ES 341: Ecological Restoration &
ER 311: Principles and Concepts of Ecological Restoration

Lectures—Mondays and Thursdays 13:00 – 14:20 Cornett A229

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Ecological restoration has emerged in the last twenty years as a critical approach to repairing damage to ecosystems, and according to the mission of the Society for Ecological Restoration International, "as a means of sustaining the diversity of life on Earth and reestablishing an ecologically healthy relationship between nature and culture." Taking up from the introduction to restoration provided in ES 200, this course will give you a panoramic view of the practice, science and conceptual foundations of ecological restoration. More specifically we will examine together how effective restoration depends on both ecological and cultural awareness, including:

- physical, chemical and biological characteristics of ecosystems from local to global scales
- impacts of human-induced change
- philosophical and ethical context for good restoration
- significance of community involvement
- legal and policy frameworks that direct and influence restoration activities
- essential ecosystem characteristics in restoration.

There is an emphasis on British Columbia but the approach taken to restoration is applicable to issues around the globe.

This course is required for students taking Environmental Studies as a major or minor subject. It is also a key course for those wishing to emphasize ecological restoration in their program by taking restoration related courses at the 400-level. ES 341 is also cross-listed with ER 311, the foundational course in our award-winning Restoration of Natural Systems Diploma program. There is an excellent opportunity for students pursuing a major or minor in Environmental Studies at UVic to complete the Diploma program, which provides hands-on professional training in the practice of restoration. For more information, please see http://www.uvcs.uvic.ca/restore/.

Course Objectives

i. To introduce the physical, biotic and cultural issues of restoration of ecosystems by summarizing and examining the wide scope of topics related to contemporary restoration, providing readings and access to additional information including websites, and facilitating contacts with restoration projects.
ii. To demonstrate the critical role of scientific description and analyses (especially ecology) and the importance of the integration of scientific data, models, and approaches with human needs and attitudes (social sciences) for successful restoration.

iii. To demonstrate the importance of communication for the successful development and management of a restoration project through preparation of written assignments, classroom discussion, and the development of community contacts in the field of the restoration of natural systems.
iv. To link you with restoration activities locally and beyond.
v. To provide you with ideas to spur deeper thought about the relationship of people with nature.

Finally, building on skills developed in ES 200 (Introduction to Environmental Studies), you should leave this course having improved the skills necessary to research, analyze and communicate about environmental issues generally, including:

- the ability to read a variety of different kinds of texts and materials effectively, emerging with a good understanding of their core arguments and analyses;
- the ability to thoughtfully engage analyses, whether oral or written: to ask good questions, think through implications, weigh evidence, and carefully evaluate ideas and arguments, and
- the ability to express yourself clearly, effectively and persuasively, both orally and in writing.

Course Structure

This course will consist primarily of lectures (including guest lectures), but there will be in-class activities (e.g., group discussions) and local walking fieldtrips. **Even though this is a larger course we encourage class discussions and questions; you'll learn more by discussing ideas inside and outside of class.** All of this has implications for how you prepare for classes. It is not enough only to do the reading before each class, although this is the absolute minimum you should do. You should have thought about your reading with enough care to have some issues and questions prepared to stimulate the class discussion. In other words, you are partly responsible for making the class interesting, challenging and relevant to your own interests. We will do our best to encourage your learning with new ideas, resources, and general intellectual guidance.

Course Readings

A list of "essential readings" is provided for most weeks (see below). We will provide updates on essential readings from time to time and make suggestions of additional (optional) readings you may find helpful. Most of the readings for this course are available from the CourseSpaces website. Check the website on a regular basis for links to .pdf readings or downloads.

There are two key texts that have a Canadian focus or origin, and are available for free download from their respective websites. Please download at your earliest convenience. There is some overlap between the two, but they have different virtues.

The Principles and Guidelines for Ecological Restoration in Canada's Protected Natural Areas, is the first national-level document of its kind in the world, and has extensive information on best practices. Download it here: http://www.pc.gc.ca/docs/pc/guide/resteco/index.aspx (you may need to change the file type from .aspx to .pdf if you right-click to save it).

The Canadian document formed the basis of the first global principles and guidelines for ecological restoration, *Ecological Restoration for Protected Areas,* produced by the World Commission on Protected Areas in 2012 (the WCPA is part of the International Union of Nature and Natural Resources, a UN-associated agency). This is a higher level document than

its Canadian counterpart, but there is more attention given to cultural diversity and global change. Download it from: www.iucn.org/dbtw-wpd/edocs/PAG-018.pdf

It is important that you do the required reading **before** class, as the lectures will build on, rather than repeating, the information contained in the readings. The lectures are your opportunity to ask questions about anything you find confusing, problematic, or difficult to understand in the readings for the week. You will understand the lectures better, and be able to ask better questions, if you've done the readings.

Course Requirements and Assessment

1. What is restoration? essay: 15%. Ecological restoration is a rapidly evolving discipline, filled with some of the most ambitious and novel ideas in environmental circles. This evolution leads to fast development of restoration best practices. Read the following three short essays and write a synthesis of your thoughts on what these ideas mean for how you think restoration will succeed most strongly.

Please include a description of what you learned about ecological restoration in these readings (and perhaps in restoration activities you have already been involved with), and reflect on what you think restoration should accomplish (is it more than just putting an ecosystem back on track?). Due in class on Monday February 2nd.

1. Society for Ecological Restoration International Science & Policy Working Group, 2004. The SER International Primer on Ecological Restoration. http://www.ser.org/resources/resources-detail-view/ser-international- primer-on-ecological-restoration
2. Shackelford,N.,R.J.Hobbs,J.M.Burgar,T.E.Erickson,J.B.Fontaine, E. Laliberté, C. E. Ramalho, M. P. Perring, and R. J. Standish. 2013. Primed for Change: Developing Ecological Restoration for the 21st Century. Restoration Ecology 21:297–304.
3. Hallett LM, Diver S, Eitzel MV, Olson JJ, Ramage BS, Sardiñas H, et al. 2013. Do We Practice What We Preach? Goal Setting for Ecological Restoration. Restoration Ecology. 21:312–9.

Mid-term Exam: 25%. There will be an in-class mid-term exam on Thursday February 19th. The exam will include short-answer and essay questions.

Restoration Project Design: 30%. This is a major course project that has both an individual component and a group component. Each person in the class will focus on one of the following five major components of a restoration design (there is some flexibility in defining these categories to respond to individual project needs):

- Site description and problem identification
- Develop restoration goals (using reference conditions/sites, consultation and so on)
- Formulate a plan for achieving restoration goals (activities, interventions, etc.)
- Budget and Timeline
- Monitoring plan

You will also work as part of teams who will select the restoration project, meet regularly to compare notes and exchange ideas, and ultimately assemble your individual components into a coherent design document.

Each person will be graded (10 of 30 marks) individually on your specific contribution to the overall report, but will also receive a group mark (20 of 30 marks) for the quality and integration of the overall report. Each group is to provide a clear indication of how people divided up the tasks (i.e., who did what). All reports should be submitted as a single .pdf file to ehiggs@uvic.ca and soph.park@yahoo.ca . Brief group presentations will be given on March 26th to share your hard work with the rest of the class.

Hyeone Park, the Teaching Assistant, will be the primary resource person for the assignment, and will be available to help guide your work individually and in groups.

The final group projects are due at the beginning of class on Thursday March 26th

Final Exam: 30%. Examination questions will be handed out in class and later made available on the Moodle site on Thursday April 2nd, (the final class of the term). Responses to the questions will be due on Thursday April 9th.

Key Dates
What Is Restoration?: February 2nd
Mid-term Exam: February 19th.
Restoration Project Design due & in-class group presentations: March 26th
Final Exam: take-home due April 9th

ALWAYS KEEP A COPY FOR YOURSELF OF ANY WRITTEN WORK SUBMITTED

Course Schedule: this is subject to change as we revise the course structure in response to discussion in class

Theme 1: ES341 Introduction: What is ecological restoration? Why restore?

Monday, January 5: ES341 Introduction & Overview

Thursday, January 8: What Is Ecological Restoration? - case studies, varieties of practice, define restoration, intro to world of restoration

Monday, January 12: Why restore? -- reasons, differing values

Thursday, January 15: History & Historicity. Why historical knowledge matters

Monday, January 19: Intro to the restoration class project. Come prepared to decide on a group project, and group membership.

Essential readings for Blocks 1 & 2 (see above)

1. Principles and Guidelines for Ecological Restoration in Canada's Protected Natural Areas. National Parks Directorate, Parks Canada Agency. Download (see Readings above).
2. Society for Ecological Restoration International Science & Policy Working Group, 2004. The SER International Primer on Ecological Restoration. Download from http://www.ser.org/resources/resources-detail-view/ser-international-primer-on-ecological-restoration
3. Ecological Restoration for Protected Areas. WCPA-IUCN. Download (see Readings above)
4. Shackelford,N.,R.J.Hobbs,J.M.Burgar,T.E.Erickson,J.B.Fontaine, E. Laliberté, C. E. Ramalho, M. P. Perring, and R. J. Standish. 2013. Primed for Change: Developing Ecological Restoration for the 21st Century. Restoration Eco logy 21:297–304.
5. Hallett LM, Diver S, Eitzel MV, Olson JJ, Ramage BS, Sardiñas H, et al. 2013. Do We Practice What We Preach? Goal Setting for Ecological Restoration. Restoration Ecology. 21:312–9.

6. Hall, Marcus. 2005. Cross-cultural Restoration. From *Earth Repair - A Transatlantic History of Environmental Restoration*. University of Virginia Press. pp. 192-228.
7. Higgs E, Falk DA, Guerrini A, Hall M, Harris J, Hobbs RJ, et al. 2014. The changing role of history in restoration ecology. Front Ecol Environ. 12::499–506.

Theme 2: Ecosystems, Processes, and Essential Ecosystem Characteristics

Thursday, January 22: Invasives Management Class Field Project. Field trip! **Come prepared to get a bit dirty; we will be pulling English Ivy and other invasives on campus.**

Monday, January 26: Best Practices: Effectiveness – does restoration work?

Thursday, January 29: Biological Diversity: Basic concepts, ecosystem attributes, patterns and processes

Monday, February 2: Biological Diversity: declining globally but locally increasing? What is restoration? essay due.

Essential readings:

1. R.M. Thompson and B.M. Starzomski 2007. What does biodiversity actually do? A review for policy makers and managers. Biodiversity and Conservation 16: 1359-1378 DOI: 10.1007/s10531-005-6232-9
2. Taking Nature's Pulse: The status of biodiversity in British Columbia Read- Section 3: Threats to Biodiversity in British Columbia http://www.biodiversitybc.org/EN/main/26.html.
3. Chapin III, F. S., E. S. Zavaleta, V. T. Eviner, R. L. Naylor, P. M. Vitousek, H. L. Reynolds, D. U. Hooper, S. Lavorel, O. E. Sala, S. E. Hobbie, M. C. Mack, and S. Diaz. 2000. Consequences of changing biodiversity. Nature 405:234- 242. doi: 10.1038/35012241.
4. rey Benayas, J. M. R., A. C. Newton, A. Diaz, and J. M. Bullock. 2009. Enhancement of Biodiversity and Ecosystem Services by Ecological Restoration: A Meta-Analysis. Science 325:1121–1124. doi: 10.1126/science.1172460.
5. Vellend, M., L. Baeten, I. H. Myers-Smith, S. C. Elmendorf, R. Beauséjour, C. D. Brown, P. D. Frenne, K. Verheyen, and S. Wipf. 2013. Global meta-analysis reveals no net change in local-scale plant biodiversity over time. Proceedings of the National Academy of Sciences 110:19456–19459.
6. Dornelas, M., N. J. Gotelli, B. McGill, H. Shimadzu, F. Moyes, C. Sievers, and A. E. Magurran. 2014. Assemblage Time Series Reveal Biodiversity Change but Not Systematic Loss. Science 344:296–299.

Theme 3: Doing Restoration--Best Practices

Thursday, February 5: Best Practices: Efficiency

Reading Break February 9-13

Monday February 16: Best Practices: Engagement

Thursday, February 19: Mid-term [in class]

Essential readings:

1. Ecological Restoration for Protected Areas. WCPA-IUCN. Download (see Readings above)

Theme 4: Restoration of different habitats and major challenges

Monday, February 23: Looking closely at Garry Oak/grassland ecosystems
Field trip. We'll be heading to the top of Mt. Tolmie. Dress for the weather

Thursday, February 26: Invasive species

Monday, March 2: Fire as an ecosystem process & restoration

Thursday, March 5: Urban ecosystems

Essential Readings

1. Vellend, M., Bjorkman, A.D. & McConchie, A. 2008. Environmentally biased fragmentation of oak savanna habitat on southern Vancouver Island, British Columbia, Canada. *Biological Conservation* 141:2576-2584. doi:10.1016/j.biocon.2008.07.019
2. MacDougall, A. S., B. R. Beckwith, and C. Y. Maslovat. 2004. Defining Conservation Strategies with Historical Perspectives: a Case Study from a Degraded Oak Grassland Ecosystem. Conservation Biology 18:455-465. doi: 10.1111/j.1523-1739.2004.00483.x.
3. Davis,M.A.,M.K.Chew,R.J.Hobbs,A.E.Lugo,J.J.Ewel,G.J. Vermeij, J. H. Brown, M. L. Rosenzweig, M. R. Gardener, S. P. Carroll, K. Thompson, S. T. A. Pickett, J. C. Stromberg, P. D. Tredici, K. N. Suding, J. G. Ehrenfeld, J. Philip Grime, J. Mascaro, and J. C. Briggs. 2011. Don't judge species on their origins. Nature 474:153–154.
4. Simberloff D. Biological invasions: What's worth fighting and what can be won? Ecological Engineering. Elsevier B.V; 2014 Apr 1;65:112–21.
5. Jeschke JM, BACHER S, BLACKBURN TM, DICK JTA, ESSL F, EVANS T, et al. 2014. Defining the Impact of Non-Native Species. Conservation Biology. 28:1188–94.
6. Shackelford,N.,R.J.Hobbs,N.E.Heller,L.M.Hallett,andT.R. Seastedt. 2013. Finding a middle-ground: The native/non-native debate. Biological Conservation 158:55–62.
7. Standish RJ, Hobbs RJ, Miller JR. Improving city life: options for ecological restoration in urban landscapes and how these might influence interactions between people and nature. 2013. Landscape Ecol. Springer Netherlands; 28:1213–21.

Theme 5: Restoration and People: Participation and Traditional Ecological Knowledge

Monday, March 9: Ethnoecological restoration & focal practices

Thursday, March 12: Engaging people in restoration projects

Monday, March 16: Ecosystem services

Essential Readings

1. Kimmerer R. 2011. Restoration and Reciprocity: The Contributions of Traditional Ecological Knowledge. In D Egan, E Hjerpe and J Abrams. *Human Dimensions of Ecological Restoration: Integrating Science, Nature, and Culture*. Island Press. pp. 257-276.
2. Higgs E. 2003. Focal Restoration. In *Nature By Design - People, Natural Process, And Ecological Restoration*. MIT Press. pp. 225-263.
3. Costanza R, de Groot R, Sutton P, van der Ploeg S, Anderson SJ, Kubiszewski I, et al. 2014. Changes in the global value of ecosystem services. Global Environmental Change. 26:152–8.
4. Dempsey J, Robertson MM. Ecosystem services: Tensions, impurities, and points of engagement within neoliberalism. 2012. Progress in Human Geography. 36:758–79.urban

Theme 6: Change, and the future of restoration

Thursday, March 19: Global environmental change

Monday, March 23: Managing the whole landscape: Hybrid and novel ecosystems

Thursday, March 26: Brief presentations of restoration design projects. Restoration design projects due.

Monday, March 30 – Changing nature: Imagining the future of ecological restoration

Thursday, April 2: Wrapping up & picking up take-home exam

Essential Readings

1. Starzomski, B.M. 2013. Novel Ecosystems and Climate Change. Pages 88–101 *in* R. J. Hobbs, E. S. Higgs, and C. M. Hall, editors. Novel Ecosystems. John Wiley & Sons, Ltd.
2. Gibson, S., R. van der Marel, & B.M. Starzomski. 2009. Climate Change and Conservation of Leading-Edge Peripheral Populations. Conservation Biology 23:1369-1373. doi: 10.1111/j.1523-1739.2009.01375.x.
3. Hobbs RJ, Higgs E, Hall CM, Bridgewater P, Chapin FS III, Ellis EC, et al. 2014. Managing the whole landscape: historical, hybrid, and novel ecosystems. Front Ecol Environ.12:557–64.
4. Hobbs R, Higgs E and C Hall. 2013. Introduction: Why Novel Ecosystems? In Hobbs R, Higgs E and C Hall (eds.) *Novel Ecosystems: Intervening in the New Ecological World Order*. Wiley-Blackwell.
5. Standish, R. J., A. Thompson, E. S. Higgs, and S. D. Murphy. 2013. Concerns about Novel Ecosystems. Pages 296–309 *in* R. J. Hobbs, E. S. Higgs, and C. M. Hall, editors. Novel Ecosystems. John Wiley & Sons, Ltd.

Important Information

Academic Integrity

Academic integrity is intellectual honesty and responsibility for academic work that you submit, whether individual or group work. It involves commitment to the values of honesty, trust, and responsibility. It is expected that students will respect these ethical values in all activities related to learning, teaching, research, and service. Therefore, plagiarism and other acts against academic integrity are serious academic offences. UVic's policy on Academic Integrity is available here: http://web.uvic.ca/calendar2012/FACS/UnIn/UARe/PoAcI.html. Depending on the severity of the case, penalties include a warning, a failing grade, a record on the student's transcript, or a suspension.

The responsibility of the institution: Instructors and academic units have the responsibility to ensure that standards of academic honesty are met. By doing so, the institution recognizes students for their hard work and assures them that other students do not have an unfair advantage through cheating on essays, exams, and projects.

The responsibility of the student: Plagiarism sometimes occurs due to a misunderstanding regarding the rules of academic integrity, but it is the responsibility of the student to know them. If you are unsure about the standards for citations or for referencing your sources, talk to your instructor or take advantage of the following resources: http://ltc.uvic.ca/initiatives/integrity/student.php or http://www.uvic.ca/library/research/citation/plagiarism/index.php .

Grading Policy

Grades	Percentage *	Description
A+ A A-	90 – 100 85 – 89 80 – 84	An A+, A, or A- is earned by work which is technically superior, shows mastery of the subject matter, and in the case of an A+ offers original insight and/or goes beyond course expectations. Normally achieved by a minority of students.
B+ B B-	77 – 79 73 – 76 70 – 72	A B+, B, or B- is earned by work that indicates a good comprehension of the course material, a good command of the skills needed to work with the course material, and the student's full engagement with the course requirements and activities. A B+ represents a more complex understanding and/or application of the course material. Normally achieved by the largest number of students.
C+ C	65 – 69 60 – 64	A C+ or C is earned by work that indicates an adequate comprehension of the course material and the skills needed to work with the course material and that indicates the student has met the basic requirements for completing assigned work and/or participating in class activities.
D	50 – 59	A D is earned by work that indicates minimal command of the course materials and/or minimal participation in class activities that is worthy of course credit toward the degree.
F	0 – 49	F is earned by work, which after the completion of course requirements, is inadequate and unworthy of course credit towards the degree.
N	0 – 49	Did not write examination or complete course requirements by the end of term or session; no supplemental.

The following correlation of letter grade and numerical score will be used in the class. Final grades will be recorded as percentages.

Course Evaluations

I value your feedback on this course, and each year I spend significant time figuring out how to incorporate calss comments to improve my teaching. Towards the end of term, as in all other courses at UVic, you will have the opportunity to complete an anonymous survey regarding your learning experience (called the Course Experience Summary: CES). The survey provides vital feedback to me regarding the course and my teaching, as well as helping the School of Environmental Studies improve the overall program for students in the future. When it is time for you to complete the survey you will receive an email inviting you to do so. Please ensure that your current email address is listed in MyPage (http://uvic.ca/mypage) . If you do not receive an email invitation, you can go directly to http://ces.uvic.ca. You will need to use your UVic netlink ID to access the survey, which can be done on your laptop, tablet, or mobile device. I will remind you and provide you with more detailed information nearer the time but please keep your ideas for constructive feedback in mind throughout the course.

Accessibility Statement

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may requireaccommodations, please feel free to approach me and/or the Resource Centre for Students with a Disability (RCSD) as soon as possible. The RCSD staff are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations http://rcsd.uvic.ca/. The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course. Please let me know and I will do my best to work with you on this.

NOTE: *The University of Victoria is committed to promoting, providing and protecting a positive and safe learning and working environment for all its members. Student evaluation forms now include questions on the respect shown by the instructor for students, particularly those of diverse origins, orientation and physical abilities.*