A Volunteer-Mediated 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 methods (see Appendix) refined by Metro, based upon peer-reviewed protocol. Completing its third year, the program has been very successful at establishing a skilled and faithful volunteer base of over 90 members, contributing over 950 hours at 12 different sites and generating extremely useful and in some cases dramatic wildlife population data. Three volunteer interns from local universities were recruited to assist with the volunteer coordination.

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

Ten study sites were surveyed for pond-breeding amphibians in 2006 (Figure 4). Sites included: Multnomah Channel Natural Area, Killin Wetlands, Gotter Prairie, Coffee Lake Bottoms, Cooper Mountain Natural Area, Hooten Pond, Lovejoy, Arrowhead Creek, River Island, and Smith and Bybee Wetlands Natural Area. 2006 marked the first year that Smith and Bybee was surveyed as part of the program. Egg mass surveys are conducted throughout all suitable breeding 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).

Spotlight on a project site: The Multnomah Channel Natural Area

Nearly all of the sites Metro samples for pond-breeding amphibians are locations where habitat restoration is either ongoing or planned. 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). This trend continued in 2006, with a further expansion of oviposition throughout the site as breeding habitat increased. No longer confined to the original breeding areas, some areas such as the willow pond witnessed a decline in oviposition over time as more habitat opened up (Figure 6).

In 2007, 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 wildlife.

RESULTS

Distributions of red-legged frog northwestern salamander egg masses detected and mapped by Metro biologists and volunteers in 2006 are presented in Figures 6 – 14. Count data for red-legged frogs and northwestern salamanders tracked via egg mass surveys are presented in Tables 1 - 10. 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 most sites. Some interesting trends are described below. As mentioned before, the Multnomah Channel Natural Area has seen an increase in the number of red-legged frog and northwestern salamander egg masses due to the restoration of emergent wetlands and scrublands via the introduction of water control structures creating broader seasonal ponds (Figure 6). The Gotter Prairie Natural Area in five years has witnessed an incredible transformation from the restoration of wet meadow and emergent wetlands at a floodplain previously managed for agriculture (Figure 8). The restoration of emergent wetland and shrublands via replanting and removal of agricultural tile at Killin Wetlands has resulted an incredible population increase of northwestern salamanders in 2006 (Figure 7). Finally, Coffee Lake Wetlands has also witnessed an expansion in the oviposition towards the northern and southern ends of the site (Figure 9).

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, and 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.

ACKNOWLEDGMENTS

On behalf of the Metro Regional Parks and Greenspaces Department, we would like to acknowledge and thank all of the volunteers that assisted with the amphibian egg mass monitoring in 2006:

Audrey Addison, Bob Barlow, Amy Baur, Marie Boisvert, Diane Bretz, Tim Brooks, Deanna Brown, Jeri Cerulli, Bridger Cohan, Tierra Curry, Natalie Day, Tony Defalco, Jess Dolan, John Driscoll, Carolyn Eckrich, Candace Fallon, Brian Fletcher, Helen Forbes, Bob Fuquay, Kevin Fuquay, Lisa Geidel, Diane Harris, TJ Harrison, Scott Havis, Julie Hawkins, Kevin Hawkins, Neyssa Hays, Bill Hogan, Maureen Hogan, Jon Jansky, Lauren Johnson, Ben Jones, Cindy Jones, Bob Kreinberg, Michelle Lennox, Sarah Lee Lopert, Greg Mazer, Bob Meehan, Leif Mortenson, Jim Morton, Judy Morton, Trevor Murphy, Jonathon Oltmans, Frank Opila, John Ost, Kristin Provezano, Wendy Sletten, Todd Stevenson, Elaine Stewart, Paul Swain, Haylie Swenson, Julie Tench, Arielle Tozier de la Poterie, Sarah Velander, Alix Whitehead, Tina Woods, and Megan Zimmerman

A more dedicated and enthusiastic group could not be assembled. In 2006, 57 volunteers participated with the surveys, contributing over 740 hours to the project! Each year the program has expanded allowing more extensive data to be collected.

We couldn't have done it without your help. Thank you everyone!

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 bio-indicators

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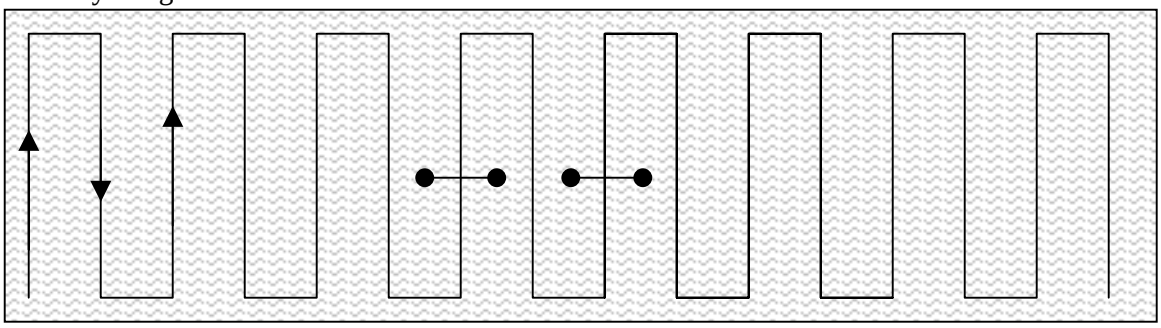
BASICS:
To assess and track wetland ecosystem quality and the impacts and effects of Metro's restoration projects by monitoring egg masses from target amphibian populations

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:

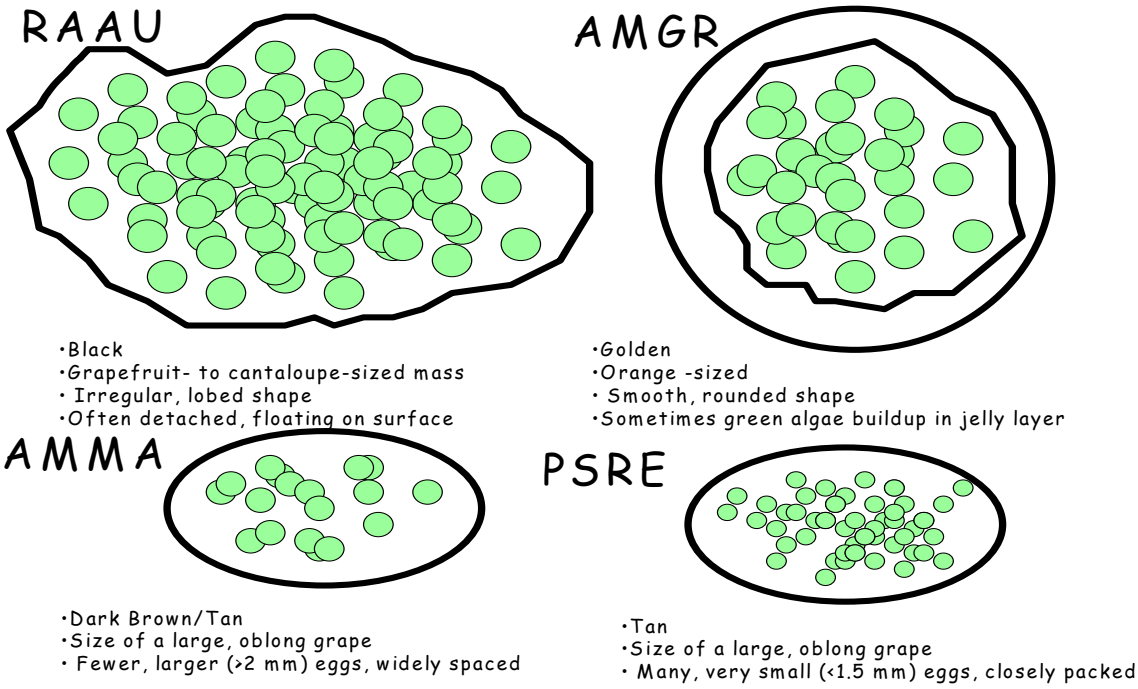


= direction of survey
= distance with clear visibility

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 stopwatch 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



Egg Mass Survey

Data Form

Sheet _____ of _____

DATE:	**OBSERVERS:**	**SITE** **Unit # or Quadrat #:**	
START TIME: **END TIME:**	**TOTAL SEARCH TIME:**	**Subsurface Visibility*:** **Poor / Fair / Excellent**	**PSRE: None / Few / Many** **AMMA: None / Few / Many**

FIELD NOTES: (e.g., weather, waterfowl/human disturbance, oil sheen/algae)

_____

_____

_____

Time on stopwatch	Species (RAAU or AMGR)	Stage**	Attachment Species	Field Notes

Time on stopwatch	Species (RAAU or AMGR)	Stage**	Attachment Species	Field Notes

*Visibility: Poor=less than one foot down, Fair=less than two feet, Excellent=greater than two feet
**Stages: 1. Round embryo (R), 2. Pre-hatch embryo with tail feature (T), 3. Hatched (H)

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

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

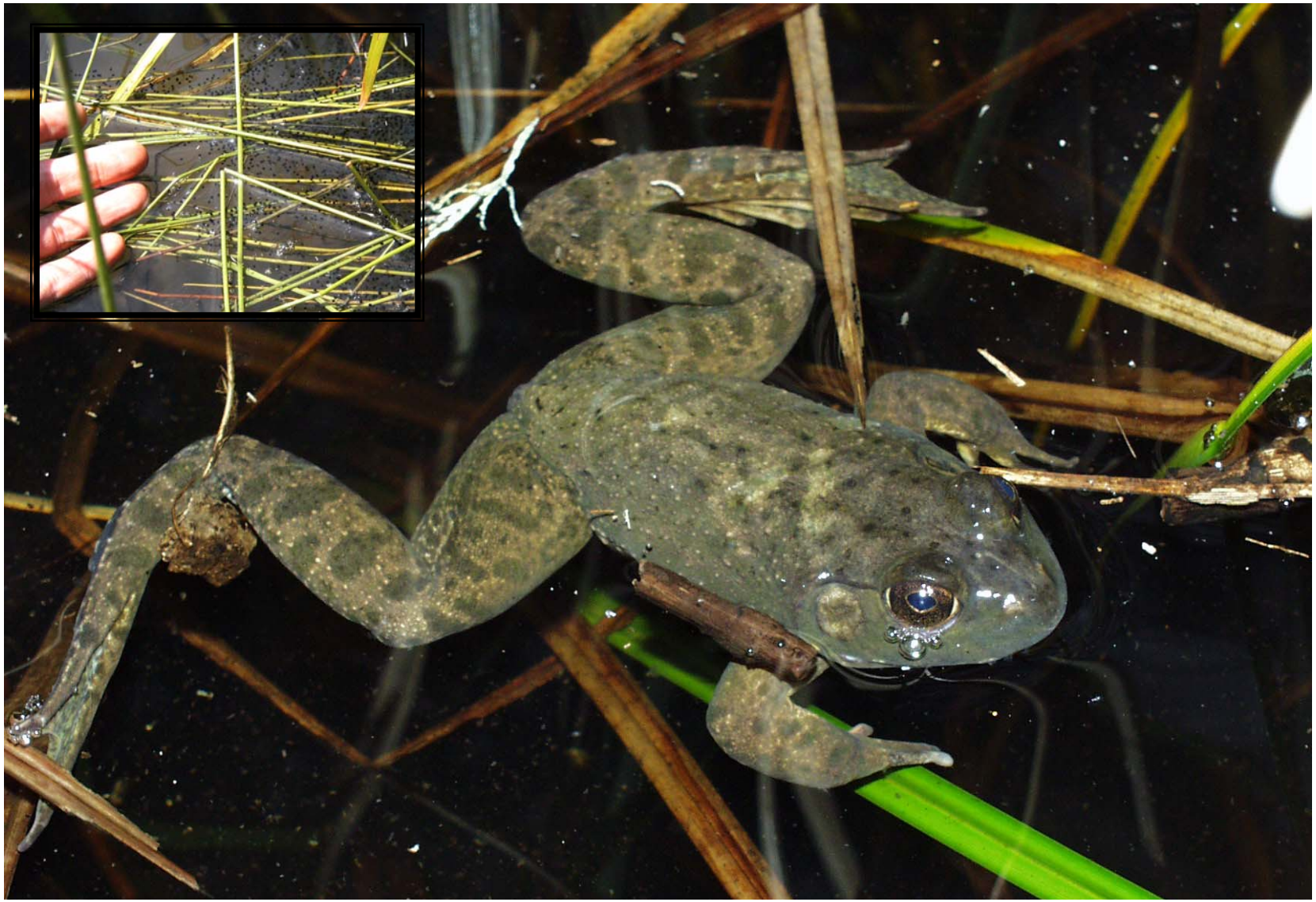


Figure 3. Bullfrog (*Rana catesbeiana*) and egg mass (inset).

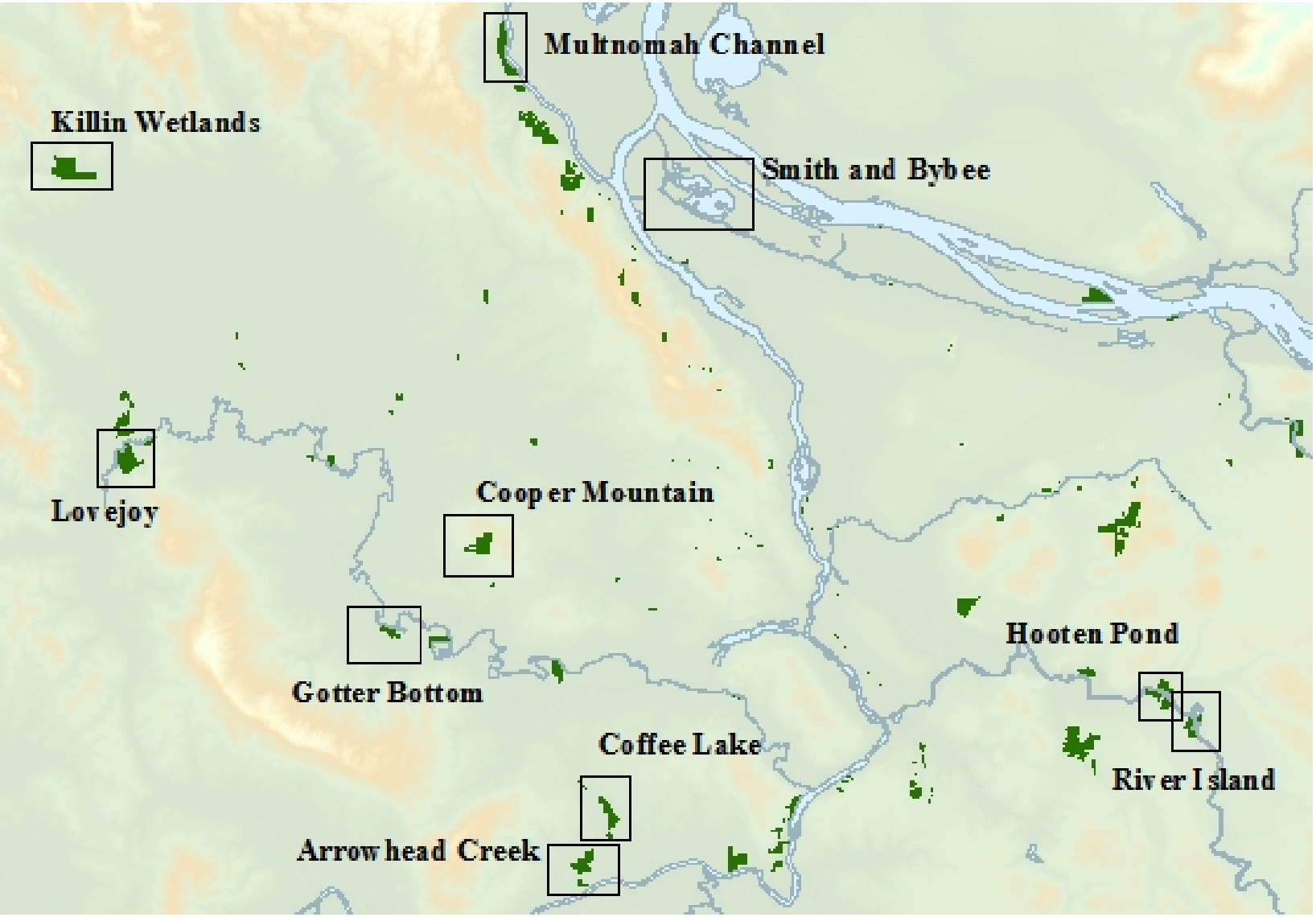


Figure 4. In 2006, amphibian egg mass surveys were conducted at 10 different Metro Natural Areas.

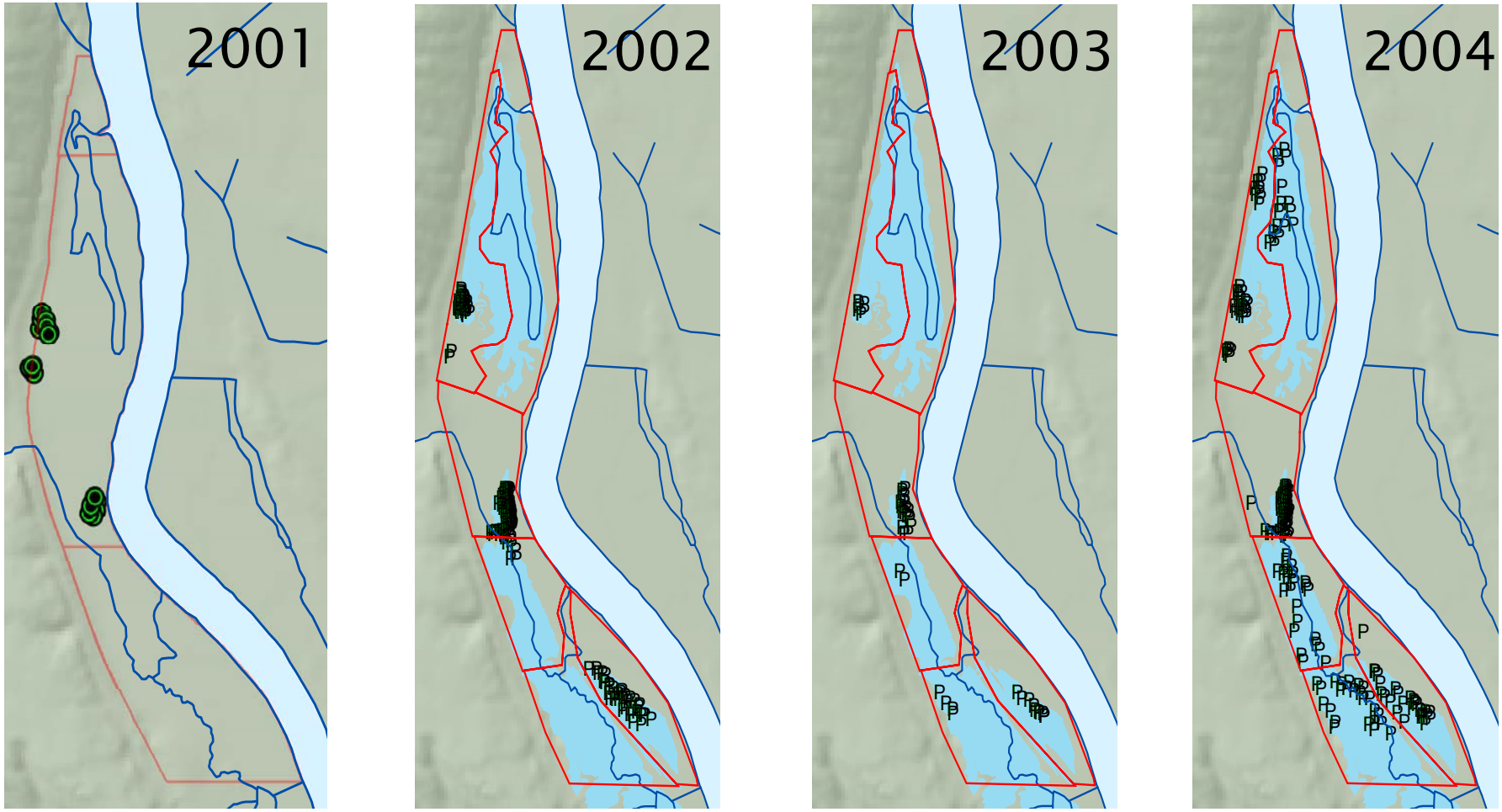


Figure 5. Distribution of northern red-legged frog (*Rana aurora aurora*) at the Metro Multnomah Channel Freshwater Tidal Marsh prior to (2001) and following installation (2002) and full operation (2003-2004) of two water control structures.

2006 DATA

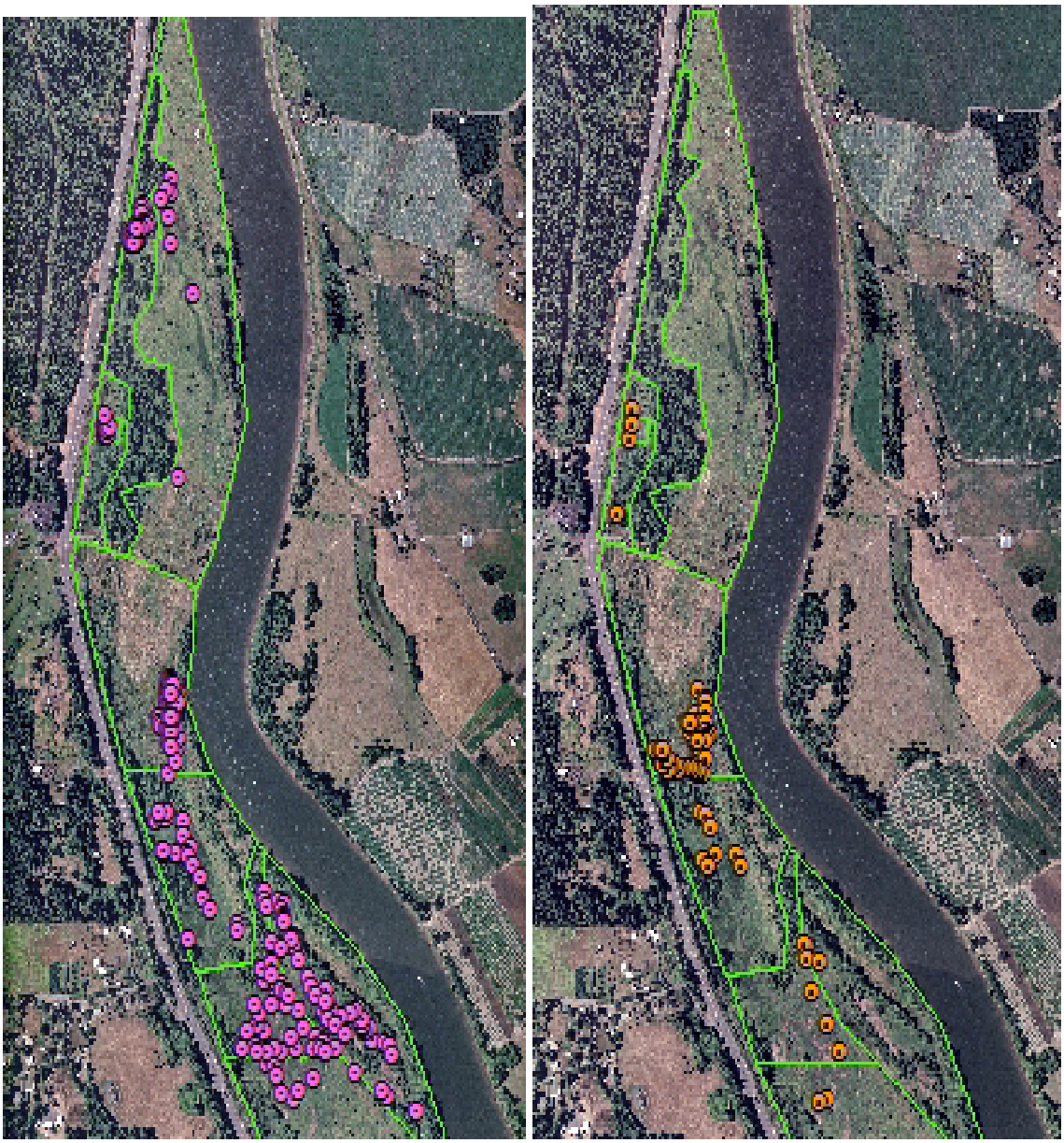


Figure 6. Distribution of northern red-legged frog (*Rana aurora aurora*) and northwestern salamander (*Ambystoma gracile*) at the Multnomah Channel Natural Area in 2006.

Figure 7. Distribution of northern red-legged frog (*Rana aurora aurora*) and northwestern salamander (*Ambystoma gracile*) at the Killin Wetlands Natural Area in 2006.

Figure 8. Distribution of northern red-legged frog (*Rana aurora aurora*) at the Gotter Prairie Natural Area in 2006.

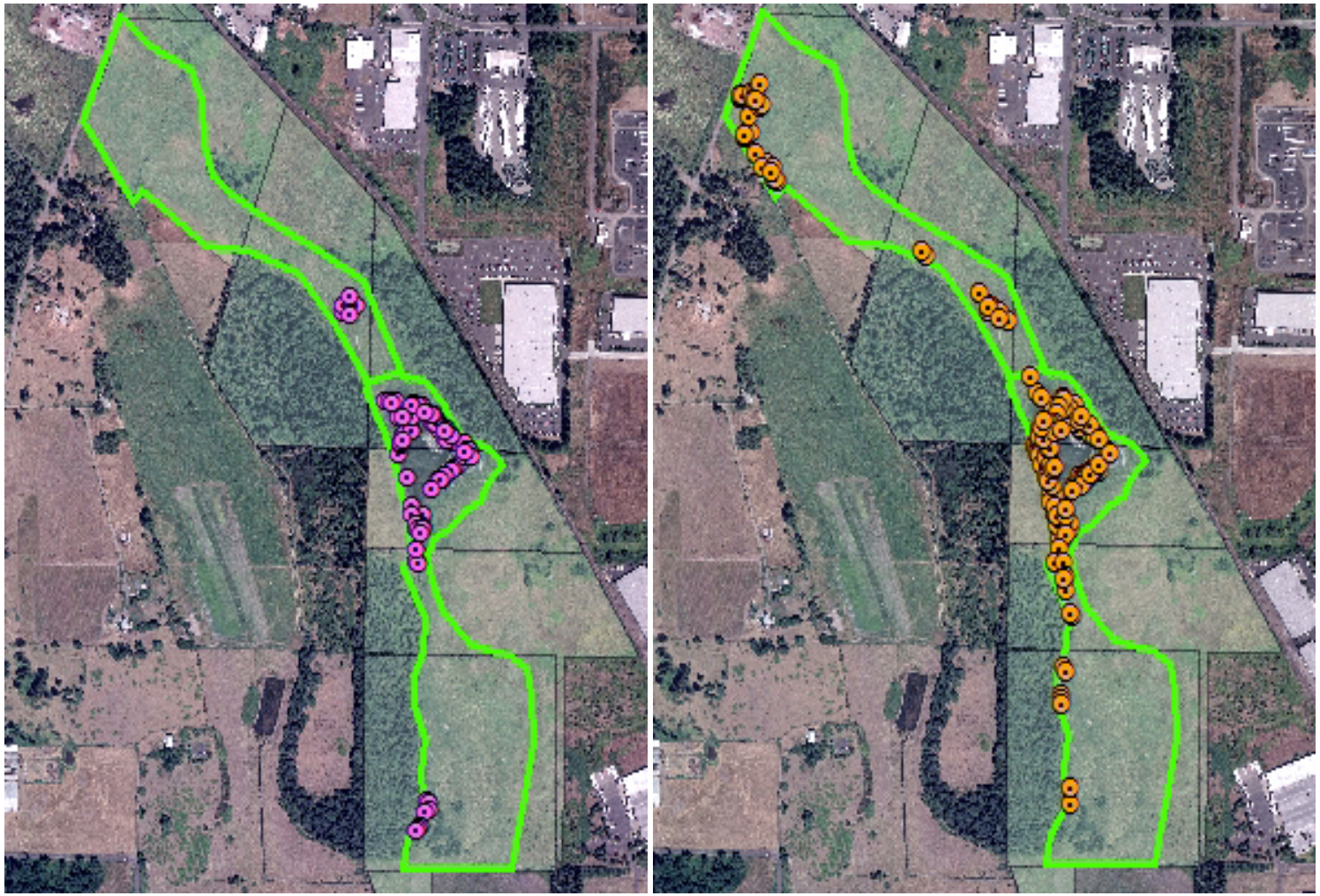


Figure 9. Distribution of northern red-legged frog (*Rana aurora aurora*) and northwestern salamander (*Ambystoma gracile*) at the Coffee Lake Bottoms Natural Area in 2006.

Figure 10. Distribution of northern red-legged frog (*Rana aurora aurora*) at the Cooper Mountain Natural Area in 2006.

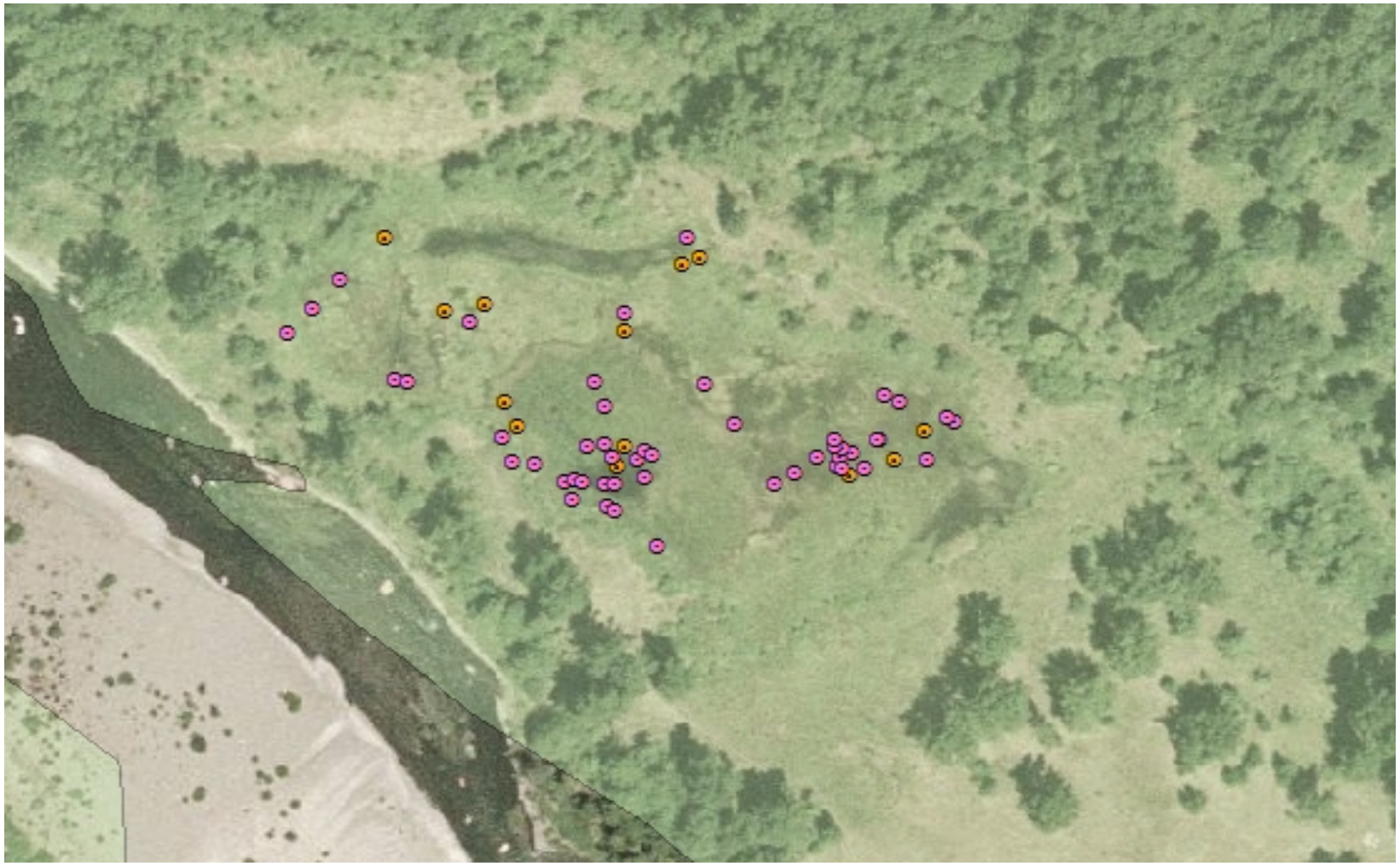


Figure 11. Distribution of northern red-legged frog (*Rana aurora aurora*) and northwestern salamander (*Ambystoma gracile*) at the Hooten Pond Natural Area in 2006.

Figure 12. Distribution of northern red-legged frog (*Rana aurora aurora*) and northwestern salamander (*Ambystoma gracile*) at the Lovejoy –Gales Creek Natural Area in 2006.

Figure 13. Distribution of northern red-legged frog (*Rana aurora aurora*) at the Graham Oaks – Arrowhead Creek Natural Area in 2006.

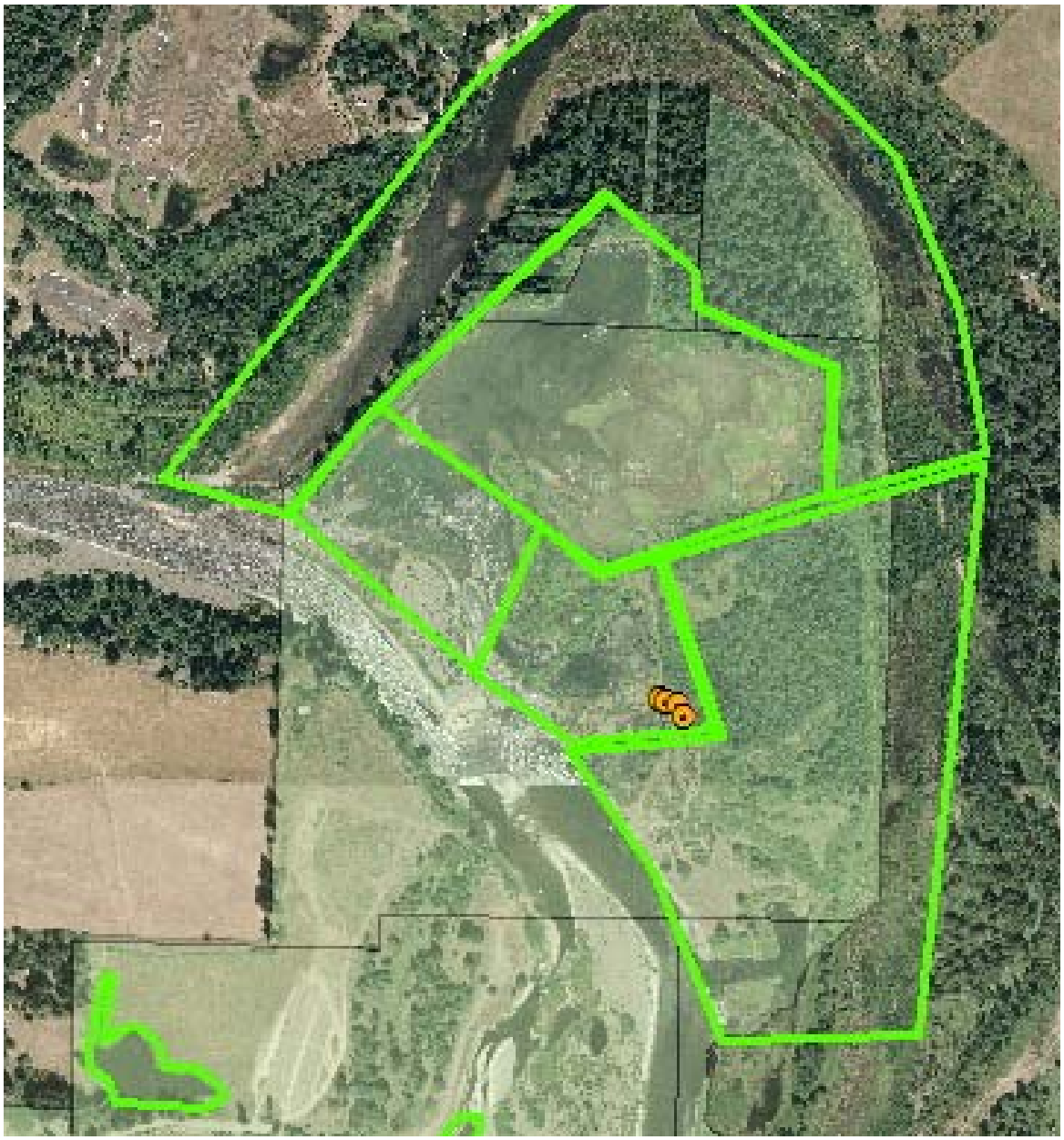


Figure 14. Distribution of northwestern salamander (*Ambystoma gracile*) at the River Island Natural Area in 2006.

		RAAU						AMGR					
Site	**Unit**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Multnomah Channel	1	10	42	6	32	18	53	3	3	0	2	3	5
Multnomah Channel	2	0	0	0	16	NS	7	0	0	0	2	NS	0
Multnomah Channel	3	13	81	19	67	48	95	0	4	1	4	12	50
Multnomah Channel	4	0	6	2	24	48	23	0	3	4	6	5	8
Multnomah Channel	5	0	0	4	24	102	39	0	0	0	0	3	4
Multnomah Channel	6	0	37	10	25	22	47	0	0	0	2	5	0
Total		**23**	**166**	**41**	**188**	**238**	**264**	**3**	**10**	**5**	**16**	**28**	**67**
Total estimated search time (minutes)		160	1142	257.5	4735	4735	3425	160	1142	257.5	4735	4735	3425
Estimated # masses/search hour		**8.63**	**8.72**	**9.55**	**2.38**	**3.02**	**4.62**	**1.13**	**0.53**	**1.17**	**0.20**	**0.35**	**1.17**

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.

		RAAU						AMGR					
Site	**Unit**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Killin Wetlands	1	NS	NS	4	10	1	68	NS	NS	73	220	6	562
Killin Wetlands	2	NS	NS	0	0	108		NS	NS	21	265	62	
Killin Wetlands	3	NS	NS	NS	NS	0	2	NS	NS	NS	NS	125	477
Killin Wetlands	4	NS	NS	NS	NS	23	6	NS	NS	NS	NS	51	1082
Killin Wetlands	5	NS	NS	NS	NS	5	1	NS	NS	NS	NS	0	33
Total		**0**	**0**	**4**	**10**	**137**	**77**	**0**	**0**	**94**	**485**	**244**	**2154**
Total estimated search time (minutes)				**28**	**959**	**1754**	**1542**			**28**	**959**	**1754**	**1542**
Estimated # masses/search hour		**0**	**0**	**8.57**	**0.63**	**4.69**	**3.00**	**0**	**0**	**201.43**	**30.34**	**8.35**	**83.81**

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.

		RAAU						AMGR					
Site	**Unit**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Gotter Prairie	1	NS	NS	0	0	NS	64	NS	NS	0	0	NS	0
Gotter Prairie	2	NS	NS	0	0	NS	NS	NS	NS	0	0	NS	NS
Gotter Prairie	3	NS	NS	0	195	87	182	NS	NS	0	14	17	7
Total		**0**	**0**	**0**	**195**	**87**	**246**	**0**	**0**	**0**	**14**	**17**	**7**
Total estimated search time (minutes)				**90**	**987**	**1096**	**558**			**90**	**987**	**1096**	**558**
Estimated # masses/search hour		**0**	**0**	**0**	**11.85**	**4.76**	**26.45**	**0**	**0**	**0**	**0.85**	**0.93**	**0.75**

Table 3. Egg mass survey data for red-legged frogs (*Rana aurora aurora*) and northwestern salamanders (*Ambystoma gracile*) at the Gotter Prairie. 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.

		RAAU						AMGR					
Site	**Unit**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Coffee Lake	1	NS	NS	NS	14	2	5	NS	NS	NS	23	7	36
Coffee Lake	2	NS	97	NS	8	65	87	NS	130	NS	182	63	160
Coffee Lake	3	NS	NS	NS	0	0	10	NS	NS	NS	8	3	14
Total		**0**	**97**	**0**	**22**	**67**	**102**	**0**	**130**	**0**	**213**	**73**	**210**
Total estimated search time (minutes)			**719**		**1309**	**1278**	**1132**		**719**		**1309**	**1278**	**1132**
Estimated # masses/search hour		**0**	**8.09**	**0**	**1.01**	**3.15**	**5.41**	**0**	**10.85**	**0**	**9.76**	**3.43**	**11.13**

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.

		RAAU						AMGR					
Site	**Unit**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Cooper Mountain	1	NS	NS	NS	25	21	22	NS	NS	NS	0	0	0
Total		**0**	**0**	**0**	**25**	**21**	**22**	**0**	**0**	**0**	**0**	**0**	**0**
Total estimated search time (minutes)					**30**	**5.5**	**49**				**30**	**5.5**	**49**
Estimated # masses/search hour		**0**	**0**	**0**	**50.00**	**229.09**	**26.94**	**0**	**0**	**0**	**0**	**0.00**	**0.00**

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.

		RAAU						AMGR					
Site	**Unit**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Hooten Pond	Pond	NS	11	NS	NS	NS	48	NS	3	NS	NS	NS	13
Total		**0**	**11**	**0**	**0**	**0**	**48**	**0**	**3**	**0**	**0**	**0**	**13**
Total estimated search time (minutes)			**83**				**376**		**83**				**376**
Estimated # of masses/ search hour		**0**	**7.9518**	**0**	**0**	**0**	**7.66**	**0**	**2.1687**	**0**	**0**	**0**	**2.074**

Table 6. Egg mass survey data for red-legged frogs (*Rana aurora aurora*) and northwestern salamanders (*Ambystoma gracile*) at the Hooten Pond Natural Area. 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.

		RAAU						AMGR					
Site	**Unit**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Lovejoy	1	NS	NS	NS	NS	5	22	NS	NS	NS	NS	0	1
TOTAL		**0**	**0**	**0**	**0**	**5**	**22**	**0**	**0**	**0**	**0**	**0**	**1**
Total estimated search time (minutes)						**67**	**210**					**67**	**210**
Estimated # of masses/ search hour		0	**0**	**0**	**0**	**4.478**	**6.286**	**0**	**0**	**0**	**0**	**0**	**0.286**

Table 7. 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.

		RAAU						AMGR					
Site	**Unit**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Arrowhead Creek	Pond	NS	NS	NS	NS	4	8	NS	NS	NS	NS	0	0
Total		**0**	**0**	**0**	**0**	**4**	**8**	**0**	**0**	**0**	**0**	**0**	**0**
Total estimated search time (minutes)						**17.5**	**28**					**17.5**	**28**
Estimated # of masses/ search hour		**0**	**0**	**0**	**0**	**13.71**	**17.14**	**0**	**0**	**0**	**0**	**0**	**0**

Table 8. 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.

			RAAU						AMGR				
Site	**Unit**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
River Island	Pond	NS	NS	NS	NS	NS	0	NS	NS	NS	NS	13	4
Total		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**13**	**4**
Total estimated search time (minutes)							**75**					**42**	**75**
Estimated # of masses/ search hour		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3.2**

Table 9. Egg mass survey data for red-legged frogs (*Rana aurora aurora*) and northwestern salamanders (*Ambystoma gracile*) at the River Island Natural Area. 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.

		RAAU						AMGR					
Site	**Unit**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Smith and Bybee	Smith	NS	NS	NS	NS	NS	0	NS	NS	NS	NS	NS	0
Smith and Bybee	Bybee	NS	NS	NS	NS	NS	0	NS	NS	NS	NS	NS	0
Smith and Bybee	Interlake	NS	NS	NS	NS	NS	0	NS	NS	NS	NS	NS	0
Total		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total estimated search time (minutes)							**1110**						**1110**
Estimated # of masses/ search hour		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Table 10. Egg mass survey data for red-legged frogs (*Rana aurora aurora*) and northwestern salamanders (*Ambystoma gracile*) at the Smith and Bybee 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.