USING ECO-EVOLUTIONARY INDIVIDUAL-BASED MODELS TO INVESTIGATE SPATIALLY-DEPENDENT PROCESSES IN CONSERVATION GENETICS

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Eco-evolutionary population simulation models are powerful new forecasting tools for exploring management strategies for climate change and other dynamic disturbance regimes. Additionally, eco-evo individual-based models (IBMs) are useful for investigating theoretical feedbacks between evolutionary and wildlife population dynamics. We designed a series of theoretical simulation models within the software platform HexSim, to investigate how spatial landscape pattern influence eco-evo processes relevant to conservation. Our simulation uses a changing landscape to drive changes in isolation by distance (IBD), drift, migration, and selection, incorporating both demographic and genetic metrics to track eco-evolutionary responses. Our series of simulations addresses the following questions: 1. In well-connected landscapes exhibiting little genetic drift, how does isolation by distance (IBD) affect inferences of genetic structure? 2. In disconnected landscapes, how does drift interact with IBD, and thus affect inferences of genetic structure? 3. In poorly-connected landscapes, how effective is dispersal at homogenizing population structure resulting from both IBD and drift? 4. In poorly-connected landscapes, how does dispersal ability influence genetic structure when populations are subjected to IBD, drift, and selective pressure? We demonstrate how the results of our simulations lay the groundwork for applying eco-evo spatial IBMs to specific conservation applications with a simulation investigating jaguar habitat connectivity and landscape genetics in southern Mexico.