MILES KELLEY



AFTER THE ASHES

Commemorating Eugene's Amazon Park Ash Groves in the Wake of Emerald Ash Borer



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Landscape
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All images
by the
author
unless
otherwise
noted.





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Indigenous Wisdom + Knowledge
Kalapuya Tribes, including:
- Chifin
- Winefelly
- Pee-u
- Mohawk
- Chelamela
- Yoncalla

Confederated Tribes of Grand Ronde
The Confederated Tribes of Siletz
The Confederated tribes of Warm Springs
Klamath-Modoc-Yahooskin Tribes
Cow Creek Tribe
Coquille Tribe
Confederated Tribes of:
- Coos
- Lower Umpqua
- Siuslaw

And the many more who *continue* to steward the region.

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00 INTROD

An increasingly connected world means that our trees, and the ecosystems they help comprise, face increasing pressure from pests, blights, and disease. One insect, the Emerald Ash Borer Beetle (EAB), has proven especially devastating to United States forests. Between 2002 and 2022, EAB decimated tens of millions of ash trees (*Fraxinus sp.)* in the Midwest and Eastern United States.[1] Such a steep decline has left many city streets, forest ecosystems, and riparian habitats struggling after the collapse of ash canopy cover. Social, ecological, and climate welfare impacts are entangled as the dead trees left behind from EAB pose health and safety challenges, habitat disruption, and carbon sequestration setbacks.

What is now a decades-old problem for the Eastern United States is new news for our Western ecologies. As of 2022, EAB had officially infected trees in Forest Grove, Oregon and now, as of 2025, it has already infected trees over 50 miles away in a total of four Oregon counties.[2] The destruction of ash trees in Oregon is imminent, as USDA reports that all ash forests infected reach 99% mortality rate regardless of their condition.[3]



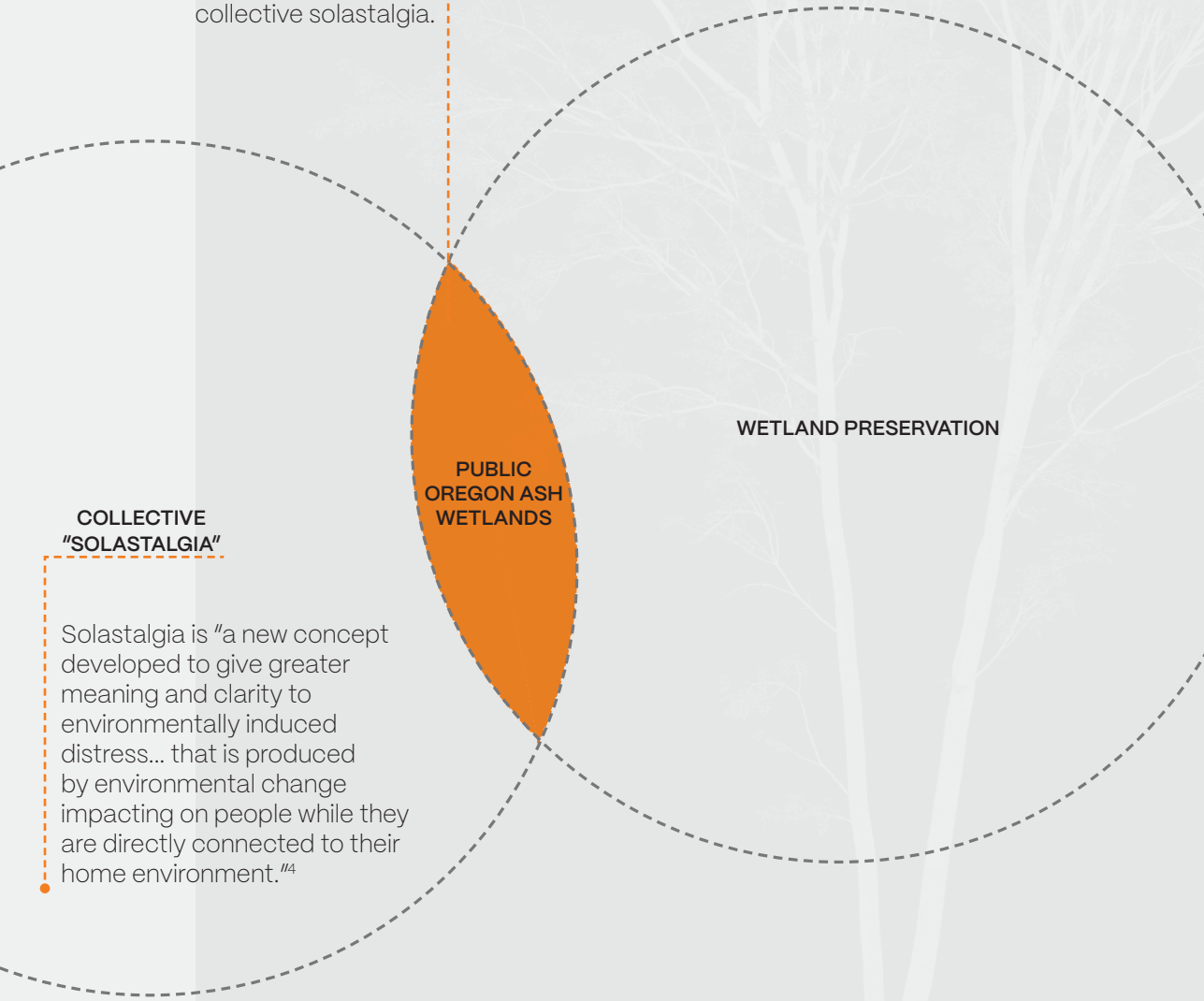
Even as public education efforts ramp up, quarantine boundaries can quickly dissolve after just one human-assisted transportation of EAB, such as driving firewood to a neighboring city or campsite. These anthropogenic spread events heighten the potential for the beetle to jump quickly over long distances, presenting challenges for county and state monitoring efforts with limited resources.

Assuming a swift impact to our Oregon cityscapes in the coming decade, Landscape Architecture is poised to contribute a unique anticipatory perspective that weighs both the ecological and socio-cultural aspects of public land management in the face of ash tree decimation.

This project aims to contextualize the impending issue of West Coast public ash forest loss by redesigning Eugene Oregon's Amazon Park Ash Groves for a post-EAB future. It addresses wetland mitigation alongside societal grief, offering an outlook for a brighter and potentially more resilient future.

DUCTION

The impacts of EAB on our wetlands will undoubtedly be mourned no matter where they occur. However, our Oregon Ash public wetlands face an especially complex mix of ecological and societal impacts that entangle wetland preservation with collective solastalgia.



Solastalgia is "a new concept developed to give greater meaning and clarity to environmentally induced distress... that is produced by environmental change impacting on people while they are directly connected to their home environment."[4]

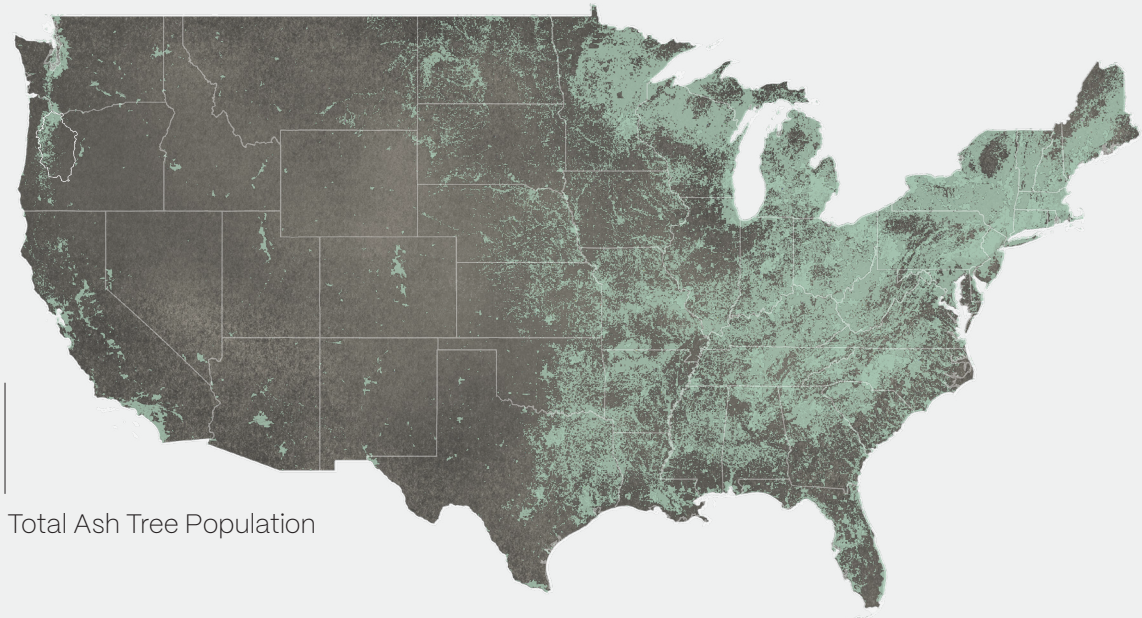
Project Relevance
ASH SPECIES INVENTORY

01 PROJEC

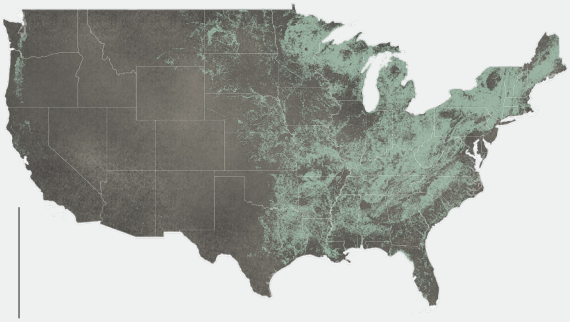
There are around 70 species of Ash (*Fraxinus sp.*) in the world today, and 16 of them are native to the United States. While our ash trees are most commonly found in the Eastern portion of the country, they have been planted in every state for their popular fall foliage, textural beauty, and ecological function.

Data collected from USDA Forest Service[5]

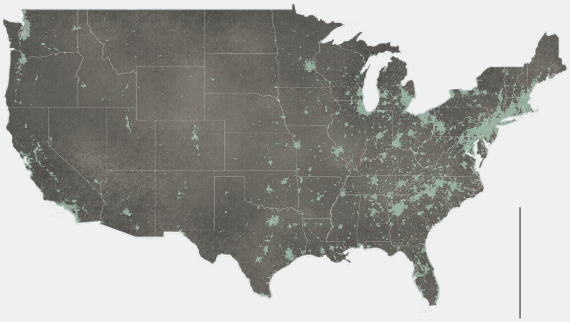
Ash Tree (*Fraxinus sp.)* Population



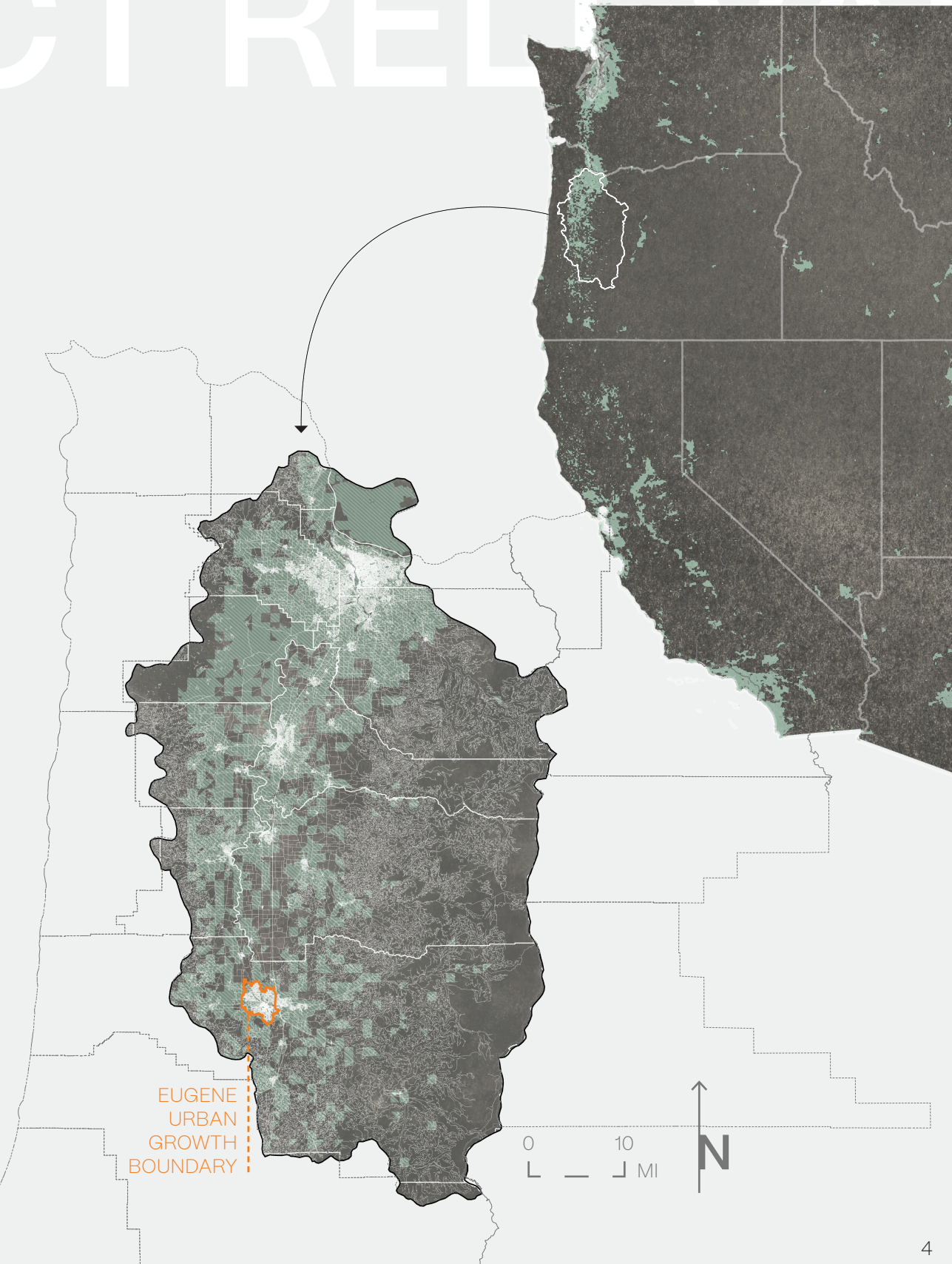
Total Ash Tree Population



Naturalized Ash Population



Urban Ash Population


EUGENE
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GROWTH
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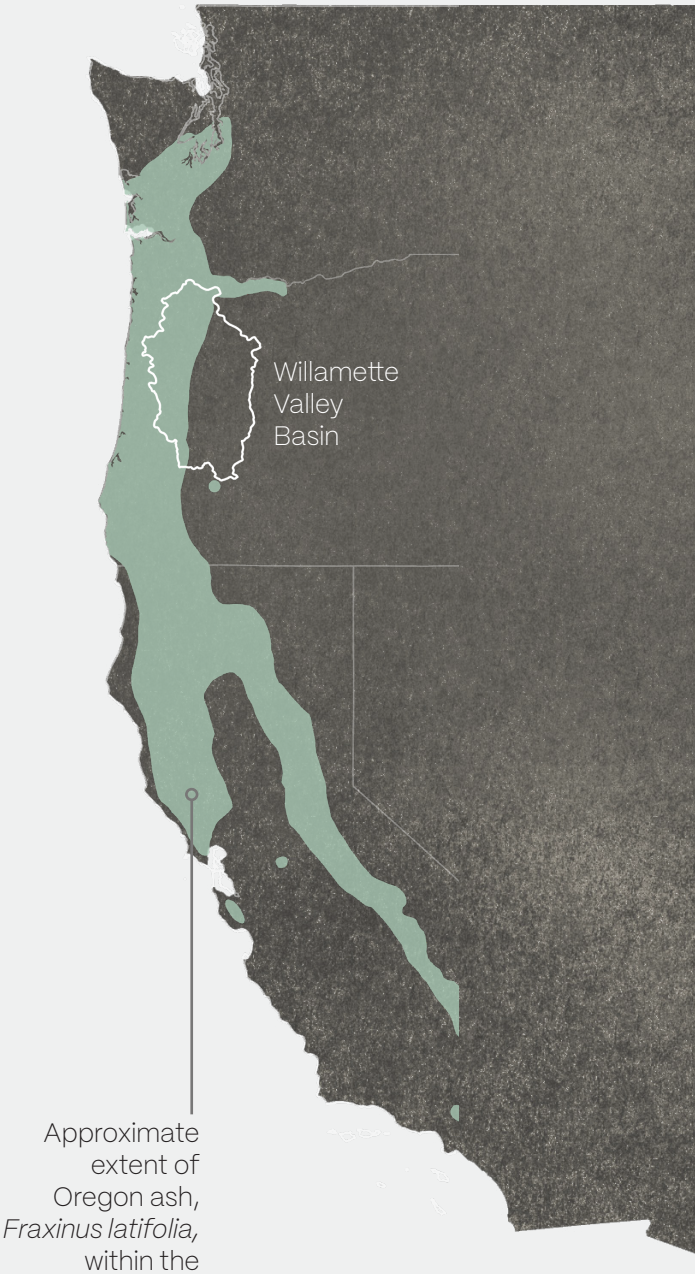
Project Relevance

01 OREGON'S ONLY NATIVE ASH TREE



Of our 16 native ash species found in the United States, *Fraxinus latifolia*, known colloquially as Oregon Ash, is the only west coast endemic species. Stretching from the southern Sierra Nevadas up through the Willamette Valley to the lower reaches of the Puget Sound, this tree plays a crucial role in riparian ecosystems and is commonly found growing along waterways and other wetland areas. The unique ability for Oregon ash to grow in areas with a fluctuating water table (such as seasonally inundated wetlands) combined with it's tolerance of heavy clay soils makes the tree invaluable in bottomlands that would be unsuitable to most other trees. Filling such a unique niche, Oregon ash is heralded for creating shady riparian habitat, controlling erosion, managing water levels in flood prone areas, and contributing to ecosystem nutrient cycling with deciduous leaf fall.[6]

In the face of canopy loss due to EAB, many wetland areas with a high proportion of Oregon ash may face issues of invasive replacement of ash, lack of shade, soil stability, and nutrient cycling.[7]



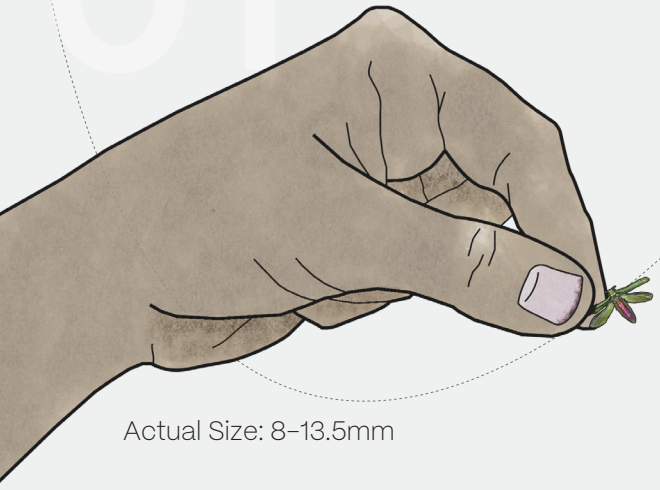
Approximate extent of Oregon ash, *Fraxinus latifolia,* within the United States.



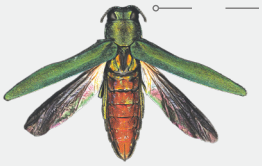


Amazon Park's MA-LIK Grove in fall.

EMERALD ASH BORER + LIFE CYCLE[8]



Actual Size: 8–13.5mm



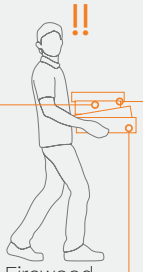
ADULT

Adult beetles will fly up to 7 miles to find mates and a new host tree.

The final stage before adulthood, occurs in the spring/early summer.



PUPA



Firewood Transport

EGGS



In the summer months, often June through September, a female EAB will lay up to 90 eggs into the bark crevices of an ash tree. Each egg is roughly 1mm in size.

3 weeks

LARVAE*



Larvae eat tunnels, called galleries, into nutritious wood tissue below the bark until the upper trunk and canopy of a tree can no longer receive proper nutrients and water from the roots. Surviving multiple winters and are often transported in firewood after a tree felled.

*The most destructive stage of the Emerald Ash Borer

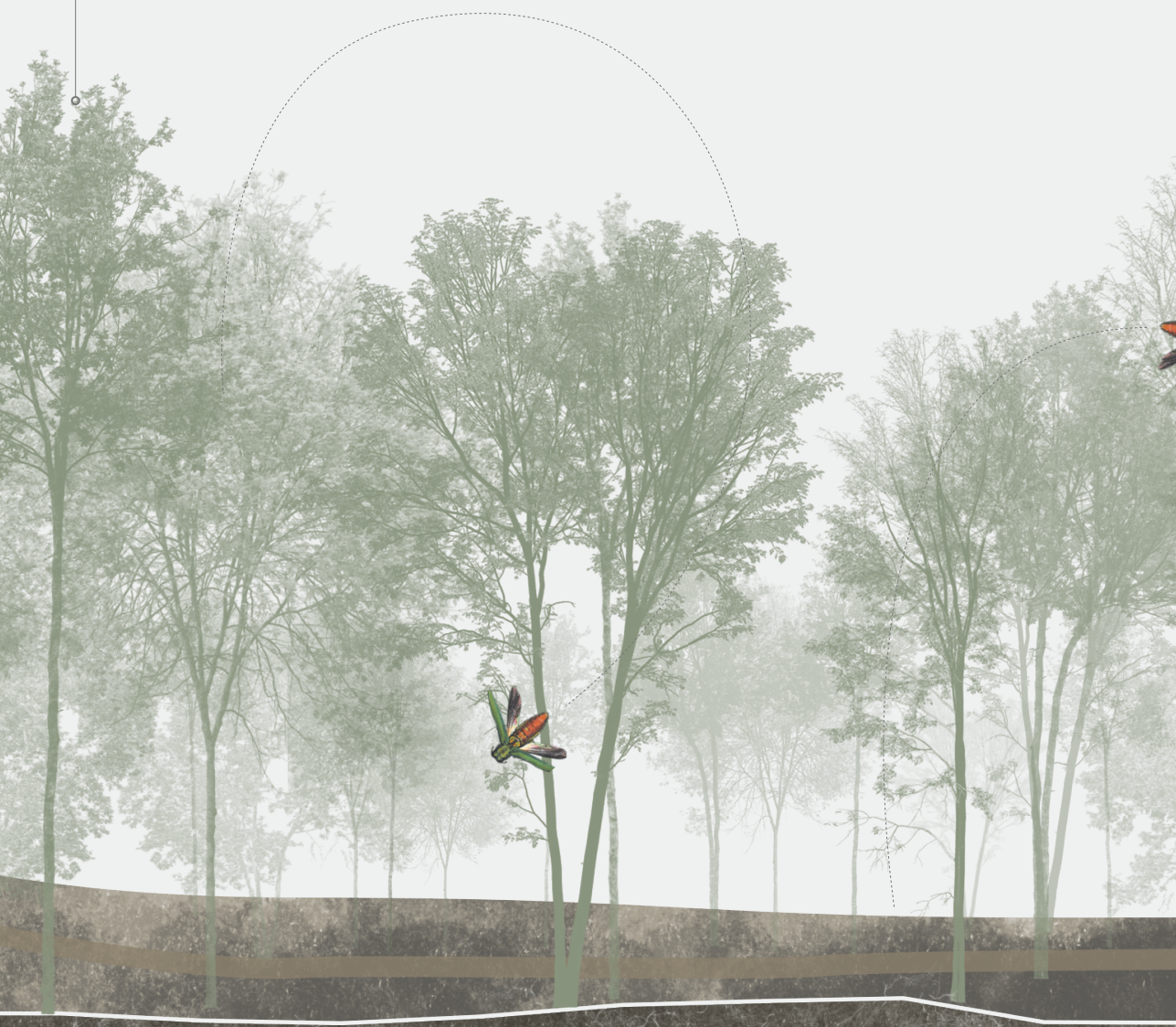


Emerald Ash Borer (EAB) makes contact with a healthy forest of Ash Trees Fraxinus (sp.) and lays eggs in the cracks of tree bark.

YEAR 1

01

Little noticeable canopy change to the untrained eye unless infection is severe.



EAB will most likely go undetected as the insects begin to burrow into the cambium and phloem (vital woody tissue responsible for tree growth and nutrient uptake).

YEAR 2



The tree's phloem will continue to be devoured by hungry larvae and with each bite less and less nutrients can travel from root to leaf. By this year, infection is often noticeable as the leaves at the top of the canopy die from lack of nutrient uptake.

YEAR 3

01



Larvae are continually laid within the bark of infected trees until they die.

In severe infestations, the dramatic loss of canopy shown above can happen in just one year.

YEAR 4



Ultimately, a mature EAB infestation can have disastrous consequences for natural areas that contain a heavy proportion of Ash trees. In its wake, erosion, nutrient cycling changes, and a lack of shade often take hold, leaving an ecosystem more susceptible to pressure from invasive species.



The tree trunk is too riddled with larvae tunnels to properly send water to the tree tops , killing the tree from the ground up. Fully grown Emerald Ash Borers take flight in search of their next host.

YEAR 5





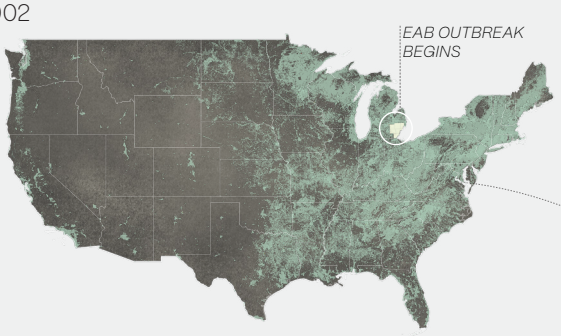
An Eastern Pennsylvania ash forest of predominately *Fraxinus pennsylvanica* after decimation from emerald ash borer. Just five years prior this forest appeared healthy. Image credit: Ignacio Lopez Buson

Project Relevance

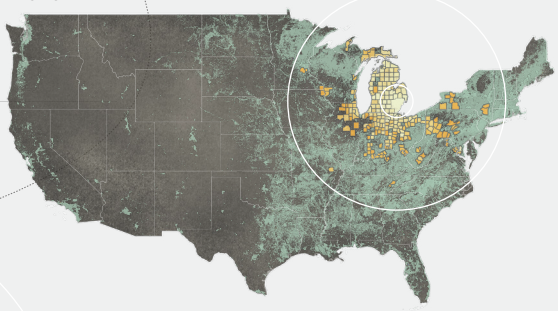
WEST COAST OUTBREAK



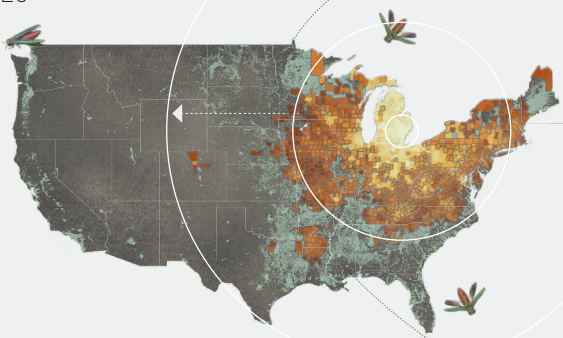
2002



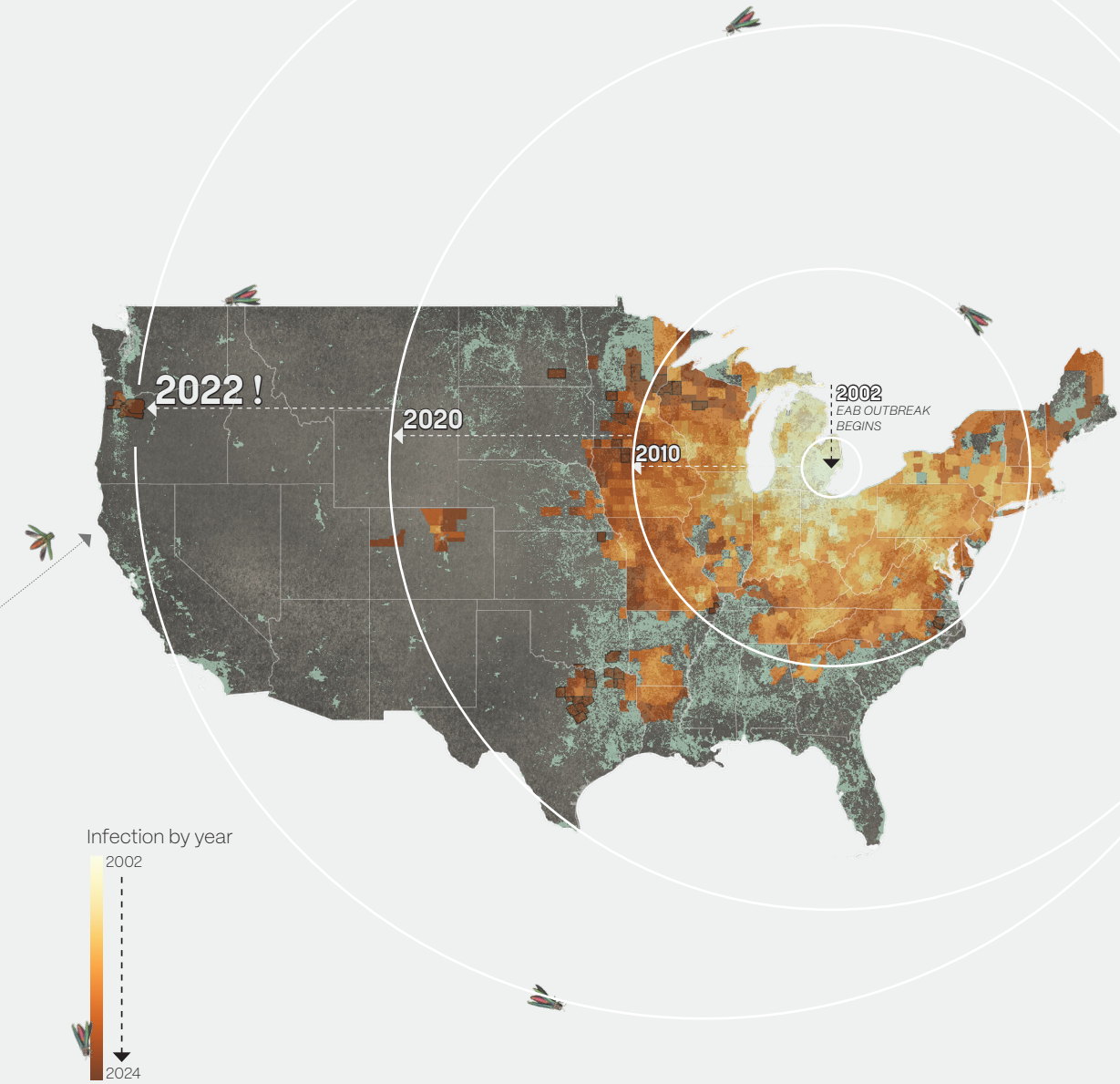
2010



2020



First discovered in 2002 in Southeastern Michigan, the dense populations of ash trees on the east coast (along with developing mitigation strategies) may have contributed to a such a rapid and widespread outbreak. While there are fewer ash trees west of the Mississippi, the insect was likely able to spread via further anthropogenic means such as firewood transportation.



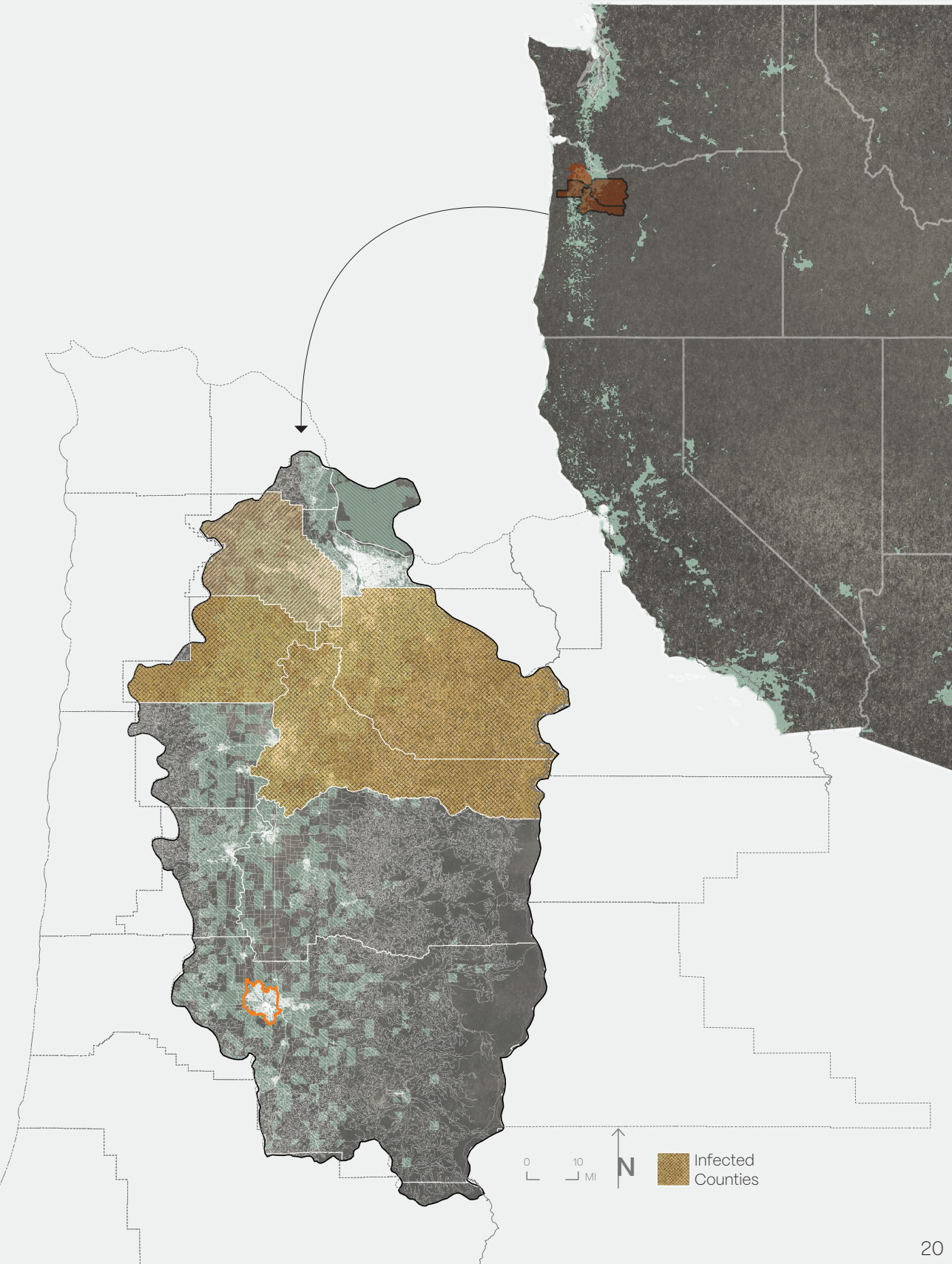
KNOWN CASES OF EAB IN OREGON

01

EAB has been confirmed in several Oregon counties since it's original detection in a school parking lot in Forest Grove during the summer of 2022. As of 2025, tree infections have expanded to Marion, Yamhill, and Clackamas counties, prompting the establishment of a permanent quarantine in these areas to restrict the movement of ash wood products. Surveys and trapping efforts have revealed that infestations in some locations, such as Marion County, may have been ongoing for years before detection.[9]

State and local agencies have responded with a variety of management strategies, including removing infested trees, treating healthy ash with pesticides, releasing parasitoid wasps in the hope of "bio-control," and conducting extensive public outreach.[10]

Despite these efforts, EAB infections are likely to spread across the state and eventually kill a large majority of Oregon's ash trees. In the face of such massive forest disruption, landscape architecture efforts can offer creative solutions that bridge habitat mitigation efforts with the ecological commemoration of ash forests.[11]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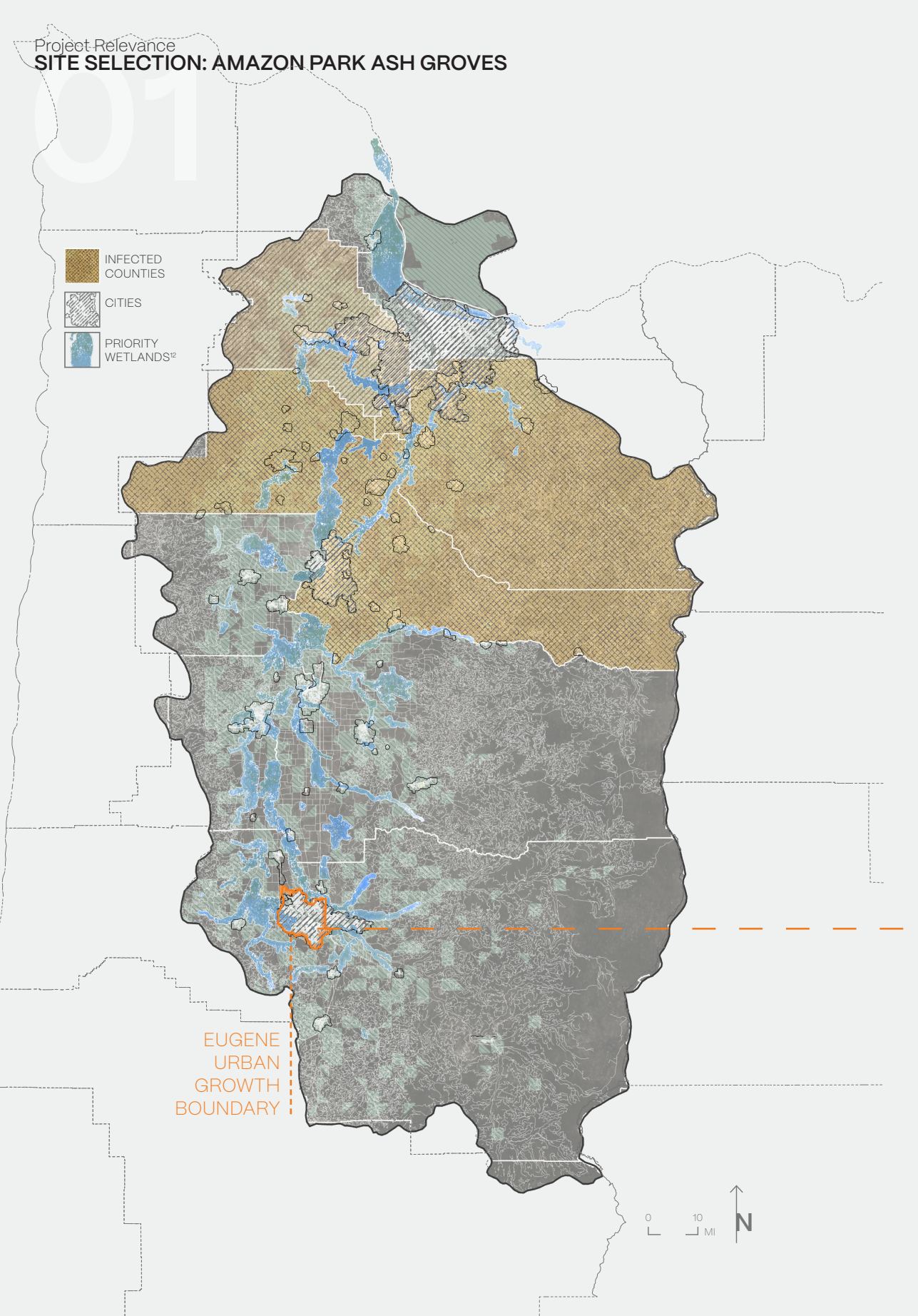
Counties

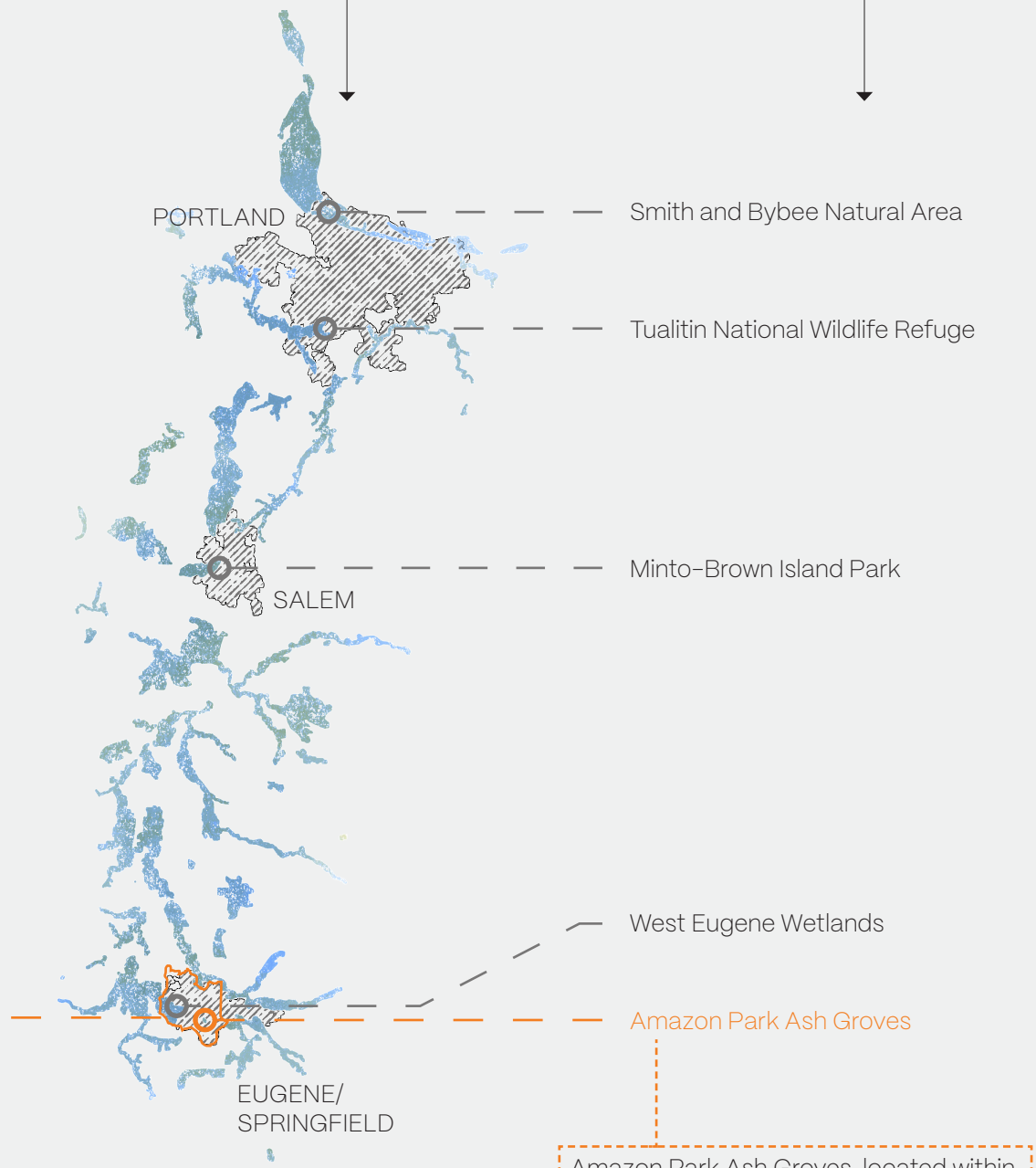
Project Relevance

SITE SELECTION: AMAZON PARK ASH GROVES



3 Most Populated Willamette Valley Cities

Willamette Valley Wetland Priority Sites Within City Limits



Amazon Park Ash Groves, located within Amazon Park in Eugene, OR, was picked as a priority site for it's density of Oregon Ash and sensitive wetland ecology – including a rich understory of Camas species presumed to be pre-colonial. Comprised of 3 forest patches, the total acreage of Oregon Ash forested wetland within the park is approximately 14 acres.

Project Relevance

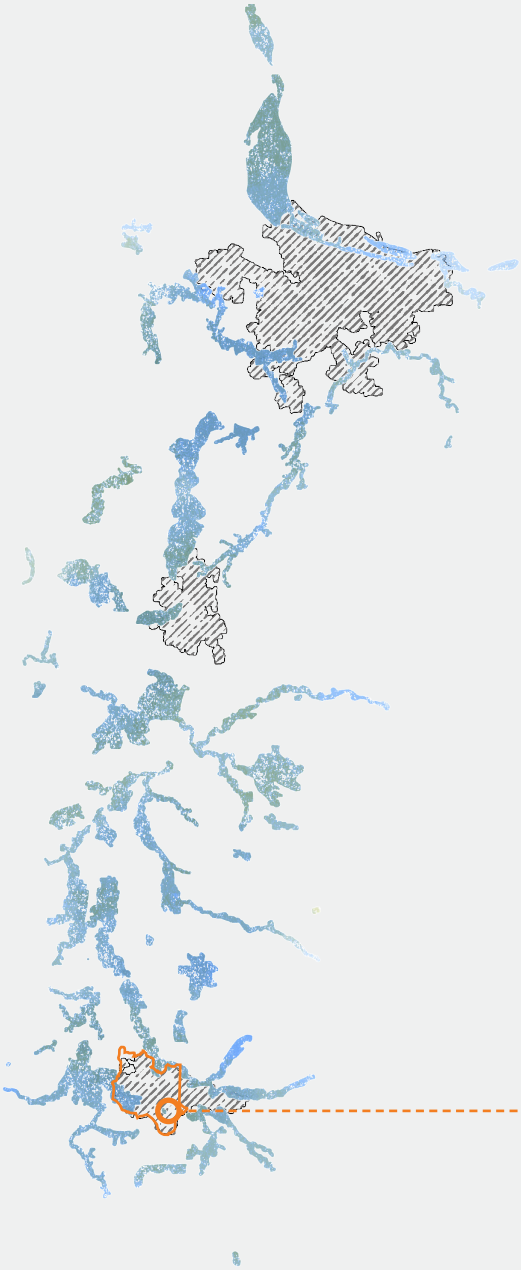
EUGENE'S OREGON ASH TREES UNDER THREAT

01

Mapping the extent of Oregon Ash within the Eugene area is a an extensive task to say the least. However, over the course of this project I had the pleasure of working alongside students in the University of Oregon Environmental Leadership Program as we coordinated with the City of Eugene to measure sample plots in key public natural areas.

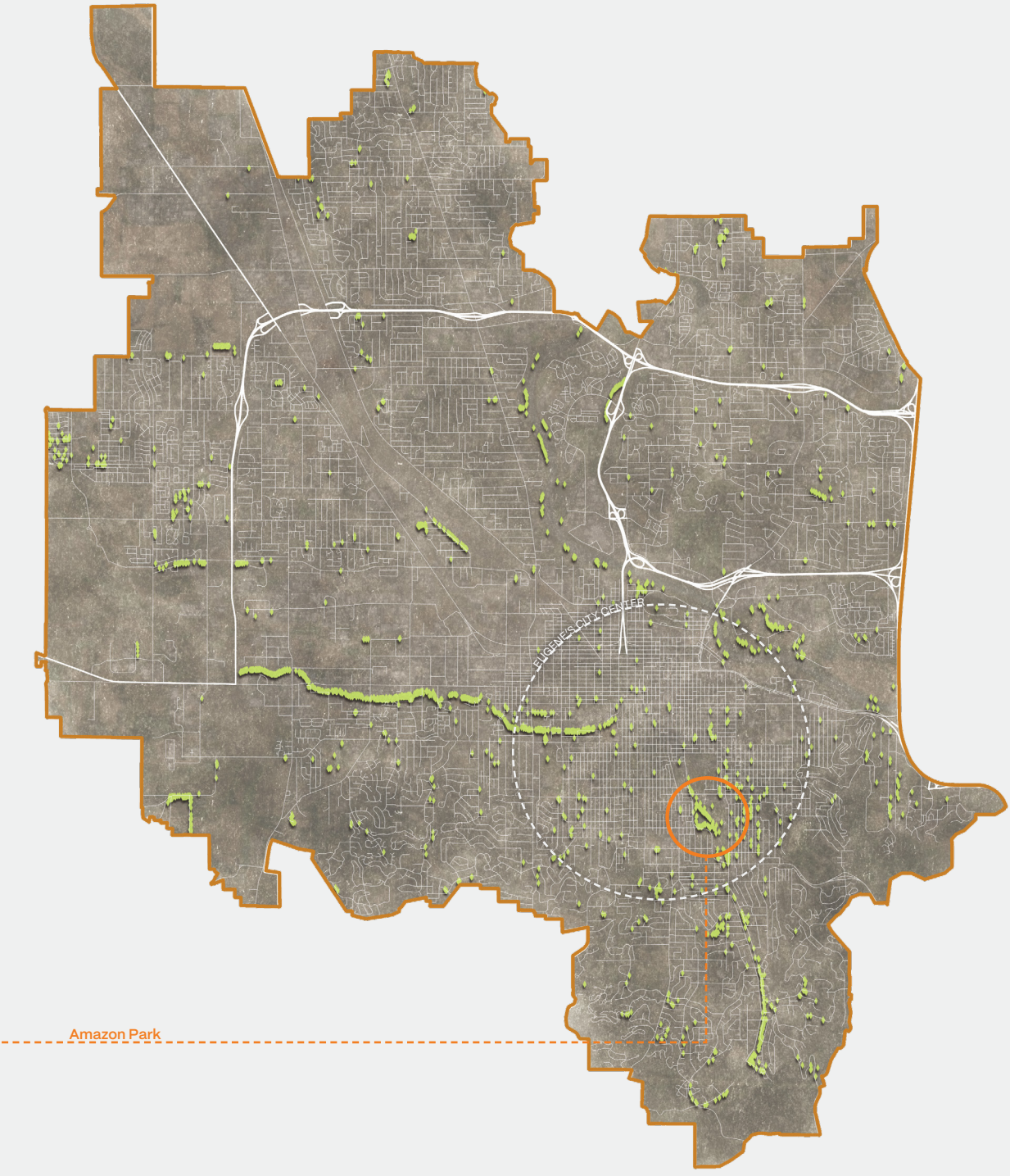
In total, we collected data on almost 13,000 square feet of ash wetland habitat, and measured and assessed over 630 Oregon ash trees. Using our samples along with additional tree data collected from the City of Eugene[13] (shown on the right), there are at least 12,618 public Oregon ash trees within Eugene's urban growth boundary and its adjacent wetlands. Of this number, a whopping 4,363 are estimated to be at Amazon Park.

According to these estimates, **the Amazon Park Ash Groves contain roughly 35% of Fraxinus latifolia in Eugene's urban growth boundary and adjacent wetlands.**



OREGON ASH TREE SURVEY LOCATIONS

- Amazon Park
- Amazon Prairie
- Coyote Prairie
- Bethel Community Park
- Gudukut Natural Area
- Oak Patch West
- Frank Kinney Park
- Bertelson Nature Park
- Public Street Trees



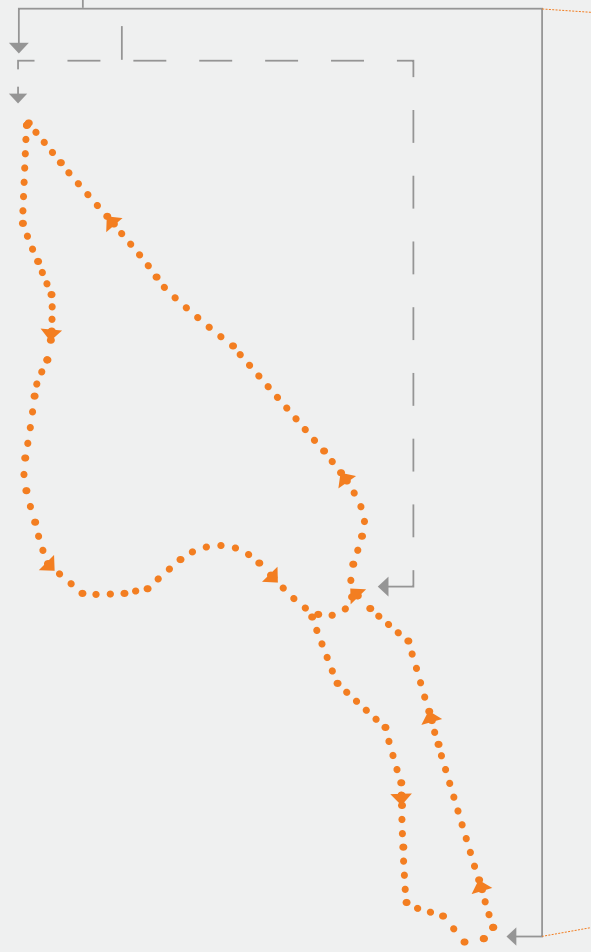
Oregon Ash (*Fraxinus latifolia*) that have been mapped by the city of Eugene. Total count: 2,848

N 0 .75 1.5 MI

02 SITE CO

Established in 1947, Amazon Park is one of Eugene's longest-standing and largest-acreage recreational areas. At nearly 100 acres, circulation within the park is facilitated by a network of bike and pedestrian paths, including a 5.5-mile bark-mulch jogging trail that loops through the park and connects to adjacent neighborhoods and parks. Off-street paths, ample parking, and ADA-accessible features ensure easy access for all visitors.[14]

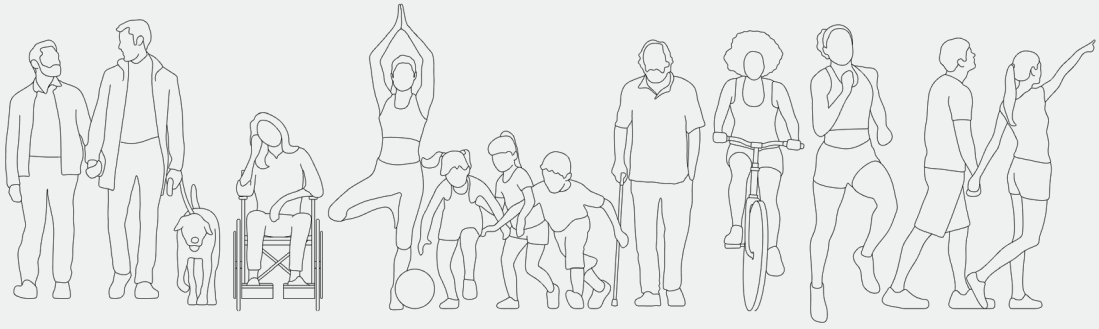
Bordering 2 neighborhoods, the park includes a public middle school, a community center, and a YMCA, a skate park, a dog park, and a popular trail system.



IDENTIFIED USER GROUPS

- Neighborhood residents
- Dog Owners
- Skaters
- Athletes
- Students
- Runners
- Nature Enthusiasts
- Bikers







NORTH GROVE

MA-LIK GROVE
"Ma-lik" means ash grove in kalapuyan

SOUTH GROVE

Arrows represent formal or informal entrances to Amazon Park

EXISTING HABITAT TYPES

02

Amazon Park's Ash Groves are centered within a larger ecological mosaic that features restored wetland and upland prairies alongside a portion of Amazon Creek. These natural areas, including the Gawa-Ni, Kalapuya for the "place where you walk through wetlands," supports native plant communities that include rare (and previously endangered) species like Bradshaw's lomatium, a federally protected wildflower.

Since the 1990s, restoration efforts have focused on enhancing wet prairie and riparian habitats in an effort to return ecological function to some spaces at Amazon Park reviving vital habitat for pollinators, amphibians, and birds. Amazon Creek, which flows through the park, provides essential wildlife habitat but continues to face challenges from urban runoff and historic channelization. During large flood events, the Ma-lik Ash Grove will absorb flooding from the creek. To the north, a recent project has removed a scetion of concrete channels in an attempt to restore native vegetation and improve water quality, making the creek more hospitable for fish and aquatic life.

These habitats collectively offer flood control, water filtration, and carbon sequestration, while supporting a wide diversity of species. While historically overlooked, ecological stewardship is now integrated into the park's management, ensuring that Amazon Park remains a valuable refuge for both wildlife and people within Eugene's urban landscape.[15]

Habit Types



Ash Forest



Riparian Forest



Social Lawn



Upland Prairie



Wetland Prairie



NORTH GROVE
1.2 ACRES

MA-LIK GROVE
11.4 ACRES

GAWA-NI
WETLAND

SOUTH GROVE
1.75 ACRES

APPROXIMATE
TOTAL ACERAGE
OF ASH GROVES:
14.35 ACRES


GAWA-NI
WETLAND
NORTH



A bird's eye perspective of Amazon Park, with the Northern Ash Grove and Ma-lik Ash Grove in view.
Image credit: Ignacio Lopez Buson

SITE CONTEXT

A STORY OF ASH AND CAMAS[16,17]

02

>14,000 Years ago until today Amazon Park is Kalapuya Land.

Pre–1850, Cultivated and managed by Kalapuyan peoples, likely the Chafin (Chifin, Chafan) Band of Kalapuya. Annual and Semi-Annual burning of meadows meant ash trees were not able to establish.

1846 Eugene Skinner colonizes what is today known as "Skinner Butte".

1850 Oregon Donation Land Claim Act grants Kalapuya land for white settlers without Tribal consent

1855 "Treaty with the Kalapuya" cedes over 1 million acres to the USA due to pressure from colonizers

1856 Many tribal members are forcibly displaced and moved to The Grand Ronde Tribal Reservation on the headwaters of the Yamhill River

1850–1930 Colonizers use land for agriculture and animal husbandry

1938 City of Eugene envisions "Amazon Park" on 17 acres of "swampy land"

1943–1948 Century Progress Fund (established by Eugene citizens) begins purchasing parcels for parkland, mostly for $10 each

1947 Amazon Park is established and two softball fields are built

1954 All remaining agricultural structures are moved or demolished



1930: Only small ash stands visible in aerial imagery

Oregon Ash encroaches after tribal burning stops

Only a few small stands of native Oregon ash exist

Among many plants, Camas (Camassia leichtlinii and other Camas sp.), is culivated and cared for by Kalapuya tribes

Pasture grazing is practiced in remaining areas of upland and wet prairie



1955 City officials officially ratify the name "Amazon Park"

1958 Army Corps of Engineers channelizes the adjacent Amazon Creek, leaving behind mounds of fill

1973 Amazon Community Center is built; bike path installed from 24th to 29th Avenue

1975 Amazon Jogging Trail is installed by community volunteers

1983 Jogging trail around the Ma-lik Ash Grove is renovated to give "Track Town USA's" a perfect 1km and 1mile loop.

1985 Bus transfer Station built to accommodate a growing community

1994 Public hearings held to update the park development plan, emphasizing wetland preservation



1994:
Ash groves are fully established

What once was wet prairie is replaced by a forested wetland dominated by Oregon Ash

Sports fields and social lawn replace many areas of remaining upland prairie.

Camas remains and thrives underneath the forest canopy, becoming one of the densest camas populations in Eugene according to ecological surveys

AERIAL HISTORY 1936 – 1960

02

Between 1936 and 1960, Amazon Park underwent significant changes in land use and vegetation. In 1938, the city purchased 17 acres of "swampy" floodplain land near Willamette Street, envisioning it as a future park with community and athletic facilities. At that time, the area was characterized by ash woodlands and wet prairie that had already undergone significant change due to agriculutral settlement from colonizers. Vegetation likely included Oregon ash, native wetland grasses, and various riparian species.

Development pressures increased after World War II, but substantial park projects were delayed until the 1950s and 1960s. During this period, Eugene's population grew, and community efforts focused on expanding recreational spaces.

Around the early 1950's, roads can be seen established through the Ma-Lik Grove, perhaps used in City of Eugene channelization efforts for flood control (following earlier settler-colonial efforts). In 1958, the Army Corps of Engineers further channelized Amazon Creek and shaped it's course, which it still runs today. While the downstream portion of the creek was channelized using concrete retaining walls, the areas in Amazon Park were not. It is likely, instead, that the creek in this area was less in need of flood control due to the surrounding undevelopment parkland and left dredged without further construction.[18]

Note: For graphic clarity, the park boundary displayed here does not include the Amazon Park Ball Fields, located to the north.

AMAZON PARK BOUNDARY

NORTH GROVE: EMERGENT SHRUBLAND

MA-LIK GROVE: REMNANT MEADOW CONDITIONS / PASTURE

PRIMARILY AGRICULTURAL USE

SOUTH GROVE: ESTABLISHED TREES

SCHOOL DEVELOPMENT

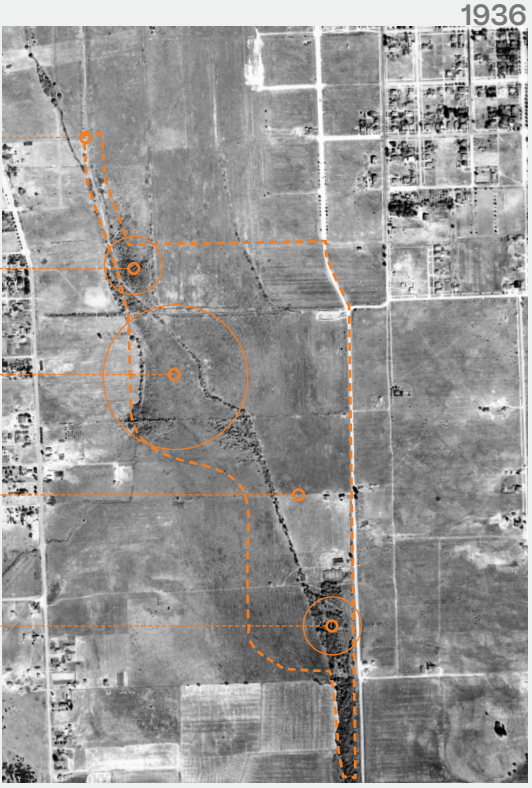
NORTH GROVE: ESTABLISHED FOREST

MA-LIK GROVE: EMERGENT ASH FOREST, UNPAVED ROADS ESTABLISHED

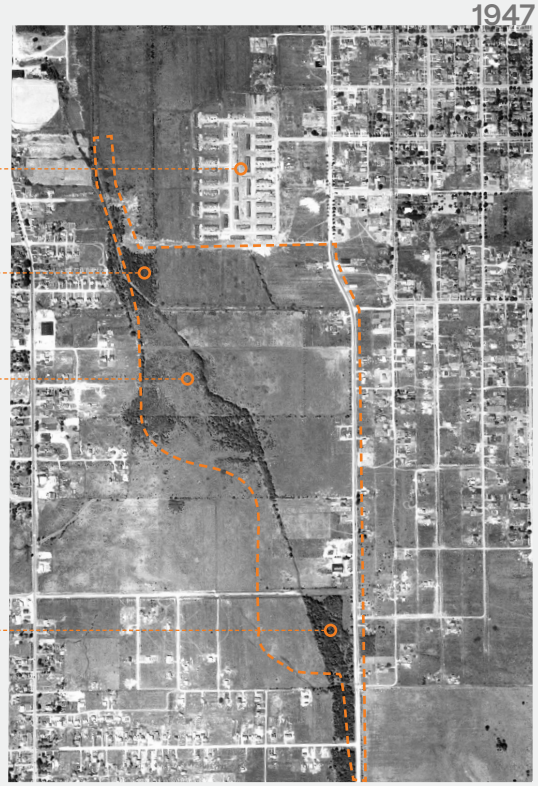
AMAZON CREEK: CHANNELIZED BY CITY OF EUGENE

SOUTH GROVE: ESTABLISHED FOREST CONDITIONS

1936



1947



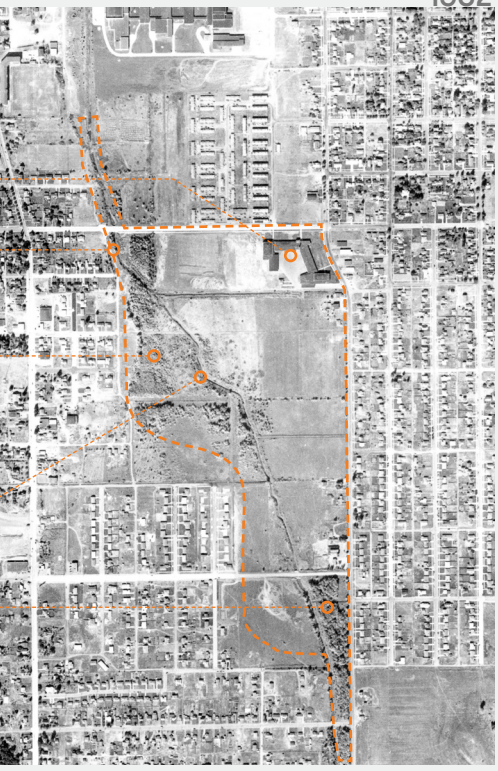
POST WWII DEVELOPMENT ENCROACHES ON WETLANDS

NORTH GROVE: EMERGENT FOREST CONDITIONS

MA-LIK GROVE: EMERGENT WOODY VEGETATION

SOUTH GROVE: FOREST CONDITIONS MATURE

1952



1960



NORTH GROVE: FOREST SIZE DEMINISHED

MA-LIK GROVE: FOREST CONDITIONS MATURE

AMAZON CREEK CHANNELIZED BY ARMY CORPS OF ENGINEERS

AMAZON POOL ESTABLISHED

SOUTH GROVE: NO SIGNIFICANT CHANGE

AERIAL HISTORY 1961 – 1994

02

Between 1961 and 1994, Amazon Park continued to experienced significant development. The 1961 parks levy enabled the city to invest in park infrastructure, finalizing the transition of Amazon Park from a largely natural wet prairie into a multi-use urban park with a focus on recreational sports, trails, and a community center.

By the 1970s and 1980s, the park had become a central green space in south Eugene, featuring athletic fields, trails, and community center areas. While some natural features, such as the current Ash Groves, were preserved, much of the original wetland was replaced or fragmented.

It was not until the 1990's that community members and city officials started to place an increased emphasis on balancing ecological preservation with recreation, laying the idealogical foundation for wetland restoration efforts such as the Gawa-ni wetland area.[19]

RECREATION DEVELOPMENT CONTINUES

NORTH GROVE: FOREST SIZE INCREASES, ALTHOUGH BISECTED

MA-LIK GROVE: FOREST MATURES, OLD ROADS ARE NO LONGER USED

SOUTH GROVE: NO SIGNIFICANT CHANGE

NORTH GROVE: CONDITIONS REMAIN SIMILAR

MA-LIK GROVE: FOREST CONTINUES TO MATURE

AMAZON RUNNING TRAIL ESTABLISHED

TRAIL SYSTEM HARDENED

BUS STOP ESTABLISHED

SOUTH GROVE: NO SIGNIFICANT CHANGE

1968



1977



RECREATION DEVELOPMENT CONTINUES

NORTH GROVE: CONDITIONS REMAIN SIMILAR

MA-LIK GROVE: FOREST CONTINUES TO MATURE

TRAIL SYSTEM FORMALIZED

AMAZON COMMUNITY CENTER ESTABLISHED

SOUTH GROVE: NO SIGNIFICANT CHANGE

1987



1994



NORTH GROVE: EMERGENT SHRUBLAND

MA-LIK GROVE: REMNANT MEADOW CONDITIONS

SKATE PARK ESTABLISHED

SOUTH GROVE: NO SIGNIFICANT CHANGE

SITE CONTEXT

TOPOGRAPHICAL VARIATION IN THE MA-LIK GROVE

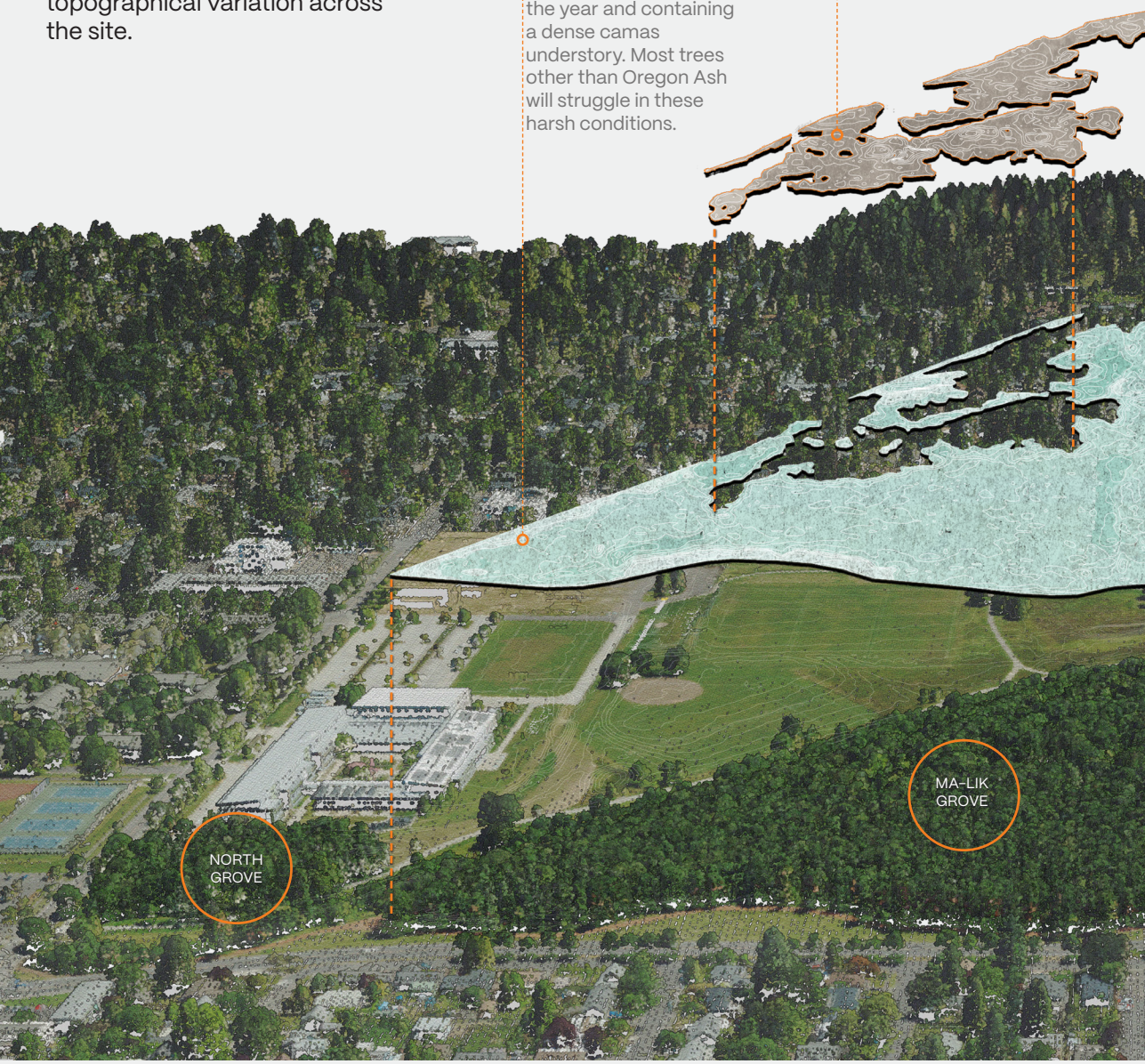
02

While much of the site has been left undeveloped below surface level, the channelizing of Amazon Creek resulted in large mounds of soil, which the city of Eugene identifies as "fill mounds," on the north-western aspect of the Ma-Lik Grove. This creates unique topographical variation across the site.

These mounds are drier and less clay-heavy than the surrounding wetland, offering opportunity for unique oak-savanna succession after Ash forest collapse.

Additionally, site visits show that camas understory is much less present on these mounded areas.

A majority of the site is heavy-clay wetland, seasonally inundated during the rainy part of the year and containing a dense camas understory. Most trees other than Oregon Ash will struggle in these harsh conditions.

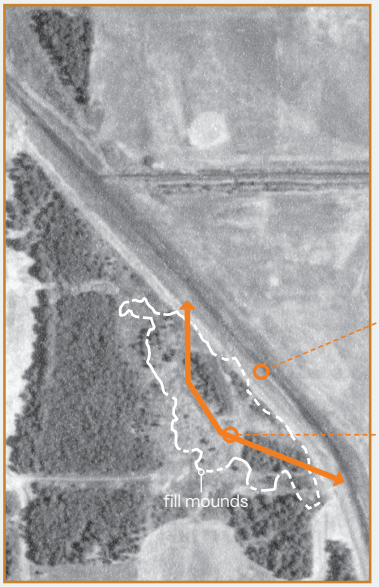


PRE-CHANNELIZATION



Amazon Creek channelized by local farmers

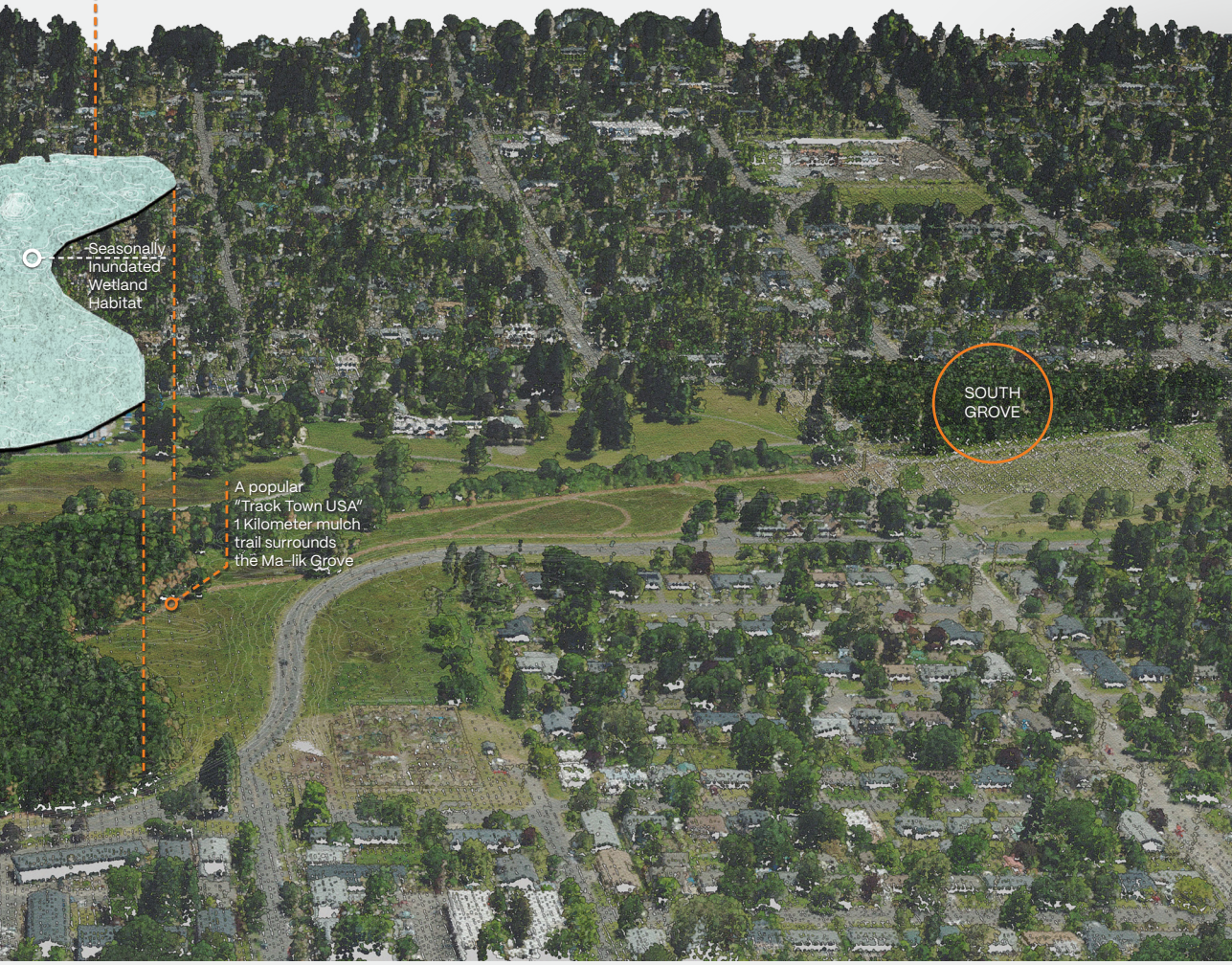
POST-CHANNELIZATION



Amazon Creek, presumed to be channelized by Army Corps of Engineers

Previous channel route, now mounded





MA-LIK GROVE: TOPOGRAPHICAL HYDROLOGY

02

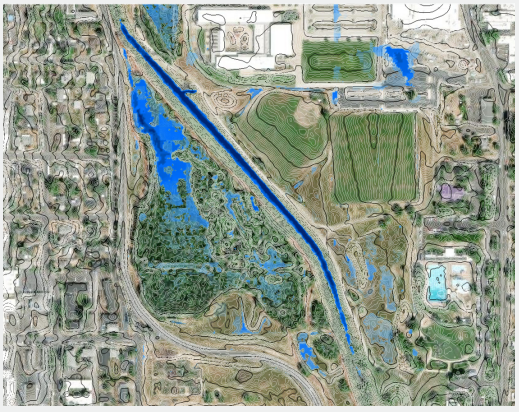
3hr Heavy Rain (1.5″/hr)

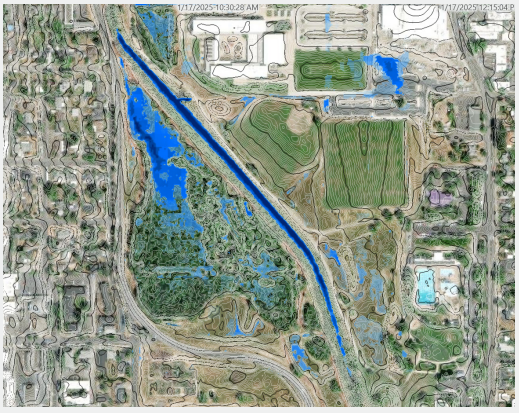
1st HR



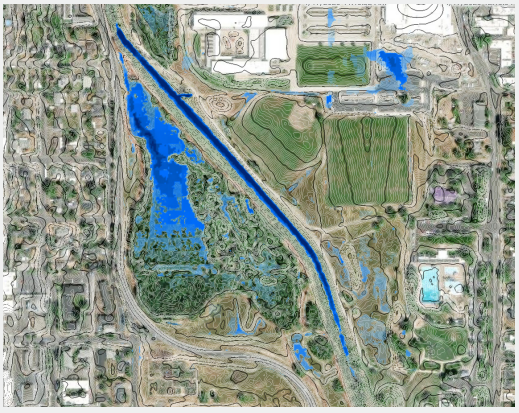


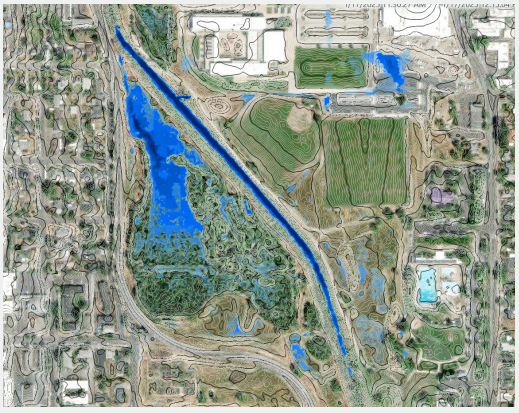
2nd HR

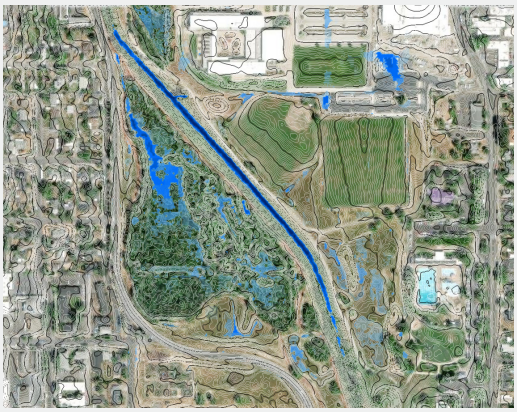


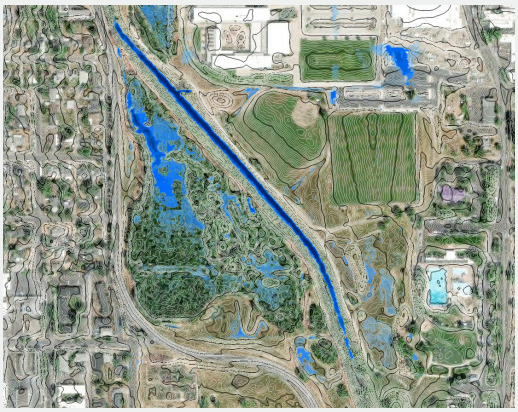


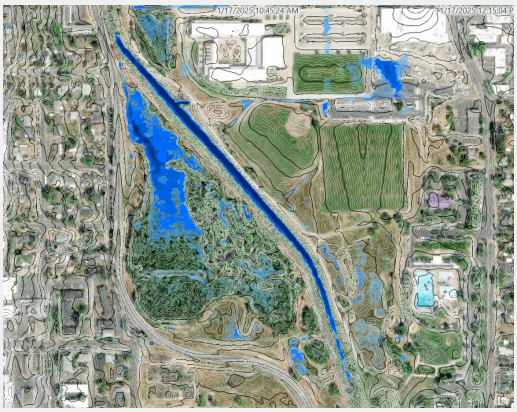
3rd HR

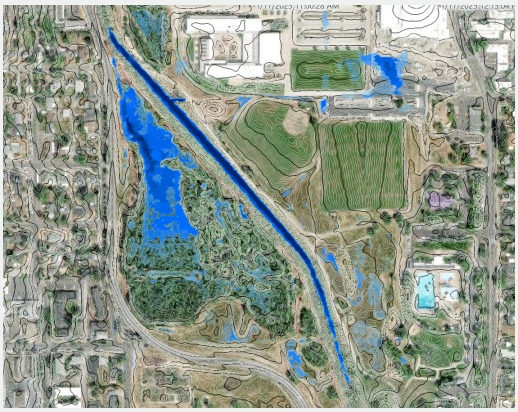


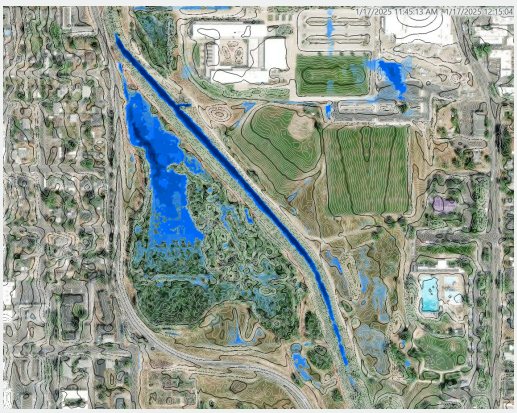


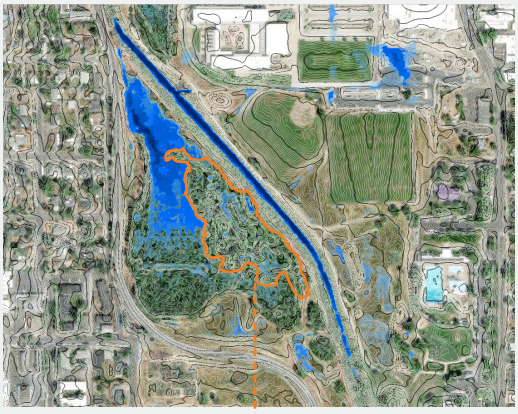











Historic Mounds

SITE CONTEXT
CRUCIAL FLOOD FUNCTION

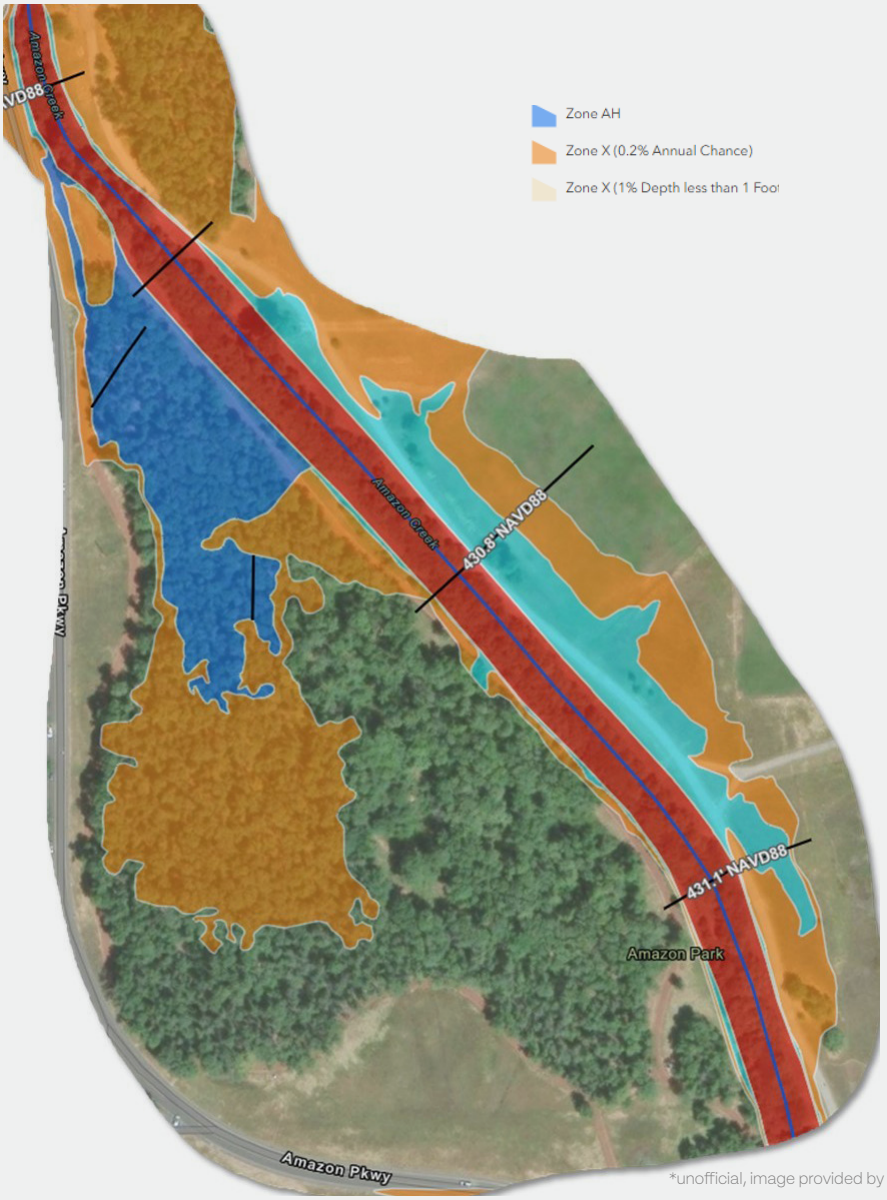
02

Willamette Valley wetlands play a crucial role in regional flood control by acting as natural sponges that absorb and store excess rainwater and storm runoff.[20]

During heavy rains, wetlands slow the movement of water, reducing peak flood levels and protecting downstream communities, roads, and infrastructure from flood damage.

By gradually releasing stored water, the Ma-Lik wetland area helps maintain stable hydrological

2025 FEMA FLOOD MAP*

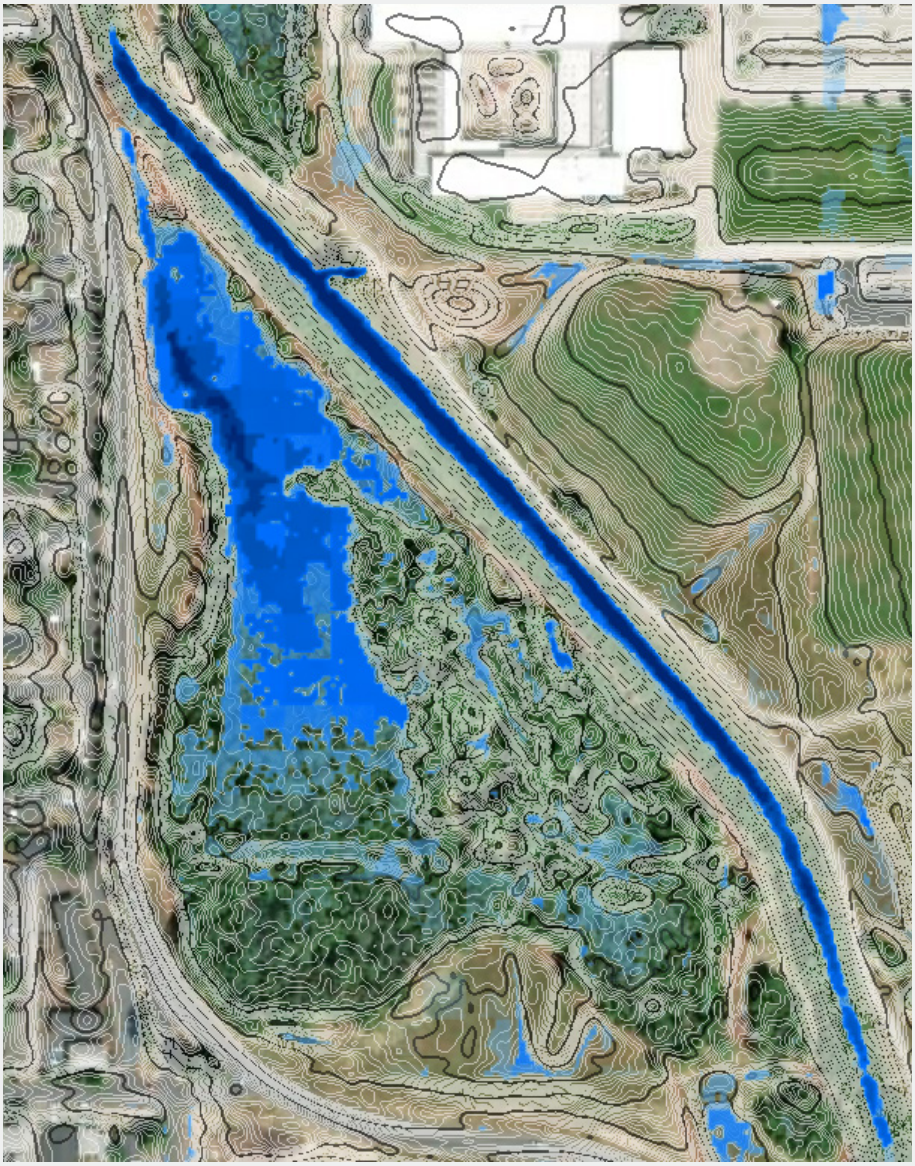


*unofficial, image provided by the City of Eugene

conditions during dry periods and prevents rapid runoff that can exacerbate erosion.

As seen in the maps to the right, a large portion of the wetland is alleviating flood pressure from downstream areas of Amazon Creek. Careful preservation of this wetland environment in future design considerations is essential to ensuring continued hydrological function as climate change continues to intensify storm events.

ArcGIS FLOOD SIMULATION (3 HRS HEAVY RAIN)



02

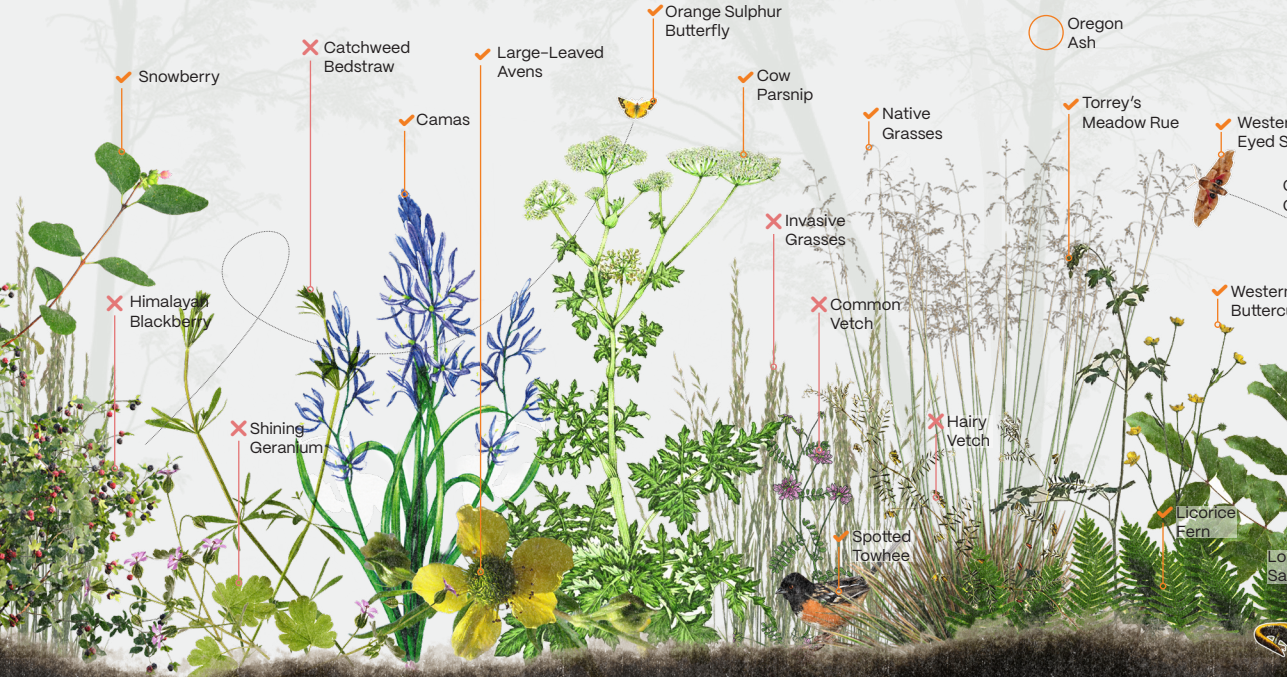
The Ash Groves support a rich mix of desirable natives, as well as a number of undesirable invasive species.

Desirable species include charasmatic endemics such as the Pacific chorus frog (*Pseudacris regilla*) and long-toed salamander (*Ambystoma macrodactylum*), both of which are signals of a healthy wetland ecosystem.

Undesirable species, both animal and plant, threaten this balance. The American bullfrog (*Lithobates catesbeianus*), an invasive predator, preys on native amphibians and disrupts local populations. Nutria (*Myocastor coypus*), a large invasive rodent, damages wetland vegetation and destabilizes animal populations. Plant invasives such as Armenian (Himilayan) blackberry (*Rubus armeniacus and/or Rubus bifrons*) outcompete native flora, degrade habitat quality, and reduce biodiversity. These species are persistent in the Ash Groves and the surrounding wetlands, requiring ongoing management.

A sensitive ecological approach is key when adapting wetland conditions as even some native species can deplete desirable vegetation (such as white tailed deer) while others can outcompete a number of desireable forbs like Camas (for example, bunch grasses such as Tufted Hair Grass).

The coexistence of rare, native wildlife alongside aggressive invasives underscores the importance of stewardship efforts in futuredesign considerations in order to ensure ecological integrity.





DESIRABLE SPECIES

MANAGEMENT OF EXISITNG DESIRED PLANTS

Seeding
Transfer (plugs)
Monitoring



UNDESIRABLE SPECIES

MANAGEMENT OF EXISTING UNDESIRED PLANTS

Hand-pulling
Mowing
Spot-spraying
Monitoring

DESIRABLE PLANT SPECIES*

TREES
Oregon Ash
Native Hawthorns
Native Cherries

SHRUBS
Nootka Rose
Osoberry
Snowberry

HERBACEOUS
Common Camas
Great Camas
Sukdorf's Large Camas
Western Buttercup
Pacific Willow-Dock
Native Grasses
Licorice Fern
Common Cowparsnip
Oregon Grape
Large-Leaved Avens
Poisin Oak
Spreading Rus
Torrey's Meadow Rue
Western Sword Fern

UNDESIRABLE PLANT SPECIES*

TREES
European Holly
Non-native Hawthorns
Cherry-Plum

SHRUBS
Laurustinus Viburnum
Common Privet
Portuguese Laurel

HERBACEOUS
Hairy Vetch
Common Vetch
Invasive Grasses
Shining Geranium
Himilayan Blackberry
Catchweed Bedstraw
Salsify
Nipplewort

DESIREABLE ANIMAL SPECIES*

MAMMALS
American Beaver

BIRDS
Red Shoulderd Hawk
Harrier Hawk
Killdeer
Black Pheobe
American Crow
Bushtit
Spotted Towhee

AMPHIBIANS
Pacific Chorus Frog
Long-Toed Salamander

INSECTS
Orange Sulphur Butterfly
Wetern-Eyed Sphinx

UNDESIRABLE ANIMAL SPECIES*

MAMMALS
Nutria
White Tailed Deer

AMPHIBIANS
American Bullfrog

*This list is based on an incomplete list of research-grade observations from inaturalist.org, along with field observations on site.







Camas blooming underneath a section of Amazon Park Ash Groves on May 12th, 2012.
Image Credit: City of Eugene

02

ArcGIS TREE SEGMENTATION + COST ESTIMATE

MEAN CONFIDENCE RATING 50%

North Grove: 257 Trees
$51,400 every 2 years

TOTAL: 2,890 Trees
$578,000 every 2 years

Currently, direct-injection insecticide treatment can be given to EAB susceptible trees every two to three years.[21] Expenses of the treatment can vary. This analysis uses an estimate of $200 per tree, based on average contractor rates as of 2025. Estimating the amount of trees which would require treatment helps to build a realistic picture of future management options.

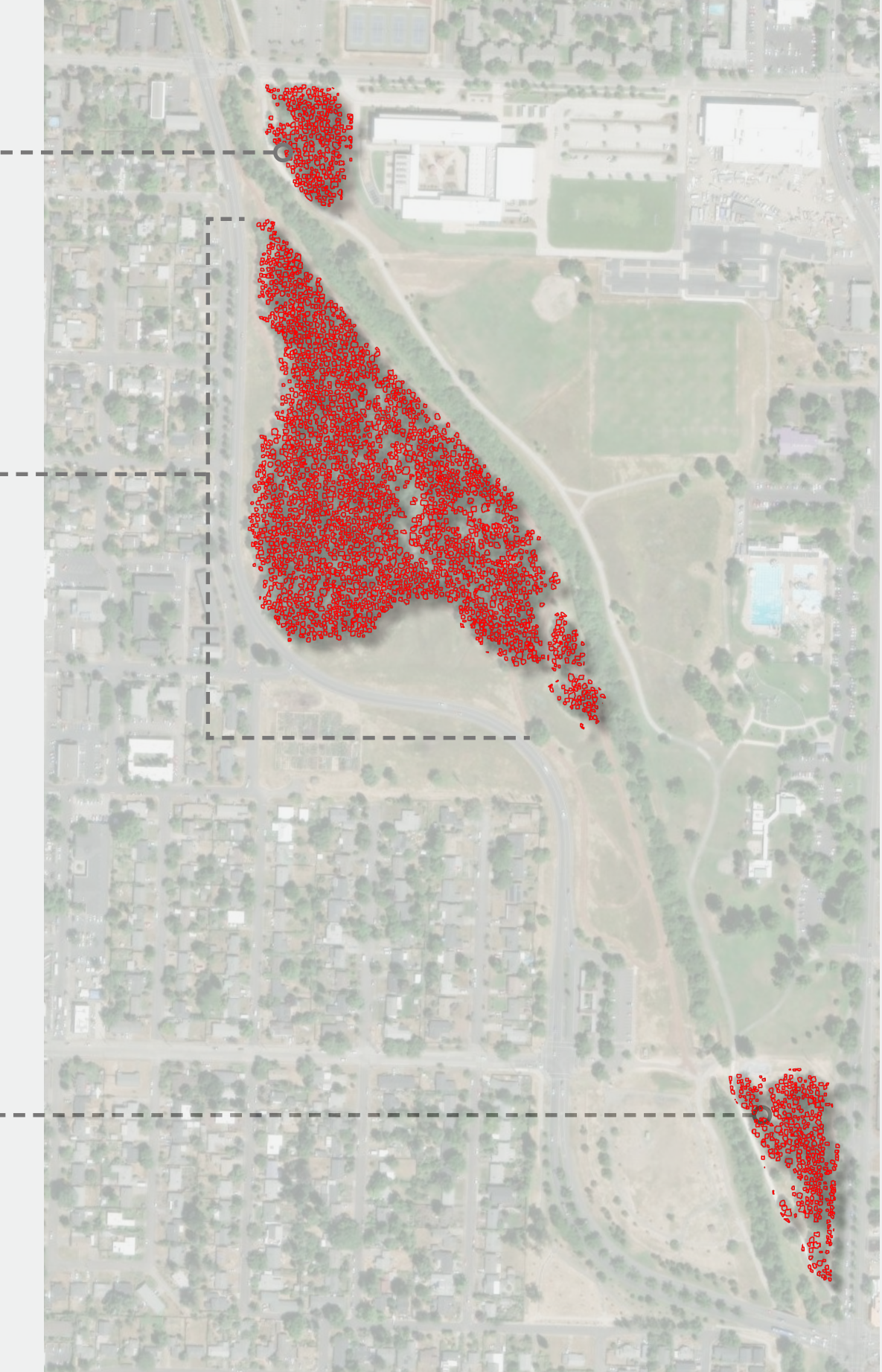
Ma-lik Grove: 2,285 Trees
$457,000 every 2 years

First released in 2023, the ArcGIS Tree Segmentation Pretrained Model is a deep learning tool designed to detect and segment individual trees in high-resolution aerial or drone imagery. Built on the DeepForest Python package and leveraging the RetinaNet architecture with Meta's "1-billion mask" Segment Anything Model (SAM), it was trained using data from the National Ecological Observatory Network.[22]

Essentially, the model processes 8-bit, 4-band imagery and outputs a "feature class," or a series of outlines, for each individual tree. While optimized for U.S. geography, the mean confidence rating I achieved when using this tree segmentation method was only 50%. Even with higher resolution imagery, the ESRI estimates this program to have average precision scores of around 66%.

Knowing this, we can assume that this methodology may falsely estimate the amount of individual trees in Amazon Park's Ash Groves. Additionally, this assumes all trees are found to be Fraxinus latifolia, while site visits have shown a significant number of cherry-plum (*Prunus sp.*) trees scattered throughout the North and Ma-lik Groves.

South Grove: 348 Trees
$69,600 every 2 years



LIDAR 360 TREE SEGMENTATION + COST ESTIMATE ($200/tree every two years)

CONFIDENCE RATING.....Unknown

02

TOTAL: 1,744 Trees
$348,800 every 2 years

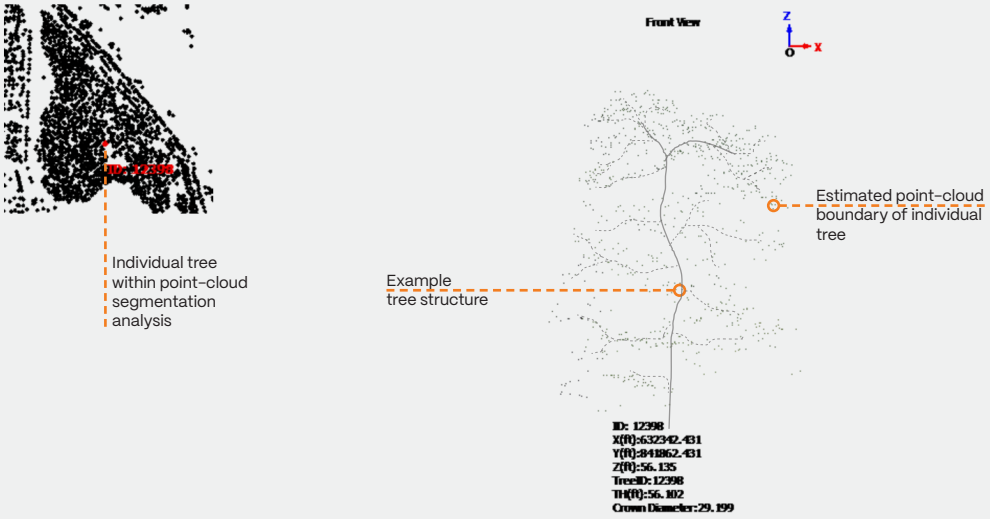
GreenValley International's Lidar360 also offers a Tree Segmentation Analysis[23], housed within its forestry modules. While is supports both aerial (ALS) and terrestrial (TLS) LiDAR data, this project used 4-band imagery ALS LiDAR data as provided by the city of Eugene. The accuracy and resolution of the LiDAR data is unknown but the data was sufficient enough to estimate indiviudal canopy (although not inividual tree trunks).

The software provides multiple segmentation methods, including Canopy Height Model (CHM) Segmentation, Point Cloud Segmentation, and Layer Stacking Segmentation.

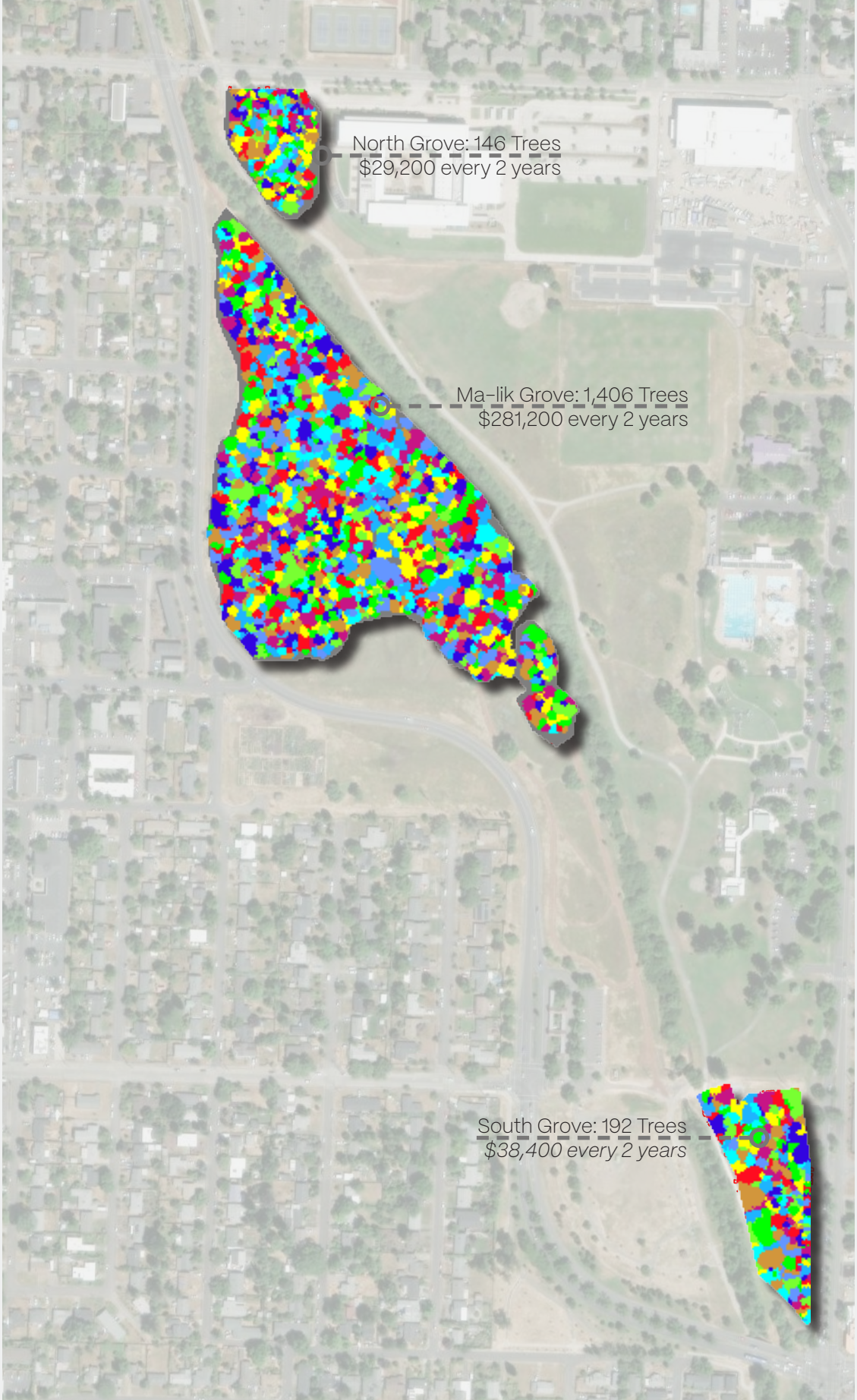
The point cloud segmentation method, used in this project, clusters LiDAR points into individual trees by starting from the highest point (seed), then classifies surrounding points based on a user-defined critical spacing value, typically related to canopy radius. This process extracts tree attributes like location, height, and crown dimensions (as shown in the figure below).

This method of using LiDAR, while potentially more robust than using orthographic data, is only as accurate as the lidar data that is available. As the lidar data quality from the City of Eugene is unkown, it is possible that this analysis underrepresents the complexity of the Ash Groves, underestimating the total amount of trees in any given grove.

Tree ID	Location	TreeID	TH(ft)	Crown Diameter	Crown Diameter(S-N)	Crown Diameter(E-W)	Crown Area	Crown Volume
12398	632342.431, 841862.431, 56.135	12398	56.102	29.199	25.262	33.793	636.146	12353.07



A report as shown above is generated for each individual tree


North Grove: 146 Trees
$29,200 every 2 years
Ma-lik Grove: 1,406 Trees
$281,200 every 2 years
South Grove: 192 Trees
$38,400 every 2 years

SITE CONTEXT

UNIVERSITY OF OREGON'S ENVIRONMENTAL LEADERSHIP PROGRAM

02

TOTAL: 4,363 Trees $872,600 every 2 years

The third and final method used for individual tree segmentation was conducted as part of the Environmental Leadership Program.

The University of Oregon program brings together students from various disciplines to work in teams with nonprofits, government agencies, and businesses, tackling environmental challenges identified by the community.[24] For the spring 2025 term, I was hired as the Graduate Employee Project Manager for the team.

Following protocol laid out by the City of Eugene (our community partner), our group spent eight consecutive Fridays from 9am to 5pm out in the field, and collected data on hundreds of trees and the understory beneath them.

Based on our sample plots at Amazon Park, we estimate a total of 4,363 trees within the Ash Groves, costing the city of Eugene the better part of a million dollars every two years to keep these forests alive in the face of EAB. This estimate may be the most accurate, as it relies on in-field sampling.

SURVEY ESTIMATES BY GROVE

- Ma-Lik Grove = 3,790 Trees
- South Grove = 378 trees
- North Grove = 195 Trees

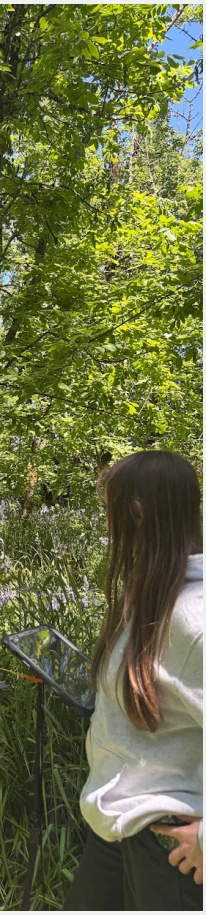




Measuring survey plot size among the cama



Oregon Ash ELP Team. May 2025. Image Credit: Cooper Eccles



s at Amazon Park



Student measuring a particularly knobbly multi-stemmed Oregon ash tree.

DESIGN
INTENT

03 DESIGN

Acknowledging the prohibitive cost of complete forest treatment for EAB resistance, this project imagines a resilient future in which Eugene's Amazon Park Ash Groves are transformed into a commemorative ash meadow, including treating select trees to stand as commemorators that honor one of Eugene's most beloved forests.

With no official city plan for the area, project outcomes are poised to act as early precedents for future Oregon Ash wetlands while EAB continues to spread across the state and is soon to be found in other cities along the West Coast.

Currently, the groves contain one of the oldesr and densest camas understories in Eugene, along with several other desirable native plants, mammals, birds, and amphibians who benefit from the seasonally inundated conditions.

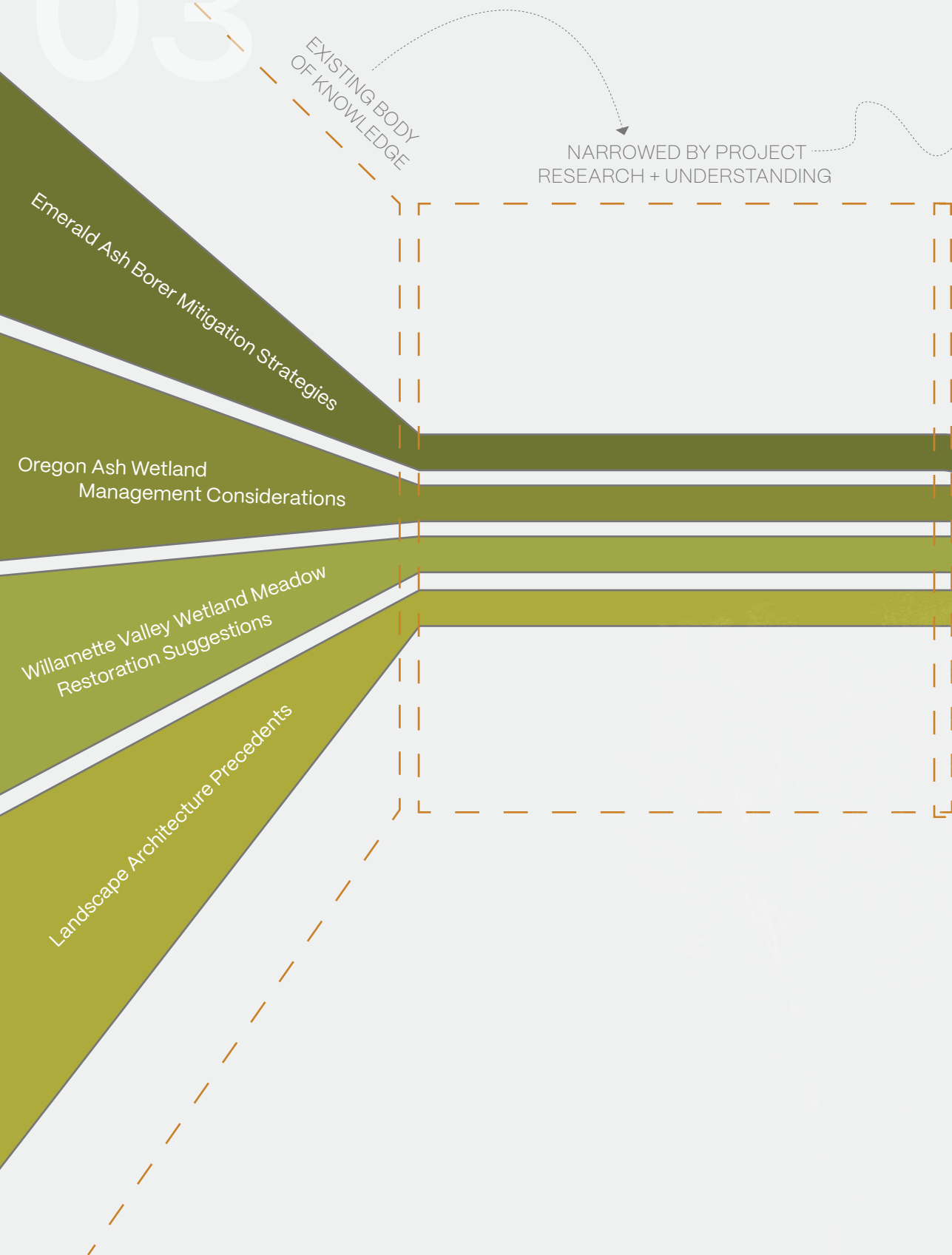
Design considerations hinge on uncovering this camas understory, thought to be originally planted and stewarded by Kalapuyan peoples, while also providing ecological commemoration of the forest that has established over the last 75 years.

It should be noted that this design is inherently speculative, and encounters various uncertainties that range from the future of EAB spread to the hydrological nuances of the site.

However, there is considerable merit in exploring the impact of landscape architecture on urban natural areas susceptible to EAB impact, as speculative designs can offer optimistic frameworks for exploring socio-ecological solutions.



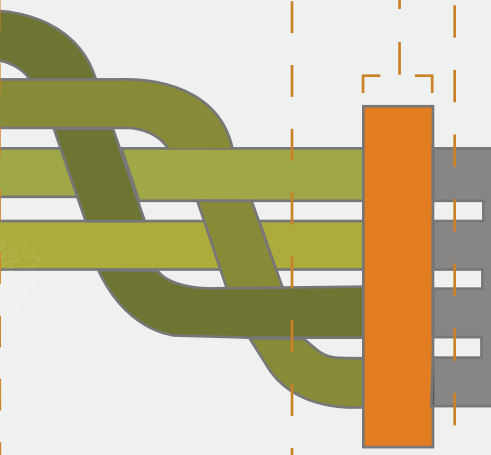



EXISTING BODY OF KNOWLEDGE
NARROWED BY PROJECT RESEARCH + UNDERSTANDING
Emerald Ash Borer Mitigation Strategies
Oregon Ash Wetland Management Considerations
Willamette Valley Wetland Meadow Restoration Suggestions
Landscape Architecture Precedents

SYNTHESIZED

FILTERED THROUGH SITE CONTEXT

GENERATES UNIQUE PROJECT GOALS



Ecological Adaptation

Adapt wetland forest into wet prairie while preserving high value existing understory habitat in areas of Oregon Ash forest

Continued Research

Using cost-estimate data, preserve select forest stands for future research opportunities

Increased Social Engagment

Propose design suggestions for increased visitor access that commemorate previous conditions while celebrating a more resilient future.

DESIGN PROCESS
MASTER PLAN

03

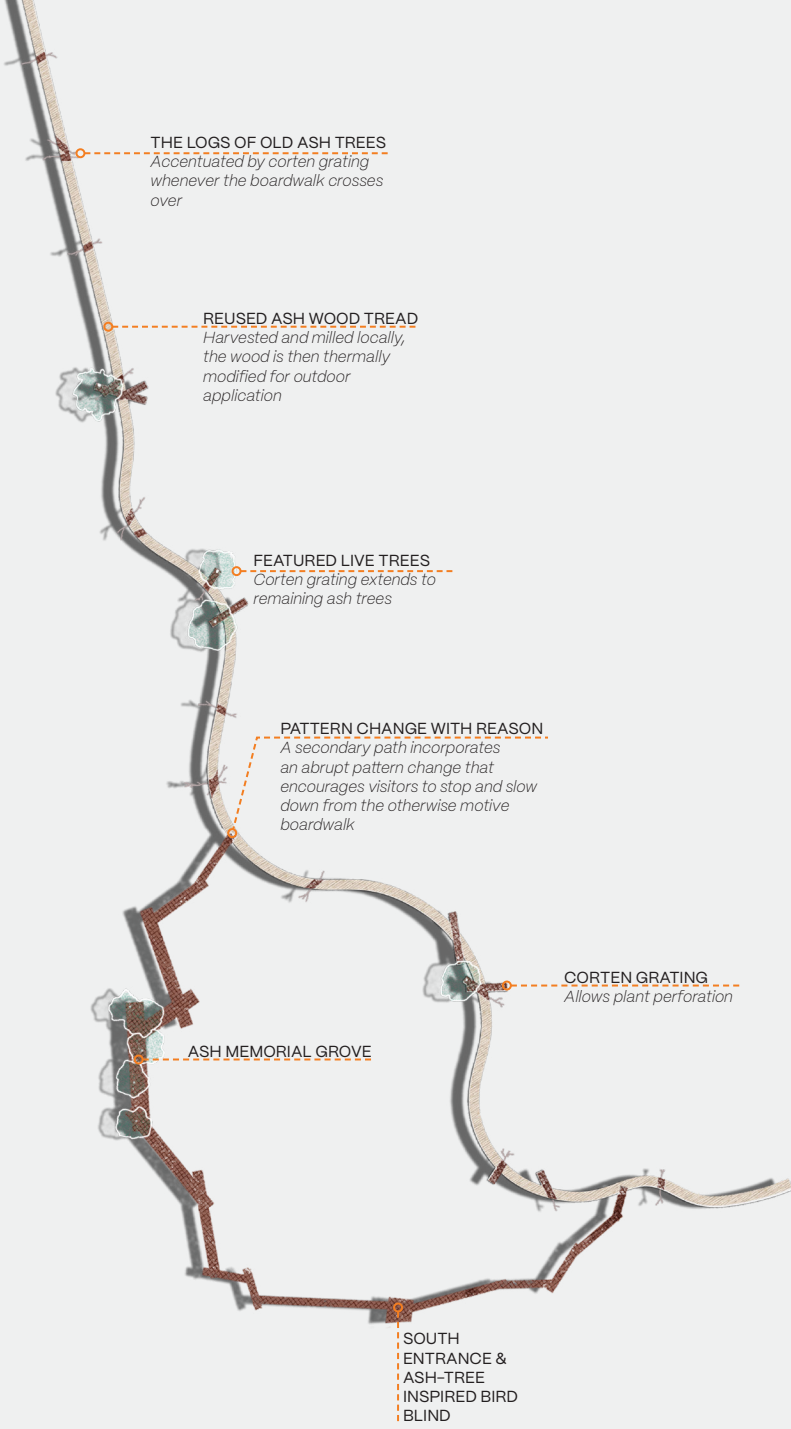
A sensitive approach to site ecology transforms the Ma-Lik Grove into a mixed wetland of camas-meadow, ash savanna, and oak savanna. 100 ash trees, along with the North and South Groves, will be preserved using a direct injection insecticide every two years, believed to have little to no impact on the surrounding ecology.

Troughout the meadow, infested trunks of dead ash trees will be scattered across the site to provide vital habitat for amphibians such as the Pacific Chorus Frog and Long-Toed Salamander.

Each time the boardwalk crosses one of these ash nursey logs, its surface is interrupted by perforated corten panels that allows rain and weather to penetrate the wetland floor while also calling visitors' attention to the decay of trees past.

On the site's southern end, a secondary path departs from the curvilinear ash-topped boardwalk and confronts visitors with a contrasting geometry that encourages pause and reflection.

Along the way, the addition of specific elements such as a memorial ash grove and an ash-tree inspired bird blind invite visitors to pause and reflect on previous conditions.





NORTH GROVE
150 trees treated and reserved for research: $30,000 every 2 years

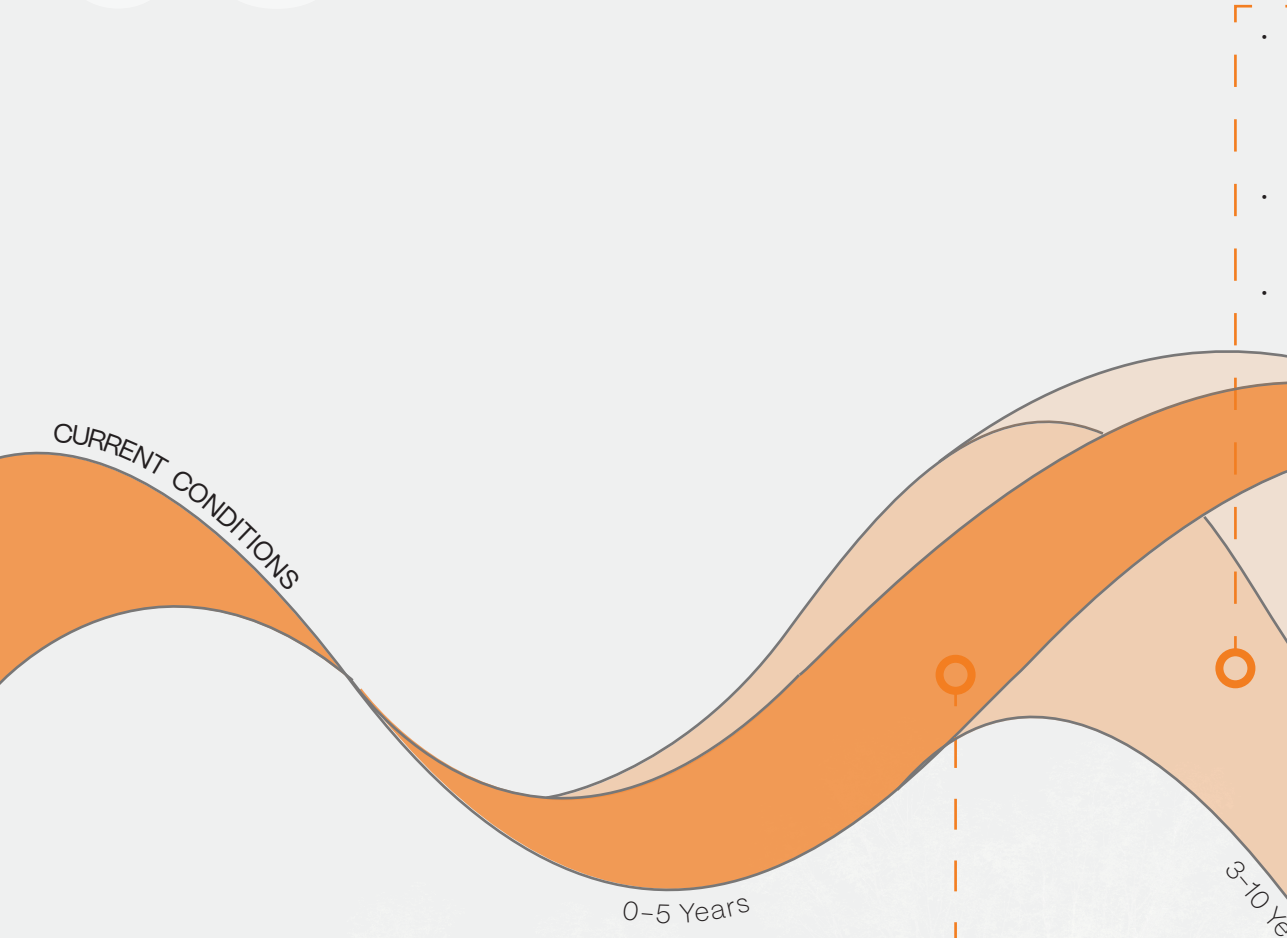
NORTH BRIDGE
The new entranceway for the Amazon Park Running Trail Loop, officiating the sidewalk entrance on 24th street and replacing a small and dangerous eroding trail between Amazon Parkway and Amazon Creek.

MA-LIK GROVE
100 trees treated in commemoration of what used to be: $20,000 every two years

EAST BRIDGE
Bridging two sides of Amazon Creek for better access, this bridge aligns the commemorative boardwalk with the main trail system of the park.

SOUTH GROVE
300 trees treated and reserved for research: $60,000 every 2 years

03



PHASE 1: PREPARE FOR EAB

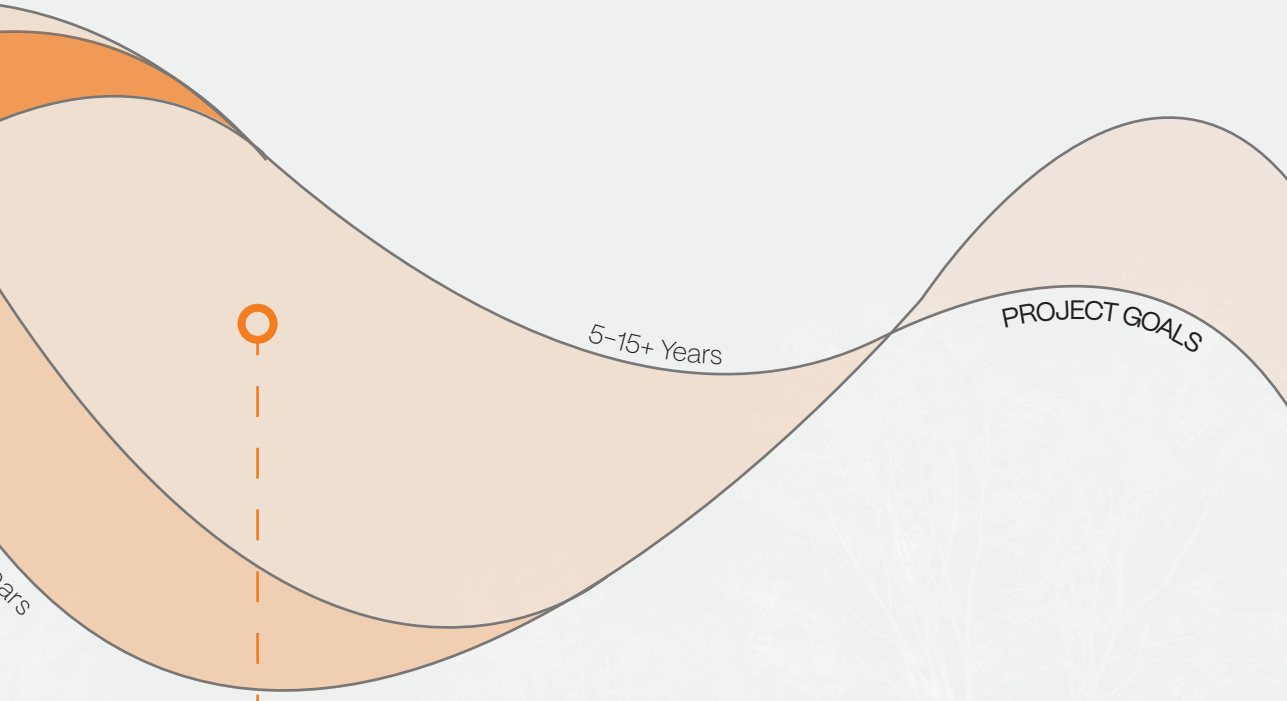
- Inter-plant Oregon white oak at the identified high-points of fill mounds.
- Begin EAB insecticide treatment of all healthy Oregon ash trees in the North and South Groves
- Identify Oregon ash in the Ma-lik Grove to server as commemorative trees in future ash savanna transformation.

PHASE 2: RESPOND TO EAB

Cut all infected trees. Leave some as snags and others as nursery logs. Infected wood is chipped and stored on-site for Amazon Park's bark mulch trail.

Where needed, establish native wet prairie species after tree removal.

Remove invasive vegetation after tree removal.



PHASE 3: ENGAGE

- Construct commemorative boardwalk, reestablishing natives in areas disrupted by construction.
- Construct bridges across Amazon Creek for increased connectivity.
- Continue monitoring and maintaining native wet prairie habitat.

DESIGN
PHASE 1: PREPARE FOR EAB
0 – 5 YEARS

03



30′ DIAMETER INITIAL CLEARING
AROUND OAK SAPLINGS

OAK SAVANNA
Identify suitable locations on the Ma-Lik Grove fill mounds for interplanting Oregon White Oak (*Quercus garryana*). Clear 30 feet around each tree and begin oak savanna transformation + maintainence within 30′ radius.

NORTH GROVE
Begin EAB direct insecticide treatmeant on all healthy trees (150 individuals or fewer)

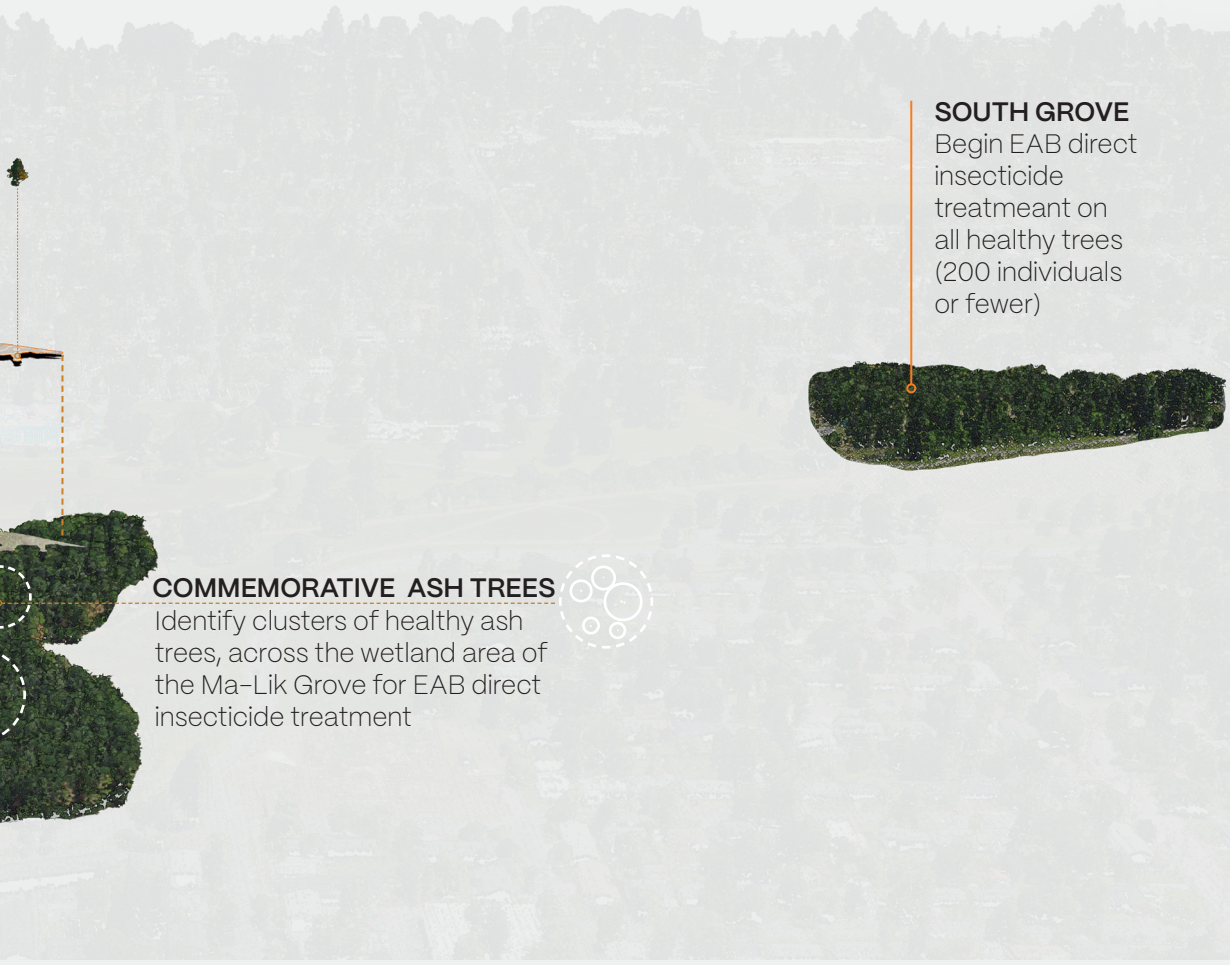


Phase 1 starts immediately and should be accomplished as soon as possible – before EAB has been found at Amazon Park.

Treating both the North and South Groves with direct insecticide treatment will preserve these groves against EAB and offer future research opportunities while maintaining vital shady wetland habitat. Understory maintainence will include invasive plant and animal removal and the continual monitoring of native species. No new planting is reccomended in these areas.

Approximately 100 Ash trees will be treated in the Ma-Lik Grove, ensuring they will continue to stand once EAB infects the forest and the grove is transformed into an Ash-Savanna and Camas wetland prairie.

In the Ma-Lik Grove fill mounds, Oregon White Oaks (who are most suitable for the overlap of increasing temperatures of climate change and potentially wet heavy-clay soils) will be interplanted in 30' diameter clearings. As they are slow growing, this will jumpstart the transition of the fill mound area to a post-EAB oak savanna.



SOUTH GROVE
Begin EAB direct insecticide treatmeant on all healthy trees (200 individuals or fewer)

COMMEMORATIVE ASH TREES
Identify clusters of healthy ash trees, across the wetland area of the Ma-Lik Grove for EAB direct insecticide treatment

PHASE 2: RESPOND TO EAB
3–5 YEARS

03



PRIORITIZE CLEARING
AROUND TREATED ASH TREES

CLEARING AROUND TREATED ASH TREES

As EAB infects the Ma-Lik Grove, felling operations should prioritize clearing room around treated ash trees to prevent harm to them by falling wood.

NORTH GROVE

Continue insecticide treatment



Phase 2 starts immediately after EAB is found at Amazon Park, likely to occur in the next decade.

The south and north groves will continue to be monitored for insecticide effectiveness, and may offer unique oportunities to study EAB. The Ma-Lik Grove will also be monitored for rate and severity of inspection, and in this period research opportunities such as biocontrol will offer strategies for slowing EAB spread. This grove should be closed during this period of time, to prevent falling trees or tree limbs from hurting pedestrians.

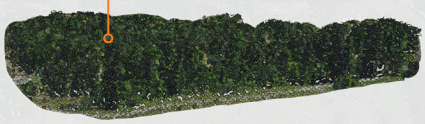
A clearing will also be made around each treated tree in the Ma-Lik Grove to prevent harm from falling infected trees - and understory health and management strategies can be assesed at this time as well.

While some dead trees will be left partially standing as habitat-enhancing snags, others will be left on site to provide habitatat ground level. Excess infested wood will be chipped to less than one inch (as required by the Oregon Department of Forestry guidlines), and stored onsite for later use as bark-mulch throughout the site.



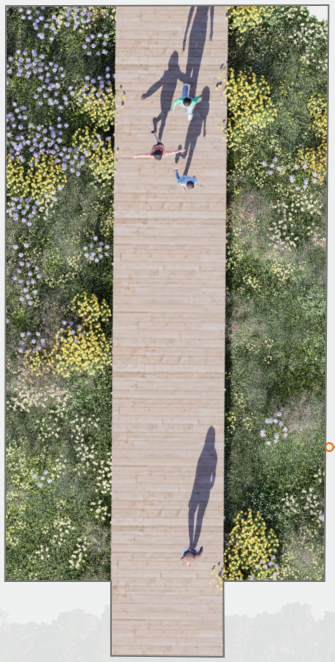
COMMEMORATIVE ASH TREES
Up to 100 trees should continue being treated as delicate felling operations begin to clear space for a new meadow.

SOUTH GROVE
Continue insecticide treatment



DESIGN
PHASE 3: RESPOND TO EAB
5–15+ YEARS

03



Ash Commemorative Walk

As EAB infects the Ma-Lik Grove, felling operations should prioritize clearing room around treated ash trees to prevent harm to them by falling wood.

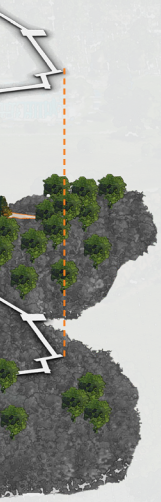
NORTH GROVE

Continue insecticide treatment

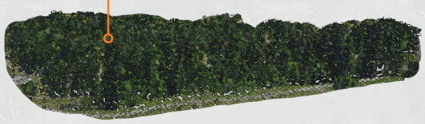


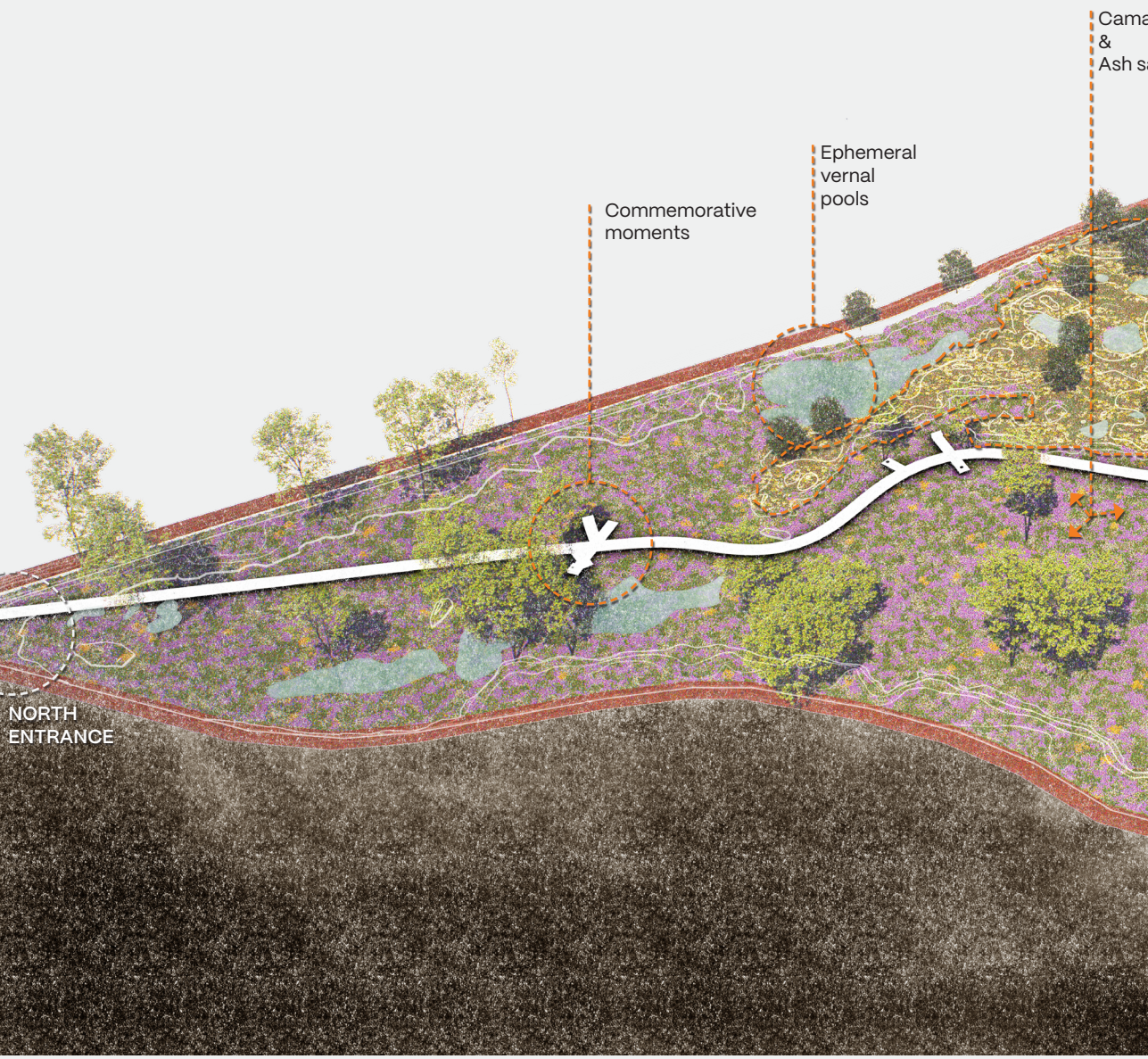
Phase 3 begins once all infested trees have been felled and there is no longer a health and safety hazard of falling tree limbs.

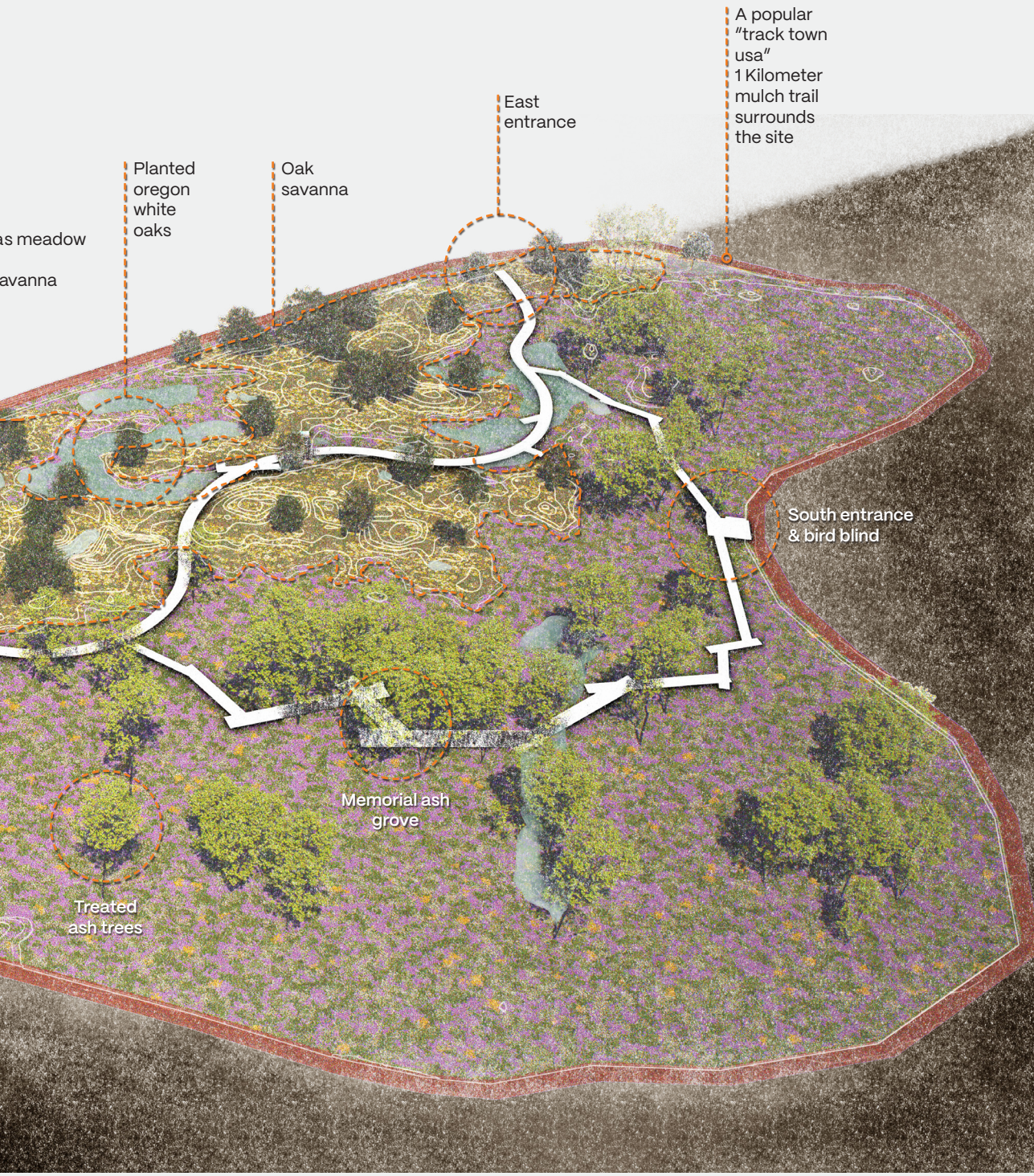
A boardwalk will be constructed using helical pilings for minimal soil distrubance, and non-infested ash wood harvested from on site will be locally milled and then thermally modified (a non-chemical heat treatment ensuring outdoor longevity) for outdoor application as furnishing and boardwalk decking. The boardwalk will vary in width, with the wood-topped section 8-feet wide and the secondary walkway varying between 6 and 12 feet wide. All areas of the boardwalk maintain a 2% or less grade no more than 28" off the wetland floor.



SOUTH GROVE
Continue insecticide treatment




Cama
&
Ash s
Ephemeral
vernal
pools
Commemorative
moments
NORTH
ENTRANCE


A popular
"track town
usa"
1 Kilometer
mulch trail
surrounds
the site
East
entrance
Planted
oregon
white
oaks
Oak
savanna
as meadow
avanna
South entrance
& bird blind
Memorial ash
grove
Treated
ash trees

COMMEMORATIVE BOARDWALK: DIALOGUING WITH ECOLOGY

03



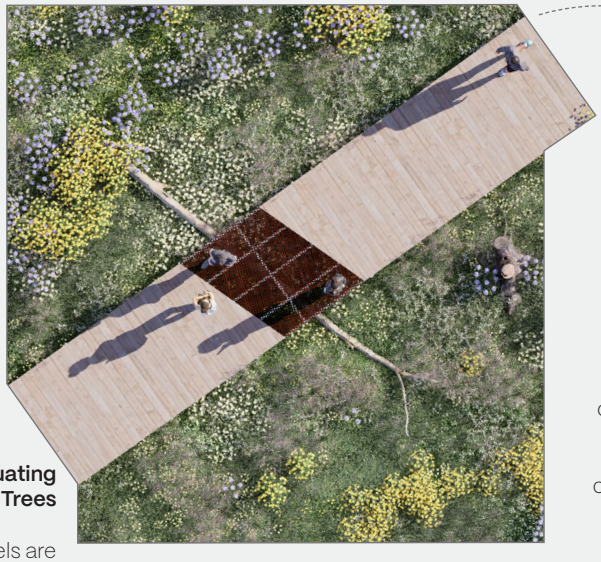
Changing Boardwalk

Corten panels interupt this softly winding boardwalk with rectalinear form, mimicking the criss-cross tree trunk array of the previous dense ash grove that used to exist before EAB infestation.



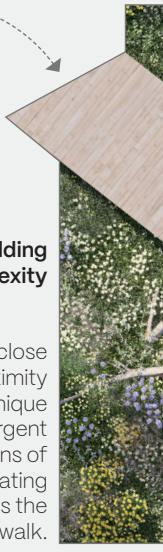
Featuring Remaining Ash Trees

Corten panels extend to remaining ash trees on site for intimate opportunities to reflect on past ecology (trees area treated for EAB resistance every two years).



Accentuating Fallen Trees

Corten panels are inserted whenever the boardwalk crosses a felled ash tree that has been left to enhance meadow habitat.

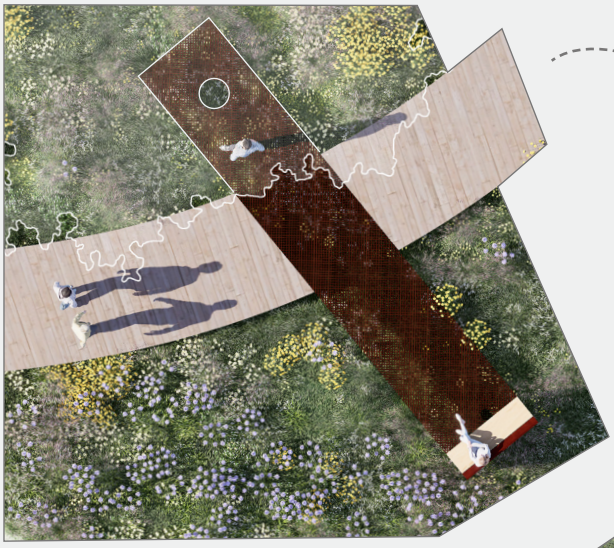


Adding Complexity

Logs in close proximity create unique emergent patterns of corten grating across the boardwalk.

Adding Room for Contemplation

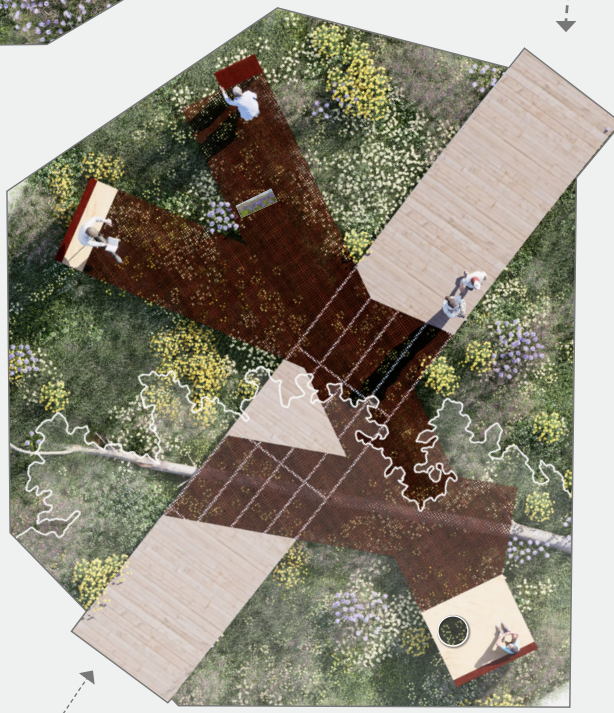
Adding seating opportunities across from featured trees allow for park-goers to step off the boardwalk, rest, and contemplate.





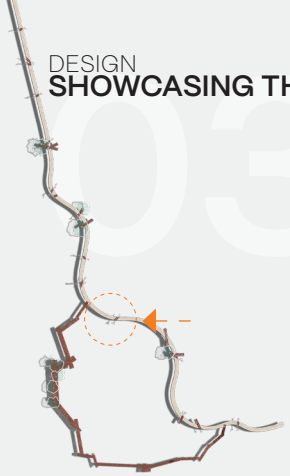
Combining Forms

Highlighting remaining trees and fallen trees together create spatially rich moments that layer past history with new wetland meadow conditions.



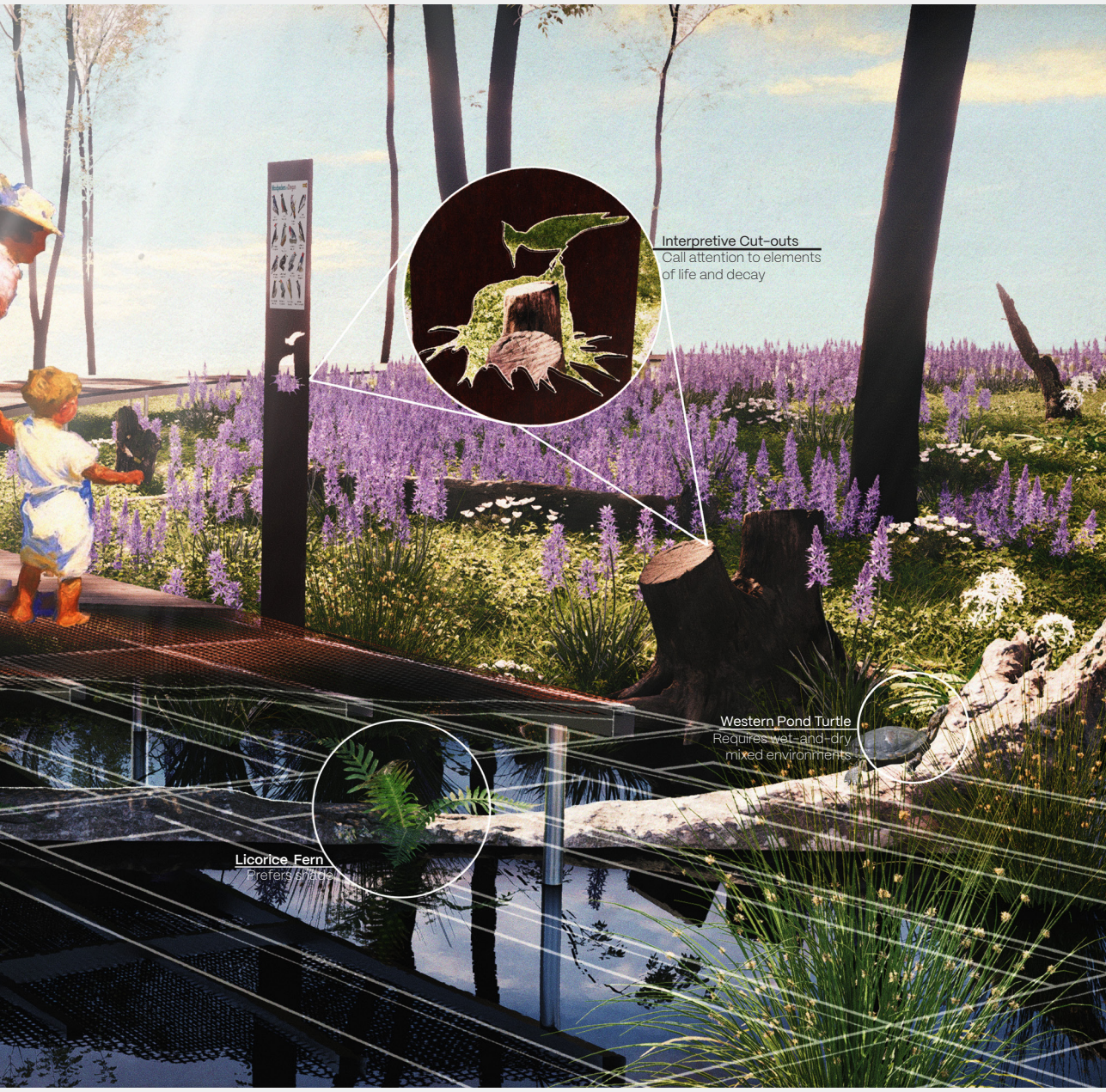
DESIGN
SHOWCASING THE PAST

03





The corten grating allows for weather to penetrate beneath the boardwalk and onto the fallen logs. In moments of ephemeral pool overlap, the decomposing logs will offer valuable habitat to key species such as the Pacific Chorus Frog, Long-Toed Salamander, and Western Pond Turtle. Alongside the boardwalk, creative corten signage encourages visitors to examine moments of life and decay around them.



DESIGN
COMMEMORATIVE MOMENTS

03





While logs can be moved, the exact location and form of many of these commemorative moments will depend greatly on the location of the remaining living ash trees.

EAB will likely still be present, but the beetle will be unable to fully colonize these trees as long as they receive a direct insecticide treatment every two to three years.



DESIGN
CONTRASTING HABITATS

03



ASH SAVANNA & CAMAS MEADOW
IN AREAS OF CLAY -HEAVY WETLAND

EPHEMER
FOUND THR
THE



AL POOLS
ROUGHOUT
SITE

OAK SAVANNA
PLANTED ON FILL MOUNDS



Unique moments will be created as the boardwalk winds through existing ephemeral pools and between the contrasting habitats of ash-savanna/wet-prairie and oak savanna.

DESIGN

NORTH AND SOUTH GROVES: LEAVING ROOM FOR RESEARCH

03

NORTH GROVE

SOUTH GROVE




Research
will
continue
to offer
new
insights
on EAB
mitigation
strategies

DESIGN
SECONDARY PATH

03





As visitors stroll along the seconday path, the overlapping rectilinear geometry creates pockets of pause to delight in the meadow environment or rest and consider the change that has occured on site. Interpretive signage and benches



DESIGN
ASH MEMORIAL GROVE

03



At the ash memorial grove, visitors are encouraged to pause at integrated seating areas, including a wooden platform designed for rest, reflection, and small gatherings. Interpretive signage and a simple material palette, that includes site-harvested ash wood, leave room to contemplate the grove's memorial significance while celebrating the reinvigorated understory beneath.



DESIGN
ASH MEMORIAL GROVE

03



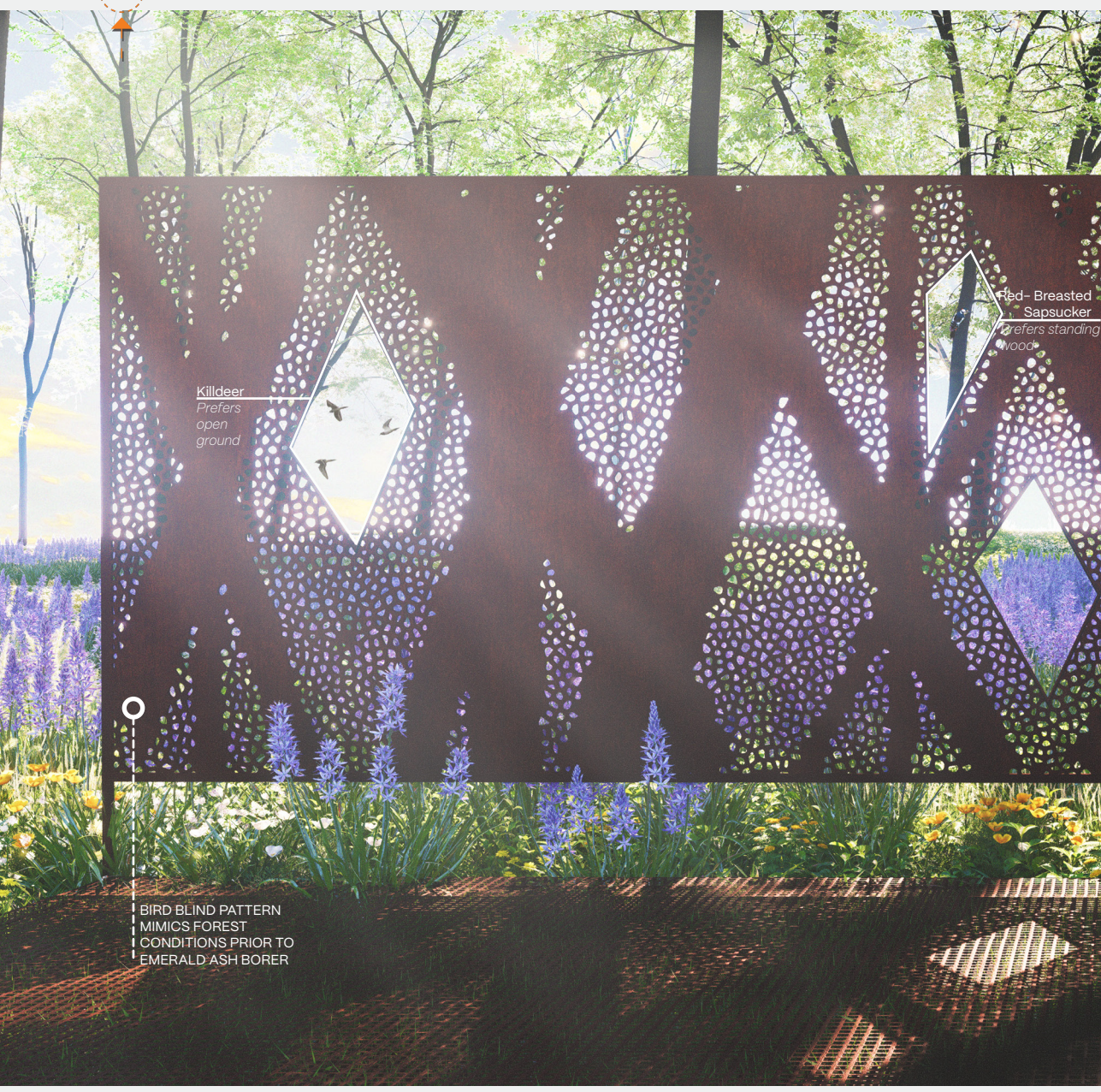


DESIGN

ASH TREE INSPIRED BIRD BLIND

03



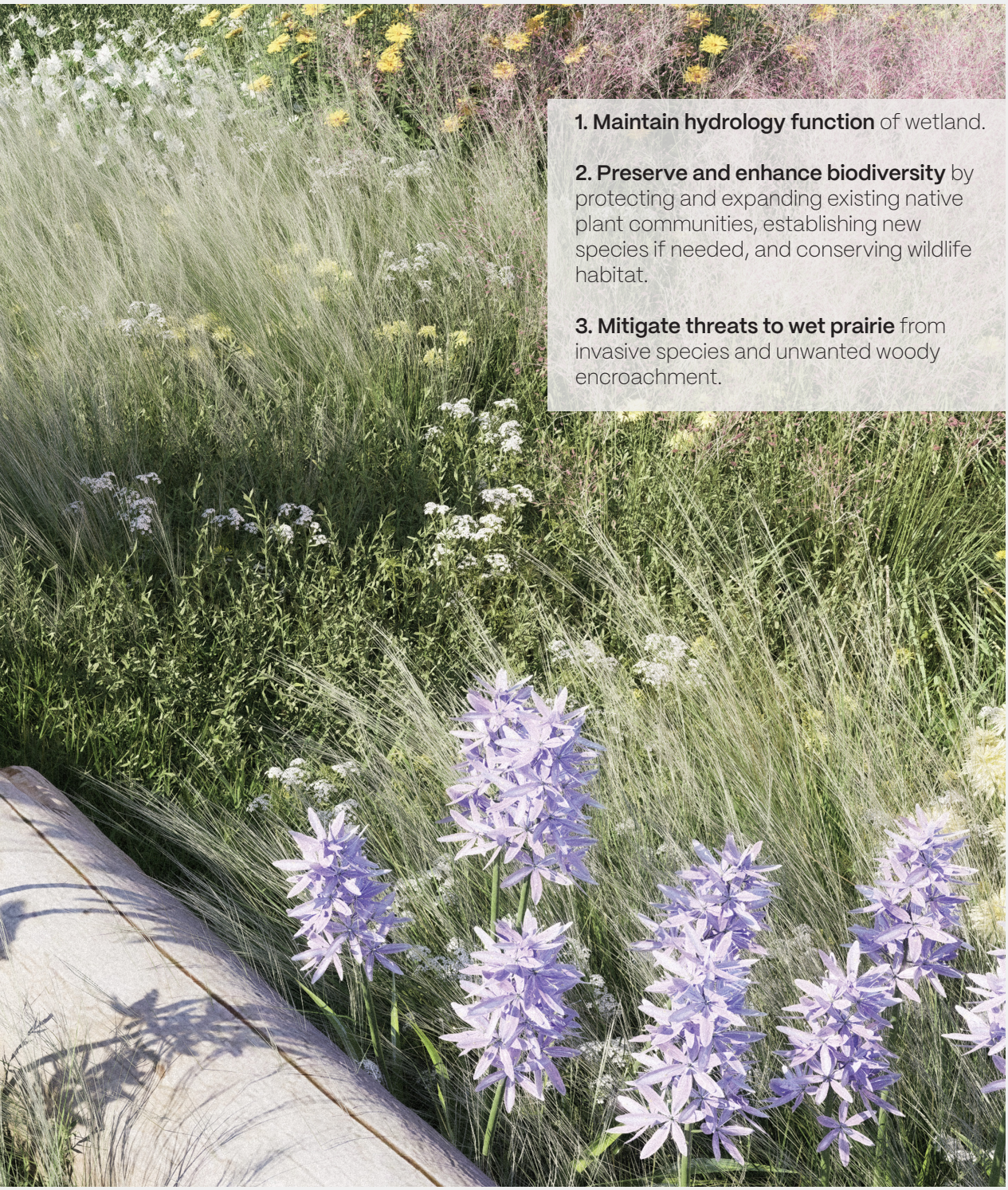



Harrier Hawk
Prefers wetland
meadows

LONG TERM MAINTAINENCE GOALS

03





1. Maintain hydrology function of wetland.

2. Preserve and enhance biodiversity by protecting and expanding existing native plant communities, establishing new species if needed, and conserving wildlife habitat.

3. Mitigate threats to wet prairie from invasive species and unwanted woody encroachment.

WINTER

MONITOR + ASSESS

Assess surface water presence: note depth and overall distribution. Document presence of overwintering wildlife. Develop 1, 3, and 5-year adaptive maintenance plans.

INVASIVE SPECIES CONTROL

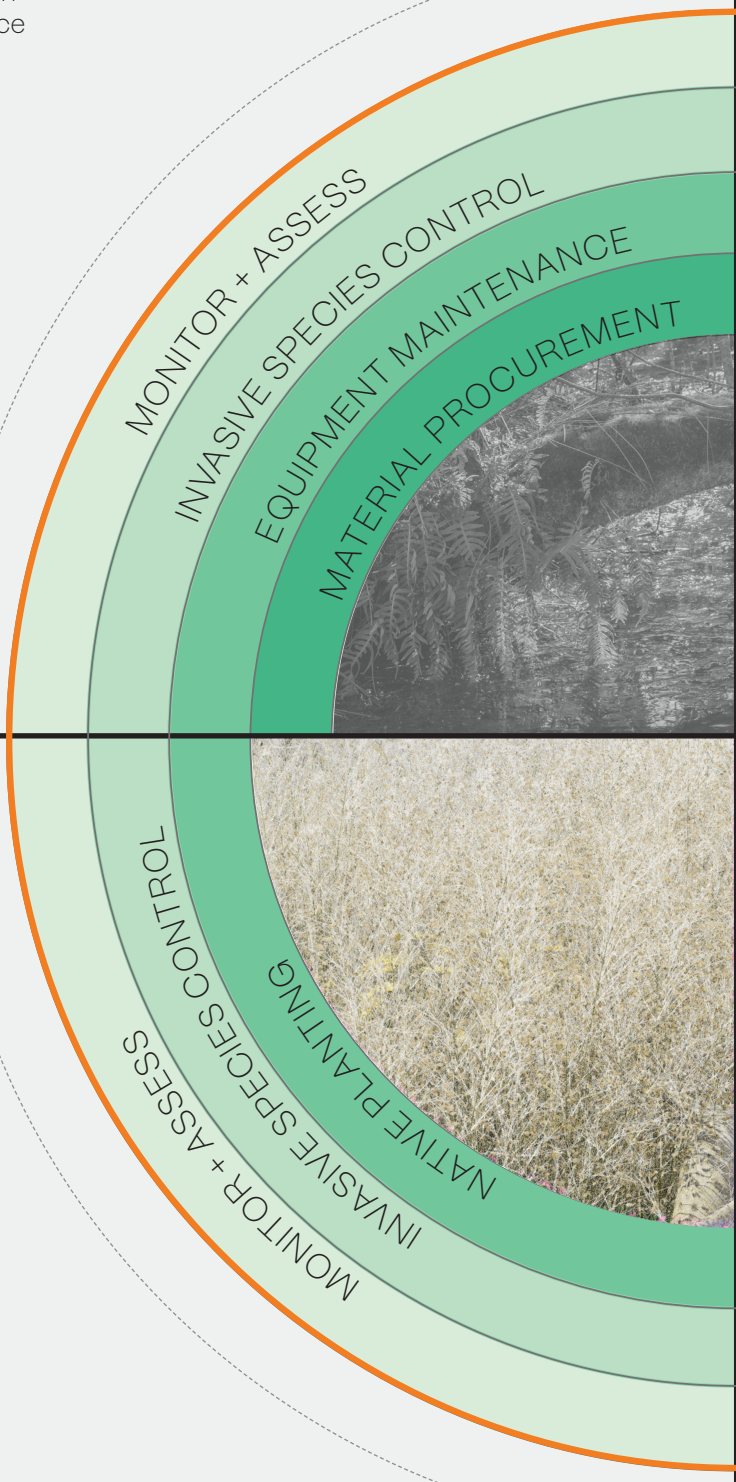
Hand pull, mow, and/or apply insecticide to woody invasives. Map invasive species habitat (ex: Blackberry, Nutria).

EQUIPMENT MAINTENANCE

Service mowers, seed drills, and herbicide applicators.

MATERIAL PROCUREMENT

Order native seeds, bulbs, and root stock. Order herbicides and other invasive management tools.



MONITOR + ASSESS

Evaluate mowing: measure bare ground exposure and re-sprouting. Monitor seedling establishment following fall seeding or bulb planting. Document invasive plant encroachment and effectiveness of recent control measures. Prepare and archive seasonal monitoring data for winter review and future adaptive management plans.

INVASIVE SPECIES CONTROL

Hand pull, mow, and/or apply insecticide to woody invasives. Map invasive species habitat (ex: Blackberry, Nutria).

NATIVE PLANTING

Broadcast native seed mixes (2:1 forbs:grasses). Plant bulbs (ex: camas bulbs in clusters during Oct-Nov)

FALL

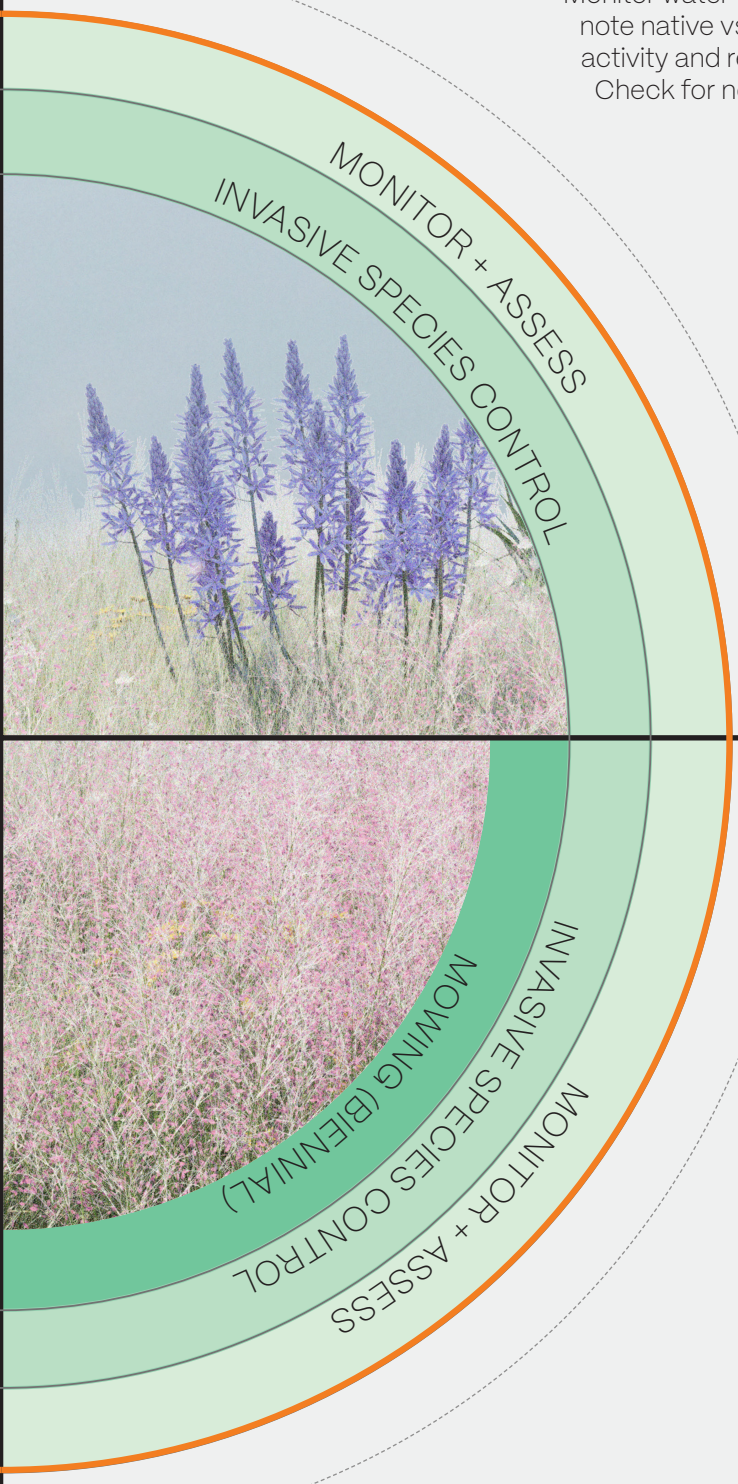
SPRING

MONITOR + ASSESS

Monitor water table. Survey early vegetation emergence: note native vs invasive species. Assess wildlife breeding activity and record locations to protect from disruption. Check for new or expanding invasive species patches.

INVASIVE SPECIES CONTROL

Hand pull, mow, and/or apply insecticide (ex: spot spraying glyphosate) to emerging invasives.



MONITOR + ASSESS

Conduct vegetation surveys: Note cover and frequency of native vs invasive species. Monitor effectiveness of invasive species treatments and mowing or grazing impacts Monitor wildlife activity and habitat locations. Observe for signs of drought stress or unusual plant mortality.

INVASIVE SPECIES CONTROL

Hand pull, mow, and/or apply insecticide to persistent invasives.

MOWING (BIENNIAL)

Mow after native plants set seed (late July–August). Vary mowing patterns and leave uncut habitat for insects and wildlife. Remove thatch during or post mow to prevent smothering native seedlings.

SUMMER

CONCLUSION

04 CONCL

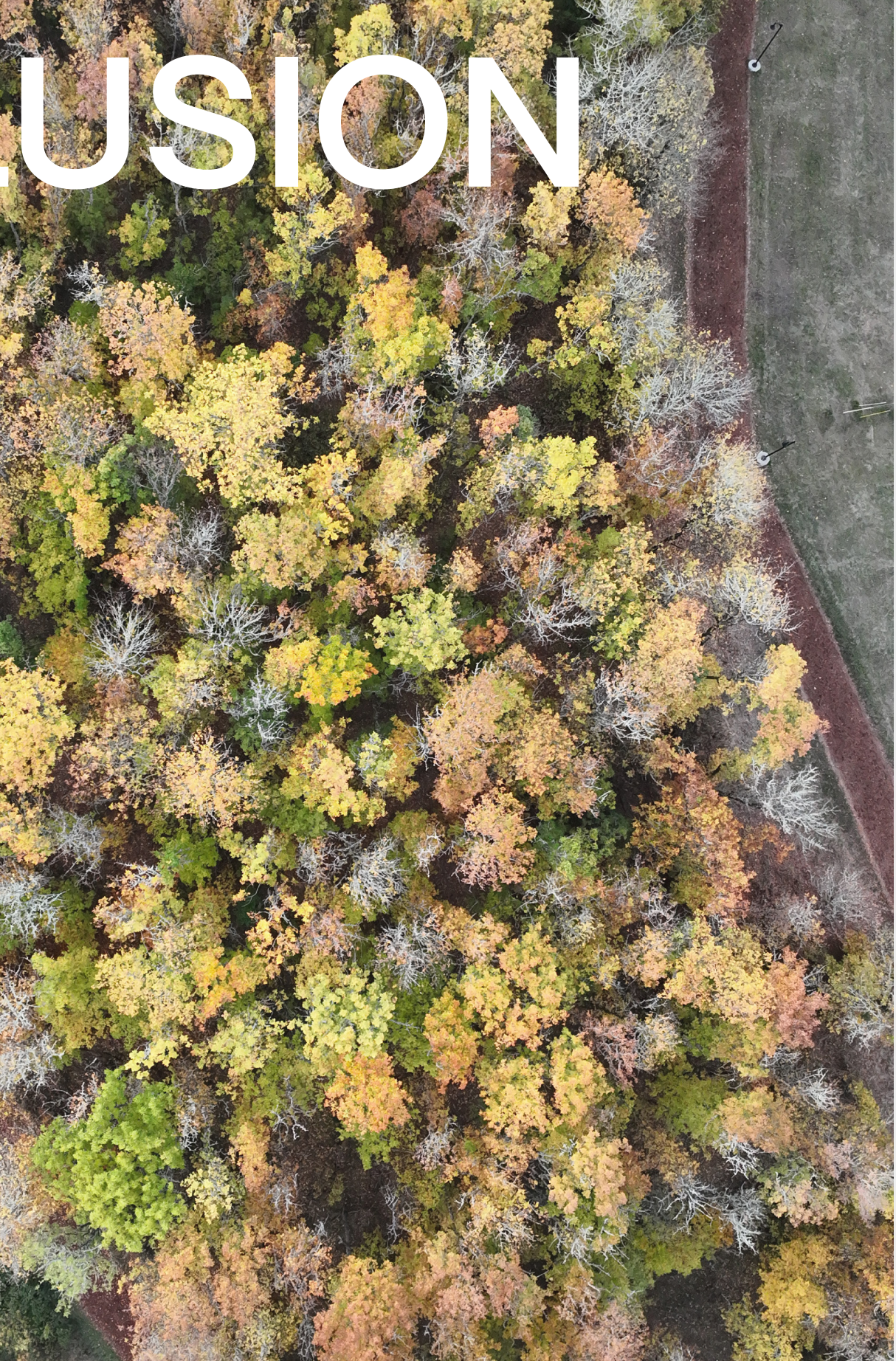
The arrival of EAB in Oregon in 2022 marked a morbid turning point for the management of urban and rural natural areas across Willamette Valley. Despite rapid and coordinated management responses (including public outreach, tree removal, pesticide treatments, and biocontrol efforts), the prognosis for Oregon's ash trees remains dire, with near-total mortality expected in infested areas regardless of condition. This impending loss underscores the importance of a commemorative and adaptive landscape design that seeks to honor the ecological role of ash trees while preparing for a more resilient post-EAB future.

Taking an ecology-first approach, this project seeks to bridge habitat transformation with cultural engagment by merging restoration practices with architectural elements such as accessible pathways, interpretive elements, and spaces for reflection. Ecological adaptation, continued research, and increased social engagement are unique site-driven outcomes, further underpined by a phased plan to prepare and respond to EAB.

Moving forward with this project, more work should to be done to clarify spatial uncertainties regarding topography, environmental conditions, and vegetation. Community Partnerships should also be established, and close work with local tribes could offer additional place-making and place-restoring outcomes.

Ultimatelty, this project demonstrates that even in the face of ecological disruption, urban parks can serve as laboratories for resilience, adaptation, and remembrance. Future design efforts at Amazon Park's Ash Groves can offer a beacon for how communities can respond to environmental loss: not with resignation, but with creativity, reverence, and hope.




USION



























ENDNOTES

00

INTRODUCTION

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01

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02

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NOTE: All images by the author unless otherwise noted.



AFTER THE ASHES
Commemorating Eugene's Amazon Park Ash Groves in the Wake of Emerald Ash Borer

In the wake of destruction from the Emerald Ash Borer beetle, the transformation of Amazon Park's Ash Groves honors one of Eugene, Oregon's most beloved wetland priority sites while restoring pre-colonial camas meadow conditions. Advocating for a mixed solution of ash tree treatment and wetland adaptation, After the Ashes provides an ecologically sensitive approach that balances visitor engagement with habitat needs. A boardwalk offers commemorative moments while a memorial ash grove invites visitors to pause and reflect on previous conditions. Rich in character and unobtrusive in form, After the Ashes offers a resilient future that remembers its past.

AFTER THE ASHES