
GLENWOOD PRESERVE MONITORING REPORT - YEAR 2

Scotts Valley, Santa Cruz County California

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EXECUTIVE SUMMARY

This Year 2 Annual Monitoring Report describes the management and monitoring activities conducted on the Glenwood Preserve ("Preserve"). Monitoring is conducted according to the guidelines set forth in the final Open Space Management Plan ("OSMP") for the Preserve (WRA 2003).

Monitoring of the federally endangered Ohlone tiger beetle (*Cicindela ohlone*, OTB) occurred on the Preserve between January and October of 2005. A total of 79 adult observations occurred throughout 2005, compared to 239 during 2003. During the July 2005 monitoring of larval burrows, 167 active larvae were inventoried in the Glenwood Preserve. A total of 347 active larval burrows were observed during the June 2004 visit and 556 in 2003. The observed decline in the number of larval burrows and occupied area between 2003 and 2005 may be due to insufficient grazing in the OTB habitat. Extraordinarily high rainfalls in the winter and spring of 2004-2005 also likely contributed to larval beetle mortality due to excess soil saturation. This above-average rainfall also allowed the growth of significantly more vegetation which reduces the amount of suitable adult beetle habitat. Since suitable soil conditions for the OTB appear to be limited to a rather small portion of the Preserve, it is important to continue the grazing there to maintain bare and sparsely-vegetated areas of ground for the OTB to use. OTB monitoring in future years once the Preserve's grazing program is established will demonstrate whether the grazed habitat allows the OTB to extend its distribution within the Preserve.

Point counts of adult Opler's longhorn moth (*Adela oplerella*, OLM), a Federal Species of Concern, continued in 2005 at the seven patches of its larval food plant, *Platystemon californicus*, which had been previously identified within the Preserve. These counts were performed on the same dates as the transect counts for the OTB. A total of 37 adults of the OLM were observed in 2005, down from 48 individuals observed in 2004. All observations were made at the same patch of its food plant as in 2004, while no OLMs were observed at any of the other six patches. Manual introduction of the moths to other patches of its food plant may be warranted if they do not naturally colonize these other areas on their own.

Population monitoring of the federally endangered Scotts Valley spineflower (*Chorizanthe robusta* var. *hartwegii*) occurred on the Preserve in June 2005. A total of 28,118 individuals were counted at nine sites. The majority of sites had similar or slightly higher counts in 2005 than in 2004. Five of these occur in a narrow panhandle off Tabor Drive which was previously disturbed by the adjacent housing development and had been fenced from grazing for several years. No adverse environmental site conditions were noted during the spring 2005 field surveys, and there was no evidence of erosion, over-grazing or trampling in the majority of spineflower habitat. One exotic species, narrow-leaved clover (*Trifolium angustifolium*) increased in cover by over 25 percent in 2005 from 2004 in spineflower populations C-74 and C-77. It is recommended that grazing continue to occur in the spineflower habitat, particularly at those sites where no spineflower was observed in 2004 or 2005.

The Preserve grazing program implemented in 2004 to monitor the horses' grazing patterns and coordinate the horse grazing rotation plan was continued in 2005. Final modifications to pasture infrastructure, including repair and replacement of perimeter fencing, shifting of cross fencing, and installing locks on water troughs, were completed

in 2005. Monitoring and management of the grazing program in 2005 included reconnaissance surveys, coordination of the grazing rotation program, photo documentation, vegetation transects, and end of the season measurements of grazing utilization, which are determined by measuring residual dry matter (RDM). Horse utilization of the preserve improved during this time as the horses adapted to the new fences, gates and stream crossings. The Preserve was grazed at about 80% of its grazing capacity in 2005. The addition of 2 more horses to the herd is a priority for 2006. Current grazing in the panhandle portion of the Beetle pasture does not maintain sufficient bare ground for the Scotts Valley spineflower. The addition of a temporary fence and water trough in this area is recommended to achieve the required disturbance. This report includes a Pasture Rotation Program for the Glenwood Preserve revised for 2006 based on adjusted rangeland production values and usage.

Long-term vegetation monitoring on the Preserve continued in 2005 by conducting surveys along fifteen permanent transects previously established throughout the Preserve in different habitat types. Native species cover increased on the preserve and the amount of exposed bare ground decreased from 2004 to 2005. This is likely due to a combination of factors including annual weather patterns and effective grazing management that promotes the growth of native forbs since horses favor non-native annual grasses as a food source. Overall plant species diversity also increased on the preserve as more native and non-native species were observed in the monitoring transects. Four species of known exotic invasive plants persist on the preserve. Some populations of Blackwood acacia (*Acacia melanoxylon*) were removed in the preserve in 2005; the remaining populations of acacia and populations of French broom (*Genista monspessulana*) are slated for removal by landscape contractors during the winter of 2005-2006. Small patches of thistles (Italian thistle, *Carduus pycnocephalus* and bull thistle, *Cirsium vulgare*) persist and will continue to be monitored. Grazing management will be used to attempt to control pennyroyal (*Mentha pulegium*), an invasive wetland plant in Pasture A.

Monitoring of several other special status plant species continued in the Preserve in 2005. Mt. Diablo cottonweed (*Micropus amphibolus*), a CNPS List 3 plant, continues to occur on the Preserve in small patches in Pastures B, C, and D. Choris's popcorn flower (*Plagiobothrys chorisianus* var. *chorisianus*), was again documented on the Preserve during 2005 monitoring visits. Choris's popcorn flower is a USFWS Species of Local Concern and a CNPS List 1B species; it was reported on the Preserve about 15 years ago and has been observed by WRA each year since 2002. Surveys for these species will continue as part of the annual monitoring program.

A copy of this report is being provided to The City of Scotts Valley, the Glenwood Homeowners Association, the Land Trust of Santa Cruz County, the Department of Fish and Game, and the US Fish and Wildlife Service.

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1.0 INTRODUCTION

This document presents results and recommendations of the second year of monitoring activities conducted on the Glenwood Open Space Preserve (“Preserve”) in Scotts Valley, Santa Cruz County, California. The 160-acre Preserve was dedicated in 2003 to the City of Scotts Valley by American Dream / Glenwood, L.P. as a condition of approval for development of forty-four single-family residences on the remainder of the 195-acre Glenwood property.

1.1 PRESERVE DESCRIPTION

The Preserve is located on either side of Glenwood Drive, north and east of Scotts Valley High School in the City of Scotts Valley, Santa Cruz County. The Preserve is included in the Felton and Laurel Quadrangles (USGS 7.5 minute series topographic maps). Adjacent land uses are rural-density residences to the north, Scotts Valley High School and undeveloped parcels to the west, medium-density residential housing to the east, and Vine Hill School and existing homes and Siltanen Park to the south.

Approximately 60 percent of the Preserve is non-native annual grassland with the remainder consisting of wetlands, willow riparian, native grassland, coyote bush scrub, and oak and redwood forest. Soils in the valleys are primarily of Danville loams, which are deep, well-drained soils with slow permeability found on alluvial fans and valley bottoms (USDA 1980). Slopes are moderate with elevations of 750 to 860 feet. Soil on the slopes and ridges is Bonnydoon loam, which is a shallow, somewhat excessively drained soil with moderate permeability.

Two federally listed species occur in the Preserve. The southeast corner of the Preserve is one of fifteen currently known locations of the endangered Ohlone tiger beetle (*Cicindela ohlone*, sometimes referred to as OTB) (USFWS 2001, DFG 2002). Portions of grassland in the Preserve also support the endangered Scotts Valley spineflower (*Chorizanthe robusta* var. *hartwegii*, sometimes referred to as SVSF), and the Preserve is part of designated critical habitat for the species (USFWS 2002).

Several additional special status species are known to occur within the Preserve. The Opler’s longhorn moth (*Adela oplerella*, sometimes referred to as OLM), a Federal Species of Concern, has been observed in the southeastern portion of the Preserve. Mount Diablo cottonweed (*Micropus amphibolus*), included on the California Native Plant Society’s (“CNPS”) List 3, has been observed in grassland throughout the Preserve.

1.2 BACKGROUND

Prior to 2004, sensitive species or habitats were not managed or monitored on the Glenwood property. The property east of Glenwood Drive was fenced as a single pasture and grazed by horses at above its calculated carrying capacity. Horses had year round access to sensitive habitats, including Ohlone tiger beetle habitat, and concentrated in sensitive native grasslands, wetlands, and riparian areas in the dry season. In contrast, the property west of Glenwood Drive had not been grazed for many years. In the absence of grazing, growth of non-native annual grasses is dense and native shrubs have become established. The conditions within those portions of the site

containing native grassland, Scotts Valley spineflower and other sensitive plant species habitat have not been monitored.

The City of Scotts Valley, in approving the Environmental Impact Report, Mitigation and Monitoring Reporting Program (MMRP) for the Glenwood Project, required the preparation of an Open Space Management Plan (“OSMP” or “Plan”) (WRA 2003). The Plan was developed after several public hearings and input from resource agencies, environmental groups and the public. The OSMP provides guidance on how to maintain the existing condition of the sensitive habitats (wetland, riparian, and native grassland) and of the grassland habitat that is home to the rare insect and plant species. Restoration and enhancement of sensitive habitats are not required by the project conditions and the MMRP. The U.S. Fish and Wildlife Service and the California Department of Fish and Game reviewed and approved the vegetation management practices recommended in the Plan.

The primary goals of the Open Space Management Plan are to:

- 1) Maintain, at a minimum, the existing habitat conditions in order to preserve the suitability of the grassland habitats of sensitive species, including: the Ohlone tiger beetle, Scott’s Valley spineflower, Opler’s longhorn moth, and Mount Diablo cottonweed;
- 2) Preserve and maintain the existing condition of sensitive habitats including wetland, riparian, and native grassland.

The Plan provides specific management objectives for each of the sensitive species and habitats and includes a monitoring program. The Plan objectives are based on qualitative knowledge of existing habitat conditions and site history and the current knowledge of the life histories and habitat requirements for each of the sensitive species. Thus far, there have been few quantitative surveys of the sensitive species on the Preserve, and no quantitative data exists on characteristics of the grassland habitat of the sensitive species. Therefore, it is stated in the Plan that initial data from the monitoring program is to be used as baseline data, and baseline data will need to continue to be developed as the Plan is implemented.

This monitoring report presents results of the second year of baseline data collection. Baseline data may require several years of monitoring to allow differentiation between normal fluctuations in population numbers and habitat from responses to management actions as well as variations in climatic and other natural conditions (floods, fires, drought, etc.). Once sufficient baseline data on distribution and populations are developed, thresholds can be established which alert the preserve manager when population or habitat changes occur that are outside the natural variability expected. The manager will consider short and long term habitat and population data, as well as the influence of climatic conditions in making adjustments to baselines, thresholds and management activities. This adaptive management approach will allow the Plan to evolve as habitat or regulatory conditions change, and as more information is gained about the site and the species through annual monitoring. Future annual monitoring reports will recommend appropriate changes in habitat management practices based on the monitoring results, revision of preliminary baselines, and refinement of thresholds.

2.0 OHLONE TIGER BEETLE

Prepared by: Richard A. Arnold, Ph.D., Entomological Consulting Services, Ltd. This report summarizes the findings of the 2005 monitoring activities on the endangered Ohlone Tiger Beetle (OTB). Comparisons to findings from 2003 and 2004 surveys are also provided.

2.1 METHODS

Surveys were conducted during 2005 to monitor adult and larval life stages of the OTB. This section describes the monitoring methods and data analysis methods used to monitor the life stages of this insect.

2.1.1 Adult OTB Counts

Adults of the OTB can be active from mid-January to mid-May, although annual variation occurs in the duration of adult activity period, as well as starting and ending dates. In 2004, a transect route was established along existing trails in the southeastern portion of the Glenwood study site to monitor adult OTBs. The transect route was divided into six segments or intervals (A-F in Figure 4-a) based on landmarks or prominent vegetation in the field. Total length of the transect route is 1,105 feet, with interval A measuring 254 feet, B 156 feet, C 101 feet, D 360 feet, E 61 feet, and F 173 feet.


The entire transect route was walked once daily on each of 16 survey dates, which spanned from the beginning to the end of the 2005 adult season. As OTB adults were observed within 15 feet on either side of the centerline of the trail (i.e., a 30 ft. wide belt transect), the location of each individual was obtained using a hand held global positioning system (GPS), and information about each individual's sex and observed behavior was recorded on a data sheet. The tally of all observed adults along the transect route on a particular survey date comprised the daily transect count.

The transect counts along this route establish the starting and ending dates of the OTB's adult season, plus the magnitude and shape of the seasonal population curve for the transect route. When the counts are plotted against the day number of the adult activity season, the seasonal population curve of OTB numbers is illustrated. This seasonal population curve can be described mathematically by fitting a curve to the count data.







My colleague, Dr. Tyson Holmes (Stanford University School of Medicine, Dept. of Health Research & Policy, Division of Biostatistics) and I have developed a deterministic transition model for estimating a seasonal population size and death rate for a closed population from transect counts. The observed counts are fitted to a mathematical function via non-linear mixed effect modeling methods (NLME), which provides the estimates of these population parameters. A complete explanation of the model will be published elsewhere (Holmes and Arnold, in prep.). The code to perform these calculations was programmed in the commercially-available statistical package, S-Plus (Insightful Corporation, v. 7).

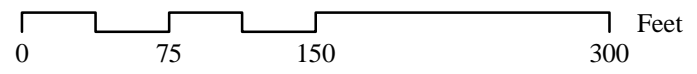
2005 Ohlone Tiger Beetle Study
Scotts Valley - Glenwood Site
Adult transect route and intervals (A - F) and location of larval burrows



 Area Where Tiger Beetles Observed in 2005

Adult Transect Route

-  Interval A
-  Interval B
-  Interval C
-  Interval D
-  Interval E
-  Interval F



Prepared September 7, 2005
by Entomological Consulting Services, Ltd.

2.1.2 OTB Larval Burrows

The same trails that were used for the adult surveys were checked for egg, larval, and adult emergence burrows throughout the 2005 survey period. In addition, surveys of barren or sparsely vegetated areas within the adjacent grasslands were also checked for burrows. All burrows observed during 2005 were located within the trails or immediately adjacent to them.

In prior monitoring at Glenwood I have marked egg and larval burrows with pre-numbered, aluminum tree tags by nailing them to the ground near the burrow. Because vandals have removed my tags during each of the past two years, I did not attempt to mark any burrows in 2005. Instead the position of every active larval burrow was mapped in July 2005 using a mapping grade GPS manufactured by Trimble. Coordinates for all burrows were differentially corrected to improve their positional precision. The diameter of the mouth of every larval burrow was also measured to determine the instar of any larvae associated with each burrow.

2.2 RESULTS

2.2.1 Adult OTB Counts

In 2005, the first adult OTBs were observed on January 30th at Glenwood, or about 12 days earlier than when the first adult beetles were observed in 2004. Adult counts were performed while walking along the transect route, as illustrated in Figure 4-a, on 16 days between January 21st and April 25th. The transect route was the same as was used in 2004 to facilitate comparison of seasonal adult counts. No adults were observed on the first or last three survey dates. The additional 14 survey dates in 2005 included January 30th, February 5th, 11th, 18th and 26th, March 6th, 8th, 13th, 20th, and 27th, plus April 3rd, 10th, 15th, and 19th. These dates were selected because weather conditions were suitable for adult OTBs to be active, i.e., sunny and temperatures $\geq 62^{\circ}$ F.

Figure 4-b illustrates the portions of the transect route where adults and/or larvae were observed in 2005. Table 4-a summarizes the numbers of adult OTBs that were observed on each survey date throughout 2005 by transect interval. Areas where adults or larvae were not observed have generally become overgrown by herbaceous vegetation.

A total of 79 adult observations occurred throughout 2005, compared to 239 adults in 2004 and 372 adults during 2003. Average numbers of OTB adults observed per site visit was only 5.1/survey date in 2005, compared to 19.9 in 2004 and 24.8 in 2003. The numbers of OTB adults observed in 2005 represents nearly an 80% decline from the numbers observed in 2003.

The duration of the adult activity period was about 71 days in 2005, compared to 60 days in 2004 and about 70 days in 2003. The population peak occurred on day 38 (March 8th) compared to day 27 (March 7th) in 2004 and day 37 (March 5th) in 2003.

2005 Ohlone Tiger Beetle Study
Scotts Valley - Glenwood Site
Area of Study Site Where Burrows Were Identified



0 80 160 320 Feet



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Transect Survey Date	OTB Numbers by Transect Interval (A-F, see Figure 1)						Daily Transect Totals
	A	B	C	D	E	F	
21 Jan..	0	0	0	0	0	0	0
30 Jan	0	0	0	0	0	2	2
5 Feb.	0	0	0	0	0	4	4
11 Feb.	0	0	1	0	1	3	5
18 Feb.	0	0	0	1	1	3	5
26 Feb.	0	0	0	1	1	5	7
6 March	0	1	1	1	2	5	10
8 March	0	2	2	1	2	8	15
13 March	0	2	0	1	3	6	12
20 March	0	0	1	1	1	5	8
27 March	0	0	0	0	2	3	5
3 April	0	0	0	0	0	3	3
10 April	0	0	0	0	1	2	3
15 April	0	0	0	0	0	0	0
19 April	0	0	0	0	0	0	0
25 April	0	0	0	0	0	0	0
Seasonal Totals	0	5	5	6	14	49	79

Throughout the 2005 adult season, approximately 62% of the beetle observations were along transect interval F. In contrast, no adults were observed along interval A. Observations along the other four transect intervals ranged from about 6% to 17% of the total observed number of adults. The disproportionate number of OTB adults along transect interval F suggests that management to open up more areas of bare or sparsely-vegetation ground along the other transect intervals would be beneficial for the OTB.

The NLME model estimated a seasonal population size of 30 to 50 OTB adults in 2005. These estimated OTB numbers are only 10-17% of the 2005 seasonal population estimate of 300 adults. Observed behaviors of OTB adults included basking (n = 51), foraging (n = 2), running (n = 1), flying (n = 14), mating (n = 10), and ovipositing (n = 1). A total of 50 males and 29 females were observed. The difference between the estimated numbers of OTB adults for the entire season of 30-50 individuals versus the 79 observations may be due to multiple observations of the same individual beetle. Since beetles were not marked, captured, or otherwise handled to permit individual recognition, it is possible some individuals were observed more than once on a particular survey date or on different survey dates during the 2005 adult season.

2.2.2 OTB Larval Burrows

A total of 167 active larval burrows were observed during my July 2005 mapping of the burrows. As detailed in Table 4-b, most of these burrows (n = 142) supported mature, third instar larvae of the OTB, with burrow diameters ranging in size from 3.6 to 6.0 mm. Most of these larvae remained active through the September and October site visits. However, showers and rains in November caused any remaining larvae to plug their

burrows. The remaining 25 larvae in burrows were first (n = 2) or second instars (n = 23), measuring <3.6 mm in Table 2). The correlations between burrow size and larval instar number were determined by lab rearing studies by Dr. Knisley and reported in Kinsley and Arnold (2004, Biology and conservation of *Cincidela ohlone*, the Ohlone Tiger Beetle. Final report to U.S. Fish & Wildlife Service).

Larval Survey Year	Observed Numbers by Larval Instar			
	1.5-2.3 mm 1 st Instar	2.4-3.5 mm 2 nd Instar	3.6-6.0 mm 3 rd Instar	Totals
2003 (July)	3	21	532	556
2004 (June)	2	57	288	347
2005 (July)	2	23	142	167

The numbers of larval burrows declined 70% between 2003 and 2005. Figure 4-c illustrates the locations of all larval burrows at the Glenwood site in 2003, 2004, and 2005. Note that the occupied area was substantially greater in 2003 than 2005. Indeed, the occupied burrow area was only 0.07 acres in 2005, which was a 66% decrease compared to 0.206 acres in 2003.

2.3 CONCLUSIONS AND RECOMMENDATIONS

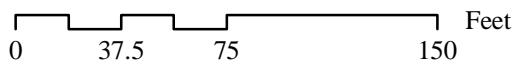
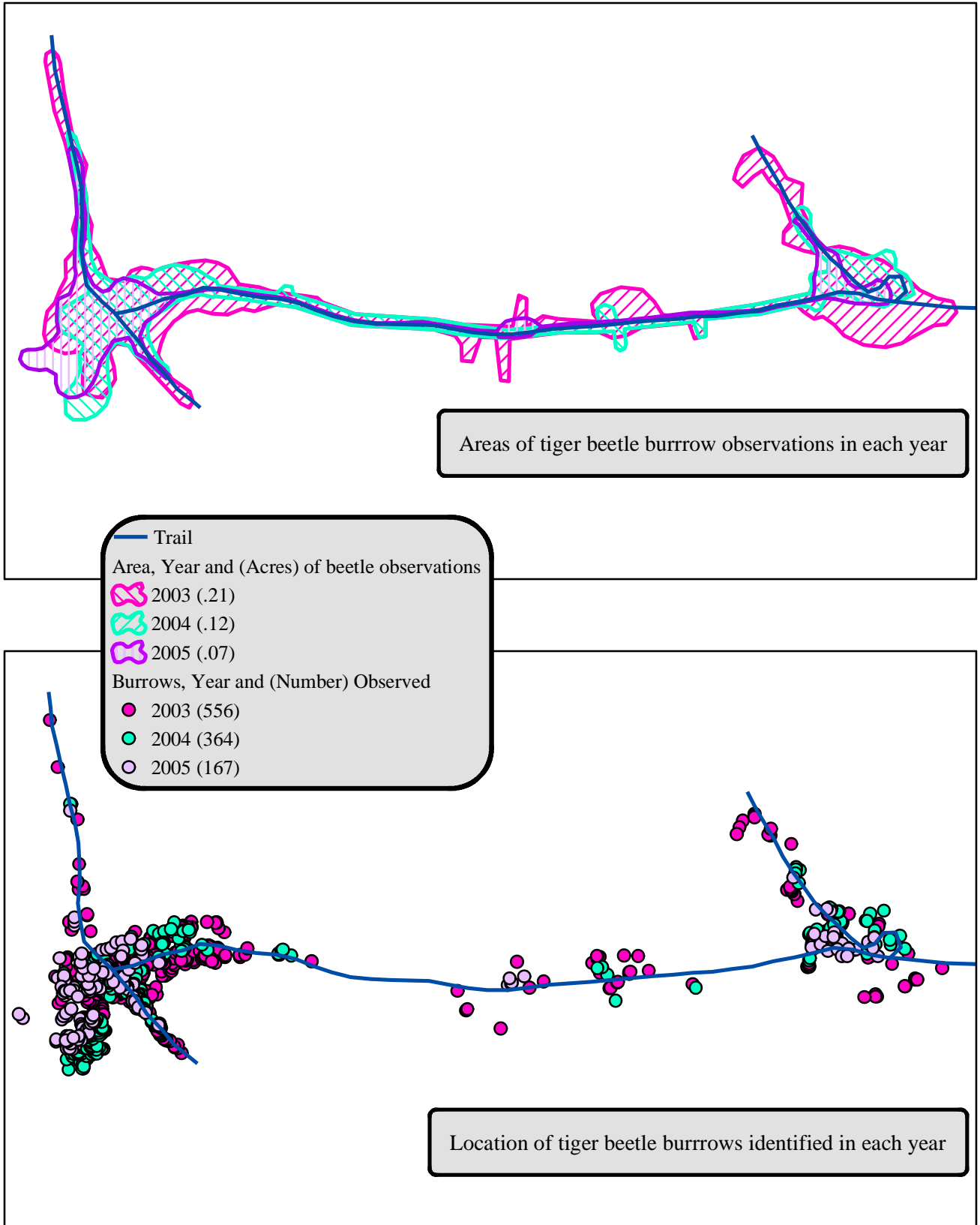
Maintenance of the endangered OTB population at Glenwood is at a critical stage. Population numbers of the adult and larval stages of the beetle, as well as its area of occupation cannot continue to decline at the current rates and expect that the OTB population will persist at Glenwood. The exceptionally high rainfall amounts during the winter and spring in 2005 undoubtedly enabled more vegetation to grow than in a year of normal or low precipitation. The high precipitation levels may have kept the soil saturated longer, which caused potentially greater mortality of overwintering larvae of the OTB. Unfortunately, the activities of vandals at Glenwood the past two years kept me from marking larval burrows that would have enabled me to collect data needed to identify specific mortality factors.

Declines in population numbers of the OTB also occurred at other known locations during 2005, but the declines were generally not as precipitous as at Glenwood. However, at one site where cattle grazing has been utilized to manage the vegetation, the OTB may have been inadvertently extirpated due to a massive reduction in bare ground during the past few years. At the UC Santa Cruz campus, where the university annually erects fences and information signs to divert mountain bikers and hikers away from secondary trails that were previously occupied by the OTB, vegetation has colonized these formerly barren trails and displaced the OTB population. In 2005, the distribution of this beetle population had largely shifted from the secondary trails to an area of recent pig rooting. At the Grey Whale portion of Wilder State Park, officials closed the primary trail used by hikers and mountain bikers in 2004 where it crossed through the OTB population, and diverted visitors through a nearby portion of heavily vegetated grassland to create a new trail. In 2005, the primary trail location was reopened to park visitors, and OTBs utilized the newly created trail segment that was closed to visitors.

Based on the aforementioned observations, at Glenwood we need to create substantially more bare ground and sparsely-vegetated ground, especially in the beetle pasture to provide more suitable areas of habitat to support greater numbers of OTBs. Adult and larval beetle observations for the 3-year period of 2003 through 2005 illustrate that not only numbers of these life stages have declined dramatically, but also the area of occupied habitat at Glenwood (Figure 3) has similarly declined. Habitat areas that were formerly characterized by bare ground and used to be occupied were covered with low-growing herbaceous vegetation during the adult activity period in 2005. Even the formerly barren trails that beetles used to occupy have been colonized by vegetation and overgrown.

These formerly occupied areas of habitat need to be re-opened to allow the beetle population to expand its area of occupation and increase its population numbers. Grazing in 2005, particularly in the summer, reduced the thatch throughout the beetle pasture and opened up some small areas of bare or sparsely vegetated ground. The horses have opened up a barren trail segment to the new water trough. Digging by ground squirrels also opened up a few small areas. However, the amount of bare ground needs to be greatly expanded throughout the pasture and maintained as bare ground throughout the adult activity period. During the past two years, low growing herbaceous vegetation has colonized most portions of the former trails and barren areas. It may even be necessary to graze for short periods of dry weather during the spring to maintain the bare ground to benefit the OTB. If the horse grazing by itself is not successful at opening up and maintaining areas of bare or sparsely-vegetated ground, then we need to consider creating small patches of bare ground by scraping, flaming, temporary use of goats, or other alternative vegetation management methods. A trial in late spring of 2005 of the flaming technique offers some promise, but should be repeated earlier in the growing season to achieve the best results. Ideally, I'd like to see the beetle pasture include a series of trails that are characterized by barren or sparsely vegetated ground, with numerous table-top size patches of bare/sparsely vegetated ground scattered throughout the remainder of the grassland.

2005 Ohlone Tiger Beetle Study
 Scotts Valley - Glenwood Site
 Comparison of Burrow Locations 2003, 2004 & 2005



3.0 OPLER'S LONGHORN MOTH

Prepared by: Richard A. Arnold, Ph.D., Entomological Consulting Services, Ltd. This report summarizes the findings of the 2005 monitoring activities on the rare Opler's Longhorn Moth (OPM).

3.1 METHODS

Point counts of the numbers of observed OLM adults were performed at the seven patches of its larval food plant, cream cups (*Platystemon californicus*) which grow at the Glenwood study site. These counts were performed on the same dates as the transect counts for the OTB. Point counts were used because the seven patches of the food plant are very small in size and area.

3.2 RESULTS

Adults of the OLM were observed at only one (OLM #1, as described in Arnold, R.A. 2000, Ohlone Tiger Beetle Report prepared for American Dream/Glenwood Limited Partners, 8 pp.) of the seven patches of its food plant, on a slope next to the man-made reservoir. A total of 37 adults were active between March 6th and April 3rd, with the peak flight occurring between March 13th and 20th. No OLMs were observed at any of the other six patches of its food plant (OLM #2 -#7 of prior reports). Observations of the OLM declined from 48 in 2004 to 37 in 2005.

3.3 CONCLUSIONS AND RECOMMENDATIONS

Implementation of the grazing program will hopefully increase the abundance of the OLM's larval food plant, which in turn should increase the population size of the moth. Once this occurs, we may want to consider introducing the moth to other patches of the food plant at the Glenwood site if natural colonization does not occur.

4.0 SCOTTS VALLEY SPINEFLOWER

Kathy Lyons of Biotic Resources Group implemented the monitoring of the Scotts Valley spineflower in 2005 (Year 2).

4.1 METHODS

4.1.1 Quantitative Sampling of Vegetation within Spineflower Habitat Areas

The occupied and suitable spineflower habitat areas were quantitatively sampled on June 24, 2005 by Kathleen Lyons and a field assistant to document baseline conditions of plant species composition and plant cover. Three transects (T6, T14 and T15, see map in Appendix A), that were established in Year 1 (2004) were re-sampled to document percent vegetative cover and plant species composition. The transects are located in and adjacent to occupied and suitable habitat areas. Within the three transects, a total of forty-one quadrats were sampled (20 quadrats in T6, 8 quadrats in T14 and 13 quadrats in T15).

Data from the quadrats were analyzed to determine absolute plant cover, relative plant cover and the percentage of native species, non-native species, grass species and forbs (i.e., non-grass herbaceous species). Photography was utilized to document the spineflower habitat in June 2005. Permanent photo stations that were established at each transect in 2004, were re-shot to depict 2005 conditions; random photos were also taken of other occupied areas and suitable habitat areas.

4.1.2 Spineflower Population Counts

On May 6, 2005, at the height of plant growth and flowering of the Scotts Valley spineflower, a census was conducted. Kathleen Lyons and a field assistant counted the number of individual plants within each occupied site (locations of spineflower colonies are shown on the map in Appendix A). For colonies supporting less than 100 individuals, accuracy is to one individual. Colonies supporting between 100 and 1,000 individuals were counted to the nearest ten individuals. For colonies supporting greater than 1,000 individuals, accuracy is estimated to plus/minus 50 individuals. These data were compared to the population data from 1992 and 2004.

Additionally, two reconnaissance surveys were conducted within the known and potential spineflower habitat areas on March 17th and May 20th 2005. During each site visit, the occupied and suitable habitat areas were visually assessed for plant species composition and general site conditions.

4.1.3 Monitoring of Management Activities Implemented in 2004

While conducting the vegetation surveys related to monitoring spineflower and its habitat, observations were made on the effects of the grazing program on the spineflower habitat. These include species composition changes, mechanical effects of horses on the environment (e.g. trampling and erosion), and effects of grazing on spineflower population numbers.

4.2 RESULTS

4.2.1 Vegetation within Spineflower Habitat Areas

Data from the three transects (T6, T14, and T15, see Appendix C for data) revealed that 55% of the plant species within the occupied and suitable spineflower habitat areas are non-native. This is ten percent less than was recorded in 2004 wherein 65% of plant species were non-native. The percentage of non-natives ranged from a high of 75% in T15 (an increase from 60% in 2004) to a low of 23% in T6 (a decrease from 63% in 2004). T14 had 66% by non-natives in 2005 (a decrease from 72% in 2004). In T14 and T15 the cover provided by narrow-leaved clover (*Trifolium angustifolium*) was higher than recorded in 2004, at 27.8% and 32.6%, respectively. Cover by rattail fescue (*Vulpia myuros*), however, declined significantly in T14 from 63% in 2004 to 7.7% in 2005. In T15, cover by rattail fescue decreased 45% in 2004 to 12.1% in 2005. Windmill pink (*Silene gallica*) provided 8% cover in T6. Other non-native plant species providing relative cover values greater than 5% were filaree (*Erodium botrys*), wild oat (*Avena sp.*), and soft chess (*Bromus hordeaceus*). Photographs of the transects are in Appendix D.

Data from the three transects revealed that 45% of the plant species within the occupied and suitable spineflower habitat areas are native; this is an increase from 35% cover in 2004. The percentage of native plant species in the transects ranged from a low of 33.7% in T14 (an increase from 27% in 2004) to a high of 78% in T6 (an increase from 37% in 2004). T15 displayed 25% cover by native plant species (a decrease from 40% in 2004). Other native plant species that provided greater than 5% relative cover in these transects, are woolly blue curls (*Trichostema lanceolatum*) and Spanish clover (*Lotus purshianus*).

In 2005 the cover provided by Scotts Valley spineflower increased in both T14 and T6; T15 showed a decline in spineflower cover. Spineflower cover was 23.4% in T14 (compared to 14% in 2004) and 2% in T15 (compared to 4.4% in 2004). T6 showed an increase of over 20% in spineflower cover in 2005, when compared to 2004. In this transect, Scotts Valley spineflower provided 61% cover, which is an increase from 40% in 2004. These data are portrayed on Figures 6-a (T6), 6-b (T14) and 6-c (T15).

The transect data and the seasonal reconnaissance surveys from the occupied and suitable Scotts Valley habitat areas documented the presence of several other native plant species growing amid the rocky outcrops. These species include small-headed clover (*Trifolium macrocephalum*), sand pygmy weed (*Crassula erecta*), common beach aster (*Lessingia filaginifolia*), owl's clover (*Castilleja exserta*), sky lupine (*Lupinus nanus*), skunkweed (*Navarretia squarrosa*), golden aster (*Chrysopsis villosa* var. *villosa*), coast tarweed (*Madia sativa*), California poppy (*Eschscholtzia californica*), California plantain (*Plantago erecta*), blue-eyed grass (*Sisyrinchium bellum*), pale sack clover (*Trifolium depauperatum*), soap plant (*Chlorogalum pomeridianum*), mariposa lily (*Calochortus luteus*), false lupine (*Thermopsis macrophyla*), checkerbloom (*Sidalcea malvaeflora*), and purple needlegrass (*Nassella pulchra*).

Other non-native grasses and forbs were observed growing in and around the outcrop areas, including rattlesnake grass (*Briza maxima*), Italian ryegrass (*Lolium multiflorum*), nit grass (*Gastridium ventricosum*), European hairgrass (*Aira caryophyllea*), rose clover (*Trifolium hirtum*), white clover (*Trifolium repens*), and sheep sorrel (*Rumex acetosella*).

No invasive, non-native plant species were observed within the occupied and suitable habitat areas during the spring 2005 surveys.

4.2.2 Population Counts

The census of the Scotts Valley spineflower was conducted during a year with above average rainfall, as portrayed in the rainfall summary table. A total of approximately 28,118 individuals were counted at nine sites. This compares to approximately 25,237 individuals counted at ten sites in 2004. One site (C-124) that supported 28 individuals in 2004 did not support any plants in 2005. As depicted on Table 6-a, most of the occupied sites, however, displayed similar or slightly higher plant numbers that recorded in 2004. Within the occupied sites, plant counts per site ranged from a low of one individual (site C-74) to a high of 11,010 individuals (C-128), as depicted on Table 6-a. Eight sites that contained plants in 1992 had no aboveground spineflower plants in May 2005. Based on the comparison of these three years of data, the number of occupied sites continues to decline from a high of 17 occupied sites in 1992 to nine occupied sites in 2005. None of the previously mapped uninhabited, yet suitable, habitat areas were found to support the spineflower in 2005.

The occupied sites west of Glenwood Drive (sites C-129, C-128, C-127, C-126, C-125, C-123, and C-122) support the majority of the site's population (26,609 individuals or 95% of the population). The spineflower inhabits the rocky outcrop along the lower edge of Teacup Hill. Native and non-native plant species intermix with the spineflower in these areas; however, the spineflower grows very densely in some areas. Individuals of dudleya (*Dudleya ceaspitosa*), California fuchsia (*Epilobium canum*), California phacelia (*Phacelia egeana*), sticky monkey flower (*Mimulus aurantiacus*) were observed within these sites, in addition to the herbaceous species documented in the transects. This area appears to have received less unauthorized activity that observed in 2004. Only minor human disturbances were observed in and around these sites (some vegetation trampling and debris was observed between Teacup Hill and the high school property).

The sites east of Glenwood Drive collectively support 4,209 individuals, or 15%, of the population. Despite horse grazing within the panhandle area in 2004/05, no spineflower plants were observed in this area in May 2005 (previously occupied sites C-160, C-159, C-158, C-155, and C-156). During the June 2005 field survey, annual, non-native grasses and forbs continue to dominate the area, although the persistence of some native species was observed (i.e., individuals of dwarf brodiaea [*Brodiaea terrestris*]). Horses grazed the area in summer 2004, reducing the cover of the non-native grasses.

Figure 4-a. Relative cover by species in spineflower transect T6.

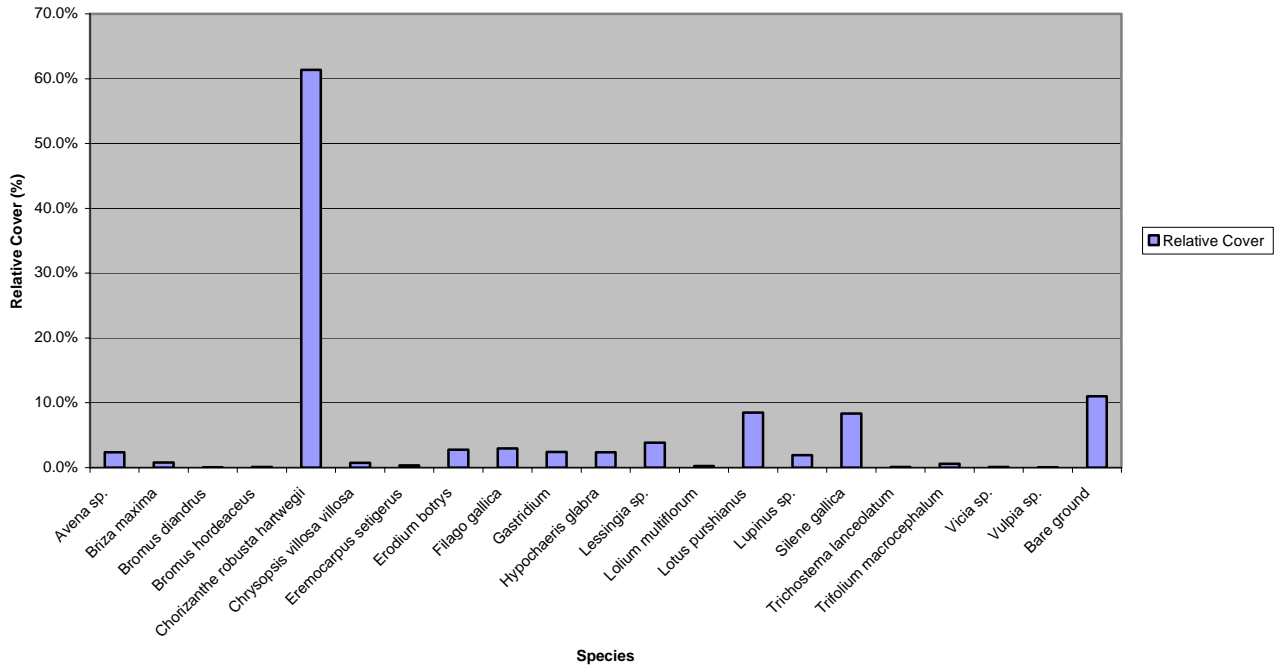


Figure 4-b. Relative cover by species in spineflower transect T14.

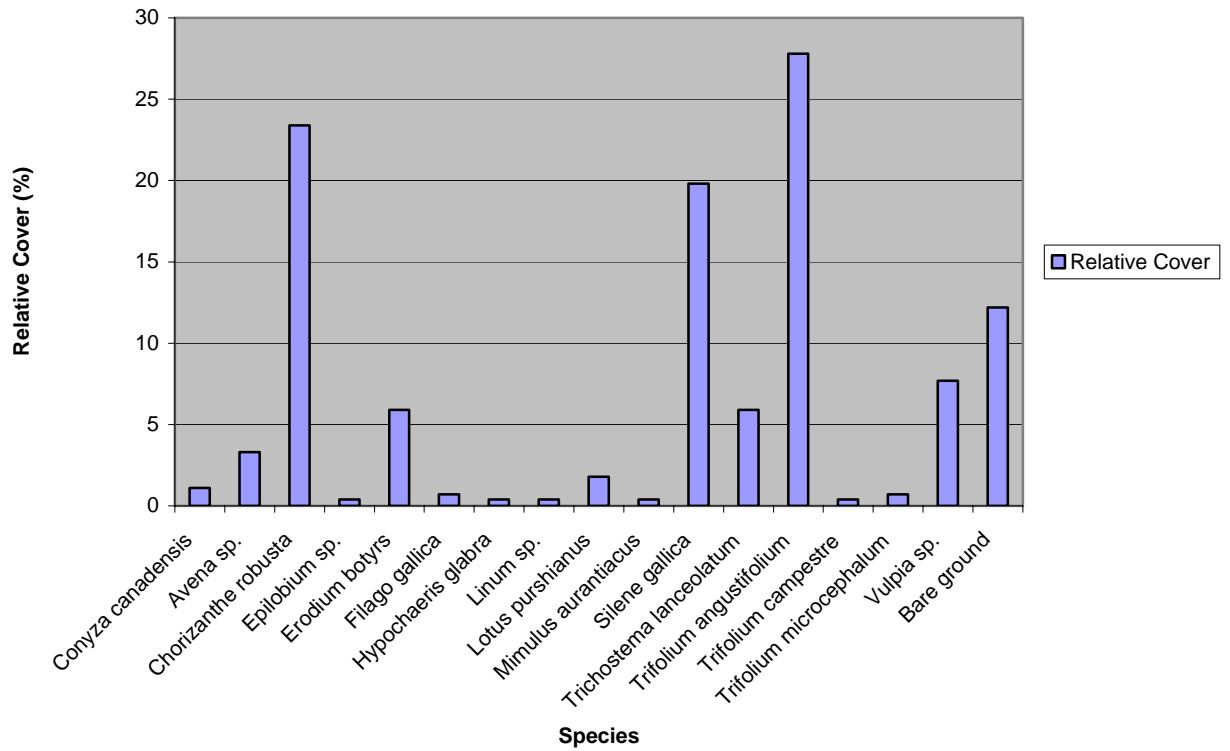


Figure 4-c. Relative cover by species in spineflower transect T15.

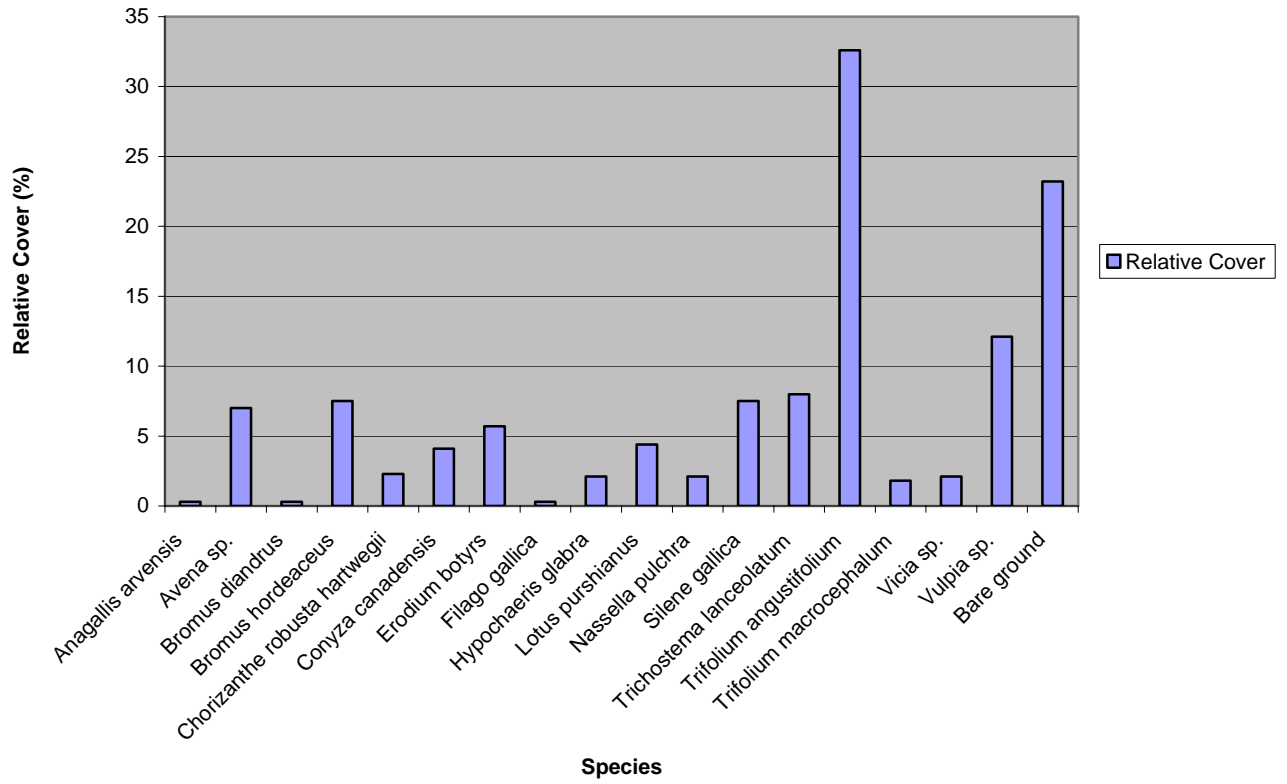


Table 4-a. Census of Scotts Valley Spineflower at Glenwood Preserve, 1992, 2004 and 2005

Site Number	Population Estimate 1992 ¹	Population Census, May 2004	Population Census 2005	Location
C-64	1-10	0	0	E of Glenwood Drive, SE section
C-74	10-50	55	1	E of Glenwood Drive, central section
C-77	1,000-5,000	1,204	1,018	E of Glenwood Drive, central section
C-122	5,000-10,000	5,050	3,190	W of Glenwood Drive, Teacup Hill
C-123	1,000-5,000	370	363	W of Glenwood Drive, Teacup Hill
C-124	1-10	28	0	W of Glenwood Drive, Teacup Hill
C-125	1,000-5,000	1,490	1,760	W of Glenwood Drive, Teacup Hill
C-126	500-1,000	200	850	W of Glenwood Drive, Teacup Hill
C-127	5,000-10,000	5,390	6,933	W of Glenwood Drive, Teacup Hill
C-128	5,000-10,000	6,170	11,010	W of Glenwood Drive, Teacup Hill
C-129	5,000-10,000	5,280	2,993	W of Glenwood Drive, Teacup Hill
C-147	100-500	0	0	W of Glenwood Drive, grassland site
C-155	50-100	0	0	E of Glenwood Drive, panhandle area
C-156	50-100	0	0	E of Glenwood Drive, panhandle area
C-158	500-1,000	0	0	E of Glenwood Drive, panhandle area
C-159	50-100	0	0	E of Glenwood Drive, panhandle area
C-160	50-100	0	0	E of Glenwood Drive, panhandle area
Total	28,500-55,000	25,237	28,118	

¹ – Source: 1992 Survey Data, Habitat Restoration Group

The two other occupied sites east of Glenwood Drive are located north of the pond. As depicted in Table 4-a, site C-74 only supported one spineflower plant in 2005. This plant was observed down slope of the informal trail that traverses the hillside. This site supported 55 plants in 2004. Site C-77 supported approximately 1, 018 plants, which is a decrease from approximately 1, 204 plants in 2004.

4.2.3 Monitoring of Management Activities Implemented in 2004

The goal for the population of extant Scotts Valley spineflower is to maintain, on average, all extant colonies and a total population that meets or exceeds the population data collected in 1992, although it is acknowledged that the population will vary from year to year based on environmental conditions.

The grassland management program (i.e., horse grazing) was implemented in spring 2004. Horses grazed sites east of Glenwood Drive in 2005. No obvious adverse environmental site conditions (e.g., erosion, over-grazing or trampling) were noted during the spring 2005 field surveys within the occupied spineflower areas. During 2005, the spineflower areas within the Preserve were subject to minor human disturbances. Pedestrians, many with unleashed dogs, traversed through the grassland on both sides of Glenwood Drive. To date, however, no significant impacts to the Scotts Valley spineflower were noted from this activity.

The spineflower areas both east and west of Glenwood Drive supported a dense growth of narrow-leaved clover in 2005; this species was only marginally present in 2004. It is not known if the abundant growth of this non-native forb affected the germination or growth of Scotts valley spineflower since spineflower numbers were higher in C-128 (near transect T15, yet lower in C-77 (T6). The spineflower population within the grazed areas (C-77 and C-74) declined in 2005, however, the abundant growth of other plant species within these areas does not suggest that the area was overgrazed.

4.3 CONCLUSIONS AND RECOMMENDATIONS

With the exception of the spineflower sites in the panhandle near Tabor Drive, non-native grasses and forbs continue to grow on and around the occupied sites, but not at levels that adversely affect the growth of the spineflower. In order to ensure the continuing presence of spineflower on the Preserve, the following recommendations are offered:

1. The Management Plan recommends an increase in the intensity of grazing if any known areas occupied by Scotts Valley spineflower east of Glenwood Drive become colonized by invasive species or coverage by non-native annual grasses increases by more than 25%. At sites C-77 and C-74 spineflower numbers declined in 2005 and the cover by narrow-leaved clover (a non-native short-lived perennial species) increased by more than over 25%. Assuming that the narrow-leaved clover is functioning like that of a competing annual grass species, it is recommended that the grassland in and around sites C-77 and C-74 continue to be grazed intensively, particularly in above-normal rainfall years, to inhibit the growth of narrow-leaved clover and other non-native grasses and forbs. Continued intensive grazing in this area (as was conducted in 2005) is expected to maintain existing open area and

create additional areas that would be suitable for the spineflower. The Management Plan recommends that spineflower areas maintain a high proportion of un-vegetated weathered sandstone or bare ground and additional grazing is expected to create such conditions.

2. Continue to graze the panhandle and monitor whether any spineflower plants occupy the area in spring 2006 (sites C-155, C-156, C-158, C-159 and C-160) and at spineflower site C-64, where no spineflower plants were observed in 2004 or 2005.
3. The Scotts Valley spineflower population should be monitored in spring 2006, with data compared to previous year's observations.
4. Although no evidence of impacts to spineflower was observed, human access within the Preserve should be monitored. As recommended in the Year 1 report, fencing should be maintained on the portion of the Preserve west of Glenwood Drive to discourage unauthorized human access to the hillside area.

5.0 GRAZING MANAGEMENT

Prepared by David Amme, Resource Restoration and Management.

The 2005 grazing management program goals included 1.) building up the horse numbers, 2) repairing and rebuilding the fence and water infrastructure, 3) monitoring the horses' grazing patterns, 4) coordinating the horse grazing rotation plan in order to encourage more even forage utilization, and 5) maintain the locally open ground that is a critical environmental element for the Ohlone beetle habitat.

5.1 METHODS

To accomplish these goals reconnaissance surveys, photo documentation, and fall residual dry matter (RDM) surveys were conducted. Reconnaissance surveys were conducted February 7, March 1 and 13, April 13 and 26, May 30, June 26, July 7, 13 and 30, August 5, September 3 and 30, October 8, and November 5. The end of the grazing season reconnaissance surveys took place on September 30, October 8 and November 5. Prior to the completion of this report a reconnaissance survey was conducted on December 10. The RDM values were measured on October 8. A portion of the time during several of these visits was also devoted to managing the replacing of the eastern boundary fence, installing the new creek gate, activating water troughs, and meeting and corresponding with the horse owners.

5.2 RESULTS

5.2.1 Pasture Infrastructure

Implementation of the grazing program outlined in the Glenwood Open Space Management Plan (OSMP) was initiated in 2004 with the creation of four pastures on the Preserve east of Glenwood Drive: Pastures A (Canham pasture), B (Pond pasture), C (Tabor pasture) and D (Beetle pasture). The Beetle pasture encompasses the Ohlone tiger beetle habitat. A significant factor in the management of the horses was the loss of a functioning gate early in 2004 at the creek between the Canham pasture and the three eastern pastures. In addition, the horses still had a preference for staying in the Canham pasture. Prior to the creation of the Preserve and the four separate pastures, the north gate on Canham Road was the preferred gate used by owners to access their horses. The Canham pasture is a moist and productive pasture with abundant perennial grasses and clover. Horses returned there regularly and owners were accustomed to finding and caring for them in this area. In 2005 the Tabor pasture fence line along Tabor Drive was also in poor repair and the horses could potentially escape or be injured on Tabor Drive. The creek gate was not repaired until early August when the eastern perimeter Tabor Drive fence line was rebuilt. Horses could be moved into to the Tabor pasture by closing the Tabor gate. The water troughs in both the Tabor and Beetle pastures were functioning well.

With the final installation of the creek gate and the eastern boundary perimeter fence in August 2005, the horses are finally able to be rotated and graze each of the four pastures. Access for horse owners to the Pond and Tabor pastures was improved with

the installation of a metal corral near the entrance of the water company gate. The horse owners are now able to access their horses, feed and groom them separately, and hold them until they can be moved into a trailer at this location. Access by the horse owners to their horses when they are in the Beetle pasture (Pasture D) is from a gate on the access road behind Vine Hill Elementary School along the south boundary of the Preserve.

5.2.2 Horse Management/Rotation

During the 2004-5 grazing season 3 to 5 older horses or horses in danger of foundering were removed by the owners to stables or other pastures during the winter and returned in the spring or summer. During 2005 the herd was increased to a maximum 22 horses and presently has 21 horses. Currently 2 horses have left the Glenwood pasture to stables leaving 19 horses in the pasture. The horses are moved by horse owners Renie Gallagher and Katie Harper with periodic help from the other horse owners.

Table 2-a shows the utilization of each pasture in terms of Animal Unit Months (AUMs) on a monthly basis in the 2004-05 grazing season (October 2004 to December 2005). The dashed line between the pastures means the gate is open between those pastures. At the beginning of the 2005 season, five new horses were moved into the Beetle pasture for two months between November to January and joined the rest of the herd in the Canham pasture in mid January 2005. During the fall and early winter the horses stayed in the Canham pasture even though the creek gate was open and the horses could access the Pond and Tabor pastures. During this time 2 horses were moved off permanently and 2 horses were moved to winter stables keeping the herd number at 16. In February the horses began to move into the Pond and Tabor pastures. The February numbers reflect the estimated use of the horses based on observation and is shown by an arrow.

In March the horses were moved out of the Canham pasture to the Tabor pasture with the gates to the Beetle pasture left open. Reconnaissance surveys by Dr. Arnold and David Amme at this time indicated the horses were not sufficiently utilizing the Beetle pasture. This corresponds to the time when Dr. Arnold recorded the Ohlone tiger beetle population peak at Glenwood (March 8). Because there was a lull in the rain and the soil was not saturated, Dr. Arnold recommended that horses be confined in the Beetle pasture for a short period of time. Twelve of the horses were locked in the Beetle pasture for 16 days (6 AUMs) starting on March 14th while 5 horses remained in the Tabor Pasture. The twelve horses were moved back into the Tabor pasture on March 30. In mid April the horses were moved into Canham and Pond pastures spending equal amounts of time in each pasture. During this time four horses were added to the herd and two horses returned bringing the number to 22 horses. In July and August twenty horses were moved to the Tabor pasture where they took advantage of the forage in the large wet area of Danville Loam and the higher surrounding ground near Tabor Drive. During this time nine of the horses were confined in the Beetle pasture to graze down the remaining feed and open up more bare areas for Ohlone tiger beetle habitat in late July and August (as per Dr. Arnold's recommendation). A substantial amount of new bare ground was created to prepare the site for the next Ohlone tiger beetle breeding season. Even though the Beetle pasture was impacted by 30 AUMs in 2005 grazing season because of the extra rainfall most of the pasture was moderately grazed. As soon as the creek gate was fixed all the horses were rotated to the Pond pasture in September and then allowed to roam into the Canham pasture in October.

Despite the heavy use of the Canham pasture during the 2004-05 grazing season (~94 AUMs), the abundant rainfall coupled with a 2-3 month period of regrowth in the spring and summer when the horses were moved to the eastern pastures enabled the Canham pasture to regrow and remain in good condition with reserve forage for the horses in the fall and early winter (Nov-Dec).

Table 5-a. Actual grazing of the Glenwood Open Space in 2004-05 grazing season													Estimated AUMs per Pasture*	
Grazing season November to October Grazing Capacity: 275 AUMs. 2005 Actual: 231.5 AUMs														
Pasture	N	D	J	F	M	A	M	J	J	A	S	O		
Canham (75 AUM)	15	15	16	7			4	10	12	2	2		11	~94 AUMs*
Pond (88 AUM)				5			4	10	10			21	11	~61 AUMs*
Tabor (93 AUM)				4	8	2	8			11	11			~45 AUMs*
Beetle (19 AUM)	2.5	5				6				9	9			~31.5 AUMs
Adult Beetle	*****												*estimates based on observed movements	
Active Larvae	*****													
Below Ground	*****													
Spineflower	*****													
Total AUM's	17.5	20	16	16	17	16	20	22	22	22	21	22		231.5 AUMs

All but the Beetle pasture gates were opened in October. The horses began to migrate on their own into the Pond pasture and then the Tabor pasture in November searching for fresh forage. The Beetle pasture gates were opened in November and the horses began to congregate in the Beetle pasture for portions of each day and walking the paths and bare areas that support the Ohlone tiger beetle. In November the horses were spending much of their time in the Pond pasture ranging as far as the Beetle pasture. In December the horses are grazing the Tabor pasture a little more than the Pond and still ranging into the Beetle pasture.

5.2.3 Pasture Utilization and Residual Dry Matter (RDM) Measurements

The main purpose of the RDM measurements is to determine the grazing utilization of the Glenwood pasture. Figure 5-a shows the heavily utilized areas and the locations of the sample RDM plots. In general the target RDM average is 1000 to 1200 lbs/acre to assure enough cover and forage for the horses in the fall and early winter months. Table 5-b summarizes the average RDM from the nine areas sampled in 2004. The

values of these clipped RDM plots indicated very light grazing and many of the plots were de facto ungrazed (primary production) samples. This information is presented as a comparison for the 2005 grazing season utilization. On September 30 and October 8, 2005, a utilization survey was conducted. The 2005 RDM clipped plots were located in sites that represent typical areas of varying uniform utilization and identified and sampled the areas of light, moderate, and heavy grazing. Table 5-c gives the RDM values for the 21 sample plots for 2005. Nine of the sites correspond to the established vegetation transects (Transects 1, 2, 3, 4, 5, 7, 10, 11, & 12) including seven of the transects with RDM measurements in 2004 (Transects 1, 2, 3, 4, 5, 7, & 10). Comparing similarly grazed areas between the 2003-04 and 2004-05 grazing seasons indicates that the 2004-05 season produced 2000 to 3000 lbs/acre more forage while grazing utilization increased.

Table 5-b. 2004 Average Residual Dry Matter (Pastures A, B, C, and D)		RDM lbs/acre
Canham	Annual Grass Transect 1 . Evidence of moderate grazing/trampling.	6,316
Canham	Wetland Transect 2 . Evidence of moderate grazing and trampling.	7,296
Pond	Cream Cups/Opler's Moth Transect 4 . No evidence of grazing.	3,321
Pond	Cream Cups/Opler's Moth Transect 7 . Moderate grazing.	3,103
Pond	South Facing Slope. (3:1 slope). No evidence of grazing.	4,301
Pond	South Facing Slope Below Transect 3 . (2:1 slope). No grazing.	4,682
Tabor	Annual Grass Transect 5 . Evidence light grazing and disturbance.	6,443
Tabor	Wetland Transect 10 . No evidence of grazing. Lodged mulch 7" high.	11,888
Beetle	(Transect 12). Mostly ungrazed	6,533



Table 5-c. Residual Dry Matter Summaries (Pastures A, B, C, and D).	
Canham Pasture (A). Danville loam. Normal year forage production 4000 lbs per acre (SCS).	
Plot 1 Near redwood grove, northeast corner. Moderately grazed, few weeds, 1-3" height. Flat surface, no gopher signs.	
	1,878 lbs/acre
Plot 2 Southwest of Plot 1 between ground squirrel area and heavily used flat. Moderately grazed. 3" laying down. Flat surface, no gopher signs.	
	3,267 lbs/acre
Plot 3 West of Plot 2 between two heavily used area. Lightly grazed. 7-10" upright. Flat surface.	
	5,173 lbs/acre
Plot 4 North end of south field (south of willow island). Lightly grazed, heavy RDM. 4-5" laying down. Scattered tar weed. Irregular surface. No signs of gophers.	
Near Transect 1	5,989 lbs/acre
Plot 5 Sample of heavily grazed clover flat west of Plot 4 (Typical). Flat surface, no gophers.	
	844 lbs/acre
Plot 6 West side of south field. Lightly grazed, heavy RDM. Laying down. 6-7". Signs of gophers.	
	6,969 lbs/acre
Plot 7 Wetland plot, southwest end of field in grassy only area. Lightly to moderately grazed. Irregular surface, no signs of gophers.	
Near Transect 2	9,256 lbs/acre
Pond Pasture (B). Bonnydoon loam. Normal year forage production 3200 lbs per acre (SCS).	
Plot 8 Cream cups/Opler's moth site. No signs of grazing, some trailing. 4-5" standing and laying down. Irregular surface, signs of gophers. (Represents possible primary production)	
Near Transect 4	6,806 lbs/acre
Plot 9 Cream cups/Opler's moth site. Moderately grazed, trailing. 4-6" laying down. Irregular surface, signs of gophers.	
Near Transect 7	2,423 lbs/acre
Plot 10 Grassy area northeast of pond. Horses beginning to graze area when measured. 3-6" laying down. Irregular surface, signs of gophers.	
	2,804 lbs/acre
Plot 11 South facing slope. No evidence of grazing. 6" laying down. Irregular surface, signs of gophers. (Represents possible primary production)	
Below Transect 3	5,009 lbs/acre
Plot 12 Northeast corner of pasture near top of hill. Horse trail through area. 4" laying down. Irregular surface, signs of gophers.	
	3,049 lbs/acre
Plot 13 Westside near top of ridge. Moderately grazed. 4" laying down. Flat surface, no signs of gophers.	
	2,314 lbs/acre

Plot 19 North side of fence line at top of hill. Lightly or not grazed. Grey matter in sample. 4" laying down. Irregular surface, signs of gophers. (Represents possible primary production)	
Near North Transect 5	5,989 lbs/acre
Tabor Pasture (C). Hillsides dominated by Bonnydoon loam, normal year forage production 3200 lbs per acre. Wetland flat, Danville loam, normal year forage production 4000 lbs per acre (SCS).	
Plot 17 Wetland sample in center of pasture. Moderately grazed 6-8" standing and laying. No signs of gophers.	
Near Transect 10	4,356 lbs/acre
Plot 18 Wetland southwest corner of pasture. Lightly grazed. 8-10" standing and laying down. No signs of gophers.	
	6,806 lbs/acre
Plot 20 South of fence on top of hill opposite Plot 19. Moderately grazed area near heavily grazed area. 4" laying down. Irregular surface, signs of gopher activity.	
Near South Transect 5	1,797 lbs/acre
Plot 21 Southeast end of pasture on side of hill near Gray's clover sites. Moderately grazed. 4" laying down. Irregular surface, signs of gopher activity.	
	3131 lbs/acre
Beetle Pasture (D). Bonnydoon loam. Normal year forage production 3200 lbs per acre (SCS).	
Plot 14 Moderately grazed. Irregular surface. No gophers.	
Near Transect 11	2,396 lbs/acre
Plot 15 Heaviest RDM in central beetle area. Moderately grazed. Irregular surface. No signs of gophers. Ground squirrels active near by.	
Near Transect 12	2,722 lbs/acre
Plot 16 North of water trough, west end of pasture. Lightly grazed. Irregular surface. No sign of gophers.	
	4,900 lbs/acre

Late spring rainfall in the 03-04 season was below average totaling only 2" after March 1st. For the same period the rainfall for the 04-05 season was above average totaling 17" of rain after March 1st (Appendix B). In the 2004-05 grazing season areas that showed signs of light or no grazing consistently had RDM values above 5,000 lbs/acre. Moderately grazed areas had RDM values between 2,000 and 3,000 lbs/acre. The areas of heaviest grazing had very little RDM (trace to 250 lbs/acre). These areas were preferred by the horses and grazed the closest, reflecting moist subsoil and the presence of the prostrate perennial rose clover (*Trifolium hirtum*). Plot 5 represents the upper end of a heavily grazed/preferred site at 844 lbs/acre. Based on ocular estimates, the average heavily grazed areas had RDM amounts between 250 to 800 lbs/acre). The wetland sites (Danville loam) in the Tabor pasture were much more evenly grazed than the previous year providing an estimated 3-4,000 lbs/acre of consumed forage.

In the Beetle pasture the recommended July and August grazing greatly expanded the open ground around the main horse trails and loafing areas of the Ohlone tiger beetle habitat (with little or no RDM) while maintaining moderate RDM values in between (2,300-2,700 lbs/acre). Figures 5-b – 5-e show aspect of grassland and wetland RDM plots.



Figure 5-b. Canham moderately grazed grassland Plot #1 (1,878 lbs/acre).



Figure 5-c. Canham closely grazed grassland Plot #5 (844 lbs/acre).



Figure 5-d. Canham wetland Plot # 7 (9,256 lbs/acre).



Figure 5-e. Tabor wetland Plot # 18 (6,806 lbs/acre).2.2.4



Figure 5-f. Close up of Beetle habitat in March 2005.

Figure 5-g shows an overview of one of the propane torch treated plots after three weeks of regrowth. The flowering herbs were killed but the filaree and annual grasses survived. One of the beetle paths can be seen in the top of this photograph.



Figure 5-g. Flaming application plot three weeks after treatment. Photo taken April 13.

Figure 5-h shows the aspect of the larger beetle “barren” after the horses were moved out of the Beetle pasture. Native wildflowers normally cover this area in April but completely dry out and disappear in the summer. With the extra spring rain the drying of this area may have been delayed.



Figure 5-h. Photo of beetle area on April 13, 2005. Note hoof print in lower left.

The two primary Opler's longhorn moth habitats were monitored in the spring and RDM plots were measured in October. There was little sign of grazing in the vicinity of RDM Plot 8. The RDM value of plot 8 was 6,800 lbs/acre. The RDM value for this plot in 2004 was 3,300 lbs/acre reflecting the different conditions between years and the much greater production in 2005. Despite the heavy grass cover there were scattered cream cups (*Platystemon californicus*) at this site in both years. The cream cups were more numerous on the north-facing slope next to the pond that was moderately grazed in 2005. The RDM value for the pond slope area (Plot 9) was 2,400 lbs/acre (See Figure 2-i). In 2004 the RDM value in this area averaged 3,100 lbs/acre.

5.2.4 Panhandle Spineflower Habitat

In 1992 a scattered population of the Scotts Valley spineflower was found growing on a weeping or moist interface just above the east entrance to Siltanen Park. At the time this site was surveyed it was unfenced and open to horses grazing. Subsequent home construction created a narrow strip or panhandle of grassland within the Glenwood Preserve along the entrance road. At the time the houses were built this panhandle was fenced off from grazing. This area has remained ungrazed for 10 years until the construction of the new perimeter fence that included this area in the Beetle pasture in 2004. Presently the horses graze this area lightly. To encourage spineflower habitat in this area it is possible that the area could be fenced off and grazed by 4-6 horses for short periods if a water trough could be filled during these periods.



Figure 5-i. Opler's longhorn moth habitat near Pond (April 13, 2005).

5.3 DISCUSSION

The Glenwood carrying capacity as determined in the 2003-04 monitoring report is 23 horses (275 AUMs). It is clear from total Animal Unit Months given in Table 2-a and the high RDM values in Table 2-c that the horse numbers need to be raised by 2 horses (36-40 AUMs). Given the absence of horses in the winter this number could be increased by another horse (24 AUM's). Utilization has improved as the Glenwood horse herd is adapting to the new conditions of the pasture and seem to be more comfortable crossing the creek to the east side of the pasture and moving throughout the different pastures when the gates are open.

Almost 36 inches of rain had fallen on the Glenwood pasture in the previous year by the end of February 2004. Similarly, forage production was high in the first part of 2005 aided by the forty inches of rainfall that had soaked the Glenwood pasture by the end of February 2005 and above normal rainfall (17 inches) in April, May and June. Except for clover, horses generally do not eat flowering forbs and cannot be forced to eat the wildflowers and forbs when surrounded by productive grassland. The open bare ground along narrow paths and in larger connected patches is more a result of horse traffic than horse grazing. While the soil in the beetle area is barren it is not hard and rocky. It may be that the physical presence of horses walking into and loafing in the Ohlone tiger beetle area is what maintains the tiger beetle habitat. It may be critical to have horses walking in and out of this area throughout the spring growing season (March to June). It may be that the scientifically obtained grazing capacity of 19 AUM for the Beetle pasture may not be enough impact to maintain the Ohlone tiger beetle habitat and, in fact, may have been heavily utilized prior to the building of the housing development.

5.4 GRAZING RECOMMENDATION FOR 2005-06 GRAZING SEASON

Twenty-one horses currently comprise the horse herd. Presently nineteen horses are grazing the pasture in the winter with two horses off for the winter. In the next grazing season it will be a priority to increase the herd by 2 horses to stock the pasture at the proper stocking rate (i.e., 23 horses). The larger the herd the more interaction there is between the horses and the more likely they are to begin to move around or even break up into two subgroups. Notwithstanding the increase in horse numbers, the grazing strategy for 2005-06 will be to utilize the four pasture system to encourage the horses to move to the east side of the pasture towards the Beetle pasture and give the horses increased opportunity to walk onto and through the Beetle pasture. Table 5-d sketches the proposed pasture rotation program for the 2005-06 grazing season and includes an increase to 23 horses in the spring. The key to this grazing strategy is to allow the horses access to the Beetle pasture at least every two months but not to concentrate them in the pasture where they may possibly negatively impact the beetle habitat during the larvae and adult stages. If the higher horse numbers are not attained then a little more concentrated grazing of the Beetle pasture can be encouraged with the rotation.

To address the Scott Valley spineflower in the Beetle pasture panhandle, a temporary fence and a temporary water trough should be installed to allow three or four horses to clean up the excess forage and expose the soil to encourage spineflower habitat. The trough in the panhandle can be filled during the short concentrated grazing period from a hose bib at Vine Hill School. It may be necessary to introduce spineflower seed to this area in the future if the seed bank is exhausted.

Infrastructure improvements needed in 2006 include: installing pressure reducers for the water troughs, installing special ramps in the water troughs to enable bird and mammals to escape, and rebuilding the Canham corral.

Table 5-d. Scheduled Pasture Rotation Program for Glenwood Preserve for the 2005-06 grazing season (November to October).													
	2005-06 Grazing Season Grazing Capacity: 275 AUMs Goal: Add 2 horses to the herd.												Estimated AUMs per Pasture
Pasture	N	D	J	F	M	A	M	J	J	A	S	O	
Canham (75 AUM)	8 ↑	5			1 0	2 3					1 4	8 8	~68 AUMs
Pond (88 AUM)	7 ↓	8 ↑		1 9			1 4	2 3			9	8 ↑	~88 AUMs
Tabor (93 AUM)	4 ↓	6 ↓	1 0 ↑		5 ↑		5 ↑		2 3	1 3 ↓		7 ↓	~73 AUMs
Beetle (19 AUM)			9 ↓		4 ↓		4 ↓			1 0			~27 AUMs
Adult Beetle/Egg Laying	*****												
Egg Hatching/Active Larvae Stages	*****												
Below Ground Pupae Stage	*****												
Scotts Valley spineflower	*****												
Total AUM's	1 9	1 9	1 9	1 9	1 9	2 3	2 3	2 3	2 3	2 3	2 3	2 3	256 AUMs

6.0 VEGETATION MONITORING IN SENSITIVE HABITATS

Prepared by Philip Greer, Geoff Smick, WRA, Inc.

6.1 METHODS

Quantitative sampling of vegetation transects allows tracking of changes in plant cover and species composition. This information can be used in determining the effectiveness of the grazing and other management tools in maintaining habitat for sensitive species. The fifteen permanent transects established throughout the Preserve in different habitat types were monitored again in 2005. Locations of these transects are shown on the Preserve Map (Appendix A). Within the Ohlone tiger beetle and Scotts Valley spineflower habitats, three transects each were used to measure the vegetation characteristics. Three transects were established in wetlands, three in native grasslands, two in annual grasslands, and two in grasslands with the larval food plant (*Platystemon californicus*) for the Opler's longhorn moth.

Sampling was conducted along each transect using 0.1 meter-square quadrats, placed 1 meter apart, perpendicular to and on alternating sides of the meter tape. Species composition and percent cover were measured within each quadrat. Plant cover was estimated using Braun-Blaquet cover classes. Special attention was focused on the presence, estimated number, and/or percent cover of native perennial bunchgrasses, sensitive plant species, and invasive species.

Photographs were taken at each transect. Photographs will be used to monitor long-term changes in the site and its plant communities. Photographs can also be used to determine if localized areas are receiving either light or heavy grazing, are subject to erosion, or are being adversely affected by invasive species.

Vegetation surveys were conducted in March, April, and June in 2005, depending on the maturity of the flora in each habitat. Exact surveying dates for specific transects can be found on the 2005 data sheets included in Appendix C (2004 data is also included for comparison).

6.2 RESULTS

Data collected during transect monitoring in 2005 is presented in Appendix C. Examples of photographs taken at transects are presented in Appendix D. Figures 6-a - 6-d compare vegetation composition and cover across the transects.

Figure 6-a shows the relative cover of bare ground compared to vegetation in the 15 transects. The average area with vegetation along the transects increased almost 10 percent from 2004 ($x = 82.6\%$) to 2005 ($x = 90.6\%$). This is likely due to the above average late season rainfall that occurred in the spring of 2005 (Appendix B). All but one of the 15 transects had over 80 percent relative cover of vegetation in 2005 compared to only 9 transects in 2004. Transects with the highest proportion of bare ground were the OTB transects (11, 12 and 13), and transects 14 and 15 in SVSF habitat.

The relative percent cover of the vegetation in the transects is presented in Figures 6-b and 6-c. Relative cover of native vs. non-native species is graphed in Figure 6-b. Average relative percent cover of native species throughout the transects increased over 10 percent between 2004 ($x = 13.1\%$) and 2005 ($x = 25.4\%$). Relative cover by natives increased in 10 transects from 2004 to 2005. Transects 7 and 11 (OLM and OTB habitats, respectively) had over 50 percent relative cover by native plants in 2005, while in 2004 the highest levels of relative cover were around 30 percent. Transect 4 (native grassland/OLM habitats) had no native plants in 2005, down from 12 percent native cover in 2004.

Relative cover of forbs vs. grasses, sedges, and rushes is graphed in Figure 6-c. Average cover on all transects by grasses, sedges, and rushes dropped 34 percent between 2004 ($x = 75\%$) and 2005 ($x = 37\%$). Data from 2004 indicates that only two transects had a greater percentage of cover by forbs than non-forbs (transects 6 and 15). In 2005 12 transects had a higher percentage of cover by forbs than non-forbs. This increase may be related to increased grazing and differences in rainfall between the two years that favored the growth of forbs in 2005. Above normal late spring rains could increase forb cover by prolonging the growth period before low soil moisture induced senescence.

The number and type of species occurring in the transects are presented in Figure 6-d. The average number of species across all transects rose by 2.7 species between 2004 ($x = 14.6$ species) and 2005 ($x = 17.3$ species). Only three transects had a total of 20 or more species in 2005: transects 3, 6, and 7, down slightly from 2004 when four transects had a total of 20 or more species (transects 4, 7, 13, and 15). In 2004 transects 1, 2, 5, and 12 had ten or fewer species, but no transects had less than 10 species in 2005. The transects with the lowest numbers of species in 2005 were 1 and 2 which had 11 and 12 species per transect respectively.

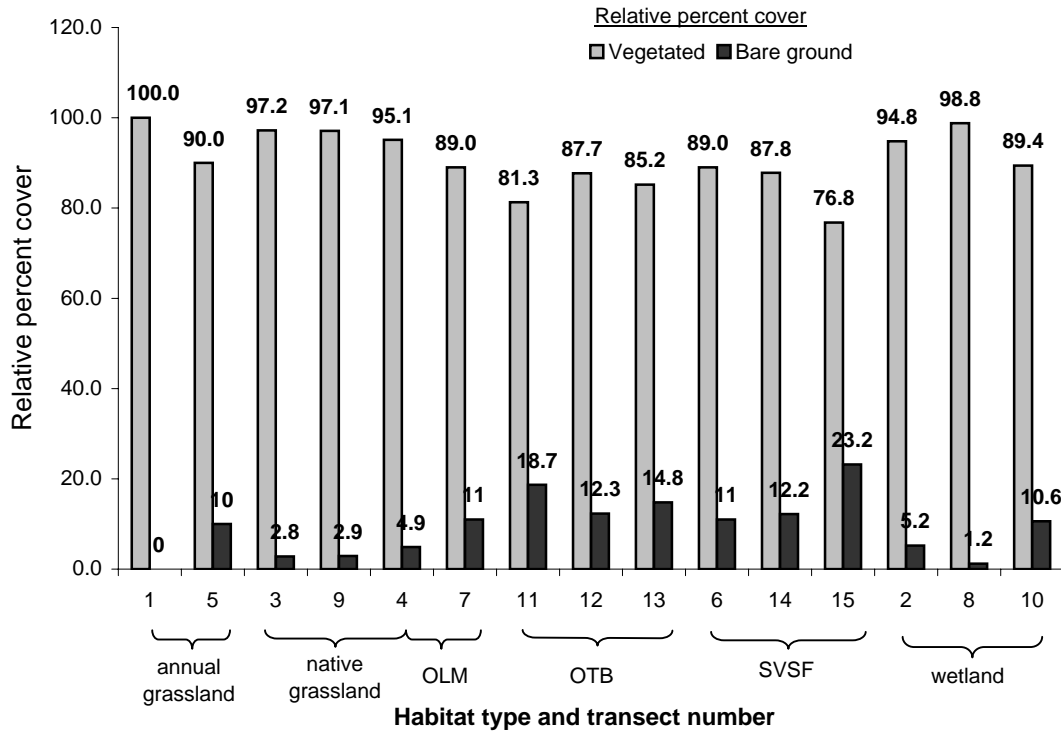


Figure 6-a. Relative percent cover of vegetation and bare ground calculated from transects placed in different habitat types in the Glenwood Preserve, 2005.

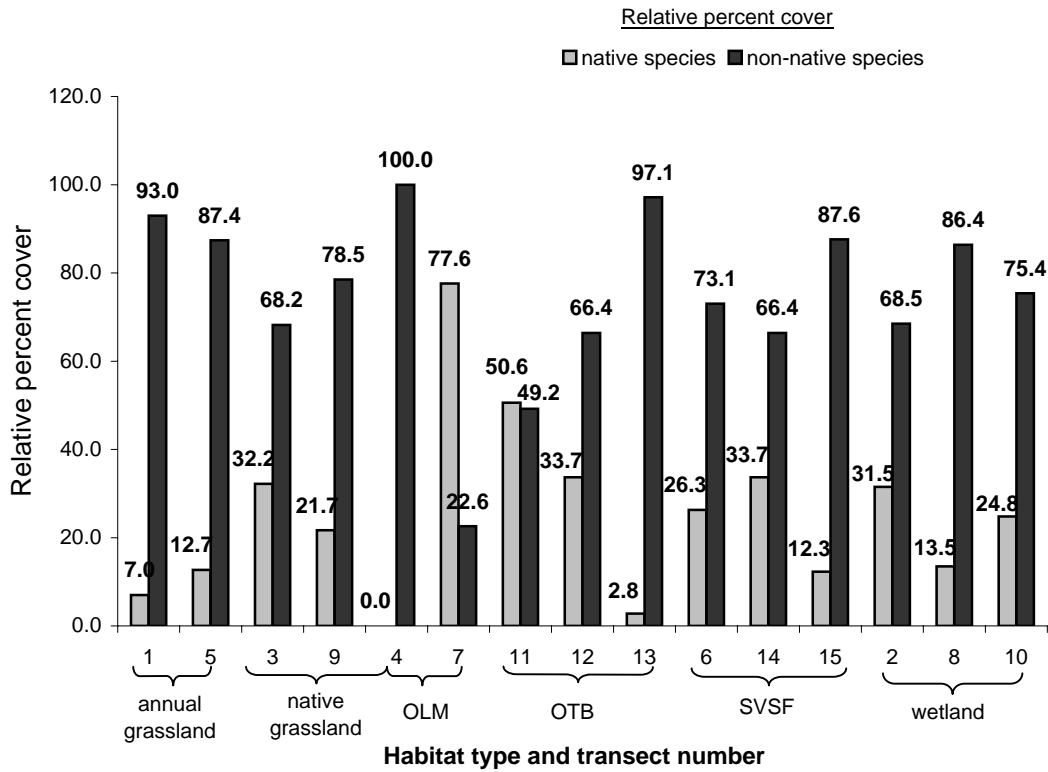


Figure 6-b. Relative percent cover of native and non-native species calculated from transects placed in different habitat types at the Glenwood Preserve, 2005.

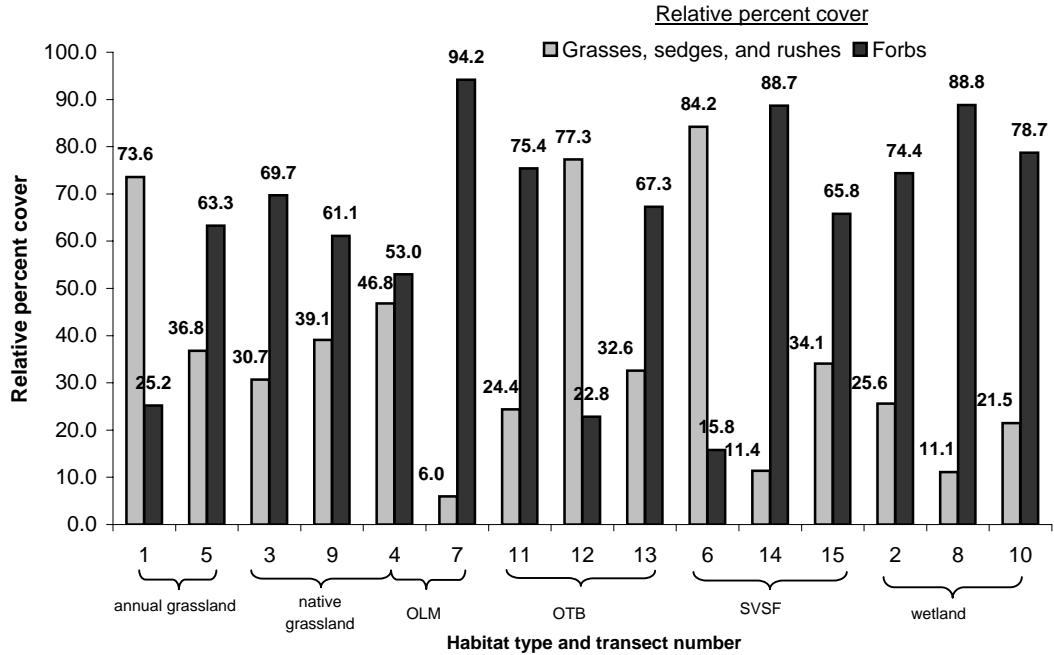


Figure 6-c. Relative percent cover of grasses, sedges, and rushes compared to forbs calculated from transects placed in different habitat types on the Glenwood Preserve, 2005.

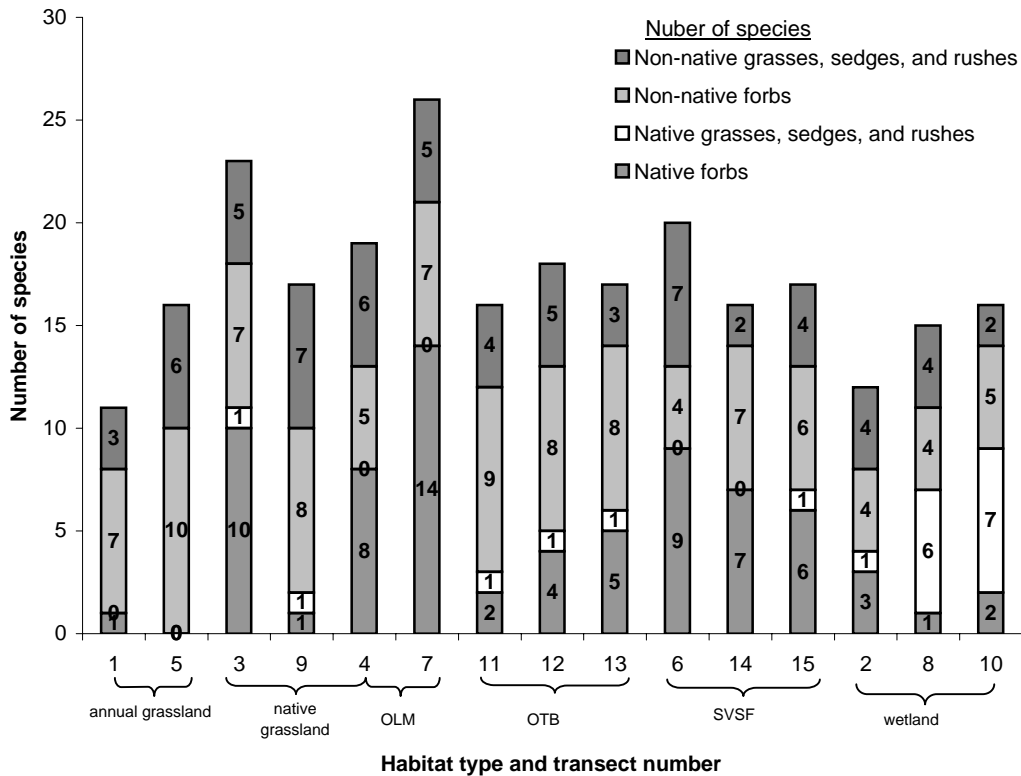


Figure 6-d. Species composition of transects placed in different habitat types at the Glenwood Preserve, 2005.

7.0 OTHER SPECIAL STATUS PLANTS

7.1 METHODS

Surveys were conducted by WRA, Inc. in April, May and June to monitor the distribution of several special status species historically reported to occur in the Preserve. Locations were mapped using GPS/GIS. These species included linanthus (*Linanthus parviflorus/androsaceus* complex), white-tipped clover (*Trifolium* aff. *polyodon*), Gray's clover (*Trifolium barbigerum* var. *andrewsii*, formerly *T. grayi*), and grassland stebbinsoseris (*Stebbinsoseris heterocarpa*), all species of CNPS local concern, in addition to Choris's popcorn flower (*Plagiobothrys chorisianus* var. *chorisianus*, CNPS List 1B) and Mt. Diablo cottonweed (*Micropus amphibolus*, CNPS List 3).

The Glenwood Preserve is included in designated critical habitat for the federally endangered Scotts Valley polygonum (*Polygonum hickmanii*) (USFWS, Federal Register, Vol. 68, No. 67, April 8, 2003). Habitat for this species is very similar to that of the Scotts Valley spineflower. Biotic Resources Group conducted the survey for this species in May 2005.

7.2 RESULTS

7.2.1 Mt. Diablo cottonweed

Locations of Mt. Diablo cottonweed are shown on the Preserve Map (Appendix A). Vegetation transects 6 and 9 were located near patches of Mt. Diablo cottonweed so that future cottonweed population trends can be examined in relation to trends in grassland plant composition.

If structural characteristics (e.g. percent vegetative cover, cover of non-native vs. native species, etc.) of the grassland habitat preferred by the Mt. Diablo cottonweed change in a way that is judged to be negatively impacting the species, management activities such as changes to the grazing regime will occur.

7.2.2 Gray's clover

Individuals of Gray's clover were observed at two locations in the Preserve in 2003, but they were not observed during area-wide surveys for the taxon in mid-April of 2004. In general, clovers bloomed earlier than expected in 2004, so it is possible that 2004 surveys were too late to locate the species. This taxon was observed at four locations in Pasture C during spring surveys in 2005 and the populations were mapped using GPS and are shown on the Preserve Map in Appendix A. It should be noted that at the state level CNPS rejected *Trifolium grayi* for listing, considering it a synonym of *Trifolium barbigerum* var. *andrewsii*, a common taxon.

7.2.3 Choris's popcorn flower

Choris's popcorn flower was located in a wetland in the southern part of Pasture C (see Appendix A, Preserve Map). Approximately 10 plants were observed in two locations in

2003. Transect 10 was located in the portion of the wetland where Choris's popcorn flower occurs so that future popcorn flower population trends can be examined in relation to trends in wetland vegetation composition. Surveys conducted in May of 2005 turned up approximately 15 individuals of this species located in two adjacent patches near transect 10.

7.2.4 Scotts Valley polygonum

On May 6, 2005, during the growth and flowering period of the Scotts Valley polygonum, a census was conducted by Biotic Resources Group. As the Scotts Valley polygonum has not been previously recorded from the Glenwood Open Space Preserve, a nearby locality (Polo Ranch) was field checked to ensure that the field surveys were conducted at the appropriate time. Kathleen Lyons and a field assistant, Garv Hoefler, conducted the census within the known and suitable Scotts Valley spineflower habitat areas. No individuals of Scotts Valley polygonum were observed within the open space preserve.

7.2.5 Other rare plant species

The rare linanthus complex, white-tipped clover, and grassland stebbinsoseris were not observed on the Preserve in 2003, 2004, and 2005. Care will be taken to look for these species during Preserve reconnaissance surveys and surveys for Mount Diablo cottonweed in future years.

8.0 EXOTIC PEST PLANTS

Reconnaissance-level surveys were conducted by WRA, Inc. to monitor stands of exotic pest plants (species listed on the Cal-IPC List A or B) that may threaten sensitive habitats and to monitor effectiveness of control activities. Although no new stands of invasive exotics were located during the 2005 surveys, previously known occurrences still exist onsite.

Stands of exotic plants on Cal-IPC's List A or B monitored on the Preserve in 2005 include:

- Pennyroyal (*Mentha pulegium*, List A-2) in the wetland swale near the south end of Pasture A.
- French broom (*Genista monspessulana*, List A-1) located in a few locations in the Preserve: east of the wetland in Pasture C, in the middle of Pasture A, and at the east end of Pasture D. Only a few plants were present at each location.
- Blackwood acacia (*Acacia melanoxylon*, 'Need More Information' List) was located in a few locations near the West Branch of Carbonera Creek and near the Water District Road.
- Italian thistle (*Carduus pycnocephalus*, List B) and bull thistle (*Cirsium vulgare*, List B) were found in scattered locations throughout the Preserve including across from the corral west of the borrow area and along the Preserve fenceline northwest of transect five.

The acacia along the water district road was cut in the summer of 2005. A landscape contractor will remove the remaining populations of acacia and broom during the winter of 2005-2006. Thistle will continue to be monitored and efforts will be made to remove it. Percent relative cover of pennyroyal was nearly identical in 2005 (34.5%) to the percent relative cover in 2004 (32.8%) along transect two in the wetland in Pasture A. Grazing rotation is expected to help control pennyroyal by providing periods of rest from grazing allowing increased growth of native rushes and forbs which should out compete the pennyroyal over time. If 2006 monitoring shows that grazing management is insufficient to control it, additional control measures will be implemented.

9.0 REFERENCES

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Holmes, T. and D. Arnold. A deterministic transition model for estimating a seasonal population size and death rate for a closed population from transect counts. In preparation.

U.S. Fish & Wildlife Service (USFWS). 2001. Endangered and threatened wildlife and plants; endangered status for the Ohlone tiger beetle (*Cicindela ohlone*). 50 DFR Part 17, Federal Register 66 (192): 50340-50350.













U.S. Fish and Wildlife Service (USFWS). 2002. Critical habitat designation for *Chorizanthe robusta* var. *hartwegii* (Scotts Valley Spineflower). 50 DFR Part 17, Federal Register. 67(103): 37336-37353.

Wetlands Research Associates, Inc. (WRA). 2003. Glenwood Open Space Management Plan. Prepared for the City of Scotts Valley. June 4, 2003.

APPENDICES

Appendix A: Preserve Map

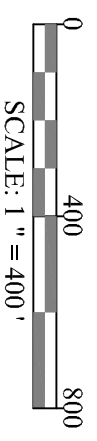
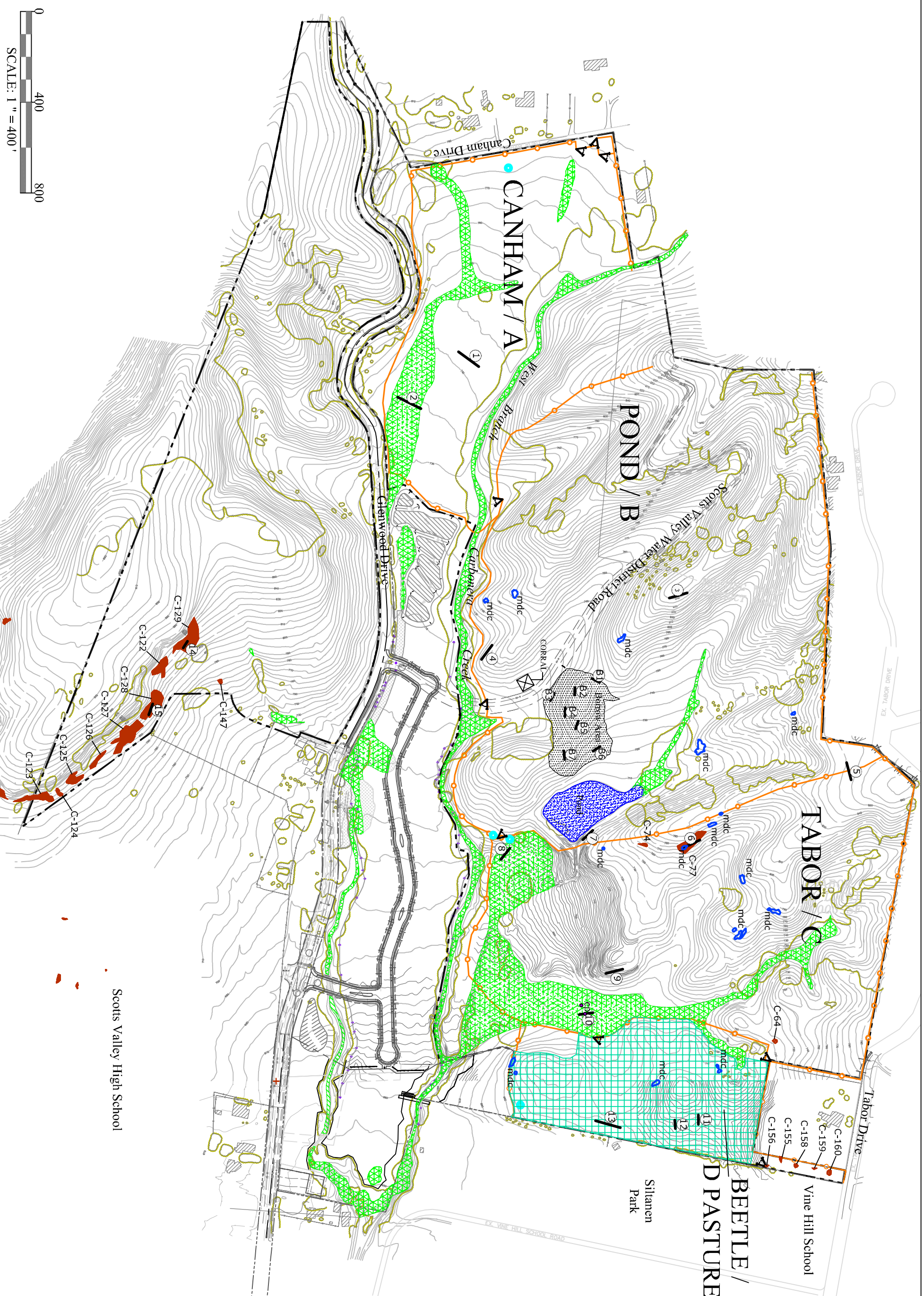
Map of
Glenwood Preserve

- LEGEND**
-  Open Space Preserve
 -  Boundary
 -  Wetlands
 -  Fence
 -  Gate Location
 -  Water Trough
 -  Water Pipe
 -  Transect (with number)
- Special Status Species**
-  Mount Diablo Cottonweed (mdc)
 -  Scotts Valley Spineflower (C-#)
 -  Ohlone Tiger Beetle
 -  Choris's Popcornflower (cp)

Date	AS BUILT	No.
8-29-2005		
	Issues And Resolves	

PROJECT #686
DRAWN BY SCS
ORIGINAL DRAWING SIZE: 24" X 36"
SCALE: 1" = 400'

SCALE: 1" = 400'



Appendix B: Area Rainfall Data for 2003-2005 Growing Seasons

Appendix B. Area rainfall data for 2003-2005 growing season.

	02-03 growing season		03-04 growing season		04-05 growing season	
	SVWD ¹	Ben Lomand ²	SVWD ¹	Ben Lomand ²	SVWD ¹	Ben Lomand ²
Sep	0	0	0	0	0.11	0.2
Oct	0	0	0.19	-	7.24	8.7
Nov	5.8	7.43	3.93	4.49	3.25	4.24
Dec	21.4	24.77	17.55	19.39	14.39	15.49
Jan	2.77	2.52	4.44	6.14	8.3	11.83
Feb	2.95	3.15	9.69	11.33	7.2	8.05
Mar	2.54	2.44	1.19	1.65	10.01	10.36
Apr	5.75	7.52	0.65	0.8	3.79	4.35
May	1.08	1.1	0.07	0.05	2.13	2.47
Jun	0.16	0.08	0	0	0.94	1.26
Jul	0	0	0.06	0.01	0.02	0
Aug	0	0	0	0	0	0
TOTAL	42.45	49.01	37.77	43.86	57.38	66.95

green values indicate above normal rainfall³
 red values indicate below normal rainfall³
 no color indicates value is within "normal" range³
 "-" indicates no data for given period

¹ Data obtained from Scotts Valley Water District.

² Data obtained from NOAA/NCDC. Station ID: Ben Lomand No. 4.

³ Data compared to USDA/NRCS WETS table for Ben Lomand station.

Appendix C: Data from Vegetation Transect Monitoring

Glenwood Preserve vegetation transects 2005

Date: 6/13/05
 Monitor(s): GAS/SW
 Transect: 1
 original transect #: A2
 pasture: A
 habitat: annual grassland

class	Range	Mean
r	<<1	*
+	<1	0.1
1	1 to 5	2.5
2	5 to 25	15
3	25 to 50	37.5
4	50 to 75	62.5
5	75 to 100	87.5

SPECIES	Present?	n=native, i=invasive x=exotic	g=grass, h=herb	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	SUM	% ABS	%REL
Bromus hordeaceus	y	x	g	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	2.5	0.2%	0.2%
Hordeum marinum ssp. gussoneanum	y	x	g	37.5	37.5	37.5	37.5	15.0	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	517.5	35.7%	36.1%
Lolium multiflorum	y	x	g	37.5	37.5	0.0	37.5	62.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	550.0	37.9%	38.3%
Trifolium subterraneum	y	x	h	15.0	0.0	15.0	0.0	0.0	2.5	0.0	0.0	15.0	2.5	15.0	15.0	15.0	2.5	0.0	97.5	6.7%	6.8%
Anthemis cotula	y	x	h	2.5	0.0	2.5	0.0	37.5	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	60.0	4.1%	4.2%
Unknown bristly hairs	y	?	h	15.0	2.5	2.5	0.0	15.0	2.5	0.1	2.5	2.5	0.0	0.0	0.0	0.0	0.0	0.0	42.6	2.9%	3.0%
Trifolium wormskoldii	y	n	h	0.0	15.0	37.5	15.0	2.5	15.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	6.9%	7.0%
Geranium dissectum	y	x	h	0.0	0.0	2.5	0.0	0.0	0.0	0.0	2.5	2.5	15.0	15.0	15.0	2.5	0.0	0.0	55.0	3.8%	3.8%
Trifolium dubium	y	x	h	0.0	0.0	0.0	0.0	0.0	2.5	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	0.3%	0.3%
Trifolium fragiferum	y	x	h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.2%	0.2%
Lythrum hyssopifolia	y	x	h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.2%	0.2%
VEGETATION TOTALS																			1435.1	99.0%	
Bare ground																			0.0	0.0	
Moss																			0.0		
Thatch				0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	15.0	1.0%	1.0%
Rock																					
GRAND TOTALS																			1450.1	1.0%	100.0%

% native	% non-native	% grass	% non-grass	% native grass	% non-native grass	% native forb	% non-native forb
0.0	0.2%	0.2%	0	0	0.2%	0	0
0.0	35.7%	35.7	0	0	35.7	0	0
0.0	37.9%	37.9	0	0	37.9	0	0
0.0	6.7%	0	6.7	0	0	0	6.7
0.0	4.1%	0	4.1	0	0	0	4.1
0.0	2.9%	0	2.9	0	0	0	2.9
7.0	0.0%	0	7	0	0	7	0
0.0	3.8%	0	3.8	0	0	0	3.8
0.0	0.3%	0	0.3	0	0	0	0.3
0.0	0.2%	0	0.2	0	0	0	0.2
0.0	0.2%	0	0.2	0	0	0	0.2
7.0	93.0	73.6	25.2	0.0	73.6	7.0	18.2

Glenwood Preserve vegetation transects 2005

Date: 6/13/05
 Monitor(s): GAS/SW
 Transect: 2
 original transect # A1 Wetland
 pasture A
 habitat wetland

Cover class	Range	Mean
r	<<1	*
+	<1	0.1
1	1 to 5	2.5
2	5 to 25	15
3	25 to 50	37.5
4	50 to 75	62.5
5	75 to 100	87.5

SPECIES	Present?	n=native, i=invasive x=exotic	g=grass, h=herb	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	SUM	% ABS	%REL
Geranium dissectum	y	x	h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	2.5	0.0	0.0	0.0	5.0	0.3%	0.3%
Hordeum marinum ssp. gussoneanum			g	15.0	15.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32.5	2.0%	2.1%
Juncus xiphioides	y	n	g	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62.5	37.5	0.0	37.5	137.5	8.4%	8.8%
Lolium multiflorum	y	x	g	37.5	37.5	15.0	15.0	15.0	15.0	15.0	15.0	37.5	0.0	37.5	2.5	15.0	62.5	0.0	320.0	19.5%	20.5%
Mentha pulegium	y	i	h	15.0	15.0	62.5	15.0	37.5	37.5	2.5	62.5	37.5	62.5	37.5	37.5	37.5	62.5	15.0	537.5	32.7%	34.5%
Polypogon monspeliensis	y	x	g	0.0	0.0	0.0	15.0	2.5	2.5	15.0	0.0	0.0	15.0	15.0	0.0	15.0	2.5	2.5	85.0	5.2%	5.4%
Rumex crispus	y	x	h	15.0	15.0	2.5	37.5	15.0	15.0	37.5	15.0	15.0	15.0	62.5	15.0	15.0	15.0	15.0	305.0	18.5%	19.6%
Hemizonia sp.	y	n	h	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0	0.9%	1.0%
Lythrum hyssopifolia	y	x	h	0.0	0.0	0.0	0.0	0.0	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0	15.0	45.0	2.7%	2.9%
Rorippa nasturtium-aquaticum	y	n	h	0.0	0.0	0.0	0.0	0.0	0.0	15.0	15.0	0.0	0.0	0.0	0.0	0.0	15.0	0.0	45.0	2.7%	2.9%
Mimulus guttatus	y	n	h	0.0	0.0	0.0	0.0	0.0	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0	0.9%	1.0%
Briza minor	y	x	g	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	15.0	17.5	1.1%	1.1%
VEGETATION TOTALS																			1560	94.8%	100.0%
Bare ground				2.5	2.5	2.5	2.5	37.5	37.5	0	0	0	0	0	0	0	0	0	85	5.2%	
Moss																					
Thatch																					
Rock																					
GRAND TOTALS																			1645	5.2%	

% native	% non-native	% grass, sedge, rushes	% non-grass	% native grass	% non-native grass	% native forb	% non-native forb
0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
8.8	0.0	8.8	0	8.8	0	0	0
0.0	20.5	20.5	0	0	20.5	0	0
0.0	34.5	0	34.5	0	0	0	34.5
0.0	5.4	5.4	0	0	5.4	0	0
0.0	19.6	0	19.6	0	0	0	19.6
1.0	1.0	0	1	0	0	1	1
0.0	2.9	0	2.9	0	0	0	2.9
2.9	0.0	0	2.9	0	0	2.9	0
1.0	0.0	0	1	0	0	1	0
0.0	1.1	0	1.1	0	0	0	0
13.7	87.4	36.8	63.3	8.8	28	4.9	58.3

Glenwood Preserve vegetation transects 2005

Date: 6/13/05
 Monitor(s): GAS/SW
 Transect: 8
 original transect #: C-5
 pasture: C
 habitat: wetland

Cover class	Range	Mean
r	<<1	*
+	<1	0.1
1	1 to 5	2.5
2	5 to 25	15
3	25 to 50	37.5
4	50 to 75	62.5
5	75 to 100	87.5

SPECIES	Present?	n=native, i=invasive x=exotic	g=grass, h=herb	Cover Class															SUM	% ABS	%REL	% native	% non-native grass	% non-native grass	% native forb	% non-native forb			
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15											
Briza minor	y	x	g	15.0	15.0	2.5	0.0	15.0	15.0	0.0	2.5	0.0	15.0	15.0	15.0	15.0	0.0	15.0	140.0	7.7%	7.8%	0.0	7.8	7.8	0	0	7.8	0	0
Eleocharis macrostachya	y	n	g	0.0	0.0	0.0	0.0	2.5	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	0.3%	0.3%	0.3	0.0	0.3	0	0.3	0	0	0
Holcus lanatus	y	i	g	0.0	0.0	0.0	0.0	0.0	2.5	0.0	15.0	0.0	0.0	15.0	15.0	15.0	0.0	0.0	62.5	3.4%	3.5%	0.0	3.5	3.5	0	0	3.5	0	0
Lythrum hyssopifolia	y	n	g	0.0	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0	0.8%	0.8%	0.8	0.0	0.8	0	0.8	0	0	0
Lolium multiflorum	y	x	g	37.5	37.5	37.5	37.5	15.0	62.5	15.0	15.0	15.0	15.0	15.0	15.0	2.5	15.0	15.0	350.0	19.2%	19.5%	0.0	19.5	19.5	0	0	19.5	0	0
Hypochaeris radicata	y	n	h	0.0	0.0	0.0	15.0	0.0	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	17.5	1.0%	1.0%	1.0	0.0	0	1	0	0	1	0
Polypogon monspeliensis	y	n	g	2.5	15.0	15.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	2.5	0.0	2.5	2.5	0.0	42.5	2.3%	2.4%	2.4	0.0	2.4	0	2.4	0	0	0
Trifolium wormsoldii	y	x	h	15.0	15.0	2.5	15.0	0.0	0.0	0.0	2.5	0.0	15.0	0.0	15.0	0.0	2.5	37.5	120.0	6.6%	6.7%	0.0	6.7	0	6.7	0	0	0	6.7
Trifolium dubium	y	x	h	15.0	37.5	0.0	2.5	15.0	0.0	0.0	15.0	37.5	37.5	15.0	0.0	0.0	2.5	15.0	192.5	10.6%	10.7%	0.0	10.7	0	10.7	0	0	0	10.7
Trifolium subterraneum	y	x	h	0.0	0.0	0.0	15.0	15.0	2.5	15.0	15.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	77.5	4.3%	4.3%	0.0	4.3	0	4.3	0	0	0	4.3
Vulpia sp.	y	x	g	15.0	15.0	2.5	15.0	37.5	15.0	15.0	37.5	37.5	2.5	0.0	0.0	2.5	15.0	37.5	247.5	13.6%	13.8%	0.0	13.8	13.8	0	0	13.8	0	0
Juncus bufonius	y	n	g	37.5	37.5	37.5	2.5	2.5	0.0	0.0	2.5	0.0	0.0	15.0	15.0	15.0	15.0	0.0	180.0	9.9%	10.0%	10.0	0.0	10	0	10	0	0	0
Juncus sp.	y	n	g	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.1%	0.1%	0.1	0.0	0.1	0	0.1	0	0	0
Juncus xiphioides	y	n	g	2.5	15.0	15.0	37.5	37.5	2.5	37.5	15.0	37.5	15.0	37.5	0.0	37.5	37.5	15.0	342.5	18.8%	19.1%	19.1	0.0	19.1	0	19.1	0	0	0
Rumex pulcher	y	x	h	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.1%	0.1%	0.0	0.1	0	0.1	0	0	0	0.1
				VEGETATION TOTALS															1797.5	98.8%	100.0%	33.7	66.4	77.3	22.8	32.7	44.6	1	21.8
Bare ground				0	0	0	0	0	0	0	0	2.5	0	0	15	2.5	0	2.5	22.5	1.2%									
Moss																													
Thatch																													
Rock																													
				GRAND TOTALS															1820.0	100.0%									

Appendix D: Vegetation Transect Photos



Left: Transect 11

Photograph taken at Glenwood Preserve, 2005



Right: Transect 13

Photograph taken at Glenwood Preserve, 2005



Left: Transect 12:

Photograph taken at Glenwood Preserve, 2005



Right: Transect 7

Photograph taken at Glenwood Preserve, 2005



Left: Transect 1

Photograph taken at Glenwood Preserve, 2005

Right: Transect 8

Photograph taken at Glenwood Preserve, 2005

Transect T-6, June 2005



Transect T-14, June 2005



Transect T-15, June 2005



Transect T-6, June 2005



Transect T-14, June 2005



Transect T-15, June 2005

