

2015 Clackamas County Herpetological Surveys

In Coordination with:

Clean Water Services
Lake Oswego Corporation
Metro
Molalla River Watch
North Clackamas Parks and Recreation District
Oregon Wildlife
Oregon Department of Fish and Wildlife
Oregon Wildlife Institute
Oswego Lake Watershed Council
Pudding Watershed Council
Water Environment Services

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Introduction

This project was funded by the Oregon Zoo's Future for Wildlife Conservation Fund Grant Program and Oregon Wildlife's Beulah Drake Grant Program with matching funds and/or in-kind services provided by Washington County Clean Water Services, Oregon Department of Fish and Wildlife (ODFW), North Clackamas Parks and Recreation District (NCPRD) and Clackamas County Water Environment Services (WES) as part of a two-year effort to determine the presence of pond-breeding amphibians and turtles at selected sites within Clackamas County. Sites with known or potential suitable habitat were chosen by ODFW and local watershed councils and surveyed by 70 volunteers over 587 hours. These surveys will supply baseline data to monitor future population trends for the target species and inform potential on-the-ground management decisions including, but not limited to, habitat restoration projects. Particular outreach efforts were made to private landowners through independent watershed councils to facilitate the transmission of data produced by these surveys into the hands of individuals that will effect positive change for local wildlife and their habitats.

The need to spread awareness of the importance of protecting the environment in which we live and on which we depend has become increasingly obvious, particularly among the conscientious population of the Portland Metro region. Recent years have been a source of increasing data on the plight of wildlife globally, amphibian species in particular (Beebee, 2004). Turtles and pond-breeding amphibians require specific types of aquatic and terrestrial habitats, once quite common in the Lower Willamette Basin, but often lost or diminished in urban environments due to development. Remaining habitats are often degraded by non-native species (plant and animal) and various pollutants. Changes in hydrology, physical barriers to natural movement corridors, and the lack of key micro-habitat features are additional challenges. As the Portland Metro region continues to grow, the importance of monitoring and protecting vulnerable animal populations becomes progressively more important.

The first step in an organized effort to preserve the general abundance of any wild population is to gather data on the distribution and population densities of the species. Data on amphibian and reptile populations in the Portland Metro area have been more of a focus in recent years, yet heretofore no coordinated efforts had previously been done to collect data on this group of wildlife in Clackamas County. Amphibian egg mass surveys have been conducted in the Portland area for over ten years using a standardized protocol developed by Metro. During the 2015 survey efforts in Clackamas County, volunteers surveyed 34 sites up to four times each, searching for six species of pond-breeding amphibians while evaluating existing habitat conditions. A series of 3 turtle surveys at 26 potential turtle sites with a combined 38 observation points (OP's) were also conducted as part of an ongoing region-wide effort by the Oregon Native Turtle Working Group to determine the present distribution of turtle populations in the Portland Metro region in order to prevent further decline of Oregon's two native turtle species.

The long-term survival of urban wildlife will depend in part on an informed populace that recognizes the value of living in a place with whole ecosystems. Toward this goal, another objective of these surveys was to involve concerned citizens and educate the local community about the importance of maintaining a diverse local ecosystem. A training session was held in January 2015 at Chrysalis Farms, Damascus, Oregon to familiarize volunteers with the subjects, protocols, and rationale for the amphibian surveys. An additional training session was held in March 2015 at Meldrum Bar Park, Gladstone, Oregon to acquaint volunteers with the details of the turtle surveys. Onsite training at the time of the surveys was available for those who wanted to participate, but could not attend the training sessions in order to make the surveys inclusive of all who wanted to assist.

As the population of the Portland area continues to grow, more pressure is put on its green spaces to support wildlife populations. Little data existed about the specific wildlife populations at these sites prior to this series of surveys and the data collected from these surveys will provide baseline data to track future population changes acting as a barometer for monitoring the health of the local ecosystem. As more data is gathered on the mean habitat requirements of the target species, policies can be adopted to allow for the maximum success of urban wildlife. An informed and knowledgeable community will be crucial to preserving local species diversity and maintaining the high quality of life people living as part of an intact ecosystem enjoy.

Background

Amphibians

Amphibians are sensitive to many aspects of change to their environments. Pond breeding amphibians in particular are considered indicators of ecosystem health as they depend on both aquatic and terrestrial habitats. Amphibian egg mass surveys are conducted to assess wetland habitat conditions using pond-breeding amphibians as bio-indicators, to gather baseline information on amphibian species presence and relative abundance, and to identify opportunities to improve habitat conditions for local amphibian populations.

In the Portland area, there are six species of pond breeding amphibians: red-legged frog (*Rana aurora*), Pacific treefrog (*Pseudacris regilla*), northwestern salamander (*Ambystoma gracile*), long-toed salamander (*Ambystoma macradactylum*), rough-skinned newt (*Taricha granulosa*) and American bullfrog (*Lithobates catesbeianus*). Red-legged frog, Pacific treefrog, northwest salamander and long-toed salamander were targeted due to their conspicuous egg masses and relatively concurrent breeding seasons. Rough-skinned newts are also native to the area and breed in pond habitat, but their egg masses are much more difficult to locate due to their habit of laying single eggs attached to stems or leaves. Non-native invasive bullfrogs lay eggs in late spring and early summer, which falls outside the times of intense survey efforts. The target species all

breed in wetland and pond habitat safely accessible by volunteers using chest waders. Chance encounters with amphibians in terrestrial habitats and other species of interest were noted, but not the focus of the surveys.

Although amphibians are highly associated with aquatic habitats, their name correctly implies that they nearly all have the need for non-aquatic habitat as well. The amphibians targeted in these surveys also require a variety of micro-habitat types to fulfill their life histories. Oviposition is generally done by attaching egg masses to submergent and emergent vegetation, woody twigs, and debris in slow-moving water in ponds and vernal wetlands. Early stages including larvae and tadpoles require emergent vegetation for cover and food. Upon maturation, depending on species, most individuals will migrate short distances upland to feed and live, though some individuals and populations (*Ambystoma* spp.) will live their entire lifecycle in an aquatic state maintaining paedomorphic features such as external gills. All of the native species targeted for these surveys generally spend a majority of their lives away from aquatic habitat to complete their life cycle (i.e., moist micro-habitat features that provide ample foraging opportunity and hiding cover).

The red-legged frog is the most immediately threatened of the targeted amphibian species in this study. It is on Oregon's Sensitive Species List as "Vulnerable" in the Willamette Valley Ecoregion, a Strategy Species in the Oregon Conservation Strategy (ODFW 2006), and a U.S. Fish and Wildlife Service Species of Concern. They require forests with diverse understories of woody shrubs and herbaceous vegetation (Jones 2005). Their upland habitat requirements are more robust than other local species and likely a substantial reason why their populations are more threatened than other local species. Although the Portland Metro area has significant wetland remnants dating from before the rivers of the region were manipulated by human activity, sites with clean water and the presence of quality nearby upland habitat and safe corridors connecting them are limited. Maintaining the multiple distinct habitats necessary for all aspects of their life cycle is integral for the long-term survival of local amphibian populations.

Turtles

Surveys of potential turtle habitat were also conducted as part of an ongoing region-wide effort by the Oregon Native Turtle Working Group to better assess the present distribution of turtle populations in the Portland Metro region. Oregon has two native turtle species, the Western Painted Turtle (*Chrysemys picta belli*) and the Northern Pacific Pond Turtle (*Actinemys marmorata*). Oregon's native turtle populations face a number of threats including habitat loss, competition from invasive turtle species, road kills, and nest predation (Gervais et al. 2009). Three rounds of terrestrial observation surveys were conducted by volunteers at 26 sites between April and June 2015.

C. picta belli and *A. marmorata* require multiple habitats to accommodate the varied stages and requirements of their life cycle. Adults require soft-bottomed ponds with open water, places to bask (logs, rocks, protected banks) and low current velocity as well as

access to other similar habitats. Juveniles require emergent vegetation in which to hide and feed. For nesting, females need a vegetated substrate preferably near the water with southern exposure to help incubate the eggs (Kutschera 2010). Essential habitat connectivity is threatened by not only naturally occurring separation, but also anthropogenic fracturing, which combined with additional pressures including innate limited mobility, risk of predation, and pollution pose legitimate threats to the breeding populations.

Turtles are ectothermic, requiring long periods of basking to thermoregulate, maintain proper metabolic function, and incubate their eggs (Kutschera 2010). Turtles are easily disturbed due to their acute senses of sight and hearing. Therefore, ideal basking structures are located at a distance from the shore and command full view of their surroundings. All of the sites studied have been highly impacted and fragmented by human activities. Little wood and debris that would historically be naturally occurring turtle basking habitat remain in place due to the developed nature of the area. Sites chosen for surveys that lacked sufficient natural basking structures had temporary artificial basking structures placed in them with the purpose of aiding turtle observation.

Excellent in-depth details of turtle natural history and their status in the Portland region can be found in the Kutschera 2010 and Gervais et al. 2009 links in the bibliography.

Habitat Issues

Local turtle and amphibian populations require many of the same features provided by aquatic habitats and often share overlapping territories. The sites used in this study all contain at least one type of aquatic habitat and share several of the same major ecological issues: loss of habitat, decreasing water quality, and competition from invasive species.

Invasive plants and animals take over niches previously held by native species, disrupting local ecosystems to degrees varying from non-impactful isolated stands to ecosystem dominating monoculture. Non-native animals (eg. bullfrogs, red-eared sliders, nutria) compete for food and resources with natives. Limiting and controlling the spread of invasive animal species before they out-compete native species should be a priority. Invasive plants can alter the basic nature of the habitat and degrade its utility for native species. Controlling invasive plants and replacing them with native vegetation is another important step in improving the habitat quality at nearly all survey sites.

The foreboding reality of nearly all potential turtle habitat is that bullfrogs, red-eared sliders, and nutria, the dominant invasive fauna, require the same features as native turtles: year round water, emergent vegetation, and soft bottoms. Complete elimination of non-native species populations in the region is unlikely considering the present extent of established populations. The bullfrog population can best be controlled by limiting successful breeding opportunities through well timed egg mass roundups in June. The red-eared slider population would best be controlled through public outreach as wild release of pet turtles is the primary source of invasive sliders. Further studies need to be

conducted to determine best management practices for controlling local invasive nutria populations. As of now, they have no known natural predators or susceptible stages in their breeding cycle that can be exploited for population control.

Part of the life cycle of all target species in this study requires long periods of time submerged in water so maintaining a high water quality is important for both their short and long-term survival. The water quality of an area is affected by many factors including water flow rate, dissolved nutrient levels, and presence of anthropogenic pollutants. Primary sources of the aforementioned factors include a legacy of industrial pollutants, runoff of excess fertilizers and herbicides from agriculture and landscaping, and the bodily waste of non-migratory waterfowl.

Waterfowl frequently become non-migratory when they grow accustomed to being fed by humans. Oftentimes, this is a detriment to their health because they become reliant on one readily available source of food (often bread) that does not meet their natural health requirements. Year-round occupation of local waterbodies by waterfowl that have had their behaviors altered by human interaction results in excess nutrient loading leading to degraded water quality.

Historically, beaver have significantly change the hydrology of streams from a predominantly lotic to a lentic system. By building dams, beaver activity increases slow-water habitat favored by herpetofauna. The decline of the local beaver population, in conjunction with the draining of large areas of wetland habitat for human uses has caused many local rivers to become entrenched and is a large factor in amphibian and turtle population declines.

Restoration Efforts

The obvious answer to maintaining native herpetofauna populations in the area is to attempt to mimic historic conditions. This is a challenging task due to the spatial limitations imposed by human development and non-native plant and animal communities. Successful restoration projects will include an aspect of long-term maintenance, accountability, and supervision.

Methods

Amphibians

Visual encounter surveys were used to assess amphibian presence and relative abundance in wetland areas around Clackamas County. The surveys were timed to determine search intensity. Before each survey, date, site name, surveyor names, start time, weather conditions, and pertinent field notes were all recorded on the data sheet. Species, confidence level of correct species identification, number of egg masses, attachment material and stage of development were all recorded when an egg mass was encountered. The exact number of red-legged frog and northwest salamander masses was recorded as

well as an estimate (0, <10, 10-100, >100) of Pacific treefrog and long-toed salamander egg masses, as well as observation of other adult amphibian activities.

Waders, sanitized by a 70% isopropyl alcohol solution, were provided to volunteers when they did not have their own. Disinfecting waders to minimize their opportunity to become a vector to transport invasive plants and microbes to other sites is of the utmost priority. Use of walking sticks to safely determine the uncertain depth of surveyed wetlands was encouraged. Surveyors moved slowly and methodically in a grid-like pattern through the targeted wetland area searching for signs of amphibians and their egg masses. High priority target habitat within the survey areas contained one or more of the following features: 1. shallow water less than 1 meter deep, 2. south-facing areas with sunny exposure, 3. still and slow-moving backwater areas containing 4. attachment material including emergent vegetation, submergent vegetation, and woody debris with narrow stems. If conditions of the site did not allow for safe coverage of the entire survey area, a pedestrian survey was conducted along the perimeter of the inaccessible survey area.

When an egg mass was encountered, it was identified by unique characteristics of size shape, number and size of eggs, and consistency. If further identification was required, the masses were kept in the water and handled minimally in contact with human skin, often using a white plastic spoon to provide contrast for better viewing of the specimen. Details of the egg masses, as well as signs of amphibian occupation including presence of tadpoles, larvae, adults, and other non-targeted species as well as other factors which could influence amphibian activity were recorded.

After each survey, the end time and current water visibility were recorded. The red-legged frog population estimate conversion factor is one female to one egg mass found. The population estimate is double the estimated number of females.

Turtles

Turtle surveys were designed to determine turtle presence. Absence cannot be proven by lack of presence, nor can population numbers be inferred from this study. Site selection requirements consisted of: 1. A permanent body of water at least one meter maximum depth that could potentially meet the needs of the adult portion of a turtle's life cycle with a preference for sites containing 2. Emergent vegetation, and 3. Potential nesting areas, usually south facing, sun-exposed slopes with softer soil and breaks in the vegetation.

The survey data form contained entry fields for the date, surveyor name, site name, percent cloud cover, current wind conditions, temperature, and additional notes. Each blank area was to be filled in. When a turtle was observed, the time, species, number of turtles, age class, confidence level, and other notes were recorded.

Each surveyor was trained on how to prepare and use all of their equipment prior to approaching the site. The surveyors were to remain as still as possible for the entire

survey maintaining focus upon the subject area. Upon arrival at the designated observation point, the surveyor would perform an initial scan with bare eyes to take in the current conditions of the site. An additional scan with binoculars was executed in order to note anything of particular interest. Finer details were then investigated with the spotting scope. The procedure of scanning with tools of differing resolution would continue for a duration of 30 minutes. Due to the limited view of many of the observation points, surveyors were allowed to move slowly and quietly about to obtain a better and more complete view of the site at their discretion. A limited number of observation points were more appropriately designated as walking surveys due to the highly vegetated nature of the banks allowing no single sufficient view of a high percentage of the site as a whole.

Only one basking structure was built and placed in 2015 at a site that lacked ample and easily visible basking habitat from a designated Observation Point (OP). The structure was anchored at a location at least 2 meters from shore to allow the animal ‘space to be comfortable in’ while facilitating surveyor observation. Placing basking structures has the dual purpose of providing the turtles prime additional basking habitat as well as facilitating surveyor observation.

Results

Molalla Basin

The Molalla River is one of the few undammed rivers in the Pacific Northwest. With its headwaters on the western edge of Mount Hood National Forest, the river initially flows through timberland surrounding the Molalla River Recreation Corridor owned by the BLM. Further downstream large agricultural properties on flat bottomland frequently have ponds for irrigation and drainage that make excellent herpetofauna habitat. Milk Creek from the north, and the Pudding River from the south are its biggest tributaries. The Molalla River provides drinking water for the cities of Canby and Molalla making clean water a high priority.

Site Name: Molalla River State Park

Site UTM: 45.295325,-122.697431

Site Manager: Oregon State Parks, Private Landowner Montecucco Farms

Wildlife Survey Results: Red-legged Frog, Pacific Tree Frog, Northwest Salamander, Long-toed Salamander, American Bullfrog, Western Painted Turtle, Western Pond Turtle, Red-eared Slider

Water Body Type	Oxbow Lake split into 6 Ponds
Water Duration	Perennial
Median Depth	1m

Maximum Depth	2m
Overhead Canopy Cover (%)	20
Aquatic Vegetation (% open water)	70
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Moderate Leaf Litter, Down Wood
Distance to closest patch of Trees/Shrubs	<5m
Basking Structures	10+ logs
Invasive Plant Species	Himalayan Blackberry, Yellow Flag Iris, English Ivy

*Habitat Assessment describes Pond #2. Ponds numbered from north to south beginning with the private Montecucco Pond.

Description: This site was formerly a channel of the mainstem Willamette River that was cut off and formed an oxbow lake that was likely separated into individual ponds to drain the land for ease of agricultural use. The majority of the site is managed by Oregon State Parks and is used frequently by the public. Beaver are active in the area. Six of the seven ponds are in the park and are ringed by a well used walking path with a solid riparian buffer between the path and the ponds in most places. Ponds 5 and 6 are the most southern and most shaded of the site. They contained most of the salamander breeding activity due to their excellent attachment material. The Western Pond Turtle was sighted in Pond 6.

The largest pond, #1, lies farthest to the north. It is ringed by yellow flag iris and is privately owned as part of a farm operation. It was not surveyed for amphibian activity, but was observed with the highest occupancy by Western Painted Turtles, likely due to its relative lack of human occupation despite the lack of any true basking structure.

Recommendations: Add 3-10 logs to pond 1. Remove yellow flag iris and other invasives in a coordinated project beginning at pond 1. Plant native species to form a riparian zone that does not exclude direct sunlight from basking areas. Place informative signs along the trail as part of a self-guided tour with information about the local fauna that use the wetlands, the history of the oxbow, and the people of the historic Willamette floodplain.

Site Name: Lochs

Site UTM: 45.249903,-122.7003233

Site Manager: Private Nursery

Wildlife Survey Results: Western Painted Turtle, American Bullfrog

Water Body Type	Pond
Water Duration	Perennial
Median Depth	Unknown
Maximum Depth	Unknown
Overhead Canopy Cover (%)	5
Aquatic Vegetation (% open water)	95
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Moderate Leaf Litter
Distance to closest patch of Trees/Shrubs	<5m
Basking Structures	4 logs
Invasive Plant Species	Himalayan Blackberry
Other Notes	Pond a part of a larger oxbow/sidechannel system with great potential as wildlife habitat

Description: This pond is situated in the middle of a big bend in the Molalla River where it wraps around downtown Canby. Thirteen turtles were observed, at least six of them western painted turtles and the remainder unknown, but likely also western painted turtles. There is a very large gravel operation on the adjacent property, nearer the river that is likely also premium turtle habitat. Reports of western pond turtles in the area have not been confirmed.

Permission to survey the site was not obtained until mid-spring so no amphibian surveys were performed.

Recommendations: Perform amphibian egg mass surveys to establish baseline population numbers. Add 5-10 medium basking logs. Remove blackberry. Plant native vegetation in the riparian area. Re-establish complex side channel habitat between Highway 170 and Canby Community Park. Investigate a potential large scale project reestablishing side channel habitat on the Molalla River.

Site Name: Unnamed Tributary

Site UTM: 45.243422,-122.684469

Site Manager: Private Landowner, David Peter

Wildlife Survey Results: Pacific Tree Frog (heard), Northwest Salamander, Long-toed Salamander, American Bullfrog

Water Body Type	Pond/Wetland
Water Duration	Perennial
Median Depth	1m
Maximum Depth	1.5m
Overhead Canopy Cover (%)	5
Aquatic Vegetation (% open water)	65
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Brush Piles, Shallow Leaf Litter
Distance to closest patch of Trees/Shrubs	<10m
Basking Structures	2 logs
Invasive Plant Species	Himalayan Blackberry, Yellow Flag Iris

Description: This site is a private residence located south of where the Goods Bridge crosses the Molalla River. In March of 2012, about 2400 plants were planted along a quarter mile stretch of the Molalla River. A culvert impounds a small tributary to form a small pond whose open water area has been halved by yellow flag iris since the owner purchased the property in 2010. Upstream on the tributary lies an agricultural operation with a small pond containing a duck donut (manmade island) and cattails where most of the Northwest salamander egg masses were located. Long-toed salamander egg masses were found in relatively dense numbers in flooded tire grooves in fields.

Recommendations: Continue restoration plans removing invasive species and planting native species in the littoral zone and along the riparian banks of both the pond and mainstem Molalla. Inform farmers as to the presence of egg masses and larvae during times of vernal occupation (January through April).

Site Name: Union 701

Site UTM: 45.2125246,-122.6031476

Site Manager: Union 701

Wildlife Survey Results: Western Painted Turtle

Water Body Type	Pond
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Water Duration	Perennial
Median Depth	Unknown
Maximum Depth	Unknown
Overhead Canopy Cover (%)	5
Aquatic Vegetation (% open water)	Unknown
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Unknown
Distance to closest patch of Trees/Shrubs	<10m
Basking Structures	At least 1 log
Invasive Plant Species	Unknown

Description: This site has several large ponds located alongside the mainstem Molalla River. Permission to enter the property and survey for turtles could not be obtained. Western Painted Turtles were observed with spotting scopes from the road.

Recommendations: Obtain access and perform amphibian and turtle surveys to establish baseline populations.

Site Name: 312 LeRoy St Molalla

Site UTM: 45.150771,-122.588095

Site Manager: Private Landowner Bill Blackburn

Wildlife Survey Results: Pacific Tree Frog

Water Body Type	Swimming Pool
Water Duration	Perennial
Median Depth	1.5m
Maximum Depth	1.5m
Overhead Canopy Cover (%)	0
Aquatic Vegetation (% open water)	100
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Wood Piles, Shrubs

Distance to closest patch of Trees/Shrubs	<10m
Basking Structures	0
Invasive Plant Species	None

Description: The above ground swimming pool on this property near the center of Molalla has for years seen Pacific Tree Frog breeding activity. The owner reported that this year there was considerably less activity than usual. Recent nearby development has likely had an impact by decreasing habitat in the area.

Recommendations: Educate landowners about ways to landscape that build habitat for amphibians.

Site Name: Creamery Creek Pond

Site UTM: 45.1536761,-122.5789847

Site Manager: City of Molalla

Wildlife Survey Results: Pacific Tree Frog, American Bullfrog

Water Body Type	Wetland/Pond
Water Duration	Perennial
Median Depth	1m
Maximum Depth	2m
Overhead Canopy Cover (%)	20
Aquatic Vegetation (% open water)	90
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Moderate Leaf Litter, Down Wood
Distance to closest patch of Trees/Shrubs	5m
Basking Structures	5 logs
Invasive Plant Species	Reed Canary Grass, Himalayan Blackberry
Other Notes	Pond likely formed by beaver activity

Description: Creamery Creek Pond is located where the Creamery Creek first emerges above ground in Molalla. It then runs through a subdivision and agricultural land with little riparian vegetation before it drains into Gribble Creek and eventually into the Molalla River. This wetland pond was created by beaver activity and the surrounding area is inundated with Reed Canary Grass. Downstream, Creamery Creek parallels the Molalla Forest Rd which has potential as a public use pedestrian and bike path.

Recommendations: As this site is located near the headwaters of the creek, it holds large potential for a major restoration project. Planting native wetland plants and maintaining them until they grow taller than invasive grasses would be a key part of this initiative.

Site Name: Aquila Vista

Site UTM: 44.9845674,-122.493515

Site Manager: Bureau of Land Management

Wildlife Survey Results: Red-legged Frog, Pacific Tree Frog, Northwest Salamander, Rough-skinned Newt

Water Body Type	Beaver Pond/Wetland
Water Duration	Perennial
Median Depth	1m
Maximum Depth	2.5m
Overhead Canopy Cover (%)	10
Aquatic Vegetation (% open water)	65
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Deep leaf litter, Down wood
Distance to closest patch of Trees/Shrubs	0m
Basking Structures	10+ logs
Invasive Plant Species	Himalayan Blackberry, Reed Canary Grass

Description: Aquila Vista is located in the upper part of the Molalla River Basin and is used as an outdoor education site for students and private groups. The primary water source is a small waterfall flowing over the cliff which has been dammed twice by beaver backing the water up to form one large pond and a smaller wetland. The vegetation in the area is primarily native and the larger pond has an abundance of wood varying in size from small branches to old growth reminiscent of what most beaver ponds used to look

like before wood was a commodity. The site is surrounded by second-growth forest which provides substantial upland habitat necessary for red-legged frogs and northwest salamanders full life cycle. Over 500 red-legged frog egg masses were observed during surveys which is quite a large population.

Recent reports indicate that the beaver dams may have been abandoned since the surveys were completed. No turtles were observed at the site.

Recommendations: This site could be used as part of a long-term study to track the health of red-legged frog populations.

Milk Creek Basin

Milk Creek drains the small cities of Mulino and Colton. The area is largely undeveloped and the land-use of the basin consists primarily of timber and agriculture.

Site Name: Ranch Hills Golf Course

Site UTM: 45.2202129,-122.5738621

Site Manager: Private Landowner

Wildlife Survey Results: Red-legged Frog, Northwest Salamander, Long-toed Salamander

Water Body Type	Pond
Water Duration	Perennial
Median Depth	1m
Maximum Depth	2m
Overhead Canopy Cover	0
Aquatic Vegetation (% open water)	80
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Sparse overgrown grass areas
Distance to closest patch of Trees/Shrubs	100m
Basking Structures	10+ rocks
Invasive Plant Species	Reed Canary Grass

*Habitat assessment describes Pond near Hole #9.

Description: The water features on Ranch Hills Golf Course consists of 2 ponds and Milk Creek flowing right through its center. The riparian area around the creek is quite

limited with little wetted area outside of the active channel and no egg masses were observed. The first pond, located near hole #1, is small and shaded and contained 11 Northwest salamander egg masses attached to the plethora of small twigs in the pond. The second pond, near hole #9, is much larger and held 4 red-legged frog masses and over 40 northwest salamander egg masses. Koi were recently introduced to the second pond from an upstream neighbor. The area east of the site is forested upland, likely providing high quality upland habitat required by these species during the non-breeding seasons.

A new development adjacent to the golf course was recently built and the water of the wetland drained into a lake now called Trinity Lake. About 60% of the banks are mowed up to the water's edge. 14 Northwest salamander egg masses were observed, all in places containing emergent vegetation.

Turtle surveys were not performed.

Recommendations: A wildlife corridor featuring overgrown grasses and ground cover connecting the pond on the golf course to the upland habitat would improve accessibility between different habitat features for native amphibians. Planting native vegetation along Milk Creek, around the pond at hole #9, and around 90% of the banks of Trinity Lake would benefit amphibian populations as well as providing attachment material and emergent vegetation for juvenile populations. Installing a small fence around riparian areas to keep rolling golf balls out and would help delineate a wider riparian zone that could allow taller and wilder for cover for amphibians.

Site Name: Big Rock Lake

Site UTM: 45.2060125,-122.5470515

Site Manager: Private Landowners

Wildlife Survey Results: American Bullfrog

Water Body Type	Manmade Lake
Water Duration	Perennial
Median Depth	Unknown
Maximum Depth	5m
Overhead Canopy Cover (%)	15
Aquatic Vegetation (% open water)	95
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Deep leaf litter, Brush piles, and Down wood

Distance to closest patch of Trees/Shrubs	0m
Basking Structures	3 logs, 2 rocks
Invasive Plant Species	Yellow Flag Iris

Description: Big Rock Lake is over 7 acres in area and drains into Milk Creek just downstream of Cedar Creek. The shoreline is nearly fully wooded and there are several corners with emergent vegetation. There is abundant wooded area with deep leaf litter meaning all phases of the amphibian and turtle life cycles should be present. Pet turtles, likely red-eared sliders, were released and were seen in the lake until about 2012.

No amphibian surveys were performed.

Recommendations: Educate landowners about ways to improve their land and lake as amphibian and turtle habitat while also keeping its recreational assets accessible. Treat the yellow flag iris before it becomes dominant.

Site Name: Bonnell

Site UTM: 45.19827,-122.556311

Site Manager: Private Landowner

Wildlife Survey Results: Pacific Tree Frog (adult)

Water Body Type	Pond
Water Duration	Perennial
Median Depth	2m
Maximum Depth	3m
Overhead Canopy Cover (%)	25
Aquatic Vegetation (% open water)	90
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Moderate leaf litter, Down wood
Distance to closest patch of Trees/Shrubs	5m
Basking Structures	0
Invasive Plant Species	Himalayan Blackberry

Other Notes	
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Description: This small pond is located a short distance away from Milk Creek. The banks are quite steep on 3 sides dropping off too quickly for emergent vegetation. There is limited attachment material with only a few willow saplings along the banks. No turtle surveys were performed.

Recommendations: Plant native plants around some of the perimeter of the pond. Allow fallen trees and branches to remain in place to provide salamander habitat. Enhance a wildlife corridor connecting the pond to Milk Creek and other nearby habitats in part by allowing more grass to go unmowed.

Site Name: Harold Howard
Site UTM: 45.193767,-122.551563
Site Manager: Private Landowner
Wildlife Survey Results: American Bullfrog, Western Painted Turtle

Water Body Type	Pond
Water Duration	Perennial
Median Depth	1m
Maximum Depth	2m
Overhead Canopy Cover (%)	10
Aquatic Vegetation (% open water)	95
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Shallow Leaf litter, Down wood
Distance to closest patch of Trees/Shrubs	5m
Basking Structures	Banks
Invasive Plant Species	Yellow Flag Iris

Description: This active farm contains a small hand dug pond at the base of a wooded hillside on the edge of a field used as pasture for a donkey. There is good emergent vegetation. Bass were stocked in the pond years ago. One painted turtle was sighted but up to five have been seen. A pile of blown down logs is stacked next to the pond waiting to be milled. Permission to survey this site was not obtained until the end of spring. Amphibian surveys were not performed and only one turtle survey occurred.

Recommendations: Place two logs in the pond to provide premium basking areas for resident turtles. Perform full amphibian and turtle surveys to document the site. Fence off a small portion of the pond for livestock access.

Site Name: Silverthorn

Site UTM: 45.1665085,-122.4256633

Site Manager: Private Landowner

Wildlife Survey Results: Red-legged Frog, Pacific Tree Frog (calling), Northwest Salamander, Rough-skinned Newt

Water Body Type	Pond with earthen dam
Water Duration	Perennial
Median Depth	1m
Maximum Depth	2m
Overhead Canopy Cover (%)	10
Aquatic Vegetation (% open water)	90
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Leaf litter, Down wood
Distance to closest patch of Trees/Shrubs	5m
Basking Structures	2 logs
Invasive Plant Species	None

Description: This privately owned site is located along the course of South Fork Bee Creek. All of the observed egg masses were seen in a manmade pond behind an earthen dam. There are beaver present in the area creating other potential amphibian breeding habitat. A landowner recently tore out a beaver dam for fear of flooding.

No turtle surveys were performed.

Recommendations: Meet with landowners to learn about their needs and how beaver habitat needs can coexist.

Site Name: Gard Rd

Site UTM: 45.2258647,-122.4824395

Site Manager: Private Landowner Mark Schmidt

Wildlife Survey Results: Red-legged Frog, Pacific Tree Frog, Northwest Salamander, Rough-skinned Newt, American Bullfrog

Water Body Type	Beaver Pond/Wetland/Stream
Water Duration	Perennial
Median Depth	1m
Maximum Depth	2.5m
Overhead Canopy Cover (%)	20
Aquatic Vegetation (% open water)	40
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Deep leaf litter, Down wood
Distance to closest patch of Trees/Shrubs	0m
Basking Structures	5 logs
Invasive Plant Species	Reed Canary Grass

Description: Located near the headwaters of Cedar Creek in a rural setting, this beautiful beaver created wetland contains excellent amphibian breeding habitat in close to perfectly natural conditions. With abundant emergent vegetation, a variety of native vegetation and minimal invasive species, and a large variety of micro-habitats, this site supports a large number and variety of amphibians.

Recommendations: This site should continue to be monitored as the area develops. Every 5 years should be enough unless there is a major change in the area.

Pudding River Basin

Site Name: Pat's Racing Acres

Site UTM: 45.261787,-122.740914

Site Manager: Private Landowner

Wildlife Survey Results: No amphibian or turtle presence detected.

Water Body Type	Oxbow Lake
Water Duration	Perennial
Median Depth	Unknown

Maximum Depth	Unknown
Overhead Canopy Cover (%)	25
Aquatic Vegetation (% open water)	80
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Moderate Leaf Litter, Down Wood
Distance to closest patch of Trees/Shrubs	0m
Basking Structures	5+ logs
Invasive Plant Species	Himalayan Blackberry
Other Notes	Frequent, extended loud noise volumes

Description: This site is located on a big bend in the Pudding River. The oxbow is still connected to the river but the flow is much slower. The go kart race track on the site is quite loud and may be the primary reason for low herpetofauna occupancy.

Amphibian egg mass surveys were not performed.

Recommendations: Perform amphibian egg mass surveys to establish a baseline presence.

Site Name: Manuel

Site UTM: 45.1557559,-122.700722

Site Manager: Private Landowner Allen Manuel

Wildlife Survey Results: Red-legged Frog, Pacific Tree Frog, Northwest Salamander, Long-toed Salamander, American Bullfrog

Water Body Type	Manmade Pond
Water Duration	Perennial
Median Depth	1m
Maximum Depth	2m
Overhead Canopy Cover (%)	40
Aquatic Vegetation (% open water)	85

Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Moderate Leaf Litter
Distance to closest patch of Trees/Shrubs	0m
Basking Structures	5 logs
Invasive Plant Species	Reed Canary Grass, Himalayan Blackberry

Description: This privately owned pond lies between Bear and Rock Creeks in the midst of a large agricultural area. Water flows into the pond through tile pipes and is likely highly enriched by fertilizer. There is an island and a long peninsula with excellent wood complexity and good attachment material. The northern end of the pond is shaded by large cottonwood trees. The surrounding properties are mainly nurseries with moderate potential as upland habitat.

Recommendations: Test the water and inform the neighbors of the results regarding toxins and the effects on amphibians.

Site Name: St. Josef's Winery

Site UTM: 45.190103,-122.721524

Site Manager: Private Landowner

Wildlife Survey Results: Rough-skinned Newt, American Bullfrog, Western Painted Turtle

Water Body Type	Manmade Pond
Water Duration	Perennial
Median Depth	Unknown
Maximum Depth	2+m
Overhead Canopy Cover (%)	0
Aquatic Vegetation (% open water)	95
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Shallow Leaf Litter
Distance to closest patch of Trees/Shrubs	5m
Basking Structures	1 log

Invasive Plant Species	Himalayan Blackberry, Reed Canary Grass
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Description: This large pond near the lower section of Bear Creek has an established population of Western Painted Turtles. Although, only a maximum of two were sighted in these surveys, recent reports have up to 7 confirmed at the site. There is one medium log that they often bask upon. The banks are 50% blackberry thicket and 50% nearly bare creating little attachment material for amphibians. Livestock have open access to the pond.

Recommendations: Place 2-4 medium logs on the northern banks for turtle habitat. Fence out the livestock and plant native species along the degraded north and eastern banks. Remove blackberry.

Site Name: Shorty's Pond

Site UTM: 45.136952,-122.571861

Site Manager: City of Molalla

Wildlife Survey Results: Pacific Tree Frog, American Bullfrog, Red-eared Slider

Water Body Type	Manmade Pond/Wetland
Water Duration	Perennial
Median Depth	1m
Maximum Depth	2m
Overhead Canopy Cover (%)	15
Aquatic Vegetation (% open water)	95
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Moderate Leaf Litter, Down Wood
Distance to closest patch of Trees/Shrubs	5m
Basking Structures	1 placed BS, 3 small logs
Invasive Plant Species	Reed Canary Grass, Himalayan Blackberry

Description: This pond is formed by an earthen dam near the headwaters of Bear Creek and is known for its trout fishing accessibility for children. It has excellent potential to serve as critical breeding habitat for native pond-breeding amphibians. There is virtually

no emergent vegetation or attachment material for amphibians. One artificial BS was placed in the pond due to the lack of basking structures for turtles to bask on. An invasive red-eared slider was sighted in nearly every turtle survey. On the last survey, a second unknown turtle was sighted. Several years ago a restoration effort was attempted with several hundred native plantings.

Recommendations: Place 1-4 medium logs to add structure and complexity. Plant native vegetation with maintenance plan for enhanced plant survival. If there are 2 invasive turtles they may be able to establish a permanent population and efforts should be made to prevent this from occurring. Place a sign stating the negative impacts invasive animals have on native wildlife.

Site Name: Wade Rice

Site UTM: 45.087007,-122.542796

Site Manager: Private Landowner Wade Rice

Wildlife Survey Results: Northwest Salamander, Rough-skinned Newt

Water Body Type	Natural Swale
Water Duration	Perennial
Median Depth	0.5m
Maximum Depth	1m
Overhead Canopy Cover (%)	80
Aquatic Vegetation (% open water)	85
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Deep Leaf Litter, Down Wood
Distance to closest patch of Trees/Shrubs	0m
Basking Structures	1 log
Invasive Plant Species	None

Description: This privately held site is located in shady second growth forest near the headwaters of Teasel Creek that eventually feeds into the Pudding River. The pond is spring fed and naturally forms a meter deep pool with lots of twigs for attachment material which is perfect for Northwest salamander breeding.

Recommendations: Monitor for changes as the surrounding forest changes.

Pudding Turtle Surveys by Canoe

Description: Three days of surveys were done by canoe beginning at Whiskey Hill Rd (45.1799103,-122.7556064) in Aurora down through the mouth of the Pudding River, the lower Molalla River with the boat pulling out at Molalla River State Park (45.2937776, -122.7156185) along the Willamette River. Over the course of the surveys, nearby oxbows were investigated for turtle presence when possible. One significant painted turtle population of at least 30 turtles was discovered in an oxbow just upstream of Arndt Rd (45.256297,-122.744265). Two other adult painted turtles were seen basking between Anderson Rd and Arndt Rd. A juvenile red-eared slider was sighted a quarter mile upstream of Molalla River State Park's boat ramp. Significant knotweed is established in the Molalla River somewhere upstream of the Pudding confluence. There is suitable basking habitat throughout the lower 18 miles of the Pudding system.

Recommendations: Outreach efforts should be made to contact landowners of the large amount of lowland former oxbows on the floodplain of the Pudding River and inform them of their importance in maintaining healthy turtle populations in the area.

Abernethy Basin

The Abernethy is a small drainage between the Clackamas River basin and Beaver Creek in northern Oregon City. There is a large amount of recent and historical turtle activity reported, but no observation points were available. The upper basin is largely undeveloped and contains all of the habitat requirements for native turtles and amphibians.

Site Name: Clackamas Community College Environmental Learning Center (ELC)

Site UTM: 45.3279241, -122.5701363

Wildlife Survey Results: Red-eared slider, Red-legged Frog, Northwest Salamander, Pacific Tree Frog, Long-Toed Salamander, American Bullfrog

Water Body Type	Man-made Pond
Water Duration	Perennial
Median Depth	1m
Maximum Depth	1.5m
Overhead Canopy Cover	35%
Aquatic Vegetation (% open water)	60% polygonum, 20% Open Water, 10% Willow, 10% Grass

Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Moderate Leaf Litter, Down Wood
Distance to closest patch of Trees/Shrubs	0m
Basking Structures	1 log
Invasive Plant Species	Reed Canary Grass

Description: The Clackamas Community College Environmental Learning Center is the site of a former Smuckers berry processing plant and is the headwaters of Newell Creek. The creek appears out of a culvert from nowhere as across the street from the ELC are ballfields where runoff feeds the creek. There are two small former settling ponds with a majority of its area covered by an abundant species of native polygonum providing excellent attachment for Pacific tree frog, red-legged frog, long-toed salamander, and northwest salamander egg masses. There was a significant dropoff of red-legged frog egg masses (2014: 88, 2015: 36) in the ponds in 2015, which could be attributed to only visiting the site once but should be monitored for trends that place the local population in danger. Other egg mass quantities remained similar. The lone red-eared slider was not sighted during brief visits but likely still lives in the larger pond. Plans are being made to bring a natural meander back to the creek.

Recommendations: When the restoration of the creek is done, care should be made to preserve the current amphibian breeding habitat by maintaining ample habitat out of the main channel. The slider should be removed. Install educational signs about turtles to deter future releases of pet turtles by students or citizens and about amphibians to inform visitors as to the importance of the site.

Site Name: Yodis

Site UTM: 45.358871,-122.525302

Site Manager: Private Landowner

Wildlife Survey Results: Red-legged Frog

Water Body Type	Creek/Beaver Ponds
Water Duration	Perennial
Median Depth	0.25m
Maximum Depth	1m
Overhead Canopy Cover (%)	70
Aquatic Vegetation (% open water)	85

Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Leaf Litter, Down Wood
Distance to closest patch of Trees/Shrubs (m)	0
Basking Structures	Numerous logs
Invasive Plant Species	None
Other Notes	

Description: This privately owned site is a portion of Potter Creek slowed by several beaver dams. One red-legged frog mass was observed, but the water generally has too much velocity to be considered appropriate for native amphibian breeding. The ponds are likely too small to attract native turtles. If the beaver continue to maintain and build in the basin, habitat could be created suitable for use by native turtles and amphibian species.

Recommendations: Continue to monitor the area when changes in local land-use occur.

Beaver Creek Basin

Beaver Creek is a minor tributary to the Willamette River draining the southern part of Oregon City south to Camas squeezed between the larger Clackamas and Molalla Rivers along with Abernethy Creek. The southern border of the Metro Urban Growth Boundary contains the northern edge of this watershed so the basin retains a primarily agricultural nature with development encroaching. There are remnant turtle populations, a multitude of beaver dams, healthy amphibian populations and large areas of near-pristine uplands. Special attention should be kept on this basin as the density of an urban area puts pressure on a traditionally rural area.

Site Name: Stone Creek Golf Club

Site UTM: 45.2987971,-122.5640409

Site Manager: Stone Creek Golf Club

Wildlife Survey Results: Red-legged Frog, Pacific Tree Frog, Northwest Salamander, Long-toed Salamander, American Bullfrog, Western Painted Turtle, Red-eared Slider

Water Body Type	Creek/4 Ponds
Water Duration	Perennial
Median Depth	Unknown (1m)

Maximum Depth	Unknown (3m)
Overhead Canopy Cover (%)	10
Aquatic Vegetation (% open water)	85
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Rock Piles, Shallow Leaf Litter
Distance to closest patch of Trees/Shrubs	5m
Basking Structures	10+ rocks, 4 logs
Invasive Plant Species	Reed Canary Grass, Himalayan Blackberry

*Habitat Summary of Pond C

Description: This golf club is managed privately on land owned by Clackamas County. Beaver Creek flows through the northern area with numerous beaver dams expanding the wetland's surface area and a forest following both sides of the creek providing upland habitat. Ponds B, C and D all contain large and/or small mouth bass populations, which prey upon juvenile amphibians and limit their success. Pond A lies furthest to the east and is a vernal wetland drying up at the end of spring to eliminate fish as predators and contained most of the red-legged frog egg masses (7). The innovative use of fishing line around the perimeter of ponds to limit Canada geese access appears to prevent excessive use by geese.

Recommendations: This site contains excellent elements of amphibian and turtle presence but could flourish with a few modifications. Finding a way to remove bass from the 3 larger ponds (temporary draining, fishing derby) would improve the success of juvenile amphibians and turtles. Maintaining and/or enhancing the unmowed buffer area, particularly Pond B, around the water features will improve the habitat for amphibians. Possibly installing a short fence around riparian areas to keep rolling golf balls out and delineate a riparian zone would allow wilder cover for amphibians without excessively interrupting business and recreation. Placing signs informing people of the dangers invasive turtles pose to native turtles will help prevent the release of more red-eared sliders and avoid their becoming further established.

Site Name: Oregon City Golf Course

Site UTM: 45.3161772,-122.5486191

Site Manager: Privately Owned and Operated.

Wildlife Survey Results: Red-legged Frog, Rough-skinned Newt

Water Body Type	3 Ponds
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Water Duration	Perennial
Median Depth	1m
Maximum Depth	1.5m
Overhead Canopy Cover (%)	0
Aquatic Vegetation (% open water)	95
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	None
Distance to closest patch of Trees/Shrubs	100m
Basking Structures	0
Invasive Plant Species	0

Description: This privately owned and operated golf course built the 3 water features present primarily for irrigation purposes. There is virtually no riparian buffer and very little emergent vegetation. East of the golf course lies excellent upland habitat around the headwaters of Thimble Creek.

Recommendations: Leave a 1-2m buffer zone around the ponds and encourage emergent vegetation to grow. Allowing grass and shrubs to grow taller to form a rough corridor connecting the water to the nearby upland habitat would make the ponds more enticing for use. Installing a small fence around riparian areas to keep rolling golf balls out and delineate a riparian zone would allow taller and wilder for cover for amphibians. As the area develops further efforts should be made to maintain intact upland habitat and keep it connected to other natural areas such as the golf course.

Site Name: Mud Creek Main

Site UTM: 45.3233842,-122.5957884

Site Manager: Oregon City Public Works

Wildlife Survey Results: Red-legged Frog, Pacific Tree Frog, Northwest Salamander, Rough Skinned Newt, American Bullfrog, Western Painted Turtle

Water Body Type	Beaver Pond
Water Duration	Perennial
Median Depth	1m
Maximum Depth	2m

Overhead Canopy Cover (%)	20
Aquatic Vegetation (% open water)	90
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Deep Leaf Litter, Down Wood
Distance to closest patch of Trees/Shrubs	0m
Basking Structures	7 logs
Invasive Plant Species	Reed Canary Grass

*Habitat Assessment of Mud Creek Mainstem Pond at Meyers Rd

Description: This site lies near the headwaters of Mud Creek between numerous sub divisions in a broad riparian area. There are active beaver in the area creating excellent conditions for amphibian breeding and turtle basking. The limited nearby upland habitat likely limits the local red-legged frog and northwest salamander populations. A bioswale under power lines on the east side of Meyers Rd contained densely clustered (>100) Pacific tree frog egg masses and 2 red-legged frog egg masses. A healthy population of Western Painted Turtles could exist on private land downstream from this site which was unable to be accessed for these surveys.

Recommendations: Maintain firm buffers protecting wetlands and the stream from excessive development and human contact. Contact landowners to perform surveys and educate them on the value of maintaining a healthy riparian area and the place of beaver within the local ecosystem.

Site Name: Mud Creek Duck Pond

Site UTM: 45.3196823,-122.5827157

Site Manager: Oregon City Public Works

Wildlife Survey Results: American Bullfrog, Western Painted Turtle, Red-eared Slider

Water Body Type	Beaver Pond
Water Duration	Perennial
Median Depth	0.5m
Maximum Depth	1m
Overhead Canopy Cover (%)	30
Aquatic Vegetation (% open water)	90

Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Shallow Leaf Litter
Distance to closest patch of Trees/Shrubs	5m
Basking Structures	2 logs
Invasive Plant Species	None

Description: This shallow beaver pond is on a tributary of Mud Creek that attracts many pedestrians who stop to feed the ducks. Largely unnoticed, are the turtles who frequent the site. There were no amphibian egg masses observed during surveys.

Recommendations: Place signs advising people why feeding animals is harmful to native wildlife and what should be done with unwanted pets. Remove invasive red-eared slider and control bullfrog populations, potentially by organizing local volunteers.

Site Name: CSWCD Demonstration Farm 22055 S Beavercreek Rd

Site UTM: 45.28685,-122.529872

Site Manager: Clackamas Soil and Water Conservation District

Wildlife Survey Results: Red-legged Frog, Northwest Salamander, Rough-skinned Newt, American Bullfrog

Water Body Type	2 Ponds
Water Duration	Perennial
Median Depth	1m
Maximum Depth	2m
Overhead Canopy Cover (%)	10
Aquatic Vegetation (% open water)	90
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Shallow Leaf Litter
Distance to closest patch of Trees/Shrubs	5m
Basking Structures	Bare Banks
Invasive Plant Species	None

*Habitat Assessment of northern pond

Description: This site was recently purchased by the Clackamas Soil and Water Conservation District for use as a Demonstration Farm to show exhibit more ecological and efficient ways to run a farm. Llamas are kept on the property and the farmland is being allowed to recharge and regenerate its vital balance. The eastern pond is spring fed and ringed by decorative birch trees. The smaller western pond has a concrete dam slowing a small tributary to Beaver Creek that formerly powered a still-standing mill. Limited nearby upland habitat likely limits the breeding population of these ponds with the nearest significant forest about a half mile downstream. There is little attachment material present for amphibian egg masses.

No turtles were detected. There are reports that turtles were formerly present around 2012.

Recommendations: An ailing birch tree was felled into the spring-fed pond providing attachment material for amphibian egg masses. Adding 2-3 more logs in each pond will improve the structure for herpetofauna needs. Encouraging or planting further emergent vegetation will allow for possible expansion of amphibian breeding and potential turtle juvenile habitat should they return.

Site Name: Tooze

Site UTM: 45.3193652,-122.5722815

Site Manager: Private Landowner Dan Tooze

Wildlife Survey Results: Red-legged Frog, Pacific Tree Frog, Northwest Salamander, American Bullfrog, Unknown Turtles

Water Body Type	Manmade Pond
Water Duration	Perennial
Median Depth	1m
Maximum Depth	3m
Overhead Canopy Cover (%)	10
Aquatic Vegetation (% open water)	90
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Shallow Leaf Litter, Brush Piles, Down Wood
Distance to closest patch of Trees/Shrubs	5m
Basking Structures	3 Logs, Shoreline Rocks

Invasive Plant Species	Reed Canary Grass, Himalayan Blackberry
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Description: This property is situated on the southern edge of the UGB. A large pond runs under a large BPA powerline that is formed by an impoundment in Caufield Creek that has been built upon by a local beaver population. Historically, western pond turtles, western painted turtles, and red-eared sliders have all been sighted here. Downstream lies a forested area that is functional upland habitat.

Recommendations: Remove blackberry on the north side of the pond and plant native species. Add 2-5 more logs for basking. With its proximity to Clackamas Community College the area has potential as a park with a walking path and educational signs.

Site Name: Lazy S Home Pond

Site UTM: 45.2351921,-122.5070821

Site Manager: Private Landowner

Wildlife Survey Results: Red-legged Frog, Northwest Salamander

Water Body Type	Pond
Water Duration	Perennial
Median Depth	1m
Maximum Depth	1.5m
Overhead Canopy Cover (%)	80
Aquatic Vegetation (% open water)	70
Terrestrial Micro Habitats (Leaf Litter, Brush Piles, Rock Piles, Down Wood)	Leaf Litter, Down Wood
Distance to closest patch of Trees/Shrubs	0m
Basking Structures	None
Invasive Plant Species	Himalayan Blackberry

Description: This small pond was originally dug out for irrigation but now serves as excellent amphibian breeding habitat. Lying beneath a forested canopy there are plenty of sticks to serve as attachment material for a dense concentration of Northwest salamander egg masses.

Recommendations: Monitor the area about every 5 years or when a change is made to the forested nature of the area.

Site Name: Lazy S Lumber

Site UTM: 45.238199,-122.501542

Site Manager: Lazy S Lumber

Wildlife Survey Results: Red-legged Frog, Pacific Tree Frog, Northwest Salamander, Rough Skinned Newt

Water Body Type	Wetland/Pond
Water Duration	Perennial
Median Depth	2m
Maximum Depth	3m
Overhead Canopy Cover (%)	10
Aquatic Vegetation (% open water)	80
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Deep Leaf Litter, Down Wood
Distance to closest patch of Trees/Shrubs	0m
Basking Structures	3 logs
Invasive Plant Species	Reed Canary Grass

Description: This operational lumber mill is located near the headwaters of Buckner Creek in a largely undeveloped area. There is excellent emergent and submergent vegetation providing attachment for red-legged frog and northwest salamander egg masses as well as mature second growth forest that serves as excellent upland habitat providing superb fulfillment of all aspects of the amphibian life cycle. No turtles were observed.

Recommendations: Monitor the area about every 5 years or when a change is made to the forested nature of the area.

Site Name: Merrywood Farm

Site UTM: 45.265861,-122.616086

Site Manager: Private Landowner

Wildlife Survey Results: Red-legged Frog, Pacific Tree Frog, Northwest Salamander, Rough-skinned Newt, American Bullfrog

Water Body Type	Beaver Pond
Water Duration	Perennial
Median Depth	0.5m
Maximum Depth	1.5m
Overhead Canopy Cover (%)	25
Aquatic Vegetation (% open water)	65
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Deep Leaf Litter, Down Wood
Distance to closest patch of Trees/Shrubs	0m
Basking Structures	1 log
Invasive Plant Species	Reed Canary Grass, Himalayan Blackberry

*Habitat Assessment of Beaver Pond

Description: Merrywood Farm is a Christmas tree farm situated on 45 acres. There are a variety of wet habitats, including heavy beaver activity along a tributary to Parrott Creek, a spring-fed pool and a vernal swamp, as well as forested upland habitat satisfying all aspects of all of our native amphibians' habitat needs. There have been historical sightings of western pond turtles in the area, but none were observed during our survey. The landowners have attracted bluebirds to the property.

Recommendations: Monitor the area about every 5 years or when a change is made to the forested nature of the area.

Gladstone Area

The drainages of the City of Gladstone, Forest, Boardman and Rinearson Creeks, are remnants of a vast wetland that filled the current McLoughlin Boulevard Corridor 150 years ago (Boardman Watershed Initiative, September 26, 2014). Although the population of the region growing, there are still some strong pockets of amphibian and turtle activity. Efforts to maintain riparian buffers are being made. Particular attention should be paid to building and maintaining upland habitat and keeping it connected to wetlands and riparian areas in the area.

Site Name: Stringfield Family Park/Trolley Trail

Site UTM: 45.39877, -122.625102

Site Manager: NCPRD

Wildlife Survey Results: Northwestern Salamander, Pacific Treefrog, American Bullfrog

Water Body Type	Stream
Water Duration	Perennial
Median Depth	0.5m
Maximum Depth	2m
Overhead Canopy Cover (%)	40
Aquatic Vegetation (% open water)	40
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Shallow Leaf Litter, Down Wood
Distance to closest patch of Trees/Shrubs	>100m
Basking Structures	None
Invasive Plant Species	Yellow Flag Iris, Himalayan Blackberry

*Habitat Assessment is of a beaver dammed area east of the Trolley Trail

Description: The Trolley Trail and Stringfield Family Park are both managed by NCPRD. The popular bike path runs through the recently restored riparian area in Stringfield Family Park then follows along Boardman Creek upstream to Boardman Wetlands. Beaver activity along the Trolley Trail Bike Path creates meter deep, slow-moving water with numerous willow branches for attachment material, the habitat preferred for breeding by northwest salamanders. It should be noted that this area superficially appears to be more polluted than the Boardman wetlands upstream yet it contains Northwest salamander egg masses where the more apparently typical amphibian habitat upstream contains none, possibly indicating a neotenic population due to the limited surrounding upland habitat. Efforts to prevent beaver activity from flooding the adjacent bike trail have met mixed results. Yellow flag iris is abundant along the Trolley Trail, dominant in some areas. Additional areas were surveyed in 2015, but there was also a significant increase in density of Northwest salamander egg masses (2014: 30 AMGR, 2015: 95 AMGR). This could be explained by a more targeted search effort knowing the area is preferred by this species.

Recommendations: Beaver activity along the Trolley Trail should continue to be monitored to better inform the issue of how to balance the needs of both keeping the bike

trail open and encouraging native wildlife. The yellow flag iris should be managed beginning as far upstream as the invasive is found.

Site Name: Boardman Wetlands

Site UTM: 45.3944119, -122.6106082

Site Manager: NCPRD

Wildlife Survey Results: Pacific Treefrog, Long-toed Salamander, American Bullfrog

Water Body Type	Wetland
Water Duration	Intermittent
Median Depth	0.5m
Maximum Depth	1m
Overhead Canopy Cover	5%
Aquatic Vegetation (% open water)	90% Reed Canary Grass, 5% Open Water, 5% Shrubs
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Brush Piles
Distance to closest patch of Trees/Shrubs	>10m
Basking Structures	none
Invasive Plant Species	Reed Canary Grass

Description: Boardman Wetlands is managed by NCPRD and is the headwaters of both Boardman Creek and Rinearson Creek. This wetland most likely commanded large amphibian populations of all four of the target species of this study plus a few others, but now only contains Pacific treefrog and long-toed salamander egg masses. An obvious explanation is the lack of adjacent upland habitat and a change in wetland vegetation from almost entirely native species to being filled primarily with canary reed grass which grows more densely than native wetland plants. There are some deeper areas with potential for use by red-legged frogs and northwest salamanders, but they are limited in potential by the lack of ample nearby upland habitat. Curiously, there were several northwest salamander egg masses downstream along the more polluted trolley trail than the superficially better habitat at Boardman wetlands. Culverts at both ends of the wetland are undersized. There are plans to restore the area to better manage stormwater.

Recommendations: When a restoration takes place, amphibian habitat should be installed. Planting native wetland vegetation and including some deeper, off-channel pools will allow more native species to return to the site.

Site Name: Rinearson Pond / Meldrum Bar

Site UTM: 45.379921,-122.6135992

Site Manager: City of Gladstone

Wildlife Survey Results: Pacific Treefrog (calls heard), Western Painted Turtle, Red-eared Slider

Water Body Type	Man-made Lake
Water Duration	Perennial
Median Depth	1.5m
Maximum Depth	2m
Overhead Canopy Cover	10%
Aquatic Vegetation (% open water)	95% Open Water, 5% Yellow Flag Iris
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Moderate Leaf Litter, Brush Piles, Down Wood
Distance to closest patch of Trees/Shrubs	0m, Good Riparian Zone
Basking Structures	>5 logs
Invasive Plant Species	Yellow Flag Iris, Himalayan Blackberry
Other Notes	The dam will likely be partially removed in the near future restoring riparian stream habitat

Description: Rinearson Pond is a result of the impoundment of Rinearson Creek on the north side of Meldrum Bar City Park managed by the City of Gladstone. It has a large observed turtle population. It presently has excellent turtle habitat and with numerous basking logs, perennial water, and access to the nearby Willamette River to provide connectivity for dispersal. Both adults and juveniles are present with nesting areas observed on the western banks of the lake. This habitat fills all aspects of a turtle’s natural history. There is little attachment for amphibian breeding with the bank vegetation primarily blackberry and yellow flag iris. The site will likely undergo major changes soon with the partial removal of the earthen dam as part of a mitigation project for the lower Willamette River. The current plan calls for “a solution in which the pond,

or some open water, is left intact, but fish passage is restored (The Oregonian, November 20th, 2013).” Formal surveys were not conducted at the site in 2015, but similar numbers of western painted turtles and red-eared sliders were observed at the annual turtle training under excellent viewing conditions on March 28th, 2015.

Recommendations: Prior to the proposed dam removal, the turtles are going to be trapped to avoid their harm during construction. It would be interesting to know how the turtles migrate before, during, and after construction and attaching transmitters would accomplish this. Improving other nearby suitable high quality turtle habitat should be considered being included in the mitigation plan as there will certainly be a reduction in size of the available turtle habitat when the dam is breached. The closest nearby place not currently being utilized fully with good potential as turtle habitat is River Forest Lake. Promoting beaver activity to aid in the restoration effort should be considered.

Kellogg Creek Basin

Kellogg Creek roughly parallels Highway 224 from Clackamas through Milwaukie. There are pockets of significant amphibian activity and one known site with a moderate sized native turtle population. The riparian area is highly confined between developments and efforts to maintain this strip are in progress. Attention should continue to be paid to the amazing new beaver ponds that are being expanded in the middle section of the creek. Efforts were made to survey the sites of greatest activity from 2014. Only one survey at each site was able to be made so the 2015 results are far from conclusive, but significant drop-offs in red-legged frog breeding were observed. These natural areas should continue to be monitored help determine the rates at which amphibians colonize new habitat and to determine the effects of increased human population density upon the wetlands.

Site Name: Mabel Ave A & B

Site UTM: 45.4093576,-122.5953217

Site Manager: Private Landowners

Wildlife Survey Results: Red-legged Frog, Pacific Tree Frog, Northwest Salamander, Long-toed Salamander, American Bullfrog

Water Body Type	Ponds
Water Duration	Perennial
Median Depth	1m
Maximum Depth	1.5m
Overhead Canopy Cover	10%, Mostly Sunny
Aquatic Vegetation (% open water)	80% Open Water, 15% Willow, 5% Blackberry

Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Moderate Leaf Litter, Down Wood
Distance to closest patch of Trees/Shrubs	0m
Basking Structures	20+ Logs
Invasive Plant Species	Yellow Flag Iris, Himalayan Blackberry
Other Notes	Unique large woody debris quantity, large area of forested hillside adjacent

Description: These two private ponds near the headwaters of Kellogg Creek contain abundant wood, particularly Mabel A. The standout feature of this site is the large upland habitat directly west of the site. Carp and nutria are present in Mabel B. There was a significant dropoff in red-legged frog egg masses from last year (2014: 110, 2015: 4). This could be attributed to the warmer and dryer than typical breeding season, recent construction decreasing the amount of upland habitat, or a gap in the monitoring as the site was only surveyed once in 2015.

Recommendations: Preserving the large, upland forest habitat should remain a priority for the preservation of this amphibian population. Performing outreach to inform local citizens of the treasure in their backyards will serve to help protect this ecosystem. Controlling the invasive plants and planting natives will improve the habitat, particularly in areas helping to provide reaches connecting the pond habitat with Kellogg Creek. The red-eared slider, carp, and nutria should be removed.

Amphibian monitoring should be continued to determine if 2015 was an anomaly or there is an actual collapse of the red-legged frog population occurring. The nearby Parmenter site is less than a mile downstream and Johnson Lake less than a mile upstream, so maintaining the integrity of the riparian zone along Kellogg Creek will continue to provide habitat connectivity.

Site Name: Parmenter

Site UTM: 45.4208108, -122.5998855

Site Manager: Private Landowners, Metro

Wildlife Survey Results: Pacific Treefrog (calls heard), American Bullfrog

Water Body Type	Beaver Pond
Water Duration	Perennial
Median Depth	1m

Maximum Depth	2m
Overhead Canopy Cover	75%, Mostly Shady
Aquatic Vegetation (% open water)	70% Open Water, 20% Woody Vegetation, 10% Emergent Vegetation
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Moderate Leaf Litter, Woody Debris
Distance to closest patch of Trees/Shrubs	Good Riparian
Basking Structures	Numerous Logs
Invasive Plant Species	Yellow-Flag Iris, Reed Canary Grass, Himalayan Blackberry
Other Notes	Recently built suburban beaver pond

Description: This privately-owned, unique site is where Kellogg Creek was dammed by beaver in the fall of 2013 in a residential area near SE Parmenter Drive. METRO has recently bought property adjacent to east side of the lower pond. Normally, beaver dams affecting residential areas are immediately removed, breached, or bypassed to prevent property damage, but as no homes are in immediate danger, the dam is being allowed to run its natural course with the participation of several local landowners and local agencies. In 2015, the beaver have added a second large dam downstream and ponded significant additional area. The original pond is becoming more established and large cottonwood and alder trees that were formerly in the riparian zone are being permanently flooded and beginning to perish.

The effects of beaver on an ecosystem can be numerous, often altering the vegetation and wildlife tremendously as a narrow flowing stream becomes a more lentic, broad meadow (Haemig 2012). If the dams remain in place, a renewed wetland habitat will be formed which will be prime habitat for amphibian breeding and potentially for turtle habitat.

Recommendations: This site should continue to be monitored as the nature of the area matures. Trees inundated with water and dying should be left standing to serve as wildlife habitat unless they pose a threat to human safety. Communication with local homeowners should continue to address potential issues before they become a major problem.

Site Name: 3 Creeks Natural Area

Site UTM: 45.430686, -122.58997

Site Manager: NCPRD

Wildlife Survey Results: Red-legged Frog, Pacific Treefrog, Long-toed Salamander, American Bullfrog

Water Body Type	Wetland
Water Duration	Intermittent
Median Depth	0.5m
Maximum Depth	1.5m
Overhead Canopy Cover	5%
Aquatic Vegetation (% open water)	50%
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Deep Leaf Litter, Brush Piles, Down Wood
Distance to closest patch of Trees/Shrubs	10m
Basking Structures	None
Invasive Plant Species	Himalayan Blackberry
Other Notes	Large wetland complex

*Habitat Assessment of the large wetland mitigation site in the center of 3 Creeks Natural Area

Description: The 89-acre 3 Creeks Natural Area is managed by NCPRD and consists of the riparian zones between Mt. Scott Creek, Phillips Creek, and Dean Creek at their confluence. This is about 20% of an historically large wetland that is now filled by the Clackamas Town Center, Costco Shopping Center, and Milwaukie Business-Industrial Area (3-Creeks.org, August 17, 2014). It features a recently restored open wetland habitat and about 15 smaller swales containing three species of amphibian breeding. Since the 1990's efforts have been made to restore the wetland to its former state. The presence of red-legged frog breeding and the large numbers of Pacific treefrog and long-toed salamander egg masses indicate that the conditions enabled by the restoration of the large vernal swale and the types of vegetation planted are conducive to amphibian breeding. The presence of such a large site with numerous breeding areas is a positive sign that amphibian populations in the area are healthy.

Recommendations: Continue maintaining the native vegetation that has been planted and monitoring the native amphibian populations.

Site Name: Happy Valley Wetland Park

Site UTM: 45.4499384, -122.5182511

Wildlife Survey Results: Red-legged Frog, Pacific Treefrog, Northwestern Salamander, Long-Toed Salamander, American Bullfrog

Water Body Type	Man-made Pond/Wetland
Water Duration	Perennial
Median Depth	1m
Maximum Depth	1.5m
Overhead Canopy Cover	70%
Aquatic Vegetation (% open water)	60% open water, 30% woody shrubs, 10% grass
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Moderate Leaf Litter, Brush Piles
Distance to closest patch of Trees/Shrubs	0m
Basking Structures	4 logs
Invasive Plant Species	Reed Canary Grass, Himalayan Blackberry
Other Notes	Frequently fed ducks

*Habitat Assessment of North Pond

Description: Happy Valley Wetland Park is managed by the City of Happy Valley and is the headwaters of Mt. Scott Creek, a major tributary to Kellogg Creek. The reserve is on property adjacent to Happy Valley Middle School and Happy Valley Elementary School presenting excellent field education opportunities for children. There is a secluded pond in the northern section of the park, a pond on the main boardwalk popular for children to feed waterfowl, several swales and an area of large vernal wetland habitat behind the schools containing abundant amphibian activity. Healthy populations of all 4 targeted species were observed.

The number of red-legged frog egg masses roughly doubled (2014: 91, 2015: 197) while the northwest salamander egg mass count was up slightly (2014: 82, 2015: 93). Upland habitat east of the site at Scouters Mountain is now owned by Metro and should offer security for the stability of this amphibian population.

Recommendations: Continuing to have local schoolchildren engage in citizen science to monitor amphibians. Once they learn about the wetland, they can make informational signs with facts about the plants, ecosystem and why it is detrimental to feed the wildlife as part of a self-guided nature walk would benefit the entire community.

Site Name: Audobahn Lake

Site UTM: 45.4487957,-122.5837359

Site Manager: Privately Owned

Wildlife Survey Results: American Bullfrog, Red-eared Slider

Water Body Type	Pond
Water Duration	Perennial
Median Depth	Unknown
Maximum Depth	Unknown
Overhead Canopy Cover (%)	0
Aquatic Vegetation (% open water)	99
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Down Wood
Distance to closest patch of Trees/Shrubs	>100m
Basking Structures	12 Placed Logs
Invasive Plant Species	None

Description: This large manmade pond is located in the middle of a mobile home community and is isolated from other natural areas. There are many placed basking structures which attract numerous waterfowl. A red-eared slider resides here. There are no large trees in the riparian area and little emergent vegetation for juvenile amphibians and turtles making it highly unlikely. This site may actually be a part of the Johnson Creek Basin.

Recommendations: This area would require a large amount of resources to transform it into functional native amphibian and turtle habitat and is therefore low priority. Establishing a riparian buffer with emergent vegetation would make it suitable for Pacific tree frogs.

Tualatin River Basin

The Tualatin River drains much of the land on the west side of the Portland METRO area. The area is primarily agricultural in nature outside of the suburbs of Beaverton, Tigard, Tualatin, and Cornelius within the UGB on the eastern side of Washington County. There is a plethora of potential herpetofauna habitat within the basin with ponds and wetlands dotting the rural landscape. This valley will be the focus of surveys in 2016.

Site Name: Canal Acres Park/Bryant Woods Nature Park

Site UTM: 45.3871298,-122.7245586

Site Manager: City of Lake Oswego

Wildlife Survey Results: Red-legged Frog, Pacific Tree Frog, Long-toed Salamander, Red-eared Slider

Water Body Type	Wetland
Water Duration	Intermittent
Median Depth	0.75m
Maximum Depth	1m
Overhead Canopy Cover (%)	10
Aquatic Vegetation (% open water)	75
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Deep Leaf Litter, Brush Piles, Down Wood, Rock Piles
Distance to closest patch of Trees/Shrubs (m)	15
Basking Structures	0
Invasive Plant Species	Reed Canay Grass, Yellow Flag Iris, Himalayan Blackberry

*Large swale in Bryant Woods Nature Park described above

Description: These two adjacent nature parks are located at the confluence of an old channel of the Tualatin River that has been enhanced to serve as a canal to maintain water levels in Oswego Lake.

Bryant Woods Nature Park contains a small spring fed creek draining into the canal, a small vernal pond that contained all of the densely packed red-legged frog egg masses, and an ash swale that had significant Pacific Tree frog and Long-toed salamander activity.

Canal Acres lies along the banks of the Tualatin River with the dam at the mouth of the canal near the center. West of the canal is a large forested area with a long sedge wetland at its center. This area provides excellent upland habitat for local amphibian populations during the non-breeding season. East of the canal is a more exposed scrub-shrub wetland. In a wetter year, this area could provide excellent Pacific Tree frog and Long-toed salamander breeding habitat, but nearly all of Canal Acres was dry by early March.

North of the parks an invasive red-eared slider was found in the canal in early July.

Recommendations: Install signs about the dangers red-eared sliders and other invasive animals pose to native ecosystems. Control invasive vegetation and plant natives.

Site Name: Rivergrove Heritage Park

Site UTM: 45.3845254,-122.7324691

Site Manager: City of Rivergrove

Wildlife Survey Results: Pacific Tree Frog

Water Body Type	Wetland
Water Duration	Intermittent
Median Depth	0.25m
Maximum Depth	0.5m
Overhead Canopy Cover (%)	5
Aquatic Vegetation (% open water)	5
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Down Wood
Distance to closest patch of Trees/Shrubs (m)	10
Basking Structures	0
Invasive Plant Species	Reed Canary Grass, Himalayan Blackberry
Other Notes	

Description: Rivergrove Heritage Park is a new park located just west of Canal Acres Park along the banks of the Tualatin River. Most of the water in the park originates from Canal Acres Park and is directed into one bulrush dominated swale through the park. No egg masses were found but a gravid female Pacific Tree frog was observed.

Recommendations: As the park is developed, maintaining connectivity from the waterways to upland habitat in Canal Acres should be a priority. A larger, more natural wetland area could be formed enhancing amphibian breeding habitat opportunities. Leaving deadfall wood in place enhances amphibian habitat.

Oswego Lake/Sucker Creek Basin

The City of Lake Oswego was founded as a center for the iron industry and is now an affluent community featuring the Oswego Lake. It is connected to the Tualatin River via the Oswego Canal to maintain water levels in the lake during the dry season. The community is proud of its many trees and natural legacy. The basin contains some excellent pond and wetland habitat in remnant agricultural areas and excellent riparian buffers around the creeks draining into Sucker Creek.

Site Name: Lily Bay

Site UTM: 45.416400, -122.690861

Site Manager: Lake Oswego Corporation

Wildlife Survey Results: Pacific Tree Frog, Northwest Salamander, Rough-skinned Newt, American Bullfrog, Common Snapping Turtle

Water Body Type	Wetland/Beaver Pond
Water Duration	Perennial
Median Depth	0.5m
Maximum Depth	2m
Overhead Canopy Cover	10
Aquatic Vegetation (% open water)	30
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Deep Leaf Litter, Down wood, Brush Piles
Distance to closest patch of Trees/Shrubs	0m
Basking Structures	10+
Invasive Plant Species	English Ivy, Yellow Flag Iris, English Holly, Bamboo,
Other Notes	Nutria present

Description: Lily Bay is a large beaver pond on the north side of Oswego Lake with abundant large woody debris in the water. The surface of the pond is dominated by large mats of yellow flag iris and pond lily. Only 3 Northwest Salamander egg masses were found in spite of the large size of the pond. Numerous rough-skinned newts were observed as well as several Pacific Tree frog adults. The upland areas around the bay are forested with mature trees and a large variety of invasive plant species. The understory is rich and should be sufficient to support a larger amphibian presence.

Lily Bay is home to an established invasive common snapping turtle population.

Recommendations: Restoring this site by controlling invasive species will be a large project. Installing native species such as spirea, native sedges and rushes will provide excellent attachment material to enhance the habitat for native amphibian species. Snapping turtles should be removed.

Site Name: Oswego Lake

Site UTM: 45.4107639,-122.6664279

Site Manager: Lake Oswego Corporation

Wildlife Survey Results: Western Painted Turtle

Water Body Type	Man-made Lake
Water Duration	Perennial
Median Depth	>3m
Maximum Depth	>3m
Overhead Canopy Cover	5%
Aquatic Vegetation (% open water)	95%
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Deep Leaf Litter, Brush Piles
Distance to closest patch of Trees/Shrubs	0m
Basking Structures	2 logs
Invasive Plant Species	Numerous Ornamental Landscaping Plants

Description: Oswego Lake was a naturally occurring lake formed as a result of the Missoula Floods and enhanced by the damming of Sucker Creek originally to power the local iron industry, and now, primarily for recreational purposes. It is fed by numerous small tributaries and, seasonally, by the Lake Oswego Canal which connects the lake to the Tualatin River to maintain water levels.

The artificially deep nature of the lake has created a majority of the shoreline to be quite steep and composed of concrete. These features do not allow for the growth of emergent vegetation, required habitat of juvenile turtles and amphibians as well as attachment material for amphibian egg masses. The large vertical drops severely limit access in and

out of the lake for any wildlife. No likely native turtle nesting habitat was identified during the surveys.

Two Western Painted turtles are seen regularly basking on boom logs in front of the dam. There is a dearth of other basking structures throughout the rest of the lake due to meticulous clearing of debris by lake staff to ensure boating safety. The lake has the potential to host one hundred fold the current turtle population.

Recommendations: Create more basking structures to expand the usable habitat of the lake by turtles, potentially by attaching logs to sea walls. Create nesting habitat. Identify shore locations to slope gently into the lake to allow emergent vegetation to grow for useage by amphibian larvae and juvenile turtles. Begin initial habitat restoration with small test areas, then expand to include other willing landowners.

Site Name: George Rogers Park

Site UTM: 45.4108498,-122.6620615

Site Manager: City of Lake Oswego

Wildlife Survey Results: Western Painted Turtle

Water Body Type	Creek
Water Duration	Perennial
Median Depth	0.25m
Maximum Depth	2m
Overhead Canopy Cover (%)	70
Aquatic Vegetation (% open water)	85
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Deep Leaf Litter, Brush Piles
Distance to closest patch of Trees/Shrubs	0m
Basking Structures	3 logs, Rocky shoreline
Invasive Plant Species	English Ivy, Himalayan Blackberry

Description: Sucker Creek emerges below the Oswego Lake Dam and runs through George Rogers Park into the Willamette River. The lower area of the creek has a sandy beach that sees high volume use by the public, limiting wildlife useage of the area. The creek has minimal flow due to the dam and largely lacks emergent vegetation due to the

rocky nature of the creek. In spite of the human presence, a Western Painted Turtle regularly occupies a deep, rocky pool just below the dam.

The surrounding upland habitat is robust and could support an adult population if a nearby breeding pond exists.

Recommendations: This site has limited potential as amphibian breeding habitat due to the lotic nature of the creek. Work removing dominant invasive plants should continue.

Site Name: Mary S. Young Park

Site UTM: 45.3811377,-122.630412,288

Site Manager: Oregon State Parks

Wildlife Survey Results: Red-legged Frog

Water Body Type	Beaver Pond, River
Water Duration	Perennial
Median Depth	0.25m
Maximum Depth	0.5m
Overhead Canopy Cover (%)	20
Aquatic Vegetation (% open water)	70
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Deep Leaf Litter
Distance to closest patch of Trees/Shrubs	0m
Basking Structures	5 logs
Invasive Plant Species	English Ivy
Other Notes	

*Habitat Assessment of Beaver Pond

Description: This popular state park has a long border along the shores of the Willamette River. There is a quiet, sandy cove which could be potential turtle habitat, but no turtles were observed. A small beaver dam was recently built along walking paths on the edge of mature upland forest. Suprisingly, three red-legged frog egg masses were found in this newly formed wetland.

Recommendations: Allow the beaver dam to remain undisturbed. If the path becomes flooded, build a boardwalk to keep the walking path open and let the natural wetland renewal process unfold.

Site Name: Garden Lake Court

Site UTM: 45.4189239,-122.6756785

Site Manager: Private Landowners

Wildlife Survey Results: Red-eared Slider, American Bullfrog

Water Body Type	Pond
Water Duration	Perennial
Median Depth	Unknown
Maximum Depth	Unknown
Overhead Canopy Cover (%)	15
Aquatic Vegetation (% open water)	70
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Shallow Leaf Litter, Down Wood
Distance to closest patch of Trees/Shrubs	10m
Basking Structures	2 logs
Invasive Plant Species	-

Description: This private site near Lake Oswego Country Club was recommended by a pedestrian who observed a volunteer watching turtles at the Oswego Lake Dam. This pond lies in the middle of a cul de sac and contains an island. There is some emergent vegetation and small woody debris which would make good egg mass attachment material, but the lack of nearby upland terrestrial habitat lowers the likelihood of most species using the habitat.

No amphibian surveys were conducted.

Recommendations: Conduct amphibian egg mass surveys. Remove the red-eared sliders and bullfrogs. Post a sign explaining the harms invasive species cause to local ecosystems and what to do with an unwanted pet turtle.

Site Name: Lake Oswego Hunt Club

Site UTM: 45.4144579,-122.7019803

Site Manager: Lake Oswego Hunt
Wildlife Survey Results: American Bullfrog

Water Body Type	Pond
Water Duration	Perennial
Median Depth	Unknown
Maximum Depth	Unknown
Overhead Canopy Cover (%)	10
Aquatic Vegetation (% open water)	90
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Deep Leaf Litter, Down Wood
Distance to closest patch of Trees/Shrubs	0m
Basking Structures	10+
Invasive Plant Species	Himalayan Blackberry

Description: The Lake Oswego Hunt site features a pond on the edge of the community equestrian center. The pond contains abundant emergent vegetation and woody debris which are excellent attachment material for pond-breeding amphibians as well as featuring excellent upland habitat adjoining the pond for the non-breeding season habitat. No amphibian surveys were conducted this year. No turtles were sighted.

Recommendations: Conduct amphibian egg mass surveys to determine the extent of amphibian use of the area.

West Linn

Site Name: Cascade Springs Pond Creek
Site UTM: 45.3658778,-122.6078675
Site Manager: Private Landowner Peggy Watters
Wildlife Survey Results: Pacific Tree Frog, Western Painted Turtle

Water Body Type	Stream
Water Duration	Perennial
Median Depth	0.25m

Maximum Depth	0.5m
Overhead Canopy Cover (%)	60
Aquatic Vegetation (% open water)	10
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Deep Leaf Litter, Brush Piles, Down Wood
Distance to closest patch of Trees/Shrubs	0m
Basking Structures	0
Invasive Plant Species	Many

Description: This small canyon drains a basin just west of the Willamette River and has had intermittent beaver activity for many years which was largely ignored. It was laden with a large variety of invasive plant species. In 2014, the beaver began killing ornamental and fruit trees and the neighborhood took note. In the summer of 2015, neighbors collaborated and hired a company to bring in goats to reset the canyon. There are plans to revegetate the canyon with native species.

Recommendations: Monitor the canyon and keep up with weed control. Perform amphibian surveys to see if any new species are attracted to the renewed habitat in future years.

Site Name: 5597 River St West Linn

Site UTM: 45.368113,-122.607164

Site Manager: Private Landowner

Wildlife Survey Results: Pacific Tree Frog

Water Body Type	Rocky Floodplain
Water Duration	Perennial
Median Depth	0.25m
Maximum Depth	1.5m
Overhead Canopy Cover (%)	0
Aquatic Vegetation (% open water)	100
Terrestrial Micro habitats (Leaf litter, Brush piles, Rock piles, down wood)	Shallow Leaf Litter, Rock Piles

Distance to closest patch of Trees/Shrubs	10m
Basking Structures	Rocks
Invasive Plant Species	None

Description: This property is located downstream of Willamette Falls just past the Abernethy Bridge along the west side of the Willamette River in West Linn just downstream of Cascade Springs Pond Creek. The Army Corps of Engineers placed a large amount of rip rap to control flooding of the Willamette River decades ago. There are several potholes over 1m deep that retain water year-round and numerous smaller vernal pools that are excellent for Pacific tree frog breeding. Turtles have been sighted here in past years. The site is across the river from Meldrum Bar and its significant turtle population. Many willows have colonized the rip rap increasing the diversity of habitat.

Recommendations: The possibility of cutting a side-channel through the rip rap could open up off channel habitat for fish, amphibians, and turtles without significantly altering the flood protection provided by the rock placements.

Wildlife Survey Results

Site	Basin	RA AU	PS RE	AM GR	AM MA	TA GR	LIC A	CH PI	AC MA	TR SC	CH SE	Total Turtles
Molalla River State Park	Molalla	5	<10	85	>100	0	Yes	10	1	1	0	12
Aquila Vista	Molalla	525	10-100	92	0	yes	0	0	0	0	0	0
Creamery Creek Pond	Molalla	0	<10	0	0	0	yes	0	0	0	0	0
David Peter	Molalla	0	<10	37	10-100	0	yes	na	na	na	na	na
Lochs	Molalla	na	na	na	na	na	na	6	0	0	0	13
Union 701	Molalla	na	na	na	na	na	na	3	0	0	0	3
Blackburn	Molalla	0	10-100	0	0	0	0	na	na	na	na	na
Ranch Hills GC	Milk	4	0	39	<10	0	yes	na	na	na	na	na

Big Rock Lake	Milk	na	na	na	na	na	yes	0	0	0	0	0
Gard Rd	Milk	86	<10	38	0	yes	yes	0	0	0	0	0
Silverthorn	Milk	13	<10	68	<10	yes	0	na	na	na	na	na
Bonnell	Milk	0	<10	0	0	0	0	na	na	na	na	na
Harold Howard	Milk	na	na	na	na	na	yes	1	0	0	0	1
Manuel	Puddin g	13	10-100	68	<10	0	yes	0	0	0	0	0
Pat's Racing Acres	Puddin g	0	0	0	0	0	yes	0	0	0	0	0
Manuel	puddin g	13	10-100	68	<10	0	yes	0	0	0	0	0
Shorty's Pond	Puddin g	0	<10	0	0	0	yes	0	0	1	0	2
St Josef's Winery	Puddin g	na	na	na	na	yes	yes	2	0	0	0	2
Bryant Woods	Tualati n	83	>100	0	10-100	0	0	0	0	1	0	1
Canal Acres	Tualati n	0	0	0	0	0	0	na	na	na	na	na
Rivergrove Heritage Park	Tualati n	0	<10	0	0	0	0	na	na	na	na	na
George Rogers Park	Sucker	0	0	0	0	0	0	1	0	0	0	1
Lily Bay	Sucker	0	<10	3	0	yes	yes	0	0	0	1	1
Oswego Lake	Sucker	na	na	na	na	na	na	2	0	0	0	2
Garden Lake Court	Sucker	na	na	na	na	na	yes	0	0	5	0	5
Lake Oswego Hung Club	Sucker	na	na	na	na	na	yes	0	0	0	0	0

Mary S Young Park	Willamette	3	0	0	0	0	0	0	0	0	0	0	0
Cascade Springs Pond Creek	Willamette	0	<10	0	0	0	0	1	0	0	0	0	1
5597 River St West Linn	Willamette	0	10-100	0	0	0	0	0	0	0	0	0	0
Pat's Racing Acres	Pudding	0	0	0	0	0	yes	0	0	0	0	0	0
Manuel	pudding	13	10-100	68	<10	0	yes	0	0	0	0	0	0
Shorty's Pond	Pudding	0	<10	0	0	0	yes	0	0	1	0	0	1
St Josef's Winery	Pudding	na	na	na	na	yes	yes	2	0	0	0	0	2
Lazy S home pond	Beaver creek	3	0	44	0	0	0	na	na	na	na	na	0
Lazy S Mill	Beaver creek	31	<10	78	0	yes	0	0	0	0	0	0	0
Merrywood Farm	Beaver creek	11	10-100	43	0	yes	yes	0	0	0	0	0	0
CSWC D Beaver creek Demonstration Farm	Beaver creek	9	0	2	0	yes	yes	0	0	0	0	0	0
Mud Creek @ Myers Rd	Beaver creek	3	>10	2	0	yes	0	1	0	0	0	0	1
Mud Ck Duck Pond	Beaver creek	0	0	0	0	0	yes	1	0	1	0	0	2

Stone Creek Golf Club	Beaver creek	9	10-100	5	<10	0	yes	1	0	1	0	2
Oregon City Golf Club	Beaver creek	24	0	0	0	yes	0	na	na	na	na	0
Tooze	Beaver creek	3	<10	1	0	0	yes	0	0	0	0	1
CCC ELC	Abernet hy	31	>100	36	0	0	0	na	na	na	na	0
Yodis	Abernet hy	1	0	0	0	0	0	na	na	na	na	0
Mabel Ave	Kellogg	4	10-100	9	<10	Yes	Yes	na	na	na	na	0
Parmenter	Kellogg	0	<10	0	0	0	Yes	0	0	0	0	0
3 Creeks	Kellogg	1	>100	0	<10	0	0	na	na	na	na	0
Happy Valley Wetland Park	Kellogg	197	10-100	93	>100	0	Yes	na	na	na	na	0
Autobahn Lake	Kellogg	na	na	na	na	na	Yes	0	0	1	0	1
Rinears on Pond	Gladstone	0	<10	0	0	0	0	5	0	5	0	13
Boardman Wetlands	Gladstone	0	<10	0	<10	0	Yes	na	na	na	na	0
Stringfield Family Park/Trolley Trail	Gladstone	0	0	95	0	0	Yes	na	na	na	na	0

RAAU = Red-legged frog (*Rana aurora*), AMGR = NW salamander (*Ambystoma gracile*), PSRE = Pacific tree frog (*Pseudacris regilla*), AMMA = Long-toed salamander (*Ambystoma macrodactylum*), TAGR = Rough-skinned newt (*Taricha granulosa*), LICA = American Bullfrog (*Lithobates catesbeianus*), CHPI = Western Painted Turtle (*Chrysemys picta*), ACMA = Western Pond Turtle (*Actinemys marmorata*), TRSC =

Red-eared Slider (*Trachemys scripta elegans*), CHSE = Common Snapping Turtle (*Chelydra serpentina*)

Conclusion

Turtles and amphibians have thrived in the floodplain of the Lower Willamette River, now called the Portland Metro area, for millennia. As the human population of the region has grown, herpetofauna population numbers have declined along with their available habitat. Though there are still remnant healthy populations of all of the target species at certain locations, knowing the locations and habitat preferences of these animals will be key to their preservation in the area. The still mostly-rural county of Clackamas is an exemplary microcosm of the worldwide trend of dwindling native wildlife populations occurring as a result of regional human expansion.

Finding the ideal balance between conservation of existing wildlife populations and human development is a challenging task, but one that can be accomplished through a combination of awareness and directed effort involving agencies and developers together with the local community. Maintaining extant wildlife populations is much simpler and less expensive than attempting to reintroduce extirpated species. As development of the region progresses, helping to maintain healthy populations of amphibians and turtles can be achieved by following the below-listed recommendations.

Ensuring clean water for amphibians and turtles is crucial for species survival. The nature of the oviposition habits, larval stages, and porous skin of pond-breeding amphibians require that water be relatively contaminant-free in order to minimize exposure to toxins. While turtles show amazing tolerance for contaminated water, the extended amounts of time turtles spend in the water suggests that cleaner water would contribute to ensuring the survival of individuals as well as overall success of the species. WES has numerous ongoing projects which are contributing to improved Clackamas County water quality. Other actions that can be undertaken to improve water quality are:

- Install more green streets to limit stormwater surface flows directly into creeks during rain events.
- Continue community outreach and education about the harms fertilizers and lawn chemicals have on local ecosystems.
- Perform regular water quality testing to ensure pollutants are not accumulating above dangerous levels.

Model future sites on historic data. Returning green spaces back to a semblance of their historic ecology will benefit not only turtles and amphibians, but the entire living ecosystem over time. Littering floodplains and ponds with large woody debris and planting more native vegetation is an important step in the restoration process. Native animal species have evolved locally along with native plant species, forming unique relationships that invasive species cannot replicate. Restoration activity should include:

- Continued replacement of invasive species with native plants at restoration sites.
- Placing large, woody debris in wetland and stream areas.

Maintain existing habitat and open spaces. As the human population of the region becomes more dense the biggest pressure on herpetofauna will likely be lack of space. In addition to preserving and improving existing turtle and amphibian aquatic habitat, uplands near amphibian pond-breeding areas also need preservation to ensure the terrestrial portion of their life cycles has a place to be completed. This can be accomplished by:

- Preserving current intact upland habitat.
- Creating upland habitat by encouraging landowners to plant native species and leave portions of their lawn unmanicured.

Connectivity between habitats, wildlife corridors, are important for individual species' health as well as ecosystem health. Several of the sites surveyed for this project have excellent habitat potential, but are isolated from other habitats causing their populations to suffer accordingly. Turtles travel between water bodies regularly and amphibians often require several habitats to complete their life cycle. Opportunities to move about safely must be available to preserve healthy populations. The next steps in ensuring proper wildlife corridors include:

- Identifying likely corridors between habitats.
- Planting native species and ensure a minimum complexity level of ground cover to enable safe passage.

Control invasive plants and animals which compete for resources and limited habitat with native species. Invasive animals should be removed from an ecosystem when the opportunity is available and efforts should be made to control populations before they run amok. Invasive management plans should include:

- Performing American bullfrog egg mass roundups in June
- Engaging local partners to coordinate in the removal of invasive plants and replanting natives.
- Posting signs at sites with turtle habitat to discourage release of pet turtles.

Education and outreach on the importance of keeping diverse wildlife populations in all ecosystems should continue to be directed toward local landowners, business owners, and developers as well as local citizens and school children.

- Organize public meetings discussing the future of public areas.
- Engage local citizens to monitor wildlife at sites in their neighborhoods.

- Go to schools and teach children about the importance of respecting nature; provide materials for them to make signage for their local parks to help inform others of proper behavior toward and about their natural surroundings.
- Develop pamphlets and websites with answers to specific questions about how to help wildlife, specifically beaver.
- Place informational signs with natural facts about local habitat, possibly as parts of self-guided tours at various park spaces. These will serve to raise overall awareness of nature in the urban environment.

Continued surveys should be employed to monitor the health of local populations following the baseline data contained herein. Surveys should be performed before, during, and after major projects affecting pond-breeding amphibian and turtle habitat or large swaths of existing upland habitat. These can be performed every 3 to 5 years without losing track of species health. A potential, related type of survey that could help to further elucidate local target turtle species health is a turtle nesting survey. Terrestrial amphibian surveys would contribute to enhance amphibian management efforts. In addition to surveying known species, terrestrial amphibian surveys aid in discovering the presence of previously undocumented species of amphibians and assessing the quality of existing local upland habitat based on their niches and needs.

The target species in this study persist in the area in spite of numerous challenges posed by natural and human pressures. Strong, healthy local turtle and amphibian populations are an indicator that important aspects of their historical environment, including sensitive aquatic habitat, are being maintained in the face of human development. The chosen target species are highly associated with clean water and intact forests. Should the health and abundance of the target species begin to wane or disappear from the urban landscape, the Earth is losing more than just the joys of glimpsing frogs in the environment from time to time. A decline in the health and abundance of the target surveyed species is indicative of a decline in the health of the of the larger overall ecosystem that supports them and all of the ecological functions that its various and distinct habitats provide. Humans enjoy the same benefits as our herpetofaunal cousins from our local ecosystems. The financial cost of ecological health is difficult to calculate until it is too late.

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