

University of Waterloo
ERS 375 Stopping the Sixth Extinction:
Biodiversity Conservation and Recovery in Canada
Fall Term 2021, Mondays 2:30 - 4:20, Rm. DWE 3522



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.

A weekly in-class seminar/lecture, including discussions of course material and assigned readings, case studies and assignments, will be scheduled. Simultaneous broadcast will be provided, if necessary, for those not attending in-person. Your instructors will generally be available before class in ENV-2022 if you need any help or wish to discuss term paper ideas. Time can also be scheduled for individual discussions and counsel if required.

All the course information and material will be posted 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 both historical and new or novel ecosystems.

2. Weekly Modules and Schedule

In a typical week:

- Read assigned materials and review announcements for the week, provided before Monday at 1:00 pm via LEARN. Please at least scan all readings, and read one in detail before class.
- Attend (in-person or virtually) the Monday (1hr 50min) seminar/lecture.
- Work on assignments and complete a weekly mini-quiz (by Sunday 11:59 pm).

Week	Topic	Summary
1. Sep. 13 - 17	Welcome and course outline. Introduction to Canadian biodiversity. <u>Reading:</u> FPT (2010); Kraus & Hebb (2020); WWF (2020)	Introduction and course framework. Logistics and overview of lectures / seminar, weekly announcements, course readings, assignments and mini-quizzes. 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.
2. Sep. 20 - 24	The six mass extinction events. Understanding extirpation and extinction. Global conservation perspectives. <u>Reading:</u> Barnosky et al. (2011); CBD (2020); De Vos et al. (2015)	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 introduce the Convention of Biological Diversity, including the Post-2020 Global Biodiversity Framework. We’ll also examine the global recognized competences for species recovery practitioners.
3. Sep. 27 - Oct. 1	Canada’s biodiversity policies and legislative context.	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

	<p><u>Reading:</u> Canada (2002); Kraus et. al (2021); Ray et. al (2021)</p>	<p>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.</p>
<p>4. Oct. 4 - 8.</p>	<p>Assessing extinction risk.</p> <p><u>Reading:</u> Caughley (1994); ECCC (2020a); IUCN Standards and Petitions Committee (2019)</p>	<p>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.</p>
<p>Reading Week: Oct. 9 - 17</p>		
<p>5. Oct. 18 - 22</p>	<p>Managing for persistence or change?</p> <p><u>Reading:</u> Barnosky et al. (2017); Lynch et al. (2021)</p>	<p>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.</p>
<p>6. Oct. 25 - 29</p>	<p>Indigenous knowledge and community stewardship.</p> <p><u>Reading:</u> Hill et. al (2019); ICE (2018); Schuster et. al (2019)</p>	<p>We'll examine the importance of Indigenous knowledge in species assessments and broader community stewardship in species protection and recovery.</p>
<p>7. Nov. 1 - 5</p>	<p>Recovery planning and critical habitat.</p> <p><u>Reading:</u> Naujokaitis-Lewis et al. (2021); Palm et. al (2020); Pawluk et al (2019)</p>	<p>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 including ecosystem-based approaches.</p>
<p>8. Nov. 8 - 12</p>	<p>Protected and conserved areas.</p> <p><u>Reading:</u> Coristine et al. (2018); ECCC (2020b); IUCN (2021)</p>	<p>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 and respond to biodiversity loss through planning, management and network building.</p>
<p>9. Nov. 15 - 19</p>	<p>Habitat restoration.</p> <p><u>Reading:</u> Gann et al. (2019); Higgs et al. (2018)</p>	<p>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.</p>

		We'll also discuss the role of ecological restoration in a novel and rapidly changing world.
10. Nov. 22 - 26	Conservation breeding and translocation. <u>Reading:</u> Lamothe et al. (2019); Swan et al. (2018)	We'll explore the opportunities and challenges of conservation breeding and reintroduction 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. 29 – Dec. 3	Science communications and inspiring action <u>Reading:</u> Manfredo et. al (2018); McCune et. al (2017); Smol (2018)	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. Dec. 6 - 8	Final review and reflection	In our last class we will review and reflect on the key challenges and opportunities for stopping the 6th extinction.

2.1 Weekly Readings for Discussion

- 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.
- Barnosky, A. D., Hadly, E. A., Gonzalez, P., Head, J., Polly, P. D., Lawing, A. M., et al. (2017). Merging paleobiology with conservation biology to guide the future of terrestrial ecosystems. *Science*, 355(6325), 10. xCaughley, G. 1994. Directions in conservation biology. *Journal of Animal Ecology*, 63(2), 215-244.
- Canada (2002). Species at Risk Act, c. 29. <http://laws-lois.justice.gc.ca/eng/acts/S-15.3/>
- CBD (2020). Global Biodiversity Outlook 5. Convention on Biological Diversity. <https://www.cbd.int/gbo5>
- Coristine, LE, Jacob, AL, Schuster, R, Otto, SP, Baron, NE, Bennett, NJ, Bittick, SJ, Dey, C, Favaro, B, Ford, A *et al.* 2018. Informing Canada's commitment to biodiversity conservation: A science-based framework to help guide protected areas designation through Target 1 and beyond. *Facets*. 3:531-562. doi:10.1139/facets-2017-0102.
- 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.
- Environment and Climate Change Canada [ECCC]. 2020a. Canadian environmental sustainability indicators: changes in the status of species at risk. Environment and Climate Change Canada: Ottawa. p. 13.
- Environment and Climate Change Canada [ECCC]. 2020b. Canadian environmental sustainability indicators: Canada's conserved areas. Environment and Climate Change Canada: Ottawa. p. 23.
- 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>
- 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.
- 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.

- Hill, CJ, Schuster, R, and Bennett, JR. 2019. Indigenous involvement in the Canadian species at risk recovery process. *Environmental Science & Policy*, 94, 220-226.
- 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>
- IUCN Standards and Petitions Committee (2019). *Guidelines for Using the IUCN Red List Categories and Criteria. Version 14*. Prepared by the Standards and Petitions Committee. <https://www.iucnredlist.org/resources/redlistguidelines>
- IUCN. 2021. *Conserving at least 30% of the planet by 2030 – what should count?* https://www.iucn.org/sites/dev/files/content/documents/what_counts_final_en_web.pdf
- Kraus, D, Murphy, S, and Armitage, D. 2021. Ten bridges on the road to recovering Canada’s endangered species. *Facets*, 6, 1088-1127.
- Kraus, D, and Hebb, A. 2020. Southern Canada’s crisis ecoregions: Identifying the most significant and threatened places for biodiversity conservation. *Biodiversity and Conservation*, 29, 3573–3590.
- 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.
- Lynch, A.J., Thompson, L.M., Beever, E.A., Cole, D.N., Engman, A.C., Hawkins Hoffman, C., Jackson, S.T., Krabbenhoft, T.J., Lawrence, D.J., Limpinsel, D. et al. (2021). Managing for RADical ecosystem change: applying the Resist-Accept-Direct (RAD) framework. *Frontiers in Ecology and the Environment*. doi:10.1002/fee.2377.
- Manfredo, MJ, Sullivan, L., Don Carlos, A. W., Dietsch, A. M., Teel, T. L., Bright, A. D., & Bruskotter, J. (2018). *America’s Wildlife Values: The Social Context of Wildlife Management in the U.S.* <https://www.fishwildlife.org/application/files/9915/4049/1625/AWV - National Final Report.pdf>
- McCune, JL, Carlsson, AM, Colla, S, Davy, C, Favaro, B, Ford, AT, et al. 2017. Assessing public commitment to endangered species protection: A Canadian case study. *Facets*, 2(1), 178-194.
- Naujokaitis-Lewis, I, Endicott, S, Guezen, J. 2021. Treatment of climate change in extinction risk assessments and recovery plans for threatened species. *Conservation Science and Practice*.15. doi:10.1111/csp2.450.
- Palm, EC, Fluker, S, Nesbitt, HK, Jacob, AL, and Hebblewhite, M. 2020. The long road to protecting critical habitat for species at risk: The case of southern mountain woodland caribou. *Conservation Science and Practice*, 2(7), e219.
- Pawluk, KA, Fox, CH, Service, CN, Stredulinsky, EH, and Bryan, HM. 2019. Raising the bar: Recovery ambition for species at risk in Canada and the US. *PLoS one*, 14(11), e0224021.
- Ray, JC, Grimm, J, Olive, A. 2021. The biodiversity crisis in Canada: failures and challenges of federal and sub-national strategic and legal frameworks. *Facets*. 6:1044-1068. doi:10.1139/facets-2020-0075.
- Schuster, R, Germain, RR, Bennett, JR, Reo, NJ, and Arcese, P. 2019. Vertebrate biodiversity on indigenous-managed lands in Australia, Brazil, and Canada equals that in protected areas. *Environmental Science & Policy*, 101, 1-6.
- 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 Moehrenschrager, 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.
- WWF. (2020). *Living Planet Report Canada. 2020 Wildlife at Risk*. World Wildlife Fund. <https://wwf.ca/wp-content/uploads/2020/08/WWF-FINAL-EN-1.pdf>

3. Grade Breakdown

The following table represents the grade breakdown of this course.

Assignments and Quizzes	Weight (%)
<p>Assignment 1. Endangered species analysis Due: October 8, 2021 at 11:59 pm Students are to select one of the assigned species at risk of extinction in Canada, examine the factors that make it vulnerable to extinction, then discuss our current responses and actions needed to recover this species.</p>	25%
<p>Assignment 2. IUCN Red List Assessment Training Due: November 5, 2021 at 11:59 pm Students are to complete the IUCN online training modules 1 to 7 and provide results of the module 8 exam.</p>	10%
<p>Weekly mini-quizzes Due: Sunday's at 11:59 pm Most weeks you will complete a short quiz or assignment based on the lecture material, assigned reading and in-class discussion. These will be posted on LEARN on Monday and students have until the following Sunday to complete. Grade is based on percent calculated from the sum of all these mini-quizzes and assignments.</p>	15%
<p>Assignment 3(1). Term paper proposal Due: October 22, 2021 at 11:59 Explain how you will address one of the assigned questions. The proposal is meant to be a starting point for the Introduction section of the Final Term Paper.</p>	5%
<p>Assignment 3(2). Peer-review two other draft term papers i) Students are to submit their Draft Term Paper to PEAR. Due: November 12, 2021 at 11:59 pm (no extensions possible). ii) Students are to peer-review two other randomly assigned student draft term papers. Due: November 19, 2021 at 11:59 pm</p>	5%
<p>Assignment 3(3). Final term paper and briefing Due: Dec 8, 2021 at 11:59 pm Building on the 3(1) Proposal and 3(2) Peer-review feedback, students are to submit a Final Term Paper and an engaging, lay-audience briefing.</p>	40%

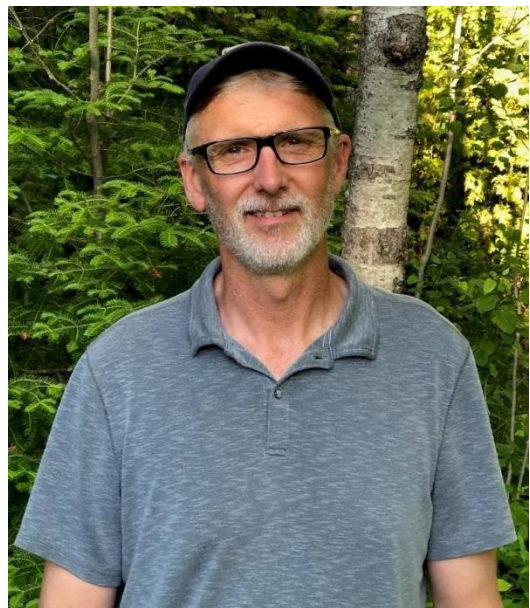
4. Your Instructors

4.1 Instructor Introductions

Dan Kraus is the Director of National Conservation for the Wildlife Conservation Society Canada also worked as a conservation biologist for the Nature Conservancy of Canada's 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 councillor 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 an ecosystem scientist with Parks Canada with over 32-years experience in conservation planning and management. During this time, he has worked as an ecologist in several national parks and national marine conservation areas, including Gwaii Haanas, Bruce Peninsula / Fathom Five, Riding Mountain and Pukaskwa, and he now works on regional and national conservation issues within the Protected Areas Establishment and Conservation directorate. He is also a member of various national and international conservation committees, including the World Commission on Protected Areas, Great Lakes Water Quality Agreement 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 and his family now live on Ontario's biologically diverse Bruce Peninsula.



4.2 Conflict of Interest

In addition to being instructors at the University of Waterloo, Scott Parker and Dan Kraus are also senior scientists with Parks Canada and the Wildlife Conservation Society 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
<p>Instructors</p> <p>Course-related questions (e.g., course content, deadlines, assignments, etc.)</p> <p>Questions of a personal nature</p>	<p>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.</p> <p>Office: ENV-2022</p> <p>Your instructors will only have office hours on Monday before classes. You are welcome to drop by or make an appointment.</p> <p>Dr. Scott Parker Email: Scott.Parker@uwaterloo.ca Phone: 519.377.4040</p> <p>Dan Kraus Email: dkraus@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. 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 and 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 are 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 5% 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 an 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 support when it is 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. Copyright

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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.

Appendix 1. Assignments

Course Assignments – Fall 2021

Assignment 1. Endangered species analysis (25%)

Due: Friday, October 8, 2021, posted to LEARN (Dropbox) by 11:59 pm.

Q. Both the Redside Dace (*Clinostomus elongatus*) and Northern Myotis (*Myotis septentrionalis*) are listed on Schedule 1 of SARA as Endangered. For this question, choose **only one** of these species and examine the reasons for its status and the effectiveness of current and proposed recovery actions. As a guide, briefly introduce the natural history of the species and its endangered species status (1 page), examine the factors that make it vulnerable to extirpation/extinction (1-2 pages), and then discuss and evaluate historic and on-going recovery efforts and recommend future actions (2-3 pages).

- Maximum 2,500 words, excluding Title Page, References, Tables, Figures, and Captions.
- Your name to be included in the header space.
- Font size of 12 with one-inch margins all around.
- Use a standard reference style (e.g., CSE Name-Year) and it must be applied consistently. We recommend the use of a citation management software at this point in your academic career (e.g., RefWorks, EndNote, Mendeley).
- Minimum of 5 references from the primary literature in peer-reviewed scientific journals with at least 2 being from the past five years.
- Figures and Tables are to be placed after the References section.
- You may work with other students; however, you are required to individually complete and submit the assignment.
- Paper is graded out of 100% and is worth 25% of final course grade.
- Penalty for lateness (<7 days): -5% of assignment grade.

Table 1. Assignment 1 grading rubric.

	Superior >90%	Above Average 80-89%	Developing 70-79%	Beginning 50-69%	Poor <49%
Scientific Content: 55%	Supportive scientific evidence is superior; excellent citations; enhances existing knowledge; comprehensive	Supportive scientific evidence is good; proper and relevant citations; enhances existing knowledge; main points covered	Supportive scientific evidence is adequate; one or more problems with citations; presents content established as common knowledge	Supportive scientific evidence is inadequate; many problems with citations; low educational or technical value	Supportive scientific evidence is absent; poor or no citations; no educational or technical value
Creativity and synthesis of ideas: 20%	High level of initiative and development of ideas; very convincing and exceeds expectations; capture reader's attention immediately	Good initiative and development of ideas; convincing and above what is expected; provides a learning experience	Shows initiative but one or more problems in the development of ideas; meets reader expectation; learning experience present	Does not demonstrate initiative and has problems with the development of ideas; does not fully convince the reader that the topic has been well considered	No initiative and a little development of ideas; raises more questions in a reader's mind than the work answers
Logical organization and writing style: 15%	Writing is exceptional, it is smooth and coherent and ideas flow	Writing is good with no trouble understanding flow	Writing disorganized in a few places, and ideas and/or paragraphs do not flow easily	Writing disorganized and ideas and/or paragraphs do not flow easily	Writing disorganized, poor flow causes confusion
Grammar, spelling and punctuation: 10%	Entirely free of grammatical, spelling or punctuation errors	Few errors, does not impede understanding	Several errors, may temporarily confuse reader	Many errors, may be difficult to follow	Frequent errors, impossible to follow

Assignment 2. IUCN Red List Assessment Training (10%)

Due: Friday, November 5, 2021, posted to LEARN (Dropbox) by 11:59 pm.

- Students are to complete the IUCN Red List Conservation Training online course, modules 1 to 7 and submit a PDF copy of the module 8 Red List Assessor exam results for grading.
<https://www.conservationtraining.org/course/index.php?categoryid=23>
- Student grade is simply correlated to the module 8 exam results. Of note, the exam may be taken several times without penalty and students who get a minimum of 75% will receive an IUCN recognized Certificate of Achievement from the course provider.
- Penalty for lateness (<7 days): -5% of assignment grade.
- **Estimated completion time: 10-12 hours.** This can be done at your own pace and students are encouraged to begin this assignment early in the term.

Assignment 3. Term Paper (5% + 5% + 35%+5% = 50%)

Q. TBD

Base your term paper on one of the five questions below:

Q1. Are we experiencing the 6th mass extinction event? Introduce different, and potentially conflicting perspectives, and provide evidence in support of your own arguments and conclusions.

Q2. As novel ecosystems continue to emerge and the persistence of or restoration towards historical states become increasingly untenable, how should endangered species conservation actions respond?

Q3. Explore an example of a Canadian species that was once assessed as at risk by COSEWIC but has now been delisted because of genuine reasons. What were the actions taken and the social and ecological factors that contributed to this success? Explain why you think the status of this species will, or will not, remain secure in the future?

Q4. Habitat loss, invasive species and climate change are increasing the risk of extirpation and extinction to many species. Should threatened species just be relocated to more favourable habitats or climatic conditions? Using Canadian species and ecosystems as examples, describe the context, and assessment and evaluation process needed to support a decision to translocate, including the social and ecological risks of such actions.

Q5. How do we bend the curve for freshwater biodiversity in Ontario? Introduce the conservation status of freshwater species and ecosystems in Ontario. Examine historic, persistent and emerging threats and conservation challenges. Discuss relevant interventions, key evidence gaps and recommend recovery actions.

The Assignment has four components that comprise a total of 50% of your final grade: 1) Term Paper proposal (5%); 2) Peer-review of two other student's work (5%); 3) Final Term Paper (35%), and 4) Briefing (5%).

3(1) Term Paper Proposal (5%)

Due: Friday, October 22, 2021, posted to LEARN (Dropbox) before 11:59 pm.

- A proposal provides a logical argument for studying the research question. The proposal is very much like an "Introduction" of the Term Paper, where the objectives are to: i) explain the general significance of the broader topic; and, ii) explain why the chosen sub-topic is being explored.
- A paragraph addressing each objective is suggested, along with one additional short paragraph explaining how you plan to search the literature (i.e., what databases? what search terms?).
- Maximum 2 pages, excluding Title Page (with your name) and References Cited
- The choice of reference formation is up to you, but the format must be applied consistently.
- Students are encouraged to study and work together, however each student is required to individually complete and submit the assignment.
- Assessment to consider relevance of background information and justification. i.e.,
 - Is the background information relevant to the issue or challenge?
 - Does the justification rely on cliché and/or unsupported opinion or logical consideration of prior literature?

- Is the significance of the research question clearly stated?
- Is communication clear and elegant?

3(2) Peer-review of two other student's Draft Term Paper (5%)

i) Submit Draft Term Paper due: Friday, November 12, 2021, posted to PEAR by 11:59 pm.

ii) Peer-review due: Friday, November 19, 2021, posted to PEAR by 11:59 pm.

- Peer-review is anonymous and therefore the Draft Term Paper submitted to PEAR must not include the student's name.
- Peer-review template to be provided, the process does not include grading another student's work.
- Assessment of the peer-review of two other student Draft Term Paper is based on the overall quality and constructive nature of the feedback (5%), i.e.,
 - Are comments thorough and demonstrate a full understanding of the paper?
 - Are they specific and will help the author fully address an issue?
 - Are they constructive and respectful?

3(3) Final Term Paper (35%)

Due: Wednesday, December 8, 2021, posted to LEARN (Dropbox) before 11:59 PM

- Maximum 3,000 words, excluding Title Page, References, Tables, Figures, and Captions.
- Your name to be included in the header space.
- Font size of 12 with one-inch margins all around.
- Use a standard reference style (e.g., CSE Name-Year) and it must be applied consistently. We recommend the use of a citation management software at this point in your academic career (e.g., RefWorks, EndNote, Mendeley).
- Minimum of 10 references from the primary literature in peer-reviewed scientific journals with at least two being from the past three years.
- Figures and Tables are to be placed after the References section.
- You are encouraged to work with other students; however, you are required to individually complete and submit the assignment.
- Paper is graded out of 100% and is worth 35% of final course grade.
- Penalty for lateness (<7 days): -5% of assignment grade.

3(4) Term Paper Briefing (5%)

Due: Wednesday, December 8, 2021, posted to LEARN (Dropbox) before 11:59 PM

- Many environmental challenges are the result of our inability to effectively communicate issues and solutions to the public and decision-makers. As a complement to your Term Paper, include a brief lay-person's summary. In non-technical language, summarize the purpose and results of your paper. Clearly identify who your intended audience is. It can be a written summary, infographic, poster, blog, news article, placemat, video, podcast, etc... Demonstrate your ability to communicate science in an interesting and engaging manner.
- Assessment is based on the briefing's ease and effectiveness at communicating scientific information in a way that is easy to understand.

Table 1. Assignment 3(3) grading rubric

	Superior >90%	Above Average 80-89%	Developing 70-79%	Beginning 50-69%	Poor <49%
Scientific Content: 55%	Supportive scientific evidence is superior; excellent citations; enhances existing knowledge; comprehensive	Supportive scientific evidence is good; proper and relevant citations; enhances existing knowledge; main points covered	Supportive scientific evidence is adequate; one or more problems with citations; presents content established as common knowledge	Supportive scientific evidence is inadequate; many problems with citations; low educational or technical value	Supportive scientific evidence is absent; poor or no citations; no educational or technical value
Creativity and synthesis of ideas: 20%	High level of initiative and development of ideas; very convincing and exceeds expectations; capture reader's attention immediately	Good initiative and development of ideas; convincing and above what is expected; provides a learning experience	Shows initiative but one or more problems in the development of ideas; meets reader expectation; learning experience present	Does not demonstrate initiative and has problems with the development of ideas; does not fully convince the reader that the topic has been well considered	No initiative and a little development of ideas; raises more questions in a reader's mind than the work answers
Logical organization and writing style: 15%	Writing is exceptional, it is smooth and coherent and ideas flow	Writing is good with no trouble understanding flow	Writing disorganized in a few places, and ideas and/or paragraphs do not flow easily	Writing disorganized and ideas and/or paragraphs do not flow easily	Writing disorganized, poor flow causes confusion
Grammar, spelling and punctuation: 10%	Entirely free of grammatical, spelling or punctuation errors	Few errors, does not impede understanding	Several errors, may temporarily confuse reader	Many errors, may be difficult to follow	Frequent errors, impossible to follow