**BIOL 450w**

**Experimental Field Biology (Field Ecology)**

***Syllabus***

**Instructor:** Dr. Tomás A. Carlo - Associate Professor of Biology & Ecology

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Office Hours: by appointment

**Meeting time and place:**

Tuesdays 12:05 - 1:20 pm Boucke Bldg. 109

Thursdays 1:25 – 5:30 pm Life Science Bldg. 006

**Course description and goals:**

This is a practical introduction to modern experimental techniques for ecological studies. This is an outdoor course almost as much as a classroom one. Be prepared to go outside, develop the power of observation, and discover. Emphasis is given to learning scientific skills via active-learning methods. Students will learn to formulate research questions, and develop adequate hypotheses and study designs and experiments. Students will be guided step-by-step to perform basic and advanced data analyses: from data tables and frames, to parametric, non-parametric, and multivariate statistical methods used in everyday biology and ecology research driven hypothesis-testing approaches. Every week the class meets in the classroom (Tuesdays) for discussion-format lectures, and on lab day (Thursdays) the class goes out into the field, both near campus and farther away, to collect data and perform experiments. Student evaluations are based on participation, engagement, oral presentations, and written reports (no exams). At least one field trip involves staying overnight in a natural area. Specific topics covered in this class are: asking questions in science, designs of studies and experiments, ecological data collection techniques, data storing methods, statistical analyses (univariate to multivariate), graphical representation of results, oral presentation skills, research ethics, and writing and publication skills and techniques.

Learning objectives:

1. Increase awareness and experiences in natural history and field ecology.
2. Based on field observations and problems, students will formulate research questions to answers such questions.
3. Given a particular question, students will develop adequate sampling methods and execute such protocols.
4. To apply the most common analytical approaches to question-driven ecology.
5. Visualize and present data in effective ways.
6. Adopt methods for the writing of scientific reports in the style of peer-reviewed journals in biology and ecology.

**Course spirit:**

Both Carlo and Owen are practicing ecologists and are very excited to be working with you this semester. Emphasis will be place on active learning rather than on lecturing and testing. Students are expected to participate in all classes and to cooperate with each other in the conception, design, and data analysis of research projects. Some important class activities will be on weekends (See schedule below) and one will involve staying overnight.

**Course materials:**

1. If you have a laptop, please bring it to meetings in the classroom (not to field trips). You will be analyzing data, making figures, writing reports, and making presentations. We may be working in a computer lab, in such a case, you will not need your personal computer but you may choose to work in it.
2. Software: It will be optimal for you to install JMP Pro 11 (or higher) in your laptop. You can get it here for $45: <https://software.psu.edu/sas-license/-7750>. A free trial will last you 30 days and you can install it from here: <http://www.jmp.com/en_us/offers/free-trial.html>. The Program also runs from Penn State WebApps for free (<https://webapps.psu.edu>), but again, it runs best if installed in your computer.
3. Come ready to step to be outside on Thursdays and during weekend field trips. Check weather reports and dress appropriately, use shoes that allow you to take a walk into the woods. Rain coat and/or small portable umbrellas are always a good idea.
4. I will provide you with a list of recommended items to bring on each of the two overnight trips.
5. You will need a folder or binder to keep the handouts that will be distributed in class. Information in the handouts will be material for quizzes.
6. Last and not least – please get and always bring a **field notebook** and pencil to take notes and gather data in the field.

**Grading:**

Assistance and participation in projects – 25%

Written reports – 30%

Proposal– 10%

Quizzes – 10%

Independent project ­– 20%

(independent project topics from supplied list below).

**List of topics for independent projects:**

1. Seed fate (dispersal, predation, interactions with predators and mutualists)
2. Forest ecology (structure, gradients, habitat comparisons, succession)
3. Behavioral ecology (energy, foraging ecology, niche partitioning)
4. Mutualisms (pollination biology, frugivory, mycorrhizal associations, other networks of interaction)
5. Habitat selection and preference
6. Herbivory
7. Community composition and structure
8. Niche partitioning
9. Food webs
10. Predator-prey interactions
11. Aquatic ecology (limnology, water quality, bio-indicators)
12. Agroecology
13. Method validation or method comparison
14. Conservation
15. Sustainability

**Note:** Although we will be relying on the use of computers in this course, texting and the use of social media is strictly forbidden during class. Violations of this norm will result in a loss of assistance/participation points.

**Academic Integrity/Academic Dishonesty:** Academic integrity is the pursuit of scholarly activity in an open, honest and responsible manner. Academic integrity is a basic guiding principle for all academic activity at The Pennsylvania State University, and all members of the University community are expected to act in accordance with this principle. Consistent with this expectation, the University’s Code of Conduct states that all students should act with personal integrity, respect other students’ dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts.

Academic integrity includes a commitment by all members of the University community not to engage in or tolerate acts of falsification, misrepresentation or deception. Such acts of dishonesty violate the fundamental ethical principles of the University community and compromise the worth of work completed by others.

**Disability Accommodation Statement:** Penn State welcomes students with disabilities into the University’s educational programs. Every Penn State campus has an office for students with disabilities. Student Disability Resources (SDR) website provides [contact information for every Penn State campus](http://equity.psu.edu/sdr/disability-coordinator). For further information, please visit [Student Disability Resources website](http://equity.psu.edu/sdr/).

In order to receive consideration for reasonable accommodations, you must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: [See documentation guidelines](http://equity.psu.edu/sdr/guidelines). If the documentation supports your request for reasonable accommodations, your campus disability services office will provide you with an accommodation letter. Please share this letter with your instructors and discuss the accommodations with them as early as possible. You must follow this process for every semester that you request accommodations.

**EXAMPLE EDUCATIONAL EQUITY/REPORT BIAS STATEMENTS**

Penn State takes great pride to foster a diverse and inclusive environment for students, faculty, and staff.  Acts of intolerance, discrimination, or harassment due to age, ancestry, color, disability, gender, gender identity, national origin, race, religious belief, sexual orientation, or veteran status are not tolerated and can be reported through Educational Equity via the [Report Bias webpage](http://equity.psu.edu/reportbias/). Penn State University has adopted a “[Protocol for Responding to Bias Motivated Incidents](http://equity.psu.edu/reportbias/reports/protocol-for-responding-to-bias-motivated-incidents)” that is grounded in the policy that the “University is committed to creating an educational environment which is free from intolerance directed toward individuals or groups and strives to create and maintain an environment that fosters respect for others.” That policy is embedded within an institution traditionally committed to [academic freedom](https://guru.psu.edu/policies/OHR/hr64.html). Bias motivated incidents include conduct that is defined in University [Policy AD 91: Discrimination and Harassment, and Related Inappropriate Conduct](https://guru.psu.edu/policies/ad91.html).  Students, faculty, or staff who experience or witness a possible bias motivated incident are urged to report the incident immediately by doing one of the following:

\* Submit a report via the [Report Bias webpage](http://equity.psu.edu/reportbias/)  
\* Contact one of the following offices:

University Police Services, University Park: 814-863-1111  
Multicultural Resource Center, Diversity Advocate for Students: 814-865-1773  
Office of the Vice Provost for Educational Equity: 814-865-5906  
Office of the Vice President for Student Affairs: 814-865-0909  
Affirmative Action Office: 814-863-0471

\* Dialing 911 in cases where physical injury has occurred or is imminent

**COUNSELING AND PSYCHOLOGICAL SERVICES STATEMENT**

Many students at Penn State face personal challenges or have psychological needs that may interfere with interfere with their academic progress, social development, or emotional wellbeing.  The university offers a variety of confidential services to help you through difficult times, including individual and group counseling, crisis intervention, consultations, online chats, and mental health screenings.  These services are provided by staff who welcome all students and embrace a philosophy respectful of clients’ cultural and religious backgrounds, and sensitive to differences in race, ability, gender identity and sexual orientation.

[Counseling and Psychological Services at University Park  (CAPS)](http://studentaffairs.psu.edu/counseling/): 814-863-0395  
Counseling and Psychological Services [Commonwealth Campuses](http://senate.psu.edu/faculty/counseling-services-at-commonwealth-campuses/)  
Penn State Crisis Line (24 hours/7 days/week): 877-229-6400  
Crisis Text Line (24 hours/7 days/week): Text LIONS to 741741

**Class schedule**\*

Notes: include a peer-review exercise of their proposals and presentations.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date |  | Meeting @ | | Topic |
| August 27 |  | Boucke 109 | | Introduction, presentation |
| August 29 |  | LS 006 | | What is Ecology for? Detecting patterns in nature |
| Sept 3 |  | Boucke 109 | | Quiz 1, Design of Thursday’s flower visitor lab. |
| Sept 5 |  | Sunset Park | | Mutualisms: Focal observation of flower visitors |
| Sept 10 |  | Boucke 109 | | Quiz 2, Flower visitor report |
| Sept 12 |  | LS 006 - campus | | Introduce factor analysis with Roadside ecology – Design of Thistle dispersal experiment |
| Sept 17 |  | | Boucke 109 | Quiz 3. Finalize data collection on Thistles |
| Sept 19 |  | LS 006 | | Thistle analyses 2– finalize and write-up |
| Sept. 21-22 |  | \*\*Powdermill Nature Reserve, Rector, PA\*\* | | Seed Predation Experiment (overnight at Powdermill) |
| Sept 24 |  | Boucke 109 | | Quiz # 4, Powdermill data preparation. |
| Sept 26 |  | LS 006 | | Powdermill Analyses & Report. |
| Oct. 1 |  | Boucke 109 | | Quiz 5. Behavioral ecology - what to look for, what to measure? |
| Oct. 3 |  | Sunset Park | | Fruit eating behavior - focal observations - plants move like birds. |
| Oct. 8 |  | Boucke 109 | | Quiz # 6. Community ecology: nature vs. nurture |
| Oct. 10 |  | LS 006 | | Vegetation sampling – design for Grennwood furnace exercise |
| Oct. 12 |  | \*\*Greenwood Furnace Field trip\*\* | | Meet @ Whitmore parking 6:30 AM |
| Oct. 15 |  | Boucke 109 | | Quiz # 7, Greenwood furnace data 1 |
| Oct. 17 |  | LS 006 | | Greenwood furnace data reports |
| Oct. 22 |  | Boucke 109 | | Quiz 8, Intro distance sampling |
| Oct. 24 |  | LS 006 - campus | | Distance Sampling Lab |
| Oct. 29 |  | Boucke 109 | | Quiz 9. Dist. Sampling report |
| Oct. 31 |  | LS 006 | | Ind. Project Proposal Presentations |
| Nov. 5 |  | Boucke 109 | | Quiz 10. Landscape ecology intro. |
| Nov. 7 |  | Whitehall fields | | Fragmentation lab. – Whitehall fields. |
| Nov. 12 |  | Boucke 109 | | Quiz 11. Landscape ecology data analyses |
| Nov. 14 |  | LS 006 | | Landscape ecology report |
| Nov. 19 |  | Boucke 109 | | Species-area curves |
| Nov. 21 |  | LS 006 | |  |
| Nov. 26 |  | Thanksgiving week \*\*\* | | \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* |
| Nov. 28 |  | Thanksgiving week \*\*\* | | \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* |
| Dec. 3 |  | Independent project | | Independent project |
| Dec. 5 |  | Independent project | | Independent project |
| Dec. 10 |  | Independent project | | Independent project |
| Dec. 12 |  | LS 006 | | Independent project presentations and final discussion |
| **Dec. 12** |  |  | | **Independent Projects due** |

\* = Subject to change

\*\* = Fieldtrips are compulsory