CHARACTERIZATION OF THE ECOLOGICAL REQUIREMENTS FOR THREE PLETHODONTID SALAMANDER SPECIES

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Increased availability of habitat and climate data has facilitated much research concerning the influence of these characteristics on the structure of salamander communities. We aimed to outline environmental requirements influencing the distribution of three sympatric plethodontid salamander species, including *Plethodon cinereus, Desmognathus ochrophaeus,* and the federally protected *Plethodon nettingi.*

To examine differences in microhabitat use, we collected a series of microhabitat variables at "present" and "absent" sites for each species. We tested multiple microhabitat models with logistic regression followed by Akaike's Information Criterion to select the most parsimonious microhabitat model based on logistic regression results. Akaike's Information Criterion is advantageous for studies of microhabitat use because multiple working hypotheses can be evaluated simultaneously. Each hypothesis is ranked with the top model representing the most parsimonious solution. We found that *P. nettingi* was positively associated with sites possessing emergent rock cover and historic fire, while *D. ochrophaeus* and *P. cinereus* were negatively associated with these site attributes.

To better understand the geographic distribution of these salamanders, we used abiotic variables to predict species' distributions via ecological niche modeling (ENM) with the maximum entropy algorithm. Ecological niche modeling uses point locality data combined with environmental data to make spatially explicit predictions concerning geographic areas that are suitable for a particular taxon. These environmental data can then be used to define abiotic requirements of taxa, explore speciation, compare diversity gradients, and investigate concordant phylogeographic patterns. Furthermore, predictions made by ENM allow for identification of new geographic areas where there is suitable climate for organisms; this has important conservation and management implications. Not surprisingly, we revealed that *P. cinereus* was predicted to inhabit a larger geographic area than either *P. nettingi* or *D. ochrophaeus.* This indicates that *P. cinereus* individuals can tolerate a wider range of abiotic variables than *P. nettingi* or *D. ochrophaeus.*

Collectively, our analyses attempted to predict the fundamental niche for each of these salamander species. Our analyses suggest that the current distribution and microhabitat associations of *P. nettingi* are due to a series of drastic habitat disturbances and resulting competitive interactions between these species. Although *D. ochrophaeus* and *P. cinereus* were undoubtedly affected by these disturbances, these two species appear to tolerate broad microclimate and microhabitat characteristics and have a less restricted distribution than *P. nettingi*. Our results indicate that it is imperative to protect remaining red spruce forests to ensure the long term survival of disjunct *P. nettingi* populations.

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