The ecology laboratory is designed to complement the second-year ecology course, Principles of Ecology (Biology 203). Laboratories will consist of research projects that address questions at each level of ecological organization, from organisms to populations, communities, and ecosystems. Emphasis is placed on the types of research questions and designs used by a variety of sub-disciplines of ecology to expose students to the diverse nature of this field. Students will be engaged in all aspects of the development of an ecological study: making observations, formulating hypotheses and predictions, designing experiments and strategies for data collection, statistical and graphical analysis, interpreting results, and reporting findings in written and oral formats.

Instructor: Regina Clinton
Office: ISC 139
Phone: 245-6051
e-mail: clinton@geneseo.edu

Lab: ISC 107
Office hours: MW 9:00-10:30 am, T 1:00-2:30 pm
(I am also available to meet with students by appointment outside of office hours.)


Learning Outcomes

Successful students will be able to:

- make observations, generate hypotheses and carry out simple experiments and/or collect field data to answer questions from different sub-disciplines in ecology
- collect, organize, analyze and present ecological data using appropriate sampling methods, instrumentation, quantitative statistical and graphical analyses
- explore and evaluate the primary ecological literature to provide background information for your studies as well as to help put your results into the context of other ecological research
- communicate their findings using the conventions of scientific writing in reports which include:
  1) Introduction - identifies the context for the work, citing previous research
  2) Description of Methods
  3) Results including figures, tables, and statistics
  4) Discussion clearly identifies and explains the key results and their significance

Course Organization

Working in groups of four, students will cooperate to set up and run experiments or make observations, collect data, and prepare a formal lab report for each of the four projects done over the course of the semester. Because some projects require more time and steps than others, we may be engaged in several projects at one time.
Overview of Projects

**Project 1** Mimicry and predation risk (Behavior/evolutionary ecology) – In this experiment, we will observe and quantify the responses of local birds to the availability of artificial prey that vary in appearance and palatability. Through this study we will investigate factors that influence the effectiveness of Batesian mimicry as an anti-predator strategy and document patterns in bird foraging behavior.

**Project 2** Goldenrods and insect galls (Population ecology) – In this project we will sample stems of goldenrod plants in the field to measure the incidence of galls caused by various gall-forming insects. In the lab, we will dissect galls and identify their inhabitants. Data collected may include the spatial distribution of galls within and between patches of plants, attributes of plants with and without galls, and predation and/or parasitism rates on galling insects.

**Project 3** Forest communities (Community ecology) – We will learn how to quantitatively describe a forest community using plot and plot-less sampling techniques. We will calculate diversity indices and standard measures of plant community structure to compare forest composition and structure in at least two contrasting environments in a local forest stand.

**Project 4** Soil CO2 emission (Ecosystem ecology) – In a forested ecosystem, we will investigate factors that affect soil CO2 emission, a process that results from both root respiration and decomposition of organic matter in soils. Using the soda-lime method we will determine the effects of particular microclimate or soil characteristics on the rate of CO2 emission in a field incubation experiment.

**Expectations**

There will be a group, as well as an individual component on each of the four projects covered in lab. For the group component, it’s very important to establish a good working relationship with your peers as all members of your group will be expected to participate in the design/set-up, collection and analysis of data. You will also be expected to contribute to the writing, editing, proof-reading and commenting on any group assignment. All files (Excel spreadsheets, R scripts, Word, etc.) used for analyzing data/construction of any assignment must be submitted to the designated drop box on Canvas (or points will be deducted). Group members will evaluate your participation/contribution after each submission of group assignments. This peer evaluation will be used in the calculation of your participation grade.

We will be developing your lab report writing skills in the lab. Independently, you will write the Introduction (Project 1) and Methods (Project 2) sections of a lab report. As a group, you will write the Discussion section (Project 3) and conclude with a complete lab report for the Mimicry and predation risk Project 4.

Your final lab report will include the following sections:

1. Introduction
2. Methods
3. Results
4. Discussion

Your report should also include a descriptive title, list of authors, and a literature cited section.
**Course Evaluation**

Grades will follow the following point distribution:

- > 93%, A
- 90-93%, A-
- 87-89%, B+
- 83-86%, B
- 80-82%, B-
- 77-79%, C+
- 73-77%, C
- 70-72%, C-
- 60-69%, D
- < 60%, E

**Individual 35%**
Lab Report Development: writing Introduction, Methods sections

**Data Analysis**

**Group 35%**
- Project 4: Complete Soil CO₂ Emissions Lab Report - all members receive same grade
- Data Analysis of Goldenrod, Forest Communities & Soil CO₂
- Results Sections of Goldenrod, Forest Communities & Soil CO₂

**Quizzes 15%** (In-lab and Online)

**Participation/Presentations 15%** (includes preparedness, peer evaluation, in-class assignments, engagement in lab work, timeliness of assignments, organization & effectiveness of the PowerPoint presentations)

**Course Policies**

**Lab attendance.** Your participation in lab every week is expected. Unexcused absences will negatively affect your participation grade and increase the workload of your fellow group members. If given advance warning of a verifiable absence (college activity, family emergency, illness) there might be the option of attending Dr. Apple’s lab on Tuesday from 2:00-4:50, with written documentation for legitimate absences.

**Student Athletes.** Intercollegiate athletics are an important part of a “rich co-curricular” experience while at college; however, it is important to remember academics come first. As such, you will be expected to make up any and all labs missed due to sporting activities. Your coach should send me an e-mail outlining any and all games/intramurals/etc. that will require you to miss your scheduled lab time.

**Lab preparation.** You are expected to pay attention to the syllabus, emails from me, and posted announcements on Canvas and come prepared for each day’s planned activities. If we are doing a field-based activity, make sure you are dressed for the weather with appropriate outerwear and shoes that can get muddy or wet – it is your responsibility to check the weather conditions and use your judgment about what to wear. Bring all lab-related handouts to each lab session (especially previously collected data), and when requested, bring your laptops. Sometimes plans for a lab session may change at the last minute due to weather; make sure you check your email on the day of a lab for any changes. Please be courteous to the instructor and your classmates by arriving on time, particularly on field trip days.

**Quizzes.**

*Online Quizzes:* There are NO online make-up quizzes. You are given advance notice of approaching quizzes so there are no excuses for not completing a quiz, barring a prolonged verifiable illness. It is always best to complete your quiz a couple of days in advance to ensure
something more important doesn’t come up that results in you missing a quiz. Online Quizzes will be delivered one question at a time with NO backtracking allowed. Once you move on to the next question you are not permitted to return to any previous questions. Any skipped questions will result in loss of points, so consider all questions thoroughly before moving on to the next question. If you lose your internet connection, your quiz will be submitted with whatever questions are answered and any unanswered questions will result in loss of points. Therefore, it is critical to have a good network connection to receive full credit. You will be given an unlimited time to complete online quizzes.

*In lab Quizzes:* There are no make-up quizzes unless you have a verifiable excuse and/or make previous arrangements with me.

**Office hours and email.** I’m happy to meet with you at times other than my office hours if your schedule does not allow you to attend office hours. Send me an e-mail outlining your problems and or concerns with some possible times that you will be available to meet. It’s always best to not wait till the last minute when completing your assignments, so you have time to check in with me should you encounter a problem. Concerning e-mails: Please do not expect an immediate response – I will try to get back to you within 24 hours. If you are emailing me about a problem with R, be very specific about your problem. I cannot diagnose a problem unless you send me your complete R code and excel file (just attach a copy to your email).

**Group dynamics.** Success in this course depends to a great degree on effective collaboration with your group members. If your group is having any problems working together, please alert me as soon as possible in the semester so that we can come up with a solution.

**Plagiarism and academic dishonesty.** Plagiarism and other forms of academic dishonesty (e.g., copying work from another student) will not be tolerated. According to the Student Code of Conduct (http://www.geneseo.edu/dean_office/dishonesty), “plagiarism shall be considered to be deliberate representation of someone else’s words or ideas as one’s own or the deliberate arrangement of someone else’s material(s) as one’s own.” Read this code to understand the consequences of all forms of academic dishonesty. 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.

**Accommodations**
SUNY Geneseo will make reasonable accommodations for persons with documented physical, emotional, or cognitive disabilities. Accommodations will also be made for medical conditions related to pregnancy or parenting. Students should contact Ms. Heather Packer in the Office of Disability Services (disabilityservices@geneseo.edu or 585-245-5112). Students with letters of accommodations should submit a letter to each faculty member at the beginning of the semester and discuss specific arrangements.

**Course schedule**
We depend on the weather and schedules of living things to determine when and how to run our projects. The course schedule is subject to change, often.
## Tentative Course Schedule*

<table>
<thead>
<tr>
<th>Date</th>
<th>Notes</th>
<th>Activity</th>
<th>Individual Assignments</th>
<th>Group Assignments</th>
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</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>comp</td>
<td>Introduction to course; introduce mimicry project</td>
<td>Online Quiz #1 on Kricher reading pp. 332-341, 356-358, 442-450; Install R and RStudio on laptop &amp; do pre-lab R exercise; Due Thursday, Jan 30</td>
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<td>Jan 23</td>
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<tr>
<td>Week 2</td>
<td>comp</td>
<td>Plan mimicry project; start statistics tutorial and data analysis exercise 1</td>
<td>Data analysis Exercise #1, make a random Mimicry Array &amp; Mimicry Exp Quiz #2 due Thursday, Feb 6.</td>
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<td>Jan 30</td>
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<tr>
<td>Week 3</td>
<td>comp</td>
<td>Mimicry: Prepare bait and start feeding trials. Experiment runs: Feb 6 -13</td>
<td>Online Quiz #3 on Lab Report Format, Find one primary journal article on mimicry that can be used in your Mimicry Lab Report plan due Feb 13.</td>
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<td>Feb 6</td>
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<tr>
<td>Week 4</td>
<td>comp</td>
<td>Mimicry lab report plan in groups; Practice data analysis &amp; complete statistics tutorial</td>
<td>Mimicry lab - Introduction section and Goldenrod gall web page Online Quiz #4 due Thurs, Feb 20</td>
<td>Mimicry Results Presentation and Results Section due Thurs, Feb 20</td>
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<td>Feb 13</td>
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<tr>
<td>Week 5</td>
<td>comp</td>
<td>Present Mimicry Results: Introduce Goldenrod Project; discussion of primary literature, group presentations of Goldenrod research papers</td>
<td>In lab: Stats Quiz #5 Feb 27</td>
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<td>Feb 20</td>
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<tr>
<td>Week 6</td>
<td>FW</td>
<td>Goldenrod galls: field trip to collect goldenrod galls; In lab Stats quiz</td>
<td>Goldenrod Gall lab plan due Thurs, March 5</td>
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<td>Feb 27</td>
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<td>Week 7</td>
<td>comp</td>
<td>Goldenrod galls: Finish gall dissections, organize data, refine lab report plan;</td>
<td>Goldenrod Methods section due Thurs, March 12</td>
<td>Goldenrod Gall presentation &amp; Results Section due Thurs, March 12</td>
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<td>Mar 5</td>
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<td>Week 8</td>
<td>FW</td>
<td>Present Goldenrod results to lab; Forest communities: field trip to learn tree identification and forest sampling techniques and develop group project ideas</td>
<td>Online Quiz #6 on reading pp. 8-51, 58-70, 72-75, 77-85 due Thurs, March 12;</td>
<td>Enter Point Quarter data, due Friday, March 13</td>
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<td>Mar 12</td>
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<td>Week 9</td>
<td>FW</td>
<td>Spring Break: Mar 16-20 No lab this week</td>
<td>In-lab tree ID Quiz #7: Thurs, Mar 26</td>
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<td>Mar 26</td>
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<td>Week 10</td>
<td>comp</td>
<td>Forest communities: field trip to carry out group projects; In lab Tree ID quiz #6</td>
<td>Online Quiz #8 on reading pp. 415-436 due Thursday, April 9;</td>
<td>Forest Communities Presentation &amp; Results Section due Thurs, April 9</td>
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<td>April 2</td>
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<td>Week 11</td>
<td>FW</td>
<td>Present Forest results Soil CO₂ emission: field trip to locate sites for CO₂ emission study, understory sampling; weigh soil CO₂ sampling jars</td>
<td>Soil CO₂ lab report plan due Thurs, April 16</td>
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<td>April 9</td>
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<td>Week 12 April 16</td>
<td>FW</td>
<td>Soil CO₂ emission: <strong>field trip</strong> to set up experiment and collect soil samples</td>
<td>Retrieve jars 48-72 hrs later on your own, measure soil wet weight on your own;</td>
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<tr>
<td>Week 13 April 23</td>
<td>comp</td>
<td>Soil CO₂ emission: Soil CO₂ lab measurements, data analysis</td>
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<td>Soil CO₂ Emission Complete lab report due Thursday, April 30</td>
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<tr>
<td>Week 14 April 30</td>
<td>comp</td>
<td>Wrap-up soil CO₂ emission lab; Present results &amp; Peer evaluations.</td>
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† FW = field work: wear appropriate clothing & footwear for working outside – check weather; comp = bring your laptop computer to lab

‡ Readings refer to *A Field Guide to Eastern Forests* by John Kricher; assignments should be completed before lab period unless otherwise specified

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