

ECO 602 – Week 4 Reading Questions

this week's readings are:

- McGarigal Chapter 4: Deterministic Functions
- Bolker Chapter 3. Deterministic Functions for Ecological Modeling
 - Read the chapter introduction (Section 3.1)

Q1: Predictors (2 pts.):

A model of Brown creeper abundance explained by late-successional forest percent.

- Predictor variable = extent of late-successional forest
- This is a continuous variable expressed as a percent (0-100%)

A model of Brown creeper presence/absence explained total basal area (a measure of tree cover).

- Predictor variable = the total basal area of trees
- This is a continuous variable that ranges from 0-200.

Q2: Responses (2 pts.):

A model of Brown creeper abundance explained by late-successional forest percent.

- Response variable = brown creeper abundance
- This is a continuous variable expressed as a value from 0.0-1.0

A model of Brown creeper presence/absence explained total basal area (a measure of tree cover).

- Response variable = Brown creeper occurrence
- This is a categorical variable that is either 1 or 0.

Q3: Model Constraints (4 pts.): For both models: How did the data type or scale influence or constrain the choice of model?

We were able to use a linear model for the first example of brown creeper abundance and late-successional forest percent because both variables are continuous.

It doesn't make sense to use a linear model for the second example of brown creeper occurrence and total basal area because the dependent/response variable is binary. There isn't a way to draw a single straight line that would fit the binary presence/absence data. Therefore, we needed to use a logistic function because its sigmoid shape is better suited to the response variable data type.

Q4: Predator-Prey Model

(1 pt): What are the pros and cons of the Ricker model? What are the pros and cons of the quadratic model?

The Ricker model is mechanistic, so it is based on what we would expect to happen a priori given the factors we are studying. We know that the predators will kill more larvae as the density increases, but also that the predators are limited by how long they need to handle each prey. So we can use a mechanistic model to predict the type of relationship we expect to see based on what we know about the predators and how long they need to handle each prey. The pros are that it fits the data fairly well and we have a clear environmental reason for the model. The cons are that it's not a phenomenological model that is based on the data from the experiment.

The quadratic function is phenomenological because it is fit specifically to the data we have in the example. The pro is that it fits the data a little better than the Ricker model. The con is that we didn't chose the function based on a priori theories about the relationship we expect to observe.