

Barb Goat Grass Control on Coyote Ridge, Santa Clara County, California

Stuart B. Weiss, Ph.D.

Creekside Center for Earth Observation
27 Bishop Lane, Menlo Park, CA 94025 USA
tel: 650-854-9732, fax: 650-644-3355
e-mail: stu@creeksidescience.com
<http://www.creeksidescience.com>

February, 2006

In May 2005, it became apparent during survey work that barb goat grass (*Aegilops triuncialis*, from now on referred to as BGG) has become established and is spreading across serpentine grasslands on Coyote Ridge. BGG is an annual grass that can invade serpentine soils (even in the absence of N-deposition), crowd out native forbs, and reduce range forage. It is the largest current biological threat to the integrity and biodiversity of the serpentine grasslands on Coyote Ridge (Santa Clara County, California), and implementation of control measures is imperative.

This document summarizes our present knowledge of BGG, and recommends actions including immediate containment/local control measures, mapping, and a long-term strategy for containment, control, and to the degree feasible, eradication.

Status, Biology, and impacts

The California Department of Agriculture lists BGG a B-rated noxious weed. It is regarded among the wildland weed community as particularly invasive, destructive, and difficult to control. Photo 1 shows a typical stand. It seeds later than most annual grasses, remaining green well into May in most years. Rangelands infested with BGG provide poor forage, especially after BGG flowers and develops sharp, long, barbed awns (Photo 2). It can be dispersed

by livestock, wild animals, people, and vehicles. Roads provide primary invasion routes (Photos 3, 4). BGG alters the soil microbial community to its own advantage and to the detriment of *Plantago* and *Lasthenia* (Batten and Scrow, abstract 2004). It can puncture bicycle tires. When the large seeds germinate, roots can extend down through dense thatch, and seeds elevated on bunchgrasses have been noted to root successfully (S. Barry, UC Cooperative Extension).

Members of the wildland weed community (California Invasive Plant Council, Cal IPC) and university extension specialists (Adina Merenlender, Hopland Research Station, and Sheila Barry, UC Cooperative Extension Specialist Santa Clara and Alameda Counties), among others, have emphasized the need for rapid action

Known distribution on Coyote Ridge (Map 1)

BGG was first noted near the southernmost fenceline on the UTC property by Don Mayall (California Native Plant Society) around 2002. In 2005, a linear infestation along the ridgetop road was observed extending into the newly acquired VTA property, up to 10 yards either side of the road (more typically around 3-6 yards, Photo 1). The distribution is nearly continuous along the road south from the fence for ~500 yards, then a gap, then a

relatively small infestation at the road junction, another gap across the swale (where the UTC property line actually is), and a ~200 yard long linear infestation centered on the next high spot on the road. No plants were observed along the road south of the VTA parcel. Overall, the BBG infestation extends ~1 mile south from the fenceline.

North of the UTC fenceline, the infestation is more widespread and plants are found in varying densities across a minimum of ~20 acres. The extent of the BGG north along the ridgeline or downslope beyond this area is not yet known.

Another infestation was noted along the PG&E road at the base of Coyote Ridge, just north of the Los Esteros (Calpine) and Pico (Silicon Valley Power) powerplant mitigation parcels. This area is in a swale area of serpentine colluvium.

Infestations over many (>10) acres were also observed north of the Field Sports Park, and north of Metcalf Road, both at the base of the ridge and at higher elevations. These latter infestations extend well away from roads into undisturbed grassland.

These infestations are coarsely mapped out in Figure 1. Karen Cotter (SC County Parks) knows of other infestations on and off of serpentine soils.

Mapping 2006

One major priority for spring 2006 is a comprehensive mapping effort that will identify the extent and spread of BBG. Outlying populations and opportunities for containment along invasion pathways – primarily roads – will be identified. The major infestations will be mapped at coarser scales. Exact mapping protocols will be developed as the shape of the distributions

become clear. These maps will be the basis for development of short-term and long-term control strategies.

Control efforts to date

In May 2005, hand pulling was done on the fringes of the VTA infestation (the southernmost known along Coyote Ridge). Approximately 15 person hours were spent pulling over 2 days. About 50 yards of scattered individuals were pulled on the south end, and another 50 yards were pulled on the N end. All visible plants were pulled from the road junction. Many plants had a small fraction of mature seeds. It became apparent that hand pulling would not work when BGG cover became nearly continuous.

Impacts on non-target organisms

There is a need for rapid response to the BGG invasion using effective control measures, but control options need to be weighed against their impact on the Bay checkerspot butterfly (BCB) and other protected species. The population of BCB across Coyote Ridge is currently greater than 300,000 larvae. The elimination of hostplants and nectar sources can be minimized. Impacts on protected plants, primarily *Streptanthus albidus albidus* and *S. albidus peramoenus* and *Dudleya* can be considered in that context as well.

Management and control of invasive plants such as BGG is most effectively done in the context of ecosystem management. There are thousands of acres of serpentine grassland on Coyote Ridge, and localized impacts from control efforts and other management can be minimized. The large dynamic checkerspot butterfly populations can rapidly respond to increased habitat quality as invasive species are controlled, and similar responses are likely by the protected plants. For example, *Streptanthus albidus* can increase dramatically after

disturbance along roadsides and within grasslands.

Control Options

A non-trivial fraction of BBG seeds do not germinate in the first year, so repeat control is necessary. A three-year program appears necessary for site-level eradication – the third year should (ideally) concentrate on eliminating the last scattered individuals after the majority has been controlled in the first two years. Long-term vigilance with early detection and response will be essential.

Manual

Hand pulling has not proven effective except for isolated plants. Karen Cotter (Santa Clara County Parks) reports poor success with pulling above-ground parts, and resorted to digging out the top several inches of soil. Digging has potential impacts on diapausing BCB larvae.

Mowing

Mowing must be well-timed to the stage when flowering has begun, but seeds have not ripened. Mowing too early encourages tillering and subsequent flowering, and mowing too late disperses ripened seeds. Mowing takes place after BCB larvae have entered diapause and are below ground.

Disking

Disking following germination may be effective, but the shallow, rocky serpentine soils may prove difficult to thoroughly disk. Disking poses a greater risk to diapausing BCB larvae.

Herbicides

“Envoy” (clethodim) is a grass-specific herbicide that has been used on wildlands and rangelands. It will not impact native forbs, including Bay checkerspot hostplants and nectar sources. It is effective against all

grasses, and the only restrictions on grazing post-spray are waiting until the application has dried. Envoy has been recommended by Scott Johnson, Vegetation Management Specialist, Wilbur-Ellis Company, as well as by staff of the Santa Clara County Agriculture Department (Eric Wylde and Keith Meyer

“Fusilade” (FLUAZIFOP-P-BUTYL), a grass-specific herbicide, is effective once all seed have germinated by January or later depending on rainfall (Joe DiTomasio, UC Davis). It will also kill other non-native annual grasses and likely native bunchgrasses as well. The major drawback is that the areas cannot be grazed for 1 year following treatment, which will lead to increased annual grass cover.

Glyphosate (more commonly referred to as Round Up) is a non-specific herbicide that is effective against BBG, but will also kill desirable native forbs. No grazing restrictions beyond the drying period are required.

“Landmark” herbicide has been tried on goatgrass. This is a combination of chorsulfuron (Telar) and sulfometuron (Oust). Joe DiTomasio found it to be very effective but also injures perennial grasses and most broadleaf species, and it will generally produce bare ground. Grazing restrictions are not clear.

“Plateau” (imazapic) is about to be registered in CA (2007) for annual grasses. It is effective on *Bromus* species; it does not hurt composites or perennials. But, it gets tied up in thatch and binds more tightly to thatch than other herbicides. Imazapic is both a pre- and post emergent herbicide. It does not hurt legumes. Pre-emergent liquid can be applied at a very low rate, and can be

combined with burning. Grazing restrictions are not yet known.

Herbicide spraying poses minimal direct risk to Bay checkerspot larvae, other than minimal vehicular and foot traffic.

Fire

Two consecutive spring burns will control (>95% reduction) BGG, and it appears to be the only effective treatment for large areas (A. Merenlender, UC Cooperative Extension). Burning is most effective when seeds are still up on the stems – it is recommended that burns occur as soon as the other grasses and forbs have cured enough to carry a fire. Complete coverage by burns is essential. Follow-up in year 3 with spot control (hand and/or chemical) is an essential step.

Monitoring data of grassland composition following a spring burn on Tulare Hill indicates that spring burns increase forb cover and decrease grass cover. The impacts of spring fire on diapausing Bay checkerspot larvae are unknown: if larvae are deep enough in the soil or under rocks, they are likely protected from a low-intensity grassland fire. Fire may impact *Streptanthus* since it is blooming at the same time as BGG. *Dudleya* may be well-protected by its rocky habitat.

There are opportunities to implement prescribed fires on UTC property (Patrick Congdon, SCCOSA). We would like to pursue this option vigorously.

Flaming – the brief application of a propane torch to living vegetation -- during the growing season can kill BGG. Flaming is typically done during wet periods when the habitat is not flammable. Flaming can be effective for spot treatments, but identification of vegetative BGG individuals

is difficult among the other grasses. Flaming will also kill all other annual vegetation and could have impacts on larval BCB.

Recommended course of action

- 1) Spray Envoy along the ridgetop road from the VTA infestation to the UTC fenceline in February/March 2006 when grasses have reached the appropriate height. If Envoy cannot be used, then treat with Roundup, despite impacts on other plants, with special care to minimize the spray area.
- 2) Follow-up with control by hand, mowing, and other means during the spring when live plants are detected in the spray area, April-May 2006.
- 3) Map with GPS across Coyote Ridge in May 2006.
- 4) Develop a long-term control strategy
- 5) Develop institutional capacity for reliably implementing controlled burns.

Funding Sources

There is endowment-based management money from MEC, LECEF, PICO, and VTA that can cover some immediate costs for 2006. Mitigation money from PG&E activities may also be pursued. Possible future grant sources include EQIP, USFWS, CVPCP, NFWF, and other government and private sources. Appropriate institutional

arrangements need to be met for each grant opportunity.

Existing Management Plans and Permits

Several USFWS-approved Resource Management Plans (RMPs) are currently in place. These RMPs describe monitoring, management, and reporting activities. The VTA plan was recently approved in early 2006, and highlighted the imperative need for control of BGG. Other approved management plans include Metcalf Energy Center, Los Esteros Critical Energy Facility, PICO powerplant, and Kirby Canyon Butterfly Trust. Each of these projects requires regular biological reports to USFWS and other regulatory agencies.

We note that prior weed control efforts, including yellow and purple star thistle projects funded by the Santa Clara County Weed Management Area, were quickly granted (David Wright, independent). In the long-term, these activities will likely be permitted under the HCP/NCCP.

Photo 1. BGG N of Metcalf Road (May 2005)



Photo 2. BGG germinating (Dec 2005) awn length ~1 inch



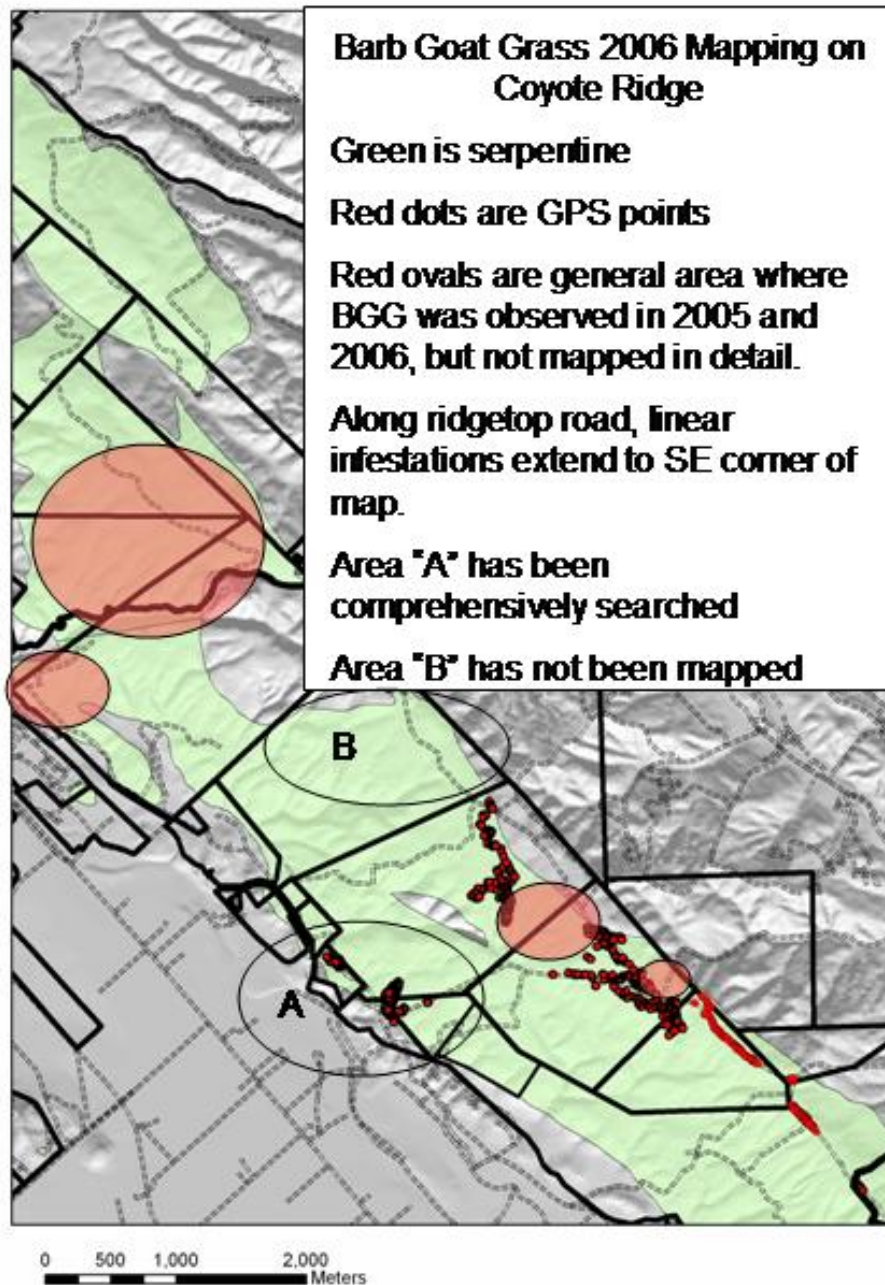
Photo 3. Whitish areas are 2005 BGG thatch, VTA, typical dense roadside infestation



Photo 4. BGG among *Layia* just N of Los Esteros mitigation parcel (Apr 2005)



Map 1.



This map only shows known infestations, the actual distribution is likely wider than mapped here.