BIOL 397 (Western Colorado University/RMBL summer course)
Course Title: Rocky Mountain Ecosystems
Course Instructor: Dr. Kaysee Arrowsmith (kcarrows@utexas.edu)
Course Schedule: M/Th, 9am – 5pm, 6/15/2026 – 7/10/2026

Course Description: This field-based course provides students with an introduction to the diverse methods that field ecologists use to study patterns of environmental change in the montane ecosystems of the Rocky Mountains. The Rockies have experienced nearly 2˚C of warming over the past century and we could see an additional 1˚C of warming in the next 25 years. These warming trends have been associated with earlier snowmelts, altered species ranges, and mismatches in the timing of biological events, among many other impacts. But environmental changes occur on time scales and across geographic ranges that are hard to observe first-hand. How do scientists study these processes?

In this course, students will be introduced to research studying the effects of environmental change in the Rocky Mountains. We will discuss the methods that researchers use to measure changing environments, from long-term monitoring of temperature and precipitation to discrete measurements of streamflow and land cover. We will also interact with scientists who experimentally manipulate environmental conditions to identify how these changes affect specific biological processes like pollination and plant reproduction. Finally, we will explore how natural history museums provide valuable opportunities to study how species' distributions, traits, and life histories have changed over time. Students taking this course should expect to spend substantial time outdoors, including moderate hiking, but accommodations will be available for any students experiencing any limitations with these activities. By the end of this course, students will be familiar with the flora and fauna of diverse mountain ecosystems and will be equipped with a wide range of research methods to apply to their own questions related to global environmental change.

Course Objectives

1. *Ecological content*
    a. Students will be able to communicate the goals and methods of multiple research groups at the Rocky Mountain Biological Laboratory who are studying elements of global environmental change.
    b. Students will be able to identify major ways in which global change is affecting montane ecosystems.
    c. Students will be able to describe and measure specific environmental variables and discuss how these variables can provide information about broad-scale global change trends.
2. *Scientific literacy*
    a. Students will be able to identify credible, peer-reviewed journal articles relating to their topics of research interest.
    b. Students will be able to understand and synthesize information from published scientific literature.
    c. Students will be able to identify flaws in published research and propose ideas for how these flaws could be remedied using the researchers' original data or in future scientific studies.
    d. Students will be able to write their own research findings in the style of a peer-reviewed journal.
3. *Research methodology*

a. Students will be able to formulate a research question and hypotheses relevant to that question.
b. Students will be able to select appropriate methodologies to measure environmental change at spatial and temporal scales relevant to a desired outcome.
c. Students will be able to develop research plans to relate environmental variables (e.g., temperature, precipitation, snowmelt, land cover, streamflow) to biological processes (e.g., emergence from overwintering, predation, pollination, reproduction).
d. Students will be able to analyze data and discuss results using statistical results and figures.

Grading

Students will receive a numeric grade for each day (10 points per day). Over the eight course periods, these daily grades will yield a final grade of 80 total points at the end of the course. Daily grades will be based on the following criteria:

- Maintaining a field notebook (5 points/day, 40 points total)
    - Students will be required to keep a field notebook. In that field notebook, they should record relevant details and notes from each site visit.
    - Details of specific information that should be in field notebooks for each site visit will be provided prior to each site visit.
- Reading and discussing journal articles (2 points/day, 16 points total)
    - Students will be given time in-class to read journal articles and will be asked to discuss them with their peers in small groups and/or with the entire class.
    - To receive all points for a day, students must be respectfully engage in these discussions. Points will be deducted if students are disruptive or do not participate in journal discussions.
- Engaging with research teams during site visits (2 points/day, 16 points total)
    - Students will visit a research team at RMBL on each course day. During these visits, they will be expected to ask questions and engage with the researchers who are introducing their field work to the class in order to earn full points.
    - Engagement could include, but is not limited to, asking questions of the researchers, answer questions when asked of the group, and participating in field activities related to the research as assigned.
- Participating in other course activities and with peers (1 point/day, 8 points total)
    - Throughout the course, students will be asked to collaboratively support their own and others' learning. Students will receive full points for the day if they are productively pursuing their own educational goals and are not engaging in behavior that interferes with other students' abilities to do likewise.

COURSE SCHEDULE

Overview

Date	Topic	Scientist	Pre-Class Reading
June 15 (Mon)	Welcome to the Jungle (intro to field ecology)	billy barr (measuring environmental variables)	Demery & Pipkin 2021
June 17 (Wed) *(make-up for 6/26)*	Rocky Mountain High (Gothic & RMBL)	Rick Williams (RMBL Herbarium)	Pyke & Ehrlich 2010
June 19 (Fri)	Hot In Herre (elevation as a proxy for temperature)	None (tour of Gunnison Valley ecoregions)	Richman et al. 2020
June 22 (Mon)	Paranoid Android (remote sensing & data)	Ian Breckheimer (remote sensing)	Reichman et al. 2011
June 26 (Fri)	**NO CLASS**		
June 29 (Mon)	Staying Alive (environmental filtering & demography)	Bobbi Peckarsky (benthic macroinvertebrates) Dylan Simpson (plant demography)	Baudraz et al. 2025
July 3 (Fri)	Time of Your Life (phenology)	Brian Inouye & Nora Underwood (long-term phenology project)	Inouye 2022
July 6 (Mon)	Come Together (species interactions)	Berry Brosi (plant-pollinator networks) Melanie Kazenel (interactions & climate change)	Brosi & Briggs 2013
July 10 (Fri)	Free Fallin' (go forth and research!)	Jennie Reithel (research communication) John Hausdoerffer/Suzanne Ennis (science outreach & storytelling)	Journal article of your choice!

Detail

Monday, June 15: Welcome to the Jungle (intro to field ecology)

Pre-class reading: Demery & Pipkin 2021. Safe fieldwork strategies for at-risk individuals, their supervisors, and institutions. *Nature Ecology & Evolution* 5(1):5–9. https://doi.org/10.1038/s41559-020-01328-5

Field Notebook: (1) field safety plan; (2) notes from billy barr site visit

Wednesday, June 17: Rocky Mountain High (Gothic and RMBL)

(make-up session for 6/26)

Pre-class reading: Pyke & Ehrlich 2010. Biological collections and ecological/environmental research: a review, some observations and a look to the future. *Biological Reviews* 85(2):247–266. https://doi.org/10.1111/j.1469-185X.2009.00098.x

Field notebook: (1) Gothic townsites notes & comparison to home ecosystem; (2) notes from Rick Williams site visit, including details about the plant that you collect

Friday, June 19: Hot in Herre (elevation as a proxy for temperature)

Pre-class reading: Richman et al. 2020. Asynchronous range shifts drive alpine plant–pollinator interactions and reduce plant fitness. Global Change Biology 26(5):3052–3064. https://doi.org/10.1111/gcb.15041

Field notebook: (1) site descriptions/notes; (2) assessment of differences in plant communities

Monday, June 22: Paranoid Android (remote sensing & data)

Pre-class reading: Reichman et al. 2011. Challenges and opportunities of open data in ecology. *Science* 331(6018):703–705. https://doi.org/10.1126/science.1197962
Field notebook: TBD

Monday, June 29: Staying Alive (environmental filtering & demography)

Pre-class reading: Baudraz et al. 2025. Several candidate size metrics explain vital rates across multiple populations throughout a widespread species' range. *Journal of Ecology* 113(11):3149–3176. https://doi.org/10.1111/1365-2745.70148
Field notebook: TBD

Friday, July 3: Time of Your Life (phenology)

Pre-class reading: Inouye 2022. Climate change and phenology. *Interdisciplinary Reviews: Climate Change* 13(3):e764. https://doi.org/10.1002/wcc.764
Field notebook: TBD

Monday, July 6: Come Together (species interactions)

Pre-class reading: Brosi & Briggs 2013. Single pollinator species losses reduce floral fidelity and plant reproductive function. *PNAS* 110(32):13044–12048. https://doi.org/10.1073/pnas.1307438110
Field notebook: TBD

Friday, July 10: Free Fallin' (go forth and research!)

Pre-class reading: Journal article of your choice!
Field notebook: (1) research description for a scientific audience; (2) research description for a non-scientific audience; (3) final reflection

Last Updated: 3/5/2026