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March 3, 2023

Multnomah County Planning Commission
Multnomah County Land Use Planning
1600 SE 190th Avenue
Portland, OR. 97231

Submitted by e-mail to:

lup-hearings@multco.us

Re: Testimony on the Metro North Tualatin Mountains applications

Case No. T3-2017-9165 / T4-2017-9166

Dear Chair Ingle and Planning Commissioners:

Thank you for the opportunity to provide additional testimony about this complicated application. I have attached to my email several documents that I reference in this letter.

Northern red-legged frogs (Rana aurora aurora) is a state listed vulnerable species. Metro's Burlington Creek Forest (BCF) property is in a high value habitat area.

The map on page 5-12 of the Multnomah County Comprehensive Plan shows that the Burlington Creek Forest property is not only SEC-h, but it is also identified by ODFW as being important habitat for both elk and black bear. The map is included in an end note[i].

In 2009, Metro worked with partners to map important wildlife habitat for the regional Urban and Rural Reserves process (Natural Features for Reserves Process, 2009). All of the unincorporated land in the west hills area of Multnomah County was designated as a Rural Reserve because it is an important natural landscape feature, known for high value wildlife habitat and as a wildlife corridor between the coast range, Forest Park and the Willamette River. I will provide the map as an attachment so you can see that the area around these Metro properties shows up as the largest block of high value habitat in our region. The map was created by overlaying many habitat maps. Each layer was given the same color and color density, so the areas with the deepest color are recognized as high value habitat by the most authorities.

More specifically, ODFW has noted (Exhibit D.108.3) that the Burlington Creek Forest property is within two Conservation Opportunity Areas (places identified by the state as places where broad wildlife conservation goals would best be met) – COA ID 054 and COA ID 058. Conservation actions for these COAs include managing public access and recreation to protect fish and wildlife. ODFW also notes that

Exhibit H.20

this property is located with their Compiled Crucial Habitat Priority Ranks of 1 and 2 (out of a rank of 6, where 1 is the most valuable habitat), where goals include preventing declines of at-risk species.

A state listed sensitive species in a high value habitat area deserves protection from new recreational trails. The quality of the habitat makes natural resource conservation in this area very important.

Metro uses the same basic language to argue for the quality of their plan in many places in their applications. I'm not going to try to identify them all. I will focus on one key approval criteria, **§ 33.6010 (B) Will not adversely affect natural resources;** but these comments also apply to these policies:

Section 10.11-4 of the staff report (starting page 197 of the PDF).

> **GOAL, POLICIES, AND STRATEGIES**
>
> **Goal: To help meet the recreational needs of Multnomah County rural residents and visitors to its rural areas through support of, and coordination with local, regional, state, and federal agencies that manage recreation facilities and sites within the County.**
>
> **Policies and Strategies Applicable County-wide**
>
> **The policies in this section focus on coordination with other agencies in planning for and providing recreational facilities and services and with balancing recreational needs with goals for natural resource protection. Additional related policies are found in Chapter 5 of this plan and in the County's Transportation System Plan (referenced in Chapter 12).**
>
> **Parks and Recreation Planning**
>
> **Policy 8.2 Encourage the development of recreation opportunities by public agencies and private entities consistent with wildlife habitat and wildlife corridor protection.**

My testimony shows that Metro's plan is not "consistent with wildlife habitat and wildlife corridor protection."

Section 10.11-6 of the staff report (starting page 201 of the PDF)

> **Policy 8.8 Support only those recreational activities within the West Hills area that are consistent with, and do not cause significant negative impacts on, natural and environmental resources that are identified in Goal 5.**

My testimony shows that Metro failed to prove that their plan will not "cause significant negative impacts" on Goal 5 resources.

This West Hills specific policy is rooted in the Multnomah County Comprehensive Plan's "West Hills Vision" (page 1-30-31) and more detailed description of the character to be preserved:

West Hills Vision

The vision for the West Hills planning area is to retain its cherished rural character, natural features, scenic views, forestry and agricultural productivity, to enhance resource protections, and to reduce and manage cumulative impacts of traffic, recreation, and development in order to preserve the distinctive character of the West Hills for future generations.

The rural and distinctive character of the West Hills to be preserved, its "sense of place", includes the following:

- **Wildlife and habitat:** The West Hills are a long, narrow extension of the Coast Range ecoregion that reaches into the Willamette Valley ecoregion. The West Hills connect wildlife in Forest Park to the Coast Range, Tualatin Basin, Multnomah Channel, Sauvie Island, and the Columbia River and Willamette Rivers. This confluence of three different habitat types (valley, river/wetlands, and mountains) provides particularly rich but fragile (due to its long narrow shape and nearby urbanization) wildlife connections of statewide importance, identified by the State of Oregon's Department of Fish and Wildlife as a Conservation Opportunity Area. Large areas of contiguous forest canopy provide an increasingly rare and valuable habitat for neo-tropical migrant birds and other habitat specialists. Pockets of rare native oak woodland and savannah are also valued.

The vision calls for resource protections to be enhanced and the impacts of recreation to be reduced and managed.

Section 10.06 of the staff report (page 190 of the staff report PDF) assesses Approval Criteria for Community Service use that I am again going to address:

> **§ 33.6010 APPROVAL CRITERIA**
>
> **In approving a Community Service use, the approval authority shall find that the proposal meets the following approval criteria, except for radio and television transmission towers, which shall meet the approval criteria of MCC 33.6100 through 33.6125, wireless communications facilities which shall meet the approval criteria of MCC 33.6175 through 33.6188; and except for regional sanitary landfills which shall comply with MCC 33.6200 through 33.6230.**
>
> **(B) Will not adversely affect natural resources;**

Metro's own ***Green Trails, Guidelines for environmentally friendly trails*** (https://www.oregonmetro.gov/green-trails-guidelines-environmentally-friendly-trails) advises that as part of the site analysis before trail planning (p. 22):

> Trail planners should particularly seek information about the locations of habitats of sensitive species – those that are listed as threatened, endangered under the Endangered Species Act, or for which the need for concentrated conservation actions are noted.

Unfortunately, as I pointed out in my previous testimony (Exhibit D.108), Metro did not seek information from ODFW or other likely sources (for example WMSWCD) about the presence of sensitive species in the Burlington Creek Forest (BCF) property before the proposed trails were planned.

Trail planners are advised in these Metro guidelines (p. 35) to avoid the kind of stacked switchbacks that appear to be planned for Trail AA. This is the trail segment where ODFW staff observed numerous Red-legged frogs and other amphibians, as noted in their 2017 comments (Exhibit D.108.3, bottom of p. 2).

> **Avoid stacking switchbacks and climbing turns.** Trail switchbacks and climbing turns need to be carefully sited so that their locations do not invite cut-throughs. When more than one switchback is necessary, they should not be inter-visible, particularly in winter, when many plants do not have leaves. Switchbacks should be offset from one another, and they should take advantage of natural benches, slope breaks and natural screening to prevent cut-throughs and short-cuts.

The Green Trails guidelines also show that "full bench" trail construction involves clearing a much wider area than the simple trail width (page 76, see image below). That means that when trails are constructed along a slope, the "cut" into the adjacent hillside will be at least the width of the trail itself, and a cleared. The diagram shows that the likely width of the required soil and vegetation removal will be much wider (perhaps 3 times the trail width) than the noted trail width in many locations since most of the proposed trails run across the sides of steep hills.

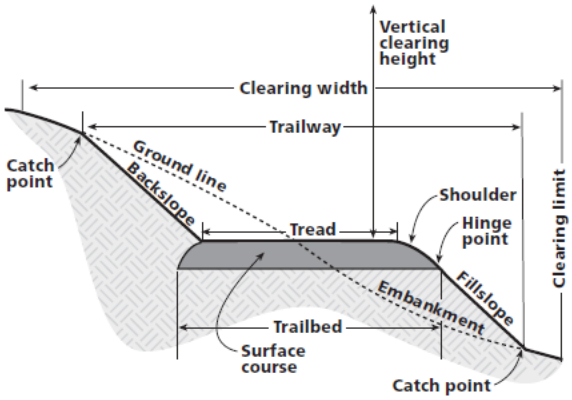

Figure 8-1 Trail structure terminology. (Hesselbarth, W. 2000. Trail Construction and Maintenance Notebook. United States Forest Service.)

Before the base rock is placed, the prepared sub-grade is usually compacted. If the sub-grade is wet or moist for even part of the year, drainage needs to be provided and/or a moisture barrier of some sort placed between the sub-grade and the base materials. Typically, a geotextile fabric can provide this barrier, although additional drainage measures may need to be designed. When a layer of large angular rock is placed on top of the fabric, the fabric keeps the rock from sinking into the yielding, wet soils.

However, sometimes the wet soils must be removed and replaced with angular rock. It is important to first know for certain whether a wetland fill/removal permit will be needed to remove wet soils or to place base rock in wet settings (see Chapter 6 for information about environmental permits). It also is important for an engineer to prescribe how to prepare the ground on which fill material will be placed and the thickness and compaction necessary for each layer of fill (see Figure 8-2). An engineer can determine whether it will be necessary to

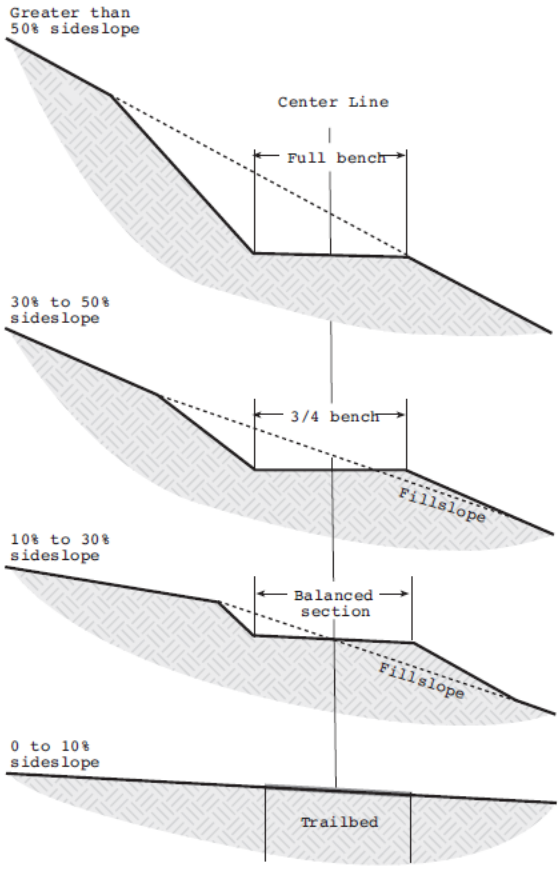

Figure 8-2 Typical trail cross sections. (Trail Construction and Maintenance Notebook, 2000)

Metro's response to this Approval Criteria includes Exhibit A.24. Because it is several pages long and I disagree with many of the arguments, I am going to embed my comments within the Metro text (in italics), using indentation and a different font so they'll be easily distinguishable.

Applicant: [Exhibit A.24, June 10, 2019]
"***Recreation and Wildlife/Amphibian Concerns***
Some community members have asserted that trail development will result in adverse impacts to wildlife, including red-legged frogs. The below information on wildlife and amphibian concerns and

potential recreational impacts was provided by Metro's team of scientists, including Katy Wei[1] and Jonathan Soll[2].

[portions omitted]

Core Habitat Areas

Out of an existing 1,300 acres, Metro's plan preserves over three-fourths of the total acreage of the NTM sites.

> I have attached a new report, the Harborton Wetland Amphibian Assessment by James Holley of Bio-Surveys LLC. This report shows that there are very few wetland ponds available for Red-legged frogs and other amphibians in and around Forest Park. Several ponds appear to be hold unusually large numbers of Red-legged frog egg masses, probably because the ponds are so rare. The report highlights the importance of Burlington Bottoms for Red-legged frogs and other wetland pond breeding amphibians – these ponds (and safe access to them) are critical.
>
> While aimed at Harborton (south of BCF), the roadkill map extends up into the portion of HWY 30 adjacent to BCF and Burlington Bottoms.

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[1] *Katy Weil has worked in wildlife conservation and environmental public policy for 37 years. She currently serves as a senior science analyst within Metro's Parks and Nature Conservation Program. She has been with Metro since 1998, and before that was the Oregon/Washington Coordinator for Partners in Flight, program director for the Audubon Society of Portland, and consultant for the United Nations Environment Programme, working with the Terrestrial Ecosystem and Programme Coordination Units, as well as working previously with the US Fish and Wildlife Service in the northeast. Katy has a background in wildlife biology, particularly effectiveness monitoring and management, and applies this within a restoration context. She is currently the senior co-chair of NW PARC. This working group consists of the western states and western Canada, and consists of scientists, academics, and land managers all working in reptile and amphibian research and conservation. Katy has a graduate certificate in international wildlife study from the UNGCP - United Nations Graduate Certificate Program through Long Island University and biology degree. She has completed amphibian monitoring techniques courses, and organized, presented, and moderated amphibian research talks at numerous conferences.*

[2] *Jonathan Soll has been the Science Division Manager for Metro since 2009. He leads a team of natural resources scientists responsible for setting natural area acquisition and restoration priorities and for implementing and tracking restoration projects on Metro's portfolio of nearly 17,000 acres. Jonathan and his team are also responsible for representing Metro regionally on conservation science issues and working with partners on conservation oriented projects throughout the region. Jonathan's training includes a biology degree from Reed College with thesis work in Evolutionary Biology; and a Master's degree in Forest Ecosystem Analysis from the University of Washington, College of Forest Resources. He has since spent over 25 years doing practical conservation biology and natural resources management in the Pacific Northwest. Jonathan's conservation work has focused on three main tracks: restoration ecology, especially controlling invasive species to restore high quality habitat; conservation planning and monitoring for enhancing management effectiveness; and, developing conservation priorities for large landscapes. Before joining Metro in 2009, Jonathan worked for the Nature Conservancy in Oregon and Washington for 16 years. He served as Field Ecologist (OR), Shrub-steppe Project Manager (WA), Portland Area Preserves Manager (OR) and Willamette Basin Conservation Director (OR).*

The highest month for roadkill was not January, when Metro looks for dead frogs on the trail (one day of the year), but in February.

I would also like to note that this study, according to the author, cost only $5000 and took only two years, finishing in 2022. In that time, not only were dead frogs frequently counted on Highway 30, but breeding ponds were identified and surveyed for egg masses. This is a tiny fraction of what Metro has spent on their North Tualatin Mountains Access Plan and what they will invest in building the facilities planned for BCF.

Metro has not made any effort to date to identify what portions of the BCF property are used by migrating Red-legged frogs, or what areas are used during the rest of the year.

I am also attaching the Burlington Creek Stream Conservation Plan that was written for the CREST application to build the Hwy 30 amphibian undercrossing, because it includes a graphic (Figure 6) showing frog mortality data (from ODFW) on Hwy 30 that was used to decide on the location for the undercrossing. The undercrossing will be located at the point of the highest mortality, adjacent to the middle of the BCF property.

Metro has owned most of the BCF property since 2002. Their Site Conservation plan was written in 2014. Their one day a year "dead frog count" monitoring started in 2018.

It wasn't until after your February 6 hearing that Metro asked ODFW for their data on Red-legged frogs in this area.

Amphibians

Red-legged frogs have been highlighted as a concern by some community members and are noteworthy for several reasons. Red-legged frogs are designated a conservation strategy species by ODFW and considered declining and vulnerable. Although U.S. Highway 30 poses a significant barrier, some amphibians successfully migrate between Burlington Creek and Ennis Creek forests and breeding habitat on the east side of Highway 30. A group of volunteers (Harborton Frog Rescue) catches and transports frogs across Highway 30 at designated locations during late winter and early spring when they migrate to local wetlands to breed and then to return to upland forests. Metro's conservation science team, in addition to knowledge gained through decades of experience and study, conducted a thorough review of red-legged frog literature. That together with basic conservation biology theory and common sense indicates that impacts from trail development will be minimal and be far surpassed by the benefits of Metro's restoration work. Specific noteworthy points include:

So what does current research say? Amphibian biology and reactions to stressors are complex, as noted in this abstract from a research paper "The complexity of amphibian population declines: understanding the role of cofactors in driving amphibian losses"[3]

[3] Andrew R. Blaustein, Barbara A. Han, Rick A. Relyea, Pieter T.J. Johnson, Julia C. Buck, Stephanie S. Gervasi, Lee B. Kats (2011), The complexity of amphibian population declines: understanding the role of cofactors in driving amphibian losses. Annals of the New York Academy of Sciences, Volume1223, Issue1, Pages 108-119. https://doi.org/10.1111/j.1749-6632.2010.05909.x

Abstract

Population losses and extinctions of species are occurring at unprecedented rates, as exemplified by declines and extinctions of amphibians worldwide. However, studies of amphibian population declines generally do not address the complexity of the phenomenon or its implications for ecological communities, focusing instead on single factors affecting particular amphibian species. We argue that the causes for amphibian population declines are complex; may differ among species, populations, and life stages within a population; and are context dependent with multiple stressors interacting to drive declines. Because amphibians are key components of communities, we emphasize the importance of investigating amphibian declines at the community level. Selection pressures over evolutionary time have molded amphibian life history characteristics, such that they may remain static even in the face of strong, recent human-induced selection pressures.

An article from Ecology Letters Complexity in conservation: lessons from the global decline of amphibian populations[4] by Andrew R. Blaustein, Joseph M. Kiesecker makes similar conclusions:

> "It is clear that amphibians are subjected simultaneously to a cocktail of abiotic and biotic stressors that affect them in a variety of ways. Thus, we suggest that amphibian population declines are the result of complex interactions among numerous factors often acting synergistically. Moreover, global changes (including stochastic events) such as changes in temperature, precipitation, UV-V radiation, and global spread of contaminants may affect amphibian populations on a local scale. However, different populations of amphibians may react differently to the same combination of stressors. Differences in susceptibility to stressors depend on numerous variables including life stage, species, population, geography, weather parameters, water chemistry, history of experiencing particular stressors and numerous other factors. ***
>
> Although it may be difficult to generalize about amphibian population declines, some generalities can be made. One consistent theme appears to be the interactions between environmental change at local (e.g. habitat modifications), regional (e.g. acidification or contaminants) and global scales (e.g. climate change or UV-B radiation) with the modification of local biotic interactions (e.g. disease or introduced species). For example, there appears to be a link between stressors and disease outbreaks (Pounds *et al.* 1999; Kiesecker *et al.* 2001c). ***
>
> *** These conclusions highlight two important points: (1) the difficulty that will exist in predicting how global and regional environmental change will be translated into local species loss, and (2) the critical need for ecological theory to address the pervasiveness of such context dependency." (*** is used to indicate where text was not included)

[4] Blaustein, A.R. and Kiesecker, J.M. (2002), Complexity in conservation: lessons from the global decline of amphibian populations. Ecology Letters, 5: 597-608. https://doi.org/10.1046/j.1461-0248.2002.00352.x

In other words, amphibian populations are declining worldwide. There is a lot we don't know, and it is dangerous to make assumptions about how local stressors (such as new trails that alter microclimates, create new pathways for predators and disease, and create more opportunities for human collection of amphibians) will affect an amphibian population.

What we do know is that adding new trails in an important amphibian migration corridor will introduce new stressors on the local population of Northern Red-legged frogs.

The more people who visit an area, the higher the odds of invasive species and diseases being introduced. The more trail miles within an area, the more widespread the distribution of those invasive species and diseases will be. Anyone who is familiar with invasive plant species such as Herb Robert (Geranium robertianum) will notice that it is widespread now along trails in Forest Park and gradually spreading into the forest away from trails.

Are Red-legged frogs susceptible to disease? They can be infected with a fungal pathogen called Batrachochytrium dendrobatidis. Here's a quote from abstract for another paper (Global Patterns of the Fungal Pathogen Batrachochytrium dendrobatidis Support Conservation Urgency) that discusses the global risk from this pathogen[5]. The paper includes graphs showing that Bd is found in our area.

> The amphibian chytrid fungus Batrachochytrium dendrobatidis (Bd) is a skin pathogen that can cause the emerging infectious disease chytridiomycosis in susceptible species. It has been considered one of the most severe threats to amphibian biodiversity. *** The accretion of Bd occurrence reports points to the common aims of worldwide investigators to understand the conservation concerns for amphibian biodiversity in the face of potential disease threat. Renewed calls for better mitigation of amphibian disease threats resonate across continents with amphibians, especially outside Asia. As Bd appears to be able to infect about half of amphibian taxa and sites, there is considerable room for biosecurity actions to forestall its spread using both bottom-up community-run efforts and top-down national-to-international policies. Conservation safeguards for sensitive species and biodiversity refugia are continuing priorities.

As has been previously noted, Northern red-legged frogs are a state listed sensitive species.

I have already submitted Metro's 2017 Recreation Ecology Literature Review[6], which summarizes research findings related to recreation effects on wildlife and habitat as reference material. Some additional quotes are included in the footnote.

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[5] Olson, Deanna & Ronnenberg, Kathryn & Glidden, Caroline & Christiansen, Kelly & Blaustein, Andrew. (2021). Global Patterns of the Fungal Pathogen Batrachochytrium dendrobatidis Support Conservation Urgency. Frontiers in Veterinary Science. 8. 10.3389/fvets.2021.685877.

[6] Recreation Ecology Literature Review, Metro, 2017.

Page 69:

"the relationship between disturbance and large carnivores does not change: trails and recreational areas tend to repel large carnivores resulting in mesopredator release, with real potential to disrupt entire ecosystems and

Now we go back to two of Metro's many points about amphibians and the proposed trails.

• *Animals that are capable of travelling ½ mile or more between breeding ponds and non-breeding habitat, including crossing major highways, railroad tracks, residential streets and driveways, hardscapes, development, and intensively managed landscapes are not going to be adversely impacted by narrow, soil surface trails in the forest.*

A female Red-legged frog in winter, full to bursting with eggs and hormones pulsing through her body, has only one purpose: to get to a breeding pond and lay those eggs, no matter what obstacles are in her way. She will hop into a 4 lane highway with fast moving tractor trailer rigs that could squash her, she will hop into puddles with hazardous chemicals that could poison her and her eggs, she will hop through residential areas with dogs who might eat her – she knows that she has no purpose except to get to that pond to lay her eggs. Frogs didn't evolve with trucks and chemicals – her biology doesn't give her a choice.

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ecosystem processes by altering food webs, habitat and wildlife community dynamics. Recreational disturbance also substantially reduces the amount of habitat available to large carnivores."

Page 73:

CHAPTER 7 SUMMARY – Effects on wildlife by species group
Reptiles and amphibians
- Trail use may create movement barriers for some amphibian species, especially when trails intersect mass breeding migrations.
- Frogs can be easily disturbed and may become sensitized to recreationists near streams.

Mammals
- Any visible or audible human presence can negatively affect ungulates, carnivores and probably small mammals.
- Human disturbance can reduce elk reproductive success.
- The predator shelter effect, in which animals move to non-hunted areas during hunting season, is well documented for elk. In such cases elk tend to shift towards night-time activities to avoid humans.
- Higher levels of recreational use cause higher levels of disturbance for ungulates.
- Large carnivores are fragmentation-sensitive, are even more sensitive to human disturbance than ungulates, and tend to avoid recreational areas rather than habituating (except red fox).
- Reduction in large carnivores can lead to increases in medium-sized carnivores (the so-called "mesopredator release" effect), thereby altering food webs and disproportionately affecting birds and small mammals.

From pages 54 & 55: "In a central Spain experimental study, researchers simulated human disturbance (walkers) on frogs using stream banks.[261] The more a given frog was disturbed, the longer it took to recover to pre-disturbance activities. This suggests sensitization, the opposite of habituation. Flight initiation distance did not differ between low and high disturbance levels, although FID was shorter where there was higher vegetative cover, possibly either because (a) the perceived risk of predation was less because they could hide, or (b) the frogs couldn't see the approaching person until he/she was close. Frog abundance was lower in areas closer to recreational areas, suggesting population-level disturbance effects."

From page 55: "Invasive species may be an issue for some amphibian species. A study in Gresham, Oregon examined amphibian community composition and occurrence patterns in relationship to various local and landscape attributes. Three out of five native amphibian species were negatively correlated with invasive species.[393] Trails are vectors for invasive species, and such introductions could reduce breeding habitat quality for some pond-breeding amphibian species."

But that doesn't mean that those obstacles and barriers aren't harmful to her along the way, or that it is OK for Metro to add more hazards along her route. The approval criteria is "will not adversely affect natural resources."

Trails can add several risks and stressors. At the February 6 hearing, Metro staff said that their new trails will have adverse impacts on wildlife. They hope the impact will not be significant, but they don't provide much data or research to back up this claim.

Trails can add these hazards to that migration:

- Increased exposure to disease introduced by increased numbers of humans
- Increased exposure to illegal collection of frogs
- Microclimates that are warmer and dryer due to loss of vegetation and compacted soils
- Additional predators who follow the new trails into areas that used to be more difficult for them to access
- Reduced forage due to loss of vegetation along the trail
- Getting trapped in trail ruts
- And yes, possibly getting stepped on by a hiker or run over by a bicycle.

• *The proposed trails will not meaningfully affect microclimate because they are narrow, soft-surface trails and will not adversely affect canopy cover.*

The effect of the trails on the microclimate will be proportional to the width of the trail and the adjacent cleared areas. See the diagram above from Metro's Green Trails guide, which indicates that the area cleared for trails that run across steep slopes will be considerably wider than the trail surface. In some areas, the cleared slopes above and below the trail may eventually revegetate, but this depends on the soil, exposure, and tree canopy. Many sections of trail in Forest Park have bare earth next to them because the shade, rain shadow of the tree canopy, and soil erosion don't allow for native plants to establish themselves, even long after the trails are built.

Summary

I do not believe that Metro satisfies this Approval Criteria for Community Service Use with their application:

§ 33.6010 APPROVAL CRITERIA

In approving a Community Service use, the approval authority shall find that the proposal meets the following approval criteria, except for radio and television transmission towers, which shall meet the approval criteria of MCC 33.6100 through 33.6125, wireless communications facilities which shall meet the approval criteria of MCC 33.6175 through 33.6188; and except for regional sanitary landfills which shall comply with MCC 33.6200 through 33.6230.

(B) Will not adversely affect natural resources;

This is a high standard – "will not". Metro staff have said that their new trails will have adverse impacts on wildlife. They hope the impact will not be significant and argue that the need for public access balances out this harm. But that doesn't meet this standard, which says "will not adversely affect natural resources." The standard doesn't allow credit for the benefits of public access to balance harm to wildlife.

We need to have meaningful data about our local Red-legged frog population and their use of the Burlington Creek Forest property, or Metro needs to eliminate the new trails from their plan. There is ample evidence that the proposed new trails will adversely affect these listed frogs.

I believe these modifications to the Burlington Creek Forest plans would allow the application to satisfy this Approval Criteria:

1. The best approach would be to eliminate all new trails in BCF, because new trails will inevitably adversely affect an important natural resource – red legged frogs. Just keep the existing gravel road.

2. Given the low odds that Metro's current amphibian monitoring in Burlington Creek Forest will yield useful information, approval of this application should be conditioned on Metro developing and implementing a new RLF population monitoring plan using the method in the ODFW report – a plan must be developed and approved by a team of outside amphibian experts working with Metro, not just written by Metro. We now have motion sensitive wildlife cameras that can capture frogs migrating at night which could be used to collect more useful data for less expense than walking trails to count dead frogs one day a year. If the county can't require this monitoring plan be developed and implemented as an approval condition, the construction of any new trails in BCF should be forbidden until Metro develops and implements a new plan approved by outside experts, and has some monitoring data to use in assessing potential harm from proposed trails.

3. If trails must be added in BCF, make these changes to better comply with ODFW recommendations (these comments use the trail and crossing numbering scheme on the map of the Proposed Trail System at Burlington Creek Forest on page 5 of the staff report):

    a. Eliminate the .1 mile long Trail C, which in its .1 miles requires a creek crossing (#4) and then dead ends at the edge of the Ancient Forest Preserve. Dead end trails invite people to build informal trails, and a .1 mile dead end trail with a creek crossing is of little value relative to the harm it will cause. It is not shown ending at a viewpoint – I have no idea why this trail is in the plan.

    b. Eliminate Trail AA, which places many close switchbacks in an important frog migration area, as documented in ODFW comments from 2017.

    c. Eliminate 3 creek crossings by moving short mountain bike trail sections onto the gravel road – Crossings 7, 6, 5, and possibly 8 could be eliminated this way. To visualize how this would work, look at the trail map and visualize the box with the

crossing number being dragged upstream along that creek to the gravel road, so the gravel road's existing creek crossing is used instead of adding a new crossing. Crossings 7 and 8 appear to be within only about 200' of the gravel road. This change would add small additional trail segments but reduce creek crossing impacts.

d. Shift the new trails into the powerline corridor wherever possible (see Trails D and F) – that corridor will always be lower quality habitat.

4. Because there may be black bears in the area, trash cans and facilities should be bear-proof.

Thank you for your consideration,

Carol Chesarek

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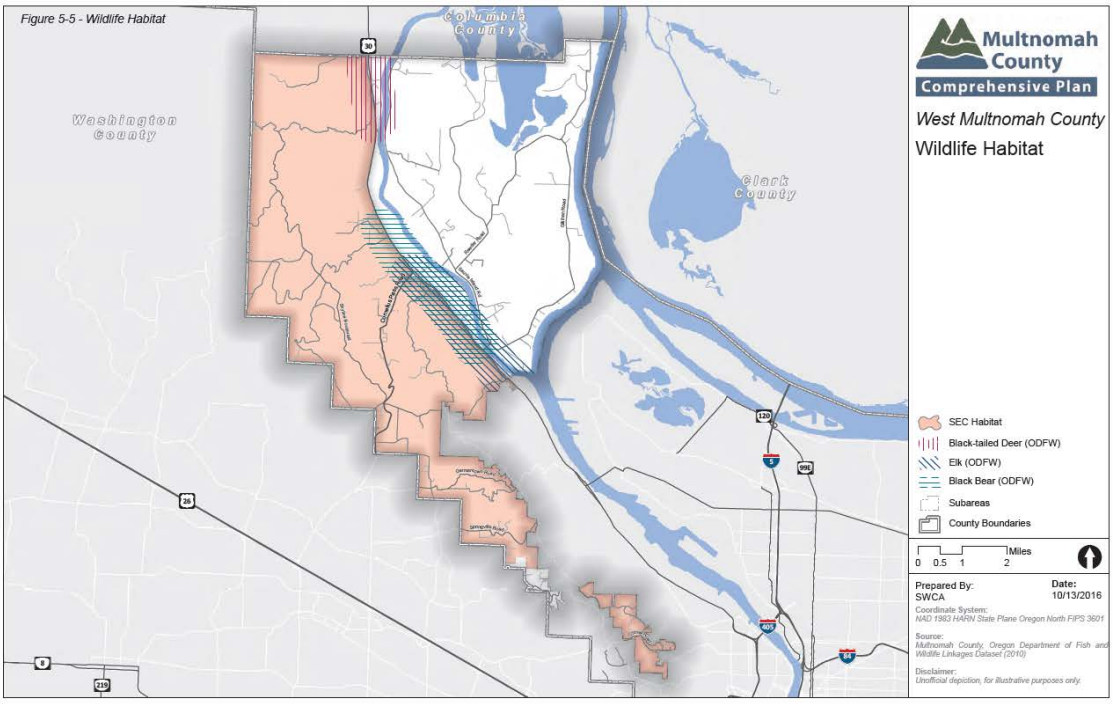
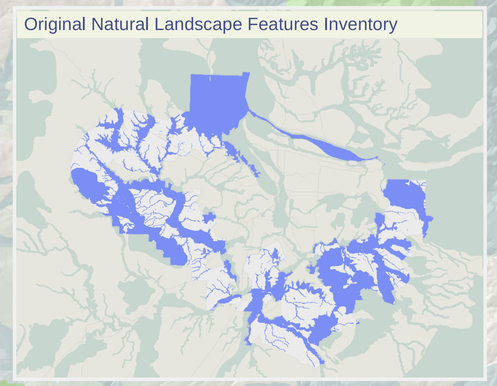
Figure 5-5 - Wildlife Habitat



Natural Features for Reserves Process



NFLI Layers for Urban and Rural Reserves

- KeyFeatures_2007
- Clackamas Cnty UR 06/11/2009 (58 sq miles)
- Multnomah Cnty UR 04/01/2009 (13.6 sq miles)
- Washington Cnty UR 07\01\2009 (84.3 sq miles)
- Title 13 study area (~132,000 acres) *1
- Rural Reserv study area
- Synthesis_COAs 2009 *2
- FloodPlains - FEMA and 96 Flood
- Wetlands Metro
- ESRI Perenial Stream Buffers 200ft
- PNW-ERC (Hulse 2002)
- Charrette Professionals Input (06-08)
- Title 13 Nature in Neighborhoods
- Natural Features Outside Study Area
- Title 13 inside UGB

*1 - Title 13 study area was not conducted on the whole Reserves study area infact in only comprises 132,000 acres of the 400,000 acres in the study area. This data was left off the original map as it was not readable at that scale. However it has always been part of the Natural Features Landscape Inventory.

*2) Synthesis Conservation Opportunity Areas 2009
Used to revise three data inputs of the 2008 NFLI data set provided October 2008 for the Reserve process. This refines the data and does not add to the NFLI. These include The Nature Conservancy's Opportunity Areas, ODFW's Conservation Opportunity Areas, and the 2008 draft Synthesis data.

Base Layers

- Public and/or protected lands
- Streams & water bodies
- Main roads
- County line

0 0.250.5 1 1.5 2 2.5 3 3.5 Miles

Exhibit A.20.1

Metro

Harborton Wetland Amphibian Assessment

James Holley, Bio-Surveys, LLC

Funded by: Oregon Wildlife Foundation

December 2022

Exhibit A.20.2

Cover photo: Roadkill red-legged frog on the shoulder of Highway 30 (J. Holley)

Abstract

Portland's Forest Park extends from downtown Portland northwest to its city limits paralleling the Lower Willamette River (Figure 2). Annually, hundreds to thousands of Northern red-legged frogs (*Rana aurora*, RAAU) migrate from this terrestrial upland habitat across Highway 30 to the Harborton Wetland to breed. During this migration, passing cars kill an unknown number of animals. Conservative estimates put amphibian road crossing deaths in the hundreds at the site, but the number could be substantially higher with evidence of soft frog carcasses disappearing rapidly on a busy highway. The cause of the large Harborton frog migration seems to be tied to the loss of prime breeding areas for RAAU populations previously found on the east side of Forest Park within the Willamette River floodplain and on the west slope of the park in headwater wetlands of the Tualatin River Basin. This project was funded by the Oregon WIldlife Foundation to explore the issues surrounding the causes of this disconnection, its ramifications, and potential solutions to bridge the gaps in connectivity. The most promising mitigation solutions are a highway undercrossing at NW Harborton Drive and building upland ponds within and around Forest Park.

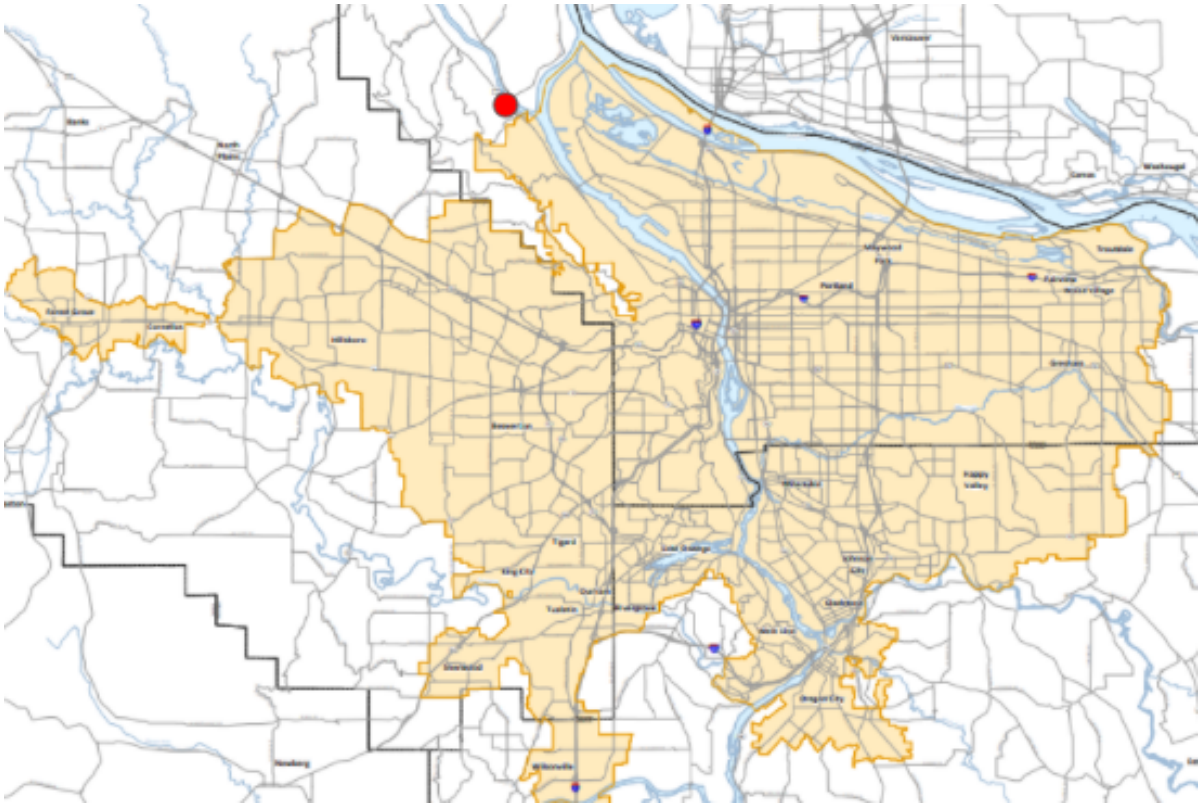


Figure 1: Portland, Oregon Urban Growth Boundary. Harborton Wetland indicated by the red circle.

Background

This assessment was funded by the Oregon Wildlife Foundation to gather existing data and collect other pertinent information to fill in gaps in knowledge surrounding the RAAU population using the Harborton Wetland to breed. This information is being used to propose and critique potential habitat and connectivity improvement options.

Harborton Wetland is a 74-acre parcel owned by Portland General Electric (PGE) which underwent

habitat restoration in 2020, creating 28 acres of new riparian habitat. It is located along Multnomah Channel within the historic Willamette River Delta at its confluence with the Columbia River about 10 miles downstream of Oregon's largest city: Portland (Figure 1). Since the City of Portland was founded, all of the wetlands and riparian habitats of the Lower Willamette River Basin have been altered or destroyed. Harborton Wetland is the first intact wetland along the banks of the Willamette River downstream of Portland and sits just beyond the Portland Metro Urban Growth Boundary. It is the breeding destination of thousands of amphibians annually.

In 2014, a local resident smelled a distinct rotting fish scent and found a large number of frog carcasses squished on the road after a winter rain event. The Harborton Frog Shuttle was established to assist the frog migration and reduce the effects of anthropogenically inflated mortality. This group of 100+ volunteers assist RAAU and other amphibians in getting safely across Highway 30 throughout the migration season (December through April). The efficiency of the Harborton Frog Shuttle has increased tremendously over its existence in terms of safely assisting frogs and predicting the staffing needed each night, but there is still a considerable investment of time and resources to monitor conditions and recruit, coordinate, train, and supply volunteers that is not sustainable over the long-term. The shuttle only operates during likely peak movement times and over a limited area, while many frogs move at other times and in beyond the reach of the shuttle team. Other solutions to mitigate this predictable slaughter of wildlife are necessary.

The steep slopes and thick canopy cover within Forest Park are not conducive to ponding water, limiting upland breeding opportunities. The only known breeding habitats currently used within the boundaries of Forest Park are two small wetlands with minimal RAAU breeding and the pond at Audubon, approximately 11 straight line kilometers to the south of Harborton Wetland. The known migration range of RAAU is about 7 kilometers. All three of these sites are highly shaded making them low-quality amphibian breeding sites. Ideal habitat has high levels of solar exposure in addition to the preferred aquatic conditions. Typical RAAU breeding sites are large enough to create a canopy gap allowing solar exposure to reach the water's surface demonstrated by the frequency of egg masses found on the northern edge of wetlands which receive more sunlight here in the Northern hemisphere. This leaves many amphibians with little choice but to risk their lives playing 'Frogger' to reach the habitat necessary to complete the crucial stage of reproduction in their life history.

Species Status

RAAU is a federally listed species of concern and a state listed sensitive species in Oregon. RAAU is also a Species of Greatest Conservation Need (Strategy Species) in the Oregon Department of Fish and Wildlife Oregon Conservation Strategy (OCS) (ODFW 2016).

RAAU in the area of interest are present within and moving between one or more OCS Conservation Opportunity Areas (Forest Park COA 058, Sauvie Island-Scappoose COA 054, and Lower Willamette River Floodplain COA 059). Several relevant Recommended Conservation Actions as highlighted in the OCS include:

- Address fish and wildlife movement barriers (roads, culverts, fences).
- Maintain wetlands and open water areas for the benefit of waterfowl, shorebirds, turtles, amphibians, and bats.
- Protect and improve habitat for turtles, amphibians, and bats.
- Protect and restore wetlands (seasonal and perennial).
- Reduce road mortality for amphibians and other wildlife crossing Highway 30.

RAAU Life History

Adult RAAU are between 4.4 - 7.6 cm long with females larger than males and weighing up to 60 g. Males typically become sexually mature at 2 years, females at 3 years. Individuals can live longer than 10 years in captivity. RAAU spend 8 - 11 months of the year dwelling in upland terrestrial habitat with a dense understory, well-represented in Portland's Forest Park. Between November and February most adults migrate to wetlands to mate and lay egg masses, often in their natal wetland. Eggs hatch within 6 weeks of being laid in the early spring. Tadpoles metamorphose within 5 months. Data gaps remain in specific movement patterns, but they are primarily mobile nocturnally and require a moist environment; only keen to cross pavement when it is wet.

Specific conditions for frog wetland breeding habitat include:

- Depth 0.3 - 1.5 m (0.5 - 1.0 m preferred)
- A brace for attachment of their egg masses (small woody debris, shrub stems and branches, forbs, and graminoids)
- High solar exposure
- Low flow velocity (typically <0.07 cm/sec)
- Hydroperiod through at least July 1st/vernal (dries annually)
- Proximate to upland habitat (within ~7 km) (Hayes, pers. com.)
- Connectivity corridors between upland and wetland habitat (<100 m gaps, pavement is optimally avoided)

These wetland conditions are well-represented at the PGE Harborton Wetland. Forest Park contains excellent upland habitat for RAAU throughout its length with connected forest habitat from downtown Portland to the Coast Range via the Tualatin Mountains (Figure 2). The major limiting factor for this species of frog and other amphibians in the region appears to be lack of breeding habitat connected to the terrestrial upland habitat.

Methods

1. Gather existing agency and non-profit data (Harborton Frog Shuttle, Oregon Department of Fish and Wildlife (ODFW), PGE, Metro, Clean Water Services) on RAAU populations within the immediate study area and the larger population connected to Forest Park.
2. Collect supplemental data about the annual RAAU migration in the vicinity of Harborton Wetland. Identify all wetland habitats within the study area. Perform wetland habitat assessments, egg mass surveys, roadkill surveys, and community outreach wherever possible to better understand the full scope of the issues surrounding the Harborton RAAU population.
3. Investigate and perform amphibian egg mass surveys at all accessible ponds/wetlands within 9 km of the site.
4. Perform bimonthly roadkill surveys to determine the location, timing, and species of animal crossing deaths, increasing the frequency of surveys during prime amphibian crossing conditions (>45F and wet).
5. Investigate sites for potential habitat improvements. Observe water levels at sites for at least 1 year. Perform hand auger borings to determine the substrate composition and depth of the fragipan.
6. Contact and communicate with all interested parties.
7. Recommend next steps.

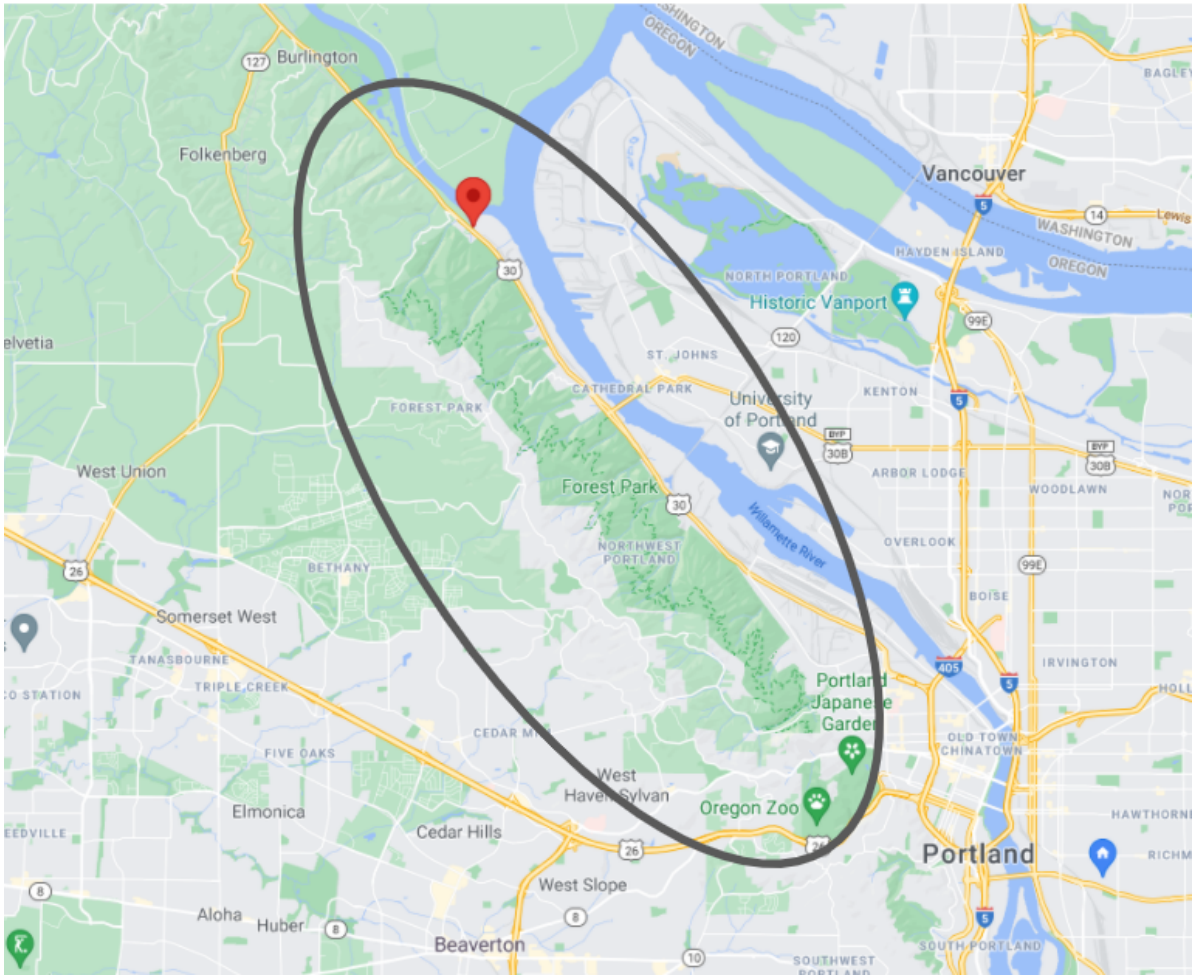


Figure 2: Map of the Harborton Wetland study area. Forest Park has few wetlands appropriate for RAAU breeding habitat. Most historic riparian wetlands along the banks of the Willamette River have been developed.

Harborton Frog Shuttle

The Harborton Frog Shuttle is composed of seven groups of on-call volunteers, one for each night of the week. The group focuses on peak RAAU migration times between December and March. When conditions are appropriate for frog movement (>45F and wet), members patrol NW Harborton Drive and NW Marina Way directly above the wetland to collect frogs before they cross Highway 30 and transport them safely to or from the wetland, thus avoiding the busy highway. It has assisted between 433 and 2006 RAAU each year since its founding in 2014 (Table 1). The wide variation in numbers from year to year is largely due to a natural fluctuation in frog populations, but is also closely tied to the timing of the proper climatic conditions which cue frog movement and do not necessarily align with the shuttle's operating times.

This effort has filled in several data gaps regarding the specific climatic and timing details cuing RAAU movement. In more natural settings, the animals move cryptically at night through ground litter to reach their breeding ponds. To reach the wetland from the upland forest above Harborton Wetland, the frogs must cross the logistical bottleneck created by two surface streets, the paved 5 lane highway, and a set of railroad tracks. This makes them far more visible to human observers, but also extremely vulnerable to the additional peril of anthropogenically assisted mortality. The presence of Harborton Frog Shuttle volunteers at times of likely peak movement is an excellent means of data collection.

Typically, the warmest temperatures of the evening are just before dark. On wet winter evenings the bulk of frogs move in the 2 hours following sunset. During the peak of early winter migrations this

timing also coincides with evening rush hour traffic. This is the focus period of the Harborton Frog Shuttle's efforts. When the temperatures increase and/or rain occurs later in the night the shuttle is not active, and, therefore, not available to assist and count the frogs moving down to the wetland. Traffic is also typically much lighter in the early morning hours so lower mortality rates are assumed to occur. Many frogs also outflank the patrol area of the shuttle and face their odds against traffic.

The Harborton Frog Shuttle has been a great aid to the frogs migrating to Harborton Wetland and has certainly reduced the amount of frog mortality due to roadkill. It has also provided education and opportunity to learn about frogs to hundreds of community scientists. However, this means of supporting migrating frogs is limited and long-term solutions are required.

Table 1: Number of red-legged frogs assisted down hill from NW Harborton Dr to Harborton Wetland. Statistics on frog sex were not recorded until 2017. Egg mass surveys were not conducted until 2018.

Year	# RAAU Assisted Down	# Female RAAU Assisted Down	RAAU Egg Masses at Harborton
2013-2014	580	-	-
2014-2015	695	-	-
2015-2016	688	-	-
2016-2017	834	457	-
2017-2018	433	135	158
2018-2019	1231	90	194
2019-2020	2006	811	1392
2020-2021	423	271	435
2021-2022	266	42	172

Frog Migration and Roadkill Numbers

Bimonthly roadkill surveys were conducted from March 2021 through November 2021 to better understand which species are the most impacted and identify location trends. From December 2021 through March 2022, surveys were conducted during likely periods of frog migration (>45F and wet). All roadkill was recorded with a GPS location and identified to the lowest certain Linnaean classification.

Total RAAU population numbers are generally assumed to be approximately double the number of egg masses counted. At Harborton Wetland, the additional data points of the Harborton Frog Shuttle and 2021-2022 roadkill data have potential to add information to the population estimate. Total roadkill numbers are difficult to calculate due to the soft nature of frog carcasses and their near complete disappearance within 24 hours or less of being struck by vehicular traffic. Unless an animal is observed being hit the direction of its travel is unknown with some minimal assumptions being made by the time within the season. Figure 3 shows the seasonality of the 2022 frog migration. Zero dead frogs were recorded in the 4 summer months. Over 92% of all RAAU roadkill observed in 2022 was between January and April.

The surveys began with a hope of calculating a crude estimate for rate of successful frog road crossing. The many uncertainties of traffic volume, frog migration intensity, timing of frog movement, place of crossing, and rate of body disappearance made even rough assumptions difficult. Studies with more

resources over the entirety of the peak migration season are necessary to obtain a better estimate of the number of animals killed during migration. The general estimate of double the number of egg masses is currently the most accurate population estimate available.

While the target of the study was RAAU and amphibian migration at the Harborton Wetland, data was gathered on all species being killed by traffic on Highway 30. Knowing the trends of the broader region and if other species are being impacted by the limited access to wetland habitat will impact any proposed solutions. As seen in Figure 4, 83.5% of all species recorded were amphibians. 9% were mammals, 3.5% were birds, and 1% were reptiles, all species of garter snakes (*Thamnophis genus*). Larger animal corpses persist for periods lasting weeks rather than hours or minutes for small animals.

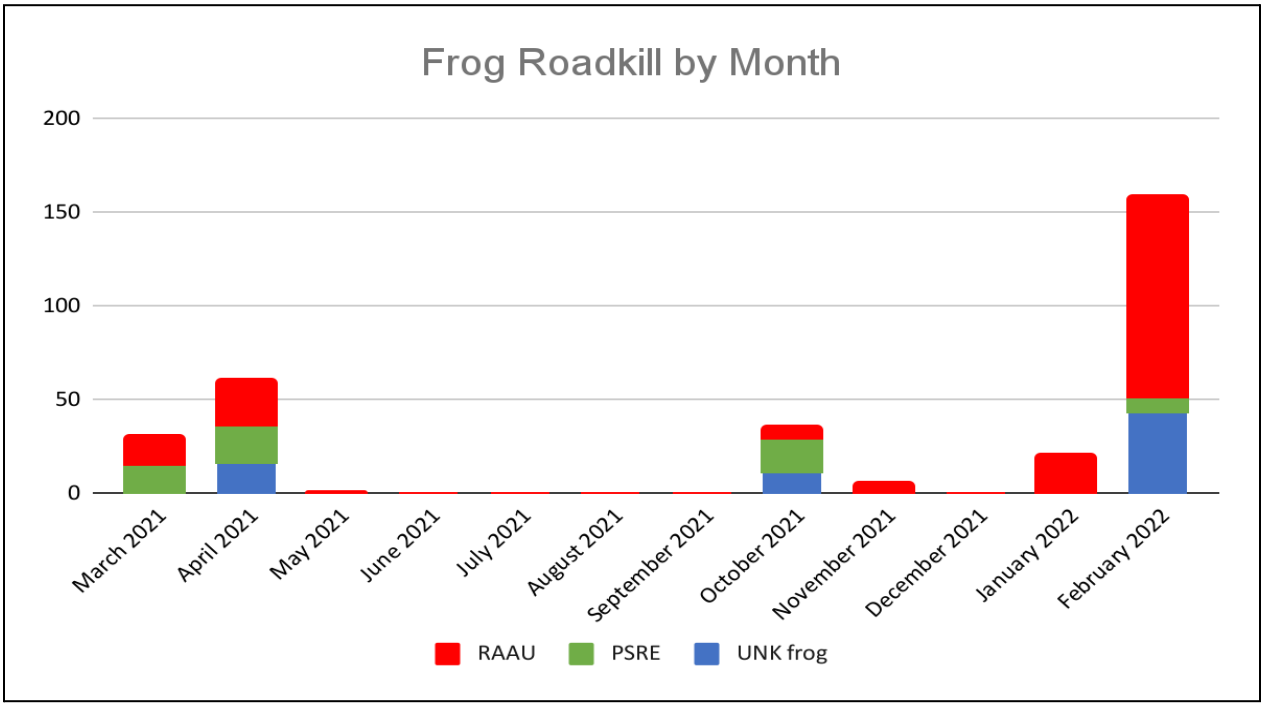


Figure 3: Stacked column chart of frog roadkill by month. As expected, the majority of roadkill was observed during the peak winter breeding season. The area surveyed was an 8 km stretch of Highway 30 between Linnton and NW Burlington Rd.

The GPS points shown in Figure 5 & 6 depict the concentration of roadkill above Harborton Wetland and Palensky Wildlife Area. NW Harborton Drive, the road south of Highway 30 at the northern edge of the kill cluster, is the focus of where the Harborton Frog Shuttle operates, but only extends part of the width of the wetland. The 2021-2022 migration season saw few frogs assisted relative to previous years. Most of these points were recorded on mornings after the frog migration occurred in the hours after midnight when the shuttle was not operational. This demonstrates the need and potential success of a properly planned point of connectivity between the upland and wetland habitats. Similar density of points was observed at the site of the planned undercrossing at Palensky Wildlife Area.

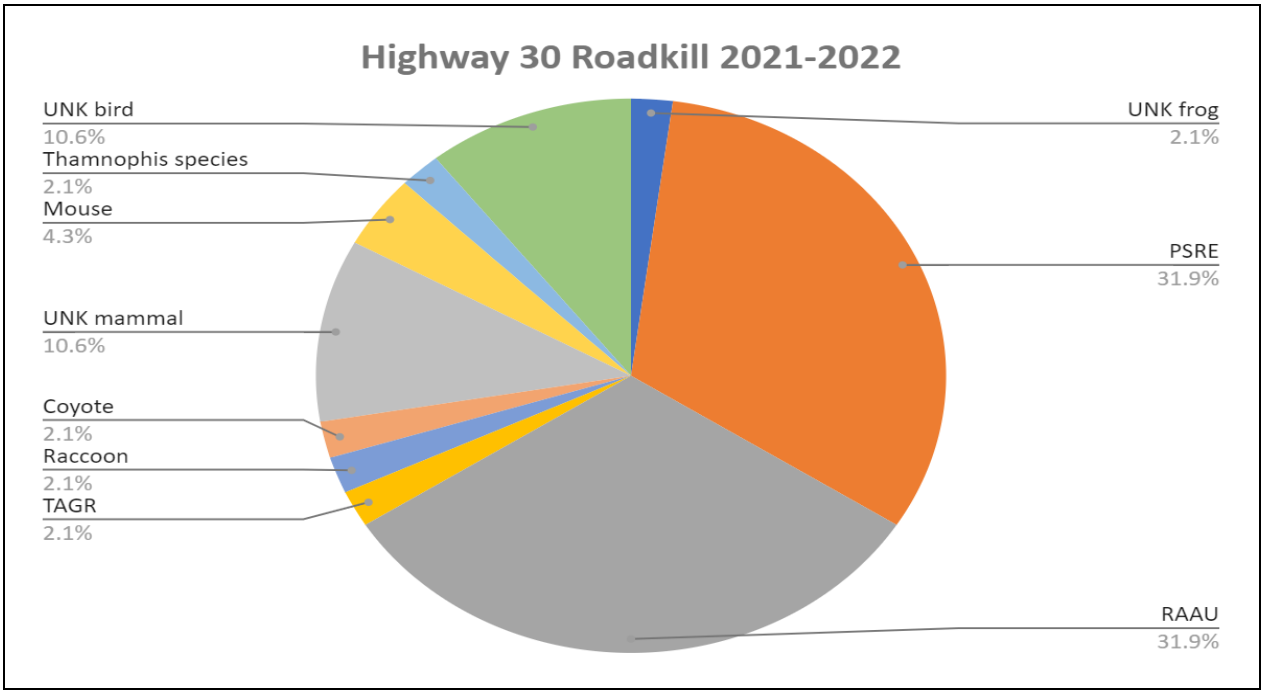


Figure 4: Pie chart of all roadkill observed during roadkill surveys from March 2021 - March 2022. Note that greater than 65% of animals recorded were frogs, but that they were also targeted during their migration season. Large gaps of unobserved deaths are also certain to have also occurred. PSRE is *Pseudacris regilla*, Pacific tree frog, TAGR is *Taricha granulosa,* rough-skinned newt, RAAU is *Rana aurora*, Northern red-legged frog.

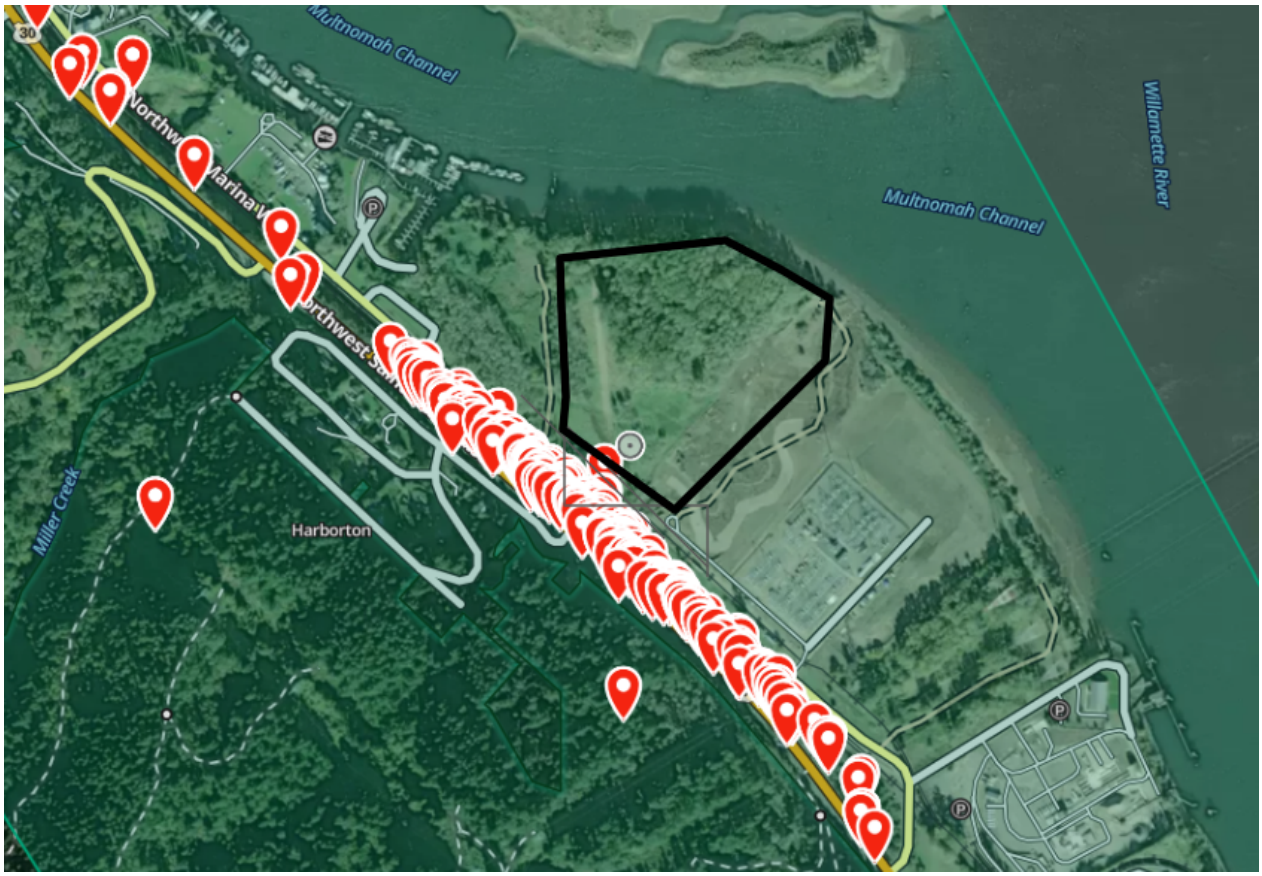


Figure 5: Roadkill GPS points along Highway 30 from March 2021 - March 2022. The area directly above Harborton Wetland where Harborton Drive intersects Highway 30 is the epicenter of the migration to the wetland. Over 83% of the roadkill recorded were frogs. The black outline indicates the Harborton Wetland periphery.

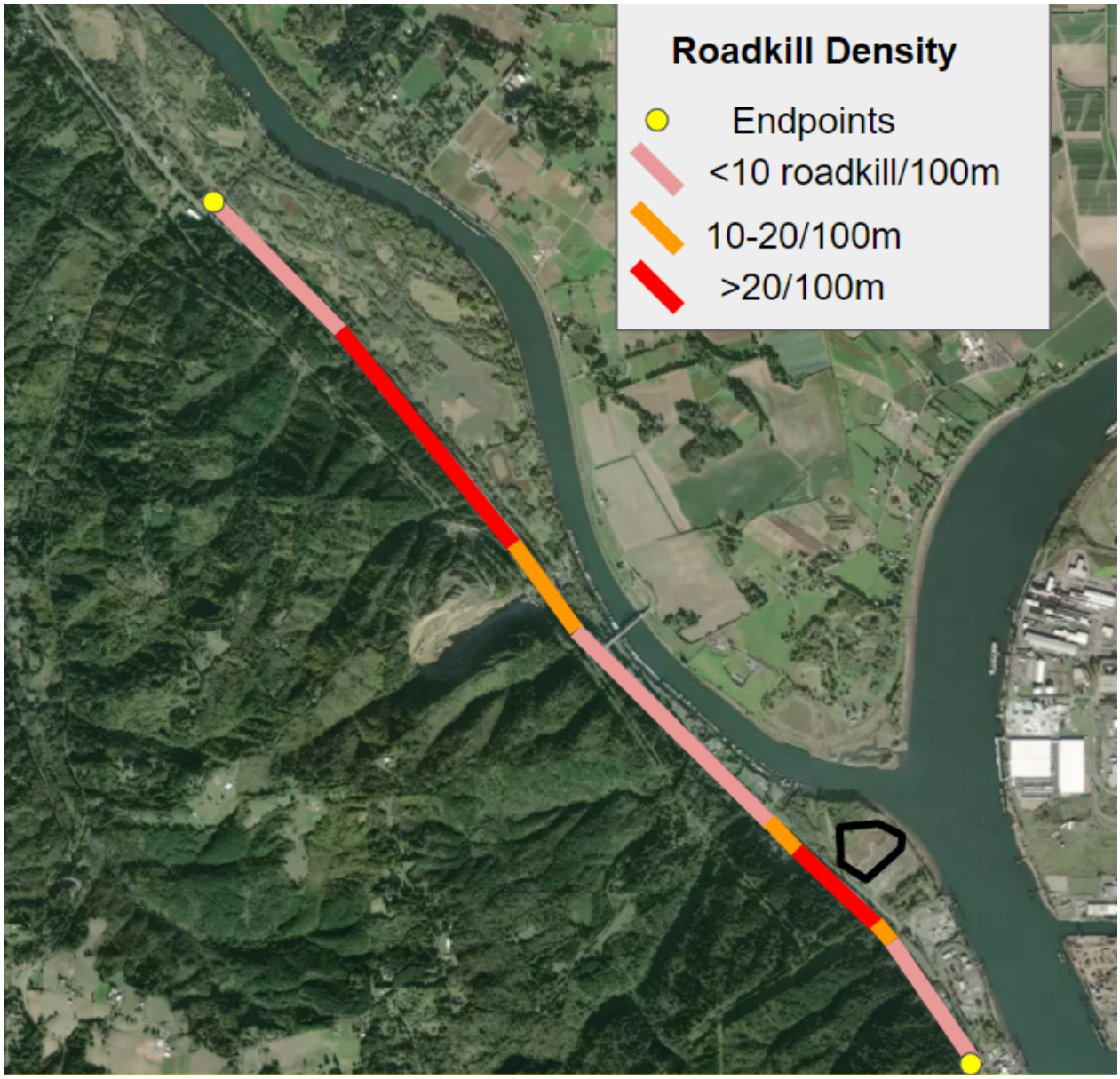


Figure 6: Roadkill density along Highway 30 from March 2021 - March 2022. The area above the Harborton Wetland and also above the Palensky Wetland has a high concentration of roadkilled frogs. The long area between wetlands has distinctly fewer roadkill points. The black outline is Harborton Wetland.

Assessment Synopsis

RAAU upland and wetland habitat have been broadly diminished within the Portland Metro Urban Growth Boundary by extensive development and increasing urbanization. The large tract of intact upland habitat found in Forest Park serves as home to a large population of RAAU. The riparian area along the banks of the Lower Willamette River, formerly rife with vernal pond habitats supporting historic amphibian habitat needs, has nearly all been destroyed. Harborton Wetland is the closest large, intact, high-quality breeding habitat suitable for pond-breeding amphibians to serve this large population. Harborton Wetland is now starkly disconnected from the upland habitat in Forest Park by Highway 30.

The migration occurring to Harborton Wetland may be unnaturally large, drawing animals from a larger radius than was historically typical due to the lack of other suitable breeding habitat in the southern two-thirds of the park (Figure 7, Table 3). Frogs are likely migrating farther to reach Harborton Wetland, or, potentially, are extirpated from suitable upland habitat due to the distance required to travel to and from a breeding site.

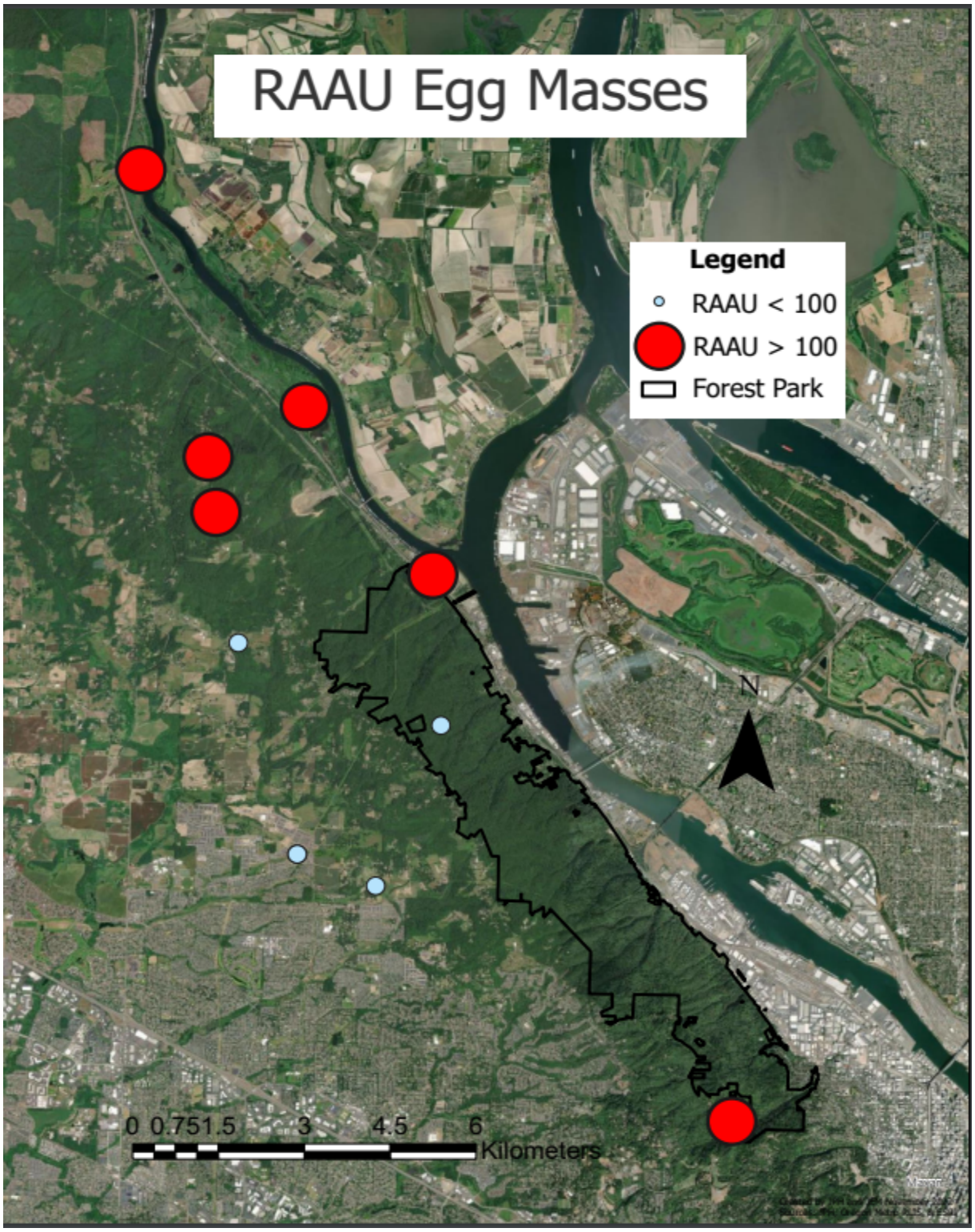


Figure 7: Map of the Harborton Wetland study area including Forest Park. The distance between Audubon Pond in the southern end of Forest Park and Harborton Wetland is substantially greater than the distances between other ponds with high levels of RAAU breeding.

The wetland pond at Audubon is the only major RAAU egg mass site within the boundaries of Forest Park. A very high number of egg masses are produced annually (>500) at this small wetland. The Audubon Pond is not ideal breeding habitat due to the substantial forest canopy cover over the wetland allowing low levels of solar exposure to penetrate to the water surface. The high density of egg masses in the small Audubon pond may lead to unnatural competition for resources among more than 250,000 larvae (Table 2).

Harborton Wetland is the nearest large, quality breeding habitat to Audubon Pond, about 11 km to the north. There are other breeding sites along the west slope of the park that are closer as the crow flies, but are small and have multiple road crossings limiting connectivity. North of Harborton Wetland, appropriate breeding habitats occur more frequently including upland ponds and sites within the floodplain of Multnomah Channel (Palensky Wildlife Area and several Metro sites) that contain diverse riparian habitat ideal for RAAU breeding wetland habitat which are comparable to the breadth of the historic floodplain. Most frogs living in Forest Park need to cross one or several roads to reach breeding ponds limiting their desirability for amphibian breeding.

The cause of the large Harborton frog migration seems to be tied to the loss of prime breeding areas for RAAU populations previously found on the east side of Forest Park within the Willamette River floodplain and on the west slope of the park in headwater wetlands of the Tualatin River Basin. Increasing connectivity to existing wetland habitats and decreasing the distance between wetlands will likely decrease the intensity of the migration crossing Highway 30 at Harborton Wetland.

Table 2: Egg mass density at known RAAU breeding sites in 2021 & 2022. Area estimates are of the entire wetland area which may not all be appropriate RAAU breeding habitat. Surveys of sites larger in area are known to underestimate the true number due to difficult access to all sections of the wetland. Highlighted cells represent substantially greater densities than is typical.

Site Name	2021 RAAU egg masses	2022 RAAU egg masses	Pond Area (m^2)	2021-2022 MAX. Egg Mass Density
Harborton	435	174	17305	0.02514
Palensky	~500+	~500+	1137600	0.0004
Audubon	~500+	641	828	0.7741
McNamee 1	~500+	706	734.8	0.9619
McNamee 2	~75	141	140.5	1.0036
Multnomah Channel	~500+	~500+	744793	0.0006
Springville 1	47	38	4166	0.0091
Springville 2	81	85	682.2	0.1246
Teufel	7	7	15232	0.0004
Bethany Ck NA	9	8	30	0.3
Metro Abbey Creek	12	20	9	0.45
Wetland J	N/A	3	15	0.2

Table 3: Crow's distances between wetlands and their 2 closest neighbors. Only sites with >50 RAAU egg masses included in this table. Highlighted cells represent the greatest distances between sites.

Site Name	Site Manager	Nearest Neighbor	Nearest Neighbor Distance (m)	Second Nearest Neighbor	2nd neighbor Distance (m)
Harborton	PGE	Palensky	2832	McNamee 2	3878
Palensky	ODFW	Harborton	2832	McNamee 1	2210
Audubon	Audubon	Springville	7790	Harborton	11247
McNamee 1	private	McNamee 2	1000	Palensky	2390
McNamee 2	private	McNamee 1	1000	Palensky	2080
Mult Ch	Metro	Whittle	2070	Palensky	5670
Springville	private	Audubon	7010	Palensky	7280

Potential Partial Solutions

Increasing connectivity across Highway 30 between the upland and wetland habitats is the most obvious and direct solution to the long-term health of the RAAU population of Forest Park. Decreasing the necessary migration distance by strategically creating wetland habitat between existing wetlands will likely also decrease the intensity of the migration at Harborton Wetland. Ideal locations would be located near the Harborton Wetland, but additional locations to the south are likely to improve the health of amphibian populations in light of the dearth of wetlands available.

The scenario surrounding the Harborton Wetland amphibian migration is complex. Any alteration to infrastructure requires years of bureaucratic processing with multiple agencies and outside parties holding interests and responsibility toward the myriad details of how changes are made to the current state of affairs. There are many unknowns surrounding any effort to assist wildlife as a seemingly minor detail may dissuade them from utilizing any potential well-intentioned habitat improvement. None of the remedies are easy, cheap or a total solution to the problem of mass seasonal amphibian roadkill on Highway 30. Two long-term potential restoration approaches stand out:

1. **Wildlife Highway Undercrossing under Highway 30 @ Harborton**

Amphibians evolved to migrate when particular habitat conditions occur. These traits did not factor in rush hour traffic occurring at the peak of their migratory time. A direct connection bypassing the barrier between the upland and wetland habitats is an obvious solution to assist animal migration. Finding a way for frogs to both follow their natural inclination to move with no disruption to human traffic is essential.

A working group of interested parties and agencies has been assembled calling itself the Harborton Undercrossing Working Group. Members include representatives of the US Fish and Wildlife Service, the Harborton Frog Shuttle, West Multnomah Soil and Water Conservation District, Columbia River Estuary Study Taskforce (CREST), Metro, Portland Parks, ODFW, PGE, and the Oregon Wildlife Foundation. Funds are currently being raised for a feasibility assessment for a highway undercrossing near the intersection of NW Harborton Drive and Highway 30, the centerpoint of the Harborton Wetland migration as determined by a year of roadkill surveys funded by the Oregon Wildlife Foundation (Figure 5). An Oregon Conservation Recreation Fund grant has already been obtained as well as commitments of resources from other sources with additional grant applications pending. Additional funding sources of up to $1 million will have to be found to build the undercrossing.

Funding is not the only challenge for a wildlife undercrossing. To date, no amphibian tunnel has been constructed that is even half of the length required to span five lanes of traffic, so it is unknown if frogs will enter the tunnel. The animals must also be funneled into this 1.5 meter wide tunnel from a span of over 600 meters of highway. The terrain is steep and rough so thoughtful placement of directional barriers is important to assist as many animals as possible. Also, there is almost always precipitation associated with amphibian migrations. A tunnel will attract water as well as animals and attention must be paid to the preferences of these terrestrial creatures for wet, solid ground rather than flowing water.

An effort led by CREST to build an undercrossing is being planned three kilometers north on Highway 30 at Palensky Wildlife Area. This site also has a large annual RAAU migration with hundreds of animals killed each year (Figure 6). Their tunnel design incorporates features to funnel the animals to it, separate flowing water from the amphibian path, and daylighting features in the tunnel design to make the climate of the tunnel match the ambient conditions. The Harborton Undercrossing Working Group is modeling their plans on this very similar project and monitoring its successes and challenges as it moves toward construction.

2. **Build/Improve Upland Breeding Ponds**

Another direct way to minimize road crossing mortality is to eliminate the need to cross a road for some frogs. Creating alternative suitable pond habitat within the upland forest will negate the need for some percentage of the migrating frogs to cross this lethal man-made barrier. Justification for altering existing habitat can be made by the massive loss of riparian habitat with the development of the City of Portland waterfront. Currently, only 3 sites within the outer boundaries of Forest Park are known to support RAAU breeding: Audubon, Wetland J (near Newton Road), and Firelane 15 (FIgure 7). All three have a dense tree canopy limiting direct solar exposure. Wetland J and Firelane 15 have each had less than 10 RAAU egg masses in the last 2 years of observations. Audubon Pond had 641 RAAU egg masses in an area of about 828 m^2 (Table 2), well above egg mass density typically observed for this species.

The steep terrain and northwest aspect within most of Forest Park allows for few areas to site potential wetland improvements. Additionally, any work performed must comply with the Forest Park Natural Resources Management Plan and the stringent regulations for altering hydrology and creating water features in Oregon. A team composed of a retired soils engineer, the Harborton Frog Shuttle Founder, a Portland Parks Resource Ecologist, and a herpetologist was assembled to identify sites for potential improvements.

Initial investigations were based on a 2014 City of Portland Bureau of Environmental Services wetland inventory which identified 12 wetlands in Forest Park (Wetlands A - L). After initial site visits to all 12 locations, hand-auger borings were performed at three sites to determine the soil composition and the depth of the fragipan, the subsurface soil layer that restricts water flow and root penetration in wetlands. Water level monitoring will be observed for two years to corroborate the findings and determine site suitability.

Wetland I, located near the Newton Road trailhead, stands out as having the best potential for habitat improvements. Initial results indicate that the substrate is suitable to hold water to create suitable RAAU pond breeding habitat. The aspect of the site lies such that, with a few select tree removals, solar exposure levels will likely be favorable for RAAU breeding. The site is also proximate to the Harborton Wetland, approximately 2.5km southwest, which will potentially provide an immediate alternative for some amphibians to crossing Highway 30. Additionally, the site has an exception written into the Forest Park Natural Resources Management Plan for wetland alteration which will speed the process of bureaucratic approval. The nearby Wetland J can be deepened to improve conditions for pond-breeding amphibians.

The Audubon Pond, privately owned by the Portland Audubon, is located on the southern edge of Forest Park. It is crucial for maintaining amphibian populations in the southern portion of Forest Park. It is formed by an impoundment on Balch Creek which hosts native cutthroat trout. This structure is due for

maintenance. All efforts to keep this wetland feature intact should be taken.

The extreme density of egg masses found at the Audubon Pond reflects the lack of any other available known breeding habitat within 7.5 km straight line distance of the site. This distance to the next nearest breeding site is above the maximum known distance of RAAU migration capacity (~7 km) indicating the importance of this site to the overall Forest Park amphibian population. These facts (high egg mass density, long distance to other ponds, and the lack of direct solar exposure on the Audubon Pond) point to the lack of alternatives for frogs in the southern portion of Forest Park. Opportunities to create or enhance pond habitat at Audubon and in the surrounding area would also prove beneficial to other native amphibians and wildlife.

Additional opportunities to increase pond breeding amphibian habitat within and around Forest Park should be explored. The Oregon Zoo and the Abbey Creek property owned by Metro have been identified as having potential to benefit amphibian populations.

Monitoring

Monitoring is a crucial step in demonstrating and understanding the impacts of any changes made to benefit wildlife. Cameras within and roadkill surveys around any undercrossing projects are also necessary to document the functionality and usage of the new tunnels.

Continued egg mass surveys pre- and post-connectivity and habitat improvements within the study area around Harborton Wetland in combination with data from the Harborton Frog Shuttle and partner agencies will build upon baseline data to document any changes in breeding pond preference and population trends. Egg mass surveys at known RAAU breeding sites identified in this report should be continued for 10 years (approximate RAAU lifespan) following any habitat alterations.

Resources

Forest Park Natural Resources Management Plan. 1995. Portland City Council.

Oregon Conservation Strategy. 2016. Oregon Department of Fish and Wildlife, Salem, Oregon

Prepared By: April Silva, Lead Ecologist
Columbia River Estuary Study Taskforce

Burlington Creek Stream Conservation Plan

Impact assessment for a proposed wildlife corridor under Highway 30

Exhibit A.20.3

Contents

Background

Figure 1. Wildlife underpass location.

This conservation plan addresses project impacts within the limits of construction for a proposed wildlife corridor under Highway 30 east of the Cornelius Pass junction. US Highway 30 in Western Oregon bisects a wildlife migration corridor between the Tualatin Hills and the Burlington Bottoms floodplain along Multnomah Channel. Amphibian species including Northern Red-Legged frogs and Pacific Chorus frogs migrate back and forth between the upland forests of the Tualatin Hills and the floodplain wetlands along Multnomah Channel throughout the year. The 4-lane highway greatly impacts migration patterns, killing many of these amphibians as they traverse back and forth. The Highway 30 wildlife underpass project seeks to remedy this problem along a section of the highway, by installing a 54" steel casing underneath the existing roadway. This casing will be hydraulicly driven through the existing highway embankment, without open cutting any sections of the Hwy 30 travel lanes. Construction access is planned along the existing roadway shoulder and ODOT right of way. Location of the wildlife corridor is based on data collection from the Oregon Department of Fish and Wildlife on this section of highway.

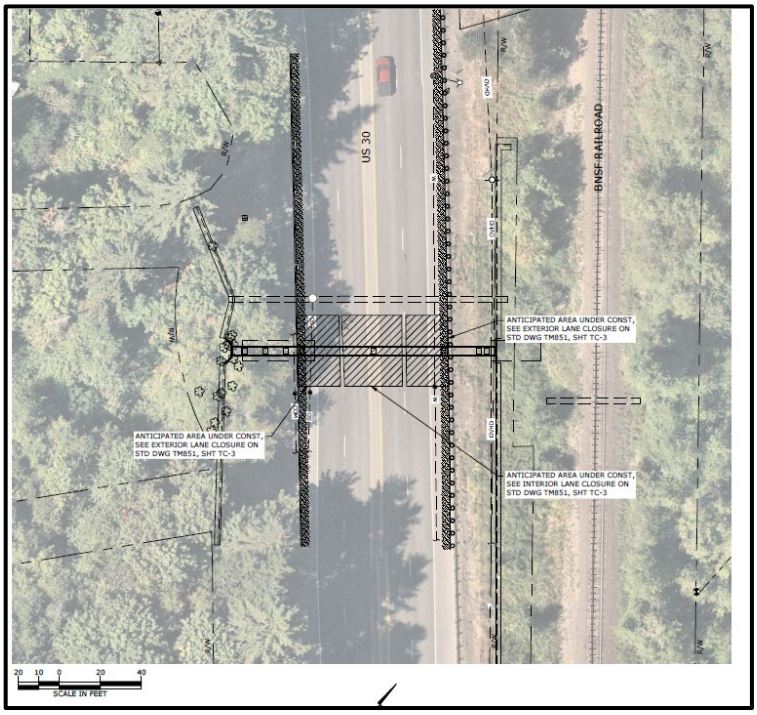


Figure 2. Wildlife underpass design drawing.

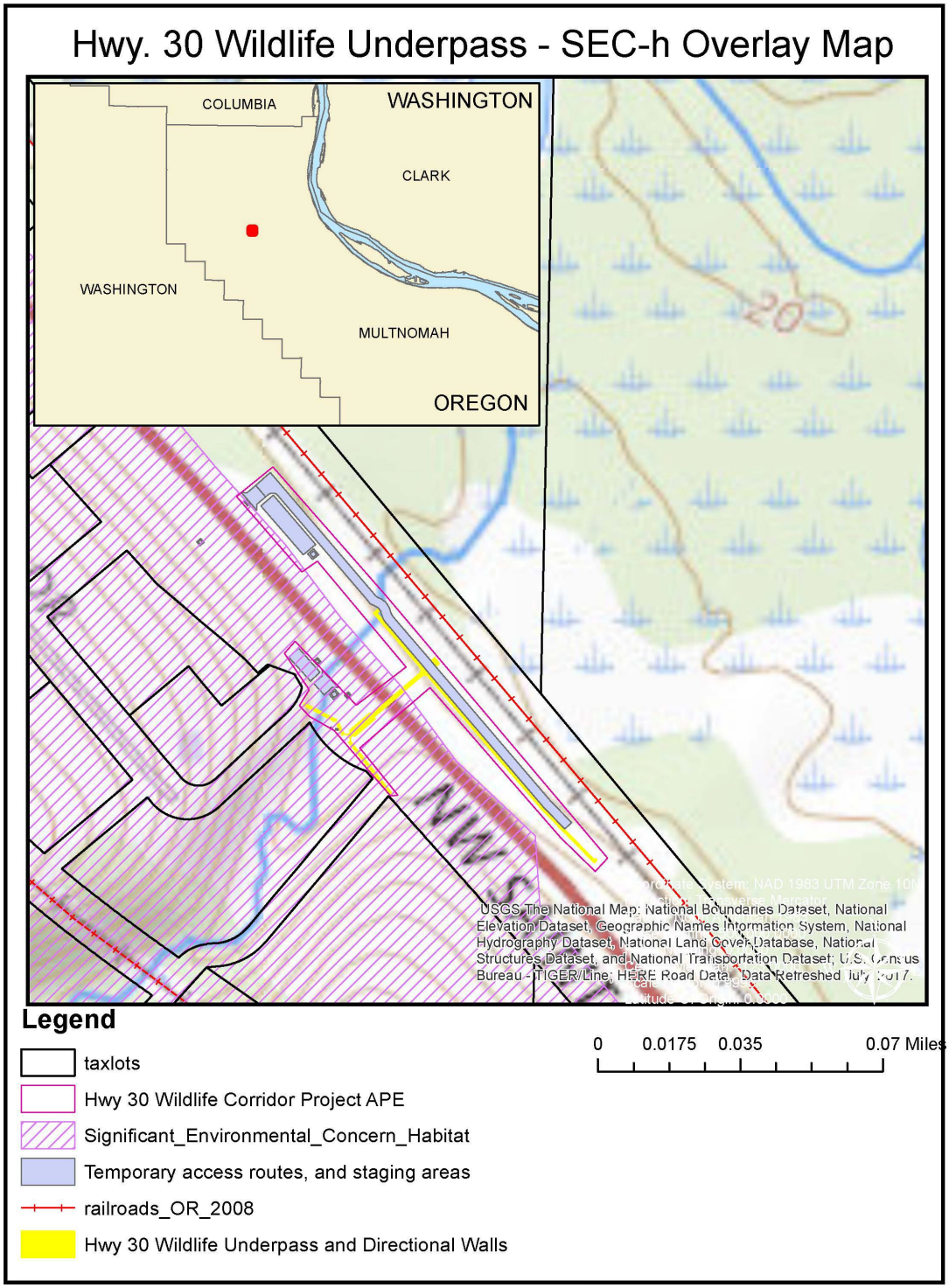


Figure 3. Hwy. 30 wildlife underpass SEC-h wetland overlay map.

Existing Conditions Assessment

Figure 4. West side of HWY30. Top: Main channel. Bottom: Intermittent side channel.

This existing stream conditions assessment focuses on the area of impact which is in the highway 30 right of way. The highway effectively disconnects hydrology of Burlington Creek at the culvert below highway 30. Burlington Creek is a perennial stream that runs from its headwaters in forested hills, it is restricted into a culvert below Highway 30 and the railroad, traverses Burlington Bottoms Wildlife Mitigation Site before discharging into Multnomah Channel. The creek extends beyond the immediate construction and impact areas. This project strategically works around the stream itself in order to establish a wildlife corridor below the highway which is adjacent to the creek without causing the creek to change course.

The following focuses on general baseline conditions of the creek segment inside the limits of construction, with additional baseline information for the lower and upper reaches that are outside and unaffected by construction. Burlington Creek is present on both the west and east sides of Highway 30 and represents the only non-wetland waters present within the project area. The section of creek adjacent to construction is outside of the Burlington Creek Forest Nature Park. No permanent impacts will occur to the creek as a result of the proposed wildlife corridor project. This includes any impact to functions, wetlands associated with the creek within the project boundary, and riparian area vegetation. The lower stream reaches are going to have substrates dominated by fines with small percentages which likely transitions into more gravel towards the headwaters. USDA mapped soils are primarily Haploxerolls (19C), with small amounts of Sauvie silt loam (44) to the east, Goble silt loam (17E) and Quatama loam (37D) to the west. Tree and shrub layers are dominated by native species with the herbaceous layer being more a mix of native and non-native/invasive species; depending largely on location along the stream with lower reaches dominated by Reed Canary Grass (*Phalaris arundinacea*) and forested areas having higher percentages of bare ground. Downstream in Burlington

Bottoms, restoration work has recently been completed to restore tidal hydrology, predictably increasing or allowing ESA listed juvenile salmonids to access more of the stream below the proposed wildlife corridor project.

Figure 5. Burlington Creek west of HWY30. Right: Ditch section of stream, looking south. Left: Stream traveling under railroad towards Burlington

Under the SFAM, the overall stream's watershed has intermediate ratings for Amphibians & Reptile Species, and Songbirds, Raptors, and Mammals. Invertebrate Species scored a Low rating. The stream is within a HUC12 watershed that has designated essential salmonid habitat, with juvenile salmon expected to use the tidal wetlands for refuge and foraging, but not capable of passing upstream of the culvert underneath Highway 30. The stream has been recognized as a key migration area for amphibians including Red-legged frogs (*Rana aurora*). Western pond turtles (*Actinemys marmorata*) have established breeding habitat adjacent to the stream. The forested uplands beyond the area of impact are known to have black bears (*Ursus americanus*), coyotes (*Canis latrans*), and numerous small mammals associated with deciduous forests. This combination of multiple habitat types, use by numerous native species, and upland and lowland habitat protections results in a larger conservation corridor that will only be enhanced by a wildlife corridor under Highway 30.

On the west side of the highway, the stream has one main perennial channel, with an intermittent side channel activated during high water events. The stream has a well-developed riparian area consisting of large evergreens mixed in with Red alder (*Alnus rubra*). Below the forested canopy are abundant Salmonberry (*Rubus spectabilis*), Snowberry (*Symphoricarpos albus*), Red osier dogwood (*Cornus sericea*), and Red elderberry (*Sambucus racemosa*). The herbaceous layer is dominated by English ivy (*Helix hedera*), Horsetail (*Equisetum arvense*), and Fringecup (*Tellima grandiflora*). Most of these are listed as nuisance species in Multnomah County's Zoning Plan and will be removed by hand or spray and the area(s) replanted with native herbaceous species. The steepness of the channel banks results in a hydroperiod that does not support wetland formation as determined in the wetland delineation #WD2022-0074. The intermittent side channel similarly does not support wetland development along channel edges due to the topography.

On the east side of Highway 30 the stream discharges into a drainage ditch between the highway and the railroad berms, creating unnatural impoundments and channelization. This ditched section of stream is heavily impacted by anthropogenic features. Here it is characterized by a drainage ditch channel morphology and the directional flow of water from the Highway 30 culvert to the culvert traversing the railroad prism. Once past the railroad culvert, and outside of the study area, Burlington Creek empties into a wetland complex that has undergone multiple stages of restoration and includes tidal, non-tidal, perennial and seasonal channels and ponds.

The Oregon Department of Fish and Wildlife has been collecting data on density and mortality of amphibians at and around the study area for multiple years. Below is a map showing the mortality data from red-legged frogs along the work area. The red line on the map shows the alignment of the proposed wildlife underpass which has been strategically proposed in a high-density spot for mortality. It is anticipated that locating the wildlife corridor in a “hot spot” for amphibian mortality will result in the highest possible ecological lift from pre-project conditions.

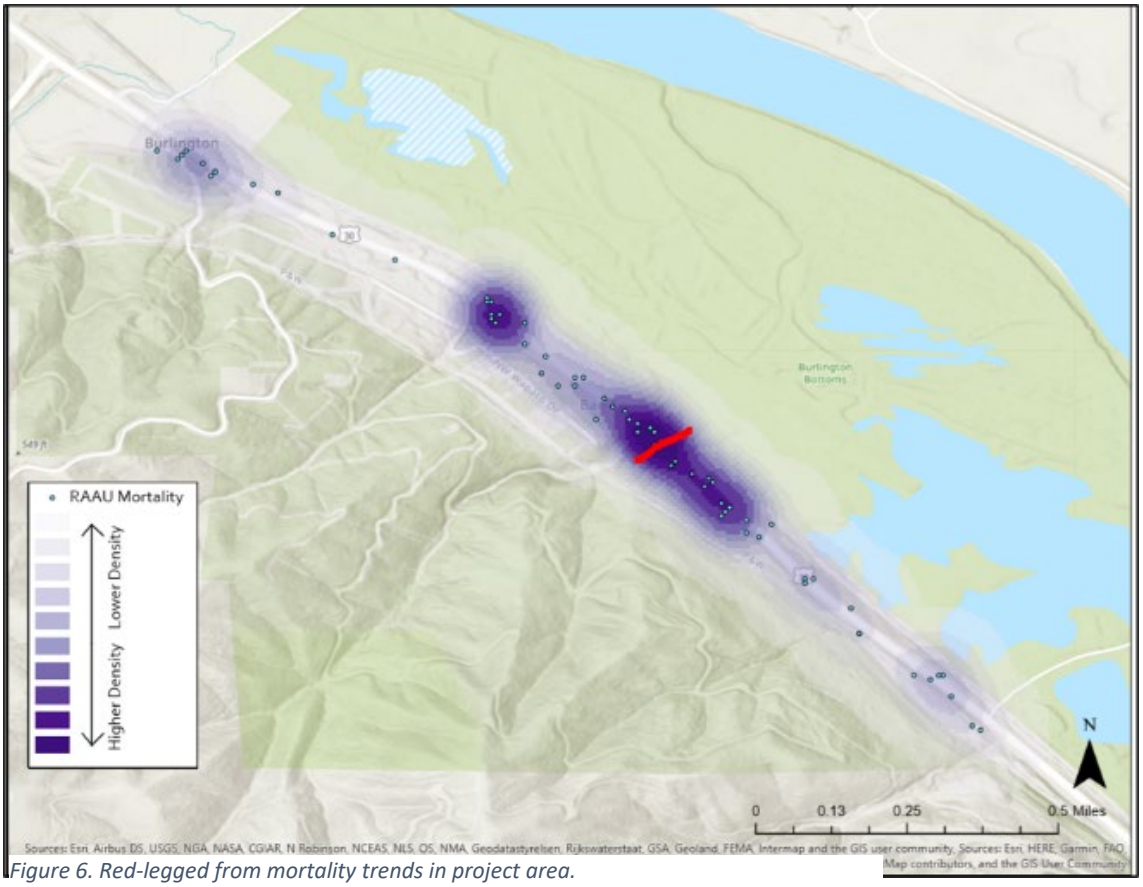


Figure 6. Red-legged from mortality trends in project area.

Impact Assessment

One of the key elements of this project is concentrating impacts within the existing road right of way for Highway 30. This minimizes impacts to the forested uplands to the west, and the tidal wetland complex to the east. Post project conditions will include permanent artificial structures and increased native species diversity in tree, shrub, and herbaceous layers. All artificial structures (corridor tunnel itself, directional walls) will be located within the road prism effectively minimizing wildlife and habitat impacts.

The proposed wildlife corridor will not impact the creek. The wildlife corridor has been designed to work around the creek, providing a route for amphibians and small mammals to migrate without diverting the creek. hydrologic impacts will not occur because there is an existing culvert in place conveying Burlington Creek underneath the highway and this project is not intended to change or alter that flow regime. No permanent fills will encroach any waterways or water bodies. The permanent restoration features are well above waterways or water bodies and are part of the existing highway 30 roadway embankment and will not alter the existing hydrology or result in any net change in the flood hazard risk, erosion hazard risk, and/or any other natural hazards in the proposed development area. The highway 30 road prism is already equipped with a storm drain system, that will not be changed as a result of this project. There is a small amount of grading (excavation) proposed on the west side of the project area, just west of the entrance to the wildlife underpass. All material will be removed from the site and hauled to an approved upland disposal site. The west side grading is a preventative/precautionary measure to ensure the wildlife underpass does not become a means to convey water, and as a result, there are no changes in the flow of Burlington Creek, and is therefore not increasing or decreasing the hydrology beyond existing conditions. Grading in this area has been minimized to the maximum extent practical and will remove patches of non-native Reed Canary Grass. All grading will be performed to mimic natural site contours and will be seeded and planted with native emergent and riparian species. The entire project area where there are disturbed soils will be reseeded and replanted immediately following completion of the project.

Figure 7. Proposed location of directional walls.

Mitigation

This is a voluntary restoration and enhancement project that will result in a net increase in wildlife habitat conditions, connectivity, and functions. The restoration effort is specifically designed to minimize impacts by focusing work elements in already disturbed areas (Highway 30 road prism and embankment) and will not cause the loss of any existing wetland areas. The project will have short-term, temporary impacts, to a roadway and a small strip of low-quality wetland that exists in a ditch between the highway 30 and ODOT Rail/PNWR railroad. The conditions of this wetland will be improved as a result of this project as non-native species will be replaced with a diverse native community. The project seeks to offset negative impacts of past development in a key wildlife corridor. As a result, it is expected to not trigger the need for mitigation effort. The project will occur in Summer and early Fall 2022 when the site is dry and there is little or no flow coming through the existing culvert. The entire work area will be surrounded by straw wattles and other Best Management Practices to ensure that construction is not impacting nearby wetlands. This project will only temporarily impact a very small, low-quality wetland (ditch between the railroad prism and highway 30 road prism that has trash and mostly non-native plant species) and replant dozens of native trees, shrubs, and emergent vegetation throughout the non-roadway portions of the site. It should not require any replacement wetlands. Attached are the plan sheets showing the revegetation plan for the site.

Size of tree to be removed (inches in diameter)	Number of trees and shrubs to be planted	Hwy 30 Wildlife Corridor Tree Removal (See SHT C-1)	Plantings Required
6 to 12	2 trees and 3 shrubs	12 in the 6-12” DBH Range	24 trees 36 shrubs
13 to 18	3 trees and 6 shrubs	4 in the 13-18” DBH Range	12 trees 24 shrubs
19 to 24	5 trees and 12 shrubs	2 in the 19-24” DBH Range	10 trees 24 shrubs
25 to 30	7 trees and 18 shrubs	No Trees of this size class will be removed	0
over 30	10 trees and 30 shrubs	No Trees of this size class will be removed	0

Monitoring

CREST in coordination with ODFW proposes a five-year monitoring plan to determine the long-term impacts of the wetland enhancement area. After vegetation monitoring has been implemented an updated map of monitoring metrics and locations will be provided to the necessary permitting agencies. Monitoring metrics will determine how wetland characteristics and functions continue with changes in vegetation. Vegetation monitoring will determine the success rate of replanting over time and ensure that an 80% survival rate of all the plantings associated with the project is achieved.

Vegetation monitoring will be implemented during the growing season annually for five years. There will be a maximum of two transects, and the number of plots will depend on the final size of the wetland enhancement area. Plots will be one meter squared in size and spaced consistently along the baseline. These plots will be randomly placed in year one, making sure they cover the elevation gradient. All of these plots will be permanent, marked with PVC at each corner, so that trends data can be established. Permanent plots allow for trends data temporally, however if permanent plots fail to be representative of overall site conditions additional randomly placed plots will be added after year one. Photo points will be taken every year during the growing season to provide qualitative evidence of overall landscape changes.

This restoration project will only temporarily impact a very small, low-quality wetland (ditch between the railroad prism and highway 30 road prism that has trash and non-native plant species) and replant dozens of native trees, shrubs, and emergent vegetation throughout the non-roadway portions of the site. It should not require any replacement wetlands. Attached are the plan sheets showing the revegetation plan for the site.

After the five-year CREST monitoring period, ODFW will continue to monitor the sites vegetative community, perform any maintenance on the corridor itself, and track wildlife usage of the corridor to inform future projects where infrastructure and wildlife corridors intersect.

SFAM Report

OREGON EXPLORER

Stream Function Assessment Method (SFAM) Report

Report Generated: April 13, 2022 03:03 PM

Location Information

Latitude	45.642 N	Longitude	-122.8367 W
Elevation	62 ft	Level III Ecoregion	Willamette Valley
HUC8	17090012 Lower Willamette		
HUC10	1709001203 Multnomah Channel		
HUC12	170900120305 Multnomah Channel		
Linear ft of stream in HUC8	308,399	Annual precipitation	41 in

Stream Type and Classifications

No results

Stream classifications and associated attributes are derived from a U.S. Environmental Protection Agency stream classification geospatial data layer developed for Oregon (2015). This layer provides a statewide stream/watershed classification system for streams and rivers of various sizes, based in part on a hydrologic landscape classification system.

Report Generated: April 13, 2022 03:03 PM

data are insufficient to assign another category.

Dominant soil type(s)			
Soil Type	**Erosion Hazard Rating**	**Hydric Rating**	**Percent Area**
Haploxerolls, steep	Severe	No	49.22%
Quatama loam, 15 to 30 percent slopes	Severe	No	33.27%
Sauvie silt loam	Slight	Yes	10.76%
Goble silt loam, 30 to 60 percent slopes	Severe	No	6.75%

This report contains both centroid-based and polygon-based data. The Location Information section of the report contains centroid-based data (determined by the center point of the polygon), while the remaining sections are polygon-based (determined from the entire polygon).

The rare species results in this report are based on a subset of the ORBIC rare species dataset. The SFAM tool only reports on rare species that meet the following criteria: wetland habitat species that are tracked by ORBIC, excluding historical or extirpated sites or those with low mapping accuracy. More information about specific sites and additional species can be obtained from ORBIC through data requests, see https://inr.oregonstate.edu/orbic/data-requests for details.

OREGON EXPLORER

Stream Function Assessment Method (SFAM) Report

Report Generated: April 13, 2022 03:03 PM

Rare Species Scores and Special Habitat Designations

Rare Species Type	Maximum score	Sum Score	Rating
Non-anadromous Fish Species	0	0	None
Amphibian & Reptile Species	0.45	0.45	Intermediate
Feeding Waterbirds	0	0	None
Songbirds, Raptors, and Mammals	0.33	0.33	Intermediate
Invertebrate Species	0.36	1.35	Low
Plant Species	0	0	None

Scores have taken into account several factors for each rare species record contained in the official database of the Oregon Biodiversity Information Center (ORBIC): (a) the regional rarity of the species, (b) their proximity to the point of interest, and (c) the "certainty" that ORBIC assigns to each of those records.

Within 300 ft of a Special Protected Area?	No
Within a HUC12 that has designated Essential Salmonid Habitat?	Yes
Within 2 miles of an Important Bird Area?	Yes

Water Quality Impairments

Water quality information is derived from Oregon's 2012 Integrated Report, including the list of water quality limited waters needing Total Maximum Daily Loads (303d List). Each record in the report is assigned an assessment category based on an evaluation of water quality information. Categories included in the SFAM Report are:

Category 5: *Water is water quality limited and a TMDL is needed; Section 303(d) list.*

Category 4: *Water is impaired or threatened but a TMDL is not needed because: (A) the TMDL is approved, (B) other pollution requirements are in place, or (C) the impairment (such as flow or lack of flow) is not caused by a pollutant.*

Category 3B: *Water quality is of potential concern; some data indicate non-attainment of a criterion, but*

Prepared By: April Silva, Lead Ecologist
Columbia River Estuary Study Taskforce

Burlington Creek Wildlife Conservation Plan

Impact assessment for a proposed wildlife corridor under Highway 30

Contents

Background

This wildlife conservation plan addresses project impacts within the limits of construction for a proposed wildlife corridor under Highway 30 east of the Cornelius Pass junction. This document is an assessment of the existing wildlife corridor characteristics, and specifically addresses potential impacts and how the project aims to not only reduce adverse-construction impacts but result in an ecological lift in habitat and migration conditions within the project boundaries. High quality forested uplands extend to the west and a tidal freshwater wetland complex borders the project to the east. Basic information is provided on these habitats as they are adjacent to the work area, with the main focus of this plan being a benefit/impact analysis for the actual project footprint which is entirely within the road prism.

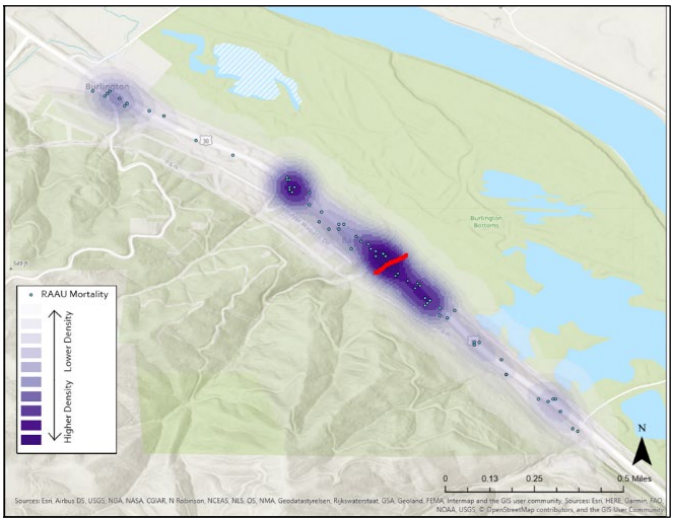


Figure 1. Current mortality trend of red-legged frogs in project area.

US Highway 30 in Western Oregon bisects a wildlife migration corridor between the Tualatin Hills and the Burlington Bottoms floodplain along Multnomah Channel. The Oregon Department of Fish and Wildlife has been collecting data on density and mortality of amphibians at and around the study area. Figure 1 shows the mortality trend data from red-legged frogs attempting migrations in the proposed project area. The red line on the map shows the alignment of the proposed wildlife underpass, note how it's located in a "hot spot" for frog mortality. Amphibian species including Northern Red-Legged frogs and Pacific Chorus frogs migrate back and forth between the upland forests of the Tualatin Hills and the floodplain wetlands along Multnomah Channel throughout the year. The four lane highway greatly impacts migration patterns, killing many of these amphibians as they traverse back and forth. The proposed wildlife underpass aims to reduce wildlife mortality along a section of the highway, by installing a 54" steel casing underneath the existing roadway. Construction access is planned along the existing roadway shoulder and ODOT right of way.

Figure 2. Wildlife underpass location.

Existing Conditions Assessment

This existing wildlife corridor conditions assessment focuses on the area of impact which is confined to the road prism of highway 30. The road prism does not support quality wildlife habitat, with the highway instead being a source of vehicle-wildlife collisions that result in animal mortality. Habitat within the road prism currently includes a strip of deciduous native trees and a small, ditched wetland. The wetland may provide some forage and refuge for amphibians, and resting perches for wrens or small songbirds. The proximity to the highway and to wetland quality habitat likely decreases the use of the heavily impacted ditched wetlands. Burlington Creek and its watershed and can help reduce the impacts that humans have on wildlife movement by offering a large contiguous habitat corridor. However, the creek is disconnected hydrologically below highway 30 and no current wildlife underpass or corridor exists, which reduces both habitat opportunity and accessibility. Migration corridors are not only important movement pathways, but also provide critical seasonal resources during migration for non-resident wildlife as well.

There is a creek and a wetland within the project area. Burlington Creek is a perennial stream that runs from its headwaters in forested hills, is restricted to a culvert below Highway 30 and the railroad, traverses Burlington Bottoms Wildlife Mitigation Site and tidal wetland complex before discharging into Multnomah Channel. The creek is present on both sides of Highway 30 and represents the only non-wetland waters present within the project area. The section of stream adjacent to construction is outside of the Burlington Creek Forest Nature Park. The lower stream reaches substrates are going to be dominated by fines with small percentages of gravels, which likely increase in percentage towards the headwaters. USDA mapped soils are primarily Haploxerolls (19C), with small amounts of Sauvie silt loam (44) to the east, Goble silt loam (17E) and Quatama loam (37D) to the west.

An ORWAP report was generated for the area and provides rare species scores for HUC8: 17090012, Lower Willamette. This includes the watershed that Burlington Creek and its associated wetlands connect to. The watershed received a Low score for Invertebrate Species, and Intermediate scores for both Amphibian & Reptile Species, and Songbirds, Raptors, and Mammals.

Tree and shrub layers are dominated by native deciduous and evergreen species with the herbaceous layer being more a mix of native and non-native/invasive species; depending largely on location along the stream with lower reaches dominated by Reed Canary Grass (*Phalaris arundinacea*). Downstream in Burlington Bottoms, restoration work has recently been completed to restore tidal hydrology, predictably increasing or allowing ESA listed juvenile salmonids to access more of the stream below the proposed wildlife corridor project. The forest and wetlands provide a valuable combination of nesting and foraging for birds, providing a

variety of tree and shrub sizes and species, emergent herbaceous areas, as well as mud flats during low tide or low water events.

On the west side of the highway, Burlington Creek has one main perennial channel, with an intermittent side channel activated during high water events. Side channels likely change with changes in downed trees, or obstacles redirecting high flows driven by precipitation events. The creek has a well-developed riparian area consisting of large evergreens mixed in with Red alder (*Alnus rubra*). Below the forested canopy are abundant Salmonberry (*Rubus spectabilis*), Snowberry (*Symphoricarpos albus*), Red osier dogwood (*Cornus sericea*), and Red elderberry (*Sambucus racemosa*). The herbaceous layer is dominated by English ivy (*Helix hedera*), Horsetail (*Equisetum arvense*), and Fringecup (*Tellima grandiflora*). The steepness of the channel banks results in a hydroperiod that does not support wetland formation as determined in the wetland delineation #WD2022-0074. Soils are primarily Haploxerolls within the road prism, transitioning into Quatama Loam to the west, and into Sauvie Silt Loam to the east. The intermittent side channel similarly does not support wetland development along channel edges due to the topography.

Figure 3. West side of Highway 30. Top: Main channel. Bottom: Intermittent channel.

The combination of multiple habitat types adjacent to the project area, use by numerous native species, and upland and lowland protections results in a larger conservation corridor that will only be enhanced by the proposed wildlife underpass under Highway 30. Burlington Creek and its watershed has been recognized as a key migration area for amphibians including Red-legged frogs (*Rana aurora*) and Pacific Chorus frogs (*Pseudacris regilla*). Western pond turtles (*Actinemys marmorata*) have established breeding habitat adjacent to the creek, in the ponds and lakes that exist where the creek meets the floodplain wetlands. The forested uplands beyond the area of impact are known to have black bears (*Ursus americanus*), coyotes (*Canis latrans*), and numerous small mammals associated with deciduous forests. Seasonal migrations take many of these species across highway 30. The Highway 30 obstacle can act as barriers to

migration or increase the chance that the animal will be killed while migrating. However, by documenting migration corridors such as ODFW has, restoration practitioners can help reduce the impacts that humans have on wildlife movement.

On the east side of Highway 30 the creek discharges into a drainage ditch between the highway and the railroad berms, creating unnatural impoundments and channelization. This ditched section of stream is heavily impacted by anthropogenic features. Here it is characterized by a drainage ditch channel morphology and the directional flow of water from the Highway 30 culvert to the culvert traversing the railroad prism. Once past the railroad culvert, and outside of the study area, Burlington Creek empties into a wetland complex that has undergone multiple stages of restoration and includes tidal, non-tidal, perennial and seasonal channels and ponds.

Figure 4. Burlington Creek east of HWY30. Right: Ditch section of stream, looking south. Left: Stream traveling under railroad towards Burlington Bottomlands.

Impact Assessment for Wildlife

Wildlife corridors connect habitats separated by development. As a result, they have the potential to increase habitat accessibility and opportunity. The proposed wildlife corridor is to address this significant loss of amphibians through a known migration corridor, which is supported by years of data collection from the Oregon Department of Fish and Wildlife. The proposed project will have habitat (e.g., opportunity) over environmental benefits (e.g., water conveyance). Connecting fragmented habitat will not only decrease mortality but can also benefit the genetic makeup and diversity of a population when increased numbers of individuals from varying locations can interact and breed, potentially increasing species resiliency.

The ditched wetland between the highway and railroad is the only wetland that will be impacted and these impacts are entirely temporary, no long term adverse wetland impacts will occur; there will be a net long-term benefit in the establishment of native plant species in previously degraded areas. On the western edge of the project footprint small deciduous trees will be removed, replaced with native species at a higher density. The temporary impacts to a low functioning lo quality wetland and removal of a small band of vegetation will reduce habitat available for insects, amphibians, and potentially birds over the short-term. These areas will transition into higher quality habitat as a result of aggressive native plantings.

Figure 5. Location of directional walls.

The proposed wildlife tunnel will result in a net positive change in habitat and migration conditions post project. Post project conditions will include permanent artificial structures to reduce the likelihood of wildlife mortality, and increased native species in tree, shrub, and herbaceous layers. All artificial structures (corridor tunnel itself, directional walls) will be located within the road prism effectively minimizing wildlife and habitat impacts. One of the key elements of this project is concentrating impacts within the existing road right of way for Highway 30. This minimizes impacts to the forested uplands to the west, and the tidal wetland complex to the east. The proposed wildlife corridor will not impact the stream long term. The wildlife corridor has been designed to work around the creek, providing a route for amphibians

and small mammals to migrate without diverting the creek. Fish are not able to migrate past the culvert below highway 30, reducing their habitat availability upstream. The forested uplands to the west of the project boundary are part of a forest preserve. This habitat effectively ends in the work area where forests transition to impervious manmade structures.

No permanent fills will encroach any waterways or water bodies. The permanent restoration features are well above waterways or water bodies and are part of the existing highway 30 roadway embankment and will not alter the existing hydrology or result in any net change in the flood hazard risk, erosion hazard risk, and/or any other natural hazards in the proposed development area. The highway 30 road prism is already equipped with a storm drain system, that will not be changed as a result of this project. There is a small amount of grading (excavation) proposed on the west side of the project area, just west of the entrance to the wildlife underpass. All material will be removed from the site and hauled to an approved upland disposal site. This west side grading is necessary to help ensure that the wildlife crossing does not become a means to convey water through the highway 30 road prism. Stream impacts will not occur as there is already an existing culvert in place conveying Burlington Creek underneath the highway and this project is not intended to change or alter that flow regime.

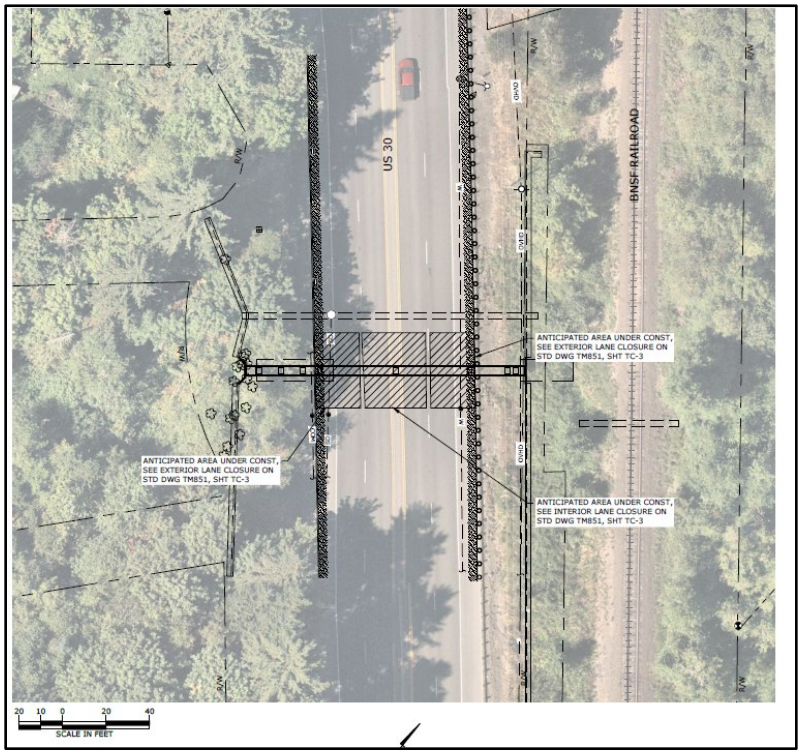


Figure 6. Project design.

The west side grading is a preventative/precautionary measure to ensure the wildlife underpass does not become a means to convey water, and as a result, there are no changes in the flow of Burlington Creek, and is therefore not increasing or decreasing the hydrology beyond existing conditions. Grading in this area will remove patches of non-native Reed Canary Grass (RCG) and has been minimized to the maximum extent practical. All grading will be performed to mimic natural site contours and will be seeded and planted with native emergent and riparian species. The entire project area where there are disturbed soils will be reseeded and replanted

immediately following completion of the project. Field investigations revealed that most soils encountered are going to be fill material from the development of Highway 30 (see delineation report #WD2022-0074).

Mitigation

This is a voluntary restoration and enhancement project that will result in a net increase in wildlife habitat conditions, connectivity, and functions. The restoration effort is specifically designed to minimize impacts by focusing work elements in already disturbed areas (Highway 30 road prism and embankment) and will not cause the loss of any existing wetland areas. The project will have short-term, temporary impacts, to a roadway and a small strip of low quality wetland that exists in a ditch between the highway 30 and ODOT Rail railroad. The conditions of this wetland will be improved as a result of this project as non-native species will be replaced with a diverse native community. The project seeks to offset negative impacts of past development in a key wildlife corridor. As a result, it is expected to not trigger the need for mitigation effort. The project will occur in Summer and early Fall 2022 when the site is dry and there is little or no flow coming through the existing culvert. The entire work area will be surrounded by straw wattles and other Best Management Practices to ensure that construction is not impacting nearby wetlands. This project will only temporarily impact a very small, low-quality wetland (ditch between the railroad prism and highway 30 road prism that has trash and mostly non-native plant species) and replant dozens of native trees, shrubs, and emergent vegetation throughout the non-roadway portions of the site. It should not require any replacement wetlands. Attached are the plan sheets showing the revegetation plan for the site.

Size of tree to be removed (inches in diameter)	Number of trees and shrubs to be planted	Hwy 30 Wildlife Corridor Tree Removal (See SHT C-1)	Plantings Required
6 to 12	2 trees and 3 shrubs	12 in the 6-12” DBH Range	24 trees 36 shrubs
13 to 18	3 trees and 6 shrubs	4 in the 13-18” DBH Range are necessary for removal	12 trees 24 shrubs
19 to 24	5 trees and 12 shrubs	2 in the 19-24” DBH Range are necessary for removal	10 trees 24 shrubs
25 to 30	7 trees and 18 shrubs	No trees of this size class will be removed	0
over 30	10 trees and 30 shrubs	No trees of this size class will be removed	0

Monitoring

CREST in coordination with ODFW proposes a five-year monitoring plan to determine the long-term impacts of the wetland enhancement area. After vegetation monitoring has been implemented an updated map of monitoring metrics and locations will be provided to the necessary permitting agencies. Monitoring metrics will determine how wetland characteristics and functions continue with changes in vegetation. Vegetation monitoring will determine the success rate of replanting over time and ensure that an 80% survival rate of all the plantings associated with the project is achieved, which is expected to be required by regulatory agencies

Vegetation monitoring will be implemented during the growing season annually for five years. There will be a maximum of two transects, and the number of plots will depend on the final size of the wetland enhancement area. Plots will be one meter squared in size and spaced consistently along the baseline. These plots will be randomly placed in year one, making sure they cover the elevation gradient. All of these plots will be permanent, marked with PVC at each corner, so that trends data can be established. Permanent plots allow for trends data temporally, however if permanent plots fail to be representative of overall site conditions additional randomly placed plots will be added after year one. Photo points will be taken every year during the growing season to provide qualitative evidence of overall landscape changes.

This restoration project will only temporarily impact a very small, low-quality wetland (ditch between the railroad prism and highway 30 road prism that has trash and non-native plant species) and replant dozens of native trees, shrubs, and emergent vegetation throughout the non-roadway portions of the site. It should not require any replacement wetlands. Attached are the plan sheets showing the revegetation plan for the site.

After the five-year CREST monitoring period, ODFW will continue to monitor the sites vegetative community, perform any maintenance on the corridor itself, and track wildlife usage of the corridor to inform future projects where infrastructure and wildlife corridors intersect.

ORWAP Report

OREGON EXPLORER

Oregon Rapid Wetland Assessment Protocol (ORWAP) Report

Report Generated: April 20, 2022 01:19 PM

Assessment Area: 3.6 Acres

Location Map

Location Information

Latitude	45.6424246557422	Longitude	-122.836920255534
Elevation	43 ft	Annual precipitation	41 in
Watershed (HUC12)		Multnomah Channel (170900120305)	
Presettlement Vegetation Class		Riparian hardwoods	
Rare Wetland Type(s)		None	
Hydrologic Landscape Class		Wet	
In Special Protected Area?		No	

View Salinity Maps (pdf)

Soil Information

Soil Name	Haploxerolls, steep
Soil Symbol	19E
Hydric Rating	No
Hydric Percent	2
Percent Area	50%
Erosion Hazard	Severe

This report was generated using the ORWAP Map Viewer, a tool of the Oregon Explorer (http://oregonexplorer.info).

Dom. Cond. Non-irrigated Capability Class	Class 6 soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Soil Name	Sauvie silt loam
Soil Symbol	44
Hydric Rating	Yes
Hydric Percent	98
Percent Area	27.5%
Erosion Hazard	Slight
Dom. Cond. Non-irrigated Capability Class	Class 6 soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Soil Name	Quatama loam, 15 to 30 percent slopes
Soil Symbol	37D
Hydric Rating	No
Hydric Percent	0
Percent Area	22.5%
Erosion Hazard	Severe
Dom. Cond. Non-irrigated Capability Class	Class 4 soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Watershed Information

HUC Best

HUC Code	HUC Name	Is HUC Best?	Greatest Criteria met	FW, s/f, lg (Acres)	FW, em, lg (Acres)	EST, em, lg (Acres)	EST, s/f, lg (Acres)
HUC8: 17090012	Lower Willamette	No	n/a	253.9	124.6	0	0
HUC10: 1709001203	Columbia Slough-Willamette River	No	n/a	123.6	88.7	0	0
HUC12: 170900120305	Multnomah Channel	No	n/a	n/a	n/a	n/a	n/a

[abbreviations: FW- freshwater (wetland); em- Emergent; lg- largest; s/f- Shrub/Forested; EST- Estuarine (wetland)

HUC 12 Functional Deficit

HUC Code	HUC Name	WS	SR	NT	WC	INV	AM	FH	WB
HUC12: 170900120305	Multnomah Channel								

Rare Species Scores

Rare Species Type	Maximum score	Sum Score	Rating
Non-anadromous Fish Species	0	0	None
Amphibian & Reptile Species	0.45	0.45	Intermediate
Feeding Waterbirds	0	0	None
Nesting Waterbirds	0	0	None
Songbirds, Raptors, and Mammals	0.33	0.33	Intermediate
Invertebrate Species	0.33	1.23	Low
Plant Species	0	0	None

Scores have taken into account several factors for each rare species record contained in the official database of the Oregon Biodiversity Information Center (ORBIC): (a) the regional rarity of the species, (b) their proximity to the point of interest, and (c) the "certainty" that ORBIC assigns to each of those records.

Element of Occurrence (Rare Species)

View wildlife list for Multnomah Channel (170900120305)

Within Assessment Area	1 EO Records
Within 1 mile	2 EO Records
In HUC12 watershed	25 EO Records

Element of Occurrence Record(s) in HUC12

1. Chinook salmon (Lower Columbia River ESU, fall run)
   [2 occurences]
   Oncorhynchus tshawytscha pop. 22
   ORBIC State Status: S2
   ORBIC Global Status: G5T2Q
   ODFW Strategy Species: Yes

2. Steelhead (Lower Columbia River ESU, winter run)
   [2 occurences]
   Oncorhynchus mykiss pop. 27
   ORBIC State Status: S2
   ORBIC Global Status: G5T2Q
   ODFW Strategy Species: Yes

3. Purple martin
   [2 occurences]
   Progne subis
   ORBIC State Status: S2B
   ORBIC Global Status: G5
   ODFW Strategy Species: Yes

4. Coho salmon (Lower Columbia River ESU)
   [2 occurences]
   Oncorhynchus kisutch pop. 1
   ORBIC State Status: S2
   ORBIC Global Status: G5T2Q
   ODFW Strategy Species: No

5. Painted turtle
   [8 occurences]
   Chrysemys picta

ORBIC State Status: S2

ORBIC Global Status: G5
ODFW Strategy Species: Yes

6 Chinook salmon (Lower Columbia River ESU, spring run)
[2 occurences]
Oncorhynchus tshawytscha pop. 21

ORBIC State Status: S2

ORBIC Global Status: G5T2Q
ODFW Strategy Species: Yes

7 California floater (mussel)
[1 occurences]
Anodonta californiensis

ORBIC State Status: S2

ORBIC Global Status: G3Q
ODFW Strategy Species: No

8 Western ridged mussel
[1 occurences]
Gonidea angulata

ORBIC State Status: S2S3

ORBIC Global Status: G3
ODFW Strategy Species: No

9 Olympia pebblesnail
[2 occurences]
Fluminicola virens

ORBIC State Status: S2

ORBIC Global Status: G2
ODFW Strategy Species: No

10 Columbian white-tailed deer
[1 occurences]
Odocoileus virginianus leucurus

ORBIC State Status: S2

ORBIC Global Status: G5T3Q
ODFW Strategy Species: Yes

11 Pacific lamprey
[1 occurences]
Entosphenus tridentatus

ORBIC State Status: S1S2

ORBIC Global Status: G4
ODFW Strategy Species: No

12 Winged floater (mussel)
[1 occurences]
Anodonta nuttalliana

ORBIC State Status: S2?

ORBIC Global Status: G2G3Q
ODFW Strategy Species: No

• *HUC Best: Oregon watersheds (HUC8, HUC10, HUC12) with greatest type diversity, proportional area, or density of wetlands according to available National Wetland Inventory maps.*

"Type diversity" is the number of unique NWI codes in the watershed (e.g., PEMA, PEMC, PEMCx) and excluded types that have no vegetation component (e.g., PUBH, R3US2).

"Density" is the number of vegetated NWI polygons divided by the acreage of the watershed; many of these polygons may be contiguous with each other, forming a single wetland.

"Proportional Area" is the proportion of the watershed's total area occupied by vegetated wetlands as mapped by NWI.

• *The digital maps used to determine this do not show many wetlands or cover the entire state. Data were compiled only from watersheds that have been at least 90% mapped by NWI (see worksheets for HUC8, 10, and 12). Data were received in November 2008 from ORBIC.*

• *METHODS: The above 3 metrics can be strongly correlated with watershed size and with each other. To minimize that bias, the rankings of the residuals from a regression analysis were used, rather than simply the top-ranking watersheds, to identify the most "important" watersheds for each metric at each scale. That is, the watersheds were identified that were in the top 5% in terms of variety of mapped wetland types for watersheds of that size, the largest area of mapped wetlands as a proportion of the watershed area for watersheds of that size, and/or the greatest number of mapped wetland polygons for watersheds with that much wetland area.*

• *Global rank. ORBIC participates in an international system for ranking rare, threatened and endangered species throughout the world. The system was developed by The Nature Conservancy and is now maintained by NatureServe in cooperation with Heritage Programs or Conservation Data Centers (CDCs) in all 50 states, in 4 Canadian provinces, and in 13 Latin American countries. The ranking is a 1-5 scale, primarily based on the number of known occurrences, but also including threats, sensitivity, area occupied, and other biological factors. In this book, the ranks occupy two lines. The top line is the Global Rank and begins with a "G". If the taxon has a trinomial (a subspecies, variety or recognized race), this is followed by a "T" rank indicator. A "Q" at the end of this line indicates the taxon has taxonomic questions. The second line is the State Rank and begins with the letter "S". The ranks are summarized as follows: 1 = Critically imperiled because of extreme rarity or because it is somehow especially vulnerable to extinction or extirpation, typically with 5 or fewer occurrences; 2 = Imperiled because of rarity or because other factors demonstrably make it very vulnerable to extinction (extirpation), typically with 6-20 occurrences; 3 = Rare, uncommon or threatened, but not immediately imperiled, typically with 21-100 occurrences; 4 = Not rare and apparently secure, but with cause for long-term concern, usually with more than 100 occurrences; 5 = Demonstrably widespread, abundant, and secure; H = Historical Occurrence, formerly part of the native biota with the implied expectation that it may be rediscovered; X = Presumed extirpated or extinct; U = Unknown rank; ? = Not yet ranked, or assigned rank is uncertain.*

• *This report contains both centroid-based and polygon-based data. The Location Information and Watershed Information sections of the report contain centroid based data (determined by the center point of the polygon), while the remaining sections are polygon-based (determined from the entire polygon).*

• *The rare species results in this report are based on a subset of the ORBIC rare species dataset. The ORWAP tool only reports on rare species that meet the following criteria: wetland habitat species that are tracked by ORBIC, excluding historical or extirpated sites or those with low mapping accuracy. More information about specific sites and additional species can be obtained from ORBIC through data requests, see https://inr.oregonstate.edu/orbic/data-requests for details.*

Sources

United States Fish and Wildlife Service. National Wetland Inventory. Wetlands and waters. https://www.fws.gov/wetlands/Data/Mapper.html

Nadeau, T L. United States Environmental Protection Agency. 2011. Streamflow Duration Assessment Method for Oregon, Region 10, Document No. EPA910-R-11-002.

USDA. NRCS. Chapter 4: Corridor benefits. https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_014927.pdf

Sahlean, Tiberiu. Papes, Monica. Strugariu, Alexandru, Gherghel, Lulian. 2020. Ecological corridors for the amphibians and reptiles in the Natura sites of Romania. Scientific Reports. https://doi.org/10.1038/s41598-020-76596-z.

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April Silva has over 13 years of working experience in fisheries biology and wetland ecology. She performs a variety of wetland and fisheries biology monitoring, research, permitting, and reporting activities for Columbia River Estuary Study Taskforce (CREST). She manages the monitoring department at CREST, ensuring pre-and post project data collection is completed in accordance with funder requirements and is consistent with estuary wide protocols to support a multi-agency data set for the tidal reaches of the Lower Columbia River. April performs wetland delineations for local jurisdiction members and private parties, completes functional assessments and delineations for restoration sites pre- and post-project, and assists with state and federal permitting in both Oregon and Washington. April also maintains a lab and processes a variety of macroinvertebrate sample types collected in coordination with juvenile salmonid research in the Lower Columbia River.

EDUCATION

Bachelors of Science in Natural Resources. Oregon State University
Associates Degree. Clatsop Community College

EXPERIENCE

Level II Action Effectiveness Monitoring & Research (AEMR)
I secure and manage contracts for the Lower Columbia Estuary Partnership's (LCEP) AEMR program, order and maintain necessary equipment and chemicals, schedule work in coordination with multiple agencies, collect vegetation data and macroinvertebrate samples based on standardized protocls, at selected sites, enter and QA/QC data, and submit deliverables including biological samples, electronic and hard copies of data. 2012- ongoing.

Level III AEMR
I participate in workshops demonstrating data collection protocols, manage scheduling and collection of data in alignment with select metrics following standardized protocols, record metric location using GPS or RTK equipment and map into GIS database, data analysis, compose annual findings report, and submit data exchange templates to the LCEP for all Boneville Power Asdministration (BPA) funded projects. 2013-ongoing.

Bear River Estuary Restoration Fish Monitoring
I drafted a scope of work and budget for fish community sampling at multiple restoration and reference sites in the Willapa Bay National Wildlife Refuge, implement fish community sampling and collected non-lethal stomach content samples from juvenile salmonids, processed samples, completed data management, and composed and submitted annual reports. 2014-2015.

Sturgeon Lake Wetland Delineation
In the Suavie Island Wildlife Area, I assisted with wetland impact permitting and completed a wetland delineation for a juvenile salmonid habitat restoration project. 2017.

Megler Creek Restoration Project Monitoring
I installed and maintain a passive integrated transponder (PIT) tag antenna array, acquire annual federal, state, and National Park Service permits for fish community sampling and collection of genetic samples from juvenile Chinook salmon, and download and mange PIT tag data in coordination with PTAGIS, submit annual monitoring and permitting reports, maintain field sampling equipment, and will present a final report to the LCEP Science Work Group.
2017- ongoing.

Pacific Avenue Wetland Delineation
I conducted a wetland delineation for a road safety improvement project, including surveying, mapping, and reporting for the City of Warrenton. 2014.

Steamboat Slough Restoration Project
I completed a pre-project wetland rating and debit/credit assessment for the Army Corp of Engineers at a juvenile salmonid habitat restoration project in the Julia Butler Hansen Wildlife Refuge, and assisted in completing restoration project permits. 2013.

Dibblee Point Restoration & Mitigation Project
I completed a pre-project wetland delineation and assessment of a juvenile salmon habitat restoration project with an emphasis on impacts of treatment actions in different wetland types (forested and herbaceous); drafted and implemented a mitigation plan for Teevin Bros., completed mitigation area monitoring and a light delineation, and submitted annual and final reports to the Department of State lands (DSL). 2012-2018.

Gearhart Local Wetlands Inventory
I assisted in public outreach, private property access, wetland determinations and mapping, and completion of the wetland inventory. 2010-2011.

TRAINING

Intermediate and Advanced Microsoft Excel 2016
Online courses 2018

Tree and Shrub Indentification for Western Washington Puget Lowland Habitats
Coastal Training Program 2017

Using the Credit/Debit Method for Estimating Mitigation Needs
Coastal Training Program 2016

Hydric soils for Regional Supplements, Professional Certificate of Completion of Wetland Delineation
Environmental Professional Program, Portland State University 2016

Using the Revised Washington State Wetland Rating System in Western Washington.
Coastal Training Program 2015

Grass, sedge, and Rush Identification for Western WA Puget Lowland Habitats.
Coastal Trining Program. 2015

Advanced Wetland Delineation Training.
Wetland Training Institute 2010

Introduction to Electrofishing.
Smith-Root, Inc. 2011

Coastal Application Using ArcGIS/Introduction to ArcGIS
NOAA Coastal Service Center 2007

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