CCFC 2018, Section 6, Lesson Plan March 7-8, 2018

***Section 6: Species Distributions, Climate Change, and Conservation***

*Learning Outcomes*

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| ***Learning Outcome*** | ***Description*** |
| 1 | Students will **understand** how species presence data and climate data are used to model species distributions, and how those models can be projected into the future using estimates of future climate. |
| 2 | Students will be able to **articulate** the importance of uncertainty in modeling – both the importance of uncertainty about species' presence/absence in modeling current distributions, and the importance of uncertainty of future climate conditions (especially precipitation) in modeling future range changes. |
| 3 | Students will be able to **explain** the difference between geographic space and climate space, and why the distinction is crucial for thinking about species' responses to climate change. |
| 4 | Students will be able to **discuss** various conservation concerns and management implications of potential species responses to climate change. |

*Activities*

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| ***Time***  ***(min)*** | ***Target Learning Outcomes*** | ***Activity*** | ***Description*** |
| 2 | n/a | Review results of mid-semester teaching survey | GSIs should take a few minutes to summarize what they learned from the mid-semester teaching surveys that were completed last week, particularly identifying the range of students' opinions about valuable class resources and activities, and what the GSI can and will try to do to make suggested changes/improvements. |
| 25 | 2 | Guided walk-through of Ponderosa pine SDMs | The GSI should first distribute the handout, and instruct students to follow along in the code-and-comments section of the handout as they move through the script. Then, the GSI will walk through the script, step by step, explaining the general idea of what is being done in each step, briefly discussing the output text and graphics as they come up, and referring to the additional resources (Worldclim, GBIF, and iNat websites; Jepson Herbarium ponderosa specimen) where appropriate, as time allows. (NOTE: it will be important not to get tied up in details and intricacies of the code during this!) |
| 23 | n/a | Group discussion about implications | GSI has the option to play the 2-minute drone video, showing ponderosa mortality in the Bass Lake region of the Sierra (FYI: this is only a stand that was classified as having moderate mortality, per the USFS 2015 aerial surveys!). Encourage the students to connect the ideas embedded in the SDM activity to on-the-ground phenomena and impacts, such as what they're seeing in the video. Then, using the resulting figures and the discussion questions on the handout, students will discuss the guiding questions (either in small groups, or as a whole-class guided discussion; facilitation up to the GSI, and may depend on class size). Questions could be discussed in order, but needn't be. If in small groups, the GSI may want to save some time at the end to regroup as a class and hammer down any major take-home points. |

*Materials*

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| ***Activity*** | ***Materials needed*** |
| General | Section notepad, attendance sheet, chalk/markers |
| Survey summary | - Key points about survey results |
| SDM activity | - Handout-packets (with 3 sections: code and comments, guiding questions, and resulting figures).  - Computer capable of projecting, with R and the necessary packages installed, and with model already pre-run and data downloaded (so that the model can be run offline if need be)  - Herbarium specimen |
| Group discussion | - Handouts |