PROGRESS REPORTS

2011




FISH DIVISION
Oregon Department of Fish and Wildlife

Amphibian Distribution in Wadeable Streams and Ponds in Western and Southeast Oregon, 2009-2010

Amphibian Distribution in Wadeable Streams and Ponds in Western and Southeast Oregon, 2009-2010

Sharon E. Tippery
Kim K. Jones

Oregon Department of Fish and Wildlife
Corvallis, OR

Dicamptodon tenebrosus Location: Alsea River Basin. Photo S. Tippery.

April, 2011

This project was financed with funds from the Oregon Department of Fish and Wildlife, Oregon Plan for Salmon and Watersheds.

Citation: Tippery, 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.

CONTENTS

FIGURES

TABLES

INTRODUCTION

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). The distribution of many species of amphibians in western Oregon is sparsely documented (Oregon Conservation Strategy, page 27). Although a broad-scale survey for amphibian presence would provide important baseline information about amphibian species composition and distribution, most studies have focused on limited areas.

The majority of Oregon's amphibians rely on aquatic habitats at some point of their life, either for breeding and juvenile development or to inhabit as adults. Most aquatic amphibians breed from late winter to early summer, and adults frequently remain in or near their breeding sites into the summer. Most tadpoles and juvenile amphibians are also active in and occupy aquatic habitats during the summer. Ongoing aquatic habitat and fish surveys are opportunities to observe species and life stages (breeding adults, tadpoles and juveniles) that occupy aquatic or riparian habitats during the summer.

One cost-effective approach is to combine amphibian surveys with existing aquatic habitat and fish surveys such as those conducted as part of the Oregon Plan for Salmon and Watersheds (OCSRI 1997). The Oregon Plan has been in place since 1997 and the monitoring component provides a survey framework for streams in the lower Columbia River and Oregon coast drainages. The sampling framework is also compatible with implementation of the aquatic components of the Conservation Strategy, as demonstrated by this study. This study describes the presence of amphibians in and along wadeable streams in coast and lower Columbia River drainages of Oregon, ponds and sloughs in the Willamette Valley, and selected streams in the Great Basin of southeast and central Oregon.

As a component of monitoring under the Oregon Plan, the Aquatic Inventories Project (AIP) conducts aquatic habitat surveys at randomly selected and spatially balanced sites across all 1st through 4th order streams in coastal and lower Columbia River drainages. The purpose of the habitat surveys is to describe stream morphology, instream physical habitat, and riparian vegetation. Because the surveyors were already observing features within and alongside the stream channel, they were able to record observations of amphibians. The advantage of coupling an amphibian component with the OR Plan aquatic surveys was that it not only was an efficient use of resources, but more importantly, provided information using a statistically rigorous survey design across a broad geographic area.

The Native Fish Investigations Project began a six year study in 2007 to document the distribution and abundance of redband trout in the Great Basin region of Eastern Oregon. The site selection procedure is comparable to the statistical standards as the Oregon Plan survey design.

Amphibian data are also collected during three other survey projects, and although the site selection procedure does not conform to the same statistical standards as the Oregon Plan survey design, the projects offer a number of opportunities to collect amphibian occurrence information

over a wide variety of habitats. The amphibian observations from these three projects are also included in this report. The three projects are as follows:

- AIP conducts aquatic habitat surveys on selected streams throughout the state.
- AIP conducts aquatic habitat surveys at stream habitat restoration projects in Western Oregon.
- Native Fish Project conducts surveys of pond and slough sites for Oregon chub in the Willamette Valley.

Due to the success of the 2007 and 2008 field studies, we continued our research during the summer of 2009 and 2010 to improve our knowledge of distribution and community structure of amphibians. The summer 2009 and 2010 surveys took place in 9 of Oregon's 10 ecoregions (Figure 1) (Thorson et al. 2003). Ecoregions provide a framework for discussing amphibian distribution across the state because they are relatively large areas defined by distinctive geographic and ecological (flora and fauna) characteristics.

The goals of our 2009-2010 work were to:

- Increase the consistency, efficiency and ability of habitat crews in identifying amphibians through improved training.
- Increase knowledge of distribution, community structure, and habitat associations of amphibians in streams in:
    - Western Oregon coastal and lower Columbia drainages.
    - Ponds, sloughs and other off-channel aquatic habitats in the Willamette Valley.
    - Great Basin of eastern Oregon and selected streams in central Oregon.
- Combine the 2009-2010 observations with the 2007-2008 results.

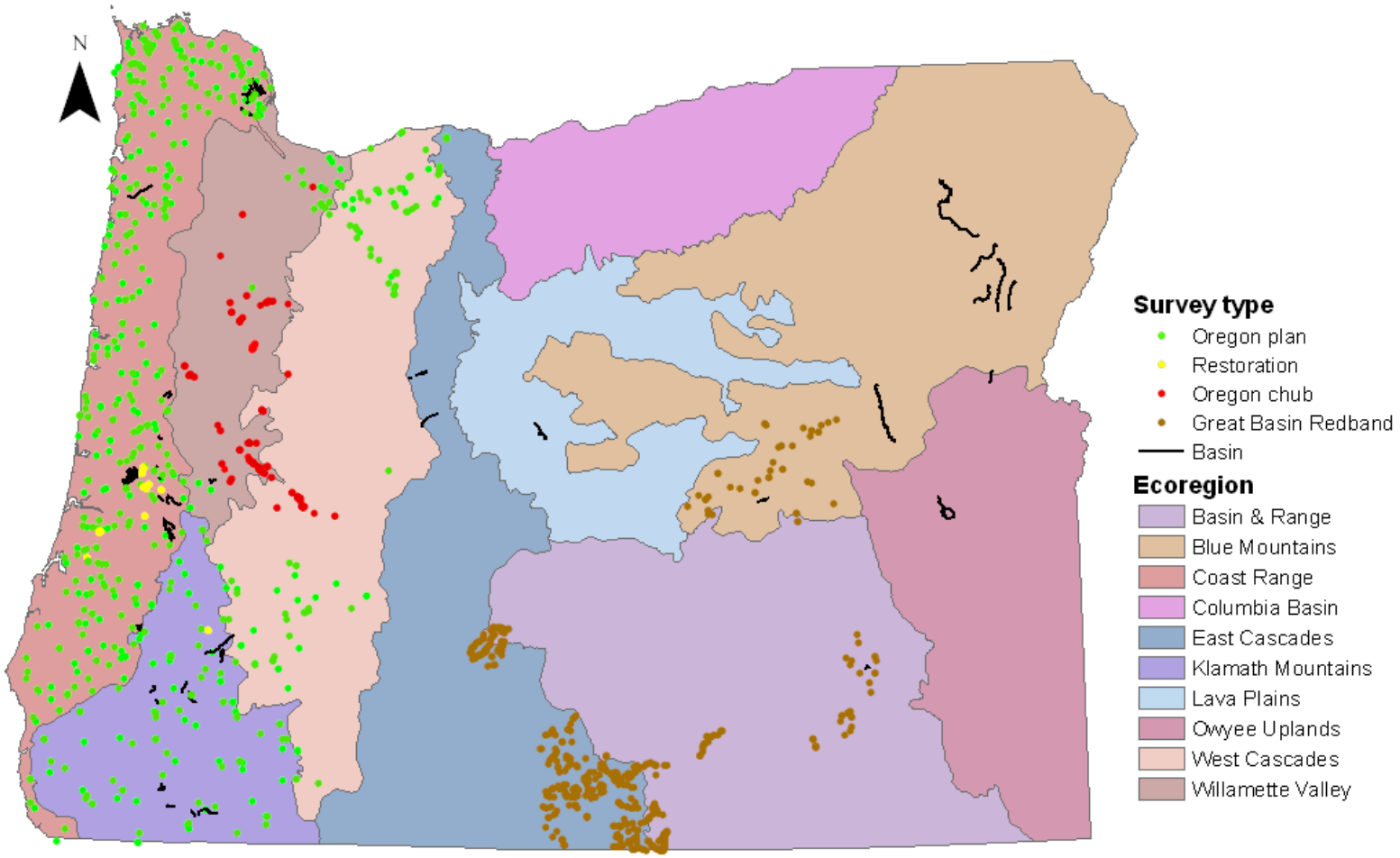

Figure 1. 2009-2010 Oregon Plan, Restoration, Basin, Oregon chub and Great Basin redband trout survey locations.

METHODS

Survey Projects

Amphibian sampling was coupled onto five ongoing survey projects. While the primary goal of these projects was to collect fish and habitat data, amphibian observations were recorded concurrently. Previous studies found parallels between the habitat and fish sampling methods that were utilized and standard amphibian sampling procedures (Bangs and Jones 2009).

Oregon Plan habitat surveys

The Generalized Random Tessellation Stratified design (GRTS) (Stevens and Olsen 2004) was used to randomly select 350 sites within coast range and lower Columbia basins for each sample year (Figure 1). This survey design allows inferences to be drawn about amphibians in streams that were part of the frame from which the sample sites were randomly drawn. Sample sites begin at the selected point, and are surveyed in an upstream direction. Approximately 25% of the selected surveys are visited once, 25% are revisited annually, 25% are revisited every 3 years and 25% are revisited every 9 years. Sites in medium size streams are 1000 meters in length, and sites in small and headwater streams are 500 meters in length.

Habitat surveys record stream morphology, instream habitat, and riparian characteristics. A reference guide to Oregon amphibians was developed and included with the sampling manual that crews carried in the field and all personnel attended an amphibian identification component during their training. Crews identified and noted amphibian presence during stream and riparian surveys. Sampling was completed through a walking survey, and data are collected on a channel habitat unit basis.

A crew (hereafter referred to as a resurvey crew) also revisited 30 sites after they were initially surveyed to establish variability in observations and surveyor bias. We then estimated surveyor bias by comparing standard crew data with the intensive resurveys.

Basin habitat surveys

Basin habitat surveys are very similar to Oregon Plan habitat surveys, except that we selected the streams to be surveyed (non-random) and the streams were surveyed from mouth to headwaters (census). In 2009, streams were surveyed in the Scappoose, South Umpqua, Smith, Applegate, and Illinois river basins (Oregon coast). In Eastern Oregon streams were surveyed in the Malheur, Willow Creek, Powder, Metolius, and Deschutes river basins (Figure 1). In 2010, streams were surveyed in the Nestucca, Alsea, Long Tom, Siuslaw, South Umpqua and Lower Umpqua river basins (Oregon coast). In Eastern Oregon streams were surveyed in the Malheur Lake, Silvies, Grande Ronde, and Deschutes river basins (Figure 1).

As with Oregon Plan habitat surveys, crews identified and noted amphibian presence as they walked the stream and riparian transects.

Restoration habitat surveys

Restoration habitat surveys are very similar to Oregon Plan habitat surveys, except that we selected the streams to be surveyed (non-random) and the surveyed length was determined by the portion of the stream in which restoration treatment was planned or had been completed. Each restoration site was surveyed before the restoration treatment, immediately after treatment, and every five years. One restoration site was sampled during the summer of 2009 and 12 restoration sites were surveyed during the summer of 2010 (Figure 1). As with Oregon Plan habitat surveys, the crew identified and noted amphibian presence as they walked the stream and riparian transects.

Oregon Chub fish surveys

Site selection was based upon historical distribution and current knowledge of habitat types preferred by Oregon chub (Figure 1). These sites are typically low gradient, low flow, and off-channel habitats, such as disconnected sloughs, ponds, and channels with an organic or silt rich substrate. Locations that contain Oregon chub populations are revisited annually to establish population trends. The sampling for Oregon chub typically occurred from April through May, and from September through October, to avoid sampling during the Oregon chub spawning season. Some sampling outside of those months has occurred.

Fish sampling was conducted using baited mesh minnow traps, a seine, and dip nets. Minnow traps were fished on the bottom or in the water column for 3 to 18 hours, often overnight or over multiple days. All fish, reptiles, and amphibians captured were identified. Physical and biological habitat characteristics were measured at each site.

Great Basin Redband fish surveys

GRTS protocol was used to randomly select sites within the range of redband trout in the Catlow Valley, Chewaucan, Silver Lake, Goose Lake, Malheur Lakes and Warner Valley basins (Miller et al. 2010). The findings reported here represent 277 sites in 2009 and 264 sites in 2010 on public and private lands (Figure 1).

Site length was set at 30 wetted widths, with a minimum length of 30 meters and a maximum length of 100 meters. Fish were sampled by electrofishing. Physical and biological habitat characteristics were recorded.

Amphibian and reptile species were recorded when observed at each site. A reference guide to amphibians specific to region was developed and included with the sampling manual that crews carried in the field. All personnel attended an amphibian identification session during their training.

RESULTS

Sixteen of Oregon's 32 amphibian species were observed in 2009-10, including 9 strategy species (Oregon Conservation Strategy, pages 337-341, 375) (Table 1). Because of difficulty identifying species, crews were instructed to identify Pacific giant salamanders and Cope's giant salamanders as the same species, *Dicamptodon tenebrosus*. Western red-backed and Dunn's salamanders were similarly lumped together as *Plethodon* spp.

Table 1. Taxonomic details of amphibian species observed.

Order	Caudata (salamanders)	Strategy Species
Family	Ambystomatidae (Mole salamanders)	
	Ambystoma gracile (Northwestern salamander)	
	Ambystoma macrodactylum (Long-toed salamander)	
Family	Dicamptodontidae (Giant salamanders)	
	Dicamptodon tenebrosus (Pacific giant salamander)	X
Family	Salamandridae (Newts)	
	Taricha granulosa (Rough-skinned newt)	
Family	Plethodontidae (Woodland salamanders)	
	Aneides ferreus (Clouded salamander)	X
	Plethodon dunni (Dunn's salamander)	
	Plethodon vehiculum (Western red-backed salamander)	
Family	Rhyacotritonidae (Torrent salamanders)	
	Rhyacotriton cascadae (Cascade torrent salamander)	X
Order	Anura (frogs and toads)	
Family	Leiopelmatidae (Bell toads)	
	Ascaphus truei (Tailed frog)	X
Family	Bufonidae (True toads)	
	Bufo boreas (Western toad)	X
Family	Hylidae (Treefrogs)	
	Pseudacris regilla (Pacific treefrog)	
Family	Ranidae (True frogs)	
	Rana aurora (Red-legged frog)	X
	Rana luteiventris (Columbia spotted frog)	X
	Rana cascadae (Cascades frog)	X
	Rana boylii (Foothill yellow-legged frog)	X
	Rana catesbeiana (American bullfrog)	

Survey crews observed amphibians at 722 of 1,693 sites (Tables 2 and 3). Surveys took place in nine ecoregions across the state, and amphibians were found in every ecoregion except the Owyhee Uplands. Amphibians were observed during surveys as early as April and as late as the first week of October. The West Cascades ecoregion had the highest observed number of species, with ten amphibian species. The largest number of amphibians was observed in the Willamette Valley, primarily rough-skinned newts and bullfrogs.

Western Oregon ecoregions had the highest percentage of sites (50-82%) with amphibians observed in Oregon. Amphibians were observed at 82% of the Willamette Valley sites, 54% of the Klamath Mountain sites, 54% of the West Cascades sites, and 50% of the Coast Range sites.

All of the Eastern Oregon ecoregions had low percentages of sites where amphibians were observed (Table 3). Amphibians were observed at 15% of the sites in the Basin and Range, 19% of the sites in the East Cascades, 33% of the sites in the Lava Plains, and 53% of the sites in the Blue Mountains ecoregions. No amphibians were observed in the Owyhee Uplands ecoregion. Pacific treefrogs, Columbia spotted frogs and western toads were the only native amphibians identified in Eastern Oregon.

Table 2. Number of sites with amphibian observations in ecoregions of western Oregon.

	Coast Range	Willamette Valley	Klamath Mountains	West Cascades
Rough-skinned Newt	143	87	12	36
Pacific Giant Salamander	59	2	35	26
Northwestern Salamander		48		11
Long-toed Salamander		1		
Clouded Salamander	1		1	
Plethodon	16	1		
Torrent Salamander				1
Red-legged Frog	68	10	10	7
Yellow-legged Frog	9		8	4
Cascades Frog			1	6
Tailed Frog	15	1	3	4
Pacific Treefrog	10	8	12	7
Spotted Frog				
Western Toad				
Bullfrog	1	75	8	16
Unknown Amphibian	89	5	33	19
Sites with amphibians	272	124	91	74
Sites surveyed	542	151	168	138

Table 3. Number of sites with amphibian observations in ecoregions of eastern Oregon.

	East Cascades	Lava Plains	Basin and Range	Blue Mountains	Owyhee Uplands
Pacific Treefrog	26	1	14	9	
Spotted Frog	2			13	
Western Toad	4	1		2	
Bullfrog	4		7	10	
Unknown Amphibian	31		18	44	
Sites with amphibians	65	1	33	62	0
Sites surveyed	339	3	218	117	17

Oregon Plan surveys were conducted at more sites and across the largest geographic area than other survey projects (Figure 1). Consequently, the highest number and diversity of amphibian species were observed during these surveys (Table 4, Figure 2).

Table 4. Number of sites with amphibian observations for each survey type.

All Ecoregions						
Species	Oregon Plan	Restoration	Basin	Oregon chub	Redband	Total
Rough-skinned Newt	106	8	49	115		278
Pacific Giant Salamander	79		30	13		122
Northwestern Salamander				59		59
Long-toed Salamander				1		1
Clouded Salamander	1	1				2
Ensatina						0
Plethodon	12	1	4			17
Tiger Salamander						0
Torrent Salamander	1					1
Red-legged Frog	77	1	9	8		95
Yellow-legged Frog	21					21
Cascades Frog	7					7
Tailed Frog	21	1	1			23
Pacific Treefrog	18	1	22	9	37	87
Spotted Frog			8		7	15
Western Toad			5		2	7
Bullfrog	10		10	89	12	121
Unknown Amphibian	104	3	71		61	239
Sites with amphibians	300	9	153	147	113	722
Sites surveyed	644	13	348	147	541	1693

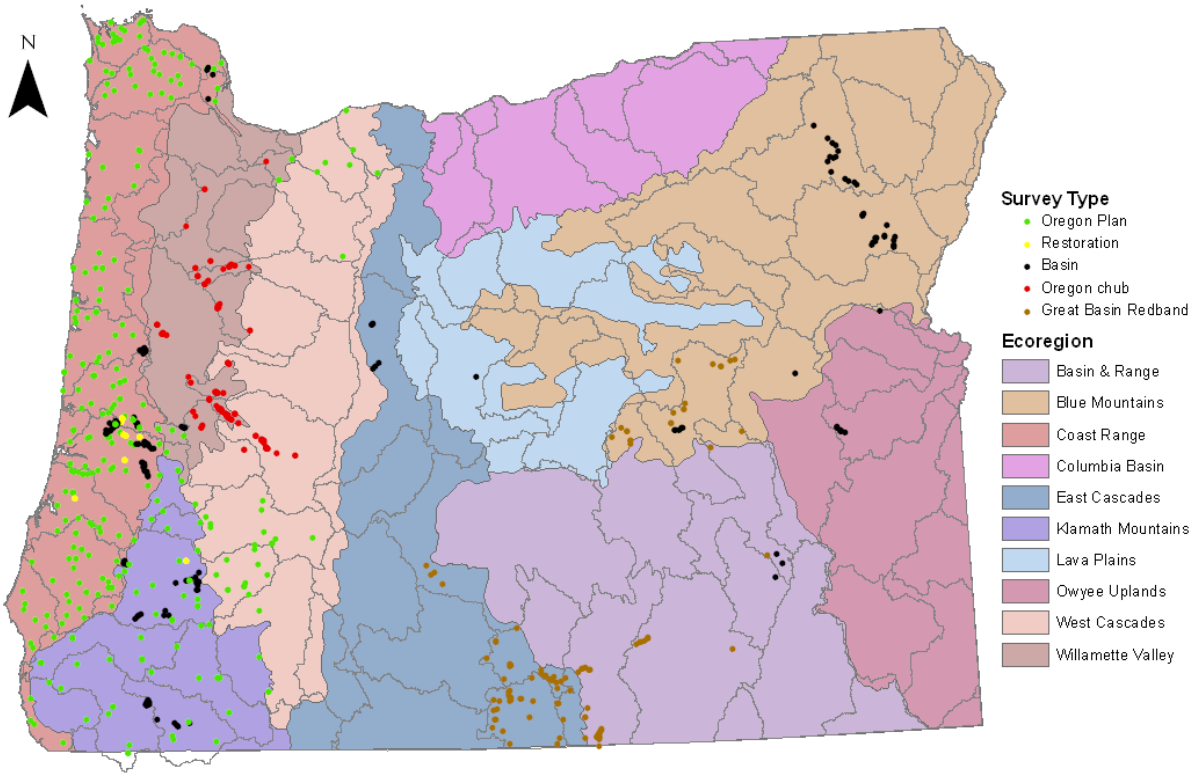

Figure 2. Distribution of amphibian occurrences by survey type. Gray lines denote 4th field hydrologic units.

Results by species

Rough-skinned Newt (*Taricha granulosa*)

Rough-skinned newts were the most encountered amphibian on the west side of the state with 278 occurrences (Figure 3). Rough-skinned newts were observed in the Coast Range, Willamette Valley, West Cascades, and Klamath Mountains ecoregions. Only adult forms of this species were identified.

The breeding season for rough-skinned newts overlaps the typical sampling schedule for the Oregon chub surveys (April – May) and the beginning of the Oregon Plan surveys (June). The high number of observations of this species is probably due to it being diurnal, and active within the water column of ponds, low gradient streams and beaver ponds.

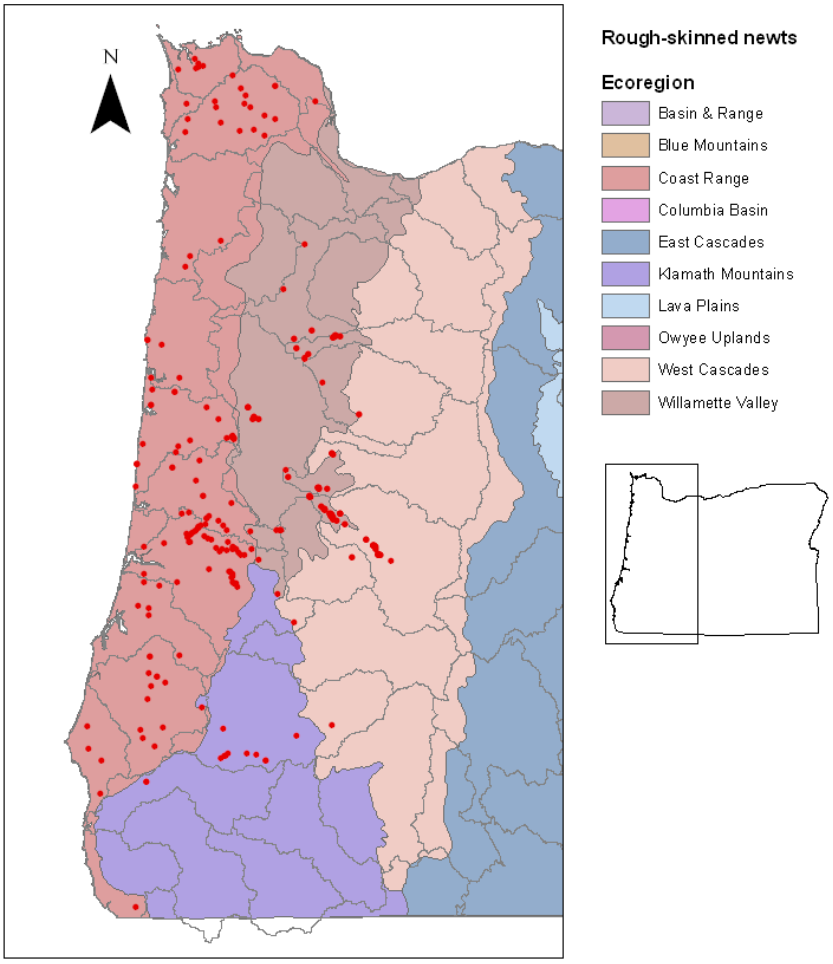

Figure 3. Rough-skinned newt distribution at Oregon Plan, Oregon chub, Restoration, and Basin sites. Gray lines denote 4th field hydrologic units.

Pacific Giant Salamander (*Dicamptodon tenebrosus*)

Pacific giant salamanders were encountered throughout western Oregon, but were observed most frequently in the coast range south of the Yaquina River on the central Oregon coast (Figure 4). Pacific giant salamanders were observed at 122 locations by Oregon Plan, Basin, and Oregon chub survey crews. This species was found in the Coast Range, Willamette Valley, Cascades West and Klamath Mountains ecoregions. Juveniles, neotenic forms, and metamorphosed adults were observed. Crews were instructed not to differentiate between Cope's giant salamander and Pacific giant salamander due to identification difficulties.

Northwestern Salamander (*Ambystoma gracile*)

Northwestern salamanders were encountered from April through October along the Willamette River and its tributaries south of the city of Salem in the Willamette Valley and West Cascades ecoregions (Figure 4). This species was encountered at 59 locations in ponds and low gradient streams during Oregon chub surveys. Larvae, juveniles, neotenic forms, and metamorphosed adults were observed.

Long-toed Salamander (*Abystoma macrodactylum*)

Long-toed salamanders were encountered at one location in the Willamette Valley ecoregion (Figure 4). This species was only encountered during Oregon chub surveys. All of the individuals encountered were juvenile or neotenic forms.

Clouded Salamander (*Aneides ferreus*)

Two adult clouded salamanders were encountered during Oregon Plan and Restoration surveys in the Coast Range and Klamath Mountain ecoregions during the summer of 2009 (Figure 4).

Plethodon (most likely *P. dunni or P. vehiculum*)

Members of the genus *Plethodon* were encountered at 17 locations in western Oregon (Figure 4). Oregon Plan, Restoration, and Basin survey crews recorded members of this genus in the Coast Range and Willamette Valley ecoregions.

Crews reported difficulty identifying this genus down to species level. The species encountered were most likely *P. dunni* or *P. vehiculum.* Surveyors reported spotting these individuals after seeing movement in the riparian areas of the creek.

Cascades Torrent Salamander (*Rhyacotriton cascadae*)

A single Cascades torrent salamander was encountered during an Oregon Plan survey in the Sandy River basin in the West Cascades ecoregion during the summer of 2009 (Figure 4).

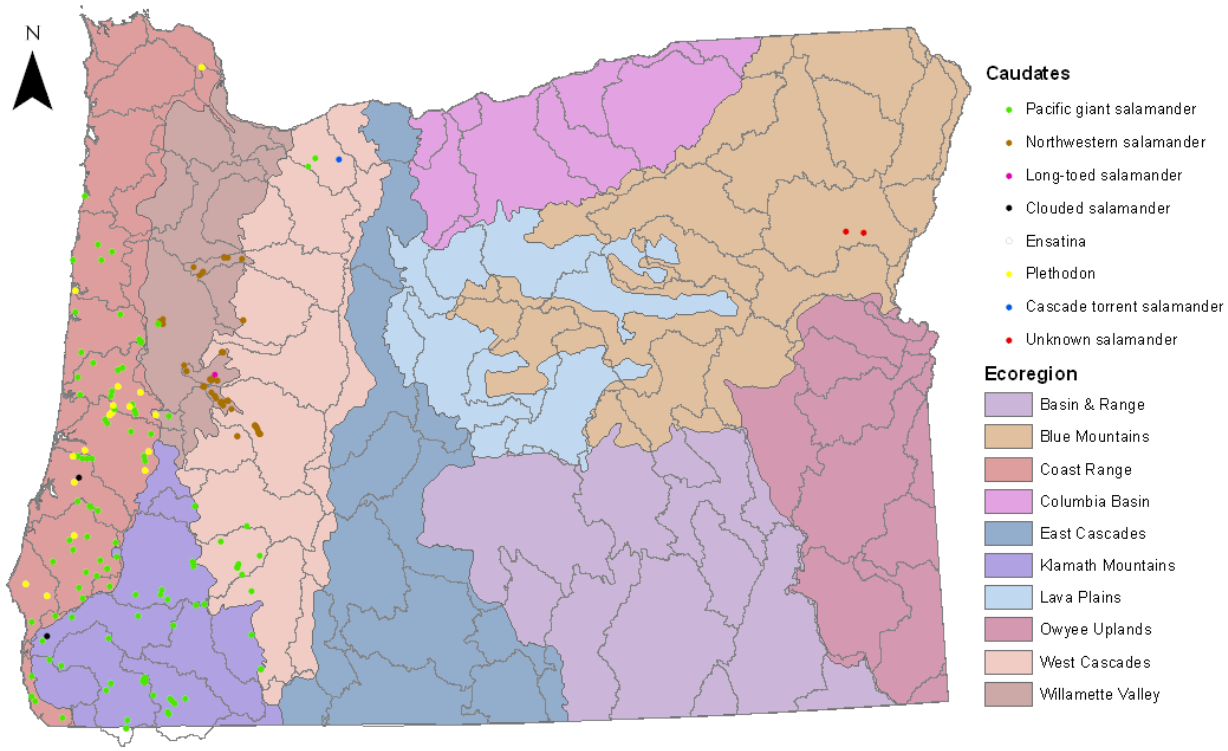

Figure 4. Native caudate distribution in Oregon. Gray lines denote 4th field hydrologic units.

Western Toad (*Bufo boreas*)

Adult western toads were encountered at 7 locations in the Metolius River, Deschutes River, Grande Ronde River and Silver Lake basins in the East Cascades, Lava Plains and Blue Mountains ecoregions by basin and redband trout survey crews (Figure 5). Tadpoles and adult toads were observed.

Columbia Spotted Frog (*Rana luteiventris*)

Columbia spotted frogs were encountered in the Malheur Lakes, Malheur River, Powder River, Grande Ronde River, Silvies River and Goose Lake basins of eastern Oregon (Figure 5). Columbia spotted frogs were observed at 15 locations during basin and redband trout surveys in the East Cascades and Blue Mountains ecoregions. Only adult frogs were observed.

Foothill Yellow-legged Frog (*Rana boylii*)

Foothill yellow-legged frogs were encountered by Oregon Plan survey crews at 21 locations in the Coast Range, Klamath Mountains and West Cascades ecoregions in western Oregon (Figure 5). Tadpoles and adult frogs were observed. More than 100 individuals, juveniles and adults only, were encountered on the South Fork Coquille River in early September 2009.

Red-legged Frog (*Rana aurora*)

Red-legged frogs were observed throughout western Oregon (Figure 5). They were encountered at 95 locations in the Coast Range, Willamette Valley, Klamath Mountains and West Cascades ecoregions. Oregon Plan surveys had the highest number of observations. Tadpoles and adult frogs were observed.

Cascades Frog (*Rana cascadae*)

Cascades frogs were observed by Oregon Plan crews at 7 locations (Figure 5) in the Klamath Mountains and West Cascades ecoregions. Only adult frogs were observed.

Tailed Frog (*Ascaphus truei*)

Tailed frogs were encountered at 23 locations (Figure 5) in the Coast Range, Willamette Valley, Klamath Mountains and West Cascades ecoregions in western Oregon. Tadpoles and adult frogs were observed.

Pacific Treefrog (*Psuedacris regilla*)

Pacific treefrogs were observed at 87 locations throughout the state (Figure 5). Individuals occurred in the Coast Range, Willamette Valley, Klamath Mountains, West Cascades, East Cascades, Lava Plains, Basin and Range and Blue Mountains ecoregions. Tadpoles and adult frogs were observed. Individuals were observed in a wide range of habitats ranging from isolated coastal streams to areas of open desert.

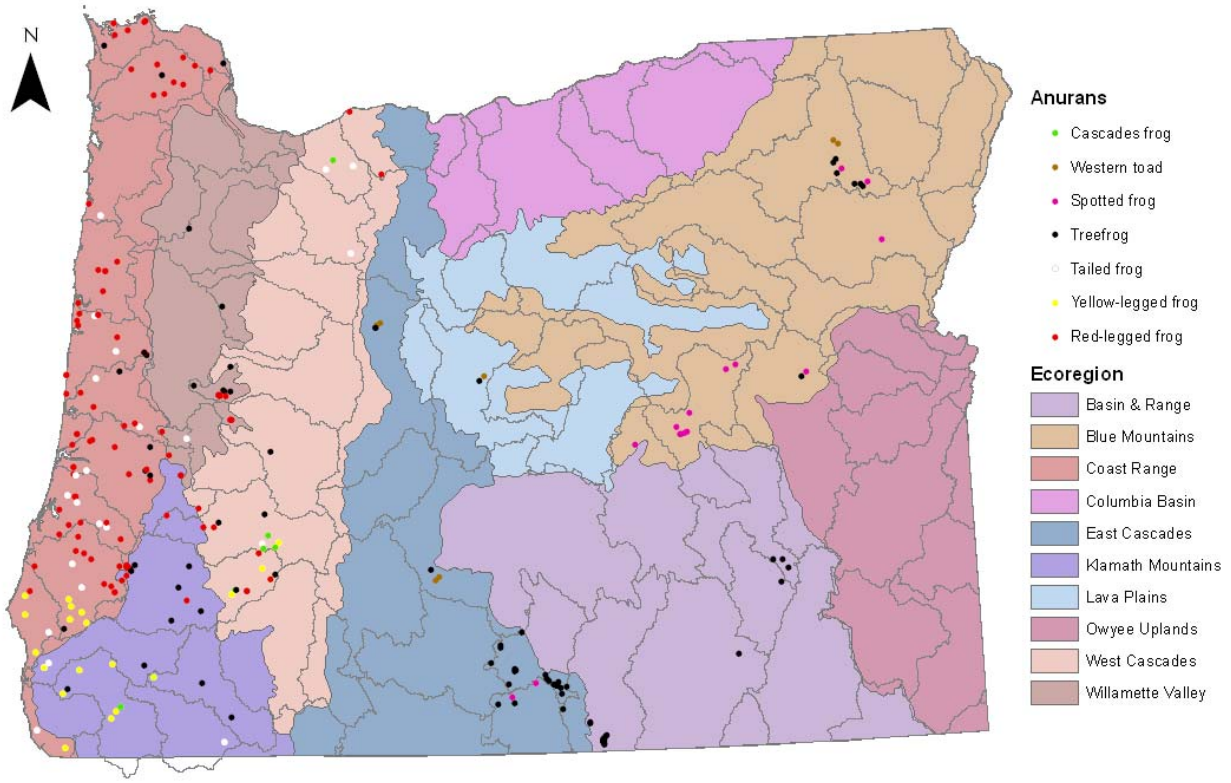

Figure 5. Native anuran distribution at survey sites across Oregon. Gray lines denote 4th field hydrologic units.

American Bullfrog (*Rana catesbeiana*)

Bullfrogs are nonnative and are considered an invasive species in Oregon. There is growing concern about their distribution and ability to prey on and out-compete native species for food and space. Bullfrogs were observed at 121 locations (Figure 6), and were the most commonly observed amphibian in the state. While bullfrogs were present at sites in the Coast Range, Klamath Mountains, West Cascades, East Cascades, Basin and Range and Blue Mountains ecoregions, the majority of the observations were made in the Willamette Valley ecoregion. Oregon chub surveys had the highest number of observations. These records include observations of tadpole, juvenile and adult frogs. Bullfrogs were typically observed in isolated ponds, beaver ponds, off-channel habitats and other slow water environments. Bullfrogs were not commonly observed in stream environments.

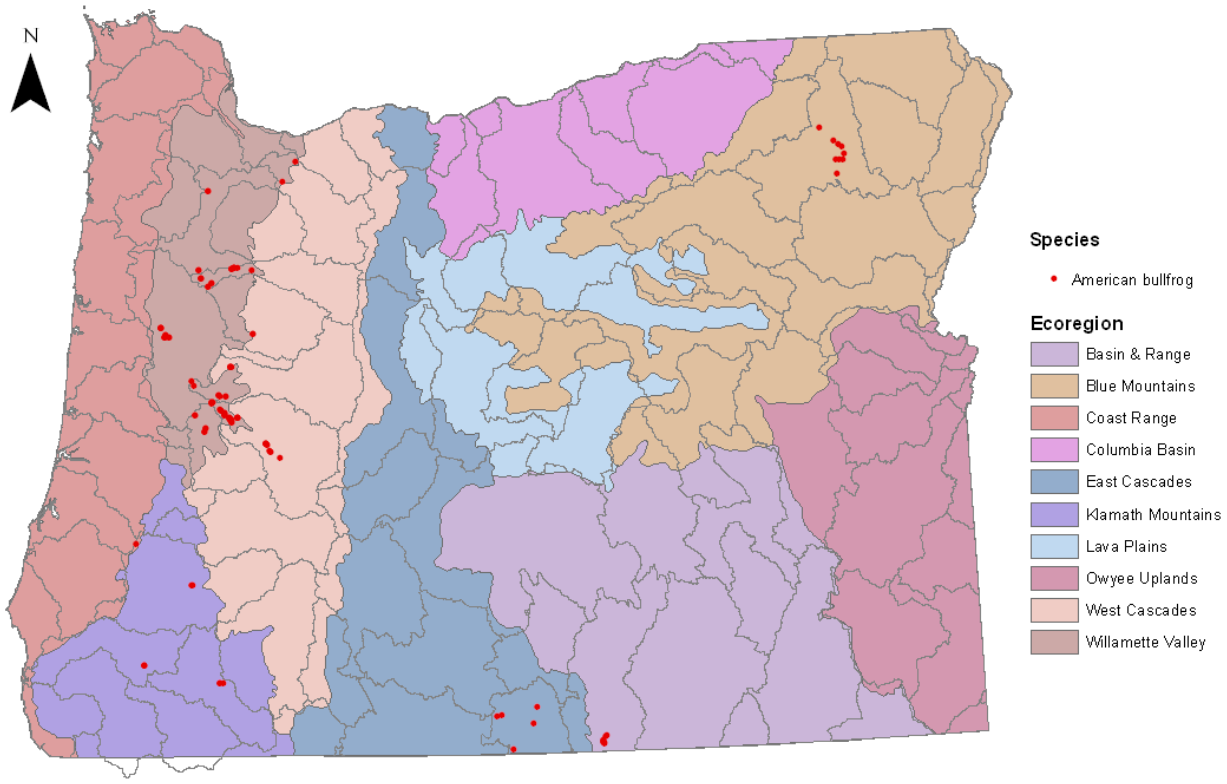

Figure 6. Bullfrog distribution at Oregon Plan, Basin, Oregon chub, and Great Basin Redband survey sites. Gray lines denote 4th field hydrologic units.

DISCUSSION

This study continues the amphibian surveys begun in 2007 in aquatic habitats in coastal and lower Columbia basins of western Oregon, in the Willamette Valley, and in the basin and range province of south central Oregon. This study has demonstrated that combining amphibian surveys with ongoing fish and aquatic habitat surveys is a cost-effective approach to achieve a key research objective in the Oregon Conservation Strategy. The GRTS survey design of the Oregon Plan habitat and Redband trout surveys selected sites in a random and spatially balanced pattern across a large region to assess amphibian presence and species composition in the coast and lower Columbia basins in western Oregon and in the Great Basin of eastern Oregon. The survey design affords broad spatial coverage and permits assumptions about amphibian presence in unsurveyed streams. Because we do not observe amphibians at some sites even though present, we are somewhat limited in our ability to extrapolate to all unsurveyed streams with the sample frame or area. However, it does increase the probability or likelihood that these species are present in similar streams within the respective range of distribution for each species. For example, plethodons were observed at many of the sites in the Coos and Coquille basins on the mid-South coast. We would expect that plethodons are also present in other streams of similar size in those basins. However, until we can establish firm habitat associations for each species, our powers of inference will remain limited outside of the sample frame.

The project was not without challenges. Surveys were conducted by 50 individuals who, while trained and carried an identification guide, were not amphibian specialists. Despite these limitations, these surveys represented a substantial effort to expand the limited knowledge of community structure and distribution of amphibians in Oregon.

Comparison of 2007 through 2010 Occurrence Data

Our primary goal is to increase the knowledge of the distribution of amphibians across the state. Multiple years of data are needed because of the variability in weather and local conditions that may impact the visibility and behavior of amphibians, seasonality, surveyor bias, and the distribution of survey locations. In 2007 and 2008 we observed a combined 1,837 amphibians (Tippery et al 2010). We combined these observations with the 544 observations at 370 sites made in 2009 and the 551 observations at 352 sites made in 2010 to provide a more comprehensive map of amphibian ranges across the state (Figures 7, 8, and 9).

Since 2007, survey crews have observed 18 of Oregon's 32 amphibian species in all ten ecoregions. The greatest richness of species was observed in western Oregon, with at least 9 species identified in each of the four ecoregions. The Coast Range ecoregion had the highest number of observed species, with 11 amphibian species. Rough-skinned newts, Pacific giant salamanders, red-legged frogs, yellow-legged frogs, tailed frogs and Pacific treefrogs were observed in all four ecoregions in western Oregon.

Surveyors observed and identified 5 amphibian species in six ecoregions of eastern Oregon. Pacific treefrogs were the most widespread species, occurring in every ecoregion but the Owyhee Uplands. Spotted frogs and western toads were each observed in four ecoregions and tiger salamanders were observed in the Silvies River basin in the Blue Mountains ecoregion. In 2009, surveyors reported juvenile and adult caudates in two tributaries to the Powder River in northeast Oregon. It may be possible the unidentified caudates were long-toed salamanders due to the extensive distribution and varied habitat range of this species, as well as the lack of other caudates expected in the area.

American bullfrogs, considered invasive to Oregon, were observed in 7 ecoregions since surveys began in 2007. The highest density of observations was in the Willamette Valley ecoregion, and several bullfrogs were observed in the Grande Ronde River, Malheur Lakes, Goose Lake and Warner Valley basins of Eastern Oregon.

In 2007-2010, we observed eight anuran species each year and continued to make new observations within the known geographic distribution of each species. The addition of basin surveys in 2009-10 in central and northeast Oregon increased the number of observations of western toad, Columbia spotted frog, Pacific treefrog, and bullfrog within their known geographic distribution.

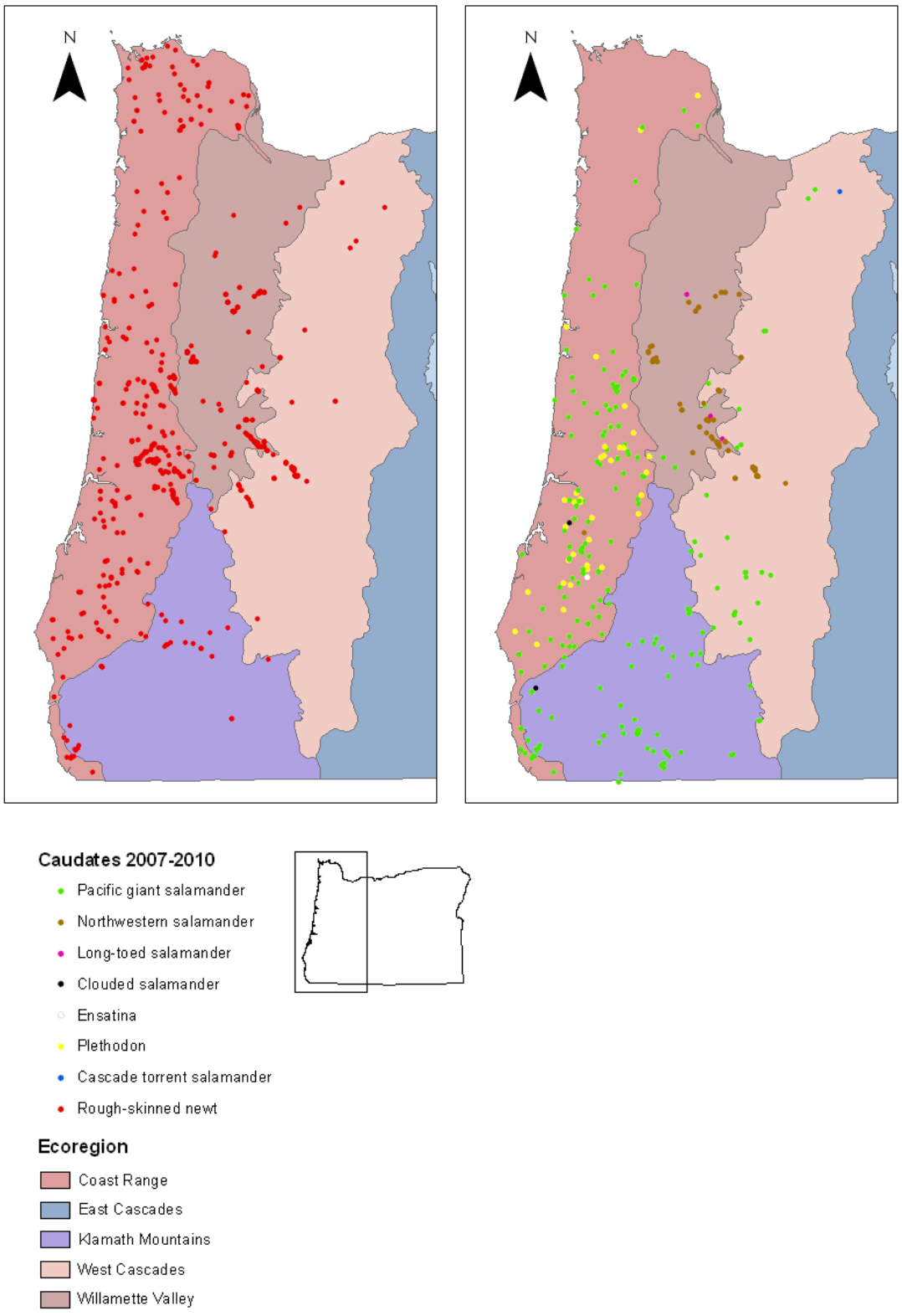

Figure 7. Distribution of caudates in 2007 through 2010. The left panel shows only rough-skinned newt observations. The right panel shows all other caudate observations.

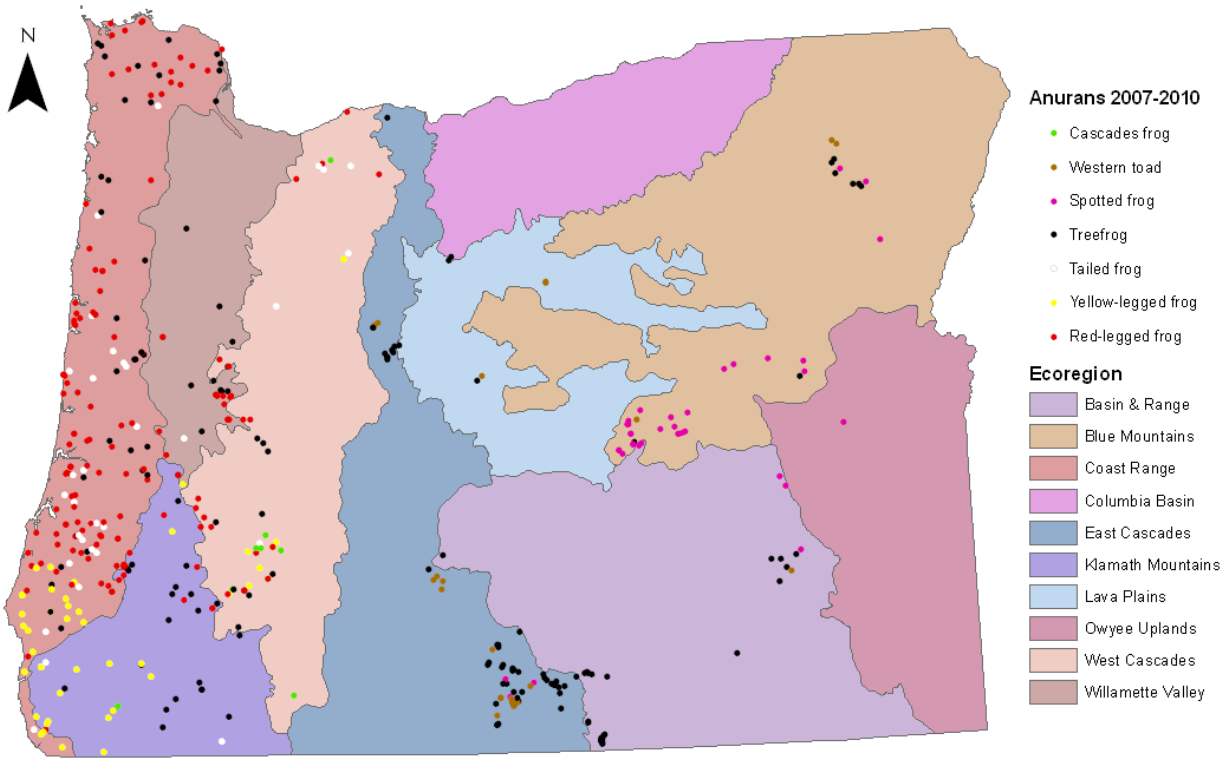

Figure 8. Distribution of anurans in 2007 through 2010.

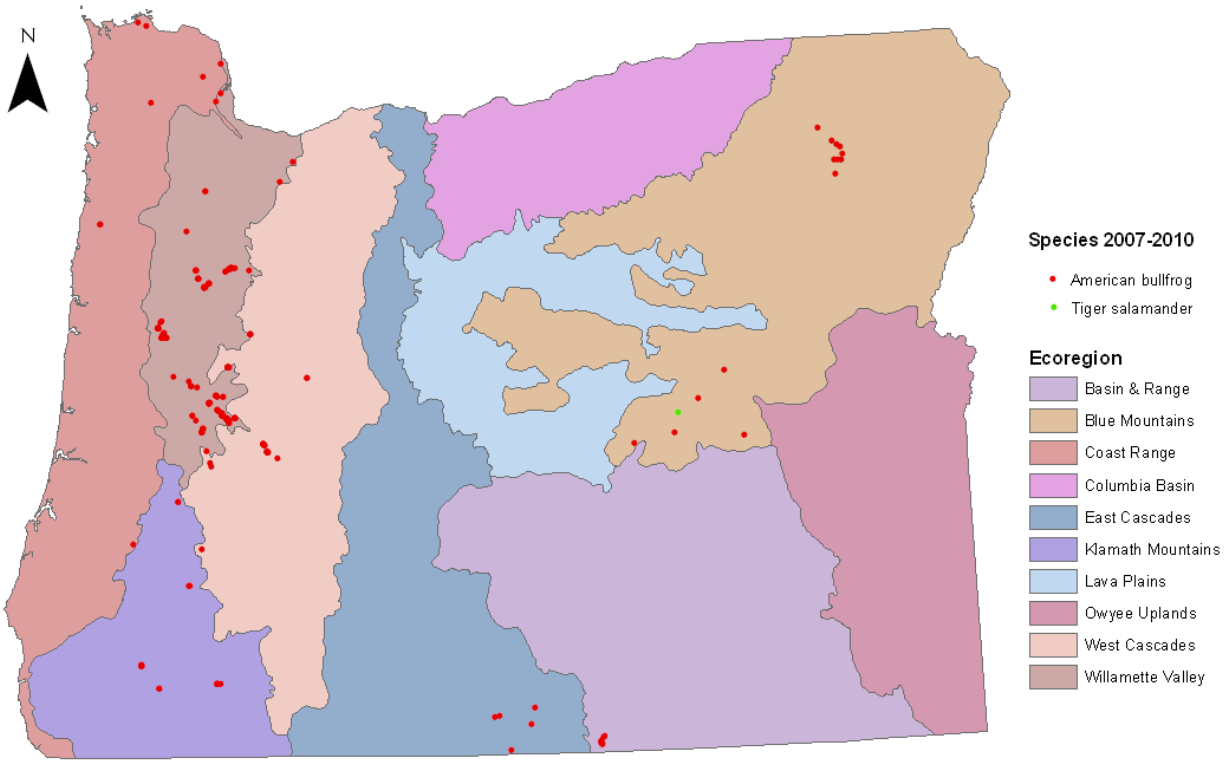

Figure 9. Distribution of American bullfrog and tiger salamander in 2007 through 2010.

Only four caudates, Northwestern salamanders, Pacific giant salamanders, plethodon, and rough-skinned newts, were observed each year from 2007-2010. Two additional caudates were observed in only one or two survey years. Although common, long-toed salamanders were only observed in 2008 and 2009 in the Willamette Valley. Because adults spend most of the year underground, emerging in winter and early spring to lay their eggs, long-toed salamanders are not frequently observed during summer stream surveys. Likewise, ensatina, another common salamander, are difficult to observe because they live underground during dry weather and under wood debris during and after rain. They are almost never found in perpetually wet areas, resulting in less frequent observations during stream surveys. Only one ensatina was observed in 2008 in the Coquille River basin on the southern Oregon coast.

Rarely observed amphibians included tiger salamanders, Cascade torrent salamanders, and clouded salamanders. Tiger salamanders are thought to be introduced as fishing bait and are located in small, isolated populations. Juvenile caudates were recorded in 2007 in the Silvies River basin, but the surveyors were unable to identify the species. In 2008, tiger salamander larvae were identified and observed in the Silvies River basin. Tiger salamanders were not observed in 2009 and 2010 in the basin, but the same survey site was not revisited.

Two Cascades torrent salamanders, an Oregon Conservation Strategy species, were observed at one survey location in the Sandy River basin in 2009. Three species of torrent salamanders are known to western Oregon, each with a distinct geographic distribution. Their habitat consists of very cold, clear springs, seeps, and small headwater streams, and may be observed in the splash zone of waterfalls, in silt-free gravel and cobble, and in moist riparian forests. Although Oregon Plan, Restoration, and several basin surveys overlap their geographic distribution, surveyors did not observe torrent salamanders in 2007, 2008, or 2010.

Clouded salamanders are another Oregon Conservation Strategy species that was only observed in 2009. Clouded salamanders were observed at two locations on the southern Oregon coast in the Coos River and Rogue River basins. They are a terrestrial species that live in moist decaying logs and stumps, especially Douglas fir. Without actively searching under the surface of large woody debris, surveyors may not have many opportunities to observe clouded salamanders.

Oregon Plan sites in western Oregon are assigned to a rotating panel of annual, three-year, nine-year, and once-only visits. This provided an opportunity to assess between year variability at the site level. From 2007-2010, Oregon Plan crews surveyed 87 annual sites and 61 three-year sites at least twice (2007 and 2010). Survey crews consistently observed the same species at only 34% of the revisited locations. Rough-skinned newt observations were the most consistent, followed by Pacific giant salamanders, red-legged frogs, and yellow-legged frogs. Survey crews that revisited sites annually were able to observe amphibians at locations where in previous years none were observed. Crews were also able to identify multiple species of amphibians over several visits to the same survey location. Two or more species were identified at 31 of the annual sites and 11 of the three-year sites. During four years of surveys, crews identified six amphibian species in Burnt Creek, South Umpqua River basin, the greatest species richness observed at a single survey location. There were 23 annual Oregon Plan sites surveyed two or more times where amphibians were not observed. Three sites were visited 5 or 6 times due to resurveys, but no amphibians were observed. This suggests that some sites probably have no

amphibians, although we were unable to discern how these sites differed from nearby sites with amphibians.

Amphibians were observed less frequently in the Great Basin compared to Western Oregon. In 2008-2010, Redband survey crews annually surveyed 77 locations, and observed amphibians at 26 sites (34%). However, the surveyors consistently observed amphibians at 10 of 26 (38%) of the revisit sites over the three years, a frequency similar to that in Western Oregon.

Habitat Data

Amphibians were detected in a variety of stream and pond habitats. Some species were encountered in a variety of habitats, spanning a wide range in elevation and stream size. Some species were observed across the region, while others were observed at very few sites. We conducted a more exhaustive analysis of potential habitat associations with the 2007 data with little success (Bangs and Jones 2009). The associations are stronger at the ecoregion scale than with stream specific habitat. However, we will revisit habitat association after another two years of data collection.

Observation Bias

Observation and identification of amphibians was a primary goal of the surveys. Yet, sources of variability are difficult to manage. Variation in amphibian observations can be an effect of surveyor training, surveyor awareness, and amphibian visibility. It is clear from the Oregon Plan revisits that amphibians are most likely present at many sites, but not consistently observed by the surveyors. The within year and between year observations were quite variable. Lack of identification adds to the variability associated with determining presence or absence of many species. For example, in 2009 and 2010, of the 1,095 amphibians observed, 239 were unidentified. Oregon Plan and Basin survey crew were unable to identify 23% and 34% of the amphibians they observed, respectively. There were no differences between the training, objectives, or resources available to the Oregon Plan and Basin survey crews.

All of the amphibians observed during the Oregon chub project were identified. The Oregon chub project is typically able to handle the amphibians that they observed, as they were caught in minnow traps. Many of the Oregon chub sites are visited multiple times in order to obtain mark-recapture population estimates, which may have aided in their ability to identify amphibians. The crew for this project also remains the same year after year, so there may be an experience component to their ability to identify amphibians as well.

Redband trout crews were unable to identify 51% of the amphibians. In general, the use of electrofishers to collect fish should have increased the number of amphibians observed and handled, and aided in accurate identification. These crews may have been more focused on efficient fish collection than in collecting or observing amphibians.

The resurvey crew observed amphibians at a similar frequency of sites as the regular Oregon Plan crews in 2009 and 2010. Fifty-two sites were surveyed by both Oregon Plan and resurvey crews. The resurvey crew observed amphibians at 25 sites and the Oregon Plan crew observed amphibians 33 sites. There were 20 sites where the Oregon Plan and resurvey crews were able to locate amphibians at the same site. This suggests that the regular Oregon Plan crews were accomplished at observing and identifying amphibians. Amphibians may change behavior (affect probability of observation) with season or life stage, temperature, weather, or time of day.

The repeatability of observation at the same site was lower in 2007 and 2008 than in 2009-10 (Tippery et al 2010). For this reason, these data should not be used to establish the absence of amphibians at a site. However, the information collected may be very useful in identifying current distribution, locating new populations or areas where further study efforts could be intensified, and supplementing the current distribution information for amphibians throughout Oregon.

CONCLUSION

The survey techniques were effective in reporting amphibian presence, but are not effective in determining the population dynamics or the absence of amphibians at a site. A goal for future work may be to compare our survey designs against a complete species inventory or population estimates at sample sites. Comparing our surveys with habitat, landscape, or climate data from other studies may yield valuable results in assessing changes in amphibian distribution.

All of the survey projects that collected amphibian data in this report occur on an annual basis. With the current protocols in place, there is potential to gain a much larger database of amphibian observations which will be useful in determining current distributions for the species encountered on these surveys. However, the resolution of the data collected may not be able to detect trends in amphibian abundance.

Future goals for this work should include more thorough training of crews to make a concerted effort to locate and confirm the identification of species and to indicate habitat use and record behavioral activities. Additional years of observational data will provide more comprehensive and up-to-date maps of amphibian distribution and range.

ACKNOWLEDGEMENTS

This study would not have been possible without the efforts of many dedicated people. We would like to acknowledge the field crews that diligently identified and recorded amphibian data during their surveys. We would like to thank the many private landowners that allowed crews access to their property to perform surveys.

REFERENCES

Bangs, B. L. and K. K. Jones. 2009. Distribution of Amphibians in Wadeable Streams and Ponds in Western and Southeast Oregon. Information Report 2009-02, Oregon Department of Fish and Wildlife, Corvallis.

Corkran, C. C. and C. Thoms. 2006. Amphibians of Oregon, Washington and British Columbia. Lone Pine Publishing, Edmonton, Canada.

Heyer, W. R., M. A. Donnelly, R. W. McDiarmid, L. C. Hayek, M. S. Foster. 1994. Measuring and Monitoring Biological Diversity. Standard Methods for Amphibians. Smithsonian Institution, Washington D.C.

Leonard, W. P., H. A. Brown, L. L. C. Jones, K. R. McAllister and R. M. Storm. 1993. Amphibians of Oregon and Washington. Seattle Audubon Society, Seattle.

Miller, S.A., S.E. Jacobs, S.L. Gunckel, and S. Richardson. 2010. Evaluation of a sampling approach to monitor the status of Great Basin redband trout in Southeastern Oregon. Oregon Department of Fish and Wildlife, Information Report 2010-02, Corvallis.

Moore, K.M.S, K.K. Jones, and J.M. Dambacher. 2007. Methods for Stream Habitat Surveys: Aquatic Inventories Project. Information Report 2007-01, Oregon Department of Fish and Wildlife, Corvallis.

Oregon Coastal Salmon Restoration Initiative (OCSRI). 1997. The Oregon plan: restoring an Oregon legacy through cooperative efforts. Coastal Salmon Restoration Initiative, Salem.

Oregon Department of Fish and Wildlife. The Oregon Conservation Strategy. 2006. Oregon Department of Fish and Wildlife, Salem.

Stevens, D.L., Jr., and A.R. Olsen. 2004. Spatially-balanced sampling of natural resources. Journal of the American Statistical Association, 99, 262-278.

Thorson, T.D., Bryce, S.A., Lammers, D.A., Woods, A.J., Omernik, J.M., Kagan, J., Pater, D.E., and Comstock, J.A. 2003. Ecoregions of Oregon (color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,500,000).

Tippery, S. E., B. L Bangs and K. K. Jones. 2010. 2008 Amphibian Distribution Surveys in Wadeable Streams and Ponds in Western and Southeast Oregon. Information Report 2010-05, Oregon Department of Fish and Wildlife, Corvallis.

3406 Cherry Ave. NE
Salem, Oregon 97303