

Comparative Abundance, Condition, and Population Structure of *Plethodon stormi* and *Plethodon asupak* across a Habitat Gradient in the Klamath River Basin in Northern California

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Objectives:

- 1) Determine if there are differences in abundance, condition, and population structure of Siskiyou Mountains salamanders (*Plethodon stormi*) and Scott Bar salamanders (*P. asupak*) across a habitat gradient.
- 2) Identify the habitat variables that best explain variation in abundance, condition, and population structure through multivariate statistical analyses.

Study area: The Klamath River basin south of the Siskiyou Crest in northern California within the ranges of *P. stormi* and *P. asupak*.

Site selection: A subset of all known *P. stormi* and *P. asupak* sites in northern California (n = ~190) will be sampled within the study area. Target sample size is 60 and sites will be distributed throughout the species' known ranges by selecting sites in proportion to the number of detections within each geographic strata. We will attempt to sample an equal number of *P. stormi* and *P. asupak* known locations (n = 30 each). Sites will be selected from 4 strata to represent a range of environmental gradients during initial site selection: mature to old-growth forest, dense younger forest (<80 years), open stands (<40% canopy closure), and mixed habitat. We will attempt to sample an equal number of sites per strata (n = 15 each). Known sites will initially be categorized based on CALVEG tree size class and density class vegetation typing. The classification will be verified by biologists familiar with the locations and with aerial photographs. Detections separated by geographic boundaries (i.e., large streams) or discrete patches of non-habitat greater than 100 m will be considered different sites. Since *P. stormi* and *P. asupak* are considered talus or rock substrate obligates, all sites must contain >25% rocky substrate. Sites having experienced a major disturbance within the last 3 years and with access issues will be removed from the selection pool.

Survey protocol: The 2007 Plethodon survey protocol was developed with reference to "The Survey Protocol for the Siskiyou Mountains Salamander (*Plethodon stormi*) Version 3.0" document (Clayton et al. 1999).

The protocol will be a time-constrained search method, with two person-hours expended per survey visit. The area surveyed will be variable among sites due to differences in the number, sizes, and distribution of suitable habitat patches. However, surveys should be restricted to within a 50-m radius from plot center. The survey effort (area covered/unit of time) should be consistent among sites regardless of the amount of suitable habitat and

surveyors are not expected to completely search all suitable habitat within the allotted survey time. We recommend that surveyors identify where they will focus their efforts to maximize the likelihood of detecting the target species prior to commencing the survey. This is a 2-4 year study with each site surveyed at least once/year. To evaluate possible influences of habitat and weather conditions on detection probabilities, multiple visits per year and across years will be a high priority.

Surveys will occur under the following climatic conditions: 4-20 °C ambient temperature, $\geq 65\%$ relative humidity, and no freezing 48 hours prior to survey. High elevation sites above 4,500 ft (1372 m) may be searched without the freezing provision when there is a light freeze the night prior to survey. The soil temperature, taken 10 cm below the surface, must fall between 4-18°C. The substrate below the first layer of rock within the area being searched must be moist to the touch. Whenever possible, we recommend the use of a reference site (historic site that supports a *Plethodon* population with consistent detections) to determine potential salamander activity at other local survey sites. If no individuals are found at the reference site, it is likely that environmental conditions are not suitable and salamander surveys may not be effective. A reference site should be located in the same sub-drainage and at the approximate elevation and aspect of the survey site.

The following websites are recommended to check climate conditions prior to surveys:

<http://cdec.water.ca.gov/cgi-progs/queryFx?CLB> (CDEC site for Collins-Baldy)

http://raws.wrh.noaa.gov/cgi-bin/roman/meso_base.cgi?stn=OKNC1 (National Weather Service for Oak Knoll)

***Plethodon* data collection:** For each *Plethodon* detected, the snout-vent length, total length, and weight will be measured for analysis of condition index. Tail autotomy and presence of dorsal stripe should be noted. Each individual will be examined for indications of reproduction (gravid females) and life stage to be used for the population structure analyses. Sites at which tail clips should be collected will be identified prior to the beginning of surveys.

Sample unit data collection: Ambient air temperature, soil temperature, and relative humidity will be recorded onsite during each visit at the start and end of sampling. Six digital photographs will be taken at each site center to capture the surrounding habitat characteristics. At the end of the survey, record actual search time in person-hours. Flag the boundaries of the area surveyed and mark the plot center with a GPS unit. Habitat characteristics will be measured at each plot during the summer after salamander sampling has ceased.