GLENWOOD OPEN SPACE MANAGEMENT PLAN

Scotts Valley, California

Prepared by:

Wetlands Research Associates, Inc.
2169 East Francisco Blvd., Suite G
San Rafael, California 94901
contact: Michael Josselyn, Philip Greer
(415) 454-8868

with assistance from:

Entomological Consulting Services, Ltd.
104 Mountain View Court
Pleasant Hill, CA 94523
contact: Richard A. Arnold
(925) 825-3784

Biotic Resources Group
2551 South Rodeo Gulch Road #12,
Soquel, CA 95073
contact: Kathleen Lyons
(831) 476-4803

David G. Amme
Resource Restoration and Management
1504 Beverly Place
Albany, CA 94706
(510) 524-3637

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1.0 INTRODUCTION

1.1 GOALS AND MANAGEMENT ACTIVITIES OF THE OPEN SPACE MANAGEMENT PLAN

The Open Space Management Plan ("OSMP" or "Plan") provides management guidelines for the preservation and maintenance of sensitive biological resources on the Glenwood Open Space Preserve ("Preserve") in Scotts Valley, Santa Cruz County, California.

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, Mount Diablo cottonweed, and Gray's clover;
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. 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. While this plan sets forth management recommendations, it is understood that as new knowledge is gained on these species and on habitat management techniques, the approaches described herein may change in order to more effectively achieve the primary goals of this Plan.

All of the Preserve's sensitive species are found in grassland habitats. The Plan focuses on maintaining grassland vegetation to achieve its primary goals. The Plan includes vegetation management practices for maintaining grassland characteristics favorable to the sensitive species including: grazing management, invasive species control, mowing, and prescribed burning.

1.1.1 Baseline Data and Adaptive Management

Because there have been few quantitative surveys of the sensitive species on the Preserve, baseline data will need to be developed as the Plan is implemented. No quantitative data exists on characteristics of the grassland habitat of the sensitive species. 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.). The Plan includes an annual monitoring program. The initial data from the monitoring program will be used as baseline data.

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 both short and long term habitat and population data, as well as influence of climatic conditions in make adjustments to baselines, thresholds and management activities. This adaptive management approach will allow this Plan to evolve as habitat or regulatory conditions change, and as annual monitoring provides new information. An annual report will recommend appropriate changes in habitat management practices based on the monitoring results, revision of preliminary baselines, and refinement of thresholds.

1.1.2 Phased Management

This Plan is required by the Glenwood Project Environmental Impact Report, Mitigation and Monitoring Reporting Program (MMRP) as mitigation for the development of the Glenwood Project. It addresses requirements for the first of two phases of management of the Preserve. Phase 1 is the initial management period during which public access will not be authorized and baseline data on sensitive species and habitats will be collected. Restoration and enhancement of sensitive habitats are not required by the project conditions and the MMRP. At the appropriate time, the planning, facilities, and measures required to allow public access to the Preserve will be evaluated by the City of Scotts Valley ("City") and undertaken with input from the federal and state resource agencies. Baseline data collected during Phase 1 will provide the basis for developing an appropriate management program to consider public access under the Phase 2 Plan.

Management during Phase 1 will focus on maintaining the existing conditions within the Open Space Preserve while assuring that management activities are controlled so that baseline data can be collected to be used in long-term management. No changes in historic land uses are contemplated. The proposed development of 49 single family homes would not have any direct effect on sensitive species, and the reduction in current pasture area due to the development will be compensated by adjusting the current grazing regime. Management activities described in this Plan have been designed to eliminate the potential for take of listed species. Any potential effects on sensitive species associated with a formal public access plan (i.e. trails) and the development of the passive park portion of the park site on Lot A will be addressed by the City when the it is ready to begin planning for these uses, as required by the MMRP contained in the August 15, 2001 Certified EIR Addendum for the Revised (49-unit) Glenwood Project. Future development of the park site and the construction of public trails within the Preserve may require amendment of this Plan.

1.1.3 Dedication of the Preserve

The approximately 160-acre Preserve (Figure 1) will be dedicated to the City of Scotts Valley by American Dream / Glenwood, L.P. as a condition of approval for development of 49 single-family residences on the

remainder of the 195-acre Glenwood property. The City is responsible for the preparation of this Open Space Management Plan

A "Reserve Parcel" (Lot E) located east of the west branch of Carbonera Creek has been zoned for construction of up to four homes. A 7.23-acre parcel located east of Glenwood Drive at the southern end of the Project Site (Lot A) will be dedicated to the City of Scotts Valley as future parkland.

1.2 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. 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. The portion of the Preserve east of Glenwood Drive is currently used as a horse pasture. The Preserve is included in the Felton and Laurel Quadrangles (USGS 7.5 minute series topographic maps).

The Preserve parcels consist of approximately 160 acres (identified as Lots B, C, and D on Figure 1). A 1.60-acre "Reserve Parcel" (Lot E) will be dedicated to the City upon recordation of the final subdivision map. The City intends to set aside the Reserve Parcel to sell, either to the Wildlife Conservation Board (WCB) or for future residential development for up to four homes (zoned RM-8). Funds from the sale will be used, in part, to establish an endowment for the permanent maintenance of the Preserve. The Land Trust of Santa Cruz County has expressed interest in taking over management of the Preserve.

Vegetation within the Open Space Preserve consists of approximately 60% 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 (SCS 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.

The two federally listed species that occur in the Preserve are the primary focus of this Plan. The southeast corner of the Preserve is one of fifteen currently known locations of the endangered Ohlone tiger beetle (*Cicindela ohlone*) (USFWS 2001, DFG 2002). The grassland in the Preserve also supports for the endangered Scotts Valley spineflower (*Chorizanthe robusta* var. *hartwegii*) and 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*), 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, and Gray's clover (*Trifolium grayi*), considered a CNPS species of local concern, have both been observed in grassland throughout the Preserve.

At this time, sensitive species or habitats are not managed or monitored on the Glenwood property. The property east of Glenwood Drive is fenced as a single pasture and is grazed by horses at above its calculated carrying capacity. Horses have year round access to sensitive habitats, including

Figure 1. Glenwood Preserve Sensitive Biological Resources and Pasture Fence Plan

Ohlone tiger beetle habitat, and concentrate in sensitive native grasslands, wetlands and riparian areas in the dry season. Over grazing increases the risk of invasion by aggressive non-native weeds.

In contrast, the property west of Glenwood Drive has 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.

1.3 Relationship of the OSMP to the Environmental Impact Report

Preparation of this Plan is required as part of the Mitigation Monitoring and Reporting Program (MMRP) contained in the August 15, 2001 Certified EIR Addendum for the Revised (49-unit) Glenwood Project. This Plan addresses portions of the Biological Resources Mitigation Measures 1, 2, and 3, and other applicable sections of the MMRP. The MMRP requires that an open space land management plan be prepared in conjunction with a habitat restoration specialist and biologists with specific expertise on the unique resources of the project site.

As contemplated by the EIR, the preparation and implementation of the OSMP is a component of the mitigation required for construction of 49 single family homes in the Glenwood Project. Public access to the Preserve is not part of the Glenwood Project and therefore, any potential impacts associated with such access (i.e. trails) and the development of the passive park area in the adjacent park site (Lot A) will be addressed by the City of Scotts Valley when the City is ready to begin planning for these uses. It is assumed that in the interim, public access to the Preserve will be restricted.

1.4 Role of the Land Trust or other Conservation Entity

To ensure that biological resources within the Preserve are protected and maintained, the Preserve will be managed in perpetuity by a land trust agency or other similar agency that specializes in land stewardship. The Land Trust of Santa Cruz County has expressed interest in taking over management of the Preserve. Other potential lands trusts or management agencies include; the Nature Conservancy, the Center for Natural Lands Management, and the California Department of Fish and Game. If ownership by the City or other conservation entity is determined to be infeasible (e.g. if the City cannot find a land trust willing to manage the property), ownership will revert to the Glenwood Project Homeowners Association (HOA). The HOA will contract with a qualified organization, private firm, or specialist to manage the Preserve and will be subject to the management guidelines of this OSMP.

1.4.1 Responsibilities of the Preserve Manager

The MMRP requires that the City designate a Preserve Manager prior to issuance of a grading permit for the Glenwood Project. The responsibilities of the Preserve Manager under this Plan include:

- Oversee monitoring and maintenance of existing conditions of the habitat occupied by the Ohlone tiger beetle and Scotts Valley spineflower;
- Maintenance of existing habitat values for other sensitive species and special status habitat areas;
- Implement and manage a grazing program for the East Preserve;
- Maintain fencing around sensitive habitat areas and other facilities (i.e. water);
- Develop and implement a public awareness program to restrict public access to the Preserve and;
- Install and maintain educational and interpretive signing around sensitive habitat areas.

Wetlands Research Associates, Inc. (WRA) shall serve as the Preserve Manager unless or until the City contracts with The Land Trust of Santa Cruz County or other conservation entity.

1.5 LISTED SPECIES DESCRIPTIONS

1.5.1 Ohlone tiger beetle

The Ohlone tiger beetle (*Cicindela ohlone*, OTB) is a federally-listed endangered species (U.S. Fish & Wildlife Service, 2001). The primary threats to this species are the loss and alteration of its coastal terrace prairie habitat and illegal collecting. Freitag, Kavanaugh, and Morgan (1993) noted that the beetle is restricted to clay-based, marine terraces, which support native grassland remnants in the coastal mid-Santa Cruz County area. Much of its former habitat in Santa Cruz, San Mateo, and Monterey counties had been converted for development or other land uses before the species was recognized in 1993.

1.5.1.1 Species Description

Tiger beetles are generally treated as a family, the Cicindelidae, in the insect order Coleoptera; however, some entomologists prefer to recognize tiger beetles as a subfamily (Cicindelinae) or tribe (Cicindelini) of the ground beetle family, Carabidae. Thus, all of these names are encountered in the entomological literature.

The OTB was described in 1993 by Freitag, Kavanaugh, and Morgan (1993). *Cicindela ohlone* is most closely related to *C. purpurea*, but can be distinguished from this and related species by its overall size, 9.5 to 12.5 mm., the color and maculation patterns on its thorax and elytra, and its genitalic features. The OTB's body color is a brilliant green, with gold maculations (Figure 2). The winter-spring activity period of the OTB is distinctive, as most tiger beetles in coastal California are active in the spring and summer months (Nagano 1980).

Larvae of tiger beetles are more uniform in appearance than adults. They have an eruciform (i.e., grub-like) appearance. The head and pronotum are strongly chitinized, and the fifth abdominal segment possesses a

pair of medial hooks that are used as anchors to secure the larvae as they reach out from the tunnel to ambush prey. The immature stages (i.e. egg, larva, and pupa) of *C. ohlone* have not been formally described.

1.5.1.2 Life History

Collection records indicate that most adult *C. ohlone* are active from mid-January through mid-May, although the duration and timing of the adult activity period can vary from year-to-year and between places within a particular year. Specific dates when beetles have been observed range from January 17th through May 11th (Freitag, Kavanaugh, and Morgan 1993; BUGGY Data Base 2003).

The diurnally active adults and larvae of *C. ohlone* are associated with sunny areas of bare or sparsely vegetated ground. Adults run rapidly in and near the larval habitat. They are strong flyers for short distances. Because they are cold-blooded, are active during the winter and spring months, and favor microhabitats that are sparsely vegetated and can become quite warm during their activity period, adults and larvae typically spend a considerable portion of their daily activity thermoregulating.

Both adults and larvae of tiger beetles are opportunistic, preying on smaller, soft-bodied insects and invertebrates. Adults possess good visual acuity and are found on sunny glades of bare or sparsely vegetated soil, where they actively search for potential prey. In contrast, larvae remain in their tunnels, and ambush prey that wander within their striking distance. Specific prey items of *C. ohlone* are not well known, but prey for other species of tiger beetles have been identified as ants, adult and larval flies (Diptera), tiny insects, small beetles, and worms (Larochelle 1974).

The OTB has one generation per year and four life stages: egg, larva, pupa, and adult. Throughout the adult activity period females lay eggs after they emerge and mate. Eggs are laid singly in the soil, immediately below the surface. In about two weeks, a tiny larva emerges and digs a shallow tunnel, or larval burrow, in the ground at the same location where the egg was laid. Larvae are active until the onset of the following rainy season, usually in late October or early November. During this several month period they molt three times, with each stage between molts referred to as an instar. With each larval instar, the diameter and depth of the burrow is enlarged to maximum sizes of about 5 mm. in diameter and 20 cm. in depth. Upon occurrence of the first ground-soaking rain in the fall, the larva plugs the upper portion of its burrow and pupates (the cocoon stage) there. The following winter, a new adult beetle emerges from the larval burrow.

1.5.1.3 Habitat

Cicindela ohlone inhabits areas characterized by remnant stands of native grassland, in particular coastal terrace prairie. California oatgrass (Danthonia californica) and Purple needlegrass (Nassella pulchra) are

two native grasses known to occur at all sites. Within these grasslands, the beetle has been observed primarily on level ground and less frequently on slopes, where the

Figure 2. Photo of the Ohlone Tiger Beetle (Cicindela ohlone)

vegetation is sparse or bare ground is prevalent. The substrate at each known beetle location consists of shallow, poorly drained clay or sandy clay soils that have accumulated over a layer of bedrock known as Santa Cruz Mudstone (Freitag, Kavanaugh, and Morgan 1993). The soils at all known OTB sites, as mapped by Bowman et al. (1980), are Watsonville Loams. Although the county's soil map (Bowman et al. 1980) does not indicate that Watsonville Loam is present at the Glenwood site, the other mapped soil types that are present may have inclusions (i.e., areas too small to map) of Watsonville Loam.

Appendix A contains reports of surveys for OTB conducted in 1996 and 2000. Figure 1 illustrates the portion of the Glenwood site where the OTB is known to occur. Potential larval burrows were observed on a grassy sparsely vegetated knoll east of the stock pond. However, no OTB were observed at this location in 1996 or 2000. Subsequent to the 2000 report, ground nesting bees were observed emerging from such burrows. The NRCS examined soils at this location and found them to be shallow and rocky. The OTB are known to be restricted to soils that are deeper and easier to burrow in.

The limited occurrence of suitable soil conditions for the OTB to inhabit may explain its restricted distribution at the Glenwood site.

The larvae of most tiger beetles occur in a narrower range of microhabitats than their adult stages, probably because they tolerate less variation in many physical factors, especially soil type, moisture, composition, and temperature (Pearson 1988; Shelford 1907 and 1909). Larvae of other tiger beetle species that live in grasslands typically build their tunnels at the edges of the bare or sparsely vegetated portions of the grassland where adult beetles are most commonly observed. The larvae of the OTB follow a similar pattern, as larval burrows are found along dirt trails and at the edges of barrens or sparsely vegetated areas.

1.5.1.4 Distribution

Of the approximately 110 species of tiger beetles that have been described in North America (Boyd and Associates 1982), *Cicindela ohlone* exhibits one of the most restricted geographic ranges. It has been reported at only 15 locations in central and western Santa Cruz County (Figure 3).

Although the potential exists for this range-limited beetle to occur in other locations in the county supporting similar habitat, to-date the beetle has not been found in other similar areas that have been checked. At this time, the OTB appears to be restricted to coastal terrace situations, at low to mid- elevations (less than 1,200 feet), located between the crest of the Santa Cruz Mountains and the Pacific Ocean.

Figure 3. Known Occurrences of the Ohlone Tiger Beetle (*Cicindela ohlone*)

1.5.1.5 Specific Management Objectives for the Ohlone tiger beetle

The specific management objectives for the OTB include:

1. Develop baseline data including:
    - OTB population data during adult and larval stages;
    - Grassland composition (areal cover by species);
    - Seasonal structure:
        - Spring season cover and average height of dominant species in vegetation transects;
        - Fall season residual dry matter (RDM).

2. Maintain the current vegetative composition and structural characteristics of the native grassland habitat preferred by the OTB including:
    - Low total vegetative cover;
    - Low relative cover of non-native annual grasses and low growing non-native herbaceous species such as *Erodium* sp.;
    - High relative cover of native perennial grass and herbaceous species;
    - High proportion of un-vegetated bare ground.

3. Conduct vegetation management practices, primarily managed grazing, only during either of the following periods to protect the OTB population on site:
    - Anytime during the inactive period of the OTB (first fall rains until adult emergence) when pupa are protected at depths up to 20 cm deep within sealed burrows;
    - During larval period after surface soils become dry such that larval burrows are stable due to the relative incompressibility of the clay soil.

1.5.1.6 Preliminary Management Thresholds for the Ohlone tiger beetle

Management thresholds serve as a guide to adjusting management actions within the Preserve. Because field information on the OTB is limited, not just at this site but elsewhere in its range, these thresholds can be modified as more information on the species is gathered. Most importantly, little information is available on annual natural population fluctuations related to climatic and biologic factors. Long-term data, once available, can be used as a means to adjust management. In the meantime, maintenance of existing habitat conditions (i.e. coverage of vegetation and percent of bare area) will be used. No sites have long-term monitoring and the implementation of this Plan will assist in the recovery of this species. The thresholds suggested in this Plan should be considered as preliminary only.

Preliminary Management Thresholds for the Ohlone tiger beetle at the Preserve are [1:]

1. Increase intensity of grazing or other vegetation management practice if any of the following preliminary thresholds are measured in vegetation transects or estimated during reconnaissance surveys in the (pre-management) occupied OTB area:
    - More than 25% increase in coverage by annual grasses or low growing herbaceous speces such as *Erodium* sp., within occupied OTB habitat;
    - Establishment of any invasive species (forbs) within bare areas of occupied OTB habitat.

2. Decrease intensity of grazing or other vegetation management practice if any of the following preliminary thresholds are measured in vegetation transects or estimated during reconnaissance surveys in the (pre-management) occupied OTB area:
    - More than 25% increase in bare areas within grassland area.

1.5.2 Scotts Valley Spineflower

A portion of the grassland habitat on the Preserve is known to support the Scotts Valley spineflower (*Chorizanthe robusta* var. *hartwegii*). The distribution of the spineflower on the Preserve, based on data collected in 1992, is shown in Figure 1.

1.5.2.1 Status Under State and Federal Laws

The Scotts Valley spineflower is federally listed as endangered and is limited in its occurrence to grasslands within the Scotts Valley region. The species is also on CNPS List 1B, a list of plants considered rare within the State. The species is not currently listed as endangered or threatened under the State Endangered Species Act.

The US Fish and Wildlife Service (Service) recently designated critical habitat for the species. A total of 287 acres of land occur within the boundaries of the critical habitat designation (USFWS, Federal Register, Vol. 67, No. 013, May 29, 2002). Critical habitat is defined as specific areas supporting physical or biological features that are essential to the conservation of the species, including areas that may require special management considerations or protection. The primary elements of critical habitat for the Scotts valley spineflower are:

- Presence of thin soils developed over outcrops of Santa Cruz mudstone or Purisima sandstone;
- Presence of wildflower field habitat (grasslands developing on thin soil areas);
- Presence of a grassland plant community that is stable over time;

1 These thresholds may be tied to population levels once baseline data is collected.

- Area to allow each population to survive catastrophic events and re-colonize suitable sites;
- Pollination activity between colonies;
- Seed dispersal between existing colonies, and;
- Sufficient protection of the watershed above spineflower habitat to maintain soil and hydrologic conditions that provide seasonally wet substrate for the species growth and reproduction.

In addition to these primary constituent elements, the Service also stated that management considerations or protections might be needed for the species (USFWS, 2002). The Service found that in some cases, protection of existing habitat and current ecological processes may be sufficient to ensure the maintenance of populations, however, active management may be needed in some areas to preserve the primary elements. The most likely management action identified by the Service include limiting the application of herbicides, fertilizers and soil amendments, avoid over spray from irrigation, limit construction of roads and some types of fencing so as to not preclude movement of pollinators, control occurrences of invasive, non-native plant species, and protect sites from heavy disturbances during the species critical growth and reproduction period.

The Service designated two units in the Scotts Valley area as critical habitat. The units were designated as the Glenwood Unit (214 acres) and the Polo Grounds Unit (73 acres). Of the approximately 214 acres designated in the Glenwood Unit (Unit 1), nine acres are on public lands (Scotts Valley Unified School District) and 205 acres are on private land (Salvation Army and American Dream/Glenwood, L.P.).

1.5.2.2 Species Description

The spineflower genus, *Chorizanthe*, is in the Polygonaceae (Buckwheat) family. It is considered by some taxonomists to be a recently derived genus; however, in California none of its species are widespread or abundant (Stebbins, 1974). In California, members of the *Chorizanthe* genus are characterized as slender, stiff and tough annual plants that inhabit dry, sandy soils.

The overall appearance of Scotts Valley spineflower is of a low-growing herb that is stiff, hairy and reddish in color (Figure 4). A short-lived annual, the plant is typically branched from the base with a spreading or prostrate habit. The plant has rose-pink modified leaves (involucral) that surround a small white-rose flower. A group of flowers form rounded heads, measuring approximately 0.5 inch in diameter. Each flower produces one seed that is enclosed by spines. The small hooks on the spines of the involucral lead to the common name of spineflower.

1.5.2.3 Life History

The Scotts Valley spineflower germinates during the winter months and flowers from April through June. The seed is mature by August with the plants becoming rusty-colored as they dry during the summer months. The seed cases shatter from the plant during the late summer, upon which the seeds are dispersed. The spiny seed covering is believed to facilitate seed dispersal, as the spiny bracts are expected to easily attach to animals and can therefore be transported. Black-tailed hares and

Figure 4. Photo of the Scotts Valley spineflower (*Chorizanthe robusta* var. *hartwegii*)

groundsquirrels have been observed to browse on other members of the *Chorizanthe* genus and other animals likely contribute to seed dispersal (e.g., mule deer, gray fox, coyote, bobcat, striped skunks, opossums, raccoons and other small mammals) (USFWS, 2002). The degree to which seeds are transported by animals, either attached to their fur or from being ingested, has not been studied. It is not known, for example, what proportion of seeds is transported within a population and/or colony and by whom. Genetic studies of a population and/or colony, which would analyze genetic exchange between colonies and the role of animals for seed transport have also not been conducted.

Although the pollination ecology and seed dispersal of this species has not been studied for this taxon, it is assumed that it is similar to other species of *Chorizanthe*. Pollinators for other *Chorizanthe* species are varied and include leaf cutter bees, butterflies, flies and wasps. Where pollinator access is limited, seed production is lowered (USFWS, 2002). It is expected that the Scotts Valley spineflower is protandrous, which is a reproductive strategy that facilitates cross-pollination. In species that are protandrous, the anthers (male, pollen-producing structures) mature and shed pollen one to two days before the style (female, pollen-receiving structure) matures. This promotes cross-pollination by insects. If, however, cross-pollination does not occur within 1-2 days, self-pollination may occur. The relative importance of insect pollination and self-pollination to seed formation (and viable seed) is not known. However, studies of Monterey spineflower (*Chorizanthe pungens* var. *pungens)* have shown that seed viability was lower in areas with poor pollination access (USFWS, 2002).

As an annual species, the number and location of aboveground plants varies annually. These variations are due to several factors, such as the amount and timing of rainfall, soil and air temperature, soil conditions and the extent and condition of the soil seedbank. Each year's population arises from all, or a portion of, the soil seedbank (i.e. the amount of dormant seeds in the soil). The seedbank includes all the seeds in a population and generally covers a larger area than the extent of aboveground plants observed in a given year. As such, populations can be variable from year to year. For the Glenwood site, only one year's population data is available: 1992 (Table 1). Most of the individual plants occur within the western portion of the Preserve. While there are larger areas of suitable soils on the eastern portion, fewer individuals were observed in this area.

1.5.2.4 Habitat

In general, members of the *Chorizanthe* genus are endemic to specific substrate and/or site conditions. They are known from habitats along the coast and inland. However, due the patchy distribution of these unique soil resources, many species of *Chorizanthe* are highly localized in their distribution. The range of many *Chorizanthe* species overlaps; however, there is no range overlap between the Scotts Valley spineflower, the related robust spineflower (*C. robusta* var. *robusta)*, or the Ben Lomond spineflower (*C. pungens* var. *hartwegiana)*.

The Scotts Valley spineflower is endemic to Purisima sandstone and Santa Cruz mudstone outcrops in Scotts Valley. The plant species grows on gently sloping to nearly level areas where fine-textured shallow soils of the Bonnydoon series occur over the mudstone or sandstone outcrops. Some of the rocky areas have bedrock intermixed with scree and/or scree intermixed with a thin soil layer. Within both the Glenwood and Polo Ground Units, the spineflower occurs in small patches on these outcrops within a larger grassland habitat; this distribution is shown on Figure 1. Although apparent suitable habitat areas (i.e. areas apparently suitable for the species, yet not occupied) occur on the Glenwood Unit, these areas have not naturally been colonized by the spineflower based on cursory field observations of these areas since 1992.

The occupied spineflower habitat areas are characteristically sparsely vegetated when compared to the adjacent grassland. The vegetation is predominantly native wildflowers and low-growing grasses and is typically devoid of tall non-native grasses. Many of the areas support lichen and mosses, indicating that the areas have high seasonal soil moisture. In addition to spineflower individuals, the rocky patches support other native plant species, such as goldfields (*Lasthenia californica)*, toad rush (*Juncus bufonius)*, sand pygmy weed (*Crassula erecta)*, California sandwort (*Minuartia californica)*, purple sand spurry (*Spergularia rubra)*, owls clover (*Castilleja densiflora)*, sky lupine (*Lupinus nanus)* and vinegar weed (*Trichostema* sp.). Some outcrops within the Glenwood Unit (Scotts Valley Unified School District and Salvation Army lands) also support Scotts Valley polygonum (*Polygonum hickmanii)*, a species proposed for federal endangered status, although the polygonum has not been found on the Glenwood property. Some outcrops within the Glenwood Unit also support Mt. Diablo cottonweed (*Stylocline amphibola)*, a locally unique species, and Grays clover (*Trifolium barbigerum* var. *andrewsii)*. Where the soil profile is deeper, semi-woody plant species have been documented within the habitat areas; these species include California aster (*Lessingia filaginifolia)* and golden aster (*Chrysopsis villosa* var. *villosa).*

The grassland around the rock outcrops is typically dominated by annual, non-native grasses, such as soft chess, rattail fescue (*Vulpia myuros)*, rattlesnake grass (*Briza maxima)*, and ripgut brome *(Bromus diandrus)*. Rattail fescue and filago (*Filago gallica)*, a non-native forb, are also prevalent adjacent to the rock outcrops. Native grasses and forbs occur in scattered locations within the grassland, such as purple needlegrass (*Nassella pulchra)*, wild rye (*Leymus triticoides)*, Grays clover, and coast tarplant (*Hemizonia corymbosa)*. Non-native species include sheep sorrel (*Rumex acetosella)* and wild oat (*Avena barbata)* (HRG, 1992).

It is postulated that the Polo Ground and Glenwood Units historically supported a native grassland, wherein the Scotts Valley spineflower (and associated wildflower species) grew on the rock outcrops and in openings amid the perennial bunch grasses (i.e. purple needlegrass).

The grassland areas within the Glenwood Unit have a long history of livestock grazing, dating back to the settlement of the valley in the early 1800's. As recently as the late 1960's the land was a local dairy operation. Since the 1980's the grassland west of Glenwood Drive has not been grazed. Horse grazing has continued on the east side of the Glenwood Drive for the last 20 years with between 26 to 28 horses (see

other sections of Chapter 2.0). This grazing regime is believed to have been an amenable management regime (or, at least, not deleterious) to the growth of the spineflower. Concurrent with construction of the Scotts Valley High School in 1999, a mowing management program was implemented for a portion of the Glenwood Unit (SVUSD Preserve).

1.5.2.5 Distribution

The Scotts Valley spineflower is known from two sites in the northern end of Scotts Valley. The sites are approximately one mile apart and are known as the Glenwood Unit and the Polo Ranch Unit.

The Polo Unit is located east of Highway 17 and north of Navarra Drive. In 1997, Scotts Valley spineflower was recorded at 25 locations and comprised approximately 8,000 individuals.

The Glenwood Unit is located north of Casa Way and both east and west of Glenwood Drive. Colonies of Scotts Valley spineflower are scattered throughout the unit, however the largest number of colonies are located west of Glenwood Drive. This unit includes spineflower colonies on properties owned by the Salvation Army, SVUSD and American Dream/Glenwood L.P. ("Glenwood Property").

In 1992, surveys of the spineflower were conducted on portions of the Glenwood Unit. The surveys, limited to the Glenwood Property and the Salvation Army property, documented approximately thirty colonies (HRG, 1992). In addition, during the environmental review of the Scotts Valley Unified School District property in the mid 1990's, additional colonies were documented from the school district's property (a parcel adjacent to the Glenwood Property). After the school district purchased a portion of the Glenwood Property, the high school was developed in 1998. The high school project impacted approximately six spineflower colonies, yet other colonies were retained within an eight-acre grassland preserve (which is owned and managed by the school district). Currently, 17 spineflower colonies occur on the Glenwood Property (both west and east of Glenwood Drive), as depicted on Figure 1. Other colonies also occur on the adjacent Salvation Army property. The spineflower occurrences on the Glenwood Property ranged from one individual to approximately 10,000 in 1992; these are designated as C-# on Figure 1 and in Table 1, below. Additionally, approximately 34 acres of the property were determined to have site characteristics suitable for the species, yet did not support the species (*ibid.* 1992). Subsequent surveys of the property have been conducted wherein the known occurrences were reconfirmed; however no new population data is available. The subsequent surveys also found that the suitable habitat areas did not support the species (Impact Sciences, 1998).

Population data for each existing colony on the Glenwood Property (as recorded in 1992) is presented in Table 1. Site numbers for the occupied sites are depicted on Figure 1. This information is the only baseline data currently available for the site.

Table 1. Population of Scotts Valley Spineflower, Glenwood Property, 1992

Site Number	Population Range Estimate
C-64	1-10
C-74	10-50
C-77	1,000-5,000
C-122	5,000-10,000
C-123	1,000-5,000
C-124	1-10
C-125	1,000-5,000
C-126	500-1,000
C-127	5,000-10,000
C-128	5,000-10,000
C-129	5,000-10,000
C-147	100-500
C-155	50-100
C-156	50-100
C-158	500-1,000
C-159	50-100
C-160	50-100

Source: Habitat Restoration Group, 1992; site numbers are depicted on Figure 1.

1.5.2.6 Specific Management Objectives for the Scotts Valley Spineflower

Specific management objectives for the Scotts Valley spineflower include:

1. Develop baseline data including:
    - Scotts Valley spineflower population data;
    - Grassland composition in Scotts Valley spineflower habitat (areal cover by species);
    - Seasonal structure;
        - Spring season cover and average height of dominant species in vegetation transects;
        - Fall season residual dry matter (RDM) if in grazed area.

2. Maintain the current vegetative composition and structural characteristics of the grassland habitat preferred by the Scotts Valley spineflower including:
    - Low total vegetative cover;
    - Low relative cover of non-native annual grasses;
    - High relative cover of native perennial grass and herbaceous species;

- High proportion of un-vegetated weathered sandstone or bare ground.

3. Conduct vegetation management practices, primarily managed grazing on the East Preserve, and mowing, if needed, on the West Preserve in the summer or fall when no live plants are present.

1.5.2.7 Preliminary Management Thresholds for the Scotts Valley Spineflower

As with the OTB, our knowledge of this species is limited and existing baseline data is insufficient to prepare detailed management thresholds at this time. Until such data is collected during the ongoing monitoring proposed in this Plan, it is most appropriate to assure that existing conditions are maintained. The following thresholds are estimated and will be adjusted if necessary as monitoring data is collected.

Preliminary Management Thresholds for the Scotts Valley spineflower include:

1. Increase intensity of grazing if any of the following preliminary thresholds are measured in vegetation transects or estimated during reconnaissance surveys in the occupied Scotts Valley spineflower area on the East Preserve:
    - If any known areas occupied by Scotts Valley spineflower become colonized by invasive species, or if coverage by non-native annual grasses increases by more than 25%.

2. Decrease intensity of grazing if any of the following preliminary thresholds are measured in vegetation transects, or estimated during reconnaissance surveys, in the occupied Scotts Valley spineflower area on the East Preserve:
    - More than any one subpopulation (as mapped in 1992) does not have any germinated individuals for two consecutive years and coverage by annual grasses has not increased.

3. Increase intensity or alter type of vegetation management if any of the following preliminary thresholds are measured in vegetation transects or estimated during reconnaissance surveys, in the occupied Scotts Valley spineflower area on the West Preserve:
    - If any known areas occupied by Scotts Valley spineflower become colonized by invasive species, or coverage by non-native annual grasses increases by more than 25%.

Because the West Preserve has not been grazed for over 20 years this Plan does not recommend grazing the West Preserve. Grazing is not necessary to mitigate for project impacts. Alternative vegetation management practices for the West Preserve Scotts Valley spineflower habitat may include: manual or mechanized removal of shrubs or selective mowing during the spring to remove annual grass flowers.

1.5.3 Scotts Valley Polygonum

The Scotts Valley polygonum (*Polygonum hickmanii*) was recently listed as a federally-endangered species, and the Glenwood Preserve is included in the species' designated critical habitat (USFWS, Federal Register, Vol. 68, No. 67, April 8, 2003). Numerous surveys have found that populations of Scotts Valley polygonum do not occur in the Preserve. Habitat for this species is very similar to that of the Scotts Valley spineflower; consequently, the primary constituent elements and management considerations listed in the critical habitat designation for the Scotts Valley polygonum are the same as those for the Scotts Valley spineflower (see Section 1.5.2.1).

Surveys for the Scotts Valley polygonum will be included in the annual Monitoring Program (see Section 2.3.1.3.5). A survey conducted during the blooming period for this species in July and August. Efforts will be made to look for this species during surveys of Scotts Valley spineflower in May or June and during

If the Scotts Valley Spineflower is found within the Preserve, data including population number, location and extent, number flowering, and management suggestions will be collected and included in the annual report. A vegetation transect will be established to monitor vegetative composition of the grassland habitat. Annual monitoring data will be used to develop a baseline and thresholds for this species. Management activities and thresholds planned to benefit the Scotts Valley spineflower (see Sections 1.5.2.6, 1.5.2.7, 2.3.1.3.2 and Table 6) would also be appropriate for the Scotts Valley polygonum.

1.6 Other Sensitive Species and Sensitive Habitats

1.6.1 Opler's longhorn moth

Opler's longhorn moth (*Adela oplerella* (Lepidoptera: Incurvariidae)) (OLM) is a federal species of concern. This moth is endemic to grasslands where its larval food plant, *Platystemon californicus* (cream cups), grows. The Glenwood site supports the only known location of this moth in Santa Cruz County. Surveys conducted in 1996 and 2000 (Appendix A) found cream cups at 7 locations within the Preserve (Figure 1). Adults were observed only at the cream cup location on the north-facing hillside above the reservoir during both surveys.

1.6.1.1 Species Description

Longhorn moths are small, day-flying moths that belong to the family Incurvariidae. These moths are in the genus Adela, and are sometimes referred to as fairy moths. J.A. Powell first described *Adela oplerella* in his synopsis of Nearetic adelid moths (Powell 1969). The moth is named after Paul A. Opler, who collected many of the specimens used to describe this species, including the type specimen collected with

W.J. Turner in 1967, near Nicasio, Marin County. When looking in literature and government documents the genus is sometimes misspelled as "Adella."

Opler's longhorn moth is a small, dark brown, hairy moth with a wingspan ranging from 9-14 millimeters. Their long antennae and bright coloration most easily distinguish Adelids from related moths. The forewings are a dark olive-bronze, metallic-looking when fresh, without markings or with two faint whitish spots. The hindwings are dark brown with a purplish reflectance when fresh (Powell 1969).

1.6.1.2 Life History

Descriptions of the life history and early stages of this moth are incomplete. Opler's longhorn moth completes the active portions of its life cycle during the winter-spring wet season (Powell 1969). Adults fly, mate, and lay their eggs between mid-March and late April; this timing varies depending on the weather. Eggs are deposited directly into the unopened flowers of the host plant, *Platystemon californicus*. A few weeks later the larvae emerge after they have consumed the developing seeds. The larvae may enter diapause during the summer and re-emerge after the winter rains to continue feeding until they are large enough to pupate. The adult host plant is not known, though it appears that the adults may feed on the nectar of *Platystemon califonicus,* and other native herbaceous species.

1.6.1.3 Habitat / Distribution

Opler's longhorn moth was previously thought to only occur in areas of serpentine soil where its exclusive host plant *Platystemon californicus* is found. The Glenwood Preserve is the only known location that is not associated with serpentine grassland. On the Preserve, *Platystemon californicus* is found on north-facing slopes containing high cover of native perennial grasses and herbs.

In recent years OLM has been recorded from sites extending along the west side of San Francisco Bay, Alameda County, Marin County, Sonoma County, Santa Cruz County, Santa Clara County and the inner Coast Ranges (A. Launer, pers. Comm.., 1997, J. Powell, pers. Comm.., 1997 in USFWS 1998b). Field observations show that the dispersal scale for this moth is small, on the order of hundreds of meters, thus limiting its ability to easily colonize new areas.

1.6.1.4 Specific Management Objectives for the Opler's longhorn moth

The specific management objectives for the Opler's longhorn moth include:

1. Develop baseline data including:
    - Opler's longhorn moth and host plant distribution data;
    - Grassland composition (areal cover by species);
    - Seasonal structure;

- Spring season cover and average height of dominant species in vegetation transects;
- Fall season residual dry matter (RDM).

2. Maintain the current vegetative composition and structural characteristics of the grassland habitat containing the Opler's longhorn moth host plant (cream cups, *Platystemon californicus*) including:
    - Distribution of host plant;
    - Low relative cover of non-native annual grasses;
    - High relative cover of native perennial grass and herbaceous species.

1.6.1.5 Preliminary Management Thresholds for the Opler's longhorn moth

As with the OTB, our knowledge of this species is limited and current baseline data is insufficient to prepare detailed management thresholds. Until such data is collected during the ongoing monitoring proposed in this Plan, it is most appropriate to assure that existing conditions are maintained. The following thresholds are estimated and will be adjusted if necessary as monitoring data is collected.

Preliminary Management Thresholds for the Opler's longhorn moth at the Preserve are:

1. Increase intensity of grazing, or other vegetation management practice, if any of the following preliminary thresholds are measured in vegetation transects, or estimated during reconnaissance surveys, in the (pre-management) occupied Opler's longhorn moth area:
    - More than 25% increase in coverage by annual grasses within suitable habitat;
    - More than 25% decrease in coverage by cream cups within suitable habitat.

2. Decrease intensity of grazing or other vegetation management practice, if any of the following preliminary thresholds are measured in vegetation transects, or estimated during reconnaissance surveys, in the (pre-management) occupied Opler's longhorn moth area:
    - Reduction in larval host plant, (cream cups), if reduction appears to be the result of overgrazing;
    - More than 25% increase in bare areas within cream cup containing grassland areas.

1.6.2 Other Special Status Plants

Several non-listed special status plant species have been known to occur within the Preserve in addition to the Scotts Valley spineflower. All of the special status plant species are annual herbaceous broadleaf (dicot) plants that occur in the native perennial and non-native annual grassland habitats.

- Mount Diablo cottonweed (*Micropus amphibolus*), included on the California Native Plant Society's ("CNPS") List 3, and Gray's clover (*Trifolium barbigerum* var. *andrewsii*, formerly *T.*

grayi), considered a CNPS species of local concern to the Santa Cruz Chapter, have both been observed within the Preserve areas.[2] Locations of sightings of these species are depicted in Figure 1.

Habitat for the Mount Diablo cottonweed and Gray's clover will be managed through a program of controlled grazing (Section 2.1) on the East Preserve and invasive exotic weed control (Section 2.2) to protect and maintain these sensitive resources. Under managed grazing, pastures will be closed to grazing periodically, allowing sensitive vegetation the opportunity to grow and reproduce. Exotic plants that have the potential to compete with special status species will be targeted for control. Following adaptive management principles, results of monitoring will be reviewed, and changes to exotic plant control measures and to grazing, including exclusionary fencing if necessary, will be initiated to protect and maintain special status species habitat.

- Linanthus (*Linanthus parviflorus*/*androsaceus* complex), White-tipped clover (*Trifolium* aff. *polyodon*), and microseris (*Stebbinoseris heterocarpa*), all species of CNPS local concern, and Choris's popcorn flower (*Plagiobothrys chorisianus*), included on CNPS List 1B, were observed by the local chapter of CNPS in the Preserve areas back in 1989-1991, but have not been observed in more recent surveys.

These species will be searched for during spring special status plant surveys as part of the annual Monitoring Program (see Section 2.3.1.3.6). Efforts will be made to look for this species during surveys for Mt. Diablo cottonweed and Gray's clover habitat conducted in April or May.

If any of these species are found within the Preserve, data including population number, location and extent, number flowering, and management suggestions will be collected and included in the annual report. A vegetation transect will be established to monitor vegetative composition of the grassland habitat. Annual monitoring data will be used to develop a baseline and thresholds for the species. Management activities and thresholds will be developed based on specific habitat preferences and life history of the species.

1.6.2.1 Specific Management Objectives for Mount Diablo cottonweed and Gray's clover

Specific management objectives for the Mount Diablo cottonweed and Gray's clover include:

1. Develop baseline data including:
    - Mount Diablo cottonweed and Gray's clover distribution data;
    - Grassland composition in Mount Diablo cottonweed and Gray's clover habitat (areal cover by species);

2 Note that at the state level, CNPS rejected *Trifolium grayi* for listing, considering it a synonym of *Trifolium barbigerum var. andrewsii*, a common taxon.

- Seasonal structure;
    - Spring season cover and average height of dominant species in vegetation transects;
    - Fall season residual dry matter (RDM) if in grazed area.

2. Maintain the current vegetative composition and structural characteristics of the grassland habitat preferred by the Mount Diablo cottonweed and Gray's clover including:
    - Moderate total vegetative cover;
    - Low relative cover of non-native annual grasses;
    - High relative cover of native perennial grass and herbaceous species.

1.6.2.2 Preliminary Management Thresholds for Mount Diablo cottonweed and Gray's clover

The following thresholds are estimated and will be adjusted if necessary as monitoring data is collected.

Preliminary Management Thresholds for the Mount Diablo cottonweed and Gray's clover include:

1. Increase intensity of grazing if any of the following preliminary thresholds are measured in vegetation transects, or estimated during reconnaissance surveys, in the occupied Mount Diablo cottonweed and Gray's clover area on the East Preserve:
    - Mount Diablo cottonweed and Gray's clover occupied area decreases significantly due to competition with annual grasses, invasive non-native species or shrubs.

2. Decrease intensity of grazing if any of the following preliminary thresholds are measured in vegetation transects, or estimated during reconnaissance surveys, in the occupied Mount Diablo cottonweed and Gray's clover area on the East Preserve:
    - Mount Diablo cottonweed and Gray's clover occupied area is overgrazed leading to decrease in occupied habitat.

3. Initiate a mowing or alternative type of vegetation management technique (fire) to reduce competing cover of annual grass if the following preliminary threshold is measured in vegetation transects, or estimated during reconnaissance surveys, in the occupied Gray's clover area on the West Preserve:
    - Gray's clover occupied area decreases significantly due to competition with annual grasses;

Alternative vegetation management practices for the West Preserve Gray's clover area habitat may include manual or chemical control of invasive non-native species or shrubs.

1.6.3 Wetlands

Wetland types within the Preserve include seasonal wet meadow, freshwater seep, stream channels and a stockpond.

Seasonal wet meadow wetlands occur in the lowest areas of the grasslands on either side of the West Branch of Carbonera Creek. This wetland type occurs primarily on the Danville soil series, which is a very deep soil formed on alluvial fans. Danville soils typically have a clay subsoil layer at 18 to 38 inches that restricts downward percolation of water. Wetlands occur on this soil type where the clay layer is closer to the surface or in low areas where lateral movement of water above the clay layer results in saturation of surface soils. Ponding may also occur in the lowest areas.

A variety of native grasses, rushes and sedges are found in the seasonal wet meadows within the Preserve including: spike bentgrass (*Agrostis exarata*), California oatgrass (*Danthonia californica*), meadow barley (*Hordeum brachyantherum*), toad rush (*Juncus bufonius*), iris leaf rush (*Juncus xiphiodes*), brown-headed rush (*Juncus phaeocephalus*), bog rush (*Juncus effusus*), baltic rush (*Juncus balticus*), spreading rush (*Juncus patens*), dense rush (*Carex densa*), Bolander's sedge (*Carex bolanderi*). Non-native species include: Mediterranean barley (*Hordeum marinum*), Italian ryegrass (*Lolium multiflorum*), annual rabbitsfoot grass (*Polypogon monspeliensis*) curly dock (*Rumex crispus*), fiddle dock (*Rumex pulcher*), and pennyroyal (*Mentha pulegium*).

Freshwater seeps are found in the Preserve on the slopes west of Glenwood Drive. In addition, the stockpond east of the West Branch of Carbonera Creek appears to be located on a seep. The vicinity of the seeps, as well as most of the grass-covered hills within the Preserve, is underlain by the Bonnydoon soil series. These soils are considered excessively drained and typically have weathered sandstone bedrock at 7 to 20 inches. Sandstone bedrock and talus are exposed at the surface on slopes throughout the Preserve. Seeps occur where groundwater moving laterally over presumably unfractured shallow sandstone bedrock reaches the ground surface. Dominant plant species in the freshwater seeps include arroyo willow (*Salix lasiolepis*), Santa Barbara sedge (*Carex barbarae*), California blackberry (*Rubus ursinus*), and spreading rush (*Juncus patens*).

Stream channel wetlands occur along the West Branch of Carbonera Creek, which flows north to south through the center of the Preserve. The channel bed is incised 10 to 15 feet below the surrounding valley bottom. Much of the channel is densely vegetated and appears to carry little coarse bedload. The densely vegetated channel banks appear to be stable and the gradient of the channel is controlled by sandstone bedrock in several locations. The width of the channel bed ranges from approximately 8 to 15 feet with an open water channel that is typically narrow and occasionally absent. Dense wetland vegetation typically covers most bed of the channel. Hydrology is perennial.

The closed canopy of the channel wetland is dominated by red willow (*Salix laevigata*). The understory is dominated by water parsley (*Oenanthe sarmentosa*) and small-fruit rush (*Scirpus microcarpus*). Grazing management prior to establishment of the Preserve has allowed access to the West Branch of Carbonera

Creek to horses. Grazing of herbaceous wetland vegetation in the stream channel wetlands has occurred adjacent to some of the crossings.

1.6.3.1 Specific Management Objectives for Seasonal Wet Meadow Wetlands

Specific management objectives for the seasonal wet meadow wetlands include:

1. Develop baseline data including:
    - Vegetation composition in seasonal wet meadow wetlands (areal cover by species);
    - Seasonal structure;
        - Spring season cover and average height of indicator species in vegetation transects;
        - Fall season residual dry matter (RDM) if in grazed area.

2. Maintain the current vegetative composition and structural characteristics of the seasonal wet meadow wetlands including:
    - Low relative cover of non-native wetland species and non-native invasive species;
    - High relative cover of native perennial wetland species;
    - High native perennial species richness (number).

1.6.3.2 Preliminary Management Thresholds for the Seasonal Wet Meadow Wetlands

The following thresholds are estimated and will be adjusted if necessary as monitoring data is collected. Preliminary Management Thresholds for the seasonal wet meadow wetlands include:

1. Decrease intensity of grazing during the summer and fall if the following preliminary threshold is measured in vegetation transects, or estimated during reconnaissance surveys, in the occupied native grassland habitat on the East Preserve:
    - Cover of native perennial wetland species decreases significantly due to late season selection by grazers.

2. Increase invasive non-native species control if the following preliminary thresholdis measured in vegetation transects, or estimated during reconnaissance surveys, in any of the wetland habitats on the Preserve:
    - Wetland habitat area or native species cover or richness decreases significantly due to competition with invasive non-native species.

1.6.4 Riparian

Riparian forest and scrub vegetation occurs along the banks and adjacent valley bottom of the West Branch of Carbonera Creek and several small tributaries that flow from the eastern portion of the Preserve. The dominant tree species in the canopy is arroyo willow. Additional tree and shrub species include: coast live oak (*Quercus agrifolia*), California bay (*Umbellularia californica*), coast redwood (*Sequoia sempervirens*), California buckeye (*Aesculus californica*), blue elderberry (*Sambucus mexicana*), coyote bush (*Baccharis pilularis*). Understory species include: poison oak (*Toxicodendron diversilobum*), California blackberry (*Rubus ursinus*), twinberry (*Lonicera involucrata*) and creek dogwood (*Cornus sericea*).

Grazing prior to establishment of the Preserve has allowed horses access to the riparian vegetation along the West Branch of Carbonera Creek. Horses have crossed the creek in several locations, but because horses generally concentrate on grasses, grazing of woody riparian vegetation appears to be negligible. Some trampling of riparian vegetation has occurred, but does not appear to have altered vegetation composition. This can be a problem when vegetation is damaged by repeated use. At one crossing located south of the Water District Road, the banks on either side of the channel lack vegetation and have eroded back several feet. Fencing and exclusion of horses from this area is recommended to allow regeneration of riparian plants.

1.6.4.1 Specific Management Objectives for Riparian Habitat

Specific management objectives for riparian habitat include:

1. Develop baseline data including:
    - Distribution of invasive non-native species in riparian habitats.

2. Maintain the current vegetative composition and structural characteristics of the seasonal wet meadow wetlands including:
    - Low relative cover of invasive non-native riparian species.

1.6.4.2 Preliminary Management Thresholds for Riparian Habitat

The following thresholds will be adjusted if necessary as monitoring data is collected.

Preliminary management thresholds for riparian habitat include:

1. Increase invasive non-native species control if the following preliminary thresholdis measured in vegetation transects, or estimated during reconnaissance surveys, in any of the riparian habitats on the Preserve:
    - Native species cover or richness decreases significantly due to competition with invasive non-native species.

1.6.5 Native Grassland

Native grassland within the Preserve is dominated by the native perennial bunchgrass purple needlegrass (*Nassella pulchra*). Two areas covering approximately 1.7 acres were mapped as native grassland within the Preserve (Figure 1) during surveys conducted for the 1998 FSEIR. The larger area, located west of Glenwood Drive, has greater than 70% cover of purple needlegrass. In addition, smaller patches of native grasses occur in scattered locations within the Preserve.

Creeping wild rye (*Leymus triticoides*) is another native perennial that occurs in the Preserve in small patches in several locations. This grass can form dense patches spreading through horizontal growth of surface roots. It is typically found on lower slopes and on the fringe of seasonal wet meadow wetlands where soil moisture is relatively high.

Additional species of native perennial grasses which have been recorded in grasslands of the Preserve include: bent grass (*Agrostis palens*), California oatgrass (*Danthonia californica*), blue wild rye (*Elymus glaucus*), red fescue (*Festuca rubra*), meadow barley (*Hordeum brachyantherum*), one-sided bluegrass (*Poa secunda*).

1.6.5.1 Specific Management Objectives for the Native Grassland Habitat

Specific management objectives for the native grassland habitat include:

1.Develop baseline data including:
- Distribution of significant stands of native grassland;
- Composition in native grassland habitat (areal cover by species);
- Seasonal structure;
    - Spring season cover and average height of indicator species in vegetation transects;
    - Fall season residual dry matter (RDM) if in grazed area.

2. Maintain the current vegetative composition and structural characteristics of the native grassland habitat including:
    - Low relative cover of non-native annual grasses;
    - High relative cover of native perennial grass and herbaceous species;

- High native perennial grass and herbaceous species richness (number).

1.6.5.2 Preliminary Management Thresholds for the Native Grassland Habitat

The following thresholds are estimated and will be adjusted if necessary as monitoring data is collected. Preliminary Management Thresholds for the native grassland habitat include:

1. Increase intensity of grazing during flowering of annual grasses if the following preliminary thresholds is measured in vegetation transects, or estimated during reconnaissance surveys, in the occupied native grassland habitat on the East Preserve:
    - Native grassland habitat area or native species richness decreases significantly due to competition with annual grasses.

2. Decrease intensity of grazing during the summer and fall if the following preliminary thresholds is measured in vegetation transects, or estimated during reconnaissance surveys, in the occupied native grassland habitat on the East Preserve:
    - Cover of native perennial grasses decreases significantly due to late season selection by grazers.

3. Initiate a mowing or alternative type of vegetation management technique (fire) to reduce competing cover of annual grass if the following preliminary threshold is measured in vegetation transects, or estimated during reconnaissance surveys, in the occupied Gray's clover area on the West Preserve:
    - Gray's clover occupied area decrease significantly due to competition with annual grasses.

    Alternative vegetation management practices for the West Preserve Gray's clover area habitat may include manual or chemical control of invasive non-native species or shrubs.

2.0 MANAGEMENT ACTIVITES

Three primary activities will be used to achieve the goals of the Plan: vegetation management, species and habitat monitoring, and adaptive management. Vegetation management practices will focus on maintaining open, sparsely vegetated grassland habitat through reducing non-native annual grasses. This objective will be achieved primarily through managed grazing on the East Preserve and, if necessary, localized mowing anywhere in the Preserve. Invasive exotic plants will be controlled if they pose a threat to sensitive habitats. Because the effects of fire on the sensitive species on the Preserve have not been studied, prescribed burning is presented only as an alternative method at this time. Monitoring of sensitive species and habitats will provide a baseline for establishment of thresholds and information on effects of management practices. Adaptive management will be the link between these components.

2.1 ADAPTIVE MANAGEMENT

Adaptive management will provide the basis for the long-term management of the Preserve and is considered fundamental to successful implementation of the preservation and maintenance measures outlined in this OSMP. Adaptive management includes four general elements:

1. Monitoring of special status species and their habitats (expected to begin in 2003 or 2004);
2. Development of baseline data and management thresholds;
3. Application of management activities to maintain sensitive species habitats;
4. Reassessment of management thresholds and activities based on the monitoring results and management goals.

There is a considerable amount of information to be learned about many aspects of the biology, habitat requirements, and management approaches required to manage the special-status species found in the Preserve. The flexibility of an adaptive management approach will allow adjustments to be made throughout implementation of the OSMP management program and ensure that the goals of the Plan are met.

The key to adaptive management of the Preserve will be the monitoring program, which will provide quantitative data on both the special status species and their grassland habitat. These data will be used to develop and refine the habitat and population based thresholds. Evaluation of management activities will involve examining annual monitoring data relative to thresholds while considering long term habitat and population data trends, as well as influence of climatic and other natural environmental fluctuations. The analysis of monitoring data and thresholds will identify where management efforts are successful and where additional measures need to be implemented to improve success. If continued monitoring shows that the management efforts are unsuccessful, the land management entity will seek advice from species experts, range managers, and federal and state resource agencies to adopt alternative management methods.

The following actions are examples of adaptive management measures that may be implemented if monitoring indicates that sensitive resource habitat is not adequately maintained:

- Placement of additional fencing to reduce trespass into the preserved lands or to reduce grazing pressures;
- Alteration in the duration and/timing of grazing within the East Preserve, including modifications to exclosures for OTB and spineflower colonies, and;
- Modifying invasive, non-native plant species control measures to increase the effectiveness of the control.

This Plan focuses on providing the necessary background and guidelines to provide for the long-term management of the special-status species habitat on the Preserve. Given the nature of adaptive

management, this Plan is not designed to provide the definitive guidelines for all aspects of the preservation and management program; instead it provides guidelines based on existing conditions and current knowledge of the special-status species on the Preserve.

2.2 VEGETATION MANAGEMENT

All of the sensitive species on the Preserve occur in portions of the grassland with a sparse cover of low growing grasses and wildflowers, often with considerable area of bare ground or weathered bedrock. The Preserve's sensitive species are not found in areas with tall and dense growth of non-native annual grasses, shrubs or invasive plants. The sparsely vegetated conditions are a result of various factors including: site history, grazing and fire regimes, competition and other interactions between species, soil depth, moisture and fertility. Management of non-native annual grasses and exotic pest plants is necessary to protect the sensitive species that occur on the Preserve and to maintain their habitats.

Prior to implementation of this Plan, there has been no active management of sensitive biological resources within the Preserve area. The Ohlone tiger beetle, Scotts Valley spineflower and other sensitive species, as well as wetlands, riparian areas and native grassland, have persisted through periods of intensive cattle grazing, the current unmanaged horse grazing east of Glenwood Drive, and unauthorized entry of people on the property.

2.2.1 East Preserve

On the Preserve areas east of Glenwood Drive, horses will be allowed to rotationally graze the occupied Ohlone tiger beetle and Scotts Valley spineflower habitats. Section 2.2.1 describes a program of managed grazing that will be used to maintain the sparsely vegetated grassland habitat for the sensitive species on the East Preserve. The removal of grazing is not recommended because it may lead to dense growth of annual grasses. However, managed grazing will reduce the height and cover of non-native annual grasses, thereby maintaining habitat for the sensitive species, especially the Ohlone tiger beetle and the Scotts Valley spineflower.

However, the number of horses will be reduced and/or precluded from grazing the occupied areas during certain critical periods when the species are most sensitive to grazing animals. Details on these exclusion practices are contained in the description concerning rotational grazing.

2.2.2 West Preserve

The West Preserve grassland has not been grazed for at least 20 years. The native grassland of the West Preserve has recovered to some extent since the end of the dairy operation, but does contain annual grasses and brush. Since the sensitive species appear to maintain viable populations on site, grazing is not recommended at this time. Grazing on the West Preserve could be added in the future to enhance habitats

On the West Preserve, vegetation management will consist of selective weed-whipping/mowing around the occupied Scotts Valley spineflower areas to control weedy, non-native herbaceous growth (primarily annual, non-native grasses), woody plant growth (i.e., removal of young coyote brush establishing in/around the rock outcrops) and invasive, non-native plants. The spineflower stands on the West Preserve occur on thin soils that overlay the relatively unfractured Purissima mudstone and are on steeper slopes. Manual control will take place in an area approximately 100 feet outwards from the occupied spineflower habitat areas. Due to the uneven terrain and other site access constraints, mowing of large areas of the grassland is not practical.

2.2.3 Fencing

Improvements to existing fences surrounding the East Preserve are described in the Grazing management section. Fences will be repaired to keep horses in and to protect resources on the Preserve from unauthorized access. Additional interior fences will be constructed to divide the Eastern portion of the Preserve into four pastures. If unauthorized public access is occurring through broken fences, it will be necessary to repair these areas if such access is causing potential harm to sensitive species. Fences will be similar to the existing pasture fence but will be constructed with a smooth bottom wire to improve wildlife passage

2.2.4 Vegetation Management Alternatives

Sections 2.2.6 and 2.2.7 describe alternatives to grazing for control of non-native annual grasses and exotic pest plants. These alternatives include manual or chemical control methods (Section 2.2.6), such as mowing and pulling, and prescribed fire (Section 2.2.7). Mowing and pulling must be repeated regularly and can be labor intensive. Fire was a natural component of native grassland and can be a very effective tool for maintaining native species composition. However, the use of fire adjacent to existing development requires careful preparation and public outreach. Both of these alternatives are considered as adaptive management tools if grazing is found to be ineffective.

2.2.5 Grazing Management

2.2.5.1 The Role of Grazing

Fire and grazing are the two most important ecological processes that govern the structure, function, and composition of California's grassland, scrubland, and forested plant communities (Heady *et al*. 1977, Sampson 1952, Savory 1988, Edwards 1992). The negative effects of uncontrolled, yearlong livestock grazing are well known. They include soil compaction and erosion, degraded riparian and other wildlife habitat, the elimination of native perennial grass, and poor water quality. The effects of total rest from grazing can be just as negative, resulting in undecomposed annual grass mulch which covers and eventually

eliminates the native perennial grasses and virtually all the native annual wildflowers (Menke 1989). More often than not, the total cessation of livestock grazing, like the exclusion of fire, generally leads to the collapse of a healthy diverse grassland, especially on productive soils where introduced annual grasses become dominant (Edwards 1995, Hayes 1998, Griggs 2000). One example, an experiment that excluded cattle grazing on a rare population of the Sonoma spineflower (*Chorizanthe valida*) at Point Reyes National Seashore resulted in a dramatic reduction of the taxon, due primarily to the competition of annual grasses and weeds (Davis and Sherman 1992).

2.2.5.2 History of Grazing at Glenwood

The Preserve has a long history of livestock grazing management dating back to the settlement of the valley in the mid 1800's. As recently as the late 1960's the land was a local dairy operation. There is evidence that during the dairy operation period, portions of the valley bottom were irrigated for pasture and cultivated for supplemental forage. A large dammed stock pond was built on the east side of the valley. The grassland was much more extensive during the 1960's and 1970's (1963 and 1974 aerial photographs, USGS Felton and Laurel quadrangles). The dairy operation impacted the upland grassland near the pond and the primary collection area near the south end of the valley. During this period, the extensive hillside livestock trails developed and it is likely that the thinner soil on the southern exposures lost some of their topsoil due to overgrazing. The extensive stands of willow riparian scrub and coyote bush (*Baccharis pilularis*) that exist today, particularly along the west fork of Carbonera Creek, did not exist in the 1960's and have since expanded in the last 25 years. When Scotts Valley High School was built in 1999, the dairy ranch headquarters on the west side of Glenwood Drive, including the main water source for the lower east side valley, was destroyed. In the vicinity of the ranch house the road was moved to the east, destroying the main ranch barn and corral. The primary cement water trough that once received water from the west side of Glenwood Drive still exists and is approximately 50 yards north of where the barn and corral once stood. Since the 1980's the grassland west of Glenwood Drive has not been grazed. Horse grazing has continued on the east side of Glenwood Drive for the last 20 years with between 26 to 28 horses (pers. com. Günter Helmholz).

2.2.5.3 Grazing Capacity

Grazing capacity is the number of animals that a grassland can support. It is calculated using annual grass production (dry weight of grass per acre) figures estimated for common rangeland soil types. A certain amount of grass must remain at the end of the dry season to protect soils from erosion. This residual dry matter (RDM) value is determined based on grassland type and slope (Clawson *et al*. 1982, USDA Forest Service 1984). The amount of grass available to grazing animals is determined by subtracting the RDM from the annual production.

Table 2 gives the potential grazing capacity of the East and West Preserve and the City Park (Lot A) and Glenwood Development areas based upon soil productivity and average rainfall. According to this

calculation, the eastern portion of the Glenwood property is currently being grazed by two animals more than its calculated carrying capacity.

The valley bottoms along Glenwood Drive and east of the West Branch of Carbonera Creek are Danville loam. This is a deep, well-drained soil with a slowly permeable subsurface clay layer. This

Table 2. Available forage production, area of grassland by soil type, and grazing capacity of Glenwood Property.

Soil	Dry Matter (lbs./acre)			Area of Grassland (acres)			Available Yearly Forage Production (lbs, dry weight /grassland area)		
	Normal Year Forage Production	Target Average Residual Dry Matter (RDM)	Normal Year Available Forage Production	West Preserve	East Preserve	City Park (Lot A) and Glenwood Development Area	West Preserve	East Preserve	City Park (Lot A) and Glenwood Development Area
Danville loam (valley soil)	4,000	1,200	2,800	0	21	18	0	58,800	50,400
Bonnydoon loam (hillside soil)	3,200	1,000	2,200	25	62	2	55,000	136,400	4,400
			Total	25	83	20	55,000	195,200	54,800
Grazing Capacity: Horses (1.0 Animal Units)/Year = lbs dry matter / grassland area ÷ 9,600 (=1.0 x 800 lbs/A.U./month x 12 months)							**6 (5.7) horses**	**20 (20.3) horses**	**6 (5.7) horses**

soil is not classified as a range resource in the Santa Cruz Soil Survey, however, it is considered to be a rich agricultural grade soil type. It produces an estimated 4,000 pounds per acre under average conditions, and 3,200 and 5,000 pounds in unfavorable and favorable years, respectively (personal communication Casale 2003). The upland grassland slopes on both sides of the valley are Bonnydoon loam, which is excessively drained but productive soil derived from sandstone and mudstone. This area produces an estimated 3,100 pounds per acre under average conditions and 2,000 and 4,500 pounds in unfavorable and favorable years.

In the high rainfall central coastal regions of California, the recommended RDM level left at the end of the grazing season (autumn) is between 750 to 1250 pounds per acre depending on the steepness of the slope. It is important to leave at least 1000 pounds of RDM per acre on the steeper Bonnydoon slopes at the end of the grazing season (autumn). The recommended minimum RDM guideline for mesic (Danville) soils is 1,200 pounds per acre (Bartolome *et al.*).

Available forage production per year for the Bonnydoon soils would be 2,200 lbs. per acre (range: 1, 000 to 3,200 lbs. per acre). Available forage production per year for the Danville soils would be 2,800 lbs. per acre (range: 1,200 – 4,00 lbs. per acre).

An animal unit (AU) is considered to be one mature animal (1000 lb. cow or horse) that requires an average daily forage consumption of 26 lbs dry matter per day or approximately 800 lbs of dry matter per month. In the literature, a mature horse is considered to be slightly more than one animal unit (1-1.2 AU) depending on its average weight (1000 to 1200 lbs) and whether or not the animals are nursing their young (Heady 1975, pers. com. Casale 2003). The average weight of the horses grazing the Glenwood property is 1000 lbs (between 900 and 1100 pounds) and the horses are not allowed to breed (pers. com. Günter Helmholz). In single pastures, horses graze differently from cows, preferring flat areas which are over-utilized. When horses are moved between smaller pastures there is less opportunity for this behavior and the grazing becomes more uniform. In addition, coastal grasslands with a higher percentage of native perennial grasses are known to have an overall increase in forage productivity in response to pasture rotation systems (Menke 1989). Because of the horses low average weight, the proposed rotation grazing program, and the vegetation objectives of the program, the horses on the Glenwood property will be considered equal to 1.0 AU.

2.2.5.4 Grazing Management Objectives

Grazing management will be used to maintain characteristics of grassland vegetation favorable to the sensitive species including the Ohlone tiger beetle, Scott's Valley spineflower, Opler's Longhorn moth, Mount Diablo cottonweed, and Gray's clover. All of these species occur in grassland that is sparsely vegetated by low growing plant species. Grazing will be the primary tool for maintaining appropriate habitat characteristics.

Four specific objectives of the grazing program are to:

- Decrease the total number of horses to reduce the overall grazing pressure on the Preserve to a sustainable level;
- Control utilization to maintain sparse and open native dominated grassland;
- Promote more even utilization of forage within each pasture, and
- Allow vegetation to recover through periods of rest.

The objectives of grazing management will be accomplished through the creation of fenced pastures and the institution of a rotational grazing program.

2.2.5.5 Grazing Constraints and Management Options

2.2.5.5.1 Kind and Class of Livestock

There are four kinds of livestock that could realistically be considered for a management program: cattle, horses, sheep, and goats.

- *Cattle*: Cattle are generalist grazers and utilize both grasses and forbs and also browse shrubs and trees (coyote brush, willows, etc.). While cows can keep coyote brush, fennel and other woody shrubs and trees from invading a grassland, they cannot reduce mature stands of these plants without mechanical assistance. Cows and growing yearlings require more forage than mature horses. The logistics of maintaining a 10-15 animal herd of lactating cows and calves on a small 120-acre grassland yearlong would be difficult and expensive. Grazing a larger group of yearlings, heifers, or dry cows, seasonally for short periods of time (1-2 months) could strategically fulfill the management objectives. However, this would be difficult given the urban setting and the cost of moving the animals on and off the property. The fence infrastructure would have to be strong and the operation would require close supervision. This option, however, could be implemented at some future time if the proper infrastructure is built and local stewardship grazing contractors are found.

- *Horses*: Generally, horses favor grasses and grass-like plants and clovers. Horses will do very little to prevent the gradual increase of woody shrubs and trees, preferring to graze around the seedlings. Horses are ineffective at reducing brush. They are hardy animals and can be easily moved and managed to achieve vegetation management objectives.

- *Sheep and Goats*: Both sheep and goats are generalist grazers and can be expected to graze areas closely and uniformly when herded. However, it is very likely that both sheep and goats will graze the spineflower and can be expected to prefer native wildflowers such as cream cups (*Platystemon californicus*), goldfields (*Lasthenia californica*), bulb species (*Brodiaea* sp., *Calachortus* sp.) etc. Sheep and goats, separately and together, are used by grazing contractors for general weed abatement

and are effectively used to revitalize overgrown native grasslands that have been rested from grazing for many years.

It is the recommendation of this grazing plan that horses continue to be the primary grazing animal.

2.2.5.5.2 Impact of the Removal of Horses from Glenwood Development and City Park (Lot A) Areas

The proposed housing development, including the wetland mitigation area (Lot H) and the City Park (Lot A), will remove 18 acres of valley grassland from grazing. This will require the removal of six horses from the Property. This will also alter movement of horses by restricting the crossing of the West Branch of Carbonera Creek to an existing crossing located north of the wetland mitigation area. An old road/trail overgrown by fifteen to twenty year-old coyote brush leads from the crossing south along the east side of the creek. Removal of this brush will facilitate the construction of a necessary fence line and allow animal movement to the east side of the creek.

2.2.5.5.3 The West Preserve

The West Preserve grassland has not been grazed for at least 20 years. Based on the May 1999 aerial photography (PAS 1999), in the last three to five years coyote brush has increased in the West Preserve area, spreading over approximately one third of the non-native annual grassland, reducing its potential forage capacity.

Under this Plan, the West Preserve will continue to be left ungrazed and localized management actions will be undertaken to protect sensitive species. However, grazing could be considered for enhancing the native grassland diversity of the West Preserve. Adding the West Preserve to the rotational grazing program could enhance native grasslands and sensitive species habitat in all pastures by allowing longer rest periods between grazing to allow recovery for native perennial grasses and forbs in all pastures. This 25-acre pasture can support 6 horses pastured year round or it can accommodate up to 23 horses for a seasonal three-month grazing period during the peak spring growing period. It will be necessary to build two small collection corrals in Pasture A and E adjacent to the crossing gates to facilitate the movement in one short procedure.

2.2.5.5.4 Grazing Strategy

Currently the Glenwood Property east of Glenwood Drive is fenced as a single large pasture, allowing horses unrestricted, year round access to all areas. A single pasture arrangement allows horses to repeatedly select preferred sites such as wet meadows and native perennial grassland which remain green longer than the annual grassland. Repeated grazing of preferred wetland and perennial species reduce these plants' cover and vigor and shifts composition to less palatable species. In addition, areas with difficult

access or less palatable or shorter-lived annual species are less used. These areas become dominated by dense growth of highly competitive non-native annual grasses which eliminate annual forb and native wildflower sites.

A rotational grazing system is recommended for the East Preserve to maintain the existing grassland condition which is characterized by low cover of non-native annual grasses and high diversity and cover of native species. The objective is to minimize the horses' opportunity to re-select and overgraze their preferred forage. This can be accomplished by grazing the horses for shorter periods of time in smaller sized pastures. This system results in greater utilization of annual grasses and a reduction in annual grass cover and a gradual reduction of its competitive advantage over native perennial grass and herbaceous species. In a rotational system, pastures are rested allowing the preferred species to re-grow. Vigor and reproduction of native perennial grasses and wildflowers increase with the regrowth that occurs during the rest periods in the rotational system.

In sensitive species habitats, cover of non-native annual grasses will be maintained within desired levels through appropriately timed grazing. Grazing in the OTB habitat will occur only between April or May, after soil dries at the surface and more shallow early stage larval burrows are stable and November or December when pupae are protected within relatively deep (to 20 cm) sealed burrows. During active periods of the OTB, or periods when early stage larval burrows are unstable, grazing will be excluded to protect the existing populations. Grazing in Scotts Valley spineflower, Mt. Diablo cottonweed, Gray's clover and cream cup habitat would target annual grasses before and during the period when grasses are at peak productivity and producing seed. Periods of grazing in the summer and fall would be used to continue to remove grass thatch and maintain the low cover open habitat characteristic of OTB and other sensitive species habitat.

2.2.5.6 The Grazing Program

The grazing program will divide the East Preserve into smaller pasture units by installation of cross fencing as depicted in Figure 1. Area and forage production of the pastures are presented in Table 3. The East Preserve will have three larger pastures and a smaller 7.4-acre pasture containing the Ohlone tiger beetle habitat. Although not required for this project, the West Preserve can be divided into a larger 32 acre pasture and a 3.4-acre exclosure around the Scotts Valley spineflower if grazing is deemed desirable in the future to enhance this area.

The rotation program for the four pastures on the East Preserve is presented in Table 4. An optional program including the West Pasture is presented in Table 5. The timing and duration of grazing in each pasture reflects the differences in habitat types as well as the size and consequent available forage of the pastures. Rotation will center around the careful timing of grazing in the Ohlone tiger beetle and other sensitive species habitats in Pastures B and C. Grazing in the OTB habitat will not take place when adults are active or when soils supporting relatively shallow early stage larval burrows are saturated. Grazing will

be limited to the period from April or May when soils are dry and relatively shallow early stage larval burrows are stable through November and December when larvae are sealed in stable deep burrows after the first rains.

The grazing program allows one to four months rest for each pasture between grazing periods. this grazing scenario will lead to an increase in forage production of the smaller north valley pasture

Table 3. Available forage production, pasture area, and grazing capacity of five pastures on the Glenwood Preserve.

Soil	Dry Matter (lbs./acre)			Area of Grassland (acres)					Available Yearly Forage Production (lbs, dry weight /grassland area)				
	Normal Year Forage Production	Target Average Residual Dry Matter (RDM)	Normal Year Production	Pasture A North Pasture	Pasture B East Pasture	Pasture C South Pasture	Pasture D OTB Pasture	Pasture E West Pasture	Pasture A North Pasture	Pasture B East Pasture	Pasture C South Pasture	Pasture D OTB Pasture	Pasture E West Pasture
Danville loam (valley soil)	4,000	1,200	2,800	15	0	6	0	0	42,000	0	16,800	0	0
Bonnydoon loam (hillside soil)	3,200	1,000	2,200	0	32	23	7	25	0	70,400	50,600	15,400	55,000
			Total	15	32	29	7	25	42,000	70,400	67,400	15,400	55,000
Annual Grazing Capacity: Horses / year = available yearly production ÷ 9,600 lbs dry matter / horse / year									**4 (4.4) horses**	**7 (7.3) horses**	**7 (7.0) horses**	**2 (1.6) horse**	**6 (5.7) horses**
Monthly Grazing Capacity: Horses/ month = Animal Unit Months (AUM)									**53**	**88**	**84**	**19**	**69**

Table 4. Four Pasture Rotation System for the East Glenwood Preserve													
(244 AUMs) Pasture	Grazing Season, month by month (20 AU)												Total AUMs per Pasture
	N	D	J	F	M	A	M	J	J	A	S	O	
Pasture A (53 AUM) North Pasture	15				20					20			55
Pasture B (88 AUM) East Pasture		15		20			16		15			20	86
Pasture C (84 AUM) South Pasture			20			20		20			20		80
Pasture D (19 AUM) Ohlone tiger beetle Pasture	5	5					4		5				19
Adult Beetle/Egg Laying	**********												
Egg Hatching/Active Larvae Stages	**********												
Below Ground Pupae Stage	********												
Scotts Valley spineflower	**********												
Total AUM's	20	20	20	20	20	20	20	20	20	20	20	20	245

Table 5. Optional Five Pasture Rotation System for the East and West Glenwood Preserve													
(313 AUMs)	Grazing Season, month by month (26 AU)												Total AUMs per Pasture
	N	D	J	F	M	A	M	J	J	A	S	O	
Pasture A (53 AUM) North Pasture	21			5				26					52
Pasture B (88 AUM) East Pasture		21			26				21		26		94
Pasture C (84 AUM) South Pasture			26			26						26	78
Pasture D (19 AUM) Ohlone tiger beetle Pasture	5	5					4		5				19
Pasture E (69 AUM) West Pasture				21			22			26			69
Adult Beetle/Egg Laying	**********												
Egg Hatching/Active Larvae Stages	**********												
Below Ground Pupae Stage	********												
Scotts Valley spineflower	**********												
Total AUM's	26	26	26	26	26	26	26	26	26	26	26	26	312

(Pasture A) by allowing it to rest for almost 4 months during the peak growing season, thus building up a good forage reserve for the mid-summer and mid-fall.

The grazing program depicted is for a normal forage production year. Grazing rotation should be altered during years of favorable or unfavorable growth to continue to meet habitat goals. For example, grazing should be reduced in the OTB habitat, Pasture D, in years with low forage production. To balance the program, grazing would need to be increased on the remaining pastures. Pasture A, which has higher productivity wet meadows and no sensitive species habitat, can be used at this time. In wetter than normal years, but after soils are dry, grazing can be increased in the OTB habitat to reduce the cover of annual grass. In wet years, grazing can be reduced in Pastures A and C, which contain significant wetland areas.

2.2.5.6.2 Supplemental Feed

Supplemental feed is often used by horse grazing associations to maintain the health of horses or supplement their diet during times of drought and low forage production. Typically, supplemental feed (alfalfa or grain) is necessary if the available range resource is not sufficient to support the number of horses. However, allowing the horses to become reliant on supplemental feed will create a stronger preference for the preferred "ice cream" species (*Danthonia californica*, *Nassella pulchra*, native clovers, wetland species etc.) and the avoidance of less desirable annual grasses that otherwise would or should be grazed. The result is uneven and patchy forage utilization.

The horses currently do not receive supplemental feed and are well adapted to this getting all nourishment from grassland forage. The grazing program described here is designed to be sustained by the forage production base. The rotational grazing program will not use supplemental feed except under special circumstances when provided by individual horse owners.

2.2.5.7 Horse Owners Association

The Glenwood Preserve horse grazing program will need to be managed by a horse owners association with a designated manager who would be responsible for coordinating the movement of the animals. Members may contribute volunteer labor, with biannual, or quarterly workdays, in order to keep boarding fees low and to help maintain the facility.

2.2.5.8 Infrastructure

2.2.5.8.1 Fencing

Figure 1 depicts locations of necessary fencing to create the 4 pastures on the East Preserve. Most of the existing perimeter fence for the East Preserve is in poor condition and will need to be reconstructed or repaired. New fencing is required to create three main pastures. Fences will also be constructed along the

West Branch of Carbonera Creek and around the stock pond. The Ohlone tiger beetle habitat will be fenced as a separate unit. Fences will be constructed to protect the pond and riparian areas. The corral at the north end of Pasture A requires repair. Six gates are required for the East Preserve.

In the future, if grazing is desired to enhance habitats and is determined to be feasible, the fence around the West Preserve would require complete rehabilitation. An additional fence would be needed surrounding the Scotts Valley spineflower population. Three gates would be required for the West Preserve. A good horse crossing point with a wide shoulder and gate along Glenwood Drive would need to be developed. At the present time no fence exists along the west ridge bordering the Salvation Army property.

New fences will be four strand with metal tee posts, similar to the existing pasture fence but will use a smooth bottom wire to allow for wildlife passage.

2.2.5.8.2 Water

Presently the Carbonera Creek riparian corridor and the stock pond are the only sources of water for the horses. Fencing riparian habitats and a portion of the pond will require development of alternative water sources. Potential sources of water include the existing pond, an existing well in the north valley, and municipal and reclaimed water. If depth of the stock pond is sufficient, a pipe could be installed in the dam to supply pond water to troughs in Pastures B and C. A municipal water source will be necessary in these pastures for use during dry periods. Redevelopment of the well in the north valley could provide a low cost water source. The OTB pasture and other pastures in which use of well or pond water is not feasible will require a trough using municipal water. Use of reclaimed water should be investigated as an alternative to municipal water. The Glenwood property has one existing water meter at Canham Road. Additional water meters may be necessary to provide water to the remaining pastures. The final water delivery system is to be installed and functional prior to take over of land management by the City Land Trust of HOA.

2.2.6 Manual and Chemical Vegetation Controls

2.2.6.1 Goals and Objectives of Manual and Chemical Vegetation Controls

Manual vegetation controls such as mowing, weed-whipping, and hand-pulling can be used to control unwanted vegetation in sensitive habitats such as wetlands, riparian areas, and native grasslands, and in habitat for the Ohlone tiger beetle (OTB) and sensitive plant species including the Scotts Valley spineflower (spineflower). It is recommended that chemical control only be used outside of sensitive habitat areas. The targets of manual and chemical vegetation controls would be invasive exotic pest plants listed by the California Exotic Pest Plant Council.

2.2.6.2 Shrubs

While native shrubs are appropriate in some portions of the Preserve, they have potential to displace native grassland or wetland species in these habitats. The intrusion of woody species in OTB or spineflower habitat would also have a negative impact by creating a dense vegetative cover, since these sensitive species require a relatively sparse, open vegetative canopy.

2.2.6.1.2 Invasive Exotic Pest Plants

The goal of exotic pest plant management is to control invasive species so that they will not have a significant impact on the ecological function of the habitat for the OTB and the spineflower or other sensitive species and habitats. Because many invasive species are highly competitive and may have a dense or tall growth habit, controlling their introduction and establishment in the special status species habitat is important and necessitates diligent monitoring and management actions.

Management will focus on plants on the California Exotic Pest Plant Council's (CalEPPC), lists of Exotic Pest Plants of Greatest Ecological Concern in California (see Appendix B). The CALEPPC lists include non-native plants that are serious problems in wildlands (natural areas that support native ecosystems). Plants found mainly in disturbed areas or established only sparingly, with minimal impact on natural habitats, are not included. The CalEPPC lists that will be the target of the control program are: "List A-1" (Most Invasive Wildland Pest Plants, Widespread), "List A-2" (Most Invasive Wildland Pest Plants, Regional), and "List B" (Wildland Pest Plants of Lesser Invasiveness). Species on the "Red Alert," "Need More Information," and "Annual Grasses" lists will be monitored and may also be considered targets for control.

Floristic surveys of the Preserve will be conducted to identify and track exotic species. Preliminary surveys indicate that exotic pest plants on the CalEPPC lists do not currently appear to be a problem in the OTB and spineflower habitats, however, once established they could be difficult to eradicate. Both OTB and spineflower habitats support a short and sparse cover of annual grassland composed of non-native annual grass and native and non-native broadleaf (forb) species. The soil, hydrologic, and grazing conditions of the habitats that support populations of OTB and spineflower have apparently precluded establishment of most exotic pest plants. If an exotic pest species is found within or surrounding the special status species habitat, appropriate controls or changes to the grazing regime will be implemented to either eliminate or control it so that it will not have an significant impact on the ecological function of the special status species habitat.

Exotic species which are particularly invasive locally, will be monitored closely. Italian thistle (*Carduus pycnocephalus*) occurs adjacent to Scotts Valley spineflower habitat on the SVUSD Preserve. This annual species can be effectively controlled by mowing or hand pulling prior to flowering. Several exotic species such as French broom (*Genista monspessulana*) which are particularly invasive locally, appear to occur on the Preserve only in scattered non-sensitive locations. These species will be monitored closely but will not be initially targeted for control unless populations appear to be spreading. Future volunteer efforts could target these species for eradication.

2.2.6.1.3 Non-native Annual Grasses

The grass species occurring on the Preserve are primarily non-native annuals including: *Aira caryophyllea*, wild oat (*Avena fatua*), ripgut brome (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), nit grass (*Gastridium ventricosum*), Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*), Italian ryegrass (*Lolium multiflorum*), and rat-tail fescue (*Vulpia myuros*). Several of these species are on the CALEPPC "Annual Grasses" list. While eradication of ubiquitous non-native grass species is not feasible, mowing as an adaptive management tool that could help prevent annual grasses from dominating Ohlone tiger beetle, Scotts Valley spineflower and other sensitive plant species habitat and native grassland.

2.2.6.2 Mowing and Hand Pulling

Mowing may be an effective way to control shrubs, invasive plant species, and annual grasses. In habitat for sensitive plant species, including the spineflower, mowing should be done outside of the growing season for the sensitive plants; for instance, in summer or fall. However, this limits the ability of mowing to control non-native annual grasses, since the annual grasses will have already set seed by the time mowing takes place. Mowing to control annual grasses is more effective in areas where sensitive plants are not a concern so that the mowing can take place in mid to late spring before seed set of the target annual grasses. Removal of exotic pest plants from occupied OTB habitat should occur during the non-breeding season of the beetle (generally May through January). In general, mowing must not involve electric or gas-powered mowers since their spinning blades could disturb or remove beetle larvae from burrows. Mowing may be conducted after the first fall rains when larvae are sealed in their burrows under the direction of the Preserve entomologist. Weed-pulling should not be used in portions of the OTB habitat that may contain occupied OTB burrows. Under the direction of the Preserve entomologist, weed-pulling may be used in densely vegetated portions of OTB habitat where OTB burrows are not present.

2.2.6.3 Chemical Controls

When manual control methods are ineffective, limited and careful use of herbicide may be an effective way to control unwanted plants in sensitive habitats such as wetlands, riparian areas, and native grasslands. However, herbicide should not be used in habitat for special status species. It may be appropriate to use herbicide following mowing or hand pulling of shrubs or other large invasive species, since it can control re-sprouting. In this case, a herbicide applied directly to the cut stem will used.

Controlled herbicides may only be applied by licensed herbicide applicators. Although control of many annual species is most effective prior to seed set, applications should not be made when soils are saturated or when rain is forecast. Timing of applications should consider the particular life history of the target species. Applications should use the minimum effective application rate.

No insecticides shall be used within the Preserve due to potential impacts to OTB, Opler's longhorn moth, and insects that may be pollinators of spineflower.

2.2.7 Prescribed Fire as a Vegetation Control

Fire was once a natural occurrence on the California landscape, and fire suppression may contribute to the influx of weedy exotic species in grasslands. Prescribed burning could be an effective management tool on the Preserve since fire could reduce the build-up of thatch and woody vegetation, limit the seed set of exotic invasive species, and maintain the sparse vegetation and open cover preferred by some sensitive species.

Research in California has shown that warm-season prescribed burning (late spring and fall) has been found to be effective for reducing abundance of annual grasses (Tu et. al, 2001). Repeated burns are sometimes necessary to effectively control weedy plants. Herbicides can be used to control the resprouts that come up after a burn. As an alternative to a large-scale burn, spot-burning using a propane torch could be effective in some situations and may be easier than hand-pulling.

Despite its advantages, prescribed fire also has numerous limitations. Public perception of fire safety can be a difficult obstacle in implementing a burn program. Getting permission from local air quality and fire authorities to conduct a controlled burn on the Preserve may be challenging, since there would be concerns about smoke and the chance that the fire could get out of control and spread. Conducting a controlled burn would require numerous skilled technicians who had been well-trained in fire management. Because the effect of fire on OTB and spineflower are unknown, fire could not be used in sensitive species habitat without first conducting burning experiments on small test plots and evaluating the results, which would be a multi-year process.

2.3 MONITORING PROGRAM

2.3.1 Monitoring Activities

Monitoring is a tool to assess the success of the management actions to meet the objectives of the plan. The monitoring methods have been developed to collect data that can be analyzed to determine whether any thresholds are exceeded. If they are, management changes may be warranted. In addition, as more information is gained about the site and the species, changes in the management activities that are not contemplated at present may be implemented—a process called adaptive management. Monitoring activities will include quantitative sampling of vegetation transects and listed species populations and qualitative reconnaissance surveys

2.3.1.1 Vegetation Transects

Quantitative sampling of vegetation transects will allow tracking of changes in plant cover and species composition. This information will be used to determine the effectiveness of the grazing and other management tools in maintaining habitat for sensitive species. The sample areas will include each of the sensitive habitats within the Preserve including: Ohlone tiger beetle habitat, Scotts Valley spineflower habitat, grasslands with the larval food plant (*Platystemon californicus*) for the Opler's longhorn moth, native perennial grassland, wetlands, riparian forest, and grasslands where Gray's clover and Mt. Diablo cottonweed are common.

A standard ten-meter long transect will be randomly located within each of the habitat types described above and permanently marked if feasible. Once established during the first year of monitoring, they will continue to be monitored to provide long-term cumulative data. Within the Ohlone tiger beetle and Scotts Valley spineflower habitats, arrays of three or more transects will be used to measure the habitat characteristics. Fewer transects will be used in other habitats. Ten 1/10th meter (20 X 50 centimeter) quadrats will be measured along each transect. The quadrats are placed 50 cm apart perpendicular to and on alternating sides of the meter tape. Species composition, percent cover, the height of annual grasses, and signs of physical disturbance (erosion and trampling), will be measured within each quadrat. Special attention will be focused on the presence, estimated number and/or percent cover of native perennial bunchgrasses, sensitive plant species, and invasive species. Cover values will be measured using 7 cover classes given as numerical values (Daubenmire 1959).

Grazing utilization will be measured by determining Residual Dry Matter at the end of the grazing season (RDM). Five to ten quadrats within ocularly identical areas (paired plots) near the transects described above will be established and clipped to the ground level. The clippings will be weighed in the field at the time of collection and later weighed after air drying. At least 4 to 6 sample areas will be identified and measured in each pasture, some areas will be measured with two to four transects and other, more uniform areas, will be measured with one to two transects. Vegetation transect monitoring shall be conducted by the range manager and the preserve manager.

2.3.1.2 Reconnaissance-level Surveying

Reconnaissance-level surveys will provide qualitative information for making adjustments to the vegetation control activities such as invasive plant controls. Surveys should be conducted four times a year. Reconnaissance-level observations shall be made during vegetation transect monitoring to reduce the number of site visits required.

2.3.1.2.1 Photo Documentation

Permanent photo stations will be established in sensitive areas to document grazing utilization and erosion. Photos will be used to monitor long-term changes in the site and its plant communities. Photos 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.

2.3.1.2.2 Exotic Pest Plants

Reconnaissance-level surveys will be used to identify new stands of exotic pest plants and to monitor effectiveness of control activities.

2.3.1.3 Sensitive Species Monitoring

2.3.1.3.1 Ohlone Tiger Beetle

Existing baseline data on the OTB consists primarily of presence-absence information to identify occupied portions. Prior surveys for the OTB have not included accurate population estimates of any life stage of the beetle, so one of the first steps necessary for the monitoring is to establish a baseline population number for the OTB. Because population numbers of insects can fluctuate substantially from year to year, several years of accurate population estimates are necessary to determine what is the normal range of population fluctuation versus a decline that may be due to deteriorating habitat conditions or an increase due to improving habitat conditions. Baseline numbers will be obtained for both adults and larval burrows, because at this time it is not known which life stage may provide a more reliable indication of how the OTB population is faring.

In order to produce population data that will support management thresholds, monitoring of the OTB will need to occur during the adult and larval life stages of the beetle. Adults of the OTB are active between mid-January and mid-May. Adult activity occurs during the warmest part of the day. During the adult activity season, adult numbers will be monitored by transect counts in areas known to support the OTB. One or more transects will be established for monitoring OTB adult numbers. Counts will be performed on days when weather conditions are appropriate for adult OTB activity. A data form, developed for similar monitoring studies at other OTB populations, is included as Appendix C. Behavioral and weather information will also be noted. A global positioning system (GPS) will be used to record the positional coordinates of every adult OTB that is observed. Transect counts will be conducted at regular intervals depending upon weather conditions from the beginning through the end of the annual adult activity period. The data will provide information on the seasonal occurrence of the beetle, occupation of management units at the site, its population curve, and the total numbers per season. Using this information, the seasonal population curve can be described mathematically and estimates of the OTB's annual adult population numbers and survival rates can also be obtained. If males and females can be accurately distinguished during the counts, then these factors can be estimated for each sex, otherwise both sexes will be combined to estimate these parameters.

Other portions of the Preserve that are being managed to benefit the OTB will be surveyed two or three times per year to search for adults and larval burrows. Adults may intentionally or accidentally wander into

other portions of the Preserve, but not breed there. If larval burrows of the OTB are found, then the transect counts for adult beetles will be performed in newly inhabited locations.

In addition, monitoring of egg and larval burrows should be performed in conjunction with monitoring of the habitat features (ex. extent of bare ground, weed cover [especially *Erodium*] vs. cover of bunch grasses, etc.) to detect and correlate OTB responses to habitat management actions. Data on pertinent habitat features will be collected as part of the vegetation monitoring. Egg and larval burrows will be marked as they are initially detected in the field using a numbered aluminum tag that is nailed to the ground. During subsequent beetle monitoring visits, the numbered burrows will be checked to determine occupancy by the OTB and diameters at the surface of the soil. Any obvious signs of mortality or damage to burrows will also be recorded. Monitoring of eggs and first instar larvae will continue at weekly intervals during the adult activity period. Monitoring of second and third instar larvae will continue throughout the summer and fall to assess survivorship and to identify any potential impacts of management activities. As new larval burrows are detected they will be tagged like the egg burrows. Site visits will occur at monthly intervals until larval activity ceases with the first ground-soaking rains. All burrows will be mapped with a global positioning system. Accumulation of such observations throughout the year will provide information on survival rates, as well as the timing and duration of immature stages.

2.3.1.3.2 Scotts Valley Spineflower

Existing baseline data on the Scotts Valley spineflower consists of 1992 population data and presence-absence information at periodic intervals between 1992 and 2002. Since 1992 surveys for the spineflower did not include accurate population estimates of any life stage (i.e., seedling, flowering plant, mature seed set), one of the first steps necessary for the monitoring is to establish a current baseline population number for the species that can be used to measure the effectiveness of habitat protection and management activities. Because population numbers of spineflower (an annual species) can fluctuate substantially from year to year, several years of accurate population estimates are necessary to determine what is the normal range of fluctuation versus a decline that may be due to deteriorating habitat conditions or an increase due to improving habitat conditions.

In late spring of each monitoring year, the population size of Scotts Valley spineflower will be determined. Each previously known occupied site, as well as previously documented suitable habitat sites, will be surveyed for spineflower plants. At each site, spineflower density data will be collected using a visual count of individuals and/or spatial estimates to determine total population size. A data form will be developed upon which to record plant density information. A global positioning system (GPS) will be used to record the positional coordinates of each occupied colony. Each site will be visited twice during the flowering period to achieve an accurate population count. The yearly distribution of the Scotts Valley spineflower will be portrayed on a project base map.

Data on pertinent habitat features will be collected as part of the vegetation monitoring. Associate plant species at each occupied and suitable habitat site will be recorded. Any obvious signs of plant damage will also be recorded, including any potential impacts of site management activities.

2.3.1.3.3 Opler's Longhorn Moth

Like the OTB, existing baseline data for the Preserve consists of only presence-absence information to identify occupied areas. No information on past or current population numbers of the moth or its food plant exists. Since the life history of this species is unknown at this time, initial monitoring activities will focus on maintaining existing patches of the moth's food plant, cream cups (*Platystemon californicus*). Spring surveys will be conducted to document occurrence of cream cups. This information will be provided to the project's entomologist, who will visit each of the locations that support the food plant three times during the moth's flight season to confirm its presence or absence at each patch of food plant. At locations where the moth is observed, all adult moths will be counted. Because the patches of *Platystemon* are quite small in size, generally no more than a few hundred square feet, a point count technique will be used to tally the numbers of moths observed. As new information about the moth's biology becomes available, appropriate changes to this preliminary monitoring protocol will be made.

2.3.1.3.4 Mt. Diablo cottonweed and Gray's clover

Spring surveys will be conducted to document distribution of Mt. Diablo cottonweed and Gray's clover. Data including estimated populations number, location and extent, number flowering, and management suggestions will be collected and included in the annual report. Following the initial distribution survey, one vegetation transect will be located in a representative occupied habitat for each of these species.

2.3.1.3.5 Scotts Valley polygonum

Potential suitable habitat for the Scotts Valley polygonum (e.g. occupied and suitable habitat for the Scotts Valley spineflower) will be monitored for its occurrence. If the Scotts Valley Spineflower is found within the Preserve, data including populations number, location and extent, number flowering, and management suggestions will be collected and included in the annual report. A vegetation transect will be established to monitor vegetative composition of the grassland habitat. Annual monitoring data will be used to develop a baseline and thresholds for this species. Management activities and thresholds planned to benefit the Scotts Valley spineflower (see Sections 1.5.2.6, 1.5.2.7, 2.3.1.3.2 and Table 6). would also be appropriate for the Scotts Valley polygonum.

2.3.1.3.6 Linanthus parviflorus/androsaceus complex, White-tipped clover (Trifolium aff. polyodon), microseris (Stebbinoseris heterocarpa), and Choris's popcorn flower

Linanthus (*Linanthus parviflorus*/*androsaceus* complex), White-tipped clover (*Trifolium* aff. *polyodon*), and microseris (*Stebbinoseris heterocarpa*), all species of CNPS local concern, and Choris's popcorn flower (*Plagiobothrys chorisianus*), included on CNPS List 1B, were observed by the local chapter of CNPS in the Preserve areas back in 1989-1991, but have not been observed in more recent surveys. These species will be searched for during spring special status plant surveys as part of the annual Monitoring Program (see Section 2.3.2.1.4). Efforts will be made to look for this species during surveys for Mt. Diablo cottonweed and Gray's clover habitat conducted in April or May.

If any of these species are found within the Preserve, data including populations number, location and extent, number flowering, and management suggestions will be collected and included in the annual report. A vegetation transect will be established to monitor vegetative composition of the grassland habitat. Annual monitoring data will be used to develop a baseline and thresholds for the species. Management activities and thresholds will be developed based on specific habitat preferences and life history of the species.

2.3.2 Monitoring Summary

Table 6 lists monitoring activities, analysis methods, thresholds for action, and adaptive management actions for each of the sensitive species and habitat. More detailed descriptions of monitoring methods can be found in Section 2.3.1. More details regarding thresholds and possible adaptive management actions can be found in the sections specific to each species or habitat (Sections 1.5 and 1.6). A schedule for monitoring activities is presented in Table 7.

2.3.3 Annual Monitoring Report

The preserve manager will prepare an annual monitoring report. The annual monitoring report will be completed in November of each year to allow distribution to resource agencies and the public for review and comment prior to the next growing season. The monitoring report will contain description of sampling methods, maps, data tables, and summaries of the analyses that will be done to determine if the thresholds are being exceeded or met. The monitoring report will make recommendations on any modifications to the management activities; recommendations for capital improvements, if needed; and procedures for making adaptive management changes based on new information. Observations of special status species will be submitted to the California Department of Fish and Game, California Natural Diversity Data Base.

The City of Scotts Valley, the Glenwood Homeowners Association, the Department of Fish and Game, and the US Fish and Wildlife Service will be on the formal distribution list. Other parties may request copies at cost.

Table 6. Monitoring Summary Table for the Glenwood Preserve.

MONITORING ACTIVITIES	ANALYSIS METHODS	THRESHOLD FOR ACTION	POSSIBLE ADAPTIVE MANAGEMENT ACTIONS
Objective: Maintain existing populations and habitat for following species:			
- Ohlone Tiger Beetle			
• **Annual population estimates** using transect counts and surveys in conjunction with monitoring of the habitat features • **Vegetation transects** including cover, species composition, and height • **Reconnaissance level surveys** including photo documentation to document grazing utilization, erosion, and exotic pest plants	Relate population trends over time (based on annual and running averages) to habitat quality and changes in occupied habitat	– if population declines; or – if annual grasses increase, invasive species increase, or bare areas decrease within occupied habitat	- Alteration of grazing management plan - Consider alternative management such as fire or mowing - Control of invasive plants if warranted - Increase open habitat area
- Scott's Valley Spineflower			
• **Quanitify population and map distribution** by annually estimating plants • **Vegetation transects** including cover, species composition, and height • **Reconnaissance level surveys** including photo documentation to document grazing utilization, erosion, and exotic pest plants	Population trends over time based on annual and running averages; percent of suitable habitat occupied by spineflower	– if loss of occupied habitat occurs; or – if invasive species or annual grasses increase within occupied habitat; or - if subpopulations decline	- Alteration of grazing management plan - Conduct seed bank study or other research to determine any change in reproductive rates - Control of invasive plants if warranted -Conduct additional mowing or alter grazing regime to: -maintain competing vegetation to less than four inches in the growing and blooming season -maintain fall litter to less than one-inch.

- Scotts Valley Polygonum			
Search for species during survey conducted during July to August blooming period. **If found:** ◆ **Quanitify population and map distribution** by annually estimating plants ◆ **Vegetation transects** including cover, species composition, and height ◆ **Reconnaissance level surveys** including photo documentation to document grazing utilization, erosion, and exotic pest plants	**If found:** Population trends over time based on annual and running averages; percent of suitable habitat occupied by spineflower	**If found:** – if loss of occupied habitat occurs; or – if invasive species or annual grasses increase within occupied habitat; or - if subpopulations decline	**If found:** - Alteration of grazing management plan - Control of invasive plants if warranted
- Opler's Longhorn Moth			
◆ **Food plant distribution and moth population estimates** by annually visiting locations that support the food plant ◆ **Vegetation transects** including cover, species composition, and height ◆ **Reconnaissance level surveys** including photo documentation to document grazing utilization, erosion, and exotic pest plants	Relate population trends over time to distribution of food plant and changes in occupied habitat	– if distribution of food plant decreases; or – if population declines; or - if coverage by annual grasses or bare area increases within suitable habitat	- Alteration of grazing management plan - Control of invasive plants if warranted
- Mount Diablo cottonweed			
◆ **Annual distribution survey** to map extent of population ◆ **Vegetation transects** including cover, species composition, and height ◆ **Reconnaissance level surveys** including photo documentation to document grazing utilization, erosion, and exotic pest plants	Relate distribution to native composition in representative transect.	- if coverage of Mount Diablo cottonweed decreases	- Alteration of grazing management plan - Control of invasive plants if warranted

- Gray's clover			
• **Annual distribution survey** to map extent of population • **Vegetation transects** including cover, species composition, and height • **Reconnaissance level surveys** including photo documentation to document grazing utilization, erosion, and exotic pest plants	Relate distribution to native composition in representative transect.	- if coverage of Gray's clover decreases	- Alteration of grazing management plan - Control of invasive plants if warranted
- Linanthus (*Linanthus parviflorus*/*androsaceus* complex), White-tipped clover (*Trifolium* aff. *polyodon*), and microseris (*Stebbinoseris heterocarpa*), and Choris's popcorn flower (*Plagiobothrys chorisianus*)			
Search for species during survey conducted during July to August blooming period. **If found conduct:** • **Annual distribution survey** to map extent of population • **Vegetation transects** including cover, species composition, and height • **Reconnaissance level surveys** including photo documentation to document grazing utilization, erosion, and exotic pest plants	**If found:** Relate distribution to native composition in representative transect.	**If found:** - if coverage of Gray's clover decreases	**If found:** - Alteration of grazing management plan - Control of invasive plants if warranted
<u>Objective: Maintain existing sensitive habitats</u> **- Wetlands**			
• **Vegetation transects** including cover, species composition, and height • **Reconnaissance level surveys** including photo documentation to document grazing utilization, erosion, and exotic pest plants	Change in cover and species diversity over time	- if coverage of native perennial wetland species, species diversity, or wetland habitat area decreases	- Repair or maintain fencing - Reduce grazing pressure - Control of invasive plants if warranted
- Riparian			

• **Vegetation transects** including cover, species composition, and height • **Reconnaissance level surveys** including photo documentation to document grazing utilization, erosion, and exotic pest plants	Change in cover and species diversity over time	- if riparian cover or species diversity decreases	- Repair or maintain fencing - Alter grazing pressure - Control of invasive plants if warranted
- Native grassland			
• **Vegetation transects** including cover, species composition, and height • **Reconnaissance level surveys** including photo documentation to document grazing utilization, erosion, and exotic pest plants	Change in areal extent and species diversity over time	- if native species cover or species richness decreases	Consider alternative management, including adding grazing or more intensive weed control to western area
Objective: **Develop or update baseline data**			
• Conduct annual surveys during first three years	Examine trends over time using running averages and relate to environmental factors	Variation in baseline data insufficient to establish long-term trends	Encourage additional research on site or in other locations to improve scientific knowledge of species

2.4 MANAGEMENT AND MONITORING SCHEDULE

A schedule for management and monitoring activities is presented in Table 7. At present, this is considered to be an annual program. As more nformation is learned about the Preserve, its species, and experience is gained with the grazing program, future monitring efforts could be reduced with input and approval from the City, the Land Manaer, and the federal and state resource agencies.

Table 7. Schedule of management and monitoring acivities for Glenwood Preserve

Task	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
OTB and Opler's longhorn moth Population Surveys	As necessary to collect baseline data and meet thresholds											
SVSF Population survey						X						
Scotts Valley polygonum survey							X					
Distribution surveys for other known and potentially occurring special status plants including Mt. Diablo cottonweed, Gray's clover, cream cup, linanthus, White-tipped clover, microseris and Choris's popcorn flower				X	X							
Grazing, Erosion and Exotic Plants Reconnaissance Surveys and Photo Documentation	X			X			X			X		
Vegetation Transect Monitoring					X							
Grazing Utilization (Residual Dry Matter)										X		
Annual Monitoring Report Submission											Nov 30	
Grazing rotation (by Horse Owners Association representatives)	X	X	X	X	X	X	X	X	X	X	X	X
Mowing of SVSF habitat								X				
Exotic pest plant control	Exact timing will depend on pest plant species.											

3.0 VEGETATION PLANTING AND MAINTENANCE PLAN FOR BORROW AREA

The proposed borrow area will involve the excavation of 1.7 acres of grassland. Subsoil from the borrow area will be used as fill in the development area of the Glenwood Project. The borrow area is located in the eastern portion of the Preserve, north of the stock pond and south of the Water District road (Figure 1). Vegetation in the borrow area has been mapped as non-native annual grassland. Although the area is dominated by non-native annual grasses, native herbaceous wildflower species are also present. Soils in the borrow area are mapped as Bonnydoon loam which typically has weathered sandstone at 7 to 20 inches. Three patches of Gray's clover (*Trifolium barbigerum* var. *andrewsii*), a CNPS species of local concern, were mapped in the borrow area in 1997 (City of Scotts Valley, 1998) (Figure 1).

The objective of this Plan is to restore grassland habitat within the borrow area with a similar or better composition of native / non-native species. The Plan includes requirements for collection of native plant seeds and stockpiling of surface soils, which must take place prior to removal of fill. A floristic survey and soil characterization will be conducted and seeds of target native species will be collected before construction occurs.

3.1 RESTORATION PLAN

3.1.1 Floristic Survey and Seed Collection

A floristic survey of the borrow area will be conducted by the preserve manager. Plot based quantitative sampling of species cover will be conducted in late April to May, along transects to characterize the vegetative composition of the borrow area. The data will be used as performance criteria to assess the success of the restoration. Locations of native grass and wildflower species and invasive exotic species shall be mapped or flagged as appropriate to allow later identification. Seeds of native grass and wildflower species will be collected following flowering and maturation of seed and prior to dispersal. Collection should take place in May. Collection should focus on the annual Gray's clover if still present within the Borrow Area. Seed collection outside the Borrow Area may be necessary to provide an adequate quantity of seed.

3.1.2 Soil Characterization and Stockpiling

Surface soils within the borrow area will be stockpiled in order to salvage the organic and fine textured mineral soil material, as well as the seed bank and beneficial soil bacteria and symbiotic fungi contained in the surface soils.

Prior to removal of fill material, an investigation of soils shall be conducted under supervision of the preserve manager to characterize soil depths within the borrow area. Locations of surface soils to be stockpiled will be flagged and mapped. Some areas with very thin soils may be determined to be unsuitable for salvage. In addition, topsoil from areas with invasive exotic species or few native species may be unsuitable for salvage. Surface soil layers identified will be excavated and stockpiled by the grading contractor.

3.1.3 Final Grading and Stockpiled Soil Placement

Prior to placement of stockpiled soil, the grading contractor shall meet with the preserve manager to identify locations and depth of stockpiled soil placement. In general, deepest soils are generally on the ridges and foot of slopes. Shallow soils are on shoulders. Proportional or greater areas shall be created which approximate the exposed bedrock and talus which existed prior to disturbance, where feasible.

3.1.4 Seeding

Seeding shall take place in the fall prior to the first rains. Seeds collected prior to disturbance may be supplemented with commercially available seed as necessary to provide a seeding rate of approximately 30 pounds per acre. Commercial seed shall be from a locally derived source. Tackified straw mulch or other appropriate erosion control measures shall be implemented on slopes greater than 5 percent.

3.2 MONITORING PLAN

Annual monitoring shall be conducted in the late growing season for ten years following planting. Permanent transects shall be established to allow repeatable plot based quantitative sampling of species cover. Results of monitoring shall be included in the annual monitoring report.

3.2.1 Performance Criteria

The restored area shall meet or exceed the following performance criteria at the end of ten years:

- Total relative cover on transects of native species shall meet or exceed 75% of the pre-disturbance total;

- Species richness (total number of species) of native species based on floristic survey shall meet or exceed 100% of the pre-disturbance species richness
- Total relative cover on transects of invasive exotic species on the CALEPPC Lists A-1, A-2, and B shall be less than 25% of the pre-disturbance total.

3.2.2 Contingency Measures

Additional seeding shall be conducted in order to meet performance criteria. The use of nursery grown plugs of native plants may be necessary to meet performance criteria. Annual monitoring shall be extended until criteria are met.

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APPENDIX A: 1996 AND 2000 OHLONE TIGER BEETLE AND OPLER'S LONGHORN MOTH SURVEY REPORTS FOR THE GLENWOOD PROJECT SITE IN SCOTTS VALLEY, CA.

APPENDIX B: CALIFORNIA EXOTIC PEST PLANTS COUNCIL (CALEPPC) LISTS OF EXOTIC PEST PLANTS

APPENDIX C: OTB TRANSECT MONITORING DATA FORM AND OTB BURROW MONITORING DATA FORM