



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

Project Overview

The San Bruno Mountain Habitat Conservation Plan (SBMHCP) Grazing Pilot Program plans to reintroduce cattle grazing to two areas of San Bruno Mountain, with the goal of testing the effectiveness of grazing 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 project goals include fuel reduction for wildfire prevention and invasive plant management.

San Bruno Mountain is a vital habitat refuge for the callippe silverspot and mission blue butterflies. The callippe silverspot butterfly is known to be extant at only three locations, with the largest population at San Bruno Mountain. The mission blue butterfly is only known from northern San Mateo, San Francisco, and southern Marin counties, with the largest population at San Bruno Mountain.

Since the inception of the SBMHCP in 1983, cattle grazing has been identified as an important management tool for habitat enhancement, and while cattle grazing occurred on the mountain until the 1960s, it has not occurred since due to the lack of required infrastructure and funding. 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. As a result, grazing may be uniquely suited 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, as well as native and non-native shrubs (Weiss et al. 2015). Grazing is a viable option for large-scale vegetation management with the goal of improving butterfly habitat. 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 reintroduce cattle grazing to these two

locations for a three-year trial period, where cattle grazing for habitat management can be thoroughly monitored and analyzed. There are 65.3 grazeable acres (i.e., accessible grassland) at the Northeast Ridge and 86 grazeable acres at the Southeast Slope (Ratcliff and Ford 2020), comprising only 12.8% of the estimated 1,180 total acres of grassland (Weiss et al. 2015) within the San Bruno Mountain HCP area. 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 and Biomass Study completed – LD Ford, Consultants in Rangeland Conservation Science

Next Steps

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

History of Grazing on San Bruno Mountain

Overview

The San Bruno Mountain ecosystem has evolved under the influence of grazing animals, fire, and human management 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 canadensis nannodes*), occasional wildfires, and intentional burning by Native Americans. 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 began being grazed by cattle. For the next two centuries, domesticated grazing animals largely replaced native grazing animals in maintaining grasslands, while fire was still utilized to clear brush. In the 1960s, cattle grazing was removed from the Mountain, and regular burning on the Mountain had been ceased or drastically reduced. These practices were key to slowing the expansion of shrublands and maintaining open

grasslands on much of the lower elevation and eastern slopes of the Mountain. Since 1982 approximately 9.5 acres of open grassland habitat for the listed butterflies have been lost on average each year (Creekside Science 2015).

Introduction of Grazing and European Annual Grasses

Cattle grazing was introduced to California grasslands at the time of Spanish settlement (mid 18th century). At the same time or earlier, European annual grasses and forbs were also introduced to California grasslands (Bartolome et al. 2007), and a rapid type conversion of these native grasslands to grasslands dominated by non-native species followed in California's central coast region. In many areas, non-native grasses were able to outcompete and almost completely replace native grasses and forbs, however, high native species richness persists in many grasslands of the Coast Ranges.

In light of the introduction and dominance of invasive annual grasses in coastal grasslands by the 18th century, the tendency for shrubs to encroach into coastal grasslands, and cessation of indigenous management activities, including burning that may have helped keep grasslands open; the food plants of the mission blue and callippe silverspot likely benefitted from livestock grazing activities on the Mountain. Some reasons for this include:

- Shrub encroachment into California coastal grasslands is reduced in areas with livestock grazing, especially grazing during the summer and fall (Ford and Hayes 2007, McBride and Heady 1963).
- Mature lupines, the larval host plant for the mission blue butterfly, are generally unpalatable to cattle and wildlife. Livestock trampling vegetation results in downslope movement of topsoil and increases the area of bare mineral soil favorable to lupine.
- Thistles (non-native), important nectar plants of callippe silverspot, are also unpalatable to cattle because of their spines, and occur in grazed grassland.
- Many of the other nectar plants of both mission blue and callippe silverspot grow well in localized areas of soil disturbance.
- The physical environmental relationships of the California golden violet (*Viola pedunculata*), larval host plant for the callippe silverspot, are not well understood from published scientific literature. While the California golden violet is fairly common in several plant communities, and widespread in coastal California, the callippe silverspot butterfly is known to occur in only three locations. In grazed areas, 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 silverspot. This impact likely benefits California golden violets and therefore callippe silverspot.

Cattle grazing following Spanish colonization may have mitigated the negative impacts of the introduction of non-native annual grasses and may have helped maintain populations of butterfly host plants on the Mountain. 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 and callippe silverspot was further accentuated. Currently the mission blue butterfly is known to occur only in northern San Mateo, San Francisco, and southern Marin counties, with San Bruno Mountain containing the largest and most important population. The callippe silverspot butterfly is known from only three locations (San Bruno Mountain, Sears Point, and Solano County) with San Bruno Mountain containing the largest and most important population.

Many of the plants found only in the San Francisco Bay Area or on San Bruno Mountain (e.g., *Arctostaphylos imbricata*) occur on rocky outcrops, scrub or chaparral, and not in areas of prime pasture; therefore, grazing probably had little impact on these species.

Grassland Habitat and Endangered Species Goals

Goals, objectives and success criteria for the mission blue and callippe silverspot butterflies are similar and focus on the protection and management of a sufficient quantity and quality of grassland habitat to support the endangered species. Protection of sufficient densities of host plants and nectar plants within the grasslands is vital for the long-term protection of the species. Monitoring of a) the extent of suitable butterfly habitat; b) habitat quality; and c) butterfly populations over time is therefore necessary for tracking the status of the conservation objectives.

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, livestock grazing and burning practices that were focused on creating large open areas for cattle grazing and farming; and during this period, riparian and coastal scrub habitats were cleared with little regard for species and habitats within these communities (Kobernus 2008). Historic land practices focused almost exclusively on creating open grasslands, whereas more recent management (due to the lack of controls on the expansion of shrublands) has inadvertently created conditions that have favored coastal scrub. Management instead should be focused on maintaining a range of grassland and shrubland acreage that is allowed to fluctuate within limits, (i.e., a 'dynamic equilibrium') to insure both the protection of the habitat of the endangered grassland species as well as protection of the native coastal scrub and woodland communities on the Mountain.

The HCP requires the protection and management of a range of 1,200 –1,800 acres of grassland habitat for the mission blue and callippe silverspot butterflies on San Bruno Mountain . 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. Of the approximately 3,000 acres of land conserved by the San Bruno Mountain HCP, 1960 acres (65.3%) were mapped as grassland in 1932. In 1983, when the HCP was approved, 1419 acres of grassland were documented. In a 2004 vegetation classification analysis (of a 2002 aerial image), 1297 acres of grasslands were mapped on San Bruno Mountain. This equates to an average loss of 9.5 acres of grassland per year. cursory visual analysis of 2014 aerial imagery

indicates further loss of grassland since the 2004 classification effort. Weiss et al. (2015) conservatively estimate that grassland habitat is now reduced to less than 1180 acres.

Reintroduction of Grazing as a Conservation Tool

Livestock 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 in addition to controlling non-native pest plants, fire hazards, and soil erosion.

Where appropriate, reintroduction of livestock grazing can be an effective means of maintaining vital grassland habitat by reducing brush encroachment 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 may increase in grazed areas. Grazing animals also limit the foliar density of annual grasses, thereby improving the competitive position of broadleaf species (wildflowers, including nectar plants important to butterflies) so that the latter 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. Despite the recommendation in the 1982 San Bruno Mountain HCP and the 2009 amendment to the HCP that livestock grazing be used as a habitat management tool, grazing has yet to be used on a large scale on San Bruno Mountain for habitat enhancement purposes.

Depending upon a variety of factors, livestock grazing can have a positive impact on native plants (Hayes and Holl 2003, Bartolome et al. 2014), a negative impact on native plants (good citation here?), or no impact on native plants. Maintaining adequate residual dry matter at the end of the grazing season (just before the onset of fall rains), is important for protecting soil from erosion and avoiding negative effects to future years' production and species composition (Bartolome et al. 2006). The number of grazing animals, type of animals, grazing season, duration and frequency of grazing events, and vegetation type are all variables that will influence the results of grazing (Bush 2006).

Research at Kirby Canyon Conservation Land Trust in Santa Clara County, 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 reducing wildfire hazard.

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 (Weiss 1999). 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.

A conservation grazing strategy, describing a phased approach that would minimize potential negative impacts on soil and vegetation and enhance habitat for the listed butterfly species and their host plants, is under development by Parks and the Technical Advisory Committee.

Target Pilot Grazing Areas

Southeast Slope

The Southeast Slope 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 (see map attached). 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 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. Until the cessation of livestock grazing in the 1960s, the area was used predominantly for cattle grazing. The Southeast Slope has very dry conditions in summer and fall, and its proximity to a freeway and a major road make it 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 manage using herbicide or hand control methods but may benefit from the use of burning, grazing and/or mowing. However, steep slopes make mowing infeasible for much of the area, and controlled burns have been difficult to implement on the Mountain due to the proximity to houses and urban infrastructure. The objective for this unit is to enhance existing butterfly habitat and populations, and to control non-native species through management of grasslands with grazing.

Northeast Ridge

The Northeast Ridge (also known as 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 plant cover type, 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 largely dominated by non-native annual grasses and herbaceous weeds.

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.

Similar to the Southeast Slope, the objective for this unit is to enhance existing butterfly habitat and populations and to control non-native species using grazing management. 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, exotic plants and scrub have proliferated. We expect the pilot grazing program to alter grassland structure and species composition in a way that is favorable to mission blue and callippe silverspot butterflies and their host plants in the Northeast Ridge.

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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, reintroduction 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.



Legend

-  SBMHCP Boundary
- Grazing Pilot Project Areas**
-  Northeast Ridge Grazing Pilot Area
-  Southeast Slope Grazing Pilot Area

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

