Garoutte Prairie restoration: 2023 annual report

March 2024

Report for Bureau of Land Management, Agreement #L21AC10245, #L23AC00272

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Institute for Applied Ecology

PREFACE

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.

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Cover photographs: Planted chocolate lily (*Fritillaria affinis*) blooming in unit 2 on April 13, 2023. Photo by Rolando Beorchia.

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

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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 2023, IAE performed a variety of restoration activities including herbicide and mowing treatments, broadcast seeding, and planting native bulbs and shrubs. This was the third full year herbicides were permitted at Garoutte Prairie. 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, sweet briar rose (*Rosa rubiginosa*), and Himalayan blackberry. IAE broadcast 29.85 pounds of a native seed mix and planted a total of 1,733 bulbs from six species: crown brodiaea (*Brodiaea coronaria*) harvest brodiaea (*Brodiaea elegans*), Tolmie's star-tulip (*Calochortus tolmiei*), ookow (*Dichelostemma congestum*), chocolate lily (*Fritillaria affinis*), and Gardner's yampah (*Perideridia gairdneri*). IAE also planted golden chinquapin (*Chrysolepis chrysophylla*), Pacific crabapple (*Malus fusca*), osoberry (*Oemleria cerasiformis*), Lewis' mock-orange (*Philadelphus lewisii*), Oregon white oak (*Quercus garryana*), salmon berry (*Rubus spectabilis*), oval-leaved viburnum (*Viburnum ellipticum*) red-flowering currant (*Ribes sanguineum*), stink currant (*Ribes bracteosum*) and red elderberry (*Sambucus racemosa*) to start a living fence habitat buffer between the road and meadow. Jonny Native Seed donated 20 pounds of Oregon white oak acorns, which were also planted along the road. 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 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 2013-2026.

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.

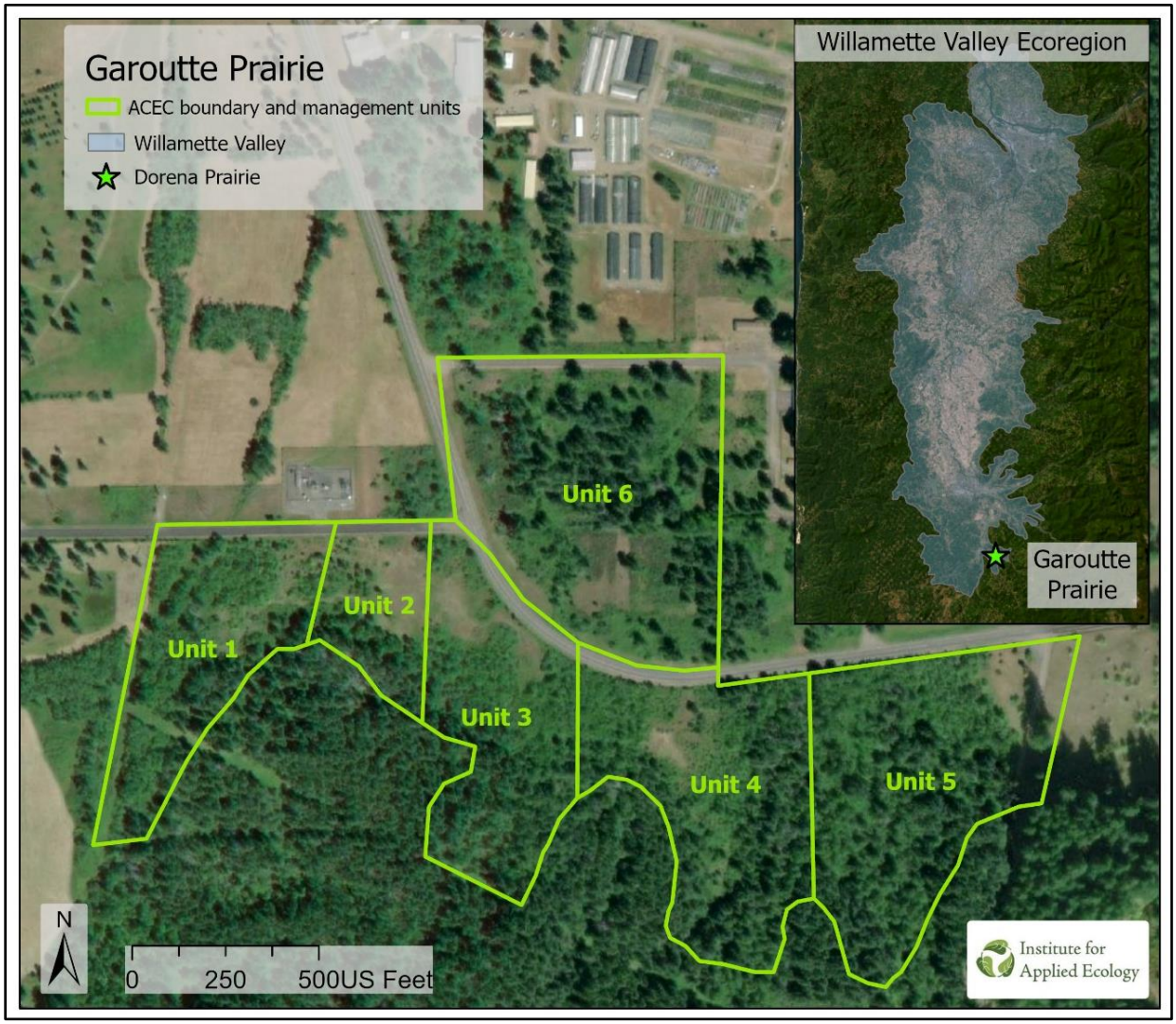

Figure 1. Garoutte Prairie management units and meadow location within the Willamette Valley Ecoregion.

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 (850 ft) 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. 2023 RESTORATION ACTIONS

In 2023, IAE broadcast a native seed mix, planted bulbs, planted 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 2013-2026. Appendix B shows the management units established in 2022 compared to those used from 2013-2021.

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 2023 to reduce their abundance (Table 1). In April, we mowed units 1, 2 and 3 targeting Himalayan blackberry, one-seed hawthorn, cluster rose (*Rosa pisocarpa*), and sweet-brier (*Rosa rubiginosa*) (Figure 2, Figure 3). In May, we applied Garlon 3A (triclopyr) to target Himalayan blackberry and one-seeded hawthorn in units 1, 2, 3 and 6 (Figure 4). In October, we mowed Scotch broom in unit 6 to continue reclaiming the grassland from the dense thickets of invasive shrubs that dominate the area. Herbicide and mowing treatments are scheduled for 2024 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 April, IAE mowed shrubs along the forest edge and in November, IAE and AmeriCorps National Civilian Community Corps (NCCC) removed meadow edge wood piles and relocated them onto a preexisting burn pile (Figure 2). 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. IAE is scheduling activities for 2024 tree limbing, non-native shrubs removal, and old wood pile removal within this important habitat transition zone.

Table 1. 2023 management actions at Garoutte Prairie.

Date	Management Unit	Activity
March 9	All units	Assessed that winter storms had minimal damage, planned spring mowing, observed plant phenology from fall 2022 seeding.
April 13	1, 2, 3, 6	Assessed revegetation growth and planned weed treatments with Jessica Celis (Bureau of Land Management).
April 17	1,2	Mowed Himalayan blackberry (*Rubus bifrons*), one-seeded hawthorn (*Crataegus monogyna*), cluster rose (*Rosa pisocarpa*), sweet-brier (*Rosa rubiginosa*), and Oregon ash (*Fraxinus latifolia*).
April 18	1, 2, 3	Mowed Himalayan blackberry one-seeded hawthorn, cluster rose, sweet-brier, and Oregon ash.
May 18	1, 2, 3, 6	Sprayed Garlon 3A (triclopyr) herbicide on Himalayan blackberry and Scotch broom (*Cytisus scoparius*).
	All units	Sprayed Garlon 3A (triclopyr) herbicide on roadside meadow knapweed (Centaurea ×moncktonii).
September 18	All units	Assessed success of weed treatments and planned upcoming planting.
October 5	1, 2	Planted shrubs donated from BLM in living fence. Planted Pacific crabapple (Malus fusca) in living fence and throughout Oregon Ash understory of Units 1 and 2 for climate adaptive measures for bay horsehair lichen (*Sulcaria badia*) host.
October 10	1, 2, 3, 6	Mowed Himalayan blackberry and Scotch broom.
October 11	1, 2	Planted shrubs.
	1, 2, 6	Planted bulbs.
October 25	1, 2	Planted shrubs and trees.
	1, 2, 6	Planted bulbs.
	6	Broadcast seed mix.
November 6	6	Planted bulbs.
	2	Removed woody debris from meadow/forest boundary and created a burn pile with AmeriCorps (NCCC).

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

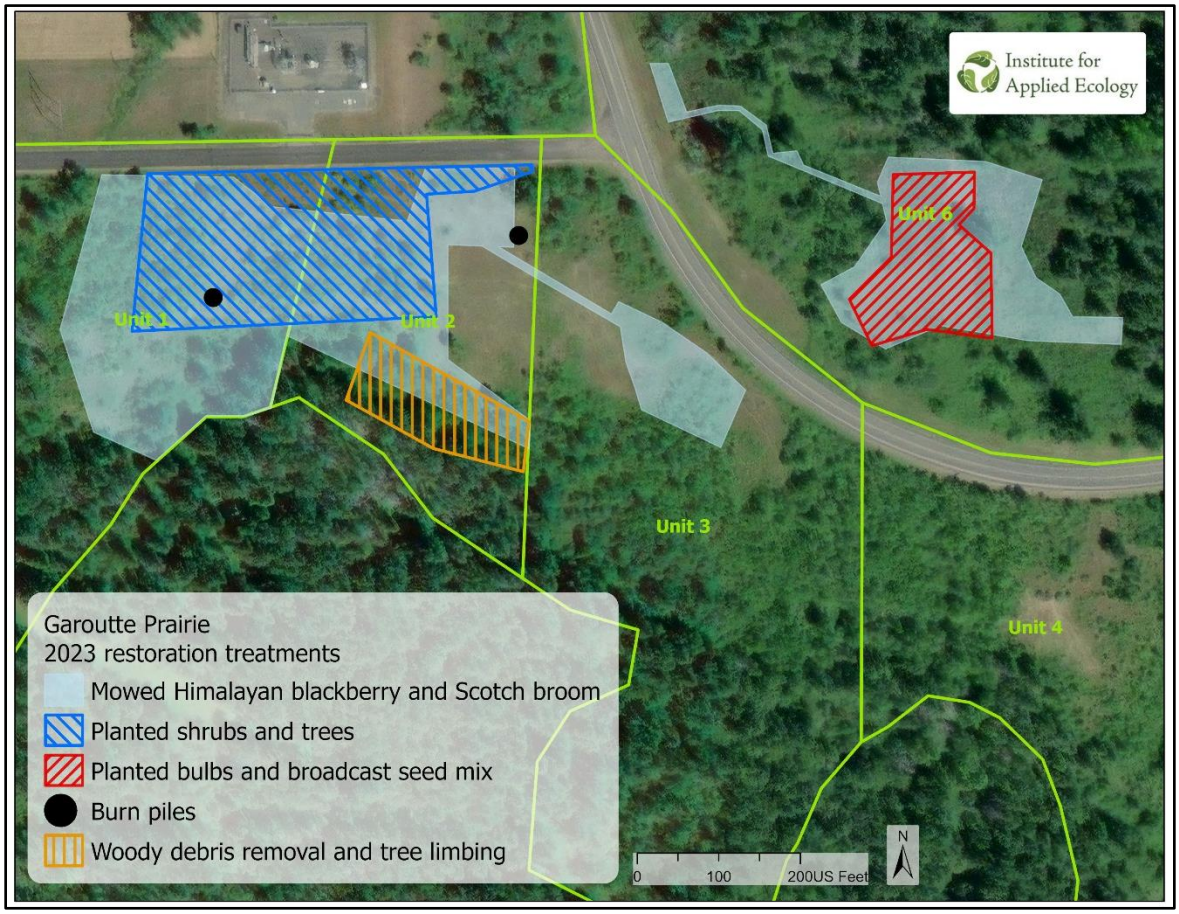

Figure 2. 2023 mowing, woody debris removal and piling, planting, and seeding treatments at Garoutte Prairie.

Figure 3. Zade Clark-Henry mowing (top left) and immediate results (bottom left) in unit 1. Unit 2 mow treatment reduced shrub abundance (right). April 18, 2023.

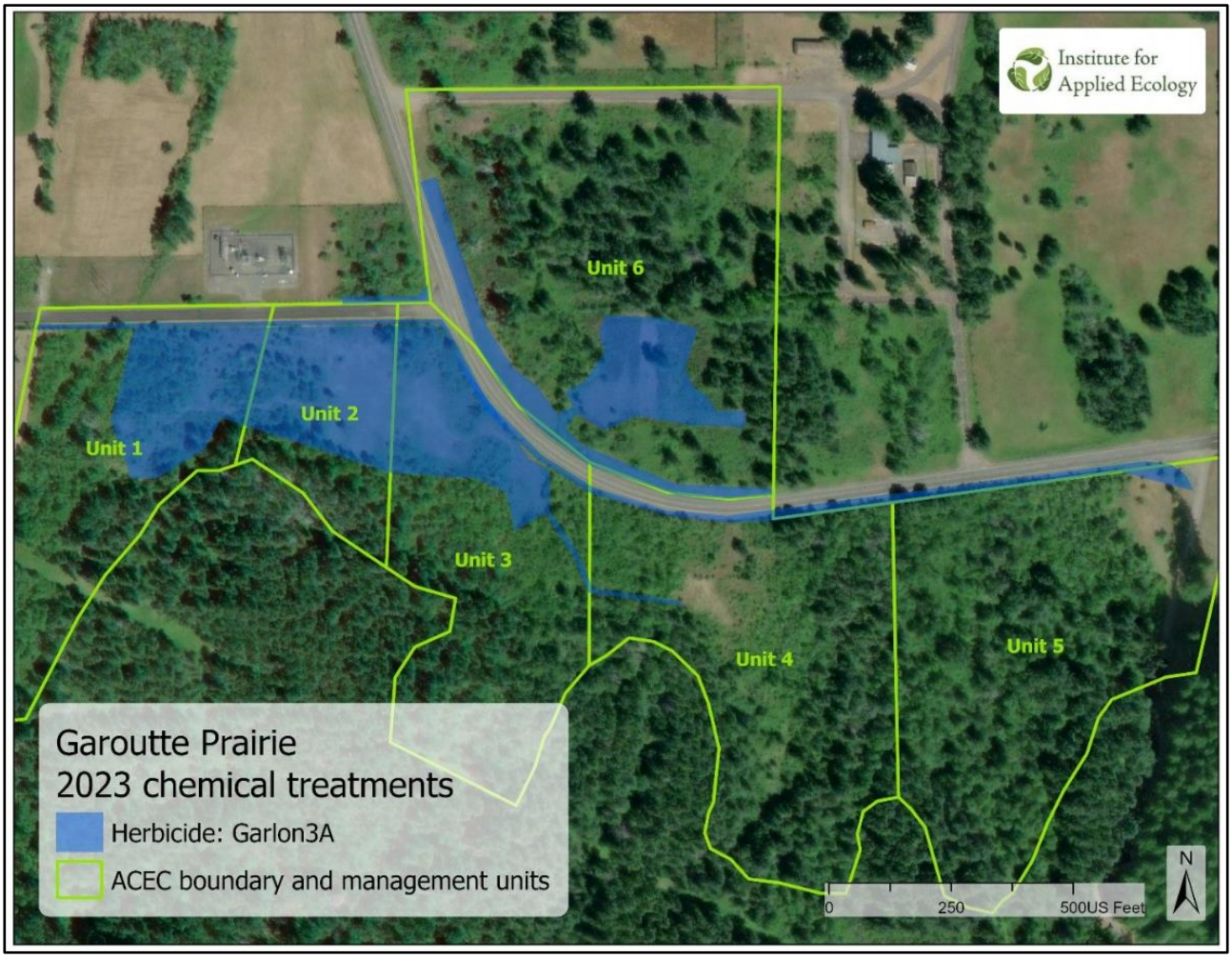

Figure 4. 2023 Garlon 3A (triclopyr) herbicide treatments at Garoutte Prairie.

Planting

To mitigate the effects of climate change and the threat of emerald ash borer (*Agrilus planipennis*), IAE planted Pacific crabapple (*Malus fusca*) in units 1 and 2 near the existing population of bay horsehair lichen (Figure 2). The intention is to provide a potential future native host for the lichen in the event emerald ash borer reaches the prairie and causes large-scale damage to Oregon ash. Since bay horsehair lichen at Garoutte Prairie uses common apple and pear as a host, it is possible Pacific crabapple will be a suitable alternative.

IAE enhanced native plant diversity in units 1, 2, and 6 at Garoutte Prairie by planting native forb bulbs. In October and November, we planted a total of 1,733 bulbs of narrowleaf onion (*Allium amplectens*), crown brodiaea (*Brodiaea coronaria*), harvest brodiaea (*Brodiaea elegans*), Tolmie star-tulip (*Calochortus tolmiei*), ookow (*Dichelostemma congestum*), Henderson's shooting star (*Dodecatheon hendersonii*), chocolate lily (*Fritillaria affinis*), tiger lily (*Lilium columbianum*), and Gardner's yampah (*Perideridia gairdneri*) in the open prairie of these units (Table 2, Figure 2, Figure 5).

Table 2. Bulbs and potted shrubs planted in 2023 at Garoutte Prairie.

Scientific name	Common Name	Bulbs	Shrubs/trees
Allium amplectens	narrow leaved onion	100	
Brodiaea coronaria	crown brodiaea	183	
Brodiaea elegans	harvest brodiaea	67	
Calochortus tolmiei	Tolmie star-tulip	100	
Dichelostemma congestum	ookow	200	
Dodecatheon hendersonii	Henderson's shooting star	50	
Fritillaria affinis	chocolate lily	100	
Lilium columbianum	tiger lily	400	
Perideridia gairdneri	Gardner's yampah	533	
Chrysolepis chrysophylla	golden chinquapin		7
Corylus cornuta	beaked hazelnut		13
Malus fusca	Pacific crabapple		80
Quercus garryana	Oregon white oak		10
Ribes bracteosum	stink currant		10
Ribes sanguineum	red-flowering currant		11
	Total	**1,733**	**131**

Figure 5. Aynesley Wilson, Institute for Applied Ecology, showing Gardner's yampah (*Perideridia gairdneri*, left), a handful of narrow-leaved onion (*Allium amplectens)* and Gardner's yampah (center), and native shrubs freshly planted as a living fence in unit 2 (right).

IAE planted shrubs and small deciduous trees to continue a living fence along the roadsides, 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. The upper layer (one to eight feet tall) is composed of a shrub row containing beaked hazelnut (*Corylus cornuta*), Oregon white oak (*Quercus garryana*), stink currant (*Ribes bracteosum*), and red-flowering currant (*Ribes sanguineum*) (Table 2, Figure 2, Figure 5), in addition to the shrub species planted in 2022 (Beorchia & Esterson 2023). The lower layer is composed of tenacious grasses and forbs and was seeded in 2022 with Roemer's fescue (*Festuca roemeri*). It is scheduled for additional

seeding in 2024. Additionally, Jonny Native Seed donated 20 pounds of Oregon white oak acorns, which were also planted along the road.

Seeding

IAE broadcast 29.85 pounds of native seed mix composed of both upland and wet prairie species roadside in units 1 and 2, and to recently reclaimed unit 6 using belly bag seeders (Table 3, Figure 2). The seed mix was sourced from the Willamette Valley, contained thirty-two species, and emphasized increasing diversity of native graminoids and annual forbs.

Table 3. 2023 Garoutte Prairie seed mix.

Scientific Name	Common Name	Amount (lb)
Achillea millefolium	common yarrow	1
Agrostis exarata	spike bentgrass	0.75
Allium amplectens	narrow-leaf onion	0.14
Beckmannia syzigachne	American sloughgrass	5
Bromus carinatus	California brome	10
Clarkia amoena ssp. lindleyi	farewell-to-spring	0.5
Collinsia grandiflora	large-flowered blue-eyed Mary	0.5
Deschampsia cespitosa	tufted hairgrass	1
Dodecatheon pulchellum	dark throat shooting star	0.06
Downingia elegans	elegant calicoflower	1.01
Eleocharis ovata	ovoid spikerush	1
Eleocharis palustris	creeping spikerush	1
Epilobium densiflorum	denseflower willowherb	0.03
Grindelia integrifolia	Puget Sound gumweed	0.17
Hordeum brachyantherum	meadow barley	1
Lotus pinnatus	meadow bird's foot trefoil	0.33
Lotus purshianus	American bird's foot trefoil	0.14
Lupinus bicolor	bi-colored lupine	1
Lupinus rivularis	river lupine	1
Madia glomerata	cluster tarweed	0.16
Madia gracilis	grassy tarweed	0.5
Microsteris gracilis	slender phlox	0.15
Mimulus guttatus	common monkeyflower	0.1
Montia linearis	narrow-leaf miner's lettuce	0.12
Plagiobothrys figuratus	fragrant popcornflower	0.86
Plectritis congesta	shortspur seablush	1
Poa secunda	pine bluegrass	0.75
Rorippa curvisiliqua	western yellow-cress	0.25
Rumex salicifolius	willow dock	0.08
Sanguisorba occidentalis	western burnet	0.15
Triteleia hyacinthina	hyacinth brodiaea	0.11
Veronica peregrina	American speedwell	0.01
	Total (lb):	**29.85**

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, and 3 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. Units 4 and 6 have potential to become quality meadows, but they are inundated with invasive shrubs. Intensive weed treatment followed by native species revegetation will be needed to rehabilitate these units.

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 application of herbicide 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 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 outside the ACEC, so surveys should be conducted throughout riparian areas on all BLM land adjacent to the ACEC.

The following restoration actions are recommended for 2024 and beyond:

- Mowing treatments:
    - Mow Oregon ash regrowth with brush mower. The growth appeared to be less in 2023 than 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 and Scotch broom.
    - Mow Himalayan blackberry at forest edges to open the forest-meadow ecotone.
- Cover burn piles in spring 2024 and request that the BLM burn them in fall 2024.
- Herbicide treatments:
    - 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.
- 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 for the bay horsehair lichen known to grow on common pear and apple.
- Seeding and/or planting Pacific crabapple may provide an alternative native host and a transition could be possible while maintaining a host 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 2024-2026 can be found at the bottom of Appendix A.

5. REFERENCES

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APPENDIX A. COMPLETED AND PROPOSED MANAGEMENT ACTIONS: 2013-2025

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, sweet-brier, 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 (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.
- Complete habitat management plan.

2025 (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.

2026 (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 6). 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 6).

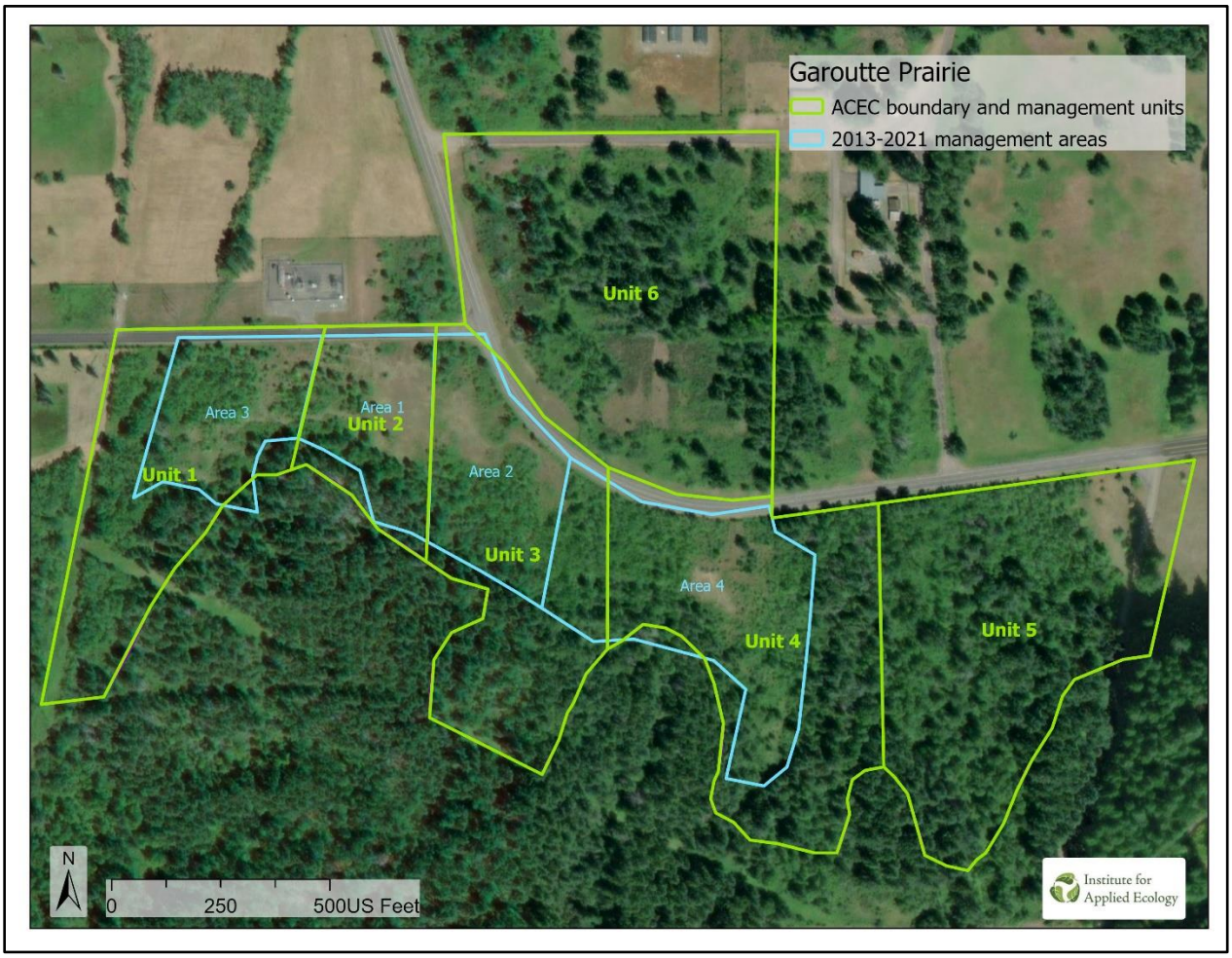

Figure 6. New management units established in 2022 and previously used management areas from 2013-2021.

APPENDIX C. COMPREHENSIVE PLANTING AND SEEDING RECORD 2018-2023

Scientific name	Common name	Amount seed (lb.) and number of plugs or shrubs {quantity}.				
		2023	2022	2021	2019	2018
Achillea millefolium	common yarrow	1	0.03	0.02		
Allium amplectens	narrow leaved onion	0.14 {100}	{175}			
Agrostis exarata	spike bentgrass	0.75	0.03			
Aquilegia formosa	red columbine			0.14		
Barbarea orthoceras	American yellowrocket		0.17			
Beckmannia syzigachne	American sloughgrass	5				
Brodiaea coronaria	crown brodiaea	{183}				
Brodiaea elegans	harvest brodiaea	{67}	{300}			
Bromus carinatus	California brome	10				
Calochortus tolmiei	Tolmie's star-tulip	{100}	{175}			
Camassia leichtlinii	great camas		1.62			
Camassia quamash var. azurea	common camas		{200}		1.7	2.8
Carex densa	dense sedge		0.25			
Carex pachystachya	chamisso sedge		0.18			
Carex scoparia	pointed-broom sedge		0.13			
Carex stipata	saw-beaked sedge		0.28			
Carex unilateralis	one-sided sedge		0.15			
Chrysolepis chrysophylla	golden chinquapin	{7}				
Clarkia amoena ssp. lindleyi	farewell-to-spring	0.5	0.03			
Clarkia purpurea	winecup clarkia		0.02	0.04		
Collinsia grandiflora	large-flowered blue-eyed Mary	0.5				
Collomia grandiflora	large-flowered collomia		0.66			
Corylus cornuta	beaked hazelnut	{13}				
Danthonia californica	California danthonia		1.39			
Deschampsia caespitosa	tufted hairgrass	1	0.06			
Deschampsia danthonioides	annual hairgrass		0.06			
Deschampsia elongata	slender hairgrass		0.05			
Dichelostemma congestum	ookow	{200}	{300}			
Dodecatheon hendersonii	Henderson's shooting star	{50}	{300}			
Dodecatheon pulchellum	dark throated shooting star	0.06				
Downingia elegans	elegant calicoflower	1.01	0.51			
Eleocharis ovata	ovoid spikerush	1				
Eleocharis palustris	creeping spikerush	1				
Epilobium densiflorum	denseflower willowherb	0.03	0.04			
Eriophyllum lanatum	Oregon sunshine		1.1	0.06		
Festuca roemeri	Roemer's fescue		4			
Fritillaria affinis	chocolate lily	{100}	{200}			
Grindelia integrifolia	Puget Sound gumweed	0.17	0.25			
Hordeum brachyantherum	meadow barley	1				
Iris tenax	toughleaf iris		1.32			
Juncus tenuis	path rush		0.01			

Scientific name	Common name	Amount seed (lb.) and number of plugs or shrubs {quantity}.				
		2023	2022	2021	2019	2018
Lomatium nudicaule	barestem biscuitroot		1.32			
Lotus pinnatus	meadow bird's foot trefoil	0.33				
Lotus purshianus	American bird's foot trefoil	0.14				
Lupinus bicolor	bi-colored lupine	1				
Lupinus rivularis	river lupine	1	1.12			
Madia elegans	showy tarweed		0.975	0.33		
Madia glomerata	cluster tarweed	0.16				
Madia gracillis	grassy tarweed	0.5				
Malus fusca	Pacific crabapple	{80}				
Microsteris gracilis	slender phlox	0.15				
Mimulus guttatus	common monkeyflower	0.1				
Montia linearis	narrow-leaf miner's lettuce	0.12				
Oemleria cerasiformis	osoberry		{7}			
Perideridia gairdneri	Gardner's yampah	{533}				
Perideridia oregana	Oregon yampah		0.27			
Plagiobothrys figuratus	fragrant popcornflower	0.86	0.57			
Plagiobothrys nothofulvus	rusty-haired popcornflower		0.5			
Plectritis congesta	shortspur seablush	1	0.05	0.05		
Poa secunda	pine bluegrass	0.75				
Potentilla gracilis	slender cinquefoil		0.09	0.02		
Prunella vulgaris var. lanceolata	common selfheal		0.32	0.09		
Prunus virginiana	chokecherry		{2}			
Quercus garryana	Oregon white oak	{10}				
Ranunculus occidentalis	western buttercup		0.66			
Ranunculus orthorhynchus	straightbeak buttercup		0.46			
Ribes bracteosum	stink currant	{10}				
Ribes sanguineum	red-flowering currant	{11}	{10}			
Rorippa curvisiliqua	western yellow-cress	0.25				
Rumex salicifolius	willow dock	0.08				
Sanguisorba occidentalis	western burnet	0.15	0.2			
Sidalcea campestris	meadow checkermallow		2.765			
Sidalcea malviflora spp. virgata	rose checkermallow		0.33	0.52		
Thalictrum polycarpum	tall meadow-rue		0.43			
Triteleia hyacinthina	hyacinth brodiaea	0.11				
Veronica peregrina	American speedwell	0.01				
Wyethia angustifolia	narrowleaf mule's ear		5			
	Totals:	**29.85 lb. 1,733 bulbs 131 shrubs**	**27.4 lb. 1,850 bulbs 19 shrubs**	**1.27 lb.**	**1.7 lb.**	**2.8 lb**
	Seed source notes: Willamette Valley (WV) or mid-elevation (ME) genetic origin.	**All Willamette Valley**	**All Willamette Valley except F. roemeri**	**All mid-elevation except A. formosa, M. elegans, and S. malviflora.**	**All mid-elevation.**	**All mid-elevation.**