

Lathyrus holochlorus: 2021 Annual Report



3/22/2022

Report prepared for the Bureau of Land
Management, Agreement #L19AC00044

Report prepared by Celeste Lebo
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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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Cover photograph: *Lathyrus holochlorus*, Hansen, West Eugene Wetlands.
Photo by Celeste Lebo, May 5, 2021.

SUGGESTED CITATION

Lebo, C. and Esterson, A. 2022. *Lathyrus holochlorus*: 2021 Annual Report. Unpublished report for the Bureau of Land Management, Northwest Oregon District. Institute for Applied Ecology. Corvallis, Oregon.

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Lathyrus holochlorus: 2021 Annual Report

1. EXECUTIVE SUMMARY

This report summarizes habitat restoration and monitoring work conducted in 2021 by the Institute for Applied Ecology (IAE) at several prairie sites where thin-leaved peavine (*Lathyrus holochlorus*) has been introduced. IAE has partnered with the Bureau of Land Management (BLM) on this project since 2012 to prevent the federal listing of thin-leaved peavine, a BLM sensitive species. Beginning in 2016, our work has included seed amplification for reintroduction, population monitoring, and maintenance of thin-leaved peavine plantings at introduction sites. In 2021, introduction plots (planted in 2016 and 2018) were monitored for survival and vigor of thin-leaved peavine plants. Habitat-enhancement actions (trimming and cutting) were also completed in introduction plots to decrease the extent of woody species and non-native perennial grasses.

Survival of thin-leaved peavine planted in 2016 decreased from 60% in the first year of monitoring to 12% in 2021 (five years later). In terms of habitat quality, observations suggest that sites with higher average shrub and lower non-native perennial grass cover may have higher rates of survival. This information could help land managers and ecologists make strategic choices about where to make future thin-leaved peavine introductions and prioritize restoration efforts at those sites currently occupied thin-leaved peavine. In 2022, we recommend that the seed-increase bed continue to be maintained, wild seed is collected, and the 2019 seed plots be monitored for seedling establishment.

2. INTRODUCTION

Thin-leaved peavine (*Lathyrus holochlorus*) is a rare member of the pea family (*Fabaceae*). Both the BLM and U.S. Fish and Wildlife consider thin-leaved peavine a species of concern and the Oregon Biodiversity Information Center (ORBIC) categorizes it as a List 1 species. Primarily found throughout the Willamette Valley and south toward Roseburg in Oregon, there are also a few small populations 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* spp.), and poison oak (*Toxicodendron diversilobum*). Many populations are threatened by weed-management practices that utilize mowing and herbicides during the growing and reproductive season.

Thin-leaved peavine is a rhizomatous, perennial forb. Small populations are likely composed of a single, self-incompatible genetic clone that typically does not produce viable seed. Results from a 2012-2014 range-wide inventory performed by IAE and volunteers from the Native Plant Society of Oregon (NPSO) found that 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 (Ottobrino-Haworth et al. 2018).

In 2016, four sites were chosen for the introduction of thin-leaved peavine: Dorena Prairie, Bake Stewart, Hansen, and South Taylor (Figures 1 and 2; Appendices A-C). Bake Stewart Park is public land managed by the U.S. Army Corps of Engineers (ACOE). All other sites are on public lands managed by the BLM. Two plots were established at both Dorena and Bake Stewart to assess the efficacy of planting thin-leaved peavine with and without existing shrubs in the plots. At Dorena, the west plot is virtually shrub-

free, while the east plot is colonized by snowberry. 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 selected 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 Small Plot); and two plots were established at Herbert Farm and Natural Area (Herbert Farm Big Plot and Small Plot) (Figures 1 and 2; Appendices A-C).

3. GOAL AND OBJECTIVES

The goal of this project is to prevent the listing of thin-leaved peavine. The primary objectives are to:

- maintain seed-increase beds for thin-leaved peavine;
- continue to collect wild seed from a geographical range of extant populations to maintain genetic diversity;
- monitor the establishment of outplanted plugs and seeded plots; and
- improve habitat quality at reintroduction sites to increase plant-establishment success.

4. 2021 RESTORATION ACTIVITIES

Monitoring and management activities in 2021 focused on monitoring, plot maintenance, seed collection, and continued production of seed-increase fields (Table 5). See Appendix D for a list of restoration activities completed and proposed from 2012 to 2022.

Table 5. Monitoring and management activities conducted in 2021 at thin-leaved peavine introduction sites by the Institute for Applied Ecology.

Date	Personnel	Management Activity or Observations
3/16/2021	IAE	Site visit to thin-leaved peavine plots at South Taylor and Hansen
3/23/2021	IAE, Jessica Celis (UWFO BLM Botanist)	Site visit to thin-leaved peavine plots at Dorena and Bake Stewart
4/9/2021	IAE, Jessica Celis (UWFO BLM Botanist)	Met to discuss budgets, workplans, and BLM assistance agreements
4/9/2021	IAE	Site visit to thin-leaved peavine plots at South Taylor and Hansen. Flagged and mapped plot corners.
4/19/2021	IAE, Jessica Celis (UWFO BLM Botanist)	Met with BLM to discuss project work
4/22/2021	IAE	Site visit to thin-leaved peavine plots at Dorena and Bake Stewart. Flagged and mapped plot corners.
6/3/2021	IAE, Jessica Celis (UWFO BLM Botanist)	Monitored thin-leaved peavine plots at Dorena
6/10/2021	IAE	Monitored thin-leaved peavine plots at Dorena, Bake Stewart, and Hansen

Date	Personnel	Management Activity or Observations
6/17/2021	IAE	Monitored thin-leaved peavine plot at South Taylor
9/23/2021	IAE	Cut and trimmed woody species in thin-leaved peavine plots at South Taylor and Hansen
9/30/2021	IAE	Cut and trimmed woody species and spot sprayed invasive non-native species in thin-leaved peavine plots at Dorena and Bake Stewart
10/6/2021	IAE Jessica Celis, (UWFO BLM Botanist)	Met with BLM to discuss project work
11/23/2021	IAE	Cut and trimmed woody species in thin-leaved peavine plots at Dorena. Seeded plots with a diverse forb mix.



Figure 1. Thin-leaved peavine (*Lathyrus holochlorus*) plants and introduction plot at Hansen in the West Eugene Wetlands. Photos taken by Celeste Lebo.

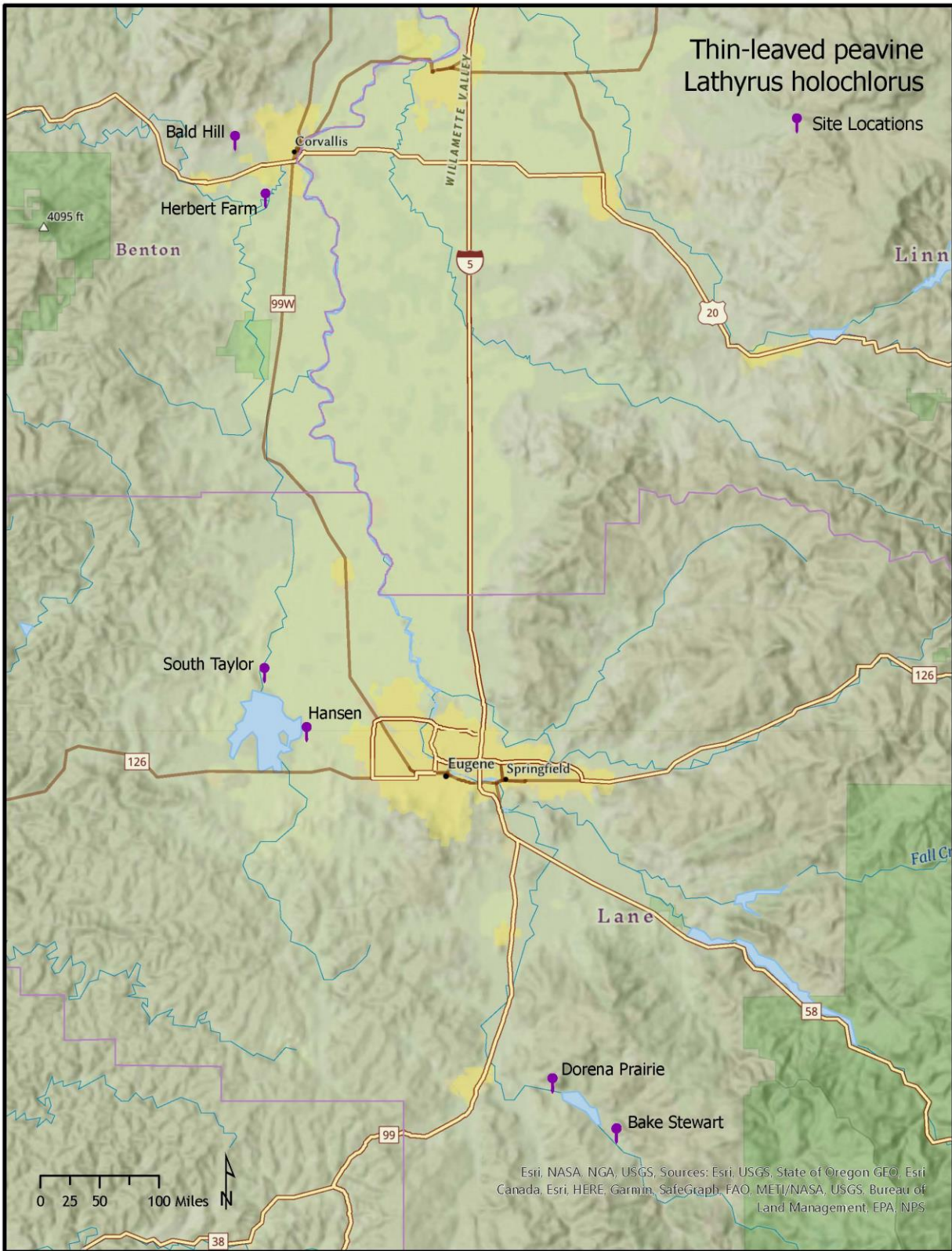


Figure 2. Introduction sites for thin-leaved peavine.

3.1. Thin-leaved peavine monitoring

In 2021, survival and vigor of thin-leaved peavine plugs were monitored between June 3 and June 17 (Table 1). If a plant was visible within a plot, it was given a measure of vigor between 0 and 4 (0 indicating a dead plant, 4 indicating a healthy and hearty plant, and 1-3 indicating variability between 0 and 4). If the plant was flowering or fruiting, an “FL” or “FR” was noted, respectively.

3.2. Wild seed collection

In 2021, IAE collected approximately 0.04 pounds of thin-leaved peavine seed from two sites: Cutler Lane and Herbert Farm (Table 2).

Table 6. Thin-leaved peavine seed collected 2021.

Date collected	Collection site	Cleaned weight (lbs)
July 2021	Cutler Lane	0.02345
July 2021	Herbert Farm	0.01595
TOTAL		0.03940

3.3. Seed production

In March 2016, two raised beds (480 ft² total) were planted with nursery-grown plugs, since then these beds have failed to produce seed. In 2020, a decision was made to decommission the raised beds and establish a new seed production field at the IAE farm. Approximately 20 trays (~1700 plugs) were seeded with seed that was either collected by IAE or donated by the NRCS Plant Materials Center. These plugs were used to establish the new seed-amplification bed in 2021. Thin-leaved peavine plants were planted with snowberry shrubs in the new field to test if the presence of shrubs will encourage plant growth and seed production. As temperatures and afternoon winds began to rise during summer 2021, IAE’s farm manager, Mara Fiddle, installed a short, black-cloth protective fence to reduce desiccation from wind and provide a little shade for the growing peavine and snowberry plants. We found this simple step made a significant difference in the health and vigor of the plants. Even in September, peavine plants were still green and actively growing (Figure 2). We anticipate that the seed field will produce seed in summer 2022.



Figure 3. Thin-leaved peavine seed field. Photo taken on September 15, 2021 by Celeste Lebo.

3.4. Habitat enhancement

Snowberry (*Symphoricarpos albus*) and other shrubs were extremely dense at the South Taylor plot. In 2021, IAE mowed diagonal strips within these plots, resulting in ~50% of competing vegetation being mowed. In addition, IAE and a volunteer AmeriCorps team removed three oak trees that fell into thin-leaved peavine plots at Dorena the previous winter. Logs were piled in the adjacent woods and small branches were added to existing burn piles.



Figure 4. Thin-leaved peavine (*Lathyrus holochlorus*) introduction plot at South Taylor before (A) and after (B) woody species treatments. Photos taken by Celeste Lebo.

4. RESULTS

4.1. Thin-leaved peavine transplant monitoring

Survival

In 2021, the estimated mean survival of thin-leaved peavine transplants differed between the six outplanted plots (Table 3). The average percent survival across all 6 plots (year 4 after planting) remained at 12% from 2020 to 2021.

Vigor

In 2021, the average thin-leaved peavine transplant vigor across all sites was 2.4 (with zero being not present and four being healthy and vigorous), with the range extending from 2.4 to 3.1 (Table 4).

Stem count

We did not count individual plant stems in 2021. Jessica Celis, UWFO BLM botanist, determined that counting stems often resulted in injury to the plants based on her experience monitoring introduction plots in previous years. We decided that the data were not as important as maintaining healthy plants in plots.

Flowering and fruiting

In 2021, we did not observe thin-leaved peavine in flower or fruit at any of the introduction sites.

Table 7. Number and percent survival of thin-leaved peavine transplants from 2016-2021.

Introduction Site	Year Planted	Number Planted	Survival 2016 No. (%)	Survival 2017 No. (%)	Survival 2018 No. (%)	Survival 2019 No. (%)	Survival 2020 No. (%)	Survival 2021 No. (%)
Bake Stewart E	2016	200	142 (71)	27 (14)	19 (10)	18 (9)	17 (9)	20 (10)
Bake Stewart W	2016	200	146 (73)	39 (20)	43 (22)	38 (19)	47 (24)	23 (12)
Dorena E	2016	100	61 (61)	22 (22)	24 (24)	24 (24)	6 (6)	22 (22)
Dorena W	2016	100	36 (36)	8 (8)	5 (5)	5 (5)	0	0
Hansen	2016	200	131 (66)	76 (38)	58 (29)	59 (30)	55 (28)	40 (20)
South Taylor	2016	200	108 (54)	59 (30)	32 (16)	20 (10)	10 (5)	9 (5)
Average across all sites			104 (60)	39 (22)	30 (18)	27 (16)	23 (12)	19 (12)

Table 8. Vigor of thin-leaved peavine transplants from 2016-2021. Vigor ranges from 0 (not present) to 4 (healthy and vigorous).

Introduction site	Mean vigor of surviving plants 2016	Mean vigor of surviving plants 2017	Mean vigor of surviving plants 2018	Mean vigor of surviving plants 2019	Mean vigor of surviving plants 2020	Mean vigor of surviving plants 2021
Bake Stewart E	2.2	2.1	2.0	2.3	2.4	3.1
Bake Stewart W	2.3	2.6	2.2	2.6	2.6	2.4
Dorena E	2.2	2.7	2.9	2.9	3.5	3.1
Dorena W	1.9	2	3.1	3.1	No survivors	No survivors
Hansen	2.2	2.7	2.5	2.6	2.4	2.9
South Taylor	2.3	2.4	1.8	1.6	2.3	2.6
Average across all sites	2.2	2.4	2.3	2.5	2.2	2.4

5. DISCUSSION

5.1 Monitoring methods

Given the low survival rate of thin-leaved peavine plugs outplanted at new outplanting sites added in 2018, we recommend that future monitoring continue only at the original outplanted sites. Additionally, given the relatively stable survival rate at original outplanted sites, we recommend that the monitoring schedule change from annual to biennial monitoring. We also recommend that monitoring be limited to documenting plant survival (number of plants present) and evaluation of recruitment (e.g., seedling counts). A count of both mature plants and seedlings present in seeded plots should also occur in 2022 (three years 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

Some die-off of transplanted plugs in the first year and subsequent years after outplanting is common with 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) (Table 3). However, although rates declined slightly in subsequent years, thin-leaved peavine survival, vigor, and stem counts remained relatively stable following the high transplant mortality observed one year after outplanting. These preliminary data could indicate that, once established, plants are likely to survive—and probably reproduce—in the future.

Outplanted plots have a wide range of percent cover for native and non-native plants of various growth forms and life histories. Plots with higher-than-average cover of non-native perennial grasses appear to be associated with lower-than-average thin-leaved peavine survival. No regression analyses were run on these data and thus these observations are preliminary.

We also observed that sites with higher levels of shrub cover and lower non-native perennial grass cover appeared to have slightly higher rates of thin-leaved peavine survival. These observations could help land managers make strategic choices about where to plant plugs and where to focus restoration efforts at those sites currently occupied by thin-leaved peavine. For example, when choosing an introduction site, land managers might choose sites with at least some shrub cover, and, if outplanting at sites without shrub cover, they might consider planting native shrubs at the same time as planting thin-leaved peavine plugs. Additionally, land managers might target non-native perennial grasses when treating weeds around existing thin-leaved peavine populations or as a site-preparation treatment before planting.

6. 2021 MANAGEMENT RECOMMENDATIONS

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

- Continue monitoring of original outplanted plots and seeded plots every other year instead of annually (unless additional site treatment or augmentation occurs, and monitoring is desired to document the effects of the treatment or survival of introduced plants or seed).
- Implement habitat-management actions annually when appropriate (see Table 5 for a list of recommended actions).

- Habitat-enhancement efforts should occur in the fall or winter when thin-leaved peavine is dormant. Efforts should focus on spot-spraying non-native perennial grasses and Himalayan blackberry (*Rubus armeniacus*) and mowing approximately 40%-60% of the plots when shrub growth becomes too dense.
- Maintain thin-leaved peavine seed-increase beds. Harvest and clean seed as it becomes available.
- Continue to collect wild seed of thin-leaved peavine to use for grow-out of plugs or to support seed-increase efforts.
- Grow thin-leaved peavine plugs to (1) replace dead plants in seed-increase beds and (2) augment outplanted sites where high plant-establishment rates are observed.

Table 5. 2022 recommended habitat maintenance activities at thin-leaved peavine introduction sites.

Site	Habitat Maintenance Activities
Bake Stewart East	<ol style="list-style-type: none"> 1. Manage tall oatgrass (<i>Arrhenatherum elatius</i>) inside and outside of plot by digging up plants, treating them mechanically (mowing with a string trimmer), or, if possible, spot-spraying a grass-specific herbicide. 2. Monitor orchard grass (<i>Dactylis glomerata</i>) for any increases in cover and manage if necessary.
Bake Stewart West	<ol style="list-style-type: none"> 1. Monitor regrowth of shrubs and consider mowing if their growth is significantly outpacing that of thin-leaved peavine and appears detrimental to thin-leaved peavine establishment.
Bald Hill Small and Big Plots	<ol style="list-style-type: none"> 1. Manage false brome (<i>Brachypodium sylvaticum</i>) population by either grubbing or spraying with herbicide. 2. Monitor for and remove conifer seedlings and saplings.
Dorena East	<ol style="list-style-type: none"> 1. Manage tall oatgrass (only found on south side of plot) by digging up plants, mechanically treating them (mowing with a string trimmer), or, if possible, spot-spraying herbicide.
Dorena West	<ol style="list-style-type: none"> 1. Remove oxeye daisy (<i>Leucanthemum vulgare</i>) by digging up plants, mechanically treating them (mowing with a string trimmer), or, if possible, spot-spraying herbicide. 2. Mow tall oatgrass prior to seed set and after plants have gone dormant.
Hansen	<ol style="list-style-type: none"> 1. Grub out roots of or spot-spray Himalayan blackberry. 2. Spot-spray non-native perennial grasses.
Herbert Farm Small and Big Plots	<ol style="list-style-type: none"> 1. Monitor for and remove conifer seedlings and saplings (mostly in big plot). 2. Grub out roots of Himalayan blackberry. 3. Manage tall oatgrass inside and outside of plot by spot-spraying herbicide.

South Taylor	<ol style="list-style-type: none">1. There is a substantial amount of Himalayan blackberry outside of the plot that could be grubbed or spot-sprayed in the fall.2. When thin-leaved peavine is dormant, mow/cut approximately 40%-60% of the plot (preferably where the plants were not found in 2021).
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7. REFERENCES

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APPENDIX A. THIN-LEAVED PEAVINE INTRODUCTION PLOT MAPS

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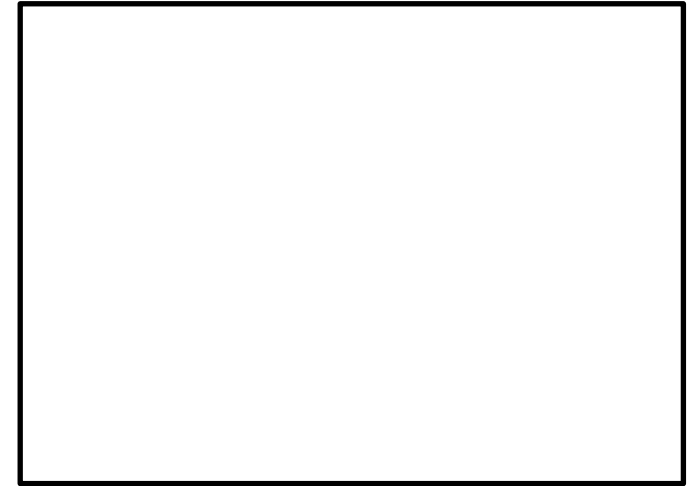


Figure 1. The white outlines show the perimeter of the introduction plots planted in 2016 at Dorena Prairie. The small orange box near the Dorena East introduction plot is the seed plot that was added in 2019.

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Figure 2. The white outlines show the perimeter of the introduction plots planted in 2016 at Bake Stewart Park. The small orange box near the west introduction plot is the seed plot that was added in 2019.

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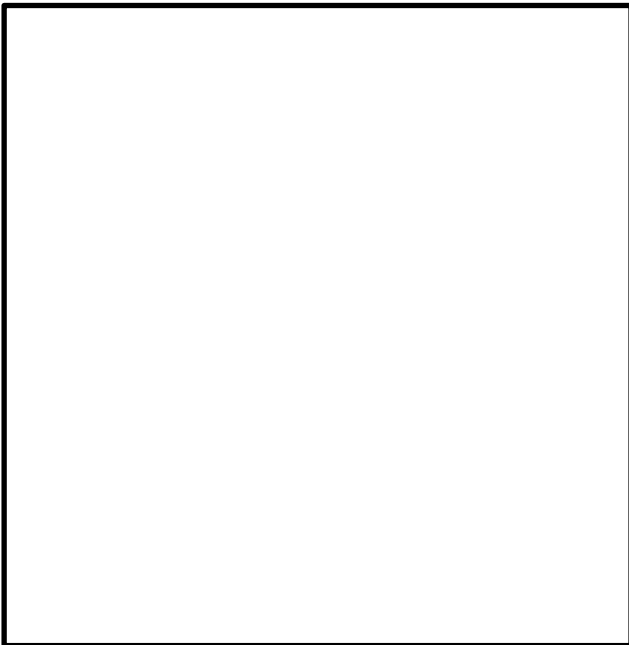
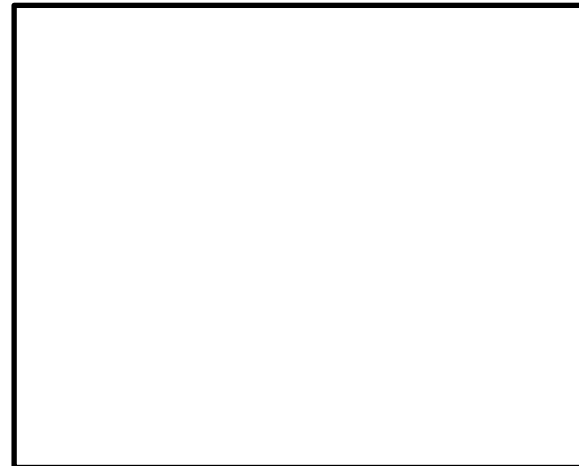


Figure 3. The white outline shows the perimeter of the introduction plot planted in 2016 at Hansen. The small orange box near the plot is the seed plot that was added in 2019.

Figure 4. The white outline shows the perimeter of the introduction plot 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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Figure 5. Big and small introduction plots at Herbert Farm.

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Figure 6. Big and small introduction plots at Bald Hill.

APPENDIX B. PLUG INTRODUCTION PLOT LOCATIONS
AND DATE OF ESTABLISHMENT.

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APPENDIX C. THIN-LEAVED PEAVINE INTRODUCTION PLOT PHOTO POINTS

During 2016-2021, photos were taken at a corner of the introduction plots, looking into the plot. Photos below show one representative plot photo for 2016, 2020, and 2021. Plot-corner numbers listed in the captions below correspond to the plot-corner numbers in Appendix A.

Bake Stewart East:

Corner 1 (Origin): Photos in clockwise order
2016, 2020, and 2021.



Bake Stewart West

Corner 2: Photos in clockwise order 2016, 2020, and 2021.



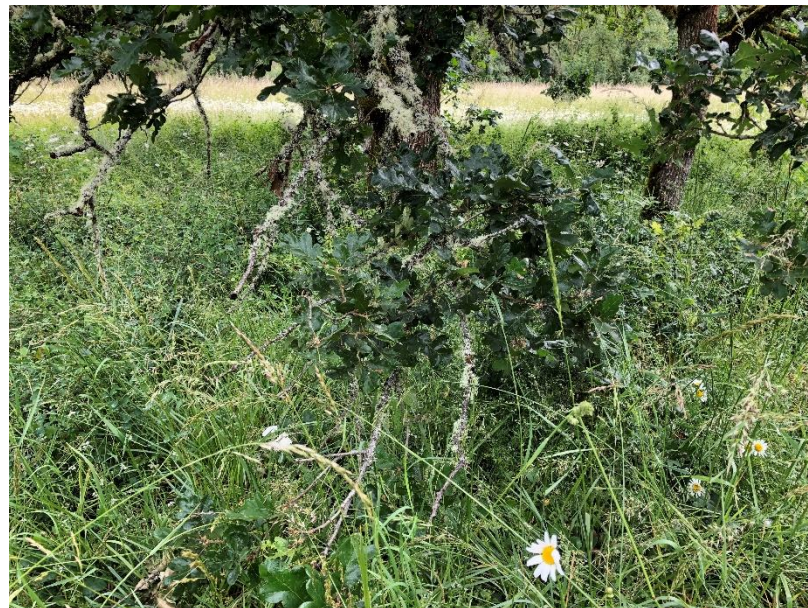
Dorena East

Corner 1 (Origin): Photos in clockwise order
2016, 2020, and 2021.



Dorena West

Corner 2: Photos in clockwise order 2016, 2020, and 2021.



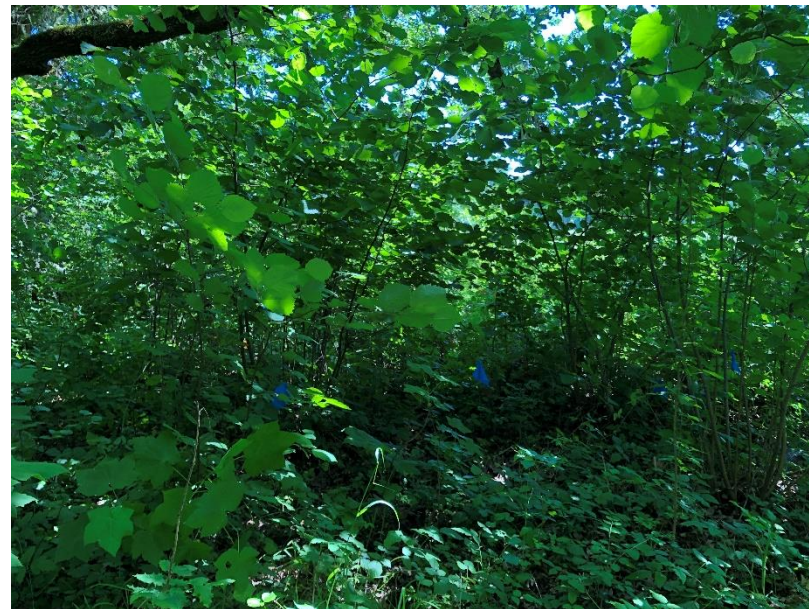
Hansen

Corner 4: Photos in clockwise order 2016, 2020, and 2021.



South Taylor

Corner 3: Photos in clockwise order 2016, 2020, and 2021.



APPENDIX D. HISTORY OF COMPLETED AND PROPOSED RESTORATION ACTIVITIES (2012-2022)

2012 Management Actions

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

2013 Management Actions

- Site inspection and partner coordination
- Scotch broom, Himalayan blackberry, and fruit tree removal

2013 Management Actions

- Continued work on Phase I of the project by conducting extensive field surveys of known locations of thin-leaved peavine.
- Efforts by 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 Management Actions

- IAE and NPSO continued field surveys of known locations of thin-leaved peavine 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 Management Actions

- A total of 47.8 grams of thin-leaved peavine seed was collected.
- A total of 1000 plants were grown at the NRCS Corvallis Plant Materials Center.
- One hundred second-year-old plants were grown at IAE.
- A seed-increase bed was initiated in late 2014 by direct seeding into a raised bed located at the Forestry Sciences Laboratory (FSL) at OSU.
- Visits were made to potential introduction sites. Four sites were selected 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 to eliminate competing vegetation and the grubbing of roots of Himalayan blackberry.

2016 Management Actions

- Due to poor germination in seed-increase beds at FSL, two raised beds (480 ft² total) were planted with nursery-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 at four introduction sites in March 2016. Sites included Dorena East and West, Bake Stewart East and West, Hansen, and South Taylor.
- Introduction plots were monitored for survival and plant community composition.
- Monitoring data were analyzed and synthesized.

2017 Management Actions

- The FSL seed-increase beds were weeded and dead thin-leaved peavine plants were replaced with live transplants.
- Introduction plots were monitored for survival and plant community composition.
- Monitoring data were analyzed and synthesized.

2018 Management Actions

- The FSL seed-increase beds were weeded.
- Five new introduction plots were established and planted with 1,464 thin-leaved peavine plugs under RAC agreement # L16AC00150-0001. Sites included Herbert Big and Small Plots, Bald Hill Big and Small Plots, and Hansen RAC.
- Introduction plots were monitored for survival and plant community composition.
- Introduction plots and the surrounding area were weeded.
- Monitoring data were analyzed and synthesized.

2019 Management Actions

- FSL beds were weeded and an electric fence was installed to prevent herbivory.
- Monitered outplanted plots
- Entered and analyzed plot data
- Collected thin-leaved peavine 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 Management Actions

- Monitored and analyzed outplanted plot data
- Collected thin-leaved peavine seed from large, healthy, wild populations
- Established thin-leaved peavine seed production field

2021 Management Actions

- Monitored and analyzed outplanted plot data
- Collected thin-leaved peavine seed from large, healthy, wild populations
- Took photo points in June

2022 Management Actions (proposed)

- Continue monitoring of original outplanted plots and seeded plots every other year.
- Spot-spray non-native perennial grasses and Himalayan blackberry and mow approximately 40%-60% of the plots when shrub growth becomes too dense.
- Maintain thin-leaved peavine seed-increase beds.
- Continue to collect wild seed of thin-leaved peavine to use for the grow-out of plugs.
- Grow thin-leaved peavine plugs to replace dead plants in seed-increase beds and to augment outplanted sites where high plant-establishment rates are observed.