Introduction of the Thin-Leaved Peavine (Lathyrus holochlorus): 2018 Annual Report

4/17/2019

[Report for the Bureau of Land Management, Agreement # L16AC00150-0001

Report prepared by Jessica Celis

Institute for Applied Ecology

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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ACKNOWLEDGMENTS

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Cover photographs: *Lathyrus holochlorus* flowers observed at Dorena East on May 17, 2018. *Photo by Jessica Celis.*

SUGGESTED CITATION

Celis, J. 2019. Population Introduction of the Thin-leaved Peavine (*Lathyrus holochlorus*): 2018 Annual Report. Unpublished report prepared for the Bureau of Land Management, Northwest District for agreement #L16AC00150-0001. Institute for Applied Ecology, Corvallis, Oregon.

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1. EXECUTIVE SUMMARY

This report describes the actions taken in 2018 to continue implementation of Phase 4 of a multi-phase project designed to help prevent the listing of a Bureau of Land Management (BLM) Sensitive Species, *Lathyrus holochlorus* (thin-leaved peavine). Phase 4 (FY 2016-18) focuses on continued seed increase and monitoring and maintenance of *L. holochlorus* plantings at reintroduction sites. In 2018, seed increase beds were weeded and monitored. Flowering and fruiting was not observed in these beds. Reintroduction plots (planted in 2016) were monitored for survival, number of stems, and vigor of *L. holochlorus*, and associated plant community characteristics were assessed. Weed management was conducted in the outplanted plots. Five additional plots were planted in the early spring (1,464 plugs), monitored, and maintained as part of another project for the BLM; data from these plots are presented in this report.

Survival of *L. holochlorus* remained relatively stable in 2018. Our plant community assessment qualitatively shows that sites with higher average shrub cover and lower cover of exotic perennial grasses appear to have a higher survival rate in 2018. 2019 should see continued monitoring of introduced plots and habitat maintenance should be implemented.

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 it is 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, and 40 had 100 or less stems (Ottombrino-Haworth et al. 2014).

This report includes information about Phases 4 of a four-phase project. Phases 1 and 2 of the project included field surveys of historic populations, seed collection, germination testing, and limited plug production. Phase 3 involved further seed collection, plug grow out, site preparation at selected locations, and population increase by outplanting *L. holochlorus* plugs. 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. Additionally, as apart of another project with the BLM to engage the youth in the conservation of a rare species, five additional plots were planted with 1,464 plugs in the early spring, they were monitored, and maintained using identical methodology for the plots established as a part this project; data from these plots are presented in this report.

3. 2018 ACTIONS

In 2018, actions included maintenance of seed increase beds and monitoring and maintenance of out-planted sites (Appendix A).

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 transplants flowered or produced seed pods in 2018. The raised beds were weeded two times in 2018.

3.2. Lathyrus holochlorus introduction management activities

Site selection

In 2015, 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 (USACOE) and all other sites are owned by the BLM. Sites were chosen based on soils, habitat, geographic location and shrub cover (observations of natural populations by IAE restoration ecologist Ian Silvernail showed that *L. holochlorus* is commonly found with shrubs). 1,000 plants were planted in six plots divided between four sites (Appendix B). 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. All plots were mowed prior to planting (including the shrubs within the plots). See Silvernail (2016) for more information about pre-planting site preparation.

Concurrent with this project, IAE's Habitat Restoration and Ecological Education Program engaged in a Resource Advisory Ccommittee (RAC) project where a high school and middle school participated in propogating, planting, and monitoring of *L. holochlorus* (see Celis 2019). Students from Oak Hill Middle school in Eugene and College Hill High school in Corvallis helped propogate 1,500 *L. holochlorus* plugs. In 2018, IAE staff chose and prepared three additional sites for outplanting: an additional plot was established near the existing outplanted plot at the Hansen Site in the West Eugene Wetlands, two plots

were established at the Green Belt Land Trust Bald Hill site in Corvallis (Bald Hill), and two plots were established at Herbert Farm and Natural Area (Herbert Farm) (Figure 1).

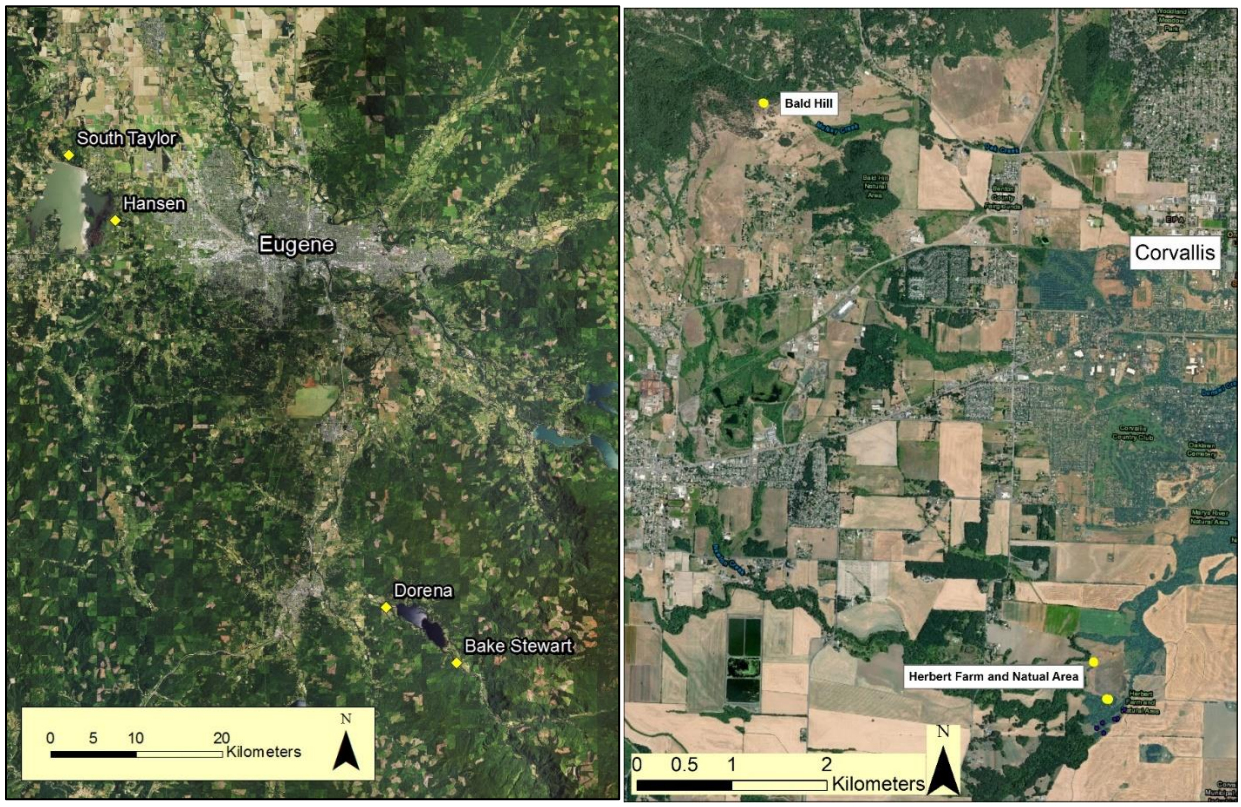

FIGURE 1. Locations of *Lathyrus holochlorus* outplanting sites (yellow points). A second plot was added to hansen 2018. Four plots were established at two sites in 2018 in Corvallis.

Plug Planting

Between February 7th and March 27th 2018, 1,464 *L. holochlorus* plugs were planted under the RAC agreement # L16AC00150-0001. Five hundred plugs were planted by students from Oak Hill Middle School in Eugene at Hansen. Another 500 were planted by students from College Hill High School in Corvallis at Bald Hill. Finally, out of the 500 remaining plants grown by the two schools, 464 were planted by volunteers at Herbert Farm. Many of the plug containers brought to Herbert Farm appeared to be diseased or had little to no root development, therefore only 464 were planted and even some of those seemed unlikely to survive. For this reason, Herbert Farm data should be interpreted with this in mind and was not included when exploring community composition and survival.

Survival monitoring methods

In 2018, *L. holochlorus* outplant survival, vigor, and stem count at introduction plots was monitored between May 17th and 30th (Table 1). Bald Hill Small Plot was not monitored for survival. 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.

Associated plant community

Between May 17th and June 5th , 2018 the associated plant community at all sites, with the exception of Hansen RAC, was assessed by randomly placing five 1m x 1m plots in each reintroduction plot. In each of these smaller plots, the percent cover of all vascular plant species observed was visually assessed and recorded (Appendix D). Ocular percent cover of bare ground, thatch, lichens/bryophytes, and rocks was also assessed (Appendix D). All vascular plant species present in the overall reintroduction plot (but not assigned to a smaller monitoring plot) were noted.

A summary of the plant community assessment by species growth form and life history is presented in Table 4. Trends between the survival rate of *L. holochlorus* within plots and the average cover of different functional groups was explored using scatterplots and the lm function in the package ggplot2 in R (Wickham 2016, R Core Team 2018). Only those functional groups that showed a consistent relationship with survival between 2017 and 2018 are displayed in this report (Figures 2 and 3). Herbert Farm plots, as well as Bald Hill Small Plot were not included in the exploration of trends. Herbert Farm was excluded given the low vitality of the plugs before transplanting, which undoubtedly influenced the survival rate at this site. Bald Hill Small Plot was excluded due to lack of survival data.

3.3 Maintenance of outplanted plots

Different vegetation management was implemented at each outplanted plot to accommodate the weed issues specific to each site (Table 1). IAE conducted mechanical weed management at all plots between October 23rd and 30th, 2018. In addition, the outplanted plots at Hansen and one of the plots at Bake Stewart Park (East, less shrubby) were burned in the fall of 2018 by the land owners. After plots were weeded, a mix of native forb and grass seed was broadcast over them to increase diversity and provide competition to reestablishing weeds (Table 2).

Table 1. Management activities conducted in 2018 at the outplanted plots.

Introduction Site	Date	Management Activity
Hansen	2/14, 5/18, 5/23 and 10/30	Established another outplanted plot. Planted another 500 *L. holochlorus* plugs. Monitored *L. holochlorus* plugs and associated plant community. Prescribed fire and grubbed blackberries from site. Spread native seed within and around outplanted plot.
Dorena East	5/17 and 10/23	Monitored *L. holochlorus* plugs and associated plant community. Grubbed blackberry and Scotch broom from within and around the plot. Spread native seed within and around outplanted plot.

Introduction Site	Date	Management Activity
Bake Stewart West	5/24 and 10/30	Monitored *L. holochlorus* plugs and associated plant community. Grubbed blackberry and Scotch broom from within and around the outplanted plot. Spread native seed within and around outplanted plot.
South Taylor	5/23, 6/5, 10/27 and 11/9	Monitored *L. holochlorus* plugs and associated plant community. Grubbed blackberry from within, and around the outplanted plot. Spread native seed within and around outplanted plot.
Bake Stewart East	5/24 and 10/30	Monitored *L. holochlorus* plugs and associated plant community. Prescribed fire and dug up perennial grass roots from within and around the outplanted plot. Spread native seed within and around outplanted plot.
Dorena West	5/17 and 10/23	Monitored *L. holochlorus* plugs and associated plant community. Grubbed blackberry and Scotch broom from within and around the plot. Spread native seed within and around outplanted plot.
Bald Hill Small Plot	2/27, 5/22, and 10/25	Established another outplanted plot. Planted another 188 *L. holochlorus* plugs. Monitored *L. holochlorus* plugs and associated plant community. Removed conifer seedlings and saplings. Grubbed out false brome (*Brachypodium sylvaticum*) from within the plot. Spread native seed within and around outplanted plot.
Bald Hill Big Plot	2/27, 5/22, and 10/25	Established another outplanted plot. Planted another 312 *L. holochlorus* plugs. Monitored *L. holochlorus* plugs and associated plant community. Removed conifer seedlings and saplings. Grubbed out false brome (*Brachypodium sylvaticum*) from within the plot. Spread native seed within and around outplanted plot.
Herbert Farm Small Plot	2/21, 5/30, and 10/25	Established another outplanted plot. Planted another 64 *L. holochlorus* plugs. Monitored *L. holochlorus* plugs and associated plant community. Grubbed blackberry from within, and around the outplanted plot. Spread native seed within and around outplanted plot.
Herbert Farm Big Plot	2/20, 5/30, and 10/25	Established another outplanted plot. Planted another 64 *L. holochlorus* plugs. Monitored *L. holochlorus* plugs and associated plant community. Grubbed blackberry from within, and around the outplanted plot. Spread native seed within and around outplanted plot.

Table 2. Species and lbs/acres of seed used outplanted plots.

Species	Common name	Quantity (lbs/acre)
Clarkia amoena	farewell to spring	1.27
Prunella vulgaris	self-heal	1.09
Ranunculus uncinatus	woodland buttercup	3.27
Achillea millefolium	common yarrow	0.46

Species	Common name	Quantity (lbs/acre)
Elymus glaucus	blue wild rye	5.45
Bromus carinatus	California brome	9.2
Bromus sitchensis	Alaska brome	9.2

4. RESULTS

4.1. Survival monitoring

Survival

In 2018, estimated mean survival differed between the six outplanted plots (Table 3; Appendix Figure F1). The average percent survival across all six plots was 17.8%; down from 21.8% in 2017 (year 1). However, for those plots with three years of monitoring, there was a smaller drop in survival from year one to year two (4.3% less survival) when compared to that of year zero to year one, 38.3% less (Table 3). Dorena East and Bake Stewart West, both plots that were noted as having a higher shrub cover than their counterparts, had a small increase in survival from year one to year two, albeit insignificant (Appendix F1). Continued monitoring will help to elucidate reasons for differences in survival between sites.

Vigor

Vigor was similar between all sites (mean=2.4, range=1.8 - 3.1; Table 3; Appendix Figure F2). Although the Dorena West plot had the lowest survival percentage it did have the highest rating of vigor out of all plots.

Stem Count

Stem count/plant was variable between all sites (Table 3; Appendix Figure F3). The overall average of 1.57 was slightly lower than the 2016 average of 1.8.

Flowering

Across all sites only one plant at Dorena East (shrubs common in planting area) was found flowering.

4.2. Plant Community

Our assessment shows that sites with higher average shrub cover appear to have a higher survival rate in 2017 and 2018 (Figures 5). In addition, our data suggests that sites with less average exotic perennial grass cover appear to have higher survival rates than those with higher exotic perennial grass cover. No formal regression analyses were run on this data and thus these observations are purely explorative. Future years of assessment after habitat maintenance activities are performed will help managers to evaluate the effectiveness of those actions and allow IAE ecologists to better conclude reasons for greater survival at some sites rather than others.

Table 3. Descriptive statistics for *Lathyrus holochlorus* monitoring data for 2016 (year 0), 2017 (year 1), and 2018 (year 2). Sites are ordered from the highest to lowest percent survival of outplanted *L. holochlorus* in 2018. The table includes the number of *L. holochlorus* planted in 2016 (original sites) or 2018 (new sites), the percentage of surviving plants (# of plants found alive/# of plants planted), and the mean vigor and stem count of surviving outplants.

Introduction Site	Year Planted	Number Planted	Percent Survival 2016	Percent Survival 2017	Percent Survival 2018	Mean Vigor of Surviving Plants 2016	Mean Vigor of Surviving Plants 2017	Mean Vigor of Surviving Plants 2018	Mean Stem Count of Surviving Plants 2016	Mean Stem Count of Surviving Plants 2017	Mean Stem Count of Surviving Plants 2018
Bald Hill Big Plot	2018	312	NA	NA	33%	NA	NA	2.1	NA	NA	1.6
Hansen	2016	200	65.5%	38%	29%	2.2	2.7	2.5	1.5	1.8	1.7
Dorena East	2016	100	61%	22%	24%	2.2	2.7	2.9	1.9	1.8	1.9
Bake Stewart West	2016	200	73%	19.5%	21.5%	2.3	2.6	2.2	1.6	2.0	1.6
Hansen RAC	2018	500	NA	NA	21%	NA	NA	2.3	NA	NA	1.6
South Taylor	2016	200	54%	29.5%	16%	2.3	2.4	1.8	1.6	1.4	1.4
Herbert Farm Small Plot	2018	64	NA	NA	14%	NA	NA	1.9	NA	NA	1.8
Bake Stewart East	2016	200	71%	13.5%	9.5%	2.2	2.1	2.0	1.5	1.3	1.5
Dorena West	2016	100	36%	8%	5%	1.9	2	3.1	1.6	2.75	1.2
Herbert Farm Big Plot	2018	400	NA	NA	5%	NA	NA	2.0	NA	NA	1.4
Bald Hill Small Plot	2018	188	NA	NA	NA	NA	NA	NA	NA	NA	NA
Across All Sites		2464	60.1%	21.8%	17.8%	2.2	2.4	2.28	1.6	1.8	1.57

Table 4. Results of the 2018 plant community assessment within the *Lathyrus holochlorus* outplanting plots. Sites are ordered from the highest to lowest percent survival of outplants for 2018 (bald hill small plot does not have survival data). For each site, the table shows the average percent cover for overall native and exotic plants, native and exotic forbs, native and exotic graminoids , native and exotic shrubs/trees, and overall average shrub/tree cover. Biennial species, ground cover, and those that were not identified to species are not included in these averages with the exception of the overall shrub/tree column. The average overall shrub/tree column was calculated using the cover for shrubs/trees not identified to species or unknown in their nativity.

Site	Overall Average % Cover		Average % Cover Annual Forbs		Average % Cover Perennial Forbs		Average % Cover Perennial Graminoids		Average % Cover Annual Graminoids	Average % Cover Shrubs/Trees		
	Native	Exotic	Native	Exotic	Native	Exotic	Native	Exotic	Exotic	Native	Exotic	All Shrubs
Bald Hill Big Plot	1.65	0.66	0.85	0.84	1.19	0.41	0.29	1.24	NA	3.00	NA	2.98
Hansen	2.14	0.54	0.20	0.18	0.28	0.39	0.04	5.71	0.02	6.60	NA	6.60
Dorena East	4.20	0.59	0.43	0.53	0.20	0.74	0.10	0.38	NA	10.80	NA	10.80
Bake Stewart West	3.22	0.34	0.11	0.21	0.51	0.51	1.4	0.08	NA	10.27	0.22	10.49
South Taylor	5.42	3.12	0.28	0.16	NA	0.39	NA	5.15	NA	8.73	2.00	10.70
Herbert Farm Small Plot	2.23	3.81	1.53	NA	0.89	0.13	1.50	7.50	NA	2.99	NA	2.80
Bake Stewart East	1.22	2.37	0.27	0.17	1.17	0.14	0.04	5.71	0.12	3.50	NA	3.50
Dorena West	2.21	1.57	0.31	0.65	0.49	1.25	3.9	3.51	0.9	4.05	0.04	4.09
Herbert Farm Big Plot	5.8	0.03	4.12	0.04	1.97	NA	NA	NA	NA	13.36	NA	13.36
Bald Hill Small Plot	1.95	0.35	1.17	0.26	0.65	0.22	0.73	0.72	NA	7.28	NA	7.28

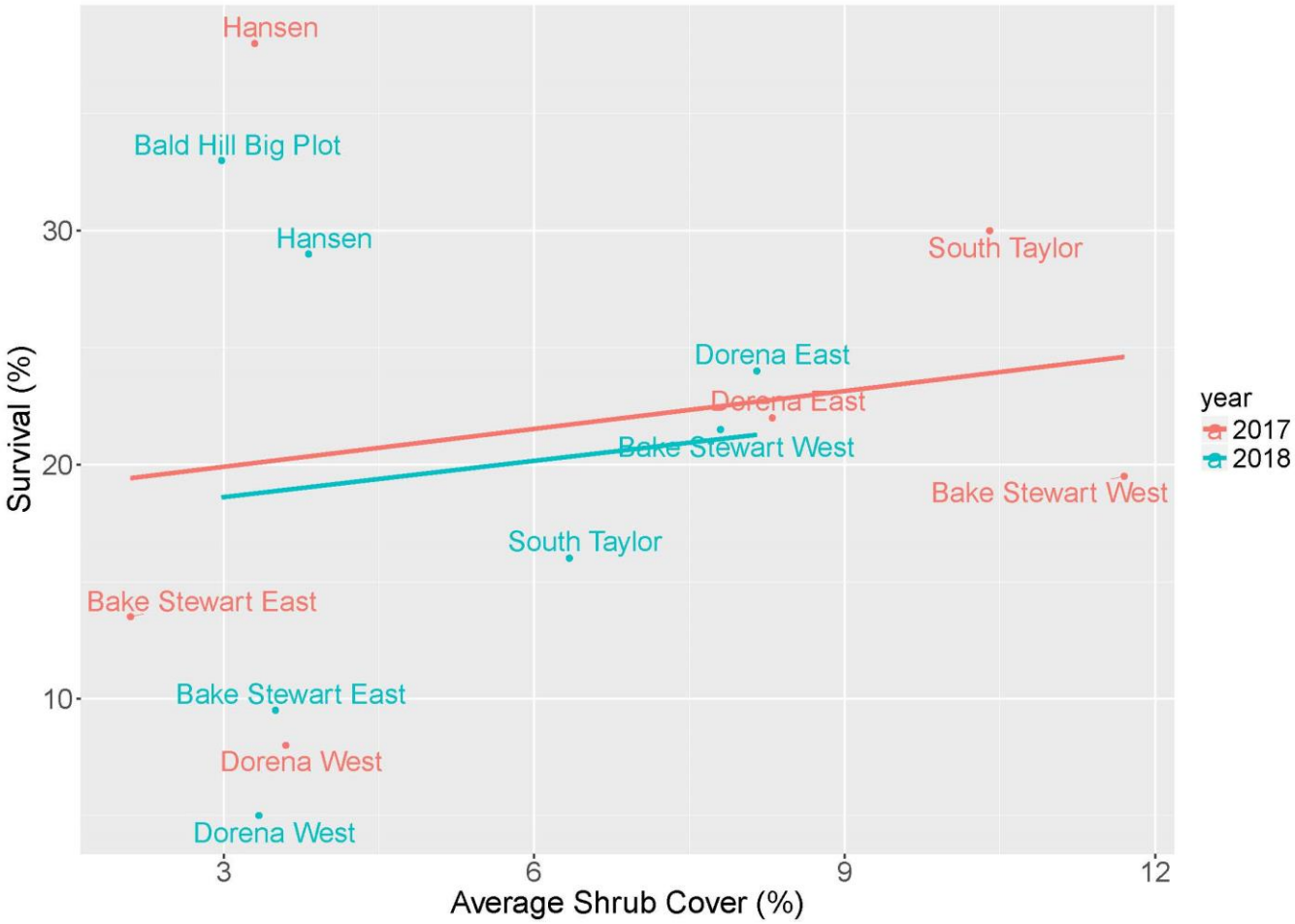

FIGURE 2. Scatterplot of the survival of outplanted *Lathyrus holochlorus* and the average cover of shrubs in 2017 (red) and 2018 (blue). Plotted points represent sites (labeled). Trend lines do not represent formal regression analyses. Herbert plots and the bald hill small plot are excluded from this graph (see methods).

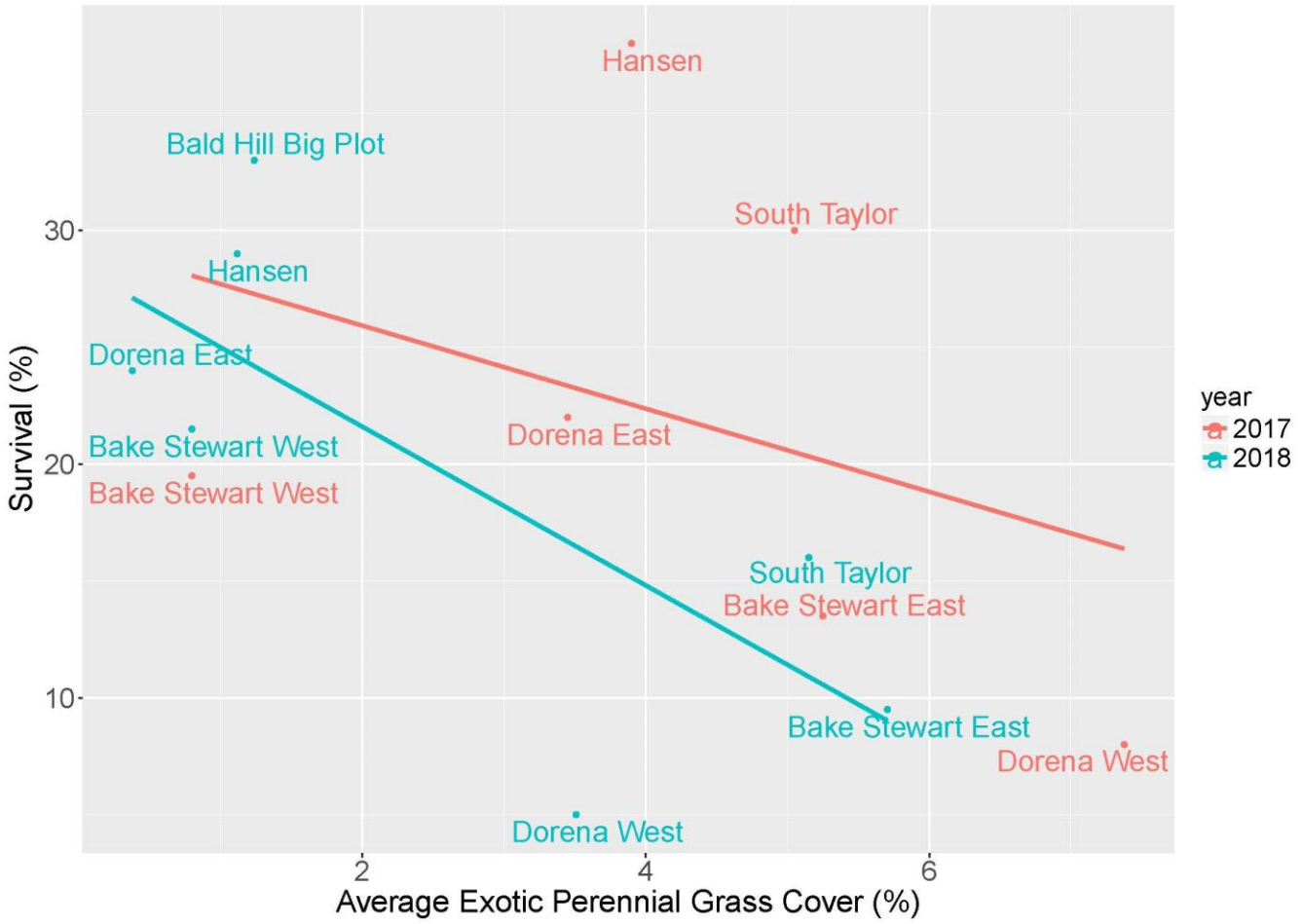

FIGURE 3. Scatterplot of the survival of outplanted *Lathyrus holochlorus* and the average cover of exotic perennial grasses in 2017 (red) and 2018 (blue). Plotted points represent plots (labeled). Trend lines do not represent formal regression analyses.

5. DISCUSSION

5.1. Monitoring methods

Lathyrus holochlorus monitoring was conducted earlier in the season in 2018 compared to that of 2017, early-mid May as opposed to late-May, early-June. The *L. holochlorus* and surrounding community appeared to be at peak vegetation during the earlier monitoring making the identification and cover estimations more accurate. We recommend that this continue to be the timing of monitoring for the *L. holochlorus* plots in 2019 and beyond.

5.2. Monitoring results

A decline in survival of outplanted plugs in the first year and subsequent years after planting is common for restoration projects (Vance et. al. 2006). Our results in 2017 showed a drastic decline in average survival. However, the drop in survival was less between year one and year two compared to the previous year indicating that plants that have survived two years after transplanting are likely to continue to survive into the future. It is possible that some of the transplants may persist underground and have remained dormant because of certain environmental cues or a lack thereof. We also found some evidence that sites which provided higher average shrub cover tended to have higher rates of survival. This could help land managers and ecologists make strategic choices about where they decide to plant *L. holochlorus* plugs and whether they decide to also plant native shrubs commonly associated with wild populations at the same sites.

5.3. Habitat Maintenance

Care was taken when performing management actions to avoid damaging *L. holochlorus* individuals. The optimum time to engage in activities are between August and January, when *L. holochlorus* plants are dormant.

6. MANAGEMENT RECOMMENDATIONS AND/OR NEXT STEPS

It is recommended that future monitoring and maintenance of outplanted plots include those plots established in 2018 as a result of the RAC project. The following actions are proposed for 2019: See Table 5 for site specific habitat maintenance activities.

- Monitor reintroduction plots in mid-May.
- Implement habitat management actions as needed (see Table 5 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 throughout the year. Manage weed establishment and harvest and clean seed as available.
- Collect wild seed of *L. holochlorus* and begin grow out for augmentation at sites that show high survivorship.
- Order and plant shrub species, *S. albus* and *S. mollis* to improve habitat conditions at outplanted plots.

Table 5. Proposed habitat maintenance activities at *Lathyrus holochlorus* introduction sites for 2019.

Site	Habitat Maintenance Activities
Hansen and Hansen RAC	1. Grub out roots of *Rubus bifrons* (blackberry).
South Taylor	1. Grub out orchard grass (*Dactylus glomerata*) and *R. bifrons*. There is significant *R. bifrons* outside of the plot that could be grubbed as well. 2. Consider mowing/cutting to reduce height of hazelnut shrubs (*Corylus cornuta* var. *calfornica*) if interfering with establishment of *L. holochlorus*.

Dorena East	1. Remove St. John's wort (*Hypericum perforatum*) plants. 2. Manage tall oatgrass (*Arrhenantherum elatius*; only found on south side of plot) by either digging up mechanically, mowing using a string trimmer, or if possible spot spray grass specific herbicide.
Bake Stewart West	1. Monitor regrowth of shrubs and consider mowing if their growth is significantly outpacing that of *L. holochlorus* and appears detrimental to *L. holochlorus* establishment.
Bake Stewart East	1. Manage *A. elatius* inside and outside of plot by either digging up mechanically, mowing using a string trimmer, or if possible spot spray grass specific herbicide. 2. Monitor *D. glomerata* for any increases in cover and manage if necessary.
Dorena West	1. Grub out roots of *R. bifrons*. 2. Remove oxeye daisy (*Leucanthemum vulgare*) by either digging up mechanically, or if possible spot spraying herbicide.. 3. Mow *A. elatius* prior to seed set and after monitoring.
Bald Hill Small and Big Plots	1. Manage *Brachypodium sylvaticum* population by either grubbing or spraying with grass specific herbicide. 2. Monitor for and remove conifer seedlings and saplings.
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*. 3. Manage *A. elatius* inside and outside of plot by spot spraying grass specific herbicide.

7. REFERENCES

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APPENDIX A: INTRODUCTION PLOT LOCATIONS

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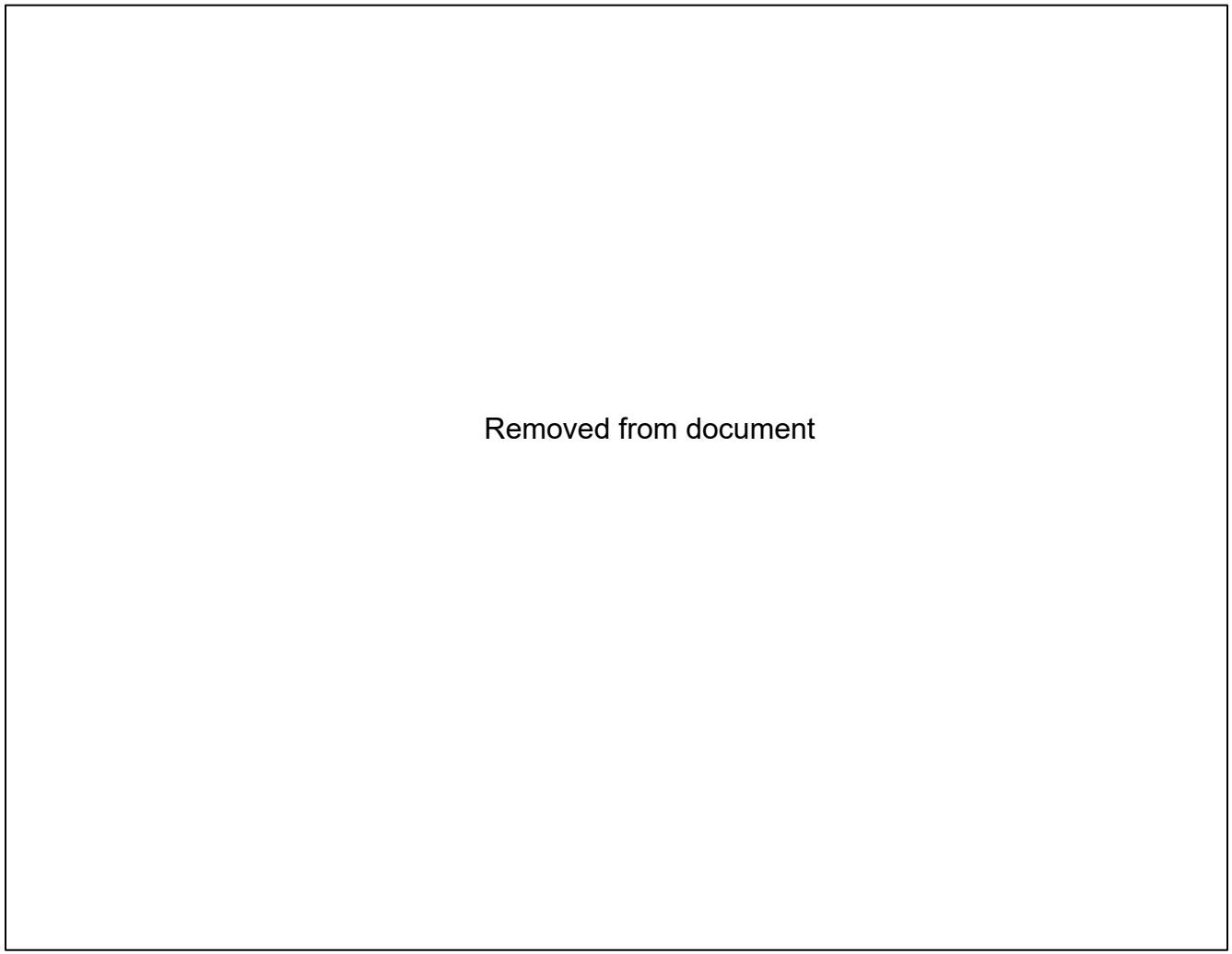
APPENDIX B: INTRODUCTION PLOT LAYOUTS



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APPENDIX C: 2018 *LATHYRUS HOLOCHLORUS* INTRODUCTION PLOT PHOTOPOINTS

Photopoints were taken from the 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

Clockwise from upper left: corner 1(origin), corner 2, corner 3, and corner 4.

Bake Stewart West

Clockwise from upper left: corner 1(origin photopoint missing), corner 2, corner 3, and corner 4.

Dorena East

Clockwise from upper left: corner 1(origin), corner 2, corner 3, and corner 4.

Dorena West

Clockwise from upper left: corner 1(origin), corner 2, corner 3, and corner 4.

Hansen

Clockwise from upper left: corner 1(origin), corner 2, corner 3, and corner 4.

South Taylor

Clockwise from upper left: corner 1(origin), corner 2, corner 3, and corner 4.

APPENDIX D: COMMUNITY COVER MONITORING DATA (2016-2018)

Plant community assessment for all sites. This tables includes the mean relative cover of each species observed at each site for years 2016-2018. The mean absolute cover for ground cover measurements (Ground in table) are also included for each site. The table is ordered first by site: highest survival rate in 2017 to the lowest. Plant growth forms are then ordered as follows: Forb, Grass (all graminoids), Shrubs, Ground, and fern (only found at 2 sites). Species are ordered within their growth forms from highest relative mean cover to lowest. Species with a mean relative cover rate in 2017 of NA were noted in the plot, but not counted specifically in the 1x1m quadrat. Information on each species native status and life-cycle duration, where known, are also included.

Site	Growth Form	Scientific Name	Common Name	2018 Mean relative cover	2017 Mean relative cover	2016 Mean relative cover	Native (N), Exotic (E)	Annual (A), perennial (P), or biennial (B)
Hansen	Forb	*Hypochaeris radicata*	hairy cat's ear	0.14	10.4	7.2	E	P
Hansen	Forb	*Trifolium dubium*	Suckling clover	NA	7	0.6	E	A
Hansen	Forb	*Eriophyllum lanatum*	Oregon sunshine	NA	NA	NA	N	P
Hansen	Forb	*Torilis arvense*	spreading hedgeparsley	NA	NA	NA	E	A
Hansen	Forb	*Sanicula graveolens*	northern sanicle	0.38	NA	NA	N	P
Hansen	Forb	*Lactuca serriola*	prickly lettuce	0.1	NA	NA	E	P
Hansen	Forb	*Medicago sp.*	alfalfa	0.16	NA	NA	E	NA
Hansen	Forb	*Conium sp.*	poison hemlock	0.2	NA	NA	E	NA
Hansen	Forb	*Vicia sativa*	garden vetch	0.28	4	1.2	E	A
Hansen	Forb	*Vicia hirsuta*	tiny vetch	0.5	3.7	0.2	E	A
Hansen	Forb	*Clinopodium douglasii*	yerba Buena	0.6	NA	NA	N	P
Hansen	Forb	*Myosotis discolor*	forget me not	0.08	NA	NA	E	A/P
Hansen	Forb	*Sherardia arvensis*	blue field madder	0.04	NA	NA	E	A
Hansen	Forb	*Daucus carota*	Queen Anne's lace	1.1	3.7	1.3	E	B
Hansen	Forb	*Geranium dissectum*	cutleaf geranium	0.6	2.7	1.5	E	A/B
Hansen	Forb	*Lathyrus holochlorus*	Thin-leaved peavine	0.3	1.6	1.6	N	P
Hansen	Forb	*Hypericum perforatum*	St. John's wort	0.16	1	0.7	E	P
Hansen	Forb	*Leucanthemum vulgare*	oxeeye daisy	1.3	1	3.6	E	P

Hansen	Forb	*Trifolium sp.*	clover	0.04	NA	NA	NA	NA
Hansen	Forb	*Oxalis* sp.	woodsorrel		0.8	NA	NA	NA
Hansen	Forb	*Osmorhiza chilensis*	sweet cicely	0.84	0.7	1.8	N	P
Hansen	Forb	*Galium aparine*	stickwilly	0.2	0.4	NA	N	A
Hansen	Forb	*Sanicula crassicaulis*	Pacific black snakeroot	NA	0.4	0.2	N	P
Hansen	Forb	*Dichelostemma congestum*	ookow	NA	0.2	NA	N	P
Hansen	Forb	*Prunella vulgaris* var. *lanceolata*	lance selfheal	NA	0.2	NA	N	P
Hansen	Forb	*Satureja douglasii*	yerba buena		NA	0.4	N	P
Hansen	Forb	*Sidalcea malviflora* ssp. *virgata*	dwarf checkerbloom	0.1	NA	0.4	N	P
Hansen	Forb	*Crepis capillaris*	smooth hawksbeard	NA	NA	0.1	E	A/B
Hansen	Forb	*Cirsium vulgare*	bull thistle	NA	NA	0.1	E	B
Hansen	Forb	*Taraxacum officinale*	Dandelion	0.4	NA	0.5	E	P
Hansen	Forb	*Trifolium repens*	white clover	NA	NA	0.2	E	P
Hansen	Grass	*Anthoxanthum odoratum*	sweet vernal grass	2.9	17.2	10.0	E	P
Hansen	Grass	*Luzula campestris*	field woodrush	NA	NA	NA	NA	P
Hansen	Grass	*Elymus glaucus*	blue wildrye	NA	6.3	2.9	N	P
Hansen	Grass	*Cynosurus echinatus*	bristly dogstail grass	0.08	5.6	9.7	E	A
Hansen	Grass	*Dactylis glomerata*	orchard grass	3.4	4.1	14.7	E	P
Hansen	Grass	*Schedonorus arundinaceus*	tall fescue	0.1	3.7	NA	E	P
Hansen	Grass	*Bromus carinatus*	California brome	NA	0.4	1.4	N	P
Hansen	Grass	*Bromus diandris*	ripgut	0.2	NA	NA	E	A
Hansen	Grass	*Bromus vulgaris*	Columbia brome	0.6	NA	0.5	N	P
Hansen	Grass	*Bromus commutatus*	bald brome	NA	NA	0.7	E	A
Hansen	Grass	*Arrhenatherum elatius*	tall oatgrass	0.02	NA	NA	E	P
Hansen	Grass	*Holcus lanatus*	common velvet grass	0.04	NA	0.4	E	P
Hansen	Grass	*Poa secunda*	Sandberg bluegrass	0.08	NA	NA	E	P
Hansen	Grass	*Poa pratensis*	Kentucky bluegrass	NA	NA	0.8	NA	P
Hansen	Shrubs	*Rubus bifrons*	Himalayan blackberry	NA	17	22.6	E	P

Hansen	Shrubs	*Rubus ursinus*	trailing blackberry	19.8	NA	NA	N	P
Hansen	Shrubs	*Toxicodendron diversilobum*	Poison oak	15.0	3.8	11.1	N	P
Hansen	Shrubs	*Rubus laciniatus*	cutleaf blackberry	NA	0.9	0.3	N	P
Hansen	Shrubs	*Lonicera ciliosa*	orange honeysuckle	NA	0.6	1.4	N	P
Hansen	Shrubs	*Lonicera hispidula*	pink honeysuckle	1.7	NA	NA	N	P
Hansen	Shrubs	*Amelanchier alnifolia*	serviceberry	1.6	0.4	0.2	N	P
Hansen	Shrubs	*Prunus avium*	sweet cherry	NA	0.4	NA	E	P
Hansen	Shrubs	*Crataegus* sp.	hawthorn	NA	0.2	NA	NA	P
Hansen	Shrubs	*Arbutus menziesii*	madrone	0.2	NA	NA	N	P
Hansen	Shrubs	*Corylus cornuta* var. *californica*	California hazelnut	0.7	NA	1.5	N	P
Hansen	Shrubs	*Quercus garryana*	Oregon white oak	1.6	NA	NA	N	P
Hansen	Shrubs	*Quercus kellogii*	Black oak	NA	NA	NA	N	P
Hansen	Shrubs	*Rosa* sp.	rose	0.24	NA	NA	NA	P
Hansen	Shrub	*Fraxinus latifolia*	Oregon ashe	0.04	NA	NA	N	P
Hansen	Shrub	*Symphoricarpos mollis*	snowberry	0.8	NA	NA	N	P
Hansen	Ground	Thatch	Thatch	11.6	21	25.0	NA	NA
Hansen	Ground	Bare	Bare	1.3	NA	5.2	NA	NA
Hansen	Ground	Lichen/bryophyte	Lichen/bryophyte	1.0	NA	0.8	NA	NA
Hansen	Ground	Rock	Rock	0	NA	0	NA	NA
Hansen	Fern	*Polystichum munitum*	Sword fern	0.4	1.7	0.1	N	P
South Taylor	Forb	*Vicia sativa*	garden vetch	0.2	7	3.8	E	A
South Taylor	Forb	*Osmorhiza chilensis*	sweet cicely	0.48	3	1.9	N	P
South Taylor	Forb	*Galium aparine*	stickwilly	0.28	2.3	2.7	N	A
South Taylor	Forb	*Vicia hirsuta*	tiny vetch	0.12	2.2	0.2	E	A
South Taylor	Forb	*Lathyrus holochlorus*	Thin-leaved peavine	0.3	0.8	0.5	N	P
South Taylor	Forb	*Hypochaeris radicata*	hairy cat's ear	NA	0.1	0.1	E	P
South Taylor	Grass	*Dactylis glomerata*	orchard grass	19.6	14.2	23.4	E	P
South Taylor	Grass	*Alopecurus pratensis*	meadow foxtail	0.1	3.7	1.5	E	P

South Taylor	Grass	*Schedonorus arundinaceus*	tall fescue	0.1	1.3	0.1	E	P
South Taylor	Grass	*Anthoxanthum odoratum*	vanilla grass	0.8	NA	NA	E	P
South Taylor	Grass	*Arrhenatherum elatius*	tall oatgrass	NA	1	0.2	E	P
South Taylor	Grass	*Elymus glaucus*	blue wildrye	NA	0.9	1.5	N	P
South Taylor	Grass	*Carex* sp.	sedge	NA	0.7	NA	NA	NA
South Taylor	Grass	*Poa pratensis*	Kentucky bluegrass	NA	0.3	NA	NA	P
South Taylor	Grass	*Bromus carinatus*	California brome	NA	0.2	NA	N	P
South Taylor	Shrubs	*Rubus ursinus*	native blackberry	24.4	24.9	39.7	N	P
South Taylor	Shrubs	*Corylus cornuta* var. *californica*	California hazelnut	21.4	17.6	7.9	N	P
South Taylor	Shrub	*Mahonia nervosa*	Oregon grape	0.8	NA	NA	N	P
South Taylor	Shrubs	*Symphoricarpos albus*	Snowberry	5.2	10.4	7.6	N	P
South Taylor	Shrubs	*Berberis aquifolium*	holly-leaved barberry	NA	4.3	1.8	N	P
South Taylor	Shrubs	*Toxicodendron diversilobum*	Poison oak	0.2	3.1	1.9	N	P
South Taylor	Shrubs	*Prunus avium*	sweet cherry	4.0	2.1	NA	E	P
South Taylor	Shrubs	*Amelanchier alnifolia*	serviceberry	0.4	NA	0.5	N	P
South Taylor	Shrubs	*Oemleria cerasiformis*	indian plum	NA	NA	1.1	N	P
South Taylor	Shrubs	*Quercus garryana*	Oregon white oak	0.7	NA	NA	N	P
South Taylor	Shrubs	*Rhamnus purshiana*	Cascara	NA	NA	NA	N	P
South Taylor	Shrubs	*Rubus parviflorus*	thimbleberry	NA	NA	NA	N	P
South Taylor	Shrubs	*Viburnum ellipticum*	common viburnum	NA	NA	2.0	N	P
South Taylor	Shrubs	*Rubus bifrons*	Himalayan blackberry	NA	NA	1.8	E	P
South Taylor	Ground	Thatch	Thatch	99.3	42	48.0	NA	NA
South Taylor	Ground	Bare	Bare	0.4	2.6	10.8	NA	NA
South Taylor	Ground	Lichen/bryophyte	Lichen/bryophyte	0.44	0.4	1.5	NA	NA
South Taylor	Ground	Rock	Rock	NA	NA	0.0	NA	NA
Dorena East	Forb	*Galium aparine*	stick willy	0.22	6.3	2.8	N	A
Dorena East	Forb	*Sidalcea malviflora* ssp. *virgata*	dwarf checkerbloom	0.84	3.5	11.2	N	P

Dorena East	Forb	*Vicia sativa*	garden vetch	1.6	3.5	0.5	E	A
Dorena East	Forb	*Calochortus tolmeii*	cats ear lily	0.12	NA	NA	N	P
Dorena East	Forb	*Torilis arvensis*	Spreading hedge parsley	0.34	3	0.8	E	A
Dorena East	Forb	*Geranium dissectum*	cutleaf geranium	1.5	2.4	0.7	E	A/B
Dorena East	Forb	*Leucanthemum vulgare*	oxeeye daisy	2.3	2.4	0.4	E	P
Dorena East	Forb	*Vicia hirsuta*	tiny vetch	0.14	1.7	0.2	E	A
Dorena East	Forb	*Nemophilia parviflora*	small-flowered nemophila	0.64	1.3	NA	N	A
Dorena East	Forb	*Viola praemorsa*	canary violet	NA	1.3	NA	N	P
Dorena East	Forb	*Achillea millefolium*	Yarrow	NA	1.2	1.2	N	P
Dorena East	Forb	*Calystegia atriplicifolia*	Night blooming false bindweed	NA	1.1	0.9	E	P
Dorena East	Forb	*Lonicera* sp.	honeysuckle	NA	0.9	NA	E	P
Dorena East	Forb	*Rumex acetosella*	common sheep sorrel	0.2	0.8	0.9	E	P
Dorena East	Forb	*Lathyrus holochlorus*	Thin-leaved peavine	0.2	0.7	0.9	N	P
Dorena East	Forb	*Lupinus rivularis*	broadleaf lupine	NA	0.7	0.2	N	P
Dorena East	Forb	*Hypochaeris radicata*	hairy cat's ear	NA	0.7	0.1	E	P
Dorena East	Forb	*Galium pedemontanum*	piedmont bedstraw	NA	0.6	NA	E	A
Dorena East	Forb	*Sherardia arvensis*	blue field madder	NA	0.6	NA	E	A
Dorena East	Forb	*Hypericum perforatum*	St. John's wort	0.08	0.5	2.4	E	P
Dorena East	Forb	*Fragaria virginiana*	Virginia strawberry	NA	0.4	0.3	N	P
Dorena East	Forb	*Plantago lanceolata*	narrowleaf plantain	0.1	0.4	0.9	E	A/B/P
Dorena East	Forb	*Myosotis laxa*	bay forget me nots	NA	0.3	NA	N	A/B/P
Dorena East	Forb	*Myosotis discolor*	forget me nots	0.04	NA	NA	E	P
Dorena East	Forb	*Dichelostemma congestum*	ookow	0.04	0.3	NA	N	P
Dorena East	Forb	*Trifolium dubium*	Suckling clover	NA	0.3	NA	E	A
Dorena East	Forb	*Veronica arvensis*	corn speedwheel	NA	0.3	NA	E	A
Dorena East	Forb	*Camassia leichtlinii*	large camas	NA	NA	NA	N	P
Dorena East	Forb	*Epilobium ciliatum*	fringed willow herb	NA	NA	NA	N	P
Dorena East	Forb	*Sanguisorba officinalis*	great burnet	NA	NA	0.3	N	P

Dorena East	Forb	*Lactuca serriola*	prickly lettuce	NA	NA	NA	E	A/B
Dorena East	Forb	*Cirsium vulgare*	bull thistle	0.8	NA	NA	E	B
Dorena East	Forb	*Cirsium arvense*	Canada thistle	NA	NA	NA	E	P
Dorena East	Forb	*Convolvulus arvensis*	field bindweed	0.2	NA	NA	E	P
Dorena East	Forb	*Mitella* sp.	miterwort	NA	NA	NA	NA	NA
Dorena East	Forb	*Nemophila* sp.	nemophila	NA	NA	2.4	NA	NA
Dorena East	Form	*Arnica cordifolia*	heartleaf arnica	NA	NA	NA	N	P
Dorena East	Grass	*Arrhenatherum elatius*	tall oatgrass	0.64	5.7	2.7	E	P
Dorena East	Grass	*Anthoxanthum odoratum*	sweet vernal grass	0.8	NA	NA	E	P
Dorena East	Grass	*Poa secunda*	Sandberg bluegrass	0.04	1.2	NA	E	P
Dorena East	Grass	*Schedonorus arundinaceus*	tall fescue	NA	1.1	3.0	E	P
Dorena East	Grass	*Bromus vulgaris*	Columbia brome	0.1	NA	NA	N	P
Dorena East	Grass	*Bromus sitchensis*	Alaska brome	NA	0.8	NA	N	P
Dorena East	Grass	*Danthonia compressa*	flattened oatgrass	NA	0.2	NA	N	P
Dorena East	Grass	*Elymus glaucus*	blue wildrye	NA	NA	2.7	N	P
Dorena East	Grass	*Festuca roemeri*	Roemer's fescue	NA	NA	NA	N	P
Dorena East	Grass	*Anthoxanthum odoratum*	sweet vernal grass	NA	NA	NA	E	P
Dorena East	Grass	*Dactylis glomerata*	orchard grass	0.04	NA	NA	E	P
Dorena East	Grass	*Bromus* sp.	brome	NA	NA	NA	NA	NA
Dorena East	Grass	*Festuca* sp	Fescue	NA	NA	NA	NA	NA
Dorena East	Grass	*Poa* sp.	bluegrass	NA	NA	NA	NA	NA
Dorena East	Shrubs	*Symphoricarpos albus*	Snowberry	51.0	27.7	34.4	N	P
Dorena East	Shrubs	*Rubus ursinus*	native blackberry	9.7	11.8	14.5	N	P
Dorena East	Shrubs	*Toxicodendron diversilobum*	Poison oak	1.2	8.1	0.6	N	P
Dorena East	Shrubs	*Lonicera ciliosa*	orange honeysuckle	1.4	6.8	6.8	N	P
Dorena East	Shrubs	*Rosa nutkana*	Nootka rose	1.4	2.4	NA	N	P
Dorena East	Shrubs	*Quercus garryana*	Oregon white oak	0.3	1.1	6.7	N	P
Dorena East	Shrubs	*Fraxinus latifolia*	Oregon ash	NA	0.4	NA	N	P

Dorena East	Shrubs	*Crataegus monogyna*	one seed hawthorn	NA	NA	NA	E	P
Dorena East	Shrubs	*Prunus avium*	sweet cherry	0.2	NA	NA	E	P
Dorena East	Shrubs	*Rubus bifrons*	Himalayan blackberry	NA	NA	NA	E	P
Dorena East	Shrub	*Oemleria cerasiformis*	Indian plum	NA	NA	NA	N	P
Dorena East	Shrubs	*Rosa* sp.	rose	NA	NA	1.5	NA	P
Dorena East	Ground	Thatch	Thatch	8	27	22.5	NA	NA
Dorena East	Ground	Bare	Bare	0	NA	6.8	NA	NA
Dorena East	Ground	Lichen/bryophyte	Lichen/bryophyte	0.48	NA	1.5	NA	NA
Dorena East	Ground	Rock	Rock	NA	NA	0.1	NA	NA
Bake Stewart West	Forb	*Vicia sativa*	garden vetch	0.04	10.3	0.7	E	A
Bake Stewart West	Forb	*Vicia hirsuta*	tiny vetch	0.54	9.6	3.3	E	A
Bake Stewart West	Forb	*Torilis arvensis*	Spreading hedge parsley	0.04	6.4	0.4	E	A
Bake Stewart West	Forb	*Galium* sp.	bedstraw	NA	4.6	2.1	NA	NA
Bake Stewart West	Forb	*Lapsana communis*	common nipplewort	NA	3.1	1.1	E	A
Bake Stewart West	Forb	*Marah oreganus*	coastal manroot	0.04	2	NA	N	P
Bake Stewart West	Forb	*Geranium dissectum*	cutleaf geranium	1.18	1.6	0.7	E	A/B
Bake Stewart West	Forb	*Lactuca serriola*	prickly lettuce	0.3	NA	NA	E	P
Bake Stewart West	Forb	*Fritillaria affinis*	checker lily	0.54	NA	NA	N	P
Bake Stewart West	Forb	*Hypericum perforatum*	St. John's wort	0.48	0.9	0.2	E	P
Bake Stewart West	Forb	*Lathyrus holochlorus*	Thin-leaved peavine	0.84	0.7	4.4	N	P
Bake Stewart West	Forb	*Centaurea cyanus*	garden cornflower	NA	0.7	NA	E	A
Bake Stewart West	Forb	*Collinsia parviflora*	Chinese houses	0.04	NA	NA	N	A
Bake Stewart West	Forb	*Galium aparine*	stick willy	0.12	NA	0.1	N	A
Bake Stewart West	Forb	*Nemophila menziesii* var. *atomaria*	baby blue eyes	0.16	NA	3.6	N	A
Bake Stewart West	Forb	*Claytonia perfoliata*	miner's lettuce	0.14	NA	7.0	N	A/P
Bake Stewart West	Forb	*Lamium purpureum*	purple deadnettle	0.08	NA	1.1	E	A
Bake Stewart West	Forb	*Senecio sylvaticus*	woodland ragwort		NA	NA	E	A
Bake Stewart West	Forb	*Medicago sp.*	alfalfa	0.04	NA	NA	E	NA

Bake Stewart West	Forb	*Stellaria media*	Common chickweed	NA	NA	0.3	E	A/P
Bake Stewart West	Grass	*Elymus glaucus*	blue wildrye	2.6	2.6	2.5	N	P
Bake Stewart West	Grass	*Agrostis capillaris*	colonial bentgrass	NA	0.8	NA	E	P
Bake Stewart West	Grass	*Schedonorus arundinaceus*	tall fescue	0.8	NA	NA	E	P
Bake Stewart West	Grass	*Bromus vulgaris*	Columbia brome	0.2	0.5	NA	N	P
Bake Stewart West	Grass	*Juncus sp.*	rush	0.04	NA	NA	N	NA
Bake Stewart West	Grass	*Bromus diandrus*	ripgut	NA	NA	NA	E	A
Bake Stewart West	Shrubs	*Symphoricarpos albus*	Snowberry	21.6	37.5	52.7	N	P
Bake Stewart West	Shrubs	*Toxicodendron diversilobum*	Poison oak	8.8	7.2	15.1	N	P
Bake Stewart West	Shrubs	*Cytisus scoparius*	Scotch broom	0.4	NA	NA	E	P
Bake Stewart West	Shrubs	*Quercus garryana*	Oregon white oak	NA	2	2.6	N	P
Bake Stewart West	Shrubs	*Prunus avium*	sweet cherry	NA	0.2	NA	E	P
Bake Stewart West	Shrubs	*Oemleria cerasiformis*	indian plum	0.4	NA	0.1	N	P
Bake Stewart West	Shrubs	*Rosa* sp.	rose	NA	NA	NA	NA	P
Bake Stewart West	Ground	Thatch	Thatch	27.8	30	29	NA	NA
Bake Stewart West	Ground	Bare	Bare	0	NA	16	NA	NA
Bake Stewart West	Ground	Lichen/bryophyte	Lichen/bryophyte	0.94	NA	1.2	NA	NA
Bake Stewart West	Ground	Rock	Rock	NA	NA	0.8	NA	NA
Bake Stewart West	Fern	*Polystichum munitum*	Sword fern	NA	9.2	2.1	N	P
Bake Stewart West	Fern	*Polypodium sp.*	licorice fern	0.4	NA	NA	N	NA
Bake Stewart East	Forb	*Moehringia macrophylla*	large leaf sandwort	0.84	9.7	3.7	N	P
Bake Stewart East	Forb	*Vicia sativa*	garden vetch	0.2	7	6.6	E	A
Bake Stewart East	Forb	*Vicia hirsuta*	tiny vetch	NA	5.8	0.2	E	A
Bake Stewart East	Forb	*Vicia americana*	common vetch	5.4	NA	NA	N	P
Bake Stewart East	Forb	*Fragaria virginiana*	Virginia strawberry	NA	2.3	NA	N	P
Bake Stewart East	Forb	*Fragaria vesca*	woodland strawberry	1.2	NA	NA	N	P
Bake Stewart East	Forb	*Lapsana communis*	common nipplewort	NA	2.3	2.5	E	A
Bake Stewart East	Forb	*Galium* sp.	bedstraw	0.36	2.1	NA	NA	NA

Bake Stewart East	Forb	*Geranium molle*	dove foot geranium	0.14	1.5	0.1	E	A/B/P
Bake Stewart East	Forb	*Lathyrus holochlorus*	Thin-leaved peavine	0.8	1.2	3.6	N	P
Bake Stewart East	Forb	*Torilis arvensis*	spreading hedge parsley	0.26	1	1.4	E	A
Bake Stewart East	Forb	*Nemophila menziesii* var. *atomaria*	baby blue eyes	0.42	0.9	NA	N	A
Bake Stewart East	Forb	*Aquilegia formosa*	columbine	NA	0.8	NA	N	P
Bake Stewart East	Forb	*Achillea millefolium*	Yarrow	0.8	0.7	NA	N	P
Bake Stewart East	Forb	*Centaurea cyanus*	garden cornflower	NA	0.7	NA	E	A
Bake Stewart East	Forb	*Camassia leichtlinii*	large camas	NA	0.3	NA	N	P
Bake Stewart East	Forb	*Sidalcea malviflora* ssp. *virgata*	dwarf checkerbloom	NA	0.3	NA	N	P
Bake Stewart East	Forb	*Myosotis discolor*	changing forget me nots	NA	0.2	NA	N	A/P
Bake Stewart East	Forb	*Lamium purpureum*	purple deadnettle	NA	0.2	NA	E	A
Bake Stewart East	Forb	*Hypericum perforatum*	St. John's wort	NA	0.2	NA	E	P
Bake Stewart East	Forb	*Stellaria* sp.	Common chickweed	NA	0.2	NA	NA	NA
Bake Stewart East	Forb	*Fragaria vesca*	woodland strawberry	NA	NA	1.6	N	P
Bake Stewart East	Forb	*Collinsia parviflora*	Chinese houses	0.04	NA	NA	N	A
Bake Stewart East	Forb	*Marah oreganus*	coastal manroot	NA	NA	NA	N	P
Bake Stewart East	Forb	*Geranium dissectum*	cutleaf geranium	NA	NA	NA	E	A/B
Bake Stewart East	Forb	*Allium sp.*	onion	0.64	NA	NA	NA	NA
Bake Stewart East	Forb	*Fritillaria affinis*	checker lily	2.9	NA	NA	N	P
Bake Stewart East	Forb	*Lactuca sp.*	lettuce	1.5	NA	NA	NA	NA
Bake Stewart East	Forb	*Claytonia perfoliata*	miner's lettuce	0.24	NA	NA	N	P
Bake Stewart East	Forb	*Daucus carota*	Queen Anne's lace	0.08	NA	NA	E	B
Bake Stewart East	Forb	*Ranunculus uncinatus*	buttercup	0.28	NA	NA	N	A/P
Bake Stewart East	Forb	*Sanicula graveolens*	northern sanicle	0.4	NA	NA	N	P
Bake Stewart East	Forb	*Sherardia arvensis*	blue field madder	0.04	NA	NA	E	A
Bake Stewart East	Forb	*Stellaria media*	Common chickweed	NA	NA	0.2	E	A/P
Bake Stewart East	Grass	*Bromus vulgaris*	Columbia brome	0.04	39.5	0.5	N	P

Bake Stewart East	Grass	*Dactylis glomerata*	orchard grass	2.04	8.6	36.0	E	P
Bake Stewart East	Grass	*Schedonorus arundinaceus*	tall fescue	19.44	NA	NA	E	P
Bake Stewart East	Grass	*Bromus diandrus*	ripgut brome	0.12	3.4	7.8	E	A/P
Bake Stewart East	Grass	*Juncus sp.*	rush	0.04	NA	NA	NA	NA
Bake Stewart East	Grass	*Anthoxanthum odoratum*	sweet vernal grass	1.24	1.9	NA	E	P
Bake Stewart East	Grass	*Poa* sp.	bluegrass	NA	0.3	NA	NA	NA
Bake Stewart East	Grass	*Bromus carinatus*	California brome	NA	NA	0.2	N	P
Bake Stewart East	Grass	*Elymus glaucus*	blue wildrye	NA	NA	1.0	N	P
		Avena sativa	wild oatgrass	0.1	NA	NA	E	P
Bake Stewart East	Grass	*Agrostis capillaris*	colonial bentgrass	NA	NA	NA	E	P
Bake Stewart East	Grass	*Arrhenatherum elatius*	tall oatgrass	NA	NA	31.0	E	P
Bake Stewart East	Shrubs	*Oemleria cerasiformis*	indian plum	6.1	6.9	3.5	N	P
Bake Stewart East	Shrubs	*Acer macrophyllum*	Big leaf maple	NA	0.7	NA	N	P
Bake Stewart East	Shrubs	*Toxicodendron diversilobum*	Poison oak	0.9	0.5	NA	N	P
Bake Stewart East	Shrubs	*Quercus garryana*	Oregon white oak	NA	0.3	0.3	N	P
Bake Stewart East	Shrubs	*Symphoricarpos albus*	Snowberry	NA	NA	NA	N	P
Bake Stewart East	Shrubs	*Prunus avium*	sweet cherry	NA	NA	NA	E	P
Bake Stewart East	Ground	Thatch	Thatch	39.2	42	39	NA	NA
Bake Stewart East	Ground	Bare	Bare	0.04	NA	0.4	NA	NA
Bake Stewart East	Ground	Lichen/bryophyte	Lichen/bryophyte	0.4	NA	0	NA	NA
Bake Stewart East	Ground	Rock	Rock	NA	NA	0	NA	NA
Dorena West	Forb	*Leucanthemum vulgare*	oxeeye daisy	3.0	8.2	10.0	E	P
Dorena West	Forb	*Galium aparine*	stick willy	0.58	4.3	0.4	N	A
Dorena West	Forb	*Geranium dissectum*	cutleaf geranium	2.3	3.7	1.0	E	A/B
Dorena West	Forb	*Torilis arvensis*	Spreading hedge parsley	0.18	2.2	0.6	E	A
Dorena West	Forb	*Vicia sativa*	garden vetch	0.64	1.8	0.3	E	A
Dorena West	Forb	*Fragaria virginiana*	Virginia strawberry	1.5	1.7	4.0	N	P
Dorena West	Forb	*Rumex acetosella*	common sheep sorrel	1.00	1.7	2.8	E	P

Dorena West	Forb	*Vicia hirsuta*	tiny vetch	1.68	1.4	0.3	E	A
Dorena West	Forb	*Dichelostemma congestum*	ookow	NA	1.3	NA	N	P
Dorena West	Forb	*Hypericum perforatum*	St. John's wort	0.5	1.2	0.6	E	P
Dorena West	Forb	*Myosotis discolor*	forget me nots	0.08	NA	NA	E	A/P
Dorena West	Forb	*Myosotis laxa*	bay forget me nots		1	NA	N	A/B/P
Dorena West	Forb	*Convolvulus arvensis*	field bindweed	0.1	1	NA	E	P
Dorena West	Forb	*Camassia leichtlinii*	large camas		0.7	NA	N	P
Dorena West	Forb	*Plantago lanceolata*	narrow leaf plantain	0.6	0.7	1.5	E	A/B/P
Dorena West	Forb	*Nemophila parviflora*	small-flowered nemophila	0.04	0.6	NA	N	A
Dorena West	Forb	*Galium pedemontanum*	piedmont bedstraw	NA	0.5	NA	E	A
Dorena West	Forb	*Cirsium vulgare*	bull thistle	NA	0.4	NA	E	B
Dorena West	Forb	*Mitella* sp.	miterwort	NA	0.4	NA	NA	NA
Dorena West	Forb	*Sanguisorba officinalis*	great burnet	NA	0.2	0.5	N	P
Dorena West	Forb	*Trifolium dubium*	Suckling clover	NA	0.2	NA	E	A
Dorena West	Forb	*Achillea millefolium*	Yarrow	NA	NA	0.2	N	P
Dorena West	Forb	*Calystegia atriplicifolia*	Night blooming false bindweed	NA	NA	NA	N	P
Dorena West	Forb	*Camassia leichtlinii* ssp. *suksdorfii*	Suksdorf's large camas	NA	NA	NA	N	P
Dorena West	Forb	*Camassia quamash*	small camas	0.3	NA	NA	N	P
Dorena West	Forb	*Epilobium ciliatum*	fringed willow herb	NA	NA	0.1	N	P
Dorena West	Forb	*Lathyrus holochlorus*	Thin-leaved peavine	NA	NA	0.8	N	P
Dorena West	Forb	*Potentilla gracilis*	slender cinquefoil	NA	NA	NA	N	P
Dorena West	Forb	*Sanicula crassicaulis*	Pacific black snakeroot	NA	NA	0.4	N	P
Dorena West	Forb	*Sidalcea malviflora* ssp. *virgata*	dwarf checkerbloom	0.1	NA	NA	N	P
Dorena West	Forb	*Calochortus tolmeii*	cats ear lily	0.04	NA	NA	N	P
Dorena West	Forb	*Taraxacum officinale*	Dandelion	NA	NA	0.1	E	P
Dorena West	Forb	*Vicia cracca*	bird vetch	NA	NA	NA	E	P
Dorena West	Forb	*Galium* sp.	bedstraw	NA	NA	1.3	NA	NA

Dorena West	Grass	*Dactylis glomerata*	orchard grass	4.2	8.8	NA	E	P
Dorena West	Grass	*Arrhenatherum elatius*	tall oatgrass	5.0	8.7	38.8	E	P
Dorena West	Grass	*Anthoxanthum odoratum*	sweet vernal grass	4.5	6.5	1.0	E	P
Dorena West	Grass	*Schedonorus arundinaceus*	tall fescue	NA	5.5	2.2	E	P
Dorena West	Grass	*Festuca roemeri*	Roemer's fescue	3.9	3.4	NA	N	P
Dorena West	Grass	*Poa* sp.	bluegrass	NA	2.2	NA	NA	NA
Dorena West	Grass	*Bromus* sp.	brome	NA	0.8	NA	NA	NA
Dorena West	Grass	*Poa secunda*	Sandberg bluegrass	0.34	NA	NA	E	P
Dorena West	Grass	*Bromus carinatus*	California brome	NA	NA	0.6	N	P
Dorena West	Grass	*Bromus vulgaris*	Columbia brome	NA	NA	0.3	N	P
Dorena West	Grass	*Elymus glaucus*	blue wildrye	NA	NA	0.3	N	P
Dorena West	Grass	*Bromus diandrus*	ripgut brome	0.9	NA	0.3	E	A/P
Dorena West	Grass	*Poa pratensis*	Kentucky bluegrass	NA	NA	0.2	E	P
Dorena West	Grass	*Festuca* sp.	fescue	NA	NA	11.2	NA	NA
Dorena West	Shrubs	*Rosa nutkana*	Nootka rose	9.0	10.9	NA	N	P
Dorena West	Shrubs	*Symphoricarpos albus*	Snowberry	5.4	4.7	7.4	N	P
Dorena West	Shrubs	*Rubus ursinus*	native blackberry	1.6	3.2	NA	N	P
Dorena West	Shrubs	*Toxicodendron diversilobum*	Poison oak	0.2	2.9	NA	N	P
Dorena West	Shrubs	*Quercus garryana*	Oregon white oak	3.8	2.6	3.2	N	P
Dorena West	Shrubs	*Rubus bifrons*	Himalayan blackberry	0.04	2.2	2.7	E	P
Dorena West	Shrubs	*Crataegus monogyna*	one seed hawthorn	NA	1.6	NA	N	P
Dorena West	Shrubs	*Fraxinus latifolia*	Oregon ash	NA	0.4	NA	N	P
Dorena West	Shrubs	*Rosa* sp.	rose	NA	NA	7.1	NA	P
Dorena West	Ground	Thatch	Thatch	15.8	18	26.3	NA	NA
Dorena West	Ground	Bare	Bare	0	1.2	6.1	NA	NA
Dorena West	Ground	Lichen/Bryophyte	Lichen/bryophyte	3.8	1.2	0.5	NA	NA
Dorena West	Ground	Rock	Rock	NA	NA	0.1	NA	NA
Bald Hill Big Plot	Forb	Osmorhiza berteroi	sweet cicely	2.3	NA	NA	N	P

Bald Hill Big Plot	Forb	Galium aparine	stick willy	1.5	NA	NA	N	A
Bald Hill Big Plot	Forb	Lathyrus holochlorus	thin leaved peavine	1.2	NA	NA	N	P
Bald Hill Big Plot	Forb	Sanicula graveolens	northern sanicle	1.14	NA	NA	N	P
Bald Hill Big Plot	Forb	Claytonia sibirica	Siberian sprinbeauty	1.1	NA	NA	N	P
Bald Hill Big Plot	Forb	Hypochaeris radicata	false dandelion	1	NA	NA	E	P
Bald Hill Big Plot	Forb	Torilis arvensis	spreading hedgeparsley	0.84	NA	NA	E	A
Bald Hill Big Plot	Forb	Erysimum oreganum	wall flower	0.2	NA	NA	N	P
Bald Hill Big Plot	Forb	Madia sp.	tar weed	0.2	NA	NA	NA	NA
Bald Hill Big Plot	Forb	Nemophila parviflora	small-flowered nemophila	0.2	NA	NA	N	A
Bald Hill Big Plot	Forb	Senecio jacobea	stinking willy	0.2	NA	NA	E	P
Bald Hill Big Plot	Forb	Epilobium sp.	unknown willowherb	0.18	NA	NA	NA	NA
Bald Hill Big Plot	Forb	Cirsium vulgare	bull thistle	0.04	NA	NA	E	P
Bald Hill Big Plot	Grass	Brachypodium sylvaticum	false brome	1.24	NA	NA	E	P
Bald Hill Big Plot	Grass	Bromus vulgaris	Columbia brome	0.6	NA	NA	N	P
Bald Hill Big Plot	Grass	Elymus glaucus	blue wild rye	0.24	NA	NA	N	P
Bald Hill Big Plot	Grass	Bromus carinatus	California brome	0.04	NA	NA	N	P
Bald Hill Big Plot	Shrub/Tree	Toxicodendron diversilobum	poison oak	14.54	NA	NA	N	P
Bald Hill Big Plot	Shrub/Tree	Quercus garryana	Oregon white oak	1.8	NA	NA	N	P
Bald Hill Big Plot	Shrub/Tree	Rosa nutkana	nootka rose	0.8	NA	NA	N	P
Bald Hill Big Plot	Shrub/Tree	Acer macrophyllum	big leaf maple	0.34	NA	NA	N	P
Bald Hill Big Plot	Shrub/Tree	Garrya elliptica	silk tassle	0.2	NA	NA	N	P
Bald Hill Big Plot	Shrub/Tree	Symphoricarpus albus	snowberry	0.2	NA	NA	N	P
Bald Hill Big Plot	Ground	Thatch	thatch	91.2	NA	NA	NA	NA
Bald Hill Big Plot	Ground	Bare ground	bare ground	6	NA	NA	NA	NA
Bald Hill Big Plot	Ground	Bryophytes/lichens	bryophytes/lichens	1.3	NA	NA	NA	NA
Bald Hill Big Plot	Ground	Log	log	2	NA	NA	NA	NA
Bald Hill Small Plot	Forb	Galium aparine	stick willy	2.14	NA	NA	N	A

Bald Hill Small Plot	Forb	Osmorhiza berteroi	sweet cicely	1.94	NA	NA	N	P
Bald Hill Small Plot	Forb	Moehringia macrophyllum	large leaf sandwort	1.4	NA	NA	N	P
Bald Hill Small Plot	Forb	Lathyrus holochlorus	thin leaved peavine	0.6	NA	NA	N	P
Bald Hill Small Plot	Forb	Torilis arvensis	spreading hedgeparsley	0.42	NA	NA	E	A
Bald Hill Small Plot	Forb	Adenocaulon bicolor	pathfinder	0.4	NA	NA	n	P
Bald Hill Small Plot	Forb	Hypochaeris radicata	false dandelion	0.4	NA	NA	E	P
Bald Hill Small Plot	Forb	Lomatium/Sanicula	unknown lomation or sanicle	0.4	NA	NA	NA	NA
Bald Hill Small Plot	Forb	Nemophila parviflora	small-flowered nemophila	0.2	NA	NA	N	A
Bald Hill Small Plot	Forb	Erysimum oreganum	wallflower	0.1	NA	NA	N	P
Bald Hill Small Plot	Forb	Vicia sativa	garden vetch	0.1	NA	NA	E	A
Bald Hill Small Plot	Forb	Sanicula graveolens	northern sanicle	0.08	NA	NA	N	P
Bald Hill Small Plot	Forb	Daucus carota	Queen Anne's lace	0.04	NA	NA	E	B
Bald Hill Small Plot	Forb	Epilobium sp.	unknown willowherb	0.04	NA	NA	NA	NA
Bald Hill Small Plot	Forb	Lactuca muralis	wall lettuce	0.04	NA	NA	E	P
Bald Hill Small Plot	Forb	Viola sempervirens	redwood violet	0.04	NA	NA	N	P
Bald Hill Small Plot	Grass	Brachypodium sylvaticum	false brome	1.4	NA	NA	E	P
Bald Hill Small Plot	Grass	Elymus glaucus	blue wild rye	1.2	NA	NA	N	P
Bald Hill Small Plot	Grass	Bromus vulgaris	Columbia brome	0.9	NA	NA	N	P
Bald Hill Small Plot	Grass	Poa sp.	unknown poa	0.2	NA	NA	NA	NA
Bald Hill Small Plot	Grass	Bromus carinatus	California brome	0.1	NA	NA	N	P
Bald Hill Small Plot	Grass	Avena ovatum	wild oat	0.04	NA	NA	E	P
Bald Hill Small Plot	Shrub/Tree	Toxicodendron diversilobum	poison oak	15.4	NA	NA	N	P
Bald Hill Small Plot	Shrub/Tree	Holodiscus discolor	oceanspray	6	NA	NA	N	P
Bald Hill Small Plot	Shrub/Tree	Acer macrophyllum	big leaf maple	0.44	NA	NA	N	P
Bald Hill Small Plot	Ground	Thatch	thatch	62.4	NA	NA	NA	NA
Bald Hill Small Plot	Ground	Bare ground	bare ground	11.6	NA	NA	NA	NA

Bald Hill Small Plot	Ground	Bryophytes/lichens	Bryophytes and lichens	1.5	NA	NA	NA	NA
Bald Hill Small Plot	Ground	Rock	rock	0	NA	NA	NA	NA
Bald Hill Small Plot	Ground	Log	log	1.6	NA	NA	NA	NA
Bald Hill Small Plot	Fern	Polystichum munitum	sword fern	0.2	NA	NA	N	P
Herbert Big Plot	Forb	Galium aparine	stick willy	7.4	NA	NA	N	A
Herbert Big Plot	Forb	Heracleum maximum	cow parsnip	5.4	NA	NA	N	P
Herbert Big Plot	Forb	Tellima grandiflora	fringecup	5.4	NA	NA	N	P
Herbert Big Plot	Forb	Angelica sp.	Angelica	3.6	NA	NA	N	P
Herbert Big Plot	Forb	Viola glabella	stream violet	1.4	NA	NA	N	P
Herbert Big Plot	Forb	Nemophila parviflora	small-flowered nemophila	0.84	NA	NA	N	a
Herbert Big Plot	Forb	Lathyrus holochlorus	thin leaved peavine	0.6	NA	NA	N	P
Herbert Big Plot	Forb	Osmorhiza berteroi	sweet cicely	0.5	NA	NA	N	P
Herbert Big Plot	Forb	Delphinium menziesii	Menzie's larkspur	0.4	NA	NA	N	P
Herbert Big Plot	Forb	Camas quamash	common camas	0.3	NA	NA	N	P
Herbert Big Plot	Forb	Potentilla gracilis	slender cinquefoil	0.1	NA	NA	N	P
Herbert Big Plot	Forb	Vicia sativa	garden vetch	0.04	NA	NA	E	A
Herbert Big Plot	Forb	Conium maculatum	poison hemlock	0	NA	NA	E	B
Herbert Big Plot	Grass	Bromus diandrus	ripgut	0.04	NA	NA	E	A
Herbert Big Plot	Shrub/Tree	Rubus ursinus	trailing blackberry	48	NA	NA	N	P
Herbert Big Plot	Shrub/Tree	Toxicodendron diversilobum	poison oak	10	NA	NA	N	P
Herbert Big Plot	Shrub/Tree	Symphoricarpus albus	snowberry	4.8	NA	NA	N	P
Herbert Big Plot	Shrub/Tree	Oemleria cerasiformis	Indian plum	3.8	NA	NA	N	P
Herbert Big Plot	Shrub/Tree	Acer macrophyllum	big leaf maple	0.2	NA	NA	N	P
Herbert Big Plot	Ground	Thatch	thatch	100	NA	NA	NA	NA
Herbert Big Plot	Ground	Bare ground	bare ground	0	NA	NA	NA	NA
Herbert Small Plot	Forb	Marah oreganus	western wild cucumber	2	NA	NA	N	P
Herbert Small Plot	Forb	Nemophila parviflora	small-flowered nemophila	1.75	NA	NA	N	A
Herbert Small Plot	Forb	Galium aparine	stick willy	1.3	NA	NA	N	A

Herbert Small Plot	Forb	Lathyrus holochlorus	thin leaved peavine	0.425	NA	NA	N	P
Herbert Small Plot	Shrub/Tree	Ribes lobbii	gummy gooseberry	0.25	NA	NA	N	P
Herbert Small Plot	Forb	Lactuca serriola	prickly lettuce	0.125	NA	NA	E	P
Herbert Small Plot	Grass	Hordeum brachyantherum	meadow foxtail	7.5	NA	NA	E	P
Herbert Small Plot	Grass	Elymus glaucus	blue wild rye	1.5	NA	NA	N	P
Herbert Small Plot	Shrub/Tree	Rubus ursinus	trailing blackberry	7.5	NA	NA	N	P
Herbert Small Plot	Shrub/Tree	Rubus parviflora	thimbleberry	6.25	NA	NA	N	P
Herbert Small Plot	Shrub/Tree	Symphoricarpus albus	snowberry	3.25	NA	NA	N	P
Herbert Small Plot	Shrub/Tree	Prunus americana	American plum	2.5	NA	NA	N	P
Herbert Small Plot	Shrub/Tree	Spirea like species	unknown spirea looking plant	2.5	NA	NA	NA	P
Herbert Small Plot	Shrub/Tree	Toxicodendron diversilobum	poison oak	2.5	NA	NA	N	P
Herbert Small Plot	Shrub/Tree	Fraxinus latifolia	Oregon ashe	1.75	NA	NA	N	P
Herbert Small Plot	Shrub/Tree	Rubus sp.	blackberry	1.55	NA	NA	NA	P
Herbert Small Plot	Shrub/Tree	Quercus garryana	Oregon white oak	0.125	NA	NA	N	P
Herbert Small Plot	Shrub/Tree	Acer macrophyllum	big leaf maple	0.05	NA	NA	N	P
Herbert Small Plot	Ground	Thatch	thatch	81.25	NA	NA	NA	NA
Herbert Small Plot	Ground	Bare ground	bare ground	6.25	NA	NA	NA	NA
Herbert Small Plot	Ground	Bryophytes/lichens	bryophytes and lichens	2.75	NA	NA	NA	NA
Herbert Small Plot	Ground	Log	log	12.5	NA	NA	NA	NA

APPENDIX E: OVERVIEW OF MANAGEMENT ACTIONS FOR THE REINTRODUCTION OF LATHYRUS HOLOCHLORUS (2012-2018)

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 impact of different cultivation.

2014

- IAE and NPSO continued field surveys of known locations of *L. holochlorus* resulting in 90 of the 109 sites visited
- 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 (planned activities)

- Weed FSL beds and collect seed if produced
- Moniter and analyze outplanted plots data
- Collect LAHO seed from larger, healthy population
- Start grow out of plugs for planting in 2020 at sites with the highest survival counts.

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

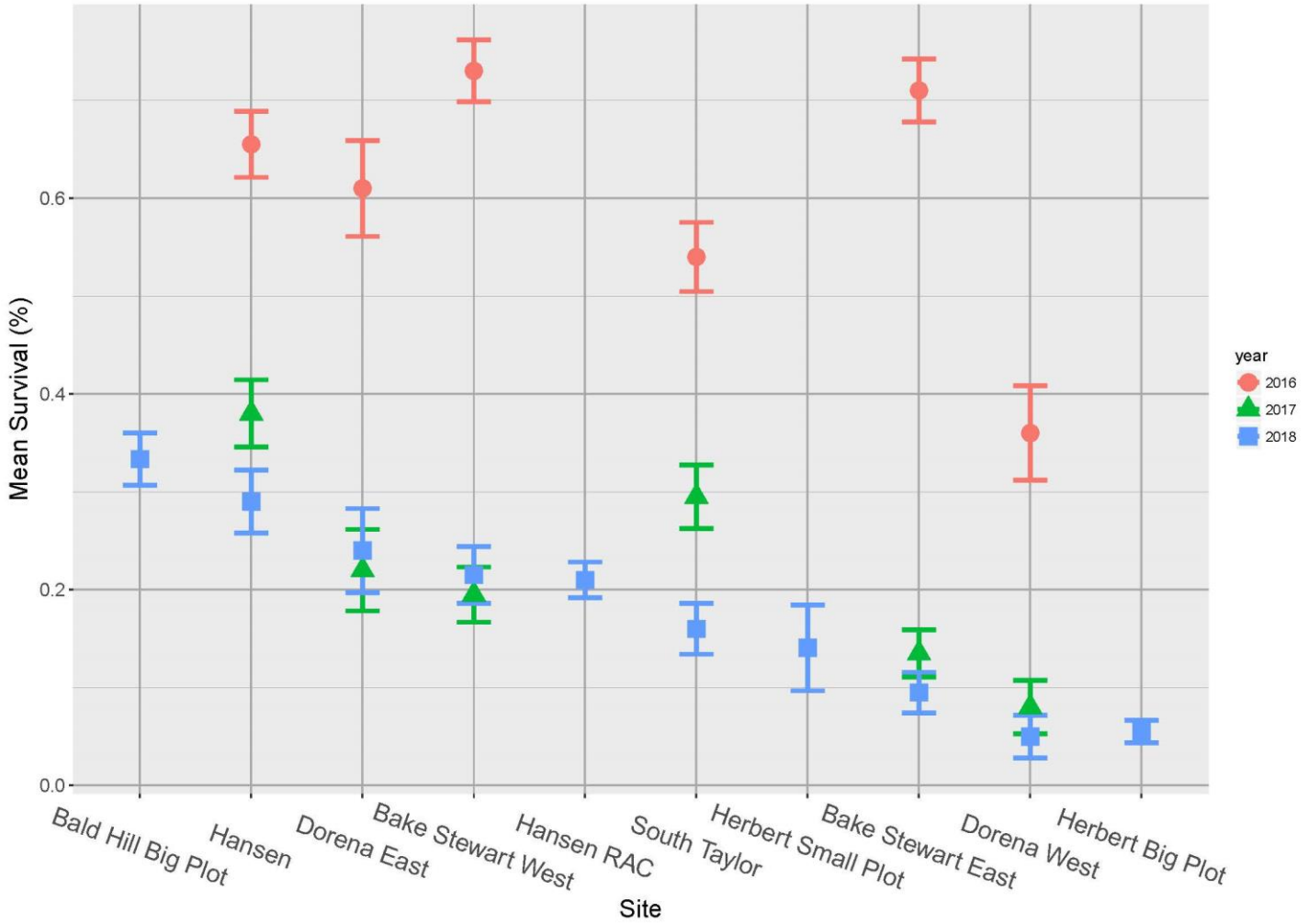

Figure F1. Mean and standard error of *Lathyrus holochlorus* survival at each site for monitoring years 2016, 2017 and 2018. Sites (x-axis) are ordered from highest to lowest percent survival in 2018. Bald Hill Small Plot data was not taken.

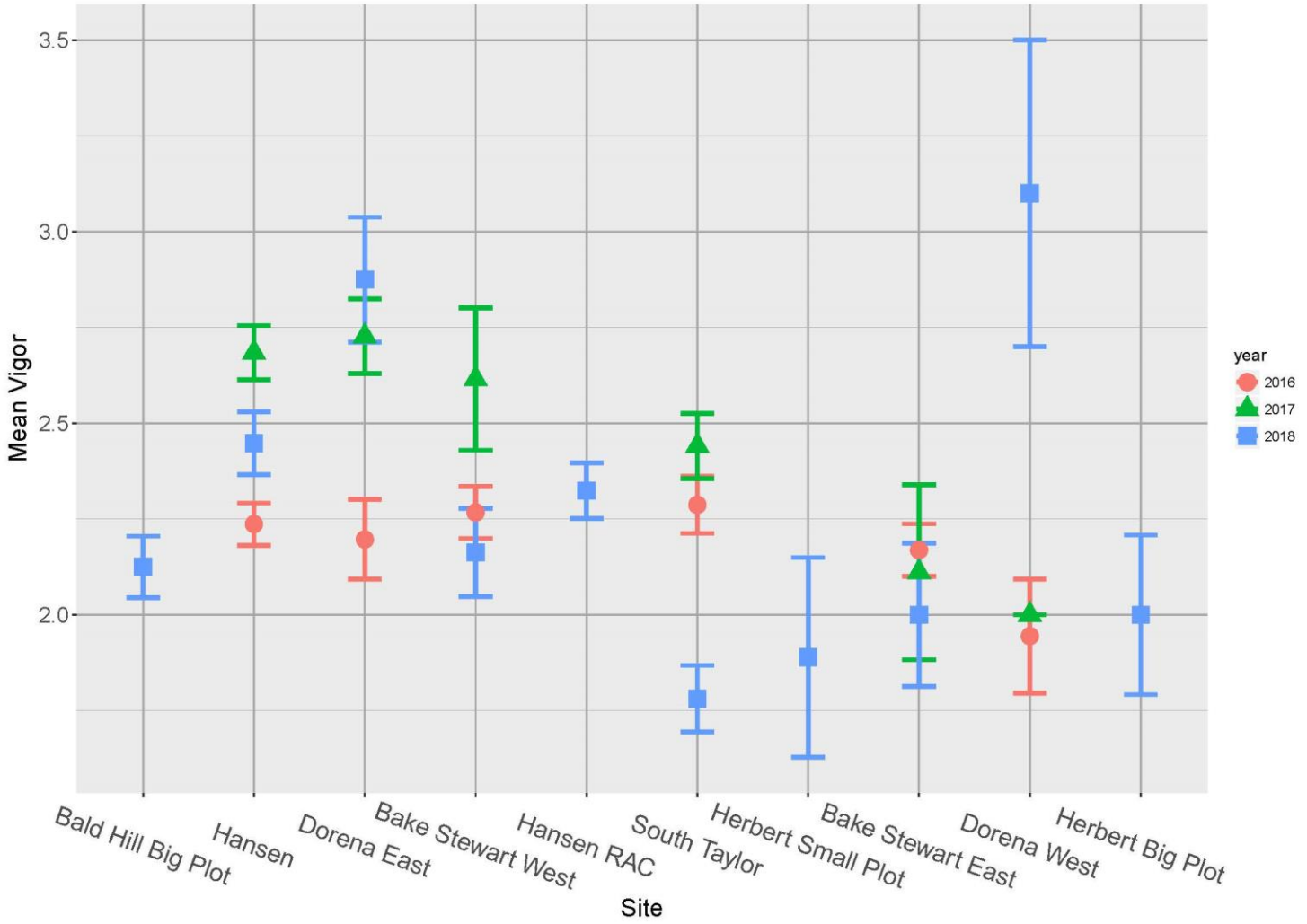

Figure F2. Mean and standard error of the vigor of the surviving *Lathyrus holochlorus* for each site for monitoring years 2016, 2017 and 2018. Sites (x-axis) are ordered from highest to lowest percent survival in 2018. Bald Hill Small Plot data was not taken.

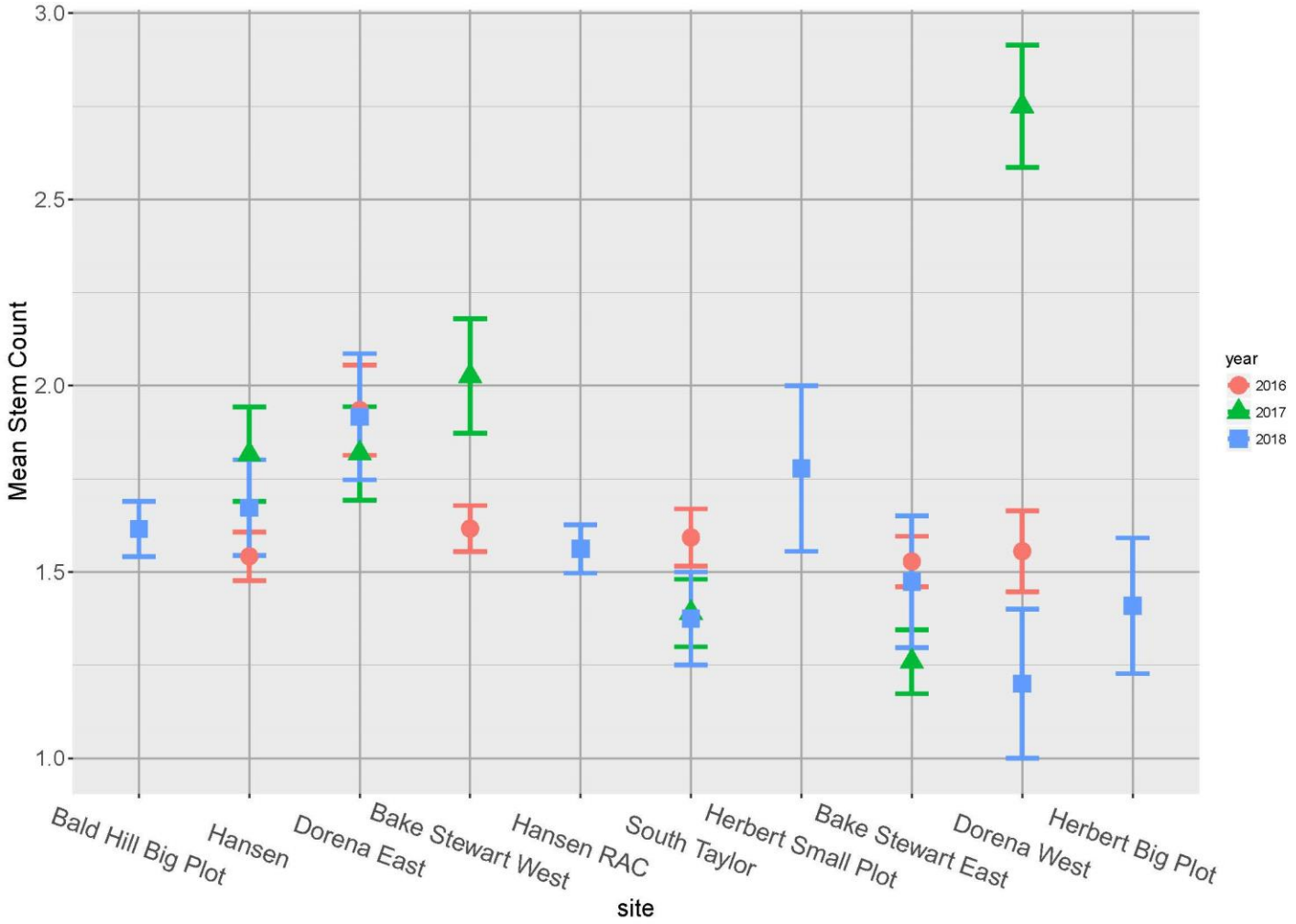

Figure F3. Mean and standard error of the stem count of the surviving *Lathyrus holochlorus* for each site for monitoring years 2016, 2017 and 2018. Sites (x-axis) are ordered from highest to lowest percent survival in 2018. Bald Hill Small Plot data was not taken in 2018.