GEOG 670 Wetlands fall 2020
Tentative Course Outline

*The **Covid-19 pandemic** has significantly changed the world we live in and GEOG-470/670 will exceptionally be offered remotely this year. GEOG 470 / 670 will cover the same material as in previous years, with the same learning outcomes. Traditionally there are no exams in 470/670 and instead students upload their written essays in the Assignments tool in MyCourses, a practice that will continue. Necessarily, a few things will be different.*

1) Each student usually gives a 3-minute presentation on the paper the student choses for their assignment - there are 4 assignments of this nature. Previously, students have told me that they appreciated getting this experience and prefer not to have it graded. We will maintain this aspect of the course this fall, but students will likely be recording their PowerPoint presentations and uploading them to my courses. There will be some instructions to help you get started (if I can do it, anyone can ;-) One option is to record it as part of a zoom meeting in which at least some of the class attends.

2) In consideration of possible differences in time zones and limitations in internet access I will record my weekly lectures in segments that should be easy to download.

3) I am working on ways that will promote interaction among class members and me - and will entertain any suggestions. As the class is small we should be able to find some options that can work with varied time zones.

4) With the exception of two, all "labs" are based in the electronic classroom in Burnside's Geographical Information Centre. We will have remote access to the computers (and software) in the electronic classroom. I have not sorted out how we will proceed with this if time zones are a challenge. We will discuss this as the course begins to make certain that each student can equally engage with the course.

5) The greatest disappointment is the absence of the field trip! I am planning to develop a virtual field trip to the different types of wetlands we would have visited.

Instructor: Prof. Gail Chmura, (514) 926-6854, gail.chmura@mcgill.ca, virtual office hours by appointment, if you have internet limitations and calls are long distance, I am happy to call you.

Lectures: posted by 11:30 am Montreal time, Tuesdays

Labs: instructions and oral introductions posted by 12:30-2:25 am Montreal time**,** Thursdays
I am hoping to have the 2 labs that we would have as “wet labs” immediately following our virtual field trips a combination of videos with some chance for interaction.
The remainder of the semester will not vary from previous years and will be computer labs with short oral introductions. (Learning outcomes of these labs are to make efficient use of Excel, how to organize data sets for publication, become familiar analyses of plant community data including statistical analyses.) Students will be able to work on the computers in the electronic classroom of Burnside’s Geographic Information Centre by logging in remotely. Once we know in what time zones Wetland students are working in I can schedule zoom sessions so that we can share screens and help you work through any challenges and answer questions. Often students are able to help each other with lab tasks.

Field trip:
I am still designing a virtual field trip that would take you to the same types of wetlands we visited personally in previous years. Assignment 1 will be adapted to be executable with the virtual field trip. In the past, we collected data and sample during the field trip. The virtual field trip will show you how the data and samples are usually collected. Data will be available for all the follow-up labs.
In previous years, this trip took 3 days, but this year you will be able to avoid the driving and getting stuck in the mud! Note that a university fee of $68 covered transportation and the costs of the professor's accommodation. I assume that McGill will waive the fee this year. (It may be automatically applied when you register, thus may have to be rebated.)

Course Description

A review of the classification, ecosystem services, and biophysical aspects of wetlands: soils, hydrology, and adaptations of biota with an emphasis on ecological biogeography. Includes major ecological processes that occur in wetlands and the environmental factors that control the structure and function of wetland systems. Field and laboratory work techniques for studying plant communities are emphasized and applied to the three different types of wetlands visited.

Prerequisites: Permission of instructor. Students should have completed other courses in natural science at the 300 level or above. A course in ecology or plant science will be particularly helpful.

Course outcomes
This course covers many of the basics of biogeography using wetland ecosystems as examples.

1. Experience with field and mathematical techniques for describing plant communities.
2. Knowledge of ecological biogeography.
3. An appreciation of the biophysical structure of wetlands, the major ecological processes that occur in wetlands and the environmental factors that control the structure and function of wetland systems
4. A wetland vocabulary (understanding of terms for wetlands and their vegetation)
5. Ability to organize and present scientific data and prepare a paper in a manner suitable for journal publication.
6. Familiarity with statistical techniques useful for analyzing environmental data (similarity measures, regression, classification and ordination methods)
7. Knowledge of critical ecosystem functions and services of wetlands
8. Knowledge of anthropogenic impacts (climate change, nutrient enrichment, invasives) on wetlands

Evaluation:
Rather than test your ability to recall information and compose thoughtful prose in a sleep-deprived state, you will be evaluated on your knowledge of the course material through a series of assignments. These assignments will require you to apply material from lectures and readings as you assess data from the field trip and labs, or the primary literature. (Lecture topics are followed by A# to indicate the relevant assignment.) To obtain a "B" grade it should be clear from your writing that you have covered and understand the assigned material as well as the science it is based upon. If you make a statement that contradicts your readings you must recognize that apparent contradiction and explain your position. You also must follow instructions. For example, if you are asked to critique a model or hypothesis presented in a paper, you must be able to recognize these aspects and not simply consider a related detail. "A" grades will be awarded to those papers that demonstrate insight and creativity. To receive top grades you also must write clear, direct prose with good grammar. You will receive critiques of these aspects of your writing using Word's track changes and expectations of good writing will increase over the semester.
The research you do for assignments is original and the whole class can benefit from what you have learned. Thus, each student will prepare a 3-minute oral presentation (limited to 3 PowerPoint slides) for Assignments 2 – 4. The presentation for Assignment 5 is longer. These will not be graded, but do provide a chance to get feedback on your assignment before it is submitted for grading. Depending upon who is in the class (and where they are) we may be able to do some of these "live" in a zoom meeting which is recorded for those who are limited by time zones or internet connections. Those not recorded "live" will be recorded by each student and uploaded to MyCourses for all to review. At the beginning of the semester we will have some practice in making, saving and loading videos. We also will discuss how to proceed with this part of the course to be sure that all are in agreement.

Once we know what time zone and internet limitations are face by class members dates for presentations and submission of written products (mentioned below) will be set.

GEOG 470 does not include Assignment 7 and in that course greater weight is given to other assignments. Undergraduates also receive 5% for course participation.		
Assignment#	Topic	Course weight
Assignment 1	Classification and values of wetlands visited on field trip written product due date	10%
Assignment 2	Assess the nature of wetland succession as reflected in the paleoecological record reported in the primary literature class presentations written product due date	10%
Assignment 3	Critique Zedler's invasive model with recent examples from the primary literature class presentations written product due date	5%
Assignment 4	Critique flood-pulse concept with recent examples from the primary literature class presentations written product due date	5%
Assignment 5	Update of textbook chapter on a type of wetland written proposal due class presentations written product due date	20%
Assignment 6	Diversity of wetlands & its controls (this is an original analysis and report of data collected in the field and laboratory – no oral presentation) 1st draft Final version due	20%
Assignment 7	Meta-analysis or original review on topic to be chosen in consultation with Prof. Chmura Meeting to choose topic Preliminary literature list (annotate) Meeting to discuss analyses Initial text Revised text	30%

Readings

REQUIRED

Mitsch, WJ and Gosselink, JG. 2015. *Wetlands, fifth edition*. John Wiley & Sons, Inc. ISBN: 978-1-118-67682-0

The McGill library owns an electronic copy of this text; which is available to all McGill students. (You must be using the McGill VPN or be properly signed in. (Of course, one could also purchase an electronic or hard copy of this text through online sources.)

Strunk, W, Jr and White, EB. multiple years. *The Elements of Style*. Macmillan, NY.

You will need to read this entire (26 page) book before writing your first assignment – grading of all your texts will consider how well you followed the guidelines of Strunk and White. A pdf copy is available on MyCourses.

Additional publications are assigned for many topics. Many will be downloadable from MyCourses, while journal articles can be obtained online when using a McGill IP address.

Tentative lecture topics and readings see announcements in class for updates
"Chapters" refers to Mitsch & Gosselink text, additional papers may be assigned

The quagmire of wetland plant forms, wetland types and classification (A1)

- Chapter 2 Wetland Definitions and 8 Wetland Classification
- Cowardin, LM, Carter, V, Golet, FC, & LaRoe, ET. 1979. Classification of Wetlands and Deepwater Habitats of the United States. FWS/OBS-79/31, U.S. Fish and Wildlife Service, Washington, D.C. 103 pp. (pdf available on MyCourses)
- Warner, BG & Rubec, CDA. 1997. The Canadian Wetland Classification System, second edition. National Wetlands Working Group, Wetlands Research Centre, University of Waterloo, Ontario. (pdf available on MyCourses)

Ecological services of wetlands (including uses and management (A1)

- Chapter 1 Wetlands: Human History, Use and Science;
- Chapter 11 Values and Valuation of Wetlands
- Costanza, R. & others. 1997. The value of the world's ecosystem services and natural capital. Nature 387:253-260.
- Mayer, PM, Reynolds, SK Jr, McCutchen, MD & Canfield, TJ. 2007. Meta-analysis of nitrogen removal in riparian buffers. *Journal of Environmental Quality* 36:1172–1180.

Special adaptations of organisms to wetland conditions (field trip, A2, 5, 6)

- Chapter 6 Biological Adaptations to the Wetland Environment

Wetland succession – myths, historical baggage and evidence from paleoecological studies (A2)

- Chapter 7 Wetland Ecosystem Development
- Excerpts from writings of Clements and Gleason – download from MyCourses
- Hughes, PDM, & Dumayne-Peaty, L. 2002. Testing theories of mire development using multiple successions at Crymlyn Bog, West Glamorgan, South Wales, UK. *Journal of Ecology* 90:456-471.
- Written "dialog" with Hughes – download from MyCourses
- Wetland terms and definitions – download from MyCourses

What is a propagule? Climate warming and problems of upstream migration! (A3, 6)

- Green, AJ, Figuerola, J & Sanchez, MI. 2002. Implications of waterbird ecology for the dispersal of aquatic organisms. *Acta Oecologia* 23:177-189.
- Middleton, B. 2000. Hydrochory, seed banks, and regeneration dynamics along the landscape boundaries of a forested wetland. *Plant Ecology* 146:169-184.

Invasive species (A3)

- Zedler, JB & Kercher, S. 2004. Causes and consequences of invasive plants in wetlands: Opportunities, opportunists, and outcomes. *Critical Reviews in Plant Sciences* 23(5):431–452.
- Lavoie, C, Jean, M, Delisle, F & Letourneau, G. 2003. Exotic plant species of the St Lawrence River wetlands: a spatial and historical analysis. *Journal of Biogeography* 30:537–549.

Pulse-flood concept (A4)

- Junk, WJ & Wantzen, KM. 2006. Chapter 11 Flood pulsing and the development and maintenance of biodiversity in floodplains. Pp. 407-435 IN Baltzer, DP & Sharitz, RR (eds.) *Ecology of Freshwater and Estuarine Wetland*s. University of California Press, Berkeley.

Hydrology - why do wetlands exist? - Tides, floods, and *Sphagnum* (A5)

- Chapter 4 Wetland Hydrology

What makes flooded soils special? Wetland soil chemistry and redox potential (A5, 6)

- Chapter 5 Wetland Biogeochemistry

What controls diversity of wetlands? Environment, stress and competition (A6)

- Keddy, PA 2000. Chapter 3 Diversity. In: Keddy, PA, *Wetland Ecology* (pp. 124-176). Cambridge: Cambridge University Press.
- Virtanen, R, Muotka, T, & Saksa, M. 2001. Species richness-standing crop relationship in stream bryophyte communities: patterns across multiple scales. *Journal of Ecology* 89:14-20.

Global change, sea level rise, hurricanes and tidal wetland sustainability

- Chapter 7 Wetland Ecosystem Development and Chapter 10 Climate Change and Wetlands
- Torio, D & Chmura, GL. 2013. Assessing Coastal Squeeze of Tidal Wetlands. *Journal of Coastal Research* 29(5):1049-1061.
- Cahoon, DR, Hensel, P, Rybczyk, J, McKee, KL, Profitt, CE & Perez, BC. 2003. Mass tree mortality leads to mangrove peat collapse at Bay Islands, Honduras after Hurricane Mitch. *Journal of Ecology* 91:1093-1105.
- McKee, KL, Cahoon, DR & Feller, IC. 2007. Caribbean mangroves adjust to rising sea level through biotic controls on change in soil elevation. *Global Ecology and Biogeography* 16:545-556.

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- *McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see **www.mcgill.ca/students/srr/honest/** for more information).* ***Much of the graded material in this course is prepared using a single data set available to the class. You may discuss the veracity of this data with class members, but all thoughts expressed in your written products must be your own or properly referenced – see journal articles for examples.***
- *In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded.*
- *For information on university and department policies for student assessment, please go to http://www.mcgill.ca/geography/studentassessment*
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- *As the instructor of this course, I endeavor to provide an inclusive learning environment. However, if you experience barriers to learning in this course, do not hesitate to discuss them with me and the Office for Students with Disabilities, 514-398-6009.*
- *End-of-course evaluations are one of the ways that McGill works towards maintaining and improving the quality of courses and the student's learning experience. You will be notified by e-mail when the evaluations are available on Mercury, the online course evaluation system. Please note that a minimum number of responses must be received for results to be available to students."*
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