

University of Waterloo

ERS 375 (002) Stopping the Sixth Extinction: Recovering Canada's Endangered Species

Fall 2020



Photo: Blanding's Turtle. Rouge Urban National Park. Parks Canada.

1. Course Description and Learning Outcomes

1.1 Course Description

With extinction rates up to 1,000 times greater than historic background levels, the current global state of species loss has been called the "Sixth Extinction". The focus of this course is finding solutions to slow down and stop this trend in biodiversity loss. We will explore the history and root causes of species decline and loss in Canada, and evaluate our current approaches to protection, restoration and recovery. The course will review Canada's domestic and international commitments to conserve biodiversity, the legislative context on species at risk, the role of conserved and protected areas, diverse social values, Indigenous and community stewardship, and endangered species recovery planning. There will also be opportunities to learn strategies to engage with the public and civil society and inspire action to stop biodiversity loss and foster a transition to a more sustainable future.

We have developed this on-line course to be flexible and accommodating and to mobilize a variety of teaching modes that facilitate learning no matter where you are. Pre-recorded lectures and case studies, assigned readings, and other resources will be posted weekly. You are encouraged to join one of the two optional "class connect" sessions offered each week. These sessions will provide an opportunity to further examine some of the ideas and questions raised by the lectures and connect with the instructors, guest speakers and fellow students. Time with the instructors can also be scheduled for individual discussions and counsel if required.

The course information and material is in LEARN (<https://learn.uwaterloo.ca/>).

1.2 Learning Outcomes

The overall objective of this course is to help inform and empower a new generation of transdisciplinary conservation scientists to understand and solve the complex problems of biodiversity loss.

By the end of this course, students should be able to:

- Describe the major trends and drivers of biodiversity loss in Canada.
- Demonstrate an ability to assess species extinction risks using the IUCN Red List methodology.
- Explain Canada’s legislative landscape for species at risk.
- Examine the context, complexities and solutions specific to a key biodiversity conservation issue in Canada.
- Develop effective and adaptive strategies for species conservation in the context of managing for both historical and novel ecosystems.

2. Weekly Modules and Schedule

In a typical week:

- Weekly Module are released before Monday at 8:00 am.
- Announcements for the week provided before Monday at 1:00 pm via LEARN.
- “Class Connect” sessions (Bongo, Virtual Classroom in LEARN) on Tuesdays and Thursdays (12:30-1:30pm). Students are welcome to attend either or both.
- Work on Assignments.

Module	Topic	Summary
1. Sep 8- 13, 2020	Welcome and course outline Introduction to Canadian biodiversity Case Study: Grassland Birds (<i>Guest Speaker: Ron Reid, Couchiching Conservancy</i>)	Introduction and course framework. Logistics and overview of pre-recorded lectures, weekly announcements, course readings, assignments and “class connect” sessions. We’ll explore the distribution and abundance of wild species and Canada’s ecological regions. Students will gain an understanding of endangered species and ecosystems from a Canadian and global context, and why biodiversity loss matters. Profile Bobolink and Lakeside Daisy.
2. Sep 14-20, 2020	The six mass extinction events Understanding extirpation and extinction Case Study: Great Lakes Ciscoes (<i>Guest Speaker: Dr. Nicholas Mandrak, UofT</i>)	The five previous mass extinction events and are we entering the 6th now? Why do some species thrive while others go extinct? We’ll examine the biological traits that can increase extinction risk and major threats to biodiversity globally and within Canada. We’ll also examine how and why threats to species have changed in Canada, including our evolving societal values about nature. Profile Passenger Pigeon and Karner Blue.

3. Sep 21 – 27, 2020	Canada’s biodiversity policies and legislative context Case Study: Beluga and North Atlantic Right Whales of the Gulf of St. Lawrence (<i>Guest Speaker: Nadia Menard, Parks Canada</i>)	This week we’ll explore Canada’s current policies to protect endangered species including the Species at Risk Act (SARA). In addition to understanding the policy, we’ll examine how and why the implementation of SARA varies across the country, and how this model of governance compares to other countries. As well, we’ll discuss some of the different attitudes and feelings towards species conservation and endangered species legislation.
4. Sep 28 – Oct 4, 2020	Assessing extinction risk Case Study: How the assessment process works (COSSARO and COSEWIC)	One of the most critical steps to prevent species loss and extinction is to prioritize risk. This week we will review and analyze the criteria for assessing and categorizing endangered species globally and in Canada. Profile Salmon (designatable units).
5. Oct 5-11, 2020	Managing for persistence or change? Case Study: Sea Otters (<i>Guest Speakers: Dr. Lynn Lee and Dr. Norman Sloan, Parks Canada</i>)	In the face of rapid environmental change, efforts to protect or restore individual species may become untenable, so how do we accept or direct ecosystem change in such a context? This week we’ll explore a spectrum of conservation pathways from resistance through transformation, as well as concepts such as shifting baselines.
Reading Week: Oct 12-18, 2020		
6. Oct 19-25, 2020	Indigenous knowledge and community stewardship Case Studies: A) Haida Gwaii; and, B) Polar Bears	We’ll examine the importance of Indigenous knowledge and community stewardship in species conservation and recovery.
7. Oct 26- Nov 1, 2020	Recovery planning and critical habitat Case Study: Point Pelee multi-species action plan	Once a species is listed as endangered, the next step is recovery planning. In this module we’ll examine the trend in species recovery, Canada’s framework for recovery planning, mapping critical habitat, and alternative approaches to conserving endangered species.
8. Nov 2-8, 2020	Protected and conserved areas Case Studies: A) World Commission on Protected Areas (<i>Guest Speaker: Dr.</i>	Protected and conserved areas serve as a cornerstone for Canada’s species and ecosystem conservation efforts. Despite the protection they afford, the drivers of mass extinction will challenge their very effectiveness. In this module we’ll explore their role and how they can adapt

	<i>Stephen Woodley, IUCN</i>); and, B) Canada's Prairies	and respond to biodiversity loss through planning, management and network building.
9. Nov 9 – 15, 2020	Habitat restoration Case Studies: A) Garry Oak Ecosystem (<i>Guest Speaker: Dr. Marlow Pellatt, Parks Canada/SFU</i>); and, B) Herb Gray Parkway	In this module we'll learn about the role of habitat restoration in protecting and restoring species and explore some of the restoration projects that are happening in Canada's endangered species hotspots. We'll also discuss the role of ecological restoration in a novel and rapidly changing world.
10. Nov 16 – 22, 2020	Conservation breeding and translocation Case Studies: A) Bison (<i>Guest Speaker: Dr. Todd Shury, Parks Canada/UofS</i>); and, B) Great-sage Grouse	We'll explore the opportunities and challenges of conservation breeding and reintroduction's for recovering endangered species. We'll discuss the concepts of novel ecosystems, and when reintroduced populations can be considered "wild by nature" and count towards species recovery.
11. Nov 23- 29, 2020	Science communications and inspiring action Case Study: Pelee Island	We'll discuss the skills and approaches needed to engage a variety of audiences, with a focus on decision-makers and the public, and why science communication is critical for species at risk recovery and socio-ecological transformation.
12. Nov 30 – Dec 6, 2020	Final review and reflection	We will review and reflect on the key challenges and opportunities for stopping the 6th extinction.

2.1 Required Readings

A. Journal Articles

- Akcakaya, H. R., Bennett, E. L., Brooks, T. M., Grace, M. K., Heath, A., Hedges, S., et al. (2018). Quantifying species recovery and conservation success to develop an IUCN Green List of Species. *Conservation Biology*, 32(5), 1128-1138. doi:10.1111/cobi.13112.
- Barnosky, A. D., Matzke, N., Tomiya, S., Wogan, G. O. U., Swartz, B., Quental, T. B., et al. (2011). Has the Earth's sixth mass extinction already arrived? *Nature*, 471(7336), 51-57. doi:10.1038/nature09678.
- Bird, S. C. and Hodges, K. E. (2017). Critical habitat designation for Canadian listed species: Slow, biased, and incomplete. *Environmental Science & Policy*, 71, 1-8. doi:10.1016/j.envsci.2017.01.007.
- De Vos, J. M., Joppa, L. N., Gittleman, J. L., Stephens, P. R., and Pimm, S. L. (2015). Estimating the normal background rate of species extinction. *Conservation Biology*, 29(2), 452-462. doi:10.1111/cobi.12380.
- Favaro, B., Claar, D. C., Fox, C. H., Freshwater, C., Holden, J. J., Roberts, A., et al. (2014). Trends in Extinction Risk for Imperiled Species in Canada. *PLoS ONE*, 9(11), 8. doi:10.1371/journal.pone.0113118.

- Gann, G. D., McDonald, T., Walder, B., Aronson, J., Nelson, C. R., Jonson, J., et al. (2019). International principles and standards for the practice of ecological restoration. Second edition. *Restoration Ecology*, 27, S3-S46. doi:10.1111/rec.13035.
- Gooden, J. and Grenyer, R. (2019). The psychological appeal of owning private land for conservation. *Conservation Biology*, 33(2), 339-350. doi:10.1111/cobi.13215.
- Higgs, E., Harris, J., Murphy, S., Bowers, K., Hobbs, R., Jenkins, W., et al. (2018). On principles and standards in ecological restoration. *Restoration Ecology*, 26(3), 399-403. doi:10.1111/rec.12691.
- Lamothe, K. A. and Drake, D. A. R. (2019). Moving repatriation efforts forward for imperilled Canadian freshwater fishes. *Canadian Journal of Fisheries and Aquatic Sciences*, 76(10), 1914-1921. doi:10.1139/cjfas-2018-0295.
- Mace, G. M., Collar, N. J., Gaston, K. J., Hilton-Taylor, C., Akcakaya, H. R., Leader-Williams, N., et al. (2008). Quantification of Extinction Risk: IUCN's System for Classifying Threatened Species. *Conservation Biology*, 22(6), 1424-1442. doi:10.1111/j.1523-1739.2008.01044.x.
- Olive, A. (2016). It is just not fair: the Endangered Species Act in the United States and Ontario. *Ecology and Society*, 21(3), 10. doi:10.5751/es-08627-210313.
- Perring, M. P., Erickson, T. E., and Brancalion, P. H. S. (2018). Rocketing restoration: enabling the upscaling of ecological restoration in the Anthropocene. *Restoration Ecology*, 26(6), 1017-1023. doi:10.1111/rec.12871.
- Smol, J. P. (2018). A crisis in science literacy and communication: Does reluctance to engage the public make academic scientists complicit? *Facets*, 3, 952-957. doi:10.1139/facets-2018-0022.
- Swan, K. D., Lloyd, N. A., and Moehrensclager, A. (2018). Projecting further increases in conservation translocations: A Canadian case study. *Biological Conservation*, 228, 175-182. doi:10.1016/j.biocon.2018.10.026.

B. Online Reports

- Canada (2002). Species at Risk Act, c. 29. <http://laws-lois.justice.gc.ca/eng/acts/S-15.3/>
- ECCC (2019a). Canadian Environmental Sustainability Indicators: Changes in the status of wildlife species at risk. Environment and Climate Change Canada, Ottawa, ON. <https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/changes-status-wildlife-species-risk.html>
- ECCC (2019b). Canadian Environmental Sustainability Indicators: Species at risk population trends. Environment and Climate Change Canada, Ottawa, ON. <https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/species-risk-population-trends.html>
- ECCC (2019c). Report on steps taken and protection of critical habitat for species at risk in Canada. Environment and Climate Change Canada, Ottawa, ON. <http://publications.gc.ca/site/eng/9.875699/publication.html>
- ECCC (2020). Canadian Environmental Sustainability Indicators: Canada's conserved areas. Environment and Climate Change Canada, Ottawa, ON. <https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/conserved-areas.html>
- FPT (2010). Canadian Biodiversity: Ecosystem Status and Trends 2010. Federal, Provincial and Territorial Governments of Canada, Canadian Councils of Resource Ministers, Ottawa, ON. <http://www.biodivcanada.ca/default.asp?lang=En&n=83A35E06-1>
- ICE (2018). We Rise Together. Achieving Pathway to Canada Target 1 through the creation of Indigenous Protected and Conserved Areas in the spirit and practice of reconciliation. Indigenous Circle of Experts, Ottawa, ON. <http://www.conservation2020canada.ca/home>

WWF. (2017). Living Planet Report Canada. A National Look at Wildlife Loss. World Wildlife Fund. https://wwf.ca/wp-content/uploads/2020/02/WEB_WWF_REPORT_v3-1.pdf

3. Grade Breakdown

The following table represents the grade breakdown of this course.

Assignments	Weight (%)
Assignment 1. Policy/legislation or endangered species analysis 1) Within the broader context of biodiversity conservation or species at risk in Canada, students are to analyze and critically evaluate a specific policy or piece of legislation; or, 2) Choose a species or species group (e.g., aerial insectivores) that is at risk of extinction in Canada. Discuss the factors that make it vulnerable to extinction, our current responses and the actions needed to recover the species.	25%
Assignment 2. IUCN Red List Assessment Training Students are to complete the IUCN online training modules 1 to 7 and provide results of the module 8 exam. A minimum grade of 75% is required.	10%
Assignment 3. Conservation Question Essay Answer one of three conservation questions provided. In general: 1) Are we in the 6th extinction; 2) How should we respond to novel ecosystems; and, 3) What are the actions that led to the successful recovery of a species?	15%
Assignment 4. (1) Term Paper Proposal Relevant to the 6th mass extinction event, students are to identify a significant biodiversity conservation challenge or species at risk issue in Canada. The proposal is meant to be a starting point for the Introduction section to the Final Term Paper.	5%
Assignment 4. (2) Peer-Review two other students Draft Term Paper	5%
Assignment 4. (3) Final Term Paper and Briefing Building on their Proposal and Student Peer-review feedback (if applicable), students are to submit their Final Term Paper and associated briefing.	40%
Bonus: One-on-one chat with the instructor(s). We'd like to learn more about the students and why they are taking the course? What can we do to make it more authentic and accessible and better align with their interests?	3%

General Grade Guideline's

Numeric grades on a scale from 0-100 are used in grading all assignments. The following list will give you a general idea of the basis upon which numeric grades are assigned. Rubrics for specific assignments will be provided.

- **>90%** Work that shows a high level of initiative and is clearly above and beyond what is expected. Referencing, style, grammar/spelling, content and the development of ideas are all superior.
- **80-89%** Work that shows good initiative and is above what is expected. Referencing, style, grammar/spelling, content and the development of ideas are all good.
- **70-79%** Work that shows initiative and is about what is expected, but one or more problems are evident in referencing, style, grammar/spelling, content and/or the development of ideas.
- **60-69%** Work that does not demonstrate initiative, has a series of problems in referencing, style, grammar/spelling, content and/or the ideas, and overall, does not fully convince the reader that the topic has been well considered.
- **50-59%** Work that is substandard/sloppy in places, has many problems in referencing, style, grammar/spelling, content and/or the development of ideas, and overall, raises more questions in a reader's mind than the work answers.
- **40-49%** Work that is of consistently poor quality, demonstrates gaps in comprehension of the assigned material, and/or indicates that not enough time was taken to properly address the assignment.
- **<40** Work that is clearly of poor quality, demonstrates a lack of comprehension of the assigned material, shows little attempts at a personal development of ideas or efforts to back up arguments with suitable evidence, and/or indicates that the work was completed "at the last minute".

4. Your Instructors

4.1 Instructor Introductions

Dan Kraus is the Senior Conservation Biologist with the Nature Conservancy of Canada's (NCC) national office. He is an expert on Canadian biodiversity and conservation and has recently written reports on a variety of topics including freshwater Key Biodiversity Areas in Canada and species at risk legislation. His current projects include developing Canada's first list of nationally endemic species, a review of biodiversity in Canadian cities, and an assessment of biodiversity, threats and conservation responses across southern Canada. Dan often shares his passion about nature and the importance of conservation, and his editorials have appeared in media across Canada. He is a councilor on the Canadian Society for Ecology and Evolution, a member of the IUCN Species Survival Commission, Deputy Chair of the Committee on the Status of Species at Risk in Ontario and was a founding board member of the Ontario Invasive Plant Council. He is currently researching the socio-ecological drivers of wildlife extinction and recovery at the University of Waterloo. Prior to NCC, Dan worked with Parks



Canada and as an environmental consultant. Dan lives at the headwaters of Bronte Creek in the Lake Ontario watershed where he enjoys chopping wood and raising happy chickens.

Dr. Scott Parker is as an ecologist (formerly a Park Warden) with Parks Canada (PC). For over 30-years he has worked on science and monitoring projects in sites across the country, from invasive species eradication on the islands of Gwaii Haanas to aquatic habitat mapping and restoration in Fathom Five, and he is currently PC's Great Lakes regional ecosystem scientist. He is a member of several national and international conservation committees, including the World Commission on Protected Areas and was the founding chair of Canada's Biodiversity Adaptation Working Group. He completed his Ph.D. at the University of Waterloo, where he has been an adjunct professor since 2012. He lives on the Bruce Peninsula with his wife and two kids (who are temporarily at home from university riding out this part of the pandemic).



4.2 Special Note

In addition to being instructors at the University of Waterloo, Scott Parker and Dan Kraus are also senior scientists with Parks Canada and the Nature Conservancy of Canada, respectively. While these positions provide experience and perspective relevant to the course, the views, statements, findings and conclusions expressed during the course are solely those of the instructors and do not necessarily reflect the views and policies of their respective agencies. Furthermore, to avoid any real, potential or perceived conflict of interest, the instructors will not be advocating for any specific positions on current issues, regulatory matters or policies within their respective agencies.

4.3 Contact Us

Who and Why	Contact Details
Instructors Course-related questions (e.g., course content, deadlines, assignments, etc.) Questions of a personal nature	Post your course-related questions to the Ask the Instructors discussion topic. This allows other students to benefit from your question as well. Questions of a personal nature can be directed to your instructors. Dr. Scott Parker Adjunct Professor, University of Waterloo Email: Scott.Parker@uwaterloo.ca Phone: 519.377.4040 Dan Kraus

	<p>Nature Conservancy of Canada Email: dtkraus@uwaterloo.ca Phone: 647.299.2425</p> <p>Your instructors check email and the Ask the Instructor discussion topic frequently and will make every effort to reply to your questions within 24 hours, Monday to Friday. When emailing the instructors, please indicate the course code in the subject line.</p>
<p>Technical Support</p> <p>Technical problems with Waterloo LEARN</p>	<p>learnhelp@uwaterloo.ca</p> <p>Include your full name, WatIAM user ID, student number, and course name and number.</p> <p>Technical support is available during regular business hours, Monday to Friday, 8:30 AM to 4:30 PM (Eastern Time).</p> <p>LEARN Help Student Documentation</p>
<p>Student Resources</p>	<p>Student Resources</p> <ul style="list-style-type: none"> • Academic advice • Student success • WatCards • Library services and more

5. Course Materials

All the required readings are either reports which are freely accessible on-line (URL provided) or are journal articles that can easily be accessed through regular University of Waterloo Library privileges (no course reserves in place). No other textbooks or materials is required.

6. Course and Department Policies

6.1 Course Policies

Requests for Extensions for Assignments: All assignments are due on the date set by the instructors. An extended deadline of 7 calendar days past a written assignment due date is available, however a 10% late penalty will be assigned (off the assignment mark). After the 7 day extension, assignments will no longer be accepted and no further extensions will be granted. Please ensure that you are diligent in backing up computer files and making draft copies of all assignments, as computer/disk failures, printer problems, etc... will not normally be considered a valid reason to waive the late assignment deadline.

Plagiarism: To avoid plagiarism, the use of other people's work or ideas must be cited in all written assignments. Properly acknowledging sources is an accepted and important part of scholarship. Use of

such material without complete and unambiguous acknowledgement, however, is an offence under the University of Waterloo, Policy 71 and can result in a significant penalty being assigned (e.g., failing grade on an assignment).

Recorded Materials: Recorded video material cannot be copied or distributed without the permission of the presenter. Material is for restricted use in the course unless further permission is granted.

6.2 Department Policies

The Faculty of Environment maintains a webpage (<https://uwaterloo.ca/environment/undergraduate-teaching-resources>) dedicated to student resources.

6.3 University Policies

Academic integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. [Check the [Office of Academic Integrity](#) for more information.]

Grievance: A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read [Policy 70, Student Petitions and Grievances, Section 4](#). When in doubt, please be certain to contact the department's administrative assistant who will provide further assistance.

Discipline: A student is expected to know what constitutes academic integrity to avoid committing an academic offence, and to take responsibility for his/her actions. [Check the [Office of Academic Integrity](#) for more information.] A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate associate dean. For information on categories of offences and types of penalties, students should refer to [Policy 71, Student Discipline](#). For typical penalties, check [Guidelines for the Assessment of Penalties](#).

Appeals: A decision made or penalty imposed under [Policy 70, Student Petitions and Grievances](#) (other than a petition) or [Policy 71, Student Discipline](#) may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to [Policy 72, Student Appeals](#).

Note for students with disabilities: [AccessAbility Services](#), located in Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term.

Turnitin.com: Text matching software (Turnitin®) may be used to screen assignments in this course. Turnitin® is used to verify that all materials and sources in assignments are documented. Students' submissions are stored on a U.S. server, therefore students must be given an alternative (e.g., scaffolded assignment or annotated bibliography), if they are concerned about their privacy and/or security. Students will be given due notice, in the first week of the term and/or at the time assignment details are provided, about arrangements and alternatives for the use of Turnitin in this course. It is the

responsibility of the student to notify the instructor if they, in the first week of term or at the time assignment details are provided, wish to submit alternate assignment.

7. Coronavirus Information

[Coronavirus Information for Students](#)

This resource provides updated information on COVID-19 and guidance for accommodations due to COVID-19.

8. Mental Health Support

All of us need a support system. We encourage you to seek out mental health supports when they are needed. Please reach out to [Campus Wellness and Counselling Services](#).

We understand that these circumstances can be troubling, and you may need to speak with someone for emotional support. [Good2Talk](#) is a post-secondary student helpline based in Ontario, Canada that is available to all students.

9. Territorial Acknowledgement

We acknowledge that this course is being taught on the traditional territory of the Attawandaron (Neutral), Anishinaabeg, and Haudenosaunee peoples. The University of Waterloo is situated on the Haldimand Tract, the land promised to the Six Nations that includes ten kilometres on each side of the Grand River.

10. Copyright

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