

BIOLOGY 445
PLANT CONSERVATION (Advanced Topics in
Organismal Biology)

SEC. 1: CRN – 30952
Credit Hours: 3
Course Format: Lecture
Spring 2016

“Without plants, there is no life. The functioning of the planet, and our survival, depends on plants.”

*- Global Strategy for Plant Conservation 2011-2020,
Convention on Biological Diversity*

Instructor

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Office hours: MWF 9:00 AM – 10:00 AM; Th 8:00 AM – 11:00 AM, by appointment, or any other time you can find me.

Outside of office hours the best way to contact me is via email. I will respond to your email within 24 hours. I do not carry around a smart phone or remain in constant email contact so do not expect an immediate response.

Course information

Meeting time and place: T/TH 11:15 AM - 12:35PM, 310 Berndt Hall

Course Description

Plants are the base for virtually all other life on Earth however humans appropriate approximately 1/3 to 1/2 of all plant productivity. Additionally a 2010 study found that 1 in 5 plants worldwide are threatened with extinction. In the United States and its territories alone, 200 species of plants are known to have gone extinct and 989 extant plant species are federally listed as threatened or endangered by the U. S. Fish and Wildlife Service, comprising over half of all imperiled species. And this is not just the loss of plant species. A US Forest Service study has estimated that for every plant species lost up to 30 other species of plants, insects and other animals may also decline.

These are disturbing statistics. What can we as biologists do to understand this loss of biodiversity? What tools do we have to accurately assess the status of threatened plant species? This class will review the causes of plant species decline, the biological factors associated with small populations at both the ecological and genetic level, the current practices of population monitoring and management for conservation in both *in-situ* and *ex-situ* environments and the possibility of reintroduction. We will investigate these topics through a review of studies principally from the primarily literature and understand the contribution that biological science and theory play in the conservation and management of imperiled species.

Prerequisite

Junior or senior status, completion of BIO 208 or 270, BIO 245, and BIO 260, all with a minimum grade of C- or equivalent course preparation as determined by instructor.

Course Objectives

1. Recognize the natural and human-caused factors that cause plant species to be rare or imperiled, and describe the genetic and ecological implications of rarity in plant species.
2. Evaluate and generate a conservation strategy for a rare or imperiled plant species.
3. Apply ecological and population genetics principles to evaluate the long-term viability of such a plant species.

Biology Program Learning Outcomes

1. Biology graduates will be able to explain key principles, assumptions, and criticisms of evolutionary theory and natural selection.

2. Biology graduates will be able to explain the relationship between form, function, and organization across biological systems.
3. Biology graduates will be able to effectively use laboratory and field techniques relevant to their area of specialization.
4. Biology graduates will be able to manage, explore, and analyze biological data.
5. Biology graduates will be able to read and interpret primary literature in the biological sciences in their area of specialization.
6. Biology graduates will be able to design, implement, and communicate an original research project in the biological sciences under the supervision of a faculty member.

Credit Hour Statement

One credit hour is equivalent to one hour of guided instruction (50 minute class) and a minimum of two hours of out-of-class student work each week for approximately 15 weeks for one semester. The typical student in this 3 credit course should expect to spend at least 6 hours per week of concentrated attention on course-related work, including but not limited to time attending class, as well as out-of-class time spent reading, reviewing, organizing notes, preparing for upcoming quizzes/ exams, problem solving, developing and completing projects, and other activities that enhance learning.

Course Website

Canvas via <https://courses.fortlewis.edu/>

This site will maintain all relevant course lecture materials, copies of class and homework assignments, required reading, our class discussion board as well as updates to the schedule.

Course Evaluation

Grades will be determined through a mix of exams and assignments, and will *roughly* follow the point system below:

Exams (2 @ 100 pts each)	200 pts
Conservation strategy presentation	100 pts
Conservation strategy paper	100 pts
Course participation	100 pts
Additional assignments	100 pts

Your grade will be a sum of the earned points you have accrued throughout the semester. Late submitted work will be subject to a penalty of 10% per day late, with a 0 for a week or later OR turning in after the instructor has already graded and returned the assignment to the rest of the class. Make-up lecture exams may be scheduled within 5 days of the original exam date ONLY in the case of a legitimate absence. If you miss an exam for a legitimate reason and are unable to make up the exam within 5 days the percentage score on the final exam will be substituted for the missed exam score.

Legitimate absences will include any absence with a letter documenting that absence from the appropriate college official, be a documented medical excuse, or be a documented religious observance. If you miss for an illegitimate reason then you will receive a zero for that particular exam.

Grading Scale by %

A	94-100	C+	77-79
A-	90-93	C-	70-72
B+	87-89	D+	67-69
B	83-86	D	63-66
B-	80-82	D-	60-62
C	73-76	F	0-59

Course Structure and Specific Requirements

Lecture

Lecture will consist of, well, lecture, but it will also include discussions of readings and time spent working on problems.

Exams

We will have two exams this term, a mid-term and a final. Both exams will require you to interpret data derived from the primary conservation literature. Exams will be open note; however you may not access the internet.

Rare plant conservation strategy presentation/paper

You will prepare a conservation strategy for a rare and/or imperiled plant species. This project will 1) describe the species in question, its distribution, evolutionary relationships, and its economic uses and ecological importance, 2) explain the factors contributing to the species status as rare and/or imperiled, 3) outline what, if any, steps are being undertaken to conserve the species in question, and 4) recommend how to ensure the future viability of the species (this may include necessary scientific study and/or recommendations).

Your plant may be here in Colorado or a plant from another region of the world. What is important is that there is at least a preliminary amount of published literature on this species. You will turn in a research proposal summarizing the species and conservation issue and include citations to your principal sources of information.

This assignment will be presented in two formats: a class presentation near the end of the semester, and a paper due at the sometime thereafter. Your presentation should be expected to take 15 minutes. There will be no specific page count for the paper but I will expect it to be of the depth of detail a college senior is capable of writing.

Canvas discussion board – current events in plant conservation

You will be required to participate in a discussion board on Canvas focusing on drawing our attention to current happenings in plant conservation. Everyone must make a minimum of one post and comment on others. These could be links to a recent news article with your interpretation, a personal observation, out of class discussion on class topics – actually anything so long as it is appropriately on-topic. Inappropriate posts or comments will be removed and a grade penalty given.

Other Course policies

Academic Integrity

The Biology Department upholds College policy on Academic Integrity. Therefore, students who commit acts of academic dishonesty (a.k.a. cheating, copying, plagiarizing):

1) on homework or other less major assignments, will receive a ZERO on the assignment in question, and will be reported to Academic Affairs.

2) on exams, major papers or reports will earn a ZERO and be automatically removed from the COURSE, and will be reported to Academic Affairs.

Any student who accumulates two reported incidents of dishonesty with the Academic Affairs office will have a formal hearing with the Academic Standards Committee and faces academic dismissal from the College.

Attendance

While I do not take a daily role, regular attendance is expected – particularly if you want to do well. I will try to post much of our class material on Canvas however this may not always be possible as all course materials may not be easily converted to digital format, particularly material resulting from class discussions. If you know you are going to miss class please let me know beforehand. If your absence results in your missing an exam, and is legitimate, the aforementioned policy stands. If your absence results in your missing an in-class assignment be aware that there

Classroom conduct

While I hope it goes without saying, please respect the rights of myself and your fellow classmates. If you are late try not to disturb everyone else. Additionally please leave mobile phones, pagers, iPods, etc, at home or turn them off and keep them stowed during class. There is no need for you to keep your phone next to you on your desk during class time. I will not allow texting or checking of messages on any electronic device during class time. If this becomes a problem you will be asked to forfeit your device. Such activity is not only very disrespectful but also interferes with your ability to learn.

Add/Drop policy

The last day to add the class is census date, January 26, 2016. Prior to this date you may drop the course at anytime with no grade being recorded. College policy states that not attending the first two class meetings will result in automatic disenrollment.

The last day to withdraw from FLC classes with a grade of "CW" (course withdrawal) is 4 pm Friday, March 4, 2016. This is a college-wide deadline that is not negotiable.

To withdraw from this course, go to the Registrar's Office, Room 160, Miller Student Services Building before the course withdrawal deadline. They will help you through the process. You do not need my signature on the course withdrawal request form.

Starting Fall 2013, students have a life-time limit of three individual course withdrawals from FLC courses. If you have withdrawn from classes before Fall 2013, these will not count towards your lifetime limit. Also, withdrawing entirely from a semester (all classes) does not count against your lifetime "CW" limit. Semester withdrawal is handled under a different policy and procedure. Please refer to the Academic Policies section of the Fort Lewis College Catalog of Courses for more information about course and semester withdrawal policies and procedures.

Accommodations

Students with disabilities who require reasonable accommodations to fully participate in course activities or meet course requirements must register with the Disability Services Office. If you qualify for services through the Disability office, bring your letter of accommodations to me as soon as possible so I can make the appropriate arrangements. Letters are available through Dian Jenkins, Coordinator of Disability Services, 280 Noble Hall, 247-7459.

Tentative Schedule

Check Canvas for the most up-to-date schedule.

Wk	Date	Course Topics
	Section I:	The Biological Background and Consequences of Rarity
1	Jan. 12/14	
		<p>T: Introduction Read: Soule, M. 1985 “What is Conservation Biology?” Th: Why conserve plants and the trouble with conservation The case of <i>Laelia speciosa</i> Assignment: IUCN Red List Assessment</p>
2	Jan. 19/21	
		<p>T: What are the principle threats to plant biodiversity? Read: Rabinowitz, D. 1981. Seven Forms of Rarity. Th: What is rarity? Natural vs. human-caused rarity Read: Fiedler, P.L. 1987. Life history and population dynamics of rare and common mariposa lilies (<i>Calochortus</i> Pursh: Liliaceae)</p>
3	Jan. 26/28	
		<p>T: Causes of rarity in Colorado Rare plants; Common biological features of rare plants Th: Demographics of plant populations– Introduction to Population Viability Analysis Assignment: Stage-Based Deterministic PVA Model for the Western Prairie Fringed Orchid Read: Floyd, S.K., and T.A. Ranker. 1998. Analysis of a transition matrix model for <i>Gaura neomexicana</i> ssp. <i>coloradensis</i> (Onagraceae) reveals spatial and temporal demographic variability</p>
4	Feb. 2/4	
		<p>T: Population Viability Analysis – discuss <i>Gaura</i> and application to a management plan Th: Using monitoring and census data to understand the causes of rarity in an endangered cactus (<i>Echinocereus chisosensis</i>) Assignment: Complete analysis of monitoring data to assess causes of decline and suggestions for further monitoring and research in <i>Echinocereus</i></p>
5	Feb. 9/11	
		<p>T: An introduction to population and conservation genetics (Factors affecting genetic structure and diversity) Th: Molecular biological techniques used in conservation science; Gene diversity and gene flow metrics Read: Wolfe, A. D. et al. 2014. Conservation genetics and breeding system of <i>Penstemon debilis</i> (Plantaginaceae), a rare beardtongue endemic to oil shale talus in western Colorado, USA.</p>
6	Feb. 16/18	
		<p>T: Complete discussion of gene flow metrics; Discuss Wolfe et al; Schedule student presentations Read: Hardcastle, E. L. and J.L. Gentry. 2009. Conservation genetics of <i>Delphinium newtonianum</i> Dw. Moore (Moore’s Delphinium) [Ranunculaceae], a rare endemic of the Interior Highlands. Th: Evolutionary Significant Units</p>
7	Feb. 23/25	
		<p>T: Linking evolutionary and geological history to plant conservation – the case of Mexican <i>Guaiacum</i></p>

		Th: Review for midterm
8	Mar. 1/3	
		T: Midterm Exam – part I in class (Part II – take home will be due on March 4) Th: Video: Call of Life: Facing the Mass Extinction
Spring Break!		
	Section II:	Applications and Case Studies
9	Mar. 15/17	
		T: Guest Speaker: Ken Heil, Professor Emeritus San Juan College and principal author "Flora of the Four Corners Region." Lecture title: "Flora and Geology of the Four Corners Region" Th: Guest Speaker: Renee Rondeau, Conservation Planner/Ecologist, Colorado Natural Heritage Program. Lecture title: "Patterns in Colorado's Rare Plants and Conservation Efforts"
10	Mar. 22/24	
		T: Guest Speaker: Tova Spector, Ecologist, Mesa Verde National Park. Lecture title: "Recovery of rare plants" Th: Open
11	Mar. 29/31	
		T/Th: Student Presentations
12	Apr. 5/7	
		T/Th: Student Presentations
13	Apr. 12/14	
		T: Student Presentations Th: Ex-situ conservation methods and examples
14	Apr. 19/21	
		T/Th: Reintroduction and facilitated migration
15	Mon. Apr. 25	Take home exam. Due by 4:30 PM