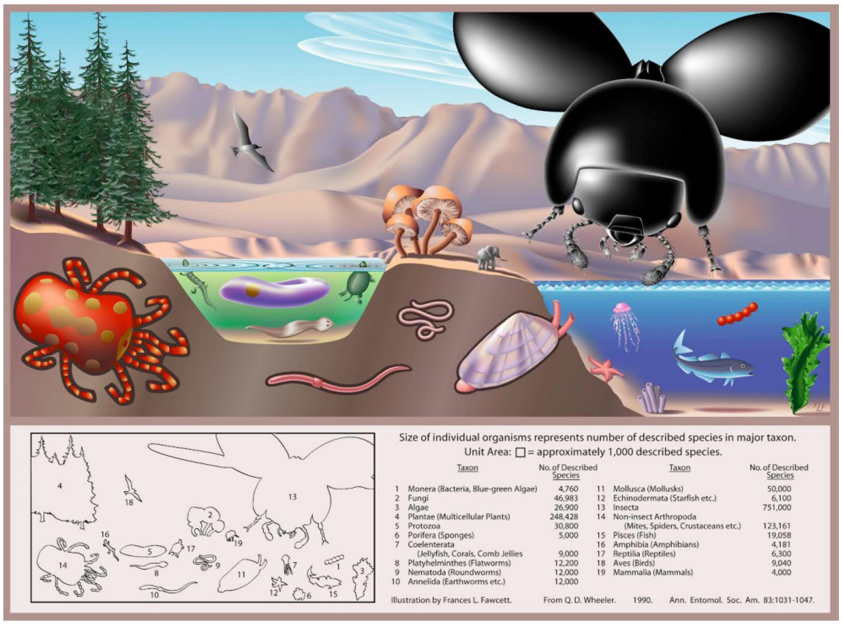
**Ecology and Field Biology (BIO 221)**
Fall 2016
Professor: Natalie Howe – howen@tcnj.edu




Lecture: Tuesday & Friday 11:00 AM-12:20 PM (208 Biology Building)
Lab: Tuesday 2:00 PM-4:50 PM (145 Biology Building)
Office Hours: Tuesday 12:30-1:30 (127 Biology Building)

**Course Description:**
An introduction to modern ecology. The interactions that determine the distribution, abundance, and function of organisms, populations, and species are examined both theoretically and practically within an evolutionary context. Topics covered include physiological ecology, optimization theory, natural selection, population biology, species interactions, community relationships, and ecosystem dynamics. Laboratory and field activities emphasize quantitative and experimental approaches to the study of biology.

Course units: 1.0
Prerequisites: Biology 201

**Course Synopsis:**

> If you are a poet, you will see clearly that there is a cloud floating in this sheet of paper. Without a cloud, there will be no rain; without rain, the trees cannot grow: and without trees, we cannot make paper. The cloud is essential for the paper to exist. If the cloud is not here, the sheet of paper cannot be here either. So we can say that the cloud and the paper inter-are.
>
> – Thich Naht Hanh

Understanding how ecosystems function and how people influence them is vital for appreciating how we interact with the natural world. This lecture, discussion, and field course will address key issues in ecosystems through discussion of topics in science, policy, and stewardship. The course will begin with an introduction to ecology, considering population and community dynamics. We will then investigate global cycles and human influence on natural systems.

The lab portion of this course satisfies the fourth hour requirement and takes place regardless of weather, unless the college is closed. Check the weather forecast before lab time, and choose clothes that will keep you warm and dry; the class will be more productive and fun if you are comfortable. Labs involve travel to off-campus sites, and you must arrange your transportation to those sites. Lab projects may also require your involvement at times other than the designated lab period, but you can schedule those times to fit your schedule.

Plan to spend about 2-3 hours outside of class on average for every hour in class (=6 to 12 hours per week for this course). Your studying will be more engaging and memorable if you form study groups, and if you consistently discuss the material in these groups throughout the semester, not only before the exam.

**Course objectives:**
After this course, students will be able to…

- Compare the evolution and natural history of common local plants and animals, and explain which characteristics (including reproductive strategies, competitive abilities, stress tolerance) help species thrive in their environment.
- Analyze data using standard statistical methods to understand biological trends and to assess the success of different human interventions to maintain biodiversity, provide ecosystem services, and accomplish community goals.
- Apply knowledge of general ecological principles (including population growth trends, community interactions, and the links between diversity and ecosystem function) to critically assess other research projects and to plan research projects.
- Develop effective strategies for science communication, considering the importance of goal, medium, and target audience for transmitting information.

**Course Materials:**
Readings:

- Cain, M.L., Bowman, W.D., and Hacker, S.D. 2014. Ecology, 3rd ed. Sinauer Associates, Inc., Sunderland, MA.
- Other readings will be from articles provided by the professor

Other Material:
The lecture presentations, classwork, the projects for lab, readings from the primary literature, and other files will be posted on Canvas (http://canvas.tcnj.edu). Many of these files will contain information and images from a variety of sources, and much of the content is protected by copyright so the files should not be shared, directly or indirectly.

**Grading:**
Grades will be assigned for the following activities in the course:

Class Participation / Questions : Much of the course is discussion-based and requires your input in order to be a robust and exciting experience, so you should come to class prepared with a discussion question about the reading.

Plagiarism / Primary Literature worksheet: Any modern scientific work relies on previous projects to inform its guiding questions and its methodological approaches. So that your lab reports and literature research papers to will properly reflect these contributions from others, the class will involve these exercises that will familiarize you with standardized methods of citing sources.

Statistics worksheet: Ecological interactions are complex, so ecological data is also necessarily complex. In order to understand what the results of our experiments do (and do not) tell you, you should first understand standardized methods for analyzing data.

T.C.N.J. Personal Bioblitz: Document the biodiversity around you using INaturalist. All students must document 20 organisms for full credit, but prizes will be given at the end of the semester for more observations.

Quizzes and Exams: Quizzes will be in the same format as the exam, and will involve both long and short answer questions on the organisms we study in class and in lab, and on the interactions between them.

Lab Project: You will undertake a research project that involves submitting a 12-15 page final paper in the style of a scientific manuscript, citing at least 10 scientific papers and incorporating data from your original research project. (Guidelines will be provided).

Poster: The research project also involves group development of a poster that will be displayed in the hallways of the biology building at the end of the semester.

Lab Papers and Lab Summaries: You will also submit shorter lab papers based on smaller studies in lab, and lab summaries that describe the important ecological processes of a site.

Science Communication Project: You will be expected to create a piece of scientific outreach material (brochure, website, video) on an ecological topic of your choosing that demonstrations understanding of the topic and that clearly and compellingly conveys the material to members of the public.

The relative contribution of each assessment to your final grade is outlined below:

| Type | Assessment | points | % of final grade |
|---|---|---|---|
| Lab Project | Field observations | 5 | 29% |
| | Mini-proposal | 10 | |
| | Annotated literature list | 10 | |
| | First draft Intro / Methods | 20 | |
| | Final Term Paper | 50 | |
| | Poster | 25 | |
| Lab papers | Old Field Summary | 10 | 17% |
| | Pine Barrens Summary | 10 | |
| | Soil Ecology Paper | 25 | |
| | Urban Lichen Paper | 25 | |
| Assignments | Citation Worksheet | 10 | 10% |
| | Statistics Practice | 10 | |
| | Bioblitz | 20 | |
| Group Projects and Participation | Science Communication | 20 | 12% |
| | Class Discussions | 20 | |
| | Questions | 10 | |
| Quizzes and Exams | Quiz I | 20 | 32% |
| | Midterm Exam | 40 | |
| | Quiz II | 20 | |
| | Final Exam | 50 | |
| Total | | 410 | 100% |

Assignments turned in after the due date will receive a 10% penalty per day.
Grades will be determined on the following scale: 93-100% = A, 92-90% = A-, 87-89% = B+, 83-86% = B, 80-82%=B-, 77-79%=C+, 76-73%=C, 70-72%=C-, 60-69%=D, 0-60%=F

**Academic Honesty:**
This course follows the Academic Integrity Policy of the University:
http://policies.tcnj.edu/policies/digest.php?docId=7642
More about plagiarism: http://library.stevens.edu/plagiarism
Citation guidelines can be found at:
http://www.chicagomanualofstyle.org/tools_citationguide.html

**Electronic Devices:**
I encourage the use of electronic devices for documenting biodiversity, for conducting literature research, for analyzing data, and for taking notes. However, you should silence your cell phones during class and refrain from conversations on them. During exams, calculators will be provided (Casio FX-260) and phone use will not be allowed.

**Attendance:**
The official college attendance policy can be found at:
http://policies.tcnj.edu/policies/digest.php?docId=8162
For any unavoidable absence, students should contact the professor before the start of the class, preferably at the beginning of the semester.

**Americans with Disabilities Act:**
The official College policy with respect to students and employees with disabilities can be found at: http://policies.tcnj.edu/policies/digest.php?docId=8082 . If you are entitled to accommodations under the ADA, please let me know by 6 September 2016, and I will work with the Office of Disability Support Services to make the necessary accommodations

Course schedule – subject to change
Chapter readings from Cain, Bowman and Hacker (2014), with additional reading material

| Date | Unit | Topic | Reading | Lab | Assignment due |
|---|---|---|---|---|---|
| 30 Aug | Intro | Introduction: Biodiversity, ecology & climate | Ch 1 & 2 | TCNJ campus ecology | Personal Bioblitz Begins |
| 2 Sep | | Energy in the biosphere | Ch 4 & 5 | | Lab Project –Observation |
| 9 Sep | Evolution | Evolution | Ch 6. Darwin 1859. The Origin of Species | | |
| 13 Sep | | Life History | Ch 7 | Hypothesis testing | Plagiarism/ Primary Literature worksheet |
| 16 Sep | | Behavior | Ch 8, Dawkins 2006. The Selfish Gene | | |
| 20 Sep | Population | Measuring populations | Ch 9 | Wetlands I (off campus) | Lab Project - Mini Proposals |
| 23 Sep | | Population Growth | Ch 10-11 | | Stats worksheet |
| 27 Sep | Communities | Competition | Ch 12 | Wetlands II (off campus) | |
| 30 Sep | | Predation | Ch 13 | | Personal Bioblitz Ends<br>Quiz 1: 30 Aug – 23 Sept |
| 4 Oct | | Parasites | Ch 14 | Research project | Wetlands lab paper |
| 7 Oct | | Mutualisms | Ch 15, Thomson 2003. When is it mutualism? | | |
| 14 Oct | | Communities | Ch 16 | | |
| 18 Oct | | Succession | Ch 17 | Old Fields (off-campus) | Lab Project - Literature list |
| 21 Oct | | Biogeography | Ch 18 | | |
| 25 Oct | | Biodiversity | Ch 19, Costello et al. 2013. Can we name earth's species before they go extinct? | Pine barrens (off-campus) | Old Fields Summary |
| 28 Oct | | Exam | | | Midterm Exam:30 Aug-21 Oct |
| 1 Nov | Ecosystem Ecology | Conservation | Ch 23, Hoekstra et al. 2005. Confronting a biome crisis: global disparities of habitat loss and protection | Soil Ecology I | Pine Barrens Summary |
| 4 Nov | | Carbon cycle – primary production and food webs | CH 20 & 21, Estes et al. 2011. Trophic downgrading of planet earth | | |
| 8 Nov | | Nitrogen / Phosphorus cycle | Ch 22 | Soil Ecology II | Lab Project - Intro and Methods (1st draft) |
| 11 Nov | | Pollution | Kozlov and Zvereva 2011. A second life for old data: Global patterns in pollution ecology revealed from published observational studies | | |
| 15 Nov | 21st century ecology | Urban habitats | Seto et al. 2012. Global forecasts of urban expansion to 2030 and direct impacts on biodiversity and carbon pools. | Urban lichen I (off-campus) | Soil Ecology Paper |
| 18 Nov | | Ecosystem Services | Cardinale et al. 2006. Effects of biodiversity on the functioning of trophic groups and ecosystems | | Quiz 2: 25 Oct – 11 Nov |
| 22 Nov | | Land management | Ch 24 | Urban lichen II (off-campus) | |
| 29 Nov | | Climate change | Ch 25 | Science communication | Science communication |
| 2 Dec | | Environmental justice | Kinzig et al. 2005. The effects of human socioeconomic status & cultural characteristics on urban patterns of biodiversity | | Urban Lichen Paper |
| 6 Dec | | Presentations | | Poster presentation | Posters |
| 9 Dec | | Review | | | Lab Project Final Paper |
| ? | | Exam | | | |