Garoutte Prairie restoration: 2024 annual report

February 2025

Report for Bureau of Land Management, Agreement #L23AC00272

Report prepared by Rolando Beorchia and Andrew Esterson

Institute for Applied Ecology

PREFACE

The Institute for Applied Ecology (IAE) is a non-profit organization whose mission is the 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.

Questions regarding this report or IAE should be directed to:

Keith Norris (Executive Director)
Institute for Applied Ecology
4950 SW Hout St.
Corvallis, OR 97333

phone: 541-753-3099
fax: 541-753-3098
email: info@appliedeco.org

ACKNOWLEDGEMENTS

Funding for this project was provided by the Bureau of Land Management (BLM) Upper Willamette Field Office, Northwest Oregon District. We are grateful to Emily Erickson, Upper Willamette Field Office botanist for her continued support and commitment to restoring Garoutte Prairie.

We thank Esri for their support of our GIS program. Maps were created using ArcGIS® software by Esri. ArcGIS® and ArcMap™ are the intellectual property of Esri and are used herein under license. Copyright©Esri. All rights reserved. For more information about Esri® software, please visit www.esri.com.

Cover photographs: Unit 6 forest understory after first mow treatment, March 20, 2024. Photo by Zade Clark-Henry.

Photo credits: All photos taken by IAE staff unless otherwise noted.

SUGGESTED CITATION

Beorchia, Rolando and Andrew Esterson. 2025. Garoutte Prairie restoration: 2024 annual report. Unpublished report for the Bureau of Land Management, Northwest Oregon District. Institute for Applied Ecology. Corvallis, Oregon.

TABLE OF CONTENTS

Garoutte Prairie restoration: 2024 annual report

EXECUTIVE SUMMARY

The Institute for Applied Ecology (IAE) has conducted habitat restoration at Garoutte Prairie in partnership with the Bureau of Land Management (BLM) Upper Willamette Field Office (UWFO), Northwest Oregon District, since 2013. This site hosts many native wetland prairie species and is home to the northernmost population of bay horsehair lichen (*Sulcaria badia*). In 2024, IAE performed a variety of restoration activities including herbicide and mowing treatments, broadcast seeding, and planting native bulbs. IAE completed herbicide spot treatments to Himalayan blackberry (*Rubus bifrons*), one-seeded hawthorn (*Crataegus monogyna*), Scotch broom (*Cytisus scoparius*), and meadow knapweed (*Centaurea ×moncktonii)*. IAE reduced woody species in wetland prairie habitat by mowing large areas containing Scotch broom, one-seeded hawthorn, sweetbriar rose (*Rosa rubiginosa*), and Himalayan blackberry. IAE broadcast 115 pounds of a native seed mix and planted a total of 875 bulbs from four species: crown brodiaea (*Brodiaea coronaria*), common camas (*Camassia quamash*), ookow (*Dichelostemma congestum*), and Oregon yampah (*Perideridia oregana*). IAE also seeded 2.63 pounds of native shrub seed from three species: beaked hazelnut (*Corylus cornuta*), osoberry (*Oemleria cerasiformis*), and red-flowering currant (*Ribes sanguineum*) to continue a living fence habitat buffer between the road and meadow. Future restoration activities will include herbicide and manual weed treatments, mowing and/or burning to reduce woody vegetation, and revegetation with appropriate native plant materials.

1. INTRODUCTION

Garoutte Prairie is a 46-acre, mid-elevation (850 ft) site located west of Dorena Lake in Lane County, Oregon, with unique wet prairie, riparian, and ash-dominant forest habitat. The site is managed by the Bureau of Land Management (BLM) Upper Willamette Field Office, Northwest Oregon District (Figure 1). Garoutte Prairie is designated as a BLM Area of Critical Environmental Concern (ACEC) and was once part of a contiguous prairie network with the nearby Dorena Prairie ACEC.

The Institute for Applied Ecology (IAE) began habitat restoration at Garoutte Prairie as part of a separate BLM-funded project at the nearby Dorena Prairie in 2013 (Banner & Axt 2013). Garoutte Prairie became an independent restoration project in 2016. See Appendix A for a summary of completed and proposed management activities conducted by IAE from 2013-2027.

Garoutte Prairie hosts a population of bay horsehair lichen (*Sulcaria badia*). Endemic to the Pacific Northwest, bay horsehair lichen is most often found hanging from the branches of apple (*Malus spp.*) and Oregon white oak (*Quercus garryana*) in well-lit overstories but can also live on conifers and Oregon ash (*Fraxinus latifolia*, Carlberg & Toren 2006). At Garoutte Prairie, this epiphytic species has only been positively identified near the western edge of the ACEC and is found on mature Oregon ash, common apple (*Malus x domestica*), and common pear (*Pyrus communis*). While removal of woody vegetation is an important component of prairie restoration, trees that host bay horsehair lichen are protected at this site. Garoutte Prairie is at the northern edge of bay horsehair lichen's geographical range and is important for preserving genetic diversity in the lichen's overall population. Outlier populations may be crucial for species conservation as climate change pushes species' distributions outside of their historical ranges.

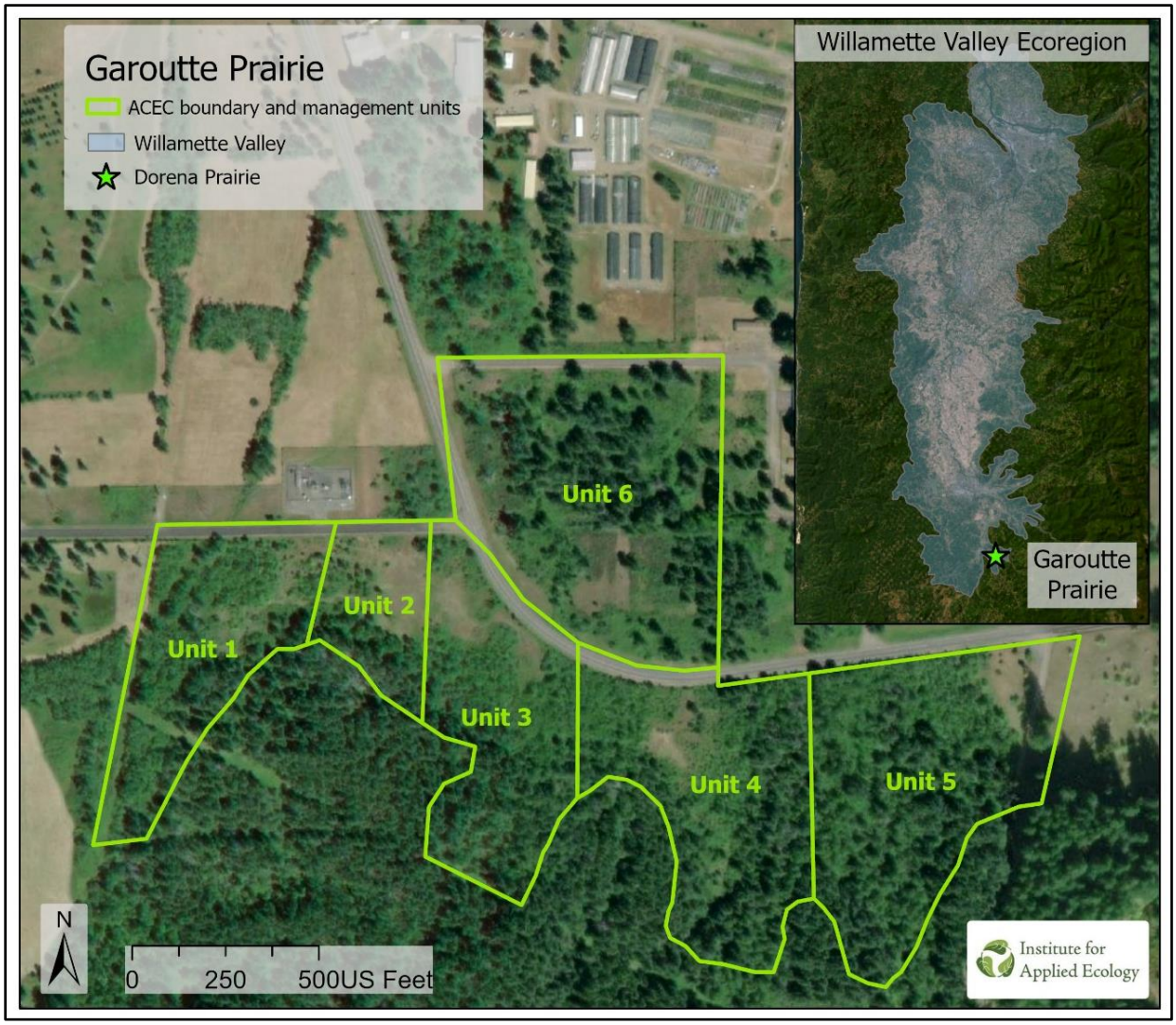

Figure 1. Garoutte Prairie management units and meadow location within the Willamette Valley Ecoregion.

Prior to September 2020, manual and mechanical weed removal techniques were the only tools available to maintain the meadow and slow the spread of non-native species. Herbicides have since been approved for use in the BLM Northwest Oregon District, making it possible to more effectively address the threat posed by Himalayan blackberry (*Rubus bifrons*), one-seeded hawthorn (*Crataegus monogyna*), meadow knapweed (*Centaurea ×moncktonii*), and Scotch broom (*Cytisus scoparius*). While manual techniques will still be important for site management, the use of herbicides will result in more efficient and effective control of non-native weeds. All units of the ACEC have Himalayan blackberry, one-seeded hawthorn, and Scotch broom and a considerable amount of work will be needed to remove these. Meadow knapweed is prevalent along the roadsides and poses a risk requiring diligent observation and treatment to keep out of the prairie.

2. GOALS AND OBJECTIVES

The purpose of this project is to assist the BLM with maintaining and improving rare mid-elevation prairie habitat in support of the native plant community and bay horsehair lichen population at Garoutte Prairie.

There are five primary objectives of this project:

1. Increase native meadow plant abundance and diversity by augmenting species occurring in low abundance.
2. Reduce low-abundance invasive plants in open prairie to below 5% cover (or eradication): Scotch broom, Himalayan blackberry, one-seeded hawthorn, Canada thistle (*Cirsium arvense*), meadow knapweed, and bull thistle (*Cirsium vulgare*).
3. Reduce high-abundance priority invasive plants to below 10% cover: Oxeye daisy (*Leucanthemum vulgare*), and Queen Anne's lace (*Daucus carota*).
4. Reduce high abundance invasive grasses in open prairie below 10% cover by implementing regular burning, mowing, and herbicide applications.
5. Increase forest-meadow ecotone diversity by increasing fruit and nut-bearing shrubs.

3. 2024 RESTORATION ACTIONS

In 2024, IAE staff broadcast a native seed mix, planted bulbs, seeded shrubs in a living fence, mowed invasive shrubs, and applied Garlon 3A (triclopyr) herbicide targeting Himalayan blackberry, meadow knapweed, and Scotch broom (Table 1). See Appendix A for a list of completed and proposed management actions at Garoutte Prairie from 2013-2027. Appendix B shows the management units established in 2022 compared to those used from 2013-2021.

Over the first seven months of 2024 herbicide application was not permitted because the BLM's pesticide use permit (PUP) expired. Therefore, only manual and mechanical treatments were used. The PUP was signed in August and herbicide treatments were permitted at that point.

Weed treatments

Woody species such as Himalayan blackberry, Scotch broom, and one-seeded hawthorn pose a priority threat to Garoutte Prairie. In response, we performed multiple treatments in 2024 to reduce their abundance (Table 1). In March, we mowed units 4 and 6 targeting Himalayan blackberry, one-seed hawthorn, Scotch broom, and sweetbriar rose (*Rosa rubiginosa*) (Figure 2). Between April and August, IAE staff removed invasive forbs and shrubs with hand tools including mowing with a scythe during fire-restrictions. In October, we applied Garlon 3A (triclopyr) to target Himalayan blackberry and one-seeded hawthorn in units 1, 2, 3 and 6 (Figure 2). In December, we mowed Scotch broom in unit 6 to continue reclaiming the grassland from the dense thickets of invasive shrubs that dominate the area (Figure 2). Herbicide and mowing treatments are scheduled for 2025 to reduce the impact of these non-native shrubs on the native plant community.

Restoration efforts included work on the meadow-forest ecotone to allow better access for restoration practitioners to perform future weed treatments and allow wildlife to travel between habitat types. In March and December, IAE staff mowed shrubs along the forest edge and observations of both Columbian black-tailed deer (*Odocoileus hemionus*) and black bear (*Ursus americanus*) scat within mowed areas provided evidence of immediate use of these newly opened areas by local megafauna (Figure 2). IAE is scheduling activities for 2025 tree limbing, non-native shrub removal, and woody debris removal within this important habitat transition zone.

Table 1. 2024 management actions at Garoutte Prairie.

Date	Management Unit(s)	Activity
18-Mar	4	Mowed non-native shrubs with Canycom at 6 inches targeting Himalayan blackberry (*Rubus bifrons*), cutleaf blackberry (*Rubus laciniatus*), Scotch broom (*Cytisus scoparius*), one-seed hawthorn (*Crataegus monogyna*).
19-Mar	6	
20-Mar		
21-Mar		
17-Apr	1, 2, 3, 6	Manual weed removal targeting bull thistle (*Cirsium vulgare*), oxeye daisy (*Leucanthemum vulgare*), Fuller's teasel (*Dipsacus fullonum*), St. John's wort (*Hypericum perforatum*). Planted white-topped aster (*Sericocarpus rigidus*) in test plot in unit 2.
16-May		
23-May	6	Mowed Scotch broom with brush mower.
2-Jul	1, 2, 3, 6	Site visit and evaluation with BLM staff: Emily Erickson, Jessica Celis, Matt Bahm.
3-Jul		Manual weed removal targeting bull thistle, oxeye daisy, Fuller's teasel, St. John's wort.
16-Jul	3, 6	Scotch broom, one-seed hawthorn, and Himalayan blackberry removal with AmeriCorps NCCC.
31-Jul		
1-Aug		
1-Aug	2	Scythe mowed around white-topped aster (*Sericocarpus rigidus*) planting zone. Scythe mowed Queen Anne's lace (*Daucus carota*).
1-Oct	1, 2, 3, 6	Applied triclopyr (Garlon 3A) targeting Himalayan blackberry.
3-Oct	4, 5, 6	Applied triclopyr (Garlon 3A) targeting meadow knapweed (*Centaurea ×moncktonii*) along the roadside.
5-Nov	1, 2, 3	Broadcast 115 pounds of native seed.
26-Nov		
26-Nov	6	Planted 875 bulbs in unit six.
5-Dec	1, 2, 3, 6	Mowed to reduce Himalayan blackberry and Scotch broom regrowth and expand meadow edge. Mowed unit 2/3 edge to release narrowleaf mules' ear (*Wyethia angustifolia*)

*Institute for Applied Ecology (IAE), Bureau of Land Management (BLM), AmeriCorps National Civilian Community Corps (AmeriCorps NCCC)

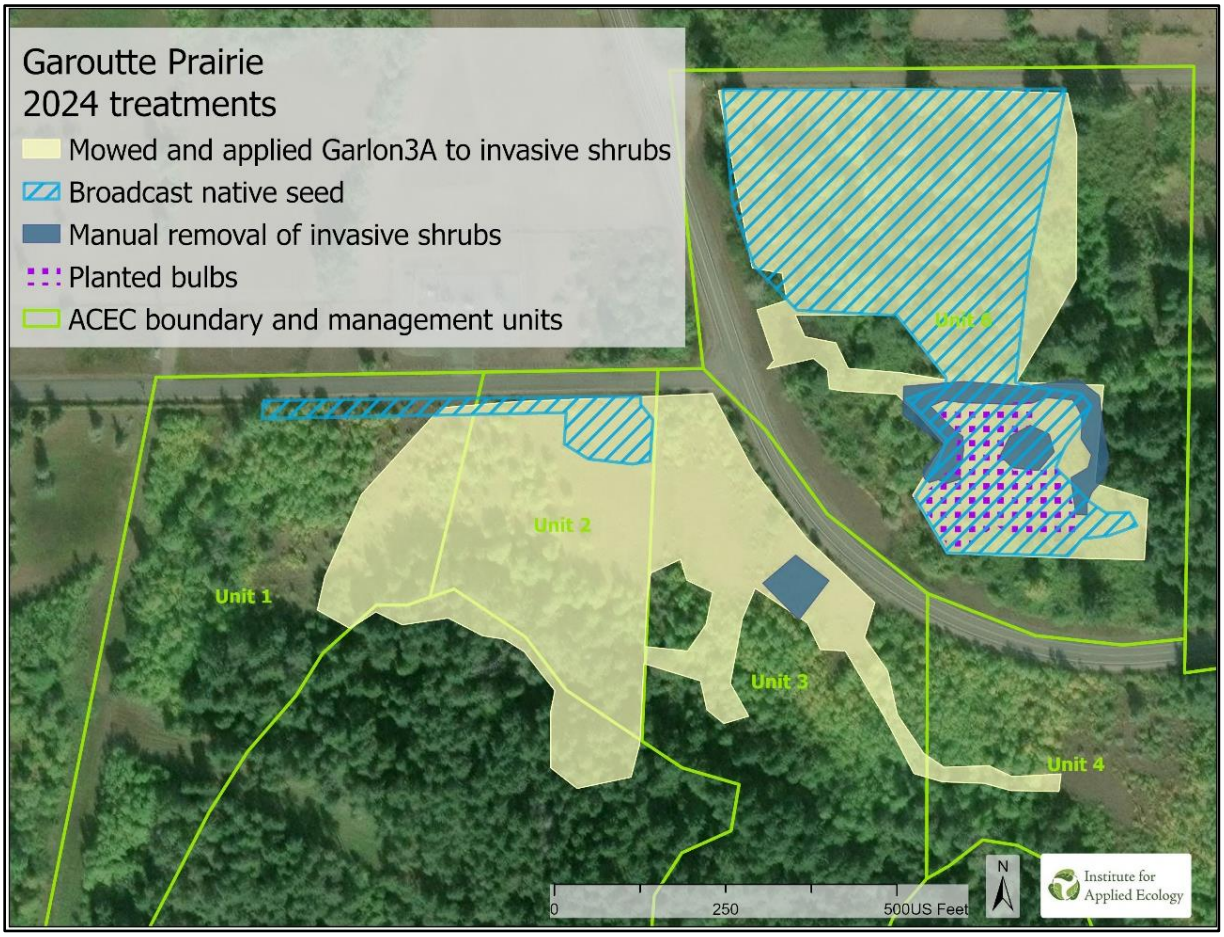

Figure 2. 2024 mowing, herbicide, manual shrub removal, planting, and seeding treatments at Garoutte Prairie.

Seeding and Planting

IAE staff broadcast 115 pounds of a native seed mix composed of both upland and wet prairie species in units 1, 2, and 6 using belly bag seeders (Table 2, Figure 2). The seed mix was sourced from the Willamette Valley, contained 81 species, and emphasized increasing diversity of native graminoids and annual forbs. IAE staff enhanced native plant diversity in units 1, 2, and 6 at Garoutte Prairie by planting native forb bulbs and seeding native shrubs. In November, we planted a total of 875 bulbs of crown brodiaea (*Brodiaea coronaria*), common camas (*Camassia quamash*), ookow (*Dichelostemma congestum*), and Oregon yampah (*Perideridia oregana*) in the open prairie of unit 6 (Table 2, Figure 2).

IAE staff seeded shrub species to continue a living fence along the roadsides, which was started in 2022 (Beorchia & Esterson 2023). Once fully grown, this living fence will provide structural shelter and forage to birds and mammals frequenting the meadow and will help limit the introduction of non-native seed from the road into the meadow. To make an effective weed barrier multiple vegetative layers needed to be planted. To promote an upper growth layer (one to eight feet tall) IAE seeded beaked hazelnut (*Corylus cornuta*), osoberry (*Oemleria cerasiformis*), and red-flowering currant (*Ribes sanguineum*) (Table 1, Table 2, Figure 2) in addition to the shrub species planted in 2022 and 2023 (Beorchia & Esterson 2024). The lower layer will be composed of tenacious grasses and forbs seeded in 2024.

Table 2. 2024 Garoutte Prairie seed mix and bulbs planted.

Scientific Name	Common Name	Graminoid and Forb (lb.)	Shrub Seed (lb.)	Bulb (quantity)
Achillea millefolium	common yarrow	0.13		
Agrostis exarata	spike bentgrass	0.0044		
Allium amplectens	narrow leaved onion	0.06		
Amsinckia intermedia	common fiddleneck	0.62		
Asclepias speciosa	showy milkweed	0.2		
Barbarea orthoceras	American yellowrocket	0.05		
Brodiaea coronaria	crown brodiaea			250
Bromus carinatus	California brome	0.06		
Bromus vulgaris	Columbia brome	0.15		
Camassia leichtlinii	great camas	0.56		
Camassia quamash	common camas			300
Carex densa	dense sedge	0.06		
Carex leporina	oval sedge	0.03		
Carex pachystachya	Chamisso sedge	0.04		
Carex stipata	saw-beaked sedge	0.04		
Carex tumulicola	splitawn sedge	0.27		
Carex unilateralis	one-sided sedge	0.03		
Clarkia amoena ssp. lindleyi	farewell-to-spring	0.28		
Clarkia purpurea	winecup clarkia	0.23		
Clarkia rhomboidea	diamond clarkia	0.34		
Collinsia grandiflora	large-flowered blue-eyed Mary	0.55		
Collomia grandiflora	large-flowered collomia	1.33		
Corylus cornuta	beaked hazelnut		0.5	
Danthonia californica	California danthonia	41.7*		
Deschampsia caespitosa	tufted hairgrass	0.01		
Deschampsia danthonioides	annual hairgrass	0.03		
Deschampsia elongata	slender hairgrass	0.01		
Dichelostemma congestum	ookow			125
Downingia elegans	elegant calicoflower	0.0022		
Elymus glaucus	blue wildrye	3.18*		
Elymus trachycaulus	slender wheatgrass	15.41*		
Epilobium densiflorum	denseflower willowherb	0.1		
Eriophyllum lanatum	Oregon sunshine	1.37		
Erythronium oregonum	giant white fawn-lily	0.13		
Festuca roemeri	Roemer's fescue	4.88*		
Geum macrophyllum	large-leaved avens	0.12		
Gilia capitata	bluehead gilia	0.22		
Grindelia integrifolia	Puget Sound gumweed	6.83		
Heuchera chlorantha	tall alumroot	0.0041		
Hordeum brachyantherum	meadow barley	10.2		
Hosackia pinnata	bog bird's foot trefoil	0.08		
Iris tenax	toughleaf iris	0.05		
Juncus ensifolius	dagger-leaf rush	0.0009		
Juncus tenuis	path rush	0.0042		
Koeleria macrantha	prairie Junegrass	9.33*		

Scientific Name	Common Name	Graminoid and Forb (lb.)	Shrub Seed (lb.)	Bulb (quantity)
Ligusticum apiifolium	celery-leaved lovage	2.37		
Lomatium dissectum	fern-leaved biscuitroot	0.77		
Lomatium nudicaule	barestem biscuitroot	0.44		
Lomatium utriculatum	spring gold	0.13		
Lotus purshianus	American bird's foot trefoil	0.13		
Lupinus polycarpus	small-flowered lupine	1.30		
Lupinus rivularis	river lupine	0.24		
Luzula comosa	Pacific woodrush	0.04		
Luzula subsessilis	short-stalked woodrush	0.02		
Madia elegans	showy tarweed	0.69		
Madia gracilis	grassy tarweed	0.52		
Microseris laciniata	cutleaf silverpuffs	0.11		
Mimulus guttatus	common monkeyflower	0.0003		
Oemleria cerasiformis	osoberry		2	
Perideridia gairdneri	Gardner's yampah			
Perideridia oregana	Oregon yampah			200
Phacelia nemoralis var. oregonensis	shade phacelia	0.3		
Plagiobothrys figuratus	fragrant popcornflower	0.24		
Plectritis congesta	shortspur seablush	0.18		
Poa secunda	pine bluegrass	0.08		
Potentilla glandulosa	sticky cinquefoil	0.03		
Potentilla gracilis	slender cinquefoil	0.19		
Prunella vulgaris var. lanceolata	common selfheal	0.56		
Ranunculus occidentalis	western buttercup	0.15		
Ranunculus orthorhynchus	straightbeak buttercup	0.1		
Ribes sanguineum	red-flowering currant		0.13	
Rumex salicifolius	willow dock	0.28		
Sanguisorba occidentalis	western burnet	0.19		
Sanicula bipinnatifida	purple sanicle	0.4		
Scrophularia californica	California bee plant	0.03		
Sidalcea campestris	meadow checkermallow	0.4		
Sidalcea malviflora spp. virgata	rose checkermallow	0.23		
Sisyrinchium idahoense	Idaho blue-eyed grass	0.06		
Symphyotrichum hallii	Hall's aster	0.03		
Thalictrum polycarpum	tall meadow-rue	0.14		
Viola praemorsa	prairie violet	0.05		
Wyethia angustifolia	narrowleaf mule's ear	3.5		
	Total (lb.):	**115.19 lb.**	**2.63 lb.**	**875**

***Mid-elevation sourced seed grown in amplification fields between 2015-2018.**

4. MANAGEMENT RECOMMENDATIONS

The overarching goal of this project is to restore regionally rare, wet meadow habitat at Garoutte Prairie by controlling priority invasive species and increasing native plant community diversity. Units 1, 2, 3, and 6 show the best potential for expanding suitable meadow habitat and work should prioritize reduction of Himalayan blackberry, one-seeded hawthorn, and Scotch broom, which threaten the open prairie habitat. Unit 4 has potential to become quality meadow but is inundated with invasive shrubs. Intensive weed treatment followed by native species revegetation will be needed to rehabilitate this unit.

Queen Anne's lace in unit 2 is a growing concern that needs to be monitored and managed. An infestation starting along the road has begun to spread into the meadow and now extends into approximately one quarter of the open prairie. Mowing to reduce flower heads, collecting seed heads (manually or mechanically), and early spring application of herbicide (Garlon 3A) should all be implemented to battle the spread of this species.

Climate-adaptive measures should continue to be implemented to benefit all the habitat types at Garoutte Prairie. Weed reduction and revegetation of forest-meadow ecotones will be beneficial to local native birds, insects, and mammals and create a more diverse and resilient ecosystem. Identifying and implementing strategies to mitigate harm from the impacts of climate change should be incorporated in restoration practices. We suggest monitoring survivorship of Pacific crabapple planted in 2023, plant more if it survives, and consider transplanting pieces of bay horsehair lichen onto crabapple to test its suitability as a host for the rare lichen.

Bay horsehair lichen may exist on BLM land outside the ACEC in remnant strips of riparian zones. Surveys should be conducted throughout riparian areas on all BLM land adjacent to the ACEC within the next five years to determine the full extent of the population (Figure 3).

The following restoration actions are recommended for 2025 and beyond:

- Mowing treatments:
    - Mow Oregon ash regrowth with brush mower. The growth appeared to be less in 2024 than in previous years. Hopefully, this anecdotal trend continues and the trees in the middle of unit 3 meadow stop producing shoots.
    - Reclaim grassland habitat in units 4 and 6 using walk-behind brush mowers targeting Himalayan blackberry, Scotch broom, and one-seed hawthorn.
    - Mow Himalayan blackberry at forest edges to open the forest-meadow ecotone.
- Cover burn piles in spring 2025 and request that the BLM burn them in fall 2025.
- Herbicide treatments:
    - Spray Queen Anne's lace in unit 2, in early spring with Garlon 3A, to reduce spread.
    - Spot spray Himalayan blackberry, Scotch broom, and one-seeded hawthorn in spring and/or fall with glyphosate or triclopyr.
    - Spot spray thistles in the bolting-to-bud stage in spring with clopyralid.
    - Spot spray roadside meadow knapweed with glyphosate or clopyralid.
- Manual weed removal:
    - Hand-pull priority weeds (teasel and Scotch broom) if they are not treated with herbicide prior to flowering.
    - Cut and bag inflorescences of Queen Anne's lace, oxeye daisy, Canada thistle, and bull thistle and remove them from the site if they are not treated with herbicide prior to the flowering stage.

- Revegetation and increasing diversity:
    - Revegetate areas disturbed by restoration activities in the fall using a mix of native forb and grass seed. Native prairie species abundance and diversity can also be improved by augmentation with appropriate plugs, bulbs, and bare root plants.
    - There are numerous non-native common apple and pear trees on site that seem to support at least one black bear and multiple Columbian black-tailed deer that inhabit the meadow and surrounding forest. We suggest leaving these fruit-bearing species specifically for wildlife forage and to provide host trees for the bay horsehair lichen known to grow on common pear and apple.
    - Seeding and/or planting Pacific crabapple may provide a future alternative native host for bay horsehair lichen and mitigate the effects of climate change and the threat of emerald ash borer (*Agrilus planipennis*). Retaining current Oregon ash, common apple, and common pear will help maintain host options for the lichen. Consider transplanting pieces of lichen to Pacific crabapple planted in 2023 to test host capability.
    - Continue planting a living fence along both roads. We recommend planting more fruit and nut-bearing shrubs to enhance bird and mammal forage.

A simplified timeline of these recommended and planned activities for 2024-2027 can be found at the bottom of Appendix A.

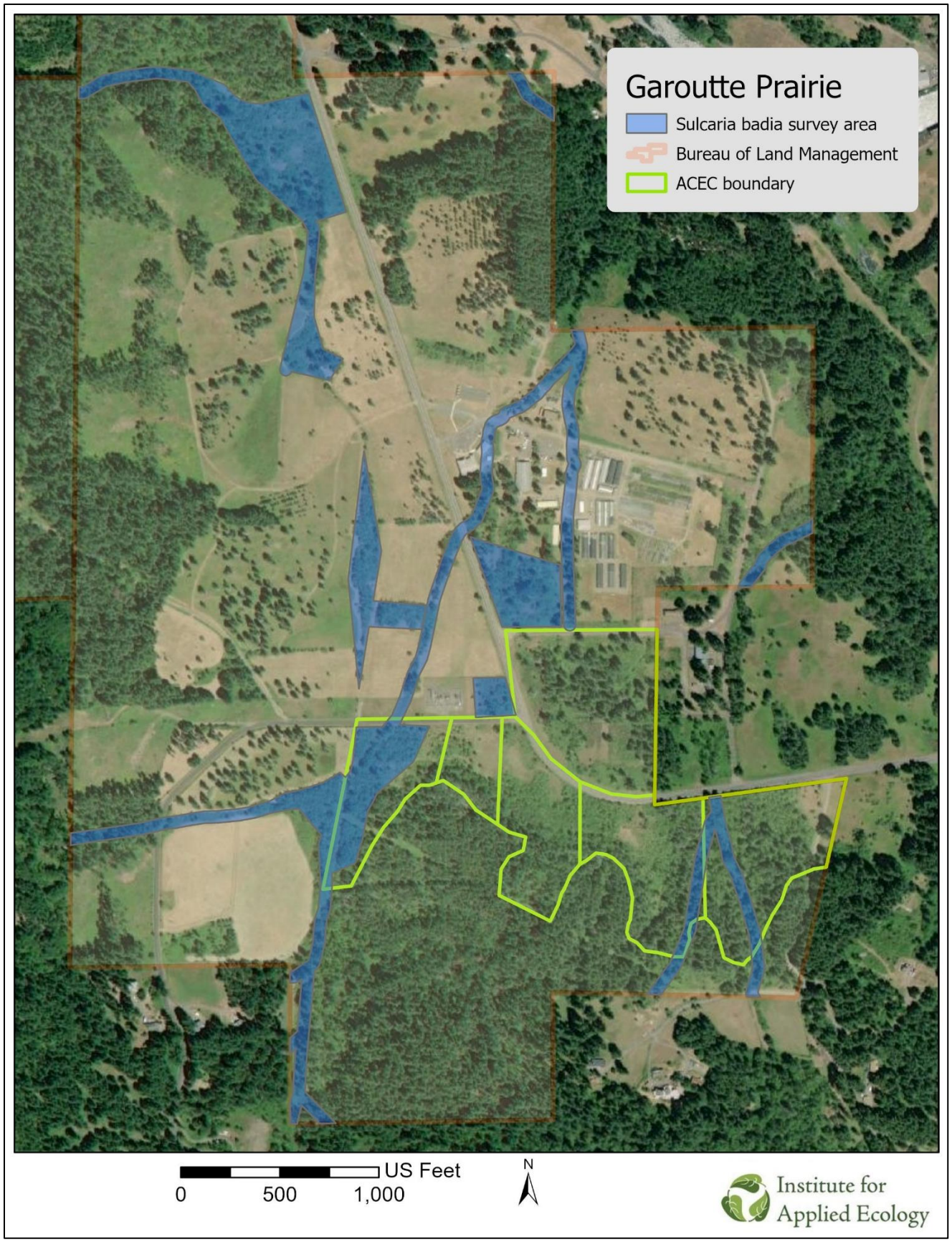

Figure 3. Proposed Bay Horsehair Lichen survey area of BLM land surrounding Garoutte Prairie.

5. REFERENCES

Banner, G and B. Axt. 2013. Restoration of Dorena Prairie ACEC. Unpublished report prepared for the Bureau of Land Management Northwest Oregon District. Institute for Applied Ecology, Corvallis, Oregon.

Beorchia, Rolando and Andrew Esterson. 2023. Garoutte Prairie restoration: 2022 annual report. Unpublished report for the Bureau of Land Management, Northwest Oregon District. Institute for Applied Ecology. Corvallis, Oregon.

Beorchia, Rolando and Andrew Esterson. 2024. Garoutte Prairie restoration: 2023 annual report. Unpublished report for the Bureau of Land Management, Northwest Oregon District. Institute for Applied Ecology. Corvallis, Oregon.

Carlberg, T. and D. Toren. 2006. *Sulcaria badia,* Sponsorship for the CALS Conservation Committee. Bulletin of the California Lichen Society 13 (2).

APPENDIX A. COMPLETED AND PROPOSED MANAGEMENT ACTIONS: 2013-2027

2013

- Brush cut Himalayan blackberry (*Rubus bifrons*) and Scotch broom (*Cytisus scoparius*).

2014

- Scotch broom, Himalayan blackberry, and fruit tree removal.

2016

- Scotch broom, Oregon ash (*Fraxinus latifolia*), one-seeded hawthorn (*Crataegus monogyna*), and fruit tree removal with AmeriCorps Gold 5 crew.

2017

- Oregon ash trees in the meadow were felled, bucked, and piled for burning by the Bureau of Land Management (BLM) fire management crew.
- Covered burn piles with plastic for fall burning.
- Removal of Scotch broom in prairie.
- Purchased native seed for sowing into burned areas.

2018

- Manual removal of Himalayan blackberry.
- BLM fire management crew burned slash piles in the fall.
- Broadcasted native seed mix in areas burned or disturbed by restoration activities.

2019

- Manual removal of Himalayan blackberry and Scotch broom.
- Cut and piled sprouting Oregon ash, fruit trees, and one-seeded hawthorn and removed from open prairie.
- Seeded areas disturbed by restoration activities.

2020

- Surveyed for bay horsehair lichen (*Sulcaria badia*) and riparian loop lichen (*Hypotrachyna riparia*).
- Pulled Scotch broom and cut sprouting Oregon ash.
- Began cutting a corridor between Areas 2 and 4 on the eastern side of the prairie.
- Drafted a habitat management plan.

2021

- Pulled Scotch broom.
- Cut and piled sprouting Oregon ash.
- Surveyed for bay horsehair lichen prior to cutting trees.
- Removed trees from open meadow that do not have bay horsehair lichen.
- Treated meadow knapweed (*Centaurea x moncktonii*) and other perennial weeds with herbicide in the spring.
- Treated Himalayan blackberry and other non-native woody species with herbicide in the fall.

- Coordinated with BLM fire management crew to burn piles of woody material.
- Seeded areas disturbed by restoration activities.
- Took photo points in June.

2022

- Removed Douglas-fir (*Pseudotsuga menziesii*) trees from open meadow that do not have bay horsehair lichen, creating burn piles with the limbs.
- Treated Himalayan blackberry, Scotch broom and one-seeded hawthorn with herbicide.
- Seeded areas disturbed by restoration activities.
- Planted native fruit bearing shrubs.
- Planted native bulb forming forbs.

2023

- Mowed Oregon ash regrowth, Himalayan blackberry, one-seed hawthorn, cluster rose, sweetbriar rose (*Rosa rubiginosa*), and Scotch broom in units 1, 2, and 3.
- Treated Himalayan blackberry and Scotch broom with Garlon 3A in units 1, 2, 3 and 6.
- Treated meadow knapweed with Garlon 3A roadside in all units.
- Planted 131 shrubs and deciduous trees within roadside living fence in units 1 and 2. Planted Pacific crabapple throughout Oregon ash understory in units 1 and 2.
- Planted 1,733 bulbs.
- Removed woody debris from meadow/forest boundary and created a burn pile with AmeriCorps (NCCC).

2024

- Mowed Himalayan blackberry, one-seed hawthorn, and Scotch broom.
- Treated Himalayan blackberry, one-seed hawthorn, and Scotch broom with herbicide (Garlon 3A).
- Planted 875 bulbs of four species.
- Seeded 115 pounds of seed comprised of 81 species to disturbed ground.
- Planted test plot of white-topped aster (*Sericocarpus rigidus*) in Unit 2.

2025 (proposed)

- Survey for bay horsehair lichen within ACEC and nearby BLM riparian areas.
- Spot spray Himalayan blackberry, Scotch broom, and one-seeded hawthorn in spring and/or fall with glyphosate or triclopyr.
- Cover burn piles and request BLM burn them fall 2024.
- Seed native mix, plant bulbs, plant fruit and nut bearing living fence.
- Continue herbicide, mowing, and manual removal treatments of non-native plants.

2026 (proposed)

- Continue survey for bay horsehair lichen on nearby BLM riparian areas.
- Continue mowing, herbicide, and manual removal treatments of non-native plants.
- Seed native mix, plant bulbs, plant fruit and nut bearing living fence.

2027 (proposed)

- Completed survey for bay horsehair lichen on nearby BLM riparian areas.
- Seed native mix, plant bulbs, plant fruit and nut bearing living fence.

APPENDIX B. GAROUTTE MANAGEMENT UNITS 2013 AND 2022

In 2022, Garoutte Prairie management areas were redrawn to accurately represent the full extent of the ACEC and delineate areas for a targeted restoration approach. From 2013-2022, four management areas were utilized based on restoration priority (Figure 4). Since the boundaries of these four management areas did not align with BLM ACEC maps, IAE designated six replacement units to facilitate restoration beginning in 2022 (Figure 4).

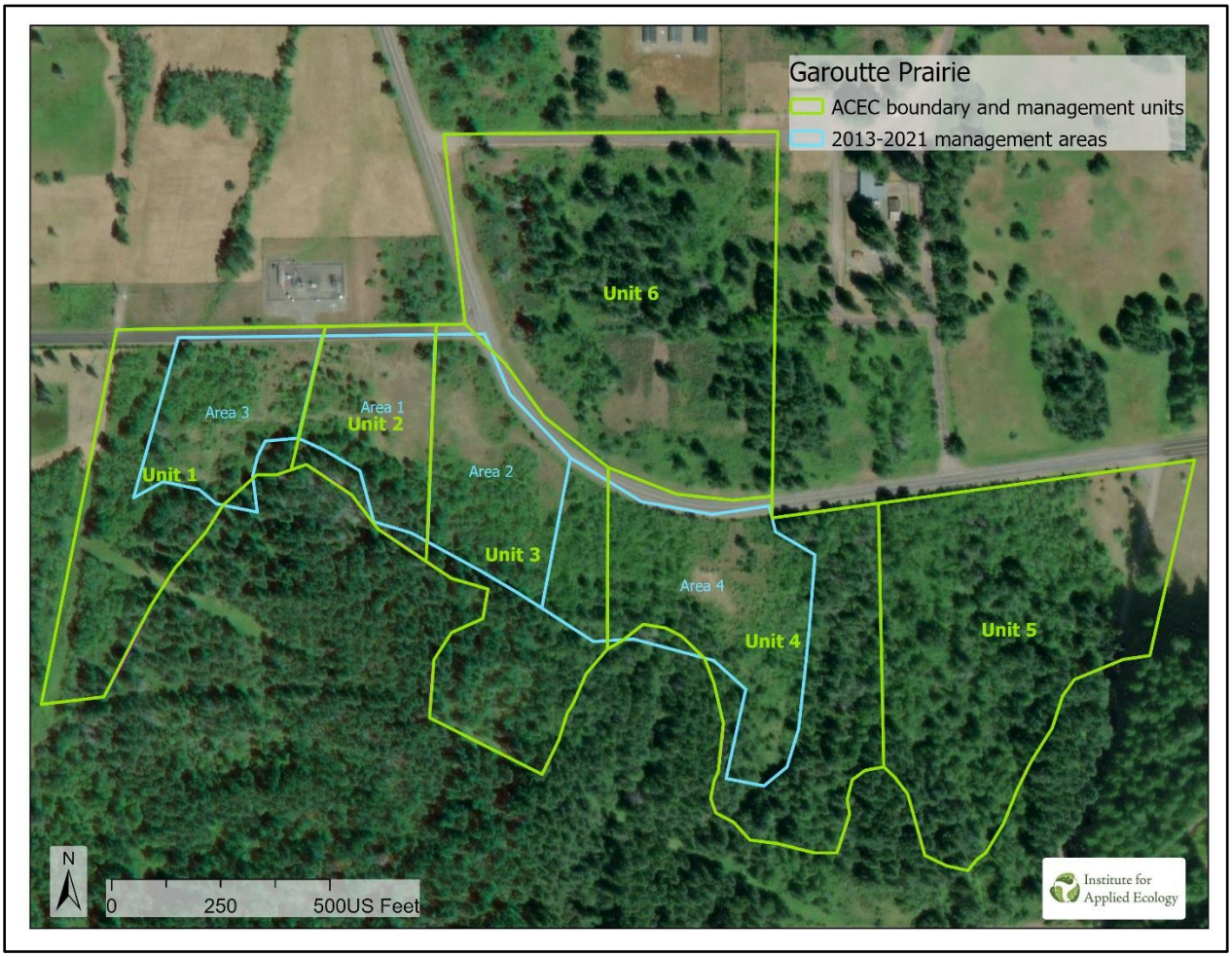

Figure 4. New management units established in 2022 and previously used management areas from 2013-2021

APPENDIX C. COMPREHENSIVE PLANTING AND SEEDING RECORD 2018-2024

Scientific name	Common name	Amount seed (lb.) and number of plugs or shrubs {quantity}.					
		2018	2019	2021	2022	2023	2024
Achillea millefolium	common yarrow			0.02	0.03	1	0.13
Agrostis exarata	spike bentgrass				0.03	0.75	0.0044
Allium amplectens	narrow leaved onion				{175}	0.14 {100}	0.06
Amsinckia intermedia	common fiddleneck						0.62
Aquilegia formosa	red columbine			0.14			
Asclepias speciosa	showy milkweed						0.2
Barbarea orthoceras	American yellowrocket				0.17		0.05
Beckmannia syzigachne	American sloughgrass					5	
Brodiaea coronaria	crown brodiaea					{183}	{250}
Brodiaea elegans	harvest brodiaea				{300}	{67}	
Bromus carinatus	California brome					10	0.06
Bromus vulgaris	Columbia brome						0.15
Calochortus tolmiei	Tolmie's star-tulip				{175}	{100}	
Camassia leichtlinii	great camas				1.62		0.56
Camassia quamash var. azurea	common camas	2.8	1.7		{200}		{300}
Carex densa	dense sedge				0.25		0.06
Carex leporina	oval sedge						0.03
Carex pachystachya	chamisso sedge				0.18		0.04
Carex scoparia	pointed-broom sedge				0.13		
Carex stipata	saw-beaked sedge				0.28		0.04
Carex tumulicola	splitawn sedge						0.27
Carex unilateralis	one-sided sedge				0.15		0.03
Chrysolepis chrysophylla	golden chinquapin					{7}	
Clarkia amoena ssp. lindleyi	farewell-to-spring				0.03	0.5	0.28
Clarkia purpurea	winecup clarkia			0.04	0.02		0.23
Clarkia rhomboidea	diamond clarkia						0.34
Collinsia grandiflora	large-flowered blue-eyed Mary					0.5	0.55
Collomia grandiflora	large-flowered collomia				0.66		1.33
Corylus cornuta	beaked hazelnut					{13}	0.5
Danthonia californica	California danthonia				1.39		41.7*
Deschampsia caespitosa	tufted hairgrass				0.06	1	0.01

Scientific name	Common name	Amount seed (lb.) and number of plugs or shrubs {quantity}.					
		2018	2019	2021	2022	2023	2024
Deschampsia danthonioides	annual hairgrass				0.06		0.03
Deschampsia elongata	slender hairgrass				0.05		0.01
Dichelostemma congestum	ookow				{300}	{200}	{125}
Dodecatheon hendersonii	Henderson's shooting star				{300}	{50}	
Dodecatheon pulchellum	dark throated shooting star					0.06	
Downingia elegans	elegant calicoflower				0.51	1.01	0.0022
Eleocharis ovata	ovoid spikerush					1	
Eleocharis palustris	creeping spikerush					1	
Elymus glaucus	blue wildrye						3.18*
Elymus trachycaulus	slender wheatgrass						15.41*
Epilobium densiflorum	denseflower willowherb				0.04	0.03	0.1
Eriophyllum lanatum	Oregon sunshine			0.06	1.1		1.37
Erythronium oregonum	giant white fawn-lily						0.13
Festuca roemeri	Roemer's fescue				4		4.88*
Fritillaria affinis	chocolate lily				{200}	{100}	
Geum macrophyllum	large-leaved avens						0.12
Gilia capitata	bluehead gilia						0.22
Grindelia integrifolia	Puget Sound gumweed				0.25	0.17	6.83
Heuchera chlorantha	tall alumroot					1	0.0041
Hordeum brachyantherum	meadow barley						10.2*
Hosackia pinnata	bog bird's foot trefoil					0.33	0.08
Iris tenax	toughleaf iris				1.32		0.05
Juncus ensifolius	dagger-leaf rush						0.0009
Juncus tenuis	path rush				0.01		0.0042
Koeleria macrantha	prairie Junegrass						9.33*
Ligusticum apiifolium	celery-leaved lovage						2.37
Lomatium dissectum	fern-leaved biscuitroot						0.77
Lomatium nudicaule	barestem biscuitroot				1.32		0.44
Lomatium utriculatum	spring gold						0.13
Lotus purshianus	American bird's foot trefoil					0.14	0.13
Lupinus bicolor	bi-colored lupine					1	
Lupinus polycarpus	small-flowered lupine						1.30
Lupinus rivularis	river lupine				1.12	1	0.24
Luzula comosa	Pacific woodrush						0.04

Scientific name	Common name	Amount seed (lb.) and number of plugs or shrubs {quantity}.					
		2018	2019	2021	2022	2023	2024
Luzula subsessilis	short-stalked woodrush						0.02
Madia elegans	showy tarweed			0.33	0.975		0.69
Madia glomerata	cluster tarweed					0.16	
Madia gracilis	grassy tarweed					0.5	0.52
Malus fusca	Pacific crabapple					{80}	
Microseris laciniata	cutleaf silverpuffs						0.11
Microsteris gracilis	slender phlox					0.15	
Mimulus guttatus	common monkeyflower					0.1	0.0003
Montia linearis	narrow-leaf miner's lettuce					0.12	
Oemleria cerasiformis	osoberry				{7}		2
Perideridia gairdneri	Gardner's yampah					{533}	
Perideridia oregana	Oregon yampah				0.27		{200}
Phacelia nemoralis var. oregonensis	shade phacelia						0.3
Plagiobothrys figuratus	fragrant popcornflower				0.57	0.86	0.24
Plagiobothrys nothofulvus	rusty-haired popcornflower				0.5		
Plectritis congesta	shortspur seablush			0.05	0.05	1	0.18
Poa secunda	pine bluegrass					0.75	0.08
Potentilla glandulosa	sticky cinquefoil						0.03
Potentilla gracilis	slender cinquefoil			0.02	0.09		0.19
Prunella vulgaris var. lanceolata	common selfheal			0.09	0.32		0.56
Prunus virginiana	chokecherry				{2}		
Quercus garryana	Oregon white oak					{10}	
Ranunculus occidentalis	western buttercup				0.66		0.15
Ranunculus orthorhynchus	straightbeak buttercup				0.46		0.1
Ribes bracteosum	stink currant					{10}	
Ribes sanguineum	red-flowering currant				{10}	{11}	0.13
Rorippa curvisiliqua	western yellow-cress					0.25	
Rumex salicifolius	willow dock					0.08	0.28
Sanguisorba occidentalis	western burnet				0.2	0.15	0.19
Sanicula bipinnatifida	purple sanicle						0.4
Scrophularia californica	California bee plant						0.03
Sidalcea campestris	meadow checkermallow				2.765		0.4
Sidalcea malviflora spp. virgata	rose checkermallow			0.52	0.33		0.23

Scientific name	Common name	Amount seed (lb.) and number of plugs or shrubs {quantity}.					
		2018	2019	2021	2022	2023	2024
Sisyrinchium idahoense	Idaho blue-eyed grass						0.06
Symphyotrichum hallii	Hall's aster						0.03
Thalictrum polycarpum	tall meadow-rue				0.43		0.14
Triteleia hyacinthina	hyacinth brodiaea					0.11	
Veronica peregrina	American speedwell					0.01	
Viola praemorsa	prairie violet						0.05
Wyethia angustifolia	narrowleaf mule's ear				*5*		3.5
	Totals:	**2.8 lb.**	**1.7 lb.**	**1.27 lb.**	**27.4 lb. 1,850 bulbs 19 shrubs**	**29.85 lb. 1,733 bulbs 131 shrubs**	**875 bulbs, 111.69 lb.**
	Number of species:	**1**	**1**	**9**	**49**	**45**	**81**
	Seed source notes: Willamette Valley (WV) or mid-elevation (ME) genetic origin.	**All mid-elevation.**	**All mid-elevation.**	**All mid-elevation except A. formosa, M. elegans, and S. malviflora.**	**All Willamette Valley except F. roemeri**	**All Willamette Valley**	**Mix of WV and ME sources. *Mid-elevation sourced seed grown in amplification fields between 2015-2018 (84lb.).**