



PORTLAND PARKS & RECREATION

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Amphibian Monitoring Program

2011 Field Season (January-June) Results and Recommendations



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Funding provided by the Bureau of Environmental Services

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Table of Contents

INTRODUCTION	1
METHODS	5
EGG MASS SURVEYS	5
Species	5
Sampling Sites	6
Survey Protocol.....	8
Volunteer Training.....	9
TERRESTRIAL SURVEYS.....	9
Species	10
Survey Protocol.....	13
RESULTS	15
EGG MASS SURVEYS	15
Target Species Presence.....	15
Non-target Species	24
TERRESTRIAL SURVEYS.....	24
Target Species Presence.....	24
DISCUSSION.....	27
2011 Egg Mass Surveys.....	27
2011 Terrestrial Surveys.....	29
Egg Mass Multi-Year Comparison (2008-2011)	30
2011 INDIVIDUAL SITE COMMENTS & RECOMMENDATIONS.....	45
Columbia Slough Watershed	49
Big Four Corners Natural Area.....	49
Blue Heron Wetland	51
Johnson Lake/92 nd Ave Water Quality Facility	52
BES Ramsey Wetland Complex	52
Schlessinger (Zen)—138 th Water Quality Facility	53
Whitaker Ponds.....	53
Johnson Creek Watershed.....	54
Beggar’s Tick Marsh.....	54
Brookside Park: 7 constructed ponds.....	55
Circle Avenue Sites (Pumpelly Pond, Water Bureau Site, Brunkow Pond).....	55
Crystal Springs and Reed College Canyon.....	56
East Powell Butte Restoration Area.....	57
(Brownwood-Schweitzer, Johnson and Kelley Creek Backwaters, Alsop Wetland)	57
Errol Heights.....	58
Flavel Ridge	58
Hillside Properties: north of Springwater Trail at base of the bluff	58
Leach Botanical Gardens Pond.....	59
Mitchell Creek	59
Powell Butte.....	59
Tideman-Johnson.....	61

Veterans Creek Pond.....	61
Zenger Farm Wetland & “Triangle Site”	61
Willamette Watershed.....	62
Audubon Society: Sanctuary Pond	62
BES Fiske B.....	63
Butterfly Park.....	63
Cottonwood Bay	63
Forest Park	63
Hoyt Arboretum	64
Kelley Point	64
Moorage Marine.....	64
Oaks Bottom Wildlife Refuge	64
(Aurora Lake, Ancient Pond/Salamander Slough, Tadpole Pond, Channels site).....	64
Powers Marine Park.....	66
Sellwood Riverfront Park	66
Water Pollution Control Lab and Test Swale*	67
Tryon Creek Watershed	68
Foley-Balmer Natural Area.....	68
Maricara Park.....	68
Tryon Creek Headwaters	68
Fanno Creek Watershed.....	69
April Hill.....	69
Gabriel Park Wetlands	69
ACKNOWLEDGEMENTS.....	71
LITERATURE CITED	72
APPENDICES	74

Table of Tables

Table 1: Pond-breeding amphibians in Portland, OR.....	5
Table 2. 2011 Egg Mass Survey sites.	7
Table 3: Amphibians Targeted in Terrestrial Surveys.....	10
Table 4. 2011 Terrestrial Amphibian Survey Sites.....	12
Table 5: 2011 Amphibian Species Presence During Egg Mass Surveys.....	16
Table 6: 2011 Amphibian Species Presence (based on one egg mass survey to check for breeding).19	
Table 7: 2011 Egg Mass Counts by Site.....	20
Table 8: 2011 Sites Ranked by Targeted Species’ Egg Mass Counts.	21
Table 9: 2011 Amphibians Species Observed during Terrestrial Surveys in May.....	25
Table 10: Species assemblage comparison between years for sites surveyed in 2008-2011.....	1
Table 11: Year to Year Variations in Amphibian Presence.....	33
Table 12: Recommendations for sites surveyed during 2008-2011 amphibian monitoring season.	1

Table of Figures

Figure 1: Photos of Select Species Found in the City of Portland.....	11
Figure 2: 2011 Egg Mass Survey Site Locations and Species Presence Map.	17
Figure 3: Documented Breeding Sites Egg Mass Survey 2011.....	18
Figure 4: 2011 Terrestrial Survey Site Locations and Species Presence Map.	26
Figure 5. Pond-Breeding Amphibian Species Observed 2008-2011.....	32
Figure 6: Big Four Corners Natural Area Wetland Complex, Columbia Slough Watershed.....	35
Figure 7: East Johnson Creek Watershed Sites.....	37
Figure 8: Oaks Bottom Wildlife Refuge and Sellwood Riverfront Park.....	39
Figure 9: West Johnson Creek Watershed Sites.....	41

Table of Appendices

Appendix 1: Egg Mass Survey Datasheet 2011.....	74
Appendix 1: Terrestrial Amphibian Survey Datasheet 2011.....	76

INTRODUCTION

Amphibian populations are declining and species are becoming extinct across the globe. Factors such as habitat fragmentation, introduced species, global climate change, disease outbreaks, and pesticide contamination are contributing to a forty-three percent decline in amphibian populations worldwide (Stuart *et al* 2004). Amphibians have moist, permeable skin that can rapidly absorb toxic substances in the environment and because of this they can be considered excellent indicators of environmental health (Marks 2006). Amphibians are an indicator species (Sparling *et al* 2001), whose presence indicates healthy conditions of Special Status habitat types. If amphibians are flocking to or fleeing from a site it is an early indication of large scale changes to the ecosystem that may not be identified by other methods for many years. Amphibians are typically an indicator species because of their semi-permeable skin which is easily affected by environmental toxins, their dependence on both aquatic and terrestrial habitat to complete their life cycle, and the susceptibility of their early developmental stages to gross morphological anomalies when in the presence of environmental toxins (Marks 2006). Habitat requirements for many species of amphibians include a variety of both wetland and forested areas. For populations to be successful, these habitats must be both individually suitable for amphibians and connected to each other (Bowne & Bowers 2004).

Here in the Pacific Northwest urban sprawl and development are increasing at an alarming rate and natural habitats and fragile wetland areas are disappearing. In the Willamette Valley alone, 40-87% of original wetland areas have been lost to urbanization, agriculture, silviculture, and flood control projects (Gabriel 1993, Oregon Biodiversity Project 1998). Therefore, it is imperative that we attempt to gain a more complete understanding of the effects of development on amphibians populations so that better management decisions can be implemented in an effort to prevent further displacement of species from their native ranges (Paton and Egan 2001; Mitchell and Brown 2008).

The ODFW *Oregon Conservation Strategy* identified monitoring needs for 17 amphibian species native to the state of Oregon that are designated as “Strategy Species”, or “Species of Greatest Conservation Need” (per USFWS requirements for State Wildlife Action Plans). One of these species, the Northern Red-legged Frog was observed in 2011

during surveys. As amphibian distribution is not well documented, ODFW recently completed a report summarizing amphibian surveys of the last few years to document the presence of amphibians in Oregon, titled “Amphibian Distribution in Wadeable Streams and Ponds in Western and Southeastern Oregon, 2009-2010” (Tippery and Jones 2011). The report stated that ODFW observed sixteen of Oregon’s 32 amphibian species in 2009-2010. ODFW surveys found amphibians at 82% of their survey sites in the Willamette Valley, showing that even in the more developed areas of Oregon, amphibians currently persist. In the Willamette Valley, nine amphibian species were observed at 151 sites surveyed. The species are listed in Table 9.

The Portland Parks & Recreation Amphibian Monitoring Program has been evolving since its inception in 2008. What started as an undergraduate student research project on amphibians and the microclimes they inhabited at Oaks Bottom has expanded into a Citizen Science outreach program that focuses on species presence, absence, and population abundance across 7189 acres of City properties in the Portland metro area. In the fourth year of the program, the collection of detailed habitat characteristics at sites has become less important than obtaining a complete picture of the size and abundance of the amphibian populations inhabiting a greater number of the City’s properties. Once the baseline population has been established at a site, comparisons between years can be made that will indicate the success of restoration efforts and the expansion or contraction of amphibian populations as their habitats change. With this in mind, the Amphibian Monitoring Program continued in the 2011 breeding season (January-June 2011) with the following goals:

1. Add to the knowledge of amphibian species at properties owned by the City of Portland,
2. Collect appropriate quantities and types of data to make recommendations to assist planners with management of properties owned by the City of Portland,
3. Establish baseline knowledge before restoration and construction projects document and changes to amphibian populations and diversity,
4. Collect regionally equivalent data so that the City of Portland are included in regional amphibian research efforts as befits the largest city government in our area, so that it may benefit from the regional group’s expertise and combined data analyses, and

5. Continue to share with and learn from other regional city governments and bureaus also trying to incorporate amphibians into their assessment of successful management of their sites.

This report summarizes the findings of the 2011 field season for pond-breeding amphibians and also discusses the future goals of the Amphibian Monitoring Program of the City of Portland. The focus of this report is to summarize the findings of the 2011 field season for pond-breeding amphibians and to introduce long-term ecological monitoring goals for the amphibian monitoring project in the City of Portland.

The Portland Parks & Recreation Amphibian Monitoring Program also has a unique opportunity this year to participate in the regional collection and distribution of amphibian species egg mass counts and terrestrial adult surveys. With the goal of collective group data sharing, protocols and data sheets were revised for the 2011 egg mass survey season in an effort to collect equivalent types of data by the various municipalities while still meeting the diverse needs of the individual programs. Key personnel at Metro, the City of Gresham, Clark County Community Amphibian Monitoring Project, The Willapa Hills Audubon Society, Washington Department of Fish and Wildlife (WDFW), and the City of Portland Bureau of Parks and Recreation are working together to compile existing egg mass count data from the region into a few scientific papers. The papers will be presented at wildlife management and herpetological conferences. Paper presentation will provide recognition for the thousands of hours of field work over the past few years. The regional group is also interested in acquiring a grant for analysis of our egg mass count data that will have management impacts for the Pacific Northwest states. The grant is focused on answering a few key questions pertaining to the habitat requirements of the Northern Red-legged Frog within developed urban landscapes of the Pacific Northwest. When the *Oregon Conservation Strategy* (Oregon Department of Fish and Wildlife 2006) indicated Northern Red-legged Frogs were to be utilized in conservation plans as an umbrella species for other amphibians, amphibian research in Oregon and Washington switched focus to that species. This program is proud to have our data incorporated into amphibian management research currently being conducted in the region. The questions answered by analysis of the collective egg mass survey data of the region will lead to amphibian habitat recommendations for the next decade.

The Amphibian Monitoring Program is also attempting to have a one of our sites qualify for reintroduction of the Oregon Spotted Frog (*Rana pretiosa*), which has been designated a “strategy species” by the Oregon Fish and Wildlife Department (Oregon Fish and Wildlife Department, 2006). A grant has recently been awarded to WDFW allowing them to expand their successful reintroduction program to include sites in Portland. The Oregon Zoo hatches the egg masses, and rears the tadpoles to a stable developmental stage before transferring them to prison inmates who raise the Oregon Spotted Frogs to maturity. The frogs are released to a test site in Tacoma, WA which has now shown a breeding population of the endangered frog established after only three years. Marc Hayes, a Senior Research Scientist at WDFW, is the grant awardee and as such is responsible for selecting sites within the Portland metro area for reintroduction. Our sites may or may not meet the habitat requirements and size necessary for selection, but to be considered for stewardship of these rare animals is rewarding and shows how much our program has grown in a few short years. Through the Amphibian Monitoring Program’s connections with the Oregon Spotted Frog Reintroduction Program, Portland Parks & Recreation will be better able to offer management recommendations for enhancing City of Portland properties’ habitats for amphibians.

We are constantly working towards better distribution of information between and within different branches of the City of Portland’s various bureaus. The lessons learned from our regional meetings between employees of Metro, the City of Gresham, Portland Parks & Recreation, the Clark County Community Amphibian Monitoring Project, and local amphibian specialists should also be used within the City of Portland itself. These lessons are to:

1. Learn which City employees currently collect amphibian information as a part of their positions, and collect more data through the efforts of many individuals,
2. Distribute contact information to all amphibian data collectors,
3. Share annual data and reports, and
4. Try to eliminate duplication of effort for greater efficiency and cost-effectiveness within the City of Portland departments.

METHODS

EGG MASS SURVEYS

The goal of the egg mass surveys was to determine the presence of pond-breeding amphibians at selected private and City of Portland-owned properties throughout the Portland metro area.

Species

The Pacific Northwest provides aquatic breeding grounds for over twenty species of native frogs, toads, and salamanders (Corkran and Thoms 2006). In the Portland area, six species of pond-breeding amphibians occur. Five species are native to the region and one, the American Bullfrog (*Lithobates catesbeianus*), is a non-native species introduced from the eastern United States in the 1920s or 1930s to meet the demands of the restaurant industry. The egg mass surveys target pond-breeding species by surveying standing water in the appropriate months. In this study, four of the native pond-breeding species were targeted during field surveys (Table 1). One of the species, the Northern Red-legged Frog, is listed by the Oregon Department of Fish and Wildlife (ODFW) as a “Strategy Species” in the *Oregon Conservation Strategy* which directs the ODFW to concentrate their conservation efforts on that species.

Table 1: Pond-breeding amphibians in Portland, OR.

Common Name	Latin name	Species Code	Strategy Species
Targeted Species			
Northern Pacific Treefrog	<i>Pseudacris regilla</i>	PSRE	
Northern Red-legged Frog	<i>Rana aurora</i>	RAAU	X
Long-toed Salamander	<i>Ambystoma macrodactylum</i>	AMMA	
Northwestern Salamander	<i>Ambystoma gracile</i>	AMGR	
Other Species			
Rough-skinned Newt	<i>Taricha granulosa</i>	TAGR	
American Bullfrog*	<i>Lithobates catesbeianus</i>	LICA	

* Non-native species

Rough-skinned Newt (*Taricha granulosa*) was not a target species this season due to the difficulty in locating egg masses. However, when observed in the field as an adult, *T. granulosa* was recorded and is noted in the “Results” and “Individual Site Comments & Recommendations” sections of this report. Additionally, American Bullfrog (*Lithobates catesbeianus*) was included in the data set when observed in the field, typically in adult form, due to their indistinct and late breeding season.

Sampling Sites

A total of thirty-nine sites within five watersheds were surveyed in Portland, Oregon, from January 2011 through April 2011. Twenty-six of these sites were selected for intensive monitoring in the 2011 field season by a committee of ecologists within the Bureau of Environmental Science (BES) and Portland Parks & Recreation (PP& R) based on the needs and interests of individual watershed teams. Each of the twenty-six sites was visited four times during the winter egg mass season. Additional sites were also checked for breeding populations, but were only surveyed once. All sites are listed in Table 2 by watershed.

Several individual sites are actually components of a larger wetland, stream, and floodplain system. A “site” was determined and named for the egg mass surveys as a location easily surveyed in its entirety in one outing. With that in mind, many large properties were divided into smaller sites. For the purposes of simplicity and displaying information on maps, several individual sites may sometimes be referred to by a group name (See Table 2).

Table 2. 2011 Egg Mass Survey sites.

Watershed	Site Location / Group Name	Site Name	Man-made	Restored	Ownership
Columbia Slough	Big 4 Corners Natural Area	Winmar Flats: North ponds	X	X	BES
	Big 4 Corners Natural Area	Winmar Flats: South ponds	X	X	BES
	Big 4 Corners Natural Area	Mason Flat's: Bart's Hollow	X	X	BES
	Big 4 Corners Natural Area	Alice Springs: East Pond	X		PP&R
	Big 4 Corners Natural Area	Alice Springs: West Pond	X		PP&R
	Big 4 Corners Natural Area	WMS Ponds	X	X	PP&R
	Big 4 Corners Natural Area	Bernard's Pond	X	X	PP&R
	NE 138 th WQF	Schlessinger (Zen Pond)	X		BES
	Johnson Lake *	Johnson Lake			Private, BES PP&R
	Blue Heron Wetland *	Blue Heron Wetland			BES
Johnson Creek	Circle Ave	Pumpully Pond	X	X	Private
	Circle Ave	Water Bureau wetland			Water Bureau
	Circle Ave	Brunkow Pond			PP&R
	Powell Butte	Stock Pond	X		PP&R
	Zenger Farms	Tire Pond			BES
	Zenger Farms	Wetland			BES
	North Zenger	Triangle Site			BES
	Leach Botanical Gardens	Leach Pond	X		PP&R
	Brookside Park	Constructed ponds (1-7)	X	X	BES, PP&R
	East Powell Butte Restoration Area	Brownwood/Schweitzer North Backwaters	X	X	BES, PP&R, Metro
	East Powell Butte Restoration Area	Brownwood/Schweitzer South Backwaters	X	X	BES, PP&R, Metro
	East Powell Butte Restoration Area	JC/KC North Backwater	X	X	BES, PP&R, Metro
	East Powell Butte Restoration Area	JC/KC South Backwaters	X	X	BES, PP&R, Metro
	East Powell Butte Restoration Area	Alsop Wetland			BES, PP&R, Metro
	Veterans Creek *	Veteran's Creek Pond	X	X	BES, PP&R
	Mitchell Creek *	Mitchell Creek Pond	X		PP&R
Crystal Springs area *				PP&R	
Reed College Canyon *				Private	
Willamette River	Oaks Bottom	Tadpole Pond	X	X	PP&R
	Oaks Bottom	Aurora Lake	X	X	PP&R
	Oaks Bottom	Ancient Pond			PP&R
	Oaks Bottom	Channels			PP&R
	Sellwood Riverfront Park	Sellwood Pond			PP&R
	Water Pollution Control Lab	Control Lab pond	X	X	BES
	BES Fiske B *	BES Fiske B	X	X	BES
	Audubon Society Portland	Sanctuary Pond	X	X	Private
	Tryon Creek	Tryon Creek Headwaters			PP&R
	Fanno Creek	April Hill Park			PP&R
	Gabriel Park Wetlands *		X	X	PP&R

* Additional site added to check for breeding population, but not to be surveyed more than once in a season, and only as time permitted.

Oaks Bottom Wildlife Refuge on the bank of the Willamette River has several individual sites within and near it. All are managed by Portland Parks & Recreation. The individual sites are referred to as: Tadpole Pond, Aurora Lake, Ancient Pond, and Channels. The location and proximity of the sites to each other can be seen in Figure 4 on page 26. All are referred to as “Oaks Bottom” on the Egg Mass Survey Site Location and Species Presence Map in the Results section (Figure 1 on page 11).

The Big Four Corners Natural Area (“Big Four”) is owned and managed by the City of Portland and is located in the Columbia Slough watershed. The Big Four Corners Natural Area has been divided into several sites for the purposes of the egg mass surveys (Figure 6 on page 35). These include Winmar Flats north ponds, Winmar Flats south ponds, Mason Flats–Bart’s Hollow, Alice Springs east pond, Alice Springs west pond, WMS ponds, and Bernard’s Pond. All individual sites are referenced as “Big Four” on most maps.

The Johnson Creek watershed has a series of sites located consecutively along the banks of Johnson Creek and adjacent properties. The Circle Avenue sites are located at the base of Powell Butte and include Pumpully Pond, Water Bureau wetland, and Brunkow Pond. They are labeled as “Circle Ave” on the Egg Mass Survey Site Location and Species Presence Map (Figure 2 on page 17).

Slightly farther downstream are a series of adjacent sites now joined by a restored wetland and referred to as “East Powell Butte Restoration Area.” These sites are located on Figure 7 on page 37 and are individually named: Brownwood/Schweitzer North Backwaters (1-4), Brownwood/ Schweitzer South Backwaters (1-4), Johnson Creek/Kelly North Backwater (1), Johnson Creek/ Kelley Creek South Backwaters (1), and Alsop Wetlands.

Survey Protocol

During the 2011 egg mass season area-constrained surveys were performed at all sites. An area-constrained survey calculates the relative amphibian abundance by determining the number of egg masses surveyed per square meter sampled. Area-constrained surveys best account for various microclimates, aquatic plant coverage, and multiple target species. They also collect the most accurate relative abundance data. Time-constrained surveys bias the relative abundances of the population and, while measures can be taken to minimize the bias, it is inherently present.

For each egg mass survey, the surveyor started at one end of the pond and walked along a transect to visually scan an area approximately 1 meter in width, moving continuously until the other end of the site was reached. The direction was then reversed as the surveyor walked another transect, parallel to the last and approximately 1 meter apart. This method was continued until all surveyable portions (three feet deep or less) of the site were surveyed. For sites with no established perimeter, such as wetland areas with forested corridors, a portion of the area was marked off to create a visually recognizable perimeter, and the new site dimensions were recorded.

Upon spotting an egg mass, the surveyor stopped and recorded: species, developmental stage of the eggs, and egg mass depth. Survey start and end times were also recorded, as were any other observations of wildlife, invasive species, weather, and water clarity. An example datasheet used during the 2011 egg mass season is included in Appendix 1.

Volunteer Training

One of the goals of the 2011 Amphibian Monitoring Program was to promote outreach and education. In an effort to involve concerned citizens and City of Portland employees in the Amphibian Monitoring Program, each volunteer was trained in January of 2011. Volunteers attended an in-class training session on survey protocol and amphibian identification methods for both pond-breeding and terrestrially-breeding species. Interested parties attended an onsite field-based training session to further their amphibian identification skills and to assist with the 2011 monitoring efforts. After Program Coordinator, Meghan Young, felt confident with each volunteer's identification skills, they performed surveys individually. Otherwise, Meghan partnered with them for their surveys, typically on larger sites where extra manpower was required to complete the area-constrained survey in one day.

TERRESTRIAL SURVEYS

Terrestrial Surveys for adult salamanders are important to the City of Portland because they consider amphibians in management plans for many properties. Currently, it is not known which of those properties and habitats are being utilized by adult amphibians. In

addition, several of the properties with suitable amphibian upland habitat have recently undergone restoration efforts, and more restoration and construction projects are planned for the near future. As the goal of many restoration efforts is to improve the habitat for local wildlife, it would be especially helpful to learn if construction and restoration efforts increase or decrease wildlife populations.

The goals of the terrestrial surveys are two-fold. The surveys will: 1) determine the presence or absence of amphibian species utilizing the upland forested habitats surveyed, and 2) target species that are terrestrially-breeding. Thus, terrestrial surveys will inventory species whose populations are not currently being surveyed with egg mass surveys, and support the egg mass surveys by confirming the presence of adult pond-breeders.

Species

The goal of the 2011 terrestrial surveys was to determine the presence/absence and, if possible, the approximate size density of populations of adult terrestrially-breeding amphibians at selected sites. Targeted species are listed in Table 3 and photos of these species are found in Figure 1 on page 11.

Table 3: Amphibians Targeted in Terrestrial Surveys.

Common Name	Latin name	Species Code	Strategy Species
Ensatina / Oregon Salamander	<i>Ensatina enschscholtzii</i>	ENES	
Western Red-backed Salamander	<i>Plethodon vehiculum</i>	PLVE	
Dunn's Salamander	<i>Plethodon dunni</i>	PLDU	
Long-toed Salamander *	<i>Ambystoma macrodactylum</i>	AMMA	
Northwestern Salamander *	<i>Ambystoma gracile</i>	AMGR	
Northern Red-legged Frog *	<i>Rana aurora</i>	RAAU	X
Northern Pacific Treefrog *	<i>Pseudacris regilla</i>	PSRE	
Pacific Giant Salamander	<i>Dicamptodon tenebrosus</i>	DITA	

* Pond-breeding.



Northwestern Salamander
Pond-breeding
(photo credit: Sara Viernum)



Northern Pacific Treefrog
Pond-breeding



Long-toed Salamander
Pond-breeding



Northern Red-legged Frog
Pond-breeding



Dunn's Salamander
Terrestrially-breeding



Ensatina (Oregon Salamander)
Terrestrially-breeding



Western Red-backed Salamander
Terrestrially-breeding

Figure 1
Photos of Select Target Species
Found in City of Portland

PP&R Amphibian Monitoring Program, 2011



Sampling Sites

Several sites were selected for the initial 2011 spring terrestrial surveys: Forest Park, Tryon Creek Headwaters, Powell Butte, Oaks Bottom Wildlife Refuge, Sellwood Riverfront Park, Whitaker Ponds and Errol Heights. Selected Willamette River park sites were to be added as time allowed. The sites are listed in Table 4.

Table 4. 2011 Terrestrial Amphibian Survey Sites.

Watershed	Site Name	Restoration Complete	Restoration Ongoing	Ownership
Columbia Slough	Whitaker Ponds		X	PP&R
Johnson Creek	Errol Heights		X	PP&R
	Powell Butte		X	PP&R
Willamette River	Butterfly Park		X	PP&R
	Cottonwood Bay		X	PP&R
	Forest Park		X	PP&R
	Kelley Point		X	PP&R
	Oaks Bottom		X	PP&R
	Power Marine		X	PP&R
	Sellwood Riverfront		X	PP&R
	Willamette Moorage Natural Area		X	PP&R
Tryon Creek	Tryon Creek Headwaters	X		PP&R

Survey Timing

Surveying for amphibians must occur during the appropriate months; generally late fall through late spring when the salamanders are active and most likely to be seen near the surface of the substrate. This time period includes the fall and spring rainy seasons when warm weather fronts offer ideal conditions for salamander movement above ground. Spring usually offers a longer period of time with appropriate conditions for surveying and this is the preferred survey season. Portland Parks & Recreation surveyed for terrestrial amphibians during the months of May and June, 2011.

Each site was surveyed three times, as weather and time allowed for ideal conditions. Humidity, air temperature, and ground temperature on the day of the survey were important criteria for survey day selection. Surveys were conducted during or shortly after rain events when the amphibians were likely to be closer to the ground surface. Both

dry and cold conditions may cause the salamanders to burrow farther into the substrate, making them more difficult to detect.

It was important to visit each site multiple times, especially if no individuals were detected on the first visit. Site visits to individual sites were separated by at least 10 days.

Survey Protocol

The terrestrial surveys were time-constrained surveys. While time-constrained surveys have inherent species abundance biases, they are preferred for inventory studies, especially when habitat patches are large and relatively homogenous. The biases of this method include unequal search effort among microhabitat types and skewed relative abundance estimates. As we were looking for the presence or absence of amphibians that all share similar habitat needs of moist woodlands in the vicinity of springs and ponds, the biases of this type of survey are of minor concern.

When starting a survey, the extent of the habitat patch was first determined. The site was divided into different habitat patches so that the surveyors could characterize the different microclimates of the site. A habitat patch is defined as a portion of the larger site that has the same or similar enough vegetation, slope, and canopy cover. This is somewhat subjective. The surveyors determined where two sections of a site were different enough to be distinguished as two separate habitat patches. Their boundaries were drawn on an aerial photo so that they could be added to GIS maps. At least one habitat patch was surveyed at each site. Most sites had only one habitat patch associated with them while Forest Park had three patches, and Powell Butte had four patches.

The search protocol was time-constrained. Keeping track of the minutes surveyed was the key to the success of this protocol. Surveyors spent 30 minutes of search time per habitat sector. Therefore, for each habitat patch or site, one surveyor spent 30 minutes, or two surveyors 15 minutes each. For sites larger than could be covered in 30 minutes, different habitat patches were visited for each survey. Transects were walked across the habitat patch. The stopwatch was started when the search began. Then the surveyors carefully looked under rocks, moss, bark slabs, downed woody debris, and any other groundcover likely to house amphibian species.

All surveys were conducted in a relatively non-destructive manner. Surface objects were lifted and replaced as near to their original position as possible. Hillsides were kept

relatively intact. Bark was sometimes pulled off logs, then replaced. Logs that were moderately decayed were sometimes separated, and the pieces replaced as well as possible. No logs were completely destroyed. The intent was not to abstain from any alteration, but rather to be conscientious about minimizing disturbance to the habitat by using a light-handed approach.

For this protocol, the surface was generally considered to be within the upper 30 cm of the top of the substrate. A maximum of five minutes was spent at any specific spot. When a salamander was found, the stopwatch was stopped, data collected, and the amphibian was replaced as close to where it was found as possible. The survey continued as the timer started again. Unknown species were marked as "UNK" to prevent a double error of inflating the count of a misidentified species and undercounting the actual species that was misidentified . Photos were taken of all unknown individuals for possible identification to species by an expert at a later date.

RESULTS

EGG MASS SURVEYS

Target Species Presence

This is the fourth year of egg mass survey results for the majority of the 2011 sites. Volunteer effort was expanded to 105 hours, which allowed the Amphibian Monitoring Program to visit thirty-nine sites in five watersheds searching for the egg masses of pond-breeding amphibians. Twenty-six of the sites received the full protocol and were scheduled for four surveys during the egg mass season. There were four target species: Northern Red-legged Frogs (*Rana aurora*), Northwestern Salamanders (*Ambystoma gracile*), Northern Pacific Treefrogs (*Pseudacris regilla*) and Long-toed Salamanders (*Ambystoma macrodactylum*). Table 5 shows the sites surveyed this season, their watershed, and the species observed pond-breeding at the site. Other species were noted if observed, irrespective of their lifecycle stage.

Results for the 2011 sampling season indicate the presence of all four target species in varying abundances and densities throughout the Portland area. Out of 38 sites surveyed during egg mass season, Northern Pacific Treefrog egg masses were found at 24 sites (63%), Northwestern Salamander egg masses were found at 13 sites (34%), Long-toed Salamander egg masses were found at 21 sites (55%), and Northern Red-legged Frog egg masses were found at 17 sites (45%). Table 5 lists the presence of species for each watershed in the 2011 breeding season and Figure 2 shows the location of these species within each watershed of Portland. The geographic distribution of the species shows that amphibians inhabit properties spread throughout the Portland metro area. However, there is less species richness at the southwestern Tryon Creek and Fanno Creek watershed sites. Figure 3 shows the geographic distribution of individual amphibian species found in 2011.

Table 5: 2011 Amphibian Species Presence During Egg Mass Surveys.

Species codes: RAAU: *Rana aurora* (Northern Red-legged Frog), PSRE: *Pseudacris regilla* (Northern Pacific Treefrog), AMGR: *Ambystoma gracile* (Northwestern Salamander), AMMA: *Ambystoma macrodactylum* (Long-toed Salamander), LICA: *Lithobates catesbeiana* (American Bullfrog), TAGR: *Taricha granulosa* (Rough-skinned Newt).

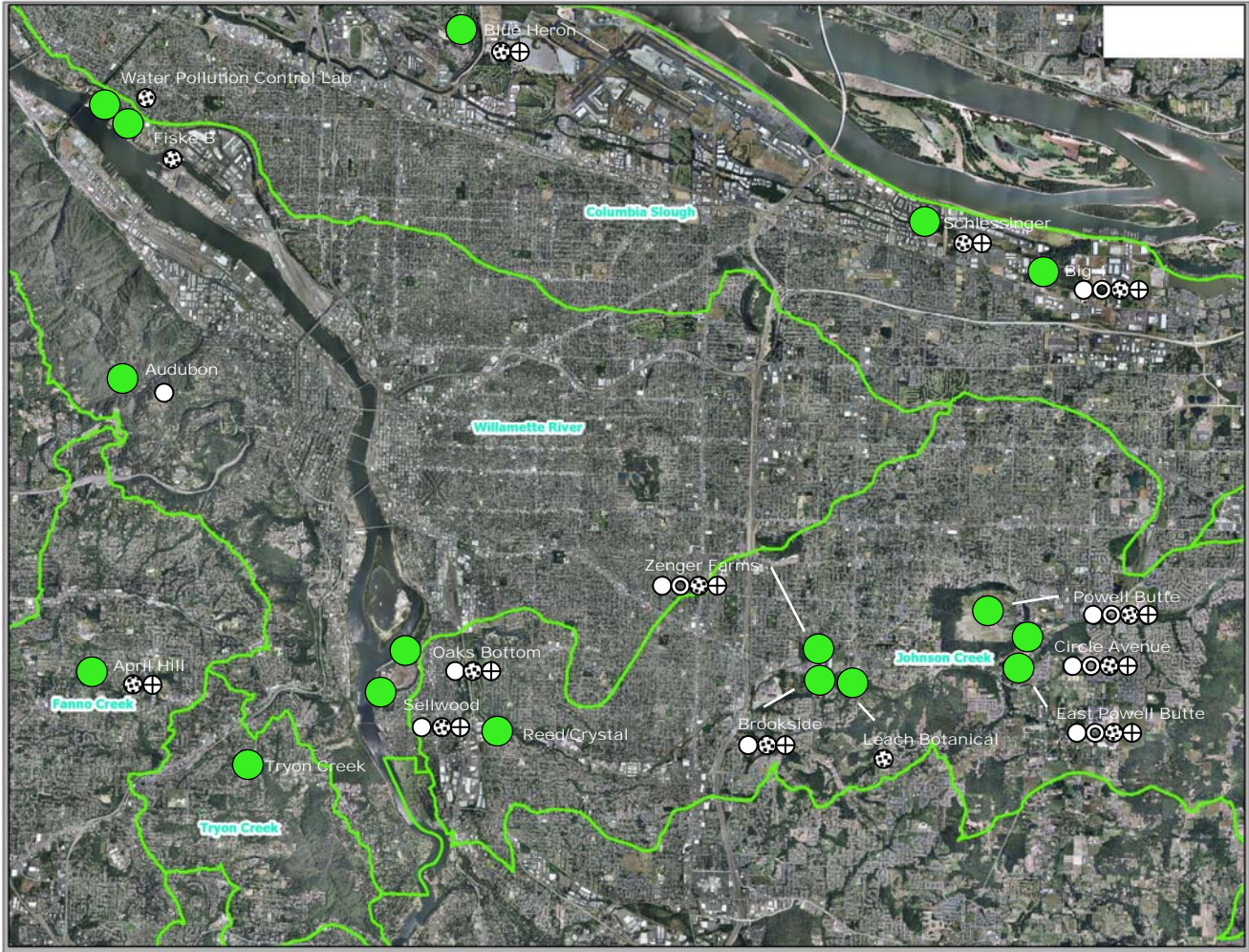
Species Code	RAAU	AMGR	PSRE	AMMA	LICA	TAGR
<i>Columbia Slough Watershed</i>						
Alice Springs – east pond	X	X	X	X		
Alice Springs – west pond	X	X	X	X		
Big 4 North Swales – WMS Ponds *	X	X	X	X	X	
Big 4 North Swales – Bernard’s Pond *		X	X		X	
Blue Heron Wetland *			X	X	X	
Johnson Lake **						
Mason Flats – Bart’s Hollow						
Schlessinger			X	X	X	
Winmar Flats – north ponds		X	X	X	X	
Winmar Flats – south ponds		X	X	X	X	
<i>Johnson Creek Watershed</i>						
Alsop Wetlands	X		X	X		
Brookside Park Park	X		X	X		
Brownwood/Schweitzer – North BWs	X	X	X		X	
Brownwood/Schweitzer – South BWs ***					X	
Circle Ave – Pumpelly Pond	X	X	X	X		X
Circle Ave – Water Bureau wetland	X		X	X	X	
Circle Ave – Brunkow Pond	X					
Crystal Springs area *						
JC/KC Backwaters – N BW	X	X		X		
JC/KC Backwaters – S BW ***	X	X				
Leach Botanical Gardens			X			
Mitchell Creek *						
North Zenger – Triangle		X		X		
Powell Butte – stock pond	X	X	X	X		
Reed College Canyon *						
Veteran’s Creek *	X					
Zenger Farms – Tire Pond	X			X		
Zenger Farms – Wetland		X	X	X		
<i>Willamette River Watershed</i>						
Audubon Society Sanctuary Pond	X					X
BES Fiske B *			X			
Oaks Bottom – Ancient Pond			X	X	X	
Oaks Bottom – Aurora Lake			X	X		
Oaks Bottom – Channels	X		X			
Oaks Bottom – Tadpole Pond			X	X		
Sellwood Riverfront Park	X		X	X	X	
Water Pollution Control Lab - pond			X			
<i>Tryon Creek Watershed</i>						
Tryon Creek Headwaters						
<i>Fanno Creek Watershed</i>						
April Hill Park ****			X	X		
Gabriel Park Wetlands *						
Species Present (# of sites)	17	13	24	21		
Species Present (% of sites)	45%	34%	63%	55%		
4 species Present # of sites (% of sites)		5/38 (13%)				
3 species Present # of sites (% of sites)		9/38 (24%)				
2 species Present # of sites (% of sites)		11/38 (29%)				
1 species Present # of sites (% of sites)		6/38 (16%)				
0 species Present # of sites (% of sites)		6/38 (16%)				

* Checked for Breeding

** Not surveyed due to time constraints and the appearance of unsuitable habitat.

*** Sites Brownwood/Schweitzer South Backwaters and JC/KC South Backwaters were surveyed three times, not four as the other sites were due to weather.

**** AMMA larvae were observed during egg mass surveys but no AMMA egg masses.



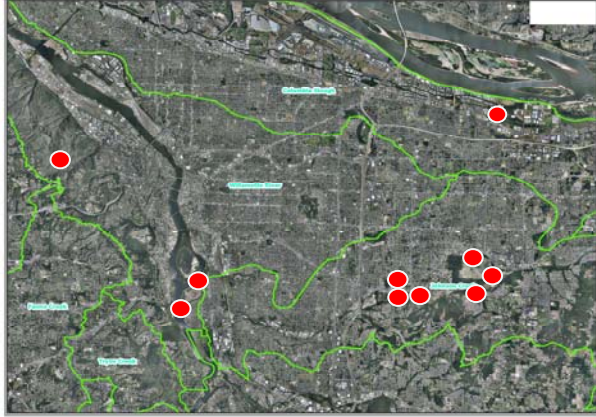
Watershed
Watershed outlines in green.

● Site

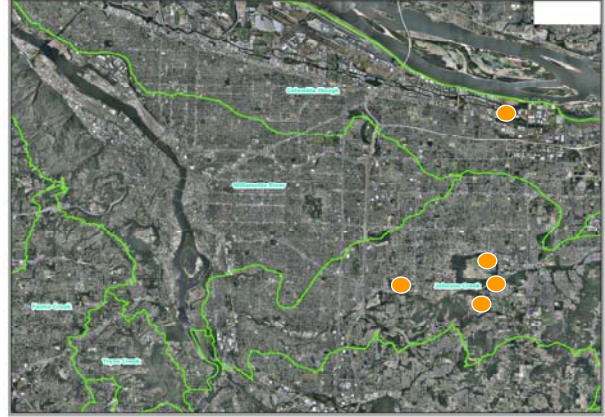
○ Northern Red-legged Frog
○ Northwestern Salamander
○ Northern Pacific Treefrog
○ Long-toed Salamander

Figure 2
2011 Egg Mass Survey
Site Locations and
Species Presence Map

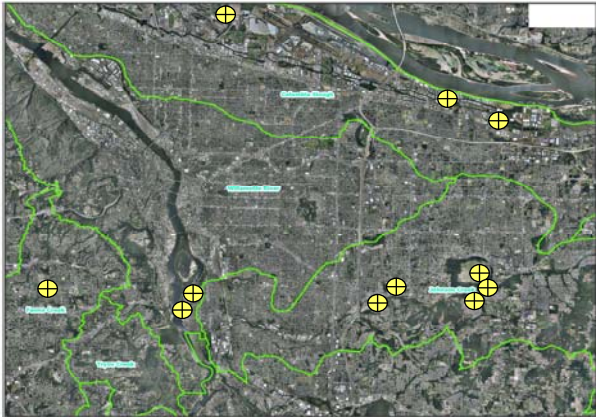




Northern Red-legged Frog



Northwestern Salamander



Long-toed Salamander



Northern Pacific Treefrog

**Figure 3
Documented Breeding Sites
Egg Mass Surveys 2011**

PP&R Amphibian Monitoring Program, 2011



In terms of species richness, five sites (13%) contained all four target species breeding together and 9 sites (24%) contained three target species breeding together. The species composition of which three species were present was not uniform. Seven sites were breeding locations for Northern Pacific Treefrogs, Long-toed Salamanders and either Northern Red-legged Frogs or Northwestern Salamanders, while two sites were a breeding site for Northwestern Salamanders, Northern Red-legged Frogs and either Northern Pacific Treefrogs or Long-toed Salamanders. Eleven sites (29%) had only two target species and six sites (16%) had only one target species. Sites with only one species contained either Northern Red-legged Frogs or Northern Pacific Treefrogs.

Due to the time constraints involved with visiting each site four times during a three month period, site prioritization was required. After exclusion from the full survey protocol, several sites were tagged to be checked for breeding populations as extra time and weather allowed. These sites are shown in Table 6. Time and weather allowed for three of the sites to be surveyed more than once. Those sites are indicated in the footnote to Table 6.

Table 6: 2011 Amphibian Species Presence (based on one egg mass survey to check for breeding)
 Species codes: RAAU: *Rana aurora* (Northern Red-legged Frog), AMGR: *Ambystoma gracile* (Northwestern Salamander), PSRE: *Pseudacris regilla* (Northern Pacific Treefrog), AMMA: *Ambystoma macrodactylum* (Long-toed Salamander), LICA: *Lithobates catesbeiana* (American Bullfrog), TAGR: *Taricha granulosa* (Rough-skinned Newt). [LICA species observed as juveniles or adults in pond.]

Species Code	RAAU	AMGR	PSRE	AMMA	LICA	TAGR
Columbia Slough Watershed						
Big 4 North Swales – WMS Ponds *	X	X	X	X		
Big 4 North Swales – Bernard’s Pond *		X	X		X	
Blue Heron Wetland			X	X	X	
Johnson Lake **						
Johnson Creek Watershed						
Crystal Springs area						
Mitchell Creek						
Reed College Canyon						
Veteran’s Creek	X					
Willamette River Watershed						
BES Fiske B *			X			
Fanno Creek Watershed						
Gabriel Park Wetlands						

* Sites Big 4 North Swales – WMS Ponds, Bernard’s Pond, and BES Fiske B were surveyed twice.

** Site was visited but due to time constraints and the appearance of unsuitable habitat, no survey was completed.

Species densities varied across watersheds and can be seen in Table 7. Total egg mass counts were determined by site by adding the number of newly laid, round stage egg masses from the four surveys. If there were any questions about the stages of the egg

masses counted, the greatest egg mass count from a single survey at that site was counted. This eliminated the possibility of counting an egg mass more than once and overestimating the total number of egg masses laid at that site during the season. Table 8 sorts the information in Table 7 by egg mass counts per site and by species.

Table 7: 2011 Target Species Egg Mass Counts by Site.

Species codes: RAAU: *Rana aurora* (Northern Red-legged Frog), AMGR: *Ambystoma gracile* (Northwestern Salamander), PSRE: *Pseudacris regilla* (Northern Pacific Treefrog), AMMA: *Ambystoma macrodactylum* (Long-toed Salamander).

Species Code	RAAU	AMGR	PSRE	AMMA
<i>Columbia Slough Watershed</i>				
Mason Flats – Bart’s Hollow				
Alice Springs – east pond	7	2	1-20	1-20
Alice Springs – west pond	14	9	1-20	21-100
Big 4 North Swales – WMS Ponds	2	9	1-20	1-20
Big 4 North Swales – Bernard’s Pond		14	1-20	
Blue Heron Wetland			1-20	1-20
Schlessinger/138 th WQF			100+	100+
Winmar Flats – north ponds		4	1-20	1-20
Winmar Flats – south ponds		4	1-20	1-20
<i>Johnson Creek Watershed</i>				
Alsop Wetlands	29		100+	21-100
Brookside Park	53		21-100	100+
Brownwood/Schweitzer – North BWs	1	4	1-20	
Brownwood/Schweitzer – South BWs				
Circle Ave – Pumpelly Pond	27	20	1-20	1-20
Circle Ave – Water Bureau wetland	17		21-100	4
Circle Ave – Brunkow Pond	2			
Crystal Springs area				
JC/KC Backwaters – N BW	19	1		1-20
JC/KC Backwaters – S BW	6	16		
Leach Botanical Gardens			21-100	
Mitchell Creek				
North Zenger – Triangle		34		1-20
Powell Butte – stock pond	73	12	100+	100+
Reed College Canyon				
Veteran’s Creek	2			
Zenger Farms – Tire Pond	1			1-20
Zenger Farms - Wetland		12	1-20	1-20
<i>Willamette River Watershed</i>				
Audubon Society Sanctuary Pond	40			
BES Fiske B			1-20	
Oaks Bottom – Ancient Pond			1-20	100+
Oaks Bottom – Aurora Lake			100+	100+
Oaks Bottom – Channels	15		1-20	
Oaks Bottom – Tadpole Pond			100+	1-20
Sellwood Riverfront Park	4		21-100	1-20
Water Pollution Control Lab - pond			100+	
<i>Tryon Creek Watershed</i>				
Tryon Creek Headwaters				
<i>Fanno Creek Watershed</i>				
April Hill Park			1-20	larvae
Gabriel Park Wetlands				

Table 8: 2011 Sites Ranked by Targeted Species' Egg Mass Counts.

For the purposes of this table, sites were not listed if they did not have any egg masses observed of that species.

Species codes: RAAU: *Rana aurora* (Northern Red-legged Frog), AMGR: *Ambystoma gracile* (Northwestern Salamander), PSRE: *Pseudacris regilla* (Northern Pacific Treefrog), AMMA: *Ambystoma macrodactylum* (Long-toed Salamander).

	Northern Red-legged Frog RAAU	Northwestern Salamander AMGR
Most egg masses per site	Powell Butte – stock pond	North Zenger – Triangle
	Brookside Park	Circle Ave – Pumpelly Pond
	Audubon Society Sanctuary Pond	JC/KC Backwaters – S BW
	Alsop Wetlands	Big 4 North Swales – Bernard’s Pond
	Circle Ave – Pumpelly Pond	Powell Butte – stock pond
	JC/KC Backwater – N BW	Zenger Farms – Wetland
	Circle Ave – Water Bureau wetland	Alice Springs – west pond
	Oaks Bottom – Channels	Big 4 North Swales – WMS Ponds
	Alice Springs – west pond	Winmar Flats – north ponds
	Alice Springs – east pond	Winmar Flats – south ponds
	JC/KC Backwaters – S BW	Brownwood/Schweitzer – North BWs
	Sellwood Riverfront Park	Alice Springs – east pond
	Big 4 North Swales – WMS Ponds	JC/KC Backwater – N BW
	Circle Ave – Brunkow Pond	
	Zenger Farms – Tire Pond	
Least egg masses per site	Brownwood/Schweitzer – North BWs	
	Northern Pacific Treefrog PSRE	Long-toed Salamander AMMA
100+ Egg Masses	Schlessinger/138 th WQF	Schlessinger/138 th WQF
	Powell Butte – stock pond	Powell Butte – stock pond
	Alsop Wetlands	Brookside Park
	Oaks Bottom – Tadpole Pond	Oaks Bottom – Aurora Lake
	Oaks Bottom – Aurora Lake	Oaks Bottom – Ancient Pond
	Water Pollution Control Lab - pond	
21-100 Egg Masses	Circle Ave – Water Bureau wetland	Alice Springs – west pond
	Leach Botanical Gardens	Alsop Wetlands
	Brookside Park Park	
	Sellwood Riverfront Park	
1-20 Egg Masses	Winmar Flats – north ponds	Winmar Flats – north ponds
	Winmar Flats – south ponds	Winmar Flats – south ponds
	Alice Springs – east pond	Alice Springs – east pond
	Alice Springs – west pond	Big 4 North Swales – WMS Ponds
	Big 4 North Swales – WMS Ponds	Blue Heron Wetland
	Big 4 North Swales – Bernard’s Pond	Circle Ave – Pumpelly Pond
	Blue Heron Wetland	Circle Ave – Water Bureau wetland
	Circle Ave – Pumpelly Pond	Zenger Farms – Tire Pond
	Zenger Farms - Wetland	Zenger Farms - Wetland
	Brownwood/Schweitzer – North BWs	North Zenger – Triangle
	Oaks Bottom – Ancient Pond	Brownwood/Schweitzer – North BWs
	Oaks Bottom – Channels	Oaks Bottom – Tadpole Pond
	BES Fiske B	Sellwood Riverfront Park
	April Hill Park	

Northern Red-legged Frog

Northern Red-legged Frogs (the egg mass survey's only Oregon Strategy Species) were found in three of the five watersheds surveyed: the Columbia Slough, Johnson Creek, and Mainstem Willamette River watersheds. No Northern Red-legged Frog egg masses were observed within the southwestern Tryon Creek or Fanno Creek watersheds.

The Powell Butte stock pond (Johnson Creek watershed) had the greatest concentration of Northern Red-legged Frog egg masses observed this season at any one site (73) accounting for 25% of the total number of egg masses found at all sites combined. Forty-three percent (43%) of all Northern Red-legged Frog egg masses were found at the top two Johnson Creek sites, the Powell Butte stock pond and the Brookside Park swales, while 73% of all Northern Red-legged Frog egg masses surveyed by the Amphibian Monitoring Program were from breeding populations within the Johnson Creek watershed. The Columbia Slough watershed supported 19% of the Northern Red-legged Frog egg masses found, while the remaining 7% were from the Mainstem Willamette River watershed at Oaks Bottom/Sellwood sites on the river and the Audubon Society pond.

Northwestern Salamander

Northwestern Salamander egg masses were found within the Johnson Creek (70%) and Columbia Slough watersheds (30%). The North Zenger Farms Triangle site (Johnson Creek watershed) had the greatest concentration of Northwestern Salamanders egg masses observed this season (34) accounting for 24% of the total number of egg masses found at all sites combined. Five of the top 6 sites for Northwestern Salamander egg mass count (Table 8) were located in the Johnson Creek watershed accounting for 67% of the species' egg masses surveyed this season. No Northwestern Salamander egg masses were observed within the Fanno Creek, Tryon Creek, or Willamette watersheds.

Northern Pacific Treefrog

The Northern Pacific Treefrog egg masses are surveyed as ranges rather than individual egg masses both because they are so plentiful and because an exact count is not directly correlated to the number of breeding females. Female Northern Pacific Treefrogs lay their eggs in a series of egg masses containing 9-70 eggs (Hallock and McAllister 2005) in multiple locations within the same breeding pond. For this reason, relative abundances of

egg masses describe relative abundances of females in the local population (eg. a pond with hundreds of Northern Pacific Treefrog egg masses has a relatively higher number of breeding females than a pond with 20 Northern Pacific Treefrog egg masses). The sites with greater than 100 Northern Pacific Treefrog egg masses were: Schlessinger pond in the Columbia Slough watershed; Powell Butte stock pond and Alsop Wetlands in the Johnson Creek watershed; and the Water Pollution Control Lab pond, Oaks Bottom Tadpole Pond, and Oaks Bottom Aurora Lake on the Willamette River. The next largest egg packet counts were also from Johnson Creek and Mainstem Willamette River watershed sites. The remaining sites that had 1-20 Northern Pacific Treefrog egg masses this season were from the above mentioned watersheds as well as from the Columbia Slough and Fanno Creek watersheds. No Northern Pacific Treefrog egg masses were observed in the Tryon Creek watershed. In summary, Northern Pacific Treefrogs breed in four of the five watersheds sampled by the Amphibian Monitoring Program.

Long-toed Salamander

The Long-toed Salamander egg masses are surveyed as ranges like the Northern Pacific Treefrog because their egg packet counts are also not directly correlated to the number of breeding females. Female Long-toed Salamanders lay their eggs in a series of egg masses. The number of eggs per packet is extremely variable. Single eggs are laid as well as masses of 10-20 eggs or more (Corkran and Thoms 2006). Like the Northern Pacific Treefrogs, a pond with hundreds of Long-toed Salamander egg masses has a relatively higher number of breeding females than a pond with twenty Long-toed Salamander egg masses. Sites with greater than 100 Long-toed Salamander egg masses were spread throughout the Portland Metro area at: Schlessinger pond in the Columbia Slough watershed; Powell Butte stock pond and the Brookside Park Park site in the Johnson Creek watershed; and at Aurora Lake and Ancient Pond in the Oaks Bottom Wildlife Refuge on the Willamette River. The next largest egg packet counts (21-100) were from Alice Springs west pond in the Big 4 complex in the Columbia Slough watershed, and Alsop Wetlands in the Johnson Creek watershed. The remaining sites that had 1-20 Long-toed Salamander egg masses were all from the same watersheds already mentioned. No Long-toed salamander egg masses were observed in the Tryon Creek watershed.

Non-target Species

Rough-skinned Newt

Rough-skinned Newts were identified at Circle Avenue Pumpully Pond, and eggs that may have been Rough-skinned Newts' were observed at Alsop Wetlands (however these were most likely individually laid Long-toed Salamander eggs). Both these sites are within the Johnson Creek watershed. Adult newts were observed at Audubon Sanctuary Pond.

American Bullfrog

American Bullfrogs were visually observed (in adult or tadpole form) at six of the nine sites (66%) surveyed in the Columbia Slough watershed (Table 5). Adult bullfrogs were also observed within the Willamette River and Johnson Creek watersheds this season at five of those watersheds' twenty-six sites (19%).

TERRESTRIAL SURVEYS

Target Species Presence

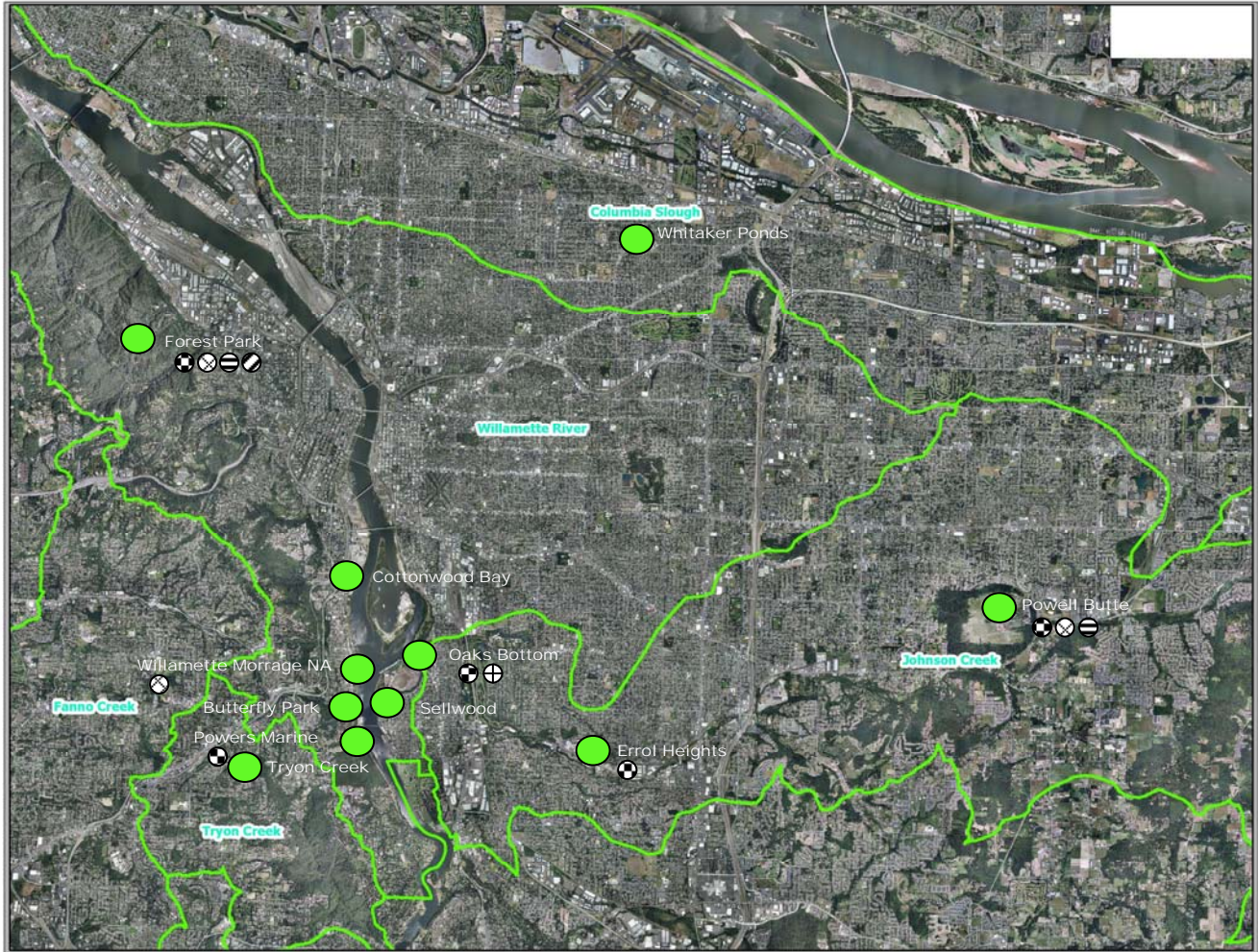
Terrestrial surveys were performed in the months of May and June 2011 targeting the terrestrially-breeding amphibians. However, any adult pond-breeding species was noted as well. The results of the terrestrial surveys are shown in Table 9. Several targeted species were not observed at any of the sites. Figure 4 shows the location of the species found during terrestrial surveys.

Table 9: 2011 Amphibians Species Observed during Terrestrial Surveys in May.

Species codes: ENES: *Ensatina enschscholzii* (Ensatina/Oregon Salamander), PLVE: *Plethodon vehiculum* (Western Red-backed Salamander), PLDU: *Plethodon dunni* (Dunn's Salamander), AMMA: *Ambystoma macrodactylum* (Long-toed Salamander), AMGR: *Ambystoma gracile* (Northwestern Salamander), RAAU: *Rana aurora* (Northern Red-legged Frog), PSRE: *Pseudacris regilla* (Northern Pacific Treefrog), and TAGR: *Taricha granulosa* (Rough-skinned Newt).

Breeding Location	Terrestrial			Pond				
Species Code	ENES	PLVE	PLDU	AMMA	AMGR	RAAU	PSRE	TAGR
Columbia Slough Watershed								
Whitaker Ponds								
Johnson Creek Watershed								
Errol Heights	X							
Powell Butte	X	X	X					
Willamette River Watershed								
Butterfly Park *								
Cottonwood Bay *								
Forest Park	X	X	X			X		
Kelley Point *								
Oaks Bottom	X			X				
Powers Marine	X							
Sellwood Riverfront Park *								
Willamette Moorage Natural Area		X						
Tryon Creek Watershed								
Tryon Creek Headwaters								

* These sites were to be added as time and weather permitted. They were only visited once and did not receive the full and complete protocol.



Watershed
Watershed outlines in green.

- Site
- ⊕ Oregon Salamander (ENES)
- ⊗ Western Red-backed Salamander (PLVE)
- ⊖ Dunn's Salamander (PLDU)
- ⊕ Long-toed Salamander (AMMA)
- ⊗ Northern Red-legged Frog (RAAU)

Figure 4
2011 Terrestrial Survey
Site Locations and
Species Presence Map

PP&R Amphibian Monitoring Program, 2011



DISCUSSION

2011 Egg Mass Surveys

The goal of the egg mass surveys was to determine the presence or absence of pond-breeding amphibians at selected properties throughout the Portland metro area. Pond-breeding amphibians were found to be actively breeding at 30 of 38 surveyed locations during spring 2011. Organization and survey timing was enhanced in 2011 so that virtually all the priority sites were surveyed the preferred four times. In addition, many of the additional sites that were added to “check for breeding populations” were surveyed more than once to minimize false designations of species absence. In contrast, in 2010 not all “check for breeding” sites were visited nor did the priority sites receive a consistent number of visits. Surveyor confidence in species absence was much stronger in 2011, due to the extra effort put forth in survey scheduling. The additional early attention to survey scheduling led to an increase in surveyor confidence, completion of all but two of the required priority surveys (two backwaters: Brownwood /Schweitzer South and Johnson Creek/Kelley Creek South), greater efficiency in data logging, greater volunteer involvement and completion of several extra surveys. The Project Coordinator will continue concentrating early in the winter field season on scheduling 2012 egg mass surveys due to the unprecedented efficiency gained. For the next egg mass season, the Project Coordinator would also like to concentrate on ensuring a return to previous sites no longer prioritized to confirm the continued pond-breeding activity of known amphibian populations and suitable sites with unknown amphibian activity.

In the 2011 pond-breeding amphibian season, Northern Pacific Treefrogs were found once again to be the most common native species in Portland, OR. Long-toed Salamanders and Northern Red-legged Frogs were less common than Northern Pacific Treefrogs but of similar abundance (although this is difficult to quantify statistically as the number of egg masses is not directly proportional to the number of breeding female Long-toed Salamanders). These results are largely consistent with findings in 2009 and 2010. Northwestern Salamanders were least populous of the four target species

Both Northern Pacific Treefrogs and Long-toed Salamanders have a large range of habitat preferences, which is one possible reason for their relative abundance compared to

other amphibians in the city. Both of these species are relatively tolerant to habitat disturbances and alterations, although this does not imply they can be found in highly developed areas (Leonard *et al* 1993). Northern Red-legged Frogs and Northwestern Salamanders, however, have more constrained habitat requirements, they are more sensitive to habitat changes, especially when neighboring upland habitat is destroyed or disconnected from sites in which they breed (Nussbaum *et al* 1983, Oregon Conservation Strategy 2006).

Despite the fact that Northern Red-legged Frogs have declined by nearly 70% in the Willamette Valley (Kiesecker *et al* 2001), this species has been found for the fourth consecutive year at specific sites in the Portland area. When looking at an enlarged map of each watershed, it appears that Northern Red-legged Frogs are ovipositing in sites that border a significant amount of upland habitat. When moving to and from breeding grounds, adult Northern Red-legged Frogs can migrate an average of 300 m to 1 km, and infrequently, up to 5 km (Hayes *et al* 2008). During these migrations, Northern Red-legged Frogs typically move through forested upland habitat, and their preferred upland habitat vegetation has been documented to be Sword Fern (Hayes *et al* 2008). Therefore, it is not surprising that in this study, Northern Red-legged Frogs were found in highest densities in sites with neighboring forest habitat, specifically in the Johnson Creek watershed and the east end of the Columbia Slough watershed (Figures 7 & 6). In the 2011 egg mass season, six of the top seven counts for Northern Red-legged Frog egg masses were found within the Johnson Creek watershed.

Although lower counts were recorded for Northwestern salamanders during the 2011 season, this species appears to have found a niche at certain sites in the Columbia Slough watershed. Nearly one third of the documented Northwestern Salamander egg masses (30%) were found in the Big Four Corners Natural Area in the Columbia Slough watershed located in the northeastern region of the city (Figure 2 on page 17). The other two-thirds (70%) were found spread throughout the Johnson Creek watershed. Preservation of and continued restoration to the Big Four Corners Natural Area is essential to the continued success of the Northwestern Salamander in the city.

Based on these observations, it is recommended that Northern Red-legged Frogs and Northwestern Salamanders be continuously monitored in the City of Portland. In areas of known species presence, improving habitat connectivity and establishing wildlife corridors

may greatly improve populations and increase breeding capabilities of both species. For example, allowing a 1 km radius review of adjacent upland habitat for potential habitat connectivity could greatly benefit existing populations.

2011 Terrestrial Surveys

Spring 2011 was the first time since 2009 that terrestrial surveys have been performed as part of the Amphibian Monitoring Program. The program viewed the 2011 season as a testing ground for the protocol, surveyors, and the decisions necessary for determining when each survey would occur. The goals for this season were to begin determining the presence/absence of terrestrially-breeding amphibians on City of Portland properties, to test the protocol, and to select habitat patches that would yield accurate results. The first two goals were achieved when the presence of terrestrial-breeding amphibians was documented at six properties. False negatives (absences) of species were minimized by surveying the same habitat patches several times throughout the season. However, only multiple seasons will determine if the absences are accurate.

Habitat patch selection was discovered to be a nuanced art and surveyor confidence in the patch selection varied greatly throughout the season. For the sake of survey consistency, the same habitat patches were surveyed each time. However, it was determined that for the larger sites it would be helpful to plan to spend 2 days testing several habitat patches early in the next season and to then use the best patches for the remainder of the surveys.

Surveyors also recommended beginning the terrestrial surveys concurrently with the egg mass surveys next spring. This modification was recommended after several surveys encountered difficulties with both high water flooding habitat patches and survey sites and overgrown vegetation affecting surveyor confidence in May and June of 2011. The protocol allows for repeated surveys to minimize the possibility of inaccurate species absences (false negatives) however, smaller vegetation will lead to a greater surveyor confidence in finding all amphibians on-site during the survey. An earlier start time for the season will also mean that more sites will receive their full three surveys each season as more surveys can be completed at low-lying sites before the spring rains inundate habitat patches. These surveys will have to be timed so that the ground temperature is well above freezing.

Egg Mass Multi-Year Comparison (2008-2011)

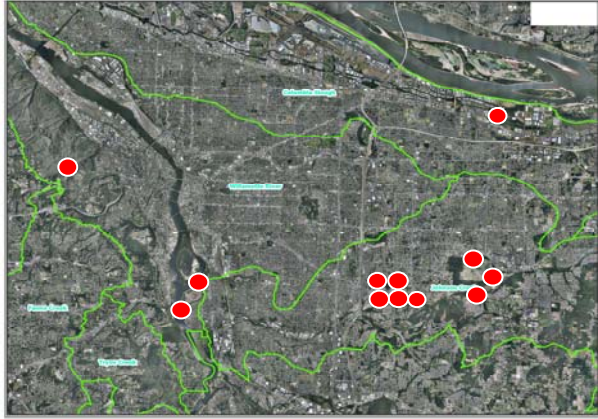
The Amphibian Monitoring Program has been surveying for amphibians within the Portland metro area since 2008. Table 10 compiles amphibian species found at individual locations by year. A cumulative map showing the distribution of pond-breeding amphibians found over that time is included in Figure 5.

Table 10: Species assemblage comparison between years for sites surveyed in 2008-2011.

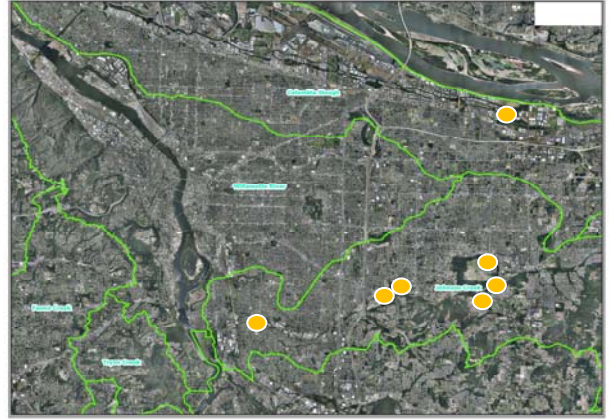
Species codes: PSRE: Pacific Treefrog (*Pseudacris regilla*), RAAU: Northern Red-legged Frog (*Rana aurora*), AMMA: Long-toed Salamander (*Amybstoma macrodactylum*), AMGR: Northwestern Salamander (*Ambystoma gracile*), TAGR: Rough-skinned Newt (*Taricha granulose*), LICA: American Bullfrog (*Lithobates catesbeiana*). ("N/A" is placed in the column if a site did not receive a survey in a given year.)

Water-shed	Site	PSRE				RAAU				AMMA				AMGR				TAGR				LICA			
		2008	2009	2010	2011	2008	2009	2010	2011	2008	2009	2010	2011	2008	2009	2010	2011	2008	2009	2010	2011	2008	2009	2010	2011
CS	Alice Springs	x	x	x	x		x	x	x	x	x	x	x				x					x			
CS	Big 4 N. swales	n/a	x	x	x	n/a	x	x	x	n/a	x	x	x	n/a		x	x	n/a				n/a		x	x
CS	Ramsey pond WQF			n/a	n/a			n/a	n/a			n/a	n/a			n/a	n/a			n/a	n/a	x	x	n/a	n/a
CS	Schlessinger/ 138th WQF	x	x	x	x					x	x	x	x	x								x	x	x	
CS	Whitaker			x	n/a				n/a				n/a				n/a				n/a	x	x	x	n/a
CS	Winmar Flats	x	x	x	x		x	x		x	x	x	x	x	x	x	x		x			x	x	x	x
JC	Beggar's Tick	x	x	x	n/a			x	n/a	x	x	x	n/a				n/a				n/a				n/a
JC	Brookside Park	x	x	x	x	x	x	x	x	x	x	x	x	x				x				x	x		
JC	Circle Ave Sites	x	x	x	x	x	x	x	x		x	x		x	x							x		x	
JC	Erroll Heights				n/a				n/a				n/a				n/a				n/a				n/a
JC	Kelly Creek					x	x															x	x	x	
JC	Leach Botanical Gardens	n/a	x	x	x	n/a	x	x		n/a		x		n/a				n/a				n/a			
JC	Powell Butte Stock Pond	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x						
JC	Pumpully Pond	x	x	x	x		x	x	x		x	x	x		x	x	x	x	x		x				
JC	Schweitzer/ Alsop	n/a	n/a	x	x	n/a	n/a	x	x	n/a	n/a	x	x	n/a	n/a			n/a	n/a			n/a	n/a	x	
JC	Tideman Johnson	n/a		x	n/a	n/a			n/a	n/a		x	n/a	n/a			n/a	n/a	x		n/a	n/a			n/a
JC	Zenger Farms	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x						
WMM	Audubon Society Pond	n/a	n/a			n/a	n/a		x	n/a	n/a			n/a	n/a			n/a	n/a	x		n/a	n/a		
WM	Oaks Bottom	x	x	x	x	x	x	x	x	x	x	x	x					x				x	x	x	
WM	Sellwood Riverfront Pond	n/a	n/a	x	x	n/a	n/a	x	x	n/a	n/a	x	x	n/a	n/a			n/a	n/a			n/a	n/a		
WM	Water Poll. Control Lab	n/a	x	x	x	n/a				n/a				n/a				n/a				n/a			n/a
FC	April Hill	n/a	x	x	x	n/a			x	n/a	x	x	x	n/a				n/a				n/a			n/a
TC	Maricara				n/a				n/a				n/a				n/a				n/a				n/a
TC	Tryon Creek Headwaters																								

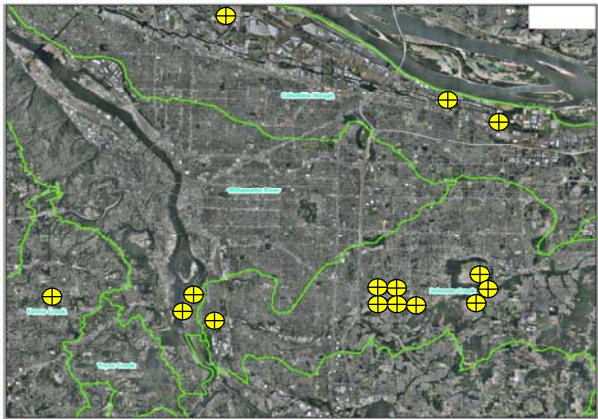
Watershed codes: CS- Columbia Slough, JC- Johnson Creek, WM(M)- Mainstem Willamette (& Willamette), TC- Tryon Creek, FC- Fanno Creek



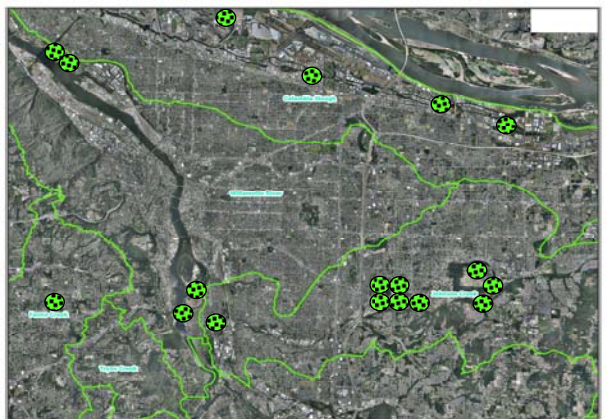
Northern Red-legged Frog



Northwestern Salamander



Long-toed Salamander



Northern Pacific Treefrog

Watershed
Watershed outlines in green.

Figure 5
Pond-Breeding Amphibian Species
Observed by Amphibian Monitoring Program
2008-2011

PP&R Amphibian Monitoring Program, 2011



Species Movement Amongst Sites 2010-2011

The 2011 Egg Mass Survey season revealed fluctuations in the presence of pond-breeding amphibians at particular sites as compared to other years (Table 10). Differences in egg mass presence from 2010 to 2011 are highlighted in Table 11. Two sites (Alice Springs east pond and Johnson Creek/Kelley Creek north backwater) had an amphibian species oviposit egg masses in 2011 that were not documented in 2010 (Northern Pacific Treefrog and Northwestern Salamander, and Long-toed Salamander and Northwestern Salamander, respectively). Five sites had species deposit egg masses in 2010 that did not return to the site to oviposit in 2011. The specific species and sites are identified in Table 11.

Table 11: Year to Year Variations in Amphibian Presence.

Species codes: AMMA: *Ambystoma macrodactylum* (Long-toed Salamander), AMGR: *Ambystoma gracile* (Northwestern salamander), RAAU: *Rana aurora* (Northern Red-legged Frog), PSRE: *Pseudacris regilla* (Northern Pacific Treefrog).

Site	2010	2011
Alice Springs – east pond	No PSRE nor AMGR	PSRE, AMGR
JC/KC N Backwater	No AMMA nor AMGR	AMMA, AMGR
Winmar Flats - north ponds	RAAU	No RAAU
Circle Ave- Brunkow Pond	PSRE, AMMA	No PSRE nor AMMA
Zenger Farms – tire Pond	PSRE	No PSRE
Zenger Farms – Wetland	RAAU	No RAAU
Leach Botanical Gardens	RAAU, AMMA	No RAAU nor AMMA

These fluctuations in the number of species found at any particular site in any particular year should not be a concern unless they have been documented for several years, and the populations inhabiting the habitat complex appear to be in decline. Individual “sites”, as referred to in this report, are political properties determined by deeds, and sometimes portions of properties subdivided to represent an area easily surveyed by one person in one workday. Thus, a park managed and named as a whole by Portland Parks & Recreation could have five “sites” within its boundaries. From the wildlife’s point of view, the entire property and possibly some of the adjacent upland

habitat is utilized as one home range for an individual population of a particular species. Multiple species will have overlapping home range habitats that may or may not compare favorably to the political boundaries of the land deeded to the City of Portland to be managed as a park. Thus, individuals of each species will move freely year to year between and amongst “sites” and breed within whichever body of water is most attractive to them at that time. For this reason, it would take years to collect enough data to determine with any confidence that a breeding population was no longer utilizing any particular home range. In addition, not enough is known about most of these amphibian species’ habitat size requirements to draw any conclusions about the “size” of any given population’s habitat.

Because so little is known about amphibian habitat usage in Oregon, the Oregon Conservation Strategy has named the Northern Red-legged Frog a “strategy species” in order to concentrate research efforts on that species, as it is considered an “umbrella species” for conservation efforts. An umbrella species is a species that, due to its habitat requirements, requires unique habitat management for conservation and protection which protects a broader list of similar species with narrower life cycles or less critical habitat requirements. It is currently hypothesized that Northern Red-legged Frogs migrate an average of 1-3 km, and sometimes up to 5 km, throughout the year (Hayes *et al* 2008). This large amount of area is larger than any of the Amphibian Monitoring Program’s “sites” and larger than most of the City of Portland’s managed properties. Therefore, the following section will discuss amphibian movement and site utilization from year to year within a broader context by grouping “sites” into geographic locales and ecosystems.

Big Four Corners

There are several possible explanations for the appearance of previously undocumented species’ egg masses at Winmar Flats and the Alice Springs ponds within the Big Four Corners Natural Area (Figure 6). In the case of the Alice Springs sites, the Northern Pacific Treefrogs and Northern Red-legged Frogs were already pond-breeding within the larger wetland and pond complex and perhaps merely

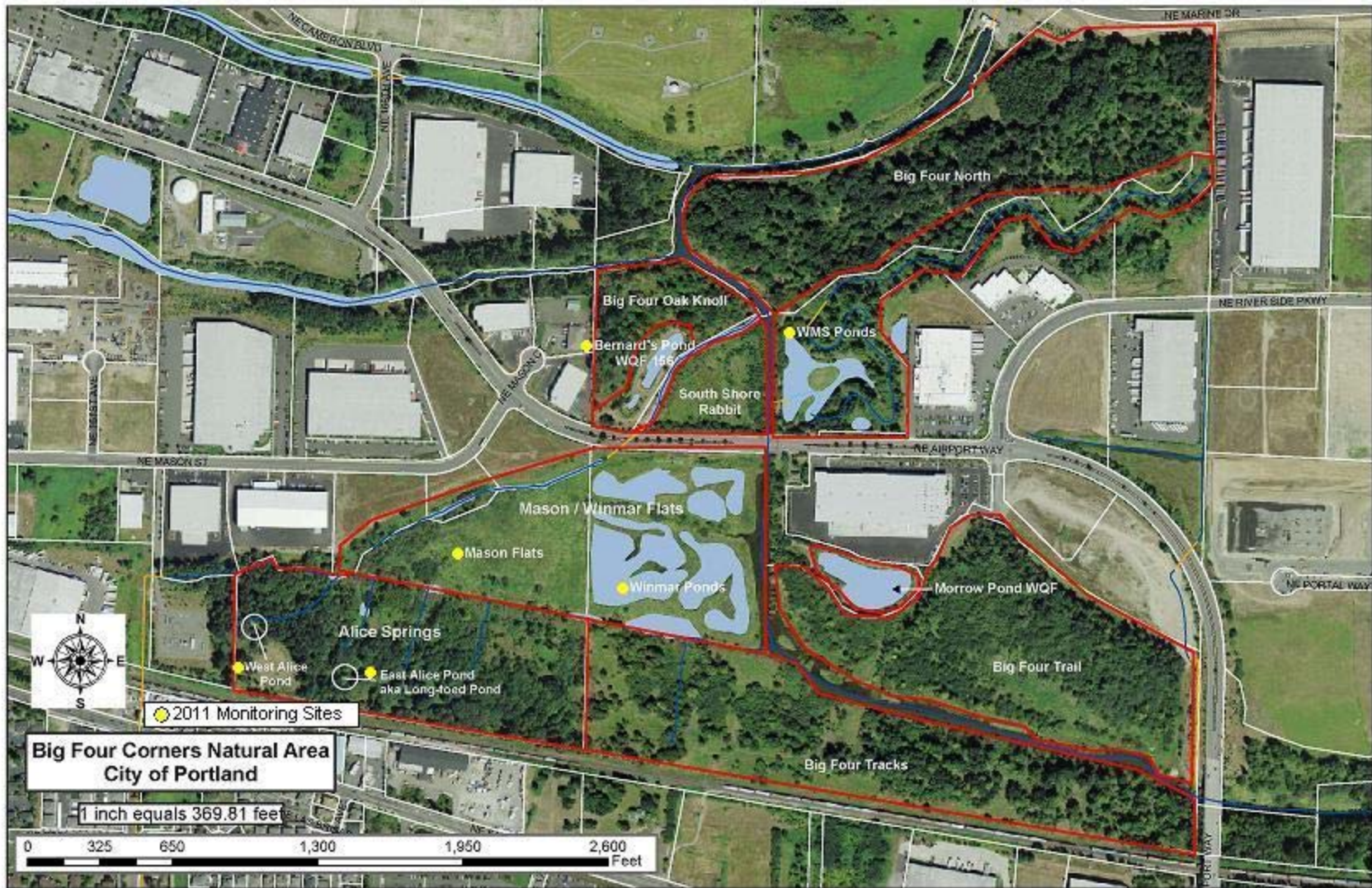


Figure 6. Big Four Corners Natural Area wetland complex, Columbia Slough Watershed.

This map shows habitat connectivity between sites in "Big 4" where all four target native species are breeding. (ArcMap created by BES Columbia Slough Watershed Team 2010)

selected different individual ponds within the complex this season. However, in the case of the Northwestern Salamander, no egg masses had ever been observed in the past four field seasons at Alice Springs. This is possibly an example of Northwestern Salamanders expanding their habitat range into the Alice Springs ponds. However, it is unknown if variability in the rainy season made the Alice Springs area more attractive this year, than previously utilized Winmar Flats. Figure 6 shows the proximity of Alice Springs to the other Big Four Corners sites: Bernard's Pond, Mason Flats, Winmar Flats, and the Big Four North Swales. In the case of Winmar Flats, this area has had a large breeding population of Northwestern Salamanders three of the last four years. The 2011 field season was the first year in this study that very few Northwestern Salamander egg masses were documented at Winmar Flats. Instead, for the first time in the history of this program, they were found at Alice Springs. In fact, the total number of Northwestern Salamander egg masses found within the Big Four Corners Natural Area (42), North Swales included, is nearly equal to that of Winmar Flats alone in 2010 (44). If egg mass numbers continue to be found in these numbers in future years, this may indicate a stable breeding population of approximately 40 Northwestern Salamander females within the Big Four Corners Natural Area.

Johnson Creek East

The 2011 field season is the first season that Long-toed and Northwestern Salamander egg masses were documented at the Johnson Creek and Kelley Creek North Backwater within the East Powell Butte Restoration Area (Figure 7). However, the previous year (2010), was the first year the East Powell Butte Restoration Area was visited by the Amphibian Monitoring Program. Preliminary surveys and site visits were made in 2010, but egg masses were not fully documented for the entire season, nor was the site visited in its entirety. The 2011 field season was the first season to fully document the egg mass season following the four survey protocol. It is not surprising that in this area, a greater number of egg masses spread over a greater number of "sites" were documented in 2011. The Amphibian Monitoring Program is just beginning to understand the extent to which this Restoration Area is being utilized by amphibians for egg mass oviposition.

Prioritizing the East Powell Butte Restoration Area in 2011 greatly enhanced the understanding of which amphibian species are utilizing the various parts of the stream and wetland complex for oviposition. In 2010, only Alsop Wetlands to the south had a

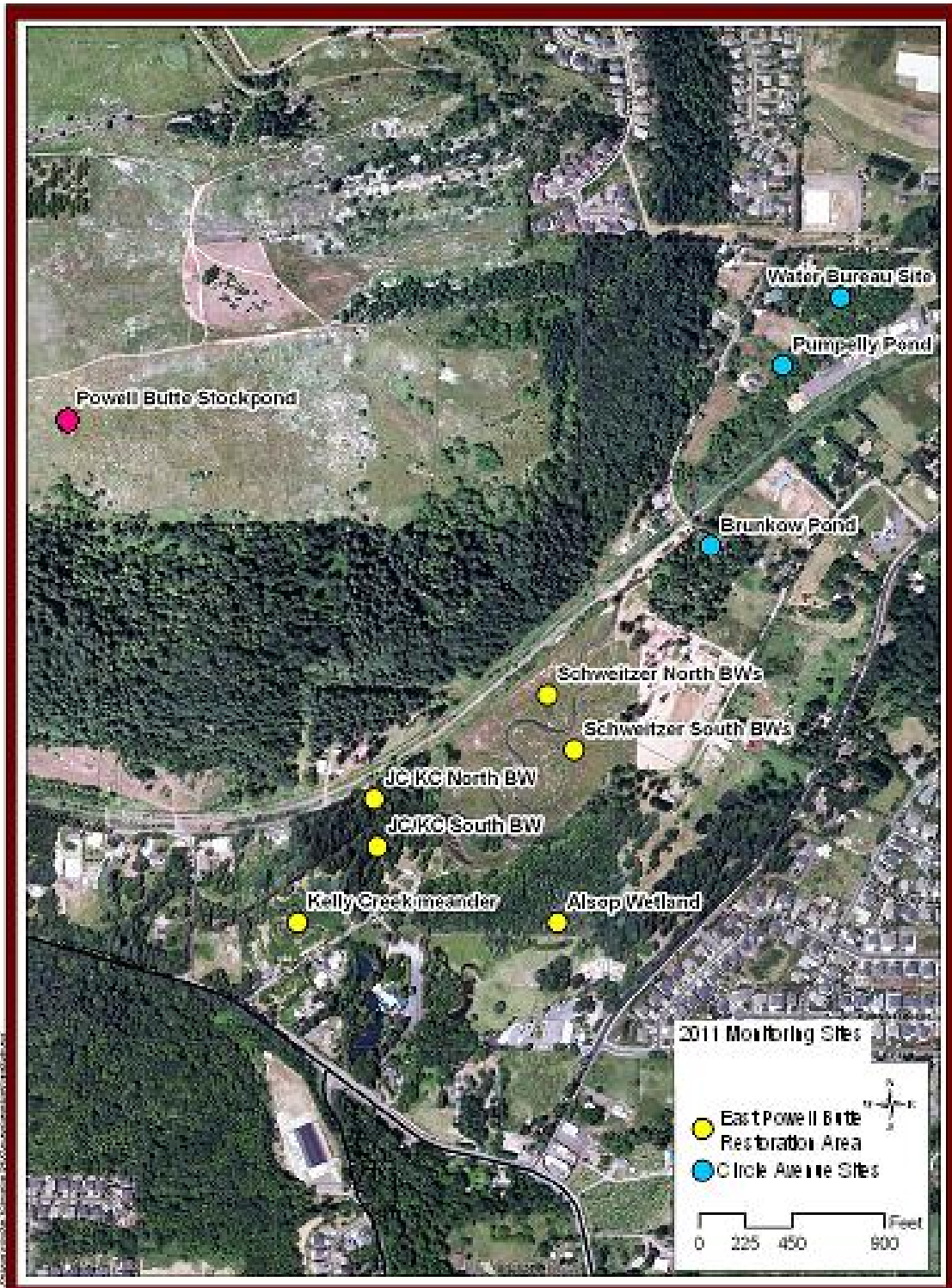


Figure 7: East Johnson Creek Watershed Sites.

This figure shows the connectivity of shared upland adult amphibian habitat as well as the aquatic interconnectedness of these sites. While amphibian population presence and absence fluctuate year to year at individual sites, the populations as a whole appear to be utilizing more of the available habitat and growing in population size.

documented richness of three species. However, in 2011 the Johnson Creek and Kelley Creek backwaters were documented to contain Northern Red-legged Frog, Long-toed Salamander, and Northwestern Salamander egg masses. The Brownwood/ Schweitzer sites were also documented to support Northern Red-legged Frogs, Northwestern Salamanders, and Northern Pacific Treefrogs. In 2010, all four target species were present and breeding within the larger wetland and stream aquatic complex shown in Figure 7 but only the Northern Red-legged Frog egg masses were documented at more than one location. This season, 2011, all the target pond-breeding species were ovipositing at more than one site and half of them were breeding at three distinct locations. This is a significant increase in the documentation of the utilization of the larger aquatic complex by all amphibian species observed onsite. In addition, a greater number of egg masses of each species were observed in the 2011 season, indicating that the full survey protocol is more comprehensive than the informal and initial survey efforts of 2010.

Oaks Bottom Wildlife Refuge

Oaks Bottom Wildlife Refuge is another ecosystem complex managed by Portland Parks & Recreation (Figure 8). It is a slice of forested riparian upland Black Cottonwood forest along the shores of the Willamette River. This forest is prime overwintering habitat for adult frogs. Between the riparian forest and the bluffs, river terraces lie with wetlands, ponds, and meandering streams containing suitable breeding sites for pond-breeding amphibians. Some of the ponds are man-made, some are naturally occurring. The largest body of water, Wapato Marsh, is a naturally occurring feature, but its water level is controlled with a dam. This allows for a perpetual shallow lake that supports waterfowl and allows a slower drainage of the basin after rain events which enhance the extensive wetlands. Native amphibians have been found breeding within the northernmost ponds closest to the widest section of the riparian upland forest. South of these north ponds (Aurora Lake, Ancient Pond, and Tadpole Pond) is the “channels” site, that feeds into the large shallow ponded water body that is the heart of the Refuge. Southwest of the Refuge and on the Willamette River itself is the Sellwood Riverfront Park. Due to the close proximity of these sites and the contiguous upland riparian forest that encompasses and connects the sites, this entire area should be viewed as one breeding population and discussed as a



Figure 8: Oaks Bottom Wildlife Refuge and Sellwood Riverfront Park.

This map illustrates the shared habitat connecting sites throughout north and south Oaks Bottom Wildlife Refuge, in what is known as the "Oaks Bottom Amphibian Conservation Area"

whole unit. Northern Red-legged Frogs appear to be utilizing the entire Oaks Bottom/Sellwood Riverfront Park ecosystem. The 2011 results were consistent with 2010 hypothesis that Northern Red-legged Frogs are overwintering in the riparian upland Black Cottonwood forest and crossing Springwater Trail to breed and oviposit throughout the Oaks Bottom ecosystem.

Johnson Creek West

The Zenger Farms Tire Pond site had Northern Pacific Treefrog egg masses documented onsite in 2010, but not in 2011; the Zenger Farms Wetlands had Red-legged Frog egg masses documented onsite in 2010, but not in 2011; and the Leach Botanical Gardens pond had Red-legged Frog and Long-toed Salamander egg masses documented onsite in 2010, but not in 2011. These sites are part of a larger Johnson Creek wetland/creek complex shown in Figure 9 and located west and downstream of the other Johnson Creek complex identified in Figure 7. This western Johnson Creek complex includes Beggar's Tick, Zenger Farm sites, Brookside Park swales, and Leach Botanical Gardens. Lack of oviposition by any one species at a particular "site" may simply indicate yearly variations in hydrology and the suitability of particular sites under differing hydrologic regimes. Continued monitoring is recommended to determine amphibian movement within the larger home range ecosystem.

At the Leach Botanical Gardens pond, low pond water levels were observed and noted during the first two surveys in February and March 2011 and these low levels may have impacted the total season egg mass counts for all species. For example, in 2011, no Red-legged Frog or Long-toed Salamander egg masses or masses were observed at Leach Botanical Gardens, while five Red-legged Frog and seven Long-toed Salamander egg masses and masses were observed the year before (2010). Northern Pacific Treefrogs were breeding at Leach Botanical Gardens in 2011 as 21-100 egg masses were observed. However, 243 were counted in 2010, indicating that all species counts were low at this site in 2011. It is possible and likely that breeding adults self-selected a different breeding pond when conditions were not favorable early in the season.

When the three Zenger Farm sites' egg mass counts are tallied as a whole, three Red-legged Frog egg masses were observed in 2010 and one in 2011, 25 Long-toed

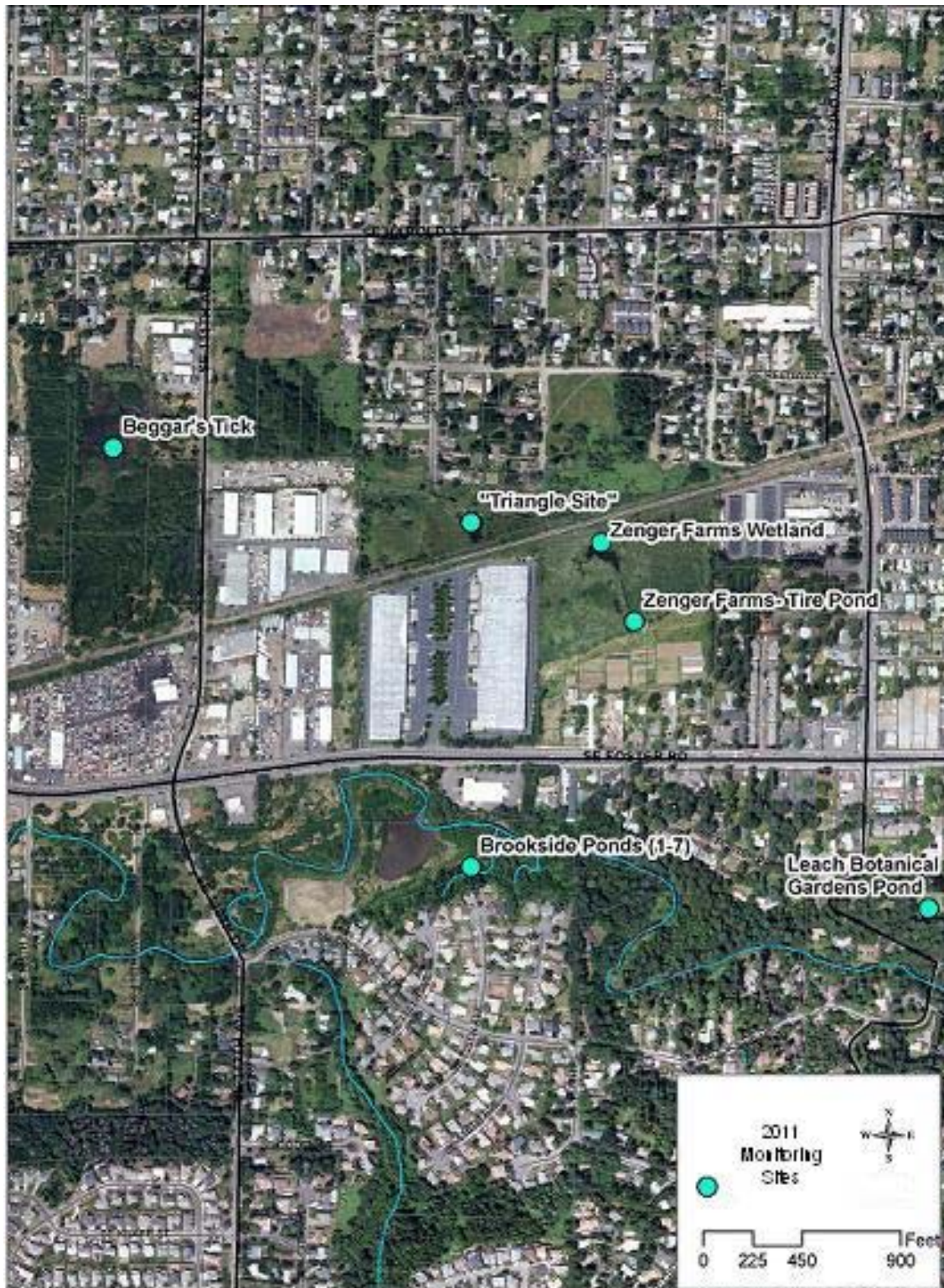


Figure 9: West Johnson Creek Watershed Sites.

This map also shows upland habitat connectivity between all seven Brookside Park Ponds and the forested areas surrounding Leach Gardens. Sites of high density for Northwestern Salamanders include Zenger Farms and neighboring Triangle site. (Beggar's Tick was not surveyed in 2011.)

Salamander egg masses were observed in 2010 and 1-20 in 2011, and 13 Northern Pacific Treefrog egg masses were observed in 2010 and 1-20 in 2011. Overall, the 2010 and 2011 populations appear to be similar to each other with minor variations in egg mass and packet deposition. Future surveys will show if the lone 2011 Red-legged Frog breeding female leaves the Zenger Farm complex, but the yearly variations are minimal enough for the other two species to assume the current population, while not booming, does not appear to be in decline either.

Overview and Future Direction

Since an undergraduate student project led to an amphibian monitoring project in 2008, the Portland Parks & Recreation Amphibian Monitoring Program has addressed species presence and abundance at selected sites in five watersheds. The program has successfully documented amphibian presence throughout the Portland area. At various times, the program has focused on habitat micro-niches, species egg mass densities, and population abundance estimates with varying degrees of success. This past year's regional data sharing with other amphibian monitoring programs led the Program Coordinator to redirect to focus of the program during the 2011 field season. This included: assessing the regional distribution of existing amphibian populations, documenting egg mass presence through standardized surveys, inventorying more City-managed properties pre- and post-construction and restoration activities, and adding another survey protocol to document additional amphibian species.

After meeting to discuss conservation efforts with other regional amphibian monitoring programs, it was deemed that restoration efforts focused solely on vegetation recommendations should not be as important this year. Instead, it is clear from these regional meetings that conservation efforts for native Oregon amphibians will be best served by concentrating on the Northern Red-legged Frog as it is an umbrella species and an ODFW Strategy Species.

One of the most pressing research questions about the Northern Red-legged Frog yet unanswered is the size of its home range is. Portland Parks & Recreation property management strategies for amphibians will look radically different if the populations are found to migrate 250-500m or 1-2 km from overwintering uplands to breeding ponds.

The City of Portland may wish to focus management efforts on creating habitat corridors and constructing more ponds in documented Northern Red-legged frog habitats within each watershed. However, linking habitat corridors that vary between 1 km and 250m long are very different undertakings. Thus, the Portland Parks & Recreation Amphibian Monitoring Program would like to concentrate its 2012 goals on supporting the regional effort to more fully document the current ranges of the amphibians within the Portland Metro area. Once the current breeding locations are more fully documented, and scientists determine the average migration range, more productive conservation plans can be developed. Sharing egg mass location data amongst programs will increase individual program knowledge of nearby sites managed by other entities.

In previous years, assumptions may have been made based on the belief that amphibians are everywhere in the city, and that if the ideal breeding habitat is built, then they will come. In the city of Portland, however, this may be incorrect. For example, the pond built within the Tryon Creek headwaters in 2009, has yet to have any egg masses. Perhaps this is because there are no adult amphibians in the vicinity of the pond, or perhaps this is because the area needs to naturalize more completely to erase construction scars before amphibians will find it to be suitable. This cannot be determined with the data currently available. Rather than recommend more plantings and modifications, this year, the Amphibian Monitoring Program is recommending increasing the number of sites, and the intensity of survey effort at priority sites so that a more complete picture of amphibian population distribution can be drawn.

The goals for the 2012 monitoring season are to:

1. add to the knowledge of amphibian species at selected sites,
2. collect appropriate quantities and types of data to make recommendations to assist planners with management of properties owned by the City of Portland,
3. establish baseline knowledge before restoration and construction projects and document any changes to amphibian populations and diversity with species inventory data,
4. collect regionally equivalent data so that we are included in regional amphibian research efforts and benefit from the regional group's expertise and combined data analyses,

5. continue to share with and learn from other regional city governments and bureaus who are also trying to incorporate amphibians into their assessment of successful management of their sites, and
6. continue to develop the Citizen Science aspect of the program both as a public outreach and education goal, and as a means to make the program more cost-effective.

2011 INDIVIDUAL SITE COMMENTS & RECOMMENDATIONS

This section is devoted to the site recommendations suggested for the continued success of the amphibian species currently breeding onsite and the development of more attractive breeding habitat for amphibian species not currently breeding there. Table 12 provides a quick overview of monitoring recommendations for all sites that the Amphibian Monitoring Program has surveyed or visited between 2008 and 2011. This includes sites that have been heavily surveyed over many years, sites visited only once or twice, sites that have yet to have their habitat assessed, and sites that have never been surveyed but could be considered for the future.

No habitat recommendations were made based on results from the 2011 Terrestrial-breeding Amphibian Surveys. It is too early in this new branch of the program to make recommendations. While the Amphibian Monitoring Program has great confidence in the presence of species found with the new protocol, any absence of species noted in this first season should be suspected of being reported as a false negative. There were too many variables of new protocol, new surveyors, and an inconsistent number of return surveys to the same site. The fall surveys will provide more data per site and the Amphibian Monitoring Program will have much greater confidence in their absence designations. With the completion of the fall surveys, staff will also have observed habitat conditions for a greater part of a year and will be able to make more astute observations that may explain a possible absence of some of the more common terrestrially-breeding amphibians.

This section discusses all sites that have ever been surveyed, from 2008 to present. They are listed alphabetically by watershed, and this section is to be used as a reference that is all encompassing (of any and all sites ever looked at or surveyed as part of the Amphibian Monitoring Program). In addition, all monitoring sites for the City of Portland are listed together, regardless of whether they were visited 4 times (as “priority sites”) or simply visited once (as “non-priority sites”), and independent of survey year. Smaller sites are sometimes grouped together within a larger area, and species presence refers to the area at large, with individual pond discussions to follow. For each site, the following information will be provided:

1. years surveyed (2008-2011),
2. cumulative species presence (for all years surveyed),
3. site comments, and
4. recommendations.

Management recommendations will be kept to a minimum. In previous years, site recommendations for improvements have been made, and followed, but the goal of this section is to serve as a reference to look up past site info or to plan for the future, and to provide more encompassing large scale goals. As for the “non-priority sites”, these have been inconsistently surveyed year to year and therefore their blanket recommendation is that each of these sites needs to be surveyed at least once in the 2012 egg mass season to assess site suitability and oviposition or lack thereof. Continued monitoring for these sites is essential as the Amphibian Monitoring Program does not currently have enough data to make recommendations. Some of these non-priority sites do not have enough surveys and information to make recommendations, while others have produced inconsistent data year to year.

Table 12: Recommendations for sites surveyed during 2008-2011 amphibian monitoring season.

Watershed codes: CS- Columbia Slough, JC- Johnson Creek, WM- Willamette Watershed, TC- Tryon Creek, FC- Fanno Creek

Species codes: ENES: *Ensatina enschscholzii* (Ensatina/Oregon Salamander), PLVE: *Plethodon vehiculum* (Western Red-backed Salamander), PLDU: *Plethodon dunni* (Dunn’s Salamander), AMMA: *Ambystoma macrodactylum* (Long-toed Salamander), AMGR: *Ambystoma gracile* (Northwestern salamander), RAAU: *Rana aurora* (Northern Red-legged Frog), PSRE: *Pseudacris regilla* (Northern Pacific Tree Frog), DITE: *Dicamptodon tenebrosus* (Pacific Giant salamander), LICA: *Lithobates catesbeianus* (American Bullfrog), and TAGR: *Taricha granulosa* (Rough-skinned Newt).

Recommendations for 2011-2012 Amphibian Sites and Future Monitoring Efforts						
Watershed	Site Name	Site Owner	Species Present 2008-2011	Egg Mass Monitoring	Terrestrial Monitoring	Monitoring Recommendations
CS	Big 4 Corners: Winmar & Mason Flats, Alice Springs, North Swales	BES PP&R	PSRE, RAAU, AMMA, AMGR, LICA	X X	X	Winmar Flats– continue full egg mass survey protocol. Alice Springs– continue full egg mass survey protocol and terrestrial surveys. North Swales – egg mass check for breeding.
CS	Blue Heron Wetland	BES	AMMA, PSRE, LICA			Egg mass check for breeding.
CS	Columbia Children’s Arboretum	PP&R	Unknown.			Egg mass check for breeding.
CS	Johnson Lake	Private BES PP&R	Unknown			Egg mass check for breeding.
CS	BES Ramsey Wetland Complex	BES	LICA			
CS	Schlessinger (Zen) Pond	BES	AMMA, PSRE, LICA			Egg mass check for breeding.
CS	Whitaker Ponds	PP&R	PSRE, LICA		X	Egg mass check for breeding.
JC	Beggar’s Tick	PP&R	PSRE, RAAU, AMMA	X		
JC	Brookside Park Constructed Ponds	BES PP&R	PSRE, RAAU, AMMA, ENES	X		
JC	Circle Avenue:Brunkow Pond, Pumpelly Pond, Water Bureau Site.	PP&R Private Water Bureau	PSRE, RAAU, AMMA, AMGR, TAGR, LICA	X		
JC	Crystal Springs and Reed College Canyon	PP&R Private	None			Egg mass check for breeding. Consider for terrestrial surveys based on undocumented reports of salamanders onsite.
JC	Errol Heights	PP&R	ENES		X	Egg mass check for breeding.
JC	East Powell Butte Restoration Area: Brownwood / Schweitzer, Johnson Creek /Kelley Creek Backwaters, Alsop Wetlands	BES PP&R Metro	PSRE, RAAU, AMMA, AMGR, LICA	X		Consider for terrestrial surveys.
JC	Flavel Ridge	PP&R	None			No further site visits or surveys are recommended.
JC	Foster & 106 th	BES	Unknown.			Egg mass check for breeding.
JC	Hillside Properties	BES PP&R	None			No further site visits or surveys are recommended.
JC	Leach Botanical Gardens	PP&R	RAAU, PSRE, AMMA			Egg mass check for breeding.
JC	Mitchell Creek Pond	PP&R	PSRE			No further site visits or surveys are recommended.
JC	Powell Butte	PP&R Water Bureau	RAAU, PSRE, AMGR, AMMA, TAGR, ENES, PLVE, PLDU	X	X	
JC	Tideman-Johnson	PP&R	PSRE, AMMA, TAGR, ENES			Egg mass check for breeding.
JC	Veteran’s Creek Pond	BES PP&R	RAAU	X		
JC	Zenger Farms & Triangle	BES	PSRE, RAAU, AMMA, AMGR	X		
WM	Audubon Society Pond	Private	RAAU, TAGR			Egg mass check for breeding. Consider for future terrestrial survey.
WM	Butterfly Park	PP&R	None		X	
WM	Cottonwood Bay	PP&R	None		X	
WM	BES Fiske B	BES	PSRE			Egg mass check for breeding.
Watershed	Site Name	Site Owner	Species Present	Egg Mass	Terrestrial	Monitoring Recommendations

			2008-2011	Monitoring	Monitoring	
WM	Forest Park	PP&R	ENES, PLVE, PLDU		X	
WM	Hoyt Arboretum	PP&R	None			No further site visits or surveys are recommended.
WM	Kelley Point	PP&R	None		X	
WM	Oaks Bottom	PP&R	PSRE, AMMA, RAAU, LICA, ENES, PLVE	X	X	
WM	Powers Marine	PP&R	ENES		X	
WM	Sellwood Riverfront Pond	PP&R	PSRE, AMMA, RAAU	X	X	
WM	Water Pollution Control Lab	BES	PSRE			Egg mass check for breeding.
WM	Willamette Moorage Natural Area	PP&R	PLVE		X	
TC	Foley-Balmer Natural Area	PP&R	PLVE			Consider for terrestrial surveys.
TC	Maricara Park	PP&R	ENES			Consider for terrestrial surveys.
TC	Marshall Park	PP&R	PLVE			Consider for terrestrial surveys.
TC	Tryon Creek headwaters	PP&R	None			Egg mass check for breeding.
FC	April Hill	PP&R	PSRE, AMMA, TAGR			Egg mass check for breeding.
FC	Gabriel Park Wetland	PP&R	None			No further site visits or surveys are recommended.

Columbia Slough Watershed

Big Four Corners Natural Area

(Winmar Flats, Mason Flats, Alice Springs, and Big Four North Swales)

- 1) Survey years: 2008, 2009, 2010, 2011
- 2) Species Presence (2008-2011): Northern Pacific Treefrog, Northern Red-legged Frog, Long-toed Salamander, Northwestern Salamander, American Bullfrog (invasive)
- 3) Comments:

WINMAR FLATS: This large wetland area has been surveyed every year since 2008. The site is divided into quadrants (NW, NE, SW, SE) to better record species findings in the wetland, although all of these sites are connected during periods of high water and/or via beaver channels. Species presence in Winmar Flats has varied year to year, but typically each field season produces low populations of Northern Pacific Treefrog and Long-toed Salamander. Although the site has attracted Northern Red-legged Frogs for the past three survey years (mostly in the north ponds), no Northern Red-legged Frog egg masses were found in 2011. Similarly, during the 2010 field season, a record number of 44 Northwestern Salamander egg masses were recorded in the south ponds, where as in the 2011 field season, fewer than 8 egg masses were found (in the north and south ponds combined). This is most likely not indicative of a decline in breeding populations of Northwestern Salamanders. The physical characteristics of the Big Four Corners Natural Areas has changed over the years based on a number of factors (eg., weather, restoration projects). These changes in water depth and inundation allow for Northwestern Salamanders (and Northern Red-legged Frogs) to preferentially choose which pond (within the large site) is most desirable during a given year. Winmar Flats was not desirable for breeding amphibians this year, in particular Northwestern Salamanders and Northern Red-legged Frogs, based on observations that water levels were low and there was very little attachment vegetation submerged in the water. The few Northwestern Salamanders that did attempt breeding this year at Winmar, most likely did not succeed as their egg masses were found decimated on the shore. When looking at the entire Big Four Corners site from an aerial view, there is much shared habitat, both upland and wetland, and it is easy to

understand why this is a stronghold for many native species. However, how each species chooses when and where to breed within the complex is difficult to pre-determine because each site within the large natural area is subject to significant hydrologic change throughout the year.

MASON FLATS: This adjoining wetland area was surveyed in 2010 & 2011. The north & south channels surrounding this are incredibly difficult to survey for egg masses due to the silty substrate (one Northern Pacific Treefrog egg mass was found in 2010). This difficult terrain is also found throughout the “Bart’s Hollow” area, where no egg masses were found in 2011. It is suspected that most amphibians in the area are preferentially choosing the neighboring site of Alice Springs, just to the north. In 2010, during an unofficial survey, approximately 10 Northwestern Salamander egg masses were observed in the north channel during March, suggesting that this site is supporting populations of breeding Northwestern Salamanders also.

ALICE SPRINGS: Both ponds (East and West) in this portion of Big Four have been surveyed every year since 2008. In the West Pond of Alice Springs, Northern Pacific Treefrogs and Long-toed Salamanders are commonly found, while in the East Pond (formerly “Long-toed Pond”), Northern Red-legged Frogs and Long-toed Salamanders are breeding. Common throughout the site is a significant amount of garbage that can be found in each of the ponds, as well as several abandoned tires in the East Pond. Although disconcerting and potentially hazardous to the surveyor, breeding amphibians do not appear to mind the debris. In fact, during the 2011 field season, East Pond attracted an abundance of Northwestern Salamanders as well as Northern Red-legged Frogs, possibly because of the low water levels and other unfavorable breeding conditions at neighboring site Winmar Flats.

BIG FOUR NORTH SWALES: The North Swales (Bernards Pond and WMS Ponds) have also been surveyed every year since 2008, however with varying degrees of effort and have been deemed less of a *priority site* than the aforementioned areas of Big Four. Bernard’s Pond is dominated by Yellow Flag Iris and Bullfrogs, although it appears to support a healthy population of Northwestern Salamander as well as both Northern Pacific Treefrog and Long-toed Salamander. In WMS Ponds (the large area consisting of the round pond along the east site and the channel area along the west), there is excellent aquatic vegetation to serve as attachment surfaces for Northern Red-legged Frogs. Reed

Canarygrass (*P. arundinacea*) dominates the perimeter of the site, providing an attachment species for Northwestern Salamanders. Both of these amphibians, as well as Northern Pacific Treefrog and Long-toed Salamander have been reported breeding at WMS Ponds each year. These North Swales are important to continue surveying, as they provide information on amphibian dispersal, outside of the more frequently surveyed areas of Big Four. To the amphibians, it is all the same habitat after all.

4) Recommendations: Continued surveys are recommended for the entirety of the Big Four Corners Natural Areas wetland complex, including the north and south channels of Mason and Winmar Flats, and the North Swales: Bernard's pond and WMS pond. For the past four years this area has been documented to experience seasonal movement of breeding amphibians (as witnessed with the lack of species' egg masses found at Winmar Flats in 2011). The City of Portland needs to document all that it can with regard to what human changes have been made (or will be made) at these sites and how these changes could potentially influence the entire area. Because this area will undergo a large restoration effort, led by BES in 2012, surveys should continue to occur prior to and post planned restoration activities. Native plants installed in fall 2010, should be monitored for success or failure and subsequent plantings (and/or trash removals) should be planned. Successive survey years will be of great importance in yielding further information for the Amphibian Monitoring Program. On a final note: Bullfrogs are breeding here (mainly observed in Winmar Flats, and the north swale ponds) and have an unknown impact on native amphibians.

Blue Heron Wetland

- 1) Years Surveyed: 2010, 2011
- 2) Species Present: Northern Pacific Treefrog, Long-toed Salamander, American Bullfrog (invasive)
- 3) Comments: This site was first visited at the end of the breeding season, in the summer of 2010, when the west half of the site had dried up and the water depth in the east half was 2-3 ft. It was not surprising to find American Bullfrog tadpoles, recorded in the hundreds, as this invasive species breeds later in the season than the native species. During the 2011 field season, one survey was completed in March

(during the middle of the native species breeding season), and egg masses of Northern Pacific Treefrog and Long-toed Salamanders were recorded.

- 4) Recommendations: The 2011 field season is our only year of data collection for egg masses at Blue Heron Wetland. Further surveys are necessary to determine presence/absence of Northern Red-legged Frogs in the area.

Johnson Lake/92nd Ave Water Quality Facility

- 1) Years Surveyed: 2011 (site visit)
- 2) Species Present: Unknown
- 3) Comments: At the time of the brief site visit during the 2011 egg mass field season, it was determined that the terrain of the lake would be too difficult for survey to be completed. The habitat also appeared to be unsuitable for amphibians.
- 4) Recommendations: No further surveys are recommended for this site.

BES Ramsey Wetland Complex

- 1) Years surveyed: 2008, 2009
- 2) Species Present: American Bullfrog (invasive)
- 3) Comments: This wetland is very large with many water features of varying size and hydroperiod, however; no native amphibians have been documented to be breeding at this site. There are two perennial ponds that are overrun with bullfrogs. There is little potential for successful native breeding within those ponds. There are several smaller ponds that tend to dry up in late spring or early summer, but this is not a long enough hydroperiod for most native amphibians. Although native egg masses have not been observed, one adult Northern Pacific Treefrog has been seen and several have been heard calling. This indicates that there is possibly a nearby population that could potentially colonize this area if suitable breeding habitat existed. No terrestrially-breeding salamanders were found here in 2008 or 2009, even though there is ground cover and downed woody material. It is suspected that their absence is due to the sandy soils at the site that retain little moisture. Because of this, there are no recommendations for encouraging terrestrial salamanders here as it is inherently not a favorable site for them.
- 4) Recommendations: None.

Schlessinger (Zen)—138th Water Quality Facility

- 1) Survey years: 2008, 2009, 2010, 2011
- 2) Species Presence (2008-2011): Northern Pacific Treefrog, Long-toed Salamander, American Bullfrog (invasive)
- 3) Comments: This area has healthy populations of both Northern Pacific Treefrogs and Long-toed Salamanders that are likely attracted to the diverse amount of plant cover and the longer hydroperiod of the site. This is an isolated site where both native amphibian species appear to be thriving. The only difficulty in surveying this site occurs during periods of heavy rain when the site experiences extensive flooding. Bullfrogs have been observed in the far eastern end of the site where the water is warmer and appears to be more stagnant. It is likely American Bullfrogs are breeding here as well.
- 4) Recommendations: Continued egg mass surveying is recommended, for at least one or two visits during the breeding season. One final note: In June of 2010, dead salamanders were found floating on the surface of the water. The reason for their demise is unknown. An email from Denis O'Brien, dated 2/6/2011, verified that no spraying of herbicides has occurred at this location since 2008. In the future, IF herbicide application is necessary *in the pond*, it is recommended that it not occur until after the breeding season when the native amphibians have left the water (July/August through early December).

Whitaker Ponds

- 1) Survey Years: 2008, 2009, 2010
- 2) Species Presence (2008-2010): Northern Pacific Treefrog, American Bullfrog (Invasive)
- 3) Comments: Whitaker Ponds was not surveyed for egg masses in 2011, but was surveyed three consecutive years prior. No native amphibian egg masses have ever been found in either of the large ponds (west & east) or the small pond at the base of the gazebo. However, in 2010, during an unofficial survey, approximately 100 Northern Pacific Treefrog tadpoles were observed in one of the small storm water ponds in late June, suggesting that this site is supporting populations of breeding treefrogs. Terrestrial surveys were performed here in 2009 and spring 2011. No

species were found during either survey. There is also a large population of Bullfrogs throughout the site, with an especially high concentration in the east pond. Bullfrog removal efforts at this site *may* increase native amphibian presence, but because the habitat is so favorable for them, it is likely that they will readily return. Small scale “Bullfrog round-ups” have been conducted, as an educational outreach event by Portland Parks & Recreation, from 2008-2010.

- 4) Recommendations: Continued terrestrial surveys are recommended at Whitaker Ponds. At the end of the 2010 egg mass field season, recommendations were made to monitor the water levels and hydro-period of the site where Northern Pacific Treefrog tadpoles were found, and to deepen one of the other adjacent storm water ponds that is typically dried out each season (and dominated by *Juncus spp.*) thus increasing the hydroperiod and potentially providing additional breeding opportunities for Northern Pacific Treefrogs at Whitaker Ponds. As of 2011, however, no site changes have occurred.

Johnson Creek Watershed

Beggar’s Tick Marsh

- 1) Years Surveyed: 2008, 2009, 2010
- 2) Species Present: Northern Pacific Treefrog, Northern Red-legged Frog, Long-toed Salamander
- 3) Comments: Approximately 30% of this enormous wetland/pond site was surveyed during the 2010 field season and moderate numbers of Northern Pacific Treefrog and Long-toed Salamander were recorded. In addition, a small number of Northern Red-legged Frog egg masses were recorded for the first time at this site. The center of this pond is ideal habitat for this species, so it is not surprising that they are breeding here. Terrestrial surveys were performed here during 2009, but no amphibians were found.
- 4) Recommendations: Although this site was *not* surveyed in the 2011 season, there is definitely potential here for continued Northern Red-legged Frog oviposition (based on findings in 2010). It is recommended that this site be included in the 2012 field season, if for no other reason than to determine presence of Northern Red-legged

Frogs in "Johnson West" and to eliminate a presumed *absence* of Northern Red-legged Frogs in the area.

Brookside Park: 7 constructed ponds

- 1) Years surveyed: 2008, 2009, 2010, 2011
- 2) Species Present: Northern Pacific Treefrog, Northern Red-legged Frog, Long-toed Salamander, Oregon Salamander
- 3) Comments: For the past four years, these seven small ponds are providing excellent habitat for native amphibians. The ponds are now well established and incorporated into the local ecosystem. Although American Bullfrogs are present, they appear to only be breeding in the large, exposed, main pond at Brookside Park. Terrestrial surveys in 2009 found Oregon Salamanders onsite.
- 4) Recommendations: It is recommended that these constructed ponds are continually surveyed in successive years as they are a hot spot of native amphibian activity, especially for Northern Red-legged Frogs. The site is also ideal for Citizen Science surveying. No changes have been observed at the site since 2008.

Circle Avenue Sites (Pumpelly Pond, Water Bureau Site, Brunkow Pond)

- 1) Years surveyed: 2008, 2009, 2010, 2011
- 2) Species Present: Northern Pacific Treefrog, Northern Red-legged Frog, Long-toed Salamander, Northwestern Salamander, Rough-skinned Newt, American Bullfrog (invasive)
- 3) Comments: Terrestrial surveys were performed at Circle Avenue sites in 2009, but no amphibians were found.

BRUNKOW POND: This is an interesting "pit" that has become a "pond" that is attracting low densities of Northern Pacific Treefrog, Long-toed Salamander, and Northern Red-legged Frog since surveys began in 2008. The dominant vegetation throughout the site is Yellow Pond-lily (*Nuphar luteum*) although there is a diverse amount of perimeter vegetation and shrubbery surrounding the pond. Although this site is not ideal, it does appear to be providing odd but suitable breeding habitat, and attracting the occasional Northern Red-legged Frog as well (only one egg mass was found in 2011).

PUMPELLY PRIVATE POND: This privately owned and maintained pond, at the base of the east side of Powell Butte, has been surveyed every year since 2008.

Consistent with findings in 2008, 2009, and 2010, this site has had very healthy populations of all 4 native pond-breeding amphibians (and Rough-skinned Newts are likely breeding here). Even though the pond retains water year-round, there are no Bullfrogs breeding here, quite possibly because they are removed by the owner of the pond. Mr. Pumpelly's pond is an excellent example of a healthy, man-made site that successfully attracts native amphibians in high abundances and future monitoring of this site will forever be recommended.

WATER BUREAU SITE: Surveyed since 2008, this large wetland area attracts a large population of three native species (Northern Pacific Treefrog, Long-toed Salamander, and Northern Red-legged Frog) and a high density of American Bullfrogs that are unlikely to be breeding on site. Because of the density of Yellow Flag Iris in the south end of the site, this area has not been surveyed since 2009. However, in the remainder of the site, fallen branches and plentiful aquatic vegetation provide ideal attachment objects for Northern Red-legged Frog and occasionally Northwestern Salamander.

4) Recommendations: For the past four years these sites surrounding the Powell Butte forest have been surveyed and continue to show a high species diversity with high numbers of egg masses from all species. Without a doubt these sites should be monitored continuously, year to year, as they are located in an incredibly important part of the ecosystem with immense upland habitat and connectivity to Gresham's natural areas and amphibian populations. Mr. Pumpelly's pond should continue to serve as an ideal training site for those involved in the City of Portland's Amphibian Monitoring Program.

Crystal Springs and Reed College Canyon

- 1) Years Surveyed: 2011 (site visits)
- 2) Species Present: none
- 3) Comments: Both of these sites were surveyed in 2011 for the first time. No egg masses for any species were found. Dr. Kaplan & Zach Perry (of Reed College Biology dept) insist that RAAU are breeding in these areas. Despite the lack of egg masses findings during the one visit to the Crystal Springs Rhododendron Garden in 2011, the habitat does appear to be suitable for Northwestern Salamander in particular. One adult salamander was found by a PP& R employee at entrance to the Rhododendron Garden (at SE 28th Ave and SE Woodstock).

- 4) Recommendations: Continue egg mass monitoring for species presence or absence, possibly expanding into the West Moreland golf course area. Also, consider adding to the list of terrestrial survey sites.

East Powell Butte Restoration Area

(Brownwood-Schweitzer, Johnson and Kelley Creek Backwaters, Alsop Wetland)

- 1) Years surveyed: 2010, 2011
- 2) Species Present: Northern Pacific Treefrog, Northern Red-legged Frog, Long-toed Salamander, Northwestern Salamander, American Bullfrog (invasive)
- 3) Comments:

BROWNWOOD/SCHWEITZER and JOHNSON AND KELLEY CREEK

BACKWATERS: This huge restoration area, located on the southeast side of Powell Butte, and thus adjacent to habitat known to shelter overwintering amphibians, has been surveyed since 2010. Each of the sites surveyed within this area is not a *pond* but a *backwater*, with fluctuating water levels. In several of these, specifically both the north and the south “JC/KC” backwaters, Northern Red-legged Frog egg masses were found. (The only Bullfrogs observed on site are breeding in the “Abandoned JC Channel”, as observed in 2010.) The backwaters are not always possible to survey due to the flooding of Johnson Creek, however there is potential for some of the backwaters to evolve into suitable breeding habitat for amphibians. For example, one of the backwaters (Schweitzer North BW 1) has been attracting Northwestern Salamanders for the past two years. This entire area of Brownwood-Schweitzer has very high breeding potential, and excellent upland habitat, although it is difficult to know which areas of the site are most suitable for pond-breeding amphibians.

ALSOP WETLAND: Within this large wetland complex, three native species are breeding in a select area of the site, bordering the private property at the south end. The small area of the wetland that is most suitable to amphibians is approximately 30m x 60m and has excellent aquatic vegetation and is an ideal depth for breeding individuals of Northern Pacific Treefrogs, Long-toed Salamanders, and Northern Red-legged Frogs. Alsop Wetland was added to the Amphibian Monitoring Program in 2010, and was found to be a hot spot for Northern Red-legged Frogs. This was not surprising based on its proximity to Powell Butte, Circle Avenue, and the surrounding connected forested upland habitat.

- 4) Recommendations: It is recommended that egg mass monitoring efforts continue throughout this immense area, as flooding conditions allow, to determine how the site continues or discontinues to be utilized by breeding amphibians, specifically in each of the backwaters. East Powell Butte Restoration Area should also be considered for terrestrial amphibian surveys.

Errol Heights

- 1) Years surveyed: 2008, 2009, 2010, 2011 (terrestrial surveys only)
- 2) Species Present: Oregon Salamander
- 3) Comments: In 2007, three ponds were constructed by BES. All ponds on the property were surveyed in 2008 and 2009. No amphibian egg masses or tadpoles/larvae were observed. The site was surveyed in 2010 and no amphibian egg masses were present. It is unclear why no amphibians are breeding throughout Errol Heights. High nitrate levels were persistent from 2008-2010, but that may not be the only contributing factor to the lack of pond-breeding amphibians here. However, terrestrial surveys in both 2009 and spring 2011 found Oregon Salamanders onsite.
- 4) Recommendations: Yearly site visit to check for pond-breeding amphibians, and continued terrestrial surveys.

Flavel Ridge

- 1) Years Surveyed: 2009
- 2) Species Present: none
- 3) Comments & Recommendations: No egg masses of pond-breeding species observed in site, as the area probably dries before the end of the season. No further site visits or surveys are recommended.

Hillside Properties: north of Springwater Trail at base of the bluff

- 1) Years Surveyed: 2010 (site visit)
- 2) Species Present: none
- 3) Comments & Recommendations: This site was visited in the winter of 2010 and was reported to be dry, with the exception of a few inches of moist substrate in parts of the site. This site is most likely not a realistic breeding site. No further visits or surveys necessary.

Leach Botanical Gardens Pond

- 1) Years surveyed: 2008, 2009, 2010, 2011
- 2) Species Present: Northern Pacific Treefrog, Northern Red-legged Frog, Long-toed Salamander
- 3) Comments: This tiny pond supports a small population of Northern Pacific Treefrog, Long-toed Salamander, and the occasional Northern Red-legged Frog egg mass, however no egg masses were found in 2011.
- 4) Recommendations: For the past three years, recommendations have been made to deepen the pond and to remove the residing plants from plastic tubs and to actually plant them into the pond. As of 2011, no progress has been made on these recommendations. However, these small improvements may help to continue attracting Northern Red-legged Frogs, even if the neighboring site of Brookside Park is more desirable to them. Continue to check the pond for egg masses.

Mitchell Creek

- 1) Years Surveyed: 2011 (site visit)
- 2) Species Present: none
- 3) Comments & Recommendations: Not suitable amphibian habitat. No further site visits or surveys are recommended.

Powell Butte

- 1) Years surveyed: 2008, 2009, 2010, 2011
- 2) Species Present: Northern Pacific Treefrog, Northern Red-legged Frog, Long-toed Salamander, Northwestern Salamander, Rough-skinned Newt, Oregon Salamander, Western Red-backed Salamander, Dunn's Salamander
- 3) Comments: Terrestrial surveys in both 2009 and spring 2001 found three species of amphibians in the Powell Butte uplands: Oregon Salamanders, Western Red-backed Salamanders, and Dunn's Salamanders.

POWELL BUTTE STOCK POND: For the past four years, this small, vernal pond at the top of Powell Butte (aptly named "stock pond") has had some of the highest densities of native amphibian species breeding in the city of Portland. On a single day in 2010, with only 40% of the site covered, a record number of egg masses, 586 for Northern Pacific

Treefrog , 509 for Long-toed Salamander, and 112 for Northern Red-legged Frog, were recorded. During the 2011 season, the pond continued to yield high numbers of egg masses for Northern Red-legged Frogs and other natives as well. Because this is an ephemeral site, American Bullfrogs do not breed here, although the hydroperiod of the pond is much longer than most seasonal ponds in the city (with drying dates occurring as late as August/September). Because of the large amount of upland habitat surrounding Powell Butte, and the popularity of Stock Pond for breeding amphibians, the construction of additional vernal ponds has been strongly encouraged recommended for the last three years. It appears that progress on this is being made and funding has been acquired to build additional ponds.

PRIVATE PROPERTY ON NORTH SIDE: This site was visited in 2010 and is located near SE 141st & Mall, which places it along the west side of Powell Butte. The amount of water in this site varies seasonally but it does not appear to be a suitable breeding ground for amphibians. The site is also very exposed, sandwiched between two lawns and a neighborhood street. No amphibians were found during a tadpole/larvae survey in the spring.

THREE FIRS RIDGE WETLAND (BOG) SITE: When visited in the spring of 2010, no pond was found at this site. Instead, a very moist, bog-like area was holding about an inch of water in one area. Based on the contours of the slope where this bog is located, it is not suspected that believe that this area will ever retain amounts of water sufficient for pond-breeding amphibians.

POWELL BUTTE TERRESTRIAL QUADRANTS: Four quadrants were surveyed for terrestrial amphibians in the spring 2011 season: north, south, east, and west slopes of the butte. A greater number of individuals, and three species were observed on the three coniferous slopes. One individual Oregon Salamander was observed on the Big Leaf Maple dominated slope. Further monitoring is recommended to determine if these early findings represent a trend that persists through many seasons, and throughout the year.

- 4) Recommendations: For the past four years the Powell Butte stock pond has been surveyed and shows a high species diversity with high numbers of egg masses from all species. The stock pond should continue to be a key site in the Amphibian Monitoring Program, for both egg mass and terrestrial surveys, because Powell Butte

and its extended ecosystem are an important natural refuge in the east Portland metro area.

Tideman-Johnson

- 1) Years Surveyed: 2008, 2009, 2010
- 2) Species Present: Northern Pacific Treefrog, Long-toed Salamander, Rough-skinned Newt, Oregon Salamander
- 3) Comments: This pond by the boardwalk has a relatively small population of Northern Pacific Treefrog and Long-toed Salamander attempting to breed here as surveys have shown in previous years. In 2009, Rough-skinned Newt were also observed. The only other site surveyed in this area was in 2010, across the creek, on the south side by Associated Chemicals, and it was reported as “dry”. Although it is possible that this site may seasonally fill with water, it is not suspected to be a suitable breeding habitat. Terrestrial surveys of upland habitat in 2009 found Oregon Salamanders onsite.
- 4) Recommendations: This pond was not surveyed in 2011. It is shallower than most ponds surveyed in the city, and the recommendation to deepen it has been made in previous years. It is unlikely for Northern Red-legged Frogs to be found here, however annual site visits are recommended to monitor other native species presence.

Veterans Creek Pond

- 1) Years Surveyed: 2011 (site visit)
- 2) Species Present: Northern Red-legged Frog
- 3) Comments & Recommendations: In 2011, the pond was relocated during a restoration project. This site should continue to receive egg mass surveys for the next 3-5 years to determine the success of amphibian breeding in the restored pond.

Zenger Farm Wetland & “Triangle Site”

- 1) Years surveyed: 2008, 2009, 2010, 2011
- 2) Species Present: Northern Pacific Tree-frog, Northern Red-legged Frog, Long-toed Salamander, Northwestern Salamander
- 3) Comments: The wetland at Zenger Farms (including the Tire Pond at the base of the hill), has been surveyed every year since 2008. The neighboring site of Triangle

across the spring water trail has very similar habitat characteristics to Zenger and was surveyed in 2010 and 2011. Large numbers of Northwestern Salamanders are attracted to both sites (42 egg masses recorded at Zenger Wetland during a single survey in 2010, and 34 were found at Triangle in the 2011 season). Long-toed Salamanders can also be found at each site, however Northern Pacific Treefrogs and Northern Red-legged Frogs appear to be in the minority at both sites. In 2010, only one Northern Red-legged Frog egg mass was found in Tire Pond, and in 2011, zero egg masses were found in either the wetland or the Tire pond. It is possible, however, that Northern Red-legged Frogs are breeding in areas of the wetland that are either too difficult to survey or in areas where surveying would cause disturbance to the wetland and its breeding bird populations.

- 4) Recommendations: Continue monitoring in 2012 and every year if possible, because Zenger Wetland and its neighboring site, Triangle, are clearly important breeding grounds that should be monitored to show changes in breeding populations of native species. One final note: During every field season, Northwestern Salamander egg masses can be found attached to Reed Canarygrass (*P. arundinacea*), as that is the dominant plant on site, and in 2010 it was recommended that this plant *not* be removed from the wetland, as it is the *only* plant species being utilized by Northwestern Salamanders for egg mass attachment.

Willamette Watershed

Audubon Society: Sanctuary Pond

- 1) Years surveyed: 2010, 2011
- 2) Species Present: Northern Red-legged Frog, Rough-skinned Newt
- 3) Comments: In 2010, no amphibian egg masses were recorded here in the winter, and the only amphibian species observed during a tadpole/larvae survey was Rough-skinned Newt. However, in 2011, twenty-one Northern Red-legged Frog masses were recorded in a single survey, despite the extremely turbid water conditions (making visibility very low). In previous years, all five native pond-breeding amphibians have been found here by Tierra Curry in 2006 (Curry 2007).

- 4) Recommendations: This pond is definitely an important egg mass site to monitor as it clearly draws Northern Red-legged Frogs from Forest Park and there are not many breeding ponds surveyed in this area. Water in the pond is typically very turbid and makes for poor survey results unless egg masses are on the surface. This site should be considered for terrestrial surveys due to the quality of its upland habitat.

BES Fiske B

- 1) Years Surveyed: 2011 (site visit)
- 2) Species Present: Northern Pacific Treefrog
- 3) Comments & Recommendations: This small storm water pond is providing a small but suitable habitat for Northern Pacific Treefrogs and possibly Long-toed Salamander, although these are the only species likely to be breeding here. Future monitoring is unnecessary, beyond a yearly site visit.

Butterfly Park

- 1) Years Surveyed: 2011 (terrestrial)
- 2) Species Present: None
- 3) Comments & Recommendations: This site is in a riparian corridor dominated by Black Cottonwood. Ground cover was sparse due to invasive plant removal restoration efforts. Continued terrestrial monitoring is recommended to monitor populations as the native ground cover reestablishes itself following restoration efforts.

Cottonwood Bay

- 1) Years Surveyed: 2011 (terrestrial)
- 2) Species Present: None
- 3) Comments & Recommendations: This site is in a riparian corridor dominated by Black Cottonwood. Ground cover was sparse due to invasive plant removal restoration efforts. Continued terrestrial monitoring is recommended to monitor populations as the native ground cover reestablishes itself following restoration efforts.

Forest Park

- 1) Years Surveyed: 2009, 2011

- 2) Species Present: Oregon Salamander, Western Red-backed Salamander, Dunn's Salamander
- 3) Comments: Preliminary surveys indicate a diverse amphibian community within Forest Park. Three terrestrially-breeding species were observed here in 2009 and 2011.
- 4) Recommendations: Continued terrestrial surveys are recommended. Sites with potential for pond-breeding amphibians should be monitored when and if any suitable sites are discovered.

Hoyt Arboretum

- 1) Years Surveyed: 2009 (terrestrial)
- 2) Species Present: None
- 3) Comments & Recommendations: No further site visits or surveys are recommended.

Kelley Point

- 1) Years Surveyed: 2011 (terrestrial)
- 2) Species Present: None
- 3) Comments & Recommendations: This site is in a riparian corridor dominated by Black Cottonwood and other native tree species. Soils are incredibly sandy here and may not be suitable for terrestrially-breeding amphibians, although continued surveying is recommended.

Moorage Marine

- 1) Years Surveyed: 2011 (terrestrial)
- 2) Species Present: Western Red-backed Salamander
- 3) Comments & Recommendations: This site is in a riparian corridor dominated by Black Cottonwood. Ground cover was sparse due to invasive plant removal restoration efforts. Amphibian species were found under downed logs. Continued terrestrial monitoring is recommended to monitor populations as the native ground cover reestablishes itself following restoration efforts.

Oaks Bottom Wildlife Refuge

(Aurora Lake, Ancient Pond/Salamander Slough, Tadpole Pond, Channels site)

- 1) Years Surveyed: 2008, 2009, 2010, 2011

- 2) Species Present: Northern Pacific Treefrog, Northern Red-legged Frog, Long-toed Salamander, American Bullfrog (invasive), Oregon Salamander, Western Red-backed Salamanders
- 3) Comments: Terrestrial surveys in 2009 found Oregon Salamanders and Western Red-backed Salamanders. Terrestrial surveys in spring 2001 found Oregon Salamanders.

AURORA LAKE and TADPOLE POND: The two constructed ponds in the north part of Oaks Bottom, have been surveyed since 2008 and are an integral part of the project. Large numbers of Northern Pacific Treefrog & Long-toed Salamander come out of the woodwork to breed in these ponds however the salamanders appear to prefer the deeper and colder Aurora Lake. In both sites, the planted aquatic vegetation is slowly establishing and the placed branches in Aurora Lake are providing egg mass attachment for Long-toed salamanders as well as providing an immense amount of refuge & shelter for amphibians in Tadpole Pond.

ANCIENT POND: This pond, at the base of the north parking lot (also referred to as “salamander slough”), supports a small population of Northern Red-legged Frogs, as well as Northern Pacific Treefrogs & Long-toed Salamanders. Although it is not always the most suitable looking site, the aquatic vegetation appears to be improving (*Eleocharis spp.* is found in over 50% of the pond) and it is likely that Northern Red-legged Frogs may continue their attempts to breed here.

CHANNELS: This area of Oaks Bottom, near the bluff trail and adjacent to the springwater corridor trail, also hosts moderate populations of Northern Pacific Treefrogs, Long-toed Salamanders, and Northern Red-legged Frogs. It has been surveyed, with varying degrees of success, since 2008, and Northern Red-legged Frog egg masses have been found throughout the site, attached to plants such as *Polygonum spp.* The survivorship of these frogs in this area, however, may be affected by the late spring rains which have the potential to flood the entirety of the low-lying wetland area north of Wapato Lake (as observed in 2010 when large numbers of Willamette River fish were observed within feet of the bluff trail). In addition, this area is notoriously difficult, if not dangerous, to survey and only experienced surveyors should attempt a survey here.

- 4) Recommendations: It is recommended that all of Oaks Bottom be continually monitored for Northern Red-legged Frog egg masses, especially in areas where they

are appearing in surveys for the first time. In fact, the entire area of habitat that extends from just south of Tadpole Pond, north through the open meadow and towards the northernmost portion of the park, should be called the "Oaks Bottom Amphibian Conservation Area" (OBCA) and this area should be surveyed thoroughly. Another area, likely to be utilized by Northern Red-legged Frogs for oviposition of egg masses, can be described as the area between the Channels site and the southernmost part of the Oaks Bottom reservoir (or Wapato Lake). This portion of the park has never been formally surveyed by the Amphibian Monitoring Program but site visits are recommended for the 2012 monitoring season. Additionally, transient camps are routinely discovered throughout Oaks Bottom and these should continue to be reported. (Invasive plant species, such as the mint (found throughout the north part of the Oaks Bottom), and Purple Loosestrife, may need to be routinely monitored.) Although American Bullfrogs do not appear to be breeding in the sites sampled in 2011, they are occasionally observed in one of the north ponds. It is suspected, however, that if Bullfrogs are successfully breeding at Oaks Bottom, this would be occurring in Wapato Lake reservoir. Terrestrial surveys of Oaks Bottom should also be continued because of its prime upland habitat. They are also recommended to assess the presence or absence of the Western Red-backed Salamander population found in 2009, but not in 2011.

Powers Marine Park

- 1) Years Surveyed: 2011 (terrestrial)
- 2) Species Present: Oregon Salamander
- 3) Comments & Recommendations: This site is in a riparian corridor dominated by Black Cottonwood. Ground cover was sparse due to invasive plant removal restoration efforts. Amphibian species were found under downed logs. Continued terrestrial monitoring is recommended to monitor populations as the native ground cover reestablishes itself following restoration efforts.

Sellwood Riverfront Park

- 1) Years Surveyed: 2010, 2011

- 2) Species Present: Northwest Pacific Tree-frog, Northern Red-legged Frog, Long-toed Salamander, American Bullfrog (invasive), Oregon Salamander, Long-toed Salamander
- 3) Comments: This pond was surveyed for egg masses in 2010 and a healthy population of Northern Pacific Treefrogs, Northern Red-legged Frogs and Long-toed Salamanders were found breeding here. Again in 2011, Northern Red-legged Frog egg masses were observed. Because of the vulnerability of these egg masses in such an exposed site adjacent to an off-leash dog park, signage was created in 2010 to notify the public of the presence of the “rare frog”, referring to *Rana aurora*, or Northern Red-legged Frogs. Terrestrial surveys were performed onsite in spring 2011 but no amphibians were found. In 2011, during a PP&R educational field trip to Sellwood Riverfront Park, Oregon Salamanders and Long-toed Salamanders were observed by Amphibian Monitoring Program staff, suggesting that this site is supporting populations of these species. Future terrestrial surveys anticipate continuing to document these species at this location.
- 4) Recommendations: Sellwood Riverfront Park should be included in, and treated as part of, any and all Oaks Bottom species inventory surveys. American Bullfrogs have also been reported here and this site should be monitored to determine whether or not breeding is occurring in the pond.

Water Pollution Control Lab and Test Swale*

- 1) Years Surveyed: 2008, 2009, 2010, 2011
- 2) Species Present: Northern Pacific Treefrog
- 3) Comments: This site has been surveyed every year since 2008 and appears to be supporting a healthy, though small, population of Northern Pacific Treefrogs. The pond here, at the base of the St. John’s Bridge, is abundant with birds and a diverse amount of vegetation, and despite the large amount of trash debris that is carried into the site via run-off, there is potential for this site to continue providing a suitable breeding habitat for Northern Pacific Treefrog. No site changes have been observed year-to-year.

*The test swale was not surveyed as it is not a realistic breeding option as no water remains here for the season.

- 4) Recommendations: Continue to monitor Northern Pacific Treefrog populations during annual site visit during the middle of breeding season to confirm presence.

Tryon Creek Watershed

Foley-Balmer Natural Area

- 1) Years surveyed: 2009 (terrestrial site)
- 2) Species Present: Western Red-backed Salamander
- 3) Comments & Recommendations: Consider for future terrestrial surveys.

Maricara Park

- 1) Years surveyed: 2008, 2009
- 2) Species Present: Oregon Salamander
- 3) Comments: It was determined in 2009 that this site does not have any suitable breeding areas for pond-breeding amphibians, however it is likely to house terrestrially-breeding species. 2009 terrestrial surveys found Oregon Salamanders.
- 4) Recommendations: Consider for future terrestrial surveys.

Marshall Park

- 1) Years surveyed: 2009 (terrestrial site)
- 2) Species Present: Western Red-backed Salamander
- 3) Comments & Recommendations: Consider for future terrestrial surveys.

Tryon Creek Headwaters

- 1) Years surveyed: 2010, 2011
- 2) Species Present: none
- 3) Comments: The newly constructed ponds at Tryon Creek Headwaters did not attract breeding amphibians in the 2010 season nor in the 2011 season, but it is possible that Northern Pacific Treefrog will colonize this site in the next couple of years. Terrestrial surveys were also performed onsite in spring 2011, but found no amphibians in the uplands.
- 4) Recommendations: Over the last year, site changes have been observed in the form of grasses taking over areas of the small ponds. This does not necessarily deter

native species from breeding, however if grasses continue to take over the site, there may not be much of a pond left. Continued site visits are recommended.

Fanno Creek Watershed

April Hill

- 1) Years Surveyed: 2009, 2010, 2011
- 2) Species Present: Northern Pacific Treefrog, Long-toed Salamander, Rough-skinned Newt
- 3) Comments: This site is a very small wetland that supports populations of Northern Pacific Treefrogs, Long-toed Salamanders, and Rough-skinned Newts. It is relatively shallow, compared to most ponds that are surveyed in the city, although it is possible that a small percentage of amphibians are successfully breeding here. Long-toed Salamander larvae are recorded here in early spring, several months prior to the pond drying. However it is incredibly challenging to quantify survey findings because the egg masses are next to impossible to find, the larvae that we find are most likely Long-toed Salamanders (early on in the season), and it is not clear how many complete metamorphosis.
- 4) Recommendations: In 2010, it was recommended that water levels be monitored and that amphibian surveys continue to inform us of species presence in the Fanno Creek Watershed. Once the deepest area of the wetland is determined, a small area of the wetland could be deepened (approximately 10mx10m). A longer hydroperiod and a larger area for amphibians to disperse would allow for a greater percentage of successfully breeding species. For the following field season, a site visit should be made to monitor for egg masses & larvae.

Gabriel Park Wetlands

- 1) Years Surveyed: 2011 (site visit)
- 2) Species Present: none
- 3) Comments: The entirety of Gabriel Park Wetlands was visited in search of suitable breeding areas and no ponds were located. The area exists on a slope that would prevent any water from collecting long enough to form a pond-breeding habitat. There is, however, an abundance of other wildlife benefitting from the plentiful wetland habitat, including songbirds and coyote pups.

- 4) Recommendations: If a pond is desired in the wetland, areas of the site could potentially be deepened and native amphibians could potentially colonize the area. Otherwise, no surveys are necessary.

ACKNOWLEDGEMENTS

Program Coordinator:

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Nancy Harger

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Rachel Kutschera

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LITERATURE CITED

- Bowne, D.R. and M.A. Bowers. 2004. Interpatch movements in spatially structured Populations: a literature review. *Landscape Ecology* **19** (1): 1-20.
- Corkran, C.C., and C.Thoms. 2006. Amphibians of Oregon, Washington, and British Columbia. Lone Pine Publishing, Renton, WA.
- Curry, T.R. 2007. Evaluation of Managed Hydrological Regimes on Native Amphibians and Invasive Bullfrogs. Chapter 1: Master's Thesis, Portland State University, Portland, OR.
- Gabriel, J.T. 1993. A modified synoptic analysis of the status of Oregon's Willamette Valley Wetlands. Master's Degree Research Paper. Oregon State University, Corvallis, OR.
- Hallock, L.A. and McAllister, K.R. 2005. Pacific Treefrog. Washington Herp Atlas. <http://www1.dnr.wa.gov/nhp/refdesk/herp/>.
- Hayes, M.P., T. Quinn, K.O. Richter, J.P. Schuett-Hames, J.T. Serra Shean. 2008. Maintaining lentic-breeding amphibians in urbanizing landscapes: the case study of the Northern red-legged frog (*Rana aurora*). *Herpetological Conservation* 3.
- Kiesecker, J.M., A.R. Blaustein, and C.L.Miller. 2001. Potential mechanisms underlying the displacement of native red-legged frogs by introduced bullfrogs. *Ecology* 82(7): 1964-1970.
- Leonard, W.P., H.A. Brown, L.L.C. Jones, K.R. McAllister, and R.M. Storm. 1993. Amphibians of Washington and Oregon. Seattle Audubon Society, Trainside Series. Seattle Audubon Society, Seattle, Washington.
- Marks, R. 2006. Fish and Wildlife Habitat Management Leaflet: Number 35, Amphibians and Reptiles. Natural Resources Conservation Service. USDA, Washington, DC.
- Nussbaum, R.A., E.D. Brodie, Jr., and R.M. Storm. 1983, Amphibians and reptiles of the Pacific Northwest. University of Idaho Press, Moscow, Idaho.
- Oregon Biodiversity Project. 1998. Oregon's living landscape: Strategies and opportunities to conserve biodiversity. Defenders of Wildlife, West Coast Office, West Linn, OR.
- Oregon Department of Fish and Wildlife. 2006. The Oregon Conservation Strategy. <http://www.dfw.state.or.us/conservationstrategy/contents.asp>
- Paton, P.W.C. and S. Egan. 2001. Effects of Roads on Amphibian Community Structure at Breeding Ponds in Rhode Island. Unpublished Final Report to the Transportation Environmental Research Program (TERP) Federal Highway Administration.
- Stuart, S.N., J.S. Chanson, N.A. Cox, B.E. Young, A.S.L. Rodrigues, D.L. Fischman, D.L. Waller, and R.W. Waller. 2004. Status and trends of amphibian declines and extinctions Worldwide. *Science* 306(5702): 1783-1786.

- Thoms, C., C.C. Corkran, and D.H. Olsen. 1997. Basic amphibian survey for inventory and Monitoring in lentic habitats, p. 35-46. *In* D.H. Olsen, W.P. Leonard, and R.B. Bury, [eds.], Sampling Amphibians in Lentic Habitats. Society for Northwestern Vertebrate Biology, Olympia, WA.
- Tipperry, S. E. and K. K. Jones. 2011. Amphibian Distribution in Wadeable Streams and Ponds in Western and Southeast Oregon, 2009-1010. Oregon Department of Fish and Wildlife, Fish Research Project, Progress Report, Corvallis.

APPENDICES

Appendix 1: Egg Mass Survey Datasheet 2011

Appendix 2: Terrestrial Amphibian Survey Datasheet 2011

Volunteer Egg Mass Survey Data Form

Sheet of

Date (mmm/dd/yyyy):	OBSERVERS:	Site Name:	
		Location or GPS Coordinates:	
Survey# 1 2 3 4			
START TIME:	Total Time: _____ hr _____ m	Water Clarity (circle) >2 ft 1-2ft 8 in-1ft < 8 in Water depth: _____ in	Pictures Taken: Yes/No Attach and label pictures of each species identified. Include size reference (such as frog wand or dime) in pictures.
END TIME:	Processing Time: _____ hr _____ m		
Time x (# of people) : _____ hr _____ m			
Area Surveyed: >90% 75-90% 50-75% less than 50%		Other Species Noted (Circle One):	
Your Red-legged and NW salamander eggmass ID: very confident mostly confident not confident		PSRE MASSES: 0 1-20 21-100 100+ AMMA MASSES: 0 1-20 21-100 100+ Presence: TAGR (newts) Yes/No Fish Yes/No RACAT (bullfrog) Yes/No BUFO (toad) Yes/No	
FIELD NOTES: (e.g., weather, waterfowl/human disturbance oil sheen/algae, comments on other species noted)			

RAAU: Northern Red-Legged Frog AMGR: Northwestern Salamander PSRE: Pacific Tree Frog AMMA: Long-Toed Salamander
 TAGR: Rough-skinned newt BUFO: Western Toad RACAT: Bullfrog

Processing Time	Species (Circle One)	# of Egg masses	Stage ^b	Eggmass Depth (ft) ^c	FIELD NOTES: (vegetation attachment, mold, dead eggs etc)
⊕	RAAU AMGR		R T H		
⊕	RAAU AMGR		R T H		
⊕	RAAU AMGR		R T H		
⊕	RAAU AMGR		R T H		
⊕	RAAU AMGR		R T H		
⊕	RAAU AMGR		R T H		
⊕	RAAU AMGR		R T H		
⊕	RAAU AMGR		R T H		
⊕	RAAU AMGR		R T H		
⊕	RAAU AMGR		R T H		
⊕	RAAU AMGR		R T H		
⊕	RAAU AMGR		R T H		
⊕	RAAU AMGR		R T H		
⊕	RAAU AMGR		R T H		
⊕	RAAU AMGR		R T H		
⊕	RAAU AMGR		R T H		

Appendix 2. Terrestrial Amphibian Survey Datasheet 2011. 2 pages, front and back.

Site Information

Site Name: _____ Date: _____
 Habitat Patch #: _____
 Estimated Habitat Dimension: _____ (ft or m) X _____ (ft or m) = _____ (ft² or m²)

Observers

Name	Start Time	End Time	No. Minutes
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Weather and Soil Conditions:

Sky (circle one): Clear Partly Cloudy Very Cloudy

Moisture (circle one): Dry Foggy Intermittent Rain Light Rain Heavy Rain Sleet/Snow

Wind (circle one): None Light Moderate Strong

Air Temperature (°C)

Start _____
 Middle _____
 End _____

Froze Last Night?

Yes _____
 No _____

Available Cover

Cover Type	% Available	Code
Rock	_____	0 = none
Moss	_____	1 = 1-25%
Wood	_____	2 = 26 – 50%
Litter	_____	3 = 51-75%
Lichen	_____	4 = 76 – 100%

Comments

Surface Water (circle all that apply)

Seep Pond Stream None

Species Abbreviations

Pacific Giant Salamander = DITE
 Northwestern Salamander = AMGR
 Ensatina = ENES
 Western Red-backed Salamander = PLVE
 Dunn’s Salamander = PLDU

