FLORIDA PLANTS AND CLIMATE CHANGE

BOT4935/BSC2930

Spring 2022 Syllabus

INSTRUCTORS

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OBJECTIVES AND LEARNING GOALS

1. Develop a research question: formulate testable hypotheses and state predictions.
2. Describe the potential utility, along with the biases and uncertainties, in digitized specimen data.
3. Analyze data to create and interpret informative data visualizations.
4. Communicate methods and results to other researchers.

DAYS	TIME OF DAY	LOCATION
Monday	12:50-1:40PM	TBD
Wednesday	12:50-1:40PM	TBD

COURSE DESCRIPTION

Florida is part of a biodiversity hotspot and is home to ~4000 species of plants. These plant species form unique and complex communities that are the basis for the iconic ecosystems of Florida, from the Everglades to the sandhill scrub. How will this immense diversity of plant life respond to climate change? Will species go extinct, move to new habitats, or new locations? Will current protected areas be adequate to protect plant communities in the future, or will new conservation areas be needed? Using computational methods and natural history specimens collected over the past few centuries, we will explore the underlying abiotic environmental variables (temperature, precipitation, soil composition) that govern a species' distribution, investigate where the species will occur under alternative climate scenarios, and discover whether or not the species will occur on protected lands. This real-world research will have consequences for conservation of Florida's biodiversity.

The course will introduce students to scientific collections and research; it will provide an authentic research experience, along with basic training in research skills, ethics, objectivity & bias, and research communication. Each week the class will meet for two (2) one-hour classes as a group for basic instruction, but most of the learning will be achieved through hands-on research.

POLICIES

Your success in this class is important to us. We will all need accommodations because we all learn differently. If there are aspects of this course that prevent you from learning or that form barriers to your inclusion, please let us know as soon as possible. Together we'll develop strategies that can enable you to succeed in the course. You are also welcome to contact Student Accessibility Services to begin this conversation or to establish accommodations for this and/or other courses.

Classroom Etiquette

- Please arrive to class on time and plan to stay for the full period of the class.
- If you miss a class, you are responsible for getting assignments and other information you missed.
- Always be neat and clean up your area completely at the end of class.
- Discussion in class is expected, but always interact with instructors and other students in a respectful and civil manner.

Classroom Equity (from www.educationevolving.org)

- Our vision is that all students have opportunities for student-centered learning, which is characterized as learning designed based on each individual student's needs.
- We recognize and acknowledge that significant disparities in educational opportunities and outcomes exist among students based on socioeconomic status, race, ethnicity, gender, special needs, English language proficiency, sexual orientation, and geography, which result from a history of systemic, economic, political, and moral inequity.
- We also recognize, as individuals and as an organization, that an important step in the quest for equity is to better *understand* systems of *in*equity—and in particular, to understand ourselves, and our own identities, cultures, and roles in these systems.

COURSE MATERIALS

1. Internet access

ASSIGNMENTS

- **Reading Blogs**
    - Blogs will be assigned for all assignments that we read together in class and submitted on Canvas.
    - The main point of blogs is to improve your learning and be a helpful summary for you.
    - The blogs will be graded as outstanding, good, or not done yet. Outstanding and good blogs get the full 10 points. If "not done yet", you have ONE week to resubmit an improved and satisfactory blog, otherwise you do not get the blog points. When you resubmit, do NOT discard your original blog on Canvas but rather, add your improved one as a comment. You can fix up to 3 "not done yet" blogs.
    - Blogs are due by midnight before the day of class. This will then give the Instructor time before class to go over the blogs before we meet as a class.
    - Blogs should be a minimum of 300 words and include things in the readings that you thought were interesting, novel, intriguing, puzzling, frustrating, annoying, repetitious, review, problems where you got stuck, ideas for improvement, questions that you thought of, etc.
- **Function Notes**
    - Functions are "self contained" modules of code that accomplish a specific task. We will be utilizing many of these in our projects.
    - The main point of function notes will be to gain familiarity with code before using it.
    - You will be given a list of functions which you will write short summaries for what those functions do and the parameters available. These will be submitted on Canvas.

    - Function notes will be assigned before each class where we work through scripts and will be due at midnight before the day of class.
    - Function notes will be graded as “complete” or “not yet done” and will be worth 10 points each. You can fix up to 3 "not done yet" function notes.
- **Written Summaries and Scripts**
    - At the end of weeks 5-9 and 11-13 written summaries and scripts will be turned in through Canvas.
    - These short write ups will act as scaffolds for your final project.
    - Instructor feedback will be provided for both the summaries and scripts.
    - We expect that feedback is taken into consideration before turning the final project with suggested changes made and/or corrected.
- **Poster/Presentation**
    - Part of this CURE will include presenting your work at the Undergraduate Research Symposium (April 7th 1pm – 4pm).
    - You will create a poster which will be printed and presented during the assigned times of the Research Symposium.
    - This poster may also be shared more broadly with other Courses at Universities across the US.
- **Final Report**
    - The final report will consist of:
        - A written summary of your methods and results as well as an introduction and discussion. Your methods will consist of your modified summaries from the weeks prior.
        - All scripts used.
        - An updated presentation that includes climate projections.

OFFICE HOURS

Office hours are an opportunity for you to connect with us, a chance to ask clarifying questions about content and/or scripts, explore what you may want to do after you graduate, and find support. We will host open office hours on Fridays, but also are more than happy to meet by appointment.

LAND ACKNOWLEDGMENT

We acknowledge the land we are meeting on is the territory of many nations, including the Seminole and Timucua peoples. Additionally, the specimens which we will be utilizing in this course were collected across several nations, including the territories of the Ais, Apalachee, Calusa, Choctaw, Creek, Jeaga, Miccosukee, Seminole, Tequesta, and Timucua (http://www.native-languages.org/florida.htm).

GRADING

While below we outline assignments and their point value, we expect that everyone who submits their assignments will achieve passing grades in this course.

Assignments	**Number**	**Points**	**Total Points**
Reading Blogs	5	10	50

Function Notes	7	10	70
Scripts	7	30	210
Written Summaries	8	30	240
Final report	1	200	200 (100 scripts/100 written)
Poster	1	100	100
Presentations	2	50	100
Participation	1	100	100
			1070

SEMESTER SCHEDULE

The general course syllabus for weekly meetings follows:

Week #	**Date**	**Topic**	**Assignment Due**
1	01/05	Introductions (All)	
2	01/10	Research Skills - Florida plants and ecoregions (D. Soltis)	Blog 1(Article 1)
2	01/12	Research Skills - Niche modeling overview: Specimens and digitalization (P. Soltis)	Blog 2 (Article 2)
3	01/17	Martin Luther King Jr. Day	
3	01/19	Research Skills - Herbarium Tour + Climate change (Mabry)	Blog 3 (Articles 3 and 4)
4	01/24	Research Skills - Intro to R and HiPerGator (Mabry)	Practice R
4	01/26	Research Skills - Intro to R and HiPerGator (Mabry)	Practice R
5	01/31	Data reproducibility/responsibility (P. Soltis)	Blog 4 (Article 5); Choose species
5	02/02	Species of interest (D. Solits)	
6	02/07	Occurrence downloading	Written Summaries on species (1); Function notes (1)

6	02/09	Occurrence downloading	
7	02/14	Georeferencing	Written Summaries (2) and scripts (1) on occurrence downloading
7	02/16	Georeferencing	
8	02/21	Occurrence data cleaning	Written Summaries (3) and scripts (2) on georeference; Function notes (2)
8	02/23	Occurrence data cleaning	
9	02/28	Environmental layers	Written Summaries (4) and scripts (3) on data cleaning; Function notes (3)
9	03/02	Environmental layers	Blog 5 (Article 6)
10	03/07	Spring Break	
10	03/09	Spring Break	
11	03/14	Variable selection	Written Summaries (5) and scripts (4) on environmental layers; Function notes (4)
11	03/16	Variable selection	
12	03/21	Ecological niche modeling	Written Summaries (6) and scripts (5) on variable selection; Function notes (5)
12	03/23	Ecological niche modeling	
13	03/28	ENM processing	Written Summaries (7) and scripts (6) on ENM; Function notes (6)
13	03/30	ENM processing	
14	04/04	Practice poster presentations	Written summaries (8) and scripts (7) on ENM processing
14	04/06	Practice poster presentations	
15	04/11	Future climate projections	Function notes (7)
15	04/13	Future climate projections	
16	04/18	Final report class time	
16	04/20	Final report class time	
FINAL	04/27 (12:30 -	Putting it all together; What does the data say collectively?	Final report and presentation DUE

	2:30 PM)		

*April 7th 1pm – 4pm Undergraduate Research Symposium

READING LIST

1. Mulvania, M. (1931). Ecological survey of a Florida scrub. *Ecology*, 12(3), 528-540. https://doi.org/10.2307/1928998

2. Soltis, D. E., & Soltis, P. S. (2016). Mobilizing and integrating big data in studies of spatial and phylogenetic patterns of biodiversity. *Plant Diversity*, 38(6), 264-270. https://doi.org/10.1016/j.pld.2016.12.001

3. Lozier, J. D., Aniello, P., & Hickerson, M. J. (2009). Predicting the distribution of Sasquatch in western North America: anything goes with ecological niche modelling. https://doi.org/10.1111/j.1365-2699.2009.02152.x

4. Peterson, A. T. (2001). Predicting species' geographic distributions based on ecological niche modeling. *The condor*, 103(3), 599-605.

5. TBD

6. Sillero, N., & Barbosa, A. M. (2021). Common mistakes in ecological niche models. International *Journal of Geographical Information Science*, 35(2), 213-226. https://doi.org/10.1080/13658816.2020.1798968