

San Mateo Thornmint (*Acanthomintha duttonii*) Restoration Project



Status Report, December 2015



Christal Niederer
Creekside Center for Earth Observation
27 Bishop Lane
Menlo Park, CA 94025
www.creeksidescience.com

Executive Summary

San Mateo thornmint seeding took place December 2014. Funded through a CitizenInvestor effort spearheaded by the San Mateo County Parks Foundation, 30 square meter plots were seeded with 250 seeds each (7500 seeds total). By May 2015, the total population of thornmint increased from 608 to 1134. The increase, while positive, is smaller than the increase that took place after previous seeding efforts. Plants that did survive, however, were relatively large and robust, probably due to some supplemental irrigation. Space occupied reached its highest amount since the project began.

While San Mateo thornmint still persists, and the total population increased in 2015 compared with 2014, numbers have not increased to historic highs, and are below the USFWS-approved goal of 5000 or more individuals. Many believe the current site may no longer be able to support a self-sustaining San Mateo thornmint population because of changed hydrology (a vee ditch on Hillcrest Road likely diverts sheet flow away from the site), invasion of nonnative grasses (possibly a relic from nitrogen inputs from uphill septic tanks), or other factors. In any case, a small, single site is vulnerable to climate change or stochastic events. Additional introductions to San Francisco Water Power and Sewer (aka San Francisco Public Utilities Commission) property continue to stall. With funding from Friends of Edgewood, additional serpentine vertisol sites at Edgewood were mapped and prioritized. In December 2015, the top four sites (including the existing site) received 5000 seeds, for a total of 20,000 seeds.

Bare ground decreased at the original site this year, and both nonnative and native vegetation increased. Mowing took place May 2015, but fall dethatching was not deemed necessary. Mowing (and likely dethatching) should likely continue in spring 2016.

We remain grateful to Friends of Edgewood, San Mateo County Parks Foundation, and our CitizenInvestors for continuing funding of this project. We also appreciate our partners at San Mateo County Parks for mowing and other support; our volunteers and staff from the UC Berkeley Botanical Garden, Friends of Edgewood, California Native Plant Society; as well as California Department of Fish and Wildlife and the U.S. Fish and Wildlife Service.

Introduction

Acanthomintha duttonii (Abrams) Jokerst (San Mateo thornmint) is a federal and state endangered annual mint known from only one extant population in Edgewood County Park and Natural Preserve in San Mateo County, CA. This one population has been in decline for years. Pavlik and Espeland (1998) estimated over 53,000 individuals in 1994, and only 249 individuals were censused in 2008. A restoration project began in 2008 with the goal of conducting habitat enhancement experiments at the existing site, conducting habitat suitability surveys for potential introductions, collecting and banking seed from the existing population, and initiating a seed increase program. One major success of this project has been four years of seeding at Edgewood, resulting in a population high of 3,450 on May 24, 2011. Details on the project to that point can be found in previous status reports.

Soil Coring

To determine whether a thornmint seedbank exists, we collected soil cores adjacent to extant and in historical sites in 2014. Cores were grown out to determine whether any of the seeds within are thornmint, or even other species that are no longer found at the site. The purpose was to inform us of whether a thornmint seedbank exists, about how long dormant seeds may remain viable, at what

depths those seeds can be found, and whether the surrounding vegetation community has changed. No thornmint emerged from the cores, only a few still commonly found species. This portion of the project has been discontinued indefinitely.

Weather Data

The last four growing seasons have been drought conditions (Table 1), with no measurable precipitation in January 2015. Pavlik and Espelund (1998) noted a general trend of higher thornmint numbers and seed yields in years of average or below average precipitation. It may be that monthly precipitation patterns are more important than seasonal totals, which are provided as a point of reference. Temperatures in the key spring months have been warmer than average in the last three years, which could contribute to premature senescence (Table 2).

Table 1. Yearly precipitation for nearby Pulgas Ridge (WRCC 2015), compared with the 1981-2010 baseline average of 48.1 cm (WestMap 2014).

	Yearly Precipitation (cm)
Oct 2006-Sep2007	31.1
Oct 2007-Sep2008	46.1
Oct 2008-Sep2009	50.2
Oct 2009-Sep2010	70.1
Oct-2010-Jun 2011	72.8
Oct 2011-Sep2012	41.4
Oct 2012-Sep2013	40.1
Oct 2013-Sep2014	23.3
Oct 2014-Sep2015	44.9

Table 2. March and April temperature data for nearby Pulgas Ridge (WRCC 2015), compared with the 1981-2010 baseline average (WestMap 2014).

	March	April
2007	21.2	20.1
2008	19.1	20.1
2009	18.5	20.4
2010	18.9	18.3
2011	15.8	17.6
2012	16.0	19.5
2013	19.7	22.4
2014	20.4	21.6
2015	22.6	21.0
Average 1981-2010	18.6	20.7

Seeding Efforts and Population Status

December 2014

Methods

A fundraiser by CitizenInvestor (spearheaded by the San Mateo County Parks Foundation) procured resources to plant 30 square meter plots, which were seeded with 250 seeds each (7500 seeds total) on December 9, 2014 (Figure 1). The plots were initially scraped clear of nonnative

grass and other annual vegetation with a McLeod, then seeds were broadcast and tamped in. Twenty-eight of the plots were uphill of and next to existing plants. Two were established downhill where the original smaller extirpated thornmint colony was located (S. Sommers pers. obs.).

Heavy rains soon after seeding washed some seeds downhill, as evidenced by plants later found in drainages downhill of the plots. The soil cracking and drought stress of the rainless January 2015 likely took a toll on new germinants. Nearby Friends of Edgewood supporters Carolyn Strange and Peter Alley generously donated water during a year of rationing. A system of hoses was set up from their home, across the street to the thornmint site, and a Creekside technician watered each of the thirty 2014 seeded plots with about two gallons four times, roughly once a week March 15 to April 9.

The wild population and cohorts 1 (seeded November 2009) and 2 (seeded December 2010) received no treatments.

Figure 1. Setting up seeding plots.



Photo by Lech Naumovich

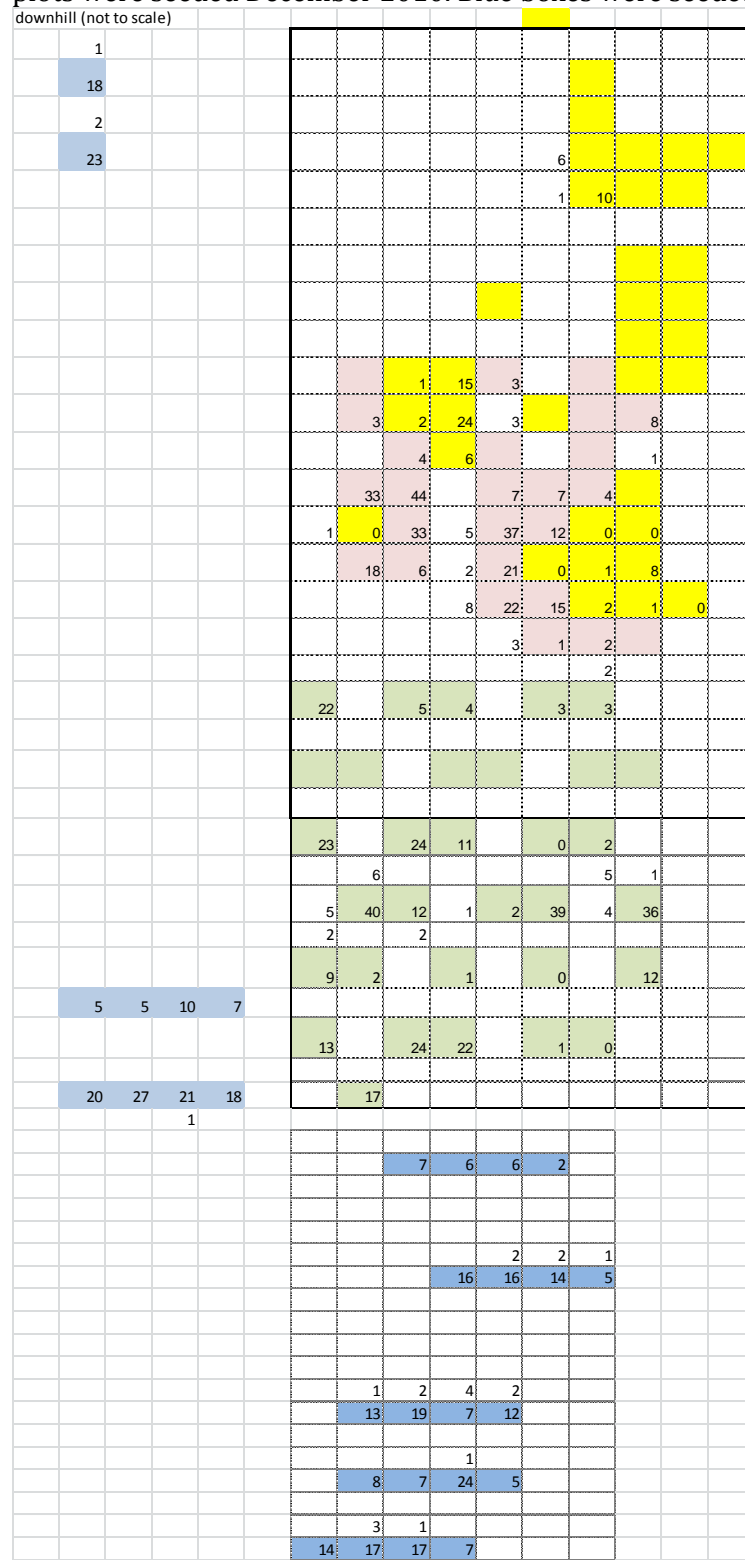
Results

The total population of San Mateo thornmint nearly doubled after this year of seeding. Areal occupancy reached its highest amount since the project began. The untreated population about doubled, but remains at a very low number of only 102 plants. Cohort 1 increased on its own, while cohort 2 decreased. Only 399 plants survived in cohort 3 (out of 7500 seeds, or 5.3%) (Table 3). Again, we assume early drought stress took its toll during the rainless January. Plants that did survive, however, were relatively large and robust, probably due to the supplemental irrigation. The layout of the survivors is shown in Figure 2.

Table 3. Summary of San Mateo thornmint survivorship

	Untreated	Cohort 1 planted Nov 2009	Cohort 2 planted Dec 2010	Cohort 3 planted Dec 2014	Total Plants	Occupied m2
2007	499				499	44
2008	249				249	33
2009	395				395	35
2010	250	2885			3135	55
2011	219	1815	1416		3450	102
2012	58	641	235		934	76
2013	61	411	403		875	70
2014	53	182	373		608	79
2015	102	280	353	399	1134	113

Figure 2. Thornmint individuals per square meter. Yellow boxes were occupied in 2008 and represent untreated (wild) population. Pink boxes represent plots seeded November 2009. Green plots were seeded December 2010. Blue boxes were seeded December 2014.



December 2015

Methods

While San Mateo thornmint still persists, and the total population increased in 2015 compared with 2014, numbers have not increased to historic highs. Many believe the current site may no longer be able to support a self-sustaining San Mateo thornmint population because of changed hydrology (a vee ditch on Hillcrest Road likely diverts sheet flow away from the site), invasion of nonnative grasses (possibly a relic from nitrogen inputs from uphill septic tanks), or other factors. In any case, a small, single site is vulnerable to climate change or stochastic events.

Creekside Science has been working with San Francisco Water Power and Sewer (aka San Francisco Public Utilities Commission) to do introductions on their property (Triangle and Pulgas Ridge). Although a funded contract was signed in 2011, a Notice to Proceed has not been provided. While staff biologists are supportive of the project, upper management is reticent to introduce a new endangered species on their property, due to concerns that regulatory agencies might limit their regular activities, penalize them if the project is not successful, or impose other financial obligations.

With funding from Friends of Edgewood, Creekside Science mapped 19 additional serpentine vertisol sites at Edgewood and prioritized them as potential seeding areas. The top four sites were selected based on presence of cracking, amount of naturally occurring bare ground (i.e., minimal management necessary to maintain habitat), vegetative associates (including lack of invasives), size, and general dispersion throughout the preserve. The top four sites are labeled 4, 11, 13, and 16 in Figure 3. Site 4 is adjacent to the existing population.

On December 4, 2015, each of four sites (including the existing site) received 5000 seeds. At each site, twenty square meter plots were installed, lightly scraped with a McLeod, and 250 seeds were broadcast onto each plot. A total of 20,000 seeds were installed at Edgewood. No tamping was done this year, as the sticky vertisols tended to adhere to the tamping tool, raising the concern that seeds could be removed from the plot.

Results

All sites will be sampled or censused for survivorship in May 2016.

Habitat Monitoring

Methods

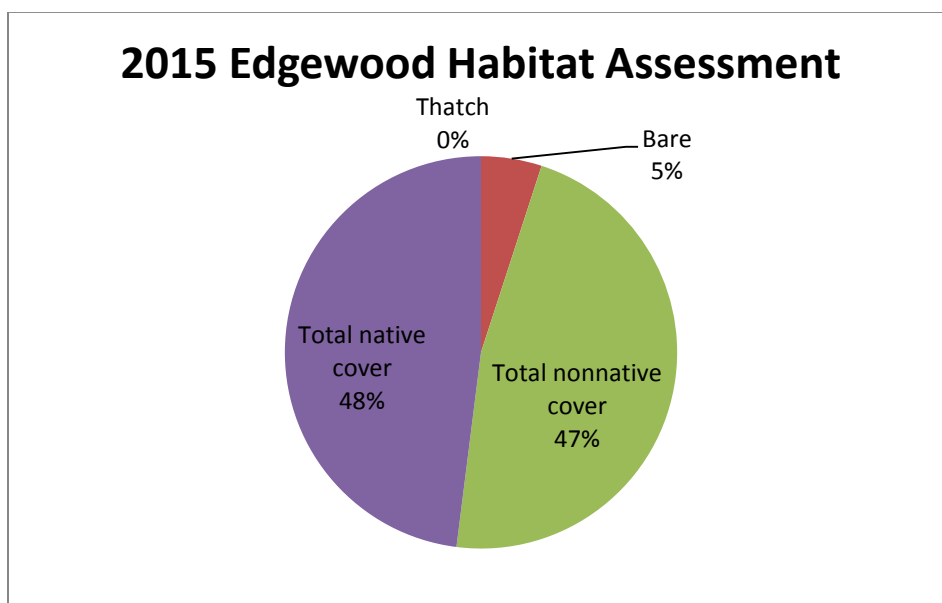
A 100-m tape is stretched haphazardly through unoccupied habitat adjacent to extant plants. A minimum of 100 point intercept points are collected. Hits are identified as bare, thatch, or to vegetative species. Monitoring is done at the height of the growing season, usually May.

Results

Bare cover is 5%, below the 20% minimum. Bare was 31% in 2014. Thatch was 0%, probably due to high vegetative cover. Total nonnative cover increased from 18% to 47%, driven by nonnative annual grass. Nonnative and thatch cover therefore is 47%, above the maximum objective of 30% cover, and up from 33% in 2014. Native cover also increased, to 48% from 36% last year (Figure 4).

Even though 2015 was very dry, nonnative annual grass (and other plants) did well and reduced bare ground. Mowing (and dethatching) did not take place in 2014 based on the previous year's high quality habitat assessment. Mowing (but not dethatching) did take place in May 2015. Mowing (and likely dethatching) should continue in 2016.

Figure 4.



Edgewood Colony Annual Objectives

Objectives for the species and for the extant Edgewood colony were presented in Niederer et al. (2010) and approved by the U.S. Fish and Wildlife Service. The main species objective is to have five self-sustaining populations of at least 5000 individuals each. To date, this has not been met.

The objectives for the original Edgewood colony are shown in Table 4. Minimum population levels have not been met. Both occupancy objectives were met in the last two years. The habitat quality objectives have been met in the past, but were not met in 2015.

Table 4. Edgewood colony objectives (Niederer et al. 2010)

Objective	2010	2011	2012	2013	2014	2015
Maintain a minimum of 5000 individuals	3135	3450	934	875	608	1134
Occupy minimum 75 square meters	55	102	76	70	79	113
Maintain minimum 40 square meters above 2007 occupied line	3	33	35	36	49	74
Minimum 20% bare	4.6	8	18.5	9	31	5
Maximum 30% nonnative plant and thatch	60.1	87.8	42.1	16	33	47

New Threats

Native parasitic dodder (*Cuscuta californica*) infested the thornmint site this year. While mainly concentrating on the native hayfield tarweed (*Hemizonia congesta* ssp. *luzulifolia*), plants were also found parasitizing thornmint. It seemed like 2015 was a big year for dodder throughout the grasslands of the preserve.

Dodder was manually removed on several occasions from the thornmint site by Creekside and volunteers. Approximately 5 contractor bags were filled. Efforts to detangle the dodder from the plants it was parasitizing proved impossible. Entire tarweed plants were removed. Thornmints were ignored until they senesced, then infected (and dead) plants were removed, with care taken to ensure any thornmint seeds stayed immediately on site. While the vast majority of dodder was removed, it is unlikely all plants were removed before seedset, and follow up will need to occur in subsequent years.

Seed Increase and Collection

The UC Botanical Garden produced 75,000 seeds in 2014, with no further efforts made in 2015. No seed collection took place in 2015 because the population was small and because the UC Botanical Garden at Berkeley currently has more than 150,000 seeds from this project.

Conclusion

The remaining San Mateo thornmint population has increased slightly with another year of seeding and with some supplemental irrigation. We are especially excited to be seeding new areas of Edgewood this year. Establishing new colonies appears key to preventing extinction of this species. We remain grateful to Friends of Edgewood, San Mateo County Parks Foundation, and our CitizenInvestors for continuing funding of this project. We also appreciate our partners at San Mateo County Parks for mowing and other support; our volunteers and staff from the UC Berkeley Botanical Garden, Friends of Edgewood, California Native Plant Society; as well as California Department of Fish and Wildlife and the U.S. Fish and Wildlife Service.

References

Niederer, C., S. Weiss, and H. Forbes. 2010. San Mateo thornmint (*Acanthomintha duttonii*) restoration project at Edgewood County Park and Natural Preserve. Year 2, Quarter 4. Status Report and Draft Adaptive Management Plan. April 13, 2010. Prepared for U.S. Fish and Wildlife Service.

Pavlik, B. and E. Espeland. 1998. Demography of natural and reintroduced populations of *Acanthomintha duttonii*. Demographic performance at Pulgas Ridge and Edgewood Park. Report prepared for Endangered Plant Program, California Department of Fish and Game. 25 pp.

Western Regional Climate Center (WRCC). 2015. Monthly current rain data taken from Pulgas Ridge. Accessed on December 11, 2015.
<http://www.raws.dri.edu/cgi-bin/rawMAIN.pl?caCPUL>.

Westmap. 2015. Climate Analysis and Mapping Tool. Accessed on November 16, 2015.
http://www.cefa.dri.edu/Westmap/Westmap_home.php