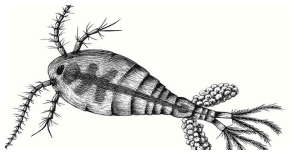
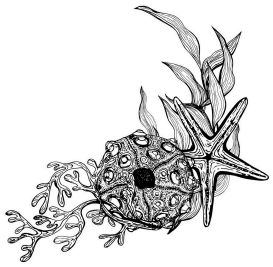
Fall 2024 **Aquatic Community Ecology (BIOL 312)** **SUNY Geneseo**

Instructor: Isidro Bosch, Professor of Biology
(Office ISC 260; E-Mail: Bosch@geneseo.edu; phone: 245-5303

Office Hours: Mon. 12:00-1:00, W 1:00-2:00,
Tue. 3:30-4:30 or by appointment



Course Schedule: MWF Lecture: 10:30 -11:20 ISC 325;
R 2:00-4:50 in ISC 105
4 cr (3 hr lec., 3 hr lab)



Course Description

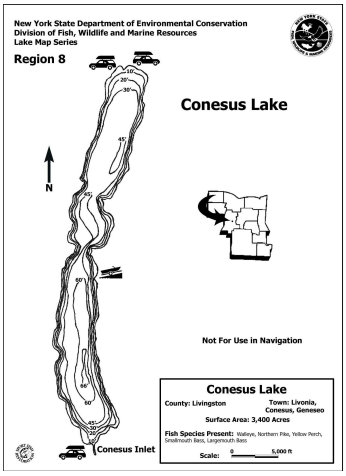
In this course we will study the communities and ecosystems that are characteristic of streams, lakes and marine environments. The topics we cover are intended to develop your understanding of the ecology of these systems and increase your awareness of the many ways human-related processes (ex. fishing) that affect their natural integrity and stability.

The success of this course depends on your contributions to our activities. Part of our time will be spent in a lecture format, but the goal is to engage in active learning through discussions of research, readings, and conversations about relevant topics.

The laboratory portion of the course will consist of several projects centered on a study of Conesus Lake and other Finger Lakes. These "lab" projects are intended to develop your technical skills in the field of aquatic biology and to build your understanding of lake ecology and water quality management. One major goal in conducting these studies is to use our expertise as biologists to gather information that could help protect the lake ecosystem and sustain the quality of services it provides to its stakeholders.

You'll be involved in two group studies during the semester. One is a "data mining" activity in which you will ask a pertinent question of your choice about the ecological history or state of a lake or lakes and then analyze data from previous studies to answer your question. The project will culminate in a group presentation. A second project will be a scientific investigation of some aspect of lake ecology, using Conesus Lake or other nearby lakes as our study systems. This will be an empirical research study consisting of multiple field data collection opportunities, sample and data analysis. Your deliverables will be a poster presentation to a public audience, an in-class presentation and a scientific journal-style report.

This year once again we'll be working primarily in Conesus Lake, one of the smallest and shallowest of the Finger Lakes. Located about 6 miles east of Geneseo, Conesus Lake serves as the drinking water supply for more than 12,000 residents of Livingston County- in fact it is the source of the very water you drink if you live or work in Geneseo. Residents refer to Conesus Lake as the jewel of Livingston County but in recent years the lake has experienced a textbook of problems such as colonization by multiple invasive species, excessive phosphorus and nitrogen inputs, and harmful algal blooms. Your projects investigating the Conesus Lake ecosystem will contribute to a better ecological understanding of important processes and perhaps even a better future for Conesus Lake.



Pre-requisites: Biology 203 or a comparable Ecology course

Readings: We do not use a textbook (see comments below). The instructor will assign readings and provide the articles as pdf files or other medium.

Intended Learning Outcomes:

To achieve minimum competency in this course should be able to:

- Describe and critically evaluate the key physical and biological processes that determine the organization and dynamics of freshwater and marine communities and ecosystems.
- Identify common patterns in the organization and dynamics of aquatic systems.
- Demonstrate an understanding of how human activities disrupt the ecological balance of aquatic ecosystems and critically evaluate potential strategies for management and mitigation of such problems.
- Demonstrate practical competence in carrying out selected analytical procedures and quantitative data analyses that are utilized in aquatic biology.
- Investigate and synthesize scientific literature and formally communicate scientific information in a manner that is effective for the discipline.

Learning outcomes will be assessed primarily through exams and a take home essay final. Success in meeting the fourth learning outcome will be assessed through your work in field and laboratory activities and by your contributions to the success of the three significant research assignments (see Grading section below).

Grades:

The final course grade will be determined by your performance in a variety of activities that are designed to develop academic and scientific competency in Biology.

Exams 48%: 3 midterm exams (43%) and one take-home final essay (5%).
Data Presentation 10%: Working in a group, you will give an oral report that quantitatively explores biological, physical or chemical trends based on studies of the Finger Lakes.
Poster Presentation 5%: Poster on your research project to be presented to a public audience at the Watershed Education Center, in Lakeville by Conesus Lake.
Research Report 15%: Formal written group report based on analyses carried out in the laboratory portion of the course. The report will follow a standard journal format.
Research "Chalk Talk" 5%: Present a "chalk talk" on your lake research to the class without computers or computer-generated graphics – you are asked to only use the whiteboard.
Discussion 2%: each student will lead a class discussion of a scientific paper assigned by the instructor; preparation and effectiveness in leading the class discussion will be evaluated.
Participation (16%): includes preparation for class and laboratory activities; participation in field trips, environmental analyses and laboratory activities; and contributions to the dynamics of class discussions. (Corresponding to 4 different parts of the semester).

Total Score	Grade Scheme
93-100 %	A
89 - 93	A-
86 - 89	B+
82 - 86	B
79 - 82	B-
76 - 79	C+
71 - 76	C
66 - 71	C-
61 - 66	D
< 61	E

Assignments and Due Dates	% of Final Grade
3 MT exams (9/23,10/21, 12/8)	10%,15% 18%
Final Exam Essay (12/13)	5%
Research Report (12/13)	15%
Leading Discussion (TBD)	2%
Data Mining Presentation (10/11)	10%
Poster(12/3), Chalk Talk (12/13)	10%
Participation	15%

Readings:

We do not use a textbook in this class as no single textbook provides adequate coverage of both freshwater and marine community ecology. Readings for lectures and group discussions will be from the scientific and popular literature. Articles will be made available primarily in digital format. Reading assignments listed by first author are included in the syllabus.

Fall 2023: Reference List of Readings for Aquatic Community Ecology

1. Cummins, K.W.1974. Structure and Function of Stream Ecosystems. BioScience 24: 631-641
   + supplementary reading on the phenomenon of stressed streams: epa.gov/caddis-vol2/caddis-volume-2-sources-stressors-responses-urbanization-stormwater-runoff
2. Zhu, B. 2006. Alteration of ecosystem function by Zebra Mussels in Oneida Lake: impacts on submerged macrophytes. Ecosystems 9:1017-1028.
   + supplementary reading on invasive macrophyte species in the Finger Lakes
   cayugacountywater.org/learn-the-issues/invasive-species/
3. Moss, B. 2011. Allied attack: Climate change and Eutrophication. Inland waters 1:101-105
   + supplementary reading on climate change effects on drinking water by Fillipelli & Ortiz
   theconversation.com/climate-change-threatens-drinking-water-quality-across-the-great-lakes-131883
4. Heisler, J. 2008. Eutrophication and harmful algal blooms: a scientific consensus. Harmful Algae 8:3-13 + supplementary reading on HABS forming species in New York State:
   dec.ny.gov/docs/water.pdf/researchguide.pdf
5. Hairston Jr., N. 2005. Species-specific Daphnia phenotypes: a history of industrial pollution and pelagic ecosystem response. *Ecology* 86:1669-1678. + supplementary reading on understanding lake food webs: *waterontheweb.org/under/lakeecology/11_foodweb.html*
6. Walsh *et al.* 2016. Invasive species triggers a massive loss of ecosystems services through a trophic cascade. PNAS 113:4081-4085. +supplementary reading Nature Conservancy page on Great Lakes invasives species:www.nature.org/en-us/about-us/where-we-work/priority-landscapes/great-lakes/great-lakes-aquatic-invasive-species-/
7. Mumby, P.J. *et al.* 2004. Mangroves enhance the biomass of coral reef fish communities in the Caribbean. Nature 427: 533-536. + supplementary reading on seagrasses: Ocean.si.edu/ocean-life/plants-algae/seagrass-beds
8. Hughes, TP. 1994. Catastrophes, phase shifts and large-scale degradation of a Caribbean coral reef. *Science* 265: 1547-1551. + supplementary reading on *Diadema* response network https://www.agrra.org/sea-urchin-die-off/
9. Ricci *et al*., 2022**.** Coral growth anomalies, neoplasms, and tumors in the Anthropocene *Trends in Microbiology 30:1160-01173.* +supplementary reading on stony coral diseases https://www.coris.noaa.gov/activities/stony_coral_tissue_loss_disease/
10. Coral restoration TBD
    Supplementary Reading: NOAA Fisheries Restoring Coral Reefs
    https://www.fisheries.noaa.gov/national/habitat-conservation/restoring-coral-reefs
11. Estes et al. 2011. Trophic Downgrading of Planet Earth. Science 333:301-306
    + supplementary reading on role of predatory fish: collegearchive.unc.edu/2017/03/01/predatory-fish/
12. Falkowski, P. 2012. The power of plankton. *Nature* 483: S17-S20
    + supplementary reading on iron controversy: *scientificamerican.com/article/iron-dumping-ocean-experiment-sparks-controversy/*

Maintaining an environment conducive to learning:

Because you are a small group, your individual contribution to the work in this class including lecture meetings and paper discussions is essential. Please try and attend all the lecture meetings. Missing one or two is not going to affect your participation grade but chronic absences will. It is important that you attend all laboratory meetings. Do your very best to arrive to class on time, stay through class, use your laptop and other technology only for class-related activities, and turn off your cell phone ringtones (including vibration mode).

Technology can be beneficial as a tool for education. For this reason, laptops and smartphones are permitted so you can take notes and view classroom materials. But please do not view social media websites, check your e-mail or play games. These diversions affect your work and distract those around you. I can usually tell when students are on-line, and it is distracting to me too. If you are being affected by the behavior of others around you, its ok to ask them to stop since their activities are disrupting your learning. Unexpected phone noises are disruptive and highly frowned upon in our class. If you have an emergency that requires your cell phone to be turned on just let me know so I am not surprised when it rings.

Because the class involves so much project work and field trips, it is important that we have efficient lines of communication. I will do my very best to deal with your emails quickly. However, while occasionally I will send or read emails outside of normal business hours, for the most part I will not reply to emails received after 5:30pm until the next day and weekend emails until Monday. Please know that I do not expect that you will read or respond to my messages outside of normal business hours.

Health and Wellbeing:

Your health and wellbeing are foundational to your ability to learn, and if you find that you are feeling unwell (physically or mentally) and it is impacting your ability to complete your coursework, don't hesitate to reach out to your professor. Please remember that it's never a mistake to ask for help. The Dean of Students (585-245-5706) can assist and provide direction to appropriate campus resources. We are a small group so there won't be any problem with me responding to individual needs as appropriate.

In a similar way, I will occasionally ask for some patience, flexibility and understanding on your part. I will generally try to post lecture notes at least 2 hours before class and have your work graded within a week after submission. If I am slow some time to grade an assignment, if I am a bit late posting a video lecture, please be patient (and feel free to send a 'nudge'). You will never suffer any disadvantage in the course because of delays on my part.

Diversity and Equity:

It is my intent to create a learning environment that supports all students. I believe the diversity that you bring to this class should be viewed as a resource, strength, and benefit. I strive to present materials and activities that are respectful of gender identity, sexuality, disability, age, socioeconomic status, ethnicity, race, nationality, religion, and culture. If you have any suggestions to improve how the course is run or to better the culture of our class please don't hesitate to let me know. For ideas, questions, or concerns related to diversity, equity, and inclusion in the Biology Dept., please reach out to bio-diversity@geneseo.edu.

Schedule for Aquatic Community Ecology Course

Week		Mon	Wed	Th Lab	Fri
1	Lecture	Lec 1. Course Intro	Lec 2. Stream Ecology		Lec 3. Stream Ecology
Aug. 26- 30	Reading	None	None		*1. Cumins*
	Due				
	Lab			Field Equipment	
2	Lecture	**Labor Day-No classes**	Lec 4. Lake Macrophytes	Macrophytes Survey	Lec 5. Lake Macrophytes
Sep. 2-6	Reading			*State of Conesus Lake*	*2. Zhu*
	Due				
	Lab			*Conesus Lake*	
3	Lecture	6. Stratification and Climate	7. Nutrients	Field: Stratification	8. Nutrients
Sep 9-13	Reading				*3. Moss*
	Due				
	Lab			*Conesus Lake*	
4	Lecture	9. Phytoplankton	10. Primary Production	Trophic State	11. Review for Exam 1
Sep 16-20	Reading				*4. Heisler*
	Due				
	Lab			Hemlock Lake	
5	Lecture	**12. Exam I**	13. Zooplankton	Zooplankton	14. Zooplankton
Sep 23-27	Reading	Lec 1-11			*5. Hairston*
	Due				
	Lab			Conesus Lake	
6	Lecture	15. Herbivory	16. Food Web Dyanamics		17. Top-Down Forces
Sep 30-Oct 4	Reading				
	Due				
	Lab			Microbes	
7	Lecture	18. Biomanipulation	19. Invasive Species		20. Estuaries/Mangroves
Oct. 7-11	Reading		*6. Walsh*		
	Due				
	Lab			Conesus Lake	
8	Lecture	Fall Break	21. Seagrasses	Lab	22. Review for Exam 2
Oct. 14-18	Reading		*7. Mumby*		
	Due				
	Lab			Data Mining Presentations	

					F 2024
Week		**Mon**	**Wed**	**Th Lab**	**Fri**
9	Lecture	**23. EXAM 2**	24. Coral Reefs/Competition		25. Reefs
Oct. 21-25	Reading	Lec 13-22			*8. Hughes*
	Due				*due Report Methods*
	Lab			Project Sample Analysis	
10	Lecture	26. Reef Health	27. Coral diseases		28. Restoration
Oct. 28 -	Reading		*9. Ricci et al.*		*10. Restoration* TBD*
1-Nov	Due				*Due Report Intro*
	Lab			Project Sample Analysis	
11	Lecture	29. Rocky shores	30. Rocky/Subsidies		31. Start Kelp Beds
Nov. 4-8	Reading				
	Due				
	Lab			Writing Results	
12	Lecture	32. Trophic Cascades	33. Regime shifts		34. Water Column
Nov. 11-15	Reading		*11. Estes*		
	Due				
	Lab			Project Work	Due Results Section
13	Lecture	35. Design Posters	***Thanksgiving***	***Thanksgiving***	***Thanksgiving***
Nov. 18-22	Reading		***Break***	***Break***	***Break***
	Due				
	Lab				
14	Lecture	36. Oceanography	37. Work on Posters		37. Deep Sea
Nov. 25-29	Reading		*12. Falkowski*		
	Due				
	Lab			Posters Due	
15	Lecture	Poster preview	**Wed. Exam review**		**39. EXAM 3**
Dec. 2-6	Reading		Lec 24-36		
	Due		Tuesday Conesus Lake Watershed		
	Lab		Education Center	Project Work	
16	Lecture	41. Synthesis			Final Exam
Dec. 9-13	Reading				3-6 PM
	Due	Essay topics			Essays Due
	Lab				Final Reports Due