Lost Creek Meadow restoration: 2023 annual report

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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: Corridor opening to eastern meadow on September 18, 2023. Photo by Rolando Beorchia.

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EXECUTIVE SUMMARY

In 2023, the Institute for Applied Ecology (IAE) in partnership with the Northwest Oregon District of the Bureau of Land Management (BLM) continued habitat restoration at Lost Creek Meadow. Restoration efforts focused on a population census, habitat improvement, and expansion of an extant population of Hitchcock's blue-eyed grass (*Sisyrinchium hitchcockii*), a species listed as endangered by the state of Oregon and is considered a species of concern by the BLM. species. Activities in 2023 primarily targeted Himalayan blackberry (*Rubus bifrons*), false brome (*Brachypodium sylvaticum*), and orchard grass (*Dactylis glomerata*) with mow and herbicide treatments. To support a targeted restoration approach, IAE divided Lost Creek Meadow into six management units. Hitchcock's blue-eyed grass only exists in unit 2. IAE collected population data on the species and found 209 individual plants and a total of 552 flowering stems. We recommend tree thinning, mowing, and herbicide treatments of Himalayan blackberry and false brome to create suitable habitat for Hitchcock's blue-eyed grass. Units 3 and 5 were the primary areas of meadow expansion, where IAE felled trees, treated Himalayan blackberry, false brome, and orchard grass with herbicide, and broadcast 13.14 pounds of native seed. No work occurred in units 1, 4, or 6 in 2023.

1. INTRODUCTION

Lost Creek Meadow is located southeast of Eugene, in the southernmost portion of the Willamette Valley in northwestern Oregon (Figure 1). This site is managed by the Northwest Oregon District of the Bureau of Land Management (BLM), is designated an Area of Critical Environmental Concern (ACEC) and is part of the larger Willamette Valley Prairie Oak and Pine ACEC complex. In addition to being one of the few remnant meadows in the area, Lost Creek Meadow hosts a population of Hitchcock's blue-eyed grass (*Sisyrinchium hitchcockii*), a species listed as endangered by the state of Oregon and is considered a species of concern by the BLM. Most recent population monitoring counted 209 individuals in 2023 (Appendix A). The Institute for Applied Ecology (IAE) has been involved with monitoring this species and implementing habitat restoration at the site since 2005 (Appendix B). Reports written by IAE before 2015 refer to the site as "Eagle's Rest." To reduce confusion between this site and another location with the same name, the BLM directed IAE to start referring to the site as "Lost Creek Meadow" in 2015.

Prior to September 2020, manual and mechanical weed removal techniques were the only tools available to managers 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 false brome (*Brachypodium sylvaticum*) and Himalayan blackberry (*Rubus bifrons*). Most of the ACEC is inundated with Himalayan blackberry, false brome and tangled with dense trees both living and dead, and a considerable amount of work is necessary to expand suitable habitat for Hitchcock's blue-eyed grass. 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.

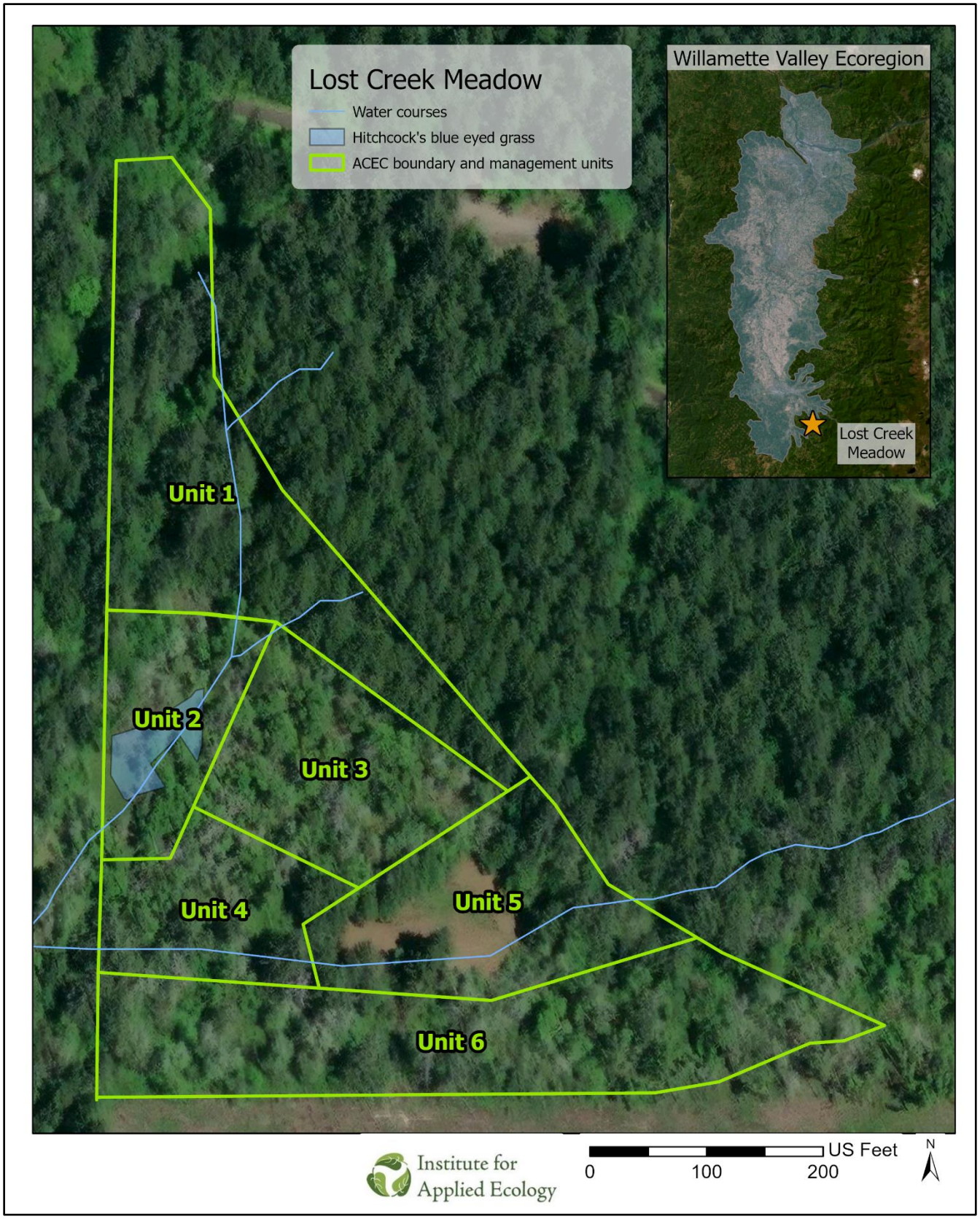

Figure 1. Lost Creek Meadow management units, Hitchcock's blue-eyed grass (*Sisyrinchium hitchcockii*) population, and meadow location within the Willamette Valley Ecoregion.

2. GOALS AND OBJECTIVES

The goal of this project is to maintain and improve rare mid-elevation meadow habitat that supports Hitchcock's blue-eyed grass. There are four primary objectives of this project:

1. Maintain and increase the population of Hitchcock's blue-eyed grass.
2. Reduce abundance of non-native species.
3. Increase abundance and diversity of native plant species.
4. Increase connectivity between restoration units.

3. RESTORATION ACTIVITIES

In 2023, restoration at Lost Creek Meadow focused on maintaining suitable Hitchcock's blue-eyed grass habitat by removing invasive grasses and shrubs, increasing meadow connectivity, monitoring Hitchcock's blue-eyed grass, and broadcasting a native seed mix.

Himalayan blackberry, and non-native grasses are priority threats to the ACEC native plant community, and both mow and herbicide treatments occurred in 2023. In March and April, IAE mowed Himalayan blackberry and cut Oregon ash (*Fraxinus latifolius*) and Douglas-fir (*Pseudotsuga menziesii*) in units 2, 3, and 5. In May, herbicide applications of Garlon 3A (triclopyr) targeted Himalayan blackberry (Figure 2, Figure 3, Table 1). Due to the level of Himalayan blackberry infestation in the understory of BLM land surrounding the ACEC, IAE also conducted herbicide treatments between Eagles Rest Road and the ACEC (Figure 2, Figure 3). In May, IAE staff treated false brome with Rodeo (glyphosate) in units 2 and 3 to reduce competitive pressure on Hitchcock's blue-eyed grass. In September, staff treated orchard grass (*Dactylis glomerata*) with Rodeo (glyphosate) in unit 5, and Himalayan blackberry with Garlon 3A (triclopyr) in units 3 and 5. No activities occurred in units 1, 4, or 6, but IAE is planning Himalayan blackberry and false brome treatments to reduce the invasive threat to the rest of the ACEC.

Figure 2. Roadside Himalayan blackberry (*Rubus bifrons*) after triclopyr treatment (June 14, 2023).

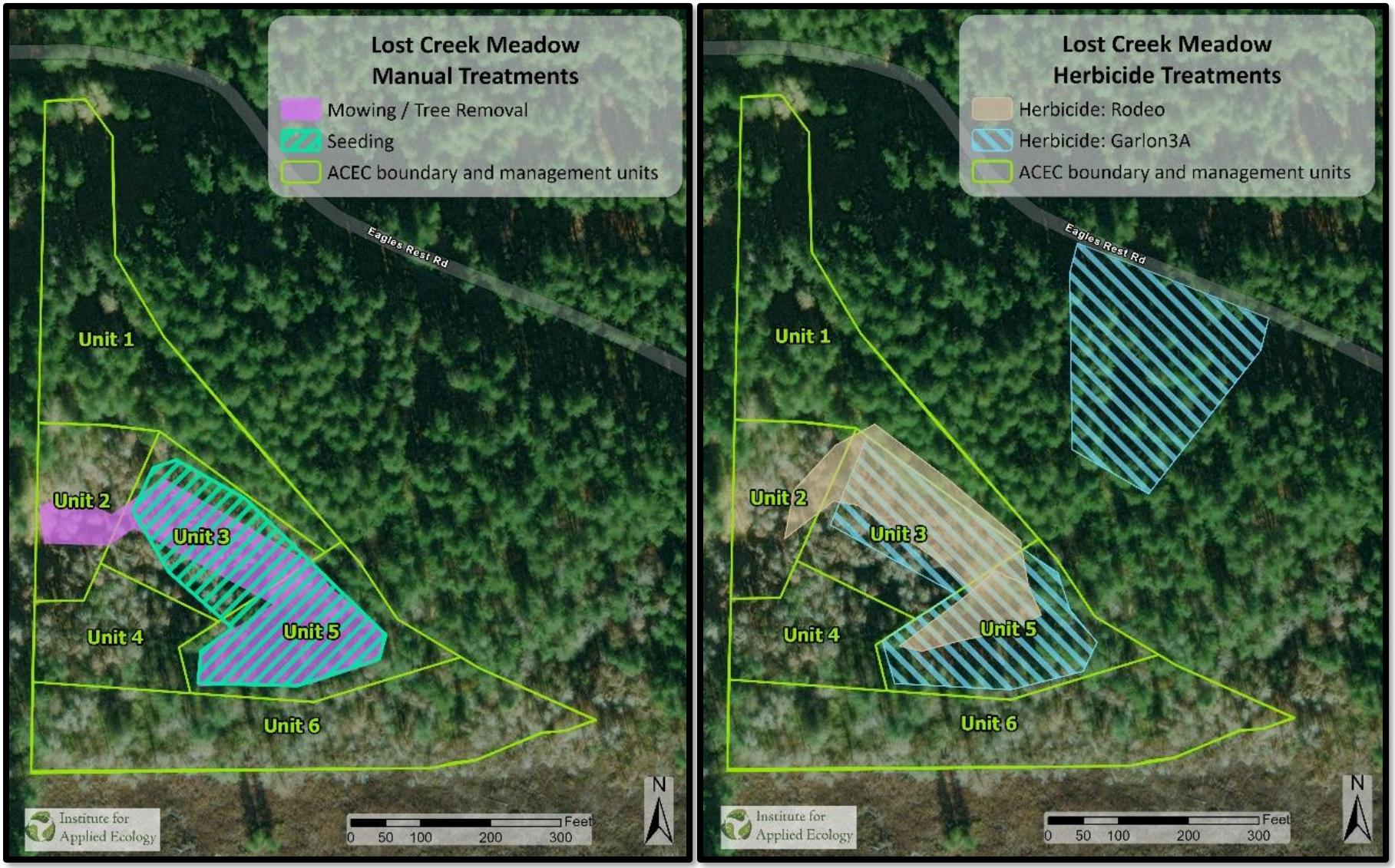

Figure 3. 2023 manual (left) and herbicide (right) treatments at Lost Creek Meadow.

Figure 4. Unit 3 Himalayan blackberry (*Rubus bifrons*) and tree removal: March 09, 2023 (left) and September 18, 2023 (right).

Table 1. 2023 management actions at Lost Creek Meadow

Date	Management Units	Management Action
March 9	1, 2, 3, and 5	Assessed winter storm damage was minimal; determined need for early spring mowing to treat Himalayan blackberry (*Rubus bifrons*).
March 15	2, 3, and 5	Mowed Himalayan blackberry and removed trees for corridor creation.
April 5		
April 13	1, 2, 3, and 5	Assessed efficacy of recent restoration efforts and discussed upcoming activities with Jessica Celis (Bureau of Land Management).
May 19	2, 3, and 5	Applied Garlon 3A (triclopyr) to Himalayan blackberry and Rodeo (glyphosate) to false brome.
May 24		
June 14	2	Monitored Hitchcock's blue-eyed grass (*Sisyrinchium hitchcockii*) with Jessica Celis (Bureau of Land Management).
September 18	2, 3, and 5	Assessed spring mowing and herbicide treatments were effective but fall herbicide treatment still needed.
September 22	5	Applied Rodeo (glyphosate) to orchard grass (*Dactylus glomerata*).
	3 and 5	Applied Garlon 3A (triclopyr) to Himalayan blackberry.
October 26		Broadcast native seed mix to bare ground.

In October, IAE broadcast 13.14 pounds of native seed mix to bare ground in units 3 and 5 to begin revegetating with native meadow species (Figure 3, Table 1, Table 2). All seed was sourced from the Willamette Valley except for western coneflower (*Rudbeckia occidentalis*) and Cusick's checkermallow (*Sidalcea cusickii*), which have mid-elevation sourced genetics. IAE selected species for both upland and wetland habitat types, fitting the unique ecology of Lost Creek. A complimentary seed mix is scheduled for seeding in fall 2024 to continue revegetating unit 3 and 5. Appendix C is a comprehensive seeding and planting record.

Table 2. 2023 Lost Creek Meadow native seed mix

Scientific name	Common name	Amount (lb)
Achillea millefolium	common yarrow	0.5
Agrostis exarata	spike bentgrass	0.75
Bromus carinatus	California brome	2
Clarkia amoena ssp. lindleyi	farewell-to-spring	0.25
Collinsia grandiflora	large-flowered blue-eyed Mary	0.2
Deschampsia cespitosa	tufted hairgrass	0.5
Downingia elegans	elegant calicoflower	0.5
Eleocharis ovata	ovoid spikerush	0.5
Eleocharis palustris	creeping spikerush	0.5
Eriophyllum lanatum	woolly sunflower	0.3
Gilia capitata	bluehead gilia	0.5
Grindelia integrifolia	Puget Sound gumweed	0.5
Hordeum brachyantherum	meadow barley	0.5
Iris tenax	toughleaf iris	0.5
Lomatium nudicaule	barestem biscuitroot	0.5
Lomatium triternatum	nine-leaf biscuitroot	0.5
Lomatium utriculatum	spring gold	0.5
Lupinus bicolor	bi-colored lupine	0.5
Lupinus rivularis	river lupine	0.5
Madia gracilis	grassy tarweed	0.25
Mimulus guttatus	common monkeyflower	0.1
Plagiobothrys figuratus	fragrant popcornflower	0.4
Plectritis congesta	shortspur seablush	0.5
Poa secunda	pine bluegrass	0.3
Rorippa curvisiliqua	western yellow-cress	0.25
Rudbeckia occidentalis	western coneflower	0.49
Sidalcea cusickii	Cusick's checkermallow	0.35
	Total (lb)	**13.14**

Hitchcock's blue-eyed grass

IAE monitored Hitchcock's blue-eyed grass at Lost Creek Meadow in June 2023 (Figure 5). Staff counted each basal crown as one individual (Figure 5), noted whether it was vegetative or flowering, and counted the number of flowering stems. Unlike previous years, staff did not count the number of fans per crown or the exact plant locations. We determined the population to have 209 individuals, 180 of which had flowering fans, and a total of 552 flowering stems (Figure 6, Appendix A).

The Hitchcock's blue-eyed grass population has increased 182% since first monitored in 2005, though it has decreased since the most recent census in 2010. The previous census occurred thirteen years ago (2010), and the population has decreased 60%, from 334 individuals in 2010, to 209 in 2023. Flowering stem counts, however, were up 57%, with 552 observed in 2023 (Figure 6, Appendix A). It is possible early spring mowing had an impact on Hitchcock's blue-eyed grass's ability to flower in higher abundance. A significant increase in population has occurred from 2009 (34 plants) to 2023 (209 plants), an increase of 515% (Figure 6, Appendix A). This increase is correlated with the start of tree removal, and Himalayan blackberry and false brome treatments that began in 2009.

The population increase in response to restoration actions emphasizes the need for further invasive weed management and tree removal across the entire ACEC. Furthermore, removing all Himalayan blackberry from within the ACEC while the surrounding BLM land is inundated with it will only leave a seed source for future spread. Treatment of invasive weeds should occur on BLM land between the ACEC and the road, to ensure long lasting suitable habitat for Hitchcock's blue-eyed grass at Lost Creek Meadow. In 2023, Hitchcock's blue-eyed grass was listed as endangered by Oregon, this further emphasizes the need for swift action to preserve and expand this population.

Complete monitoring data from 2005 to 2023 can be found in Appendix A.

Figure 5. Denise Giles and Zade Clark-Henry, Institute for Applied Ecology, and Jessica Celis, Bureau of Land Management, monitoring Hitchcock's blue-eyed grass, June 14, 2023 (left). Hitchcock's blue-eyed grass flower (center), and an individual plant with four vegetative fans arising from one crown (right).

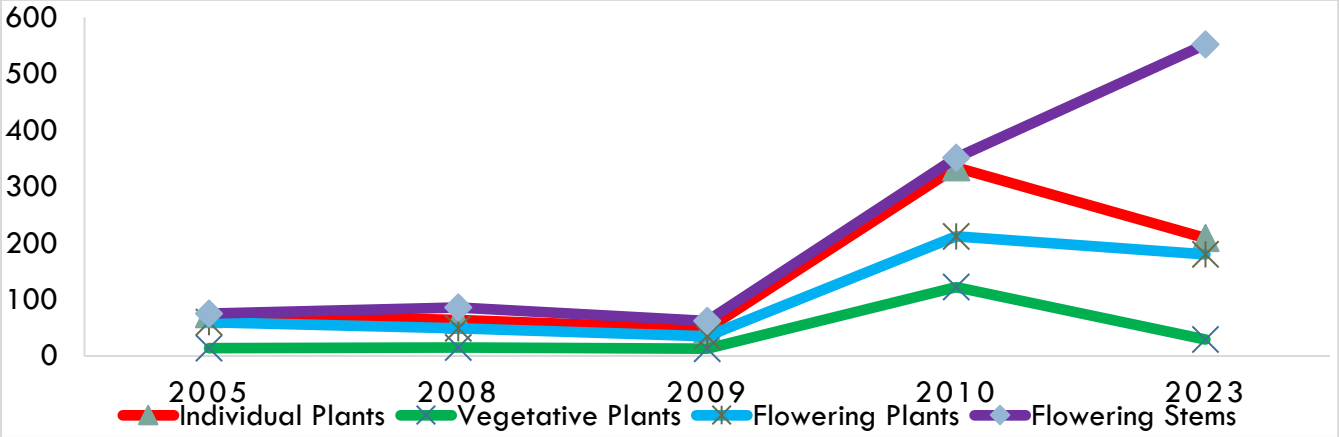

Figure 6. Census monitoring of Hitchcock's blue-eyed grass (Sisyrinchium hitchcockii) at Lost Creek 2005-2023.

In 2023, IAE started a seed amplification field for Hitchcock's blue-eyed grass using 0.68 grams of cleaned seed collected from Lost Creek Meadow in August 2022. The yield from this field will be used for future augmentation of the Lost Creek Meadow population and a smaller population on BLM land at Upper Oak Basin.

4. MANAGEMENT RECOMMENDATIONS

The primary goal of restoration at Lost Creek Meadow is to maintain and improve rare mid-elevation meadow habitat that supports Hitchcock's blue-eyed grass. Units 2, 3, and 5 show the best potential for expanding suitable meadow habitat and work should prioritize reduction of false brome and Himalayan blackberry.

To understand the effects of restoration actions on Hitchcock's blue-eyed grass and to help guide management decisions, we recommend a population census every two years. Augmentation of the population will be necessary to expand the population throughout the unit 3 corridor and the unit 5 meadow. Successful expansion into these areas coupled with tree thinning, revegetating with native species, and mowing and herbicide treatment of Himalayan blackberry and false brome across the entire site will ensure Hitchcock's blue-eyed grass at Lost Creek thrives well into the future.

In addition to protecting Hitchcock's blue-eyed grass, increasing abundance and diversity of the overall plant community should include protecting unique tree, shrub, and forb presence such as the oval-leaved viburnum (*Viburnum ellipticum*) and camas (*Camassia* sp.), collecting seed from other BLM mid-elevation ACEC locations, and purchasing seed to fill missing ecological niches. Collecting rush (*Juncus* sp.), sedge (*Carex* sp.), narrowleaf mule-ears (*Wyethia angustifolia*), Oregon geranium (*Geranium oreganum*), and western coneflower (*Rudbeckia occidentalis*) seed from McGowan Meadow and collecting camas and self-heal (*Prunella vulgaris*) seed from Garoutte Prairie should occur in 2023 to broadcast at Lost Creek Meadow in the fall.

The following management actions are recommended:

- Reduce adverse impacts to Hitchcock's blue-eyed grass while treating Himalayan blackberry and false brome by not walking on or dragging cut material over Hitchcock's blue-eyed grass and using spray shields while applying herbicide.

- Augment Hitchcock's blue-eyed grass population with plugs or seed from IAE amplification field in 2025 in units 2, 3, and 5.
- Mow Himalayan blackberry in units 2, 3 and 5. Mow in early spring with time for growth before late spring triclopyr (or glyphosate) treatment and mow again late fall after early fall triclopyr treatment to remove dead canes.
- Apply glyphosate to false brome in units 2, 3 and 1. Prioritize units in listed order and treat in spring.
- Apply triclopyr to Himalayan blackberry in units 5, 3, 2, and 1. Prioritize units in listed order and treat in late spring and early fall.
- Manually remove low abundance priority weeds that have potential to arrive with restoration disturbance: oxeye daisy (*Leucanthemum vulgare*), thistles (*Cirsium sp.*), and teasel (*Dipsacus fullonum*).
- Thin trees in unit 3 to continue corridor creation between meadows in unit 2 and 5. Create a thirty-foot-wide treeless opening between units in 2024 and continue thinning to widen in 2025.
- Cut standing dead trees absent of obvious wildlife nests, cavities, or foraging evidence. Buck and pile downed trees and branches onto existing decay piles.
- Revegetate unit 2 with native seed.
- Collect seed from oval-leaved viburnum and scatter to forested areas.
- Collect rush, sedge, narrowleaf mule-ears, Oregon geranium, and western coneflower seed from McGowan Meadow and collect camas and self-heal from Garoutte Prairie in 2024.
- Broadcast native seed mix in units 3 and 5 at a rate of 10 pounds per acre in 2024.

5. REFERENCES

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APPENDIX A. COMPLETE HITCHCOCK'S BLUE-EYED GRASS MONITORING DATA: 2005-2023

Methodology and terminology have changed multiple times since Hitchcock's blue-eyed grass was first monitored at Lost Creek in 2005. From 2005 to 2010, the census included individual plant counts, their locations within monumented plots, the number of vegetative and flowering fans (referred to in reports as ramets or stems) of each individual crown, and the number of flowering stems (Blakeley-Smith, 2011). Data from 2013 and 2017 are estimated totals calculated from population sub-samples (Axt, 2013, Ramthun, 2018).

Table 3. Hitchcock's blue-eyed grass monitoring data 2005-2023.

Year	Monitoring Method	Individual plant (one crown)	Vegetative plant	Flowering plant	Vegetative fan	Flowering fan	Flowering stems
2005	Census	74	14	60	54	73	75
2008	Census	64	15	49	116	84	86
2009	Census	48	13	35	39	53	62
2010	Census	334	122	212	393	335	351
2013	Sub-sample	368 ± 139	†	†	1243 ± 624	1592 ± 859	1608 ± 876
2017	Sub-sample	230 ± 159	†	†	1456 ±1103	1334 ± 1158	1383 ±1198
2023	Census	209	29	180	*	*	552

† Vegetative and flowering plant data not calculated in 2013 and 2017.
* Vegetative and flowering fan data not collected in 2023.

APPENDIX B. COMPLETED AND PROPOSED MANAGEMENT ACTIONS: 2005-2025

2005

- Site survey and weed assessment.
- Monitored Hitchcock's blue-eyed grass (*Sisyrinchium hitchcockii*).
- Collected Hitchcock's blue-eyed grass seeds and sent to Berry Botanical Garden for long term storage.

2006-2007

- No activities.

2008

- Monitored Hitchcock's blue-eyed grass with Cheshire Mayrsohn.
- Collected Hitchcock's blue-eyed grass seed.

2009 (Start of restoration activities at Lost Creek Meadow)

- Began growing Hitchcock's blue-eyed grass from seed collected in 2008.
- Felled ~30 trees to expand the perimeter of the meadow.
- Used brush-cutter to remove Himalayan blackberry (*Rubus bifrons*) and other shrubs from the perimeter of the meadow.

2010

- Monitored Hitchcock's blue-eyed grass.
- Collected seed of Hitchcock's blue-eyed grass.
- Removed ~20 trees to expand the perimeter of the meadow.

2011

- Collected Hitchcock's blue-eyed grass seed.
- Planted 10 Hitchcock's blue-eyed grass plants grown from seed collected in 2008.
- Contractor Walama restoration used brush-cutter to remove Himalayan blackberry and pulled false brome (*Brachypodium sylvaticum*)

2012

- Girdled Douglas-fir (*Pseudotsuga menziesii*) on east side of meadow ~six meters in the woods.
- Monitored Hitchcock's blue-eyed grass.
- Collected Hitchcock's blue-eyed grass seed.
- Used brush-cutter to remove Himalayan blackberry.

2013

- Seeded bare areas created in 2012 with Seeds of Success seed collections.
- Hand-pulled false brome and thistle (*Cirsium* sp.).
- Monitored Hitchcock's blue-eyed grass.
- Used brush cutter to remove Himalayan blackberry, one-seeded hawthorn (*Crataegus monogyna*), and Oregon ash (*Fraxinus latifolia*).

2014

- Mapped extent of Hitchcock's blue-eyed grass population with GPS.
- Brush-cutter removed Himalayan blackberry, Oregon ash, and fruit tree stump re-sprouts.
- Hand-pulled false brome.
- Consolidated slash piles.

2015

- Hand-pulled false brome.
- Used brush-cutter to remove Himalayan blackberry and Oregon ash re-sprouts.

2016

- Assessed site.

2017

- Completed census of Hitchcock's blue-eyed grass population in the meadow.

2018

- Hand-pulled false brome and grubbed Himalayan blackberry.

2019

- Felled and removed approximately 15 Douglas fir and Oregon ash from the small meadow and between the small and large meadows.
- Lopped countless saplings from the small meadow.
- Hand-pulled bracken fern, Himalayan blackberry, and false brome from within and around the Hitchcock's blue-eyed grass patch in the small meadow.

2020-2021

- Site survey and weed assessment.

2022

- Mowed unit 3 and 5 Himalayan blackberry with Northwest Youth Corp (NYC) in March and AmeriCorps: National Civilian Community Corps (NCCC) in December.
- Applied Garlon 3A (triclopyr) to unit 3 and 5 Himalayan blackberry in June and September.
- Cut down trees and piled debris into long term decay piles with NYC in March and NCCC in December.
- Collected 0.68 grams (cleaned weight) of Hitchcock's blue-eyed grass seed.

2023

- Monitored Hitchcock's blue-eyed grass. Counted 209 plants (crowns), 180 of which had flowering fans, and 552 total flowering stems.
- Applied glyphosate to false brome in unit 2 and 3.
- Applied triclopyr to Himalayan blackberry in units 2, 3, and 5.
- Mowed Himalayan blackberry in units 2, 3 and 5 in early spring.
- Removed trees in unit 2 to the south of Hitchcock's blue-eyed grass population. Bucked and piled downed woody debris onto existing decay piles.
- Broadcast native seed mix to units 3 and 5.

2024 (Proposed)

- Apply glyphosate to false brome in unit 2, 3 and 1. Prioritize units in listed order and treat in spring.
- Apply triclopyr to Himalayan blackberry in units 5, 3, 2, and 1. Prioritize units in listed order and treat in late spring and early fall.
- Mow Himalayan blackberry in units 2, 3 and 5. Mow in early spring with time for growth before late spring triclopyr (or glyphosate) treatment and mow again late fall after early fall triclopyr treatment to remove dead canes.
- Thin trees in unit 3 to continue corridor creation between meadows in unit 2 and 5. Create a thirty-foot-wide treeless opening between units in 2024 and continue thinning to widen in 2025 and 2026.
- Cut standing dead trees absent of obvious wildlife nests, cavities, or foraging evidence. Buck and pile downed woody debris onto existing decay piles.
- Broadcast selective native seed mix in unit 2, with Hitchcock's blue-eyed grass in mind.
- Broadcast native seed mix in unit 3 and 5.
- Collect seed from oval-leaved viburnum (*Viburnum ellipticum*) and scatter to forested areas.
- Collect rush, sedge, narrowleaf mule-ears, Oregon geranium, and western coneflower seed from McGowan Meadow and collect camas and self-heal from Garoutte Prairie in 2023.

2025 (Proposed)

- Monitor Hitchcock's blue-eyed grass using 2023 methods.
- Widen unit 3 corridor.
- Continue herbicide applications and mowing of blackberry and false brome.
- Broadcast native seed mix in unit 2, 3, and 5.
- Augment Hitchcock's blue-eyed grass population with plugs or seed from IAE amplification field.

APPENDIX C. COMPREHENSIVE PLANTING AND SEEDING RECORD 2011-2023

Scientific name	Common name	Amount seed (lb.) and number of plugs or shrubs {quantity}.	
		2023	2011
Achillea millefolium	common yarrow	0.5	
Agrostis exarata	spike bentgrass	0.75	
Bromus carinatus	California brome	2	
Clarkia amoena ssp. lindleyi	farewell-to-spring	0.25	
Collinsia grandiflora	large-flowered blue-eyed Mary	0.2	
Deschampsia cespitosa	tufted hairgrass	0.5	
Downingia elegans	elegant calicoflower	0.5	
Eleocharis ovata	ovoid spikerush	0.5	
Eleocharis palustris	creeping spikerush	0.5	
Eriophyllum lanatum	woolly sunflower	0.3	
Gilia capitata	bluehead gilia	0.5	
Grindelia integrifolia	Puget Sound gumweed	0.5	
Hordeum brachyantherum	meadow barley	0.5	
Iris tenax	toughleaf iris	0.5	
Lomatium nudicaule	barestem biscuitroot	0.5	
Lomatium triternatum	nine-leaf biscuitroot	0.5	
Lomatium utriculatum	spring gold	0.5	
Lupinus bicolor	bi-colored lupine	0.5	
Lupinus rivularis	river lupine	0.5	
Madia gracilis	grassy tarweed	0.25	
Mimulus guttatus	common monkeyflower	0.1	
Plagiobothrys figuratus	fragrant popcornflower	0.4	
Plectritis congesta	shortspur seablush	0.5	
Poa secunda	pine bluegrass	0.3	
Rorippa curvisiliqua	western yellow-cress	0.25	
Rudbeckia occidentalis	western coneflower	0.49	
Sisyrinchium hitchcockii	Hitchcock's blue-eyed grass		{10}
Sidalcea cusickii	Cusick's checkermallow	0.35	
Totals:		**13.14 lb.**	**10 plugs**
Seed source notes: Willamette Valley (WV) or mid-elevation (ME) genetic origin.		**All WV except R. occidentalis (ME) and S. cusickii (ME)**	**From Lost Creek collections.**