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## A Monitoring Program to Track the Effects of Habitat Restoration on Pond-breeding Amphibian Populations at Metro Natural Areas

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### **OVERVIEW**

The passage of Metro's open spaces, parks and streams bond measure in 1995 lead to the protection and restoration of thousands of acres of wildlife habitat in the Portland Metropolitan Area. Metro Regional Parks and Greenspaces initiated a program to monitor selected plant and wildlife populations linked to restoration projects on many of these newly protected lands. Metro selected bird and amphibians as wildlife indicators, primarily because these groups are:

- Relatively easy and inexpensive to track using standardized methods
- Allow the safe participation of volunteers yielding reliable population data
- Facilitate an evaluation of a diverse group of resident and migratory species representing a broad array of habitat types

Volunteers have played a key role in this effort. Beginning in 2004, Metro partnered with the Northwest Service Academy to sponsor three successive AmeriCorps positions charged with building a sustainable base of volunteer monitors. Volunteer wildlife monitors use standardized protocols (see Appendix) refined by Metro but based upon peer-reviewed protocol. Entering its third year, the program has been very successful at establishing a skilled and faithful volunteer base of over 70 members, and generating extremely useful and in some cases dramatic wildlife population data.

### **METHODS**

Metro's amphibian monitoring program focuses on tracking pond-breeding amphibian populations during the breeding period. Metro staff and volunteers conduct egg mass surveys to track the breeding distribution and relative abundance of mass-laying amphibians. A detailed protocol for the egg mass surveys is presented in the Appendix.

In the Portland Metropolitan Area, only four native pond-breeding amphibian species lay egg masses (The roughskin newt, *Taricha granulosa*, breed in ponds but lays individual eggs and therefore cannot be tracked via egg mass surveys):

- Northern red-legged frog (*Rana aurora aurora*) = RAAU
- Pacific chorus frog (*Pseudacris regilla*) = PSRE
- Northwestern salamander (*Ambystoma gracile*) = AMGR
- Long-toed salamander (*Ambystoma macrodactylum*) = AMMA
- Bullfrog (*Rana catesbeiana*)\* = RACE

\*non-native species

Highest emphasis is placed upon counting and mapping masses from red-legged frogs (Figure 1), northwestern salamanders (Figure 2) and bullfrogs (Figure 3), primarily due to the relatively large size of these masses, the rarity of red-legged frogs, and the significance of the bullfrog infestation in the PNW.

## **STUDY SITES**

Nine study sites were surveyed for pond-breeding amphibians in 2005 (Figure 4). An effort was made to conduct egg mass surveys at all suitable pond habitat (essentially all parts of the pond that are between 1-4 feet deep). Many of the sites were broken up into sub-units to make surveys more manageable and distinct survey teams were assigned to survey a single unit throughout the breeding season (February – April for natives, June – July for bullfrogs).

### ***Multnomah Channel***

Nearly all of the sites Metro samples for pond-breeding amphibians are locations where habitat restoration is either planned, or is ongoing. For example, the 300-acre Multnomah Channel Natural Area located along the Multnomah Channel in northwest Multnomah County (Figure 4), was acquired by Metro in the late 1990's. Since acquiring the site, Metro has directed a series of restoration projects at the site including heavy planting of riparian trees and shrubs in 1997 followed by the introduction of two water control structures (WCS) in 2001 designed to reestablish a native seasonal flood regime to approximately 150 acres of floodplain on site. The restored flood regime had marked effects on wildlife communities using the site including the initiation of a great blue heron rookery that has grown from 4 nests in 2002 to 19 nests in 2005 and use by western painted turtles (*Chrysemys picta*) – a species undocumented at the site prior to the restored seasonal flooding. Native amphibians, especially northern red-legged frogs, have also benefited greatly from the restored flood regime at the Multnomah Channel Natural Area. Prior to the introduction of the WCS in 2001, reliable winter ponding was limited to two small 1-2 acre ponds (one a beaver pond) and red-legged frog breeding was also confined to these small ponds. Restoring a managed seasonal flood regime to the site expended reliable winter ponding to approximately 90 acres of the site, and red-legged frogs have quickly

responded to this new habitat by expanding their breeding distribution to match that of the newly created ponding (Figure 5).

In 2006, Metro will direct further enhancement of the Multnomah Channel Natural Area when Crabtree Creek, the primary stream feeding the floodplain, is restored to its historic basin allowing the flow from this stream to be split between the two major flood basins on site. This project is designed to, among other goals, expand seasonal flooding at the site to approximately 150 acres which will further benefit native plants and animals.

## **RESULTS**

Distributions of red-legged frog egg masses detected and mapped by Metro biologists and volunteers in 2005 are presented in Figures 6 – 13 . Count data for red-legged frogs and northwestern salamanders tracked via egg mass surveys are presented in Tables 1 - 8. As the data convey, red-legged frogs breed at several Metro Natural Areas, albeit in low numbers at most sites. Furthermore, red-legged frogs have shown a marked positive response to restoration efforts at some sites, including the Multnomah Channel Natural Area (restoration of emergent wetlands and scrublands via the introduction of water control structures creating broader seasonal ponds), the Gotter Prairie Natural Area (restoration of wet meadow and emergent wetlands at a floodplain previously managed for agriculture) and Killin Wetlands (restoration of emergent wetland and shrublands via replanting and removal of agricultural tile).

## **DISCUSSION AND SUMMARY**

Developing an ongoing survey of Northern red-legged frog breeding distributions is one of the goals of the Metro amphibian monitoring program. As a state-sensitive species (“Sensitive-Vulnerable”), red-legged frogs are of concern from a regional conservation perspective and are a useful indicator to appraise the effects of habitat restoration on sensitive wetland species. Metro’s wildlife monitoring program is part of an integrated long-term ecological monitoring program also tracking selected bird and vegetative communities. Whereas trends in most species populations may take many years to become evident, an many are influenced by off-site changes, preliminary results have clearly demonstrated that some restoration projects can have a rapid and dramatic effect on resident native populations such as the Northern red-legged frog.

# **APPENDICES and FIGURES**

# Metro Regional Parks and Greenspaces

## AMPHIBIAN EGG MASS MONITORING PROTOCOL

**- Assessing and tracking wetlands habitat quality and restoration effectiveness using pond-breeding amphibians as a bio-indicators**

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### **BASICS:**

To assess and track wetland ecosystem quality and the impacts and effects of Metro's restoration projects by monitoring egg masses from target amphibian populations

### **TARGET HABITATS:**

Emergent wetlands, Shrublands and open ponds

### **TARGET SPECIES:**

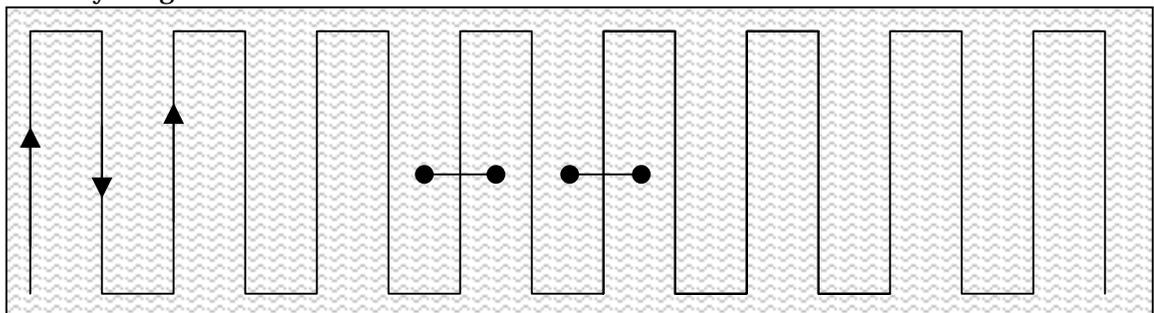
- Northern red-legged frog (*Rana aurora aurora*) = RAAU
- Pacific chorus frog (*Pseudacris regilla*) = PSRE
- Northwestern salamander (*Ambystoma gracile*) = AMGR
- Long-toed salamander (*Ambystoma macrodactylum*) = AMMA
- Bullfrog (*Rana catesbeiana*)\* = RACE \*non-native species

### **METHODS:**

**Visual Encounter Survey: Conducting visual surveys within assigned wetland units, keeping track of the amount of time spent actively searching for egg masses (e.g., not including time spent writing data as search time).**

1. Visit your assigned wetland unit.
2. Pick a logical starting point in unit (usually a corner of the unit).
3. Start stopwatch/chronometer function on watch.
4. Move slowly and methodically through study area, walking from one end of the unit to the other. It will take several back and forth passes to survey the full unit and each pass should be separated by an appropriate distance to allow you to survey the entire wetland unit without missing portions (i.e. because the passes are spaced too widely) or double-counting the same egg mass (i.e. because you spaced passes too closely).

Survey Diagram:

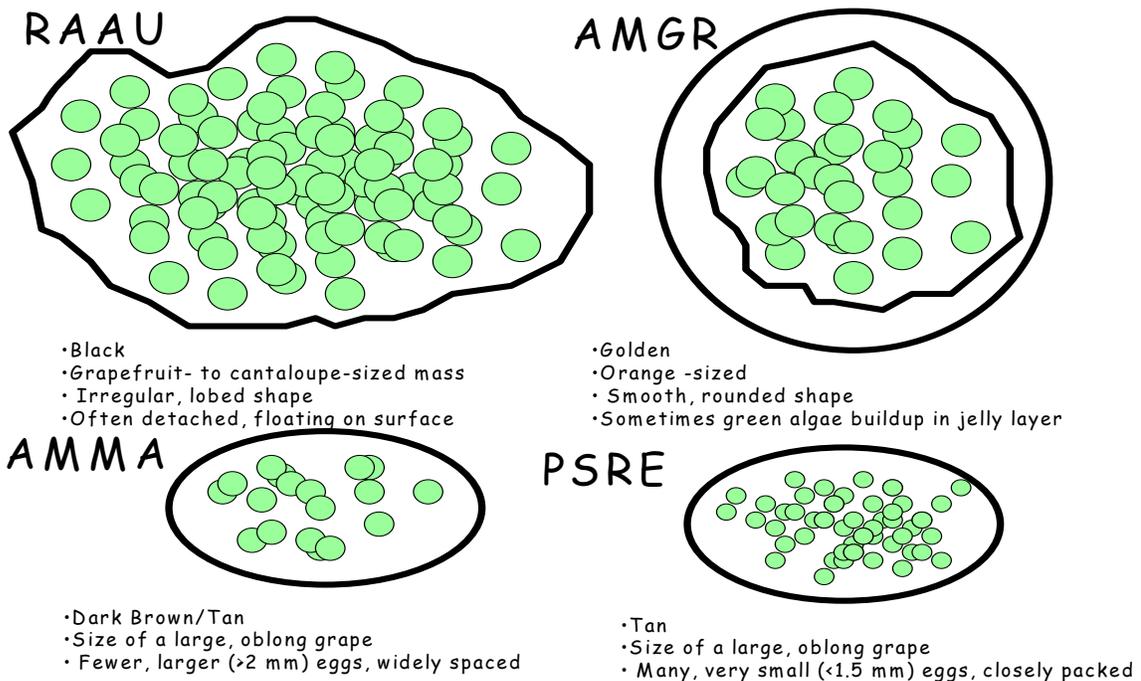


→ = direction of survey  
●—● = distance with clear visibility

5. Move slowly enough to prevent stepping on egg masses and walking slowly to avoid stirring sediment.
6. If an egg mass is encountered, stop the clock.
7. Mark the egg mass by flagging a piece of nearby vegetation (or using a bamboo pole if necessary). We will only be marking northwestern salamanders (AMGR) and northern red-legged frogs (RAAU).
8. Mark on unit map where the egg mass was found with red (RAAU) or blue (AMGR) sharpie.
9. Record data on datasheet.
10. Restart stopwatch when search resumes.
11. Survey as much of the unit as possible. After entire area is surveyed or when you have completed the portion of the survey planned for that visit:
  - mark the end time (equal to total search time) showing on your stop watch in the box entitled "Total Search Time".
  - Mark the real time (AM/AP time) in the box entitled "End Time".
12. Rate Subsurface visibility.
13. Rank none/few/many for chorus frogs (PSRE) and long-toed salamanders (AMMA).

**Note: Handling amphibians/eggs**

- Make sure there is no suntan lotion or insect repellent on your hands
- Keep your hands wet during handling
- Make sure that you keep egg masses in cold water, or in a cold, wet environment
- Do not detach individual eggs from the mass, nor the mass from the supporting vegetation









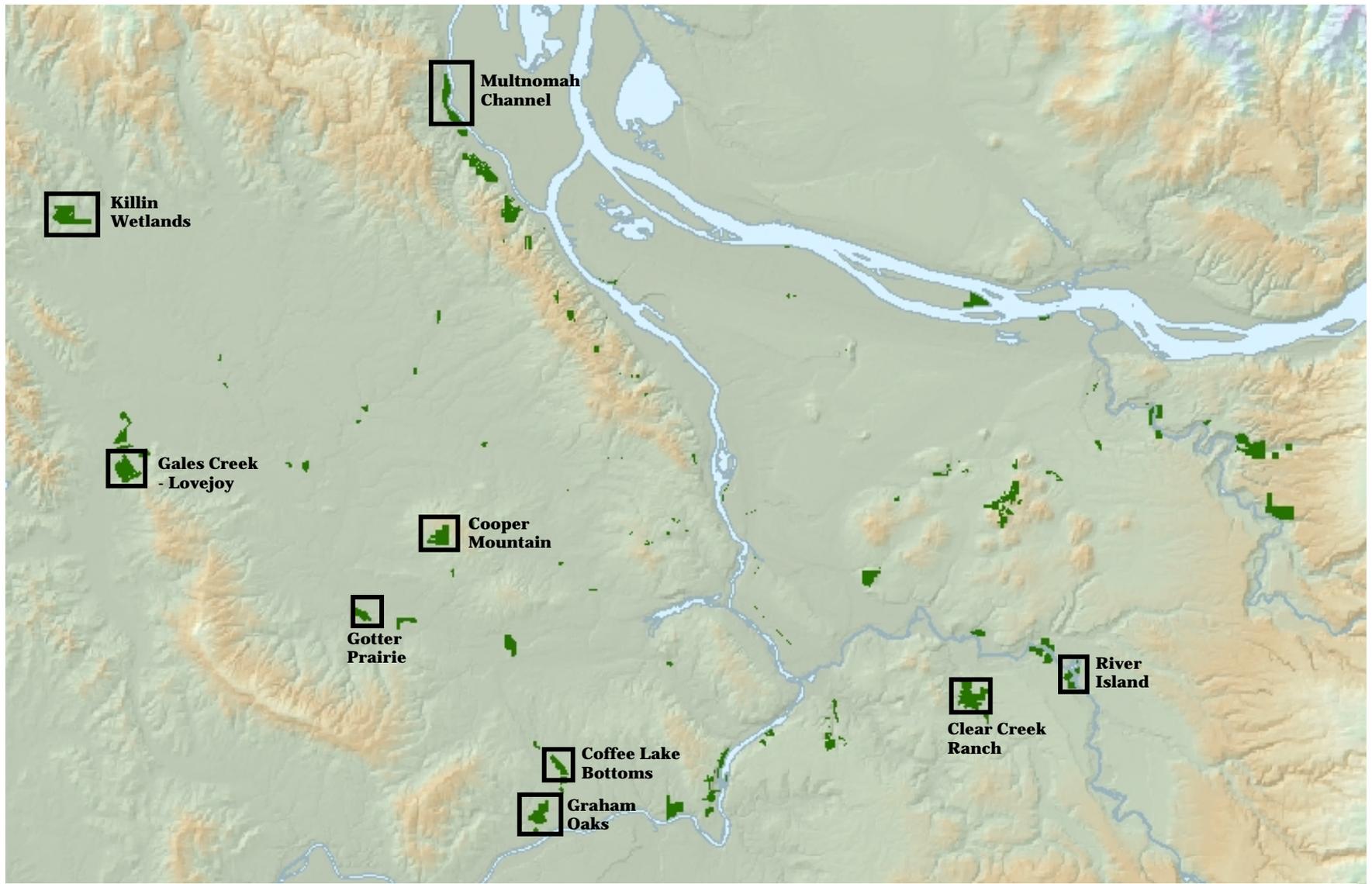
**Figure 1.** Northern red-legged frog (*Rana aurora aurora*) and egg mass (inset).



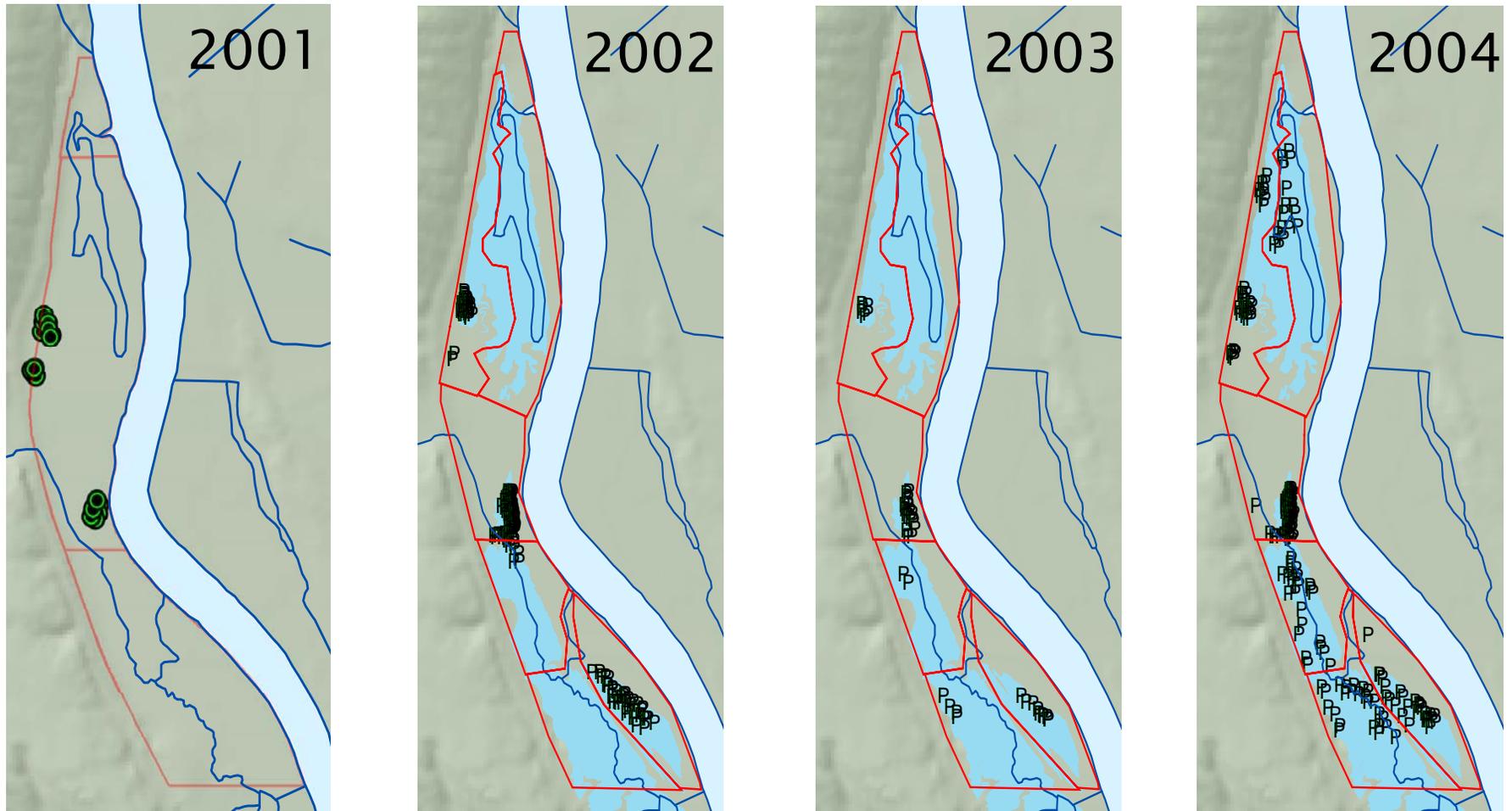
**Figure 2.** Northwestern salamander (*Ambystoma gracile*) and egg mass (inset).



**Figure 3.** Bullfrog (*Rana catesbeiana*) and egg mass (inset).



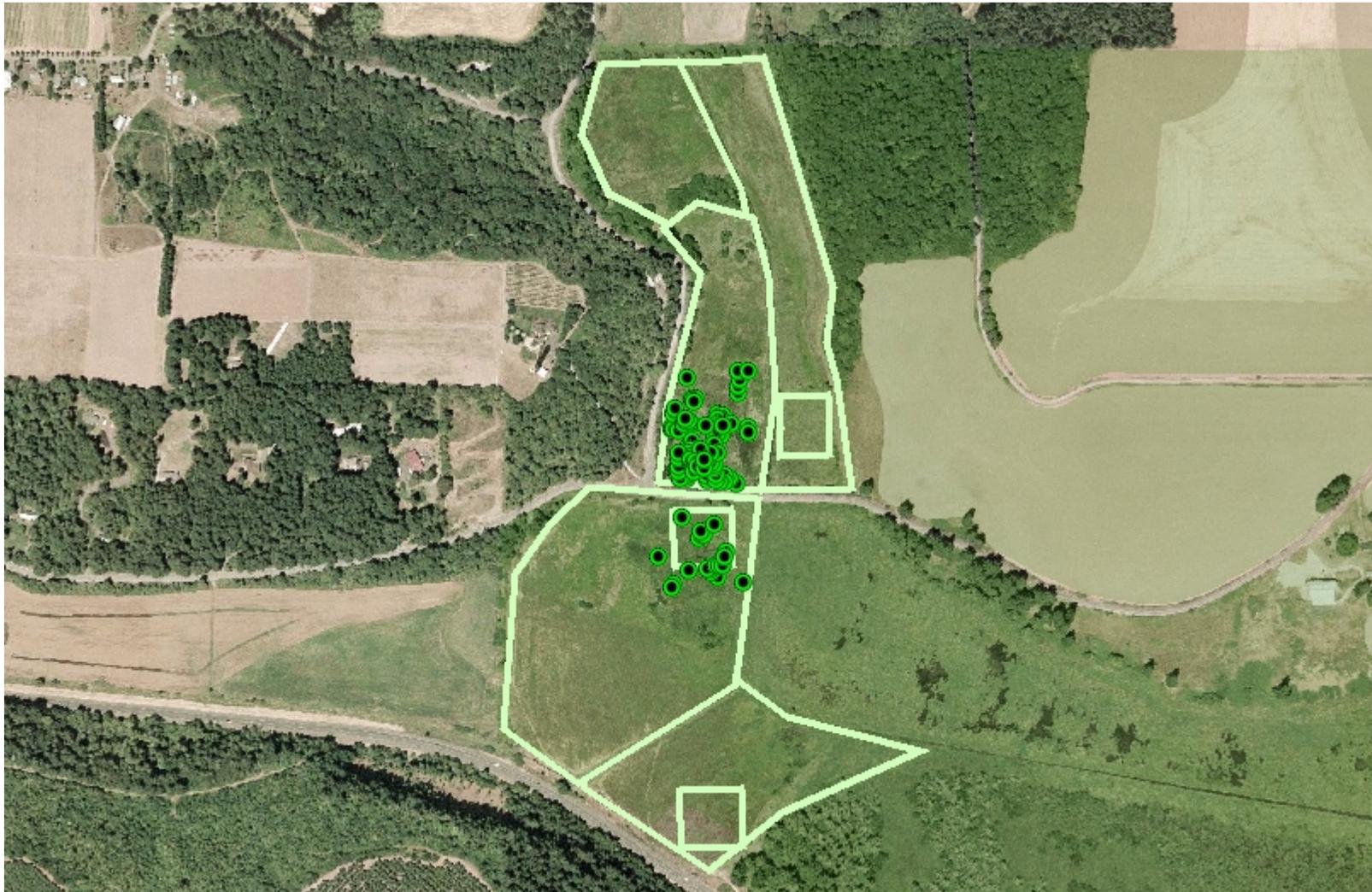
**Figure 4.** In 2005, amphibian egg mass surveys were conducted at 9 different Metro Natural Areas.



**Figure 5.** Distribution of northern red-legged frog (*Rana aurora aurora*) at the Metro Multnomah Channel Freshwater Tidal Marsh prior to (2001) and following installation (2002) and full operation (2003-2004) of two water control structures.



**Figure 6.** Distribution of northern red-legged frog (*Rana aurora aurora*) at the Metro Multnomah Channel Natural Area in 2005.



**Figure 7.** Distribution of northern red-legged frog (*Rana aurora aurora*) at the Metro Killin Wetlands Natural Area in 2005.



**Figure 8.** Distribution of northern red-legged frog (*Rana aurora aurora*) at the Metro Gotter Prairie Natural Area in 2005.



**Figure 9.** Distribution of northern red-legged frog (*Rana aurora aurora*) at the Metro Gales Creek - Lovejoy Natural Area in 2005.



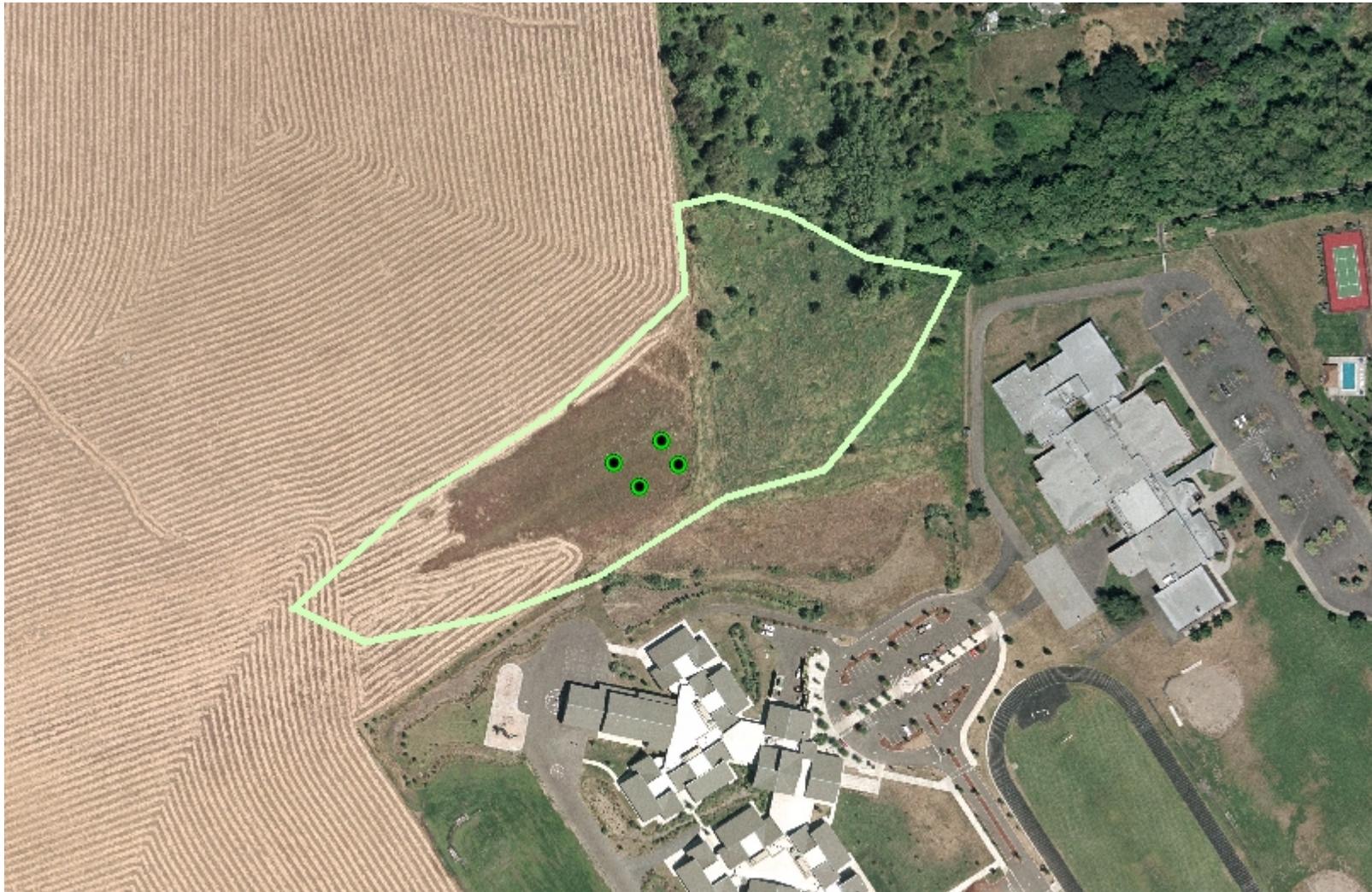
**Figure 10.** Distribution of northern red-legged frog (*Rana aurora aurora*) at the Metro Coffee Lake Bottoms Natural Area in 2005.



**Figure 11.** Distribution of northern red-legged frog (*Rana aurora aurora*) at the Metro Clear Creek Ranch Natural Area in 2005.



**Figure 12.** Distribution of northern red-legged frog (*Rana aurora aurora*) at the Metro Cooper Mountain Natural Area in 2005.



**Figure 13.** Distribution of northern red-legged frog (*Rana aurora aurora*) at the Metro Graham Oaks – Arrowhead Creek Natural Area in 2005.

Site	Unit	RAAU					AMGR				
		2001	2002	2003	2004	2005	2001	2002	2003	2004	2005
Multnomah Channel	1	10	42	6	32	18	3	3	0	2	3
Multnomah Channel	2	0	0	0	16	NS	0	0	0	2	NS
Multnomah Channel	3	13	81	19	67	48	0	4	1	4	12
Multnomah Channel	4	0	6	2	24	48	0	3	4	6	5
Multnomah Channel	5	0	0	4	24	102	0	0	0	0	3
Multnomah Channel	6	0	37	10	25	22	0	0	0	2	5
<b>Total</b>		<b>23</b>	<b>166</b>	<b>41</b>	<b>188</b>	<b>238</b>	<b>3</b>	<b>10</b>	<b>5</b>	<b>16</b>	<b>28</b>
<b>Total estimated search time</b>		160	1142	257.5	4735	4735	160	1142	257.5	4735	4735
<b>Estimated # masses/search hour</b>		<b>8.63</b>	<b>8.72</b>	<b>9.55</b>	<b>2.38</b>	<b>3.02</b>	<b>1.13</b>	<b>0.53</b>	<b>1.17</b>	<b>0.20</b>	<b>0.35</b>

**Table 1.** Egg mass survey data for red-legged frogs (*Rana aurora aurora*) and northwestern salamanders (*Ambystoma gracile*) at Multnomah Channel. Data are presented as the annual number of egg masses found in each unit sampled at the site, the total number of masses found at the site, total time spent searching at the site, and average number of masses found per search hour.

Site	Unit	RAAU					AMGR				
		2001	2002	2003	2004	2005	2001	2002	2003	2004	2005
Killin Wetlands	1			4	10	1			73	220	6
Killin Wetlands	2			0	0	108			21	265	62
Killin Wetlands	3			NS	NS	0			NS	NS	125
Killin Wetlands	4			NS	NS	23			NS	NS	51
Killin Wetlands	5			NS	NS	5			NS	NS	0
<b>Total</b>				<b>4</b>	<b>10</b>	<b>137</b>			<b>94</b>	<b>485</b>	<b>244</b>
<b>Total estimated search time</b>				28	959	1754			28	959	1754
<b>Estimated # masses/search hour</b>				<b>8.57</b>	<b>0.63</b>	<b>4.69</b>			<b>201.43</b>	<b>30.34</b>	<b>8.35</b>

**Table 2.** Egg mass survey data for red-legged frogs (*Rana aurora aurora*) and northwestern salamanders (*Ambystoma gracile*) at Killin Wetlands. Data are presented as the annual number of egg masses found in each unit sampled at the site, the total number of masses found at the site, total time spent searching at the site, and average number of masses found per search hour.

Site	Unit	RAAU					AMGR				
		2001	2002	2003	2004	2005	2001	2002	2003	2004	2005
Gotter Bottom	1			0	0	0			0	0	0
Gotter Bottom	2			0	0	0			0	0	0
Gotter Bottom	3			0	195	87			0	14	17
<b>Total</b>				<b>0</b>	<b>195</b>	<b>87</b>			<b>0</b>	<b>14</b>	<b>17</b>
<b>Total estimated search time</b>				90	987	1096			90	987	1096
<b>Estimated # masses/search hour</b>				<b>0.00</b>	<b>11.85</b>	<b>4.76</b>			<b>0.00</b>	<b>0.85</b>	<b>0.93</b>

**Table 3.** Egg mass survey data for red-legged frogs (*Rana aurora aurora*) and northwestern salamanders (*Ambystoma gracile*) at the Gotter Prairie wetlands. Data are presented as the annual number of egg masses found in each unit sampled at the site, the total number of masses found at the site, total time spent searching at the site, and average number of masses found per search hour.

Site	Unit	RAAU					AMGR				
		2001	2002	2003	2004	2005	2001	2002	2003	2004	2005
Coffee Lake	1				0	2				8	7
Coffee Lake	2				8	65				182	63
Coffee Lake	3				14	0				23	3
<b>Total</b>		<b>0</b>	<b>0</b>		<b>22</b>	<b>67</b>	<b>0</b>	<b>0</b>		<b>213</b>	<b>73</b>
<b>Total estimated search time</b>					1309	1278				1309	1278
<b>Estimated # masses/search hour</b>					<b>1.01</b>	<b>3.15</b>				<b>9.76</b>	<b>3.43</b>

**Table 4.** Egg mass survey data for red-legged frogs (*Rana aurora aurora*) and northwestern salamanders (*Ambystoma gracile*) at the Coffee Lake Bottoms. Data are presented as the annual number of egg masses found in each unit sampled at the site, the total number of masses found at the site, total time spent searching at the site, and average number of masses found per search hour.

Site	Unit	RAAU					AMGR				
					2004	2005				2004	2005
Cooper Mountain	1				25	21				0	0
<b>Total</b>					<b>25</b>	<b>21</b>				<b>0</b>	<b>0</b>
<b>Total estimated search time</b>					10	5.5				10	5.5
<b>Estimated # masses/search hour</b>					<b>150.00</b>	<b>229.09</b>				<b>0.00</b>	<b>0.00</b>

**Table 5.** Egg mass survey data for red-legged frogs (*Rana aurora aurora*) and northwestern salamanders (*Ambystoma gracile*) at the Cooper Mountain quarry pond. Data are presented as the annual number of egg masses found in each unit sampled at the site, the total number of masses found at the site, total time spent searching at the site, and average number of masses found per search hour.

Site	Unit	RAAU					AMGR				
		2001	2002	2003	2004	2005	2001	2002	2003	2004	2005
Arrowhead Creek Wetlands	1				5	4					0
<b>Total</b>					<b>5</b>	<b>4</b>				<b>0</b>	<b>0</b>
<b>Total estimated search time</b>					15	17.5				15	17.5
<b>Estimated # masses/search hour</b>					<b>20.00</b>	<b>13.71</b>				<b>0.00</b>	<b>0.00</b>

**Table 6.** Egg mass survey data for red-legged frogs (*Rana aurora aurora*) and northwestern salamanders (*Ambystoma gracile*) at the Arrowhead Creek Wetlands. Data are presented as the annual number of egg masses found in each unit sampled at the site, the total number of masses found at the site, total time spent searching at the site, and average number of masses found per search hour.

Site	Unit	RAAU					AMGR				
		2001	2002	2003	2004	2005	2001	2002	2003	2004	2005
Clear Creek	1					9					71
<b>Total</b>						<b>9</b>					<b>71</b>
<b>Total estimated search time</b>						<b>72</b>					<b>72</b>
<b>Estimated # masses/search hour</b>						<b>7.50</b>					<b>59.17</b>

**Table 7.** Egg mass survey data for red-legged frogs (*Rana aurora aurora*) and northwestern salamanders (*Ambystoma gracile*) at the Clear Creek Ranch Wetlands. Data are presented as the annual number of egg masses found in each unit sampled at the site, the total number of masses found at the site, total time spent searching at the site, and average number of masses found per search hour.

Site	Unit	RAAU					AMGR				
		2001	2002	2003	2004	2005	2001	2002	2003	2004	2005
Lovejoy Pond	1					5					0
<b>Total</b>						<b>5</b>					<b>0</b>
<b>Total estimated search time</b>						<b>68</b>					<b>68</b>
<b>Estimated # masses/search hour</b>						<b>4.41</b>					<b>0.00</b>

**Table 8.** Egg mass survey data for red-legged frogs (*Rana aurora aurora*) and northwestern salamanders (*Ambystoma gracile*) at the Gales Creek – Lovejoy Wetlands. Data are presented as the annual number of egg masses found in each unit sampled at the site, the total number of masses found at the site, total time spent searching at the site, and average number of masses found per search hour.