

ENVS 427: Environmental and Ecological Monitoring

Winter 2012 Syllabus

I. Summary Information

A. Instructors

- Peg Boulay, Instructor, 541-346-5945, boulay@uoregon.edu
Office: 242 Columbia; Office Hours: 4:00 – 5:00 p.m. Wed and by appointment
- Keats Conley, GTF, keats@uoregon.edu
Office: 47A Columbia; Office Hours: 11:00 a.m. – 12:00 p.m. Fri and by appointment

B. Meeting Times and Locations

Lecture: Wednesday 2:00 – 3:50 p.m.; 254 COL

Lab: Friday 1:00 – 4:50 p.m.; 262 LIL (unless otherwise specified)

C. Required Readings and Materials

Required readings will be from the text, on-line documents, peer-reviewed journal articles, and other materials. The text is available at the UO bookstore and is on reserve in the Science Library (3 copies).

- Text = Elzinga, C. L., D. W. Salzer, J. W. Willoughby, and J. P. Gibbs. 2001. *Monitoring Plant and Animal Populations*. Blackwell Science, Malden, Massachusetts. *Note: If you plan on a career involving environmental data collection, I recommend that you purchase this book. If not, then you may wish to use the Science Library copies instead. Most of the text (minus a few chapters and pages here and there) is available on Google Books:*
http://books.google.com/books?id=fSWchnyyLhEC&printsec=frontcover&source=qbs_qe_summary_r&cad=0#v=onepage&q&f=false.
- Handouts and additional assigned readings (available on-line and/or Blackboard)
- 4.5" x 7" (or similar size) Rite in the Rain ® notebook (mandatory; available at UO bookstore)
- Calculator for in-class exercises and exams

D. Key Dates

1/20	Fri	Homework: Worksheet draft due
1/27	Fri	Homework: Worksheet final due
2/1	Fri	Literature Review due
2/8	Wed	Exam 1
2/15	Wed	Literature Synthesis due
3/14	Wed	Monitoring Plan due
3/16	Fri	Field Notebook due
3/21?	Wed	Exam 2? <i>Please check DuckWeb later in term</i>

E. Course Website

We will be using Blackboard as a means of communication and coordination. Visit our Blackboard site regularly throughout the term for announcements, handouts, syllabus, lecture outlines or notes, and other information.

II. Course Overview and Objectives

Environmental scientists collect, analyze and share information for a variety of reasons. In this course, we will use a broad definition of environmental and ecological monitoring, one that encompasses a variety of activities, including rigorous research and long-term surveillance. Your specific objectives will shape your questions which in turn will drive your project design and methods. In the Environmental Leadership Program's (ELP) "Conservation Science in Action" projects, students collect and use information to assist our community partners with habitat restoration, management planning, policy development, species conservation and other needs. This course is designed to prepare you for your spring ELP projects by introducing you to your team, community partners, project background and protocols. However, to be an effective field scientist, you need to know more than a single methodology. We will examine the entire process of designing and implementing a monitoring program. We will investigate several local case studies and gain hands-on experience using common techniques to collect, manage, summarize and present data. The ELP projects all use established techniques to address current conservation issues, so these case studies are relevant to our course work regardless of your affiliation with a particular ELP project. In addition, we will practice some fundamental skills that all field-based environmental scientists should know.

Learning Objectives

Through active engagement in the course and course materials, students will:

- Describe how monitoring programs are used to address questions and management issues in population, habitat and ecosystem management; restoration ecology; sustainable agriculture; and other fields.
- Describe the critical role of planning and design within a monitoring program.
- Compare and contrast local case studies to discover common themes of sampling design, sources of bias, data management, and more.
- Critically consider the causes and consequences of coming to the wrong conclusion (e.g., concluding there was a change when there was none or failing to detect a real change).
- Learn how to use common monitoring tools and techniques and understand the circumstances where they are best applied.
- Practice collecting, summarizing and interpreting monitoring data.
- Search for, read, interpret, and summarize scientific literature. Communicate monitoring goals and protocols in the form of a monitoring plan.
- Apply listening, communicating, collaborating and other interpersonal skills essential to working within team settings.

Ecological monitoring is highly quantitative and relies on models for predicting outcomes and statistics for analyzing data. Because I emphasize field methods, we do not have time to adequately address statistical design. Please be aware of that you must thoughtfully consider variation, sample size, power and the assumptions of specific statistical tests **before** you collect any data! We will discuss some sampling design considerations. Students with weak statistics background often find this content challenging but not overly difficult. I encourage you to carefully read those chapters (Ch. 7 and 8) and ask questions.

III. Class Activities, Evaluation and Grading

*Note: We will post test scores and assignment grades on our Blackboard website. If you believe that we made a data entry error or that you deserve more points on an assignment or exam question, submit a brief explanation of the situation **in writing within one week** of the scores being posted.*

A. Logistics and Standards

- **Submitting Assignments by e-mail vs. paper.** You may submit assignments by e-mail or by paper. If you submit assignments by email, put ENV5 427 and the name of the assignment in the subject line. All assignments are due at the beginning of class on the specified date.
- **Late assignments.** Late assignments will be penalized 5% if turned in late on the due date, then 5% every calendar day, up to one week after the original due date. To submit a late assignment, either (a) e-mail it to me, or (b) take it to the Environmental Studies office (144 Columbia Hall), ask Alissa or a Peer Adviser to record the date/time and sign it, and place it in my mailbox. Except for emergencies, no assignments will be accepted after one week.
- **Determination of course grade.** Grading will be based on points rather than a curve: A = 450 – 500 pts (90–100%), B = 400 – 459 pts (80–89.9%), C = 350 – 399 pts (70–79.9%), D = 300 – 349 pts (60–69.9%), F = ≤ 299 pts (< 60%).

B. Summary of class activities and grading.

Activity	Type of Activity	Total Points	Percent of Grade
Participation	Individual	15	3%
Homework: Rough Draft of Worksheet	Individual	15	3%
Homework: Final Worksheet	Team	40	8%
Field Notebook	Individual	50	10%
Project: Monitoring Plan			
<i>Literature Review</i>	Individual	30	6%
<i>Literature Synthesis</i>	Individual	50	10%
<i>Final Monitoring Plan</i>	Team	100	20%
Exam 1	Individual	100	20%
Exam 2	Individual	100	20%
Total Points		500	100%

1. Participation: class meetings, Friday labs/field trips. Class meetings give us an opportunity to explore concepts in depth, place them in context, relate them to broader ecological principles, and apply them to environmental issues. We will use class time for exercises, demonstrations, discussion, and problem solving. Your attendance and active participation in class activities will provide you with a greater understanding of the material than can be gained by doing the reading on your own, by talking to someone who attended class, or by reading lecture outlines/notes on the class website. The readings will provide you with important background for understanding the material in class, and I will assume that you have done the readings before coming to class.

Factors that contribute to a high participation grade include: being prepared and fully engaged during class activities, sharing your insights on the class material, asking questions when you do not understand a concept, respectfully listening to others' viewpoints, and doing your part to keep exercises and discussions focused and on track. Lack of participation in team assignments will affect your class participation grade. The Friday labs/field trips are an important part of this course; your attendance is required and will factor into your participation grade. If an illness or unforeseeable emergency forces you to miss a field trip, let me know as soon as possible and we will work out an alternate approach.

Dress for success! The Wednesday lectures will always be indoors. This course is designed to give you hands-on practice: the Friday labs will frequently involve at least some time outside, even on days when we don't have field trips. Since this is Oregon, we can expect to get cold and/or wet. Please dress appropriately to keep yourself warm and dry. Dress in layers and bring raingear, gloves, hat and appropriate footwear. What else to bring on field trips: your Rite in the Rain[®] field notebook, 2 pencils (not pens), and water bottle. Optional: umbrella, sunglasses, binoculars, magnifying hand lens, snacks, and personal field plant or animal identification guides.

2. Homework: Community Partner Worksheet. This assignment is designed to familiarize you with your ELP Community Partner, project goals and your teammates. It will also allow you to begin planning your project as a team.

3. Field Notebook. The purpose of this assignment is to encourage you to take good notes during field trips and to allow you to create your own personal system of recording field notes. For the Field Notebook assignment, you will be required to have a 4.5" x 7" (or similar size) Rite in the Rain[®] notebook. You will be given an assignment handout with more information.

4. Project: Monitoring Plan. Often practitioners must write a monitoring plan or proposal to communicate project goals/methods and/or secure funding. You will write a streamlined plan for your ELP project. This assignment will allow you to hone your synthesis and writing skills as you prepare for your project by becoming familiar with relevant literature, completing critical background reading, thinking carefully about your protocols, becoming familiar with your site(s) and creating content that can be used during spring term. This project will be completed in stages: Literature Review, Literature Synthesis, and Monitoring plan. You will be given assignment handouts with more information.

5. Exams. There will be 2 exams. The second exam will only cover material after the first exam; however, you may be asked to relate new information to material presented earlier in the class. The exams will emphasize applying concepts rather than remembering details. Exam questions will be in a variety of formats (short essay, problem-solving, multiple choice and other approaches). Mark the exam dates on your calendar NOW. Exams cannot be made up for unexcused absences; if you miss an exam, you will get 0 points. Of course, I will work with you if you are ill or suffer an emergency. Bring a calculator to both exams!

V. Classroom Conduct

This syllabus describes the roles and expectations for each of us during the course. If you have questions or concerns about any of the course requirements, please let me know as soon as possible.

I support the use of computers to take notes. However, please show respect to your instructors and fellow students by not checking email/social media or playing games during class. Such actions can be a distraction to your neighboring students. Also, please turn off your cell phones during class. If you need to have a cell phone turned on for possible emergencies (as I do), then set the phone to vibrate mode. Do not check email or text via your phone during class.

A few words on cheating, plagiarism and other academic misconduct issues: I expect everyone to strictly adhere to the University Student Conduct Code (available at conduct.uoregon.edu) and University policies regarding academic misconduct. All work submitted for this course must be your own and be written exclusively for this course. Cheaters act unfairly and disrespectfully towards themselves, their classmates, and their instructors. Here are two examples of issues:

- You should not give or receive (or attempt to do so) unauthorized help on individual assignments or examinations without express permission from me. Discussing class concepts with your classmates can give you new insights into the class material, and I encourage you to share ideas. However, you must ensure that the work you turn in for credit is truly your own.
- You must properly acknowledge and document all sources of information (e.g., quotations, paraphrases, ideas). In this course, we will discuss proper methods for evaluating, using and citing reference material. “Cutting and pasting” from the internet is essentially stealing intellectual property and will not be tolerated.

I will treat any cases of academic dishonesty seriously. If there is any question about whether an act constitutes academic misconduct, it is your obligation to clarify the question with me before carrying out or attempting to carry out the act. Additional information about a common form of academic misconduct, plagiarism, is available at www.libweb.uoregon.edu/guides/plagiarism/students.

VI. Attendance and Special Arrangements

Your attendance is expected and part of your grade. However, please tell me if you are having significant problems that interfere with your ability to attend or do work in this class. Depending on the situation, I am willing to give you an incomplete or to make special arrangements to allow you to complete your work. However, please realize that an “I” in this class may preclude your participation in your spring ELP project. Please ensure that your need is real and unavoidable, that you have done your best to deal with the situation, and that you inform me about it as soon as is practically possible. Also, the University of Oregon strives to create inclusive learning environments. If there are aspects of the instruction or design of this course that result in disability-related barriers to your participation, please notify me as soon as possible. You may also wish to contact Disability Services in 164 Oregon Hall at 541-346-1155 or disabsrv@uoregon.edu.

VII. Acknowledgements

I'd like to thank the following people for sharing ideas, insights and materials that have improved this course: Bitty Roy, Katie Lynch, Bruce Newhouse, Pat McDowell, Nick Kohler, and Michael Pope. I would also like to thank in advance the guest speakers who will greatly enrich our discussions!

Winter 2012 Class Schedule

This schedule is subject to continual adjustments. The assignment dates will not change, but topics covered in each class may shift. Hint: if links don't work due to wrapped text, try pasting the link into the navigation bar of your browser. Note: these are abbreviated citations and not the format to follow for your assignments.

Wk	Date	Topics	Reading	Assignment Due
1	L1 – 1/11	- ELP/course overview - Upcoming assignments - Why monitor?: overview, roles, types - Field trip overview	Text (Monitoring Plant and Animal Populations): Ch 1 Introduction to Monitoring Water Quality Monitoring Technical Guide Book: Appendix B. Monitoring Types (p. B-1 – B-2), http://www.oregon.gov/OWEB/docs/pubs/wq_mon_guide.pdf	
	L2 - 1/13	- Taking field notes/ keeping a field journal - Field trip: tree measurement techniques and mistletoe data collection - Techniques: tree dbh & height, canopy closure, pacing	Husch, B., T.W. Beers, J.A. Kershaw, Jr. 2003. Forest Mensuration. <i>Read the following pages in Ch 5 Individual Tree Parameters: p. 81-91 (5-1 Age and most of 5-2 Tree Diameters and Areas); p. 99 – 110 (5-3 Height); and p. 113 – 117 (5-5 Crown Parameters).</i> Aukema, J. E. 2003. Vectors, viscin, and Viscaceae: mistletoes as parasites, mutualists, and resources. <i>Frontiers in Ecology and the Environment</i> 1:212-219. Greene, E. 2011. Why keep a field notebook? Pages 251 – 274 in M. R. Canfield, editor. <i>Field Notes on Science and Nature.</i>	<i>(field notes required)</i>
2	L3 - 1/18	- Planning and priorities - Qualitative techniques	Text: Ch 2 Monitoring Overview; Ch 3 Selecting Among Priorities; Ch 4 Qualitative Techniques for Monitoring	
	L4 - 1/20	- ELP community partners and project overview - Techniques: interpreting maps	Community Partner websites (see Homework) Princeton University's Outdoor Action Program's "The OA Guide to Map and Compass" (Ch 6 of The Backpacker's Field Manual by Rick Curtis [1998]). <i>Read the section titled "Maps and Map Reading."</i> http://www.princeton.edu/~oa/manual/mapcompass.shtml .	Due: Homework - rough draft (section I of worksheet)
3	L5 - 1/25	- General field techniques - Finding, using and citing scientific literature	Monitoring Plant and Animal Populations: Ch 5 General Field Techniques Dean Walton's Search Strategies for Environmental Studies, http://libweb.uoregon.edu/guides/envstudies/ Northey, M., and P. Von Aderkas. 2011. Making sense: life sciences, a student's guide to research and writing. <i>Read Ch 3 Researching an essay (p. 24 – 44).</i>	

	L6 – 1/27	<ul style="list-style-type: none"> - Data collection and management - Quality Assurance/ Quality Control - Data types, central tendencies and distributions - Map and compass - GPS (weather allowing) 	<p>Text: Ch 6 Data Collection and Data Management.</p> <p>Water Quality Monitoring Technical Guide Book: Ch 4 Data Quality (p. 4.1 – 4.4), http://www.oregon.gov/OWEB/docs/pubs/wq_mon_guide.pdf</p> <p>“The OA Guide to Map and Compass” cont. <i>Read all pages.</i> http://www.princeton.edu/~oa/manual/mapcompass.shtml</p> <p>Required: Garmin: What is GPS? http://www8.garmin.com/aboutGPS/</p> <p>Optional: Trimble: GPS Tutorial http://www.trimble.com/gps/index.shtml</p>	Due: Homework - Community Partners and Project Planning worksheet (final)
4	L7 - 2/1	<ul style="list-style-type: none"> - Basic principles of sampling 	<p>Text: Ch 7 Basic Principles of Sampling – <i>only read through “How to Achieve High Statistical Power,” p. 76 – 89.</i></p>	Due: Literature Review
	L8 - 2/3	<p>Computer Lab:</p> <ul style="list-style-type: none"> - Selecting random samples - Presenting monitoring data in graphs and tables <p>Spatial Data Overview and Map Library Tour:</p> <ul style="list-style-type: none"> - aerial photo interpretation, remote sensing, Google Earth 	<p>Text: Ch 11 Selecting Random Samples</p> <p>Hofmann, A. H. 2010. Scientific writing and communication: papers, proposals and presentations. <i>Read p. 186 – 211 in Chapter 9: figures and tables.</i></p> <p>Oregon Riparian Assessment Framework, Ch 6 Remote Sensing Data. <i>Read p. 62-73 only.</i> http://www.oregon.gov/OWEB/docs/pubs/OR_RiparianAssessFramework.pdf.</p> <p>Lane Council of Governments. 2006. Coyote Prairie Mitigation Improvement Plan. <i>Read p. 1-10 only.</i> http://www.eugene-or.gov/portal/server.pt/gateway/PTARGS_0_2_214921_0_0_18/Coyote-Prairie-MIP-Final-WEB.pdf.</p>	
5	L 9 - 2/8	Exam #1	Study!	Exam #1
	L10 – 2/10	<ul style="list-style-type: none"> - Field Trip: Restoration Research - Cover estimation, microtopography <p>Guest speakers: Andrea Thorpe, Institute for Applied Ecology; Jeff Kreuger, Lane Council of Governments</p>	<p>Text: Ch 12 Field Techniques for Measuring Vegetation</p> <p>2012 ELP Restoration Research Protocol</p> <p>Watch the video, “Willamette Valley Wet Prairie Restoration” (<i>the second video on the webpage, 18 min</i>) http://oregonexplorer.info/wetlands/WetlandsPhotosandVideos/PhotosandVideos</p>	(<i>field notes required</i>)
6	L11 – 2/15	<ul style="list-style-type: none"> - Scientific writing - Scientific reports and monitoring plans 	<p>Pechenik, J. A. 2010. A short guide to writing about biology, seventh edition. <i>Read Ch 1 Introduction and General Rules (p. 2-20).</i></p> <p>Text: Ch15 Communication and Monitoring Plans</p> <p><i>Short supplemental readings to be assigned later.</i></p>	Due: Literature Synthesis

	L12 – 2/17	Field Trip: Stream Stewardship and Sustainable Farms, part I Guest speaker: Jared Weybright, McKenzie Watershed Council; Jared Pruch, Berggren Demonstration Farm	Oregon Riparian Assessment Framework: Ch 5 Field Methods – <i>Only read Levels I, II and III (p. 34 – 52)</i> , http://www.oregon.gov/OWEB/docs/pubs/OR_RiparianAssessFramework.pdf 2012 ELP Riparian Planting Monitoring Protocol Berggren Demonstration Farm Plan	(field notes required)
7	L13 – 2/22	- Review Exam #1 - Objectives - Sampling design, part I	Text: Ch 14 Objectives – <i>only read Sampling Objectives, p. 265 – 270</i> ; Ch 8 Sampling Design – <i>only read p. 102 – 138</i> .	
	L16 – 2/24	Field Trip: Stream Stewardship, part II - Wolman’s pebble count, channel surveys	Watch this short news clip, http://kezi.com/news/local/228885 U.S. Forest Service. 2010. Stream Inventory Handbook, Level I & II, version 2.10. <i>Read p. 73 – 78</i> . http://www.fs.fed.us/r6/water/fhr/sida/handbook/Stream-Inv-2010.pdf . Harrelson et al. 1995. Stream Channel Reference Sites: an Illustrated Guide to Field Technique. <i>Read Ch 5 Survey Basics (p. 13 – 25) and Ch 6 Measuring Channel Cross-Section (p. 26 – 32)</i> , http://www.fs.fed.us/rm/pubs_rm/rm_gtr245.pdf . McDowell, P. GEOG 4/527 handouts.	(field notes required)
8	L15 – 2/29	Sampling design, part II	(Continuation of Ch8 Sampling Design)	
	L18 – 3/2	Field Trip: Animal (herptile) monitoring	Paton, P. W. C., and R. N. Harris. 2010. Egg mass and nest counts. C. K. Dodd, Jr., editor. Amphibian ecology and conservation: a handbook of techniques. <i>Read sections 9.1 – 9.10: p. 143 – 155</i> . Wilson, J. D., and J. W. Gibbons. 2010. Drift fences, coverboards, and other traps. Dodd, C. K. <i>ibid.</i> <i>Read section 13.3: p. 236 – 241</i> . 2011 ELP Western Pond Turtle Habitat and Population Survey Protocol	(field notes required)
9	L17 - 3/7	- Monitoring animal populations (overview)	Text: Ch 13 Specialized Sampling Methods and Field Techniques for Animals	
	L14 – 3/9	Field Trip: Sustainable Farms, part II - pollinator conservation and surveys Guest speaker: Eric Mader, Xerces Society for Invertebrate Conservation	Watch Oregon Field Guide: Native Bumblebees, 2008, http://www.opb.org/programs/ofg/segments/view/1684?q=bumblebees 2012 ELP Sustainable Farms Protocol Ullmann, K., M. Vaughn, C. Kremen, T. Shih, and M. Shepherd. 2010. California Pollinator Project: Citizen Scientist Pollinator Monitoring Guide, http://www.xerces.org/wp-content/uploads/2010/06/CA_CSM_guide.pdf .	(field notes required)

10	L19 - 3/14	Citizen science	<p>Dickenson, J. L., B. Zuckerberg, and D. N. Bonter. Citizen science as an ecological research tool: challenges and benefits. <i>Annual Review of Ecology, Evolution and Systematics</i> 41:149–72.</p> <p>Green, L. 2007. Engaging, Enhancing, and Expanding Community-Based Monitoring Programs, http://www.birds.cornell.edu/citscikit/conference/proceeding-pdfs/Green%202007%20CS%20Conference.pdf</p> <p>Galloway, A. W. E., M. T. Tudor, and W. M. Vander Haegen. 2006. The reliability of citizen science: a case study of Oregon white oak stand surveys. <i>Wildlife Society Bulletin</i> 34:1425-1429.</p>	Due: Monitoring Plan
	L20 - 3/16	- Synthesis, conclusions and applications	<i>No readings.</i>	Due: Field Notebook
11	TBD	Final Exam	Study!	Final Exam