**Recovery Plan for *Eriogonum ovalifolium* var. *williamsiae* (Steamboat buckwheat)**
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**Original Approved:** September 29, 1995
**Original Prepared by:** Nevada State Office

## RECOVERY PLAN AMENDMENT

We have identified best available information that indicates the need to amend recovery criteria for *Eriogonum ovalifolium* var. *williamsiae* (Steamboat buckwheat) since the recovery plan was completed. In this modification, we synthesize the adequacy of the existing recovery criteria, show amended recovery criteria, the rationale supporting the recovery plan modification, and analyses of the most recent monitoring data. The modification is shown as an addendum that supplements the recovery plan, superseding only p. iii of the recovery plan.

**For**
**U.S. Fish and Wildlife Service**
**Pacific Southwest Region**
**Reno, Nevada**

**October 2019**

Approved: _____

Acting Regional Director, Pacific Southwest Region
U.S. Fish and Wildlife Service

Date: 12/10/19

## METHODOLOGY USED TO COMPLETE THE RECOVERY PLAN AMENDMENT

This amendment was prepared by the Reno Fish and Wildlife Office. We used information in our files, data from the Bureau of Land Management (BLM), the Nevada geospatial database maintained by Nevada Natural Heritage Program, and information from species experts. The amended criteria were peer reviewed in accordance with the OMB Peer Review Bulletin following the publication of the Notice of Availability.

## ADEQUACY OF RECOVERY CRITERIA

Section 4(f)(1)(B)(ii) of the Endangered Species Act (Act) requires that each recovery plan shall incorporate, to the maximum extent practicable, "objective, measurable criteria which, when met, would result in a determination…that the species be removed from the list." Legal challenges to recovery plans (see Fund for Animals v. Babbitt, 903 F. Supp. 96 (D.D.C. 1995)) and a Government Accountability Audit (GAO 2006) also have affirmed the need to frame recovery criteria in terms of threats assessed under the five factors.

### Recovery Criteria

See previous version of criteria on p. iii of the Recovery Plan for *Eriogonum ovalifolium* var. *williamsiae*, available here.

### Synthesis

*Eriogonum ovalifolium* var. *williamsiae* is a low, densely matted, compact perennial plant in the buckwheat family (Polygonaceae). This species is known from a single population in Washoe County, Nevada located approximately 10 miles south of Reno. *Eriogonum ovalifolium* var. *williamsiae* is endemic to substrates derived from hot springs deposits known as sinter in the Steamboat Hills, which is an area of significant geothermal activity that once featured the largest concentration of geysers in the United States outside of Yellowstone National Park (BLM 1983). The species occupies a total of approximately 50 acres in an area of approximately 250-370 acres on lands that are managed by the Bureau of Land Management, State of Nevada, and private owners (Service 2009). About half of the lands occupied by *E. ovalifolium* var. *williamsiae* are private and under a 30-year lease by Ormat Technologies Inc. for geothermal power production. The remainder of its habitat occurs on lands under management by the BLM including the Steamboat Hot Springs Geyser Basin Area of Critical Environmental Concern (ACEC; Service 1995), proposed to be changed to the Steamboat Buckwheat Botanical ACEC (that will cover all occupied habitat for the species on BLM land) in the Carson City BLM Resource Management Plan Revision (BLM 2014).

The overall distribution of *E. ovalifolium* var. *williamsiae* has changed little since the time of listing in 1986. At the time of our last 5-Year Review, the recovery priority number was raised from 6c to 3 because threats to the species remain high, but biological and ecological needs of *E. ovalifolium* var. *williamsiae* are better understood than they were at the time of listing (Service 2009). One of the threats identified in the original listing rule has not materialized (i.e. development of a park on a BLM parcel leased to the Washoe County Parks and Recreation Department), while others (i.e. off-road vehicle activity, refuse dumping, and potential mining) have had less dire consequences than predicted due to fencing of the geothermal site (Service

2009). Other threats identified at the time of listing – drilling of geothermal test wells, commercial development on private lands adjacent to a colony of plants, and changes in moisture availability – continue to be of concern. There is also long-term concern over the sustainability of the habitat upon which the *E. ovalifolium* var. *williamsiae* depends because deposition of the sinter has been suspended or permanently stopped with the ceasing of hot spring activity, which is likely related to numerous factors including geothermal production, drawdown of the regional groundwater table resulting from increased domestic and municipal use, and possible lack of recharge due to drought (Service 2009). In 2011, an eleven-acre private parcel was transferred to the State of Nevada, of which 6.7 acres are occupied by *E. ovalifolium* var. *williamsiae* (C. Clark, unpublished data 2004, Washoe County 2018). In 2017, BLM parcels occupied by *E. ovalifolium* var. *williamsiae* were leased with a no surface occupancy stipulation for geothermal resources, however, there is potential for geothermal exploration and/or development activities to indirectly impact the species through surface water flows and altering soil conditions (BLM 2017, BLM 2018).

Various estimates of the abundance of *Eriogonum ovalifolium* var. *williamsiae* have been made over the 32 years since the plant was listed. These estimates have ranged from 10,000 to 15,000 individual plants in the final rule listing the species (Service 1986) to 85,000 plants by Knight (1997), to 200,000 plants by Morefield (2001). Knight 1993 noted that a precise enumeration of individual plants is infeasible because the species is rhizomatous and propagates primarily by vegetative runners.

In 2003, a monitoring program was implemented with sampling conducted along permanent transects in two areas within the population – one in the Central Drainage and the other on the Main Terrace (Pavlik 2002, Pavlik and Stanton 2003). Data were collected in May 2003, June 2005, and July 2017. On the Central Drainage, all size classes of *Eriogonum ovalifolium* var. *williamsiae* have been declining since 2003, especially smaller plants. On the Main Terrace, both small and medium sized plants have been declining, while larger plants have been increasing since baseline measurements in 2003. Additionally, though not identified as a threat at the time of listing, nonnative weed species have started to colonize the sinter substrate. Though weed cover is low, *Bromus tectorum* (cheatgrass) on the Central Drainage and *Vulpia myuros* (rattail fescue) on the Main Terrace have increased over time. Cover of trees, shrubs, and perennial grasses have remained unchanged over the 14-year period of monitoring data, suggesting that colonization by other native species in this habitat is not occurring. Further monitoring results are discussed in Appendix A.

In 1993, the Nature Conservancy developed the *Steamboat Buckwheat Management Plan* (Knight 1993). However, the plan is limited in scope to the private land under lease for the geothermal power production and limited in time from 1991–2021. In 2005, Pavlik *et al.* developed *A Management Plan for the Steamboat Buckwheat* that covers all lands occupied by *Eriogonum ovalifolium* var. *williamsiae* and offered a vision of restoration of the Steamboat Springs geothermal ecosystem for public enjoyment and education through restoration of ecosystem integrity in a way that sustains power production. However, implementation of the plan in full has not been achieved. Some aspects of the plan (i.e. public education and access opportunities) are unlikely to be implemented because of safety concerns with allowing public access by the geothermal company (Service 2009).

## AMENDED RECOVERY CRITERIA

Recovery criteria serve as objective, measurable guidelines to assist in determining when an endangered species has recovered to the point that it may be downlisted to threatened, or that the protections afforded by the Act are no longer necessary and *Eriogonum ovalifolium* var. *williamsiae* may be delisted. Delisting is the removal of a species from the Federal Lists of Endangered and Threatened Wildlife and Plants. Downlisting is the reclassification of a species from an endangered species to a threatened species. The term "endangered species" means any species (species, sub-species, or distinct population segment (DPS)) which is in danger of extinction throughout all or a significant portion of its range. The term "threatened species" means any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Revisions to the Lists, including delisting or downlisting a species, must reflect determinations made in accordance with sections 4(a)(1) and 4(b) of the Act. Section 4(a)(1) requires that the Secretary determine whether a species is an endangered species or threatened species (or not) because of threats to the species. Section 4(b) of the Act requires that the determination be made "solely on the basis of the best scientific and commercial data available." Thus, while recovery plans provide important guidance to the Service, States, and other partners on methods of minimizing threats to listed species and measurable objectives against which to measure progress towards recovery, they are guidance and not regulatory documents.

Recovery criteria should help indicate when we would anticipate that an analysis of the species' status under section 4(a)(1) would result in a determination that the species is no longer an endangered species or threatened species. A decision to revise the status of or remove a species from the Federal Lists of Endangered and Threatened Wildlife and Plants, however, is ultimately based on an analysis of the best scientific and commercial data then available, regardless of whether that information differs from the recovery plan, which triggers rulemaking. When changing the status of a species, we first propose the action in the *Federal Register* to seek public comment and peer review, followed by a final decision announced in the *Federal Register*.

Downlisting criteria were included in the Steamboat Buckwheat Recovery Plan (Service 1995). We provide delisting criteria for *Eriogonum ovalifolium* var. *williamsiae*, which were not included in the Steamboat Buckwheat Recovery Plan, as follows:

**Current Downlisting Recovery Criteria (from original recovery plan)**
Downlisting for *Eriogonum ovalifolium* var. *williamsiae* can be considered when:

1. Protective conservation easements or fee acquisitions secure approximately 185 acres of occupied habitat currently in private ownership;
2. Cooperative agreements are established for approximately 80 acres of occupied public lands and approximately 37 acres of occupied State lands within a highway easement; and
3. Comprehensive management plans have been developed and implemented on all occupied habitat.

**Delisting Recovery Criteria (amended recovery criteria)**
Delisting may be warranted when the current downlisting criteria have been met and the species exhibits sufficient resiliency, redundancy, and representation to support long-term viability.

When all downlisting criteria have been met for *Eriogonum ovalifolium* var. *williamsiae,* it can be considered for delisting if all three of the additional measures described below are attained:

1. Threats are reduced or eliminated so that the species is capable of persisting without substantial human intervention or perpetual endowments are secured for management necessary to maintain the continued existence of the species. Outstanding management needs include: a) implementing the monitoring protocol, b) updating and renewing the *Steamboat Buckwheat Management Plan* (Knight 1997), c) controlling competition with nonnative weeds, and d) exploring potential methods of restoration of geothermal processes that maintain and create habitat.

2. All size classes are represented, the population is increasing or stable, and management objectives identified in the monitoring protocol are achieved (Pavlik 2002, Pavlik and Stanton 2003). Monitoring objectives were developed to detect and document 1) trends in the numbers of *Eriogonum ovalifolium* var. *williamsiae* plants in characteristic habitats, 2) the frequency and contribution of episodic reproduction to population stability, and 3) successional changes in common species that comprise the plant community of Steamboat Hills. Monitoring objectives are as follows:
    a. *Eriogonum ovalifolium* var. *williamsiae* in the Main Terrace and Central Drainage habitats are within ± 15% of their 2003 baseline levels after five and ten consecutive years of monitoring with a 95% level of confidence.
    b. *Eriogonum ovalifolium* var. *williamsiae* in the Main Terrace and Central Drainage habitats each produce a significant cohort of seedlings (20% of the mean density in a given subpopulation in a given year is contributed by "seedlings") at least once during five consecutive years of monitoring (or twice in ten years) with a 95% level of confidence.
    c. Total live absolute cover by subpopulations of common shrubs [e.g. *Artemisia tridentata* (sagebrush), *Atriplex confertifolia* (shadscale), *Chrysothamnus nauseosus* (rabbitbrush), *Purshia tridentata* (bitterbrush)], perennial grasses [e.g. *Poa secunda* (bluegrass), *Leymus cinereus* (Great Basin wildrye)], and weeds [e.g. *Bromus tectorum* (cheatgrass)], as well as *E. ovalifolium* var. *williamsiae* are within ± 15% of their 2003 baseline levels after five and ten consecutive years of monitoring with a 95% level of confidence.

3. The *ex situ* seedbank is maintained through the collection of fresh seed from *Eriogonum ovalifolium* var. *williamsiae* plants every 10 years. Collections that are spread over time produce lower extinction risk to wild populations, while maintaining a species' genetic variation within an *ex situ* seedbank (Menges *et al.* 2004). The *ex situ* seedbank is currently maintained with Center for Plant Conservation-affiliated botanic garden, the Rae Selling Berry Seed Bank and Plant Conservation Program at Portland State University (formally the Berry Botanic Garden). Currently, the *ex situ* seedbank holds approximately 23,000 viable seeds from collections made from 1992-1995 in long-term

storage (i.e. freezer). In 1999, a germination trial on a sample of these seeds found greater than 70% germination (E. Guerrant, Rae Selling Berry Seed Bank, pers. comm. 2018a, E. Guerrant, unpubl. data, 2018b).

**Rationale for Amended Recovery Criteria**

We have amended the recovery criteria for *Eriogonum ovalifolium* var. *williamsiae* to include delisting criteria that incorporates the biodiversity principles of representation, resiliency, and redundancy (Schaffer and Stein 2000) and threats addressed under the five factors. The amended criteria were developed based on the Service's current understanding of the species needs and requirements. This understanding includes information gathered since the original recovery plan was published, such as recent population monitoring and trends, along with an updated understanding of threats affecting this species. The criteria presented are based on an improved understanding of biological and ecological factors and the reduction of threats to the species; they include a temporal aspect to ensure that the species is resilient to expected variation within a reasonable time frame.

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## APPENDIX A: Monitoring Results for *Eriogonum ovalifolium* var. *williamsiae*

Appendix A describes results from 2003, 2005, and 2017 monitoring of *Eriogonum ovalifolium* var. *williamsiae* in the Central Drainage and Main Terrace permanent transects established in 2003. Monitoring was only conducted in these years. The Central Drainage is a shallow, ephemeral drainage basin with deep colluvial sinter soils that support high densities of *E. ovalifolium* var. *williamsiae.* It contrasts sharply with the Main Terrace, which is a largely un-vegetated expanse of exposed sinter bedrock with little soil development and smaller numbers of *E. ovalifolium* var. *williamsiae* individuals. Until the mid-1980s, the Main Terrace was the location of several geysers that expelled boiling waters dozens of meters into the air. The monitoring program and sampling procedure is described in Pavlik and Stanton 2003. The monitoring program specifies that transects should be monitored at 5 and 10 years post-installation in 2003. However, an interim monitoring event occurred in 2005 to record a possible recruitment event due to a very wet precipitation year. Monitoring did not occur again until 2017 - 14 years post-installation.

### Data Analysis

For the Central Drainage, in 2003, *Eriogonum ovalifolium* var. *williamsiae* data were collected along 16 established transects (0, 6, 10, 17, 25, 27, 35, 37, 44, 49, 51, 53, 87, 89, 94, 99). In 2005, data were collected along 8 of the 16 transects (0, 6, 35, 37, 87, 89, 94, 99). In 2017, data were collected along 16 transects (0, 6, 10, 17, 25, 27, 35, 37, 44, 46, 51, 53, 87, 89, 94, 99); however, one transect differed from what was established in 2003. For the purposes of this analysis, data was analyzed on 7 of the 16 transects that were consistent across all three years. For 2003, 2005, and 2017, weed cover data was collected and analyzed for five transects (17, 35, 46, 51, 87). For 2003 and 2017, vegetative functional group cover data was collected and analyzed along 16 transects listed above for 2017.

For the Main Terrace, in 2003, *Eriogonum ovalifolium* var. *williamsiae* data were collected along 20 established transects (1, 4, 16, 19, 23, 28, 32, 37, 41, 46, 50, 52, 60, 69, 72, 75, 86, 88, 91, 95). In 2005 and 2017, data were collected along these same 20 transects. For the purposes of this analysis, data was analyzed for all 20 transects because they were consistent across all three years. For 2003, 2005, and 2017, weed cover data was collected and analyzed for five transects (16, 32, 50, 69, 86). For 2003 and 2017, vegetative functional group cover data was collected and analyzed for the same 20 transects listed above.

Analyses were conducted using JMP version 14 statistical software (SAS Institute Inc., Cary, NC). For *Eriogonum ovalifolium* var. *williamsiae* data, differences in size class (<1 cm – seedling; 1-5 cm – small; 6-10 cm – medium; and >11 cm – large) were compared using a linear model to determine significance of a year (a fixed factor) by site. For weed (*Bromus tectorum*, *Vulpia myuros*, and other weeds) and vegetative functional group data (Tree/shrub, grass, and *E. ovalifolium* var. *williamsiae*), differences in percent cover were compared using a mixed model and the restricted maximum likelihood method to determine a significance of year (fixed) and transect (random) factors by site and species and/or functional group. All values presented are means and standard errors, and significance is determined by P values <0.05.

## Central Drainage

Across all size classes on the Central Drainage, the number of living (reproductive and non-reproductive) *Eriogonum ovalifolium* var. *williamsiae* plants has significantly differed over time (Figure 1). The number of *E. ovalifolium* var. *williamsiae* plants in the small size class (1-5 cm; $F_{2,18} = 4.1$, $P$=0.033) and medium size class (6-10 cm; $F_{2,18} = 5.2$, $P$=0.016) has decreased since the baseline survey in 2003. The number of *E. ovalifolium* var. *williamsiae* in the large size class has increased (> 11 cm; $F_{2,18}$= 27.8, $P$<0.001) since the baseline survey in 2003. However, since 2005, the number of small plants (1-5 cm) decreased by 57%, the number of medium plants (6-10 cm) decreased by 43%, and the number of large plants (>11 cm) decreased by 27% (Figure 1). Additionally, 290 seedlings (<1 cm) were observed in 2005, perhaps documenting a rare recruitment event for *E. ovalifolium* var. *williamsiae* due to an increased precipitation event. There were three seedlings observed in 2003 and nine seedlings observed in 2017.

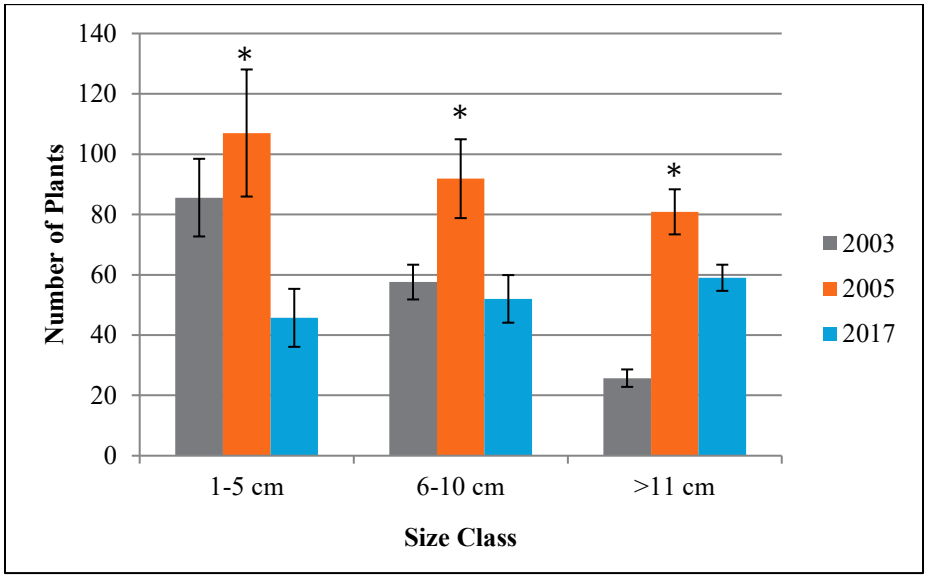


**Figure 1.** Change in size class distribution of living (reproductive and non-reproductive) *Eriogonum ovalifolium* var. *williamsiae* in the Central Drainage in 2003, 2005, and 2017. Results are from a linear model using the restricted maximum likelihood method to determine a significance of a fixed factor (year) by size class of living (reproductive and non-reproductive) *Eriogonum ovalifolium* var. *williamsiae* plants. Values are means (n=55) for each size class and standard errors. * indicates significant (P <0.05) differences among years, by size class.

Weed cover data in the Central Drainage is low, with less than 3% cover of all species. *Bromus tectorum* ($F_{2,158}$= 6.5, $P$=0.0019) cover has significantly increased over time. *Vulpia myuros* ($F_{2,158}$= 3.14, $P$=0.0457) cover has significantly decreased over time. Other weed species only covered <1% of the Central Terrace in 2005 ($F_{2,158}$= 1.0, $P$=0.3702; Figure 2).

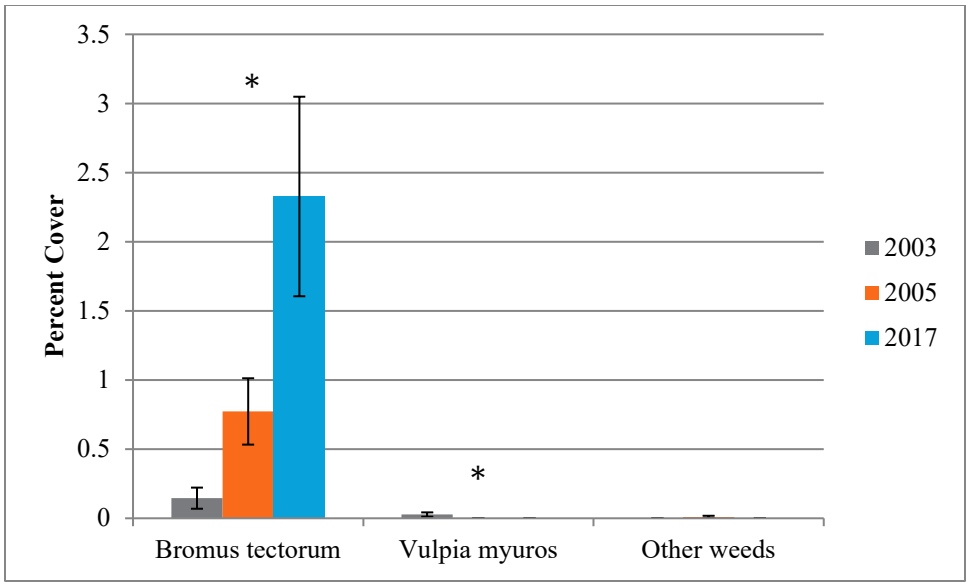


**Figure 2.** Percent cover of weed species in the Central Drainage in 2003, 2005, and 2017. Results are from a mixed model using the restricted maximum likelihood method to determine a significance of a fixed (year) and random (transect) factors by weed species. Values are means (n=55) and standard errors. * indicates significant (P <0.05) differences among years, by functional group or species.

Tree/shrub ($F_{1,15}$= 0.5644, *P*=0.4641) and grass ($F_{1,15}$= 0.0079, *P*=0.9302) cover has not significantly changed over time. The cover of *Eriogonum ovalifolium* var. *williamsiae* has increased over time ($F_{1,15}$= 7.76, *P*=0.0138; Figure 3).

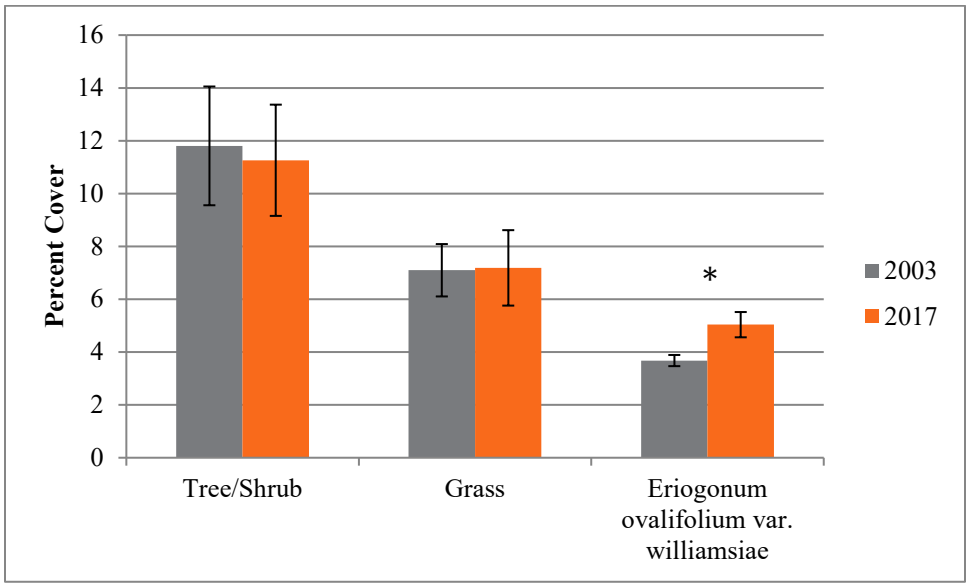


**Figure 3.** Percent cover of vegetative functional groups in the Central Drainage in 2003, 2005, and 2017. Results are from a mixed model using the restricted maximum likelihood method to determine a significance of a fixed (year) and random (transect) factors by weed species. Values are means (n=16) and standard errors. * indicates significant (P <0.05) differences among years, by functional group or species.

## Main Terrace

Only the medium size class (6-10 cm) of living (reproductive and non-reproductive) *Eriogonum ovalifolium* var. *williamsiae* plants on the Main Terrace has significantly differed over time (Figure 4). Though not significant, the number of *E. ovalifolium* var. *williamsiae* plants in the smallest size class (1-5 cm; $F_{2,57}$= 1.38, *P*=0.2587) has decreased since the baseline survey in 2003. The medium size class (6-10 cm; $F_{2,57}$ = 4.57, *P*=0.0143) of *E. ovalifolium* var. *williamsiae* plants has decreased since the baseline survey in 2003. Though not significant, the number of *E. ovalifolium* var. *williamsiae* plants in the largest size class (> 11 cm; $F_{2,57}$= 1.1, *P*=0.3393) has increased since both the baseline survey in 2003 and the 2005. Since 2005, the number of small plants (1-5 cm) decreased by 17%, the number of medium plants (6-10 cm) decreased by 25%, but the number of large plants (>11 cm) increased by 10% (Figure 4). Only one seedling (<1 cm) of *E. ovalifolium* var. *williamsiae* was found during sampling of the Main Terrace in 2003; seedlings were not observed in 2005 and 2017.

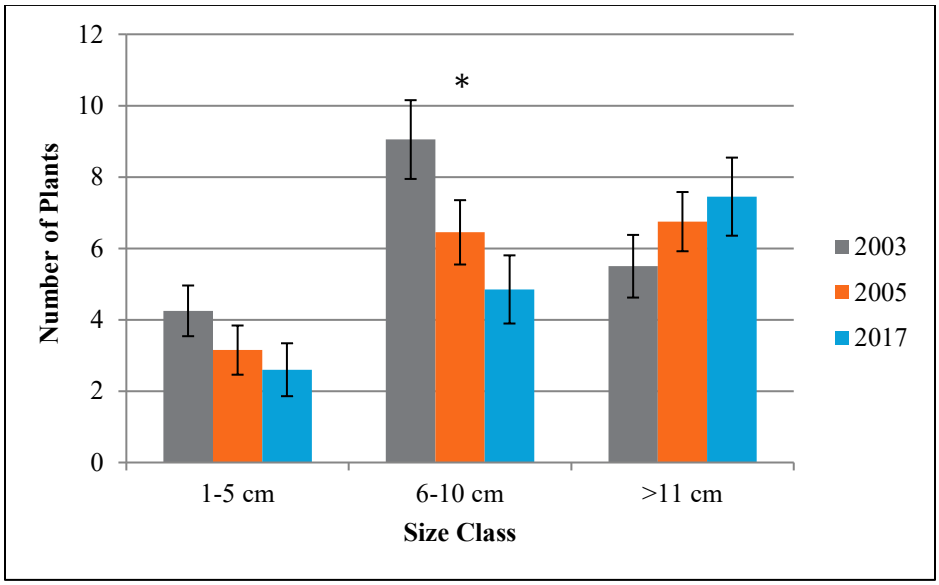


**Figure 4.** Change in size class distribution of living (reproductive and non-reproductive) *Eriogonum ovalifolium* var. *williamsiae* in the Main Terrace in 2003, 2005, and 2017. Results are from a linear model using the restricted maximum likelihood method to determine a significance of a fixed factor (year) by size class of living (reproductive and non-reproductive) *Eriogonum ovalifolium* var. *williamsiae* plants. Values are means (n=20) for each size class and standard errors. * indicates significant (P <0.05) differences among years, by size class.

Weed cover data in the Main Terrace is low, with less than 3% cover of all species. *Bromus tectorum* (cheatgrass; $F_{2,158}$= 0.3, *P*=0.6915) cover has remained stable over time. The cover of *Vulpia myuros* (rattail fescue; $F_{2,158}$= 4.78, *P*=0.0096) and other weeds ($F_{2,158}$= 32.47, *P*<0.0001) have significantly increased over time (Figure 5).

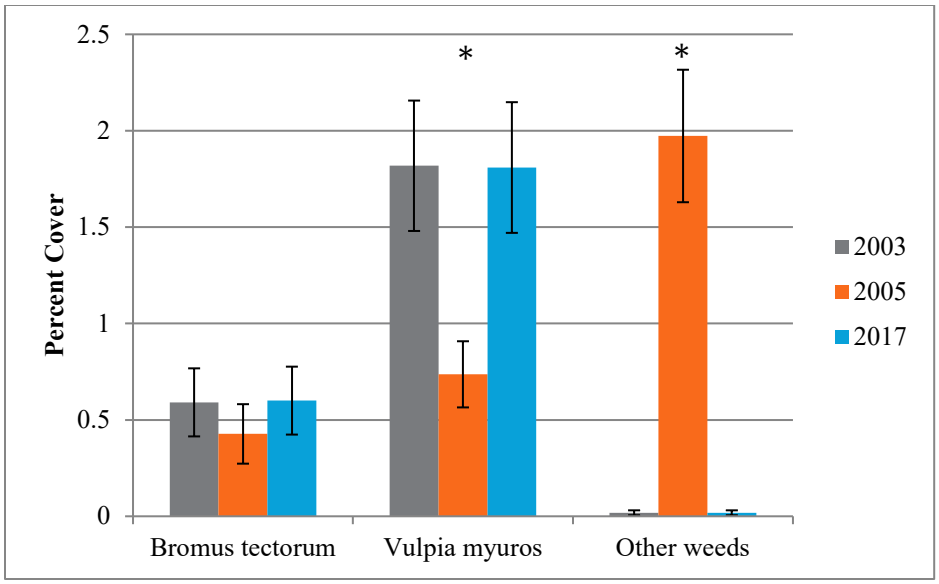


**Figure 5.** Percent cover of weed species in the Main Terrace in 2003, 2005, and 2017. Results are from a mixed model using the restricted maximum likelihood method to determine a significance of a fixed (year) and random (transect) factors by weed species. Values are means (n=55) and standard errors. * indicates significant (P <0.05) differences among years, by functional group or species.

Tree/shrub ($F_{1,19}$= 1.7071, *P*=0.2070) and grass ($F_{1,19}$= 0.7016, *P*=0.4126) cover has not significantly changed over time, continuing to remain sparse. The cover of *Eriogonum ovalifolium* var. *williamsiae* has increased, but not significantly, over time ($F_{1,19}$= 0.4997, *P*=0.4882; Figure 6).

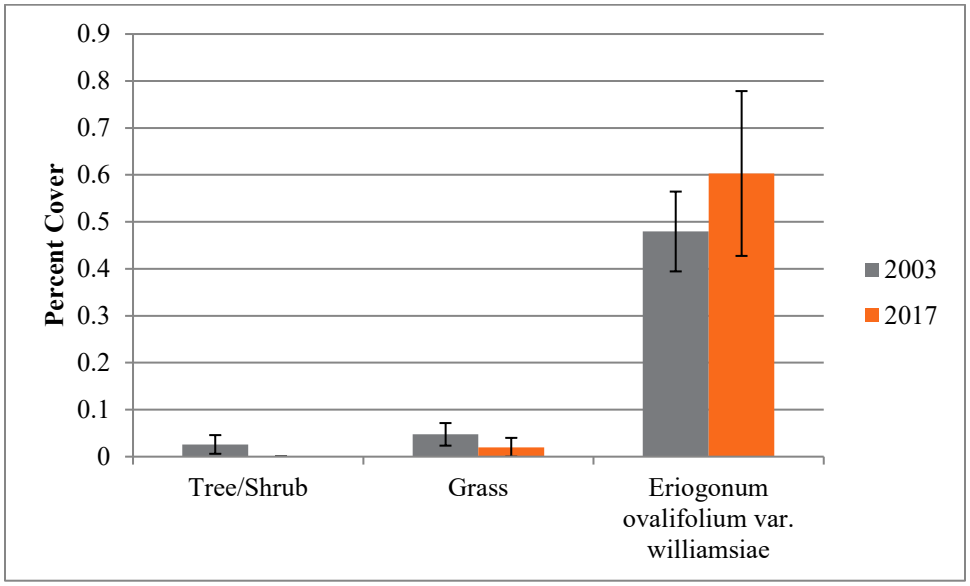


**Figure 6.** Percent cover of vegetative functional groups in the Main Terrace in 2003, 2005, and 2017. Results are from a mixed model using the restricted maximum likelihood method to determine a significance of a fixed (year) and random (transect) factors by weed species. Values are means (n=20) and standard errors.

## APPENDIX B: Summary of public, partner, and peer review comments received

### Summary of Public Comments

We published a notice of availability in the *Federal Register* on June 27, 2019 (84 FR 30760-30764) to announce that the draft recovery plan amendment for *Eriogonum ovalifolium* var. *williamsiae* was available for public review, and to solicit comments by the scientific community, State and Federal agencies, Tribal governments, and other interested parties on the general information base, assumptions, and conclusions presented in the draft revision. An electronic version of the draft recovery plan amendment was posted on the Service's Species Profile website (https://ecos.fws.gov/ecp0/profile/speciesProfile?sId=413). We also developed and implemented an outreach plan that included (1) publishing a news release on our national webpage (https://www.fws.gov/news/) on June 26, 2019, (2) sending specific notifications to Congressional contacts in Districts (NV-2), and (3) sending specific notifications to key stakeholders in conservation and recovery efforts. These outreach efforts were conducted in advance of the *Federal Register* publication to ensure that we provided adequate notification to all potentially interested audiences of the opportunity to review and comment on the draft recovery plan amendment.

We did not receive any comments in response to our request.

### Summary of Peer Review Comments

We solicited independent peer review of the draft recovery plan amendment for *Eriogonum ovalifolium* var. *williamsiae* in accordance with the requirements of the Act from State and Federal agencies and academic entities. Criteria used for selecting peer reviewers included their demonstrated expertise and specialized knowledge related to *E. ovalifolium* var. *williamsiae* biology, conservation, monitoring and ecology; buckwheat species biology, conservation, monitoring, and ecology; and seed collection, storage, and viability testing. The qualifications of the peer reviewers are in the decision file and the administrative record for this recovery plan amendment.

In total, we solicited review and comment from 5 peer reviewers. We received comments from two peer reviewers. Peer reviewers that responded included representatives from one Federal agency [Bureau of Land Management] and one academic entity [Rae Selling Berry Seed Bank and Plant Conservation Program]. In general, the draft recovery plan revision was well-received by the peer reviewers.

We considered all substantive comments, and to the extent appropriate, we incorporated the applicable information or suggested changes into the final revised recovery plan. Below, we provide a summary of specific comments received from peer reviewers with our responses; however, we addressed many of the reviewers' specific critiques and incorporated their suggestions as changes to the final revised recovery plan. Such comments did not warrant an explicit response, and as such, are not addressed here. We appreciate the input from all commenters, which helped us to consider and incorporate the best available scientific and commercial information during development and approval of the final revised recovery plan.

***Peer Review:***

*Peer Review Comment* (1): Please use recent (2017) mapped acres of occupied habitat on BLM lands.

*Response:* The Service did not use this estimate because it only covers BLM land and does not estimate occupied habitat on private or State lands. We used the best available estimate of occupied habitat that covers all lands occupied by *Eriogonum ovalifolium* var. *williamsiae* as described in Service 2009.

*Peer Review Comment* (2): What period of time is covered by the 30 year lease? Are there any provisions about what happens when the lease expires?

*Response:* The lease agreement is from 1991 to 2021. The Service and partnering agencies will re-visit this agreement in the coming year.

*Peer Review Comment* (3): What, if any, impact might this name change have on management?

*Response:* The proposed Steamboat Buckwheat Botanical ACEC is 80 acres and covers all occupied habitat for the species on BLM land. The Steamboat Hot Springs Geyser Basin ACEC only covers 40 acres of BLM land.

*Peer Review Comment* (4): What does it mean to go from 6c to 3? It seems to mean that the 3rd recovery potential, the "Certainty that management or protective actions will be effective" has gone from "Low to Moderate" to "High". Is this correct? And if so, it seems like things have gotten worse - https://www.federalregister.gov/documents/2017/05/31/2017-11157/endangered-and-threatened-species-listing-and-recovery-priority-guidelines

*Response:* As described in Service 2009, *Eriogonum ovalifolium* var. *williamsiae* continues to face a high magnitude of threat, but the species needs and biology are relatively well understood. The recovery priority number was raised from a 6c (high degree of threat and low recovery potential) to a 3 (high degree of threat and high recovery potential).

*Peer Review Comment* (5): What is the current status, and potential future of a park being developed?

*Response:* There is a low likelihood that a park will be developed in this area due to safety issues associated with the adjacent geothermal development.

*Peer Review Comment* (6): Are these figures meant to be taken at face value? If so, it seems like the population has enlarged greatly.

*Response:* Reliable estimates of population size or trends is complicated by several factors. Estimates of population size (in terms of abundance of individuals) have usually been obtained by different observers employing a variety of means and levels of survey effort. At one extreme,

observations consist of coarse estimates (e.g., individuals ranging from 0 to 100, 100 to 999, > 1,000, etc.); at the other extreme, they consist of meticulous counts of every plant present. Still other observers have estimated abundance by extrapolating from counts within a small portion of occupied habitat (delimited with or without the use of plots and/or transects, usually without random placement of these sampling units). Differences in the methods used to map populations create additional discrepancies, in that boundaries vary considerably in terms of the unoccupied (but presumed suitable) and/or buffer habitat included.

*Peer Review Comment* (7): Given their ability to spread vegetatively, is there a specific protocol for deciding what constitutes an individual? Are there any genetic studies that have specifically looked at or tried to quantify the incidence of asexual spread? Is it the dominant mode of increasing its numbers, or a minor one?

*Response:* Yes, per Pavlik and Stanton 2003, individuals are defined as apparently unconnected leafy stems (canopies) separated by more than 1 cm and a seedling is defined as any apparently established individual with a diameter of <1 cm that occurs more than 5 cm away from another *Eriogonum ovalifolium* var. *williamsiae* individual. Archibald *et al.* (2001) investigated the genetic structure of *E. ovalifolium* var. *williamsiae* using allozyme (protein) markers. This study showed that the species has relatively high genetic variability for a narrow endemic and does not appear to be inbreeding. The plant also reproduces vegetatively, but the clones appear to be small (less than 27 in (70 cm) each). However, the study was not designed to assess the extent of clonal growth in the population.

*Peer Review Comment* (8): The monitoring program was a pilot to determine the feasibility of collecting data on this species and to gather baseline data. It was not intended as a monitoring program in and of itself. Only two locations were selected. The Main Terrace is very sparsely populated with vegetation and represents the lowest density and cover of *Eriogonum ovalifolium* var. *williamsiae* plants. The Central Drainage is located on the very northern edge of occupied habitat on BLM. The density of *E. ovalifolium* var. *williamsiae*, relative to the Main Terrace and other areas, is in the upper-middle range while areas to the west and south of the Central Drainage have higher densities based upon my observations over the years. I feel that caution should be used in using this limited dataset in characterizing the habitat and demographics of *E. ovalifolium* var. *williamsiae*.

*Response:* We thank the reviewer for the comment, and agree that the monitoring data does not represent a comprehensive view of *Eriogonum ovalifolium* var. *williamsiae* occurrence or demographics. Nonetheless, the monitoring data and method is the best available science that we currently have. Per Pavlik 2002, these subpopulations occupy two distinctive habitats at the site. Both habitats contain plants and support sufficient numbers of individuals. These lands are owned by two different stakeholders (BLM and private) and are unlikely to be disturbed by human activities in the near future. Both subpopulations were determined to be strongholds supporting characteristic individuals in natural settings. We will continue to revise and update the recovery plan as new information becomes available.

*Peer Review Comment* (9): There is something vaguely disconcerting about the second paragraph on page 4. It seems implicitly to indicate some sort of political influence, or at least recognition that there is political influence in the listing/downlisting/delisting process.

*Response:* No such indication was intended. Both the development of recovery criteria and reclassification decisions are based on the best available science. That said, the two processes are separate in that, while a reclassification decision can consider recovery criteria, the analysis must be based on the listing factors identified in Section 4 of the Act. Our intent was to clarify that this document and recovery criteria in general, provide guidance for the recovery process and are not regulatory.

*Peer Review Comment* (10): What is covered under "commercial data?"

*Response:* This term refers to trade data such as commercial harvest and landing data associated with aquatic species, and is not applicable to *Eriogonum ovalifolium* var. *williamsiae*.

*Peer Review Comment* (11): What is meant by "...and the species exhibits sufficient resiliency, redundancy, and representation to support long-term viability?" Are there any specific criteria that address those properties?

*Response:* Resiliency is the ability of a species to withstand stochastic disturbance and is positively related to population size and growth rate and may be influenced by connectivity among populations. Redundancy is the ability of a species to withstand catastrophic events by spreading risk among multiple populations or across a large area. Representation is the ability of a species to adapt to changing environmental conditions over time as characterized by breadth of genetic and environmental diversity within and among populations (Smith *et al.* 2018). The criteria presented here, which address the threats to the species as well as marking important demographic considerations, reflect the levels of resiliency, redundancy and representation that we think are sufficient for the species. We will continue to evaluate the sufficiency of these measures as new information becomes available.

*Peer Review Comment* (12): I am concerned that the monitoring program is integral to several of the stated objectives. The pilot monitoring program was never vetted by the respective land managing agencies and agreed upon as the method and source of monitoring data for management of *Eriogonum ovalifolium* var. *williamsiae* and its habitat. There are other threats not mentioned in this document, consequently, there is no mention of actions needed to address these threats.

*Response:* Despite the limitations accurately noted by the reviewer, the monitoring data is the best available science that we currently have. As new or more comprehensive information about *Eriogonum ovalifolium* var. *williamsiae* becomes available, we will incorporate it into our recovery planning efforts. While this document is only intended to address recovery criteria, future, more extensive revisions of the recovery plan will seek to ensure that the recovery actions adequately address all threats to the species to the extent necessary for achieving recovery.

*Peer Review Comment* (13): The locations of the two monitoring plots are not well reflective of the larger habitat or demography of the plant community. The Main Terrace represents, currently, the harshest portion of the habitat with correspondingly fewest numbers of plants in all size classes. While it would represent the lower end of the data spectrum, it is also the least

representative, percentage-wise, of the larger occupied habitat. The Central Drainage is located at the northern edge of occupied habitat and represents an area with a much greater density of *Eriogonum ovalifolium* var. *williamsiae* plants than the Main Terrace but lower than occupied habitat to the south and west based on field observations. Continued use of just these two sites for data collection has the potential for skewed analysis that would then be used to formulate criteria used in making listing decisions.

*Response:* We thank the reviewer for the comment. To clarify, however, criteria simply indicate the point at which reclassification may be warranted, but are not used in any listing decision, which must be based on the best available science and provide and analysis of the five listing factors under Section 4 of the Act. As for the utility of the monitoring data, per Pavlik 2002, these subpopulations occupy two distinctive habitats at the site. Both habitats contain plants and support sufficient numbers of individuals. These lands are owned by two different stakeholders (BLM and private) and are unlikely to be disturbed by human activities in the near future. Both subpopulations were determined to by strongholds supporting characteristic individuals in natural settings.

*Peer Review Comment* (14): Is there historic data that allow any sort of quantification about how often, or better yet, what conditions produce such seedling recruitment episodes?

*Response:* The monitoring data presented in Appendix A is the best available science that we have. 290 seedlings (<1 cm) were observed in 2005, perhaps documenting a rare recruitment event for *E. ovalifolium* var. *williamsiae* due to an increased precipitation event. There were three seedlings observed in 2003 and nine seedlings observed in 2017.

*Peer Review Comment* (15): See comments previously made on the monitoring program. It would be interesting to see the data from the Central Drainage with just 2003 and 2017 as this would allow all but one of the transect data to be compared. Or, perhaps use all years and conduct a "missing observations" statistical analysis.

*Response:* We chose to use all three years, so that there was consistency in data presented for the Central Drainage and Main Terrace. We realize that we were unable to analyze all data on the Central Drainage, but we analyzed transects that were consistently monitored during all three monitoring years (2003, 2005, and 2017).