Effect of Spatial Arrangement of Habitats on Detecting Species Occurrence for Conservation

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Habitat distribution models are being utilized by conservation planners to provide insight into the drivers and patterns of the spatial distribution of rare and endangered species. These models have been used to assist in identifying previously unknown populations, determining sites of high candidacy for reintroductions and to guide management of protected areas. Species of conservation concern often have sparse and/or restricted distribution patterns resulting in species locality data that is unevenly distributed in space with small sample sizes. Generating accurate habitat distribution models with locality data with these characteristics poses many challenges. Though the statistical implications of small sample sizes are difficult to control, the problems posed by patchy distributions can be addressed by methods that include some measure of 'space'. Habitat suitability maps were created for virtual species that have hypothetical ecological niche requirements. Realized distribution maps were generated to simulate various distribution patterns imposed by biological processes such as species dispersal ability and home range requirements or historical factors such as dispersal barriers and distributional changes due to anthropogenic activity. Existing spatially explicit modelling methods were compared to our proposed method that combines logistic regression, stratified kriging and local landscape connectivity for their ability to accurately predict the simulated distribution patterns imposed by various ecological processes. Environmental data from Napa county California were used for evaluation purposes.