Oregon Ash and Emerald Ash Borer monitoring in Willamette Valley forests: 2024 progress report

December 2024

Report to the Bureau of Land Management, Northwest Oregon District

Report prepared by J. Christina Mitchell and Scott Harris

Institute for Applied Ecology

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PREFACE

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

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Cover photograph: Oregon ash (*Fraxinus latifolia*) community on Wells Island, situated within the Willamette River. Photograph, and all others unless documented otherwise, by J. Christina Mitchell.

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EXECUTIVE SUMMARY

In 2023, the Institute for Applied Ecology (IAE) partnered with the Bureau of Land Management (BLM) to monitor riparian Oregon ash (*Fraxinus latifolia*) communities for signs of Emerald Ash Borer (EAB; *Agrilus planipennis*) infestation. Collecting vegetation community data before the expected invasion will serve as a baseline for future restoration and management efforts. Oregon ash is the only native ash species in Oregon and fills a niche in Willamette Valley ecology. In Oregon, EAB was first detected in Washington County in June 2022 and detected in Clackamas, Marion, and Yamhill Counties in 2024. IAE joined the statewide EAB Task Force, supported by the Oregon Department of Agriculture and the Oregon Department of Forestry, in 2022 to assist with statewide efforts and stay informed of the status of EAB in Oregon.

In 2024, we scouted 35 sites for inclusion in this study and collected overstory and understory vegetation data from seven sites with Oregon ash communities. We will include additional sites (up to 20) following 2025 scouting of the remaining suggested BLM sites. We were not able to set up purple prism traps for monitoring EAB in 2024, but we will deploy traps in 2025. We visually inspected Oregon ash trees and did not detect signs of EAB infestation in visited sites. Most sites had high levels of canopy closure and the understory vegetation community associated with Oregon ash was comprised mostly of native forbs with high amounts thatch and litter.

An Oregon ash management strategy should be considered if EAB is detected in BLM forests. 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.

1. INTRODUCTION

In June 2022, the invasive Emerald Ash Borer (EAB; *Agrilus planipennis;* Figure 1) 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* (IUCN 2024). 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 1. 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, state, 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 Oregon ash communities within BLM land. These sites span the Willamette Valley and are important areas to survey because EAB will likely be found in riparian Oregon ash communities, which occur along the Willamette River, and new populations may be detected in any western county. Additionally, many sites contain rare species or a diversity of native species, and EAB will influence conservation management if found near these sites. In 2024, we scouted 35 sites for inclusion in this study and collected Oregon ash community overstory and understory vegetation data from seven sites with Oregon ash communities. We visually inspected Oregon ash trees and did not detect signs of EAB infestation in visited sites.

2. GOALS AND OBJECTIVES

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

Specific objectives are to:

1) Provide early detection monitoring for EAB;
2) Conduct pre-EAB invasion surveys at up to 20 sites identified with project partners; and
3) Provide management recommendations to slow Oregon ash mortality (SLAM) and minimize negative effects on riparian ecosystems, including habitat for special status species.

3. METHODS

3.1. Site Descriptions

In 2024, we visited 35 sites out of the 55 sites suggested by BLM partners (Appendix A). From the sites visited, we were able to gather enough information to determine that seven were suitable for initial vegetation community data collection.

Fishermens Bend

Located along the North Santiam River by Mill City, OR in Marion County, most of this 195-acre site burned in 2020. While most of the trees on site prior to 2020 have burned or have been cut down, there are still some larger diameter Oregon ash trees along the river corridor (Figure 2).

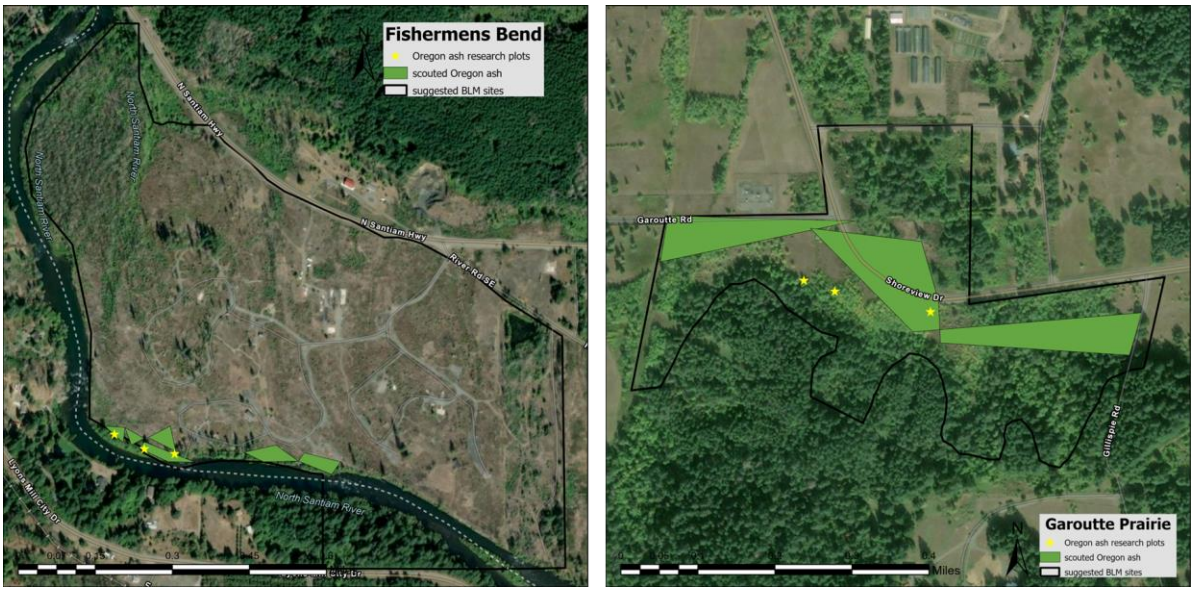

Figure 2. Site maps of Fishermens Bend (left) and Garoutte Prairie (right), indicating Oregon ash research plots (yellow stars), areas of Oregon ash scouted on initial site visits (green polygons), and boundaries of suggested BLM sites (black lines).

Garoutte Prairie

This site is located west of Dorena Lake in Lane County, OR, and has had previous restoration management (Figure 2; Ramthun and Neill 2017). This 46-acre site is mostly wet prairie with dense, mostly small diameter Oregon ash.

Shotgun Creek Rec Site

This roughly 278 acres site is located near Mabel, OR, in Lane County. Shotgun Creek runs through the forested site and Oregon ash trees were found along the waterway (Figure 3). There is also a stand of large, older Oregon ash within the managed area near the day use shelter.

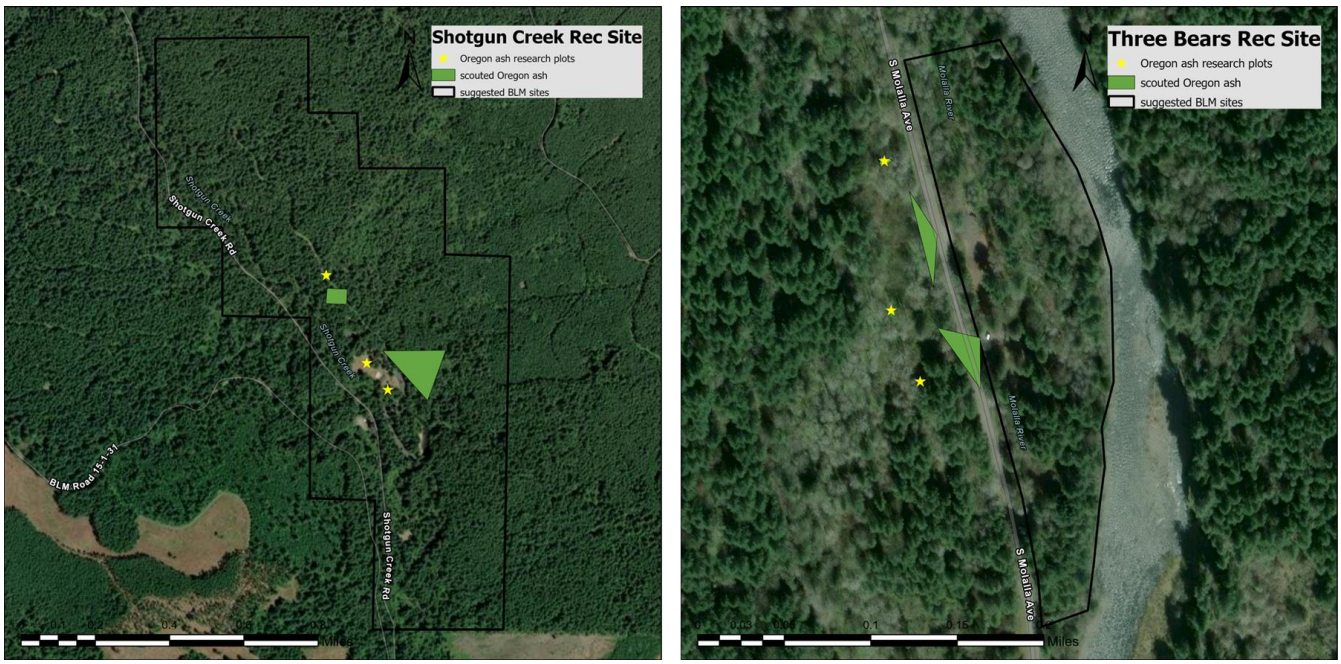

Figure 3. Site maps of Shotgun Creek Rec Site (left) and Three Bears Rec Site (right), indicating Oregon ash research plots (yellow stars), areas of Oregon ash scouted on initial site visits (green polygons), and boundaries of suggested BLM sites (black lines).

Three Bears Rec Site

This site is about 7 acres and located along the Molalla River, south of Glen Avon, OR, in Clackamas County (Figure 3). Stands including mature Oregon ash were found along the area west of the river.

UWVM Parcel 4

This site is about 160 acres and located southeast of Brownsville, OR, in Linn County (Figure 4). The site includes a couple lower-lying wetter areas with a more open canopy that contains Oregon ash.

Wells Island

This site is a roughly 68-acre island situated in the Willamette River near Buena Vista, OR, in Polk County and only accessible by watercraft (Figure 4). This site is dominated by Oregon ash and observations in September 2024 indicate the island experiences flooding in the winter.

Figure 4. Site maps of UWVM Parcel 4 (left) and Wells Island (right), indicating Oregon ash research plots (yellow stars), areas of Oregon ash scouted on initial site visits (green polygons), and boundaries of suggested BLM sites (black lines).

WVPOP Eagles Rest Parcel 1

This site is located south of Dexter, OR, in Lane County and has had previous restoration management. This 8-acre site contains Oregon ash and open areas being restored to native prairie (Figure 5).

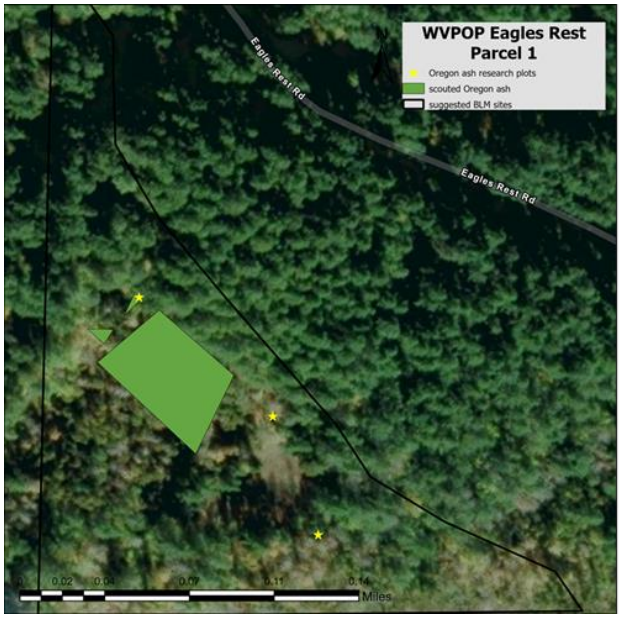

Figure 5. Site map of WVPOP Eagles Rest Parcel 1 indicating Oregon ash research plots (yellow stars), areas of Oregon ash scouted on initial site visits (green polygons), and boundaries of suggested BLM sites (black lines).

3.2. Early detection surveys

Early detection monitoring in 2024 included visual inspections for EAB presence. We inspected 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 Oregon ash tree is dead or killed for any reason, we will strip the bark and inspect for evidence of EAB galleries or larval instars.

We were not able to set up purple prism traps for monitoring EAB in 2024, but we will deploy traps in 2025. Purple prism traps will be baited with z-3 hexanol, a pheromone released by plants when damaged, during the EAB flight season between May and September. 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 will be placed throughout the riparian corridor in Oregon ash trees with diameters greater than 10 cm DBH (diameter at breast height; 1.4 m) and branches that allow for placement 1-3 meters high. If EAB is detected at any point, we will report observations to the Oregon Department of Agriculture.

3.3. Vegetation community surveys

Monitoring effects of EAB on the vegetation community requires surveys of Oregon ash and associated plants. We gathered pre-invasion vegetation community data from seven sites in 2024 and will include additional sites (up to 20) following 2025 scouting of the remaining suggested BLM sites. At each site surveyed in 2024, we collected vegetation data in three 'ash plots' a minimum of 30 m apart. Ash plots were established in areas that had a minimum of three Oregon ash trees within 400m^2 over 10 cm DBH.

Overstory Vegetation

We adapted forest inventory protocols to quantify overstories of Oregon ash communities in each site (Knight et al. 2014, Mitchell et al. 2023). All data were collected within an 11.3 m radius circle from the center of each ash plot. We quantified the overstory within each ash plot by measuring the DBH and identifying each tree to species. A tree was defined as any woody stem 1.0 m or taller with a minimum of 2.5-cm DBH (Nowak et al. 2008). We quantified canopy closure at each ash plot using a spherical crown densiometer (convex, Forestry Suppliers) and averaged readings taken 5 m from plot center in three compass directions (0/360˚, 120˚, 240˚). This information can then be used to assess changes in both light penetration and species composition following EAB invasion.

Understory Vegetation

At each ash plot, we quantified the understory plant community in the same locations as the densiometer readings (5 m from plot center at 0/360˚, 120˚, and 240˚). We collected understory data using a 1-m x 1-m pvc-frame quadrat and estimated percent cover for each plant species and five types of ground cover: bare ground, plant basal area, moss and lichen, rock, and thatch and litter. Plant basal area is not the total cover of vegetation over a plot, but rather the amount of the plot's surface covered by plant stems if all the plants were cut to soil level. Each plant species was identified to the lowest taxonomic level possible and categorized as native or nonnative, and forb (including shrubs, trees, ferns, and vines) or graminoid.

4. RESULTS

4.1. Early detection surveys

Throughout our surveying period of July 25th to September 3rd 2024, we saw no signs of EAB on Oregon ash trees in the seven sampled sites. We inspected Oregon ash trees in each monitored ash plot and determined pre-invasion canopy conditions (Appendix B).

4.2. Vegetation community surveys

Overstory Vegetation

Throughout the 21 sampled ash plots across seven sites, we measured a total of 903 trees. We measured 122 standing dead trees, for a total of 781 live trees. Of all the live trees measured, 74.6% were represented by five species. We measured 371 Oregon ash (*Fraxinus latifolia*), representing 47.5% of all live trees. We measured 79 cascaras (*Frangula purshiana*), representing 10.1% of all live trees. We measured 52 red-osier dogwoods (*Cornus sericea*), representing 6.7% of all live trees. We measured 48 beaked hazelnuts (*Corylus cornuta*), representing 6.1% of all live trees. We measured 33 Oregon white oaks (*Quercus garryana*), representing 4.2% of all live trees. The majority of sampled trees were native species. We only measured the nonnative common hawthorn *(Crataegus monogyna*) at Fishermens Bend and Garoutte Prairie. Additionally, we did not identify apple (*Malus spp.*) or pear (*Pyrus spp.*) trees to species, so those categories may be a combination of native and nonnative species.

Sites differed in the amount of Oregon ash (Appendix C) and in the amount of canopy closure in the sampled ash plots. At Fishermens Bend, 23.0% of sampled live trees were Oregon ash and there was an average of 76.7% canopy closure. At Garoutte Prairie, 65.5% of sampled live trees were Oregon ash and there was an average of 55.6% canopy closure. At Shotgun Creek Rec Site, 34.5% of sampled live trees were Oregon ash and there was an average of 78.6% canopy closure. At Three Bears Rec Site, 23.9% of sampled live trees were Oregon ash and there was an average of 89.4% canopy closure. At UWVM Parcel 4, 35.2% of sampled live trees were Oregon ash and there was an average of 79.2% canopy closure. At Wells Island, 80.7% of sampled live trees were Oregon ash and there was an average of 81.0% canopy closure. At WVPOP Eagles Rest Parcel 1, 48.9% of sampled live trees were Oregon ash and there was an average of 75.5% canopy closure.

Understory Vegetation

Across all sites, thatch and litter covered the most area in sampled quadrats at ash plots. The amount of ground covered by bare ground, plant basal area, moss and lichen, and rock varied slightly among sites (Figure 6). Mid to late succession sites (Shotgun Creek Rec Site, Three Bears Rec Site, and WVPOP Eagles Rest Parcel 1) had more moss and lichen than other sites. UWVM Parcel 4, a large, mature forest, had the least variation in ground cover, with a majority of thatch and litter and little else. The sites with more early successional conditions (Fishermens Bend, Garoutte Prairie, and Wells Island) tended to have more plant basal area, suggesting a dense understory. Wells Island had the most bare ground, suggesting the area experiences a high level of disturbance, likely by flooding. Shotgun Creek Rec Site and Fishermens Bend also had cover of bare ground, but one ash plot at Shotgun Creek was in a high public use area with worn grass and the ash plots at Fishermens Bend were partially burned in 2020.

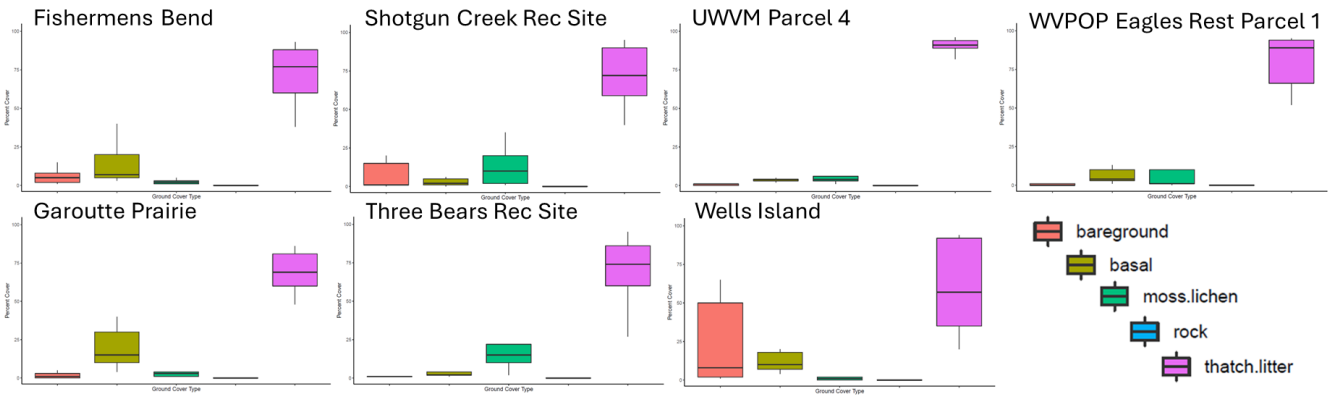

Figure 6. Percent ground cover of different cover types at the seven sites sampled. From left to right on each graph, categories are bare ground, plant basal area, moss and lichen, rock, and thatch and litter.

Across all sites, vegetation cover was comprised by native forbs, nonnative forbs, then nonnative graminoids, with native graminoids representing a small percentage. The amount of vegetation cover of native and nonnative forbs and graminoids varied slightly among sites (Figure 7). Shotgun Creek and Three Bears Rec Sites had more native forbs than other vegetation types, and all sites had some native forb cover. Fishermens Bend, Parcel 4, and Eagles Rest had more nonnative forbs than other sites, and Fishermens Bend, Garoutte Prairie, and Wells Island had more nonnative graminoids than other sites.

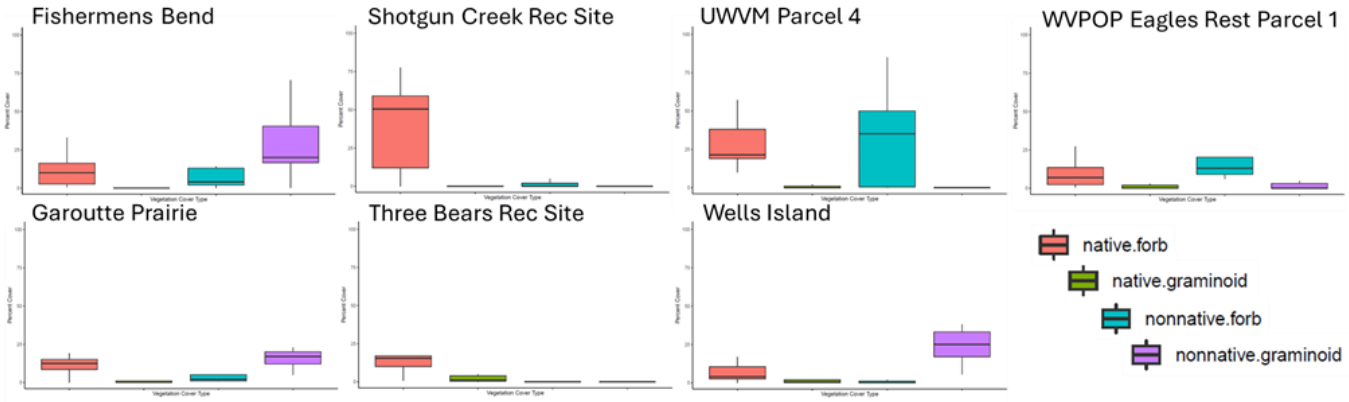

Figure 7. Percent vegetation cover of different cover types at the seven sites sampled. From left to right on each graph, categories are native forbs (including forb, fern, shrub, tree, and vine species), native graminoids, nonnative forbs (including forb, shrub, and tree species), and nonnative graminoids.

5. DISCUSSION

We found no evidence of adult EAB or damage from EAB larvae at any of the seven sites sampled. Prior to 2024, the only known occurrence of EAB in Oregon was in Washington County, about 60 miles northwest from the closest sampled site, Three Bears Rec Site, in Clackamas County. Current sites are in or nearby counties with known EAB populations (Clackamas, Linn, Marion, and Polk) and a potential site is in Yamhill County. EAB populations may move south along riparian corridors, often dominated by Oregon ash, including the Willamette River, Santiam River, and other waterways near BLM sites. 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 majority of Oregon ash observed during surveys was in good condition. The only exception was Fishermens Bend, which burned in 2020. Sites varied, but most sites had high levels of canopy closure. Across sites, the understory vegetation community associated with Oregon ash was comprised mostly of native forbs with high amounts thatch and litter. However, sites also had high amounts of nonnative forb and graminoid cover. Some of these sites are actively managed, and effort should be made to minimize the amount of nonnative diversity and abundance on sites, while increasing diversity and abundance of native species. 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 survey additional sites with Oregon ash communities to add to this dataset and refine our inference. We will also deploy and monitor purple prism traps for EAB, which will contribute to state-wide efforts to detect populations of EAB. Since 2022, we have participated in the statewide EAB Task Force organized by Oregon Department of Agriculture and Oregon Department of Forestry and in collaboration with numerous entities. This partnership enables us to stay cognizant of current EAB-related information, which both informs our project and protocols and allows us to share our methods and perspectives with others.

While EAB remains outside of surveyed BLM sites, we recommend continued EAB monitoring with pheromone-baited purple prism traps, and scouting new sites for inclusion in this study and for any signs of EAB damage on Oregon ash. Our continued participation in the EAB Task Force will ensure we stay informed of additional EAB detections and can respond accordingly. Preemptive management suggestions include to stop planting Oregon ash as part of any 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. If Oregon ash dies, canopies will become more open. This can increase stream and soil temperature and alter species' phenology, ecological functioning, or survival and affect community compositions (Maze et al. 2024). Long term, this has the implication of altering our ecological systems which may enable extirpations or extinctions of native species and introductions of nonnative species (Mitchell et al. 2023). 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). An Oregon ash management strategy should be considered in the event that EAB is detected in BLM forests. 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. The BLM may also want to consider releasing biocontrol agents into their forests, either prior to an EAB detection to contribute to statewide research and management efforts or following an EAB detection as a management strategy.

6. CONCLUSIONS

In summary,

- EAB trapping and Oregon ash monitoring across BLM forests will benefit statewide surveying efforts and assist in early detection of EAB populations.
- Knowledge of initial site condition and community change over time are crucial to understanding how the loss of Oregon ash will affect Oregon's natural 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 BLM sites.

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APPENDIX A. SUMMARY OF BLM SITES VISITED IN 2024

Table A1. Summaries for all sites suggested by the BLM for project inclusion, including access and selection notes for sites visited in 2024.

BLM Site or Parcel Name	Site Coordinates	Site Visited?	Site Accessed?	Site Selected?	Reason for Selection Status	Data Collected?	Notes
Fishermens Bend	44.756483, -122.515734	visited in 2024	accessed in 2024	yes	enough ash for 3 plots	initial veg data collected in 2024	recent burn, resprouted ash and surviving ash along river (adds interesting variety to study)
Garoutte Prairie	43.777076, -122.963249	visited in 2024	accessed in 2024	yes	enough ash for 3 plots	initial veg data collected in 2024	IAE works here - stay out of west side, ash all over (esp. in middle)
Shotgun Creek Rec Site	44.230867, -122.847526	visited in 2024	accessed in 2024	yes	enough ash for 3 plots	initial veg data collected in 2024	fee lot, but accessible
Three Bears Rec Site	45.043098, -122.488710	visited in 2024	accessed in 2024	yes	enough ash for 3 plots	initial veg data collected in 2024	fee'd lot, ash for 1-2 plots within polygon, 2-3 plots if outside polygon (otherside of road) on BLM land
UWVM Parcel 4	44.332716, -122.929227	visited in 2024	accessed in 2024	yes	enough ash for 3 plots	initial veg data collected in 2024	accessed via logging road
Wells Island	44.775852, -123.141020	visited in 2024	accessed in 2024	yes	enough ash for 3 plots	initial veg data collected in 2024	took Buena Vista ferry to scout site with binoculars, saw lots of ash but need boat to access. Put in canoes from Buena Vista and put out at Independence.
WVPOP Eagles Rest Parcel 1	43.863258, -122.799747	visited in 2024	accessed in 2024	yes	enough ash for 3 plots	initial veg data collected in 2024	accessible, lots of ash
WVPOP Weiss Rd. Parcel 2 Oak Demo Site	43.903719, -123.140994	visited in 2024	accessed in 2024	maybe	only saw enough ash for 1-2 plots	not in 2024	NEED SIUSLAW KEY - not much ash, but had some (maybe 1-2 plots?)
WVPOP SE Cloverdale	43.912817, -122.927221	visited in 2024	accessed in 2024	maybe	only saw enough ash for 1-2 plots	not in 2024	NEED PAPENFUS/UWFO KEY - site fairly steep, but got to the mid point where there was an open area (thought water, but didn't see any) and a few ash. One was large and wind-storm broken, the others seen were saplings. Should be enough for 1 ash plot, not sure if there's enough for 2 (likely not 3)

WVPOP Gilkey Ck - Camp Creek Ridge - Parcel 3	44.082881, -122.887787	visited in 2024	accessed in 2024	maybe	only saw enough ash for 1-2 plots	not in 2024	Parcel where IAE works, parking spot off long drive off camp creek rd (not great site, lots of broken topped trees, some ash)
Cedar Grove Rec Site	45.033289, -122.484408	visited in 2024	accessed in 2024	no	didn't see accessible ash on site	no	feed camping lot, no ash for plots (some inaccessible across river)
Culp Creek Trailhead	43.704977, -122.848888	visited in 2024	accessed in 2024	no	didn't see ash on site	no	accessible, no ash
Crooked Creek OHV Staging Area	44.245722, -122.862737	visited in 2024	accessed in 2024	no	not better than Shotgun Creek Rec Site	no	too small, too close to Shotgun, some ash
Sharps Creek Rec Site	43.663109, -122.806944	visited in 2024	accessed in 2024	no	didn't see ash on site	no	accessible (feed/camping lot) but no ash (saw 2 across street along stream bank)
South River Mile Trail	44.316107, -123.481181	visited in 2024	accessed in 2024	no	didn't see ash on site	no	accessible and beautiful, saw no ash near stream (lots of alder)
UWVM Parcel 34	43.805223, -122.912108	visited in 2024	accessed in 2024	no	didn't see ash on site	no	accessible, no ash
North Fork County Park	44.796763, -122.566294	visited in 2024	accessed in 2024	no	didn't see usable ash on	no	recent burn, no usable ash
Lake Creek Falls	44.157670, -123.580705	visited in 2024	accessed in 2024	no	didn't see accessible ash	no	only saw a few ash, but not good site for ash plots (mostly rocks, by fish dam/river)
Hult Pond	44.242812, -123.493751	visited in 2024	accessed in 2024	no	didn't see ash on site	no	accessible and beautiful, saw no ash
WVPOP Weiss Rd. Parcel 3	43.900301, -123.131924	visited in 2024	accessed in 2024	no	didn't see ash on site	no	accessible, didn't see ash
McCully Mountain	44.734944, -122.634010	visited in 2024	accessed in 2024	no	didn't see ash on site	na	didn't see any ash, steep site and would have to hike in from NE corner of BLM land
Horse Rock Ridge	44.296862, -122.877921	not visited, but confirmed no ash with IAE staff	na	no	told no ash on site	na	IAE works on site

Oak Basin Parcel 3	44.303440, -122.928452	not visited, but confirmed no ash with IAE staff	na	no	told no ash on site	na	IAE works on site
Oak Basin Parcel 1	44.318264, -122.948007	not visited, but confirmed no ash with IAE staff	na	no	told no ash on site	na	IAE works on site
Oak Basin Parcel 2	44.311836, -122.943945	not visited, but confirmed no ash with IAE staff	na	no	told no ash on site	na	IAE works on site
UWVM Parcel 40	43.720544, -123.028428	visited in 2024	not accessed in 2024	tbd	na	na	not accessible (signs/gate, including Weyerhaeuser)
WVPOP Cedar Creek	44.003787, -122.836072	visited in 2024	not accessed in 2024	tbd	na	na	could not access - private roads + signs/gate
WVPOP Gilkey Ck - Camp Creek Ridge - Parcel 2	44.088272, -122.883348	visited in 2024	not accessed in 2024	tbd	na	na	could not access - private roads
UWVM Parcel 2	44.346486, -122.912962	visited in 2024	not accessed in 2024	tbd	na	na	not accessible (signs/gate/private roads)
Waterloo	44.488238, -122.803930	visited in 2024	not accessed in 2024	tbd	na	na	could not get to BLM polygon, surrounded by private property, partially blocked by fence, ash in park across river
WVPOP Gettings Ck	43.863332, -123.004590	visited in 2024	not accessed in 2024	tbd	na	na	no trespassing signs, parcel surrounded by private, not sure how to access, saw some ash from road
WVPOP Gilkey Ck - Camp Creek Ridge - Parcel 1	44.095880, -122.872937	visited in 2024	not accessed in 2024	tbd	na	na	could not access - private roads/signs/gate

Jordan Creek	43.927514, -123.298771	visited in 2024	not accessed in 2024	tbd	na	na	made it to yellow gate (1 lock), tried 3 keys that didn't open lock, not accessible
The Butte	45.207841, -123.348193	visited in 2024	not accessed in 2024	tbd	na	na	not accessible (signs/gate, including Weyerhaeuser) after driving down gravel road with 'private' and 'dead end/no turn around', but no 'no trespassing' signs
Lorane Ponderosa Pine Parcel 1	43.937544, -123.145858	visited in 2024	not accessed in 2024	tbd	na	na	surrounded by private property, couldn't access
North Taylor	44.139055, -123.290259	not visited in 2024	na	tbd	na	na	na
South Taylor	44.125356, -123.295225	not visited in 2024	na	tbd	na	na	na
Mid Indian HYRI4	44.156346, -122.576282	not visited in 2024	na	tbd	na	na	na
Row River	43.786380, -122.969797	not visited in 2024	na	tbd	na	na	na
WhyPass Site #1	43.815824, -123.295738	not visited in 2024	na	tbd	na	na	na
McKercher County Park	44.357197, -122.877158	not visited in 2024	na	tbd	na	na	na
UWVM Parcel 39	43.741222, -122.922111	not visited in 2024	na	tbd	na	na	na
UWVM Parcel 37	43.761313, -122.937525	not visited in 2024	na	tbd	na	na	na
UWVM Parcel 35a	43.785910, -122.975886	not visited in 2024	na	tbd	na	na	na
WVPOP Coburg Ridge South - Parcel 1	44.096747, -122.989580	not visited in 2024	na	tbd	na	na	na
UWVM Parcel 9	44.291838, -122.911853	not visited in 2024	na	tbd	na	na	na

UWVM Parcel 8	44.305890, -122.888538	not visited in 2024	na	tbd	na	na	na
UWVM Parcel 6	44.326641, -122.956070	not visited in 2024	na	tbd	na	na	na
WVPOP Rattlesnake Prairie	43.729441, -123.025948	not visited in 2024	na	tbd	na	na	na
UWVM Parcel 38a	43.748110, -122.871032	not visited in 2024	na	tbd	na	na	na
UWVM Parcel 36	43.771317, -122.870417	not visited in 2024	na	tbd	na	na	na
Camas Swale	43.887565, -123.122201	not visited in 2024	na	tbd	na	na	na
UWVM Parcel 29	43.959917, -122.737515	not visited in 2024	na	tbd	na	na	na
WVPOP Coburg Ridge South - Parcel 2	44.101101, -122.982244	not visited in 2024	na	tbd	na	na	na
UWVM Parcel 1	44.354952, -122.878205	not visited in 2024	na	tbd	na	na	na

APPENDIX B. ASH PLOT LOCATIONS AND CONDITION OF OREGON ASH

Table A2. Ash plot locations and Oregon oak condition for each site selected for data collection in 2024.

Site	Ash Plot	Coordinates	Oregon ash Condition
Fishermens Bend	Ash Plot #1	44.753905, -122.519574	ash not in best condition, but because of recent fire
	Ash Plot #2	44.753698, -122.51880	all ash in ok condition (fire)
	Ash Plot #3	44.753546, -122.51798	all ash in ok condition (fire)
Garoutte Prairie	Ash Plot #1	43.77725, -122.96431	all ash in good condition
	Ash Plot #2	43.77716, -122.96377	all ash in good condition
	Ash Plot #3	43.77686, -122.96202	all ash in good condition
Shotgun Creek Rec Site	Ash Plot #1	44.229472, -122.845926	all ash in good condition
	Ash Plot #2	44.232676, -122.848312	all ash in good condition
	Ash Plot #3	44.23014, -122.84662	all ash in good condition
Three Bears Rec Site	Ash Plot #1	45.04303, -122.48971	all ash in good condition
	Ash Plot #2	45.04173, -122.48964	all ash in good condition
	Ash Plot #3	45.04226, -122.48999	all ash in good condition
UWVM Parcel 4	Ash Plot #1	44.33126, -122.92820	all ash in good condition
	Ash Plot #2	44.331443, -122.927487	all ash in good condition
	Ash Plot #3	44.33137, -122.92650	all ash in good condition
Wells Island	Ash Plot #1	44.77339, 123.14430	all ash in good condition
	Ash Plot #2	44.773825, -123.144589	all ash in good condition
	Ash Plot #3	44.77455, -123.144286	all ash in good condition
WVPOP Eagles Rest Parcel 1	Ash Plot #1	43.86352, -122.799324	all ash in good condition
	Ash Plot #2	43.8638024, -122.8003310	all ash in good condition
	Ash Plot #3	43.8630042, -122.7988267	all ash in good condition

APPENDIX C. ABUNDANCE OF TREE SPECIES SAMPLED PER SITE

Table A3. Summary of tree species and abundance for each site selected for data collection in 2024. For each site, the percentage of sampled live trees that were Oregon ash trees is given.

Site	Tree Species	Abundance	Per Site, % of total live trees that were Oregon ash
Fishermens Bend	*Acer macrophyllum*	9	
	Alnus rubra	14	
	Amelanchier alnifolia	1	
	Cornus sericea	52	
	Dead	62	
	Frangula purshiana	8	
	Fraxinus latifolia	28	23.0%
	Physocarpus capitatus	4	
	Populus trichocarpa	5	
	Pseudotsuga menziesii	1	
Garoutte Prairie	*Crataegus douglasii*	4	
	Crataegus monogyna	17	
	Dead	2	
	Frangula purshiana	18	
	Fraxinus latifolia	129	65.5%
	Malus sp.	23	
	Pseudotsuga menziesii	1	
	Pyrus sp.	5	
Shotgun Creek Rec Site	*Acer macrophyllum*	2	
	Amelanchier alnifolia	3	
	Corylus cornuta	6	
	Crataegus douglasii	1	
	Dead	1	
	Frangula purshiana	13	
	Fraxinus latifolia	19	34.5%
	Oemleria cerasiformis	2	
	Pseudotsuga menziesii	4	
	Thuja plicata	5	
Three Bears Rec Site	*Acer circinatum*	30	
	Alnus rubra	3	
	Corylus cornuta	39	
	Dead	7	
	Frangula purshiana	3	
	Fraxinus latifolia	27	23.9%
	Oemleria cerasiformis	4	
	Physocarpus capitatus	5	
	Pseudotsuga menziesii	1	

	Rubus spectabilis	1	
UWVM Parcel 4	*Acer macrophyllum*	1	
	Alnus rubra	1	
	Amelanchier alnifolia	6	
	Corylus cornuta	1	
	Dead	18	
	Frangula purshiana	10	
	Fraxinus latifolia	31	35.2%
	Malus sp.	1	
	Pseudotsuga menziesii	6	
	Quercus garryana	29	
	Thuja plicata	1	
	Toxicodendron diversilobum	1	
Wells Island	*Acer macrophyllum*	2	
	Crataegus douglasii	1	
	Dead	18	
	Fraxinus latifolia	92	80.7%
	Populus trichocarpa	19	
WVPOP Eagles Rest Parcel 1	*Abies grandis*	1	
	Acer macrophyllum	3	
	Amelanchier alnifolia	2	
	Corylus cornuta	2	
	Dead	14	
	Frangula purshiana	27	
	Fraxinus latifolia	45	48.9%
	Malus sp.	3	
	Pseudotsuga menziesii	4	
	Pyrus sp.	1	
	Quercus garryana	4	