. 225-235.

Rathbun, G.B., N. Siepel, and D.C. Holland, 1992. Nesting Behavior and Movements of Western Pond Turtles (*Clemmys marmorata*). The Southwestern Naturalist, 37(3):319-324.

Saab, V.A., C.E. Bock, T.D. Rich, and S. Dobkin. 1995. Livestock grazing effects in western North America. *In* Ecology and management of neotropical migratory birds. T.E. Martin and D.M. Finch (editors). Oxford Univ. Press, New York, N.Y., pp. 311–353.

Safford, H. D. and S. Harrison. 2001. Grazing and substrate interact to affect native vs. exotic diversity in roadside grasslands. Ecological Applications. 11:1112-1122.

Sakai, H.F. and B.R. Noon, 1993. Dusky-footed woodrat abundance in different-aged forests in Northwest California. Journal of Wildlife Management. 57(2); 373-381.

Santa Clara County. 1992. "Santa Clara County Parkland Range Management Policy." Adopted by the Board on July 21, 1992.

Santa Clara County. 1994. Santa Clara County General Plan, Charting a Course for Santa Clara County's Future: 1995-2010. Adopted December 20, 1994 by the Santa Clara County Board of Supervisors and the Santa Clara County Planning Commission.

Santa Clara County. 1998. Tree Preservation and Removal. Santa Clara County Code. Viewed on-line at : http://www.sccgov.org/scc_ordinance/41600000.HTM

Santa Clara County. 2005. An Oak Woodlands Management Plan for Santa Clara County. Adopted by Santa Clara County Board of Supervisors, May 3, 2005.

Santa Clara County. 2008. "Lease Preparation & Monitoring Policy For County Parks." Adopted 12/9/2008.

Santa Clara County Parks and Recreation Department & Bellinger Foster Steinmetz Landscape Architecture. 2009. Santa Teresa County Park Historic Site Plan Draft Initial Study/Mitigated Negative Declaration, July 2009. Viewed online at: http://www.sccsheriff.org/SCC/docs/Parks%20and%20Recreation,%20Department%20of%20%28DEP%29/attachments/CEQA_IS_MND_Final_Draft_7_30_09.pdf.

Santa Clara Valley Water District. 2001. Santa Clara Valley Water District Stream Maintenance Program Draft Environmental Impact Report (March 2001). Viewed online at: http://www.valleywater.org/Water/Technical_Information/Technical_Reports/_Reports/SMP_Notice_of_DEIR.shtm.

Sawyer. J.O. and T. Keeler-Wolf, and J.M. Evens. 2009. Terrestrial Vegetation of California—Second Edition. California Native Plant Society, Sacramento, CA.

SCS. 1968. U.S.D.A. Soil Conservation Service, Soils of Santa Clara County .

SCS. 1974. U.S.D.A. Soil Conservation Service, Soil Survey of Eastern Santa Clara Area, California.

Seltenrich, C. P., and A.C Pool. 2002. TES - A standardized approach for habitat assessments and visual encounter surveys for the Foothill yellow-legged frog (*Rana boylii*). Prepared for Pacific Gas and Electric Technical and Ecological Services, San Ramon, California. Viewed online at: http://ice.ucdavis.edu/CANVDecliningAmphibians/pdf/FYLFMethods052002.pdf.

Semlitsch, R.D. and J.R. Bodie. 2003. Biological criteria for buffer zones around wetlands and riparian habitats for amphibians and reptiles. *Conservation Biology* 17:1219-1228.

Sherrets, H.D. 1989. "Wildlife Watering and Escape Ramps on Livestock Water Developments." Idaho BLM Technical Bulletin 89-4. U.S.D.A. Boise, ID: Bureau of Land Management, Idaho State Office.

Shuford, W.D., and Gardali, T., editors. 2008. California Bird Species of Special Concern: A ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California. Studies of Western Birds 1. Western Field Ornithologists, Camarillo, California, and California Department of Fish and Game, Sacramento.

Singer, S.W. 1997. An Erosion Assessment of the Cloverdale Ranch with Recommendations for Soil Conservation. Unpublished report prepared for the Peninsula Open Space Trust. Steven Singer Environmental and Ecological Services, Santa Cruz, CA.

Soil Survey Division Staff. 1993. Soil Survey Manual. U.S. Department of Agriculture Handbook No. 18, U.S. Government Printing Office, Washington, D.C.

Soil Survey Staff. 2010. Keys to Soil Taxonomy, Eleventh Edition. U.S.D.A. Natural Resources Conservation Service, Washington, D.C.

Sonoma Ecology Center. 2003. Fencing Guidelines and Specifications for Conservation Easements. Prepared for Sonoma County Agricultural Preservation and Open Space District. July 2003. Available at: http://knowledge.sonomacreek.net/files/FencingGuidelines.pdf.

[SRCD] Sotoyome Resource Conservation District (L. Bush). 2006. Grazing handbook, a guide for resource managers in coastal California. Santa Rosa, CA.

Stechman, J.V. 1983. Fire hazard reduction practices for annual-type grassland. *Rangelands* 5(2).

Sterling, J.; Paton, P.W.C. 1996. Breeding distribution of Vaux's swift in California, Western Birds, 27:30-40.

Suttle, K.B. and M.A. Thomsen. 2007. Climate change and grassland restoration in California. *Madrono* 54(3):225-233.

Sweitzer, R.A. 1998. Conservation implications of feral pigs in island and mainland ecosystems and a case study of feral pig expansion in California. Proceedings of the Vertebrate Pest Conference 18:26–34.

Tate, K.W. 2010. Presentation From Workshop on Grazing Livestock and Water Quality: Options and Solutions for California Rangelands. April 27, 2010. Lucchesi Park Community Center, Petaluma, California.

Tate, K.W., E.R. Atwill, M.R. George, N.K. McDougald, and R.E. Larsen. 2000. Cryptosporidium parvum transport from cattle fecal deposits on California rangelands. *Journal of Range Management* 53(3):295-299.

Tate, K.W., E.R. Atwill, N.K. McDougald, and M.R. George. 2003. Spatial and temporal patterns of cattle feces deposition on rangeland. J. Range Management 56 (5): 432-438.

Tate, K.W., M.D.G.C. Pereira, and E.R. Atwill. 2004. Efficacy of vegetated buffer strips for retaining Cryptosporidium parvum. Journal of Environmental Quality 33:2243-2251.

Taylor, D.A.R. and M.D. Tuttle. 2007. Water for Wildlife: A Handbook for Ranchers and Range Managers. Produced by Bat Conservation International. Available at: http://www.batcon.org/news2/pdf/bciwaterforwildlife.pdf.

Thomas, J.H. 1960. Flora of the Santa Cruz Mountains of California. Stanford University Press, Stanford, California. 434 pp.

Thomsen, C.D., W.A. Williams, M.P. Vayssieres, C.E. Turner, and W. T. Lanini. 1996. Yellow starthistle biology and control. Pub 21541. Oakland, CA: Division of Agriculture and Natural Resources, University of California. 19p.

Tibor, D.P. (ed.). 2001. Inventory of rare and endangered vascular plants of California. California Native Plant Society Special Publication No. 1 [6th edition]. California Native Plant Society, Sacramento, CA.

Tierney, T. A., and J. H. Cushman. 2006. Temporal changes in native and exotic vegetation and soil characteristics following disturbances by feral pigs in a California grassland. Biological Invasions 8:1073-1089.

Tito Patri & Associates. 1990. Santa Teresa Park Master Plan, Appendix to Program Document, August 1990.

Tito Patri & Associates. 1992. Santa Teresa County Park Final Master Plan Report. Prepared for County of Santa Clara Parks and Recreation Department. April 1992.

Toy, T.J., G.R. Foster, and K.F. Renard. 2002. Soil Erosion: Processes, Prediction, Measurement, and Control. John Wiley and Sons, New York, NY.

Tricolored Blackbird Working Group. 2007. Conservation Plan for the Tricolored Blackbird (*Agelaius tricolor)*. Susan Kester (ed.). Sustainable Conservation. San Francisco, CA. Viewed online at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Management/FocalSpecies/Plans/TCBL.pdf.

Ubick, D. and T.S. Briggs. 1989. The harvestman family Phalangodidae. 1. The new genus *Calicina*, with notes on *Sitalcina* (Opiliones, Laniatores). Proceedings of the California Academy of Sciences 46 (4): 95-136.

UCCE. 1997. Research update - San Francisco water district targets cattle. *California Agriculture* March-April.

UCCE. 2001. "Off-site Water Development…The Drinks are On Us." *Foothill Rancher* 8(3):1-2. University of California Cooperative Extension, Placer and Nevada Counties.

UC Center for Range and Forested Ecosystems. 1998. "Rangeland monitoring."

Wood, Alley, and Co. 1879. History of Solano County. San Francisco: Wood, Alley, and Co., East Oakland.

U.S.D.A. Natural Resources Conservation Service. 2008. The PLANTS database. Viewed online at: http://plants.usda.gov. National Plant Data Center, Baton Rouge, LA.

U.S.D.A. Natural Resources Conservation Service. 2010. Soil Survey of the Santa Clara Area, California – Western Part. Published on the web at: http://soildatamart.nrcs.usda.gov . Viewed January 18, 2011.

U.S.D.A. Natural Resources Conservation Service. 2011. Official Soil Series Descriptions. Published on the web at: http://soils.usda.gov/technical/classification/osd/index. html . Viewed January 18, 2011.

U.S.D.A. Soil Conservation Service. 1968. Soils of Santa Clara County. U.S.D.A. Soil Conservation Service, Berkeley, CA.

U.S. Environmental Protection Agency (EPA). 2003. National Management Measures to Control Nonpoint Source Pollution from Agriculture. EPA Manual #841-B-03-004. Published on the web at: www.epa.gov/owow/nps/agmm/index.html.

U.S. Environmental Protection Agency (EPA). 2006. Court issues stipulated injunction regarding pesticides and the California red-legged frog. Case No. C-02-1580-JSW. Viewed online at: http://www.epa.gov/espp/litstatus/redleg-frog/rlf.htm

U.S. Environmental Protection Agency (EPA). 2008. Memorandum – Effects determination for Glyphosate relative to the California red-legged frog and designated critical habitat. Dated October 17, 2008. Viewed online at: http://www.epa.gov/oppfead1/endanger/litstatus/effects/redleg-frog/glyphosate/transmittal-memo.pdf

U.S. Fish and Wildlife Service. 1995. Endangered and Threatened wildlife and plants; Determination of Endangered status for ten plants and Threatened status for two plants from serpentine habitats in the San Francisco Bay region of California. Federal Register 60(23): 6671- 6685.

U.S. Fish and Wildlife Service. 1998. Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area. Portland, Oregon. 330+pp.

U.S. Fish and Wildlife Service. 2004. Endangered and threatened wildlife and plants; Determination of threatened status for the California tiger salamander; and Special Rule Exemption for existing routine ranching activities; Final Rule. Federal Register Vol 69, No. 149, August 4, 2004.

U.S. Fish and Wildlife Service. 2005a. Revised Guidance on Site Assessments and Field Surveys for the California Red-legged Frog. [dated August 2005].

U.S. Fish and Wildlife Service. 2005b. Endangered and threatened wildlife and plants; Designations of critical habitat for the California tiger salamander, Central Population; Final Rule. Federal Register 50 CFR Part 17: Vol. 70, No. 162, August 23, 2005.

U.S. Fish and Wildlife Service. 2006. Designation of Critical Habitat for the California Red Legged Frog, and Special Rule Exemption Associated With Final Listing for Existing Routine Ranching Activities; Final Rule; Federal Register Vol. 71, No. 71, April 13, 2006

U.S. Fish and Wildlife Service. 2007. Habitat Conservation Plan for the Santa Clara Valley, Santa Clara County, California. Federal Register, Volume 72, No. 1721: 51247-51248. Viewed online at: http://www.fws.gov/policy/library/2007/E7-17588.html.

U.S. Fish and Wildlife Service. 2008a. Revised Critical Habitat for the California red-legged frog (*Rana aurora draytonii*); Proposed Rule; Federal Register Vol. 31, No. 180, September 16, 2008.

U.S. Fish and Wildlife Service. 2008b. Birds of Conservation Concern 2008. Division of Migratory Bird Management Arlington, Virginia. 85p. [December 2008]. Viewed online at: http://migratorybirds.fws.gov/migratorybirds/.

U.S. Fish and Wildlife Service. 2010a. USFWS Threatened and Endangered Species System (TESS). Plants. Viewed online at: http://ecos.fws.gov/tess_public/SpeciesReport.do?dsource=plants.

U.S. Fish and Wildlife Service. 2010b. USFWS Threatened and Endangered Species System (TESS). Proposed Endangered, Proposed Threatened. Viewed online at: http://ecos.fws.gov/tess_public/SpeciesReport.do?listingType=P.

U.S. Fish and Wildlife Service. 2010c. USFWS Threatened and Endangered Species System (TESS). Candidates for listing. Viewed online at: http://ecos.fws.gov/tess_public/SpeciesReport.do?listingType=C.

U.S. Fish and Wildlife Service. 2010d. Revised Designation of Critical Habitat for California Red-Legged Frog; Final Rule. Federal Register Vol. 75, No. 51 March 17, 2010. Viewed online at: http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=2010_register&docid=fr17mr10-23

Walk, J.E. and R.E. Warner. 2000. Grassland management for the conservation of songbirds in the Midwestern U.S.A. Biol. Conserv. 94(2):165–172.

Warner, P.J., C.C. Bossard, M.L. Brooks, J.M. DiTomaso, J.A. Hall, A.M. Howald, D.W. Johnson, J.M. Randall, C.L. Roye, M.M. Ryan, and A.E. Stanton. 2003. Criteria for Categorizing Invasive Non-Native Plants that Threaten Wildlands. California Exotic Pest Plant Council and Southwest Vegetation Management Association. 24 pp.

Weiss, S.B. 1999. Cars, cows, and checkerspot butterflies: nitrogen deposition and management of nutrient poor grasslands for a threatened species. Conservation Biology 13(6):1476-1486.

Weiss, S.B., D.H. Wright, and C. Niederer. 2007. Serpentine Vegetation Management Project Final Report. Creekside Center for Earth Observation Report.

Western Bat Working Group. 1998. Western bat species: regional priority matrix. Pamphlet produced by Western Bat Working Group Workshop, February 9-13, 1998.

Wilcox, J. T., and D. H. Van Vuren. 2009. Wild Pigs as Predators in Oak Woodlands of California. Journal of Mammalogy 90:114-118.

Wildland Solutions. 2008. Monitoring Annual Grassland Residual Dry Matter: A Mulch Manager's Guide for Monitoring Success. (2nd ed.) [Brochure 34 pp.]. Brewster, WA: Guenther, K. and Hayes, G.

Williams, D.F. 1986. California Department of Fish and Game Mammal species of special concern. Department of Biological Sciences California State University, Stanislaus, Turlock, California. Viewed online at: http://www.dfg.ca.gov/wildlife/species/publications/mammal_ssc.html.

Wyoming Game and Fish Department. 2004. Fencing Guidelines for Wildlife. Revised Version. Habitat Extension Bulletin. No. 53. Available at: http://gf.state.wy.us/downloads/pdf/habitat/Bulletin%20No.%2053.pdf.

Zeiner, D., W. Laudenslayer, and K. Mayer. 1988. California's Wildlife, Sacramento, California.

9 PERSONAL COMMUNICATION

Arnold, Richard, Ph.D. 2011. Entomologist. Entomological Consulting Services, Ltd.

Atwill, E.R. 2011. Professor of Environmental Animal Health and Medical Ecology, University of California, Davis.

Bush, L. 2010. Certified Rangeland Manager (CRM #18).

Calhoun, Brett. 2010. Senior Water Quality Specialist. Stream Stewardship Unit, Santa Clara Valley Water District.

Call, C.A. 2010. Professor of Vegetation Manipulation/Management and Rangeland Resources Advisor, Utah State University.

Fewless, C.R. 2011. Environmental Scientist, San Francisco Bay Regional Water Quality Control Board, TMDL Implementation Section.

Mayall, D. 2011. Rare Plant Coordinator, Santa Clara Valley CNPS. Phone discussion regarding Monolopia gracilens in the Santa Clara Valley.

Reilly, J. 2011. Associate Planner, County of Santa Clara County, Planning Office.

Rocha, Don. 2011. Natural Resource Program Supervisor. County of Santa Clara Department of Parks and Recreation.

Tippets, S. 2011. Engineering Manager, Community Projects Review Unit, Santa Clara Valley Water District.

10 APPENDIX A. Santa Teresa County Park Grazing Management Plan Contributors and Specialty Topics

The Grazing Management Plan for Santa Teresa County Park (Park) was developed primarily by Rangeland Management and Conservation Science, in collaboration with the County of Santa Clara Department of Parks and Recreation. EcoSystems West Consulting Group served as the Project Manager, Team Liaison, and assisted in the final organization and preparation of the Grazing Management Plan. Sections on biological and physical resource specialty topics were prepared in collaboration with the following consultants, listed in Table A-1:

Table A-1. Contributors to Specialized Sections.

Collaborator and Company	Sections, Tables, and Figures
Richard A. Arnold, Ph.D., President and Principal, Entomological Consulting Services, Ltd., 104 Mountain View Court, Pleasant Hill, CA 94523 (925-825-3784)	2.2.1 Special-Status Invertebrates 4.4.1 Predicted Effects on Invertebrates Table 2 and 3 Figure 6 Appendix C
Justin Davilla, M.S., Senior Plant Ecologist, EcoSystems West Consulting Group, 180 7th Avenue Suite 201, Santa Cruz, CA 95062 (831-429-6730)	2.1 Botanical Resources, 2.3 Pest Plants, 2.4 Shrub Encroachment 4.2, 4.3, 4.5, 4.6 Predicted Effects on Special-Status Plants, Sensitive Natural Communities, Shrub Encroachment, and Pest Plants Tables 1, 5, & 11 Figures 3, 4, 5, 8 Appendix B
William Davilla, M.A., Principal and Senior Botanist, EcoSystems West Consulting Group, 180 7th Avenue Suite 201, Santa Cruz, CA 95062 (831-429-6730)	All EcoSystems West sections; overall editing; overall project strategy
Lawrence D. Ford, Ph.D., Principal, Senior Scientist, Certified Rangeland Manager, LD Ford Rangeland Management and Conservation Science, 5984 Plateau Drive, Felton, CA 95018 (831-335-3959)	All other sections; overall editing; overall project strategy
Kim Glinka, B.A., Senior Wildlife Biologist, EcoSystems West Consulting Group, 180 7th Avenue Suite 201, Santa Cruz, CA 95062 (831-429-6730)	2.2.2 Special-Status Wildlife 4.4.2 Predicted Effects on Vertebrates Tables 4 & 10 Figure 7
Toby Hanes, M.S., Principal, HydroScience, 419 Mason Street, Suite 200A, Vacaville, CA 95866 (707-529-4773)	5.8.3 Tables 19, 20, & 21
Devii Rao, M.S., Associate Scientist, Associate Rangeland Manager, LD Ford Rangeland Management and Conservation Science, 5984 Plateau Drive, Felton, CA 95018 (831-389-4306)	Overall report compilation; all other sections
Don Rocha and Daniel Clark, County of Santa Clara, Parks and Recreation Department	All figures, except 6
Steven W. Singer, M.S., Principal, Steven Singer Environmental and Ecological Services, 218 Nevada Street, Santa Cruz, CA 95060 (831-427-3297)	2.6.1 Soils 4.7 Predicted Effects on Soils and Water 5.6.2, 5.6.3 Management Restrictions to Protect Soils and Water Tables 6, 12, & 18 Figures 10, 12, & 13

11 APPENDIX B. Supplemental Information on the Botanical Resources of Santa Teresa County Park

11.1 Methodology

EcoSystems West botanists identified special-status plant species with potential to occur in Santa Teresa County Park (Park) prior to field visits. Sources reviewed include California Natural Diversity Data Base (CNDDB) (2010) occurrence records for the Santa Teresa Hills USGS 7.5' quadrangle and all surrounding quadrangles; county occurrence records and USGS quadrangle occurrence records for the same nine quadrangles in the CNPS *Inventory* (Tibor 2001; CNPS 2011); the draft Santa Clara Valley Habitat Plan (ICF International 2010), and regional and local floras (Abrams 1923, 1944, 1951; Abrams and Ferris 1960; Thomas 1960; Munz and Keck 1973; Hickman 1993). Sources consulted for up-to-date agency status information include USFWS (2010a, b, c) for federally listed species and CDFG (2010) for State of California listed species. Scientific nomenclature for plants identified in this plan follows Hickman (1993) and, for special-status species, Tibor (2001); and CNPS (2010). Common names follow Abrams (1923, 1944, 1951); Abrams and Ferris (1960); Hickman (1993); and the U.S. Department of Agriculture (USDA) PLANTS database (USDA 2010), except for special-status species, which follow Tibor (2001) and CNPS (2011).

EcoSystems West botanists reviewed the CNDDB list of high priority habitats as well as the Santa Clara County General Plan (1994), Santa Teresa County Park Master Plan (Tito Patri & Associates 1992) and the draft Santa Clara Valley Habitat Plan (ICF International 2010) for sensitive vegetation community designations prior to conducting the reconnaissance level field visits.

EcoSystems West botanists conducted reconnaissance level surveys for special-status plants and sensitive vegetation community types within the Park on 16 April and 12 May 2010. Surveys for special-status plant species did not follow formal CNPS botanical survey guidelines (2001) and are not considered protocol-level surveys. Botanists targeted species occurrences using information obtained from database records and locally unique edaphic conditions – namely serpentine soils—known to support special-status plants and communities. Botanists walked meandering transects within specifically targeted areas to determine the approximate extent of distinct rare plant occurrences. Due to time constraints, it is likely that smaller populations and later blooming plants were not observed during the reconnaissance site visits.

Incidental observations of invasive weeds were also documented during reconnaissance surveys. These include invasive weeds listed on the California Invasive Plant Council Inventory (2007) and the California Department of Food and Agriculture noxious weed list (2003). Particularly large weed infestations were noted on field maps and evaluated for species composition, disturbance level, and potential management strategies.

Shrub encroachment into grasslands at Santa Teresa County Park was estimated by comparing high-resolution aerial photographs of the park from 1948 and 2009. Shrubland patches were digitized using ArcGIS Version 9.3. The boundary of each shrubland patch within the park was approximated by distinguishing distinct vegetation "signatures" (color, spatial arrangement, and location) that clearly delineated shrubland from surrounding vegetation types. Due to time and feasibility constraints inherent when digitizing over aerial photographs, northern coastal scrub and mixed chaparral community types were not independently characterized for this analysis. Total shrub acreage was determined for each year using the Xtools Pro extension for ArcGIS.

11.2 Special-Status Plants

The special-status plants known to occur or with potential to occur (but undocumented) at the Park, as well as their habitat requirements and distribution information are listed in Table B-1. Special-status plant occurrences at the Park are mapped in Figure 4 of the main body of this GMP.

Table B-1. Special-Status Plants at Santa Teresa County Park, Santa Clara County, CA.

Species	Status Federal/State/CNPS	Blooming Period[i]	Habitat Requirements
Known Occurrences at Santa Teresa County Park			
Mt. Hamilton Thistle (*Cirsium fontinale var. campylon*)	-/-/1B.2	(Feb)April-October	**General:** Cismontane woodland, chaparral, valley and foothill woodland. Typically found in seasonal and perennial drainages on serpentine soils. 95-890M. **Park:** In seeps, springs and slow moving ephemeral/intermittent creeks with serpentine soils. This species is restricted to areas with little to no overstory tree canopy.
Santa Clara Valley dudleya (*Dudleya setchellii*)	FT/-/1B.1	April-July	**General:** Rocky areas (outcrops) in serpentine soil, cismontane woodland, valley and foothill grassland. 80-335M. **Park:** On just about every prominent serpentine rock outcrop throughout the entire park. This species is quite extensive on the site and where the rocks are 1-3 feet above the grassland with deep, narrow cracks you are almost guaranteed to find at least one individual.
Loma Prieta hoita (*Hoita strobilina*)	-/-/1B.1	May-July(Aug-Oct)	**General:** Moist sites in chaparral, cismontane woodland, riparian woodland, usually serpentine soil. 30–860M. **Park:** Seeps and riparian corridors along intermittent creeks with serpentine soils.
Smooth lessingia (*Lessingia micradenia var. glabrata*)	-/-/1B.2	July-November	**General:** Serpentine soil, chaparral, often disturbed areas. 120-485M. **Park:** Not observed due to timing of reconnaissance level surveys, although assumed present. Most likely in serpentine grassland and along roadcuts with exposed serpentine soils. Prefers shallow/disturbed soils with limited competition from annual grasses.
Hall's bush mallow (*Malacothamnus hallii*)	-/-/1B.2	May-September	**General:** Chaparral, Diablan sage scrub. Usually on serpentine soil in the Santa Clara Valley. 10-550M. **Park:** In rocky/serpentine chaparral dominated by black sage.
Woodland monolopia (*Monolopia gracilens*)	-/-/1B.2	March-July	**General:** Usually on serpentine soil, broadleafed upland forest openings, chaparral openings, cismontane woodland, North Coast coniferous forest openings, valley and foothill grassland; roadcuts. 100-1200M. **Park:** Observed in serpentine grassland on south facing slope along dirt roadway, particularly in western portion of the Park. However, this species was not listed by CNPS at the time of reconnaissance level surveys and therefore was not specifically targeted by EcoSystems West botanists. Assume potential presence in many of the same areas as most beautiful jewelflower, smooth lessingia, and Santa Clara Valley dudleya.

Table B-1. (Continued)

Species	Status Federal/State/CNPS	Blooming Period	Habitat Requirements
Most beautiful jewelflower (*Streptanthus albidus* ssp. *peramoneus*)	-/-/1B.2	(Mar)April-September(Oct)	**General:** Serpentine soil, chaparral, cismontane woodland, valley and foothill grassland. 120-730M. **Park:** Primarily in serpentine grassland. Occasionally in, or along the margins of chaparral. Mostly on north or west facing aspects in shallow soils with limited competition from annual grasses. However, several populations were observed in areas with 3-foot + tall annual grasses including wild oats (*Avena* spp.)
Potential/Undocumented Occurrences at Santa Teresa County Park			
Coyote ceanothus (*Ceanothus ferrisiae*)	FE/-/1B.1	January-May	**General:** In rocky serpentine chaparral, coastal scrub and valley and foothill grassland **Park:** Not known. This species is limited to four extant occurrences east of Highway 101 in the vicinity of Kirby Canyon/Anderson Reservoir Dam. One historic occurrence in Croy Canyon near Uvas Creek several miles southwest of the Park has not been observed since 1929 despite repeated attempts to relocate this population.
Fragrant fritillary (*Fritillaria liliaceae*)	-/-/1B.2	February-April	**General:** Heavy clay or serpentine soils, cismontane woodland, coastal prairie, coastal scrub, valley and foothill grassland. 3-410M. **Park:** Not known although likely to occur in small, isolated populations in open serpentine grassland. Fragrant fritillary flowers only remain in bloom for several weeks and are susceptible to herbivory and trampling.
Arcuate bush mallow (*Malacothamnus arcuatus*)	-/-/1B.2	April-September	**General:** Chaparral, cismontane woodland; gravelly alluvium. 15-355M. **Park:** Not known. No chaparral with gravelly alluvium substrates were observed by EcoSystems West or previously documented for the site.
Metcalf Canyon jewelflower (*Streptanthus albidus* ssp. *albidus*)	FE/-/1B.1	April-July	**General:** Serpentine soil, valley and foothill grassland. 45-245M. **Park:** Not known. No populations documented west of Highway 101.

Note: The following two species were identified by Park staff for consideration (D. Rocha, Pers. Comm. 2011) but are not listed in this table:

- Crystal Springs fountain thistle (*Cirsium fontinale* var. *fontinale*) is closely related to Mt. Hamilton thistle but is known from only 5 occurrences near Crystal Springs Reservoir in San Mateo County. This species is almost definitely not located within Santa Teresa County Park.
- Valley oak (*Quercus lobata*) is no longer on CNPS List 4 because it is considered too common. It is the longest living and native species of oak in California and requires a steady source of ground water for nourishment. As a result, Valley oak is commonly found on valley floors and arroyos in close proximity to flowing waterways with high water tables. Grazing may negatively impact recruitment from seedlings to saplings. Cattle will graze on seedlings before they become too woody thereby directly limiting recruitment. Furthermore, seedlings are sensitive to trampling and are unlikely to survive in cattle wallow areas.

[i] Months listed in parentheses indicate an occasional extension of the blooming period due to unseasonable weather patterns.

11.3 Sensitive Natural Communities

Four sensitive natural communities were identified within Santa Teresa County Park: serpentine grassland (serpentine bunchgrass grassland), mixed serpentine chaparral, riparian forests and woodlands (mixed riparian forest and woodland and willow riparian forest and scrub), and emergent freshwater wetlands (wetlands, serpentine seep, seep/springs, and pond). These habitat types are described below and mapped in Figure 5 of the main body of this GMP.

SERPENTINE GRASSLAND (SERPENTINE BUNCHGRASS GRASSLAND)

Serpentine grasslands are known for their abundance of native vegetation tolerant of nutrient poor, ultramaphic (elevated magnesium and iron) soils. In general, serpentine soils serve as refugia for native grassland plant species that have largely been displaced throughout California by invasive annual grasses and forbs of Eurasian origins. Native serpentine plants have high rates of endemism[47] and have developed unique adaptations allowing them to thrive in serpentine soils (Stromberg 2007; Kruckeberg 1984).

In Santa Teresa County Park, serpentine soils are readily distinguished by their shallow, rocky profile and prolific rock outcrops, often bluish-green in color. This substrate is metamorphic in origin and typically occurs along fault lines and areas of increased seismic activity. A defining characteristic of serpentine soils is the relative amounts of magnesium and calcium. In serpentine grassland, the magnesium to calcium ratio is much higher than for non-serpentine soils, greatly reducing the amount of available calcium, a vital nutrient for plant growth. Moreover, serpentine soils are often nitrogen limited systems and favor species that are cable of hyper-accumulation of nitrogen while limiting or excluding uptake of magnesium and iron.

Serpentine grasslands are typically dominated by shorter-statured grasses and wildflowers less common or entirely absent in adjacent non-serpentine grassland. The serpentine grasslands of the Park are somewhat variable in species composition, but native grasses are typically among the dominant species. These include perennial species such as purple needlegrass (*Nasella pulchra*), one-sided bluegrass (*Poa secunda* ssp. *secunda*), big squirreltail grass (*Elymus multisetus*), June grass (*Koeleria macrantha*), California melic grass (*Melica californica*), and the annual species small fescue (*Vulpia microstachys* vars. *ciliata* and *pauciflora*). A diverse and somewhat distinctive assemblage of native herb species is associated with these serpentine grasslands, including California goldfields (*Lasthenia californica*), tidy tips (*Layia platyglossa*), hayfield tarweed (*Hemizonia congesta* ssp. *luzulifolia*), Fremont's western rosinweed (*Calycadenia fremontii*), smooth lessingia (*Lessingia micradenia* var. *glabrata*; CNPS List 1B.2), California plantain (*Plantago erecta*), cream cups (*Platystemon californicus*), flax-flowered linanthus (*Linanthus liniflorus*), blue-eyed grass (*Sisyrinchium bellum*), Ithuriel's spear (*Triteleia laxa*), coast range false bindweed (*Calystegia collina* ssp. *collina*), slender woolly buckwheat (*Eriogonum gracile* var. *gracile*), most beautiful jewel-flower (*Streptanthus albidus* ssp. *peramoneus*; CNPS List 1B.2), yarrow (*Achillea millefolium*), and slender cottonweed (*Micropus californicus* var. *californicus*). The federally endangered species Santa Clara Valley dudleya (*Dudleya setchellii*; FE/CNPS List 1B.1) is found growing on serpentine rock outcrops and barrens within serpentine grasslands throughout the Park.

[47] Endemism = the ecological state of being unique to a defined geographic location, such as an island, nation or other defined zone, or habitat type.

Despite high levels of endemism, non-native grasses and other nitrophilous[48] species are becoming relatively abundant in serpentine grassland. Recent studies have shown that elevated levels of nitrogen deposition from increased automobile traffic and significantly warmer and wetter rainy seasons have increased the susceptibility of serpentine grasslands to invasion by non-native species, most notably Italian ryegrass (Weiss et al. 1999). In the greater San Francisco Bay Area, Italian ryegrass is rapidly becoming the dominant species in both grazed and ungrazed grasslands (Hopkinson 2008). In the absence of grazing, serpentine grasslands in the Santa Clara Valley often resemble adjacent non-serpentine grasslands in terms of species composition and physiognomy. This shift towards non-native dominant species not only adversely affects the viability of rare and endangered serpentine endemic plants, but also significantly limits the fecundity of California plantain, the primary host plant for larvae of the federally endangered Bay checkerspot butterfly (*Euphydryas editha bayensis*). In several studies, reintroduction of grazing in serpentine grasslands has dramatically decreased the abundance of non-native grasses while increasing cover of native forbs, including dwarf plantain. It should be noted that in a recent multi-year study in the East Bay, dominance by Italian ryegrass was not affected by grazing in non-serpentine grasslands, although overall species richness was greater in grazed areas (Hopkinson 2008).

MIXED SERPENTINE CHAPARRAL

Similar to serpentine grassland, the mixed serpentine chaparral community type is underlain by rocky, ultramaphic soils limiting the vegetation to species tolerant of nutrient poor, well-drained edaphic conditions. Serpentine chaparral is dominated by a unique assemblage of woody shrubs that intergrades with surrounding grasslands and oak woodlands. Within the Park, serpentine chaparral is dominated by mix of woodier, sclerophyllous species such as chamise (*Adenostoma fasciculatum*), big-berry manzanita (*Arctostaphylos glauca*), toyon (*Heteromeles arbutifolia*), and leather oak (*Quercus durata*), as well as soft-leaved shrubs including sticky monkeyflower (*Mimulus aurantiacus*), black sage (*Salvia melifera*), poison oak (*Toxicodendron diversilobum*), and occasionally Hall's bush mallow (*Malacothamnus halli*; CNPS List 1B.2). Where the shrub cover is dense, there are few associated understory plants. Openings support a diverse assortment of mostly native species, including the subshrub yellow-yarrow (*Eriophyllum confertiflorum*) and herbaceous species including purple needlegrass, soap plant (*Chlorogalum pomeridianum*), and nude buckwheat (*Eriogonum nudum*).

The cessation of domestic livestock grazing and alteration of the natural fire regime within the Park has resulted in gradual shrub encroachment from serpentine chaparral into adjacent grassland habitat. This pattern of incursion is discussed in further detail in Sections 2.4, 4.5, and 5.5.4 of the main body of this GMP.

RIPARIAN FORESTS AND WOODLANDS (MIXED RIPARIAN FOREST AND WOODLAND AND WILLOW RIPARIAN FOREST AND SCRUB)

Riparian forests and woodlands are comprised of vegetation dependent on the surface and sub-surface hydrology of an adjacent watercourse. In general riparian vegetation is either distinctly different in species composition and structure to adjacent upland terrestrial vegetation or exhibits a more robust growth form than adjacent vegetation due to increased soil moisture and nutrients. Riparian vegetation is particularly important for streambank stabilization, erosion control, water quality, and wildlife habitat.

[48] Nitrophilous = thriving in or preferring soils rich in nitrogen.

Within the Park, riparian corridors are diverse both in terms of species richness and structure. Both mixed oak- and willow-dominated riparian communities are found along perennial and intermittent drainages of the park.

Mixed oak riparian woodlands and forests are dominated by overstory species including broadleaved coast live oak (*Quercus agrifolia*), blue oak (*Quercus douglasii*), and valley oak (*Quercus lobata*). This community is often differentiated from adjacent non-riparian oak woodland by the presence of buckeye (*Aesculus californica*) and California bay (*Umbellularia californica*) trees. The understory vegetation contains a unique assemblage of sparse to locally dense shrubs and herbaceous species largely depending on the amount of available light penetrating through the canopy. Common shrubs include poison oak (*Toxicodendron dirversilobum*), coyote brush (*Baccharis pilularis*), and coffeeberry (*Rhamnus californica*), while dominant herbs include stinging nettle (*Urtica dioica*), willowherb (*Epilobium ciliatum*), dock (*Rumex* sp.), seep monkeyflower (*Mimulus guttatus*), watercress (*Rorripa nasturtium-aquaticum*), Fuller's teasel (*Dipsacus fullonum*), common rush (*Juncus patens*), and occasionally the special-status species Loma Prieta hoita (*Hoita strobilina*; CNPS List 1B.1).

Willow riparian habitat is located along several drainages near the eastern park boundary above the former Buck Norred Ranch and is dominated by dense thickets of arroyo willow (*Salix lasiolepis*). Understory species are primarily limited to herbaceous plants similar to those found in mixed oak riparian woodlands and forests throughout the park.

EMERGENT FRESHWATER WETLANDS (WETLANDS, SERPENTINE SEEP, SEEP/SPRINGS, POND)

Wetlands are those areas that are transitional between aquatic and terrestrial systems where surface water is at a depth and duration sufficient to promote the development of hydric soils and a preponderance of hydrophytic wetland vegetation. Within the Park, emergent freshwater wetland types include seasonal wetlands, seeps, springs, and freshwater marsh vegetation along the margins of ponds.

Seasonal wetlands are characterized by shallow depressional topography with inundation or saturation only occurring during the rainy season. These features are typically dominated by annual grasses and forbs that occur in both wetlands and upland habitats. In general, seasonal wetlands at the Park contain a high percentage of non-native, weedy species including Italian ryegrass, Fuller's teasel, bird's foot trefoil (*Lotus corniculatus*), prickly lettuce (*Lactuca serriola*), and sow thistle (*Sonchus asper*). Several seasonal wetlands are scattered throughout the Park, particularly in annual grassland along the toe of the slope adjacent to the Pueblo Day Use Area.

Seeps and springs are seasonally to perennially moist areas where the groundwater table regularly intercepts the ground surface. These areas may exhibit water flow during especially wet periods or when positioned on relatively steep slopes. Seeps and springs at the Park are generally dominated by native hydrophytic vegetation, including special-status plant species, such as Loma Prieta hoita and Mount Hamilton thistle (*Cirsium fontinale* ssp. *campylon*; CNPS List 1B.2). Other common associates include soft rush (*Juncus effusus*), spike rush (*Eleocharis macrostachya*), California blackberry (*Rubus ursinus*), and seep monkeyflower.

Freshwater marsh is limited to areas with year-round standing water. These areas are dominated entirely by emergent wetland vegetation including cattails (*Typha* sp.), bulrush (*Schoenoplectus californica*), flatsedge (*Cyperus eragrostis*), and smartweed (*Polygonum amphibium*). This habitat type is largely restricted to the margin of a pond immediately south of the golf course.

12 APPENDIX C. Supplemental Information on the Special-Status Invertebrates of Santa Teresa County Park

12.1 Methodology

Entomological Consulting Services reviewed databases and literature to identify invertebrate taxa for which their historic or present-day geographic ranges include Santa Teresa County Park or its general vicinity. The list of these invertebrates was compiled by consulting the following sources of information:

a. The California Natural Diversity Data Base (CNDDB), which summarizes information on special-status animal and plant species contained in the state and is maintained by the California Department of Fish & Came (2011);
b. The BUGGY database (2011a), which summarizes information on special-status insects and invertebrates, and which was compiled and is maintained by my firm, Entomological Consulting Services, Ltd.; and
c. Pertinent entomological and invertebrate literature (Briggs and Hom 1966; Briggs and Ubick 1989; Powell 1969; Ubick and Briggs 1989; USFWS 1998).

During April 2010, Arnold visited the Park to evaluate existing habitat conditions there.

12.2 Special Status Invertebrates

Table 2 of the main body of this GMP identifies four special-status or sensitive invertebrate species and their conservation status: Bay checkerspot butterfly, Hom's blind harvestman, Jung's blind harvestman, and Opler's longhorn moth, which have potential to occur within the Park. Endangered or threatened taxa are recognized at the federal level under the provisions of the Endangered Species Act. Most of the sensitive species treated herein are former candidates or species of concern at the federal level. Although the State of California does not recognize insects as a type of animal that can be designated as an endangered species, the CNDDB tracks many insects and other types of invertebrates which may be treated as rare or endangered species by the under Section 15380 of the California Environmental Quality Act (CEQA).

The two following species were eliminated from further consideration: San Francisco forktail damselfly (*Ischnura gemina*) and the Edgewood Blind harvestman (*Calicina minor*). The San Francisco forktail damselfly was originally identified by the County of Santa Clara Department of Parks and Recreation as having the potential to occur at the Park. This species almost certainly no longer has conservation status. Additionally, under the planned arrangement of grazing fields, the habitat for this species has been avoided. The canal that runs along the northern and northeast borders of the Park may provide habitat for this damselfly, but the canal actually lies outside of the park. Drainages within the park generally have rather steep gradients and portions are lined with dense vegetative cover, conditions that are not favorable for the damselfly. It is possible the damselfly might inhabit pools within these drainages or slow-moving portions that are covered by dense overhanging vegetation. However, if the drainages are not perennial, they are unlikely to be inhabited by the damselfly. This species is not considered further in the grazing plan.

The Edgewood Blind harvestman (*Calicina minor*) is only known from Edgewood Park in San Mateo County. This species was formerly in the phalangid genus *Sitalcina* and when it was originally described as a new species (Briggs and Hom 1966), several specimens were reported from additional locations, including near the Park. Subsequently, it was determined (Ubick and Briggs 1989) the specimens from Santa Clara County actually represented a new genus and species, *Microcina homi*. Thus, the Edgewood Blind harvestman does *not* occur at the Park. Unfortunately, this error continues to be promulgated by various other references.

BAY CHECKERSPOT BUTTERFLY

The draft HCP for the Santa Clara Valley provides a detailed species account of the BCB, including life history and seasonal timing of the BCB life stages. This species account is contained at the end of this Appendix (C) (ICF International 2010, Appendix D, Species Accounts, pp. 3-30).

TWO SPECIES OF HARVESTMEN

The animal class Arachnida consists of several orders, including ticks and mites (Acarina), scorpions (Scorpiones), spiders (Areaneida), harvestmen and phalangids (Opiliones), false scorpions (Pseudoscorpions), and sun spiders (Solifugae). Several species of blind and microblind harvestmen (Phalangodidae) are associated with serpentine habitats, including grasslands, chaparral, or forests in the greater San Francisco-San Jose Bay Area. The following species of harvestmen were previously considered candidates for endangered status.

Hom's microblind harvestman (*Microcina homi*) is known from several locations in Santa Teresa County Park, the Coyote Valley, Silver Creek Hills, Tulare Hill, and Metcalf Canyon areas of Santa Clara County (Briggs and Ubick 1989). It lives in the soil under serpentine rocks at locations characterized by serpentine grassland habitat. Adults are approximately one millimeter in length.

Jung's microblind harvestman (*Microcina jungi*) is known from only a single serpentine grassland location about one mile south of the intersection of Silver Creek and San Felipe Roads near San Jose. There it co-occurs with Hom's microblind Harvestman and like its congener measures approximately one millimeter in length. This harvestman is mentioned here because of the proximity of its only known location.

OPLER'S LONGHORN MOTH

Adelids are small, brightly colored, day-flying moths with exceptionally long antennae, hence their common name of Longhorn moths. They have been treated both as a family, the Adelidae, and as a subfamily (the Adelinae) of the Incurvariidae. These and other small moths are often referred to as microlepidoptera because of their small size.

This microlepidopteran is known primarily from various localities in Marin, San Francisco, Santa Clara, and Santa Cruz counties. Opler's Longhorn moth is known primarily from serpentine grasslands throughout most of its geographic range (U.S. Fish & wildlife Service 1998). Adult moths are usually found in association with cream cups (*Platystemon californicus*), its larval food plant (Powell 1969). However, this plant is not strictly limited to serpentine grasslands.

Little specific information is available about the biology and life history of this species. Indeed, none of the 11 Nearctic species of *Adela* have been reared. Information on the biology of Nearctic species is inferred from information gained from rearing related European species (Powell 1969). There is only one generation per year. Adults are active in the spring, typically during the flowering period of cream cups, which is early April through mid-May. Larvae of *Adela oplerella* are presumed to feed on cream cups because females have been observed ovipositing on the flowers. Young larvae probably consume the contents of developing seed capsules and then descend to the ground. There they construct a case, in which they feed on the lower or fallen leaves of the same or other plants.

12.3 Bay Checkerspot Butterfly Species Account from the Draft Santa Clara Valley Habitat Plan (ICF International 2010, Appendix D, Species Accounts, pp. 3-30)

Bay Checkerspot Butterfly (*Euphydryas editha bayensis*)

© Alan Launer

Legal Status

State: None
Federal: Threatened (U.S. Fish and Wildlife Service 1987)
Critical Habitat: Designated (U.S. Fish and Wildlife Service 2008)
Recovery Planning: Recovery plan approved (U.S. Fish and Wildlife Service 1998)

General Notes

The Bay checkerspot butterfly is one of the most-studied invertebrate taxa in the world. Starting in 1960, Dr. Paul Ehrlich, his research group at Stanford University, and numerous academic graduates or associates of the Stanford group have studied *Euphydryas* butterflies across western North America. Given its distribution in areas near Stanford, and historic presence on campus, the Bay checkerspot butterfly is the most studied of the *Euphydryas* subspecies. This butterfly has been the subject of many hundreds of articles published in peer-reviewed journals, chapters of academic books, more than a dozen doctoral dissertations and master's theses, and many field projects. Much of the accumulated knowledge, along with many of the key references, can be found in the book *On the Wings of Checkerspots: A Model System for Population Biology* (Ehrlich and Hanski 2004).

Taxonomy

The Bay checkerspot butterfly is a subspecies of the widespread Edith's checkerspot butterfly (*Euphydryas editha*). This species, a member of the family Nymphalidae, is found across much of western North America, from northern Mexico to southern Canada and from the Pacific coast to Wyoming (White and Singer 1974). Subspecies of Edith's checkerspot butterfly are generally distinguished on the basis of differences in phenotype and primary larval host plant. Phenology tends to be closely associated with larval host plant and local environment and also varies among subspecies (Singer and Parmesan 1993; Singer et al. 1993). Most genetic analyses have supported the traditional groupings of populations into subspecies. Depending on the reference, there are more than 30 accepted subspecies of Edith's checkerspot butterfly, including approximately 12 subspecies from California.

The Bay checkerspot butterfly is distinct from Luesther's checkerspot butterfly (*Euphydryas editha luestherae*), a subspecies that feeds on lousewort (*Pedicularis* sp.) and perennial paintbrushes (*Castilleja* spp.) (Murphy and Ehrlich 1980). Luesther's checkerspot butterfly is often found in chaparral in close proximity to Bay checkerspot butterfly populations. The Bay checkerspot butterfly is very similar in appearance to an unnamed form of *E. editha* that also feeds on plantain (*Plantago* sp.) and annual paintbrushes (*Castilleja* spp.), which is found in areas south of the range of the Bay checkerspot butterfly.

Edith's checkerspot butterfly is occasionally placed within the genus *Occidryas* and it has been suggested that the proper name of the Bay checkerspot butterfly is *E. editha editha*. Neither the generic name *Occidryas* nor the reassignment to *E. editha editha* are presently accepted in the scientific community.

Distribution

General

The Bay checkerspot butterfly is known from the southern and eastern portion of the greater San Francisco Bay area. Populations, most of which have been extirpated, were known from San Francisco (Twin Peaks and Mount Davidson), San Mateo County (San Bruno Mountain south to Woodside), Santa Clara County (numerous locations), Alameda County (Oakland hills), and Contra Costa County (Franklin Canyon and Morgan Territory). The subspecies is not known from areas north of San Francisco Bay. To the south, starting in San Benito County, an unnamed form of Edith's checkerspot butterfly replaces the Bay checkerspot butterfly in the area's serpentine grasslands.

Within this limited geographic region, butterfly populations are patchily distributed in serpentine grasslands. It is unclear whether the Bay checkerspot butterfly was more widely distributed within the region prior to the major changes in composition and distribution of plant species associated with the European colonization of the area (Ehrlich and Murphy 1987).

As of 2005, all populations of the Bay checkerspot butterfly on the San Francisco Peninsula were extirpated, including all populations in San Francisco, San Mateo, and northern Santa Clara counties. Bay checkerspot butterflies were reintroduced to Edgewood County Park and Natural Preserve in April 2007. In the East Bay, the Bay checkerspot butterfly has been extirpated from most of its range, but may still exist in Contra Costa County in the general vicinity of Mt. Diablo. Unfortunately, records from Contra Costa County are often confounded by the presence of the relatively common Luesther's checkerspot butterfly. In south-central Santa Clara County, the Bay checkerspot butterfly is still abundant at multiple locations. Most butterflies are found along the ridge that forms the eastern boundary of the Coyote and southern Santa Clara valleys. This ridge consists of extensive serpentine grasslands, and extends from the Silver Creek Hills, through the Edenvale Hills (sometimes called the East Hills or Coyote Hills), to Pigeon Point just north of Anderson Reservoir Dam. There are multiple

populations of the butterfly along this ridge. There are smaller, scattered populations of the butterfly along the eastern foothills south of the Anderson Reservoir dam and along the western foothills of the Coyote Valley.

Factors implicated in these multiple extinctions on the Peninsula and in the East Bay include direct habitat loss through development, habitat degradation due to non-native species (likely exacerbated by nitrogen-containing pollutants), successional changes from grasslands to scrub and chaparral, periods of unfavorable or highly variable weather, and disruption of regional metapopulation dynamics. The detrimental impacts of these factors are more problematic for the butterflies because the extent of the serpentine grasslands of the Peninsula and East Bay is limited.

Occurrences within the Study Area

The majority of habitat of the Bay checkerspot butterfly and the vast majority of individuals of the subspecies are found in the area covered by this HCP/NCCP.

Historical

Bay checkerspot butterflies have been studied in central Santa Clara County since the 1960s and extensive work on the butterfly was conducted in the region during the 1980s and 1990s. Populations located in the Silver Creek Hills, Tulare Hill, and near Coyote Reservoir were study sites for many research projects in the 1960s and 1970s. In the 1980s, research on the butterfly shifted to the large concentration of butterflies present in the hills adjacent to the Kirby Canyon Sanitary Landfill.

Population declines and expansions are well documented for this subspecies, and are very common in this region. No extinctions of populations have been conclusively confirmed (a difficult task requiring multiple years of monitoring) in the area, but at various times populations located in the Silver Creek Hills, Tulare Hill, and the serpentine grasslands located near Kalana Avenue have declined to extinction or near-extinction. It is unclear if the records of isolated butterflies from Communication Hill, the hills south of Anderson Reservoir dam, and the hills west of Highland Avenue (San Martin) represent now-extirpated populations or merely transient butterflies.

Additionally, broad expansions and contractions of populations across slope exposures are common. Warm slopes (generally low elevation, and west- or south-facing) in particular often support high densities of butterflies in seasons following years with ample winter and spring rain. In seasons following drought years, few if any butterflies can be found on the warm slopes.

Recent

As of 2005 Bay checkerspot butterflies were abundant in the multiple populations found along the eastern foothills, from the Silver Creek Hills to Pigeon Point. Several of these populations regularly support more than 250,000 adult butterflies. In areas south of Pigeon Point, Bay checkerspot butterflies are present in the small patches of grassland just west of Coyote Reservoir. On the west side of the Coyote Valley, Bay checkerspot butterflies have been present in the recent past in serpentine grasslands adjacent to Hale Avenue, in areas adjacent to Kalana Avenue, in the southern portions of the Santa Teresa Hills, in the hills near Calero Reservoir, and on Tulare Hill. Survey effort in this part of the study area in uncertain, though it is believed that these sites do not consistently support this species, due to lack of beneficial management. See *Population Trends 1985–2008*, below, for site specific population information.

Natural History

Habitat Requirements

At the present time, the Bay checkerspot butterfly reproduces only in serpentine grasslands. These native species-dominated grasslands support the larval host plants, dwarf plantain (*Plantago erecta*) and purple owl's clover (*Castilleja exserta* and/or *Castilleja purpurescens*), at densities that are high enough to sustain butterfly larvae. These host plants are not serpentine-dependent species and are distributed more widely outside of the study area. Within the study area these nutrient-poor serpentine habitats likely allow these host plants to compete with other non-native grassland species that would typically out-compete them. These grasslands also tend to support many additional species that can provide nectar to the adult butterflies.

Topography is an additional factor determining habitat quality and a variety of microclimates are needed for Bay Checkerspot butterflies to persist (Singer and Ehrlich 1979; Fleishman et al. 2000). Relatively cool and moderate microclimates are critical to a butterfly population's ability to survive drought (Weiss and Murphy 1983) while warm slopes appear to be important during wet/cool years (Weiss et al. 1988). Sites lacking cool and moderate slope exposures are unable to continuously support populations of Bay checkerspot butterflies.

Patch size and proximity to other sites supporting butterflies are also factors in determining suitability of particular serpentine grasslands for Bay checkerspot butterfly populations. In general, as patch size drops below several hectares it becomes increasingly unlikely that the grassland can support a viable population. However, given the dispersal capabilities of the butterfly, small patches of serpentine grassland located a few hundred meters from groups of other small

patches can support butterflies. Additionally, many relative small patches of serpentine grassland located within several kilometers of the region's large checkerspot butterfly populations are frequently occupied.

Weather is an important determinant of habitat quality (Dobkin et al. 1987; Hellmann 2002). Growing season rainfall, which delays senescence of larval host plants, is favorable for the butterfly. During periods of favorable weather, Bay checkerspot butterfly populations expand in extent and abundance. During these periods, grasslands generally considered too warm, too small, or too distant can be occupied by the butterfly.

Conversely, during periods in which there is relatively little growing season rainfall, the larval host plants senesce earlier in the year, and larvae in many locations cannot obtain sufficient food. This results in extensive contractions of the large populations as the distribution of butterflies shifts to cooler microclimates (Weiss et al. 1988). Many of the smaller and flatter patches of serpentine grassland tend to lose butterflies during these periods.

Table 1. Habitat Associations for the Bay Checkerspot Butterfly

Land Cover Type	Use by the Butterfly	Habitat Designation	Habitat Characteristics	Explanation
Serpentine grassland	Reproduction, growth, feeding—larvae and adult	Primary	Native bunch grasses; high species richness of native forbs; dwarf plantain (*Plantago erecta*); owl's clover (*Castilleja exserta*, *C. purpurascens*)	Dwarf plantain is the primary larval food plant. Two species of owl's clover are utilized as secondary larval food plants when available. Adults feed on nectar from a variety of native forbs, including species of *Mullia*, *Layia*, *Lomatium*, *Lasthenia*, *Linanthus*, and *Allium*.

Life History

Bay checkerspot butterflies are univoltine, and individuals typically have a maximum life span of only slightly longer than one year. During this year, individuals progress through six fairly distinct life history stages: egg, prediapause larva, diapause (larval dormancy), postdiapause larva, pupa, and adult.

Eggs generally are laid in masses of 50 to 200, typically on the base of the larval host plants (Labine 1968; Singer 1972). Egg masses are occasionally laid on other plants or substrate such as rocks or dirt. The primary larval host plant species is the annual dwarf plantain (*Plantago erecta*). Two annual species of owl's-clover (*Castilleja* sp.) and purple owl's-clover (*C. exserta* ssp. *exserta*) are also used as larval host plants (Hickman 1993).

The eggs hatch in approximately 10 days. Egg masses frequently disappear, apparently from predation by invertebrates or possibly vertebrates. Heavy rain or

hail can also cause significant loss of eggs. Desiccation causes egg mortality under laboratory conditions, but it is not clear if this is a significant problem under field conditions.

After hatching, prediapause larvae feed on their host plants for two to six weeks, until either the larvae are large enough to enter and survive diapause (fourth instar) or have depleted the available food supply. Mortality during this phase is thought to be the primary determinant of the following year's population size; if prediapause survival is high, the population size will increase, and if prediapause survival is low, the population size will decrease. Even in "good" years at least 80% of larvae die prior to diapause (Singer 1972; Fleishman et al. 1997) and larvae resulting from egg masses laid in the mid-to late part of the season have very little chance of surviving (Singer and Ehrlich 1979). Most mortality during this stage is due to lack of food. Predation and excessive precipitation can also result in larval mortality (Dobkin et al. 1987).

Food supply can prove inadequate if the larval host plants senesce early relative to the butterfly (White 1974). This is often the case in dry years and for larvae originating from egg masses laid relatively late in the season. Low density of host plants can also lead to local depletion of resources. In general, dwarf plantain is a more consistent host plant, with densities and standing biomass being less variable than the owl's-clover species (which in some years are virtually absent). Dwarf plantain individuals, however, are typically smaller and senesce earlier than individuals of owl's-clover. While there is certainly a limit to how far larvae can disperse, even first instar larvae will easily traverse several meters in search of suitable host plants, and most larvae shift among individual plants several times.

Newly hatched larvae sometimes group together and make small webs around portions of their host plant. Field studies indicate that the proportion of larvae that make webs is variable (Labine 1968).

As the end of the spring growing season approaches, the larval host plants senesce and many of the butterfly larvae enter a period of physiological dormancy known as diapause. Alternately, many larvae die of starvation trying to reach the appropriate size needed to survive diapause or die shortly after entering diapause due to insufficient amounts of stored resources. Larvae spend diapause under rocks, debris, or plant litter, or in cracks and crevices in the soil. Diapause lasts until larval host plants germinate during the onset of the rainy season in late autumn and early winter. Dwarf plantain tends to be the primary early season food source.

Postdiapause larvae spend the next several months feeding and basking in the sun, growing quickly from small fourth instar larvae to 4 cm long seventh instar larvae. Postdiapause larvae can disperse several tens of meters, and frequently do so in search of host plants, appropriate basking areas, or areas sheltered from inclement weather. Development of larvae in warm microclimates (defined primarily by slope, aspect, and elevation) is frequently several weeks ahead of larvae in cool microclimates. These phenological differences are present even

when the distance between the areas of different microclimates is quite small, on the order of ten meters.

After the larvae reach sufficient size and stage, they pupate. In most years, the majority of larvae pupate in February or March. Phenology is extremely weather dependent, and all of the major transitions it the butterfly's life cycle, including pupation, can be shifted several months. Pupae are formed in a loose web, typically at the base of vegetation or rocks. Individuals remain as pupae for three to five weeks, or longer if there are extended periods of cold and rain.

Some mortality occurs during the post-diapause and pupal stages; the magnitude varies from year to year (White 1986). Parasitoids are evident in post-diapause larvae and pupae, and a high percentage of late-developing larvae are typically parasitized. Parasitoids, however, do not appear to be a major factor in determining population size in the Bay checkerspot butterfly (parasitism is a controlling factor for populations of other species of checkerspot butterflies; Moore 1989). In some years a pathogen, which causes the darkening, liquefication, and death of butterfly larvae, is present. Field studies have observed that pupae frequently disappear, and predation has long been presumed to be the cause. In general, approximately 50% of the late (at least early sixth instar) post-diapause larvae present at a given location will survive to become an adult butterfly.

After several weeks and when the weather warms, butterflies will eclose (emerge from pupae). Newly-emerged individuals crawl to a somewhat exposed location and sun themselves until their wings have fully hardened. Male butterflies tend to emerge earlier in the season than females (Ehrlich 1965), and are on average smaller than females. Individual butterflies survive as adults for seven days to two weeks. How long adult butterflies are present in a given location depends on the number of butterflies (the more butterflies, the more prolonged the adult season), topographic diversity of the site (the more diversity, the more microclimates), and weather (Hellmann et al. 2003). The adult flight season is typically about four to six weeks in length, generally starts in March, and terminates in late April to early May. Actual starting and ending times can vary by several weeks from year to year.

The majority of female butterflies are mated soon after eclosion, occasionally before their wings have hardened fully. There is some hilltopping in the Bay checkerspot butterfly (i.e., congregation for mating at visible landmarks, often hilltops, that may have few larval or adult resources), with males in particular tending to concentrate local ridges (Ehrlich and Wheye 1986). Most female Bay checkerspot butterflies mate only once and are prevented from subsequent mating by a waxy plug deposited by the male (Labine 1964). Females lay multiple egg masses; earlier egg masses contain a greater number of eggs than later egg masses. Nectar is utilized by both male and female butterflies, and is provided by a variety of plant species, including common muilla (*Mullia maritima*), tidytips (*Layia platyglossa*), California goldfields (*Lasthenia californica*), lomatiums (*Lomatium* sp.), onions (*Allium* sp.), and several linanthus species (*Linanthus* sp.).

Rain and hail can cause substantial mortality of adult Bay checkerspot butterflies. Strong wind can also be problematic for the butterflies, often damaging their wings to the point that their ability to fly is compromised. Bay checkerspot butterfly adults are also eaten by a variety of predators. Spiders catch butterflies both in their webs and while the butterflies are not flying (Ehrlich 1965). Other invertebrates undoubtedly prey on some butterflies while the butterflies are on the ground or in the vegetation. Mammals may take some butterflies, particularly during periods when the butterflies are inactive (at night and during periods of bad weather). Birds take Bay checkerspot butterflies, but predation by birds is typically not high (Ehrlich 1965).

Although the Bay checkerspot butterfly is considered an annual univoltine species, it is possible that under some conditions, the butterfly can extend its life cycle for several years. Under laboratory conditions, individual butterflies frequently enter a second diapause (or even three or four diapauses). Given this observed ability, it is very possible that under some circumstances, post-diapause larvae occasionally re-enter diapause, thereby extending their life span from one to two years.

Table 2. Generalized Phenology of the Bay Checkerspot Butterfly

Life History Stage	December, January	February	March	April	May	June	July to November
Eggs			✓	✓	✓		
Pre-diapause larvae				✓	✓	✓	
Diapausing larvae	✓				✓	✓	✓
Post-diapause larvae	✓	✓					
Pupae		✓	✓	✓			
Adults			✓	✓			

Movement

Adult Bay checkerspot butterflies are relatively agile, and can easily fly several kilometers (Harrison 1989). Bay checkerspot butterflies have a general propensity to remain associated with serpentine grasslands, and most movements are within a single patch of serpentine grassland (Ehrlich et al. 1980; Ehrlich and Murphy 1981). Within a given patch, butterflies will frequently fly from one area to another, looking for potential mates, feeding on nectar on scattered groups of flowers, avoiding wind, avoiding other butterflies (mated females in particular tend to avoid males), and looking for oviposition sites. In smaller habitat patches, this means that individual butterflies often fly from one end of the patch to the other. In large habitat patches, those several kilometers in length or width, individual butterflies will generally stay in a portion of the overall site, usually moving much less than a kilometer from the point where they eclosed.

In areas where serpentine grasslands transition into other types of plant communities, Bay checkerspot butterflies will usually turn around and remain in the serpentine grassland (Ehrlich 1965). Butterflies that do not turn around at the edge of their serpentine habitat tend to keep flying—presumably until another patch of habitat is encountered. It is assumed that butterflies may use any land cover type as a movement corridor if the land cover is adjacent to serpentine grassland. Harrison (1989) documented colonization up to 2.8 miles from Coyote Ride, and one individual moved 3.5 miles. Another marked individual was documented to have flown 4.7 miles (U.S. Fish and Wildlife Service 1998). Based on numerous mark-recapture studies, the percentage of individuals that leave particular serpentine grassland areas is thought to be generally low, less than 10%. This percentage apparently increases as the season progresses, and may be higher in populations with very low densities of Bay checkerspot butterflies.

Even with the fairly low percentage of butterflies that leave specific sites, if the butterfly population is large (several of the Bay checkerspot butterfly populations in the HCP/NCCP study area frequently consist of 250,000+ adult butterflies), a large number of Bay checkerspot butterflies will disperse away from their natal habitat patch. For example, if a population includes 250,000 adult butterflies and 1% of the population leaves the site, then 2,500 individual butterflies are expected to leave the site. Given the patchiness of serpentine grasslands and the apparently limited ability of Bay checkerspot butterflies to locate these grasslands from more than a few hundreds of meters distant, most Bay checkerspot butterflies that leave serpentine grasslands do not find other patches of habitat. However, patches of serpentine grassland that are within a few kilometers of moderate to large populations of Bay checkerspot butterflies will receive immigrants on a regular basis; larger patches of serpentine grassland will receive more immigrants, but even very small patches will occasionally be occupied by Bay checkerspot butterflies if the patches are within five to 10 kilometers of the large populations. Conversely, as distance between patches increases, the chance of butterflies migrating between the two patches decreases.

Prediapause larvae generally do not disperse far from where they hatched, but undoubtedly some individuals disperse distances in excess of 10 meters (Launer pers. comm.). Postdiapause larvae are more prone to disperse, but it is unlikely that many move farther than 50 meters from their place of diapause (Launer pers. comm.).

Table 3. Movement Distances for Bay Checkerspot Butterfly

Type	Distance	Notes	Sources
Adults—within habitat	Depend on size of habitat patch	Generally stay associated with patch of serpentine grassland	Harrison 1989
Adults—out of habitat	Up to several kilometers	Out of habitat movement tends to be random and linear; ridges are occasionally followed	Harrison 1989
Prediapause	Generally fewer than 10 meters		Harrison 1989
Postdiapause	Generally fewer than 50 meters	Larvae tend to move toward warmer microclimates (often uphill)	Harrison 1989

Ecological Relationships and Population Dynamics

Regional population dynamics of the Bay checkerspot butterfly tend to be complex. The abundance of individual populations increases or decreases in response to site-specific characteristics (topography, patch size, management regime, etc.) and weather. Likewise, in expansive patches of serpentine grassland, particularly those with considerable topographic diversity, shifts in butterfly density across the landscape are common. Most of these shifts in density across the landscape are expansions and contractions, with the butterfly population shifting from cool and moderate microclimates during dry years, to warmer microclimates during rainy years, and then back to the cool and moderate microclimates during the next drought (Weiss et al. 1988).

Local extinctions of entire populations and of segments of large populations are not uncommon. Reestablishment of populations in areas formerly supporting distinct populations or the spatial expansion of extant populations are also not uncommon. This loose pattern of extinctions, colonizations, contractions, expansions, has led many to characterize the Bay checkerspot butterfly as a series of metapopulations.

The classical concept of a metapopulation (Levins 1969, 1970), a series of ephemeral local populations linked by dispersal, does not apply to the Bay checkerspot butterfly. A better description of the population dynamics of this species is a source-sink metapopulation (Harrison et al. 1988; Hanski 1994). The expansive populations occupying the serpentine grasslands found in the hills along the eastern edge of the Coyote Valley (variously known as the southern Silver Creek Hills, the Edenvale Hills, the East Hills, and the Coyote Hills) are large and microclimatically diverse enough that if properly managed, they may be essentially "extinction proof" (i.e., a perennial "source" population), barring any dramatic shifts in climate, land use, or habitat management. The many smaller and less diverse sites to the west and south are much more susceptible to periods of unfavorable weather, and hence more extinction prone (i.e., "sink" populations). The large populations in the eastern hills are the source of

butterflies, providing butterflies that either supplement the small populations to the west or that actually reestablish populations that have been extirpated.

There have been substantial changes in plant composition and distribution since European colonization. As a result, regional population dynamics of the Bay checkerspot butterfly may be quite different than historically.

The main factor contributing to a butterfly population's decrease or increase is the availability of edible host plants for the prediapause larvae. Host plant availability is determined by two factors, biomass of the host plants and their phenology (relative to the butterflies). Plant biomass in turn is determined by weather, number of viable seeds, seed germination, seedling growth and survival, and land management (e.g., livestock grazing, competition from alien species, etc.). There is considerable annual variation in biomass of the larval host plants. The annual owl's-clover species, in particular, vary greatly spatially and temporally, and are virtually absent in some years.

The second principal factor contributing to availability of larval host plants is phenology (i.e., the timing of development, or more precisely, the relative timing of the butterfly larval development and the developmental timing of their host plants. If many of individual plants do not senesce until mid-May, as is the case when there is at least some precipitation during the early spring growing season, then the butterfly larvae should be able to find sufficient quantities of edible food. If the rains stop early in the growing season, the majority of the plants may senesce early and the majority of the butterfly larvae will have trouble finding enough food to survive.

Population Status and Trends

Global: Declining
State: Declining
Within Study Area: Declining

Threats

The Bay checkerspot butterfly is in a precarious situation, but it is not threatened with immediate extinction. There are many threats acting on the butterfly and the serpentine grasslands upon which it depends. These threats include:

Habitat loss via development. Many Bay checkerspot butterfly populations have been lost due to conversion of serpentine grasslands to residential, recreational, and commercial development.

Habitat modification via development. A number of serpentine grasslands have been partially destroyed by urban and suburban development, either directly (e.g., quarries, dumps, roads) or indirectly by adjacent land use. Water, either irrigation or runoff, from built environments can significantly alter the species

composition of plants on a site, potentially rendering portions of a site unsuitable for Bay checkerspot butterflies.

Non-native species. Although serpentine grasslands are typically more resistant to invasion by non-native species than many other vegetation types, non-native species eventually degrade serpentine grasslands. Habitat management is an absolute necessity to control this threat.

Pollution. A number of pollutants, especially nitrogen-based pollutants, threaten the Bay checkerspot butterfly. Deposition of nitrogen on serpentine grasslands can radically alter the plant composition. Deposition of nitrogen acts to fertilize the nutrient-poor serpentine soil, and greatly exacerbates the problems caused by non-native species (Weiss 1999).

Succession. Given the present species composition, rates and types of disturbance, and pollutants, it appears that areas of serpentine grassland that have been recently disturbed, either by grazing or fire, are better able to support Bay checkerspot butterflies that areas that have not been recently disturbed (Weiss 1999). This probably reflects that grazing and fire tend to reduce the dominance of non-native species. It is not clear what the successional patterns were in prior to European colonization and whether Bay checkerspot butterflies were associated with any particular successional stage.

Over-collecting/poaching. Although mentioned by various agencies as being a general threat to rare butterflies, there is no evidence suggesting that the current level of illegal collecting that undoubtedly occurs is of any consequence to Bay checkerspot butterfly persistence. In fact, artificial application of heavy "predation pressure" in the form of intensive collecting was applied to the Jasper Ridge colony in 1964 and 1965, with very little reduction in population size (Ehrlich 1965).

Overstudy. Many populations of the Bay checkerspot butterfly have been studied, often quite invasively, since 1960. Several of the most intensely studied populations have gone extinct, most notably those located at Jasper Ridge on Stanford and at Edgewood County Park in San Mateo County. None of the studies designed specifically to examine the potential impacts of research on Bay checkerspot butterfly populations have identified any significant negative impacts (Harrison et al. 1991; Hellmann et al. 2003). Harrison et al. (1991) did indicate that collections may have increased the chances of extinction, with an effect ranging from negligible to a 15% increase in extinction probability over 30 years depending on model assumptions.

Weather. Both current weather and potential future changes in weather can impact the Bay checkerspot butterfly. Periods of drought and deluge both have the potential to negatively impact Bay checkerspot butterflies (Singer 1972; Hellmann 2002c). Drought tends to cause Bay checkerspot butterfly populations to retreat to areas with moderate to cool microclimates. If these microclimates are present at a site, then the population merely experiences a contraction in distribution and abundance. If a site does not have sufficient areas of moderate and cool microclimates, then extirpation of the population is a definite

possibility. The impacts of excessively wet years are somewhat more difficult to quantify. Some shifts in microclimatic zone utilized by the butterfly may occur; the very cool microclimates may simply become too wet to successfully sustain butterflies. Other negative impacts of above-average precipitation include increased competition between the native forbs and mostly non-native grasses and, possibly, increased butterfly mortality due to pathogens. Extremes in annual variation of weather may also negatively impact Bay checkerspot butterfly populations.

Predicting future climate changes and the impacts of these changes on biotic systems is a highly inexact science. However, given the sensitivity of butterfly populations to host plant phenology, it is reasonable to assume that future climate change could significantly impact Bay checkerspot butterfly populations (Dennis 1993; Hellmann 2000, 2002).

Data Characterization

The Bay checkerspot butterfly is one of the most studied invertebrate taxon in the world. Stating in 1960, Dr. Paul Ehrlich, his research group at Stanford University, and numerous academic affiliates of the Stanford group have studied *Euphydryas* butterflies across western North America. Given its distribution in areas near Stanford, and indeed the former presence of three populations of the butterfly on campus, the Bay checkerspot butterfly is the most studied of the *Euphydryas* species and subspecies. This butterfly has been the subject of many hundreds of articles published in peer-reviewed journals, multiple chapters of academic books, more than a dozen doctoral and master's dissertations, and many field projects. Much of the accumulated knowledge, along with many of the key references can be found in the book *On the Wings of Checkerspots: A Model System for Population Biology* (Ehrlich and Hanski 2004).

Population Trends 1985–2008

Long term monitoring sites have been established along Coyote Ridge. Annual estimates of larval population size are the essential component of long-term monitoring of the Bay checkerspot butterfly. The distribution and abundance of the butterfly has been monitored at Kirby Canyon (KC) since 1985, and across most of the core populations since the 1990s. This period included a record 5-year drought (1987–1991), a strong El Nino in 1998, and other wide swings in weather.

This summary includes data for several core areas, and a discussion of broad features of the observed population dynamics that are highly relevant to conservation planning. These features include the range of population fluctuations, synchrony or asynchrony across Coyote Ridge, and responses to exceptional weather events. Also, notable population crashes in response to lack of grazing are also discussed.

Methods

Larvae are counted in a stratified sampling design developed at Kirby Canyon in the mid-1980s (Murphy and Weiss 1988). The habitat is stratified by March 21 solar radiation (insolation) into 5 "thermal strata;" Very Warm, Warm, Moderate, Cool, and Very Cool. Within each stratum, multiple samples of larval densities are taken over 1,500–3,000 m^2 areas using a timed search technique (10 person-minutes) that can be converted to absolute densities (Weiss 1996). The map of the Kirby Butterfly Trust Leasehold (Figure 3) with Thermal strata and larval sample areas shows the sample sites that have been visited in recent years. 35–40 sites are sampled within the 100 hectare leasehold each year in a window from January through March, the exact dates being weather dependent. The thermal stratification scheme is shown in color—red corresponds to Very Warm, yellow Warm, green Moderate, cyan Cool, and dark blue Very Cool. Larval sample areas are the white polygons.

Larval surveys were extended to most of Coyote Ridge in the 1990s (Weiss 1996). More than 200 sites are visited in a typical year across Coyote Ridge as a whole. Surveys were stratified by "population zones" —habitat blocks 500 or more meters across, corresponding to local topography and grazing regimes (Figure 3). These surveys monitor the health of the overall population on Coyote Ridge, and are a foundation for conservation. These surveys track local and regional population dynamics, and are now supported by a variety of mitigation sources.

Results

Population Trends at Kirby Canyon 1985–2008

Since 1985, larval abundance at KC ranged from 25,000 to 800,000 (Figure 4a). From 1985 to 1987, numbers increased from 100,000 to nearly 900,000, followed by a four-year crash down to 30,000. A one year increase in 1992 to 100,000 was followed by several years of relative stability. A sharp decrease in 1997 to 25,000 was followed by a 7-year increase to 500,000+ by 2004, followed by a sharp three year decline to 50,000 by 2007 and 2008.

The 1987–1991 population declines correspond to a multi-year drought, and the particularly sharp decline in 1989 followed a truncated rainy season with a warm March-April. The decline in 1997 followed a record warm, but cloudy/rainy winter. The decline in 2005 followed a warm, dry March–April.

An additional drive of population response was also noted in 2004–2005. On many moderate and cool slopes, larval population densities were high enough (>1 larva/m^2) in successive years that local defoliation of Plantago occurred, and sharp drops to <0.05 larvae/m^2 were observed the following year. The combination of the warm-dry spring 2004 and defoliation exacerbated the population declines.

Population Dynamics across Coyote Ridge 1992–2008

Larval population estimates in the other population zones show large fluctuations (Figures 4b–4g). The ridgetop areas just north of KC (VTA High 1 and VTA High 2, new names) showed relative stability from 1992 to 1996, sharp declines in 1997, increases through 2004, and subsequent declines through 2007 and 2007. Note that abundance in these areas, especially VTA High1, dropped to near 1000 from peaks of 100,000. These fluctuations were largely synchronous with those at KC.

On the lower slopes of the VTA parcel (VTA low), abundance peaked at 70,000 in 1994, and dropped below detection limits from 1998 to 2000. During this time, some adult butterflies were observed in this area each year, indicating persistence. Larval abundance recovered to 70,000 again by 2003, probably enhanced by immigration from large populations on the ridgetop, and fell to 10,000 by 2006–2008.

Although sampled more intermittently, the data indicate that the southern parts of the UTC property also experienced similar fluctuations. R2A (south of the fence dividing the winter-spring grazing from the spring/summer/fall grazing) peaked in 2003 and 2004, and UTC South (north of the fence) peaked a couple years later in 2006.

Sampling has been even more intermittent in UTC North (numbers not shown) but in 2008, local densities there were among the highest seen on Coyote Ridge.

Areas between UTC South and UTC North have maintained occupancy by Bay checkerspot butterfly, tended to follow the broader trends, but not enough survey sites have been done to estimate total population size.

Larval densities at lower elevations north of the VTA property, including the Los Esteros and Silicon Valley Power 40-acre mitigation parcels, have historically been lower than on the ridgetop. Larval populations in these areas have been estimated to be several hundred to several thousands. In recent years, population trends have tracked the lower slopes of VTA.

The habitat north of Metcalf Canyon (Metcalf, 114 ha included in the population estimate) has historically supported a large population of Bay checkerspot butterflies (Figure 2). Larval numbers increased from 27,000 in 1997 to 200,000 in 2000, to >400,000 in 2001, 800,000 in 2004, and then declined sharply to 83,000 in 2005, and 20,000 in 2007 followed by an increase to 35,000 in 2008.

The adjacent habitat to the northeast (Metcalf North Ridge, or San Felipe) has supported butterflies since 1997, but no quantitative estimates have been made of total numbers.

At the SE end of Coyote Ridge, the serpentine grasslands on Pigeon Point just NW of Anderson Dam has supported moderate to low densities of larvae during intermittent surveys since 1985.

Overall the subpopulations on Coyote Ridge exhibited relative stability from 1992 to 1996, a sharp decline in 1997, increases by an order of magnitude from 1997 through 2004, and subsequent declines by an order of magnitude or more through 2007 and 2008. Fluctuations were largely in synchrony with each other, but asynchronous population responses were noted at some sites in some years. Peak numbers of Bay checkerspot larvae in 2004 across all of Coyote Ridge were on the order of 2,000,000, and the 2008 estimate is on the order of 150,000 larvae.

Silver Creek Hills

The Environmental Trust of the Ranch at Silver Creek has been responsible for managing the conserved habitat in the Silver Creek Hills. Much of this area was heavily degraded by lack of grazing from 1992 through 1995 (Silver Creek Valley Country Club side) and from 1992 through 2002 on the Ranch at Silver Creek side. Populations are extant in the hundreds. Documentation is provided by Wetland Research Associates who manage the Environmental Trust.

Tulare Hill

In 2002, there were an estimated 2–3,000 larvae on Tulare Hill, but in 2003 the numbers dropped into the low hundreds, and the population declined to fewer than 100 by 2005. The northern 2/3 of Tulare Hill was ungrazed starting in 2001, and a rapid invasion of annual grasses eliminated what had once been quality habitat, leading to the. The population is just barely hanging on; in each year from 2006–2008 one individual checkerspot butterfly was observed.

Management activities on the southern parcel Tulare Hill are now being done as mitigation for NO_X and NH_3 emissions from the Metcalf Energy Center, and have maintained high habitat quality. A Safe Harbor Agreement with The Pacific Gas and Electric Company was developed from 2004 through 2008, and cattle were introduced into the northern 230+ acres that had been ungrazed since 2001. Recovery of hostplant and nectar sources is expected over the next 5–10 years depending on restoration efforts.

Other Habitat Areas

No systematic surveys of other serpentine patches west of the Coyote Valley were done from 2004 through 2008. It is likely that several of the larger patches (Hale Ave, the Kalana's) support small populations. Butterflies were observed in Rancho Canada del Oro in recent years.

Habitat conditions in the Santa Teresa Hills, especially in the County Park, continue to deteriorate as grass invasions continue in areas with no grazing. No systematic surveys for adult butterflies have been done. Grazed areas in the

southeast portions of the Santa Teresa Hills (owned by IBM) continue to support high densities of Plantago erecta and nectar sources.

Existing Conservation Actions in the Study Area

The U.S. Fish and Wildlife Service published a recovery plan for serpentine plants and animals of the San Francisco Bay area in 1998, which includes the Bay checkerspot butterfly. The primary recovery tasks identified for the butterfly are protection of existing habitats, along with their habitat restoration and management, plus population monitoring and further research.

Fifteen units of critical habitat for the bay checkerspot butterfly were designated by the U.S. Fish and Wildlife Service in 2008. The designated critical habitat includes 1,692 acres in San Mateo County and 16,601 acres in Santa Clara County.

At least two HCPs have been approved that provide an incidental take permit for the Bay checkerspot. The San Bruno Mountain HCP, approved in 1982 as the first HCP in the country, includes the bay checkerspot. However, because the butterfly has not been observed on San Bruno Mountain since the mid-1980s, the permit had no provision for incidental take of the butterfly, so no permit was issued for the species. The Bay Checkerspot butterfly may be added as a covered species under an amendment to the San Bruno Mountain HCP, which is currently in development. Two HCP's were prepared by The Pacific Gas and Electric Company for the Metcalf-Edenvale reconductoring project in San José and the related Metcalf-Hicks/Vasona Line Extension from San José to Los Gatos. The Metcalf-Edenvale HCP had a three year permit term, which expired in 2001.There are at least two other agreements related to HCP's that are currently in development in the Coyote Hills.

Other agreements have led to the establishment of two preserves for the bay checkerspot butterfly. In 1986, USFWS entered into a conservation agreement with Waste Management of California, Inc. and the City of San José to protect 267 acres of habitat for a 15-year period at the Kirby Canyon Landfill in San José (Murphy 1988). In 1991, a housing and golf course project in the Silver Creek Hills of San José resulted in the perpetual protection of a 115-acre conservation area. Since 1991, additional land has also been set aside for numerous projects as mitigation for impacts to Bay checkerspot butterfly, including the Metcalf Energy Center Ecological Preserve on Tulare Hill and their Coyote Ridge parcel (131 acres total), and a parcel acquired by VTA in 2006 on Coyote Ridge for mitigation for recent highway widening projects.

Active research and monitoring on the Bay checkerspot continues by several workers affiliated with Stanford University, other institutions, and consulting firms is ongoing.

Modeled Habitat Distribution in Study Area

The serpentine habitats where this species reproduces are easily identified in the study area. Due to the extensive research on the population dynamics of this species most of these areas have been surveyed, some quite extensively. Other areas have been surveyed in a more cursory fashion merely to determine whether the species is present or not and to assess the available habitat. The suitable habitat known or expected to occur in the study area is shown in Figure 1. This map was developed using an iterative process of refinement with two experts in Bay checkerspot butterfly biology, Dr. Stuart Weiss and Dr. Alan Launer. Maps were first developed showing patches of serpentine bunchgrass grassland as mapped by the Habitat Plan (see Chapter 3 for a description of the mapping methods). These patches of serpentine grassland, referred to as "habitat units", were further refined in consultation with the experts to delineate populations of Bay checkerspot butterfly based on field research and observations.

Bay checkerspot butterfly habitat units are divided into two broad categories: core and satellite. The definitions for core and satellite habitat units are adapted from the *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998). Core habitat units are "moderate to large areas of suitable habitat that support persistent bay checkerspot populations." Satellite habitat units are "generally smaller and contain less high-quality habitat than core areas, and may occur some distance from core areas."

The Habitat Plan identified eight core habitat units found within the four "core areas" defined by the Recovery Plan. The Habitat Plan also identified 13 satellite habitat units. The status of each core and satellite habitat units is classified as "occupied" or "historic/unoccupied". For habitat units defined as "occupied," species is known to occupy the patch at least in some years. Where individuals were present historically, but now the site is unoccupied and likely no longer suitable, the habitat unit is defined as "historic/unoccupied" Additional areas that support serpentine bunchgrass grassland (as mapped by the HCP/NCCP) and are adjacent to known populations or are within the known dispersal distance for the adults in these populations were also delineated as either suitable but "occupancy unknown" or suitable and "potential (no records)" habitat. If the site had not been surveyed thoroughly or surveyed in the last ten years, a habitat unit was classified as "occupancy unknown". Otherwise suitable patches of serpentine grassland within the dispersal distance of known populations were considered "potential (no records)" habitat units if land use management practices such as livestock grazing could improve conditions for the species. The habitat units are described further and the categories are explained in Table 4.

Table 4. Bay Checkerspot Butterfly Habitat Units in the Study Area

Habitat Unit[1] (from North to South)	Status in 2006[2]	Size (acres)
Target Areas		
UTC	Occupied	1,607
Kirby/East Hills	Occupied	1,334
Pigeon Point	Occupied	117
Silver Creek Hills (Central)	Occupied	353
Metcalf North Ridge[3]	Occupied	564
Metcalf	Occupied	779
Pound Site	Occupied	216
Hale/Falcon Crest	Occupied	371
Cañada Garcia	Occupied	180
Kalana Avenue (1–4)	Occupied	110
Tulare Hill	Occupied	336
Santa Teresa Hills (Main)	Occupied	936
Santa Teresa Hills (North)	Potential (no records)	190
Coyote-Bear Ranch County Park	Occupied	60
Calero	Occupied	359
Subtotal Target Areas		7,512
Non-Target Areas		
Silver Creek Hills (North #1)	Occupied	382
Silver Creek North #2	Potential (no records)	406
Communications Hill 1	Historic/Unoccupied	230
Communications Hill 2	Historic/Unoccupied	25
San Martin/Hayes Valley	Occupancy Unknown	201
Southwest Anderson Reservoir	Occupancy Unknown	189
Valley Christian High School	Historic/Unoccupied	15
Subtotal Non-Target Areas		1,449
Grand Total		**8,961**

Notes:

[1] Habitat Unit names are based on labels used by researchers at Stanford University for long-term monitoring and ecological studies. Also see Figure 1.

[2] Historic/Unoccupied = Site formally occupied but now extirpated and no longer suitable; Occupied = Site remains suitable and Bay checkerspot butterflies observed in at least a portion of the site in some years (not occupied every year); Potential (no records) = Site contains habitat that could be made suitable with proper management (currently unoccupied); Occupancy Unknown = Site status unknown due to lack of field surveys.

[3] Metcalf North Ridge is also referred to as "San Felipe"

Sources: ICF Land Cover Maps, Stanford University Center for Conservation Biology Population Data (through 2006), and personal communications with S. Weiss and A. Launer (2006–2007).

Literature Cited

Printed References

Dennis, R.L.H. 1993. *Butterflies and climate change*. Manchester University Press, New York.

Dobkin, D.S., I. Olivieri, and P.R. Ehrlich. 1987. Rainfall and the interaction of microclimate with larval resources in the population dynamics of checkerspot butterflies (*Euphydryas editha*) inhabiting serpentine grassland. *Oecologia* 71: 161–166.

Ehrlich, P.R. 1965. The population biology of the butterfly *Euphydryas editha*. II. The structure of the Jasper Ridge colony. *Evolution* 19: 327–336.

Ehrlich, P.R., and Ilkka Hanski. (eds.). 2004. *On the wings of checkerspots: a model for population biology*. Oxford University Press. New York.

Ehrlich, P.R., and D.D. Murphy. 1981. The population biology of checkerspot butterflies (*Euphydryas*). *Biologisches Zentralblatt* 100: 612–629.

Ehrlich, P.R., and D.D. Murphy. 1987. Conservation lessons from long-term studies of checkerspot butterflies. *Conservation Biology* 1: 122–131.

Ehrlich, P.R., and D.D. Murphy, M.C. Singer, and C.B. Sherwood. 1980. Extinction, reduction, stability and increase: The responses of checkerspot butterfly (*Euphydryas*) populations to the California drought. *Oecologia* 46: 101–105.

Ehrlich, P.R., and D. Wheye. 1986. "Nonadaptive" hilltopping behavior in male checkerspot butterflies (*Euphydryas editha*). *The American Naturalist* 132: 477–483.

Fleishman, E., A.E. Launer, S.B. Weiss, D.D. Murphy, J.M. Reed, and P.R. Ehrlich. 2000. Effects of microclimate and oviposition timing on prediapause larval survival of the Bay checkerspot butterfly, *Euphydryas editha bayensis*. *Journal of Research on the Lepidoptera* 36: 31–44.

Hanski, I. 1994. A practical model of metapopulation dynamics. *Journal of Animal Ecology* 63: 151–162.

Harrison, S. 1989. Long-distance dispersal and colonization in the Bay checkerspot butterfly, *Euphydryas editha bayensis*. *Ecology* 70: 1236–1243.

Harrison, S., D.D. Murphy, and P.R. Ehrlich. 1988. Distribution of the bay checkerspot butterfly, *Euphydryas editha bayensis:* Evidence for a metapopulation model. *The American Naturalist* 132: 360–382.

Harrison, S., J.F. Quinn, J.F. Baughman, D.D. Murphy, et al. 1991. Estimating the effects of scientific study on two butterfly populations. *The American Naturalist* 137: 227–243.

Hellmann, J.J. 2000. The role of environmental variation in the dynamics of an insect-plant interaction. PhD dissertation, Department of Biological Sciences, Stanford University, Stanford, CA.

Hellmann, J.J. 2002. The effect of an environmental change on mobile butterfly larvae and the nutritional quality of their hosts. *Journal of Animal Ecology* 70: 925–936.

Hellmann, J.J., S.B. Weiss, J.F. McLaughlin, C.L. Boggs, P.R. Ehrlich, A.E. Launer, and D.D. Murphy. 2003. Testing short-term hypotheses with a long-term study of a butterfly population. *Ecological Entomology* 28: 74–84.

Hickman, J.C. (ed.) 1993. *The Jepson Manual of Higher Plants in California*. University of Berkeley Press, Berkeley, CA.

Labine, P.A. 1964. Population biology of the butterfly, *Euphydryas editha*. I. Barriers to multiple inseminations. *Evolution* 18: 335–336.

Labine, P.A. 1968. The population biology of the butterfly, *Euphydryas editha*. VIII. Oviposition and its relation to patterns of oviposition in other butterflies. *Evolution* 22: 799–805.

Levins, R. 1969. Some demographic and genetic consequences of environmental heterogeneity for biological control. *Bulletin of the Entomological Society of America* 15: 237–240.

Levins, R. 1970. Extinction. Pages 77–107 in M. Gerstenhaber, ed. *Some Mathematical Problems in Biology*. American Mathematical Society, Providence, RI.

Murphy, D.D. 1988. The Kirby Canyon conservation agreement: a model for resolution of land-use conflicts involving threatened invertebrates. *Environmental Conservation* 15:45-48.

Murphy, D.D., and P.R. Ehrlich. 1989. Conservation biology of California's remnant native grasslands. Pages 201–211 in L.F. Huenneke and H. Mooney, eds. *Grassland Structure and Function: California Annual Grassland*. Kluwer Academic, Dordrecht.

Singer, M.C. 1972. Complex components of habitat suitability within a butterfly colony. *Science* 176: 75–77.

Singer, M.C., and P.R. Ehrlich. 1979. Population dynamics of the checkerspot butterfly *Euphydryas editha*. *Fortschritte der Zoologie* 25: 53–60.

Singer, M.C., and C. Parmesan. 1993. Sources of variation in patterns of plant-insect association. *Nature* 361: 251–253.

Singer, M.C., C.D. Thomas, and C. Parmesan. 1993. Rapid human-induced evolution of insect diet. *Nature* 366: 681–683.

U.S. Fish & Wildlife Service. 1987. Endangered and threatened wildlife and plants; determination of threatened status and critical habitat for the Bay Checkerspot butterfly (*Euphydryas editha bayensis*). Federal Register 52:35366-35378.

U.S. Fish & Wildlife Service. 1998. Recovery plan for serpentine soil species of the San Francisco Bay area. Portland, OR. 330 + pp.

U.S. Fish and Wildlife Service. 2008. Endangered and Threatened Wildlife and Plants: Designation of Critical Habitat for the Bay Checkerspot Butterfly (*Euphydrya editha bayensis*), Final Rule. *Federal Register* 73(176):50406–50452. August 26.

Weiss, S.B. 1999. Cars, cows, and checkerspot butterflies: Nitrogen deposition and management of nutrient poor grasslands for a threatened species. *Conservation Biology* 13: 1476–1486.

Weiss, S.B. and D.D. Murphy. 1993. Climatic considerations in reserve design and ecological restoration. Pages 89–107 in D.A. Saunders, R.J. Hobbs, and P.R. Ehrlich, eds. *Nature Conservation 3. Reconstruction of Fragmented Ecosystems*. Surrey Beatty & Sons, Chipping Norton, New South Wales.

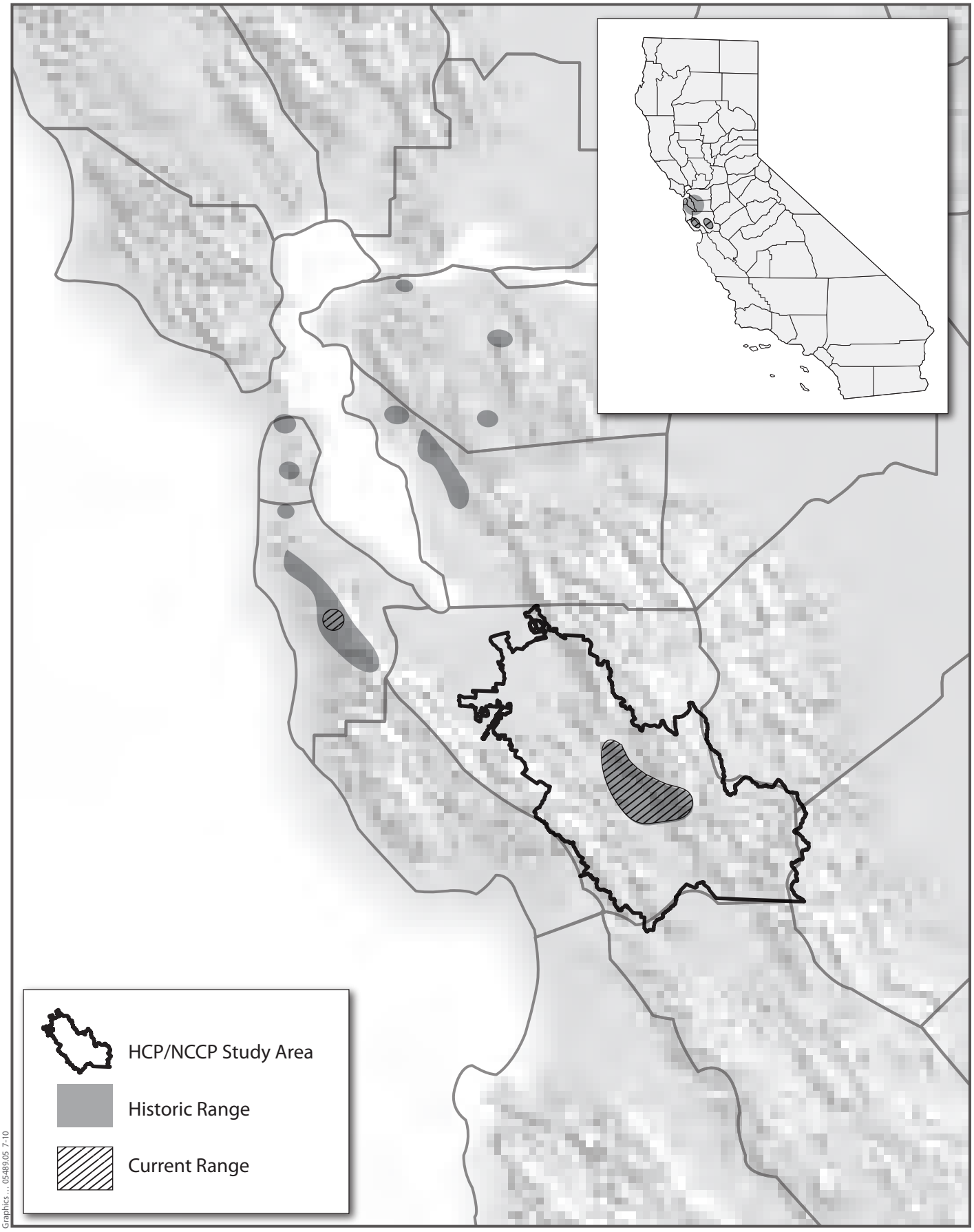
Weiss, S.B., D.D. Murphy, and R.R. White. 1988. Sun, slope, and butterflies: Topographic determinants of habitat quality for *Euphydryas editha*. *Ecology* 69: 1486–1496.

White, R.R. 1974. Food plant defoliation and larval starvation of *Euphydryas editha*. *Oecologia* 14: 307–315.

Personal Communications

Launer, Alan. 2006-2007. Research Scientist, Stanford University Center for Conservation Biology, Palo Alto, CA. Various meetings and e-mail correspondence with David Zippin.

Weiss, Stuart. 2007. Consultant, Creekside Center for Earth Observation, Menlo Park, CA. Meeting with David Zippin, January.



Graphics ... 05489.05 7-10

ICF INTERNATIONAL

Figure 1
Bay Checkerspot Butterfly (*Euphydryas editha bayensis*)
Distribution in California

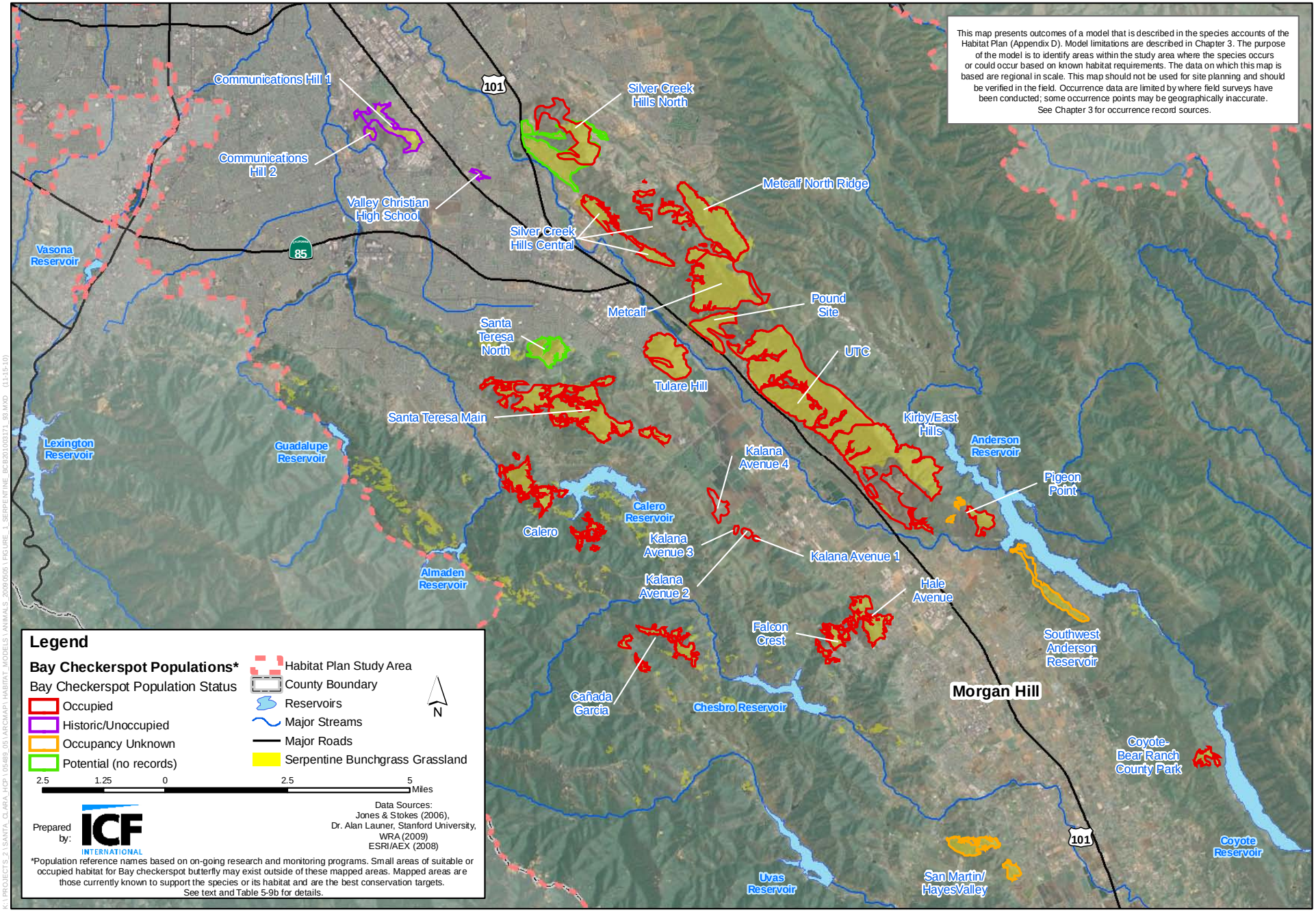
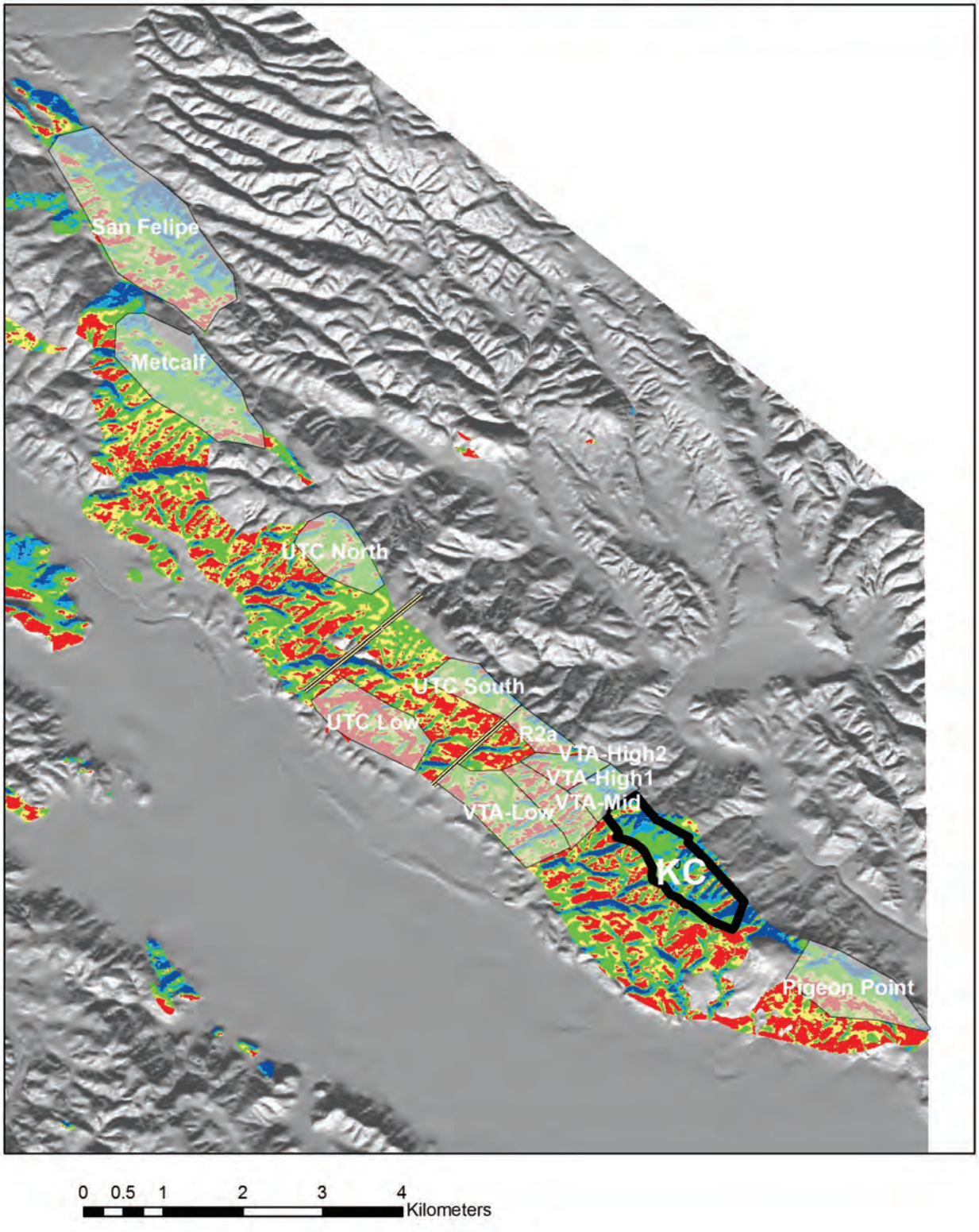


Figure 2

Santa Clara Valley Habitat Plan - Bay Checkerspot Butterfly Populations



Graphics ... 05489.05 (1-10) tm

ICF INTERNATIONAL

Figure 3
Coyote Ridge Population Zones

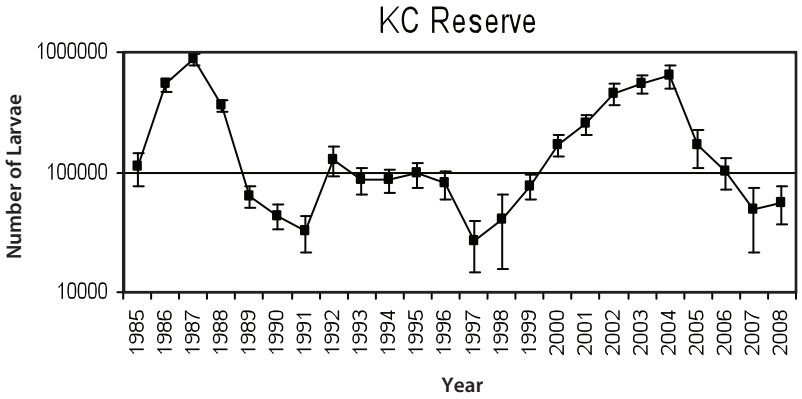


Figure 4a. Population Trends at Kirby Canyon Trust Butterfly Leasehold

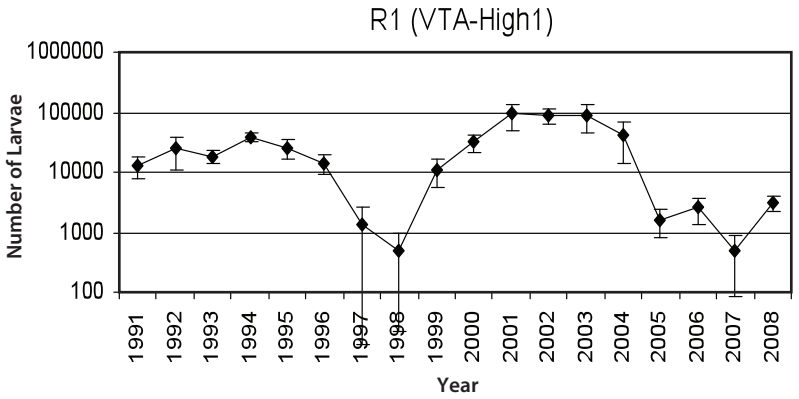


Figure 4b. Population Trends at VTA High 1

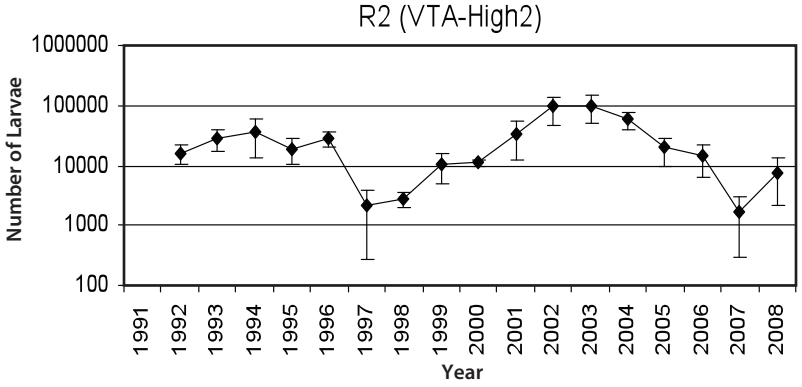


Figure 4c. Population Trends at VTA High 2

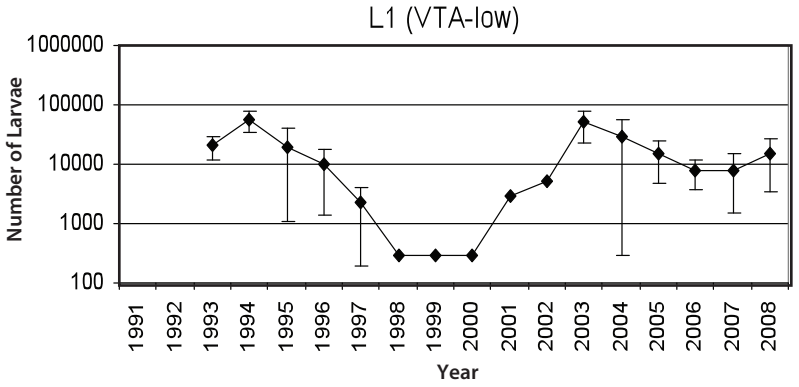


Figure 4d. Population Trends at VTA Low

Graphics ... 05489.05 (1-10) tm

ICF INTERNATIONAL

Figure 4
Population Trends

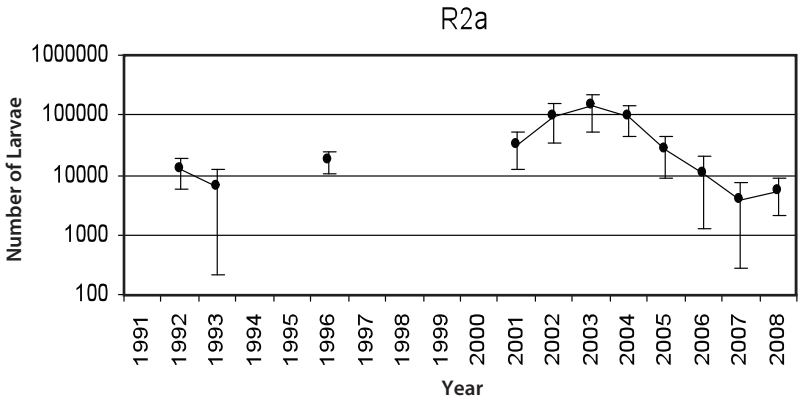


Figure 4e. Population Trends at R2a

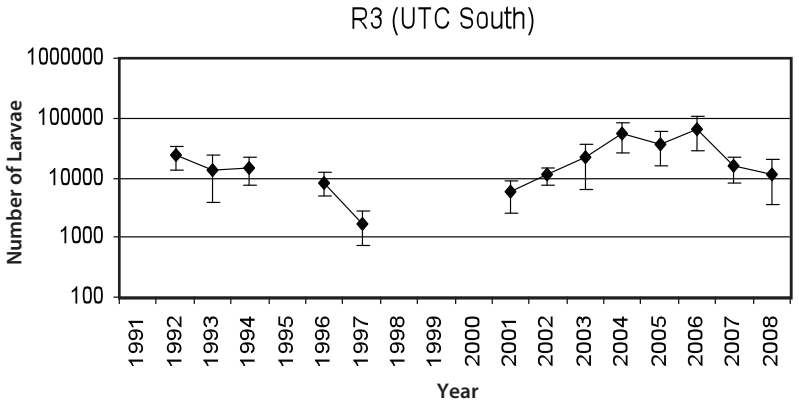


Figure 4f. Population Trends at UTC South

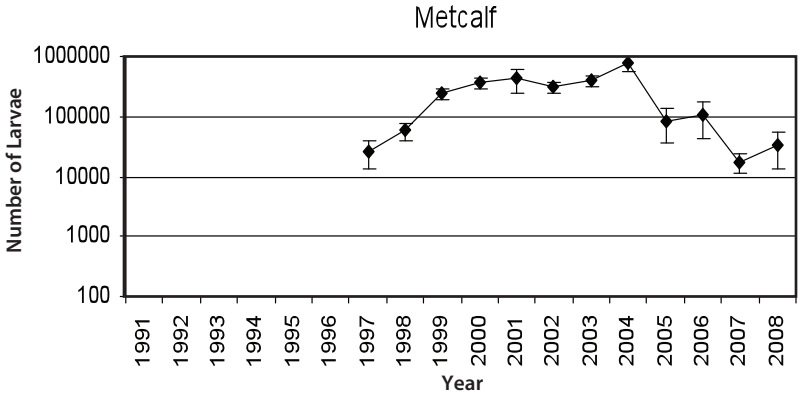


Figure 4g. Population Trends at Metcalf

ICF INTERNATIONAL

Figure 4 (continued)
Population Trends

13 Appendix D. Supplemental Information on the Special-Status (Vertebrate) Wildlife of Santa Teresa County Park

13.1 Methodology

EcoSystems West wildlife biologists reviewed CNDDB occurrence records of special-status wildlife species for the USGS 7.5 minute Santa Teresa Hills quadrangle (CNDDB 2011). In addition, we reviewed documents previously prepared for Santa Teresa County Park and for nearby projects that contained sensitive wildlife species lists and locations of species observations. We consulted the following sources for up-to-date agency status and federally designated critical habitat information: USFWS (2004, 2005a, 2006, 2008, 2010, 2011a, b, and c); the National Oceanic Atmospheric Administration (NOAA) documents (2005, 2006) for information on federally listed fish species; and CDFG for species listed by the state as 'Threatened' or 'Endangered' or as 'Species of Special Concern' (CFGC 2010 and CDFG 2011a, b). Additional species observation information was obtained from the Biogeographic Information and Observation System (BIOS) (CDFG 2011c), eBird database (2011), and the Santa Clara County Habitat Conservation Plan (HCP) (ICF International 2010), and interviews with Park staff to obtain distribution information for special-status species.

EcoSystems West reviewed species considered in the USFWS *Birds of Conservation Concern* (BCC) (USFWS 2008) and in the Draft Santa Clara County Habitat Plan (ICF International 2010). We also reviewed the preliminary and revised list of CDFG Mammal Species of Special Concern (Williams 1986; Bolster et al. 1998), as well as the list of species considered 'High Priority' by the Western Bat Working Group (WBWG) (1998). According to the CDFG Special Animals List, bat species designated as 'High Priority' by WBWG are defined as "imperiled or are at high risk of imperilment based on available information on distribution, status, ecology and known threats" (CDFG 2011a).

From these sources we developed a target list of special-status wildlife species and their habitat requirements to evaluate grazing considerations for SCTP (Table D-1). Grazing considerations were derived primarily from reviewing literature, database records, and a reconnaissance-level field visit to the Park.

An EcoSystems West wildlife biologist conducted a reconnaissance-level field visit survey of Santa Teresa County Park on 12 May 2010. The wildlife biologist targeted aquatic features and adjacent upland habitats to assess potential habitat for special-status wildlife. For aquatic features we noted the size, approximate depth, the presence of emergent, overhanging, or dominant vegetation, if the feature was perennial , ephemeral or intermittent; approximate stream gradient, substrate type, and any observations or evidence of special-status species that were present or have the potential to be present. We also noted observations of any predators (e.g. fish, bullfrogs, or raccoons) within the Park.

Upland habitats were evaluated by foot and from aerial maps of the park. In upland habitats, we evaluated the presence of small mammal burrows, cracks, or crevices on the ground and density of vegetation cover and tree canopy for potential subterranean habitat for amphibians and for ground-nesting birds. Stick nest structures, snags, trees with senescent limbs, cavities, hollows, peeling bark, dense riparian foliage, rock outcrops, abandoned structures, and bridges were also evaluated (where accessible) for potential nesting habitat for birds and roosting features for bats (Ralph et al. 1993; Brown et al. 1996).

13.2 Special-Status (Vertebrate) Wildlife Species

Twenty special-status vertebrate wildlife species occur at Santa Teresa County Park or in its vicinity. These species, along with their conservation status and habitat requirements, are identified in Table D-

1. Figure 7 of the main body of this GMP depicts the locations of potential habitat features or observations of special-status (vertebrate) wildlife species within the Park. Six species originally identified by the County of Santa Clara Department of Parks and Recreation (County Parks) are not included in this GMP. Each of those species, along with an explanation of why it is not included in this GMP, is described below.

The Cooper's hawk is not considered here because California Department of Fish and Game (CDFG) changed (reduced) their conservation status from Species of Special Concern to Watch List. Currently there are no documented nesting records for Cooper's hawk in the Park. If active nesting is documented in the Park, nesting Cooper's hawks (as well as nests, eggs, and young) are protected by the Migratory Bird Treaty Act and Fish and Game codes. Grazing regimes recommended for other special-status species (e.g. white tailed kite) will benefit the Cooper's hawk. This species is not identified in the Draft Santa Clara Valley Habitat Plan.

The black swift is not considered here. During 2010 reconnaissance field surveys of the Park, EcoSystems West did not identify any suitable potential nesting habitat. The waterfall feature at the Park does not provide suitable nesting habitat. Nesting sites for the black swift are considered under the California Environmental Quality Act (CEQA) whereas individual black swifts are not afforded protection under CEQA. Individuals of this species may occur as seasonal migrants. No grazing considerations are necessary for this species. This species is not included in the Draft Santa Clara Valley Habitat Plan.

The great blue heron is not considered here. Great blue heron rookeries are formally protected by the federal Migratory Bird Treaty Act. Rookery sites have not been documented within the Park. County Parks' records of observations of individual great blue herons (near Calero Reservoir) are not considered under CEQA. No grazing considerations are necessary for this species. This species is not included in the Draft Santa Clara Valley Habitat Plan.

The bank swallow is not considered here. Nest sites are considered by the state to be "Threatened". During 2010 reconnaissance field surveys of the Park, EcoSystems West did not identify any suitable potential nesting habitat. The waterfall feature in the Park does not provide suitable nesting habitat, nor do the banks of the riparian areas. This species may occur as a seasonal migrant. No grazing considerations are necessary for this species. This species is not included in the Draft Santa Clara Valley Habitat Plan.

The Berkeley kangaroo rat is not considered here. Currently this subspecies has no federal or state listing status [previously listed by CDFG as a Species of Concern (Williams 1986)]. Its distribution has been documented (most recently in 1940) between Calaveras Reservoir and Mt. Diablo - east of Berkeley. More research (DNA studies) needs to be conducted within the Bay Area to determine the extent of the range for the subspecies. Moderate grazing recommended for American badger and San Joaquin kit fox will benefit this species. This species is not included in the Draft Santa Clara Valley Habitat Plan.

The mountain lion is not considered here because it does not have any federal or state listing status under the federal Endangered Species Act, California Endangered Species Act, or with CDFG. Current CDFG codes protect individuals. Project activities that impede or obstruct wildlife movement are considered under CEQA. Recommended grazing regimes for special-status species that provide a mosaic of grazed and ungrazed areas will indirectly benefit the mountain lion. This species is not included in the Draft Santa Clara Valley Habitat Plan.

Table D-1. Special-Status Vertebrates in the Vicinity of Santa Teresa County Park, Santa Clara County, CA.

Common Name ***Scientific Name***	**Status** Federal/State/Other	**Habitat Requirements/Occurrence Records**
Fish		
Steelhead Central California Coast Distinct Population Segment (DPS) (*Oncorhynchus mykiss*)	FT/ -/AFS-TH	**General:**Found in perennial and intermittent creeks, streams and rivers. Occupy small, shaded pools of cool, low flow stream reaches that are unobstructed by barriers. Spawning sites have a clean gravel base with sufficient flow velocity. Winter habitat includes small tributaries, backwater areas, and other low-flow areas. **Park:** No records are known from within the Park. Steelhead have been observed by D. Rocha (Pers. Comm. 2011), downstream of the Park in nearby Alamitos Creek. Unconfirmed observations have been made by Park staff within Park. Recommend further surveys of Santa Teresa Creek.
Amphibians and Reptiles		
California tiger salamander (*Ambystoma californiense*)	FT/ST/CSC	**General:** Seasonal pools, stock ponds, vernal pools, detention basins, and ditches with nearby upland grasslands and/or open woodlands within Central California. CTS require upland underground refuge habitat (e.g. small mammal and /or California ground squirrel burrows). Adults migrate to and from breeding ponds during the rainy season (November-May), with greatest activity occurring December-February. A minimum of 10 weeks is required to complete metamorphosis from egg to juvenile, although 4-5 months is usually required. Metamorphosis usually occurs during late-spring to summer where juveniles disperse to find underground refuge sites to continue their development. **Park:** An unconfirmed observation of CTS has been reported near/in the seasonal pond off of the Hidden Springs Trail (D. Rocha, Pers. Comm. 2011). Recommend focused surveys to confirm presence.
California red-legged frog (*Rana draytonii*)	FT/-/CSC	**General:** Requires the presence of surface water until mid to late summer for reproduction; occupies ephemeral and/or perennial aquatic habitats with standing or slow moving flows. Upland habitat includes leaf litter and small mammal burrows and damp springs. Adults are known to travel up to 2 miles overland between aquatic sites. Breeding and peak movement patterns are associated with winter rain events (November-April). **Park:** No current California red-legged frog (CRLF) records occur in the Park. CRLF are known just outside of the Park near and at Calero Reservoir (CNDDB 2011). Recommend focused CRLF surveys of aquatic habitats in the Park.

Table D-1. (Continued)

Common Name ***Scientific Name***	**Status** Federal/State/Other	**Habitat Requirements/Occurrence Records**
Foothill yellow-legged frog (*Rana boylii*)	-/-/CSC	**General:** Found in perennial streams, creeks, and rivers. Can be found in intermittent watercourses provided a permanent water source is nearby. May temporarily occupy nearby ponds if drainage features dry. Breeds in open, low gradient, clear watercourses with mostly cobble-sized substrates with some gravel; may move up to 164 feet to upland areas to forage or seek refuge from winter flooding. Breeding season from March to June. Metamorphosis and dispersal occur between July and October. **Park:** No current foothill yellow-legged frog (FYLF) records occur in the Park. The nearest records are known from approximately 5 miles southeast in the Rancho Canada del Oro Open Space Preserve and from approximately 5 miles southwest near Guadalupe Reservoir. The Santa Teresa Creek watershed within the Park is included in the Draft Santa Clara County Habitat Plan as a restoration/enhancement site to provide potential habitat for FYLF.
Blainville's horned lizard [= Coast horned lizard] (*Phrynosoma blainvillii*)	-/-/CSC	**General:** Inhabits open areas of sandy loosely textured soils within chaparral, grasslands, low vegetation in valleys, foothills and semiarid mountains from sea level to 8,000 ft. in elevation (Jennings and Hayes 1994). Often found in lowlands along sandy washes with scattered shrubs and along dirt roads, and frequently found near anthills. Eats mainly ants, especially harvester ants, but also consumes other small invertebrates such as spiders, beetles, termites, flies, bees, and grasshoppers. Breed between April and June. Hatchlings emerge between August and September. Active during periods of warm weather, retreating underground and becoming inactive during extended periods of low temperatures or extreme heat. Overwinter from November through March. **Park:** No current Blainville's horned lizard (BLHL) records occur on Park lands. The nearest record is known from approximately 1.5 miles southeast near the Calero Reservoir Dam and further southeast in Henry Coe State Park.
Western pond turtle (*Actinemys marmorata*)	-/-/CSC	**General:** Highly aquatic. Found in ponds, marshes, rivers, streams, and ditches containing aquatic vegetation; usually seen sunning on logs, banks, or rocks. Moves up to 3-4 miles within a creek system, especially during "walk-abouts" before a female lays eggs (April-July); nests in burrows in upland areas up to several hundred feet away from aquatic habitat, in woodlands, grasslands, or open forest. Hatchlings emerge the following spring. Active in Santa Clara County year-round. **Park:** Western pond turtles (WPT) have been recorded utilizing the large pond feature bordering the neighboring golf course to the northeast and in the Santa Teresa Spring feature located in the northwest end of the Park (D. Rocha Pers. Comm. 2011). Recommend focused surveys of aquatic sites for WPT.

Table D-1. (Continued)

Common Name *Scientific Name*	Status Federal/State/Other	Habitat Requirements/Occurrence Records
Ground Nesting Raptors/Birds		
Northern harrier (*Cirus cyaneus*)	-/-/CSC	**General:** Nests on the ground in well-concealed undisturbed open grasslands with thatch used for nesting cover; forages in open moist grasslands, meadows, and in marshes. Nesting season is from April to July. Highly sensitive to human disturbance. **Park:** Observations of Northern harriers (NOHA) have been made in the Park (D. Rocha Pers. Comm. 2011). It is not known whether or not they currently nest in the Park.
Western burrowing owl (*Athene cunicularia*)	-/-/CSC; BCC	**General:** Found in open areas with low growing vegetation including annual and perennial grasslands, deserts, open scrub habitats, and agricultural fields with suitable burrows. Burrows of fossorial mammals (e.g. California ground squirrel [CAGS]) are an essential component of their nesting and wintering habitat, but they may also use artificial structures such as culverts, openings in asphalt pavement, woody debris/rock piles, and crevices in stacks of straw bales. Breeding typically occurs between February and August with a peak between March and May. **Park:** There are no known records of burrowing owls (BUOW) using the Park for breeding or wintering habitat. Nearby observations of BUOW occur southeast and northeast of the Park (CNDDB 2011; eBird 2011). Recommend future periodic focused surveys to see if BUOW utilize Park resources.
Grasshopper sparrow (nesting) (*Ammodramus savannarum*)	-/-/CSC	**General:** Distribution in California is sparse and irregular. Require dry, well drained, middle-height grasslands with patches of bare ground to forage in and scattered, taller shrubs to perch and sing from. The breeding season extends from mid March to August. Builds a cup-shaped nest on the ground domed with grasses and with a side entrance; nests are well concealed in depressions at the base of grass clumps with the rim approximately level to the ground. Rarely observed in pasturelands and annual grasslands dominated by star thistle. **Park:** Grasshopper sparrows (GRSP) have been observed during the winter off of the Mining Trail in the Park. No nesting records currently occur in the Park.
Above-Ground Nesting Raptors/Birds		
Golden eagle (nesting & wintering) (*Aquila chrysaetos*)	-/-/FP; BCC	**General:** Resident in open mountains, foothills, canyons, or plains. Nests in a mass of sticks on cliffs or in trees. Feeds mostly on lagomorphs and small rodents; also forages for reptiles, birds and carrion. Breeding season from January to August. **Park:** Observations of Golden eagles (GOEA) have been made in the Park (D. Rocha Pers. Comm. 2011). Possible nesting may occur near the east boundary of the Park (eBird 2011). Nearest known nest site is from Calero Reservoir to the south.

Table D-1. (Continued)

Common Name ***Scientific Name***	**Status** Federal/State/Other	**Habitat Requirements/Occurrence Records**
Bald eagle (nesting & wintering) *(Haliaeetus leucocephalus)*	Delisted/SE/FP; BCC	**General:** Nests in large old growth trees or in large prominent live trees with open branches. Forages over large waterbodies, lakes, bays, or free flowing rivers with abundant fish and adjacent snags or other perches. Roosts communally in winter. **Park:** Nearest observations of wintering bald eagles (BAEA) have been made over Calero Reservoir (eBird 2011). Park staff is investigating possible nesting of BAEA near Calero Reservoir. No nesting or wintering records occur from within the Park boundary.
White-tailed kite (*Elanus leucurus*)	-/-/FP	**General:** Nests in undisturbed areas in moderately tall trees and forages over open meadows, grasslands, and agricultural fields. Forages mostly on small rodents. Nest activity occurs between January through August (peak March – April). Sensitive to disturbance from human activity. **Park:** Observations of white-tailed kites (WTKI) have been made in the Park (D. Rocha, Pers. Comm. 2011). Possible nesting may occur in the vicinity of the Ohlone and Laurel Canyon Nature Trails (eBird 2011).
Loggerhead shrike (*Lanius ludovicianus*)	-/-/CSC; BCC	**General:** Rare breeding species in the Santa Clara Valley. Loggerhead shrikes occur primarily in shrubs adjacent to grasslands, wetlands and agricultural areas, where trees and shrubs are interspersed. Shrikes forage on insects, reptiles, and small birds and mammals. Prey are often impaled on thorns or barbed wire. Nests are usually built in trees and shrubs, however, structures such as telephone poles are also used. In Santa Clara County, loggerhead shrikes primarily nest in foothills and bayside marshes. Typically breeds between March and May. **Park:** No records of loggerhead shrikes (LOSH) have been observed in the Park (D. Rocha, Pers. Comm. 2011). The nearest nesting records are from Coyote Creek, northeast of Park.
Least bell's vireo (*Vireo belli pusillus*)	FE/SE/CSC; BCC	**General:** Rarely occurs (nests) in Santa Clara County. Nest sites occur in dense shrub layer 2-10 feet above the ground in dense riparian woodlands dominated by willow and cottonwood. Breeding season occurs from March to July; may stay at breeding grounds until October. **Park:** There are no documented records for Least Bell's vireos (LBVI) occurring in the Park. The nearest documented nesting record is from Llagas Creek near Gilroy and an undocumented nest record is from Coyote Creek, near Coyote Golf Course.
Tricolored blackbird (*Agelaius tricolor*) (nesting colony)	-/-/CSC; BCC	**General:** Colonial nesting species. Inhabits agricultural fields, pastures, ponds, sloughs, marshes, swamps, and estuaries. Nests in dense stands of tall emergent vegetation over fresh-water aquatic habitat often adjacent to open grasslands or fields to forage in. Breeding occurs from mid-April to mid-July. **Park:** Tricolored blackbirds (TRBL) have been observed in the Park (D. Rocha, Pers. Comm. 2011). It is not known whether or not they form nesting colonies within the Park. The nearest known record is from the vicinity of Calero Reservoir. Recommend conducting breeding/nesting surveys.

Table D-1. (Continued)

Common Name *Scientific Name*	Status Federal/State/Other	Habitat Requirements/Occurrence Records
Mammals		
Townsend's big-eared bat *(Corynorhinus townsendii)*	-/-/CSC; HP	**General:** Roost sites are highly associated w/ caves and mines; buildings must offer "cave-like" features; known to roost in tree hollows and under bridges. Form maternity roosts in early spring (April) to give birth and raise young until late summer (August). Maternity colonies disperse and find mates to breed with in the fall. Hibernate in mixed-sex aggregations of several hundred individuals from November to March. Forages on a variety of insects, primarily moths. Foraging activity takes place primarily along the edges of riparian vegetation. Highly sensitive to roost disturbance. **Park:** There are no known records of Townsend's big-eared bats (CORY) from the Park. The nearest observation of a CORY is from Almaden Quicksilver County Park. Recommend conducting a survey of the mines, and any closed structures located within the Park.
Pallid bat *(Antrozous pallidus)*	-/-/CSC; HP	**General:** In California, roost sites are primarily associated with oak woodland, redwood, ponderosa pine, and giant sequoia forests. Will also roost under bridges, in mines, buildings, and rock outcrops. Highly sensitive to roost disturbance. Maternity colonies form from May to August. Hibernacula form typically from November through February. Forage strategy includes flying low over or landing on the ground to feed on scorpions, crickets, grasshoppers, and spiders or glean insects from the foliage of shrubs or trees. **Park:** Potential roosting habitat for Pallid bats (ANPA) was identified in the Park Historic Area Site Plan [County of Santa Clara Parks and Recreation Department (County Parks) & Bellinger Foster Steinmetz Landscape Architecture 2009] among the historic buildings in the northwest end of the Park. Recommend conducting a survey of the mines and any closed structures located within the Park.
San Francisco dusky-footed woodrat *(Neotoma fuscipes annectens)*	-/-/CSC	**General:** Associated with riparian, oak woodland and redwood forest habitats. Builds stick nests in dense understory of native vegetation, under or in buildings, hollow trees, or in tree canopy. **Park:** San Francisco dusky-footed woodrats (NEAN) have been observed in the area of the Park Historic Area Site Plan (County Parks & Bellinger Foster Steinmetz Landscape Architecture 2009). Recommend conducting surveys of the riparian corridors and adjacent upland habitats to identify locations of NEAN colonies or assume presence.
American badger (*Taxidea taxus*)	-/-/CSC	**General:** Found in friable soils and open, uncultivated grasslands and meadows. Forages on burrowing rodents, insects, and ground nesting birds. Associated with grasslands colonized by California ground squirrels, pocket gophers and voles. Badgers mate in the summer and early fall and experience delayed embryonic implantation. Young are born the following spring (March-April). **Park:** There are currently no documented records of American badger in the Park. Undocumented observations from Calero Park (approximately 2.4 miles south) have been made by Park staff. Documented records of AMBA occur from approximately 1 mile northeast of the Park at Tulare Hill; approximately 6 miles northeast near Animas Creek; and 15 miles southeast of the Park, near Gilroy.

Table D-1. (Continued)

Common Name *Scientific Name*	Status Federal/State/Other	Habitat Requirements/Occurrence Records
San Joaquin kit fox *(Vulpes macrotis mutica)*	FE/ST/-	**General:** Grassland, open scrub, or woodland areas; Some agricultural and urbanized areas. Predominate food source are small mammals/rodents. California ground squirrels appear to be the dominant food source in the northern range of the species whereas kangaroo rats are e the dominant food source in the southern range. Core populations occur further south in San Luis Obispo and Kern counties. Current management emphasis is to maintain open space areas to provide connectivity between the northern and southern populations of SJKF. **Park:** A historical record (unverified) from 1975 documents SJKF approximately 4 miles northeast of the Park up Metcalf Road, near Metcalf Canyon. A 2002 record documented a SJKF observation approximately 30 miles south Park in the vicinity of Henry Coe State Park and Pacheco Pass in the southern end of Santa Clara County. The Draft Santa Clara Valley Habitat Plan emphasizes that management efforts should focus on linking open habitats within the vicinity of Pacheco and South Santa Clara Valley watersheds to develop connectivity opportunities between the southern and northern ranges of SJKF. The Park is well north of this recommended management area. Movement corridors from the southern region of Santa Clara County up to the Park are restricted by major highways and urbanization.

Notes:
Federal Status (CDFG 2011a, b)
FE = Endangered: Any species, which is endangered of becoming extinct throughout all, or a significant portion of its range.
FT = Threatened: Any species, which is threatened of becoming an endangered within the foreseeable future throughout all, or a significant portion of its range.
Delisted= Delisted from the federal Endangered Species List.
State Status (CDFG 2011a, b; CRNR 2010)
SE = Endangered: A native species or subspecies of animal which is in serious danger of becoming extinct throughout all, or a significant portion of its range, due to loss of habitat, change in habitat, over exploitation, predation, competition and/or disease.
ST = Threatened: A native species or subspecies that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of special protection and management efforts.

Other (CDFG 2011a; USFWS-BCC 2008b; Jelks et. al, 2008; WBWG 1998)
CSC = CDFG Species of Special Concern are taxa given special consideration because they are biologically rare, very restricted in distribution, declining throughout their range, or at a critical stage in their life cycle when residing in California or taxa that are closely associated with a habitat that is declining in California (e.g., wetlands)
FP = Fully Protected: This classification was the State's initial effort in the 1960's to identify and provide additional protection to those animals that were rare or faced possible extinction. Fully Protected species may not be taken or possessed at any time and no licenses or permits may be issued for their take except for collecting these species for necessary scientific research and relocation of the bird species for the protection of livestock.
AFS-TH= Fish species considered 'Threatened' by the American Fisheries Society under a set of criteria developed from peer review and expert scientific opinion.
BCC= Species of migratory nongame birds that USFWS considers to be of concern in the United States because of (1) documented or apparent population declines, (2) small or restricted populations, (3) dependence on restricted or vulnerable habitats.
HP = Considered "High Priority" on the Western Bat Working Group's (WBWG) Western Bat Species Regional Priority Matrix (1998)
** = Included on preliminary list of revised CDFG Mammal Species of Special Concern (Williams 1986)

14 APPENDIX E. Vegetated Buffer Width Guidance Adjacent to Waters and Riparian Woodlands for California Annual Grasslands

Poorly managed grazing operations can cause water pollution and damage to riparian vegetation. Appropriate grazing management strategies, including the establishment and maintenance of vegetated buffers adjacent to waters and riparian woodlands, can reduce the transport of livestock-generated pathogens, nutrients, and sediments into streams and wetlands.

The existing scientific literature is not comprehensive for all types of terrain, water pollution, or impacts to riparian areas; therefore, unverified measures must often be used. Such gaps in guidance indicate that additional research on these topics would be very useful. A review of the scientific literature, coupled with information from a UC Cooperative Extension workshop and interviews of specialists is summarized below.

A vegetated buffer is defined here as natural California annual grassland that is left unused and undeveloped, and has, for at least several years, not been grazed by livestock (except for short periods of time, if allowed), tilled, excavated, fertilized, planted, developed with any buildings or structures, used for storage of materials or manure, or in any way used for recreation, agriculture, or other purposes that would have altered it from the natural characteristics of typical annual grassland of the region. A vegetated buffer is designed to collect and remove pollutants that might otherwise move by overland flow to a water body on the downhill side of the buffer, and thus reduce water quality. Waters and riparian areas include streams with year-round flow and woody riparian vegetation, intermittent streams with riparian woody vegetation, ponds with riparian woody vegetation, other wetlands with riparian vegetation, channelized streams and canals, and un-vegetated channels. The width of the vegetated buffer is measured from the edge of the high-water mark or from the edge of the riparian vegetation, whichever is greater, to the uphill edge of the unused and undeveloped California annual grassland vegetation.

The basic guidance for the width of the vegetated buffer is no less than 45 or 50 feet (Castelle, Johnson, and Conolly 1994). Sites on relatively flat ground adjacent to crop lands or un-vegetated channels may have comparatively narrower buffers (30 feet) (E. R. Atwill, pers. comm. 2011).

Vegetated buffers can be effective in protecting water quality on California annual grasslands that are grazed by livestock when:

b. Buffers are located adjacent to slopes of less than or equal to 20% (Tate, Pereira, and Atwill 2004); although some guidance from the U.S.D.A. Natural Resources Conservation Service [Conservation Practice for Filter Strips (Code 393)] limits slopes to 5%;
c. Precipitation intensity (not necessarily quantity) in the area has remained less than or equal to normal (Atwill 2010);
d. Buffers are maintained with at least 800 pounds per acre Residual Dry Matter in the late autumn (Tate 2010);
e. Buffers are not grazed, which is especially important where the affected water may be used as a human domestic drinking source; or if grazed, no calves are present, the grazing is short-duration, and no grazing occurs during the wet seasons (Tate 2010).

The existing scientific literature and specialist opinion does not address precise modifications to grazing management in the following situations (O'Geen 2010):

a. Herbaceous vegetation cover of the buffer is less than 95%;
b. Stream beds and banks show a high degree of vulnerability to erosion;
c. Soils in the adjacent grazed areas are highly erodible;
d. There is a high degree of overland flow due to soil compaction, presence of a claypan, or because the ground water is elevated to the surface during the wet seasons, in excess of runoff associated directly with precipitation events;
e. There is a high degree of leaching of water pollutants through the soil column, such as with porous soils.

In these circumstances, the prescribed buffer should be increased in width, monitored to determine whether any significant impacts occur, subject to adaptation to ensure impacts are reduced to less than significant levels, and tested through scientific research (O'Geen 2010).

Other potential management measures to reduce water pollution and damage to riparian woodlands (Atwill 2010, Tate 2010, O'Geen 2010, Ford, personal observation) include:

a. Remove or rotate the livestock to uplands during precipitation events and during wet seasons, when soils are wet, and vulnerable soils will be compacted or eroded;
b. Graze livestock only during the spring;
c. Use attractants (watering facilities, mineral licks, or molasses licks) or herding to increase livestock distribution and increase the time spent in the uplands and away from the lowlands, waters, and riparian woodlands, while avoiding arrangements of those attractants that create livestock trails or movement zones that are hydrologically connected to streams or riparian areas or other wetlands or waters;
d. Use supplemental feed to reduce livestock preference or selection of riparian browse during seasons when the herbaceous forage is less preferred (mostly autumn);
e. Where drainage features are constructed, or will be constructed or re-constructed, use designs with channelized ditches with check-dams instead of grassed waterways.

15 APPENDIX F. Natural Resource Conservation Service Fence Specifications

Natural Resources Conservation Service, California, Conservation Practice Specification #382A – Fence (July 2000) – first 4 of 8 pages

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE SPECIFICATION

382A - FENCE

I. SCOPE

The work shall consist of furnishing materials and installing either barbed, smooth, or woven wire, or combinations thereof at the location as shown on the drawings or as staked in the field.

II. TYPES OF FENCES

A. 4 wire barbed and/or smooth--min. height 42 inches. (Figure 1)

B. 3 wire barbed and/or smooth-min. height 40 inches. (Figure 2)

C. Woven wire and barbed wire--min. height 40 inches. (Figure 3)

D. 4 wire barbed and/or smooth--min. height 42 inches. Bottom wire a minimum of 15 inches above ground.

III. MATERIALS

The materials used must be constructed to equal or exceed, in strength and durability in accordance with the following specifications:

A. Wire

Barbed wire, woven wire and wire netting fencing shall conform to the requirements of Federal Specification RR-F-221f, and further specified:

Type I - Barbed wire, style 2 - zinc coated. Barbed wire shall be 13 gage or wire of greater diameter (lesser gage), or 15 1/2 gage high tensile double strand. The minimum breaking strength for single 13 gage wire is 590 lbs, and for double 15 1/2 gage wire is 850 lbs, the wire shall have barbs at a spacing of 4-inch interval. The zinc-coating shall be at least 0.50 ounces per square foot of wire surface.

Type II - woven wire, style 4 - Farm fence. Woven wire shall be a minimum of 26 - inch high with 14 1/2 gage with stay wires spaced at an interval of 12 - inches or less. All woven wire shall be of new galvanized material, with a zinc-coating of 0.40 ounces per square feet of wire surface.

Woven wire fences shall be topped by at least two lines of double strand barbed wires.

When splicing is necessary, the "Western Union" splice shall be used (Figure 6). The splice is made by overlapping the ends of each wire and wrapping each wire five times around the other wire. The use of a fence splicing tool will facilitate this operation and result in a neat job. (Figure 6). High compression splices (Figure 6) should be used when High tensile wire is used.

B. Staples

Staples shall be of nine gauge polished (bright) hard wire and should be 1 1/2 inches long for soft woods and 1 1/4 inches long for hardwood posts. The staples shall be driven diagonally with the wood grain to avoid splitting. Space should be left between the staple and the linepost to permit movement of the wire. Tie wires of galvanized 12 gauge may be substituted for staples.

C. Posts

Line Posts

Wood Type. Untreated posts from such species as juniper, cedar, oak, osage orange, black locust, and redwood or pine posts treated with a creosote coal-tar solution, or pentachloropherol, with not less than six pounds retention per cubic foot, in accordance with Federal Specification TT-W-571c, are acceptable.

Steel. Standard "Tee" or "U" section steel posts weighing not less than 1.29 pounds per foot of length, exclusive of anchor plate, may be used in lieu of wood line posts. Length shall be the same as for wooden posts.

Steel posts shall be rolled from high carbon steel and shall have a protective coating. The coating may be either galvanizing by the hot dip process or painting in accordance with Commercial Standard 184 with one of more coats of high graded, weather resistant steel paint or enamel applied and baked. Steel posts shall be

382A-2

studded, embossed or punched for the attachment of wire to the posts. Wire shall be attached to the posts by wrapping with 16 gauge galvanized wire or by use of manufacturer's specially designed clips.

Size. Post length must be at least 5 feet 6 inches to construct a 42-inch high fence and be set solidly in the ground a minimum depth of two feet in deep soils or 18 inches in rocky shallow soil. Ninety-five percent of top diameters of wooden posts (two inches minimum above the top wire) must be three inches or larger. In shallow or rocky soil where penetration cannot be obtained with ordinary hand tools, straddlejacks may be used.

Spacing. On 4 wire and woven wire standard fences, maximum post interval shall not exceed 20 feet if no stays are used between post, or 30 feet if stays are used between posts at intervals not greater than 10 feet.

On 3 wire standard fences, maximum interval between posts shall not exceed 16 1/2 feet with or without stays.

D. Corner, Gate and Brace Posts
(Figure 4,5,7)

Brace Posts

Wood. Same species as for line posts.

Size. Length shall be 6 feet 6 inches minimum to provide for the construction of at least a 42-inch high fence and permit setting at least 36 inches in the ground, top diameter commercial size six inches or larger.

Steel. Steel corner or brace posts with a three-inch new (or equivalent weight of 7.58 pounds per linear foot) pipe or larger, with brace member welded to the posts. Posts to be set in concrete. (Figure 7)

If soil conditions prevent proper brace or line post installations, trees may be used.

Rock cribs may be used in shallow rocky areas. (refer to BLM 2400--Range)

Bracing. Required at all corners, gates and at all definite angles in the line fence. In straight sections brace units (pull posts) shall be spaced at intervals not to exceed 1,320 feet. Horizontal braces can be a six-inch diameter top line post of the above species with minimum length of 6.0 feet notched into the top one-half of the brace post and post being braced, or two inch new or used pipe or angle iron (2" x 2" x 1/4") installed not less than three feet above ground line and no higher than the top wire. A tension member composed of two complete loops of number 12 1/2 gauge double strand barbed or smooth wire, shall extend from a point approximately six inches below the top of the brace post to ground level of the post being braced. The brace wire shall be twisted to secure the brace and provide needed rigidity. (Figure 4).

A diagonal fence strainer is equal in strength and holding force to a horizontal strainer (fig.1). On a high-tensile, smooth-wire fence, one or two diagonal strainer(s) can be used for a corner in place of two horizontal braces (fig. 2). In the design and installation of a diagonal brace or strainer, several principles should be kept in mind. (Figure 5).

1. Make the diagonal (horizontal as well) brace as long as possible.

2. Be sure that the end of the diagonal brace in contact with the ground is free to move forward and is not blocked by a stack or post.

3. The diagonal brace can bear against the corner post in any location from the middle of the post to the top. However, probably the best place to have the diagonal brave contact the corner post is at the top.

4. When installing a diagonal strainer, the corner post should be set first, then the diagonal brace installed, then the bottom holding wire brace installed, and then the wires attached and tensioned. If this procedure is followed, the lower wire brace will not have to be twisted to tighten.

5. The diameter of the corner post should be as large as possible.

6. If one diagonal strainer will not hold the fence tension, a second diagonal strainer should be installed with each strainer taking half the tension of the fence (fig.3).

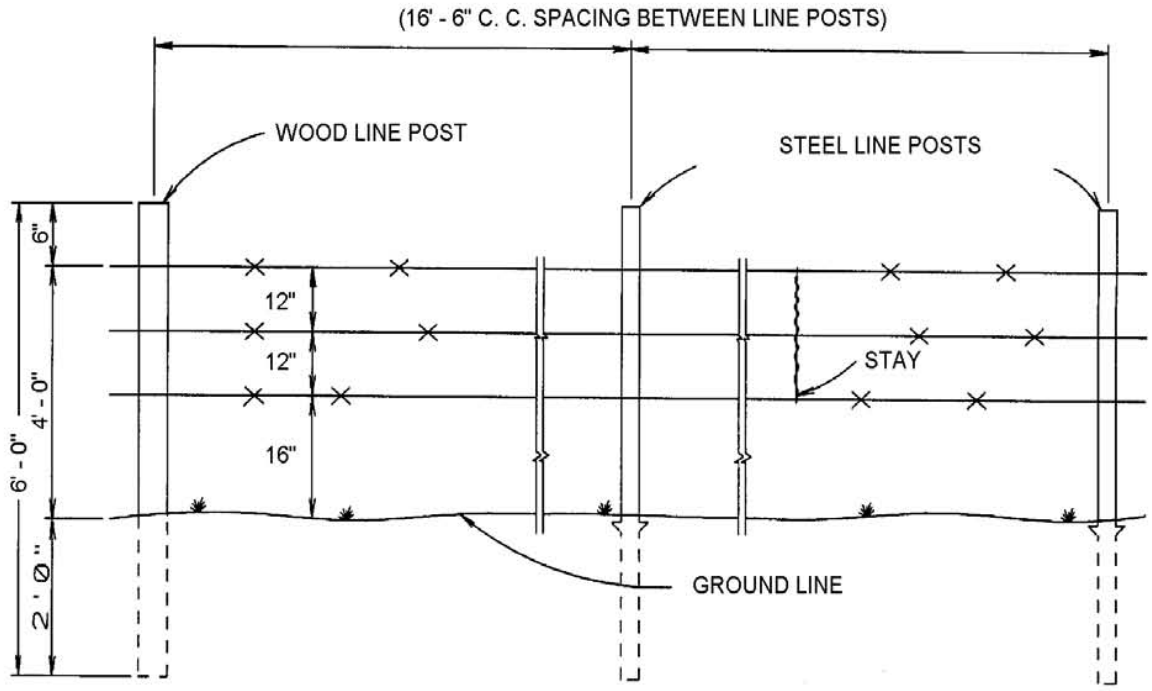
7 When using the diagonal strainer as a line brace, care must be exercised not to over-tension the brace wires. The vertical post can be jacked out of the ground.

IV. INSTALLATION

The installation of the fence shall conform to the figures and to the drawings. All posts shall be placed to the required depth and shall be firmly embedded so

NRCS, CA
July 2000

382A-4



STANDARD 3 WIRE FENCE
FIGURE 2.

NRCS, CA
July 2000

16 APPENDIX G. Wildlife Friendly Fencing Recommendations

All existing and new livestock fencing for perimeters, internal cross-fence, and exclosures for the Santa Teresa County Park grazing management program and for the Park's border, must be built and maintained in good working condition to contain the grazing livestock, prevent passage by trespassing livestock, limit unauthorized vehicle access, and allow authorized access for management activities. Recommended fencing locations at the Park are designed to achieve the combined conservation, recreation, and cattle management goals. Perimeter fencing and any associated access points at the Park must be built and maintained to meet the legal requirements of California Livestock Law[49], thus reducing risks of liability claims against the County for negligence in the event of livestock escape and resulting accidents or other damages.

The local community surrounding the Park is concerned about Wildlife Friendly Fencing (WFF); although there are no known records of wildlife injuries as a result of fencing at the Park or in the vicinity. The fencing specifications described and recommended in the main document of this GMP (Section 5.8.1) meet the CDFG (2003) guidance for WFF (described in more detail below). In general, the recommended specifications allow adult deer to easily jump over the top strand and allow fawns, skunks, raccoons, and coyotes to crawl under the bottom strand. While the recommended livestock fencing standards do not meet all WFF specifications (see Paige 2008, described in more detail below), they are necessary to keep livestock within the Park boundaries and meet California state law.

If additional WFF elements are desired, County Parks can consult and contract a qualified fencing contractor (possibly the Livestock Operator) with experience in building fences for conservation, recreation, and livestock management purposes for fence installations, modifications, and/or repairs. As described below, most WFF guidelines are from out of state and there are a wide range of recommendations among these various sources. Recommendations from most sources do not meet the California Food and Agriculture Code of a lawful fence (See footnote on Legal Fencing below). The Park must meet the standards of this Code; therefore WFF elements can be incorporated where appropriate and legal. County Parks could plan to change from conventional to WFF fencing, as feasible, giving highest priority to areas where the most fence-related wildlife injuries occur.

16.1 Fencing Guidelines

---

[49] A lawful fence as designated by the California Livestock Law, California Food and Agriculture Code (http://asci.uvm.edu/equine/law/fence/ca_fnc.htm) is as follows:

> "***17121. 'Lawful fence'; Wire fence; Good and substantial fence; Cattle guards***
> A lawful fence is any fence which is good, strong, substantial, and sufficient to prevent the ingress and egress of livestock. No wire fence is a good and substantial fence within the meaning of this article unless it has three tightly stretched barbed wires securely fastened to posts of reasonable strength, firmly set in the ground not more than one rod [16.5 feet] apart, one of which wires shall be at least four feet above the surface of the ground. Any kind of wire or other fence of height, strength and capacity equal to or greater than the wire fence herein described is a good and substantial fence within the meaning of this article. The term 'lawful fence' includes cattle guards of such width, depth, rail spacing, and construction as will effectively turn livestock."

The lawful fence standard must be met in order to comply with the following section of the same code:

> "*16902. Permitting livestock on highway*
> A person that owns or controls the possession of any livestock shall not willfully or negligently permit any of the livestock to stray upon, or remain unaccompanied by a person in charge or control of the livestock upon, a public highway, if both sides of the highway are adjoined by property which is separated from the highway by a fence, wall, hedge, sidewalk, curb, lawn, or building."

The California Department of Fish and Game (CDFG) provides the primary wildlife friendly fencing (WFF) document for California: the *Draft Wildlife Friendly Fencing Guidelines* (CDFG 2003). The author of this guidance concludes that the best way to allow free and safe movement of wildlife is to avoid fencing altogether; however, if fencing is required, they suggested the following guidelines for most livestock operations:

- Simple wire strung along posts
- Barbed or smooth wires
- Smooth bottom wire is preferred
- Wires should be taught
- 1 to 6 wires
- 4 to 6 feet high maximum (adult deer can typically jump 6 feet)
- 12" to 18" between bottom wire and ground (allows skunks, raccoons, fawns, and coyotes to move underneath bottom wire)
- 10" minimum between wires

CDFG suggested the following type of fence for cow-calf or lambing operations. Because this type of fence can cause wildlife mortalities, it is preferable to use it as interior fencing as opposed to perimeter fencing.

- Graduated field fence (woven or welded wire) to ground level
- Barbed top wires
- Wires should be taught
- 1 barbed wire 18 inches above ground
- 4 to 6 feet high maximum (adult deer can typically jump 6 feet)
- 10" between top wires

CDFG (2003) also recommended that fencing not cross creeks. Instead, fencing should parallel creeks. A minimum of 30-foot buffer (see also Appendix E) should be maintained between livestock grazing and the creek. This should reduce pollution and allow a wide wildlife corridor with free access to creeks.

Most guidelines related to wildlife-friendly fencing (WFF) have come from states other than California, such as Wyoming (Wyoming Game and Fish Department 2004, Jackson Hole Wildlife Foundation, undated), Montana (Paige 2008), and Colorado (Habitat Partnership Program, undated).

One of the WFF guidelines from Montana, *A Landowner's Guide to Wildlife Friendly Fences* (Paige 2008), indicates that an ideal wildlife-friendly fence would easily be seen by ungulates and birds. To accomplish this recommendation, use a PVC cover or high-visibility wire on the top wire or use durable markers on the top 3 wires. In addition, this guidance gives fencing specifications (per WFF guidelines by Montana Fish Wildlife and Parks) such that wildlife can pass over or under the fence easily:

- Smooth top and bottom wire
- 4 wires
- 42" maximum height for top wire
- 12" minimum between top two wires
- 18" minimum between bottom wire and the ground

- No vertical wires
- 16.5 feet between posts
- Gates, drop-down wires, or top rails for easy movement where large numbers of wildlife pass through

Additional considerations from Paige (2008) are:

- If possible, allow wildlife clear access to (i.e., do not fence) streams, water sources, and movement corridors.
- If livestock use is seasonal, install fencing that can be laid down to ground level when livestock are not present.
- If possible, install fencing on flat ground. A deer will have to jump 42 inches to cross a 42-inch fence on flat ground. A deer will have to jump 62 inches to cross the same 42-inch fence if it is on a 30% slope.

16.2 Designing Fencing to Accommodate Local Wildlife Species

When designing WFF, it is important to determine which wildlife species in the area could be negatively affected, depending on the type of fence you plan to construct. If conflicts between the recommended fencing and a particular species are observed at the Park, then WFF recommendations should be made for that species. Some species of concern might be deer, bats, waterfowl, owls, skunks, or raccoons. Each species is affected in different ways and might need different specifications to make a fence more wildlife-friendly. For example, Bat Conservation International noted that bats and some birds will drink from water troughs while in flight (Taylor and Tuttle 2007). Anything which obstructs their flight path, including fencing, can potentially be fatal. Fencing should not be installed across or near water sources such as troughs, creeks, or other wet areas. Water troughs that are designed to be accessible from two pastures, with fencing across the middle of the trough, are particularly problematic. It is important to identify the wildlife species most likely to be affected by the installation of new fencing at Santa Teresa County Park, and design fencing specifications accordingly.

16.3 Wildlife Mortalities Associated with Fencing

Harrington and Conover (2006) discuss the effects of fencing on wildlife in Colorado and Utah. They observed fence-caused mortalities of mule deer, pronghorn, and elk from roadsides. The average annual mortalities/km of wire fence was 0.08 for mule deer, 0.11 for pronghorn, and 0.06 for elk. Mortality rates were highest during August when fawns were weaning, and were highest among juveniles compared to adults. Mortalities were greater from woven wire fences topped with one or two strands of barbed wire compared to four-strand barbed wire fences. Over 70% of observed mortalities were on fences taller than 3.3 feet. This study suggested the best way to make fencing more wildlife-friendly to ungulates is to use barbed or smooth wire instead of woven wire. The authors recommended that priority areas for fence modifications are areas where the most fence-related mortalities occur, e.g. areas with high numbers of ungulates, especially juveniles; sites near water sources; or specific fence segments that are regularly crossed by ungulates.

17 APPENDIX H. Stock Water Analysis of Santa Teresa County Park

WETLANDS • ENVIRONMENTAL HYDROLOGY
WATERSHED MANAGEMENT • CHANNEL DYNAMICS

January 18, 2011

Lawrence D. Ford, Ph.D.
5984 Plateau Drive
Felton, California 95018

RE: Santa Teresa County Park Stock Water Analysis

Dear Larry:

The following represents the tentative conclusions available based on the hours allotted to perform this assessment. The assessment is based on a field reconnaissance of the various springs and ponds of interest, followed by an analysis to estimate:

1. If the ponds reliably fill to capacity during normal and wetter years.

2. A rough estimate of the number of days required for each pond to dry to 10% of its available capacity assuming various starting dates for seasonal drying (the date at which the evaporate rate exceeds the inflow rate), along with an assumed stocking rate and cattle water consumption rate and an assumed seepage loss rate.

3. The number of cattle which could be supported by each spring, using an assumed cattle water consumption rate.

4. Recommendations for steps needed to plan for repairing the three priority stock ponds.

Because a number of the variables are unknown, I am providing a spreadsheet that will allow you to use different assumptions for stocking rates, water consumption rates, pond seepage loss rates, and spring discharge rates so you can see how various assumptions will affect the number of cattle capable of being supported at each water source.

Unfortunately, this analysis can only be considered a first approximation because of the following unknowns:

1. Pond seepage loss rates.

419 Mason Street, Suite 200A • Vacaville CA 95688 • (707) 455-7642 • Fax (707) 455-7079 • thhydroscience@cs.com

2. The date at which the streams feeding the ponds stop flowing, during a range of conditions, from drought to wet years.

3. The fluctuation in spring discharge rates, both during the year and as they will vary under dry to wet year conditions.

While it is possible to measure seepage rates in the ponds through the use of infiltrometers, there is no reliable way to determine the date that the streams dry during a range of dry to wet years except through observation. Likewise, spring discharge rates made during August 31 are only a snapshot made during the driest part of the year, but made during a wet year with a particularly wet spring. Recommendations for some minor monitoring which will improve the accuracy of the estimates provided here are made at the conclusion of this correspondence. In the interim, the attached spreadsheet provides an ability to see how stocking rates might change based on other assumed values.

Stock Pond Analysis

An analysis was performed to determine if, based on average water yield estimates, the stock ponds would fill to capacity. If so, then several scenarios were evaluated to determine how many days it would take the pond to dry down to 10 percent of its total capacity, based on an assumed number of cattle and an assumed water consumption rate. The pond volume was computed based on a measured surface area provided by Dan Clark of Santa Clara County Parks. I used an ocular estimate of the depth at maximum capacity, without any gain in pond volume which might be gained through sediment removal. To account for sploping soling sides and bottom, I applied a correction factor of 0.7. As a result, the pond estimate volumes are crude and considerably more precise estimates of their volume, such as through a ground survey, would provide a much more accurate estimate of the number of cattle which could be supported.

The water yield analysis was performed by computing the mean water yield, in area-inches of several gauged basins in the vicinity as shown in Table 1.

Table 1. Mean Water Yield of Nearby Gauged Basins.

Basin Name	Drainage Area (sq. miles)	Mean Yield (area-inches)
Bodfish Creek Near Gilroy	7.4	7.01
Alamitos Creek Near New Almaden	31.9	7.00
Llagas Creek Above Chesbro Reservoir	9.63	6.69

Source: U.S. Geological Survey web site

419 Mason Street, Suite 200A • Vacaville CA 95688 • (707) 455-7642 • Fax (707) 455-7079 • thhydroscience@cs.com

Although the mean yield of these basins are in close agreement, it is known that there are strong orographic influences in the area wherein precipitation is correlated with elevation and distance from the upwind ridge crest. A second estimate was used based on a relationship derived by the author between mean basin precipitation and water yield at a number of gauged basins in Alameda and Santa Clara counties. Although the precipitation within Santa Teresa Park is unknown, the 30-year average precipitation at Morgan Hill is 19.27 inches, and the 56-year mean at Los Gatos is 24.78 inches (NOAA database). Based on these figures, the mean annual precipitation within the park is probably 20-22 inches. Using the rainfall-water yield relationship, the estimated water yield is approximately 3.5 area-inches (the depth of water if the total runoff were uniformly spread over the entire surface of the watershed). The relatively large discrepancy between the estimates is probably associated with the above watersheds extending into higher elevation areas that receive much higher rainfall than does Santa Teresa Park. In order to be conservative, I used a water yield of 3.0 area inches in the analysis.

The above analysis is based on the long-term mean streamflow from gauged basins. Basin geology and soils do influence watershed response, but more from the standpoint of the shape of storm hydrographs and less from the perspective of water yield. In general, the water yield from basins is not highly sensitive to basin soil and geology except when it affects evapotranspiration as might occur where, for example, a large portion of the basin is bare rock, or most of the basin has highly permeable, coarse and deep soils which would constrain normal levels of vegetative cover. Overall, most of the soils within the park are relatively shallow over lithic (bedrock) contacts, which suggests that the selected water yield of 3.0 area inches is probably conservatively low.

Table 2 below summarized the results of the water yield analysis for the three stock ponds analyzed. A very small stockpond on the hillside in Big Oak Canyon was not analyzed since it is supported by spring flow.

Table 2. Stock Pond Analysis.

Pond Name	Watershed (acres)	Water Yield (acre-feet)	Pond Volume (acre feet)	Ratio: Yield to Storage
Hidden Spring	22	5.5	0.92	6.0
Mine Field	39	9.8	0.71	13.7
Big Oak Valley	116	29.0	0.29 *	98.3

* assuming repair of outlet to yield an average maximum depth of 5 feet.

The results indicate that all of the stockponds will reliably fill during normal and wet years and possibly even in moderately dry years. Table 3 gives an example from the spreadsheet of how many days past the assumed inflow cessation date of April 1 would it take to drawn down the capacity of the pond by 90 percent.

419 Mason Street, Suite 200A • Vacaville CA 95688 • (707) 455-7642 • Fax (707) 455-7079 • thhydroscience@cs.com

SW-03 at the time of the inspection on April 14, 2010 was actually two features. The northern portion is a distinct pool. The southern portion is located principally on a compacted native-surface roadway that is slightly depressional. The northern pool spills into the roadway depression. During wet conditions it appears that these two features could coalesce into a single pool, although the northern segment is distinctly higher than the roadway depression.

Table 3. Number of Days to Utilize 90 percent of Storage Capacity by 60 Cattle Past Assumed Inflow Cessation Date of April 1.

Pond Name	Days
Hidden Spring	113
Mine Field	101
Big Oak Valley	59

Assumptions: Individual Water Consumption rate is 15 gal/day
Evaporation rate based on June average for Gilroy of 5.55 inches/month
Pond Seepage Loss Rate is 2 inches/month

Based on Table 3, the Hidden Springs pond would be able to support 60 cattle until July 22 during an average year. The supplied spreadsheet provides several other scenarios, and the variables in the spreadsheet are in blue for easy identification of those parameters which can be modified. It should be noted that although evaporation has been accounted for in the analysis. Somewhat higher water usage might be expected because of water use by other wildlife, for example, feral pigs, and because riparian vegetation around the perimeter of the pond could also draw on pond storage to support transpiration (in effect the net pond water surface is larger than measured).

Stock Pond Condition

All of the stockponds appear to have been built without any formal hydrologic, hydraulic, or structural design. The dams are all composed of earth, most likely obtained through excavation immediately upslope. Given their age, there has been some loss of storage volume associated with sediment accumulation, however, this appeared to be a relatively minor problem and I would expect that only 10-20 percent of the original volume of the ponds has been lost to sediment accumulation.

All of the ponds need to be equipped with an adequate spillway which is capable of passing a design flow through it without erosion. Since these are modest investments, I suggest that the spillway be sized to pass a 50-year flood, but in no case should be sized to pass less than a 25-year event.

None of the ponds meet the criterion as jurisdictional with respect to the California Division of Safety of Dams (http://damsafety.water.ca.gov) and no conceivable modifications/repairs would bring them under jurisdiction.

419 Mason Street, Suite 200A • Vacaville CA 95688 • (707) 455-7642 • Fax (707) 455-7079 • thhydroscience@cs.com

The Hidden Spring stockpond is immediately adjacent to a native surface road and the outlet/spillway is at the edge of the road fill. This pond has the smallest water yield:storage ratio such that the small watershed has not generated a peak flow of sufficient magnitude to erode the outlet. It appears that up to three feet of sediment accumulation may have occurred here, although it may be considerably less. There is some opportunity to significantly expand the capacity of the pond by excavating out a portion of low-sloped ground which protrudes into the pond footprint.

The outlet of the Big Oak pond has eroded down through the dam and this process appears to be actively continuing. The spillway would need to be repaired if this feature is needed for stock watering.

The mine field pond is still functional in that it appears that a portion of the dam remains completely intact. However, the situation for overflows is confused and needs further investigation. Currently, it appears that overflows spill over the dam crest and then quickly converge and are currently actively eroding a channel through the downstream toe of the dam.

Recommendations for repairing the ponds are provided at the conclusion of the report.

Spring Analysis

There are several springs which have been identified for possible re-construction to support cattle. These include the Bernal Hill Spring, Laurel Spring, and a complex of small springs at the Rosetto site.

The Rosetto complex, which is located in a small draw above the abandoned resort appears, in my opinion, to have yields which are too small to be viable compared to alternative sources of supply at that location. At the time of inspection in the afternoon of August 31, 2010 the streamflow in Santa Teresa Creek at an abandoned diversion dam a short distance upstream of the abandoned resort was flowing at an estimated rate of 0.05 cfs. The stream itself could be utilized as a water source. Alternately, an abandoned well located a short distance from the stream at the resort could be used as a water source since there is electric power supplied to a nearby residence.

Dan Clark, the Santa Clara County Park Ranger made flow measurements of the Bernal Hill and Laurel Springs on September 2, 2010. The flow observations below are only a snapshot and flow rates will vary both during the year and between years, in response to wetter or drier conditions. Dan Clark noted that both the Bernal Hill and Laurel springs were discharging late in the summer of 2008, which was the second of three consecutive dry years (2007-09). This is certainly a positive indication of the reliability of these springs. Both springs are located off nearby drainage bottoms. This indicates that their flow is likely less seasonally variable. Although this previous rainy season was wetter-than-normal, the fact that the flow observations were made on August 31 and September 2 provides some assurance that the flows are representative of discharges during the grazing season in years of normal runoff.

419 Mason Street, Suite 200A • Vacaville CA 95688 • (707) 455-7642 • Fax (707) 455-7079 • thhydroscience@cs.com

Table 4 below gives the number of cattle that could be supported based on the flows observed. Until additional flow measurements can be made, the numbers given should be used with caution. Additionally, cattle should not exhaust the flow as some is required to support wildlife and riparian vegetation. Evaporation from a 4 x 8 foot trough is accounted for.

Table 4. Number of Cattle Which Could be Supported by the Observed Flows Based on a Consumption Rate of 15 gal/day.

Water Source	Flow on Aug 31, 2010 (gal/minute)	Number of Cattle
Bernal Spring	0.28	27
Laurel Spring	0.25	24
Santa Teresa Ck Abv Rosetto	22	2,100

Recommendations

Considerable uncertainty exists with respect to the number of cattle which can be supported by the various water sources because of a lack of knowledge of their individual characteristics with regard to seasonal fluctuation and duration and how these change across the spectrum of dry to wet years. Field monitoring is the only reliable way to increase the accuracy of the preliminary estimates given above. The following recommendations are given.

1. Perform a pump test at the abandoned Rosetto resort well to test the sustainable discharge from the well.

2. Take discharge measurements on Santa Teresa Creek and the springs on or about September 1, November 1, and April 1. The April 1 data should correlate to the seasonal high for the springs and near the high for non-storm associated flows in Santa Teresa Creek. If the November 1 reading in the springs is the same or lower than the September 1 reading, it indicates that the springs are tapping deep sources of percolating groundwater not subject to extraction by vegetation. If that is the case, it is likely that the seasonal fluctuation may not vary substantially although you should expect that the springs will eventually respond to lower rates of recharge during dry years.

3. Monitor the streams supplying each pond weekly in the spring and record the date at which there is no flow.

419 Mason Street, Suite 200A • Vacaville CA 95688 • (707) 455-7642 • Fax (707) 455-7079 • thhydroscience@cs.com

4. Install a recording precipitation gauge at a representative location within the park not subject to vandalism. Initiating a long-term record of precipitation that can be correlated with the date of flow cessation and seasonal maximum and minimum flows in the springs and in Santa Teresa Creek will provide for the ability to predict water usage in future years.

5. Perform a ground survey of the stock ponds to compute their present volume and the volume which might be gained through repairs to the spillways and/or removal of accumulated sediment.

6. Each of the stockponds needs an outlet installed that is formally designed and achieves the goal of passing the selected design peak flow over/through the dam in a manner which will cause neither erosion of the dam nor of the downstream channel. Typically, the stockponds would be equipped with a rock-lined spillway with the invert at the top of normal water surface when the pond is full, with sufficient spillway depth to pass the design flood without overtopping the dam. The rock lining would typically be composed of a graded rock blanket composed of a geotextile placed over the subgrade followed by some crushed gravel and then rock of sufficient dimension that will not be moved during the design peak flow. Only crushed rock should be used and the placement and water jetting of crushed gravel followed by crushed drain rock into the voids of the largest rock used will greatly aid its stability.

   The selection of a design storm is made through a cost/benefit analysis based on the cost of installation versus the cost of repairing or replacing the dam once a storm of larger magnitude overtops the dam.

I am in no way an expert on permitting for these types of activities but would assume that the work envisioned where would fall within one of the Nationwide permits under the Corps of Engineers' 404 permit program. Consultation with Fish & Game should be made to determine if a streambed alteration agreement is required.

Because access is limited at Big Oak Valley pond and perhaps at the Mine Field pond, the import of gravel and rock might be difficult. One possible alternative might be the use of a large diameter culvert to form the spillway.

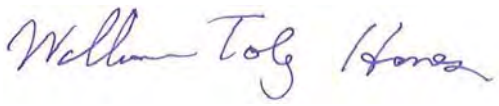
Repairs of the Big Oak Valley and Mine Field pond dams will require scarification and compaction of any existing surfaces to be graded and compaction of any material placed as fill, so some provision for water for this purpose should be planned.

Any sediment removed from the ponds should be placed outside of the floodplain and provision made to revegetate it. Generally, the footprint where it will be placed should be stripped of topsoil to a depth of 0.4 feet and then replaced over the finish graded fill.

419 Mason Street, Suite 200A • Vacaville CA 95688 • (707) 455-7642 • Fax (707) 455-7079 • thhydroscience@cs.com

I enjoyed being able to assist on this ecologically important project.

Sincerely,



Toby Hanes, P.H.
Senior Hydrologist

419 Mason Street, Suite 200A • Vacaville CA 95688 • (707) 455-7642 • Fax (707) 455-7079 • thhydroscience@cs.com

Table H-5. Hydrologic Analysis of Ponds, Springs, and Streams at Santa Teresa County Park, Santa Clara County, CA.

POND SPECIFICATIONS

Pond	Annual Water Yield (inches)	Drainage Area (≈) (acres)	Watershed Yield (acre-feet)	Pond Surface Area (sq. feet)	Maximum Depth (≈) (feet)	Volume Adjustment Factor	Pond Volume (acre-feet)	Pond fills in average Year?	Yield:Storage Ratio
Hidden Springs	3	22	5.5	9570	6	0.7	0.92	Yes	5.96
Mine Hill	3	39	9.8	7380	6	0.7	0.71	Yes	13.70
Big Oak Valley	3	116	29.0	3670	5	0.7	0.29	Yes	98.34

ESTIMATED SEASONAL CHANGES IN POND CAPACITY

Assumptions:
Pond inflow stops March 1
Stocking rate = 60 cattle
Water consumption = 15 gal/day
Seepage rate: 2 inches/month

Monthly Evapotranspiration (ET) Rates (inches/month)	
April	4.13
May	5.25
June	5.55
July	6.1
August	5.49

Number of Days until Pond is at 10% Capacity	past March 1 (using May ET rate)	Past April 1 (using June ET rate)	Past May 1 (using July ET rate)
Hidden Springs	116	113	108
Mine Hill	104	101	97
Big Oak Valley	60	59	57

NUMBER OF CATTLE SUPPORTED BY SPRINGS AND STREAMS

Assumptions:
June trough evaporation rate = 4 gal/day
Cattle daily water consumption rate = 15 gal/day

Springs	1-Sept-10 Flow Rate (gal/min)	Number of Cattle Supported
Bernal Hill	0.28	27
Laurel	0.25	24
Streams		
Santa Teresa Creek at Rosetto Springs (estimated at 0.05 cfs)	22	2112

18 APPENDIX I. Managing Stock Ponds to Benefit Special-Status Amphibians

18.1 Introduction

Many stock ponds provide potential habitat for special-status amphibians such as the California red-legged frog (CRLF) and the California tiger salamander (CTS). Both species are known to occur in the vicinity of Santa Teresa County Park, but have not been confirmed within the Park. The potential of a pond to provide CRLF/CTS habitat depends on its size and depth. New stock ponds can be constructed and ponds that have fallen into disrepair can be repaired to provide suitable habitat for special-status amphibians. CRLF and/or CTS may occupy suitable aquatic habitat at any point after a pond's initial construction or repair, depending on a number of factors, such as the locations of nearby known occurrences, dispersal patterns and intermediate terrain, and climate and weather patterns.

18.2 Exemption to Federal ESA CRLF "Take" Provisions for Ranching Activities

A recent special rule adopted under Section 4(d) of the federal Endangered Species Act waives the "take" prohibitions, including accidental kill or injury and modifications to habitat of the CRLF associated with operation of stock watering ponds, on routine ranching activities on non-federal rangelands (USFWS 2006). The USFWS states that incentives to continue routine ranching activities will provide a net benefit to the CRLF by conserving its habitat. Exemption under this rule appears to require, by definition, that affected ponds be used routinely in ranching, and thus, an exempt pond must be open (not entirely enclosed by fencing) for routine livestock access to the water. This exemption does not apply to construction of a new pond. In this rule, the USFWS recommends (but does not require) "best management practices" that would minimize "take" associated with routine management and maintenance of stock ponds and containment structures to maintain livestock water supplies, including:

a. Routine maintenance, which can include periodic dredging, dam or berm repair, and draining in stock ponds, so long as these activities are not conducted during the CRLF breeding season (November through April); adequate maintenance prior to the rainy season should reduce the need for emergency repair of a catastrophic breach, but such emergency repair would be covered by the rule;
b. Maintaining consistent water levels during the breeding and juvenile rearing season (November through August); drawdown of water levels after juvenile metamorphosis would be desirable, to control non-native predators;
c. Routine mechanical or chemical control of aquatic vegetation that impedes stock pond functionality, so long as it is not conducted during the CRLF breeding and juvenile metamorphosis seasons (November through September); mechanical control should be restricted in time to singular events; mechanical control methods are preferred over chemical control;
d. Control of mosquitoes can be readily adapted to minimize take of CRLF by appropriate water level management and/or proper application of bacterial larvicide; this rule does *not* exempt the purposeful introductions of non-native organisms, including mosquitofish and other predators.

18.3 CRLF Pond Design

An ideal CRLF pond design includes the following (NRCS 2006):

a. Ensure sufficient duration of water inundation in the pond for tadpole development during the entire rearing season (start of the rainy season until early August); create an un-shaded, warm, and shallow (depth of 0.25 to 0.5 m) area with no or short emergent plants for tadpole and juvenile rearing at one end of an oval pond, which can be achieved by appropriate livestock herbivory; at the other end of the pond, create an un-vegetated deep (depth greater than 1 m, preferably greater than 1.5 m) area to discourage dense emergent plants in the center, with adjacent dense patches of shoreline vegetation for escape from predators; i.e. the deepest area of the pond should be shifted from the center to one end of an oval pond, and the other end should be a shallow shelf;
b. Establish regenerating stands of typical emergent pond vegetation and willows at the pond margin for frog embryo attachment and adult refuge, which can be achieved by partial exclusion of grazing from the deeper end of the pond;
c. Adjacent to the pond, establish upland vegetation of low grassland with brushy patches for shelter and movement of adult frogs, which can be achieved, in part, with a winter or spring grazing period;
d. Control rodent activity that threatens the structural integrity and sustained functioning of the pond; use appropriate methods based on NRCS technical assistance and evaluation of potential conflicts with desirable rodent activity in the adjacent uplands;
e. Develop alternative livestock watering facilities away from the pond to facilitate better management of livestock effects at the pond;
f. Reduce or eliminate non-native frog predators by draining the pond after two consecutive years without complete drying and by prohibiting introductions of those predators; or conduct alternative control measures recommended by the NRCS or the USFWS;
g. Minimize pesticide and fertilizer use in and upstream of the pond; create or manage for vegetated buffers (see also Appendix E), sediment traps, and other management to reduce siltation and nutrient addition from upstream sources into the pond;
h. Control non-native invasive plants by hand, mowing, or grazing.

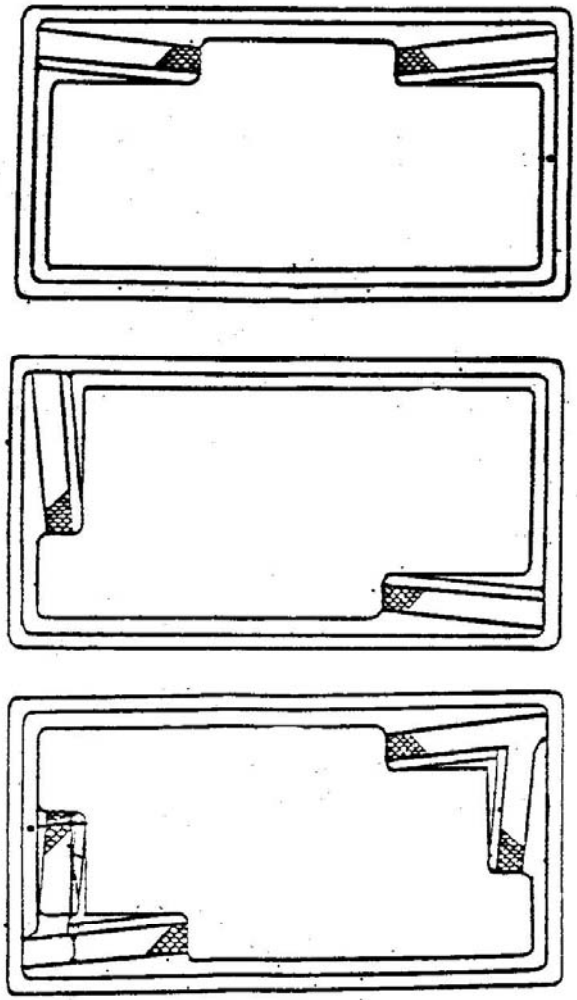
Photographs of a stock pond managed effectively for CRLF habitat are shown in Figure I-1.

Figure I-1. Stock pond managed effectively for CRLF.

19 APPENDIX J. Wildlife-Friendly Trough Design

Figure J-1. Example Watering Facilities with Hardened Surface and Wildlife Escape Ramp

Preferred wildlife ramp locations.



These ramps could be molded in concrete or fiberglass troughs. For metal troughs the ramps may be constructed of wood or metal and attached. Note: these ramps are fully enclosed to prevent entrapment.

ILLUSTRATION 19: Preferred wildlife ramp locations

Figure J-2. Preferred Wildlife Ramp Locations by the Idaho BLM (Sherrets 1989).

20 APPENDIX K. Natural Resource Conservation Service Watering Facility Conservation Practice Standard

Natural Resources Conservation Service, California, Conservation Practice Standard Code 614 – Watering Facility (September 2007) – 5 pages

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

WATERING FACILITY

(No.)

CODE 614

DEFINITION

A permanent or portable device to provide an adequate amount and quality of drinking water for livestock and or wildlife.

PURPOSE

To provide access to drinking water for livestock and/or wildlife in order to:

- Meet daily water requirements
- Improve animal distribution

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all land uses where there is a need for new or improved watering facilities for livestock and/or wildlife.

CRITERIA

General Criteria Applicable To All Purposes

Design watering facilities with adequate capacity and supply to meet the daily water requirements of the livestock and/or wildlife planned to use the facility. Include the storage volume necessary to provide water between periods of replenishment. Refer to the National Range and Pasture Handbook for guidance on livestock water quantity and quality requirements. For wildlife, base water quantity and quality requirements on targeted species needs.

Locate facilities to promote even grazing distribution and reduce grazing pressure on sensitive areas.

Design the watering facility to provide adequate safe access and escape opportunities by the animals planned to use the facility. Incorporate escape features such as ramps out of the watering facility design.

Include design elements to meet the specific needs of the animals that are planned to use the watering facility, both livestock and wildlife.

Protect areas around watering facilities where animal concentrations or overflow from the watering facility will cause resource concerns. Use criteria in NRCS Conservation Practice Standard 561, Heavy Use Area Protection to design the protection.

Install permanent watering facilities on a firm, level, foundation that will not settle differentially. Examples of suitable foundation materials are bedrock, compacted gravel and stable, well compacted soils.

Design and install watering facilities to prevent overturning by wind and animals.

Design watering facilities and all valves and controls to withstand or be protected from damage by livestock, wildlife, freezing and ice damage.

Construct watering facilities from durable materials that have a life expectancy that meets or exceeds the planned useful life of the installation. Follow appropriate NRCS design procedures for the material being used or industry standards where NRCS standards do not exist.

Use the criteria in NRCS Conservation Practice Standard 516, Pipeline to design piping associated with the watering facility. Include backflow prevention devices on

614 - 2

facilities connected to wells, domestic or municipal water systems.

Criteria for Wildlife Facilities

Site Location

1. The site chosen for wildlife watering development or gallinaceous guzzler will serve as a covey center. Escape cover must be provided adjacent to the water. A clump (5 or more plants) of gooseberry, wild rose, mesquite, quailbush, scrub oak or other shrubs furnishes favorable escape, forage and loafing cover near the installation and increases its effectiveness as a covey center. Brush piles can be used for temporary cover until vegetation can be established at the site. If quail roosting cover is limited, a site within 100 to 200 yards of a good roost tree is desirable. Chukars roost in the open on the ground.

2. An abundant food supply must be present and the necessity for water in the area should be positively established. The area will be thoroughly checked for permanent water, however, one should remember a small amount of water is sufficient if it is permanent.

3. If possible, guzzlers will be located where excavation work and maintenance can be easily accomplished. A gentle slope for soil surface type water collecting aprons is desirable. Do not locate the guzzler where silt or debris laden floodwater will flow into the tank, or in heavy cover where leaves from trees too close to the installation will fill the collecting basin.

4. If water is to be hauled to a storage tank, it must be located near an access road.

Water Storage Tank Capacity

The recommended size of a water storage tank for a guzzler can be estimated by the minimum average rainfall, as follows:

Minimum Average Rainfall	Tank Storage Capacity Req.
10 inches or over	500 gallons
5-10 inches	750 gallons

Water Collecting Apron

A water collecting apron can be used to fill and maintain water in a guzzler tank. The size of the water collecting apron is determined by the least annual rainfall on record for the site, and the tank storage capacity. Use the following formula in making this determination for circular, rectangular, or metal roof-type aprons.

A. Size (radius) of circular collecting apron.

$$r = \frac{(8 \text{ feet}/100 \text{ gallons})g}{a}$$

WHERE: r = radius in feet, a = least annual rainfall in inches, and g = size of tank in gallons.

B. Area of rectangular collecting apron:

$$A = \frac{(316 \text{ SF}/100 \text{ gal})g}{a}$$

WHERE: A = area in square feet, a = least annual rainfall in inches, and g = size of tank in gallons.

C. Standard 16x16 foot metal collecting apron will supply:

A 500 gallon tank in 6 inches or more annual rainfall

A 750 gallon tank in 9 inches or more annual rainfall, or

A 1000 gallon tank in 12 inches or more annual rainfall

Temporary guzzlers

Temporary "guzzlers" can be created by modifying barrels and filling them as needed with water hauled to the site. A fifty-five gallon steel drum can be connected by pipe to a small basin at ground level. Water flow is regulated by atmospheric pressure or a float valve. Barrels should not contain any residue of contaminant harmful to wildlife.

CONSIDERATIONS

Design fences associated with the watering facilities to allow safe access and exit for area wildlife species. To protect bats and other species that access water by skimming across the surface, fencing material should not extend across the water surface. If fencing across the water is necessary it should be made highly visible by avoiding the use of single wire fences and using fencing materials such as woven wire or by adding streamers or coverings on the fence.

For watering facilities that will be accessible to wildlife, give consideration to the effects the location of the facility will have on target and non-target species. Also consider the effect of introducing a new water source within the ecosystem in the vicinity of the facility. This should include things such as the concentration of grazing, predation, entrapment, drowning, disease transmission, hunting and expansion of the wildlife populations beyond the carrying capacity of available habitat.

Consider the following guidelines for materials commonly used for watering facilities.

Concrete	3000 psi compressive strength
Galvanized Steel	20 gauge thickness
Plastic	Ultraviolet resistance
Fiberglass	Ultraviolet resistance

Where water is supplied continuously or under pressure to the watering facility consider the use of automatic water level controls to control the flow of water to the facility and to prevent unnecessary overflows.

Watering facilities often collect debris and algae and should be cleaned on a regular basis. Consider increasing the pipe sizes for inlets and outlets to reduce the chances of clogging. Maintenance of a watering facility can be made easier by providing a method to completely drain the watering facility.

Steep slopes leading to watering facilities can cause erosion problems from over use by animals as well as problems with piping and valves from excess pressure. Choose the location of watering facilities to minimize these problems from steep topography.

Considerations For Wildlife Facilities

Typical wildlife water use:

Antelope	1-2 gal/animal/day
Mule deer	1-2 gal/animal/day
Elk	5-8 gal/animal/day
Chukar	750 gal/covey/year
Quail	750 gal/covey/year
Wild turkey	500 gal/flock/year
Pheasant	2-5 gal/day yearlong
Mourning dove	2-5 gal/day yearlong
Songbirds	1-2 gal/day yearlong

Site Spacing

1. Wildlife watering facilities may be provided if:

   (a) The range of the desired species of wildlife might be extended by providing additional water developments;

   (b) present population densities of the desired species can be increased by further water development; or

   (c) new habitat can be created.

2. The distance the desired species will travel for water is the main criteria that should be used for spacing of wildlife watering facilities.

   a. California quail - The suggested spacing pattern for California quail is at least one installation per 160 acres. Water should be located one to two miles apart on California quail ranges. Water should be placed at one-half mile intervals for optimum utilization.

   b. Mountain quail and chukar - Water should be available at about two mile intervals in mountain quail and chukar range, however, the type of terrain, feed and cover may alter the necessary distribution of water for good coverage of the area.

   c. Gambel's and desert quail - Less conclusive evidence is available on the

NRCS, CA

September 2007

summer radius of Gambel's or desert quail, but from data based on field observations, it is thought that watering sites should be available at intervals of three to five miles.

3. Consider these estimates of distance some wildlife will travel to water:

Species	Optimum (Miles)	Maximum (Miles)
Antelope	2	3
Mule deer	1	3
Elk	1	3
Chukar	1	2
Mountain quail	1	2
California quail	0.5	1
Gambel's quail	1	4
Desert quail	1	4
Pheasant	0.5	1
Turkey	1	2
Mourning dove	3	5
Songbirds	0.25	0.5

Cultural Resources

NRCS policy is to avoid any effect to cultural resources and protect them in their original location. Determine if installation of this practice or associated practices in the plan could have an effect on cultural resources. The National Historic Preservation Act may require consultation with the California State Historic Preservation Officer. The primary website for cultural resources information is http://www.nrcs.usda.gov/technical/cultural.html The California Environmental Handbook and the California Environmental Assessment Worksheet also provide guidance on how the NRCS must account for cultural resources. The e-Field Office Technical Guide, Section II contains general information, with Web sites for additional information.

Document any specific considerations for cultural resources in the design docket and the Practice Requirements worksheet.

Endangered Species

If during the Environmental Assessment NRCS determines that installation of this practice, along with any others proposed, will have an effect on any federal or state listed Rare, Threatened or Endangered species or their habitat, NRCS will advise the client of the requirements of the Endangered Species Act and recommend alternative conservation treatments that avoid the adverse effects. Further assistance will be provided only if the client selects one of the alternative conservation treatments for installation; or with concurrence of the client, NRCS initiates consultations concerning the listed species with the U.S. Fish and Wildlife Service, National Marine Fisheries Service and/or California Department of Fish and Game.

PLANS AND SPECIFICATIONS

Plans and specifications for watering facilities shall provide the information necessary to install the facility. As a minimum this shall include the following:

- A map or aerial photograph showing the location of the facility
- Detail drawings showing the facility, necessary appurtenances (such as foundations, pipes and valves) and stabilization of any areas disturbed by the installation of the facility
- Construction specifications describing the installation of the facility

OPERATION AND MAINTENANCE

Provide an O&M plan specific to the type of watering facility to the landowner. As a minimum include the following items in the plan:

- a monitoring schedule to ensure maintenance of adequate inflow and outflow;
- checking for leaks and repair as necessary;
- if present, the checking of the automatic water level device to insure proper operation;
- checking to ensure that adjacent areas are protected against erosion;
- if present, checking to ensure the outlet pipe is freely operating and not causing erosion problems;

- a schedule for periodic cleaning of the facility.

REFERENCES

Brigham, William and Stevenson, Craig, 1997, Wildlife Water Catchment Construction in Nevada, Technical Note 397.

Tsukamoto, George and Stiver, San Juan, 1990, Wildlife water Development, Proceedings of the Wildlife Water Development Symposium, Las Vegas, NV, USDI Bureau of Land Management.

Yoakum, J. and W.P. Dasmann. 1971. Habitat manipulation practices. Ch. 14 in Wildlife Management Techniques, Third Edition. Ed. Robert H. Giles, Jr. Pub. The Wildlife Society. 633 pp.

National Engineering Handbook, Part 650 Engineering Field Handbook, Chapters 5, 11 & 12, USDA Natural Resources Conservation Service.

National Range and Pasture Handbook, Chapter 6, Page 6-12, Table 6-7 & 6-8, USDA-Natural Resources Conservation Service.

National Research Council, 1996 Nutrient Requirements of Domestic Animals, National Academy Press.

Taylor, D.A.R. and M.D. Tuttle, 2007 Water for Wildlife: A Handbook for Ranchers and Range Managers, Bat Conservation International, 17pp, http://www.batcon.org/home/index.asp?idPage=62&idSubPage=143

NRCS, CA

September 2007