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1) In 1 - 2 short paragraphs, explain the dichotomy in your own words and briefly describe how you might approach one of your research interests from each of the dichotomy endpoints.

One dichotomy explored In the text is deterministic models vs. stochastic models. In a deterministic model, the output is purely defined by the inputs and conditions provided in the model, while in a stochastic model an aspect of randomness is added to the model that leads to a variation in results. A stochastic model more closely represents environmental conditions and processes.

I can apply these two different types of models to my own previous research of plants’ phenological responses to climate change. A deterministic model that might be used in my line of study is to use a previously found statistic that late summer blooming plants, on average, are flowering 1.42 days earlier per 1˚C increase in mean spring temperature of the corresponding year. This model can be used to predict the acceleration in flowering time of a specific species . There is no randomness in this model, as the same results will be produced every time the model is run, based on the increase in mean spring temperature recorded. A stochastic model in my system might be a model that predicts phenology under future temperatures under climate change. There are several random factors that go into this model that might produce different results. For example, temperature changes as a result of climate change is not a set predicable equation, but rather has a lot of variation and uncertainties that could produce many different results based on the randomness included. One example is the natural unpredictable variations in temperature from year to year.

2) These seem like great ideals to strive for, right? But are there any biases in these statements?

A good model does not contain biases that will result in a less accurate depiction of your study system. One example of bias comes from the four testimonials regarding climate change and bird nesting habitat. A potential sampling bias occurs in this scenario when distributional data is mainly collected along or in easy to access places. In this case, that is initially along a high-elevation hiking trail. To see species moving higher in elevation from year to year along just one path is not enough to make a claim that this is occurring in all spruce-fir forest systems. This problem is addressed in testimony #3, and the scope of the study is vastly increased to account for this bias. Had this bias remained unaddressed, a conclusion from just one area might have been applied too vastly, resulting in incorrect management. For example, habitat alterations in areas where birds are not actually moving higher in elevation but were thought to be due to this biased study might be detrimental to populations of birds there.

3) In 1 - 2 short paragraphs, describe the following:

* Identify and briefly the two primary components of a model constructed in the dual model paradigm?
* Give an example of the two components in the context of a system you are interested in studying.

The two primary components of a model constructed in the dual model paradigm are the deterministic component and the random (stochastic) component. The deterministic component is where the outputs of the model are purely determined by the inputs to the model. The random component assumes and adds variation to the model from a combination of unknown factors. An example of a deterministic component in a plant invasion model would be converting specific locality data into a coordinate point. There is only one possible coordinate point as an output when a specific locality is utilized as the input (although this kind of data is rare). An example of a random (stochastic) component in a model in plant invasion ecology would be trying to predicting which plants become invasive. The species input will have many random variations based on changes in environmental conditions, where it is introduced, the propagule pressure, etc.

4) In 1 - 2 short paragraphs, describe the difference between a statistical and biological or ecological population.

* Which of these populations may vary depending on the spatial or temporal scale of the research question?

The difference between a statistical and biological/ecological population is that a statistical population represents the population in the entire study area, while the biological/ecological population may span outside the boundaries of the statistical population area. The statistical population may vary depending on the spatial or temporal scale of the research question depending on what data is needed, as opposed to the biological population that will not change size no matter what the research question is.

5) Consider the scenario your group chose to use in the model thinking in-class activity:

* Cascades snow pack
* White pine blister rust
* Cattails

Choose 2 of the of the following data types and scales.

1. A continuous variable on an ratio scale
2. A categorical, nominal variable
3. A discrete variable
4. A numerical variable on an interval scale

For each of your chosen variable type/scale types:

* Propose an entity and/or variable in your scenario that you could measure using the data type/scale.
* Explain why the data type or scale is appropriate for the entity/variable you chose.

A continuous variable on a ratio scale that could apply to the cattail system is the average height of cattails within a 1 square ft area. This variable is continuous because it can be any number on a scale and there is an absolute 0 (there is no such thing as a negative height), which means it’s on a ratio scale. This data could be used to answer the question of does cattail height have an effect on any other variable in the environment? A discrete variable that would apply to this system is the number of cattail plants are present per square foot. This is a discrete variable because there can only be a whole number of plants. This data would allow a researcher to answer questions about cattail density compared to other environmental variables.