

Investigating the Effects of Livestock Grazing on Greene's Mariposa Lily (*Calochortus greenei*) in the Cascade-Siskiyou National Monument



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Calochortus greenei
Greene's Mariposa Lily

Project Background and Objectives

The 52,000 acre Cascade-Siskiyou National Monument (CSNM) was established by presidential proclamation on June 9, 2000, in recognition of the outstanding biological resources of this BLM-administered landscape, located at the crossroads of the Klamath Basin, Cascades and Siskiyou Mountains. Wildwood Consulting was contracted to design and implement a study to assess the effects of livestock grazing on locally rare and endemic plant taxa. Based on a review of available literature on sensitive plant taxa and existing survey data, Greene's mariposa lily (*Calochortus greenei*; CAGR) has been selected as the focal species of this investigation.

CAGR is a local endemic restricted to the region between the CSNM and the Little Shasta River, located 40 miles to the southeast. Currently it is a federal Species of Concern, a State of Oregon Candidate for listing as Threatened or Endangered (ONHP List 1), and considered "endangered in a portion of its range" by the California Native Plant Society in California. The species is closely associated with open shrub/woodlands on heavy montmorillonite clay soils. Two population centers are left to maintain this species; a large, dense population in the upper reaches of the Little Shasta River (Siskiyou County, CA) and many small populations (approximately 90) scattered throughout the CSNM. Some of the CSNM's populations are located in areas that are potentially subjected to relatively high levels of livestock use.

The specific objectives of this study is to investigate whether and to what extent livestock have adversely impacted this rare plant species, and if so, explore how these impacts may translate into landscape-level effects.

Study Design

The most effective way to assess the effects of livestock grazing on rare plants in the CSNM would be to create exclosures around some populations and compare demographic trends over time with grazed populations that are located nearby (e.g. Kaye 2002). However, this type of study requires a relatively long period of time (~10 years) and considerable financial resources to complete¹. In this short-term study, we propose to investigate grazing effects on CAGR retrospectively, using a multi-pronged approach described below:

- 1) Resurvey all known CAGR populations across several study areas within the monument that occur along a continuum of livestock grazing intensity, from high utilization to essentially ungrazed. Spatial data on known populations of CAGR was overlaid with broad-scale livestock utilization classes to identify three study areas that appear best-suited to this approach:

Area 1 - high to moderate livestock utilization

Area 2 - moderate to low utilization

Area 3 - low utilization to ungrazed

¹ Medford BLM has recently entered into a Challenge Cost Share agreement with Institute for Applied Ecology (Corvallis, OR) to undertake a long-term monitoring study of CAGR in several areas of the Monument. Wildwood Consulting is coordinating with this longer-term study and is hoping to utilize complimentary study areas so that results of both efforts are mutually beneficial.

Each of these areas contains at least ten known sighting records for CAGR, and many of these populations have not been resurveyed in 15 to 20 years. At each of these sites, basic attributes of existing CAGR populations will be recorded, including number of plants, plant distribution, habitat structure and composition, and evidence of recent livestock use. Using both these data and previous sighting reports, it may then be possible to determine whether individual populations have changed over time, and examine whether any observed changes are correlated with recent grazing history. In addition, data on the presence and relative abundance (% cover) of non-native annual grasses and forbs will also be collected. This information will be used to search for potential correlations between the presence and abundance of non-native plants and the density of *Calochortus*.

- 2) Analyze the spatial distribution of all known CAGR populations with respect to livestock utilization levels and other landscape-level variables to which livestock are most likely to respond (distance to water, topography, forage availability, etc.). This analysis will be done using Geographic Information Systems to investigate the relationship between the location and size of existing CAGR populations, livestock grazing levels and other habitat attributes (vegetation type, geomorphology, etc.).
- 3) Conduct field surveys for additional (previously unknown or unreported) populations of CAGR in areas of the monument that have been poorly surveyed. These data will then be fed into landscape analysis described above (#2). The more populations that can be included in the landscape analysis, the more likely we'll be able to identify the variables that are most strongly influencing the distribution of this species within the CSNM.
- 4) Compare reproductive fitness within CAGR populations that experience differential grazing pressure. At least two known CAGR populations are bisected by fences that separate grazing allotments. In both cases, one side of the fence is more intensively grazed than the other, offering an opportunity to investigate whether higher grazing levels are affecting CAGR in terms of reproductive fitness (e.g. # of flowers per plant, # fruits per plant, # of seeds/fruit). A stratified random sampling design will be used to collect data on reproductive output from both heavily and lightly grazed subpopulations.

Collectively, it is expected that this multi-pronged, retrospective study design will allow some determination of the extent to which CAGR may be directly impacted by livestock grazing and the potential consequences on population fitness for this rare plant. This approach will nicely complement the long-term CAGR population monitoring that is just now getting underway.

Literature Referenced in the Development of Study Design

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Individuals Consulted

- Richard Brock, Siskiyou Bio-Survey, Ashland, OR
- Frank Callahan, Local botanist with expertise on genus *Calochortus*, Central Point, OR
- Tom Kaye, Institute for Applied Ecology, Corvallis, OR
- Jimmy Kagan, Oregon Natural Heritage Program, Portland, OR
- Erik Jules, Dept. of Biology, Humboldt State University, Arcata, CA