# Herbert Farm and Natural Area restoration – 2024 annual report

2/25/2025

Report for the Willamette Wildlife Mitigation Program, Oregon Department of Fish and Wildlife

Report prepared by Sara Alaica and Andrew Esterson

*Institute for Applied Ecology*

## 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.

Questions regarding this report should be directed to:
Keith Norris, Executive Director
Institute for Applied Ecology
4950 SW Hout Street
Corvallis, Oregon 97333

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

# ACKNOWLEDGMENTS

A key to the overall success of restoration work at Herbert Farm has been the collaboration between IAE and its funders and restoration partners, several of which have contributed important on-the-ground actions and project support. Funding was provided by the Oregon Department of Fish and Wildlife (ODFW) through Grant Agreement Number 107-22, and we thank ODFW's Willamette Wildlife Mitigation Program Owen Cass for his help administering the grant and providing support. Restoration activities were coordinated or conducted by Jude Geist from the Parks and Recreation Department of the City of Corvallis, Susan Barnes from ODFW, and IAE staff: Aynesley Wilson, Evan Lasley, Jeni Nugent, Llew Whipps, and Zade Clark-Henry. Photos in this report were taken by Sara Alaica, unless otherwise stated.



**Cover photograph**: Golden paintbrush (*Castilleja levisecta*) at Herbert Farm Natural Area, May 1, 2024.

## Suggested citation

Alaica, S, A. Esterson. 2025. Herbert Farm and Natural Area restoration – 2024 annual report. Unpublished report for the Willamette Wildlife Mitigation Program, Oregon Department of Fish and Wildlife. Institute for Applied Ecology, Corvallis, OR.

# TABLE OF CONTENTS

# Herbert Farm and Natural Area restoration – 2024 annual report

**REPORT FOR THE WILLAMETTE WILDLIFE MITIGATION PROGRAM, OREGON DEPARTMENT OF FISH AND WILDLIFE**

## 1. EXECUTIVE SUMMARY

Herbert Farm and Natural Area, a 221-acre property near Corvallis in Benton County, Oregon, is owned by the City of Corvallis, and has a conservation easement held by Oregon Department of Fish and Wildlife through the Willamette Wildlife Mitigation Program. Since 2013, the Institute for Applied Ecology (IAE), with assistance and funding from several agencies, has restored formerly farmed areas to natural habitats. In 2024, contractors and IAE staff manually removed and applied herbicide to noxious weeds, mapped over a dozen weed species, created 10 nesting patches for streaked horned lark (*Eremophila alpestris strigata*), and planted 25,849 bulbs and roots to increase diversity of the plant community. The City of Corvallis mowed the prairies in the fall. IAE staff also put out traps and monitored for emerald ash borer, surveyed the swales and standing ponds for amphibian egg masses, and trapped and tagged an adult western pond turtle. Lastly, in collaboration with City of Corvallis staff, IAE drafted a land management plan that will guide management actions at Herbert Farm through 2034.

## 2. INTRODUCTION

Herbert Farm and Natural Area (HFNA) is a 221-acre property located south of Corvallis in Benton County, Oregon. The property is owned and administered by the Parks and Recreation Department of the City of Corvallis (City) and has a conservation easement with Oregon Department of Fish and Wildlife (ODFW) through the Willamette Wildlife Mitigation Program (WWMP), which is funded by the Bonneville Power Administration (BPA).

Despite previous agricultural use, the property retained areas of high-quality native prairie, oak savanna, and riparian forest (Figure 1). In addition, two federally listed plant species were present, including Kincaid's lupine (*Lupinus oreganus*) and Nelson's checkermallow (*Sidalcea nelsoniana*; delisted in 2022). Peacock larkspur (*Delphinium pavonaceum)*; listed as endangered by the state of Oregon) and several rare species were also present (Institute for Applied Ecology 2013).

The City developed a management plan for HFNA to guide restoration and management over a 10-year period (2011-2021, City of Corvallis 2011). The Institute for Applied Ecology (IAE) developed habitat restoration plans with guidance from the management plan and collaboration with restoration partners including the City, ODFW, BPA, and the U.S. Fish and Wildlife Service (USFWS) for two phases of habitat restoration at HFNA (Menke et al. 2013, Moore 2017a). Restoration of Phase I, 84 acres north-west of Matt Creek, and Phase II, 130 acres east of Muddy and Matt creeks, began in 2013 and 2015, respectively.

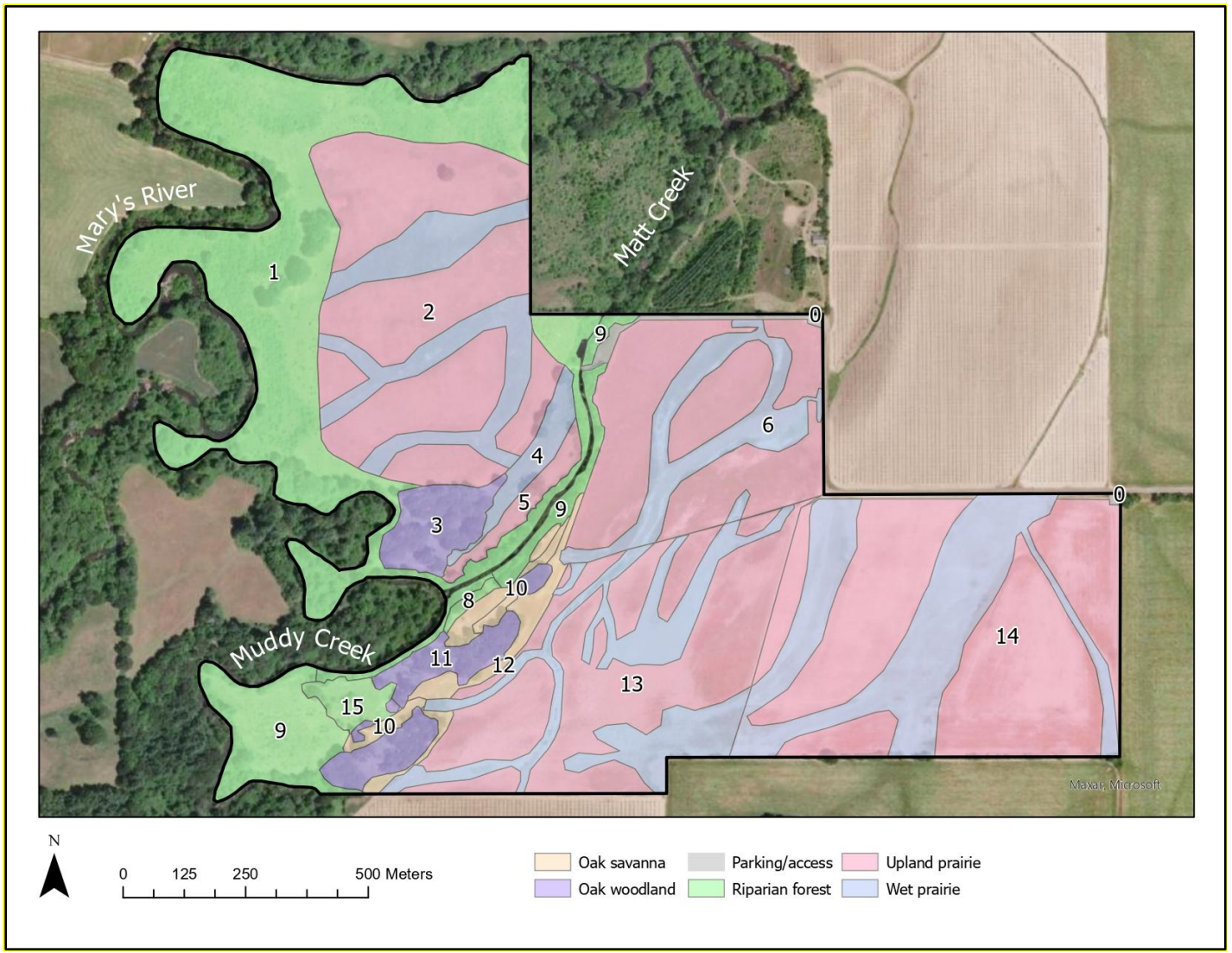



Figure 1. Current habitats at Herbert Farm and Natural Area in 2024 with map codes for individual areas.

HFNA is an important site for streaked horned larks (*Eremophila alpestris strigata*), a threatened species found nearby at the Corvallis Municipal Airport. Restoration east of Matt Creek focused in part on creating habitat for streaked horned larks. An Endangered Species Conservation Recovery Implementation grant, funded by USFWS, was implemented in 2016-2017 to compare restoration treatments for creating streaked horned lark habitat and to monitor the population at HFNA (Moore 2017b).

The USFWS Partners for Fish and Wildlife Program constructed berms in 2016 to flood two swales and promote bare ground and sparse vegetation for streaked horned lark habitat (Moore 2017c). In 2018, the City of Corvallis, IAE, and Precision Approach and Ecological Assessment and Restoration Services, began comanaging a runway improvement mitigation project funded by the Federal Aviation Administration (FAA). Between 2018 and 2020, 23 acres of former grass seed production fields were chemically fallowed for three years to attract streaked horned larks and minimize potential negative impacts to the species during runway construction at Corvallis Municipal Airport. This project, with additional funding from City of Salem and USFWS, included monitoring streaked horned lark populations and testing efficacy of decoys and a sound attraction system at HFNA (Lapinski and Bahm 2018).

Restoration was conducted and coordinated by IAE using operations and maintenance funding from the WWMP, as well as several other grants including three Plants for People grants (funded by the Oregon Watershed Enhancement Board) and three State Wildlife Grants (funded by USFWS through the Center for Natural Lands Management [CNLM]). Other partner agencies, including the USFWS Partners for Fish and Wildlife Program, ODFW, the City, and Confederated Tribes of Grand Ronde (CTGR) contributed in-kind efforts.

Since active restoration efforts began in 2012, all former-agricultural fields have transitioned into prairie habitat. Threatened and endangered species have been augmented with plantings and seedings, and riparian areas have been revegetated with trees and shrubs. In the forest, conifers were felled and girdled to open the canopy. For a complete list of restoration actions conducted to date see Appendix 1.

## 3. GOALS AND OBJECTIVES

The City's overall mission for HFNA includes maintaining and restoring ecological attributes, managing agriculture compatible with natural and cultural resources, supporting education projects, and encouraging recreation while protecting rare species and sensitive habitat (City of Corvallis 2011).

The City's restoration goals (City of Corvallis 2011) include:

- Conserve, protect, and enhance natural functioning habitats of HFNA, in particular the prairie, oak savanna, oak woodland, and riparian corridors.
- Manage HFNA agricultural lands in a sustainable manner that affords protection and restoration of natural habitat functions.

Management Plan restoration objectives (City of Corvallis 2011):

- Restore prairie structure, diversity, and plant community composition by reducing encroachment of woody vegetation, controlling invasive plant species, and increasing native plant and animal species abundance.
- Enhance oak savanna habitat by improving stand composition and structure and expanding the presence of rare plant and animal species.
- Improve health and vigor of upland forest and oak woodland.

- Increase native plant abundance, vigor, and diversity of riparian corridors and buffers, increase stream bank shading and reduce erosion.

This report summarizes restoration work completed at HFNA in 2024. It also summarizes actions achieved under other grants and in-kind actions by partner agencies to recognize the multiple contributions to restoration at HFNA. The current habitat conditions at HFNA are shown in Figure 1, with map codes provided for interpretation of tables and the text. Previous years' restoration actions are summarized in Appendix 1 and described in previous reports (Moore 2017c, 2018, 2019, 2020, Moore & Currin 2021, 2022, Alaica et al. 2023, Alaica et al. 2024).

# 4. 2024 RESTORATION ACTIONS

Restoration actions conducted at HFNA are shown in Figure 3, with detailed descriptions in the text. For a breakdown of actions by habitat unit, see Appendix 1.

## 4.1. Vegetation management

### Broadcast and spot spraying

In 2024, IAE applied herbicide targeting reed canarygrass (*Phalaris arundinacea)* along Matt and Muddy Creeks starting in February to capture early growth while other species are dormant (Figure 2). This was highly successful in reducing blooming and seed set in the summer.

In April, R Franco Restoration spot treated common invasive plants such as oneseed hawthorn (*Crataegus monogyna)*, velvet grass (*Holcus lanatus)*, and stinking chamomile (*Anthemis cotula)*. The spray crew targeted stinking chamomile before this annual species flowered, to reduce its presence in the seed bank (Figure 2). In Fall 2024, IAE staff broadcast glyphosate herbicide targeting large patches of a new invasion of North Africa grass (*Ventenata dubia*) in the west prairie (Figure 3). This first year of treatment targeted newly sprouted early fall growth while native species remained dormant from the summer.

Figure 2. (l-r) New winter growth of reed canarygrass (*Phalaris arundinacea)*, February 22, 2024; stinking chamomile (*Anthemis cotula)* growing in the swales, April 2, 2024.

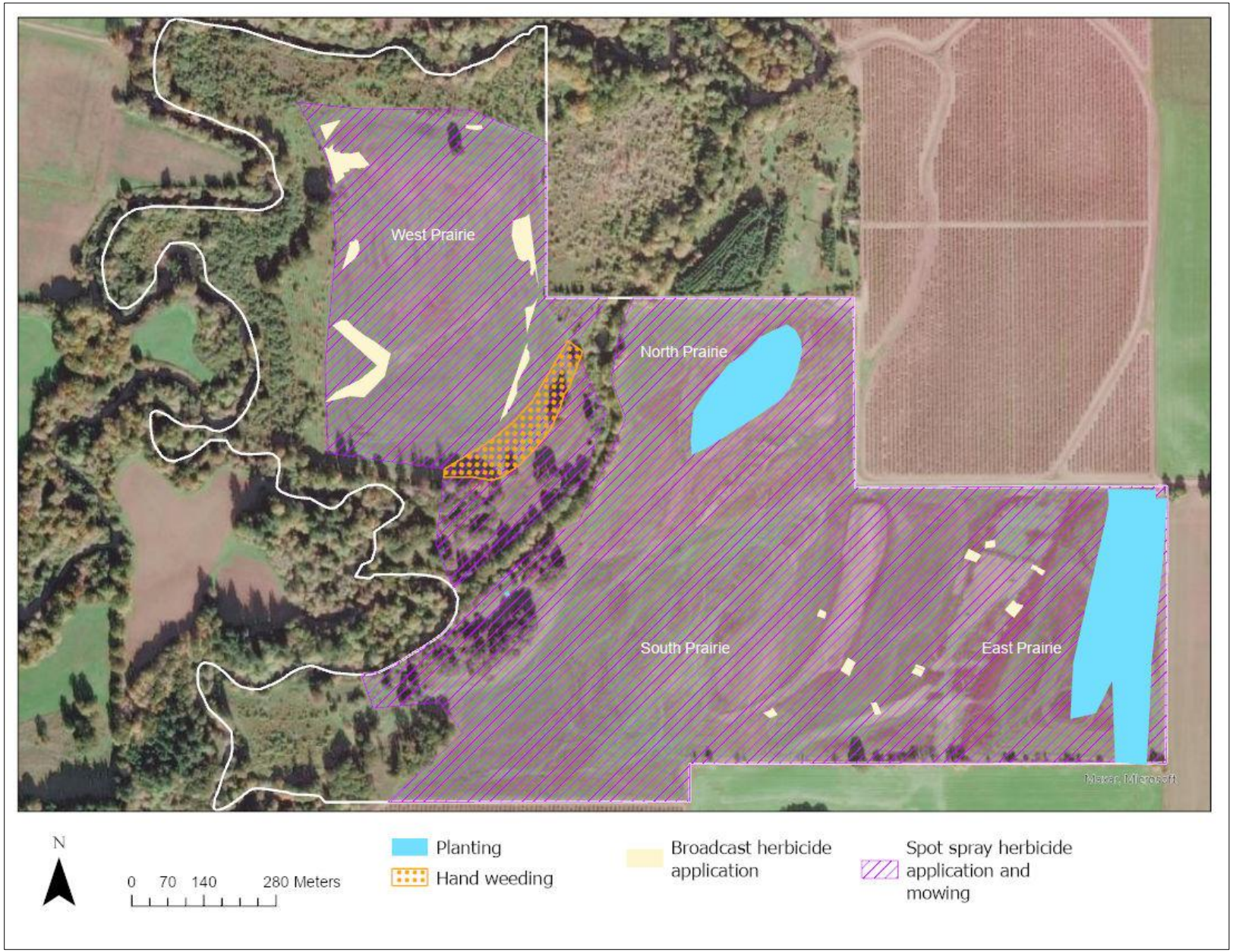



Figure 3. Restoration actions at Herbert Farm Natural Area in 2024.

### Streaked horned lark nesting area creation

The federally threatened streaked horned lark (*Eremophila alpestris strigata*) is a disturbance specialist that relies on bare ground for nesting. In 2024, as part of a grant with ODFW, IAE staff applied broad spectrum herbicide to 10 patches of vegetation, each approximately 0.05 acres, in East Prairie to create nesting habitat (Figure 4). Staff broadcast herbicide in April and again in November, to kill the vegetation, mowed the dying grass to expose the soil. Staff selected nesting patch locations adjacent to swales where the larks are known to forage.

Figure 4. (l-r) Broadcast glyphosate herbicide to reduce vegetation, April 30, 2024; Institute for Applied Ecology staff applying herbicide, November 8, 2024.

### Manual removal

The biennial legume hairy vetch (*Vicia villosa*) continues to be an issue in West Prairie, smothering native plants (Figure 5). Herbicide applications could inadvertently harm intermixed rare native species, so manual removal was the preferred treatment in 2024. In June, IAE staff and R Franco Restoration manually removed hairy vetch from areas with Kincaid's lupine, golden paintbrush (*Castilleja levisecta*), and Nelson's checkermallow.

Figure 5. (l-r) Hairy vetch (*Vicia villosa*) smothering native plants in west prairie; Institute for Applied Ecology staff removing hairy vetch by hand, June 4, 2024.

### Mowing

In June, R. Franco Restoration mowed an access path around the HFNA perimeter, and between the riparian planting areas. In August, IAE staff mowed Queen Anne's lace (*Daucus carota*) to prevent seed set. On September 26, The City of Corvallis mowed all four prairies, leaving sporadic wildlife habitat patches.

## 4.2. Planting

In 2024, IAE organized two volunteer events in collaboration with the City of Corvallis. On November 21, eight community volunteers and three IAE staff planted 3,387 bulbs and bare-root plants in North Prairie (Figure 6). On December 20, 16 volunteers and four staff planted 8,467 plants in East Prairie (Figure 6). IAE staff added additional plant materials in the fall, totaling 25,849 bulbs and bare-root plants at HFNA in 2024 (Table 1).

Figure 6. (l-r) Institute for Applied Ecology staff with community volunteers planting bulbs in North Prairie, November 21, 2024; volunteers in East Prairie on December 20, 2024. Photos by Evan Lasley.

Table 1. Bulbs and bare-root species planted at Herbert Farm and Natural Area in 2024.

| Scientific Name | Common Name | Type | Amount |
|---|---|---|---|
| *Allium cernuum* | nodding onion | bulb | 367 |
| *Asclepias speciosa* | showy milkweed | bare root | 370 |
| *Brodiaea coronaria* | crown brodiaea | bulb | 2,400 |
| *Brodiaea elegans* | harvest brodiaea | bulb | 2,610 |
| *Camassia leichtlinii* | large camas | bulb | 4,427 |
| *Camassia quamash* | common camas | bulb | 3,890 |
| *Dichelostemma congestum* | ookow | bulb | 500 |
| *Lomatium nudicaule* | barestem biscuitroot | bare root | 550 |
| *Perideridia gairdneri* | Gairdner's yampah | bulb | 500 |
| *Sisyrinchium idahoense* | Idaho blue-eyed grass | bare root | 6,200 |
| *Triteleia hyacinthina* | white brodiaea | bulb | 4,035 |
| | Total | | 25,849 |

# 5. MONITORING

## 5.1 Weed mapping

In 2024, IAE staff mapped non-natives species at HFNA and listed below, in order of management priority, are the six most abundant species (Figure 7).

**North Africa grass (*Ventenata dubia*)**

This is the first year this grass was identified at HFNA, and it is present in large quantities in West Prairie (Figure 7). In the Willamette Valley, North Africa grass tends to occur in Oregon white oak (*Quercus garryana*)/blue wildrye (*Elymus glaucus*) savannas where it can outcompete native perennial grasses and forbs, causing a decrease in species diversity (Innes 2022), threatening the high-quality prairies at HFNA. This species, being a winter annual, should be sprayed with glyphosate between October and December while native species are dormant.

**Velvet grass (*Holcus lanatus*)**

Velvet grass occurs throughout HFNA, but is particularly abundant in South Prairie along the walking path where visitors are likely the vector of dispersal (Figure 7). This fast-growing species quickly creates monocultures if not detected and treated early and is best managed with a broad-spectrum herbicide that can penetrate the hairy stems early in the spring (February and March).

**Reed canary grass (*Phalaris arundinacea)***

Reed canary grass is present along the banks of the Marys River, Muddy River, and Matt Creek, and therefore seed is spread to the riparian areas at HFNA during high water events (Figure 7). It requires regular maintenance to prevent it from spreading farther into the prairies. The application of an aquatic formulation of glyphosate in early February allows contact with young growing shoots before they are inundated by water in the spring.

**Oneseed hawthorn (*Crataegus monogyna*)**

Oneseed hawthorn is common in North Prairie, likely spreading from a large population on the adjacent private property (Figure 7). It is best managed with a broadleaf-specific herbicide, such as triclopyr, in the fall and regular mowing to prevent tree establishment.

**Common sheep sorrel (*Rumex acetosella)***

Common sheep sorrel is a perennial weed that is likely a remnant from agricultural uses at HFNA. It has a long-lived seed bank of more than 25 years (DiTomaso 2013) and will require ongoing maintenance to prevent its spread. It responds well to a broad-leaf specific herbicide treatment in the spring that avoids damaging native grasses.

**Stinking chamomile (*Anthemis cotula*)**

In 2024, IAE discovered stinking chamomile in a swale in East Prairie (Figure 7). It is the first time it has been seen outside of West Prairie, and may have been spread from one swale to another by migrating birds. This annual is easily controlled by an aquatic glyphosate herbicide in the early spring.

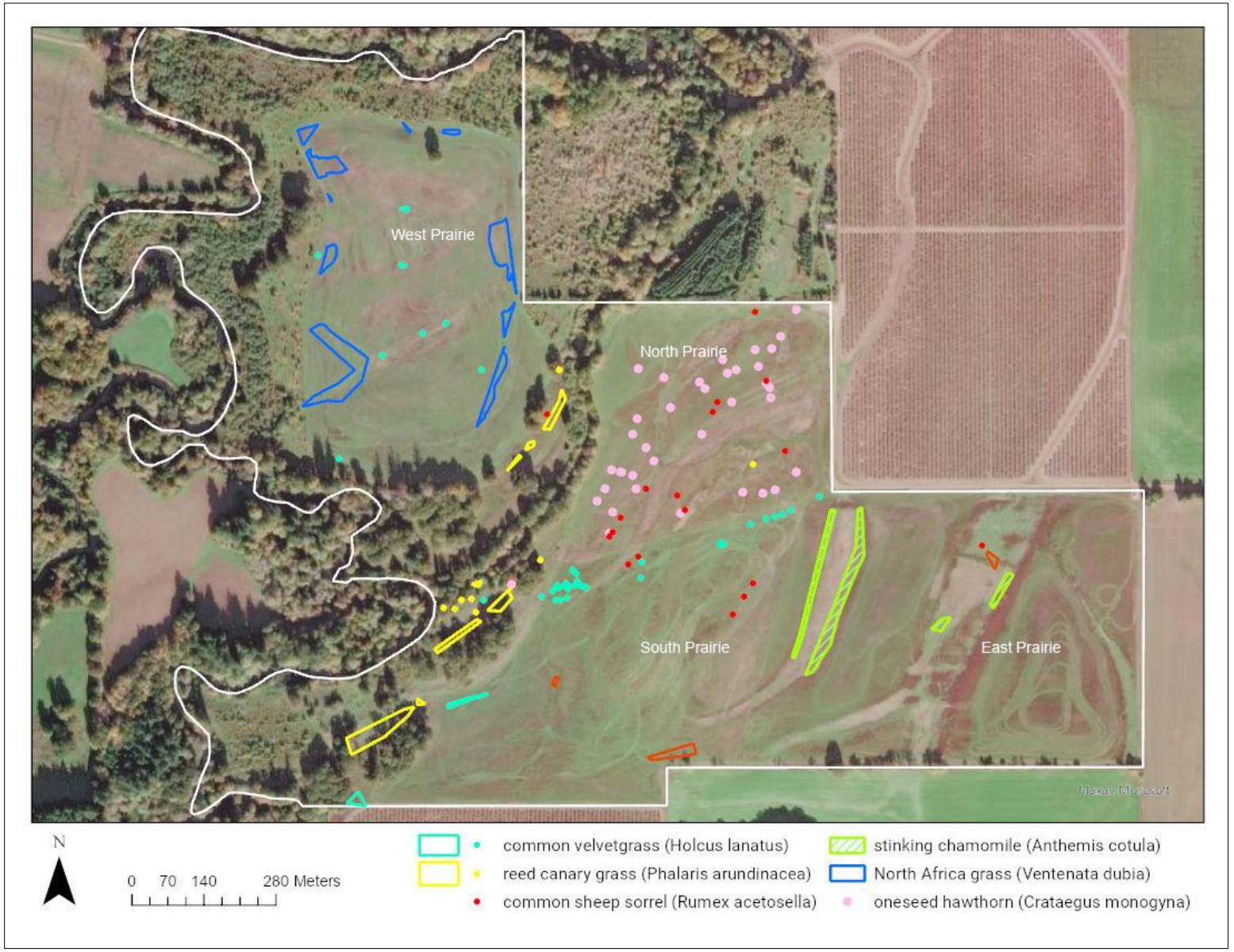



Figure 7. Priority target non-native species at Herbert Farm Natural Area.

## 5.2 Amphibian egg mass surveys

On March 14, 2024, Owen Cass from ODFW led an amphibian survey of the four constructed swales and the two natural ponds at HFNA where red-legged frog *(Rana aurora*) had previously been documented (Figure 8). Red-legged frog is a sensitive species in Oregon that requires forested wetland habitat adjacent to still water for breeding. Mapping their presence at HFNA would help inform management decisions for this sensitive species.

The surveys revealed over a hundred Pacific tree frog (*Pseudacris regilla*) egg masses in the north and east swales, and one larval long-toed salamander (*Ambystoma macrodactylum*) in the south pond (Figure 9). The eastern swales had fewer egg masses than the northern swales, likely due to the higher number of waterfowl frequenting those ponds resulting in poorer water quality. Surveys did not detect any red-legged frog egg masses, however the two natural ponds had suitable habitat with lots of woody attachment material. It is possible that doing additional surveys throughout the breeding season would result in positive detections. The full report can be read in Appendix 3. 2024 Amphibian survey

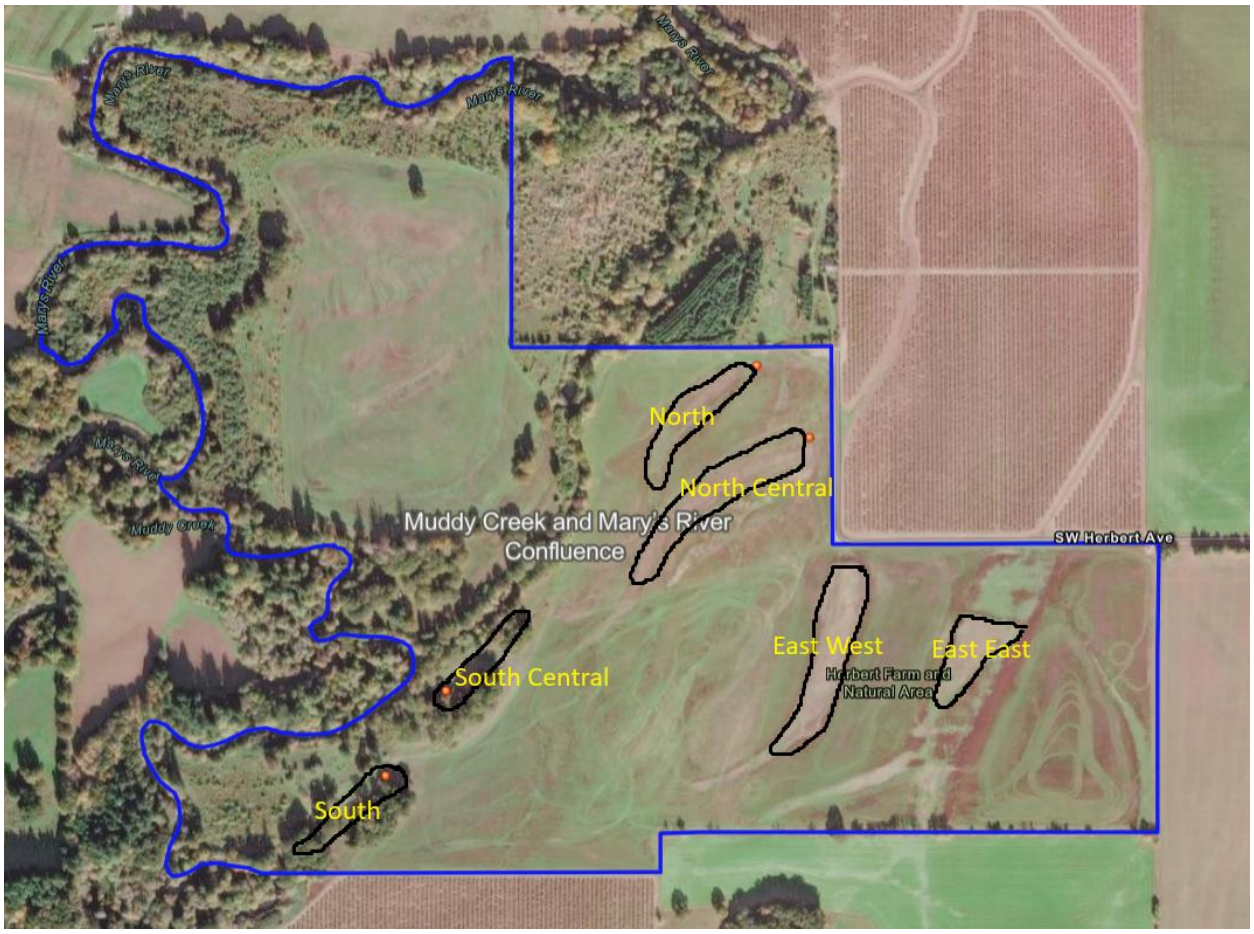



Figure 8. Locations of amphibian surveys completed by ODFW, March 14, 2024.

Figure 9. (l-r) Pacific tree frog (*Pseudacris regilla*) egg mass; larval long-toed salamander (*Ambystoma macrodactylum*) March 14, 2024.

## 5.3 Western pond turtle trapping

On July 23 and 24, 2024, Susan Barnes from ODFW trapped a western pond turtle (*Actinemys marmorata*) at HFNA. Western pond turtle is in decline and has been proposed for federally threatened status. Although western pond turtles have been previously documented at HFNA, tagging individuals allows ODFW to estimate population numbers and to better understand connectivity between sites. This can not only help inform management decisions at HFNA, but also at other known turtle nesting sites that these individuals may frequent. The trapped turtle was an adult female at least ten years old, so there is a potential for breeding at HFNA if habitat conditions are appropriate (Figure 10). The full report is in Appendix 4. 2024 Western pond turtle trapping.

Figure 10. (l-r) Institute for Applied Ecology staff with hoop trap; captured western pond turtle #59.

## 5.4 Emerald ash borer monitoring

In 2022, the Oregon Department of Agriculture detected the first presence of the emerald ash borer (EAB) in the state. Since then, it has spread to three additional counties, the closest being Marion County, approximately 60 miles north of HFNA. IAE monitored Oregon ash (*Fraxinus oreganus*) at HFNA to look for signs of EAB, and collect vegetation community data before the invasion to serve as a baseline for future restoration and management efforts.

In 2024, IAE set up five purple prism traps baited with z-3 hexanol in Oregon ash trees greater than 10 cm DBH, approximately 1-3 meters high (Figure 11). Staff checked the traps every 2-4 weeks, and visually inspected the trees for exit holes and other evidence of EAB. Staff also collected vegetation data along a transect and in a 1 x 1 m plot. The full methodology is in Appendix 5. 2024 Emerald ash borer monitoring.


Figure 11. Locations of 2024 emerald ash borer monitoring traps at Herbert Farm and Natural Area.

In 2024, IAE did not detect EAB in the traps or in the Oregon ash trees at HFNA. As for the vegetation community, IAE found that the understory of the Oregon ash was dominated by native forbs with high amounts of bare ground, thatch, and litter (Figure 12, Figure 13). The lack of nonnative forbs in the understory highlights the positive results of ongoing management at the site and means that aggressive noxious weeds will not benefit from an opening of the overstory after EAB infestation. Underplanting with saplings of other species such as cottonwood and alder will also help in creating additional resiliency to EAB.

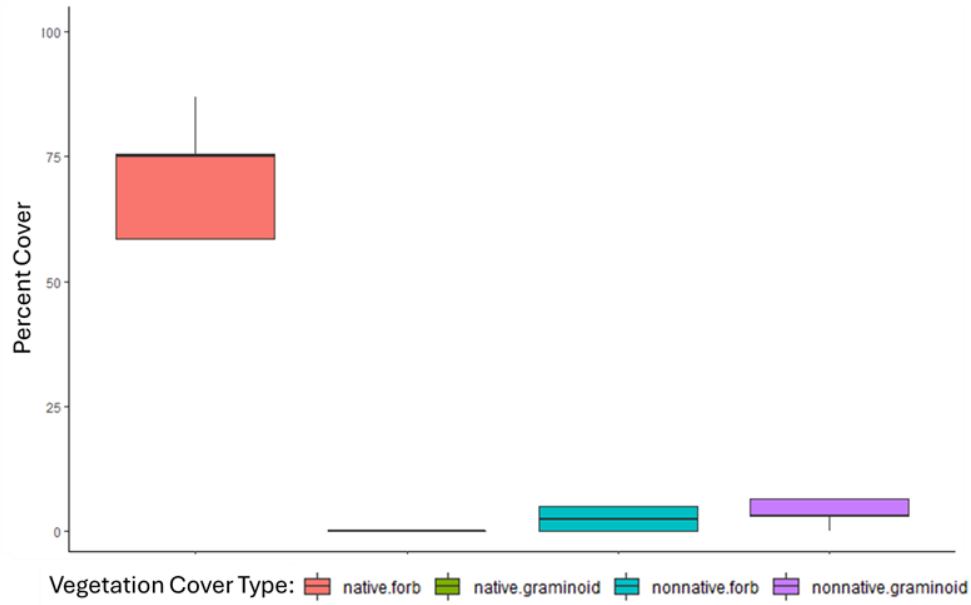



Figure 12. Ranges and averages of cover by native forb (coral), native graminoid (green), nonnative forb (teal), and nonnative (purple) for five understory plots.

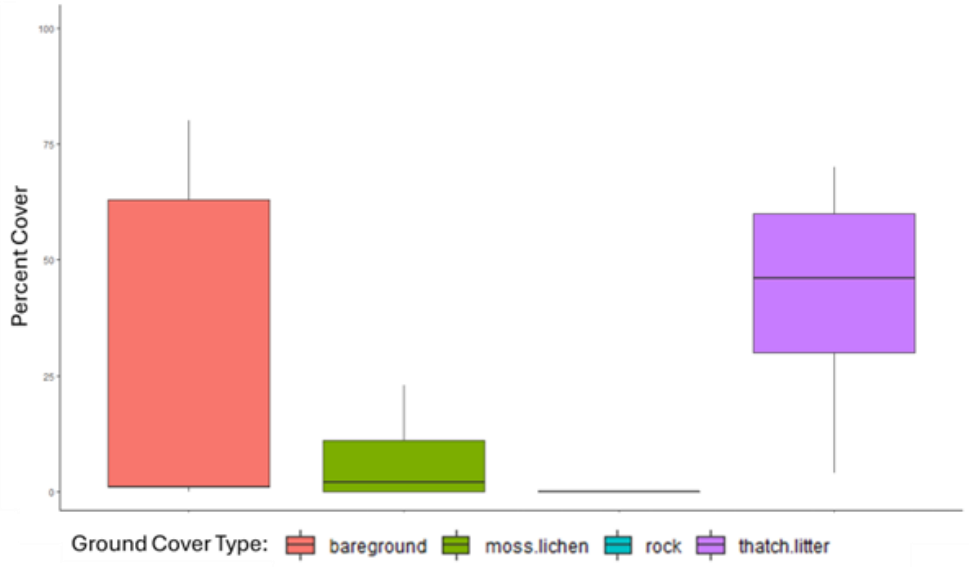



Figure 13. Ranges and averages of cover by bare ground (coral), moss and lichen (green), rock (teal), and thatch and litter (purple) for five understory plots.

## 6. LAND MANAGEMENT PLAN

HFNA is protected under a conservation easement owned by ODFW. Under the agreement, the City of Corvallis, as landowner, is required to produce a land management plan (LMP) covering a ten-year time frame. The LMP outlines planned activities at the site, including any restoration, enhancement, and stewardship.

The City of Corvallis produced the previous LMP in 2011 (City of Corvallis 2011). In 2024, IAE staff wrote an updated LMP with goals and planned activities until 2034. Once finalized, ODFW will make the LMP available to the public. The primary goals outlined in the LMP are to:

- Maintain and enhance rare grassland habitat for high ecosystem function
- Create self-sustaining, resilient populations of existing threatened species to support delisting
- Support and introduce wildlife species dependent on grassland habitat
- Enhance culturally significant native species to create indigenous gathering opportunities
- Maintain riparian forest for ecosystem function and wildlife habitat
- Maintain rare oak woodland habitat to support native wildlife and plant species
- Provide compatible public access and trails

## 7. OUTREACH

IAE led two tours of HFNA on May 10 and 17 for the Oregon State University Ecorestoration course. Approximately 30 OSU students joined IAE to learn about the important work being done on behalf of wildlife and threatened and endangered plant species at HFNA. An additional tour, led by Sara Alaica, occurred on September 23, 2024.

## 8. PHOTO POINTS AND AERIAL VIEWS

Photographs were taken at 18 photo points (Appendix 2) on May 31, 2024 for comparison with photos taken prior to or during restoration.

These photographs help illustrate changes that occurred during restoration. For example, the Phase I prairie transitioned from a ryegrass field in 2013 to a well-established native prairie in 2024 (Figure 14). Restored riparian areas show a similar trajectory from fallow to partially closed canopy within high-density plantings in 2024 (Figure 15). A full set of photos are on file at IAE and available upon request.

These restoration progressions are also illustrated by Google Earth photographs (Figure 16, Figure 17, Figure 18 and Figure 19) with changes described in the captions.

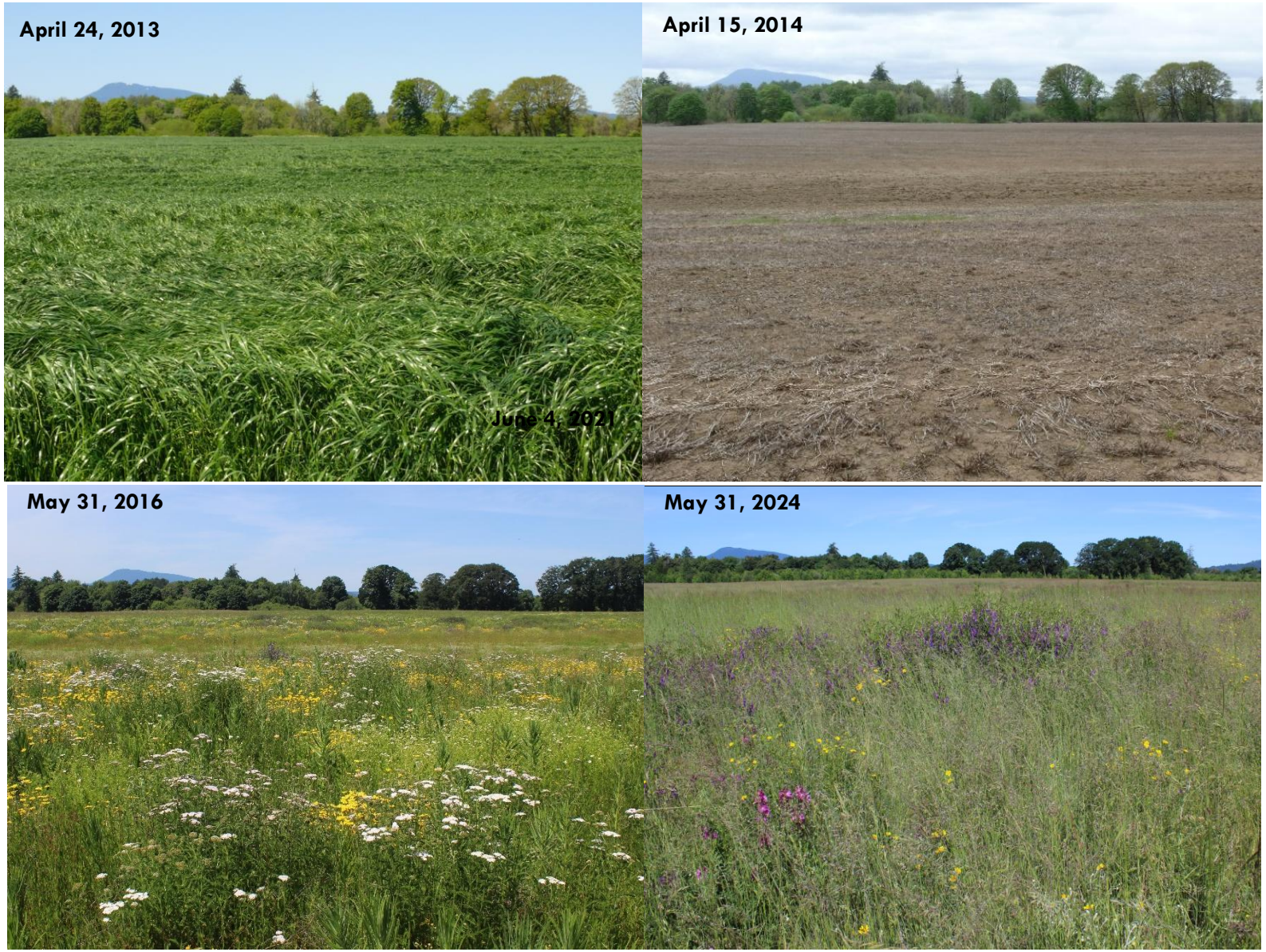



**Figure 14.** Photo point 1: Progression of upland prairie restoration at Herbert Farm and Natural Area, showing the ryegrass (*Lolium* sp.) field prior to restoration in 2013 (top left); during site preparation (top right); after second year of seeding native forbs and grasses, including common madia (*Madia elegans*, not yet flowering), woolly sunflower (*Eriophyllum lanatum*) and common yarrow (*Achillea millefolium*; bottom left); and well-established prairie checkermallow (*Sidalcea campestris*) and golden paintbrush (*Castilleja levisecta*) in 2024 (bottom right).


**Figure 15**. Photo point 7: Progression of riparian tree and shrub restoration at Herbert Farm and Natural Area, showing: fallow grassland after one year of site preparation (top left); during the first year of establishing riparian trees and shrubs (top right), two years after planting (bottom left); and canopy closure in 2024 (bottom right).

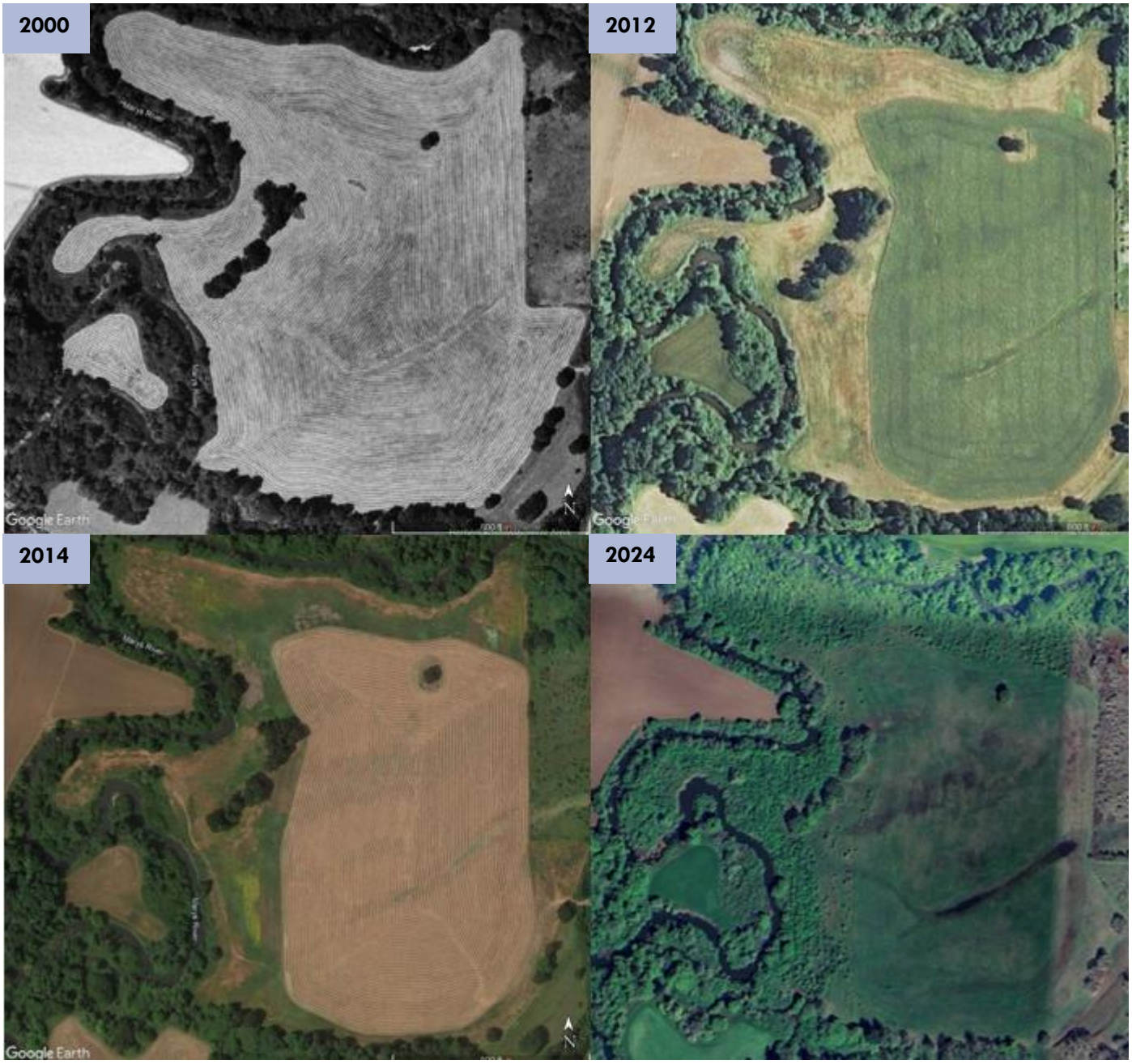



**Figure 16.** A Google Earth view of Phase I areas in 2000 (upper left), at the time when the City of Corvallis acquired the property, most of which was actively farmed; 2012 (upper right), when farming was restricted to the central 37-acre field and the outer 28-acre portion was fallow grassland; 2014 (lower left) during site preparation before riparian planting (map code 1); and 2024 (lower right) after riparian (map code 1) and prairie restoration (map code 2).


**Figure 17.** Google Earth view of Phase I riparian plantings (map code 1) in May 2024, showing canopy closure in the high-density planting areas to the center-left and wider spacing between rows in the low-density plantings to the right.


**Figure 18.** Google Earth view of Phase II riparian plantings in May 2024 showing establishment of trees and shrubs. The first plantings were in 2017-2018 (map code 9), then in 2020-2021 (map codes 8, 15).


**Figure 19.** Google Earth view of Phase II restoration areas in 2012 (left), when most of the area was farmed and after restoration in 2024 (right).

# 9. MANAGEMENT RECOMMENDATIONS

## 9.1 Manage non-native species

Regular, ongoing management is necessary to prevent existing noxious species from establishing in new areas, and stopping new invasions from worsening, such as the 2024 introduction of north Africa grass.

**Recommendations for 2025**

- In spring, spot spray weeds across the site, focusing on the species listed in Section 5.1 Weed mapping
- In fall, broadcast spray patches of north Africa grass and spot spray encroaching shrubs
- Mow all prairies after August 15
- Update existing non-native species distribution map

## 9.2 Host regular volunteer planting events

In 2024, 24 people attended volunteer planting events at Herbert Farm, helping get over 10,000 plants in the ground and educating the public about City of Corvallis natural spaces.

**Recommendations for 2025**

- Organize an annual planting event in the fall for the public to get engaged
- Purchase bulbs and roots such as Gairdner's yampah (*Perideridia gardneri*) that have difficulty establishing from seed.

## 9.3 Prepare for arrival of emerald ash borer (EAB)

After spreading to three new counties in 2024, it is likely EAB will arrive at HFNA in the near future, and some advanced planning may help mitigate negative effects.

**Recommendations for 2025**

- Continue trapping and monitoring of Oregon ash to identify arrival of EAB on site
- Underplant mature Oregon ash with replacement species such as black cottonwood (*Populus trichocarpa*), willow (*Salix spp.*) and white alder (*Alnus rhombifolia*).

## 9.4 Install a turtle basking structure

The western pond turtles at HFNA lack basking opportunities critical to their health (ODFW 2015).

**Recommendations for 2025**

- Build a structure or install a basking log in the turtle pond

## 9.5 Conduct amphibian egg mass surveys

Almost all the egg masses found during the 2024 surveys were hatched, suggesting earlier, and more frequent surveys could provide a more accurate picture of the amphibian presence at HFNA.

**Recommendations for 2025**

- Conduct two egg mass surveys in 2025: once early and another in late March

- Focus on natural ponds where red-legged frogs have been sighted

## 10. REFERENCES

Alaica, S, P. Moore and A. Esterson. 2023. Herbert Farm and Natural Area restoration – 2022 annual report. Unpublished report for the Willamette Wildlife Mitigation Program, Oregon Department of Fish and Wildlife. Institute for Applied Ecology, Corvallis, OR.

City of Corvallis. 2011. Herbert Farm and Natural Area Management Plan. Parks and Recreation Department, City of Corvallis, Oregon. 135 pp.

DiTomaso, JM, GB Kyser et al. 2013. *Weed Control in Natural Areas in the Western United States*. Weed Research and Information Center, University of California.

Innes, R. 2022. *Ventenata dubia,* Ventenata. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Missoula Fire Sciences Laboratory (Producer). Available: www.fs.usda.gov/database/feis/plants/gram

Institute for Applied Ecology. 2013. City of Corvallis Herbert Farm and Natural Area Restoration Plan. 45 pp., plus appendices.

Lapinski, M.K. and M.A. Bahm. 2018. Investigating the potential of using playback and decoys to attract streaked horned lark to unoccupied habitats. Progress Report for U.S. Fish and Wildlife Service. Institute for Applied Ecology, Corvallis, Oregon. vi + 17 pp.

Menke, C., P. Moore and M. Gisler. 2013. Herbert Farm and Natural Area Restoration Plan Phase I: 2013-2017. Prepared for the City of Corvallis and Oregon Department of Fish and Wildlife. Institute for Applied Ecology, Corvallis, Oregon. 45 pp. + appendices.

Moore, P. 2017a. Herbert Farm and Natural Area Restoration Plan; Phase II: 2017-2023. Prepared for the City of Corvallis and Oregon Department of Fish and Wildlife. Institute for Applied Ecology, Corvallis, Oregon. 58 pp. + appendices.

Moore, P. 2017b. Evaluating streaked horned lark habitat creation and population response at Herbert Farm. Final report to US Fish and Wildlife Service; Grant Agreement #F14AP00668. Institute for Applied Ecology, Corvallis, Oregon. 30pp.

Moore, P. 2017c. Herbert Farm Restoration Summary 2016/17. Report for the Willamette Wildlife Mitigation Program, Oregon Department of Fish and Wildlife. Institute for Applied Ecology, Corvallis, OR. 24 pp.

Moore, P. 2018. Herbert Farm Restoration Summary July-December 2017. Report for the Willamette Wildlife Mitigation Program, Oregon Department of Fish and Wildlife. Institute for Applied Ecology, Corvallis, OR. 15 pp.

Moore, P. 2019. Herbert Farm and Natural Area restoration – 2018 annual report. Unpublished report for the Willamette Wildlife Mitigation Program, Oregon Department of Fish and Wildlife. Institute for Applied Ecology, Corvallis, OR. 36 pp.

Moore, P. 2020. Herbert Farm and Natural Area restoration – 2019 annual report. Unpublished report for the Willamette Wildlife Mitigation Program, Oregon Department of Fish and Wildlife. Institute for Applied Ecology, Corvallis, OR. 42 pp.

Moore, P. and R. Currin. 2021. Herbert Farm and Natural Area restoration – 2020 annual report. Unpublished report for the Willamette Wildlife Mitigation Program, Oregon Department of Fish and Wildlife. Institute for Applied Ecology, Corvallis, OR. 45 pp.

Moore, P. and R. Currin. 2022. Herbert Farm and Natural Area restoration – 2021 annual report. Unpublished report for the Willamette Wildlife Mitigation Program, Oregon Department of Fish and Wildlife. Institute for Applied Ecology, Corvallis, OR. 38 pp.

ODFW. 2015. Guidance for Conserving Oregon's Native Turtles including Best Management Practices. Oregon Dept. of Fish and Wildlife. 99 pp.

# APPENDICES

## Appendix 1. Summary of restoration actions at Herbert Farm and Natural Area conducted from 2012-2024

| Year | Habitat type | Map code | Acres | IAE/Contractor | City/Contractor | USFWS | ODFW | Description |
|---|---|---|---|---|---|---|---|---|
| 2012 | Agriculture, fallow grassland, woodland, upland and wet prairies | 1, 2, 3, 4, 5 | 84 | X | X | X | X | A meeting of partner groups was held on site to discuss plans for restoration. |
| 2012 | Agriculture, fallow grassland, woodland, upland and wet prairies | 1, 2, 3, 4, 5 | 84 | X | | | | A draft restoration plan was prepared for Phase I areas. |
| 2012 | Grassland and prairie areas | 1, 3, 4, 5, 9, 12 | 40 | | X | | | Fallow grassland, some field edges, oak woodland and prairies were mowed with a tractor, as part of the annual mowing maintenance. |
| 2012 | Agriculture | 2, 6, 7, 13, 14 | 84 | | X | | | Areas farmed in annual ryegrass under an annual agreement with a local farmer. |
| 2013 | Agriculture, fallow grassland, woodland, upland and wet prairies | 1, 2, 3, 4, 5 | 83 | X | X | X | X | Phase I restoration plan was finalized. |
| 2013 | Agriculture, fallow grassland, woodland, upland and wet prairies | 1, 2, 3, 4, 5 | 83 | X | | | | Surveys of baseline vegetation, threatened species and weed distribution were conducted. |
| 2013 | Fallow grassland - site preparation for riparian forest | 1 | 22 | X | | | | Two broadcast herbicide (Aquamaster) treatments >100 feet from Marys River and three spot spray (Aquamaster & Transline) treatments <100 feet from water. |
| 2013 | Riparian shrub-scrub - site preparation for riparian forest | 1, 3 | 7 | X | | | | The weedy sections of riparian border, vegetated primarily with blackberry and reed canarygrass, were mowed with a skid steer in summer and regrowth was spot sprayed (Opensight & Rodeo) in the fall. |
| 2013 | Wet prairie | 4 | 2 | X | | | | Broadcast and spot spray herbicide (Rodeo). |

| Year | Habitat type | Map code | Acres | IAE/Contractor | City/Contractor | USFWS | ODFW | Description |
|---|---|---|---|---|---|---|---|---|
| 2013 | Upland prairie | 5 | 2 | X | | | | Nelson's checkermallow rhizomes were planted along the bank between the upland and wet prairies. |
| 2013 | Grassland and prairie areas | 3, 5, 9, 12 | 16 | | X | | | Annual mowing maintenance. |
| 2013 | Agriculture - site preparation for prairie | 2 | 37 | X | X | | | Farming ceased after the 2013 harvest and pre-emergent herbicide was broadcast in the fall. |
| 2014 | Riparian shrub-scrub - site preparation for riparian forest | 1, 3 | 29 | X | | | X | Two broadcast (Rodeo and Rodeo/Escort) and spot spray herbicide treatments (Rodeo and Renovate). Selected portions of riparian margin were mowed with a skid steer. A native grass seed mix was prepared and broadcast in the fall. |
| 2014 | Former agriculture converted to upland prairie and wet prairie swales | 2 | 37 | X | | | X | Two broadcast herbicide (Rodeo and Rodeo/Escort) treatments. A seed mix of native forbs and Roemer's fescue was prepared and broadcast in the fall. |
| 2014 | Wet prairie | 4 | 2 | X | | | | Two broadcast and spot spray herbicide treatments. Native seed was broadcast in the fall. |
| 2014 | Upland prairie | 5 | 2 | X | | | | Seed of threatened species was collected for propagation. |
| 2014 | Agriculture - site preparation for prairie | 6 | 25 | | X | | X | Farming ceased after the 2014 harvest and the area was broadcast with herbicide in the fall. |
| 2014 | Restoration areas | 1, 2, 3, 4, 5 | 83 | X | X | | | IAE and the City hosted a visit by elders of the Confederated Tribes of Grand Ronde as part of the Plants for People project. Photo points were established for restoration monitoring. |
| 2014 | Grassland and prairie areas | 3, 4, 5, 9, 12 | 18 | | X | | | Annual mowing maintenance. |
| 2014 /2015 | Agriculture, fallow grassland, riparian forest and shrub-scrub, woodland, upland and wet prairies | All zones | | X | | | X | An archaeological survey was conducted to identify cultural resources. After consultation, Bonneville Power Administration gave permission for the use of ground-disturbing restoration techniques. Planning started for Phase II restoration. |

| Year | Habitat type | Map code | Acres | IAE/Contractor | City/Contractor | USFWS | ODFW | Description |
|---|---|---|---|---|---|---|---|---|
| 2015 | Former fallow grassland and shrub-scrub converted to riparian forest | 1, 3 | 29 | X | X | | X | Trees and shrubs were planted in 22 acres of high density and 7 acres of low density plantings in March. Competition from weeds and grasses was reduced for the new seedlings by spot spraying and mowing (by hand and tractor) in summer and fall. Some hand watering in the low density plantings helped alleviate drought conditions. Tree survival was monitored. |
| 2015 | Upland prairie and wet prairie swales | 2 | 37 | X | | X | | Herbicide treatments included broadcast spraying (Select Max) of grasses over the whole prairie and sow thistle/prickly lettuce in the northern 13 acres (Stinger), and spot spraying (and dead-heading) of thistles throughout. Native forb and grass seed mixes for upland and wet swales were prepared and drilled in the fall. |
| 2015 | Upland and wet prairie | 4, 5 | 4 | X | | X | | Limited spot spraying of reed canarygrass and thistles occurred. A fire line was mowed around the upland prairie in anticipation of a prescribed burn, but the burn was not achieved. Native seed, including Nelson's checkermallow, was drilled in the wet prairie in the fall. |
| 2015 | Agriculture - site preparation for prairie | 6 | 25 | X | | | | A broadcast herbicide (Rodeo) treatment was conducted in the fall. |
| 2015 | Fallow grassland and shrub-scrub - site preparation for riparian forest | 9 | 4.5 | X | | | | Blackberry and reed canarygrass patches in the riparian edge were mowed with a skid steer. Weedy fallow grassland was treated by broadcasting and spot spraying herbicide (Rodeo, Habitat, Renovate). |
| 2015 | Streaked horned lark experiment | 7 | 1 | X | X | | X | Farming ceased in October and experimental plots marked out for comparing combinations of herbicide, mowing and disking to create streaked horned lark habitat. Herbicide and harrow (in lieu of disking) treatments commenced in November. |
| 2015 | Grassland and prairie areas | 3, 4, 5, 12 | 14 | | X | | | Annual mowing maintenance. |

| Year | Habitat type | Map code | Acres | IAE/Contractor | City/Contractor | USFWS | ODFW | Description |
|---|---|---|---|---|---|---|---|---|
| 2016 | Riparian forest | 1 | 27 | X | | | X | A second cohort of trees and shrubs were inter-planted to offset mortality from the first year. Ongoing spot spraying and mowing maintenance, including mowing high-density area twice. Tree survival was monitored. Additional spot spraying and dead-heading of thistles occurred in summer-fall. |
| 2016 | Riparian, woodland, upland and wet prairies | 1, 2, 3, 4, 5 | 83 | X | | | | Surveys of riparian vegetation, threatened species and weed distribution were conducted for comparison with 2013 baseline. |
| 2016 | Upland prairie and wet prairie swales | 2 | 37 | X | | X | | The northern 13 acres was mowed to limit flowering of an infestation of stinking chamomile, prickly lettuce and sow thistle. Two spot spray treatments and dead-heading of thistles occurred in summer-fall in this zone. Supplementary seed of forb and grasses in upland and wet swale mixes was broadcast in the 13-acre area. Rushes were planted in the southern swales. |
| 2016 | Fir-dominated woodland | 3 | 4 | | X | | | Douglas fir trees were girdled to release oaks from competition. |
| 2016 | Wet prairie | 4 | 2 | X | | | | Limited spot spraying of reed canarygrass patches. Bulbs and bare root of native forbs were planted in the fall. |
| 2016 | Upland prairie | 5 | 2 | X | X | X | X | Seedling shrubs were spot sprayed, a fire line was mowed, and a prescribed burn conducted in late September. Emerging weeds and non-native grasses were treated by broadcasting herbicide (Rodeo). Seed of native forbs, including Kincaid's lupine and golden paintbrush, and grasses were drilled in October. Kincaid's lupine plugs were planted in spring and peacock larkspur plugs, and bulbs and bare root of other native forbs, were planted in fall. |

| Year | Habitat type | Map code | Acres | IAE/Contractor | City/Contractor | USFWS | ODFW | Description |
|---|---|---|---|---|---|---|---|---|
| 2016 | Former agriculture - site preparation for prairie | 6 | 25 | X | | X | X | A survey of anadromous fish using two swales was conducted in February. Three broadcast and spot spray treatments targeted weedy forbs and regrowth of ryegrass. Berms were constructed to flood swales in the winter and create streaked horned lark habitat. Three seed mixes, including forbs of low stature, were drilled on 20 acres in the fall. Bulbs and bare root of native forbs were also planted. |
| 2016 | Fallow grassland and shrub-scrub - site preparation for riparian forest | 9 | 4.5 | X | | | | Two broadcast (Rodeo/Renovate, Stinger) and three spot spray herbicide treatments were conducted through the year, and a graminoid seed mix was broadcast in the fall. |
| 2016 | Streaked horned lark experiment | 7 | 1 | X | | | X | Spring and fall treatments comparing combinations of herbicide, mowing and disking. The streaked horned lark population was monitored here and throughout Herbert Farm (April-August). |
| 2016 | Grassland and prairie areas | 3, 4, 12 | 10 | | X | | | Annual mowing maintenance. |
| 2017 | Agriculture, fallow grassland, woodland, upland and wet prairies | 6, 7, 8, 9, 10, 11, 12, 13, 14 | 130 | X | X | X | X | Phase II restoration plan was finalized. |
| 2017 | Upland and wet prairies | 2, 4, 5 | 41 | X | | | | Surveys of prairie vegetation were conducted for comparison with 2013 baseline. Photo points were repeated in all restoration areas. |
| 2017 | Riparian forest | 1 | 27 | X | | | | Ongoing spot spraying and mowing maintenance occurred, and tree survival was monitored. Additional spot spraying and dead-heading of thistles occurred in summer-fall, and blackberry in the fall. |

| Year | Habitat type | Map code | Acres | IAE/Contractor | City/Contractor | USFWS | ODFW | Description |
|---|---|---|---|---|---|---|---|---|
| 2017 | Upland prairie and wet prairie swales | 2 | 37 | X | | X | | Spot spray treatments targeted thistles and velvet grass in spring and summer. A fire line was mowed in August and the whole prairie mowed high prior to a prescribed burn in September. In the fall, upland areas were drilled with a native forb/grass mix, including Kincaid's lupine and golden paintbrush in the southern zones. Wet swales were broadcast seeded. Bulbs and bare roots of native plants were also planted in the fall. |
| 2017 | Wet prairie | 4 | 2 | X | | | | Spot spray treatments targeted reed canarygrass. Milkweed was planted in spring. |
| 2017 | Upland prairie | 5 | 2 | X | X | X | X | Kincaid's lupine plugs were planted in spring. |
| 2017 | Former agriculture - site preparation for prairie | 6 | 24 | X | | X | X | The fall seeding was unsuccessful because of heavy flooding in the winter. Site preparation resumed with three broadcast (Rodeo) and spot spray herbicide treatments. |
| 2017 | Riparian forest | 9 | 4.5 | X | | | | Trees and shrubs were planted in high density rows in February. Competition from weeds and grasses was reduced for the new seedlings by spot spraying and hand mowing in summer and fall. |
| 2017 | Streaked horned lark experiment | 7 | 1 | X | | | X | Spring and fall treatments comparing combinations of herbicide, mowing and disking. The streaked horned lark population was monitored here and throughout Herbert Farm (April-August). |
| 2017 | Agriculture - site preparation for prairie | 14 | 23 | | X | | | Farming ceased after the 2017 harvest and the area was partially broadcast with herbicide in the winter as part of mitigation for airport runway development on streaked horned lark habitat. This area was managed by City staff from the airport. |
| 2017 | Grassland and prairie areas | 3, 4, 12 | 18 | | X | | | Annual mowing maintenance. |

| Year | Habitat type | Map code | Acres | IAE/Contractor | City/Contractor | USFWS | ODFW | Description |
|---|---|---|---|---|---|---|---|---|
| 2018 | Riparian forest | 1 | 27 | X | | | | Ongoing spot spraying and mowing maintenance occurred, and tree survival was monitored. Additional spot spraying and dead-heading of thistles occurred in summer-fall. |
| 2018 | Upland prairie and wet prairie swales | 2 | 37 | X | | | X | Spot spray treatments and mowing. Plant and seed Kincaid's lupine, plant Nelson's checkermallow, bare root materials, including camas and yampah. |
| 2018 | Wet prairie | 4 | 2 | X | | | | Spot spray treatments. |
| 2018 | Upland prairie | 5 | 2 | X | | | | Spot spray treatments. |
| 2018 | Former agriculture converted to upland prairie and wet prairie swales | 6 | 25 | X | | X | | Site preparation continued with three broadcasts (Rodeo, Rodeo/Escort, Rodeo) and one spot spray herbicide treatment. Two low density/low stature seed mixes of native forbs and Roemer's fescue were drilled or broadcast in the fall. |
| 2018 | Riparian forest | 9 | 4.5 | X | | | | A second cohort of trees and shrubs were inter-planted in February to offset mortality from the first year. Ongoing spot spraying and mowing maintenance occurred, and tree survival was monitored. |
| 2018 | Riparian shrub-scrub - site preparation for riparian forest | 8 | 0.5 | X | | | | Blackberry and reed canarygrass patches in the riparian edge were mowed with a skid steer. |
| 2018 | Oak woodland | 11 | 6 | X | X | | | Douglas fir trees were felled and removed to release oaks from competition. A woodland forb/grass seed mix was broadcast in the understory. |
| 2018 | Grassland - site preparation for prairie | 10, 12 | 6 | X | | | | Grassland was broadcast with herbicide (Rodeo/Escort) in fall. |
| 2018 | Fallow grassland | 7 | 1 | X | X | | | The streaked horned lark habitat experiment ended in 2017 and this area became fallow grassland in 2018. The strips were mowed in late summer and treated with herbicide in fall as part of the larger prairie site preparation area (below). |

| Year | Habitat type | Map code | Acres | IAE/Contractor | City/Contractor | USFWS | ODFW | Description |
|---|---|---|---|---|---|---|---|---|
| 2018 | Agriculture - site preparation for prairie | 13 | 61 | X | | | | Farming ceased after the 2018 harvest and the area was broadcast with pre-emergent herbicide (Rodeo/Plateau) in fall. |
| 2018 | Agriculture - site preparation for prairie | 14 | 23 | | X | | | No treatments occurred during 2018. |
| 2018 | Grassland and prairie areas | 3 | 18 | | X | | | Annual mowing maintenance by City was limited to Phase I oak woodland. Existing prairies were not mowed. |
| 2019 | Riparian forest | 1 | 27 | X | | | | Ongoing spot spraying maintenance of riparian plantings in May and mowing in June. Other spot spraying and hand weeding in Sep-Oct. Tree survival was monitored in November. |
| 2019 | Upland prairie and wet prairie swales | 2 | 37 | X | | | X | Golden paintbrush was surveyed in May. Spot spray treatments in May-August and most of the prairie was mowed in August. 54 peacock larkspur were planted in October. |
| 2019 | Oak woodland | 3 | 4 | X | | | | Thin-leaved peavine plots were monitored in May. |
| 2019 | Wet prairie | 4 | 2 | X | | | | Spot spray treatments in August-September targeted reed canarygrass, thistles and encroaching shrub and tree seedlings. A fire line was mowed in late August in preparation for a prescribed burn which was deferred until 2020. Tall meadow-rue were planted in November. |
| 2019 | Upland prairie | 5 | 2 | X | | | | Golden paintbrush was surveyed in May. Spot spray treatments in August targeted shrub and tree seedlings. A fire line was mowed in preparation for a prescribed burn which was deferred until 2020. Woodland strawberry was planted in November. |

| Year | Habitat type | Map code | Acres | IAE/Contractor | City/Contractor | USFWS | ODFW | Description |
|---|---|---|---|---|---|---|---|---|
| 2019 | Upland prairie and wet prairie swales | 6 | 25 | X | | X | X | Three partial broadcast treatments with grass-specific herbicide (Poast, Select Max and Fusilade) in April, June and October, and glyphosate on 2-3 acres to maintain bare ground areas. Spot spraying broadleaf weeds in May, June and September and mowing in late August. Native seed mixes were drilled or broadcast seeded over 21 acres in Sep-Oct. Kincaid's lupine was also seeded. |
| 2019 | Riparian forest | 9 | 4.5 | X | | | | Ongoing spot spraying in May and mowing maintenance of riparian plantings in June, with further spot spraying in July. Tree survival was monitored in November. |
| 2019 | Oak woodland | 11 | 6 | X | | | | Limited spot spraying of blackberry and broadleaf weeds in July. |
| 2019 | Prairie and riparian site preparation | 8, 10, 12, 15 | 6 | X | | | | Broadcast spray of Rodeo on 6 acres in April and June, Rodeo/Escort on 3.5 acres and Rodeo on 2.5 acres in October. Spot spraying of reed canarygrass, seedling shrubs and broadleaf weeds in August-September. Wood debris cleared. Native grass seed was broadcast over 2 acres of riparian site preparation area. |
| 2019 | Prairie site preparation | 7, 13 | 61 | X | | | | Broadcast spray of Rodeo in June, partial spray of swales in August, and broadcast of Rodeo/Escort mix in October. |
| 2019 | Airport mitigation prairie site preparation | 14 | 23 | X | X | | | Partial broadcast herbicide spray in winter, mow and harrow in late May, partial broadcast in July. IAE start managing. Broadcast spray of Rodeo/Escort mix in October and a mow in late November over the whole field. A sound and decoy system and streaked horned lark monitoring program ran from April-August. |
| 2020 | Riparian forest | 1 | 27 | X | | | | Ongoing spot spraying maintenance of riparian plantings in May and mowing in June. Other spot spray in October. A partner tour of all areas was held in August. |

| Year | Habitat type | Map code | Acres | IAE/Contractor | City/Contractor | USFWS | ODFW | Description |
|---|---|---|---|---|---|---|---|---|
| 2020 | Upland prairie and wet prairie swales | 2 | 37 | X | | | X | Golden paintbrush and Kincaid's lupine populations were surveyed in May. Infestation of vetch hand weeded or weed-whacked near these rare species. Spot spray treatments in May-June and October. Perimeter was mowed in June and whole prairie in October. |
| 2020 | Wet prairie | 4 | 2 | X | X | | X | Prescribed burn planning meeting held in August, but burn was deferred to 2021. Spot spray treatments in August targeted reed canarygrass, thistles and encroaching shrub and tree seedlings. Mowed in October. |
| 2020 | Upland prairie | 5 | 2 | X | | | X | Golden paintbrush and Kincaid's lupine were surveyed in May. Spot spray treatments in August targeted shrub and tree seedlings. Mowed in October. |
| 2020 | Upland prairie and wet prairie swales | 6 | 25 | X | | X | X | Two broadcast herbicide treatments (Rodeo) in one swale and a fallow area near road in June and October. Spot spraying broadleaf weeds in March, May, June, September, and October. Mow berms in June and 20 acres in October. Native seed mixes were drilled or broadcast seeded over 5 acres in October. Kincaid's lupine seed was sown in October. Bare root native plants were planted in February, Kincaid's lupine plugs planted in March-April, and Nelson's checkermallow and peacock larkspur were planted in November. |
| 2020 | Riparian forest | 8, 9, 15 | 4.5 | X | | | | Plant trees and shrubs in new area. Line spray and spot spraying in May and mowing maintenance of riparian plantings in June. Further spot spray around perimeter in October. Tree survival was monitored in November. |
| 2020 | Oak woodland | 11 | 5 | X | | | | Limited spot spraying of blackberry in October. |
| 2020 | Oak savanna | 10, 12 | 4 | X | | X | | Broadcast spray (Rodeo) in June and October. Spot spray in October. Native forb and grass seed was drilled and broadcast in October. |

| Year | Habitat type | Map code | Acres | IAE/Contractor | City/Contractor | USFWS | ODFW | Description |
|---|---|---|---|---|---|---|---|---|
| 2020 | Prairie site preparation | 13 | 61 | X | | X | | Streaked horned larks monitored April-August. Broadcast spray (Rodeo) all or partial areas in April, June, August, and October (Rodeo for seeding areas and Rodeo/Escort in fallow field). Native forbs and Roemer's fescue was seeded by no-till drill and hand broadcast swales in October. |
| 2020 | Airport mitigation prairie site preparation | 14 | 23 | X | | | | Streaked horned larks monitored April-August. Broadcast spray all or partial areas in April, June, August (Rodeo) and October (Rodeo/Escort). |
| 2021 | Riparian forest | 1 | 27 | X | | | | Ongoing spot spraying maintenance of riparian plantings in May and limited mowing in June. Other spot spray in September. |
| 2021 | Upland prairie and wet prairie swales | 2 | 37 | X | | | X | Spot spray treatments in May-June and September. Perimeter was mowed in June and the whole prairie in October. |
| 2021 | Oak woodland | 3 | 4 | | X | | | Mowed in November to control shrub encroachment of open areas and camas field. 6 Douglas-fir trees re-girdled and 8 more girdled to release oaks. |
| 2021 | Wet prairie | 4 | 2 | X | X | | X | Spot spray treatments in August targeted reed canarygrass, thistles and encroaching shrub and tree seedlings. A fire line was mowed, and a prescribed burn was conducted in September. Native forbs and grasses were sown with no-till drill and additional grasses hand broadcast in October. Camas and other bulb species were planted in November. |
| 2021 | Upland prairie | 5 | 2 | X | X | | X | Spot spray treatments in August-September targeted shrub and tree seedlings. A fire line was mowed, and a prescribed burn was conducted in September. Post-burn glyphosate spray of upland. Native forbs and grasses were sown with no-till drill and additional grasses hand broadcast in October. Brodiaea bulbs and yampah roots were planted in November. |

| Year | Habitat type | Map code | Acres | IAE/Contractor | City/Contractor | USFWS | ODFW | Description |
|---|---|---|---|---|---|---|---|---|
| 2021 | Upland prairie and wet prairie swales | 6 | 25 | X | | X | X | Spot spray periphery in March. Two broadcast herbicide treatments (Rodeo) in one swale in June and October. Spot spraying broadleaf weeds in May and grasses in June. Mow berms in June and 20 acres in September. Native seed was broadcast by hand and ATV over 5 acres in October. |
| 2021 | Riparian forest | 8, 9, 15 | 6.6 | X | | | | Interplanting of trees and shrubs in January in new 2.1-acre riparian restoration area in January. Spot spraying of oxeye daisy in March. Line spray and spot spraying in May and mowing maintenance of riparian plantings in June. |
| 2021 | Oak savanna | 10, 12 | 4 | X | X | X | | Spot spray in March. Broadcast spray patches of reed canarygrass in September. Mowed in September. Grass seed was drilled in October. |
| 2021 | Prairie | 13 | 35 | X | | X | X | Streaked horned larks were monitored April-August. Broadcast spray grass-specific herbicide in April and June. Spot spraying broadleaf weeds in June. Mowed in September. Native grasses seeded by no-till drill in October. |
| 2021 | Prairie site preparation | 13, 14 | 49 | X | X | X | X | Streaked horned larks monitored April-August. Broadcast herbicide spray in May (Rodeo/Escort) and October (Rodeo). Native grasses and forbs were seeded by no-till drill on the uplands and ATV broadcast in swales in October. A native grass mix was drilled around the field perimeter. Camas planted in November. Damage by vehicle repaired and re-seeded in December. |
| 2022 | Riparian forest | 1 | 27 | X | | | | Ongoing spot spraying (Rodeo/Vastlan) maintenance of riparian plantings in May and limited mowing in June. |
| 2022 | Upland prairie and wet prairie swales | 2 | 37 | X | X | | X | Spot spray treatments (Transline/Vastlan) in May. Perimeter was mowed in June. HCP area was surveyed for threatened plant species, vegetation plots and weed mapping in May-June. Mowed in August. |

| Year | Habitat type | Map code | Acres | IAE/Contractor | City/Contractor | USFWS | ODFW | Description |
|---|---|---|---|---|---|---|---|---|
| 2022 | Oak woodland | 3 | 4 | | X | | | Mowed in August. |
| 2022 | Wet prairie | 4 | 2 | X | X | | | HCP area was surveyed for threatened plant species, vegetation plots and weed mapping in May-June. Mowed in August. |
| 2022 | Upland prairie | 5 | 2 | X | X | | | HCP area was surveyed for threatened plant species, vegetation plots and weed mapping in May-June. Mowed in August. |
| 2022 | Upland prairie and wet prairie swales | 6 | 25 | X | X | | | Spot spray (Transline/Vastlan) periphery in April. Spot spray (Rodeo) broadleaf weeds and grasses in May. Mow berms and access road in June. HCP area was surveyed for threatened plant species, vegetation plots and weed mapping in May-June. Mowed in August. Wet swale sprayed out (Rodeo) and broadcast seeded in October.( |
| 2022 | Riparian forest | 8, 9, 15 | 6.6 | X | | | | Line spray and spot spraying in May and mowing maintenance of riparian plantings in June. Spot spray in November. |
| 2022 | Oak savanna | 10, 12 | 4 | X | X | | | Spot spray (Garlon 3A) in April and May. Mowed in August. Spot sprayed perimeter (Garlon 3A) in November. |
| 2022 | Prairie | 13 | 35 | X | | | X | Streaked horned larks were monitored April-August. Spot spray broadleaf weeds in May. Mowed in August. |
| 2022 | Prairie | 13, 14 | 49 | X | | | X | Streaked horned larks monitored April-August. Spot spray (Transline/Vastlan) periphery in April-May. Spot spray grasses (Rodeo) in June. Mowed in August. Native grasses seeded by no-till drill in October. |
| 2023 | Riparian forest | 1 | 27 | X | | | | Vegetation monitoring, photo points and spot spray of riparian plantings in June. |

| Year | Habitat type | Map code | Acres | IAE/Contractor | City/Contractor | USFWS | ODFW | Description |
|---|---|---|---|---|---|---|---|---|
| 2023 | Upland prairie and wet prairie swales | 2 | 37 | X | | | X | Vegetation monitoring, photo points and spot spray in June. Weed mapped in July. Perimeter mowed in June by contractors and patchily mowed by ODFW in September. |
| 2023 | Oak woodland | 3 | 4 | X | | | | Spot sprayed and photo points in June. |
| 2023 | Wet prairie | 4 | 2 | X | | | | Spot spray in May. Vegetation monitoring, photo points, and spot spray in June. Weed mapped in July. |
| 2023 | Upland prairie | 5 | 2 | X | | | | Spot spray in May and June. Vegetation monitoring and photo points in June. Weed mapped in July. |
| 2023 | Upland prairie and wet prairie swales | 6 | 25 | X | | | X | Spot sprayed and photo points in June. Weed mapped in July. Patchy mow by ODFW in September. |
| 2023 | Riparian forest | 8, 9, 15 | 6.6 | X | | | | Spot sprayed for reed canarygrass (*Phalaris arundinacea)* from April to June. Mowed and photo points in June. Spot sprayed for Himalayan blackberry (*Rubus armeniacus*) in July and August. |
| 2023 | Oak savanna | 10, 12 | 4 | X | | | | Spot sprayed for reed canarygrass (*Phalaris arundinacea)* from April to June. Photo points in June. Mowed in July. |
| 2023 | Prairie | 13 | 35 | X | | | X | Spot sprayed and photo points in June. Weed mapped in July. ODFW mowed in September. |

| Year | Habitat type | Map code | Acres | IAE/Contractor | City/Contractor | USFWS | ODFW | Description |
|---|---|---|---|---|---|---|---|---|
| 2023 | Prairie | 14 | 47 | X | | | X | Weed mapped and flame weeded in April. Spot sprayed in April. Photopoints in June. Weed mapped again in July. ODFW mowed in September. |
| 2024 | Riparian forest | 1 | 27 | X | X | | | Photo points in May, rows mowed by City of Corvallis in August. |
| 2024 | Upland prairie and wet prairie swales | 2 | 37 | X | X | | | Spot spray and photopoints in May, hand weeding in June. Broadcast North Africa grass (*Ventenata dubia*) in November. Patchily mowed by City of Corvallis in August. |
| 2024 | Oak woodland | 3 | 4 | X | X | | | Spot spray and photo points in May. Patchily mowed by City of Corvallis in August. |
| 2024 | Wet prairie | 4 | 2 | X | X | | | Spot spray and photopoints in May, woody spot spray in August. Patchily mowed by City of Corvallis in August. |
| 2024 | Upland prairie | 5 | 2 | X | X | | | Spot spray in April. Photopoints in May. Handweeded hairy vetch (*Vicia villosa*) in June. Patchily mowed by City of Corvallis in August. |
| 2024 | Upland prairie and wet prairie swales | 6 | 25 | X | X | | | Spot spray in April. Photopoints in May. Handweeded oxeye daisy (*Leucanethmum vulgare*) in August. Patchily mowed by City of Corvallis in August. Planted in November. |
| 2024 | Riparian forest | 8, 9, 15 | 6.6 | X | | | | Spot sprayed for reed canarygrass (*Phalaris arundinacea)* from February to June. Photo points in May. Spot sprayed for woody species in August. |

| Year | Habitat type | Map code | Acres | IAE/Contractor | City/Contractor | USFWS | ODFW | Description |
|---|---|---|---|---|---|---|---|---|
| 2024 | Oak savanna | 10, 12 | 4 | X | X | | | Spot sprayed for reed canarygrass (*Phalaris arundinacea)* from February to June. Photo points in May. Patchily mowed by City of Corvallis in August. |
| 2024 | Prairie | 13 | 35 | X | X | | | Spot spray in April and photo points in May. Patchily mowed by City of Corvallis in August. |
| 2024 | Prairie | 14 | 47 | X | X | | | Spot spray in April and photo points in May. Patchily mowed by City of Corvallis in August. Planted in December. |

## Appendix 2. Photo point locations at Herbert Farm and Natural Area

Photo point coordinates (projection is WGS 1984) and direction of one to four photographs taken at each point.

| Photopoint number | Latitude | Longitude | Directions of photos (degrees) | | | |
|---|---|---|---|---|---|---|
| 1 | 44.521444 | -123.295944 | 186 | 284 | 346 | 84 |
| 2 | 44.520806 | -123.295556 | 210 | 26 | 158 | |
| 3 | 44.519833 | -123.296361 | 28 | 217 | 300 | |
| 4 | 44.520139 | -123.298833 | 296 | 12 | 100 | 260 |
| 5 | 44.5205 | -123.301167 | 24 | 75 | 105 | 190 |
| 6 | 44.521833 | -123.301056 | 320 | 17 | 84 | 150 |
| 7 | 44.523167 | -123.30175 | 90 | 120 | 165 | 240 |
| RB1 | 44.523278 | -123.300944 | 55 | | | |
| RB2 | 44.523333 | -123.300583 | 282 | 27 | 140 | 175 |
| 8 | 44.524139 | -123.296167 | 180 | 225 | 285 | 326 |
| 9 | 44.524167 | -123.300028 | 200 | 320 | 25 | 95 |
| 10 | 44.522139 | -123.299861 | 346 | 335 | 15 | 80 |
| 11 | 44.516727 | -123.299486 | 220 | 266 | 314 | |
| 12 | 44.516859 | -123.300122 | 0 | 90 | 180 | 270 |
| 13 | 44.522015 | -123.290778 | 210 | 255 | | |
| 14 | 44.519009 | -123.295266 | 25 | 80 | | |
| 15 | 44.518323 | -123.296837 | 0 | 90 | 180 | 270 |
| 16 | 44.517308 | -123.298805 | 0 | 90 | 180 | 270 |
| 17 | 44.518403 | -123.292639 | 0 | 90 | 180 | 270 |
| 18 | 44.519695 | -123.285466 | 180 | 225 | 265 | |

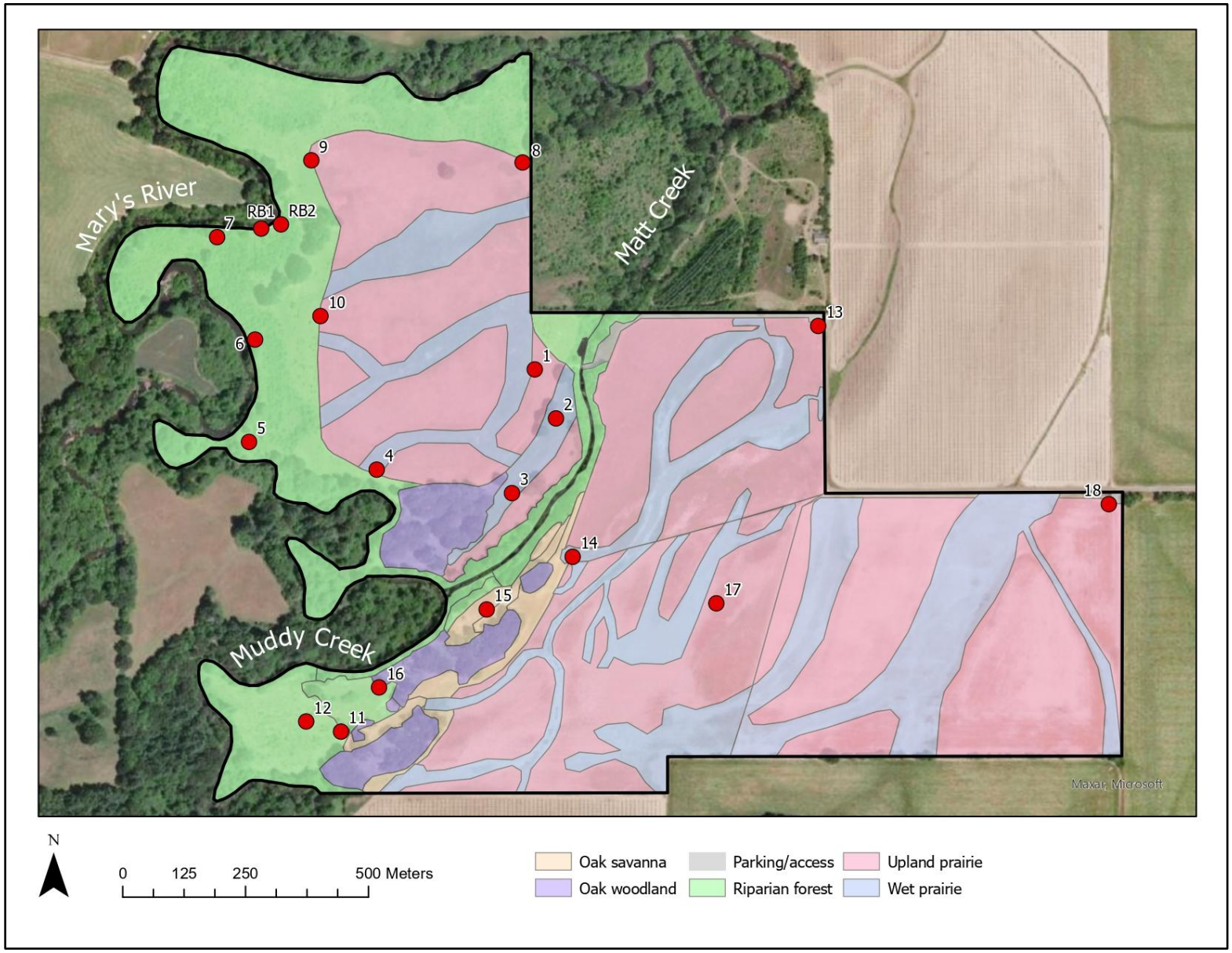



Photo point locations at Herbert Farm and Natural Area.

## Appendix 3. 2024 Amphibian survey

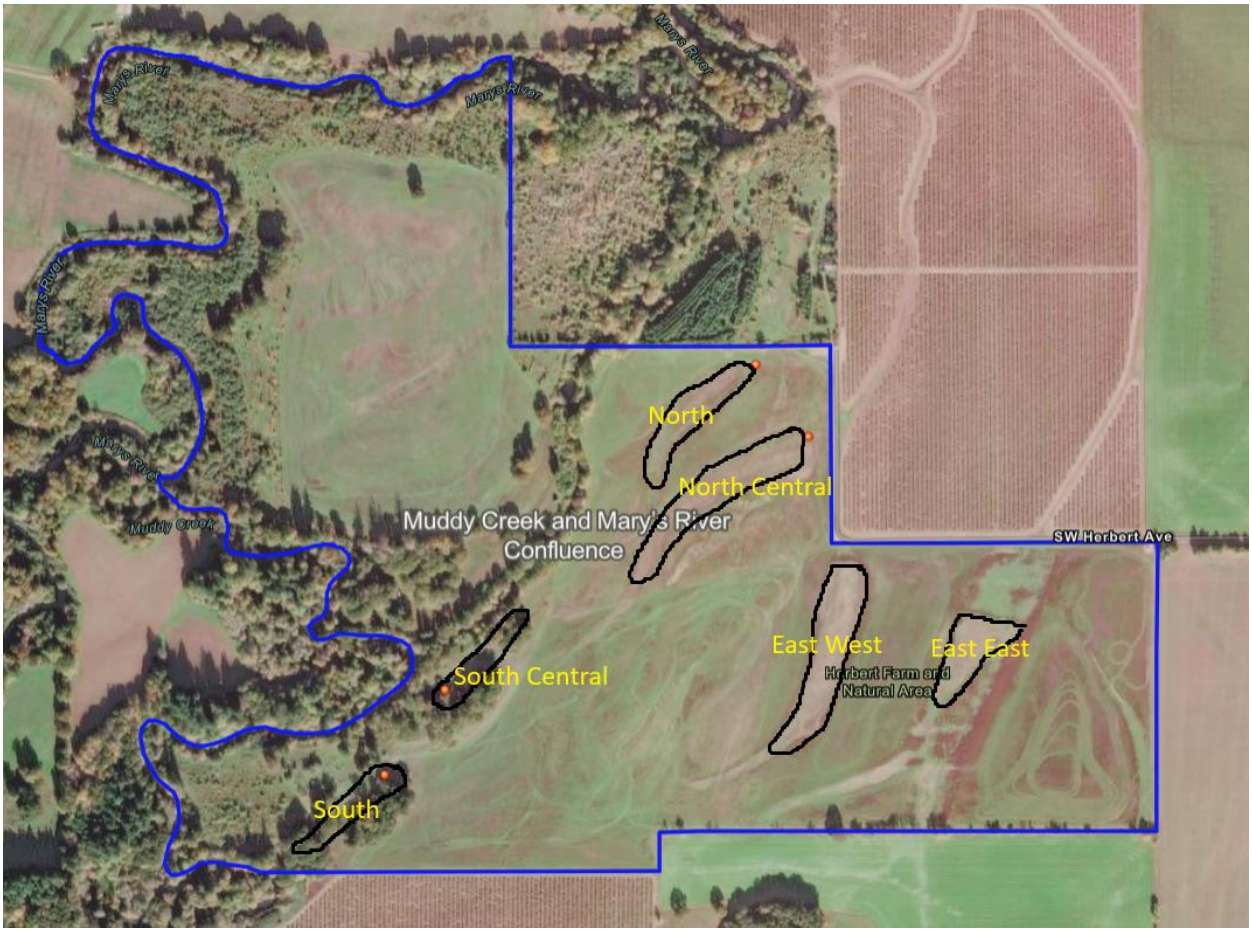
City of Corvallis, Herbert Farm and Natural Area

Summary of Amphibian Survey Efforts

Survey Date: 3/14/2024

Surveyors: ODFW (Owen Cass), IAE (Sara Alaica, Christina Mitchell)

Weather: Sunny, light wind in morning, breezy in afternoon, temperature range from 46F to 60F



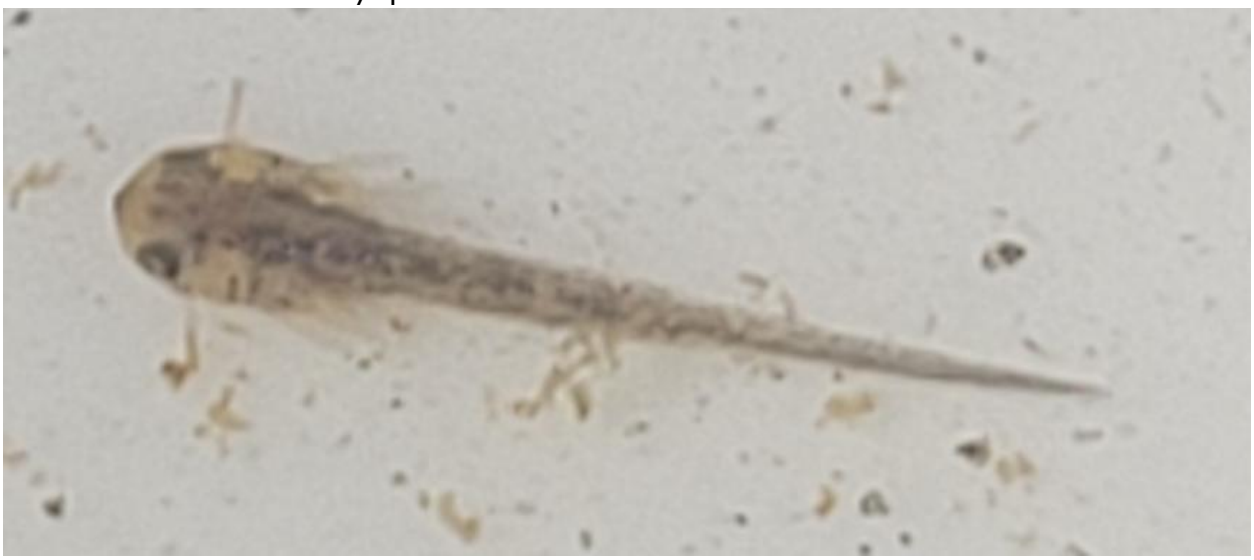

North Pond (10:47 to 11:11)

- 44.521716, -123.292744
- Constructed pond in 2019? Revegetated with native plants
- 90% surveyed
- Many Pacific Tree Frog tadpoles and hatching egg masses, 60+ egg masses
- Water visibility = excellent, water temperature 50F
- Max pond depth 18”
- Suitable herbaceous attachment material

South Pond (11:23 to 11:43)

- 44.516730, -123.298678
- Natural pond, south side is oak woodland
- 80% surveyed
- Water visibility = Fair, Water Temp = 46F
- 3 Pacific Tree Frog Egg masses, unhatched
- Max depth 22 inches
- Woody and herbaceous attachment material

South Central Pond (11:51 to 12:10)

- 44.518112, -123.296678
- Natural Pond, south side is oak woodland
- 90% surveyed
- Water Visibility = Poor in shady spot, excellent in sunny spot, Water Temp = 46F
- No egg masses found
- One Rough Skinned Newt in ditch just north of this pond
- 1 larval salamander in sunny spot
- 
- Lots of Woody attachment material in shady spot
- Max Depth 12”

North East Pond (12:57 to 1:27)

- 44.520429, -123.292764
- Constructed pond, 2019?
- 70% surveyed
- Water visibility poor, Water Temp 55F
- 100+ Pacific Tree Frog egg masses, pretty well developed. North Pond had later stage of lifecycle.
- Max Depth 22”

- Herbaceous attachment material around edge

East West Pond (1:31 to 1:50)

- 44.518618, -123.290586
- Constructed pond 2020?
- 60% surveyed
- Water Visibility = poor, water temp = 56F
- 50+ Pacific Tree Frog egg masses in shallower grassy inlet side
- Max depth 20”
- Not much attachment material, some floppy herbaceous material around perimeter

East East Pond (1:54 – 2:07)

- 44.518295, -123.288498
- Constructed Pond 2020?
- 60% surveyed
- Water Visibility = Fair, Temperature = 57F
- Shallow pond, 6-8 inches
- No egg masses

**ODFW Amphibian Egg Mass Survey Data Form** *(revised 3/12/2021)*

| | | |
|---|---|---|
| **DATE:** 3/14/2024 | **SITE / Sub-Unit :** HFNA N pond | **SURVEYORS:** Owen, Christina (IAE), Sara (IAE |
| **WEATHER:** (sunny) / partly sunny / cloudy / (no wind) / lt. wind / windy **AIR TEMP:** 46 °F<br>**RAIN:** Yes (No) **WATER TEMP:** 50 °F | | **Estimated # of Egg Masses:**<br>**PTFrog:** 0 <10 10-100 (>100)<br>**LTSal:** (0) <10 10-100 >100 |
| **START TIME:** 10:47<br>**END TIME:** 11:11 | **WATER VISIBILITY:**[1] Poor / Fair / (Excellent)<br>**% AREA SURVEYED:** 90 | |
| **FIELD NOTES:** (e.g., sign of beaver activity, presence of waterfowl, human disturbance, oil sheen, algae, water clarity, visibility etc.) over 100ft from trees<br>**Lat / Long:** max pond depth 18", PTFrog vocalizing, good veg attachments in pond | | |

[1] **Water Visibility**: **Poor** = less than 1 ft down, **Fair** = less than 2 ft, **Excellent** = greater than 2 ft
[2] **Species:** **PTFrog** = Pacific Treefrog, **LTSal** = Long-toed Salamander, **RLF** = Red-legged Frog, **NWS** = Northwestern Salamander
[3] **Confidence Level**: Rate your level of confidence in your ability to identify egg mass species as either **L** = Low, **M** = Medium, or **H** = High
[4] **Stage:** Indicate development stage of egg mass. **R** = Round embryo, **T** = Pre-hatch embryo with tail feature, **H** = Hatching or Hatched
[5] **Attachment Vegetation**: **G** = Grass or grass-like plant, **W** = Woody plant, **O** = Other, **N** = None (egg mass floating)
[6] **Max Water Depth:** Measure in inches water depth at egg mass location. The distance from bottom substrate to water's surface.
7 **Egg Mass Water Depth**: Measure in inches distance between top of the egg mass to the water's surface. Mass at surface = 0. Mass above water use "-"

| Species[2] | Confidence Level[3] | # of Egg Masses | Stage[4] | Attachment Vegetation[5] | Max Water Depth[6] | Egg Mass Water Depth[7] | Field Notes (record sightings of adult amphibians, tadpoles, vocalizations, eggs dead or partially predated) |
|---|---|---|---|---|---|---|---|
| ~~RLF~~ PTF ~~NWS~~ | L M (H) | hundreds | R T (H) | G W O N | 12 | 8 | tadpoles, all eggs hatched |
| RLF NWS | L M H | | R T H | G W O N | | | |
| RLF NWS | L M H | | R T H | G W O N | | | |
| RLF NWS | L M H | | R T H | G W O N | | | |
| RLF NWS | L M H | | R T H | G W O N | | | |

**ODFW Amphibian Egg Mass Survey Data Form** *(revised 3/12/2021)*

| | | |
|---|---|---|
| **DATE:** 3/14/24 | **SITE / Sub-Unit :** HFNA S. Pond | **SURVEYORS:** OCC, JCM, SA |
| **WEATHER:** sunny / (partly sunny) / cloudy / (no wind) / lt. wind / windy **AIR TEMP:** 47 °F<br>**RAIN:** Yes (No) filtered sun through trees **WATER TEMP:** 46 °F | | **Estimated # of Egg Masses:**<br>**PTFrog:** 0 (<10) 10-100 >100<br>**LTSal:** 0 <10 10-100 >100 |
| **START TIME:** 1123<br>**END TIME:** 1143 | **WATER VISIBILITY:**[1] Poor / (Fair) Excellent<br>**% AREA SURVEYED:** 80 | |
| **FIELD NOTES:** (e.g., sign of beaver activity, presence of waterfowl, human disturbance, oil sheen, algae, water clarity, visibility etc.)<br>waterfowl made water slightly murkey, max depth 22<br>**Lat / Long:** | | |

[1] **Water Visibility**: **Poor** = less than 1 ft down, **Fair** = less than 2 ft, **Excellent** = greater than 2 ft
[2] **Species: PTFrog** = Pacific Treefrog, **LTSal** = Long-toed Salamander, **RLF** = Red-legged Frog, **NWS** = Northwestern Salamander
[3] **Confidence Level**: Rate your level of confidence in your ability to identify egg mass species as either **L** = Low, **M** = Medium, or **H** = High
[4] **Stage:** Indicate development stage of egg mass. **R** = Round embryo, **T** = Pre-hatch embryo with tail feature, **H** = Hatching or Hatched
[5] **Attachment Vegetation**: **G** = Grass or grass-like plant, **W** = Woody plant, **O** = Other, **N** = None (egg mass floating)
[6] **Max Water Depth:** Measure in inches water depth at egg mass location. The distance from bottom substrate to water's surface.
7 **Egg Mass Water Depth**: Measure in inches distance between top of the egg mass to the water's surface. Mass at surface = 0. Mass above water use "-"

| Species[2] | Confidence Level[3] | # of Egg Masses | Stage[4] | Attachment Vegetation[5] | Max Water Depth[6] | Egg Mass Water Depth[7] | Field Notes (record sightings of adult amphibians, tadpoles, vocalizations, eggs dead or partially predated) |
|---|---|---|---|---|---|---|---|
| RLF NWS | L M H | | R T H | G W O N | | | |
| RLF NWS | L M H | | R T H | G W O N | | | |
| RLF NWS | L M H | | R T H | G W O N | | | |
| RLF NWS | L M H | | R T H | G W O N | | | |
| RLF NWS | L M H | | R T H | G W O N | | | |

**ODFW Amphibian Egg Mass Survey Data Form** *(revised 3/12/2021)*

| | | |
|---|---|---|
| **DATE:** 3/14/2024 | **SITE / Sub-Unit :** HENA S. Central | **SURVEYORS:** OCC, JCM, SA |

**WEATHER:** sunny / partly sunny / cloudy / no wind / lt. wind / windy **AIR TEMP:** 48 °F

**RAIN:** Yes (No) filtered through trees **WATER TEMP:** 46 °F

**START TIME:** 11:51 **END TIME:** 12:10

**WATER VISIBILITY:**[1] Poor / Fair / (Excellent) 6-12" **% AREA SURVEYED:** 90%

**Estimated # of Egg Masses:**

| | | | | |
|---|---|---|---|---|
| **PTFrog:** | 0 | (<10) | 10-100 | >100 |
| **LTSal:** | 0 | <10 | 10-100 | >100 |

**FIELD NOTES:** (e.g., sign of beaver activity, presence of waterfowl, human disturbance, oil sheen, algae, water clarity, visibility etc.)

murkey, lots of woody material, max depth 12", stonefly, Springtail

**Lat / Long:**

PTF - tadpoles in sunny spot - Salamander larvae - pic on AGOL

[1] **Water Visibility**: **Poor** = less than 1 ft down, **Fair** = less than 2 ft, **Excellent** = greater than 2 ft
[2] **Species:** **PTFrog** = Pacific Treefrog, **LTSal** = Long-toed Salamander, **RLF** = Red-legged Frog, **NWS** = Northwestern Salamander
[3] **Confidence Level**: Rate your level of confidence in your ability to identify egg mass species as either **L** = Low, **M** = Medium, or **H** = High
[4] **Stage:** Indicate development stage of egg mass. **R** = Round embryo, **T** = Pre-hatch embryo with tail feature, **H** = Hatching or Hatched
[5] **Attachment Vegetation**: **G** = Grass or grass-like plant, **W** = Woody plant, **O** = Other, **N** = None (egg mass floating)
[6] **Max Water Depth:** Measure in inches water depth at egg mass location. The distance from bottom substrate to water's surface.
[7] **Egg Mass Water Depth**: Measure in inches distance between top of the egg mass to the water's surface. Mass at surface = 0. Mass above water use "-"

| Species[2] | Confidence Level[3] | # of Egg Masses | Stage[4] | Attachment Vegetation[5] | Max Water Depth[6] | Egg Mass Water Depth[7] | Field Notes (record sightings of adult amphibians, tadpoles, vocalizations, eggs dead or partially predated) |
|---|---|---|---|---|---|---|---|
| RLF NWS | L M H | | R T H | G W O N | | | |
| RLF NWS | L M H | | R T H | G W O N | | | |
| RLF NWS | L M H | | R T H | G W O N | | | |
| RLF NWS | L M H | | R T H | G W O N | | | |
| RLF NWS | L M H | | R T H | G W O N | | | |

**ODFW Amphibian Egg Mass Survey Data Form** *(revised 3/12/2021)*

| | | |
|---|---|---|
| **DATE:** 3/14/24 | **SITE / Sub-Unit :** HFNA NE | **SURVEYORS:** OCG, JCM, SA |
| **WEATHER:** (sunny) / partly sunny / cloudy / no wind / lt. wind / (windy) **AIR TEMP:** 50 °F<br>**RAIN:** Yes (No) **WATER TEMP:** 55 °F | | **Estimated # of Egg Masses:**<br>**PTFrog:** 0 <10 (10-100) >100<br>**LTSal:** 0 <10 10-100 >100 |
| **START TIME:** 12:57<br>**END TIME:** 1:27 | **WATER VISIBILITY:**[1] (Poor) / Fair / Excellent<br>**% AREA SURVEYED:** 70% | |
| **FIELD NOTES:** (e.g., sign of beaver activity, presence of waterfowl, human disturbance, oil sheen, algae, water clarity, visibility etc.)<br>**Lat / Long:** max depth 22", very murky from wind/waterfowl, many PTF on edge | | |

[1] **Water Visibility**: **Poor** = less than 1 ft down, **Fair** = less than 2 ft, **Excellent** = greater than 2 ft
[2] **Species:** **PTFrog** = Pacific Treefrog, **LTSal** = Long-toed Salamander, **RLF** = Red-legged Frog, **NWS** = Northwestern Salamander
[3] **Confidence Level**: Rate your level of confidence in your ability to identify egg mass species as either **L** = Low, **M** = Medium, or **H** = High
[4] **Stage:** Indicate development stage of egg mass. **R** = Round embryo, **T** = Pre-hatch embryo with tail feature, **H** = Hatching or Hatched
[5] **Attachment Vegetation**: **G** = Grass or grass-like plant, **W** = Woody plant, **O** = Other, **N** = None (egg mass floating)
[6] **Max Water Depth:** Measure in inches water depth at egg mass location. The distance from bottom substrate to water's surface.
7 **Egg Mass Water Depth**: Measure in inches distance between top of the egg mass to the water's surface. Mass at surface = 0. Mass above water use "-"

| Species[2] | Confidence Level[3] | # of Egg Masses | Stage[4] | Attachment Vegetation[5] | Max Water Depth[6] | Egg Mass Water Depth[7] | Field Notes (record sightings of adult amphibians, tadpoles, vocalizations, eggs dead or partially predated) |
|---|---|---|---|---|---|---|---|
| RLF NWS | L M H | | R T H | G W O N | | | |
| RLF NWS | L M H | | R T H | G W O N | | | |
| RLF NWS | L M H | | R T H | G W O N | | | |
| RLF NWS | L M H | | R T H | G W O N | | | |
| RLF NWS | L M H | | R T H | G W O N | | | |

**ODFW Amphibian Egg Mass Survey Data Form** *(revised 3/12/2021)*

| | | |
|---|---|---|
| **DATE:** 3/14/2024 | **SITE / Sub-Unit :** HFNA E.W. | **SURVEYORS:** OCC, JCM, SA |
| **WEATHER:** (sunny) / partly sunny / cloudy / no wind / lt. wind / (windy) **AIR TEMP:** 50 °F<br>**RAIN:** Yes (No) **WATER TEMP:** 56 °F | | **Estimated # of Egg Masses:**<br>**PTFrog:** 0 <10 10-100 >100<br>**LTSal:** 0 <10 10-100 >100 |
| **START TIME:** 1:31<br>**END TIME:** 1:50 | **WATER VISIBILITY:**[1] (Poor) / Fair / Excellent<br>**% AREA SURVEYED:** 60% | |
| **FIELD NOTES:** (e.g., sign of beaver activity, presence of waterfowl, human disturbance, oil sheen, algae, water clarity, visibility etc.)<br>**Lat / Long:** murkey in N part, most masses in shallow grassy South part | | |

[1] **Water Visibility**: **Poor** = less than 1 ft down, **Fair** = less than 2 ft, **Excellent** = greater than 2 ft
[2] **Species: PTFrog** = Pacific Treefrog, **LTSal** = Long-toed Salamander, **RLF** = Red-legged Frog, **NWS** = Northwestern Salamander
[3] **Confidence Level**: Rate your level of confidence in your ability to identify egg mass species as either **L** = Low, **M** = Medium, or **H** = High
[4] **Stage:** Indicate development stage of egg mass. **R** = Round embryo, **T** = Pre-hatch embryo with tail feature, **H** = Hatching or Hatched
[5] **Attachment Vegetation**: **G** = Grass or grass-like plant, **W** = Woody plant, **O** = Other, **N** = None (egg mass floating)
[6] **Max Water Depth:** Measure in inches water depth at egg mass location. The distance from bottom substrate to water's surface.
[7] **Egg Mass Water Depth**: Measure in inches distance between top of the egg mass to the water's surface. Mass at surface = 0. Mass above water use "-"

| Species[2] | Confidence Level[3] | # of Egg Masses | Stage[4] | Attachment Vegetation[5] | Max Water Depth[6] | Egg Mass Water Depth[7] | Field Notes (record sightings of adult amphibians, tadpoles, vocalizations, eggs dead or partially predated) |
|---|---|---|---|---|---|---|---|
| RLF NWS | L M H | | R T H | G W O N | | | |
| RLF NWS | L M H | | R T H | G W O N | | | |
| RLF NWS | L M H | | R T H | G W O N | | | |
| RLF NWS | L M H | | R T H | G W O N | | | |
| RLF NWS | L M H | | R T H | G W O N | | | |

## Appendix 4. 2024 Western pond turtle trapping

**Herbert Farm**
**2024 Turtle Trapping CMR Project Summary**

*updated by Barnes on 8/27/2024*

**Trapping Session #1**

**Dates: July 23-24, 2024**

Participants: Lilia Chapman (ODFW WWMP Intern), Sofia Tate (ODFW WWMP Intern), Lilly White (ODFW Conservation Intern), Susan Barnes (ODFW Conservation), Christina Mitchell (IAE), Sara Alaica (IAE). Kylie Kress (AmeriCorps student from SUNY - Utica).

Sites/Areas Trapped: Matt Creek Culvert Pond #1
Traps Used: 3 Hoop
Trap Numbers Used: #71, #72, #73
Number of Trapping Nights: 1

Notch numbers used previously in vicinity: NWPT: #1791, #4826, #4828, #4829, #4830-38, #4840, #4850, #4928, (Holland). WEPT: #31 (Holland). NWPT Notch Assignment from 1991-1994: #4851-5050

Notch numbers used this session: #59

**# Turtle Capture Events = 1 NWPT (NEW)**

Non-Target Species Captured: None

7/23/2024: Barnes, White, Chapman, Tate, Mitchell, Alaica and Kress met on-site at 1:45 pm. Set 3 hoop traps in Matt Creek Culvert Pond #1 beginning ~2:30 pm. Water depths at traps and water temperature NR. One adult female NWPT observed surface basking after trap set.

Location of Traps (Datum: WGS84)

| Pond 1 (74 ºF) | Latitude | Longitude | Water Depth at Trap (in) |
|---|---|---|---|
| H #71 | 44.521667 | -123.295 | ~30 |

| | | | |
|---|---|---|---|
| H #72 | 44.521667 | -123.295 | ~30 |
| H #73 | 44.521667 | -123.295 | ~30 |

**7/24/2024:** Mitchell and Thompson checked and pulled traps beginning ~1:45 pm. End Time: 2:08pm. One adult female NWPT (NEW) captured in Hoop #71. Was supposed to be notched #4851, but was accidentally notched #59 (#50, #8, #1).

Herbert Farm

NWPT Notch #59

7/24/2024

**Appendix 5. 2024 Emerald ash borer monitoring**

# Oregon Ash and Emerald Ash Borer monitoring at Herbert Farm Natural Area

Report prepared by J. Christina Mitchell

*Institute for Applied Ecology, Conservation Research Program*

## PLEASE INCLUDE WITH ACKNOWLEDGEMENTS:

Emerald Ash Borer monitoring was supported by Claire Rubens and Oregon ash community field work was supported by Kristi Brazile. Mariah Davis with the United States Department of Agriculture provided purple prism trap materials and Wyatt Williams with the Oregon Department of Forestry provided access for data submission.

## 1. INTRODUCTION

In June 2022, the invasive Emerald Ash Borer (EAB; *Agrilus planipennis;* Figure 20) was detected in Oregon ash (*Fraxinus latifolia*) trees in Forest Grove outside of Portland, Oregon. EAB is a beetle (Insect Family: Buprestidae) native to Asia that specializes on ash trees (*Fraxinus spp.*). Outside of its native range, populations of EAB are less influenced by natural predators and have expanded to decimate populations of North American ash species including *Fraxinus americana*, *Fraxinus nigra*, and *Fraxinus pennsylvanica*. Variable by location, ecosystem biodiversity and functions have been altered by the loss of native ash species. Oregon ash is the only native ash species in Oregon and fills a niche in Willamette Valley ecology. Oregon ash is a deciduous, early successional tree often growing in riparian areas or wetlands. It can provide shade and shelter and food resources for native species in open prairies and along waterways.

**Figure 20.** Adult EAB on ash leaf, photograph by David Cappaert.

In 2002, EAB was discovered in North America for the first time in the state of Michigan. Since then, it has spread throughout the eastern United States and into Canada. EAB was detected in Colorado in 2013 but had not been found in states farther west until its 2022 detection in Oregon. This occurrence initiated a widespread response by local and federal governmental agencies, universities, and other entities. The Institute for Applied Ecology (IAE) joined the statewide task force supported by the Oregon Department of Agriculture and the Oregon Department of Forestry to assist with statewide efforts and stay informed of the status of EAB in Oregon. After the discovery of EAB in Washington County, agencies conducted widespread surveying and detection efforts to determine whether the Forest Grove occurrence was the only or first-known EAB infestation. In 2024, trapping and inspection efforts across the state found additional occurrences of EAB in Clackamas, Marion, and Yamhill Counties.

As part of these efforts, IAE surveyed and monitored ash communities at Herbert Farm Natural Area. This location is an important area to survey for EAB because of the riparian ash community and location within the confluence of the Marys River, Muddy Creek, and Matt Creek. Additionally, Herbert Farm Natural Area contains a variety of natural resources and a diversity of native species, including threatened and endangered species. We collected ash community overstory and understory vegetation data and maintained five EAB traps for state-coordinated early detection efforts; we did not detect EAB.

## 2. GOALS AND OBJECTIVES

The goals of this project are to monitor riparian Oregon ash communities for signs of Emerald Ash Borer (*Agrilus planipennis*) infestation and collect vegetation community data before the expected invasion to serve as a baseline for future restoration and management efforts.

Specific objectives are:

1) Maintain and remove Emerald Ash Borer traps from July to August 2024;
2) Coordinate and share trap data with the Oregon Department of Forestry; and
3) Analyze and summarize trap and vegetation community data to provide recommendations for future management.

# 3. METHODS

## 3.1. Early detection surveys

Early detection monitoring included visual inspections for EAB presence and monitoring of pheromone-baited sticky traps. Visual inspections included inspecting Oregon ash trees for crown weakness and dieback, epicormic sprouting, trunk and bark splitting, woodpecker and other excavation activities, and D-shaped exit holes (Knight et al. 2014). If multiple indications of EAB are present, we may strip sections of bark to confirm the presence of galleries and larvae. If an ash tree is dead or killed for any reason, we will strip the bark and inspect for evidence of EAB galleries or larval instars.

**Figure 21.** A purple prism trap in an Oregon ash tree, targeting Emerald Ash Borer.

In 2024 we set up five purple prism traps baited with z-3 hexanol (Figure 21), a pheromone released by plants when damaged, during the EAB flight season. If EAB are in an area, they may be attracted to a pheromone-baited trap because it mimics a stressed ash tree suitable for laying eggs. Traps were placed throughout the riparian corridor in ash trees with diameters greater than 10 cm DBH (diameter at breast height) and branches that allowed for placement 1-3 meters high (Figure 3, purple markers). We deployed three traps on April 11th and the remaining two traps on April 25th, once Matt Creek was low enough to cross. We checked traps every 2-4 weeks and replaced pheromones monthly. All traps were removed on August 19th and trapping data were submitted to the Oregon Department of Forestry. If EAB is detected at any point, we will report observations to the Oregon Department of Agriculture.

## 3.2. Vegetation community surveys

Monitoring effects of EAB on the vegetation community requires surveys of Oregon ash and associated plants.

### Overstory Vegetation

Amongst ash trees by Muddy Creek, near the Marys River (Figure 3, yellow star), we established a transect array with three 35-m long transects running from a central point to the north, the southeast, and the southwest. At 33 points along each transect, we used a GRS densiometer to determine whether the vertical projection of the overstory on each meter mark was conifer, hardwood (identified by species), or open (Applegate 2000, Adikari & MacDicken 2015, Harris and Betts 2021). This information can then be used to assess changes in both light penetration and species composition following EAB invasion.


**Figure 22.** Location of Oregon ash overstory data collection (yellow star) and Oregon ash trees with purple prism traps and understory data collection (purple markers) at Herbert Farm Natural Area.

### Understory Vegetation

Nearby each Oregon ash with a purple prism trap (Figure 3, purple markers), we placed a 1-m x 1-m pvc-frame quadrat and estimated percent cover for each plant species and four types of ground cover: bare ground, moss and lichen, rock, and thatch and litter. Each plant species was identified to the lowest taxonomic level possible and categorized as native or nonnative, and forb or graminoid or shrub.

# 4. RESULTS

## 4.1. Early detection surveys

Throughout our monitoring period of April 11th to August 19th 2024, we saw no signs of EAB on Oregon ash trees or purple prism traps at Herbert Farm Natural Area. We shared trap data with

the Oregon Department of Forestry for inclusion in their 'Emerald Ash Borer Green & Purple Trap Site Locations' AGOL WebMap (Figure 4).

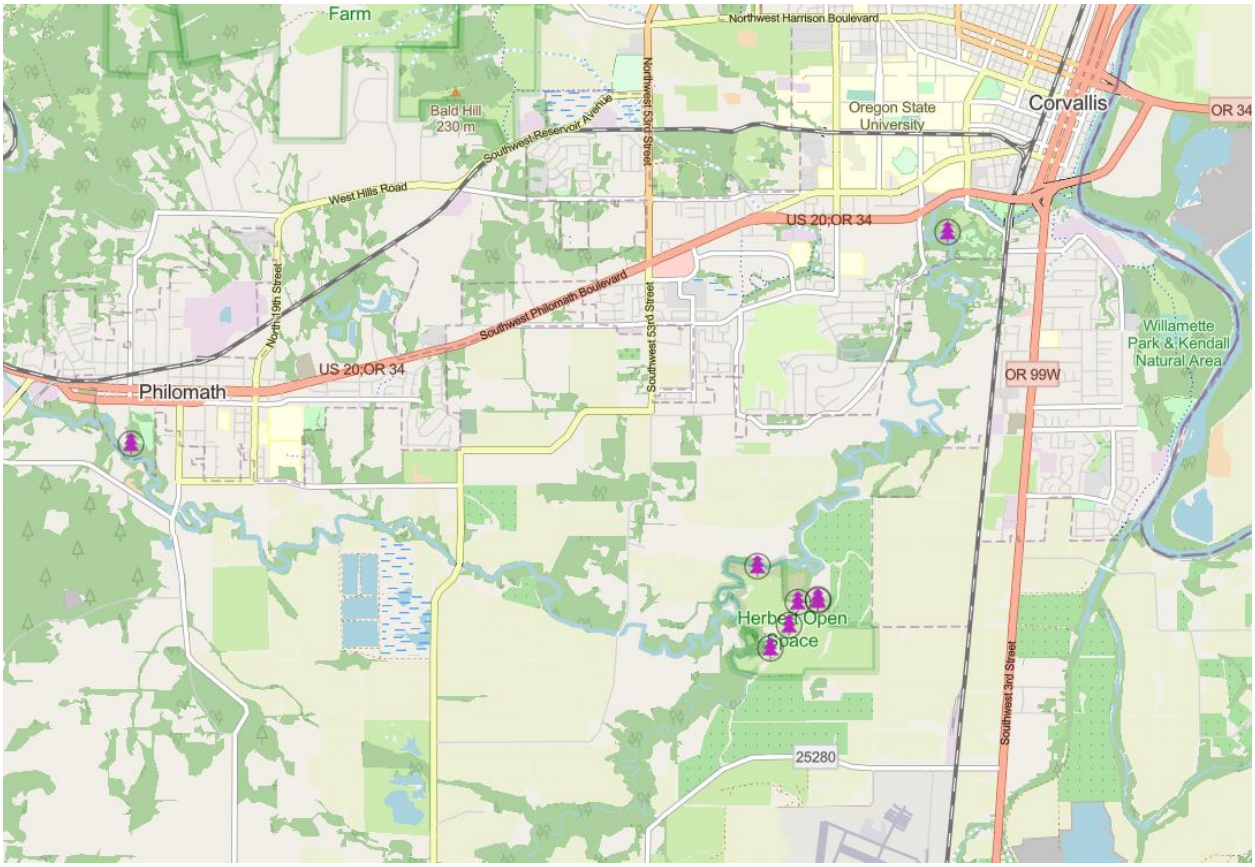



**Figure 23**. From Oregon Department of Forestry's AGOL WebMap 'Emerald Ash Borer Green & Purple Trap Site Locations' showing traps at Herbert Farm Natural Area as part of 2024 data collection efforts around Corvallis.

## 4.2. Vegetation community surveys

### Overstory Vegetation

Among the Oregon ash community along Muddy Creek, the quantified overstory community was dominated by hardwood species (91.0%). While we targeted an area with mature Oregon ash for sampling, the most dominant hardwood species in the sampled overstory was Oregon white oak (*Quercus garryana*; 48.3%), followed by Oregon ash (*Fraxinus latifolia*; 21.3%), Pacific willow (*Salix lucida*; 12.4%), and apple (*Malus sp.*; 9.0%). We observed no conifer species (0.0%) and some open canopy (9.0%) in the sampled overstory, likely influenced by site management.

### Understory Vegetation

Thatch and litter had the greatest average percentage (42.0%) of cover across the five understory vegetation community plots (Figure 5). The amount of bare ground was more variable

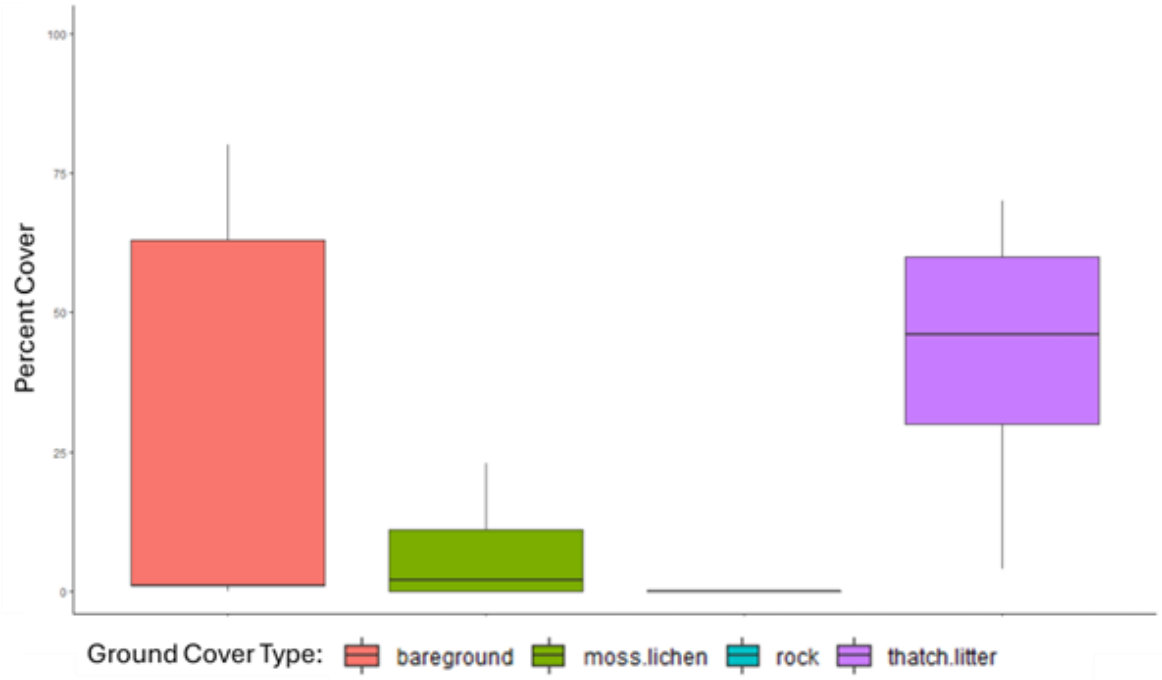
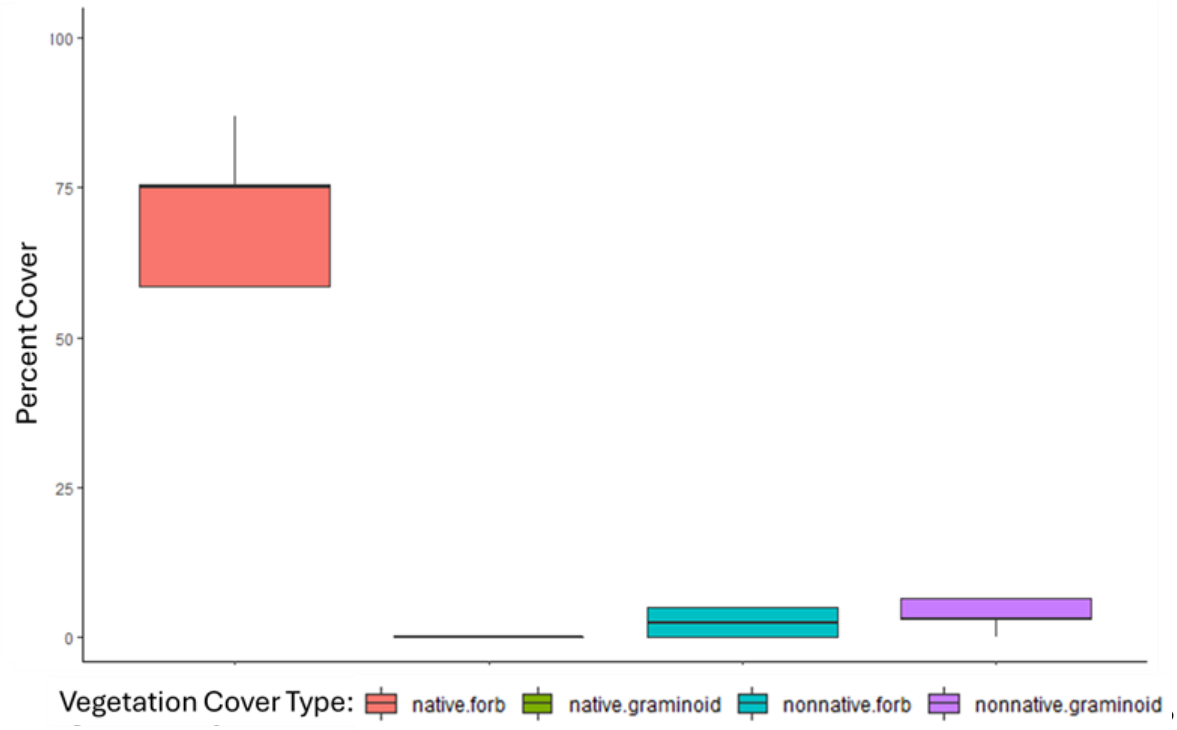



**Figure 25.** Ranges and averages of cover by bare ground (coral), moss and lichen (green), rock (teal), and thatch and litter (purple) for five understory plots.

across the five plots (range = 0 to 80%) than the amount of moss and lichen (range = 0 to 23%), and rocks were not present in any understory plot (Figure 5). Native forbs had the greatest average percentage (60.0%) of cover across the five understory vegetation community plots




(teal), and nonnative graminoid (purple)for five understory plots.

(Figure 6). Native graminoids averaged 0.1% cover, nonnative forbs averaged 6.9% cover, and nonnative graminoids averaged 7.5% cover (Figure 6).

# 5. DISCUSSION AND MANAGEMENT RECOMMENDATIONS

We found no evidence of adult EAB or damage from EAB larvae at Herbert Farm Natural Area. Prior to 2024, the only known occurrence of EAB in Oregon was in Washington County, about 80 miles north of Herbert Farm Natural Area. However, EAB was detected in three additional counties during the 2024 flight season: Clackamas County (~65 miles north), Marion County (~60 miles north), and Yamhill County (~70 miles north). EAB populations may move south along riparian corridors, often dominated by Oregon ash, including the Willamette River and Marys River. There may exist undetected populations in other areas of the state, as was found this year on the border of Clackamas and Marion Counties. The known extent of the newly detected Clackamas/Marion infestation is now more than double (23.6 sq. miles) the known extent of the previously detected Forest Grove infestation (10.4 sq. miles) and will likely increase as survey efforts continue. It is important to continue survey efforts across the Willamette Valley, to track the spread of EAB and provide rapid response to any detections.

The understory vegetation community associated with Oregon ash was dominated by native forbs with high amounts of bare ground and thatch and litter. While this may be influenced by the active restoration and management that occurs at Herbert Farm Natural Area, these conditions provide the opportunity for native seeds to make soil contact and germinate and prevent nonnative plants from dominating the community. A diversity of native plant species can help fill functional niches left by the loss of Oregon ash following EAB infestation and continue providing resources for native wildlife. In 2025, we will continue monitoring purple prism traps for EAB and monitor Oregon ash trees for any signs of damage from EAB.

While EAB remains outside of Herbert Farm Natural Area, we recommend to continue EAB monitoring with pheromone-baited purple prism traps, stay informed of additional EAB detections, and recollect vegetation data about every three years to track changes in community composition over time. In addition, we recommend to stop planting Oregon ash as part of restoration efforts and consider alternative species to interplant among planted and native Oregon ash trees to provide cover and resources if Oregon ash succumbs to EAB. Alternative species to Oregon ash include, but are not limited to, alders (*Alnus spp.*), maples (*Acer spp.*), black hawthorn (*Crataegus douglasii*), cottonwood (*Populus trichocarpa*), and willows (*Salix spp.*; Kral & Shaw 2023). If EAB is detected at Herbert Farm Natural Area, an Oregon ash management strategy should be developed. This strategy may include management techniques like cutting down smaller-diameter Oregon ash trees, preserving larger keystone trees with pesticide treatments, long term monitoring of compositional changes in the vegetation community, and adapting restoration management techniques to account for updated information from the EAB research community and site conditions.

## CONCLUSIONS

In summary,

- Continued EAB trapping and Oregon ash monitoring at Herbert Farm Natural Area will benefit statewide surveying efforts and assist in early detection of EAB populations.
- State agencies, including the Oregon Department of Forestry and the Oregon Department of Agriculture, provide numerous EAB resources.
- Oregon ash management strategies, including Oregon ash removal or treatment and resampling of the vegetation community, should be implemented if EAB is found on or near Herbert Farm Natural Area.

## REFERENCES

Adikari, Y., and K. MacDicken. 2015. Testing field methods for assessing the forest protective function for soil and water. Page 48. Food and Agriculture Organization of the United Nations, Rome, Italy.

Applegate, J. R. 2000. Comparison of techniques for estimating overstory canopy cover. University of Montana.

Harris, S. H., and M. G. Betts. 2021. Bird abundance is highly dynamic across succession in early seral tree plantations. Forest Ecology and Management 483:118902.

IUCN. 2024. The IUCN Red List of Threatened Species. Version 2024-2. https://www.iucnredlist.org. Accessed on October 31, 2024.

Knight, K. S., J. A. Throckmorton, B. P. Flash, B. Grafton, R. H. Kappler, and C. E. Flower. Monitoring Ash (*Fraxinus spp.*) Decline and Emerald Ash Borer (*Agrilus planipennis*) Symptoms in Infested Areas. General Technical Report NRS-139. U.S. Department of Agriculture, Forest Service, Northern Research Station, Newtown Square, PA.

Kral, G. and D. C. Shaw. 2023. Alternatives to Ash in Western Oregon: With a Critical Tree Under Threat, These Options Can Help Fill Habitat Niche. Oregon State University Extension Service. https://extension.oregonstate.edu/catalog/pub/em-9396-alternatives-ash-western-oregon- critical-tree-under-threat-these-options-can

Oregon Department of Forestry (ODF). 2024. EAB Traps WebMap. https://geo.maps.arcgis.com/apps/mapviewer/index.html?webmap=e7969fabb08f4d369e06f a95d73645de