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Abstract Title: Mapping sources, sinks, and connectivity using a simulation model of northern spotted owls.

Source-sink dynamics are an emergent property of complex species-landscape interactions. A better understanding of how human activities affect source-sink dynamics has the potential to inform and improve the management of species of conservation concern. Here we use a study of the northern spotted owl (Strix occidentalis caurina) to introduce new methods for quantifying source-sink dynamics that simultaneously describe the population-wide consequences of changes to landscape connectivity. Our spotted owl model is mechanistic, spatially-explicit, individual-based, and incorporates competition with barred owls (Strix varia). Our observations of spotted owl source-sink dynamics could not have been inferred solely from habitat quality, and were sensitive to landscape connectivity and the spatial sampling schemes employed by the model. We conclude that a clear understanding of source-sink dynamics can best be obtained from sampling simultaneously at multiple spatial scales. Our methodology is general, can be readily adapted to other systems, and will work with population models ranging from simple and low-parameter to complex and data-intensive.