ISSSSP Final Report

*Calamagrostis breweri* Thurb. Population and Defensibility Monitoring, Jefferson Park with *Rivulariella gemmipara* Site Revisit

Willamette National Forest

Prepared by Charity Glade, Detroit District Botanist

December 2019
Introduction

*Calamagrostis breweri* is a subalpine meadow grass species with a sparse distribution limited to Mt. Hood and Mt. Jefferson in Oregon and a few high peaks in the Klamath and Sierra Nevada Mountains in California (Roché et al. 2019). Once thought to be more abundant, a 2002 paper by Wilson and Gray distinguished *C. muiriana* from *C. breweri* based on differing morphological details, leaf anatomy, ecology, range, chromosome number, and isozymes. The Oregon Natural Heritage global ranking for *C. breweri* was subsequently changed from G5 (secure and locally abundant) to G3 (vulnerable, at moderate risk of extinction in Oregon) to reflect this change in taxonomy (Nugent et al. 2012). *C. breweri* populations in the Mt. Jefferson Wilderness are considered particularly vulnerable due to lack of upslope habitat for migration in response to changing climate (Wilson, pers. comm.) and high recreational use of Jefferson Park.

The Conservation Strategy for this species recommends that population and defensibility monitoring of the Jefferson Park populations should be conducted every five years. Defensibility monitoring is revisiting populations in order to determine persistence and assess threats that may affect resource management, Transect population monitoring plots were established in 2013 and known population polygons were last updated in the Natural Resource Information System (NRIS) database in 2009. In 2019 known populations of *Calamagrostis breweri* were revisited and the surrounding areas were surveyed. New populations were documented and polygons were updated in NRIS. Four transect monitoring plots were revisited and potential and evident impacts to populations were recorded. Additional survey and monitoring needs as well as management actions designed to reduce impacts on the Mt. Jefferson populations are recommended here.

*Rivulariella gemmipara* is a rare aquatic liverwort formerly known as *Chiloscyphus gemmiparus* and recognized as a new genus in 2013 by liverwort expert David Wagner. It is found growing attached to rock in subalpine streams. This plant was found somewhere along the South Breitenbush trail in 2012 and recorded in the spatial database at three locations. It can be deduced from the specimen packet label that the three sites recorded in the spatial database were potential sites of one specimen with uncertainty as to which was correct. On our way out of the Mt. Jefferson Wilderness we revisited all three sites and determined, to the best of our ability, presence or absence.

Methods

Monitoring visits were undertaken at the same time of year in 2013 and 2019. Weather conditions between the two visits were much different; 2013 photos evidence sunny weather while the 2019 visit was almost called off due to heavy rain and wind.

A team of four botanists hiked into Jefferson Park from the Whitewater trailhead on day one. The more highly used areas of Jefferson Park near designated campsites surrounding Bays and Scout Lakes were surveyed on day two. On day three we continued to survey Jefferson Park and revisited monitoring plots established in 2013. We extended our survey to the morning of day four and then hiked out the South Breitenbush trail on day four in order to revisit the potential sites of *Rivulariella gemmipara*.

Transect monitoring plots were located by UTMs, written location data, and photos from the 2013 trip. Transects are 5 meters long and population data was recorded a meter to either side (5 x 2 meters). Data recorded includes percent cover of CABR plants, number of flowering stems, percent of flowering plants, and height and width measurements of flowering culms.
Not all photos appeared to align with the directions captioned on the photos but we determined that strategically placed rocks indicated north and south ends of the transects. We took pictures of each of the transect plots oriented north and south so that they can be more easily found by the next monitoring crew. Transects are named according to the records on the 2013 data sheets; Transect 1, Transect Trail 1 (shown in Figure 1), Transect Camp 1, and Transect Camp 2. Transect Camp 1 UTM data was corrected as the 2013 UTMs appeared to be incorrect. Recorded data at this plot appeared to be offset by one meter judging by the 2013 diagram, which we also corrected on the 2019 data sheets.

![Figure 1: Setting up "Transect Trail 1"](image)

**Results**

**Defensibility Monitoring**

Populations nearest the more popular camping areas surrounding Bays Lake appear to be dwindling in size compared to the large polygons recorded in 2009 (Figures 2 and 3). Populations north of Russell Lake have also diminished. It is unclear if the farthest north population has shifted north due to a mapping error or if the population is possibly migrating upslope. The largest population near Russell Lake, however, appears to have grown and our surveys document a continuous population all along the
Pacific Crest Trail (PCT) to just east of Scout Lake\(^1\). This represents a significant expansion of the previously recorded population. We attempted to determine the southern extent of this population on day 4 before hiking out until it became too late in the day to continue surveying this location.

Additionally, four new populations were noted along the South Breitenbush trail as we hiked out. UTM coordinates and ecological data were recorded for the first of these, which is a very healthy population upwards of 5,000 square feet at seven percent cover. Only UTM coordinates were recorded for the next three sites and no attempt was made to determine the extent of these populations. It is highly likely that the new populations of *Calamagrostis breweri* found on the South Breitenbush trail extend into the wilderness.

---

1. The PCT is mis-mapped east of Scout Lake and is actually about 250 feet west, bisecting the SW arm of the 2019 population.
Figure 2: Map of CABR populations last updated 2009
Figure 3: Map of 2019 CABR populations
It should be noted that *Podagrostis humilis x thunbergii* also occurs in the alpine meadows of Mt. Jefferson. This species can only be confidently differentiated from *C. breweri* when it is in flower. Vegetative *C. breweri* often exhibits semi-rhizomatous growth patterns while *Podagrostis* is non-rhizomatous, but this feature is somewhat subtle (Figure 4). For this reason it is possible that some current and previously recorded population polygons are inaccurate due to vegetative *Podagrostis* being counted as *C. breweri*. One of the populations we documented near Bays Lake (CABR 2) may or may not be *C. breweri*, as all of the plants were vegetative. Figures 5-7 compare flowering plants of *P. humilis x thunbergii* with *C. breweri*. *Agrostis variabilis* also occurs in these meadows but it is more easily differentiated from *C. breweri* due to wider leaf blades that lack the glaucous color of the other two species.

*Figure 4: Vegetative CABR or POHU at CABR 2 site*
We noted several factors that may be impacting the vigor of *C. breweri* populations including competition with other plants such as *Carex nigricans* and *Aster alpigenus*. The winter of 2019 was unusual in that it was relatively mild until March, when there was significant snowfall even at lower elevations. This would indicate that snowpack in the wet meadows of Jefferson Park persisted longer than usual, which may have influenced growth and flowering of *C. breweri*. We noted off trail use by recreationists and dogs, and found it plausible that horses might be allowed to graze in the meadows. One team member noted that *C. breweri* appeared to be more abundant in areas where the biotic soil crust is intact (Figure 7). Higher-use areas showed more evidence of disruption of this natural layer intrinsic to the alpine meadow ecosystem in Jefferson Park.
Population Monitoring

Transect 1:

At first glance population data for CABR appears to be in decline; however we recorded a number of patches of the look-alike, *Podagrostis humilis X thunbergii* in this plot. As the species is not recorded in the “Associated species” data, it is possible that it was vegetative and counted as CABR in 2013 which would have inflated the counts. This is the only monitoring plot where we found the look-alike species.

Transect Trail 1:

This transect crosses a trail. Populations appear to be declining. Populations were recorded in four square meters near the trail in 2013 and 2019; however the average percent cover in 2013 was 2% and in 2019 was 0.75% (trace). 22 flowering stems were recorded in 2013 and only four were recorded in 2019.

Transect Camp 1:

One population is currently found in this monitoring plot. Population appears to be stable at 5% of one square meter.

Transect Camp 2:

Percent cover was lower in this plot in 2019 but the number of flowering stems was much greater. 25% was noted in one square meter in 2013 and 7% cover was in 2019. 44 flowering stems were recorded in 2013 and 90 were recorded in 2019.

*Rivulariella*

One of the South Breitenbush CABR trail sites occurs at one of the potential *Rivulariella gemmipara* sites recorded in 2012. This was the first potential site we revisited. We did not locate *R. gemmipara* here but we did locate and map what was later identified by David Wagner as *Solenostoma fusiforme* (Figure 8). This plant is another rare species which will be submitted to Oregon Biodiversity Information Center (ORBIC) as a result of this survey. Additionally, Wagner will change his Liverworts of Oregon key to accommodate this species which had previously been identified in Oregon only from a photo (Wagner, pers. comm.). The population here is very robust and was also found a little further down the trail where it crosses the same stream.
The second potential Rivulariella site was a rockslide that had washed out any drainage that had once been there. Because of the steep slope and closed canopy it is unlikely that R. gemmipara was ever present at this site.

We successfully relocated R. gemmipara and have confirmed the third potential Rivulariella site.

**Conclusions and Recommendations**

*Calamagrostis breweri* populations appear to be declining in the areas that are most heavily impacted by recreation. User-created trails are abundant near the established camp sites around Bays and Scout Lakes. When conditions are wet they fill with water which encourages users to walk next to the trail, more than doubling the footprint (Figure 9).
Work is being done to rehabilitate areas where this occurs (Figure 10).
Closing trails for rehab appears to be effective (Figure 11).

*Figure 11: Area closed for rehab*
People and animals such as dogs and horses may be causing deleterious effects in a delicate ecosystem as the subalpine meadow habitat has not evolved with these species. When many visitors walk off-trail, dogs run off-leash, and horses graze in the meadows, it is likely that the soil crust continuity is broken and the ability of the environment to sustain sensitive species such as *C. breweri* becomes compromised. Other plants, such as *Carex nigricans* and *Aster alpigenus*, appear to have a higher tolerance for disturbance and move into areas vacated by *C. breweri*.

Some suggestions for relieving impacts on *C. breweri* populations due to high recreational use are:

1. Continue rehabilitation efforts such as those pictured above.
2. Add the user trails at Jefferson Park to the recognized National Forest System trails so they can be maintained and included on public maps.
3. Route people to drier trails during the shoulder seasons (spring and fall).
4. Educate recreational users about habitat degradation and recreational impacts through trailhead signs, brochures, and by Wilderness Rangers, as recommended in the Conservation Strategy.

5. Raise the profile of the below grade trails that become inundated by adding backfill, using turnpike rock retainers with native soil backfill, or installing puncheon. These techniques would add a level of development to the wilderness but could be justified for resource protection.

6. Regulate use by visitors with dogs or equine animals in Jefferson Park.

Educating the public about impact to this rare species is one of the most positive and effective management action we can take, along with adding the Jefferson Park user trails to the National Forest System trails. It would be beneficial to create a brochure that maps the designated campsites and user trails and outlines impacts to the rare species *Calamagrostis breweri* and the subalpine meadows, encouraging people to visit in the drier season and keep dogs and horses on the trail in areas where *C. breweri* populations are found. The highest likelihood is that visitors are unaware of their impacts and once educated, will have the knowledge to enjoy the wilderness with a more delicate touch.

Limiting general recreational usage in the Mt. Jefferson Wilderness has already been implemented. This will hopefully result in fewer impacts to declining populations, however limiting the number of people allowed to hike in Jefferson Park in the dry season may result in more visitors in the wetter shoulder seasons. Willamette botanists will work with the Recreation department to strategize the best ways to reduce impacts if populations near established campsites continue to decline at a faster rate than other populations.

Management recommendations from the 2012 Conservation Strategy also state that we should:

1. Monitor new populations – future efforts should include monitoring the new populations found in Jefferson Park, and along the South Breitenbush trail once these are completely surveyed.

2. Institute annual monitoring if high priority populations decrease by 30% or more in a single year. Since the 2013 monitoring trip several documented populations have decreased drastically. Monitoring trips in two consecutive years would be required in order to determine if populations have decreased by 30% in a single year.

3. Develop habitat restoration plans which may include reintroducing *C. breweri* in areas where populations are sparse or declining, such as those populations surrounding Bays Lake and north of Russell Lake. Future transect monitoring efforts will help determine if the large population near Russell Lake is declining in percent cover and flowering plants. This may occur even though the size of the population appears to be increasing. In this case it would be advisable to include this population in future reintroduction and restoration efforts. A common garden study was recommended but has not yet been implemented.

4. Some populations have decreased by 50% which is the threshold that should trigger active management.

Additional monitoring plots would help to assess whether or not populations are declining due to recreational impacts versus natural/climactic causes. The four plots established in 2013 are all located within the largest population polygon near Russell Lake and were intentionally established adjacent to campsites and trails (Figure 13). Of these, Transect Trail 1 and Transect Camp 2 are most highly impacted, however the populations near the campsites and network of user trails between Bays and Scout lakes appear to be more at risk.
Figure 14 shows suggested sites for four additional monitoring plots (highlighted). Plots 1 and 2 would be established in populations that appear to be heavily impacted by recreation. Plots 3 and 4 would be no-impact controls. Plot 3 would be established in a location removed as much as possible from trails and campsites. Plot 4 would be established in one of the newly mapped populations southeast of the PCT and should be placed adjacent to water, if possible, on the opposite shore from the PCT. We observed thriving populations at the edges of ponds and rivulets in this area, and the numerous small ponds provide a natural barrier to foot traffic.
Planning for two consecutive years of surveys in Jefferson Park should be considered in order to determine if populations are decreasing by 30% or more in a single year. As monitoring is recommended every five years, the next Jefferson Park trips should be planned for 2024 and 2025. The 2024 Jefferson Park monitoring trip would be best accomplished by a six-person crew. This would ensure enough personnel to establish additional monitoring plots and inventory the large Russell Lake population with a higher level of completeness.

As noted, several new populations of *Calamagrostis breweri* were found in 2019. Three sites along the South Breitenbush trail and the expansion of the Russell Lake population are incompletely documented. We recommend that the South Breitenbush populations should be surveyed on a separate visit prior to and independent of the next Jefferson Park monitoring trip in 2024. The *Solenostoma fusiforme* and *Rivulariella gemmipara* sites can be monitored during this inventory. This would be best accomplished by planning a four day excursion for a four- to six-person crew.

Future studies such as those proposed in the Conservation Assessment should be implemented. In particular, soil with the intact soil crust should be collected on the next monitoring trip and the soil biota and soil type should be analyzed.

*Figure 14: The Crew – Lin Kyan, Sarah Uebel, and Jeff Lesh*
Literature cited:


Appendix A

_Calamagrostis breweri_ Monitoring Plot Photos

2019
CABR Transect 1 facing north
CABR Transect 1 facing south
CABR Transect Trail 1 facing north
CABR Transect Trail 1 facing south
CABR Transect Camp 1 facing north
CABR Transect Camp 1 facing north
CABR Transect Camp 2 facing north
CABR Transect Camp 2 facing south