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Potential migration corridors and source populations for climate-change induced tree migration in southern Ontario

Although efforts to increase landscape connectivity are widely recognized as important strategies to facilitate climate change-induced migration, little research has addressed where such increases might best occur. We analyzed migration of 127 tree species in the fragmented landscape of southern Ontario, Canada, for six climate change scenarios, and calculated "back-cast" migration paths; i.e., the shortest paths between presumptive future and current range locations. Two migration scenarios were used: a "buffer" approach in which trees could migrate only through forest and land within 1 or 2 km of forests and a "cost-path" approach in which migration through forest was less costly than through other land cover types. The relationships between forest cover and migration path concentration varied for the two methods: the buffer method showed a marked increase in path concentration below 25-30 percent forest cover, whereas the cost-path method showed more-or-less linear increase with decreasing forest cover. We found support for the importance of existing corridors such as the Oak Ridges Moraine and the Niagara Escarpment, suggesting the current efforts to facilitate large-scale connectivity, such as the Adirondack-to-Algonquin initiative, will prove useful in increasing future migration. Source populations showed few differences between the two models, with existing forest cover and connectivity critical in determining their locations. Compared to straight line (crowfly) migration, fragmentation increased migration rates by a factor of 1.6 on average. In general, our results were relatively robust in that important migration routes and sources tended to be similar among climate change scenarios and among calculation methods.