

ENVS 427: Environmental and Ecological Monitoring

Winter 2013 Syllabus

I. Summary Information

A. Instructors

- Peg Boulay, Instructor, 541-346-5945, boulay@uoregon.edu
Office: 242 Columbia; Office Hour: 2:00 – 3:00 p.m. Wed and by appointment
- Collin Eaton, GTF, ceaton@uoregon.edu
Office: 47A Columbia; Office Hour: 11:00 a.m. – 12:00 p.m. Fri and by appointment

B. Meeting Times and Locations

Lecture: Wednesday 12:00 – 1:50 p.m.; 142 COL

Lab: Friday 1:00 – 4:50 p.m.; 471 MCK (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 (4 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. Excerpts from the text are 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). Do not use a smaller notebook (e.g., 3" x 4.5") – it won't be big enough.
- Calculator for in-class exercises and exams.

D. Key Dates

1/11 Fri Homework: Partner/Planning Worksheet Section 1 draft due
1/18 Fri Field Observation topic due
1/23 Wed Homework: Partner/Planning Worksheet completed final due
2/1 Fri Literature Search due
2/6 Wed Exam 1
2/8 Fri Field Observation update due
2/20 Wed Literature Synthesis due
3/8 Fri Field Notebook due
3/13 Wed Monitoring Plan due
3/19? Tues? Exam 2 *Please check DuckWeb later in term*

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 read Chapters 7 and 8 carefully 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.** To save paper, we will use Blackboard (for submitting and returning assignments) and the editing function in Word (for feedback). Unless otherwise instructed, submit all assignments via Blackboard. Please complete your assignments in Microsoft Word or a compatible word processing program (generally, open access software works fine). Name your file with your first name and assignment title (e.g., Boulay_Synthesis.docx). 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, simply use Blackboard. If you need to submit a hard copy (e.g., your Field Notebook), take it to the Environmental Studies office (144 Columbia Hall), ask Alissa or a Student 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		
Mid-term update		10	2%
Final Notebook		40	8%
Project: Monitoring Plan			
<i>Literature Search</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 or policy considerations, 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 expect 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.

Poor participation in team assignments will affect both the assignment grade and your class participation grade. Lack of participation in ENVS 427 group assignments will result in a "0" for the assignment.

Lastly, the Friday labs/field trips are an important part of this course and are designed to give you hands-on practice; 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. You are required to make up missed field trips.

Dress for success! Unless otherwise indicated, the Wednesday lectures will be indoors. The Friday labs will almost always 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. You will be given an assignment handout with more information. Lack of participation in ENVS 427 group assignments will result in a "0" for the assignment.

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. In addition, you will practice field observation skills and hypothesis generation through a weekly exercise. For the Field Notebook assignment, you are 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 Search, Literature Synthesis, and Monitoring plan. You will be given assignment handouts with more information. Lack of participation in ENVS 427 group assignments will result in a "0" for the assignment.

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, fill-in-the-blank, 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!

6. Extra Credit. As part of the Wetlands Wildlife ELP project, we will be using auditory surveys to document Northern Pacific Treefrog activity at Delta Ponds. Because these are nighttime surveys that occur outside of the scheduled class periods, these field trips are not required. However, the surveys are interesting and will give you practice with a particular field method. You may earn up to 12 points extra credit (4 points per auditory survey, up to 3 surveys) for participating in these field trips. Auditory survey field trips will be scheduled during Weeks 8-10 based upon weather conditions.

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 “Incomplete” grade 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 the Accessible Education Center in 164 Oregon Hall at 541-346-1155 or uoaec@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 2013 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 – 1/09	- ELP/course overview - Upcoming assignments - Why monitor?: overview, roles, types	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 - 1/11	- ELP community partners and project overview - Planning a monitoring program - Techniques: interpreting maps - Techniques: taking field notes/ keeping a field journal;	Community Partner websites (see Homework) Text: Ch 2 Monitoring Overview 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 - Partner/ Planning Worksheet (section I draft)
2	L3 - 1/16	- Priorities - Qualitative techniques - Techniques: taking field notes/ keeping a field journal	Text: Ch 3 Selecting Among Priorities (<i>note: you don't need to read Upper-Level Priorities, p. 22-24</i>); Ch 4 Qualitative Techniques for Monitoring (<i>read carefully for a class exercise</i>). Greene, E. 2011. Why keep a field notebook? Pages 251 – 274 in M. R. Canfield, editor. Field Notes on Science and Nature. Dangles, O., and J. Casas. 2012. The bee and the turtle: a fable from Yasuní National Park. <i>Frontiers in Ecology and the Environment</i> 10:446-447.	
	L4 – 1/18	Guest speaker: Tom Titus, Amphibians of Willamette Valley Wetlands Field Trip: Wetlands Wildlife Project (Delta Ponds) - Techniques: coverboards, auditory monitoring	Watch this video, http://vimeo.com/28513274 . Delta Ponds Floodplain Restoration Summary, Spring 2012, http://www.eugene- or.gov/DocumentCenter/Home/View/5890 [Optional: Lane Council of Governments. 2005. Delta Ponds: a vision for enhancement and management. http://www.eugene- or.gov/DocumentCenter/Home/View/5888 . <i>Read pages 1-18.</i>] Wilson, J. D., and J. W. Gibbons. 2010. Drift fences, coverboards, and other traps. C. K. Dodd, Jr., editor. <i>Amphibian ecology and conservation: a handbook of techniques. Read section 13.3: p. 236 – 241.</i> Moore, J. D. 2005. Use of native dominant wood as a new coverboard type for monitoring eastern red-backed salamanders. <i>Herpetological Review</i> 36:268-270. 2013 ELP Wetlands Wildlife Protocol: read coverboard and auditory monitoring sections	(<i>field notes required</i>) Due: Field Observation topic

3	L5 - 1/23	- 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>	Due: Homework - Partner/ Planning Worksheet (final)
	L6 – 1/25	Computer Lab: - Selecting random samples - Presenting monitoring data in graphs and tables - Spatial data: aerial photo interpretation, remote sensing, Google Earth - GPS (<i>weather allowing</i>)	Text: Ch 11 Selecting Random Samples Hofmann, A. H. 2010. Scientific writing and communication: papers, proposals and presentations. <i>Read p. 186 – 211 in Chapter 9: figures and tables.</i> Paine, D. P., and J. D. Kiser. 2012. Aerial photography and image interpretation. Ch 15 Principles and techniques of aerial image interpretation. <i>Read pages 280-291.</i> Ch 19 Environmental monitoring. <i>Read pages 370-379.</i> Required: Garmin: What is GPS? http://www8.garmin.com/aboutGPS/	
4	L7 - 1/30	- Data collection and management - Quality Assurance/ Quality Control (QA/QC) - Map and compass	Text: Ch 6 Data Collection and Data Management. 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 "The OA Guide to Map and Compass" cont. <i>Read all pages.</i> http://www.princeton.edu/~oa/manual/mapcompass.shtml	
	L8 – 2/1	Field Trip: Oregon Oaks Project (HBRA) Techniques: tree dbh & height; canopy closure; pacing	Watch this video, http://vimeo.com/43211144 . 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> 2013 Oregon Oaks Habitat Assessment Protocol.	(field notes required) Due: Literature Search
5	L 9 - 2/6	Exam #1	Study!	Exam #1
	L10 – 2/8	Field Trip: Stream Stewardship Project (BWCA) Guest speaker: Jared Weybright, McKenzie Watershed Council	Read about the Berggren Watershed Conservation Area, http://mckenzieiver.org/protected-lands/owned-properties/berggren-watershed-conservation-area/ . Roni, P., T. J. Beechie, R. E. Bilby, F. E. Leonetti, M. M. Pollock, and G. R. Pess. 2002. A review of stream restoration techniques and a hierarchical strategy for prioritizing restoration in Pacific Northwest watersheds. <i>North American Journal of Fisheries Management</i> 22 :1-20. <i>Only read p. 1-14 (through Table 6).</i> 2013 ELP Riparian Planting Monitoring Protocol	(field notes required) Due: Field Observation update

6	L11 – 2/13	- Scientific writing for different audiences - Scientific reports and monitoring plans	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> Text: Ch15 Communication and Monitoring Plans – <i>only read p. 275-276.</i> Discover blog entry: http://blogs.discovermagazine.com/notrocketscience/2010/04/07/gut-bacteria-in-japanese-people-borrowed-sushi-digesting-genes-from-ocean-bacteria/ Read the abstract and first 2 paragraphs of the original article: http://www.nature.com/nature/journal/v464/n7290/full/nature08937.html .	
	L12 – 2/15	Field Trip: Wetlands Wildlife Project, part II (Delta Ponds) Techniques: egg mass surveys	Thoms, C., C. C. Corkran, and D. H. Olson. 1997. Basic amphibian survey for inventory and monitoring in lentic habitats. Pages 35-46 Olson, D. H., W. P. Leonard, and R. Bruce Bury. 1997. Sampling amphibians in lentic habitats. 2013 ELP Wetlands Wildlife Protocol: egg mass survey section	
7	L13 – 2/20	- Review Exam #1 - Monitoring animal populations, part I	Text: Ch 13 Specialized Sampling Methods and Field Techniques for Animals – <i>read p. 232-238.</i>	Due: Literature Synthesis
	L14 – 2/22	Field Trip: Oregon Oaks, part II (Wild Iris Ridge) Guest speakers: Emily Steele, City of Eugene; Alex Park, Oregon Dept of Agriculture Techniques: tree id, percent cover, photo points	Text: Ch 12 Field Techniques for Measuring Vegetation Shaff, C. J. Reiher, and J. Cambell. 2007. OWEB guide to photo point monitoring, http://www.oregon.gov/OWEB/docs/pubs/photopoint_monitoring_doc_july2007.pdf . 2013 Oregon Oaks Habitat Assessment Protocol.	(field notes required)
8	L15 – 2/27	- Monitoring animal populations, part II - Data types, central tendencies and distributions - Basic principles of sampling, part I	Text: Ch 13 Specialized Sampling Methods and Field Techniques for Animals – <i>read p. 238-245.</i> U.S. Geological Survey. 2005. Occupancy models to study wildlife. Fact Sheet 2005-3096, http://fresc.usgs.gov/products/fs/fs2005-3096.pdf Text: Ch 7 Basic Principles of Sampling – <i>read p. 76 – 81.</i>	

	L16 – 3/1	<p>“Field Trip:” Stream Stewardship, part II (EMU)</p> <p>Team meeting</p> <p>Techniques: Wolman’s pebble count, channel surveys, plus more practice estimating percent cover</p>	<p>Read this short press release, http://www.fs.usda.gov/detail/willamette/news-events/?cid=STELPRDB5336766.</p> <p>U.S. Forest Service. 2010. Stream Inventory Handbook, Level I & II, version 2.10. <i>Read p. 73 – 78.</i> http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsbdev2_023934.pdf. <i>Note: additional pages may be added.</i></p> <p>Harrelson et al. 1994. Stream Channel Reference Sites: an Illustrated Guide to Field Technique. <i>Read Ch 4 Drawing a Site Map (p. 10 – 12), 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.</p> <p>McDowell, P. GEOG 4/527 handouts.</p>	(bring Field Notebook for recording data)
	TBA	Technique: auditory monitoring (treefrogs)	N/A	Extra credit
9	L17 - 3/6	<ul style="list-style-type: none"> - Basic principles of sampling, part II - Objectives - Sampling design, part I 	Text: Ch 7 Basic Principles of Sampling – <i>read p. 81 – 89 (only through “How to achieve high statistical power.” We will not cover the content on p. 89-100).</i> Ch 14 Objectives – <i>only read Sampling Objectives, p. 265 – 270.</i> Ch 8 Sampling Design – <i>read through p. 102-117.</i>	
	L18 – 3/8	<p>Team meeting</p> <p>Field Trip: Wetlands Wildlife Project, part III (Delta Ponds)</p> <p>Techniques: more veg monitoring</p>	2013 ELP Wetlands Wildlife Protocol: read habitat assessment sections	Due: Field Notebook
	TBA	Technique: auditory monitoring (treefrogs)	N/A	Extra credit
10	L19 - 3/13	Sampling design, part II	Text: Ch 8 Sampling Design – <i>read through p. 117-143.</i>	Due: Monitoring Plan
	L20 - 3/15	<ul style="list-style-type: none"> - Citizen Science - Field Trip: Synthesis, conclusions and applications 	<p>Dickenson, J. L., B. Zuckerberg, and D. N. Bonter. 2010. Citizen science as an ecological research tool: challenges and benefits. <i>Annual Review of Ecology, Evolution and Systematics</i> 41:149–72.</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>	
	TBA	Technique: auditory monitoring (treefrogs)	N/A	Extra credit
11	TBA	Final Exam	Study!	Final Exam