Delia Mahoney
Eco 602 Nelson
Reading Question's 1
September 8, 2021
worked solo

1. Dichotomies

    One of the modeling dichotomies Bolker presents is mechanistic vs phenomenological models. Mechanistic models are concerned with why the data set appears like it does, what may have been the causes of certain typical and unusual aspects. Phenomenological models are more observation based and focus on the data set exactly as it appears and then try to create a best fit for it. Phenomenological shows what the data is and mechanistic tries to explain the why.

    In my area of research, urban forestry, a research topic might be assessing the conditions of sidewalks under shad tree plantings. The phenomenological model would show how many sidewalks have been disturbed by plantings and to what degree the damage is. The mechanistic model would focus on what caused the damage, and why it differs in different locations around the city.

2. Assumptions and Biases

    In McGarigal's example with the testimonials, one example of bias is an assumption by the scientist about the data collected. Without running any sort of analysis beyond making the graph, the scientist assumed that his observation is indicative of climate change, and goes into the rest of the process with the idea that his data set will reflect a certain outcome.

    Additionally, having achieved a result that shows the nesting habits are changing significantly, the scientist fails to look at other possible causes that would display this effect. A comparison with average temperatures, rainfall, wind, snowfall, etc. would provide evidence that this mountain has been affected by climate change and thus the inhabitants are as well. Otherwise something like the budworm outbreak mentioned, or increased human traffic along the trail could have also been a factor in the observed nesting elevation change.

3. Dual Model Paradigm

    The two primary components of a model in the dual model paradigm are deterministic models and probability distributions. The deterministic modelling component is the mathematical aspect of the data, the pattern that you expect to see in your analysis. The probability distribution is a mathematical representation of the data set that you would expect to see over a long time or many trials. A deterministic model is fully contained in the specified parameters, usually based on the probability distribution. By contrast, a stochastic model accounts for unforeseen randomness and variability in the data that may not have been accounted for when those parameters were set.

    In the example I used previously with trees and sidewalks, a deterministic model would define the expected range of damage that a sidewalk might encounter from a poorly planned street tree. This would include cracks from uplifting roots or discoloration from sap or fruit. A stochastic model might account for some random anomalies in damage, such as particular tree and site that suffered heavily in a storm, while its neighbors were not so affected. The probability distribution would display the expected set of all possible outcomes, and the expected probability of each.

Delia Mahoney
Eco 602 Nelson
Reading Question's 1
September 8, 2021
worked solo

4. Populations

As McGarigal outlines in chapter 2, a statistical population is the entire possible population that our query applies to, versus an ecological population which is the sample of individuals we are looking at. The statistical population might be the entire species population in a given region, whereas the ecological population is the individuals we have physically observed for study. The ecological population varies depending on the spatial and temporal scale of the research, because the statistical population will always be present, but the number of individuals studied in the ecological may vary depending on the length and scope of the research.

5. Model Thinking

In class, my group choose the cattail problem for the model thinking activity. The scenario states that cattail populations are increasing in some areas of the Chesapeake Bay region, which is disturbing native plant and animal habitats. In other areas however, the populations are small and contained, and not displacing native species.

One method of measuring the scenario would be measure the presence of native species among cattail populations. This would be a discrete numeric variable, because you couldn't have half a species individual. This might be more effective converted to a presence/absence way of measuring if cattail have completely outcompeted native populations in certain areas.

A second method of measuring could be measuring human activities around the cattail populations. If you chose to study the areas where cattails have out competed native species, or significantly disturbed wetland habitats, you could then observe in what type of environment the area is in. This would be accomplished with a categorical scale, where you classify the surrounding regions (urban/suburban/rural/etc) and observe the state of the cattail and wetland environment of that area.