



UNIVERSITY OF CALGARY
FACULTY OF SCIENCE
DEPARTMENT OF BIOLOGICAL SCIENCES
COURSE OUTLINE

1. Course: ECOLOGY 419 – TERRESTRIAL COMMUNITIES AND ECOSYSTEMS

Lecture Sections:	L01	MWF	13:00-13:50	ST 139	WINTER 2015
Labs		T	09:00; 12:00; 15:00	BI 236	
		W	09:00; 14:00	BI 236	
Instructors:	Dr. M. Reid		BI 339	220-3033	mreid@ucalgary.ca
	Dr. P. Dunfield		BI 319D	220-2469	pdfunfie@ucalgary.ca
	Dr. D. Layzell		BI 473	220-5161	dlayzell@ucalgary.ca
Lab supervisor:	Ms. Louise Hahn		BI 235	220-5280	lhahn@ucalgary.ca

D2L Course: [W2014ECOL419L01 - ECOL 419 L01 \(Winter 2014\) - Terrestrial Comm & Ecosystem](#)

Biological Sciences Department BI 186; (403) 220-3140; biosci@ucalgary.ca

- 2. PREREQUISITE(S):** Biology 313 and one of Biology 315 or Environmental Science 401
See section 3.5.C in the Faculty of Science section of the online Calendar
(<http://www.ucalgary.ca/pubs/calendar/current/sc-3-5.html>)
- 3. Grading:** The University policy on grading and related matters is described sections F.1 and F.2 of the online University Calendar. In determining the overall grade in the course the following weights will be used:

First Midterm Examination	(Feb 13)	17.5%	In-Class
Second Midterm Examination	(Mar 16)	17.5%	In-Class
Laboratory Assignments		30%	
Final Examination		35%	

(There will be a final exam scheduled by the Registrar's office.)

Grade	A+	A	A-	B+	B	B-	C+	C	C-	D+	D	F
Cutoff	95	88	83	78	74	70	66	62	58	54	50	<50

"Each piece of work (assignment, laboratory report, midterm test or final examination) submitted by the student will be assigned a percentage score. The student's average percentage score for the various components listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade."

- 4. Missed Components of Term Work:** The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in [Section 3.6](#). It is the student's responsibility to familiarize himself/herself with these regulations. See also [Section E.6](#) of the University Calendar
- 5. Scheduled out-of-class activities:** Dates and times of approved class activities held outside of class hours. NIL

REGULARLY SCHEDULED CLASSES HAVE PRECEDENCE OVER ANY OUT-OF-CLASS-TIME-ACTIVITY. If you have a clash with this out-of-class-time-activity, please inform your instructor as soon as possible so that alternative arrangements may be made for you.

- 6. Course Materials: TEXT:** Recommended: [Principles of Terrestrial Ecosystem Ecology](#), Chapin III FS, Matson PA & Vitousek, PM., Springer-Verlag, New York., Latest Edition.

7. **Examination Policy:** No electronic devices may be used during exams. Students should also read the Calendar, [Section G](#), on Examinations.
8. **Writing across the curriculum statement:** e.g. “In this course, the quality of the student’s writing in laboratory reports will be a factor in the evaluation of those reports.” See also [Section E.2](#) of the University Calendar.
9. **Human studies statement:** indicating whether students in the course may be expected to participate as subjects or researchers. See also [Section E.5](#) of the University Calendar.

STUDIES IN THE BIOLOGICAL SCIENCES INVOLVE THE USE OF LIVING AND DEAD ORGANISMS. Students are expected to be familiar with <http://www.ucalgary.ca/pubs/calendar/current/sc-5-1.html> of the on-line calendar.

See also <http://www.ucalgary.ca/pubs/calendar/current/e-5.html>.

10. OTHER IMPORTANT INFORMATION FOR STUDENTS:

- (a) **Misconduct:** Academic misconduct (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under [Section K](#). Student Misconduct to inform yourself of definitions, processes and penalties.
- (b) **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on [assembly points](#).
- (c) **Academic Accommodation Policy:** Students with documentable disabilities are referred to the following links: Students with Disabilities: <http://www.ucalgary.ca/pubs/calendar/current/b-1.html> [B.1](#) and Student Accessibility Services: <http://www.ucalgary.ca/access/>.
- (d) **Safewalk:** Campus Security will escort individuals day or night (<http://www.ucalgary.ca/security/safewalk/>). Call 220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.
- (e) **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPPA). As one consequence, students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information see also <http://www.ucalgary.ca/secretariat/privacy>.
- (f) **Student Union Information:** VP Academic Phone: 220-3911 Email: suvpaca@ucalgary.ca.
SU Faculty Rep. Phone: 220-3913 Email: sciencerep@su.ucalgary.ca; [Student Ombudsman](#)
- (g) **Internet and Electronic Device Information:** You can assume that in all classes that you attend, your cell phone should be turned off unless instructed otherwise. Also, communication with other individuals, via laptop computers, Blackberries or other devices connectable to the Internet is not allowed in class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.
- (h) **U.S.R.I.:** At the University of Calgary, feedback provided by students through the Universal Student Ratings of Instruction (USRI) survey provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses (www.ucalgary.ca/usri). Your responses make a difference - please participate in USRI Surveys.

Department Approval _____ ORIGINAL SIGNED _____ Date _____

E419 co W15; 12/19/2014 9:53 AM

Ecology 419 Course Goals and Tentative Outline

Ecosystem definition <http://www.merriam-webster.com/dictionary/ecosystem>

Complex of living organisms, their physical environment, and all their interrelationships in a particular unit of space. An ecosystem's abiotic (nonbiological) constituents include minerals, climate, soil, water, sunlight, and all other nonliving elements; its biotic constituents consist of all its living members. Two major forces link these constituents: the flow of energy and the cycling of nutrients. The fundamental source of energy in almost all ecosystems is radiant energy from the sun; energy and organic matter are passed along an ecosystem's food chain. The study of ecosystems became increasingly sophisticated in the later 20th century; it is now instrumental in assessing and controlling the environmental effects of agricultural development and industrialization.

Terrestrial ecosystems provide a home for much of the world's biodiversity, supply humans with most of the food and fibre they demand, and are increasingly looked upon to play a major role in efforts to manage greenhouse gas emissions and mitigate climate change. Ecology 419 will explore the biological principles that underpin these three major roles for terrestrial ecosystems with a focus on the forces, pathways and technologies controlling the flows of energy, carbon (C) and nitrogen (N) through terrestrial ecosystems. By the end of this course, engaged students will be able to:

- Quantitatively compare the annual flows of energy and carbon through biological systems globally, and within Canada, with the energy and carbon flows that provide humans with fuels and electricity;
- Describe the opportunities within Canada for using biological systems to mitigate climate change through either reductions in CH₄ and N₂O emissions or by enhancing carbon 'sinks';
- Describe the drivers of primary productivity and the potential for positive feedbacks among them
- Predict plant traits given resource availability to plants
- Describe the biotic and abiotic processes by which microbes control nutrient and carbon cycling through soil, water and air
- Explain the mutual relationships between diversity and productivity
- Describe the current knowledge of climate change impacts on terrestrial systems, and suggest strategies to mitigate or minimize these impacts
- Describe the policy instruments that could be deployed to facilitate the use of biological systems in the mitigation of climate change in Canada and globally.
- Apply lab skills to measure the characteristics and bio-physical processes in soils
- Develop and test predictions of soil responses to disturbance

Content (approx. number of lectures)

- Setting the stage: The annual flows of energy, carbon and nitrogen in biological systems compared to fuels and electricity production (4)
- Plant carbon allocation strategies; herbivory (9)
- Diversity and trophic interactions (3)
- Microbial ecology (9)
- Climate change: predicted and observed effects on terrestrial systems (3)
- The Agri-food systems of Canada (2)
- Enabling biological solutions to climate change: policy instruments, opportunities and challenges (3)

Instructor

Layzell

Reid

Reid

Dunfield

Reid

Layzell

Layzell

Optional Field Trip!

The instructors are planning to be at the Biogeoscience Institute's Barrier Lake Field Station (<http://bgs.ucalgary.ca>) on the afternoon of **March 14th** (Saturday) and students are invited to join them for an afternoon in the forest ecosystem there. This is an opportunity to see the sites from which your lab samples came, to think in the real world about some of the processes discussed in lectures, and to learn some natural history and plant identification (and it always good to get outside into natural areas, even in winter). As an optional trip, no transportation is provided although we can help organize carpooling. More information will be provided in class.

Ecology 419 – Tentative Laboratory Schedule W15

Lab 1 (Jan 13, 14)	Introduction to soils and scientific writing
Lab 2 (Jan 19, 20)	Soil texture, moisture and organic content
Lab 3 (Jan 27, 28)	Root and plant biomass, soil bacteria and fungi
Lab 4 (Feb 3, 4)	Soil and forest invertebrates
Lab 4 (Feb 10, 11)	Soil and forest invertebrates
(Feb 18, 19)	Reading Break
Lab 5 (Feb 24, 25)	Soil Chemistry
Lab 6 (Mar 3, 4)	Data Analysis, soil nitrifying potential (requires 2 weeks)
Lab 7 (Mar 10, 11)	Soil respiration
Lab 8 (Mar 17, 18)	Soil respiration and nitrifying potential
Lab 10 (Mar 24, 25)	Poster presentation workshop
Lab 11 (Mar 31, Apr)	Open lab: poster assembly workshop
Lab 12 (Apr 7, 8)	Term project due/project presentations

Details

Jan. 13, 14	Lab 1: Introduction to Soils, Term Project, and Scientific Writing <ul style="list-style-type: none">- introduce Ecology 419 labs- introduce term project- review of scientific writing- preliminary examination of soil samples- dry soil samples (for Lab 2, Walkley-Black method of soil carbon determination)- start soil invertebrate extraction (for Lab 4)
Jan. 19, 20	Lab 2: Soil texture, moisture and organic content <ul style="list-style-type: none">- soil moisture content analysis- soil organic matter estimation (incineration method)- soil organic carbon estimation (Walkley-Black method)- soil texture analysis- Assignment 1: Essay on the effects of clearcutting on the abundance and distribution of soil organisms (invertebrates, bacteria, fungi, plants). (value = 6%, due Feb. 10, 11)
Jan. 27, 28	Lab 3: Root biomass, plant biomass, soil fungi and bacteria <ul style="list-style-type: none">- begin root biomass estimation- begin plant biomass estimation- start soil bacteria plates- start soil fungi plates
Feb. 3, 4	Lab 4: Soil and forest invertebrates <ul style="list-style-type: none">- weigh root biomass- weigh plant biomass- count fungi plates- count bacteria plates- soil and forest invertebrate ID and enumeration
Feb. 10, 11	Lab 4: Soil and forest invertebrates <ul style="list-style-type: none">- finish soil and forest invertebrate ID and enumeration- Assignment 1 due- Assignment 2: Proposed term project topic (value = 5%, due Feb. 24, 25)
Feb. 17, 18	READING WEEK, NO LABS
Feb. 24, 25	Lab 5: Soil chemistry <ul style="list-style-type: none">- pH- calcium, potassium, sodium- ammonia, nitrate, phosphate- Assignment 1 returned- Assignment 2 due

- Mar. 3, 4 Lab 6: Data Analysis
- Overview of data analysis
 - set up soil nitrifying potential (requires 2 weeks incubation)
 - Assignment 2 returned
 - **Assignment 3: Data analysis methods and preliminary results (value = 6%, due Mar 17, 18)**
- Mar. 10, 11 Lab 7: Soil respiration
- set up soil respiration experiment
 - class discussion of preliminary results
- Mar. 17, 18 Lab 8: Soil respiration and nitrifying potential
- complete soil respiration
 - complete soil nitrifying potential
 - **Assignment 3 due**
 - **Assignment 4: Term Project (value 10%, due April 7, 8)**
- Mar 24, 25 Open lab for help with term project
- Poster presentation workshop
 - Assignment 3 returned
- Mar 31, Apr 1 Open lab:
- Poster assembly workshop
- Apr. 7, 8 Poster presentations in lab
- **Assignment 4 due**

Participation: Value = 3% Students are expected to be prepared for labs, and to participate fully in all labs. This means having read the lab manual before coming to lab, being on time, being able to answer pre-lab questions, completing pre-lab assignments, and attending all labs. Labs that are missed for invalid reasons will result in lost participation marks.