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VTA-COYOTE RIDGE PROPERTY
YEAR 4 (2010) MONITORING REPORT

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EXECUTIVE SUMMARY

The VTA-Coyote Ridge Property is a 548-acre site located on Coyote Ridge south of San Jose in Santa Clara County. This property was purchased by the Santa Clara Valley Transportation Authority (VTA) as compensation for known and predicted impacts to serpentine communities. The VTA prepared a Resource Management Plan (RMP) to describe the natural resource management program that will be implemented on the Coyote Ridge Property by the Santa Clara County Open Space Authority (SCCOSA), which will provide long-term management of this site. Managed grazing is the primary management tool on the site. The RMP includes a description of the monitoring activities that will be performed to ensure that grazing management is maintaining suitable serpentine grassland communities without adversely affecting the wetland and riparian habitats used by species such as the California red-legged frog. Staff of the SCCOSA and Creekside Center for Earth Observation performed the fourth annual monitoring on the Coyote Ridge Property in 2010. This document describes the results of monitoring of the Coyote Ridge site during 2010, thus summarizing monitoring results through the fourth full year of management under the RMP.

Residual Dry Matter (RDM) provides a quantitative measure of the dry, above-ground plant material left standing or on the ground at the beginning of a new growing season. High RDM values are associated with poor serpentine habitat quality. One of nine RDM monitoring transects was in the RMP's initial target range of 500-750 pounds (lbs)/acre. Five locations were lower than the target range and three were higher. Overall RDM values may be lower at some locations than in previous years due to an increase in spring grazing and/or the timing of RDM sampling, which was conducted in December. High RDM levels on some of the sample plots may result from reduced grazing pressure in the sampling locations, or a high composition of coarse RDM in these locations.

Data on plant species composition and cover were collected at four monitoring sites, consisting of at total of 13 transects, on the Coyote Ridge Property. These transects capture different grazing regimes, elevations and topoclimates throughout the property, allowing managers to make inferences to various portions of the Coyote Ridge Property, and to detect changes over time. Bay checkerspot host and nectar plant cover remained fairly low across sites in 2010. The diversity and cover of native species and perennial species remained relatively constant within the limits of expected annual fluctuations. The habitat continues to support larval hostplants and nectar sources, and is being maintained as high-quality bay checkerspot butterfly habitat by the current grazing regimes.

Bay checkerspot butterfly populations were estimated on the VTA-Coyote Ridge Property based on larval surveys. In 2008, larval densities increased along the ridgetop, and held steady on the lower slopes. In 2009 and 2010, densities were stable on the ridgetop, whereas they dropped on the lower slope in 2009 and rose slightly in 2010. Populations were well within a normal range of fluctuations during the last 3 years.

Five monitoring plots established in Year 1 for each of three special-status plant species (Santa Clara Valley dudleya, most beautiful jewelflower, and Mt. Hamilton thistle) were surveyed in Year 4, and the following densities were determined within the monitoring plots: 11.7 plants/m^2

for Santa Clara valley dudleya, >35 plants/m^2 for Mt. Hamilton thistle, and 0.2 plants/m^2 for most beautiful jewelflower. Preserve-wide population estimates of at least 10,000 dudleya and 50,000 Mt. Hamilton thistle were made. These monitoring results indicate a large increase in Santa Clara Valley dudleya and Mt. Hamilton thistle populations, but a substantial decrease in most beautiful jewelflower in 2010, within the monitoring plots. Populations of smooth lessingia and San Francisco wallflower in 2010 seemed robust.

Seven California red-legged frogs were detected on the Preserve in 2010. The presence of these individuals indicates that drainages in this part of the site are being used as non-breeding habitat by frogs associated with the Kirby Canyon Landfill's wetlands and red-legged frog pond, where the species breeds. No bullfrogs have been recorded using the Preserve.

No major erosional problems were noted on the Preserve in 2010. However, there were two incidents on the Ridge Road where a vehicle was driven on a very wet surface causing considerable damage to the road by forming deep ruts. Also, a deep cut in the surface along an old road near the Coyote Creek Golf Course was made by heavy winter rains and resulting flows. Neither occurrence required remedial measures, however.

Although feral pigs and tule elk have potential to adversely affect sensitive habitats on the Preserve, problems to date have been very localized and limited; monitoring of on-site abundance of these species, and potential damage to sensitive habitats and species caused by pigs and tule elk, will continue.

Measures to control invasive plants in 2010 focused on barbed goatgrass, yellow star thistle, and purple star thistle. Areas along the ridgetop infested with barbed goatgrass were treated with hand pulling. The barbed goatgrass infestations along the ridgetop road on VTA property have significantly decreased due to treatment efforts. However, larger infestations on adjoining UTC and other properties threaten VTA property if they are not controlled. Constant vigilance will be required to identify and promptly treat new infestations that are introduced by vehicles and animals.

For the star thistles, a combination of controls, including mechanical, herbicide, and livestock (goats and sheep) were used on the site. Several control areas were sprayed with the specialty herbicide Milestone VM, which is approved for wildland and rangeland use. The treatment for yellow star thistle appears to be successful and it is expected that treatment of the remaining individuals will exhaust the seed bank, thus allowing SCCOSA to perform only spot follow-up maintenance to these control areas in the future. Monitoring for occurrences of other invasives, and application of integrated pest management as needed, will continue on the Preserve.

In general, monitoring activities in 2010 documented that management of the VTA-Coyote Ridge Property continued to maintain suitable conditions for the sensitive species and habitats for which this property is being managed, and continued to maintain healthy populations of those species.

In addition to routine monitoring activities to be performed in 2011 according to the schedule in the RMP, the following recommendations and action items are noted for 2011:

- Grazing
  - SCCOSA will consider including a portion of the northwestern section of the property within the main southern pasture. The section immediately north of the existing fence gets little grazing pressure because a steep canyon largely prevents cattle in the larger northern pasture from accessing this small area. Up to 500 m of fencing could be used to alter the existing fence so that it follows topography, rather than being an arbitrary straight line.
  - RDM values will be carefully monitored in the coming year to verify whether the RDM values in the plots that were lower than the target level are a result of increased grazing pressure. It should be determined in areas with RDM values that are higher than target levels whether or not cattle grazing is having the desired effect on RDM levels and may need to be adjusted accordingly.
- Rare Plants
  - Due to the limited area surveyed according to the current rare plant monitoring protocol, compared to the 548-acre property (of which not all is appropriate habitat for these species), site-wide population estimates derived from the current protocol are imprecise. We propose altering the monitoring protocol to provide more meaningful data. In order to track the populations of these rare species, we will develop a statistically sound, scientifically rigorous monitoring protocol. The key elements of this protocol will be 1) delineating the current distribution of each species, 2) estimating local density in a repetitive sample to yield a total site population estimate, and 3) continued monitoring of a subset of the populations to track trends over time. Pilot data will be used to refine sampling methodology, including size and number of sampling units.
  - Santa Clara Valley dudleya: Colonies within the larger population will be selected for permanent monitoring. For larger populations, a macroplot approach using long skinny quadrats will be used. A single long quadrat tends to encounter both dense and sparse patches, minimizing variability between sampling units. This approach provides known levels of precision and is used in monitoring other local rare plant populations (such as Presidio Clarkia at both the Presidio of San Francisco and the Serpentine Prairie in Oakland). We will census a subset of smaller populations. Rather than trying to determine individuals, we will count rosettes.
  - Mount Hamilton thistle: Sampling areas will be stratified by canyon and by elevation. We will sample cross sections of stream reaches, counting flowering individuals, seedlings, and other vegetative individuals. Some exclusionary fencing will be installed to qualitatively assess impacts of cattle grazing.
  - Most beautiful jewelflower: We will develop a permanent macroplot method for the more extensive colonies, similar to that developed for Santa Clara Valley dudleya. Because this plant exhibits extreme interannual variability, a multiyear baseline may be appropriate. Some exclusionary fencing will be installed to qualitatively assess impacts of cattle grazing.
- Invasive Plants

- Continue visual monitoring for invasives on the Preserve and quantitative monitoring on neighboring property, and apply integrated pest management as needed.
- Continue to work with adjoining landowners to assist them in their management of invasive plants.
- Infestations of barbed goatgrass on the Coyote Ridge property appear to be reduced to low densities where hand pulling is the most effective treatment. Hand pulling sweeps should be done at least every two weeks during the flowering season, to ensure early and late plants are treated, and that treatment is thorough for this often cryptic species. Hand pulling should continue for at least three years to exhaust the seedbank.
- Early detection and rapid response is critical for keeping infestations manageable.

- Erosion/Animal Damage
  - Work with adjoining property owners and researchers to educate them on the detrimental effects of driving roads when they are muddy.
  - Monitor use of the site by tule elk (in addition to feral pigs, which are addressed in the RMP), and in particular, monitor damage to sensitive habitats by elk.
- General
  - Continue to monitor human activities by the golf course as they relate to the management of local wildlife populations.

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INTRODUCTION

VTA-COYOTE RIDGE PROPERTY OVERVIEW

The VTA-Coyote Ridge Property is a 548-acre site located on Coyote Ridge south of San Jose in Santa Clara County (Figure 1). This property was purchased by the Santa Clara Valley Transportation Authority (VTA) from Castle & Cooke as compensation for known and predicted impacts to serpentine communities resulting from VTA-proposed transportation projects. The site consists predominantly of areas dominated by serpentine-derived soils, but the eastern and western site boundaries extend slightly beyond the serpentine-derived soils to include small amounts of adjacent non-serpentine grassland included in the original Critical Habitat designation for the bay checkerspot butterfly (*Euphydryas editha bayensis*) by the U.S. Fish and Wildlife Service (USFWS 2001). The VTA-Coyote Ridge Property also includes a ± 98-acre site, located east/northeast of the U.S. 101/Coyote Creek Golf Drive intersection, that had been preserved by Castle & Cooke as mitigation for impacts to the California red-legged frog (*Rana draytonii*) from expansion of the Coyote Creek Golf Course (BonTerra Consulting 1999).

Coyote Ridge comprises the westernmost foothills of the Diablo Range of California's Inner South Coast Range. The western boundary is located immediately upslope from the Coyote Valley floor, being bounded on the southwestern side by U.S. 101 and the Signature Course East of the Coyote Creek Golf Club. From here, the Preserve extends upslope to the crest of Coyote Ridge, then eastward downslope toward San Felipe Creek and Anderson Reservoir. The Preserve is bounded on the north side by property owned by United Technologies Corporation (UTC), on the east side by property owned by Castle & Cooke, and on the south/southeast side by property owned by Waste Management, Inc., including the Kirby Canyon Landfill and associated mitigation lands (Figure 2).

Two out-parcels within the boundaries of the VTA-Coyote Ridge Property, a ± 90-acre parcel owned by William Lyon Homes and a ± 15-acre parcel owned by the Silicon Valley Land Conservancy, serve as mitigation for impacts to serpentine habitat from projects by William Lyon Homes and Calpine, respectively. Other mitigation lands adjacent to the VTA-Coyote Ridge Property include the 267-acre Kirby Canyon bay checkerspot butterfly preserve (which serves as mitigation for serpentine impacts from the landfill), a ± 8-acre Santa Clara Valley dudleya (*Dudleya setchellii*) mitigation area owned by Castle & Cooke, and another ± 100-acre mitigation area located along U.S. 101 northwest of the Preserve (Figure 2).

The majority of the Coyote Ridge site is dominated by California annual grassland and serpentine grassland studded with small rock outcrops and patches of chaparral, coastal sage scrub, and oak woodland. These grasslands are interrupted by several drainages, some of which contain streams, seepage wetlands, and in the case of deeper drainages, riparian scrub/woodland. Figure 2 provides a map depicting the biotic habitats on this site.

Greater detail on the geological, hydrological, and biological conditions of the Coyote Ridge site is provided in the site's Resource Management Plan (RMP; VTA 2006). The VTA prepared the RMP to describe the natural resource management program that will be implemented on the VTA-Coyote Ridge Property by the Santa Clara County Open Space Authority (SCCOSA),

which will provide long-term management of this site. The primary management goal is to preserve, monitor, and, if necessary in the future, enhance habitat on the Preserve for serpentine-endemic flora and fauna, and to preserve existing habitat for the California red-legged frog. Non-native grass management through cattle grazing, while protecting sensitive aquatic resources from damage by livestock, is the key objective. The USFWS approved the RMP in 2006.

MONITORING REQUIREMENTS

The RMP includes a description of the monitoring activities that will be performed to ensure that grazing management is maintaining suitable serpentine grassland communities without adversely affecting the wetland and riparian habitats used by species such as the California red-legged frog. A monitoring report is prepared to summarize the results of all monitoring activities during the previous calendar year. Results for monitoring of Residual Dry Matter (RDM), grazing period/season forage availability, permanent vegetation transects (including bay checkerspot butterfly larval food plants and adult nectar sources), bay checkerspot larvae and adults, special-status plants, California red-legged frogs, wetland and riparian habitats, erosion problems, grazing intensity, and invasive species is included in the report as appropriate, based on the monitoring procedures and frequency described in the RMP. The annual report also includes any recommended changes to the management plan or monitoring regime, any remedial actions taken, and an analysis of relationships between monitoring results and grazing management.

Table 1 summarizes the monitoring efforts that are implemented on the VTA-Coyote Ridge Property, based on the RMP, and that are to be summarized in the annual monitoring report. Collectively, the Coyote Ridge dataset captures different grazing regimes, elevations, and topoclimates throughout the Preserve, allowing managers to make inferences to various portions of the VTA-Coyote Ridge Property.

This document describes the results of monitoring of the Coyote Ridge site during 2010, the fourth year of management under the RMP.

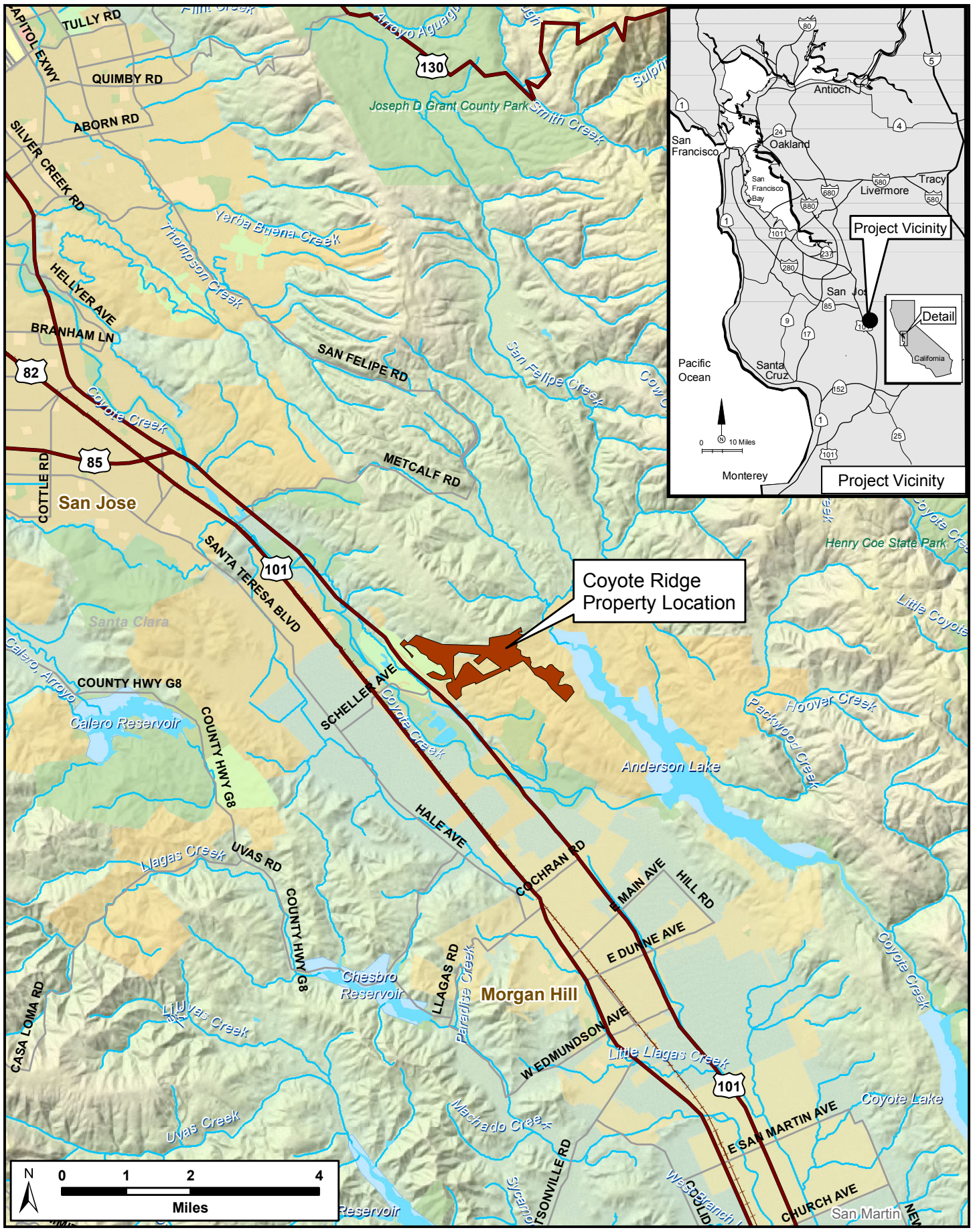

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Figure 1: Vicinity Map

Coyote Ridge Year 4 Monitoring Report (3040-02)
April 2011

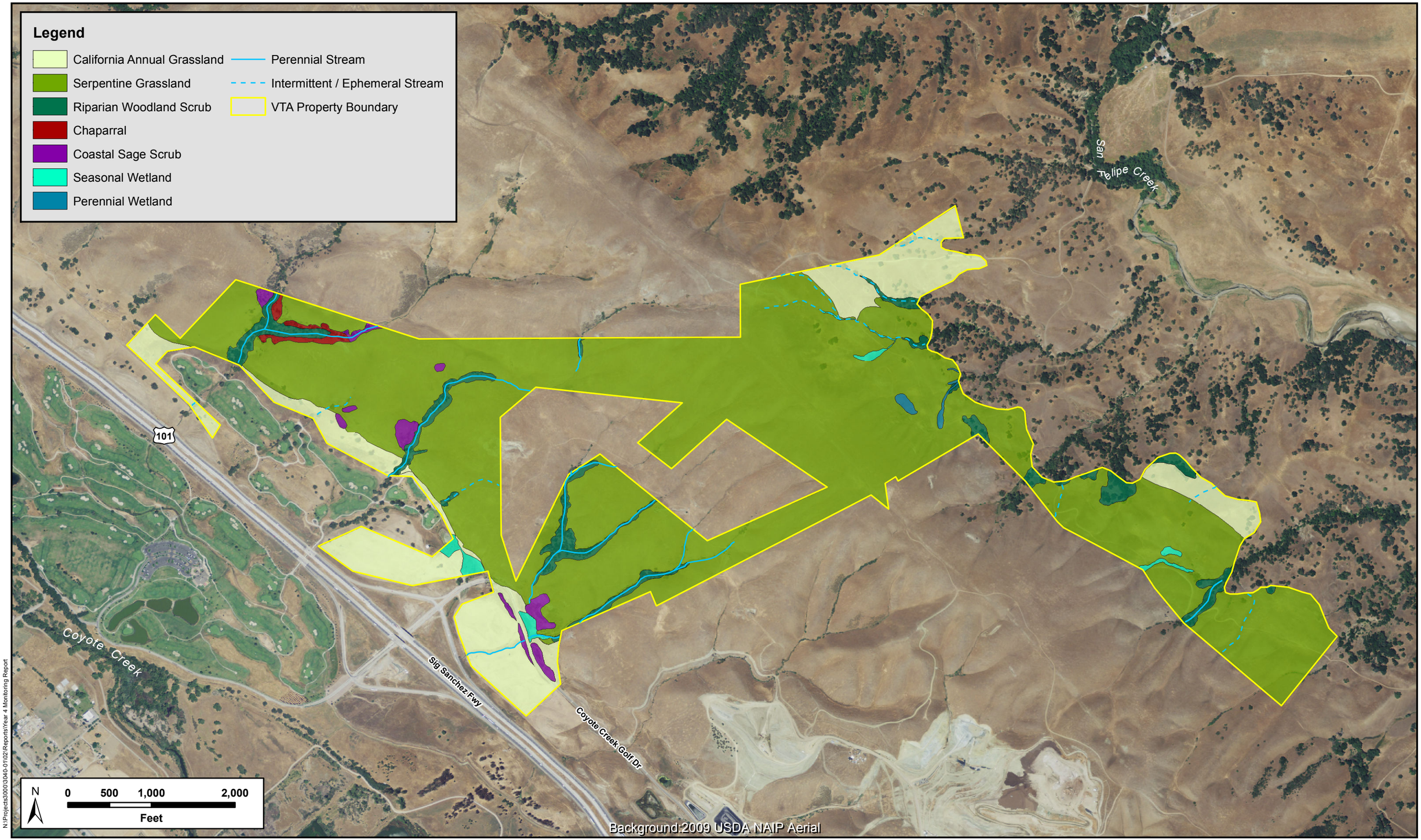

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Figure 2: Biotic Habitats Map
Coyote Ridge Year 4 Monitoring Report (3040-02)
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Table 1. VTA-Coyote Ridge Property Monitoring Summary

Parameter	Monitoring Period	Monitoring Protocol
Residual Dry Matter (RDM)	Late fall (October and November)	Prior to the first significant rain in fall, RDM will be measured at each of 10 key monitoring locations, the locations of which will be stratified according to slope, aspect, and grazing regime (spring and fall vs. winter/spring grazing). RDM is most commonly measured through a combination of clipping plots and estimation, although an experienced land manager may be able to accurately estimate RDM visually. The initial target range for RDM is 500-750 lbs/acre. Target RDM values may be adjusted by SCCOSA staff in consultation with the current grazing lessee, as necessary, depending on correlations between RDM and parameters related to sensitive resources.
Grazing Period/season Standing Forage	Throughout grazing period (winter/spring or spring and fall depending on grazing regime)	Immediately adjacent to each of the 10 key monitoring locations described above for RDM monitoring, standing herbage biomass plots will be established in grazed areas, and small fenced exclosures will be established to provide ungrazed reference areas. During the grazing period, all plants on the biomass plots and associated reference plots will be clipped and weighed monthly. Percent utilization will be estimated by comparing measurements taken from the grazed and ungrazed areas. When available biomass drops below an established threshold, to be determined during the first 2-5 years of vegetation monitoring, livestock will be removed as directed by staff of SCCOSA.
Plant Species Composition/cover	Spring (late March to early May)	One permanent transect will be established adjacent to each of the 10 key monitoring locations described above for RDM monitoring. Transects will be 50 m in length. Species percent cover will be measured using the quadrat method. A 50-m tape will be stretched along the transect, and a 0.5 x 0.5 m (0.25 m2) quadrat will be placed at 10, 20, 30, 40, and 50 m along the right side of the tape, and at 5, 15, 25, 35, and 45 m along the left side of the tape. The percent cover (on a cover class scale of 1, 2, 5, 10, 20, 30…100%) of each plant species within the quadrat will be recorded. Percent cover of bare ground, rock, and litter will be included in the cover total. Monitoring will be conducted during peak spring flowering season (typically late March-early May). Timing of monitoring is expected to vary with transect location due to differences in phenology among areas with different topoclimates, and may vary among years.
Grazing Infrastructure	Ongoing	The ranching lessee will continuously monitor fencelines and other infrastructure (e.g., troughs) and maintain and repair such features as necessary. When on the Preserve, SCCOSA staff and docents will note and report to the rancher any grazing infrastructure problems or maintenance needs observed.

Parameter	Monitoring Period	Monitoring Protocol
Bay Checkerspot Butterfly	February/March (larvae), March/April (adults)	Post-diapause larvae will be counted annually on permanent plots. The number and location of plots will be stratified according to topoclimate and upper vs. lower slope, and will include plots monitored in past years by Dr. Weiss. Timing of larval surveys may be modified based on extremes in temperature or precipitation, as determined by a qualified biologist. More qualitative, reconnaissance-level surveys of other areas will be conducted annually during the peak of the flight season to determine the presence and relative abundance of adult bay checkerspots.
Santa Clara Valley Dudleya	May	Focused surveys will be conducted on 5 permanent plots in Years 1, 5, and every 5th year thereafter (10, 15, etc.). The locations of the 5 plots will be stratified by grazing intensity (accessibility to livestock may be used as a proxy for different levels of grazing pressures). On each plot, the number of plants will be counted, age classes will be determined, and evidence of reproduction will be noted. Plots will be photographed, and any evidence of grazing or trampling impacts will be noted. Any necessary remedial measures (e.g., fencing around localized areas) will be identified.
Mt. Hamilton Thistle	February to May	Focused surveys will be conducted on 5 permanent plots in Years 1, 5, and every 5th year thereafter (10, 15, etc.). The locations of the 5 plots will be stratified by grazing intensity (accessibility to livestock may be used as a proxy for different levels of grazing pressures). The number of plants within each plot will be counted or estimated, and density estimates from these counts will be used to estimate population size on the Preserve. Plots will be photographed, and any evidence of grazing or trampling impacts will be noted. Monitoring results will be correlated with livestock activity to determine the effects of grazing and trampling on freshwater resources and to identify any necessary remedial measures (e.g., fencing around localized areas).
Most Beautiful Jewelflower	May	Focused surveys will be conducted on 5 permanent plots in Years 1, 5, and every 5th year thereafter (10, 15, etc.). The 5 plots will be located randomly in serpentine grassland habitat, stratified by slope and aspect. The number of plants within each plot will be counted or estimated, and density estimates from these counts will be used to estimate population size on the Preserve. Plots will be photographed.
Smooth Lessingia	Late summer	Incidental observations made during other monitoring efforts will be compiled. Evidence of declines in abundance or threats from grazing or invasive species will be noted. If numbers appear to be declining, more focused surveys could be conducted and/or remedial measures identified.

Parameter	Monitoring Period	Monitoring Protocol
San Francisco Wallflower	Spring	Incidental observations made during other monitoring efforts will be compiled. Evidence of declines in abundance or threats from grazing or invasive species will be noted. If numbers appear to be declining, more focused surveys could be conducted and/or remedial measures identified.
Riparian/wetland Habitats	Late summer/fall	Permanent stations in representative seepage wetlands, low-gradient vs. high-gradient streams, and dense vs. relatively open riparian habitats on both the eastern and western slopes will be monitored annually for dominant species composition, percent cover by plants in the ground layer (0-1 m), understory layer (1-2 m), and canopy layer (>2 m), and any obvious detrimental effects of livestock activity. Monitoring results will be correlated with livestock activity to determine the effects of grazing and trampling on freshwater resources and to identify any necessary remedial measures (e.g., fencing around localized areas). If no adverse effects of livestock activity (or lack thereof) are noted, monitoring frequency can be reduced (e.g., once every 2 or 3 years).
Erosion Problems	Spring	A reconnaissance survey to qualitatively assess potential erosion problems will be conducted annually in spring along all drainages. Any necessary remedial measures (e.g., fencing around localized areas) will be identified and recommended. If no adverse effects of livestock activity are noted, monitoring frequency can be reduced in known areas of low livestock use (e.g., once every 2 or 3 years).
California Red-legged Frog	Late spring/ summer	Focused surveys, including both daytime and nighttime surveys, will be conducted every 2 years, focusing on seeps, springs, and drainages. The locations and numbers of red-legged frogs will be recorded and any evidence of breeding will be noted. Any adverse effects of livestock on red-legged frogs or on particularly important habitat areas (e.g., breeding pools, if present) will be noted. Any bullfrogs detected will be captured and removed from the Preserve.
Invasive Plants	March/early April	A reconnaissance survey for barb goatgrass, purple star-thistle, and other invasives will be conducted annually in spring. SCCOSA staff, docents, and ranchers will be on the lookout for invasives during all activities on the Preserve, year-round. Infestations of noxious weeds will be eradicated immediately.
Feral Pigs	Year-round	SCCOSA staff, docents, and ranchers will be on the lookout for evidence of feral pig damage, especially in riparian areas, during all activities on the Preserve, year-round. Substantial pig damage in sensitive areas will be addressed by removal of pigs and/or the construction of localized fencing around the affected areas.

YEAR 4 (2010) MONITORING METHODS, RESULTS, AND DISCUSSION

Staff of the SCCOSA and Creekside Center for Earth Observation performed annual monitoring for Year 4 on the VTA-Coyote Ridge Property in 2010. Below, the monitoring methodology and results are described separately for each monitoring parameter.

For some monitoring parameters, such as monitoring of populations of individual special-status plants, optional monitoring was conducted even though such monitoring is not required again until Year 5. For these parameters, results of Year 4 monitoring are reported simply, and discussion is limited.

In general, the Year 1 (2007) monitoring report provided more detailed discussion, and provided more detail than would be expected in future monitoring reports, to provide an appropriate context for the results of baseline (Year 1) monitoring. This is particularly true for monitoring parameters such as RDM, bay checkerspot butterfly abundance, plant species composition/cover, and invasive plants, for which monitoring on the VTA-Coyote Ridge Property has been ongoing for years. Additional transect clusters elsewhere on Coyote Ridge are monitored each year for the Annual Monitoring Report for the Metcalf Energy Center (MEC) Ecological Preserve (Weiss and CH2MHill 2009). The VTA-Coyote Ridge Property Year 1 (2007) Monitoring Report included comparisons to these neighboring transect clusters to provide a regional context to the baseline data. The report for Years 2-3 and the current Year 4 report, however, only contain data collected on VTA's Coyote Ridge Property. Regional comparisons can be made by accessing the MEC report, prepared annually for the Silicon Valley Land Conservancy.

RESIDUAL DRY MATTER (RDM)

RDM provides a quantitative measure of the dry, above-ground plant material left standing or on the ground at the beginning of a new growing season. The amount of RDM remaining in a pasture at the time of the first germinating rain in fall influences soil protection and the microclimate for the coming year's herbaceous plant community. Properly managed RDM protects soil from erosion and nutrient loss and increases organic matter content in clay soils (Bartolome et al. 2006, Wildland Solutions 2001). In serpentine communities, where sensitive native plants may be outcompeted by invasives if grazing intensity is not sufficiently high, the amount of RDM remaining also provides a measure of the success of grazing management over the prior year in reducing invasive grasses, thus informing the management regime for the following year. Thus, RDM analysis provides a measure of range condition and a forecast for future utilization, and facilitates rapid monitoring by providing data that can be extrapolated over an entire pasture.

Methods

The Coyote Ridge Property covers different grazing pastures and regimes, topoclimates, and elevations. On 7 and 10 December 2010, SCCOSA staff collected RDM data at nine sites representative of different grazing regimes, topoclimates, and elevations within the VTA-Coyote Ridge Property (Figure 3). The majority of the RDM monitoring sites are located in paddocks

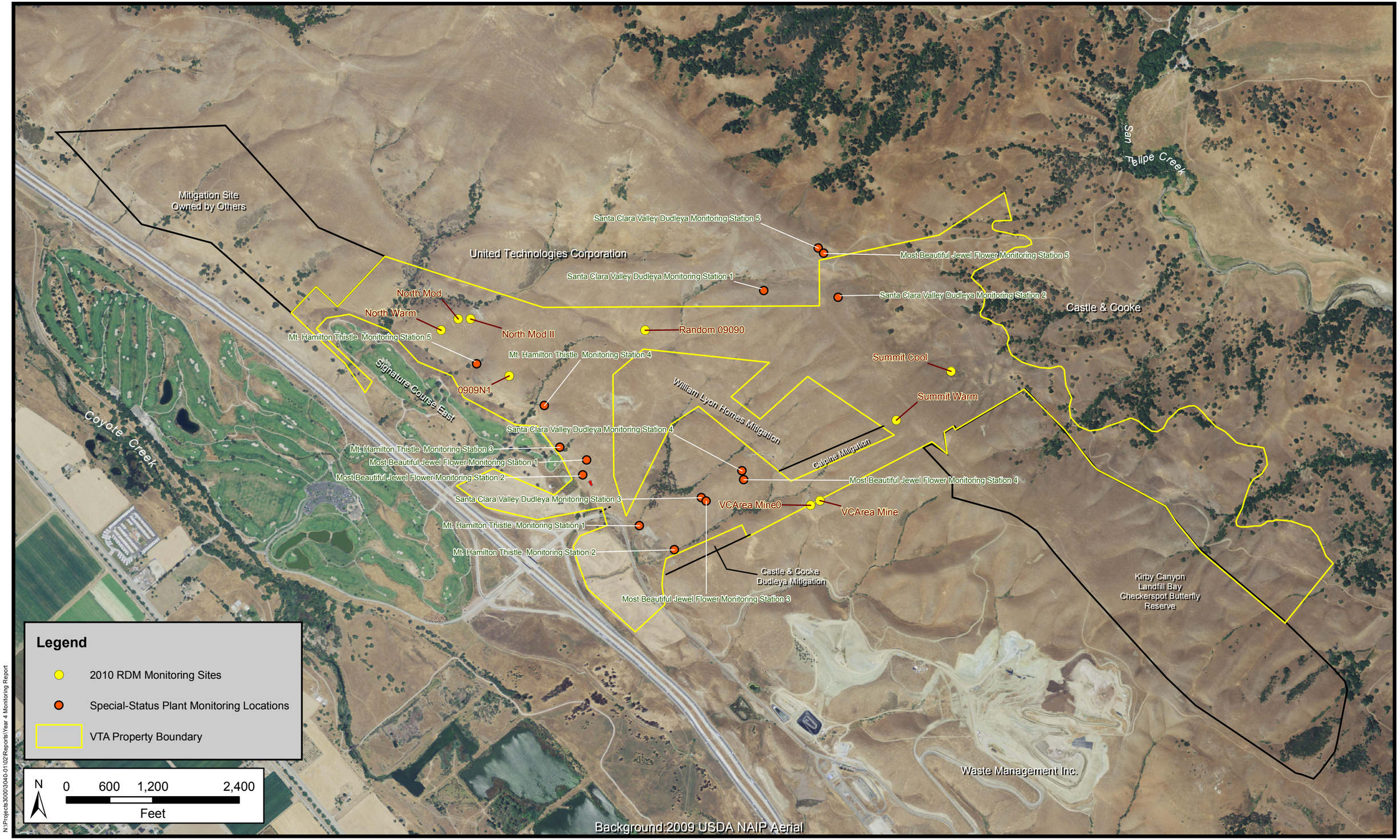

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Figure 3: 2010 RDM Monitoring Sites
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that are grazed by cattle in winter and spring, which is the predominant grazing regime on the Coyote Ridge Preserve. From 15 December 2009 to 8 May 2010, the property was grazed by 255 cows and 14 bulls. There are 20 cows that remain on the ridge year-round.

Table 2. Properties of 2010 RDM Sites.

Transect Name	Elevation	Grazing Regime
North Mod	Mid	Spring, Fall
North ModII	Mid	Spring, Fall
North Warm	Mid	Spring, Fall
Summit Cool	High	Winter, Spring
Summit Warm	High	Winter, Spring
0909N1	Mid	Winter, Spring
VCArea Mine	Mid	Winter, Spring
VCArea Mine01	Mid	Winter, Spring
Random090901	Mid	Winter, Spring

A photo guide was used to estimate the mean RDM (lbs/acre) at each of the nine sites. Photos were taken at each of the sites from distances of 10 and 20 feet, including a Robel pole with subdivisions every 5 centimeters and colored golf balls (Wildland Solutions 2008). Vegetation from within a 13.25-inch diameter circular hoop-plot was clipped and weighed at all sites to verify the visually estimated RDM values. The 2010 methods differ slightly from the 2009 methods because RDM was cut and weighed in all nine sampling locations; in 2009, RDM was visually estimated in all plots and only clipped and weighed at three of the sampling locations. Thus, the RDM values obtained in 2010 were likely more accurate overall than previous estimates.

Results

RDM estimates from the nine monitoring sites indicate that one of the sampling areas of the VTA-Coyote Ridge Property met the RMP's objective of 500-750 lbs/acre in 2010. Three of the sites were above the management objective, and five were below (Table 3). Estimated RDM values at the RDM monitoring sites ranged from 115 to 1780 lbs/acre.

Table 3. Mean RDM (lbs/acre) on VTA-Coyote Ridge Property RDM Monitoring Sites in 2010.

Site	Estimated RDM	Meets Objective of 500 – 750 lbs/acre?
North Mod	1780	High
North ModII	760	High
North Warm	415	Low
Summit Cool	825	High
Summit Warm	225	Low
0909N1	445	Low
VCArea Mine	115	Low
VCArea Mine01	325	Low
Random090901	630	Yes

Data sheets and photographs for each RDM monitoring site are provided in Appendix A.

Discussion

In 2010, RDM values at five of the sample locations were lower than the management objective of 500-750 lbs/acre. Several factors in 2010 were different from previous years and may have influenced these results. For example, above-average rainfall during the 2009/2010 rainy season allowed land managers to graze the site from December to May with 255 cows and 14 bulls. This high-density spring grazing may have resulted in a significant decrease in vegetation cover that did not replenish after grazing stopped and spring rains had ceased. Additionally, in 2010 RDM sampling was conducted in early December as opposed to early October in 2009 (where reported RDM values are higher). Because RDM disappears due to weather and microbial action, a decrease in RDM can vary from 7-15% per month (Bartolome et al. 2006, Wildland Solutions 2008). Decomposition of RDM likely resulted in a decrease of RDM values from October to December.

RDM values were higher than the management objective in three of the sample locations. This may be the result of reduced grazing preference in these areas, or a large amount of coarse plants such as Mediterranean annual grasses that decompose at a slower rate than fine-leaved herbaceous species such as clover (*Trifolium* sp.) and filaree (*Erodium cicutarium*) (Wildland Solutions 2008).

PLANT SPECIES COMPOSITION/COVER

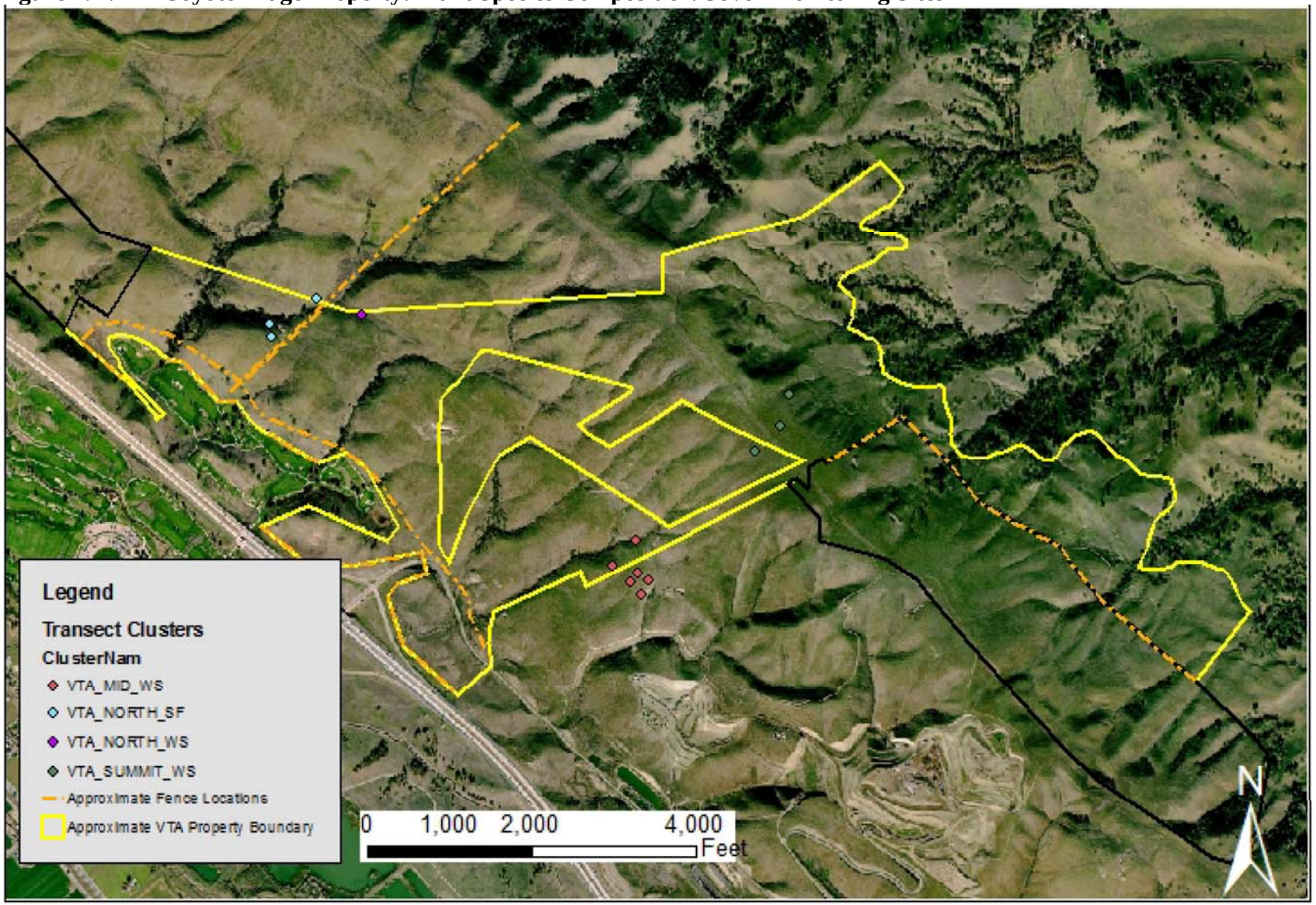
The purpose of monitoring the overall composition of the serpentine grassland is to provide a reliable system for detecting major changes in grassland composition in response to climate, topography, and management. A standard methodology, the same one described for this purpose in the RMP, is being used at multiple sites in the region. The system is designed to monitor large changes in composition from year to year (inter-annual) and across topographic and edaphic (soil) gradients, while at the same time being efficient for data collection and interpretation.

This information can be used to gauge changes or monitor range trend over time in response to changes in grazing pressure and as a means to correlate the RDM target levels to key plant species (e.g., dwarf plantain [*Plantago erecta*], owl's clover [*Castilleja* spp.], and adult nectar sources for the bay checkerspot butterfly).

Methods

Four plant species composition/cover monitoring sites, consisting of one or more sampling transects each, were established on the VTA-Coyote Ridge Property beginning in 2006. The VTA_Mid_WS site, consisting of six transects (Figure 4), was established in spring 2006 to complement existing vegetation transect clusters located on other Coyote Ridge properties. Two additional transect clusters, consisting of three transects each, were sampled in 2008: VTA_Summit_WS and VTA-North_SF. One transect at the VTA_North_WS site was added in 2009, for a total of 15 transects (Figure 4). In 2010, the four monitoring sites were sampled again, although only one transect was sampled at the VTA_North_WS site, for a total of 13 transects.

Figure 4. VTA-Coyote Ridge Property: Plant Species Composition/Cover Monitoring Sites



Transects were 50 meters long and permanently marked at each end with rebar. During sampling, a 50-m tape was stretched along the transect, and a 0.5 x 0.5 m (0.25 m^2) quadrat was placed at 10, 20, 30, 40, and 50 m along the right side of the tape, and at 5, 15, 25, 35, and 45 m along the left side of the tape. The percent relative cover (on a cover class scale of 1, 2, 5, 10, 20, 30, 40 . . . 100%) of each plant species within the quadrat was recorded. Percent cover of bare ground, rock, and litter were included in the cover total. This method has been used regionally to measure serpentine grassland composition, and was described in the RMP.

Monitoring was conducted during the peak spring flowering season (late March-early May). Timing of monitoring varies with transect location due to differences in phenology among areas with different topoclimates, and will vary among years.

Results

Plant species/composition monitoring results are compiled in Table 4 for specific plant species and functional groups that are used as indicators of bay checkerspot and serpentine grassland habitat quality. Data are averaged for each transect cluster.

Table 4. Vegetation Composition Results for 2010.

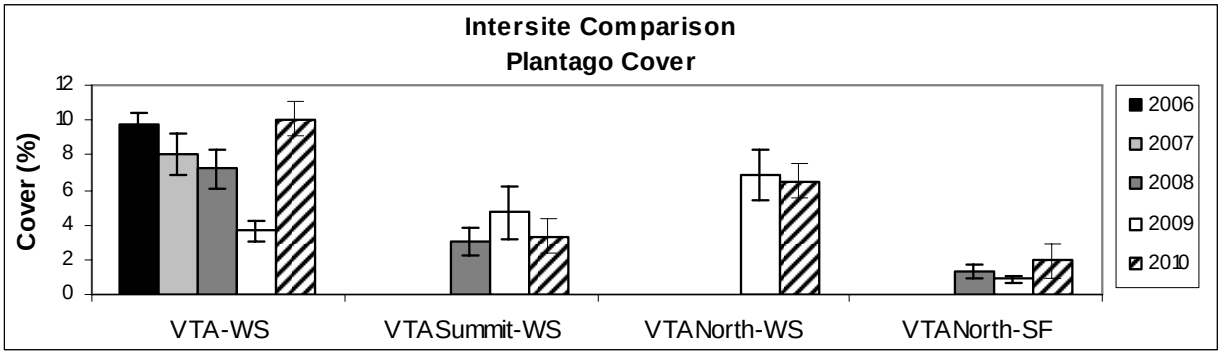
Species	Mean Cover ± SE			
	VTA-Mid-WS	VTA-Summit-WS	VTA-North-WS	VTA-North-SF
Checkerspot Host and Nectar Plants				
Dwarf plantain (*Plantago erecta*)	10.07 ± 1.24	3.33 ± 0.85	6.50 ± 1.5	1.93 ± 0.48
Owl's clover (*Castilleja* spp.)	0.28 ± 0.10	2.8 ± 0.9	0.6 ± 0.31	0.2 ± 0.10
Goldfields (*Lasthenia californica*)	3.67 ± 1.13	4.77 ± 1.17	0 ± 0	0 ± 0
Tidy tips (*Layia gaillardioides*)	0 ± 0	0.33 ± 0.18	0.0 ± 0.0	0.33 ± 0.10
Jeweled onion (*Allium serra*)	0 ± 0	0.1 ± 0.06	0 ± 0	0.07 ± 0.07
Seaside maritima (*Muilla maritima*)	0.48 ± 0.15	0.6 ± 0.13	1.3 ± 0.26	0.6 ± 0.21
Key Non-native Grasses				
Italian ryegrass (*Lolium multiflorum*)	12.02 ± 1.66	11.87 ± 2.11	8.0 ± 2.22	12.07 ± 2.10
Soft chess (*Bromus hordeaceus*)	1.13 ± 0.7	4.53 ± 1.29	9.5 ± 2.25	1.27 ± 0.29
Functional Guilds				
Native perennial grasses	0.68 ± 0.14	2.53 ± 0.64	6.2 ± 2.52	0.67 ± 0.21
Nonnative annual grasses	15.23 ± 1.94	16.73 ± 2.55	17.6 ± 3.36	20.8 ± 2.47
Geophytes	2.07 ± 0.26	2.37 ± 0.28	2.1 ± 0.6	2.7 ± 0.52
Perennial forbs	3.5 ± 0.71	2.77 ± 0.78	1.0 ± 0.33	5.03 ± 1.36
Annual forbs	20.83 ± 2.0	26.27 ± 2.2	21.0 ± 2.29	6.37 ± 0.75
Legumes	2.18 ± 0.24	4.23 ± 0.46	2.6 ± 0.62	1.57 ± 0.22
Native Richness and Cover				
Native species richness*	11.35 ± 0.37	12.4± 0.62	9.1 ± 0.62	8.1 ± 0.56
Native cover	28.93 ± 2.02	38.5 ± 2.39	32.9 ± 2.51	19.43 ± 2.01
Totals				
Total plant cover	44.78 ± 2.24	55.23 ± 2.44	50.5 ± 4.13	40.23 ± 1.97
Thatch	1.9 ± 0.41	3.73 ± 0.68	6.2 ± 1.31	14.2 ± 1.69
Bare	44.5 ± 2.49	37.67 ± 2.53	38.0 ± 4.16	40.0 ± 2.09
Rock	7.76 ± 1.71	4.63 ± 1.98	3.1 ± 1.64	6.9 ± 1.38

*Average number of native species per quadrat

The VTA-Coyote Ridge Property covers different grazing regimes, topoclimates, and elevations. A brief table listing each site's grazing regime, elevation class, and approximate nitrogen deposition is given in the VTA-Coyote Ridge Property Year 1 (2007) Monitoring Report. As a brief summary, the three WS sites are in the winter-spring grazing paddock. The North-SF site is grazed spring-fall, and is directly across the fence from the North-WS site. Differences in the two North sites should therefore reflect different management effects related to the different timing of grazing regimes. The Summit site has high elevation and lower nitrogen deposition (~11 kg-N/ha/year), while the Mid and both North sites are mid elevation with higher nitrogen deposition rates (~15 kg-N/ha/year). This range of deposition is well beyond the level (~5 kg-N/ha/year) at which effects become apparent in ungrazed serpentine grassland.

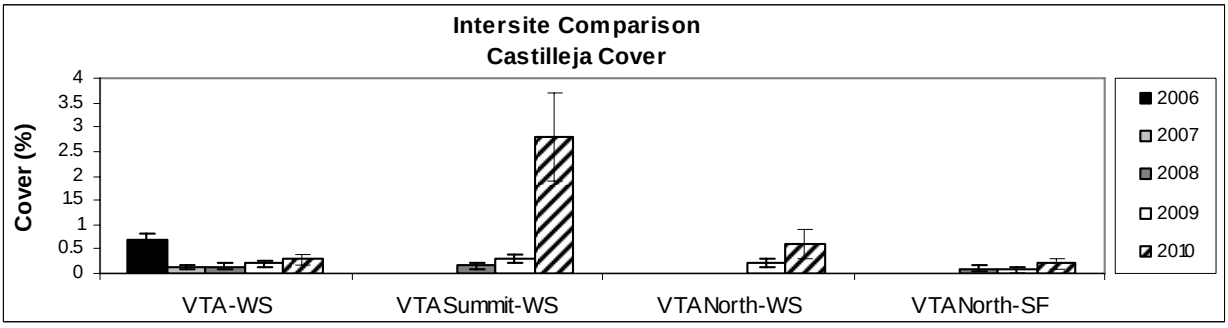
Bay Checkerspot Host Plants. Dwarf plantain cover at the Mid-WS transect cluster had been decreasing since 2006, with the biggest drop in 2009; however the Mid-WS transect cluster had the highest cover of dwarf plantain in 2010. The North-SF transect cluster continued to exhibit the lowest cover values of among all clusters in 2010 and the cover values at two other sites remained relatively constant from previous years (Figure 5).[1]

Figure 5. Average Cover of Dwarf Plantain (*Plantago erecta*), ± SE.



Owl's clover cover at the Mid-WS cluster showed a sharp decline from 2006 to 2007, and remained low thru 2010. Cover increased substantially at the Summit-WS cluster (Figure 6).

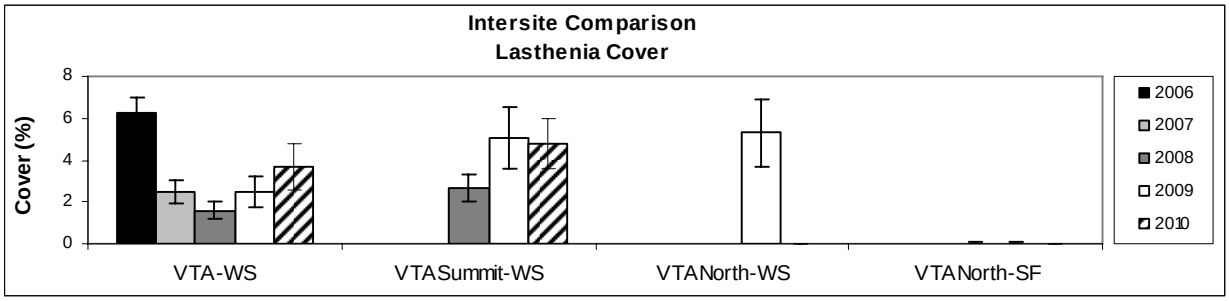
Figure 6. Average Cover of Owl's Clover (*Castilleja* spp.), ± SE.



[1] Note Figures 10-24 reflect different years of data collection for each cluster. For example, data were not collected in 2006-2008 at VTA-North-WS.

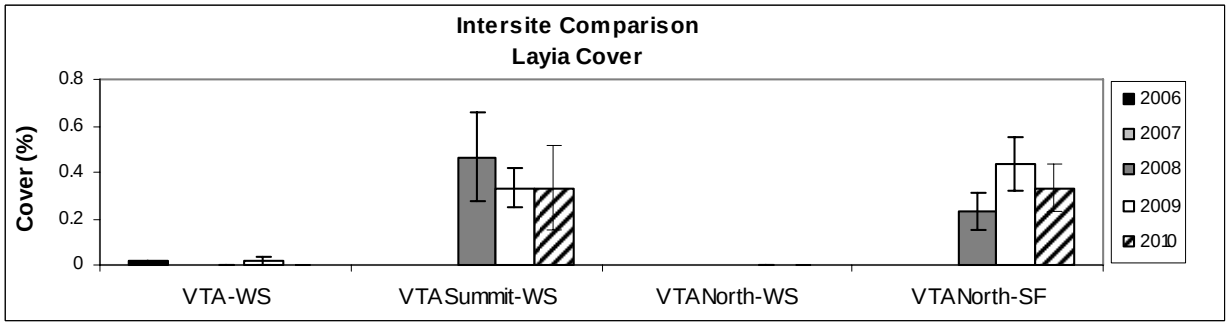
Bay Checkerspot Nectar Plants. Similar to owl's clover, goldfields (*Lasthenia californica*) cover at the Mid-WS transects dropped from 2006 to 2007, and gradually increased in 2009 and 2010. Cover increased at the Summit-WS cluster in 2009 and remained relatively constant in 2010. However, there was no owl's clover cover at the North-WS and North-SF transect clusters in 2010 (Figure 7).

Figure 7. Average Cover of Goldfields (*Lasthenia californica*), ± SE.



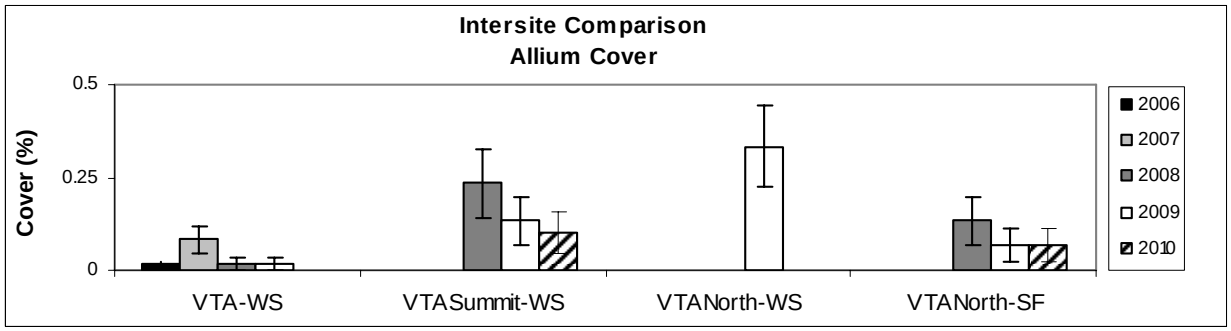
Tidy tips (*Layia gaillardioides*) cover values remained very low at all sites, which is typical of sites in the South Bay (see Year 1 Monitoring Report). The greatest cover values were detected at the Summit-WS cluster and the North-SF cluster from 2008 through 2010. Tidy tips have been hardly detectable in the Mid-WS cluster over 4 years of monitoring, and were not present at the North-WS site (Figure 8).

Figure 8. Average Cover of Tidy Tips (*Layia gaillardioides*), ± SE.



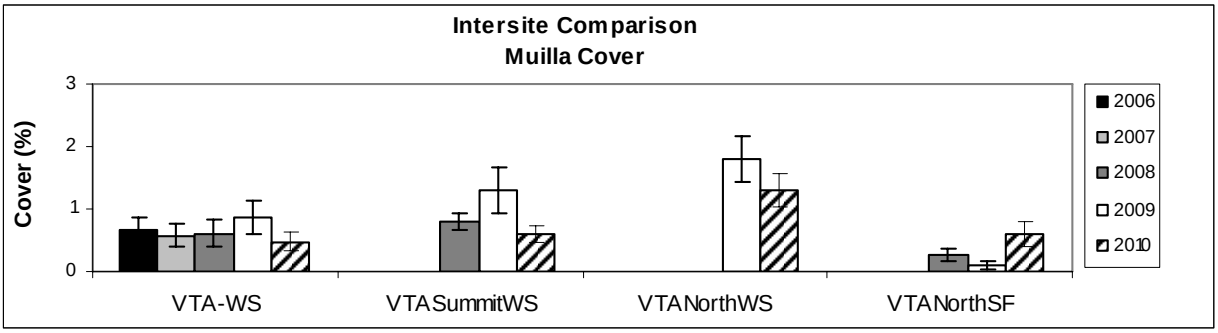
Jeweled onion (*Allium serra*) continued to show very low cover at the Summit-WS and North-SF sites and the species was not detected at the Mid-WS and the North-WS sites (Figure 9).

Figure 9. Average Cover of Jeweled Onion (*Allium serra*), ± SE.



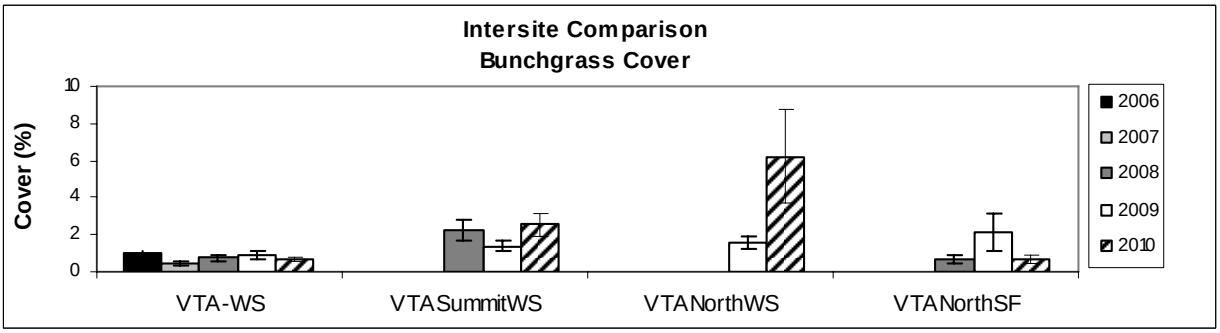
Seaside muilla (*Muilla maritima*) also had low cover values at all sites, with the North-WS transect clusters having the highest cover in 2010 (Figure 10). However, there did not appear to be a clear trend based on grazing regime, given the steady, low cover values observed across all years at the Mid-WS site.

Figure 10. Average Cover of Seaside Muilla (*Muilla maritima*), ± SE.



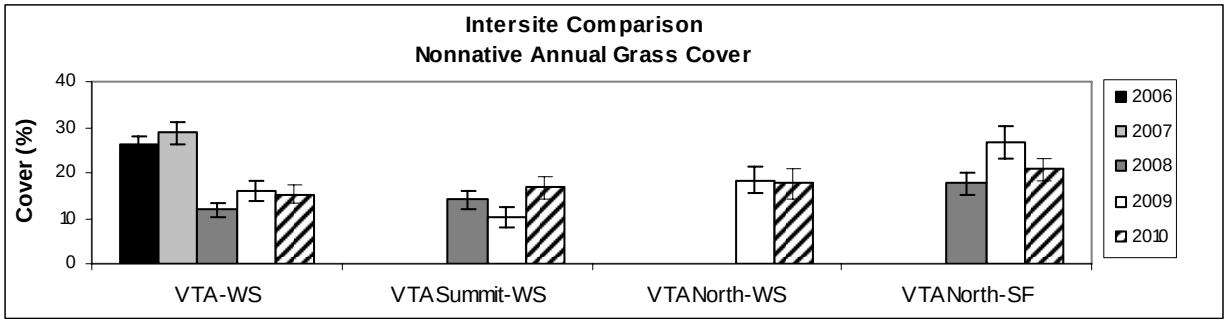
Grasses. Bunchgrass cover at the North-WS transect site increased substantially in 2010 but decreased at the North-SF transect site. Cover values at the Mid-WS site remained static across all sampling years and increased slightly at the Summit-WS site (Figure 11). All recorded perennial grasses were native, and cover values of averaged between 1-6% were observed across the VTA-Coyote Ridge Property.

Figure 11. Average Cover of Perennial Grasses, ± SE.



Total annual grass cover dropped significantly at the Mid-WS transect cluster in 2008 and has remained relatively constant in 2009 and 2010 (Figure 12). Cover values for non-native annual grasses did not vary significantly at any of the sites, with the cover ranging between 16 and 21%; these values are much higher than native perennial bunchgrass cover across the VTA-Coyote Ridge Property. Dominance by annual grasses is typical for grasslands in the South Bay. See Table 4 for the relative contributions of two key non-native annual grasses in this functional group, Italian ryegrass (*Lolium multiflorum*) and soft chess (*Bromus hordeaceus*).

Figure 12. Average Cover of Non-native Annual Grasses, ± SE.

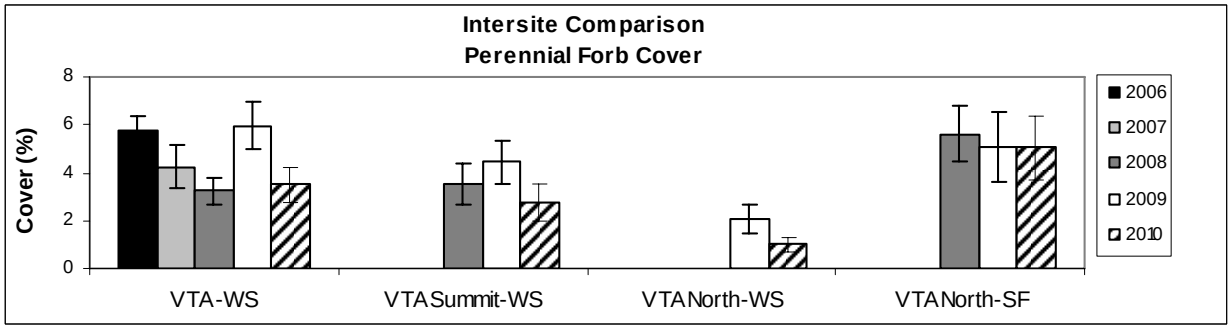


Other Functional Groups. A geophyte is a plant that has bulbs, corms, tubers, or similar underground structures. The California poppy (*Eschscholzia californica*) and blue-eyed grass (*Sisyrinchium bellum*) are two common examples. While technically a type of perennial forb, here geophytes are calculated separately from that category. Legumes are members of the pea family, which are biologically important because they have nitrogen-fixing bacteria in their root nodules. The legumes found on these sites are all technically annual forbs, but again are not double counted in that category. See Table 4 for cover values of geophytes and legumes in the VTA transect clusters in 2010.

Forbs. Forbs are herbaceous (non-woody) plants that are not grasses, sedges, or rushes. The perennial forbs are all natives, and the annual forbs are almost entirely native.

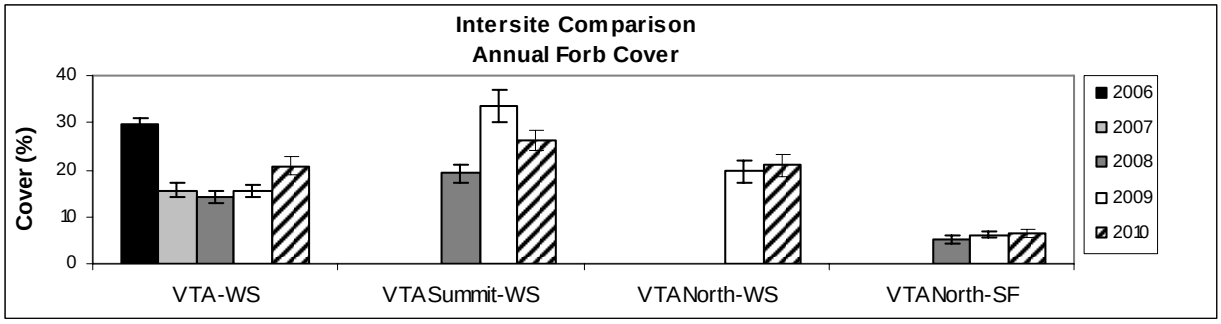
Perennial forb cover decreased at the Mid-WS site from 2006 through 2008, rebounded in 2009 and decreased sharply in 2010 back to the previous values detected in 2008. This was unlike the North-SF site, which had consistent perennial forb cover values during all sampling periods. The cover values at the Summit-WS and North-WS transect clusters decreased slightly in 2010 (Figure 13).

Figure 13. Average Cover of Perennial Forbs, ± SE.



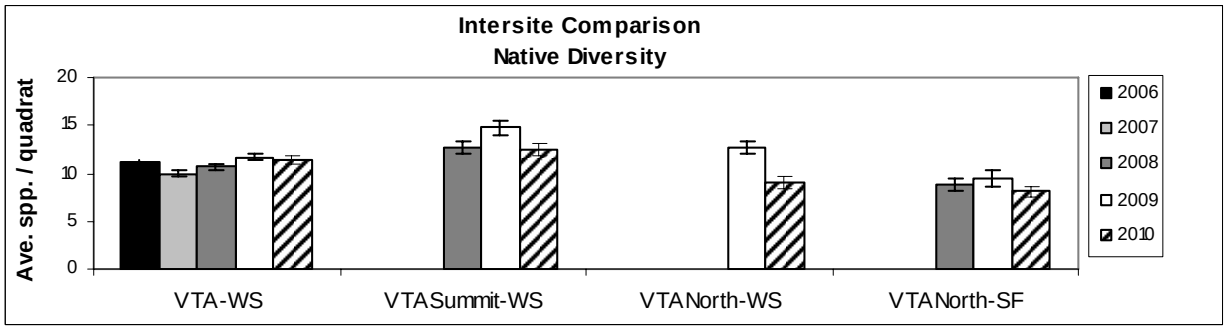
Annual forb cover at the Mid-WS site in 2007 through 2009 was about half that of 2006, but increased slightly in 2010. Annual forbs decreased at the Summit-WS site in 2010 compared to 2009; however this site had the greatest annual forb cover of all sites in 2010. The North-WS site also had high cover values for annual forbs, and again very low cover values were observed across the fence at the North-SF site (Figure 14).

Figure 14. Average Cover of Annual Forbs, ± SE.



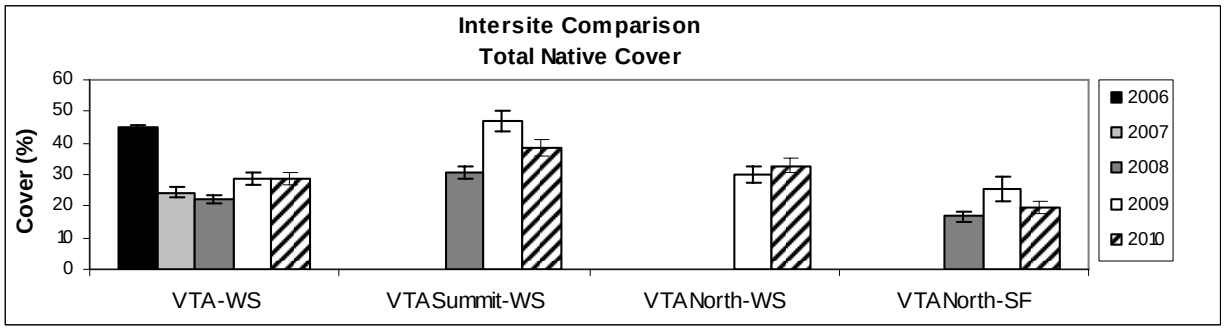
Species Richness and Plant Cover. Native species richness remained relatively constant at the Mid-WS during all years but the Summit-WS and North-WS sites experienced a decrease in 2010 compared to 2009 cover values. Native species richness at the North-SF sites remained relatively constant in 2010, with only a slight decrease compared to 2009 values (Figure 15).

Figure 15. Average Number of Native Species, ± SE.



Native species richness at the Mid-WS site remained steady from 2007-2010 after native species cover dropped by approximately 50% from 2006 to 2007 (Figure 16). In contrast, native cover decreased at both the Summit-WS and North-SF sites in 2010, after increases in 2009. Native cover was similar across the three mid-elevation sites, and has been higher at the Summit-WS site, particularly in 2009 (Figure 16).

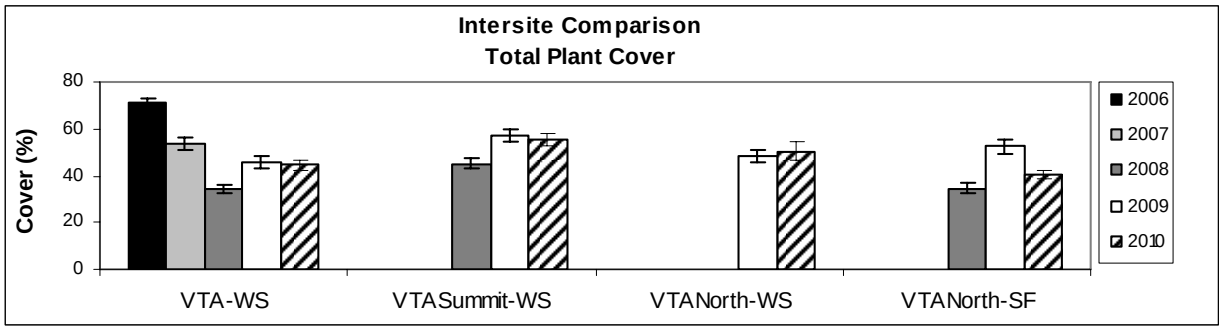
Figure 16. Average Cover of Native Species, ± SE.



Total plant cover increased across sites and grazing regimes in 2009 compared to 2008 and remained relatively constant in 2010, except at North-SF, where cover decreased significantly

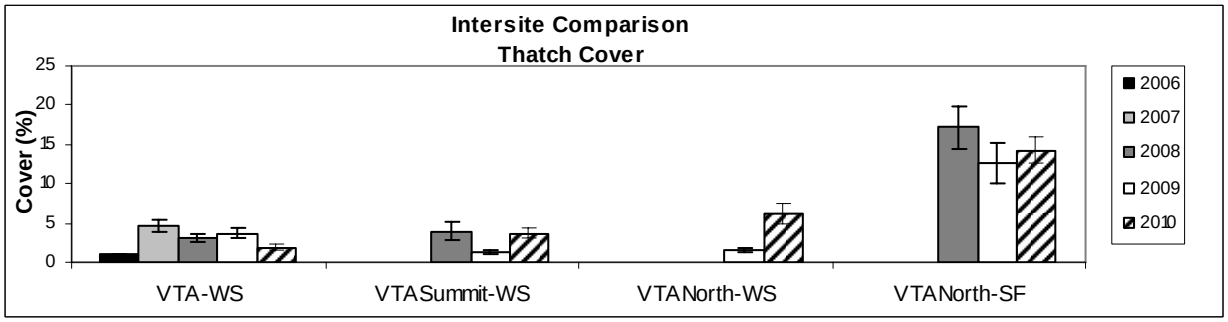
(Figure 17). Native cover and total plant cover has been relatively similar across the northern fenceline between the North-WS and North-SF sites. This is one of the few measured parameters that did not show obvious differences between management regimes, even under different annual weather patterns. This apparent "equilibrium" may be ascribed to the competitive tradeoff between native species and non-natives — predominantly annual grasses.

Figure 17. Average Total Plant Cover, ± SE.



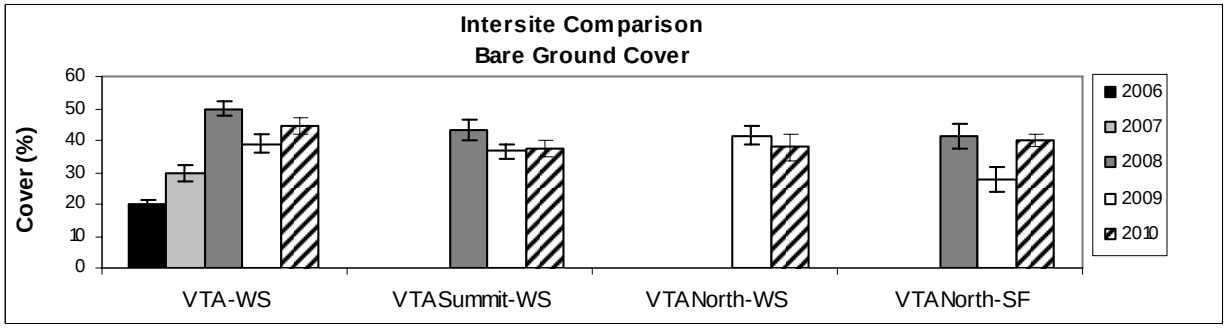
Abiotic. Similar to previous years, thatch cover in 2010 was much higher at the North-SF site than at other sites (Figure 18). Thatch cover decreased slightly at the Mid-WS site but increased at the Summit-WS and North-WS sites.

Figure 18. Average Cover of Thatch, ± SE.



Bare ground cover increased at the Mid-WS and North-SF sites, remained constant at Summit-WS, and decreased slightly at the North-WS site (Figure 19).

Figure 19. Average Bare Ground Cover, ± SE.



Discussion

Bay checkerspot host and nectar plant cover remained low across sites in 2010. Many of these species, such as jeweled onion, owl's clover, and seaside muilla, exhibited low cover in most years (i.e., less than 3% cover). Goldfields appear to be more abundant at the Mid-WS and Summit-WS sites but are generally represented in low numbers, if present at all, at the North-WS and North-SF sites.

The two northern VTA sites (North-WS and North-SF) offer an interesting comparison because they are located across the fenceline from each other. The North-WS (grazed in winter-spring) site boasted excellent bay checkerspot host and nectar sources, having the highest cover values for dwarf plantain and goldfields of all VTA sites in 2009 but in 2010 no goldfields were located during sampling. This site experienced a significant increase in bunchgrass cover. This site also had generally low thatch and high bare ground cover values, and moderate cover of annual forbs and native plants. The North-SF site (grazed intermittently spring-fall) generally has had the lowest cover of checkerspot host plants since monitoring began in 2006. Most of the plant species providing Bay checkerspot nectar sources had low cover values, although the North-SF site did have high cover value for tidytips in 2009 and 2010, and was similar to the Summit-WS site in those years. The North-SF site had the highest cover values for annual grass and thatch (ecological indicators that tend to decrease in high-quality serpentine habitats), and the lowest cover values for annual forbs and relatively low values for bare ground (indicators that tend to be positively associated with high-quality serpentine habitats). However, the North-SF site has had consistently high values of perennial forbs and moderate values of native species.

GRAZING AND GRAZING INFRASTRUCTURE

Tracking cattle stocking rates on the VTA-Coyote Ridge Property allows the correlation of grazing intensity with habitat characteristics. In addition, the maintenance of grazing infrastructure is important both for the cattle and the ranching operation and to ensure adequate grazing management for habitat purposes.

The ranching lessee tracks the livestock stocking rate (i.e., the number of cattle/acre) on the VTA-Coyote Ridge Property. The rancher continuously monitors fencelines and other infrastructure (e.g., troughs) and maintains and repairs such features as necessary. When on the Preserve, staff of the SCCOSA and the Creekside Center for Earth Observation also note and report to the rancher any grazing infrastructure problems or maintenance needs observed.

On 15 December 2009, 255 cows and 14 bulls were moved onto the property and remained there until 8 May 2010. A herd of 20 cows remains on the ridge year-round. In 2008 and 2009, livestock stocking rates were approximately one cow-calf pair per 10 acres, thus the number of cows on the site in 2010 represents a considerable increase in grazing pressure compared to previous years.

The only infrastructure work that was performed on the VTA property by SCCOSA staff in 2010 was the repair to gate (VTA02) that was damaged by PG&E in 2009. Fences and other infrastructure on the Preserve are repaired as needed, and no change to the way in which such infrastructure is maintained is recommended at this time.

BAY CHECKERSPOT BUTTERFLY

The bay checkerspot butterfly is a federally threatened subspecies closely associated with serpentine grasslands, which support its larval food plants and adult nectar sources. The grazing program at the VTA-Coyote Ridge Property is intended to manage the serpentine grasslands on the Preserve specifically for the benefit of this species and for rare, serpentine-associated plants. The RMP requires monitoring of bay checkerspot populations on the site to ensure that long-term stewardship of the Preserve continues to benefit special-status serpentine-associated species, and to identify the nature of (and need for) any modifications to the management program that become necessary to protect these species.

This section provides current (2010) bay checkerspot butterfly population estimates. See the Year 1 Monitoring Report for a discussion and background on population dynamics on the VTA-Coyote Ridge Property and adjacent areas of Coyote Ridge, which allows observed population fluctuations to be placed in the context of spatial and temporal variability.

Methods

The basic method of population estimation is timed counts of larvae in a stratified sampling design (Murphy and Weiss 1988). The methods are described fully in the Year 1 Monitoring Report.

The VTA property is divided into four larval population zones (Figure 20). A total of 56 sites were sampled among the four population zones in 2010. Per the RMP, if no larvae are found in an area, then reconnaissance-level surveys for adults are conducted to establish presence-absence. Because larvae were found in each of the four larval population zones within the Coyote Ridge property in 2010, no adult surveys were conducted.

Results

The total number of larvae across the VTA property is on the order of 10,000, and was almost evenly divided between the three major population zones (i.e., VTA-Low, VTA-High 1, VTA-High 2). VTA-Mid was sparsely populated, with low hundreds of larvae at best, similar to previous years. Larval numbers in 2010 were similar to those from 2009, with only minor fluctuations observed (Figures 21-24).

Figure 20. Bay Checkerspot Larval Population Zones on Coyote Ridge Property.

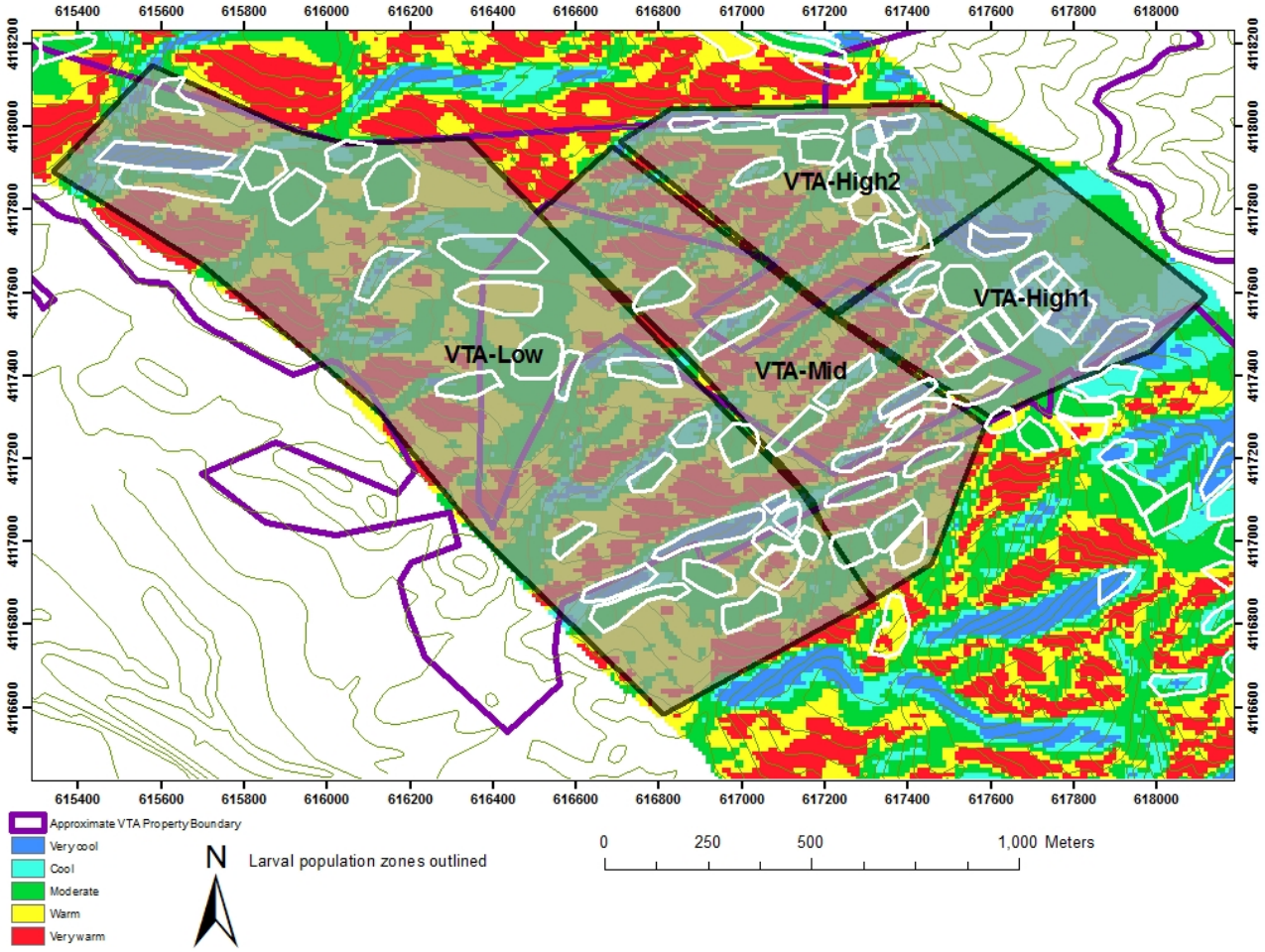


Figure 21. Bay Checkerspot Larval Densities in 2010.

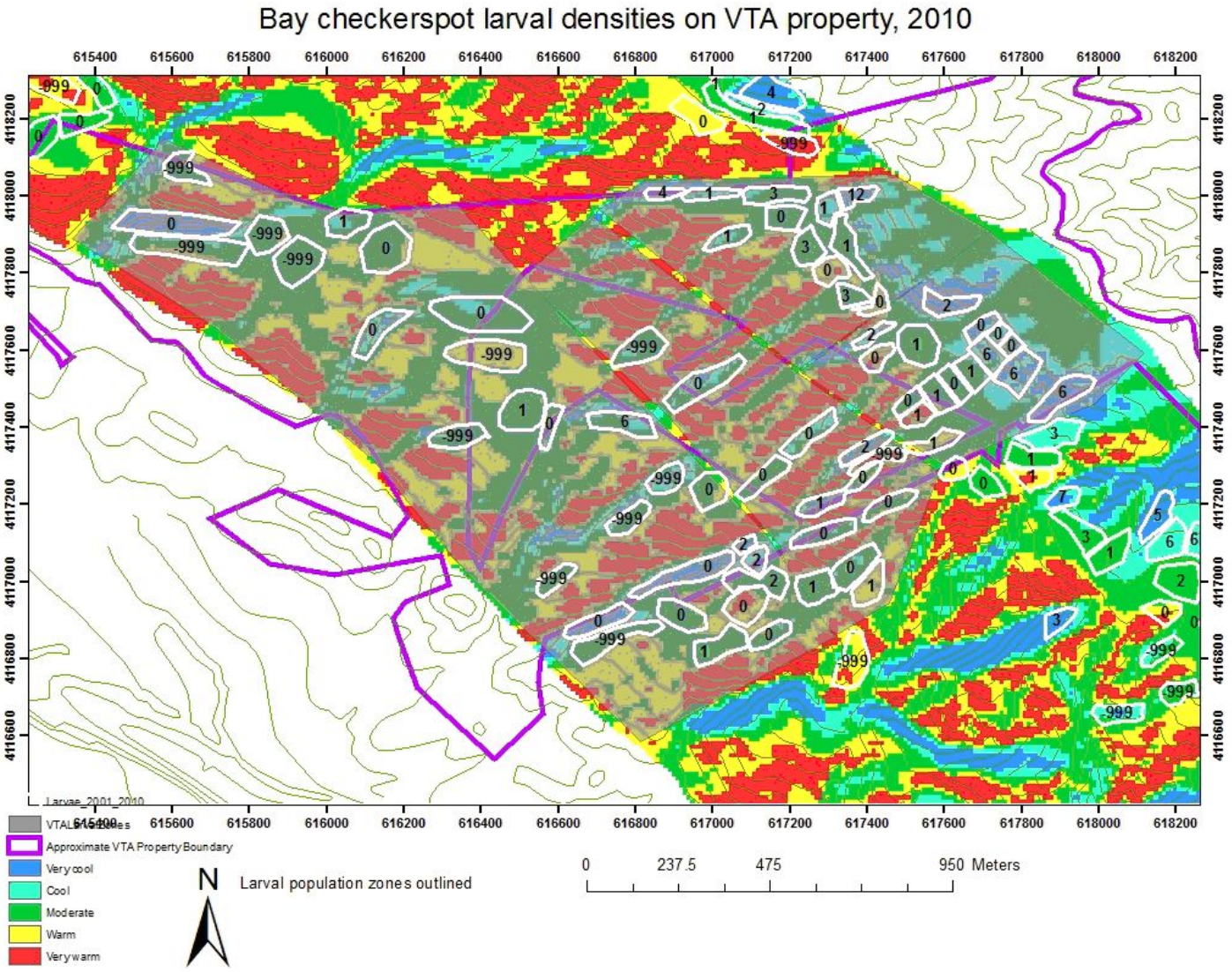


Figure 22. Bay Checkerspot Population History in VTA Population Zone VTA-High1, ± 95% CI.

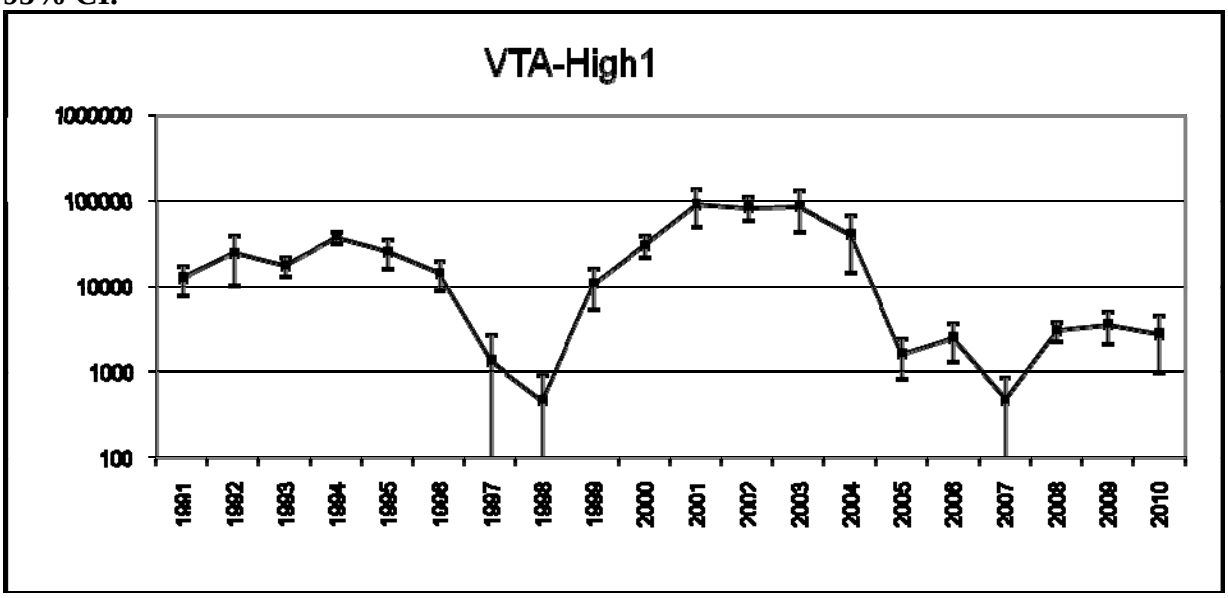


Figure 23. Bay Checkerspot Population History in VTA Population Zone VTA-High2, ± 95% CI.

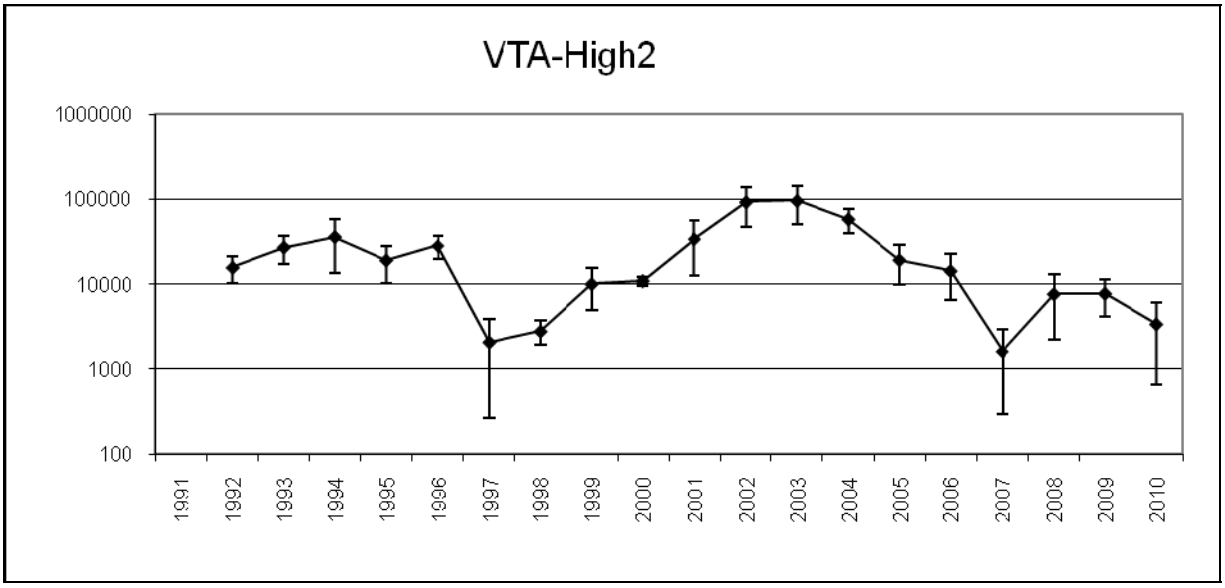
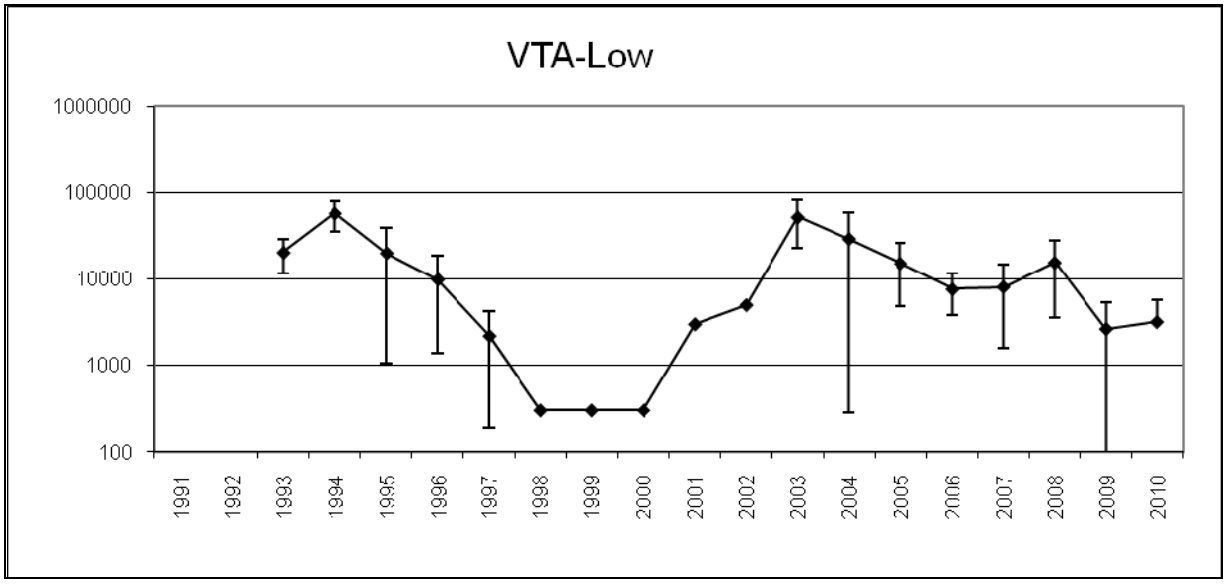


Figure 24. Bay Checkerspot Population History in VTA Population Zone VTA-Low, ± 95% CI.



Discussion

All the changes of larval densities are well within normal fluctuations (historical context and comparisons with other populations can be found in the RMP and first annual report). The resilience of these populations through three consecutive dry winters (2007-2009) is encouraging. The 2009-2010 rainy season was an El Nino year, with above average precipitation, early germination from heavy rains in October, heavy rains in mid-winter, and a long extended spring with cool temperatures and intermittent moderate rainfall. Postdiapause larvae had an abundance of hostplants in the winter. The cool April in 2010, was the major determinant of late hostplant senescence. Hostplants (including extensive stands of *Castilleja densiflorus* and *C. exserta*) senesced relatively late (mid-May on flats, late may on the coolest slopes) compared with the peak adult flight (mid-April), leading to high potential for prediapause survival. These effects may have been countered by the high number of rainy days in April, which can increases adult, egg, and prediapause larval mortality, but rainy periods were short and interspersed with periods of sunny days. Monitoring in 2011 will determine whether the events will produce a net gain or loss for bay checkerspots on Coyote Ridge. We can tentatively predict an increase in numbers in 2011.

SANTA CLARA VALLEY DUDLEYA

The Santa Clara Valley dudleya is a federally endangered, perennial, succulent herb endemic to the ultramafic formations (serpentinite and peridotite) of the Santa Clara Valley. On the VTA-Coyote Ridge Property, Santa Clara Valley dudleya is concentrated on areas of serpentine bedrock that were exposed or fractured relatively recently. This type of substrate is found along recent roadcuts, on the eroded banks of drainages, and on scree piles associated with several old mine trenches. Plants also occur on "islands" of exposed bedrock within the larger matrix of serpentine grassland along the ridgeline. The grazing program at the VTA-Coyote Ridge Property is intended to manage the serpentine grasslands on the property specifically for the

benefit of rare, serpentine-associated plants such as the dudleya without leading to excessive grazing that might adversely affect dudleya populations. The RMP requires monitoring of dudleya populations on the site to ensure that long-term stewardship of the Preserve continues to benefit special-status serpentine-associated species, and to identify the nature of (and need for) any modifications to the management program that become necessary to protect these species.

Methods

Five permanent Santa Clara Valley dudleya monitoring plots were established in areas supporting dudleya stands on the Coyote Ridge Property during Year 1 monitoring. These locations are appropriate for long-term monitoring of this species on the VTA-Coyote Ridge Property, representing a diversity of slopes, aspects, and elevations. Each station is located in a different physiographic position, and the plots represent a diversity of slopes and aspects. Metal rebar stakes were installed in the corners of the monitoring plots and a GPS unit was used to record each plot location; these locations are shown on Figure 3.

SCCOSA Field Technician David Tharp performed sampling in these plots on 11 and 13 April 2010. For each plot, a 1-m^2 quadrat constructed of PVC material was placed on the ground, four consecutive times and oriented to form a 4-m^2 square plot. Within this plot, the number of Santa Clara Valley dudleya plants was counted. In addition to individual plants counted, health and vigor was estimated on a scale of one to three, with one measuring less than 1 inch in plant size, two measuring less than 2 inches in plant size, and three measuring greater than 3 inches in plant size.

In addition, in the spring of 2010 SCCOSA staff took on the responsibility of recording the location and mapping of dudleya throughout the VTA managed property.

Results

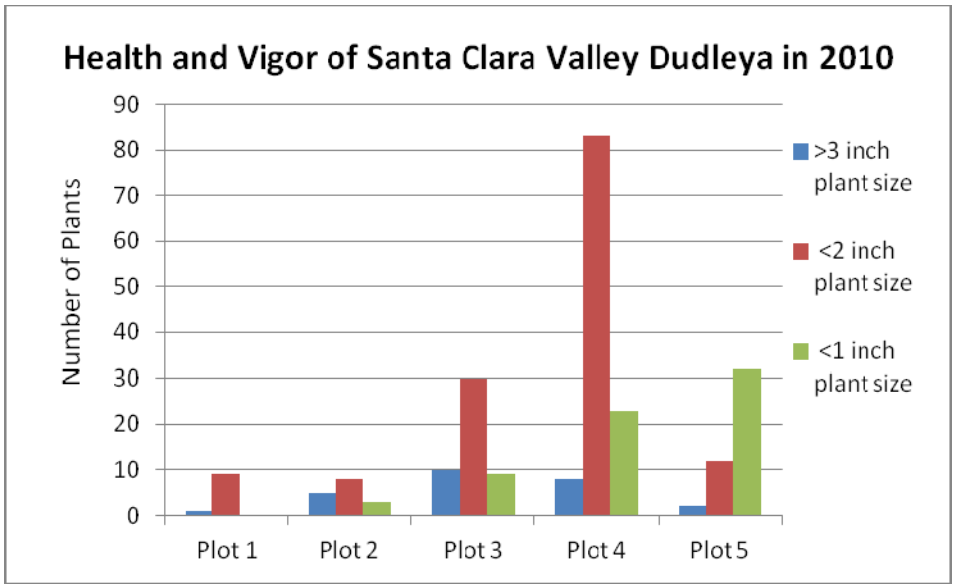
Results of the Year 4 Santa Clara Valley dudleya monitoring effort are shown in Table 5.

Table 5. Total Numbers of Santa Clara Valley Dudleya by Plot for 2010 Monitoring.

Plot Number	Total Plants 2010
1	10
2	16
3	49
4	114
5	44
Total	**233**

The mean density of dudleya plants in 2010 was approximately 46.6 plants/plot, or 11.7 plants/m^2. Grazing was observed on several individuals in Plots 1 and 3. Evidence of cattle and/or other hooved ungulates such as hoof punch, manure and uprooted plants was present in Plots 1, 3, 4, and 5. A summary of health and vigor data for Santa Clara Valley dudleya is provided in Figure 25.

Figure 25. Health and Vigor (HV) for Santa Clara Valley Dudleya, Year 4 Monitoring.



Throughout the entire site, SCCOSA staff estimated the total number of dudleya plants on the VTA property to exceed 10,000 individuals. All populations of dudleya that SCCOSA staff observed this spring appeared to be very healthy and most populations were classified as excellent. This is the result of several factors, which include an extended amount of cool weather and rainfall, the timing of cattle grazing, and the aggressive management of non-native species throughout the site.

Discussion

The count of 233 plants on the five monitoring plots, compared to the 111 plants recorded on these plots during Year 3 monitoring in 2009, represents a substantial increase in the population. Cattle grazing does not appear to be adversely affecting dudleya populations on the Preserve.

MT. HAMILTON THISTLE

Mt. Hamilton thistle (*Cirsium fontinale* var. *campylon*) is a perennial herbaceous moisture-loving plant restricted to seeps and creek channels on serpentine soils in Santa Clara, Alameda and Stanislaus counties. On Coyote Ridge, this species occurs within drainages that are recharged by seeps or on sedimentary soils that are influenced by adjacent serpentine seeps. Mt. Hamilton thistle is listed as a CNPS List 1B (plants rare, threatened, or endangered in California and elsewhere) special-status plant species by the California Native Plant Society. On the VTA-Coyote Ridge Property, large occurrences of Mt. Hamilton thistle are present in nearly all the creeks and seeps that drain the southwest-facing serpentine slopes. Management of Mt. Hamilton thistle on the VTA-Coyote Ridge Property is focused on conserving and protecting existing populations.

Methods

Five permanent Mt. Hamilton thistle monitoring plots were established in several seeps and drainages within the study area during Year 1 monitoring. These locations are appropriate for long-term monitoring of this species on the VTA-Coyote Ridge Property. Each station is located in a different drainage, and the plots represent a diversity of slopes and aspects. Metal rebar stakes were installed in the corners of the monitoring plots and a GPS unit was used to record each plot location; these locations are shown on Figure 3.

SCCOSA Field Technician David Tharp performed sampling of these plots on 10 and 11 April 2010. For each plot, a 1-m^2 quadrat constructed of PVC material was placed on the ground, four consecutive times and oriented to form a 4-m^2 square plot. Within this plot, the number of Mt. Hamilton thistle plants was counted. In addition to individual plants counted, health and vigor was estimated on a scale of one to three, with one measuring less than 1 inch in plant size, two measuring less than 2 inches in plant size, and three measuring greater than 3 inches in plant size.

In addition, in the spring of 2010 SCCOSA staff took on the responsibility of recording the location and mapping of Mt. Hamilton thistle throughout the VTA managed property.

Results

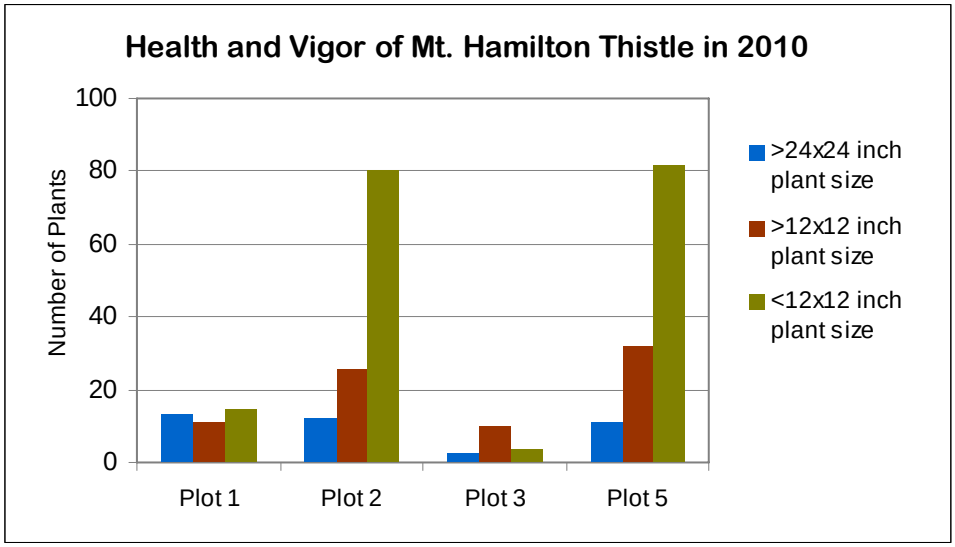
Results of the Year 4 Mt. Hamilton thistle monitoring effort are shown in Table 6.

Table 6. Total Numbers of Mt. Hamilton Thistles by Plot for 2010 Monitoring.

Plot Number	Total Plants 2010
1	39
2	115
3	17
4	>400
5	125
Total	**>696**

The mean density of thistle plants was over 139 plants/plot, or 35 plants/m^2. The high density of individuals in Plot 4 (>400) skews this number much higher than in the remaining four plots, where the mean density is 79 plants/plot, or 18.5 plants m^2. Evidence of cattle hoof punch was noted in three of the five plots, including the extremely dense Plot 4. No grazing was observed in the five plots. A summary of health and vigor data is provided in Figure 26.

Figure 26. Health and Vigor for Mt. Hamilton Thistle, Year 4 Monitoring.



*There are over 400 individuals in Plot 4 thriving in all three size classes.

Plot 4 was omitted from Figure 26 because the Mt. Hamilton thistle population has overgrown the transect. As a result, the Field Technician did not attempt to enter and locate the transect within the population. The population at Plot 4 is very large and robust, with many large plants. More than 400 individuals represented by all levels of growth were present within this population. Current recommendations regarding specific changes in the rare plant monitoring protocol will address and correct this for future monitoring.

Throughout the entire site, SCCOSA staff estimated the total number of Mt. Hamilton thistle plants on the VTA property to exceed 50,000 individuals. All populations that SCCOSA staff observed this spring appeared to be very healthy and most populations were classified as excellent.

Discussion

The count of over 696 plants on the five monitoring plots, as compared to the count of 289 plants in 2009, indicates the population is increasing. Cattle grazing does not appear to be adversely affecting Mt. Hamilton thistle populations on the Preserve. Wooly, spiny mature plants are unpalatable to livestock. However, this species can be consumed by goats, which were used in grazing management for lower portions of the Preserve, close to U.S. 101. During those grazing efforts, goats were restricted by temporary fencing from grazing along drainages containing thistle, and no goat grazing damage to this species was noted.

MOST BEAUTIFUL JEWELFLOWER

Most beautiful jewelflower (*Streptanthus albidus* ssp. *peramoenus*) is an annual herbaceous plant that occurs primarily on serpentine soil formations around the San Francisco Bay Area including the Diablo Range and in Monterey County. Although not a state or federally listed plant, most beautiful jewelflower is listed as a CNPS List 1B plant species (i.e., a plant that is rare, threatened or endangered in California and elsewhere) by the California Native Plant Society.

On the VTA-Coyote Ridge Property, most beautiful jewelflower is extremely abundant within serpentine grassland on the ridge and southwestern slopes, along roadcuts and drainage channels, and within coastal sage scrub habitat. Fewer plants are present northeast of Coyote Ridge where serpentine intergrades with clay soils and the cooler, moisture microclimate favors the growth of non-native grasses. The grazing program at the VTA-Coyote Ridge Property is intended to manage the serpentine grasslands on the property specifically for the benefit of rare, serpentine-associated plants such as the most beautiful jewelflower without leading to excessive grazing that might adversely affect jewelflower populations. The RMP requires monitoring of most beautiful jewelflower populations on the site to ensure that long-term stewardship of the Preserve continues to benefit special-status serpentine-associated species, and to identify the nature of (and need for) any modifications to the management program that become necessary to protect these species.

Methods

Five permanent monitoring plots were established in select locations on serpentine soils within the study area. An effort was made to stratify the plots by slope and aspect, but otherwise plot locations were determined randomly. Metal rebar stakes were installed in the corners of the monitoring plots and a GPS unit was used to record each plot location; these locations are shown on Figure 3.

SCCOSA Field Technician David Tharp performed sampling in these plots on 10, 11, and 13 April 2010. For each plot, a 1-m^2 quadrat constructed of PVC material was placed on the ground, 4 consecutive times and in an orientation to form a 4-m^2 square plot. Within this plot, individual most beautiful jewelflower plants were counted.

Results

Results of the Year 4 most beautiful jewelflower monitoring effort are shown in Table 7.

Table 7. Total Numbers of Most Beautiful Jewelflower by Plot for 2010 Monitoring.

Plot Number	Total Plants 2010
1	0
2	0
3	1
4	3
5	0
Total	**4**

Health and vigor data were not collected due to the minimal number of plants identified within the survey plots. It was noted that 10 individuals were identified within 10 meters of four of the plots. No evidence of grazing or uprooting was found within the survey plots, although a hoof punch was noted in Plot 4.

The mean density of most beautiful jewelflower plants was approximately 0.8 plants/plot, or 0.2 plants/m^2. Unlike Mt. Hamilton thistle, which principally occurs in discrete populations within

drainages, most beautiful jewelflower is widely scattered throughout the upland serpentine areas on-site, making it difficult to estimate population size over the entire site.

Discussion

The count of only four plants on the five monitoring plots, as compared to the count of 86 plants on these plots during in 2009, indicates the population is erratic. As noted above, a larger sample size (in terms of number of plots) would be needed to accurately estimate the total population size within the VTA-Coyote Ridge Property. The habitats supporting the plants appeared to be grazed appropriately, and thus there is no obvious reason for such a decline.

SMOOTH LESSINGIA

Smooth lessingia (*Lessingia micradenia* var. *glabrata*) is an erect annual herbaceous plant endemic to serpentine soils in Santa Clara County. It is a delicate, many-branched plant with thread-like leaves along the stem and small, white-to-lavender flowers that are produced in late summer (July through September). Smooth lessingia is listed as a CNPS List 1B plant species (i.e., a plant that is rare, threatened or endangered in California and elsewhere) by the California Native Plant Society. On the VTA-Coyote Ridge Property, smooth lessingia occurs within grassland along the toe of the southwestern slopes, and presumably within areas of coastal sage scrub and chaparral. Farther upslope, the population grades into the common slender-stemmed lessingia (*Lessingia nemaclada*; Don Mayall, pers. comm. 2005). The RMP specifies that incidental observations of smooth lessingia made during other special-status plant monitoring efforts will be compiled and that evidence of declines in abundance or threats from grazing or invasive species will be noted. If numbers appear to be declining, more focused surveys could be conducted and/or remedial measures identified.

Results of a taxonomic analysis for lessingia voucher specimens collected along the lower western shoulder of Coyote Ridge in 2007 revealed that some of these plants were approaching the phenotype of smooth lessingia while some were more obvious hybrids between smooth lessingia and slender-stemmed lessingia (Staci Markos, pers. comm. 2007). None of the specimens appeared to be "pure" smooth lessingia. However, observations by H. T. Harvey staff in 2007 documented the presence of what are likely to be primarily smooth lessingia throughout much of the lower elevations of the Coyote Ridge Property.

Methods

SCCOSA staff recorded observations of lessingia while performing activities on the site in 2010.

Results

Extensive populations of lessingia were observed throughout the site in 2010. Because of the difficulty of distinguishing between smooth lessingia and slender-stemmed Lessingia, SCCOSA staff collected samples at different locations throughout Coyote Ridge to submit to Staci Markos at the Jepson Herbarium for positive identification. Markos identified all these specimens as smooth lessingia (Staci Markos, pers. comm. 2011).

Discussion

No obvious differences in distribution of lessingia were noted between 2009 and 2010, and because all of the populations of observed lessingia on serpentine are extensive, no change in management is recommended. At this time, site management, including grazing, does not appear to be adversely affecting this species, and rather, the species appears to be responding well to managed grazing.

SAN FRANCISCO WALLFLOWER

San Francisco wallflower (*Erysimum franciscanum*) is a biennial herb/subshrub associated with serpentine or granitic substrates within a variety of plant communities. The range of San Francisco wallflower includes Marin, Santa Clara, Santa Cruz, San Francisco, San Mateo, and Sonoma counties. San Francisco wallflower is listed as a CNPS List 4 plant species (i.e., a plant of limited distribution) by the California Native Plant Society. Populations are typically associated with exposed areas of little soil development, including serpentine outcrops and granitic cliffs. San Francisco wallfower reportedly occurs on the VTA-Coyote Ridge Property (Don Mayall, pers. comm. 2005), and elsewhere on Coyote Ridge, San Francisco wallflower has been observed within the California sagebrush/California poppy association and various serpentine grassland associations (Evans and San 2004). The RMP specifies that incidental observations of San Francisco wallflower made during other special-status plant monitoring efforts will be compiled and that evidence of declines in abundance or threats from grazing or invasive species will be noted. If numbers appear to be declining, more focused surveys could be conducted and/or remedial measures identified.

Methods

SCCOSA staff recorded observations of San Francisco wallflower while performing activities on the site in 2010.

Results

For the 2010 growing season the heaviest concentrations of San Francisco wallflower were observed in the southern area of the VTA property, and in some of these locations the populations would be considered robust.

Discussion

Occurrences of San Francisco wallflower on the site suggest that the species' populations on the site are stable. The areas where the species is the most dense are along old road cuts and do not seem to have any adverse response to grazing pressure. In the future, SCCOSA staff may provide more accurate mapping and GPS locations of the species.

EROSION PROBLEMS AND FERAL PIGS

The degradation of habitat quality resulting from erosion and rooting by feral pigs could potentially have adverse effects on biological resources at the VTA-Coyote Ridge Property. Erosion could also damage on-site roads. As a result, problems resulting from erosion and feral

pigs are noted during monitoring so that they can be addressed as needed. Staff of the SCCOSA and the Creekside Center for Earth Observation were on the lookout during 2010 monitoring for erosion issues, damage caused by feral pigs, and damage by grazing animals to sensitive habitat.

During the winter/spring season of 2010 there were two separate incidents on the Ridge Road where a vehicle was driven on a very wet surface causing considerable damage to the road in the form of deep ruts. These vehicles appeared to drive off road a considerable distance to avoid standing water and the slippery road surface. SCCOSA staff never observed the vehicle or vehicles that caused this damage.

Also, a deep cut in the surface along an old road near the Coyote Creek Golf Course was made by heavy winter rains and resulting flows. However, the only recommended action is to continue to monitor this location.

The De Anza College Environmental Science Department has several wildlife monitoring stations located on the VTA property. By using remote sensing cameras they have recorded images of feral pigs at several locations and SCCOSA staff have noted rooting in adjacent areas. At this time, the pig population appears to be small and stable; however, SCCOSA will continue to monitor the population size and impacts on biological resources at the Preserve.

CALIFORNIA RED-LEGGED FROG

The VTA-Coyote Ridge Property includes a ±98-acre site, located east/northeast of the U.S. 101/Coyote Creek Golf Drive intersection, that had been preserved by Castle & Cooke as mitigation for impacts to the California red-legged frog from expansion of the Coyote Creek Golf Course (BonTerra Consulting 1999). This parcel includes two perennial stream systems and associated wetlands that provide potential red-legged frog habitat. Red-legged frogs are known to breed in wetlands along the Kirby Canyon Landfill entrance road south of the VTA-Coyote Ridge Property, and red-legged frogs are expected to use drainages on the VTA-Coyote Ridge Property as summer aquatic refugia, foraging and dispersal habitat, and possibly as breeding habitat. To ensure that management of the property maintains suitable habitat for red-legged frogs within this 98-acre area, focused surveys for red-legged frogs will be conducted every two years in this area, both to detect frogs and to determine whether conditions remain suitable for the species' use. California red-legged frog surveys were conducted in 2009, and thus no formal surveys were conducted in 2010, as the RMP requires sampling every other year.

However, in 2010, SCCOSA staff incidentally observed seven red-legged frogs during monitoring activities. These locations were also recorded with a sub meter GPS unit (Trimble XT) and mapped for species inventory. The locations of these frogs are recorded in Table 8.

The sightings of red-legged frogs by SCCOSA staff indicate that this species continues to use the Preserve in moderate numbers. These individuals are likely dispersants from the Kirby Canyon Landfill wetlands and red-legged frog pond. Such individuals are expected to occur in low numbers on the Preserve, using drainages as non-breeding aquatic habitat. During the wet season in particular, red-legged frogs likely disperse overland among these drainages, crossing the grasslands along the southwestern slope of the VTA-Coyote Ridge Property.

Table 8. Locations of California Red-legged Frogs Observed During 2010 Monitoring.

Frog Number	Latitude	Longitude	Elevation (m)
1	37.192531992	-121.690484788	123
2	37.190195890	-121.690379608	110
3	37.193349734	-121.687618157	113
4	37.187132210	-121.683921270	32
5	37.192454455	-121.690563976	121
6	37.193501035	-121.679846142	225
7	37.146151017	-121.774887116	220

SCCOSA staff also located and removed several live amphibian pit traps at four different locations on the VTA property. There were no animals observed in these traps and they appeared to have been unused for an extended period of time. SCCOSA staff have no record of permits being issued for these traps and do not know who placed them on the Preserve.

ADDITIONAL WILDLIFE OBSERVATIONS

Tule elk (*Cervus canadensis nannodes*) were observed on the site on three different days in the spring of 2010 by SCCOSA staff. The elk were observed near the Coyote Creek Golf Club, the northern boundary with the UTC property, and the eastern boundary with Anderson Reservoir. Respectively the herd size varied 18, 38, and 42. These animals were observed with a mix of cows, calves and bulls.

Additionally, the De Anza College Environmental Science Department has reported many species of wildlife in their camera trap locations. The species include American badger (*Taxidea taxus)*, mountain lion (*Puma concolor*), bobcat (*Felis rufus*), coyote (*Canis latrans*), burrowing owl (*Athene cunicularia*), and tule elk.

INVASIVE PLANTS

Invasive annual grasses represent the greatest threat to the diversity of native serpentine plant communities and the persistence of populations of special-status serpentine-associated species on the VTA-Coyote Ridge Property. Most such grasses can be managed through grazing, as described previously. However, some invasive plants, including yellow star-thistle (*Centaurea solstitialis*), Italian thistle (*Carduus pycnocephalus*), purple star-thistle (*Centaurea calcitrapa*), and barbed goatgrass (*Aegilops triuncialis*), are less palatable to livestock. These species present a serious invasion risk to sensitive native grasslands, and infestations of these species may need to be controlled by means other than grazing.

Among these four species, barbed goatgrass represents the greatest threat on the Preserve, given the extent of infestations observed elsewhere on Coyote Ridge. Barbed goatgrass is regarded among the wildland weed community as particularly invasive and difficult to control. It sets seed later than most annual grasses, remaining green into May or June in most years. The seeds remain viable in the soil for two or more years. Its roots reach deeper than many other annual grasses, allowing it to use high amounts of soil moisture and further enhancing its competitive ability. Goatgrass can decrease forage production in rangelands from 50 to more than 75%,

especially after it flowers and develops its sharp, long, barbed awns. Heavy grazing, either throughout the season or in short durations, appears to increase density. It can be dispersed by livestock, wild animals, people, and vehicles. Roads provide key invasion routes at Coyote Ridge.

Known Distribution of Barbed Goatgrass on Coyote Ridge

Regionally, the infestation is estimated to be on the order of hundreds of acres, although the entire ridge has not been mapped. Many of the PG&E towers along the lower ridge have populations of goatgrass near them (Heath Bartosh, pers. comm., 2007). The infestations cross property lines, and are known from the VTA Coyote Ridge property, Silicon Valley Land Conservancy, UTC, Kirby Canyon Butterfly Trust, Santa Clara County Parks, and Young Ranch properties.

The VTA property infestation on the top of the ridge is less than 5 acres, and is thus considered controllable. The large infestation on UTC property to the north, however, presents a source that is threatening to continually invade into neighboring parcels. It is unknown at this point whether goatgrass infests other areas of the Coyote Ridge property.

A comprehensive goatgrass management plan for Coyote Ridge was designed and implemented by the CCEO and SCCOSA. This U.S. Fish and Wildlife Service-approved plan uses a combination of spraying graminicide, burning, handpulling, and string cutting. Tarping and flaming may also be considered in the future. The predicted effects of treatment on bay checkerspots, their host and nectar plants, and other sensitive species have been taken into consideration and are detailed in the management plan (Weiss and Niederer 2007).

Methods

Areas along the ridgetop infested with barbed goatgrass were treated with the graminicide Envoy, which is approved for wildland and rangeland use, in the springs of 2006, 2007, and 2008. Spraying was followed up with string cutting in 2008. In 2008, 2009, and 2010, sprayed areas have been followed up with hand pulling.

For the 2010 season, SCCOSA staff focused on the control of yellow star thistle and purple star thistle in several locations throughout the VTA property. The entrance to the Landfill, around the boundary with Coyote Creek Golf Course, and the main road on the east side of the Ridge were treated to control these species. These areas were treated with a combination of controls, including mechanical, herbicide, and livestock (goats and sheep).

During two days in late June and one day in early July, several control areas were sprayed with the specialty herbicide Milestone VM, which is approved for wildland and rangeland use. The locations of the control areas were then recorded with a sub-meter GPS (Trimble XT) unit and the sites were monitored throughout the remaining grow season. Any plants that resprouted were removed using manual methods (i.e., hand pulling). These areas will be revisited and assessed during the 2011 growing season.

Areas that were considered sensitive (e.g., rare species present, wetland areas) were treated with mechanical and manual methods (i.e., weed whip, hand pulling) and those locations were recorded with a GPS unit and subsequently monitored throughout the remaining growing season. Follow up control was minimal and effective; these areas will also be monitored for invasive re-growth in the 2011 growing season.

From 6 May to 26 June 2010, SCCOSA used goats and sheep from Star Creek Ranch to graze approximately 85 acres on the VTA property. These animals were used because of their ability to graze specific areas. There were approximately 1000 animals (500 adults and 500 kids-lambs), as well as several dogs and a shepherd present on the site during grazing. This was the second year these animals were used in the area adjacent to, and south of, the golf course.

Results

In 2010, barbed goatgrass was detected at a few locations along the ridgeline on the site, with additional colonies found near the UTC/VTA border (Figure 27). These were mapped and hand pulled. Limited mapping forays off the ridgetop have not located goatgrass (Figure 27).

The 2006 spraying of barbed goatgrass was not successful, probably because it was done too late in the season. The next two years of spraying with Envoy, plus a year of string cutting, have successfully reduced the density of individuals on the VTA property to the point where hand pulling is the preferred method. Goatgrass showed a slight but statistically insignificant increase in the sprayed areas in 2009 and 2010 (Figure 28).

Grazing, as well as the use of other treatments (e.g., mechanical and manual), have drastically reduced the large populations of yellow star-thistle that have been previously observed in these areas.

Discussion

The barbed goatgrass infestations along the ridgetop road on VTA property have significantly decreased due to treatment efforts. The slight increase in 2010 could be primarily due to the cooler and wetter conditions present through spring of 2010. However, because of the low density of the cover here, hand pulling is still the preferred treatment method. This should be done several times a season to ensure a thorough effort in fighting this often cryptic plant. It is expected to take at least three years of careful follow up to eradicate a population, as its seedbank continues to germinate and as hard-to-find individuals escape detection and are allowed to reproduce. Constant vigilance will be required to identify and promptly treat new infestations that are introduced by vehicles and animals.

Larger infestations on adjoining UTC and other properties threaten VTA property if they are not controlled. The ridgetop road has been identified as an important vector in the spread of this weed (Santa Clara Valley Transportation Authority 2009), and spraying along this corridor is a priority. Spraying occurred along the road north of VTA property in 2009 and 2010. Hydromechanical obliteration and limited string cutting also took place north of VTA, on UTC property. The new infestations found at the VTA/UTC border will need continued treatment, and underscore this plant's ability to disperse.

Figure 27. Barbed Goatgrass Infestations on VTA Property, 2010

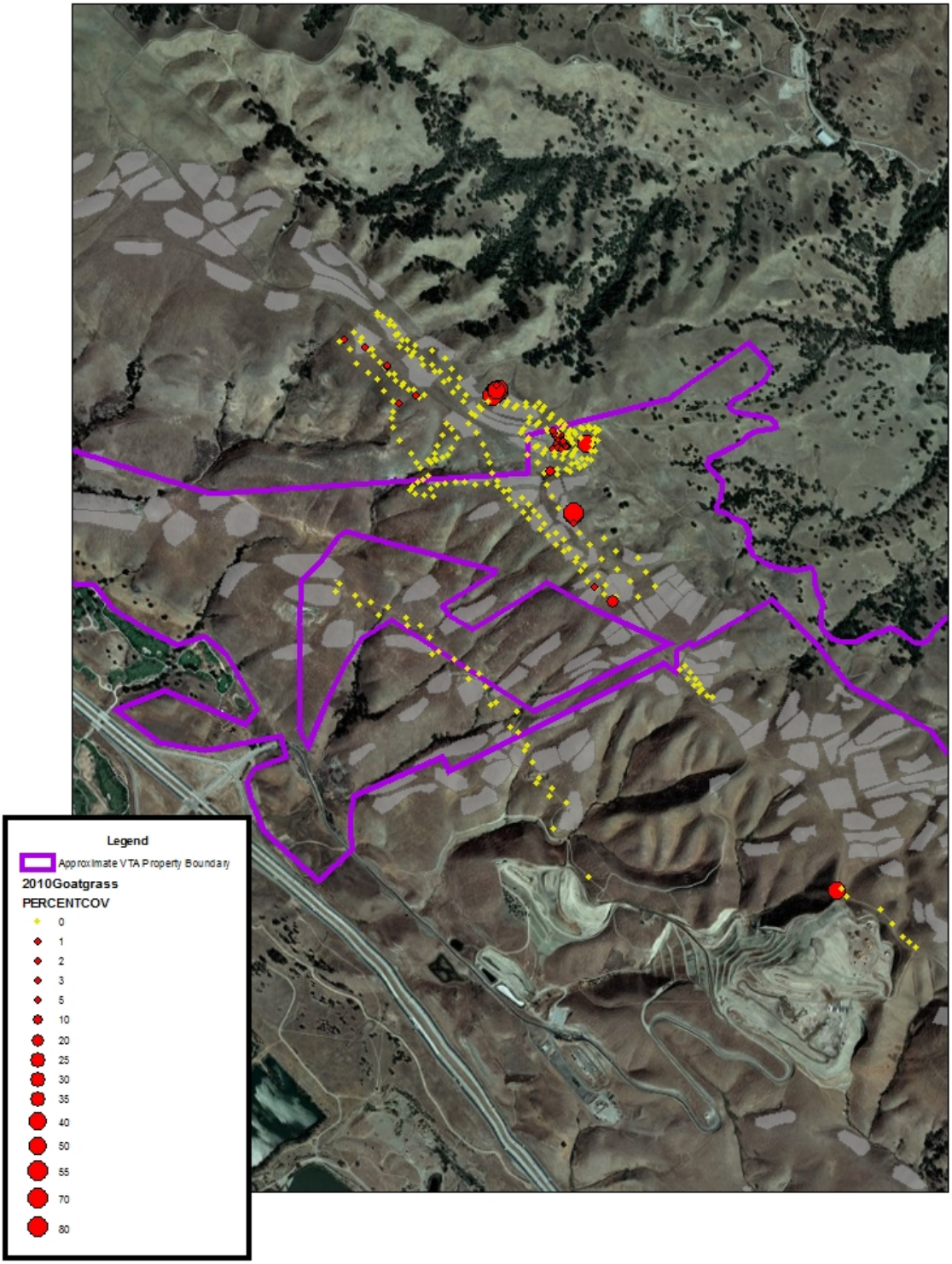
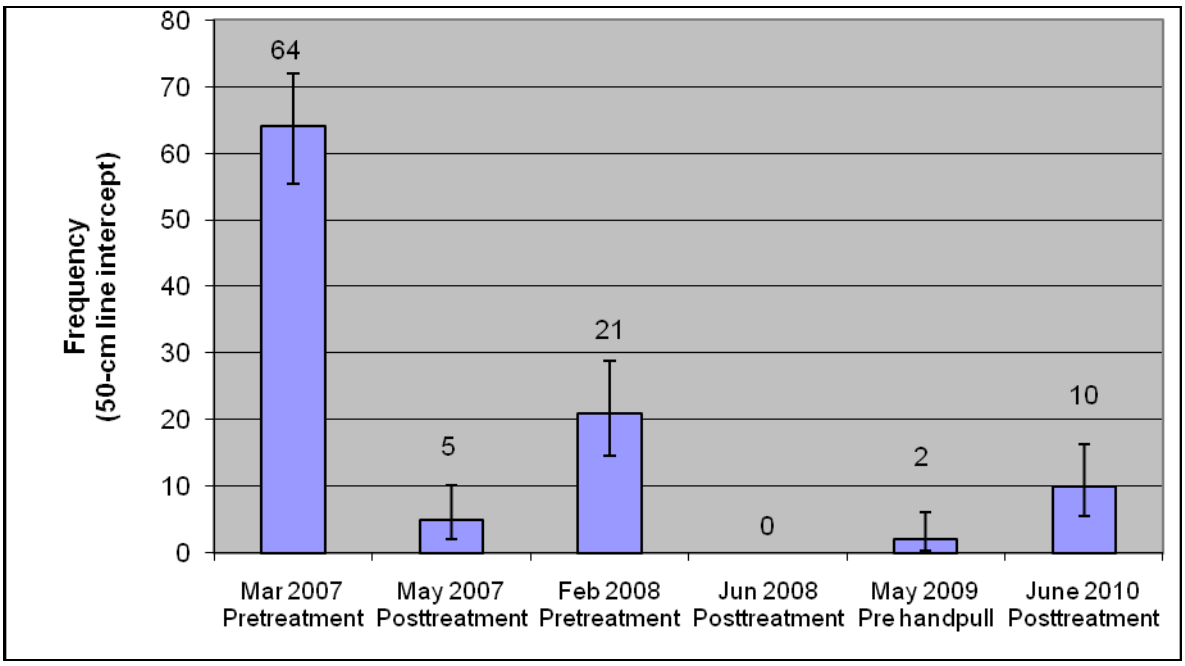


Figure 28. Effects of Envoy (Clethodim) on Barbed Goatgrass at Coyote Ridge (±90% CI)



The treatment for yellow star-thistle appears to be successful and it is expected that vigilant treatment of the remaining individuals will exhaust the seed bank, thus allowing SCCOSA to perform only future follow up maintenance to these control areas.

SUMMARY AND RECOMMENDATIONS

MONITORING SUMMARY

The managed grazing that has occurred for years on the VTA-Coyote Ridge Property has been effective at maintaining suitable habitat for serpentine-associated plants and animals, including the bay checkerspot butterfly, while maintaining the integrity of aquatic, wetland, and riparian communities. Monitoring during the fourth year of management according to the Coyote Ridge RMP generally documented that suitable conditions for these resources continued to be maintained in 2010. Management in 2010 continued to provide quality habitat for checkerspots, sensitive plants and animals, and serpentine vegetation. Management should continue with the two different grazing regimes currently being implemented, which favor different species in different years.

Baseline data on plant species composition and cover was collected along 12 transects at three monitoring sites on the VTA-Coyote Ridge Property in 2008, and 15 transects at four sites in 2009, and 13 transects at four sites in 2010. This protocol allows various habitat parameters to be compared among different management regimes and elevations on the property. One of the monitoring sites has plant composition data for 2006 and 2007, illustrating the effects of inter-annual climate variation. Comparisons of sites in this spatial and temporal context provide a reliable system for detecting major changes in grassland composition in response to climate, topography, and management.

Monitoring in 2010 did not reveal any major changes to habitat quality across the measured parameters. Annual fluctuations in these parameters are expected due to varying climatic factors. Populations of annual species such as goldfields and tidytips fluctuate widely from year to year. The increase in native bunchgrasses; which are perennial species, is the possible result of the current year's spring grazing regime and could be part of a larger trend.

In 2010 livestock stocking rates were increased from past levels (approximately one cow-calf pair per 10 acres) to 255 cows and 14 bulls from 15 December 2009 to 8 May 2010. A herd of 20 cows remained on the property year round. The increase in cattle stocking rates as well as the timing of December monitoring may have resulted in RDM values that were below the target range (500-750 lbs/acre) in five out of the nine plots surveyed. In two of the plots, higher RDM values may be a result of differences in vegetation decomposition rate or a reduced cattle grazing preference.

Bay checkerspot butterfly populations were estimated on the VTA-Coyote Ridge Property based on larval surveys, and compared with previous monitoring results (where such data were available) to provide a temporal context, since populations of this species can show dramatic fluctuations. In 2008, larval densities increased along the ridgetop, and held steady on the lower slopes. In 2009 and 2010, densities were stable on the ridgetop, whereas they dropped on the lower slope in 2009 and rose slightly in 2010 population. Populations were well within a normal range of fluctuations during the last three years.

Monitoring results of special-status plants indicate that there was a large increase in Santa Clara Valley dudleya and Mt. Hamilton thistle populations and a significant decrease in most beautiful jewelflower in 2010. Lessingia and San Francisco wallflower populations appeared stable and robust in 2010.

Although feral pigs and tule elk have potential to adversely affect sensitive habitats on the Preserve, problems to date have been very localized and limited; monitoring of on-site abundance of these species, and potential damage to sensitive habitats and species caused by pigs and tule elk, will continue.

California red-legged frogs were detected for the first time on the Preserve in 2009, with three individuals detected in the southwestern part of the site and seven more detected in 2010. The presence of these individuals indicates that drainages in this part of the site are being used as non-breeding habitat by frogs associated with the Kirby Canyon Landfill's wetlands and red-legged frog pond, where the species breeds.

Measures to control invasive plants in 2010 focused on barbed goatgrass, yellow star thistle, and purple star thistle. Areas along the ridgetop infested with barbed goatgrass were treated with hand pulling. The barbed goatgrass infestations along the ridgetop road on VTA property have significantly decreased due to treatment efforts. However, larger infestations on adjoining UTC and other properties threaten VTA property if they are not controlled. Constant vigilance will be required to identify and promptly treat new infestations that are introduced by vehicles and animals.

For the star thistles, a combination of controls, including mechanical, herbicide, and livestock (goats and sheep) were used on the site. Several control areas were sprayed with the specialty herbicide Milestone VM, which is approved for wildland and rangeland use. The treatment for yellow star thistle appears to be successful and it is expected that treatment of the remaining individuals will exhaust the seed bank, thus allowing SCCOSA to perform only spot follow-up maintenance to these control areas in the future. Monitoring for occurrences of other invasives, and application of integrated pest management as needed, will continue on the Preserve.

RECOMMENDATIONS AND ACTION ITEMS

In addition to routine monitoring activities to be performed in 2011 according to the schedule in the RMP, the following recommendations and action items are noted for 2011:

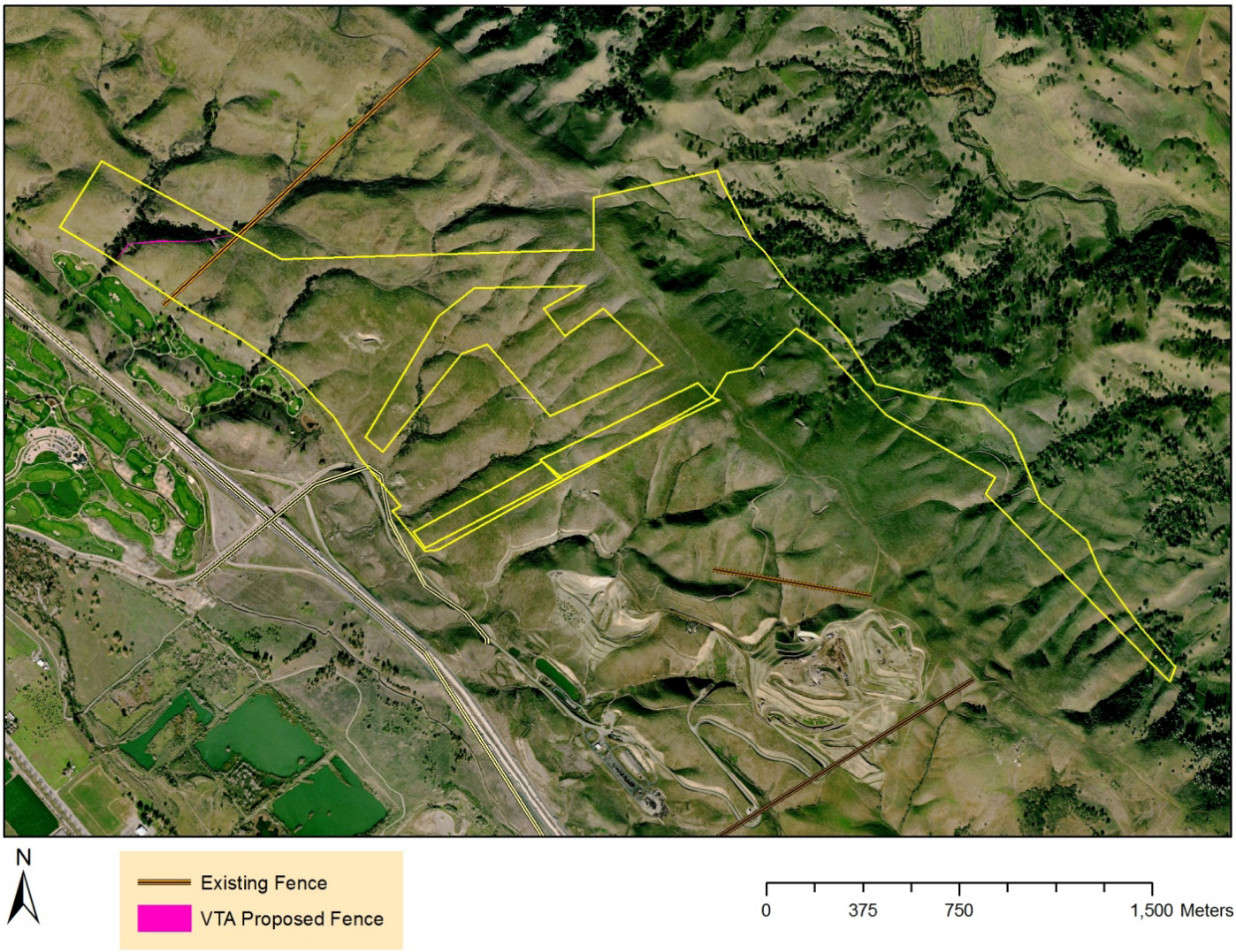
- **Rare Plants**
  - The RMP calls for monitoring three rare plant species: Santa Clara Valley dudleya, Mount Hamilton thistle, and most beautiful jewelflower, in Year 1, Year 5, and every 5th year thereafter (10, 15, etc.). The VTA and USFWS agreed upon a monitoring protocol that would require a modest effort. Currently for each of the three species, individuals are counted in five permanent 4x4m plots. From this information, a density estimate for the entire population on the property is extrapolated. The small amount of area surveyed compared to the 548-acre property (of which not all is appropriate habitat for these species) makes these estimates imprecise. Because 2011

is Year 5, we propose altering the monitoring protocol so we may present more meaningful data. In order to track the populations of these rare species, we will develop a statistically sound, scientifically rigorous monitoring protocol. The key elements of this protocol will be 1) delineating the current distribution of each species, 2) estimating local density in a repetitive sample to yield a total site population estimate, and 3) continued monitoring of a subset of the populations to track trends over time. Pilot data will be used to refine sampling methodology, including size and number of sampling units.

- *Santa Clara Valley dudleya*. Distribution has been mapped and a preliminary estimate has been made. Colonies within the larger population will be selected for permanent monitoring. For larger populations, a macroplot approach using long skinny quadrats will be used. A single long quadrat tends to encounter both dense and sparse patches, minimizing variability between sampling units. This approach provides known levels of precision and is used in monitoring other local rare plant populations (such as Presidio clarkia at both the Presidio of San Francisco and the Serpentine Prairie in Oakland). We will census a subset of smaller populations. Rather than trying to determine individuals, we will count rosettes. This is more objective than deciding if clumped groups are a single individual. Health and vigor will be qualitatively assessed. We will not stratify on grazing, based on previous studies showing grazing effects both inside and outside cattle pastures (Weiss et al. 2007).
- *Mount Hamilton thistle*. Distribution has been mapped. Sampling areas will be stratified by canyon and by elevation. We will sample cross sections of stream reaches, counting flowering individuals, seedlings, and other vegetative individuals. Health and vigor will be qualitatively assessed. Some exclusionary fencing will be installed to qualitatively assess impacts of cattle grazing.
- *Most beautiful jewelflower*. Distribution still needs to be mapped. We will develop a permanent macroplot method for the more extensive colonies, similar to that developed for Santa Clara Valley dudleya. Health and vigor will be qualitatively assessed. Because this plant exhibits extreme interannual variability, a multiyear baseline may be appropriate. Some exclusionary fencing will be installed to qualitatively assess impacts of cattle grazing.

- **Grazing**
  - RDM values should be carefully monitored in the coming year to verify whether the RDM values in the plots that were lower than the target level are a result of increased grazing pressure. It should be determined in areas with RDM values that are higher than target levels whether or not cattle grazing is having an effect on RDM levels and may need to be adjusted accordingly.
  - The SCCOSA will consider including a portion of the northwestern section of the property within the main southern pasture. The section immediately north of the existing fence gets little grazing pressure because a steep canyon largely prevents cattle in the larger northern pasture from accessing this small area. Up to 500 m of fencing could be used to alter the existing fence so that it follows topography, rather than being an arbitrary straight line (Figure 29).

Figure 29. Proposed New Fence in Northwestern Section of Property.



- **Invasive Plants**
  - Continue visual monitoring for invasives on the Preserve and quantitative monitoring on neighboring property, and apply integrated pest management as needed.
  - Continue to work with adjoining landowners to assist them in their management of invasive plants.
  - Infestations of barbed goatgrass on the Coyote Ridge property appear to be reduced to low densities where hand pulling is the most effective treatment. Hand pulling sweeps should be done at least every two weeks during the flowering season, to ensure early and late plants are treated, and that treatment is thorough for this often cryptic species. Hand pulling should continue for at least three years to exhaust the seedbank.
  - Early detection and rapid response is critical for keeping infestations manageable.

- **Erosion/Animal Damage**
  - Work with adjoining property owners and researchers to educate them on the detrimental effects of driving roads when they are muddy.
  - Monitor use of the site by tule elk (in addition to feral pigs, which are addressed in the RMP), and in particular, monitor damage to sensitive habitats by elk.
- **General**
  - Continue to monitor human activities by the golf course as they relate to the management of local wildlife populations.

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APPENDIX A.
RESIDUAL DRY MATTER DATA SHEETS AND PHOTOS

VTA RDM
12-7-10
11:55
Site RDM4 (VTA – 0909N1) 4117627.00N 615905.00E
Photo from South
First plot cut on 12-7
Small amount of thatch present <2%
Collected dry grass only, small amount of grass actively growing from recent rain.

13.25” hoop used
4.45gX100=445 lbs/acre of RDM

RDM4 (VTA – 0909N1) – 10 Feet – 350-700 lbs/acre

RDM4 (VTA – 0909N1) – 20 Feet – 350-700 lbs/acre

VTA RDM
12-7-10
13:55
Site RDM5 (VTA – Random 090901) 4117820.00N 616480.00E
Photo from South
Fifth plot cut on 12-7
Small amount of thatch present <1%
Collected dry grass only, very little grass actively growing from recent rain.

13.25” hoop used
6.30gX100=630lbs/acre of RDM

RDM5 (VTA – Random 090901) - 10 Feet – 350-700 lbs/acre

RDM5 (VTA – Random 090901) - 20 Feet – 350-700 lbs/acre

VTA RDM
12-7-10
13:00
Site RDM8 (VTA – North Mod) 4117868.00N 615689.00E
Photo from South
Third plot cut on 12-7
Very Heavy amount of thatch present >2%
Collected dry grass only, small amount of grass actively growing from recent rain.

13.25” hoop used

17.80gX100= 1780lbs/acre of RDM

Site RDM8 (VTA – North Mod) – 10 Feet - >1500 lbs/acre

Site RDM8 (VTA – North Mod) – 20 Feet - >1500 lbs/acre

VTA RDM
12-7-10
12:40
Site RDM9 (VTA - North Warm) 4117820.00N 615617.00E
Photo from South
Second plot cut on 12-7
Small amount of thatch present <2%
Collected dry grass only, small amount of grass actively growing from recent rain.

13.25” hoop used

4.15gX100=415lbs/acre of RDM

RDM9 (VTA - North Warm) - 10 Feet – 350-700 lbs/acre

RDM9 (VTA - North Warm) - 20 Feet – 350-700 lbs/acre

VTA RDM
12-7-10
13:20
Site RDM10 (VTA - North Mod II) 4117868.00N 615741.00E
Photo from South
Forth plot cut on 12-7
Heavy amount of thatch present >2%
Collected dry grass only, small amount of grass actively growing from recent rain.

13.25” hoop used
7.60gX100=760lbs/acre of RDM

RDM10 (VTA - North Mod II) – 10 Feet – 700-1000 lbs/acre

RDM10 (VTA - North Mod II) – 20 Feet – 700-1000 lbs/acre

VTA RDM
12-10-10
10:30
Site RDM12 (VTA - VCArea Mine01) 4117080.00N 617180.00E
Photo from South
First plot cut on 12-10
Amount of thatch present <1%
Collected dry grass only, small amount of grass actively growing from recent rain.
13.25" hoop used
3.25gX100=325lbs/acre of RDM

RDM 12 (VTA - VCArea Mine01) – 10 Feet – < 350 lbs/acre

RDM 12 (VTA - VCArea Mine01) – 20 Feet – < 350 lbs/acre

VTA RDM
12-10-10
11:00
Site RDM13 (VTA – VCArea Mine) 4117100.00N 617220.00E
Photo from South
Second plot cut on 12-10
Amount of thatch present <1%
Collected dry grass only, small amount of grass actively growing from recent rain.

Very rich native forb cover.
13.25” hoop used
1.15gX100= 115lbs/acre of RDM

RDM 13 (VTA – VCArea Mine) – 10 Feet - <350 lbs/acre

RDM 13 (VTA – VCArea Mine) – 20 Feet - <350 lbs/acre

VTA RDM
12-10-10
12:40
Site RDM14 (VTA Summit Cool) 4117647.00N 617775.00E
Photo from South
Forth plot cut on 12-10
Amount of thatch present >1%
Collected dry grass only, small amount of grass actively growing from recent rain.

13.25” hoop used

8.25gX100=825lbs/acre of RDM

RDM14 (VTA Summit Cool) – 10 Feet – 700 – 1000 lbs/acre

RDM14 (VTA Summit Cool) – 20 Feet – 700 – 1000 lbs/acre

VTA RDM
12-10-10
12:10
Site RDM15 (VTA - Summit Warm) 4117440.00N 617543.00E
Photo from South
Third plot cut on 12-10
Amount of thatch present <1%
Collected dry grass only, small amount of grass actively growing from recent rain.

Very rich native forb cover.
13.25” hoop used
2.25gX100=225lbs/acre of RDM

RDM15 (VTA - Summit Warm) - 10 Feet - < 350 lbs/acre

RDM15 (VTA - Summit Warm) - 20 Feet - < 350 lbs/acre