THE UNIVERSITY OF TEXAS AT EL PASO
COLLEGE OF SCIENCE
Department of Biological Sciences

Course #:	BIOL 6312/5301/4395 CRN#27635
Course Title:	Biodiversity
Credit Hrs:	3
Term:	Spring 2025
Course Meetings & Location:	Mondays & Wednesdays 3:00–4:20 PM, HSSN 212
Instructor:	Eli Greenbaum, Ph.D.
Office Location:	Biology 301 (between Classroom & Biosciences Buildings).
Contact Info:	Phone # 747-5553; Fax # 747-5808 E-mail address: egreenbaum2@utep.edu Emergency Contact: (Cell) 785-393-3583 *emergencies only please*
Office Hrs:	Tuesdays 1:30-4:00 PM in Biology #301.
Textbook(s), Materials:	**Required** Roberts, Patrick. 2022. *Jungle: How Tropical Forests Shaped World History – And Us*. Dublin, Ireland: Penguin Random House UK. Other readings will be provided via PDF format on Blackboard
Course Objectives (Learning Outcomes):	This course is for graduate students interested in biodiversity and conservation biology. Because the vast majority of our planet's biodiversity occurs in tropical regions, we will focus on tropical forests, but we will also discuss coral reefs and other habitats/biomes. This course is intended to educate students on the state of biodiversity on planet Earth in the 21st century, including issues related to conservation, coevolution, phylogenetic relationships, ecology, and the effects of humans. Additional details are listed below in the course schedule and assigned readings.
Course Activities/Assignments:	Students in the class will make presentations from assigned readings and the current scientific literature 2 times over the course of the semester, and during these presentations, they will lead the discussion of the issues/science involved therein. Depending on the number of enrolled students, two students may be permitted to present the same topic together. **Please note that presentation Powerpoints should be prepared with a PC computer because many UTEP AV systems are not compatible with Macintosh.**
Assessment of Course Objectives:	Evaluation will be through two lecture examinations (a midterm and final), class participation, and evaluations of individual presentations (see grading rubric on Blackboard). Attendance and vocal participation during class are also important.
Grading Policy:	**Grading**: Grades will be calculated from the following: 10% - Attendance and participation 60% - Individual student presentations (30% each- see grading rubric) 15% - Midterm examination 15% - Final Examination
Make-up Policy:	Makeup exams will be offered to students who miss a scheduled exam because of illness, death in the family or university-sponsored activity, **but written documentation must be provided <u>within 1 week</u> of the missed exam.** Makeup exams will not necessarily conform to the scheduled exam format, and often consist of several essays worth 10–25 points each. **NOTE: Final grades will be submitted within 48 hours after the final exam**; thus, final exam makeups must be completed within 48 hours of the scheduled final exam.

Attendance Policy:	**Attendance and punctuality are a significant portion of your grade in this course.** Valid excuses for tardiness/missing class include illness, vehicle breakdown, death in the family, or university-sponsored activity, but **all valid excuses must be accompanied by written documentation** to receive credit. I will monitor attendance/punctuality on a regular basis throughout the semester.
Netiquette:	Students are expected to communicate with the professor and each other in a professional and respectful manner at all times—failure to do so can result in penalties to the final grade, or in extreme cases, reporting to the UTEP Office of Student Conduct and Conflict Resolution. Students should be mindful that their actions are being recorded on Lockdown browser during exams, and to avoid penalties, they should avoid taking their eyes off the computer screen, talking to other people (nobody else should be in the room), using cell phones, or otherwise engaging in behavior that could give the impression of academic misconduct.
Academic Integrity Policy:	The UTEP policy on academic honesty can be found at: https://www.utep.edu/student-affairs/osccr/student-conduct/academic-integrity.html. All students will be expected to adhere to this policy.
Civility Statement:	I expect all students to be actively engaged in taking notes and class activities during the brief time we meet each week. This means that students should not: (1) converse with classmates during lectures; (2) use cell phones during class (including texting); (3) use laptop computers for any purpose other than note taking; or (4) otherwise disrupt your fellow students from learning and active participation.
Disability Statement:	If you have a disability and need classroom accommodations, please contact The Center for Accommodations and Support Services (CASS) at 747-5148, or by email to cass@utep.edu, or visit their office located in UTEP Union East, Room 106. For additional information, please visit the CASS website at https://www.utep.edu/student-affairs/cass/. Requested accommodations must be made 3 working days before an examination. **All students requesting disability accommodations must request an office hours phone call with the professor to discuss the details before they will be implemented, preferably at the beginning of the semester.**
Military Statement:	If you are a military student with the potential of being called to military service and/or training during the course of the semester, please contact me within the first two weeks of class to arrange in advance for makeup exams, etc.
A Note About Dropping the Course:	Students are cautioned to consider dropping the course if they are performing poorly **BEFORE** the drop deadline. Per College of Science policy, I am not authorized to assist with a course drop after the drop deadline.

Course Schedule:

Lecture Schedule		Topic/Exam
W	Jan 22	Course Introduction and First Readings
M	Jan 27	The Current State of Biodiversity on Planet Earth
W	Jan 29	Deforestation
M	Feb 3	Forest Restoration and Carbon Sink Potential
W	Feb 5	Biodiversity Loss Globally
M	Feb 10	**NO CLASS**
W	Feb 12	Biodiversity Loss in Protected Areas
M	Feb 17	Extinction
W	Feb 19	Human Use and Misuse of Tropical Forests
M	Feb 24	Forest Services
W	Feb 26	Forest Fragmentation
M	Mar 3	Fire
W	Mar 5	**MIDTERM EXAM**
**********SPRING BREAK MARCH 10–14**********		
M	Mar 17	Invasive Species
W	Mar 19	Synergistic Effects
M	Mar 24	Emerging Pathogens
W	Mar 26	Bushmeat and Hunting
M	Mar 31	Coral Reefs
W	Apr 2	The Amphibian Extinction Crisis
Fri	Apr 4	**********DROP DEADLINE**********
M	Apr 7	IUCN Red List
W	Apr 9	Climate Change Part 1
M	Apr 14	Climate Change Part 2
W	Apr 16	Sustainable-Use Forests
M	Apr 21	Governance, Business and Conservation
W	Apr 23	Conservation Victories
M	Apr 28	Ecotourism
W	Apr 30	Captive Breeding Programs
M	May 5	Group Discussion of Robert's *Jungle*
W	May 7	**FINAL EXAM**

READINGS

NOTE: In general, students are responsible for reading the ENTIRE assigned chapter and/or paper shown below. When in doubt, email me. Keep in mind that many of the papers below will touch on the same themes and this is purposeful—different perspectives and data will enrich our understanding of the material.

Wednesday January 22: Biodiversity in Central Africa: Model Lecture
On the first day of class I will give a brief lecture about my own work in Central Africa, both to inform you and to demonstrate the way to present a lecture. The reading below can be done after class.

Greenbaum, E. 2017. ***Emerald Labyrinth: A Scientist's Adventures in the Jungles of the Congo.*** *ForeEdge* (imprint of *University Press of New England*), ISBN 1512600970.
You do NOT need to read this entire book, nor do you need to buy it. A copy of the book is available on reserve at the library, and it can also be accessed as an ebook via the UTEP library website. I would like you to focus on the parts of the book that deal with the science, so please read these pages: pp. 73–74, 77–83, 88–90, 177–180, 105–113, 221–224, and Chapter 11. Below I have assigned some of these relevant pages to the topics we will cover later in the semester, so feel free to read them as the topics come up.

Monday January 27: The Current State of Biodiversity on Planet Earth

Díaz, S., and Y. Malhi. 2022. Biodiversity: Concepts, Patterns, Trends, and Perspectives. Annual Review of Environment and Resources 47:31–63.

Raven, P. H., R. E. Gereau, P. B. Phillipson, C. Chatelain, C. N. Jenkins, and C. U. Ulloa. 2020. The distribution of biodiversity richness in the tropics. Science Advances 6:eabc6228.

Wednesday January 29: Deforestation

Sodhi, N. S., B. W. Brook, and C. J. A. Bradshaw. 2007. Tropical Conservation Biology. Chapter 1: Diminishing habitats in regions of high biodiversity, pp. 1–32.

Rosa, I. M. D., M. J. Smith, O. R. Wearn, D. Purves, and R. M. Ewers. 2016. The environmental legacy of modern tropical deforestation. Current Biology 26:2161–2166.

Marsh, C. J., E. C. Turner, B. Wong Blonder, B. Bongalov, S. Both, R. S. Cruz, D. M. O. Elias, et al. 2025. Tropical forest clearance impacts biodiversity and function, whereas logging changes structure. Science (Washington) 387:171–175.

Monday February 3: Forest Restoration and Carbon Sink Potential

Koch, A., and J. O. Kaplan. 2022. Tropical forest restoration under future climate change. Nature Climate Change 12:279–283.

Heinrich, V. A., C. Vancutsem, R. Dalagnol, T. M. Rosan, D. Fawcett, C. H. L. Silva-Junior, H. L. G. Cassol, et al. 2022. The carbon sink of secondary and degraded humid tropical forests. Nature (London) 615:436–442.

Emerald Labyrinth: pp. 257–259

Wednesday February 5: Biodiversity Loss Globally

Jaureguiberry, P., N. Titeux, M. Wiemers, D. E. Bowler, L. Coscieme, A. S. Golden, C. A. Guerra, et al. 2022. The direct drivers of recent global anthropogenic biodiversity loss. Science Advances 8:eabm9982.

Sage, R. F. 2020. Global change biology: a primer. Global Change Biology 26:3–30.

Arponen, A. 2024. Conservation interventions are effective but far from sufficient. Nature Ecology and Evolution 8:1567–1568.

Wednesday February 12: Biodiversity Loss in Protected Areas

Li, G., C. Fang, J. E. M. Watson, S. Sun, W. Qi, Z. Wang, and J. Liu. 2024. Mixed effectiveness of global protected areas in resisting habitat loss. Nature Communications 15: 8389.

Gray, C. L., S. L. L. Hill, T. Newbold, L. N. Hudson, L. Börger, S. Contu, A. J. Hoskins, S. Ferrier, A. Purvis, and J. P. W. Scharlemann. 2016. Local biodiversity is higher inside than outside terrestrial protected areas worldwide. Nature Communications 7:12306.

Monday February 17: Extinction

Urban, M. C. 2024. Climate change extinctions. Science (Washington) 386:1123–1128.

Senior, R. A., R. Bagwyn, D. Leng, A. K. Killion, W. Jetz, and D. S. Wilcove. 2024. Global shortfalls in documented actions to conserve biodiversity. Nature (London) 630:387–391.

Wednesday February 19: Human Use and Misuse of Tropical Forests

Ghazoul, J. and D. Sheil. 2010. Tropical Rain Forest Ecology, Diversity, and Conservation. Chapter 15: People of the forest: Livelihoods and welfare, pp. 327–350.

Bourgoin, C., G. Ceccherini, M. Girardello, C. Vancutsem, V. Avitabile, P. S. A. Beck, R. Beuchle, et al. 2024. Human degradation of tropical moist forests is greater than previously estimated. Nature (London) 631:570–576.

Monday February 24: Forest Services

Sodhi, N. S., B. W. Brook, and C. J. A. Bradshaw. 2007. Tropical Conservation Biology. Chapter 2: Invaluable losses, pp. 33–52.

Brander, L. M., R. de Groot, J. P. Schägner, V. Guisado-Goñi, S. Solomonides, A. McVittie, et al. 2024. Economic values for ecosystem services: A global synthesis and way forward. Ecosystem Services 66:101606.

Emerald Labyrinth: pp. 105–113

Wednesday February 26: Forest Fragmentation

Sodhi, N. S., B. W. Brook, and C. J. A. Bradshaw. 2007. Tropical Conservation Biology. Chapter 3: Broken homes: tropical biotas in fragmented landscapes, pp. 53–71.

Bello, C., T. W. Crowther, D. Leal Ramos, T. Morán-López, M. A. Pizo, and D. H. Dent. 2024. Frugivores enhance potential carbon recovery in fragmented landscapes. Nature Climate Change 14:636–643.

Monday March 3: Fire

Sodhi, N. S., B. W. Brook, and C. J. A. Bradshaw. 2007. Tropical Conservation Biology. Chapter 4: Burning down the house, pp. 72–88.

Jones, M. W., S. Veraverbeke, N. Andela, S. H. Doerr, C. Kolden, G. Mataveli, M. Lucrecia Pettinari, et al. 2024. Global rise in forest fire emissions linked to climate change in the extratropics. Science (Washington) 386:eadl5889.

Monday March 17: Invasive Species

Seebens, H., A. Niamir, F. Essl, S. T. Garnett, J. A. Kumagai, Z. Molnár, et al. 2024. Biological invasions on indigenous peoples' lands. Nature Sustainability 7:737–746.

Peller, T., and F. Altermatt. 2024. Invasive species drive cross-ecosystem effects worldwide. Nature Ecology & Evolution 8:1087–1097.

Wednesday March 19: Synergistic Effects

Culot, L., C. Bello, J. Luis Ferreira Batista, H. Thadeu Zarate do Couto, and M. Galetti. 2017. Synergistic effects of seed disperser and predator loss on recruitment success and long-term consequences for carbon stocks in tropical rainforests. Scientific Reports 7:7662.

Dantas, A., and C. Roberto Fonseca. 2024. Synergistic effect of habitat loss and chronic anthropogenic disturbances on ant species richness. Biodiversity and Conservation 33:205–219.

Monday March 24: Emerging Pathogens

Schmeller, D. S., F. Courchamp, and G. Killeen. 2020. Biodiversity loss, emerging pathogens and human health risks. Biodiversity and Conservation 29:3095–3102.

Afelt, A., R. Frutos, and C. Devaux. 2018. Bats, coronaviruses, and deforestation: toward the emergence of novel infectious diseases? Frontiers in Microbiology 9:702.

Wednesday March 26: Bushmeat and Hunting

Ripple, W. J., C. Wolf, T. M. Newsome, M. G. Betts, G. Ceballos, F. Courchamp, M. W. Hayward, B. Van Valkenburgh, A. D. Wallach, and B. Worm. 2019. Are we eating the world's megafauna to extinction? Conservation Letters 12:e12627.

Benítez-López, A., L. Santini, A. M. Schipper, M. Busana, and M. A. J. Huijbregts. 2019. Intact but empty forests? Patterns of hunting induced mammal defaunation in the tropics. PLoS Biology 17:e3000247.

Monday March 31: Coral Reefs

Edwards, A., J. Guest, and A. Humanes. 2024. Rehabilitating coral reefs in the Anthropocene. Current Biology 34:PR399-R406.

Klein, S. G., C. Roch, and C. M. Duarte. 2024. Systematic review of the uncertainty of coral reef futures under climate change. Nature Communications 15:2224.

Wednesday April 2: The Amphibian Extinction Crisis

Luedtke, J. A., J. Chanson, K. Neam, L. Hobin, A. O. Maciel, A. Catenazzi, A. Borzée, et al. 2023. Ongoing declines for the world's amphibians in the face of emerging threats. Nature (London) 622:308–314.

Mi, C., L. Ma, M. Yang, X. Li, S. Meiri, U. Roll, O. Oskyrko, et al. 2023. Global protected areas as refuges for amphibians and reptiles under climate change. Nature Communications 14:1389.

Monday April 7: IUCN Red List

Betts, J., R. P. Young, C. Hilton-Taylor, M. Hoffmann, J. P. Rodríguez, S. N. Stuart, and E. J. Milner-Gulland. 2020. A framework for evaluating the impact of the IUCN Red List of threatened species. Conservation Biology 34:632–643.

Rodrigues, A. S. L., J. D. Pilgrim, J. F. Lamoreux, M. Hoffmann, and T. M. Brooks. 2006. The value of the IUCN Red List for conservation. Trends in Ecology and Evolution 21:71–76.

Wednesday April 9: Climate Change Part 1

Ismaeel, A., A. P. K. Tai, E. Ghizoni Santos, H. Maraia, I. Aalto, J. Altman, Jiří Doležal, et al. 2024. Patterns of tropical forest understory temperatures. Nature Communications 15:549.

Ortega, M. A., L. Cayuela, D. M. Griffith, A. Camacho, I. M. Coronado, R. F. del Castillo, B. L. Figueroa-Rangel, et al. 2024. Climate change increases threat to plant diversity in tropical forests of Central America and southern Mexico. PLoS ONE 19:e0297840.

Monday April 14: Climate Change Part 2

Outhwaite, C. L., P. McCann, and T. Newbold. 2022. Agriculture and climate change are reshaping insect biodiversity worldwide. Nature (London) 605:97–102.

Pörtner, H. -O., R. J. Scholes, A. Arneth, D. K. A. Barnes, M. T. Burrows, S. E. Diamond, C. M. Duarte, et al. 2023. Overcoming the coupled climate and biodiversity crises and their societal impacts. Science (Washington) 380:eabl4881.

Emerald Labyrinth: 264–270.

Wednesday April 16: Sustainable-Use Forests

Howes, M.-J. R., C. L. Quave, J. Collemare, E. C. Tatsis, D. Twilley, E. Lulekal, A. Farlow, L. Li, M.-E. Cazar, D. J. Leaman, T. A. K. Prescott, W. Milliken, C. Martin, M. Nuno De Canha, N. Lall, H. Qin, B. E. Walker, C. Vásquez-Londoño, B. Allkin, M. Rivers, M. S. J. Simmonds, E. Bell, A. Battison, J. Felix, F. Forest, C. Leon, C. Williams, and E. Nic Lughadha. 2020. Molecules from nature: Reconciling biodiversity conservation and global healthcare imperatives for sustainable use of medicinal plants and fungi. Plants People Planet 2:463–481.

Campos-Silva, J. V., C. A. Peres, J. E. Hawes, T. Haugaasen, C. T. Freitas, R. J. Ladle, and P. F. M. Lopes. 2021. Sustainable-use protected areas catalyze enhanced livelihoods in rural Amazonia. Proceedings of the National Academy of Sciences (USA) 118:e2105480118.

Monday April 21: Governance, Business and Conservation

Edwards, D. P., J. B. Socolar, S. C. Mills, Z. Burivalova, L. Pin Koh, and D. S. Wilsove. 2019. Conservation of tropical forests in the Anthropocene. Current Biology 29:PR1008-R1020.

Reed, J., J. Barlow, R. Carmenta, J. van Vianen, and T. Sunderland. 2019. Engaging multiple stakeholders to reconcile climate, conservation and development objectives in tropical landscapes. Biological Conservation 238:108229.

Wednesday April 23: Conservation Victories

Waldron, A., R. Justicia, L. Smith, and M. Sanchez. 2012. Conservation through chocolate: a win-win for biodiversity and farmers in Ecuador's lowland tropics. Conservation Letters 5:213–221.

Hopkins, S. K., S. H. Sokolow, J. C. Buck, G. A. De Leo, I. J. Jones, L. H. Kwong, C. LeBoa, et al. 2021. How to identify win-win interventions that benefit human health and conservation. Nature Sustainability 4:298–304.

Monday April 28: Ecotourism

Stronza, A. L., C. A. Hunt, and L. A. Fitzgerald. 2019. Ecotourism for conservation? Annual Review of Environment and Resources 44:229–253.

Dinh Tien, N., T. Nhat Lam Duyen, N. Thi Thanh Huyen, P. Quang Anh, N. Thi Oanh, V. Van Tich, D. Thanh Dat, et al. 2024. Community-based ecotourism for sustainability: An evaluative analysis of Binh Son district, Quant Ngai province in Vietnam. Social Sciences & Humanities Open 9:100807.

Shreeve, J. 2021. Preserving paradise: Costa Rica's Osa Peninsula is a model for conservation. National Geographic Magazine 239:124–141.

Wednesday April 30: Captive Breeding Programs

Johnson, K. and J. R. Mendelson III. 2022. Status of global amphibian declines and the prioritization of species for captive breeding. In: Silla, A. J., A. J. Kouba, and H. Heatwole (eds.), Reproductive Technologies and Biobanking for the Conservation of Amphibians, pp. 10–22. Link.

Farquharson, K. A., C. J. Hogg, and C. E. Grueber. 2021. Offspring survival changes over generations of captive breeding. Nature Communications 12:3045.

Emerald Labyrinth: 259–264.

Monday May 5: Book Discussion- Dr. Greenbaum will lead Discussion

Roberts, P. 2022. *Jungle: How Tropical Forests Shaped World History – And Us*. Dublin, Ireland: Penguin Random House UK.