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2015 Chehalis Stream-Associated Amphibian Survey
2nd (31 December 2015) Progress Report

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EXECUTIVE SUMMARY: Introduction: This report summarizes results of the Chehalis ASRP stream-associated amphibian surveys to date in the headwaters of the Chehalis mainstem that includes the vicinity of the proposed footprint of the dam and its reservoir. This study contributes directly and indirectly to the Chehalis Aquatic Species Restoration Plan (ASRP). Its goals are to contribute to identifying the patterns of occupancy of the biota occupying the headwaters of the Chehalis mainstem, to support occupancy modeling that will characterize the distribution of species defined as ASRP targets in the headwaters of the Chehalis mainstem, to support the PEIS development process, and to help inform and prioritize restoration efforts in the Chehalis floodplain. These surveys focus on the terrestrial stream-associated amphibians because Van Dyke's salamander (*Plethodon vandykei*) and Dunn's salamander (*Plethodon dunnii*), two of the eight ASRP non-fish aquatic-habitat associated target species, are stream-associated but exist in the terrestrial (or riparian) habitat immediately adjacent streams. This survey effort, which captured the suite of terrestrial amphibian using that footprint, represents the second year of a four-year effort that began on 24 February 2014. Four years are necessary because the late winter-early spring time window with adequate surface moisture for species detection is short, a condition especially true in the 2015 season. We did this work with permission of Panesko Tree Farms and Weyerhaeuser Company that allowed access to their lands.

Methods: We randomly selected riparian sites in the Chehalis mainstem headwaters in a pattern encompassing the vicinity of the proposed dam and its reservoir from a selection pool in which each site was no closer than 400 m to the next adjacent site. At each site, we sampled a series of nine 3 m wide × 5 m long plots, each of which abutted the wetted edge of the stream along their short axis. We sampled by raking through the litter, rock and soil substrate with a potato rake, overturning movable surface objects, and taking apart woody debris sufficiently decayed to be dismantled. The minimum total number of sites we targeted for sampling in 2015 was 30, with 16 within, 11 above, and three below the proposed dam footprint.

Results and Conclusions: In 2015, we reached our planned 30-site target, and also included the only two sites at which Van Dyke's salamander had been found in 2014. We recorded observations of 354 individuals of 10 species of amphibians at the 32 sites sampled. The four species of terrestrial amphibians (all salamanders) recorded represent 81.9% of observations; the six non-terrestrial species represented the remainder of observations. Of the four terrestrial amphibian species observed, the two ASRP target species, Dunn's and Van Dyke's salamanders, were, respectively, the second (47%: 15 of 32); and least frequently encountered (16%: 5 of 32)

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based on sites, and second (47%: 15 of 32) and (16%: 5 of 32) fourth most often encountered in context of observations. One site with Van Dyke's salamander is within the proposed dam footprint, but four sites with this species occur above the proposed dam footprint and no Van Dyke's salamanders were found below the proposed dam footprint. In contrast, 60% (9 of 15) sites with Dunn's salamander were recorded within the proposed dam footprint, and two and four sites with Dunn's salamander were recorded, respectively, below and above the proposed dam footprint. If one does the cut by elevation in 750-ft (229 m) intervals, Dunn's and Van Dyke's show inverse occupancy patterns with Dunn's being unrecorded above 1500 ft in elevation and Van Dyke's being infrequent below 750 ft in elevation (which encompasses the proposed reservoir footprint). The latter suggests that habitat loss from placement of a reservoir under either alternative option would be significant for Dunn's salamander, but limited for Van Dyke's salamander. This pattern generally agrees with the data obtain in 2014.

Besides the two ASRP target species, eight additional amphibian species were incidentally recorded, including the Coastal tailed frog (*Ascaphus truei*), an ASRP target species for which this sampling was not designed. This pattern reflects the richness of amphibians in the Chehalis headwater landscape.

Next Steps: The work in 2014 and 2015 represented half of the study effort, and the remaining half planned for this biennium, will determine whether or not the patterns observed to date change significantly. The assessment based on loss of habitat with elevation does not address patterns of isolation in the landscape, which would likely be more important for Dunn's than Van Dyke's salamander. Evaluation of that potential loss would require genetic data that is not part of the data collection for this biennium. The third stream-associated ASRP species target for which this sampling designed was not addressed, Coastal tailed frog, will have to be addressed in the next biennium.

PROGRESS REPORT TEXT: INTRODUCTION: This report summarizes results of the Chehalis ASRP stream-associated amphibian surveys to date in the headwaters of the Chehalis mainstem that includes the vicinity of the proposed footprint of the dam and its reservoir. These surveys focus on the terrestrial stream-associated amphibians because Van Dyke's salamander (*Plethodon vandykei*), one of the eight ASRP non-fish aquatic-habitat associated target species, is stream-associated but found in the terrestrial (or riparian) habitat immediately adjacent streams. We initiated these surveys on 24 February 2014. This progress report adds information obtained during the first half of 2015, during which time data were collected over 1.3-month period from 18 March through 29 April 2015.

SITE SELECTION: We chose sites from a 128-site pool systematically placed along the stream network with a minimum distance of 400 m between sites to provide a site array dispersed across the footprint of the proposed dam and its reservoir and the immediately surrounding area. Sites sampled in 2014 were selected so that about 60% of the sites were from within the

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reservoir footprint; the remaining ~40% of the sites were selected from above and below the dam footprint in a ratio of 9:1 above versus below the reservoir. The 14 sites sampled in 2015 outside of the reservoir footprint were selected in a ratio 11:3 above versus below the reservoir. We designed this selection pattern to capture potential changes in the distribution of species that might occur as a consequence of the reservoir footprint when contrasted to the considerable habitat available upstream, which appeared similar; such habitat was limited downstream. Figure 1 shows the 126 sites; sites sampled in the footprint are gold ●, below the footprint are pink ○ and above the footprint are blue ●. Sites not selected are white ○. Our minimum total target number of sites for 2015 was 30, with 16 within, 11 above, and three below the proposed dam footprint. The collective total of different sites sampled in 2014 and 2015 was 51, with 31 within, 18 above, and 2 below the footprint. Further, in 2015 we resampled the two sites where Van Dyke's salamander (*Plethodon vandykei*) was found in 2014 to assess whether the species was still present at those sites. Our site selection pool was much larger than our target number to enable randomized selection and site replacement if some sites prove inaccessible because of steep slope conditions (safety) or road washouts, both of which occurred during our selection and survey process.

SAMPLING: We conducted all surveys with a field crew of at least three with sampling done on four days each week. We surveyed by laying out nine 3 m wide × 5 m long plots at each site, each of which abutted the wetted edge of the stream along their short axis. Sampling was done by raking through the litter (leaves, conifer needles, and small wood debris), rock and soil substrate with a potato rake, overturning movable surface objects, and taking apart woody debris sufficiently decayed to be dismantled.

RESULTS: In 2015, we reached our planned 30-site target, including the two sites sampled in 2014 for Van Dyke's salamander. Three of the sites were located below the inundation footprint of the reservoir, 16 sites were located within the footprint, and 11 sites were located upstream of the footprint (**Figure 1**). Further, incidental observations were made at two other sites included in the total.

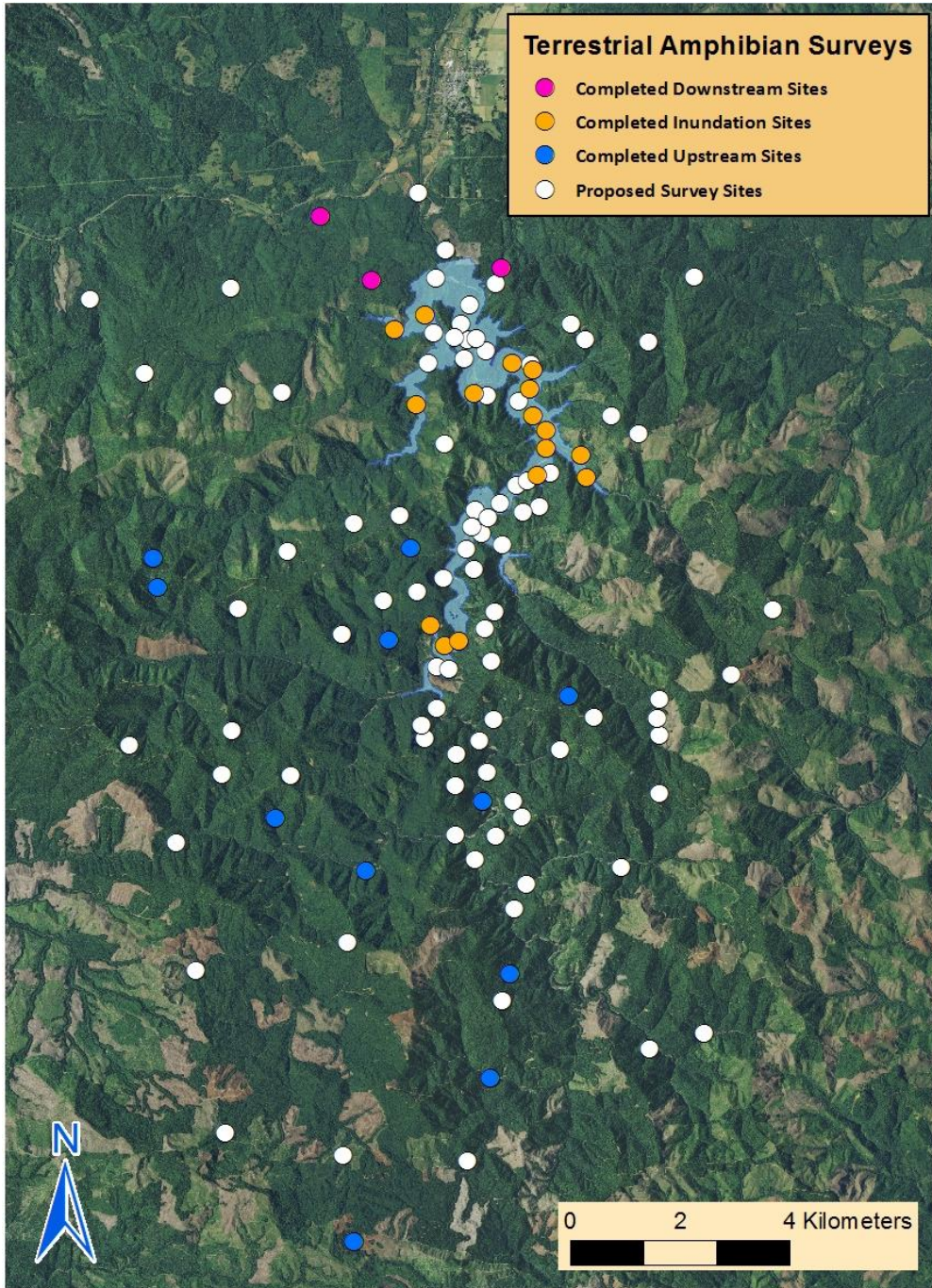
In 2015, we recorded observations of 354 individuals of 10 species of amphibians at the 32 sites sampled (**Table 1, Appendix 2**). We found at least one species of amphibian at all 32 sites. The four species of terrestrial amphibians (all salamanders) recorded represent 81.9% of observations; the six non-terrestrial species we recorded incidentally represented 18.1% of observations.

Of terrestrial amphibians observed, western red-backed salamanders (*Plethodon vehiculum*) were the most frequently encountered, representing 63.1% of all observations and recorded at 81.3% of sites. The second most frequently encountered was Dunn's salamander (*Plethodon dunnii*), representing 23.4% of observations and recorded at 46.9% of sites. Van Dyke's salamander and *Ensatina* (*Ensatina eschscholtzii*) were the two least frequently recorded species, being found, respectively, at 15.6% and 18.8% of sites, and representing, respectively,

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10.3% and 3.1% of observations. Van Dyke's salamander was the only one of the four terrestrial amphibian species recorded more frequently above the proposed dam footprint than within the proposed dam footprint (**Table 1**). Van Dyke's also had more animals above the footprint of

Figure 1. Site Distribution for Terrestrial Amphibians Surveys.



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Table 1. Amphibian species and numbers of observations during terrestrial amphibians surveys, March-April 2015. Subtotals or totals for sites may be less than summed site sums for species across habitat categories because one or more species may have occurred at the same site. The overall number of sites includes two sites with incidental observations.

Species		Numbers of <i>Sites</i> and <i>Individuals (Ind)</i> observed							
Standard English Name	Scientific Name	Below footprint		In footprint		Above footprint		Totals	
		<i>Sites</i>	<i>Ind</i>	<i>Sites</i>	<i>Ind</i>	<i>Sites</i>	<i>Ind</i>	<i>Sites</i>	<i>Ind</i>
Terrestrial Amphibians									
Dunn's salamander	<i>Plethodon dunnii</i>	2	3	9	36	4	29	15	68
Ensatina	<i>Ensatina eschscholtzii</i>	1	2	3	4	2	3	6	9
Van Dyke's salamander	<i>Plethodon vandykei</i>	0	0	1	3	4	27	5	30
Western red-backed salamander	<i>Plethodon vehiculum</i>	3	5	13	73	10	105	26	183
Subtotals		3	10	15	116	10	164	27	290
Stillwater-breeding Amphibians									
Pacific treefrog	<i>Pseudacris regilla</i>	1	3	2	5	1	2	4	10
Northern red-legged frog	<i>Rana aurora</i>	0	0	0	0	0	0	0	0
Roughskin newt	<i>Taricha granulosa</i>	1	6	1	1	0	0	2	7
Western toad	<i>Anaxyrus boreas</i>	0	0	7	7	1	1	8	8
Subtotals		2	9	8	13	2	3	12	25
Stream-breeding Amphibians									
Coastal giant salamanders	<i>Dicamptodon tenebrosus</i>	0	0	0	0	1	2	1	2
Coastal tailed frog	<i>Ascaphus truei</i>	0	0	1	2	4	5	5	7
Columbia torrent salamander	<i>Rhyacotriton kezeri</i>	1	2	5	19	4	9	10	30
Subtotals		1	2	5	21	5	16	11	39
Overall Totals		4	21	18	150	10	183	32	354

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the dam than anywhere else. The four terrestrial amphibians also differed in the mean number of individuals recorded per site sampled. Western red-back salamanders had the highest mean (7.0 individuals/site), followed by Van Dyke's salamanders (6.0 individuals/site), Dunn's salamanders (4.5 individuals/site), and *Ensatina* (1.5 individuals/site). Van Dyke's salamanders were found at all two sites where they were recorded in 2014 and three new sites above the proposed dam footprint.

Discussion: With a few exceptions, the patterns we observed in 2014 are similar to those observed during surveys in 2015. Parallel patterns between 2014 and 2015 include:

- 1) Mostly terrestrial amphibians were recorded.
- 2) Western red-backed salamander was the most frequently recorded terrestrial amphibian; this agrees with previous work on Western red-backed salamanders, which require relatively mesic terrestrial habitats, are typically the most frequently recorded terrestrial salamander in the generally more mesic Willapa Hills (M. Hayes, unpublished data) as well as generally in Coast Ranges habitats in Washington (Raphael et al. 2002).
- 3) *Ensatina*, a relatively drier habitat-adapted terrestrial salamander species, was much less frequent than the Western red-backed salamander in this mesic Coast Range habitat, a pattern recorded elsewhere (Raphael et al. 2002); *Ensatina* tends to be more frequent in more interior forest habitats in Oregon and Washington (Bury et al. 1991). Further, because our surveys were riparian-focused to enable detecting Van Dyke's salamanders, they would be expected to be less frequent in the riparian margin than in the drier adjacent uplands.
- 4) Dunn's salamander was more frequently recorded than *Ensatina*, which likely reflects the riparian-focused nature of our surveys. Dunn's salamander, a terrestrial salamander with greater moisture requirements than *Ensatina*, is a more stream-associated terrestrial species and the terrestrial amphibian surveys were stream margin-focused. The less mesic uplands away from the stream, in which more *Ensatina* might be expected, was not surveyed.
- 5) Van Dyke's salamander was infrequently found. Van Dyke's salamander, also a strongly stream-associated species, is the least frequently recorded terrestrial salamander in several Coast Range habitats (Raphael et al. 2002). Only two historical records exist for Van Dyke's salamander from the upper Chehalis system (WDFW WSDM database, accessed 12 February 2014). Both records come from elevations around 400 m (1300 feet).

The exceptions to the patterns observed in 2014 are:

- 1) Van Dyke's salamander was found at three new sites, all above the proposed footprint of the dam. Though Van Dyke's salamander has been found at few sites overall ($n = 5$), the distribution of sites at which it was found suggests that the species is more frequent above ($n = 4$) than within ($n = 1$) the proposed dam footprint. Additional presence points will be needed to have confidence in this pattern. However, the pattern is consistent with

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this species being a cool-adapted stenotherm, since the old Forest Service *Survey and Manage Species* criteria for Van Dyke's salamander recommend that surveys be conducted at air temperatures $\leq 15^{\circ}\text{C}$ [59°F] (Jones 1999), and temperatures that satisfy its presumed optimal thermal regime are more frequent at the higher elevations.

- 2) *Ensatina* was recorded at a disproportionately greater number of sites in 2014 in contrast to 2015. The explanation of this pattern is unclear. An opportunistic pattern of selection within in our stratified random selection of sampling sites may be the cause. Analysis of the distribution of the sites sampled in 2014 versus 2015 for differences in aspect and elevation, which could influence the degree of dryness that *Ensatina* favors, may help identify the difference between years.

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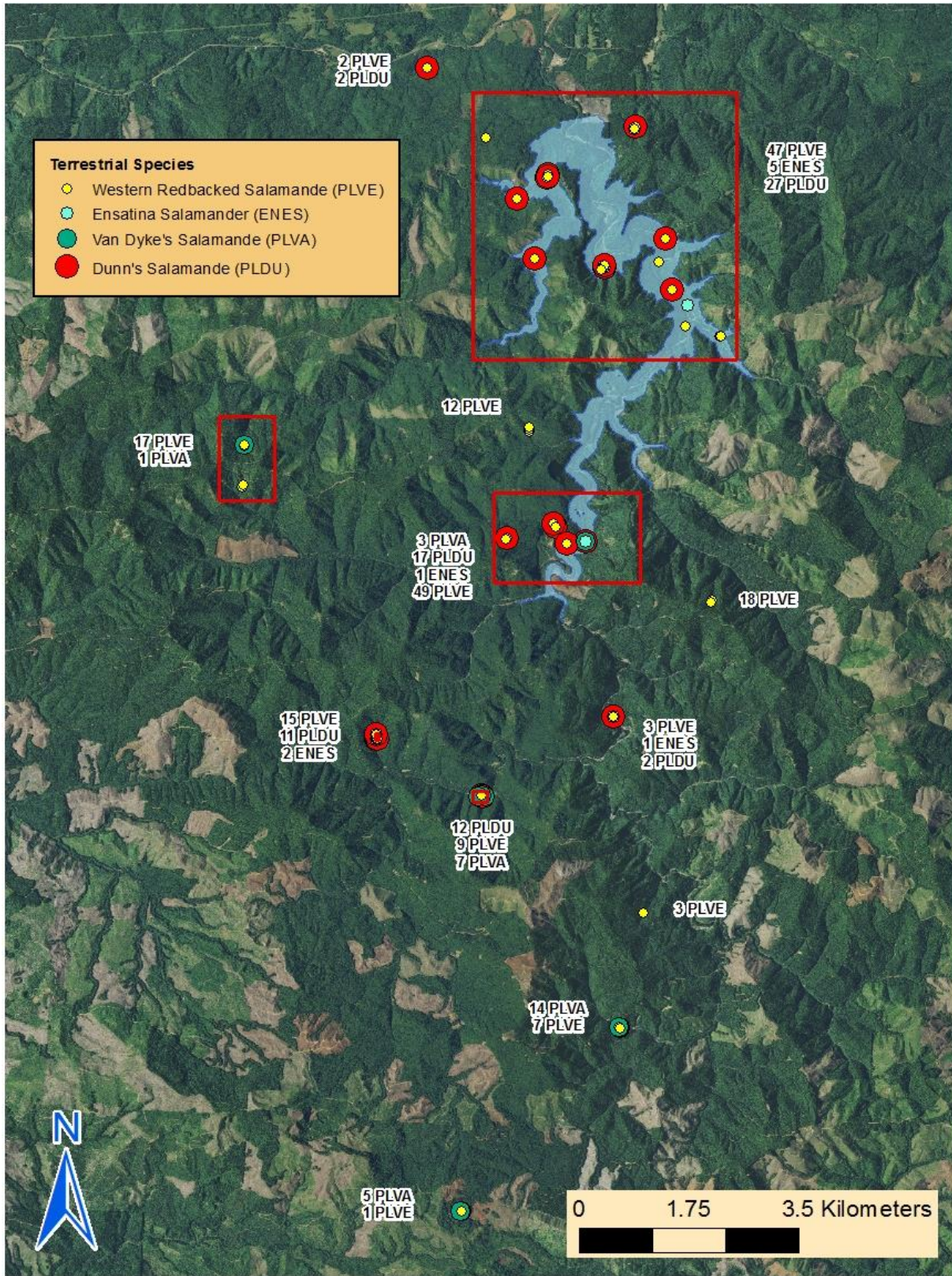
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Appendix 1. Amphibian species and numbers of observations during terrestrial amphibians surveys, February-July 2014. Subtotals or totals for sites may be less than summed site sums for species across habitat categories because one or more species may have occurred at the same site.

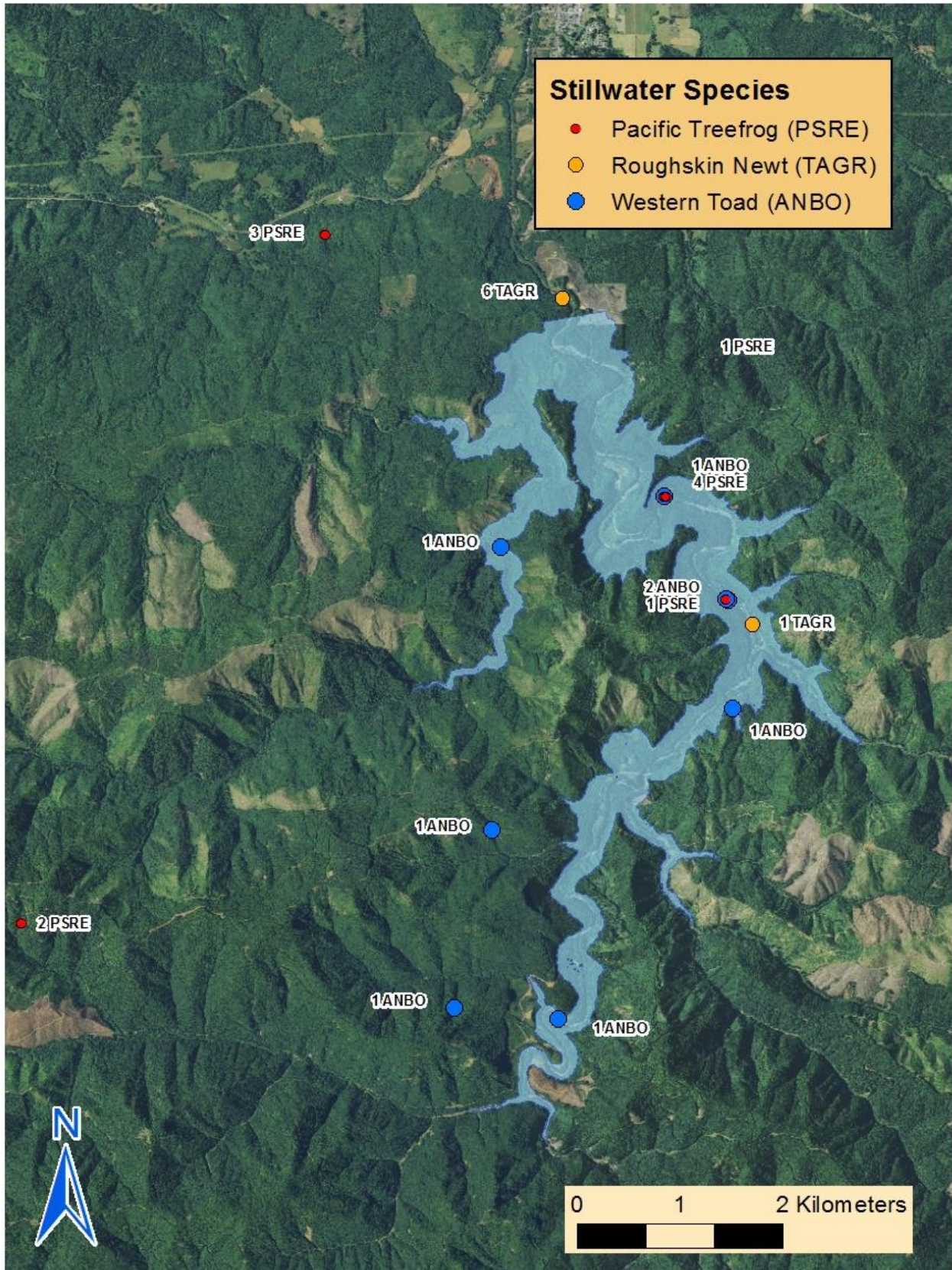
Species		Numbers of <i>Sites</i> and <i>Individuals (Ind)</i> observed							
Standard English Name	Scientific Name	Below footprint		In footprint		Above footprint		Totals	
		<i>Sites</i>	<i>Ind</i>	<i>Sites</i>	<i>Ind</i>	<i>Sites</i>	<i>Ind</i>	<i>Sites</i>	<i>Ind</i>
Terrestrial Amphibians									
Dunn's salamander	<i>Plethodon dunnii</i>	0	0	7	16	3	8	10	24
Ensatina	<i>Ensatina eschscholtzii</i>	1	1	5	6	8	11	14	18
Van Dyke's salamander	<i>Plethodon vandykei</i>	0	0	1	5	1	7	2	12
Western red-backed salamander	<i>Plethodon vehiculum</i>	3	7	18	93	16	91	37	191
Subtotals		3	8	20	120	17	117	40	245
Stillwater-breeding Amphibians									
Pacific treefrog	<i>Pseudacris regilla</i>	0	0	6	11	0	0	6	11
Northern red-legged frog	<i>Rana aurora</i>	1	1	1	1	1	1	3	3
Roughskin newt	<i>Taricha granulosa</i>	0	0	2	2	1	2	3	4
Western toad	<i>Anaxyrus boreas</i>	1	1	6	10	2	2	9	13
Subtotals		3	2	20	24	4	5	27	31
Stream-breeding Amphibians									
Giant salamanders	<i>Dicamptodon sp.</i>	0	0	0	0	4	4	4	4
Coastal tailed frog	<i>Ascaphus truei</i>	0	0	5	6	4	6	9	12
Columbia torrent salamander	<i>Rhyacotriton kezeri</i>	0	0	6	34	7	11	13	45
Subtotals		0	0	11	40	9	21	20	61
Overall Totals		6	10	23	184	22	143	48	337

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Appendix 2. Distribution Maps of Amphibians Encountered in 2015.



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