***Exploring how climate will impact plant-insect distributions***

***and interactions using open data and informatics***

**SP-2: Species Distribution Maps (SDMs) and Hypothesis**

**- Pre-Class Assignment for Class 2 -**

**Introduction on Species Distribution Maps (SDMs):** The distribution of a species across space can be visualized in a number of ways. When searching for a species on iNaturalist, an observation map will appear pinpointing the exact locations of where a species has been spotted or reported. However, do these observation maps represent the true distribution of the species? Often times these data represent ‘presence only’ which means the maps tell you where the species occurs, but does not include points to show you where the species have been verified to *not* occur. Further, reports of species occurrence, particularly in the case of citizen science data, are often concentrated to areas where naturalist enthusiasts frequent; i.e. more occurrences are typically reported for areas in or adjacent to cities, while hard to reach places (mountain tops, oceans, etc.) are less frequented by such citizen science participants and thus have fewer occurrence records. Museum records from taxonomists specializing in various groups of organisms can help supplement these maps, however, there are typically many fewer scientists compared to citizen scientists allowing much less coverage of area. And these scientists have their own collection bias such as specific groups of interest and quality of specimens. Species distribution models (SDM) are one way to use all these data (presence only or presence/absence data) to estimate the distribution of a species. These maps can then be used to guide further exploration of the distribution of the species or used in studies of the ecology of a species (Figure 1). SDM and observation maps can also be used to look at the distribution of species in different time periods and life stages. When considering the distribution of caterpillars versus adult butterflies of the same species, given differences in mobility we might expect to see different ranges. Further, we might be more interested in caterpillar distributions as these are often dependent upon their host plants for food during development. Looking at distributions throughout a growing season can be informative for thinking about migration patterns and how these patterns may be affected over time.

To prepare for our Species Distribution Map workshop in class, please complete the following:

1. Finish SP1 and submit assignment
2. Download R, RStudio, and Git using the tutorials provided (each member of the group must download each piece of software)
3. Watch a short video that shows you some of the basics and windows in RStudio: <https://youtu.be/5YmcEYTSN7k>
4. Read and take notes on the following: Biesmeijer et al. 2006. Parallel declines in pollinators and insect-pollinated plants in Britain and the Netherlands. *Science*. 313: 351-354.