Type N Experimental Buffer Treatment Study: The Amphibian Demographic Response

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Introduction

The Washington State Department of Fish and Wildlife is implementing the amphibian demographic response portion of the Type N Experimental Buffer Treatment Study. Forest and Fish Report (FFR) research focuses on amphibians because they were a factor in establishing riparian buffer prescriptions in headwater basins and are covered in the Habitat Conservation Plan (HCP). Amphibians represent the vertebrate group that is thought to be most vulnerable to environmental change, and thus, most suitably monitor environmental conditions (Wake 1991).

Objective

The purpose of this study is to evaluate the relative effectiveness of alternative riparian buffer prescriptions in meeting FFR resource goals, which includes protecting stream-associated amphibians (SAAs). Amphibians are sampled to identify potential treatment-specific changes in occupancy and density. Target SAAs include: coastal tailed frog (*Ascaphus truei*), 3 species of torrent salamander (*Rhyacotriton*), and 2 species of giant salamander (*Dicamptodon*).

a)

b)

c)

Figure 1. Target stream-associated amphibians (SAAs). a) Coastal tailed frog (*Ascaphus truei*); b) Pacific giant salamander (*Dicamptodon tenebrosus*); c) Columbia torrent salamander (*Rhyacotriton kezeri*)

Methods

We are collecting demographic data using 2 methods: longitudinal light-touch and rubble rousing sampling. To date we have completed amphibian sampling at all 18 study sites for the first pre-treatment year (2006).

During longitudinal light-touch sampling (Figure 2) all moveable objects on the streambed gravel-sized and larger are overturned to increase likelihood of detection. This method will provide life-stage specific presence/absence information for all amphibian species encountered, and relative abundance for some.

Rubble rousing sampling (Figure 2), used to estimate amphibian density, involves block netting the up- and downstream ends of randomly chosen 1-m reaches. Within these reaches, all substrate gravel-sized and larger is removed from the stream channel, and remaining fines are sifted to located amphibians.

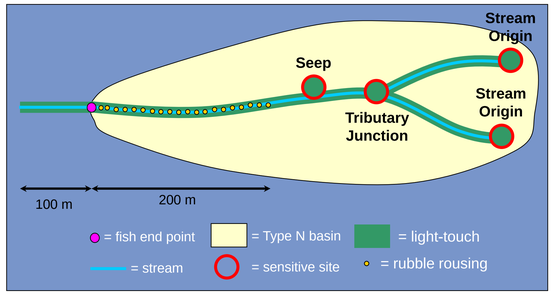

Figure 2. Amphibian sampling. During longitudinal light-touch sampling, the entire non-fishbearing stream network within each treatment basin, including all sensitive sites, and the stream reach 100 m downstream into fishbearing waters, is sampled. During rubble rousing, a 1-m reach chosen randomly in each 10-m interval within the first 200-m immediately upstream from the fish end point, is sampled.

Results

In total, 13 amphibians species were detected across all sites using the longitudinal light-touch method. Species detected were: *A. truei*, *Bufo boreas*, *D. copei*, *D. tenebrosus*, *Pseudacris regilla*, *Plethodon vandykei*, *P. vehiculum*, *Rana aurora*, *R. cascadae*, *Rhyacotriton cascadae*, *R. kezeri*, *R. olympicus*, and *Taricha granulosa*. During pre-study occupancy verification in 2005, *A. truei* was detected at all 18 sites, *Rhyacotriton* at 13, and *Dicamptodon* at 14. Using longitudinal light-touch in 2006, *A. truei* was detected at 15 sites, *Rhyacotriton* at 17 and *Dicamptodon* at all 18.

Using rubble rousing in 2006, *A. truei* was detected at 12 sites, *Rhyacotriton* at 14, and *Dicamptodon* at all 18. At sites where the species were detected the average number of individuals per 1-m stream reach ranged from 0.05 (SD = 0.22) to 1.85 (SD = 3.80) for *A. truei* (Figure 3), 0.05 (SD = 0.22) to 3.9 (SD = 4.78) for *Rhyacotriton* (Figure 4), and 0.05 (SD = 0.22) to 3.25 (SD = 4.78) for *Dicamptodon* (Figure 5).

The number of *Rhyacotriton* detected per 10-m stream interval using the light-touch method (Figure 6) was highly correlated to the number detected per 1-m stream unit using the rubble rousing method (Spearman Rank Correlation, $\rho = 0.779$, $p = 0.0013$). Coefficients of variation (CV) for both light-touch and rubble rousing sampling were high (typically ≥ 1) across sites.

Analysis

Analysis of longitudinal light-touch data will employ non-parametric and Bayesian approaches. Analysis of rubble rousing density data will employ a mixed model repeated measures analysis of variance (ANOVA). Factors in the analysis will include: 1. before-after treatment, 2. year, 3. reference-treatment comparison, and 4. interaction between before-after and reference-treatment. We anticipate that these analyses will distinguish potential differences among treatments, and establish the ability of each alternative buffer to maintain populations of SAAs.

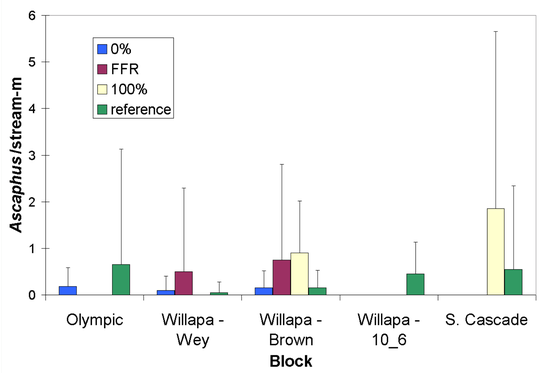

Figure 3. Average number of *A. truei* detected per stream meter using the rubble rousing method at the 18 Type N Study sites.

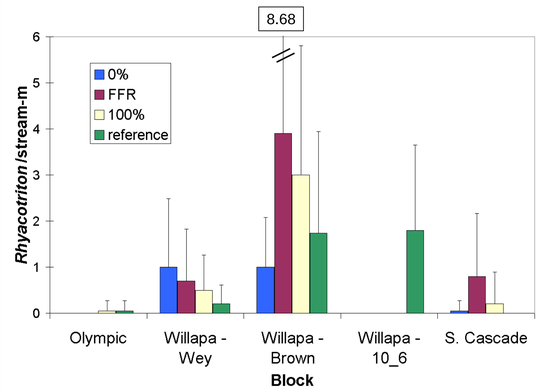

Figure 4. Average number of *Rhyacotriton* detected per stream meter using the rubble rousing method at the 18 Type N Study sites.

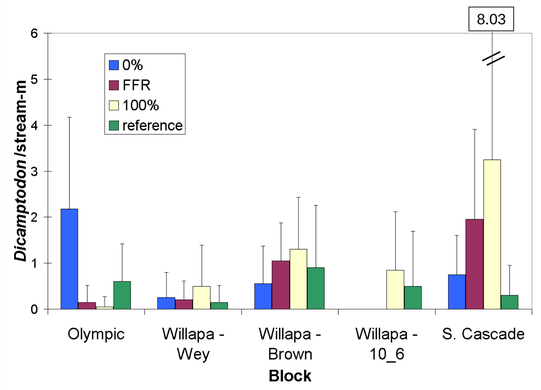

Figure 5. Average number of *Dicamptodon* detected per stream meter using the rubble rousing method at the 18 Type N Study sites.

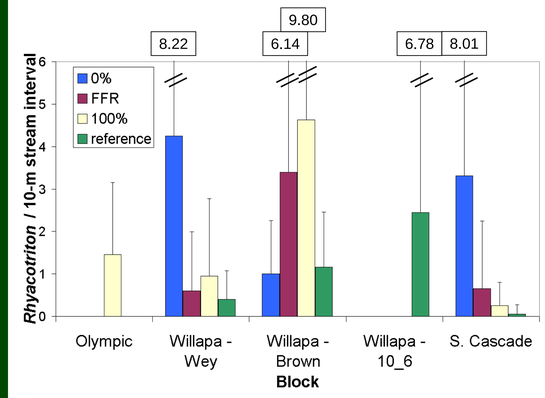

Figure 6. Average number of *Rhyacotriton* detected per 10-m stream interval using the longitudinal light-touch method at the 18 Type N Study sites.

High correlation between the numbers of *Rhyacotriton* detected using the light-touch versus rubble rousing methods confirms the validity of light-touch as an alternative method to assess relative abundance for *Rhyacotriton*, and increases confidence in this species' assessment.

Literature Cited

Wake, D. B. 1991. Declining Amphibian Populations. *Science* 253:860.

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