An eco-evolutionary IBM improves predictions of future genetic connectivity for American Pikas (Ochotona princeps) in Crater Lake National Park, Oregon

Jessica Castillo, Oregon State University

Donelle Schwalm, Oregon State University

Clinton Epps, Oregon State University

William Monahan, Oregon State University

Nathan Schumaker, US EPA

Tom Rodhouse, Oregon State University

In the face of rapid, contemporary climate change, conservation biologists are relying heavily on species distribution models (SDMs) to predict shifting occupancy and distribution patterns in response to future conditions. These models are critical tools for assessing vulnerability to climate change. However, SDMs are often limited to climate variables, neglecting to incorporate other factors which drive occupancy patterns and ultimately population viability. For example, SDMs fail to capture species-landscape interactions (e.g., dispersal ability and behavior) that can be significant drivers of not only occupancy rates, but also gene flow and genetic diversity. This is particularly concerning for species restricted to specialized habitats which are spatially disjunct. Here, we expand on traditional approaches used to explore the species-climate change interaction. First, we develop an SDM for the American pika (Ochotona princeps) using a combination of climatic and habitat variables, including connectivity metrics derived from empirical genetic data. We then predict occupancy in the contemporary landscape, as well as in three future timesteps with two scenarios depicting possible future conditions. We incorporate these changing occupancy patterns with an empirically-derived landscape resistance and demographic model in HexSim. Using this model, we predict changes in genetic structure and diversity for American pikas in Crater Lake National Park, Oregon. Finally, we evaluate the potential for artificial habitat construction and translocation to improve future population connectivity and genetic diversity. Our approach ranks alternate conservation strategies intended to improve gene-flow and long-term population viability, providing critical insights that will inform the management of this climate-sensitive species.