Introduction of the Thin-Leaved Peavine (Lathyrus holochlorus): 2019 Annual Report

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PREFACE

IAE is a non-profit organization whose mission is conservation of native ecosystems through restoration, research and education. IAE provides services to public and private agencies and individuals through development and communication of information on ecosystems, species, and effective management strategies. Restoration of habitats, with a concentration on rare and invasive species, is a primary focus. IAE conducts its work through partnerships with a diverse group of agencies, organizations and the private sector. IAE aims to link its community with native habitats through education and outreach.

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Cover photograph: *Lathyrus holochlorus* fruits observed at Bake Stewart Park (East plot) on May 29, 2019. *Photo by Jessica Celis.*

SUGGESTED CITATION

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1. EXECUTIVE SUMMARY

This report describes the actions taken in 2019 to continue implementation of Phase 4 of a multi-phase project designed to help prevent the listing of Bureau of Land Management (BLM) Sensitive Species, *Lathyrus holochlorus* (thin-leaved peavine). Phase 4 (FY 2016-19) focuses on continued seed increase and monitoring and maintenance of *L. holochlorus* plantings at introduction sites. In 2019, seed increase beds were protected with electric fencing to prevent herbivory and weeded. Plants in these beds were herbivorized heavily by deer early in the season and thus did not produce seed. Introduction plots (planted in 2016 and 2018) were monitored for survival, number of stems, and vigor of *L. holochlorus*, and associated plant community composition was assessed. Seed was collected from wild populations and seeded into plots at those outplanted sites where survival was 10 percent and above (Dorena East, Bake Stewart West, Hansen, and South Taylor). Habitat enhancement in the form of shrub planting was conducted at Dorena, Bake Stewart East, and Hansen.

Survival of *L. holochlorus,* for those plots planted in 2016, had a 3.8% drop in survival from 2018 to 2019; for plots planted in 2018 survival dropped 10.1% from 2018 to 2019. In terms of habitat quality, we also found some evidence that sites with higher average shrub and lower exotic perennial grass cover have higher rates of survival. This could help land managers and ecologists make strategic choices about where to plant *L. holochlorus* plugs and where to focus restoration efforts at those sites currently occupied by *L. holochlorus*.

It is recommended that in 2020 the seed increase bed continue to be managed, wild seed is collected, and monitoring data be conducted on only at the seed plots added in 2019 for sprouting seeds. Survival and plant community data monitoring should continue in 2021 or 2022 pending agreement between IAE and BLM partners.

2. INTRODUCTION

Lathyrus holochlorus (thin-leaved peavine) is a rare member of the pea family (Fabaceae). It is a Bureau of Land Management (BLM) Sensitive Species, a U.S. Fish and Wildlife (USFWS) Species of Concern, and an Oregon Biodiversity Information Center (ORBIC) List 1 species. It is found throughout the Willamette Valley and south toward Roseburg in northwestern Oregon. A few small populations are also found in Lewis County, Washington. Most of the remaining populations exist along roadsides and unmowed fencerows, where they are commonly associated with Oregon white oak (*Quercus garryana*), common

snowberry (*Symphoricarpos albus*), various species of rose (*Rosa* sp.), and poison oak (*Toxicodendron diversilobum*). Many populations are threatened by weed management practices that utilize mowing and herbicides during the growing and reproductive season.

Lathyrus holochlorus is a rhizomatous perennial forb. Small populations are likely composed of a single, self-incompatible genetic clone which typically do not produce viable seed. In a 2012-2014 range-wide inventory performed by the Institute for Applied Ecology (IAE) and volunteers from the Native Plant Society of Oregon (NPSO), 31% (37) of the 90 known populations appeared to be extirpated. Of the remaining 53 populations, 17 had 10 or less stems, 23 had 100 or less stems, and 13 had greater than 100 stems (Ottombrino-Haworth et al. 2018).

In phase two of this project, four sites were chosen for introduction of *L. holochlorus*: Bake Stewart Park, Dorena Prairie, Hansen, and South Taylor (Figure 1; Appendices B and C). Bake Stewart Park is owned by the U.S. Army Corps of Engineers (ACOE) and all other sites are owned by the BLM. Two plots were established at both Dorena and Bake Stewart to assess the efficacy of planting *L. holochlorus* with and without existing shrubs. At Dorena, the west plot is virtually shrub free, while the east plot is colonized with snowberry (Table 3). At Bake Stewart Park, the east plot is virtually shrub free, while the west plot is colonized by snowberry and poison oak. In 2018, IAE staff chose and prepared three additional sites for outplanting: an additional plot was established near the existing outplanted plot at Hansen (Hansen RAC), two plots were established at the Greenbelt Land Trust Bald Hill site in Corvallis (Bald Hill Big Plot and Bald Hill Small Plot), and two plots were established at Herbert Farm and Natural Area (Herbert Farm Big Plot and Herbert Farm Small Plot) (Figure 1).

This report describes the actions taken as apart of Phase 4 of a four-phase project. Phase 4 objectives are to maintain *L. holochlorus* seed increase beds, monitor establishment of outplanted plugs, and improve habitat quality at reintroduction sites to enhance outplanting and establishment success.

FIGURE 1. Locations of *Lathyrus holochlorus* outplanting sites (yellow points on both maps). In 2018, a second plot was added to Hansen and four plots were established at two sites in Corvallis (right).

3. ACTIVITIES IN 2019

In 2019, activities included maintenance of seed increase beds; monitoring of outplanted plots; collection, cleaning and sowing of seed from wild populations; maintenance of select outplanted sites; and planting of native shrubs (Table 1; Appendix A).

TABLE 1. Monitoring and management activities conducted in 2019. Sites are in alphabetical order.

Site	Date	Management Activity/Observations
Bake Stewart East	1/31, 5/29, and 11/22/19	Re-established plot markers that were burned in a 2018 prescribed fire. Monitored outplanted plot survival and assessed the surrounding plant community. Planted approximately 20 shrubs to enhance conditions of this less shrubby plot.
Bake Stewart West	5/29 and 10/30/19	Monitored outplanted plot survival and assessed the surrounding plant community. Established a seed plot and sowed ~243 seeds in a 2m^2 area.
Bald Hill Big Plot	5/23/19	Monitored outplanted plot survival and assessed the surrounding plant community.
Bald Hill Small Plot	5/23/19	Monitored outplanted plot survival and assessed the surrounding plant community.
Coyote Spencer Wetlands	7/15/19	Seed collection of wild population. Oak woodland population. Although the population here is extensive not many of the plants were fruiting resulting in a low yield of seed.
Cutler Lane	5/17 and 7/15/19	Seed collection of wild population. Oak woodland/prairie edge habitat. May: Reproductive and phenological assessment of *L. holochlorus* populations. Several larger patches of *L. holochlorus* at this site with lots of flowers. Site visit showed that flowers would need another two months at least to mature. July: Seed collection from three patches here.
Dorena East	5/21, 10/30, and 11/22/19	Monitored outplanted plot survival and assessed the surrounding plant community. Established a seed plot and sowed ~243 seeds in a 2m^2 area. Planted approximately 20 shrubs and two oak saplings to enhance conditions of the plot.
Dorena West	5/17 and 10/30/19	Monitored outplanted plot survival and assessed the surrounding plant community.
Fish Hatchery Road	7/15/19	Seed collection of wild population. Roadside location.
Hansen	1/31, 5/30, 6/3, 10/30 and 11/22/19	Re-established plot markers that were burned in a prescribed fire in 2018. Monitored outplanted plot survival and assessed the surrounding plant community. Established a seed plot and sowed ~243 seeds in a 2m^2 area. Planted approximately 10 shrubs.
Hansen RAC	5/30, 6/3, and 11/22/19	Re-established plot markers that were burned in a prescribed fire in 2018. Monitored outplanted plot survival and assessed the surrounding plant community. Planted approximately 15 shrubs.
Herbert Farm Big Plot	5/20/19	Monitored outplanted plot survival and assessed the surrounding plant community.

Site	Date	Management Activity/Observations
Herbert Farm Small Plot	5/20/19	Monitored outplanted plot survival and assessed the surrounding plant community.
Linn Benton Community College	7/15/19	Seed collection of wild population. Roadside location. Only collected one small bags worth of seed pods from this site.
South Taylor	6/3 and 10/30/19	Monitored outplanted plot survival and assessed the surrounding plant community. Established a seed plot and sowed ~243 seeds in a 2m^2 area.

3.1. Seed increase bed maintenance

Two raised beds (480 ft^2 total) were planted with greenhouse-grown plugs in March 2016. None of the plants flowered or produced seed pods in 2019. This was likely due to heavy herbivory occurring shortly after the plants emerged. The plants regrew vegetatively after an electric fence was installed around the beds. The beds were weeded twice during the year. In 2020, an electric fence will be installed prior to emergence and a shade cloth will be added to mimic the natural edge habitat that these plants prefer. Plugs will be sown into the beds In the winter of 2021 to replace those plants that have died.

3.2. *Lathyrus holochlorus* monitoring

In 2019, *L. holochlorus* outplant survival, vigor, stem count, and associated plant community at introduction plots was monitored between May 21st and June 3rd (Table 1). Within a plot, if a plant was visible it was given a measure of vigor between 0 and 4: 0 indicated that it was dead, 4 indicated that it was healthy and hearty, and 1-3 indicated variability between those. If it was found alive the number of stems were also counted. Additionally, if the plant was flowering or fruiting an "FL" or "FR" was noted, respectively.

3.3. Plant community monitoring

The associated plant community at all sites, was assessed by randomly placing three to four 1m x 1m quadrats in each introduction plot. In each quadrat, the percent cover of all vascular plant species was visually assessed and recorded (Appendix D). Ocular percent cover of bare ground, thatch, lichens/bryophytes, and rocks was also assessed and recorded (Appendix D). All vascular plant species present in the overall reintroduction plot (but that did not fall within a quadrat) were noted, but no cover data was recorded.

Average cover of each species and each category (growth-form, nativity, and life-history) were recalculated for all years. When reviewing previous years' data we discovered that some pertinent data was not included in analyses. This data was added to the overall dataset. In years past, shrubs and trees were treated as one category, this year however these growth forms were broken into two categories. Non-statistical trends between the survival rate of *L. holochlorus* within plots and the average cover of different functional groups was explored visually between years (2016-2019) using scatterplots and the "lm" function in the package ggplot2 in R (Wickham 2016, R Core Team 2018). Herbert Farm plots were not included in the exploration of trends given the low vitality of the plugs before transplanting, which undoubtedly influenced the low survival rate observed at this site.

3.3. Seed collection

In order to continue *L. holochlorus* augmentation efforts at outplanted sites where *L. holochlorus* transplant survival was ten percent or more, wild seed of this species was collected from four naturally-occuring populations. Seed source sites were chosen based on those that yielded highest amounts of collected seed in 2014: Cutler Lane, Linn Benton Community College, Fish Hatchery Road, and Coyote Spencer Wetlands. Once collected, the seed was hand cleaned.

3.4. Direct seed sowing

Lathyrus holochlorus seeding plots (2m x 2m) were established near the original plug introduction plots at the four sites with *L. holochlorus* transplant survival rates of ten percent or more: Dorena East, Bake Stewart West, Hansen, and South Taylor (Appendix B). Vegetation was not removed from the seed plots prior to seeding in the hopes that existing vegetation would provide some protection from herbivory. Plots were oriented to the cardinal directions, and the northeast and northwest corners of each plot were morked using staked orange "birdie" markers (Figure 2 and Figure 3). Wild-collected seeds were then sown every 20cm, starting 20cm from the plot edges and ending at 1.8m (20 cm from the opposite plot edge), with approximately three seeds dropped in each of the 81 holes (~243 seeds per plot; Figure 2 and Figure 3).

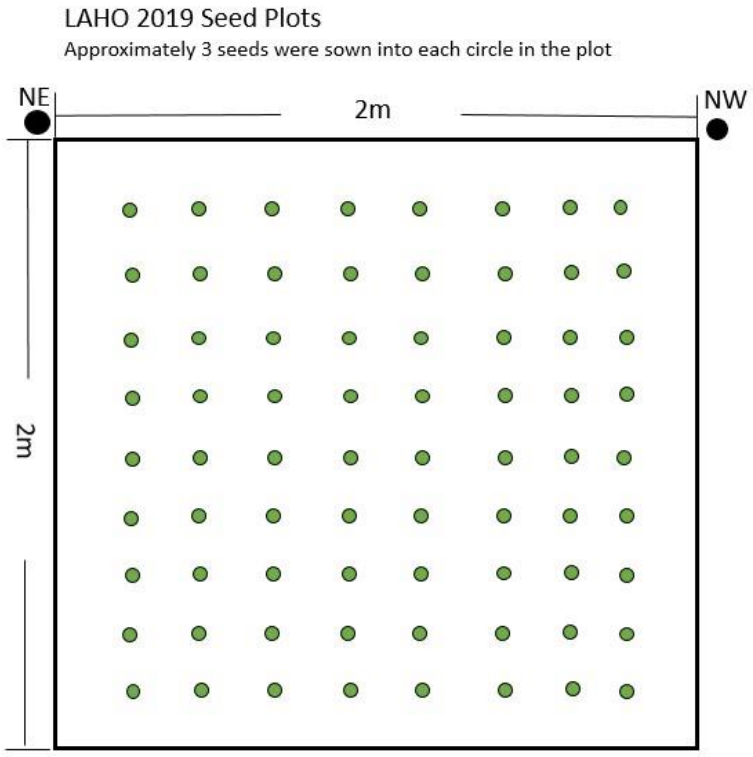

FIGURE 2. 2019 *Lathyrus holochlorus* (LAHO) seed plot diagram. Seed plots were established at four sites (Dorena West, Bake Stewart East, Hansen, and South Taylor). Approximately three seeds were sown in each circle.

FIGURE 3. Seed plot at hansen looking from nw corner (orange birdie visible on bottom end of the photo).

3.4. Shrub enhancement of outplanted plots

Outplanted plot enhancement was implemented in the four plots (at three sites) that showed potential for increased survival or reproduction of *L. holochlorus* (see survival and reproduction rates in Results, section 4.1). Seventy shrubs were planted at four plots on November 22, 2019 with the help of National Civilian Community Corps (NCCC) AmeriCorp's Blue 5: Bake Stewart East, which has less shrub cover, but was the only plot where *L. holochlorus* was seen fruiting (cover photo); Dorena Wast and Hansen RAC, where lack of shrub cover is likely contributing to the lower survival rate compared to the neighboring outplanted plot; and finally at Hansen, where survival is highest, but shrub cover is low (Table 2).

TABLE 2. Shrub species planted at *Lathyrus holochlorus* introduction plots: Hansen, Hansen RAC, Bake Stewart East, Dorena West.

Species	Common name	Quantity (# of gal containers)
Amelanchier alnifolia	serviceberry	8
Mahonia aquifolium	Oregon grape	8
Oemleria cerasiformis	Indian plum	6
Philadelphis lewisii	mock orange	8
Physocarpus capitatus	Pacific ninebark	12
Ribes sanguineum	red flowering currant	15
Rubus parviflorus	thimbleberry	4
Symphoricarpus albus	snowberry	7
Quercus garryana	Oregon white oak	2

4. RESULTS

4.1. *Lathyrus holochlorus* monitoring

Survival

In 2019, estimated mean survival of *L. holochlorus* transplants differed between the 11 outplanted plots (Table 3; Appendix F Figure F1). The average percent survival across all 11 plots (year 3 survival for 2016 plots and year 1 survival for 2018 plots) was 9.5%. This average survival rate was impacted heavily by the low survival rates in the five plots added in 2018; they had an average survival rate of 4.5%, whereas the *L. holochlorus* in the plots planted in 2016 had an average survival of 13.7%.

Table 3. Descriptive statistics for *Lathyrus holochlorus* survival monitoring data for all years. Sites are ordered alphabetically. The table includes the number of *L. holochlorus* planted in 2016 (original sites) or 2018 (new sites) and the percentage of surviving plants (# of plants found alive/# of plants planted).

Introduction Site	Year Planted	Number Planted	Survival 2016 (%)	Survival 2017 (%)	Survival 2018 (%)	Survival 2019 (%)
Bake Stewart East	2016	200	71	13.5	9.5	9
Bake Stewart West	2016	200	73	19.5	21.5	19
Bald Hill Big Plot	2018	312	NA	NA	33	6.3
Bald Hill Small Plot	2018	188	NA	NA	NA	2.3
Dorena East	2016	100	61	22	24	12
Dorena West	2016	100	36	8	5	2
Hansen	2016	200	65.5	38	29	29.5
Hansen RAC	2018	500	NA	NA	21	9
Herbert Farm Big Plot	2018	400	NA	NA	5	1
Herbert Farm Small Plot	2018	64	NA	NA	14	4
South Taylor	2016	200	54	29.5	16	10
Across All Sites		**2464**	**60.1**	**21.8**	**17.8**	**9.5**

Vigor

In 2019, the average *L. holochlorus* transplant vigor across all sites was 2.5, with the range being 1.3-3.1 (**Error! Reference source not found.**; Appendix F Figure F2). This is a slight increase from the 2018 verage of 2.3.

Table 4. Descriptive statistics for *Lathyrus holochlorus* vigor data for all years. Sites are ordered alphabetically. The table includes the number of *L. holochlorus* planted in 2016 (original sites) or 2018 (new sites) and the mean vigor of surviving plants.

Introduction Site	Year Planted	Number Planted	Mean Vigor of Surviving Plants 2016	Mean Vigor of Surviving Plants 2017	Mean Vigor of Surviving Plants 2018	Mean Vigor of Surviving Plants 2019
Bake Stewart East	2016	200	2.2	2.1	2.0	2.3
Bake Stewart West	2016	200	2.3	2.6	2.2	2.6
Bald Hill Big Plot	2018	312	NA	NA	2.1	2.5
Bald Hill Small Plot	2018	188	NA	NA	NA	2.3
Dorena East	2016	100	2.2	2.7	2.9	2.9
Dorena West	2016	100	1.9	2	3.1	3.1
Hansen	2016	200	2.2	2.7	2.5	2.6
Hansen RAC	2018	500	NA	NA	2.3	2.9
Herbert Farm Big Plot	2018	400	NA	NA	2.0	3.0
Herbert Farm Small Plot	2018	64	NA	NA	1.9	1.3
South Taylor	2016	200	2.3	2.4	1.8	1.6
Across All Sites		**2464**	**2.2**	**2.4**	**2.3**	**2.5**

Stem count

Lathyrus holochlorus stem counts were variable between all sites, but the average stem count remains similar for all years (**Error! Reference source not found.**; Appendix F Figure F3). In 2019, the average tem count for all sites was 1.7 (range 1.2 - 2.3). This is slightly higher than the 2018 average of 1.6.

Table 5. Descriptive statistics for *Lathyrus holochlorus* stem count data for all years. Sites are ordered alphabetically. The table includes the number of *L. holochlorus* planted in 2016 (original sites) or 2018 (new sites) and the mean stem count of surviving plants.

Introduction Site	Year Planted	Number Planted	Mean Stem Count of Surviving Plants 2016	Mean Stem Count of Surviving Plants 2017	Mean Stem Count of Surviving Plants 2018	Mean Stem Count of Surviving Plants 2019
Bake Stewart East	2016	200	1.5	1.3	1.5	1.8
Bake Stewart West	2016	200	1.6	2.0	1.6	1.9
Bald Hill Big Plot	2018	312	NA	NA	1.6	2.1
Bald Hill Small Plot	2018	188	NA	NA	NA	1.5
Dorena East	2016	100	1.9	1.8	1.9	1.9
Dorena West	2016	100	1.6	2.75	1.2	1.2
Hansen	2016	200	1.5	1.8	1.7	1.9
Hansen RAC	2018	500	NA	NA	1.6	2.3
Herbert Farm Big Plot	2018	400	NA	NA	1.4	1.3
Herbert Farm Small Plot	2018	64	NA	NA	1.8	1.3
South Taylor	2016	200	1.6	1.4	1.4	1.5
Across All Sites		**2464**	**1.6**	**1.8**	**1.6**	**1.7**

Flowering and fruiting

In 2019, only one *L. holochlorus* plant was in fruit at the time of monitoring (cover photo). The fruiting plant was located in the non-shrubby plot at Bake Stewart East. This site had a prescribed underburn in 2018. Two plants at Dorena East (in the shrubbier of the two Dorena plots) were flowering.

4.2. Plant community monitoring

Outplanted plots have a wide range of percent cover for native and exotic plants of varying growth forms and life history (Table 6). Our visual exploration of trends indicate that those plots with higher average shrub cover also have higher average *L. holochlorus* survival (Figure 4). Plots with higher average cover of exotic perennial grasses appear to be associated with lower average *L. holochlorus* survival (Figure 5). No regression analyses were run on this data and thus these observations are purely explorative.

TABLE 6. Results of the 2019 plant community assessment within the *Lathyrus holochlorus* plots. Sites are ordered alphabetically. For each site, the table shows the average percent cover for overall native and exotic plants, native and exotic forbs, native and exotic graminoids (includes grasses, sedges, and rushes), native and exotic shrubs, and overall average shrub cover. Biennial species or those with variable life history, ground cover, and those that were not identified to species and whose genera have both natives and exotics are not included in these averages with the exception of the overall shrub column.

Site	Overall Average % Cover		Average % Cover Annual Forbs		Average % Cover Perennial Forbs		Average % Cover Perennial Graminoids		Average % Cover Annual Graminoids	Average % Cover Shrubs		
	Native	Exotic	Native	Exotic	Native	Exotic	Native	Exotic	Exotic	Native	Exotic	All Shrubs
Bake Stewart East	21.6	9.3	2.9	0.8	15.7	0.1	0.4	8.4	0	2.0	0	2.0
Bake Stewart West	41.9	3.2	0.7	2.1	1.8	0.4	2.9	0.5	0	36.0	0	36.0
Bald Hill Big Plot	18.8	4.5	6.5	0.8	3.7	2.4	2.3	0.8	0	5.8	0.1	5.9
Bald Hill Small Plot	26.3	3.4	4.1	0.7	2.0	0.5	1.6	2.1	0	17.1	0	17.1
Dorena East	66.1	5.8	2.8	2.0	4.2	2.1	0.4	1.2	0	57.3	0.1	57.4
Dorena West	12.7	24.1	3.0	4.0	1.0	0.9	0.8	19.0	0	4.6	0.0	11.1
Hansen	19.4	20.2	0.5	4.2	4.2	0.7	0.5	2.2	0.7	11.3	9.8	21.5
Hansen RAC	25.9	21.5	1.5	14.7	3.1	0.5	0.6	2.2	2.3	15.6	1.3	16.9
Herbert Farm Big Plot	78.1	8.0	2.5	0	24.0	0	0	0	0	51.4	0.4	51.8
Herbert Farm Small Plot	23.2	11.0	3.2	0	0	0.5	4.3	7.7	0	12.5	0	15.3
South Taylor	30.4	6.1	0.4	0.3	1.0	0	0	5.8	0	28.9	0	28.9

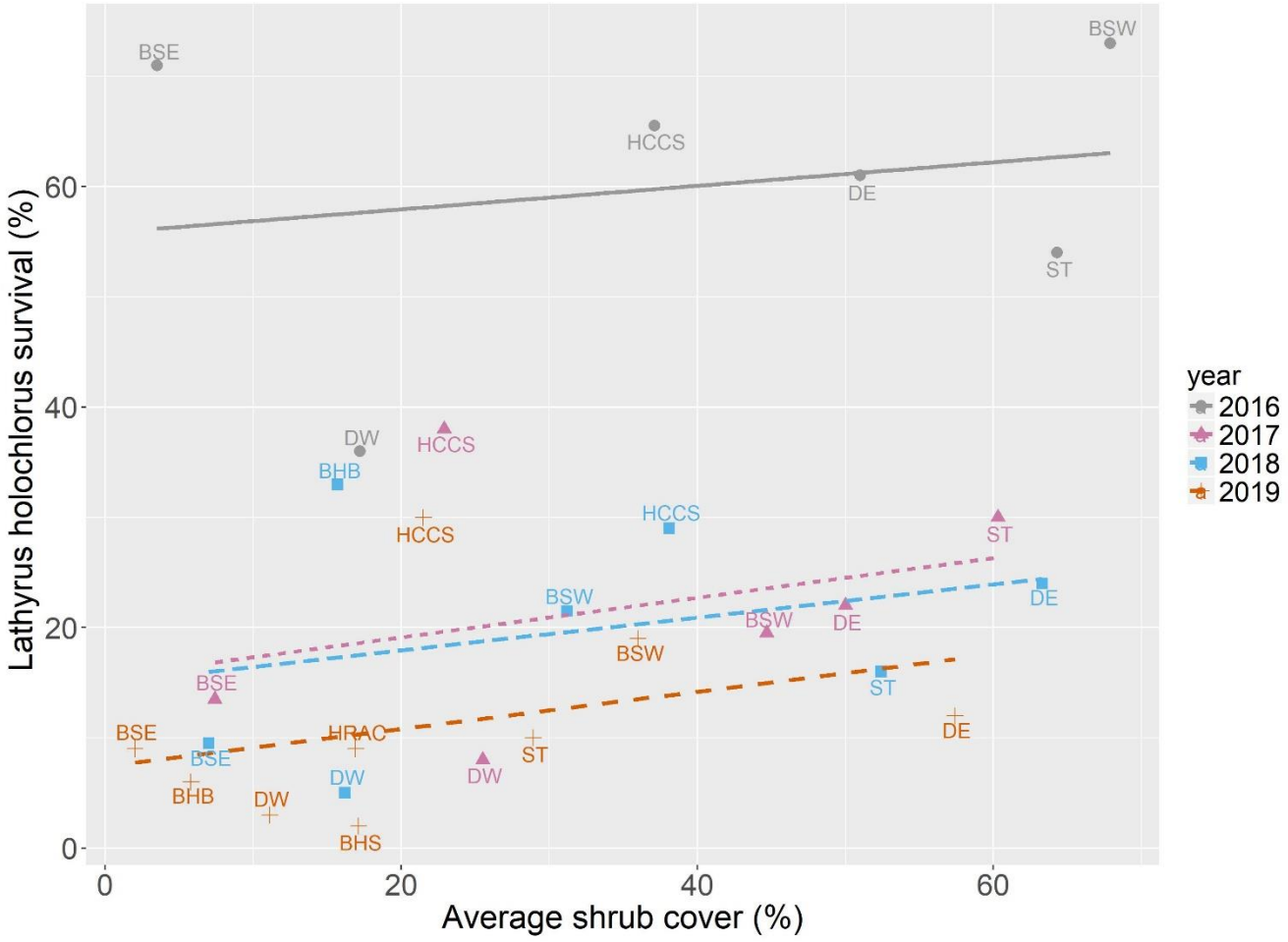

FIGURE 4. Scatterplot of the survival of outplanted *Lathyrus holochlorus* and the average cover of shrubs in all years. Points represent sites: Bake Stewart East (BSE), Bake Stewart West (BSW), Bald Hill Big Plot (BHB), Bald Hill Small Plot (BHS), Dorena East (DE), Dorena West (DW), Hansen (HCCS), Hansen RAC (HRAC), and South Taylor (ST). Trend lines do not represent formal regression analyses. Herbert plots are excluded from this scatterplot (see methods).

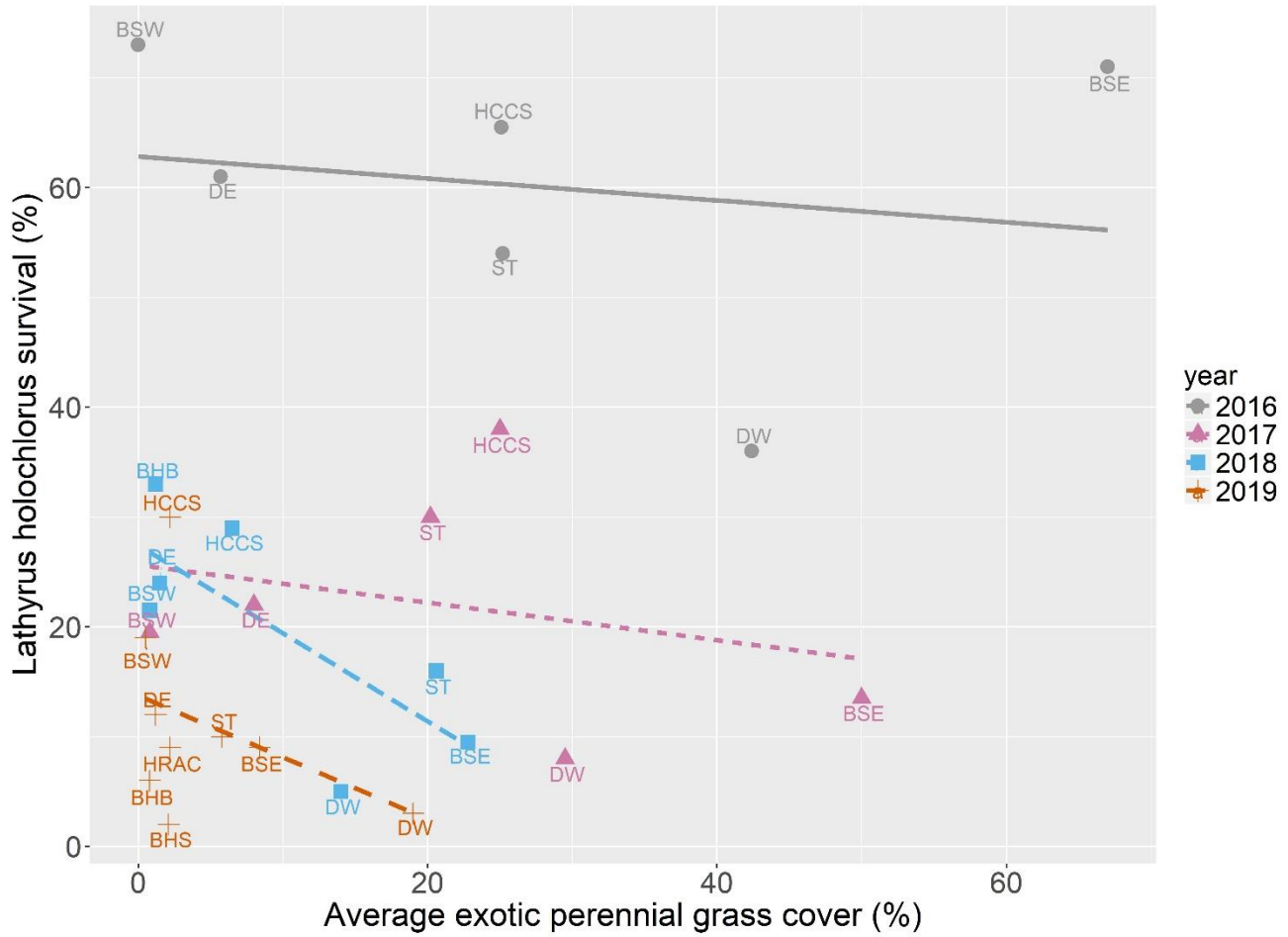

FIGURE 5. Scatterplot of the survival of outplanted *Lathyrus holochlorus* and the average cover of exotic perennial grasses in all years. Points represent sites: Bake Stewart East (BSE), Bake Stewart West (BSW), Bald Hill Big Plot (BHB), Bald Hill Small Plot (BHS), Dorena East (DE), Dorena West (DW), Hansen (HCCS), Hansen RAC (HRAC), and South Taylor (ST). Herbert farm was excluded from these scatterplots (see methods). Trend lines do not represent formal regression analyses.

5. DISCUSSION

5.1. Monitoring methods

Given the very low survival rate of outplanted *L. holochlorus* plugs at the new outplanting sites (added in 2018), it is recommended that future monitoring continue only at the original outplanted sites. Additionally, given the relatively stable survival rate at sites, it is recommended that the monitoring schedule change from annual to biennial monitoring. That being said, if monitoring happened in 2020 it is recommended that only survival data be taken and plants are observed to ensure that evidence of reproduction is not missed. Additionally, a count of seedlings present in seeded plots should occur in 2020

(one year after direct seeding) to assess the effectiveness of outplanting using seed rather than plugs (at Bake Stewart West, Dorena East, Hansen, and South Taylor).

5.2. Monitoring results

The die off of transplanted plugs in the first year and subsequent years after planting is common for restoration projects (Vance et. al. 2006). Our results in 2017 (two years after outplanting) showed a drastic decline in average survival when compared to initial survival the first year after outplanting. However, although rates declined slightly in subsequent years, *L. holochlorus* survival, vigor and stem counts remained relatively stable after the high transplant mortality observed one year after outplanting. This could indicate that once established, plants are likely to survive, and possibly reproduce, into the future.

We also found some suggestion that sites with higher average shrub cover and lower exotic perennial grass cover have slightly higher rates of *L. holochlorus* survival. This could help land managers make strategic choices about where to plant *L. holochlorus* plugs and where to focus restoration efforts at those sites currently occupied by *L. holochlorus*. For example, when choosing *L. holochlorus* reintroduction sites, land managers might choose sites with at least some shrub cover, and, if outplanting at sites without shrub cover, they might consider also planting native shrubs at the same time as *L. holochlorus* plants. Additionally, land managers might target exotic perennial grasses when conducting weed treatments around existing populations or as a priority site preparation treatment before planting *L. holochlorus*.

6. Management recommendations and next steps

The following actions are proposed for future work on this project:

- Starting in 2020, monitor seed plots annually in mid-May to early July. If germination is low, we recommend that sites be cleared of all vegetation before seeding occurs in the future or that plugs are used to augment populations.
- Continue monitoring original outplanted plots every other year, with the next monitoring year being 2021. If monitoring happens in 2020, only conduct survival monitoring.
- Implement habitat management actions annually as needed (see Table 7 for a list of recommended actions) following monitoring of *L. holochlorus* and surrounding vegetation and throughout the fall and winter as appropriate.
- Maintain *L. holochlorus* seed increase beds. Harvest and clean seed as available.
- Collect wild seed of *L. holochlorus* to use for plug growout
- Grow *L. holochlorus* plugs to 1) replace dead plants in seed increase beds and 2) augment outplanting sites that show high survivorship.

TABLE 7. 2020 recommended habitat maintenance activities at *Lathyrus holochlorus* introduction sites.

Site	Habitat Maintenance Activities
Bake Stewart East	1. Manage tall oatgrass (*Arrhenantherum elatius*) inside and outside of plot by either digging up mechanically, mowing using a string trimmer, or if possible spot spray grass specific herbicide. 1. Monitor orchard grass (*Dactylis glomerata*) for any increases in cover and manage if necessary.
Bake Stewart West	2. Monitor regrowth of shrubs and consider mowing if their growth is significantly outpacing that of *L. holochlorus* and appears detrimental to *L. holochlorus* establishment.
Bald Hill Small and Big Plots	1. Manage false brome (*Brachypodium sylvaticum*) population by either grubbing or spraying with herbicide. 1. Monitor for and remove conifer seedlings and saplings.
Dorena East	2. Manage *A. elatius* (only found on south side of plot) by either digging up mechanically, mowing using a string trimmer, or if possible spot spray herbicide.
Dorena West	1. Remove oxeye daisy (*Leucanthemum vulgare*) by either digging up mechanically, or if possible spot spraying herbicide.. 1. Mow *A. elatius* prior to seed set and after monitoring.
Hansen and Hansen RAC	2. Grub out roots of *Rubus bifrons* (blackberry). 2. Spot spray exotic perennial grasses.
Herbert Farm Small and Big Plots	1. Monitor for and remove conifer seedlings and saplings (mostly in big plot). 2. Grub out roots of *R. bifrons*. 2. Manage *A. elatius* inside and outside of plot by spot spraying herbicide.
South Taylor	1. There is significant *R. bifrons* outside of the plot that could be grubbed as well. 3. Consider mowing/cutting to reduce height of hazelnut shrubs (*Corylus cornuta* var. *calfornica*) if interfering with establishment of *L. holochlorus*.

7. REFERENCES

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APPENDIX A: PLUG INTRODUCTION PLOT LOCATIONS AND DATE OF ESTABLISHMENT.

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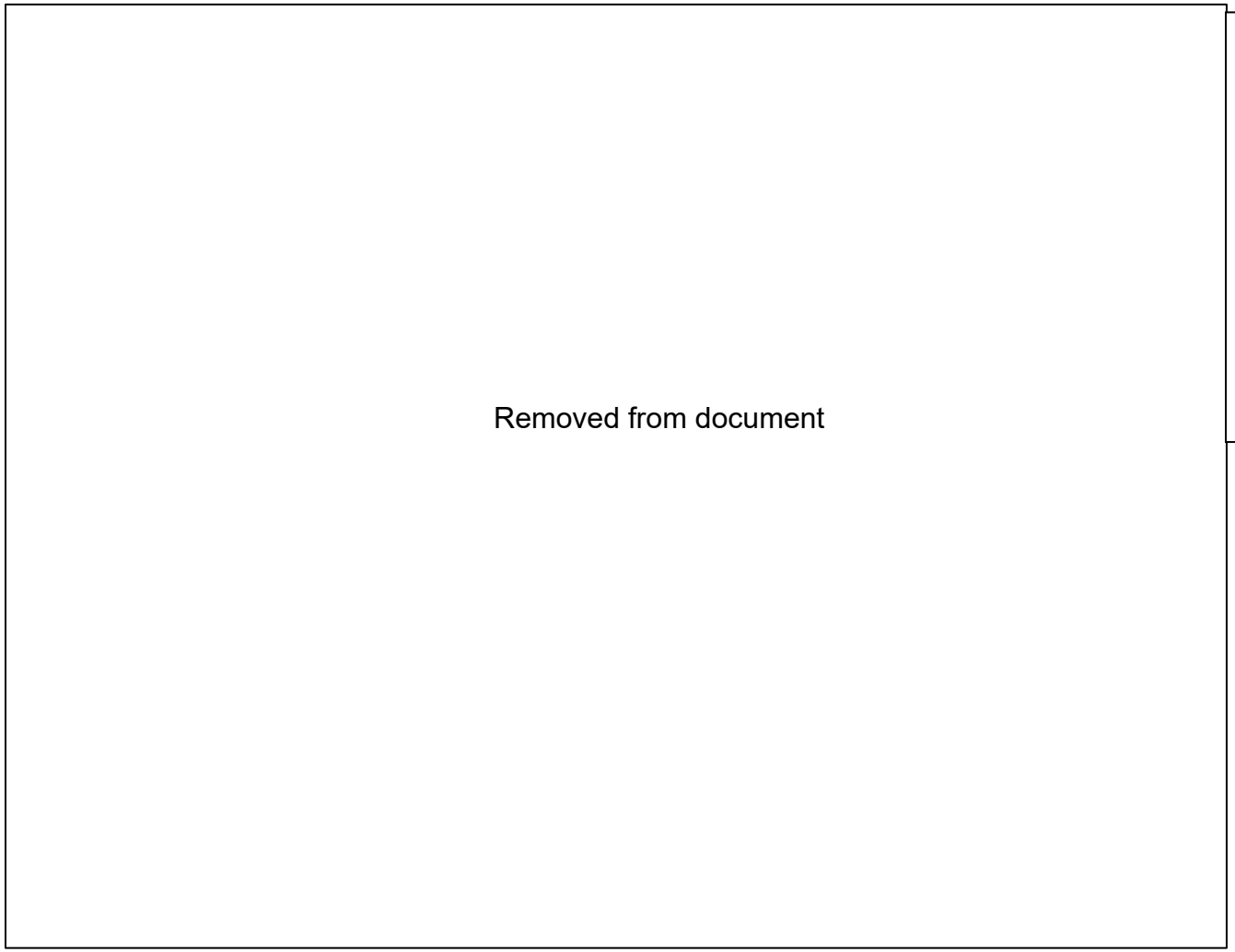
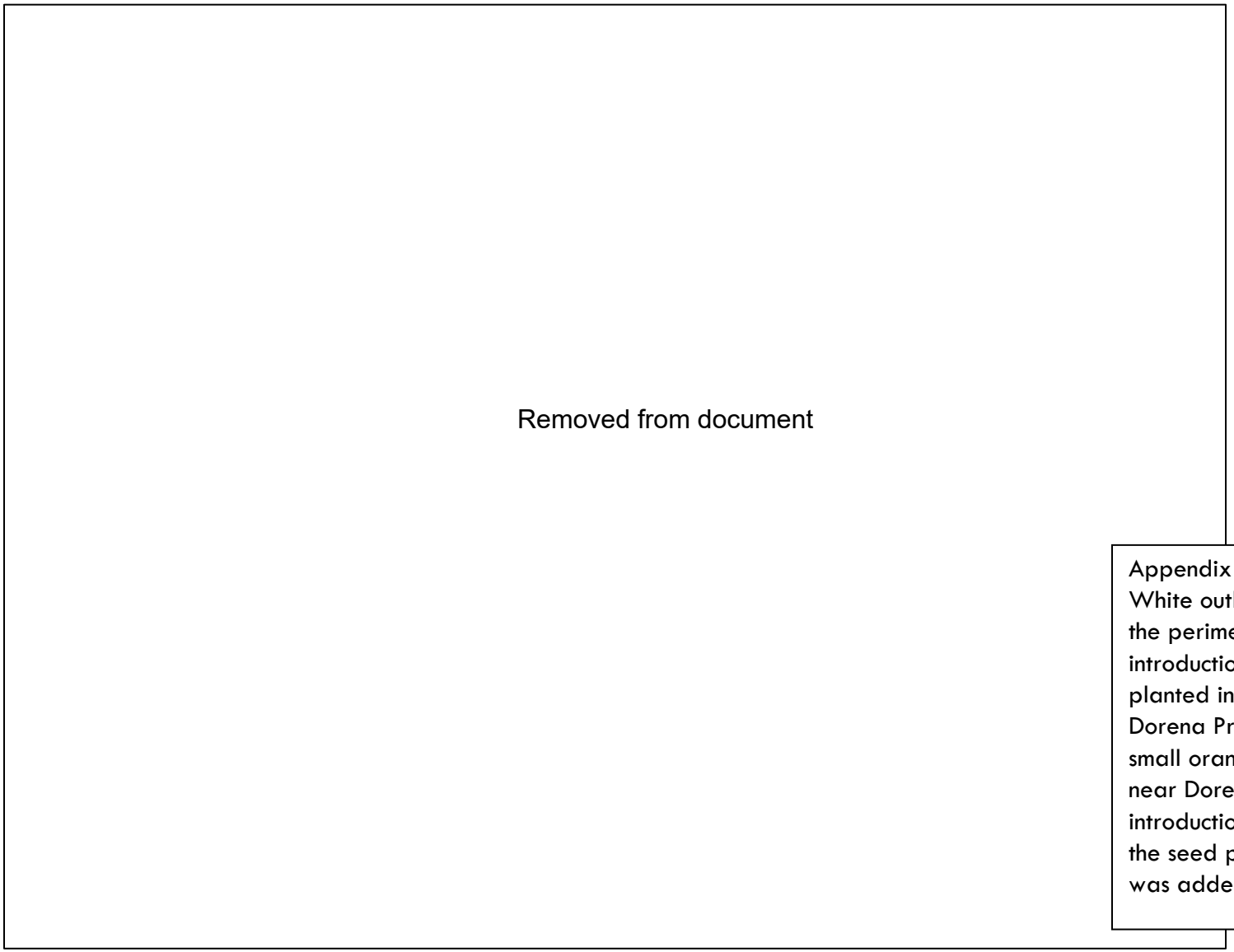
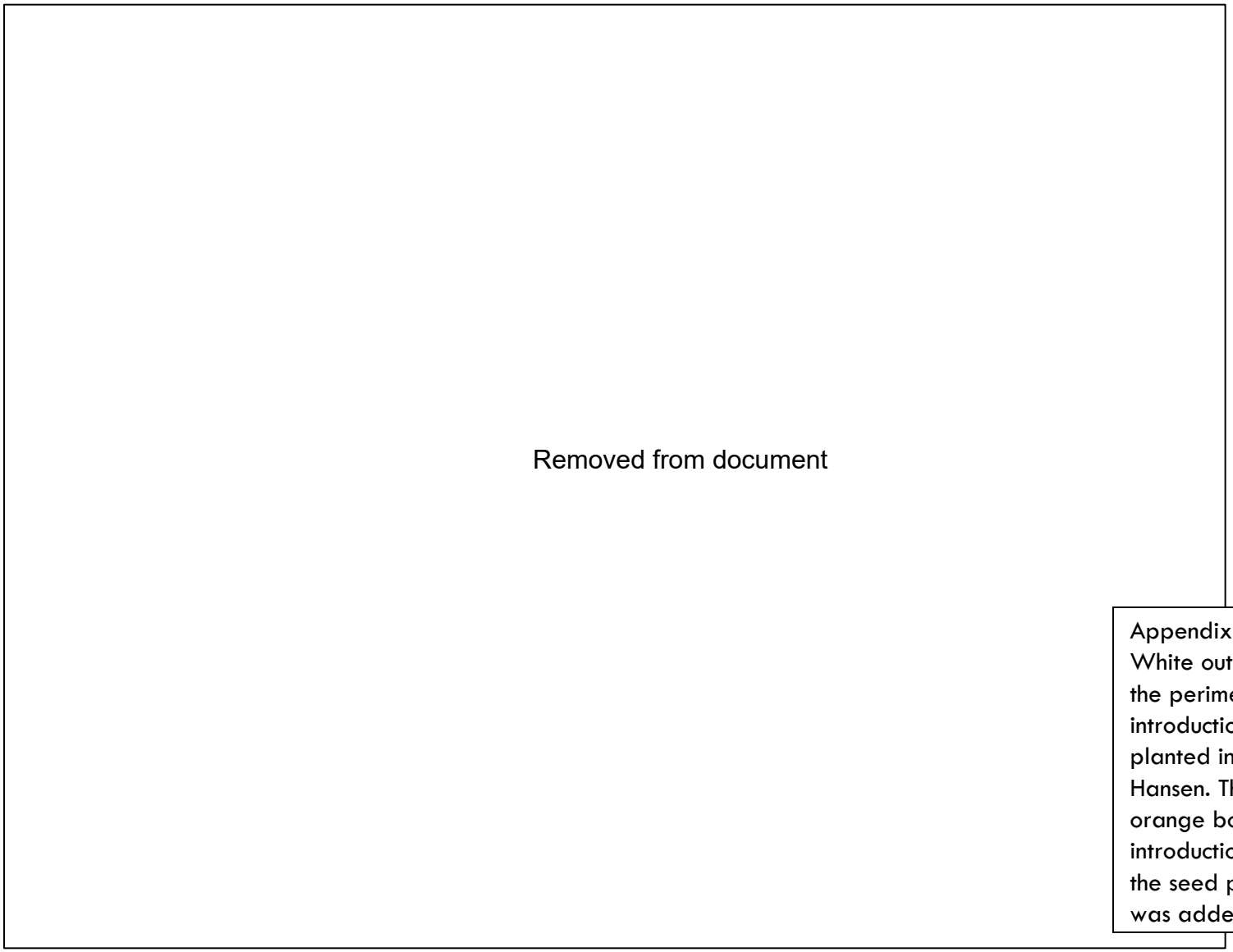
APPENDIX B: INTRODUCTION PLOT LAYOUTS



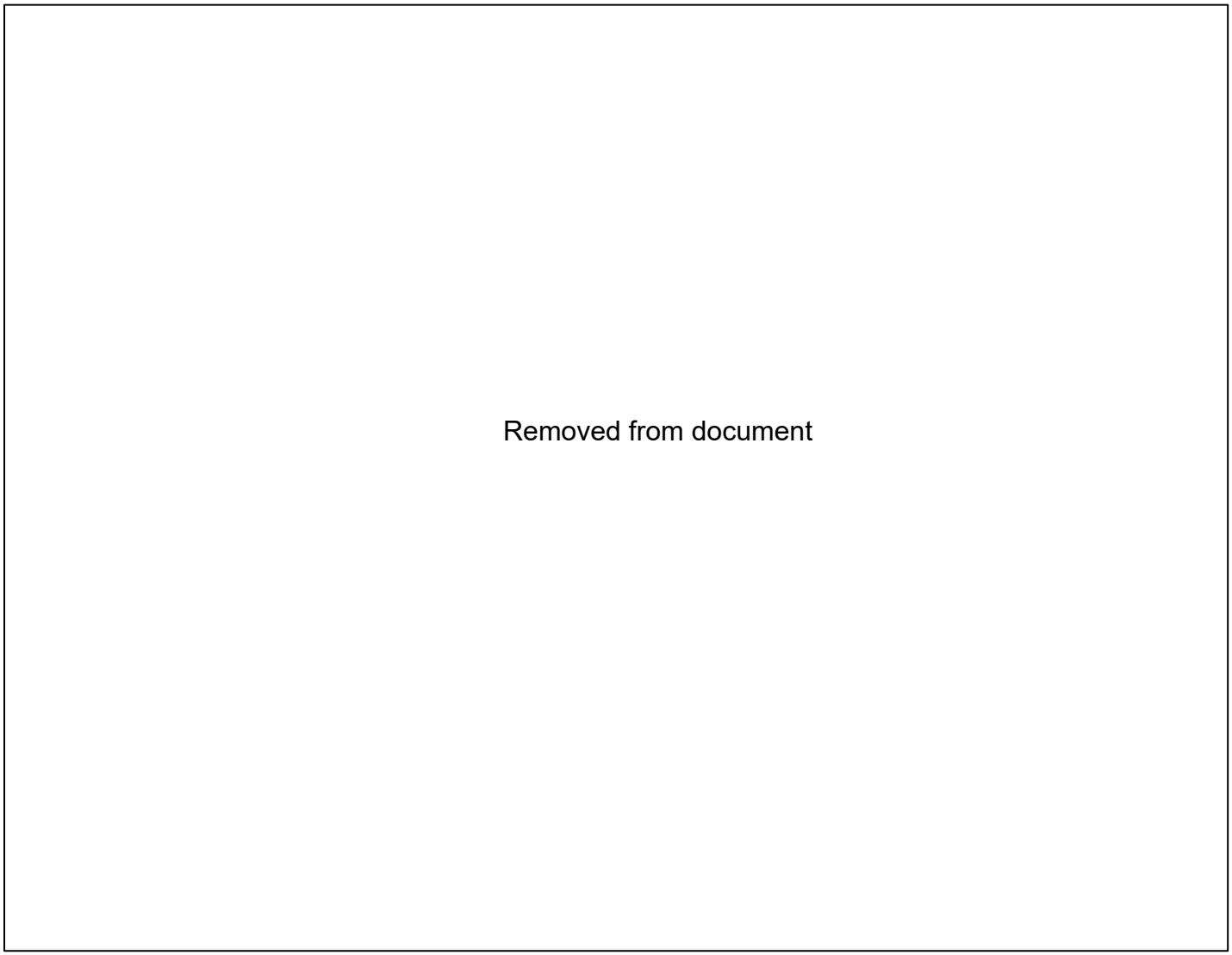
Appendix B Figure 1. White outlines show the perimeter of the introduction plots, planted in 2016 at Bake Stewart Park. Small orange box near the west-most introduction plot is the seed plot that was added in 2019.



Appendix B Figure 2. White outlines show the perimeter of the introduction plots, planted in 2016 at Dorena Praire. The small orange box near Dorena East introduction plot is the seed plot that was added in 2019.



Appendix B Figure 3. White outline shows the perimeter of the introduction plots, planted in 2016 at Hansen. The small orange box near the introduction plot is the seed plot that was added in 2019.



Appendix B Figure 4. White outline shows the perimeter of the introduction plots, planted in 2016 at South Taylor. The small orange box near the introduction plot is the seed plot that was added in 2019.

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APPENDIX C: 2019 *LATHYRUS HOLOCHLORUS* INTRODUCTION PLOT PHOTO POINTS

Photo points were taken from each corner of each introduction plot looking into the plot. Plot corner numbers listed in the captions below correspond to the plot corner numbers in Appendix B.

Bake Stewart East

From left to right: corner 2016, 2017, 2018, and 2019.




Bake Stewart West

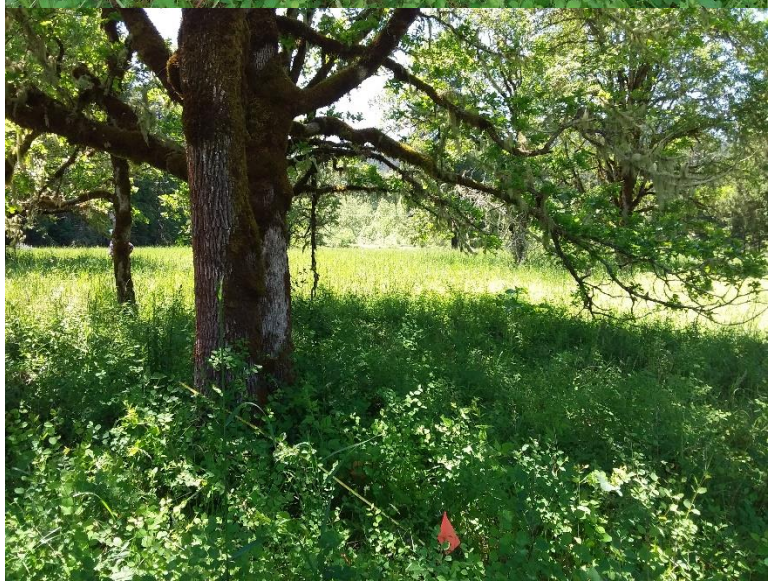
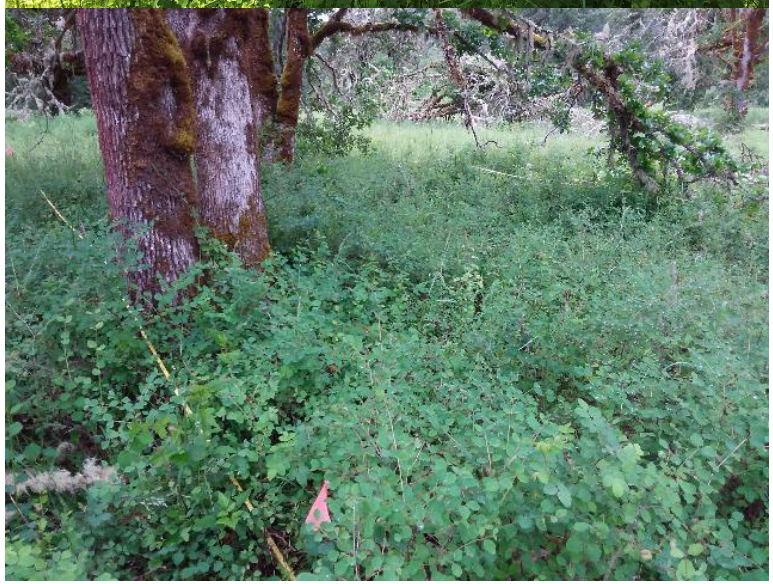
From left to right: corner 2016, 2017, 2018, and 2019.




Dorena East

From right to left: corner 2016, 2017, 2018, and 2019.



Dorena West

From left to right: corner 2016, 2017, 2018, and 2019.




Hansen

Clockwise from upper left: 2016, 2017, 2018, and 2019.




South Taylor

From left to right: 2016, 2017, 2018, and 2019.




APPENDIX D: COMMUNITY COVER MONITORING DATA (2016-2019)

Plant community assessment for all sites. This tables includes the mean relative cover of each species observed at each site each year for years 2016-2019. The mean absolute cover for ground cover measurements ("Ground" in table) are also included for each site. The table is ordered first, alphabetically by site, second by growth form, and lastly by species scientific name. Plant growth forms are ordered as follows: Fern, Forb, Graminoid, Ground, Shrubs, and Trees. Species with a mean relative cover rate of NA (not present) across all years were noted in the plot, but not counted in the 1x1m quadrat. Information on each species native status and life history, where known, are also included.

Site	Growth Form	*Scientific Name*	Common Name	Native (N) or Exotic (E)	Annual (A), perennial (P), or biennial (B)	2016 Mean relative cover	2017 Mean relative cover	2018 Mean relative cover	2019 Mean relative cover
Bake Stewart East	Forb	*Achillea millefolium*	common yarrow	N	P	NA	0.7	0.8	0.25
Bake Stewart East	Forb	*Allium sp.*	onion	NA	NA	NA	NA	0.64	0.35
Bake Stewart East	Forb	*Aquilegia formosa*	columbine	N	P	NA	0.8	NA	NA
Bake Stewart East	Forb	*Arnica sp.*	arnica	N	P	NA	NA	NA	1.88
Bake Stewart East	Forb	*Camassia leichtlinii*	large camas	N	P	NA	0.3	NA	NA
Bake Stewart East	Forb	*Camassia quamash*	small camas	N	P	NA	NA	NA	0.13
Bake Stewart East	Forb	*Centaurea cyanus*	garden cornflower	E	A	NA	0.7	NA	NA
Bake Stewart East	Forb	*Clarkia amoena*	farewell to spring	N	A	NA	NA	NA	2.25
Bake Stewart East	Forb	*Claytonia perfoliata*	miner's lettuce	N	P	NA	NA	0.24	0.30
Bake Stewart East	Forb	*Collinsia parviflora*	Chinese houses	N	A	NA	NA	0.04	0.05
Bake Stewart East	Forb	*Daucus carota*	Queen Anne's lace	E	B	NA	NA	0.08	NA
Bake Stewart East	Forb	*Dichelostemma congestum*	ookow	N	P	NA	NA	NA	0.05
Bake Stewart East	Forb	*Fragaria vesca*	woodland strawberry	N	P	1.6	NA	1.2	0.55

Bake Stewart East	Forb	*Fragaria virginiana*	Virginia strawberry	N	P	NA	2.3	NA	NA
Bake Stewart East	Forb	*Fritillaria affinis*	checker lily	N	P	NA	NA	2.9	1.30
Bake Stewart East	Forb	*Galium aparine*	stickwilly	N	A	NA	NA	NA	0.15
Bake Stewart East	Forb	*Galium sp.*	bedstraw	NA	NA	NA	2.1	0.36	NA
Bake Stewart East	Forb	*Geranium dissectum*	cutleaf geranium	E	A/B	NA	NA	NA	NA
Bake Stewart East	Forb	*Geranium molle*	dove foot geranium	E	A/B/P	0.1	1.5	0.14	NA
Bake Stewart East	Forb	*Hypericum perforatum*	St. John's wort	E	P	NA	0.2	NA	0.10
Bake Stewart East	Forb	*Lactuca sp.*	lettuce	NA	NA	NA	NA	1.5	NA
Bake Stewart East	Forb	*Lamium purpureum*	purple deadnettle	E	A	NA	0.2	NA	NA
Bake Stewart East	Forb	*Lapsana communis*	common nipplewort	E	A	2.5	2.3	NA	NA
Bake Stewart East	Forb	*Lathyrus holochlorus*	thin leaved peavine	N	P	3.6	1.2	0.8	1.00
Bake Stewart East	Forb	*Marah oreganus*	coastal manroot	N	P	NA	NA	NA	NA
Bake Stewart East	Forb	*Moehringia macrophylla*	large leaf sandwort	N	P	3.7	9.7	0.84	4.13
Bake Stewart East	Forb	*Myosotis discolor*	changing forget me not	N	A/P	NA	0.2	NA	NA
Bake Stewart East	Forb	*Nemophila parviflora*	baby blue eyes	N	A	NA	0.9	0.42	0.40
Bake Stewart East	Forb	*Ranunculus uncinatus*	woodland buttercup	N	A/P	NA	NA	0.28	0.63
Bake Stewart East	Forb	*Sanicula crassicaulis*	Pacific black snakeroot	N	P	NA	NA	NA	0.13
Bake Stewart East	Forb	*Sanicula graveolens*	northern sanicle	N	P	NA	NA	0.4	NA
Bake Stewart East	Forb	*Sherardia arvensis*	blue field madder	E	A	NA	NA	0.04	NA
Bake Stewart East	Forb	*Sidalcea malviflora ssp. virgata*	dwarf checkerbloom	N	P	NA	0.3	NA	NA
Bake Stewart East	Forb	*Stellaria media*	common chickweed	E	A/P	0.2	NA	NA	NA

Bake Stewart East	Forb	*Stellaria sp.*	common chickweed	NA	NA	NA	0.2	NA	NA
Bake Stewart East	Forb	*Torilis arvensis*	spreading hedge parsley	E	A	1.4	1	0.26	0.15
Bake Stewart East	Forb	*Vicia americana*	common vetch	N	P	NA	NA	5.4	6.00
Bake Stewart East	Forb	*Vicia hirsuta*	tiny vetch	E	A	0.2	5.8	NA	NA
Bake Stewart East	Forb	*Vicia sativa*	garden vetch	E	A	6.6	7	0.2	0.63
Bake Stewart East	Forb	*Vicia sp.*	unknown vetch	NA	NA	NA	NA	NA	0.05
Bake Stewart East	Graminoid	*Agrostis capillaris*	colonial bentgrass	E	P	NA	NA	NA	NA
Bake Stewart East	Graminoid	*Anthoxanthum odoratum*	sweet vernal grass	E	P	NA	1.9	1.24	NA
Bake Stewart East	Graminoid	*Arrhenatherum elatius*	tall oatgrass	E	P	31	39.5	19.5	6.75
Bake Stewart East	Graminoid	*Avena sativa*	wild oatgrass	E	P	NA	NA	0.1	NA
Bake Stewart East	Graminoid	*Bromus carinatus*	California brome	N	P	0.2	NA	NA	NA
Bake Stewart East	Graminoid	*Bromus diandrus*	ripgut brome	E	A/P	7.8	3.4	0.12	NA
Bake Stewart East	Graminoid	*Bromus vulgaris*	Columbia brome	N	P	0.5	NA	0.04	0.38
Bake Stewart East	Graminoid	*Dactylis glomerata*	orchard grass	E	P	36	8.6	2.04	1.63
Bake Stewart East	Graminoid	*Elymus glaucus*	blue wildrye	N	P	1	NA	NA	NA
Bake Stewart East	Graminoid	*Juncus sp.*	rush	NA	NA	NA	NA	0.04	0.05
Bake Stewart East	Graminoid	*Poa sp.*	bluegrass	NA	NA	NA	0.3	NA	NA
Bake Stewart East	Ground	Bare ground	bare ground	NA	NA	0.4	NA	0.04	NA
Bake Stewart East	Ground	*Bryophytes/lichens*	bryophytes/lichens	NA	NA	0	NA	0.4	NA
Bake Stewart East	Ground	Rock	rock	NA	NA	0	NA	NA	NA
Bake Stewart East	Ground	Thatch	thatch	NA	NA	39	42	39.2	83.63

Bake Stewart East	Shrub	*Oemleria cerasiformis*	Indian plum	N	P	3.5	6.9	6.1	1.50
Bake Stewart East	Shrub	*Toxicodendron diversilobum*	poison oak	N	P	NA	0.5	0.9	0.50
Bake Stewart East	Tree	*Acer macrophyllum*	big leaf maple	N	P	NA	0.7	NA	NA
Bake Stewart East	Tree	*Prunus avium*	sweet cherry	E	P	NA	NA	NA	NA
Bake Stewart East	Tree	*Quercus garryana*	Oregon white oak	N	P	0.3	0.3	NA	0.05
Bake Stewart West	Fern	*Polypodium sp.*	licorice fern	N	NA	NA	NA	0.4	NA
Bake Stewart West	Fern	*Polystichum munitum*	sword fern	N	P	2.1	9.2	NA	NA
Bake Stewart West	Forb	*Arnica sp.*	arnica	NA	NA	NA	NA	NA	0.55
Bake Stewart West	Forb	*Centaurea cyanus*	garden cornflower	E	A	NA	0.7	NA	NA
Bake Stewart West	Forb	*Clarkia amoena*	farewell to spring	N	A	NA	NA	NA	0.18
Bake Stewart West	Forb	*Claytonia perfoliata*	miner's lettuce	N	A/P	7	NA	0.14	0.05
Bake Stewart West	Forb	*Collinsia parviflora*	Chinese houses	N	A	NA	NA	0.04	0.05
Bake Stewart West	Forb	*Fragaria vesca*	woodland strawberry	N	P	NA	NA	NA	0.25
Bake Stewart West	Forb	*Fritillaria affinis*	checker lily	N	P	NA	NA	0.54	NA
Bake Stewart West	Forb	*Galium aparine*	stickwilly	N	A	0.1	NA	0.12	0.15
Bake Stewart West	Forb	*Galium sp.*	bedstraw	NA	NA	2.1	4.6	NA	NA
Bake Stewart West	Forb	*Geranium dissectum*	cutleaf geranium	E	A/B	0.7	1.6	1.18	0.23
Bake Stewart West	Forb	*Hypericum perforatum*	St. John's wort	E	P	0.2	0.9	0.48	0.38
Bake Stewart West	Forb	*Lactuca serriola*	prickly lettuce	E	P	NA	NA	0.3	NA
Bake Stewart West	Forb	*Lamium purpureum*	purple deadnettle	E	A	1.1	NA	0.08	0.05
Bake Stewart West	Forb	*Lapsana communis*	common nipplewort	E	A	1.1	3.1	NA	NA

Bake Stewart West	Forb	*Lathyrus holochlorus*	thin leaved peavine	N	P	4.4	0.7	0.84	1.50
Bake Stewart West	Forb	*Marah oreganus*	coastal manroot	N	P	NA	2	0.04	NA
Bake Stewart West	Forb	*Medicago sp.*	alfalfa	E	NA	NA	NA	0.04	NA
Bake Stewart West	Forb	*Nemophila parviflora*	baby blue eyes	N	A	3.6	NA	0.16	0.28
Bake Stewart West	Forb	*Ranunculus uncinatus*	woodland buttercup	N	A/P	NA	NA	NA	0.05
Bake Stewart West	Forb	*Senecio sylvaticus*	woodland ragwort	E	A	NA	NA	NA	NA
Bake Stewart West	Forb	*Stellaria media*	common chickweed	E	A/P	0.3	NA	NA	NA
Bake Stewart West	Forb	*Torilis arvensis*	spreading hedge parsley	E	A	0.4	6.4	0.04	0.68
Bake Stewart West	Forb	*Vicia hirsuta*	tiny vetch	E	A	3.3	9.6	0.54	0.13
Bake Stewart West	Forb	*Vicia sativa*	garden vetch	E	A	0.7	10.3	0.04	1.23
Bake Stewart West	Graminoid	*Agrostis capillaris*	colonial bentgrass	E	P	NA	0.8	NA	NA
Bake Stewart West	Graminoid	*Bromus carinatus*	California brome	N	P	NA	NA	NA	0.88
Bake Stewart West	Graminoid	*Bromus diandrus*	ripgut brome	E	A	NA	NA	NA	NA
Bake Stewart West	Graminoid	*Bromus vulgaris*	Columbia brome	N	P	NA	0.5	0.2	NA
Bake Stewart West	Graminoid	*Elymus glaucus*	blue wildrye	N	P	2.5	2.6	2.6	2.00
Bake Stewart West	Graminoid	*Juncus sp.*	rush	N	NA	NA	NA	0.04	NA
Bake Stewart West	Graminoid	*Poa sp.*	bluegrass	NA	NA	NA	NA	NA	0.50
Bake Stewart West	Graminoid	*Schedonorus arundinaceus*	tall fescue	E	P	NA	NA	0.8	0.50
Bake Stewart West	Ground	Bare ground	bare ground	NA	NA	16	NA	0	NA
Bake Stewart West	Ground	*Bryophytes/lichens*	bryophytes/lichens	NA	NA	1.2	NA	0.94	NA
Bake Stewart West	Ground	Rock	rock	NA	NA	0.8	NA	NA	NA

Bake Stewart West	Ground	Thatch	thatch	NA	NA	29	30	27.8	99.75
Bake Stewart West	Shrub	*Cytisus scoparius*	Scotch broom	E	P	NA	NA	0.4	NA
Bake Stewart West	Shrub	*Oemleria cerasiformis*	Indian plum	N	P	0.1	NA	0.4	0.25
Bake Stewart West	Shrub	*Rosa sp.*	rose	NA	P	NA	NA	NA	NA
Bake Stewart West	Shrub	*Symphoricarpos albus*	snowberry	N	P	52.7	37.5	21.6	21.00
Bake Stewart West	Shrub	*Toxicodendron diversilobum*	poison oak	N	P	15.1	7.2	8.8	14.75
Bake Stewart West	Tree	*Prunus avium*	sweet cherry	E	P	NA	0.2	NA	NA
Bake Stewart West	Tree	*Quercus garryana*	Oregon white oak	N	P	2.6	2	NA	0.50
Bald Hill Big Plot	Forb	*Adenocaulon bicolor*	pathfinder	N	P	NA	NA	NA	0.25
Bald Hill Big Plot	Forb	*Cirsium vulgare*	bull thistle	E	P	NA	NA	0.04	0.13
Bald Hill Big Plot	Forb	*Clarkia amoena*	farewell to spring	N	A	NA	NA	NA	4.63
Bald Hill Big Plot	Forb	*Claytonia sibirica*	Siberian springbeauty	N	P	NA	NA	1.1	0.10
Bald Hill Big Plot	Forb	*Daucus sp.*	wild carrot	NA	NA	NA	NA	NA	0.30
Bald Hill Big Plot	Forb	*Epilobium sp.*	unknown willowherb	NA	NA	NA	NA	0.18	0.05
Bald Hill Big Plot	Forb	*Erysimum oreganum*	wallflower	N	P	NA	NA	0.2	NA
Bald Hill Big Plot	Forb	*Galium aparine*	stickwilly	N	A	NA	NA	1.5	1.68
Bald Hill Big Plot	Forb	*Geranium dissectum*	cutleaf geranium	E	A/B	NA	NA	NA	0.30
Bald Hill Big Plot	Forb	*Hypochaeris radicata*	false dandelion	E	P	NA	NA	1	2.25
Bald Hill Big Plot	Forb	*Lathyrus holochlorus*	thin leaved peavine	N	P	NA	NA	1.2	0.55
Bald Hill Big Plot	Forb	*Madia sp.*	tar weed	NA	NA	NA	NA	0.2	0.88
Bald Hill Big Plot	Forb	*Mentha pulegium*	pennyroyal	NA	NA	NA	NA	NA	0.10

Bald Hill Big Plot	Forb	*Nemophila parviflora*	small-flowered nemophila	N	A	NA	NA	0.2	0.15
Bald Hill Big Plot	Forb	*Osmorhiza berteroi*	sweet cicely	N	P	NA	NA	2.3	2.00
Bald Hill Big Plot	Forb	*Ranunculus uncinatus*	woodland buttercup	N	A/P	NA	NA	NA	0.28
Bald Hill Big Plot	Forb	*Sanicula crassicaulis*	Pacific black snakeroot	N	P	NA	NA	NA	0.80
Bald Hill Big Plot	Forb	*Sanicula graveolens*	northern sanicle	N	P	NA	NA	1.14	NA
Bald Hill Big Plot	Forb	*Senecio jacobaea*	stinking willy	E	P	NA	NA	0.2	0.05
Bald Hill Big Plot	Forb	*Torilis arvensis*	spreading hedgeparsley	E	A	NA	NA	0.84	0.68
Bald Hill Big Plot	Forb	*Vicia sativa*	garden vetch	E	A	NA	NA	NA	0.13
Bald Hill Big Plot	Graminoid	*Avena ovatum*	wild oat	E	P	NA	NA	NA	0.13
Bald Hill Big Plot	Graminoid	*Brachypodium sylvaticum*	false brome	E	P	NA	NA	1.24	0.65
Bald Hill Big Plot	Graminoid	*Bromus carinatus*	California brome	N	P	NA	NA	0.04	0.75
Bald Hill Big Plot	Graminoid	*Bromus vulgaris*	Columbia brome	N	P	NA	NA	0.6	0.50
Bald Hill Big Plot	Graminoid	*Cynosorus echinatus*	bristly dogstail grass	NA	NA	NA	NA	NA	0.75
Bald Hill Big Plot	Graminoid	*Danthonia californica*	California oatgrass	NA	NA	NA	NA	NA	2.00
Bald Hill Big Plot	Graminoid	*Elymus glaucus*	blue wildrye	N	P	NA	NA	0.24	1.00
Bald Hill Big Plot	Graminoid	*Luzula campestris*	field woodrush	NA	P	NA	NA	NA	0.05
Bald Hill Big Plot	Ground	Bare ground	bare ground	NA	NA	NA	NA	6	0.38
Bald Hill Big Plot	Ground	*Bryophytes/lichens*	bryophytes/lichens	NA	NA	NA	NA	1.3	0.50
Bald Hill Big Plot	Ground	Log	log	NA	NA	NA	NA	2	NA
Bald Hill Big Plot	Ground	Thatch	thatch	NA	NA	NA	NA	91.2	99.63

Bald Hill Big Plot	Shrub	*Crataegus monogyna*	oneseed hawthorn	E	P	NA	NA	NA	0.05
Bald Hill Big Plot	Shrub	*Garrya elliptica*	silk tassle	N	P	NA	NA	0.2	NA
Bald Hill Big Plot	Shrub	*Rosa nutkana*	Nootka rose	N	P	NA	NA	0.8	3.00
Bald Hill Big Plot	Shrub	*Symphoricarpos albus*	snowberry	N	P	NA	NA	0.2	NA
Bald Hill Big Plot	Shrub	*Toxicodendron diversilobum*	poison oak	N	P	NA	NA	14.54	2.75
Bald Hill Big Plot	Tree	*Acer macrophyllum*	big leaf maple	N	P	NA	NA	0.34	0.10
Bald Hill Big Plot	Tree	*Prunus avium*	sweet cherry	E	P	NA	NA	NA	0.18
Bald Hill Big Plot	Tree	*Quercus garryana*	Oregon white oak	N	P	NA	NA	1.8	0.23
Bald Hill Small Plot	Fern	*Polystichum munitum*	sword fern	N	P	NA	NA	0.2	NA
Bald Hill Small Plot	Forb	*Adenocaulon bicolor*	pathfinder	n	P	NA	NA	0.4	0.05
Bald Hill Small Plot	Forb	*Clarkia amoena*	farewell to spring	N	A	NA	NA	NA	1.63
Bald Hill Small Plot	Forb	*Claytonia sibirica*	Siberian springbeauty	N	P	NA	NA	NA	0.05
Bald Hill Small Plot	Forb	*Daucus carota*	Queen Anne's lace	E	B	NA	NA	0.04	NA
Bald Hill Small Plot	Forb	*Epilobium sp.*	unknown willowherb	NA	NA	NA	NA	0.04	NA
Bald Hill Small Plot	Forb	*Erysimum oreganum*	wallflower	N	P	NA	NA	0.1	NA
Bald Hill Small Plot	Forb	*Galium aparine*	stickwilly	N	A	NA	NA	2.14	2.25
Bald Hill Small Plot	Forb	*Hypochaeris radicata*	false dandelion	E	P	NA	NA	0.4	0.50
Bald Hill Small Plot	Forb	*Iris tenax*	toughleaf iris	NA	NA	NA	NA	NA	0.75
Bald Hill Small Plot	Forb	*Lactuca muralis*	wall lettuce	E	P	NA	NA	0.04	NA
Bald Hill Small Plot	Forb	*Lathyrus holochlorus*	thin leaved peavine	N	P	NA	NA	0.6	0.13
Bald Hill Small Plot	Forb	*Lomatium/Sanicula*	unknown lomation or sanicle	NA	NA	NA	NA	0.4	0.50

Bald Hill Small Plot	Forb	*Moehringia macrophylla*	large leaf sandwort	N	P	NA	NA	1.4	0.25
Bald Hill Small Plot	Forb	*Nemophila parviflora*	small-flowered nemophila	N	A	NA	NA	0.2	0.23
Bald Hill Small Plot	Forb	*Osmorhiza berteroi*	sweet cicely	N	P	NA	NA	1.94	1.38
Bald Hill Small Plot	Forb	*Prunella vulgaris*	common selfheal	N	P	NA	NA	NA	0.05
Bald Hill Small Plot	Forb	*Ranunculus uncinatus*	woodland buttercup	N	A/P	NA	NA	NA	0.28
Bald Hill Small Plot	Forb	*Sanicula crassicaulis*	Pacific black snakeroot	N	P	NA	NA	NA	0.05
Bald Hill Small Plot	Forb	*Sanicula graveolens*	northern sanicle	N	P	NA	NA	0.08	NA
Bald Hill Small Plot	Forb	*Torilis arvensis*	spreading hedgeparsley	E	A	NA	NA	0.42	0.48
Bald Hill Small Plot	Forb	*Vicia sativa*	garden vetch	E	A	NA	NA	0.1	0.18
Bald Hill Small Plot	Forb	*Viola sempervirens*	redwood violet	N	P	NA	NA	0.04	0.05
Bald Hill Small Plot	Graminoid	*Avena ovatum*	wild oat	E	P	NA	NA	0.04	NA
Bald Hill Small Plot	Graminoid	*Brachypodium sylvaticum*	false brome	E	P	NA	NA	1.4	2.13
Bald Hill Small Plot	Graminoid	*Bromus carinatus*	California brome	N	P	NA	NA	0.1	0.75
Bald Hill Small Plot	Graminoid	*Bromus vulgaris*	Columbia brome	N	P	NA	NA	0.9	0.38
Bald Hill Small Plot	Graminoid	*Carex sp.*	unknown sedge	NA	NA	NA	NA	NA	0.50
Bald Hill Small Plot	Graminoid	*Cynosorus echinatus*	bristly dogstail grass	NA	NA	NA	NA	NA	0.80
Bald Hill Small Plot	Graminoid	*Elymus glaucus*	blue wildrye	N	P	NA	NA	1.2	0.50
Bald Hill Small Plot	Graminoid	*Poa sp.*	unknown poa	NA	NA	NA	NA	0.2	0.25
Bald Hill Small Plot	Ground	Bare ground	bare ground	NA	NA	NA	NA	11.6	3.00
Bald Hill Small Plot	Ground	*Bryophytes/lichens*	bryophytes/lichens	NA	NA	NA	NA	1.5	1.63

Bald Hill Small Plot	Ground	Log	log	NA	NA	NA	NA	1.6	1.50
Bald Hill Small Plot	Ground	Rock	rock	NA	NA	NA	NA	0	NA
Bald Hill Small Plot	Ground	Thatch	thatch	NA	NA	NA	NA	62.4	95.00
Bald Hill Small Plot	Shrub	*Holodiscus discolor*	oceanspray	N	P	NA	NA	6	0.05
Bald Hill Small Plot	Shrub	*Symphoricarpos albus*	snowberry	N	P	NA	NA	NA	0.25
Bald Hill Small Plot	Shrub	*Toxicodendron diversilobum*	poison oak	N	P	NA	NA	15.4	16.75
Bald Hill Small Plot	Tree	*Acer macrophyllum*	big leaf maple	N	P	NA	NA	0.44	0.88
Bald Hill Small Plot	Tree	*Prunus avium*	sweet cherry	E	P	NA	NA	NA	0.10
Bald Hill Small Plot	Tree	*Quercus garryana*	Oregon white oak	N	P	NA	NA	NA	0.13
Bald Hill Small Plot	vine	*Lonicera hispidula*	pink honeysuckle	N	P	NA	NA	NA	0.25
Dorena East	Forb	*Achillea millefolium*	common yarrow	N	P	1.2	1.2	NA	0.05
Dorena East	Forb	*Arnica cordifolia*	heartleaf arnica	N	P	NA	NA	NA	NA
Dorena East	Forb	*Calochortus tolmeii*	Tolmie star tulip	N	P	NA	NA	0.12	NA
Dorena East	Forb	*Calystegia atriplicifolia*	night blooming false bindweed	E	P	0.9	1.1	NA	NA
Dorena East	Forb	*Camassia leichtlinii*	large camas	N	P	NA	NA	NA	NA
Dorena East	Forb	*Camassia quamash*	small camas	N	P	NA	NA	NA	0.05
Dorena East	Forb	*Cirsium arvense*	Canada thistle	E	P	NA	NA	NA	NA
Dorena East	Forb	*Cirsium vulgare*	bull thistle	E	B	NA	NA	0.8	NA
Dorena East	Forb	*Convolvulus arvensis*	field bindweed	E	P	NA	NA	0.2	NA
Dorena East	Forb	*Dichelostemma congestum*	ookow	N	P	NA	0.3	0.04	0.05
Dorena East	Forb	*Epilobium ciliatum*	fringed willow herb	N	P	NA	NA	NA	NA

Dorena East	Forb	*Fragaria virginiana*	Virginia strawberry	N	P	0.3	0.4	NA	1.68
Dorena East	Forb	*Galium aparine*	stickwilly	N	A	2.8	6.3	0.22	1.75
Dorena East	Forb	*Galium pedemontanum*	piedmont bedstraw	E	A	NA	0.6	NA	NA
Dorena East	Forb	*Geranium dissectum*	cutleaf geranium	E	A/B	0.7	2.4	1.5	0.23
Dorena East	Forb	*Hypericum perforatum*	St. John's wort	E	P	2.4	0.5	0.08	0.13
Dorena East	Forb	*Hypochaeris radicata*	hairy cat's ear	E	P	0.1	0.7	NA	NA
Dorena East	Forb	*Lactuca serriola*	prickly lettuce	E	A/B	NA	NA	NA	NA
Dorena East	Forb	*Lathyrus holochlorus*	thin leaved peavine	N	P	0.9	0.7	0.2	0.75
Dorena East	Forb	*Leucanthemum vulgare*	oxeeye daisy	E	P	0.4	2.4	2.3	0.88
Dorena East	Forb	*Lonicera sp.*	honeysuckle	E	P	NA	0.9	NA	NA
Dorena East	Forb	*Lupinus rivularis*	broadleaf lupine	N	P	0.2	0.7	NA	NA
Dorena East	Forb	*Mitella sp.*	miterwort	NA	NA	NA	NA	NA	NA
Dorena East	Forb	*Myosotis discolor*	changing forget me not	E	P	NA	NA	0.04	0.05
Dorena East	Forb	*Myosotis laxa*	bay forget me nots	N	A/B/P	NA	0.3	NA	NA
Dorena East	Forb	*Nemophila parviflora*	small-flowered nemophila	N	A	NA	1.3	0.64	1.00
Dorena East	Forb	*Nemophila sp.*	nemophila	NA	NA	2.4	NA	NA	NA
Dorena East	Forb	*Plantago lanceolata*	narrowleaf plantain	E	A/B/P	0.9	0.4	0.1	0.25
Dorena East	Forb	*Rumex acetosella*	common sheep sorrel	E	P	0.9	0.8	0.2	1.00
Dorena East	Forb	*Sanguisorba officinalis*	great burnet	N	P	0.3	NA	NA	NA
Dorena East	Forb	*Sanicula crassicaulis*	Pacific black snakeroot	N	P	NA	NA	NA	0.38

Dorena East	Forb	*Sherardia arvensis*	blue field madder	E	A	NA	0.6	NA	NA
Dorena East	Forb	*Sidalcea malviflora ssp. virgata*	dwarf checkerbloom	N	P	11.2	3.5	0.84	1.25
Dorena East	Forb	*Torilis arvensis*	spreading hedge parsley	E	A	0.8	3	0.34	1.38
Dorena East	Forb	*Trifolium dubium*	suckling clover	E	A	NA	0.3	NA	NA
Dorena East	Forb	*Veronica arvensis*	corn speedwheel	E	A	NA	0.3	NA	NA
Dorena East	Forb	*Vicia hirsuta*	tiny vetch	E	A	0.2	1.7	0.14	0.20
Dorena East	Forb	*Vicia sativa*	garden vetch	E	A	0.5	3.5	1.6	0.43
Dorena East	Forb	*Viola praemorsa*	canary violet	N	P	NA	1.3	NA	NA
Dorena East	Graminoid	*Anthoxanthum odoratum*	sweet vernal grass	E	P	NA	NA	0.8	0.05
Dorena East	Graminoid	*Arrhenatherum elatius*	tall oatgrass	E	P	2.7	5.7	0.64	0.88
Dorena East	Graminoid	*Bromus carinatus*	California brome	N	P	NA	0.8	NA	0.13
Dorena East	Graminoid	*Bromus sp.*	brome	NA	NA	NA	NA	NA	NA
Dorena East	Graminoid	*Bromus vulgaris*	Columbia brome	N	P	NA	NA	0.1	NA
Dorena East	Graminoid	*Dactylis glomerata*	orchard grass	E	P	NA	NA	0.04	NA
Dorena East	Graminoid	*Danthonia compressa*	flattened oatgrass	N	P	NA	0.2	NA	NA
Dorena East	Graminoid	*Elymus glaucus*	blue wildrye	N	P	2.7	NA	NA	0.25
Dorena East	Graminoid	*Festuca roemeri*	Roemer's fescue	N	P	NA	NA	NA	NA
Dorena East	Graminoid	*Festuca sp*	fescue	NA	NA	NA	NA	NA	NA
Dorena East	Graminoid	*Poa secunda*	Sandberg bluegrass	E	P	NA	1.2	0.04	NA
Dorena East	Graminoid	*Poa sp.*	bluegrass	NA	NA	NA	NA	NA	0.15
Dorena East	Graminoid	*Schedonorus arundinaceus*	tall fescue	E	P	3	1.1	NA	0.25

Dorena East	Ground	Bare ground	bare ground	NA	NA	6.8	NA	0	NA
Dorena East	Ground	*Bryophytes/lichens*	bryophytes/lichens	NA	NA	1.5	NA	0.48	4.75
Dorena East	Ground	Rock	rock	NA	NA	0.1	NA	NA	NA
Dorena East	Ground	Thatch	thatch	NA	NA	22.5	27	8	100.00
Dorena East	Shrub	*Crataegus monogyna*	oneseed hawthorn	E	P	NA	NA	NA	0.13
Dorena East	Shrub	*Oemleria cerasiformis*	Indian plum	N	P	NA	NA	NA	NA
Dorena East	Shrub	*Rosa nutkana*	Nootka rose	N	P	NA	2.4	1.4	0.25
Dorena East	Shrub	*Rosa sp.*	rose	NA	P	1.5	NA	NA	NA
Dorena East	Shrub	*Rubus bifrons*	Himalayan blackberry	E	P	NA	NA	NA	NA
Dorena East	Shrub	*Rubus ursinus*	trailing blackberry	N	P	14.5	11.8	9.7	11.63
Dorena East	Shrub	*Symphoricarpos albus*	snowberry	N	P	34.4	27.7	51	45.00
Dorena East	Shrub	*Toxicodendron diversilobum*	poison oak	N	P	0.6	8.1	1.2	0.38
Dorena East	Tree	*Fraxinus latifolia*	Oregon ash	N	P	NA	0.4	NA	NA
Dorena East	Tree	*Prunus avium*	sweet cherry	E	P	NA	NA	0.2	NA
Dorena East	Tree	*Quercus garryana*	Oregon white oak	N	P	6.7	1.1	0.3	0.68
Dorena East	Vine	*Lonicera hispidula*	pink honeysuckle	N	P	6.8	6.8	1.4	0.88
Dorena West	Forb	*Achillea millefolium*	common yarrow	N	P	0.2	NA	NA	NA
Dorena West	Forb	*Calochortus tolmeii*	Tolmie star tulip	N	P	NA	NA	0.04	0.05
Dorena West	Forb	*Calystegia atriplicifolia*	night blooming false bindweed	N	P	NA	NA	NA	NA
Dorena West	Forb	*Camassia leichtlinii*	large camas	N	P	NA	0.7	NA	NA
Dorena West	Forb	*Camassia leichtlinii ssp. suksdorfii*	Suksdorf's large camas	N	P	NA	NA	NA	NA

Dorena West	Forb	*Camassia quamash*	small camas	N	P	NA	NA	0.3	0.17
Dorena West	Forb	*Cirsium vulgare*	bull thistle	E	B	NA	0.4	NA	NA
Dorena West	Forb	*Clarkia amoena*	farewell to spring	N	A	NA	NA	NA	0.18
Dorena West	Forb	*Convolvulus arvensis*	field bindweed	E	P	NA	1	0.1	NA
Dorena West	Forb	*Dichelostemma congestum*	ookow	N	P	NA	1.3	NA	NA
Dorena West	Forb	*Epilobium ciliatum*	fringed willow herb	N	P	0.1	NA	NA	NA
Dorena West	Forb	*Fragaria virginiana*	Virginia strawberry	N	P	4	1.7	1.5	0.25
Dorena West	Forb	*Galium aparine*	stickwilly	N	A	0.4	4.3	0.58	2.55
Dorena West	Forb	*Galium pedemontanum*	piedmont bedstraw	E	A	NA	0.5	NA	NA
Dorena West	Forb	*Galium sp.*	bedstraw	NA	NA	1.3	NA	NA	NA
Dorena West	Forb	*Geranium dissectum*	cutleaf geranium	E	A/B	1	3.7	2.3	0.20
Dorena West	Forb	*Hypericum perforatum*	St. John's wort	E	P	0.6	1.2	0.5	0.10
Dorena West	Forb	*Lathyrus holochlorus*	thin leaved peavine	N	P	0.8	NA	NA	NA
Dorena West	Forb	*Leucanthemum vulgare*	oxeeye daisy	E	P	10	8.2	3	0.75
Dorena West	Forb	*Mitella sp.*	miterwort	NA	NA	NA	0.4	NA	NA
Dorena West	Forb	*Myosotis discolor*	changing forget me not	E	A/P	NA	NA	0.08	0.10
Dorena West	Forb	*Myosotis laxa*	bay forget me nots	N	A/B/P	NA	1	NA	NA
Dorena West	Forb	*Nemophila parviflora*	small-flowered nemophila	N	A	NA	0.6	0.04	0.23
Dorena West	Forb	*Plantago lanceolata*	narrow leaf plantain	E	A/B/P	1.5	0.7	0.6	NA
Dorena West	Forb	*Potentilla gracilis*	slender cinquefoil	N	P	NA	NA	NA	NA

Dorena West	Forb	*Ranunculus uncinatus*	woodland buttercup	N	A/P	NA	NA	NA	0.15
Dorena West	Forb	*Rumex acetosella*	common sheep sorrel	E	P	2.8	1.7	1	NA
Dorena West	Forb	*Sanguisorba officinalis*	great burnet	N	P	0.5	0.2	NA	NA
Dorena West	Forb	*Sanicula crassicaulis*	Pacific black snakeroot	N	P	0.4	NA	NA	0.50
Dorena West	Forb	*Sidalcea malviflora ssp. virgata*	dwarf checkerbloom	N	P	NA	NA	0.1	NA
Dorena West	Forb	*Taraxacum officinale*	dandelion	E	P	0.1	NA	NA	NA
Dorena West	Forb	*Torilis arvensis*	spreading hedge parsley	E	A	0.6	2.2	0.18	3.50
Dorena West	Forb	*Trifolium dubium*	suckling clover	E	A	NA	0.2	NA	NA
Dorena West	Forb	*Vicia cracca*	bird vetch	E	P	NA	NA	NA	NA
Dorena West	Forb	*Vicia hirsuta*	tiny vetch	E	A	0.3	1.4	1.68	0.35
Dorena West	Forb	*Vicia sativa*	garden vetch	E	A	0.3	1.8	0.64	0.13
Dorena West	Graminoid	*Anthoxanthum odoratum*	sweet vernal grass	E	P	1	6.5	4.5	0.23
Dorena West	Graminoid	*Arrhenatherum elatius*	tall oatgrass	E	P	38.8	8.7	5	3.75
Dorena West	Graminoid	*Bromus carinatus*	California brome	N	P	0.6	NA	NA	0.25
Dorena West	Graminoid	*Bromus diandrus*	ripgut brome	E	A/P	0.3	NA	0.9	NA
Dorena West	Graminoid	*Bromus sp.*	brome	NA	NA	NA	0.8	NA	NA
Dorena West	Graminoid	*Bromus vulgaris*	Columbia brome	N	P	0.3	NA	NA	NA
Dorena West	Graminoid	*Dactylis glomerata*	orchard grass	E	P	NA	8.8	4.2	15.00
Dorena West	Graminoid	*Elymus glaucus*	blue wildrye	N	P	0.3	NA	NA	NA
Dorena West	Graminoid	*Festuca roemeri*	Roemer's fescue	N	P	NA	3.4	3.9	0.50
Dorena West	Graminoid	*Festuca sp.*	fescue	NA	NA	11.2	NA	NA	NA

Dorena West	Graminoid	*Poa pratensis*	Kentucky bluegrass	E	P	0.2	NA	NA	NA
Dorena West	Graminoid	*Poa secunda*	Sandberg bluegrass	E	P	NA	NA	0.34	NA
Dorena West	Graminoid	*Poa sp.*	bluegrass	NA	NA	NA	2.2	NA	0.40
Dorena West	Graminoid	*Schedonorus arundinaceus*	tall fescue	E	P	2.2	5.5	NA	NA
Dorena West	Ground	Bare ground	bare ground	NA	NA	6.1	1.2	0	0.00
Dorena West	Ground	*Bryophytes/lichens*	bryophytes/lichens	NA	NA	0.5	1.2	3.8	7.00
Dorena West	Ground	Rock	rock	NA	NA	0.1	NA	NA	NA
Dorena West	Ground	Thatch	thatch	NA	NA	26.3	18	15.8	100.00
Dorena West	Shrub	*Crataegus monogyna*	oneseed hawthorn	N	P	NA	1.6	NA	0.05
Dorena West	Shrub	*Rosa nutkana*	Nootka rose	N	P	NA	10.9	9	0.75
Dorena West	Shrub	*Rosa pisocarpa*	cluster rose	NA	NA	NA	NA	NA	6.50
Dorena West	Shrub	*Rosa sp.*	rose	NA	P	7.1	NA	NA	NA
Dorena West	Shrub	*Rubus bifrons*	Himalayan blackberry	E	P	2.7	2.2	0.04	NA
Dorena West	Shrub	*Rubus ursinus*	trailing blackberry	N	P	NA	3.2	1.6	1.50
Dorena West	Shrub	*Symphoricarpos albus*	snowberry	N	P	7.4	4.7	5.4	NA
Dorena West	Shrub	*Toxicodendron diversilobum*	poison oak	N	P	NA	2.9	0.2	2.25
Dorena West	Tree	*Fraxinus latifolia*	Oregon ash	N	P	NA	0.4	NA	NA
Dorena West	Tree	*Quercus garryana*	Oregon white oak	N	P	3.2	2.6	3.8	3.38
Hansen	Fern	*Polystichum munitum*	sword fern	N	P	0.1	1.7	0.4	1.75
Hansen	Forb	*Achillea millefolium*	common yarrow	N	P	NA	NA	NA	0.05
Hansen	Forb	*Cirsium sp.*	unknown thistle	NA	NA	NA	NA	NA	0.50

Hansen	Forb	*Cirsium vulgare*	bull thistle	E	B	0.1	NA	NA	NA
Hansen	Forb	*Clarkia amoena*	farewell to spring	N	A	NA	NA	NA	0.43
Hansen	Forb	*Clinopodium douglasii*	yerba buena	N	P	NA	NA	0.6	NA
Hansen	Forb	*Conium sp.*	poison hemlock	E	NA	NA	NA	0.2	NA
Hansen	Forb	*Crepis capillaris*	smooth hawksbeard	E	A/B	0.1	NA	NA	NA
Hansen	Forb	*Daucus carota*	Queen Anne's lace	E	B	1.3	3.7	1.1	0.50
Hansen	Forb	*Dichelostemma congestum*	ookow	N	P	NA	0.2	NA	0.05
Hansen	Forb	*Eriophyllum lanatum*	Oregon sunshine	N	P	NA	NA	NA	NA
Hansen	Forb	*Galium aparine*	stickwilly	N	A	NA	0.4	0.2	0.10
Hansen	Forb	*Geranium dissectum*	cutleaf geranium	E	A/B	1.5	2.7	0.6	0.28
Hansen	Forb	*Hypericum perforatum*	St. John's wort	E	P	0.7	1	0.16	0.10
Hansen	Forb	*Hypochaeris radicata*	hairy cat's ear	E	P	7.2	10.4	0.14	0.23
Hansen	Forb	*Lactuca serriola*	prickly lettuce	E	P	NA	NA	0.1	NA
Hansen	Forb	*Lathyrus holochlorus*	thin leaved peavine	N	P	1.6	1.6	0.3	0.88
Hansen	Forb	*Leucanthemum vulgare*	oxeeye daisy	E	P	3.6	1	1.3	0.35
Hansen	Forb	*Medicago lupulina*	alfalfa	E	NA	NA	NA	0.16	1.55
Hansen	Forb	*Myosotis discolor*	changing forget me not	E	A/P	NA	NA	0.08	0.15
Hansen	Forb	*Osmorhiza berteroi*	sweet cicely	N	P	1.8	0.7	0.84	1.00
Hansen	Forb	*Oxalis sp.*	woodsorrel	NA	NA	NA	0.8	NA	NA
Hansen	Forb	*Prunella vulgaris var. lanceolata*	lance selfheal	N	P	NA	0.2	NA	NA
Hansen	Forb	*Ranunculus uncinatus*	woodland buttercup	N	A/P	NA	NA	NA	0.15

Hansen	Forb	*Sanicula crassicaulis*	Pacific black snakeroot	N	P	0.2	0.4	NA	2.00
Hansen	Forb	*Sanicula graveolens*	northern sanicle	N	P	NA	NA	0.38	NA
Hansen	Forb	*Satureja douglasii*	yerba buena	N	P	0.4	NA	NA	NA
Hansen	Forb	*Senecio jacobaea*	stinking willy	E	P	NA	NA	NA	0.05
Hansen	Forb	*Sherardia arvensis*	blue field madder	E	A	NA	NA	0.04	0.05
Hansen	Forb	*Sidalcea malviflora ssp. virgata*	dwarf checkerbloom	N	P	0.4	NA	0.1	0.25
Hansen	Forb	*Stellaria media*	common chickweed	E	A/P	NA	NA	NA	0.10
Hansen	Forb	*Taraxacum officinale*	dandelion	E	P	0.5	NA	0.4	NA
Hansen	Forb	*Torilis arvensis*	spreading hedgeparsley	E	A	NA	NA	NA	NA
Hansen	Forb	*Trifolium dubium*	suckling clover	E	A	0.6	7	NA	NA
Hansen	Forb	*Trifolium repens*	white clover	E	P	0.2	NA	NA	NA
Hansen	Forb	*Trifolium sp.*	clover	NA	NA	NA	NA	0.04	NA
Hansen	Forb	*Vicia hirsuta*	tiny vetch	E	A	0.2	3.7	0.5	1.13
Hansen	Forb	*Vicia sativa*	garden vetch	E	A	1.2	4	0.28	3.00
Hansen	Graminoid	*Anthoxanthum odoratum*	sweet vernal grass	E	P	10	17.2	2.9	1.13
Hansen	Graminoid	*Arrhenatherum elatius*	tall oatgrass	E	P	NA	NA	0.02	0.25
Hansen	Graminoid	*Bromus carinatus*	California brome	N	P	1.4	0.4	NA	0.07
Hansen	Graminoid	*Bromus commutatus*	bald brome	E	A	0.7	NA	NA	NA
Hansen	Graminoid	*Bromus diandrus*	ripgut brome	E	A	NA	NA	0.2	0.05
Hansen	Graminoid	*Bromus vulgaris*	Columbia brome	N	P	0.5	NA	0.6	NA
Hansen	Graminoid	*Cynosorus echinatus*	bristly dogstail grass	E	A	9.7	5.6	0.08	0.68

Hansen	Graminoid	*Dactylis glomerata*	orchard grass	E	P	14.7	4.1	3.4	0.50
Hansen	Graminoid	*Elymus glaucus*	blue wildrye	N	P	2.9	6.3	NA	0.48
Hansen	Graminoid	*Holcus lanatus*	common velvet grass	E	P	0.4	NA	0.04	NA
Hansen	Graminoid	*Luzula campestris*	field woodrush	NA	P	NA	NA	NA	NA
Hansen	Graminoid	*Poa pratensis*	Kentucky bluegrass	NA	P	0.8	NA	NA	NA
Hansen	Graminoid	*Poa secunda*	Sandberg bluegrass	E	P	NA	NA	0.08	0.05
Hansen	Graminoid	*Schedonorus arundinaceus*	tall fescue	E	P	NA	3.7	0.1	0.30
Hansen	Ground	Bare ground	bare ground	NA	NA	5.2	NA	1.3	1.13
Hansen	Ground	*Bryophytes/lichens*	bryophytes/lichens	NA	NA	0.8	NA	1	0.50
Hansen	Ground	Rock	rock	NA	NA	0	NA	0	NA
Hansen	Ground	Thatch	thatch	NA	NA	25	21	11.6	98.75
Hansen	Shrub	*Amelanchier alnifolia*	serviceberry	N	P	0.2	0.4	1.6	NA
Hansen	Shrub	*Corylus cornuta var. californica*	California hazelnut	N	P	1.5	NA	0.7	NA
Hansen	Shrub	*Crataegus sp.*	oneseed hawthorn	NA	P	NA	0.2	NA	NA
Hansen	Shrub	*Lonicera ciliosa*	orange honeysuckle	N	P	1.4	0.6	NA	NA
Hansen	Shrub	*Rosa sp.*	rose	NA	P	NA	NA	0.24	0.50
Hansen	Shrub	*Rubus bifrons*	Himalayan blackberry	E	P	22.6	17	NA	9.75
Hansen	Shrub	*Rubus laciniatus*	cutleaf blackberry	N	P	0.3	0.9	NA	NA
Hansen	Shrub	*Rubus ursinus*	trailing blackberry	N	P	NA	NA	19.8	1.00
Hansen	Shrub	*Symphoricarpos mollis*	snowberry	N	P	NA	NA	0.8	NA
Hansen	Shrub	*Toxicodendron diversilobum*	poison oak	N	P	11.1	3.8	15	10.25

Hansen	Tree	*Arbutus menziesii*	madrone	N	P	NA	NA	0.2	NA
Hansen	Tree	*Fraxinus latifolia*	Oregon ash	N	P	NA	NA	0.04	NA
Hansen	Tree	*Prunus avium*	sweet cherry	E	P	NA	0.4	NA	NA
Hansen	Tree	*Quercus garryana*	Oregon white oak	N	P	NA	NA	1.6	0.13
Hansen	Tree	*Quercus kellogii*	black oak	N	P	NA	NA	NA	NA
Hansen	Tree	*Unknown tree*	unknown tree	NA	P	NA	NA	NA	0.55
Hansen	Vine	*Lonicera hispidula*	pink honeysuckle	N	P	NA	NA	1.7	0.88
Hansen RAC	Fern	*Polystichum munitum*	sword fern	N	P	NA	NA	NA	4.75
Hansen RAC	Forb	*Achillea millefolium*	common yarrow	N	P	NA	NA	NA	0.05
Hansen RAC	Forb	*Camassia quamash*	small camas	N	P	NA	NA	NA	0.43
Hansen RAC	Forb	*Clarkia amoena*	farewell to spring	N	a	NA	NA	NA	0.35
Hansen RAC	Forb	*Daucus carota*	Queen Anne's lace	E	B	NA	NA	NA	0.15
Hansen RAC	Forb	*Eriophyllum lanatum*	Oregon sunshine	N	P	NA	NA	NA	0.25
Hansen RAC	forb	*Galium aparine*	stickwilly	N	A	NA	NA	NA	0.73
Hansen RAC	Forb	*Geranium dissectum*	cutleaf geranium	E	A	NA	NA	NA	0.35
Hansen RAC	Forb	*Hypericum perforatum*	St. John's wort	E	P	NA	NA	NA	0.05
Hansen RAC	Forb	*Lactuca serriola*	prickly lettuce	E	P	NA	NA	NA	0.25
Hansen RAC	Forb	*Lathyrus holochlorus*	thin leaved peavine	N	P	NA	NA	NA	0.13
Hansen RAC	Forb	*Leucanthemum vulgare*	oxeeye daisy	E	P	NA	NA	NA	0.10
Hansen RAC	Forb	*Medicago lupulina*	alfalfa	E	A/P	NA	NA	NA	0.18
Hansen RAC	Forb	*Myosotis discolor*	changing forget me not	E	A/P	NA	NA	NA	0.23

Hansen RAC	Forb	*Nemophila parviflora*	baby blue eyes	N	A	NA	NA	NA	0.38
Hansen RAC	Forb	*Osmorhiza berteroi*	sweet cicely	N	P	NA	NA	NA	1.25
Hansen RAC	Forb	*Potentilla gracilis*	slender cinquefoil	N	P	NA	NA	NA	0.05
Hansen RAC	Forb	*Prunella vulgaris*	common selfheal	N	P	NA	NA	NA	0.10
Hansen RAC	Forb	*Ranunculus uncinatus*	woodland buttercup	N	A/P	NA	NA	NA	0.10
Hansen RAC	Forb	*Rumex acetosella*	common sheep sorrel	E	P	NA	NA	NA	0.13
Hansen RAC	Forb	*Sanicula crassicaulis*	Pacific black snakeroot	N	P	NA	NA	NA	0.05
Hansen RAC	Forb	*Sherardia arvensis*	blue field madder	E	A	NA	NA	NA	0.10
Hansen RAC	Forb	*Sidalcea campestris*	meadow checkermallow	N	P	NA	NA	NA	0.50
Hansen RAC	Forb	*Stellaria media*	common chickweed	E	A/P	NA	NA	NA	0.05
Hansen RAC	Forb	*Torilis arvensis*	spreading hedgeparsley	E	A	NA	NA	NA	0.23
Hansen RAC	Forb	*Vicia americana*	American vetch	N	P	NA	NA	NA	0.25
Hansen RAC	Forb	*Vicia hirsuta*	tiny vetch	E	A	NA	NA	NA	0.05
Hansen RAC	Forb	*Vicia sativa*	garden vetch	E	A	NA	NA	NA	14.00
Hansen RAC	Graminoid	*Bromus carinatus*	California brome	N	P	NA	NA	NA	0.05
Hansen RAC	Graminoid	*Cynosorus echinatus*	bristly dogstail grass	E	A	NA	NA	NA	2.25
Hansen RAC	Graminoid	*Dactylis glomerata*	orchard grass	E	P	NA	NA	NA	1.63
Hansen RAC	Graminoid	*Elymus glaucus*	blue wild rye	N	P	NA	NA	NA	0.50
Hansen RAC	Graminoid	*Schedonorus arundinaceus*	tall fescue	E	P	NA	NA	NA	0.55
Hansen RAC	Ground	Bare ground	bare ground	NA	NA	NA	NA	NA	2.88

Hansen RAC	Ground	*Bryophytes/lichens*	bryophytes/lichens	NA	NA	NA	NA	NA	0.38
Hansen RAC	Ground	Thatch	thatch	NA	NA	NA	NA	NA	97.00
Hansen RAC	Shrub	*Corylus cornuta var. californica*	California hazelnut	N	P	NA	NA	NA	0.05
Hansen RAC	Shrub	*Rubus bifrons*	Himalayan blackberry	E	P	NA	NA	NA	1.25
Hansen RAC	Shrub	*Symphoricarpos mollis*	snowberry	N	P	NA	NA	NA	15.25
Hansen RAC	Shrub	*Toxicodendron diversilobum*	poison oak	N	P	NA	NA	NA	0.30
Hansen RAC	Tree	*Quercus garryana*	Oregon white oak	N	P	NA	NA	NA	0.30
Hansen RAC	vine	*Lonicera hispidula*	pink honeysuckle	N	P	NA	NA	NA	0.05
Herbert Big Plot	Forb	*Anemone deltoidea*	Columbian windflower	N	P	NA	NA	NA	0.04
Herbert Big Plot	Forb	*Angelica sp.*	angelica	N	P	NA	NA	3.6	0.40
Herbert Big Plot	Forb	*Camassia quamash*	common camas	N	P	NA	NA	0.3	0.60
Herbert Big Plot	Forb	*Conium maculatum*	poison hemlock	E	B	NA	NA	0	6.40
Herbert Big Plot	Forb	*Delphinium trolliifolium*	Columbian larkspur	N	P	NA	NA	0.4	1.80
Herbert Big Plot	Forb	*Galium aparine*	stickwilly	N	A	NA	NA	7.4	2.10
Herbert Big Plot	Forb	*Heracleum maximum*	cow parsnip	N	P	NA	NA	5.4	14.40
Herbert Big Plot	Forb	*Lathyrus holochlorus*	thin leaved peavine	N	P	NA	NA	0.6	0.60
Herbert Big Plot	Forb	*Nemophila parviflora*	small-flowered nemophila	N	A	NA	NA	0.84	0.44
Herbert Big Plot	Forb	*Osmorhiza berteroi*	sweet cicely	N	P	NA	NA	0.5	0.14
Herbert Big Plot	Forb	*Potentilla gracilis*	slender cinquefoil	N	P	NA	NA	0.1	NA
Herbert Big Plot	Forb	*Tellima grandiflora*	fringecup	N	P	NA	NA	5.4	4.20
Herbert Big Plot	Forb	*Vicia sativa*	garden vetch	E	A	NA	NA	0.04	0.04

Herbert Big Plot	Forb	*Viola glabella*	stream violet	N	P	NA	NA	1.4	1.80
Herbert Big Plot	Graminoid	*Bromus diandrus*	ripgut brome	E	A	NA	NA	0.04	NA
Herbert Big Plot	Graminoid	*Scirpus sp.*	bulrush	NA	NA	NA	NA	NA	0.04
Herbert Big Plot	Ground	Bare ground	bare ground	NA	NA	NA	NA	0	NA
Herbert Big Plot	Ground	*Bryophytes/lichens*	bryophytes/lichens	NA	NA	NA	NA	NA	0.90
Herbert Big Plot	Ground	Log	log	NA	NA	NA	NA	NA	7.00
Herbert Big Plot	Ground	Thatch	thatch	NA	NA	NA	NA	100	100.00
Herbert Big Plot	Shrub	*Crataegus monogyna*	oneseed hawthorn	E	P	NA	NA	NA	0.40
Herbert Big Plot	Shrub	*Oemleria cerasiformis*	Indian plum	N	P	NA	NA	3.8	1.00
Herbert Big Plot	Shrub	*Rubus ursinus*	trailing blackberry	N	P	NA	NA	48	45.40
Herbert Big Plot	Shrub	*Symphoricarpos albus*	snowberry	N	P	NA	NA	4.8	0.60
Herbert Big Plot	Shrub	*Toxicodendron diversilobum*	poison oak	N	P	NA	NA	10	4.40
Herbert Big Plot	Tree	*Acer macrophyllum*	big leaf maple	N	P	NA	NA	0.2	0.10
Herbert Big Plot	Tree	*Prunus avium*	sweet cherry	E	P	NA	NA	NA	1.20
Herbert Big Plot	Tree	*Quercus garryana*	Oregon white oak	N	P	NA	NA	NA	0.10
Herbert Small Plot	Forb	*Cirsium arvense*	Canada thistle	E	P	NA	NA	NA	0.50
Herbert Small Plot	Forb	*Clarkia sp.*	farewell to spring	NA	NA	NA	NA	NA	0.57
Herbert Small Plot	Forb	*Epilobium sp.*	unknown willowherb	NA	NA	NA	NA	NA	2.00
Herbert Small Plot	Forb	*Galium aparine*	stickwilly	N	A	NA	NA	1.3	1.90
Herbert Small Plot	Forb	*Lactuca serriola*	prickly lettuce	E	P	NA	NA	0.125	NA
Herbert Small Plot	Forb	*Lathyrus holochlorus*	thin leaved peavine	N	P	NA	NA	0.425	NA

Herbert Small Plot	Forb	*Marah oreganus*	western wild cucumber	N	P	NA	NA	2	NA
Herbert Small Plot	Forb	*Nemophila parviflora*	small-flowered nemophila	N	A	NA	NA	1.75	1.33
Herbert Small Plot	Graminoid	*Elymus glaucus*	blue wildrye	N	P	NA	NA	1.5	4.33
Herbert Small Plot	Graminoid	*Hordeum brachyantherum*	meadow foxtail	E	P	NA	NA	7.5	7.67
Herbert Small Plot	Ground	Bare ground	bare ground	NA	NA	NA	NA	6.25	0.13
Herbert Small Plot	Ground	*Bryophytes/lichens*	bryophytes/lichens	NA	NA	NA	NA	2.75	2.33
Herbert Small Plot	Ground	Log	log	NA	NA	NA	NA	12.5	NA
Herbert Small Plot	Ground	Thatch	thatch	NA	NA	NA	NA	81.25	97.33
Herbert Small Plot	Shrub	*Crataegus monogyna*	oneseed hawthorn	E	P	NA	NA	NA	2.83
Herbert Small Plot	Shrub	*Ribes lobbii*	gummy gooseberry	N	P	NA	NA	0.25	NA
Herbert Small Plot	Shrub	*Rubus parviflora*	thimbleberry	N	P	NA	NA	6.25	NA
Herbert Small Plot	Shrub	*Rubus sp.*	blackberry	NA	P	NA	NA	1.55	NA
Herbert Small Plot	Shrub	*Rubus ursinus*	trailing blackberry	N	P	NA	NA	7.5	9.33
Herbert Small Plot	Shrub	*Spirea like species*	unknown spirea looking plant	NA	P	NA	NA	2.5	NA
Herbert Small Plot	Shrub	*Symphoricarpos albus*	snowberry	N	P	NA	NA	3.25	NA
Herbert Small Plot	Shrub	*Toxicodendron diversilobum*	poison oak	N	P	NA	NA	2.5	3.17
Herbert Small Plot	Tree	*Acer macrophyllum*	big leaf maple	N	P	NA	NA	0.05	NA
Herbert Small Plot	Tree	*Fraxinus latifolia*	Oregon ash	N	P	NA	NA	1.75	2.50
Herbert Small Plot	Tree	*Prunus americana*	American plum	N	P	NA	NA	2.5	NA
Herbert Small Plot	Tree	*Quercus garryana*	Oregon white oak	N	P	NA	NA	0.125	0.67

South Taylor	Forb	*Daucus carota*	Queen Anne's lace	E	B	NA	NA	NA	0.05
South Taylor	Forb	*Galium aparine*	stickwilly	N	A	2.7	2.3	0.28	0.35
South Taylor	Forb	*Hypochaeris radicata*	hairy cat's ear	E	P	0.1	0.1	NA	NA
South Taylor	Forb	*Lathyrus holochlorus*	thin leaved peavine	N	P	0.5	0.8	0.3	0.38
South Taylor	Forb	*Osmorhiza berteroi*	sweet cicely	N	P	1.9	3	0.48	0.50
South Taylor	Forb	*Prunella vulgaris*	common selfheal	N	P	NA	NA	NA	0.05
South Taylor	Forb	*Ranunculus uncinatus*	woodland buttercup	N	A/P	NA	NA	NA	0.15
South Taylor	Forb	*Vicia hirsuta*	tiny vetch	E	A	0.2	2.2	0.12	0.15
South Taylor	Forb	*Vicia sativa*	garden vetch	E	A	3.8	7	0.2	0.18
South Taylor	Graminoid	*Alopecurus pratensis*	meadow foxtail	E	P	1.5	3.7	0.1	2.25
South Taylor	Graminoid	*Anthoxanthum odoratum*	vanilla grass	E	P	NA	NA	0.8	NA
South Taylor	Graminoid	*Arrhenatherum elatius*	tall oatgrass	E	P	0.2	1	NA	NA
South Taylor	Graminoid	*Bromus carinatus*	California brome	N	P	NA	0.2	NA	NA
South Taylor	Graminoid	*Carex sp.*	sedge	NA	NA	NA	0.7	NA	NA
South Taylor	Graminoid	*Dactylis glomerata*	orchard grass	E	P	23.4	14.2	19.6	3.50
South Taylor	Graminoid	*Elymus glaucus*	blue wildrye	N	P	1.5	0.9	NA	NA
South Taylor	Graminoid	*Poa pratensis*	Kentucky bluegrass	NA	P	NA	0.3	NA	NA
South Taylor	Graminoid	*Schedonorus arundinaceus*	tall fescue	E	P	0.1	1.3	0.1	NA
South Taylor	Ground	Bare ground	bare ground	NA	NA	10.8	2.6	0.4	0.05
South Taylor	Ground	*Bryophytes/lichens*	bryophytes/lichens	NA	NA	1.5	0.4	0.44	3.00
South Taylor	Ground	Rock	rock	NA	NA	0	NA	NA	NA

South Taylor	Ground	Thatch	thatch	NA	NA	48	42	99.3	99.75
South Taylor	Shrub	*Amelanchier alnifolia*	serviceberry	N	P	0.5	NA	0.4	0.33
South Taylor	Shrub	*Berberis aquifolium*	holly-leaved barberry	N	P	1.8	4.3	NA	NA
South Taylor	Shrub	*Corylus cornuta var. californica*	California hazelnut	N	P	7.9	17.6	21.4	9.33
South Taylor	Shrub	*Mahonia nervosa*	Oregon grape	N	P	NA	NA	0.8	4.00
South Taylor	Shrub	*Oemleria cerasiformis*	Indian plum	N	P	1.1	NA	NA	NA
South Taylor	Shrub	*Rhamnus purshiana*	cascara	N	P	NA	NA	NA	NA
South Taylor	Shrub	*Rubus bifrons*	Himalayan blackberry	E	P	1.8	NA	NA	NA
South Taylor	Shrub	*Rubus parviflorus*	thimbleberry	N	P	NA	NA	NA	NA
South Taylor	Shrub	*Rubus ursinus*	trailing blackberry	N	P	39.7	24.9	24.4	7.50
South Taylor	Shrub	*Symphoricarpos albus*	snowberry	N	P	7.6	10.4	5.2	7.00
South Taylor	Shrub	*Toxicodendron diversilobum*	poison oak	N	P	1.9	3.1	0.2	0.73
South Taylor	Shrub	*Viburnum ellipticum*	common viburnum	N	P	2	NA	NA	NA
South Taylor	Tree	*Malus fusca*	common apple	NA	NA	NA	NA	NA	6.00
South Taylor	Tree	*Prunus avium*	sweet cherry	E	P	NA	2.1	4	NA
South Taylor	Tree	*Quercus garryana*	Oregon white oak	N	P	NA	NA	0.7	0.07

APPENDIX E: OVERVIEW OF MANAGEMENT ACTIONS FOR THE REINTRODUCTION OF *LATHYRUS HOLOCHLORUS* (2012-2019)

2012

- Phase I of the project was started by soliciting historic location records from ORBIC and the US Fish and Wildlife Service (USFWS).
- A few small populations local to Corvallis were visited to increase IAE staff familiarity with the species' appearance, habit, and phenology.
- Site prioritization and map making was done in the fall to prepare for field surveys in 2013

2013

- Continued work on Phase I of the project by engaging in extensive field surveys of known locations of *L. holochlorus*.
- Efforts from IAE and Native Plant Society (NPSO) volunteer Julie Gibson resulted in a total of 62 sites visited by the end of the 2013 field season.
- IAE collected a total of 174.2 grams of seed from 12 different populations with the two largest populations yielding 73.5% of the total collected seed by weight.
- Germination testing was initiated.
- Germinated seeds were planted in the greenhouse to test the effects of different types of cultivation.

2014

- IAE and NPSO continued field surveys of known locations of *L. holochlorus* resulting in a total of 90 of the 109 sites visited in 2013 and 2014.
- A total of 126.2 grams of seed was collected from 20 different populations between July and August.
- Germination trials continued.
- Plug production continued.

2015

- A total of 47.8 grams of L. holochlorus seed was collected.
- A total of 1000 plants were grown at the Corvallis Plant Materials Center.
- One hundred second-year plants were grown at IAE.
- A seed increase bed was initiated in late 2014 by direct seeding into a raised bed located at the Forest Science Laboratory at OSU.
- Visits were made to potential introduction sites. Four sites were chosen for introduction based on soils, habitat, and geographic location.
- In December 2015 and January 2016, management activities occurred at several sites in preparation for plant introduction including mowing with a hand-held brush cutter to reduce vegetation height and eliminate some competing vegetation and grubbing of roots of *Rubus bifrons*.

2016

- Due to poor germination of the seed increase beds at FSL two raised beds (480 ft^2 total) were planted with greenhouse-grown plugs in March 2016. Both beds were weeded and fertilized twice in 2016 and irrigated regularly in early summer. None of the transplants flowered or set seed in 2016.
- 1000 plants were transplanted to four introduction sites in March 2016.
- Introduction plots were monitored for survival and the associated plant community.
- Monitoring data was analyzed and synthesized.

2017

- The FSL seed increase beds were weeded and dead *L. holochlorus* plants were replaced with live transplants.
- Introduction plots were monitored for survival and the associated plant community.
- Monitoring data was analyzed and synthesized.

2018

- The FSL seed increase beds were weeded.
- Five new introduction plots were established and planted with 1,464 *L. holochlorus* plugs under the RAC agreement # L16AC00150-0001
- Introduction plots were monitored for survival and the associated plant community.
- Introduction plots and surrounding area were weeded.
- Monitoring data was analyzed and synthesized.

2019

- FSL beds were weeded and an electric fence was installed to prevent herbivory.
- Monitered outplanted plots.
- Entered and analyzed plot data.
- Collected *L. holochlorus* seed from four wild populations: Coyote Spencer Wetland, Cutler Lane, Fish Hatchery Road, and Linn Benton Community College.
- Planted 59 shrubs in 3 locations with highest potential to benefit from site enhancement.

2020 (planned activities)

- Install electric fencing early in the season, weed FSL beds and collect seed if produced
- Moniter and analyze outplanted plot data
- Collect *L. holochlorus* seed from larger, healthy wild populations
- Spot spray exotic perennial grasses at outplanted sites if available as a treatment method on BLM lands.

APPENDIX F: FIGURES SHOWING SURVIVAL, VIGOR, AND STEM COUNTS OF OUTPLANTED PLOTS.

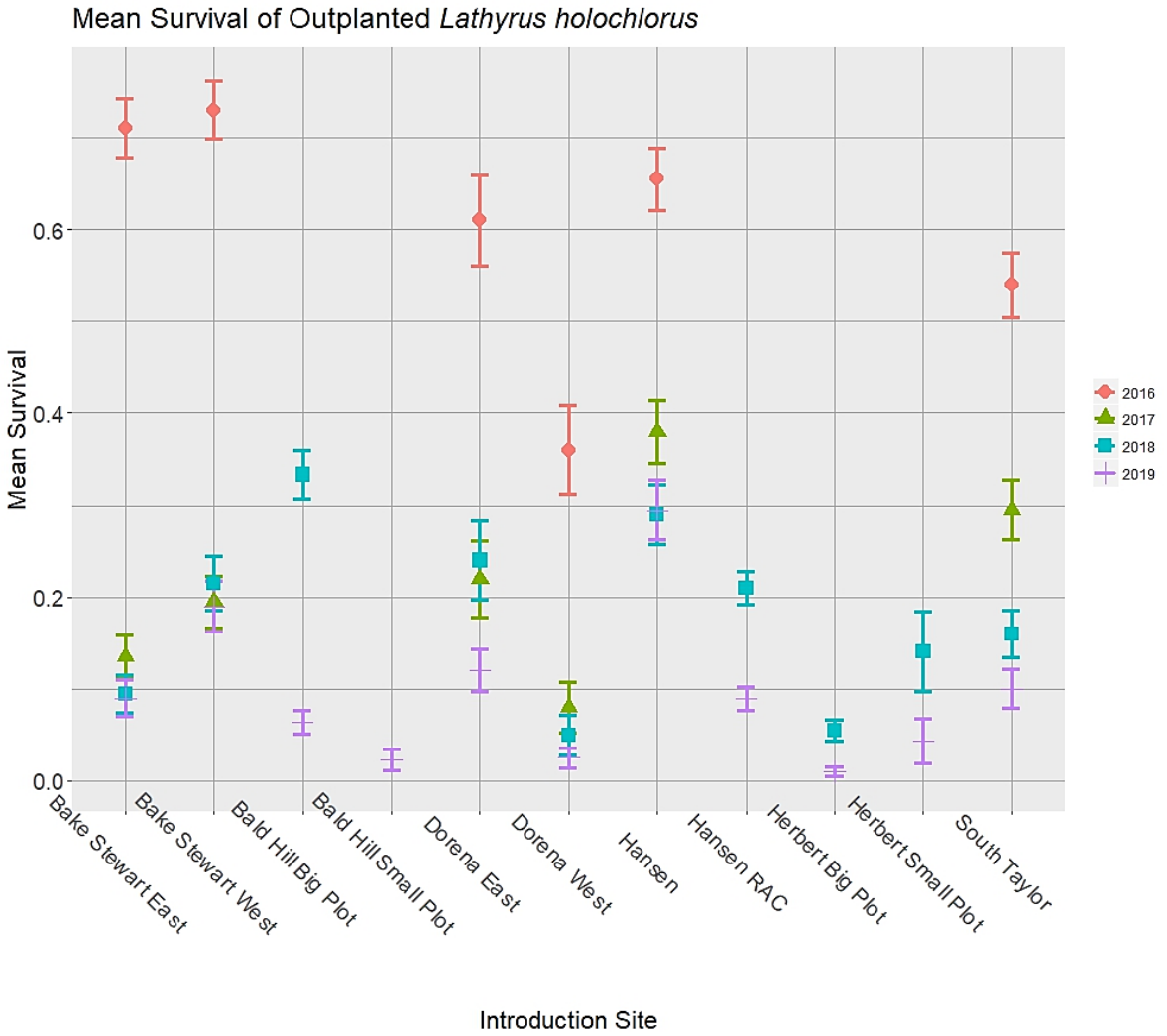


Figure F1. Mean ratio and standard error of *Lathyrus holochlorus* survival at each site for monitoring years 2016, 2017 2018, and 2019. Sites (x-axis) are in alphabetical order. Bald Hill Small Plot data was not taken in 2018.

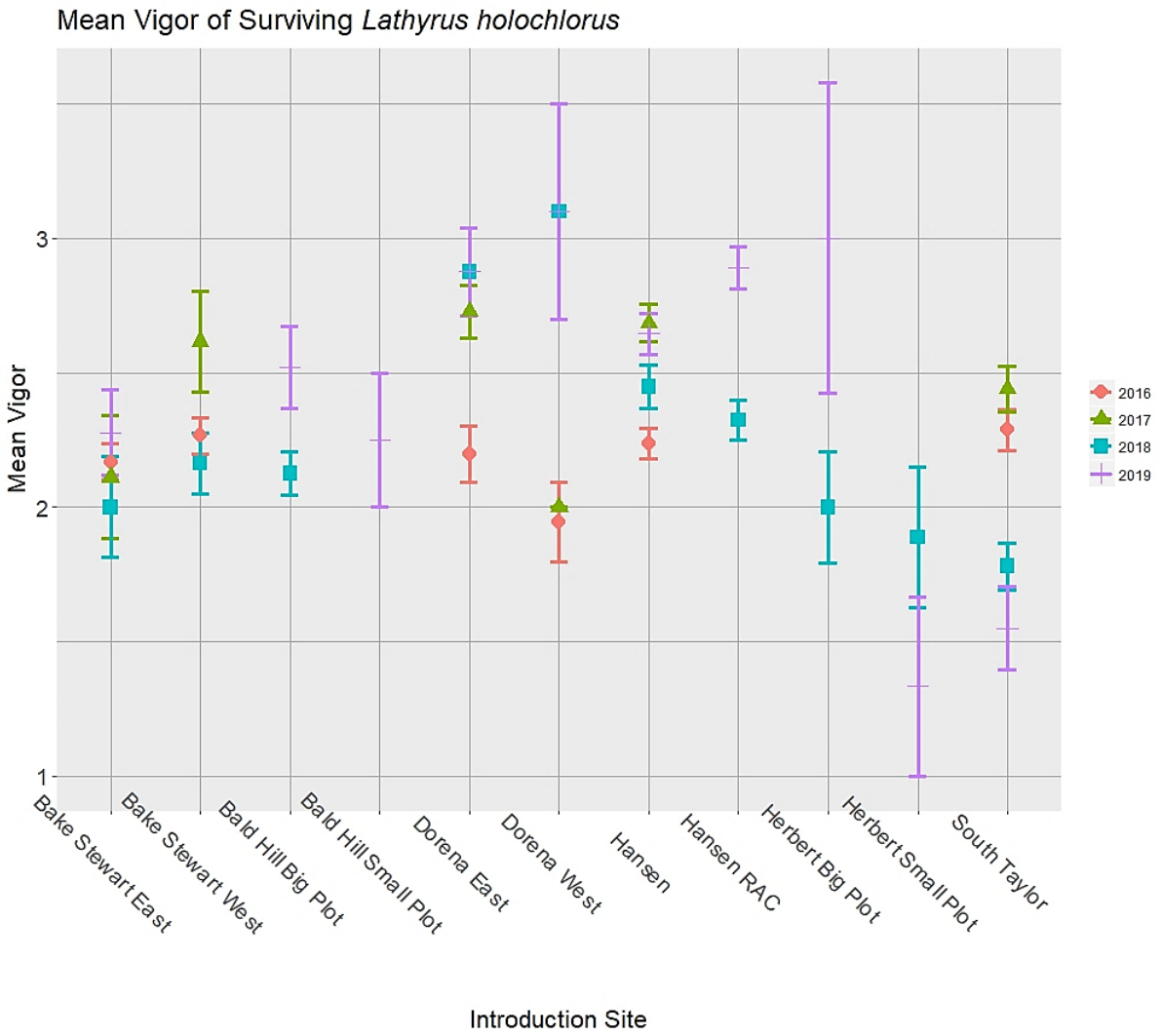


Figure F2. Mean and standard error of the vigor of the surviving *Lathyrus holochlorus* for each site for monitoring years 2016, 2017, 2018, and 2019. Sites (x-axis) are in alphabetical order. Bald Hill Small Plot data was not taken in 2018.

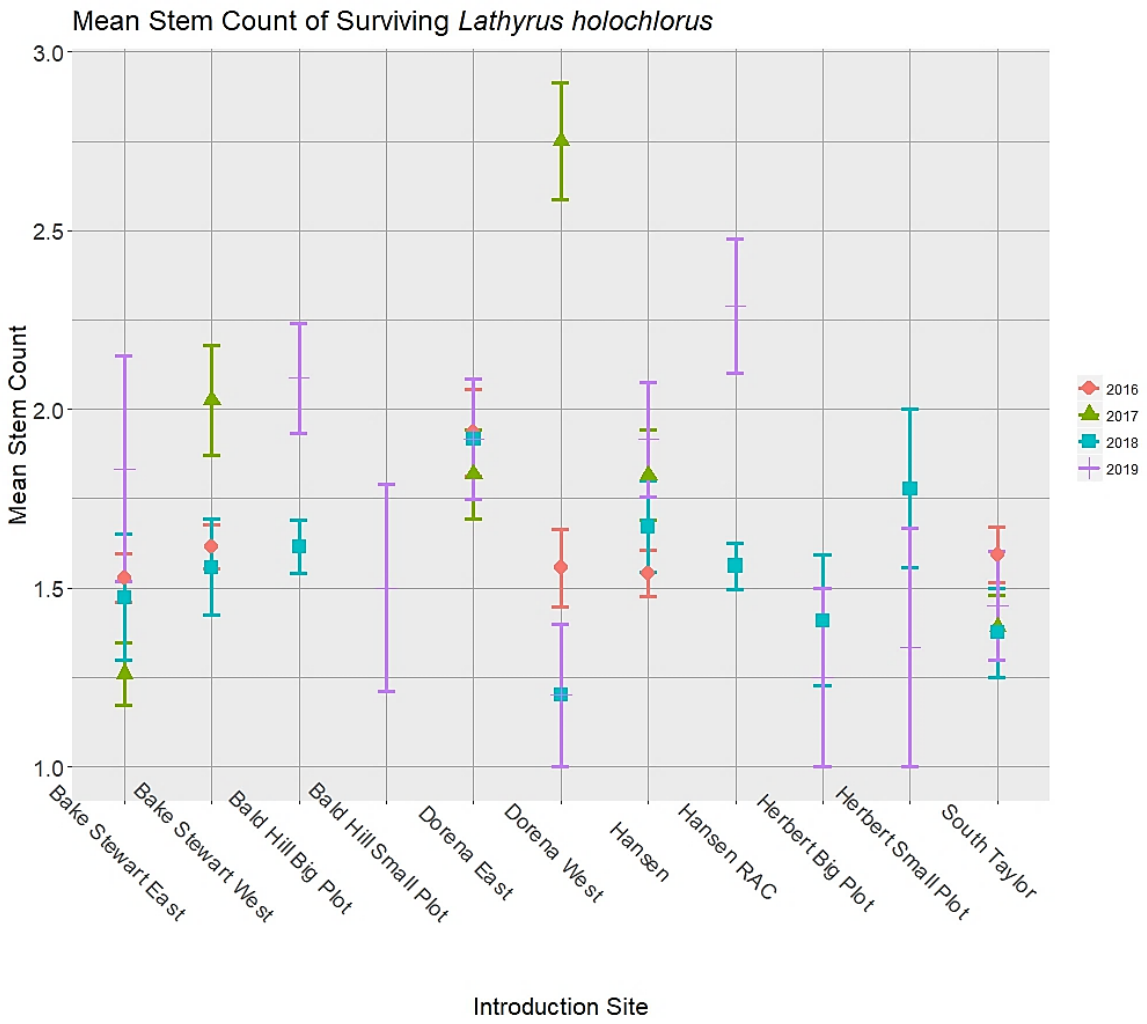


Figure F3. Mean and standard error of the stem count of the surviving *Lathyrus holochlorus* for each site for monitoring years 2016, 2017, 2018, and 2019. Sites (x-axis) are in alphabetical order. Bald Hill Small Plot data was not taken in 2018.