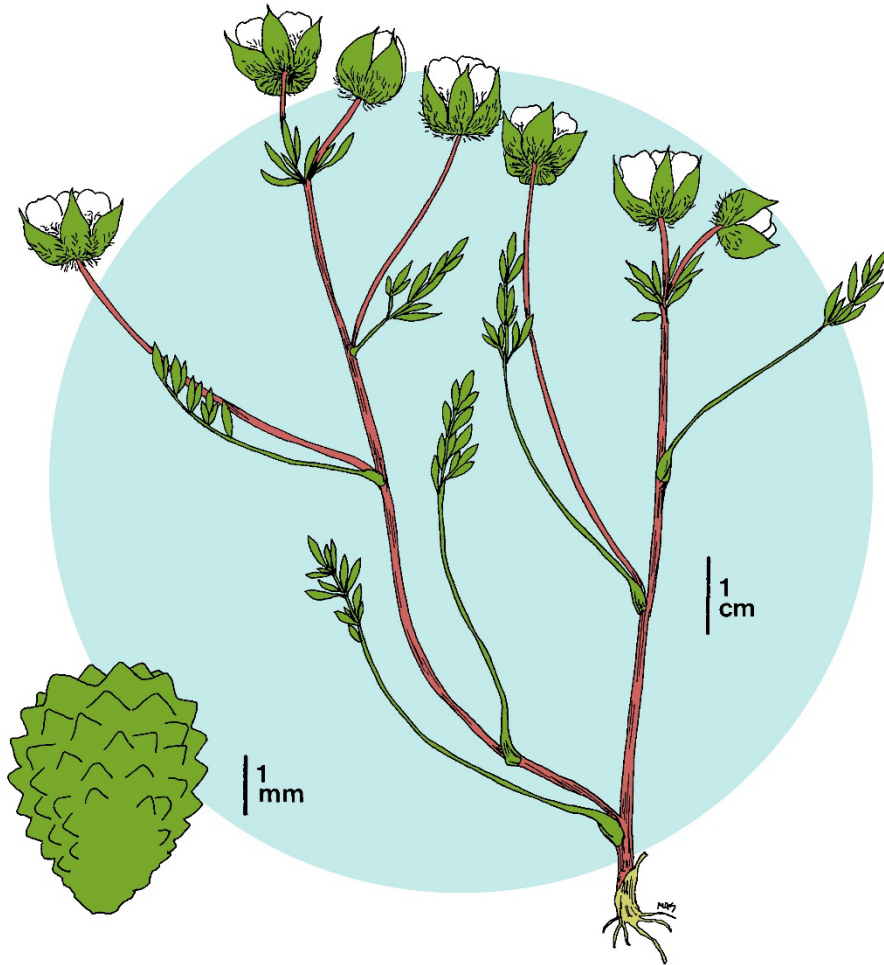


NORTH TABLE MOUNTAIN ECOLOGICAL RESERVE BUTTE COUNTY MEADOWFOAM MONITORING RESULTS AND DISCUSSION 2015-2023



PREPARED BY THE CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE
NATIVE PLANT PROGRAM

JANUARY 2024

FUNDING PROVIDED BY COOPERATIVE ENDANGERED SPECIES CONSERVATION
FUND GRANTS F15AP00059, F18AP00042, F21AP00514 AND THE RARE AND
ENDANGERED SPECIES PRESERVATION FUND

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INTRODUCTION

Butte County meadowfoam (*Limnanthes floccosa* ssp. *californica*) is a California- and federally-endangered plant that is endemic to Butte County California. It occurs in vernal swales, vernal pools, and similar habitat types. This document summarizes the 2015-2023 monitoring results from implementation of the 2018 North Table Mountain Ecological Reserve Butte County Meadowfoam Monitoring Plan (CDFW 2018, Monitoring Plan). The Monitoring Plan includes detailed instructions on how to implement a monitoring protocol for Butte County meadowfoam at the California Department of Fish and Wildlife (CDFW) North Table Mountain Ecological Reserve (Reserve), with the goal of facilitating adaptive management of Butte County meadowfoam at the Reserve. The Reserve is approximately 3,300 acres, however Butte County meadowfoam is only found in one localized area of less than three acres, with a patchy distribution. This document includes an interpretation of the 2015-2023 monitoring results, an assessment of the monitoring project, and management recommendations. The results and recommendations in this document are a critical step in the adaptive management process for Butte County meadowfoam.

SUMMARY OF RESULTS

This document reports on the results of the following monitoring components:

- Censusing Butte County meadowfoam plants within monitoring plots
- Photomonitoring
- Observations of grazing and other impacts

In addition, precipitation information generated using a publicly-available climate model (PRISM 2023) is evaluated in relation to the census information. Other general observations are also reported.

BUTTE COUNTY MEADOWFOAM CENSUS

Collectively, plants within monitoring plots and reported in this document are the only locations that CDFW has observed Butte County meadowfoam at the Reserve during implementation of the Monitoring Plan. Due to the size of the Reserve, it is possible that undiscovered Butte County meadowfoam populations occur elsewhere on the Reserve and we conducted additional opportunistic surveys for Butte County meadowfoam outside of known populations as time allowed. Butte County meadowfoam has also been mapped in the California Natural Diversity Database (CNDDDB) at a location approximately 900 feet south of the known populations at the Reserve but CDFW staff have not observed any plants at this location during site visits.

Populations of Butte County meadowfoam were searched for and counted in monitoring plots in every year from 2015 to 2023 (Figure 1). The locations of monitoring plots are presented in Figures 2 and 5 of the Monitoring Plan but are not presented here due to the sensitivity of the species. Monitoring plots ranged in size from 200 to 2,827 m². The monitoring data is also available at the following location: <https://data.cnra.ca.gov/dataset/north-table-mountain-ecological-reserve-butte-county-meadowfoam-monitoring-plan>.

Reproductive Butte County meadowfoam plants were present at the Reserve during every monitoring year, with total population counts ranging from 187 to 1,130 plants (Figure 1; 107 plants were found in 2015, but this census was prior to the discovery of all colonies). The average abundance at the Reserve from 2016 to 2023 was 677 plants.

Butte County meadowfoam was monitored in a total of seven plots (Table 1). The species was observed in Plot A in 2014 prior to implementation of the Monitoring Plan, but a comprehensive count was not conducted during that year. Plots B and D were expanded in 2016 to include plants found outside of the plots that were not present when the plots were first established in 2015. An additional group of Butte County meadowfoam plants was also discovered in 2016, and Plot F was established in 2016 to monitor this group of plants. An additional small cluster of plants was discovered along the margin of an old (pre-2008) bulldozer line in 2021 and was recensused in 2022 and 2023. This group of plants is referred to as “B-displaced”.

Table 1 Plots and years they were censused

Plot	Years Censused	Notes
A	2015-2023	
B	2015-2023	Expanded in 2016
B-displaced	2021-2023	Discovered in 2021
C	2015-2023	
D	2015-2023	Expanded in 2016
E	2015-2023	
F	2016-2023	Discovered in 2016

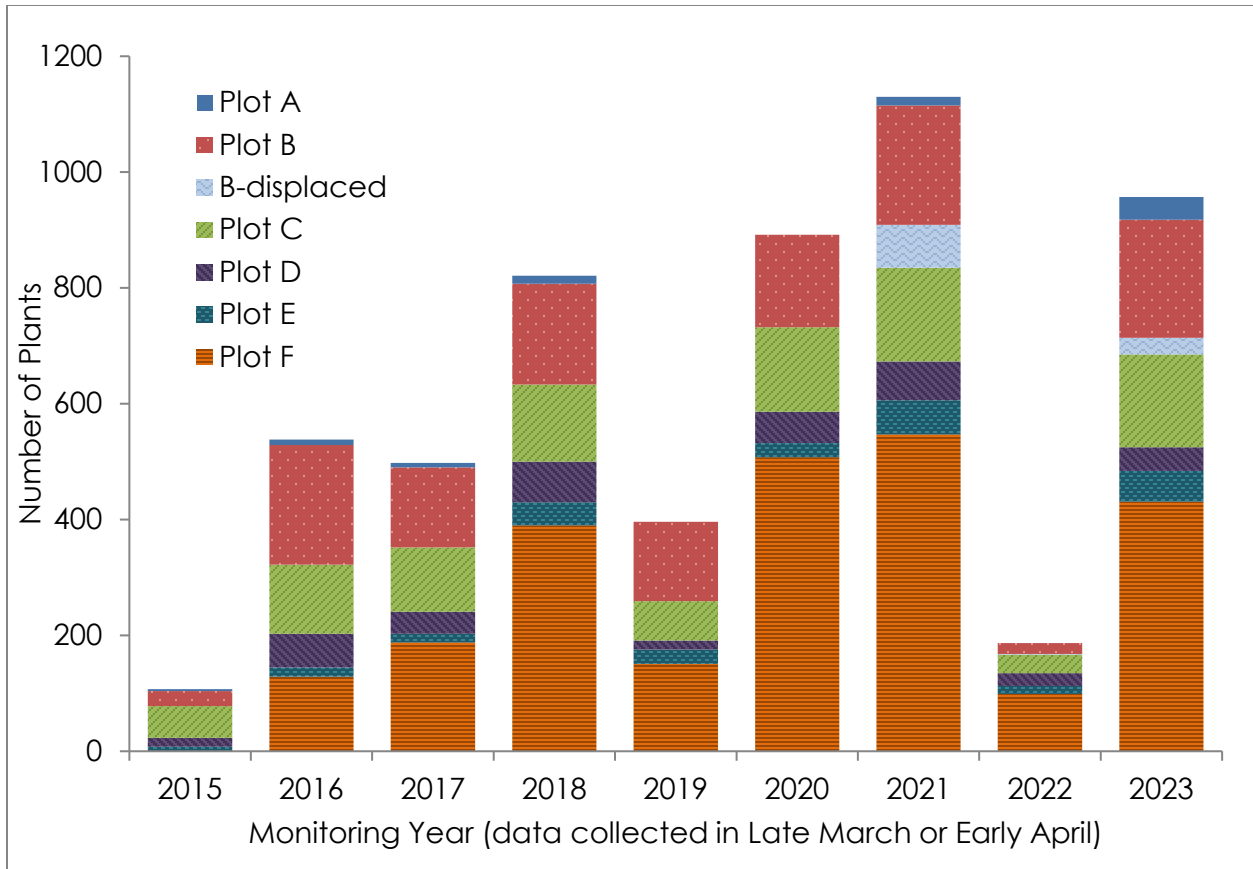


Figure 1. Butte County meadowfoam plants counted in all North Table Mountain Ecological Reserve monitoring plots. Plants first discovered at Plot F in 2016 and at the B-displaced population in 2021.

PHOTOMONITORING

Thirteen Butte County meadowfoam photo monitoring positions were established at the Reserve in 2015 and 2016, with monitoring photos taken in March or April from 2015 to 2023 after population counts were completed. Monitoring photos were also taken on October 27, 2017 to document the aftermath of the Cherokee Fire, which burned most of the Reserve, including all known populations of Butte County meadowfoam at the Reserve. All monitoring photos are available at the following location: <https://data.cnra.ca.gov/dataset/north-table-mountain-ecological-reserve-butte-county-meadowfoam-monitoring-plan>. Monitoring photos at one of the photomonitoring positions (position Fm) from 2016 to 2023 are provided at the end of this report.

OBSERVATIONS OF GRAZING AND OTHER POTENTIAL IMPACTS

The Reserve appears to have been grazed every year since monitoring began. CDFW leases the Reserve to grazing tenants. The details of the grazing leases prior to 2018 are unknown. The most recent 5-year leases were issued in 2018 and 2023 for annual seasonal grazing. The best time to modify grazing practices

is therefore prior to the start of a new lease. Grazing tenant proposals in both 2018 and 2023 were required to: (1) have a maximum of 300 animal units per month, (2) have a November 1– April 30 grazing season, (3) have an average of 500 lbs. per acre of Residual Dry Matter (RDM) remaining and evenly distributed on the grounds, as much as possible, whereas steeper (10-40%) slopes may have an average of 750 lbs. per acre. Weaned calves and light steers between 350-600 pounds are each counted as 0.7 animal units; and bulls, cows, cows with calves, and steers over 600 pounds are counted as 1 animal unit.

Based on our casual observations during site visits, the impacts of grazing on Butte County meadowfoam fluctuated from year to year. In some years (2019, 2021, 2023) we observed moderate cattle trampling and many flowers and stems removed due to cattle herbivory, and in other years we observed little to no obvious trampling or herbivory. We did not explicitly measure herbivory in 2021, but estimated that approximately ten percent of Butte County meadowfoam plants showed signs of herbivory.

The October 2017 Cherokee Fire burned most of the Reserve affecting all plots, and it eliminated nearly all residual dry matter in the vicinity of the Butte County meadowfoam population. *Lupinus* sp. abundance was notably higher on mima mounds during the 2018 and 2019 monitoring visits that followed the Cherokee Fire. Possible effects of the fire on Butte County meadowfoam are discussed in the Interpretation of Results section of this document.

Emergency bulldozer lines were cut on the Reserve during the Cherokee Fire and one of them was cut within 50 ft (15 m) of the Butte County meadowfoam population at Plot C (see monitoring photo Cf20171027). These bulldozer lines are different than the previously mentioned pre-2008 bulldozer line that passed through Plot B and perhaps other areas supporting the species, presumably impacting the population and moving the B-displaced population to its current location.

In mid to late 2018, the grazing tenant placed a mineral lick approximately 450 ft (137 m) south of the Butte County meadowfoam population at Plot C. Mineral licks cause a concentration of livestock in an area, which can result in increased impacts (e.g., trampling and/or herbivory) in the vicinity of the mineral lick.

In late 2022 a new fence was installed approximately 350 feet (107 m) east of the Butte County meadowfoam population. The fence is located on a previously unfenced north-south property line between the Reserve and a neighboring parcel. Although this fence did not pass through the Butte County meadowfoam population, it could concentrate cattle at the population.

RELATIONSHIPS BETWEEN ABUNDANCE AND PRECIPITATION

We used a PRISM climate model (PRISM 2023) to calculate several precipitation datasets. These included monthly and half-monthly precipitation totals during the germination and growing season (September -March), number of days per month with over 0.2 in. of precipitation during the germination and growing season, and the date of the earliest large rainfall event that produced more than one inch of precipitation. We evaluated this information for correlation with total Butte County meadowfoam abundance in Plots A through E as the dependent variable (these are the plots that were censused consistently in each of the nine monitoring years).

Monthly Precipitation

We looked at pairwise correlations between monthly precipitation (October – March) and Butte County meadowfoam abundance. We found a marginally significant negative pairwise correlation between October precipitation and Butte County meadowfoam abundance ($r = -0.62$, $p = 0.07$), and a significant positive pairwise correlation between March precipitation and Butte County meadowfoam abundance ($r = 0.66$, $p = 0.05$). With only nine years of data our power to detect the effect of monthly precipitation on abundance through multiple regression is limited. However, when we used multiple regression to test the effect of monthly precipitation on Butte County meadowfoam abundance in the core winter months of December, January, and February, while accounting for possible correlations between those months in “wet years” and “dry years,” the model was marginally significant ($R^2 = 0.69$, $F_{(3,5)} = 3.76$, $p = 0.09$), and January was the only month that had a significant positive effect on Butte County meadowfoam abundance ($\beta = 19.88$, $p = 0.04$).

Half-monthly Precipitation and Date of First Large Rainfall Event

We found no significant pairwise correlations or causal relationships between total Butte County meadowfoam abundance and half-monthly precipitation totals or date of first large rainfall event.

Number of Precipitation Days

We considered a precipitation day to be any day receiving more than 0.2 in of precipitation. We found a significant positive pairwise correlation between the number of precipitation days in January and Butte County meadowfoam abundance ($r = 0.71$, $p = 0.03$), and a significant positive pairwise correlation between number of precipitation days in March and Butte County meadowfoam abundance ($r = 0.66$, $p = 0.05$). We found a marginally significant negative pairwise correlation between number of precipitation days in October and Butte County meadowfoam abundance ($r = -0.59$, $p = 0.10$). Using a multiple regression to account for correlations between months, we modeled

the effect of precipitation days in October, January, and March on Butte County meadowfoam abundance ($R^2 = 0.80$, $F_{(3,5)} = 6.47$, $p = 0.04$). Using this model we found that Butte County meadowfoam abundance increased as the number of precipitation days in October decreased ($\beta = -28.57$, $p = 0.05$), and the precipitation days in January increased ($\beta = 27.23$, $p = 0.05$).

OTHER GENERAL OBSERVATIONS

The habitat in the vicinity of the Butte County meadowfoam population is a mosaic of rocky pools and swales of varying depths, veins of shallow volcanic rock outcrops, and shallow mima mounds of soil. The mosaic of habitat on the rocky tabletop landscape of the Reserve exhibits drastically different residual dry matter levels in different microhabitats. The Butte County meadowfoam population on the Reserve only grows in rocky pools of moderate depth, and these pools were observed to be predominately occupied by native plants in the spring, with very low amounts of residual dry matter in the fall. This contrasts with the vegetation on the nearby mima mounds, which have thick soil often occupied by forbs and non-native grasses in the spring, with higher amounts of residual dry matter in the fall. Most Butte County meadowfoam are found at or near the bottoms of shallow rocky swales and depressions that sometimes have standing water, but it is not typically found in the wetter, deeper depressions that support high densities of white headed navarretia (*Navarretia leucocephala* ssp. *leucocephala*). Butte County meadowfoam is often found in dense clusters of several plants rooted underneath loose cobbles, with stems ascending from below the cobble. In 2019 we observed for the first time a small cluster of plants rooted in moss, which was unusual. Tight clusters of plants rarely exceed five individuals and often appear to be rooted together, suggesting seeds from a single flower may not disperse well and often remain in close proximity.

INTERPRETATION OF RESULTS

EFFECTS OF PRECIPITATION ON ABUNDANCE

Although its abundance is low, the Butte County meadowfoam population at the Reserve has remained relatively stable despite weather variability over the monitoring period, with many individuals completing their life cycle and thus likely contributing some seed back to the soil seed bank in every monitoring year. The total population size fluctuated by less than one order of magnitude during the monitoring period, demonstrating that Butte County meadowfoam is capable of utilizing various precipitation patterns to successfully complete its life cycle.

Variable timing, amounts of precipitation, and the resulting inundation from year to year can present risks to annual plant populations such as those of Butte County meadowfoam; however, species may reduce risks by implementing

certain life history strategies. Ritland and Jane (1984) found that woolly meadowfoam (*Limnanthes floccosa* ssp. *floccosa*), which is closely-related to Butte County meadowfoam, has several characteristics of a life history strategy that focuses on lowering its exposure to risks from a variable environment. These strategies include greater seed dormancy (not risking germination of too many seeds in a single growing season), later germination times (not risking germination too early), slower seedling growth rates (not risking being too large to be killed by winter drought), and earlier flowering times (to ensure reproduction before the onset of high temperatures and summer drought). As a result of these strategies, *Limnanthes floccosa* may have a relatively lower reproductive output than similar annual plant species, but a higher survivorship of individuals and therefore a greater stability of population growth and persistence over longer timescales.

We found evidence that October precipitation has a negative effect on Butte County meadowfoam abundance, suggesting that early rainfall may be a risk to the species. This negative effect may be due to October precipitation causing germination of Butte County meadowfoam seeds that are unable to survive to maturity. Butte County meadowfoam germination data from California Botanic Garden (2023) provides data from 21 Butte County meadowfoam germination trials, with the percentage of seeds germinating in each trial ranging from 0%-82%. These germination trials found that seeds were more likely to germinate when there was a water soaking pre-treatment and a treatment of cold, moist stratification at 5° C which supports the theory that October precipitation, followed by colder winter temperatures may induce germination of some Butte County meadowfoam seeds too early in the season.

December is the month with the highest average precipitation at the Reserve (8.16 in), followed by January (7.40 in), February (7.14 in), and March (6.28 in) (PRISM 2023). October average precipitation is 2.06 in, and November average precipitation is 4.17 in. December may therefore be the least-risky month for Butte County meadowfoam seed germination. Our results suggest that January is the most important precipitation month for Butte County meadowfoam at the Reserve, and January precipitation may therefore be important for plant survival after germination in December, when plants are in the vulnerable seedling life history stage.

The positive correlations between March precipitation and Butte County meadowfoam abundance are somewhat puzzling because while field surveyors attempted to locate and count every Butte County meadowfoam present within monitoring plots during monitoring visits, we found very few vegetative plants (i.e. plants lacking even immature inflorescences). Because plants likely need several months after germination to mature into reproductive adults, seed germination from March rains is therefore not responsible for increased abundance in years with higher March precipitation. It is therefore possible that

March precipitation is important for plant survival immediately leading up to flowering. It is also possible, that some vegetative Butte County meadowfoam plants were present but not detected by field surveyors in some years due to the difficulty of detecting Butte County meadowfoam when only leaves are present. March precipitation could therefore be responsible for increasing the likelihood that vegetative individuals develop inflorescences, which in turn would increase their detectability by surveyors.

We also noted in several years that the areas supporting Butte County meadowfoam had standing water in early March, but the standing water was gone and Butte County meadowfoam plants were evident and blooming several weeks later in late March or early April.

SEED PRODUCTION AND DISPERSAL

Butte County meadowfoam populations primarily set seed via self-fertilization (Sloop et al. 2011), which may be a beneficial strategy when pollinators are unavailable, but it can become disadvantageous over the long term as it could lead to inbreeding depression and reduced fitness.

We observed no evidence of any Butte County meadowfoam dispersal outside of already occupied areas from 2015 to 2023 (plants in Plot F were not found during initial surveys in 2015, but we believe this was due to oversight, not rapid colonization). The monitoring photos demonstrate that plants were in very similar locations in every monitoring year, despite the influences of wind, rain, cattle grazing, recreational land use (hiking), and our presence in and around the plots each year. While some groups of Butte County meadowfoam plants were absent in some years and then reappeared in the same location or very close to it in a later year, this was likely a result of viable seeds remaining present in the soil seedbank, and not local extirpation and recolonization of habitat. For example, the group of plants within Plot A was observed in 2018, was not seen in 2019 or 2020, but then was observed again in 2021. The dispersal ability of Butte County meadowfoam appears to be extremely low and colonization of a new area is rare. Butte County meadowfoam is a habitat specialist and appears to produce relatively few seeds, so seed dispersal into unsuitable habitat is risky for the species because plants from those seeds would have a lower likelihood of long-term survival than if they remained close to the parent plant. This is likely the reason that the species has adapted to be a poor disperser.

The bulldozer-displaced population is a small cluster of plants growing in atypical habitat along the margin of an old bulldozer line. These plants were found at a single location along a long narrow ridge of material (soil and rocks) piled a few inches high. Based on an examination of aerial imagery, this ridge was likely created by the edge of a bulldozer blade sometime before February 11, 2008, but we only discovered them in 2021, and saw them again in 2022 and

2023. The bulldozer line connects this small population with the group of Butte County meadowfoam plants at Plot B. The bulldozer line is at a distance of approximately 35.15 meters from the Plot B monument (measured in a 230° direction from the monument to the crest of the bulldozer line). The newly discovered subpopulation is approximately 40 meters to the south-southeast of Plot B as measured along this bulldozer line, and it seems likely that seed from Plot B was moved to the new location by the bulldozer, and a small population has presumably persisted at the new location for approximately 15 years. This observation suggests that Butte County meadowfoam may be capable of reproducing and persisting outside of its typical habitat if its seed is distributed there, even if the habitat is not ideal for long-term population persistence. There are many areas that are superficially similar to occupied Butte County meadowfoam habitat at the Reserve, but that are not currently occupied. The apparent persistence of the bulldozer-displaced population in atypical habitat, combined with the high site fidelity of all existing groups of plants at the reserve, and the lack of any other natural colonization suggests that one of the biggest limiting factors for colonization of unoccupied habitat is simply the fact that Butte County meadowfoam seeds do not get to these areas.

THREATS

The Cherokee Fire that started on October 8, 2017 burned much of the Reserve, including all known areas occupied by Butte County meadowfoam. The Cherokee Fire did not appear to significantly harm the soil seed bank and may have improved conditions for the species, which is supported by the absences of any clear negative effects on the Butte County meadowfoam population following the fire, and a higher average number of plants in the monitoring years after the fire than in the monitoring years before. The fire may have improved conditions for the population by reducing competition and/or increasing nutrients.

The biggest threats to the Butte County meadowfoam population at the Reserve are (1) herbivory and trampling impacts from grazing, (2) the general vulnerability of having a relatively low number of individuals in the population, and (3) wildfire emergency response actions such as the creation of fire breaks by scraping of bulldozer lines. Microhabitats that support Butte County meadowfoam do not appear to be under a significant threat from invasive plant species, likely because the species tends to occur in areas that are subject to periodic flooding and have a higher proportion of native species than surrounding areas. Human foot traffic appears to be light in the parts of the Reserve where the species is found, but the impact from human foot traffic in other areas of the Reserve has noticeably increased since we began monitoring in 2015. Improved signage may now draw more people to areas of the Reserve that were less-frequently visited in the past. Human foot traffic could therefore become a greater threat to Butte County meadowfoam in the future. The

anticipated effects of climate change on Butte County meadowfoam are not currently known, but if the correlations identified in this report are representative of true relationships between precipitation and abundance, then increased precipitation in October, or decreased precipitation in January or March could have an overall negative impact on the species in the future.

ASSESSMENT OF THE MONITORING PROJECT

Our methods have resulted in important data that the grazing at the Reserve from 2015-2023 has been compatible with a small but relatively stable population of Butte County meadowfoam. All known patches of Butte County meadowfoam on the Reserve are within monitoring plots, and all plants detected within the monitoring plots were counted; therefore, the monitoring data for Butte County meadowfoam is based on annual censuses of the entire known population. Uncertainty in the data is therefore not statistical, but a result of counting errors due to the difficulty of counting in areas with a high number of overlapping Butte County meadowfoam plants, and the difficulty in detecting vegetative plants. While the Reserve has received a lot of attention from botanical surveyors, and we have conducted additional opportunistic surveys for Butte County meadowfoam outside of known populations from 2015-2023, the Reserve is large and there may nevertheless be undiscovered Butte County meadowfoam populations. It is likely that at least some Butte County meadowfoam plants were present in Plot F in 2015; and in the bulldozer-displaced population from 2015-2020 but these areas were not specifically searched in those years.

We have conducted the annual spring census as described in the Monitoring Plan from 2015-2023, but changes in funding, management priorities, or staffing could mean that staff are unable to continue this work in the future. If this work continues, the annual spring census can be conducted in one long field day with a crew of three people if at least one of the people has experience with the site and can easily relocate the monitoring plots. Additional time may be required if plot monuments cannot be relocated, the abundance of Butte County meadowfoam is particularly high, or if surveys outside of established plots are also conducted.

MANAGEMENT RECOMMENDATIONS

The management objectives and management implications identified in the Monitoring Plan are repeated below, with a discussion of whether the management implications should be triggered based on the monitoring results. Additional management recommendations for the project are also included.

MANAGEMENT OBJECTIVE #1

Maintain at least 100 Limnanthes floccosa ssp. californica plants in North Table Mountain Ecological Reserve plots in at least two of the five years from 2018 to 2022.

Management Implication Identified in the Monitoring Plan: If fewer than 100 Butte County meadowfoam plants are counted in North Table Mountain Ecological Reserve plots in three of the five years between 2018 and 2022, collect seed from the population in 2022 for propagation and seed bulking by a qualified institution and return the seed to the Reserve in the spring of 2023.

Recommendation: The management objective has been met. There have been at least 100 Butte County meadowfoam plants on the Reserve in every monitoring year from 2018 to 2023. While the management recommendation as originally written has been met, the objective is likely too low to be effective at enhancing the population as a hedge against extinction. With more than eight years of monitoring data available we now recommend a revision to the objective due to (1) the low abundance at the Reserve relative to other Butte County meadowfoam populations, and (2) because the population is genetically distinct from other populations and has a higher genetic diversity when compared with other populations (Sloop et al. 2011). For these reasons we also recommend an experiment to test the feasibility of Butte County meadowfoam assisted local dispersal at the Reserve. Assisted local dispersal is expected to increase the population's abundance and occupied area, reducing risk from threats. The overall genetic diversity of Butte County meadowfoam is also low, so preserving the taxon's genetic diversity at the Reserve is critically important and may be useful for genetic rescue of other populations in the future.

UPDATED MANAGEMENT OBJECTIVE #1

Maintain at least 500 Limnanthes floccosa ssp. californica plants at North Table Mountain Ecological Reserve in at least two of the five years from 2024 to 2028.

MANAGEMENT OBJECTIVE #2

Prevent grazing-related disturbances from impacting the ability of Butte County meadowfoam to maintain healthy self-sustaining populations at North Table Mountain Ecological Reserve.

Management Implication Identified in the Monitoring Plan: If a qualitative assessment of photomonitoring and Butte County meadowfoam abundance indicates that grazing-related disturbances are presenting an ongoing impact to the ability of Butte County meadowfoam to maintain a healthy self-sustaining population at the Reserve, the grazing intensity at the Reserve shall be reduced

by decreasing the number of grazing animals on the Reserve in the following year, or during implementation of the next grazing lease.

Recommendation: Butte County meadowfoam has persisted as a small but apparently self-sustaining population at the Reserve despite grazing impacts in the past. Nevertheless, a slight reduction of grazing intensity may reduce herbivory of flowers and trampling of plants, leading to higher recruitment and an increase in Butte County meadowfoam abundance. Grazing leases in 2018 and 2023 have requested an average of 500 lbs. per acre of Residual Dry Matter (RDM) to be remaining and evenly distributed on flatter (0–10% slopes) of the Reserve at the end of each grazing season. This grazing intensity may be too high for Butte County meadowfoam. To reduce impacts on the small Butte County meadowfoam population at the Reserve, a reduced grazing intensity at the commencement of the next grazing lease (likely 2028) may help increase Butte County meadowfoam abundance. We therefore recommend implementation of slightly reduced grazing intensity at the Reserve at the next opportunity. This change would also likely help promote more abundant displays of native wildflower species at the Reserve, which is a primary attraction for visitors. A target of 600-700 lbs. per acre of RDM evenly distributed on flatter (0–10% slopes) of the Reserve at the end of each grazing season may be more appropriate. This would require a corresponding reduction in the number of animal units per month that are used on the Reserve (down from the 300 animal units per month used in the 2018 and 2023 grazing leases). We don't recommend complete cessation of grazing due to the risks of long-term thatch build-up and increasing abundance of non-native grasses, but reducing grazing intensity could be implemented in an adaptive management context, if monitoring continues.

OTHER RECOMMENDATIONS

- CDFW's Native Plant Program and/or North Central Region should continue to prioritize monitoring of Butte County meadowfoam population at the Reserve.
- Continue efforts to search for additional populations of Butte County meadowfoam at the Reserve and at nearby properties.
- Management Recommendation: If another wildfire threatens the vicinity of the Reserve, CDFW's North Central Region should rapidly coordinate with bulldozer crews to avoid impacting the Butte County meadowfoam population.

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REVIEWERS

This document was prepared by Jeb McKay Bjerke, a senior environmental scientist (specialist) in the CDFW's Native Plant Program. The following individuals received this this document for review:

- Laurel Low, CDFW Native Plant Program
- Kristi Lazar, CDFW Native Plant Program
- Dr. Raffica La Rosa, CDFW Native Plant Program
- Dustin Wallis, CDFW Region 2 Rangeland Conservation

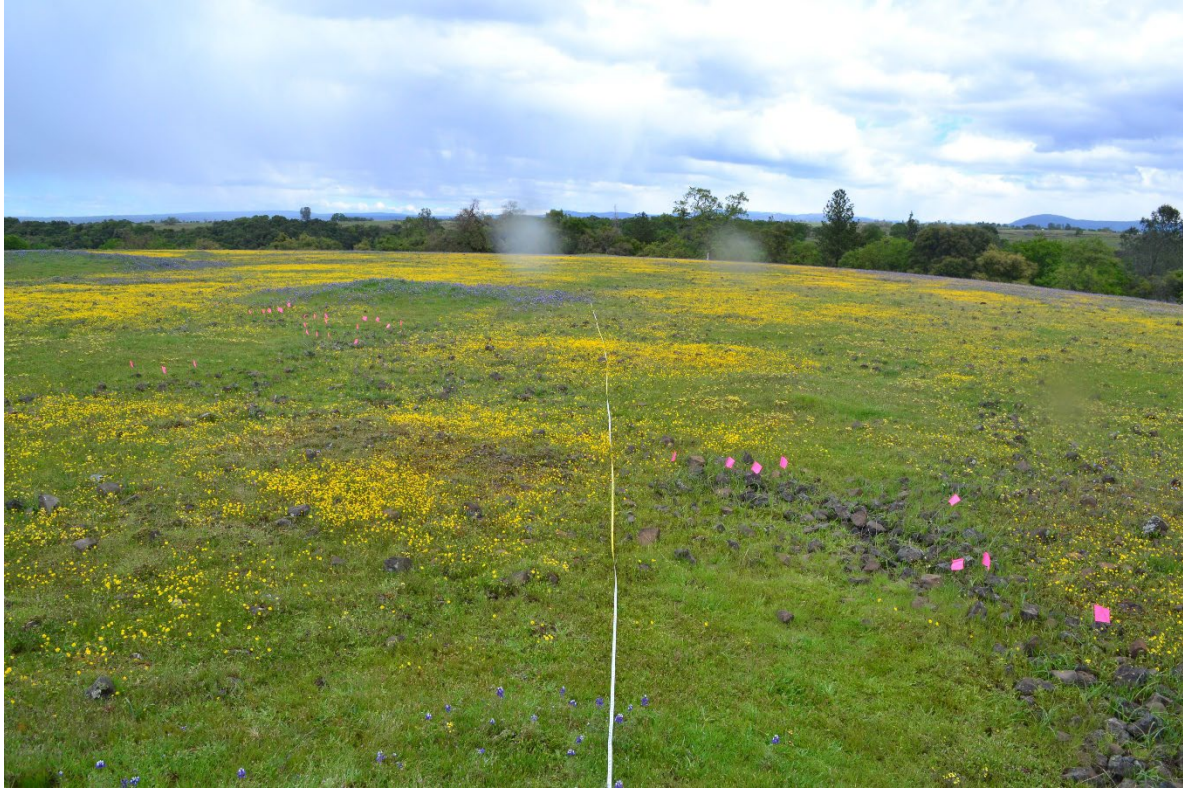


Figure 2. Photopoint Fm on March 28, 2016. Pink pin flags are locations of Butte County meadowfoam.



Figure 3. Photopoint Fm on April 6, 2017. Pink pin flags are locations of Butte County meadowfoam.



Figure 4. Photopoint Fm on October 27, 2017 showing the aftermath of the Cherokee Fire



Figure 5. Photopoint Fm on March 30, 2018. Pink pin flags are locations of Butte County meadowfoam.



Figure 6. Photopoint Fm on April 16, 2019. Pink pin flags are locations of Butte County meadowfoam.



Figure 7. Photopoint Fm on April 8, 2020. Pink pin flags are locations of Butte County meadowfoam.



Figure 8. Photopoint Fm on April 6, 2021. Pink pin flags are locations of Butte County meadowfoam.



Figure 9. Photopoint Fm on April 7, 2022. Pink pin flags are locations of Butte County meadowfoam.



Figure 10. Photopoint Fm on April 12, 2023. Pink pin flags are locations of Butte County meadowfoam.