BIOL 5316

Principles of Terrestrial Ecosystem Ecology
Spring 2026

1 Course Description

Students in this course will learn the fundamentals of ecosystem ecology. This will include interactions between biological organisms and themselves as well as their environment. Concepts taught will include water and energy cycling as well as carbon and nutrient flows in natural and managed systems. This will include aboveground and belowground processes. As ecosystem ecology is the largest scale of ecology, the class will also cover necessary concepts of individual, population, and community ecology. Spatial extent of processes will extend to the globe. Temporal extent will extend to millenia. The class will consider applied aspects of global change and human decision making.

Students will be evaluated on their ability to discuss and disseminate course topics. Additionally, as graduate students, you will be evaluated on your ability to help lead the implementation and discussion of multiple topics on course content throughout the semester.

1.1 Class Time and Location

Tuesdays and Thursdays 9:30-10:50

Biology Building Room 102

1.2 Instructor

Dr. Evan Perkowski

Experimental Sciences Building II (ESBII) Room 402

evan.a.perkowski@ttu.edu

Meetings by appointment

1.3 Text

Principles of Terrestrial Ecosystem Ecology (2nd Edition; 2011) by Chapin, Matson, and Vitousek

The book can be accessed from Springer here: `https://link.springer.com/book/10.1007/978-1-4419-9504-9`. Click on "Access this title on SpringerLink." It can also be accessed through the TTU library.

2 Statement on connection to and differences from BIOL 4316

This class is being offered jointly alongside an undergraduate version of the same course, BIOL 4316. The content and mode of instruction will be similar. However, there are a number of differences. Graduate students will also complete the literature review independently, rather than in groups of at least 3 as in 4316 (40% of total grade; see below). It is expected that this review will not only review the current state of knowledge on the topic, but also produce novel findings, questions, and hypotheses.The content of the review should be of suitable quality for partial inclusion in the introduction of a manuscript or proposal or be submittable for publication on its own. Additionally, graduate students in this course will be expected to serve as a topic co-lead for 2 separate weeks during the course. This involves three assignments per week totaling 30% of their total grade that is not required for undergraduate students. These assignments are to evaluate graduate students at a higher level. Notably they will need to display knowledge of topics that are sufficient to teach these to their peers in the course. This will require substantial reading and studying on the topics. Together, these differences constitute criteria for evaluation that is above and beyond that for undergraduate students in BIOL 4316. In total, 50% of the written final literature review (25% * 50% = 12.5%), 70% of the oral presentation of the literature review (5% * 70% = 3.5%) will have unique evaluation criteria. In addition, 30% of the graduate student total grade will come from the weekly co-leads, an additional assignment not required by the undergraduate section. The additional evaluation criteria are in place to more critically evaluate graduate student understanding and mastery of the course content.

3 Course Materials

All course materials, including lecture slides, readings, activities, and code will be posted to RaiderCanvas.

4 Learning Objective

This course will broadly focus on understanding the interactions between biological organisms and their environment that drive cycles of energy, water, carbon, and nutrients at local to global scales. An emphasis will be placed on how these processes influence humanity in a changing world. Applied concepts will consider human decisions as a means to reduce the negative impact of global change. 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.

5 Attendance Policy

Attendance is strongly recommended. In class activity points will only be granted if students are in class. Makeups will not be granted.

6 Course Assessment

6.1 *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.

6.2 *Mini-quizzes*

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

6.3 *Reading feedback*

Each week students will be required to read a a section of the book and produce a short summary as well as two questions that arose during their reading.

6.4 *Recent literature feedback*

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

6.5 *Weekly co-leads*

Twice throughout the semester, students will be asked to co-lead on the week's discussion topic with Dr. Perkowski. This will consist of answering class feedback questions from the reading feedback. It will also consist of leading a 50-minute discussion of a recent literature article of their choice and answering class questions from the Current literature feedbacks. Students will be evaluated on their ability to respond accurately to their peers' questions as well as their ability to summarize and generate discussion on a recent literature article.

6.6 *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 terrestrial ecosystem ecology and review the current state of knowledge on the topic. The review should be forward thinking, in that it forms the basis for understanding ecosystem moving forward. The review should be novel in that it should not be similar to previously published review papers. **It is highly encouraged that students choose a topic that is related to their research interests that could be used as an initial chapter for their thesis or dissertation.**

Students will 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 will be done individually. Students are encouraged to receive help and guidance from the instructors as well as the class at large, particularly at

the idea generation phase of the project.

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

The grading of this review will differ from that for the undergraduate section. Specifically,for full points on the breadth and originality portion (20% of written grade), the question addressed must be completely novel andnot something that has been reviewed in the published literature. The review should produce novel findings, questions, and hypotheses. For full points on the scientific rigor portion (30% of written grade), the content of the review should be of suitable quality for partial inclusion in the introduction of a manuscript or proposal or be submittable for publication on its own. For full points on the oral presentation portion (5% of total oral grade), publication on its own. For full points on the oral presentation portion (5% of total oral grade), the presentation should be of suitable quality that it could be presented at a national conference in the field of plant science (Botanical Society of America) and/or ecology (Ecological Society of America).

7 Grading

Participation and Engagement: 20%

Mini-quizzes: 5%

Reading feedback: 5%

Co-lead discussion leads: 10%

Co-lead response to reading feedback: 10%

Co-lead response to recent literature feedback: 10%

Recent literature feedback: 5%

Literature review idea proposal: 10%

Final literature review presentation: 5%

Final literature review: 25%

Grades will be made available on RaiderCanvas. All grades posted at the end of the course will be final, unless an error has been made in their calculation. Please contact Dr. Perkowski if you feel your grade has been calculated incorrectly.

8 Grading Scale

A: $\geq$ 90%

B: 80 – 90%

C: 70 – 80%

D: 60 – 70%

F: $\leq$ 59.9%

Topic Schedule by Week

January 15, 2026 - No class Thursday

January 20, 2026 - Introductions, semester planning, and the Ecosystem Concept (Ch. 1)

January 27, 2026 - The Ecosystem Concept (continued; Ch. 1)

February 3, 2026 - Climate and Soils (Ch. 2, 3)

February 10, 2026 - Water and Energy Balance (Ch. 4); **Literature review idea list due**

February 17, 2026 - Carbon Inputs (Ch. 5)

February 24, 2026 - Ecosystem carbon budgets (Ch. 7)

March 2, 2026 - Plant Nutrient Use and Nutrient Cycling (Ch. 8,9); **Literature review idea proposals due**

March 9, 2026 - Species and Trophic Dynamics (Ch. 10, 11)

March 16, 2026 - **No class - Spring Break**

March 23, 2026 - Temporal Dynamics (Ch. 12)

March 30, 2026 - Landscape heterogeneity and ecosystem dynamics (Ch. 13)

April 6, 2026 - Changes in the Earth system (Ch. 15); **Literature review rough drafts due**

April 13, 2026 - Managing and sustaining ecosystems (Ch. 15)

April 20, 2026 - Literature review presentations

April 27, 2026 - Literature review presentations; **Literature review final drafts due**

Deadlines (due11:59pm on RaiderCanvas)

March 5, 2026 - **Literature review idea proposal**

April 6, 2026 - **Literature review rough draft**

April 29, 2026 - **Literature review final draft**