BIOE 440 Conservation Ecology
Syllabus (DRAFT)
3 credits; Lectures, Labs, Field Work
Course dates: June 25–July 6, 2018
Instructor: Dr. Chris Frissell
Email chris.frissell@flbs.umt.edu
http://flbs.umt.edu/urls/peo

General note: This draft version of the course syllabus is subject to change. Revisions will be posted to the FLBS website as they are received. The final syllabus will be marked final and will be distributed on day one of the course.

Prerequisites: One semester of college-level biology and an ecology course (can be met via BIOE 342 Field Ecology at FLBS) or equivalents; or consent of instructor.

Course Description:
Principles and methods of conservation ecology applied to aquatic and terrestrial species and ecosystems with emphasis on concepts of evolution, genetics, population ecology, behavioral ecology, species interactions, and ecosystem pattern and process as key attributes to be considered in the design and implementation of nature conservation and restoration. This course emphasizes the application of basic biological research to problems in conservation and management with an eye toward the interface between science and policy. There are five primary themes to the course: defining population units of conservation; effects of introduced species (including invasive species, hybridization, and infectious disease); population viability and monitoring; habitat pattern, ecosystem dynamics, and environmental change across landscapes; and the relation of conservation science and practice to culture, policy and politics. Case studies will consider the reversibility and irreversibility of threats and of the demographic, genetic, environmental and cultural changes threats cause. These themes are applied to a diversity of case studies to illustrate general concepts in real world application. We will be spending much of our time in the field with practicing, expert conservation biologists who work for state and federal government agencies or for nongovernmental organizations.

Student Learning Objectives:
At the end of the course, you will be able to:

- Compare and contrast conservation biology from other scientific and management disciplines.
- Identify 6 major principles or concepts of ecological, evolutionary and genetic science that are critical to the conservation and restoration of biota.
- Differentiate among the conservation practices of protection, restoration, and remediation.
- Recall the basic requirements for protection of biodiversity and biological integrity of four major US environmental laws: the Endangered Species Act, The National Environmental Policy Act, the National Forest Management Act, the Clean Water Act.
- Describe field observations in a standard field notebook format
- Recognize principle threats to conservation and restoration of native species, habitats, and ecosystems in northwestern Montana and the Crown of the Continent Ecosystem including the impact of introduced species
- Evaluate population abundance data collected with a variety of methods to assess population trends.
• Interpret field observations and scientific literature, and recognize how to apply it when formulating a field study or conservation program.
• Discuss how the precautionary principle can inform the conservation decision-making or policy.
• Explain why an interdisciplinary approach (involving the domains of policy, economics, culture, ethics and science) is vital to the conservation decision-making process.
• Illustrate with examples how scientific information and analysis can be used to formulate and inform practices and policies to achieve conservation goals in the face of critical uncertainties, and in a way that openly responds to social considerations.

Required Text: We will read parts of the following text: Groom et al., 2006, *Principles of Conservation Biology* 3rd edition, Sinauer Publ. FLBS will provide several classroom copies of this text, but sharing will be necessary. Students who wish to have a private copy may purchase a used copy of this book at the FLBS bookstore.

Reference Texts: Identification guides to local biota will be available; students are strongly encouraged to bring personal copies of field guides for mammals, amphibians, fishes, flowers, trees, and other biota in the northern Rocky Mountains region of the USA.

Course and Field Supplies/Equipment: (*available for purchase at the FLBS Bookstore)
- Plenty of pencils, regular or mechanical*
- Permanent-ink or weather-resistant pens*
- Hot/cold mug*
- Rite in the Rain field notebook*
- Sunscreen, sun hat, and sunglasses
- Lunch pack-up container(s) (resealable) *
- Mess kit and utensils
- Packable water bottles (total capacity at least 2 liters)*
- Digital camera with zoom (optional)
- Hip boots or waders (optional)
- Bear spray*
- Binoculars (optional but encouraged)
- Laptop computer
- Headlamp and small flashlight, extra batteries

- Required Overnight Field Gear and Other Items to Bring Checklists: [http://flbs.umt.edu/urls/lists](http://flbs.umt.edu/urls/lists)
We will camp overnight one-two nights each week in the field. Food and cooking equipment will be provided, but you will need your own eating utensils, plate or bowl, cup and water bottle. We will spend time wading in cold streams and clean but leech-infested wetlands. You will need a good headlamp, good footwear for hiking lover rough terrain, including snowfields, good footwear or waders for working in cold water, extra dry socks and warm clothes (click above to view required overnight and field gear). We will be camping out two nights and a warm sleeping bag and small backpacking tent are recommended (though students ideally will share tents to avoid crowding limited campsite space). We are in grizzly country, and bear spray is highly recommended, as is your preferred insect repellent.

Grading (percent of final grade):
• Field Notebook (week 1): 10%
• Field Notebook (week 2): 10%
• Independent Report Oral Presentation: 25%
• Independent Written Report (roughly *Cons. Biol.* Format): 25%
• Final Exam (Short essay, open book, take home): 30%

Substantive participation in class discussions factored in as extra credit
NOTE: In cases where the instructor judges that a student 1) shows clear improvement in performance and cognition over time or 2) shows strong bias in aptitudes even with good effort (e.g., intrinsic difficulty in oral
presentation or handling exam pressures, or illness), the student’s lowest assignment score might be dropped in calculating the final grade. This is at the instructor’s discretion.

Course Policies:
Students will adhere to University of Montana Student Conduct Code and Discrimination, Harassment, Sexual Misconduct, Stalking, and Retaliation Policy, which may be accessed at this link: http://www.umt.edu/safety/policies and to the Biological Station Code of Conduct re: form signed to complete student registration.

Students who have not already completed the University of Montana PETSA training may access the Moodle module at this link: http://www.umt.edu/petsa.

Students must also follow FLBS Rules and Regulations and abide by the Safety Orientation Checklist.

The goal in this class is for students to learn and understand basic principles of conservation biology in the context of examples of real world conservation challenges in the Crown of the Continent Ecosystem. Through field visits, lectures, and participation in field studies with guest scientists, we will view how principles of conservation, ecology, and evolution inform conservation research. We will also discuss the codependent interplay between conservation science and the policy and politics of natural resource and landscape management.

Logistical notes: the majority of this course is taught outside, regardless of weather, with class plus transport time often taking 10 hours or more per day, at locations far from your housing at the Biological Station. We will hike some most days and on some days we will hike or float most of the day. Students must be prepared. If you are certain that you can hike 5–10 miles in a day, you will really enjoy this course. If you are not sure of your hiking skills in the rough terrain of mountain landscapes, but you like to exercise and are really committed to learning about Conservation Ecology in this marvelous field setting, the instructor will help teach you how to enjoy hiking as a part of the ecological experience. Please pay very close attention to the requirements you pack wet weather and cold weather gear, including a change of clothes for overnight campouts, and appropriate footwear for hiking in rough terrain and wading in smaller streams and wetlands. And remember to keep a clean camp and carry bear-grade pepper spray on your person and at the ready whenever hiking in open country or forest.

Synthesis, writing and reporting assignments
Field Notebooks—You will be graded on the comprehensiveness, content, and professional quality of notes you keep in a field notebook. You’ll be provided with guidelines on how to keep a scientific notebook. As a general rule, if you find yourself going for more than 45 minutes in the field without making any notes you should check yourself and make sure you’re allocating time appropriately. That said, the content of your notebook can and should span the full scope of classroom work, from observations to immediate, tentative questions and speculations, to retrospective thoughts you may have later in the day or week, or additional information (including answers to your questions) you might glean from follow-up discussions with instructors, guests, or peers, or from research in journals. Ideally, besides general information, your field notebook should contain the initial seeds of your written and oral reports.

Written Reports—Each student is required to produce one short written report, due at 5pm on the final Friday of class. The instructor will be available to evaluate and discuss report topics and drafts with each student to improve research and writing skills. The report is to be a review and synthesis of published research on a narrowly defined topic of your choice, on any subject in conservation science or the science-policy interface,
as approved by the instructor. Reports should generally follow formatting for article category of Review or Essay for the journal Conservation Biology; see http://onlinelibrary.wiley.com/journal/10.1111/(ISSN)1523-1739/homepage/ForAuthors.html, although your reports will likely be shorter, with a word count in the range of 2000–2500 words (includes any tables, figure legends, and literature cited). To produce a good review or essay of this length, it will be important to select a topic/conservation ecological question that is focused narrowly enough that no more than 10–15, but no fewer than 5–6 published articles provide the cited essential content of your review. Your report should identify a conservation problem or goal in the form of a species, community, habitat, or landscape, and identify known threats to that goal or resource. Your review should recognize apparent agreements and disagreements among papers in the published literature, suggest ways to understand or reconcile any disagreements, and discuss the potential consequences of uncertainties arising from 1) disagreement among sources, and 2) lack of critical information for conservation management. Finally, you should suggest conservation management actions of policies that could protect the biological resource of concern in the face of recognized threats and uncertainties. It is strongly advised that you propose a topic and discuss it with the instructor by the end of the first Friday of class, June 29, and certainly by the morning of Monday, July 2.

Oral Report—On the final Friday of class, July 6, you will present the content of your final independent written report to the class in the form of a PowerPoint presentation or alternative oral presentation (on approval from the instructor) as you would give at a scientific meeting. You are required to condense the essentials of your presentation to 9 minutes, allocating 5 minutes for questions and class discussion.

Final Exam
The final exam will consist of about 5–6 questions, from which you will choose 4 to answer. Your answers will be in the form of short essays. Questions will either 1) present as scenario and ask you to provide principles of conservation ecology relevant to resolve a key conservation question about the scenario, or conversely 2) will identify a concept or principle an ask you describe examples of how that knowledge has been, or could be fruitfully applied to a conservation problem. The final exam will be open book, but you should allocate about 30 minutes to answering each question, so there will be little time for research. You will not know the questions prior to the exam period (2-5pm on the final Friday). You will need to be prepared to draw on your in-class experience and what you recall from prior readings and discussion to do well. Your answers should display an integrated understanding of the course field experiences, presentations, and literature readings, as well as the textbook. You’ll be free to take exams out of the classroom, but they are due by 5pm sharp.

Outside of Class
Plan on allocating a good share of your evening hours and your intervening weekend to reading the text and research and prepare your reports. You cannot do well in this course without reading the text and keeping up with the 3–4 supplementary journal articles the instructor will provide each week. Hiking on the off days is encouraged because there is so much to see around FLBS, but conduct your trips with an eye toward the course content, and allocate time accordingly.

Use of Wireless Internet at FLBS:
A reliable secure wireless connection to the Internet is available in selected areas. An online learning interface (Moodle) is used to provide electronic versions of many of the course assignments and supplementary readings for the Field Ecology course.
**Schedule:** The schedule below is subject to change. It based on the 2017 syllabus updated with 2018 dates. Note: Make sure you pack your brown bag lunch each day at breakfast!

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<tr>
<th>Date</th>
<th>Lectures/Lab/Field Work</th>
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| 25-Jun-17 (M) | **8:30am: Ecology East classroom** - Introductions, orientation, syllabus discussion, grading basis, report expectations, field trip logistics and prep.  
10:00am-11:00am: Elrod Lecture Hall - Data and Donuts Seminar  
11:30am-12:00pm: Elrod Lecture Hall - Field notebook format and content.  
1:00pm-3:00pm: Elrod Lecture Hall - Joint lectures & Discussion with Field Ecology - Lectures: Understanding evolution (ER); The domestication of life (ER)  
3:00-5:00pm: Elrod Lecture Hall - Len Broberg, U of MT Environmental Studies, lecture and discussion session on conservation law and policy in North America. |
| 26-Jun-17 (T) | **8:30: Leave for Bison Range** - Germaine (SK Tribes) White, tribal history, culture, ecogeography, and geopolitics; Stacey Dunn (U of ID), Pronghorn ecology; Amy Lisk (USFWS-NBR), invasive weeds, their management and biocontrol [*tentative*]; stop at CF’s home in Polson to discuss top-down ecological processes and invasive species in grasslands.  
4:00pm: Depart for return to FLBS |
| 27-Jun-17 (W) | **DINNER IN CAMP**  
10:00am-5:00pm: Clint Muhlfeld (USGS) and Steve Amish (U of MT Genetics Lab [Tentative]. Native trout conservation field project  
**Location:** North Fork Flathead River. Camp out Weds. Night at Big Creek Campground. |
| 28-Jun-17 (Th) | **BREAKFAST IN CAMP**  
9:00am-12:00pm: Depart camp for Big Creek & North Fork Flathead River. Fire ecology and post-fire management.  
12:00-3:30pm: Erin Sexton (FLBS), transboundary conservation issues.  
3:30pm: Depart field for return to FLBS  
**8:30am: Depart for Swan Valley, Tabitha Graves (USGS).** Grizzly bear habitat, foraging ecology.  
3:30pm: Return to FLBS  
**5:00pm: Field Notebooks due for grading.** |
| 29-Jun-17 (F) | **8:30-10am: Ecology East classroom** - Class discussion, then consultation time with instructor regarding presentations and written reports.  
10:00am-11:00am: Elrod Lecture Hall - Data and Donuts Seminar  
11:30am Depart for Swan Valley, wetland ecology and diversity.  
3:30: Depart for return to FLBS |
| 2-Jul-17 (M) | **8:30-10:00am: Lecture and discussion. Ecology East classroom** - Forest management and stream fish conservation (CF).  
11:30am-5:00pm: Free time to work & consult with CF on independent project report and presentation. |
| 3-Jul-17 (T) | **9:00am: Depart for Glacier NP; stake out campsites at Apgar Campground.**  
12:00pm: Depart camp for Logan Pass w/ Field Ecology class and Joe Giersch (USGS), stream insect diversity, endemism, and climate change.  
4:30pm: Depart Logan Pass for overnight at Apgar |
| 4-Jul-17 (W) | **DINNER IN CAMP**  
**9:00am: Depart for Glacier NP; stake out campsites at Apgar Campground.**  
12:00pm: Depart camp for Logan Pass w/ Field Ecology class and Joe Giersch (USGS), stream insect diversity, endemism, and climate change.  
4:30pm: Depart Logan Pass for overnight at Apgar |
| 5-Jul-17 (Th) | **BREAKFAST IN CAMP**  
**9:00am: Decamp, depart for Nyack and vicinity** – Insect collection or Amphibian survey of floodplain.  
12:30pm: Depart field for return to FLBS.  
**2:30-5:00pm: Ecology East classroom** –prep time and consultation time with instructor regarding presentations, reports. |
6-Jul-17 (F) | 8:30am-12:00pm/1:00-2:00pm: Independent Report presentations (10 min. + 5 min. Q &A each)
2:00-5:00pm: Final Exam; Written reports and Field notebooks due (will be returned via mail).

Students with disabilities may request reasonable modifications by emailing flbs@flbs.umt.edu or contacting Marie Kohler at 406-982-3301 ext. 221. The University of Montana assures equal access to instruction for students with disabilities in collaboration with instructors and Disability Services for Students. The University does not permit fundamental alterations of academic standards or retroactive modifications.