

GEOG 405 – Wetlands

University of Waterloo, Geography and Environmental Management

Fall 2019 (10/09/2018)

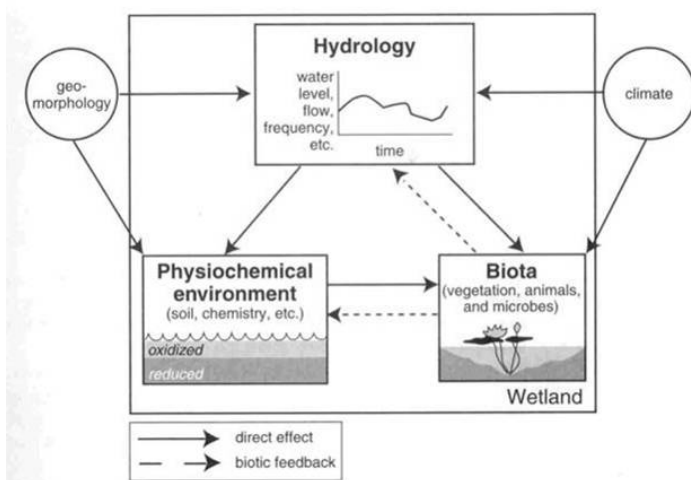
Instructor: Jonathan Price, EV1-122, jsprice@uwaterloo.ca. Office hours TBA

Teaching Assistant: TBA Office hours TBA

Meeting times: Wednesday and Friday 8:30-10:20

EV1 350

Wetlands are land areas with persistent saturation resulting in distinct soils, and vegetation adapted to wet conditions. There is a great variety of wetland types, since they are subject to the particular geomorphic setting in the landscape and the local climate. These high-level controls dictate the hydrological regime, biogeochemistry and ultimately the ecology, as shown in the diagram. Take a moment to reflect on the range of possible conditions dictated by the location in a landscape, and how these may vary in



different climates, or if the climate changes. Wetlands provide billions of dollars of ecosystem services annually in Canada, including flood protection, water quality amelioration, carbon sequestration and habitat. Human activities including resource development, climate change and accidental contamination affect wetland function. Can these systems be restored? Can they be better managed? If so, only if they are

well understood. This course examines the biophysical and geochemical processes associated with wetlands and wetland development, methods to identify, classify and systematically determine their value, examines human impacts on wetland functions, and considers approaches to restoration. This course will provide the essential information for your future career as environmental scientists, consultants, educators, regulators or policy-makers dealing with landscapes that include wetlands.

The course includes several field visits, which will form the basis for major assignments in which you will use the Southern Ontario Wetland Evaluation System to score different wetlands and synthesize field data and information inferred from the literature. The goal of the course is to familiarize you with the science and issues relating to wetlands, so you are positioned to contribute to their protection and continued function.

Intended Learning Outcomes

At the end of the course student should be able to:

1. Identify classes of wetlands as described by the Canadian Wetland Classification System (bogs, fens, swamps, marshes, shallow water) and determine the wetland forms within these classes.
2. Describe the hydrological, biogeochemical, carbon and ecological character of each wetland class.
3. Understand and use (parts of) the Southern Ontario Wetland Evaluation System.
4. Recognize the threats to wetlands imposed by human activity, and approaches to their restoration.
5. Synthesize field and secondary data to make a logical, science-based assessment of selected local wetland systems.

This outline is available online at LEARN. Materials presented in the lectures will be posted on LEARN before the lecture. You may choose to use these as a basis for your notes during class. You are expected to attend all lectures. Materials presented in lectures will be part of the quizzes.

Course Requirements and Evaluation

Field Trip Wetland Evaluation	20%
Site Assessment Report	15%
Independent Study Oral Presentation	20%
Independent Study Report	15%
Online Quizzes	20% (best 4 out of 5)
Participation	10%

Field Trips:

The assignment work in this course is built on field trips. One trip will be an all-day trip to wetlands in the Waterloo Region. This trip is intended to provide you with exposure and appreciation of their role in the natural environment and are essential to complete the wetland evaluation project. If you are unable to participate, there is an alternative assignment you must complete in lieu of the field trip.

There will be an all-day field trip on **Saturday 14 September**, leaving from the Ring Road in front of ES2 at 8:30 am or as otherwise designated. You must provide your own food and refreshments. For this trip, there is a Field Trip Report required (20% of your final mark), in which you will complete selected sections of the Southern Ontario Wetland Evaluation System (SOWES) for the sites visited. This may be done in pairs. In addition, you will be required to write a concise (~500 word) Site Assessment of one of these systems (15% of your final mark);

group members must choose alternate systems, and these must be done individually. As part of your participation mark, you will critique your partner's first draft using the edit function in MS-Word (or equivalent), showing all corrections and comments. If you do not attend this field trip, your alternate assignment will be to provide a report on sites chosen by the instructor that you must visit on your own time and with your own transport (allowing for disability), and a ~2500 word report explaining their regional context, contrasts, vulnerabilities and management options.

The Independent Study will be based on a wetland of your choice. You may work in groups of 2 or 3 to gather and assess the information you collect. This could include an assessment using SOWES, information from the regional data base (<https://data.grandriver.ca>), site information on hydrology, soils, vegetation, local impacts, policies, management plans, etc. The oral presentation (20% of your final mark) will be done by the group, and group members will receive the same grade. A ~500 word Independent Study Report must be done individually (15% of your final mark). You will provide critiques of oral presentations of other groups, and a critique of a draft of one of your partners' reports as part of your participation mark.

The participation mark will be based on a) the quality of editorial comments in your assessment of your partner's Field Trip Report (0 – not done; 1 – weak/minor; 2 – mostly grammatical; 3 – grammatical and some helpful comments; 4 – includes corrections to grammar and syntax, including helpful and insightful comments; 5 – helpful, substantial and insightful); b) assessment of the Independent Study Report using the same criteria listed above; and c) critique of oral presentations (0 – not done; 1 – present and providing critiques on one of the presentation days ; 2 – present and providing critiques on both of the presentation days).

All material is due at the beginning of class on the specified due date. Late work will be subject to a late penalty of 10% off the total marks assigned for the exercise per day (including weekends). Assignments will not be accepted seven days after the due date. Special arrangements can be made when an assignment is late for university accepted, verifiable reasons beyond one's control. You must inform your professor immediately when such circumstances arise

There will be five quizzes each worth 10%; the best four out of five will count toward your final mark. They will be based on the materials of the preceding several lectures, assigned readings and discussion papers. The tests will be online, posted on as shown on the itinerary table below. You have one week to complete the quiz unless indicated otherwise.

Itinerary: Assignments, quizzes, and lectures dates (unless notified otherwise)

Wednesday	Friday
Sept 4 <i>Introduction: What is a wetland? Concept and Definitions</i> (Ch. 1, p.1-6) Wetlands of Canada (pdf 232 MB)	Sept 6 <i>Hydrogeomorphic Setting of Wetlands</i> (Ch. 1, p.7-12; Ch. 10, 199-205) (Brinson, 1993 p. 19-25) <i>Wetland identification and classification</i> Canadian Wetland Classification System
Sept 11 <i>Wetland Valuation; Southern Ontario Wetland Evaluation System (SOWES)</i>	Sept 13 Online Quiz Field Trip Preparation
Saturday September 14 Field Trip	
Sept 18 Discussion: Evaluating SOWES (Savanta 2018) Help Session field trip report	Sept 20 <i>Wetland Development</i> (Ch. 7, p.127-143); Belyea and Baird (2006) p. 299-305
Sept 25 <i>Wetland Development Case Study: O. Volik</i> Discussion Belyea and Baird (2006) p. 299-305	Sept 27 <i>Carbon Exchanges in Wetlands</i> (Maria Strack) (Ch. 12, p.254-273 & Ch. 14, 296-306) (Limpens et al. 2008). Draft Site Assessment Report due
Oct 2 Online Quiz Discussion paper: Roulet et al. 2007 Independent Study Assignment Site Assessment critiques due	Oct 4 Site Assessment Reports and due <i>Wetland Hydrology</i> (Ch. 8); Rochefort et al. (2012), p. 119-121
Oct 9 Online Quiz Discussion paper: Ingram (1982) Independent Study Help Session	Oct 11 <i>Wetland Hydrology</i> (continued) Case Study (M. Elmes) Field Trip: Written (SOWES) Reports due
Oct 16/18 Thanksgiving/Reading Week	
Oct 23 <i>Wetland Biogeochemistry</i> (Ch. 9); Rochefort et al. (2012), p.121-123	Oct 25 Online Quiz <i>Wetland Ecology Case Study: C. Robichaud;</i> Robichaud and Rooney (2017)
Oct 30 <i>Wetland Ecology and Adaptation</i> (Ch. 3, p. 274-287)	Nov 1 <i>Human Use of Wetlands</i> (Ch. 12, p.259-261; Ch. 13, p.262-279)
Nov 6 <i>Contamination of wetlands</i> Case Study	Nov 8 <i>Wetland Restoration</i> (Ch. 12, p.287-294)
Nov 13 Online Quiz Discussion paper: Elzinga, 2010	Nov 15 <i>Wetland Construction (Reclamation)</i> Draft Independent Study written assignment due
Nov 20 Oral Presentations	Nov 22 Oral Presentations Independent Study Written Assignment & critique due

Required Texts

Rydin, H., & Jeglum, J. K. (2013). *The Biology of Peatlands*, 2e. Oxford University Press. (This book is on reserve in Davis library, and is **available online through the library**).

Readings (available online or through LEARN):

Belyea LR, Clymo RS. 2001. Feedback control of the rate of peat formation. *Proceedings of the Royal Society of London: Biological Sciences* 268: 1315–1321.

Brinson, MM., 1993a. A Hydrogeomorphic Classification for Wetlands. Technical Report WRP-DE-4. US Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi, USA.

Canadian Wetland Classification System http://www.gret-perg.ulaval.ca/fileadmin/fichiers/fichiersGRET/pdf/Doc_generale/Wetlands.pdf

Elzinga, M. (2010). The Peat Report: A Case For Canadian Peat Moss. Greenhouse Grower. <http://www.greenhousegrower.com/article/19187/the-peat-report-a-case-for-canadian-peat-moss>

Ingram, H. A. P. (1982). Size and shape in raised mire ecosystems: a geophysical model.

Limpens, J., Berendse, F., Blodau, C., Canadell, J. G., Freeman, C., Holden, J., ... & Schaepman-Strub, G. (2008). Peatlands and the carbon cycle: from local processes to global implications-a synthesis. *Biogeosciences*, 5, 1475-1491.

Robichaud, C. D., & Rooney, R. C. (2017). Long-term effects of a *Phragmites australis* invasion on birds in a Lake Erie coastal marsh. *Journal of Great Lakes Research*, 43(3), 141-149.

Rocheftort, L., Strack, M., Poulin, M., Price, J.S. and Lavoie, C. 2012. Northern Peatlands, *in* *Wetland Habitats of North America: Ecology and Conservation Concerns* (Batzer, D.R., and Baldwin, A.H., eds), University of California Press, Los Angeles, 119-134.

Roulet, N. T., Lafleur, P. M., Richard, P. J. H., Moore, T. R., Humphreys, E. R., and Bubier, J. 2007. Contemporary carbon balance and late holocene carbon accumulation in a northern peatland, *Glob. Change Biol.*, 13, 397–411.

Rubec, C. D. A. (1988). *Wetlands of Canada*. Polyscience Publications Inc.

Savanta 2018. Ontario Wetland Conservation Strategy and Evaluation System: Technical Paper. http://cms.savanta.ca/sites/default/files/2018-04/Ontario%20Wetland%20Strategy%20and%20Evaluation%20System%20Technical%20Paper_0.pdf

Southern Ontario Wetland Evaluation System (SOWES)

Zoltai, S.C. and D. Vitt. 1995. Canadian Wetlands - Environmental Gradients and Classification. Vegetation, 118: 131-137.

Additional Reading and Reference Materials

Grand River Information Network <https://data.grandriver.ca> (Online mapping tools showing wetlands, soils, land use, etc)

MNR of Ontario Flow Assessment Tool (OFAT; for mapping watersheds, etc.).
<http://www.gisapplication.lrc.gov.on.ca/OFAT/Index.html?site=OFAT&viewer=OFAT&locale=en-US>

Publications of the North American Wetlands Conservation Council (Canada)
<http://nawcc.wetlandnetwork.ca/pubs.html> (Many useful government reports and publications)

Academic Honesty

Academic Integrity: To create and promote a culture of academic integrity, the behavior of all members of UW is based on honesty, trust, fairness and responsibility. Students who are unsure what constitutes an academic offence are requested to visit the on-line Tutorial at <http://www.lib.uwaterloo.ca/ait/>

Note for students with disabilities: The Office for Persons with Disabilities (OPD), located in Needles Hall, Room 1132, 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 the OPD at the beginning of each academic term.

Religious Observances: Please inform the instructor at the beginning of term if special accommodation needs to be made for religious observances that are not otherwise accounted for in the scheduling of classes and assignments.

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, <http://www.secretariat.uwaterloo.ca/Policies/policy70.htm>

Discipline: A student is expected to know what constitutes academic integrity, to avoid committing academic offenses, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offense, or who needs help in learning how to avoid offenses (e.g., plagiarism, cheating) or about “rules” for group work/collaboration should seek guidance from the course professor, academic advisor, or the Undergraduate Associate Dean. When misconduct has been found to have occurred, disciplinary penalties will be imposed under Policy 71—Student Discipline. For information on categories of offenses and types of penalties, student should refer to Policy 71—Student Discipline, <http://www.secretariat.uwaterloo.ca/Policies/policy71.htm>

Appeals: A student may appeal the finding an/or penalty in a decision made under Policy 70 or Policy 71 if a ground for an appeal can be established. Read Policy 72—Student Appeals, <http://www.secretariat.uwaterloo.ca/Policies/policy72.htm>