



San Bruno Mountain Habitat Conservation Plan (HCP) Grazing Pilot Program

Project Overview

The goal of the SBMHCP Grazing Pilot Program is to re-introduce cattle grazing to San Bruno Mountain, and test the effectiveness of this as a tool to enhance and conserve critical habitat for the federally endangered mission blue and callippe silverspot butterfly species that rely on this mountain as some of the last remaining habitat available to them. Additional goals include fuel reduction for fire prevention and invasive plant management.

Since the inception of the SBMHCP in 1982, cattle grazing has been identified as an important management tool for habitat enhancement, and while cattle grazing occurred on the Mountain in the 1960s, it has not been used since due to the lack of required infrastructure and funding. However, other management options such as controlled burns, extensive mowing, and manual or chemical vegetation management have also been difficult or infeasible to use on a large scale due to the costs, steep terrain, urban interface, and other factors. Grazing has become a more critical tool for achieving the HCP's conservation mandates, which requires ongoing habitat management to support the presence of these protected butterflies.

The butterflies' host plant species are currently negatively impacted by competition from non-native and invasive grasses and forbs, and, to a lesser extent, native and non-native shrubs. Grazing is a viable option for large-scale vegetation management with the goal of improving butterfly habitat. Active populations of both butterflies and their host plants are found in the grassland habitat on the southeast slopes and northeast ridge of San Bruno Mountain, where livestock grazing could be reintroduced (see map attached). The Grazing Pilot Program aims to re-introduce cattle grazing to these two locations for a three-year trial period, where cattle grazing for habitat management can be thoroughly monitored and analyzed. Pending the results of this pilot period, more widespread and long-term implementation of grazing at San Bruno Mountain can be considered. The Grazing Pilot Program will also support the agricultural economy of the region by providing additional grazing lands in San Mateo County.

Progress-to-Date

- Assembled Grazing Technical Advisory Committee (TAC) for quarterly meetings

- Literature review and consultation with other Bay Area land management agencies
- Baseline Biological Assessment completed – Nomad Ecology
- Grassland Productivity Study completed – LD Ford Rangeland Conservation Science

Next Steps

- Develop grazing strategy and monitoring plan
- Install infrastructure (fencing, water, access improvements)
- Compose license agreement and solicit vendor

History of Grazing on San Bruno Mountain

Overview

The San Bruno Mountain ecosystem has evolved over time under the influence of grazing animals, fire, and humans for thousands of years. Grazing animals, including Pleistocene herbivores that are no longer present, are likely to have grazed on San Bruno Mountain and had a strong influence over the vegetation composition of native plant communities (Edwards 1992).

Over the last several thousand years, native grasslands were likely maintained by herds of native grazing animals such as Tule elk (*Cervus elaphus nannodes*), occasional wildfires, and intentional burning by Native American Indians. Native Americans are likely to have conducted burning on San Bruno Mountain for centuries and possibly longer, to encourage the growth of forbs harvested for food (Keeley 2002). With the coming of Europeans in the late 1700's and the arrival of domesticated livestock, the Mountain was cleared for ranching and farming and was grazed by cattle. For the next two centuries, domesticated grazing animals had replaced native grazing animals in maintaining grasslands, while fire was still being utilized to clear brush. By the late 20th Century, however, native grazing animals had been eliminated and the practices of cattle grazing and regular burning on the Mountain had been ceased or drastically reduced. These practices had maintained much of the lower elevation and eastern slopes of the Mountain as open grasslands.

Introduction of Grazing and European Annual Grasses

At the time of Spanish settlement (mid 18th century), cattle grazing, and thus European annual grasses, were introduced (Heady 1977). The European grasses were able to outcompete and almost completely replace perennial native bunch grasses of the coastal prairie. The European grasses had adapted to moderate to heavy grazing pressure over several thousand years in the Old World and were capable of setting adequate seed unless severely overgrazed or grazed too early in the season. Native bunch grasses, on the other hand, were not adapted to grazing and their seed set was markedly reduced. Such perennial plants also generally produce less seed, per unit of

biomass in a single season than annuals do. Under grazing pressure alone, without competition from European annuals, the poor seed set of perennial grasses would have allowed brush to spread. Grazing would also reduce the competition between shrubs and the native grass community after a fire, allowing shrub invasion (Wright, 1971). On San Bruno Mountain the brush probably spread initially after grazing started, but since grazers browse on young brush seedlings, grazing also held brush in check as the annual grasses took over. The net amount of fuel was reduced in the grazed grassland and whatever fires occurred were probably less severe.

The food plants of the Mission Blue most likely increased in density in the grazed annual grassland compared to their abundance in the ancestral grassland for several reasons. Mature lupines are unpalatable to cattle; most were left to flower and set seed while other wildflowers were consumed. Livestock trampling vegetation, particularly in overgrazed situations, resulted in downslope movement of topsoil and increased the area of bare mineral soil favorable to lupine. Many of the nectar plants of both Mission Blue and Callippe are also likely to grow in localized areas of soil disturbance. The continuation of grazing over 100 to 150 years probably favored an overall increase in Mission Blue density on the Mountain which paralleled the increased density of its food plants. As other grazed grasslands in the San Francisco Bay area were lost first to row crop agriculture and then to urbanization, the relative importance of San Bruno Mountain to the Mission Blue was further accentuated.

The physical environmental relationships of the violet are not well understood. It is fairly common in several plant communities, and widespread in California. Under grazing, the overall height of the grassland is shorter and the cover less complete which allows more violet patches to be discovered and utilized by Callippe. This impact was most likely reflected by an increase in the Callippe. Thistles (non-native), important nectar plants of Callippe, are also unpalatable to cattle because of their spines, and thrive in grazed grassland.

Since many of the San Francisco Bay Area endemic plants and those found only on San Bruno Mountain (*Arctostaphylos* spp.) are on rocky outcrops, scrub or chaparral, and not in areas of prime pasture, grazing probably had little impact on these species. Some of them, similar to lupines, may have expanded into grasslands in areas of thin or exposed soil.

Grassland Habitat and Endangered Species Goals

Goals, objectives and success criteria for the mission blue and callippe silverspot butterflies are identical and focus on the protection of a sufficient quantity and quality of grassland to support the endangered species. Protection of sufficient densities of host plants and nectar plants within the grasslands is vital toward the long term protection of the species. Monitoring of a) the butterflies' habitat quantity; b) habitat quality; and c) populations over time is therefore necessary for tracking the status of the objectives listed in Table 1.

A goal of maintaining 1,200 –1,800 acres of grassland on San Bruno Mountain is established in the HCP. A range of acreage is used as the management goal since plant communities are dynamic and fluctuate over time, due to climatic and biotic factors as well as from habitat management activities. The low end of this goal is based on the current extent of grassland habitat which has been shown to support stable populations of mission blue and callippe silverspot butterflies. The current estimate of grasslands on the Mountain is 1,287 acres (estimated in 2004). The high end of the goal (1,800 acres) is consistent with the level of grassland present on San Bruno Mountain in 1981, prior to development impacts and coastal scrub succession over the past 25 years. Management shall aim to prevent the total acreage of grassland from ever dropping below 1,200 acres and shall strive for an increase in current acreage by 10-20 percent.

Though the historical amount of grassland in the late 19th and early 20th century was higher than 1,800 acres on San Bruno Mountain, it should be understood that this was the result of farming, grazing and burning practices that were focused on creating large open areas for cattle foraging and farming; and during this period, riparian and coastal scrub habitats were cleared with little regard for species and habitats within these communities. Historic land practices focused almost exclusively on creating open grasslands, whereas more recent management (due to the lack of controls on the expansion of brush) has inadvertently created conditions that have favored coastal scrub. Management instead should be focused on maintaining a range of grasslands and brush that is allowed to fluctuate within limits, (i.e., a 'dynamic equilibrium') to insure both the protection of the habitat of the endangered species as well as protection of the native coastal scrub and woodland communities on the Mountain.

Re-introduction of Grazing as a Conservation Tool

Grazing is the utilization of grassland (forage) by domestic livestock such as cattle, sheep, goats or horses. Conservation grazing is the targeted use of grazing as a tool to increase biodiversity or support the conservation of imperiled native species or habitats.

Where appropriate, re-introduction of grazing can be an effective means of maintaining vital grassland habitat by eliminating brush and tall grass which would outcompete the butterfly host plants. Because some of the host plants (e.g. lupine) are not palatable to grazing animals, they tend to increase in grazed areas. A grazing regime also crops and limits the seed production of the annual grasses, thereby improving the competitive position of broadleaf species (wildflowers, including nectar plants important to butterflies) so that they maintain a higher overall density within the grassland.

Since the cessation of livestock grazing in the early 1960's, and the more efficient prevention of fire since that time, the grasslands on San Bruno Mountain have reduced in a real extent as a result of the expansion of coastal scrub and the influx of weeds. During the nearly 40-year span of the HCP, grazing has yet to be used on a large scale on San Bruno Mountain for habitat enhancement purposes. Though grazing was recommended as an important tool to utilize on the Mountain in the original San Bruno Mountain HCP, grazing has been regarded by many as an environmentally damaging

activity. This is due to the history of overgrazing that has occurred on lands used for cattle grazing. The damage has occurred due to a single-minded focus on raising as many cattle as possible for dairy and meat products, without consideration of the impacts to vegetation and soils.

Depending upon a variety of factors, grazing can have a positive (encourage more natives) or negative (stimulate more invasives and erosion) impact upon a landscape. The number of animals, type of animals, season, duration and frequency of grazing events, and vegetation type are all variables that will influence the results of grazing. Grazing will effect soil compaction, soil nutrients, light, and both native and nonnative vegetation. Livestock type may be the most critical factor to consider due to the variation in diet preferences for different species and even breeds. For instance goats tend to focus on broadleaf species, cattle on grasses, and sheep on a combination of both grasses and forbs.

There is substantial evidence that documents the impacts on the California landscape that have resulted from the removal of grazing and the suppression of fire. Grazing was an integral part in shaping and maintaining grassland communities over thousands of years (Edwards, 1992).

Research at Kirby Canyon and elsewhere has indicated that cattle grazing in the early spring is beneficial to native grasses if it is done prior to seed set of weedy annual grasses. Native bunchgrasses are less palatable at this time and their deep root structure is an adaptation which allows rebound after being grazed. Over time, a consistent practice of grazing in the early spring can result in a reduction of weedy annual grasses and perpetuation of native grasslands and native annual wildflowers. Grazing can also be an effective tool for managing fire buffers.

Cattle grazing has proven to be a cost effective tool for managing serpentine grasslands and protecting habitat for the federally Threatened bay checkerspot butterfly at Kirby Canyon Conservation Land Trust in Santa Clara County. Cattle grazing has also been tested within non-serpentine coastal prairie habitats, and native annual forbs were found to increase within grazed plots (Hayes, et al 2003), however native perennial forbs were found to have higher coverage within non-grazed plots. The cattle grazing program at Kirby Canyon utilizes low intensity grazing with 1 cow/calf per 10 acres and two grazing periods per year, one in winter/spring and one in summer/fall. Cattle are allowed to graze over large paddocks, approximately 1,000 acres or larger. Ranchers typically remove their cattle from the conservation area in April, coinciding with the time that the cattle stop gaining weight and when annual wildflowers come into bloom, including the host plants for the federally threatened bay checkerspot butterfly.

A conservation grazing strategy, describing a phased approach and rotational grazing program that would minimize the negative impact and maximize the beneficial impact of cattle on soils and vegetation, is under development by Parks and the Technical Advisory Committee.

Target Pilot Grazing Areas

Southeast Ridge

The Southeast Ridge is located on the far eastern edge of the Mountain and is bordered by Bayshore Boulevard and Highway 101 on the east and south, and the ridge trail on the north. The unit has expansive areas of grassland on steep slopes and narrow bands of coastal scrub and some woodland vegetation within the ravines. The grassland within this unit has infestations of French broom, fennel, and a variety of herbaceous weeds. The unit has significant mission blue and callippe silverspot habitat along the upper ridgelines and on the northern slopes between Bayshore Boulevard and the ridge. Significant patches of mission blue habitat are located along the ridge trail and on fire roads, rocky outcrops and slumps within the unit. The steep slopes were used for cattle grazing primarily in the last century. The Southeast Ridge has very dry conditions in summer and fall, and is prone to occasional wildfires.

This unit, like many grassland areas on the south side of the Mountain, has many species of grassland weeds. Many of these weeds are too ubiquitous to control using herbicide or hand control methods and require the use of burning, grazing and/or mowing. The objective for this unit is to protect existing butterfly habitat and populations through management of grasslands with grazing and control of non-natives.

Resource	Habitat Value
Mission Blue	High
Callippe Silverspot	High
San Bruno Elfin	Not Present
Bay Checkerspot	Moderate
Native Plant Community Diversity and Dominance	Moderate

Northeast Ridge

The Northeast Ridge or the Guadalupe Hills area includes rolling hillsides, terraces and slopes. It is an important habitat area for the callippe silverspot and mission blue butterflies. Grasslands are the dominant community and host plants for both the callippe silverspot and mission blue are present. Plant communities include valley needlegrass grassland, blue wild rye grassland, northern coastal scrub, non-native grassland, eucalyptus forest, and broom shrublands. The grasslands are dominated by non-native annual grasses and herbaceous weeds in many areas, yet the grasslands still support the rare butterflies and their host plants in stable numbers.

PG&E transmission lines run northeast to southwest across the ridge. The Ridge development is located on Mission Blue Drive spanning the entire southern boundary of the conserved habitat.

With both mission blue and callippe silverspot abundant on the Northeast Ridge, the greatest conservation need is the restoration and maintenance of grassland habitat. Grazing and burning are two processes that, as is common with the whole of the Mountain, were vital for the maintenance of the Northeast Ridge grassland habitat. In the absence of these processes, exotics and scrub have proliferated. To manage unwanted vegetation, the Northeast Ridge would likely benefit from a cattle grazing program. Areas for restoration and maintenance should be prioritized by butterfly host plant densities.

Resource	Habitat Value
Mission Blue	High
Callippe Silverspot	High
San Bruno Elfin	Not Present
Bay Checkerspot	Low
Native Plant Community Diversity and Dominance	Low

References

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Hayes, Grey F., Holl, Karen D., 2003. Cattle Grazing Impacts on Annual Forbs and Vegetation Composition of Mesic Grasslands in California. Conservation Biology 17 (6), 1694– 1702.

Heady, Harold F. 1977. "Valley Grassland". In Terrestrial Vegetation of California. M.G. Barbour, J. Major (eds.). John Wiley and Sons, New York.

Keeley, J. E., 2002. Native American impacts on fire regimes of the California coastal ranges. Journal of Biogeography, 29, 303–320. Blackwell Science Ltd. Website accessed July 8, 2007. <http://www.werc.usgs.gov/seki/pdfs/jbiogeography2002.pdf>

Wright, Henry A. 1971. "Shrub Response to Fire". In Wildland Shrubs - Their Biology and Utilization. USDA Forest Service General Technical Report INT-1, 1972.

HCP Authority to Implement Grazing as a Habitat Management Tool

From Amendment 5 to the HCP regarding grazing:

- ". . . seek authorization to conduct more intensive habitat management (utilizing burning and **grazing**) within Conserved Habitat for the benefit of the callippe and the bay checkerspot butterfly." (p. 1)
- "the additional funding . . . will provide funding for a **grazing** and brush control program that would improve the San Bruno Mountain ecosystem for the benefit of covered species." (p. 7)
- "Within each unit, specific management activities are prescribed to counteract processes, such as brush succession, build up of thatch and non-native species invasion that adversely affect the amount and quality of the Mountain's grassland areas. Techniques include the following. In many cases, a combination of these techniques will be warranted. . . . **Livestock Grazing:** Grazing is the utilization of grassland (forage) by domestic livestock such as cattle, sheep, goats, or horses. Where appropriate, re-introduction of grazing can be an effective means of maintaining the grassland habitat by reducing brush and tall annual grasses which out-compete native grassland plants, including the butterfly host plants. Grazing has yet to be used on a large scale on San Bruno Mountain for habitat enhancement purposes. Depending upon a variety of factors, grazing can have a positive (encourage more natives) or negative (stimulate more invasives and erosion) impact upon a landscape. The number of animals, type of animals, duration and frequency of grazing events, and vegetation type are all variables that will influence the results of grazing. Grazing will effect soil compaction, soil nutrients, light, and both native and nonnative vegetation. Livestock type may be the most critical factor to consider due to the variation in diet preferences for different species. While it is possible that a significant improvement in the landscape from grazing may occur immediately, it typically takes at least a 2-4 years to obtain significant results. Over time, a consistent practice of grazing in the early spring can result in reduction of weedy annuals and perpetuation of native grasslands and native annual wildflowers. Grazing can also be an effective tool for managing fire buffers." (p. 9).
- "The additional management funded by the development of the 2007 VTM would provide funding to support ongoing **grazing** and brush removal experiments and invasive species control to protect and restore grassland butterfly habitat on a much more thorough scale than is possible under the current management budget." (p. 30).
- "Amending the ITP to authorize incidental take related to management activities will allow for broader use of more efficient management techniques, including mowing, **grazing**, and burning. These activities will allow for more grassland habitat to be managed using techniques that mimic the natural conditions (i.e., episodic disturbance from fire and grazing) that shaped the composition of the grasslands on San Bruno Mountain." (p. 31)

- "Though grazing was recommended as an important tool to utilize on the Mountain in the San Bruno Mountain HCP, grazing as a land management tool has not been implemented or tested on a significant scale. This is largely due to **a lack of infrastructure to support grazing** (i.e. fencing, water system), **and a lack of funding to support grazing experiments** and research on the Mountain. (p. 33)
- **"Implement a grazing program on a small scale and at low intensities** to determine the overall benefit of the grazing on the endangered butterflies. Areas selected for grazing should be degraded with invasive species, coastal scrub, or heavy thatch such that host plants are already scarce and the benefits of grazing are high. Management of grazing areas should include post-grazing monitoring of invasive species, and invasive species control using hand removal, herbicide, and/or mowing. **Grazing would first be implemented on a small scale (50 - 100-acre sized plots) to determine the impact on callippe habitat, before being applied on a larger scale basis** (i.e., up to 200 acres per year)." (p. 34).
- Further discussion of grazing is in Appendix B The Habitat Management Plan attached to Amendment 5.



**San Bruno Mountain State and County Park:
Grazing Pilot Program Areas**