Accounting for uncertainty in the parameterisation of cost-surfaces used in estimating landscape connectivity.

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Estimates of landscape connectivity are routinely used to inform decision-making by conservation biologists. Most connectivity estimates rely on cost-surfaces, raster representations of landscapes where cost values denote the difficulty involved with traversing an area. However, there is considerable uncertainty in many facets of the creation of cost-surfaces, and this uncertainty has not been systematically explored. We investigated the impact of uncertainty in four such facets namely, 1) cost-value selection 2) number of landscape classes represented, 3) spatial resolution (grain size) and 4) edge misclassification. Following a factorial design we simulated multiple cost-surface pairs, each comprising one surface with no errors and one where some combination of the four error sources had been added. We evaluated the relative importance of each source of uncertainty in determining the amount of difference between the least-cost paths (LCPs) generated for the unchanged and the erroneous cost-surfaces. Cost-value selection was the most important factor influencing the accuracy of the least-cost paths. Of the error types introduced during the creation of the categorical landscape, edge misclassification was the most important, directly impacting the configuration of the LCPs generated and interacting with cost-value selection to impact LCP composition. The other two error types, number of landscape classes and grain size, had a limited effect. We suggest that the levels of uncertainty in parameters used to generate cost-surfaces should be reported along with connectivity estimates.