GEOG 540 Wetlands fall 2016 Tentative Course Outline

There will be no lab on Friday Sept 2.

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

Lectures Thursday 3:35-am 5:25 pm, room 308 Burnside Hall (BH)

Labs Monday 11:35 am – 2:25, pm One week will be outside, then BH 5th floor electronic classroom (511), except for 2 labs immediately following our field trip when we will be processing samples in BH 615. 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 (Sept 23-25) to wetlands along the St. Lawrence River. Students will be responsible for costs of meals, cost of housing and partial cost of transportation. Transportation will be partially subsidized for Geography majors. You will need rubber boots (calf height) and rain gear that you are willing to get muddy.

Prerequisites: Permission of instructor. Students should have completed other courses in natural science at the 300 level. 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

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

Calendar description of GEOG 470
An examination of the structure, function and utility of wetlands. Topics include the fluxes of energy and water, wetland biogeochemistry, plant ecology in freshwater and coastal wetlands and wetlands use, conservation and restoration. Field trip(s) are envisaged to illustrate issues covered in class.

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.) By their nature, there can be no set rubric for grading the assignments. 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 and 5 for Assignment 5 which will be a longer presentation. These will not be graded, but do provide a chance to get feedback on your assignment before it is submitted for grading.

Assignment 1	Classification and values of wetlands visited on field trip written product due date	10% Oct 7
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% Sept 29 Oct 3
Assignment 3	Critique Zedler's invasive model with recent examples from the primary literature class presentations written product due date	5% Oct 13 Oct 17
Assignment 4	Critique flood-pulse concept with recent examples from the primary literature class presentations written product due date	5% Nov 3 Nov 7
Assignment 5	Update of textbook chapter on a type of wetland written proposal due class presentations written product due date	20% Nov 3 Nov 17 Nov 21
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	30% Dec 7 Dec 16
Grad only 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	20% Sept 18 Oct 16 Oct 23 Nov 10 Dec 14

Readings

Copies of the two texts will be on reserve at the Schulich Library and the fifth edition of Wetlands has been ordered at the McGill bookstore. (It also is available as an ebook for CDN $124.99.)

Mitsch, W.J. and Gosselink, J.G. 2015. *Wetlands, fifth edition*. John Wiley & Sons, Inc. ISBN: 978-1-118-67682-0
You will use this text for Assiginment 5

Additional publications are assigned (see attached) for many topics. Some will be downloadable from mycourses, some distributed in class and others can be obtained through the McGill Library.

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.
- Paul M. Mayer, P.M., S.K. Reynolds, Jr., M.D. McCutchen, and T.J. Canfield. 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, 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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