

University of Victoria  
School of Environmental Studies  
Course Syllabus

**ES 341: Ecological Restoration (cross-listed with ER311)**

Lecture: Monday and Thursday 8:30-9:50am, Cornett B111

Instructor: Dr. Brian Starzomski

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Office Hours: **Wednesday 9:30-11:30**  
(or by appointment)

Teaching Assistant: Abra Martin

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Office: TBA

Office Hours: **TBA**

Ecological restoration is a critical approach to repairing damage to ecosystems, and according to the mission of the Society for Ecological Restoration International, “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 an overview of the practice, science, and conceptual foundations of ecological restoration. More specifically we will examine how effective restoration depends on both ecological and social practice, including:

- Biotic and abiotic characteristics of ecosystems from local to global scales. A special focus will be placed on understanding biodiversity patterns and processes
- impacts of human-induced change and how restoration evolves to address these changes
- the context for restoration best practice
- significance of community involvement
- the integral nature of a clear question and plan
- essential ecosystem characteristics in restoration

There is an emphasis on British Columbia but the theory and practice 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 ecology and 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 the Restoration of Natural Systems Diploma program. Students pursuing a major or minor in Environmental Studies at UVic may choose 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/sustainability/programs/>.

## Course Objectives

- i. To introduce the abiotic, 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, 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.
- iv. To link you with restoration activities locally and beyond.
- v. To provide you with ideas to spur deeper thought about the relationship of humans to nature.

Finally, building on skills developed in ES 200 and 240, 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 class. 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 course website which will be released next week. Check the website on a regular basis for links to .pdf readings or downloads.

A key text is *Principles and Guidelines for Ecological Restoration in Canada's Protected Natural Areas*. This is the first national-level document of its kind in the world. It will form the core of the course, and over the semester you should plan to read the entire document. Download it here:

[http://www.pc.gc.ca/docs/pc/guide/resteco/guide\\_e.pdf](http://www.pc.gc.ca/docs/pc/guide/resteco/guide_e.pdf).

We recommend the following texts should you wish a more systematic guide to the opportunities and challenges of ecological restoration. This is a short list of texts from a field that is rapidly changing: updated textbooks are available as well.

- Apostol, Dean and Marcia Sinclair (eds). 2006. *Restoring the Pacific Northwest: The art and Science of Ecological restoration in Cascadia*. Island Press.
- Falk, Don, Margaret Palmer, and Joy Zedler (eds). 2006. *Foundations of Restoration Ecology*. Island Press.
- Hobbs, R. J., E. S. Higgs, and C. Hall. 2013. *Novel Ecosystems: Intervening in the New Ecological World Order*. John Wiley & Sons.
- Kareiva, Peter and Michelle Marvier. 2010. *Conservation Science: Balancing the Needs of People and Nature*. Roberts and Company.
- Primack, Richard. 2014. *Essentials of Conservation Biology*. Sinauer.

It is extremely important that you do the required reading before class, as the lectures will build on, rather than repeat, 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

**There is no lab for ES341/ER311: we simply do not have the facilities to run these. Nevertheless, ecological restoration is clearly an outdoors activity and arguably the most interesting and important component of it happens outside. A deep familiarity with the natural history of a restoration site, in combination with a background in theory, is the recipe for success as a restoration practitioner. As a consequence, we encourage you to get experience with local restoration projects. There are many in the region around Victoria and southeastern Vancouver island, from city parks to**

**federally managed lands to small private restoration projects. Each student is required to volunteer for 6 hours on restoration projects of their choosing: these can be with any restoration project, and the locations, times, and goals of the projects should be listed at the end of your group project. Local restoration opportunities include (but are not limited to) the following:**

- 1) UVic restoration club**
- 2) Rithet's Bog**
- 3) Swan Lake/Christmas Hill**
- 4) Ft Rodd Hill National Historic Site**
- 5) Gulf Islands National Park**
- 6) City of Victoria Parks (maybe: there has been a moratorium on volunteers)**
- 7) Your group project**

**1. What is restoration? essay: 10%.** 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 two 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 [January 29th](#).

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.

**Mid-term Exam: 25%.** There will be an in-class mid-term exam on [February 5th](#). The exam will include short-answer and essay questions.

**Restoration Project Design: 35%.** This is the 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
- Developing 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 35 marks) individually on your specific contribution to the overall report, but will also receive a group mark (25 of 35 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 two files: a .pdf and a .doc or .docx file to [starzom@uvic.ca](mailto:starzom@uvic.ca) and [abram@uvic.ca](mailto:abram@uvic.ca). If they are very large then using a program like Dropbox or Google Drive is useful.

Abra Martin, 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 by the end of the day on [March 30th](#).

**Final Exam: 30%.** Examination questions will be handed out in class and later made available on the course website on [Thursday April 2nd](#), (the final class of the term). Responses to the questions will be due on [Thursday April 9th, 12 p.m \(Noon\)](#) to Dr. Starzomski's office (B225 DTB).

### **Key Dates**

What is restoration? essay: [January 29th](#)

Mid-term Exam: [February 5th](#)

Restoration Project Design: [March 30th](#)

Final Exam: [April 2nd](#), **due Thursday April 9<sup>th</sup> at noon.**

***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**

### **Part 1: ES341 Introduction & What Is Ecological Restoration?**

Monday, January 5th: ES341 Introduction

Thursday, January 8th: What is restoration? - case studies, varieties of practice, define restoration, intro to world of restoration

*Essential readings for first 2 weeks:*

3. Principles and Guidelines for Ecological Restoration in Canada's Protected Natural Areas. National Parks Directorate, Parks Canada Agency. [http://www.pc.gc.ca/docs/pc/guide/resteco/guide\\_e.pdf](http://www.pc.gc.ca/docs/pc/guide/resteco/guide_e.pdf).
4. 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>
5. 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.

### **Part 2: Why Restore?**

Monday, January 12th: Why Restore? – reasons, differing values

Thursday, January 15th: Intro to the [restoration class project](#). **Come prepared to decide on a group project, and group membership.**

*Essential readings for first 2 weeks:*

1. Principles and Guidelines for Ecological Restoration in Canada's Protected Natural Areas. National Parks Directorate, Parks Canada Agency. [www.pc.gc.ca/docs/pc/guide/resteco/guide\\_e.pdf](http://www.pc.gc.ca/docs/pc/guide/resteco/guide_e.pdf)
2. 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>

### **Parts 3 & 4: Ecosystems, Processes, and Essential Ecosystem Characteristics**

Monday, January 19th: 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.***

Thursday, January 22nd: Does restoration work?

Monday, January 26th: Biological Diversity: Basic concepts, ecosystem attributes, patterns and processes

Thursday, January 29th: 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](https://doi.org/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](https://doi.org/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.

<b>Part 5: The Restoration Project</b>
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Monday, February 2nd: Elements of a Successful Project 1

Thursday, February 5th: [Mid-term \[In class\]](#)

Monday, February 9th: [Reading Break, No Class](#)

Thursday, February 13<sup>th</sup>: [Reading Break, No Class](#)

Monday, February 16th: Elements of a Successful Project 2

*Essential readings:*

1. Principles and Guidelines for Ecological Restoration in Canada's Protected Natural Areas. National Parks Directorate, Parks Canada Agency. [www.pc.gc.ca/docs/pc/guide/resteco/guide\\_e.pdf](http://www.pc.gc.ca/docs/pc/guide/resteco/guide_e.pdf)

<b>Parts 6&amp;7: Restoration of different habitats and major challenges 1</b>
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Thursday, February 19th: Ecosystem Services

Monday, February 23rd: 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 26th: New ways of looking at invasive species?  
Guest lecturer: Nancy Shackelford

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

*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](https://doi.org/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](https://doi.org/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. 2011. Non-natives: 141 scientists object. *Nature* 475:36–36.

5. Shackelford, N., R. J. Hobbs, N. E. Heller, L. M. Hallett, and T. R. Seastedt. 2013. Finding a middle-ground: The native/non-native debate. *Biological Conservation* 158:55–62.

### **Part 8: Restoration and People: Participation and Traditional Ecological Knowledge**

Thursday, March 5th- Slow-responding ecosystems

Monday, March 9th- Ethnoecological Restoration

*Essential readings: TBA*

### **Part 9: People way in the mix: Human dominated Ecosystems**

Thursday, March 12th: Pushing restoration's boundaries

Monday, March 16th: Urban ecosystems and restoration  
Guest lecturer: Dr. Val Schaefer

*Essential Readings*

1. Gobster, P.H. 1994. The urban savanna: reuniting ecological preference and function. *Restoration and Management Notes*, 12 pp. 64–71.
2. Marris, E. 2009. Ecology: Ragamuffin Earth. *Nature News* 460:450–453. doi: 10.1038/460450a.
3. Hobbs, R. J., E. Higgs, and J. A. Harris. 2009. Novel ecosystems: implications for conservation and restoration. *Trends in Ecology & Evolution* 24:599-605. doi: [doi:10.1016/j.tree.2009.05.012](https://doi.org/10.1016/j.tree.2009.05.012)

### **Part 10: Major challenges to Restoration 1b**

Thursday, March 19th: Global Environmental Change, Part 1: Exotics, Invasive Species, and Globalization

Monday, March 23rd: Global Environmental Change, Part 2: Human domination of the planet?

*Essential Readings*

1. Norton, D. A. 2009. Species Invasions and the Limits to Restoration: Learning from the New Zealand Experience. *Science* 325:569-571. doi: [10.1126/science.1172978](https://doi.org/10.1126/science.1172978).
2. McLachlan, J. S., J. J. Hellmann, and M. W. Schwartz. 2007. A Framework for Debate of Assisted Migration in an Era of Climate Change. *Conservation Biology* 21:297-302. doi: [10.1111/j.1523-1739.2007.00676.x](https://doi.org/10.1111/j.1523-1739.2007.00676.x).
3. 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.
4. Ellis, E. C., and N. Ramankutty. 2007. Putting people in the map: anthropogenic biomes of the world. *Frontiers in Ecology and the Environment* 6:439–447.

<b>Part 11: Major challenges to Restoration 2</b>
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Thursday, March 26th: Global Environmental Change, Part 3: Embracing Novel Ecosystems?

Monday, March 30th: Novel ecosystems: in class discussion and debate;  
[\[Restoration Design Projects due\]](#)

**Thursday, April 2nd:** [Pick up take-home exam](#)

**Thursday, April 9th:** [Take home exam due](#), **High noon**

*Essential Readings*

1. 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](https://doi.org/10.1111/j.1523-1739.2009.01375.x).
2. Jackson, S. T., and R. J. Hobbs. 2009. Ecological Restoration in the Light of Ecological History. *Science* 325:567-569. doi: [10.1126/science.1172977](https://doi.org/10.1126/science.1172977).
3. Hobbs, R. et al. 2014. Managing the whole landscape: historical, hybrid and novel ecosystems. *Frontiers in Ecology and the Environment*.
4. 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/PoAcl.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

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

<b>Grades</b>	<b>Percentage *</b>	<b>Description</b>
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.

### Course Evaluations

I value your feedback on this course, and each year I spend significant time figuring out how to incorporate class 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 require

accommodations, 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.*