Dorena Prairie restoration: 2022 annual report

May 2023

Report for Bureau of Land Management, Agreements #L21AC10245 and #L20AC00228

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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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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 Jessica Celis, Upper Willamette Field Office botanist, and John Klock, Northwest Oregon District botanist, for their continued support and commitment to restoring Dorena Prairie.

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Cover photographs: Prescribed burn of Dorena Prairie October 01, 2022. Photo by Rolando Beorchia.

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SUGGESTED CITATION

Beorchia, Rolando and Andrew Esterson. 2023. Dorena Prairie restoration: 2022 annual report. Unpublished report for the Bureau of Land Management, Northwest Oregon District. Institute for Applied Ecology. Corvallis, Oregon. 13 pages plus appendices.

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EXECUTIVE SUMMARY

The Institute for Applied Ecology (IAE) has conducted habitat restoration at Dorena Prairie in partnership with the Bureau of Land Management (BLM) Upper Willamette Field Office (UWFO), Northwest Oregon District, since 2010. In 2022, IAE performed a variety of restoration activities including conifer limb chipping, broadcast seeding, native planting, and herbicide and manual weed treatments. This was the second full year the use of herbicides has been permitted at Dorena Prairie. IAE completed herbicide spot treatments on Canada thistle (*Cirsium arvense*), Himalayan blackberry (*Rubus bifrons*), and Fuller's teasel (*Dipsacus fullonum*), and prepared the meadow for a prescribed burn in fall 2022. Burning preparations included removing tree limbs from the meadow interior. The BLM implemented a prescribed burn across five of the six acres in 2022 and IAE applied a post-burn herbicide treatment and broadcast 86.6 pounds of native seed. IAE planted 2,050 bulbs from eight species: narrow leaved onion (*Allium amplectens*), harvest brodiaea (*Brodiaea elegans*), Tolmie star-tulip (*Calochortus tolmiei*), common camas (*Camassia quamash*), ookow (*Dichelostemma congestum*), Henderson's shooting star (*Dodecatheon hendersonii*), chocolate lily (*Fritillaria affinis*), and tiger lily (*Lilium columbianum*). Heritage Seedlings and Liners Inc. donated rose checker-mallow (*Sidalcea virgata*) to the BLM and about 400 were planted at Dorena prairie. IAE also planted osoberry (*Oemleria cerasiformis*), chokecherry (*Prunus virginiana*), red-flowering currant (*Ribes sanguineum*) and blue elderberry (*Sambucus cerulea*) to start 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

Dorena Prairie is a six-acre upland prairie located southeast of Eugene, Oregon and west of Dorena Lake (Figure 1). The prairie is managed by the Bureau of Land Management (BLM) Upper Willamette Field Office, Northwest Oregon District. Dorena Prairie is designated a BLM Area of Critical Environmental Concern (ACEC) and hosts a diverse community of native plant species, including an introduced population of thin-leaved peavine (*Lathyrus holochlorus*), a BLM Sensitive Species.

Institute for Applied Ecology (IAE) began working with the BLM to restore and maintain habitat at Dorena Prairie in 2010. This prairie has undergone extensive restoration and could be a suitable location to introduce rare and/or federally listed plants. In addition, the prairie is located next to Schwarz Park, which is managed by the U.S. Army Corps of Engineers (USACE), providing an opportunity to educate the public about habitat restoration. An educational sign was installed in early 2017 to help inform the public about the ongoing work at Dorena Prairie.

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 Fuller's teasel (*Dipsacus fullonum*), Himalayan blackberry (*Rubus bifrons*), Scotch

broom (*Cytisus scoparius*), and Canada thistle (*Cirsium arvense*). 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.

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

2. GOALS AND OBJECTIVES

The purpose of this project is to assist the BLM with maintaining and improving rare mid-elevation (750 ft) prairie habitat in support of the native plant community at Dorena Prairie.

There are three primary objectives of this project:

1. Control high priority invasive plants such as Fuller's teasel, Scotch broom, Canada thistle, and Himalayan blackberry
2. Prepare the site for regular prescribed burning
3. Increase native plant abundance and diversity

3. 2022 RESTORATION ACTIONS

To help describe where management actions occur, we split Dorena Prairie into four management units (Figure 1). In 2022, IAE and the BLM chipped Douglas-fir (*Pseudotsuga menziesii*) limbs, implemented a prescribed burn, broadcast native seed, planted bulbs and shrubs, and mowed Himalayan blackberry. IAE also treated Himalayan blackberry with Garlon 3A (triclopyr) herbicide, Canada thistle with Stinger (clopyralid) herbicide, and perennial grasses with Rodeo (glyphosate) herbicide. (Table 1, Figure 2,

Figure 3). See Appendix A for a complete list of management actions at Dorena Prairie from 2010-2022.

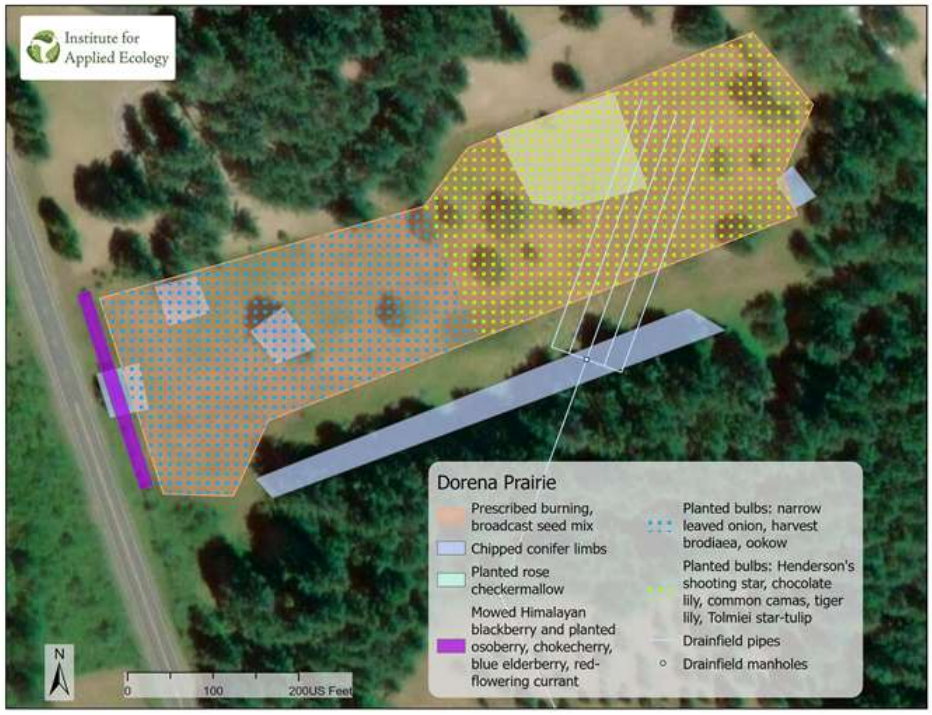

Figure 2. 2022 manual treatments, planting and drain field pipe locations at Dorena Prairie.

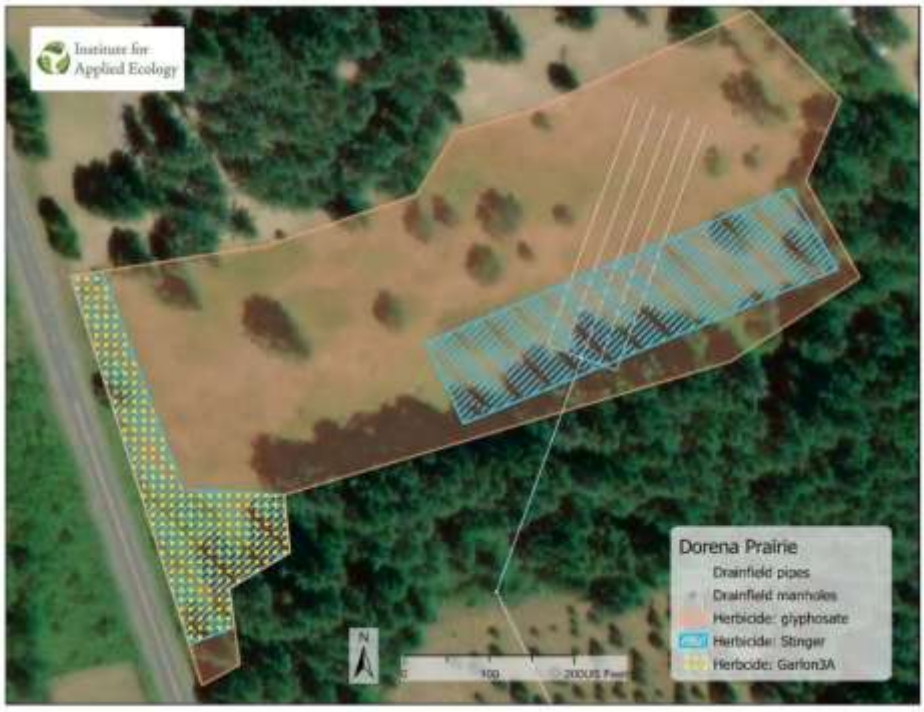

Figure 3. 2022 chemical treatments and drain field pipe locations at Dorena Prairie.

Table 1. 2022 management actions at Dorena Prairie.

Date	Personnel*	Activity
Jan 26	IAE	Assessed need for limb removal, weed treatments and mowing.
Mar 10	IAE, BLM	Planted 20 flats each with about 20 rose checker-mallow (*Sidalcea virgata*) donated by Heritage Seedlings and Liners Inc.
Mar 31	IAE, NYC	Chipped conifer limbs with wood chipper, blasting material beneath one large conifer and into forest on the southern edge.
May 16	IAE	Treated Himalayan blackberry (*Rubus bifrons*) with Rodeo (glyphosate).
Jun 27	IAE	Treated Himalayan blackberry with Garlon 3A (triclopyr). Treated Canada thistle (*Cirsium arvense*) with Stinger (clopyralid).
Aug 22	IAE	Mowed Himalayan blackberry along western fence line. Assessed site was prepared for prescribed burning.
Sep 21	IAE	Treated Himalayan blackberry with Garlon 3A (triclopyr).
Sep 30	IAE	Treated Himalayan blackberry with Garlon 3A (triclopyr).
Oct 01	BLM	Implemented a prescribed burn of the meadow.
Oct 20	IAE, BLM	Planted bulbs and shrubs, but stopped early due to smoke conditions. Mowed Himalayan blackberry along the western fence line.
Oct 25	IAE, Volunteers	Planted bulbs throughout the meadow and shrubs along western fence.
Oct 31	IAE	Planted bulbs throughout the meadow and shrubs along western fence.
Nov 14	IAE	Treated perennial grasses in the meadow with Rodeo (glyphosate). Broadcast native seed mix.
*Institute for Applied Ecology (IAE), Bureau of Land Management (BLM), Northwest Youth Corps (NYC).		

In March, IAE continued preparations for a prescribed burn by chipping branches in the unburned edges of burn piles and those left in the prairie after conifer limb removal in 2021. (Lebo, C). The Northwest Youth Corps (NYC) helped remove the material from the meadow and blasted the chips into the forest on the southern edge of Units 3 and 4, and at the base of one large Douglas-fir inside Unit.

Additionally in March, Heritage Seedlings and Liners Inc. dug up one of their production beds and donated twenty flats of bareroot rose checker-mallow (*Sidalcea virgata*) to the BLM, each containing about twenty plants. IAE and BLM staff planted these at Dorena Prairie in Unit 2 in dense clusters (Figure 2).

Figure 4. Northwest Youth Corps and Institute for Applied Ecology chipping branches, March 2022 (top); prairie edge post treatment (bottom).

Himalayan blackberry poses a significant threat to the native plant community and the sustainability of Dorena Prairie habitat. IAE treated Himalayan blackberry with Rodeo (glyphosate) in May, with Garlon 3A (triclopyr) in September, and mowed dead canes in October. IAE also conducted a June application of Stinger (clopyralid) herbicide on Canada thistle in Units 3 and 4 (Figure 3).

On October 1st, the BLM was able to burn five of the six acres, with environmental conditions preventing the flame carrying to the southern portion of Units 3 and 4 (Figure 2). Wood chips piled at the base of a large Douglas-fir in Unit 1 became an area for fire to linger, and it needed additional care from the fire team. In hindsight, wood chips should have been spread out instead of piling to reduce fuel loading.

Implementation of the first ever prescribed burn was a pivotal moment for 2022 restoration at Dorena Prairie. IAE staff returned after the burn to apply herbicide to invasive weeds, plant native bulbs, broadcast seed, and plant a living fence composed of native shrubs and trees (Table 1, Figure 2, Figure 3). The November post-burn application of Rodeo (glyphosate) reduced non-native grasses such as velvet

grass (*Holcus lanatus*), tall oat grass (*Arrhenatherum elatius*), and tall fescue (*Schedonorus arundinaceus*), decreasing competition for the native plant community. To increase diversity in the prairie, IAE planted 2,050 bulbs of eight forb species (Figure 3). IAE planted narrow leaved onion (*Allium amplectens*), harvest brodiaea (*Brodiaea elegans*), and ookow (*Dichelostemma congestum*) in Unit 2 and in the burned portion of Unit 3; common camas (*Camassia quamash*), Henderson's shooting star (*Dodecatheon hendersonii*), chocolate lily (*Fritillaria affinis*), Tolmie star-tulip (*Calochortus tolmiei*), and tiger lily (*Lilium columbianum*)in Unit 2 and the burned portion of Unit 4; and a native seed mix over the entire burned area using belly bag seeders (Figure 2, Table 3). Seed was purchased for the "IAE developed mix" under agreement #L21AC10245 and for the "burn pile mix" under agreement #L20AC00228.

Table 2. Bulbs, bareroot forbs and potted shrubs planted in 2022 at Dorena Prairie.

Species/Variety	Common Name	Bulbs (bareroot)	Rooted shrubs
Allium amplectens	narrow leaved onion	175	
Brodiaea elegans	harvest brodiaea	300	
Calochortus tolmiei	Tolmie star-tulip	175	
Camassia quamash	common camas	400	
Dichelostemma congestum	ookow	300	
Dodecatheon hendersonii	Henderson's shooting star	300	
Fritillaria affinis	chocolate lily	200	
Lilium columbianum	tiger lily	200	
Sidalcea virgata	rose checker-mallow	~400	
Oemleria cerasiformis	osoberry		23
Prunus virginiana	chokecherry		14
Ribes sanguineum	red-flowering currant		30
Sambucus cerulea	blue elderberry		6
	Totals	**2050 bulbs (~400 bareroot)**	**73 shrubs**

Table 3. 2022 Dorena Prairie native seed mix.

Scientific Name	Common Name	Burn pile mix† (lbs)	IAE developed mix* (lbs)	Total seed (lbs)
Achillea millefolium	common yarrow	0.19	0.77	0.96
Amsinckia menziesii	Menzies' fiddleneck	0.845		0.845
Aquilegia formosa	red columbine		0.63	0.63
Asclepias speciosa	showy milkweed		0.54	0.54
Bromus carinatus	California brome		6.53	6.53
Carex densa	dense sedge		0.2	0.2
Clarkia amoena ssp. lindleyi	farewell-to-spring	0.275	1	1.275
Clarkia purpurea	winecup clarkia	0.1		0.1
Collinsia grandiflora	large-flowered blue-eyed Mary	0.41	1	1.41
Collomia grandiflora	large-flowered collomia	1.56	1.16	2.72
Danthonia californica	California oatgrass		2.8	2.8
Deschampsia cespitosa	tufted hairgrass		0.52	0.52
Elymus glaucus	blue wildrye		4.87	4.87
Epilobium densiflorum	denseflower willowherb		1	1
Eriophyllum lanatum	woolly sunflower	0.57	0.99	1.56
Festuca roemeri	Roemer's fescue	4.745	3*	7.745
Geranium oreganum	Oregon geranium		0.0055	0.0055
Geum macrophyllum	large-leaved avens	0.75		0.75
Gilia capitata	bluehead gilia	7.2	0.5	7.7
Iris tenax	toughleaf iris		1.32	1.32
Juncus bolanderi	Bolander's rush		0.0325	0.0325
Juncus bufonius	toad rush		0.0335	0.0335
Juncus effusus	soft rush		0.0565	0.0565
Juncus occidentalis	poverty rush		0.006	0.006
Lomatium nudicaule	barestem biscuitroot	0.28	1.32	1.6
Acmispon americanus	American bird's-foot trefoil	3.28		3.28
Lupinus bicolor	bi-colored lupine		3.6	3.6
Lupinus rivularis	river lupine	9.85	0.335	10.185
Madia elegans	showy tarweed	1.055	0.495	1.55
Madia gracilis	grassy tarweed	0.46		0.46
Mimulus guttatus	common monkeyflower		0.0275	0.0275
Phacelia nemoralis var. oregonensis	Oregon woods phacelia	1.02		1.02
Plectritis congesta	shortspur seablush		0.54	0.54
Potentilla gracilis	slender cinquefoil		0.0875	0.0875
Prunella vulgaris var. lanceolata	common selfheal	1.185	0.98	2.165
Ranunculus occidentalis	western buttercup	2.375	0.66	3.035
Sidalcea campestris	meadow checkermallow	5.695	0.825	6.52
Sidalcea malviflora ssp. virgata	dwarf checkermallow	3.57	0.33	3.9
Solidago canadensis	Canada goldenrod	0.085		0.085
Wyethia angustifolia	mule ears		5	5
	Totals (lbs):	**45.5**	**41.164**	**86.664**
	Five acre meadow pounds per acre:	**9.1**	**6.68***	**15.78***

*Roemer's fescue from IAE developed mix broadcast on fence line only; †Burn pile mix purchased from Heritage Seedlings and Liners Inc. with money from UWRA Burn agreement #L20AC00228.

IAE built a living fence along the roadside using shrubs, small deciduous trees, and tenacious bunch grass. Once fully grown, this living fence will not only provide structural shelter and forage to birds and mammals frequenting the meadow but will help limit the introduction of non-native seed from the road into the meadow. In order 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 osoberry (*Oemleria cerasiformis*), chokecherry (*Prunus virginiana*), red-flowering currant (*Ribes sanguineum*), and blue elderberry (*Sambucus cerulea*) (Figure 2, Table 2), and the ground layer (under one foot tall) was heavily seeded with Roemer's fescue (*Festuca roemeri*).

Figure 5. Institute for Applied Ecology Restoration Technician Zade Clark-Henry showing chocolate lilies (*Fritillaria affinis*) they are planting at Dorena Prairie (left), and planted shrub row along western fence line on October 25, 2022 (right).

4. MANAGEMENT RECOMMENDATIONS

The overarching goal of this project is to restore regionally rare meadow habitat at Dorena Prairie by controlling priority invasive species and managing woody encroachment. Many of the invasive species are currently in low abundance and could be controlled in the next few years with steady diligent treatments, while other species will need regular annual treatments for many years to keep their abundance at a tolerable level. Moving forward, we suggest evaluating the desired target levels for recovery and establishing metrics for achieving these targets.

We recommend the following four goals:

1. Reduce low abundance priority invasive plants to below 1% total cover (or eradication): Scotch broom, Fuller's teasel, Canada thistle, Himalayan blackberry, and bull thistle (*Cirsium vulgare*).
2. Reduce high abundance priority invasive plants to below 10% total cover: Oxeye daisy (*Leucanthemum vulgare*), and Queen Anne's lace (*Daucus carota*)
3. Reduce high abundance non-native grasses below 10% cover by implementing regular burning, mowing and herbicide applications
4. Increase meadow plant community diversity by augmenting species occurring in low abundance

With these goals in mind, we recommend the following for 2023 and beyond:

- Implement a prescribed burn every three years if resources allow. The next prescribed burn year is 2025. Mow any unburned portion of Units 3 and 4.
    - Following prescribed burns, apply glyphosate herbicide three to four weeks after burning to kill disturbance-loving invasive plants. Following herbicide application, sow a native seed mix at 10-15 lbs per acre to increase native plant community.
- Mow the meadow every two years to reduce non-native thatch buildup. Because of the 2022 prescribed burn, the next mowing is recommended for 2024. Because conditions to successfully implement prescribed burning can be unpredictable and the combination of three year burning and two year mowing can get complicated, we suggest assessing in late fall (October/November). If prescribed burning or mowing did not happen in the current year or the previous year, mowing should happen that November.
- Herbicide treatments:
    - Spot spray Himalayan blackberry in spring and/or fall with glyphosate or triclopyr.
    - Spot spray teasel in the rosette to bolting stage in spring and fall with glyphosate or clopyralid.
    - 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.
- Revegetate areas disturbed by restoration activities in the fall using a mix of native forb and grass seed. Improve native prairie species abundance and diversity by augmenting with appropriate plugs, bulbs, and bare root plants.
- Plant more fruit and nut-bearing shrubs within living fence.

A simplified timeline of these recommended and planned activities for 2023-2025 can be found at the bottom of Appendix A.

5. REFERENCES

Lebo, C., Beorchia, R., and Esterson, A. 2022. Dorena Prairie Restoration: 2021 Annual Report. Unpublished report for the Bureau of Land Management, Northwest Oregon District. Institute for Applied Ecology. Corvallis, Oregon.

APPENDIX A. COMPLETED AND PROPOSED RESTORATION ACTIVITIES: 2010-2025

2010

- Planned and coordinated with partners mapped priority invasive plant species, and surveyed native vegetation.
- Removed approximately 300 Scotch broom and 25 Himalayan blackberry (R*ubus bifrons*) plants.
- U.S. Army Corps of Engineers (USACE) mowed the entire prairie in mid-summer to enhance habitat for herbaceous species by reducing dominance of tall oatgrass and woody species.

2011

- Removed Scotch broom and Himalayan blackberry.
- Surveyed Bald Mountain milkvetch (*Astragalus umbraticus*).
- USACE mowed the entire prairie in mid-summer.

2012

- Removed Scotch broom and seeded with upland prairie native grass and forb mix.
- Mapped site and updated plant species list.
- Grew and planted plugs (containerized seedlings) from seed collected for Seeds of Success (SOS) native seed collections.
- Weed-wacked thistle and teasel.
- USACE mowed the entire prairie in mid-summer.

2013

- Planted 1,224 California oatgrass (*Danthonia californica*), 216 slender cinquefoil (*Potentilla gracilis*), 648 common rush (*Juncus effusus*), 144 dense sedge (*Carex densa*), and 648 slough sedge (*Carex obnupta*).
- Removed Scotch broom (*Cytisus scoparius*), Himalayan blackberry, teasel (*Dipsacus fullonum*), and bull thistle (*Cirsium vulgare*) by hand. Focused removal of Scotch broom and teasel in SE corner of prairie, and Himalayan blackberry surrounding blue elderberry (*Sambucus cerulea*) in SE corner.
- Removed teasel seed heads.
- Weed-whacked thistle and teasel.
- USACE mowed the entire prairie in mid-summer.

2014

- Planted bare-root Oregon geranium (*Geranium oreganum*) and plugs of river lupine (*Lupinus rivularis*), western columbine (*Aquilegia formosa*), and prairie violet (*Viola praemorsa*)
- Removed Scotch broom and teasel by hand and weed-whacked Himalayan blackberry and non-native woody species.
- USACE mowed the entire prairie in mid-summer.

2015

- Removed Scotch broom and Himalayan blackberry.

2016

- Planted 198 showy milkweed (*Asclepia* speciosa) and 200 thin-leaved peavine (*Lathyrus holochlorus*) plugs in two introduction plots.
- Manually removed Scotch broom and Himalayan blackberry.
- Hired subcontractor to mow entire prairie in mid-summer.

2017

- Installed interpretive sign.
- Monitored thin-leaved peavine introduction plots.
- Manually removed Himalayan blackberry.
- Limbed Douglas-fir (*Pseudotsuga menziesii*).

2018

- Monitored planted thin-leaved peavine introduction plots.
- Removed Scotch broom and Himalayan blackberry from within and around plots planted with thin-leaved peavine.

2019

- Monitored planted thin-leaved peavine introduction plots.
- IAE mowed entire prairie in mid-summer.
- Manually removed Scotch broom, Himalayan blackberry, and lower limbs of large Douglas-fir trees. Felled smaller trees along the southern and eastern edges of the prairie.
- Piled limbs in open meadow with the AmeriCorps Blue 5.

2020

- Monitored thin-leaved peavine introduction plots.
- Hand-pulled Scotch broom.
- Bucked and removed wind-fallen Oregon white oak (*Quercus garryana*) from thin-leaved peavine plots with AmeriCorps Blue 4.
- Planted 500 small camas (*Camassia quamash*) bulbs with AmeriCorps Blue 4.

2021

- Spot-sprayed Canada thistle.
- Monitored thin-leaved peavine introduction plots.
- Manually and mechanically removed Canada thistle (*Cirsium arvense*), Scotch broom, and blackberry
- Cut and trimmed woody species and spot sprayed invasive species in thin-leaved peavine plots. Spot sprayed perennial grasses and oxeye daisy (*Leucanthemum vulgare*) in and around plots after mowing diagonal strips though plots with a weed trimmer.
- Contracted skid-steer operator, Cutaway, Inc., to mow entire meadow to prepare for fall 2022 prescribed burn. Removed downed Oregon white oak limbs from meadow. Cleared small Oregon ash (*Fraxinus latifolia*) and shrub layer around meadow edges.
- Seeded bare soil created by skid steer with native grass species and thin-leaved peavine plots with a diverse native forb mix.
- Limbed trees up to 20 feet above the ground and topped one large Douglas-fir to create a wildlife tree to prep site for a prescribed burn in fall 2022.

- Burned brush piles and seeded exposed bare ground.

2022

- Wood chipped tree limbs to prepare for prescribed burning.
- Applied Stinger (clopyralid) herbicide to Canada thistle.
- Applied Rodeo (glyphosate) and Garlon 3A (triclopyr) to Himalayan blackberry throughout the prairie and at forest edge.
- BLM implemented a prescribed burn of the entire prairie in October 2022, followed by IAE herbicide application of glyphosate and seeding.
- Planted a living fence shrub row on western fence line.

2023 (Proposed)

- March-June: Spot spray Himalayan blackberry, teasel, and non-native thistles with herbicide. Manually remove inflorescences if not treated prior to flowering.
- June-July: Monitor population of thin-leaved peavine.
- Oct-Nov: Broadcast native seed mix to disturbed areas. Plant more bulbs throughout the meadow and fruit and nut bearing shrubs along fencerow if available.

2024 (Proposed)

- March-June: Spot spray reed canarygrass, Himalayan blackberry, false brome, meadow knapweed, teasel, and non-native thistle with herbicide. Manually remove inflorescences if not treated prior to flowering.
- Oct-Nov: Mow north and south section of meadow with deck mower or skid steer in north and string trimmer in the south.
- Oct-Nov: Broadcast native seed mix to disturbed areas. Plant more bulbs throughout the meadow and fruit and nut bearing shrubs along fencerow if available.

2025 (Proposed)

- March-June: Spot spray reed canarygrass, Himalayan blackberry, false brome, meadow knapweed, teasel, and non-native thistle with herbicide. Manually remove inflorescences if not treated prior to flowering.
- Oct: Prescribed burn.
- Oct-Nov: Treat invasive weeds with glyphosate 3-5 weeks after prescribed burning.
- Oct-Nov: Broadcast native seed mix to disturbed areas, plant plugs and bulbs if available. Plant fruit and nut bearing shrubs along fencerow.