

# Habitat and Management of the Endangered Ohlone Tiger Beetle (*Cicindela ohlone*)

Lawrence D. Ford, Richard A. Arnold, James W. Bartolome, and Devii R. Rao (April 30, 2013)

## INTRODUCTION

The Ohlone Tiger beetle (OTB) (*Cicindela ohlone*), was recognized as an endangered species by the U.S. Fish & Wildlife Service in 2001. It is endemic to coastal prairie habitat that occurs on former marine terraces characterized by mima mound topography in northern Santa Cruz County, CA. Since its scientific description in 1993, about 1/2 of the 17 known OTB sites (Figure 1) have been extirpated due to urbanization, agriculture, or changes in habitat conditions. The extant OTB sites are threatened not only by changes in land use practices (especially removal of extensive cattle grazing), but also changing habitat conditions due to colonization by invasive weeds plus non-native annual and perennial grasses, absence of disturbance factors such as wildfires, and successional changes. Recent changes to their prairie habitat include increased plant density, accumulation of thatch, and reduced amount of bare or sparsely-vegetated ground, which are notably reduced by livestock grazing and traffic by recreationists and maintenance vehicles.

The purpose of this study is to better understand the OTB's breeding habitat requirements so the remaining sites can be managed to improve habitat conditions that favor the beetle, occupied sites can be maintained, and extirpated sites can be restored. We present results from 2010-2012.

## RESULTS AND CONCLUSIONS

### 1. Current And Historical Management

Two main kinds of current management activities appear to be most associated with maintenance of habitat conditions beneficial for OTB persistence—extensive cattle or horse grazing and moderate-frequency hiking and bicycling traffic (Table 1).

All 17 OTB sites were historically grazed by cattle. At all of the recently extirpated OTB sites, grazing was either removed or the grazing regime was changed, and there was no moderate-frequency hiking, bicycling, or horse riding. OTBs are no longer found at a recently extirpated site where grazing switched from extensive horse grazing to a horse stable facility with smaller pastures.

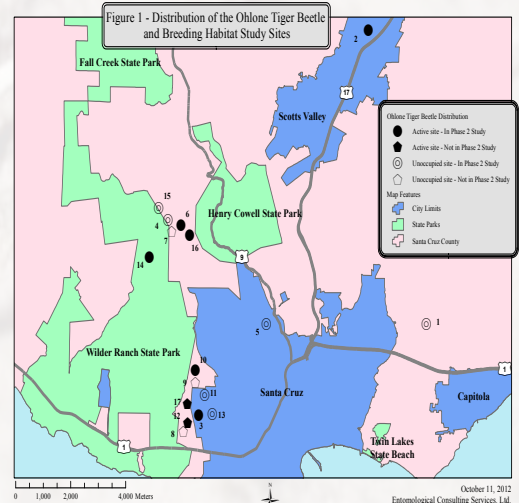
OTB eggs and larvae often co-occur in more restricted portions of their prairie habitat than do adults. The larval microhabitat is determined by the adult female in her selection of an oviposition site, which is where not only the egg, but also three larval instars and the pupae of the OTB, will complete their development before adults emerge in spring. Although bare or sparsely-vegetated Watsonville loam soils are utilized by the OTB, it does not utilize all bare patches at every occupied site. The 17 current or historical OTB sites include approximately 200 ha of grassland habitat, yet within these grasslands, oviposition and larval development has consistently been observed over the last 20 years in only about 5-7.5% of those grasslands. Our Phase 1 study of the OTB examined vegetation and physical features of currently occupied and unoccupied grasslands at the macro-habitat (grassland site) scale, and compared the historical land uses associated with historical and current persistence at all 17 sites. Our Phase 2 study examined the features at the micro-habitat (breeding habitat) scale, specifically places within the grasslands where OTB adult ovipositing and larval burrows have been observed, in contrast to places where ovipositing and burrows were not found.

Prehistorically, factors such as periodic wildfires, grazing by large and small mammals, burrowing animals, and herbivorous insects created and maintained patches of bare ground suitable for OTB occupation. Today coastal terrace prairie habitats have been colonized to varying degrees by invasive weeds and annual grasses, wild fires are generally controlled more quickly, and many of the native grazers and burrowing animals have been displaced. Thus sufficient bare and sparsely-vegetated ground does not persist at sites after management activities that contributed to their creation and maintenance cease.

### Ohlone Tiger Beetle



### OTB Burrows in Grassland Habitat



OTB Status / OTB Site Numbers	Current Year										Typical Year										Historically										
	Grazing	Other Uses/Management	Hiking - Extensive	Hiking - Moderate Frequency Use	Hiking - Low Frequency Use	Vehicle Driving - High Frequency Use	Vehicle Driving - Moderate Frequency Use	Vehicle Driving - Low Frequency Use	Scraping/Digging/Flipping/Disks/Spilling/Rooting	Gravel Present on Dirt Road	Grazing	Other Uses/Management	Hiking - Extensive	Hiking - Moderate Frequency Use	Hiking - Low Frequency Use	Vehicle Driving - High Frequency Use	Vehicle Driving - Moderate Frequency Use	Vehicle Driving - Low Frequency Use	Scraping/Digging/Flipping/Disks/Spilling/Rooting	Gravel Present on Dirt Road	Grazing	Other Uses/Management	Hiking - Extensive	Hiking - Moderate Frequency Use	Hiking - Low Frequency Use	Vehicle Driving - High Frequency Use	Vehicle Driving - Moderate Frequency Use	Vehicle Driving - Low Frequency Use	Scraping/Digging/Flipping/Disks/Spilling/Rooting	Gravel Present on Dirt Road	
<b>CURRENTLY OCCUPIED</b> #1, 2, 3, 8, 10, 12, 14, 16, 17	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<b>RECENTLY EXTIRPATED</b> #1, 5, 6	0	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
<b>HISTORICALLY EXTIRPATED</b> #4, 7, 9, 11, 13, 15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

**Table 1. Summary of Site Management History and OTB Status —management activities and time periods with numbers of properties in each category of occupancy**

## 2. Suitable Breeding Habitat Characterization

Results distinguished OTB breeding habitat areas from non-breeding habitat areas within the beetle's grassland habitat. The three groups of sample transects created by Detrended Correspondence Analysis (DCA) were based on a variety of habitat features which distinguished the OTB sample sites. Current occupancy by OTB was most closely related to the amount of bare soil and associated differences in vegetation. No sample site averaging less than 5% bare soil was occupied by the OTB. The occupancy of Grassland and Trail/Road transects differed considerably in area non-vegetated. Occupied Trail/Road transects averaged nearly 50% non-vegetated, whereas occupied Grassland transects averaged only about 12% non-vegetated, which is in the range of the unoccupied and formerly occupied Trail/Road transects (Figure 2). Unoccupied Trail/Road transects had about the same percentage non-vegetated as occupied Grassland samples.

Non-native perennial grasses are the main driver of a DCA grouping of unoccupied or formerly occupied transects, all with non-native perennial grasses above 35% cover (Figure 3). The role of invasive non-native perennial grasses in loss of favorable sites for occupancy needs further investigation and control of these species may be warranted.

### ADAPTIVE MANAGEMENT GUIDELINES

Combinations of management treatments should be practiced to maintain and enhance OTB habitat quality:

- A combination of grazing plus moderate-frequency hiking and bicycling traffic would provide duplication of the two most effective means to maintain OTB habitat quality; such a combination would also reduce extirpation vulnerability due to reductions of one or the other management action.
- Current management activities at the eight sites still occupied by OTB (Table 1) should be continued; if these management activities were to be discontinued, habitat conditions would likely deteriorate, thus increasing the likelihood of extirpating the OTB.
- Combining grazing and moderate-frequency recreational bicycling and hiking traffic would be likely to increase the effectiveness and sustainability of the beetle habitat.

Because the amount of sunlit, bare soil is so important to OTB habitat quality, management should be focused upon maintaining it, and whenever feasible, expanding it. This can include existing trails averaging >50% bare soil or grassland areas averaging >12% bare soil. Although we can expect the amount of bare soil in grassland sites to be more dependent on fluctuations in cover due to weather (which varies between years) rather than management, the effects of livestock grazing, livestock trailing, weed-whacking, scraping, and other management treatments are likely to be most important during years with weather more favorable to herbaceous vegetation growth. Also, control of non-native perennial grasses should be a high priority management objective for sites with potential OTB habitat.

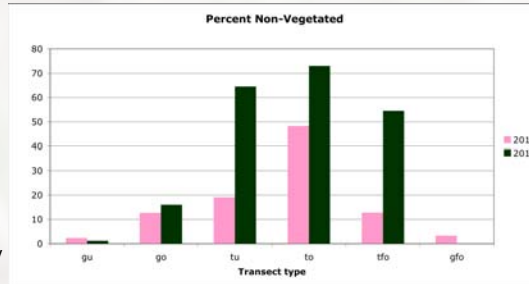


Figure 2. Average percent non-vegetated surface and OTB occupancy status

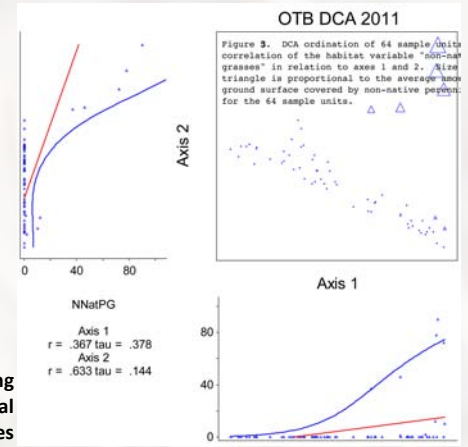


Figure 3. DCA Ordination of 64 samples units showing correlation of the habitat variable "non-native perennial grasses"



Unoccupied Grassland Quadrat



Unoccupied Trail Quadrat



Occupied Grassland Quadrat



Occupied Trail Quadrat



Extirpated Grassland Site—no recreation, no grazing, dense high-thatch grassland, little bare ground



Extirpated Trail Site—hiking trails (low use), no bikes, no grazing, dense high-thatch grassland



Occupied Grassland Site—continuous extensive cattle grazing, hiking trails (low use), no bikes, gophers, and ranch roads



Occupied Trail Site—hiking/biking trails (moderate use), mowing, maintenance roads, and no grazing



Occupied Trail and Grassland Site—extensive horse grazing, trailing (with weed-whacking), little thatch