

Habitat Restoration and Monitoring of Shaggy Horkelia at Twin Prairie: 2019 Annual Report



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PREFACE

IAE is a non-profit organization whose mission is conservation of native ecosystems through restoration, research and education. IAE provides services to public and private agencies and individuals through development and communication of information on ecosystems, species, and effective management strategies. Restoration of habitats, with a concentration on rare and invasive species, is a primary focus. IAE conducts its work through partnerships with a diverse group of agencies, organizations and the private sector. IAE aims to link its community with native habitats through education and outreach.



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Cover photographs: Looking west over Twin Prairie. Photo taken on June 19th, 2018 by Andrew Esterson.

SUGGESTED CITATION

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TABLE OF CONTENTS

PREFACE.....	II
ACKNOWLEDGMENTS.....	III
SUGGESTED CITATION.....	III
TABLE OF CONTENTS.....	IV
LIST OF TABLES	IV
LIST OF FIGURES	V
1. EXECUTIVE SUMMARY	1
2. INTRODUCTION	1
3. GOALS AND OBJECTIVES	3
4. 2019 RESTORATION ACTIONS	3
5. SHAGGY HORKELIA MONITORING.....	5
5.1. Background and methods	4
5.2. Results	5
6. DISCUSSION	8
6.1. Habitat management.....	8
6.2. Shaggy horkelia monitoring	8
6.3. Shaggy horkelia augmentation	8
7. MANAGEMENT RECOMMENDATIONS	9
8. REFERENCES.....	9
APPENDICES.....	11
Appendix A. Restoration actions at Twin Prairie (2013-2019).....	11

LIST OF TABLES

Table 1. Summary of 2019 restoration activities at Twin Prairie.....	3
Table 2. Results of the shaggy horkelia (<i>Horkelia congesta</i> ssp. <i>congesta</i>) individual plant counts from 2014 to 2019 including reproductive individuals. Counts from 2016 to 2019 including seedlings.....	6
Table 3. Results of shaggy horkelia (<i>Horkelia congesta</i> ssp. <i>congesta</i>) stem counts from 2013 to 2019.....	7

LIST OF FIGURES

Figure 1. Location of Twin Prairie in the context of the greater Willamette Valley. Map inset shows the boundaries of Twin Prairie (yellow) and part of the Willamette Valley Prairie Oak and Pine Area of Critical Environmental Concern (orange; ACEC).	2
Figure 2. Location of shaggy horkelia (<i>Horkelia congesta</i> ssp. <i>congesta</i> ; HOCO) and non-native species within Twin Prairie.	4
Figure 3. Shaggy horkelia (<i>Horkelia congesta</i> ssp. <i>congesta</i>) population trends from 2013 – 2019. Data show total number of stems (browsed and unbrowsed), individuals (vegetative and reproductive) and reproductive individuals. In 2013 number of stems was the only data collected.....	5

Habitat Restoration and Monitoring of Shaggy Horkelia at Twin Prairie: 2019 Annual Report

1. EXECUTIVE SUMMARY

Twin Prairie is a mid-elevation meadow owned and managed by the Bureau of Land Management, Northwest Oregon District (BLM), and located in southern Lane County, Oregon, south of Cottage Grove. The meadow supports a population of shaggy horkelia (*Horkelia congesta* ssp. *congesta*), a rare species endemic to Oregon. The goals of restoration actions at Twin Prairie are to maintain and improve rare upland prairie habitat in support of the shaggy horkelia population that exists at the site. In 2019, restoration actions consisted of monitoring the shaggy horkelia population, pulling Scotch broom (*Cytisus scoparius*), removing encroaching trees, and sowing of native seed in those areas disturbed by restoration activities. In one day of monitoring, we observed 883 shaggy horkelia; of those, 70% were flowering, 33% were vegetative, and 4% were seedlings. A total of 1,460 stems were counted, 25% of which were browsed. The shaggy horkelia population at Twin Prairie has declined in size in 2018 and 2019. It is unclear what factors are contributing to this decrease, but possibilities include warm and dry springs, competition from non-native species, woody species encroachment, and herbivory. Improving habitat by reducing non-native species abundance (mainly grasses) and limiting encroachment may be one approach to slowing shaggy horkelia population reduction. In addition, fencing off some of the populations to reduce browsing may be useful to allow young plants to mature and older plants to reproduce and set seed. Furthermore, augmentation of shaggy horkelia following restoration disturbance activities should be included in future planning and restoration work.

2. INTRODUCTION

Twin Prairie is a mid-elevation prairie owned and managed by the Bureau of Land Management, Northwest Oregon District (BLM), and located in southern Lane County, Oregon, south of Cottage Grove (Figure 1). The prairie supports a population of the Oregon endemic, BLM Sensitive and State of Oregon Candidate (Oregon Department of Agriculture 2017) species shaggy horkelia (*Horkelia congesta* ssp. *congesta*) (Appendix A). The Oregon Biodiversity Information Center (ORBIC) designates shaggy horkelia as a “List 1” species that “contains taxa which are endangered or threatened throughout their range or which are presumed extinct” (ORBIC 2016). Management that protects or bolsters shaggy horkelia populations is necessary to prevent the listing of this species under the Federal Endangered Species Act.

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Figure 1. Location of Twin Prairie in the context of the greater Willamette Valley. Map inset shows the boundaries of Twin Prairie (yellow) and part of the Willamette Valley Prairie Oak and Pine Area of Critical Environmental Concern (orange; ACEC).

The Institute for Applied Ecology (IAE) and the BLM have partnered since 2013 to perform restoration work at Twin Prairie. This report describes restoration activities performed in 2019.

3. GOALS AND OBJECTIVES

The goals of restoration actions at Twin Prairie are to maintain and improve rare upland prairie habitat in support of the shaggy horkelia population that exists at the site. The four primary objectives of this project are to:

1. Decrease the abundance of non-native invasive plant populations,
2. Prevent encroachment of woody species into the prairie,
3. Increase diversity and abundance of the native plant community, and
4. Improve connectivity between meadows at Twin Prairie

4. 2019 RESTORATION ACTIONS

In 2019, restoration actions consisted of monitoring the shaggy horkelia population, pulling Scotch broom (*Cytisus scoparius*), removing trees, and sowing of native seed in those areas disturbed by restoration activities (TABLE 1). See Appendix A for a list of all restoration activities conducted at Twin Prairie from 2013 to 2019.

Table 1. Summary of 2019 restoration activities at Twin Prairie.

Date	Personnel	Task
5/30/2019	IAE and BLM staff	Site visit with new Upper Willamette Field Office Botanist John Klock to assess site conditions and discuss plans for the season.
6/17/2019	IAE and BLM staff	Monitored the shaggy horkelia population.
7/16/2019	IAE staff	Site visit to familiarize Jessica Celis, the new project lead, with the site, its issues, and plans for the remainder of the year.
12/13/2019	IAE staff and AmeriCorps Blue 5 Team	Handpulled Scotch broom in the western most prairie and removed approximately twelve Douglas-fir (<i>Pseudotsuga menziesii</i>) between 4 and 18 inches DBH. Additionally, countless tree saplings were removed from the north and west edges of the largest prairie.
12/23/2019	IAE staff	Broadcast a mix of mid-elevation native seed: California oatgrass (<i>Danthonia californica</i>), Roemer's fescue (<i>Festuca roemerii</i>), and common woolly sunflower (<i>Eriophyllum lanatum</i>) onto areas disturbed by tree and Scotch broom removal activities.

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Figure 2. Location of shaggy horkelia (*Horkelia congesta* ssp. *congesta*; HOCO) and non-native species within Twin Prairie.

5. SHAGGY HORKELIA MONITORING

5.1. Background and methods

In 2013, when shaggy horkelia monitoring began, geographically unique clusters of shaggy horkelia were designated as “patches” and mapped (FIGURE 2). Since then, patches have either been added or consolidated as new patches were found or as patches grew together and became indistinguishable from one another respectively. In 2019, a total of 22 patches were monitored.

Initially, every reproductive stem in each patch was counted. Since 2014, additional data has been collected, including the total number of individuals, reproductive status (rosette or flowering) and the number of browsed stems. To document evidence of reproduction, since 2016 mature individuals were distinguished from seedlings. Individual plants were defined as basal rosettes not obviously connected to a single crown, usually a minimum of 1-2 inches apart (Alverson 2013).

In 2015, 220 shaggy horkelia plugs were planted in two locations; these plots were monitored in 2016, 2018 and 2019, but no plugs have been found since 2016 (Shultz 2016).

5.2. Results

In 2019, 883 shaggy horkelia individuals were recorded; of those, 70% were flowering, 33% were vegetative and 4% were seedlings. There was a total of 1,460 reproductive stems counted; of those, 25% were browsed. Between 2018 and 2019 there was a slight increase in overall abundance, reproductive individuals, and total number of stems by 3%, 32%, and 18%, respectively; however, these two years had the lowest number of individuals since monitoring began in 2013 (Figure 3, Table 2, and Table 3).

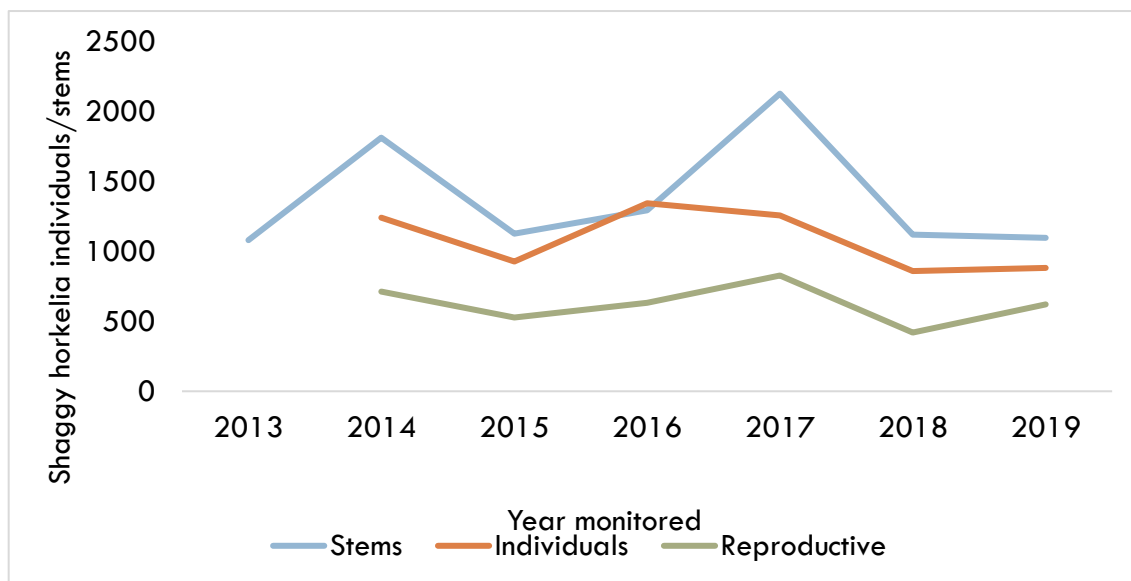


FIGURE 3. Shaggy horkelia (*Horkelia congesta* ssp. *congesta*) population trends from 2013 – 2019. Data show total number of stems (browsed and unbrowsed), individuals (vegetative and reproductive) and reproductive individuals. In 2013 number of stems was the only data collected.

TABLE 2. Results of the shaggy horkelia (*Horkelia congesta* ssp. *congesta*) individual plant counts from 2014 to 2019 including reproductive individuals. Counts from 2016 to 2019 including seedlings.

Patch	# of total plants (# seedlings)						# of reproductive plants					
	2014	2015	2016	2017	2018	2019	2014	2015	2016	2017	2018	2019
1	12	11	17	20	0	0	12	9	5	15	0	0
2	7	5	1	9 (4)	8	15	7	5	1	5	8	13
3,4,5*	407	406	503	700 (124)	484 (45)	528 (27)	235	216	263	408	188	358
6	20	16	18	23	0	0	10	9	13	16	0	0
7	62	35	42	46	41 (15)	39	50	30	30	33	19	20
7a	1	0	0	0	0	0	1	0	0		0	0
8	68	12	58	52	68 (14)	39	35	12	37	41	31	35
8a	0	1		2	0	1	0	1	0	2	0	1
9	3	1	1	2	0	0	3	1	1	2	0	0
10	1	0		20	0	0	1	0	0	0	0	0
10a	0	1	1	1	0	0	0	1	1	1	0	0
11	5	9	11	7	8	6	4	8	6	6	6	6
12	104	67	117 (5)	50	27	42 (1)	64	37	56	39	22	34
12a	0	2	2	1	1	4	0	2	2	1	1	4
12b	0	0	0	0	3	0					3	0
13	3	6	7	2	0	2	3	5	5	1	0	1
14	1	1	2	8	2	0	1	1	2	6	1	0
15	92	80	99	84	48 (1)	40	45	37	43	58	38	34
16	355	216	303 (81)	211	122 (12)	111 (3)	184	116	125	159	78	82
17	2	2	0	0	0	0	2	2	0	0	0	0
18	76	44	104 (60)	31	31 (7)	31	46	24	36	27	18	25
19	15	14	59 (50)	8	17 (1)	20 (3)	10	11	7	8	7	8
Total	1242	929	1345 (196)	1257 (128)	860 (95)	883 (34)	713	527	633	828	420	621

* Initially, patches 3, 4 and 5 were distinct, but over time they have expanded and merged, and are now counted as one patch.

Table 3. Results of shaggy horkelia (*Horkelia congesta* ssp. *congesta*) stem counts from 2013 to 2019.

Patch	# of reproductive stems (# of browsed stems)						
	2013	2014	2015	2016	2017	2018	2019
1	12	12 (24)	27	6	56	0	0
2	13	10 (6)	8 (3)	1 (1)	14	21	45 (3)
3,4,5*	489	212 (315)	325 (168)	88 (409)	423(634)	417 (158)	530 (288)
6	27	5 (25)	20	11 (17)	41	0	0
7	77	51 (63)	51 (11)	30 (38)	84(7)	39	38
7a	0	2	0	0	0	0	0
8	61	39 (54)	24	44 (39)	99(23)	62 (18)	55 (29)
8a	0	0	2	0	3	0	2 (1)
9	3	3 (1)	2	2	5	0	0
10	9	6	0	0	0	0	0
10a	0	0	1	1	1(1)	0	0
11	2	8	6 (16)	1 (9)	6(15)	17(16)	10 (3)
12	17	113 (79)	54 (23)	33 (86)	80(23)	38(5)	93
12a	0	0	5	6 (2)	1	5	16
12b	0	0	0	0	0	9(1)	0
13	19	2 (12)	11	2 (9)	1	0	2
14	6	3 (4)	1 (2)	3	14	11	0
15	4	43 (56)	43 (27)	42 (38)	83	59	50
16	229	205 (287)	111 (98)	83 (185)	239(136)	167 (9)	149 (37)
17	4	2	2	0	0	0	0
18	102	66 (68)	48 (4)	10 (85)	57(35)	40 (6)	76
19	7	8 (29)	35	3 (17)	15(14)	18 (5)	33
Unbrowsed + (browsed)	N/A	790 + (1023)	776 + (352)	359 + (935)	1222 + (907)	903 + (218)	1098 + (362)
TOTAL Combined	1081	1813	1128	1294	2129	1121	1460
Percent browsed	N/A	56%	31%	72%	42%	19%	25%

* Initially, patches 3, 4 and 5 were distinct, but over time they have expanded and merged, and are now counted as one patch.

6. DISCUSSION

6.1. Habitat management

A variety of trees, including Douglas-fir, Pacific madrone (*Arbutus menziesii*), bigleaf maple (*Acer macrophyllum*) and Oregon ash (*Fraxinus latifolia*), along with shrubs Himalayan blackberry (*Rubus bifrons*) and Scotch broom, are the primary woody species establishing in the prairie. Limbing and/or removal of the aforementioned species that encroach into shaggy horkelia habitat is a priority for restoration. In 2019, with the help of AmeriCorps Blue 5 Team we were able to remove a dozen Douglas-fir trees and countless saplings from the northern edge of the largest prairie where most of the shaggy horkelia population remains. Continued monitoring will inform whether this species is responding positively to these removal efforts. Additionally, a large area of Scotch broom was removed from the westernmost edge of the prairie, expanding rare upland prairie habitat. Once the Scotch broom is under control, efforts to remove Himalayan blackberry should be prioritized. If the use of herbicides becomes available at this site, non-native shrubs should be treated to prevent resprouting from root-system fragments that remain in the ground after hand-pulling.

In previous years, after non-native species removal, a native seed mix was broadcast in disturbed areas. The mix consisted of Roemer's fescue, common woolly sunflower and California oatgrass. This seed was grown in partnership with the BLM and The Nature Conservancy and was provided for restoration use at no cost to the project; however, the last of this seed was broadcast in 2019. Ongoing seed collections from Twin Prairie and other mid-elevation sites and subsequent seed amplification would be beneficial to ensure mid-elevation seed is available for future restoration actions.

6.2. Shaggy horkelia monitoring

In 2018, the shaggy horkelia population at Twin Prairie had its lowest population count since we started monitoring this population in 2014. It is unclear what factors are contributing to these low counts, but possibilities include warm and dry springs, herbivory, forest encroachment and competition from non-native species. Of these factors, forest encroachment, non-native plant competition and herbivory are ones that can be managed, although these efforts may be cost-prohibitive. Improving habitat by reducing non-native species (primarily non-native perennial grasses) and limiting tree encroachment may be one approach to preventing the further decline of this shaggy horkelia population. In addition, fencing off some of the populations to reduce browsing may be useful to allow young plants to mature and older plants to reproduce and set seed.

Finally, it may be worth altering the monitoring cycle of shaggy horkelia from annually to once every two years. This would allow more resources to be shifted to implementing restoration treatments for the enhancement of shaggy horkelia habitat in the non-monitoring years.

6.3. Shaggy horkelia augmentation

Previous augmentation efforts of shaggy horkelia in 2015 were unsuccessful. Discussion from the 2016 annual report suggested this could have been due to low vigor of out planted plugs or a lack of moss cover at planting sites (Schultz 2016). Future augmentation should test the efficacy of planting plugs versus sowing seeds and plots should be chosen near existing patches where moss cover is high. Plant

material could be collected on or off site. Collecting seed from off site could increase the genetic diversity of the Twin Prairie shaggy horkelia population, which may contribute to its long-term viability. If using source seed from sites other than Twin Prairie, we recommend only collecting from sites with similar thin-soiled, mid-elevation habitat. Population information collected by Kaye and Gisler in 1993 reported 20 known populations of shaggy horkelia within the Willamette Valley, Oregon. Permission should be sought to collect seed from public and private mid-elevation sites.

7. MANAGEMENT RECOMMENDATIONS

- **Monitor shaggy horkelia:** Consider a change in the monitoring cycle of shaggy horkelia from annually to biennially.
- **Remove encroaching vegetation:** Tree clearing should continue along prairie edges, especially near shaggy horkelia patches and surrounding Oregon white oaks (*Quercus garryana*).
- **Manage non-native shrubs:** Remove Scotch broom and Himalayan blackberry. If herbicides become available for use, consider cut and dab method for treating these shrubs.
- **Locate and remove non-native grass and forb species:** Surveys should be conducted in spring to determine where large patches of non-native herbaceous species occur. The most aggressive species should be targeted for removal by hand weeding or mowed with a string trimmer to reduce seed set. If herbicides becomes available for use, consider spot spraying these species using a backpack sprayer.
- **Collect mid-elevation native seed:** Native seed (e.g. California fescue [*Festuca californica*], blue wildrye [*Elymus glaucus*] and Junegrass [*Koeleria macrantha*]) should be collected from Twin Prairie and other mid-elevation sites and stored until used for future direct seeding (especially in areas where woody material has been removed), plug production and/or seed amplification.
- **Wild-collect shaggy horkelia seed:** To increase the size and genetic diversity of the shaggy horkelia population at Twin Prairie, seed should be collected from this and other mid-elevation wild populations. Some of this seed should be used to grow plugs for fall outplanting. The remainder should be direct seeded at the site.

8. REFERENCES

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APPENDICES

Appendix A. Restoration actions at Twin Prairie (2013-2019)

2013

- Seeds of Success collection (common yarrow (*Achillea millefolium*), winecup (*Clarkia purpurea*), American wild carrot (*Daucus pusilis*), Roemer's fescue (*Festuca roemerii*), prairie Junegrass (*Koeleria macrantha*), nineleaf biscuitroot (*Lomatium triternatum*), common madia (*Madia elegans*), grassy tarweed (*Madia gracilis*), woodland madia (*Madia madioides*), and short spurred seablush (*Plectritis congesta*))
- Shaggy horkelia, Himalayan blackberry and Scotch broom populations were mapped
- ~1.17 acres of Himalayan blackberry was removed
- ~0.4 acres of Scotch broom was removed
- Shaggy horkelia was monitored (only stems counted)

2014

- Shaggy horkelia, Himalayan blackberry and Scotch broom populations were mapped
- ~1.2 acres of Himalayan blackberry were removed
- ~0.5 acres of Scotch broom was removed
- A native seed mix was broadcast over disturbed areas (common selfheal (*Prunella vulgaris*), blue wildrye (*Elymus glaucus*), Roemer's fescue and California oatgrass (*Danthonia californica*))
- Shaggy horkelia was monitored (vegetative and reproductive individuals, browsed and unbrowsed stems)

2015

- Scotch broom was removed
- Shrubs and trees around shaggy horkelia populations were limbed or felled
- Large trees near shaggy horkelia plots were girdled
- Shaggy horkelia was monitored (vegetative and reproductive individuals, browsed and unbrowsed stems)
- 220 shaggy horkelia plugs were planted in two locations (110 plugs in each)

2016

- Shaggy horkelia population was mapped
- Himalayan blackberry and Scotch broom was removed
- Shrubs and trees around shaggy horkelia populations were limbed or felled
- Large trees near shaggy horkelia plots were girdled
- Shaggy horkelia was monitored (vegetative and reproductive individuals, browsed and unbrowsed stems)

- Augmented shaggy horkelia population was monitored
- A native seed mix was broadcast over disturbed areas (blue wildrye, Roemer's fescue, common woolly sunflower, and California oatgrass)

2017

- Scotch broom was removed
- Shaggy horkelia was monitored (vegetative and reproductive individuals, browsed and unbrowsed stems)
- Shrubs and trees around shaggy horkelia populations were limbed or felled
- Management plan was reviewed by IAE staff

2018

- Scotch broom was removed
- Shaggy horkelia was monitored (vegetative and reproductive individuals, browsed and unbrowsed stems)

2019

- Scotch broom was removed
- Shaggy horkelia was monitored (vegetative and reproductive individuals, browsed and unbrowsed stems)
- Approximately 12, 14-18 inch DBH Douglas-fir (*Pseudotsuga menziesii*) trees were cut from the northern edge of the large meadow and countless saplings were cut from along the north and west edges of the meadow.

2020 (proposed)

- Consider a change in the monitoring cycle of shaggy horkelia from annual to biennial.
- Tree clearing should continue along prairie edges, with emphasis on shaggy horkelia patch locations and those surrounding Oregon white oaks (*Quercus garryana*).
- Remove Scotch broom and Himalayan blackberry. If herbicides become available for use, consider cut and dab method for treating these shrubs.
- Determine where large patches of non-native prairie species occur and target the most aggressive for removal by hand or mow reproductive stems with a string trimmer to reduce seed set. If herbicides becomes available for use, consider spot spraying these species.
- Collect mid-elevation native seed (e.g., California fescue (*Festuca californica*), blue wildrye and prairie Junegrass), should be collected from Twin Prairie and stored to use for future prairie seeding, especially in areas where woody material has been removed.
- Wild-collect shaggy horkelia seed should be collected from Twin Prairie and other mid-elevation wild populations for growing plugs for planting in the fall.