

# Final Project

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Your final project is a spatial analysis of social-ecological dynamics in the Chesapeake Bay Watershed (CBW). You will perform geoprocessing and/or exploratory spatial data analysis. You will choose from a list of specified research questions (see below) to seed your analysis. You may modify and expand upon the research question, but it is not required. The project **must** use Python, and it **must** address a "spatial problem." However, it does **not** need to use ArcGIS Pro and/or arcpy. Further, the project should emphasize the problem you wish to solve, rather than the number of lines of code you write. It is strongly encouraged that your project slightly exceeds your programming skill level. There is strong research suggesting that we learn most effectively when we "stretch" ourselves just beyond our current skill/knowledge level.

## Data

You will be able to find most of the relevant data for the research questions below on the Chesapeake Bay Open Data Portal (<https://data-chesbay.opendata.arcgis.com>). However, depending on the research question you choose and if/how you modify it, you may need to obtain additional data (e.g., from the US Census).

## Research questions

Choose one of the following research questions below:

1. How has land use in the CBW changed over time and how is it predicted to change in the future? Are there any spatial patterns you can detect in this land use change?
2. How and where has sea level rise (SLR) occurred in the region, and which areas or communities might be vulnerable to future SLR?
3. What management activities have taken place (and where) that may affect the movement of Brook Trout in the region? Are there any clear spatial patterns to these habitat-altering activities?
4. How have flood hazards changed over time and space? Which areas, communities, or populations are at increased risk of flooding?
5. What are the spatial patterns of climate change over the CBW region? For example, how have temperature and precipitation changed over time and space?
6. Protected areas are designed to protect vital species habitat across the watershed and in the Bay. What are the spatial relationships among protected areas, habitat, and public access to the Bay?
7. What is the extent of hardened shoreline in specific areas of the Bay? How does the amount of protected shoreline relate to the presence/location of sensitive or protected areas?
8. Something else of your choosing

## Deliverable 1: project proposal (20 points)

You must submit a proposal for your project detailing the following items:

1. The research question you chose
2. Preliminary or sample data (can be a list of sources). Should NOT be speculative.
3. Any preliminary work (strongly encouraged)

Other details:

- 1-2 pages, inclusive of figures
- Microsoft Word document or PDF
- 1-inch margins
- Font: Times New Roman, size 12, 1.5 spacing or less
- Cite all sources using a standard referencing format (e.g., Chicago, APA, your favorite journal). However, you may NOT use an end note style.

## Deliverable 2: in-class project update (10 points)

You will give a 3-5 minute presentation to the class that will cover:

1. Your objectives, topic area, and/or problem of interest
2. What tools you are using to accomplish the task
3. Your current progress in accomplishing the task
4. Evidence of work
5. Any issues or challenges you have encountered

The class/audience is expected to listen attentively and ask questions of the speaker. The presenter should be prepared to answer questions from your peers and instructor.

## Deliverable 3: final report (120 points)

Your final report will follow the format of a short technical report where you should provide:

1. A short introduction to the topic and research question
2. A methods section detailing the data you used and the work you completed
3. A results section that explains, in detail, what you accomplished. Be sure to connect to how you defined success in the project proposal (e.g., what should be understood from them)
4. A discussion section that covers the implications of your results, including a critical self-reflection of the project (e.g., what limitations, assumptions, or uncertainties are present). Also, what have you learned and what would you do differently next time (and why)?

## Deliverable 4: in-class final presentation (graduate students only)

Graduate students will also give a 5-8 minute presentation during the final week of class detailing the full extent of your project work and accomplishments

In this presentation, you will at a minimum discuss:

1. Your questions/objectives/problem/task
2. Your dataset(s) and methods used to accomplish the task
3. Your results - including a discussion about how you measured success (look back to your proposal)
4. The implications of your work (e.g., for your research, job)

## Other details:

- 2 pages exclusive of figures (832 students, 3-4 pages)
- At least three figures, two of which must be maps (these do NOT count towards the page requirements)
- Microsoft Word document or PDF
- 1-inch margins
- Font: Times New Roman, size 12, 1.5 spacing or less
- Cite all sources using a standard referencing format (e.g., Chicago, APA, your favorite journal). However, you may NOT use an end note style.
- It is strongly suggested that you format your text using a Jupyter notebook

## Code

- You must also submit your code and any data (if sharable and of reasonable size). I must be able to run the code on a similar computing environment to yours
- I expect your code to be readable and documented at a minimal level. However, graduate students must fully document all functions and tasks completed by their code. You do NOT need to document every instance variable or line of code, but your script should be exceptionally well-formatted and documented. There are multiple examples of standards and best practices on the web.