

BIOL 4350

Physiological Plant Ecology

Spring 2023

Course Description

Students in this course will learn the fundamentals of plant physiology through an ecological lens. The course will focus on plant responses to environmental conditions across multiple spatial and temporal scales. The course will cover plant, water, carbon, and nutrient relations in natural and managed systems across multiple ecological scales. Students will be evaluated on their ability to discuss and disseminate ecophysiological topics.

Class Time and Location

Tuesdays and Thursdays 9:30-10:50

Biology Building (BIOL) Room 101 or synchronous online via Zoom (see Mode of Instruction section below).

Instructor

Dr. Nick Smith

Biology Building (BIOL) Room 215

806-834-7363

nick.smith@ttu.edu

Meetings by appointment

Teaching Assistant

Mr. Evan Perkowski

evan.a.perkowski@ttu.edu

Meetings by appointment

Recommended Texts

Plant Physiological Ecology (2nd Edition; 2008) by Lambers, Chapin, and Pons

The book can be accessed from Springer here: <https://www.springer.com/us/book/9780387783406>. Click on "Access this title on SpringerLink." It can also be accessed through the TTU library.

Plant Physiology and Development (6th Edition) by Taiz, Ziegler, Moller, and Murphy

Mode of Instruction

All instruction will be done face-to-face unless the university directs classes be taught online.

Course Materials

All course materials, including lecture slides, readings, activities, and code will be posted to a GitHub repository for the course. The primary repository address is https://github.com/SmithEcophysLab/biol43506350_spring2023.

Learning Objective

This course will broadly focus on understanding the role that plant physiological processes play in driving ecological responses across multiple scales from the individual to the globe. Class activities will be based on discussion and dissemination of ideas, including classic and recent scientific literature. Topics will be flexible and modified to match student interests where possible.

Attendance Policy

Attendance is strongly recommended. Much of the graded content will be completed in class and students will not be permitted to complete this material outside of class. See course assessments below for details. Makeups will not be granted.

Course Assessment

Participation and Engagement

Being an active and engaged participant in the class will benefit your understanding of material as well as your peers'. Examples include asking questions, providing feedback, and facilitating discussion. Participation and engagement of each student will be monitored during each class period.

Mini-quizzes

Short "quizzes" will be given in class each week (typically on Thursdays). These quizzes will be used to stimulate discussion and to assess how well prior concepts were understood by the class.

Classical literature feedback

Each week students will be required to read a "classic" article on the current weeks' topic and produce a short summary as well as two questions that arose during their reading of the article. Students are encouraged to bring up these questions during the Tuesday class discussions.

Recent literature article lead

Each student will be required to lead one Thursday discussion on recent literature. This will involve presenting the article and leading a discussion related to the article. Students must read some of the cited literature integral to the study in order to answer relevant questions brought forth during the discussion. The article will be chose by Dr. Smith, unless a different arrangement is made. Discussion leads will be done in groups of 2-3 students.

Recent literature article feedback

Students not leading the current week's discussion will be required to produce a summary and develop two questions based on each week's article.

Literature Review

The primary semester project will be to produce a literature review on a topic of the student's choice. Broadly, the review should address a question or problem related to plant ecophysiology and review the current state of knowledge on the

topic. The review should be forward thinking, in that it forms the basis for understanding plant physiological processes moving forward. The review should be novel in that it should not be similar to previously published review papers.

Students will first develop a written proposal for their literature review and present their idea to the class. The class and instructors will provide feedback. Students will then produce and present their review to the class at the end of the semester.

This project can be done in groups of up to 3 students. Students are encouraged to receive help and guidance from the instructors as well as the class at large.

The literature review will be assessed for completeness, breadth, originality, and presentation. Students must have their project OKed by the instructor after the proposal and prior to beginning the final project.

Grading

Participation and Engagement: 15%

Mini-quizzes: 10%

Classical literature feedback: 5%

Recent literature lead: 15%

Recent literature feedback: 5%

Review idea proposal: 10%

Review idea feedback: 5%

Final review presentation: 10%

Final review: 25%

Grades will be made available on Blackboard. All grades posted at the end of the course will be final. Please contact Dr. Smith if you feel your grade has been calculated incorrectly.

Grading Scale

A: $\geq 90\%$

B: 80 – 90%

C: 70 – 80%

D: 60 – 70%

F: $\leq 59.9\%$

Missing In-class Activities

Students will be required to be in class to receive in-class activity points. Please contact Dr. Smith if you plan to miss class for a university function *prior to class*. If class is missed due to an illness, please let Dr. Smith know as soon as possible (see COVID illness based absence policy below).

Illness Based Absence Policy

If at any time during this semester you feel ill, in the interest of your own health and safety as well as the health and safety of your instructors and classmates, you are encouraged not to attend face-to-face class meetings or events. Please review the steps outlined below that you should follow to ensure your absence for illness will be excused. These steps also apply to not participating in synchronous online class meetings if you feel too ill to do so and missing specified assignment due dates in asynchronous online classes because of illness. If you are ill and think the symptoms might be COVID-19-related:

- Call Student Health Services at 806.743.2848 or your health care provider. After hours and on weekends contact TTU COVID-19 Helpline at [TBA].
- Self-report as soon as possible using the Dean of Students COVID-19 webpage. This website has specific directions about how to upload documentation from a medical provider and what will happen if your illness renders you unable to participate in classes for more than one week.
- If your illness is determined to be COVID-19-related, all remaining documentation and communication will be handled through the Office of the Dean of Students, including notification of your instructors of the period of time you may be absent from and may return to classes.
- If your illness is determined not to be COVID-19-related, please follow steps below.

If you are ill and can attribute your symptoms to something other than COVID-19:

- If your illness renders you unable to attend face-to-face classes, participate in synchronous online classes, or miss specified assignment due dates in asynchronous online classes, you are encouraged to visit with either Student Health Services at 806.743.2848 or your health care provider. Note that Student Health Services and your own and other health care providers may arrange virtual visits.
- During the health provider visit, request a “return to school” note;

- E-mail the instructor a picture of that note;
- Return to class by the next class period after the date indicated on your note.

COVID-19 Statement

The University will continue to monitor CDC, State, and TTU System guidelines concerning COVID-19. Any changes affecting class policies or temporary changes to delivery modality will be in accordance with those guidelines and announced as soon as possible. Students will not be required to purchase specialized technology to support a temporary course modality change, though students are expected to have access to a computer to access course content and course-specific messaging as needed.

If you test positive for COVID-19, report your positive test through TTU's reporting system: <https://www.depts.ttu.edu/communications/emergency/coronavirus/>. Once you report a positive test, the portal will automatically generate a letter that you can distribute to your professors and instructors.

The TTU COVID-19 resource page is here: <https://www.depts.ttu.edu/communications/emergency/coronavirus/>.

Special Considerations

ADA Statement

Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor's office hours. Please note: instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, please contact Student Disability Services in West Hall or call 806-742-2405.

Religious Holy Days

"Religious holy day" means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code §11.20. A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. A student who is absent from classes for the observance of a religious holy day shall be allowed to

take an examination or complete an assignment scheduled for that day within a reasonable time after the absence. A student who is excused may not be penalized for the absence; however, the instructor may respond appropriately if the student fails to complete the assignment satisfactorily.

TTU Resources for Discrimination, Harassment, and Sexual Violence

Texas Tech University is committed to providing and strengthening an educational, working, and living environment where students, faculty, staff, and visitors are free from gender and/or sex discrimination of any kind. Sexual assault, discrimination, harassment, and other Title IX violations are not tolerated by the University. Report any incidents to the Office for Student Rights & Resolution, (806)-742-SAFE (7233), or file a report online at <https://www.depts.ttu.edu/titleix/>. Faculty and staff members at TTU are committed to connecting you to resources on campus. Some of these available resources are: TTU Student Counseling Center, 806-742-3674, <https://www.depts.ttu.edu/scc/> (provides confidential support on campus). TTU Student Counseling Center 24-hour Helpline, 806-742-5555, (assists students who are experiencing a mental health or interpersonal violence crisis; if you call the helpline, you will speak with a mental health counselor). Voice of Hope Lubbock Rape Crisis Center, 806-763-7273, voiceofhopelubbock.org (24-hour hotline that provides support for survivors of sexual violence). The Risk, Intervention, Safety and Education (RISE) Office, 806-742-2110, <https://www.depts.ttu.edu/rise/> (provides a range of resources and support options focused on prevention education and student wellness). Texas Tech Police Department, 806-742-3931, <http://www.depts.ttu.edu/tttd/> (to report criminal activity that occurs on or near Texas Tech campus).

LGBTQIA

Please contact the Office of LGBTQIA, Student Union Building Room 201, 806-742-5433, www.lgbtqia.ttu.edu. Within the Center for Campus Life, the Office serves the Texas Tech community through facilitation and leadership of programming and advocacy efforts. This work is aimed at strengthening the lesbian, gay, bisexual, transgender, queer, intersex, and asexual (LGBTQIA) community and sustaining an inclusive campus that welcomes people of all sexual orientations, gender identities, and gender expressions.

Classroom Civility

Texas Tech University is a community of faculty, students, and staff that enjoys an expectation of cooperation, professionalism, and civility during the conduct of all forms of university business, including the conduct of student–student and student–faculty interactions in and out of the classroom. Further, the classroom is a setting in which an exchange of ideas and creative thinking should be encouraged and where intellectual growth and development are fostered. Students who disrupt this classroom mission by rude, sarcastic, threatening, abusive or obscene language and/or behavior will be subject to appropriate sanctions according to university policy. Likewise, faculty members are expected to maintain the highest standards of professionalism in all interactions with all constituents of the university (www.depts.ttu.edu/ethics/matadorchallenge/ethicalprinciples.php).

Academic Integrity

Academic integrity is taking responsibility for one’s own class and/or course work, being individually accountable, and demonstrating intellectual honesty and ethical behavior. Academic integrity is a personal choice to abide by the standards of intellectual honesty and responsibility. Because education is a shared effort to achieve learning through the exchange of ideas, students, faculty, and staff have the collective responsibility to build mutual trust and respect. Ethical behavior and independent thought are essential for the highest level of academic achievement, which then must be measured. Academic achievement includes scholarship, teaching, and learning, all of which are shared endeavors. Grades are a device used to quantify the successful accumulation of knowledge through learning. Adhering to the standards of academic integrity ensures grades are earned honestly. Academic integrity is the foundation upon which students, faculty, and staff build their educational and professional careers. [Reference: Texas Tech University Quality Enhancement Plan, Academic Integrity Task Force, 2010].

Plagiarism Statement

Texas Tech University expects students to “understand the principles of academic integrity and abide by them in all class and/or course work at the University” (OP 34.12.5). Plagiarism is a form of academic misconduct that involves (1) the representation of words, ideas, illustrations, structure, computer code, other expression, or media of another as one’s own and/or failing to properly cite direct, paraphrased, or summarized materials; or (2) self-plagiarism, which involves the submission of the same academic work more than once without the prior permission of the instructor and/or failure to correctly cite previous work written

by the same student. Please review Section B of the TTU Student Handbook for more information related to other forms of academic misconduct, and contact your instructor if you have questions about plagiarism or other academic concerns in your courses. To learn more about the importance of academic integrity and practical tips for avoiding plagiarism, explore the resources provided by the TTU Library and the School of Law.

Statement about Food Insecurity

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact the Dean of Students for support. Furthermore, please notify the professor if you are comfortable in doing so. The TTU Food Pantry is in Doak Hall 117. Please visit the website for hours of operation at <https://www.depts.ttu.edu/dos/food/pantry.php>.

Creating Livable Futures

This class is part of a campus-wide initiative called Creating Livable Futures, which is sponsored in part by the Texas Tech Center for Global Communication. As such, one of our objectives is to prepare you to communicate, in a fully interdisciplinary and global way, the challenges posed by pressing issues that speak to our collective wellbeing and sustainability. You will be asked to translate and communicate the work of leading thinkers on sustainability, and to expand discussing those materials through research experience and experiential learning. These objectives will be met through discussion leads and the review paper.

Your progress in communicating about global issues will be evaluated according to the Center for Global Communication rubric, so you will be invited to participate in one or more Creating Livable Futures activities outside of class that will complement class content. Planned Creating Livable Futures activities include participating in and attending speaker events and conferences, edit-a-thons, blogging and publication opportunities, student organizations, a book club, and even small scholarship opportunities for research.

You'll be informed of relevant opportunities and activities as they arise over the course of the semester.

Schedule of Topics by Week

09/01/23 - Introductions, semester planning, and goals

16/01/23 – Physiology’s role in ecology (pp. 1-8)

23/01/23 – Key physiological processes: photosynthesis, respiration, transpiration, translocation (pp. 11-203)

30/01/23 – Light (pp. 26-47, 237-238)

06/02/23 – Temperature (pp. 60-63, 127-129, 239-244)

13/02/23 – Water (53-57, 163-217)

20/02/23 – CO₂ (pp. 87-90)

27/02/23 – Nutrients (pp. 58-59, 225-310)

06/03/23 – Growth and allocation (pp. 321-367), Life cycles, ontogeny, and phenology (pp. 375-398)

13/03/23 – NO CLASS

20/03/23 – **Literature review proposal presentations**

27/03/23 – Competition (pp. 505-527), Symbioses (pp. 522-524)

03/04/23 – NO CLASS

10/04/23 – Scaling from cells to canopies to ecosystems to the globe (pp. 247-253, 555-569)

17/04/23 – **Literature review presentations**

24/04/23 – NO CLASS

01/05/23 – **Literature review presentations**

General Weekly Schedule

Generally, each Tuesday will consist of a lecture by Dr. Smith followed by a discussion of a classical literature article. Students will turn in their classical literature feedback at the end of Tuesday’s lecture. Thursdays will generally begin with an in-class mini-quiz and discussion. This will be followed by a discussion of a recent literature article and (time permitting) an in-class activity.