CONSERVATION BIOLOGY (BIOL457)

3 credits, winter semester, January – April 2019
Course prerequisites, any three of: BIOL321, BIOL350, BIOL351, BIOL353, BIOL354

INSTRUCTOR	Dr. Dylan Fraser, Department of Biology, Faculty of Arts and Sciences; Email: dylan.fraser@concordia.ca; Telephone extension: 8729
LECTURES	10h15-11h30, Mon/Wed, CJ1.125 (Loyola Campus)
TUTORIALS	13h15-14h30, Mon CC305 (Loyola Campus)
OFFICE HOURS	11h30-12h30, Mondays, SP437.03 (Loyola Campus)

Specify the details of margins, line spacing etc, for the essay.

Dear class,

Please make note of the following changes to the time allotted to different debate activities. Also, as a general reminder, I would ask that both debate groups show up by 1:10pm on the day of their debate to ensure that the tutorial can start at 1:15pm promptly.

Format for the debate will now proceed as follows to ensure we stay ontime, and to allow more time for audience participation:

a) Group 'A' opening statements and main arguments (**4 minutes MAX**: up to three major arguments only)

b) Group 'B' opening statements and main arguments (**4 minutes MAX**: up to three major arguments only)

e) Intermission – Groups 'A' and 'B' have time to formulate rebuttals (10 minutes). **These rebuttals should relate directly to the major arguments put forth by the other group.**

f) Group 'A' begins to present rebuttals (7 **minutes**). After **two** minutes of speech, Group 'B' is entitled to ask the debate moderator (Dr. Fraser) for a 'point of information' (POI) which can be used to question Group 'A' on a point or point out a weakness of that point to the audience.

g) Group 'B' presents rebuttals (**7 minutes**), with the POI process for Group 'A' as in f) above.

h) Debate opens to the audience; students outside the debaters ask questions (**20-25min**)

i) Closing arguments of each Group (1-2 minutes each), informal class vote thereafter.

thanks, have a great evening!

COURSE OUTLINE

We live in an age of unprecedented environmental change and biodiversity loss due to human population growth and activities. *Conservation biology* applies interdisciplinary scientific principles to identify and manage (or try to manage) environmental problems, and to find a balance between protecting biodiversity and providing for human needs. This course attempts to introduce students to these scientific principles. In addition, as many ecology/environmental science students exiting universities will work in applied sciences, the emphasis in course assignments is on effective scientific communication, collaboration and problem-solving. There is also an emphasis on 'synthesis-type' questions on exams.

GRADING COMPONENTS*	Midterm I^	30%
	Midterm II^	30%
	Tutorials	
	-Oral presentation	9%
	-Short essay	9%

-Group assignment (debate)	12%
-Participation	10%

^Includes exercise work and presentation material in tutorials

Final grades out of 100 will be assigned a letter according to Concordia University standards:
A^+ = ≥90; A = 85-89; A^- = 80-84; B^+ = 77-79; B = 74-76; B^- = 70-73; C^+ = 67-69; C = 64-66; C^-= 60-63; D^+ = 57-59; D = 54-56; D^- = 50-53; F = <50

COURSE TEXT (RECOMMENDED, NOT REQUIRED)
A primer of conservation biology, 4th, 5th or 6th edition, by Primack RB (2008/12/15). Published by Sinauer Associates Inc., Sunderland, MA, USA. This text book is short, succinct and affordable, but it lacks detail.

Essentials of conservation biology, 5th or 6th edition, by Primack RB (2010/14). Published by Sinauer Associates Inc., Sunderland, MA, USA: more detailed but is costlier. If you are keen on pursuing a career in this subdiscipline of biology, it is a better choice than the primer.

LECTURE SCHEDULE*

Week 1		
Jan 7	Lecture 1	What is conservation biology?
Jan 9	Lecture 2	What is biodiversity? I
Week 2		
Jan 14	Lecture 3	What is biodiversity? II
Jan 16	Lecture 4	The value of biodiversity
Week 3		
Jan 21	Lecture 5	Threats to biodiversity I
Jan 23	Lecture 6	Threats to biodiversity II
Week 4		
Jan 28	Lecture 7	The problems facing small populations
Jan 30	Lecture 8	Population and species monitoring I
Week 5		
Feb 4	Lecture 9	Population and species monitoring II
Feb 6	Lecture 10	Metapopulations
Week 6		
Feb 11	Lecture 11	Supplementation, reintroductions and ex situ conservation
Feb 13		Midterm I (covers material up to *and including* Lecture 11)
Week 7		
Feb 18	Lecture 12	Case study exemplifying species conservation issues
Feb 20	Lecture 13	Contemporary evolution in conservation biology
Week 8		
Feb 25		No lecture (Reading week)
Feb 27		No lecture (Reading week)
Week 9		
Mar 4	Lecture 14	Hot topics I: Population/genetic diversity at a broad scale (Lawrence) + 1 grad student presentation
Mar 6	Lecture 15	Establishing protected areas
Week 10		
Mar 11	Lecture 16	Designing networks of protected areas
Mar 13	Lecture 17	Managing inside/outside of protected areas I
Week 11		
Mar 18	Lecture 18	Managing inside/outside of protected areas II
Mar 20	Lecture 19	Restoration ecology and genetics

Week 12

Mar 25	Lecture 20	Rewilding and wilderness in the anthropocene
Mar 27	Lecture 21	Hot topics II: TBD (Demers) + 2 grad student presentations

Week 13

Apr 1	Lecture 22	The future of life on Earth
Apr 3	Lecture 23	Midterm II (covers material up to *and including* Lecture 22)

Week 14

Apr 8	Group #4 debate
Apr 10	Group #6 debate

**In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change*

Tentative: please discuss with Dr. Fraser

TUTORIAL SCHEDULE*

**May be subject to change*

Jan 7	Introduction to the tutorial objectives, assignments
Jan 14	No tutorial, work on oral presentations/essays
Jan 21	Talks 1-7
Jan 28	Talks 8-14
Feb 4	Talks 15-21
Feb 11	Talks 22-28
Feb 18	Exercises on status designations of species in Canada
Feb 25	No tutorial (reading week)
Mar 4	Group #1 debate
Mar 11	Talks 29-36
Mar 18	Group #2 debate
Mar 25	Talks 36-44
Apr 1	Group #3 debate
Apr 8	Group #5 debate

ATTENDANCE AND ABSENCE POLICY: Students who miss a lecture or tutorial are expected to obtain missed lecture notes or any presentation notes from their classmates. No make-up mid-term exams (or final exams) will be given without a valid, written medical excuse ('valid' usually means the student saw a physician on the day that they were ill, and that the physician saw evidence that the student was ill on that date). **Any make-up mid-term exams will be taken in Dr. Fraser's office between 11:30am and 1:00pm on Thursday, February 14 (Midterm I) and Tuesday April 2 (Midterm II).

ACADEMIC INTEGRITY AND ACADEMIC CODE OF CONDUCT: This course (like all other courses offered at Concordia University), follows the 'Academic Integrity and the Academic Code of Conduct'. We strongly encourage students to take a moment to read over this code: http://registrar.concordia.ca/calendar/17/17.10.html. *Conservation Biology* (BIOL 457) has a zero tolerance policy for any cheating, plagiarism, personation, or falsification of a document as well as any other form of dishonest behaviour related to the obtention of academic gain or the avoidance of evaluative exercises committed by the student.

IMPORTANT MESSAGE ABOUT LECTURES AND TUTORIALS: It is expected that students will attend all lectures, tutorials and group debates, particularly because the tutorial is considered to be a forum for discussion, a critical component of the course. Students are expected to contribute actively to an interesting and stimulating course through their presentations and debates, but also through questions and discussions. Your degree of participation will also influence your final grade (10%). Specifically, your participation mark will be graded according to the number of questions and points of discussion you make in the tutorials, and the regular lecture periods concerning the graduate student hot topics and group

debates; Dr. Fraser will also make note when students ask questions during his regular lectures. Note that exercises/material presented in the tutorial talks may be included on the exams.

DETAILS ON THE ASSIGNMENTS

Oral presentation (9%) and short essay (9%) (graded independently): These assignments are intended to determine whether students have understood relevant concepts, whether students can read and synthesize scientific literature, and whether they can present research findings. Each student will perform independent research on an assigned paper in applied ecology/conservation biology. The research will comprise (i) an oral presentation (a 'talk') and (ii) a short essay. During the Monday tutorials, five-six papers relating to previous lecture material will be scheduled and five-six students will each give a **7 minute (no more) talk** on their paper. Each student will also prepare a short, **two page (no more) essay (references not included)**. This essay is NOT a summary of the chosen paper. This essay will summarize an answer to a principle question in conservation biology related to the supplied paper but will include literature sources and references other than the supplied paper and lecture notes. Students are expected to come up with a reasoned discussion of the topic, as well as incorporate data and logic to back up their arguments. Essays should be in a scientific format with appropriate documentation of sources. Essays are due on the day of the pre-assigned tutorial oral presentation and are to be submitted as a printed copy to Dr. Fraser at the beginning of the tutorial. There will be a 25% penalty per week for late essays.

Grades will be given for both content and for presentation (for oral presentations, this includes how the speaker communicates to the audience during the presentation and in answering questions, and whether he/she stays within **7 minutes**).

Choice of assigned paper is on a first-come, first-served basis. The sign-up sheet will be brought to the first week of lectures and first tutorial.

Suggestions for scientific essay writing

-Read the paper(s) – what is the principle question/hypothesis and the main conclusion?
-Which results are relevant to the main question, which address different questions?
-If the authors' conclusions contrast previous works, what is the source of disagreement?
-Start structuring your essay with the motivation behind it – why is your question important and interesting? It is always useful to consider the theoretical interest behind the question/hypothesis and its applications to conservation.
-Once you have posed the question, outline your answer in a logical manner, making it clear which of the arguments are your own and which are derived from the papers.
-End your essay with a concluding paragraph; this should briefly summarize what you think is the answer to the question you address.
-Cite sources with a usual style found in scientific papers. Web-based literature (e.g. Wikipedia) is not an acceptable literature source: scientific papers only.

Notes on essay style

-Do not use colloquial language or slang
-Do not use jargon; break down the scientific results IN YOUR OWN WORDS
-Pay close attention to sentence and paragraph structure. You have only two pages-what can be condensed? What can be cut? Are points made clearly and succinctly? Revise your essay accordingly.
-Do NOT quote from articles; paraphrase or cite appropriately.
-Do NOT use sentences from the literature; explain things IN YOUR OWN WORDS
-If an idea is not yours, CITE whose it is!

Notes on oral presentations

Biggest mistakes when doing oral presentations

-Too much text on slides (more likely to read slides)
-Background information is presented as if it is common knowledge
-Research problem identification, aims, and motivation are unclear
-Poor pacing (either too fast or too slow; getting 'stuck' on some slides; monotone)
-Poor posture (hands in pockets; pacing back and forth; little eye contact)
-Exceed the allotted time (you DO NOT want to be remembered for this!)

General tips

-You may follow the traditional style (outline/intro, methods, results, discussion/conclusions), but we encourage your own creative style – go nuts! Just remember the points below, and also try to attract the audience's attention at the beginning and provide 'take-home' messages at the end.
-Ask yourself: what do I want the audience to know when my presentation is finished?
-Ask yourself: how can I present my oral presentation such that the audience will understand and remember what I have to say?
-Carry out the proper preparation of your talk
-Spend the time to incorporate interesting and relevant visual aids in your talk
-PRACTICE your talk flow (pace) and your posture AHEAD OF TIME
-DO NOT use any form of cue cards
-DO NOT read your essay to the audience. The talk and essay are separate assignments.
-Try to keep no more than 3 bullets per slide
-Use graphics/illustrations as much as possible to illustrate your points
-Tell a story (to facilitate easier explanations of complex theory and concepts)
-Your summary should briefly reiterate your objectives, in addition to what you found
-Font size – make it big enough for people at the back of the room! (usually ≥24pt)
-Use contrasting colours for text and background
-Do not use monochromatic or rainbow colour schemes
-Use same fonts, background, slide layout for all slides
-Know your audience (specialized/nonspecialized in your field, academic/non-academic?
-Beware of using too much Powerpoint animation
-Number of slides can vary (usually 3-4 per 2 minutes of presentation)

Group debate (12%): This assignment is intended to offer students the opportunity to work effectively on a complex conservation issue in collaboration with their peers, and to determine whether students can synthesize scientific literature, formulate arguments and understand complex, integrative issues surrounding many conservation situations. Separate groups of four-five students will debate one of five subject themes. For each debate, one group will focus their arguments on one side of the conservation issue; the other group will focus on the opposing side of the debate. When developing their arguments, groups should keep in mind that it will be important to consider both the strengths of their side of the conservation issue as well as the weaknesses of potential counter-arguments. After the arguments are put forth orally by each group in the tutorial, the groups will then have time to generate rebuttals for the opposing group's arguments. It is imperative that the topic and potential counter-arguments be well-researched by each group.

Grades will be given for (i) the presentation, structure, and scientific soundness of the different arguments (i.e. they should be backed up with scientific evidence from the literature); (ii) the ability of the group to address counter-arguments of the opposing group and those raised by the audience; and (iii) the demonstration of active involvement of all group members. Groups are

encouraged to use the multi-media projector (e.g. powerpoint) to spell out their arguments, as well as any props that they feel will help them support their points.

Format for the debate

a) Group 'A' opening statements (2 minutes)
b) Group 'A' main arguments (2 minutes each/up to 3 arguments)
c) Group 'B' opening statements (2 minutes)
d) Group 'B' main arguments (2 minutes each/up to 3 arguments)
e) Intermission – Groups 'A' and 'B' have time to formulate rebuttals (10 minutes)
f) Group 'A' begins to present rebuttals (5-10 minutes). After one minute of speech, Group 'B' is entitled to ask the debate moderator (Dr. Fraser) for a 'point of information' (POI) which can be used to question Group 'A' on a point or point out a weakness of that point to the audience.
g) Group 'B' presents rebuttals (5-10 minutes), with the POI process for Group 'A' as in f) above.
h) Debate opens to the audience; students outside the debaters ask questions (15-20min)
i) Closing arguments of each Group (1-2 minutes each)

Tutorial papers

Talks on the value of biodiversity or fundamental considerations about biodiversity

1) Balmford A et al. (2002) Economic reasons for conserving wild nature. Science 297:950-953.
2) Tilman D, Wedin D, Knops J (1996) Productivity and sustainability influenced by biodiversity in grassland ecosystems. Nature 379:718-721
3) Schindler DE, Hilborn R et al. (2010) Population diversity and the portfolio effect in an exploited species. Nature 465:609-613.
4) Estes JA, Terborgh J et al. (2011) Trophic downgrading of planet Earth. Science 333: 301-306.
5) Reusch, T. B. H., A. Ehlers, A. Hammerli, and B. Worm. 2005. Ecosystem recovery after climatic extremes enhanced by genotypic diversity. Proceedings of the National Academy of Sciences.

Talks on threats to biodiversity

6) Peterson CH et al. (2003) Long-term ecosystem response to the Exxon Valdez oil spill. Science 302:2082-2086.
7) Thomas CD et al. (2004) Extinction risk from climate change. Nature 427:145-148.
8) Baum JK, Myers RA, Kehler D, Worm B, Harley SJ, Doherty PA (2003) Collapse and conservation of shark populations in the Northwest Atlantic. Science 299:389-392.
9) Schlaepfer, MA, Runge MC, Sherman PW (2002) Ecological and evolutionary traps. Trends in Ecology and Evolution 17: 484-480.
10) Hoffman M et al. (2010) The impact of conservation on the status of the world's vertebrates. Science 330: 1503-1509.
11) Hughes TP et al. (2003) Climate change, human impacts, and the resilience of coral reefs. Science 301: 929-933.
12) Jeschke JM, et al. (2014) Defining the impact of non-native species. Conservation Biology 28: 1188-1194.
13) Schuyler Q, et al. (2014) Global analysis of anthropogenic debris ingestion by sea turtles. Conservation Biology 28: 129-139.

Talks on problems in small populations

14) Saccheri I, M Kuusaarri et al. (1998) Inbreeding and extinction in a butterfly metapopulation. Nature 392: 491-494.

15) Whiteley AR, Fitpatrick SW, Funk WC, Tallmon DA (2015) Genetic rescue to the rescue. Trends in Ecology and Evolution 30: 42-49.
16) Frankham R (2005) Genetics and extinction. Biological Conservation 126: 131-140.
17) Jamieson IG, Allendorf FW (2012) How does the 50/500 rule apply to MVPs? Trends in Ecology and Evolution 27: 578-584.
18) Bell G, Gonzalez A (2011) Adaptation and Evolutionary Rescue in Metapopulations Experiencing Environmental Deterioration. Science 332:1327-1330.
19) Hughes JB, Daily GC, Ehrlich PR (1997) Population diversity: its extent and extinction. Science 278:689-692.

Talks on management and conservation of populations, species and ecosystems

20) Christie MR, et al. (2012) Genetic adaptation to captivity can occur in a single generation. Proc. Nat. Academy Sciences U.S.A.
21) Roman J, Palumbi SR (2003) Whales before whaling in the North Atlantic. Science 301:508-510.
22) Moritz C (1994) Defining evolutionary significant units for conservation. Trends in Ecology and Evolution 9: 373-375.
23) Green DM (2005) Designatable units for status assessment of endangered species. Conservation Biology 19: 1813-1820.
24) Westemeier RL, et al. (1998) Tracking the long-term decline and recovery of an isolated population. Science 282: 1695-1698.
25) Halpern BS (2003) The impact of marine reserves: do reserves work and does reserve size matter? Ecological Applications 13: 117-137.
26) Eikeset A et al. (2013) Economic consequences of fisheries-induced evolution. PNAS 110: 12259-12264.

Talks on restoration ecology

27) Dobson AP, Bradshaw AD, Baker AJM (1997) Hopes for the future: restoration ecology and conservation biology. Science 277:515-522
28) Bakker JP, Berendse F (1999) Constraints in the restoration of ecological diversity in grassland and heathland communities. Trends in Ecology and Evolution 14:63-68
29) Halme, P., et al. (2013) Challenges of ecological restoration: lessons from forests in northern Europe. Biological Conservation 167: 248-256.
30) Seddon PJ, Moehenschlager A, Ewen J (2014) Reintroducing resurrected species: selecting dextinction candidates. Trends in Ecology and Evolution 29: 140-147.
31) Rubenstein DR, Rubsenstein DI (2015) From Pleistocene to trophic rewilding: a wolf in sheep's clothing. PNAS, online early. http://www.pnas.org/content/early/2015/12/15/1521757113.short

Talks on sustainable development/global approaches to conservation

32) Pimm SL et al. (2001) Can we defy nature's end? Science 293:2207-2208
33) Rodrigues ASL et al. (2004) Effectiveness of the global protected area network in representing species diversity. Nature 428:640-643
34) Smith RJ, Muir RDJ, Walpole MJ, Balmford A, Leader-Williams N (2003) Governance and the loss of biodiversity. Nature 426:67-70
35) Myers N, Mittermeier RA, Mittermeier CG, da Fonseca GAB, Kent J (2000) Biodiversity hotspots for conservation priorities. Nature 403:853-858
36) Thomas CD, et al.(2012) Protected areas facilitate species' range expansions. Proceedings of the National Academy of Sciences 109: 14063-14068.
37) Wilson KA, Underwood EC, et al. (2007) Conserving biodiversity efficiently: what to do, where and when. Public Library of Science Biology 5: e223.

38) Dawson TP, et al. (2011) Beyond predictions: biodiversity conservation in a changing climate. Science 332: 53-58.
39) Daily GC, et al. (2009) Ecosystem services in decision making: time to deliver. Frontiers in Ecology and the Environment 7: 21–28.
40) Waldron A, et al. (2017) Reductions in global biodiversity loss predicted from conservation spending. Nature 551: 364-367.
41) Game ET, et al. (2013) Six common mistakes in conservation priority setting. Conservation Biology 27: 480-485.
42) Oldekop JA, et al. (2016) A global assessment of the social and conservation outcomes of protected areas. Conservation Biology 30: 133-141.

Other papers of relevance

43) Tulloch AIT, et al. (2013) Realising the full potential of citizen science monitoring programs. Biological Conservation 165: 128-138.
44) Blickley JL, et al. (2013) Graduate student's guide to necessary skills for non-academic conservation careers. Conservation Biology 27: 24-34.

Group debate topics

1) Triage in species conservation planning: necessary reality or problematic?
2) Assisted migration: necessary reality or problematic?
3) De-extinction: should we or should we not be bringing back extinct species, and why or why not?
4) The Trans-Canada pipeline and the Canadian economy/environment: for or against?
5) Genetically modified agriculture: boon or bane for biodiversity on our planet?
6) Are incentive schemes (e.g. payments for reduced emissions from deforestation) effective or ineffective for biodiversity conservation?