**Assignment 5**

**John Hopkins University – Computational Modeling for Policy and Security Analysis**

When analyzing the graphs of the results of the butterfly model with the artificial landscape and the real landscape, it is immediately clear that there are many differences in the results. The most striking difference is the general behavior of the lines – the lines in the graph of artificial landscapes are almost perfectly straight in sections, particularly for low values of q, while the lines in the graph of the real landscape are much less rigid. This is likely due to the artificial landscape having much less randomness in it. The artificial landscape has straight paths to the top of the hills, so there are less possible options for butterflies to move to when following their non-random behavior. This hypothesis is further confirmed by the variation between the lines of the same graph – the lines representing models with a higher q value (meaning less random butterfly behavior) are much straighter than the lines representing models with a lower value of q. The other striking difference between the two graphs is the over-all shape of the lines. While lines in both graphs show an initial spike followed by longer decline, the graph of artificial models the lines all seem to flatline by tick 500 at the latest. In the graph of the real landscape models, however, all but the lines representing the highest value of q seem to never really flatline. Once again, this difference appears due to the noise in the models, as it appears across landscape types, and across values of q. It appears that noise in the behavior of the agents and noise in the landscape creates noise in the results of the corridor width.

**Assignment 4 – Exercise 4**

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After adding some noise to patch elevation, the butterflies move similarly to how they moved in the original model, except for that there appears to be a bit more randomness. Instead of heading straight-up the nearest hill, butterflies occasionally take longer, more winding paths up the hill. I imagine this is due to the terrain being a bit more difficult to navigate – the fastest way to the summit isn’t necessarily by moving to the highest neighboring area. Adding in this noise clarified the role of the landscape in the movement of the butterflies, it became more clear that the unnatural landscape played a role in the unnatural movement of the butterflies.