

**CACHE Discovery Course:  
Research in Aquatic Ecosystems  
BSC 2917  
Fall 2018  
1 credit**

Instructor: Dr. Sarah L. Eddy

Discipline: Behavioral Ecology, Education

E-mail: seddy@fiu.edu\*\*

Office Hours in OE 215:

Mon 9 – 9:50 am

Weds 2 – 2:50 pm,

Thurs 4 – 4:50 pm,

Or by appointment

Class:

Day/Time: Mon

1:00 pm – 2:50 pm

Location: TBD

Co-instructors and Content Experts:

To help you integrate into the scientific community here in CACHE, multiple researchers will visit us during this course, but the three researchers you will have the most contact with are:

	Brad Schonhoff	Julie Charbonnier
Discipline:	Science Communication Environmental Science	Biology
E-mail:	bschonho@fiu.edu**	jcharbon@fiu.edu**
Office:	ECS 158	VH 179

\*\* We will only check class emails weekdays between 9:00 am and 5:30 pm.

Course Purpose:

In this class, you will experience the role that science plays in policy and community decisions by exploring and identifying patterns in long-term aquatic ecosystem data. The experiences and skills you foster in this course will be valuable for leveraging undergraduate research opportunities.

Course Outcomes:

Through this course, assuming you fulfill the expectations outlined in the syllabus, you will be able to:

- Explore what it means to do science and be a scientist in today's world and evaluate whether this would be a satisfying job for you.
- Communicate like a scientist including creating credibility and writing for broad understanding.
- Discuss environmental issues impacting local aquatic ecosystems and communities in South Florida.
- Take on a leadership role in conducting research and communicating science in the community.

Text: No textbook is required

## Classroom Etiquette:

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The ways in which we treat one another matters. In order to learn, every person must both be and feel safe enough to express themselves. As members of a learning community, we should strive to create a constructive learning environment for the entire class. Specifically, this means members of this class:

- Show respect and consideration for those speaking in class. For instance, avoid talking when an instructor or a classmate is speaking to your group or the class as a whole.
- Be as actively engaged in the class activities and discussions as you can. You can facilitate this by turning all electronic devices to silent or vibrate so they don't distract you or the learners around you. Also avoid accessing materials not related to the course during class time.
- Be prepared to contribute to the learning of your group. Share potential answers or questions you have and solicit questions and potential answers from all your group members, especially from those who are most quiet. If someone is struggling with a concept that you understand, help them. Explaining something to a peer both increases your own ability to remember it into the future (McKeachie and Svinicki 2006) and makes sure that no one remains confused at the end of the activity.

*Equity in Learning:* This class will be conducted in an environment that is open, welcoming, and safe to all students. The instructor is willing and committed to providing an atmosphere of support and affirmation for all people. **Do not** display disrespectful behavior toward any individual based upon age, ability, race/color/ethnicity, religious/spiritual, political affiliation, socioeconomic, immigration, marital, military/veteran status, gender identity/expressions, sexual/affectional orientations, relationship status, and/or anything that is likely to be perceived as disrespectful to someone's background, culture, or identity. **For instance, some derogatory, but commonly used language includes "that's gay" or "that's retarded."** Unprofessional, derogatory, and/or offensive behavior may result in disciplinary action.

## Grades:

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This course uses a competency-based grading scheme. This means we will evaluate you as if you were on the job or a graduate student: you either meet the standards of the task (pass the assignment) or you do not (fail the assignment). Your assigned mentor and other instructors will work closely with you throughout the term to make sure you are prepared for these assignments. Four major assignments contribute to your grade as well as attendance.

Use the following breakdown to determine and plan for the grade you want to work toward in this class:

- To earn an A:** Demonstrate mastery of all four assignments. Attend 80% of class sessions on time (i.e., can be late or absent at most 3 times in the term), one field trip (or complete a make-up assignment), and complete the Responsible Conduct of Research Online Module.
- To earn a B:** Demonstrate mastery of three of the four assignments. Attend 80% of class sessions on time, attend one field trip (or complete a make-up assignment), and complete the Responsible Conduct of Research Online Module.
- To earn a C:** Demonstrate mastery on two of the four assignments. Attend ~70% of classes on time (can be late or absent at most 5 times in a term) and complete the Responsible Conduct of Research Online Module.
- To earn a D:** Demonstrate mastery on one of the assignments or attend < 70% of classes on time.

## Field Trips and Sea Level Solutions Day:

There are two field trips this semester and one outreach event. To earn an A or a B you must attend one field trip. The dates and times of the field trips are:

Sunday September 9, 2018: Measuring Urban Flooding in Miami in Shorecrest  
Meet: 7:00 am at MMC (or arrange to meet us at site)  
Return: MMC by 12 pm at latest

Saturday October 6, 2018: Measuring Urban Flooding in Miami in Shorecrest  
Meet 5:30pm at MMC (or arrange to meet us at site)  
Return: MMC by 10 pm at latest

The cumulative event of the course is the Sea Level Solutions Day. To earn an A or B you must attend:

Saturday October 27, 2018  
Meet by 7 – 7:30 am at a location TBD  
Done by 1 pm

## Assignments:

The majority of the work for this course will be done outside of class. We will practice, critique, and develop skills in class, but expect to spend, on average, two hours a week outside of class on class assignments.

**Late work.** Much of the progress you will make in this class hinges on assignments getting done at specific times. So, please try to get your work done on time. If something comes up communicate with me in advance. **Due date extensions require at least two full weekdays advanced approval from your instructors.** Late work that you have not spoken to an instructor about in advance will cause you to fail an assignment.

1) **Assignment 1: Experiment Notebook (Group & Individual).** You and your teammates should create a Google Doc as a notebook shared with your team and your mentor. Each week you and your teammates are responsible for updating your notebook **before Sunday at 5 pm.** Each person must write their own entry. Your mentor will review the notebook before the next class and discuss your progress with you in class.

**Overall Notebook Structure.** Your notebook should contain a table of contents and the following sections: Timeline, Background Research, Research Questions/Hypotheses, Materials/Data Sources/Data, Experimental Setup and proposed Analyses, Results, Conclusions and Implications, and a Personal Reflection page for each team member.

### **Content of weekly notebook entries:**

**a. Narrative and Evidence.** Each week **each group member** will enter a narrative of what they did that week in the appropriate section. Start your weekly entry with the date and your initials in bold. The narrative should focus on how you advanced the research project in this particular area as well as evidence of that advancement. Evidence could include: a list of research questions brainstormed, sites chosen to use in data analysis, citations that have been annotated for background, statistics chosen and why, a link to the section of the draft manuscript you worked on, etc.

*Special circumstances:*

- If you worked on different aspects in the same week, you may have entries in multiple sections of the notebook.
- If there was shared work accomplished that week, record everyone's initials on the entry and indicate who is entering the narrative.
- If you were not able to advance the research in a particular week, write an entry in the Timeline section detailing what you will do in the next weeks to make up for this.

**b. Reflection.** Each week students will also be asked to write a one paragraph reflection. A reflection prompt will be provided each week to guide this reflection. This reflection should be on your personal page in the notebook.

**Specifications to pass Experimental Notebook Assignment:** The experimental notebook must be updated weekly and turned in by 5pm on Sunday. Your weekly entries should be sufficiently detailed that a person not working on your project can read it and understand what you did and evidence must be provided to back up your description. Three late entries will be considered failure of the assignment.

2) **Assignment 2: Primary Research Paper (Group).** Once scientists have discovered a pattern they have two responsibilities for communication. The first is to communicate to the scientific community and the second is to communicate to the public. This assignment is the communication to the scientific community. Research papers are submitted to experts for review and commentary before they are published and authors make revisions based on this feedback. We will follow this cycle.

**Specifications to pass Primary Research Paper Assignment:** A scientific research report has five major sections: the introduction, methods, results, discussion, and citations. Below are the criteria that indicate mastery of each section. To pass this assignment your article must be 'accepted for publication' by two anonymous reviewers who will use these criteria to evaluate the paper. Your article may be 'returned without review' if you do not meet the minimum quality criteria of a complete manuscript with all five sections, clear writing, proper grammar, and in-text citations. You will have three opportunities for review. *If your manuscript is not 'accepted' by the third review, you will fail the assignment.*

Section	Content	Quality
<b>Introduction</b>	<input type="checkbox"/> Background facts and assumptions <input type="checkbox"/> Motivation for the study <input type="checkbox"/> Definitions of key terms <input type="checkbox"/> Literature references <input type="checkbox"/> Identify gap in knowledge will address in paper <input type="checkbox"/> Thesis statement, hypothesis, and/or research question	<input type="checkbox"/> Concise <input type="checkbox"/> Clear writing <input type="checkbox"/> Logical argument laid out <input type="checkbox"/> Proper grammar <input type="checkbox"/> Proper citations (APA format) <input type="checkbox"/> Accessible to science audience
<b>Methods</b>	<input type="checkbox"/> Logically follows from introduction <input type="checkbox"/> Describe the process of research <input type="checkbox"/> Analyses described as well as why they are appropriate <input type="checkbox"/> Conditions or assumptions of the study <input type="checkbox"/> Literature references, if necessary, to support procedures or design <input type="checkbox"/> Description of the source of the data	<input type="checkbox"/> Complete and in sufficient detail that reader understands exactly what was done <input type="checkbox"/> Laid out in a logical order <input type="checkbox"/> Concise <input type="checkbox"/> Clear writing <input type="checkbox"/> Proper grammar <input type="checkbox"/> Proper citations (APA format) <input type="checkbox"/> Accessible to science audience

<b>Results</b>	<input type="checkbox"/> Numerical or qualitative data and analyses are presented in sufficient detail <input type="checkbox"/> Visual aids(figures and/or tables) present <input type="checkbox"/> Captions, labels, and titles of visual aids present <input type="checkbox"/> Visual aids are described in text	<input type="checkbox"/> Aligned with research question/hypotheses/prediction <input type="checkbox"/> Avoids bias <input type="checkbox"/> Visual aids clearly communicate main findings <input type="checkbox"/> Labels and titles are clear <input type="checkbox"/> Logical order <input type="checkbox"/> Clear writing <input type="checkbox"/> Complete <input type="checkbox"/> Proper grammar <input type="checkbox"/> Accessible to science audience
<b>Discussion</b>	<input type="checkbox"/> Summary of key points from results <input type="checkbox"/> Interpretation of results <input type="checkbox"/> Defend or Answer thesis, hypothesis, or research question <input type="checkbox"/> Identify improvements or limitations of the study <input type="checkbox"/> Put research in context of published studies: have similar results been found by others? <input type="checkbox"/> Real-world application and/or policy suggestions <input type="checkbox"/> Identify future research	<input type="checkbox"/> Aligned with Thesis/Hypothesis/Research Question In-depth and concise <input type="checkbox"/> Logical argument <input type="checkbox"/> Clear writing <input type="checkbox"/> Proper grammar <input type="checkbox"/> Proper citations (APA format) <input type="checkbox"/> Accessible to science audience
<b>Annotated Bibliography</b>	<input type="checkbox"/> At least 9 citations <input type="checkbox"/> 3 -5 sentence <i>summary</i> of essential information from each article. <input type="checkbox"/> 3-5 sentence <i>reflection</i> on relevance of each article to the research. For example, is the article useful as a reference and if so, how? Is it different or similar to other references already collected? Does it contribute something unique? How does it help shape your argument?	<input type="checkbox"/> Concise <input type="checkbox"/> Clear writing <input type="checkbox"/> Proper grammar <input type="checkbox"/> Accessible to someone who has not read the article <input type="checkbox"/> Proper citations format (APA format)

3) **Assignment 3: What is it like to be a researcher? Reflection assignment** (Individual). The pathways to becoming a scientist and what scientists actually do are not always clear. In this assignment you will interview a scientist about their path and their research to get a clear picture of what it takes to do what they do. This is an opportunity to reflect on what you thought researchers did and whether a research career could be fulfilling to you. There are four steps to this assignment.

- a. *Identify a researcher* (faculty, staff, advanced graduate student, post-doc, or research associate in the Center for Aquatic Chemistry and the Environment, the Earth and Environment Department, Chemistry Department, or Department of Biological Sciences) *who is working on something that interests you*. To identify potential researchers visit the CACHE homepage (<https://crestcache.fiu.edu/index.html>) or departmental websites. Each person in your group should read a paper from a different researcher and be prepared to convince your group that this is the

person to interview. Read a research article where this researcher is first or last author (but not a review paper) from the primary literature on this topic.

- b. *Determine researchers to interview.* After reviewing each person's researchers, each group will rank them by who you most want to interview. **You will turn this ranking in to Sarah by Mon Sept 17 at 5 pm.** Only one group can cover each researcher, so you may not get your first choice. If you want to change your scientist after Week 5, e-mail me and I will let you know if anyone else has chosen your scientist already.
- c. *Contact Researchers to Set up Interview.* Send a professional email to the scientist you wish to interview. We will review the guidelines for a professional email in class. Ask them for the name of a graduate student or post-doc in their lab they could also contact. Write this person too. CC Sarah on these emails to receive credit. **These should be sent by 5 pm Mon Oct 1 at the latest.**
- d. *Interview Researchers.* As a group, come up with 5-10 questions you would like to ask these researchers about their path, their daily life as a researcher, and their research. Then interview them. Ideally, you will record this interview in some way for your reference later. *All group members must attend at least one interview, ideally both.* One person from each group should email me with where and when each interview was held and who was there by Weds Feb 28.
- e. Write reflection. **The reflection is due to Sarah on Sun November 18th by 5 pm.**

**Specifications to pass this assignment.** To pass this assignment you must:

- Demonstrate the timely completion of each of the four steps and attend at least one interview.
- Individually write a 3-4 page (double-spaced, Times New Roman 12 pt font) reflection on your interviews that answers the following questions concisely and clearly. What did you originally think a career in science would be like? What did you find out a career in science is actually like? What experiences have helped the researchers achieve their goals? Would being a researcher be a satisfying career for you? Why or why not? What would you change about a research career to make it more interesting to you?

- 4) **Assignment 4: Outreach and Leadership (Group).** Sea Level Solutions day is an effort to raise public awareness about sea level rise and other impacts of aquatic environments of the humans living in south Florida. As a culminating experience in the class, your group will develop a tabletop display to communicate about your research topic. In addition, you will be a team leader guiding a group of citizens in the collection of sea level data.

**Specification to pass this assignment:**

- Demonstrate timely arrival on Sea Level Solutions day that allows your group to set up your table before volunteers arrive.
- Develop an interactive tabletop display related to your research topic. Table for an hour at Sea Level Solutions Day.
- Lead a group of citizens in data collection successfully.

## Schedule of Topics:

<i>Week:</i>	<i>Date:</i>	<i>Topics of Day:</i>	<i>Suggested Experiment Notebook content for the week:</i>	<i>Due Sunday before current week's class at 5pm:</i>
1	Mon Aug 20	Introduction: Center for Aquatic Chemistry and Environment (CACHÉ) Introduction to the challenge of sea level rise  <i>Skills:</i> Finding Primary Literature; Writing annotated bibliographies	Annotate citations for articles read in class; Complete Responsible Conduct of Research NSF training module	
2	Mon Aug 27	Explore Available Data: DBHydro, Sea Level Solutions Center  What are suitable questions? Timeline for completing project	Find and annotate citations on own; Brainstorm research questions; Complete Responsible Conduct of Research if haven't already; Create timeline for accomplishing research project	<input type="checkbox"/> Experimental Notebook entries for Week 1
3	Mon Sept 3	No Class		
	Sun Sept 9	Field Trip 1		
4	Mon Sept 10	Types of studies Methods for observational studies	Describe your ideal study design; Identify what type of data you ideally would need to answer your question; find useable study sites	<input type="checkbox"/> Experimental Notebook entries for Week 2
5	Mon Sept 17	Conference with Mentors on Question, Study Design, and Data Available What should go in a Methods and Results section <i>Skill:</i> Working with Excel	Find and annotate relevant citations; start compiling data set; begin work on methods; Brainstorm appropriate ways to summarize your data; begin work on results section	<input type="checkbox"/> Experimental Notebook entries for Week 4 <input type="checkbox"/> Give Sarah ranked list of researchers to interview
6	Mon Sept 24	Writing an Introduction and Discussion <i>Skill:</i> Telling a story <i>Skill:</i> Professional emails	Identify potential hooks; Outline possible arguments for introduction; Find and	<input type="checkbox"/> Experimental Notebook entries for Week 5

			annotate relevant citations; begin introduction	
7	Mon Oct 1	Science Communication with the Public: Principles of effective communication	Develop idea want to communicate through Outreach; Brainstorm how to make interactive	<input type="checkbox"/> Experimental Notebook entries for Week 6 <input type="checkbox"/> CC Sarah on email to researchers requesting an interview
	Sun Oct 6	Field Trip II		
8	Mon Oct 8	Science Communication with the Public: Examples from previous classes.	Outline a plan of activities and materials for outreach; continue working on data collection	<input type="checkbox"/> Have set-up interview by this date. <input type="checkbox"/> Experimental Notebook entries for Week 7
9	Mon Oct 15	Science Communication: Working Day	An outline of what will say to people at your booth; Identify your hook; continue working on data collection	<input type="checkbox"/> Experimental Notebook entries for Week 8 <input type="checkbox"/> Send Brad a list of what supplies needed and/or files that need to be printed.
10	Mon Oct 22	Science Communication: Practice Outreach	Try activity out with family and friends and report feedback; describe revisions made to activity; Continue working on data collection	<input type="checkbox"/> Experimental Notebook entries for Week 9
	Sat Oct 27	Sea Level Solutions Day		
11	Mon Oct 29	Visualizing your data Interview Questions <i>Skill: Making figures in excel</i>	Brainstorm potential figures and determine which best illustrates the answer to your question; Find and annotate relevant citations; create figures and figure legends; continue to work on results section	<input type="checkbox"/> Experimental Notebook entries for Week 10
12	Mon Nov 5	<i>Skill: Writing an Introduction and Discussion</i>	Outline important points for the discussion; Find and annotate relevant citations; begin discussion	<input type="checkbox"/> Experimental Notebook entries for Week 11



13	Mon Nov 12	No Class		<input type="checkbox"/> <b>Report Draft by 5 pm Monday</b>
14	Mon Nov 19	What makes an article peer reviewed? Receive feedback	<i>N/A</i>	<input type="checkbox"/> Scientist Reflection Due <input type="checkbox"/> Can turn in revision by Sunday Nov 25 <sup>th</sup> for a second round of reviews
15	Mon Nov 26	<b>Wrap Up</b>	<i>N/A</i>	<i>N/A</i>
16	Mon Dec 3	No Class	<i>N/A</i>	<input type="checkbox"/> <b>Final Report Due by 5 pm</b>