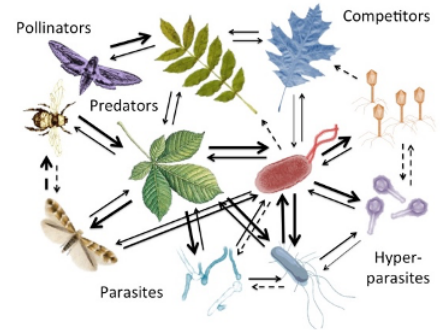


# BI 370 GENERAL ECOLOGY

CRN: 20801

Winter 2023



## Instructor

**Dr. Tobias Policha.** [tpolicha@uoregon.edu](mailto:tpolicha@uoregon.edu); Office hour: Monday 2:00 – 3:00 pm in GER 303, or by appointment (in-person or over Zoom).

## Graduate Employees (GEs)

**Emily Cook.** [ecook3@uoregon.edu](mailto:ecook3@uoregon.edu); Office hour: Wednesday 11:00-12:00 in STB 258

**Nicole Martinez-Llaurador.** [nmarti12@uoregon.edu](mailto:nmarti12@uoregon.edu); Office hour: Tuesday 10:00-11:00 in STB 258

**Cal Penkauskas.** [cpenkaus@uoregon.edu](mailto:cpenkaus@uoregon.edu); Office hour: Tuesday 4:00-5:00 in STB 258

**Monika Ruwaimana.** [mruwaima@uoregon.edu](mailto:mruwaima@uoregon.edu); Office hour: Friday 1:30-2:30 in STB 258

## Biology Undergraduate Lab Assistant (BULA)

**Julia Prange.** [jprange7@uoregon.edu](mailto:jprange7@uoregon.edu)

**Overview -> Goals -> Format -> Materials -> Assessments -> Policies -> Resources -> Schedule**

## COURSE OVERVIEW

This is an introductory course focusing on the scientific study of organisms' interactions with abiotic and biotic components of the environment. This course will include general principles of ecology and contemporary applications, as well as methods used in studying ecological interactions. Basic working knowledge of biology and chemistry will be assumed. The prerequisite for this course is Biology 213/283H or the equivalent.

## COURSE GOALS

Appreciate the broad biological significance of ecological theory.

Understand the questions that ecologists ask and the methods they use to study them.

Develop your ability to apply quantitative skills to analyze and interpret ecological data.

## **COURSE OUTCOMES**

### **Students should be able to:**

1. Survey key principles of organisms' interactions with abiotic and biotic components of ecosystems.
2. Understand techniques used in studying plant and animal species, communities, and ecological interactions.
3. Apply quantitative reasoning and analysis to biological science problems.
4. Read and critically evaluate primary literature in the field of ecology.
5. Ask questions, test hypotheses, and write reports in the format of a scientific journal.

## **COURSE FORMAT**

### **LECTURES (Monday & Wednesday 12:00-13:20 in 302 Gerlinger)**

You should do the assigned readings before coming to the lectures. During the lectures there will be activities that will help you to learn difficult concepts; these will often be done collaboratively with two or three students discussing the problem together for a few minutes before discussing the problem as a whole class. Your active participation in lectures will help you understand the material better and prepare you for exams. ***You may drop three Lecture Activities without penalty.***

### **iCLICKERS**

We will pose iClicker questions in almost every class to encourage participation and to provide valuable feedback to both instructors and students. Register your clicker on the course Canvas site before coming to the first class. Clicker questions during lecture will be multiple-choice. You can earn points through both participation and by choosing the correct answer (when appropriate). The total points for the clicker portion of your grade will be based on 85% of the total possible points: your grade = points earned/85% of total possible points (not to exceed 100%).

### **LAB [Thursday 9:00 - 11:50 (CRN 20802) or 12:00 - 14:50 (CRN 20803) in 13 Klamath]**

We consider the labs to be an integral part of the course. We have tried to design active learning experiences that will broaden your understanding of what the science of ecology is all about. Lab handouts will be available on Canvas and should be read before coming to lab. There will be a pre-lab quiz on Canvas that will be due before each lab session. Lab handouts will usually be turned in at the end of each lab or at the beginning of class the following day (we will announce this during each lab). You must attend the lab section that you are registered for. Each lab (including the pre-lab) is worth three percent of your final grade. ***You may drop one Lab without penalty. The field trip packing list below also applies to outdoor lab activities.***

### **ALL-DAY FIELD TRIP (8:00 AM - 8:00 PM) *Please arrive early for a prompt departure***

Our field trip this term will be on **Saturday, February 18<sup>th</sup>**. We will go to the coast, and spend time in both the dune and rocky intertidal habitats focusing on a combination of natural history and data collection. Please dress appropriately for the field trip as we might get cold, wet, and muddy and may encounter difficult terrain.

While in the field, you will need:

- Closed-toed shoes (e.g., hiking boots, rubber boots, sneakers)
- Long pants and warm clothing (we will be walking through brush that can scratch arms and legs). Layers are recommended.
- Rain gear (including rain pants!), even if it is not supposed to rain.
- Drinking water, and meals/snacks.
- A field notebook (Rite in the Rain® recommended) is encouraged as you will be tested on some of the species and concepts we encounter in the field.

## COURSE MATERIALS

### TEXTBOOK

*Bowman, W., S. Hacker, M. Cain. 2017. **Ecology 4th Edition**. Sinauer Associates, Sunderland, MA.* The readings include background material useful for preparing for lecture and for studying for quizzes. A good strategy would be to skim over the entire chapter first, concentrating on the major concepts, then to re-read more carefully for details. Currently, the course is set up to follow the 4th edition. There is a new 5th edition that you are welcome to use as well. However, **if you would like to save some money, students have been successful in the past using the 3rd or even the 2nd editions.** I will not typically ask you to recall specific details from the text, but we will use it as a general reference throughout the course. I will assign the chapters as they appear in the 4th edition but will also give guidance as to the topics in the 3rd and 5th editions.

Additional materials such as scientific papers, book chapters, and news articles will be available on Canvas under the Module for the week that they are assigned.

You may get your own copy of the UO Common Reading text: **'Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge, and the Teachings of Plants'** by **Robin Wall Kimmerer**, if you like. We will read a couple of chapters from this book for class (pdfs will be posted to Canvas).

### iCLICKERS

Please obtain an iClicker for this course. We will use clickers on the first day of class. You will need to register your clicker ID number on the Canvas page.

### CALCULATOR

You will need a scientific calculator capable of doing natural logarithms and square roots for use in lecture activities, in lab, and on exams. Calculators that have the ability to store text will not be allowed. *Cell phone calculator apps cannot be used during exams.*

### ACCESS TO CANVAS

We will be using Canvas daily for content delivery, communication, and assessment. If you have questions or concerns about accessing and using Canvas, visit the [Canvas support page](#). Canvas and Technology Support also is available by phone or live chat: 6 a.m.–12 a.m. 541-346-4357 [livehelp.uoregon.edu](http://livehelp.uoregon.edu)

**AN INATURALIST ACCOUNT AND A CAMERA (phones ok)**

As a way to get you out and observing nature on your own, you will be responsible for making and posting ten observations to the iNaturalist citizen science platform. You will need to make an account (free) at <https://www.inaturalist.org/>, and you will need access to a digital camera (phones ok). Further details will be available in the Assignments section of Canvas.

**COURSE ASSESSMENTS**

ASSESSMENT	EACH	NUMBER	TOTAL
Labs	25	9/10	225
Research Papers	100	2	200
Final Exam	150	1	150
DRQ's	5	26/29	130
Midterm Exam	100	1	100
Lecture Activities	5	15/18	75
Field Trip	40	1	40
iClickers	tbd	tbd	30
iNaturalist	3	10	30
Discussion Posts	5	4	20
Syllabus Quiz	0	1	0
<b>TOTAL</b>			<b>1000</b>

**ESTIMATED WORKLOAD ALLOCATION**

This is an estimate of the amount of time that you should expect to spend engaged in various activities in order to be successful in this course.

ACTIVITY	HOURS	EXPLANATION
Reading	54.5	~60 pages from the textbook/week @ 11 pages/hour = 5.45 hours/week
Labs	28.3	Ten labs at 170 min/each
Lectures	24.0	Eighteen Lectures at 80 min/each
Research Papers	20.0	We estimate that each successful paper will require ~10 hours of work outside of class time.

Field Trip	12.0	
DRQ's	9.6	Twenty-nine DRQs at 20 min/each
Final Exam	1.8	
iNaturalist	1.7	Ten Observations at 10 min/each
Midterm Exam	1.3	
Discussion Posts	1.0	Four Discussions at 15 min/each
Syllabus Quiz	0.3	
<b>TOTAL</b>	<b>~155 hours</b>	

### RESEARCH PAPERS

You will develop hypotheses, collect data, and write two original research papers this term. We will collect data as a class during lab (week 3) and the field trip, and work on the initial analysis together in subsequent labs. You will be responsible for writing up your methods and results as well as an introduction and discussion based on your review of the relevant literature. This project will be introduced in class and more details including a rubric will be posted to Canvas. Each paper will be worth 10% of your final grade.

### EXAMS

There will be one midterm and a final exam in this course. The exams will cover material from lecture, lab, the field trip, and the readings. They will be a mix of short answer and other types of questions. Exams will be designed to probe a deep understanding of the concepts and principles discussed, and an ability to apply the concepts to novel situations rather than memorization of detail. The final will be cumulative and is scheduled for **10:15 on Monday March 20<sup>th</sup>**.

### DAILY READING QUIZZES (DRQs)

Reading quizzes will be administered on Canvas **prior** to all class sessions to assure that the readings are done in a timely manner. Questions will reflect readings from the textbook or other assigned materials, including posted lab hand-outs. Each quiz will be worth 0.5% of your final grade. Your lowest three quiz scores will be dropped.

### DISCUSSION POSTS

As a way to encourage interaction outside the classroom you will be required to post to Discussion Forums at a few points during the term. Sometimes this will be relatively personal, like introductions, mid-term feedback on the course, or a final reflection. Other weeks it will be more aligned with various assignments. *You will be required to respond to someone else's post for all Discussions.*

## GRADES

Scores for assignments and exams will be posted on Canvas. Check your scores every time we post them, as you will have only one week after the posting to notify us about mistakes or omissions. Final grades will follow typical >90%=A, >80%=B, >70%=C, >60%=D cutoffs with '+/-'s assigned within ~2% of each cutoff. We reserve the right to lower these thresholds, but we will never raise them.

**A:** Quality of performance is outstanding relative to that required to meet course requirements; demonstrates mastery of course content at the highest level.

**B:** Quality of performance is significantly above that required to meet course requirements; demonstrates mastery of course content at a high level.

**C:** Quality of performance meets the course requirements in every respect; demonstrates adequate understanding of course content.

**D:** Quality of performance is at the minimal level necessary to pass the course, but does not fully meet the course requirements; demonstrates a marginal understanding of course content.

**F:** Quality of performance in the course is unacceptable and does not meet the course requirements; demonstrates an inadequate understanding of course content.

## COURSE POLICIES

### ABSENCES AND LATE WORK

Generally speaking, **attendance is required in this course** and students do better when they show up for class. That being said, things come up. We have adopted a few policies in order to provide some flexibility and avoid people coming to class when they are sick. We do not explicitly take attendance, but your participation is part of your final grade. To allow reasonable flexibility, we only grade you on 85% of your possible iClicker points. This effectively gives you a pass on attending three lectures. We will also drop your lowest three scores on both Lecture Activities and the Daily Reading Quizzes. Additionally, we will drop your lowest lab grade, including zeros received for an absence. You can turn in most work up to a week late for credit, with a 10% penalty accrued for each day (or fraction thereof) that it is late. We do not ask for reasons for absences and shall not distinguish between 'excused' and 'unexcused' absences.

### PROFESSIONAL CONDUCT

We will work hard to make this course valuable to your learning. We welcome suggestions from you at any time about things you think could be done to improve the course. In return, we ask that you arrive to lab and lecture on time and stay until class is over without making unnecessary noise that could distract your classmates. Please put away and do not use your own computers, cell phones, or other electronic devices during lecture or lab **unless specifically related to a class activity**. We promise to respect you as students and as individuals, and ask that you return that respect to us and to your fellow classmates. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the quarter (or before) so that I may address you properly. We're happy to talk to you in person or over email about this. You can also update your Canvas profile.

### ACADEMIC INTEGRITY

All students are expected to complete assignments in a manner consistent with academic integrity. Students must produce their own work and properly acknowledge and document all sources. Students

can find more complete information about the University of Oregon's Policy on Academic Dishonesty in the [student conduct code](https://dos.uoregon.edu/conduct) (located at [dos.uoregon.edu/conduct](https://dos.uoregon.edu/conduct)).

### **INCLUSIVENESS**

Open inquiry, freedom of expression, and respect for difference are fundamental to a comprehensive and dynamic education. We are committed to upholding these ideals by encouraging the exploration, engagement, and expression of divergent perspectives and diverse identities. Our classroom is a learning environment, and as such should be a safe, inclusive, and respectful place. Being respectful includes using preferred pronouns for your classmates. Disrespecting fellow students as well as combative approaches, tones, and/or actions are not acceptable. Please make me aware if there are classroom dynamics that impede your (or someone else's) full engagement.

### **COMMUNICATION**

In general, our class will communicate through our Canvas site. **Check Canvas daily.** Announcements and emails are archived there and automatically forwarded to your UO email, and can even reach you by text or push notification. Consider getting the phone app to receive the quickest up-to-date information. Check and adjust your settings under Account > Notifications. We will have a running Discussion forum on our Canvas site called "Question Board" for the entire group to ask and answer questions.

The teaching staff tries to be as available as possible for questions related to course material. However, we ask that you make an honest effort to find the answers yourself, including posing questions to fellow students first (you can do this through Canvas). If it pertains to course administration, double-check the syllabus and Canvas. If you email after regular business hours you may not hear back from us until the next day. We reserve the right to reply to messages received over the weekend on the next business day. **Please add "BI 370" at the beginning of the subject line of all emails.**

### **PROHIBITED DISCRIMINATION AND HARASSMENT**

UO is committed to providing an environment free of all forms of prohibited discrimination and harassment, including sex or gender-based violence. As an instructor, one of my responsibilities is to help create a safe learning environment for my students and for the campus as a whole. Students experiencing any form of prohibited discrimination or harassment may seek further information on [safe.uoregon.edu](https://safe.uoregon.edu), [respect.uoregon.edu](https://respect.uoregon.edu), [titleix.uoregon.edu](https://titleix.uoregon.edu), or [aaeo.uoregon.edu](https://aaeo.uoregon.edu) or contact the Title IX office (541-346-8136), Office of Civil Rights Compliance office (541-346-3123), or Dean of Students offices (541-346-3216), or call the 24-7 hotline 541-346-SAFE for help.

### **CRISES HAPPEN**

If you are having difficulties that are interfering with your ability to do well in the class, please tell an instructor as soon as possible. We may be able to refer you to someone for help or to make special arrangements if the need is real and you have done your best to deal with the situation in a timely manner. There is a Crisis Center on campus that you should not hesitate to call if you, or a friend, are in need of assistance. Their phone number is 346-4488.

### **REPORTING**

The instructor of this class, Tobias Policha, is a '**Student-Directed Employee.**' As such, if you disclose to

me, I will respond to you with respect and kindness. I will listen to you and will be sensitive to your needs and desires. I will not judge you. I will support you. As part of that support, I will direct students who disclose sexual harassment or sexual violence to helpful resources. I will only report the information shared to the university administration when you as the student requests that the information be reported (unless someone is a minor or is at imminent risk of serious harm). Please note the difference between 'privacy' and 'confidentiality.' As a Student-Directed Employee I can offer privacy because I am not required to report certain information to the university. However, I cannot be bound by confidentiality in the same way that a counselor or attorney is. Confidential resources such as these means that information shared is protected by federal and state laws. Any information that I as a student-directed employee receive may still be accessed by university or court proceedings. This means, for example, that I could still be called as a witness or required to turn over any related documents or notes that I keep. Please note also that I am required to report all other forms of prohibited discrimination or harassment to the university administration. Specific details about confidentiality of information and reporting obligations of employees can be found at <https://investigations.uoregon.edu/>

### **MANDATORY REPORTING OF CHILD ABUSE**

UO employees, including faculty, staff, and GEs, are mandatory reporters of child abuse. Child abuse pertains to individuals who are under the age of 18. This statement is to advise you that your disclosure of information about child abuse to the instructor may trigger my duty to report that information to the designated authorities. Please refer to the following link for detailed information about mandatory reporting: <https://hr.uoregon.edu/policies-leaves/general-information/mandatory-reporting-child-abuse-and-neglect>

## **CAMPUS RESOURCES**

### **TUTORING AND ACADEMIC ENGAGEMENT CENTER**

Drop-in math and writing support in addition to tutoring, and study skills support. Located in the 4<sup>th</sup> Floor Knight Library (541) 346-3226, [engage@uoregon.edu](mailto:engage@uoregon.edu). <https://engage.uoregon.edu/services/>

### **ACCESSIBLE EDUCATION CENTER (AEC)**

The University of Oregon is working to create inclusive learning environments. If there are aspects of the instruction or design of this course that result in barriers to your participation, please notify us as soon as possible. You are also encouraged to contact the Accessible Education Center if you are not a student with a documented disability, but you would like for us to know about class issues that will impact your ability to learn, contact us so that we can strategize how you can get the most out of this course. They are available Monday-Friday 8am-5pm by calling (541) 346-1155 or emailing [uoaec@uoregon.edu](mailto:uoaec@uoregon.edu). <https://aec.uoregon.edu/>

### **UO ACCESS SHUTTLE**

The UO Access Shuttle is an on-campus ride service provided at no cost to students with conditions that limit mobility. More information and a sign-up form can be found on the parking & transportation department website: <https://parking.uoregon.edu/content/access-shuttle>.



**CENTER FOR MULTICULTURAL ACADEMIC EXCELLENCE (CMAE)**

Promoting student retention and persistence for historically underrepresented and underserved populations. Programs and services that support retention, academic excellence, and success at the UO and beyond. Committed to all students, including undocumented and tuition equity students. Email [cmae@uoregon.edu](mailto:cmae@uoregon.edu). or call the front desk at 541-346-3479.

**COUNSELING CENTER**

The Counseling Center provides students with confidential consultation 24 hours a day, 7 days a week. Their number is 346-3227. Students often believe that their issues are not “severe” enough for them to call, but at the Counseling Center, no problem is too small. <https://counseling.uoregon.edu/>.

If you’re unable or don’t wish to come to the Counseling Center in person, help is still available. Our after-hours support/crisis line is open to all students, wherever you are located. Call 541-346-3227 when the Counseling Center is closed to speak to a therapist. Counseling Center staff can help you figure out how to find mental health services in your area. Call 541-346-3227 during business hours to schedule a consultation with a case manager.

**DEAN OF STUDENTS**

The Dean of Students website has additional resources targeted to specific communities on campus. Check out <https://dos.uoregon.edu/community> for information on the Black Cultural Center, LGBT+ Support Services, the Women’s Center, as well as resources for Nontraditional students and Veterans.

**DUCK RIDES (FORMERLY ‘SAFE RIDES’)**

Duck Rides is a student-led organization dedicated to providing free and accessible transportation to all university students, staff and faculty. The goal is to provide safe transportation that is an alternative to walking home alone at night, and to prevent sexual assault and driving under the influence. Hours of Operation: 6:00 pm – 12:00 am. 7-days-a-week. 541-346-7433. [duckrides@uoregon.edu](mailto:duckrides@uoregon.edu).

<https://duckrides.uoregon.edu/>

**ACADEMIC DISRUPTION**

In the event of a campus emergency that disrupts academic activities, course requirements, deadlines, and grading percentages are subject to change. Information about changes in this course will be communicated as soon as possible by email, and on Canvas. If we are not able to meet face-to-face, students should immediately log onto Canvas and read any announcements and/or access alternative assignments. Students are also expected to continue coursework as outlined in this syllabus or other instructions on Canvas. ***In the event that the instructor of this course has to quarantine, this course may be taught online during that time.***

It is generally expected that class will meet unless the University is officially closed for inclement weather. If it becomes necessary to cancel class while the University remains open, this will be announced on Canvas and by email. Updates on inclement weather and closure are also communicated as described on the [Inclement Weather webpage](#).

**COVID-19**


**Please do not come to campus if you have symptoms of COVID.** For information on testing, vaccination, isolation protocols, and other resources go to <https://coronavirus.uoregon.edu>.


**COURSE SCHEDULE**


WEEK	DATE	TOPIC	READINGS [all labs will include handouts (*Ch. refers to 'Ecology')]	ASSESSMENTS
1	1/9	The Web of Life	*Ch. 1; ' <a href="#">What is Ecology?</a> '; Kimmerer 2013 pp. 3-10 "Skywoman Falling"	DRQ 1 (due 1/11)
1	1/11	Organisms and their Environment	Ch. 2-3	DRQ 2
1	1/12	<b>LAB: Plant Nutrient Experiment</b>	Turbek <i>et al</i> 2016	DRQ 3; LAB 1
2	1/16	<b>NO SCHOOL: MLK DAY</b>		
2	1/18	Measuring Variation in Nature	Kimmerer 2013 pp.156-166 "The Teachings of Grass"; Cox 2001	DRQ 4
2	1/19	<b>LAB: Measuring Variation in Nature (outside)</b>	MacDonald 2014 pp. 102-121 + 127-131	DRQ 5; LAB 2
3	1/23	Coping with Environmental Variation	Ch. 4 – 5	DRQ 6
3	1/25	Life on a Rock	Kimmerer 2003 pp. 35-61 "Gathering Moss"	DRQ 7
3	1/26	<b>LAB: Moss/Lichen Data Collection (outside)</b>	USGS FS-154-02; Smullen 2016	DRQ 8; LAB 3
4	1/30	Population Distribution and Abundance	Ch. 9	DRQ 9
4	2/1	Mutualism	Ch. 15	DRQ 10
4	2/2	<b>LAB: Moss/Lichen Data Analysis</b>	Muir <i>et al</i> 2006	DRQ 11; LAB 4
5	2/6	Population Growth, Regulation, and Dynamics	Ch. 10-11	DRQ 12
5	2/8	Behavior	Ch. 8	DRQ 13

5	2/9	<b>LAB: Delta Ponds (Field Trip)</b>	Ch. 24	DRQ 14; LAB 5; <b>Paper 1 Draft</b>
6	2/13	<b>MIDTERM EXAM</b>		<b>MIDTERM EXAM</b>
6	2/15	Biodiversity	Ch. 18-19	DRQ 15
6	2/16	<b>LAB: Field Trip Prep - Plant ID, Crab ID</b>		DRQ 16; LAB 6; <b>Paper 1 Peer Review</b>
6	2/18	<b>ALL-DAY FIELD TRIP: COAST</b>	Schultz 1990 pp. 9-27, 33-37 & 99-146	DRQ 17
7	2/20	Energy Flow and Capture	Ch. 20-21	DRQ 18
7	2/22	Communities: Structure and Dynamics	Ch. 16-17	DRQ 19
7	2/23	<b>LAB: Field Trip Data Analyses</b>		DRQ 20; LAB 7; <b>Paper 1 Final</b>
8	2/27	Consumption/ Parasitism	Ch. 12-13	DRQ 21
8	3/1	Competition	Ch. 14	DRQ 22
8	3/2	<b>LAB: Squirrel Net: Behavioral Data (outside)</b>		DRQ 23; LAB 8; <b>Paper 2 Draft</b>
9	3/6	Evolutionary Ecology	Ch. 6; Raguso 2020	DRQ 24
9	3/8	Conservation	Ch. 23; Swing <i>et al</i> 2022, Guayasamin <i>et al</i> 2021	DRQ 25
9	3/9	<b>LAB: Squirrel Net: Data Analysis</b>		DRQ 26; LAB 9; <b>Paper 2 Peer Review</b>
10	3/13	Nutrients	Ch. 22 & 25	DRQ 27
10	3/15	Ecological Scavenger Hunt		DRQ 28
10	3/16	<b>LAB: Nutrient Data Analysis</b>		DRQ 29; LAB 10; <b>Paper 2 Final</b>
<b>Finals</b>	<b>3/20</b>	<b>MONDAY 10:15 AM</b>		<b>FINAL EXAM</b>

“Even if a career in research is not part of your long-term goals, it is still worth throwing yourself into the world of research while you work on your degree. The process of doing research will give you insights into ecology that are extremely difficult to get anywhere else.

 *Doing experiments yourself helps you understand how individual biases, preconceptions, and points of view shape the ecological information that appears in textbooks.*

 *Over time, working on independent research helps you to incorporate the scientific method into your own thinking, which allows you to analyze reports and articles critically and to teach the information to others more effectively.*

 *Writing a thesis teaches even strong writers how to write more concisely, and clearly.*

These and other insights and skills are virtually impossible to gain solely through reading; instead you are more likely to learn these things by truly immersing yourself in your research. And besides, it’s fun.”

- Karban & Huntzinger. 2006. **How to Do Ecology: A Concise Handbook**. Princeton University Press, Princeton NJ. (p. 2)