Predicting the Impacts of Land-Use Policies on Habitat for Amphibians Across a Privately-Owned Landscape in northern Idaho

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Predicting impacts of landscape change on wildlife populations is essential for designing strategies to ensure persistence of species in a changing environment. We surveyed for presence of pond-breeding amphibian larvae at 105 randomly-selected wetlands in rural northern Idaho. We compared algorithmic (random forest) and information theoretic approaches to modeling breeding habitat for Columbia spotted frog (*Rana luteiventris*), Pacific treefrogs (*Pseudacris regilla*), and long-toed Salamanders (*Ambystoma macrodactylum*) using these data. The information theoretic approach indicated that all three species were negatively associated with presence of fish, while the algorithmic approach indicated that fish were an important predictor of occurrence for Pacific treefrogs and long-toed salamanders and that soil type was an important predictor for all species. The best models from the information theoretic approach indicated that long-toed salamanders were positively associated with wetlands in forests and grasslands and negatively associated with agriculture, while Pacific treefrogs were positively associated with wetlands in agriculture and low-density forests and negatively associated with development. Both algorithmic and information theoretic models found that solar insulation was strongly associated with Columbia spotted frog presence. We used these models in conjunction with sets of stochastically predicted landscapes based on landowner surveys to predict the impact of land-use policies on amphibian breeding habitat. Policies that encouraged forest thinning and transitioning land from agriculture to grassland resulted in increased habitat for long-toed salamanders and Columbia spotted frogs. Concentrating future development around existing towns resulted in reduced breeding habitat for all three species.