GEOG 670 Wetlands Advanced fall 2022
Tentative Course Outline

Instructor: Prof. Gail Chmura, Room 628, Burnside Hall, 926-6854, gail.chmura@mcgill.ca
office hours by appointment

Lectures: Monday 2:35-4:25 pm, BH 308

Labs: Thursday 2:35-5:25 am
One week will be outside, otherwise BH 5th floor electronic classroom (511), except for 2 labs immediately following our field trip when we will be processing samples in BH 608. I hope to have lab instructions distributed in class prior to the scheduled lab activity.

Required Field trip:
We will take a three day field trip from Sept 17-19 to three wetlands, in the St. Lawrence River Valley. You will need rubber boots (calf height) and rain gear that you are willing to get muddy. Students pay for their own meals and accommodations. I have reserved a mixed dorm room of a hostel in Quebec City (https://qbeds.ca/en/). The university fee of $68 covers ground transportation (vehicle rental, fuel, and ferry tolls from Levis to Quebec City across the St. Lawrence) and the costs of the professor's accommodation. The trip's duration is 3 days.

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. Techniques for studying plant communities are emphasized and applied to 3 different types of wetlands through field and laboratory work.

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 primarily 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.

Assignment#	Topic	Course weight
Assignment 1	Classification and values of wetlands visited on field trip written product due date	10% Sept 29
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% Oct 17 Oct 19
Assignment 3	Critique Zedler's invasive model with recent examples from the primary literature class presentations written product due date	5% Nov 7 Nov 9
Assignment 4	Critique flood-pulse concept with recent examples from the primary literature class presentations written product due date	5% Nov 21 Nov 23
Assignment 5	Update of textbook chapter on a type of wetland written proposal due class presentations written product due date	20% Nov 14 Dec 5 Dec 6
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% Dec 11 Dec 19
Assignment 7	Meta-analysis or original review on topic to be chosen in consultation with Prof. Chmura Meeting to choose topic Preliminary literature list (annotated if a review) Meeting to discuss analyses Initial text Revised text	25% Nov 15 Nov 23 Nov 30 Dec 15 Dec 21
	Pop quizzes There will be 5 pop quizzes over the semester, possibly at the beginning of labs or lectures. Each will be worth 1% of your final grade. If you find it necessary to miss a class or lab, please give me notice!	5%

Readings

REQUIRED

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

Copies have been ordered by the McGill bookstore. (It also is available as an ebook for CDN $124.99.)

Strunk, W., Jr. and White, E.B. 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. If you would like a hard copy you can find one in the McGill Library system.

Additional publications are assigned for many topics. Some will be downloadable from myCourses and 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)

- Chapters 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. and others. 1997. The value of the world's ecosystem services and natural capital. Nature 387:253-260.

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, P.D.M, & 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)

- See PowerPoint on mycourses.
- 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, D.P. and Sharitz, R.R. (eds.) Ecology of freshwater and estuarine wetlands. 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, P.A. 2000. Chapter 3 Diversity. In: Keddy, P.A. (Ed.), *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. in press. Assessing Coastal Squeeze of Tidal Wetlands. *Journal of Coastal Research*.
- 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.
- 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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