Capstone Project
MEES698C / BIOL650: Spatial Ecology in R
Fall 2022

Capstone Project Objectives:

To perform a detailed spatial analysis that explores a research topic of particular interest to you. The project will provide experience in (i) spatial analysis from "top-to-bottom" in R, (ii) concise scientific writing, and, (iii) preparing a study for oral presentation.

Topics:

What should you do for your project? Because there is a wide array of interests in any class, the topics are not restricted to any particular field of research, *but the project must involve statistical analyses of spatially referenced biological and environmental data*. Example projects include: (1) modeling the distribution of a species or group of species (perhaps including climate change impacts); (2) exploring the interplay between animal movement and environment; (3) modeling gene flow between populations; (4) modeling the spread of an invasive species; (5) examining how land use influences ecosystem processes; (6) point-pattern analysis; (7) insert your super cool topic here.

Grading:

The capstone project constitutes 45% of your final grade and will involve three assignments, including: (1) a proposal presentation and document (10%, due 10/10/2022); (2) a project progress / update presentation and document (10%, due 11/07/2022); and (3) final presentation, report, R scripts (25%, due at the end of the semester, exact date TBD).

Format for the Project Proposal (10%, due 10/10/2022):

Students will give a short (4-minute **max**) presentation to the class and will write a brief project proposal outlining the research topic to be addressed.

The presentation and written proposal will cover the same four topics, with a maximum of one slide per topic (so four slides total). Also **use section headers** in your written proposal to indicate each of these four topics:

1. Research Question & Rationale
2. Study system / species
3. Anticipated data requirements (please indicate whether you currently have the data required or if you will need to find datasets, including both the biological and environmental data)
4. Potential / planned analyses / methods / techniques

Maximum duration of the presentation is four (4) minutes. **Do not go over.** There are 14 students in the class and everyone will have time to present only if everyone keeps to the 4-minute time limit. Please don't make us mute you.

Maximum length of the proposal is 750 words, *excluding literature cited*. Please submit the proposal as an MS Word document via email to Emily and Matt with the subject: "*Last Name: Spatial Ecology Project Proposal*".

The rubric for grading will include: 1) met the requirements for time (4 minute presentation), length (<750 words), and components (the 4 requested topic sections/ slides), 2) well communicated (oral and written), 3) informed ideas and rational for questions and system (scholarship and thoughtfulness), 4) identification of potential datasets / approaches or questions regarding data needs/ analytical approach.

Proposal presentation & document are due by the beginning of class (11:00AM) Monday, October 10th.

Format for the Project Progress Report(10%, due 11/09/2022):

This will follow the same general format as the proposal presentation with a written and oral presentation component, but will emphasize clearly defining the research question and predictions, update on the project status, clear descriptions of the data required and what data are in hand vs what needs to be obtained, and to the extent, possible descriptions of identified R packages and functions that will likely be used for analyses, etc. The written report will be an updated version of the proposal that responds to our comments and adds 1) a statement of the specific prediction(s) you will test with the analysis (including the predictor and response variables), explanations of the data that will be used in the study and their status, including summaries of sample sizes and spatial and temporal distribution and resolution, an explanation of and justification for the analytical approach (mentioning R packages and functions to the extent possible) that will be used to address the study predictions, and an explanation of progress or current status of the analysis.

The presentation will cover the same four topics, with a maximum of one slide per topic (so four slides total). Also **use section headers** in your written proposal to indicate each of these four topics:

1. Specific prediction statement for what you will test in the study
2. The data that will be used: sample sizes and spatial and temporal distributions
3. The analytical approach (R packages, functions)
4. Explanation of progress and/or planned workflow

The rubric for grading will include:

1) met the requirements: time (<6 minute presentation, <1500 words written), components (the 4 requested topic sections/ slides), and well communicated (oral and written),

2) clear statement of the specific prediction(s) you will test with the analysis (including a justification and the predictor and response variables)

4) clear explanations of the data that will be used in the study: sample sizes and spatial and temporal distribution and resolution

5) clear explanation of and justification for the analytical approach (with descriptions of R packages, functions as possible) that will be used to address the study predictions

6) explanation of progress progress and/or planned workflow (i.e., data in hand and completed exploration of collinearity among predictors).

Progress presentation & document are due by the beginning of class (11:00AM) Wednesday, November 9th.

Format for the Capstone Project (25%, due date TBD, but usually during finals week):

The capstone project will be consist of four parts, each graded individually:

(1) A well-commented and organized R script that acts as documentation of the scripts used, analyses performed, etc. In short, this document should contain all scripts, perform all

analyses, and plot relevant results, tables, etc. Someone else should be able to run your document and produce all results *without error*. You can use R-Markdown if you wish.

(2) A written report following the format of a scientific journal article. The body of the report should not exceed ~**1500 words** of text.

(3) Slides of your presentation of sufficient clarity to serve as a stand-alone account of your research.

(4) An oral presentation given to the class.

Guidelines for Final Oral Presentations:

Everyone will present their research in class – exact dates TBD. Each student will be given 12 minutes to present, with 3 minutes provided to the audience for questions. The presentation should focus on the key research question(s), the major aspects of the spatial analysis, a brief discussion, and the most significant findings & conclusions.

We are happy to schedule a time to meet with each of you to discuss your proposed project ideas. Approval of your research topic is required before proceeding with your project.

WE WILL DISCUSS IN CLASS THE DUE DATES FOR FINAL MATERIALS. LATE MATERIALS WILL NOT BE ACCEPTED. THE FINAL PROJECT COUNTS TOWARDS 45% OF YOUR FINAL GRADE.