BIOL 6301-029

Principles of Terrestrial Ecosystem Ecology
Fall 2023

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.

The course is part of a TTU-wide *Creating Livable Futures* initiative. The purpose of the initiative is to create opportunities for students to hear and disseminate information related to global sustainability. More information on the initiative is listed below.

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 graudate 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.

2.1 Class Time and Location

Tuesdays and Thursdays 12:30-13:50

Science Building Room 204

2.2 Instructor

Dr. Nick Smith

Experimental Sciences Building II (ESBII) Room 402D

806-834-7363

nick.smith@ttu.edu

Meetings by appointment

2.3 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.

3 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/biol43165316_fall2023`. The repository will include the syllabus, daily class notes, readings, and mini-quizzes. The repository will also include other miscellaneous class materials as the semester progresses. A README file will contain information on the repository, including links to different sections at `https://github.com/SmithEcophysLab/biol43165316_fall2023/README.md`.

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. Note that broad course objectives meet the objectives of the *Creating Livable Futures* initiative (more information below).

5 Attendance Policy

Attendance will not be taken, but 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 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. These 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. Smith. 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.

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 will be done individually. 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.

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 and not 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), 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: 15%

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 Blackboard. All grades posted at the end of the course will be final, unless an error has been made in their calculation. Please contact Dr. Smith 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%

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).

9.1 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.

10 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 COVD-19 resource page is here: `https://www.depts.ttu.edu/communications/emergency/coronavirus/`.

11 Special Considerations

11.1 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.

11.2 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.

12 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 `titleix.ttu.edu/students`. 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 24-hour Crisis 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/ttpd/` (To report criminal activity that occurs on or near Texas Tech campus.)

13 Student Support Statement

The Office of Campus Access and Engagement works across Texas Tech University to foster, affirm, engage, and strengthen all student communities. For more information about services, opportunities for participation, and ways in which Texas Tech can support your success in college, please contact (806) 742-7025.

14 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`).

15 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. [Texas Tech University ("University") Quality Enhancement Plan, Academic Integrity Task Force, 2010].

16 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.

17 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 room 117. Please visit the website for hours of operation at`https://www.depts.ttu.edu/dos/foodpantry.php`.

18 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 Communica-

tion. 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

Note: Book chapters in parentheses

08/21/2023 – **No class Tuesday**; Introductions, semester planning, and the Ecosystem Concept (Ch. 1)

08/28/2023 – Ecosystem Concept continued (Ch. 1)

09/04/2023 – **No class Thursday**; Climate and Soils (Ch. 2, 3)

09/11/2023 – Water and Energy Balance (Ch. 4)

09/18/2023 – Carbon inputs (Ch. 5)

09/25/2023 – Ecosystem carbon budgets (Ch. 7)

10/02/2023 – Fire w/ guest lecturer Dr. Dylan Schwilk

10/09/2023 – Plant Nutrient Use and Nutrient Cycling (Ch. 8, 9); **Literature review idea proposals due**

10/16/2023 – Species and Trophic Dynamics (Ch. 10, 11)

10/23/2023 – Temporal dynamics (Ch. 12)

10/30/2023 - **No class Thursday**; Landscape heterogeneity and ecosystem dynamics (Ch. 13)

11/06/2023 – Changes in the Earth System (Ch. 14)

11/13/2023 – Managing and sustaining ecosystems (Ch. 15)

11/20/2023 – **No classes** - Happy Thanksgiving!

11/27/2023 – **Literature review presentations**

12/05/2023 – **No class Thursday**; **Literature review presentations**; **Literature review due**

General Weekly Schedule

Generally, each Tuesday will consist of a lecture by Dr. Smith followed by a discussion of the reading. Students will turn in their reading 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.