Principles of Ecology (Biology 203)
Spring 2023
(MWF 10:30 – 11:20 am Newton 205)

Course overview

This course will provide an overview of ecology, the study of the interactions among organisms and between organisms and their environment. One of the central goals of this science is to identify, describe, and explain the processes that determine the distribution and abundance of organisms in nature. We will survey this discipline across multiple levels of organization: the individual organism, the population, the community, and the ecosystem. Throughout the course, we will emphasize the central role of natural selection and evolutionary thinking in the study of ecology. The course will demonstrate how ecologists employ the scientific process in answering questions about ecological systems. We will learn about (and practice using) quantitative tools like mathematical models, statistics, and graphical representations of data to help us understand ecological systems. The course will also explore how ecological principles can be applied to environmental problems and conservation challenges.

Instructor: Dr. Jennifer L. Apple (*she/her/hers*) Office: ISC 258   Lab: ISC 340
   e-mail: applej@geneseo.edu   Phone: 245-5442

Office hours: In person (ISC 206) or virtual (Teams): M 11:30 am-12:30 pm, W 4-5 pm
      Virtual only: R 10:30 – 11:30 am (see Canvas for how to connect)

Course description from Bulletin: A study of the interrelationship of organisms and their environment. Emphasis is placed upon levels of ecological organization. (3 credits)

Prerequisites: Biol 117 and Biol 119   Course website: canvas.geneseo.edu

What you will need: Internet access, computer with Microsoft Word, Microsoft Excel, R, and RStudio installed. Top Hat account (www.tophat.com, join code 463616)

No required textbook (we will use open-access, online resources), but recommended texts include:
Elements of Ecology by Thomas M. Smith & Robert Leo Smith (2015, 9th ed or prior editions)
A Primer in Biological Data Analysis and Visualization Using R by Gregg Hartvigsen (1st ed, 2014 or 2nd ed, 2021)
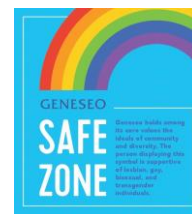
Learning outcomes

Upon completion of this course, successful students will be able to:

- apply evolutionary theory to help explain ecological patterns and to develop hypotheses for how ecological interactions contribute to evolutionary outcomes
- apply knowledge of ecological processes and develop models to explain ecological patterns and make predictions
- visualize, analyze, and interpret data to document ecological patterns and test hypotheses
- apply knowledge of ecological concepts to predict impacts of human activities on ecosystems and biodiversity
- synthesize ecological knowledge to evaluate the value of healthy ecosystems and the sustainability of human activities
- productively collaborate in a group to solve problems and communicate scientific information and results effectively

How is your grade determined?

<u>Unit tests</u> (40% of grade)

After each of our 5 course units, you will have an in-class test.
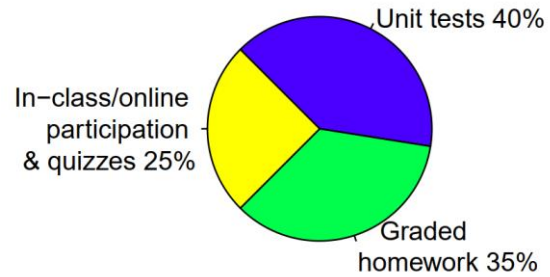
<u>Graded homework</u> (35% of grade)

These assignments are graded for correctness and quality and may include both individual assignments and some group activities. They will mostly be completed outside of class.

Ecological data & models (EDM) assignments.   Homework for this course will include assignments dealing with using the statistical and programming software R to answer ecological questions. These assignments will involve entering, manipulating, visualizing, and analyzing data in R as well as interpreting your results. They will also include using R to simulate ecological processes and/or to fit models to data. Additional individual and group activities may make use of R.

Community science assignments. As part of this course you will participate in the collection and organization of scientific observations through a community science program. Community science describes efforts to engage curious individuals from the general public in collecting useful scientific data in collaboration with professional scientists. Often such programs involve online platforms through which participants can submit observations and data to databases that are set up and curated by experts. The online interface iNaturalist (http://www.inaturalist.org/pages/about) collects natural history observations of plants, animals, and other organisms in an effort to help document biodiversity and the distribution of species. You will collect your own observations as well as do some analysis and synthesis of information in the iNaturalist database. My hope is that these activities will help you appreciate the natural world around you and find enjoyment in observing it, stimulate your curiosity, and perhaps encourage you to continue to participate in community science!

Other assignments engaging with primary literature and ecological data. Some assignments will involve working with real ecological data or interpreting the scientific literature. Scientists communicate their findings through peer-reviewed publications. As a developing scientist, it is important that you improve your skills in reading, interpreting, and evaluating this primary literature, as well as practice the skills of communicating scientific ideas and data.

<u>In-class/online participation & quizzes</u> (25% of grade)

These components include responding to Top Hat questions in class, working with your group on in-class activities, contributing posts to discussion boards, and weekly review quizzes online.

<u>Grading scale</u>

A 93.0-100%	B 83.0-86.9%	C 73.0-76.9%
A- 90.0-92.9%	B- 80.0-82.9%	C- 70.0-72.9%
B+ 87.0-89.9%	C+ 77.0-79.9%	D 60.0-69.9%

I follow conventional rounding procedures, so a 92.94% would represent an A- (rounded down to 92.9%), while a 92.95% would be rounded up to 93.0% and an A.

How to be successful in this course

Come prepared to class sessions

Class sessions often consist of activities that reinforce course content and practice skills that you will need to demonstrate on exams. You will get more out of the class and each class session if you follow instructions on Canvas for any necessary preparations like readings, watching videos, or viewing websites. I will also be using questions delivered via Top Hat to help reinforce concepts and gauge your understanding of lecture material (www.tophat.com, join code 463616); you can access this tool using a smartphone, tablet, or your laptop. On some days I will ask you to bring your laptops for collaborative activities using Google Docs or exercises involving R. You will also need your laptops on days you are working with your groups to complete online assignments. It is your responsibility to check Canvas and your e-mail frequently for course-related announcements. Make sure you set your notifications in Canvas to keep up to date with course activities.

Take advantage of course resources and study aids

I maintain a running Google doc of study questions for lectures and online readings which can serve as review questions for each unit test to help guide your studying. Review of these questions before lectures might help focus you on the most important concepts. If you keep up with reviewing these questions, you can be better prepared for unit tests without a lot of last-minute cramming. PDFs of the lecture slides are posted in a Google folder.

Embrace learning R

One of my objectives in this course is to help you develop and refine skills in visualizing, analyzing, and interpreting data. R is a powerful and free platform for statistical analysis and programming and an excellent tool for achieving this goal. Learning R now will provide skills that you can build on and use for other courses (and even a job) in the future. You will have the opportunity to practice using R both in class and for homework assignments.

Come see me if you need help!

Office hours. I will be available in room ISC 206 at designated times for in-person office hours and will also offer some virtual office hours via Microsoft Teams. See Canvas for details. If any of the posted times do not suit you, you can email me to set up another appointment for a video conference. When doing so, please suggest some possible times that you are available to meet in your email to make our correspondence more efficient.

Email communication. I can often answer your questions by email as well. I will try to get back to you within 24 hours. If you have a question about R, attach both your complete R code (the whole .Rmd or .R file, not just the part with an error) and the data file (.csv) that you are using with it (if applicable) to your email message. You can easily attach these files to your email message. Let me know any error messages you are getting, but recognize that a screenshot of an error message alone is not helpful in diagnosing your problem without the actual code itself. Feel free to seek help in this way - sometimes it only requires a second set of eyes to solve your problem!

Back up your work

Do yourself a favor to avoid last-minute computer calamities and stress by saving your work frequently and backing up your files using a cloud storage system like Google Drive, Dropbox, OneDrive, or some other service. CIT provides some tips on data backup. Also, don't wait until the day before a deadline to get started!

Respect our learning environment

Please help promote an effective learning environment by avoiding distractions and disruptions to others. Silence your cell phone and refrain from texting/browsing while in class except when phone use is needed for class participation (i.e., Top Hat questions). I will permit the use of laptops for taking notes (and of course in-class activities that require them) but will ask you to turn them off if I see they are not being used for classroom activities and/or are distracting to others. Please be courteous to me and your classmates by arriving on time.

Attendance guidelines, COVID-19, and your well-being and mental health

Guidelines for attendance and public health considerations

SUNY Geneseo is a residential liberal arts college where we all learn together in a shared space. Our classroom community is vital for engaging in discussions, solving problems, and answering questions together. I strive to create an interactive and collaborative classroom space, and in return I expect you to attend and engage in the activities.

We know that COVID is shifting from a pandemic to endemic stage, and it's possible that some of you may get infected over the course of the semester. Because we want you to be successful and because we value your contribution to the course, we expect you to prioritize consistent attendance. If you are experiencing symptoms associated with COVID on a day we have class, please take a self-test. If you test negative and feel well enough to attend, put on a well-fitting mask, come to class, and maintain physical distance as much as possible. If your symptoms do not allow you to attend class, stay home (except to go to the health center), rest, and take care of yourself. See this page if you have questions about COVID, like what to do if you test positive or are exposed to someone with COVID: https://www.geneseo.edu/covid. I can support you to keep up with class if you are out for COVID or other health-related reasons, but I need you to be proactive in letting me know when you will be absent and why. Although I can work with you on keeping up, you may miss some course content and extended absences may impact your ability to realize your full potential in this class. For extended absences (i.e., more than a couple of days of classes), you should contact the Dean of Students (585-245-5706, http://www.geneseo.edu/dean_students) who can assist with reaching out to all of your professors about challenges you face and accommodations you may require. I want you to succeed and learn in this class, and I want to protect our community from COVID as best as I can.

Student well-being and mental health

Prioritizing well-being can support the achievement of academic goals and alleviate stress. Eating nutritious foods, getting enough sleep, exercising, avoiding drugs and alcohol, maintaining healthy relationships, and building in time to relax all help promote a healthy lifestyle and general well-being.

As a student, you may experience a range of challenges that can impact your mental health and thus impact your learning; common examples include increased anxiety, shifts in mood, strained relationships, difficulties related to substance use, trouble concentrating, and lack of motivation, among many others. These experiences may reduce your ability to participate fully in daily activities and affect your academic performance. Students are strongly encouraged to communicate their needs to faculty and staff and seek support if they are experiencing unmanageable stress or are having difficulties with daily functioning. The Dean of Students can assist and provide direction to appropriate campus resources.

SUNY Geneseo offers free, confidential counseling for students at the Lauderdale Center for Student Health and Counseling; seeking support for your mental health can be key to your success at college. You can learn more about the various mental health services available on campus at health.geneseo.edu. To request a counseling appointment, please complete the online form through myhealth.geneseo.edu. Getting help is a smart and courageous thing to do -- for yourself and for those who care about you.

Diversity and inclusion

The Department of Biology has pledged to develop more inclusive pedagogical practices and work to promote diversity in our curriculum while confronting racism, particularly ways in which science has been used to sustain it (Biology Department's Statement in Support of Racial Justice, also available on Department of Biology website). This course is no exception, and to help achieve these goals I will be highlighting the work of a diversity of scientists and incorporating topics that demonstrate the impacts of systemic racism as it pertains to the study of ecology. I hope to create an inclusive and supporting learning environment in which anyone can succeed, regardless of your identity (race, gender, ethnicity, sexual orientation, age, socioeconomic status, religion, and ability). I want to provide for students' growth as learners and scientists and promote a sense of belonging.

Land acknowledgment

Land acknowledgements are expressions of sorrow and remembrance to those whose historic territory one resides on. Geneseo resides on the historic homelands of the Seneca Nation of Indians and Tonawanda Seneca Nation. As stated in the Community Commitment to Diversity, Equity, and Inclusion, "we at SUNY Geneseo have an obligation to recognize all who, through history or identity, have been marginalized or oppressed, made invisible or silenced." I encourage you to learn more about these original occupants and those indigenous to other places you have lived. You may consider using the Native Land app and/or websites such as sni.org to learn more about the community of more than 7,000 enrolled Indigenous Peoples**.**

Other course policies

Late work

I generally will not re-open online quizzes or discussion posts if you miss a deadline unless there are extenuating circumstances. These deadlines are important to maintain as tools to assess your progress in learning the material and to interact with peers in real-time discussions. Graded homework assignments will be penalized by a loss of 5% of the total assignment's points possible per day and will not be accepted at all after graded work has been returned to students or answer keys have been provided. (But if you think you must turn in something late because of extenuating circumstances, feel free to discuss the situation with me and we can negotiate terms.) If meeting these deadlines becomes a problem for

you, please discuss your situation with me and we can work toward a solution to help you keep up with the class.

Plagiarism and academic dishonesty

Plagiarism and other forms of academic dishonesty (cheating, turning in another student's work as your own) will not be tolerated. Evidence of academic dishonesty is grounds for a score of zero on any assignment and further action including notifying the department chair, Dean of Academic Planning and Advising, Dean of Students, and Student Conduct Board, which can result a report filed with the Dean of Students.

Plagiarism. According to the Academic Dishonesty Policy in the Student Handbook (https://www.geneseo.edu/handbook/academic-dishonesty-policy), plagiarism includes the following:
1. direct quotation without identifying punctuation and citation of source;
2. paraphrase of expression or thought without proper attribution;
3. unacknowledged dependence upon a source in plan, organization, or argument.

In SUNY Geneseo's policy, "Plagiarism is the representation of someone else's words or ideas as one's own or the arrangement of someone else's material(s) as one's own." Take care to properly cite sources of ideas, figures, data, etc. (including internet sources) in your writing and presentations. Even if you properly cite your source, when you borrow wording and sentence structure from the original source and pass it off as your own (i.e., by not using quotation marks), you are guilty of plagiarism. Learn how to paraphrase in your own words information from the original source.

Working with students on homework. Although I do not mind if you work with other students on homework assignments, you must each produce original written answers to the questions and prepare or adapt code on your own (no copying and pasting from classmates). Identical or highly similar responses from two or more students suggest answers are being copied and all students may receive a zero or substantial penalty on the assignment. Feel free to collaborate and help each other, but always turn in your own work.

Use of AI tools. All work on written assignments should be in your own words and represent your own thoughts and opinions (or those of your group members in the case of group assignments). You may not use a large language model, such as OpenAI's chatGPT, to edit or generate text because it is not guaranteed to be free from using the intellectual products of others.

Copyright statement

Many of the materials that are provided to students in this course have been created by me. Students would be best to assume that all course materials are protected by legal copyright. Copyright will be indicated by a "© DATE AUTHOR" on the document. Copyright protection means that reproduction of this material is prohibited without the author's consent. Thus, students are prohibited from sharing or posting copyrighted material to any websites outside our course Canvas site. Students are also prohibited from reproducing material to be shared with other more limited groups (*e,g.,* sorority/fraternity test bank).

Department of Biology minimum competence requirement

To graduate with a biology major, students must attain a grade of C- or better in all required biology courses, excluding electives. A grade of C- must be achieved in any course before it can be used as a prerequisite for another course. A student may only repeat a required biology course or related requirement once for major credit and the course must be taken at the next offering of the class. If the student does not earn at least a C- on the second taking of the class, they will not be able to complete the major.

Religious observation and class attendance

New York State Education Law 224-a stipulates that "any student in an institution of higher education who is unable, because of [their] religious beliefs, to attend classes on a particular day or days shall, because of such absence on the particular day or days, be excused from any examination or any study or work requirements" (see https://www.geneseo.edu/apca/classroom-policies). SUNY Geneseo has a commitment to inclusion and belonging, and I want to stress my respect for the diverse identities and faith traditions of students in my class. If you anticipate an absence due to religious observations, please contact me as soon as possible in advance to discuss your needs and arrange make up plans.

Military obligations and class attendance

Federal and New York State law requires institutions of higher education to provide an excused leave of absence from classes without penalty to students enrolled in the National Guard or armed forces reserves who are called to active duty. If you are called to active military duty and need to miss classes, please let me know and consult as soon as possible with the Dean of Students.

Student success resources

Accessibility and accommodations

SUNY Geneseo is dedicated to providing an equitable and inclusive educational experience for all students. The Office of Accessibility will coordinate reasonable accommodations for persons with disabilities to ensure equal access to academic programs, activities, and services at Geneseo. Students with letters of accommodation should submit their letter to each faculty member and discuss their needs as soon as possible. Please contact the Office of Accessibility Services for questions related to access and the process for requesting academic accommodations: access@geneseo.edu, 585-245-5112, www.geneseo.edu/accessibility-office.

Reporting bias-related incidents

Here at SUNY Geneseo, we want to provide a space where everyone feels welcome to learn and grow in their identities as well as in their role as students, faculty, and staff. If in the unfortunate instance you experience an incident of bias, we encourage you to reach out to the we encourage you to reach out to the Chief Diversity Officer (routenberg@geneseo.edu), Interim Director of Multicultural Affairs (nweathers@geneseo.edu), and/or our University Police Department. In trying to create an environment that facilitates growth through diverse thoughts and ideas, reporting incidents of bias – including threats, vandalism, and microaggressive behaviors – can help bring a better understanding of our campus climate as well as provide opportunities for learning and restoring harm.

Other resources

Additional resources are available to support your academic success and well-being, including [academic support services](), [library research help](), [computer and technology support](), food security support, and emergency funding. See the "Student Success Resources" link on the Canvas course page for more information about these services.

Other learning outcomes met by this course

In addition to the specific learning outcomes outlined on p. 1, this course also fulfills learning outcomes for the SUNY Natural Science General Ed requirement and for the Sustainability and Contemporary Global Challenges components of the "Participation in a Global Society" area of Geneseo's Learning Outcomes for Baccalaureate Education (GLOBE).

SUNY Natural Science General Ed requirement

Students will demonstrate

- the ability to analyze data
- understanding of the methods scientists use to explore natural phenomena, including observation, hypothesis development, measurement and data collection, experimentation, evaluation of evidence, and employment of mathematical analysis
- the ability to apply scientific data, concepts, and models

GLOBE Sustainability requirement

Students will be able to

- identify and analyze major sustainability challenges and solutions at local to global scales
- understand the interactions between political, economic, socio-cultural, and environmental systems
- understand the roles of power, influence, and inequity in sustainability

GLOBE Contemporary Global Challenges requirement

Students will

- understand how local and global systems depend upon one another
- apply global perspectives in addressing challenges and solving problems

Principles of Ecology – Spring 2023
Course Schedule

*Note: Deadlines and topics covered are subject to change; consult Canvas for most up-to-date information. Only major graded assignments are listed. See Canvas for announcements of due dates for weekly quizzes, group activities, and small homework assignments as well as for links to short readings or videos to read/view before each class. *Indicates laptops needed in class that day.*

Day	Date	Topics & activities	Assignment due dates
		Unit 1: Evolution, the organism, and the environment	
W	25 Jan	Introduction to course, ecology	
F	27 Jan	Experimental design and introduction to statistics	
M	30 Jan	Natural selection and evolution*	
W	1 Feb	Natural selection and evolution; Hardy-Weinberg	
F	3 Feb	Applying HWE (group activity*)	
M	6 Feb	Global and regional climate patterns	
W	8 Feb	Coping with environmental variation	
F	10 Feb	Climate change science	EDM 1 due
M	13 Feb	Climate change and species responses: lizards in the cold (group activity*)	
W	15 Feb	*Unit 1 test*	
		Unit 2: Population ecology	
F	17 Feb	Exponential growth; life tables	
M	20 Feb	Demography and matrix population models and R*	
W	22 Feb	Life history patterns	
F	24 Feb	Logistic growth	
M	27 Feb	Predicting population growth; practice problems*	
W	1 Mar	Population responses to climate change (group activity*)	
F	3 Mar	Conservation biology	EDM 2 due
M	6 Mar	Arboretum visit – *meet in Arboretum*	Sign up for iNaturalist
W	8 Mar	*Unit 2 test*	
		Unit 3: Species interactions	
F	10 Mar	Outcomes of competition	
		SPRING BREAK – 11 Mar – 19 Mar	
M	20 Mar	Competition model	
W	22 Mar	SIR model and R*	
F	24 Mar	Parasitism	
M	27 Mar	Predator-prey interactions	
W	29 Mar	Herbivory and mutualisms	
F	31 Mar	Invasive species*	EDM 3 due
M	3 Apr	Primary lit/scientist spotlight: urban streams (group activity*)	
W	5 Apr	*Unit 3 test*	
		Unit 4: Community & landscape ecology	
F	7 Apr	Community structure – measuring diversity	
M	10 Apr	Biomes	

Day	Date	Topics & activities	Assignment due dates
W	12 Apr	Succession	
F	14 Apr	Island biogeography	5 iNaturalist observations due
M	17 Apr	Landscape ecology	
W	19 Apr	Primary lit/scientist spotlight: diversity & disease (group activity*)	EDM 4 due
F	21 Apr	Urban ecology, ecosystem services, and socioeconomics (group activity*)	
M	24 Apr	*Unit 4 test*	
W	26 Apr	***GREAT DAY – no class***	
		Unit 5: Ecosystem ecology & global change	
F	28 Apr	Primary production	
M	1 May	Secondary production	
W	3 May	Nutrient cycling	
F	5 May	Biogeochemical cycles & human impacts	
M	8 May	Climate change impacts & solutions	8 iNaturalist observations due
W	10 May	Sustainability and feeding the world (group activity*)	
F	12 May		Final iNaturalist reflection due Fri
M	15 May	*Unit 5 test in final exam period:* 8:00 – 10:30 am	

Tests and due dates for major out-of-class assignments

Test dates are final; other due dates could be adjusted.

Unit tests		Ecological data & models assignments		Other major assignments	
Unit test 1	W 15 Feb	EDM assignment 1	F 10 Feb	5 iNaturalist observations	F 14 Apr
Unit test 2	W 8 Mar	EDM assignment 2	F 3 Mar	Final 8 iNat observations	M 8 May
Unit test 3	W 5 Apr	EDM assignment 3	F 31 Mar	iNat final reflection/report	F 12 May
Unit test 4	M 24 Apr	EDM assignment 4	W 19 Apr		
Unit test 5	M 15 May				