**Science Curriculum Development**

Below is the outline of ideas for the science curriculum. If you’re interested in helping out with this aspect, some tasks include:

* Editing the outline with additional ideas and modifications
* Writing scripts for sections
* Making sure the right supplies get to the right place

Learning Goals

1. See some examples of university-level research
2. Understand some fundamental concepts in ecology
3. Learn about the impacts of humans on the environment

Overview

1. Time: 10 am – 12 pm
2. Location: A greenhouse and Bivens Arm Research Station
3. Lessons
   1. Invasive species and infectious disease
   2. Introduction to Bivens Arm
   3. Biodiversity and its benefits

Invasive species and infectious disease

1. Mini lecture concepts
   1. Invasive species
      1. EDDMapS app
   2. Infectious disease
   3. Plant traits
   4. Question: Does the origin (i.e. native vs. invasive) of plant species or their traits affect susceptibility to disease?
   5. Hypotheses:
      1. Pathogens are less adapted to infect invasive species, leading to fewer disease symptoms.
      2. Fast-growing, broad-leaf plants have more resources available to pathogens, leading to more disease symptoms.
2. Experimental design: Plant *Microstegium vimineum* and native grasses in pots in the greenhouse, move them out to Bivens, move them back to the greenhouse after a few days, incubate in plastic bags to promote foliar fungal infection. If infection doesn’t work, we can just talk about plant traits.
3. Data collection: In the groups of 2-3, students will collect data on plant traits and disease symptoms for multiple species in the greenhouse
   1. Measure height
   2. Scan leaf for leaf area and disease symptoms
   3. Measure leaf weight
4. Supplies (5 each)
   1. Data sheets
   2. Pencils
   3. Clipboards
   4. Rulers/tape measures
   5. Scanner and computer
   6. Scales
   7. Weigh boats

Introduction to Bivens Arm

1. Describe current research taking place here
   1. Drought/invasion experiment
      1. Soil microbial communities
      2. Animals and granivory
   2. Microstegium trial
   3. Others? Greenhouse?

Biodiversity and its benefits

1. Mini lecture concepts
   1. Biodiversity
      1. Species richness
      2. What is a species?
   2. Ecosystem functions
      1. Biomass
      2. Disease suppression
      3. Pollination
   3. Question: Does higher species richness lead to more biomass, greater disease suppression, and/or higher pollinator abundance?
   4. Hypotheses:
      1. Higher species richness leads to more biomass unless a high-biomass invasive species is present in the community.
      2. Higher species richness leads to fewer disease symptoms because specialist pathogens are prevented from spreading rapidly.
      3. Higher species richness leads to more pollinators because more specialized pollinators are more likely to have food/reproductive host plants present in the community.
2. Experimental design: [**https://doi.org/10.1002/ece3.2729**](https://doi.org/10.1002/ece3.2729)
3. Data collection: In groups of 2-3, students will collect data from the drought/invasion experiments on species richness, an approximation for biomass, and either pollinator or disease intensity.
   1. Hold PVC quadrats over a plot
   2. Record number of observable plant species (morphological differences)
      1. Can use iNaturalist for species identification
   3. Use a meter stick to estimate height of plants within quadrat
      1. Pick a medium height plant?
   4. Record number of observable pollinators
   5. Record percentage of leaf area with disease symptoms
      1. Use phone app to take pictures of a few leaves with white/blue paper underneath
4. Supplies (5 each)
   1. Quadrats
   2. Data sheets
   3. Pencils
   4. Clipboards
   5. Blue or white blank pieces of paper
   6. Phone apps (tell them to download ahead of time)
   7. Meter sticks