Armadillo Resistance Model Results

November 3, 2020

After further updates to the model by estimating the parameters from mean covariate values per step, new resistance surfaces have been produced. Additionally, individual-level random effects were also included for the armadillos to take individual heterogeneity into account. In this set of models, only land use-land cover (LU/LC), average daily temperature, and average daily rainfall were included. While similar, the number and types of land cover classes differed between the North and South Pantanal sites. Models were analyzed on aggregated active behavioral states (foraging/transit) as opposed to the analysis of behavior-specific models.

*North Pantanal*

Overall, armadillos spent the least time per pixel in Cane, followed closely by Fence (i.e., dirt paths). Water was masked (white) since armadillos don’t move through this land class and any purported use would be an artifact of assumptions of linear movement between consecutive observations. Most individual-level resistance surfaces are comparable, however, the resistance estimates for ID ‘tm30’ are much higher than the others. Based on the plotted track for this ID (green), this is likely due to most time spent in the rare Forest land class, which is not used by any other ID. Assuming all IDs are weighted equally, regardless of sample size or number of land use classes visited, mean values of resistance were also calculated across all individuals. These average resistance measures appear to be reflective of values most common across all IDs.

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*South Pantanal*

Overall, armadillos spent the least time per pixel in Road and spent considerably more time in Pasture, Field, and Forest. Per descriptions from one of Nina’s prior studies, Field and Pasture are native vs invasive grass habitats. Water was masked (white) as an artifact as previously described. There was relatively greater variability in the individual-level resistance surfaces compared to the North Pantanal site, but the absolute range in resistance values was lower than in the northern site (South: 2-9 s; North: 3-15 s). IDs ‘tm12’ and ‘tm10’ showed the greatest resistance measures, where ‘tm12’ did not have many observations and primarily used the Forest land class, whereas ‘tm10’ primarily occupied the Field land class that was only used rarely by other IDs. Similar to the northern site, resistance values were averaged across all IDs with equal weighting, which resulted in a compromise of the individual-based estimates.

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*Conclusions*

Results from this updated version of the model provides some new insight, as well as confirms some previous results that were found. These models extracted data that were stored at a 1 m spatial resolution for LU/LC, whereas average daily temperature and average daily rainfall did not include a spatial component.

There was a relatively high level of individual-level variability (accounted for by the random effect). By accounting for these differences among individuals, we may be able to account for spurious estimates of the beta coefficients for the fixed effects from the resistance model. Cane was associated with the lowest estimates of resistance in the northern site, whereas Roads showed the lowest estimates of resistance in the southern site. This is unusual since we expected Fence/Road to show the lowest resistance for both sites. The reason that Cane may display the lowest resistance may be because there are few armadillo movements through this land class and they are all fast, directed movements. Therefore, this result may reflect a bias in how we have configured the model: we only take movements into account, not habitat preference.

Future versions of our resistance model should potentially provide some method by which to include habitat preference (via RSFs/SSFs) to further inform resistance estimates. This also calls into question whether habitat preference and/or the resistance model should be performed for each behavioral state or not since habitat selection is known to change with behavior. Additionally, the inclusion of a measure of LU/LC variability (e.g. NDVI) should also be included since it is not realistic that these broad land cover categories would display the same level of landscape resistance.