

BIOLOGY 5440

Urban Ecology

Fall Semester, 2023

Time and Place: Mon/Wed 3:00-4:20, GC 2660

Instructors: Fred Adler, Colby Tanner

Textbook: Urban Ecosystems: Ecological Principles for the Built Environment (F. R. Adler and C. J. Tanner)

Teaching Assistant: Amy Buxton (amy.buxton@utah.edu)

Office: Fred: Biology 321
Colby: Biology 321-B or JTB 245

Office Hours: By appointment

Email: adler@math.utah.edu, colby.tanner@utah.edu

BIOL 5440 Course Description: Applying the principles of modern ecology as they relate to socio-economic and technological urban ecosystems. Detailed examination of how altered flows of energy, water, and nutrients affect plants, animals, and ecological communities in highly modified environments. We will explore the feedbacks at different scales to better understand how intended and unintended consequences of urbanization have immediate, as well as long lasting, local and global downstream effects. We will focus on several case studies in the U.S. and abroad, which will provide a framework for place-based urban ecology as it relates to sustainability, resiliency, and conservation.

Course Outcomes: By the end of this course, you will be able to:

- Apply the definitions of ecology and their associated methodologies in the biological sciences.
- Analyze the inter-relationships among the natural and built environments of cities, and how these complex relationships have led to intended and unintended physical, biological, economical, and sociological consequences for humans as well as local and downstream communities of non-human organisms (e.g., the role urban ecosystems play in global climate change).
- Apply urban ecological research methods for answering questions about the functioning and sustainability of cities, as well as how these this can enhance or impair the living conditions of a city's human and non-human inhabitants.

- Synthesize the complex interactions among socio-economic and ecological frameworks to begin developing sustainable cities that provide equal access to ecosystem services: regulating, supporting, provisioning, and cultural.
- Design and carry out experiments and plans within an interdisciplinary framework.
- Communicate clearly and effectively through oral, written, and visual/graphic interfaces.
- Proactively source and synthesize a wide range of quantitative and qualitative information to generate new knowledge in urban ecosystem science and its application to urban health and wellbeing.

Teaching and Learning Methods: This course is problem-based and employs active learning. In addition to short class activities, you will also work in interdisciplinary teams on several applied projects that will be graded in phases throughout the semester. Some of this work will take place outside of class hours, but some will occur during the class period. Therefore, attendance is essential. Projects/exams will be based on understanding concepts, not memorization. It will be very difficult to succeed in this class without attending almost every class session.

Readings and Assignments: Weekly readings are “due” before class. On Tuesdays, our in-class lectures and activities assume that you have already done the assigned textbook and supplemental reading for that week. You won’t get much out of your time in class if you skip the readings. A measurable part of your class participation grade each week will come from answering questions and joining discussions.

Deliverables. Grades will be determined by performance on the following elements.

1. Homework problems (from the textbook): 15%
2. Class participation (based on assigned readings and in-class activities): 10%
3. Essays, reports, in-class presentations: 15%
4. Daily journal entries (~5 per week): 20%
5. Midterm (open book/notes), synthesis of information: 15%
6. Capstone project, developed in groups, presented in phases (for a total of 25%)

Classroom etiquette. We are all here to learn together and have fun together. Students will maintain a respectful and safe learning atmosphere toward each other.

University Policies 1. The Americans with Disabilities Act. The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, (801) 581-5020. CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability



Services. 2. Addressing Sexual Misconduct. Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veterans status or genetic information. If you or some- one you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801- 581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS) 3. Student Code: <http://regulations.utah.edu/academics/6-400.php> (Links to an external site.) 4. Accommodation Policy (see Section Q): <http://regulations.utah.edu/academics/6-100.php> (Links to an external site.)

Course Policies: It is our responsibility to come to class on time and prepared, to be available during office hours and by email to answer your questions, and to grade your assignments and exams fairly and in a timely manner.

It is your responsibility to come to class on time and prepared, to turn in your assignments on time, and to complete your assignments and exams honestly, refraining from academic misconduct as defined in the campuswide Student Code. Documented cases of academic misconduct will result in sanctions according to university policy.

Attendance & Punctuality: Attendance of all class sessions is highly recommended. Attendance will not be recorded; however, 10% of your grade will be based on participation during class. If you will be absent from class for officially sanctioned university activities or government obligations (“type 1” absences as defined in Policy 6-100-III-O), you can arrange for a makeup assignment with at least 1-week notice beforehand. For illnesses or other emergencies, you can request a makeup assignment no more than twice during the semester. Please be punctual: late-comers may be subject to some degree of public chastisement.

Food & Drink: Beverages will be allowed within reason. Please respect our janitorial staff and leave the classroom as clean as you found it.

Electronic Devices in Class: Except during the midterm exam, laptops and other electronic devices are allowed in our classroom if you are using them for taking notes or otherwise taking part in the classwork of this course. At the discretion of the instructor, you will be asked to turn off your devices if you are using them for non-academic purposes in class. No electronic devices will be allowed during in-class exams.

Note: This syllabus serves as an outline and guide for our course. Please note that we may modify it with reasonable notice to you. We may also modify the Course Schedule to accommodate the needs of our class. Any changes will be announced in class and posted on Canvas under Announcements.

Tentative Schedule

Week of	Topic	In Class	Reading / Homework
August 21	Introduction (all) Urban Ecosystems (Chapter 1) (Colby)	Class Intro/Campus walk with John Walker (U of U Facilities) Urban Ecosystems	Chapter 1.1-1.3 / 1.1(3),1.2(2), 1.3(1-3) Chapter 1.4-1.6 / 1.4(1,3), 1.5(3), 1.6(3)
August 28	The Urban Metabolism (Chap 2) (Fred) Urban Accounting (Fred)	Budgets/Flows Ecological Footprint	Chapter 2.1-2.2 / 2.1(3), 2.2(1-3) Chapter 2.3-2.4 / Lab A, 2.3(1-2), Lab B.
September 4	Labor Day Urban Climate (Colby)	No Class Urban Heat Island (and trees)	Chapter 3.1-3.2 / 3.1(3), 3.2(2,5)
September 11	Water Cycle (Colby) Urban Nutrient Dynamics/Amplification (3.3-3.4) (Fred)	Water walk (living lab?) Discussion	Chapter 3.3-3.4 /3.3(1-2), 3.4(4-5) Chapter 4.1-4.2/4.1(1-2,4-5), 4.2(1,4,6)
September 18	Urban Biodiversity & Invasive Species 4.1& 4.2 (colby) Species Interactions (4.2 & 4.3) (colby)	Discussion Discussion	Chapter4.3/4.3(2-4) Chapter 4.4/4.4(1-3)
September 25	Urban Diseases (4.4) (fred)	Discussion In-class (open book/notes)	Study/Review Chapter 4.5/4.5(1,3,7)

	Midterm		
October 2	Traits of Urban Organisms (4.5) (Amy) Discussion of Final Project (Colby)	Discussion Project examples	Chapter 4.6/4.6(4)
October 9	Fall Break	No Class No Class	
October 16	Urban Evolution (4.6) (colby) Urban Health (5.1) (fred)	Discussion Discussion	Chapter 5.1/5.1(2-3) Chapter 5.2/5.2(1-3)
October 23	Urban Ecological Design and Policy (5.2) The future of cities	Connection between design and the built environment Preparation for panel discussion	Chapter 5.3/5.3(1,4-5) Come with project ideas/questions
October 30	Panel Discussion 1 Panel Discussion 2		
November 6	Project Proposals Urban Ecology	Present/discuss in class Discussion	“1° literature” Ecological beginnings of Urban Ecology “1° literature” Intended/Unintended consequence
November 13	Consequences Perception vs. Reality	Discussion Discussion	“1° literature” Perception vs Reality

			“1° literature” Access to ecosystem services
November 20	Social-ecological interactions (ecosystem services) Project work	Discussion Work on projects	Find & summarize your own literature “1° literature” role of transport in shaping urban development
November 27	Transport – urban growth Human well being	Discussion Discussion	“1° literature” Ecological basis of human well being
December 4	Project work Ecological quality	Work on projects Discussion	“1° literature” Growth & Ecological Quality
December 11	Finals Week	Poster presentations (Panel judges)	Wednesday 13 December, 3:30-5:30

References

1. C.J. Tanner, F. R. Adler, N. B. Grimm, P. M. Groffman, S. A. Levin, J. Munshi-South, D.E. Pataki, M. Pavao-Zuckerman, and W. G. Wilson, “Urban ecology: advancing science and society,” *Frontiers in Ecology and the Environment*, vol. 12, pp. 574–581, 2014.
2. T. McPhearson, S. T. A. Pickett et al, "Advancing urban ecology toward a science of cities", *BioScience*, vol 66, pp. 198-212, 2016.
3. M. Chester, S. Pincetl, B. Allenby, "Avoiding unintended tradeoffs by integrating life-cycle impact assessment with urban metabolism," *Current Opinion in Environmental Sustainability*, vol. 4:451-457, 2012.

4. M. L. Imhoff, P. Zhang, R. E. Wolfe, L. Bounoua, "Remote sensing of the urban heat island effect across biomes in the continental USA," [*Remote Sensing of Environment*](#), vol. 114, pp. 504-513, 2010.
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11. S.H. Faeth, P. S. Warren, E. Shochat, and W. A. Marussich, "Trophic dynamics in urban communities," [*Bioscience*](#), vol. 55, pp. 399–407, 2005.
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14. M. Giraudeau, M. Mousel, S. Earl, and K. McGraw, "Parasites in the city: degree of urbanization predicts poxvirus and coccidian infections in house finches (*Haemorhous mexicanus*)," [*PLoS ONE*](#), vol. 9, art. e86747, 2014
15. V. B'okony, A. Kules'ar, and A. Liker, "Does urbanization select for weak competitors in house sparrows?," [*Oikos*](#), vol. 119, pp. 437–444, 2010.

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